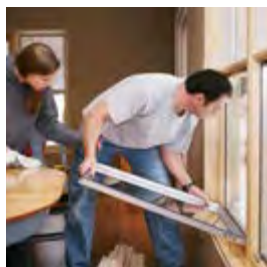


An Evaluation  
of Affordable  
Housing  
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Standard



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Prepared for  
U.S. Department of Housing  
and Urban Development  
Washington, D.C.

Prepared by  
NAHB Research Center, Inc.  
Upper Marlboro, MD

October 2012

# Acknowledgments

U.S. Department of Housing and Urban Development (HUD), Office of Healthy Homes and Lead Hazard Control, Policy and Standards Division:

Peter J. Ashley, Director  
HUD, Office of Policy Development and Research:  
Edwin Stromberg, Government Technical Representative

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Michael Grothe, NAHB Research Center  
John Peavey, NAHB Research Center

Other Contributing Agencies and Housing Authorities

The authors thank the following public agencies and housing authorities for providing the architectural designs and specifications that made this report possible.

HUD

The Housing Opportunities for People Everywhere (HOPE) VI Program  
The HOME Program  
The Federal Emergency Management Agency  
The Alternative Housing Pilot Program  
The City of Bayou La Batre in Alabama  
The Louisiana Recovery Authority in Louisiana  
The Oakland Housing Authority in California  
The Richmond Redevelopment Housing Authority in Virginia  
The Seattle Housing Authority in Washington  
The Akron Metropolitan Housing Authority in Ohio  
The Cuyahoga Metropolitan Housing Authority in Ohio  
The Montgomery County Department of Housing and Community Affairs in Maryland

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# Abstract

Using the National Green Building Standard (NGBS) as the benchmark, this report provides a retrospective evaluation of eight affordable housing designs that were built in compliance with various green building programs. The areas of improvement include water conservation, land design and use, energy efficiency, and green education. The total minimum cost of the improvements is from \$950 to \$3,600. In addition, the report identifies how green remodeling can enhance older houses (residential structures built on or before December 31, 1979) for a minimum cost of \$3,000. The NGBS is a nationally recognized, complete green building standard that complies with Office of Management and Budget Circular No. A-119, which establishes a preference for federal agencies to use voluntary consensus standards.



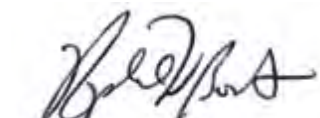
# Foreword

The U.S. Department of Housing and Urban Development, through its housing development programs and the American Recovery and Reinvestment Act of 2009 (ARRA) initiatives, now actively supports the construction of affordable housing using green construction rating systems. This represents billions of dollars in annual federal investment that now supports green building. The expected benefits of these investments are to enhance the quality, longevity, and energy efficiency of HUD's existing and newly-developed housing stock, as well as to assist in the creation and preservation of jobs in communities across the country.

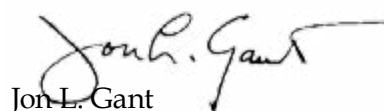
As part of the Department's commitment to create a sustainable future, the Office of Policy Development and Research has initiated a series of research studies to support the Department's efforts to go green and to make HUD's housing stock more energy-efficient. The study reported here, *An Evaluation of Affordable Housing Using the National Green Building Standard*, was conducted in partnership with the Office of Healthy Homes and Lead Hazard Control. The purpose was to estimate the incremental cost of adding green features to existing HUD-assisted properties to make them fully compliant with green building guidelines. Using this, the financial feasibility of bringing these units into full compliance with a nationally recognized, complete green building standard was assessed. In this study, the National Green Building Standard (NGBS) was used as the national standard, although others could have been used.

The study demonstrated that recent affordable housing designs under HUD programs are close to meeting a green standard, and with modest design changes and modest cost increases—up to \$3500 per unit—and could achieve compliance with a green standard. This study provided strong evidence that new or rehabilitated HUD-assisted housing can achieve green ratings at a relatively modest incremental cost, and that such green enhancements would likely be cost-effective because they focus on features that would yield demonstrable cost savings.

We at HUD recognize that much more research is needed to realize the full potential of the greening of affordable housing, and this study represents a useful step in achieving that goal.



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# Table of Contents

<b>Executive Summary</b> .....	<b>xiii</b>
Summary of Evaluation Results: The Affordable House Designs.....	xvi
Summary of Evaluation Results: The Pre-1980 Multifamily Apartment Building.....	xvii
Summary of Key Findings.....	xviii
Potential Policy Implications.....	xix
<b>Introduction</b> .....	<b>1</b>
<b>Chapter 1. Evaluation Protocol</b> .....	<b>3</b>
1.1. National Green Building Standard.....	3
1.2. Defining the Cost and Benefit Analysis.....	5
1.3. The Greening Process.....	7
<b>Chapter 2. Overview of the Baseline Green Ratings</b> .....	<b>9</b>
2.1. Baseline Green Ratings for Affordable House Designs.....	9
2.2. Baseline Green Remodeling Ratings for Multifamily Apartment Units.....	15
<b>Chapter 3. Case Studies: Making Green Improvements</b> .....	<b>17</b>
3.1. Climate Zone #2.....	18
3.1.1. Louisiana Disaster Relief Housing.....	18
3.1.2. Alabama Disaster Relief Housing.....	28
3.2. Climate Zone #3.....	39
3.2.1. Oakland, California: Tassafaronga Development.....	39
3.3. Climate Zone #4.....	51
3.3.1. Richmond, Virginia: Blackwell Development.....	51
3.3.2. Seattle, Washington: High Point Development.....	62
3.4. Climate Zone #5.....	72
3.4.1. Akron, Ohio: Edgewood Homes Development.....	73
3.4.2. Cuyahoga Falls, Ohio: Valley View Homes Development.....	94

3.5	Green Remodeling Using the National Green Building Standard.....	106
3.5.1	Montgomery County, Maryland—The Multifamily Example .....	107
<b>Chapter 4. Key Findings and Green Research Topics.....</b>		<b>129</b>
4.1	Characterizing the Affordable Housing Designs.....	129
4.2	Characterizing the Pre-1980 Multifamily Apartment Units.....	130
4.3	Quantifying Benefits and Affordability.....	131
4.4	Quantifying Energy Savings.....	131
4.5	Quantifying Water Savings .....	135
4.6	Limitations of This Study.....	136
4.7	Recommended Green Research Topics .....	136
<b>APPENDIX A COST DETAILS .....</b>		<b>137</b>
<b>APPENDIX B GREEN SCORING AND COST.....</b>		<b>211</b>
<b>APPENDIX C ENERGY MODELS .....</b>		<b>429</b>
<b>Endnotes.....</b>		<b>731</b>

## List of Tables

Table A-1. Description of Affordable House Designs and Pre-1980 Multifamily Apartment .....	xiii
Table A-2. Baseline NGBS Ratings for the Eight Affordable House Designs .....	xv
Table A-3. Baseline Conditions of Pre-1980 Multifamily Units—Energy, Water, and IEQ .....	xvi
Table A-4. Simple Payback Periods for Energy and Water Improvements .....	xviii
Table 1-1. Rating Levels for the National Green Building Standard.....	3
Table 1-2. Threshold Point Ratings for Green Buildings.....	3
Table 1-3. Remodeling Threshold Ratings for Energy and Water Consumption Reductions .....	4
Table 2-1. Baseline NGBS Ratings for the Eight Affordable House Designs .....	9
Table 2-2. Total Accrued Green Points Versus Performance Path.....	11
Table 2-3. Baseline Existing Conditions per Apartment Unit—Energy, Water, and IEQ .....	15
Table 3-1. Baseline Rating for KC910 Model.....	20
Table 3-2. Bronze Rating for KC910 Model.....	21
Table 3-3. Initial Cost to the Builder for the Bronze KC910 Model .....	22
Table 3-4. Silver Rating for KC910 Model .....	23
Table 3-5. Initial Cost to the Builder for the Silver KC910 Model .....	23
Table 3-6. Gold Rating for KC910 Model.....	24
Table 3-7. Initial Cost to the Builder for the Gold KC910 Model.....	25
Table 3-8. Emerald Rating for KC910 Model .....	26

Table 3-9. Initial Cost to the Builder for the Emerald KC910 Model.....	26
Table 3-10. Overall Cost and Performance Data for KC910 Model.....	28
Table 3-11. Baseline Rating for AMT2356A Model.....	30
Table 3-12. Bronze Rating for AMT2356A Model.....	31
Table 3-13. Initial Cost to the Builder for the Bronze AMT2356A Model .....	31
Table 3-14. Silver Rating for AMT2356A Model .....	33
Table 3-15. Initial Cost to the Builder for the Silver AMT2356A Model.....	33
Table 3-16. Gold Rating for AMT2356A Model.....	34
Table 3-17. Initial Cost to the Builder for the Gold AMT2356A Model.....	35
Table 3-18. Emerald Rating for AMT2356A Model .....	36
Table 3-19. Initial Cost to the Builder for the Emerald AMT2356A Model.....	36
Table 3-20. Overall Cost and Performance Data for AMT2356A Model .....	38
Table 3-21. Baseline Rating for Two-Story Townhouse.....	41
Table 3-22. Bronze Rating for Two-Story Townhouse.....	42
Table 3-23. Initial Cost to the Builder for the Bronze Two-Story Townhouse.....	43
Table 3-24. Silver Rating for Two-Story Townhouse.....	44
Table 3-25. Initial Cost to the Builder for the Silver Two-Story Townhouse .....	44
Table 3-26. Gold Rating for Two-Story Townhouse .....	46
Table 3-27. Cost to the Builder for the Gold Two-Story Townhouse .....	46
Table 3-28. Emerald Rating for Two-Story Townhouse.....	48
Table 3-29. Initial Cost to the Builder for the Emerald Two-Story Townhouse .....	49
Table 3-30. Overall Cost and Performance Data for Two-Story Townhouse .....	50
Table 3-31. Baseline Rating for Single-Family Rowhouse.....	53
Table 3-32. Bronze Rating for Single-Family Rowhouse.....	54
Table 3-33. Initial Cost to the Builder for the Bronze Single-Family Rowhouse .....	54
Table 3-34. Silver Rating for Single-Family Rowhouse .....	55
Table 3-35. Initial Cost to the Builder for the Silver Single-Family Rowhouse.....	56
Table 3-36. Gold Rating for Single-Family Rowhouse.....	57
Table 3-37. Initial Cost to the Builder for the Gold Single-Family Rowhouse.....	58
Table 3-38. Emerald Rating for Single-Family Rowhouse .....	59
Table 3-39. Initial Cost to the Builder for the Emerald Single-Family Rowhouse.....	60
Table 3-40. Overall Cost and Performance Data for Single-Family Rowhouse.....	61
Table 3-41. Baseline Rating for Two-Story Stacked Multiunit .....	64
Table 3-42. Bronze Rating for Two-Story Stacked Multiunit .....	65
Table 3-43. Initial Cost to the Builder for the Bronze Two-Story Stacked Multiunit.....	65

Table 3-44. Silver Rating for Two-Story Stacked Multiunit.....	66
Table 3-45. Initial Cost to the Builder for the Silver Two-Story Stacked Multiunit.....	67
Table 3-46. Gold Rating for Two-Story Stacked Multiunit .....	68
Table 3-47. Initial Cost to the Builder for the Gold Two-Story Stacked Multiunit .....	69
Table 3-48. Emerald Rating for Two-Story Stacked Multiunit.....	70
Table 3-49. Initial Cost to the Builder for the Emerald Two-Story Stacked Multiunit.....	71
Table 3-50. Overall Cost and Performance Data for Two-Story Stacked Multiunit.....	72
Table 3-51. Baseline Rating for Townhouse Type A .....	74
Table 3-52. Bronze Rating for Townhouse Type A.....	75
Table 3-53. Initial Cost to the Builder for the Bronze Townhouse Type A .....	76
Table 3-54. Silver Rating for Townhouse Type A.....	77
Table 3-55. Initial Cost to the Builder for the Silver Townhouse Type A.....	77
Table 3-56. Gold Rating for Townhouse Type A .....	79
Table 3-57. Initial Cost to the Builder for the Gold Townhouse Type A .....	79
Table 3-58. Emerald Rating for Townhouse Type A.....	81
Table 3-59. Initial Cost to the Builder for the Emerald Townhouse Type A.....	81
Table 3-60. Overall Cost and Performance Data for Townhouse Type A.....	83
Table 3-61. Baseline Rating for Single-Family Type D .....	85
Table 3-62. Bronze Rating for Single-Family Type D.....	86
Table 3-63. Initial Cost to the Builder for the Bronze Single-Family Type D .....	87
Table 3-64. Silver Rating for Single-Family Type D.....	88
Table 3-65. Initial Cost to the Builder for the Silver Single-Family Type D.....	88
Table 3-66. Gold Rating for Single-Family Type D .....	90
Table 3-67. Initial Cost to the Builder for the Gold Single-Family Type D .....	90
Table 3-68. Emerald Rating for Single-Family Type D.....	92
Table 3-69. Initial Cost to the Builder for the Emerald Single-Family Type D.....	92
Table 3-70. Overall Cost and Performance Data for Single-Family Type D .....	94
Table 3-71. Baseline Rating for One-Bedroom Apartment.....	96
Table 3-72. Bronze Rating for One-Bedroom Apartment .....	98
Table 3-73. Initial Cost to the Builder for the Bronze One-Bedroom Apartment.....	98
Table 3-74. Silver Rating for One-Bedroom Apartment .....	100
Table 3-75. Initial Cost to the Builder for the Silver One-Bedroom Apartment .....	100
Table 3-76. Gold Rating for One-Bedroom Apartment .....	102
Table 3-77. Initial Cost to the Builder for the Gold One-Bedroom Apartment.....	102
Table 3-78. Emerald Rating for One-Bedroom Apartment.....	104



Table 3-79. Initial Cost to the Builder for the Emerald One-Bedroom Apartment .....	104
Table 3-80. Overall Cost and Performance Data for One-Bedroom Apartment .....	106
Table 3-81. Unit #1—Baseline Existing Conditions .....	108
Table 3-82. Unit #2—Baseline Existing Conditions.....	109
Table 3-83. Unit #3—Baseline Existing Conditions.....	109
Table 3-84. Unit #4—Baseline Existing Conditions .....	110
Table 3-85. Unit #1—Bronze Green Remodel Rating.....	111
Table 3-86. Unit #1—Initial Cost to the Builder for Bronze Green Remodeling .....	111
Table 3-87. Unit #2—Bronze Green Remodel Rating .....	112
Table 3-88. Unit #2—Initial Cost to the Builder for Bronze Green Remodeling .....	112
Table 3-89. Unit #3—Bronze Green Remodel Rating.....	113
Table 3-90. Unit #3—Initial Cost to the Builder for Bronze Green Remodeling.....	113
Table 3-91. Unit #4—Bronze Green Remodel Rating.....	114
Table 3-92. Unit #4—Initial Cost to the Builder for Bronze Green Remodeling.....	114
Table 3-93. Unit #1—Silver Green Remodel Rating.....	115
Table 3-94. Unit #1—Initial Cost to the Builder for Silver Green Remodeling.....	115
Table 3-95. Unit #2—Silver Green Remodel Rating.....	115
Table 3-96. Unit #2—Initial Cost to the Builder for Silver Green Remodeling.....	116
Table 3-97. Unit #3—Silver Green Remodel Rating.....	116
Table 3-98. Unit #3—Initial Cost to the Builder for Silver Green Remodeling.....	116
Table 3-99. Unit #4—Silver Green Remodel Rating .....	117
Table 3-100. Unit #4—Initial Cost to the Builder for Silver Green Remodeling.....	117
Table 3-101. Unit #1—Gold Green Remodel Rating .....	118
Table 3-102. Unit #1—Initial Cost to the Builder for Gold Green Remodeling.....	118
Table 3-103. Unit #2—Gold Green Remodel Rating .....	119
Table 3-104. Unit #2—Initial Cost to the Builder for Gold Green Remodeling .....	119
Table 3-105. Unit #3—Gold Green Remodel Rating.....	119
Table 3-106. Unit #3—Initial Cost to the Builder for Gold Green Remodeling .....	120
Table 3-107. Unit #4—Gold Green Remodel Rating .....	120
Table 3-108. Unit #4—Initial Cost to the Builder for Gold Green Remodeling .....	120
Table 3-109. Unit #1—Emerald Green Remodel Rating .....	121
Table 3-110. Unit #1—Initial Cost to the Builder for Emerald Green Remodeling .....	121
Table 3-111. Unit #2—Emerald Green Remodel Rating .....	122
Table 3-112. Unit #2—Initial Cost to the Builder for Emerald Green Remodeling.....	122
Table 3-113. Unit #3—Emerald Green Remodel Rating.....	123

Table 3-114. Unit #3—Initial Cost to the Builder for Emerald Green Remodeling.....	123
Table 3-115. Unit #4—Emerald Green Remodel Rating.....	123
Table 3-116. Unit #4—Initial Cost to the Builder for Emerald Green Remodeling.....	124
Table 3-117. Overall Cost and Performance Data for Unit #1.....	125
Table 3-118. Overall Cost and Performance Data for Unit #2.....	126
Table 3-119. Overall Cost and Performance Data for Unit #3.....	127
Table 3-120. Overall Cost and Performance Data for Unit #4.....	128

## List of Graphics

Graph A-1. Incremental Cost To Achieve NGBS Green Ratings.....	xvi
Graph A-2. Incremental Renovation Cost To Achieve NGBS Green Remodeling Ratings.....	xvii
Graph 4-1. Incremental Cost of Energy Renovations.....	130

## List of Charts

Chart 3-1. Map of Climate Zones.....	17
Chart 4-1. Annual Energy Cost Distribution for the Original Baseline AMT2356A Design.....	132
Chart 4-2. Annual Energy Cost Distribution for the Silver-Rated AMT2356A Design.....	133
Chart 4-3. Annual Energy Cost Distribution for the Maryland Multifamily Unit #2 Design.....	133
Chart 4-4. Annual Energy Cost Distribution for the Silver-Rated Unit #2 Design.....	134

## Photo


Photo 3-1. Multifamily Demonstration for NGBS Green Remodel Path.....	107
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# Executive Summary

Using the National Green Building Standard (NGBS) as the benchmark, this report provides a retrospective evaluation of affordable housing designs that were built in compliance with various green building programs. In addition, the report identifies how green remodeling can enhance older houses (residential structures built on or before December 31, 1979). The National Association of Home Builders (NAHB) Research Center selected eight affordable house designs and four multifamily apartment units to evaluate; Table A-1 summarizes these designs and units.

Table A-1. Description of Affordable House Designs and Pre-1980 Multifamily Apartment

House Type	House Design Details and Green Program
LRA <sup>a</sup> KC910	Site-built housing, three-bedroom unit, 910 ft <sup>2</sup> , Climate Zone #2, 2006 IRC <sup>a</sup> , built in 2007 as part of the Hidden Cove (AHPP <sup>a</sup> ) Development (Disaster Recovery Program), (Green Program: None)
City of Bayou La Batre AMT2356A	Factory-built modular housing, two-bedroom unit, 967 ft <sup>2</sup> , Climate Zone #2, 2006 IRC, built in 2008 as part of the Safe Harbor (AHPP <sup>a</sup> ) Development (Disaster Recovery Program), (Green Program: None), ENERGY STAR
OHA <sup>a</sup> Townhouse	Site-built townhouse, two-bedroom unit, 1,105 ft <sup>2</sup> , Climate Zone #3, 2007 California Building Code, started in 2009 as part of the Tassafaronga Development, (Green Program: LEED-h <sup>a</sup> )
RRHA <sup>a</sup> Rowhouse	Site-built rowhouse, three-bedroom unit, 1,656 ft <sup>2</sup> , Climate Zone #4, 2006 Virginia Building Code, started in 1997 as part of the Blackwell Development, (Green Program: EarthCraft), ENERGY STAR
SHA <sup>a</sup> Two-Story Multiunit	Site-built two-story multiunit, two-bedroom unit, 946 ft <sup>2</sup> , Climate Zone #4, 2003 Seattle Code, started in 2004 as part of High Point, (Green Program: Breathe Easy Homes), ENERGY STAR
AMHA <sup>a</sup> Townhouse Type A	Site-built townhouse Type A, two-bedroom unit, 1,296 ft <sup>2</sup> , Climate Zone #5, 2003 IRC, started in 2005 as part of Edgewood Homes (Green Program: Ohio Green Community)
AMHA <sup>a</sup> Single-Family Type D	Site-built single-family Type D, four-bedroom unit, 1,908 ft <sup>2</sup> , Climate Zone #5, 2003 IRC/OBC, started in 2005 as part of Edgewood Homes (Green Program: Ohio Green Community)
CMHA <sup>a</sup> One-Bedroom Apartment	Site-built apartment building, one-bedroom unit, 658 ft <sup>2</sup> , Climate Zone #5, 2003 IRC/OBC, started in 2004 as part of Valley View Homes (Green Program: Ohio Green Community)
Pre-1980 Multifamily Units #1-#4	Site-built apartment building, one- and two-bedroom units, 485 ft <sup>2</sup> and 820 sq-ft <sup>2</sup> , Climate Zone #4, built on or before December 31, 1979, in accordance with BOCA <sup>a</sup> , renovation candidate for HOME program, (Green Program: None)
<sup>a</sup> LRA = Louisiana Recovery Authority; IRC = International Residential Code; OHA = Oakland Housing Authority; LEED = Leadership in Energy and Environmental Design; RRHA = Richmond Redevelopment Housing Authority; SHA = Seattle Housing Authority; AMHA = Akron Metropolitan Housing Authority, CMHA = Cuyahoga Metropolitan Housing Authority, and AHPP = Alternative Housing Pilot Program; BOCA = Building Officials Code Administrators International.	



The NGBS promotes a balanced approach to green building by requiring a minimum level of green performance in all green categories (that is, Land/Lot Use, Resource Efficiency, Energy Efficiency, Water Efficiency, Indoor Environmental Quality, and Green Education for Owner). In fact, the Cincinnati Chapter of the American Institute of Architects (AIA Cincinnati) recognizes that the “NGBS requires higher point totals within each division as higher certification levels are sought. LEED does not require higher point totals within each division when seeking higher tier certification [rating]; only the minimum point level is required, allowing for a project to possibly be very strong in several divisions and weak in others. The committee applauds the NGBS requirement for higher point totals within each division as higher certification is sought, thus creating a more balanced project.”<sup>1</sup>

The affordable designs that were built with green programs lacked a balanced approach to green building; instead, these designs focused on maximizing one or two categories of green building, while other areas were rated lower or neglected. Table A-2 summarizes the baseline NGBS rating for the eight affordable house designs. We did not include the pre-1980 multifamily apartment building in Table A-2 because it was evaluated using the NGBS green remodeling method, called the Green Remodel Path,<sup>2</sup> which we discuss later in this report.

Table A-2. Baseline NGBS Ratings for the Eight Affordable House Designs

House Designs and Specifications	Chapter 5 Lot Design, Preparation, and Development	Chapter 6 Resource Efficiency	Chapter 7 Energy Efficiency	Chapter 8 Water Efficiency	Chapter 9 Indoor Environmental Quality	Chapter 10 Operation, Maintenance, and Building Owner Education
LRA <sup>a</sup> KC910	26 NR <sup>a</sup>	52 Bronze	35 Bronze	16 Bronze	43 Bronze	0 NR <sup>a</sup>
City of Bayou La Batre AMT2356A	21 NR <sup>a</sup>	56 Bronze	49 Bronze	5 NR <sup>a</sup>	71 Silver	1 NR <sup>a</sup>
OHA <sup>a</sup> Townhouse	110 Gold	49 Bronze	145 Emerald	18 Bronze	43 Bronze	0 NR <sup>a</sup>
RRHA <sup>a</sup> Rowhouse	68 Silver	78 Bronze	70 Silver	8 NR <sup>a</sup>	103 Gold	0 NR <sup>a</sup>
SHA <sup>a</sup> Two-Story Multiunit	109 Gold	99 Silver	49 Bronze	11 NR <sup>a</sup>	104 Gold	6 NR <sup>a</sup>
AMHA <sup>a</sup> Townhouse Type A	76 Silver	66 Bronze	53 Bronze	35 Silver	39 Bronze	0 NR <sup>a</sup>
AMHA <sup>a</sup> Single-Family Type D	72 Silver	57 Bronze	42 Bronze	36 Silver	49 Bronze	0 NR <sup>a</sup>
CMHA <sup>a</sup> One-Bedroom Apartment	96 Gold	81 Silver	19 NR <sup>a</sup>	10 NR <sup>a</sup>	46 Bronze	6 NR <sup>a</sup>

<sup>a</sup> LRA = Louisiana Recovery Authority; OHA = Oakland Housing Authority; RRHA = Richmond Redevelopment Housing Authority; SHA = Seattle Housing Authority; AMHA = Akron Metropolitan, CMHA = Cuyahoga Metropolitan Housing Authority, and NR = means not rated because the minimum required green points were not achieved for a given green category.

Most of the affordable designs were built before the American National Standards Institute approved the NGBD in January 2009. Therefore, we did not expect any of the designs to meet all the requirements of the NGBS, and we expected some variation across the green building categories, as shown in Table A-2. We estimated the incremental cost of achieving all NGBS ratings (that is, Bronze, Silver, Gold, and Emerald) compared with the baseline rating.

The team evaluated the pre-1980 multifamily apartment building using the NGBS Green Remodeling method. The evaluation focused on four of the eight apartment units. Table A-3 summarizes the existing conditions for each apartment unit in terms of energy performance, water consumption, and Indoor Environmental Quality (IEQ) requirements. We estimated the incremental cost of achieving all NGBS Green Remodeling ratings (that is, Bronze, Silver, Gold, and Emerald) compared with the existing condition of each apartment unit.

Table A-3. Baseline Conditions of Pre-1980 Multifamily Units—Energy, Water, and IEQ

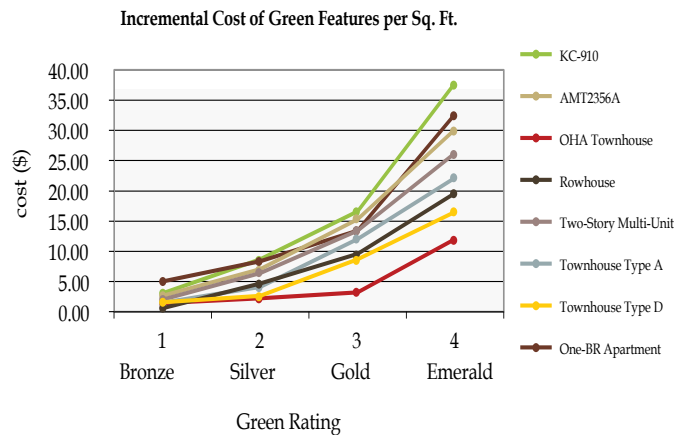
TYPE	Energy Efficiency (e-Ratio <sup>a</sup> )	Water Efficiency (gpd <sup>b</sup> )	IEQ <sup>c</sup> (Requirements)
Unit #1	2.15	51.4	Not met
Unit #2	1.51	43.3	Not met
Unit #3	1.64	45.7	Not met
Unit #4	1.95	53.2	Not met

<sup>a</sup> e-Ratio = computer modeled energy performance/the benchmark energy performance (2006 International Energy Conservation Code (IECC). When the e-Ratio is equal to 1, the house design meets the 2006 IECC requirements. When the e-Ratio is greater than 1, the house design does not meet the 2006 IECC requirements. When the e-Ratio is less than 1, the house design exceeds the 2006 IECC requirements.  
<sup>b</sup> gpd = gallons per day (which is applied to each occupant in the dwelling).  
<sup>c</sup> IEQ = Indoor Environmental Quality.

## Summary of Evaluation Results: The Affordable House Designs

Because most of the affordable house designs have significant green features, the incremental cost of improving the green rating is lower in categories in which green features already exist. In fact, if we were improving a design with no green features, the incremental cost would be higher but the green improvement would be greater. Graph A-1 illustrates the incremental cost of improving the baseline green ratings to a specified NGBS rating level (that is, Bronze, Silver, Gold, and Emerald).

Graph A-1. Incremental Cost to Achieve NGBS Green Ratings



Because the OHA (Townhouse) design has an Emerald rating in the energy-efficiency category and green-rated performance in all but one category, OHA has the lowest incremental cost to achieve the NGBS Silver, Gold, and Emerald ratings. The LRA (KC910), Bayou La Batre (AMT2356A), and CMHA (One-Bedroom Apartment) designs lack significant green features in two or three green categories; as a result, the corresponding incremental cost to make these designs fully compliant with the NGBS trends higher than the other affordable designs.

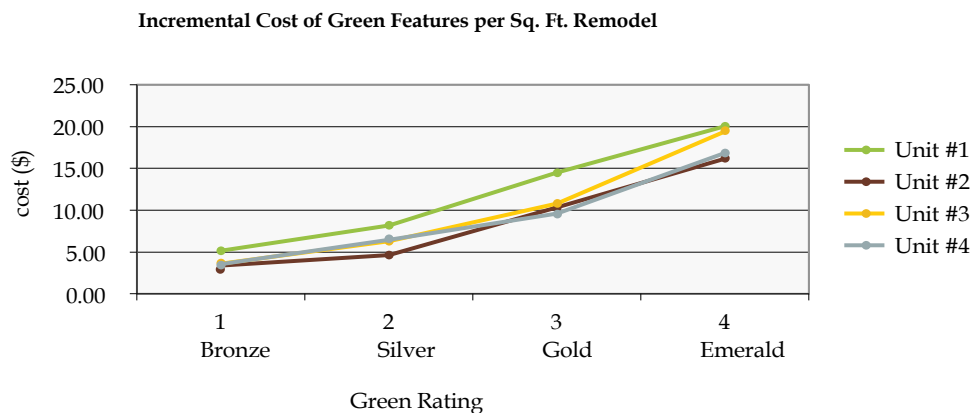
For all affordable designs in Graph A-1, the total incremental cost to achieve an NGBS Bronze rating ranges from \$950 to \$3,300. We consider this range the minimum estimated cost of making the original affordable designs equally strong in all categories of green building and compliant with the NGBS Bronze rating. The OHA (Townhouse) design can be made equally strong in all categories of green building for less than \$3,600, which makes the design compliant with an NGBS Gold rating.

The simple payback period for water-efficiency improvements is less than 5 years for Bronze and Silver ratings and ranges from 5 to 13 years for Gold and Emerald ratings. Energy-efficiency practices were significant in most of the affordable house designs, and the incremental improvements typically exceeded a payback period of 30 years for most of the affordable designs, except the CMHA (One-Bedroom Apartment) design, which had minor energy-efficient features. We were able to improve the energy performance and achieve a simple payback period from 19 to 21 years for the CMHA (One-Bedroom Apartment) design by specifying a centralized boiler system (with solar panels at the Gold and Emerald levels) to supply heat and hot water for the entire apartment building. This economy-of-scale approach to green building has real cost saving potential for multifamily housing.

## Summary of Evaluation Results: The Pre-1980 Multifamily Apartment Building

To estimate the incremental cost of green remodeling, we examined the baseline conditions and then determined the green renovations necessary to achieve the Bronze, Silver, Gold, and Emerald ratings. Graph A-2 illustrates the incremental cost of improving the existing conditions of the four apartment units within the pre-1980 multifamily apartment building.

Graph A-2. Incremental Renovation Cost To Achieve NGBS Green Remodeling Ratings



For these apartment units, the total cost to achieve the Bronze-level rating is estimated to be from \$2,500 to \$3,000, and the Silver-level rating is estimated to be from \$4,000 to \$5,300. This cost does not include the comprehensive audits to establish the existing conditions of the apartment units or the third-party verification of the improvements. The simple payback periods for the energy and water improvements are summarized in Table A-4.

Table A-4. Simple Payback Periods for Energy and Water Improvements

TYPE	Energy Improvement (Simple Payback Period <sup>a</sup> )				Water Improvement (Simple Payback Period <sup>a</sup> )			
	Bronze	Silver	Gold	Emerald	Bronze	Silver	Gold	Emerald
<b>Improved</b>	<b>20%</b>	<b>34%</b>	<b>43%</b>	<b>50%</b>	<b>20%</b>	<b>34%</b>	<b>43%</b>	<b>50%</b>
<b>Units #1 through 4</b>	6–8 years	6–9 years	10–16 years	14–22 years	2–4 years	2–4 years	3–4 years	4–6 years

<sup>a</sup> Simple payback periods for energy and water efficiency are based on the current cost estimates and projected savings; we do not consider future rate increases, inflation, replacement costs, or other conditions over the 30-year evaluation period.

The simple payback periods in Table A-4 are compelling for water-efficiency improvements and reasonable for energy-efficiency improvements, especially at the green remodeling Bronze- and Silver-level ratings. To realize this type of payback period, the house must have older plumbing fixtures and a low-efficiency hot-water heater or heating, ventilation, and air conditioning system.

## Summary of Key Findings

The affordable housing designs in this study can be made equally strong in all areas of green building according to the NGBS for less than \$3,600. Nonetheless, we believe that the U.S. Department of Housing and Urban Development’s (HUD’s) affordable housing programs, independent of the green program, could encourage the following basic improvements.

1. If HUD intends to specify a level of green performance, then the design specifications should identify mandatory green building requirements.
2. Because water conservation practices are lacking in most of the affordable designs based on the NGBS ratings in Table A-2, HUD needs to encourage more water conservation practices in green building because they are cost effective based on simple payback period data.
3. Because green education for homeowners was significantly lacking in most of the affordable designs based on the NGBS ratings in Table A-2, HUD needs to encourage more green education to greater ensure the proper use and maintenance of green technologies by the occupants.
4. Because most of the affordable housing designs were lopsided in their approach to green building based on the NGBS ratings in Table A-2, meaning that certain areas of green were very significant and others were neglected.
5. Because green remodeling for older homes can represent a significant improvement in terms of energy efficiency, water conservation, and indoor environmental quality and, because it has the added benefit of being cost effective, provided the homes have not been updated since 1980.



## Potential Policy Implications

For years, HUD has supported sustainability and affordability in its housing programs. Those programs were developed from existing industry guidelines and criteria that HUD developed. Subsequent to the establishment of HUD's current housing programs was the approval of the National Green Building Standard, ICC 700-2008. The NGBS is a national, voluntary consensus<sup>3</sup> standard that defines criteria for rating the environmental impact of design and construction practices to achieve conformance with specific performance levels for green residential buildings. All residential dwelling types are represented in the NGBS, including new construction and rehabilitation, single-family, multifamily, and residential portions of mixed-use buildings. The NGBS includes building lot and subdivision land development sustainability criteria. The analysis provided in this report identifies the gaps of green building attributes between selected HUD housing programs and the NGBS.

The findings summarized in Table A-2 indicate that HUD's housing programs have fallen behind regarding the level of sustainability when gauged against the NGBS. When HUD considers updating its housing programs for sustainability and green building attributes, the NGBS is the preferred standard to determine those changes, according to federal policy on standards. Office of Management and Budget Circular A-119<sup>4</sup> establishes policies to improve the internal management of the Executive Branch. Consistent with Section 12(d) of P.L. 104-113, the National Technology Transfer and Advancement Act of 1995, this circular directs agencies to use voluntary consensus standards in lieu of nonconsensus standards and government-unique standards, except when they are inconsistent with the law or are otherwise impractical.



# Introduction

Green building has been a goal of many public and private organizations for decades. As a result, several green building programs have been developed that recognize a wide range of sustainable residential construction practices, including low-impact land development, energy efficiency, water conservation, healthy homes initiatives, and recycling. Although the specific details of each green building program can vary significantly, most programs offer design guidance, verification or inspection requirements, and final certification of residential developments and individual houses.

The U.S. Environmental Protection Agency (EPA) defines “green building” as “the practice of creating structures and using processes that are environmentally responsible and resource-efficient throughout a building’s life-cycle from siting to design, construction, operation, maintenance, renovation and deconstruction.”<sup>5</sup> Furthermore, EPA states that “the built environment has a vast impact on the natural environment, human health, and the economy. By adopting green building strategies, we can maximize both economic and environmental performance. Green construction methods can be integrated into buildings at any stage, from design and construction, to renovation and deconstruction. However, the most significant benefits can be obtained if the design and construction team takes an integrated approach from the earliest stages of a building project.”<sup>6</sup>

In recent years, HUD has evaluated green building practices and products through various research projects and field studies. In January 2008, as part of HUD’s Partnership for Advancing Technology in Housing (PATH) program, the NAHB Research Center (Research Center) completed a study that converted a conventional home design into a green-rated design using the NAHB Green Building Guidelines, a predecessor of the National Green Building Standard (NGBS). The house was built by the Lancaster County Career and Technology Center (a vocational high school), as part of the school’s Building Green Community Education project. The Research Center evaluated many green technologies and provided technical support during the construction process.<sup>7</sup>

This study aims to expand HUD’s green building research by evaluating the benefits of green practices that are prescribed in affordable housing designs and identifying green renovations that could improve the existing housing stock. The Research Center selected eight affordable house designs and four multifamily apartment units to evaluate using the NGBS. The evaluation protocol and methodology are defined in chapter 1.

Because most of the affordable house designs in this study were built in accordance with a green building program, we expect the initial green rating to be significant in various green categories; however, we do not expect any of the affordable house designs to meet all requirements of the NGBS. In fact, most of the affordable homes in this study were built before the American National Standards Institute (ANSI) approved the NGBS.

Our study is too limited to reach specific conclusions about the value of any given green program used by the public housing authorities to build their affordable developments. In fact, our evaluations are based on the available architectural designs and specifications, which were built several years ago. With this in mind, the reader should consider the baseline green ratings presented in chapter 2 as that which could be confirmed with available information.

In chapter 3, we incrementally improve the baseline green ratings up to the Emerald level. The following general assumptions were made to standardize our evaluation.

- If a design is built in compliance with 2006 International Residential Code (IRC), then we assume no additional costs are incurred to meet mandatory green requirements that are equivalent to 2006 IRC code minimums.
- If a design is built to the 2003 IRC (or a previous code version), we will identify an estimated additional cost to build the design in compliance with 2006 IRC during the baseline rating evaluation.
- Because documentation of green products and practices is an essential part of designing a green-rated house, we do not assume that green products and practices are in use if they are not identified within the drawings or specifications. Therefore, the baseline rating is developed based on the documentation—in some cases, green products and practices could have been used in construction but were not fully documented in the design and specification materials that we received for the study.
- Because actual air infiltration performance is unknown for most of the house designs in the study, we assumed that all designs were built to the minimum standards of the IECC 2006 with regard to envelope and duct tightness (that is, SLA = 0.00036 and DSE 80 percent, respectively) because doing so would further indicate compliance with the 2006 IRC.
- Other performance provisions embodied in 2006 IRC—such as using Manual J for HVAC system design and sealing ducts with code-approved adhesives—were assumed to be in practice if the design was identified to be in compliance with 2006 IRC. Nonetheless, if documentation for Manual J compliance was not included in the design and specification materials, the baseline rating did not receive credit for this mandatory green requirement.
- The performance approach to calculating energy efficiency improvement defined in the IECC 2006 was followed—only modeled heating, cooling, and water-heating loads are contained in the efficiency improvement calculation. Detailed energy models are included in Appendix C.
- The initial costs (that is, direct cost of construction and overhead) are the costs that a builder would incur to implement the green products and practices.
- The operation and maintenance costs are the costs that an owner would incur to maintain the green products and practices.
- The replacement costs are the costs that an owner would incur to replace a green product assuming a 30-year period.
- A one-time cost is associated with developing the documentation system for green building. This one-time cost will vary based on the experience of the builder and the code jurisdiction where construction is occurring. This cost should be considered an investment in green building.

In chapter 4, we identify cost effective green building approaches that can be implemented in affordable house designs independent of the green program. We recommend green research topics that can validate expected green benefits and quantify the impact of occupant behavior on green performance, especially in the areas of energy efficiency and water conservation.

# Chapter 1.

## Evaluation Protocol

### 1.1 National Green Building Standard

The ANSI approved ICC-700-2008 National Green Building Standard (NGBS) is a consensus standard that was codeveloped by the National Association of Home Builders (NAHB) and the International Code Conference (ICC). The NGBS is the only ANSI-recognized green rating system for residential buildings. The standard defines four rating levels in Table 1-1.

Table 1-1. Rating Levels for the National Green Building Standard

	NGBS
Achievement Level Lowest ↓ Highest	Bronze
	Silver
	Gold
	Emerald

NGBS = National Green Building Standard

The NGBS can be used to rate single-family and multifamily homes, residential remodeling projects, and site-development projects and still allow for the flexibility that is required for regionally appropriate best green practices.<sup>8</sup> In this study, the NGBS is used to evaluate various residential designs and determine the cost and benefits of achieving various levels of green building (that is, Bronze, Silver, Gold, and Emerald). Table 1-2 summarizes the minimum green points required to achieve different levels of green building as defined by the NGBS.

Table 1-2. Threshold Point Ratings for Green Buildings

Green Building Category			Performance Point Levels <sup>a, b</sup>			
			Bronze	Silver	Gold	Emerald
1.	Chapter 5	Lot Design, Preparation, and Development	39	66	93	119
2.	Chapter 6	Resource Efficiency	45	79	113	146
3.	Chapter 7	Energy Efficiency	30	60	100	120
4.	Chapter 8	Water Efficiency	14	26	41	60
5.	Chapter 9	Indoor Environmental Quality	36	65	100	140
6.	Chapter 10	Operation, Maintenance, and Building Owner Education	8	10	11	12
7.		Additional Points from any category	50	100	100	100
Total Points			222	406	558	697

<sup>a</sup> In addition to the threshold number of points in each category, all mandatory provisions of each category are implemented.

<sup>b</sup> For dwelling units greater than 4,000 ft<sup>2</sup> (372 m<sup>2</sup>), the number of points in Category 7 (Additional Points from any category) is increased in accordance with Section 601.1. The Total Points are increased by the same number of points.

The NGBS provides two possible options to achieve a green rating for an existing residential structure that is being remodeled. The renovation can be a project that simply improves features within the residential structure without increasing the size of the living space, or it can be a project that includes an addition to the existing floor space that is less than 75 percent of the original conditioned living space. If the renovation increases the conditioned living space beyond 75 percent of the original conditioned living space, then one must follow the green certification process for new construction.

The first option, called the Green Building Path, is required for all residential structures built after January 1, 1980. This option requires that all threshold points in Table 1-2 be achieved, along with all mandatory renovation/addition practices defined within the NGBS.

The second option, called the Green Remodel Path, is an alternative for houses built on or before December 31, 1979. This option is designed as a simplified method of improving older homes by focusing on reducing energy and water consumption, while improving indoor environmental quality. The Green Remodel Path offers a means of improving older home performance by targeting discreet levels of performance and verifying that the target performance was met through third-party audits and actual energy and water bills. Table 1-3 contains the threshold ratings for green remodeling.

Table 1-3. Remodeling Threshold Ratings for Energy and Water Consumption Reductions

Green Remodel Path	Performance Level Improvements <sup>a</sup>			
	Bronze	Silver	Gold	Emerald
Reduction in Energy and Water Consumption in Accordance with Section 305.5.5	20%	34%	43%	50%
<sup>a</sup> Defines the percentage of reduction in energy and water consumption required to achieve the rated level of green remodeling in accordance with National Green Building Standard (NGBS).				

In addition to the reductions in energy and water consumption in Table 1-3, the following indoor environmental quality requirements must be met during the remodeling project.

- Section 901.1.1—Natural draftspace-heating or water-heating equipment is not located in the conditioned spaces.
- Section 901.5—New Carpets are in accordance with emissions levels of CDPH 01350, as certified by a third party, such as CRI Green Label Plus IAQ Program.
- Section 902.1—Spot ventilation is required in Bathrooms, Kitchens, and Clothes Dryers—all must be vented outside and meet the prescribed ventilation rates in the NGBS.
- Section 902.4(2)—HVAC supply registers, return grilles, and duct terminations are inspected and vacuumed. In addition, the coils are inspected and cleaned, and filters are replaced if necessary.
- Section 904.3(1)—Replace any existing unsealed combustion gas dryer vent with a sealed exhaust vent (and ducted make-up air is provided).

## 1.2 Defining the Cost and Benefit Analysis

In this report, we estimate cost for each green practice. We consider the direct cost (that is, green products and labor) and, where possible, the operating, maintenance, and replacement costs when selecting green practices. Ultimately, affordability is a primary objective of the cost-benefit study.

**Direct costs of construction.** We define direct costs of construction as those that can be traced directly to the finished product—the house. In residential construction, direct costs for the lot and direct costs for the house are frequently tracked separately because of the emphasis on the cost per square foot of the building. This report follows convention and tracks these costs as direct-lot and direct-house costs.

We estimated direct costs of construction based on a database developed by the NAHB Research Center and a team of builders from around the country for ASHRAE in 2008,<sup>9</sup> R.S. Means 2009, 28th Annual Editions (cost sets),<sup>10</sup> and internet/distributor/big box supplier survey in 2009. Costs, including sales tax, delivery, installation labor, and trade contractor's overhead and profit, are reported as to the builder. Costs were developed at the national level.

**Overhead costs.** We define overhead costs as program or personnel development expenses that do not directly benefit a product, but that support the organization's development of the product(s). Overhead costs tend to be allocated across production as an expense; thus, the greater the production volume, the less the overhead allocated per product. Because of this fact and to avoid overstating the effect of overhead costs on direct costs, particularly for this study, overhead costs associated with implementing a green building program are highlighted separately.

Overhead costs per hour for several classes of employee were estimated from Bureau of Labor Statistics average wage rates adjusted by 27 percent for taxes and insurance. Rates were multiplied by the estimated hours required to complete the action. The number of people and hours estimated are minimums, because they will vary by the size of the organization. An average wage rate of \$47/hr was used for administrative functions, \$37/hr was used for general maintenance, and \$130/hr for green consultation (Appendix A—Labor Cost Chart shows details).<sup>11</sup>

**Annual operating costs.** We define annual operating costs as the estimated energy and water costs a homeowner or occupant would pay for utilities. We use EnergyGauge® computer simulation results to estimate the annual energy costs. We base the annual water costs on an estimated average daily water usage rate per person and the local water utility rates. We do not adjust the annual water utility rate for projected increases, inflation, or other conditions over the 30-year evaluation period. These costs are not builder costs.

**Maintenance costs.** We base maintenance costs on product information and standard maintenance agreements for appliances. The added cost of repainting and weatherproofing is also considered for a given product.

**No-cost products and practices.** The measures that make a project green are often preferential practices that builders can adopt with little or no additional cost. Therefore, a number of activities or products, not explicitly stated as features of the baseline house, are awarded points for compliance and assigned a zero cost. Examples of these common sense measures include developing a bill of materials and cut list to minimize framing material waste (for example, ordering precut lengths, exact piece counts, reusing bracing materials for blocking, and so



on). These types of practices help demonstrate that green building is not merely a purchased commodity; it is a way of doing business with an awareness of the environmental impact of the processes.

Further, if an above-code specification or feature was available at no additional cost and a code-minimum product was not widely available, the upgraded item was chosen. Examples of no-cost, above-code specifications include an 80 Annual Fuel Utilization Efficiency (AFUE) furnace (78 AFUE is the code-minimum), a 0.62 EF water heater (0.58 is the minimum), and an ENERGY STAR dishwasher. All these more efficient performers (from a green building perspective) are available at costs comparable to an alternative model of lesser efficiency. When determining that a green option is at no additional cost, we compare the cost of the green product or practice with the cost of the original design specification.

**Replacement costs.** We determine replacement costs for those products or practices in which the life of the product is known by the manufacturer or established by other resources, such as the 2006 NAHB/Bank of America Home Equity Study of Life Expectancy of Home Components publication. The replacement cost may not be known for all new green technologies, but we provide this information when it is available.

**Benefits of green building.** We define the benefits of green building within the content of each chapter of the NGBS. Stated simply, Chapter 5: Lot Design, Preparation, and Development identifies practices that minimize the environmental impact on the land; Chapter 6: Resource Efficiency identifies practices that maximize the use of recycled, renewable, durable, and salvaged materials and reduce waste; Chapter 7: Energy Efficiency identifies practices that minimize the use of energy; Chapter 8: Water Efficiency identifies practices that minimize the use of water; Chapter 9: Indoor Environmental Quality identifies practices that minimize exposure to pollutants; and Chapter 10: Operation, Maintenance, and Building Owner Education focuses on educating the homeowner and occupants about the green features. Where possible, in this study, we also identify the cost savings that the green product or practice (that is, energy and water usage) generates. For other areas of green (lot design, resource efficiency, indoor environmental quality, and homeowner education on green), we base the benefits on the green practices or products selected and how these products and practices minimize environmental impact, reduce waste, and minimize exposure to pollutants.

Although some research efforts attempt to monetize many of these benefits, we have not done so in this report. For example, health benefits may result from improved indoor environmental quality, but this benefit is not monetized in terms of fewer doctor visits, increased productivity, or improved quality of life. In general, the more green points accrued the greater the benefit; hence, the incremental green ratings (that is, Bronze, Silver, Gold, and Emerald).



## 1.3 The Greening Process

Create a baseline<sup>12</sup> green rating for each house design using existing drawings and specifications.

*Case #1:* If the baseline is “unrated” (meaning that the house design does not meet all the requirements of the NGBS to achieve a green rating), then we will incrementally modify the design to meet each performance level of green building (that is, Bronze, Silver, Gold, and Emerald).

**Baseline (“Not Rated”) → Bronze → Silver → Gold → Emerald**

*Case #2:* If the baseline is “rated” (meaning the house design does meet one of the rating levels [that is, Bronze, Silver, Gold, and Emerald] as per NGBS), then we will incrementally modify the design to meet each of the remaining levels of green building (but we will not create an unrated example).

**Baseline (Bronze) → Silver → Gold → Emerald**

**Bronze ← Baseline (Silver) → Gold → Emerald**

**Bronze ← Silver ← Baseline (Gold) → Emerald**

**Bronze ← Silver ← Gold ← Baseline (Emerald)**

Next, the following methodology is used when selecting green practices to achieve various levels of green building based on NGBS.

1. **First**, implement all mandatory green practices.
2. **Second**, obtain the minimum threshold points for each level of green building as defined by each chapter within the NGBS (Table 1-2). When achieving these minimum threshold points, identify and select the most affordable green practices first (for each green building category). For Chapter 7, Energy Efficiency, we applied the performance path as per the requirements of Section 702 in the NGBS (corresponding energy models are in Appendix C).
3. **Third**, obtain the additional points for each level of green building as defined by each chapter within the NGBS (Table 1-2). When achieving these additional points, identify the most affordable green practice available across all green building categories. If two green practices are equally cost effective and one of the practices is within Chapter 9 (Indoor Environmental Quality), we will select the Chapter 9 green practice. This approach will enable us to maximize the IEQ benefits without sacrificing affordability.
4. **Finally**, when selecting alternative materials during the green process, we will first try to identify material alternatives that are green versions of the originally specified material, so that the original design intent is maintained.



## Chapter 2.

# Overview of the Baseline Green Ratings

## 2.1 Baseline Green Ratings for Affordable House Designs

Using the NGBS, we developed initial green ratings for eight affordable house designs and four multifamily apartment units. Each initial green rating was used to establish a baseline of green performance, one that we incrementally improved up to the Emerald level rating. For each incremental improvement, we identified the corresponding cost and the increased benefit (based on accrued green points and specific green construction practices).

The affordable house designs were evaluated in six green categories, which were quantified in terms of green points to determine a rating level (that is, Bronze, Silver, Gold, Emerald—or NR [no rating, if the points do not meet a minimum threshold]). Table 2-1 summarizes the baseline green ratings for the eight affordable house designs.

Table 2-1. Baseline NGBS Ratings for the Eight Affordable House Designs

House Designs and Specifications	Chapter 5 Lot Design, Preparation, and Development	Chapter 6 Resource Efficiency	Chapter 7 Energy Efficiency	Chapter 8 Water Efficiency	Chapter 9 Indoor Environmental Quality	Chapter 10 Operation, Maintenance, and Building Owner Education
LRA <sup>a</sup> KC910	26 NR	52 Bronze	35 Bronze	16 Bronze	43 Bronze	0 NR
City of Bayou La Batre AMT2356A	21 NR	56 Bronze	49 Bronze	5 NR	71 Silver	1 NR
OHA <sup>a</sup> Townhouse	110 Gold	49 Bronze	145 Emerald	18 Bronze	43 Bronze	0 NR
RRHA <sup>a</sup> Rowhouse	68 Silver	78 Bronze	70 Silver	8 NR	103 Gold	0 NR
SHA <sup>a</sup> Two-Story Multiunit	109 Gold	99 Silver	49 Bronze	11 NR	104 Gold	6 NR
AMHA <sup>a</sup> Townhouse Type A	76 Silver	66 Bronze	53 Bronze	35 Silver	39 Bronze	0 NR
AMHA <sup>a</sup> Single-Family Type D	72 Silver	57 Bronze	42 Bronze	36 Silver	49 Bronze	0 NR
CMHA <sup>a</sup> One-Bedroom Apartment	96 Gold	81 Silver	19 NR	10 NR	46 Bronze	6 NR

<sup>a</sup>AMHA = Akron Metropolitan. CMHA = Cuyahoga Metropolitan Housing Authority. LRA = Louisiana Recovery Authority. OHA = Oakland Housing Authority. RRHA = Richmond Redevelopment Housing Authority. SHA = Seattle Housing Authority.

The six categories of green building identified in Table 2-1 represent a comprehensive definition of sustainable construction practices and green education reflected in the content of each chapter of the NGBS. Stated simply, Chapter 5: Lot Design, Preparation, and Development identifies practices that minimize the environmental impact on the land; Chapter 6: Resource Efficiency identifies practices that maximize the use of recycled, renewable, durable, and salvaged materials and reduce waste; Chapter 7: Energy Efficiency identifies practices that minimize the use of energy; Chapter 8: Water Efficiency identifies practices that minimize the use of water; Chapter 9: Indoor Environmental Quality identifies practices that minimize exposure to pollutants; and Chapter 10: Operation, Maintenance, and Building Owner Education focuses on educating the homeowner and occupants about the green features. When we consider the details of each original design, the following observations are made.

Lot Design, Preparation, and Development was a core consideration for all affordable house developments that used a green building program. The Tassafaronga, High Point, and Valley View Homes developments were rated Gold due to their extensive use of low-impact development practices and development of grayfield, brownfield, and infill lots. The Blackwell and Edgewood developments were rated Silver due to moderate use of low-impact development practices. For houses built without a green building program, such as the Safe Harbor development in Bayou La Batre, Alabama, and the Hidden Cove development in Baton Rouge, Louisiana, the land and lot development practices did not meet the rating requirements of NGBS. Although both developments were compliant with 2006 IRC, code compliance alone was not enough to achieve a green rating in this category.

Resource Efficiency was a core consideration for all affordable house designs including the houses that were built without a green building program. The High Point (Two-Story Multiunit) and Valley View Homes (One-Bedroom Apartment) designs were rated Silver due to their moderate use of optimal lumber sizes, prefabricated components, and recycled construction materials. The Hidden Cove (KC910), Tassafaronga (Townhouse), Blackwell (Rowhouse) and Edgewood (Townhouse Type A and Single-Family Type D) designs were rated Bronze due to some use of optimal lumber sizes, prefabricated components, and recycled construction materials. The Safe Harbor (AMT236A) design was rated Bronze and built in a factory, which extensively used prefabricated components and optimal lumber sizes. Improvements in resource efficiency may require some modified construction practices to reduce waste and some alternative construction materials. Only the Safe Harbor (AMT2356A), High Point (Two-Story Multiunit), and Valley View Homes (One-Bedroom Apartment) met all mandatory NGBS green rating requirements. Although the other designs had enough total accrued points to achieve a rating, these designs cannot be rated for resource efficiency until the mandatory requirements<sup>13</sup> are met.

Energy Efficiency was a core consideration for all affordable house designs including the houses that were built without a green building program, but the baseline green ratings cover the full spectrum of possibilities. Before considering the energy rating details of each affordable design, consider how NGBS defines the three following methods of achieving an energy rating.

1. Any ENERGY STAR-certified home can be rated Bronze through the Alternative Bronze Level Compliance method. This Bronze rating does not consider the energy performance details of the house, it is simply awarded based on the ENERGY STAR home certification.
2. Any house can be rated through the Prescriptive Path method, which requires compliance with Section 703 and implementation of a minimum of two practices from Section 704 of the NGBS. The Prescriptive Path can be used only to achieve a Bronze, Silver, or Gold rating; this method cannot be used to achieve an Emerald rating. The prescriptive method allows for points to be accrued based on the selection of specific building envelope, insulation, window, HVAC, and water heater design features within the NGBS.
3. Any house can be rated through the Performance Path method, which requires compliance with Section 702 and implementation of a minimum of two practices from Section 704 of the NGBS. The Performance Path can be used to achieve a Bronze, Silver, Gold or Emerald rating. The performance method allows for points to be accrued based on energy modeling as defined by the 2006 IECC.<sup>14</sup> Four energy improvement thresholds are defined (that is, 15, 30, 50, and 60 percent); each threshold equals the minimum point requirements for Bronze, Silver, Gold, and Emerald, respectively. Points cannot be accrued from both the performance and prescriptive methods.

During the development of a baseline energy efficiency rating for the affordable house designs, we considered all three energy rating methods and decided to use the performance method for two reasons. First, because our study develops an Emerald rating for each affordable house design, the performance method is required. For consistency and quantitative analysis, we decided to use the performance method for all incremental improvements. Second, because our study considers the incremental cost of energy improvements, energy modeling software<sup>15</sup> provides an accurate method of calculating and comparing cost reductions due to performance improvements. In Table 2-2, we compare the total points accrued for the baseline energy efficiency rating with the energy modeling results based on the NGBS *Performance Path method*.

Table 2-2. Total Accrued Green Points Versus Performance Path

House Designs and Specifications	Chapter 7 Energy Efficiency Total Points	e-Ratio <sup>a</sup> 1 = 2006 IECC Energy Modeling Performance
LRA <sup>a</sup> KC910	35 Bronze	0.91 NR
City of Bayou La Batre AMT2356A	49 Bronze	0.92 NR
OHA <sup>a</sup> Townhouse	145 Emerald	0.36 Emerald
RRHA <sup>a</sup> Rowhouse	70 Silver	0.85 Bronze
SHA <sup>a</sup> Two-Story Multiunit	49 Bronze	0.89 NR
AMHA <sup>a</sup> Townhouse Type A	53 Bronze	0.94 NR

continued on next page

Table 2-2. Total Accrued Green Points Versus Performance Path (cont.)

House Designs and Specifications ↓	Chapter 7 Energy Efficiency Total Points	e-Ratio <sup>a</sup> 1 = 2006 IECC Energy Modeling Performance
AMHA <sup>a</sup> Single-Family Type D	<b>42</b> <b>Bronze</b>	<b>0.88</b> <b>NR</b>
CMHA <sup>a</sup> One-Bedroom Apartment	<b>19</b> <b>NR</b>	<b>0.96</b> <b>NR</b>

<sup>a</sup>e-Ratio = computer modeled energy performance and the benchmark energy performance (in this case 2006 IECC).

The energy modeling performance results are expressed as an e-Ratio. When the e-Ratio = 1, then the energy performance is the same as the benchmark. In our case, the benchmark is defined as 2006 IECC, so any e-Ratio equal to 1 meets the 2006 IECC requirements. When the e-Ratio is greater than 1, then the energy performance is worse than the 2006 IECC. When the e-Ratio is less than 1, then the energy performance is more efficient than the 2006 IECC. The NGBS Performance Path thresholds (that is, 15, 30, 50, and 60 percent) are equal to e-Ratios of 0.85, 0.70, 0.50, and 0.40, respectively. The baseline energy modeling results in Table 2-2 indicates that all affordable house designs including the houses that were built without a green building program perform more efficiently than the 2006 IECC.

The Safe Harbor (AMT2356A), Blackwell (Rowhouse), and High Point (Two-Story Multiunit) designs are certified ENERGY STAR designs and have e-Ratios equal to 0.92, 0.85, and 0.89, respectively. A Bronze rating can be obtained under the alternative compliance method for all three designs, but the Blackwell (Rowhouse) design also meets the performance method requirements for a Bronze rating. The reason an ENERGY STAR design may fall short of an e-Ratio of 0.85 is because the ENERGY STAR design must be 15 percent more efficient than a house built in accordance with 2004 International Residential Code (IRC).<sup>16</sup> Because the NGBS benchmarks energy performance against the 2006 IECC, minor incremental energy improvements were required to achieve a Bronze rating using the performance method for the Safe Harbor and High Point designs.

The Tassafaronga (Townhouse) design has an e-Ratio of 0.36, which equals an Emerald rating due to the use of a solar water heater, a high-efficiency boiler, and several ENERGY STAR-rated appliances. Nonetheless, mandatory compliance verification for the radiant space-heating system was not met.

The Hidden Cove (KC910) and Edgewood (Townhouse Type A and Single-Family Type D) designs have e-Ratios equal to 0.91, 0.94, and 0.88, respectively. Although the accrued point totals meet the Bronze rating based on the prescriptive method of compliance, these designs lack a number of mandatory requirements. Incremental energy improvements were required to achieve a Bronze rating for these designs.

The Valley View Homes (One-Bedroom Apartment) design has an e-Ratio of 0.96 meaning that it performs more efficiently than the 2006 IECC, but the design has 19 total green points, which means it cannot be rated. When apartment buildings are evaluated using the NGBS, each apartment unit type must comply with the green rating threshold requirements. After evaluating every apartment unit type within the Valley View Homes apartment building we selected the


worst performing unit to incrementally improve. Although other apartment unit types performed more efficiently than the One-Bedroom Apartment design, the Valley View Homes apartment building rating is based on the performance of the worst unit type; as a result, the overall green rating was NR. In addition, several mandatory requirements were unmet. Incremental energy improvements were required to achieve a Bronze rating for this design.

Water Efficiency was a core consideration for one-half of the affordable house designs including one house that was built without a green building program. The Edgewood (Townhouse Type A and Single-Family Type D) designs were rated Silver due to their moderate use of low-flow plumbing fixtures, water-conserving appliances, and landscaping practices that limit water use. The Tassafaronga (Townhouse) and Hidden Cove (KC910) designs were rated Bronze due to some use of low-flow faucets, water-conserving appliances, and low-volume irrigation systems. The Safe Harbor (AMT2356A), Blackwell (Rowhouse), High Point (Two-Story Multiunit), and Valley View Homes (One-Bedroom Apartment) designs did not meet the water-efficiency rating requirements of NGBS. The Edgewood, Tassafaronga, and Hidden Cove designs met all mandatory NGBS green rating requirements. Basic water-efficiency improvements can be achieved by specifying low-flow plumbing fixtures, water-conserving appliances, and implementing efficient plumbing supply design. These minor changes in product specification and plumbing design can be made with little or no additional cost.

Indoor Environmental Quality was a core consideration for all affordable house designs including the houses that were built without a green building program. The Blackwell (Rowhouse) and High Point (Two-Story Multiunit) designs were rated Gold due to their extensive use of no- and low-Volatile Organic Compound (VOC) products, ENERGY STAR-rated exhaust fans, Minimum Efficiency Reporting Value (MERV) 8 filters, whole-building ventilation systems, and Breathe Easy Home™ features. The Safe Harbor (AMT2356A) design was rated Silver due to moderate use of no- and low-VOC products, ENERGY STAR-rated exhaust fans, and several moisture management practices. The Hidden Cove (KC910), Tassafaronga (Townhouse), Edgewood (Townhouse Type A and Single-Family Type D), and Valley View Homes (One-Bedroom Apartment) designs were rated Bronze due to some use of no- and low-VOC products and ENERGY STAR-rated exhaust fans. For houses built without a green building program, such as the Safe Harbor (AMT2356A) and Hidden Cove (KC910) designs, indoor environmental quality was considered because of participation in the Alternative Housing Pilot Program (AHPP). Because formaldehyde was an issue with previous disaster recovery housing efforts, the AHPP participants specified products to minimize exposure to formaldehyde and VOC-emitting materials. Only the Hidden Cove (KC910), Safe Harbor (AMT2356A), and High Point (Two-Story Multiunit) met all mandatory NGBS green rating requirements. Although the other designs had enough total accrued points to achieve a rating, these designs cannot be rated for indoor environmental quality until the mandatory requirements are met.

Operation, Maintenance, and Building Owner Education was not a significant consideration for any of the affordable house designs including the houses that were built without a green building program. The High Point (Two-Story Multiunit) and Valley View Homes (One-Bedroom Apartment) developments provided operational and maintenance information to the occupants but this educational effort falls short of the Bronze rating requirement. All other developments provided virtually no educational material or training on the green features of the original designs.





Green education and training is critical to maximizing the potential benefits of a green-rated house. For example, a homeowner or occupant must be aware of thermostat operation and programming to maximize energy efficiency, without this basic training the occupant may never realize reduced energy use and cost savings. The difference in thermostat set point can be the difference between realizing Gold-rated energy performance and Bronze-rated energy performance. Because the maintenance schedule for solar or tankless water heaters may be different from conventional water heaters, the homeowner will need to be aware of any special requirements to ensure good operation and a valid warranty. The NGBS requires comprehensive green education and training that addresses specific features within the house and sustainable resources within the local community.

Total Points are important to achieving an overall NGBS green rating, but specific minimum points must also be achieved in each of the six green categories. The NGBS requires this balanced green building approach to ensure that no category of green is neglected and that all areas of green are equally strong. For example, this approach means an NGBS Gold-rated house has a minimum Gold rating performance in each of the six green categories. If one considers the baseline green ratings summarized in Table 2-1, none of the original affordable house designs have a balanced overall green design as defined by the NGBS, even when green building education is ignored.

After establishing the baseline green ratings for the original affordable house designs, we improved each green rating by incrementally advancing through the various levels (that is, Bronze, Silver, Gold, and Emerald) of green building as defined by the NGBS. First, we met all mandatory green building requirements were met, then specified the most cost-effective green practices for each category of green building until we achieved the overall green rating. The details of the original design and the baseline green rating in Table 2-1 greatly influence the process of making incremental green changes.



## 2.2 Baseline Green Remodeling Ratings for Multifamily Apartment Units

To demonstrate the potential benefits of green remodeling older residential structures, we evaluated an apartment building in Montgomery County, Maryland, that was built on or before December 31, 1979. The evaluation focused on four of the eight apartment units. A comprehensive field audit was performed on the units to establish baseline energy usage, water consumption, and identify whether five critical IEQ practices were met. Table 2-3 summarizes the baseline results for each apartment unit evaluated in terms of energy performance, water consumption, and IEQ requirements.

Table 2-3. Baseline Existing Conditions per Apartment Unit—Energy, Water, and IEQ

<b>TYPE</b>	<b>Energy Efficiency (e-Ratio<sup>a</sup>)</b>	<b>Water Efficiency (gpd<sup>b</sup>)</b>	<b>IEQ (Requirements)</b>
<b>Unit #1</b>	<b>2.15</b>	<b>51.4</b>	<b>Not met</b>
<b>Unit #2</b>	<b>1.51</b>	<b>43.3</b>	<b>Not met</b>
<b>Unit #3</b>	<b>1.64</b>	<b>45.7</b>	<b>Not met</b>
<b>Unit #4</b>	<b>1.95</b>	<b>53.2</b>	<b>Not met</b>

<sup>a</sup>e-Ratio = computer modeled energy performance and the benchmark energy performance (2006 IECC). When the e-Ratio is equal to 1, the house design meets the 2006 IECC requirements. When the e-Ratio is greater than 1, the house design does not meet the 2006 IECC requirements. When the e-Ratio is less than 1, the house design exceeds the 2006 IECC requirements.

<sup>b</sup>gpd means gallons per day (which is applied to each occupant in the dwelling).

After establishing the baseline green ratings for the apartment units, we identified the mandatory IEQ improvements that must be made and then specified the most cost-effective green practices to achieve incremental improvements for each green remodeling level.



## Chapter 3.

# Case Studies: Making Green Improvements

We selected affordable housing developments that were supported by HOPE VI, HOME, and the Alternative Housing Pilot Program. This study evaluates single-family, multifamily, and disaster-relief housing in the following four climate zones illustrated in Chart 3-1.

### Climate Zone #2:

Louisiana—Katrina Cottages (Disaster Relief Housing).

Alabama—Palm Harbor Homes (Disaster Relief Housing).

### Climate Zone #3:

Oakland, California—Townhouse Duplex (Tassafaronga Development).

### Climate Zone #4:

Richmond, Virginia—Single-Family House (Blackwell Development).

Seattle, Washington—Single-Family or Townhouse (High Point Development).

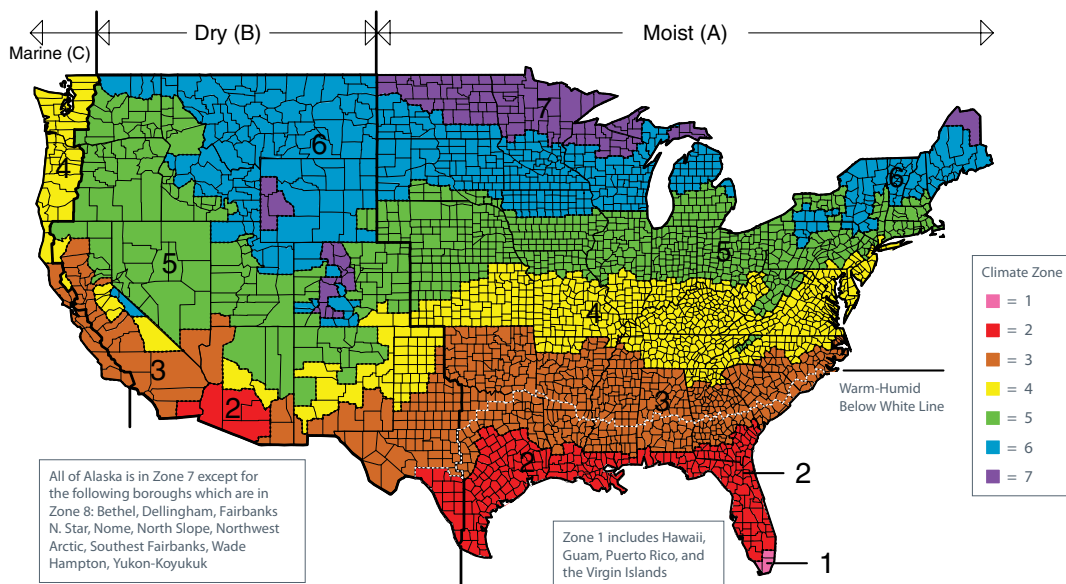
Green Remodeling: Multifamily Housing Built Before 1980 (Washington, D.C., Maryland, and Virginia—Climate Zone #4).

### Climate Zone #5:

Akron, Ohio—Single-Family House and Townhouse (Edgewood Development).

Cuyahoga, Ohio—Multifamily House (Tremont Point Development).

Chart 3-1. Map of Climate Zones <sup>a</sup>



<sup>a</sup>Source: U.S. Department of Energy (<http://www.energycodes.gov>)

According to the U.S. Department of Energy, “Climate zones were developed based on a traditional system of climate classification used in many other disciplines. That classification provided quantitative definitions for three major climate types—humid climates, dry climates, and marine climates. These major climate types are important for buildings because they affect solar loads, humidity, daily temperature ranges, and whether heating and cooling seasons are short and intense or long and mild. These are all aspects of climate that cannot be addressed simply by looking at heating degree days—the primary basis for the current zones.

“In addition to the major humid/dry/marine climate types, climate divisions were defined based on thermal criteria. But instead of using heating degree days for the entire country, as has been done for the Model Energy Code (MEC) and IECC in the past, thermal divisions for cooling-dominated regions of the country were defined based on cooling degree days. The selected thermal criteria resulted in mostly horizontal bands across the country with the hottest zone (#1) occupying the southern tip of Florida to the coldest zone (#8) covering the northern half of Alaska. Regular increments of heating and cooling degree days were selected that worked well climatologically, facilitated the representation of current code requirements, and enabled a substantial reduction in the number of zones.”<sup>17</sup>

## 3.1 Climate Zone #2

Baton Rouge, Louisiana, is located in climate zone 2A, a predominantly cooling, moist climate with 26,938 cooling degree hours (CDH)<sup>18</sup> and 1,673 heating degree days (HDD)<sup>19</sup>. Bayou La Batre, Alabama, is located in climate zone 2A, a predominantly cooling, moist climate with 28,912 CDH and 1,694 HDD.

Traditionally, disaster-relief housing has been temporary housing provided by FEMA. After Hurricanes Katrina and Rita in 2005, at the direction of Congress, FEMA implemented an Alternative Housing Pilot Program (AHPP) to investigate other temporary and long-term housing options as part of the disaster recovery effort in the Gulf Coast region. Participants in the AHPP (that is, Mississippi, Louisiana, Alabama, and Texas) explored a wide range of disaster-relief housing, including permanent housing to rebuild neighborhoods.

### 3.1.1 Louisiana Disaster Relief Housing

In Louisiana, several single-family and multifamily designs were developed and built as part of the recovery effort. We selected the KC910 Model (a single-family, one-story house) in the Hidden Cove Development of Baton Rouge, Louisiana, to demonstrate the NGBS evaluation process. This house was not designed using a green building program.

## *KC910 Baseline Green Rating*

Several green features are included in the original KC910 design; in fact, the baseline green rating exceeds the minimum threshold points for a Bronze rating in the areas of resource efficiency, energy efficiency, water efficiency, and indoor environmental quality. Nonetheless, many mandatory resource and energy efficiency practices and requirements were not implemented. The lot design and development specifications fall short of the Bronze minimum by 13 points, and the owner education documentation for green practices does not exist (because the house was not originally designed in accordance with a green program).

The KC910 design was built in accordance with 2006 IRC. Green points were achieved for building in an existing neighborhood (that is, Hidden Cove is an in-fill development). This area of Baton Rouge includes close proximity to a recreational youth center, mass transportation, and the development has good housing “density” (in terms of lot size and shared parking areas). The resource-efficient green features included a compact air-conditioned space (that is, 910 ft<sup>2</sup> disaster-relief housing alternatives tend to be small houses), the use of optimal material sizes, pier and pad foundations, termite barriers, moisture prevention practices, and resource-efficient materials (such as engineered wood products). The energy efficient green features include the use of ENERGY STAR appliances (that is, refrigerator, dishwasher, and washing machine), HVAC cooling efficiency and heat pump heating efficiency, and ductwork design features. The water-efficient green features include using appliances that conserve water (that is, dishwasher and washing machine), minimizing the hot-water pipe runs, and using water-conserving fixtures (that is, faucets). The IEQ green features include using cabinets that are Kitchen Cabinet Manufacturers Association (KCMA) Environmental Stewardship Program compliant (that is, KCMA ESP 01), sealing the living space to prevent contaminants, not having an attached garage or using combustion appliances, installing a carbon monoxide detector, and several moisture management practices including insulating plumbing and ductwork in unconditioned areas.

Although the original KC910 design falls short of the Bronze rating, the unit has several green features that put it well within reach of receiving a Bronze rating (that is, achieving a total of 172 points). Table 3-1 summarizes the baseline rating and identifies where the design needs additional green features. Additional green-scoring details are in Appendix B.

Table 3-1. Baseline Rating for KC910 Model

Green Building Category	Bronze <sup>a</sup> Required Points	Claimed <sup>b</sup> Points	Additional <sup>c</sup> Claimed Points Above Bronze	Point <sup>d</sup> Shortfall	Mandatory <sup>e</sup> Status
Chapter 5: Lot Design, Preparation, and Development	39	26	—	13	Not applicable
Chapter 6: Resource Efficiency	45	52	7	—	Not met
Chapter 7: Energy Efficiency	30	35	5	—	Not met
Chapter 8: Water Efficiency	14	16	2	—	Met
Chapter 9: Indoor Environmental Quality	36	43	7	—	Met
Chapter 10: Operation, Maintenance, and Building Owner Education	8	0	—	8	Not met
<b>Section Total</b>	172	172	21	21	
<b>Additional Points</b>	50	—	21	29	
<b>Total Points</b>	222	172	—	50	

<sup>a</sup>Bronze Required Points are the minimum green points needed to achieve a Bronze Rating.  
<sup>b</sup>Claimed Points are the green points we identified (and claimed) based on the KC910 Original Design.  
<sup>c</sup>Additional Claimed Points Above Bronze are the green points that exceed the Bronze minimum for each green category.  
<sup>d</sup>Point Shortfalls are the number of green points needed to meet the Bronze minimum for each green category.  
<sup>e</sup>Mandatory Status identifies whether mandatory requirements were met for each green category.

- The annual maintenance cost to achieve the base rating is \$409 (Appendix A).
- The annual energy operating cost to achieve the base rating is \$1,052 (Appendix A).
- The annual water operating cost to achieve the base rating is \$578 (Appendix A).
- The 30-year lifetime replacement cost to achieve the base rating is \$18,412 (Appendix A).

## KC910 Incremental Green Ratings

### The Bronze Rating

To achieve the Bronze rating, all mandatory green requirements were met (some of these requirements were implemented by 2006 IRC and were not explicitly documented in the designs and specifications). All chapter thresholds were achieved, including an additional 99 points. The Bronze rating requires only 222 points, but we were able to achieve 271 points simply by implementing green practices that added little or no cost to the project (for example, scheduling construction to minimize length of time soil is exposed, placement of utilities, and onsite supervision of green practices), specifying an integrated pest management plan to minimize chemical and fertilizer use, implementing a construction waste management plan, specifying green materials that have comparable cost to the originally specified materials, and selecting water-efficient fixtures that have comparable cost to the originally specified fixtures.

The largest one-time cost of going green is the initial investment in developing green documentation and the homeowner's binder templates. For this study, we estimated the going-green cost at \$5,640<sup>20</sup> (this cost will be the case for any rated level). Nonetheless, other green practices required additional costs, including a maintenance plan for vegetation, borate-treated Oriented Strand Board (OSB) for termites, energy modeling, mandatory caulking and sealing, and educational materials for the owner. Additional green-scoring details are in Appendix B. Table 3-2 contains the Bronze rating summary.

Table 3-2. Bronze Rating for KC910 Model

Green Building Category	Bronze <sup>a</sup> Required Points	Claimed <sup>b</sup> Points	Additional <sup>c</sup> Claimed Points Above Bronze	Point <sup>d</sup> Shortfall	Mandatory <sup>e</sup> Status
<b>Chapter 5: Lot Design, Preparation, and Development</b>	39	51	12	—	Not applicable
<b>Chapter 6: Resource Efficiency</b>	45	78	33	—	Met
<b>Chapter 7: Energy Efficiency</b>	30	62	32	—	Met
<b>Chapter 8: Water Efficiency</b>	14	18	4	—	Met
<b>Chapter 9: Indoor Environmental Quality</b>	36	53	17	—	Met
<b>Chapter 10: Operation, Maintenance, and Building Owner Education</b>	8	9	1	—	Met
<b>Section Total</b>	172	271	99	0	
<b>Additional Points</b>	50	—	99	0	
<b>Total Points</b>	222	271	—	0	

<sup>a</sup>Bronze Required Points are the minimum green points needed to achieve a Bronze Rating.  
<sup>b</sup>Claimed Points are the green points we identified (and claimed) based on the Green Improvements.  
<sup>c</sup>Additional Claimed Points Above Bronze are the green points that exceed the Bronze minimum for each green category.  
<sup>d</sup>Point Shortfalls are the number of green points needed to meet the Bronze minimum for each green category.  
<sup>e</sup>Mandatory Status identifies whether mandatory requirements were met for each green category.

## The Bronze Cost

The total initial cost to achieve the Bronze-level rating is shown in Table 3-3.

Table 3-3. Initial Cost to the Builder for the Bronze KC910 Model

Green Category	Bronze Points	Cost (\$)
<b>Chapter 5: Lot Design, Preparation, and Development</b>	51	117
<b>Chapter 6: Resource Efficiency</b>	78	745
<b>Chapter 7: Energy Efficiency</b>	62	982
<b>Chapter 8: Water Efficiency</b>	18	0
<b>Chapter 9: Indoor Environmental Quality</b>	53	0
<b>Chapter 10: Operation, Maintenance, and Building Owner Education</b>	9	950
<b>Total</b>	<b>271</b>	<b>\$2,794</b>

- The annual maintenance cost to achieve the Bronze rating is \$409 (Appendix A).
- The annual energy operating cost to achieve the Bronze rating is \$1,022 (Appendix A).
- The annual water operating cost to achieve the Bronze rating is \$570 (Appendix A).
- The 30-year lifetime replacement cost to achieve the Bronze rating is \$18,412 (Appendix A).

## The Bronze Benefits

The annual energy savings (compared with 2006 IECC—Chapter 7) are approximately a 15-percent reduction in energy usage (Appendix C—Summary Data for Climate Zone 2 Baton Rouge, Louisiana). The annual water savings (compared with the Average Daily Per Capita Usage in Gallons, as defined by the *Handbook of Water Use and Conservation*—chapter 8) are approximately a 16.4-percent reduction in water usage (Appendix A—Indoor Water Usage Calculation Table for Baton Rouge, Louisiana). The energy efficiency is actually a low-level Silver rating, and the resource efficiency is very close to a Silver rating. Nonetheless, the overall green rating is Bronze because the total points are less than the Silver minimum, and most green categories are also less than the Silver minimum.

## The Silver Rating

To achieve the Silver rating, we improved the Bronze-rated design by meeting the threshold chapter requirements and selecting an additional 104 points in green features. The Silver rating requires 406 points; we achieved 410 points by implementing additional plans for restoring natural vegetation and establishing areas for preserving trees and vegetation. To improve resource efficiency, additional prefabricated components and reusable materials are specified. To improve the energy efficiency, we improved the building enclosure insulation, heating and cooling equipment efficiencies, and location of the ductwork. The water efficiency was improved largely by green points associated with the landscape plan and no irrigation usage (the associated cost with this improvement was already captured in the lot design and development category). The IEQ was improved by specifying the use of low-VOC paints, adhesives, sealants, coatings, and MERV 8 filters (which are priced similarly to the original filters) and adding kitchen exhaust.



The homeowner’s manual will include additional details. Additional green-scoring details are in Appendix B. Table 3-4 contains the Silver rating summary.

Table 3-4. Silver Rating for KC910 Model

Green Building Category	Silver <sup>a</sup> Required Points	Claimed <sup>b</sup> Points	Additional <sup>c</sup> Claimed Points Above Silver	Point <sup>d</sup> Shortfall	Mandatory <sup>e</sup> Status
<b>Chapter 5: Lot Design, Preparation, and Development</b>	66	68	2	—	Not Applicable
<b>Chapter 6: Resource Efficiency</b>	79	89	10	—	Met
<b>Chapter 7: Energy Efficiency</b>	60	119	59	—	Met
<b>Chapter 8: Water Efficiency</b>	26	33	7	—	Met
<b>Chapter 9: Indoor Environmental Quality</b>	65	86	21	—	Met
<b>Chapter 10: Operation, Maintenance, and Building Owner Education</b>	10	15	5	—	Met
<b>Section Total</b>	306	410	104	0	
<b>Additional Points</b>	100	—	104	0	
<b>Total Points</b>	406	410	—	0	

<sup>a</sup>Silver Required Points are the minimum green points needed to achieve a Silver Rating.  
<sup>b</sup>Claimed Points are the green points we identified (and claimed) based on the Green Improvements.  
<sup>c</sup>Additional Claimed Points Above Silver are the green points that exceed the Silver minimum for each green category.  
<sup>d</sup>Point Shortfalls are the number of green points needed to meet the Silver minimum for each green category.  
<sup>e</sup>Mandatory Status identifies whether mandatory requirements were met for each green category.

## The Silver Cost

The total initial cost to achieve the Silver-level rating is shown in Table 3-5.

Table 3-5. Initial Cost to the Builder for the Silver KC910 Model

Green Category	Silver Points	Cost (\$)
<b>Chapter 5: Lot Design, Preparation, and Development</b>	68	803
<b>Chapter 6: Resource Efficiency</b>	89	752
<b>Chapter 7: Energy Efficiency</b>	119	5,063
<b>Chapter 8: Water Efficiency</b>	33	0
<b>Chapter 9: Indoor Environmental Quality</b>	86	215
<b>Chapter 10: Operation, Maintenance, and Building Owner Education</b>	15	1,044
<b>Total</b>	<b>410</b>	<b>\$7,877</b>

- The annual maintenance cost to achieve the Silver rating is \$409 (Appendix A).
- The annual energy operating cost to achieve the Silver rating is \$909 (Appendix A).
- The annual water operating cost to achieve the Silver rating is \$570 (Appendix A).
- The 30-year lifetime replacement cost to achieve the Silver rating is \$19,772 (Appendix A).

## The Silver Benefits

The annual energy savings (compared with 2006 IECC—chapter 7) are approximately a 32-percent reduction in energy usage (Appendix C—Summary Data for Climate Zone 2—Baton Rouge, Louisiana). The annual water savings (compared with the Average Daily Per Capita Usage in Gallons, as defined by the *Handbook of Water Use and Conservation*—chapter 8) are approximately a 16.4-percent reduction in water usage (Appendix A—Indoor Water Usage Calculation Table for Baton Rouge, Louisiana). The energy efficiency is actually a Gold rating, and the homeowner education on green practices is at an Emerald rating. Nonetheless, the overall green rating is Silver because the total points are less than the Gold minimum and most green categories are also less than the Gold minimum.

## The Gold Rating

To achieve the Gold rating, we improved the Silver-rated design by meeting the threshold chapter requirements and selecting an additional 102 points in green features. The Gold rating requires 558 points; we achieved 560 points by implementing additional soil disturbance and erosion practices, land preservation practices, and heat island mitigation practices. To improve resource efficiency, we specified additional preassembly components and indigenous materials, and specified advanced recycling methods (such as composting on site). To improve the energy efficiency, we upgraded the water heater to a solar water heater. To improve water efficiency, a central plumbing core system is added and low-flow toilets are specified. The IEQ was improved by specifying higher performance exhaust fans (in the bathroom and kitchen). Additional green-scoring details are in Appendix B. Table 3-6 contains the Gold rating summary.

Table 3-6. Gold Rating for KC910 Model

Green Building Category	Gold <sup>a</sup> Required Points	Claimed <sup>b</sup> Points	Additional <sup>c</sup> Claimed Points Above Gold	Point <sup>d</sup> Shortfall	Mandatory <sup>e</sup> Status
<b>Chapter 5: Lot Design, Preparation, and Development</b>	93	105	12	—	Not applicable
<b>Chapter 6: Resource Efficiency</b>	113	115	2	—	Met
<b>Chapter 7: Energy Efficiency</b>	100	171	71	—	Met
<b>Chapter 8: Water Efficiency</b>	41	52	11	—	Met
<b>Chapter 9: Indoor Environmental Quality</b>	100	102	2	—	Met
<b>Chapter 10: Operation, Maintenance, and Building Owner Education</b>	11	15	4	—	Met
<b>Section Total</b>	458	560	102	0	
<b>Additional Points</b>	100	—	102	0	
<b>Total Points</b>	558	560	—	0	

<sup>a</sup> Gold Required Points are the minimum green points needed to achieve a Gold Rating.  
<sup>b</sup> Claimed Points are the green points we identified (and claimed) based on the Green Improvements.  
<sup>c</sup> Additional Claimed Points Above Gold are the green points that exceed the Gold minimum for each green category.  
<sup>d</sup> Point Shortfalls are the number of green points needed to meet the Gold minimum for each green category.  
<sup>e</sup> Mandatory Status identifies whether mandatory requirements were met for each green category.

## The Gold Cost

The total initial cost to achieve the Gold-level rating is shown in Table 3-7.

Table 3-7. Initial Cost to the Builder for the Gold KC910 Model

Green Category	Gold Points	Cost (\$)
Chapter 5: Lot Design, Preparation, and Development	105	2,754
Chapter 6: Resource Efficiency	115	1,118
Chapter 7: Energy Efficiency	171	9,713
Chapter 8: Water Efficiency	52	175
Chapter 9: Indoor Environmental Quality	102	298
Chapter 10: Operation, Maintenance, and Building Owner Education	15	1,044
<b>Total</b>	<b>560</b>	<b>\$15,102</b>

- The annual maintenance cost to achieve the Gold rating is \$456 (Appendix A).
- The annual energy operating cost to achieve the Gold rating is \$786 (Appendix A).
- The annual water operating cost to achieve the Gold rating is \$536 (Appendix A).
- The 30-year lifetime replacement cost to achieve the Gold rating is \$30,157 (Appendix A).

## The Gold Benefits

The annual energy savings (compared with 2006 IECC—chapter 7) are approximately a 55-percent reduction in energy usage (Appendix C—Summary Data for Climate Zone 2—Baton Rouge, Louisiana). The annual water savings (compared with the Average Daily Per Capita Usage in Gallons, as defined by the *Handbook of Water Use and Conservation*—chapter 8) are approximately a 26.7-percent reduction in water usage (Appendix A—Indoor Water Usage Calculation Table for Baton Rouge, Louisiana). The energy efficiency and homeowner education on green practices are at an Emerald rating. Nonetheless, the overall green rating is Gold because the total points are less than the Emerald minimum and most green categories are also less than the Emerald minimum.

## The Emerald Rating

To achieve the Emerald rating, we improved the Gold-rated design by meeting the threshold chapter requirements and selecting an additional 103 points in green features. The Emerald rating requires 697 points; we achieved 700 points by implementing training in the areas of natural resource protection, stormwater management, and maintenance of vegetation in accordance with TCIA A300. To improve resource efficiency, we added detailed framing plans, roof overhangs, ENERGY STAR cool roof construction, and use of certified wood based materials (that is, AFF, FSC, and so on). To improve the energy efficiency, the cooling and heating systems were further upgraded and the air handling unit was relocated to the conditioned space. The water efficiency was improved by installing a rainwater collection and distribution system. The IEQ was improved by specifying the use of all hardwood surfaces and wall coverings that comply with CDPH 01350. In addition, a whole building ventilation system was added including ENERGY STAR exhaust

fans, humidity control, and kitchen exhaust (with make-up air). Additional green-scoring details are in Appendix B. Table 3-8 contains the Emerald rating summary.

Table 3-8. Emerald Rating for KC910 Model

Green Building Category	Emerald <sup>a</sup> Required Points	Claimed <sup>b</sup> Points	Additional <sup>c</sup> Claimed Points Above Emerald	Point <sup>d</sup> Shortfall	Mandatory <sup>e</sup> Status
<b>Chapter 5: Lot Design, Preparation, and Development</b>	119	138	19		Not Applicable
<b>Chapter 6: Resource Efficiency</b>	146	152	6		Met
<b>Chapter 7: Energy Efficiency</b>	120	181	61		Met
<b>Chapter 8: Water Efficiency</b>	60	60	—		Met
<b>Chapter 9: Indoor Environmental Quality</b>	140	154	14		Met
<b>Chapter 10: Operation, Maintenance, and Building Owner Education</b>	12	15	3		Met
<b>Section Total</b>	597	700	103	0	
<b>Additional Points</b>	100	—	103	0	
<b>Total Points</b>	697	700	—	0	

<sup>a</sup> Emerald Required Points are the minimum green points needed to achieve an Emerald Rating.  
<sup>b</sup> Claimed Points are the green points we identified (and claimed) based on the Green Improvements.  
<sup>c</sup> Additional Claimed Points Above Emerald are the green points that exceed the Emerald minimum for each green category.  
<sup>d</sup> Point Shortfalls are the number of green points needed to meet the Emerald minimum for each green category.  
<sup>e</sup> Mandatory Status identifies whether mandatory requirements were met for each green category.

## The Emerald Cost

The total initial cost to achieve the Emerald-level rating is shown in Table 3-9.

Table 3-9. Initial Cost to the Builder for the Emerald KC910 Model

Green Category	Emerald Points	Cost (\$)
<b>Chapter 5: Lot Design, Preparation, and Development</b>	138	7,145
<b>Chapter 6: Resource Efficiency</b>	152	7,372
<b>Chapter 7: Energy Efficiency</b>	181	13,072
<b>Chapter 8: Water Efficiency</b>	60	557
<b>Chapter 9: Indoor Environmental Quality</b>	154	5,232
<b>Chapter 10: Operation, Maintenance, and Building Owner Education</b>	15	1,044
<b>Total</b>	<b>700</b>	<b>\$34,422</b>

- The annual maintenance cost to achieve the Emerald rating is \$456 (Appendix A).
- The annual energy operating cost to achieve the Emerald rating is \$758 (Appendix A).
- The annual water operating cost to achieve the Emerald rating is \$536 (Appendix A).
- The 30-year lifetime replacement cost to achieve the Emerald rating is \$35,515 (Appendix A).

## The Emerald Benefits

The annual energy savings (compared with 2006 IECC—chapter 7) are approximately a 61-percent reduction in energy usage (Appendix C—Summary Data for Climate Zone 2—Baton Rouge, Louisiana). In Appendix C, we also included an alternative energy model option that considers installing Solar PV, which increases the savings to 63 percent, but because 2006 IECC does not consider Solar PV in the formal energy reduction equation, we used the 61-percent energy model option (which is compliant with 2006 IECC method of calculating energy reductions). The annual water savings (compared with the Average Daily Per Capita Usage in Gallons, as defined by the *Handbook of Water Use and Conservation*—chapter 8) are approximately a 26.7-percent reduction in water usage (Appendix A—Indoor Water Usage Calculation Table for Baton Rouge, Louisiana). The water usage reduction estimate does not include the water that would be reduced by using the rainwater collection system (instead of municipal water sources).

Overall cost and performance data are provided in Table 3-10. The water utility rates are based on Baton Rouge, Louisiana water-supply meter rates and a flat sewer rate (source: Louisiana Public Service Commission). We base the simple payback periods for energy and water efficiency on the current cost estimates and projected savings and do not consider future rate increases, inflation, replacement costs, or other conditions over the 30-year evaluation period.

Table 3-10. Overall Cost and Performance Data for KC910 Model

<b>LRA<sup>a</sup> KC910 910 ft<sup>2</sup></b>	<b>Baseline</b>	<b>Bronze</b>	<b>Silver</b>	<b>Gold</b>	<b>Emerald</b>
<b>Cost Comparison</b>					
<b>Total Initial Green Cost (\$)</b>	Unknown	2,794	7,877	15,102	34,515
<b>Annual Maintenance Cost (\$)</b>	409	409	409	456	456
<b>Annual Energy Operating Cost (\$)</b>	1,052	1,022	909	786	758
<b>Annual Water Usage Cost (\$)</b>	578	570	570	536	536
<b>30-Year Lifetime Replacement Cost (\$)</b>	18,412	18,412	19,772	30,157	35,515
<b>Incremental Performance Improvement</b>					
<b>Energy Efficiency (e-Ratio) (compare to 2006 IECC)</b>	0.91	0.85	0.69	0.45	0.39
<b>Water Efficiency (%) (compares to 56.4 gpd<sup>a</sup>)</b>	14.3	16.4	16.4	26.7	26.7
<b>Land and Lot Use (points) (NGBS Rating)</b>	26 NR	51 Bronze	68 Silver	105 Gold	138 Emerald
<b>Resource Efficiency (points) (NGBS Rating)</b>	52 Bronze	78 Bronze	89 Silver	115 Gold	152 Emerald
<b>IEQ (points) (NGBS Rating)</b>	43 Bronze	53 Bronze	86 Silver	102 Gold	154 Emerald
<b>Green Education for Owner (points) (NGBS Rating)</b>	0 NR	9 Bronze	15 Emerald	15 Emerald	15 Emerald
<b>Simple Payback Periods</b>					
<b>Energy Efficiency (years) (initial energy cost and savings)</b>	<b>NA</b>	<b>33</b>	<b>35</b>	<b>37</b>	<b>44</b>
<b>Water Efficiency (years) (initial water cost and savings)</b>	<b>NA</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>6</b>
<small><sup>a</sup>The benchmark for comparison assumes four occupants using 56.4 gpd each. The benchmark cost is \$626; all projected savings are compared with this benchmark. IEQ = Indoor Environmental Quality; NA = not applicable; NGBS = National Green Building Standard; NR = not required.</small>					

### 3.1.2 Alabama Disaster Relief Housing

In Alabama, several single-family modular housing designs were developed and built as part of the recovery effort. Palm Harbor Homes built the modular houses in a production facility in Plant City, Florida, and then transported them to Alabama. We selected the AMT2356A Model (a single-family, two-bedroom and two-bathroom, one-story house) in Bayou La Batre, Alabama, to demonstrate the NGBS evaluation process. This house was not designed with the intent of being green.

## *AMT2356A Baseline Green Rating*

Several green features are included in the original AMT2356A design; in fact, the baseline green rating exceeds the minimum threshold points for a Bronze rating in the areas of resource efficiency, energy efficiency, and indoor environmental quality. In addition, most mandatory green practices and requirements were implemented. The lot design and development specifications fall short of the Bronze minimum by 18 points and the water-efficiency specifications fall short of the Bronze minimum by 9 points. Owner-education documentation for green practices does not exist, because the house was not originally designed in accordance with a green program.

The AMT2356A design was built in accordance with 2006 IRC. Green points were achieved for building in a development that avoided environmentally sensitive areas, while incorporating soil disturbance and erosion measures (that is, Safe Harbor Estates and Landing). The resource-efficient green features include a small air-conditioned space (that is, 960 ft<sup>2</sup>; disaster-relief housing alternatives tend to be small houses) and the use of optimal material sizes, prefabricated components, moisture-prevention practices, and renewable materials. The energy-efficient green features include an ENERGY STAR home rating, the use of ENERGY STAR appliances (that is, dishwasher), HVAC cooling efficiency and heat pump heating efficiency, and ductwork design features. The water-efficient green features include using appliances that conserve water (that is, dishwasher) and minimizing the hot-water pipe runs. The IEQ green features include using cabinets that are KCMA ESP 01 compliant, using non-VOC paints and hard-surface flooring in accordance with CDPH 01350, sealing the living space to prevent contaminants, not having an attached garage or using combustion appliances, installing a carbon monoxide detector and ENERGY STAR-rated kitchen and bathroom exhaust fans, and incorporating several moisture-management practices, including insulating plumbing and ductwork in unconditioned areas.

Although the original AMT2356A design falls short of the Bronze rating, the unit has several green features that put it well within reach of receiving a Bronze rating (that is, achieving a total of 203 points). Table 3-11 summarizes the baseline rating and identifies where the design needs additional green features. Additional green-scoring details are in Appendix B.

Table 3-11. Baseline Rating for AMT2356A Model

Green Building Category	Bronze <sup>a</sup> Required Points	Claimed <sup>b</sup> Points	Additional <sup>c</sup> Claimed Points Above Bronze	Point <sup>d</sup> Shortfall	Mandatory <sup>e</sup> Status
Chapter 5: Lot Design, Preparation, and Development	39	21	—	18	Not Applicable
Chapter 6: Resource Efficiency	45	56	11	—	Met
Chapter 7: Energy Efficiency	30	49	19	—	Met
Chapter 8: Water Efficiency	14	5	—	9	Met
Chapter 9: Indoor Environmental Quality	36	71	35	—	Met
Chapter 10: Operation, Maintenance, and Building Owner Education	8	1	—	7	Not Met
Section Total	172	203	65	34	
Additional Points	50	—	65	—	
Total Points	222	203	—	34	

<sup>a</sup> Bronze Required Points are the minimum green points needed to achieve a Bronze Rating.  
<sup>b</sup> Claimed Points are the green points we identified (and claimed) based on the AMT2356A Original Design.  
<sup>c</sup> Additional Claimed Points Above Bronze are the green points that exceed the Bronze minimum for each green category.  
<sup>d</sup> Point Shortfalls are the number of green points needed to meet the Bronze minimum for each green category.  
<sup>e</sup> Mandatory Status identifies whether mandatory requirements were met for each green category.

- The annual maintenance cost to achieve the base rating is \$399 (Appendix A).
- The annual energy operating cost to achieve the base rating is \$904 (Appendix A).
- The annual water operating cost to achieve the base rating is \$538 (Appendix A).
- The 30-year lifetime replacement cost to achieve the base rating is \$16,017 (Appendix A).

## AMT2356A Incremental Green Ratings

### The Bronze Rating

To achieve the Bronze rating, a few remaining mandatory green requirements were met. Some of these requirements were implemented by 2006 IRC and were not explicitly documented in the designs and specifications. All chapter thresholds were achieved, including an additional 109 points. The Bronze rating requires only 222 points, but we were able to achieve 281 points simply by implementing green practices that added little or no cost to the project (for example, scheduling construction to minimize length of time soil is exposed, placement of utilities, and onsite supervision of green practices), implementing an ongoing maintenance plan in accordance with TCIA A300, using advanced framing techniques, specifying green materials that have comparable cost to the originally specified materials (indigenous materials, biobased materials, cabinets in accordance with GGPS.EC.010.R0), and selecting water-efficient fixtures that have comparable cost to the originally specified fixtures.



The largest one-time cost of going green is the initial investment in developing green documentation and the homeowner’s binder templates. For this study, we estimated the going-green cost at \$5,640<sup>21</sup> (this cost will be the case for any rated level). Nonetheless, other green practices required additional costs, including a maintenance plan for vegetation, energy modeling and third-party verification, mandatory caulking and sealing, and educational materials for the owner. Additional green-scoring details are in Appendix B. Table 3-12 contains the Bronze rating summary.

Table 3-12. Bronze Rating for AMT2356A Model

Green Building Category	Bronze <sup>a</sup> Required Points	Claimed <sup>b</sup> Points	Additional <sup>c</sup> Claimed Points Above Bronze	Point <sup>d</sup> Shortfall	Mandatory <sup>e</sup> Status
<b>Chapter 5: Lot Design, Preparation, and Development</b>	39	53	14	—	Not Applicable
<b>Chapter 6: Resource Efficiency</b>	45	76	31	—	Met
<b>Chapter 7: Energy Efficiency</b>	30	55	25	—	Met
<b>Chapter 8: Water Efficiency</b>	14	14	—	—	Met
<b>Chapter 9: Indoor Environmental Quality</b>	36	74	38	—	Met
<b>Chapter 10: Operation, Maintenance, and Building Owner Education</b>	8	9	1	—	Met
<b>Section Total</b>	172	281	109	0	
<b>Additional Points</b>	50	—	109	0	
<b>Total Points</b>	222	281	—	0	

<sup>a</sup>Bronze Required Points are the minimum green points needed to achieve a Bronze Rating.  
<sup>b</sup>Claimed Points are the green points we identified (and claimed) based on the Green Improvements.  
<sup>c</sup>Additional Claimed Points Above Bronze are the green points that exceed the Bronze minimum for each green category.  
<sup>d</sup>Point Shortfalls are the number of green points needed to meet the Bronze minimum for each green category.  
<sup>e</sup>Mandatory Status identifies whether mandatory requirements were met for each green category.

## The Bronze Cost

The total initial cost to achieve the Bronze-level rating is shown in Table 3-13.

Table 3-13. Initial Cost to the Builder for the Bronze AMT2356A Model

Green Category	Bronze Points	Cost (\$)
<b>Chapter 5: Lot Design, Preparation, and Development</b>	53	417
<b>Chapter 6: Resource Efficiency</b>	76	0
<b>Chapter 7: Energy Efficiency</b>	55	1,095
<b>Chapter 8: Water Efficiency</b>	14	114
<b>Chapter 9: Indoor Environmental Quality</b>	74	0
<b>Chapter 10: Operation, Maintenance, and Building Owner Education</b>	9	950
<b>Total</b>	<b>281</b>	<b>\$2,576</b>

- The annual maintenance cost to achieve the Bronze rating is \$399 (Appendix A).
- The annual energy operating cost to achieve the Bronze rating is \$837 (Appendix A).
- The annual water operating cost to achieve the Bronze rating is \$479 (Appendix A).
- The 30-year lifetime replacement cost to achieve the Bronze rating is \$16,105 (Appendix A).

## The Bronze Benefits

The annual energy saving (compared with 2006 IECC—chapter 7) is approximately 15 percent. (Appendix C—Summary Data for Climate Zone 2 Bayou La Batre, Alabama). The annual water savings (compared with the Average Daily Per Capita Usage in Gallons, as defined by the *Handbook of Water Use and Conservation*—chapter 8) are approximately a 12.5-percent reduction in water usage (Appendix A—Indoor Water Usage Calculation Table for Bayou La Batre, Alabama). The indoor environmental quality is actually a low-level Silver rating, and the resource efficiency is very close to a Silver rating. Nonetheless, the overall green rating is Bronze because the total points are less than the Silver minimum and most green categories are also less than the Silver minimum.

## The Silver Rating

To achieve the Silver rating, we improved the Bronze-rated design by meeting the threshold chapter requirements and selecting an additional 104 points in green features. The Silver rating requires 406 points; we achieved 410 points by restoring or preserving trees and vegetation and an integrated pest management plan. To improve resource efficiency, additional recycled materials are specified. To improve the energy efficiency, we improved the building enclosure insulation, heating and cooling equipment efficiencies, and water heater. The water efficiency was improved largely by green points associated with the landscape plan and no irrigation usage (the associated cost with this improvement was already captured in the lot design and development category). The IEQ was improved by specifying the use of low-VOC sealants, adhesives, insulation, and MERV 8 filters (which are priced similarly to originally specified products). The homeowner's manual will include additional details. Additional green-scoring details are in Appendix B. Table 3-14 contains the Silver rating summary.

Table 3-14. Silver Rating for AMT2356A Model

Green Building Category	Silver <sup>a</sup> Required Points	Claimed <sup>b</sup> Points	Additional <sup>c</sup> Claimed Points Above Silver	Point <sup>d</sup> Shortfall	Mandatory <sup>e</sup> Status
<b>Chapter 5: Lot Design, Preparation, and Development</b>	66	72	6	—	Not Applicable
<b>Chapter 6: Resource Efficiency</b>	79	87	8	—	Met
<b>Chapter 7: Energy Efficiency</b>	60	100	40	—	Met
<b>Chapter 8: Water Efficiency</b>	26	37	11	—	Met
<b>Chapter 9: Indoor Environmental Quality</b>	65	99	34	—	Met
<b>Chapter 10: Operation, Maintenance, and Building Owner Education</b>	10	15	5	—	Met
<b>Section Total</b>	306	410	104	0	
<b>Additional Points</b>	100	—	104	0	
<b>Total Points</b>	406	410	—	0	

<sup>a</sup>Silver Required Points are the minimum green points needed to achieve a Silver Rating.  
<sup>b</sup>Claimed Points are the green points we identified (and claimed) based on the Green Improvements.  
<sup>c</sup>Additional Claimed Points Above Silver are the green points that exceed the Silver minimum for each green category.  
<sup>d</sup>Point Shortfalls are the number of green points needed to meet the Silver minimum for each green category.  
<sup>e</sup>Mandatory Status identifies whether mandatory requirements were met for each green category.

## The Silver Cost

The total initial cost to achieve the Silver-level rating is shown in Table 3-15.

Table 3-15. Initial Cost to the Builder for the Silver AMT2356A Model

Green Category	Silver Points	Cost (\$)
<b>Chapter 5: Lot Design, Preparation, and Development</b>	72	1,103
<b>Chapter 6: Resource Efficiency</b>	87	0
<b>Chapter 7: Energy Efficiency</b>	100	3,990
<b>Chapter 8: Water Efficiency</b>	37	461
<b>Chapter 9: Indoor Environmental Quality</b>	99	207
<b>Chapter 10: Operation, Maintenance, and Building Owner Education</b>	15	1,044
<b>Total</b>	<b>410</b>	<b>\$6,805</b>

- The annual maintenance cost to achieve the Silver rating is \$399 (Appendix A).
- The annual energy operating cost to achieve the Silver rating is \$767 (Appendix A).
- The annual water operating cost to achieve the Silver rating is \$441 (Appendix A).
- The 30-year lifetime replacement cost to achieve the Silver rating is \$19,047 (Appendix A).

## The Silver Benefits

The annual energy savings (compared with 2006 IECC—chapter 7) are approximately a 30-percent reduction in energy usage (Appendix C—Summary Data for Climate Zone 2—Bayou La Batre, Alabama). The annual water savings (compared with the Average Daily Per Capita Usage in Gallons, as defined by the *Handbook of Water Use and Conservation*—chapter 8) are approximately a 20.1-percent reduction in water usage (Appendix A—Indoor Water Usage Calculation Table for Bayou La Batre, Alabama). The energy efficiency is actually a Gold rating, and the indoor environmental quality is very close to a Gold rating. The homeowner education on green practices is at an Emerald rating. Nonetheless, the overall green rating is Silver because the total points are less than the Gold minimum and most green categories are also less than the Gold minimum.

## The Gold Rating

To achieve the Gold rating, we improved the Silver-rated design by meeting the threshold chapter requirements and selecting an additional 107 points in green features. The Gold rating requires 558 points; we achieved 565 points by implementing additional wildlife support plans, hydrozoning, and landscaping for shade. To improve resource efficiency, we specified certified wood components, indigenous materials, and specified advanced recycling methods (such as composting on site). To improve the energy efficiency, we upgraded the water heater to a solar water heater. To improve water efficiency, dual flush toilets are specified. The IEQ was improved by specifying higher performance exhaust fans (in kitchen, bathroom, and laundry area). Additional green-scoring details are in Appendix B. Table 3-16 contains the Gold rating summary.

Table 3-16. Gold Rating for AMT2356A Model

Green Building Category	Gold <sup>a</sup> Required Points	Claimed <sup>b</sup> Points	Additional <sup>c</sup> Claimed Points Above Gold	Point <sup>d</sup> Shortfall	Mandatory <sup>e</sup> Status
<b>Chapter 5: Lot Design, Preparation, and Development</b>	93	94	1	—	Not Applicable
<b>Chapter 6: Resource Efficiency</b>	113	114	1	—	Met
<b>Chapter 7: Energy Efficiency</b>	100	152	52	—	Met
<b>Chapter 8: Water Efficiency</b>	41	55	14	—	Met
<b>Chapter 9: Indoor Environmental Quality</b>	100	135	35	—	Met
<b>Chapter 10: Operation, Maintenance, and Building Owner Education</b>	11	15	4	—	Met
<b>Section Total</b>	458	565	107	0	
<b>Additional Points</b>	100	—	107	0	
<b>Total Points</b>	558	565	—	0	

<sup>a</sup> Gold Required Points are the minimum green points needed to achieve a Gold Rating  
<sup>b</sup> Claimed Points are the green points we identified (and claimed) based on the Green Improvements  
<sup>c</sup> Additional Claimed Points Above Gold are the green points that exceed the Gold minimum for each green category  
<sup>d</sup> Point Shortfalls are the number of green points needed to meet the Gold minimum for each green category  
<sup>e</sup> Mandatory Status identifies whether mandatory requirements were met for each green category

## The Gold Cost

The total initial cost to achieve the Gold-level rating is shown in Table 3-17.

Table 3-17. Initial Cost to the Builder for the Gold AMT2356A Model

Green Category	Gold Points	Cost (\$)
Chapter 5: Lot Design, Preparation, and Development	94	2,173
Chapter 6: Resource Efficiency	114	1,337
Chapter 7: Energy Efficiency	152	8,615
Chapter 8: Water Efficiency	55	811
Chapter 9: Indoor Environmental Quality	135	856
Chapter 10: Operation, Maintenance, and Building Owner Education	15	1,044
<b>Total</b>	<b>565</b>	<b>\$14,836</b>

- The annual maintenance cost to achieve the Gold rating is \$493 (Appendix A).
- The annual energy operating cost to achieve the Gold rating is \$684 (Appendix A).
- The annual water operating cost to achieve the Gold rating is \$409 (Appendix A).
- The 30-year lifetime replacement cost to achieve the Gold rating is \$28,146 (Appendix A).

## The Gold Benefits

The annual energy savings (compared with 2006 IECC—chapter 7) are approximately a 51-percent reduction in energy usage (Appendix C—Summary Data for Climate Zone 2—Bayou La Batre, Alabama). The annual water savings (compared with the Average Daily Per Capita Usage in Gallons, as defined by the *Handbook of Water Use and Conservation*—chapter 8) are approximately a 26.7-percent reduction in water usage (Appendix A—Indoor Water Usage Calculation Table for Bayou La Batre, Alabama). The energy efficiency and homeowner education on green practices is at an Emerald rating, and the indoor environmental quality is close to an Emerald rating. Nonetheless, the overall green rating is Gold because the total points are less than the Emerald minimum and most green categories are also less than the Emerald minimum.

## The Emerald Rating

To achieve the Emerald rating, we improved the Gold-rated design by meeting the threshold chapter requirements and selecting an additional 103 points in green features. The Emerald rating requires 697 points; we achieved 700 points by implementing training in the areas of natural resource protection and stormwater management. To improve resource efficiency, we added detailed framing plans, gutter and downspout system, ENERGY STAR cool roof construction, and flashing details. To improve the energy efficiency, the cooling and heating systems were further upgraded and the air handling unit was relocated to the conditioned space. The water efficiency was improved by installing a rainwater collection and distribution system. The IEQ was improved by specifying the use of all hardwood surfaces and wall coverings that comply with CDPH 01350. Additional green-scoring details are in Appendix B. Table 3-18 contains the Emerald rating summary.

Table 3-18. Emerald Rating for AMT2356A Model

Green Building Category	Emerald <sup>a</sup> Required Points	Claimed <sup>b</sup> Points	Additional <sup>c</sup> Claimed Points Above Emerald	Point <sup>d</sup> Shortfall	Mandatory <sup>e</sup> Status
Chapter 5: Lot Design, Preparation, and Development	119	121	2		Not Applicable
Chapter 6: Resource Efficiency	146	154	8		Met
Chapter 7: Energy Efficiency	120	181	61		Met
Chapter 8: Water Efficiency	60	72	12		Met
Chapter 9: Indoor Environmental Quality	140	157	17		Met
Chapter 10: Operation, Maintenance, and Building Owner Education	12	15	3		Met
<b>Section Total</b>	597	700	103	0	
<b>Additional Points</b>	100	—	103	0	
<b>Total Points</b>	697	700	—	0	

<sup>a</sup> Emerald Required Points are the minimum green points needed to achieve an Emerald Rating.  
<sup>b</sup> Claimed Points are the green points we identified (and claimed) based on the Green Improvements.  
<sup>c</sup> Additional Claimed Points Above Emerald are the green points that exceed the Emerald minimum for each green category.  
<sup>d</sup> Point Shortfalls are the number of green points needed to meet the Emerald minimum for each green category.  
<sup>e</sup> Mandatory Status identifies whether mandatory requirements were met for each green category.

## The Emerald Cost

The total initial cost to achieve the Emerald-level rating is shown in Table 3-19.

Table 3-19. Initial Cost to the Builder for the Emerald AMT2356A Model

Green Category	Emerald Points	Cost (\$)
Chapter 5: Lot Design, Preparation, and Development	121	5,643
Chapter 6: Resource Efficiency	154	5,675
Chapter 7: Energy Efficiency	181	12,858
Chapter 8: Water Efficiency	72	1,345
Chapter 9: Indoor Environmental Quality	157	2,687
Chapter 10: Operation, Maintenance, and Building Owner Education	15	1,044
<b>Total</b>	<b>700</b>	<b>\$29,252</b>

- The annual maintenance cost to achieve the Emerald rating is \$493 (Appendix A).
- The annual energy operating cost to achieve the base rating is \$642 (Appendix A).
- The annual water operating cost to achieve the base rating is \$388 (Appendix A).
- The 30-year lifetime replacement cost to achieve the Emerald rating is \$34,001 (Appendix A).



## The Emerald Benefits

The annual energy savings (compared with 2006 IECC—chapter 7) are approximately a 61-percent reduction in energy usage (Appendix C—Summary Data for Climate Zone 2—Bayou La Batre, Alabama). The annual water savings (compared with the Average Daily Per Capita Usage in Gallons, as defined by the *Handbook of Water Use and Conservation*—chapter 8) are approximately a 30.9-percent reduction in water usage (Appendix A—Indoor Water Usage Calculation Table for Bayou La Batre, Alabama). The water-usage reduction estimate does not include the water that would be reduced by using the rainwater-collection system (instead of municipal water sources).

Overall cost and performance data are provided in Table 3-20. The water utility rates are based on Mobile, Alabama water supply and sewer meter rates (source: Mobile Area Water & Sewer System). We base the simple payback periods for energy and water efficiency on the current cost estimates and projected savings and do not consider future rate increases, inflation, replacement costs, or other conditions over the 30-year evaluation period.

Table 3-20. Overall Cost and Performance Data for AMT2356A Model

City of Bayou La Batre AMT2356A 967 ft <sup>2</sup>	Baseline	Bronze	Silver	Gold	Emerald
<b>Cost Comparison</b>					
<b>Total Initial Green Cost (\$)</b>	Unknown	2,576	6,805	14,836	29,252
<b>Annual Maintenance Cost (\$)</b>	399	399	399	493	493
<b>Annual Energy Operating Cost (\$)</b>	904	837	767	684	642
<b>Annual Water Usage Cost (\$)</b>	538	479	441	409	388
<b>30-Year Lifetime Replacement Cost (\$)</b>	16,017	16,105	19,047	28,146	34,001
<b>Incremental Performance Improvement</b>					
<b>Energy Efficiency (e-Ratio) (compare to 2006 IECC)</b>	0.92	0.84	0.71	0.49	0.39
<b>Water Efficiency (%) (compares to 56.4 gpd<sup>a</sup>)</b>	0.6	12.5	20.1	26.7	30.9
<b>Land and Lot Use (points) (NGBS Rating)</b>	21 NR	53 Bronze	72 Silver	94 Gold	121 Emerald
<b>Resource Efficiency (points) (NGBS Rating)</b>	56 Bronze	76 Bronze	87 Silver	114 Gold	154 Emerald
<b>IEQ (points) (NGBS Rating)</b>	71 Silver	74 Silver	99 Silver	135 Gold	157 Emerald
<b>Green Education for Owner (points) (NGBS Rating)</b>	1 NR	9 Bronze	15 Emerald	15 Emerald	15 Emerald
<b>Simple Payback Periods</b>					
<b>Energy Efficiency (years) (initial energy cost and savings)</b>	NA	16	29	39	49
<b>Water Efficiency (years) (initial water cost and savings)</b>	NA	2	5	6	9
<small><sup>a</sup>The benchmark for comparison assumes three occupants using 56.4 (gpd) each. The benchmark cost is \$540; all projected savings are compared with this benchmark. IEQ = Indoor Environmental Quality; NA = not applicable; NGBS = National Green Building Standard; NR = not required</small>					



## 3.2 Climate Zone #3

Oakland, California, is located in climate zone 3C, a warm-marine climate with 435 cooling degree hours (CDH) and 2,880 heating degree days (HDD).

### 3.2.1 Oakland, California: Tassafaronga Development

The Tassafaronga development has approximately 180 new residential units consisting of apartments and townhouses that were constructed in an existing development renovated with HOPE VI grant funding from HUD. This Brownfields Program redevelopment project, known as the Tassafaronga HOPE VI Revitalization Area, was to remediate a former U.S. government-owned temporary housing complex, built to house war workers in 1945. The Tassafaronga housing site was redeveloped into a mixed-income housing development, which included new streets and associated infrastructure, and implemented low-impact and sustainable design.

The new townhomes and apartments were built to LEED standards through a partnership with the Oakland Housing Authority. The LEED-rated townhomes in the Tassafaronga Village community incorporate green building and energy efficient practices into the site development and housing design. The newly constructed homes were designed, built, and certified to ENERGY STAR and LEED homes criteria.

We selected a two-story duplex townhouse in the Tassafaronga Village development of Oakland for the NGBS evaluation process. This townhouse is ENERGY STAR compliant and was designed to LEED homes criteria with the intent of being a green residential house.

#### *Two-Story Townhouse Baseline Green Rating*

Many green features are included in the original two-story townhouse design. In fact, the baseline green rating exceeds the minimum threshold points for a Bronze rating in all areas, except for the Operation, Maintenance and Building Owner Education category, where no points were achieved (because the necessary owner's documentation does not exist). Also, Water Efficiency was the only section that met the mandatory green practices requirements.

The two-story townhouse design was built in accordance with the 2007 California Building Codes and LEED homes criteria. Green points were achieved for building on a brownfield site that was previously developed, incorporating mixed use development, and the lot provides for, and is close to, pedestrian access to community resources and mass transportation. A knowledgeable team was established with respect to green lot design, preparation, and development; a plan was formulated to restore or enhance natural vegetation that was cleared during construction; environmentally sensitive areas were avoided; turf grass species and other vegetation and trees were selected that were native or regionally appropriate; turf areas were limited; plants with similar watering needs were grouped; specific types of trees were located in areas to provide summer shading of streets, parking areas, and buildings; measures were planned that will support wildlife habitat; and ongoing maintenance of vegetation and tree pruning were conducted by a certified arborist.

Construction activities were scheduled to minimize exposed soils, a stormwater management plan was developed and implemented, sediment and erosion controls were installed and maintained in accordance with the stormwater pollution prevention plan (SWPPP), natural water and drainage features were preserved and used, a pest management plan was developed to minimize pesticides and fertilizer use, limits of clearing and grading were demarcated on the plan, and soil was improved with organic amendments. Points were also achieved for density (21 or greater dwelling units per acre), installing shared driveways and parking, and taking measures to mitigate the “Heat Island” effect (that is, patio paving is concrete with two overlapping trees for shading).

Resource-efficient green features include a conditioned space (above grade) of 1,105 ft<sup>2</sup> and material use is minimized through optimal framing techniques (roof trusses at 24 in on center). The roof system is shipped as preassembled components; points are awarded for one stacked story above grade, and the rake and eave overhangs are 12 in. A construction waste-management plan was developed and implemented, onsite recycling measures followed applicable regulations and codes, and six types of construction materials (asphalt, concrete, wood, metals, shingles, and gypsum) were recycled. Points were also achieved for using resource-efficient engineered wood products (roof trusses).

For energy efficiency, the two-story townhouse is ENERGY STAR and LEED homes compliant and exceeds the minimum Emerald rating threshold when designed with the optional solar domestic water heater. Several mandatory NGBS items for energy efficiency, however, were not specified in the available design documentation.

We selected the townhouse design that includes the solar domestic water heater option because it provides the best energy-performance option within the Tassafaronga development. The Emerald-rated energy design exceeds the 2006 IECC performance requirements by reducing energy usage by 65 percent. Several energy-efficient systems are in use, including a 92-percent AFUE boiler for hydronic baseboard heating, a solar domestic water-heating system with an electric storage tank, and several ENERGY STAR-rated appliances. Additional points were gained for specifying ENERGY STAR hard-wired lighting fixtures, no recessed lighting, and a space-heating system that does not include air ducts.

The water-efficient green features include low-flow showerheads and faucets in all lavatories and a low-volume irrigation system that includes high-distribution (DU) rotating spray heads, bubblers, and subsurface irrigation.

The IEQ green features include no natural draftspace-heating or water-heating equipment is located in conditioned spaces, no garage is installed, no fireplace(s) or solid-fuel-burning appliances are installed, bathroom exhaust fan(s) are provided with automatic timer and humidistat, bathroom fan(s) are ENERGY STAR compliant and rated at or below 1 sone, and no plumbing is installed in unconditioned spaces.

Although the original two-story townhouse design obtained a total of 365 green points, the overall green rating falls short of achieving the Bronze-level rating because it lacks several mandatory practices. The design must implement all mandatory practices and meet the threshold requirements for all green categories to achieve a rating. Table 3-21 summarizes the baseline rating and identifies where the design exceeds Bronze-level rating thresholds. Additional green-scoring details are in Appendix B.

Table 3-21. Baseline Rating for Two-Story Townhouse

Green Building Category	Bronze <sup>a</sup> Required Points	Claimed <sup>b</sup> Points	Additional <sup>c</sup> Claimed Points Above Bronze	Point <sup>d</sup> Shortfall	Mandatory <sup>e</sup> Status
<b>Chapter 5: Lot Design, Preparation, and Development</b>	39	110	71	—	Not Applicable
<b>Chapter 6: Resource Efficiency</b>	45	49	4	—	Not Met
<b>Chapter 7: Energy Efficiency</b>	30	145	115	—	Not Met
<b>Chapter 8: Water Efficiency</b>	14	18	4	—	Met
<b>Chapter 9: Indoor Environmental Quality</b>	36	43	7	—	Not Met
<b>Chapter 10: Operation, Maintenance, and Building Owner Education</b>	8	—	—	8	Not Met
<b>Section Total</b>	172	365	201	8	
<b>Additional Points</b>	50	—	201	—	
<b>Total Points</b>	222	365	—	8	

<sup>a</sup>Bronze Required Points are the minimum green points needed to achieve a Bronze Rating.

<sup>b</sup>Claimed Points are the green points we identified (and claimed) based on the Two-Story Townhouse Original Design.

<sup>c</sup>Additional Claimed Points Above Bronze are the green points that exceed the Bronze minimum for each green category.

<sup>d</sup>Point Shortfalls are the number of green points needed to meet the Bronze minimum for each green category.

<sup>e</sup>Mandatory Status identifies whether mandatory requirements were met for each green category.

- The annual maintenance cost to achieve the base rating is \$323 (Appendix A).
- The annual energy operating cost to achieve the base rating is \$748 (Appendix A).
- The annual water operating cost to achieve the base rating is \$458 (Appendix A).
- The 30-year lifetime replacement cost to achieve the base rating is \$13,508 (Appendix A).

## Two-Story Townhouse Incremental Green Ratings

### The Bronze Rating

To achieve the Bronze rating, the remaining mandatory green requirements were met for resource efficiency, energy efficiency and indoor environmental quality. In addition, a building owner's manual is provided that includes a list of green building features and product manufacturers' manuals or data sheets.

All chapter thresholds and mandatory items were achieved, including an additional 208 points. The Bronze rating requires only 222 points, but we were able to achieve 380 points simply by implementing the mandatory items not included in the baseline design, along with several green practices that added little or no cost to the project (for example, adding drip edges at eaves and gable roof edges, specifying the use of building materials without any visible mold, and never enclosing wet insulation products in wall cavities).

The largest one-time cost of going green is the initial investment in developing green documentation and the homeowner's binder templates. For this study, we estimated the going-green cost at \$5,640<sup>22</sup> (this cost will be the case at any rated level). Some additional cost was incurred to meet the mandatory requirements and provide the building owner's manual. Additional green-scoring details are in Appendix B. Table 3-22 contains the Bronze rating summary.

Table 3-22. Bronze Rating for Two-Story Townhouse

Green Building Category	Bronze <sup>a</sup> Required Points	Claimed <sup>b</sup> Points	Additional <sup>c</sup> Claimed Points Above Bronze	Point <sup>d</sup> Shortfall	Mandatory <sup>e</sup> Status
<b>Chapter 5: Lot Design, Preparation, and Development</b>	39	110	71	—	Not Applicable
<b>Chapter 6: Resource Efficiency</b>	45	52	7	—	Met
<b>Chapter 7: Energy Efficiency</b>	30	145	115	—	Met
<b>Chapter 8: Water Efficiency</b>	14	18	4	—	Met
<b>Chapter 9: Indoor Environmental Quality</b>	36	47	11	—	Met
<b>Chapter 10: Operation, Maintenance, and Building Owner Education</b>	8	8	—	—	Met
<b>Section Total</b>	172	380	208	0	
<b>Additional Points</b>	50	—	208	0	
<b>Total Points</b>	222	<b>380</b>	—	0	

<sup>a</sup> Bronze Required Points are the minimum green points needed to achieve a Bronze Rating.  
<sup>b</sup> Claimed Points are the green points we identified (and claimed) based on the Green Improvements.  
<sup>c</sup> Additional Claimed Points Above Bronze are the green points that exceed the Bronze minimum for each green category.  
<sup>d</sup> Point Shortfalls are the number of green points needed to meet the Bronze minimum for each green category.  
<sup>e</sup> Mandatory Status identifies whether mandatory requirements were met for each green category.

## The Bronze Cost

The total initial cost to achieve the Bronze-level rating is shown in Table 3-23.

Table 3-23. Initial Cost to the Builder for the Bronze Two-Story Townhouse

Green Category	Bronze Points	Cost (\$)
Chapter 5: Lot Design, Preparation, and Development	110	0
Chapter 6: Resource Efficiency	52	117
Chapter 7: Energy Efficiency	145	520
Chapter 8: Water Efficiency	18	0
Chapter 9: Indoor Environmental Quality	47	0
Chapter 10: Operation, Maintenance, and Building Owner Education	8	950
<b>Total</b>	<b>380</b>	<b>\$1,587</b>

- The annual maintenance cost to achieve the Bronze rating is \$323 (Appendix A).
- The annual energy operating cost to achieve the Bronze rating is \$748 (Appendix A).
- The annual water operating cost to achieve the Bronze rating is \$458 (Appendix A).
- The 30-year lifetime replacement cost to achieve the Bronze rating is \$13,508 (Appendix A).

## The Bronze Benefits

The annual energy savings (compared with 2006 IECC—chapter 7) are approximately a 65-percent reduction in energy usage (Appendix C—Summary Data for Climate Zone 3C, Oakland, California). The annual water savings (compared with the Average Daily Per Capita Usage in Gallons, as defined by the *Handbook of Water Use and Conservation*—chapter 8) are approximately a 12-percent reduction in water usage (Appendix A—Indoor Water Usage Calculation Table for Oakland, California). The energy efficiency was originally designed at the Emerald level, and the lot design and development are at a Gold-level rating. Nonetheless, the overall green rating is Bronze because the total points are less than the Silver minimum in many green categories.

## The Silver Rating

To achieve the Silver rating, we improved the Bronze-rated design by exceeding the threshold chapter requirements and selecting an additional 156 points in green features. The Silver rating requires 406 points. We achieved 462 points by changing the wall dimensions to reduce material cuts and waste, supplying precut or preassembled panels for the floor and wall systems, specifying vinyl windows, specifying a gutter and downspout system with extensions or splash blocks, and using biobased wood materials (cabinets, trim, and engineered wood). To improve energy and water efficiency, we added an ENERGY STAR dishwasher and washing machine (because the original specifications did not explicitly identify an ENERGY STAR dishwasher or washing machine). The IEQ was improved by specifying the use of low-VOC site-applied interior products that are in accordance with the emissions levels of the third-party programs outlined in section 901.8.2. Low-emission kitchen and bath cabinets were specified, along with installing

low-emission insulation in walls, floors, ceilings, and ducts. Kitchen exhaust units are ducted to the outdoors, and unwanted contaminants are prevented from entering the living space by sealing all penetrations in ceilings, walls, and floors, including the attic access. Green points were also awarded by providing training to building owners and occupants with regard to green building goals and strategies, and equipment and controls. Additional green-scoring details are in Appendix B. Table 3-24 contains the Silver rating summary.

Table 3-24. Silver Rating for Two-Story Townhouse

Green Building Category	Silver <sup>a</sup> Required Points	Claimed <sup>b</sup> Points	Additional <sup>c</sup> Claimed Points Above Silver	Point <sup>d</sup> Shortfall	Mandatory <sup>e</sup> Status
<b>Chapter 5: Lot Design, Preparation, and Development</b>	66	110	44	—	Not Applicable
<b>Chapter 6: Resource Efficiency</b>	79	80	1	—	Met
<b>Chapter 7: Energy Efficiency</b>	60	151	91	—	Met
<b>Chapter 8: Water Efficiency</b>	26	28	2	—	Met
<b>Chapter 9: Indoor Environmental Quality</b>	65	79	14	—	Met
<b>Chapter 10: Operation, Maintenance, and Building Owner Education</b>	10	14	4	—	Met
<b>Section Total</b>	306	462	156	0	
<b>Additional Points</b>	100	—	156	0	
<b>Total Points</b>	406	462	—	0	

<sup>a</sup>Silver Required Points are the minimum green points needed to achieve a Silver Rating.  
<sup>b</sup>Claimed Points are the green points we identified (and claimed) based on the Green Improvements.  
<sup>c</sup>Additional Claimed Points Above Silver are the green points that exceed the Silver minimum for each green category.  
<sup>d</sup>Point Shortfalls are the number of green points needed to meet the Silver minimum for each green category.  
<sup>e</sup>Mandatory Status identifies whether mandatory requirements were met for each green category.

## The Silver Cost

The total initial cost to achieve the Silver-level rating (above the baseline) is shown in Table 3-25.

Table 3-25. Initial Cost to the Builder for the Silver Two-Story Townhouse

Green Category	Silver Points	Cost (\$)
<b>Chapter 5: Lot Design, Preparation, and Development</b>	110	0
<b>Chapter 6: Resource Efficiency</b>	80	436
<b>Chapter 7: Energy Efficiency</b>	151	520
<b>Chapter 8: Water Efficiency</b>	28	200
<b>Chapter 9: Indoor Environmental Quality</b>	79	250
<b>Chapter 10: Operation, Maintenance, and Building Owner Education</b>	14	1,044
<b>Total</b>	<b>462</b>	<b>2,450</b>

- The annual maintenance cost to achieve the Silver rating is \$323 (Appendix A).
- The annual energy operating cost to achieve the Silver rating is \$744 (Appendix A).
- The annual water operating cost to achieve the Silver rating is \$405 (Appendix A).
- The 30-year lifetime replacement cost to achieve the Silver rating is \$15,008 (Appendix A).

## The Silver Benefits

The annual energy savings (compared with 2006 IECC—chapter 7) remains at approximately a 65-percent reduction in energy usage (Appendix C—Summary Data contains Climate Zone 3C, Oakland, California). The annual water savings (compared with the Average Daily Per Capita Usage in Gallons, as defined by the *Handbook of Water Use and Conservation*—chapter 8) are approximately a 27-percent reduction in water usage (Appendix A—Indoor Water Usage Calculation Table for Oakland, California). The energy efficiency remains well above the Emerald level, and the lot design and development remain at a Gold-level rating, and the homeowner education on green practices is at an Emerald rating. Nonetheless, the overall green rating is Silver because the total points are less than the Gold minimum and many of the green categories are less than the Gold minimum.

## The Gold Rating

To achieve the Gold rating, we improved the Silver-rated design by meeting the threshold chapter requirements and selecting an additional 109 points in green features. The Gold rating requires 558 points; we achieved 567 points by providing onsite supervision and coordination during clearing, grading, trenching, paving, and installation of utilities. For improved resource efficiency, we added flashing details to the plans, installed a recycling collection space in the kitchen and containers on the back porch, specified the use of gypsum board and cellulose insulation with 75-percent recycled content, procured OSB from a factory where one-third of the process energy comes from renewable resources, specified the use of OSB for floor decking and roof sheathing, and used five indigenous construction materials or products (stone, OSB, deck lumber, windows, and siding).

To improve water efficiency, low-flow toilets with an effective flush rate volume of 1.28 gallons or less were installed in all lavatories. Green points for IEQ were achieved by conditioning the mechanical room with an added radiator; specifying the use of low-emission carpet, padding, and carpet adhesives; verifying the airflow of all exhaust equipment at the point of exhaust; sampling the moisture content of framing lumber before closing-in wall cavities; checking the moisture content of subfloors, substrates, and concrete slabs before applying finish products; and not installing plumbing distribution lines in exterior wall cavities. Green points were also gained for placing fixed exterior grilles or mats by the entranceways. Additional green-scoring details are in Appendix B. Table 3-26 contains the Gold rating summary.



Table 3-26. Gold Rating for Two-Story Townhouse

Green Building Category	Gold <sup>a</sup> Required Points	Claimed <sup>b</sup> Points	Additional <sup>c</sup> Claimed Points Above Gold	Point <sup>d</sup> Shortfall	Mandatory <sup>e</sup> Status
Chapter 5: Lot Design, Preparation, and Development	93	114	21	—	Not Applicable
Chapter 6: Resource Efficiency	113	116	3	—	Met
Chapter 7: Energy Efficiency	100	159	59	—	Met
Chapter 8: Water Efficiency	41	46	5	—	Met
Chapter 9: Indoor Environmental Quality	100	118	18	—	Met
Chapter 10: Operation, Maintenance, and Building Owner Education	11	14	3	—	Met
<b>Section Total</b>	458	567	109	0	
<b>Additional Points</b>	100	—	109	0	
<b>Total Points</b>	558	567	—	0	

<sup>a</sup> Gold Required Points are the minimum green points needed to achieve a Gold Rating.  
<sup>b</sup> Claimed Points are the green points we identified (and claimed) based on the Green Improvements.  
<sup>c</sup> Additional Claimed Points Above Gold are the green points that exceed the Gold minimum for each green category.  
<sup>d</sup> Point Shortfalls are the number of green points needed to meet the Gold minimum for each green category.  
<sup>e</sup> Mandatory Status identifies whether mandatory requirements were met for each green category.

## The Gold Cost

The total initial cost to achieve the Gold-level rating is shown in Table 3-27.

Table 3-27. Cost to the Builder for the Gold Two-Story Townhouse

Green Category	Gold Points	Cost (\$)
Chapter 5: Lot Design, Preparation, and Development	114	0
Chapter 6: Resource Efficiency	116	1,014
Chapter 7: Energy Efficiency	159	520
Chapter 8: Water Efficiency	46	400
Chapter 9: Indoor Environmental Quality	118	592
Chapter 10: Operation, Maintenance, and Building Owner Education	14	1,044
<b>Total</b>	<b>567</b>	<b>\$3,570</b>

- The annual maintenance cost to achieve the Gold rating is \$323 (Appendix A).
- The annual energy operating cost to achieve the Gold rating is \$744 (Appendix A).
- The annual water operating cost to achieve the Gold rating is \$405 (Appendix A).
- The 30-year lifetime replacement cost to achieve the Gold rating is \$15,008 (Appendix A).



## The Gold Benefits

The annual energy savings (compared with 2006 IECC—chapter 7) remained at approximately a 65-percent reduction in energy usage (Appendix C—Summary Data for Climate Zone 3C, Oakland, California). The annual water savings (compared with the Average Daily Per Capita Usage in Gallons, as defined by the *Handbook of Water Use and Conservation*—chapter 8) remains at approximately a 27-percent reduction in water usage (Appendix A—Indoor Water Usage Calculation Table for Oakland, California). The energy efficiency remains well above the Emerald level and the homeowner education on green practices is at an Emerald rating. Nonetheless, the overall green rating is Gold, because the total points are less than the Emerald minimum and most green categories are also less than the Emerald minimum.

## The Emerald Rating

To achieve the Emerald rating, we improved the Gold-rated design by meeting the threshold chapter requirements and selecting an additional 104 points in green features. Although the Emerald rating requires 697 points, we were able to achieve 701 points by providing basic training in tree or other natural resource protection to the onsite supervisor, creating vegetative wind breaks appropriate for local conditions, using onsite tree trimmings or stump grindings to provide protective mulch during construction, recycling cleared trees, using fencing to protect trees and other vegetation, staking out limits of clearing and grading, creating no-disturbance zones to protect vegetation and other sensitive areas, stockpiling and stabilizing topsoil for future use, compacting soil, and avoiding trenching and significant changes in grade in critical root zones of tree-save areas. We also achieved points for stabilizing disturbed areas within 14 days, using methods recommended by the EPA or in the approved stormwater pollution prevention plan (SWPPP).

For improved resource efficiency, we added detailed framing plans with sheathing layouts and cut lists, designed roof dimensions and layout to reduce material cuts and waste, specified prefinished fiber cement siding, installed a portico at each exterior entrance to protect that section of the building from precipitation and solar radiation, installed a continuous physical termite barrier at the foundation, converted all walls and a deck to termite-resistant materials, provided a compost facility on site, specified two FSC-certified wood products (interior doors and kitchen cabinets), and procured another construction material from a factory that uses one-third of the process energy from a renewable resource. To improve energy efficiency, we specified an ENERGY STAR refrigerator and required that the HVAC contractor and service technician(s) be certified by a nationally or regionally recognized program, so that the installation and performance of the heating and cooling system were verified by the HVAC contractor.

Water efficiency was improved by specifying a washing machine with a water factor of 6.0 or less, having the irrigation system designed and installed by professionals in accordance with EPA WaterSense requirements or equivalent, zoning the irrigation system separately for turf and bedding areas; and collecting and using rainwater.

The IEQ was improved by specifying the use of low-emission particleboard and MDF cabinets and hardwood plywood trim, specifying low-emission hard-surface flooring that meets third-party certification requirements, specifying the use of interior low-VOC adhesives and sealants that meet third-party certification requirement, and requiring more stringent emission

specifications for kitchen and bath cabinets. Additional green points were also achieved for installing a heat-recovery ventilator, protecting HVAC supply registers and return grilles by covering the openings during construction to prevent dust and other pollutants from entering the system, adding a capillary break on the footing to prevent moisture migration into the foundation wall, and installing a humidity-monitoring system with a mobile base unit that displays temperature and humidity. Additional green-scoring details are in Appendix B. Table 3-28 contains the Emerald rating summary.

Table 3-28. Emerald Rating for Two-Story Townhouse

Green Building Category	Emerald <sup>a</sup> Required Points	Claimed <sup>b</sup> Points	Additional <sup>c</sup> Claimed Points Above Emerald	Point <sup>d</sup> Shortfall	Mandatory <sup>e</sup> Status
<b>Chapter 5: Lot Design, Preparation, and Development</b>	119	150	31		Not Applicable
<b>Chapter 6: Resource Efficiency</b>	146	150	4		Met
<b>Chapter 7: Energy Efficiency</b>	120	168	48		Met
<b>Chapter 8: Water Efficiency</b>	60	61	1		Met
<b>Chapter 9: Indoor Environmental Quality</b>	140	158	18		Met
<b>Chapter 10: Operation, Maintenance, and Building Owner Education</b>	12	14	2		Met
<b>Section Total</b>	597	701	104	0	
<b>Additional Points</b>	100	—	104	0	
<b>Total Points</b>	697	701	—	0	

<sup>a</sup> Emerald Required Points are the minimum green points needed to achieve an Emerald Rating.  
<sup>b</sup> Claimed Points are the green points we identified (and claimed) based on the Green Improvements.  
<sup>c</sup> Additional Claimed Points Above Emerald are the green points that exceed the Emerald minimum for each green category.  
<sup>d</sup> Point Shortfalls are the number of green points needed to meet the Emerald minimum for each green category.  
<sup>e</sup> Mandatory Status identifies whether mandatory requirements were met for each green category.

## The Emerald Cost

The total initial cost to achieve the Emerald-level rating (above the baseline) is shown in Table 3-29.

Table 3-29. Initial Cost to the Builder for the Emerald Two-Story Townhouse

Green Category	Emerald Points	Cost (\$)
<b>Chapter 5: Lot Design, Preparation, and Development</b>	150	1,670
<b>Chapter 6: Resource Efficiency</b>	150	7,619
<b>Chapter 7: Energy Efficiency</b>	168	594
<b>Chapter 8: Water Efficiency</b>	61	891
<b>Chapter 9: Indoor Environmental Quality</b>	158	1,439
<b>Chapter 10: Operation, Maintenance, and Building Owner Education</b>	14	1,044
<b>Total</b>	<b>701</b>	<b>\$13,257</b>

- The annual maintenance cost to achieve the Emerald rating is \$323 (Appendix A).
- The annual energy operating cost to achieve the Emerald rating is \$719 (Appendix A).
- The annual water operating cost to achieve the Emerald rating is \$390 (Appendix A).
- The 30-year lifetime replacement cost to achieve the Emerald rating is \$15,931 (Appendix A).

## The Emerald Benefits

The annual energy savings (compared with 2006 IECC—chapter 7) remained at approximately a 65-percent reduction in energy usage (Appendix C—Summary Data for Climate Zone 3C, Oakland, California). The annual water savings (compared with the Average Daily Per Capita Usage in Gallons, as defined by the *Handbook of Water Use and Conservation*—chapter 8) are approximately a 31-percent reduction in water usage (Appendix A—Indoor Water Usage Calculation Table for Oakland, California). The water usage reduction estimate does not include the water that would be reduced from using the rainwater-collection system (instead of municipal water sources).

Overall cost and performance data are provided in Table 3-30. The water utility rates are based on Oakland, California water supply and sewer meter rates (source: East Bay Municipal Utility District). We base the simple payback periods for energy and water efficiency on the current cost estimates and projected savings and do not consider future rate increases, inflation, replacement costs, or other conditions over the 30-year evaluation period.

Table 3-30. Overall Cost and Performance Data for Two-Story Townhouse

OHA Townhouse 1,105 ft <sup>2</sup>	Baseline	Bronze	Silver	Gold	Emerald
<b>Cost Comparison</b>					
<b>Total Initial Green Cost (\$)</b>	Unknown	1,587	2,450	3,570	13,257
<b>Annual Maintenance Cost (\$)</b>	323	323	323	323	323
<b>Annual Energy Operating Cost (\$)</b>	748	748	744	744	719
<b>Annual Water Usage Cost (\$)</b>	458	458	405	405	390
<b>30-Year Lifetime Replacement Cost (\$)</b>	13,508	13,508	15,008	15,008	15,931
<b>Incremental Performance Improvement</b>					
<b>Energy Efficiency (e-Ratio) (compare to 2006 IECC)</b>	0.36	0.36	0.36	0.36	0.36
<b>Water Efficiency (%) (compares to 56.4 gpd<sup>a</sup>)</b>	11.9	11.9	26.7	26.7	30.9
<b>Land and Lot Use (points) (NGBS Rating)</b>	110 Gold	110 Gold	110 Gold	114 Gold	150 Emerald
<b>Resource Efficiency (points) (NGBS Rating)</b>	49 Bronze	52 Bronze	80 Silver	116 Gold	150 Emerald
<b>IEQ (points) (NGBS Rating)</b>	43 Bronze	47 Bronze	79 Silver	118 Gold	158 Emerald
<b>Green Education for Owner (points) (NGBS Rating)</b>	0 NR	8 Bronze	14 Emerald	14 Emerald	14 Emerald
<b>Simple Payback Periods</b>					
<b>Energy Efficiency (years) (initial energy cost and savings)</b>	NA	0	0	0	0
<b>Water Efficiency (years) (initial water cost and savings)</b>	NA	0	2	4	8
<small><sup>a</sup>The benchmark for comparison assumes three occupants using 56.4 (gpd) each. The benchmark cost is \$501; all projected savings are compared with this benchmark. IEQ = Indoor Environmental Quality; NA = not applicable; NGBS = National Green Building Standard; NR = not required</small>					

## 3.3 Climate Zone #4

Richmond, Virginia, is located in climate zone 4A, a mixed-humid climate with 12,260 cooling degree hours (CDH) and 3,969 HDD. Seattle, Washington, is located in climate zone 4C, a mixed-marine climate with 1,050 CDH and 5,122 HDD.

### 3.3.1 Richmond, Virginia: Blackwell Development

In Virginia, approximately 470 new units consisting of townhouse and garden style apartments, and single-family homes were constructed in several existing neighborhoods renovated with HOPE grant funding from the U.S. Department of Housing and Development. This urban revitalization project was to rebuild and improve former public housing developments located in the city of Richmond. Construction also included a recreation and community center, parks, and an elementary school.

Construction was managed by the Richmond Redevelopment and Housing Authority (RRHA) and was completed in different phases, and in several different neighborhoods. The largest amount of construction took place in the Blackwell community, with the construction of 188 single-family houses. The Blackwell community incorporates green building and energy efficient practices into the housing designs, along with making the homes easily accessible to community services and amenities. The newly constructed homes were designed, built, and certified to ENERGY STAR and EarthCraft House™ criteria.

We selected a single-family 18 foot-wide rowhouse in the Blackwell community of Richmond, Virginia, for the NGBS evaluation process. This home was designed to be ENERGY STAR compliant and EarthCraft™ certified with the intent of being green.

#### *Single-Family Rowhouse Baseline Green Rating*

Many green features are included in the original single-family rowhouse design. In fact, the baseline green rating exceeds the minimum threshold points for a Bronze rating in all areas, except for water efficiency and Operation, Maintenance and Building Owner Education, where no points were achieved (because the necessary owner's documentation does not exist). Although the minimum Bronze threshold was not met for water efficiency, the mandatory water-efficiency requirements were met. The mandatory green practice requirements were not met for other green categories.

The single-family rowhouse design was built in accordance with the 2006 Virginia Construction Code (USBC) and the City of Richmond Zoning Ordinance. Green points were achieved for building on a grayfield site that was previously developed. The lot provides for, and is close to, pedestrian access to community resources and transportation. Construction activities were scheduled to minimize exposed soils, and limits of clearing and grading are shown on the plans. Environmentally sensitive areas were avoided and cleared trees recycled. Measures were taken to minimize soil disturbance and erosion, and to protect trees and vegetation during construction. Light colored hardscaping was also installed.

Resource-efficient green features include a conditioned space (above grade) of 1,656 ft<sup>2</sup>, roof trusses and floor trusses at 24 in on center, 2 by 6 in walls at 24 in on center, and single top plates. The building dimensions and layouts were designed to reduce material cuts and waste. Prefabricated components were used for the roof system, and points were achieved for one stacked story. Windows, decking, and siding do not require onsite application of paint or stain. Exterior doors are covered to protect them from the rain and sun, drip edges are installed, and flashing details are implemented and shown on the plans. Sorting and reuse of scrap building materials are implemented, and biobased wood materials and resource-efficient engineered products are installed.

The single-family rowhouse was built to the 2006 IECC. The rowhouse exceeds the 2006 IECC performance requirements by reducing energy usage by 15 percent. All mandatory items under energy efficiency were met except for one. A 13 SEER Heat Pump was installed. Additional green features include upgraded windows and doors, upgraded insulation in the ceiling (R-38) and walls (R-19), 2 by 6 in wall construction, and 5-percent duct loss. The design includes an ENERGY STAR dishwasher, energy-efficient lighting (CFLs), programmable thermostat, and no recessed lighting. The duct system was designed in accordance with Manual D, all ducts were in conditioned space, no building cavities were used for ducts, and return ducts were in every room with a door. Also, a third-party inspection verified duct installation and sealing and envelope insulation and sealing.

The water-efficient green features included using appliances and fixtures that conserve water (that is, dishwasher and low-flow showerheads), and minimizing the hot-water pipe runs. The IEQ green features included an air handler in conditioned space, low-emission carpeting, and low-VOC interior architectural coatings and exterior adhesives and sealants. The rowhouse had no fireplace(s) or solid-fuel-burning appliances, and no garage. The kitchen exhaust fan was vented to the outdoors, the bath and laundry exhaust fans was wired to a humidistat, and all exhaust fans are ENERGY STAR rated. A whole building ventilation system was implemented, MERV 8 filters or better were installed, and indoor contaminants were prevented through sealing of the envelope. Green points were also gained under moisture management by correctly installing a vapor barrier on the crawlspace floor, and not installing plumbing in exterior walls or unconditioned space(s).

Although the original single-family rowhouse design obtained a total of 327 green points, the overall green rating falls short of achieving the Bronze-level rating because it lacks several mandatory practices. The design must implement all mandatory practices and meet the threshold requirements for all green categories to achieve a rating. Table 3-31 summarizes the baseline rating and identifies where the design exceeds Bronze-level rating thresholds. Additional green-scoring details are in Appendix B.

Table 3-31. Baseline Rating for Single-Family Rowhouse

Green Building Category	Bronze <sup>a</sup> Required Points	Claimed <sup>b</sup> Points	Additional <sup>c</sup> Claimed Points Above Bronze	Point <sup>d</sup> Shortfall	Mandatory <sup>e</sup> Status
Chapter 5: Lot Design, Preparation, and Development	39	68	29	—	Not Applicable
Chapter 6: Resource Efficiency	45	78	33	—	Not met
Chapter 7: Energy Efficiency	30	70	40	—	Not met
Chapter 8: Water Efficiency	14	8	—	6	Met
Chapter 9: Indoor Environmental Quality	36	103	67	—	Not met
Chapter 10: Operation, Maintenance, and Building Owner Education	8	—	—	8	Not met
<b>Section Total</b>	172	327	169	14	
<b>Additional Points</b>	50	—	169	—	
<b>Total Points</b>	222	327	—	14	

<sup>a</sup>Bronze Required Points are the minimum green points needed to achieve a Bronze Rating.

<sup>b</sup>Claimed Points are the green points we identified (and claimed) based on the Single-Family Rowhouse Original Design.

<sup>c</sup>Additional Claimed Points Above Bronze are the green points that exceed the Bronze minimum for each green category.

<sup>d</sup>Point Shortfalls are the number of green points needed to meet the Bronze minimum for each green category.

<sup>e</sup>Mandatory Status identifies whether mandatory requirements were met for each green category.

- The annual maintenance cost to achieve the base rating is \$273 (Appendix A).
- The annual energy operating cost to achieve the base rating is \$1,150 (Appendix A).
- The annual water operating cost to achieve the base rating is \$981 (Appendix A).
- The 30-year lifetime replacement cost to achieve the base rating is \$11,010 (Appendix A).

## Single-Family Rowhouse Incremental Green Ratings

### The Bronze Rating

To achieve the Bronze rating, all remaining mandatory green requirements were met. These requirements included adding specifications to the plans to provide proper slope at finish grade, specifying that insulation was installed according to manufacturer’s specifications, verifying the moisture content of wall insulation before close-in, and including a list of green building features and product manufacturers’ manuals or data sheets.

All chapter thresholds and mandatory items were achieved, including an additional 178 points. The Bronze rating requires only 222 points, but we were able to achieve a total of 350 points simply by implementing the mandatory items not included in the baseline design, along with several green practices that added little or no cost to the project (for example, installing lower flow faucets and showerheads in all lavatories, installing a vapor retarder on the crawlspace floor and extending it up the foundation wall, and developing a manual to provide information on the building’s use, maintenance, and green components).



The largest one-time cost of going green is the initial investment in developing green documentation and the homeowner’s binder templates. For this study, we estimated the going-green cost at \$5,640<sup>23</sup> (this cost will be the case at any rated level). Some additional cost was incurred to meet the mandatory requirements and provide the building owner’s manual. Additional green-scoring details are in Appendix B. Table 3-32 contains the Bronze rating summary.

Table 3-32. Bronze Rating for Single-Family Rowhouse

Green Building Category	Bronze <sup>a</sup> Required Points	Claimed <sup>b</sup> Points	Additional <sup>c</sup> Claimed Points Above Bronze	Point <sup>d</sup> Shortfall	Mandatory <sup>e</sup> Status
<b>Chapter 5: Lot Design, Preparation, and Development</b>	39	68	29	—	Not Applicable
<b>Chapter 6: Resource Efficiency</b>	45	78	33	—	Met
<b>Chapter 7: Energy Efficiency</b>	30	70	40	—	Met
<b>Chapter 8: Water Efficiency</b>	14	14	—	—	Met
<b>Chapter 9: Indoor Environmental Quality</b>	36	111	75	—	Met
<b>Chapter 10: Operation, Maintenance, and Building Owner Education</b>	8	9	1	—	Met
<b>Section Total</b>	172	350	178	0	
<b>Additional Points</b>	50	—	178	0	
<b>Total Points</b>	222	350	—	0	

<sup>a</sup> Bronze Required Points are the minimum green points needed to achieve a Bronze Rating.  
<sup>b</sup> Claimed Points are the green points we identified (and claimed) based on the Green Improvements.  
<sup>c</sup> Additional Claimed Points Above Bronze are the green points that exceed the Bronze minimum for each green category.  
<sup>d</sup> Point Shortfalls are the number of green points needed to meet the Bronze minimum for each green category.  
<sup>e</sup> Mandatory Status identifies whether mandatory requirements were met for each green category.

## The Bronze Cost

The total initial cost to achieve the Bronze-level rating is shown in Table 3-33.

Table 3-33. Initial Cost to the Builder for the Bronze Single-Family Rowhouse

Green Category	Bronze Points	Cost (\$)
<b>Chapter 5: Lot Design, Preparation, and Development</b>	68	0
<b>Chapter 6: Resource Efficiency</b>	78	0
<b>Chapter 7: Energy Efficiency</b>	70	0
<b>Chapter 8: Water Efficiency</b>	14	0
<b>Chapter 9: Indoor Environmental Quality</b>	111	0
<b>Chapter 10: Operation, Maintenance, and Building Owner Education</b>	9	950
<b>Total</b>	<b>350</b>	<b>\$950</b>



- The annual maintenance cost to achieve the Bronze rating is \$273 (Appendix A).
- The annual energy operating cost to achieve the Bronze rating is \$1,140 (Appendix A).
- The annual water operating cost to achieve the Bronze rating is \$936 (Appendix A).
- The 30-year lifetime replacement cost to achieve the Bronze rating is \$11,010 (Appendix A).

## The Bronze Benefits

The annual energy savings (compared with 2006 IECC—chapter 7) are approximately a 15-percent reduction in energy usage (Appendix C—Summary Data for Climate Zone 4, Richmond, Virginia). The annual water savings (compared with the Average Daily Per Capita Usage in Gallons, as defined by the *Handbook of Water Use and Conservation*—chapter 8) are approximately a 12-percent reduction in water usage (Appendix A—Indoor Water Usage Calculation Table for Richmond, Virginia). The IEQ is actually at a Gold rating. The lot design and development and energy efficiency are at a Silver rating, and resource efficiency is within 1 point of a Silver rating. Nonetheless, the overall green rating is Bronze because the total points are less than the Silver minimum.

## The Silver Rating

To achieve the Silver rating, we improved the Bronze-rated design by meeting the threshold chapter requirements and selecting an additional 130 points in green features. The Silver rating requires 406 points; we achieved 436 points by specifying precut floor trusses for both floors, and improving energy efficiency by increasing the attic insulation to R-49, installing one-inch exterior foam sheathing, improving window performance, upgrading the heat pump to 16 SEER, adding a communicating programmable thermostat, reducing infiltration further, and installing a tankless water heater. For improved water efficiency, we added low-flow toilets with flush rates of 1.28 gallons or less in all bathrooms. The IEQ was improved by specifying the use of low-emission carpet padding and adhesives; installing low-emission kitchen and bath cabinets; installing low-emission insulation in walls, floors, ceilings, and ducts; sampling moisture content of lumber for acceptable levels; and installing exterior grilles or mats at door entrances. Training and orientation of the building owners for the green building systems and operations were implemented. Additional green-scoring details are in Appendix B. Table 334 contains the Silver rating summary.

Table 3-34. Silver Rating for Single-Family Rowhouse

Green Building Category	Silver <sup>a</sup> Required Points	Claimed <sup>b</sup> Points	Additional <sup>c</sup> Claimed Points Above Silver	Point <sup>d</sup> Shortfall	Mandatory <sup>e</sup> Status
<b>Chapter 5: Lot Design, Preparation, and Development</b>	66	68	2	—	Not Applicable
<b>Chapter 6: Resource Efficiency</b>	79	82	3	—	Met
<b>Chapter 7: Energy Efficiency</b>	60	102	42	—	Met
<b>Chapter 8: Water Efficiency</b>	26	38	12	—	Met
<b>Chapter 9: Indoor Environmental Quality</b>	65	131	66	—	Met

continued on next page

Table 3-34. Silver Rating for Single-Family Rowhouse (cont)

Green Building Category	Silver <sup>a</sup> Required Points	Claimed <sup>b</sup> Points	Additional <sup>c</sup> Claimed Points Above Silver	Point <sup>d</sup> Shortfall	Mandatory <sup>e</sup> Status
<b>Chapter 10: Operation, Maintenance, and Building Owner Education</b>	10	15	5	—	Met
<b>Section Total</b>	306	436	130	0	
<b>Additional Points</b>	100	—	130	0	
<b>Total Points</b>	406	436	—	0	

<sup>a</sup>Silver Required Points are the minimum green points needed to achieve a Silver Rating  
<sup>b</sup>Claimed Points are the green points we identified (and claimed) based on the Green Improvements.  
<sup>c</sup>Additional Claimed Points Above Silver are the green points that exceed the Silver minimum for each green category.  
<sup>d</sup>Point Shortfalls are the number of green points needed to meet the Silver minimum for each green category.  
<sup>e</sup>Mandatory Status identifies whether mandatory requirements were met for each green category.

## The Silver Cost

The total initial cost to achieve the Silver-level rating is shown in Table 3-35.

Table 3-35. Initial Cost to the Builder for the Silver Single-Family Rowhouse

Green Category	Silver Points	Cost (\$)
<b>Chapter 5: Lot Design, Preparation, and Development</b>	68	0
<b>Chapter 6: Resource Efficiency</b>	82	0
<b>Chapter 7: Energy Efficiency</b>	102	6,384
<b>Chapter 8: Water Efficiency</b>	38	525
<b>Chapter 9: Indoor Environmental Quality</b>	131	44
<b>Chapter 10: Operation, Maintenance, and Building Owner Education</b>	15	1,044
<b>Total</b>	<b>436</b>	<b>\$7,997</b>

- The annual maintenance cost to achieve the Silver rating is \$273 (Appendix A).
- The annual energy operating cost to achieve the Silver rating is \$1,043 (Appendix A).
- The annual water operating cost to achieve the Silver rating is \$906 (Appendix A).
- The 30-year lifetime replacement cost to achieve the Silver rating is \$15,371 (Appendix A).

## The Silver Benefits

The annual energy savings (compared with 2006 IECC—chapter 7) are approximately a 30-percent reduction in energy usage (Appendix C—Summary Data for Climate Zone 4, Richmond, Virginia). The annual water savings (compared with the Average Daily Per Capita Usage in Gallons, as defined by the *Handbook of Water Use and Conservation*—chapter 8) are approximately a 19-percent reduction in water usage (Appendix A—Indoor Water Usage Calculation Table for Richmond, Virginia). The energy efficiency and IEQ categories have Gold ratings, and the lot design, preparation and development, the resource efficiency, and the operation, maintenance, building

owner education categories are slightly above the Silver rating. The water-efficiency category is close to achieving a Gold rating. Nonetheless, the overall green rating is Silver because the total points are less than the Gold minimum.

## The Gold Rating

To achieve the Gold rating, we improved the Silver-rated design by meeting the threshold chapter requirements and selecting an additional 113 points in green features. The Gold rating requires 558 points; we achieved 571 points by implementing measures to support wildlife habitat and developing a landscape plan to restore or enhance natural vegetation that is cleared during construction and that limits water and energy use. We also specified a pest-management plan. To improve resource efficiency, we specified wall dimensions that reduce material cuts and waste, and we required panelized wall assemblies. We specified the use of gypsum board and cellulose insulation with 75-percent recycled content, three types of building materials that were recycled, and five indigenous construction materials.

To improve energy efficiency, we upgraded to a closed-loop solar hot-water system and all hard-wired lighting fixtures to an ENERGY STAR rating. We selected the heating and cooling equipment using ACCA Manual S, and ensured that the installation technician(s) were certified by a nationally recognized program. To improve water efficiency, we installed no irrigation system and we developed a landscape plan to conserve water. We improved the IEQ by selecting interior doors and trim with no added urea formaldehyde and by selecting kitchen cabinets and all interior wood materials that have very low emissions. Additional green-scoring details are in Appendix B. Table 3-36 contains the Gold rating summary.

Table 3-36. Gold Rating for Single-Family Rowhouse

Green Building Category	Gold <sup>a</sup> Required Points	Claimed <sup>b</sup> Points	Additional <sup>c</sup> Claimed Points Above Gold	Point <sup>d</sup> Shortfall	Mandatory Status <sup>e</sup>
<b>Chapter 5: Lot Design, Preparation, and Development</b>	93	95	2	—	Not Applicable
<b>Chapter 6: Resource Efficiency</b>	113	114	1	—	Met
<b>Chapter 7: Energy Efficiency</b>	100	155	55	—	Met
<b>Chapter 8: Water Efficiency</b>	41	53	12	—	Met
<b>Chapter 9: Indoor Environmental Quality</b>	100	139	39	—	Met
<b>Chapter 10: Operation, Maintenance, and Building Owner Education</b>	11	15	4	—	Met
<b>Section Total</b>	458	571	113	0	
<b>Additional Points</b>	100	—	113	0	
<b>Total Points</b>	558	571	—	0	

<sup>a</sup> Gold Required Points are the minimum green points needed to achieve a Gold Rating.  
<sup>b</sup> Claimed Points are the green points we identified (and claimed) based on the Green Improvements.  
<sup>c</sup> Additional Claimed Points Above Gold are the green points that exceed the Gold minimum for each green category.  
<sup>d</sup> Point Shortfalls are the number of green points needed to meet the Gold minimum for each green category.  
<sup>e</sup> Mandatory Status identifies whether mandatory requirements were met for each green category.

## The Gold Cost

The total initial cost to achieve the Gold-level rating (above the baseline) is shown in Table 3-37.

Table 3-37. Initial Cost to the Builder for the Gold Single-Family Rowhouse

Green Category	Gold Points	Cost (\$)
Chapter 5: Lot Design, Preparation, and Development	95	1,590
Chapter 6: Resource Efficiency	114	0
Chapter 7: Energy Efficiency	155	13,009
Chapter 8: Water Efficiency	53	525
Chapter 9: Indoor Environmental Quality	139	44
Chapter 10: Operation, Maintenance, and Building Owner Education	15	1,044
<b>Total</b>	<b>571</b>	<b>\$16,212</b>

- The annual maintenance cost to achieve the Gold rating is \$320 (Appendix A).
- The annual energy operating cost to achieve the Gold rating is \$910 (Appendix A).
- The annual water operating cost to achieve the Gold rating is \$906 (Appendix A).
- The 30-year lifetime replacement cost to achieve the Gold rating is \$25,756 (Appendix A).

## The Gold Benefits

The annual energy savings (compared with 2006 IECC—chapter 7) are approximately a 54-percent reduction in energy usage (Appendix C—Summary Data for Climate Zone 4, Richmond, Virginia). The annual water savings (compared with the average daily per capita usage in gallons, as defined by the *Handbook of Water Use and Conservation*—chapter 8) are approximately a 19-percent reduction in water usage (Appendix A—Indoor Water Usage Calculation Table for Richmond, Virginia). Energy efficiency is at an Emerald rating, and IEQ is only 1 point from the Emerald rating. The lot design and development, resource efficiency, and building owner education are Gold rating, and water efficiency is close to an Emerald rating. Nonetheless, the overall green rating is Gold because the total points are less than the Emerald minimum.

## The Emerald Rating

To achieve the Emerald rating, we improved the Gold-rated design by meeting the threshold chapter requirements and selecting an additional 102 points in green features. The Emerald rating requires 697 points; we achieved 699 points by requiring basic training in tree and natural resource protection to the onsite supervisor, specifying a stormwater management plan, limiting turf areas, and specifying trees and vegetation that are native or regionally appropriate for local growing conditions. Onsite supervision was also required during excavation, trenching, paving, and utility installation. To improve resource efficiency, we specified detailed framing plans, extended roof overhangs, added extensions to downspouts, added a recycling area in the kitchen, and installed a compost facility on site. A construction waste management plan is specified and must be implemented on site. Certified wood-based products were specified for doors, kitchen

cabinets, and deck railings, and another construction material was selected from a factory that uses one-third of the process energy from a renewable resource. To improve energy efficiency, we specified R-60 insulation in the attic with raised heel trusses, R-10 foam sheathing to the exterior, and triple-pane windows. We installed an 18 SEER heat pump, improved the structure’s infiltration rate further, and balanced the HVAC system airflow. We also specified verification of the installation and performance of the heating and cooling system by a certified technician. The water efficiency was improved by installing a rainwater-collection and -distribution system. The IEQ was improved by verifying the ventilation airflow of all exhaust equipment; specifying the use of interior low-VOC adhesives and sealants certified by a third party; installing a central vacuum system; cleaning and vacuuming all HVAC supply registers, return grilles and duct terminations, and coils; and adding a capillary break on the footing to prevent moisture migration into the foundation wall. A humidity-monitoring system was also specified. Additional green-scoring details are in Appendix B. Table 3-38 contains the Emerald rating summary.

Table 3-38. Emerald Rating for Single-Family Rowhouse

Green Building Category	Emerald <sup>a</sup> Required Points	Claimed <sup>b</sup> Points	Additional <sup>c</sup> Claimed Points Above Emerald	Point <sup>d</sup> Shortfall	Mandatory <sup>e</sup> Status
<b>Chapter 5: Lot Design, Preparation, and Development</b>	119	122	3		Not Applicable
<b>Chapter 6: Resource Efficiency</b>	146	147	1		Met
<b>Chapter 7: Energy Efficiency</b>	120	189	69		Met
<b>Chapter 8: Water Efficiency</b>	60	61	1		Met
<b>Chapter 9: Indoor Environmental Quality</b>	140	165	25		Met
<b>Chapter 10: Operation, Maintenance, and Building Owner Education</b>	12	15	3		Met
<b>Section Total</b>	597	699	102	0	
<b>Additional Points</b>	100	—	102	0	
<b>Total Points</b>	697	699	—	0	

<sup>a</sup> Emerald Required Points are the minimum green points needed to achieve an Emerald Rating.  
<sup>b</sup> Claimed Points are the green points we identified (and claimed) based on the Green Improvements.  
<sup>c</sup> Additional Claimed Points Above Emerald are the green points that exceed the Emerald minimum for each green category.  
<sup>d</sup> Point Shortfalls are the number of green points needed to meet the Emerald minimum for each green category.  
<sup>e</sup> Mandatory Status identifies whether mandatory requirements were met for each green category.

## The Emerald Cost

The total initial cost to achieve the Emerald-level rating is shown in Table 3-39.

Table 3-39. Initial Cost to the Builder for the Emerald Single-Family Rowhouse

Green Category	Emerald Points	Cost (\$)
<b>Chapter 5: Lot Design, Preparation, and Development</b>	122	6,256
<b>Chapter 6: Resource Efficiency</b>	147	3,728
<b>Chapter 7: Energy Efficiency</b>	189	19,528
<b>Chapter 8: Water Efficiency</b>	61	907
<b>Chapter 9: Indoor Environmental Quality</b>	165	1,840
<b>Chapter 10: Operation, Maintenance, and Building Owner Education</b>	15	1,044
<b>Total</b>	<b>699</b>	<b>\$33,303</b>

- The annual maintenance cost to achieve the Emerald rating is \$320 (Appendix A).
- The annual energy operating cost to achieve the Emerald rating is \$861 (Appendix A).
- The annual water operating cost to achieve the Emerald rating is \$906 (Appendix A).
- The 30-year lifetime replacement cost to achieve the Emerald rating is \$31,134 (Appendix A).

## The Emerald Benefits

The annual energy savings (compared with 2006 IECC—chapter 7) are approximately a 60-percent reduction in energy usage (Appendix C—Summary Data for Climate Zone 4, Richmond, Virginia). The annual water savings (compared with the Average Daily Per Capita Usage in Gallons, as defined by the *Handbook of Water Use and Conservation*—chapter 8) are approximately a 19-percent reduction in water usage (Appendix A—Indoor Water Usage Calculation Table for Richmond, Virginia). The water usage reduction estimate does not include the water that would be reduced from using the rainwater-collection system (instead of municipal water sources).

Overall cost and performance data are provided in Table 3-40. The water utility rates are based on Richmond, Virginia water supply and sewer meter rates (source: Richmond Public Utility). We base the simple payback periods for energy and water efficiency on the current cost estimates and projected savings and do not consider future rate increases, inflation, replacement costs, or other conditions over the 30-year evaluation period.

Table 3-40. Overall Cost and Performance Data for Single-Family Rowhouse

<b>RRHA Rowhouse 1,656 ft<sup>2</sup></b>	<b>Baseline</b>	<b>Bronze</b>	<b>Silver</b>	<b>Gold</b>	<b>Emerald</b>
<b>Cost Comparison</b>					
<b>Total Initial Green Cost (\$)</b>	Unknown	950	7,997	16,212	33,303
<b>Annual Maintenance Cost (\$)</b>	273	273	273	320	320
<b>Annual Energy Operating Cost (\$)</b>	1,142	1,142	1,043	910	861
<b>Annual Water Usage Cost (\$)</b>	981	936	906	906	906
<b>30-Year Lifetime Replacement Cost (\$)</b>	11,010	11,010	15,371	25,756	31,134
<b>Incremental Performance Improvement</b>					
<b>Energy Efficiency (e-Ratio) (compare to 2006 IECC)</b>	0.85	0.85	0.69	0.46	0.40
<b>Water Efficiency (%) (compares to 56.4 gpd<sup>a</sup>)</b>	2.6	12.5	19.0	19.0	19.0
<b>Land and Lot Use (points) (NGBS Rating)</b>	68 Silver	68 Silver	68 Silver	95 Gold	122 Emerald
<b>Resource Efficiency (points) (NGBS Rating)</b>	78 Bronze	78 Bronze	82 Silver	114 Gold	147 Emerald
<b>IEQ (points) (NGBS Rating)</b>	103 Gold	111 Gold	131 Gold	139 Gold	165 Emerald
<b>Green Education for Owner (points) (NGBS Rating)</b>	0 NR	9 Bronze	15 Emerald	15 Emerald	15 Emerald
<b>Simple Payback Periods</b>					
<b>Energy Efficiency (years) (initial energy cost and savings)</b>	NA	0	60	54	68
<b>Water Efficiency (years) (initial water cost and savings)</b>	NA	0	6	6	11
<small><sup>a</sup>The benchmark for comparison assumes four occupants using 56.4 (gpd) each. The benchmark cost is \$992; all projected savings are compared with this benchmark. IEQ = Indoor Environmental Quality; NA = not applicable; NGBS = National Green Building Standard; NR = not required</small>					



### 3.3.2 Seattle, Washington: High Point Development

In Seattle, approximately 60 new Breathe Easy homes consisting of duplex and stacked unit designs were constructed in an existing neighborhood renovated with HOPE grant funding from the U.S. Department of Housing and Development. This urban revitalization project was to rebuild 700 worn-out units of a public housing project in the High Point community of West Seattle. Construction also included improvements to roads and infrastructure, implementing low-impact and sustainable design practices.

The Breathe Easy homes were built through a partnership between the Seattle Housing Authority and Neighborhood House. The Breathe Easy houses in the High Point community incorporate green building and energy efficient practices into its housing designs, along with features that improve indoor air quality. The newly constructed homes were designed, built, and certified to ENERGY STAR and Breathe Easy homes criteria.

We selected a two-story stacked multiunit structure in the High Point development for the NGBS evaluation process. This multiunit structure is ENERGY STAR compliant and was designed to Breathe Easy homes criteria with the intent of being green.

#### *Two-Story Stacked Multiunit Baseline Green Rating*

Many green features are included in the original two-story stacked multiunit design. In fact, the baseline green rating exceeds the minimum threshold points for a Bronze rating in all areas, except for water efficiency and the building owner education requirements. In addition, all mandatory green practices were specified (except the green operation and maintenance manual).

The two-story stacked multiunit design was built in accordance with the 2003 Seattle Building Codes and Breathe Easy homes criteria. Green points were achieved for building on a grayfield site that had been developed previously. The lot provided for, and was close to, pedestrian access to community resources and mass transportation. A natural resources inventory was completed by a qualified professional, a plan was implemented to conserve high-priority natural resources, ongoing maintenance of vegetation and tree pruning was conducted by a certified arborist, and basic training in tree and other natural resource protection was provided to the onsite supervisor.

Construction activities were scheduled to minimize exposed soils; a stormwater management plan was developed and implemented; impervious surfaces were minimized; onsite tree trimmings or stump grindings were used to provide protective mulch; a pest management plan was developed to minimize pesticides and fertilizer use; measures were taken to protect trees, tree roots, and vegetation during construction; limits of clearing and grading were staked out; and topsoil was stockpiled for later use. Disturbed areas that were to be left unworked were stabilized, and soil was improved with organic amendments. Green points were also achieved for density (14 to less than 21 dwelling units per acre) and the use of shared driveways and parking.

Resource-efficient green features included a conditioned space (above grade) of 946 ft<sup>2</sup>, and minimizing material use through optimal framing techniques (roof trusses and wall studs at 24 in on center and 2 stud corners). Building dimensions were designed to reduce material cuts (floors), the floor and roof system were shipped as precuts or panels, and points were awarded for one stacked story above grade. Vinyl windows did not require application of paint or stain,



exterior entries were covered to protect them from the rain and sun, 12 in rake and 16 in eave overhangs were specified, drip edges were installed, a gutter and downspout system with extensions was installed, and flashing details were implemented and shown on the plans. Sorting and reuse of scrap building materials were implemented, a construction waste management plan was developed and implemented, seven types of construction materials were recycled (asphalt, concrete, wood, glass, gypsum, paint and insulation), biobased and certified wood products were installed, and resource-efficient engineered wood products were used (OSB, roof trusses, floor trusses, and joists).

To improve energy efficiency, the two-story stacked multiunit structure was ENERGY STAR compliant and met the minimum Bronze rating as designed. A 13 SEER air conditioning system was specified, a 91-percent AFUE boiler was used for hydronic heat, and domestic water heating was installed. An ENERGY STAR dishwasher, minimal recessed lighting, and a space-heating system that does not include air ducts were specified. The water-efficient green features included using a dishwasher that conserves water and minimizing the hot-water pipe runs. A low-volume irrigation system was used with high distribution (DU) rotating spray heads, and an evapotranspiration-based (ET-based) controller with a rain sensor was installed.

The IEQ green features included no air handling equipment or return ducts located in a garage; no fireplace(s) or solid-fuel-burning appliances; low-emission, or nonemitting cabinets, shelves, and trim were specified; low-emission carpeting and carpet adhesives were specified; and no garage was installed. The kitchen exhaust fan was vented to the outdoors, all exhaust equipment was tested and verified to specification, all ventilation airflow was tested at point of exhaust, supply registers and return grilles and rough-ins were covered and protected during construction, no plumbing was installed in exterior walls or unconditioned space, the attic access was caulked and sealed, all exhaust fans were ENERGY STAR (at or below 1 sone), and a heat-recovery ventilator was installed. Additional green points were also obtained by measuring the moisture content of lumber and insulation before closing-in walls and floors, and measuring the moisture content of subfloors, substrates, and concrete slabs before applying any finish or flooring material. Training and orientation were provided to the building owners and occupants for the green building systems.

Although the original two-story stacked multiunit design obtained a total of 378 green points, the overall green rating falls short of achieving the Bronze-level rating because it lacks several water-efficiency and owner-training requirements. The design must implement all threshold requirements for all green categories to achieve a rating. Table 3-41 summarizes the baseline rating and identifies where the design exceeds Bronze-level rating thresholds. Additional green-scoring details are in Appendix B.

Table 3-41. Baseline Rating for Two-Story Stacked Multiunit

Green Building Category	Bronze <sup>a</sup> Required Points	Claimed <sup>b</sup> Points	Additional <sup>c</sup> Claimed Points Above Bronze	Point <sup>d</sup> Shortfall	Mandatory <sup>e</sup> Status
<b>Chapter 5: Lot Design, Preparation, and Development</b>	39	109	70	—	Not Applicable
<b>Chapter 6: Resource Efficiency</b>	45	99	54	—	Met
<b>Chapter 7: Energy Efficiency</b>	30	49	19	—	Met
<b>Chapter 8: Water Efficiency</b>	14	11	—	3	Met
<b>Chapter 9: Indoor Environmental Quality</b>	36	104	68	—	Met
<b>Chapter 10: Operation, Maintenance, and Building Owner Education</b>	8	6	—	2	Not met
<b>Section Total</b>	172	378	211	5	
<b>Additional Points</b>	50	—	211	—	
<b>Total Points</b>	222	378	—	5	

<sup>a</sup> Bronze Required Points are the minimum green points needed to achieve a Bronze Rating.  
<sup>b</sup> Claimed Points are the green points we identified (and claimed) based on the Two-Story Stacked Original Design.  
<sup>c</sup> Additional Claimed Points Above Bronze are the green points that exceed the Bronze minimum for each green category.  
<sup>d</sup> Point Shortfalls are the number of green points needed to meet the Bronze minimum for each green category.  
<sup>e</sup> Mandatory Status identifies whether mandatory requirements were met for each green category.

- The annual maintenance cost to achieve the base rating is \$323 (Appendix A).
- The annual energy operating cost to achieve the base rating is \$615 (Appendix A).
- The annual water operating cost to achieve the base rating is \$1,186 (Appendix A).
- The 30-year lifetime replacement cost to achieve the base rating is \$15,308 (Appendix A).

## Two-Story Stacked Multiunit Incremental Green Ratings

### The Bronze Rating

All chapter thresholds and mandatory items were achieved, including an additional 217 points. The Bronze rating requires only 222 points, but we were able to achieve 389 points simply by implementing the mandatory items not included in the baseline design, along with several green practices that added modest cost to the project (for example, providing a green building manual, improving the energy performance to 15 percent [using energy modeling], and installing low-flow faucets and showerheads). The original baseline design actually represents a 10-percent reduction in energy usage when compared with 2006 IECC; therefore, the baseline energy performance falls short of the Bronze rating, which is based on a 15-percent reduction in energy usage (as per the NGBS Performance Path method of determining energy efficiency). To achieve the greater energy efficiency, the slab insulation was increased to R-10 and window performance was improved.

The largest one-time cost of going green is the initial investment in developing green documentation and the homeowner’s binder templates. For this study, we estimated the going-green cost at \$5,640<sup>24</sup> (this cost will be the case at any rated level). Along with the cost of developing green documentation, some additional cost was incurred to improve energy and water

efficiency. Additional green-scoring details are in Appendix B. Table 3-42 contains the Bronze rating summary.

Table 3-42. Bronze Rating for Two-Story Stacked Multiunit

Green Building Category	Bronze <sup>a</sup> Required Points	Claimed <sup>b</sup> Points	Additional <sup>c</sup> Claimed Points Above Bronze	Point <sup>d</sup> Shortfall	Mandatory <sup>e</sup> Status
<b>Chapter 5: Lot Design, Preparation, and Development</b>	39	109	70	—	Not Applicable
<b>Chapter 6: Resource Efficiency</b>	45	99	54	—	Met
<b>Chapter 7: Energy Efficiency</b>	30	49	19	—	Met
<b>Chapter 8: Water Efficiency</b>	14	16	2	—	Met
<b>Chapter 9: Indoor Environmental Quality</b>	36	104	68	—	Met
<b>Chapter 10: Operation, Maintenance, and Building Owner Education</b>	8	12	4	—	Met
<b>Section Total</b>	172	389	217	0	
<b>Additional Points</b>	50	—	217	0	
<b>Total Points</b>	222	389	—	0	

<sup>a</sup>Bronze Required Points are the minimum green points needed to achieve a Bronze Rating.  
<sup>b</sup>Claimed Points are the green points we identified (and claimed) based on the Green Improvements.  
<sup>c</sup>Additional Claimed Points Above Bronze are the green points that exceed the Bronze minimum for each green category.  
<sup>d</sup>Point Shortfalls are the number of green points needed to meet the Bronze minimum for each green category.  
<sup>e</sup>Mandatory Status identifies whether mandatory requirements were met for each green category.

## The Bronze Cost

The total initial cost to achieve the Bronze-level rating is shown in Table 3-43.

Table 3-43. Initial Cost to the Builder for the Bronze Two-Story Stacked Multiunit

Green Category	Bronze Points	Cost (\$)
<b>Chapter 5: Lot Design, Preparation, and Development</b>	109	0
<b>Chapter 6: Resource Efficiency</b>	99	0
<b>Chapter 7: Energy Efficiency</b>	49	966
<b>Chapter 8: Water Efficiency</b>	16	0
<b>Chapter 9: Indoor Environmental Quality</b>	104	0
<b>Chapter 10: Operation, Maintenance, and Building Owner Education</b>	12	950
<b>Total</b>	<b>389</b>	<b>\$1,916</b>

- The annual maintenance cost to achieve the Bronze rating is \$323 (Appendix A).
- The annual energy operating cost to achieve the Bronze rating is \$599 (Appendix A).
- The annual water operating cost to achieve the Bronze rating is \$1,100 (Appendix A).
- The 30-year lifetime replacement cost to achieve the Bronze rating is \$15,308 (Appendix A).

## The Bronze Benefits

The annual energy savings (compared with 2006 IECC—chapter 7) are approximately a 16-percent reduction in energy usage (Appendix C—Summary Data for Climate Zone 4C, Seattle, Washington). The annual water savings (compared with the Average Daily Per Capita Usage in Gallons, as defined by the *Handbook of Water Use and Conservation*—chapter 8) are approximately a 9-percent reduction in water usage (Appendix A—Indoor Water Usage Calculation Table for Seattle, Washington). The builder-owner education is at an Emerald rating. The lot design and development and IEQ are at a Gold rating, and the resource efficiency is at a Silver rating. Nonetheless, the overall green rating is Bronze because the total points are less than the Silver minimum.

## The Silver Rating

To achieve the Silver rating, we improved the Bronze-rated design by meeting the threshold chapter requirements and selecting an additional 171 points in green features. The Silver rating requires 406 points; we achieved 477 points by specifying 2 by 6 in wall stud spacing at 24 in on center, adding R-5 foam sheathing, upgrading the boiler efficiency to 94 AFUE, specifying exterior doors with more efficient energy performance, and reducing the infiltration of the building envelope. In addition, we specified an ENERGY STAR refrigerator and washing machine, and a third-party inspection of installed insulation. For improved water efficiency, we specified a washing machine that conserves water, lower flow showerheads, and toilets with flush rates of 1.28 gallons or less in all bathrooms. The IEQ was improved by specifying the use of low-emission carpet padding; installing low-emission insulation in walls, floors, ceilings, and ducts; preventing unwanted contaminants by sealing all penetrations in ceilings, walls, and floors; and avoiding the installation of any building material with visible mold. Additional green-scoring details are in Appendix B. Table 3-44 contains the Silver rating summary.

Table 3-44. Silver Rating for Two-Story Stacked Multiunit

Green Building Category	Silver <sup>a</sup> Required Points	Claimed <sup>b</sup> Points	Additional <sup>c</sup> Claimed Points Above Silver	Point <sup>d</sup> Shortfall	Mandatory <sup>e</sup> Status
<b>Chapter 5: Lot Design, Preparation, and Development</b>	66	109	43	—	Not Applicable
<b>Chapter 6: Resource Efficiency</b>	79	99	20	—	Met
<b>Chapter 7: Energy Efficiency</b>	60	101	41	—	Met
<b>Chapter 8: Water Efficiency</b>	26	37	11	—	Met
<b>Chapter 9: Indoor Environmental Quality</b>	65	119	54	—	Met
<b>Chapter 10: Operation, Maintenance, and Building Owner Education</b>	10	12	2	—	Met
<b>Section Total</b>	306	477	171	0	

continued on next page

Table 3-44. Silver Rating for Two-Story Stacked Multiunit (cont)

Green Building Category	Silver <sup>a</sup> Required Points	Claimed <sup>b</sup> Points	Additional <sup>c</sup> Claimed Points Above Silver	Point <sup>d</sup> Shortfall	Mandatory <sup>e</sup> Status
<b>Additional Points</b>	100	—	171	0	
<b>Total Points</b>	406	477	—	0	

<sup>a</sup> Silver Required Points are the minimum green points needed to achieve a Silver Rating.  
<sup>b</sup> Claimed Points are the green points we identified (and claimed) based on the Green Improvements.  
<sup>c</sup> Additional Claimed Points Above Silver are the green points that exceed the Silver minimum for each green category.  
<sup>d</sup> Point Shortfalls are the number of green points needed to meet the Silver minimum for each green category.  
<sup>e</sup> Mandatory Status identifies whether mandatory requirements were met for each green category.

## The Silver Cost

The total initial cost to achieve the Silver-level rating is shown in Table 3-45.

Table 3-45. Initial Cost to the Builder for the Silver Two-Story Stacked Multiunit

Green Category	Silver Points	Cost (\$)
<b>Chapter 5: Lot Design, Preparation, and Development</b>	109	0
<b>Chapter 6: Resource Efficiency</b>	99	0
<b>Chapter 7: Energy Efficiency</b>	101	4,954
<b>Chapter 8: Water Efficiency</b>	37	150
<b>Chapter 9: Indoor Environmental Quality</b>	119	0
<b>Chapter 10: Operation, Maintenance, and Building Owner Education</b>	12	950
<b>Total</b>	<b>477</b>	<b>\$6,054</b>

- The annual maintenance cost to achieve the Silver rating is \$323 (Appendix A).
- The annual energy operating cost to achieve the Silver rating is \$550 (Appendix A).
- The annual water operating cost to achieve the Silver rating is \$914 (Appendix A).
- The 30-year lifetime replacement cost to achieve the Silver rating is \$19,305 (Appendix A).

## The Silver Benefits

The annual energy savings (compared with 2006 IECC—chapter 7) are approximately a 31-percent reduction in energy usage (Appendix C—Summary Data for Climate Zone 4C, Seattle, Washington). The annual water savings (compared with the Average Daily Per Capita Usage in Gallons, as defined by the *Handbook of Water Use and Conservation*—chapter 8) are approximately a 27-percent reduction in water usage (Appendix A—Indoor Water Usage Calculation Table for Seattle, Washington). The builder-owner education remains at an Emerald rating. The lot design and development and IEQ are Gold rating, and the energy efficiency improves to a Gold rating. Nonetheless, the overall green rating is Silver because the total points are less than the Gold minimum.

## The Gold Rating

To achieve the Gold rating, we improved the Silver-rated design by meeting the threshold chapter requirements and selecting an additional 111 points in green features. The Gold rating requires 558 points; we achieved 569 points by changing the wall dimensions to optimize material usage, using precuts or panels for the wall system, specifying the use of gypsum board and cellulose insulation with 75-percent recycled content, and specifying five indigenous construction materials or products. To improve energy efficiency, we upgraded to a closed-loop solar hot-water system and required the use of Manual S to select HVAC equipment. In addition, the HVAC contractor and service technicians were certified by a nationally recognized program. To improve water efficiency, a low-volume drip irrigation system was specified that is designed and installed in accordance with the EPA WaterSense requirements. The IEQ was improved by installing carbon monoxide detectors and placing fixed exterior grilles or mats by the entranceways. Additional green-scoring details are in Appendix B. Table 3-46 contains the Gold rating summary.

Table 3-46. Gold Rating for Two-Story Stacked Multiunit

Green Building Category	Gold <sup>a</sup> Required Points	Claimed <sup>b</sup> Points	Additional <sup>c</sup> Claimed Points Above Gold	Point <sup>d</sup> Shortfall	Mandatory <sup>e</sup> Status
<b>Chapter 5: Lot Design, Preparation, and Development</b>	93	109	16	—	Not Applicable
<b>Chapter 6: Resource Efficiency</b>	113	127	14	—	Met
<b>Chapter 7: Energy Efficiency</b>	100	154	54	—	Met
<b>Chapter 8: Water Efficiency</b>	41	44	3	—	Met
<b>Chapter 9: Indoor Environmental Quality</b>	100	123	23	—	Met
<b>Chapter 10: Operation, Maintenance, and Building Owner Education</b>	11	12	1	—	Met
<b>Section Total</b>	458	569	111	0	
<b>Additional Points</b>	100	—	111	0	
<b>Total Points</b>	558	569	—	0	

<sup>a</sup>Gold Required Points are the minimum green points needed to achieve a Gold Rating.  
<sup>b</sup>Claimed Points are the green points we identified (and claimed) based on the Green Improvements.  
<sup>c</sup>Additional Claimed Points Above Gold are the green points that exceed the Gold minimum for each green category.  
<sup>d</sup>Point Shortfalls are the number of green points needed to meet the Gold minimum for each green category.  
<sup>e</sup>Mandatory Status identifies whether mandatory requirements were met for each green category.

## The Gold Cost

The total initial cost to achieve the Gold-level rating is shown in Table 3-47.

Table 3-47. Initial Cost to the Builder for the Gold Two-Story Stacked Multiunit

Green Category	Gold Points	Cost (\$)
Chapter 5: Lot Design, Preparation, and Development	109	0
Chapter 6: Resource Efficiency	127	0
Chapter 7: Energy Efficiency	154	11,579
Chapter 8: Water Efficiency	44	150
Chapter 9: Indoor Environmental Quality	123	44
Chapter 10: Operation, Maintenance, and Building Owner Education	12	950
<b>Total</b>	<b>569</b>	<b>\$12,723</b>

- The annual maintenance cost to achieve the Gold rating is \$323 (Appendix A).
- The annual energy operating cost to achieve the Gold rating is \$472 (Appendix A).
- The annual water operating cost to achieve the Gold rating is \$914 (Appendix A).
- The 30-year lifetime replacement cost to achieve the Gold rating is \$20,302 (Appendix A).

## The Gold Benefits

The annual energy savings (compared with 2006 IECC—chapter 7) are approximately a 50-percent reduction in energy usage (Appendix C—Summary Data for Climate Zone 4C, Seattle, Washington). The annual water savings (compared with the Average Daily Per Capita Usage in Gallons, as defined by the *Handbook of Water Use and Conservation*—chapter 8) are approximately a 27-percent reduction in water usage (Appendix A—Indoor Water Usage Calculation Table for Seattle, Washington). The energy efficiency and building owner education is at an Emerald rating. Nonetheless, the overall green rating is Gold because the total points are less than the Emerald minimum.

## The Emerald Rating

To achieve the Emerald rating, we improved the Gold-rated design by meeting the threshold chapter requirements and selecting an additional 101 points in green features. The Emerald rating requires 697 points; we achieved 698 points by specifying a plan to restore or enhance natural vegetation that is cleared during construction, limiting turf areas, selecting trees and vegetation that are native or regionally appropriate for local growing conditions, grouping plants with similar watering needs, locating trees in areas appropriate for shading, creating vegetative wind breaks appropriate for local conditions, and taking measures to support wildlife habitat. Green points were also achieved for having onsite supervision and coordination during clearing, grading, trenching, paving, and installation of utilities.

To improve resource efficiency, we specified detailed framing plans with sheathing layouts and cut lists, prefinished fiber cement siding, and a recycling area in the kitchen with a compost facility on site. Further, two FSC-certified products (interior doors and kitchen cabinets) were specified, along with the procurement of construction material from a factory that uses one-third of the process energy from a renewable resource. To improve energy efficiency, we specified the use of R-10 foam sheathing to the exterior, triple pane windows, a boiler efficiency of 95-percent



AFUE, and exterior doors with more efficient energy performance. We also specified the verification of the installation and performance of the heating and cooling system by a certified HVAC contractor.

We improved the water efficiency by installing a washing machine with a water factor of 6.0 or less, zoning the irrigation system separately for turf and bedding areas, and adding bubblers to the irrigation system. We also added a rainwater-collection and -distribution system. We improved the IEQ by specifying the use of low-emission hard-surface flooring that meets third-party certification requirements, specifying low-VOC interior and exterior adhesives and sealants that meet third-party certification requirements, installing kitchen and bath cabinets that contain no added urea formaldehyde, and adding a capillary break on the footing to prevent moisture migration into the foundation wall. We also installed a humidity-monitoring system with a mobile base unit that displays temperature and humidity. Additional green-scoring details are in Appendix B. Table 3-48 contains the Emerald rating summary.

Table 3-48. Emerald Rating for Two-Story Stacked Multiunit

Green Building Category	Emerald <sup>a</sup> Required Points	Claimed <sup>b</sup> Points	Additional <sup>c</sup> Claimed Points Above Emerald	Point <sup>d</sup> Shortfall	Mandatory <sup>e</sup> Status
<b>Chapter 5: Lot Design, Preparation, and Development</b>	119	146	27		Not Applicable
<b>Chapter 6: Resource Efficiency</b>	146	147	1		Met
<b>Chapter 7: Energy Efficiency</b>	120	180	60		Met
<b>Chapter 8: Water Efficiency</b>	60	62	2		Met
<b>Chapter 9: Indoor Environmental Quality</b>	140	146	6		Met
<b>Chapter 10: Operation, Maintenance, and Building Owner Education</b>	12	17	5		Met
<b>Section Total</b>	597	698	101	0	
<b>Additional Points</b>	100	—	101	0	
<b>Total Points</b>	697	<b>698</b>	—	0	

<sup>a</sup> Emerald Required Points are the minimum green points needed to achieve an Emerald Rating.  
<sup>b</sup> Claimed Points are the green points we identified (and claimed) based on the Green Improvements.  
<sup>c</sup> Additional Claimed Points Above Emerald are the green points that exceed the Emerald minimum for each green category.  
<sup>d</sup> Point Shortfalls are the number of green points needed to meet the Emerald minimum for each green category.  
<sup>e</sup> Mandatory Status identifies whether mandatory requirements were met for each green category.



## The Emerald Cost

The total initial cost to achieve the Emerald-level rating is shown in Table 3-49.

Table 3-49. Initial Cost to the Builder for the Emerald Two-Story Stacked Multiunit

Green Category	Emerald Points	Cost (\$)
<b>Chapter 5: Lot Design, Preparation, and Development</b>	146	3,616
<b>Chapter 6: Resource Efficiency</b>	147	4,686
<b>Chapter 7: Energy Efficiency</b>	180	14,831
<b>Chapter 8: Water Efficiency</b>	62	582
<b>Chapter 9: Indoor Environmental Quality</b>	146	191
<b>Chapter 10: Operation, Maintenance, and Building Owner Education</b>	17	950
<b>Total</b>	<b>698</b>	<b>\$24,856</b>

- The annual maintenance cost to achieve the Emerald rating is \$323 (Appendix A).
- The annual energy operating cost to achieve the Emerald rating is \$444 (Appendix A).
- The annual water operating cost to achieve the Emerald rating is \$870 (Appendix A).
- The 30-year lifetime replacement cost to achieve the Emerald rating is \$20,302 (Appendix A).

## The Emerald Benefits

The annual energy savings (compared with 2006 IECC—chapter 7) are approximately a 61-percent reduction in energy usage (Appendix C—Summary Data for Climate Zone 4C, Seattle, Washington). The annual water savings (compared with the Average Daily Per Capita Usage in Gallons, as defined by the *Handbook of Water Use and Conservation*—chapter 8) are approximately a 31-percent reduction in water usage (Appendix A—Indoor Water Usage Calculation Table for Seattle, Washington). The water usage reduction estimate does not include the water that would be reduced from using the rainwater-collection system (instead of municipal water sources).

Overall cost and performance data are provided in Table 3-50. The water utility rates are based on Seattle, Washington water supply and sewer meter rates (source: Seattle Public Utilities). We base the simple payback periods for energy and water efficiency on the current cost estimates and projected savings and do not consider future rate increases, inflation, replacement costs, or other conditions over the 30-year evaluation period.

Table 3-50. Overall Cost and Performance Data for Two-Story Stacked Multiunit

SHA Two-Story Multiunit 946 ft <sup>2</sup>	Baseline	Bronze	Silver	Gold	Emerald
<b>Cost Comparison</b>					
<b>Total Initial Green Cost (\$)</b>	Unknown	1,916	6,054	12,723	24,856
<b>Annual Maintenance Cost (\$)</b>	323	323	323	323	323
<b>Annual Energy Operating Cost (\$)</b>	615	599	550	472	444
<b>Annual Water Usage Cost (\$)</b>	1,186	1,100	914	914	870
<b>30-Year Lifetime Replacement Cost (\$)</b>	11,010	11,010	15,371	25,756	31,134
<b>Incremental Performance Improvement</b>					
<b>Energy Efficiency (e-Ratio) (compare to 2006 IECC)</b>	0.89	0.84	0.69	0.50	0.39
<b>Water Efficiency (%) (compares to 56.4 gpd<sup>a</sup>)</b>	0.6	8.8	26.7	26.7	30.9
<b>Land and Lot Use (points) (NGBS Rating)</b>	109 Gold	109 Gold	109 Gold	109 Gold	146 Emerald
<b>Resource Efficiency (points) (NGBS Rating)</b>	99 Silver	99 Silver	99 Silver	127 Gold	147 Emerald
<b>IEQ (points) (NGBS Rating)</b>	104 Gold	104 Gold	119 Gold	123 Gold	146 Emerald
<b>Green Education for Owner (points) (NGBS Rating)</b>	6 NR	12 Emerald	12 Emerald	12 Emerald	17 Emerald
<b>Simple Payback Periods</b>					
<b>Energy Efficiency (years) (initial energy cost and savings)</b>	NA	60	76	81	87
<b>Water Efficiency (years) (initial water cost and savings)</b>	NA	0	<1	<1	2
<small><sup>a</sup>The benchmark for comparison assumes three occupants using 56.4 (gpd) each. The benchmark cost is \$1,192; all projected savings are compared with this benchmark. IEQ = Indoor Environmental Quality; NA = not applicable; NGBS = National Green Building Standard; NR = not required.</small>					

### 3.4 Climate Zone #5

Akron, Ohio, is located in climate zone 5A, a predominately heating, cool-humid climate with 4,808 cooling degree hours (CDH) and 6,248 heating degree days (HDD). Cuyahoga Falls, Ohio, is located in climate zone 5A, a predominately heating, cool-humid climate with 4,772 CDH and 6,179 HDD.

### 3.4.1 Akron, Ohio: Edgewood Homes Development

In Ohio, approximately 172 new units consisting of apartments, townhouses and single-family homes were constructed in an existing neighborhood renovated with HOPE grant funding from the U.S. Department of Housing and Development. This revitalization project was formerly a public housing development built in the 1940s consisting of 112 deteriorating apartment units. The apartment units were demolished and replaced with attractive mixed-income housing built in a variety of styles.

The newly developed neighborhood, now named Edgewood Homes, incorporates green building practices into its housing designs, along with making the homes easily accessible to community services and amenities. The Edgewood Homes development and its newly constructed homes were designed and built according to the criteria of the Ohio Green Communities program. Green Communities is part of Enterprise Green Communities, which is a national green building program. The Green Communities criteria promote smart growth, energy conservation, public health, operational savings, and sustainable building practices in affordable housing design.

We selected a Type A Model (a two-story attached townhouse unit with an attached garage) and a Type D Model (a two-story single-family unit with a detached garage) in the Edgewood Homes Development of Akron, Ohio to demonstrate the NGBS evaluation process. These homes were designed with the intent of being green.

#### *Townhouse Type A—Baseline Green Rating*

Many green features are included in the original townhouse design. In fact, the baseline green rating exceeds the minimum threshold points for a Bronze rating in all areas, except for the building owner education requirements. The mandatory requirements of water efficiency were met, but all other categories of green lacked the necessary mandatory requirements.

The townhouse Type A design was built in accordance with the 2003 Residential Code of Ohio. Green points were achieved for building on a grayfield site that was previously developed. Many previously existing units were demolished to make room for construction of new units. Several measures were taken to minimize soil disturbance, erosion, restore natural vegetation, limit turf areas, and protect trees during construction. The resource-efficient green features included a moderate-sized conditioned space (that is, 1,371 ft<sup>2</sup>), the use of optimal material sizes, prefabricated components, moisture prevention practices, and renewable materials. The energy efficient green features include a 10-percent UA improvement from the ICC IECC (Section 402.1.4), the use of ENERGY STAR appliances (that is, refrigerator, dishwasher, and washing machine), energy efficient lighting, and a 92-percent efficient gas furnace. The water-efficient green features included using appliances that conserve water (that is, dishwasher and washing machine), low-flow showerheads and faucets, minimizing the hot-water pipe runs, and using an irrigation system with smart controls. The IEQ green features included using cabinets that are KCMA ESP 01 compliant, using a direct-vent furnace, and avoiding the use of air-handling equipment or return ducts in the garage, fireplace(s), and solid-fuel-burning appliances. The kitchen exhaust fan was vented to the outdoors, the HVAC system was cleaned and inspected after construction, and plumbing was not installed in exterior walls or unconditioned spaces.

Although the original townhouse design obtained a total of 269 green points, the overall green rating falls short of achieving the Bronze-level rating because it lacks several mandatory practices. The design must implement all mandatory practices and meet the threshold requirements for all green categories to achieve a rating. Table 3-51 summarizes the baseline rating and identifies where the original design exceeds the minimum Bronze rating. Additional green-scoring details are in Appendix B.

Table 3-51. Baseline Rating for Townhouse Type A

Green Building Category	Bronze <sup>a</sup> Required Points	Claimed <sup>b</sup> Points	Additional <sup>c</sup> Claimed Points Above Bronze	Point <sup>d</sup> Shortfall	Mandatory <sup>e</sup> Status
<b>Chapter 5: Lot Design, Preparation, and Development</b>	39	76	37	—	Not Applicable
<b>Chapter 6: Resource Efficiency</b>	45	66	21	—	Not Met
<b>Chapter 7: Energy Efficiency</b>	30	53	23	—	Not Met
<b>Chapter 8: Water Efficiency</b>	14	35	21	—	Met
<b>Chapter 9: Indoor Environmental Quality</b>	36	39	3	—	Not Met
<b>Chapter 10: Operation, Maintenance, and Building Owner Education</b>	8	—	—	8	Not Met
<b>Section Total</b>	172	269	105	8	
<b>Additional Points</b>	50	—	105	—	
<b>Total Points</b>	222	269	—	8	

<sup>a</sup>Bronze Required Points are the minimum green points needed to achieve a Bronze Rating.  
<sup>b</sup>Claimed Points are the green points we identified (and claimed) based on the Townhouse Type A Original Design.  
<sup>c</sup>Additional Claimed Points Above Bronze are the green points that exceed the Bronze minimum for each green category.  
<sup>d</sup>Point Shortfalls are the number of green points needed to meet the Bronze minimum for each green category.  
<sup>e</sup>Mandatory Status identifies whether mandatory requirements were met for each green category.

- The annual maintenance cost to achieve the base rating is \$367 (Appendix A).
- The annual energy operating cost to achieve the base rating is \$1,158 (Appendix A).
- The annual water operating cost to achieve the base rating is \$576 (Appendix A).
- The 30-year lifetime replacement cost to achieve the base rating is \$13,078 (Appendix A).

## Townhouse Type A—Incremental Green Ratings

### The Bronze Rating

To achieve the Bronze rating, the remaining mandatory green requirements were met. These requirements included adding specifications to the plans to provide proper slope at finish grade, conducting a third-party review to verify design and compliance with the energy section, and specifying proper air sealing (that is, between the conditioned living space and garage, attic, walls, and ceiling). The energy performance was improved to 15 percent (using energy modeling). The original baseline design actually represents a 6-percent reduction in energy usage when compared with 2006 IECC; therefore, the baseline energy performance falls short of the Bronze

rating, which is based on a 15-percent reduction in energy usage (as per the NGBS performance path method of determining energy efficiency). To achieve the greater energy efficiency, the HVAC system equipment was sized in accordance with the ACCA Manual J, ductwork insulation was improved, and the ductwork was relocated to the interior conditioned space. Finally, the building owner’s manual was specified to provide information about the green features, building operation, and maintenance.

All chapter thresholds and mandatory items were achieved, including an additional 148 points. The Bronze rating requires only 222 points, but we were able to achieve 320 points simply by implementing the mandatory items not met at the baseline, along with several green practices that added modest cost to the project (for example, adding an interior subslab foundation perimeter drain, installing a passive radon mitigation system (Zone 1), and installing a showerhead with a flow rate of 1.6 to less than 2.0 gpm).

Also, several green practices were implemented that added little or no additional cost, such as conducting third-party verification of the insulation and air sealing, adding a capillary break on the footing to prevent moisture migration, and insulating ductwork to a minimum of R-8.

The largest one-time cost of going green is the initial investment in developing green documentation and the homeowner’s binder templates. For this study, we estimated the going-green cost at \$5,640<sup>25</sup> (this cost will be the case at any rated level). Additional green-scoring details are in Appendix B. Table 3-52 contains the Bronze rating summary.

Table 3-52. Bronze Rating for Townhouse Type A

Green Building Category	Bronze <sup>a</sup> Required Points	Claimed <sup>b</sup> Points	Additional <sup>c</sup> Claimed Points Above Bronze	Point <sup>d</sup> Shortfall	Mandatory <sup>e</sup> Status
<b>Chapter 5: Lot Design, Preparation, and Development</b>	39	76	37	—	Not Applicable
<b>Chapter 6: Resource Efficiency</b>	45	74	29	—	Met
<b>Chapter 7: Energy Efficiency</b>	30	65	35	—	Met
<b>Chapter 8: Water Efficiency</b>	14	36	22	—	Met
<b>Chapter 9: Indoor Environmental Quality</b>	36	60	24	—	Met
<b>Chapter 10: Operation, Maintenance, and Building Owner Education</b>	8	9	1	—	Met
<b>Section Total</b>	172	320	148	0	
<b>Additional Points</b>	50	—	148	0	
<b>Total Points</b>	222	320	—	0	

<sup>a</sup>Bronze Required Points are the minimum green points needed to achieve a Bronze Rating.  
<sup>b</sup>Claimed Points are the green points we identified (and claimed) based on the Green Improvements.  
<sup>c</sup>Additional Claimed Points Above Bronze are the green points that exceed the Bronze minimum for each green category.  
<sup>d</sup>Point Shortfalls are the number of green points needed to meet the Bronze minimum for each green category.  
<sup>e</sup>Mandatory Status identifies whether mandatory requirements were met for each green category.

## The Bronze Cost

The total initial cost to achieve the Bronze-level rating is shown in Table 3-53.

Table 3-53. Initial Cost to the Builder for the Bronze Townhouse Type A

Green Category	Bronze Points	Cost (\$)
Chapter 5: Lot Design, Preparation, and Development	76	0
Chapter 6: Resource Efficiency	74	365
Chapter 7: Energy Efficiency	65	647
Chapter 8: Water Efficiency	36	0
Chapter 9: Indoor Environmental Quality	60	106
Chapter 10: Operation, Maintenance, and Building Owner Education	9	950
<b>Total</b>	<b>320</b>	<b>\$2,068</b>

- The annual maintenance cost to achieve the Bronze rating is \$367 (Appendix A).
- The annual energy operating cost to achieve the Bronze rating is \$1,092 (Appendix A).
- The annual water operating cost to achieve the Bronze rating is \$554 (Appendix A).
- The 30-year lifetime replacement cost to achieve the Bronze rating is \$13,078 (Appendix A).

## The Bronze Benefits

The annual energy savings (compared with 2006 IECC—chapter 7) are approximately a 15-percent reduction in energy usage (Appendix C—Summary Data for Climate Zone 5, Akron, Ohio). The annual water savings (compared with the Average Daily Per Capita Usage in Gallons, as defined by the *Handbook of Water Use and Conservation*—chapter 8) are approximately a 14-percent reduction in water usage (Appendix A—Indoor Water Usage Calculation Table for Akron, Ohio). The lot design and development, energy efficiency, and water efficiency categories actually have low-level Silver ratings, and the building owner education category is within 1 point of a Silver rating. Nonetheless, the overall green rating is Bronze because the total points are less than the Silver minimum.

## The Silver Rating

To achieve the Silver rating, we improved the Bronze-rated design by meeting the threshold chapter requirements and selecting an additional 113 points in green features. The Silver rating requires 406 points; we achieved 419 points by specifying the development and implementation of a stormwater management plan, and preserving natural water and drainage features. To improve resource efficiency, wall-stud spacing was increased to 24 in on center and single top plates were used, sorting and reuse of scrap building materials was facilitated, and the use of building materials with recycled content was specified. To improve the energy efficiency, we improved the building enclosure insulation and air-sealing specifications, improved the water heater efficiency by specifying a tankless water heater, and specified improved ductwork sealing. We also required a third-party inspection of the HVAC installation and duct leakage to ensure specified performance was met.

The IEQ was improved by specifying the use of low-VOC sealants, adhesives, insulation, and interior trim, cabinets, and doors. MERV 8 filters and a carbon monoxide detector were specified, along with improved sealing of the living space to prevent unwanted contaminants. Training and orientation of the building owners for the green building systems and operations were also required. Additional green-scoring details are in Appendix B. Table 3-54 contains the Silver rating summary.

Table 3-54. Silver Rating for Townhouse Type A

Green Building Category	Silver <sup>a</sup> Required Points	Claimed <sup>b</sup> Points	Additional <sup>c</sup> Claimed Points Above Silver	Point <sup>d</sup> Shortfall	Mandatory <sup>e</sup> Status
<b>Chapter 5: Lot Design, Preparation, and Development</b>	66	88	22	—	Not Applicable
<b>Chapter 6: Resource Efficiency</b>	79	92	13	—	Met
<b>Chapter 7: Energy Efficiency</b>	60	87	27	—	Met
<b>Chapter 8: Water Efficiency</b>	26	36	10	—	Met
<b>Chapter 9: Indoor Environmental Quality</b>	65	101	36	—	Met
<b>Chapter 10: Operation, Maintenance, and Building Owner Education</b>	10	15	5	—	Met
<b>Section Total</b>	306	419	113	0	
<b>Additional Points</b>	100	—	113	0	
<b>Total Points</b>	406	419	—	0	

<sup>a</sup>Silver Required Points are the minimum green points needed to achieve a Silver Rating.  
<sup>b</sup>Claimed Points are the green points we identified (and claimed) based on the Green Improvements.  
<sup>c</sup>Additional Claimed Points Above Silver are the green points that exceed the Silver minimum for each green category.  
<sup>d</sup>Point Shortfalls are the number of green points needed to meet the Silver minimum for each green category.  
<sup>e</sup>Mandatory Status identifies whether mandatory requirements were met for each green category.

## The Silver Cost

The total initial cost to achieve the Silver-level rating is shown in Table 3-55.

Table 3-55. Initial Cost to the Builder for the Silver Townhouse Type A

Green Category	Silver Points	Cost (\$)
<b>Chapter 5: Lot Design, Preparation, and Development</b>	88	520
<b>Chapter 6: Resource Efficiency</b>	92	371
<b>Chapter 7: Energy Efficiency</b>	87	3,293
<b>Chapter 8: Water Efficiency</b>	36	0
<b>Chapter 9: Indoor Environmental Quality</b>	101	367
<b>Chapter 10: Operation, Maintenance, and Building Owner Education</b>	15	1,044
<b>Total</b>	<b>419</b>	<b>\$5,595</b>



- The annual maintenance cost to achieve the Silver rating is \$367 (Appendix A).
- The annual energy operating cost to achieve the Silver rating is \$946 (Appendix A).
- The annual water operating cost to achieve the Silver rating is \$554 (Appendix A).
- The 30-year lifetime replacement cost to achieve the Silver rating is \$14,418 (Appendix A).

## The Silver Benefits

The annual energy savings (compared with 2006 IECC—chapter 7) are approximately a 30-percent reduction in energy usage (Appendix C—Summary Data for Climate Zone 5, Akron, Ohio).

The annual water savings (compared with the Average Daily Per Capita Usage in Gallons, as defined by the *Handbook of Water Use and Conservation*—chapter 8) are approximately a 14-percent reduction in water usage (Appendix A—Indoor Water Usage Calculation Table for Akron, Ohio). The IEQ category actually has a Gold rating, and the building owner education category has an Emerald rating. Nonetheless, the overall green rating is Silver because the total points are less than the Gold minimum, and most green categories are also less than the Gold minimum.

## The Gold Rating

To achieve the Gold rating, we improved the Silver-rated design by meeting the threshold chapter requirements and selecting an additional 152 points in green features. The Gold rating requires 558 points; we achieved 610 points by specifying maintenance of vegetation during construction, implementation of many of the green practices for conserving the landscape, and requiring that the disturbance of vegetation and tree zones be avoided.

To improve resource efficiency, we specified a Frost Protected Shallow Foundation (FPSF), a built-in recycling area in the kitchen, a compost facility on site, three types of recycled, indigenous building material, and OSB procured from a factory that uses renewable energy in the manufacturing process.

To improve the energy efficiency, we specified a closed-loop solar hot-water system, reduced the structure's infiltration rate further, required that the installation and performance of the HVAC system was by a certified technician, selected the HVAC equipment using ACCA Manual S, and specified 1 in foam sheathing on the exterior.

To improve water efficiency, low-flow (1.28 gal or less per flush) toilets were specified for all water closets. The IEQ was improved by selecting kitchen and bath cabinets with no added urea formaldehyde, specifying higher performance exhaust fans (in kitchen, bathroom, and laundry area), and installing a whole-house balanced ventilation system. Additional green-scoring details are in Appendix B. Table 3-56 contains the Gold rating summary.



Table 3-56. Gold Rating for Townhouse Type A

Green Building Category	Gold <sup>a</sup> Required Points	Claimed <sup>b</sup> Points	Additional <sup>c</sup> Claimed Points Above Gold	Point <sup>d</sup> Shortfall	Mandatory <sup>e</sup> Status
Chapter 5: Lot Design, Preparation, and Development	93	125	32	—	Not Applicable
Chapter 6: Resource Efficiency	113	118	5	—	Met
Chapter 7: Energy Efficiency	100	161	61	—	Met
Chapter 8: Water Efficiency	41	54	13	—	Met
Chapter 9: Indoor Environmental Quality	100	137	37	—	Met
Chapter 10: Operation, Maintenance, and Building Owner Education	11	15	4	—	Met
<b>Section Total</b>	458	610	152	0	
<b>Additional Points</b>	100	—	152	0	
<b>Total Points</b>	558	610	—	0	

<sup>a</sup>Gold Required Points are the minimum green points needed to achieve a Gold Rating.  
<sup>b</sup>Claimed Points are the green points we identified (and claimed) based on the Green Improvements.  
<sup>c</sup>Additional Claimed Points Above Gold are the green points that exceed the Gold minimum for each green category.  
<sup>d</sup>Point Shortfalls are the number of green points needed to meet the Gold minimum for each green category.  
<sup>e</sup>Mandatory Status identifies whether mandatory requirements were met for each green category.

## The Gold Cost

The total initial cost to achieve the Gold-level rating is shown in Table 3-57.

Table 3-57. Initial Cost to the Builder for the Gold Townhouse Type A

Green Category	Gold Points	Cost (\$)
Chapter 5: Lot Design, Preparation, and Development	125	628
Chapter 6: Resource Efficiency	118	1,561
Chapter 7: Energy Efficiency	161	11,724
Chapter 8: Water Efficiency	54	525
Chapter 9: Indoor Environmental Quality	137	1,039
Chapter 10: Operation, Maintenance, and Building Owner Education	15	1,044
<b>Total</b>	<b>610</b>	<b>\$16,521</b>

- The annual maintenance cost to achieve the Gold rating is \$414 (Appendix A).
- The annual energy operating cost to achieve the Gold rating is \$825 (Appendix A).
- The annual water operating cost to achieve the Gold rating is \$477 (Appendix A).
- The 30-year lifetime replacement cost to achieve the Gold rating is \$29,418 (Appendix A).

## The Gold Benefits

The annual energy savings (compared with 2006 IECC—chapter 7) are approximately a 50-percent reduction in energy usage (Appendix C—Summary Data for Climate Zone 5, Akron, Ohio). The annual water savings (compared with the Average Daily Per Capita Usage in Gallons, as defined by the *Handbook of Water Use and Conservation*—chapter 8) are approximately a 27-percent reduction in water usage (Appendix A—Indoor Water Usage Calculation Table for Akron, Ohio). The IEQ category is close to the Emerald rating, and the building owner education, energy efficiency, and lot design and development categories have an Emerald rating. Nonetheless, the overall green rating is Gold because the total points are less than the Emerald minimum.

## The Emerald Rating

To achieve the Emerald rating, we improved the Gold-rated design by meeting the threshold chapter requirements and selecting an additional 106 points in green features. The Emerald rating requires 697 points; we achieved 703 points by establishing a knowledgeable team with respect to lot design, preparation, and development; by providing basic training in natural resource protection for the onsite supervisor; and including measures to support wildlife habitat.

To improve resource efficiency, we required detailed framing plans and optimized building dimensions to reduce material cuts, specified siding that required no site-applied finish, added flashing details to the plans, and required the development and implementation of a construction waste management plan (including onsite recycling of construction materials for onsite application).

To improve the energy efficiency, we specified R-60 insulation for the attic with raised heel trusses, R-10 foam sheathing for the exterior, improved thermal window performance, a higher efficiency furnace, improved infiltration rate, and a balanced HVAC system.

The water efficiency was improved by installing a rainwater-collection and -distribution system. The IEQ was improved by specifying the use of exterior low-VOC adhesives and sealants. Additional green-scoring details are in Appendix B. Table 3-58 contains the Emerald rating summary.

Table 3-58. Emerald Rating for Townhouse Type A

Green Building Category	Emerald <sup>a</sup> Required Points	Claimed <sup>b</sup> Points	Additional <sup>c</sup> Claimed Points Above Emerald	Point <sup>d</sup> Shortfall	Mandatory <sup>e</sup> Status
Chapter 5: Lot Design, Preparation, and Development	119	137	18		Not Applicable
Chapter 6: Resource Efficiency	146	155	9		Met
Chapter 7: Energy Efficiency	120	192	72		Met
Chapter 8: Water Efficiency	60	62	2		Met
Chapter 9: Indoor Environmental Quality	140	142	2		Met
Chapter 10: Operation, Maintenance, and Building Owner Education	12	15	3		Met
<b>Section Total</b>	597	703	106	0	
<b>Additional Points</b>	100	—	106	0	
<b>Total Points</b>	697	703	—	0	

<sup>a</sup> Emerald Required Points are the minimum green points needed to achieve an Emerald Rating  
<sup>b</sup> Claimed Points are the green points we identified (and claimed) based on the Green Improvements  
<sup>c</sup> Additional Claimed Points Above Emerald are the green points that exceed the Emerald minimum for each green category  
<sup>d</sup> Point Shortfalls are the number of green points needed to meet the Emerald minimum for each green category  
<sup>e</sup> Mandatory Status identifies whether mandatory requirements were met for each green category

## The Emerald Cost

The total initial cost to achieve the Emerald-level rating is shown in Table 3-59.

Table 3-59. Initial Cost to the Builder for the Emerald Townhouse Type A

Green Category	Emerald Points	Cost (\$)
Chapter 5: Lot Design, Preparation, and Development	137	2,181
Chapter 6: Resource Efficiency	155	4,630
Chapter 7: Energy Efficiency	192	20,445
Chapter 8: Water Efficiency	62	907
Chapter 9: Indoor Environmental Quality	142	1,155
Chapter 10: Operation, Maintenance, and Building Owner Education	15	1,044
<b>Total</b>	<b>703</b>	<b>\$30,362</b>

- The annual maintenance cost to achieve the Emerald rating is \$414 (Appendix A).
- The annual energy operating cost to achieve the Emerald rating is \$756 (Appendix A).
- The annual water operating cost to achieve the Emerald rating is \$477 (Appendix A).
- The 30-year lifetime replacement cost to achieve the Emerald rating is \$31,360 (Appendix A).



## The Emerald Benefits

The annual energy savings (compared with 2006 IECC—chapter 7) are approximately a 60-percent reduction in energy usage (Appendix C—Summary Data for Climate Zone 5, Akron, Ohio).

The annual water savings (compared with the Average Daily Per Capita Usage in Gallons, as defined by the *Handbook of Water Use and Conservation*—chapter 8) are approximately a 27-percent reduction in water usage (Appendix A—Indoor Water Usage Calculation Table for Akron, Ohio).

The water usage reduction estimate does not include the water that would be reduced from using the rainwater-collection system (instead of municipal water sources).

Overall cost and performance data are provided in Table 3-60. The water utility rates are based on Akron, Ohio water supply and sewer meter rates (source: Akron Public Utilities Bureau). We base the simple payback periods for energy and water efficiency on the current cost estimates and projected savings and do not consider future rate increases, inflation, replacement costs, or other conditions over the 30-year evaluation period.

Table 3-60. Overall Cost and Performance Data for Townhouse Type A

<b>AMHA Townhouse Type A 1,296 ft<sup>2</sup></b>	<b>Baseline</b>	<b>Bronze</b>	<b>Silver</b>	<b>Gold</b>	<b>Emerald</b>
<b>Cost Comparison</b>					
<b>Total Initial Green Cost (\$)</b>	Unknown	2,068	5,595	16,521	30,362
<b>Annual Maintenance Cost (\$)</b>	367	367	367	414	414
<b>Annual Energy Operating Cost (\$)</b>	1,158	1,092	946	825	756
<b>Annual Water Usage Cost (\$)</b>	576	554	554	477	477
<b>30-Year Lifetime Replacement Cost (\$)</b>	13,078	13,078	14,418	29,418	31,360
<b>Incremental Performance Improvement</b>					
<b>Energy Efficiency (e-Ratio) (compare to 2006 IECC)</b>	0.94	0.85	0.68	0.49	0.39
<b>Water Efficiency (%) (compares to 56.4 gpd<sup>a</sup>)</b>	10.2	13.9	13.9	26.7	26.7
<b>Land and Lot Use (points) (NGBS Rating)</b>	76 Silver	76 Silver	88 Silver	125 Gold	137 Emerald
<b>Resource Efficiency (points) (NGBS Rating)</b>	66 Bronze	74 Bronze	92 Silver	118 Gold	155 Emerald
<b>IEQ (points) (NGBS Rating)</b>	39 Bronze	60 Bronze	101 Gold	137 Gold	142 Emerald
<b>Green Education for Owner (points) (NGBS Rating)</b>	0 NR	9 Bronze	15 Emerald	15 Emerald	15 Emerald
<b>Simple Payback Periods</b>					
<b>Energy Efficiency (years) (initial energy cost and savings)</b>	NA	10	16	35	51
<b>Water Efficiency (years) (initial water cost and savings)</b>	NA	0	0	3	6
<small><sup>a</sup> The benchmark for comparison assumes three occupants using 56.4 (gpd) each. The benchmark cost is \$637; all projected savings are compared with this benchmark. IEQ = Indoor Environmental Quality; NA = not applicable; NGBS = National Green Building Standard; NR = not required.</small>					

## *Single-Family Type D—Baseline Green Rating*

Many green features are included in the original single-family design. In fact, the baseline green rating exceeds the minimum threshold points for a Bronze rating in all areas, except for the building owner education requirements. The mandatory requirements of water efficiency were met but all other categories of green but lacked the necessary mandatory requirements. Mandatory requirements are typically minimum building code requirements from the 2006 edition of the IRC—these requirements have no green point assigned values. Mandatory requirements, therefore, do not contribute to the overall numerical score. However, since they are classified as mandatory, any non-compliance of mandatory requirements renders a building as ineligible for a green rating under the NGBS. For this house design, certain mandatory items could not be determined from its specifications; including but not limited to: positive slope of the soil to direct rainwater away from the foundation, foundation footer drainage piping, moisture tolerant construction materials under bathroom tile, and crawlspace moisture management design.

The single-family Type D design was built in accordance with the 2003 Residential Code of Ohio. Green points were achieved for building on a grayfield site that was previously developed. Many previously existing units were demolished to make room for construction of new units. The lot provided for, and was close to, pedestrian access to community resources. According to design specifications, measures were taken to minimize soil disturbance and erosion, incorporate a landscape plan to restore and enhance natural vegetation, limit turf areas, and to protect trees and vegetation during construction. The general contractor was required to provide onsite supervision and coordination, select native species of trees for planting, and install light-colored hardscaping.

The resource-efficient green features included a conditioned space (above grade) of 1,908 ft<sup>2</sup>, roof trusses at 24 in on center, the use of optimal material sizes, prefabricated components, windows and doors that do not require paint or stain, overhangs to protect from the rain and sun, moisture prevention practices, and renewable and resource-efficient materials. The energy efficient green features included upgraded windows and doors (compared with code required performance), the use of ENERGY STAR appliances (that is, refrigerator, dishwasher, and washing machine), a 92-percent efficient gas furnace, energy efficient lighting, and return ducts in every room with a door.

The water-efficient green features included using appliances that conserve water (that is, dishwasher and washing machine), using low-flow showerheads and faucets, minimizing the hot-water pipe runs, and specifying a landscape plan to limit water and energy use (that is, avoiding the use of an irrigation system). The IEQ green features included using cabinets that were KCMA ESP 01 compliant, using a direct-vent furnace, and avoiding the use of fireplace(s) or solid-fuel-burning appliances. The kitchen exhaust fan was vented to the exterior, the HVAC duct openings were covered during construction, the plumbing was not installed in exterior walls or unconditioned spaces, and a detached garage was specified.

Although the original single-family design obtained a total of 256 green points, the overall green rating falls short of achieving the Bronze-level rating because it lacks several mandatory practices. The design must implement all mandatory practices and meet the threshold requirements for all green categories to achieve a rating. Table 3-61 summarizes the baseline rating and identifies where the original design exceeds the minimum Bronze rating. Additional green-scoring details are in Appendix B.

Table 3-61. Baseline Rating for Single-Family Type D

Green Building Category	Bronze <sup>a</sup> Required Points	Claimed <sup>b</sup> Points	Additional <sup>c</sup> Claimed Points Above Bronze	Point <sup>d</sup> Shortfall	Mandatory <sup>e</sup> Status
Chapter 5: Lot Design, Preparation, and Development	39	72	33	—	Not Applicable
Chapter 6: Resource Efficiency	45	57	12	—	Not Met
Chapter 7: Energy Efficiency	30	42	12	—	Not Met
Chapter 8: Water Efficiency	14	36	22	—	Met
Chapter 9: Indoor Environmental Quality	36	49	13	—	Not Met
Chapter 10: Operation, Maintenance, and Building Owner Education	8	—	—	8	Not Met
<b>Section Total</b>	172	256	92	8	
<b>Additional Points</b>	50	—	92	—	
<b>Total Points</b>	222	256	—	8	

<sup>a</sup>Bronze Required Points are the minimum green points needed to achieve a Bronze Rating.  
<sup>b</sup>Claimed Points are the green points we identified (and claimed) based on the Single-Family Type D Original Design.  
<sup>c</sup>Additional Claimed Points Above Bronze are the green points that exceed the Bronze minimum for each green category.  
<sup>d</sup>Point Shortfalls are the number of green points needed to meet the Bronze minimum for each green category.  
<sup>e</sup>Mandatory Status identifies whether mandatory requirements were met for each green category.

- The annual maintenance cost to achieve the base rating is \$367 (Appendix A).
- The annual energy operating cost to achieve the base rating is \$1,685 (Appendix A).
- The annual water operating cost to achieve the base rating is \$620 (Appendix A).
- The 30-year lifetime replacement cost to achieve the base rating is \$13,078 (Appendix A).

## Single-Family Type D—Incremental Green Ratings

### The Bronze Rating

To achieve the Bronze rating, the remaining mandatory green requirements were met. These requirements included adding specifications to the plans to provide proper slope at finish grade, conducting a third-party review to verify design and compliance with the energy section, and specifying proper air sealing (that is, between the conditioned living space and unconditioned space, windows, and doors). The energy performance was improved to 15 percent (using energy modeling). The original baseline design actually represents a 12-percent reduction in energy usage when compared with 2006 IECC; therefore, the baseline energy performance falls short of the Bronze rating, which is based on a 15-percent reduction in energy usage (as per the NGBS performance path method of determining energy efficiency). To achieve the greater energy efficiency, the HVAC system equipment is sized in accordance with the ACCA Manual J and ductwork insulation is improved. Finally, the building owner’s manual is specified to provide information about the green features, building operation, and maintenance.

All chapter thresholds and mandatory items were achieved, including an additional 172 points. The Bronze rating requires only 222 points, but we were able to achieve 344 points simply by

implementing the mandatory items not met, along with several green practices that added modest cost to the project (for example, a pest management plan to minimize chemical use, onsite tree trimmings and stumps ground and applied as mulch, additional landscaping practices implemented to conserve water and provide wind breaks, an interior subslab foundation perimeter drain, and at least two certified wood-based products). In addition, we specified the installation of a passive radon mitigation system (Zone 1), showerheads with a flow rate of 1.6 to less than 2.0 gpm, and MERV 8 filters on the central air system.

The largest one-time cost of going green is the initial investment in developing green documentation and the homeowner’s binder templates. For this study, we estimated the going-green cost at \$5,640<sup>26</sup> (this cost will be the case at any rated level). Additional green-scoring details are in Appendix B. Table 3-62 contains the Bronze rating summary.

Table 3-62. Bronze Rating for Single-Family Type D

Green Building Category	Bronze <sup>a</sup> Required Points	Claimed <sup>b</sup> Points	Additional <sup>c</sup> Claimed Points Above Bronze	Point <sup>d</sup> Shortfall	Mandatory <sup>e</sup> Status
<b>Chapter 5: Lot Design, Preparation, and Development</b>	39	96	57	—	Not Applicable
<b>Chapter 6: Resource Efficiency</b>	45	64	19	—	Met
<b>Chapter 7: Energy Efficiency</b>	30	64	34	—	Met
<b>Chapter 8: Water Efficiency</b>	14	37	23	—	Met
<b>Chapter 9: Indoor Environmental Quality</b>	36	74	38	—	Met
<b>Chapter 10: Operation, Maintenance, and Building Owner Education</b>	8	9	1	—	Met
<b>Section Total</b>	172	344	172	0	
<b>Additional Points</b>	50	—	172	0	
<b>Total Points</b>	222	344	—	0	

<sup>a</sup> Bronze Required Points are the minimum green points needed to achieve a Bronze Rating.  
<sup>b</sup> Claimed Points are the green points we identified (and claimed) based on the Green Improvements.  
<sup>c</sup> Additional Claimed Points Above Bronze are the green points that exceed the Bronze minimum for each green category.  
<sup>d</sup> Point Shortfalls are the number of green points needed to meet the Bronze minimum for each green category.  
<sup>e</sup> Mandatory Status identifies whether mandatory requirements were met for each green category.



## The Bronze Cost

The total initial cost to achieve the Bronze-level rating is shown in Table 3-63.

Table 3-63. Initial Cost to the Builder for the Bronze Single-Family Type D

Green Category	Bronze Points	Cost (\$)
Chapter 5: Lot Design, Preparation, and Development	96	0
Chapter 6: Resource Efficiency	64	691
Chapter 7: Energy Efficiency	64	1,175
Chapter 8: Water Efficiency	37	0
Chapter 9: Indoor Environmental Quality	74	140
Chapter 10: Operation, Maintenance, and Building Owner Education	9	950
<b>Total</b>	<b>344</b>	<b>\$2,956</b>

- The annual maintenance cost to achieve the Bronze rating is \$367 (Appendix A).
- The annual energy operating cost to achieve the Bronze rating is \$1,612 (Appendix A).
- The annual water operating cost to achieve the Bronze rating is \$620 (Appendix A).
- The 30-year lifetime replacement cost to achieve the Bronze rating is \$13,078 (Appendix A).

## The Bronze Benefits

The annual energy savings (compared with 2006 IECC—chapter 7) are approximately a 18-percent reduction in energy usage (Appendix C—Summary Data for Climate Zone 5, Akron, Ohio).

The annual water savings (compared with the Average Daily Per Capita Usage in Gallons, as defined by the *Handbook of Water Use and Conservation*—chapter 8) are approximately a 20-percent reduction in water usage (Appendix A—Indoor Water Usage Calculation Table for Akron, Ohio).

The lot design and development category has a low-level Gold rating, and the IEQ, energy efficiency, and water efficiency categories have low-level Silver ratings. The building owner education category is within 1 point of a Silver rating. Nonetheless, the overall green rating is Bronze because the total points are less than the Silver minimum.

## The Silver Rating

To achieve the Silver rating, we improved the Bronze-rated design by meeting the threshold chapter requirements and selecting an additional 140 points in green features. The Silver rating requires 406 points; we achieved 446 points by specifying a stud spacing of 24 in on center with the use of single top plates, specifying downspout extensions or splash blocks to carry water at least 5 feet away from the foundation, requiring the sorting and reusing of scrap building materials, and specifying the use of building materials with recycled content.

To improve energy efficiency, we improved the building enclosure insulation and air sealing, specified a direct-vent gas tankless water heater, and reduced duct leakage. We also required a third-party preinspection and postinspection of the insulation and ductwork, and verification of the envelope and duct leakage.

The IEQ was improved by specifying the use of low-emission carpet and padding; specifying interior low-VOC sealants and adhesives; specifying low-emission insulation in walls, floors, ceilings, and ducts; sampling moisture content of lumber for acceptable levels; and using a carbon monoxide detector. Finally, training and orientation of the building owners for the green building systems and operations were required. Additional green-scoring details are in Appendix B. Table 3-64 contains the Silver rating summary.

Table 3-64. Silver Rating for Single-Family Type D

Green Building Category	Silver <sup>a</sup> Required Points	Claimed <sup>b</sup> Points	Additional <sup>c</sup> Claimed Points Above Silver	Point <sup>d</sup> Shortfall	Mandatory <sup>e</sup> Status
<b>Chapter 5: Lot Design, Preparation, and Development</b>	66	96	30	—	Not Applicable
<b>Chapter 6: Resource Efficiency</b>	79	86	7	—	Met
<b>Chapter 7: Energy Efficiency</b>	60	107	47	—	Met
<b>Chapter 8: Water Efficiency</b>	26	37	11	—	Met
<b>Chapter 9: Indoor Environmental Quality</b>	65	105	40	—	Met
<b>Chapter 10: Operation, Maintenance, and Building Owner Education</b>	10	15	5	—	Met
<b>Section Total</b>	306	446	140	0	
<b>Additional Points</b>	100	—	140	0	
<b>Total Points</b>	406	446	—	0	

<sup>a</sup>Silver Required Points are the minimum green points needed to achieve a Silver Rating  
<sup>b</sup>Claimed Points are the green points we identified (and claimed) based on the Green Improvements  
<sup>c</sup>Additional Claimed Points Above Silver are the green points that exceed the Silver minimum for each green category  
<sup>d</sup>Point Shortfalls are the number of green points needed to meet the Silver minimum for each green category  
<sup>e</sup>Mandatory Status identifies whether mandatory requirements were met for each green category

## The Silver Cost

The total initial cost to achieve the Silver-level rating is shown in Table 3-65.

Table 3-65. Initial Cost to the Builder for the Silver Single-Family Type D

Green Category	Silver Points	Cost (\$)
<b>Chapter 5: Lot Design, Preparation, and Development</b>	96	0
<b>Chapter 6: Resource Efficiency</b>	86	697
<b>Chapter 7: Energy Efficiency</b>	107	2,985
<b>Chapter 8: Water Efficiency</b>	37	0
<b>Chapter 9: Indoor Environmental Quality</b>	105	274
<b>Chapter 10: Operation, Maintenance, and Building Owner Education</b>	15	1,044
<b>Total</b>	<b>446</b>	<b>\$5,000</b>

- The annual maintenance cost to achieve the Silver rating is \$367 (Appendix A).
- The annual energy operating cost for the Silver rating is \$1,408 (Appendix A).
- The annual water operating cost for the Silver rating is \$620 (Appendix A).
- The 30-year lifetime replacement cost for the Silver rating is \$14,418 (Appendix A).

## The Silver Benefits

The annual energy savings (compared with 2006 IECC—chapter 7) are approximately a 30-percent reduction in energy usage (Appendix C—Summary Data for Climate Zone 5, Akron, Ohio).

The annual water savings (compared with the Average Daily Per Capita Usage in Gallons, as defined by the *Handbook of Water Use and Conservation*—chapter 8) are approximately a 20-percent reduction in water usage (Appendix A—Indoor Water Usage Calculation Table for Akron, Ohio).

The lot design and development, IEQ, and energy efficiency categories have Gold ratings, and the building owner education category is an Emerald rating. Nonetheless, the overall green rating is Silver because the total points are less than the Gold minimum.

## The Gold Rating

To achieve the Gold rating, we improved the Silver-rated design by meeting the threshold chapter requirements and selecting an additional 152 points in green features. The Gold rating requires 558 points; we achieved 610 points by specifying measures to support wildlife habitat, and protecting trees and vegetation during construction. In addition, the utilities were required to be installed by tunneling, using smaller or low ground-pressure equipment.

To improve resource efficiency, we specified the use of a built-in recycling area in the kitchen and an onsite compost facility, five types of building materials must be recycled, indigenous materials must be used, and OSB must be procured from a factory that uses renewable energy in the manufacturing process.

To improve the energy efficiency, we specified a closed-loop solar hot-water system, reduced the structure's infiltration rate further, increased ceiling insulation, and specified 1-in exterior foam sheathing. In addition, we specified verification of the installation and performance of the heating and cooling system by a certified technician, selected the equipment using ACCA Manual S, and ensured that a nationally recognized program certified the installation technician(s).

To improve water efficiency, low-flow (1.28 gal or less per flush) toilets were specified for all water closets. The IEQ was improved by selecting kitchen and bath cabinets with no added urea formaldehyde, providing bath and laundry fans with automatic timers and humidistats, verifying all exhaust fans meet specifications and have proper airflow, and requiring the installation of a whole-house balanced ventilation system. Additional green-scoring details are in Appendix B. Table 3-66 contains the Gold rating summary.

Table 3-66. Gold Rating for Single-Family Type D

Green Building Category	Gold <sup>a</sup> Required Points	Claimed <sup>b</sup> Points	Additional <sup>c</sup> Claimed Points Above Gold	Point <sup>d</sup> Shortfall	Mandatory <sup>e</sup> Status
Chapter 5: Lot Design, Preparation, and Development	93	114	21	—	Not Applicable
Chapter 6: Resource Efficiency	113	113	—	—	Met
Chapter 7: Energy Efficiency	100	166	66	—	Met
Chapter 8: Water Efficiency	41	61	20	—	Met
Chapter 9: Indoor Environmental Quality	100	141	41	—	Met
Chapter 10: Operation, Maintenance, and Building Owner Education	11	15	4	—	Met
<b>Section Total</b>	458	610	152	0	
<b>Additional Points</b>	100	—	152	0	
<b>Total Points</b>	558	610	—	0	

<sup>a</sup> Gold Required Points are the minimum green points needed to achieve a Gold Rating  
<sup>b</sup> Claimed Points are the green points we identified (and claimed) based on the Green Improvements  
<sup>c</sup> Additional Claimed Points Above Gold are the green points that exceed the Gold minimum for each green category  
<sup>d</sup> Point Shortfalls are the number of green points needed to meet the Gold minimum for each green category  
<sup>e</sup> Mandatory Status identifies whether mandatory requirements were met for each green category

## The Gold Cost

The total initial cost to achieve the Gold-level rating is shown in Table 3-67.

Table 3-67. Initial Cost to the Builder for the Gold Single-Family Type D

Green Category	Gold Points	Cost (\$)
Chapter 5: Lot Design, Preparation, and Development	114	175
Chapter 6: Resource Efficiency	113	847
Chapter 7: Energy Efficiency	166	13,010
Chapter 8: Water Efficiency	61	525
Chapter 9: Indoor Environmental Quality	141	945
Chapter 10: Operation, Maintenance, and Building Owner Education	15	1,044
<b>Total</b>	<b>610</b>	<b>\$16,546</b>

- The annual maintenance cost to achieve the Gold rating is \$414 (Appendix A).
- The annual energy operating cost to achieve the Gold rating is \$1,211 (Appendix A).
- The annual water operating cost to achieve the Gold rating is \$572 (Appendix A).
- The 30-year lifetime replacement cost to achieve the Gold rating is \$31,360 (Appendix A).

## The Gold Benefits

The annual energy savings (compared with 2006 IECC—chapter 7) are approximately a 50-percent reduction in energy usage (Appendix C—Summary Data for Climate Zone 5, Akron, Ohio). The annual water savings (compared with the Average Daily Per Capita Usage in Gallons, as defined by the *Handbook of Water Use and Conservation*—chapter 8) are approximately a 27-percent reduction in water usage (Appendix A—Indoor Water Usage Calculation Table for Akron, Ohio). The energy efficiency, IEQ, water efficiency, and building owner education categories have Emerald ratings, and the lot design and development category is close to an Emerald rating. Nonetheless, the overall green rating is Gold because the total points are less than the Emerald minimum.

## The Emerald Rating

To achieve the Emerald rating, we improved the Gold-rated design by meeting the threshold chapter requirements and selecting an additional 107 points in green features. The Emerald rating requires 697 points; we achieved 704 points by requiring the preservation of natural water and drainage features, and developing a stormwater management plan.

To improve resource efficiency, we specified detailed framing plans and optimized building dimensions to reduce material cuts, and we added a Frost Protected Shallow Foundation (FPSF) under the walkout wall. In addition, all specified siding must not require onsite applied finishing. A construction waste management plan and onsite recycling of construction materials were also required.

To improve the energy efficiency, we specified R-60 insulation to the attic with raised heel trusses, R-10 foam sheathing to the exterior, improved window and door performance, installed a higher efficiency furnace, improved the structures infiltration rate further, and balanced the HVAC system.

We improved the water efficiency by installing a rainwater-collection and -distribution system. We improved the IEQ by specifying the use of exterior low-VOC adhesives and sealants and adding a capillary break on the footing to prevent moisture migration into the foundation wall. Additional green-scoring details are in Appendix B. Table 3-68 contains the Emerald rating summary.

Table 3-68. Emerald Rating for Single-Family Type D

Green Building Category	Emerald <sup>a</sup> Required Points	Claimed <sup>b</sup> Points	Additional <sup>c</sup> Claimed Points Above Emerald	Point <sup>d</sup> Shortfall	Mandatory <sup>e</sup> Status
Chapter 5: Lot Design, Preparation, and Development	119	126	7		Not Applicable
Chapter 6: Resource Efficiency	146	148	2		Met
Chapter 7: Energy Efficiency	120	197	77		Met
Chapter 8: Water Efficiency	60	69	9		Met
Chapter 9: Indoor Environmental Quality	140	149	9		Met
Chapter 10: Operation, Maintenance, and Building Owner Education	12	15	3		Met
<b>Section Total</b>	597	704	107	0	
<b>Additional Points</b>	100	—	107	0	
<b>Total Points</b>	697	704	—	0	

<sup>a</sup> Emerald Required Points are the minimum green points needed to achieve an Emerald Rating  
<sup>b</sup> Claimed Points are the green points we identified (and claimed) based on the Green Improvements.  
<sup>c</sup> Additional Claimed Points Above Emerald are the green points that exceed the Emerald minimum for each green category  
<sup>d</sup> Point Shortfalls are the number of green points needed to meet the Emerald minimum for each green category.  
<sup>e</sup> Mandatory Status identifies whether mandatory requirements were met for each green category.

## The Emerald Cost

The total initial cost to achieve the Emerald-level rating is shown in Table 3-69.

Table 3-69. Initial Cost to the Builder for the Emerald Single-Family Type D

Green Category	Emerald Points	Cost (\$)
Chapter 5: Lot Design, Preparation, and Development	126	695
Chapter 6: Resource Efficiency	148	3,916
Chapter 7: Energy Efficiency	197	23,908
Chapter 8: Water Efficiency	69	907
Chapter 9: Indoor Environmental Quality	149	1,061
Chapter 10: Operation, Maintenance, and Building Owner Education	15	1,044
<b>Total</b>	<b>704</b>	<b>\$31,530</b>

- The annual maintenance cost to achieve the Emerald rating is \$414 (Appendix A).
- The annual energy operating cost to achieve the Emerald rating is \$992 (Appendix A).
- The annual water operating cost to achieve the Emerald rating is \$572 (Appendix A).
- The 30-year lifetime replacement cost to achieve the Emerald rating is \$31,360 (Appendix A).



## The Emerald Benefits

The annual energy savings (compared with 2006 IECC—chapter 7) are approximately a 61-percent reduction in energy usage (Appendix C—Summary Data for Climate Zone 5, Akron, Ohio).

The annual water savings (compared with the Average Daily Per Capita Usage in Gallons, as defined by the *Handbook of Water Use and Conservation*—chapter 8) are approximately a 27-percent reduction in water usage (Appendix A—Indoor Water Usage Calculation Table for Akron, Ohio).

The water usage reduction estimate does not include the water that would be reduced from using the rainwater-collection system (instead of municipal water sources).

Overall cost and performance data are provided in Table 3-70. The water utility rates are based on Akron, Ohio water supply and sewer meter rates (source: Akron Public Utilities Bureau). We base the simple payback periods for energy and water efficiency on the current cost estimates and projected savings and do not consider future rate increases, inflation, replacement costs, or other conditions over the 30-year evaluation period.

Table 3-70. Overall Cost and Performance Data for Single-Family Type D

<b>AMHA Single-Family Type D 1,908 ft<sup>2</sup></b>	<b>Baseline</b>	<b>Bronze</b>	<b>Silver</b>	<b>Gold</b>	<b>Emerald</b>
<b>Cost Comparison</b>					
<b>Total Initial Green Cost (\$)</b>	Unknown	2,956	5,000	16,546	31,530
<b>Annual Maintenance Cost (\$)</b>	367	367	367	414	414
<b>Annual Energy Operating Cost (\$)</b>	1,685	1,612	1,408	1,211	992
<b>Annual Water Usage Cost (\$)</b>	620	620	620	572	572
<b>30-Year Lifetime Replacement Cost (\$)</b>	13,078	13,078	14,418	29,418	31,360
<b>Incremental Performance Improvement</b>					
<b>Energy Efficiency (e-Ratio) (compare to 2006 IECC)</b>	0.88	0.82	0.69	0.50	0.41
<b>Water Efficiency (%) (compares to 56.4 gpd<sup>a</sup>)</b>	20.1	20.1	20.1	26.7	26.7
<b>Land and Lot Use (points) (NGBS Rating)</b>	72 Silver	96 Gold	96 Gold	114 Gold	126 Emerald
<b>Resource Efficiency (points) (NGBS Rating)</b>	57 Bronze	64 Bronze	86 Silver	113 Gold	148 Emerald
<b>IEQ (points) (NGBS Rating)</b>	49 Bronze	74 Silver	105 Gold	141 Emerald	149 Emerald
<b>Green Education for Owner (points) (NGBS Rating)</b>	0 NR	9 Bronze	15 Emerald	15 Emerald	15 Emerald
<b>Simple Payback Periods</b>					
<b>Energy Efficiency (years) (initial energy cost and savings)</b>	NA	16	11	27	34
<b>Water Efficiency (years) (initial water cost and savings)</b>	NA	0	0	3	5
<small><sup>a</sup>The benchmark for comparison assumes five occupants using 56.4 (gpd) each. The benchmark cost is \$766; all projected savings are compared with this benchmark. IEQ = Indoor Environmental Quality; NA = not applicable; NGBS = National Green Building Standard; NR = not required.</small>					

### 3.4.2 Cuyahoga Falls, Ohio: Valley View Homes Development

In Ohio, a new 37-unit apartment building consisting of one-bedroom and two-bedroom apartments was constructed in an existing neighborhood renovated with HOPE grant funding from the U.S. Department of Housing and Development. This urban renewal project was to rebuild Valley View Homes Estate, a former public housing project built in 1939 and located in Cleveland’s historic Tremont neighborhood. Construction also included new streets to provide more efficient pedestrian and vehicular access, and the property was regraded so residents no longer had to climb stairs to access the upper part of the development.



The project was led by the Cuyahoga Metropolitan Housing Authority (CMHA) and was completed in different phases. CMHA worked with the development firm McCormack Baron Salazar to rebuild the development using environmentally friendly techniques and innovative site planning and design. The newly constructed apartments were designed and built as part of the Enterprise Communities Partners' Green Communities Initiative.

We selected a one-bedroom unit in the Valley View Homes Apartment Building, Cuyahoga Falls, Ohio, for the NGBS evaluation process. When considering a multifamily apartment building for an NGBS green rating, all individual apartment units must meet the NGBS green-level rating requirements for the multifamily apartment building to receive a green building rating. For example, if the multifamily apartment building is rated Silver, that means that all individual apartment units must have a minimum rating of Silver. To ensure this label is accurate, an evaluation of each type of apartment unit is necessary. During our preliminary evaluation of the Valley View Homes apartment building, we determined that a one-bedroom unit on the corner of the building (with two exterior walls and the roof exposed) would be the worst-case apartment unit to model green in terms of the NGBS, so that when this one-bedroom unit meets a certain green rating, all other units will be equal or more efficient.

### *One-Bedroom Apartment Baseline Green Rating*

Many green features are included in the original apartment design. In fact, the baseline green rating exceeds the minimum total points for a Bronze rating, but falls short of meeting mandatory requirements in the areas of energy efficiency, IEQ, and building owner education. In addition, the minimum threshold point requirements for energy efficiency, water efficiency, and building owner education are not met.

The apartment design was built in accordance with the 2005 Ohio Building Code (OBC) and 2003 IRC. Green points were achieved for promoting pedestrian activity, and providing for pedestrian access to community resources and mass transit systems. A natural resources inventory was completed and a plan was implemented to conserve high-priority resources. Development on less than 25 percent of steep slopes was avoided, and long-term erosion effects were minimized through the design and implementation of terracing, retaining walls, and restabilization techniques. A stormwater management plan was developed, construction activities were scheduled to minimize soil exposure, and limits of clearing and grading were demarcated on the plan. A landscape plan was formulated to restore or enhance natural vegetation cleared during construction, and specific types of trees were selected to provide shading. Measures were taken to minimize soil disturbance and erosion, protect trees and vegetation during construction, limit the use of fertilizer and pesticides, and stockpile topsoil for later use. Points were also awarded for density and shared parking (greater than 21 dwelling units per acre).

Resource-efficiency features included a conditioned floor area of 658 ft<sup>2</sup> (less than 1,000 square feet); roof trusses, floor trusses, and wall framing at 24 in on center; preassembled roof and floor trusses; and stacked stories. Prefinished exterior materials included brick façade, metal siding, and vinyl windows. Drip edges were installed, roof drains were specified; and flashing details were shown on the plans. Reclaimed materials were used for carpet padding and playground surfaces, and biobased materials include kitchen cabinets, OSB, and interior doors and trim. Resource-efficient materials included steel girders, and roof and floor trusses.

The energy-efficient green features included insulation and air sealing in compliance with the list of practices in section 703.2, no recessed lighting, an ENERGY STAR-rated dishwasher, and all heating and cooling ducts installed within conditioned spaces. The water-efficient green features included using an ENERGY STAR dishwasher, installing low-flow showerheads and faucets, and minimizing the hot-water pipe runs.

The IEQ green features included using a heat pump air handler in conditioned spaces; specifying nonemitting materials (wire shelves); using a building ventilation system (continuous operation fans); installing no plumbing distribution lines in exterior walls or unconditioned space(s); and avoiding the use of fireplace(s), solid-fuel-burning appliances, and garages. Green points were also awarded for training owners and occupants on equipment operation, control systems, and green building practices.

Although the original apartment design obtained a total of 258 green points, the overall green rating falls short of achieving the Bronze-level rating because it lacks several mandatory practices and threshold requirements in energy and water efficiency. The design must implement all mandatory practices and meet the threshold requirements for all green categories to achieve a rating. Table 3-71 summarizes the baseline rating and identifies where the design exceeded and fell short of the Bronze rating. Additional green-scoring details are in Appendix B.

Table 3-71. Baseline Rating for One-Bedroom Apartment

Green Building Category	Bronze <sup>a</sup> Required Points	Claimed <sup>b</sup> Points	Additional <sup>c</sup> Claimed Points Above Bronze	Point <sup>d</sup> Shortfall	Mandatory <sup>e</sup> Status
Chapter 5: Lot Design, Preparation, and Development	39	96	57	—	Not Applicable
Chapter 6: Resource Efficiency	45	81	36	—	Met
Chapter 7: Energy Efficiency	30	19	—	11	Not Met
Chapter 8: Water Efficiency	14	10	—	4	Met
Chapter 9: Indoor Environmental Quality	36	46	10	—	Not Met
Chapter 10: Operation, Maintenance, and Building Owner Education	8	6	—	2	Not Met
Section Total	172	258	103	17	
Additional Points	50	—	103	—	
Total Points	222	258	—	17	

<sup>a</sup> Bronze Required Points are the minimum green points needed to achieve a Bronze Rating.  
<sup>b</sup> Claimed Points are the green points we identified (and claimed) based on the One-Bedroom Apt Original Design.  
<sup>c</sup> Additional Claimed Points Above Bronze are the green points that exceed the Bronze minimum for each green category.  
<sup>d</sup> Point Shortfalls are the number of green points needed to meet the Bronze minimum for each green category.  
<sup>e</sup> Mandatory Status identifies whether mandatory requirements were met for each green category.

- The annual maintenance cost to achieve the base rating is \$451 (Appendix A).
- The annual energy operating cost to achieve the base rating is \$1,123 (Appendix A).
- The annual water operating cost to achieve the base rating is \$534 (Appendix A).
- The 30-year lifetime replacement cost to achieve the base rating is \$14,848 (Appendix A).

## *One-Bedroom Apartment Incremental Green Ratings*

### **The Bronze Rating**

To achieve the Bronze rating, the remaining mandatory green requirements were met. These requirements included conducting a third-party review to verify design and compliance with the energy section; sizing the HVAC equipment to meet the ACCA Manual J; sealing ducts with tape, mastic, or an approved system to reduce leakage; specifying proper air sealing of exterior architectural features; and specifying the exhaust rate of the bathroom fans.

All chapter thresholds and mandatory items were achieved, including an additional 145 points. The Bronze rating requires only 222 points, but we were able to achieve 317 points simply by implementing the mandatory items not met at the baseline, along with several green practices to meet the threshold point requirements in several green categories.

To improve energy efficiency, the design was improved by 15 percent (using energy modeling). The original baseline design actually represents a 4-percent reduction in energy usage when compared with 2006 IECC; therefore, the baseline energy performance falls short of the Bronze rating, which is based on a 15-percent reduction in energy usage (as per the NGBS performance path method of determining energy efficiency). To achieve the greater energy efficiency, windows, ductwork leakage, and insulation were improved. ENERGY STAR bulbs or fixtures were specified for at least 50 percent of all the fixtures installed, and sizing the heating and cooling equipment according to Manual S was added to the specifications. In addition, the water efficiency was improved by specifying that all water closets have flush rates of 1.28 gallons or less.

The largest one-time cost of going green is the initial investment in developing green documentation and the homeowner's binder templates. For this study, we estimated the going-green cost at \$5,640<sup>27</sup> (this cost will be the case at any rated level). Along with the cost of developing green documentation, the largest cost increase is to meet the energy efficient requirements. Nonetheless, additional green-scoring details are in Appendix B. Table 3-72 contains the Bronze rating summary.

Table 3-72. Bronze Rating for One-Bedroom Apartment

Green Building Category	Bronze <sup>a</sup> Required Points	Claimed <sup>b</sup> Points	Additional <sup>c</sup> Claimed Points Above Bronze	Point <sup>d</sup> Shortfall	Mandatory <sup>e</sup> Status
Chapter 5: Lot Design, Preparation, and Development	39	101	62	—	Not Applicable
Chapter 6: Resource Efficiency	45	81	36	—	Met
Chapter 7: Energy Efficiency	30	51	21	—	Met
Chapter 8: Water Efficiency	14	22	8	—	Met
Chapter 9: Indoor Environmental Quality	36	46	10	—	Met
Chapter 10: Operation, Maintenance, and Building Owner Education	8	16	8	—	Met
<b>Section Total</b>	172	317	145	0	
<b>Additional Points</b>	50	—	145	0	
<b>Total Points</b>	222	317	—	0	

<sup>a</sup>Bronze Required Points are the minimum green points needed to achieve a Bronze Rating.  
<sup>b</sup>Claimed Points are the green points we identified (and claimed) based on the Green Improvements.  
<sup>c</sup>Additional Claimed Points Above Bronze are the green points that exceed the Bronze minimum for each green category.  
<sup>d</sup>Point Shortfalls are the number of green points needed to meet the Bronze minimum for each green category.  
<sup>e</sup>Mandatory Status identifies whether mandatory requirements were met for each green category.

## The Bronze Cost

The total initial cost to achieve the Bronze-level rating is shown in Table 3-73.

Table 3-73. Initial Cost to the Builder for the Bronze One-Bedroom Apartment

Green Category	Bronze Points	Cost (\$)
Chapter 5: Lot Design, Preparation, and Development	101	0
Chapter 6: Resource Efficiency	81	0
Chapter 7: Energy Efficiency	51	2,882
Chapter 8: Water Efficiency	22	175
Chapter 9: Indoor Environmental Quality	46	0
Chapter 10: Operation, Maintenance, and Building Owner Education	16	250
<b>Total</b>	<b>317</b>	<b>\$3,307</b>

- The annual maintenance cost to achieve the Bronze rating is \$451 (Appendix A).
- The annual energy operating cost to achieve the Bronze rating is \$981 (Appendix A).
- The annual water operating cost to achieve the Bronze rating is \$497 (Appendix A).
- The 30-year lifetime replacement cost to achieve the Bronze rating is \$16,030 (Appendix A).

## The Bronze Benefits

The annual energy savings (compared with 2006 IECC—chapter 7) are approximately a 15-percent reduction in energy usage (Appendix C—Summary Data for Climate Zone 5A, Cuyahoga Falls, Ohio). The annual water savings (compared with the Average Daily Per Capita Usage in Gallons, as defined by the *Handbook of Water Use and Conservation*—chapter 8) are 19-percent reduction in water usage (Appendix A—Indoor Water Usage Calculation Table for Cuyahoga Falls, Ohio). The resource efficiency category has a Silver rating, and the lot design and development category has a low-level Gold rating. The building owner education category has an Emerald rating. Nonetheless, the overall green rating is Bronze because the total points are less than the Silver minimum.

## The Silver Rating

To achieve the Silver rating, we improved the Bronze-rated design by meeting the threshold chapter requirements and selecting an additional 141 points in green features. The Silver rating requires 406 points; we achieved 447 points by specifying interior foundation perimeter drains, requiring the purchase of OSB or carpeting that is produced from a factory that uses one-third of its process energy from renewable sources, and selecting three types of indigenous construction materials.

To improve energy efficiency, we required a change in fuel source (from electric to natural gas), specified one-inch foam sheathing, improved window performance, upgraded to a 14 SEER air conditioner, installed a highly efficient, 96-percent AFUE direct-vent gas furnace, and a 65-percent AFUE direct-vent gas water heater. Specifications were added to design the duct system according to Manual D, require the HVAC contractor and service technician to be certified by a national recognized program, and specify the use of an alternate refrigerant containing no HCFCs. We also specified a third-party inspection of the insulation and ductwork and verification of the envelope and duct leakage.

To improve water efficiency we eliminated the pop-up irrigation system originally specified. IEQ improvements were made by specifying the installation of a direct-vent furnace and water heater, MERV 8 filters, and HVAC registers and boots. In addition, several nonurea formaldehyde products were specified, including interior doors, trim, and cabinets, along with low-emission carpet, padding, and adhesives. The kitchen and bath cabinets were required to meet KCMA ESP 01 or equivalent, the moisture content of lumber and subfloors were specified at a minimum level, and living space contaminants were reduced by requiring the sealing of penetrations (top plates, HVAC register boots, and recessed can lights). Finally, carbon monoxide detectors were specified, along with nonsmoking areas in all interior common areas. Additional green-scoring details are in Appendix B. Table 3-74 contains the Silver rating summary.

Table 3-74. Silver Rating for One-Bedroom Apartment

Green Building Category	Silver <sup>a</sup> Required Points	Claimed <sup>b</sup> Points	Additional <sup>c</sup> Claimed Points Above Silver	Point <sup>d</sup> Shortfall	Mandatory <sup>e</sup> Status
<b>Chapter 5: Lot Design, Preparation, and Development</b>	66	101	35	—	Not Applicable
<b>Chapter 6: Resource Efficiency</b>	79	93	14	—	Met
<b>Chapter 7: Energy Efficiency</b>	60	109	49	—	Met
<b>Chapter 8: Water Efficiency</b>	26	37	11	—	Met
<b>Chapter 9: Indoor Environmental Quality</b>	65	91	26	—	Met
<b>Chapter 10: Operation, Maintenance, and Building Owner Education</b>	10	16	6	—	Met
<b>Section Total</b>	306	447	141	0	
<b>Additional Points</b>	100	—	141	0	
<b>Total Points</b>	406	447	—	0	

<sup>a</sup> Silver Required Points are the minimum green points needed to achieve a Silver Rating.  
<sup>b</sup> Claimed Points are the green points we identified (and claimed) based on the Green Improvements.  
<sup>c</sup> Additional Claimed Points Above Silver are the green points that exceed the Silver minimum for each green category.  
<sup>d</sup> Point Shortfalls are the number of green points needed to meet the Silver minimum for each green category.  
<sup>e</sup> Mandatory Status identifies whether mandatory requirements were met for each green category.

## The Silver Cost

The total initial cost to achieve the Silver-level rating is shown in Table 3-75.

Table 3-75. Initial Cost to the Builder for the Silver One-Bedroom Apartment

Green Category	Silver Points	Cost (\$)
<b>Chapter 5: Lot Design, Preparation, and Development</b>	101	0
<b>Chapter 6: Resource Efficiency</b>	93	55
<b>Chapter 7: Energy Efficiency</b>	104	5,122
<b>Chapter 8: Water Efficiency</b>	37	98
<b>Chapter 9: Indoor Environmental Quality</b>	91	0
<b>Chapter 10: Operation, Maintenance, and Building Owner Education</b>	16	250
<b>Total</b>	<b>442</b>	<b>\$5,525</b>

- The annual maintenance cost to achieve the Silver rating is \$451 (Appendix A).
- The annual energy operating cost to achieve the Silver rating is \$875 (Appendix A).
- The annual water operating cost to achieve the Silver rating is \$497 (Appendix A).
- The 30-year lifetime replacement cost to achieve the Silver rating is \$16,617 (Appendix A).

## The Silver Benefits

The annual energy savings (compared with 2006 IECC—chapter 7) are approximately a 31-percent reduction in energy usage (Appendix C—Summary Data for Climate Zone 5A, Cuyahoga Falls, Ohio). The annual water savings (compared with the Average Daily Per Capita Usage in Gallons, as defined by the *Handbook of Water Use and Conservation*—chapter 8) are a 19-percent reduction in water usage (Appendix A—Indoor Water Usage Calculation Table for Cuyahoga Falls, Ohio). The energy efficiency and lot design and development categories have a low-level Gold rating, and the building owner education category has an Emerald rating. Nonetheless, the overall green rating is Silver because the total points are less than the Gold minimum.

## The Gold Rating

To achieve the Gold rating, we improved the Silver-rated design by meeting the threshold chapter requirements and selecting an additional 120 points in green features. The Gold rating requires 558 points; we achieved 578 points by specifying the preservation of natural water and drainage features, limiting turf areas, selecting regionally appropriate trees and vegetation, and selecting plants with similar watering needs. The utilities were required to be installed using tunneling and low ground-pressure equipment.

To improve resource efficiency, we specified extended roof overhangs (parapet), a recycling area in the trash rooms, and the sorting and reuse of scrap building material. In addition, four types of construction materials with recycled content (carpet, padding, gypsum board, and cellulose insulation [in lieu of fiberglass]) were specified and four materials (drywall, copper wire, cardboard, and wood) were required to be recycled during construction.

To improve energy efficiency, we specified R-75 insulation in the ceiling, switched to a 95-percent AFUE high-efficiency boiler for heating and domestic water, upgraded to a closed-loop solar hot-water system with additional hydronic controls, reduced the structure's infiltration rate and duct leakage further, and installed a 14 SEER air conditioning system.

To improve water efficiency, rainwater was collected and used. The IEQ was improved by specifying low-VOC adhesives, sealants, and caulks; specifying no-urea formaldehyde kitchen and bath cabinets; and installing insulation products in walls, floors, ceilings, and ductwork that meet third-party certification guidelines for formaldehyde emissions. In addition, exterior grilles or mats were specified at entranceways to control pollutants. The bath and laundry fans were specified with an automatic timer and humidistat, and all the exhaust fans were required to be inspected for proper airflow. Additional green-scoring details are in Appendix B. Table 3-76 contains the Gold rating summary.



Table 3-76. Gold Rating for One-Bedroom Apartment

Green Building Category	Gold <sup>a</sup> Required Points	Claimed <sup>b</sup> Points	Additional <sup>c</sup> Claimed Points Above Gold	Point <sup>d</sup> Shortfall	Mandatory <sup>e</sup> Status
Chapter 5: Lot Design, Preparation, and Development	93	129	36	—	Not Applicable
Chapter 6: Resource Efficiency	113	117	4	—	Met
Chapter 7: Energy Efficiency	100	155	55	—	Met
Chapter 8: Water Efficiency	41	43	2	—	Met
Chapter 9: Indoor Environmental Quality	100	118	18	—	Met
Chapter 10: Operation, Maintenance, and Building Owner Education	11	16	5	—	Met
<b>Section Total</b>	458	578	120	0	
<b>Additional Points</b>	100	—	120	0	
<b>Total Points</b>	558	578	—	0	

<sup>a</sup> Gold Required Points are the minimum green points needed to achieve a Gold Rating.  
<sup>b</sup> Claimed Points are the green points we identified (and claimed) based on the Green Improvements.  
<sup>c</sup> Additional Claimed Points Above Gold are the green points that exceed the Gold minimum for each green category.  
<sup>d</sup> Point Shortfalls are the number of green points needed to meet the Gold minimum for each green category.  
<sup>e</sup> Mandatory Status identifies whether mandatory requirements were met for each green category.

## The Gold Cost

The total initial cost to achieve the Gold-level rating is shown in Table 3-77.

Table 3-77. Initial Cost to the Builder for the Gold One-Bedroom Apartment

Green Category	Gold Points	Cost (\$)
Chapter 5: Lot Design, Preparation, and Development	129	0
Chapter 6: Resource Efficiency	117	384
Chapter 7: Energy Efficiency	155	7,639
Chapter 8: Water Efficiency	43	162
Chapter 9: Indoor Environmental Quality	118	395
Chapter 10: Operation, Maintenance, and Building Owner Education	16	250
<b>Total</b>	<b>578</b>	<b>\$8,830</b>

- The annual maintenance cost to achieve the Gold rating is \$490 (Appendix A).
- The annual energy operating cost to achieve the Gold rating is \$727 (Appendix A).
- The annual water operating cost to achieve the Gold rating is \$497 (Appendix A).
- The 30-year lifetime replacement cost to achieve the Gold rating is \$24,596 (Appendix A).



## The Gold Benefits

The annual energy savings (compared with 2006 IECC—chapter 7) are approximately a 52-percent reduction in energy usage (Appendix C—Summary Data for Climate Zone 5A, Cuyahoga Falls, Ohio). The annual water savings (compared with the Average Daily Per Capita Usage in Gallons, as defined by the *Handbook of Water Use and Conservation*—chapter 8) are a 19-percent reduction in water usage (Appendix A—Indoor Water Usage Calculation Table for Cuyahoga Falls, Ohio). The energy efficiency, lot design and development, and builder-owner education categories have Emerald ratings. Nonetheless, the overall green rating is Gold because the total points are less than the Gold minimum.

## The Emerald Rating

To achieve the Emerald rating, we improved the Gold-rated design by meeting the threshold chapter requirements and selecting an additional 115 points in green features. The Emerald rating requires 697 points; we achieved 712 points by requiring the use of a knowledgeable team with respect to green lot design, preparation, and development; providing basic training in tree and other natural resource protection to the onsite supervisor; and requiring onsite supervision and coordination during clearing, grading, trenching, paving, and utility installation. In addition, the contractors were required to avoid and mitigate damage to existing trees and root zones during construction. The heat island effect was to be minimized by incorporating light-colored hardscaping or shading.

To improve resource efficiency, we specified detailed framing plans to optimize building dimensions and reduce material cuts. A construction waste management plan was developed and implemented, along with an onsite construction materials recycling program for onsite use.

To improve energy efficiency, we specified more surface area to the solar hot-water collector, R-10 foam sheathing, and a 16 SEER air conditioning system. We also specified the use of return ducts or transfer grilles in every room with a door, along with a balanced HVAC system that is verified by using a flow hood or other acceptable flow measurement tool.

The water efficiency was improved by specifying an ENERGY STAR washing machine with a water factor of 6.0, a low-volume drip irrigation system with separate zones for turf and bedding areas, and an ET-based irrigation controller with a rain sensor. Rainwater must be collected and distributed by gravity or a renewable energy source. In addition, we specified fixtures with an automatic shutoff for domestic water use.

The IEQ was improved by specifying low-emission hard-surface flooring (kitchen and bath), gypsum board, and site applied interior products certified by a third-party program. In addition, a capillary break was specified on the footers to prevent moisture migration into the foundation wall. Additional green-scoring details are in Appendix B. Table 3-78 contains the Emerald rating summary.

Table 3-78. Emerald Rating for One-Bedroom Apartment

Green Building Category	Emerald <sup>a</sup> Required Points	Claimed <sup>b</sup> Points	Additional <sup>c</sup> Claimed Points Above Emerald	Point <sup>d</sup> Shortfall	Mandatory <sup>e</sup> Status
Chapter 5: Lot Design, Preparation, and Development	119	153	34		Not Applicable
Chapter 6: Resource Efficiency	146	147	1		Met
Chapter 7: Energy Efficiency	120	191	71		Met
Chapter 8: Water Efficiency	60	61	1		Met
Chapter 9: Indoor Environmental Quality	140	144	4		Met
Chapter 10: Operation, Maintenance, and Building Owner Education	12	16	4		Met
<b>Section Total</b>	597	712	115	0	
<b>Additional Points</b>	100	—	115	0	
<b>Total Points</b>	697	712	—	0	

<sup>a</sup> Emerald Required Points are the minimum green points needed to achieve an Emerald Rating.  
<sup>b</sup> Claimed Points are the green points we identified (and claimed) based on the Green Improvements.  
<sup>c</sup> Additional Claimed Points Above Emerald are the green points that exceed the Emerald minimum for each green category.  
<sup>d</sup> Point Shortfalls are the number of green points needed to meet the Emerald minimum for each green category.  
<sup>e</sup> Mandatory Status identifies whether mandatory requirements were met for each green category.

## The Emerald Cost

The total initial cost to achieve the Emerald-level rating is shown in Table 3-79.

Table 3-79. Initial Cost to the Builder for the Emerald One-Bedroom Apartment

Green Category	Emerald Points	Cost (\$)
Chapter 5: Lot Design, Preparation, and Development	153	1,378
Chapter 6: Resource Efficiency	147	4,493
Chapter 7: Energy Efficiency	191	8,825
Chapter 8: Water Efficiency	61	2,227
Chapter 9: Indoor Environmental Quality	144	4,345
Chapter 10: Operation, Maintenance, and Building Owner Education	16	250
<b>Total</b>	<b>712</b>	<b>\$21,518</b>

- The annual maintenance cost to achieve the Emerald rating is \$614 (Appendix A).
- The annual energy operating cost to achieve the Emerald rating is \$703 (Appendix A).
- The annual water operating cost to achieve the Emerald rating is \$428 (Appendix A).
- The 30-year lifetime replacement cost to achieve the Emerald rating is \$30,626 (Appendix A).

## The Emerald Benefits

The annual energy savings (compared with 2006 IECC—chapter 7) are approximately a 60-percent reduction in energy usage (Appendix C—Summary Data for Climate Zone 5A, Cuyahoga Falls, Ohio). The annual water savings (compared with the Average Daily Per Capita Usage in Gallons, as defined by the *Handbook of Water Use and Conservation*—chapter 8) are approximately a 31-percent reduction in water usage (Appendix A—Indoor Water Usage Calculation Table for Cuyahoga Fall, Ohio). The water usage reduction estimate does not include the water that would be reduced from using the rainwater-collection system (instead of municipal water sources).

Overall cost and performance data are provided in Table 3-80. The water utility rates are based on Stow, Ohio water supply and sewer meter rates are based on Akron, Ohio (sources: Stow, Ohio Water Department and Akron Public Utilities Bureau). We base the simple payback periods for energy and water efficiency on the current cost estimates and projected savings and do not consider future rate increases, inflation, replacement costs, or other conditions over the 30-year evaluation period.

Table 3-80. Overall Cost and Performance Data for One-Bedroom Apartment

<b>CMHA One-Bedroom Apartment 658 ft<sup>2</sup></b>	<b>Baseline</b>	<b>Bronze</b>	<b>Silver</b>	<b>Gold</b>	<b>Emerald</b>
<b>Cost Comparison</b>					
<b>Total Initial Green Cost (\$)</b>	Unknown	\$3,307	\$5,525	\$8,830	\$21,518
<b>Annual Maintenance Cost (\$)</b>	\$451	\$451	\$451	\$490	\$614
<b>Annual Energy Operating Cost (\$)</b>	\$1,123	\$981	\$875	\$727	\$703
<b>Annual Water Usage Cost (\$)</b>	\$534	\$497	\$497	\$497	\$428
<b>30-Year Lifetime Replacement Cost (\$)</b>	\$14,848	\$16,030	\$16,617	\$24,596	\$30,626
<b>Incremental Performance Improvement</b>					
<b>Energy Efficiency (e-Ratio) (compare to 2006 IECC)</b>	0.96	0.84	0.70	0.49	0.40
<b>Water Efficiency (%) (compares to 56.4 gpd<sup>a</sup>)</b>	12.5	19.0	19.0	19.0	30.9
<b>Land/Lot Use (points) (NGBS Rating)</b>	96 Gold	101 Gold	101 Gold	129 Emerald	153 Emerald
<b>Resource Efficiency (points) (NGBS Rating)</b>	81 Silver	81 Silver	93 Silver	117 Gold	147 Emerald
<b>IEQ (points) (NGBS Rating)</b>	46 Bronze	46 Bronze	91 Silver	118 Gold	144 Emerald
<b>Green Education for Owner (points) (NGBS Rating)</b>	6 NR	16 Emerald	16 Emerald	16 Emerald	16 Emerald
<b>Simple Payback Periods</b>					
<b>Energy Efficiency (years) (initial energy cost/savings)</b>	NA	20	21	19	21
<b>Water Efficiency (years) (initial water cost/savings)</b>	NA	2	1	2	13
<small><sup>a</sup>The benchmark for comparison assumes two occupants using 56.4 (gpd) each. The benchmark cost is \$606; all projected savings are compared with this benchmark. IEQ = Indoor Environmental Quality; NA = not applicable; NGBS = National Green Building Standard; NR = not required.</small>					

### 3.5 Green Remodeling Using the National Green Building Standard

For our remodeling example, we selected a residential structure that was built on or before December 31, 1979, so that we can apply the Green Remodel Path<sup>28</sup> method of green renovation. First, the baseline performance must be defined through a comprehensive audit to capture the energy and water usage, along with an indoor environmental quality assessment. After the baseline is established, renovations are identified that will achieve the level of green performance desired, and this expected performance is verified by comparing actual utility bills before and after the renovation. If the utility bills confirm the necessary improvements, a green certificate is issued in accordance with the NGBS.

### 3.5.1 Montgomery County, Maryland—The Multifamily Example

Montgomery County, Maryland, is located in climate zone 4, a predominantly cooling, moist climate with 9,504 cooling degree hours (CDH) and 4,714 heating degree days (HDD).

An eight unit multifamily apartment building was selected in Silver Spring, Maryland, for the NGBS Green Remodel Path evaluation. The multifamily unit is eligible for weatherization renovations by the Montgomery County Department of Housing and Community Affairs and is also eligible for participation in the U.S. Department of Housing and Urban Development's (HUD's) HOME Program.

The four-story apartment building has two apartment units on each floor. Each apartment unit has its own metering system for gas, electric, and water. In addition, each unit also has its own individual domestic hot-water and HVAC systems. The building, which was built in the 1950s, was not originally built using green or sustainable practices. In recent years, the building was modestly repaired and maintained, but did not undergo any major repairs, which makes the apartment building an excellent candidate for a renovation based on the NGBS Green Remodel Path.

The green evaluation focused on four of the eight apartment units. A team of three field evaluators from the Research Center visited the apartment building on February 18, 2010. During this visit, the evaluators performed a comprehensive audit, which included air infiltration measurements on the apartment units and the existing HVAC systems, water flow measurements to establish flow rates for all plumbing fixtures, an inspection of the IEQ conditions, and an inventory of the apartment building features (for energy modeling purposes). The four apartment units were identified as Units #1 through #4 (starting on the first floor up to the fourth floor); the first floor unit is partially underground. All units face the front (or main entrance) of the apartment building as shown in Photo 3-1.

Photo 3-1. Multifamily Demonstration for NGBS Green Remodel Path



To actually achieve an NGBS Green Remodeling certification for the apartment building in this case study, all eight units would need to be renovated to the same level of performance improvement as per Table 1-3, and the improvements would need to be verified independently by comparing prerenovation water and energy bills to the new postrenovation water and energy bills.

### *The Multifamily Example—Baseline Existing Condition*

The IEQ requirements must be met for all green rating levels. Therefore, the field evaluators established the following IEQ conditions.

- Section 901.1.1 does not apply to Unit #2 because the space-heating and water-heating equipment is not located in the apartment. Unit #3 does apply, but the unit is power vented, so the requirement is met. For Units #1 and #4, additional work is needed for the units to be fully compliant with this IEQ requirement.
- Section 901.5 applies only if one is replacing existing carpets. For Units #1, #2, and #4, the flooring is hardwood or vinyl and no carpet exists; for Unit #3, carpet does exist and, if it were replaced, the cost would be approximately \$1.50/ft<sup>2</sup> (which would equal approximately \$360.00 for the floor area that is carpeted in Unit #3).
- Section 902.1 is required because the kitchen and bathroom need exhaust in all four units. Clothes dryers do not exist in these apartment units.
- Section 902.4(2) can be met at a maximum of 2-hr time (that is, using an HVAC technician) and minor material cost to replace filters and service coils.
- Section 904.3(1) does not apply because gas dryers are not in use.
- The total cost burden for each apartment unit (that is, Unit #1 through #4) is summarized during the incremental green rating process. A general cost estimate can be developed, if the building owner or local housing authority knows the IEQ conditions of the housing stock that are older than December 31, 1979.

### *Existing Apartment Unit Conditions*

**Unit #1** is a one-bedroom apartment unit that is approximately 485 ft<sup>2</sup> of conditioned living space. The existing condition must be improved by 20 percent to achieve a Bronze rating. Table 3-81 contains the unit’s baseline existing conditions.

Table 3-81. Unit #1—Baseline Existing Conditions

Green Remodeling Path	Baseline <sup>a</sup> Existing Condition
Energy Efficiency (e-Ratio) <sup>b</sup>	2.15
Water Efficiency (gpd) <sup>c</sup>	51.4
IEQ Requirements <sup>d</sup>	Not Met

<sup>a</sup>The Baseline Existing Condition for the Apartment Unit based on actual field evaluations.  
<sup>b</sup>An e-Ratio of 1.00 is equivalent to 2006 IECC (based on energy models using actual field data).  
<sup>c</sup>gpd is the estimated gallons of water used per day based on field data and the *Handbook of Water Use and Conservation*.  
<sup>d</sup>The IEQ assumes that new carpet is optional, but the increased cost of new carpet is \$1.50ft<sup>2</sup>.  
 IEQ = Indoor Environmental Quality.



- The annual maintenance cost to achieve the base condition is \$359 (Appendix A).
- The annual energy operating cost to achieve the base rating is \$1,959 (Appendix A).
- The annual water operating cost to achieve the base rating is \$318 (Appendix A).
- The 30-year lifetime replacement cost to achieve the base condition is \$6,800 (Appendix A).

**Unit #2** is a two-bedroom apartment unit that is approximately 820 ft<sup>2</sup> of conditioned living space. The existing condition must be improved by 20 percent to achieve a Bronze rating. Table 3-82 contains the unit’s baseline existing conditions.

Table 3-82. Unit #2—Baseline Existing Conditions

Green Remodeling Path	Baseline <sup>a</sup> Existing Condition
Energy Efficiency (e-Ratio) <sup>b</sup>	1.51
Water Efficiency (gpd) <sup>c</sup>	43.3
IEQ Requirements <sup>d</sup>	Not Met

<sup>a</sup>The Baseline Existing Condition for the Apartment Unit based on actual field evaluations.  
<sup>b</sup>An e-Ratio of 1.00 is equivalent to 2006 IECC (based on energy models using actual field data).  
<sup>c</sup>gpd is the estimated gallons of water used per day based on field data and the *Handbook of Water Use and Conservation*.  
<sup>d</sup>The IEQ assumes that new carpet is optional, but the increased cost of new carpet is \$1.50ft<sup>2</sup>.  
 IEQ = Indoor Environmental Quality.

- The annual maintenance cost to achieve the base condition is \$359 (Appendix A).
- The annual energy operating cost to achieve the base rating is \$1,910 (Appendix A).
- The annual water operating cost to achieve the base rating is \$391 (Appendix A).
- The 30-year lifetime replacement cost to achieve the base condition is \$8,672 (Appendix A).

**Unit #3** is a two-bedroom apartment unit that is approximately 820 ft<sup>2</sup> of conditioned living space. The existing condition must be improved by 20 percent to achieve a Bronze rating. Table 3-83 contains the unit’s baseline existing conditions.

Table 3-83. Unit #3—Baseline Existing Conditions

Green Remodeling Path	Baseline <sup>a</sup> Existing Condition
Energy Efficiency (e-Ratio) <sup>b</sup>	1.64
Water Efficiency (gpd) <sup>c</sup>	45.7
IEQ Requirements <sup>d</sup>	Not Met

<sup>a</sup>The Baseline Existing Condition for the Apartment Unit based on actual field evaluations.  
<sup>b</sup>An e-Ratio of 1.00 is equivalent to 2006 IECC (based on energy models using actual field data).  
<sup>c</sup>gpd is the estimated gallons of water used per day based on field data and the *Handbook of Water Use and Conservation*.  
<sup>d</sup>The IEQ assumes that new carpet is optional, but the increased cost of new carpet is \$1.50ft<sup>2</sup>.  
 IEQ = Indoor Environmental Quality.

- The annual maintenance cost to achieve the base condition is \$359 (Appendix A).
- The annual energy operating cost to achieve the base rating is \$2,152 (Appendix A).
- The annual water operating cost to achieve the base rating is \$410 (Appendix A).
- The 30-year lifetime replacement cost to achieve the base condition is \$7,183 (Appendix A).

**Unit #4** is a two-bedroom apartment unit that is approximately 820 ft<sup>2</sup> of conditioned living space. The existing condition must be improved by 20 percent to achieve a Bronze rating. Table 3-84 contains the unit’s baseline existing conditions.

Table 3-84. Unit #4—Baseline Existing Conditions

Green Remodeling Path	Baseline <sup>a</sup> Existing Condition
Energy Efficiency (e-Ratio) <sup>b</sup>	1.95
Water Efficiency (gpd) <sup>c</sup>	53.2
IEQ Requirements <sup>d</sup>	Not Met

<sup>a</sup>The Baseline Existing Condition for the Apartment Unit based on actual field evaluations.  
<sup>b</sup>An e-Ratio of 1.00 is equivalent to 2006 IECC (based on energy models using actual field data).  
<sup>c</sup>gpd is the estimated gallons of water used per day based on field data and the *Handbook of Water Use and Conservation*.  
<sup>d</sup>The IEQ assumes that new carpet is optional, but the increased cost of new carpet is \$1.50/ft<sup>2</sup>.  
 IEQ = Indoor Environmental Quality.

- The annual maintenance cost to achieve the base condition is \$359 (Appendix A).
- The annual energy operating cost to achieve the base rating is \$2,288 (Appendix A).
- The annual water operating cost to achieve the base rating is \$529 (Appendix A).
- The 30-year lifetime replacement cost to achieve the base condition is \$6,800 (Appendix A).

## *The Multifamily Example—Incremental Green Ratings*

### **The Bronze Rating and Cost**

Although each existing apartment unit has a different baseline condition, the approach to improving the unit is generally the same. In terms of improving energy efficiency, we recommend improving the building enclosure features first, then upgrading the equipment. Typically, one can expect to improve building tightness by decreasing air infiltration by approximately 30 percent in an older residential dwelling. This is a reasonable target, although a greater level of improvement might be possible depending upon the location of the leakage. Multifamily structures have the added challenge of identifying whether the leakage is between adjacent units or to the outdoors. For our study, we assumed that all measured building enclosure leakage was to the outdoors, which is the worst case scenario in terms of energy modeling. Appendix C contains energy modeling details.

To improve water conservation, we recommended replacing old plumbing fixtures first, because they are relatively inexpensive to replace and tend to have large water usage rates. After addressing these affordable items, we recommended focusing on upgrading equipment and appliances. Appendix A contains water savings details.

Because the IEQ is a mandatory list of requirements for any green rating, the approach is very straightforward, but highly dependent on the condition of the individual unit. We observed minor differences within each apartment unit (in terms of IEQ), but generally the required renovations and repairs were similar. Appendix B contains green modeling details.



**Unit #1** is a one-bedroom apartment unit that is approximately 485 ft<sup>2</sup> of conditioned living space. The Bronze energy improvements include replacing doors, caulking and weatherizing the unit, replacing ductwork, and installing a programmable thermostat. For water-efficiency improvements, the bathroom fixtures should be upgraded. Because the mechanical room is adjacent to the Unit #1 apartment, we recommend some additional sealing between the apartment and maintenance room, or replacing equipment for IEQ. The unit also requires installing of bathroom and kitchen fans and cleaning and servicing the HVAC equipment. Table 3-85 contains the Bronze rating conditions and Table 3-86 contains the total initial cost to achieve the Bronze-level rating.

Table 3-85. Unit #1—Bronze Green Remodel Rating

Green Remodeling Path	Bronze <sup>a</sup> Rating Condition
Energy Efficiency (e-Ratio) <sup>b</sup>	1.67
Water Efficiency (gpd) <sup>c</sup>	40
IEQ Requirements <sup>d</sup>	Met

<sup>a</sup> The Bronze Rating for the Apartment Unit based on actual field evaluations.  
<sup>b</sup> An e-Ratio of 1.00 is equivalent to 2006 IECC (based on energy models using actual field data).  
<sup>c</sup> gpd is the estimated gallons of water used per day based on field data and the Handbook of Water Use and Conservation.  
<sup>d</sup> The IEQ assumes that new carpet is optional, but the increased cost of new carpet is \$1.50/ft<sup>2</sup>.  
 IEQ = Indoor Environmental Quality.

Table 3-86. Unit #1—Initial Cost to the Builder for Bronze Green Remodeling

Green Category	Bronze Improvement	Cost (\$)
Energy Efficiency (e-Ratio)	21%	1,387
Water Efficiency (gpd)	23%	131
IEQ Requirements	All met	981
<b>Total</b>	<b>Meets Bronze</b>	<b>\$2,499</b>

The Bronze Rating for the Apartment Unit based on actual field evaluations.  
 An e-Ratio of 1.00 is equivalent to 2006 IECC (based on energy models using actual field data).  
 gpd is the estimated gallons of water used per day based on field data and the Handbook of Water Use and Conservation.  
 IEQ = Indoor Environmental Quality.

- The annual maintenance cost to achieve the Bronze rating is \$359 (Appendix A).
- The annual energy operating cost to achieve the Bronze rating is \$1,713 (Appendix A).
- The annual water operating cost to achieve the Bronze rating is \$255 (Appendix A).
- The 30-year lifetime replacement cost to achieve the Bronze rating is \$6,800 (Appendix A).

**Unit #2** is a two-bedroom apartment unit that is approximately 820 ft<sup>2</sup> of conditioned living space. The Bronze energy improvements include caulking/weatherizing the unit, replacing ductwork, upgrading the water heater, and installing a programmable thermostat. For water-efficiency improvements, the bathroom fixtures and the washing machine should be upgraded. The unit also requires installing of bathroom and kitchen fans and cleaning and servicing the HVAC equipment. Table 3-87 contains the Bronze rating conditions and Table 3-88 contains the total initial cost to achieve the Bronze-level rating.

Table 3-87. Unit #2—Bronze Green Remodel Rating

Green Remodeling Path	Bronze <sup>a</sup> Rating Condition
Energy Efficiency (e-Ratio) <sup>b</sup>	1.19
Water Efficiency (gpd) <sup>c</sup>	32
IEQ Requirements <sup>d</sup>	Met

<sup>a</sup> The Bronze Rating for the Apartment Unit based on actual field evaluations.  
<sup>b</sup> An e-Ratio of 1.00 is equivalent to 2006 IECC (based on energy models using actual field data).  
<sup>c</sup> gpd is the estimated gallons of water used per day based on field data and the Handbook of Water Use and Conservation.  
<sup>d</sup> The assumes that new carpet is optional, but the increased cost of new carpet is \$1.50/ft<sup>2</sup>.  
 IEQ = Indoor Environmental Quality.

Table 3-88. Unit #2—Initial Cost to the Builder for Bronze Green Remodeling

Green Category	Bronze Improvement	Cost (\$)
Energy Efficiency (e-Ratio)	22%	1,772
Water Efficiency (gpd)	26%	390
IEQ Requirements	All met	590
<b>Total</b>	<b>Meets Bronze</b>	<b>\$2,752</b>

The Bronze Rating for the Apartment Unit based on actual field evaluations.  
 An e-Ratio of 1.00 is equivalent to 2006 IECC (based on energy models using actual field data).  
 gpd is the estimated gallons of water used per day based on field data and the Handbook of Water Use and Conservation.  
 IEQ = Indoor Environmental Quality.

- The annual maintenance cost to achieve the Bronze rating is \$359 (Appendix A).
- The annual energy operating cost to achieve the Bronze rating is \$1,689 (Appendix A).
- The annual water operating cost to achieve the Bronze rating is \$301 (Appendix A).
- The 30-year lifetime replacement cost to achieve the Bronze rating is \$8,672 (Appendix A).

**Unit #3** is a two-bedroom apartment unit that is approximately 820 ft<sup>2</sup> of conditioned living space. The Bronze energy improvements include caulking/weatherizing the unit, replacing ductwork, upgrading the water heater, and installing a programmable thermostat. For water-efficiency improvements, the bathroom fixtures and washing machine should be upgraded. The unit requires installing bathroom and kitchen fans. An option would be to remove carpet so that hardwood floor is exposed, and the HVAC equipment must be cleaned and serviced. Table 3-89 contains the Bronze rating conditions and Table 3-90 contains the total initial cost to achieve the Bronze-level rating.

Table 3-89. Unit #3—Bronze Green Remodel Rating

Green Remodeling Path	Bronze <sup>a</sup> Rating Condition
Energy Efficiency (e-Ratio) <sup>b</sup>	1.29
Water Efficiency (gpd) <sup>c</sup>	34
IEQ Requirements <sup>d</sup>	Met
<sup>a</sup> The Bronze Rating for the Apartment Unit based on actual field evaluations. <sup>b</sup> An e-Ratio of 1.00 is equivalent to 2006 IECC (based on energy models using actual field data). <sup>c</sup> gpd is the estimated gallons of water used per day based on field data and the Handbook of Water Use and Conservation. <sup>d</sup> The IEQ assumes that new carpet is optional, but the increased cost of new carpet is \$1.50/ft <sup>2</sup> . IEQ = Indoor Environmental Quality.	

Table 3-90. Unit #3—Initial Cost to the Builder for Bronze Green Remodeling

Green Category	Bronze Improvement	Cost (\$)
Energy Efficiency (e-Ratio)	21%	1,922
Water Efficiency (gpd)	26%	390
IEQ Requirements	All met	644
<b>Total</b>	<b>Meets Bronze</b>	<b>\$2,956</b>
The Bronze Rating for the Apartment Unit based on actual field evaluations. An e-Ratio of 1.00 is equivalent to 2006 IECC (based on energy models using actual field data). gpd is the estimated gallons of water used per day based on field data and the Handbook of Water Use and Conservation. IEQ = Indoor Environmental Quality.		

- The annual maintenance cost to achieve the Bronze rating is \$359 (Appendix A).
- The annual energy operating cost to achieve the Bronze rating is \$1,862 (Appendix A).
- The annual water operating cost to achieve the Bronze rating is \$315 (Appendix A).
- The 30-year lifetime replacement cost to achieve the Bronze rating is \$7,549 (Appendix A).

**Unit #4** is a two-bedroom apartment unit that is approximately 820 ft<sup>2</sup> of conditioned living space. The Bronze energy improvements include caulking/weatherizing the unit, replacing ductwork, upgrading the water heater, and installing a programmable thermostat. For water-efficiency improvements, the bathroom fixtures and toilet should be upgraded. The unit also requires installing bathroom and kitchen fans and cleaning and servicing the HVAC equipment. Table 3-91 contains the Bronze rating conditions and Table 3-92 contains the total initial cost to achieve the Bronze-level rating.

Table 3-91. Unit #4—Bronze Green Remodel Rating

Green Remodeling Path	Bronze <sup>a</sup> Rating Condition
Energy Efficiency (e-Ratio) <sup>b</sup>	1.55
Water Efficiency (gpd) <sup>c</sup>	40
IEQ Requirements <sup>d</sup>	Met

<sup>a</sup>The Bronze Rating for the Apartment Unit based on actual field evaluations.  
<sup>b</sup>An e-Ratio of 1.00 is equivalent to 2006 IECC (based on energy models using actual field data).  
<sup>c</sup>gpd is the estimated gallons of water used per day based on field data and the *Handbook of Water Use and Conservation*.  
<sup>d</sup>The IEQ assumes that new carpet is optional, but the increased cost of new carpet is \$1.50/ft<sup>2</sup>.  
 IEQ = Indoor Environmental Quality.

Table 3-92. Unit #4—Initial Cost to the Builder for Bronze Green Remodeling

Green Category	Bronze Improvement	Cost (\$)
Energy Efficiency (e-Ratio)	20%	1,772
Water Efficiency (gpd)	26%	335
IEQ Requirements	All met	786
<b>Total</b>	<b>Meets Bronze</b>	<b>\$2,893</b>

The Bronze Rating for the Apartment Unit based on actual field evaluations.  
 An e-Ratio of 1.00 is equivalent to 2006 IECC (based on energy models using actual field data).  
 gpd is the estimated gallons of water used per day based on field data and the *Handbook of Water Use and Conservation*.  
 IEQ = Indoor Environmental Quality.

- The annual maintenance cost to achieve the Bronze rating is \$359 (Appendix A).
- The annual energy operating cost to achieve the Bronze rating is \$1,989 (Appendix A).
- The annual water operating cost to achieve the Bronze rating is \$403 (Appendix A).
- The 30-year lifetime replacement cost to achieve the Bronze rating is \$6,950 (Appendix A).

## The Silver Rating and Cost

All IEQ improvements are maintained as previously defined, but the energy- and water-efficiency performance is improved to 34 percent (by enhancing the Bronze-level renovations).

**Unit #1** retains all Bronze-level energy improvements, but upgrades the water heater to a high-efficiency tankless water heater. To improve water efficiency, the kitchen faucet is upgraded. Table 3-93 contains the Silver rating conditions and Table 3-94 contains the total initial cost to achieve the Silver-level rating.

Table 3-93. Unit #1—Silver Green Remodel Rating

Green Remodeling Path	Silver <sup>a</sup> Rating Condition
Energy Efficiency (e-Ratio) <sup>b</sup>	1.2
Water Efficiency (gpd) <sup>c</sup>	34
IEQ Requirements <sup>d</sup>	Met

<sup>a</sup>The Silver Rating for the Apartment Unit based on actual field evaluations.  
<sup>b</sup>An e-Ratio of 1.00 is equivalent to 2006 IECC (based on energy models using actual field data).  
<sup>c</sup>gpd is the estimated gallons of water used per day based on field data and the *Handbook of Water Use and Conservation*.  
<sup>d</sup>The IEQ assumes that new carpet is optional, but the increased cost of new carpet is \$1.50/ft<sup>2</sup>.  
 IEQ = Indoor Environmental Quality.

Table 3-94. Unit #1—Initial Cost to the Builder for Silver Green Remodeling

Green Category	Silver Improvement	Cost (\$)
Energy Efficiency (e-Ratio)	40%	2,787
Water Efficiency (gpd)	34%	183
IEQ Requirements	All met	981
<b>Total</b>	<b>Meets Silver</b>	<b>\$3,951</b>

The Silver Rating for the Apartment Unit based on actual field evaluations.  
 An e-Ratio of 1.00 is equivalent to 2006 IECC (based on energy models using actual field data).  
 gpd is the estimated gallons of water used per day based on field data and the *Handbook of Water Use and Conservation*.  
 IEQ = Indoor Environmental Quality.

- The annual maintenance cost to achieve the Silver rating is \$359 (Appendix A).
- The annual energy operating cost to achieve the Silver rating is \$1,492 (Appendix A).
- The annual water operating cost to achieve the Silver rating is \$225 (Appendix A).
- The 30-year lifetime replacement cost to achieve the Silver rating is \$8,100 (Appendix A).

**Unit #2** retains all Bronze-level energy improvements, but upgrades the water heater to a high-efficiency tankless water heater. To improve water efficiency, the kitchen faucet and washing machine are upgraded. Table 3-95 contains the Silver rating conditions and Table 3-96 contains the total initial cost to achieve the Silver-level rating.

Table 3-95. Unit #2—Silver Green Remodel Rating

Green Remodeling Path	Silver <sup>a</sup> Rating Condition
Energy Efficiency (e-Ratio) <sup>b</sup>	0.93
Water Efficiency (gpd) <sup>c</sup>	27
IEQ Requirements <sup>d</sup>	Met

<sup>a</sup>The Silver Rating for the Apartment Unit based on actual field evaluations.  
<sup>b</sup>An e-Ratio of 1.00 is equivalent to 2006 IECC (based on energy models using actual field data).  
<sup>c</sup>gpd is the estimated gallons of water used per day based on field data and the *Handbook of Water Use and Conservation*.  
<sup>d</sup>The IEQ assumes that new carpet is optional, but the increased cost of new carpet is \$1.50/ft<sup>2</sup>.  
 IEQ = Indoor Environmental Quality.

Table 3-96. Unit #2—Initial Cost to the Builder for Silver Green Remodeling

Green Category	Silver Improvement	Cost (\$)
Energy Efficiency (e-Ratio)	36%	2,700
Water Efficiency (gpd)	37%	530
IEQ Requirements	All met	590
<b>Total</b>	<b>Meets Silver</b>	<b>\$3,820</b>

The Silver Rating for the Apartment Unit based on actual field evaluations.  
 An e-Ratio of 1.00 is equivalent to 2006 IECC (based on energy models using actual field data).  
 gpd is the estimated gallons of water used per day based on field data and the *Handbook of Water Use and Conservation*.  
 IEQ = Indoor Environmental Quality.

- The annual maintenance cost to achieve the Silver rating is \$359 (Appendix A).
- The annual energy operating cost to achieve the Silver rating is \$1,519 (Appendix A).
- The annual water operating cost to achieve the Silver rating is \$262 (Appendix A).
- The 30-year lifetime replacement cost to achieve the Silver rating is \$11,928 (Appendix A).

Unit #3 retains all Bronze-level energy improvements, but upgrades the water heater to a high-efficiency tankless water heater, and the cooling system to a 13 SEER unit. To improve water efficiency, the kitchen faucet is upgraded. Table 3-97 contains the Silver rating conditions and Table 3-98 contains the total initial cost to achieve the Silver-level rating.

Table 3-97. Unit #3—Silver Green Remodel Rating

Green Remodeling Path	Silver <sup>a</sup> Rating Condition
Energy Efficiency (e-Ratio) <sup>b</sup>	1.04
Water Efficiency (gpd) <sup>c</sup>	27
IEQ Requirements <sup>d</sup>	Met

<sup>a</sup> The Silver Rating for the Apartment Unit based on actual field evaluations.  
<sup>b</sup> An e-Ratio of 1.00 is equivalent to 2006 IECC (based on energy models using actual field data).  
<sup>c</sup> gpd is the estimated gallons of water used per day based on field data and the *Handbook of Water Use and Conservation*.  
<sup>d</sup> The IEQ assumes that new carpet is optional, but the increased cost of new carpet is \$1.50/ft<sup>2</sup>.  
 IEQ = Indoor Environmental Quality.

Table 3-98. Unit #3—Initial Cost to the Builder for Silver Green Remodeling

Green Category	Silver Improvement	Cost (\$)
Energy Efficiency (e-Ratio)	35%	4,051
Water Efficiency (gpd)	42%	442
IEQ Requirements	All met	644
<b>Total</b>	<b>Meets Silver</b>	<b>\$5,137</b>

The Silver Rating for the Apartment Unit based on actual field evaluations.  
 An e-Ratio of 1.00 is equivalent to 2006 IECC (based on energy models using actual field data).  
 gpd is the estimated gallons of water used per day based on field data and the *Handbook of Water Use and Conservation*.  
 IEQ = Indoor Environmental Quality.

- The annual maintenance cost to achieve the Silver rating is \$359 (Appendix A).
- The annual energy operating cost to achieve the Silver rating is \$1,678 (Appendix A).
- The annual water operating cost to achieve the Silver rating is \$256 (Appendix A).
- The 30-year lifetime replacement cost to achieve the Silver rating is \$8,492 (Appendix A).

**Unit #4** retains all Bronze-level energy improvements, but upgrades the water heater to a high-efficiency tankless water heater, and the cooling system to a 13 SEER unit. To improve water efficiency, the bathroom and kitchen fixtures are upgraded. Table 3-99 contains the Silver rating conditions and Table 3-100 contains the total initial cost to achieve the Silver-level rating.

Table 3-99. Unit #4—Silver Green Remodel Rating

Green Remodeling Path	Silver <sup>a</sup> Rating Condition
Energy Efficiency (e-Ratio) <sup>b</sup>	1.23
Water Efficiency (gpd) <sup>c</sup>	33
IEQ Requirements <sup>d</sup>	Met

<sup>a</sup>The Silver Rating for the Apartment Unit based on actual field evaluations.  
<sup>b</sup>An e-Ratio of 1.00 is equivalent to 2006 IECC (based on energy models using actual field data).  
<sup>c</sup>gpd is the estimated gallons of water used per day based on field data and the *Handbook of Water Use and Conservation*.  
<sup>d</sup>The IEQ assumes that new carpet is optional, but the increased cost of new carpet is \$1.50/ft<sup>2</sup>.  
 IEQ = Indoor Environmental Quality.

Table 3-100. Unit #4—Initial Cost to the Builder for Silver Green Remodeling

Green Category	Silver Improvement	Cost (\$)
Energy Efficiency (e-Ratio)	35%	4,051
Water Efficiency (gpd)	39%	439
IEQ Requirements	All met	786
<b>Total</b>	<b>Meets Silver</b>	<b>\$5,276</b>

The Silver Rating for the Apartment Unit based on actual field evaluations.  
 An e-Ratio of 1.00 is equivalent to 2006 IECC (based on energy models using actual field data).  
 gpd is the estimated gallons of water used per day based on field data and the *Handbook of Water Use and Conservation*.  
 IEQ = Indoor Environmental Quality.

- The annual maintenance cost to achieve the Silver rating is \$359 (Appendix A).
- The annual energy operating cost to achieve the Silver rating is \$1,766 (Appendix A).
- The annual water operating cost to achieve the Silver rating is \$340 (Appendix A).
- The 30-year lifetime replacement cost to achieve the Silver rating is \$8,109 (Appendix A).



## The Gold Rating and Cost

All IEQ improvements are maintained as previously defined, but the energy- and water-efficiency performance is improved to 43 percent (by enhancing the Silver-level renovations).

**Unit #1** retains all Silver-level energy improvements, but upgrades the cooling and heating systems to a higher efficiency unit. To improve water efficiency, the washing machine is upgraded. Table 3-101 contains the Gold rating conditions and Table 3-102 contains the total initial cost to achieve the Gold-level rating.

Table 3-101. Unit #1—Gold Green Remodel Rating

Green Remodeling Path	Gold <sup>a</sup> Rating Condition
Energy Efficiency (e-Ratio) <sup>b</sup>	1.08
Water Efficiency (gpd) <sup>c</sup>	29
IEQ Requirements <sup>d</sup>	Met

<sup>a</sup>The Gold Rating for the Apartment Unit based on actual field evaluations.  
<sup>b</sup>An e-Ratio of 1.00 is equivalent to 2006 IECC (based on energy models using actual field data).  
<sup>c</sup>gpd is the estimated gallons of water used per day based on field data and the *Handbook of Water Use and Conservation*.  
<sup>d</sup>The IEQ assumes that new carpet is optional, but the increased cost of new carpet is \$1.50/ft<sup>2</sup>.  
 IEQ = Indoor Environmental Quality.

Table 3-102. Unit #1—Initial Cost to the Builder for Gold Green Remodeling

Green Category	Gold Improvement	Cost
Energy Efficiency (e-Ratio)	46%	5,530
Water Efficiency (gpd)	43%	521
IEQ Requirements	All met	981
<b>Total</b>	<b>Meets Gold</b>	<b>\$7,032</b>

The Gold Rating for the Apartment Unit based on actual field evaluations.  
 An e-Ratio of 1.00 is equivalent to 2006 IECC (based on energy models using actual field data).  
 gpd is the estimated gallons of water used per day based on field data and the *Handbook of Water Use and Conservation*.  
 IEQ = Indoor Environmental Quality.

- The annual maintenance cost to achieve the Gold rating is \$359 (Appendix A).
- The annual energy operating cost to achieve the Gold rating is \$1,425 (Appendix A).
- The annual water operating cost to achieve the Gold rating is \$200 (Appendix A).
- The 30-year lifetime replacement cost to achieve the Gold rating is \$8,666 (Appendix A).

**Unit #2** retains all Silver-level energy improvements but upgrades the cooling and heating systems to a higher efficiency unit. To improve water efficiency, the bathroom fixtures are upgraded. Table 3-103 contains the Gold rating conditions and Table 3-104 contains the total initial cost to achieve the Gold-level rating.

Table 3-103. Unit #2—Gold Green Remodel Rating

Green Remodeling Path	Gold <sup>a</sup> Rating Condition
Energy Efficiency (e-Ratio) <sup>b</sup>	0.83
Water Efficiency (gpd) <sup>c</sup>	24
IEQ Requirements <sup>d</sup>	Met
<sup>a</sup> The Gold Rating for the Apartment Unit based on actual field evaluations. <sup>b</sup> An e-Ratio of 1.00 is equivalent to 2006 IECC (based on energy models using actual field data). <sup>c</sup> gpd is the estimated gallons of water used per day based on field data and the <i>Handbook of Water Use and Conservation</i> . <sup>d</sup> The IEQ assumes that new carpet is optional, but the increased cost of new carpet is \$1.50/ft <sup>2</sup> . IEQ = Indoor Environmental Quality.	

Table 3-104. Unit #2—Initial Cost to the Builder for Gold Green Remodeling

Green Category	Gold Improvement	Cost (\$)
Energy Efficiency (e-Ratio)	43%	\$7,367
Water Efficiency (gpd)	44%	\$530
IEQ Requirements	All met	\$590
<b>Total</b>	<b>Meets Gold</b>	<b>\$8,486</b>
The Gold Rating for the Apartment Unit based on actual field evaluations. An e-Ratio of 1.00 is equivalent to 2006 IECC (based on energy models using actual field data). gpd is the estimated gallons of water used per day based on field data and the <i>Handbook of Water Use and Conservation</i> . IEQ = Indoor Environmental Quality.		

- The annual maintenance cost to achieve the Gold rating is \$359 (Appendix A).
- The annual energy operating cost to achieve the Gold rating is \$1,443 (Appendix A).
- The annual water operating cost to achieve the Gold rating is \$238 (Appendix A).
- The 30-year lifetime replacement cost to achieve the Gold rating is \$17,325 (Appendix A).

Unit #3 retains all Silver-level energy improvements, but upgrades the cooling and heating systems to a higher efficiency unit. To improve water efficiency, the washing machine is upgraded. Table 3-105 contains the Gold rating conditions and Table 3-106 contains the total initial cost to achieve the Gold-level rating.

Table 3-105. Unit #3—Gold Green Remodel Rating

Green Remodeling Path	Gold <sup>a</sup> Rating Condition
Energy Efficiency (e-Ratio) <sup>b</sup>	0.90
Water Efficiency (gpd) <sup>c</sup>	24
IEQ Requirements <sup>d</sup>	Met
<sup>a</sup> The Gold Rating for the Apartment Unit based on actual field evaluations. <sup>b</sup> An e-Ratio of 1.00 is equivalent to 2006 IECC (based on energy models using actual field data). <sup>c</sup> gpd is the estimated gallons of water used per day based on field data and the <i>Handbook of Water Use and Conservation</i> . <sup>d</sup> The IEQ assumes that new carpet is optional, but the increased cost of new carpet is \$1.50/ft <sup>2</sup> . IEQ = Indoor Environmental Quality.	

Table 3-106. Unit #3—Initial Cost to the Builder for Gold Green Remodeling

Green Category	Gold Improvement	Cost (\$)
Energy Efficiency (e-Ratio)	43%	7,742
Water Efficiency (gpd)	47%	530
IEQ Requirements	All met	644
<b>Total</b>	<b>Meets Gold</b>	<b>\$8,916</b>

The Gold Rating for the Apartment Unit based on actual field evaluations.  
 An e-Ratio of 1.00 is equivalent to 2006 IECC (based on energy models using actual field data).  
 gpd is the estimated gallons of water used per day based on field data and the *Handbook of Water Use and Conservation*.  
 IEQ = Indoor Environmental Quality.

- The annual maintenance cost to achieve the Gold rating is \$359 (Appendix A).
- The annual energy operating cost to achieve the Gold rating is \$1,561(Appendix A).
- The annual water operating cost to achieve the Gold rating is \$238 (Appendix A).
- The 30-year lifetime replacement cost to achieve the Gold rating is \$13,871 (Appendix A).

**Unit #4** retains all Silver-level energy improvements, but upgrades the cooling and heating systems to a higher efficiency unit. To improve water efficiency, the washing machine is upgraded. Table 3-107 contains the Gold rating conditions and Table 3-108 contains the total initial cost to achieve the Gold-level rating.

Table 3-107. Unit #4—Gold Green Remodel Rating

Green Remodeling Path	Gold <sup>a</sup> Rating Condition
Energy Efficiency (e-Ratio) <sup>b</sup>	1.07
Water Efficiency (gpd) <sup>c</sup>	28
IEQ Requirements <sup>d</sup>	Met

<sup>a</sup>The Gold Rating for the Apartment Unit based on actual field evaluations.  
<sup>b</sup>An e-Ratio of 1.00 is equivalent to 2006 IECC (based on energy models using actual field data).  
<sup>c</sup>gpd is the estimated gallons of water used per day based on field data and the *Handbook of Water Use and Conservation*.  
<sup>d</sup>The IEQ assumes that new carpet is optional, but the increased cost of new carpet is \$1.50/ft<sup>2</sup>.  
 IEQ = Indoor Environmental Quality.

Table 3-108. Unit #4—Initial Cost to the Builder for Gold Green Remodeling

Green Category	Gold Improvement	Cost (\$)
Energy Efficiency (e-Ratio)	43%	6,319
Water Efficiency (gpd)	47%	777
IEQ Requirements	All met	786
<b>Total</b>	<b>Meets Gold</b>	<b>\$7,882</b>

The Gold Rating for the Apartment Unit based on actual field evaluations.  
 An e-Ratio of 1.00 is equivalent to 2006 IECC (based on energy models using actual field data).  
 gpd is the estimated gallons of water used per day based on field data and the *Handbook of Water Use and Conservation*.  
 IEQ = Indoor Environmental Quality.

- The annual maintenance cost to achieve the Gold rating is \$359 (Appendix A).
- The annual energy operating cost to achieve the Gold rating is \$1,643 (Appendix A).
- The annual water operating cost to achieve the Gold rating is \$282 (Appendix A).
- The 30-year lifetime replacement cost to achieve the Gold rating is \$11,244 (Appendix A).

### The Emerald Rating and Cost

All IEQ improvements are maintained as previously defined, except the energy- and water-efficiency performance is improved to 50 percent (by enhancing the Gold-level renovations).

**Unit #1** retains all Gold-level energy improvements, except for upgrading the cooling and heating systems to more efficient units. To improve water efficiency, the washing machine and toilet are upgraded. Table 3-109 contains the Emerald rating conditions and Table 3-110 contains the total initial cost to achieve the Emerald-level rating.

Table 3-109. Unit #1—Emerald Green Remodel Rating

Green Remodeling Path	Emerald <sup>a</sup> Rating Condition
Energy Efficiency (e-Ratio) <sup>b</sup>	0.99
Water Efficiency (gpd) <sup>c</sup>	25
IEQ Requirements <sup>d</sup>	Met

<sup>a</sup>The Emerald Rating for the Apartment Unit based on actual field evaluations.  
<sup>b</sup>An e-Ratio of 1.00 is equivalent to 2006 IECC (based on energy models using actual field data).  
<sup>c</sup>gpd is the estimated gallons of water used per day based on field data and the *Handbook of Water Use and Conservation*.  
<sup>d</sup>The IEQ assumes that new carpet is optional—the increased cost of new carpet is \$1.50/ft<sup>2</sup>.  
 IEQ = Indoor Environmental Quality.

Table 3-110. Unit #1—Initial Cost to the Builder for Emerald Green Remodeling

Green Category	Emerald Improvement	Cost (\$)
Energy Efficiency (e-Ratio)	50%	7,859
Water Efficiency (gpd)	52%	865
IEQ Requirements	All met	981
<b>Total</b>	<b>Meets Emerald</b>	<b>\$9,705</b>

The Emerald Rating for the Apartment Unit based on actual field evaluations.  
 An e-Ratio of 1.00 is equivalent to 2006 IECC (based on energy models using actual field data).  
 gpd is the estimated gallons of water used per day based on field data and the *Handbook of Water Use and Conservation*.  
 IEQ = Indoor Environmental Quality.

- The annual maintenance cost to achieve the Emerald rating is \$359 (Appendix A).
- The annual energy operating cost to achieve the Emerald rating is \$1,379 (Appendix A).
- The annual water operating cost to achieve the Emerald rating is \$176 (Appendix A).
- The 30-year lifetime replacement cost to achieve the Emerald rating is \$14,891 (Appendix A).

**Unit #2** retains all Gold-level energy improvements, and adds a solar system to the tankless water heater. To improve water efficiency, the toilet is upgraded. Table 3-111 contains the Emerald rating conditions and Table 3-112 contains the total initial cost to achieve the Emerald-level rating.

Table 3-111. Unit #2—Emerald Green Remodel Rating

Green Remodeling Path	Emerald <sup>a</sup> Rating Condition
Energy Efficiency (e-Ratio) <sup>b</sup>	0.72
Water Efficiency (gpd) <sup>c</sup>	22
IEQ Requirements <sup>d</sup>	Met

<sup>a</sup>The Emerald Rating for the Apartment Unit based on actual field evaluations.  
<sup>b</sup>An e-Ratio of 1.00 is equivalent to 2006 IECC (based on energy models using actual field data).  
<sup>c</sup>gpd is the estimated gallons of water used per day based on field data and the *Handbook of Water Use and Conservation*.  
<sup>d</sup>The IEQ assumes that new carpet is optional—the increased cost of new carpet is \$1.50/ft<sup>2</sup>.  
 IEQ = Indoor Environmental Quality.

Table 3-112. Unit #2—Initial Cost to the Builder for Emerald Green Remodeling

Green Category	Emerald Improvement	Cost (\$)
Energy Efficiency (e-Ratio)	50%	11,867
Water Efficiency (gpd)	50%	786
IEQ Requirements	All met	590
<b>Total</b>	<b>Meets Emerald</b>	<b>\$13,243</b>

The Emerald Rating for the Apartment Unit based on actual field evaluations.  
 An e-Ratio of 1.00 is equivalent to 2006 IECC (based on energy models using actual field data).  
 gpd is the estimated gallons of water used per day based on field data and the *Handbook of Water Use and Conservation*.  
 IEQ = Indoor Environmental Quality.

- The annual maintenance cost to achieve the Emerald rating is \$453 (Appendix A).
- The annual energy operating cost to achieve the Emerald rating is \$1,368 (Appendix A).
- The annual water operating cost to achieve the Emerald rating is \$217 (Appendix A).
- The 30-year lifetime replacement cost to achieve the Emerald rating is \$27,710 (Appendix A).

**Unit #3** retains all Gold-level energy improvements, and adds a solar system to the tankless water heater. To improve water efficiency, the toilet is upgraded. Table 3-113 contains the Emerald rating conditions and Table 3-114 contains the total initial cost to achieve the Emerald-level rating.

Table 3-113. Unit #3—Emerald Green Remodel Rating

Green Remodeling Path	Emerald <sup>a</sup> Rating Condition
Energy Efficiency (e-Ratio) <sup>b</sup>	0.78
Water Efficiency (gpd) <sup>c</sup>	22
IEQ Requirements <sup>d</sup>	Met

<sup>a</sup>The Emerald Rating for the Apartment Unit based on actual field evaluations.  
<sup>b</sup>An e-Ratio of 1.00 is equivalent to 2006 IECC (based on energy models using actual field data).  
<sup>c</sup>gpd is the estimated gallons of water used per day based on field data and the *Handbook of Water Use and Conservation*.  
<sup>d</sup>The IEQ assumes that new carpet is optional—the increased cost of new carpet is \$1.50/ft<sup>2</sup>.  
 IEQ = Indoor Environmental Quality.

Table 3-114. Unit #3—Initial Cost to the Builder for Emerald Green Remodeling

Green Category	Emerald Improvement	Cost (\$)
Energy Efficiency (e-Ratio)	51%	14,488
Water Efficiency (gpd)	52%	786
IEQ Requirements	All met	644
<b>Total</b>	<b>Meets Emerald</b>	<b>\$15,918</b>

The Emerald Rating for the Apartment Unit based on actual field evaluations.  
 An e-Ratio of 1.00 is equivalent to 2006 IECC (based on energy models using actual field data).  
 gpd is the estimated gallons of water used per day based on field data and the *Handbook of Water Use and Conservation*.  
 IEQ = Indoor Environmental Quality.

- The annual maintenance cost to achieve the Emerald rating is \$453 (Appendix A).
- The annual energy operating cost to achieve the Emerald rating is \$1,461 (Appendix A).
- The annual water operating cost to achieve the Emerald rating is \$220 (Appendix A).
- The 30-year lifetime replacement cost to achieve the Emerald rating is \$29,955 (Appendix A).

**Unit #4** retains all Gold-level energy improvements, and adds a solar system to the tankless water heater. To improve water efficiency, washing machine is upgraded. Table 3-115 contains the Emerald rating conditions and Table 3-116 contains the total initial cost to achieve the Emerald-level rating.

Table 3-115. Unit #4—Emerald Green Remodel Rating

Green Remodeling Path	Emerald <sup>a</sup> Rating Condition
Energy Efficiency (e-Ratio) <sup>b</sup>	0.93
Water Efficiency (gpd) <sup>c</sup>	26
IEQ Requirements <sup>d</sup>	Met

<sup>a</sup>The Emerald Rating for the Apartment Unit based on actual field evaluations.  
<sup>b</sup>An e-Ratio of 1.00 is equivalent to 2006 International Energy Conservation Code (based on energy models using actual field data).  
<sup>c</sup>gpd is the estimated gallons of water used per day based on field data and the *Handbook of Water Use and Conservation*.  
<sup>d</sup>The IEQ assumes that new carpet is optional—the increased cost of new carpet is \$1.50/ft<sup>2</sup>.  
 IEQ = Indoor Environmental Quality.

Table 3-116. Unit #4—Initial Cost to the Builder for Emerald Green Remodeling

Green Category	Emerald Improvement	Cost (\$)
Energy Efficiency (e-Ratio)	50%	12,170
Water Efficiency (gpd)	51%	865
IEQ Requirements	All met	786
<b>Total</b>	<b>Meets Emerald</b>	<b>\$13,821</b>

The Emerald Rating for the Apartment Unit based on actual field evaluations.  
 An e-Ratio of 1.00 is equivalent to 2006 IECC (based on energy models using actual field data).  
 gpd is the estimated gallons of water used per day based on field data and the *Handbook of Water Use and Conservation*.  
 IEQ = Indoor Environmental Quality.

- The annual maintenance cost to achieve the Emerald rating is \$453 (Appendix A).
- The annual energy operating cost to achieve the Emerald rating is \$1,539 (Appendix A).
- The annual water operating cost to achieve the Emerald rating is \$282 (Appendix A).
- The 30-year lifetime replacement cost to achieve the Emerald rating is \$14,382 (Appendix A).

Overall cost and performance data for Units #1, #2, #3, and #4 are provided in Tables 3-117, 3-118, 3-119, and 3-120, respectively. The water utility rates are based on Silver Spring, Maryland water supply and sewer meter rates (source: Washington Suburban Sanitary Commission). We base the simple payback periods for energy and water efficiency on the current cost estimates and projected savings and do not consider future rate increases, inflation, replacement costs, or other conditions over the 30-year evaluation period.

Table 3-117. Overall Cost and Performance Data for Unit #1

Montgomery County, Maryland Multifamily Unit #1 485 ft <sup>2</sup>	Baseline	Bronze	Silver	Gold	Emerald
<b>Cost Comparison</b>					
<b>Total Initial Green Cost (\$)</b>	Unknown	2,499	3,951	7,032	9,705
<b>Annual Maintenance Cost (\$)</b>	359	359	359	359	359
<b>Annual Energy Operating Cost (\$)</b>	1,959	1,713	1,492	1,425	1,379
<b>Annual Water Usage Cost (\$)</b>	318	255	225	200	176
<b>30-Year Lifetime Replacement Cost (\$)</b>	6,800	6,800	8,100	8,666	14,891
<b>Incremental Performance Improvement</b>					
<b>Energy Efficiency (e-Ratio) (compare to existing condition)</b>	2.15	1.67	1.2	1.08	0.99
<b>Water Efficiency (gpd/% reduced) (compare to existing condition<sup>a</sup>)</b>	51.4 (gpd)	23.0%	34.0%	43.0%	52.0%
<b>IEQ (Mandatory Requirements) (NGBS Rating)</b>	Not Met	Met	Met	Met	Met
<b>Simple Payback Periods</b>					
<b>Energy Efficiency (years) (initial energy cost/savings)</b>	NA	6	6	10	14
<b>Water Efficiency (years) (initial water cost/savings)</b>	NA	2	2	4	6
<sup>a</sup> The benchmark for comparison assumes two occupants using 51.4 (gpd) each. The benchmark cost is \$318 is based on the actual estimated water usage; all projected savings are compared with this benchmark (which is also the baseline cost). NA = not applicable; NGBS = National Green Building Standard; NR = not required.					



Table 3-118. Overall Cost and Performance Data for Unit #2

Montgomery County, Maryland Multifamily Unit #2 820 ft <sup>2</sup>	Baseline	Bronze	Silver	Gold	Emerald
<b>Cost Comparison</b>					
<b>Total Initial Green Cost (\$)</b>	Unknown	2,752	3,820	8,486	13,243
<b>Annual Maintenance Cost (\$)</b>	359	359	359	359	453
<b>Annual Energy Operating Cost (\$)</b>	1,910	1,689	1,519	1,443	1,368
<b>Annual Water Usage Cost (\$)</b>	391	301	262	238	217
<b>30-Year Lifetime Replacement Cost (\$)</b>	8,672	8,672	11,928	17,325	27,710
<b>Incremental Performance Improvement</b>					
<b>Energy Efficiency (e-Ratio) (compare to existing condition)</b>	1.51	1.19	0.93	0.83	0.72
<b>Water Efficiency (gpd/% reduced) (compare to existing condition<sup>a</sup>)</b>	43.3 (gpd)	26.0%	37.0%	44.0%	50.0%
<b>IEQ (Mandatory Requirements) (NGBS Rating)</b>	Not Met	Met	Met	Met	Met
<b>Simple Payback Periods</b>					
<b>Energy Efficiency (years) (initial energy cost/savings)</b>	NA	8	7	16	22
<b>Water Efficiency (years) (initial water cost/savings)</b>	NA	4	4	4	5
<sup>a</sup> The benchmark for comparison assumes three occupants using 43.3 (gpd) each. The benchmark cost is \$391 is based on the actual estimated water usage; all projected savings are compared with this benchmark (which is also the baseline cost). NA = not applicable; NGBS = National Green Building Standard; NR = not required.					

Table 3-119. Overall Cost and Performance Data for Unit #3

Montgomery County, Maryland Multifamily Unit #3 820 ft <sup>2</sup>	Baseline	Bronze	Silver	Gold	Emerald
<b>Cost Comparison</b>					
<b>Total Initial Green Cost (\$)</b>	Unknown	2,956	5,137	8,916	15,918
<b>Annual Maintenance Cost (\$)</b>	359	359	359	359	453
<b>Annual Energy Operating Cost (\$)</b>	2,152	1,862	1,678	1,561	1,461
<b>Annual Water Usage Cost (\$)</b>	410	315	256	238	220
<b>30-Year Lifetime Replacement Cost (\$)</b>	7,183	7,549	8,492	13,871	29,955
<b>Incremental Performance Improvement</b>					
<b>Energy Efficiency (e-Ratio) (compare to existing condition)</b>	1.64	1.29	1.04	0.90	0.78
<b>Water Efficiency (gpd/% reduced) (compare to existing condition<sup>a</sup>)</b>	45.7 (gpd)	26.0%	42.0%	47.0%	52.0%
<b>IEQ (Mandatory Requirements) (NGBS Rating)</b>	Not Met	Met	Met	Met	Met
<b>Simple Payback Periods</b>					
<b>Energy Efficiency (years) (initial energy cost/savings)</b>	NA	7	9	13	21
<b>Water Efficiency (years) (initial water cost/savings)</b>	NA	4	3	3	4
<sup>a</sup> The benchmark for comparison assumes three occupants using 45.7 (gpd) each. The benchmark cost is \$410 is based on the actual estimated water usage; all projected savings are compared with this benchmark (which is also the baseline cost). NA = not applicable; NGBS = National Green Building Standard; NR = not required.					

Table 3-120. Overall Cost and Performance Data for Unit #4

Montgomery County, Maryland Multifamily Unit #4 820 ft <sup>2</sup>	Baseline	Bronze	Silver	Gold	Emerald
<b>Cost Comparison</b>					
<b>Total Initial Green Cost (\$)</b>	Unknown	2,893	5,276	7,882	13,821
<b>Annual Maintenance Cost (\$)</b>	359	359	359	359	453
<b>Annual Energy Operating Cost (\$)</b>	2,288	1,989	1,766	1,643	1,539
<b>Annual Water Usage Cost (\$)</b>	529	403	340	301	282
<b>30-Year Lifetime Replacement Cost (\$)</b>	6,800	6,950	8,109	11,244	14,382
<b>Incremental Performance Improvement</b>					
<b>Energy Efficiency (e-Ratio) (compare to existing condition)</b>	1.95	1.55	1.23	1.07	0.93
<b>Water Efficiency (gpd/% reduced) (compare to existing condition<sup>a</sup>)</b>	53.2 (gpd)	26.0%	39.0%	47.0%	51.0%
<b>IEQ (Mandatory Requirements) (NGBS Rating)</b>	Not Met	Met	Met	Met	Met
<b>Simple Payback Periods</b>					
<b>Energy Efficiency (years) (initial energy cost/savings)</b>	NA	6	8	10	16
<b>Water Efficiency (years) (initial water cost/savings)</b>	NA	3	2	3	4
<sup>a</sup> The benchmark for comparison assumes three occupants using 53.2 (gpd) each. The benchmark cost is \$529 is based on the actual estimated water usage; all projected savings are compared with this benchmark (which is also the baseline cost). NA = not applicable; NGBS = National Green Building Standard; NR = not required.					

## Chapter 4.

# Key Findings and Green Research Topics

## 4.1 Characterizing the Affordable Housing Designs

For all affordable designs in Table A-2 (on page xvii), the total incremental cost to achieve an NGBS Bronze rating ranges from \$950 to \$3,300. We consider this amount to be the minimum estimated cost of making the original affordable designs equally strong in all categories of green building and compliant with the NGBS Bronze rating. The OHA (Townhouse) design can be made equally strong in all categories of green building for less than \$3,600, which makes the design compliant with an NGBS Gold rating.

The simple payback period<sup>29</sup> for water-efficiency improvements is less than 5 years for Bronze and Silver ratings and ranges from 5 to 13 years for Gold and Emerald ratings. Energy-efficiency practices were significant in most affordable house designs, and the incremental improvements typically exceeded a simple payback period of 30 years for most of the designs, except the CMHA (One-Bedroom Apartment) design, which had minor energy-efficient features. We improved the energy performance and achieved a simple payback period from 19 to 21 years for the CMHA (One-Bedroom Apartment) design by specifying a centralized boiler system (with solar panels at the Gold and Emerald-levels) to supply heat and hot water for the entire apartment building. This economy-of-scale approach to green building has real cost-saving potential for multifamily housing. We recommend more research in the area of green multifamily housing, given the potential for greater performance and improved payback periods.

In general, the affordable green designs could be improved using the following measures.

1. Provide green training and education for the occupant or homeowner—effort is essential to maximizing the benefits of any green building design.
2. Use ENERGY STAR-rated appliances. In many of the affordable designs, non-ENERGY STAR-rated appliances and equipment were specified. With little or no additional cost, ENERGY STAR-rated appliances and equipment can be specified.
3. Use low-flow plumbing fixtures. In most of the affordable designs, the fixtures were not low-flow models. With little or no additional cost, low-flow plumbing fixtures can be specified.
4. Use products that have multiple green features. For example, specifying a cabinet material that has no or low-formaldehyde emissions, recycled content, and low-maintenance characteristics may have multiple green benefits in the areas of IEQ and resource efficiency.
5. Use construction practices that minimize material waste. For example, using preassembled construction components such as roof trusses or wall sections built in a factory can reduce waste and shorten construction time.
6. Optimize the house design. For example, when designing the house, consider installing ductwork inside the conditioned space; this design approach will improve energy and resource

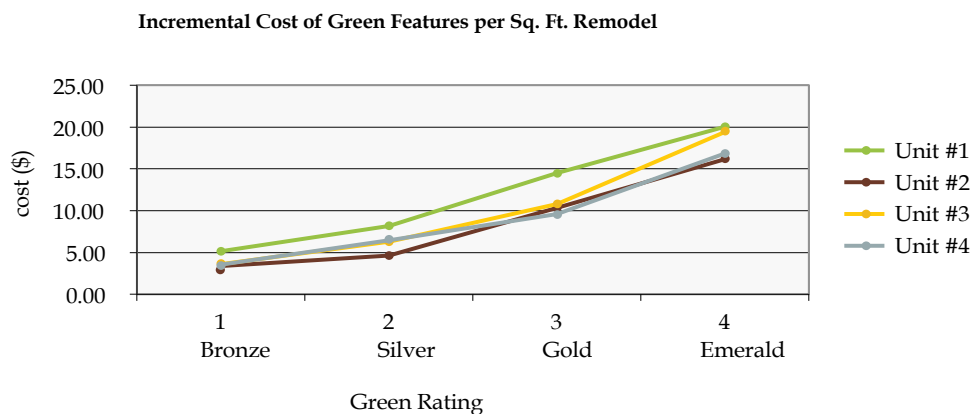
efficiency—with little or no additional cost. If the budget permits, evaluate the house design with energy-modeling software.

7. Use durable, low-maintenance materials. For example, when selecting a cladding material, durability and maintenance requirements should be considered, along with the initial cost.
8. Most green practices are interconnected. For example, one cannot fully consider energy efficiency without also considering moisture management and indoor air quality. When reviewing a green design, ensure that all related areas are fully addressed.

## 4.2 Characterizing the Pre-1980 Multifamily Apartment Units<sup>30</sup>

Green remodeling for older homes can represent a significant improvement in terms of energy efficiency, water conservation, and indoor environmental quality; in addition, it has the added benefit of being cost effective based simply on payback periods. The incremental cost of energy renovations represents the largest percentage of the total remodeling cost, which is summarized in Graph 4-1. For the multifamily apartment units in the study, e-Ratios range from 1.51 to 2.15, which mean the actual energy ratings are significantly worse than the 2006 IECC. This is not surprising; for many pre-1980 residential houses and apartments, we expect to see older equipment that is not as energy efficient as modern equipment; for example, HVAC and hot-water heaters).

Graph 4-1. Incremental Cost of Energy Renovations



For these apartment units, the total cost to achieve the Bronze-level rating is estimated to be from \$2,500 to \$3,000, and the Silver-level rating is estimated to be from \$4,000 to \$5,300. This cost does not include the comprehensive audits to establish the existing conditions of the apartment units or the third-party verification of the improvements.

If an existing house or apartment has low-efficiency heating, cooling, and hot-water equipment, the simple payback period can be less than 10 years for Bronze- and Silver-rated improvements and range from 10 to 20 years for Gold- and Emerald-rated improvements. If an existing house or apartment has pre-1980 plumbing fixtures, the simple payback period is less than 5 years for water-efficiency improvements. The indoor environmental quality improvements have the added

benefit of preventing moisture-related construction issues that may arise from energy efficiency improvements and may also be beneficial to those that have asthma.

If providers of affordable housing decide to focus on green remodeling, they will need to determine whether a particular green remodeling level should be targeted or if a certain amount of funding should be allocated for renovations. Pros and cons exist for both approaches. If the condition of the older housing stock is known or estimated from a statistical sample, one will be able to determine the best approach. Generally, if a wide variation in performance and condition exists, we recommend the allocation of a certain amount of funding for each house renovation (that is, \$3,000 to \$5,000).

Because the NGBS Green Remodeling program requires the improvement of energy efficiency, water efficiency, and IEQ, green remodeling efforts can be expanded to older residential houses and apartment buildings by leveraging many existing weatherization programs that focus only on energy improvements. If existing houses or apartment buildings are similar to the case study example, we estimate the additional cost to range from \$1,000 to \$1,500 at the Bronze remodel level assuming an existing weatherization program improves the energy efficiency by 20 percent. The added cost does not include comprehensive audits to establish the existing condition or accredited third-party verification.

### 4.3 Quantifying Benefits and Affordability

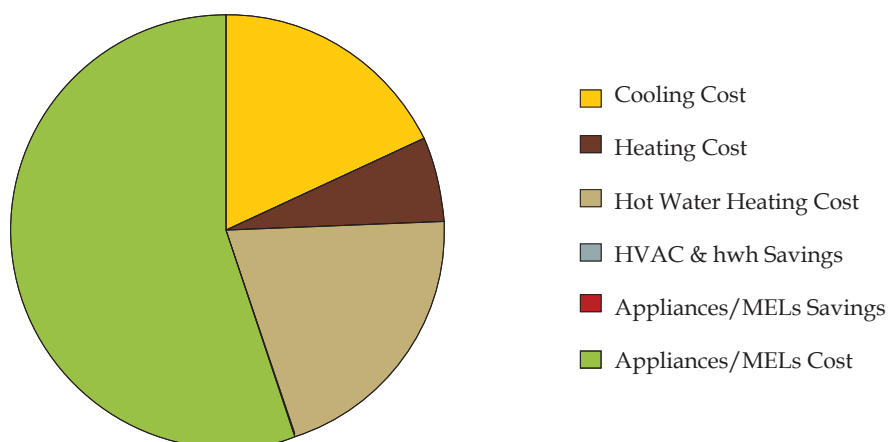
Each of the six categories of the NGBS has some economic benefit. The indirect economic benefits are difficult to quantify because they are typically realized on a large community or regional scale. For example, land development that minimizes stormwater runoff and preserves wetlands has an economic benefit in terms of preventing flash floods and minimizing pollution, which reduces the indirect costs of rebuilding housing after floods or cleaning up polluted water sheds. Using construction resources efficiently has the added value of producing less waste, which reduces the indirect cost of expanding landfills. The occupants of a green-rated house realize several direct economic benefits; these benefits may include fewer frequent visits to the hospital for those with asthma or other respiratory conditions when indoor environmental-quality practices are implemented. We also expect the occupants to use less energy and water, which is expected to lead to lower utility bills. Finally, when the occupants receive training and information about green features, they will have the ability to maximize the potential direct savings.

### 4.4 Quantifying Energy Savings

The energy performance improvements in all affordable designs are defined based on energy modeling results using the 2006 IECC criteria, which stipulates that the energy improvements must consider only reductions in energy used for heating, cooling, and service-water heating.<sup>31</sup> For example, Chart 4-1 shows the distribution of the estimated energy cost in the original baseline Safe Harbor (AMT2354A) design.

Chart 4-1. Annual Energy Cost Distribution for the Original Baseline AMT2356A Design

Bayou LaBatre, AL AMT2356A Base Cost



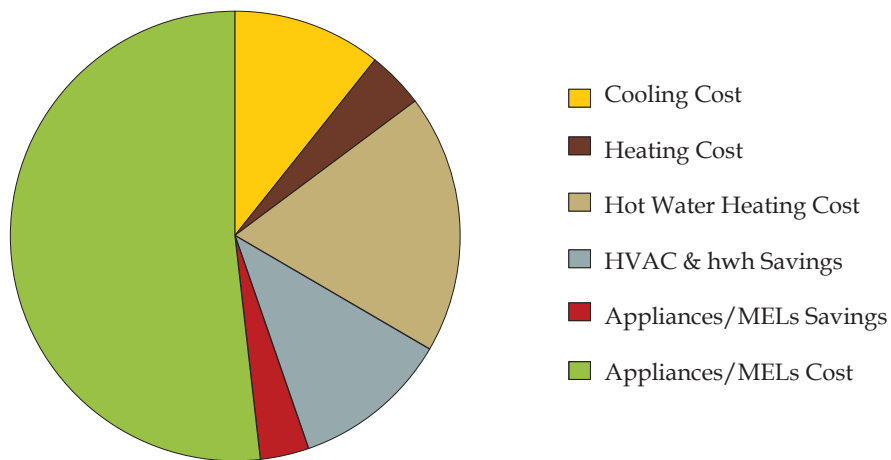
If we consider the baseline cost distribution illustrated in Chart 4-1, we notice that heating, cooling, and hot-water heating costs equal approximately 45 percent of the total annual projected energy cost. The baseline cost distribution includes the ENERGY STAR-qualified features of the original design, which makes the energy performance 6-percent more efficient than the 2006 IECC.

To demonstrate compliance with the 2006 IECC criteria, we reduced cost in the area of cooling, heating, and hot-water heating at the specified NGBS performance path method levels of 15, 30, 50, and 60 percent for Bronze, Silver, Gold, and Emerald, respectively. After achieving the required improvements based on the 2006 IECC criteria, we also improved appliance/MEL<sup>32</sup> performance by specifying energy-efficient appliances (if they were not within the original design) and compact florescent lighting. These improvements led to some marginal reductions in the appliance/MEL costs.

Chart 4-2 shows the incremental energy costs and savings of the Silver-rated Safe Harbor (AMT2356A) design. The cost distribution chart identifies the savings related to heating, cooling, and hot-water heating improvements and the savings related to appliance and MEL improvements. To achieve the Silver rating, the house was energy modeled to meet an e-Ratio of 0.70, which equaled an additional savings of 24 percent more than the original baseline heating, cooling, and hot-water heating performance. In addition, a savings of 5 percent was achieved by improving the baseline appliance and MEL energy performance. When we combine both incremental savings, a total whole-house annual energy savings of 14 percent is achieved. The reader should not confuse 2006 IECC energy savings with whole-house annual energy savings; the former is necessary for NGBS rating compliance (and other green building and energy efficiency programs), and the latter should be improved, when possible.

Chart 4-2. Annual Energy Cost Distribution for the Silver-Rated AMT2356A Design

Bayou LaBatre, AL AMT2356A Silver Cost and Incremental Savings

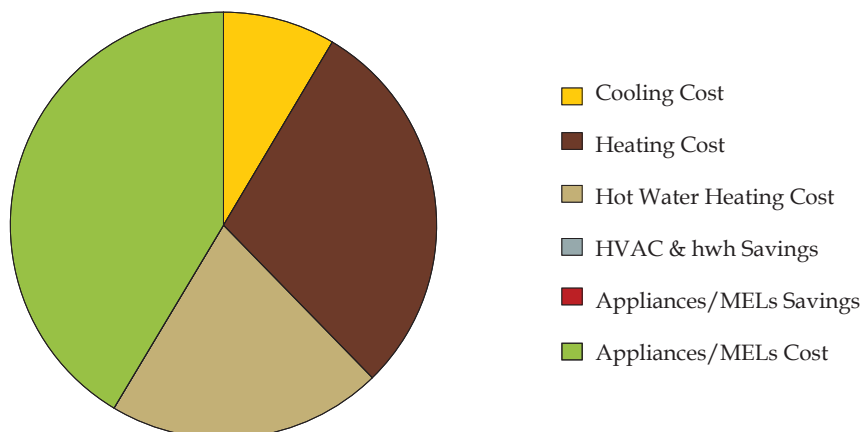


The energy performance improvements for all green remodeling multifamily apartment units are defined based on energy modeling results using the 2006 IECC criteria, which stipulate that the energy improvements must consider only reductions in energy used for heating, cooling, and service-water heating.<sup>33</sup> For example, Chart 4-3 shows the distribution of the estimated energy cost in the existing baseline Maryland Multifamily (Unit #2) design and field audit data.

If we consider the baseline cost distribution illustrated in Chart 4-3, we notice that heating, cooling, and hot-water heating costs equal approximately 59 percent of the total annual projected energy cost. This distribution results from the age of the existing HVAC and hot-water heating equipment and the e-Ratio of 1.51.

Chart 4-3. Annual Energy Cost Distribution for the Maryland Multifamily Unit #2 Design

MD Multifamily Unit #2 Apt Base Cost





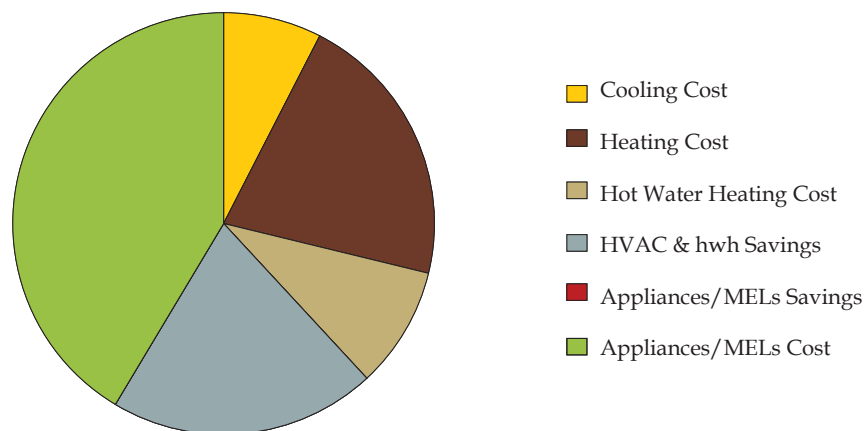
To demonstrate compliance with the 2006 IECC criteria, we reduced cost in the area of cooling, heating, and hot-water heating at the specified NGBS green remodeling path at a minimum level of 20, 34, 43, and 50 percent for Bronze, Silver, Gold, and Emerald, respectively. We did not improve the appliance/MEL<sup>34</sup> performance simply because the NGBS green remodeling path is focused cooling, heating, and hot-water heating only.

Chart 4-4 shows the incremental energy costs and savings of the Silver-rated Maryland Multifamily (Unit #2) design. The cost distribution chart identifies the savings related to heating, cooling, and hot-water heating improvements, which are significant given the size of the heating, cooling, and hot-water heating energy usage. To achieve the Silver rating, the target performance improvement of 34 percent was met. A total whole-house annual energy savings of 20 percent is achieved. The reader should not confuse 2006 IECC energy savings with whole-house annual energy savings; the former is necessary for NGBS rating compliance (and other green building and energy efficiency programs), and the latter should be improved, when possible, although appliance/MEL improvements are not required.

Because all multifamily apartment units in the study have energy performance that is much worse than the 2006 IECC, the potential incremental energy cost savings are significant. The energy improvements are similar to those being performed under weatherization programs, which further highlight the savings potential for green remodeling of pre-1980 houses and apartments.

Chart 4-4. Annual Energy Cost Distribution for the Silver-Rated Unit #2 Design

MD Multifamily Unit #2 Apt Silver Cost



Because energy-related upgrades represent the largest percentage of the total cost of green building, improvements in energy-related technology will lead to improvements in the overall affordability of green building. Energy improvements are necessary to make the Gold and Emerald levels more affordable because the payback periods are typically greater than 30-years. The U.S. Department of Energy continues to investigate strategies for reducing energy consumption in residential housing. Through programs like Building America and the Energy Value Housing Award (EVHA), we may realize further advancements in energy efficient homes.

## 4.5 Quantifying Water Savings

Using the *Handbook of Water Use and Conservation*<sup>35</sup> we defined the average daily per capita water usage as 56.4 (gpd/occupant).<sup>36</sup> This average daily water usage estimate assumes the house includes a dishwasher, washing machine, shower, faucets, and toilet. The water usage estimate is not based on the number of plumbing fixtures or appliances present in the house, but a dishwasher, washing machine, shower, faucets, and toilet must exist within the affordable house design to assume the occupant will consume the average daily quantity we defined. In fact, some water utilities publish local average daily consumption quantities and most of these values are within 10 to 20 percent of our 56.4 (gpd/occupant) benchmark. This water-consumption benchmark was developed for cost calculation purposes and is not a part of the NGBS water-efficiency requirements.

Affordable designs with existing water-efficiency features have a cost savings that can range from 10 to 20 percent, when compared with the benchmark. Affordable designs without water-efficiency features have a cost savings that are less than 3 percent when compared with the benchmark. The Valley View Homes (One-Bedroom Apartment) is the nongreen exception that has a potential cost savings of 12 percent because of a water-efficient dishwasher, shower heads, faucets, and no washing machine inside the apartment unit. In fact, the Valley View Homes (One-Bedroom Apartment) met all the mandatory NGBS requirements for water efficiency, but did not have enough water-efficient features to qualify for the Bronze rating. At the Emerald-rated level, one-half of the affordable designs have an estimated cost savings of 30 percent when compared with the benchmark.

When considering green remodeling, water usage must be reduced by a specific percentage for each green rating level. First, the average daily water usage estimate is established based on actual field measurements (or utility bills). Second, a customized approach for water usage reduction is considered for each specific unit. For this study, our approach to reducing water consumption included installing low-flow plumbing fixtures and high-water-efficiency appliances such as washing machines and dishwashers. If some of these upgrades already exist, which was the case for Unit #3, then the toilet should be replaced with low-flow or dual flush models.

To realize a monetary savings, the water utility service must have a meter-based billing system. In some areas of Baton Rouge, Louisiana (including the Hidden Cove development), flat rates are used instead of meter rates. This flat-rate method of billing can be common for both sewer and water supply services. When a flat-rate method of billing is used, the occupant will not directly realize any monetary savings associated with the individual water conservation practices. If the entire community adopts a wide range of water conservation practices, the local water utility may decrease the flat rates but no guarantee of savings exists with a flat-rate billing system.

## 4.6 Limitations of This Study

Readers who are seeking further guidance on selecting a green program should consider this study and other resources on sustainable residential construction.

The incremental costs presented in this report are skewed, because most of the affordable housing designs included significant green features; therefore, one should not attempt to extrapolate these costs to other affordable house designs or to establish a cost estimate for converting a nongreen house design.

Many incremental green costs are presented as \$/ft<sup>2</sup>, but the cost should not be scaled based on the size of the dwelling. In fact, many green costs are independent of the size of the home. For example, water conservation is a function of the number of occupants and their behaviors, not the size of the house. Energy conservation is a function of the house size, building enclosure design, equipment selection, and the occupants' behaviors.

## 4.7 Recommended Green Research Topics

Based on the findings of this report, the following green research topics are recommended for further study.

1. Develop a methodology for monetizing the benefits of products and practices that claim to improve the indoor environmental quality, land and lot use, and resource efficiency.
2. Develop green building approaches for multifamily residential housing that leverage the economy of scale that this type of housing offers.
3. Sample and characterize the condition of older homes that can benefit from green remodeling retrofits in various climate zones.
4. Evaluate nongreen affordable housing to determine the incremental cost of converting to a green design.
5. Expand green evaluations to other Climate Zones (that is, #1, #6, #7, and #8) not included in this study.
6. Conduct more long-term demonstration projects of green affordable housing that focus on occupant use and training (that is, expected performance versus actual performance).

# APPENDIX A

## COST DETAILS

### 1 – Climate Zone #2

- A. Baton Rouge, Louisiana
- B. Bayou LaBatre, Alabama

### 2 – Climate Zone #3

- A. Oakland, California

### 3 – Climate Zone #4

- A. Richmond, Virginia
- B. Seattle, Washington

### 4 – Climate Zone #5

- A. Akron, Ohio – Townhouse
- B. Akron, Ohio – Single Family Home
- C. Cuyahoga, Ohio

### 5 – Retrofit – climate zone #4

- A. Silver Spring, Maryland
  - i. Unit 1
  - ii. Unit 2
  - iii. Unit 3
  - iv. Unit 4

## Labor Cost Chart

	Annual	Hourly	Burden	Vehicle	Total/Hr.	Avg./Hr.
			1.27	.55/mile		
<b>Administrative</b>	48,700	23	30		30	47
<b>First-line Const.</b>	61,280	29	37	4	41	
<b>Business Ops Pers</b>	64,990	31	40		40	
<b>Construction Mgr.</b>	89,770	43	55	4	59	
<b>General Ops Mgr.</b>	107,970	52	66		66	
<b>Consultant</b>		110-150			0	130
<b>First-line Const.</b>	61,280	29	37	4	41	37
<b>First-line Const Mech.</b>	59,160	28	36	4	40	
<b>First-line Maint.</b>	42,990	21	26	4	30	

Source: BLS [http://www.bls.gov/oes/2008/may/oes\\_nat.htm#b00-0000](http://www.bls.gov/oes/2008/may/oes_nat.htm#b00-0000)



# APPENDIX A COST DETAILS

1 – Climate Zone #2

A. Baton Rouge, Louisiana

**Operation, Maintenance and Lifetime Replacement Cost**

**KC910 Baton Rouge**

11/20/2009

SF floor area 910

SF driveway 405

[http://www.eia.doe.gov/cneaf/electricity/epm/table5\\_6\\_b.html](http://www.eia.doe.gov/cneaf/electricity/epm/table5_6_b.html)

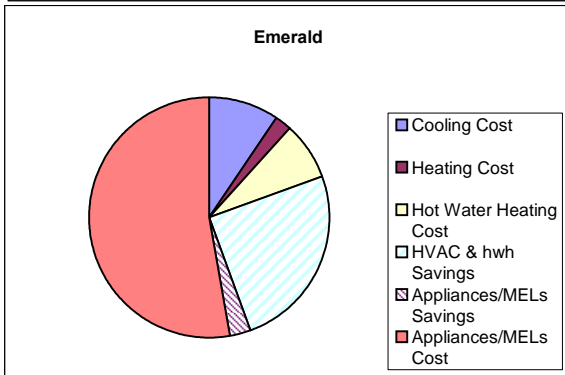
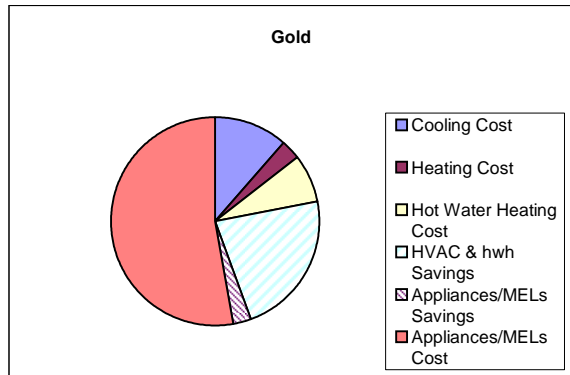
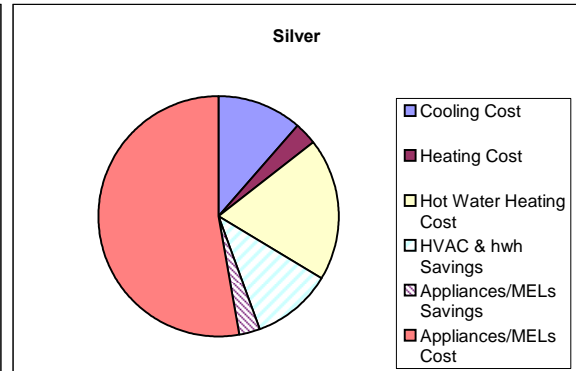
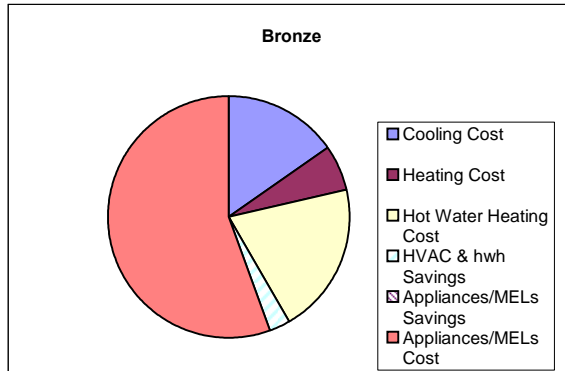
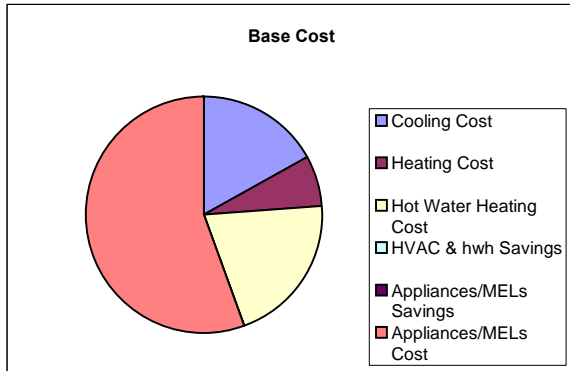
base
bronze
silver
gold
emerald

Component	Subcategory/ Activity	Annual Maint. Cost Per Year	Reference	Annual Maintenance Cost				
				base	bronze	silver	gold	emerald
<b>Appliances</b>								
	D/W, Estar	28	MA	28.00	28.00	28.00	28.00	28.00
	Range	42	MA	42.00	42.00	42.00	42.00	42.00
	Refrigerator, Estar	74	MA	73.73	73.73	73.73	73.73	73.73
	Washer/Dryer Stack, Estar	62	MA	62.00	62.00	62.00	62.00	62.00
<b>Electrical</b>								
	Incandescent Fixtures			0.00	0.00			
	Compact Fluorescent Fixtures					0.00	0.00	0.00
<b>HVAC</b>								
	Air handler, move from attic	0				0.00	0.00	0.00
	Heat pump, 13 Seer	156	MA					
	Heat pump, 14 Seer not 13	156	MA	156.00	156.00			
	Heat Pump, 15 Seer not 13	156	MA			156.00	156.00	
	Heat Pump, 18 Seer not 13	156	MA					156.00
	Ducts, Sealed	0			0.00	0.00	0.00	0.00
	Thermostat, prog.	0			0.00	0.00	0.00	0.00
<b>Insulation</b>								
	Cellulose, R38 not R30	0				0.00	0.00	0.00
	Foam, rigid R-5 sheath	0				0.00	0.00	0.00
<b>Plumbing Appliances &amp; Fixtures</b>								
	W/H, elec.. 92	47	S	47.00				
	W/H, elec. .94 not.92	47	S		47.00			
	W/H, elec. .98,tkls. not .92	47				47.00		
	ICS Solar H/W w. .98 tkls not .92	94					94.00	94.00
<b>Siding</b>								
Fiber cement		0	A	0.00	0.00	0.00	0.00	0.00
Vinyl		0						
				<b>409</b>	<b>409</b>	<b>409</b>	<b>456</b>	<b>456</b>

Baton Rouge, Louisiana  
KC -910

Annual Energy Summary	Base	Bronze			Silver			Gold			Emerald		
	Yr \$	Yr \$	savings	percent	Yr \$	savings	percent	Yr \$	savings	percent	Yr \$	savings	percent
Cooling Cost	177	161	16	9%	121	56	32%	121	56	32%	98	79	45%
Heating Cost	73	65	8	11%	31	42	58%	31	42	58%	26	47	64%
Hot Water Heating Cost	217	211	6	3%	203	14	6%	80	137	63%	80	137	63%
HVAC & hwh Savings	N/A	30			112			235			263		
Appliances/MELs Savings	N/A	0			31			31			31		
Appliances/MELs Cost	585	585			554			554			554		
HVAC & HWH sub-total	467	437		6%	355		24%	232		50%	204		56%
Grand Total	1052	1022		97%	909		86%	786		75%	758		72%

Data based on Energy Gauge - Annual Energy Summary. Not Compliance





**Operation, Maintenance and Lifetime Replacement Cost**  
**KC910 Baton Rouge** 11/20/2009  
 SF floor area 910  
 SF driveway 405  
[http://www.eia.doe.gov/cneaf/electricity/epm/table5\\_6\\_b.html](http://www.eia.doe.gov/cneaf/electricity/epm/table5_6_b.html)

base  
 bronze  
 silver  
 gold  
 emerald

Component	Subcategory/ Activity	Cost New	Reference	Est. Life	Reference	30 year Lifetime Replacement Cost				
						base	bronze	silver	gold	emerald
<b>Appliances</b>										
	D/W, Estar	300	N	9	D	1000.00	1000.00	1000.00	1000.00	1000.00
	Range	600	N	13	D	1384.62	1384.62	1384.62	1384.62	1384.62
	Refrigerator, Estar	800	N	13	D	1846.15	1846.15	1846.15	1846.15	1846.15
	Washer/Dryer Stack, Estar	1,300	N	10	D	3900.00	3900.00	3900.00	3900.00	3900.00
<b>Electrical</b>										
	Incandescent Fixtures	600	N	10	D	1800.00	1800.00			
	Compact Fluorescent Fixtures	600	N	10	D			1800.00	1800.00	1800.00
<b>HVAC</b>										
	Air handler, move from attic	680	Q	15	D			1360.00	1360.00	1360.00
	Heat pump, 13 Seer	3,413	Q	15	D					
	Heat pump, 14 Seer not 13	4,241	Q	15	D	8481.56	8481.56			
	Heat Pump, 15 Seer not 13	4,241	Q	15	D			8481.56	8481.56	
	Heat Pump, 18 Seer not 13	6,920	Q	15	D					13839.71
	Ducts, Sealed	1,450	Q	10	D					
	Thermostat, prog.	50	N	35	D					
<b>Insulation</b>										
	Cellulose, R38 not R30	214	Q	77	D					0.00
	Foam, rigid R-5 sheath	1,353	Q	77	R					0.00
<b>Plumbing Appliances &amp; Fixtures</b>										
	W/H, elec.. 92	0		11	D	0.00				
	W/H, elec. .94 not.92	0		11	D		0.00			
	W/H, elec. .98,tkls. not .92	0		12	T			0.00		
	ICS Solar H/W w. .98 tkls not .92	4,500		13					10384.62	10384.62
<b>Siding</b>										
	Fiber cement	0		50	J					0.00
	Vinyl	0		77	D					
						<b>18,412</b>	<b>18,412</b>	<b>19,772</b>	<b>30,157</b>	<b>35,515</b>

- A Power wash and 1 coat repaint for fibercement every 9 years.  
<http://www.sherwin-williams.com/pro/problem/tips/substrates/>
- B <http://www.demesne.info/Home-Maintenance/Appliance-Life-Expectancy.htm>  
 Articles and information for Demesne are contributed by experts and specialists in each area.
- C <http://www.kronotexusa.com/warranty.htm>
- D NAHB/Bank of America Home Equity Study of Life Expectancy of Home Components, 2006.  
 and, Study of Life Expectancy of Home Components, NAHB Economics Group and Bank of America, Feb. 2007.  
 Lifetime was defined by this reports authors as the average US life expectancy
- E Sustainable Building, Bamboo Flooring, Publication 443-03-017, 2003. CWIMB.  
<http://www.ciwmb.ca.gov/Publications/GreenBuilding/43303017.doc>
- F <http://www.conradfp.com/ns.shtml>  
 Wolmanized process, long as house to original owner.  
 15-20 others. Use 20
- G 25-year limited warranty - Upnor  
<http://www.uponor-usa.com/~media/Files/Warranties/Plumbing.aspx>  
 25-year limited warranty - Zurn  
<http://www.zurn.com/images/pdf/zpm08202.pdf>
- H 50-year limited warranty - CDA  
[http://www.copper.org/applications/plumbing/restools/bsp/50yr\\_wrrnty\\_itms.html](http://www.copper.org/applications/plumbing/restools/bsp/50yr_wrrnty_itms.html)
- I NAHB Report says lifetime
- J Manufacturer's warranty
- K Rheem warranty for Professional Series is 8 years lmtd.  
[http://www.rheem.com/products/tank\\_water\\_heaters/electric\\_water\\_heaters/](http://www.rheem.com/products/tank_water_heaters/electric_water_heaters/)
- L <http://www.dauphincd.org/swm/BMPfactsheets/Porous%20Asphalt%20fact%20sheet.pdf>
- M [http://www.asphaltmagazine.com/singlenews.asp?item\\_ID=1178&comm=0&list\\_code\\_int=mag01-int](http://www.asphaltmagazine.com/singlenews.asp?item_ID=1178&comm=0&list_code_int=mag01-int) Indicates 20 years; set even with asphalt.
- MA Based on purchase of a Maintenance Agreement
- N Costs developed via internet survey conducted Nov. 2009.
- O Power utility cost (EIA US average 2009) of less efficient model vs. operation cost of more efficient model based on actual utility usage as modeled or interpolated from computer simulations in Energy Gauge. No calculation of possible water savings was calculated due to difficulty of capturing efficiency and widely fluctuating costs for water service nationwide.
- P Dryer has no estimated savings over any other.
- Q ASHRAE Cost Database
- R Set even to life of vinyl siding (cladding).
- S Based on one hour per year to flush water tank, vacuum driveway, etc.
- T One manufacturer's warranty on heat exchanger. Bosch.
- U <http://www.aceee.org/Consumerguide/waterheating.htm>
- V Savings is reflected in operating cost.
- W ICS solar units typically are installed with a backup DHW source which is not included in this cost example.

**Indoor Water Usage Calculations  
KC910 Baton Rouge**

Appliance	Usage Levels	Unit	Avg.	Baton Rouge, Louisiana	Average Daily Per Capita Usage in Gallons <sup>3</sup>	Per Capita Daily Savings (% of Avg.)	Base	Bronze	Silver	Gold	Emerald
Dishwasher	Normal Wash <sup>1</sup>	gal/load	7.3	Dishwasher	1.0						
	Energy Star <sup>1</sup>		4.9			32.4%	0.3	0.3	0.3	0.3	0.3
Wash Machine	Normal Wash <sup>2</sup>	gal/load	42.5	Washing Machine	11.6						
	Energy Star <sup>2</sup>	gal/load	26.8			37.0%	4.3	4.3	4.3	4.3	4.3
	Water Factor > 6.0 <sup>2</sup>	gal/load	18.0			57.6%					
Shower(s)	Std-2.5	gpm	2.5	Showers	11.6		x				
	flow 2.0-2.5	gpm	2.3			10.0%		1.2	1.2		
	flow 1.6-2.0	gpm	1.8			28.0%				3.2	3.2
Bathroom Faucets	Std-2.2 gpm	gpm	2.2	Faucets	10.9						
	gpm > 1.5	gpm	1.5			31.8%	3.5	3.5	3.5	3.5	3.5
Toilets	Std-1.6 gpf	gpf	1.6	Toilets	18.5		x	x	x		
	gpf > 1.28	gpf	1.3			20.0%				3.7	3.7
				Baths	1.2	0.0%	x	x	x	x	x
				Other	1.6	0.0%	x	x	x	x	x
				Total (gpd/occ)	56.4	n/a	8.1	9.2	9.2	15.0	15.0
				<b>Percent Savings Over Average Daily PC</b>			<b>14.3%</b>	<b>16.4%</b>	<b>16.4%</b>	<b>26.7%</b>	<b>26.7%</b>

Key: gpm= gallons per minute; gpf=gallons per flush; gpd/occ=gallons per day per occupant; PC=Per Capita

<sup>1</sup>Frigidaire Specifications for Normal Wash and Eco Wash.

<sup>2</sup>[http://www.energystar.gov/index.cfm?c=clotheswash.pr\\_tips\\_clothes\\_washers](http://www.energystar.gov/index.cfm?c=clotheswash.pr_tips_clothes_washers)

(Water Factor (WF) measures water efficiency in gallons of water consumed per cubic foot of capacity. The lower the WF, the more water efficient the clothes washer. A water factor of 6.0 is approximately 45% more water efficient than a non-energy star model.)

Both MEF and WF are listed on the ENERGY STAR qualified product list

Based on an estimated 10 loads of laundry per week, larger front-loading washers use only 16-20 gallons of water per load, compared to a conventional top-load washer that requires 40-45 gallons per load. Factoring in the capacity advantage of a large front-loader, (almost twice the load-size of a conventional top-loader), you will use 16-20 gallons compared to 80-90 gallons to get the same amount of laundry cleaned....The ENERGY STAR® logo indicates that a particular washing machine meets or exceeds the US Department of Energy's highest minimum efficiency standards for energy-efficient washers by a at least minimum of 37%.

See also: <http://www.consumerenergycenter.org/home/appliances/washers.html>

<sup>3</sup><http://www.drinktap.org/consumerdnn/Default.aspx?tabid=85>

Source: *Handbook of Water Use and Conservation*, Amy Vickers



# APPENDIX A COST DETAILS

B. Bayou LaBatre, Alabama

**Operation, Maintenance and Lifetime Replacement Cost**

**Bayou Labatre, Alabama - AMT2356A**

SF floor area 967

SF driveway 405

[http://www.eia.doe.gov/cneaf/electricity/epm/table5\\_6\\_b.html](http://www.eia.doe.gov/cneaf/electricity/epm/table5_6_b.html)

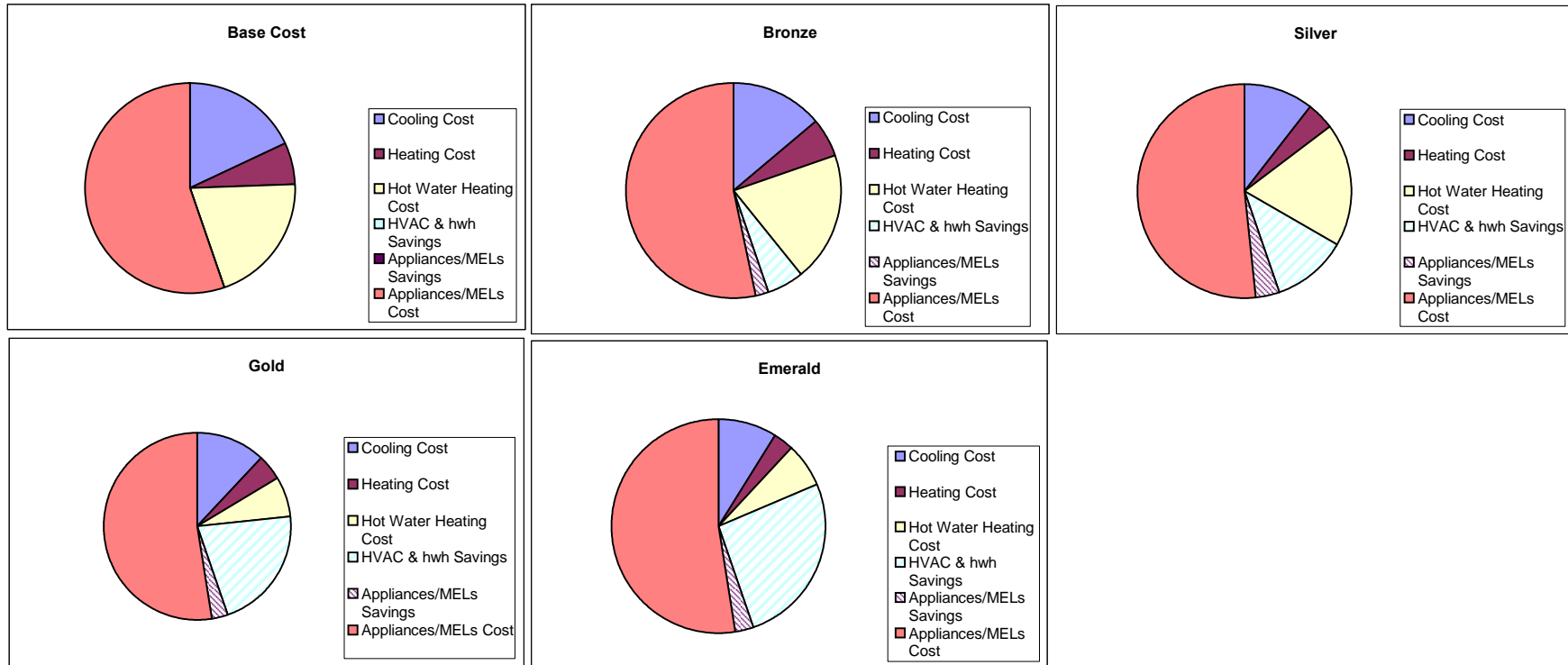
base
bronze
silver
gold
emerald

Component	Subcategory/ Activity	Annual Maint. Cost Per Year	Reference	Annual Maintenance Cost				
				base	bronze	silver	gold	emerald
<b>Appliances</b>								
	D/W, EStar	28	MA	28.00	28.00	28.00	28.00	28.00
	Range	42	MA	42.00	42.00	42.00	42.00	42.00
	Refrigerator	74	MA	73.73				
	Refrigerator, EStar	74	MA		73.73	73.73	73.73	73.73
	Washer	52	MA	52.00	52.00			
	Washer, EStar	52	MA			52.00	52.00	52.00
<b>Electrical</b>								
	Incandescent Fixtures			0.00	0.00	0.00		
	Compact Flourescent Fixtures						0.00	0.00
<b>HVAC</b>								
	Air handler, move from attic	0		0.00	0.00	0.00	0.00	0.00
	Heat pump, 13 Seer - 2 ton	156	MA	156.00	156.00			
	Heat pump, 14 Seer not 13	156	MA				156.00	
	Heat Pump, 16 Seer not 13	156	MA			156.00		
	Heat Pump, 18 Seer not 13	156	MA					156.00
	Ducts, Sealed	0			0.00	0.00	0.00	0.00
	Thermostat, prog.	0			0.00	0.00	0.00	0.00
<b>Insulation</b>								
	Cellulose, R38 not R30	0			0.00	0.00	0.00	0.00
	Foam, rigid R-5 sheath	0						0.00
<b>Plumbing Appliances &amp; Fixtures</b>								
	W/H, elec. .92	47	S	47.00				
	W/H, elec. .94 not.92	47	S		47.00			
	W/H, elec. .98,tkls. not .92	47				47.00	47.00	47.00
	ICS Solar H/W w. .98 tkls not .92	94					94.00	94.00
<b>Siding</b>								
Fiber cement		0	A	0.00	0.00	0.00	0.00	0.00
Vinyl		0						
				<b>399</b>	<b>399</b>	<b>399</b>	<b>493</b>	<b>493</b>

Bayou LaBatre, Alabama  
Palm Harbor

Annual Energy Summary	Base	Bronze			Silver			Gold			Emerald		
	Yr \$	Yr \$	savings	percent	Yr \$	savings	percent	Yr \$	savings	percent	Yr \$	savings	percent
Cooling Cost	162	126	36	22%	95	67	41%	107	55	34%	81	81	50%
Heating Cost	59	52	7	12%	38	21	36%	42	17	29%	26	33	56%
Hot Water Heating Cost	183	177	6	3%	168	15	8%	61	122	67%	61	122	67%
HVAC & hwh Savings	N/A	49			103			194			236		
Appliances/MELs Savings	N/A	18			34			26			26		
Appliances/MELs Cost	500	482			466			474			474		
HVAC & HWH sub-total	404	355		12%	301		25%	210		48%	168		58%
Grand Total	904	837		93%	767		85%	684		76%	642		71%

Data based on Energy Gauge - Annual Energy Summary. Not Compliance



**Operation, Maintenance and Lifetime Replacement Cost**

**Bayou Labatre, Alabama - AMT2356A**

SF floor area 967

SF driveway 405

[http://www.eia.doe.gov/cneaf/electricity/epm/table5\\_6\\_b.html](http://www.eia.doe.gov/cneaf/electricity/epm/table5_6_b.html)

base  
bronze  
silver  
gold  
emerald

Component	Subcategory/ Activity	Cost New	Reference	Est. Life	Reference	30 year Lifetime Replacement Cost				
						base	bronze	silver	gold	emerald
<b>Appliances</b>										
	D/W, EStar	300	N	9	D	1000.00	1000.00	1000.00	1000.00	1000.00
	Range	600	N	13	D	1384.62	1384.62	1384.62	1384.62	1384.62
	Refrigerator	800	N	13	D	1846.15				
	Refrigerator, EStar	800	N	13	D		1846.15	1846.15	1846.15	1846.15
	Washer	600	N	10	D	1800.00	1800.00			
	Washer, EStar	600	N	10	D			1800.00	1800.00	1800.00
<b>Electrical</b>										
	Incandescent Fixtures	600	N	10	D	1800.00	1800.00	1800.00		
	Compact Fluorescent Fixtures	600	N	10	D				1800.00	1800.00
<b>HVAC</b>										
	Air handler, move from attic	680	Q	15	D	1360.00	1360.00	1360.00	1360.00	1360.00
	Heat pump, 13 Seer - 2 ton	3,413	Q	15	D	6826.00	6826.00			
	Heat pump, 14 Seer not 13	4,241	Q	15	D				8482.00	
	Heat Pump, 16 Seer not 13	4,884	Q	15	D			9768.00		
	Heat Pump, 18 Seer not 13	6,920	Q	15	D					13840.00
	Ducts, Sealed	1,450	Q	10	D					
	Thermostat, prog.	50	N	35	D					
<b>Insulation</b>										
	Cellulose, R38 not R30	228	Q	77	D		88.65	88.65	88.65	88.65
	Foam, rigid R-5 sheath	1,275	Q	77	R					496.83
<b>Plumbing Appliances &amp; Fixtures</b>										
	W/H, elec. .92	0		11	D	0.00				
	W/H, elec. .94 not.92	0		11	D		0.00			
	W/H, elec. .98,tkls. not .92	0		12	T			0.00	0.00	0.00
	ICS Solar H/W w. .98 tkls not .92	4,500		13					10384.62	10384.62
<b>Siding</b>										
	Fiber cement	0		50	J					
	Vinyl	0		77	D					
						<b>16,017</b>	<b>16,105</b>	<b>19,047</b>	<b>28,146</b>	<b>34,001</b>

- A Power wash and 1 coat repaint for fibercement every 9 years.  
<http://www.sherwin-williams.com/pro/problem/tips/substrates/>
- B <http://www.demesne.info/Home-Maintenance/Appliance-Life-Expectancy.htm>  
 Articles and information for Demesne are contributed by experts and specialists in each area.
- C <http://www.kronotexusa.com/warranty.htm>
- D NAHB/Bank of America Home Equity Study of Life Expectancy of Home Components, 2006.  
 and, Study of Life Expectancy of Home Components, NAHB Economics Group and Bank of America, Feb. 2007.  
 Lifetime was defined by this reports authors as the average US life expectancy
- E Sustainable Building, Bamboo Flooring, Publication 443-03-017, 2003. CWIMB.  
<http://www.ciwmb.ca.gov/Publications/GreenBuilding/43303017.doc>
- F <http://www.conradfp.com/ns.shtml>  
 Wolmanized process, long as house to original owner.  
 15-20 others. Use 20
- G 25-year limited warranty - Upnor  
<http://www.uponor-usa.com/~media/Files/Warranties/Plumbing.aspx>  
 25-year limited warranty - Zurn  
<http://www.zurn.com/images/pdf/zpm08202.pdf>
- H 50-year limited warranty - CDA  
[http://www.copper.org/applications/plumbing/restools/bsp/50yr\\_wrrnty\\_itms.html](http://www.copper.org/applications/plumbing/restools/bsp/50yr_wrrnty_itms.html)
- I NAHB Report says lifetime
- J Manufacturer's warranty
- K Rheem warranty for Professional Series is 8 years lmtd.  
[http://www.rheem.com/products/tank\\_water\\_heaters/electric\\_water\\_heaters/](http://www.rheem.com/products/tank_water_heaters/electric_water_heaters/)
- L <http://www.dauphincd.org/swm/BMPfactsheets/Porous%20Asphalt%20fact%20sheet.pdf>
- M [http://www.asphaltmagazine.com/singlenews.asp?item\\_ID=1178&comm=0&list\\_code\\_int=mag01-int](http://www.asphaltmagazine.com/singlenews.asp?item_ID=1178&comm=0&list_code_int=mag01-int) Indicates 20 years; set even with asphalt.
- MA Based on purchase of a Maintenance Agreement
- N Costs developed via internet survey conducted Nov. 2009.
- O Power utility cost (EIA US average 2009) of less efficient model vs. operation cost of more efficient model based on actual utility usage as modeled or interpolated from computer simulations in Energy Gauge. No calculation of possible water savings was calculated due to difficulty of capturing efficiency and widely fluctuating costs for water service nationwide.
- P Dryer has no estimated savings over any other.
- Q ASHRAE Cost Database
- R Set even to life of vinyl siding (cladding).
- S Based on one hour per year to flush water tank, vacuum driveway, etc.
- T One manufacturer's warranty on heat exchanger. Bosch.
- U <http://www.aceee.org/Consumerguide/waterheating.htm>
- V Savings is reflected in operating cost.
- W ICS solar units typically are installed with a backup DHW source which is not included in this cost example.



**Indoor Water Usage Calculations**  
**Bayou Labatre, Alabama - AMT2356A**

Appliance	Usage Levels	Unit	Avg.	Bayou La Batre, Alabama	Average Daily Per Capita Usage in Gallons <sup>3</sup>	Per Capita Daily Savings (% of Avg.)	Base	Bronze	Silver	Gold	Emerald
Dishwasher	Normal Wash <sup>1</sup>	gal/load	7.3	Dishwasher	1.0	32.4%	0.3	0.3	0.3	0.3	0.3
	Energy Star <sup>1</sup>		4.9								
Wash Machine	Normal Wash <sup>2</sup>	gal/load	42.5	Washing Machine	11.6	37.0%	x	x	4.3	4.3	
	Energy Star <sup>2</sup>	gal/load	26.8								
	Water Factor > 6.02	gal/load	18.0								
Shower(s)	Std-2.5	gpm	2.5	Showers	11.6	10.0%	x				
	flow 2.0-2.5	gpm	2.3								
	flow 1.6-2.0	gpm	1.8								
Bathroom Faucets	Std-2.2 gpm	gpm	2.2	Faucets	10.9	31.8%	x		3.5	3.5	3.5
	gpm > 1.5	gpm	1.5								
Toilets	Std-1.6 gpf	gpf	1.6	Toilets	18.5	20.0%	x	x	x		3.7
	gpf > 1.28	gpf	1.3								
	Baths				1.2	0.0%	x	x	x	x	x
	Other				1.6	0.0%	x	x	x	x	x
	<b>Total (gpd/occ)</b>				<b>56.4</b>	n/a	0.3	7.0	11.3	15.0	17.4
	<b>Percent Savings Over Average Daily PC</b>						<b>0.6%</b>	<b>12.5%</b>	<b>20.1%</b>	<b>26.7%</b>	<b>30.9%</b>

Key: gpm= gallons per minute; gpf=gallons per flush; gpd/occ=gallons per day per occupant; PC=Per Capita

<sup>1</sup>Frigidaire Specifications for Normal Wash and Eco Wash.

<sup>2</sup>[http://www.energystar.gov/index.cfm?c=clotheswash.pr\\_tips\\_clothes\\_washers](http://www.energystar.gov/index.cfm?c=clotheswash.pr_tips_clothes_washers)

(Water Factor (WF) measures water efficiency in gallons of water consumed per cubic foot of capacity. The lower the WF, the more water efficient the clothes washer. A water factor of 6.0 is approximately 45% more water efficient than a non-energy star model.)

Both MEF and WF are listed on the ENERGY STAR qualified product list

Based on an estimated 10 loads of laundry per week, larger front-loading washers use only 16-20 gallons of water per load, compared to a conventional top-load washer that requires 40-45 gallons per load. Factoring in the capacity advantage of a large front-loader, (almost twice the load-size of a conventional top-loader), you will use 16-20 gallons compared to 80-90 gallons to get the same amount of laundry cleaned....The ENERGY STAR® logo indicates that a particular washing machine meets or exceeds the US Department of Energy's highest minimum efficiency standards for energy-efficient washers by a at least minimum of 37%.

See also: <http://www.consumerenergycenter.org/home/appliances/washers.html>

<sup>3</sup><http://www.drinktap.org/consumerdnn/Default.aspx?tabid=85>

Source: *Handbook of Water Use and Conservation*, Amy Vickers



# APPENDIX A COST DETAILS

2 – Climate Zone #3

A. Oakland, California

**Operation, Maintenance and Lifetime Replacement Cost  
two story townhouse, Oakland, California**

SF floor area 1105

SF driveway 200

[http://www.eia.doe.gov/cneaf/electricity/epm/table5\\_6\\_b.html](http://www.eia.doe.gov/cneaf/electricity/epm/table5_6_b.html)

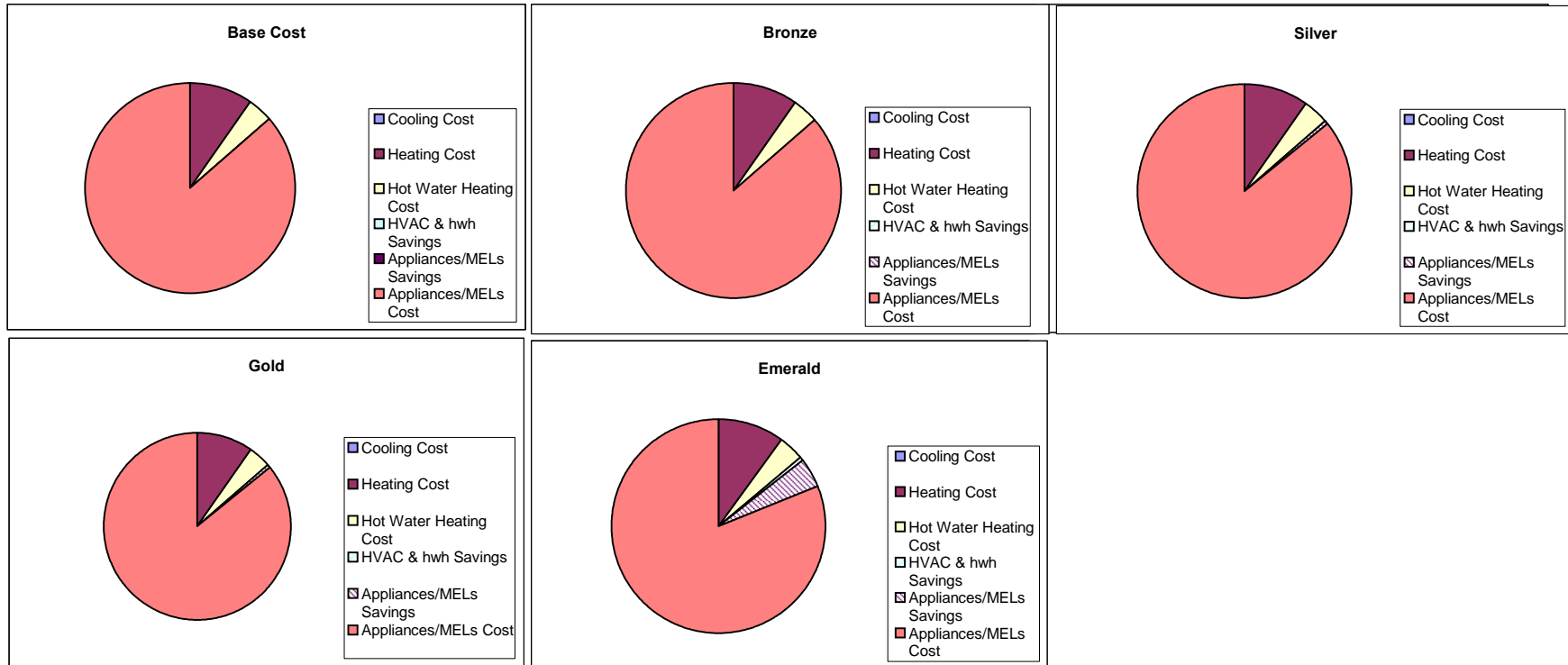
base
bronze
silver
gold
emerald

Component	Subcategory/ Activity	Annual Maint. Cost Per Year	Reference	Annual Maintenance Cost				
				base	bronze	silver	gold	emerald
<b>Appliances</b>								
	D/W, Estar	28	MA	28.00	28.00	28.00	28.00	28.00
	Dryer, elec.	52	MA	52.00	52.00	52.00	52.00	52.00
	Range, gas	42	MA	42.00	42.00	42.00	42.00	42.00
	Refrigerator	74	MA	73.73	73.73	73.73	73.73	
	Refrigerator, Estar	74	MA					73.73
	Washer	52	MA	52.00	52.00			
	Washer, EStar	52	MA			52.00	52.00	52.00
<b>HVAC</b>								
	Boiler in conditioned	0						
	Boiler 0.92 ef	75	MA	75.00	75.00	75.00	75.00	75.00
<b>Plumbing Appliances &amp; Fixtures</b>								
	Boiler 0.92 ef w/ solar dhw		S	see hvac	see hvac	see hvac	see hvac	see hvac
				<b>323</b>	<b>323</b>	<b>323</b>	<b>323</b>	<b>323</b>

Oakland, California

Annual Energy Summary	Base	Bronze			Silver			Gold			Emerald		
	Yr \$	Yr \$	savings	percent	Yr \$	savings	percent	Yr \$	savings	percent	Yr \$	savings	percent
Cooling Cost	0	0	0		0	0		0	0		0	0	
Heating Cost	72	72	0	0%	72	0	0%	72	0	0%	76	-4	-6%
Hot Water Heating Cost	30	30	0	0%	30	0	0%	30	0	0%	30	0	0%
HVAC & hwh Savings	N/A	0			0			0			-4		
Appliances/MELs Savings	N/A	0			4			4			33		
Appliances/MELs Cost	646	646			642			642			613		
HVAC & HWH sub-total	102	102		0%	102		0%	102		0%	106		-4%
Grand Total	748	748		100%	744		99%	744		99%	719		96%

Data based on Energy Gauge - Annual Energy Summary. Not Compliance



**Operation, Maintenance and Lifetime Replacement Cost  
two story townhouse, Oakland, California**

SF floor area 1105  
 SF driveway 200  
[http://www.eia.doe.gov/cneaf/electricity/epm/table5\\_6\\_b.html](http://www.eia.doe.gov/cneaf/electricity/epm/table5_6_b.html)

base
bronze
silver
gold
emerald

Component	Subcategory/ Activity	Cost New	Reference	Est. Life	Reference	30 year Lifetime Replacement Cost				
						base	bronze	silver	gold	emerald
<b>Appliances</b>										
	D/W, EStar	300	N	9	D	1000.00	1000.00	1000.00	1000.00	1000.00
	Dryer, elec.	600	N	13	D	1384.62	1384.62	1384.62	1384.62	1384.62
	Range, gas	600	N	13	D	1384.62	1384.62	1384.62	1384.62	1384.62
	Refrigerator	800	N	13	D	1846.15	1846.15	1846.15	1846.15	
	Refrigerator, EStar	1,200	N	13	D					2769.23
	Washer	600	N	10	D	1800.00	1800.00			
	Washer, EStar	1,100	N	10	D			3300.00	3300.00	3300.00
<b>HVAC</b>										
	Boiler in conditioned	0	Q	15	D					
	Boiler 0.92 ef	3,046	Q	15	D	6092.80	6092.80	6092.80	6092.80	6092.80
<b>Plumbing Appliances &amp; Fixtures</b>										
	Boiler 0.92 ef w/ solar dhw	see hvac		11	D	see hvac	see hvac	see hvac	see hvac	see hvac
						<b>13,508</b>	<b>13,508</b>	<b>15,008</b>	<b>15,008</b>	<b>15,931</b>

- B <http://www.demesne.info/Home-Maintenance/Appliance-Life-Expectancy.htm>  
Articles and information for Demesne are contributed by experts and specialists in each area.
- C <http://www.kronotexusa.com/warranty.htm>
- D NAHB/Bank of America Home Equity Study of Life Expectancy of Home Components, 2006.  
and, Study of Life Expectancy of Home Components, NAHB Economics Group and Bank of America, Feb. 2007.  
Lifetime was defined by this reports authors as the average US life expectancy
- E Sustainable Building, Bamboo Flooring, Publication 443-03-017, 2003. CWIMB.  
<http://www.ciwmb.ca.gov/Publications/GreenBuilding/43303017.doc>
- F <http://www.conradfp.com/ns.shtml>  
Wolmanized process, long as house to original owner.  
15-20 others. Use 20
- G 25-year limited warranty - Upnor  
<http://www.uponor-usa.com/~media/Files/Warranties/Plumbing.aspx>  
25-year limited warranty - Zurn  
<http://www.zurn.com/images/pdf/zpm08202.pdf>
- H 50-year limited warranty - CDA  
[http://www.copper.org/applications/plumbing/restools/bsp/50yr\\_wrrnty\\_itms.html](http://www.copper.org/applications/plumbing/restools/bsp/50yr_wrrnty_itms.html)
- I NAHB Report says lifetime
- J Manufacturer's warranty
- K Rheem warranty for Professional Series is 8 years lmted.  
[http://www.rheem.com/products/tank\\_water\\_heaters/electric\\_water\\_heaters/](http://www.rheem.com/products/tank_water_heaters/electric_water_heaters/)
- L <http://www.dauphincd.org/swm/BMPfactsheets/Porous%20Asphalt%20fact%20sheet.pdf>
- M [http://www.asphaltmagazine.com/singlenews.asp?item\\_ID=1178&comm=0&list\\_code\\_int=mag01-int](http://www.asphaltmagazine.com/singlenews.asp?item_ID=1178&comm=0&list_code_int=mag01-int) Indicates 20 years; set even with asphalt.
- MA Based on purchase of a Maintenance Agreement
- N Costs developed via internet survey conducted Nov. 2009.
- O Power utility cost (EIA US average 2009) of less efficient model vs. operation cost of more efficient model based on actual utility usage as modeled or interpolated from computer simulations in Energy Gauge. No calculation of possible water savings was calculated due to difficulty of capturing efficiency and widely fluctuating costs for water service nationwide.
- P Dryer has no estimated savings over any other.
- Q ASHRAE Cost Database
- R Set even to life of vinyl siding (cladding).
- S Based on one hour per year to flush water tank, vacuum driveway, etc.
- T One manufacturer's warranty on heat exchanger. Bosch.

**Indoor Water Usage Calculations**  
**two story townhouse, Oakland, California**

Appliance	Usage Levels	Unit	Avg.	Bayou La Batre, Alabama	Average Daily Per Capita Usage in Gallons <sup>3</sup>	Per Capita Daily Savings (% of Avg.)	Base	Bronze	Silver	Gold	Emerald
Dishwasher	Normal Wash <sup>1</sup>	gal/load	7.3	Dishwasher	1.0		x	x			
	Energy Star <sup>1</sup>		4.9			32.4%			0.3	0.3	0.3
Wash Machine	Normal Wash <sup>2</sup>	gal/load	42.5	Washing Machine	11.6		x	x			
	Energy Star <sup>2</sup>	gal/load	26.8			37.0%			4.3	4.3	
	Water Factor > 6.02	gal/load	18.0			57.6%					6.7
Shower(s)	Std-2.5	gpm	2.5	Showers	11.6						
	flow 2.0-2.5	gpm	2.3			10.0%					
	flow 1.6-2.0	gpm	1.8			28.0%	3.2	3.2	3.2	3.2	3.2
Bathroom Faucets	Std-2.2 gpm	gpm	2.2	Faucets	10.9						
	gpm > 1.5	gpm	1.5			31.8%	3.5	3.5	3.5	3.5	3.5
Toilets	Std-1.6 gpf	gpf	1.6	Toilets	18.5		x	x			
	gpf > 1.28	gpf	1.3			20.0%			3.7	3.7	3.7
				Baths	1.2	0.0%	x	x	x	x	x
				Other	1.6	0.0%	x	x	x	x	x
				<b>Total (gpd/occ)</b>	<b>56.4</b>	n/a	6.7	6.7	15.0	15.0	17.4
				<b>Percent Savings Over Average Daily PC</b>			<b>11.9%</b>	<b>11.9%</b>	<b>26.7%</b>	<b>26.7%</b>	<b>30.9%</b>

Key: gpm= gallons per minute; gpf=gallons per flush; gpd/occ=gallons per day per occupant; PC=Per Capita

<sup>1</sup>Frigidaire Specifications for Normal Wash and Eco Wash.

<sup>2</sup>[http://www.energystar.gov/index.cfm?c=clotheswash.pr\\_tips\\_clothes\\_washers](http://www.energystar.gov/index.cfm?c=clotheswash.pr_tips_clothes_washers)

(Water Factor (WF) measures water efficiency in gallons of water consumed per cubic foot of capacity. The lower the WF, the more water efficient the clothes washer. A water factor of 6.0 is approximately 45% more water efficient than a non-energy star model.)

Both MEF and WF are listed on the ENERGY STAR qualified product list

Based on an estimated 10 loads of laundry per week, larger front-loading washers use only 16-20 gallons of water per load, compared to a conventional top-load washer that requires 40-45 gallons per load. Factoring in the capacity advantage of a large front-loader, (almost twice the load-size of a conventional top-loader), you will use 16-20 gallons compared to 80-90 gallons to get the same amount of laundry cleaned....The ENERGY STAR® logo indicates that a particular washing machine meets or exceeds the US Department of Energy's highest minimum efficiency standards for energy-efficient washers by a at least minimum of 37%.

See also: <http://www.consumerenergycenter.org/home/appliances/washers.html>

<sup>3</sup><http://www.drinktap.org/consumerdnn/Default.aspx?tabid=85>

Source: *Handbook of Water Use and Conservation*, Amy Vickers



# APPENDIX A COST DETAILS

## 3 – Climate Zone #4

### A. Richmond, Virginia



**Operation, Maintenance and Lifetime Replacement Cost**

**18' SFD, Richmond VA**

SF floor area 1,695

SF driveway 405

[http://www.eia.doe.gov/cneaf/electricity/epm/table5\\_6\\_b.html](http://www.eia.doe.gov/cneaf/electricity/epm/table5_6_b.html)

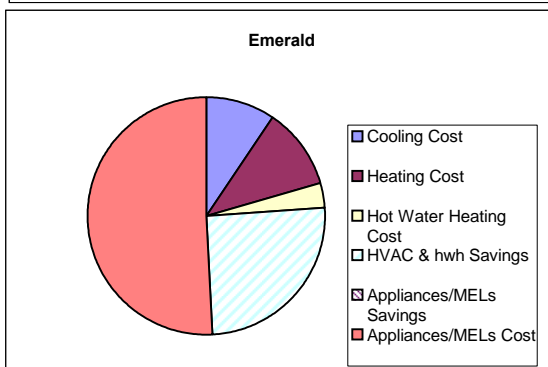
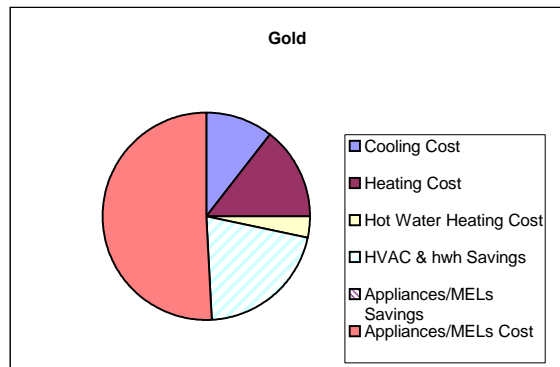
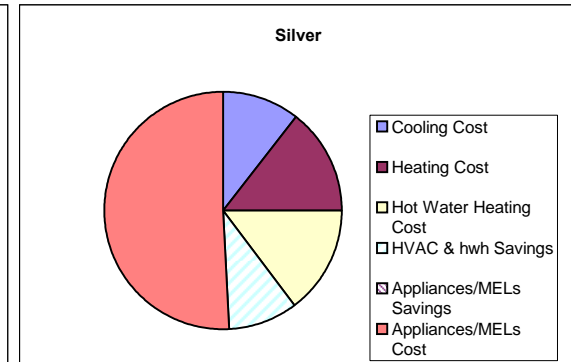
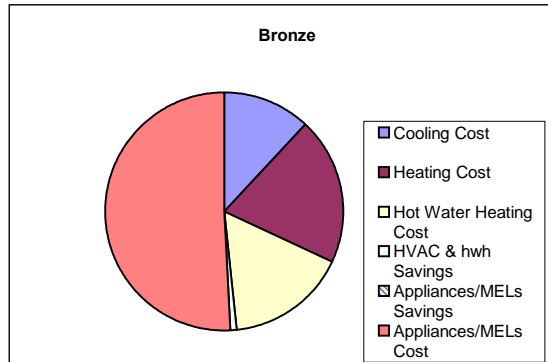
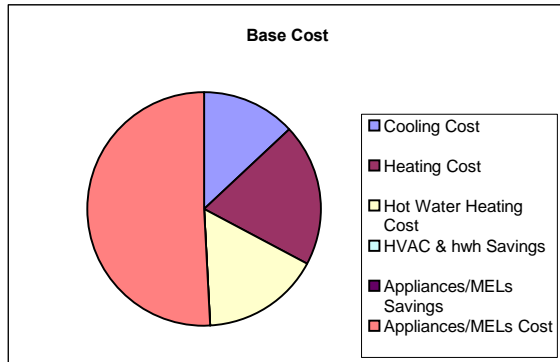
base
bronze
silver
gold
emerald

Component	Subcategory/ Activity	Annual Maint. Cost Per Year	Reference	Annual Maintenance Cost				
				base	bronze	silver	gold	emerald
<b>Appliances</b>								
	D/W	28	MA					
	D/W, Estar	28	MA	28.00	28.00	28.00	28.00	28.00
	Dryer, elec.	52	MA	none supplied				
	Range	42	MA	42.00	42.00	42.00	42.00	42.00
	Refrigerator	74	MA	none supplied				
	Washer	52	MA	none supplied				
<b>Electrical</b>								
	Incandescent Fixtures			0.00	0.00	0.00	0.00	0.00
	Compact Fluorescent Fixtures							
<b>HVAC</b>								
	Air handler, move from attic	0		0.00	0.00	0.00	0.00	0.00
	Heat pump, 13 Seer/7.7 AFUE - 2 ton	156	MA	156.00	156.00			
	Heat Pump, 16 Seer/9.0 AFUE not 13	156	MA			156.00	156.00	
	Heat Pump, 18 Seer/9.5 AFUE not 13	156	MA					156.00
	Ducts, Sealed	0			0.00	0.00	0.00	0.00
	Thermostat, prog.	0			0.00	0.00	0.00	0.00
<b>Insulation</b>								
	Cellulose, R49 not R38	0				0.00	0.00	
	Cellulose, R60 not R38	0						0.00
	Foam, rigid R-5 sheath	0				0.00	0.00	
	Foam, rigid R-10 sheath	0						0.00
<b>Plumbing Appliances &amp; Fixtures</b>								
	W/H, elec. .92	47	S	47.00	47.00			
	W/H, elec. .98,tkls. not .92	47				47.00		
	ICS Solar H/W w. .98 tkls not .92	94					94.00	94.00
<b>Siding</b>								
	Fiber cement	0	A	0.00	0.00	0.00	0.00	0.00
	Vinyl	0						
				<b>273</b>	<b>273</b>	<b>273</b>	<b>320</b>	<b>320</b>

Richmond, Va

Annual Energy Summary	Base	Bronze			Silver			Gold			Emerald		
	Yr \$	Yr \$	savings	percent	Yr \$	savings	percent	Yr \$	savings	percent	Yr \$	savings	percent
Cooling Cost	149	136	13	9%	121	28	19%	121	28	19%	108	41	28%
Heating Cost	229	232	-3	-1%	165	64	28%	165	64	28%	129	100	44%
Hot Water Heating Cost	187	187	0	0%	172	15	8%	39	148	79%	39	148	79%
HVAC & hwh Savings	N/A	10			107			240			289		
Appliances/MELs Savings	N/A	0			0			0			0		
Appliances/MELs Cost	585	585			585			585			585		
HVAC & HWH sub-total	565	555		2%	458		19%	325		42%	276		51%
Grand Total	1150	1140		99%	1043		91%	910		79%	861		75%

Data based on Energy Gauge - Annual Energy Summary. Not Compliance



**Operation, Maintenance and Lifetime Replacement Cost  
18' SFD, Richmond VA**

SF floor area 1,695  
 SF driveway 405  
[http://www.eia.doe.gov/cneaf/electricity/epm/table5\\_6\\_b.html](http://www.eia.doe.gov/cneaf/electricity/epm/table5_6_b.html)

base  
 bronze  
 silver  
 gold  
 emerald

Component	Subcategory/ Activity	Cost New	Reference	Est. Life	Reference	30 year Lifetime Replacement Cost				
						base	bronze	silver	gold	emerald
<b>Appliances</b>										
	D/W	300	N	9	D					
	D/W, Estar	300	N	9	D	1000.00	1000.00	1000.00	1000.00	1000.00
	Dryer, elec.	600	N	13	D	none supplied				
	Range	600	N	13	D	1384.62	1384.62	1384.62	1384.62	1384.62
	Refrigerator	800	N	13	D	none supplied				
	Washer	600	N	10	D	none supplied				
<b>Electrical</b>										
	Incandescent Fixtures	600	N	10	D	1800.00	1800.00	1800.00	1800.00	1800.00
	Compact Fluorescent Fixtures	600	N	10	D					
<b>HVAC</b>										
	Air handler, move from attic		Q	15	D	0.00	0.00	0.00	0.00	0.00
	Heat pump, 13 Seer/7.7 AFUE - 2 ton	3,413	Q	15	D	6825.06	6825.06			
	Heat Pump, 16 Seer/9.0 AFUE not 13	4,884	Q	15	D			9768.62	9768.62	
	Heat Pump, 18 Seer/9.5 AFUE not 13	6,920	Q	15	D					13839.71
	Ducts, Sealed	1,450	Q	10	D					
	Thermostat, prog.	50	N	35	D					
<b>Insulation</b>										
	Cellulose, R49 not R38	791	Q	77	D			308.36	308.36	
	Cellulose, R60 not R38	1,298	Q	77	D					505.67
	Foam, rigid R-5 sheath	2,849	Q	77	R			1109.83	1109.83	
	Foam, rigid R-10 sheath	5,697	Q	77	R					2219.67
<b>Plumbing Appliances &amp; Fixtures</b>										
	W/H, elec. .92	0		11	D	0.00	0.00			
	W/H, elec. .98, tkls. not .92	0		12	T			0.00		
	ICS Solar H/W w. .98 tkls not .92	4,500		13					10384.62	10384.62
<b>Siding</b>										
<b>Fiber cement</b>										
		0		50	J					
<b>Vinyl</b>										
		0		77	D					
						<b>11,010</b>	<b>11,010</b>	<b>15,371</b>	<b>25,756</b>	<b>31,134</b>

- A Power wash and 1 coat repaint for fibercement every 9 years.  
<http://www.sherwin-williams.com/pro/problem/tips/substrates/>
- B <http://www.demesne.info/Home-Maintenance/Appliance-Life-Expectancy.htm>  
 Articles and information for Demesne are contributed by experts and specialists in each area.
- C <http://www.kronotexusa.com/warranty.htm>
- D NAHB/Bank of America Home Equity Study of Life Expectancy of Home Components, 2006.  
 and, Study of Life Expectancy of Home Components, NAHB Economics Group and Bank of America, Feb. 2007.  
 Lifetime was defined by this reports authors as the average US life expectancy
- E Sustainable Building, Bamboo Flooring, Publication 443-03-017, 2003. CWIMB.  
<http://www.ciwmb.ca.gov/Publications/GreenBuilding/43303017.doc>
- F <http://www.conradfp.com/ns.shtml>  
 Wolmanized process, long as house to original owner.  
 15-20 others. Use 20
- G 25-year limited warranty - Upnor  
<http://www.uponor-usa.com/~media/Files/Warranties/Plumbing.aspx>  
 25-year limited warranty - Zurn  
<http://www.zurn.com/images/pdf/zpm08202.pdf>
- H 50-year limited warranty - CDA  
[http://www.copper.org/applications/plumbing/restools/bsp/50yr\\_wrrnty\\_itms.html](http://www.copper.org/applications/plumbing/restools/bsp/50yr_wrrnty_itms.html)
- I NAHB Report says lifetime
- J Manufacturer's warranty
- K Rheem warranty for Professional Series is 8 years lmtd.  
[http://www.rheem.com/products/tank\\_water\\_heaters/electric\\_water\\_heaters/](http://www.rheem.com/products/tank_water_heaters/electric_water_heaters/)
- L <http://www.dauphincd.org/swm/BMPfactsheets/Porous%20Asphalt%20fact%20sheet.pdf>
- M [http://www.asphaltmagazine.com/singlenews.asp?item\\_ID=1178&comm=0&list\\_code\\_int=mag01-int](http://www.asphaltmagazine.com/singlenews.asp?item_ID=1178&comm=0&list_code_int=mag01-int) Indicates 20 years; set even with asphalt.
- MA Based on purchase of a Maintenance Agreement
- N Costs developed via internet survey conducted Nov. 2009.
- O Power utility cost (EIA US average 2009) of less efficient model vs. operation cost of more efficient model based on actual utility usage as modeled or interpolated from computer simulations in Energy Gauge. No calculation of possible water savings was calculated due to difficulty of capturing efficiency and widely fluctuating costs for water service nationwide.
- P Dryer has no estimated savings over any other.
- Q ASHRAE Cost Database
- R Set even to life of vinyl siding (cladding).
- S Based on one hour per year to flush water tank, vacuum driveway, etc.
- T One manufacturer's warranty on heat exchanger. Bosch.
- U <http://www.aceee.org/Consumerguide/waterheating.htm>
- V Savings is reflected in operating cost.
- W ICS solar units typically are installed with a backup DHW source which is not included in this cost example.

**Indoor Water Usage Calculations  
18' SFD, Richmond VA**

Appliance	Usage Levels	Unit	Avg.	Bayou La Batre, Alabama	Average Daily Per Capita Usage in Gallons <sup>3</sup>	Per Capita Daily Savings (% of Avg.)	Base	Bronze	Silver	Gold	Emerald
Dishwasher	Normal Wash <sup>1</sup>	gal/load	7.3	Dishwasher	1.0						
	Energy Star <sup>1</sup>		4.9			32.4%	0.3	0.3	0.3	0.3	0.3
Wash Machine	Normal Wash <sup>2</sup>	gal/load	42.5	Washing Machine	11.6		none supplied				
	Energy Star <sup>2</sup>	gal/load	26.8			37.0%					
	Water Factor > 6.02	gal/load	18.0			57.6%					
Shower(s)	Std-2.5	gpm	2.5	Showers	11.6						
	flow 2.0-2.5	gpm	2.3			10.0%	1.2				
	flow 1.6-2.0	gpm	1.8			28.0%		3.2	3.2	3.2	3.2
Bathroom Faucets	Std-2.2 gpm	gpm	2.2	Faucets	10.9		x				
	gpm > 1.5	gpm	1.5			31.8%		3.5	3.5	3.5	3.5
Toilets	Std-1.6 gpf	gpf	1.6	Toilets	18.5		x	x			
	gpf > 1.28	gpf	1.3			20.0%			3.7	3.7	3.7
				Baths	1.2	0.0%	x	x	x	x	x
				Other	1.6	0.0%	x	x	x	x	x
				<b>Total (gpd/occ)</b>	<b>56.4</b>	n/a	1.5	7.0	10.7	10.7	10.7
				<b>Percent Savings Over Average Daily PC</b>			<b>2.6%</b>	<b>12.5%</b>	<b>19.0%</b>	<b>19.0%</b>	<b>19.0%</b>

Key: gpm= gallons per minute; gpf=gallons per flush; gpd/occ=gallons per day per occupant; PC=Per Capita

<sup>1</sup>Frigidaire Specifications for Normal Wash and Eco Wash.

<sup>2</sup>[http://www.energystar.gov/index.cfm?c=clotheswash.pr\\_tips\\_clothes\\_washers](http://www.energystar.gov/index.cfm?c=clotheswash.pr_tips_clothes_washers)

(Water Factor (WF) measures water efficiency in gallons of water consumed per cubic foot of capacity. The lower the WF, the more water efficient the clothes washer. A water factor of 6.0 is approximately 45% more water efficient than a non-energy star model.)

Both MEF and WF are listed on the ENERGY STAR qualified product list

Based on an estimated 10 loads of laundry per week, larger front-loading washers use only 16-20 gallons of water per load, compared to a conventional top-load washer that requires 40-45 gallons per load. Factoring in the capacity advantage of a large front-loader, (almost twice the load-size of a conventional top-loader), you will use 16-20 gallons compared to 80-90 gallons to get the same amount of laundry cleaned....The ENERGY STAR® logo indicates that a particular washing machine meets or exceeds the US Department of Energy's highest minimum efficiency standards for energy-efficient washers by a at least minimum of 37%.

See also: <http://www.consumerenergycenter.org/home/appliances/washers.html>

<sup>3</sup><http://www.drinktap.org/consumerdnn/Default.aspx?tabid=85>

Source: *Handbook of Water Use and Conservation*, Amy Vickers



# APPENDIX A COST DETAILS

B. Seattle, Washington

**Operation, Maintenance and Lifetime Replacement Cost  
2 story stack multi, Seattle WA**

SF floor area 910  
SF driveway 405  
[http://www.eia.doe.gov/cneaf/electricity/epm/table5\\_6\\_b.html](http://www.eia.doe.gov/cneaf/electricity/epm/table5_6_b.html)

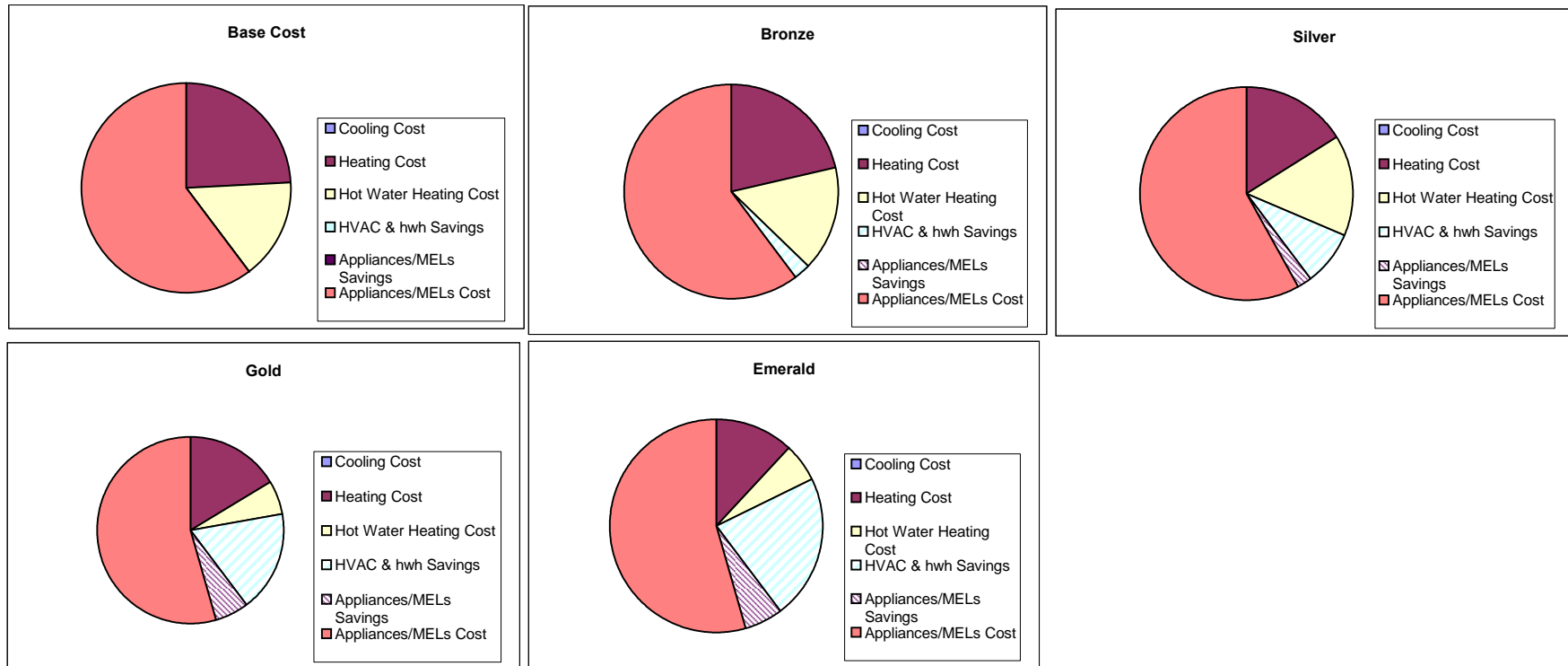
base
bronze
silver
gold
emerald

Component	Subcategory/ Activity	Annual Maint. Cost Per Year	Reference	Annual Maintenance Cost				
				base	bronze	silver	gold	emerald
<b>Appliances</b>								
	D/W, EStar	28	MA	28.00	28.00	28.00	28.00	28.00
	Dryer, elec.	52	MA	52.00	52.00	52.00	52.00	52.00
	Range, gas	42	MA	42.00	42.00	42.00	42.00	42.00
	Refrigerator	74	MA	73.73	73.73			
	Refrigerator, EStar	74	MA			73.73	73.73	73.73
	Washer	52	MA	52.00	52.00			
	Washer, EStar	52	MA			52.00	52.00	52.00
<b>Electrical</b>								
	Incandescent Fixtures			0.00	0.00	0.00		
	Compact Fluorescent Fixtures						0.00	0.00
<b>HVAC</b>								
	Boiler in conditioned	0						
	Boiler 0.90 ef	75	MA	75.00	75.00			
	Boiler 0.94 ef, not 0.90	75	MA			75.00	75.00	75.00
	Thermostat, prog.	0				0.00	0.00	0.00
<b>Insulation</b>								
	Foam, rigid R-5 sheath	0				0.00	0.00	0.00
	Foam, rigid R-10 sheath	0					0.00	0.00
<b>Plumbing Appliances &amp; Fixtures</b>								
	Boiler 0.90 ef		S	see hvac	see hvac			
	Boiler 0.94 ef, not 0.90		S			see hvac		
	Solar H/W w/ 0.94 boiler	0					see hvac	see hvac
<b>Siding</b>								
Fiber cement		0	A	0.00	0.00	0.00	0.00	0.00
				<b>323</b>	<b>323</b>	<b>323</b>	<b>323</b>	<b>323</b>

Seattle, Washington

Annual Energy Summary	Base	Bronze			Silver			Gold			Emerald		
	Yr \$	Yr \$	savings	percent	Yr \$	savings	percent	Yr \$	savings	percent	Yr \$	savings	percent
Cooling Cost	0	0	0		0	0		0	0		0	0	
Heating Cost	148	132	16	11%	99	49	33%	101	47	32%	74	74	50%
Hot Water Heating Cost	97	97	0	0%	94	3	3%	36	61	63%	35	62	64%
HVAC & hwh Savings	N/A	16			52			108			136		
Appliances/MELs Savings	N/A	0			13			35			35		
Appliances/MELs Cost	370	370			357			335			335		
HVAC & HWH sub-total	245	229		7%	193		21%	137		44%	109		56%
Grand Total	615	599		97%	550		89%	472		77%	444		72%

Data based on Energy Gauge - Annual Energy Summary. Not Compliance





**Operation, Maintenance and Lifetime Replacement Cost**

**2 story stack multi, Seattle WA**

SF floor area 910

SF driveway 405

[http://www.eia.doe.gov/cneaf/electricity/epm/table5\\_6\\_b.html](http://www.eia.doe.gov/cneaf/electricity/epm/table5_6_b.html)

base
bronze
silver
gold
emerald

Component	Subcategory/ Activity	Cost New	Reference	Est. Life	Reference	30 year Lifetime Replacement Cost				
						base	bronze	silver	gold	emerald
<b>Appliances</b>										
	D/W, Estar	300	N	9	D	1000.00	1000.00	1000.00	1000.00	1000.00
	Dryer, elec.	600	N	13	D	1384.62	1384.62	1384.62	1384.62	1384.62
	Range, gas	600	N	13	D	1384.62	1384.62	1384.62	1384.62	1384.62
	Refrigerator	800	N	13	D	1846.15	1846.15			
	Refrigerator, Estar	1,200	N	13	D			2769.23	2769.23	2769.23
	Washer	600	N	10	D	1800.00	1800.00			
	Washer, EStar	1,100	N	10	D			3300.00	3300.00	3300.00
<b>Electrical</b>										
	Incandescent Fixtures	600	N	10	D	1800.00	1800.00	1800.00		
	Compact Fluorescent Fixtures	600	N	10	D				1800.00	1800.00
<b>HVAC</b>										
	Boiler in conditioned	0	Q	15	D					
	Boiler 0.90 ef	3,046	Q	15	D	6092.80	6092.80			
	Boiler 0.94 ef, not 0.90	3,584	Q	15	D			7168.00	7168.00	7168.00
	Thermostat, prog.	50	N	35	D					
<b>Insulation</b>										
	Foam, rigid R-5 sheath	1,280	Q	77	R			498.52	498.52	498.52
	Foam, rigid R-10 sheath	2,559	Q	77	R				997.04	997.04
<b>Plumbing Appliances &amp; Fixtures</b>										
	Boiler 0.90 ef	see hvac		11	D	see hvac	see hvac			
	Boiler 0.94 ef, not 0.90	see hvac		11	D			see hvac		
	Solar H/W w/ 0.94 boiler	6,500		13					see hvac	see hvac
<b>Siding</b>										
	Fiber cement	0		50	J	0.00	0.00	0.00	0.00	0.00
						<b>15,308</b>	<b>15,308</b>	<b>19,305</b>	<b>20,302</b>	<b>20,302</b>

- A Power wash and 1 coat repaint for fibercement every 9 years.
- C <http://www.kronotexusa.com/warranty.htm>
- D NAHB/Bank of America Home Equity Study of Life Expectancy of Home Components, 2006.  
and, Study of Life Expectancy of Home Components, NAHB Economics Group and Bank of America, Feb. 2007.
- I NAHB Report says lifetime
- M [http://www.asphaltmagazine.com/singlenews.asp?item\\_ID=1178&comm=0&list\\_code\\_int=mag01-int](http://www.asphaltmagazine.com/singlenews.asp?item_ID=1178&comm=0&list_code_int=mag01-int) Indicates 20 years; set even with asphalt.
- MA Based on purchase of a Maintenance Agreement
- N Costs developed via internet survey conducted Nov. 2009.
- O Power utility cost (EIA US average 2009) of less efficient model vs. operation cost of more efficient model based on actual utility usage as modeled or interpolated from computer simulations in Energy Gauge. No calculation of possible water savings was calculated due to difficulty of capturing efficiency and widely fluctuating costs for water service nationwide.
- P Dryer has no estimated savings over any other.
- Q ASHRAE Cost Database
- R Set even to life of vinyl siding (cladding).
- S Based on one hour per year to flush water tank, vacuum driveway, etc.
- T One manufacturer's warranty on heat exchanger. Bosch.
- U <http://www.aceee.org/Consumerguide/waterheating.htm>
- V Savings is reflected in operating cost.
- W ICS solar units typically are installed with a backup DHW source which is not included in this cost example.

**Indoor Water Usage Calculations**  
**2 story stack multi, Seattle WA**

Appliance	Usage Levels	Unit	Avg.	Bayou La Batre, Alabama	Average Daily Per Capita Usage in Gallons <sup>3</sup>	Per Capita Daily Savings (% of Avg.)	Base	Bronze	Silver	Gold	Emerald
Dishwasher	Normal Wash <sup>1</sup>	gal/load	7.3	Dishwasher	1.0						
	Energy Star <sup>1</sup>		4.9			32.4%	0.3	0.3	0.3	0.3	0.3
Wash Machine	Normal Wash <sup>2</sup>	gal/load	42.5	Washing Machine	11.6		x	x			
	Energy Star <sup>2</sup>	gal/load	26.8			37.0%			4.3	4.3	
	Water Factor > 6.02	gal/load	18.0			57.6%					6.7
Shower(s)	Std-2.5	gpm	2.5	Showers	11.6		x				
	flow 2.0-2.5	gpm	2.3			10.0%		1.2			
	flow 1.6-2.0	gpm	1.8			28.0%			3.2	3.2	3.2
Bathroom Faucets	Std-2.2 gpm	gpm	2.2	Faucets	10.9		x				
	gpm > 1.5	gpm	1.5			31.8%		3.5	3.5	3.5	3.5
Toilets	Std-1.6 gpf	gpf	1.6	Toilets	18.5		x	x			
	gpf > 1.28	gpf	1.3			20.0%			3.7	3.7	3.7
				Baths	1.2	0.0%	x	x	x	x	x
				Other	1.6	0.0%	x	x	x	x	x
				<b>Total (gpd/occ)</b>	<b>56.4</b>	n/a	0.3	5.0	15.0	15.0	17.4
				<b>Percent Savings Over Average Daily PC</b>			<b>0.6%</b>	<b>8.8%</b>	<b>26.7%</b>	<b>26.7%</b>	<b>30.9%</b>

Key: gpm= gallons per minute; gpf=gallons per flush; gpd/occ=gallons per day per occupant; PC=Per Capita

<sup>1</sup>Frigidaire Specifications for Normal Wash and Eco Wash.

<sup>2</sup>[http://www.energystar.gov/index.cfm?c=clotheswash.pr\\_tips\\_clothes\\_washers](http://www.energystar.gov/index.cfm?c=clotheswash.pr_tips_clothes_washers)

(Water Factor (WF) measures water efficiency in gallons of water consumed per cubic foot of capacity. The lower the WF, the more water efficient the clothes washer. A water factor of 6.0 is approximately 45% more water efficient than a non-energy star model.)

Both MEF and WF are listed on the ENERGY STAR qualified product list

Based on an estimated 10 loads of laundry per week, larger front-loading washers use only 16-20 gallons of water per load, compared to a conventional top-load washer that requires 40-45 gallons per load. Factoring in the capacity advantage of a large front-loader, (almost twice the load-size of a conventional top-loader), you will use 16-20 gallons compared to 80-90 gallons to get the same amount of laundry cleaned....The ENERGY STAR® logo indicates that a particular washing machine meets or exceeds the US Department of Energy's highest minimum efficiency standards for energy-efficient washers by a at least minimum of 37%.

See also: <http://www.consumerenergycenter.org/home/appliances/washers.html>

<sup>3</sup><http://www.drinktap.org/consumerdnn/Default.aspx?tabid=85>

Source: *Handbook of Water Use and Conservation*, Amy Vickers



# APPENDIX A COST DETAILS

## 4 – Climate Zone #5

### A. Akron, Ohio – Townhouse

**Operation, Maintenance and Lifetime Replacement Cost**

Akron, OH - TC Project 14-A-08 - TownHouse - A unit

SF floor area

1296

SF driveway

250

[http://www.eia.doe.gov/cneaf/electricity/epm/table5\\_6\\_b.html](http://www.eia.doe.gov/cneaf/electricity/epm/table5_6_b.html)

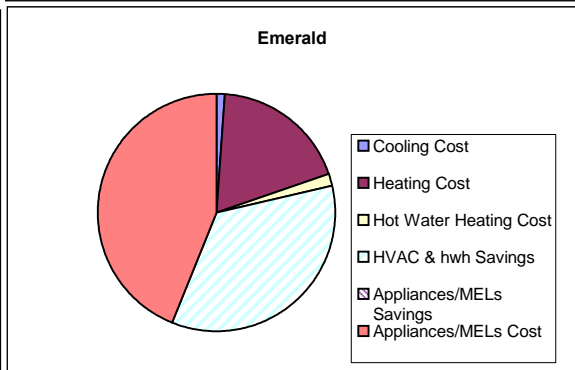
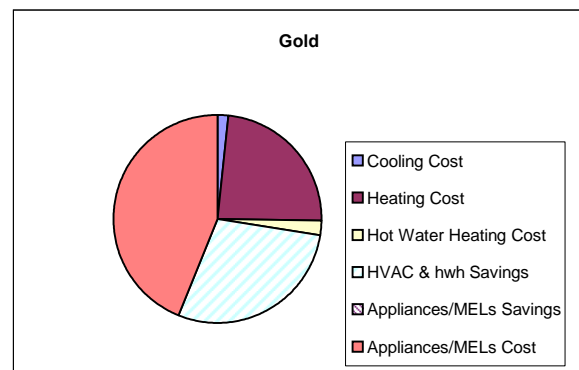
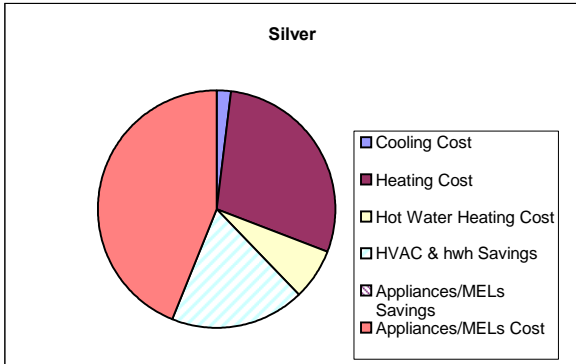
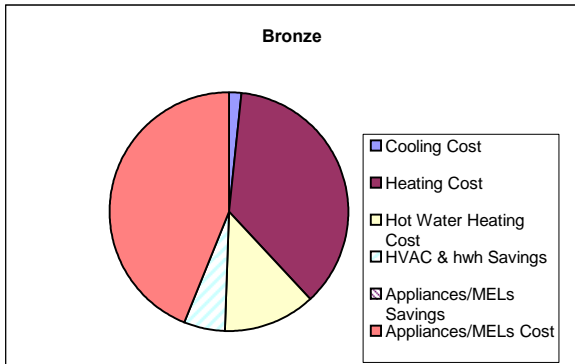
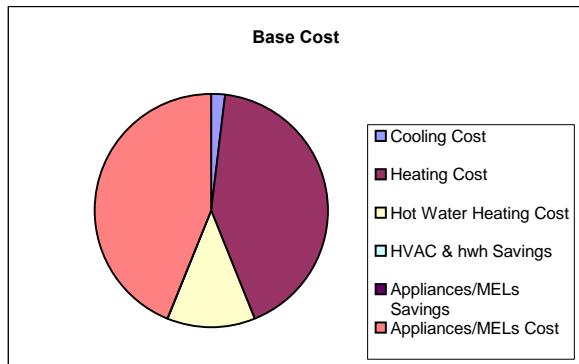
base  
bronze  
silver  
gold  
emerald

Component	Subcategory/ Activity	Annual Maint. Cost Per Year	Reference	Annual Maintenance Cost				
				base	bronze	silver	gold	emerald
<b>Appliances</b>								
	D/W, Estar	28	MA	28.00	28.00	28.00	28.00	28.00
	Refrigerator, Estar	74	MA	73.73	73.73	73.73	73.73	73.73
	Washer/Dryer Stack, Estar	62	MA	62.00	62.00	62.00	62.00	62.00
<b>Electrical</b>								
	Incandescent Fixtures							
	Compact Flourescent Fixtures			0.00	0.00	0.00	0.00	0.00
<b>HVAC</b>								
	Air handler, move from attic	0						
	Furnace, 92% AFUE not 78% 40-50 kbtu	156	MA	156.00	156.00	156.00	156.00	
	Furnace, 96% AFUE not 78% 40-50 kbtu	156	MA					156.00
	Ducts, Sealed	0			0.00	0.00	0.00	0.00
	Thermostat, prog.	0			0.00	0.00	0.00	0.00
<b>Insulation</b>								
	Cellulose, R49 not R38	0						
	Cellulose, R60 not R38	0						
<b>Plumbing Appliances &amp; Fixtures</b>								
	Water heater, gas 0.59	47		47.00	47.00			
	W/H. gas. .82 tankless not .59	47						
	W/H. gas. .92 tankless not .59	47				47.00		
	W/H. gas. .92 tankless not .59 w/Closed Loop Solar	94					94.00	94.00
<b>Siding</b>								
<b>Brick</b>								
<b>Fiber cement</b>		0	A	0.00	0.00	0.00	0.00	0.00
				<b>367</b>	<b>367</b>	<b>367</b>	<b>414</b>	<b>414</b>

Akron, Ohio  
A - Unit (townhouse)

Annual Energy Summary	Base	Bronze			Silver			Gold			Emerald		
	Yr \$	Yr \$	savings	percent	Yr \$	savings	percent	Yr \$	savings	percent	Yr \$	savings	percent
Cooling Cost	22	20	2	9%	21	1	5%	20	2	9%	14	8	36%
Heating Cost	485	420	65	13%	335	150	31%	273	212	44%	215	270	56%
Hot Water Heating Cost	143	144	-1	-1%	82	61	43%	24	119	83%	19	124	87%
HVAC & hwh Savings	N/A	66			212			333			402		
Appliances/MELs Savings	N/A	0			0			0			0		
Appliances/MELs Cost	508	508			508			508			508		
HVAC & HWH sub-total	650	584		10%	438		33%	317		51%	248		62%
Grand Total	1158	1092		94%	946		82%	825		71%	756		65%

Data based on Energy Gauge - Annual Energy Summary. Not Compliance



**Operation, Maintenance and Lifetime Replacement Cost**

**Akron, OH - TC Project 14-A-08 - TownHouse - A unit**

SF floor area

1296

SF driveway

250

[http://www.eia.doe.gov/cneaf/electricity/epm/table5\\_6\\_b.html](http://www.eia.doe.gov/cneaf/electricity/epm/table5_6_b.html)

base
bronze
silver
gold
emerald

Component	Subcategory/ Activity	Cost New	Reference	Est. Life	Reference	30 year Lifetime Replacement Cost				
						base	bronze	silver	gold	emerald
<b>Appliances</b>										
	D/W, Estar	300	N	9	D	1000.00	1000.00	1000.00	1000.00	1000.00
	Refrigerator, Estar	800	N	13	D	1846.15	1846.15	1846.15	1846.15	1846.15
	Washer/Dryer Stack, Estar	1,300	N	10	D	3900.00	3900.00	3900.00	3900.00	3900.00
<b>Electrical</b>										
	Incandescent Fixtures	600	N	10	D					
	Compact Fluorescent Fixtures	600	N	10	D	1800.00	1800.00	1800.00	1800.00	1800.00
<b>HVAC</b>										
	Air handler, move from attic	680	Q	15	D					
	Furnace, 92% AFUE not 78% 40-50 kbtu	1,474	Q	15	D	2947.97	2947.97	2947.97	2947.97	
	Furnace, 96% AFUE not 78% 40-50 kbtu	2,445	Q	15	D					4889.80
	Ducts, Sealed	1,450	Q	10	D					
	Thermostat, prog.	50	N	35	D					
<b>Insulation</b>										
	Cellulose, R49 not R38	605	Q	77	D					
	Cellulose, R60 not R38	992	Q	77	D					
<b>Plumbing Appliances &amp; Fixtures</b>										
	Water heater, gas 0.59	528		10	D	1584.00	1584.00			
	W/H. gas. .82 tankless not .59	822		13	D					
	W/H. gas. .92 tankless not .59	1,267		13	D			2923.85		
	W/H. gas. .92 tankless not .59 w/Closed Loop Solar	7,767		13	D				17923.85	17923.85
<b>Siding</b>										
<b>Brick</b>										
				77	D					
<b>Fiber cement</b>										
		0		50	J					0.00
						<b>13,078</b>	<b>13,078</b>	<b>14,418</b>	<b>29,418</b>	<b>31,360</b>

- A Power wash and 1 coat repaint for fibercement every 9 years.  
<http://www.sherwin-williams.com/pro/problem/tips/substrates/>
- B <http://www.demesne.info/Home-Maintenance/Appliance-Life-Expectancy.htm>  
 Articles and information for Demesne are contributed by experts and specialists in each area.
- C <http://www.kronotexusa.com/warranty.htm>
- D NAHB/Bank of America Home Equity Study of Life Expectancy of Home Components, 2006.  
 and, Study of Life Expectancy of Home Components, NAHB Economics Group and Bank of America, Feb. 2007.  
 Lifetime was defined by this reports authors as the average US life expectancy
- E Sustainable Building, Bamboo Flooring, Publication 443-03-017, 2003. CWIMB.  
<http://www.ciwmb.ca.gov/Publications/GreenBuilding/43303017.doc>
- F <http://www.conradfp.com/ns.shtml>  
 Wolmanized process, long as house to original owner.  
 15-20 others. Use 20
- G 25-year limited warranty - Upnor  
<http://www.uponor-usa.com/~media/Files/Warranties/Plumbing.aspx>  
 25-year limited warranty - Zurn  
<http://www.zurn.com/images/pdf/zpm08202.pdf>
- H 50-year limited warranty - CDA  
[http://www.copper.org/applications/plumbing/restools/bsp/50yr\\_wrrnty\\_itms.html](http://www.copper.org/applications/plumbing/restools/bsp/50yr_wrrnty_itms.html)
- I NAHB Report says lifetime
- J Manufacturer's warranty
- K Rheem warranty for Professional Series is 8 years lmtd.  
[http://www.rheem.com/products/tank\\_water\\_heaters/electric\\_water\\_heaters/](http://www.rheem.com/products/tank_water_heaters/electric_water_heaters/)
- L <http://www.dauphincd.org/swm/BMPfactsheets/Porous%20Asphalt%20fact%20sheet.pdf>
- M [http://www.asphaltmagazine.com/singlenews.asp?item\\_ID=1178&comm=0&list\\_code\\_int=mag01-int](http://www.asphaltmagazine.com/singlenews.asp?item_ID=1178&comm=0&list_code_int=mag01-int) Indicates 20 years; set even with asphalt.
- MA Based on purchase of a Maintenance Agreement
- N Costs developed via internet survey conducted Nov. 2009.
- O Power utility cost (EIA US average 2009) of less efficient model vs. operation cost of more efficient model based on actual utility usage as modeled or interpolated from computer simulations in Energy Gauge. No calculation of possible water savings was calculated due to difficulty of capturing efficiency and widely fluctuating costs for water service nationwide.
- P Dryer has no estimated savings over any other.
- Q ASHRAE Cost Database
- R Set even to life of vinyl siding (cladding).
- S Based on one hour per year to flush water tank, vacuum driveway, etc.
- T One manufacturer's warranty on heat exchanger. Bosch.



### Indoor Water Usage Calculations

Akron, OH - TC Project 14-A-08 - TownHouse - A unit

Appliance	Usage Levels	Unit	Avg.	Townhouse, Akron, OH	Average Daily Per Capita Usage in Gallons <sup>3</sup>	Per Capita Daily Savings as % of Avg.	Base	Bronze	Silver	Gold	Emerald
Dishwasher	Normal Wash <sup>1</sup>	gal/load	7.3	<b>Dishwasher</b>	1.0	32.4%	0.3	0.3	0.3	0.3	0.3
	Energy Star <sup>1</sup>		4.9								
Wash Machine	Normal Wash <sup>2</sup>	gal/load	42.5	<b>Washing Machine</b>	11.6	37.0%	4.3	4.3	4.3	4.3	4.3
	Energy Star <sup>2</sup>	gal/load	26.8								
	Water Factor > 6.0 <sup>2</sup>	gal/load	18.0								
Shower(s)	Std-2.5	gpm	2.5	<b>Showers</b>	11.6	10.0%	1.2				
	flow 2.0-2.5	gpm	2.3								
	flow 1.6-2.0	gpm	1.8								
Bathroom Faucets	Std-2.2 gpm	gpm	2.2	<b>Faucets</b>	10.9	31.8%				3.5	3.5
	gpm > 1.5	gpm	1.5								
Toilets	Std-1.6 gpf	gpf	1.6	<b>Toilets</b>	18.5	20.0%				3.7	3.7
	gpf > 1.28	gpf	1.3								
<b>Baths</b>					1.2	0.0%					
<b>Other</b>					1.6	0.0%					
<b>Total (gpd/occ)</b>					56.4	n/a	5.8	7.9	7.9	15.0	15.0
<b>Percent Savings Over Average Daily PC</b>							10.2%	13.9%	13.9%	26.7%	26.7%

Key: gpm= gallons per minute; gpf=gallons per flush; gpd/occ=gallons per day per occupant

<sup>1</sup>Frigidaire Specifications for Normal Wash and Eco Wash.

<sup>2</sup>[http://www.energystar.gov/index.cfm?c=clotheswash.pr\\_tips\\_clothes\\_washers](http://www.energystar.gov/index.cfm?c=clotheswash.pr_tips_clothes_washers)

(Water Factor (WF) measures water efficiency in gallons of water consumed per cubic foot of capacity. The lower the WF, the more water efficient the clothes washer. A water factor of 6.0 is approximately 45% more water efficient than a non-energy star model.)

Both MEF and WF are listed on the ENERGY STAR qualified product list

Based on an estimated 10 loads of laundry per week, larger front-loading washers use only 16-20 gallons of water per load, compared to a conventional top-load washer that requires 40-45 gallons per load. Factoring in the capacity advantage of a large front-loader, (almost twice the load-size of a conventional top-loader), you will use 16-20 gallons compared to 80-90 gallons to get the same amount of laundry cleaned....The ENERGY STAR® logo indicates that a particular washing machine meets or exceeds the US Department of Energy's highest minimum efficiency standards for energy-efficient washers by a at least minimum of 37%.

See also: <http://www.consumerenergycenter.org/home/appliances/washers.html>

<sup>3</sup><http://www.drinktap.org/consumerdnn/Default.aspx?tabid=85>

Source: Handbook of Water Use and Conservation, Amy Vickers



# APPENDIX A COST DETAILS

B. Akron, Ohio - Single Family Home

**Operation, Maintenance and Lifetime Replacement Cost**

Akron, OH - TC Project 14-A-08 - Single Family - D unit

SF floor area

1,908

SF driveway

405

[http://www.eia.doe.gov/cneaf/electricity/epm/table5\\_6\\_b.html](http://www.eia.doe.gov/cneaf/electricity/epm/table5_6_b.html)

base
bronze
silver
gold
emerald

Component	Subcategory/ Activity	Annual Maint. Cost Per Year	Reference	Annual Maintenance Cost				
				base	bronze	silver	gold	emerald
<b>Appliances</b>								
	D/W, Estar	28	MA	28.00	28.00	28.00	28.00	28.00
	Refrigerator, Estar	74	MA	73.73	73.73	73.73	73.73	73.73
	Washer/Dryer Stack, Estar	62	MA	62.00	62.00	62.00	62.00	62.00
<b>Electrical</b>								
	Incandescent Fixtures							
	Compact Fluorescent Fixtures			0.00	0.00	0.00	0.00	0.00
<b>HVAC</b>								
	Air handler, move from attic	0						
	Furnace, 92% AFUE not 78% 40-50 kbtu	156	MA	156.00	156.00	156.00	156.00	
	Furnace, 96% AFUE not 78% 40-50 kbtu	156	MA					156.00
	Ducts, Sealed	0			0.00	0.00	0.00	0.00
	Thermostat, prog.	0			0.00	0.00	0.00	0.00
<b>Insulation</b>								
	Cellulose, R49 not R38	0						
	Cellulose, R60 not R38	0						
	Foam, rigid R-5 sheath	0						
	Foam, rigid R-10 sheath	0						
<b>Plumbing Appliances &amp; Fixtures</b>								
	Water heater, gas 0.59	47		47.00	47.00			
	W/H. gas. .82 tankless not .59	47						
	W/H. gas. .92 tankless not .59	47				47.00		
	W/H. gas. .92 tankless not .59 w/Closed Loop Solar	94					94.00	94.00
<b>Siding</b>								
<b>Brick</b>								
<b>Fiber cement</b>		0	A	0.00	0.00	0.00	0.00	0.00
				<b>367</b>	<b>367</b>	<b>367</b>	<b>414</b>	<b>414</b>

Akron, Ohio  
D - Unit (single family home)

Annual Energy Summary	Base	Bronze			Silver			Gold			Emerald		
	Yr \$	Yr \$	savings	percent	Yr \$	savings	percent	Yr \$	savings	percent	Yr \$	savings	percent
Cooling Cost	43	40	3	7%	40	3	7%	39	4	9%	23	20	47%
Heating Cost	749	679	70	9%	543	206	28%	422	327	44%	219	530	71%
Hot Water Heating Cost	182	182	0	0%	114	68	37%	39	143	79%	39	143	79%
HVAC & hwh Savings	N/A	73			277			474			693		
Appliances/MELs Savings	N/A	0			0			0			0		
Appliances/MELs Cost	711	711			711			711			711		
HVAC & HWH sub-total	974	901		7%	697		28%	500		49%	281		71%
Grand Total	1685	1612		96%	1408		84%	1211		72%	992		59%

Data based on Energy Gauge - Annual Energy Summary. Not Compliance



**Operation, Maintenance and Lifetime Replacement Cost**

Akron, OH - TC Project 14-A-08 - Single Family - D unit

SF floor area

1,908

SF driveway

405

[http://www.eia.doe.gov/cneaf/electricity/epm/table5\\_6\\_b.html](http://www.eia.doe.gov/cneaf/electricity/epm/table5_6_b.html)

base  
bronze  
silver  
gold  
emerald

Component	Subcategory/ Activity	Cost New	Reference	Est. Life	30 year Lifetime Replacement Cost					
					base	bronze	silver	gold	emerald	
<b>Appliances</b>										
	D/W, Estar	300	N	9	D	1000.00	1000.00	1000.00	1000.00	1000.00
	Refrigerator, Estar	800	N	13	D	1846.15	1846.15	1846.15	1846.15	1846.15
	Washer/Dryer Stack, Estar	1,300	N	10	D	3900.00	3900.00	3900.00	3900.00	3900.00
<b>Electrical</b>										
	Incandescent Fixtures	600	N	10	D					
	Compact Fluorescent Fixtures	600	N	10	D	1800.00	1800.00	1800.00	1800.00	1800.00
<b>HVAC</b>										
	Air handler, move from attic	680	Q	15	D					
	Furnace, 92% AFUE not 78% 40-50 kbtu	1,474	Q	15	D	2947.97	2947.97	2947.97	2947.97	
	Furnace, 96% AFUE not 78% 40-50 kbtu	2,445	Q	15	D					4889.80
	Ducts, Sealed	1,450	Q	10	D					
	Thermostat, prog.	50	N	35	D					
<b>Insulation</b>										
	Cellulose, R49 not R38	891	Q	77	D					
	Cellulose, R60 not R38	1,461	Q	77	D					
	Foam, rigid R-5 sheath	0	Q	77	R					
	Foam, rigid R-10 sheath	0	Q	77	R					
<b>Plumbing Appliances &amp; Fixtures</b>										
	Water heater, gas 0.59	528		10	D	1584.00	1584.00			
	W/H. gas. .82 tankless not .59	822		13	D					
	W/H. gas. .92 tankless not .59	1,267		13	D			2923.85		
	W/H. gas. .92 tankless not .59 w/Closed Loop Solar	7,767		13	D				17923.85	17923.85
<b>Siding</b>										
<b>Brick</b>				77	D					
<b>Fiber cement</b>		0		50	J					0.00
						<b>13,078</b>	<b>13,078</b>	<b>14,418</b>	<b>29,418</b>	<b>31,360</b>

- A Power wash and 1 coat repaint for fibercement every 9 years.  
<http://www.sherwin-williams.com/pro/problem/tips/substrates/>
- B <http://www.demesne.info/Home-Maintenance/Appliance-Life-Expectancy.htm>  
 Articles and information for Demesne are contributed by experts and specialists in each area.
- C <http://www.kronotexusa.com/warranty.htm>
- D NAHB/Bank of America Home Equity Study of Life Expectancy of Home Components, 2006.  
 and, Study of Life Expectancy of Home Components, NAHB Economics Group and Bank of America, Feb. 2007.  
 Lifetime was defined by this reports authors as the average US life expectancy
- E Sustainable Building, Bamboo Flooring, Publication 443-03-017, 2003. CWIMB.  
<http://www.ciwmb.ca.gov/Publications/GreenBuilding/43303017.doc>
- F <http://www.conradfp.com/ns.shtml>  
 Wolmanized process, long as house to original owner.  
 15-20 others. Use 20
- G 25-year limited warranty - Upnor  
<http://www.uponor-usa.com/~media/Files/Warranties/Plumbing.aspx>  
 25-year limited warranty - Zurn  
<http://www.zurn.com/images/pdf/zpm08202.pdf>
- H 50-year limited warranty - CDA  
[http://www.copper.org/applications/plumbing/restools/bsp/50yr\\_wrrnty\\_itms.html](http://www.copper.org/applications/plumbing/restools/bsp/50yr_wrrnty_itms.html)
- I NAHB Report says lifetime
- J Manufacturer's warranty
- K Rheem warranty for Professional Series is 8 years lmtd.  
[http://www.rheem.com/products/tank\\_water\\_heaters/electric\\_water\\_heaters/](http://www.rheem.com/products/tank_water_heaters/electric_water_heaters/)
- L <http://www.dauphincd.org/swm/BMPfactsheets/Porous%20Asphalt%20fact%20sheet.pdf>
- M [http://www.asphaltmagazine.com/singlenews.asp?item\\_ID=1178&comm=0&list\\_code\\_int=mag01-int](http://www.asphaltmagazine.com/singlenews.asp?item_ID=1178&comm=0&list_code_int=mag01-int) Indicates 20 years; set even with asphalt.
- MA Based on purchase of a Maintenance Agreement
- N Costs developed via internet survey conducted Nov. 2009.
- O Power utility cost (EIA US average 2009) of less efficient model vs. operation cost of more efficient model based on actual utility usage as modeled or interpolated from computer simulations in Energy Gauge. No calculation of possible water savings was calculated due to difficulty of capturing efficiency and widely fluctuating costs for water service nationwide.
- P Dryer has no estimated savings over any other.
- Q ASHRAE Cost Database
- R Set even to life of vinyl siding (cladding).
- S Based on one hour per year to flush water tank, vacuum driveway, etc.
- T One manufacturer's warranty on heat exchanger. Bosch.
- U <http://www.aceee.org/Consumerguide/waterheating.htm>
- V Savings is reflected in operating cost.
- W ICS solar units typically are installed with a backup DHW source which is not included in this cost example.

**Indoor Water Usage Calculations**

Akron, OH - TC Project 14-A-08 - Single Family - D unit

Appliance	Usage Levels	Unit	Avg.	Single Family, Akron, OH	Average Daily Per Capita Usage in Gallons <sup>3</sup>	Per Capita Daily Savings as % of Avg.	Base	Bronze	Silver	Gold	Emerald						
Dishwasher	Normal Wash1	gal/load	7.3	<b>Dishwasher</b>	1.0												
	Energy Star1		4.9									32.4%	0.3	0.3	0.3	0.3	0.3
Wash Machine	Normal Wash2	gal/load	42.5	<b>Washing Machine</b>	11.6												
	Energy Star2	gal/load	26.8									37.0%	4.3	4.3	4.3	4.3	4.3
	Water Factor > 6.02	gal/load	18.0									57.6%					
Shower(s)	Std-2.5	gpm	2.5	<b>Showers</b>	11.6												
	flow 2.0-2.5	gpm	2.3									10.0%					
	flow 1.6-2.0	gpm	1.8									28.0%	3.2	3.2	3.2	3.2	3.2
Bathroom Faucets	Std-2.2 gpm	gpm	2.2	<b>Faucets</b>	10.9												
	gpm > 1.5	gpm	1.5									31.8%	3.5	3.5	3.5	3.5	3.5
Toilets	Std-1.6 gpf	gpf	1.6	<b>Toilets</b>	18.5												
	gpf > 1.28	gpf	1.3									20.0%				3.7	3.7
<b>Baths</b>					1.2	0.0%											
<b>Other</b>					1.6	0.0%											
<b>Total (gpd/occ)</b>					56.4	n/a	11.3	11.3	11.3	15.0	15.0						
<b>Percent Savings Over Average Daily PC</b>							20.1%	20.1%	20.1%	26.7%	26.7%						



# APPENDIX A COST DETAILS

C. Cuyahoga, Ohio



**Operation, Maintenance and Lifetime Replacement Cost  
Valley View Apartments (Cuyahoga, OH)  
1 bedroom apt.**

2/17/2010

SF floor area

658

base  
bronze  
silver  
gold  
emerald

[http://www.eia.doe.gov/cneaf/electricity/epm/table5\\_6\\_b.html](http://www.eia.doe.gov/cneaf/electricity/epm/table5_6_b.html)

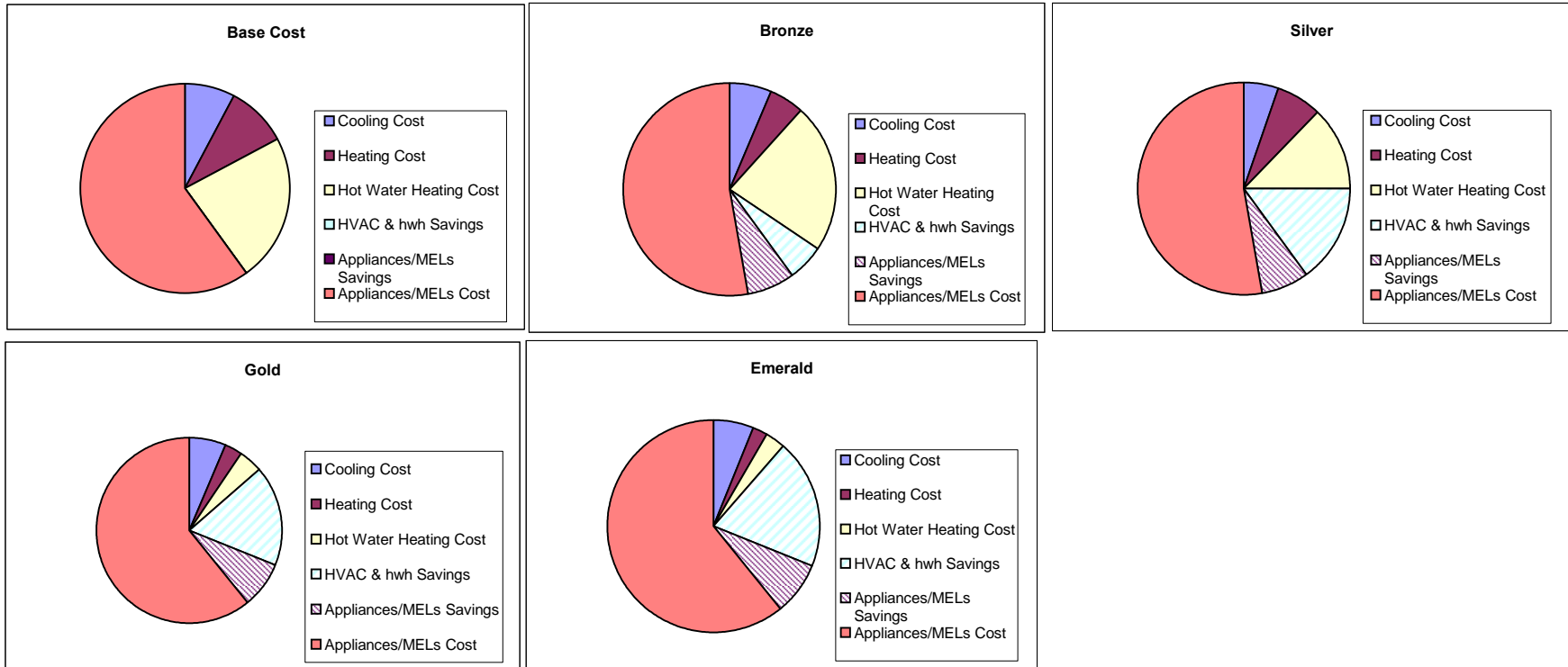
Component	Subcategory/ Activity	Annual Maint. Cost Per Year	Reference	Annual Maintenance Cost				
				base	bronze	silver	gold	emerald
<b>Appliances</b>								
	D/W, Estar	28	MA	28.00	28.00	28.00	28.00	28.00
	Dryer, elec.	52	MA	52.00	52.00	52.00	52.00	52.00
	Range	42	MA	42.00	42.00	42.00	42.00	42.00
	Refrigerator	74	MA	73.73	73.73	73.73	73.73	73.73
	Washer	52	MA	52.00	52.00	52.00	52.00	
	Washer, EStar	87	MA					86.67
<b>Electrical</b>								
	Incandescent Fixtures	0		0.00				
	50% CFLs	0			0.00	0.00	0.00	0.00
<b>HVAC</b>								
	Heat pump, 13 Seer/7.7 AFUE - 1.5 ton	156	MA	156.00				
	Heat pump, 13 Seer/8.2 AFUE - 1.5 ton	156	MA		156.00			
	A/C, 14 SEER, 1.5 ton	78	MA			78.00	78.00	
	A/C, 16 SEER, 1.5 ton	78	MA					78.00
	Furnace, Gas, 96%	78	MA			78.00		
	Boiler, Gas, 95%	0	ee				74.84	74.84
	Ducts, Sealed	0		0.00	0.00	0.00	0.00	0.00
	Thermostat, prog.	0		0.00	0.00	0.00	0.00	0.00
<b>Plumbing Appliances &amp; Fixtures</b>								
	W/H, elec. .92	47	S	47.00	47.00			
	W/H, gas, 65%	47	S			47.00		
(with dual boiler)	CL Solar H/W 24sf	89	est				89.33	
(with dual boiler)	CL Solar H/W 64sf	179	est					178.67
				<b>451</b>	<b>451</b>	<b>451</b>	<b>490</b>	<b>614</b>

Cuyahoga, Ohio

Annual Energy Summary	Base		Bronze			Silver			Gold			Emerald		
	Electric Yr \$	Gas Yr \$	Yr \$	savings	percent	Yr \$	savings	percent	Yr \$	savings	percent	Yr \$	savings	percent
Cooling Cost	88	88	73	15	17%	59	29	33%	63	25	28%	60	28	32%
Heating Cost	105	83	58	47	45%	78	27	26%	29	54	65%	20	63	76%
Hot Water Heating Cost	257	132	257	0	0%	145	112	44%	42	90	68%	30	102	77%
HVAC & hwh Savings	N/A	N/A	62			168			169			193		
Appliances/MELs Savings	N/A	N/A	80			80			80			80		
Appliances/MELs Cost	673	673	593			593			593			593		
HVAC & HWH sub-total	450	303	388		14%	282		37%	134		56%	110		64%
Grand Total	1123	976	981		87%	875		78%	727		74%	703		72%

Data based on Energy Gauge - Annual Energy Summary. Not Compliance

This apartment was energy source changed from electric to gas. Compliance increase is based on same source



Operation, Maintenance and Lifetime Replacement Cost  
 Valley View Apartments (Cuyahoga, OH)  
 1 bedroom apt.

2/17/2010

SF floor area

658

base  
 bronze  
 silver  
 gold  
 emerald

[http://www.eia.doe.gov/cneaf/electricity/epm/table5\\_6\\_b.html](http://www.eia.doe.gov/cneaf/electricity/epm/table5_6_b.html)

Component	Subcategory/ Activity	Cost New	Reference	Est. Life	Reference	30 year Lifetime Replacement Cost				
						base	bronze	silver	gold	emerald
<b>Appliances</b>										
	D/W, EStar	300	N	9	D	1000.00	1000.00	1000.00	1000.00	1000.00
	Dryer, elec.	600	N	13	D	1384.62	1384.62	1384.62	1384.62	1384.62
	Range	600	N	13	D	1384.62	1384.62	1384.62	1384.62	1384.62
	Refrigerator	800	N	13	D	1846.15	1846.15	1846.15	1846.15	1846.15
	Washer	600	N	10	D	1800.00	1800.00	1800.00	1800.00	
	Washer, EStar	1,000		10	D					3000.00
<b>Electrical</b>										
	Incandescent Fixtures	400	N	10	D	1200.00				
	50% CFLs	0	bb	10	bb		1200.00	1200.00	1200.00	1200.00
<b>HVAC</b>										
	Heat pump, 13 Seer/7.7 AFUE - 1.5 ton	2,560	Q	15	D	5119.50				
	Heat pump, 13 Seer/8.2 AFUE - 1.5 ton	3,151	dd	15	D		6302.00			
	A/C, 14 SEER, 1.5 ton	1,031	dd	15	D			2062.00	2062.00	
	A/C, 16 SEER, 1.5 ton	1,946	dd	15	D					3892.00
	Furnace, Gas, 96%	2,445	dd	15	D			4890.00		
	Boiler, Gas, 95%	3,584	est	15	ee				7168.96	7168.96
	Ducts, Sealed	651	Q	10	D					
	Thermostat, prog.	50	N	35	D					
<b>Plumbing Appliances &amp; Fixtures</b>										
	W/H, elec. .92	408		11	D	1113.00	1113.00			
	W/H, gas, 65%	350		10	D			1050.00		
(with dual boiler)	CL Solar H/W 24sf	4,500		20					6750.00	
(with dual boiler)	CL Solar H/W 64sf	6,500	ff	20	D					9750.00
						<b>14,848</b>	<b>16,030</b>	<b>16,617</b>	<b>24,596</b>	<b>30,626</b>

- A Power wash and 1 coat repaint for fibercement every 9 years.  
<http://www.sherwin-williams.com/pro/problem/tips/substrates/>
- B <http://www.demesne.info/Home-Maintenance/Appliance-Life-Expectancy.htm>  
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- H 50-year limited warranty - CDA  
[http://www.copper.org/applications/plumbing/restools/bsp/50yr\\_wrrnty\\_itms.html](http://www.copper.org/applications/plumbing/restools/bsp/50yr_wrrnty_itms.html)
- I NAHB Report says lifetime
- J Manufacturer's warranty
- K Rheem warranty for Professional Series is 8 years lmtd.  
[http://www.rheem.com/products/tank\\_water\\_heaters/electric\\_water\\_heaters/](http://www.rheem.com/products/tank_water_heaters/electric_water_heaters/)
- L <http://www.dauphinco.org/swm/BMPfactsheets/Porous%20Asphalt%20fact%20sheet.pdf>
- M [http://www.asphaltmagazine.com/singlenews.asp?item\\_ID=1178&comm=0&list\\_code\\_int=mag01-int](http://www.asphaltmagazine.com/singlenews.asp?item_ID=1178&comm=0&list_code_int=mag01-int) Indicates 20 years; set even with asphalt.
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- N Costs developed via internet survey conducted Nov. 2009.
- O Power utility cost (EIA US average 2009) of less efficient model vs. operation cost of more efficient model based on actual utility usage as modeled or interpolated from computer simulations in Energy Gauge. No calculation of possible water savings was calculated due to difficulty of capturing efficiency and widely fluctuating costs for water service nationwide.
- P Dryer has no estimated savings over any other.
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- R Set even to life of vinyl siding (cladding).
- S Based on one hour per year to flush water tank, vacuum driveway, etc.
- T One manufacturer's warranty on heat exchanger. Bosch.
- U <http://www.aceee.org/Consumerguide/waterheating.htm>
- V Savings is reflected in operating cost.
- W ICS solar units typically are installed with a backup DHW source which is not included in this cost example.

### Indoor Water Usage Calculations

Valley View Apartments (Cuyahoga, OH)

Appliance	Usage Levels	Unit	Avg.	Apartment Cuyahoga OH	Average Daily Per Capita Usage in Gallons <sup>3</sup>	Per Capita Daily Savings as % of Avg.	Base	Bronze	Silver	Gold	Emerald
Dishwasher	Normal Wash1	gal/load	7.3	<b>Dishwasher</b>	1.0						
	Energy Star1		4.9			32.4%	0.3	0.3	0.3	0.3	0.3
Wash Machine	Normal Wash2	gal/load	42.5	<b>Washing Machine</b>	11.6						
	Energy Star2	gal/load	26.8			37.0%					
	Water Factor > 6.02	gal/load	18.0			57.6%					6.7
Shower(s)	Std-2.5	gpm	2.5	<b>Showers</b>	11.6						
	flow 2.0-2.5	gpm	2.3			10.0%					
	flow 1.6-2.0	gpm	1.8			28.0%	3.2	3.2	3.2	3.2	3.2
Bathroom Faucets	Std-2.2 gpm	gpm	2.2	<b>Faucets</b>	10.9						
	gpm > 1.5	gpm	1.5			31.8%	3.5	3.5	3.5	3.5	3.5
Toilets	Std-1.6 gpf	gpf	1.6	<b>Toilets</b>	18.5						
	gpf > 1.28	gpf	1.3			20.0%		3.7	3.7	3.7	3.7
<b>Baths</b>					1.2	0.0%					
<b>Other</b>					1.6	0.0%					
<b>Total (gpd/occ)</b>					56.4	n/a	7.0	10.7	10.7	10.7	17.4
<b>Percent Savings Over Average Daily PC</b>							12.5%	19.0%	19.0%	19.0%	30.9%

Key: gpm= gallons per minute; gpf=gallons per flush; gpd/occ=gallons per day per occupant

(Water Factor (WF) measures water efficiency in gallons of water consumed per cubic foot of capacity. The lower the WF, the more water efficient the clothes washer. A water factor of 6.0 is approximately 45% more water efficient than a non-energy star model.)

Both MEF and WF are listed on the ENERGY STAR qualified product list

Based on an estimated 10 loads of laundry per week, larger front-loading washers use only 16-20 gallons of water per load, compared to a conventional top-load washer that requires 40-45 gallons per load. Factoring in the capacity advantage of a large front-loader, (almost twice the load-size of a conventional top-loader), you will use 16-20 gallons compared to 80-90 gallons to get the same amount of laundry cleaned....The ENERGY STAR® logo indicates that a particular washing machine meets or exceeds the US Department of Energy's highest minimum efficiency standards for energy-efficient washers by a at least minimum of 37%.

See also: <http://www.consumerenergycenter.org/home/appliances/washers.html>

<sup>3</sup><http://www.drinktap.org/consumerdnn/Default.aspx?tabid=85>

Source: Handbook of Water Use and Conservation, Amy Vickers



# APPENDIX A COST DETAILS

5 – Retrofit – climate zone #4

A. Silver Spring, Maryland

i. Unit 1

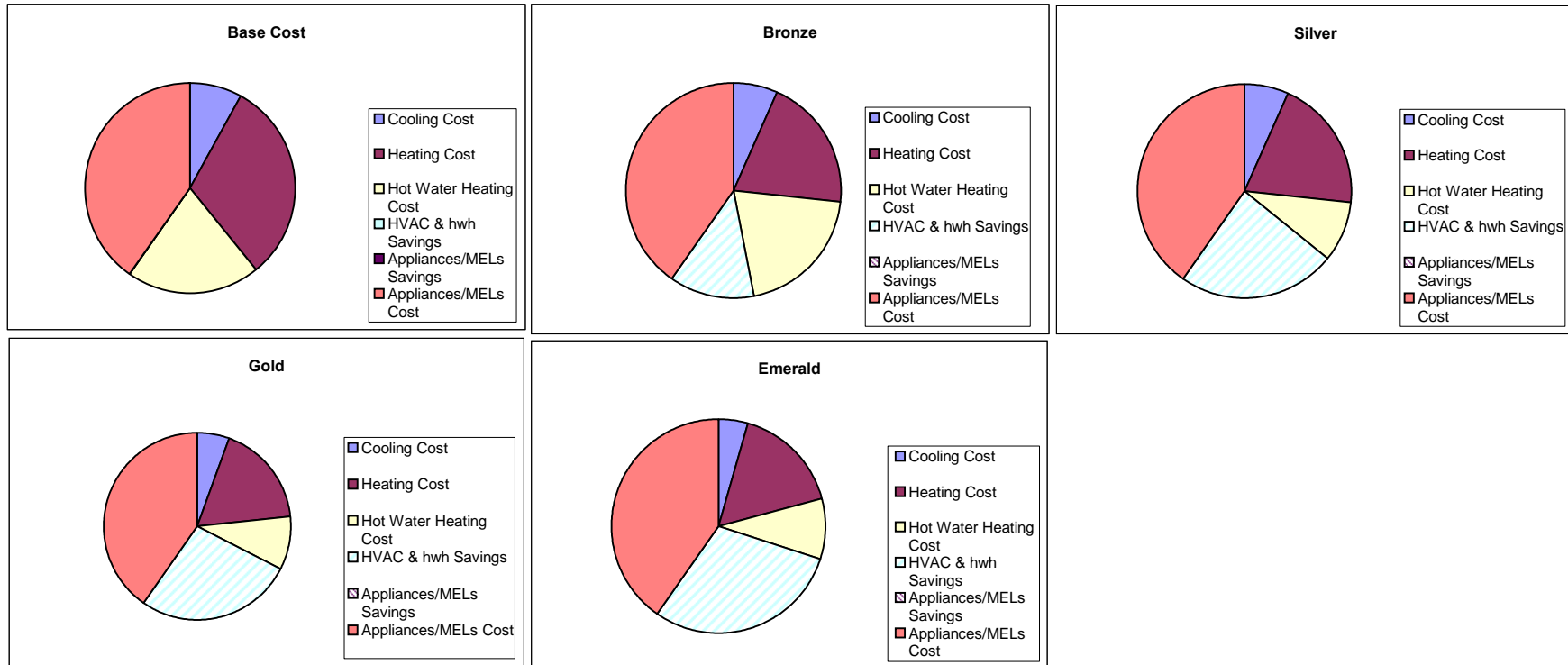
**Operation, Maintenance and Lifetime Replacement Cost**  
**Glenville Unit 1 Zone 4**  
 SF floor area 485

Component	Subcategory/ Activity	Annual Maint. Cost Per Year	Reference	Annual Maintenance Cost				
				base	bronze	silver	gold	emerald
<b>HVAC</b>								
	A/C, 10 SEER, 1.5 ton	156	MA	156.00	156.00	156.00		
	A/C, 13 SEER, 1 ton	156	MA				156.00	
	A/C, 16 SEER, 1 ton	156	MA					156.00
	Ducts, Conditioned							
	Ducts, Sealed <sup>x</sup>							
	Furnace, gas, 80%	156	MA	156.00	156.00	156.00		
	Furnace, gas, 90%	156	MA				156.00	
	Furnace, gas, 96%	156	MA					156.00
	Thermostat, prog.	0						
<b>Plumbing Appliances &amp; Fixtures</b>								
	W/H, gas, 56%	47	MA	47.00	47.00			
	W/h, gas, 65%	47	MA					
	W/h, gas, 82% tankless	47	MA			47.00	47.00	47.00
<b>Total</b>				<b>359</b>	<b>359</b>	<b>359</b>	<b>359</b>	<b>359</b>

Gaithersburg, Maryland  
Rehab Unit 1

Annual Energy Summary	Base	Bronze			Silver			Gold			Emerald		
	Yr \$	Yr \$	savings	percent	Yr \$	savings	percent	Yr \$	savings	percent	Yr \$	savings	percent
Cooling Cost	157	133	24	15%	133	24	15%	107	50	32%	85	72	46%
Heating Cost	612	390	222	36%	390	222	36%	349	263	43%	325	287	47%
Hot Water Heating Cost	399	399	0	0%	178	221	55%	178	221	55%	178	221	55%
HVAC & hwh Savings	N/A	246			467			534			580		
Appliances/MELs Savings	N/A	0			0			0			0		
Appliances/MELs Cost	791	791			791			791			791		
HVAC & HWH sub-total	1168	922		21%	701		40%	634		46%	588		50%
Grand Total	1959	1713		87%	1492		76%	1425		73%	1379		70%

Data based on Energy Gauge - Annual Energy Summary. Not Compliance





Operation, Maintenance and Lifetime Replacement Cost  
 Glenville Unit 1 Zone 4  
 SF floor area 485

Component	Subcategory/ Activity	Cost New	Reference	Est. Life	Reference	30 year Lifetime Replacement Cost				
						base	bronze	silver	gold	emerald
<b>HVAC</b>										
	A/C, 10 SEER, 1.5 ton	1,200	Q	10	D	3600.00	3600.00	3600.00		
	A/C, 13 SEER, 1.5 ton	1,203	Q	10	D				3609.00	
	A/C, 16 SEER, 1 ton	2,401	Q	10	D					7203.00
	Ducts, Conditioned		N	35	D					
	Ducts, Sealed <sup>x</sup>		Q	10	D					
	Furnace, gas, 80%	1,020	Q	18	D	1700.00	1700.00	1700.00		
	Furnace, gas, 90%	1,354	Q	18	D				2256.67	
	Furnace, gas, 96%	2,933	Q	18	D					4888.33
	Thermostat, prog.		N	35	D					
<b>Plumbing Appliances &amp; Fixtures</b>										
	W/H, gas, 56%	500		10	D	1500.00	1500.00			
	W/h, gas, 65%	650		10	D					
	W/h, gas, 82% tankless	1,400		15	J			2800.00	2800.00	2800.00
<b>Total</b>						<b>6,800</b>	<b>6,800</b>	<b>8,100</b>	<b>8,666</b>	<b>14,891</b>

- A Power wash and 1 coat repaint for fibercement every 9 years.  
<http://www.sherwin-williams.com/pro/problem/tips/substrates/>
- B <http://www.demesne.info/Home-Maintenance/Appliance-Life-Expectancy.htm>  
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- E Sustainable Building, Bamboo Flooring, Publication 443-03-017, 2003. CWIMB.  
<http://www.ciwmb.ca.gov/Publications/GreenBuilding/43303017.doc>
- F <http://www.conradfp.com/ns.shtml>  
 Wolmanized process, long as house to original owner.  
 15-20 others. Use 20
- G 25-year limited warranty - Upnor  
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<http://www.zurn.com/images/pdf/zpm08202.pdf>
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[http://www.copper.org/applications/plumbing/restools/bsp/50yr\\_wrrnty\\_itms.html](http://www.copper.org/applications/plumbing/restools/bsp/50yr_wrrnty_itms.html)
- I NAHB Report says lifetime
- J Manufacturer's warranty
- K Rheem warranty for Professional Series is 8 years lmted.  
[http://www.rheem.com/products/tank\\_water\\_heaters/electric\\_water\\_heaters/](http://www.rheem.com/products/tank_water_heaters/electric_water_heaters/)
- L <http://www.dauphinco.org/swm/BMPfactsheets/Porous%20Asphalt%20fact%20sheet.pdf>
- M [http://www.asphaltmagazine.com/singlenews.asp?item\\_ID=1178&comm=0&list\\_code\\_int=mag01-int](http://www.asphaltmagazine.com/singlenews.asp?item_ID=1178&comm=0&list_code_int=mag01-int) Indicates 20 years; set even with asphalt.
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- O Power utility cost (EIA US average 2009) of less efficient model vs. operation cost of more efficient model based on actual utility usage as modeled or interpolated from computer simulations in Energy Gauge. No calculation of possible water savings was calculated due to difficulty of capturing efficiency and widely fluctuating costs for water service nationwide.
- P Dryer has no estimated savings over any other.
- Q ASHRAE Cost Database
- R Set even to life of vinyl siding (cladding).
- S Based on one hour per year to flush water tank, vacuum driveway, etc.
- T One manufacturer's warranty on heat exchanger. Bosch.
- U <http://www.aceee.org/Consumerguide/waterheating.htm>
- V Savings is reflected in operating cost.
- W ICS solar units typically are installed with a backup DHW source which is not included in this cost example.
- X Energy usage improvement comes from building air seal as well as duct seal.

**Indoor Water Usage Calculations**  
**8804 Glenville Unit 1 - Climate 4 , MD**

Appliance	Usage Levels	Unit	Avg.		Per Capita Daily Savings (% of Avg.)	Base Usage	Bronze	Silver	Gold	Emerald
Dishwasher	Normal Wash <sup>1</sup>	gal/load	7.3	Dishwasher;		None				
	Energy Star <sup>1</sup>		4.9	Dishwasher; Estar	32.4%					
Wash Machine	Normal Wash <sup>2</sup>	gal/load	42.5	Washing Machine		x	x	x		
	Energy Star <sup>2</sup>	gal/load	26.8	Estar	37.0%				4.3	
	Water Factor > 6.02	gal/load	18.0	Estar; watersaver	57.6%					6.7
Shower(s)	Std-2.5	gpm	2.5	Shower; standard						
	Actual	gpm	2.0	Shower; 2.0-2.5 gpm	20.0%	2.3				
	Install 1.6 gpm flow	gpm	1.6	Shower; 1.6 gpm	36.0%		4.2	4.2	4.2	4.2
Bathroom Faucet*	Std-2.2 gpm	gpm	2.2	Faucets; standard						
	Actual	gpm	3.0		-36.4%	(4.0)				
	Install 1.0 gpm flow	gpm	1.0		54.5%		5.9	5.9	5.9	5.9
Kitchen Faucet*	Actual	gpm	2.0		9.1%	x	x			
	Install 1.0 gpm flow	gpm	1.0		54.5%			5.9	5.9	5.9
Toilets	Pre-'94 - 2.5 gpf	gpf	2.5	Toilets						
	Actual	gpf	1.6	Low Flow	36.0%	6.7	6.7	6.7	6.7	
	gpf > 1.28	gpf	1.3	Dual Flush Toilet	48.80%					9.0
				Baths						
				Other						
<b>gpd savings</b>						5.0	16.8	22.7	27.0	31.8
<b>Total (gpd/occ)</b>						51.4	39.6	33.7	29.4	24.6
							<b>23%</b>	<b>34%</b>	<b>43%</b>	<b>52%</b>
						<b>% savings over base home</b>				

Key: gpm= gallons per minute; gpf=gallons per flush; gpd/occ=gallons per day per occupant; PC=Per Capita

<sup>1</sup>Frigidaire Specifications for Normal Wash and Eco Wash.

<sup>2</sup>[http://www.energystar.gov/index.cfm?c=clotheswash.pr\\_tips\\_clothes\\_washers](http://www.energystar.gov/index.cfm?c=clotheswash.pr_tips_clothes_washers)

(Water Factor (WF) measures water efficiency in gallons of water consumed per cubic foot of capacity. The lower the WF, the more water efficient the clothes washer. A water factor of 6.0 is approximately 45% more water efficient than a non-energy star model.)

Both MEF and WF are listed on the ENERGY STAR qualified product list

Based on an estimated 10 loads of laundry per week, larger front-loading washers use only 16-20 gallons of water per load, compared to a conventional top-load washer that requires 40-45 gallons per load. Factoring in the capacity advantage of a large front-loader, (almost twice the load-size of a conventional top-loader), you will use 16-20 gallons compared to 80-90 gallons to get the same amount of laundry cleaned....The ENERGY STAR® logo indicates that a particular washing machine meets or exceeds the US Department of Energy's highest minimum efficiency standards for energy-efficient washers by a at least minimum of 37%.

See also: <http://www.consumerenergycenter.org/home/appliances/washers.html>

<sup>3</sup><http://www.drinktap.org/consumerdnn/Default.aspx?tabid=85>

Source: *Handbook of Water Use and Conservation*, Amy Vickers

\*Assumed 50% usage each location

Aerator source: [http://www.energyfederation.org/consumer/default.php/cPath/3499\\_3486\\_266](http://www.energyfederation.org/consumer/default.php/cPath/3499_3486_266)



# APPENDIX A COST DETAILS

ii. Unit 2

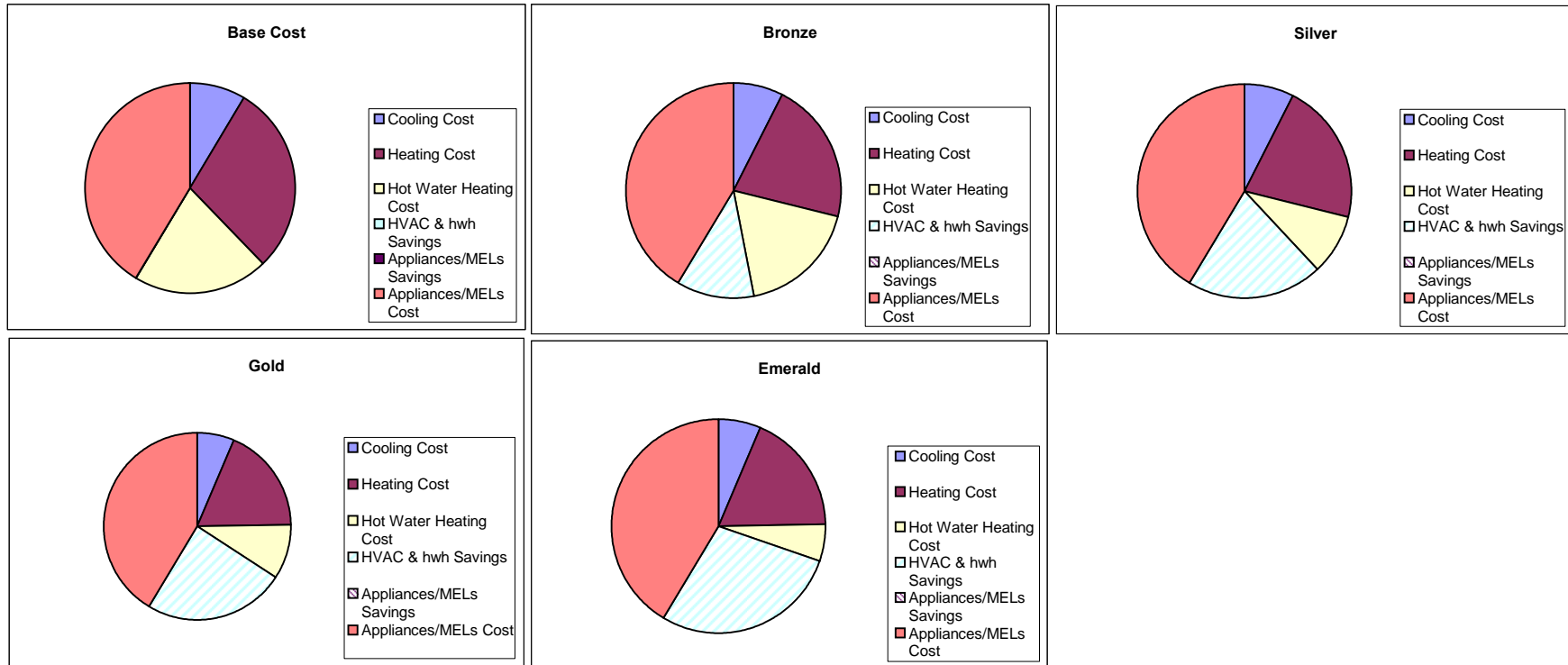
Operation, Maintenance and Lifetime Replacement Cost  
 Glenville Unit 2 Zone 4

Component	Subcategory/ Activity	Annual Maint. Cost Per Year	Reference	Annual Maintenance Cost				
				base	bronze	silver	gold	emerald
<b>HVAC</b>								
	A/C, 13 SEER, 1.5 ton	156	MA	156.00	156.00	156.00		
	A/C, 15 SEER, 1.5 ton	156	MA				156.00	156.00
	Ducts, Conditioned							
	Ducts, Sealed <sup>x</sup>	0						
	Heat Pump, 7.7 hspf	156	MA	156.00	156.00	156.00		
	Heat Pump, 9.0 hspf	156	MA				156.00	156.00
	Thermostat, prog.	0						
<b>Plumbing Appliances &amp; Fixtures</b>								
	W/H, gas, 58%	47	MA	47.00				
	W/H, gas, 60%	47	MA		47.00			
	W/h, gas, 82% tankless	47	MA			47.00	47.00	47.00
	ICS Solar H/W w. 0.82 tkls	94	MA					94.00
<b>Total</b>				<b>359</b>	<b>359</b>	<b>359</b>	<b>359</b>	<b>453</b>

Gaithersburg, Maryland  
Rehab Unit 2

Annual Energy Summary	Base	Bronze			Silver			Gold			Emerald		
	Yr \$	Yr \$	savings	percent	Yr \$	savings	percent	Yr \$	savings	percent	Yr \$	savings	percent
Cooling Cost	163	144	19	12%	144	19	12%	121	42	26%	121	42	26%
Heating Cost	557	406	151	27%	406	151	27%	353	204	37%	353	204	37%
Hot Water Heating Cost	399	348	51	13%	178	221	55%	178	221	55%	103	296	74%
HVAC & hwh Savings	N/A	221			391			467			542		
Appliances/MELs Savings	N/A	0			0			0			0		
Appliances/MELs Cost	791	791			791			791			791		
HVAC & HWH sub-total	1119	898		20%	728		35%	652		42%	577		48%
Grand Total	1910	1689		88%	1519		80%	1443		76%	1368		72%

Data based on Energy Gauge - Annual Energy Summary. Not Compliance



Operation, Maintenance and Lifetime Replacement Cost  
 Glenville Unit 2 Zone 4

Component	Subcategory/ Activity	Cost New	Reference	Est.	Reference	30 year Lifetime Replacement Cost				
						base	bronze	silver	gold	emerald
<b>HVAC</b>										
	A/C, 13 SEER, 1.5 ton	2,576	Q	10	D	7728.00	7728.00	7728.00		
	A/C, 15 SEER, 1.5 ton	4,375	Q	10	D				13125.00	13125.00
	Ducts, Conditioned		N	35	D					
	Ducts, Sealed <sup>x</sup>		Q	10	D					
	Heat Pump, 7.7 hspf	see a/c	Q	10	D	see a/c	see a/c	see a/c		
	Heat Pump, 9.0 hspf	see a/c	Q	18	D				see a/c	see a/c
	Thermostat, prog.		N	35	D					
<b>Plumbing Appliances &amp; Fixtures</b>										
	W/H, gas, 58%	472		15	D	944.00				
	W/H, gas, 60%	472		15	D		944.00			
	W/h, gas, 82% tankless	1,400		10	J			4200.00	4200.00	4200.00
	ICS Solar H/W w. 0.82 tkls	4,500		13						10384.62
<b>Total</b>						<b>8,672</b>	<b>8,672</b>	<b>11,928</b>	<b>17,325</b>	<b>27,710</b>

- A Power wash and 1 coat repaint for fibercement every 9 years.  
<http://www.sherwin-williams.com/pro/problem/tips/substrates/>
- B <http://www.demesne.info/Home-Maintenance/Appliance-Life-Expectancy.htm>  
 Articles and information for Demesne are contributed by experts and specialists in each area.
- C <http://www.kronotexusa.com/warranty.htm>
- D NAHB/Bank of America Home Equity Study of Life Expectancy of Home Components, 2006.  
 and, Study of Life Expectancy of Home Components, NAHB Economics Group and Bank of America, Feb. 2007.  
 Lifetime was defined by this reports authors as the average US life expectancy
- E Sustainable Building, Bamboo Flooring, Publication 443-03-017, 2003. CWIMB.  
<http://www.ciwmb.ca.gov/Publications/GreenBuilding/43303017.doc>
- F <http://www.conradfp.com/ns.shtml>  
 Wolmanized process, long as house to original owner.  
 15-20 others. Use 20
- G 25-year limited warranty - Upnor  
<http://www.uponor-usa.com/~media/Files/Warranties/Plumbing.aspx>  
 25-year limited warranty - Zurn  
<http://www.zurn.com/images/pdf/zpm08202.pdf>
- H 50-year limited warranty - CDA  
[http://www.copper.org/applications/plumbing/restools/bsp/50yr\\_wrrnty\\_itms.html](http://www.copper.org/applications/plumbing/restools/bsp/50yr_wrrnty_itms.html)
- I NAHB Report says lifetime
- J Manufacturer's warranty
- K Rheem warranty for Professional Series is 8 years lmtd.  
[http://www.rheem.com/products/tank\\_water\\_heaters/electric\\_water\\_heaters/](http://www.rheem.com/products/tank_water_heaters/electric_water_heaters/)
- L <http://www.dauphincd.org/swm/BMPfactsheets/Porous%20Asphalt%20fact%20sheet.pdf>
- M [http://www.asphaltmagazine.com/singlenews.asp?item\\_ID=1178&comm=0&list\\_code\\_int=mag01-int](http://www.asphaltmagazine.com/singlenews.asp?item_ID=1178&comm=0&list_code_int=mag01-int) Indicates 20 years; set even with asphalt.
- MA Based on purchase of a Maintenance Agreement
- N Costs developed via internet survey conducted Nov. 2009.
- O Power utility cost (EIA US average 2009) of less efficient model vs. operation cost of more efficient model based on actual utility usage as modeled or interpolated from computer simulations in Energy Gauge. No calculation of possible water savings was calculated due to difficulty of capturing efficiency and widely fluctuating costs for water service nationwide.
- P Dryer has no estimated savings over any other.
- Q ASHRAE Cost Database
- R Set even to life of vinyl siding (cladding).
- S Based on one hour per year to flush water tank, vacuum driveway, etc.
- T One manufacturer's warranty on heat exchanger. Bosch.
- U <http://www.aceee.org/Consumerguide/waterheating.htm>
- V Savings is reflected in operating cost.
- W ICS solar units typically are installed with a backup DHW source which is not included in this cost example.
- X Energy usage improvement comes from building air seal as well as duct seal.



**Indoor Water Usage Calculations**  
**8804 Glenville Unit 2 - Climate 4 , MD**

Appliance	Usage Levels	Unit	Avg.	Per Capita Daily Savings (% of Avg.)	Base Usage	Bronze	Silver	Gold	Emerald
Dishwasher	Normal Wash <sup>1</sup>	gal/load	7.3	Dishwasher;	None				
	Energy Star <sup>1</sup>		4.9	Dishwasher; Estar	32.4%				
Wash Machine	Normal Wash <sup>2</sup>	gal/load	42.5	Washing Machine	x				
	Energy Star <sup>2</sup>	gal/load	26.8	Estar	37.0%	4.3			
	Water Factor > 6.02	gal/load	18.0	Estar; watersaver	57.6%		6.7	6.7	6.7
Shower(s)	Std-2.5	gpm	2.5	Shower; standard					
	Actual	gpm	1.0	Shower; 1 gpm	60.0%	7.0	7.0	7.0	7.0
		gpm	1.6	Shower; 1.6 gpm	36.0%				
Bathroom Faucet*	Std-2.2 gpm	gpm	2.2	Faucets; standard					
	Actual	gpm	3.0		-36.4%	(4.0)			
		gpm	1.6	Bathroom faucet	27.3%	3.0	3.0		
	Install 1.0 gpm flow	gpm	1.0		54.5%			5.9	5.9
Kitchen Faucet*	Kitchen Faucet,	gpm	2.0	Kitchen faucet, 2 gpm	9.1%				
	Actual	gpm	1.5		31.8%	3.5			
		gpm	1.0	Kitchen faucet, 1 gpm	54.5%		5.9	5.9	5.9
Toilets	Pre-'94 - 2.5 gpf	gpf	2.5	Toilets -					
	Actual	gpf	1.6	Low Flow	36.0%	6.7	6.7	6.7	
	gpf > 1.28	gpf	1.3	Dual Flush Toilet	48.8%				9.0
				Baths					
				Other					
				<b>gpd savings</b>	13.1	24.3	29.2	32.2	34.6
				<b>Total (gpd/occ)</b>	<b>43.3</b>	<b>32.0</b>	<b>27.2</b>	<b>24.2</b>	<b>21.8</b>
						<b>26%</b>	<b>37%</b>	<b>44%</b>	<b>50%</b>
						<b>% savings over base home</b>			

Key: gpm= gallons per minute; gpf=gallons per flush; gpd/occ=gallons per day per occupant; PC=Per Capita

<sup>1</sup>Frigidaire Specifications for Normal Wash and Eco Wash.

<sup>2</sup>[http://www.energystar.gov/index.cfm?c=clotheswash.pr\\_tips\\_clothes\\_washers](http://www.energystar.gov/index.cfm?c=clotheswash.pr_tips_clothes_washers)

(Water Factor (WF) measures water efficiency in gallons of water consumed per cubic foot of capacity. The lower the WF, the more water efficient the clothes washer. A water factor of 6.0 is approximately 45% more water efficient than a non-energy star model.)

Both MEF and WF are listed on the ENERGY STAR qualified product list

Based on an estimated 10 loads of laundry per week, larger front-loading washers use only 16-20 gallons of water per load, compared to a conventional top-load washer that requires 40-45 gallons per load. Factoring in the capacity advantage of a large front-loader, (almost twice the load-size of a conventional top-loader), you will use 16-20 gallons compared to 80-90 gallons to get the same amount of laundry cleaned....The ENERGY STAR® logo indicates that a particular washing machine meets or exceeds the US Department of Energy's highest minimum efficiency standards for energy-efficient washers by a at least minimum of 37%. See also: <http://www.consumerenergycenter.org/home/appliances/washers.html>

<sup>3</sup><http://www.drinktap.org/consumerdnn/Default.aspx?tabid=85>

Source: *Handbook of Water Use and Conservation*, Amy Vickers

\*Assumed 50% usage each location

Aerator source: [http://www.energyfederation.org/consumer/default.php/cPath/3499\\_3486\\_266](http://www.energyfederation.org/consumer/default.php/cPath/3499_3486_266)

<sup>4</sup> From U of Kentucky, Coop Ext. Service "For dishwashing - On average, an automatic dishwasher uses 15 gallons of water per load.

Hand-washing dishes can use as much as 20 gallons of water for the same amount of dishes.

To limit water use, use the dishwasher only when it is full. If your dishwasher has a water saver cycle, use it. When hand-washing dishes, do not rinse them under a running tap. Use a small pan or basin of hot water instead. Limit water use further by using paper plates and plastic cups and utensils for some meals. Try to keep water use for dishwashing to an average of 15 gallons per day." <http://www.ca.uky.edu/enri/kwam2000/pdf/40galfct.pdf>



# APPENDIX A COST DETAILS

iii. Unit 3

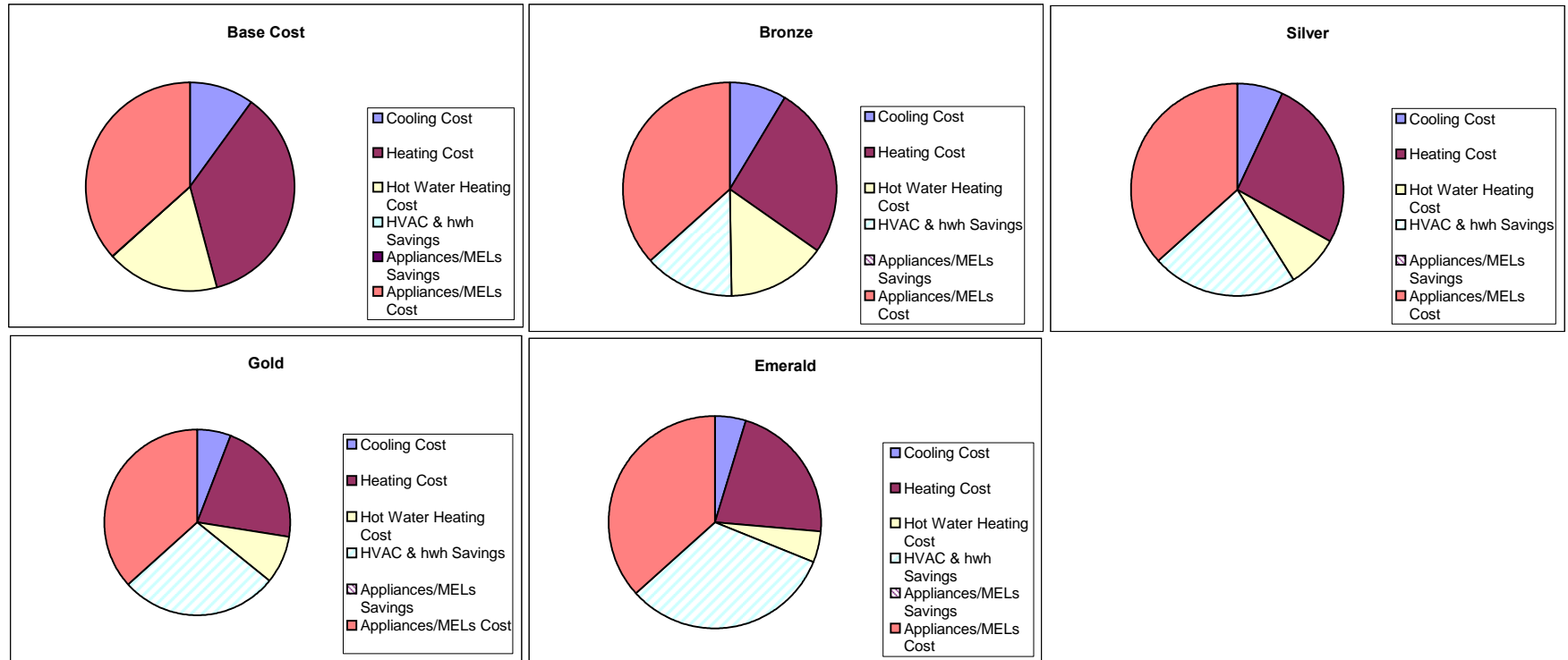
**Operation, Maintenance and Lifetime Replacement Cost  
Glenville Unit 3 Zone 4**

Component	Subcategory/ Activity	Annual Maint. Cost Per Year	Reference	Annual Maintenance Cost				
				base	bronze	silver	gold	emerald
<b>HVAC</b>								
	A/C, 10 SEER, 1.5 ton	156	MA	156.00	156.00			
	A/C, 13 SEER, 1.5 ton	156	MA			156.00		
	A/C, 15 SEER, 1.5 ton	156	MA				156.00	
	A/C, 18 SEER, 1.5 ton	156	MA					156.00
	Ducts, Conditioned	156	MA					
	Ducts, Sealed <sup>x</sup>	156	MA					
	Furnace, gas, 80%	156	MA	156.00	156.00	156.00		
	Furnace, gas, 96%	156	MA				156.00	156.00
	Thermostat, prog.	156	MA					
<b>Plumbing Appliances &amp; Fixtures</b>								
	W/H, gas, 58%	47	MA	47.00				
	W/H, gas, 62%	47	MA		47.00			
	W/h, gas, 82% tankless	47	MA			47.00	47.00	47.00
	ICS Solar H/W w. 0.82 tkls	94						94.00
<b>Total</b>				<b>359</b>	<b>359</b>	<b>359</b>	<b>359</b>	<b>453</b>

Gaithersburg, Maryland  
Rehab Unit 3

Annual Energy Summary	Base	Bronze				Silver				Gold				Emerald			
	Yr \$	Yr \$	savings	percent	Yr \$	savings	percent	Yr \$	savings	percent	Yr \$	savings	percent	Yr \$	savings	percent	
Cooling Cost	214	188	26	12%	150	64	30%	127	87	41%	102	112	52%				
Heating Cost	774	559	215	28%	559	215	28%	465	309	40%	465	309	40%				
Hot Water Heating Cost	373	324	49	13%	178	195	52%	178	195	52%	103	270	72%				
HVAC & hwh Savings	N/A	290			474			591			691						
Appliances/MELs Savings	N/A	0			0			0			0						
Appliances/MELs Cost	791	791			791			791			791						
HVAC & HWH sub-total	1361	1071		21%	887		35%	770		43%	670		51%				
Grand Total	2152	1862		87%	1678		78%	1561		73%	1461		68%				

Data based on Energy Gauge - Annual Energy Summary. Not Compliance



Operation, Maintenance and Lifetime Replacement Cost  
 Glenville Unit 3 Zone 4

Component	Subcategory/ Activity	Cost New	Reference	Est. Life	Reference	30 year Lifetime Replacement Cost				
						base	bronze	silver	gold	emerald
<b>HVAC</b>										
	A/C, 10 SEER, 1.5 ton	1,200	Q	10	D	3600.00	3600.00			
	A/C, 13 SEER, 1.5 ton	1,203	Q	10	D			3609.00		
	A/C, 15 SEER, 1.5 ton	2,248	Q	10	D				6744.00	
	A/C, 18 SEER, 1.5 ton	4,148	Q	10	D					12444.00
	Ducts, Conditioned				D					
	Ducts, Sealed <sup>x</sup>				D					
	Furnace, gas, 80%	1,250	Q	18	D	2083.33	2083.33	2083.33		
	Furnace, gas, 96%	2,596	Q	18	D				4326.67	4326.67
	Thermostat, prog.			35	D					
<b>Plumbing Appliances &amp; Fixtures</b>										
	W/H, gas, 58%	500		10	D	1500.00				
	W/H, gas, 62%	622		10	D		1866.00			
	W/h, gas, 82% tankless	1,400	Q	15	J			2800.00	2800.00	2800.00
	ICS Solar H/W w. 0.82 tkls	4,500		13						10384.62
<b>Total</b>						<b>7,183</b>	<b>7,549</b>	<b>8,492</b>	<b>13,871</b>	<b>29,955</b>

- A Power wash and 1 coat repaint for fibercement every 9 years.  
<http://www.sherwin-williams.com/pro/problem/tips/substrates/>
- B <http://www.demesne.info/Home-Maintenance/Appliance-Life-Expectancy.htm>  
 Articles and information for Demesne are contributed by experts and specialists in each area.
- C <http://www.kronotexusa.com/warranty.htm>
- D NAHB/Bank of America Home Equity Study of Life Expectancy of Home Components, 2006.  
 and, Study of Life Expectancy of Home Components, NAHB Economics Group and Bank of America, Feb. 2007.  
 Lifetime was defined by this reports authors as the average US life expectancy
- E Sustainable Building, Bamboo Flooring, Publication 443-03-017, 2003. CWIMB.  
<http://www.ciwmb.ca.gov/Publications/GreenBuilding/43303017.doc>
- F <http://www.conradfp.com/ns.shtml>  
 Wolmanized process, long as house to original owner.  
 15-20 others. Use 20
- G 25-year limited warranty - Upnor  
<http://www.uponor-usa.com/~media/Files/Warranties/Plumbing.aspx>  
 25-year limited warranty - Zurn  
<http://www.zurn.com/images/pdf/zpm08202.pdf>
- H 50-year limited warranty - CDA  
[http://www.copper.org/applications/plumbing/restools/bsp/50yr\\_wrrnty\\_itms.html](http://www.copper.org/applications/plumbing/restools/bsp/50yr_wrrnty_itms.html)
- I NAHB Report says lifetime
- J Manufacturer's warranty
- K Rheem warranty for Professional Series is 8 years lmtd.  
[http://www.rheem.com/products/tank\\_water\\_heaters/electric\\_water\\_heaters/](http://www.rheem.com/products/tank_water_heaters/electric_water_heaters/)
- L <http://www.dauphincd.org/swm/BMPfactsheets/Porous%20Asphalt%20fact%20sheet.pdf>
- M [http://www.asphaltmagazine.com/singlenews.asp?item\\_ID=1178&comm=0&list\\_code\\_int=mag01-int](http://www.asphaltmagazine.com/singlenews.asp?item_ID=1178&comm=0&list_code_int=mag01-int) Indicates 20 years; set even with asphalt.
- MA Based on purchase of a Maintenance Agreement
- N Costs developed via internet survey conducted Nov. 2009.
- O Power utility cost (EIA US average 2009) of less efficient model vs. operation cost of more efficient model based on actual utility usage as modeled or interpolated from computer simulations in Energy Gauge. No calculation of possible water savings was calculated due to difficulty of capturing efficiency and widely fluctuating costs for water service nationwide.
- P Dryer has no estimated savings over any other.
- Q ASHRAE Cost Database
- R Set even to life of vinyl siding (cladding).
- S Based on one hour per year to flush water tank, vacuum driveway, etc.
- T One manufacturer's warranty on heat exchanger. Bosch.
- U <http://www.aceee.org/Consumerguide/waterheating.htm>
- V Savings is reflected in operating cost.
- W ICS solar units typically are installed with a backup DHW source which is not included in this cost example.
- X Energy usage improvement comes from building air seal as well as duct seal.

**Indoor Water Usage Calculations**  
**8804 Glenville Unit 3**

Appliance	Usage Levels	Unit	Avg.		Per Capita Daily Savings (% of Avg.)	Base Usage	Bronze	Silver	Gold	Emerald
Dishwasher	Normal Wash <sup>1</sup>	gal/load	7.3	Dishwasher;		None				
	Energy Star <sup>1</sup>		4.9	Dishwasher; Estar	32.4%					
Wash Machine	Normal Wash <sup>2</sup>	gal/load	42.5	Washing Machine		x				
	Energy Star <sup>2</sup>	gal/load	26.8	Estar	37.0%		4.3	4.3	4.3	
	Water Factor > 6.02	gal/load	18.0	Estar; watersaver	57.6%					6.7
Shower(s)	Std-2.5	gpm	2.5	Shower; standard						
	Actual	gpm	1.0	Shower; 2.0-2.5 gpm	60.0%	7.0	7.0	7.0	7.0	7.0
	Install 1.6 gpm flow	gpm	1.6	Shower; 1.6 gpm	36.0%					
Bathroom Faucet*	Std-2.2 gpm	gpm	2.2	Faucets; standard						
	Actual	gpm	2.5		-13.6%	(1.5)				
	Install 1.0 gpm flow	gpm	1.0		54.5%		5.9	5.9	5.9	5.9
Kitchen Faucet*	Actual	gpm	2.5		-13.6%	(1.5)	(1.5)			
	Install 1.0 gpm flow	gpm	1.0		54.5%			5.9	5.9	5.9
Toilets	Pre-'94 - 2.5 gpf	gpf	2.5	Toilets						
	Actual	gpf	1.6	Low Flow	36.0%	6.7	6.7	6.7	6.7	
	gpf > 1.28	gpf	1.3	Dual Flush Toilet	48.80%					9.0
				Baths						
				Other						
<b>gpd savings</b>						10.6	22.4	29.8	29.8	34.6
<b>Total (gpd/occ)</b>						45.7	34.0	26.6	26.6	21.8
							<b>26%</b>	<b>42%</b>	<b>42%</b>	<b>52%</b>
						<b>% savings over base home</b>				

Key: gpm= gallons per minute; gpf=gallons per flush; gpd/occ=gallons per day per occupant; PC=Per Capita

<sup>1</sup>Frigidaire Specifications for Normal Wash and Eco Wash.

<sup>2</sup>[http://www.energystar.gov/index.cfm?c=clotheswash.pr\\_tips\\_clothes\\_washers](http://www.energystar.gov/index.cfm?c=clotheswash.pr_tips_clothes_washers)

(Water Factor (WF) measures water efficiency in gallons of water consumed per cubic foot of capacity. The lower the WF, the more water efficient the clothes washer. A water factor of 6.0 is approximately 45% more water efficient than a non-energy star model.)

Both MEF and WF are listed on the ENERGY STAR qualified product list

Based on an estimated 10 loads of laundry per week, larger front-loading washers use only 16-20 gallons of water per load, compared to a conventional top-load washer that requires 40-45 gallons per load. Factoring in the capacity advantage of a large front-loader, (almost twice the load-size of a conventional top-loader), you will use 16-20 gallons compared to 80-90 gallons to get the same amount of laundry cleaned....The ENERGY STAR® logo indicates that a particular washing machine meets or exceeds the US Department of Energy's highest minimum efficiency standards for energy-efficient washers by a at least minimum of 37%.

See also: <http://www.consumerenergycenter.org/home/appliances/washers.html>

<sup>3</sup><http://www.drinktap.org/consumerdnn/Default.aspx?tabid=85>

Source: *Handbook of Water Use and Conservation*, Amy Vickers

\*Assumed 50% usage each location

Aerator source: [http://www.energyfederation.org/consumer/default.php/cPath/3499\\_3486\\_266](http://www.energyfederation.org/consumer/default.php/cPath/3499_3486_266)



# APPENDIX A COST DETAILS

iv. Unit 4



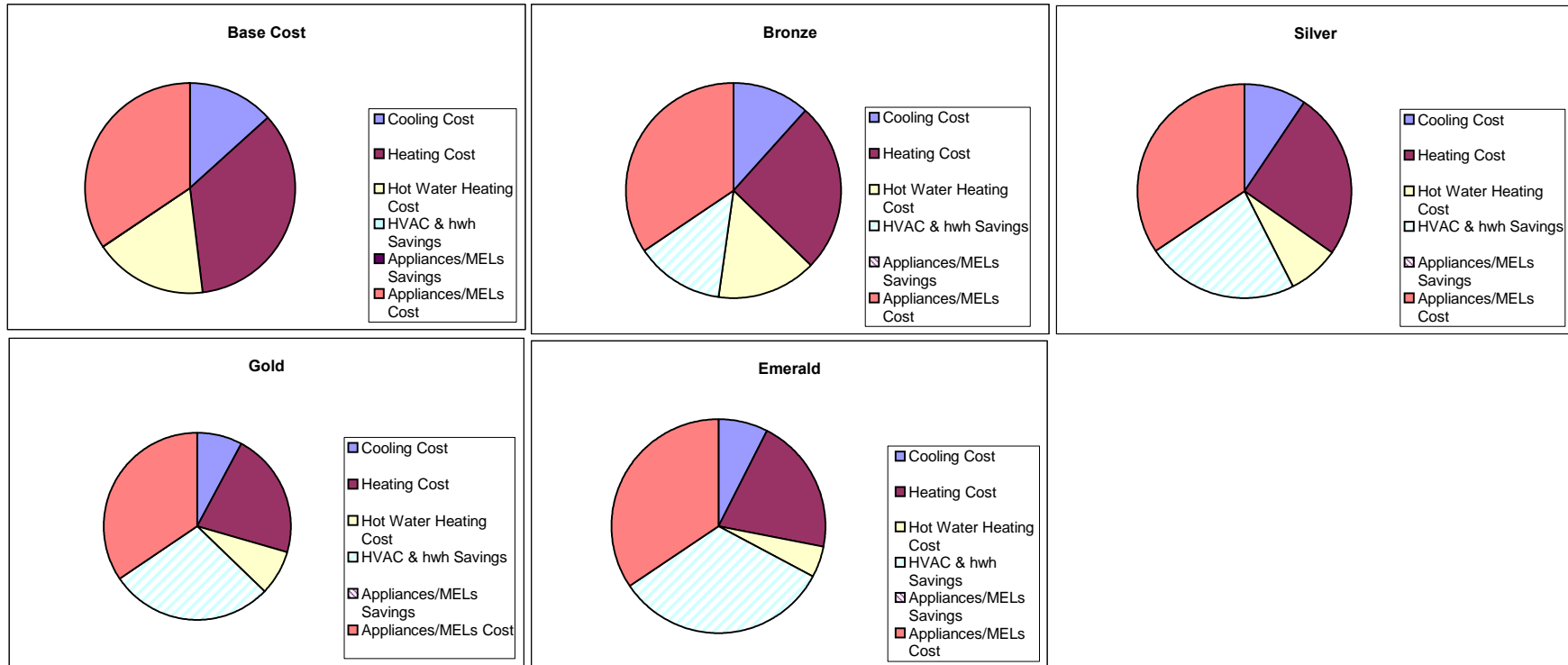
**Operation, Maintenance and Lifetime Replacement Cost  
Glenville Unit 4 Zone 4**

Component	Subcategory/ Activity	Annual Maint. Cost Per Year	Reference	Annual Maintenance Cost				
				base	bronze	silver	gold	emerald
<b>HVAC</b>								
	A/C, 10 SEER, 1.5 ton	156	MA	156.00	156.00			
	A/C, 13 SEER, 1.5 ton	156	MA			156.00		
	A/C, 15 SEER, 1 ton	156	MA				156.00	
	A/C, 16 SEER, 1 ton	156	MA					156.00
	Ducts, Conditioned	156	MA					
	Ducts, Sealed	156	MA					
	Furnace, gas, 78%	156	MA	156.00	156.00	156.00		
	Furnace, gas, 92%	156	MA				156.00	
	Furnace, gas, 96%	156	MA					156.00
	Thermostat, prog.	156	MA					
<b>Plumbing Appliances &amp; Fixtures</b>								
	W/H, gas, 54%	47		47.00				
	W/H, gas, 60%	47			47.00			
	W/h, gas, 82% tankless	47				47.00	47.00	47.00
	ICS Solar H/W w. 0.82 tkls	94						94.00
<b>Total</b>				<b>359</b>	<b>359</b>	<b>359</b>	<b>359</b>	<b>453</b>

Gaithersburg, Maryland  
Rehab Unit 4

Annual Energy Summary	Base	Bronze			Silver			Gold			Emerald		
	Yr \$	Yr \$	savings	percent	Yr \$	savings	percent	Yr \$	savings	percent	Yr \$	savings	percent
Cooling Cost	305	269	36	12%	216	89	29%	181	124	41%	171	134	44%
Heating Cost	793	581	212	27%	581	212	27%	493	300	38%	474	319	40%
Hot Water Heating Cost	399	348	51	13%	178	221	55%	178	221	55%	103	296	74%
HVAC & hwh Savings	N/A	299			522			645			749		
Appliances/MELs Savings	N/A	0			0			0			0		
Appliances/MELs Cost	791	791			791			791			791		
HVAC & HWH sub-total	1497	1198		20%	975		35%	852		43%	748		50%
Grand Total	2288	1989		87%	1766		77%	1643		72%	1539		67%

Data based on Energy Gauge - Annual Energy Summary. Not Compliance



Operation, Maintenance and Lifetime Replacement Cost  
 Glenville Unit 4 Zone 4

Component	Subcategory/ Activity	Cost New	Reference	Est. Life	Reference	30 year Lifetime Replacement Cost				
						base	bronze	silver	gold	emerald
<b>HVAC</b>										
	A/C, 10 SEER, 1.5 ton	1,200	Q	10	D	3600.00	3600.00			
	A/C, 13 SEER, 1.5 ton	1,203	Q	10	D			3609.00		
	A/C, 15 SEER, 1 ton	2,248	Q	10	D				6744.00	
	A/C, 16 SEER, 1 ton	2,398	Q	10	D					7194.00
	Ducts, Conditioned		N		D					
	Ducts, Sealed		Q		D					
	Furnace, gas, 78%	1020		18	D	1700.00	1700.00	1700.00	1700.00	
	Furnace, gas, 92%	1502		18	D					
	Furnace, gas, 96%	2633		18	D					4388.33
	Thermostat, prog.	50	N	35	D					
<b>Plumbing Appliances &amp; Fixtures</b>										
	W/H, gas, 54%	500		10	D	1500.00				
	W/H, gas, 60%	550		10	D		1650.00			
	W/h, gas, 82% tankless	1,400		15	J			2800.00	2800.00	2800.00
	ICS Solar H/W w. 0.82 tkls	4,500		13					80.00	80.00
<b>Total</b>						<b>6,800</b>	<b>6,950</b>	<b>8,109</b>	<b>11,244</b>	<b>14,382</b>

- A Power wash and 1 coat repaint for fibercement every 9 years.  
<http://www.sherwin-williams.com/pro/problem/tips/substrates/>
- B <http://www.demesne.info/Home-Maintenance/Appliance-Life-Expectancy.htm>  
 Articles and information for Demesne are contributed by experts and specialists in each area.
- C <http://www.kronotexusa.com/warranty.htm>
- D NAHB/Bank of America Home Equity Study of Life Expectancy of Home Components, 2006.  
 and, Study of Life Expectancy of Home Components, NAHB Economics Group and Bank of America, Feb. 2007.  
 Lifetime was defined by this reports authors as the average US life expectancy
- E Sustainable Building, Bamboo Flooring, Publication 443-03-017, 2003. CWIMB.  
<http://www.ciwmb.ca.gov/Publications/GreenBuilding/43303017.doc>
- F <http://www.conradfp.com/ns.shtml>  
 Wolmanized process, long as house to original owner.  
 15-20 others. Use 20
- G 25-year limited warranty - Upnor  
<http://www.uponor-usa.com/~media/Files/Warranties/Plumbing.aspx>  
 25-year limited warranty - Zurn  
<http://www.zurn.com/images/pdf/zpm08202.pdf>
- H 50-year limited warranty - CDA  
[http://www.copper.org/applications/plumbing/restools/bsp/50yr\\_wrrnty\\_itms.html](http://www.copper.org/applications/plumbing/restools/bsp/50yr_wrrnty_itms.html)
- I NAHB Report says lifetime
- J Manufacturer's warranty
- K Rheem warranty for Professional Series is 8 years lmtd.  
[http://www.rheem.com/products/tank\\_water\\_heaters/electric\\_water\\_heaters/](http://www.rheem.com/products/tank_water_heaters/electric_water_heaters/)
- L <http://www.dauphincd.org/swm/BMPfactsheets/Porous%20Asphalt%20fact%20sheet.pdf>
- M [http://www.asphaltmagazine.com/singlenews.asp?item\\_ID=1178&comm=0&list\\_code\\_int=mag01-int](http://www.asphaltmagazine.com/singlenews.asp?item_ID=1178&comm=0&list_code_int=mag01-int) Indicates 20 years; set even with asphalt.
- MA Based on purchase of a Maintenance Agreement
- N Costs developed via internet survey conducted Nov. 2009.
- O Power utility cost (EIA US average 2009) of less efficient model vs. operation cost of more efficient model based on actual utility usage as modeled or interpolated from computer simulations in Energy Gauge. No calculation of possible water savings was calculated due to difficulty of capturing efficiency and widely fluctuating costs for water service nationwide.
- P Dryer has no estimated savings over any other.
- Q ASHRAE Cost Database
- R Set even to life of vinyl siding (cladding).
- S Based on one hour per year to flush water tank, vacuum driveway, etc.
- T One manufacturer's warranty on heat exchanger. Bosch.
- U <http://www.aceee.org/Consumerguide/waterheating.htm>
- V Savings is reflected in operating cost.
- W ICS solar units typically are installed with a backup DHW source which is not included in this cost example.  
[http://www.eia.doe.gov/cneaf/electricity/epm/table5\\_6\\_b.html](http://www.eia.doe.gov/cneaf/electricity/epm/table5_6_b.html)

**Indoor Water Usage Calculations**  
**8804 Glenville Unit 4**

Appliance	Usage Levels	Unit	Avg.		Per Capita Daily Savings (% of Avg.)	Base Usage	Bronze	Silver	Gold	Emerald
Dishwasher	Normal Wash <sup>1</sup>	gal/load	7.3	<b>Dishwasher;</b>		None				
	Energy Star <sup>1</sup>		4.9	<b>Dishwasher; Estar</b>	32.4%					
Wash Machine	Normal Wash <sup>2</sup>	gal/load	42.5	<b>Washing Machine</b>		x	x	x		
	Energy Star <sup>2</sup>	gal/load	26.8	<b>Estar</b>	37.0%				4.3	
	Water Factor > 6.02	gal/load	18.0	<b>Estar; watersaver</b>	57.6%					6.7
Shower(s)	Actual	gpm	2.5	<b>Shower; standard</b>		x				
	Install 1.6 gpm flow	gpm	1.6		36.0%					
	ULF	gpm	1.0		60.0%		7.0	7.0	7.0	7.0
Bathroom Faucet*	Std-2.2 gpm	gpm	2.2	<b>Faucets; standard</b>						
	Actual	gpm	1.8		20.5%	2.2	2.2			
	Install 1.0 gpm flow	gpm	1.0	<b>Bathroom faucet</b>	42.9%			4.7	4.7	4.7
Kitchen Faucet*	Actual	gpm	2.0	<b>Kitchen faucet, 2 gpm</b>	9.1%	1.0	1.0			
		gpm	1.75							
		gpm	1.6		20.0%					
		gpm	1	<b>Kitchen faucet, 1 gpm</b>	50.0%			5.5	5.5	5.5
Toilets	Actual	gpf	2.5	<b>Toilets -</b>		x				
	Low Flow	gpf	1.6	Low Flow	36.0%		6.7	6.7	6.7	6.7
	gpf > 1.28	gpf	1.3	Dual Flush Toilet	48.8%					
				Baths						
				Other						
				<b>gpd savings</b>		3.2	16.8	23.7	28.0	30.4
				<b>Total (gpd/occ)</b>		<b>53.2</b>	39.6	32.6	28.4	26.0
							<b>26%</b>	<b>39%</b>	<b>47%</b>	<b>51%</b>
							<b>% savings over base home</b>			

Key: gpm= gallons per minute; gpf=gallons per flush; gpd/occ=gallons per day per occupant; PC=Per Capita

<sup>1</sup>Frigidaire Specifications for Normal Wash and Eco Wash.

<sup>2</sup>[http://www.energystar.gov/index.cfm?c=clotheswash.pr\\_tips\\_clothes\\_washers](http://www.energystar.gov/index.cfm?c=clotheswash.pr_tips_clothes_washers)

(Water Factor (WF) measures water efficiency in gallons of water consumed per cubic foot of capacity. The lower the WF, the more water efficient the clothes washer. A water factor of 6.0 is approximately 45% more water efficient than a non-energy star model.)

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Based on an estimated 10 loads of laundry per week, larger front-loading washers use only 16-20 gallons of water per load, compared to a conventional top-load washer that requires 40-45 gallons per load. Factoring in the capacity advantage of a large front-loader, (almost twice the load-size of a conventional top-loader), you will use 16-20 gallons compared to 80-90 gallons to get the same amount of laundry cleaned....The ENERGY STAR® logo indicates that a particular washing machine meets or exceeds the US Department of Energy's highest minimum efficiency standards for energy-efficient washers by a at least minimum of 37%.

See also: <http://www.consumerenergycenter.org/home/appliances/washers.html>

<sup>3</sup><http://www.drinktap.org/consumerdnn/Default.aspx?tabid=85>

Source: *Handbook of Water Use and Conservation*, Amy Vickers

\*Assumed 50% usage each location

Aerator source: [http://www.energyfederation.org/consumer/default.php/cPath/3499\\_3486\\_266](http://www.energyfederation.org/consumer/default.php/cPath/3499_3486_266)

# APPENDIX B

## GREEN SCORING & COST

### 1 – Climate Zone #2

- A. Baton Rouge, Louisiana
- B. Bayou LaBatre, Alabama

### 2 – Climate Zone #3

- A. Oakland, California

### 3 – Climate Zone #4

- A. Richmond, Virginia
- B. Seattle, Washington

### 4 – Climate Zone #5

- A. Akron, Ohio – Townhouse
- B. Akron, Ohio – Single Family Home
- C. Cuyahoga, Ohio

### 5 – Retrofit – climate zone #4

- A. Silver Spring, Maryland
  - i. Unit 1
  - ii. Unit 2
  - iii. Unit 3
  - iv. Unit 4





# APPENDIX B GREEN SCORING & COST

1 – Climate Zone #2

A. Baton Rouge, Louisiana



**HUD Green Building Comparison**  
**Baton Rouge LA - Katrina Cottage 910 Green Building Rating**  
**ANSI-ICC-700-2008 National Green Building Standard™**  
**Lot 60 x 120'**  
**House 26 x 35'**

**Louisiana Katrina Cottage - KC910 in Baton Rouge**

7,200  
910

- 5. Lot Design...
- 6. Resource Efficiency
- 7. Energy Efficiency
- 8. Water Efficiency
- 9. Indoor Env. Quality
- 10. Operation, Maintenance...

27

1,018

Bronze		Silver		Gold		Emerald	
Required	Actual	Required	Actual	Required	Actual	Required	Actual
39	51	66	68	93	105	119	138
45	78	79	89	113	115	146	152
30	62	60	119	100	171	120	181
14	18	26	33	41	52	60	60
36	53	65	86	100	102	140	154
8	9	10	15	11	15	12	15
50		100		100		100	
222	271	406	410	558	560	697	700
Cumulative		Points	Cost	Points	Cost	Points	Cost
Chapter 5		51	117	68	803	105	2,754
Chapter 6		78	745	89	752	115	1,118
Chapter 7		62	982	119	5,063	171	9,713
Chapter 8		18	0	33	0	52	175
Chapter 9		53	0	86	215	102	298
Chapter 10		9	950	15	1,044	15	1,044
Total		271	2,794	410	7,878	560	15,103
Cost per SF (\$)			3.07		8.66		16.60

**KEY**  
**Points are Co-Dependant on at least one other cell**  
**Overhead Cost - Dependant on subdivision size**

ANSI National Green Building Standard™	172	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost			
		0		5		40		53		133		
<b>CH. 5 LOT DESIGN, PREPARATION, AND DEVELOPMENT</b>	<b>Rating</b>	<b>26</b>	<b>0</b>	<b>25</b>	<b>117</b>	<b>17</b>	<b>686</b>	<b>37</b>	<b>1,951</b>	<b>33</b>	<b>4,391</b>	<b>Ch. 5 Subtotal Base</b>
500.0 Intent. This section applies to lot development for the eventual construction of residential buildings, multi-unit buildings, or additions thereto that contain dwelling units. The buildings on the lot earn their own performance level by complying with the provisions of Sections 303, 304, or 305.5, as applicable.												
501.1 The lot is selected to minimize environmental impact by one or more of the following:												
(1) An infill lot is selected.												
	<b>4</b>	<b>4</b>	<b>0</b>									
(2) A greyfield lot or an EPA-recognized brownfield lot is selected.												
	<b>5</b>											
(3) Addition and Renovation Note: A renovation or addition project is implemented. (Points awarded for using an existing building and infrastructure.)												
	<b>5</b>											
501.2 Mass Transportation. A range of mass transportation choices are promoted by one or more of the following:												
(1) A lot is selected within one-half mile of pedestrian access to a mass transit system or within five miles of a mass transit station with provisions for parking.												
	<b>3</b>	<b>3</b>	<b>0</b>									
(2) Walkways, street crossings, and entrances designed to promote pedestrian activity are provided. New buildings are connected to existing sidewalks and areas of development.												
	<b>3</b>											
(3) A lot is selected within one-half mile of six or more community resources (e.g., recreational facilities (such as pools, tennis courts, basketball courts), parks, grocery store, post office, place of worship, community center, daycare center, bank, school, restaurant, medical/dental office, laundromat/dry cleaner.)												
	<b>3</b>											
<b>502 Project Team, Mission Statement, and Goals</b>												
502.1 A knowledgeable team is established and team member roles are identified with respect to green lot design, preparation, and development. The project's green goals and objectives are written into a mission statement.												
	<b>4</b>									<b>4</b>	<b>754</b>	Minimum 2 person team for 1 day. Varies with size of operations.
<b>Lot Design</b>												
503.0 Intent. The lot is designed to avoid detrimental environmental impacts first, minimize any unavoidable impacts, and mitigate for those impacts that do occur. The project is designed to minimize environmental impacts and to protect, restore, and enhance the natural features and environmental quality of the lot. (To be awarded points allocated for design, the intent of the design shall be implemented.)												
503.1 Natural resources are conserved by one or more of the following:												
(1) A natural resources inventory is completed under the direction of a qualified professional.												
	<b>5</b>											
(2) A plan is implemented to conserve the elements identified by the resource inventory as high priority resources.												
	<b>6</b>											
(3) Items listed for protection in the resource inventory plan are protected under the direction of a qualified professional.												
	<b>4</b>											
(4) Basic training in tree or other natural resource protection is provided for onsite supervisor.												
	<b>4</b>									<b>4</b>	<b>627</b>	Mandatory in some states. Overhead cost of training a superintendent in a program like MD's Green Card .8 hrs. plus \$250
(5) All tree pruning on site is conducted by a Certified Arborist.												
	<b>2</b>											
(6) Ongoing maintenance of vegetation during construction is in accordance with TCIA A300.												
	<b>3</b>			<b>3</b>	<b>117</b>							Approx. 3000 sf disturbed area reseeded, 2 times.
Addition and Renovation Note: section 503.1 applies to additions that increase building footprint on the lot, and to renovations that include landscape, hardscape, and outdoor living area. (Additional points awarded for each strategy implemented.)												
	<b>1 Additional Point</b>											
503.2 Slope disturbance is minimized by one or more of the following: (Points awarded only if there are developable steep slopes on the lot.)												
(1) All or a percentage of development on steep slopes is avoided.												
	<b>2</b>											
(a) Less than 25%	<b>3</b>											
(b) 25 to 75%	<b>4</b>											
(c) Greater than 75%	<b>5</b>											
(2) Hydrological/soil stability study for steep slopes is completed and used to guide the design of all buildings on the site.												
	<b>5</b>											
(3) All or a percentage of roads and parking are aligned with natural topography to reduce cut and fill.												
	<b>1</b>											
(a) Less than 25%	<b>3</b>											
(b) 25 to 75%	<b>5</b>											
(c) Greater than 75%	<b>6</b>											
(4) Long-term erosion effects are reduced through the design and implementation of terracing, retaining walls, landscaping, and stabilization techniques.												
	<b>6</b>											
(5) Underground parking uses the natural slope for parking entrances.												
	<b>4</b>											

ANSI National Green Building Standard™	172	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
<b>Addition and Renovation Note:</b> Section 503.2 applies to additions that increase building footprint on the lot; and to renovations that include landscape, hardscape, and outdoor living area. (Additional points awarded for each strategy implemented.)												
<b>503.3 Soil disturbance and erosion</b> are minimized by one or more of the following: (Also see Section 504.3) (Points must be taken here to claim points in 504.1)	<b>2 Additional Points</b>											
(1) Construction activities are scheduled to minimize length of time that soils are exposed.	5			5	0							Stockpile lumber in construction entrance/driveway. Captured reseeded in 503.1(6)
(2) Utilities are installed using one or more alternative means:	5											
(a) tunneling instead of trenching												
(b) use of smaller (low ground pressure) equipment or geomats to spread the weight of construction equipment												
(c) shared utility trenches or easements												
(d) placement of utilities under paved surfaces instead of yards.				5	0							Coordinate with sewer and water and utilities. Bring in under driveways.
(3) Limits of clearing and grading are demarcated on the plan.	5					5	0					Site plan should include these.
<b>503.4 Storm Water Mgmt.</b> Storm water is managed using one or more of the following low impact development techniques:												
(1) Natural water and drainage features are preserved and used.	6									6	0	Implement with 503.4(2).
(2) A storm water management plan is developed and implemented that minimizes concentrated flows and simulates flows found in natural hydrology, e.g., vegetative swales, French drains, wetlands, drywells, and rain gardens.	6									6	754	Minimum 2 person team for 1 day. Varies with size of operations.
(3) All or a percentage of impervious surfaces are minimized and permeable materials are used for driveways, parking areas, walkways, and patios.												Less than 15% impervious structure/driveway to land
(a) Less than 25%	1											
(b) 25 to 75%	3											
(c) Greater than 75%	5											
(4) A minimum of 75% of the roof is vegetated (green roof)	3											
<b>Addition and Renovation Note:</b> Section 503.4 applies to additions that increase the building footprint on the lot; and to renovations that include hardscape and outdoor living area. (To be awarded these points, the amount of storm water runoff is not to	<b>1 Additional Point</b>											
<b>503.5 Landscape plan</b> is developed to limit water and energy use while preserving or enhancing the natural environment.												
(1) A plan is formulated to restore or enhance natural vegetation that is cleared during construction. Landscaping is phased to coincide with achievement of final grades to ensure denuded areas are quickly vegetated.	5					5	520					Simple implementation on infill lot. Allowed 1/2 day for professional to develop plan that includes noted actions. Include 503.5(8) and 503.6 in plan. Plan needed for 801.7.4 points.
(2) Turf grass species, other vegetation, and trees are selected that are native or regionally appropriate for local growing conditions.	4							4	1,116			See 503.5(1) for plan cost. Cost of several 3 shrubs, 2 trees and hydroseed.
(3) A percentage or all turf areas are limited.												
(a) Lot is 0% turf	4											
(b) Greater than 0% to less than 25%	3											
(c) 25% to less than 50%	2									2	1,502	28% mulched.
(d) 50% to 75%	1											
(4) Plants with similar watering needs are grouped (hydrozoning).	5							5	535			See 503.5(1) for plan cost. 3 trees and 5 shrubs.
(5) Species and locations for tree planting are identified that will provide summer shading of streets, parking areas, and buildings to moderate temperatures.	5							5	0			See 503.5(1) for plan cost. Plant 3 trees from 503.5(2) to provide shade. See 505.2(1)
(6) Vegetative wind breaks or channels are designed as appropriate for local conditions.	4									4	360	See 503.5(1) for plan cost. Add 3 trees.
(7) Onsite tree trimmings or stump grinding of regionally appropriate trees are used to provide protective mulch during construction and cleared trees are recycled as saw lumber or pulp wood.	3											Not possible with a small infill lot.
(8) An integrated pest management plan to minimize chemical use in pesticides and fertilizers is developed.	4							4	0			See 503.5(1)
<b>Addition and Renovation Note:</b> Section 503.5 applies to additions that address protection and renovation of existing vegetation during and after construction and the preservation or enhancement of the natural environment.	<b>2 Additional Points</b>											
<b>503.6 Wildlife habitat.</b> Measures are planned that will support wildlife habitat.	4									4	175	See 503.5(1). Include additional 5 shrubs.
<b>Addition and Renovation Note:</b> Section 503.6 applies to additions that increase building footprint on the lot; and to renovations that include landscape, hardscape, and outdoor living area. The existing landscape is either maintained to preserve a wildli												
(1) Maintain wildlife habitat.	1 Add'l Point											
(2) Expand wildlife habitat.	2 Add'l Points											
<b>503.7 Mixed use development</b> is incorporated.	6											Not possible with this infill.
<b>503.8 Environmentally Sensitive Areas.</b>												
(1) Environmentally Sensitive Areas are avoided.	3	3										
(2) Compromised Environmentally Sensitive Areas are mitigated or restored.	3											
<b>503.9 Density.</b> The average density on a net developable area basis is:												
(1) 7 to less than 14 dwelling units per acre (4047 m <sup>2</sup> )	4	4										
(2) 14 to less than 21 dwelling units per acre	7											
(3) 21 or greater dwelling units per acre	10											
<b>504 Lot Construction</b>												
<b>504.0 Intent.</b> Environmental impact during construction is avoided to the extent possible; impacts that do occur are minimized, and any significant impacts are mitigated.												
<b>504.1 Onsite supervision and coordination</b> is provided during clearing, grading, trenching, paving, and installation of utilities to ensure that specified green development practices are implemented (Also see Section 503.3.)	4			4	0							Standard.
<b>504.2 Trees and vegetation.</b> Designated trees and vegetation are preserved by one or more of the following:												
(1) Fencing or equivalent to protect trees and other vegetation is installed.	3					3	166					
(2) Trenching, significant changes in grade, and compaction of soil and critical root zones in "tree save" areas are avoided.	4					4	0					

ANSI National Green Building Standard™	172	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(3) Damage to designated existing trees and vegetation is mitigated during construction through pruning, root pruning, fertilizing, and watering.	4											
<b>504.3 Soil disturbance and erosion.</b> Onsite soil disturbance and erosion are minimized by one or more of the following: (also see section 503.3)												
(1) Limits of clearing and grading are staked out.	5							5	300			Note: On this size lot this activity would typically be included with house stakeout for lesser cost.
(2) "No disturbance" zones are created using fencing or flagging to protect vegetation and sensitive areas from construction activity.	5							5	0			Included with 504.3(1)
(3) Sediment and erosion controls are installed and maintained in accordance with the storm water pollution prevention plan (SWPPP), where required.	5							5	0			Included with 504.3(1)
(4) Topsoil is stockpiled and stabilized for later use to establish landscape plantings.	5	5										
(5) Soil compaction from construction equipment is reduced by distributing the weight of the equipment over a larger area (laying lightweight geogrids, mulch, chipped wood, plywood, OSB, metal plates, or other materials capable of weight distribution in the pathway of the equipment).	3											
(6) Disturbed areas that are complete or to be left unworked for greater than 21 days are stabilized within 14 days using methods as recommended by the EPA or in the approved storm water pollution prevention plan (SWPPP), where required.	3			3	0							See 503.1(6)
(7) Soil is improved with organic amendments and mulch.	3									3	220	Soil amendment.
(8) Utilities are installed using one or more alternative means such as: tunneling instead of trenching, use of smaller equipment, use of low ground pressure equipment, use of geotextiles, shared utility trenches or easements.	5			5	0							See 504.1(2) and 503.3(2)
<b>Addition and Renovation Note:</b> Additional points for Section 504.3 apply only where onsite construction staging and storage areas are planned and located to avoid soil and vegetation disturbance in areas where no construction occurs.	2 Additional Points											
<b>505 INNOVATIVE PRACTICES</b>												
<b>505.0 Intent.</b> Innovative lot design, preparation and development practices are used to enhance environmental performance. Waivers or variances from local development regulations are obtained and innovative zoning practices are used to implement such practices.												
505.1 Driveways or parking areas are shared. Waivers or variances from local development regulations are obtained to implement such practices as applicable. In a multi-unit project, parking capacity is not to exceed the local minimum requirements.	4			4								
<b>Addition and Renovation Note:</b> Section 505.1 applies only where existing impervious driveway and parking area(s) are reduced.	2 Additional Points											
505.2 Heat Island Mitigation. Any combination of the following strategies are provided for a minimum of 50% of the horizontal surface area of the hardscape: (1) Shading of hardscaping: Shade from existing or new vegetation is provided (within five years) or from trellises. Shade of hardscaping is to be measured on the summer solstice at noon. (2) Light colored hardscaping: Horizontal hardscaping materials are installed with a solar reflectance index of 29 or greater.	4							4	0			See 503.3(5).
<b>CHAPTER 6: RESOURCE EFFICIENCY</b>	<b>Base Pts.</b>	52	0	26	745	11	7	26	366	37	6,253	Ch. 6 Subtotal
<b>601 Quality of Construction Materials and Waste</b>	<b>Cost/Point</b>		0		29		1		14		169	
<b>601.0 Intent.</b> Design and construction practices that minimize the environmental impact of the building materials are incorporated; environmentally efficient building systems and materials are incorporated; and waste generated during construction is reduced.												
601.1 <b>Conditioned floor area</b> , as defined by ICC IRC calculated												
(1) Less than or equal to 1,000 square feet	15	15										910 sf.
(2) Less than or equal to 1,500 square feet	12											
(3) Less than or equal to 2,000 square feet	9											
(4) Less than or equal to 2,500 square feet	6											
(5) Greater than 4,000 square feet (373 m <sup>2</sup> )	Mandatory											
<b>For every 100 square feet over 4,000 sf, one point is to be added to Table 303, category 7 for each performance level.</b>												
<b>Multi-Unit Building Note:</b> For a multi-unit building, use a weighted average of the individual unit sizes in qualifying for available points.												
<b>Addition Note:</b> Additions more than 75% of existing building. Section 601.1 does not apply to additions with an area of more than 75% of the area of the existing building or dwelling unit.												
<b>Additions less than or equal to 75% of existing building.</b> Where the addition area is less than or equal to 75 percent of the existing building or dwelling unit area, points are awarded as follows: (1) The existing structure is 50% to 75% of total building or dwelling unit area. (2) The existing structure is 76% to 99% of total building or dwelling unit area.	1 Addt'l Point 3 Addt'l Point											
<b>Renovation Note:</b> When renovations increase the total existing building or dwelling unit area by 1 percent or less, points are awarded as follows: (a) The total area of the existing building or dwelling unit is less than or equal to 2500 sf. (b) The total area of the existing building or dwelling unit is greater than 2500 sf.	6 Addt'l Points 1 Addt'l Point											
<b>601.2 Material Usage.</b> Building-code-compliant structural systems or advanced framing techniques that optimize material usage are implemented. Points awarded for each system or framing technique implemented.	3 pts per system (9 pts max)											
601.3 Building dimensions and layouts are designed to reduce material cuts and waste. (1) When used for at least 80% of floor area (2) When used for at least 80% of wall area (3) When used for at least 80% of roof area (4) When used for at least 80% of cladding or siding area (5) When used for at least 80% of penetrations or trim area	3 3 3 3 1	3 3 3 3 1										Floors - steel at 24" oc Wall 560S162-39 at 24" oc Roof 1000S162-54 at 24" oc
601.4 Detailed framing or structural plans, material quantity lists and onsite cut lists for framing, structural materials, and sheathing materials are provided.	4									4	1,040	Have suppliers prepare use reports with their bid at no charge for joists, wall studs and rafters. Allowed 1days of professional time to prepare sheathing layouts for prints. O/H.

ANSI National Green Building Standard™	172	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
601.5 Pre-cut or pre-assembled components, or panelized or precast assemblies are utilized for 90% for the following system or building.												
(1) Floor system.	4							4	52			Estimated a 2.5% premium for precuts. With steel this should be a savings. These should have been shipped standard lengths same as studs. See note 601.5(a)
(2) Wall system.	4			4	0							
(3) Roof system.	4							4	52			
(4) modular construction for the entire building located above grade.	13											
(5) manufactured home construction for the entire building located above grade.	13											
<b>601.6 Stories above grade are stacked, such as in 1 1/2 and 2 story or greater structures. The area of the upper story shall be at least 50% of the area of the story below, based on areas with a minimum ceiling height of 7 feet.</b>	<b>Max 8 points</b>											
(1) first stacked story	4											
(2) for each additional story	2											
<b>601.7 Site applied finishing materials.</b> Building materials or assemblies that do not require additional site applied material for finishing are utilized.	<b>Max 12 points</b>											
(1) 90% or more of the installed material or assembly listed below:	5											
(2) 50% to less than 90% of the installed building material or assembly listed below:	2											
(a) Pigmented, stamped, decorative, or final finish concrete or masonry.												
(b) Trim not requiring paint or stain.												
(c) Window, skylight, and door assemblies not requiring paint or stain on exterior and/or interior surfaces.		5										
(d) Wall coverings or systems not requiring paint or stain or other type of finishing application.												Vinyl windows are prefinished.
<b>601.8 Foundations</b> such as frost-protected shallow foundations, pier and pad foundations, post foundations and other similar foundation types are designed and constructed.	3											Pier foundation.
<b>601.9 One or more of the following above grade wall systems that provide sufficient structural and thermal characteristics are used for at least 75% of the gross exterior wall area of the building:</b>	<b>4</b>											
(1) Adobe												
(2) Concrete/Masonry												
(3) Logs												
(4) Rammed earth												
<b>602 Enhanced Durability and Reduced Maintenance</b>												
<b>602.0 Intent.</b> Design and construction practices are implemented that enhance the durability of materials and reduce in-service maintenance.												
<b>602.1 Entries</b> at exterior door assemblies, inclusive of side lights, are covered by one of the following methods below to protect the building from the effects of precipitation and solar radiation. A projection factor of at least 0.375 is provided. Eastern and western facing entries in Climate Zones 1, 2, and 3, as determined in accordance with Figure 6(1), shall have a projection factor of at least 1.0 unless otherwise protected from direct solar radiation by other means (e.g. screen wall, vegetation).	<b>Maximum number of points 5</b>											
(1) Installing a porch roof or awning.												
(2) Extending the roof overhang.												
(3) Recessing the exterior door.												
Main entrance door	3	3										
Additional covered door assembly	1	1										
<b>602.2 Roof overhangs, based on inches of rainfall in Table 602.2, are provided over at least 90% of exterior walls to protect the building envelope.</b>	<b>4</b>											
Table 602.2												
Minimum Roof Overhang for One- & Two-Story Buildings												
Inches Rainfall*	Eave Overhang (inches)	Rake Overhang (inches)										
Less than 20	12	12										
21 to 40	12	12										
41 to 70	18	12							4	516		Add 10" of overhang
More than 70	24	12										
<b>Addition Note:</b> Section 602.2 applies to the new construction portion of additions.	0											
<b>Renovation Note:</b> Section 602.2 applies to renovations that alter the existing roof.	1											
<b>602.3 Foundation Drainage</b>												
<b>602.3.1</b> Where required by the IRC/IBC for habitable and usable spaces below grade, exterior drain tile is installed.	<b>Mandatory</b>											Not applicable.
<b>602.3.2</b> Interior and exterior foundation perimeter drains are installed and sloped to discharge to daylight, dry well, or sump pit.	4											
<b>Addition Note:</b> Section 602.3.2 applies to the new construction portion of additions.	0											
<b>Renovation Note:</b> Section 602.3.2 applies to renovations that involve the demolition/reconfiguration of exterior walls and/or modification of the existing foundation drainage system.	2 Additional Points											
<b>602.4</b> Drip edge is installed at eaves and gable roof edges.	3	3										
<b>602.5</b> A gutter and downspout system with extensions, or splash blocks and effective grading, are provided to carry water at least 5 feet away from perimeter foundation walls.	4							4	162			Plans indicate gutters and downspouts; cost is for 4 extensions and fold back elbows.
<b>Renovation Note:</b> Section 602.5 applies only to renovations.	1 Add'l Point											
<b>602.6 Finish grade</b> at all sides of building is sloped to provide a minimum of 6 inches of fall within 10 feet of the edge of the building. Where lot lines, walls, slopes or other physical barriers prohibit 6 inches of fall within 10 feet, the final grade	<b>Mandatory</b>											
<b>Addition Note:</b> Section 602.6 applies only to additions that increase the footprint of the building.	Mandatory 0 Add'l Points											
<b>Renovation Note:</b> The additional points for Section 602.6 apply only to renovations.	2 Add'l Points											
<b>602.7 Termite barrier.</b> Continuous, physical foundation termite barrier used with or without low toxicity treatment is installed in geographical areas that have subterranean termite infestation potential determined in accordance with Figure 6(3).	4	4										
<b>Addition Note:</b> Section 602.7 applies only to the new construction portion of additions.	0 Add'l Points											
<b>Renovation Note:</b> The additional points for section 602.7 applies only to renovations that alter the existing roof.												

ANSI National Green Building Standard™	172	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(1) new non-chemical termite barrier is provided	1 Add1 Point											
(2) existing chemical barrier is removed and replaced with a non-chemical barrier	3 Add1 Points											
602.8 Termite-resistant materials are used as follows: (1) In areas of slight to moderate termite infestation probability (as defined by Figure 6(3)) for the foundation, all structural walls, floors, concealed roof spaces not accessible for inspection, exterior decks, and exterior claddings within the first 2 feet above the top of the foundation.	2											
(2) In areas of moderate to heavy termite infestation probability (as defined by Figure 6(3)) for the foundation, all structural walls, floors, concealed roof spaces not accessible for inspection, exterior decks, and exterior claddings within the first 3 feet above the top of the foundation.	4											Specify a borate treated OSB for floor, walls and roof sheathing.
(3) In areas of very heavy termite infestation probability (as defined by Figure 6(3)) for the foundation, all structural walls, floors, concealed roof spaces not accessible for inspection, exterior decks, and exterior claddings.	6			6	745							Cost of borate-treated OSB for floor, wall, and one row of roof (at eaves) sheathing.
602.9 Where required by the IRC/IBC, a water-resistive barrier and/or drainage plane system is installed behind exterior veneer and/or siding.	Mandatory											Complies. A-01.
<b>Addition Note:</b> Section 602.9 applies to the new construction portion of additions.	Mandatory 0 Add1 Points											
<b>Renovation Note:</b> Section 602.9 applies to renovations that include exterior veneer and/or siding replacement.	Mandatory 0 Add1 Points											
602.10 In areas where there has been a history of ice forming along the eaves causing a backup of water, an ice barrier is installed at roof eaves and is extended at least 24" inside the exterior wall line of the building, in accordance with the IRC/IBC.	Mandatory											Not applicable.
602.11 Enhanced foundation waterproofing is installed: (1) Rubberized coating, or (2) Drainage mat.	4											Not applicable.
<b>Addition Note:</b> Section 602.11 applies to the new construction portion of additions.	0 Additional Points											
<b>Renovation Note:</b> Section 602.11 applies to renovations that involve the demolition/reconfiguration of exterior walls, modification of the foundation wall, or an effort to improve foundation waterproofing.	2 Additional Points											
602.12 Flashing details are shown on plans and flashing is installed at all of the following locations, as applicable: (1) Around exterior fenestrations, skylights and doors. (2) Roof valleys. (3) Deck/balcony to building intersections. (4) At roof-to-wall intersection and at roof-to-chimney intersections. (5) A drip cap is provided above windows and doors that are not flashed or protected by covering per Section 602.1.	6	6										
<b>602.13 Roof Surfaces.</b> A minimum of 90% of roof surfaces are constructed of one or both of the following: (1) Products which meet the requirements of the ENERGY STAR® local roof certification or equivalent. (2) A green (landscaped) roof system.	3											
<b>Renovation Note:</b> Section 602.13 applies to renovations that include roof replacement.	1 Add1 Point											
<b>602.14 Recycling.</b> Occupant recycling is facilitated by one or more of the following methods: (1) A built-in collection space in each kitchen and an aggregation/pick-up space in a garage, covered outdoor space or other area for recycling containers. (2) Compost facility provided on-site.	3 3							3 3	29 72			Include an under cabinet recycling container.
<b>603 Reused or Salvaged Materials</b>												
603.0 Intent. Practices that reuse or modify existing structures, salvage materials for other uses, or use salvaged materials in building's construction are implemented.												
603.1 Existing buildings and structures are reused, modified or deconstructed in lieu of demolition. <b>(One point awarded for every 200 sq. ft., 18.5m<sup>2</sup>, of floor area.)</b>	1 (Max 12 points)											
603.2 Reclaimed and/or salvaged materials and components are used. Total material and labor cost of salvaged materials shall equal or exceed 1% of total construction costs.	3											
<b>603.3 Scrap Materials.</b> Facilitation for sorting and reuse of scrap building material (e.g. provide a central storage area or dedicated bins.)	4					4	7					This cost is a one-time set up of 4x4x8' bins for sorting and reuse/reload divided by the 37 lots in the subdivision.
<b>604 Recycled-Content Building Materials</b>												
604.1 Building materials with recycled content are used for at least two minor and/or two major components of the building. <b>(NOTE: Does not specify PC consumer. Implication is that max. allowable is 4 materials. 9 points is max. in scoring tool.)</b>	Points per Table 604.1											
Table 604.1												
Recycled Content												
Material Percentage Recycled Content	Per 2 Minor	Per 2 Major										
25% - 50%	1	2	2	0				-2	0			Steel and fiberglass.
50% - 75%	2	4						4	0			Gypsum board and cellulose insulation. Note: specify correct gypsum board.
75%	3	6					3	0				Use stainless steel sink and recycled framing nails (Maze).
605.0 Intent. Waste generated during construction is recycled.												
Note: All waste classified as hazardous shall be properly handled and disposed. <b>(Points not awarded for hazardous waste removal.)</b>												
<b>605.1 A Construction Waste Management Plan</b> is developed, implemented, and posted at the jobsite with a goal of recycling or salvaging a minimum of 50% (by weight) of construction and land-clearing waste.	6									6	989	Estimate is one day for set-up and one hour/week for record keeping. Costs of removal assumed even for each method. 90 day cycle time.
<b>Addition and Renovation Note:</b> The construction waste management plan includes information on the proper handling and disposal of hazardous wastes.	Mandatory 2 Additional Points											
605.2 Onsite recycling measures following applicable regulations and codes are implemented, such as the following: (a) Materials are ground or otherwise safely applied onsite as soil amendment or fill. At least 50% (by weight) of construction and land-clearing waste shall be diverted from landfill. (b) Other methods approved by the NAHB Research Center (the Adopting Entity).	7									7	0	Include in waste management plan. See 605.1 Divert 50% of construction waste to recycle.

ANSI National Green Building Standard™	172	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
<b>Addition and Renovation Note:</b> All waste classified as hazardous waste is properly handled and disposed of. The weight of this material is exempted from landfill diversion when Section 605.2 is applied to existing buildings.	<b>Mandatory 0 Add'l Points</b>											
605.3 Recycled Construction materials: Construction materials (e.g., wood, cardboard, metals, drywall, plastic, asphalt roofing shingles, or concrete) are recycled offsite.	<b>Max 6</b>											
(1) A minimum of two types of materials are recycled.	<b>3</b>					<b>3</b>	<b>0</b>					Recycle steel and copper wire. Net savings is anticipated. Note: If steel were ordered in precuts recycle drywall.
(2) For each additional recycled material.	<b>1</b>					<b>1</b>	<b>0</b>					Recycle cardboard.
<b>605 Renewable Materials</b>												
<b>605.0 Intent.</b> Building materials derived from renewable resources are used.												
605.1 The following biobased products are used. (Note: 606.1 and 606.2 denote % of project mat'l cost req'd.)	<b>Max 8</b>											
(a) certified solid wood in accordance with Section 606.2												
(b) engineered wood												
(c) bamboo												
(d) cotton												
(e) cork												
(f) straw												
(g) natural fiber products made from crops (soy or corn-based)												
(h) products with the minimum biobased contents of the USDA 7 CFR Part 2902												
(i) other biobased materials with a minimum of 50 percent biobased content (by weight or volume).												
606.1(1) At least two types of biobased materials are used, each for more than .5% of the project's projected building material cost.	<b>3</b>			<b>2</b>	<b>0</b>							Wood cabinets and interior wood trim.
<b>Combined 8 pts Max</b>												
606.1(2) At least two types of biobased materials are used, each for more than 1% of the project's projected building material cost.	<b>6</b>			<b>6</b>	<b>0</b>							OSB sheathing and cellulose insulation.
606.1(3) For each additional biobased material used for more than .5% of the project's projected building material cost.	<b>1 (2 pts max)</b>											
<b>606.2 Wood-based products</b> are certified to the requirements of one of the following recognized product programs:												
(a) AFF American Tree Farm System®												
(b) Canadian Standards Association's Sustainable Forest Management System Standards (CAN/CSA Z609)												
(c) Forest Stewardship Council (FSC)												
(d) Program for Endorsement of Forest Certification Systems (PEFC)												
(e) Sustainable Forestry Initiative Program (SFI)												
(f) Other product programs mutually recognized by PEFC												
606.2(1) Where a minimum of two certified wood-based products are used for minor elements of the building, such as all trim, cabinetry, or millwork.	<b>3</b>									<b>3</b>	<b>350</b>	Specify Masonite doors for FSC certified. Estimated added cost of \$35/door. And kitchen cabinets at no cost.
606.2(2) Where a minimum of two certified wood-based products are used in major elements of the building, such as walls, floors, or roof.	<b>4</b>									<b>4</b>	<b>369</b>	Specify that front/rear decks/railing are certified wood.
<b>606.3 Manufacturing Energy.</b> Materials are used for major components of the building that are manufactured using a minimum of 35% of the primary manufacturing process energy derived from renewable sources, combustible waste sources, or renewable energy credits (RECs). (2 points awarded per material.)	<b>6 pts. max.</b>			<b>2</b>	<b>0</b>							Specify that OSB comes from a mill that complies.
<b>607 Resource-Efficient Materials</b>												
607.1 Products containing fewer materials are used to achieve the same end-use requirements as conventional products, including but not limited to: (3 points awarded for each material.)	<b>Max 9 points</b>											
(1) Lighter, thinner brick with bed depth less than 3 inches, brick with coring above 25%, or both.												
(2) Engineered wood or engineered steel products.			<b>3</b>									Engineered wood - OSB floor and roof
(3) Roof or floor trusses.										<b>6</b>	<b>1,866</b>	Specify steel roof and floor trusses over conventional approach.
<b>608 Indigenous Materials</b>												
608.1 Indigenous materials are used for major elements of the building.	<b>10 points max.</b>											
(1) one type of material.	<b>2</b>			<b>2</b>	<b>0</b>							Use indigenous stone for driveway base.
(2) For each additional material.	<b>2</b>			<b>2</b>	<b>0</b>			<b>6</b>	<b>0</b>			Specify OSB from local mill. Deck lumber, steel, and siding locally sourced.
<b>609 Life Cycle Analysis</b>												
609.1 A more environmentally preferable product or assembly for an application based upon the use of a Life Cycle Assessment (LCA) tool compliant with ISO 14044 or other recognized standards that compare the environmental impact of building materials, as	<b>Max 15 points</b>											
(1) Per product/system comparison	<b>3</b>											
(2) Whole building LCA analysis	<b>15</b>											
<b>610 Innovative Practices</b>												
<b>610.1 Manufacturer's environmental management system concepts.</b> Product manufacturer's operations and business practices include environmental management system concepts and the production facility is ISO 14001 certified or equivalent. The aggregate value of building products from ISO 14001 certified or equivalent production facilities is at least 1% or more of the estimated total building materials cost. (1 point awarded for every percent.)	<b>Max 10 points</b>											
<b>CHAPTER 7: ENERGY EFFICIENCY</b>	<b>Base Pts.</b>	<b>35</b>	<b>0</b>	<b>27</b>	<b>982</b>	<b>57</b>	<b>4,082</b>	<b>52</b>	<b>4,650</b>	<b>10</b>	<b>3,359</b>	<b>Ch. 7 Subtotal</b>
701.1 Mandatory requirements. The building shall comply with either Section 702 (Performance Path) or Section 703 (Prescriptive Path). Items listed as "Mandatory" in Section 701.4 apply to both the Performance and Prescriptive Paths.	<b>Cost per point</b>	<b>0</b>	<b>0</b>	<b>36</b>	<b>36</b>	<b>72</b>	<b>72</b>	<b>89</b>	<b>89</b>	<b>336</b>		
<b>Addition Note:</b> Section 701, including mandatory items, applies only to the new construction portion of additions.												
<b>Renovation Note:</b> Section 701 applies to existing buildings as follows:												
(1) For the Green Building Path (Section 305.4), the existing building or dwelling unit shall comply with the mandatory renovation/addition practices and shall achieve the points indicated in Table 303.												
(2) For the Green Remodel Path (Section 305.5), the existing building or dwelling unit shall comply with Table 305.5)												

ANSI National Green Building Standard™		172	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
			Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
<b>701.1.1 Minimum Performance Path Requirements.</b> A building complying with Section 702 shall exceed the baseline minimum performance required by the IECC by 15%, and shall include a minimum of two practices from Section 704.													Performance path selected.
<b>701.1.2 Minimum Prescriptive Path Requirements.</b> A building complying with section 703 shall obtain a minimum of 30 points from Section 703, and shall include a minimum of two practices from Section 704.													
<b>701.1.3 Alternative Bronze Level Compliance.</b> As an alternative, any building that qualifies as an ENERGY STAR qualified home or equivalent achieves the Bronze Level for Chapter 7.													
<b>701.2 Emerald Level Points.</b> The Performance Path shall be used to achieve to the Emerald Level.													Performance path selected at all levels.
<b>Mandatory Practices</b>													
<b>701.3</b> A review by the Adopting Entity or designated third party shall be conducted to verify design and compliance with Chapter 7.					0	520							Review by verifier. 4 hours at professional time estimated. Encompasses software modeling for either approach.
<b>701.4.1 HVAC SYSTEMS</b>													
<b>701.4.1.1</b> Space heating and cooling system/equipment shall be sized according to heating and cooling loads calculated using ACCA Manual J or equivalent.						0							2006 IECC requirement. Complies.
<b>Addition and Renovation Note:</b> Section 701.4.1.1 is mandatory for both additions and renovations where new HVAC equipment is installed.													
<b>Addition and Renovation Note:</b> The additional points for section 701.4.1.1 apply to additions or renovations that include one or both of the following:													
<b>(1)</b> a change in heating and cooling loads													
<b>(2)</b> a replacement and/or addition of mechanical equipment													
<b>701.4.1.2</b> Where installed, as a primary heat source in the building, radiant or hydronic space heating system is designed using industry-approved guidelines (e.g. ACCA Manual J, GAMA H-22, or an accredited design professional's and manufacturer's recommend													
<b>701.4.2 DUCT SYSTEM</b>													
<b>701.4.2.1</b> Ducts are sealed with tape complying with UL 181, mastic, gaskets, or an approved system as required by the ICC IRC (Section M1601.3.1, or ICC IMC Section 603.9) to reduce leakage.						0							2006 IECC requirement.
<b>Addition and Renovation Note:</b> Section 701.4.2.1 applies only to the new portions of a duct system, except as follows:													
<b>(1)</b> For renovations of existing buildings, the entire duct system, both existing and new, is permitted to be sealed with mastic or an aerosol spray-applied duct sealant.													
<b>(2)</b> For existing duct systems, where the existing duct system is not in accordance with Section 701.4.2.1, the overall duct system leakage is reduced by using any approved methods in Section 701.4.2.1, or aerosol spray applied duct sealant. Additional p													
<b>(a)</b> 25% to less than 50%													
<b>(b)</b> 50% to less than 75%													
<b>(c)</b> 75% to less than 100%													
<b>(d)</b> 100%													
<b>(e)</b> the entire system is upgraded in accordance with Section 704.6.2.2													
<b>701.4.2.2</b> Building cavities are not used as supply ducts.						0							All ducts are in the attic.
<b>Addition Note:</b> Section 701.4.2.2 is mandatory for new construction portion of additions.													
<b>Renovation Note:</b> Section 701.4.2.2 applies to renovations that involve one of the following:													
<b>(1)</b> the demolition, reconfiguration, or addition of interior walls or a modification in the duct system of the building													
<b>(2)</b> a focused effort to solve the use of building cavities as supply ducts													
<b>701.4.3 INSULATION and AIR SEALING</b>													
<b>701.4.3.1 GENERAL</b> Insulation and air sealing is in accordance with the following:													
<b>(1)</b> Insulation shall be installed in accordance with the manufacturer's instructions or local code, as applicable.						0							
<b>(2)</b> Shafts (duct shaft, piping shaft/penetrations, flue shaft.) Openings to unconditioned space are fully sealed with solid blocking or flashing and any remaining gaps are sealed with caulk or foam. Fire-rated collars and caulking are installed where re						0							
<b>Addition and Renovation Note:</b> Section 701.4.3.1(1) is mandatory for the new construction portion of additions and renovations.													
<b>Renovation Note:</b> Existing openings to unconditioned spaces are sealed.													
<b>701.4.3.2 FLOOR / FOUNDATION / CRAWLSPACE</b>													
<b>(1) Floors</b> (including insulated floors above garages and cantilevered floors)						0							SPF?
<b>(a)</b> Insulation is installed to maintain permanent contact with the underside of the subfloor decking, enveloping any attached ductwork within the thermal envelope without compression or air gaps in the insulation. This practice does not apply to ducts or other mechanical equipment that are adjacent to the underside of the subfloor.													
<b>(b)</b> Batt and loose-fill insulation is held in place by permanent attachments or systems in accordance with the manufacturer's instructions.													
<b>Renovation Note:</b> Insulate existing uninsulated floors.													
<b>(2) Crawlspace.</b> Where insulated, crawlspace wall insulation is permanently attached to the walls. Exposed earth in unvented crawlspaces is covered with continuous vapor retarder with overlapping joints taped or masticed.													Pier, N/A.
<b>Renovation Note:</b> In accordance with Section 701.4.3.2(2):													
<b>(1)</b> existing uninsulated crawlspace is insulated.						2							
<b>(2)</b> exposed earth in existing crawlspace is covered.						2							
<b>701.4.3.3 WALLS</b>													
<b>(1) Windows and Doors.</b> Caulking, gasketing, adhesive flashing tape, foam sealant, or weatherstripping is installed forming a complete air barrier.						0							See flashing details on plan.
<b>Renovation Note:</b> Existing windows and doors are weather-stripped and sealed.													
<b>(2) Band Joist and Rim Joists.</b> Band and rim joists are insulated and air sealed.						0							SPF?

ANSI National Green Building Standard™	172	Baseline		Bronze		Silver		Gold		Emerald		NOTES:	
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost		
<b>Renovation Note:</b> Existing uninsulated rim and/or band joists are insulated.	1 Add'l Pt												
<b>(3) Between Foundation and Sill Plate Bottom Plate</b>	Mandatory												
(a) Sill sealer, or other material that will expand and contract, shall be installed between foundation and sill plate.					0							N/a pier foundation.	
(b) Caulk or the equivalent is installed to seal the bottom plate of exterior walls.					74							Cost to retrofit from underneath. 2 hours field.	
<b>Renovation Note:</b> Existing perimeter sill plates are sealed.	1 Add'l Pt												
<b>(4) Skylights and kneewalls.</b> Skylight shafts and knee walls are insulated to the same level as the exterior walls.	Mandatory				0							N/a	
<b>Renovation Note:</b> Existing skylight shafts and kneewalls are insulated.	1 Add'l Pt												
<b>(5) Exterior Architectural features.</b> Code required building envelope insulation and air sealing is not disrupted at exterior architectural features such as stairs and decks.	Mandatory				0								
<b>701.4.3.4 CEILINGS AND ATTICS</b>													
<b>(1) Attic access (except unvented attics).</b> Attic access, knee wall door, or drop down stair is covered with insulation and gasketed. Knee wall door is insulated unit or is covered with insulation.	Mandatory				127								
<b>Renovation Note:</b> Existing attic access, knee wall door, or drop-down stairs are insulated.	1 Add'l Pt												
<b>(2) Recessed Lighting.</b> Recessed light fixtures that penetrate the thermal envelope are airtight, IC rated, and sealed with gasket, caulk, or foam.	Mandatory				0							No recessed lights.	
<b>Renovation Note:</b> Replace existing recessed lights that penetrate the thermal envelope with airtight, IC-rated recessed light fixtures that are sealed to drywall with gasket, caulk, or foam. (Additional point per fixture)	1 Add'l Pt												
<b>(3) Eave vents.</b> Where ceiling/attic assemblies or designs have eave vents, baffles, or other means shall be utilized to minimize air movement into or under the insulation.	Mandatory				0							2006 IECC R806.3	
<b>Renovation Note:</b> Provide blocking or baffle at eaves to ensure ventilation over attic insulation.	2 Add'l Pts												
<b>701.4.4 FENESTRATION</b>													
701.4.4.1 The NFRC-certified U-factor and SHGC windows, exterior doors, skylights, and tubular daylighting devices (TDDs) are in accordance with ENERGY STAR, or equivalent, or Table 701.4.4.1. Decorative fenestration elements with a maximum area of 15 sq	Mandatory				0							2006 IECC zone2 u=75 SHGC=40; cost differential between this and u=65 is negligible.	
<b>Table 701.4.4.1 Fenestration Specifications</b>													
Climate Zones	U-Factor	SHGC											
	Windows and Exterior Doors (maximum certified ratings)												
1 and 2	0.65	0.4											
3	0.4	0.4											
4 to 8	0.35	Any											
	Skylights and TDDs (max. certified ratings)												
1 to 3	0.75	0.4											
4 to 8	0.6	Any											
<b>702 Performance Path</b>													
702.1 Points from Section 702 (Performance Path) shall not be combined with points from Section 703 (Prescriptive Path).	Mandatory				0							Performance path.	
702.2 Energy efficiency features are implemented to achieve energy cost performance that exceeds ICC IECC by the following. A documented analysis using software in accordance with ICC IECC, Section 404, or ICC IECC Section 506.2 through 506.5, applied a												Ducts were sealed and a programmable Tstat was added to reach 15%. See 704.6.1(1) and	
(1) 15%	30				30	0							
(2) 30%	60						30	3,548				Upgrade attic R-38 & floor insulation to R-30+S. Install R-5 foam sheathing on top of OSB. Tankless electric high eff. water heater.	
(3) 50%	100								40	0		See 704.3.2.1 for cost of ICS solar hot water. Tankless electric cost at (2) above, silver level.	
(4) 60%	120										20	2,679	See 704.3.3.1 for cost of 0.5 kW photovoltaics. Equipment upgrade here - 8 SF, SEER 18 9.0HSPF
<b>Renovation Note:</b> Application of Section 702.2: A baseline energy use measurement is calculated for the existing building. (Based on the reduction in whole building energy use, points are given for every increase in efficiency in accordance with Section	0 Add'l Pts												
<b>703 Prescriptive Path</b>													
703.1 Building envelope. Where the total building thermal envelope UA is less than required by ICC IECC, Section 402.1.4, the total building thermal envelope UA is in accordance with Table 703.1.1. Where insulation is used to achieve these percentages, a	Points per Table 703.1.1												
	Sect. 703 pts.	17											
	Practices 704	5											
<b>Table 703.1.1 Total Building Thermal Envelope UA Climate Zone</b>													
Zone 2	Zone 3	10	(10)	0									
10% UA improvement	10 points	12 points											
20% UA improvement	20 points	24 points											
	Zone 4	Zone 5-6											
10% UA improvement	14 points	16 points											
20% UA improvement	28 points	32 points											
	Zone 7-8												
10% UA improvement	18 points												
20% UA improvement	36 points												
<b>Additional Note:</b> Section 703.1.1 applies to the new construction portion of additions.	0 Add'l Pts												
<b>Renovation Note:</b> The existing whole building thermal envelope UA is evaluated. One of the following is selected based on the evaluation.													
(1) If the overall thermal performance meets or exceeds the requirements of ICC IECC, Section 402.1.4; Section 703.1.1 applies to the renovation.	Mandatory 0 Add'l Points												



ANSI National Green Building Standard™	172	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(2) If the existing overall thermal performance is below the requirements of ICC IECC, Section 402.1.4, the overall thermal performance of the whole building thermal envelope UA is improved a minimum of the following:												
(a) 15 percent	15											
(b) 30 percent	30											
(a) 45 percent, or meets the requirement of ICC IECC, Section 402.1.4	45											
703.1.2 The insulation installation is graded by a third party and is in accordance with Sections 703.1.2.1, 703.1.2.2, 703.1.2.3, and/or 703.1.2.4, as applicable. (Points not awarded in this section if already awarded under Section 703.1.1)	Points per Table 703.1.2											
<b>Table 703.1.2</b>												
Insulation Installation Grades												
Grade	Points											
1	15											
2	10											
3	0											
703.1.2.1 Both Grade 1 and Grade 2 installations are in accordance with the following:												
(a) Grades apply to cavity fill insulation, continuous rigid insulation, and any other field-installed insulation products. Grading applies to ceilings, walls, rim joists, conditioned basements and crawlspaces, except as specifically noted. Inspections												
(b) Insulation is installed in accordance with the manufacturer's instructions and/or industry standards.												
(c) Wall cavity insulation is enclosed on all six sides, and is in substantial contact with the sheathing material on one or more sides (interior or exterior) of the cavity.												
703.1.2.2 Grade 1 installation in accordance with the following:												
(a) Insulation uniformly fills each cavity side-to-side and top-to-bottom, without substantial gaps or voids around obstructions (such as blocking or bridging).												
(b) Compression or incomplete fill amounts to no more than 2% or less, presuming the compression or fill is at least 70% of the intended fill thickness; occasional small gaps are acceptable.												
(c) Exterior rigid insulation shall have substantial contact with the structural framing members or sheathing materials, and is tightly fitted at joints.												
(d) Cavity insulation is split, installed, and/or fitted tightly around wiring and other services.												
(e) Exterior sheathing is not visible from the interior through gaps in the cavity insulation.												
(f) Faced batt insulation is permitted to have side-stapled tabs, provided the tabs are stapled neatly with no buckling, and provided the batt is only compressed at the edges of each cavity, to the depth of the tab itself.												
(g) ICFs, SIPs, and other wall systems that provide integral insulation comply with "Grade 1" insulation installation requirements where properly installed.												
(h) "Grade 1" insulation must meet or exceed all requirements of "Grade 2" insulation.												
703.1.2.3 Grade 2 installation is in accordance with the following:												
(a) A maximum of 2% of the surface area of insulation is missing. Compression or incomplete fill amounts to 10 percent or less, presuming the compression or fill is a minimum of 70 percent of the intended fill thickness.												
(b) In conditioned basement or crawlspace the following apply:												
(i) Insulation is installed in complete contact with the subfloor surfaces.												
(ii) Floor insulation over vented or ambient conditions is enclosed on six sides.												
(c) Floor insulation over unconditioned basements is not required to be enclosed on six sides.												
(d) Ceiling insulation is not required to be enclosed when the insulation is installed in complete contact with the drywall or plywood surfaces it is intended to insulate.												
(e) Eave baffles or equivalent construction is installed to prevent wind washing.												
(f) Installation with occasional installation defects is permitted: gaps around wiring, electrical outlets, plumbing and other intrusions; rounded edges or shoulders.												
703.1.2.4 Grade 3 installation is in accordance with the following:												
(a) Standard insulation installation not in accordance with Grade 1 or Grade 2 criteria.												
703.1.3 More than 75% of the above-grade exterior opaque wall area of the building is mass walls.	Points per Table 703.1.3											
<b>Table 703.1.3</b>												
Exterior Mass Walls												
	Mass Construction											
	3 in. to <6 in.	6 in.										
Climate Zones 1, 2, 3, 4 except marine, and 5 dry.	4	6										
Climate Zones 4 marine, 5 except dry, and 6.	3	5										
Climate Zones 7 and 8	0	0										
<b>703.2 Insulation &amp; Air Sealing</b>												
703.2.1 Insulation and air sealing is installed in accordance with all of the following, as applicable:												
(1) Third party verification performed.	15											
(2) No third party verification performed.	3											
703.2.1.1 GENERAL												
703.2.1.1.1 Air Barrier and Thermal Barriers												
(1) Thermal insulation is installed in substantial contact with interior and exterior air barrier to provide continuous alignment of the insulation with the air barrier. The following are deemed to be their own air barrier:												
(a) Any spray or rigid foam insulation with an air permeance of 0.02 L/s-m <sup>2</sup> or less at 75 Pa.												
(b) ICFs, SIPs, and other wall systems that provide their own air barrier, except at interfaces with other materials or assemblies, or penetrations.												
(c) Spray foam that complies with the following:												
(i) continuously attached to the top, bottom and both sides of the cavity												
(ii) Continuous in the cavity without any unrepaired breaks.												
(iii) air impermeable												

ANSI National Green Building Standard™	172	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(d) Air impermeable insulation.												
(2) Voids or areas of incomplete fill (less than 30% of full thickness) are 2% or less of the insulated area.												
(3) Insulation is in substantial contact with sheathing materials on one or more sides.												
(4) Any exterior rigid insulation is tightly fitted or interlocking at the joints.												
703.2.1.1.2 Plumbing and Wiring												
(1) At a minimum, insulation is placed between the outside (ceiling, wall, or floor) and the pipes.												
(2) Batt insulation is split or cut to fit around wiring and plumbing.												
(3) Sprayed insulation is installed to encapsulate pipes where the pipe temperature is 180 degrees F (82.2C) or less. Wiring is fastened in place to prevent displacement prior to spraying.												
703.2.1.1.3 Narrow cavities are filled and batts are cut to fit.												
703.2.1.1.4 HVAC register boots that penetrate the building envelope are caulked or sealed to the subfloor or drywall.												
703.2.1.1.5 Masonry fireplace equipped with gasketed doors, outside combustion air, and a chimney top damper.												
703.2.1.2 Air barrier is installed at any exterior edge of insulation at floors, foundations, and crawlspaces including insulated floors above garages and cantilevered floors.												
703.2.1.3 WALLS												
(1) Exterior walls behind the tub/shower are insulated and include an interior and exterior air barrier.												
(2) Air sealed type electrical outlet boxes are installed or the air barrier extends completely behind the boxes. Insulation is placed between the sheathing and the rear of electrical or phone boxes located on exterior walls. Electrical outlet boxes ar												
(3) Duplex and townhouse construction: In the common walls between dwelling units (e.g., gypsum shaft wall) an air barrier is installed to seal the gap between the common wall and the structural framing.												
(4) Skylight shafts and knee walls are air sealed. Insulation on attic knee walls and skylight shafts are physically supported by stapling in place, netting or using other mechanical attachment.												
(5) Fireplace walls: Air barrier that is aligned with insulation; any gaps are sealed with caulk or foam.												
703.2.1.4 CEILINGS and ATTICS												
(1) At dropped ceilings and soffits, the air barrier is substantially aligned with insulation and any gaps are sealed with caulk, foam, or tape.												
(2) Access to vented attics, including knee wall doors, and/or drop down stairs, is caulked, gasketed, or otherwise sealed.												
(3) An insulated cover is gasketed or sealed to the attic opening where a whole building or whole dwelling unit fan penetrates into the attic.												
<b>Addition Note:</b> Section 703.2.1 applies only to the new construction portion of additions.												
<b>Renovation Note:</b> The air infiltration of the existing whole building envelope is evaluated. Based on the evaluation, choose one of the following: (Additional points awarded only where third-party verification is not performed.)												
(1) Where the overall air infiltration rate is equal to or less than the requirements for new construction (as indicated in Section 704.6.2.1), this item applies to the renovation.												
(2) Where the overall air infiltration rate is greater than the requirements for new construction (as indicated in Section 704.6.2.1), reduce the air infiltration of the whole building envelope by:												
(a) 15 percent												
(b) 30 percent												
(c) 50 percent												
<b>703.3 FENESTRATION</b>												
703.3.1 The NFRC-certified U-factor and SHGC for windows, exterior doors, skylights, and tubular daylighting devices (TDDs) are in accordance with Table 703.3.1(a) or (b). Decorative fenestration elements with a maximum of 15 square feet or 10% of the to												
<b>Table 703.3.1(a) - Enhanced Fenestration Specifications</b>												
U-Factor and SHGC												
Climate Zone												
Windows and Exterior Doors (maximum certified ratings)												
0.45 0.30												
1 and 2												
<b>8</b>												
0.35 0.30												
3												
<b>8</b>												
0.30 Any												
4 and 5												
<b>5</b>												
0.30 Any												
6 and 8												
<b>6</b>												
Skylights and TDDs (maximum certified ratings)												
0.55 0.35												
1 to 3												
0.55 Any												
4 to 8												
<b>Included above</b>												
<b>Table 703.3.1(b) - Enhanced Fenestration Specifications</b>												
U-Factor and SHGC												
Climate Zone												
Windows and Exterior Doors (maximum certified ratings)												
0.45 0.25												
1 and 2												
<b>10</b>												
0.35 0.25												
3												
<b>10</b>												
0.25 Any												
4 and 5												
<b>10</b>												
0.25 Any												
6 thru 8												
<b>12</b>												
Skylights and TDDs (maximum certified ratings)												
0.50 0.35												
1 to 3												
0.50 Any												
4 to 8												
<b>Included above</b>												
<b>Addition Note:</b> Section 703.3.1 applies only to the new construction portion of additions. (Points available on the basis of a ratio of new window area to total window area (new window area divided by total window area).)												
<b>0 Add'l Pts</b>												
<b>Renovation Note:</b> Section 703.3.1 applies only to the replacement of existing windows. (Points available on the basis of a ratio of new window area to total window area (new window area divided by total window area).)												
<b>2 Add'l Pts</b>												
<b>703.4 HVAC Equipment Efficiency</b>												

ANSI National Green Building Standard™	172	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
703.4.1 Combination Space Heating and Water Heating System ("Combo" System) is installed using either a coil from the water heater connected to an air handler to provide heat for the building or dwelling unit, or a space heating boiler using an indirect	4											
703.4.2 Furnace and/or boiler efficiency is in accordance with one of the following:												
<b>(1) Table 703.4.2(1) Gas and propane heaters:</b>	Points per Table 703.4.2(1)											
<b>Table 703.4.2(1) - Gas / Propane Heaters:</b>												
Climate Zone	AFUE	Points										
1	≥90%	0										
1	≥92%	0										
1	≥94%	0										
2	≥90%	2										
2	≥92%	2										
2	≥94%	3										
3	≥90%	5										
3	≥92%	6										
3	≥94%	7										
4	≥90%	8										
4	≥92%	9										
4	≥94%	10										
5	≥90%	11										
5	≥92%	12										
5	≥94%	14										
6 through 8	≥90%	14										
6 through 8	≥92%	15										
6 through 8	≥94%	17										
<b>Table 703.4.2(2) Oil Furnace:</b>	Points per Table 703.4.2(2)											
<b>Table 703.4.2(2) - Oil Furnace:</b>												
Climate Zone	AFUE	Points										
1	≥83%	0										
1	≥90%	0										
2	≥83%	1										
2	≥90%	2										
3	≥83%	3										
3	≥90%	5										
4	≥83%	3										
4	≥90%	8										
5	≥83%	7										
5	≥90%	11										
6 through 8	≥83%	7										
6 through 8	≥90%	14										
<b>(3) Gas Boiler:</b>	Points per Table 703.4.2(3)											
<b>Table 703.4.2(3) - Gas Boiler</b>												
Climate Zone	AFUE	Points										
1	≥85%	0										
1	≥90%	0										
2	≥84%	0										
2	≥85%	1										
2	≥90%	2										
3	≥84%	3										
3	≥85%	3										
3	≥90%	5										
3	≥94%	7										
4	≥85%	4										
4	≥90%	8										
4	≥94%	10										
5	≥85%	6										
5	≥90%	11										
5	≥94%	14										
6 through 8	≥85%	7										
6 through 8	≥90%	14										
6 through 8	≥94%	17										
<b>Table 703.4.3.2(4) Oil Boiler:</b>	Points per Table 703.4.2(4)											
<b>Table 703.4.2(4) - Oil Boiler</b>												
Climate Zone	AFUE	Points										
1	≥85%	0										
1	≥90%	0										
2	≥85%	1										
2	≥90%	2										
3	≥85%	3										
3	≥90%	5										
4	≥85%	4										
4	≥90%	8										
5	≥85%	6										
5	≥90%	11										
6 through 8	≥85%	7										
6 through 8	≥90%	14										
703.4.3 Boiler equipped with temperature reset control or burner delay control.	1											
703.4.4 Heat pump heating efficiency is in accordance with Table 703.4.4. Refrigerant charge is verified to be in conformance with manufacturer's instructions.	Points per Table 703.4.4											
<b>Table 703.4.4 - Heat Pump Heating</b>												
Climate Zone	Efficiency	Points										
1	8.2HSPF 11.5EER	0										
1	9.0HSPF 12.5EER	0										
2	8.2HSPF 11.5EER	1	1	(1)							2 ton 8.5 HSPF	
2	9.0HSPF 12.5EER	2										
3	8.2HSPF 11.5EER	2										
3	9.0HSPF 12.5EER	5										
4	8.2HSPF 11.5EER	5										
4	9.0HSPF 12.5EER	10										
5	8.2HSPF 11.5EER	7*										
5	9.0HSPF 12.5EER	11*										
6 through 8	8.2HSPF 11.5EER	7*										
6 through 8	9.0HSPF 12.5EER	12*										
*Zones 5-8 require consideration for use of resistance heat in cold climates when installing a heat pump.												
703.4.5 Cooling efficiency is in accordance with one of the following. Refrigerant charge is verified for conformance with manufacturer's instructions.	Points per Table 703.4.5(1)											
<b>Table 703.4.5(1) - Air Conditioner and Heat Pump Cooling</b>												
Climate Zone	SEER (EER)	Points										
1	14 (11.5)	8										
1	15 (12.5)	12										

ANSI National Green Building Standard™			172	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
				Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
1	17	(12.5)	18											
1	19	(12.5)	24											
2	14	(11.5)	6	6		(6)								
2	15	(12.5)	10											
2	17	(12.5)	14											
2	19	(12.5)	18											
3	14	(11.5)	2											
3	15	(12.5)	4											
3	17	(12.5)	6											
3	19	(12.5)	8											
4	14	(11.5)	2											
4	15	(12.5)	3											
4	17	(12.5)	4											
4	19	(12.5)	4											
5	14	(11.5)	1											
5	15	(12.5)	2											
5	17	(12.5)	3											
5	19	(12.5)	3											
6 through 8	14	(11.5)	1											
6 through 8	15	(12.5)	2											
6 through 8	17	(12.5)	3											
6 through 8	19	(12.5)	3											
(2) Water Source and Cooled Air Conditioners			<b>Points per Table</b>											
<b>Table 703.4.5(2) - Water Source and Cooled Air Conditioners</b>														
Climate Zone	EER, COP	Points												
1	15 4.0	18												
2	15 4.0	14												
3	15 4.0	6												
4	15 4.0	4												
5	15 4.0	3												
6 through 8	15 4.0	3												
703.4.6 Ground source heat pump is installed by a Certified Geothermal Service Contractor in accordance with one of the following ENERGY STAR levels:														
(1) Open loop; $\geq 16.2$ EER and $\geq 3.6$ COP		20												
(2) Closed loop; $\geq 14.1$ EER and $\geq 3.3$ COP		20												
(3) Direct expansion; $\geq 15.0$ EER and $\geq 3.5$ COP		20												
(4) Any type (open, closed or direct expansion); $\geq 24$ EER and $\geq 4.3$ COP		30												
703.4.7 ENERGY STAR, or equivalent, ceiling fans are installed. (Points awarded per building.)			1											
703.4.8 Whole building or whole dwelling unit fan(s) with insulated louvers and a sealed enclosure is installed. (Points awarded per building.)			2											
703.4.9 In multi-unit buildings, an advanced electric and fossil fuel submetering system is installed to monitor electricity and fossil fuel consumption for each unit. At a minimum, the information is available to the occupants on a monthly basis.														
(1) Install a device providing monthly consumption information.		1												
(2) Install a device that can provide near real-time energy consumption information.		4												
703.4.10 An ENERGY STAR, or equivalent, programmable thermostat is installed to control each heating and cooling zone. (Points awarded per dwelling unit.)			1											
<b>Addition Note:</b> Section 703.4.10 applies to the new construction portion of additions.			0 Add'l Pts											
<b>Renovation Note:</b> Replace existing nonprogrammable thermostat.			1 Add'l Pt											
<b>703.5 Water Heating Design, Equipment, and Installation</b>														
703.5.1 Water heater Energy Factor (EF) is equal to or greater than the following:			<b>Points Per Tables</b>											
(1) Gas Water Heating			703.5.1(1)(a) or 703.5.1(1)(b)											
<b>Table 703.5.1(1)(a) - Gas Water Heating</b>														
(Storage with input rate of 75,000 Btu/hr or less or instantaneous input rate of 200,000 Btu/hr or less)														
Size (gallons)	Energy Factor	POINTS												
30 to < 40	0.64	1												
40 to < 50	0.62	1												
50 to < 65	0.6	1												
65 to < 75	0.58	1												
75	0.56	1												
Any	0.8	10												
<b>Table 703.5.1(1)(b) - Gas Water Heating</b>														
(Storage with input rate of greater than 75,000 Btu/hr or instantaneous input rate greater than 200,000 Btu/hr)														
Size (gallons)	Thermal Efficiency	POINTS												
Any	82-86%	1												
Any	> 86%	10												
(2) Electric Water Heating			<b>Points Per Tables 703.5.1(2)</b>											
<b>Table 703.5.1(2) - Electric Water Heating</b>														
Size (gallons)	Energy Factor	POINTS												
30 to < 40	0.95	1												
40 to < 50	0.94	1												
50 to < 65	0.92	1												
65 to < 80	0.9	1												
80 to < 100	0.88	1												
100	0.86	1												
(3) Oil Water Heating			<b>Points per Table 703.5.1(3)</b>											
<b>Table 703.5.1(3) - Oil Water Heating</b>														
Size (gallons)	Energy Factor	POINTS												
30 to < 50	0.59	1												
50	0.55	1												
(4) Heat Pump Water Heating			<b>Points per Table 703.5.1(4)</b>											
<b>Table 703.5.1(4) - Heat Pump Water Heating</b>														
Heat Pump	Energy Factor	POINTS												
Heat Pump	1.5	7												
Heat Pump	2	10												
703.5.2 Desuperheater, s installed by a qualified installer or is pre-installed in the factory.			<b>Points per Table 703.5.2</b>											
<b>Table 703.5.2 - Desuperheater</b>														
Climate Zone		<b>Points for Desuper heater</b>												
Zone 1-4		5												
Zone 5-8		2												

ANSI National Green Building Standard™	172	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
703.5.3 Drain-water heat recovery system is installed in multi-family units. (Points awarded per building.)	2											
703.5.4 Insulating hot water pipes												
703.5.4.1 Hot water lines are insulated with a minimum of R-4 insulation.	1											
703.5.4.2 Boiler supply piping is insulated in unconditioned spaces.	1											
<b>Addition Note:</b> Section 703.5.4 applies only to the new or modified plumbing associated with the addition.	0 Add'l Pts											
<b>Renovation Note:</b> Where hot water lines in the existing building are accessible, the hot water lines are insulated in accordance with Section 703.5.4. (To receive additional points, a minimum of 50 percent of the existing hot water lines are insulated.)	1 Add'l Pt											
703.5.5 Indirect fired water heater storage tanks heated from boiler systems are installed.	1											
<b>704 Additional Practices</b>												
<b>704.1 Application of Additional Practice Points.</b> Points from Section 704 can be added to points earned in Section 702 (Performance Path), Section 703 (Prescriptive Path) or Section 701.1.3 (alternative Bronze Level compliance).												
<b>704.2 Lighting and Appliances</b>												
704.2.1 Hard-wired lighting meets one of the following:												
(1) A minimum of 50% of the total hard-wired lighting fixtures, or the bulbs in those fixtures, qualify as ENERGY STAR or equivalent.	4											
(2) A minimum of 50% of the total hard-wired lighting fixtures qualify as ENERGY STAR or equivalent.	8					8	125					\$25 per fixture; 5 fixtures
(3) A minimum of 80% of the exterior lighting wattage has an efficiency of at least 40 lumens per watt or be a solar powered light fixture.												
<b>Addition Note:</b> Section 704.2.1 applies only to the new construction portion of additions.	0 Add'l Pts											
<b>Renovation Note:</b> A percentage of the total lighting fixtures, or the lights in those fixtures, are replaced with fixtures or lights that qualify as ENERGY STAR or equivalent.												
(1) 50 percent	1 Add'l Pt											
(2) 75 percent	2 Add'l Pts											
(3) 100 percent	3 Add'l Pts											
704.2.2 The number of recessed light fixtures that penetrate the thermal envelope are less than 1 per 400 square feet of total conditioned floor area and are in accordance with Section 701.4.3.4(2).	2		2									No recessed.
<b>Addition Note:</b> Section 704.2.2 is mandatory for the new construction portion of additions.	Mandatory 0 Add'l Pts											
<b>Renovation Note:</b> Section 704.2.2 applies where room for installation within the conditioned envelope is available. (To receive additional points, a minimum of 50% of the total recessed ceiling lights are in accordance with Section 704.2.2.)	1 Add'l Pt											
704.2.3 Occupancy sensors are installed on indoor lights, and photo or motion sensors are installed on outdoor lights to control lighting.												
(1) 25% of lighting	2											
(2) 50% of lighting	4											
704.2.4 Tubular daylighting device (TDD) or a skylight with sealed, insulated, low-E glass is installed in rooms without windows. (Points awarded per building.)	2											
704.2.5 ENERGY STAR or equivalent appliance(s) are installed:												
(1) Refrigerator	5	5										
(2) Dishwasher	2	2										
(3) Washing machine	4	4										
<b>Addition and Renovation Note:</b> Section 704.2.5 applies as follows:												
(1) replace existing refrigerator	2 Add'l Pts											
(2) replace existing dishwasher	1 Add'l Pt											
(3) replace existing washing machine	1 Add'l Pt											
704.2.6 Induction cooktop is installed.	1											
704.2.7 Occupancy sensors are installed for a minimum of 80% of hardwired lighting outlets.	1											
<b>704.3 Renewable Energy/Solar Heating and Cooling</b>												
<b>704.3.1 Solar space heating and cooling.</b>												
704.3.1.1 Sun-tempered Design: Building orientation, sizing of glazing, and design of overhangs are in accordance with all of the following:	5											
(1) The long side (or one side if of equal length) of the building faces within 20° of true south.												
(2) Vertical glazing area is between 5% and 7% of gross Conditioned Floor Area on the south face (also see Section 704.3.1.1(8)).												
(3) Vertical glazing area is less than 2% of gross Conditioned Floor Area on the west face, and glazing is ENERGY STAR compliant or equivalent.												
(4) Vertical glazing area is less than 4% of gross Conditioned Floor Area on the east face and glazing is ENERGY STAR compliant or equivalent.												
(5) Vertical glazing area is less than 8% of gross Conditioned Floor Area on the north face, and glazing is ENERGY STAR compliant or equivalent.												
(6) Skylights, where installed, are in accordance with the following:												
(a) Shades and insulated wells are used and all glazing is ENERGY STAR compliant or equivalent.												
(b) Horizontal skylights are less than 0.5 % of Finished Ceiling Area												
(c) Sloped skylights on slopes facing within 45° of true South, East or West are less than 1.5% of the Finished Ceiling area												
(7) Overhangs or adjustable canopies or awnings or trellises provide shading on south facing glass for the appropriate climate zone in accordance with Table 704.3.1.1:												
<b>Table 704.3.1.1 Southern Window Overhang Depth</b>												
<b>Climate Zone and Overhang Depth</b>												
1 through 3	2' 8"											Vertical Distance between bottom of overhang and top of window sill
1 through 3	2' 8"											≤7' 4"
1 through 3	2' 4"											≤6' 4"
1 through 3	2' 4"											≤5' 4"

ANSI National Green Building Standard™			172	Baseline		Bronze		Silver		Gold		Emerald		NOTES:	
				Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost		
1 through 3	2' 0"	≤4' 4"													
1 through 3	2' 0"	≤3' 4"													
4 through 6	2' 4"	≤7' 4"													
4 through 6	2' 4"	≤6' 4"													
4 through 6	2' 0"	≤5' 4"													
4 through 6	2' 0"	≤4' 4"													
4 through 6	1' 8"	≤3' 4"													
7 and 8	2' 0"	≤7' 4"													
7 and 8	1' 8"	≤6' 4"													
7 and 8	1' 8"	≤5' 4"													
7 and 8	1' 4"	≤4' 4"													
7 and 8	1' 0"	≤3' 4"													
(8) The south face windows have a SHGC of 0.40 or higher.															
(9) Return air or transfer grilles/ducts are in accordance with Section 704.4.5.															
<b>Addition Note:</b> Section 704.3.1.1 applies to the new construction portion of additions. (Points are available on the basis of a ratio of new building area to total building area. New building area divided by total building area.)			<b>0 Add'l Pts</b>												
<b>Renovation Note:</b> Section 704.3.1.1 applies to existing construction.			<b>1 Add'l Pt</b>												
704.3.1.2 Automated solar protection is installed to provide shading for windows.			<b>1</b>												
704.3.1.3 Passive cooling design features are in accordance with three or more of the following:			<b>3</b>												
Points for three items:			<b>3</b>												
Points for one additional item:			<b>1</b>												
(1) Exterior shading is provided on east and west windows using one or a combination of the following strategies:															
(a) Vine covered trellises with the vegetation separated a minimum of 1 foot from face of building.															
(b) Moveable awnings or louvers															
(c) Covered porches															
(d) Attached or detached conditioned/unconditioned enclosed space that provides full shade of east and west windows (e.g., detached garage, shed or building)															
(2) Overhangs are installed to provide shading on south-facing glazing in accordance with Section 704.3.1.1(7). (Points not awarded if points are taken under 704.3.1.1.)															
(3) Windows and/or venting skylights are located to facilitate cross ventilation.															
(4) Solar reflective roof or radiant barrier is installed in Climate Zones 1, 2 or 3 and roof material meets a 3 year aged criteria of 0.50.															
(5) Internal exposed thermal mass is a minimum of three inches in thickness. Thermal mass consists of concrete, brick, and/or tile that are fully adhered to a masonry base or other masonry material and is in accordance with one or a combination of the following:															
(a) A minimum of one square foot of exposed thermal mass of floor per three square feet of gross finished floor area.															
(b) A minimum of three square feet of exposed thermal mass in interior walls or elements per square foot of gross finished floor area.															
(6) Roofing material is installed with a minimum 0.75 inch continuous air space offset from the roof deck from eave to ridge.															
<b>Addition Note:</b> Section 704.3.1.3 applies to the new construction portion of additions. (Points are available on the basis of a ratio of new building area to total building area. New building area divided by total building area.)			<b>0 Add'l Pts</b>												
<b>Renovation Note:</b> Section 704.3.1.3 applies to existing construction. A minimum of one design feature is required.			<b>1 Add'l Pt</b>												
704.3.1.4 Passive solar heating design. In addition to the sun-tempered design features in Section 704.3.1.1, all of the following are implemented:			<b>4</b>												
(1) Additional glazing, no greater than 12%, is permitted on the south wall. This additional glazing is in accordance with the requirements in Section 704.3.1.1.															
(2) Additional thermal mass for any room with south-facing glazing of more than 7% of the finished floor area is provided in accordance with the following:															
(a) Thermal mass is solid and a minimum of 3" in thickness. Where two thermal mass materials are layered together (e.g. ceramic tile on concrete base) to achieve the appropriate thickness, they are fully adhered to (touching) each other.															
(b) Thermal mass directly exposed to sunlight must be provided in the following minimum ratios:															
(i) Above latitude 35°: 5 square feet of thermal mass for every 1 square foot of south facing glazing.															
(ii) Latitude 30° to 35°: 5.5 square feet of thermal mass for every 1 square foot of south facing glazing.															
(iii) Latitude 25° to 30°: 6 square feet of thermal mass for every 1 square foot of south facing glazing.															
(c) Thermal mass not directly exposed to sunlight is permitted to be used to achieve thermal mass requirements of Section 704.3.1.4 (2) based on a ratio of 40 square feet of thermal mass for every 1 square foot of south facing glazing.															
(3) In addition to return air or transfer grilles/ducts required by Section 704.3.1.1, provisions for forced airflow to adjoining areas are implemented as needed.															
704.3.2 Solar water heating															
704.3.2.1 Solar water heater. SRCC (Solar Rating & Certification Corporation) Q3 300 rated, or equivalent, solar domestic water heating system is installed. Solar Energy Factor (SEF as defined by SRCC) is in accordance with Table 704.3.2.1.															
<b>Table 704.3.2.1 - Solar Hot Water Systems</b>															
SEF - Electric Tank		SEF - Gas Tank	<b>POINTS</b>												
1.30 - 1.50		0.85 - 1.00	<b>8</b>							<b>8</b>		<b>4,500</b>			
1.51 - 1.80		1.01 - 1.20	<b>11</b>												
1.81 - 2.30		1.21 - 1.50	<b>14</b>												
2.31 - 3.00		1.51 - 2.00	<b>17</b>												
3.01		2.01	<b>20</b>												
<b>Addition and Renovation Note:</b> Section 704.3.2.1 applies to systems in additions and/or existing buildings.			<b>1 Add'l Pt</b>												
704.3.3 Additional renewable energy options															

ANSI National Green Building Standard™	172	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
704.3.3.1 Photovoltaic panels are installed on the property. (Points awarded per every 100 watts DC of the rated PV system)	1											
704.3.3.2 Other onsite renewable energy source is installed (e.g., wind energy, onsite micro-hydro power, active solar space heating systems). (Points awarded per every 1/10 kW of the system)	0.5											
<b>704.4 Ducts</b>												
704.4.1 Duct system is sized, designed, and installed according to ACCA Manual D or equivalent.	5	5										2006 IECC M1601.1
<b>Addition Note:</b> New construction portion of additions.	Mandatory Add'l Pts	0										
<b>Renovation Note:</b> Section 704.4.1 applies only where the duct system in the existing building is readily accessible, and the duct system is sized, designed, and installed in accordance with ACCA Manual D or equivalent. A minimum of 75% of the duct runs a	1 Add'l Pt											
704.4.2 Space heating is provided by a system that does not include air ducts.	15											
704.4.3 Space cooling is provided by a system that does not include air ducts.	15											
704.4.4 Ductwork is in accordance with all of the following:	12											
(1) Building cavities are not used as return ductwork.												
(2) Heating and cooling ducts and mechanical equipment are installed within the conditioned building space.												
(3) Ductwork is not installed in exterior walls												
<b>Addition Note:</b> Section 704.4.4 applies to the new construction portion of additions.	0 Add'l Pts											
<b>Renovation Note:</b> Section 704.4.4 applies to renovations that involve the demolition, reconfiguration, and/or addition of interior walls, or a modification in the duct system of the building, or an intentional effort to implement the practices in Section	2 Add'l Pts											
704.4.5 Return ducts or transfer grilles are installed in every room with a door. This practice does not apply to bathrooms, kitchens, closets, pantries, and laundry rooms.	5			5	0							Plans indicate returns every room.
<b>Addition Note:</b> Section 704.4.5 applies to the new construction portion of additions.	0 Add'l Pts											
<b>Renovation Note:</b> Section 704.4.5 applies to renovations that involve the demolition, reconfiguration, and/or addition of interior walls, or a change in the heating, cooling, and ventilation system of the building, or a test of the building for balanced p	2 Add'l Pts											
<b>704.5 HVAC Design and Installation</b>												
704.5.1 ACCA Manual S or equivalent is used to select heating and/or cooling equipment.	1			1	0							The code does not require Manual S, however, Manual D requires it.
704.5.2 HVAC contractor and service technician are certified by a nationally or regionally recognized program such as North American Technician Excellence, Inc. (NATE), Building Performance Institute (BPI), Radiant Panel Association, or manufacturers' tr	1			1	0							Standard.
704.5.3 Performance of the heating/cooling system is verified by the HVAC contractor in accordance with all of the following:	3					3						
(1) Start-up procedure is performed according to manufacturer's instructions.												Standard.
(2) Refrigerant charge is verified by super-heat and/or sub-cooling method.												Standard.
(3) Burner is set to fire at nameplate input.												Standard.
(4) Air handler setting/fan speed is set per manufacturer's instructions.												Standard.
(5) Total air flow is within 10% of design flow.												Allow team of 2 2 hours at field rate.
(6) Total external system static does not exceed equipment capability at rated airflow.							149					Standard.
704.5.4 HVAC equipment operates using an alternate refrigerant containing no HCFCs. (Points awarded only until January 20, 2010.)	1					1	0					Trane and others include 15' of line set alternate refrigerant with product.
704.5.5 Manufacturer's label or printed specifications for sealed air handler (except furnaces) indicates the leakage is less than or equal to 2% of design airflow at a pressure of 1-inch w.g. (1250 Pa). Air handlers are tested with inlets, outlets, an	4											
<b>704.6 Installation and Performance Verification</b>												
704.6.1 Third party onsite inspection is conducted to verify conformance with all of the following, as applicable. Minimum of 2 inspections are performed. One inspection after insulation is installed and prior to being covered, and another inspection up	5			5								Included in verifier's field visit. See 701.3.
(1) Ducts are installed per IRC/IMC and ducts are sealed.					260							6% leakage modeled for 15% improvement.
(2) Building envelope air sealing is installed.					0							2006 IECC required for SLA .00036.
(3) Insulation is installed in accordance with Section 703.1.2					0							
(4) Windows, skylights, and doors are flashed, caulked, and sealed in accordance with manufacturer's recommendations and in accordance with Section 703.2.1.					0							
704.6.2 Third party testing is conducted to verify performance.												
704.6.2.1 Building envelope leakage rate is demonstrated by blower door test. In addition to the test, the following practices are required:												
1. Whole building ventilation is provided in accordance with Section 902.2.												
2. Fossil fuel furnace and water heater is sealed combustion or power vented in accordance with Section 901.1.												
3. Fireplaces and Fuel Burning Appliances are in accordance with 901.2.												
<b>The maximum leakage rate is in accordance with:</b>												
(a) 5 ACH50	0.25 nat	3										
(b) 4 ACH50	0.2	6										
(c) 3 ACH50	0.15	9										
(d) 2 ACH50	0.1	12										
(e) 1 ACH50	0.05	15										

ANSI National Green Building Standard™	172	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
704.6.2.2 The entire central HVAC duct system, including air handlers and register boots, is tested for leakage at a pressure differential of 0.1 inches w.g. (25 Pa). The maximum leakage as a percent of the system design flow rate is in accordance with												
(1) 6% for ductwork entirely outside the building's thermal envelope.	15					15	260			(15)	0	See 704.6.1(1) for cost of duct seal. BD and DB tests here not subtracted.
(2) 6% for ductwork entirely inside the building's thermal envelope.	5									5	680	Move ducts and A/H inside building envelope. Cost is SF price to consumer given up to equipment.
(3) 6% for ductwork both inside and outside the building thermal envelope.	15											
704.6.2.3 Balanced HVAC air flows are demonstrated by flow hood or other acceptable flow measurement tool. Test results in accordance with both of the following:	8											
(a) Measured flow at each supply and return register is within 25% of design flow.												
(b) Total airflow is within 10% of design flow.												
<b>Addition Note:</b> Section 704.6.2 applies to the new construction portion of additions. (Points are available on the basis of a ratio of new area to total area.) (New area divided by total area.)	0 Add'l Pts											
<b>Renovation Note:</b> Section 704.6.2 applies as follows: Evaluate the performance features of the existing whole building envelope. Choose one of the following based on the evaluation:												
(1) The overall energy performance features of the existing building are equal to or better than the requirements for new construction.	1 Add'l Pt											
(2) If the overall energy performance features of the existing building are less than the requirements for new construction, third party testing is conducted to verify performance claimed in Sections 701.4.2.1, 703.1 and 703.2.1.	3 Add'l Pts											
<b>705 Innovative Practices</b>												
<b>705.1 Energy consumption control.</b> A whole building or whole dwelling unit device is installed that controls or monitors energy consumption.	7 Points Max											
(1) Programmable communicating thermostat	2			2	0							
(2) Energy monitoring device	4							4	150			
(3) Energy management control system	7											
<b>705.2 Renewable energy service plan is as follows:</b>												
(1) Builder selects a renewable energy service plan provided by the local electrical utility for interim (temporary) electric service. The builder's local administrative office has renewable energy service.	2											
(2) The buyer of the home selects a renewable energy service plan provided by the utility prior to occupancy of the home.	5											
<b>CHAPTER 8: WATER EFFICIENCY</b>	<b>Base Pts.</b>	16	0	2	0	15	0	19	175	8	382	<b>Ch. 8 Subtotal</b>
<b>801 Indoor and Outdoor Water Use</b>	<b>Cost/Point</b>		0		0		0				48	
801.0 Intent. Measures that reduce indoor and outdoor water usage are implemented.												
801.1. Indoor hot water usage is reduced by one of the following practices:												
(1) All hot water piping which runs to the plumbing fixtures in both the kitchen and bathrooms is 40-feet or less in length from the water heater and is sized in accordance with the code for the specified application.	2	2										Water heater location in attic.
(2) All hot water piping which runs to the plumbing fixtures in both the kitchen and bathrooms is 30-feet or less from the water heater and is sized in accordance with the code for the specified application.	3											Runs can be minimized further by locating the water at midpoint of bath and kitchen.
(3) One of the following piping system designs is implemented:												
(a) Use of structured-type plumbing with demand controlled hot water loops, in which the volume of water contained in the pipe and fixture fittings downstream of the recirculating trunk line is a maximum of 4 cups (0.25 gallons).	6											
(b) Implement an engineered parallel piping system (i.e. manifold system) in which the hot water line distance from the water heater to the parallel piping system is less than 15 feet and the parallel piping to the fixture fittings contains a maximum of 5	6											
(c) Central core plumbing system with all plumbing fixture fittings (e.g., faucets & showerheads) located such that the volume of water contained in each pipe run between the water heater and fixture fitting is a maximum of 6 cups (0.38 gallons).	8							8	0			Simple to implement in a small house with one bath
(4) Pipe runs exceeding 40-feet from the water heater to fixture locations are aided by one of the following:	1											
(a) Tankless water heater is installed at point of use and is served only by cold water or a solar-assisted system.												
(b) On demand hot water recirculation system is installed.												
<b>Addition Note:</b> Section 801.1 applies only to the new construction portion of additions that alter portions of a building with hot water appliances and/or fixtures.	Mandatory 0 Add'l Pts											
<b>Renovation Note:</b> Section 801.1 applies only to renovation projects that have the ability to meet the requirements of Section 801.1. (Renovation projects that are unable to meet the length of pipe runs indicated in Section 801.1, but are able to shorten	Mandatory											
(1) Minimum of 25% to less than 50% reduction in total pipe length or volume.	Points Reduced by Half											
(2) More than or equal to 50% reduction in total pipe length or volume.	0 Add'l Pts											
<b>Addition Note - Section 801.1.1(3):</b> Where a new hot water system is provided in an addition, this item applies. (Points for Section 801.1.1(3)(a), (b), and (c).)	Points Reduced by Half											
<b>Addition and Renovation Note - Section 801.1.1(3):</b> Section 801.1.1(3) applies only where hot water lines in the existing building are accessible. (To receive additional points, a minimum of 50 percent of the hot water lines are in accordance with Section	2 Add'l Pts											
801.2 Energy Star® or equivalent water-conserving appliances are installed												
(1) Dishwasher	2	2										
(2) Washing machine	8	8										
(3) Washing machine with a water factor of 6.0 or less	12											
<b>Addition and Renovation Note:</b> Section 801.2 applies as follows when existing appliance(s) are properly disposed of and not placed into secondary service in a dwelling unit.												
(1) Replace existing dishwasher	1 Add'l Pt											
(2) Replace existing washing machine	1 Add'l Pt											



ANSI National Green Building Standard™	172	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(3) Replace existing washing machine with a water factor of 6.0 or less	1 Add'l Pt											
801.3 A minimum of one food waste disposer is installed at the primary kitchen sink.	1	1										
<b>801.4 Showerheads</b>												
801.4 (1&2) 1) The total showerhead flow rate at any point in time, for all showerheads in each shower compartment is less than 2.5 gpm, tested at 80 psi per ASME A112.18.1/CSA B125.1. 2) In addition the showerheads must be equipped with an automatic com	1 Point (3 Points Max)			1	0							Showerhead flow rate max. EPA is 2.5.
801.4 (3&4) All shower compartments in the home comply with 801.4 (1&2).												
(3) All shower compartments installed meet the above conditions and are 2.0 to less than 2.5 gpm.	1 Add'l Pt			1	0			-1	0			
(4) All shower compartments installed meet the above conditions and are 1.6 to less than 2.0 gpm.	2 Add'l Pts							2	0			Specify lower flow rate faucet/aerator.
<b>Addition Note:</b> Section 801.4 applies only to additions that include a minimum of one bath or shower.	0 Add'l Pts											
<b>Renovation Note:</b> Section 801.4 applies only to renovations that include one or more bathrooms with a bath or shower. (Points awarded per fixture.)	1 Add'l Pt											
<b>Addition and Renovation Note:</b> Existing showerhead is replaced with a showerhead that has a flow rate in accordance with Section 801.4. (Points awarded per additional showerhead.)	1 Add'l Pt											
<b>801.5 Faucets</b>												
801.5.1 Water-efficient lavatory faucets with 1.5 gpm or less maximum flow rate when tested at 60 psi in accordance with ASME A112.18.1 are installed												
(1) a bathroom (Points awarded for each bathroom.)	3 Pts Max	1										
(2) all lavatory faucets in the home meet the conditions of 801.5.1	2 Add'l Pts	2										
<b>Addition Note:</b> Section 801.5.1 applies only to additions that include a bathroom.	1 Add'l Pt											
<b>Renovation Note:</b> Section 801.5.1 applies only to renovations of existing bathrooms.	2 Add'l Pts											
<b>Addition and Renovation Note:</b> Replace all faucets in non-renovated bathrooms with faucets that are in accordance with Section 801.5.1.	2 Add'l Pts											
801.5.2 Self-closing valve, motion sensor, metering, or pedal-activated faucet is installed to enable intermittent on/off operation. (Points awarded per fixture.)	1 3 Pts Max											
<b>Renovation Note:</b> Additional points for Section 801.5.2 apply where installed.	1 Add'l Pt Pts Max	6										
<b>801.6 Water closets and urinals.</b> Water closets and urinals are in accordance with the following: (For water closets, points awarded for either Section 801.6 or 802.2, but not both.)												
(1) Gold and Emerald Levels: All water closets and urinals are in accordance with either Section 801.6 or 802.2.	Mandatory											
(2) A water closet is installed with an effective flush volume of 1.28 gallons or less when tested in accordance with ASME A112.19.2 (all water closets) and ASME A112.19.14 (all dual flush water closets), and is in accordance with EPA WaterSense Tank-Typ	6 18 Pts Max							6	175			Install low flow toilet.
(3) A urinal is installed with a flush volume of 0.5 gallons or less when tested in accordance with ASME A112.19.2.	4 Max 4 Points											
(4) All water closets and all urinals are in accordance with Section 801.6(2) or Section 801.6(3), as applicable.	6 Add'l Points							6	0			
<b>Addition and Renovation Note:</b> Section 801.6 applies only to additions and renovations that include bathrooms.	0 Add'l Pts											
<b>Renovation Note:</b> Renovations that do not include bathrooms receive points for replacing existing water closets with water closets in accordance with Section 801.6 (Points awarded per fixture.)	1 Add'l Pt											
<b>801.7 Irrigation systems</b>												
801.7.1 A low-volume, irrigation system is installed for each landscape type utilized. (Points awarded for each type of irrigation system installed.)	10 Pts. Max											
(1) High distribution uniformity (DU) rotating spray heads	2											
(2) Drip irrigation	4											
(3) Bubblers	4											
(4) Drip emitters	4											
(5) Soaker hose	4											
(6) Subsurface irrigation	6											
<b>Addition and Renovation Note:</b> Section 801.7.1 applies only to additions that increase the building footprint or affect the irrigation system.	1 Add'l Pt											
<b>Renovation Note:</b> Section 801.7.1 applies only to renovations of the landscape, hardscape, or outdoor living areas with existing irrigation systems or to renovations that replace the irrigation system.	2 Add'l Pts											
801.7.2 Irrigation system is in accordance with both of the following:	3											
1) designed by a professional in accordance with EPA WaterSense requirements or equivalent												
2) installed in accordance with EPA WaterSense program or equivalent												
<b>Addition Note:</b> Section 801.7.2 applies to additions that increase the building footprint or modify an existing irrigation system.	1 Add'l Pt											
<b>Renovation Note:</b> Section 801.7.2 applies to renovations with existing irrigation systems that are modified, or to renovations where a new irrigation system is installed or the existing irrigation system is replaced.	1 Add'l Pt											
801.7.3 Irrigation system is zoned separately for turf and bedding areas.	2											
<b>Addition Note:</b> Section 801.7.3 applies to additions that increase the building footprint or affect the irrigation system.	1 Add'l Pt											
<b>Renovation Note:</b> Section 801.7.3 applies only to renovations with existing irrigation systems that are modified, or to renovations where a new irrigation system is installed or the existing irrigation system is replaced.	2 Add'l Pts											
801.7.4 The irrigation system(s) is controlled by a smart controller:												
(1) Evapotranspiration (ET) based irrigation controller with a rain sensor	4											
(2) Soil moisture sensor based irrigation controller	4											

ANSI National Green Building Standard™	172	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(3) No irrigation is installed and a landscape plan is developed in accordance with Section 503.5(1) as applicable. (Points must be taken in 503.5(1) in order to receive points for 801.7.4(3))	15					15	0					
801.8 Rainwater collection and distribution is provided.												
(1) Rainwater is collected and used	6									6	382	
(2) Rainwater is distributed using a renewable energy source or gravity.	2									2	0	Distribution by gravity.
801.9 Water Filters. Water filter is installed to improve water quality for the whole building or whole dwelling unit.	1											
802.1 Gray water (as specified in ICC IRC, Appendix O) is separated and reused, as permitted by local building code. (Points awarded for either Section 802.1(1) or 802.1(2), not both)												
(1) Each water closet flushed by reclaimed or recycled water.	4 Points (per fixture)											
(2) Irrigation from reclaimed or recycled water onsite	10											
<b>Addition and Renovation Note:</b> Additional points are available for Section 802.1 as follows:												
1) each water closet flushed by reclaimed or recycled water	2 Add'l Pts											
2) irrigation from reclaimed or recycled water onsite	5 Add'l Pts											
802.2 Composting or waterless toilets and/or urinals. Composting or waterless toilets and/or urinals are in accordance with the following: (For water closets, points awarded for either Section 802.2 or 801.6, but not both)	24 Points Max											
(1) Gold and emerald levels: All water closets and urinals are in accordance with either Section 802.2 or Section 801.6.	Mandatory											
2) Composting or waterless toilet and/or urinal is installed. (Points awarded per fixture)	8											
3) All toilets and urinals are in accordance with Section 802.2 (2).	8 Add'l Points											
802.3 Automatic shutoff water devices. One of the following automatic shutoff water supply devices is installed. Where a fire sprinkler system is present, installer is to ensure the device will not interfere with the operation of the fire sprinkler system	2											
(1) Excess Water Flow Shutoff												
(2) Leak Detection System												
<b>CHAPTER 9: INDOOR ENVIRONMENTAL QUALITY</b>	<b>Base Pts.</b>	43	0	10	0	33	215	16	83	52	4,933	<b>Ch. 9 Subtotal</b>
<b>901 Pollutant Source Control</b>	<b>Cost/Point</b>		0		0		7		5		95	
901.0 Intent. Pollutant sources are controlled.												
901.1 Space and water heating options												
901.1.1 Natural draft space heating or water heating equipment is not located in conditioned spaces, including conditioned crawl spaces. Natural draft equipment is permitted to be installed within the conditioned spaces if located in a mechanical room that has an outdoor air source, and is otherwise sealed and insulated to separate it from the conditioned space(s).	5			5	0							Furnace and water heater are electric.
<b>Addition Note:</b> Section 901.1.1 applies to additions that include the use of natural draft space heating or water heating equipment.	Mandatory											
<b>Renovation Note:</b> Section 901.1.1 applies to renovations that include areas where natural draft space heating or water heating equipment is located.	Mandatory											
<b>Renovation Note:</b> Additional points are available for any renovation that modifies all of the existing building's natural draft space heating or water heating equipment in accordance with Section 901.1.1	2 Additional Points											
901.1.2 Air handling equipment or return ducts are not located in the garage, unless placed in isolated, air-sealed mechanical rooms with an outside air source.	5	5	0									
<b>Renovation Note:</b> Section 901.1.2 applies to renovations that modify existing duct systems.	2 Additional Points											
901.1.3 The following combustion space heating and water heating equipment is installed within conditioned space.												
(1) Direct vent furnace or boiler	5											
(2) (a) Power vent water heater	3											
(b) Direct vent water heater	5											
<b>Renovation Note:</b> Section 901.1.3 applies to renovations that replace existing space heating and water heating combustion equipment with equipment in accordance with Section 901.1.3 for new construction.	2 Additional Points											
901.1.4 The following electric equipment is installed:												
1) Heat pump air handler in unconditioned space	2	2	0								-2	
2) Heat pump air handler in conditioned space	5										5	Costs to move into conditioned space in 704.6.2.2.(2). Cost of higher eff. in 702.
901.2 Fireplaces and Fuel Burning Appliances (except cooking appliances, clothes dryers, water heaters, and furnaces) located in conditioned space are code compliant, vented to the outdoors, and have adequate combustion and ventilation air provided to minimize spillage or back-drafting, in accordance with the following: <u>All of the following items are mandatory, if applicable, for certification.</u>												
901.2.1(1) Natural gas and propane fireplaces that are power vented or direct vented, are equipped with permanently fixed glass fronts or gasketed doors, and comply with ANSI Z21.88/CSA 2.33a or ANSI Z21.50/CSA 2.22	7											
901.2.1(2)(a) Wood burning fireplaces are equipped with gasketed doors designed to operate with the doors closed, outside combustion air, and a means is provided for sealing the flue to minimize interior air (heat) loss when not in operation.	4											
901.2.1(2)(b) Factory-built wood burning fireplaces are in accordance with the certification requirements of UL 127 and are EPA certified.	6											
901.2.1(2)(c) Wood stove and fireplace inserts, as defined in UL 1482, Section 3.8 are in accordance with the certification requirements of UL 1482 and are in accordance with the emission requirements of the EPA Certification and the State of Washington W	6											
901.2.1(2)(d) Pellet (biomass) stoves and furnaces are in accordance with the requirements of ASTM E1509 or are EPA Certified.	6											
901.2.1(2)(e) Masonry heaters are in accordance with the definitions in ASTM E1602 and ICC-IBC, Section 2112.1.	6											

ANSI National Green Building Standard™	172	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
<b>Renovation Note:</b> Removal of or rendering permanently unusable an existing fireplace and/or other fuel-burning appliances that are not in accordance with Section 901.2.1.	<b>2 Add'l Pts</b>											
<b>Renovation Note:</b> Additional points are awarded for the replacement of each existing fireplace that is not in accordance with Section 901.2.1 with a fireplace that is in accordance with Section 901.2.1	<b>2 Add'l Pts</b>											
<b>Renovation Note:</b> Additional points are available for removing or rendering permanently unusable each existing wood-burning fireplace that is not in accordance with Section 901.2.1(2)(a) in areas other than the main renovation area.	<b>2 Add'l Pts</b>											
901.2.2 Fireplaces, woodstoves, pellet stoves, or masonry heaters are not installed.	<b>7</b>	<b>7</b>										
901.3 Garages are in accordance with the following:												
901.3(1)(a) Where installed in the common wall between the attached garage and conditioned space, the door is tightly sealed and gasketed.	<b>Mandatory 2 Points</b>											
901.3(1)(b) A continuous air barrier is provided between walls and ceilings separating the garage space from the conditioned living spaces.	<b>Mandatory 2 Points</b>											
901.3(1)(c) For one and two-family dwelling unit attached garages, a 100 cfm or greater ducted, or 70 cfm or greater unducted wall exhaust fan is installed and vented to the outdoors, designed and installed for continuous operation, or has controls (e.g., motion detectors, pressure switches) that activate operation for a minimum of 1 hour when either human passage door or roll-up automatic doors are operated. For ducted exhaust fans, the fan airflow rating and duct sizing are in accordance with Appendix A. (If you claim points for 901.3(1)(c), you cannot claim points for 901.3(2).	<b>4</b>											
901.3(2) A carport is installed, the garage is detached from the building, or no garage is installed. (If you claim points for 901.3(2), you cannot claim points for 901.3(1)(a), 901.3(1)(b), or 901.3(1)(c).	<b>10</b>	<b>10</b>										
<b>Addition Note:</b> Section 901.3 applies where the addition is a garage or shares a continuous air barrier with a garage.	<b>Mandatory</b>											
<b>Renovation Note:</b> Section 901.3 applies to renovations that involve construction adjacent to an attached garage.	<b>1 Add'l Point</b>											
<b>Renovation Note:</b> A focused effort to create a continuous air barrier between the garage and conditioned space, including penetrations, occurring between walls and ceilings separating the garage and conditioned space.	<b>3 Add'l Points</b>											
901.4(2-6) Wood Materials. A minimum of 85% of material within a product group (i.e. wood structural panels, countertops, composite trim/doors, custom woodwork, and/or component closet shelving) is manufactured in accordance with the following:	<b>10 points max.</b>											
901.4(1) Structural plywood used for floor, wall, and/or roof sheathing is compliant with <u>DOC PS 1</u> and/or <u>DOC PS 2</u> . OSB used for floor, wall, and/or roof sheathing is compliant with <u>DOC PS 2</u> . The panels are made with moisture-resistant adhesives. The trademark indicates these adhesives as follows: Exposure 1 or Exterior for plywood, and Exposure 1 for OSB.	<b>Mandatory</b>											Meets.
(2) Particleboard and MDF (medium density fiberboard) is manufactured and labeled in accordance with CPA A208.1 and CPA A208.2, respectively.	<b>2 Points per Product Group</b>			<b>2</b>	<b>0</b>							Masterbrand cabinets (Aristokraft) have 75% by virtue of KCMa certification.
(3) Hardwood plywood is in accordance with HPVA HP-1 and HUD Title 24, Part 3280.	<b>2 Points per Product Group</b>											No hardwood plywood.
(4) Particleboard, MDF, or hardwood plywood is in accordance with CPA 2.	<b>3 Points per Product Group</b>											See Aristokraft note above.
(5) Composite wood or agrifiber panel products contain no added urea-formaldehyde or are in accordance with the CARB Composite Wood Air Toxic Contaminant Measure Standard.	<b>4 Points per Product Group</b>					<b>4</b>	<b>0</b>					Interior doors and trim.
(6) Non-emitting products.	<b>4 Points per Product Group</b>											
<b>Renovation Note:</b> Additional points for Section 901.4 apply to renovations that replace all existing countertops, shelving, and other nonstructural products.	<b>2 Add'l Pts</b>											
901.5 Carpets are in accordance with the following:												
901.5(1) Wall-to-wall carpeting is not installed adjacent to water closets and bathing fixtures.	<b>Mandatory</b>											No carpeting is installed. Laminated wood product.
901.5(2) A minimum of 85% of installed carpet area, carpet cushion (padding), and carpet adhesives are in accordance with the emission levels of CDPH 01350, as certified by a third-party program, such as the Carpet and Rug Institute's (CRI) Green Label Plus.												No padding installed.
(a) Carpet	<b>6</b>											
(b) Carpet cushion	<b>2</b>											
(c) Carpet adhesives	<b>2</b>											
<b>Renovation Note:</b> Section 901.5(2) applies to renovations where existing carpet is replaced. Remove existing carpet and perform one of the following repair methods:	<b>2 Add'l Pts</b>											
1) Existing carpeted floor area is exposed, cleaned, and finished and is used as non-carpeted finished floor.	<b>2 Add'l Pts</b>											
2) Carpet is installed in accordance with Section 901.5.	<b>0 Add'l Pts</b>											
3) New non-carpet flooring product in compliance with an approved green labeling program(s) is installed.	<b>1 Add'l Pts</b>											
901.6 Hard-surface flooring. A minimum of 85% of installed hard-surface flooring is in accordance with the emission concentration limits of CDPH 01350 (using the office scenario), as certified by a third-party program, such as the RFCI's FloorScore Indoor Air Certification Program or the Greenguard Environmental Institute's Children and Schools Certification Program.	<b>6</b>									<b>6</b>	<b>2,493</b>	Respecify hard flooring to comply (1/2 the house-leave cork in common areas).
901.7 Wall coverings. A minimum of 85% of wall coverings are in accordance with the emission concentration limits of CDPH 01350 (using the office scenario), as certified by a third-party program, such as the Scientific Certification Systems (SCS) Indoor Advantage Gold Program or the Greenguard Environmental Institute's Children and Schools Certification Program.	<b>4</b>									<b>4</b>	<b>941</b>	Specify insulation, gypsum board and paints with low VOC and low emitting products. Cost covers paperless drywall and low VOC paint. Insulation should be at n/c.
901.8 Architectural coatings. A minimum of 85% of the architectural coatings are in accordance with one of the following conditions:												
901.8.1 Site-applied interior products are in accordance with one or more of the following:	<b>5</b>					<b>5</b>	<b>0</b>			<b>(5)</b>	<b>0</b>	
(1) Zero VOC, determined by EPA Method 24 (VOC content below the detection limit for the method).												

ANSI National Green Building Standard™	172	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(2) CARB Suggested Control Measure for Architectural Coatings												
(3) GS-11												
(4) VOC limits in accordance with:												
(a) 50 grams/liter flat												
(b) 100 grams/liter non flat												
(c) 350 grams/liter clear wood varnish												
(d) 550 grams/liter clear wood lacquer												
901.8.2 Site-applied interior products are in accordance with the emissions levels of CDPH 01350, as certified by a third party program such as the Scientific Certification Systems (SCS) Indoor Advantage Gold Program or the Greenguard Environmental Institute's Children and Schools Certification Program.	8									8	0	Specify low Voc paints. See cost in 901.6
<b>Addition and Renovation Note:</b> Section 901.8 applies when the building is occupied during construction.	<b>Mandatory</b>											
901.9 Adhesives and Sealants.												
901.9.1 For exterior low-VOC adhesives and sealants, a minimum of 85% of site-applied products used for the installation of subfloors and on the exterior of the project are in accordance with one of the following:	5									5		
(1) The California Air Resources Board consumer products regulation as follows:												
a) Construction Adhesives: VOC content not to exceed 7% by weight or 75 grams/liter, whichever is greater.											108	Case adhesive - add to base.
b) The VOC content of reactive sealants (i.e., silicones, polyurethanes, and hybrids, such as MS Polymer and silylated polyurethane resin or SPUR) not to exceed 4% by weight or 50 grams/liter, whichever is greater.												
c) The VOC content of all other caulks and sealants not to exceed 2% by weight or 30 grams/liter, whichever is greater.											8	Case caulk - add to base.
d) The VOC content of contact adhesives not to exceed 55% by weight or 480 grams/liter, whichever is greater.												
(2) GS-36												
901.9.2 Interior Low-VOC Adhesives and Sealants. For interior low VOC adhesives and sealants, a minimum of 85% of site-applied products used within the interior of the building are in accordance with one of the following, as applicable:												
1) CDPH 01350, as certified by a third party program, such as Scientific Certification Systems (SCS) Indoor Advantage Gold Program or the Greenguard Environmental Institute's Children and Schools Certification Program.	5					5	0					
(2) GS-36	5											
901.10 Cabinets. A minimum of 85% of kitchen and bath vanity cabinets are in accordance with one of the following: <b>(Where more than one of the following practices is used, the practice with the fewer number of points is awarded)</b>												
(1) Kitchen and bath vanity cabinets in accordance with KCMA ESP 01, or equivalent, are installed.	2	2										
(2) Kitchen and bath vanity cabinets in accordance with CARB Composite Wood Air Toxic Contaminant Measure Standard are installed.	3											Require better specs on cabinets.
(3) Kitchen and bath vanity cabinets are installed that contain no added urea formaldehyde or are in accordance with GGPS.EC.010.R0, ASTM D6670, or equivalent.	5											
<b>Renovation Note:</b> Additional Points for Section 901.10 apply to renovations that replace all existing kitchen and bath vanity cabinets.	<b>2 Add'l Pts</b>											
901.11 Insulation is in accordance with the following:												
(1) Formaldehyde emissions of wall, ceiling, and floor insulation materials are in accordance with the emissions levels of CDPH 01350, as certified by a third-party program, such as the GREENGUARD Environmental Institute's Children and Schools Certification Program or the Scientific Certification Systems (SCS) Indoor Advantage Gold Program.	4					4	0					Insulation can be respiced to meet this criteria.
(2) Formaldehyde emissions of duct insulation materials are in accordance with the emissions levels of CDPH 01350, as certified by a third-party program, such as the GREENGUARD Environmental Institute's Children and Schools Certification Program or the Scientific Certification Systems (SCS) Indoor Advantage Gold Program.	1					1	0					Specify.
901.12 A carbon monoxide (CO) alarm is installed in a central location outside of each separate sleeping area in the immediate vicinity of the bedrooms. The CO alarm(s) is located in accordance with NFPA 720 and is hard-wired with a battery back-up. The alarm device(s) is certified by a third party for conformance with either CSA 6.19 or UL 2654.	3	3										
901.13 Building entrance pollutants control. Pollutants are controlled at all main building entrances by one of the following methods:												
(1) Exterior grilles or mats are installed in a fixed manner and may be removable for cleaning.	1									1	44	
(2) Interior grilles or mats are installed in a fixed manner and may be removable for cleaning.	1											
901.14 Non-smoking areas. All interior common areas of a multi-unit building are designated as non-smoking areas with posted signage.	1											
<b>901.15 Renovation Note:</b> For buildings constructed prior to 1978, lead-safe work practices are used during renovation, remodeling, painting, and demolition.	<b>Mandatory</b>											
<b>902 Pollutant Control</b>												
902.0 Intent. Pollutants generated in the building are controlled.												
902.1.1 Spot ventilation is in accordance with the following:												
(1) Bathrooms (including powder rooms) are vented to the outdoors. The minimum ventilation rate is 50 cfm for intermittent operation or 20 cfm for continuous operation in bathrooms.	<b>Mandatory</b>											Complies.
(2) Clothes dryers are vented to the outdoors.	<b>Mandatory</b>											Complies.

ANSI National Green Building Standard™	172	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(3) Kitchen exhaust units and/or range hoods are ducted to the outdoors and have a minimum ventilation rate of 100 cfm for intermittent operation or 25 cfm for continuous operation.	8					8	215					See also 904.2
<b>Addition Note:</b> Section 902.1 applies only to additions that include a kitchen or bathroom.	<b>Mandatory</b>											
<b>Renovation Note:</b> Section 902.1 applies to renovations that include a new or existing kitchen or bathroom. (Points available for all of the following conditions)	<b>Mandatory</b>											
1) Existing non-vented kitchen range or bathroom exhaust systems in an area that is undergoing renovation are replaced with equipment that is in accordance with Section 902.1.	2 Add'l Pts											
2) Existing non-vented kitchen range or bathroom exhaust systems in an area that is not undergoing renovation are replaced with equipment that is in accordance with Section 902.1.	3 Add'l Points											
3) New kitchen range or bathroom exhaust systems in accordance with Section 902.1 are installed where no exhaust system existed before renovation.	1 Add'l Pts											
902.1.2 Bathroom and/or laundry exhaust fan is provided with an automatic timer and/or humidistat:	9 Points Max											
1) for first device	5							5	42			
2) for each additional device	2											n/a
902.1.3 Kitchen range, bathroom, and laundry exhaust are vented to specification. Ventilation airflow at the point of exhaust is tested to a minimum of 100 cfm intermittent or 25 cfm continuous for kitchens, and 50 cfm intermittent or 20 cfm continuous	8									8	149	2 field personnel 2 hours.
902.1.4 Exhaust fans are ENERGY STAR as applicable.	Max. 6 Points											
(1) ENERGY STAR, or equivalent, fans (Points awarded per fan)	2											
(2) ENERGY STAR, or equivalent, fans operating at or below 1 sone (Points awarded per fan)	3							6	41			Note: Kitchen fan upgrade to 100 CFM in 902.1(3) would cover estar there, as well.
902.2. Building ventilation systems.												
902.2.1 One of the following whole building ventilation systems is implemented and is in accordance with the specifications of Appendix B. (Points must be claimed in 902.2.1 to claim points in 902.2.2.)												
(1) Exhaust or supply fan(s) ready for continuous operation and with appropriately labeled controls.	8											
(2) Balanced exhaust and supply fans with supply intakes located in accordance with the manufacturer's guidelines to not introduce polluted air back into the building.	10									10	345	
(3) Heat-recovery ventilator.	15											
(4) Energy-recovery ventilator.	17											
<b>Addition Note:</b> Section 902.2.1 is applied to an addition in accordance with one of the following:												
1) The pressure and thermal boundaries of the addition are separated from the existing building.	0 Add'l Pts											
2) If the pressure and thermal boundaries of the addition are not separated from the existing building, Section 902.2.1 is applied to the whole building.	1 Add'l Pts											
<b>Renovation Note:</b> Section 902.2.1 applies to the whole building for connected thermal and pressure boundaries.	2 Add'l Pts											
902.2.2 Ventilation airflow is tested to achieve the design fan airflow at point of exhaust in accordance with Appendix B. (Points must be claimed in 902.2.1 to claim points in 902.2.2)	8											
902.2.3 MERV filters 8 or greater are installed on central air systems. Designer or installer is to verify that the HVAC equipment is able to accommodate the greater pressure drop of MERV 8 filters.	3			3	0							
<b>Addition Note:</b> Section 902.2.3 applies only to additions that include a new HVAC system.	0 Add'l Pts											
<b>Renovation Note:</b> Section 902.2.3 applies only to renovations that replace an existing HVAC system.	1 Add'l Pts											
902.3 Radon control. Radon control measures are in accordance with ICC IRC Appendix F. (Zones are defined in Figure 9(1).												
902.3(1) Buildings located in Radon Zone 1 have a radon system installed.	<b>Mandatory</b>											
(a) A passive radon system is installed.	10											
(b) An active radon system is installed.	15											
902.3(2) Buildings located in Zone 2.												
(a) A passive radon system is installed.	10											
902.4 HVAC system protection. One of the following HVAC system protection measures is performed:												
(1) HVAC supply registers (boots), return grilles, and rough-ins are covered during construction activities to prevent dust and other pollutants from entering the system.	3											
<b>Addition and Renovation Note:</b> Section 902.4(1) does not apply to additions and renovations except as noted in Addition and Renovation Note (3) below.	0 Add'l Pts											
(2) Prior to owner occupancy, HVAC supply registers (boots), return grilles, and duct terminations are inspected and vacuumed. In addition, the coils are inspected and cleaned and the filter is replaced if necessary.	3											

ANSI National Green Building Standard™	172	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
<b>Addition and Renovation Note:</b> As an alternative to Section 902.4(2), one of the following options is implemented:												
<b>Mandatory</b>												
1) During construction, a construction indoor air quality (IAQ) schedule is developed that includes, at a minimum, all of the following:	<b>1 Add'l Pt</b>											
a) type of construction activity												
b) ability to occupy the building or dwelling unit												
c) IAQ protections for occupant(s) of the building or dwelling unit												
d) hazardous waste removal												
e) name and age of occupants of the building or dwelling unit at a specific time												
2) The addition or renovation area is sealed off from the occupied portion of the building or dwelling unit. The same HVAC system for conditioning the air in renovated and occupied space is not used.	<b>1 Add'l Pt</b>											
3) The building or dwelling unit is not occupied during the entire construction period and Sections 902.4(1) and 902.4(2) are implemented.	<b>1 Add'l Pt</b>											
902.5 Central vacuum systems. Central vacuum system is installed and vented to the outside.	<b>5</b>											
902.6 Living space contaminants. The living space is sealed to prevent unwanted contaminants.												
(1) Attic access, knee wall door, or drop down stair is caulked, gasketed, or otherwise sealed.	<b>2</b>											
(2) All penetrations (e.g., top plates, HVAC register boots, recessed can lights, are sealed in the following areas:												
(a) Attic/ceiling	<b>2</b>	<b>2</b>										
(b) Wall	<b>2</b>	<b>2</b>										
(c) Floors	<b>2</b>	<b>2</b>										
903 Moisture Management: Vapor, Rainwater, Plumbing, HVAC												
903.0 Intent. Moisture and moisture effects are controlled.												
903.1 Tile backing materials installed under tiled surfaces in wet areas are in accordance with ASTM C1178, C1278, C1288, or C1325.	<b>Mandatory</b>			<b>0</b>								
903.2 Capillary breaks												
903.2.1 A capillary break and vapor retarder are installed at all concrete slabs in accordance to the following:	<b>Mandatory</b>											
1) A minimum 4-inch thick bed of ½ inch diameter or greater clean aggregate, covered with polyethylene or polystyrene sheeting in direct contact with the concrete slab, with the sheeting joints lapped in accordance with Section 903.3. (or)												
2) A minimum 4-inch thick uniform layer of sand, overlain with a layer or strips of geotextile drainage matting, covered with polyethylene sheeting, with the sheeting joints lapped according to Section 903.3.												
Modification for 1&2:												
a. In areas with free-draining soils, identified as Group 1 in the ICC IRC by a certified hydrologist, soil scientist, or engineer through a site visit, a gravel bed or geotextile matting is not required.												
b. In Dry climate locations, as defined by Figure 6(1), polyethylene sheeting is not required unless required for radon resistance (Section 902.3).												
903.2.2 Add a capillary break on footing to prevent moisture migration into foundation wall.	<b>3</b>											
<b>Addition Note:</b> Section 903.2 applies only to the new construction portion of additions.	<b>Mandatory</b>											
<b>Renovation Note:</b> Section 903.2 applies only to renovations that include slab removal and/or replacement.	<b>0 Add'l Pts</b>											
903.3 Crawlspace												
903.3.1(1) Minimum 6-mil vapor retarder installed on the crawl space floor and extended up the wall sufficient to allow the material to be affixed with glue and furring strips. Joints of vapor retarder overlap a minimum of 6 inches and are taped.	<b>6</b>											
903.3.1(2) Damp-proof walls are provided below finished grade. Joints of vapor retarder overlap a minimum of 6 inches and are taped.	<b>Mandatory</b>											
<b>Renovation Note:</b> Additional Points:												
1) Additional points available for damp proofing below grade walls.	<b>1 Add'l Pt</b>											
2) Additional points available for installing a footing drainage system.	<b>2 Add'l Pts</b>											
903.3.2 Crawlspace that is built as a conditioned area is sealed to prevent outside air infiltration and provided with conditioned air at a rate not less than 0.02 cfm per square foot of horizontal area and one of the following is implemented:												
(1) A concrete slab over lapped 6 mil polyethylene or polystyrene	<b>10</b>											
(2) 6-mil polyethylene sheeting, lapped a minimum of 6 inches and taped at the seams.	<b>8</b>											
<b>Addition Note:</b> Section 903.3.2 applies only to the new construction portion of additions.	<b>1 Add'l Pt</b>											
<b>Renovation Note:</b> Section 903.3.2 applies only to renovations that include a focused effort to convert an existing vented crawl space into an unvented, conditioned crawl space.	<b>2 Add'l Pts</b>											
903.4 Moisture control measures.												
903.4.1(1) Building materials with visible mold are not installed or are cleaned or encapsulated prior to concealment and closing.	<b>2 Points</b>	<b>2</b>										
903.4.1(2) Walls are not enclosed (e.g. with drywall) if the insulation has a high moisture content. Wet insulation products are dry before enclosing.	<b>Mandatory</b>	<b>2</b>										Include site superintendent's provision to test and record moisture in wall cavity prior to hanging drywall.
903.4.1(3) The moisture content of lumber is sampled to ensure it does not exceed 19 % prior to the surface and/or wall cavity enclosure.	<b>4</b>					<b>4</b>	<b>0</b>					Include in site superintendent's responsibilities
903.4.2 Moisture content of subfloor, substrate, or concrete slabs is in accordance with the appropriate industry standard for the finish flooring to be applied.	<b>2</b>					<b>2</b>	<b>0</b>					Include in the installers scope.

ANSI National Green Building Standard™	172	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
<b>Addition and Renovation Note:</b> Section 903.4.1 (1) and (2) applies to new, reused, and salvaged materials only. It excludes undisturbed existing materials.												
<b>Addition Note:</b> Section 903.4.2 applies only where new finish flooring is applied.	<b>Mandatory</b>											
<b>Renovation Note:</b> Section 903.4.2 applies only where new finish flooring is applied. Additional points available only for correcting excess moisture levels in an existing subfloor and/or substrate.	<b>2 Add'l Pts</b>											
903.5 Plumbing.												
903.5.1 Plumbing distribution lines are not installed in exterior wall cavities.	<b>2</b>											Plumbing lines are in unconditioned attic, but not exterior walls. Insulate attic lines.
<b>Addition Note:</b> Section 903.5.1 applies only to the new construction portion of additions.	<b>Mandatory</b>											
<b>Renovation Note:</b> Section 903.5.1 applies only to renovations that include exterior walls and plumbing lines or plumbing lines in unconditioned spaces.	<b>Mandatory</b>											
1) A minimum of 50 percent of exterior wall piping is removed.	<b>3 Add'l Points</b>											
2) A minimum of 50 percent of exterior wall piping is insulated.	<b>2 Add'l Pts</b>											
903.5.2 Cold water pipes in unconditioned spaces are insulated to a minimum of R-4 with pipe insulation or other covering that adequately prevents condensation.	<b>2</b>	2										See 903.5.1.
<b>Renovation Note:</b> The entire plumbing system between the connections of the water distribution and/or waste lines and the equipment and fixtures is replaced. This item applies if one or more of the following is implemented:												
1) Plumbing in unconditioned spaces is repaired or replaced.	<b>1 Add'l Pt</b>											
2) Plumbing in unconditioned spaces is improved.	<b>2 Add'l Pts</b>											
903.5.3 Plumbing is not installed in unconditioned spaces.	<b>5</b>							5	0			Install tankless in bathroom.
<b>Renovation Note:</b> The entire plumbing system between the connections of the water distribution and/or waste lines and the equipment and fixtures is replaced. This item applies if one or more of the following conditions exist:	<b>2 Add'l Pts</b>											
1) poor joint connections												
2) thin pipe walls												
3) severely reduced water flow caused by debris buildup												
4) lead or other toxic solders												
5) drain, waste, and vent system is not in accordance with the ICC IPC.												
903.6(1) Duct insulation. All HVAC ducts, plenums, and trunks in unconditioned attics, basements, and crawlspaces are insulated to a minimum of R-6. Outdoor air supplies to ventilation systems are insulated to a minimum of R-6.	<b>Mandatory</b>											
903.6(2) Duct insulation. All HVAC ducts, plenums, and trunks in unconditioned attics, basements, and crawlspaces are insulated to a minimum of R-8. Outdoor air supplies to ventilation systems are insulated to a minimum of R-8.	<b>2</b>	2										
<b>Addition Note:</b> Section 903.6 applies only to the new construction portion of additions.	<b>Mandatory</b>											
<b>Renovation Note:</b> Section 903.6 applies to renovations as follows:												
1) areas that include replacement or disturbance of HVAC ducts, plenums and trunk	<b>2 Add'l Pts</b>											
2) in areas with specific condensation problems, remove any contaminated ductwork, remove or remediate mold-contaminated elements, and correct existing or add new insulation.	<b>2 Add'l Pts</b>											
3) insulation on the existing HVAC ducts, plenums and trunks is upgraded	<b>3 Add'l Points</b>											
903.7 Relative Humidity. In climate zones 1A, 2A, 3A, 4A, and 5A as defined by Figure 6(1), equipment is installed to maintain relative humidity (RH) at or below 60% using one of the following:	<b>8 Points</b>											
903.9.1 In "Warm-Humid" climates as defined by Figure 6(1) equipment is installed to maintain Relative Humidity (RH) at or below 60% using one of the following:										8	374	Stand alone unit with hard drain. Cost should cover a dehumidification controller and multi-speed blower for central unit that is right-sized.
(1) Additional dehumidification system(s)												
(2) Central HVAC system equipped with additional controls to operate in dehumidification mode.												
<b>904 Innovative Practices</b>												
904.1 A humidity monitoring system is installed with a mobile base unit that displays a reading of temperature and relative humidity at the base unit with a minimum of two remote units. One remote unit that is placed permanently inside the conditioned space in a central location, excluding attachment to exterior walls, and another remote unit is placed permanently outside of the conditioned space.	<b>2</b>									2	72	
904.2 Kitchen exhaust unit(s) that equal or exceeds 400 cfm, and make-up air is provided.	<b>2</b>									2	400	See 902.2.1(2) for make up air.
904.3 Renovation Note: Existing unsealed combustion gas dryer vents related to renovations.												
1) Existing unsealed combustion gas dryer vent is replaced with a sealed exhaust vent.	<b>Mandatory</b>											
2) Existing unsealed combustion gas dryer vent is replaced with a sealed exhaust vent and ducted makeup air is provided.	<b>1</b>											
	<b>2</b>											
<b>CHAPTER 10: OPERATION, MAINT., AND BUILDING OWNER EDUCATION</b>	<b>Base Pts.</b>	0	0	9	950	6	94	0	0	0	0	Ch. 10 Subtotal
<b>Building Owners' Manual for One- and Two-Family Dwellings</b>												
1001.0 Intent. Information on the building's use, maintenance and green components is provided.												
1001.1 A homeowner's binder is provided that includes the following, as available and applicable:	<b>1 point per 2 items</b>			0	100							Estimated 40 hours staff. O/H removed for separate reporting as one time cost. This reflects staff time to assemble.
<b>(Points awarded for mandatory and non-mandatory items)</b>												
(1) A green building program certificate or completion document.	<b>Mandatory</b>			0.5	850							
(2) List of green building features (can include the national green building checklist).	<b>Mandatory</b>			0.5								Included with 1001.1

ANSI National Green Building Standard™	172	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(3) Product manufacturer's manuals or product data sheet for installed major equipment, fixtures and appliances. If product data sheet is in the binder, manufacturer's manual shall may be attached to appliance in lieu of inclusion in the binder.				0.5								
(4) Information on local recycling programs.				0.5								
(5) Information about available local utility programs that purchase a portion of energy from renewable energy providers.				0.5								
(6) Explanation of the benefits of using energy efficient lighting systems (e.g., compact fluorescent light bulbs, light emitting diode (LED) in high usage areas.				0.5								
(7) A list of practices to conserve water and energy.				0.5								
(8) Local public transportation options (if applicable).				0.5								
(9) A diagram showing the location of safety valves and controls for major building systems.				0.5								
(10) Where frost protected shallow foundations are used, notify owner of precautions, including instructions not to remove or damage insulation when modifying landscaping, to provide heat to the home as required by the IRC/IBC, and to keep base materials				0.5								
(11) A list of local service providers that offer regularly scheduled service and maintenance contracts to assure proper performance of equipment and the structure (e.g., HVAC, water heating equipment, sealants, caulks, gutter and downspout system, shovels				0.5								
(12) A photo record of framing with utilities installed. Photos taken prior to installing insulation, clearly labeled, and included as part of the homeowner's binder.				0.5								
(13) Maintenance checklist.				0.5								
(14) List of common hazardous materials often used around the building and instructions for proper handling and disposal of these materials.				0.5								
(15) Information about organic pest control, fertilizers, de-icers, and cleaning products.				0.5								
(16) Information about native landscape materials and/or those that have low-water requirements.				0.5								
(17) Information about methods of maintaining the building's relative humidity in the range of 30-60%.				0.5								
(18) Instructions for inspecting the building for termite infestation.				0.5								
(19) Instructions for maintaining gutters and downspouts and importance of diverting water at least five feet away from foundation.				0.5								
(20) A narrative detailing the importance of maintenance and operation in retaining the attributes of a green-built building.				0.5								
<b>Renovations Note:</b> A building owners' manual that includes the following:												
(1) all mandatory items listed in Section 1001.1												
(2) a minimum of six of the non-mandatory items listed in Section 1001.1												
(3) the EPA publications "Reducing Lead Hazards When Remodeling Your Home" and "Asbestos in Your Home: A Homeowner's Guide"												
<b>on Building Operation And Maintenance for</b>												
1002.1 Training of building owners. Building owners/occupants are familiarized with the green building goals and strategies implemented and the impacts of the occupants' practices on the costs of operating the building. Training is provided to the responsible party(ies) regarding all equipment operation and control systems. Systems include, but are not limited to, the following:						6	94					Walk thru orientation should take about 2 hours and be standard.
(1) HVAC filters.												
(2) Thermostat operation and programming.												
(3) Lighting controls.												
(4) Appliances and settings.												
(5) Water heater settings.												
(6) Fan controls.												
<b>1003 Construction, Operation and Maintenance Manuals and Training for Multi-Unit Buildings</b>												
1003.0 Intent: Manuals are provided to the responsible parties (owner, management, tenant, and/or maintenance team) regarding the construction, operation, and maintenance of the building. Paper or digital format manuals are to include information regarding those aspects of the building's construction, maintenance, and operation that are within the area of responsibilities of the respective recipient. One or more responsible parties are to receive a copy of all documentation for archival purposes.												
1003.1 Building construction manual. A building construction manual, including five or more of the following, is compiled and distributed in accordance with Section 1003.0.												
(1)A narrative detailing the importance of constructing a green building, including a list of green building attributes included in the building. This narrative is included in all responsible parties' manuals.												
(2) A local green building program certificate as well as a copy of the National Green Building Standard™, as adopted by the Adopting Entity, and the individual measures achieved by the building.												
(3)Warranty, operation, and maintenance instructions for all equipment, fixtures, appliances, and finishes.												
(4) Record drawings of the building.												
(5) A record drawing of the site including stormwater management plans, utility lines, landscaping with common name and genus/species of plantings.												
(6) A diagram showing the location of safety valves and controls for major building systems.												
(7) A list of the type and wattage of light bulbs installed in light												
(8) A photo record of framing with utilities installed. Photos are taken prior to installing insulation and clearly labeled.												
<b>Addition and Renovation Note:</b> A building construction manual that includes the following:												
all mandatory items listed in Section 1003.1												
a minimum of two of the non-mandatory items listed in Section												
1003.2 Operations manual. Operations manuals are created and distributed to the responsible parties in accordance with Section 1003.0. Between all of the operation manuals, five or more of the following options are included.												
(Points awarded per two items. Points awarded for both mandatory and non-mandatory items.)												



ANSI National Green Building Standard™	172	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(1) A narrative detailing the importance of operating and living in a green building. This narrative is included in all responsible parties' manuals.	Mandatory											
(2) A list of practices to conserve water and energy (e.g., turning off lights when not in use, switching the rotation of ceiling fans in changing seasons, purchasing ENERGY STAR appliances and electronics).	Mandatory											
(3) Information on methods of maintaining the building's relative humidity in the range of 30 percent to 60 percent.	Mandatory											
(4) Information on opportunities to purchase renewable energy from local utilities or national green power providers and information on utility and tax incentives for the installation of on-site renewable energy systems.												
(5) Information on local and on-site recycling and hazardous waste disposal programs and, if applicable, building recycling and hazardous waste handling and disposal procedures.												
(6) Local public transportation options.												
(7) Explanation of the benefits of using compact fluorescent light bulbs, LEDs, or other high-efficiency lighting.												
(8) Information on native landscape materials and/or those that have low water requirements.												
(9) Information on the radon mitigation system, where applicable.												
(10) A procedure for educating tenants in rental properties on the proper use, benefits, and maintenance of green building systems including a maintenance staff notification process for improperly functioning equipment.												
<b>Addition and Renovation Note:</b> An operations manual that includes the following:	0											
all mandatory items listed in Section 1003.2												
a minimum of three of the non-mandatory items listed in Section 1003.2												
<b>1003.3 Maintenance manual.</b> Maintenance manuals are created and distributed to the responsible parties in accordance with Section 1003.0. Between all of the maintenance manuals, five or more of the following options are included.	1											
<b>(Points awarded per two items. Points awarded for both mandatory and non-mandatory items.)</b>												
(1) A narrative detailing the importance of maintaining a green building. This narrative is included in all responsible parties' manuals.	Mandatory											
(2) A list of local service providers that offer regularly scheduled service and maintenance contracts to ensure proper performance of equipment and the structure (e.g., HVAC, water-heating equipment, sealants, caulks, gutter and downspout system, shower												
(3) User-friendly maintenance checklist that includes:												
a) HVAC filters												
b) thermostat operation and programming												
c) lighting controls												
d) appliances and settings												
e) water heater settings												
f) fan controls												
(4) List of common hazardous materials often used around the building and instructions for proper handling and disposal of these materials.												
(5) Information on organic pest control, fertilizers, deicers, and cleaning products.												
(6) Instructions for maintaining gutters and downspouts and the												
(7) Instructions for inspecting the building for termite infestation.												
(8) A procedure for rental tenant occupancy turnover that preserves												
(9) An outline of a formal green building training program for												
<b>Addition and Renovation Note:</b> A maintenance manual that includes the following:	0											
all mandatory items listed in Section 1003.3												
a minimum of three of the non-mandatory items listed in Section 1003.3												
<b>1004</b>												
<b>INNOVATIVE PRACTICES</b>												
<b>1004.1 (Reserved)</b>												



# APPENDIX B GREEN SCORING & COST

B. Bayou LaBatre, Alabama

**HUD Green Building Comparison**  
**Bayou Labatré, Alabama - AMT2356A**  
**ANSI-ICC-700-2008 National Green Building Standard™**  
**Lot 60 x 120'**  
**House 30 x 35'**

**Alabama Cottage - Palm Harbor in Bayou LaBatre**

7,200 0.16528926  
 970

- 5. Lot Design...
- 6. Resource Efficiency
- 7. Energy Efficiency
- 8. Water Efficiency
- 9. Indoor Env. Quality
- 10. Operational, Maintenance...
- Additional Points
- Total

Bronze		Silver		Gold		Emerald		Green	
Required	Actual	Required	Actual	Required	Actual	Required	Actual	Required	Actual
39	53	66	72	93	94	119	121		
45	76	79	87	113	114	146	154		
30	55	60	100	100	152	120	181		
14	14	26	37	41	55	60	72		
36	74	65	99	100	135	140	157		
8	9	10	15	11	15	12	15		
50		100		100		100			
222	281	406	410	558	565	697	700		
<b>Overage</b>		59		4		7		3	
<b>Cummulative</b>		<b>Points</b>	<b>Cost</b>	<b>Points</b>	<b>Cost</b>	<b>Points</b>	<b>Cost</b>	<b>Points</b>	<b>Cost</b>
Chapter 5	53	417	72	1,103	94	2,173	121	5,643	
Chapter 6	76	0	87	0	114	1,337	154	5,675	
Chapter 7	55	1,095	100	3,990	152	8,615	181	12,858	
Chapter 8	14	114	37	461	55	811	72	1,345	
Chapter 9	74	0	99	207	135	856	157	2,687	
Chapter 10	9	950	15	1,044	15	1,044	15	1,044	
Total	281	2,576	410	6,805	565	14,836	700	29,251	
Cost per SF (\$)		2.66		7.01		15.29		30.15	

**KEY**  
 Points are Co-Dependant on at least one other cell  
 Overhead Cost - Dependant on subdivision size

6  
 1,278

ANSI National Green Building Standard™	203	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
		0		13		36		49		129		
<b>CH. 5 LOT DESIGN, PREPARATION, AND DEVELOPMENT</b>	<b>Rating</b>	<b>21</b>	<b>0</b>	<b>32</b>	<b>417</b>	<b>19</b>	<b>686</b>	<b>22</b>	<b>1,070</b>	<b>27</b>	<b>3,470</b>	<b>Ch. 5 Subtotal Base</b>
				13		36		49		129		
<p>500.0 Intent. This section applies to lot development for the eventual construction of residential buildings, multi-unit buildings, or additions thereto that contain dwelling units. The buildings on the lot earn their own performance level by complying with the provisions of Sections 303, 304, or 305.5, as applicable.</p>												
<p>501.1 The lot is selected to minimize environmental impact by one or more of the following:</p>												
<p>(1) An infill lot is selected.</p>												
<p>(2) A greyfield lot or an EPA-recognized brownfield lot is selected.</p>												
<p>(3) Addition and Renovation Note: A renovation or addition project is implemented. (Points awarded for using an existing building and infrastructure.)</p>												
<p>501.2 Mass Transportation. A range of mass transportation choices are promoted by one or more of the following:</p>												
<p>(1) A lot is selected within one-half mile of pedestrian access to a mass transit system or within five miles of a mass transit station with provisions for parking.</p>												
<p>(2) Walkways, street crossings, and entrances designed to promote pedestrian activity are provided. New buildings are connected to existing sidewalks and areas of development.</p>												
<p>(3) A lot is selected within one-half mile of six or more community resources (e.g., recreational facilities (such as pools, tennis courts, basketball courts), parks, grocery stores, post office, place of worship, community center, daycare center, bank, school, restaurant, medical/dental office, laundromat/dry cleaner.)</p>												
<p>502 Project Team, Mission Statement, and Goals</p>												
<p>502.1 A knowledgeable team is established and team member roles are identified with respect to green lot design, preparation, and development. The project's green goals and objectives are written into a mission statement.</p>												
<p>Lot Design</p>												
<p>503.0 Intent. The lot is designed to avoid detrimental environmental impacts first, minimize any unavoidable impacts, and mitigate for those impacts that do occur. The project is designed to minimize environmental impacts and to protect, restore, and enhance the natural features and environmental quality of the lot. (To be awarded points allocated for design, the intent of the design shall be implemented.)</p>												
<p>503.1 Natural resources are conserved by one or more of the following:</p>												
<p>(1) A natural resources inventory is completed under the direction of a qualified professional.</p>												
<p>(2) A plan is implemented to conserve the elements identified by the resource inventory as high priority resources.</p>												
<p>(3) Items listed for protection in the resource inventory plan are protected under the direction of a qualified professional.</p>												
<p>(4) Basic training in tree or other natural resource protection is provided for onsite supervisor.</p>												
<p>(5) All tree pruning on site is conducted by a Certified Arborist.</p>												
<p>(6) Ongoing maintenance of vegetation during construction is in accordance with TCIA A300.</p>												
<p>Addition and Renovation Note: section 503.1 applies to additions that increase building footprint on the lot; and to renovations that include landscape, hardscape, and outdoor living areas. (Additional points awarded for each strategy implemented.)</p>												
<p>503.2 Slope disturbance is minimized by one or more of the following: (Points awarded only if there are developable steep slopes on the lot.)</p>												
<p>(1) All or a percentage of development on steep slopes is avoided.</p>												
<p>(a) Less than 25%</p>												
<p>(b) 25 to 75%</p>												
<p>(c) Greater than 75%</p>												
<p>(2) Hydrological/soil stability study for steep slopes is completed and used to guide the design of all buildings on the site.</p>												
<p>(3) All or a percentage of roads and parking are aligned with natural topography to reduce cut and fill.</p>												
<p>(a) Less than 25%</p>												
<p>(b) 25 to 75%</p>												
<p>(c) Greater than 75%</p>												
<p>(4) Long-term erosion effects are reduced through the design and implementation of terracing, retaining walls, landscaping, and rehabilitation techniques.</p>												
<p>(5) Underground parking uses the natural slope for parking entrances.</p>												

ANSI National Green Building Standard™	203	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
<b>Addition and Renovation Note:</b> Section 503.2 applies to additions that increase building footprint on the lot; and to renovations that include landscape, hardscape, and outdoor living area. <b>(Additional points awarded for each strategy implemented.)</b>	2 Additional Points											
<b>503.3 Soil disturbance and erosion</b> are minimized by one or more of the following: (Also see Section 504.3) (Points must be taken here to claim points in 504.1)												
(1) Construction activities are scheduled to minimize length of time that soils are exposed.	5			5	0							Stockpile lumber in construction entrance/driveway. Captured reseeded in 503.1(6)
(2) Utilities are installed using one or more alternative means:	5											
(a) tunneling instead of trenching												
(b) use of smaller (low ground pressure) equipment or geotoms to spread the weight of construction equipment												
(c) shared utility trenches or easements												
(d) placement of utilities under paved surfaces instead of yards.				5	0							Coordinate with sewer and water and utilities. Bring in under driveways.
(3) Limits of clearing and grading are demarcated on the plan.	5			5	0							Site plan should include these.
<b>503.4 Storm Water Mgmt.</b> Storm water is managed using one or more of the following low impact development techniques:												
(1) Natural water and drainage features are preserved and used.	6									6	0	Implement with 503.4(2).
(2) A storm water management plan is developed and implemented that minimizes concentrated flows and simulates flows found in natural hydrology, e.g., vegetative swales, French drains, wetlands, drywells, and rain gardens.	6									6	754	Minimum 2 person team for 1 day. Varies with size of operations.
(3) All or a percentage of impervious surfaces are minimized and permeable materials are used for driveways, parking areas, walkways, and patios.	6											Less than 15% impervious structure/driveway to land
(a) Less than 25%	1											
(b) 25 to 75%	3											
(c) Greater than 75%	5											
(4) A minimum of 75% of the roof is vegetated (green roof)	3											
<b>Addition and Renovation Note:</b> Section 503.4 applies to additions that increase the building footprint on the lot; and to renovations that include hardscape and outdoor living area. <b>(To be awarded these points, the amount of storm water runoff is not to</b>	1 Additional Point											
<b>503.5 Landscape plan</b> is developed to limit water and energy use while preserving or enhancing the natural environment.												
(1) A plan is formulated to restore or enhance natural vegetation that is cleared during construction. Landscaping is phased to coincide with achievement of final grades to ensure denuded areas are quickly vegetated.	5					5	520					Simple implementation on lot. Allowed 1/2 day for professional to develop plan that includes noted actions. Include 503.5(8) and 503.6 in plan. Plan needed for 801.7.4 points.
(2) Turf grass species, other vegetation, and trees are selected that are native or regionally appropriate for local growing conditions.	4									4	1,116	See 503.5(1) for plan cost. Cost of 3 shrubs, 2 trees and hydroseed. Based on 7,200 sf lot - no site plan provided.
(3) A percentage or all turf areas are limited.												
(a) Lot is 0% turf	4											
(b) Greater than 0% to less than 25%	3											
(c) 25% to less than 50%	2											28% mulched
(d) 50% to 75%	1											
(4) Plants with similar watering needs are grouped (hydrozoning).	5							5	535			See 503.5(1) for plan cost. 3 trees and 5 shrubs
(5) Species and locations for tree planting are identified that will provide summer shading of streets, parking areas, and buildings to moderate temperatures.	5							5	0			See 503.5(1) for plan cost. Plant 3 trees from 503.5(2) to provide shade. See 505.2(1)
(6) Vegetative wind breaks or channels are designed as appropriate for local conditions.	4							4	360			See 503.5(1) for plan cost. Add 3 trees.
(7) Onsite tree trimmings or stump grinding of regionally appropriate trees are used to provide protective mulch during construction and cleared trees are recycled as saw lumber or pulp wood.	3					3	0					
(8) An integrated pest management plan to minimize chemical use in pesticides and fertilizers is developed.	4					4	0					See 503.5(1)
<b>Addition and Renovation Note:</b> Section 503.5 applies to additions that address protection and renovation of existing vegetation during and after construction and the preservation or enhancement of the natural environment.	2 Additional Points											
<b>503.6 Wildlife habitat.</b> Measures are planned that will support wildlife habitat.	4									4	175	See 503.5(1). Include additional 5 shrubs.
<b>Addition and Renovation Note:</b> Section 503.6 applies to additions that increase building footprint on the lot; and to renovations that include landscape, hardscape, and outdoor living area. The existing landscape is either maintained to preserve a wildl												
(1) Maintain wildlife habitat.	1 Addtl Point											
(2) Expand wildlife habitat.	2 Addtl Points											
<b>503.7 Mixed use development</b> is incorporated.	6											Not possible with this development
<b>503.8 Environmentally Sensitive Areas.</b>												
(1) Environmentally Sensitive Areas are avoided.	3	3										
(2) Compromised Environmentally Sensitive Areas are mitigated or restored.	3											
<b>503.9 Density.</b> The average density on a net developable area basis is:												
(1) 7 to less than 14 dwelling units per acre (4047 m <sup>2</sup> )	4											
(2) 14 to less than 21 dwelling units per acre	7											
(3) 21 or greater dwelling units per acre	10											
<b>504 Lot Construction</b>												
<b>504.0 Intent.</b> Environmental impact during construction is avoided to the extent possible; impacts that do occur are minimized, and any significant impacts are mitigated.												
<b>504.1 Onsite supervision and coordination</b> is provided during clearing, grading, trenching, paving and installation of utilities to ensure that specified green development practices are implemented (Also see Section 503.3.)	4			4	0							Standard.
<b>504.2 Trees and vegetation.</b> Designated trees and vegetation are preserved by one or more of the following:												
(1) Fencing or equivalent to protect trees and other vegetation is installed.	3					3	166					
(2) Trenching, significant changes in grade, and compaction of soil and critical root zones in "tree save" areas are avoided.	4					4	0					

ANSI National Green Building Standard™	203	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(3) Damage to designated existing trees and vegetation is mitigated during construction through pruning, root pruning, fertilizing, and watering.	4											
<b>504.3 Soil disturbance and erosion.</b> Onsite soil disturbance and erosion are minimized by one or more of the following: (also see section 503.3)												
(1) Limits of clearing and grading are staked out.	5			5	300							Note: On this size lot this activity would typically be included with house stakeout for lesser cost.
(2) "No disturbance" zones are created using fencing or flagging to protect vegetation and sensitive areas from construction activity.	5	5										Included with 504.3(1)
(3) Sediment and erosion controls are installed and maintained in accordance with the storm water pollution prevention plan (SWPPP), where required.	5	5										Included with 504.3(1)
(4) Topsoil is stockpiled and stabilized for later use to establish landscape plantings.	5	5										
(5) Soil compaction from construction equipment is reduced by distributing the weight of the equipment over a larger area (laying lightweight geogrids, mulch, chipped wood, plywood, OSB, metal plates, or other materials capable of weight distribution in the pathway of the equipment).	3											
(6) Disturbed areas that are complete or to be left unworked for greater than 21 days are stabilized within 14 days using methods as recommended by the EPA or in the approved storm water pollution prevention plan (SWPPP), where required.	3	3										See 503.1(6)
(7) Soil is improved with organic amendments and mulch.	3									3	220	Soil amendment.
(8) Utilities are installed using one or more alternative means such as:												
tunneling instead of trenching, use of smaller equipment, use of low ground pressure equipment, use of geomats, shared utility trenches or easements.	5			5	0							See 504.1(2) and 503.3(2)
Addition and Renovation Note: Additional points for Section 504.3 apply only where onsite construction staging and storage areas are planned and located to avoid soil and vegetation disturbance in areas where no construction occurs.	2 Additional Points											
<b>505 INNOVATIVE PRACTICES</b>												
<b>505.0 Intent.</b> Innovative lot design, preparation and development practices are used to enhance environmental performance. Waivers or variances from local development regulations are obtained and innovative zoning practices are used to implement such practices.												
505.1 Driveways or parking areas are shared. Waivers or variances from local development regulations are obtained to implement such practices as applicable. In a multi-unit project, parking capacity is not to exceed the local minimum requirements.	4											
Addition and Renovation Note: Section 505.1 applies only where existing impervious driveway and parking area(s) are reduced.	2 Additional Points											
505.2 Heat Island Mitigation. Any combination of the following strategies are provided for a minimum of 50% of the horizontal surface area of the hardscape:	4											
(1) Shading of hardscaping: Shade from existing or new vegetation is provided (within five years) or from trellises. Shade of hardscaping is to be measured on the summer solstice at noon.								4	0			See 503.3(5).
(2) Light colored hardscaping: Horizontal hardscaping materials are installed with a solar reflectance index of 29 or greater.												
<b>CHAPTER 6: RESOURCE EFFICIENCY</b>	<b>Base Pts.</b>	56	0	20	0	11	0	27	1,337	40	4,338	Ch. 6 Subtotal
<b>601 Quality of Construction Materials and Waste</b>	<b>Cost/Pts.</b>		0		0		0		50		108	
<b>601.0 Intent.</b> Design and construction practices that minimize the environmental impact of the building materials are incorporated; environmentally efficient building systems and materials are incorporated; and waste generated during construction is reduced.												
601.1 <b>Conditioned floor area</b> , as defined by ICC IRC calculated in:												
(1) Less than or equal to 1,000 square feet	15	15										967 sf.
(2) Less than or equal to 1,500 square feet	12											
(3) Less than or equal to 2,000 square feet	9											
(4) Less than or equal to 2,500 square feet	6											
(5) Greater than 4,000 square feet (373 m <sup>2</sup> )	Mandatory											
For every 100 square feet over 4,000 sf, one point is to be added to Table 303, category 7 for each performance level.												
<b>Multi-Unit Building Note:</b> For a multi-unit building, use a weighted average of the individual unit sizes in qualifying for available points.												
<b>Addition Note:</b> Additions more than 75% of existing building. Section 601.1 does not apply to additions with an area of more than 75% of the area of the existing building or dwelling unit.												
<b>Additions less than or equal to 75% of existing building.</b> Where the addition area is less than or equal to 75 percent of the existing building or dwelling unit area, points are awarded as follows:												
(1) The existing structure is 50% to 75% of total building or dwelling unit area.	1 Addtl Point											
(2) The existing structure is 76% to 99% of total building or dwelling unit area.	3 Addtl Point											
<b>Renovation Note:</b> When renovations increase the total existing building or dwelling unit area by 1 percent or less, points are awarded as follows:												
(a) The total area of the existing building or dwelling unit is less than or equal to 2500 sf.	6 Addtl Points											
(e) The total area of the existing building or dwelling unit is greater than 2500 sf.	1 Addtl Point											
<b>601.2 Material Usage.</b> Building-code-compliant structural systems or advanced framing techniques that optimize material usage are implemented. Points awarded for each system or framing technique implemented.	3 pts per system (9 pts max)			9	0							Incorporate: single top plate, stud wall spacing @24", roof truss spacing at 24". - design cost vs. Material cost should be equal
601.3 Building dimensions and layouts are designed to reduce material cuts and waste.												
(1) When used for at least 80% of floor area	3									3	1,040	
(2) When used for at least 80% of wall area	3	3										
(3) When used for at least 80% of roof area	3											
(4) When used for at least 80% of cladding or siding area	3											
(5) When used for at least 80% of penetrations or trim area	1											
601.4 Detailed framing or structural plans, material quantity lists and onsite cut lists for framing, structural materials, and sheathing materials are provided.	4									4	1,040	

ANSI National Green Building Standard™	203	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
601.5 Pre-cut or pre-assembled components, or paneled or precast assemblies are utilized for 90% for the following system or building.												
(1) Floor system.	4											
(2) Wall system.	4											
(3) Roof system.	4											
(4) modular construction for the entire building located above grade.	13	13										Modular home construction
(5) manufactured home construction for the entire building located above grade.	13											
601.6 Stories above grade are stacked, such as in 1 1/2 and 2 story or greater structures. The area of the upper story shall be at least 50% of the area of the story below, based on areas with a minimum ceiling height of 7 feet.	Max 8 points											
(1) first stacked story	4											
(2) for each additional story	2											
601.7 Site applied finishing materials. Building materials or assemblies that do not require additional site applied material for finishing are utilized.	Max 12 points											
(1) 90% or more of the installed material or assembly listed below:	5											
(2) 50% to less than 90% of the installed building material or assembly listed below:	2											
(a) Pigmented, stamped, decorative, or final finish concrete or masonry.												
(b) Trim not requiring paint or stain.												
(c) Window, skylight, and door assemblies not requiring paint or stain on exterior and/or interior surfaces.	5											Wood aluminum clad windows. Doors get painted.
(d) Wall coverings or systems not requiring paint or stain or other type of finishing application.												
601.8 Foundations such as frost-protected shallow foundations, pier and pad foundations, post foundations and other similar foundation types are designed and constructed.	3	3										CMU wall w/ Pier foundation @ marriage line
601.9 One or more of the following above grade wall systems that provide sufficient structural and thermal characteristics are used for at least 75% of the gross exterior wall area of the building:	4											
(1) Adobe												
(2) Concrete/Masonry												
(3) Logs												
(4) Rammed earth												
<b>602 Enhanced Durability and Reduced Maintenance</b>												
602.0 Intent. Design and construction practices are implemented that enhance the durability of materials and reduce in-service maintenance.												
602.1 Entries at exterior door assemblies, inclusive of side lights, are covered by one of the following methods below to protect the building from the effects of precipitation and solar radiation. A projection factor of at least 0.375 is provided. Eastern and western facing entries in Climate Zones 1, 2, and 3, as determined in accordance with Figure 6(1), shall have a projection factor of at least 1.0 unless otherwise protected from direct solar radiation by other means (e.g. screen wall, vegetation).	Maximum number of points 5											
(1) Installing a porch roof or awning.												
(2) Extending the roof overhang.												
(3) Recessing the exterior door.												
Man entrance door	3	3										
Additional covered door assembly	1											
602.2 Roof overhangs, based on inches of rainfall in Table 602.2, are provided over at least 90% of exterior walls to protect the building envelope.	4											
Table 602.2 Minimum Roof Overhang for One- & Two-Story Buildings												
Inches Rainfall*	Eave Overhang (Inches)	Rake Overhang (Inches)										Plans show 12" rake and eave overhang. 64" rain/year
Less than 20	12	12										
21 to 40	12	12										
41 to 70	18	12					4	258				Extend overhangs by 6".
More than 70	24	12										
Addition Note: Section 602.2 applies to the new construction portion of additions.	0											
Renovation Note: Section 602.2 applies to renovations that alter the existing roof.	1											
<b>602.3 Foundation Drainage</b>												
602.3.1 Where required by the IRC/IBC for habitable and usable spaces below grade, exterior drain tile is installed.	Mandatory	0										
602.3.2 Interior and exterior foundation perimeter drains are installed and sloped to discharge to daylight, dry well, or sump pit.	4											Not applicable
Addition Note: Section 602.3.2 applies to the new construction portion of additions.	0											
Renovation Note: Section 602.3.2 applies to renovations that involve the demolition/reconfiguration of exterior walls and/or modification of the existing foundation drainage system.	2 Additional Points											
602.4 Drip edge is installed at eaves and gable roof edges.	3	3										
602.5 A gutter and downspout system with extensions, or splash blocks and effective grading, are provided to carry water at least 5 feet away from perimeter foundation walls.	4								4	410		Plans do not indicate gutters and downspouts; cost is for 70' gutter and (2) 10' downspouts 4 extensions and fold back elbows.
Renovation Note: Section 602.5 applies only to renovations.	1 Add'l Point											
602.6 Finish grade at all sides of building is sloped to provide a minimum of 6 inches of fall within 10 feet of the edge of the building. Where lot lines, walls, slopes or other physical barriers prohibit 6 inches of fall within 10 feet, the final grade	Mandatory	0										
Addition Note: Section 602.6 applies only to additions that increase the footprint of the building.	Mandatory 0 Add'l Points											
Renovation Note: The additional points for Section 602.6 apply only to renovations.	2 Add'l Points											
602.7 Termite barrier. Continuous, physical foundation termite barrier used with or without low toxicity treatment is installed in geographical areas that have subterranean termite infestation potential determined in accordance with Figure 6(3).	4											
Addition Note: Section 602.7 applies only to the new construction portion of additions.	0 Add'l Points											
Renovation Note: The additional points for section 602.7 applies only to renovations that alter the existing roof.												

ANSI National Green Building Standard™	203	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(1) new non-chemical termite barrier is provided	1 Add'l Point											
(2) existing chemical barrier is removed and replaced with a non-chemical barrier	3 Add'l Points											
602.8 Termite-resistant materials are used as follows:												
(1) In areas of slight to moderate termite infestation probability (as defined by Figure 6(3)) for the foundation, all structural walls, floors, concealed roof spaces not accessible for inspection, exterior decks, and exterior claddings within the first 2 feet above the top of the foundation.	2											
(2) In areas of moderate to heavy termite infestation probability (as defined by Figure 6(3)) for the foundation, all structural walls, floors, concealed roof spaces not accessible for inspection, exterior decks, and exterior claddings within the first 3 feet above the top of the foundation.	4											
(3) In areas of very heavy termite infestation probability (as defined by Figure 6(3)) for the foundation, all structural walls, floors, concealed roof spaces not accessible for inspection, exterior decks, and exterior claddings.	6											
602.9 Where required by the IRC/IBC, a water-resistive barrier and/or drainage plane system is installed behind exterior veneer and/or siding.	Mandatory	0										Complies. A-01.
<b>Addition Note:</b> Section 602.9 applies to the new construction portion of additions.	Mandatory 0 Add'l Points											
<b>Renovation Note:</b> Section 602.9 applies to renovations that include exterior veneer and/or siding replacement.	Mandatory 0 Add'l Points											
602.10 In areas where there has been a history of ice forming along the eaves causing a backup of water, an ice barrier is installed at roof eaves and is extended at least 24" inside the exterior wall line of the building, in accordance with the IRC/IBC.	Mandatory	0										
602.11 Enhanced foundation waterproofing is installed:	4											
(1) Rubberized coating, or												
(2) Drainage mat.												
<b>Addition Note:</b> Section 602.11 applies to the new construction portion of additions.	0 Additional Points											
<b>Renovation Note:</b> Section 602.11 applies to renovations that involve the demolition/reconfiguration of exterior walls, modification of the foundation wall, or an effort to improve foundation waterproofing.	2 Additional Points											
602.12 Flashing details are shown on plans and flashing is installed at all of the following locations, as applicable:	6									6	0	At plan revision include all flashing details. See Ch. 6 for cost.
(1) Around exterior fenestrations, skylights and doors.												
(2) Roof valleys.												
(3) Deck/balcony to building intersections.												
(4) At roof-to-wall intersection and at roof-to-chimney intersections.												
(5) A drip cap is provided above windows and doors that are not flashed or protected by covering per Section 602.1.												
602.13 Roof Surfaces. A minimum of 90% of roof surfaces are constructed of one or both of the following:	3											
(1) Products which meet the requirements of the ENERGY STAR® cool roof certification or equivalent.												
(2) A green (landscaped) roof system.												
<b>Renovation Note:</b> Section 602.13 applies to renovations that include roof replacement.	1 Add'l Point											
602.14 Recycling. Occupant recycling is facilitated by one or more of the following methods:												
(1) A built-in collection space in each kitchen and an aggregation/pick-up space in a garage, covered outdoor space or other area for recycling containers.	3							3	29			Include an under cabinet recycling container.
(2) Compost facility provided on-site.	3							3	72			
<b>603 Reused or Salvaged Materials</b>												
603.0 Intent. Practices that reuse or modify existing structures, salvage materials for other uses, or use salvaged materials in building's construction are implemented.												
603.1 Existing buildings and structures are reused, modified or deconstructed in lieu of demolition. (One point awarded for every 200 sq. ft., 18.5m <sup>2</sup> , of floor area.)	1 (Max 12 points)											
603.2 Reclaimed and/or salvaged materials and components are used. Total material and labor cost of salvaged materials shall equal or exceed 1% of total construction costs.	3											
603.3 Scrap Materials. Facilitation for sorting and reuse of scrap building material (e.g. provide a central storage area or dedicated bins.)	4							4	260			This cost is a one-time set up of 4x8x8' bins for sorting and reuse/reload can be divided by # lots in subdivision if it were known.
<b>604 Recycled-Content Building Materials</b>												
604.1 Building materials with recycled content are used for at least two major and/or two minor components of the building. (NOTE: Does not specify PC consumer. Implication is that max. allowable is 4 materials. 9 points is max. in scoring tool.)	Points per Table 604.1											
Table 604.1												
Recycled Content												
Material Percentage Recycled Content	Per 2 Minor	Per 2 Major										
25% - 50%	1	2	2									
50% - 75%	2	4	4							1		Carpet padding and wood/plastic decking
75%	3	6	6					6	0			Stainless steel sink and masonite floors. Gypsum board and cellulose insulation. Note: specify correct gypsum board.
605.0 Intent. Waste generated during construction is recycled.												
Note: All waste classified as hazardous shall be properly handled and disposed. (Points not awarded for hazardous waste removal.)												
605.1 A Construction Waste Management Plan is developed, implemented, and posted at the jobsite with a goal of recycling or salvaging a minimum of 50% (by weight) of construction and land-clearing waste.	6									6	989	Estimate is one day for set-up and one hour/week for record keeping. Costs of removal assumed even for each method. 90 day cycle time.
<b>Addition and Renovation Note:</b> The construction waste management plan includes information on the proper handling and disposal of hazardous wastes.	Mandatory 2 Additional Points											
605.2 Onsite recycling measures following applicable regulations and codes are implemented, such as the following:	7											

ANSI National Green Building Standard™	203	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(a) Materials are ground or otherwise safely applied onsite as soil amendment or fill. At least 50% (by weight) of construction and land-clearing waste shall be diverted from landfill.										7	0	Include in waste management plan. See 605.1. Divert 50% of construction waste to recycle.
(b) Other methods approved by the NAHB Research Center (the Adopting Entity).												
<b>Addition and Renovation Note:</b> All waste classified as hazardous waste is properly handled and disposed of. The weight of this material is exempted from landfill diversion when Section 605.2 is applied to existing buildings.												
605.3 Recycled Construction materials. Construction materials (e.g., wood, cardboard, metals, drywall, plastic, asphalt roofing shingles, or concrete) are recycled offsite.												
(1) A minimum of two types of materials are recycled.						3	0					Recycle drywall and copper wire. Net savings is anticipated.
(2) For each additional recycled material.						2	0					Recycle cardboard and wood.
<b>606 Renewable Materials</b>												
<b>606.0 Intent.</b> Building materials derived from renewable resources are used.												
606.1 The following biobased products are used. (Note: 606.1 and 606.2 denote % of project mat'l cost req'd.)												
(a) certified solid wood in accordance with Section 606.2												
(b) engineered wood												
(c) bamboo												
(d) cotton												
(e) cork												
(f) straw												
(g) natural fiber products made from crops (soy or corn-based)												
(h) products with the minimum biobased contents of the USDA 7 CFR Part 2902												
(i) other biobased materials with a minimum of 50 percent biobased content (by weight or volume).												
606.1(1) At least two types of biobased materials are used, each for more than 5% of the project's projected building material cost.			3									Wood interior trim & LVL
<b>Combined 8 pts Max</b>			3									
606.1(2) At least two types of biobased materials are used, each for more than 1% of the project's projected building material cost.					5	0						OSB sheathing and cellulose insulation.
606.1(3) For each additional biobased material used for more than 5% of the project's projected building material cost.												
<b>606.2 Wood-based products</b> are certified to the requirements of one of the following recognized product programs:												
(a) AFF American Tree Farm System®												
(b) Canadian Standards Association's Sustainable Forest Management System Standards (CAN/CSA Z809)												
(c) Forest Stewardship Council (FSC)												
(d) Program for Endorsement of Forest Certification Systems (PEFC)												
(e) Sustainable Forestry Initiative Program (SFI)												
(f) Other product programs mutually recognized by PEFC												
606.2(1) Where a minimum of two certified wood-based products are used for minor elements of the building, such as all trim, cabinetry, or millwork.								3	350			Specify Masonite doors for FSC certified. Estimated added cost of \$35/door. And kitchen cabinets at no cost.
606.2(2) Where a minimum of two certified wood-based products are used in major elements of the building, such as walls, floors, or roof.								4	369			Specify that front deck/railing is certified wood.
<b>606.3 Manufacturing Energy.</b> Materials are used for major components of the building that are manufactured using a minimum of 33% of the primary manufacturing process energy derived from renewable sources, combustible waste sources, or renewable energy credits (RECs). (2 points awarded per material.)					2	0						Specify that OSB comes from a mill that complies.
<b>607 Resource-Efficient Materials</b>												
607.1 Products containing fewer materials are used to achieve the same end-use requirements as conventional products, including but not limited to: (3 points awarded for each material.)												
(1) Lighter, thinner brick with bed depth less than 3 inches, brick with coring above 25%, or both.				3								2x3 wood studs on interior walls
(2) Engineered wood or engineered steel products.												Engineered wood - OSB floor and roof
(3) Roof or floor trusses.				3								
<b>608 Indigenous Materials</b>												
608.1 Indigenous materials are used for major elements of the building.												
(1) one type of material.						2	0					Use indigenous stone for driveway base.
(2) For each additional material.						2	0		6	0		Specify OSB from local mill. Deck lumber, steel, and siding locally sourced.
<b>609 Life Cycle Analysis</b>												
609.1 A more environmentally preferable product or assembly for an application based upon the use of a Life Cycle Assessment (LCA) tool compliant with ISO 14044 or other recognized standards that compare the environmental impact of building materials, as												
(1) Per product/system comparison												
(2) Whole building LCA analysis												
<b>610 Innovative Practices</b>												
<b>610.1 Manufacturer's environmental management system concepts.</b> Product manufacturer's operations and business practices include environmental management system concepts and the production facility is ISO 14001 certified or equivalent. The aggregate value of building products from ISO 14001 certified or equivalent production facilities is at least 1% or more of the estimated total building materials cost. (1 point awarded for every percent.)												
<b>CHAPTER 7: ENERGY EFFICIENCY</b>												
701.1 Mandatory requirements. The building shall comply with either Section 702 (Performance Path) or Section 703 (Prescriptive Path). Items listed as "Mandatory" in Section 701.4 apply to both the Performance and Prescriptive Paths.												
<b>Base Pts.</b>		49	0	6	1,095	45	2,895	52	4,625	29	4,243	Ch. 7 Subtotal
<b>Cost per point</b>			0		183		64		89		146	
<b>Addition Note:</b> Section 701, including mandatory items, applies only to the new construction portion of additions.												
<b>Renovation Note:</b> Section 701 applies to existing buildings as follows:												



ANSI National Green Building Standard™	203	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(1) For the Green Building Path (Section 305.4), the existing building or dwelling unit shall comply with the mandatory renovation/addition practices and shall achieve the points indicated in Table 303.												
(2) For the Green Remodel Path (Section 305.5), the existing building or dwelling unit shall comply with Table 305.5)												
<b>701.1.1 Minimum Performance Path Requirements.</b> A building complying with Section 702 shall exceed the baseline minimum performance required by the IECC by 15%, and shall include a minimum of two practices from Section 704.												Performance path selected.
<b>701.1.2 Minimum Prescriptive Path Requirements.</b> A building complying with section 703 shall obtain a minimum of 30 points from Section 703, and shall include a minimum of two practices from Section 704.												
<b>701.1.3 Alternative Bronze Level Compliance.</b> As an alternative, any building that qualifies as an ENERGY STAR qualified home or equivalent achieves the Bronze Level for Chapter 7.		30		(30)								
<b>701.2 Emerald Level Points.</b> The Performance Path shall be used to achieve to the Emerald Level.												Performance path selected at all levels.
<b>Mandatory Practices</b>												
<b>701.3</b> A review by the Adopting Entity or designated third party shall be conducted to verify design and compliance with Chapter 7.	Mandatory			0	520							4 hrs at professional time. Could be blower door testing. Add'l hours allotted Ch. 10.
<b>701.4.1 HVAC SYSTEMS</b>												
701.4.1.1 Space heating and cooling system/equipment shall be sized according to heating and cooling loads calculated using ACCA Manual J or equivalent.	Mandatory											2006 IECC requirement. Complies.
<b>Addition and Renovation Note:</b> Section 701.4.1.1 is mandatory for both additions and renovations where new HVAC equipment is installed.	Mandatory 0 Add'l Points											
<b>Addition and Renovation Note:</b> The additional points for section 701.4.1.1 apply to additions or renovations that include one or both of the following:	2 Add'l Points											
(1) a change in heating and cooling loads												
(2) a replacement and/or addition of mechanical equipment												
701.4.1.2 Where installed, as a primary heat source in the building, radiant or hydronic space heating system is designed using industry-approved guidelines (e.g. ACCA Manual J, GAMA H-22, or an accredited design professional's and manufacturer's recommen	Mandatory											
<b>701.4.2 DUCT SYSTEM</b>												
701.4.2.1 Ducts are sealed with tape complying with UL 181, mastic, gaskets, or an approved system as required by the ICC IRC (Section M1601.3.1, or ICC IMC Section 603.9) to reduce leakage.	Mandatory											2006 IECC requirement.
<b>Addition and Renovation Note:</b> Section 701.4.2.1 applies only to the new portions of a duct system, except as follows:	Mandatory 0 Add'l Points											
(1) For renovations of existing buildings, the entire duct system, both existing and new, is permitted to be sealed with mastic or an aerosol spray-applied duct sealant.	0 Add'l Points											
(2) For existing duct systems, where the existing duct system is not in accordance with Section 701.4.2.1, the overall duct system leakage is reduced by using any approved methods in Section 701.4.2.1, or aerosol spray applied duct sealant. Additional p												
(a) 25% to less than 50%	1 Add'l Pt											
(b) 50% to less than 75%	2 Add'l Pt											
(c) 75% to less than 100%	3 Add'l Pt											
(d) 100%	4 Add'l Pt											
(e) the entire system is upgraded in accordance with Section 704.6.2.2.	5 Add'l Pt											
701.4.2.2 Building cavities are not used as supply ducts.	Mandatory											All ducts are in the attic.
<b>Addition Note:</b> Section 701.4.2.2 is mandatory for new construction portion of additions.	Mandatory 0 Add'l Pts											
<b>Renovation Note:</b> Section 701.4.2.2 applies to renovations that involve one of the following:												
(1) the demolition, reconfiguration, or addition of interior walls or a modification in the duct system of the building	1 Add'l Pt											
(2) a focused effort to solve the use of building cavities as supply ducts	2 Add'l Pt											
<b>701.4.3 INSULATION and AIR SEALING</b>												
701.4.3.1 GENERAL Insulation and air sealing is in accordance with the following:												
(1) Insulation shall be installed in accordance with the manufacturer's instructions or local code, as applicable.	Mandatory					0						
(2) Shafts (duct shaft, piping shaft/penetrations, flue shaft.) Openings to unconditioned space are fully sealed with solid blocking or flashing and any remaining gaps are sealed with caulk or foam. Fire-rated collars and caulking are installed where re	Mandatory					0						
<b>Addition and Renovation Note:</b> Section 701.4.3.1(1) is mandatory for the new construction portion of additions and renovations.	Mandatory 0 Add'l Points											
<b>Renovation Note:</b> Existing openings to unconditioned spaces are sealed.	2 Add'l Pts											
<b>701.4.3.2 FLOOR / FOUNDATION / CRAWLSPACE</b>												
(1) Floors (Including insulated floors above garages and cantilevered floors)	Mandatory					0						
(a) Insulation is installed to maintain permanent contact with the underside of the subfloor decking, enveloping any attached ductwork within the thermal envelope without compression or air gaps in the insulation. This practice does not apply to ducts or other mechanical equipment that are adjacent to the underside of the subfloor.						0						
(b) Batt and loose-fill insulation is held in place by permanent attachments or systems in accordance with the manufacturer's instructions.						0						
<b>Renovation Note:</b> Insulate existing uninsulated floors.	2 Add'l Pts											
(2) Crawlspaces. Where insulated, crawlspace wall insulation is permanently attached to the walls. Exposed earth in unvented crawlspaces is covered with continuous vapor retarder with overlapping joints taped or masticed.	Mandatory											Pier. N/A.
<b>Renovation Note:</b> In accordance with Section 701.4.3.2(2):												
(1) existing uninsulated crawlspace is insulated.	2											
(2) exposed earth in existing crawlspace is covered.	2											
<b>701.4.3.3 WALLS</b>												

ANSI National Green Building Standard™	203	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(1) Windows and Doors. Caulking, gasketing, adhesive flashing tape, foam sealant, or weatherstripping is installed forming a complete air barrier.	Mandatory					0	0					See flashing details on plan.
Renovation Note: Existing windows and doors are weather-stripped and sealed.	1 Add'l Pt											
(2) Band Joist and Rim Joists. Band and rim joists are insulated and air sealed.	Mandatory					0	0					SPF?
Renovation Note: Existing uninsulated rim and/or band joists are insulated.	1 Add'l Pt											
(3) Between Foundation and Sill Plate Bottom Plate	Mandatory											
(a) Sill sealer, or other material that will expand and contract, shall be installed between foundation and sill plate.						0	0					N/A pier foundation.
(b) Caulk or the equivalent is installed to seal the bottom plate of exterior walls.						0	74					Cost to retrofit from underneath. 2 hours field.
Renovation Note: Existing perimeter sill plates are sealed.	1 Add'l Pt											
(4) Skylights and kneewalls. Skylight shafts and knee walls are insulated to the same level as the exterior walls.	Mandatory					0	0					N/A
Renovation Note: Existing skylight shafts and kneewalls are insulated.	1 Add'l Pt											
(5) Exterior Architectural features. Code required building envelope insulation and air sealing is not disrupted at exterior architectural features such as stairs and decks.	Mandatory					0	0					
701.4.3.4 CEILINGS AND ATTICS												
(1) Attic access (except unvented attics). Attic access, knee wall door, or drop down stair is covered with insulation and gasketed. Knee wall door is insulated unit or is covered with insulation.	Mandatory					0	0					Captured in 902.6(1)
Renovation Note: Existing attic access, knee wall door, or drop-down stairs are insulated.	1 Add'l Pt											
(2) Recessed Lighting. Recessed light fixtures that penetrate the thermal envelope are airtight, IC rated, and sealed with gasket, caulk, or foam.	Mandatory					0	0					No recessed lights.
Renovation Note: Replace existing recessed lights that penetrate the thermal envelope with airtight, IC-rated recessed light fixtures that are sealed to drywall with gasket, caulk, or foam. (Additional point per fixture)	1 Add'l Pt											
(3) Eave vents. Where ceiling/attic assemblies or designs have eave vents, baffles, or other means shall be utilized to minimize air movement into or under the insulation.	Mandatory					0	0					2006 IECC R806.3
Renovation Note: Provide blocking or baffle at eaves to ensure ventilation over attic insulation.	2 Add'l Pts											
701.4.4 FENESTRATION												
701.4.4.1 The NFRC-certified U-factor and SHGC windows, exterior doors, skylights, and tubular daylighting devices (TDDs) are in accordance with ENERGY STAR, or equivalent, or Table 701.4.4.1. Decorative fenestration elements with a maximum area of 15 sq	Mandatory					0	0					2006 IECC zone2 U= .75 SHGC= .40; cost differential between this and U=.65 is negligible.
Table 701.4.4.1 Fenestration Specifications												
Climate Zones												
		U-Factor		SHGC								
		Windows and Exterior Doors (maximum certified ratings)										
1 and 2		0.65		0.4								
3		0.4		0.4								
4 to 8		0.35		Any								
		Skylights and TDDs (max. certified ratings)										
1 to 3		0.75		0.4								
4 to 8		0.6		Any								
702 Performance Path												
702.1 Points from Section 702 (Performance Path) shall not be combined with points from Section 703 (Prescriptive Path).	Mandatory						0					Performance path.
702.2 Energy efficiency features are implemented to achieve energy cost performance that exceeds ICC IECC by the following. A documented analysis using software in accordance with ICC IECC, Section 404, or ICC IECC Section 506.2 through 506.5, applied a												Ducts were sealed and a programmable Tstat was added to reach 15%. See 704.6.1(1) and
(1) 15%		30		30	575	(30)						R-38 ceiling to meet 15% efficiency. Upgrade WH from .92 to .94.
(2) 30%		60				60	2,411	(60)				Upgrade floor insulation to R-30. Upgrade heat pump to 16SEER/9.0. Cut duct leakage in half - to 6%. Tankless water heater.
(3) 50%		100						100	0	(100)		See 704.3.2.1 for cost of ICS solar hot water. Tankless electric cost at (2) above, silver level.
(4) 60%		120								120	3,413	R-40 ceiling insulation. R-5 continuous foam; move ducts inside (cost at 704.6.2.2.(2)). 18SEER/9.0
Renovation Note: Application of Section 702.2: A baseline energy use measurement is calculated for the existing building. (Based on the reduction in whole building energy use, points are given for every increase in efficiency in accordance with Section	0 Add'l Pts											
703 Prescriptive Path												
703.1 Building envelope. Where the total building thermal envelope UA is less than required by ICC IECC, Section 402.1.4, the total building thermal envelope UA is in accordance with Table 703.1.1. Where insulation is used to achieve these percentages, a												
Sect. 703 pts.		0										
Practices 704		6										
Table 703.1.1 Total Building Thermal Envelope UA												
Climate Zone												
		Zone 2		Zone 3								
10% UA improvement		10 points		12 points								
20% UA improvement		20 points		24 points								
		Zone 4		Zone 5-6								
10% UA improvement		14 points		16 points								
20% UA improvement		28 points		32 points								
		Zone 7-8										
10% UA improvement		15 points										
20% UA improvement		36 points										
Addition Note: Section 703.1.1 applies to the new construction portion of additions.	0 Add'l Pts											

ANSI National Green Building Standard™	203	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
Renovation Note: The existing whole building thermal envelope UA is evaluated. One of the following is selected based on the evaluation.												
(1) If the overall thermal performance meets or exceeds the requirements of ICC IECC, Section 402.1.4; Section 703.1.1 applies to the renovation.	<b>Mandatory 0 Add'l Points</b>											
(2) If the existing overall thermal performance is below the requirements of ICC IECC, Section 402.1.4, the overall thermal performance of the whole building thermal envelope UA is improved a minimum of the following:												
(a) 15 percent		15										
(b) 30 percent		30										
(a) 45 percent, or meets the requirement of ICC IECC, Section 402.1.4	45											
703.1.2 The insulation installation is graded by a third party and is in accordance with Sections 703.1.2.1, 703.1.2.2, 703.1.2.3, and/or 703.1.2.4, as applicable. (Points not awarded in this section if already awarded under Section 703.1.1)	Points per Table 703.1.2											
<b>Table 703.1.2</b>												
Insulation Installation Grades:												
Grade	Points											
1	15											
2	10											
3	0											
703.1.2.1 Both Grade 1 and Grade 2 installations are in accordance with the following:												
(a) Grades apply to cavity fill insulation, continuous rigid insulation, and any other field-installed insulation products. Grading applies to ceilings, walls, rim joists, conditioned basements and crawlspaces, except as specifically noted. Inspection s												
(b) Insulation is installed in accordance with the manufacturer's instructions and/or industry standards.												
(c) Wall cavity insulation is enclosed on all six sides, and is in substantial contact with the sheathing material on one or more sides (interior or exterior) of the cavity.												
703.1.2.2 Grade 1 installation in accordance with the following:												
(a) Insulation uniformly fills each cavity side-to-side and top-to-bottom, without substantial gaps or voids around obstructions (such as blocking or bridging).												
(b) Compression or incomplete fill amounts to no more than 2% or less, presuming the compression or fill is at least 70% of the intended fill thickness; occasional small gaps are acceptable.												
(c) Exterior rigid insulation shall have substantial contact with the structural framing members or sheathing materials, and is tightly fitted at joints.												
(d) Cavity insulation is split, installed, and/or fitted tightly around wiring and other services.												
(e) Exterior sheathing is not visible from the interior through gaps in the cavity insulation.												
(f) Faced batt insulation is permitted to have side-stapled tabs, provided the tabs are stapled neatly with no buckling, and provided the batt is only compressed at the edges of each cavity, to the depth of the tab itself.												
(g) ICFs, SIPs, and other wall systems that provide integral insulation comply with "Grade 1" insulation installation requirements where properly installed.												
(h) "Grade 1" insulation must meet or exceed all requirements of "Grade 2" insulation.												
703.1.2.3 Grade 2 installation is in accordance with the following:												
(a) A maximum of 2% of the surface area of insulation is missing. Compression or incomplete fill amounts to 10 percent or less, presuming the compression or fill is a minimum of 70 percent of the intended fill thickness.												
(b) In conditioned basement or crawlspace the following apply:												
(i) Insulation is installed in complete contact with the subfloor surfaces.												
(j) Floor insulation over vented or ambient conditions is enclosed on six sides.												
(k) Floor insulation over unconditioned basements is not required to be enclosed on six sides.												
(l) Ceiling insulation is not required to be enclosed when the insulation is installed in complete contact with the drywall or plywood surfaces it is intended to insulate.												
(m) Eave baffles or equivalent construction is installed to prevent wind washing.												
(n) Installation with occasional installation defects is permitted: gaps around wiring, electrical outlets, plumbing and other intrusions; rounded edges or shoulders.												
703.1.2.4 Grade 3 installation is in accordance with the following:												
(a) Standard insulation installation not in accordance with Grade 1 or Grade 2 criteria.												
703.1.3 More than 75% of the above-grade exterior opaque wall area of the building is mass walls.	Points per Table 703.1.3											
<b>Table 703.1.3</b>												
Exterior Mass Walls												
<b>Mass Construction</b>												
	3 in. to <6 in.											
	6 in.											
Climate Zones 1, 2, 3, 4 except marine, and 5 dry.	4											
Climate Zones 4 marine, 5 except dry, and 6.	3											
Climate Zones 7 and 8	0											
<b>703.2 Insulation &amp; Air Sealing</b>												
703.2.1 Insulation and air sealing is installed in accordance with all of the following, as applicable:												
(1) Third party verification performed.	15											
(2) No third party verification performed.	3											
703.2.1.1 GENERAL												
703.2.1.1.1 Air Barrier and Thermal Barriers												
(1) Thermal insulation is installed in substantial contact with interior and exterior air barrier to provide continuous alignment of the insulation with the air barrier. The following are deemed to be their own air barrier:												
(a) Any spray or rigid foam insulation with an air permeance of 0.02 L/s-m2 or less at 75 Pa.												

ANSI National Green Building Standard™	203	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(b) ICFs, SIPs, and other wall systems that provide their own air barrier, except at interfaces with other materials or assemblies, or penetrations.												
(c) Spray foam that complies with the following:												
(i) continuously attached to the top, bottom and both sides of the cavity												
(ii) Continuous in the cavity without any unrepaired breaks.												
(iii) air impermeable												
(d) Air impermeable insulation.												
(2) Voids or areas of incomplete fill (less than 30% of full thickness) are 2% or less of the insulated area.												
(3) Insulation is in substantial contact with sheathing materials on one or more sides.												
(4) Any exterior rigid insulation is tightly fitted or interlocking at the joints.												
703.2.1.1.2 Plumbing and Wiring												
(1) At a minimum, insulation is placed between the outside (ceiling, wall, or floor) and the pipes.												
(2) Batt insulation is split or cut to fit around wiring and plumbing.												
(3) Sprayed insulation is installed to encapsulate pipes where the pipe temperature is 180 degrees F (82.2C) or less. Wiring is fastened in place to prevent displacement prior to spraying.												
703.2.1.1.3 Narrow cavities are filled and batts are cut to fit.												
703.2.1.1.4 HVAC register boots that penetrate the building envelope are caulked or sealed to the subfloor or drywall.												
703.2.1.1.5 Masonry fireplace equipped with gasketed doors, outside combustion air, and a chimney top damper.												
703.2.1.2 Air barrier is installed at any exterior edge of insulation at floors, foundations, and crawlspaces including insulated floors above garages and cantilevered floors.												
703.2.1.3 WALLS												
(1) Exterior walls behind the tub/shower are insulated and include an interior and exterior air barrier.												
(2) Air sealed type electrical outlet boxes are installed or the air barrier extends completely behind the boxes. Insulation is placed between the sheathing and the rear of electrical or phone boxes located on exterior walls. Electrical outlet boxes ar												
(3) Duplex and townhouse construction: In the common walls between dwelling units (e.g., gypsum shaft wall) an air barrier is installed to seal the gap between the common wall and the structural framing.												
(4) Skylight shafts and knee walls are air sealed. Insulation on attic knee walls and skylight shafts are physically supported by stapling in place, netting or using other mechanical attachment.												
(5) Fireplace walls: Air barrier that is aligned with insulation; any gaps are sealed with caulk or foam.												
703.2.1.4 CEILINGS and ATTICS												
(1) At dropped ceilings and soffits, the air barrier is substantially aligned with insulation and any gaps are sealed with caulk, foam, or tape.												
(2) Access to vented attics, including knee wall doors, and/or drop down stairs, is caulked, gasketed, or otherwise sealed.												
(3) An insulated cover is gasketed or sealed to the attic opening where a whole building or whole dwelling unit fan penetrates into the attic.												
<b>Addition Note:</b> Section 703.2.1 applies only to the new construction portion of additions.	0 Add'l Pts											
<b>Renovation Note:</b> The air infiltration of the existing whole building envelope is evaluated. Based on the evaluation, choose one of the following: (Additional points awarded only where third-party verification is not performed.)												
(1) Where the overall air infiltration rate is equal to or less than the requirements for new construction (as indicated in Section 704.6.2.1), this item applies to the renovation.	1 Add'l Pt											
(2) Where the overall air infiltration rate is greater than the requirements for new construction (as indicated in Section 704.6.2.1), reduce the air infiltration of the whole building envelope by:												
(a) 15 percent	1 Add'l Pt											
(b) 30 percent	2 Add'l Pts											
(c) 50 percent	3 Add'l Pts											
<b>703.3 FENESTRATION</b>												
703.3.1 The NFRC-certified U-factor and SHGC for windows, exterior doors, skylights, and tubular daylighting devices (TDDs) are in accordance with Table 703.3.1(a) or (b). Decorative fenestration elements with a maximum of 15 square feet or 10% of the to	Points Per Tables 703.3.1(a) or 703.3.1(b)											
<b>Table 703.3.1(a) - Enhanced Fenestration Specifications</b>												
U-Factor and SHGC	Climate Zone											
Windows and Exterior Doors (maximum certified ratings)												
0.45 0.30	1 and 2											
0.35 0.30	3											
0.30 Any	4 and 5											
0.30 Any	6 and 8											
Skylights and TDDs (maximum certified ratings)												
0.55 0.35	1 to 3											
0.55 Any	4 to 8											
<b>Table 703.3.1(b) - Enhanced Fenestration Specifications</b>												
U-Factor and SHGC	Climate Zone											
Windows and Exterior Doors (maximum certified ratings)												
0.45 0.25	1 and 2											
0.35 0.25	3											
0.25 Any	4 and 5											
0.25 Any	6 thru 8											
Skylights and TDDs (maximum certified ratings)												
0.50 0.35	1 to 3											
0.50 Any	4 to 8											
<b>Addition Note:</b> Section 703.3.1 applies only to the new construction portion of additions. (Points available on the basis of a ratio of new window area to total window area (new window area divided by total window area.)	0 Add'l Pts											

ANSI National Green Building Standard™		203	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
			Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
Renovation Note: Section 703.3.1 applies only to the replacement of existing windows. (Points available on the basis of a ratio of new window area to total window area (new window area divided by total window area).)		2 Add'l Pts											
<b>703.4 HVAC Equipment Efficiency</b>													
703.4.1 Combination Space Heating and Water Heating System ("Combo" System) is installed using either a coil from the water heater connected to an air handler to provide heat for the building or dwelling unit, or a space heating boiler using an indirect		4											
703.4.2 Furnace and/or boiler efficiency is in accordance with one of the following:													
<b>(1) Table 703.4.2(1) Gas and propane heaters:</b>		Points per Table 703.4.2(1)											
<b>Table 703.4.2(1) - Gas / Propane Heaters</b>													
Climate Zone	AFUE	Points											
1	≥90%	0											
1	≥92%	0											
1	≥94%	0											
2	≥90%	2											
2	≥92%	2											
2	≥94%	3											
3	≥90%	5											
3	≥92%	6											
3	≥94%	7											
4	≥90%	8											
4	≥92%	9											
4	≥94%	10											
5	≥90%	11											
5	≥92%	12											
5	≥94%	14											
6 through 8	≥90%	14											
6 through 8	≥92%	15											
6 through 8	≥94%	17											
<b>Table 703.4.2(2) Oil Furnace:</b>		Points per Table 703.4.2(2)											
<b>Table 703.4.2(2) - Oil Furnace:</b>													
Climate Zone	AFUE	Points											
1	≥83%	0											
1	≥90%	0											
2	≥83%	1											
2	≥90%	2											
3	≥83%	3											
3	≥90%	5											
4	≥83%	3											
4	≥90%	8											
5	≥83%	7											
5	≥90%	11											
6 through 8	≥83%	7											
6 through 8	≥90%	14											
<b>(3) Gas Boiler:</b>		Points per Table 703.4.2(3)											
<b>Table 703.4.2(3) - Gas Boiler</b>													
Climate Zone	AFUE	Points											
1	≥85%	0											
1	≥90%	0											
1	≥94%	0											
2	≥85%	1											
2	≥90%	2											
2	≥94%	3											
3	≥85%	3											
3	≥90%	5											
3	≥94%	7											
4	≥85%	4											
4	≥90%	8											
4	≥94%	10											
5	≥85%	6											
5	≥90%	11											
5	≥94%	14											
6 through 8	≥85%	7											
6 through 8	≥90%	14											
6 through 8	≥94%	17											
<b>Table 703.4.3.2(4) Oil Boiler:</b>		Points per Table 703.4.2(4)											
<b>Table 703.4.2(4) - Oil Boiler</b>													
Climate Zone	AFUE	Points											
1	≥85%	0											
1	≥90%	0											
2	≥85%	1											
2	≥90%	2											
3	≥85%	3											
3	≥90%	5											
4	≥85%	4											
4	≥90%	8											
5	≥85%	6											
5	≥90%	11											
6 through 8	≥85%	7											
6 through 8	≥90%	14											
703.4.3 Boiler equipped with temperature reset control or burner delay control.		1											
703.4.4 Heat pump heating efficiency is in accordance with Table 703.4.4. Refrigerant charge is verified to be in conformance with manufacturer's instructions.		Points per Table 703.4.4											
<b>Table 703.4.4 - Heat Pump Heating</b>													
Climate Zone	Efficiency	Points											
1	8.2HSPF 11.5EER	0											
1	9.0HSPF 12.5EER	0											
2	8.2HSPF 11.5EER	1											
2	9.0HSPF 12.5EER	2											
3	8.2HSPF 11.5EER	2											
3	9.0HSPF 12.5EER	5											
4	8.2HSPF 11.5EER	5											
4	9.0HSPF 12.5EER	10											
5	8.2HSPF 11.5EER	7*											
5	9.0HSPF 12.5EER	11*											
6 through 8	8.2HSPF 11.5EER	7*											
6 through 8	9.0HSPF 12.5EER	12*											
*Zones 5-8 require consideration for use of resistance heat in cold climates when installing a heat pump.													

ANSI National Green Building Standard™			203	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
			Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost		
703.4.5 Cooling efficiency is in accordance with one of the following. Refrigerant charge is verified for conformance with manufacturer's instructions.			Points per Table 703.4.5(1)											
<b>Table 703.4.5(1) - Air Conditioner and Heat Pump Cooling</b>														
Climate Zone	SEER (EER)	Points												
1	14 (11.5)	8												
1	15 (12.5)	12												
1	17 (12.5)	18												
1	19 (12.5)	24												
2	14 (11.5)	6												
2	15 (12.5)	10												
2	17 (12.5)	14												
2	19 (12.5)	18												
3	14 (11.5)	2												
3	15 (12.5)	4												
3	17 (12.5)	6												
3	19 (12.5)	8												
4	14 (11.5)	2												
4	15 (12.5)	3												
4	17 (12.5)	4												
4	19 (12.5)	4												
5	14 (11.5)	1												
5	15 (12.5)	2												
5	17 (12.5)	3												
5	19 (12.5)	3												
6 through 8	14 (11.5)	1												
6 through 8	15 (12.5)	2												
6 through 8	17 (12.5)	3												
6 through 8	19 (12.5)	3												
(2) Water Source and Cooled Air Conditioners			Points per Table											
<b>Table 703.4.5(2) - Water Source and Cooled Air Conditioners</b>														
Climate Zone	EER, COP	Points												
1	15 4.0	18												
2	15 4.0	14												
3	15 4.0	6												
4	15 4.0	4												
5	15 4.0	3												
6 through 8	15 4.0	3												
703.4.6 Ground source heat pump is installed by a Certified Geothermal Service Contractor in accordance with one of the following ENERGY STAR levels:														
(1) Open loop; $\geq 16.2$ EER and $\geq 3.6$ COP		20												
(2) Closed loop; $\geq 14.1$ EER and $\geq 3.3$ COP		20												
(3) Direct expansion; $\geq 15.0$ EER and $\geq 3.5$ COP		20												
(4) Any type (open, closed or direct expansion); $\geq 24$ EER and $\geq 4.3$ COP		30												
703.4.7 ENERGY STAR, or equivalent, ceiling fans are installed. (Points awarded per building.)			1											
703.4.8 Whole building or whole dwelling unit fan(s) with insulated louvers and a sealed enclosure is installed. (Points awarded per building.)			2											
703.4.9 In multi-unit buildings, an advanced electric and fossil fuel submetering system is installed to monitor electricity and fossil fuel consumption for each unit. At a minimum, the information is available to the occupants on a monthly basis.														
(1) Install a device providing monthly consumption information.			1											
(2) Install a device that can provide near real-time energy consumption information.			4											
703.4.10 An ENERGY STAR, or equivalent, programmable thermostat is installed to control each heating and cooling zone. (Points awarded per dwelling unit.)			1											
<b>Addition Note:</b> Section 703.4.10 applies to the new construction portion of additions.			0 Add'l Pts											
<b>Renovation Note:</b> Replace existing nonprogrammable thermostat.			1 Add'l Pt											
<b>703.5 Water Heating Design, Equipment, and Installation</b>														
703.5.1 Water heater Energy Factor (EF) is equal to or greater than the following:			Points Per Tables 703.5.1(1)(a) or 703.5.1(1)(b)											
(1) Gas Water Heating														
<b>Table 703.5.1(1)(a) - Gas Water Heating</b>														
(Storage with input rate of 75,000 Btu/hr or less or instantaneous input rate of 200,000 Btu/hr or less)														
Size (gallons)	Energy Factor	POINTS												
30 to < 40	0.64	1												
40 to < 50	0.62	1												
50 to < 65	0.6	1												
65 to < 75	0.58	1												
75	0.56	1												
Any	0.8	10												
<b>Table 703.5.1(1)(b) - Gas Water Heating</b>														
(Storage with input rate of greater than 75,000 Btu/hr or instantaneous input rate greater than 200,000 Btu/hr)														
Size (gallons)	Thermal Efficiency	POINTS												
Any	82-86%	1												
Any	> 86%	10												
(2) Electric Water Heating			Points Per Tables											
<b>Table 703.5.1(2) - Electric Water Heating</b>														
Size (gallons)	Energy Factor	POINTS												
30 to < 40	0.95	1												
40 to < 50	0.94	1												
50 to < 65	0.92	1												
65 to < 80	0.9	1												
80 to < 100	0.88	1												
100	0.86	1												
(3) Oil Water Heating			Points per Table 703.5.1(3)											
<b>Table 703.5.1(3) - Oil Water Heating</b>														
Size (gallons)	Energy Factor	POINTS												
30 to < 50	0.59	1												
50	0.55	1												
(4) Heat Pump Water Heating			Points per Table 703.5.1(4)											
<b>Table 703.5.1(4) - Heat Pump Water Heating</b>														
	Energy Factor	POINTS												
Heat Pump	1.5	7												
Heat Pump	2	10												
703.5.2 Desuperheater, s installed by a qualified installer or is pre-installed in the factory.			Points per Table 703.5.2											

ANSI National Green Building Standard™	203	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
<b>Table 703.5.2 – Desuperheater</b>												
Climate Zone	Points for Desuper heater											
Zone 1-4	5											
Zone 5-8	2											
703.5.3 Drain-water heat recovery system is installed in multi-family units. (Points awarded per building.)	2											
703.5.4 Insulating hot water pipes												
703.5.4.1 Hot water lines are insulated with a minimum of R-4 insulation.	1											
703.5.4.2 Boiler supply piping is insulated in unconditioned spaces.	1											
<b>Addition Note:</b> Section 703.5.4 applies only to the new or modified plumbing associated with the addition.	0 Add'l Pts											
<b>Renovation Note:</b> Where hot water lines in the existing building are accessible, the hot water lines are insulated in accordance with Section 703.5.4. (To receive additional points, a minimum of 50 percent of the existing hot water lines are insulated.)	1 Add'l Pt											
703.5.5 Indirect fired water heater storage tanks heated from boiler systems are installed.	1											
<b>704 Additional Practices</b>												
<b>704.1 Application of Additional Practice Points.</b> Points from Section 704 can be added to points earned in Section 702 (Performance Path), Section 703 (Prescriptive Path) or Section 701.1.3 (alternative Bronze Level compliance).												
<b>704.2 Lighting and Appliances</b>												
704.2.1 Hard-wired lighting meets one of the following:	8 pts max											
(1) A minimum of 50% of the total hard-wired lighting fixtures, or the bulbs in those fixtures, qualify as ENERGY STAR or equivalent.	4	4										
(2) A minimum of 50% of the total hard-wired lighting fixtures qualify as ENERGY STAR or equivalent.	8							4	125			\$25 per fixture; 5 fixtures
(3) A minimum of 80% of the exterior lighting wattage has an efficiency of at least 40 lumens per watt or be a solar powered light fixture.												
<b>Addition Note:</b> Section 704.2.1 applies only to the new construction portion of additions.	0 Add'l Pts											
<b>Renovation Note:</b> A percentage of the total lighting fixtures, or the lights in those fixtures, are replaced with fixtures or lights that qualify as ENERGY STAR or equivalent.												
(1) 50 percent	1 Add'l Pt											
(2) 75 percent	2 Add'l Pts											
(3) 100 percent	3 Add'l Pts											
704.2.2 The number of recessed light fixtures that penetrate the thermal envelope are less than 1 per 400 square feet of total conditioned floor area and are in accordance with Section 701.4.3.4(2).	2		2									No recessed.
<b>Addition Note:</b> Section 704.2.2 is mandatory for the new construction portion of additions.	Mandatory 0 Add'l Pts											
<b>Renovation Note:</b> Section 704.2.2 applies where room for installation within the conditioned envelope is available. (To receive additional points, a minimum of 50% of the total recessed ceiling lights are in accordance with Section 704.2.2.)	1 Add'l Pt.											
704.2.3 Occupancy sensors are installed on indoor lights, and photo or motion sensors are installed on outdoor lights to control lighting.												
(1) 25% of lighting	2											
(2) 50% of lighting	4											
704.2.4 Tubular daylighting device (TDD) or a skylight with sealed, insulated, low-E glass is installed in rooms without windows. (Points awarded per building.)	2											
704.2.5 ENERGY STAR or equivalent appliance(s) are installed:												
(1) Refrigerator	5			5	0							Moved refrig to bronze. Cost neutral.
(2) Dishwasher	2	2		0								
(3) Washing machine	4					4	0					Moved to match Chapter 8 Washer. See cost
<b>Addition and Renovation Note:</b> Section 704.2.5 applies as follows:												
(1) replace existing refrigerator	2 Add'l Pts											
(2) replace existing dishwasher	1 Add'l Pt											
(3) replace existing washing machine	1 Add'l Pt											
704.2.6 Induction cooktop is installed.	1											
704.2.7 Occupancy sensors are installed for a minimum of 80% of hardwired lighting outlets.	1											
<b>704.3 Renewable Energy/Solar Heating and Cooling</b>												
<b>704.3.1 Solar space heating and cooling.</b>												
704.3.1.1 Sun-tempered Design: Building orientation, sizing of glazing, and design of overhangs are in accordance with all of the following:	5											
(1) The long side (or one side if of equal length) of the building faces within 20° of true south.												
(2) Vertical glazing area is between 5% and 7% of gross Conditioned Floor Area on the south face (also see Section 704.3.1.1(8)).												
(3) Vertical glazing area is less than 2% of gross Conditioned Floor Area on the west face, and glazing is ENERGY STAR compliant or equivalent.												
(4) Vertical glazing area is less than 4% of gross Conditioned Floor Area on the east face and glazing is ENERGY STAR compliant or equivalent.												
(5) Vertical glazing area is less than 8% of gross Conditioned Floor Area on the north face, and glazing is ENERGY STAR compliant or equivalent.												
(6) Skylights, where installed, are in accordance with the following:												
(a) Shades and insulated wells are used and all glazing is ENERGY STAR compliant or equivalent.												
(b) Horizontal skylights are less than 0.5 % of Finished Ceiling Area												
(c) Sloped skylights on slopes facing within 45° of true South, East or West are less than 1.5% of the Finished Ceiling area												
(7) Overhangs or adjustable canopies or awnings or trellises provide shading on south facing glass for the appropriate climate zone in accordance with Table 704.3.1.1.												
<b>Table 704.3.1.1 Southern Window Overhang Depth</b>												

ANSI National Green Building Standard™			203	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
			Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost		
	Vertical Distance between bottom of overhang and top of window sill													
<b>Climate Zone and Overhang Depth</b>														
1 through 3	2' 8"	≤7' 4"												
1 through 3	2' 8"	≤6' 4"												
1 through 3	2' 4"	≤5' 4"												
1 through 3	2' 0"	≤4' 4"												
1 through 3	2' 0"	≤3' 4"												
4 through 6	2' 4"	≤7' 4"												
4 through 6	2' 4"	≤6' 4"												
4 through 6	2' 0"	≤5' 4"												
4 through 6	2' 0"	≤4' 4"												
4 through 6	1' 8"	≤3' 4"												
7 and 8	2' 0"	≤7' 4"												
7 and 8	1' 8"	≤6' 4"												
7 and 8	1' 8"	≤5' 4"												
7 and 8	1' 4"	≤4' 4"												
7 and 8	1' 0"	≤3' 4"												
(8) The south face windows have a SHGC of 0.40 or higher.														
(9) Return air or transfer grilles/ducts are in accordance with Section 704.4.5.														
<b>Addition Note:</b> Section 704.3.1.1 applies to the new construction portion of additions. (Points are available on the basis of a ratio of new building area to total building area. New building area divided by total building area.)														
<b>Renovation Note:</b> Section 704.3.1.1 applies to existing construction.														
			<b>0 Add'l Pts</b>											
704.3.1.2 Automated solar protection is installed to provide shading for windows.			<b>1 Add'l Pt</b>											
704.3.1.3 Passive cooling design features are in accordance with three or more of the following:			<b>1</b>											
Points for three items:			<b>3</b>											
Points for one additional item:			<b>1</b>											
(1) Exterior shading is provided on east and west windows using one or a combination of the following strategies:														
(a) Vine covered trellises with the vegetation separated a minimum of 1 foot from face of building.														
(b) Moveable awnings or louvers														
(c) Covered porches														
(d) Attached or detached conditioned/unconditioned enclosed space that provides full shade of east and west windows (e.g., detached garage, shed or building)														
(2) Overhangs are installed to provide shading on south-facing glazing in accordance with Section 704.3.1.1(7). (Points not awarded if points are taken under 704.3.1.1.)														
(3) Windows and/or venting skylights are located to facilitate cross ventilation.														
(4) Solar reflective roof or radiant barrier is installed in Climate Zones 1, 2 or 3 and roof material meets a 3 year aged criteria of 0.50.														
(5) Internal exposed thermal mass is a minimum of three inches in thickness. Thermal mass consists of concrete, brick, and/or tile that are fully adhered to a masonry base or other masonry material and is in accordance with one or a combination of the following:														
(a) A minimum of one square foot of exposed thermal mass of floor per three square feet of gross finished floor area.														
(b) A minimum of three square feet of exposed thermal mass in interior walls or elements per square foot of gross finished floor area.														
(6) Roofing material is installed with a minimum 0.75 inch continuous air space offset from the roof deck from eave to ridge.														
<b>Addition Note:</b> Section 704.3.1.3 applies to the new construction portion of additions. (Points are available on the basis of a ratio of new building area to total building area. New building area divided by total building area.)														
<b>Renovation Note:</b> Section 704.3.1.3 applies to existing construction. A minimum of one design feature is required.														
704.3.1.4 Passive solar heating design. In addition to the sun-tempered design features in Section 704.3.1.1, all of the following are implemented:			<b>1 Add'l Pt</b>											
(1) Additional glazing, no greater than 12%, is permitted on the south wall. This additional glazing is in accordance with the requirements in Section 704.3.1.1.			<b>4</b>											
(2) Additional thermal mass for any room with south-facing glazing of more than 7% of the finished floor area is provided in accordance with the following:														
(a) Thermal mass is solid and a minimum of 3" in thickness. Where two thermal mass materials are layered together (e.g. ceramic tile on concrete base) to achieve the appropriate thickness, they are fully adhered to (touching) each other.														
(b) Thermal mass directly exposed to sunlight must be provided in the following minimum ratios:														
(i) Above latitude 35°: 5 square feet of thermal mass for every 1 square foot of south facing glazing.														
(ii) Latitude 30° to 35°: 5.5 square feet of thermal mass for every 1 square foot of south facing glazing.														
(iii) Latitude 25° to 30°: 6 square feet of thermal mass for every 1 square foot of south facing glazing.														
(c) Thermal mass not directly exposed to sunlight is permitted to be used to achieve thermal mass requirements of Section 704.3.1.4 (2) based on a ratio of 40 square feet of thermal mass for every 1 square foot of south facing glazing.														
(3) In addition to return air or transfer grilles/ducts required by Section 704.3.1.1, provisions for forced airflow to adjoining areas are implemented as needed.														
704.3.2 Solar water heating														
704.3.2.1 Solar water heater. SRCC (Solar Rating & Certification Corporation) OG 300 rated, or equivalent, solar domestic water heating system is installed. Solar Energy Factor (SEF as defined by SRCC) is in accordance with Table 704.3.2.1.														
<b>Table 704.3.2.1 - Solar Hot Water Systems</b>														
	SEF - Electric Tank	SEF - Gas Tank	<b>POINTS</b>											
	1.30 - 1.50	0.85 - 1.00	<b>8</b>							<b>8</b>	<b>4,500</b>			ICS Solar assists meeting 50% goal.



ANSI National Green Building Standard™		203	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
			Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
1.51 - 1.80	1.01 - 1.20	11											
1.81 - 2.30	1.21 - 1.50	14											
2.31 - 3.00	1.51 - 2.00	17											
3.01	2.01	20											
Addition and Renovation Note: Section 704.3.2.1 applies to systems in additions and/or existing buildings.		1 Add'l Pt.											
<b>704.3.3 Additional renewable energy options</b>													
704.3.3.1 Photovoltaic panels are installed on the property. (Points awarded per every 100 watts DC of the rated PV system)		1											
704.3.3.2 Other onsite renewable energy source is installed (e.g., wind energy, onsite micro-hydro power, active solar space heating systems). (Points awarded per every 1/10 KW of the system)		0.5											
<b>704.4 Ducts</b>													
704.4.1 Duct system is sized, designed, and installed according to ACCA Manual D or equivalent.		5	5										2006 IECC M1601.1
Addition Note: New construction portion of additions.		Mandatory Add'l Pts	0										
Renovation Note: Section 704.4.1 applies only where the duct system in the existing building is readily accessible, and the duct system is sized, designed, and installed in accordance with ACCA Manual D or equivalent. A minimum of 75% of the duct runs a		1 Add'l Pt											
704.4.2 Space heating is provided by a system that does not include air ducts.		15											
704.4.3 Space cooling is provided by a system that does not include air ducts.		15											
704.4.4 Ductwork is in accordance with all of the following:		12											
(1) Building cavities are not used as return ductwork.													
(2) Heating and cooling ducts and mechanical equipment are installed within the conditioned building space.													
(3) Ductwork is not installed in exterior walls													
Addition Note: Section 704.4.4 applies to the new construction portion of additions.		0 Add'l Pts											
Renovation Note: Section 704.4.4 applies to renovations that involve the demolition, reconfiguration, and/or addition of interior walls, or a modification in the duct system of the building, or an intentional effort to implement the practices in Section		2 Add'l Pts											
704.4.5 Return ducts or transfer grilles are installed in every room with a door. This practice does not apply to bathrooms, kitchens, closets, pantries, and laundry rooms.		5	5										Plans indicate returns every room.
Addition Note: Section 704.4.5 applies to the new construction portion of additions.		0 Add'l Pts											
Renovation Note: Section 704.4.5 applies to renovations that involve the demolition, reconfiguration, and/or addition of interior walls, or a change in the heating, cooling, and ventilation system of the building, or a test of the building for balanced p		2 Add'l Pts											
<b>704.5 HVAC Design and Installation</b>													
704.5.1 ACCA Manual S or equivalent is used to select heating and/or cooling equipment.		1	1										
704.5.2 HVAC contractor and service technician are certified by a nationally or regionally recognized program such as North American Technician Excellence, Inc. (NATE), Building Performance Institute (BPI), Radiant Panel Association, or manufacturers' tr		1			1	0							Standard.
704.5.3 Performance of the heating/cooling system is verified by the HVAC contractor in accordance with all of the following:		3					3						
(1) Start-up procedure is performed according to manufacturer's instructions.													Standard.
(2) Refrigerant charge is verified by super-heat and/or sub-cooling method.													Standard.
(3) Burner is set to fire at nameplate input.													Standard.
(4) Air handler setting/fan speed is set per manufacturer's instructions.													Standard.
(5) Total air flow is within 10% of design flow.								149					Allow team of 2 2 hours at field rate.
(6) Total external system static does not exceed equipment capability at rated airflow.													Standard.
704.5.4 HVAC equipment operates using an alternate refrigerant containing no HCFCs. (Points awarded only until January 20, 2010.)		1						1	0				Trane and others include 15' of line set alternate refrigerant with product.
704.5.5 Manufacturer's label or printed specifications for sealed air handler (except furnaces) indicates the leakage is less than or equal to 2% of design airflow at a pressure of 1-inch w.g. (1250 Pa). Air handlers are tested with inlets, outlets, an		4											
<b>704.6 Installation and Performance Verification</b>													
704.6.1 Third party onsite inspection is conducted to verify conformance with all of the following, as applicable. Minimum of 2 inspections are performed. One inspection after insulation is installed and prior to being covered, and another inspection up		5						5					Included in verifier's field visit. See 701.3.
(1) Ducts are installed per IRC/IMC and ducts are sealed.									260				6% leakage modeled for 15% improvement. See cost in 902.
(2) Building envelope air sealing is installed.									0				2006 IECC required for SLA .00036.
(3) Insulation is installed in accordance with Section 703.1.2									0				
(4) Windows, skylights, and doors are flashed, caulked, and sealed in accordance with manufacturer's recommendations and in accordance with Section 703.2.1.									0				
704.6.2 Third party testing is conducted to verify performance.													
704.6.2.1 Building envelope leakage rate is demonstrated by blower door test. In addition to the test, the following practices are required:													
1. Whole building ventilation is provided in accordance with Section 902.2.													
2. Fossil fuel furnace and water heater is sealed combustion or power vented in accordance with Section 901.1.													
3. Fireplaces and Fuel Burning Appliances are in accordance with 901.2.													

ANSI National Green Building Standard™	203	Baseline		Bronze		Silver		Gold		Emerald		NOTES:	
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost		
<b>The maximum leakage rate is in accordance with:</b>													
(a) 5 ACH50	0.25 nat	3											
(b) 4 ACH50	0.2	6											
(c) 3 ACH50	0.15	9											
(d) 2 ACH50	0.1	12											
(e) 1 ACH50	0.05	15											
704.6.2.2 The entire central HVAC duct system, including air handlers and register boots, is tested for leakage at a pressure differential of 0.1 inches w.g. (25 Pa). The maximum leakage as a percent of the system design flow rate is in accordance with													
(1) 6% for ductwork entirely outside the building's thermal envelope.		15										See 704.6.1(1) for cost of duct seal. BD and DB tests hats not subtracted.	
(2) 6% for ductwork entirely inside the building's thermal envelope.		5							5	680		Move ducts and AH inside building envelope. Cost is SF price to consumer given up to equipment -	
(3) 6% for ductwork both inside and outside the building thermal envelope.		15											
704.6.2.3 Balanced HVAC air flows are demonstrated by flow hood or other acceptable flow measurement tool. Test results in accordance with both of the following:													
(a) Measured flow at each supply and return register is within 25% of design flow.		8											
(b) Total airflow is within 10% of design flow.													
<b>Addition Note:</b> Section 704.6.2 applies to the new construction portion of additions. (Points are available on the basis of a ratio of new area to total area.) (New area divided by total area.)													
		0 Add'l Pts											
<b>Renovation Note:</b> Section 704.6.2 applies as follows: Evaluate the performance features of the existing whole building envelope. Choose one of the following based on the evaluation:													
(1) The overall energy performance features of the existing building are equal to or better than the requirements for new construction.		1 Add'l Pt											
(2) If the overall energy performance features of the existing building are less than the requirements for new construction, third party testing is conducted to verify performance claimed in Sections 701.4.2.1, 703.1 and 703.2.1.		3 Add'l Pts											
<b>705 Innovative Practices</b>													
<b>705.1 Energy consumption control.</b> A whole building or whole dwelling unit device is installed that controls or monitors energy consumption.													
		7 Points Max											
(1) Programmable communicating thermostat		2				2	0						
(2) Energy monitoring device		4							4	150			
(3) Energy management control system		7											
<b>705.2 Renewable energy service plan is as follows:</b>													
(1) Builder selects a renewable energy service plan provided by the local electrical utility for interim (temporary) electric service. The builder's local administrative office has renewable energy service.		2											
(2) The buyer of the home selects a renewable energy service plan provided by the utility prior to occupancy of the home.		5											
<b>CHAPTER 8: WATER EFFICIENCY</b>													
<b>801 Indoor and Outdoor Water Use</b>		Base Pts.	5	0	9	114	23	348	18	350	17	534	Ch. 8 Subtotal
		Cost/Point		0		13		15		19		31	
801.0 Intent. Measures that reduce indoor and outdoor water usage are implemented.													
801.1. Indoor hot water usage is reduced by one of the following practices:													
(1) All hot water piping which runs to the plumbing fixtures in both the kitchen and bathrooms is 40-feet or less in length from the water heater and is sized in accordance with the code for the specified application.		2											Water heater location in attic.
(2) All hot water piping which runs to the plumbing fixtures in both the kitchen and bathrooms is 30-feet or less from the water heater and is sized in accordance with the code for the specified application.		3	3	0							-3		Runs can be minimized further by locating the water at midpoint of bath and kitchen.
(3) One of the following piping system designs is implemented:													
(a) Use of structured-type plumbing with demand controlled hot water loops, in which the volume of water contained in the pipe and fixture fittings downstream of the recirculating trunk line is a maximum of 4 cups (0.25 gallons).		6											
(b) Implement an engineered parallel piping system (i.e. manifold system) in which the hot water line distance from the water heater to the parallel piping system is less than 15 feet and the parallel piping to the fixture fittings contains a maximum of 8		6											
(c) Central core plumbing system with all plumbing fixture fittings (e.g., faucets & showerheads) located such that the volume of water contained in each pipe run between the water heater and fixture fitting is a maximum of 6 cups (0.38 gallons).		8									8	0	Simple to implement in a small house with two baths
(4) Pipe runs exceeding 40-feet from the water heater to fixture locations are aided by one of the following:		1											
(a) Tankless water heater is installed at point of use and is served only by cold water or a solar-assisted system.													
(b) On demand hot water recirculation system is installed.													
<b>Addition Note:</b> Section 801.1 applies only to the new construction portion of addition(s) that alter portions of a building with hot water appliances and/or fixtures.													
<b>Renovation Note:</b> Section 801.1 applies only to renovation projects that have the ability to meet the requirements of Section 801.1.													
<b>(Renovation projects that are unable to meet the length of pipe runs indicated in Section 801.1, but are able to shorten e</b>													
(1) Minimum of 25% to less than 50% reduction in total pipe length or volume.		Points Reduced by Half											
(2) More than or equal to 50% reduction in total pipe length or volume.		0 Add'l Pts											
<b>Addition Note - Section 801.1.1(3):</b> Where a new hot water system is provided in an addition, this item applies. (Points for Section 801.1.1(3)(a), (b), and (c).)													
<b>Addition and Renovation Note - Section 801.1.1(3):</b> Section 801.1.1(3) applies only where hot water lines in the existing building are accessible. (To receive additional points, a minimum of 50 percent of the hot water lines are in accordance with Section													
801.2 Energy Star® or equivalent water-conserving appliances are installed													
(1) Dishwasher		2	2										
(2) Washing machine		8				8	348				(8)	(348)	Includes cost of EStar for 704.2.5
(3) Washing machine with a water factor of 6.0 or less		12									12	500	

ANSI National Green Building Standard™	203	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
<b>Addition and Renovation Note:</b> Section 801.2 applies as follows when existing appliance(s) are properly disposed of and not placed into secondary service in a dwelling unit.												
(1) Replace existing dishwasher	1 Add'l Pt											
(2) Replace existing washing machine	1 Add'l Pt											
(3) Replace existing washing machine with a water factor of 6.0 or less	1 Add'l Pt											
801.3 A minimum of one food waste disposer is installed at the primary kitchen sink.	1			1	114							
<b>801.4 Showerheads</b>												
<b>801.4 (182) 1)</b> The total showerhead flow rate at any point in time, for all showerheads in each shower compartment is less than 2.5 gpm, tested at 80 psi per ASME A112.18.1/CSA B125.1. 2) In addition the showerheads must be equipped with an automatic com	1 Point (3 Points Max)											Showerhead flow rate max. EPA is 2.5.
<b>801.4 (384)</b> All shower compartments in the home comply with 801.4 (182).				2	0							
(3) All shower compartments installed meet the above conditions and are 2.0 to less than 2.5 gpm.	1 Add'l Pt											
(4) All shower compartments installed meet the above conditions and are 1.6 to less than 2.0 gpm.	2 Add'l Pts			2	0							Specify lower flow rate faucet/aerator.
<b>Addition Note:</b> Section 801.4 applies only to additions that include a minimum of one bath or shower.	0 Add'l Pts											
<b>Renovation Note:</b> Section 801.4 applies only to renovations that include one or more bathrooms with a bath or shower. (Points awarded per fixture.)	1 Add'l Pt											
<b>Addition and Renovation Note:</b> Existing showerhead is replaced with a showerhead that has a low rate in accordance with Section 801.4. (Points awarded per additional showerhead.)	1 Add'l Pt											
<b>801.5 Faucets</b>												
<b>801.5.1</b> Water-efficient lavatory faucets with 1.5 gpm or less maximum flow rate when tested at 60 psi in accordance with ASME A112.18.1 are installed.												
(1) a bathroom (Points awarded for each bathroom.)	3 Pts Max			2	0							
(2) all lavatory faucets in the home meet the conditions of 801.5.1	2 Add'l Pts			2	0							
<b>Addition Note:</b> Section 801.5.1 applies only to additions that include a bathroom.	1 Add'l Pt											
<b>Renovation Note:</b> Section 801.5.1 applies only to renovations of existing bathrooms.	2 Add'l Pts											
<b>Addition and Renovation Note:</b> Replace all faucets in non-renovated bathrooms with faucets that are in accordance with Section 801.5.1.	2 Add'l Pts											
<b>801.5.2</b> Self-closing valve, motion sensor, metering, or pedal-activated faucet is installed to enable intermittent on/off operation. (Points awarded per fixture.)	1 3 Pts Max											
<b>Renovation Note:</b> Additional points for Section 801.5.2 apply where installed.	1 Add'l Pt 6 Pts Max											
<b>801.6 Water closets and urinals.</b> Water closets and urinals are in accordance with the following: (For water closets, points awarded for either Section 801.6 or 802.2, but not both.)												
(1) Gold and Emerald Levels: All water closets and urinals are in accordance with either Section 801.6 or 802.2.	Mandatory											
(2) A water closet is installed with an effective flush volume of 1.28 gallons or less when tested in accordance with ASME A112.19.2 (all water closets) and ASME A112.19.14 (all dual flush water closets), and is in accordance with EPA WaterSense Tank-Typ	6 18 Pts Max							12	350			Install (2) low flow toilets.
(3) A urinal is installed with a flush volume of 0.5 gallons or less when tested in accordance with ASME A112.19.2.	4 Max 4 Points											
4) All water closets and all urinals are in accordance with Section 801.6(2) or Section 801.6(3), as applicable.	6 Add'l Points							6	0			
<b>Addition and Renovation Note:</b> Section 801.6 applies only to additions and renovations that include bathrooms.	0 Add'l Pts											
<b>Renovation Note:</b> Renovations that do not include bathrooms receive points for replacing existing water closets with water closets in accordance with Section 801.6 (Points awarded per fixture.)	1 Add'l Pt											
<b>801.7 Irrigation systems</b>												
<b>801.7.1</b> A low-volume, irrigation system is installed for each landscape type utilized: (Points awarded for each type of irrigation system installed.)	10 Pts. Max											
(1) High distribution uniformity (DU) rotating spray heads	2											
(2) Drip irrigation	4											
(3) Bubblers	4											
(4) Drip emitters	4											
(5) Soaker hose	4											
(6) Subsurface irrigation	6											
<b>Addition and Renovation Note:</b> Section 801.7.1 applies only to additions that increase the building footprint or affect the irrigation system.	1 Add'l Pt											
<b>Renovation Note:</b> Section 801.7.1 applies only to renovations of the landscape, hardscape, or outdoor living areas with existing irrigation systems or to renovations that replace the irrigation system.	2 Add'l Pts											
<b>801.7.2</b> Irrigation system is in accordance with both of the following:	3											
1) designed by a professional in accordance with EPA WaterSense requirements or equivalent												
2) installed in accordance with EPA WaterSense program or equivalent												
<b>Addition Note:</b> Section 801.7.2 applies to additions that increase the building footprint or modify an existing irrigation system.	1 Add'l Pt											
<b>Renovation Note:</b> Section 801.7.2 applies to renovations with existing irrigation systems that are modified, or to renovations where a new irrigation system is installed or the existing irrigation system is replaced.	1 Add'l Pt											
<b>801.7.3</b> Irrigation system is zoned separately for turf and bedding areas.	2											
<b>Addition Note:</b> Section 801.7.3 applies to additions that increase the building footprint or affect the irrigation system.	1 Add'l Pt											
<b>Renovation Note:</b> Section 801.7.3 applies only to renovations with existing irrigation systems that are modified, or to renovations where a new irrigation system is installed or the existing irrigation system is replaced.	2 Add'l Pts											

ANSI National Green Building Standard™	203	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
801.7.4 The irrigation system(s) is controlled by a smart controller:												
(1) Evapotranspiration (ET) based irrigation controller with a rain sensor	4											
(2) Soil moisture sensor based irrigation controller	4											
(3) No irrigation is installed and a landscape plan is developed in accordance with Section 503.5(1) as applicable. (Points must be taken in 503.5(1) in order to receive points for 801.7.4(3))	15					15	0					
801.8 Rainwater collection and distribution is provided.												
(1) Rainwater is collected and used	6									6	382	
(2) Rainwater is distributed using a renewable energy source or gravity.	2									2	0	Distribution by gravity.
801.9 Water Filters. Water filter is installed to improve water quality for the whole building or whole dwelling unit.	1											
802.1 Gray water (as specified in ICC IRC, Appendix O) is separated and reused, as permitted by local building code. (Points awarded for either Section 802.1(1) or 802.1(2), not both)												
(1) Each water closet flushed by reclaimed or recycled water.	4 Points (per fixture)											
(2) Irrigation from reclaimed or recycled water onsite	10											
<b>Addition and Renovation Note:</b> Additional points are available for Section 802.1 as follows:												
1) each water closet flushed by reclaimed or recycled water	2 Add'l Pts											
2) irrigation from reclaimed or recycled water onsite	5 Add'l Pts											
802.2 Composting or waterless toilets and/or urinals. Composting or waterless toilets and/or urinals are in accordance with the following: (For water closets, points awarded for either Section 802.2 or 801.6, but not both)	24 Points Max											
Mandatory												
1) Gold and emerald levels: All water closets and urinals are in accordance with either Section 802.2 or Section 801.6.												
2) Composting or waterless toilet and/or urinal is installed. (Points awarded per fixture)	8											
3) All toilets and urinals are in accordance with Section 802.2 (2).	8 Add'l Points											
802.3 Automatic shutoff water devices. One of the following automatic shutoff water supply devices is installed. Where a fire sprinkler system is present, installer is to ensure the device will not interfere with the operation of the fire sprinkler system	2											
(1) Excess Water Flow Shutoff												
(2) Leak Detection System												
<b>CHAPTER 9: INDOOR ENVIRONMENTAL QUALITY</b>	<b>Base Pts.</b>	<b>71</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>25</b>	<b>207</b>	<b>36</b>	<b>650</b>	<b>22</b>	<b>1,830</b>	<b>Ch. 9 Subtotal</b>
<b>901 Pollutant Sources Control</b>	<b>Cost/Point</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>8</b>	<b>16</b>	<b>18</b>	<b>16</b>	<b>83</b>		
901.0 Intent. Pollutant sources are controlled.												
901.1 Space and water heating options												
901.1.1 Natural draft space heating or water heating equipment is not located in conditioned spaces, including conditioned crawl spaces. Natural draft equipment is permitted to be installed within the conditioned spaces if located in a mechanical room that has an outdoor air source, and is otherwise sealed and insulated to separate it from the conditioned space(s).	5											Furnace and water heater are electric.
<b>Addition Note:</b> Section 901.1.1 applies to additions that include the use of natural draft space heating or water heating equipment.	Mandatory											
<b>Renovation Note:</b> Section 901.1.1 applies to renovations that include areas where natural draft space heating or water heating equipment is located.	Mandatory											
<b>Renovation Note:</b> Additional points are available for any renovation that modifies all of the existing building's natural draft space heating or water heating equipment in accordance with Section 901.1.1	2 Additional Points											
901.1.2 Air handling equipment or return ducts are not located in the garage, unless placed in isolated, air-sealed mechanical rooms with an outside air source.	5	5										
<b>Renovation Note:</b> Section 901.1.2 applies to renovations that modify existing duct systems.	2 Additional Points											
901.1.3 The following combustion space heating and water heating equipment is installed within conditioned space.												
(1) Direct vent furnace or boiler	5											
(2) (a) Power vent water heater	3											
(b) Direct vent water heater	5											
<b>Renovation Note:</b> Section 901.1.3 applies to renovations that replace existing space heating and water heating combustion equipment with equipment in accordance with Section 901.1.3 for new construction.	2 Additional Points											
901.1.4 The following electric equipment is installed:	2											
1) Heat pump air handler in unconditioned space	5	5										
2) Heat pump air handler in conditioned space												
901.2 Fireplaces and Fuel Burning Appliances (except cooking appliances, clothes dryers, water heaters, and furnaces) located in conditioned space are code compliant, vented to the outdoors, and have adequate combustion and ventilation air provided to minimize spillage or back-drafting, in accordance with the following: All of the following items are mandatory, if applicable, for certification.												
901.2.(1) Natural gas and propane fireplaces that are power vented or direct vented, are equipped with permanently fixed glass fronts or gasketed doors, and comply with ANSI Z21.88/CSA 2.33a or ANSI Z21.50/CSA 2.22	7											
901.2.(2)(a) Wood burning fireplaces are equipped with gasketed doors designed to operate with the doors closed, outside combustion air, and a means is provided for sealing the flue to minimize interior air (heat) loss when not in operation.	4											
901.2.(2)(b) Factory-built wood burning fireplaces are in accordance with the certification requirements of UL 127 and are EPA certified.	6											
901.2.(2)(c) Wood stove and fireplace inserts, as defined in UL 1482, Section 3.8 are in accordance with the certification requirements of UL 1482 and are in accordance with the emission requirements of the EPA Certification and the State of Washington W	6											

ANSI National Green Building Standard™	203	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
901.2.1(2)(d) Pellet (biomass) stoves and furnaces are in accordance with the requirements of ASTM E1509 or are EPA Certified.	6											
901.2.1(2)(e) Masonry heaters are in accordance with the definitions in ASTM E1602 and ICC IRC, Section 2112.1.	6											
<b>Renovation Note:</b> Removal of or rendering permanently unusable an existing fireplace and/or other fuel-burning appliances that are not in accordance with Section 901.2.1.	2 Add'l Pts											
<b>Renovation Note:</b> Additional points are awarded for the replacement of each existing fireplace that is not in accordance with Section 901.2.1 with a fireplace that is in accordance with Section 901.2.1.	2 Add'l Pts											
<b>Renovation Note:</b> Additional points are available for removing or rendering permanently unusable each existing wood-burning fireplace that is not in accordance with Section 901.2.1(2)(a) in areas other than the main renovation area.	2 Add'l Pts											
901.2.2 Fireplaces, woodstoves, pellet stoves, or masonry heaters are not installed.	7	7										
901.3 Garages are in accordance with the following:												
901.3(1)(a) Where installed in the common wall between the attached garage and conditioned space, the door is tightly sealed and gasketed.	Mandatory 2 Points											
901.3(1)(b) A continuous air barrier is provided between walls and ceilings separating the garage space from the conditioned living spaces.	Mandatory 2 Points											
901.3(1)(c) For one and two-family dwelling unit attached garages, a 100 cfm or greater ducted, or 70 cfm or greater unducted wall exhaust fan is installed and vented to the outdoors, designed and installed for continuous operation, or has controls (e.g., motion detectors, pressure switches) that activate operation for a minimum of 1 hour when either human passage door or roll-up automatic doors are operated. For ducted exhaust fans, the fan airflow rating and duct sizing are in accordance with Appendix A. (If you claim points for 901.3(1)(c), you cannot claim points for 901.3(2).	4											
901.3(2) A carport is installed, the garage is detached from the building, or no garage is installed. (If you claim points for 901.3(2), you cannot claim points for 901.3(1)(a), 901.3(1)(b), or 901.3(1)(c).	10	10										
<b>Addition Note:</b> Section 901.3 applies where the addition is a garage or shares a continuous air barrier with a garage.	Mandatory											
<b>Renovation Note:</b> Section 901.3 applies to renovations that involve construction adjacent to an attached garage.	1 Add'l Point											
<b>Renovation Note:</b> A focused effort to create a continuous air barrier between the garage and conditioned space, including penetrations, occurring between walls and ceilings separating the garage and conditioned space.	3 Add'l Points											
901.4(2-6) Wood Materials. A minimum of 85% of material within a product group (i.e. wood structural panels, countertops, composite trim/doors, custom woodwork, and/or component closet shelving) is manufactured in accordance with the following:	10 points max.											
901.4(1) Structural plywood used for floor, wall, and/or roof sheathing is compliant with <u>DOQ-PS-1</u> and/or <u>DOQ-PS-2</u> . OSB used for floor, wall, and/or roof sheathing is compliant with <u>DOQ-PS-2</u> . The panels are made with moisture-resistant adhesives. The trademark indicates these adhesives as follows: Exposure 1 or Exterior for plywood, and Exposure 1 for OSB.	Mandatory	0										Meets.
(2) Particleboard and MDF (medium density fiberboard) is manufactured and labeled in accordance with CPA A208.1 and CPA A208.2, respectively.	2 Points per Product Group											
(3) Hardwood plywood is in accordance with HPVA HP-1 and HUD Title 24, Part 3280.	2 Points per Product Group											
(4) Particleboard, MDF, or hardwood plywood is in accordance with CPA 2.	3 Points per Product Group											
(5) Composite wood or agfiber panel products contain no added urea formaldehyde or are in accordance with the CARB Composite Wood Air Toxic Contaminant Measure Standard.	4 Points per Product Group							4	0			Interior doors and trim.
(6) Non-emitting products.	4 Points per Product Group											
<b>Renovation Note:</b> Additional points for Section 901.4 apply to renovations that replace all existing countertops, shelving, and other nonstructural products.	2 Add'l Pts											
901.5 Carpets are in accordance with the following:												
901.5(1) Wall-to-wall carpeting is not installed adjacent to water closets and bathing fixtures.	Mandatory	0										
901.5(2) A minimum of 85% of installed carpet area, carpet cushion (padding), and carpet adhesives are in accordance with the emission levels of CDPH 01350, as certified by a third-party program, such as the Carpet and Rug Institute's (CRI) Green Label Pl.												
(a) Carpet	6											
(b) Carpet cushion	2											
(c) Carpet adhesives	2											
<b>Renovation Note:</b> Section 901.5(2) applies to renovations where existing carpet is replaced. Remove existing carpet and perform one of the following repair methods:	2 Add'l Pts											
1) Existing carpeted floor area is exposed, cleaned, and finished and is used as non-carpeted finished floor.	2 Add'l Pts											
2) Carpet is installed in accordance with Section 901.5.	0 Add'l Pts											
3) New non-carpet flooring product in compliance with an approved green labeling program(s) is installed.	1 Add'l Pts											
901.6 Hard-surface flooring. A minimum of 85% of installed hard-surface flooring is in accordance with the emission concentration limits of CDPH 01350 (using the office scenario), as certified by a third-party program, such as the RFCI's FloorScore Indoor Air Certification Program or the Greenguard Environmental Institute's Children and Schools Certification Program.	6	6										specifications list only carpet and ceramic tile
901.7 Wall coverings. A minimum of 85% of wall coverings are in accordance with the emission concentration limits of CDPH 01350 (using the office scenario), as certified by a third-party program, such as the Scientific Certification Systems (SCS) Indoor Advantage Gold Program or the Greenguard Environmental Institute's Children and Schools Certification Program.	4									4	941	Specify insulation, gypsum board and paints with low VOC and low emitting products. Cost covers paperless drywall and low VOC paint. Insulation should be at n/c.

ANSI National Green Building Standard™	203	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
901.8 Architectural coatings. A minimum of 85% of the architectural coatings are in accordance with one of the following conditions:												
901.8.1 Site-applied interior products are in accordance with one or more of the following:	5	5								(5)		can only achieve 8 pts max. so when upgrading paint to CDPH, loose 3 pts here
(1) Zero VOC, determined by EPA Method 24 (VOC content below the detection limit for the method).												
(2) CARB Suggested Control Measure for Architectural Coatings												
(3) GS-11												
(4) VOC limits in accordance with:												
(a) 50 grams/liter flat												
(b) 100 grams/liter non flat												
(c) 350 grams/liter clear wood varnish												
(d) 550 grams/liter clear wood lacquer												
901.8.2 Site-applied interior products are in accordance with the emissions levels of CDPH 01350, as certified by a third party program such as the Scientific Certification Systems (SCS) Indoor Advantage Gold Program or the Greenguard Environmental Institute's Children and Schools Certification Program.	8									8	0	Specify low Voc paints. See cost in 901.6
<b>Addition and Renovation Note:</b> Section 901.8 applies when the building is occupied during construction.	<b>Mandatory 1 Add'l Point</b>											
901.9 Adhesives and Sealants.												
901.9.1 For exterior low-VOC adhesives and sealants, a minimum of 85% of site-applied products used for the installation of subfloors and on the exterior of the project are in accordance with one of the following:	5									5		
(1) The California Air Resources Board consumer products regulation as follows:												
a) Construction Adhesives: VOC content not to exceed 7% by weight or 75 grams/liter, whichever is greater.											108	Case adhesive - add to base.
b) The VOC content of reactive sealants (i.e., silicones, polyurethanes, and hybrids, such as MS Polymer and silylated polyurethane resin or SPUR) not to exceed 4% by weight or 50 grams/liter, whichever is greater.												
c) The VOC content of all other caulks and sealants not to exceed 2% by weight or 30 grams/liter, whichever is greater.											8	Case caulk - add to base.
d) The VOC content of contact adhesives not to exceed 55% by weight or 480 grams/liter, whichever is greater.												
(2) GS-36												
901.9.2 Interior Low-VOC Adhesives and Sealants. For interior low VOC adhesives and sealants, a minimum of 85% of site-applied products used within the interior of the building are in accordance with one of the following, as applicable:												
1) CDPH 01350, as certified by a third party program, such as Scientific Certification Systems (SCS) Indoor Advantage Gold Program or the Greenguard Environmental Institute's Children and Schools Certification Program.	5					5	0					
(2) GS-36	5											
901.10 Cabinets. A minimum of 85% of kitchen and bath vanity cabinets are in accordance with one of the following: <b>(Where more than one of the following practices is used, the practice with the fewer number of points is awarded)</b>												
(1) Kitchen and bath vanity cabinets in accordance with KCMA ESP 01, or equivalent, are installed.	2	2	0	-2	0							
(2) Kitchen and bath vanity cabinets in accordance with CARB Composite Wood Air Toxic Contaminant Measure Standard are installed.	3											
(3) Kitchen and bath vanity cabinets are installed that contain no added urea formaldehyde or are in accordance with GGPS.EC.010.R0, ASTM D6670, or equivalent.	5					5	0					Require better specs on cabinets.
<b>Renovation Note:</b> Additional Points for Section 901.10 apply to renovations that replace all existing kitchen and bath vanity cabinets.	<b>2 Add'l Pts</b>											
901.11 Insulation is in accordance with the following:												
(1) Formaldehyde emissions of wall, ceiling, and floor insulation materials are in accordance with the emissions levels of CDPH 01350, as certified by a third-party program, such as the GREENGUARD Environmental Institute's Children and Schools Certification Program or the Scientific Certification Systems (SCS) Indoor Advantage Gold Program.	4					4	0					Insulation can be resp'cd to meet this criteria.
(2) Formaldehyde emissions of duct insulation materials are in accordance with the emissions levels of CDPH 01350, as certified by a third-party program, such as the GREENGUARD Environmental Institute's Children and Schools Certification Program or the Scientific Certification Systems (SCS) Indoor Advantage Gold Program.	1					1	0					Specify.
901.12 A carbon monoxide (CO) alarm is installed in a central location outside of each separate sleeping area in the immediate vicinity of the bedrooms. The CO alarm(s) is located in accordance with NFPA 720 and is hard-wired with a battery back-up. The alarm device(s) is certified by a third party for conformance with either CSA 6.19 or UL 2034.	3	3										
901.13 Building entrance pollutants control. Pollutants are controlled at all main building entrances by one of the following methods: (can only use one method)												
(1) Exterior grilles or mats are installed in a fixed manner and may be removable for cleaning.	1					1	44					
(2) Interior grilles or mats are installed in a fixed manner and may be removable for cleaning.	1											
901.14 Non-smoking areas. All interior common areas of a multi-unit building are designated as non-smoking areas with posted signage.	1											
901.15 <b>Renovation Note:</b> For buildings constructed prior to 1978, lead-safe work practices are used during renovation, remodeling, painting, and demolition.	<b>Mandatory</b>											
<b>902 Pollutant Control</b>												
902.0 Intent. Pollutants generated in the building are controlled.												
902.1.1 Spot ventilation is in accordance with the following:												

ANSI National Green Building Standard™	203	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(1) Bathrooms (including powder rooms) are vented to the outdoors. The minimum ventilation rate is 50 cfm for intermittent operation or 20 cfm for continuous operation in bathrooms.		0										Complies.
(2) Clothes dryers are vented to the outdoors.		Mandatory										Complies.
(3) Kitchen exhaust units and/or range hoods are ducted to the outdoors and have a minimum ventilation rate of 100 cfm for intermittent operation or 25 cfm for continuous operation.		8										See also 904.2
<b>Addition Note:</b> Section 902.1 applies only to additions that include a kitchen or bathroom.		8										
<b>Mandatory</b>												
<b>Renovation Note:</b> Section 902.1 applies to renovations that include a new or existing kitchen or bathroom. (Points available for all of the following conditions)												
<b>Mandatory</b>												
(1) Existing non-vented kitchen range or bathroom exhaust systems in an area that is undergoing renovation are replaced with equipment that is in accordance with Section 902.1.		2 Add'l Pts										
(2) Existing non-vented kitchen range or bathroom exhaust systems in an area that is not undergoing renovation are replaced with equipment that is in accordance with Section 902.1.		3 Add'l Points										
(3) New kitchen range or bathroom exhaust systems in accordance with Section 902.1 are installed where no exhaust system existed before renovation.		1 Add'l Pts										
902.1.2 Bathroom and/or laundry exhaust fan is provided with an automatic timer and/or humidistat:		9 Points Max										
1) for first device		5						5	42			timer
2) for each additional device		2						2	42			timer
902.1.3 Kitchen range, bathroom, and laundry exhaust are verified to specification. Ventilation airflow at the point of exhaust is tested to a minimum of 100 cfm intermittent or 25 cfm continuous for kitchens, and 50 cfm intermittent or 20 cfm continuous		8						8	149			2 field personnel 2 hours.
902.1.4 Exhaust fans are ENERGY STAR as applicable.		Max. 6 Points										
(1) ENERGY STAR, or equivalent, fans (Points awarded per fan)		2										
(2) ENERGY STAR, or equivalent, fans operating at or below 1 sone (Points awarded per fan)		3	6									tech spec pg 10. E* and 0.8 sone
902.2. Building ventilation systems.												
902.2.1 One of the following whole building ventilation systems is implemented and is in accordance with the specifications of Appendix B. (Points must be claimed in 902.2.1 to claim points in 902.2.2)												
(1) Exhaust or supply fan(s) ready for continuous operation and with appropriately labeled controls.		8										
(2) Balanced exhaust and supply fans with supply intakes located in accordance with the manufacturer's guidelines to not introduce polluted air back into the building.		10						10	345			
(3) Heat-recovery ventilator.		15										
(4) Energy-recovery ventilator.		17										
<b>Addition Note:</b> Section 902.2.1 is applied to an addition in accordance with one of the following:												
1) The pressure and thermal boundaries of the addition are separated from the existing building.		0 Add'l Pts										
2) If the pressure and thermal boundaries of the addition are not separated from the existing building, Section 902.2.1 is applied to the whole building.		1 Add'l Pts										
<b>Renovation Note:</b> Section 902.2.1 applies to the whole building for connected thermal and pressure boundaries.		2 Add'l Pts										
902.2.2 Ventilation airflow is tested to achieve the design fan airflow at point of exhaust in accordance with Appendix B. (Points must be claimed in 902.2.1 to claim points in 902.2.2)		8										
902.2.3 MERV filters 8 or greater are installed on central air systems. Designer or installer is to verify that the HVAC equipment is able to accommodate the greater pressure drop of MERV 8 filters.		3				3	0					
<b>Addition Note:</b> Section 902.2.3 applies only to additions that include a new HVAC system.		0 Add'l Pts										
<b>Renovation Note:</b> Section 902.2.3 applies only to renovations that replace an existing HVAC system.		1 Add'l Pts										
902.3 Radon control. Radon control measures are in accordance with ICC IRC Appendix F. (Zones are defined in Figure 9(1)).												
902.3(1) Buildings located in Radon Zone 1 have a radon system installed.		0										
(a) A passive radon system is installed.		10										
(b) An active radon system is installed.		15										
902.3(2) Buildings located in Zone 2.												
(a) A passive radon system is installed.		10										
902.4 HVAC system protection. One of the following HVAC system protection measures is performed:												
(1) HVAC supply registers (boots), return grilles, and rough-ins are covered during construction activities to prevent dust and other pollutants from entering the system.		3				3	35					
<b>Addition and Renovation Note:</b> Section 902.4(1) does not apply to additions and renovations except as noted in Addition and Renovation Note (3) below.		0 Add'l Pts										

ANSI National Green Building Standard™	203	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(2) Prior to owner occupancy, HVAC supply registers (boots), return grilles, and duct terminations are inspected and vacuumed. In addition, the coils are inspected and cleaned and the filter is replaced if necessary.	3											
<b>Addition and Renovation Note:</b> As an alternative to Section 902.4(2), one of the following options is implemented:	<b>Mandatory</b>											
1) During construction, a construction indoor air quality (IAQ) schedule is developed that includes, at a minimum, all of the following:	1 Add'l Pt											
a) type of construction activity												
b) ability to occupy the building or dwelling unit												
c) IAQ protections for occupant(s) of the building or dwelling unit												
d) hazardous waste removal												
e) name and age of occupants of the building or dwelling unit at a specific time												
2) The addition or renovation area is sealed off from the occupied portion of the building or dwelling unit. The same HVAC system for conditioning the air in renovated and occupied space is not used.	1 Add'l Pt											
3) The building or dwelling unit is not occupied during the entire construction period and Sections 902.4(1) and 902.4(2) are implemented.	1 Add'l Pt											
902.5 Central vacuum systems. Central vacuum system is installed and vented to the outside.	5											
902.6 Living space contaminants. The living space is sealed to prevent unwanted contaminants.												
(1) Attic access, knee wall door, or drop down stair is caulked, gasketed, or otherwise sealed.	2					2	127					
(2) All penetrations (e.g., top plates, HVAC register boots, recessed can lights, are sealed in the following areas:												
(a) Attic/ceiling	2	2										
(b) Wall	2	2										
(c) Floors	2	2										
<b>903 Moisture Management: Vapor, Rainwater, Plumbing, HVAC</b>												
903.0 Intent. Moisture and moisture effects are controlled.												
903.1 Tile backing materials installed under tiled surfaces in wet areas are in accordance with ASTM C1178, C1278, C1288, or C1325.	0											
<b>Mandatory</b>												
903.2 Capillary break												
903.2.1 A capillary break and vapor retarder are installed at all concrete slabs in accordance to the following:	0											
<b>Mandatory</b>												
1) A minimum 4-inch thick bed of ½ inch diameter or greater clean aggregate, covered with polyethylene or polystyrene sheeting in direct contact with the concrete slab, with the sheeting joints lapped in accordance with Section 903.3. (or)												
2) A minimum 4-inch thick uniform layer of sand, overlain with a layer or strips of geotextile drainage matting, covered with polyethylene sheeting, with the sheeting joints lapped according to Section 903.3.												
Modification for 1&2:												
a. In areas with free-draining soils, identified as Group 1 in the ICC IRC by a certified hydrologist, soil scientist, or engineer through a site visit, a gravel bed or geotextile matting is not required.												
b. In Dry climate locations, as defined by Figure 6(1), polyethylene sheeting is not required unless required for radon resistance (Section 902.3).												
903.2.2 Add a capillary break on footing to prevent moisture migration into foundation wall.	3											
<b>Addition Note:</b> Section 903.2 applies only to the new construction portion of additions.												
<b>Renovation Note:</b> Section 903.2 applies only to renovations that include slab removal and/or replacement.												
<b>0 Add'l Pts</b>												
903.3 Crawlspace												
903.3.1(1) Minimum 6-mil vapor retarder installed on the crawl space floor and extended up the wall sufficient to allow the material to be affixed with glue and furring strips. Joints of vapor retarder overlap a minimum of 6 inches and are taped.	6											
903.3.1(2) Damp-proof walls are provided below finished grade. Joints of vapor retarder overlap a minimum of 6 inches and are taped.	0											
<b>Mandatory</b>												
<b>Renovation Note:</b> Additional Points:												
1) Additional points available for damp proofing below grade walls.	1 Add'l Pt											
2) Additional points available for installing a footing drainage system.	2 Add'l Pts											
903.3.2 Crawlspace that is built as a conditioned area is sealed to prevent outside air infiltration and provided with conditioned air at a rate not less than 0.02 cfm per square foot of horizontal area and one of the following is implemented:												
(1) A concrete slab over lapped 6 mil polyethylene or polystyrene	10											
(2) 6-mil polyethylene sheeting, lapped a minimum of 6 inches and taped at the seams.	8											
<b>Addition Note:</b> Section 903.3.2 applies only to the new construction portion of additions.												
<b>1 Add'l Pt</b>												
<b>Renovation Note:</b> Section 903.3.2 applies only to renovations that include a focused effort to convert an existing vented crawl space into an unvented, conditioned crawl space.												
<b>2 Add'l Pts</b>												
903.4 Moisture control measures.												
903.4.1(1) Building materials with visible mold are not installed or are cleaned or encapsulated prior to concealment and closing.	2											
903.4.1(2) Walls are not enclosed (e.g. with drywall) if the insulation has a high moisture content. Wet insulation products are dry before enclosing.	2											
<b>Mandatory 2 Points</b>												Include site superintendent's provision to test and record moisture in wall cavity prior to hanging drywall.



ANSI National Green Building Standard™	203	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
903.4.1 (3) The moisture content of lumber is sampled to ensure it does not exceed 19 % prior to the surface and/or wall cavity enclosure.	4					4	0					Include in site superintendent's responsibilities
903.4.2 Moisture content of subfloor, substrate, or concrete slabs is in accordance with the appropriate industry standard for the finish flooring to be applied.	2					2	0					Include in the installers scope.
<b>Addition and Renovation Note:</b> Section 903.4.1 (1) and (2) applies to new, reused, and salvaged materials only. It excludes undisturbed existing materials. <b>Addition Note:</b> Section 903.4.2 applies only where new finish flooring is applied.	<b>Mandatory</b>											
<b>Renovation Note:</b> Section 903.4.2 applies only where new finish flooring is applied. Additional points available only for correcting excess moisture levels in an existing subfloor and/or substrate.	<b>2 Add'l Pts</b>											
903.5 Plumbing.												
903.5.1 Plumbing distribution lines are not installed in exterior wall cavities.	2	2										
<b>Addition Note:</b> Section 903.5.1 applies only to the new construction portion of additions.	<b>Mandatory</b>											
<b>Renovation Note:</b> Section 903.5.1 applies only to renovations that include exterior walls and plumbing lines or plumbing lines in unconditioned spaces.	<b>Mandatory</b>											
1) A minimum of 50 percent of exterior wall piping is removed.	<b>3 Add'l Points</b>											
2) A minimum of 50 percent of exterior wall piping is insulated.	<b>2 Add'l Pts</b>											
903.5.2 Cold water pipes in unconditioned spaces are insulated to a minimum of R-4 with pipe insulation or other covering that adequately prevents condensation.	2											
<b>Renovation Note:</b> The entire plumbing system between the connections of the water distribution and/or waste lines and the equipment and fixtures is replaced. This item applies if one or more of the following is implemented:												
1) Plumbing in unconditioned spaces is repaired or replaced.	<b>1 Add'l Pt</b>											
2) Plumbing in unconditioned spaces is improved.	<b>2 Add'l Pts</b>											
903.5.3 Plumbing is not installed in unconditioned spaces.	5							5	0			Install pipes in conditioned space
<b>Renovation Note:</b> The entire plumbing system between the connections of the water distribution and/or waste lines and the equipment and fixtures is replaced. This item applies if one or more of the following conditions exist:	<b>2 Add'l Pts</b>											
1) poor joint connections												
2) thin pipe walls												
3) severely reduced water flow caused by debris buildup												
4) lead or other toxic solders												
5) drain, waste, and vent system is not in accordance with the ICC IPC.												
903.6(1) Duct insulation. All HVAC ducts, plenums, and trunks in unconditioned attics, basements, and crawlspaces are insulated to a minimum of R-6. Outdoor air supplies to ventilation systems are insulated to a minimum of R-6.	0											
<b>Mandatory</b>												
903.6(2) Duct insulation. All HVAC ducts, plenums, and trunks in unconditioned attics, basements, and crawlspaces are insulated to a minimum of R-8. Outdoor air supplies to ventilation systems are insulated to a minimum of R-8.	2											
<b>Addition Note:</b> Section 903.6 applies only to the new construction portion of additions.	<b>Mandatory</b>											
<b>Renovation Note:</b> Section 903.6 applies to renovations as follows:												
1) areas that include replacement or disturbance of HVAC ducts, plenums and trunk	<b>2 Add'l Pts</b>											
2) in areas with specific condensation problems, remove any contaminated ductwork, remove or remediate mold-contaminated elements, and correct existing or add new insulation.	<b>2 Add'l Pts</b>											
3) insulation on the existing HVAC ducts, plenums and trunks is upgraded	<b>3 Add'l Points</b>											
903.7 Relative Humidity. In climate zones 1A, 2A, 3A, 4A, and 5A as defined by Figure 6(1), equipment is installed to maintain relative humidity (RH) at or below 60% using one of the following:	<b>8 Points</b>											
903.9.1 In "Warm-Humid" climates as defined by Figure 6(1) equipment is installed to maintain Relative Humidity (RH) at or below 60% using one of the following:												
(1) Additional dehumidification system(s)										8	374	Stand alone unit with hard drain. Cost should cover a dehumidification controller and multi-speed blower for central unit that is right-sized.
(2) Central HVAC system equipped with additional controls to operate in dehumidification mode.												
904 Innovative Practices												
904.1 A humidity monitoring system is installed with a mobile base unit that displays a reading of temperature and relative humidity at the base unit with a minimum of two remote units. One remote unit that is placed permanently inside the conditioned space in a central location, excluding attachment to exterior walls, and another remote unit is placed permanently outside of the conditioned space.	2							2	72			
904.2 Kitchen exhaust unit(s) that equal or exceeds 400 cfm, and make-up air is provided.	2									2	400	See 902.2.1(2) for make up air.
904.3 <b>Renovation Note:</b> Existing unsealed combustion gas dryer vents related to renovations.												
1) Existing unsealed combustion gas dryer vent is replaced with a sealed exhaust vent.	<b>Mandatory</b>											
2) Existing unsealed combustion gas dryer vent is replaced with a sealed exhaust vent and ducted makeup air is provided.	<b>1</b>											
	<b>2</b>											
<b>CHAPTER 10: OPERATION, MAINT., AND BUILDING OWNER EDUCATION</b>		1	0	8	950	6	94	0	0	0	0	<b>Ch. 10 Subtotal</b>
<b>Base Pts.</b>												
<b>Building Owners' Manual for One- and Two-Family Dwellings</b>												
1001.0 Intent. Information on the building's use, maintenance and green components is provided.												
1001.1 A homeowner's binder is provided that includes the following, as available and applicable:	<b>1 point per 2 items</b>			0	100							Estimated 40 hours staff. O/H removed for separate reporting as one time cost. This reflects staff time to assemble.
<b>(Points awarded for mandatory and non-mandatory items)</b>												

ANSI National Green Building Standard™	203	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(1) A green building program certificate or completion document.	<b>Mandatory</b>			0.5	850							\$200 certification fee and 4 hours of professional time. Included with 1001.1.
(2) List of green building features (can include the national green building checklist).	<b>Mandatory</b>	0.5										
(3) Product manufacturer's manuals or product data sheet for installed major equipment, fixtures and appliances. If product data sheet is in the binder, manufacturer's manual shall be attached to appliance in lieu of inclusion in the binder.		0.5										
(4) Information on local recycling programs.	<b>Mandatory</b>			0.5								
(5) Information about available local utility programs that purchase a portion of energy from renewable energy providers.				0.5								
(6) Explanation of the benefits of using energy efficient lighting systems (e.g., compact fluorescent light bulbs, light emitting diode (LED)) in high usage areas.				0.5								
(7) A list of practices to conserve water and energy.				0.5								
(8) Local public transportation options (if applicable).				0.5								
(9) A diagram showing the location of safety valves and controls for major building systems.				0.5								
(10) Where frost protected shallow foundations are used, notify owner of precautions, including instructions not to remove or damage insulation when modifying landscaping, to provide heat to the home as required by the IRC/IBC, and to keep base materials				0.5								
(11) A list of local service providers that offer regularly scheduled service and maintenance contracts to assure proper performance of equipment and the structure (e.g., HVAC, water heating equipment, sealants, caulks, gutter and downspout system, shovels				0.5								
(12) A photo record of framing with utilities installed. Photos taken prior to installing insulation, clearly labeled, and included as part of the homeowner's binder.				0.5								
(13) Maintenance checklist.				0.5								
(14) List of common hazardous materials often used around the building and instructions for proper handling and disposal of these materials.				0.5								
(15) Information about organic pest control, fertilizers, de-icers, and cleaning products.				0.5								
(16) Information about native landscape materials and/or those that have low-water requirements.				0.5								
(17) Information about methods of maintaining the building's relative humidity in the range of 30-60%.				0.5								
(18) Instructions for inspecting the building for termite infestation.				0.5								
(19) Instructions for maintaining gutters and downspouts and importance of diverting water at least five feet away from foundation.				0.5								
(20) A narrative detailing the importance of maintenance and operation in retaining the attributes of a green-built building.				0.5								
<b>Renovations Note:</b> A building owners' manual that includes the following:	<b>Mandatory</b>											
(1) all mandatory items listed in Section 1001.1												
(2) a minimum of six of the non-mandatory items listed in Section 1001.1												
(3) the EPA publications "Reducing Lead Hazards When Remodeling Your Home" and "Asbestos in Your Home: A Homeowner's Guide"												
<b>Building Operation And Maintenance for One:</b>												
1002.1 Training of building owners. Building owners/occupants are familiarized with the green building goals and strategies implemented and the impacts of the occupants' practices on the costs of operating the building. Training is provided to the responsible party(ies) regarding all equipment operation and control systems. Systems include, but are not limited to, the following:	<b>6</b>					6	94					Walk thru orientation should take about 2 hours and be standard.
(1) HVAC filters.												
(2) Thermostat operation and programming.												
(3) Lighting controls.												
(4) Appliances and settings.												
(5) Water heater settings.												
(6) Fan controls.												
<b>1003 Construction, Operation and Maintenance Manuals and Training for Multi-Unit Buildings</b>												
<b>1003.0 Intent.</b> Manuals are provided to the responsible parties (owner, management, tenant, and/or maintenance team) regarding the construction, operation, and maintenance of the building. Paper or digital format manuals are to include information regarding those aspects of the building's construction, maintenance, and operation that are within the area of responsibilities of the respective recipient. One or more responsible parties are to receive a copy of all documentation for archival purposes.	<b>1</b>											
<b>1003.1 Building construction manual.</b> A building construction manual, including five or more of the following, is compiled and distributed in accordance with Section 1003.0.	<b>Mandatory</b>											
(1)A narrative detailing the importance of constructing a green building, including a list of green building attributes included in the building. This narrative is included in all responsible parties' manuals.	<b>Mandatory</b>											
(2) A local green building program certificate as well as a copy of the National Green Building Standard™, as adopted by the Adopting Entity, and the individual measures achieved by the building.	<b>Mandatory</b>											
(3)Warranty, operation, and maintenance instructions for all equipment, fixtures, appliances, and finishes.	<b>Mandatory</b>											
(4) Record drawings of the building.												
(5) A record drawing of the site including stormwater management plans, utility lines, landscaping with common name and genus/species of plantings.												
(6) A diagram showing the location of safety valves and controls for major building systems.												
(7) A list of the type and wattage of light bulbs installed in light												
(8) A photo record of framing with utilities installed. Photos are taken prior to installing insulation and clearly labeled.												
<b>Addition and Renovation Note:</b> A building construction manual that includes the following:	<b>0</b>											
all mandatory items listed in Section 1003.1												
a minimum of two of the non-mandatory items listed in Section												
<b>1003.2 Operations manual.</b> Operations manuals are created and distributed to the responsible parties in accordance with Section 1003.0. Between all of the operation manuals, five or more of the following options are included.												

ANSI National Green Building Standard™	203	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
<b>(Points awarded per two items. Points awarded for both mandatory and non-mandatory items.)</b>	<b>1</b>											
(1) A narrative detailing the importance of operating and living in a green building. This narrative is included in all responsible parties' manuals.	Mandatory											
(2) A list of practices to conserve water and energy (e.g., turning off lights when not in use, switching the rotation of ceiling fans in changing seasons, purchasing ENERGY STAR appliances and electronics).	Mandatory											
(3) Information on methods of maintaining the building's relative humidity in the range of 30 percent to 60 percent.	Mandatory											
(4) Information on opportunities to purchase renewable energy from local utilities or national green power providers and information on utility and tax incentives for the installation of on-site renewable energy systems.												
(5) Information on local and on-site recycling and hazardous waste disposal programs and, if applicable, building recycling and hazardous waste handling and disposal procedures.												
(6) Local public transportation options.												
(7) Explanation of the benefits of using compact fluorescent light bulbs, LEDs, or other high-efficiency lighting.												
(8) Information on native landscape materials and/or those that have low water requirements.												
(9) Information on the radon mitigation system, where applicable.												
(10) A procedure for educating tenants in rental properties on the proper use, benefits, and maintenance of green building systems including a maintenance staff notification process for improperly functioning equipment.												
<b>Addition and Renovation Note:</b> An operations manual that includes the following:	<b>0</b>											
all mandatory items listed in Section 1003.2												
a minimum of three of the non-mandatory items listed in Section 1003.2												
<b>1003.3 Maintenance manual.</b> Maintenance manuals are created and distributed to the responsible parties in accordance with Section 1003.0. Between all of the maintenance manuals, five or more of the following options are included:	<b>1</b>											
<b>(Points awarded per two items. Points awarded for both mandatory and non-mandatory items.)</b>												
(1) A narrative detailing the importance of maintaining a green building. This narrative is included in all responsible parties' manuals.	Mandatory											
(2) A list of local service providers that offer regularly scheduled service and maintenance contracts to ensure proper performance of equipment and the structure (e.g., HVAC, water-heating equipment, sealants, caulks, gutter and downspout system, shower												
(3) User-friendly maintenance checklist that includes:												
a) HVAC filters												
b) thermostat operation and programming												
c) lighting controls												
d) appliances and settings												
e) water heater settings												
f) fan controls												
(4) List of common hazardous materials often used around the building and instructions for proper handling and disposal of these materials.												
(5) Information on organic pest control, fertilizers, deicers, and cleaning products.												
(6) Instructions for maintaining gutters and downspouts and the												
(7) Instructions for inspecting the building for termite infestation.												
(8) A procedure for rental tenant occupancy turnover that preserves												
(9) An outline of a formal green building training program for												
<b>Addition and Renovation Note:</b> A maintenance manual that includes the following:	<b>0</b>											
all mandatory items listed in Section 1003.3												
a minimum of three of the non-mandatory items listed in Section 1003.3												
<b>1004</b>												
<b>INNOVATIVE PRACTICES</b>												
<b>1004.1 (Reserved)</b>												



# APPENDIX B GREEN SCORING & COST

2 – Climate Zone #3

A. Oakland, California

HUD Green Building Comparison  
two story townhouse, Oakland, California  
ANSI-ICC-700-2008 National Green Building Standard™

Rated 2/23/2010

Lot 35x85 2,975  
House 16 x 37' 1,105 sf  
2-story townhouse  
Density per acre at this lot size 14.7

chapter 5 totals are for whole lot,  
can be divided by 2 units

- 5. Lot Design...
- 6. Resource Efficiency
- 7. Energy Efficiency
- 8. Water Efficiency
- 9. Indoor Env. Quality
- 10. Operation, Maintenance...
- Additional Points
- Total 0

Bronze		Silver		Gold		Emerald		
Required	Actual	Required	Actual	Required	Actual	Required	Actual	
39	110	66	110	93	114	119	150	
45	52	79	80	113	116	146	150	
30	145	60	151	100	159	120	168	
14	18	26	28	41	46	60	61	
36	47	65	79	100	118	140	158	
8	8	10	14	11	14	12	14	
50		100		100		100		
222	380	406	462	558	567	697	701	
Cummulative	Points	Cost	Points	Cost	Points	Cost	Points	Cost
Chapter 5	110	0	110	0	114	0	150	1,670
Chapter 6	52	117	80	436	116	1,014	150	7,619
Chapter 7	145	520	151	520	159	520	168	594
Chapter 8	18	0	28	200	46	400	61	891
Chapter 9	47	0	79	250	118	592	158	1,439
Chapter 10	8	950	14	1,044	14	1,044	14	1,044
Total	380	1,587	462	2,450	567	3,570	701	13,257
Cost per SF (\$)	0.00	1.44		2.22		3.23		12.00

KEY  
Points are Co-Dependant on at least one other cell  
Overhead Cost - Dependant on subdivision size

ANSI National Green Building Standard™	365	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
		Cost/Point	0	#DIV/0!		#DIV/0!		0		46		
<b>CH. 5 LOT DESIGN, PREPARATION, AND DEVELOPMENT</b>	<b>Rating</b>	<b>110</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>0</b>	<b>36</b>	<b>1,670</b>	<b>Ch. 5 Subtotal Base</b>
500.0 Intent. This section applies to lot development for the eventual construction of residential buildings, multi-unit buildings, or additions thereto that contain dwelling units. The buildings on the lot earn their own performance level by complying with the provisions of Sections 303, 304, or 305.5, as applicable.												
501.1 The lot is selected to minimize environmental impact by one or more of the following:												
(1) An infill lot is selected.	4											
(2) A greyfield lot or an EPA-recognized brownfield lot is selected.	5	5	0									Leed ND docs - Brownfield cleanup
(3) Addition and Renovation Note: A renovation or addition project is implemented. (Points awarded for using an existing building and infrastructure.)	5											
501.2 Mass Transportation. A range of mass transportation choices are promoted by one or more of the following:												
(1) A lot is selected within one-half mile of pedestrian access to a mass transit system or within five miles of a mass transit station with provisions for parking.	3	3	0									leed sk-07
(2) Walkways, street crossings, and entrances designed to promote pedestrian activity are provided. New buildings are connected to existing sidewalks and areas of development.	3	3	0									mapquest
(3) A lot is selected within one-half mile of six or more community resources (e.g., recreational facilities (such as pools, tennis courts, basketball courts), parks, grocery store, post office, place of worship, community center, daycare center, bank, school, restaurant, medical/dental office, laundromat/dry cleaner.)	3	3	0									leed sk-07
502 Project Team, Mission Statement, and Goals												
502.1 A knowledgeable team is established and team member roles are identified with respect to green lot design, preparation, and development. The project's green goals and objectives are written into a mission statement.	4	4	0									Leed team already
Lot Design												
503.0 Intent. The lot is designed to avoid detrimental environmental impacts first, minimize any unavoidable impacts, and mitigate for those impacts that do occur. The project is designed to minimize environmental impacts and to protect, restore, and enhance the natural features and environmental quality of the lot. (To be awarded points allocated for design, the intent of the design shall be implemented.)												
503.1 Natural resources are conserved by one or more of the following:												
(1) A natural resources inventory is completed under the direction of a qualified professional.	5											
(2) A plan is implemented to conserve the elements identified by the resource inventory as high priority resources.	6											
(3) Items listed for protection in the resource inventory plan are protected under the direction of a qualified professional.	4											
(4) Basic training in tree or other natural resource protection is provided for onsite supervisor.	4									4	627	8 hour class plus cert
(5) All tree pruning on site is conducted by a Certified Arborist.	2	2	0									Leed ND docs

ANSI National Green Building Standard™	365	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(6) Ongoing maintenance of vegetation during construction is in accordance with TCIA A300.	3	3	0									Leed ND/ bay Friendly Landscape Maintenance Plan is title, reference ANSI A300
Addition and Renovation Note: section 503.1 applies to additions that increase building footprint on the lot; and to renovations that include landscape, hardscape, and outdoor living area. (Additional points awarded for each strategy implemented.)	1 Additional Point											
<b>503.2 Slope disturbance</b> is minimized by one or more of the following: (Points awarded only if there are developable steep slopes on the lot.)												Unknown, no grading plan was provided.
(1) All or a percentage of development on steep slopes is avoided.												
(a) Less than 25%	2											
(b) 25 to 75%	3											
(c) Greater than 75%	4											
(2) Hydrological/soil stability study for steep slopes is completed and used to guide the design of all buildings on the site.	5											
(3) All or a percentage of roads and parking are aligned with natural topography to reduce cut and fill.												
(a) Less than 25%	1											
(b) 25 to 75%	3											
(c) Greater than 75%	5											
(4) Long-term erosion effects are reduced through the design and implementation of terracing, retaining walls, landscaping, and stabilization techniques.	6											
(5) Underground parking uses the natural slope for parking entrances.	4											
Addition and Renovation Note: Section 503.2 applies to additions that increase building footprint on the lot; and to renovations that include landscape, hardscape, and outdoor living area. (Additional points awarded for each strategy implemented.)	2 Additional Points											
<b>503.3 Soil disturbance and erosion</b> are minimized by one or more of the following: (Also see Section 504.3) (Points must be taken here to claim points in 504.1)												
(1) Construction activities are scheduled to minimize length of time that soils are exposed.	5	5	0									swppp - page 3 and page 14
(2) Utilities are installed using one or more alternative means:	5											
(a) tunneling instead of trenching												
(b) use of smaller (low ground pressure) equipment or geomats to spread the weight of construction equipment												
(c) shared utility trenches or easements												
(d) placement of utilities under paved surfaces instead of yards.												
(3) Limits of clearing and grading are demarcated on the plan.	5	5	0									swppp - shows dashed line...
<b>503.4 Storm Water Mgmt.</b> Storm water is managed using one or more of the following low impact development techniques:												
(1) Natural water and drainage features are preserved and used.	6	6	0									very similar hydrology to existing
(2) A storm water management plan is developed and implemented that minimizes concentrated flows and simulates flows found in natural hydrology, e.g., vegetative swales, French drains, wetlands, drywells, and rain gardens.	6	6	0									very similar hydrology to existing
(3) All or a percentage of impervious surfaces are minimized and permeable materials are used for driveways, parking areas, walkways, and patios.												
(a) Less than 25%	1											
(b) 25 to 75%	3											
(c) Greater than 75%	5											
(4) A minimum of 75% of the roof is vegetated (green roof)	3											
<b>503.5 Landscape plan</b> is developed to limit water and energy use while preserving or enhancing the natural environment.												
(1) A plan is formulated to restore or enhance natural vegetation that is cleared during construction. Landscaping is phased to coincide with achievement of final grades to ensure denuded areas are quickly vegetated.	5	5	0									L 1-4 landscape plan
(2) Turf grass species, other vegetation, and trees are selected that are native or regionally appropriate for local growing conditions.	4	4	0									leed ss9, landscape plan L2-7, specs section 02900
(3) A percentage or all turf areas are limited.												
(a) Lot is 0% turf	4											
(b) Greater than 0% to less than 25%	3	3	0									54% impervious total
(c) 25% to less than 50%	2											
(d) 50% to 75%	1											
(4) Plants with similar watering needs are grouped (hydrozoning).	5	5	0									landscape plans L2-4, L1-4, L10-1, planters with similar plants

ANSI National Green Building Standard™	365	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(5) Species and locations for tree planting are identified that will provide summer shading of streets, parking areas, and buildings to moderate temperatures.	5	5	0									L2-4 plans show two large trees on east and west of building
(6) Vegetative wind breaks or channels are designed as appropriate for local conditions.	4									4	360	
(7) Onsite tree trimmings or stump grinding of regionally appropriate trees are used to provide protective mulch during construction and cleared trees are recycled as saw lumber or pulp wood.	3									3	0	
(8) An integrated pest management plan to minimize chemical use in pesticides and fertilizers is developed.	4	4	0									section 02900
<b>503.6 Wildlife habitat.</b> Measures are planned that will support wildlife habitat.	4	4	0									leed ND - protect and maintain wildlife habitat, food, water, shelter and nesting
<b>503.7 Mixed use development</b> is incorporated.	6	6	0									townhouses, apartment, offices....
<b>503.8 Environmentally Sensitive Areas.</b>												
(1) Environmentally Sensitive Areas are avoided.	3	3	0									epa brownfield
(2) Compromised Environmentally Sensitive Areas are mitigated or restored.	3											
<b>503.9 Density.</b> The average density on a net developable area basis is:												
(1) 7 to less than 14 dwelling units per acre (4047 m <sup>2</sup> )	4											
(2) 14 to less than 21 dwelling units per acre	7											
(3) 21 or greater dwelling units per acre	10	10	0									leed nd gct credit...
<b>504 Lot Construction</b>												
<b>504.0 Intent.</b> Environmental impact during construction is avoided to the extent possible; impacts that do occur are minimized, and any significant impacts are mitigated.												
<b>504.1 Onsite supervision and coordination</b> is provided during clearing, grading, trenching, paving, and installation of utilities to ensure that specified green development practices are implemented (Also see Section 503.3.)	4							4	0			standard
<b>504.2 Trees and vegetation.</b> Designated trees and vegetation are preserved by one or more of the following:												
(1) Fencing or equivalent to protect trees and other vegetation is installed.	3									3	184	
(2) Trenching, significant changes in grade, and compaction of soil and critical root zones in "tree save" areas are avoided.	4									4	0	
(3) Damage to designated existing trees and vegetation is mitigated during construction through pruning, root pruning, fertilizing, and watering.	4											
<b>504.3 Soil disturbance and erosion.</b> Onsite soil disturbance and erosion are minimized by one or more of the following: (also see section 503.3)												
(1) Limits of clearing and grading are staked out.	5									5	334	
(2) "No disturbance" zones are created using fencing or flagging to protect vegetation and sensitive areas from construction activity.	5									5	0	
(3) Sediment and erosion controls are installed and maintained in accordance with the storm water pollution prevention plan (SWPPP), where required.	5	5	0									swppp
(4) Topsoil is stockpiled and stabilized for later use to establish landscape plantings.	5									5	25	spec seed and tack 2 times
(5) Soil compaction from construction equipment is reduced by distributing the weight of the equipment over a larger area (laying lightweight geogrids, mulch, chipped wood, plywood, OSB, metal plates, or other materials capable of weight distribution in the pathway of the equipment).	3											
(6) Disturbed areas that are complete or to be left unworked for greater than 21 days are stabilized within 14 days using methods as recommended by the EPA or in the approved storm water pollution prevention plan (SWPPP), where required.	3									3	140	spec seed and tack 2 times
(7) Soil is improved with organic amendments and mulch.	3	3	0									leed nd credit 1.5.3.3.E
(8) Utilities are installed using one or more alternative means such as:												
tunneling instead of trenching, use of smaller equipment, use of low ground pressure equipment, use of geomats, shared utility trenches or easements.	5											
<b>505 INNOVATIVE PRACTICES</b>												
<b>505.0 Intent.</b> Innovative lot design, preparation and development practices are used to enhance environmental performance. Waivers or variances from local development regulations are obtained and innovative zoning practices are used to implement such pract												
505.1 Driveways or parking areas are shared. Waivers or variances from local development regulations are obtained to implement such practices as applicable. In a multi-unit project, parking capacity is not to exceed the local minimum requirements.	4	4	0									leed nd credit 1.3
505.2 Heat Island Mitigation. Any combination of the following strategies are provided for a minimum of 50% of the horizontal surface area of the hardscape:	4	4	0									patio paving is concrete and 2 trees overlapping/shading

ANSI National Green Building Standard™	365	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(1) Shading of hardscaping: Shade from existing or new vegetation is provided (within five years) or from trellises. Shade of hardscaping is to be measured on the summer solstice at noon.												
(2) Light colored hardscaping: Horizontal hardscaping materials are installed with a solar reflectance index of 29 or greater.												
<b>CHAPTER 6: RESOURCE EFFICIENCY</b>	<b>Base Pts.</b>	<b>49</b>	<b>0</b>	<b>3</b>	<b>117</b>	<b>28</b>	<b>320</b>	<b>36</b>	<b>578</b>	<b>34</b>	<b>6,605</b>	<b>Ch. 6 Subtotal</b>
<b>601 Quality of Construction Materials and Waste</b>	<b>Cost/Point</b>		<b>0</b>		<b>39</b>		<b>11</b>		<b>16</b>		<b>194</b>	
<b>601.0 Intent.</b> Design and construction practices that minimize the environmental impact of the building materials are incorporated; environmentally efficient building systems and materials are incorporated; and waste generated during construction is reduced.												
<b>601.1 Conditioned floor area</b> , as defined by ICC IRC calculated in												
(1) Less than or equal to 1,000 square feet	<b>15</b>											
(2) Less than or equal to 1,500 square feet	<b>12</b>	<b>12</b>	<b>0</b>									type D is 1105 sf
(3) Less than or equal to 2,000 square feet	<b>9</b>											
(4) Less than or equal to 2,500 square feet	<b>6</b>											
(5) Greater than 4,000 square feet (373 m <sup>2</sup> )	<b>Mandatory</b>											
<b>For every 100 square feet over 4,000 sf, one point is to be added to Table 303, category 7 for each performance level.</b>												
<b>Multi-Unit Building Note:</b> For a multi-unit building, use a weighted average of the individual unit sizes in qualifying for available points.												
<b>Addition Note: Additions more than 75% of existing building.</b> Section 601.1 does not apply to additions with an area of more than 75% of the area of the existing building or dwelling unit.												
<b>Additions less than or equal to 75% of existing building.</b> Where the addition area is less than or equal to 75 percent of the existing building or dwelling unit area, points are awarded as follows:												
(1) The existing structure is 50% to 75% of total building or dwelling unit area.	<b>1 Add'l Point</b>											
(2) The existing structure is 76% to 99% of total building or dwelling unit area.	<b>3 Add'l Point</b>											
<b>Renovation Note:</b> When renovations increase the total existing building or dwelling unit area by 1 percent or less, points are awarded as follows:												
(a) The total area of the existing building or dwelling unit is less than or equal to 2500 sf.	<b>6 Add'l Points</b>											
(a) The total area of the existing building or dwelling unit is greater than 2500 sf.	<b>1 Add'l Point</b>											
<b>601.2 Material Usage.</b> Building-code-compliant structural systems or advanced framing techniques that optimize material usage are implemented. Points awarded for each system or framing technique implemented.	<b>3 pts per system (9 pts max)</b>											roof truss at 24"
		<b>3</b>	<b>0</b>									
<b>601.3 Building dimensions and layouts are designed to reduce material cuts and waste.</b>												
(1) When used for at least 80% of floor area	<b>3</b>											
(2) When used for at least 80% of wall area	<b>3</b>					<b>3</b>	<b>0</b>					Wall precuts can be used for 1st and 2nd or panelize
(3) When used for at least 80% of roof area	<b>3</b>								<b>3</b>	<b>0</b>		verify roof is simple and waste should be nominal
(4) When used for at least 80% of cladding or siding area	<b>3</b>											
(5) When used for at least 80% of penetrations or trim area	<b>1</b>											
<b>601.4 Detailed framing or structural plans, material quantity lists and onsite cut lists for framing, structural materials, and sheathing materials are provided.</b>	<b>4</b>									<b>4</b>	<b>1,040</b>	Have suppliers prepare use reports with their bid at no charge for joists, wall studs and rafters. Allowed 1 days of professional time to prepare sheathing layouts for prints. O.H.
<b>601.5 Pre-cut or pre-assembled components, or panelized or precast assemblies are utilized for 90% for the following system or building.</b>												
(1) Floor system.	<b>4</b>					<b>4</b>	<b>0</b>					should be precuts specified and shipped
(2) Wall system.	<b>4</b>					<b>4</b>	<b>0</b>					These should have been shipped as precuts or panels
(3) Roof system.	<b>4</b>	<b>4</b>	<b>0</b>									
(4) modular construction for the entire building located above grade.	<b>13</b>											
(5) manufactured home construction for the entire building located above grade.	<b>13</b>											
<b>601.6 Stories above grade</b> are stacked, such as in 1 1/2 and 2 story or greater structures. The area of the upper story shall be at least 50% of the area of the story below, based on areas with a minimum ceiling height of 7 feet.	<b>Max 8 points</b>											
(1) first stacked story	<b>4</b>	<b>4</b>	<b>0</b>									
(2) for each additional story	<b>2</b>											
<b>601.7 Site applied finishing materials.</b> Building materials or assemblies that do not require additional site applied material for finishing are utilized.	<b>Max 12 points</b>											
(1) 90% or more of the installed material or assembly listed below:	<b>5</b>											



ANSI National Green Building Standard™	365	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(2) 50% to less than 90% of the installed building material or assembly listed below:	2											
(a) Pigmented, stamped, decorative, or final finish concrete or masonry.												
(b) Trim not requiring paint or stain.												
(c) Window, skylight, and door assemblies not requiring paint or stain on exterior and/or interior surfaces.						5	0					windows - spec vinyl,
(d) Wall coverings or systems not requiring paint or stain or other type of finishing application.										5	0	spec siding to be pre finished fiber cement, or vinyl (unknown)
601.8 Foundations such as frost-protected shallow foundations, pier and pad foundations, post foundations and other similar foundation types are designed and constructed.	3											
601.9 One or more of the following above grade wall systems that provide sufficient structural and thermal characteristics are used for at least 75% of the gross exterior wall area of the building:	4											
(1) Adobe												
(2) Concrete/Masonry												
(3) Logs												
(4) Rammed earth												
<b>602 Enhanced Durability and Reduced Maintenance</b>												
602.0 Intent. Design and construction practices are implemented that enhance the durability of materials and reduce in-service maintenance.												
602.1 Entries at exterior door assemblies, inclusive of side lights, are covered by one of the following methods below to protect the building from the effects of precipitation and solar radiation. A projection factor of at least 0.375 is provided. Eastern and western facing entries in Climate Zones 1, 2, and 3, as determined in accordance with Figure 6(1), shall have a projection factor of at least 1.0 unless otherwise protected from direct solar radiation by other means (e.g. screen wall, vegetation).	Maximum number of points 5											
(1) Installing a porch roof or awning.												
(2) Extending the roof overhang.												
(3) Recessing the exterior door.												
Main entrance door	3									3	500	design, material and labor for portico
Additional covered door assembly	1									1	500	design, material and labor for portico
602.2 Roof overhangs, based on inches of rainfall in Table 602.2, are provided over at least 90% of exterior walls to protect the building envelope.	4											
Table 602.2												
Minimum Roof Overhang for One- & Two-Story Buildings												
Inches Rainfall*	Eave Overhang (Inches)	Rake Overhang (Inches)										
Less than 20	12	12										
21 to 40	12	12	4	0								
41 to 70	18	12										
More than 70	24	12										
<b>Addition Note:</b> Section 602.2 applies to the new construction portion of additions.	0											
<b>Renovation Note:</b> Section 602.2 applies to renovations that alter the existing roof.	1											
<b>602.3 Foundation Drainage</b>												
602.3.1 Where required by the IRC/IBC for habitable and usable spaces below grade, exterior drain tile is installed.	Mandatory	0	0									Not applicable.
602.3.2 Interior and exterior foundation perimeter drains are installed and sloped to discharge to daylight, dry well, or sump pit.	4											
602.4 Drip edge is installed at eaves and gable roof edges.	3			3	0							pretty standard
602.5 A gutter and downspout system with extensions, or splash blocks and effective grading, are provided to carry water at least 5 feet away from perimeter foundation walls.	4					4	320					32 feet gutter, 2 - 20 feet downspouts w/ extensions or splash blocks
<b>602.6 Finish grade</b> at all sides of building is sloped to provide a minimum of 6 inches of fall within 10 feet of the edge of the building. Where lot lines, walls, slopes or other physical barriers prohibit 6 inches of fall within 10 feet, the final grade	Mandatory			0	0							add to specs
<b>602.7 Termite barrier.</b> Continuous, physical, foundation termite barrier used with or without low toxicity treatment is installed in geographical areas that have subterranean termite infestation potential determined in accordance with Figure 6(3).	4									4	348	
602.8 Termite-resistant materials are used as follows:												
(1) In areas of slight to moderate termite infestation probability (as defined by Figure 6(3)) for the foundation, all structural walls, floors, concealed roof spaces not accessible for inspection, exterior decks, and exterior claddings within the first 2 feet above the top of the foundation.	2											

ANSI National Green Building Standard™	365	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(2) In areas of moderate to heavy termite infestation probability (as defined by Figure 6(3)) for the foundation, all structural walls, floors, concealed roof spaces not accessible for inspection, exterior decks, and exterior claddings within the first 3 feet above the top of the foundation.	4											
(3) In areas of very heavy termite infestation probability (as defined by Figure 6(3)) for the foundation, all structural walls, floors, concealed roof spaces not accessible for inspection, exterior decks, and exterior claddings.	6									6	3500	1 deck plus all walls to be converted to termite resistant
602.9 Where required by the IRC/IBC, a water-resistive barrier and/or drainage plane system is installed behind exterior veneer and/or siding.	Mandatory			0	117							very standard
602.10 In areas where there has been a history of ice forming along the eaves causing a backup of water, an ice barrier is installed at roof eaves and is extended at least 24" inside the exterior wall line of the building, in accordance with the IRC/IBC.	Mandatory			0	0							very standard
602.11 Enhanced foundation waterproofing is installed:	4											
(1) Rubberized coating, or												
(2) Drainage mat.												
602.12 Flashing details are shown on plans and flashing is installed at all of the following locations, as applicable:	6							6	520			architect 4 hours
(1) Around exterior fenestrations, skylights and doors.												
(2) Roof valleys.												
(3) Deck/balcony to building intersections.												
(4) At roof-to-wall intersection and at roof-to-chimney intersections.												
(5) A drip cap is provided above windows and doors that are not flashed or protected by covering per Section 602.1.												
602.13 Roof Surfaces. A minimum of 90% of roof surfaces are constructed of one or both of the following:	3											
(1) Products which meet the requirements of the ENERGY STAR® cool roof certification or equivalent.												
(2) A green (landscaped) roof system.												
602.14 Recycling. Occupant recycling is facilitated by one or more of the following methods:												
(1) A built-in collection space in each kitchen and an aggregation/pick-up space in a garage, covered outdoor space or other area for recycling containers.	3							3	58			Include an under cabinet recycling container and back porch bin.
(2) Compost facility provided on-site.	3									3	72	
<b>603 Reused or Salvaged Materials</b>												
603.0 Intent. Practices that reuse or modify existing structures, salvage materials for other uses, or use salvaged materials in building's construction are implemented.												
603.1 Existing buildings and structures are reused, modified or deconstructed in lieu of demolition. (One point awarded for every 200 sq. ft., 18.5m2, of floor area.)	1 (Max 12 points)											
603.2 Reclaimed and/or salvaged materials and components are used. Total material and labor cost of salvaged materials shall equal or exceed 1% of total construction costs.	3											
603.3 Scrap Materials. Facilitation for sorting and reuse of scrap building material (e.g. provide a central storage area or dedicated bins.)	4											
<b>604 Recycled-Content Building Materials</b>												
604.1 Building materials with recycled content are used for at least two minor and/or two major components of the building. (NOTE: Does not specify PConsumer. Implication is that max. allowable is 4 materials. 9 points is max. in scoring tool. Have to use highest % to receive max pts.)	Points per Table 604.1											
Table 604.1												
Recycled Content												
Material Percentage Recycled Content	Per 2 Minor	Per 2 Major										
25% - 50%	1	2										
50% - 75%	2	4										
75%	3	6						9	0			Fibercement siding & aggregate at construction entrance for minors. Gypsum board and cellulose insulation. Note: specify correct gypsum board.
<b>605.0 Intent. Waste generated during construction is recycled.</b>												
Note: All waste classified as hazardous shall be properly handled and disposed. (Points not awarded for hazardous waste removal.)												
605.1 A Construction Waste Management Plan is developed, implemented, and posted at the jobsite with a goal of recycling or salvaging a minimum of 50% (by weight) of construction and land-clearing waste.	6	0										section 017419 divert 88% by weight or volume
605.2 Onsite recycling measures following applicable regulations and codes are implemented, such as the following:	7	0										section 017419 divert 88% by weight or volume
(a) Materials are ground or otherwise safely applied onsite as soil amendment or fill. At least 50% (by weight) of construction and land-clearing waste shall be diverted from landfill.												

ANSI National Green Building Standard™	365	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(b) Other methods approved by the NAHB Research Center (the Adopting Entity).												
605.3 Recycled Construction materials: Construction materials (e.g., wood, cardboard, metals, drywall, plastic, asphalt roofing shingles, or concrete) are recycled offsite.	<b>Max 6</b>											
(1) A minimum of two types of materials are recycled.	<b>3</b>	<b>3</b>	<b>0</b>									section 017419 - asphalt, concrete, wood, metals, shingles, gypsum....
(2) For each additional recycled material.	<b>1</b>	<b>3</b>	<b>0</b>									
<b>606 Renewable Materials</b>												
<b>606.0 Intent.</b> Building materials derived from renewable resources are used.												
606.1 The following biobased products are used. (Note: 606.1 and 606.2 denote % of project mat'l cost req'd.)	<b>Max 8</b>											
(a) certified solid wood in accordance with Section 606.2												
(b) engineered wood												
(c) bamboo												
(d) cotton												
(e) cork												
(f) straw												
(g) natural fiber products made from crops (soy or corn-based)												
(h) products with the minimum biobased contents of the USDA 7 CFR Part 2902												
(i) other biobased materials with a minimum of 50 percent biobased content (by weight or volume).												
606.1(1) At least two types of biobased materials are used, each for more than .5% of the project's projected building material cost. <b>Combined 8 pts Max</b>	<b>3</b>					<b>2</b>	<b>0</b>					Wood cabinets and wood trim
606.1(2) At least two types of biobased materials are used, each for more than 1% of the project's projected building material cost.	<b>6</b>					<b>6</b>	<b>0</b>					engineered wood, osb walls, lvl beams
606.1(3) For each additional biobased material used for more than 5% of the project's projected building material cost.	<b>1 (2 pts max)</b>											
<b>606.2 Wood-based products</b> are certified to the requirements of one of the following recognized product programs:												
(a) AFF American Tree Farm System®												
(b) Canadian Standards Association's Sustainable Forest Management System Standards (CAN/CSA Z809)												
(c) Forest Stewardship Council (FSC)												
(d) Program for Endorsement of Forest Certification Systems (PEFC)												
(e) Sustainable Forestry Initiative Program (SFI)												
(6) Other product programs mutually recognized by PEFC												
606.2(1) Where a minimum of two certified wood-based products are used for minor elements of the building, such as all trim, cabinetry, or millwork.	<b>3</b>									<b>3</b>	<b>420</b>	Specify Masonite doors for FSC certified. Estimated added cost of \$35/door. And kitchen cabinets at no cost.
606.2(2) Where a minimum of two certified wood-based products are used in major elements of the building, such as walls, floors, or roof.	<b>4</b>											
<b>606.3 Manufacturing Energy.</b> Materials are used for major components of the building that are manufactured using a minimum of 33% of the primary manufacturing process energy derived from renewable sources, combustible waste sources, or renewable energy credits (RECs). (2 points awarded per material.)	<b>6 pts. max.</b>							<b>2</b>	<b>0</b>	<b>2</b>	<b>225</b>	Specify that OSB comes from a mill that complies. Identify another material that complies; allowed for added cost.
<b>607 Resource-Efficient Materials</b>												
607.1 Products containing fewer materials are used to achieve the same end-use requirements as conventional products, including but not limited to: (3 points awarded for each material.)	<b>Max 9 points</b>											
(1) Lighter, thinner brick with bed depth less than 3 inches, brick with coring above 25%, or both.												
(2) Engineered wood or engineered steel products.								<b>6</b>	<b>0</b>			Engineered wood - OSB floor and roof and LVL
(3) Roof or floor trusses.		<b>3</b>	<b>0</b>									roof truss
<b>608 Indigenous Materials</b>												
608.1 Indigenous materials are used for major elements of the building.	<b>10 points max.</b>											
(1) one type of material.	<b>2</b>							<b>2</b>	<b>0</b>			Use indigenous stone for driveway base.
(2) For each additional material.	<b>2</b>							<b>8</b>	<b>0</b>			Specify OSB from local mill. Deck lumber, windows and siding locally sourced.
<b>609 Life Cycle Analysis</b>												

ANSI National Green Building Standard™		365	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
			Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
609.1 A more environmentally preferable product or assembly for an application based upon the use of a Life Cycle Assessment (LCA) tool compliant with ISO 14044 or other recognized standards that compare the environmental impact of building materials, as													
		Max 15 points											
(1) Per product/system comparison		3											
(2) Whole building LCA analysis		15											
<b>610 Innovative Practices</b>													
<b>610.1 Manufacturer's environmental management system concepts.</b> Product manufacturer's operations and business practices include environmental management system concepts and the production facility is ISO 14001 certified or equivalent. The aggregate value of building products from ISO 14001 certified or equivalent production facilities is at least 1% or more of the estimated total building materials cost. (1 point awarded for every percent.)		Max 10 points											
<b>CHAPTER 7: ENERGY EFFICIENCY</b>		Base Pts.	145	0	0	520	6	0	8	0	9	74	Ch. 7 Subtotal
701.1 Mandatory requirements. The building shall comply with either Section 702 (Performance Path) or Section 703 (Prescriptive Path). Items listed as "Mandatory" in Section 701.4 apply to both the Performance and Prescriptive Paths.		Cost per point	0		#DIV/0!			0		0		8	
<b>701.1.1 Minimum Performance Path Requirements.</b> A building complying with Section 702 shall exceed the baseline minimum performance required by the IECC by 15%, and shall include a minimum of two practices from Section 704.													Performance path selected at all levels.
<b>701.1.2 Minimum Prescriptive Path Requirements.</b> A building complying with section 703 shall obtain a minimum of 30 points from Section 703, and shall include a minimum of two practices from Section 704.													
<b>701.1.3 Alternative Bronze Level Compliance.</b> As an alternative, any building that qualifies as an ENERGY STAR qualified home or equivalent achieves the Bronze Level for Chapter 7.													
<b>701.2 Emerald Level Points.</b> The Performance Path shall be used to achieve to the Emerald Level.													Performance path selected at all levels.
<b>Mandatory Practices</b>													
701.3 A review by the Adopting Entity or designated third party shall be conducted to verify design and compliance with Chapter 7.		Mandatory	0	0									Done by leed
<b>701.4.1 HVAC SYSTEMS</b>													
701.4.1.1 Space heating and cooling system/equipment shall be sized according to heating and cooling loads calculated using ACCA Manual J or equivalent.		Mandatory			0	0							2006 IECC requirement.
701.4.1.2 Where installed, as a primary heat source in the building, radiant or hydronic space heating system is designed using industry-approved guidelines (e.g. ACCA Manual J, GAMA H-22, or an accredited design professional's and manufacturer's recommen		Mandatory			0	520							4 hours by professional to verify system
<b>701.4.2 DUCT SYSTEM</b>													
701.4.2.1 Ducts are sealed with tape complying with UL 181, mastic, gaskets, or an approved system as required by the ICC IRC (Section M1601.3.1, or ICC IMC Section 603.9) to reduce leakage.		Mandatory	0	0									do not apply
701.4.2.2 Building cavities are not used as supply ducts.		Mandatory	0	0									do not apply
<b>701.4.3 INSULATION and AIR SEALING</b>													
701.4.3.1 GENERAL Insulation and air sealing is in accordance with the following:													
(1) Insulation shall be installed in accordance with the manufacturer's instructions or local code, as applicable.		Mandatory			0	0							
(2) Shafts (duct shaft, piping shaft/penetrations, flue shaft.) Openings to unconditioned space are fully sealed with solid blocking or flashing and any remaining gaps are sealed with caulk or foam. Fire-rated collars and caulking are installed where re		Mandatory	0	0									do not apply
<b>701.4.3.2 FLOOR / FOUNDATION / CRAWLSPACE</b>													
(1) Floors (Including insulated floors above garages and cantilevered floors)		Mandatory	0	0									do not apply
(a) Insulation is installed to maintain permanent contact with the underside of the subfloor decking, enveloping any attached ductwork within the thermal envelope without compression or air gaps in the insulation. This practice does not apply to ducts or other mechanical equipment that are adjacent to the underside of the subfloor.													
(b) Batt and loose-fill insulation is held in place by permanent attachments or systems in accordance with the manufacturer's instructions.													
(2) Crawlspace. Where insulated, crawlspace wall insulation is permanently attached to the walls. Exposed earth in unvented crawlspaces is covered with continuous vapor retarder with overlapping joints taped or masticed.		Mandatory	0	0									do not apply
<b>701.4.3.3 WALLS</b>													
(1) Windows and Doors. Caulking, gasketing, adhesive flashing tape, foam sealant, or weatherstripping is installed forming a complete air barrier.		Mandatory			0	0							
(2) Band Joist and Rim Joists. Band and rim joists are insulated and air sealed.		Mandatory			0	0							

ANSI National Green Building Standard™	365	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
<b>(3) Between Foundation and Sill Plate Bottom Plate</b>	<b>Mandatory</b>			<b>0</b>	<b>0</b>							
(a) Sill sealer, or other material that will expand and contract, shall be installed between foundation and sill plate.												
(b) Caulk or the equivalent is installed to seal the bottom plate of exterior walls.												
<b>(4) Skylights and kneewalls.</b> Skylight shafts and knee walls are insulated to the same level as the exterior walls.	<b>Mandatory</b>	<b>0</b>	<b>0</b>									do not apply
<b>(5) Exterior Architectural features.</b> Code required building envelope insulation and air sealing is not disrupted at exterior architectural features such as stairs and decks.	<b>Mandatory</b>			<b>0</b>	<b>0</b>							
<b>701.4.3.4 CEILINGS AND ATTICS</b>												
<b>(1) Attic access (except unvented attics).</b> Attic access, knee wall door, or drop down stair is covered with insulation and gasketed. Knee wall door is insulated unit or is covered with insulation.	<b>Mandatory</b>			<b>0</b>	<b>0</b>							
<b>(2) Recessed Lighting.</b> Recessed light fixtures that penetrate the thermal envelope are airtight, IC rated, and sealed with gasket, caulk, or foam.	<b>Mandatory</b>	<b>0</b>	<b>0</b>									do not apply
<b>Renovation Note:</b> Replace existing recessed lights that penetrate the thermal envelope with airtight, IC-rated recessed light fixtures that are sealed to drywall with gasket, caulk, or foam. <b>(Additional point per fixture)</b>	<b>1 Add'l Pt</b>											
<b>(3) Eave vents.</b> Where ceiling/attic assemblies or designs have eave vents, baffles, or other means shall be utilized to minimize air movement into or under the insulation.	<b>Mandatory</b>			<b>0</b>	<b>0</b>							
<b>Renovation Note:</b> Provide blocking or baffle at eaves to ensure ventilation over attic insulation.	<b>2 Add'l Pts</b>											
<b>701.4.4 FENESTRATION</b>												
701.4.4.1 The NFRC-certified U-factor and SHGC windows, exterior doors, skylights, and tubular daylighting devices (TDDs) are in accordance with ENERGY STAR, or equivalent, or Table 701.4.4.1. Decorative fenestration elements with a maximum area of 15 sq	<b>Mandatory</b>											
<b>Table 701.4.4.1</b>												
Fenestration Specifications												
Climate Zones	U-Factor	SHGC										
	Windows and Exterior Doors (maximum certified ratings)											
1 and 2	0.65	0.4										
3	0.4	0.4			<b>0</b>	<b>0</b>						
4 to 8	0.35	Any										
	Skylights and TDDs (max. certified ratings)											
1 to 3	0.75	0.4										
4 to 8	0.6	Any										
<b>702 Performance Path</b>												
702.1 Points from Section 702 (Performance Path) shall not be combined with points from Section 703 (Prescriptive Path).	<b>Mandatory</b>											Performance path.
702.2 Energy efficiency features are implemented to achieve energy cost performance that exceeds ICC IECC by the following. A documented analysis using software in accordance with ICC IECC, Section 404, or ICC IECC Section 506.2 through 506.5, applied a												
(1) 15%	30											
(2) 30%	60											
(3) 50%	100											
(4) 60%	120	<b>120</b>	<b>0</b>									energy gauge eRatio of 0.55 or 45% base, but with solar DHW 0.36 or 64%
<b>703 Prescriptive Path</b>												
<b>704 Additional Practices</b>												
<b>704.1 Application of Additional Practice Points.</b> Points from Section 704 can be added to points earned in Section 702 (Performance Path), Section 703 (Prescriptive Path) or Section 701.1.3 (alternative Bronze Level compliance).												
<b>704.2 Lighting and Appliances</b>												
704.2.1 Hard-wired lighting meets one of the following:												
(1) A minimum of 50% of the total hard-wired lighting fixtures, or the bulbs in those fixtures, qualify as ENERGY STAR or equivalent.	<b>4</b>											
(2) A minimum of 50% of the total hard-wired lighting fixtures qualify as ENERGY STAR or equivalent.	<b>8</b>	<b>8</b>	<b>0</b>									section 260650-11 - fixtures are e*
(3) A minimum of 80% of the exterior lighting wattage has an efficiency of at least 40 lumens per watt or be a solar powered light fixture.												

ANSI National Green Building Standard™		365	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
			Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
704.2.2 The number of recessed light fixtures that penetrate the thermal envelope are less than 1 per 400 square feet of total conditioned floor area and are in accordance with Section 701.4.3.4(2).		2	2	0									no recess
704.2.3 Occupancy sensors are installed on indoor lights, and photo or motion sensors are installed on outdoor lights to control lighting.													
(1) 25% of lighting		2											
(2) 50% of lighting		4											
704.2.4 Tubular daylighting device (TDD) or a skylight with sealed, insulated, low-E glass is installed in rooms without windows. (Points awarded per building.)		2											
704.2.5 ENERGY STAR or equivalent appliance(s) are installed:													
(1) Refrigerator		5									5	0	cost neutral
(2) Dishwasher		2					2	0					see chapter 8
(3) Washing machine		4					4	0					see chapter 8
704.2.6 Induction cooktop is installed.		1											
704.2.7 Occupancy sensors are installed for a minimum of 80% of hardwired lighting outlets.		1											
<b>704.3 Renewable Energy/Solar Heating and Cooling</b>													
<b>704.3.1 Solar space heating and cooling.</b>													
704.3.1.1 Sun-tempered Design: Building orientation, sizing of glazing, and design of overhangs are in accordance with all of the following:		5											
(1) The long side (or one side if of equal length) of the building faces within 20° of true south.													
(2) Vertical glazing area is between 5% and 7% of gross Conditioned Floor Area on the south face (also see Section 704.3.1.1(8)).													
(3) Vertical glazing area is less than 2% of gross Conditioned Floor Area on the west face, and glazing is ENERGY STAR compliant or equivalent.													
(4) Vertical glazing area is less than 4% of gross Conditioned Floor Area on the east face and glazing is ENERGY STAR compliant or equivalent.													
(5) Vertical glazing area is less than 8% of gross Conditioned Floor Area on the north face, and glazing is ENERGY STAR compliant or equivalent.													
(6) Skylights, where installed, are in accordance with the following:													
(a) Shades and insulated wells are used and all glazing is ENERGY STAR compliant or equivalent.													
(b) Horizontal skylights are less than 0.5 % of Finished Ceiling Area													
(c) Sloped skylights on slopes facing within 45° of true South, East or West are less than 1.5% of the Finished Ceiling area													
(7) Overhangs or adjustable canopies or awnings or trellises provide shading on south facing glass for the appropriate climate zone in accordance with Table 704.3.1.1:													
<b>Table 704.3.1.1 Southern Window Overhang Depth</b>													
Climate Zone and Overhang Depth													
1 through 3	2' 8"	≤7' 4"											
1 through 3	2' 8"	≤6' 4"											
1 through 3	2' 4"	≤5' 4"											
1 through 3	2' 0"	≤4' 4"											
1 through 3	2' 0"	≤3' 4"											
4 through 6	2' 4"	≤7' 4"											
4 through 6	2' 4"	≤6' 4"											
4 through 6	2' 0"	≤5' 4"											
4 through 6	2' 0"	≤4' 4"											
4 through 6	1' 8"	≤3' 4"											
7 and 8	2' 0"	≤7' 4"											
7 and 8	1' 8"	≤6' 4"											
7 and 8	1' 8"	≤5' 4"											
7 and 8	1' 4"	≤4' 4"											
7 and 8	1' 0"	≤3' 4"											
(8) The south face windows have a SHGC of 0.40 or higher.													
(9) Return air or transfer grilles/ducts are in accordance with Section 704.4.5.													
704.3.1.2 Automated solar protection is installed to provide shading for windows.		1											
704.3.1.3 Passive cooling design features are in accordance with three or more of the following:													
Points for three items:		3											
Points for one additional item:		1											

ANSI National Green Building Standard™	365	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(1) Exterior shading is provided on east and west windows using one or a combination of the following strategies:												
(a) Vine covered trellises with the vegetation separated a minimum of 1 foot from face of building.												
(b) Moveable awnings or louvers												
(c) Covered porches												
(d) Attached or detached conditioned/unconditioned enclosed space that provides full shade of east and west windows (e.g., detached garage, shed or building)												
(2) Overhangs are installed to provide shading on south-facing glazing in accordance with Section 704.3.1.1(7). (Points not awarded if points are taken under 704.3.1.1.)												
(3) Windows and/or venting skylights are located to facilitate cross ventilation.												
(4) Solar reflective roof or radiant barrier is installed in Climate Zones 1, 2 or 3 and roof material meets a 3 year aged criteria of 0.50.												
(5) Internal exposed thermal mass is a minimum of three inches in thickness. Thermal mass consists of concrete, brick, and/or tile that are fully adhered to a masonry base or other masonry material and is in accordance with one or a combination of the fo												
(a) A minimum of one square foot of exposed thermal mass of floor per three square feet of gross finished floor area.												
(b) A minimum of three square feet of exposed thermal mass in interior walls or elements per square foot of gross finished floor area.												
(6) Roofing material is installed with a minimum 0.75 inch continuous air space offset from the roof deck from eave to ridge.												
704.3.1.4 Passive solar heating design. In addition to the sun-tempered design features in Section 704.3.1.1, all of the following are implemented:	4											
(1) Additional glazing, no greater than 12%, is permitted on the south wall. This additional glazing is in accordance with the requirements in Section 704.3.1.1.												
(2) Additional thermal mass for any room with south-facing glazing of more than 7% of the finished floor area is provided in accordance with the following:												
(a) Thermal mass is solid and a minimum of 3" in thickness. Where two thermal mass materials are layered together (e.g. ceramic tile on concrete base) to achieve the appropriate thickness, they are fully adhered to (touching) each other.												
(b) Thermal mass directly exposed to sunlight must be provided in the following minimum ratios:												
(i) Above latitude 35°: 5 square feet of thermal mass for every 1 square foot of south facing glazing.												
(ii) Latitude 30° to 35°: 5.5 square feet of thermal mass for every 1 square foot of south facing glazing.												
(iii) Latitude 25° to 30°: 6 square feet of thermal mass for every 1 square foot of south facing glazing.												
(c) Thermal mass not directly exposed to sunlight is permitted to be used to achieve thermal mass requirements of Section 704.3.1.4 (2) based on a ratio of 40 square feet of thermal mass for every 1 square foot of south facing glazing.												
(3) In addition to return air or transfer grilles/ducts required by Section 704.3.1.1, provisions for forced airflow to adjoining areas are implemented as needed.												
704.3.2 Solar water heating												
704.3.2.1 Solar water heater. SRCC (Solar Rating & Certification Corporation) OG 300 rated, or equivalent, solar domestic water heating system is installed. Solar Energy Factor (SEF as defined by SRCC) is in accordance with Table 704.3.2.1.												
<b>Table 704.3.2.1 - Solar Hot Water Systems</b>												
SEF - Electric Tank	SEF - Gas Tank	<b>POINTS</b>										
1.30 - 1.50	0.85 - 1.00	8						8	0			installed at base w/ no specs...need min.
1.51 - 1.80	1.01 - 1.20	11										
1.81 - 2.30	1.21 - 1.50	14										
2.31 - 3.00	1.51 - 2.00	17										
3.01	2.01	20										
<b>704.3.3 Additional renewable energy options</b>												
704.3.3.1 Photovoltaic panels are installed on the property. (Points awarded per every 100 watts DC of the rated PV system)		1										
704.3.3.2 Other onsite renewable energy source is installed (e.g., wind energy, onsite micro-hydro power, active solar space heating systems). (Points awarded per every 1/10 kW of the system)		0.5										

ANSI National Green Building Standard™	365	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
<b>704.4 Ducts</b>												
704.4.1 Duct system is sized, designed, and installed according to ACCA Manual D or equivalent.	5											
704.4.2 Space heating is provided by a system that does not include air ducts.	15	15	0									
704.4.3 Space cooling is provided by a system that does not include air ducts.	15											
704.4.4 Ductwork is in accordance with all of the following:	12											
(1) Building cavities are not used as return ductwork.												
(2) Heating and cooling ducts and mechanical equipment are installed within the conditioned building space .												
(3) Ductwork is not installed in exterior walls												
704.4.5 Return ducts or transfer grilles are installed in every room with a door. This practice does not apply to bathrooms, kitchens, closets, pantries, and laundry rooms.	5											
<b>704.5 HVAC Design and Installation</b>												
704.5.1 ACCA Manual S or equivalent is used to select heating and/or cooling equipment.	1											
704.5.2 HVAC contractor and service technician are certified by a nationally or regionally recognized program such as North American Technician Excellence, Inc. (NATE), Building Performance Institute (BPI), Radiant Panel Association, or manufacturers' tr	1									1	0	Standard.
704.5.3 Performance of the heating/cooling system is verified by the HVAC contractor in accordance with all of the following:	3									3	0	Specify in scope.
(1) Start-up procedure is performed according to manufacturer's instructions.												Standard.
(2) Refrigerant charge is verified by super-heat and/or sub-cooling method.												Standard.
(3) Burner is set to fire at nameplate input.												
(4) Air handler setting/fan speed is set per manufacturer's instructions.												
(5) Total air flow is within 10% of design flow.												
(6) Total external system static does not exceed equipment capability at rated airflow.												74 Allow team of 2 - 1 hours at field rate.
704.5.4 HVAC equipment operates using an alternate refrigerant containing no HCFCs. (Points awarded only until January 20, 2010.)	1											
704.5.5 Manufacturer's label or printed specifications for sealed air handler (except furnaces) indicates the leakage is less than or equal to 2% of design airflow at a pressure of 1-inch w.g. (1250 Pa). Air handlers are tested with inlets, outlets, an	4											
<b>704.6 Installation and Performance Verification</b>												
704.6.1 Third party onsite inspection is conducted to verify conformance with all of the following, as applicable. Minimum of 2 inspections are performed. One inspection after insulation is installed and prior to being covered, and another inspection upon completion of the project. Where multiple building or dwelling units of the same model are built by the same builder, a representative sample inspection of a minimum of 15% of the buildings or dwelling units is permitted.	5											
(1) Ducts are installed per IRC/IMC and ducts are sealed.												
(2) Building envelope air sealing is installed.												
(3) Insulation is installed in accordance with Section 703.1.2												
(4) Windows, skylights, and doors are flashed, caulked, and sealed in accordance with manufacturer's recommendations and in accordance with Section 703.2.1.												
704.6.2 Third party testing is conducted to verify performance.												
704.6.2.1 Building envelope leakage rate is demonstrated by blower door test. In addition to the test, the following practices are required:												
1. Whole building ventilation is provided in accordance with Section 902.2.												
2. Fossil fuel furnace and water heater is sealed combustion or power vented in accordance with Section 901.1.												
3. Fireplaces and Fuel Burning Appliances are in accordance with 901.2.												
<b>The maximum leakage rate is in accordance with:</b>												
(a) 5 ACH50	0.25 nat	3										
(b) 4 ACH50	0.2	6										
(c) 3 ACH50	0.15	9										
(d) 2 ACH50	0.1	12										
(e) 1 ACH50	0.05	15										



ANSI National Green Building Standard™	365	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
704.6.2.2 The entire central HVAC duct system, including air handlers and register boots, is tested for leakage at a pressure differential of 0.1 inches w.g. (25 Pa). The maximum leakage as a percent of the system design flow rate is in accordance with												
(1) 6% for ductwork entirely outside the building's thermal envelope.	15											
(2) 6% for ductwork entirely inside the building's thermal envelope.	5											
(3) 6% for ductwork both inside and outside the building thermal envelope.	15											
704.6.2.3 Balanced HVAC air flows are demonstrated by flow hood or other acceptable flow measurement tool. Test results in accordance with both of the following:	8											
(a) Measured flow at each supply and return register is within 25% of design flow.												
(b) Total airflow is within 10% of design flow.												
<b>705 Innovative Practices</b>												
<b>705.1 Energy consumption control.</b> A whole building or whole dwelling unit device is installed that controls or monitors energy consumption.	<b>7 Points Max</b>											
(1) Programmable communicating thermostat	2											
(2) Energy monitoring device	4											
(3) Energy management control system	7											
<b>705.2 Renewable energy service plan is as follows:</b>												
(1) Builder selects a renewable energy service plan provided by the local electrical utility for interim (temporary) electric service. The builder's local administrative office has renewable energy service.	2											
(2) The buyer of the home selects a renewable energy service plan provided by the utility prior to occupancy of the home.	5											
<b>CHAPTER 8: WATER EFFICIENCY</b>	<b>Base Pts.</b>	<b>18</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>10</b>	<b>200</b>	<b>18</b>	<b>200</b>	<b>15</b>	<b>491</b>	<b>Ch. 8 Subtotal</b>
<b>801 Indoor and Outdoor Water Use</b>	<b>Cost/Point</b>	<b>0</b>		<b>#DIV/0!</b>		<b>20</b>					<b>33</b>	
801.0 Intent. Measures that reduce indoor and outdoor water usage are implemented.												
801.1. Indoor hot water usage is reduced by one of the following practices:												
(1) All hot water piping which runs to the plumbing fixtures in both the kitchen and bathrooms is 40-feet or less in length from the water heater and is sized in accordance with the code for the specified application.	2											
(2) All hot water piping which runs to the plumbing fixtures in both the kitchen and bathrooms is 30-feet or less from the water heater and is sized in accordance with the code for the specified application.	3											
(3) One of the following piping system designs is implemented:												
(a) Use of structured-type plumbing with demand controlled hot water loops, in which the volume of water contained in the pipe and fixture fittings downstream of the recirculating trunk line is a maximum of 4 cups (0.25 gallons).	6											
(b) Implement an engineered parallel piping system (i.e. manifold system) in which the hot water line distance from the water heater to the parallel piping system is less than 15 feet and the parallel piping to the fixture fittings contains a maximum of 8	6											
(c) Central core plumbing system with all plumbing fixture fittings (e.g., faucets & showerheads) located such that the volume of water contained in each pipe run between the water heater and fixture fitting is a maximum of 6 cups (0.38 gallons).	8											
(4) Pipe runs exceeding 40-feet from the water heater to fixture locations are aided by one of the following:	1											
(a) Tankless water heater is installed at point of use and is served only by cold water or a solar-assisted system.												
(b) On demand hot water recirculation system is installed.												
801.2 Energy Star® or equivalent water-conserving appliances are installed												
(1) Dishwasher	2					2	0					
(2) Washing machine	8					8	200			(8)	(200)	
(3) Washing machine with a water factor of 6.0 or less	12									12	500	
801.3 A minimum of one food waste disposer is installed at the primary kitchen sink.	1	1	0									section 220000 ...in-sink-erator...
<b>801.4 Showerheads</b>												
<b>801.4 (1&amp;2) 1) The total showerhead flow rate at any point in time, for all showerheads in each shower compartment is less than 2.5 gpm, tested at 80 psi per ASME A112.18.1/CSA B125.1. 2) In addition the showerheads must be equipped with an automatic com</b>	<b>1 Point (3 Points Max)</b>											section 220000 - shower head 1.6 gpm maximum flow
<b>801.4 (3&amp;4) All shower compartments in the home comply with 801.4 (1&amp;2).</b>		1	0									
<b>(3) All shower compartments installed meet the above conditions and are 2.0 to less than 2.5 gpm.</b>	<b>1 Add'l Pt</b>											

ANSI National Green Building Standard™	365	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(4) All shower compartments installed meet the above conditions and are 1.6 to less than 2.0 gpm.	2 Add'l Pts	2	0									section 220000 - shower head 1.6 gpm maximum flow
<b>801.5 Faucets</b>												
801.5.1 Water-efficient lavatory faucets with 1.5 gpm or less maximum flow rate when tested at 60 psi in accordance with ASME A112.18.1 are installed.												
(1) a bathroom (Points awarded for each bathroom.)	3 Pts Max	2	0									section 220000 - 1.5 gpm maximum flow
(2) all lavatory faucets in the home meet the conditions of 801.5.1	2 Add'l Pts	2	0									section 220000 - 1.5 gpm maximum flow
(1) Gold and Emerald Levels: All water closets and urinals are in accordance with either Section 801.6 or 802.2.	Mandatory											
(2) A water closet is installed with an effective flush volume of 1.28 gallons or less when tested in accordance with ASME A112.19.2 (all water closets) and ASME A112.19.14 (all dual flush water closets), and is in accordance with EPA WaterSense Tank-Typ	6 18 Pts Max							12	200			Install low flow toilet.
(3) A urinal is installed with a flush volume of 0.5 gallons or less when tested in accordance with ASME A112.19.2.	4 Max 4 Points											
4) All water closets and all urinals are in accordance with Section 801.6(2) or Section 801.6(3), as applicable.	6 Add'l Points							6	0			
<b>801.7 Irrigation systems</b>												
801.7.1 A low-volume, irrigation system is installed for each landscape type utilized: (Points awarded for each type of irrigation system installed.)	10 Pts. Max											
(1) High distribution uniformity (DU) rotating spray heads	2	2	0									L3-6, sawn spray, bubbler, root watering...
(2) Drip irrigation	4											
(3) Bubblers	4	4	0									
(4) Drip emitters	4											
(5) Soaker hose	4											
(6) Subsurface irrigation	6	4	max of 10									
801.7.2 Irrigation system is in accordance with both of the following:	3									3	0	job this size should have been spec'd
1) designed by a professional in accordance with EPA WaterSense requirements or equivalent												
2) installed in accordance with EPA WaterSense program or equivalent												
801.7.3 Irrigation system is zoned separately for turf and bedding areas.	2									2	0	include in design of system
801.7.4 The irrigation system(s) is controlled by a smart controller:												
(1) Evapotranspiration (ET) based irrigation controller with a rain sensor	4											
(2) Soil moisture sensor based irrigation controller	4											
(3) No irrigation is installed and a landscape plan is developed in accordance with Section 503.5(1) as applicable. (Points must be taken in 503.5(1) in order to receive points for 801.7.4(3))	15											
801.8 Rainwater collection and distribution is provided.												
(1) Rainwater is collected and used	6									6	191	
(2) Rainwater is distributed using a renewable energy source or gravity.	2											
801.9 Water Filters. Water filter is installed to improve water quality for the whole building or whole dwelling unit.	1											
802.1 Gray water (as specified in ICC IRC, Appendix O) is separated and reused, as permitted by local building code. (Points awarded for either Section 802.1(1) or 802.1(2), not both)												
(1) Each water closet flushed by reclaimed or recycled water.	4 Points (per fixture)											
(2) Irrigation from reclaimed or recycled water onsite	10											
802.2 Composting or waterless toilets and/or urinals. Composting or waterless toilets and/or urinals are in accordance with the following: (For water closets, points awarded for either Section 802.2 or 801.6, but not both)	24 Points Max											
1) Gold and emerald levels: All water closets and urinals are in accordance with either Section 802.2 or Section 801.6.	Mandatory											
2) Composting or waterless toilet and/or urinal is installed. (Points awarded per fixture)	8											
3) All toilets and urinals are in accordance with Section 802.2 (2).	8 Add'l Points											
802.3 Automatic shutoff water devices. One of the following automatic shutoff water supply devices is installed. Where a fire sprinkler system is present, installer is to ensure the device will not interfere with the operation of the fire sprinkler system	2											
(1) Excess Water Flow Shutoff												
(2) Leak Detection System												

ANSI National Green Building Standard™	365	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
<b>CHAPTER 9: INDOOR ENVIRONMENTAL QUALITY</b>	<b>Base Pts.</b>	43	0	4	0	32	250	39	342	40	847	<b>Ch. 9 Subtotal</b>
<b>901 Pollutant Source Control</b>	<b>Cost/Point</b>		0		0		8		9		21	
901.0 Intent. Pollutant sources are controlled.												
901.1 Space and water heating options												
901.1.1 Natural draft space heating or water heating equipment is not located in conditioned spaces, including conditioned crawl spaces. Natural draft equipment is permitted to be installed within the conditioned spaces if located in a mechanical room that has an outdoor air source, and is otherwise sealed and insulated to separate it from the conditioned space(s).	5	5	0									92% gas boiler in exterior mechanical room
901.1.2 Air handling equipment or return ducts are not located in the garage, unless placed in isolated, air-sealed mechanical rooms with an outside air source.	5											
901.1.3 The following combustion space heating and water heating equipment is installed within conditioned space.												
(1) Direct vent furnace or boiler	5							5	100			add radiator to mech room to condition
(2) (a) Power vent water heater	3											
(b) Direct vent water heater	5							5	0			boiler
901.1.4 The following electric equipment is installed:												
1) Heat pump air handler in unconditioned space	2											
2) Heat pump air handler in conditioned space	5											
901.2 Fireplaces and Fuel Burning Appliances (except cooking appliances, clothes dryers, water heaters, and furnaces) located in conditioned space are code compliant, vented to the outdoors, and have adequate combustion and ventilation air provided to minimize spillage or back-drafting, in accordance with the following: <u>All of the following items are mandatory, if applicable, for certification.</u>												
901.2.1(1) Natural gas and propane fireplaces that are power vented or direct vented, are equipped with permanently fixed glass fronts or gasketed doors, and comply with ANSI Z21.88/CSA 2.33a or ANSI Z21.50/CSA 2.22	7											
901.2.1(2)(a) Wood burning fireplaces are equipped with gasketed doors designed to operate with the doors closed, outside combustion air, and a means is provided for sealing the flue to minimize interior air (heat) loss when not in operation.	4											
901.2.1(2)(b) Factory-built wood burning fireplaces are in accordance with the certification requirements of UL 127 and are EPA certified.	6											
901.2.1(2)(c) Wood stove and fireplace inserts, as defined in UL 1482, Section 3.8 are in accordance with the certification requirements of UL 1482 and are in accordance with the emission requirements of the EPA Certification and the State of Washington W	6											
901.2.1(2)(d) Pellet (biomass) stoves and furnaces are in accordance with the requirements of ASTM E1509 or are EPA Certified.	6											
901.2.1(2)(e) Masonry heaters are in accordance with the definitions in ASTM E1602 and ICC IBC, Section 2112.1.	6											
901.2.2 Fireplaces, woodstoves, pellet stoves, or masonry heaters are not installed.	7	7	0									
901.3 Garages are in accordance with the following:												
901.3(1)(a) Where installed in the common wall between the attached garage and conditioned space, the door is tightly sealed and gasketed.	Mandatory 2 Points	0	0									do not apply
901.3(1)(b) A continuous air barrier is provided between walls and ceilings separating the garage space from the conditioned living spaces.	Mandatory 2 Points	0	0									do not apply
901.3(1)(c) For one and two-family dwelling unit attached garages, a 100 cfm or greater ducted, or 70 cfm or greater unducted wall exhaust fan is installed and vented to the outdoors, designed and installed for continuous operation, or has controls (e.g., motion detectors, pressure switches) that activate operation for a minimum of 1 hour when either human passage door or roll-up automatic doors are operated. For ducted exhaust fans, the fan airflow rating and duct sizing are in accordance with Appendix A. (If you claim points for 901.3(1)(c), you cannot claim points for 901.3(2).	4											
901.3(2) A carport is installed, the garage is detached from the building, or no garage is installed. (If you claim points for 901.3(2), you cannot claim points for 901.3(1)(a), 901.3(1)(b), or 901.3(1)(c).	10	10	0									
901.4(2-6) Wood Materials. A minimum of 85% of material within a product group (i.e. wood structural panels, countertops, composite trim/doors, custom woodwork, and/or component closet shelving) is manufactured in accordance with the following:	10 points max.											

ANSI National Green Building Standard™	365	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
901.4(1) Structural plywood used for floor, wall, and/or roof sheathing is compliant with <u>DOC PS 1</u> and/or <u>DOC PS 2</u> . OSB used for floor, wall, and/or roof sheathing is compliant with DOC PS 2. The panels are made with moisture-resistant adhesives. The trademark indicates these adhesives as follows: Exposure 1 or Exterior for plywood, and Exposure 1 for OSB.				0	0							add to specs
(2) Particleboard and MDF (medium density fiberboard) is manufactured and labeled in accordance with CPA A208.1 and CPA A208.2, respectively.										2	0	cabinets
(3) Hardwood plywood is in accordance with HPVA HP-1 and HUD Title 24, Part 3280.										2	0	trim
(4) Particleboard, MDF, or hardwood plywood is in accordance with CPA 2.												
(5) Composite wood or agrifiber panel products contain no added urea-formaldehyde or are in accordance with the CARB Composite Wood Air Toxic Contaminant Measure Standard.												
(6) Non-emitting products.												
<b>Renovation Note:</b> Additional points for Section 901.4 apply to renovations that replace all existing countertops, shelving, and other nonstructural products.												
901.5 Carpets are in accordance with the following:												
901.5(1) Wall-to-wall carpeting is not installed adjacent to water closets and bathing fixtures.				0	0							show flooring break lines on plans
901.5(2) A minimum of 85% of installed carpet area, carpet cushion (padding), and carpet adhesives are in accordance with the emission levels of CDPH 01350, as certified by a third-party program, such as the Carpet and Rug Institute's (CRI) Green Label Pl												
(a) Carpet								6	0			should already comply in california
(b) Carpet cushion								2	0			should already comply in california
(c) Carpet adhesives								2	0			should already comply in california
901.6 Hard-surface flooring. A minimum of 85% of installed hard-surface flooring is in accordance with the emission concentration limits of CDPH 01350 (using the office scenario), as certified by a third-party program, such as the RFCI's FloorScore Indoor Air Certification Program or the Greenguard Environmental Institute's Children and Schools Certification Program.										6	0	should already comply in california
901.7 Wall coverings. A minimum of 85% of wall coverings are in accordance with the emission concentration limits of CDPH 01350 (using the office scenario), as certified by a third-party program, such as the Scientific Certification Systems (SCS) Indoor Advantage Gold Program or the Greenguard Environmental Institute's Children and Schools Certification Program.												
901.8 Architectural coatings. A minimum of 85% of the architectural coatings are in accordance with one of the following conditions:												
901.8.1 Site-applied interior products are in accordance with one or more of the following; not both.												
(1) Zero VOC, determined by EPA Method 24 (VOC content below the detection limit for the method).												
(2) CARB Suggested Control Measure for Architectural Coatings												
(3) GS-11												
(4) VOC limits in accordance with:												
(a) 50 grams/liter flat												
(b) 100 grams/liter non flat												
(c) 350 grams/liter clear wood varnish												
(d) 550 grams/liter clear wood lacquer												
901.8.2 Site-applied interior products are in accordance with the emissions levels of CDPH 01350, as certified by a third party program such as the Scientific Certification Systems (SCS) Indoor Advantage Gold Program or the Greenguard Environmental Institute's Children and Schools Certification Program.						8	0					should be spec/or code
901.9 Adhesives and Sealants.												
901.9.1 For exterior low-VOC adhesives and sealants, a minimum of 85% of site-applied products used for the installation of subfloors and on the exterior of the project are in accordance with one of the following:												
(1) The California Air Resources Board consumer products regulation as follows:										5	0	should be spec/or code
a) Construction Adhesives: VOC content not to exceed 7% by weight or 75 grams/liter, whichever is greater.												

ANSI National Green Building Standard™	365	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
b) The VOC content of reactive sealants (i.e., silicones, polyurethanes, and hybrids, such as MS Polymer and silylated polyurethane resin or SPUR) not to exceed 4% by weight or 50 grams/liter, whichever is greater.												
c) The VOC content of all other caulks and sealants not to exceed 2% by weight or 30 grams/liter, whichever is greater.												
(d) The VOC content of contact adhesives not to exceed 55% by weight or 480 grams/liter, whichever is greater.												
(2) GS-36												
901.9.2 Interior Low-VOC Adhesives and Sealants. For interior low VOC adhesives and sealants, a minimum of 85% of site-applied products used within the interior of the building are in accordance with one of the following, as applicable:												
1) CDPH 01350, as certified by a third party program, such as Scientific Certification Systems (SCS) Indoor Advantage Gold Program or the Greenguard Environmental Institute's Children and Schools Certification Program.	5	0										should be spec/or code
(2) GS-36	5											
901.10 Cabinets. A minimum of 85% of kitchen and bath vanity cabinets are in accordance with one of the following: <b>(Where more than one of the following practices is used, the practice with the fewer number of points is awarded)</b>												
(1) Kitchen and bath vanity cabinets in accordance with KCMA ESP 01, or equivalent, are installed.	2											
(2) Kitchen and bath vanity cabinets in accordance with CARB Composite Wood Air Toxic Contaminant Measure Standard are installed.	3					3	0			(3)	0	should be spec/or code
(3) Kitchen and bath vanity cabinets are installed that contain no added urea formaldehyde or are in accordance with GGPS.EC.010.R0, ASTM D6670, or equivalent.	5									5	0	Require better specs on cabinets.
901.11 Insulation is in accordance with the following:												
(1) Formaldehyde emissions of wall, ceiling, and floor insulation materials are in accordance with the emissions levels of CDPH 01350, as certified by a third-party program, such as the GREENGUARD Environmental Institute's Children and Schools Certification Program or the Scientific Certifications Systems (SCS) Indoor Advantage Gold Program.	4					4	0					should be spec/or code
(2) Formaldehyde emissions of duct insulation materials are in accordance with the emissions levels of CDPH 01350, as certified by a third-party program, such as the GREENGUARD Environmental Institute's Children and Schools Certification Program or the Scientific Certifications Systems (SCS) Indoor Advantage Gold Program.	1					1	0					should be spec/or code
901.12 A carbon monoxide (CO) alarm is installed in a central location outside of each separate sleeping area in the immediate vicinity of the bedrooms. The CO alarm(s) is located in accordance with NFPA 720 and is hard-wired with a battery back-up. The alarm device(s) is certified by a third party for conformance with either CSA 6.19 or UL 2034.	3											
901.13 Building entrance pollutants control. Pollutants are controlled at all main building entrances by one of the following methods:												
(1) Exterior grilles or mats are installed in a fixed manner and may be removable for cleaning.	1							1	44			
(2) Interior grilles or mats are installed in a fixed manner and may be removable for cleaning.	1											
901.14 Non-smoking areas. All interior common areas of a multi-unit building are designated as non-smoking areas with posted signage.	1											
<b>902 Pollutant Control</b>												
902.0 Intent. Pollutants generated in the building are controlled.												
902.1.1 Spot ventilation is in accordance with the following:												
(1) Bathrooms (including powder rooms) are vented to the outdoors. The minimum ventilation rate is 50 cfm for intermittent operation or 20 cfm for continuous operation in bathrooms.		0	0									plans M2.3.4 fans 70 and 100 cfm
<b>Mandatory</b>												
(2) Clothes dryers are vented to the outdoors.		0	0									
<b>Mandatory</b>												
(3) Kitchen exhaust units and/or range hoods are ducted to the outdoors and have a minimum ventilation rate of 100 cfm for intermittent operation or 25 cfm for continuous operation.						8	0					should be spec/or code
<b>8</b>												

ANSI National Green Building Standard™	365	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
902.1.2 Bathroom and/or laundry exhaust fan is provided with an automatic timer and/or humidistat:												
1) for first device	9 Points Max											
2) for each additional device	5	5	0									m0.0.3 ef9 - broan qtxe110s
902.1.3 Kitchen range, bathroom, and laundry exhaust are verified to specification. Ventilation airflow at the point of exhaust is tested to a minimum of 100 cfm intermittent or 25 cfm continuous for kitchens, and 50 cfm intermittent or 20 cfm continuous	2							2	50			change specs on second device
902.1.4 Exhaust fans are ENERGY STAR as applicable.	8							8	148			2 man crew - 2 hours
(1) ENERGY STAR, or equivalent, fans (Points awarded per fan)	Max. 6 Points											
(2) ENERGY STAR, or equivalent, fans operating at or below 1 sone (Points awarded per fan)	2											
902.2. Building ventilation systems.	3	6	0									m0.0.3 ef9 - broan qtxe110s is 0.7 sone, and broan qtxe080 is 0.3 sone in powder room
902.2.1 One of the following whole building ventilation systems is implemented and is in accordance with the specifications of Appendix B. (Points must be claimed in 902.2.1 to claim points in 902.2.2.)												
(1) Exhaust or supply fan(s) ready for continuous operation and with appropriately labeled controls.	8											
(2) Balanced exhaust and supply fans with supply intakes located in accordance with the manufacturer's guidelines to not introduce polluted air back into the building.	10											
(3) Heat-recovery ventilator.	15									15	700	design and installation of "clean air circulation" 1/3 fresh air supply - 2/3 cold air return
(4) Energy-recovery ventilator.	17											
902.2.2 Ventilation airflow is tested to achieve the design fan airflow at point of exhaust in accordance with Appendix B. (Points must be claimed in 902.2.1 to claim points in 902.2.2)	8											
902.2.3 MERV filters 8 or greater are installed on central air systems. Designer or installer is to verify that the HVAC equipment is able to accommodate the greater pressure drop of MERV 8 filters.	3											
902.3 Radon control. Radon control measures are in accordance with ICC IRC Appendix F. (Zones are defined in Figure 9(1).)												
902.3(1) Buildings located in Radon Zone 1 have a radon system installed.	Mandatory	0	0									zone 2
(a) A passive radon system is installed.	10											
(b) An active radon system is installed.	15											
902.3(2) Buildings located in Zone 2.												
(a) A passive radon system is installed.	10											not realistic w/ slab on grade
902.4 HVAC system protection. One of the following HVAC system protection measures is performed:												
(1) HVAC supply registers (boots), return grilles, and rough-ins are covered during construction activities to prevent dust and other pollutants from entering the system.	3									3	0	included in 902.2.1
(2) Prior to owner occupancy, HVAC supply registers (boots), return grilles, and duct terminations are inspected and vacuumed. In addition, the coils are inspected and cleaned and the filter is replaced if necessary.	3											
902.5 Central vacuum systems. Central vacuum system is installed and vented to the outside.	5											
902.6 Living space contaminants. The living space is sealed to prevent unwanted contaminants.												
(1) Attic access, knee wall door, or drop down stair is caulked, gasketed, or otherwise sealed.	2					2	250					specify, and verify
(2) All penetrations (e.g., top plates, HVAC register boots, recessed can lights, are sealed in the following areas:												
(a) Attic/ceiling	2					2	0					specify, and verify
(b) Wall	2					2	0					specify, and verify
(c) Floors	2					2	0					specify, and verify
903 Moisture Management: Vapor, Rainwater, Plumbing, HVAC												

ANSI National Green Building Standard™	365	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
903.0 Intent. Moisture and moisture effects are controlled.												
903.1 Tile backing materials installed under tiled surfaces in wet areas are in accordance with ASTM C1178, C1278, C1288, or C1325.	Mandatory			0	0							
903.2 Capillary breaks												
903.2.1 A capillary break and vapor retarder are installed at all concrete slabs in accordance to the following:	Mandatory			0	0							
1) A minimum 4-inch thick bed of ½ inch diameter or greater clean aggregate, covered with polyethylene or polystyrene sheeting in direct contact with the concrete slab, with the sheeting joints lapped in accordance with Section 903.3. (or)												
2) A minimum 4-inch thick uniform layer of sand, overlain with a layer or strips of geotextile drainage matting, covered with polyethylene sheeting, with the sheeting joints lapped according to Section 903.3.												
Modification for 1&2:												
a. In areas with free-draining soils, identified as Group 1 in the ICC IRC by a certified hydrologist, soil scientist, or engineer through a site visit, a gravel bed or geotextile matting is not required.												
b. In Dry climate locations, as defined by Figure 6(1), polyethylene sheeting is not required unless required for radon resistance (Section 902.3).												
903.2.2 Add a capillary break on footing to prevent moisture migration into foundation wall.	3									3	75	
903.3 Crawlspace												
903.3.1(1) Minimum 6-mil vapor retarder installed on the crawl space floor and extended up the wall sufficient to allow the material to be affixed with glue and furring strips. Joints of vapor retarder overlap a minimum of 6 inches and are taped.	6											
903.3.1(2) Damp-proof walls are provided below finished grade. Joints of vapor retarder overlap a minimum of 6 inches and are taped.	Mandatory	0	0									do not apply
903.3.2 Crawlspace that is built as a conditioned area is sealed to prevent outside air infiltration and provided with conditioned air at a rate not less than 0.02 cfm per square foot of horizontal area and one of the following is implemented:												
(1) A concrete slab over lapped 6 mil polyethylene or polystyrene	10											
(2) 6-mil polyethylene sheeting, lapped a minimum of 6 inches and taped at the seams.	8											
903.4 Moisture control measures.												
903.4.1(1) Building materials with visible mold are not installed or are cleaned or encapsulated prior to concealment and closing.	2 Points			2	0							Put into specs.
903.4.1(2) Walls are not enclosed (e.g. with drywall) if the insulation has a high moisture content. Wet insulation products are dry before enclosing.	Mandatory 2 Points			2	0							add to supervisors duties - to verify
903.4.1(3) The moisture content of lumber is sampled to ensure it does not exceed 19 % prior to the surface and/or wall cavity enclosure.	4							4	0			add to supervisors duties - to verify
903.4.2 Moisture content of subfloor, substrate, or concrete slabs is in accordance with the appropriate industry standard for the finish flooring to be applied.	2							2	0			add to supervisors duties - to verify
903.5 Plumbing.												
903.5.1 Plumbing distribution lines are not installed in exterior wall cavities.	2							2	0			Put into specs.
903.5.2 Cold water pipes in unconditioned spaces are insulated to a minimum of R-4 with pipe insulation or other covering that adequately prevents condensation.	2											
903.5.3 Plumbing is not installed in unconditioned spaces.	5	5	0									
903.6(1) Duct insulation. All HVAC ducts, plenums, and trunks in unconditioned attics, basements, and crawlspaces are insulated to a minimum of R-6. Outdoor air supplies to ventilation systems are insulated to a minimum of R-6.	Mandatory	0	0									
903.6(2) Duct insulation. All HVAC ducts, plenums, and trunks in unconditioned attics, basements, and crawlspaces are insulated to a minimum of R-8. Outdoor air supplies to ventilation systems are insulated to a minimum of R-8.	2											
903.7 Relative Humidity. In climate zones 1A, 2A, 3A, 4A, and 5A as defined by Figure 6(1), equipment is installed to maintain relative humidity (RH) at or below 60% using one of the following:												
903.9.1 In "Warm-Humid" climates as defined by Figure 6(1) equipment is installed to maintain Relative Humidity (RH) at or below 60% using one of the following:	8 Points											zone - 3C
(1) Additional dehumidification system(s)												
(2) Central HVAC system equipped with additional controls to operate in dehumidification mode.												

ANSI National Green Building Standard™	365	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
<b>904 Innovative Practices</b>												
904.1 A humidity monitoring system is installed with a mobile base unit that displays a reading of temperature and relative humidity at the base unit with a minimum of two remote units. One remote unit that is placed permanently inside the conditioned space in a central location, excluding attachment to exterior walls, and another remote unit is placed permanently outside of the conditioned space.	2									2	72	Bath fans are already triggered by humidistats.
904.2 Kitchen exhaust unit(s) that equal or exceeds 400 cfm, and make-up air is provided.	2											
<b>CHAPTER 10: OPERATION, MAINT., AND BUILDING OWNER EDUCATION</b>	<b>Base Pts.</b>	0	0	8	950	6	94	0	0	0	0	<b>Ch. 10 Subtotal</b>
<b>Building Owners' Manual for One- and Two-Family Dwellings</b>												
1001.0 Intent. Information on the building's use, maintenance and green components is provided.												
1001.1 A homeowner's binder is provided that includes the following, as available and applicable:	1 point per 2 items			0	100							Estimated 40 hours staff. O/H removed for separate reporting as one time cost. This reflects staff time to assemble.
<b>(Points awarded for mandatory and non-mandatory items)</b>												
(1) A green building program certificate or completion document.	Mandatory			0.5	850							\$200 certification fee and 4 hours of professional time.
(2) List of green building features (can include the national green building checklist).	Mandatory			0.5	0							Included with 1001.1
(3) Product manufacturer's manuals or product data sheet for installed major equipment, fixtures and appliances. If product data sheet is in the binder, manufacturer's manual shall may be attached to appliance in lieu of inclusion in the binder.	Mandatory			0.5	0							
(4) Information on local recycling programs.				0.5	0							
(5) Information about available local utility programs that purchase a portion of energy from renewable energy providers.												
(6) Explanation of the benefits of using energy efficient lighting systems (e.g., compact fluorescent light bulbs, light emitting diode (LED)) in high usage areas.				0.5	0							
(7) A list of practices to conserve water and energy.				0.5	0							
(8) Local public transportation options (if applicable).				0.5	0							
(9) A diagram showing the location of safety valves and controls for major building systems.												
(10) Where frost protected shallow foundations are used, notify owner of precautions, including instructions not to remove or damage insulation when modifying landscaping, to provide heat to the home as required by the IRC/IBC, and to keep base materials				0.5	0							
(11) A list of local service providers that offer regularly scheduled service and maintenance contracts to assure proper performance of equipment and the structure (e.g., HVAC, water heating equipment, sealants, caulks, gutter and downspout system, showe												
(12) A photo record of framing with utilities installed. Photos taken prior to installing insulation, clearly labeled, and included as part of the homeowner's binder.				0.5	0							
(13) Maintenance checklist.				0.5	0							
(14) List of common hazardous materials often used around the building and instructions for proper handling and disposal of these materials.				0.5	0							
(15) Information about organic pest control, fertilizers, de-icers, and cleaning products.				0.5	0							
(16) Information about native landscape materials and/or those that have low-water requirements.				0.5	0							
(17) Information about methods of maintaining the building's relative humidity in the range of 30-60%.				0.5	0							
(18) Instructions for inspecting the building for termite infestation.				0.5	0							
(19) Instructions for maintaining gutters and downspouts and importance of diverting water at least five feet away from foundation.				0.5	0							
(20) A narrative detailing the importance of maintenance and operation in retaining the attributes of a green-built building.				0.5	0							
<b>Renovations Note:</b> A building owners' manual that includes the following:	Mandatory											
(1) all mandatory items listed in Section 1001.1												
(2) a minimum of six of the non-mandatory items listed in Section 1001.1												
(3) the EPA publications "Reducing Lead Hazards When Remodeling Your Home" and "Asbestos in Your Home: A Homeowner's Guide"												
<b>1002 Education Training of Building Owners on Building Operation And Maintenance for One- and Two-Family Dwellings or Multi-Unit Buildings</b>												



ANSI National Green Building Standard™	365	Baseline		Bronze		Silver		Gold		Emerald		NOTES:	
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost		
1002.1 Training of building owners. Building owners/occupants are familiarized with the green building goals and strategies implemented and the impacts of the occupants' practices on the costs of operating the building. Training is provided to the responsible party(ies) regarding all equipment operation and control systems. Systems include, but are not limited to, the following:	6					6	94					Walk thru orientation should take about 2 hours and be standard.	
(1) HVAC filters.													
(2) Thermostat operation and programming.													
(3) Lighting controls.													
(4) Appliances and settings.													
(5) Water heater settings.													
(6) Fan controls.													
1003 Construction, Operation and Maintenance Manuals and Training for Multi-Unit Buildings													
1003.0 Intent. Manuals are provided to the responsible parties (owner, management, tenant, and/or maintenance team) regarding the construction, operation, and maintenance of the building. Paper or digital format manuals are to include information regarding those aspects of the building's construction, maintenance, and operation that are within the area of responsibilities of the respective recipient. One or more responsible parties are to receive a copy of all documentation for archival purposes.													
1003.1 Building construction manual. A building construction manual, including five or more of the following, is compiled and distributed in accordance with Section 1003.0.	1												



# APPENDIX B GREEN SCORING & COST

3 – Climate Zone #4

A. Richmond, Virginia

HUD Green Building Comparison  
18' SFD, Richmond VA

Rated 2/4/2010

ANSI-ICC-700-2008 National Green Building Standard™

Lot 41.6 x 140' 5,824

House 18 x 50' 1,695 sf

2-story on cond. crawl

Density per acre at this lot size

15.0

0

#DIV/0!

331

- 5. Lot Design...
- 6. Resource Efficiency
- 7. Energy Efficiency
- 8. Water Efficiency
- 9. Indoor Env. Quality
- 10. Operation, Maintenance...
- Additional Points
- Total

Bronze		Silver		Gold		Emerald			
Required	Actual	Required	Actual	Required	Actual	Required	Actual		
39	68	66	68	93	95	119	122		
45	78	79	82	113	114	146	147		
30	70	60	102	100	155	120	189		
14	14	26	38	41	53	60	61		
36	111	65	131	100	139	140	165		
8	9	10	15	11	15	12	15		
50		100		100		100			
222	350	406	436	558	571	697	699		
Cummulative		Points	Cost	Points	Cost	Points	Cost		
Chapter 5	68	0	68	0	95	1,590	122	6,256	
Chapter 6	78	0	82	0	114	0	147	3,728	
Chapter 7	70	0	102	6,384	155	13,009	189	19,528	
Chapter 8	14	0	38	525	53	525	61	907	
Chapter 9	111	0	131	44	139	44	165	1,840	
Chapter 10	9	950	15	1,044	15	1,044	15	1,044	
Total	350	950	436	7,997	571	16,212	699	33,303	
Est. House Cost				7,047		8,215		17,091	
% of Estimated Cost									
Cost per SF (\$)				0.56		4.72		9.56	19.65

KEY  
Points are Co-Dependant on at least one other cell  
Overhead Cost - Dependant on subdivision size

ANSI National Green Building Standard™	343	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
		Cost/Point	0	#DIV/0!	#DIV/0!	59	173					
<b>CH. 5 LOT DESIGN, PREPARATION, AND DEVELOPMENT</b>		Rating	68	0	0	0	0	27	1,590	27	4,666	Ch. 5 Subtotal Base
500.0 Intent. This section applies to lot development for the eventual construction of residential buildings, multi-unit buildings, or additions thereto that contain dwelling units. The buildings on the lot earn their own performance level by complying with the provisions of Sections 303, 304, or 305.5, as applicable.												
501.1 The lot is selected to minimize environmental impact by one or more of the following:												
(1) An infill lot is selected.		4										
(2) A greyfield lot or an EPA-recognized brownfield lot is selected.		5	5	0								
(3) Addition and Renovation Note: A renovation or addition project is implemented. (Points awarded for using an existing building and infrastructure.)		5										
501.2 Mass Transportation. A range of mass transportation choices are promoted by one or more of the following:												
(1) A lot is selected within one-half mile of pedestrian access to a mass transit system or within five miles of a mass transit station with provisions for parking.		3	3	0								mapquest
(2) Walkways, street crossings, and entrances designed to promote pedestrian activity are provided. New buildings are connected to existing sidewalks and areas of development.		3	3	0								mapquest
(3) A lot is selected within one-half mile of six or more community resources (e.g., recreational facilities (such as pools, tennis courts, basketball courts), parks, grocery store, post office, place of worship, community center, daycare center, bank, school, restaurant, medical/dental office, laundromat/dry cleaner.)		3	3	0								mapquest
502 Project Team, Mission Statement, and Goals												
502.1 A knowledgeable team is established and team member roles are identified with respect to green lot design, preparation, and development. The project's green goals and objectives are written into a mission statement.		4								4	754	Minimum 2 person team for 1 day. Varies with size of operations.
Lot Design												
503.0 Intent. The lot is designed to avoid detrimental environmental impacts first, minimize any unavoidable impacts, and mitigate for those impacts that do occur. The project is designed to minimize environmental impacts and to protect, restore, and enhance the natural features and environmental quality of the lot. (To be awarded points allocated for design, the intent of the design shall be implemented.)												
503.1 Natural resources are conserved by one or more of the following:												
(1) A natural resources inventory is completed under the direction of a qualified professional.		5										
(2) A plan is implemented to conserve the elements identified by the resource inventory as high priority resources.		6										
(3) Items listed for protection in the resource inventory plan are protected under the direction of a qualified professional.		4										
(4) Basic training in tree or other natural resource protection is provided for onsite supervisor.		4								4	627	Mandatory in some states. Overhead cost of training a superintendent in a program like MD's Green Card . 8 hrs. plus \$250

ANSI National Green Building Standard™	343	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(5) All tree pruning on site is conducted by a Certified Arborist.	2											
(6) Ongoing maintenance of vegetation during construction is in accordance with TCIA A300.	3											
Addition and Renovation Note: section 503.1 applies to additions that increase building footprint on the lot; and to renovations that include landscape, hardscape, and outdoor living area. (Additional points awarded for each strategy implemented.)	1 Additional Point											
503.2 Slope disturbance is minimized by one or more of the following: (Points awarded only if there are developable steep slopes on the lot.)												Unknown, no grading plan was provided.
(1) All or a percentage of development on steep slopes is avoided.												
(a) Less than 25%	2											
(b) 25 to 75%	3											
(c) Greater than 75%	4											
(2) Hydrological/soil stability study for steep slopes is completed and used to guide the design of all buildings on the site.	5											
(3) All or a percentage of roads and parking are aligned with natural topography to reduce cut and fill.												
(a) Less than 25%	1											
(b) 25 to 75%	3											
(c) Greater than 75%	5											
(4) Long-term erosion effects are reduced through the design and implementation of terracing, retaining walls, landscaping, and stabilization techniques.	6											
(5) Underground parking uses the natural slope for parking entrances.	4											
Addition and Renovation Note: Section 503.2 applies to additions that increase building footprint on the lot; and to renovations that include landscape, hardscape, and outdoor living area. (Additional points awarded for each strategy implemented.)	2 Additional Points											
503.3 Soil disturbance and erosion are minimized by one or more of the following: (Also see Section 504.3) (Points must be taken here to claim points in 504.1)												
(1) Construction activities are scheduled to minimize length of time that soils are exposed.	5	5	0									Virginia State Soil Erosion & Control Handbook to be followed
(2) Utilities are installed using one or more alternative means:	5											
(a) tunneling instead of trenching												
(b) use of smaller (low ground pressure) equipment or geotextiles to spread the weight of construction equipment												
(c) shared utility trenches or easements												
(d) placement of utilities under paved surfaces instead of yards.												
(3) Limits of clearing and grading are demarcated on the plan.	5	5	0									
503.4 Storm Water Mgmt. Storm water is managed using one or more of the following low impact development techniques:												
(1) Natural water and drainage features are preserved and used.	6											
(2) A storm water management plan is developed and implemented that minimizes concentrated flows and simulates flows found in natural hydrology, e.g., vegetative swales, French drains, wetlands, drywells, and rain gardens.	6									6	754	Minimum 2 person team for 1 day. Varies with size of operations.
(3) All or a percentage of impervious surfaces are minimized and permeable materials are used for driveways, parking areas, walkways, and patios.												Less than 15% impervious structure/driveway to land
(a) Less than 25%	1											
(b) 25 to 75%	3											
(c) Greater than 75%	5											
(4) A minimum of 75% of the roof is vegetated (green roof)	3											
503.5 Landscape plan is developed to limit water and energy use while preserving or enhancing the natural environment.												
(1) A plan is formulated to restore or enhance natural vegetation that is cleared during construction. Landscaping is phased to coincide with achievement of final grades to ensure denuded areas are quickly vegetated.	5							5	520			Simple implementation on infill lot. Allowed 1/2 day for professional to develop plan that includes noted actions. Include 503.5(8) and 503.6 in plan. Plan needed for 801.7.4 points.
(2) Turf grass species, other vegetation, and trees are selected that are native or regionally appropriate for local growing conditions.	4									4	504	See 503.5(1) for plan cost. Cost of several 3 shrubs, 2 trees and hydroseed.
(3) A percentage of all turf areas are limited.												
(a) Lot is 0% turf	4											
(b) Greater than 0% to less than 25%	3											
(c) 25% to less than 50%	2									2	678	28% mulched.
(d) 50% to 75%	1											
(4) Plants with similar watering needs are grouped (hydrozoning).	5							5	535			See 503.5(1) for plan cost. 3 trees and 5 shrubs.

ANSI National Green Building Standard™	343	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(5) Species and locations for tree planting are identified that will provide summer shading of streets, parking areas, and buildings to moderate temperatures.	5							5	0			See 503.5(1) for plan cost. Plant 3 trees from 503.5(2) to provide shade. See 505.2(1)
(6) Vegetative wind breaks or channels are designed as appropriate for local conditions.	4							4	360			See 503.5(1) for plan cost. Add 3 trees.
(7) Onsite tree trimmings or stump grinding of regionally appropriate trees are used to provide protective mulch during construction and cleared trees are recycled as saw lumber or pulp wood.	3	3	0									page A1.0 general site notes 7. All woody debris...ground into mulch for use in planted areas
(8) An integrated pest management plan to minimize chemical use in pesticides and fertilizers is developed.	4							4	0			See 503.5(1)
<b>503.6 Wildlife habitat.</b> Measures are planned that will support wildlife habitat.	4							4	175			See 503.5(1). Include additional 5 shrubs.
<b>503.7 Mixed use development</b> is incorporated.	6											
<b>503.8 Environmentally Sensitive Areas.</b>												
(1) Environmentally Sensitive Areas are avoided.	3	3	0									
(2) Compromised Environmentally Sensitive Areas are mitigated or restored.	3											
<b>503.9 Density.</b> The average density on a net developable area basis is:												
(1) 7 to less than 14 dwelling units per acre (4047 m <sup>2</sup> )	4	4	0									
(2) 14 to less than 21 dwelling units per acre	7											
(3) 21 or greater dwelling units per acre	10											
<b>504 Lot Construction</b>												
<b>504.0 Intent.</b> Environmental impact during construction is avoided to the extent possible; impacts that do occur are minimized, and any significant impacts are mitigated.												
<b>504.1 Onsite supervision and coordination</b> is provided during clearing, grading, trenching, paving, and installation of utilities to ensure that specified green development practices are implemented (Also see Section 503.3.)	4									4	1,130	3 days for one person to supervise.
<b>504.2 Trees and vegetation.</b> Designated trees and vegetation are preserved by one or more of the following:												
(1) Fencing or equivalent to protect trees and other vegetation is installed.	3	3	0									A8.0 division 2.9. protect trees, vegetation...construction fence...drip line
(2) Trenching, significant changes in grade, and compaction of soil and critical root zones in "tree save" areas are avoided.	4	4	0									A8.0 division 2.9. protect trees, vegetation...construction fence...drip line
(3) Damage to designated existing trees and vegetation is mitigated during construction through pruning, root pruning, fertilizing, and watering.	4											
<b>504.3 Soil disturbance and erosion.</b> Onsite soil disturbance and erosion are minimized by one or more of the following: (also see section 503.3)												
(1) Limits of clearing and grading are staked out.	5	5	0									Note: Specs indicate that there is a grading plan that was not submitted.
(2) "No disturbance" zones are created using fencing or flagging to protect vegetation and sensitive areas from construction activity.	5	5	0									A8.0 division 2.9. protect trees, vegetation...construction fence...drip line
(3) Sediment and erosion controls are installed and maintained in accordance with the storm water pollution prevention plan (SWPPP), where required.	5	5	0									A8.0 division 2.2. implement erosion&...during construction
(4) Topsoil is stockpiled and stabilized for later use to establish landscape plantings.	5	5	0									A8.0 division 2.11. strip topsoil...cover pile with tarp
(5) Soil compaction from construction equipment is reduced by distributing the weight of the equipment over a larger area (laying lightweight geogrids, mulch, chipped wood, plywood, OSB, metal plates, or other materials capable of weight distribution in the pathway of the equipment).	3	3	0									A8.0 division 2.7
(6) Disturbed areas that are complete or to be left unworked for greater than 21 days are stabilized within 14 days using methods as recommended by the EPA or in the approved storm water pollution prevention plan (SWPPP), where required.	3											See 503.1(6)
(7) Soil is improved with organic amendments and mulch.	3									3	220	Soil ammendment.
(8) Utilities are installed using one or more alternative means such as:												
tunneling instead of trenching, use of smaller equipment, use of low ground pressure equipment, use of geomats, shared utility trenches or easements.	5											See 504.1(2) and 503.3(2)
<b>505 INNOVATIVE PRACTICES</b>												
<b>505.0 Intent.</b> Innovative lot design, preparation and development practices are used to enhance environmental performance. Waivers or variances from local development regulations are obtained and innovative zoning practices are used to implement such pract												
505.1 Driveways or parking areas are shared. Waivers or variances from local development regulations are obtained to implement such practices as applicable. In a multi-unit project, parking capacity is not to exceed the local minimum requirements.	4											Plan parking at front or side curb in alley instead of additional pad on lot.
505.2 Heat Island Mitigation. Any combination of the following strategies are provided for a minimum of 50% of the horizontal surface area of the hardscape:	4											

ANSI National Green Building Standard™	343	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(1) Shading of hardscaping: Shade from existing or new vegetation is provided (within five years) or from trellises. Shade of hardscaping is to be measured on the summer solstice at noon.												See 503.3(5). Complies but points taken in part 2 aren't available here.
(2) Light colored hardscaping: Horizontal hardscaping materials are installed with a solar reflectance index of 29 or greater.		4	0									Concrete parking pad qualifies as 100% of hardscape excepting house footprint.
<b>CHAPTER 6: RESOURCE EFFICIENCY</b>	<b>Base Pts.</b>	78	0	0	0	4	0	32	0	33	3,728	<b>Ch. 6 Subtotal</b>
<b>601 Quality of Construction Materials and Waste</b>	<b>Cost/Point</b>		0		#DIV/0!		0		0		113	
<b>601.0 Intent.</b> Design and construction practices that minimize the environmental impact of the building materials are incorporated; environmentally efficient building systems and materials are incorporated; and waste generated during construction is reduced.												
<b>601.1 Conditioned floor area</b> , as defined by ICC IRC calculated in												
(1) Less than or equal to 1,000 square feet	15											
(2) Less than or equal to 1,500 square feet	12											1,656
(3) Less than or equal to 2,000 square feet	9	9										
(4) Less than or equal to 2,500 square feet	6											
(5) Greater than 4,000 square feet (373 m <sup>2</sup> )	Mandatory											
<b>For every 100 square feet over 4,000 sf, one point is to be added to Table 303, category 7 for each performance level.</b>												
<b>Multi-Unit Building Note:</b> For a multi-unit building, use a weighted average of the individual unit sizes in qualifying for available points.												
<b>Addition Note: Additions more than 75% of existing building.</b> Section 601.1 does not apply to additions with an area of more than 75% of the area of the existing building or dwelling unit.												
<b>Additions less than or equal to 75% of existing building.</b> Where the addition area is less than or equal to 75 percent of the existing building or dwelling unit area, points are awarded as follows:												
(1) The existing structure is 50% to 75% of total building or dwelling unit area.	1 Add'l Point											
(2) The existing structure is 76% to 99% of total building or dwelling unit area.	3 Add'l Point											
<b>Renovation Note:</b> When renovations increase the total existing building or dwelling unit area by 1 percent or less, points are awarded as follows:												
(a) The total area of the existing building or dwelling unit is less than or equal to 2500 sf.	6 Add'l Points											
(a) The total area of the existing building or dwelling unit is greater than 2500 sf.	1 Add'l Point											
<b>601.2 Material Usage.</b> Building-code-compliant structural systems or advanced framing techniques that optimize material usage are implemented. Points awarded for each system or framing technique implemented.	3 pts per system (9 pts max)	9	0									Floors, walls, and roof at 24"oc with I-joists and open web floor truss, single top plates, trusses
<b>601.3 Building dimensions and layouts are designed to reduce material cuts and waste.</b>												
(1) When used for at least 80% of floor area	3	3	0									Floors - 4.5 sheets across 6.25 sheets in length (18x50)
(2) When used for at least 80% of wall area	3							3	0			Wall precuts can be used for 1st and 2nd
(3) When used for at least 80% of roof area	3	3	0									18x50 with nominal slope
(4) When used for at least 80% of cladding or siding area	3											
(5) When used for at least 80% of penetrations or trim area	1											
<b>601.4 Detailed framing or structural plans, material quantity lists and onsite cut lists for framing, structural materials, and sheathing materials are provided.</b>	4									4	1,040	Have suppliers prepare use reports with their bid at no charge for joists, wall studs and rafters. Allowed 1day of professional time to prepare sheathing layouts for prints. O/H.
<b>601.5 Pre-cut or pre-assembled components, or panelized or precast assemblies are utilized for 90% for the following system or building.</b>												
(1) Floor system.	4					4	0					Estimated no premium for precuts, 18' lengths, 2 flr is open web floor joists
(2) Wall system.	4							4	0			These should have been shipped as precuts or panels
(3) Roof system.	4	4	0									
(4) modular construction for the entire building located above grade.	13											
(5) manufactured home construction for the entire building located above grade.	13											
<b>601.6 Stories above grade</b> are stacked, such as in 1 1/2 and 2 story or greater structures. The area of the upper story shall be at least 50% of the area of the story below, based on areas with a minimum ceiling height of 7 feet.	Max 8 points											
(1) first stacked story	4	4	0									
(2) for each additional story	2											
<b>601.7 Site applied finishing materials.</b> Building materials or assemblies that do not require additional site applied material for finishing are utilized.	Max 12 points											
(1) 90% or more of the installed material or assembly listed below:	5											

ANSI National Green Building Standard™	343	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(2) 50% to less than 90% of the installed building material or assembly listed below:	2											
(a) Pigmented, stamped, decorative, or final finish concrete or masonry.												
(b) Trim not requiring paint or stain.	5											
(c) Window, skylight, and door assemblies not requiring paint or stain on exterior and/or interior surfaces.	5											pre finished hardi plank siding vinyl windows
(d) Wall coverings or systems not requiring paint or stain or other type of finishing application.	2											exterior porch is composite deck
601.8 Foundations such as frost-protected shallow foundations, pier and pad foundations, post foundations and other similar foundation types are designed and constructed.	3											Pier foundation.
601.9 One or more of the following above grade wall systems that provide sufficient structural and thermal characteristics are used for at least 75% of the gross exterior wall area of the building:	4											
(1) Adobe												
(2) Concrete/Masonry												
(3) Logs												
(4) Rammed earth												
<b>602 Enhanced Durability and Reduced Maintenance</b>												
602.0 Intent. Design and construction practices are implemented that enhance the durability of materials and reduce in-service maintenance.												
602.1 Entries at exterior door assemblies, inclusive of side lights, are covered by one of the following methods below to protect the building from the effects of precipitation and solar radiation. A projection factor of at least 0.375 is provided. Eastern and western facing entries in Climate Zones 1, 2, and 3, as determined in accordance with Figure 6(1), shall have a projection factor of at least 1.0 unless otherwise protected from direct solar radiation by other means (e.g. screen wall, vegetation).	Maximum number of points 5											
(1) Installing a porch roof or awning.												
(2) Extending the roof overhang.												
(3) Recessing the exterior door.												
Main entrance door	3	3	0									
Additional covered door assembly	1	1	0									
602.2 Roof overhangs, based on inches of rainfall in Table 602.2, are provided over at least 90% of exterior walls to protect the building envelope.	4											
Table 602.2												
Minimum Roof Overhang for One- & Two-Story Buildings												
Inches Rainfall*	Eave Overhang (Inches)	Rake Overhang (Inches)										
Less than 20	12	12										
21 to 40	12	12										
41 to 70	18	12							4	265		43.9" Extend overhangs by 9" and 4"
More than 70	24	12										
<b>Addition Note:</b> Section 602.2 applies to the new construction portion of additions.	0											
<b>Renovation Note:</b> Section 602.2 applies to renovations that alter the existing roof.	1											
<b>602.3 Foundation Drainage</b>												
602.3.1 Where required by the IRC/IBC for habitable and usable spaces below grade, exterior drain tile is installed.	Mandatory	0										Not applicable.
602.3.2 Interior and exterior foundation perimeter drains are installed and sloped to discharge to daylight, dry well, or sump pit.	4											
602.4 Drip edge is installed at eaves and gable roof edges.	3	3	0									
602.5 A gutter and downspout system with extensions, or splash blocks and effective grading, are provided to carry water at least 5 feet away from perimeter foundation walls.	4								4	162		Plans indicate gutters and downspouts; cost is for 4 extensions and fold back elbows.
602.6 Finish grade at all sides of building is sloped to provide a minimum of 6 inches of fall within 10 feet of the edge of the building. Where lot lines, walls, slopes or other physical barriers prohibit 6 inches of fall within 10 feet, the final grade	Mandatory											
602.7 Termite barrier. Continuous, physical, foundation termite barrier used with or without low toxicity treatment is installed in geographical areas that have subterranean termite infestation potential determined in accordance with Figure 6(3).	4											Plans require borate treated wood; unspecific about location.
602.8 Termite-resistant materials are used as follows:												
(1) In areas of slight to moderate termite infestation probability (as defined by Figure 6(3)) for the foundation, all structural walls, floors, concealed roof spaces not accessible for inspection, exterior decks, and exterior claddings within the first 2 feet above the top of the foundation.	2											

ANSI National Green Building Standard™	343	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(2) In areas of moderate to heavy termite infestation probability (as defined by Figure 6(3)) for the foundation, all structural walls, floors, concealed roof spaces not accessible for inspection, exterior decks, and exterior claddings within the first 3 feet above the top of the foundation.	4											
(3) In areas of very heavy termite infestation probability (as defined by Figure 6(3)) for the foundation, all structural walls, floors, concealed roof spaces not accessible for inspection, exterior decks, and exterior claddings.	6											Heavy termite area.
602.9 Where required by the IRC/IBC, a water-resistive barrier and/or drainage plane system is installed behind exterior veneer and/or siding.	Mandatory	0	0									Complies.
602.10 In areas where there has been a history of ice forming along the eaves causing a backup of water, an ice barrier is installed at roof eaves and is extended at least 24" inside the exterior wall line of the building, in accordance with the IRC/IBC.	Mandatory	0	0									Not applicable.
602.11 Enhanced foundation waterproofing is installed:	4											Not applicable.
(1) Rubberized coating, or												
(2) Drainage mat.												
602.12 Flashing details are shown on plans and flashing is installed at all of the following locations, as applicable:	6	6	0									A5.1 and A5.2
(1) Around exterior fenestrations, skylights and doors.												
(2) Roof valleys.												
(3) Deck/balcony to building intersections.												
(4) At roof-to-wall intersection and at roof-to-chimney intersections.												
(5) A drip cap is provided above windows and doors that are not flashed or protected by covering per Section 602.1.												
602.13 Roof Surfaces. A minimum of 90% of roof surfaces are constructed of one or both of the following:	3											
(1) Products which meet the requirements of the ENERGY STAR® cool roof certification or equivalent.												Note: Roof indicates fiberglass shingles, but slope isn't sufficient.
(2) A green (landscaped) roof system.												
602.14 Recycling. Occupant recycling is facilitated by one or more of the following methods:												
(1) A built-in collection space in each kitchen and an aggregation/pick-up space in a garage, covered outdoor space or other area for recycling containers.	3									3	58	Include an under cabinet recycling container and back porch bin.
(2) Compost facility provided on-site.	3									3	72	
<b>603 Reused or Salvaged Materials</b>												
603.0 Intent. Practices that reuse or modify existing structures, salvage materials for other uses, or use salvaged materials in building's construction are implemented.												
603.1 Existing buildings and structures are reused, modified or deconstructed in lieu of demolition. (One point awarded for every 200 sq. ft., 18.5m2, of floor area.)	1 (Max 12 points)											
603.2 Reclaimed and/or salvaged materials and components are used. Total material and labor cost of salvaged materials shall equal or exceed 1% of total construction costs.	3											
603.3 Scrap Materials. Facilitation for sorting and reuse of scrap building material (e.g. provide a central storage area or dedicated bins.)	4	4	0									A8.0 notes 1 construction and ... to be recycled or ... to the maximum extent possible
<b>604 Recycled-Content Building Materials</b>												
604.1 Building materials with recycled content are used for at least two minor and/or two major components of the building. (NOTE: Does not specify PConsumer. Implication is that max. allowable is 4 materials. 9 points is max. in scoring tool. Have to use highest % to receive max pts.)	Points per Table 604.1											
Table 604.1												
Recycled Content												
Material Percentage Recycled Content	Per 2 Minor	Per 2 Major										
25% - 50%	1	2										
50% - 75%	2	4										Fiber cement siding & aggregate at construction entrance for minors.
75%	3	6						9	0			Gypsum board and cellulose insulation. Note: specify correct gypsum board.
<b>605.0 Intent. Waste generated during construction is recycled.</b>												
Note: All waste classified as hazardous shall be properly handled and disposed. (Points not awarded for hazardous waste removal.)												
605.1 A Construction Waste Management Plan is developed, implemented, and posted at the jobsite with a goal of recycling or salvaging a minimum of 50% (by weight) of construction and land-clearing waste.	6									6	989	Estimate is one day for set-up and one hour/week for record keeping. Costs of removal assumed even for each method. 90 day cycle time.
605.2 Onsite recycling measures following applicable regulations and codes are implemented, such as the following:	7											
(a) Materials are ground or otherwise safely applied onsite as soil amendment or fill. At least 50% (by weight) of construction and land-clearing waste shall be diverted from landfill.												



ANSI National Green Building Standard™	343	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(b) Other methods approved by the NAHB Research Center (the Adopting Entity).												
605.3 Recycled Construction materials: Construction materials (e.g., wood, cardboard, metals, drywall, plastic, asphalt roofing shingles, or concrete) are recycled offsite.	<b>Max 6</b>											
(1) A minimum of two types of materials are recycled.	<b>3</b>							<b>3</b>	<b>0</b>			Recycle steel and copper wire. Net savings is anticipated. Note: If steel were ordered in precuts recycle drywall.
(2) for each additional recycled material.	<b>1</b>							<b>1</b>	<b>0</b>			Recycle cardboard.
<b>606 Renewable Materials</b>												
<b>606.0 Intent.</b> Building materials derived from renewable resources are used.												
606.1 The following biobased products are used. (Note: 606.1 and 606.2 denote % of project mat'l cost req'd.)	<b>Max 8</b>											
(a) certified solid wood in accordance with Section 606.2												
(b) engineered wood												
(c) bamboo												
(d) cotton												
(e) cork												
(f) straw												
(g) natural fiber products made from crops (soy or corn-based)												
(h) products with the minimum biobased contents of the USDA 7 CFR Part 2902												
(i) other biobased materials with a minimum of 50 percent biobased content (by weight or volume).												
606.1(1) At least two types of biobased materials are used, each for more than .5% of the project's projected building material cost. <b>Combined 8 pts Max</b>	<b>3</b>	<b>2</b>	<b>0</b>									Wood cabinets and wood trim
606.1(2) At least two types of biobased materials are used, each for more than 1% of the project's projected building material cost.	<b>6</b>	<b>6</b>	<b>0</b>									engineered wood, osb walls, IV beams
606.1(3) For each additional biobased material used for more than 5% of the project's projected building material cost.	<b>1 (2 pts max)</b>											
<b>606.2 Wood-based products</b> are certified to the requirements of one of the following recognized product programs:												
(a) AFF American Tree Farm System®												
(b) Canadian Standards Association's Sustainable Forest Management System Standards (CAN/CSA Z809)												
(c) Forest Stewardship Council (FSC)												
(d) Program for Endorsement of Forest Certification Systems (PEFC)												
(e) Sustainable Forestry Initiative Program (SFI)												
(6) Other product programs mutually recognized by PEFC												
606.2(1) Where a minimum of two certified wood-based products are used for minor elements of the building, such as all trim, cabinetry, or millwork.	<b>3</b>									<b>3</b>	<b>350</b>	Specify Masonite doors for FSC certified. Estimated added cost of \$35/door. And kitchen cabinets at no cost.
606.2(2) Where a minimum of two certified wood-based products are used in major elements of the building, such as walls, floors, or roof.	<b>4</b>									<b>4</b>	<b>566</b>	Specify that front/rear decks/railing are certified wood.
<b>606.3 Manufacturing Energy.</b> Materials are used for major components of the building that are manufactured using a minimum of 33% of the primary manufacturing process energy derived from renewable sources, combustible waste sources, or renewable energy credits (RECs). (2 points awarded per material.)	<b>6 pts. max.</b>							<b>2</b>	<b>0</b>	<b>2</b>	<b>225</b>	Specify that OSB comes from a mill that complies. Identify another material that complies; allowed for added cost.
<b>607 Resource-Efficient Materials</b>												
607.1 Products containing fewer materials are used to achieve the same end-use requirements as conventional products, including but not limited to: (3 points awarded for each material.)	<b>Max 9 points</b>											
(1) Lighter, thinner brick with bed depth less than 3 inches, brick with coring above 25%, or both.												
(2) Engineered wood or engineered steel products.		<b>3</b>	<b>0</b>									Engineered wood - OSB floor and roof
(3) Roof or floor trusses.		<b>6</b>	<b>0</b>									Joists are engineered for less wood & roof truss components.
<b>608 Indigenous Materials</b>												
608.1 Indigenous materials are used for major elements of the building.	<b>10 points max.</b>											
(1) one type of material.	<b>2</b>							<b>2</b>	<b>0</b>			Use indigenous stone for driveway base.
(2) For each additional material.	<b>2</b>							<b>8</b>	<b>0</b>			Specify OSB from local mill. Deck lumber, windows and siding locally sourced.
<b>609 Life Cycle Analysis</b>												

ANSI National Green Building Standard™		343	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
			Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
609.1 A more environmentally preferable product or assembly for an application based upon the use of a Life Cycle Assessment (LCA) tool compliant with ISO 14044 or other recognized standards that compare the environmental impact of building materials, as													
		Max 15 points											
(1) Per product/system comparison		3											
(2) Whole building LCA analysis		15											
<b>610 Innovative Practices</b>													
<b>610.1 Manufacturer's environmental management system concepts.</b> Product manufacturer's operations and business practices include environmental management system concepts and the production facility is ISO 14001 certified or equivalent. The aggregate value of building products from ISO 14001 certified or equivalent production facilities is at least 1% or more of the estimated total building materials cost. (1 point awarded for every percent.)		Max 10 points											
<b>CHAPTER 7: ENERGY EFFICIENCY</b>		Base Pts.	70	0	0	0	32	6,384	53	6,625	34	6,519	Ch. 7 Subtotal
701.1 Mandatory requirements. The building shall comply with either Section 702 (Performance Path) or Section 703 (Prescriptive Path). Items listed as "Mandatory" in Section 701.4 apply to both the Performance and Prescriptive Paths.		Cost per point	0		#DIV/0!			199		125		192	
<b>701.1.1 Minimum Performance Path Requirements.</b> A building complying with Section 702 shall exceed the baseline minimum performance required by the IECC by 15%, and shall include a minimum of two practices from Section 704.													Performance path selected at all levels.
<b>701.1.2 Minimum Prescriptive Path Requirements.</b> A building complying with section 703 shall obtain a minimum of 30 points from Section 703, and shall include a minimum of two practices from Section 704.													
<b>701.1.3 Alternative Bronze Level Compliance.</b> As an alternative, any building that qualifies as an ENERGY STAR qualified home or equivalent achieves the Bronze Level for Chapter 7.													
<b>701.2 Emerald Level Points.</b> The Performance Path shall be used to achieve to the Emerald Level.													Performance path selected at all levels.
<b>Mandatory Practices</b>													
701.3 A review by the Adopting Entity or designated third party shall be conducted to verify design and compliance with Chapter 7.		Mandatory	0	0									
<b>701.4.1 HVAC SYSTEMS</b>													
701.4.1.1 Space heating and cooling system/equipment shall be sized according to heating and cooling loads calculated using ACCA Manual J or equivalent.		Mandatory	0	0									2006 IECC requirement. Complies A8.0.
701.4.1.2 Where installed, as a primary heat source in the building, radiant or hydronic space heating system is designed using industry-approved guidelines (e.g. ACCA Manual J, GAMA H-22, or an accredited design professional's and manufacturer's recommen		Mandatory	0	0									
<b>701.4.2 DUCT SYSTEM</b>													
701.4.2.1 Ducts are sealed with tape complying with UL 181, mastic, gaskets, or an approved system as required by the ICC IRC (Section M1601.3.1, or ICC IMC Section 603.9) to reduce leakage.		Mandatory	0	0									Complies. A8.0 requires mastic seal and max. leakage of 5%.
701.4.2.2 Building cavities are not used as supply ducts.		Mandatory	0	0									Complies
<b>701.4.3 INSULATION and AIR SEALING</b>													
701.4.3.1 GENERAL Insulation and air sealing is in accordance with the following:													
(1) Insulation shall be installed in accordance with the manufacturer's instructions or local code, as applicable.		Mandatory			0	0							Specify
(2) Shafts (duct shaft, piping shaft/penetrations, flue shaft.) Openings to unconditioned space are fully sealed with solid blocking or flashing and any remaining gaps are sealed with caulk or foam. Fire-rated collars and caulking are installed where re		Mandatory	0	0									
<b>701.4.3.2 FLOOR / FOUNDATION / CRAWLSPACE</b>													
(1) Floors (Including insulated floors above garages and cantilevered floors)		Mandatory	0	0									n/a
(a) Insulation is installed to maintain permanent contact with the underside of the subfloor decking, enveloping any attached ductwork within the thermal envelope without compression or air gaps in the insulation. This practice does not apply to ducts or other mechanical equipment that are adjacent to the underside of the subfloor.													
(b) Batt and loose-fill insulation is held in place by permanent attachments or systems in accordance with the manufacturer's instructions.													
(2) Crawlspace. Where insulated, crawlspace wall insulation is permanently attached to the walls. Exposed earth in unvented crawlspaces is covered with continuous vapor retarder with overlapping joints taped or masticed.		Mandatory	0	0									Complies.
<b>701.4.3.3 WALLS</b>													
(1) Windows and Doors. Caulking, gasketing, adhesive flashing tape, foam sealant, or weatherstripping is installed forming a complete air barrier.		Mandatory	0	0									See flashing details on plan.
(2) Band Joist and Rim Joists. Band and rim joists are insulated and air sealed.		Mandatory	0	0									SPF?

ANSI National Green Building Standard™			343	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
			Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost		
<b>(3) Between Foundation and Sill Plate Bottom Plate</b>			<b>Mandatory</b>	<b>0</b>	<b>0</b>									
(a) Sill sealer, or other material that will expand and contract, shall be installed between foundation and sill plate.														N/a pier foundation.
(b) Caulk or the equivalent is installed to seal the bottom plate of exterior walls.														A5/1 detail 12 shows a cont. seal gasket beneath plate.
<b>(4) Skylights and kneewalls.</b> Skylight shafts and knee walls are insulated to the same level as the exterior walls.			<b>Mandatory</b>	<b>0</b>	<b>0</b>									N/a
<b>(5) Exterior Architectural features.</b> Code required building envelope insulation and air sealing is not disrupted at exterior architectural features such as stairs and decks.			<b>Mandatory</b>	<b>0</b>	<b>0</b>									
<b>701.4.3.4 CEILINGS AND ATTICS</b>														
<b>(1) Attic access (except unvented attics).</b> Attic access, knee wall door, or drop down stair is covered with insulation and gasketed. Knee wall door is insulated unit or is covered with insulation.			<b>Mandatory</b>	<b>0</b>	<b>0</b>									No access required.
<b>(2) Recessed Lighting.</b> Recessed light fixtures that penetrate the thermal envelope are airtight, IC rated, and sealed with gasket, caulk, or foam.			<b>Mandatory</b>	<b>0</b>	<b>0</b>									
<b>Renovation Note:</b> Replace existing recessed lights that penetrate the thermal envelope with airtight, IC-rated recessed light fixtures that are sealed to drywall with gasket, caulk, or foam. <b>(Additional point per fixture)</b>			<b>1 Add'l Pt</b>											
<b>(3) Eave vents.</b> Where ceiling/attic assemblies or designs have eave vents, baffles, or other means shall be utilized to minimize air movement into or under the insulation.			<b>Mandatory</b>	<b>0</b>	<b>0</b>									plans A4.1
<b>Renovation Note:</b> Provide blocking or baffle at eaves to ensure ventilation over attic insulation.			<b>2 Add'l Pts</b>											
<b>701.4.4 FENESTRATION</b>														
701.4.4.1 The NFRC-certified U-factor and SHGC windows, exterior doors, skylights, and tubular daylighting devices (TDDs) are in accordance with ENERGY STAR, or equivalent, or Table 701.4.4.1. Decorative fenestration elements with a maximum area of 15 sq			<b>Mandatory</b>											zone 4 - installed - u0.35, shgc 0.40
<b>Table 701.4.4.1</b>														
Fenestration Specifications														
Climate Zones		U-Factor	SHGC											
		Windows and Exterior Doors (maximum certified ratings)												
1 and 2		0.65	0.4											
3		0.4	0.4											
4 to 8		0.35	Any	<b>0</b>	<b>0</b>									
		Skylights and TDDs (max. certified ratings)												
1 to 3		0.75	0.4											
4 to 8		0.6	Any											
<b>702 Performance Path</b>														
702.1 Points from Section 702 (Performance Path) shall not be combined with points from Section 703 (Prescriptive Path).			<b>Mandatory</b>											Performance path.
702.2 Energy efficiency features are implemented to achieve energy cost performance that exceeds ICC IECC by the following. A documented analysis using software in accordance with ICC IECC, Section 404, or ICC IECC Section 506.2 through 506.5, applied a														
(1) 15%		30	30	0			(30)							
(2) 30%		60					60	6,384		(60)				R-49 in ceiling, 1" foam sheathing, change window u-value to .30 from .35; reduce ACHnat by 50%; upgrade HVAC to 9.0 hspf from 7.7 and 16 SEER, and tankless water heater
(3) 50%		100								100	6,500	(100)		Closed loop solar hot water w/tankless backup.
(4) 60%		120										120	6,072	R-60 attic; 2" of exterior foam, triple pane u=.25 windows, 25% infiltration improvement; 18 SEER A/C; NOTE: hspf upgrades to 9.5
<b>703 Prescriptive Path</b>														
703.1 Building envelope. Where the total building thermal envelope UA is less than required by ICC IECC, Section 402.1.4, the total			Points per Table 703.1.1											
Sect. 703 pts.			0											
Practices 704			3											
<b>Table 703.1.1</b>														
Total Building Thermal Envelope UA														
Climate Zone														
		Zone 2	Zone 3											
10% UA improvement		10 points	12 points											
20% UA improvement		20 points	24 points											
		Zone 4	Zone 5-6											
10% UA improvement		14 points	16 points											
20% UA improvement		28 points	32 points											
		Zone 7-8												
10% UA improvement		18 points												

ANSI National Green Building Standard™		343	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
			Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
20% UA improvement		36 points											
<b>Addition Note:</b> Section 703.1.1 applies to the new construction		<b>0 Add'l Pts</b>											
<b>Renovation Note:</b> The existing whole building thermal envelope UA													
(1) If the overall thermal performance meets or exceeds the requirements of ICC IECC; Section 402.1.4; Section 703.1.1 applies to the renovation.		<b>Mandatory</b>											
requirements of ICC IECC, Section 402.1.4, the overall thermal													
(a) 15 percent		<b>15</b>											
(b) 30 percent		<b>30</b>											
(a) 45 percent, or meets the requirement of ICC IECC, Section		<b>45</b>											
703.1.2 The insulation installation is graded by a third party and is in accordance with Sections 703.1.2.1, 703.1.2.2, 703.1.2.3, and /or		Points per Table 703.1.2											
<b>Table 703.1.2</b>													
Insulation Installation Grades													
Grade	Points												
1	<b>15</b>												
2	<b>10</b>												
3	<b>0</b>												
703.1.2.1 Both Grade 1 and Grade 2 installations are in accordance													
(a) Grades apply to cavity fill insulation, continuous rigid insulation,													
(b) Insulation is installed in accordance with the manufacturer's													
(c) Wall cavity insulation is enclosed on all six sides, and is in													
703.1.2.2 Grade 1 installation in accordance with the following:													
(a) Insulation uniformly fills each cavity side-to-side and top-to-													
(b) Compression or incomplete fill amounts to no more than 2% or													
(c) Exterior rigid insulation shall have substantial contact with the													
(d) Cavity insulation is split, installed, and/or fitted tightly around wiring													
(e) Exterior sheathing is not visible from the interior through gaps in													
(f) Faced batt insulation is permitted to have side-stapled tabs,													
(g) ICFs, SIPs, and other wall systems that provide integral insulation													
(h) "Grade 1" insulation must meet or exceed all requirements of													
703.1.2.3 Grade 2 installation is in accordance with the following:													
(a) A maximum of 2% of the surface area of insulation is missing.													
(b) In conditioned basement or crawlspace the following apply:													
(i) insulation is installed in complete contact with the subfloor surfaces.													
(ii) Floor insulation over vented or ambient conditions is enclosed on													
(c) Floor insulation over unconditioned basements is not required to													
(d) Ceiling insulation is not required to be enclosed when the													
(e) Eave baffles or equivalent construction is installed to prevent wind													
(f) Installation with occasional installation defects is permitted: gaps													
703.1.2.4 Grade 3 installation is in accordance with the following:													
(a) Standard insulation installation not in accordance with Grade 1 or													
703.1.3 More than 75% of the above-grade exterior opaque wall area of the building is mass walls.		Points per Table 703.1.3											
<b>Table 703.1.3</b>													
Exterior Mass Walls													
		<b>Mass Construction</b>											
		3 in. to <6 in.	6 in.										
Climate Zones 1, 2, 3, 4 except marine, and 5 dry.		<b>4</b>	<b>6</b>										
Climate Zones 4 marine, 5 except dry, and 6.		<b>3</b>	<b>5</b>										
Climate Zones 7 and 8		<b>0</b>	<b>0</b>										
<b>703.2 Insulation &amp; Air Sealing</b>													
703.2.1 Insulation and air sealing is installed in accordance with all of													
(1) Third party verification performed.		<b>15</b>											
(2) No third party verification performed.		<b>3</b>											
703.2.1.1 GENERAL													
703.2.1.1.1 Air Barrier and Thermal Barriers													
(1) Thermal insulation is installed in substantial contact with interior													
(a) Any spray or rigid foam insulation with an air permeance of 0.02													
(b) ICFs, SIPs, and other wall systems that provide their own air													
(c) Spray foam that complies with the following:													
(i) continuously attached to the top, bottom and both sides of the													
(ii) Continuous in the cavity without any unrepaired breaks.													
(iii) air impermeable													
(d) Air impermeable insulation.													
(2) Voids or areas of incomplete fill (less than 30% of full thickness)													
(3) Insulation is in substantial contact with sheathing materials on one													
(4) Any exterior rigid insulation is tightly fitted or interlocking at the													
703.2.1.1.2 Plumbing and Wiring													
(1) At a minimum, insulation is placed between the outside (ceiling,													
(2) Batt insulation is split or cut to fit around wiring and plumbing.													
(3) Sprayed insulation is installed to encapsulate pipes where the pipe													
703.2.1.1.3 Narrow cavities are filled and batts are cut to fit.													
703.2.1.1.4 HVAC register boots that penetrate the building envelope													
703.2.1.1.5 Masonry fireplace equipped with gasketed doors, outside													
703.2.1.2 Air barrier is installed at any exterior edge of insulation at													
703.2.1.3 WALLS													
(1) Exterior walls behind the tub/shower are insulated and include an													
(2) Air sealed type electrical outlet boxes are installed or the air barrier													
(3) Duplex and townhouse construction: In the common walls													
(4) Skylight shafts and knee walls are air sealed. Insulation on attic													

ANSI National Green Building Standard™	343	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(5) Fireplace walls: Air barrier that is aligned with insulation; any gaps												
703.2.1.4 CEILINGS and ATTICS												
(1) At dropped ceilings and soffits, the air barrier is substantially												
(2) Access to vented attics, including knee wall doors, and/or drop												
(3) An insulated cover is gasketed or sealed to the attic opening												
<b>Addition Note:</b> Section 703.2.1 applies only to the new construction	0 Add'l Pts											
<b>Renovation Note:</b> The air infiltration of the existing whole building												
(1) Where the overall air infiltration rate is equal to or less than the	1 Add'l Pt											
(2) Where the overall air infiltration rate is greater than the												
(a) 15 percent	1 Add'l Pt											
(b) 30 percent	2 Add'l Pts											
(c) 50 percent	3 Add'l Pts											
<b>703.3 FENESTRATION</b>												
703.3.1 The NFRC-certified U-factor and SHGC for windows, exterior doors, skylights, and tubular daylighting devices (TDDs) are in accordance with Table 703.3.1(a) or (b). Decorative fenestration elements with a maximum of 15 square feet or 10% of the to	Points Per Tables 703.3.1(a) or 703.3.1(b)											
<b>Table 703.3.1(a) - Enhanced Fenestration Specifications</b>												
U-Factor and SHGC	Climate Zone											
Windows and Exterior Doors (maximum certified ratings)												
0.45 0.30	1 and 2	8										
0.35 0.30	3	8										
0.30 Any	4 and 5	5										
0.30 Any	6 and 8	6										
Skylights and TDDs (maximum certified ratings)												
0.55 0.35	1 to 3											
0.55 Any	4 to 8	included above										
<b>Table 703.3.1(b) - Enhanced Fenestration Specifications</b>												
U-Factor and SHGC	Climate Zone											
Windows and Exterior Doors (maximum certified ratings)												
0.45 0.25	1 and 2	10										
0.35 0.25	3	10										
0.25 Any	4 and 5	10										
0.25 Any	6 thru 8	12										
Skylights and TDDs (maximum certified ratings)												
0.50 0.35	1 to 3											
0.50 Any	4 to 8	included above										
<b>Addition Note:</b> Section 703.3.1 applies only to the new construction	0 Add'l Pts											
<b>Renovation Note:</b> Section 703.3.1 applies only to the replacement	2 Add'l Pts											
<b>703.4 HVAC Equipment Efficiency</b>												
703.4.1 Combination Space Heating and Water Heating System	4											
703.4.2 Furnace and/or boiler efficiency is in accordance with one of												
(1) <b>Table 703.4.2(1) Gas and propane heaters:</b>	Points per Table 703.4.2(1)											
<b>Table 703.4.2(1) - Gas / Propane Heaters</b>												
Climate Zone	AFUE	Points										
1	≥90%	0										
1	≥92%	0										
1	≥94%	0										
2	≥90%	2										
2	≥92%	2										
2	≥94%	3										
3	≥90%	5										
3	≥92%	6										
3	≥94%	7										
4	≥90%	8										
4	≥92%	9										
4	≥94%	10										
5	≥90%	11										
5	≥92%	12										
5	≥94%	14										
6 through 8	≥90%	14										
6 through 8	≥92%	15										
6 through 8	≥94%	17										
<b>Table 703.4.2(2) Oil Furnace:</b>	Points per Table 703.4.2(2)											
<b>Table 703.4.2(2) - Oil Furnace:</b>												
Climate Zone	AFUE	Points										
1	≥83%	0										
1	≥90%	0										
2	≥83%	1										
2	≥90%	2										
3	≥83%	3										
3	≥90%	5										
4	≥83%	3										
4	≥90%	8										
5	≥83%	7										
5	≥90%	11										
6 through 8	≥83%	7										
6 through 8	≥90%	14										

ANSI National Green Building Standard™		343	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
			Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
<b>(3) Gas Boiler:</b>		Points per Table 703.4.2(3)											
<b>Table 703.4.2(3) - Gas Boiler</b>													
Climate Zone	AFUE	Points											
1	≥85%	0											
1	≥90%	0											
1	≥94%	0											
2	≥85%	1											
2	≥90%	2											
2	≥94%	3											
3	≥85%	3											
3	≥90%	5											
3	≥94%	7											
4	≥85%	4											
4	≥90%	8											
4	≥94%	10											
5	≥85%	6											
5	≥90%	11											
5	≥94%	14											
6 through 8	≥85%	7											
6 through 8	≥90%	14											
6 through 8	≥94%	17											
<b>Table 703.4.3.2(4) Oil Boiler:</b>		Points per Table 703.4.2(4)											
<b>Table 703.4.2(4) - Oil Boiler</b>													
Climate Zone	AFUE	Points											
1	≥85%	0											
1	≥90%	0											
2	≥85%	1											
2	≥90%	2											
3	≥85%	3											
3	≥90%	5											
4	≥85%	4											
4	≥90%	8											
5	≥85%	6											
5	≥90%	11											
6 through 8	≥85%	7											
6 through 8	≥90%	14											
703.4.3 Boiler equipped with temperature reset control or burner		1											
703.4.4 Heat pump heating efficiency is in accordance with Table 703.4.4. Refrigerant charge is verified to be in conformance with		Points per Table 703.4.4											
<b>Table 703.4.4 - Heat Pump Heating</b>													
Climate Zone	Efficiency	Points											
1	8.2HSPF 11.5EER	0											
1	9.0HSPF 12.5EER	0											
2	8.2HSPF 11.5EER	1											
2	9.0HSPF 12.5EER	2											
3	8.2HSPF 11.5EER	2											
3	9.0HSPF 12.5EER	5											
4	8.2HSPF 11.5EER	5											
4	9.0HSPF 12.5EER	10											
5	8.2HSPF 11.5EER	7*											
5	9.0HSPF 12.5EER	11*											
6 through 8	8.2HSPF 11.5EER	7*											
6 through 8	9.0HSPF 12.5EER	12*											
*Zones 5-8 require consideration for use of resistance heat in cold													
703.4.5 Cooling efficiency is in accordance with one of the following. Refrigerant charge is verified for conformance with manufacturer's instructions.		Points per Table 703.4.5(1)											
<b>Table 703.4.5(1) - Air Conditioner and Heat Pump Cooling</b>													
Climate Zone	SEER (EER)	Points											
1	14 (11.5)	8											
1	15 (12.5)	12											
1	17 (12.5)	18											
1	19 (12.5)	24											
2	14 (11.5)	6											
2	15 (12.5)	10											
2	17 (12.5)	14											
2	19 (12.5)	18											
3	14 (11.5)	2											
3	15 (12.5)	4											
3	17 (12.5)	6											
3	19 (12.5)	8											
4	14 (11.5)	2											
4	15 (12.5)	3											
4	17 (12.5)	4											
4	19 (12.5)	4											
5	14 (11.5)	1											
5	15 (12.5)	2											
5	17 (12.5)	3											
5	19 (12.5)	3											

ANSI National Green Building Standard™		343	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
			Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
6 through 8	14 (11.5)	1											
6 through 8	15 (12.5)	2											
6 through 8	17 (12.5)	3											
6 through 8	19 (12.5)	3											
(2) Water Source and Cooled Air Conditioners		<b>Points per Table 703.4.5(2)</b>											
<b>Table 703.4.5(2) - Water Source and Cooled Air Conditioners</b>		<b>Points</b>											
Climate Zone	EER, COP												
1	15 4.0	18											
2	15 4.0	14											
3	15 4.0	6											
4	15 4.0	4											
5	15 4.0	3											
6 through 8	15 4.0	3											
703.4.6 Ground source heat pump is installed by a Certified													
(1) Open loop; ≥16.2 EER and ≥ 3.6 COP		20											
(2) Closed loop; ≥14.1 EER and ≥ 3.3 COP		20											
(3) Direct expansion; ≥15.0 EER and ≥ 3.5 COP		20											
(4) Any type (open, closed or direct expansion); ≥24 EER and ≥ 4.3		30											
703.4.7 ENERGY STAR, or equivalent, ceiling fans are installed.		1											
703.4.8 Whole building or whole dwelling unit fan(s) with insulated		2											
703.4.9 In multi-unit buildings, an advanced electric and fossil fuel													
(1) Install a device providing monthly consumption information.		1											
(2) Install a device that can provide near real-time energy		4											
703.4.10 An ENERGY STAR, or equivalent, programmable		1											
<b>Addition Note:</b> Section 703.4.10 applies to the new construction		0 Add'l Pts											
<b>Renovation Note:</b> Replace existing nonprogrammable thermostat.		1 Add'l Pt											
<b>703.5 Water Heating Design, Equipment, and Installation</b>													
703.5.1 Water heater Energy Factor (EF) is equal to or greater than		<b>Points Per Tables 703.5.1(1)(a) or 703.5.1(1)(b)</b>											
(1) Gas Water Heating													
<b>Table 703.5.1(1)(a) - Gas Water Heating</b>		<b>POINTS</b>											
(Storage with input rate of 75,000 Btu/hr or less or instantaneous input													
Size (gallons)	Energy Factor												
30 to < 40	0.64	1											
40 to < 50	0.62	1											
50 to < 65	0.6	1											
65 to < 75	0.58	1											
75	0.56	1											
Any	0.8	10											
<b>Table 703.5.1(1)(b) - Gas Water Heating</b>													
(Storage with input rate of greater than 75,000 Btu/hr or													
Size (gallons)	Thermal Efficiency	<b>POINTS</b>											
Any	82-86%	1											
Any	> 86%	10											
(2) Electric Water Heating		<b>Points Per Tables 703.5.1(2)</b>											
<b>Table 703.5.1(2) - Electric Water Heating</b>		<b>POINTS</b>											
Size (gallons)	Energy Factor												
30 to < 40	0.95	1											
40 to < 50	0.94	1											
50 to < 65	0.92	1											
65 to < 80	0.9	1											
80 to < 100	0.88	1											
100	0.86	1											
(3) Oil Water Heating		<b>Points per Table 703.5.1(3)</b>											
<b>Table 703.5.1(3) - Oil Water Heating</b>		<b>POINTS</b>											
Size (gallons)	Energy Factor												
30 to < 50	0.59	1											
50	0.55	1											
(4) Heat Pump Water Heating		<b>Points per Table 703.5.1(4)</b>											
<b>Table 703.5.1(4) - Heat Pump Water Heating</b>		<b>POINTS</b>											
	Energy Factor												
Heat Pump	1.5	7											
Heat Pump	2	10											
703.5.2 Desuperheater, s installed by a qualified installer or is pre-installed in the factory.		<b>Points per Table 703.5.2</b>											
<b>Table 703.5.2 - Desuperheater</b>		<b>Points for Desuper heater</b>											
Climate Zone													
Zone 1-4		5											
Zone 5-8		2											
703.5.3 Drain-water heat recovery system is installed in multi-family		2											
703.5.4 Insulating hot water pipes													
703.5.4.1 Hot water lines are insulated with a minimum of R-4		1											
703.5.4.2 Boiler supply piping is insulated in unconditioned spaces.		1											
<b>Addition Note:</b> Section 703.5.4 applies only to the new or modified		0 Add'l Pts											
<b>Renovation Note:</b> Where hot water lines in the existing building are		1 Add'l Pt											
703.5.5 Indirect fired water heater storage tanks heated from boiler		1											
<b>704 Additional Practices</b>													

ANSI National Green Building Standard™		343	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
			Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
<b>704.1 Application of Additional Practice Points.</b> Points from Section 704 can be added to points earned in Section 702 (Performance Path), Section 703 (Prescriptive Path) or Section 701.1.3 (alternative Bronze Level compliance).													
<b>704.2 Lighting and Appliances</b>													
704.2.1 Hard-wired lighting meets one of the following:													
(1) A minimum of 50% of the total hard-wired lighting fixtures, or the bulbs in those fixtures, qualify as ENERGY STAR or equivalent.		4	4	0									CFLs.
(2) A minimum of 50% of the total hard-wired lighting fixtures qualify as ENERGY STAR or equivalent.		8							4	125			\$25 per fixture; 5 fixtures
(3) A minimum of 80% of the exterior lighting wattage has an efficiency of at least 40 lumens per watt or be a solar powered light fixture.													
704.2.2 The number of recessed light fixtures that penetrate the thermal envelope are less than 1 per 400 square feet of total conditioned floor area and are in accordance with Section 701.4.3.4(2).		2	2	0									No recessed.
704.2.3 Occupancy sensors are installed on indoor lights, and photo or motion sensors are installed on outdoor lights to control lighting.													
(1) 25% of lighting		2											
(2) 50% of lighting		4											
704.2.4 Tubular daylighting device (TDD) or a skylight with sealed, insulated, low-E glass is installed in rooms without windows. (Points awarded per building.)		2											
704.2.5 ENERGY STAR or equivalent appliance(s) are installed:													
(1) Refrigerator		5											A8.0 "Refrig by others" presumably owner.
(2) Dishwasher		2	2	0									A8.0
(3) Washing machine		4											
704.2.6 Induction cooktop is installed.		1											
704.2.7 Occupancy sensors are installed for a minimum of 80% of hardwired lighting outlets.		1											
<b>704.3 Renewable Energy/Solar Heating and Cooling</b>													
<b>704.3.1 Solar space heating and cooling.</b>													
704.3.1.1 Sun-tempered Design: Building orientation, sizing of glazing, and design of overhangs are in accordance with all of the following:		5											
(1) The long side (or one side if of equal length) of the building faces within 20° of true south.													
(2) Vertical glazing area is between 5% and 7% of gross Conditioned Floor Area on the south face (also see Section 704.3.1.1(8)).													
(3) Vertical glazing area is less than 2% of gross Conditioned Floor Area on the west face, and glazing is ENERGY STAR compliant or equivalent.													
(4) Vertical glazing area is less than 4% of gross Conditioned Floor Area on the east face and glazing is ENERGY STAR compliant or equivalent.													
(5) Vertical glazing area is less than 8% of gross Conditioned Floor Area on the north face, and glazing is ENERGY STAR compliant or equivalent.													
(6) Skylights, where installed, are in accordance with the following:													
(a) Shades and insulated wells are used and all glazing is ENERGY STAR compliant or equivalent.													
(b) Horizontal skylights are less than 0.5 % of Finished Ceiling Area													
(c) Sloped skylights on slopes facing within 45° of true South, East or West are less than 1.5% of the Finished Ceiling area													
(7) Overhangs or adjustable canopies or awnings or trellises provide shading on south facing glass for the appropriate climate zone in accordance with Table 704.3.1.1:													
<b>Table 704.3.1.1 Southern Window Overhang Depth</b>													
Climate Zone and Overhang Depth													
1 through 3	2' 8"												
1 through 3	2' 8"												
1 through 3	2' 4"												
1 through 3	2' 0"												
1 through 3	2' 0"												
4 through 6	2' 4"												
4 through 6	2' 4"												
4 through 6	2' 0"												
4 through 6	2' 0"												
4 through 6	1' 8"												
7 and 8	2' 0"												
7 and 8	1' 8"												
7 and 8	1' 8"												



ANSI National Green Building Standard™		343	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
			Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
7 and 8	1' 4"	≤4' 4"											
7 and 8	1' 0"	≤3' 4"											
(8) The south face windows have a SHGC of 0.40 or higher.													
(9) Return air or transfer grilles/ducts are in accordance with Section 704.4.5.													
704.3.1.2 Automated solar protection is installed to provide shading for windows.													
			1										
704.3.1.3 Passive cooling design features are in accordance with three or more of the following:													
Points for three items:													
Points for one additional item:													
			3										
			1										
(1) Exterior shading is provided on east and west windows using one or a combination of the following strategies:													
(a) Vine covered trellises with the vegetation separated a minimum of 1 foot from face of building.													
(b) Moveable awnings or louvers													
(c) Covered porches													
(d) Attached or detached conditioned/unconditioned enclosed space that provides full shade of east and west windows (e.g., detached garage, shed or building)													
(2) Overhangs are installed to provide shading on south-facing glazing in accordance with Section 704.3.1.1(7). (Points not awarded if points are taken under 704.3.1.1.)													
(3) Windows and/or venting skylights are located to facilitate cross ventilation.													
(4) Solar reflective roof or radiant barrier is installed in Climate Zones 1, 2 or 3 and roof material meets a 3 year aged criteria of 0.50.													
(5) Internal exposed thermal mass is a minimum of three inches in thickness. Thermal mass consists of concrete, brick, and/or tile that are fully adhered to a masonry base or other masonry material and is in accordance with one or a combination of the fo													
(a) A minimum of one square foot of exposed thermal mass of floor per three square feet of gross finished floor area.													
(b) A minimum of three square feet of exposed thermal mass in interior walls or elements per square foot of gross finished floor area.													
(6) Roofing material is installed with a minimum 0.75 inch continuous air space offset from the roof deck from eave to ridge.													
704.3.1.4 Passive solar heating design. In addition to the sun-tempered design features in Section 704.3.1.1, all of the following are implemented:													
			4										
(1) Additional glazing, no greater than 12%, is permitted on the south wall. This additional glazing is in accordance with the requirements in Section 704.3.1.1.													
(2) Additional thermal mass for any room with south-facing glazing of more than 7% of the finished floor area is provided in accordance with the following:													
(a) Thermal mass is solid and a minimum of 3" in thickness. Where two thermal mass materials are layered together (e.g. ceramic tile on concrete base) to achieve the appropriate thickness, they are fully adhered to (touching) each other.													
(b) Thermal mass directly exposed to sunlight must be provided in the following minimum ratios:													
(i) Above latitude 35°: 5 square feet of thermal mass for every 1 square foot of south facing glazing.													
(ii) Latitude 30° to 35°: 5.5 square feet of thermal mass for every 1 square foot of south facing glazing.													
(iii) Latitude 25° to 30°: 6 square feet of thermal mass for every 1 square foot of south facing glazing.													
(c) Thermal mass not directly exposed to sunlight is permitted to be used to achieve thermal mass requirements of Section 704.3.1.4 (2) based on a ratio of 40 square feet of thermal mass for every 1 square foot of south facing glazing.													
(3) In addition to return air or transfer grilles/ducts required by Section 704.3.1.1, provisions for forced airflow to adjoining areas are implemented as needed.													
704.3.2 Solar water heating													
704.3.2.1 Solar water heater. SRCC (Solar Rating & Certification Corporation) OG 300 rated, or equivalent, solar domestic water heating system is installed. Solar Energy Factor (SEF as defined by SRCC) is in accordance with Table 704.3.2.1.													
<b>Table 704.3.2.1 - Solar Hot Water Systems</b>													
SEF - Electric Tank		SEF - Gas Tank	<b>POINTS</b>										
1.30 - 1.50		0.85 - 1.00	8										

ANSI National Green Building Standard™		343	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
			Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
1.51 - 1.80	1.01 - 1.20	11											
1.81 - 2.30	1.21 - 1.50	14											
2.31 - 3.00	1.51 - 2.00	17											
3.01	2.01	20											
<b>704.3.3 Additional renewable energy options</b>													
704.3.3.1 Photovoltaic panels are installed on the property. (Points awarded per every 100 watts DC of the rated PV system)													
		1											
704.3.3.2 Other onsite renewable energy source is installed (e.g., wind energy, onsite micro-hydro power, active solar space heating systems). (Points awarded per every 1/10 kW of the system)													
		0.5											
<b>704.4 Ducts</b>													
704.4.1 Duct system is sized, designed, and installed according to ACCA Manual D or equivalent.													
		5	5	0									2006 IECC M1601.1
704.4.2 Space heating is provided by a system that does not include air ducts.													
		15											
704.4.3 Space cooling is provided by a system that does not include air ducts.													
		15											
704.4.4 Ductwork is in accordance with all of the following:													
		12	12	0									A2.0
(1) Building cavities are not used as return ductwork.													
(2) Heating and cooling ducts and mechanical equipment are installed within the conditioned building space .													
(3) Ductwork is not installed in exterior walls													
704.4.5 Return ducts or transfer grilles are installed in every room with a door. This practice does not apply to bathrooms, kitchens, closets, pantries, and laundry rooms.													
		5	5	0									Plans indicate returns every room.
<b>704.5 HVAC Design and Installation</b>													
704.5.1 ACCA Manual S or equivalent is used to select heating and/or cooling equipment.													
		1							1	0			The code does not require Manual S, however, Manual D, code required; references
704.5.2 HVAC contractor and service technician are certified by a nationally or regionally recognized program such as North American Technician Excellence, Inc. (NATE), Building Performance Institute (BPI), Radiant Panel Association, or manufacturers' tr													
		1							1	0			Standard.
704.5.3 Performance of the heating/cooling system is verified by the HVAC contractor in accordance with all of the following:													
		3									3	0	Specify in scope.
(1) Start-up procedure is performed according to manufacturer's instructions.													
(2) Refrigerant charge is verified by super-heat and/or sub-cooling method.													
(3) Burner is set to fire at nameplate input.													
(4) Air handler setting/fan speed is set per manufacturer's instructions.													
(5) Total air flow is within 10% of design flow.													
(6) Total external system static does not exceed equipment capability at rated airflow.													
											149		Allow team of 2.2 hours at field rate.
704.5.4 HVAC equipment operates using an alternate refrigerant containing no HCFCs. (Points awarded only until January 20, 2010.)													
		1							1	0			Trane and others include 15' of line set alternate refrigerant with product.
704.5.5 Manufacturer's label or printed specifications for sealed air handler (except furnaces) indicates the leakage is less than or equal to 2% of design airflow at a pressure of 1-inch w.g. (1250 Pa). Air handlers are tested with inlets, outlets, an													
		4											
<b>704.6 Installation and Performance Verification</b>													
704.6.1 Third party onsite inspection is conducted to verify conformance with all of the following, as applicable. Minimum of 2 inspections are performed. One inspection after insulation is installed and prior to being covered, and another inspection upon completion of the project. Where multiple building or dwelling units of the same model are built by the same builder, a representative sample inspection of a minimum of 15% of the buildings or dwelling units is permitted.													
		5	5	0									Included in TBC with EStar inspection.
(1) Ducts are installed per IRC/IMC and ducts are sealed.													
(2) Building envelope air sealing is installed.													
(3) Insulation is installed in accordance with Section 703.1.2													
(4) Windows, skylights, and doors are flashed, caulked, and sealed in accordance with manufacturer's recommendations and in accordance with Section 703.2.1.													
704.6.2 Third party testing is conducted to verify performance.													
704.6.2.1 Building envelope leakage rate is demonstrated by blower door test. In addition to the test, the following practices are required:													
1. Whole building ventilation is provided in accordance with Section 902.2.													

ANSI National Green Building Standard™	343	Baseline		Bronze		Silver		Gold		Emerald		NOTES:	
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost		
2. Fossil fuel furnace and water heater is sealed combustion or power vented in accordance with Section 901.1.													
3. Fireplaces and Fuel Burning Appliances are in accordance with 901.2.													
<b>The maximum leakage rate is in accordance with:</b>													
(a) 5 ACH50	0.25 nat	3											
(b) 4 ACH50	0.2	6						6	0	(6)	0	Technically qualified for 6 points at silver	
(c) 3 ACH50	0.15	9								9	0	\$ included in performance rating	
(d) 2 ACH50	0.1	12											
(e) 1 ACH50	0.05	15											
704.6.2.2 The entire central HVAC duct system, including air handlers and register boots, is tested for leakage at a pressure differential of 0.1 inches w.g. (25 Pa). The maximum leakage as a percent of the system design flow rate is in accordance with													
(1) 6% for ductwork entirely outside the building's thermal envelope.		15										See 704.6.1(1) for cost of duct seal. BD and DB tests here not subtracted.	
(2) 6% for ductwork entirely inside the building's thermal envelope.		5	0									Move ducts and A/H inside building envelope. Cost is SF price to consumer given up to equipment -	
(3) 6% for ductwork both inside and outside the building thermal envelope.		15											
704.6.2.3 Balanced HVAC air flows are demonstrated by flow hood or other acceptable flow measurement tool. Test results in accordance with both of the following:		8								8	298	4 hours 2 technicians.	
(a) Measured flow at each supply and return register is within 25% of design flow.												incl	
(b) Total airflow is within 10% of design flow.												incl	
<b>705 Innovative Practices</b>													
<b>705.1 Energy consumption control.</b> A whole building or whole dwelling unit device is installed that controls or monitors energy consumption.		7 Points Max											
(1) Programmable communicating thermostat		2				2	0					Check w/ Dominion Power or similar for free device <a href="http://dom.mediareoom.com/index.php?s=43&amp;item=784">http://dom.mediareoom.com/index.php?s=43&amp;item=784</a>	
(2) Energy monitoring device		4											
(3) Energy management control system		7											
705.2 Renewable energy service plan is as follows:													
(1) Builder selects a renewable energy service plan provided by the local electrical utility for interim (temporary) electric service. The builder's local administrative office has renewable energy service.		2											
(2) The buyer of the home selects a renewable energy service plan provided by the utility prior to occupancy of the home.		5											
<b>CHAPTER 8: WATER EFFICIENCY</b>		Base Pts.	8	0	6	0	24	525	15	0	8	382	Ch. 8 Subtotal
<b>801 Indoor and Outdoor Water Use</b>		Cost/Point		0		0		21.875				48	
801.0 Intent. Measures that reduce indoor and outdoor water usage are implemented.													
801.1. Indoor hot water usage is reduced by one of the following practices:													
(1) All hot water piping which runs to the plumbing fixtures in both the kitchen and bathrooms is 40-feet or less in length from the water heater and is sized in accordance with the code for the specified application.		2	2	0									Water heater location in attic.
(2) All hot water piping which runs to the plumbing fixtures in both the kitchen and bathrooms is 30-feet or less from the water heater and is sized in accordance with the code for the specified application.		3											Runs can be minimized further by locating the water at midpoint of bath and kitchen.
(3) One of the following piping system designs is implemented:													
(a) Use of structured-type plumbing with demand controlled hot water loops, in which the volume of water contained in the pipe and fixture fittings downstream of the recirculating trunk line is a maximum of 4 cups (0.25 gallons).		6											
(b) Implement an engineered parallel piping system (i.e. manifold system) in which the hot water line distance from the water heater to the parallel piping system is less than 15 feet and the parallel piping to the fixture fittings contains a maximum of 8		6											
(c) Central core plumbing system with all plumbing fixture fittings (e.g., faucets & showerheads) located such that the volume of water contained in each pipe run between the water heater and fixture fitting is a maximum of 6 cups (0.38 gallons).		8											
(4) Pipe runs exceeding 40-feet from the water heater to fixture locations are aided by one of the following:		1											
(a) Tankless water heater is installed at point of use and is served only by cold water or a solar-assisted system.													
(b) On demand hot water recirculation system is installed.													
801.2 Energy Star® or equivalent water-conserving appliances are installed													
(1) Dishwasher		2	2	0									

ANSI National Green Building Standard™	343	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(2) Washing machine	8											
(3) Washing machine with a water factor of 6.0 or less	12											
801.3 A minimum of one food waste disposer is installed at the primary kitchen sink.	1	1	0									
<b>801.4 Showerheads</b>												
801.4 (1&2) 1) The total showerhead flow rate at any point in time, for all showerheads in each shower compartment is less than 2.5 gpm, tested at 80 psi per ASME A112.18.1/CSA B125.1. 2) In addition the showerheads must be equipped with an automatic com	1 Point (3 Points Max)	2	0									Showerhead flow rate max. EPA is 2.5.
801.4 (3&4) All shower compartments in the home comply with 801.4 (1&2).												
(3) All shower compartments installed meet the above conditions and are 2.0 to less than 2.5 gpm.	1 Add'l Pt	1	0	-1	0							
(4) All shower compartments installed meet the above conditions and are 1.6 to less than 2.0 gpm.	2 Add'l Pts			2	0							Specify lower flow rate faucet/aerator.
<b>801.5 Faucets</b>												
801.5.1 Water-efficient lavatory faucets with 1.5 gpm or less maximum flow rate when tested at 60 psi in accordance with ASME A112.18.1 are installed.												
(1) a bathroom (Points awarded for each bathroom.)	3 Pts Max			3	0							
(2) all lavatory faucets in the home meet the conditions of 801.5.1	2 Add'l Pts			2	0							
(1) Gold and Emerald Levels: All water closets and urinals are in accordance with either Section 801.6 or 802.2.	Mandatory											
(2) A water closet is installed with an effective flush volume of 1.28 gallons or less when tested in accordance with ASME A112.19.2 (all water closets) and ASME A112.19.14 (all dual flush water closets), and is in accordance with EPA WaterSense Tank-Typ	6 18 Pts Max					18	525					Install low flow toilet.
(3) A urinal is installed with a flush volume of 0.5 gallons or less when tested in accordance with ASME A112.19.2.	4 Max 4 Points											
4) All water closets and all urinals are in accordance with Section 801.6(2) or Section 801.6(3), as applicable.	6 Add'l Points					6	0					
<b>801.7 Irrigation systems</b>												
801.7.1 A low-volume, irrigation system is installed for each landscape type utilized: (Points awarded for each type of irrigation system installed.)	10 Pts. Max											
(1) High distribution uniformity (DU) rotating spray heads	2											
(2) Drip irrigation	4											
(3) Bubblers	4											
(4) Drip emitters	4											
(5) Soaker hose	4											
(6) Subsurface irrigation	6											
801.7.2 Irrigation system is in accordance with both of the following:	3											
1) designed by a professional in accordance with EPA WaterSense requirements or equivalent												
2) installed in accordance with EPA WaterSense program or equivalent												
801.7.3 Irrigation system is zoned separately for turf and bedding areas.	2											
801.7.4 The irrigation system(s) is controlled by a smart controller:												
(1) Evapotranspiration (ET) based irrigation controller with a rain sensor	4											
(2) Soil moisture sensor based irrigation controller	4											
(3) No irrigation is installed and a landscape plan is developed in accordance with Section 503.5(1) as applicable. (Points must be taken in 503.5(1) in order to receive points for 801.7.4(3))	15							15	0			
801.8 Rainwater collection and distribution is provided.												
(1) Rainwater is collected and used	6									6	382	
(2) Rainwater is distributed using a renewable energy source or gravity.	2									2	0	Distribution by gravity.
801.9 Water Filters. Water filter is installed to improve water quality for the whole building or whole dwelling unit.	1											
802.1 Gray water (as specified in ICC IRC, Appendix O) is separated and reused, as permitted by local building code. (Points awarded for either Section 802.1(1) or 802.1(2), not both)												
(1) Each water closet flushed by reclaimed or recycled water.	4 Points (per fixture)											
(2) Irrigation from reclaimed or recycled water onsite	10											
802.2 Composting or waterless toilets and/or urinals. Composting or waterless toilets and/or urinals are in accordance with the following: (For water closets, points awarded for either Section 802.2 or 801.6, but not both)	24 Points Max											

ANSI National Green Building Standard™	343	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
1) Gold and emerald levels: All water closets and urinals are in accordance with either Section 802.2 or Section 801.6.	<b>Mandatory</b>											
2) Composting or waterless toilet and/or urinal is installed. (Points awarded per fixture)	8											
3) All toilets and urinals are in accordance with Section 802.2 (2).	<b>8 Add'l Points</b>											
802.3 Automatic shutoff water devices. One of the following automatic shutoff water supply devices is installed. Where a fire sprinkler system is present, installer is to ensure the device will not interfere with the operation of the fire sprinkler system	2											
(1) Excess Water Flow Shutoff												
(2) Leak Detection System												
<b>CHAPTER 9: INDOOR ENVIRONMENTAL QUALITY</b>	<b>Base Pts.</b>	103	0	8	0	20	44	8	0	26	1,796	<b>Ch. 9 Subtotal</b>
901 Pollutant Source Control	<b>Cost/Point</b>		0		0		2		0		69	
901.0 Intent. Pollutant sources are controlled.												
901.1 Space and water heating options												
901.1.1 Natural draft space heating or water heating equipment is not located in conditioned spaces, including conditioned crawl spaces. Natural draft equipment is permitted to be installed within the conditioned spaces if located in a mechanical room that has an outdoor air source, and is otherwise sealed and insulated to separate it from the conditioned space(s).	5											Furnace and water heater are electric.
901.1.2 Air handling equipment or return ducts are not located in the garage, unless placed in isolated, air-sealed mechanical rooms with an outside air source.	5	5	0									
901.1.3 The following combustion space heating and water heating equipment is installed within conditioned space.												Electric appliances.
(1) Direct vent furnace or boiler	5											
(2) (a) Power vent water heater	3											
(b) Direct vent water heater	5											
901.1.4 The following electric equipment is installed:												
1) Heat pump air handler in unconditioned space	2											
2) Heat pump air handler in conditioned space	5	5	0									Costs to move into conditioned space in 704.6.2.2.(2). Cost of higher eff. in 702.
901.2 Fireplaces and Fuel Burning Appliances (except cooking appliances, clothes dryers, water heaters, and furnaces) located in conditioned space are code compliant, vented to the outdoors, and have adequate combustion and ventilation air provided to minimize spillage or back-drafting, in accordance with the following: <u>All of the following items are mandatory, if applicable, for certification.</u>												
901.2.1(1) Natural gas and propane fireplaces that are power vented or direct vented, are equipped with permanently fixed glass fronts or gasketed doors, and comply with ANSI Z21.88/CSA 2.33a or ANSI Z21.50/CSA 2.22	7											
901.2.1(2)(a) Wood burning fireplaces are equipped with gasketed doors designed to operate with the doors closed, outside combustion air, and a means is provided for sealing the flue to minimize interior air (heat) loss when not in operation.	4											
901.2.1(2)(b) Factory-built wood burning fireplaces are in accordance with the certification requirements of UL 127 and are EPA certified.	6											
901.2.1(2)(c) Wood stove and fireplace inserts, as defined in UL 1482, Section 3.8 are in accordance with the certification requirements of UL 1482 and are in accordance with the emission requirements of the EPA Certification and the State of Washington W	6											
901.2.1(2)(d) Pellet (biomass) stoves and furnaces are in accordance with the requirements of ASTM E1509 or are EPA Certified.	6											
901.2.1(2)(e) Masonry heaters are in accordance with the definitions in ASTM E1602 and ICC IBC, Section 2112.1.	6											
901.2.2 Fireplaces, woodstoves, pellet stoves, or masonry heaters are not installed.	7	7	0									
901.3 Garages are in accordance with the following:												
901.3(1)(a) Where installed in the common wall between the attached garage and conditioned space, the door is tightly sealed and gasketed.	<b>Mandatory 2 Points</b>	0	0									
901.3(1)(b) A continuous air barrier is provided between walls and ceilings separating the garage space from the conditioned living spaces.	<b>Mandatory 2 Points</b>	0	0									

ANSI National Green Building Standard™	343	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
901.3(1)(c) For one and two-family dwelling unit attached garages, a 100 cfm or greater ducted, or 70 cfm or greater unducted wall exhaust fan is installed and vented to the outdoors, designed and installed for continuous operation, or has controls (e.g., motion detectors, pressure switches) that activate operation for a minimum of 1 hour when either human passage door or roll-up automatic doors are operated. For ducted exhaust fans, the fan airflow rating and duct sizing are in accordance with Appendix A. (If you claim points for 901.3(1)(c), you cannot claim points for 901.3(2).	4											
901.3(2) A carport is installed, the garage is detached from the building, or no garage is installed. (If you claim points for 901.3(2), you cannot claim points for 901.3(1)(a), 901.3(1)(b), or 901.3(1)(c).	10	10	0									
901.4(2-6) Wood Materials. A minimum of 85% of material within a product group (i.e. wood structural panels, countertops, composite trim/doors, custom woodwork, and/or component closet shelving) is manufactured in accordance with the following:	10 points max.											
901.4(1) Structural plywood used for floor, wall, and/or roof sheathing is compliant with DOC PS 1 and/or DOC PS 2. OSB used for floor, wall, and/or roof sheathing is compliant with DOC PS 2. The panels are made with moisture-resistant adhesives. The trademark indicates these adhesives as follows: Exposure 1 or Exterior for plywood, and Exposure 1 for OSB.	Mandatory	0	0									
(2) Particleboard and MDF (medium density fiberboard) is manufactured and labeled in accordance with CPA A208.1 and CPA A208.2, respectively.	2 Points per Product Group							2	0			Specify for kitchen cabinets and all interior products.
(3) Hardwood plywood is in accordance with HPVA HP-1 and HUD Title 24, Part 3280.	2 Points per Product Group							2	0			Specify for kitchen cabinets and all interior products.
(4) Particleboard, MDF, or hardwood plywood is in accordance with CPA 2.	3 Points per Product Group											
(5) Composite wood or agrifiber panel products contain no added urea-formaldehyde or are in accordance with the CARB Composite Wood Air Toxic Contaminant Measure Standard.	4 Points per Product Group							4	0			Specify for interior doors and trim.
(6) Non-emitting products.	4 Points per Product Group											
<b>Renovation Note:</b> Additional points for Section 901.4 apply to renovations that replace all existing countertops, shelving, and other nonstructural products.	2 Add'l Pts											
901.5 Carpets are in accordance with the following:												
901.5(1) Wall-to-wall carpeting is not installed adjacent to water closets and bathing fixtures.	Mandatory	0	0									No carpeting is installed. Laminated wood product.
901.5(2) A minimum of 85% of installed carpet area, carpet cushion (padding), and carpet adhesives are in accordance with the emission levels of CDPH 01350, as certified by a third-party program, such as the Carpet and Rug Institute's (CRI) Green Label Pl												No padding installed.
(a) Carpet	6	6	0									
(b) Carpet cushion	2					2	0					Specify.
(c) Carpet adhesives	2					2	0					Specify.
901.6 Hard-surface flooring. A minimum of 85% of installed hard-surface flooring is in accordance with the emission concentration limits of CDPH 01350 (using the office scenario), as certified by a third-party program, such as the RFC's FloorScore Indoor Air Certification Program or the Greenguard Environmental Institute's Children and Schools Certification Program.	6											
901.7 Wall coverings. A minimum of 85% of wall coverings are in accordance with the emission concentration limits of CDPH 01350 (using the office scenario), as certified by a third-party program, such as the Scientific Certification Systems (SCS) Indoor Advantage Gold Program or the Greenguard Environmental Institute's Children and Schools Certification Program.	4											
901.8 Architectural coatings. A minimum of 85% of the architectural coatings are in accordance with one of the following conditions:												
901.8.1 Site-applied interior products are in accordance with one or more of the following; not both.	5											Can't take points here.
(1) Zero VOC, determined by EPA Method 24 (VOC content below the detection limit for the method).												
(2) CARB Suggested Control Measure for Architectural Coatings												
(3) GS-11												
(4) VOC limits in accordance with:												
(a) 50 grams/liter flat												
(b) 100 grams/liter non flat												
(c) 350 grams/liter clear wood varnish												
(d) 550 grams/liter clear wood lacquer												

ANSI National Green Building Standard™	343	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
901.8.2 Site-applied interior products are in accordance with the emissions levels of CDPH 01350, as certified by a third party program such as the Scientific Certification Systems (SCS) Indoor Advantage Gold Program or the Greenguard Environmental Institute's Children and Schools Certification Program.	8	0										
901.9 Adhesives and Sealants.												
901.9.1 For exterior low-VOC adhesives and sealants, a minimum of 85% of site-applied products used for the installation of subfloors and on the exterior of the project are in accordance with one of the following:	5	0										
(1) The California Air Resources Board consumer products regulation as follows:	5											
a) Construction Adhesives: VOC content not to exceed 7% by weight or 75 grams/liter, whichever is greater.												
b) The VOC content of reactive sealants (i.e., silicones, polyurethanes, and hybrids, such as MS Polymer and silylated polyurethane resin or SPUR) not to exceed 4% by weight or 50 grams/liter, whichever is greater.												
c) The VOC content of all other caulks and sealants not to exceed 2% by weight or 30 grams/liter, whichever is greater.												
(d) The VOC content of contact adhesives not to exceed 55% by weight or 480 grams/liter, whichever is greater.												
(2) GS-36												
901.9.2 Interior Low-VOC Adhesives and Sealants. For interior low VOC adhesives and sealants, a minimum of 85% of site-applied products used within the interior of the building are in accordance with one of the following, as applicable:												
1) CDPH 01350, as certified by a third party program, such as Scientific Certification Systems (SCS) Indoor Advantage Gold Program or the Greenguard Environmental Institute's Children and Schools Certification Program.	5	0								5	0	
(2) GS-36	5											
901.10 Cabinets. A minimum of 85% of kitchen and bath vanity cabinets are in accordance with one of the following: <b>(Where more than one of the following practices is used, the practice with the fewer number of points is awarded)</b>												
(1) Kitchen and bath vanity cabinets in accordance with KCMA ESP 01, or equivalent, are installed.	2					2	0					
(2) Kitchen and bath vanity cabinets in accordance with CARB Composite Wood Air Toxic Contaminant Measure Standard are installed.	3											Require better specs on cabinets.
(3) Kitchen and bath vanity cabinets are installed that contain no added urea formaldehyde or are in accordance with GGPS.EC.010.R0, ASTM D6670, or equivalent.	5											
901.11 Insulation is in accordance with the following:												
(1) Formaldehyde emissions of wall, ceiling, and floor insulation materials are in accordance with the emissions levels of CDPH 01350, as certified by a third-party program, such as the GREENGUARD Environmental Institute's Children and Schools Certification Program or the Scientific Certification Systems (SCS) Indoor Advantage Gold Program.	4					4	0					Insulation can be respected to meet this criteria.
(2) Formaldehyde emissions of duct insulation materials are in accordance with the emissions levels of CDPH 01350, as certified by a third-party program, such as the GREENGUARD Environmental Institute's Children and Schools Certification Program or the Scientific Certification Systems (SCS) Indoor Advantage Gold Program.	1					1	0					Specify.
901.12 A carbon monoxide (CO) alarm is installed in a central location outside of each separate sleeping area in the immediate vicinity of the bedrooms. The CO alarm(s) is located in accordance with NFPA 720 and is hard-wired with a battery back-up. The alarm device(s) is certified by a third party for conformance with either CSA 6.19 or UL 2034.	3											
901.13 Building entrance pollutants control. Pollutants are controlled at all main building entrances by one of the following methods:												
(1) Exterior grilles or mats are installed in a fixed manner and may be removable for cleaning.	1					1	44					
(2) Interior grilles or mats are installed in a fixed manner and may be removable for cleaning.	1											
901.14 Non-smoking areas. All interior common areas of a multi-unit building are designated as non-smoking areas with posted signage.	1											

ANSI National Green Building Standard™	343	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
<b>902 Pollutant Control</b>												
902.0 Intent. Pollutants generated in the building are controlled.												
902.1.1 Spot ventilation is in accordance with the following:												
(1) Bathrooms (including powder rooms) are vented to the outdoors. The minimum ventilation rate is 50 cfm for intermittent operation or 20 cfm for continuous operation in bathrooms.		0	0									Complies.
Mandatory												
(2) Clothes dryers are vented to the outdoors.		0	0									Complies.
Mandatory												
(3) Kitchen exhaust units and/or range hoods are ducted to the outdoors and have a minimum ventilation rate of 100 cfm for intermittent operation or 25 cfm for continuous operation.		8	0									See also 904.2
8												
902.1.2 Bathroom and/or laundry exhaust fan is provided with an automatic timer and/or humidistat:		9 Points Max										
1) for first device		5	5	0								
2) for each additional device		2	4	0								n/a
902.1.3 Kitchen range, bathroom, and laundry exhaust are verified to specification. Ventilation airflow at the point of exhaust is tested to a minimum of 100 cfm intermittent or 25 cfm continuous for kitchens, and 50 cfm intermittent or 20 cfm continuous		8								8	149	2 field personnel 2 hours, however supply side ventilation is already provided.
902.1.4 Exhaust fans are ENERGY STAR as applicable.		Max. 6 Points										
(1) ENERGY STAR, or equivalent, fans (Points awarded per fan)		2	6	0								
(2) ENERGY STAR, or equivalent, fans operating at or below 1 sone (Points awarded per fan)		3										
902.2. Building ventilation systems.												
902.2.1 One of the following whole building ventilation systems is implemented and is in accordance with the specifications of Appendix B. (Points must be claimed in 902.2.1 to claim points in 902.2.2.)												
(1) Exhaust or supply fan(s) ready for continuous operation and with appropriately labeled controls.		8	8	0								
(2) Balanced exhaust and supply fans with supply intakes located in accordance with the manufacturer's guidelines to not introduce polluted air back into the building.		10										
(3) Heat-recovery ventilator.		15										
(4) Energy-recovery ventilator.		17										
902.2.2 Ventilation airflow is tested to achieve the design fan airflow at point of exhaust in accordance with Appendix B. (Points must be claimed in 902.2.1 to claim points in 902.2.2)		8										
902.2.3 MERV filters 8 or greater are installed on central air systems. Designer or installer is to verify that the HVAC equipment is able to accommodate the greater pressure drop of MERV 8 filters.		3	3	0								
3												
902.3 Radon control. Radon control measures are in accordance with ICC IRC Appendix F. (Zones are defined in Figure 9(1).)												
902.3(1) Buildings located in Radon Zone 1 have a radon system installed.		Mandatory	0	0								
(a) A passive radon system is installed.		10										
(b) An active radon system is installed.		15										
902.3(2) Buildings located in Zone 2.												
(a) A passive radon system is installed.		10										
902.4 HVAC system protection. One of the following HVAC system protection measures is performed:												
(1) HVAC supply registers (boots), return grilles, and rough-ins are covered during construction activities to prevent dust and other pollutants from entering the system.		3										
(2) Prior to owner occupancy, HVAC supply registers (boots), return grilles, and duct terminations are inspected and vacuumed. In addition, the coils are inspected and cleaned and the filter is replaced if necessary.		3								3	0	Have central vac installer test drive with duct cleaning.
902.5 Central vacuum systems. Central vacuum system is installed and vented to the outside.		5								5	1500	



ANSI National Green Building Standard™	343	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
902.6 Living space contaminants. The living space is sealed to prevent unwanted contaminants.												
(1) Attic access, knee wall door, or drop down stair is caulked, gasketed, or otherwise sealed.	2	2	0									
(2) All penetrations (e.g., top plates, HVAC register boots, recessed can lights, are sealed in the following areas:												
(a) Attic/ceiling	2	2	0									
(b) Wall	2	2	0									
(c) Floors	2	2	0									
903 Moisture Management: Vapor, Rainwater, Plumbing, HVAC												
903.0 Intent. Moisture and moisture effects are controlled.												
903.1 Tile backing materials installed under tiled surfaces in wet areas are in accordance with ASTM C1178, C1278, C1288, or C1325.	Mandatory	0	0									
903.2 Capillary breaks												
903.2.1 A capillary break and vapor retarder are installed at all concrete slabs in accordance to the following:	Mandatory	0	0									does not apply
1) A minimum 4-inch thick bed of ½ inch diameter or greater clean aggregate, covered with polyethylene or polystyrene sheeting in direct contact with the concrete slab, with the sheeting joints lapped in accordance with Section 903.3. (or)												
2) A minimum 4-inch thick uniform layer of sand, overlain with a layer or strips of geotextile drainage matting, covered with polyethylene sheeting, with the sheeting joints lapped according to Section 903.3.												
Modification for 1&2:												
a. In areas with free-draining soils, identified as Group 1 in the ICC IRC by a certified hydrologist, soil scientist, or engineer through a site visit, a gravel bed or geotextile matting is not required.												
b. In Dry climate locations, as defined by Figure 6(1), polyethylene sheeting is not required unless required for radon resistance (Section 902.3).												
903.2.2 Add a capillary break on footing to prevent moisture migration into foundation wall.	3									3	75	
903.3 Crawlspace												
903.3.1(1) Minimum 6-mil vapor retarder installed on the crawl space floor and extended up the wall sufficient to allow the material to be affixed with glue and furring strips. Joints of vapor retarder overlap a minimum of 6 inches and are taped.	6			6	0							Alter specs to accommodate.
903.3.1(2) Damp-proof walls are provided below finished grade. Joints of vapor retarder overlap a minimum of 6 inches and are taped.	Mandatory			0	0							
903.3.2 Crawlspace that is built as a conditioned area is sealed to prevent outside air infiltration and provided with conditioned air at a rate not less than 0.02 cfm per square foot of horizontal area and one of the following is implemented:												
(1) A concrete slab over lapped 6 mil polyethylene or polystyrene	10											
(2) 6-mil polyethylene sheeting, lapped a minimum of 6 inches and taped at the seams.	8	8	0									
903.4 Moisture control measures.												
903.4.1(1) Building materials with visible mold are not installed or are cleaned or encapsulated prior to concealment and closing.	2 Points					2	0					Put into specs.
903.4.1(2) Walls are not enclosed (e.g. with drywall) if the insulation has a high moisture content. Wet insulation products are dry before enclosing.	Mandatory 2 Points			2	0							Include site superintendent's provision to test and record moisture in wall cavity prior to hanging drywall.
903.4.1(3) The moisture content of lumber is sampled to ensure it does not exceed 19 % prior to the surface and/or wall cavity enclosure.	4					4	0					Include in site superintendent's responsibilities
903.4.2 Moisture content of subfloor, substrate, or concrete slabs is in accordance with the appropriate industry standard for the finish flooring to be applied.	2					2	0					Include in the installers scope.
903.5 Plumbing.												
903.5.1 Plumbing distribution lines are not installed in exterior wall cavities.	2	2	0									Plumbing lines are in unconditioned attic, but not exterior walls. Insulate attic lines.
903.5.2 Cold water pipes in unconditioned spaces are insulated to a minimum of R-4 with pipe insulation or other covering that adequately prevents condensation.	2											See 903.5.1.
903.5.3 Plumbing is not installed in unconditioned spaces.	5	5	0									
903.6(1) Duct insulation. All HVAC ducts, plenums, and trunks in unconditioned attics, basements, and crawlspaces are insulated to a minimum of R-6. Outdoor air supplies to ventilation systems are insulated to a minimum of R-6.	Mandatory	0	0									

ANSI National Green Building Standard™	343	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
903.6(2) Duct insulation. All HVAC ducts, plenums, and trunks in unconditioned attics, basements, and crawlspaces are insulated to a minimum of R-8. Outdoor air supplies to ventilation systems are insulated to a minimum of R-8.	2											
903.7 Relative Humidity. In climate zones 1A, 2A, 3A, 4A, and 5A as defined by Figure 6(1), equipment is installed to maintain relative humidity (RH) at or below 60% using one of the following:	8 Points											
903.9.1 In "Warm-Humid" climates as defined by Figure 6(1) equipment is installed to maintain Relative Humidity (RH) at or below 60% using one of the following: (1) Additional dehumidification system(s) (2) Central HVAC system equipped with additional controls to operate in dehumidification mode.												Richmond VA is not warm/humid climate
904 Innovative Practices												
904.1 A humidity monitoring system is installed with a mobile base unit that displays a reading of temperature and relative humidity at the base unit with a minimum of two remote units. One remote unit that is placed permanently inside the conditioned space in a central location, excluding attachment to exterior walls, and another remote unit is placed permanently outside of the conditioned space.	2									2	72	Bath fans are already triggered by humidistats.
904.2 Kitchen exhaust unit(s) that equal or exceeds 400 cfm, and make-up air is provided.	2											
<b>CHAPTER 10: OPERATION, MAINT., AND BUILDING OWNER EDUCATION</b>	<b>Base Pts.</b>	0	0	9	950	6	94	0	0	0	0	<b>Ch. 10 Subtotal</b>
<b>Building Owners' Manual for One- and Two-Family Dwellings</b>												
1001.0 Intent. Information on the building's use, maintenance and green components is provided. 1001.1 A homeowner's binder is provided that includes the following, as available and applicable:	1 point per 2 items			0	100							Estimated 40 hours staff. O/H removed for separate reporting as one time cost. This reflects staff time to assemble.
<b>(Points awarded for mandatory and non-mandatory items)</b>												
(1) A green building program certificate or completion document.	Mandatory			0.5	850							\$200 certification fee and 5 hours of professional time.
(2) List of green building features (can include the national green building checklist).	Mandatory			0.5								Included with 1001.1
(3) Product manufacturer's manuals or product data sheet for installed major equipment, fixtures and appliances. If product data sheet is in the binder, manufacturer's manual shall may be attached to appliance in lieu of inclusion in the binder.	Mandatory			0.5								
(4) Information on local recycling programs.				0.5								
(5) Information about available local utility programs that purchase a portion of energy from renewable energy providers.				0.5								
(6) Explanation of the benefits of using energy efficient lighting systems (e.g., compact fluorescent light bulbs, light emitting diode (LED)) in high usage areas.				0.5								
(7) A list of practices to conserve water and energy.				0.5								
(8) Local public transportation options (if applicable).				0.5								
(9) A diagram showing the location of safety valves and controls for major building systems.				0.5								
(10) Where frost protected shallow foundations are used, notify owner of precautions, including instructions not to remove or damage insulation when modifying landscaping, to provide heat to the home as required by the IRC/IBC, and to keep base materials				0.5								
(11) A list of local service providers that offer regularly scheduled service and maintenance contracts to assure proper performance of equipment and the structure (e.g., HVAC, water heating equipment, sealants, caulks, gutter and downspout system, showe				0.5								
(12) A photo record of framing with utilities installed. Photos taken prior to installing insulation, clearly labeled, and included as part of the homeowner's binder.				0.5								
(13) Maintenance checklist.				0.5								
(14) List of common hazardous materials often used around the building and instructions for proper handling and disposal of these materials.				0.5								
(15) Information about organic pest control, fertilizers, de-icers, and cleaning products.				0.5								
(16) Information about native landscape materials and/or those that have low-water requirements.				0.5								
(17) Information about methods of maintaining the building's relative humidity in the range of 30-60%.				0.5								
(18) Instructions for inspecting the building for termite infestation.				0.5								
(19) Instructions for maintaining gutters and downspouts and importance of diverting water at least five feet away from foundation.				0.5								

ANSI National Green Building Standard™	343	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(20) A narrative detailing the importance of maintenance and operation in retaining the attributes of a green-built building.				0.5								
<b>Renovations Note:</b> A building owners' manual that includes the following:	<b>Mandatory</b>											
(1) all mandatory items listed in Section 1001.1												
(2) a minimum of six of the non-mandatory items listed in Section 1001.1												
(3) the EPA publications "Reducing Lead Hazards When Remodeling Your Home" and "Asbestos in Your Home: A Homeowner's Guide"												
<b>on Building Operation And Maintenance for</b>												
1002.1 Training of building owners. Building owners/occupants are familiarized with the green building goals and strategies implemented and the impacts of the occupants' practices on the costs of operating the building. Training is provided to the responsible party(ies) regarding all equipment operation and control systems. Systems include, but are not limited to, the following:						6	94					Walk thru orientation should take about 2 hours and be standard.
(1) HVAC filters.	6											
(2) Thermostat operation and programming.												
(3) Lighting controls.												
(4) Appliances and settings.												
(5) Water heater settings.												
(6) Fan controls.												
<b>1004</b>												
<b>INNOVATIVE PRACTICES</b>												
1004.1 (Reserved)												



# APPENDIX B GREEN SCORING & COST

B. Seattle, Washington

HUD Green Building Comparison  
 2 story stack multi, Seattle WA  
 ANSI-ICC-700-2008 National Green Building Standard™

Rated 2/15/2010

Lot 69.3x53.7 3,721  
 House 26 x 38' 946 sf  
 2-story stack multi family  
 Density per acre at this lot size 23.5

chapter 5 totals are for whole lot,  
 can be divided by 2 units

- 5. Lot Design...
- 6. Resource Efficiency
- 7. Energy Efficiency
- 8. Water Efficiency
- 9. Indoor Env. Quality
- 10. Operation, Maintenance...
- Additional Points
- Total

Bronze		Silver		Gold		Emerald	
Required	Actual	Required	Actual	Required	Actual	Required	Actual
39	109	66	109	93	109	119	146
45	99	79	99	113	127	146	147
30	49	60	101	100	154	120	180
14	16	26	37	41	44	60	62
36	104	65	119	100	123	140	146
8	12	10	12	11	12	12	17
50		100		100		100	
222	389	406	477	558	569	697	698
Cumulative		Points	Cost	Points	Cost	Points	Cost
Chapter 5	109	0	109	0	109	0	3,616
Chapter 6	99	0	99	0	127	0	4,686
Chapter 7	49	966	101	4,954	154	11,579	14,831
Chapter 8	16	0	37	150	44	150	582
Chapter 9	104	0	119	0	123	44	146
Chapter 10	12	950	12	950	12	950	17
Total	389	1,916	477	6,054	569	12,723	24,856
Est. House Cost				4,137		6,669	12,133
% of Estimated Cost							
Cost per SF (\$)		0.00	2.03	6.40		13.45	26.28

KEY  
 Points are Co-Dependant on at least one other cell  
 Overhead Cost - Dependant on subdivision size

ANSI National Green Building Standard™	378	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
		Cost/Point	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	98		
<b>CH. 5 LOT DESIGN, PREPARATION, AND DEVELOPMENT</b>		Rating	109	0	0	0	0	0	0	37	3,616	Ch. 5 Subtotal Base
500.0 Intent. This section applies to lot development for the eventual construction of residential buildings, multi-unit buildings, or additions thereto that contain dwelling units. The buildings on the lot earn their own performance level by complying with the provisions of Sections 303, 304, or 305.5, as applicable.												
501.1 The lot is selected to minimize environmental impact by one or more of the following:												
(1) An infill lot is selected.		4										
(2) A greyfield lot or an EPA-recognized brownfield lot is selected.		5	5	0								previously demolished apartment complex
(3) Addition and Renovation Note: A renovation or addition project is implemented. (Points awarded for using an existing building and infrastructure.)		5										
501.2 Mass Transportation. A range of mass transportation choices are promoted by one or more of the following:												
(1) A lot is selected within one-half mile of pedestrian access to a mass transit system or within five miles of a mass transit station with provisions for parking.		3	3	0								mapquest
(2) Walkways, street crossings, and entrances designed to promote pedestrian activity are provided. New buildings are connected to existing sidewalks and areas of development.		3	3	0								mapquest
(3) A lot is selected within one-half mile of six or more community resources (e.g., recreational facilities (such as pools, tennis courts, basketball courts), parks, grocery store, post office, place of worship, community center, daycare center, bank, school, restaurant, medical/dental office, laundromat/dry cleaner.)		3	3	0								mapquest
502 Project Team, Mission Statement, and Goals												
502.1 A knowledgeable team is established and team member roles are identified with respect to green lot design, preparation, and development. The project's green goals and objectives are written into a mission statement.		4								4	752	Minimum 2 person team for 1 day. Varies with size of operations.
Lot Design												
503.0 Intent. The lot is designed to avoid detrimental environmental impacts first, minimize any unavoidable impacts, and mitigate for those impacts that do occur. The project is designed to minimize environmental impacts and to protect, restore, and enhance the natural features and environmental quality of the lot. (To be awarded points allocated for design, the intent of the design shall be implemented.)												
503.1 Natural resources are conserved by one or more of the following:												
(1) A natural resources inventory is completed under the direction of a qualified professional.		5	5	0								section 015639-8
(2) A plan is implemented to conserve the elements identified by the resource inventory as high priority resources.		6	6	0								section 015639 appendix B
(3) Items listed for protection in the resource inventory plan are protected under the direction of a qualified professional.		4	4	0								section 015639-1
(4) Basic training in tree or other natural resource protection is provided for onsite supervisor.		4	4	0								section 015639-1

ANSI National Green Building Standard™	378	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(5) All tree pruning on site is conducted by a Certified Arborist.	2	2	0									section 015639-1
(6) Ongoing maintenance of vegetation during construction is in accordance with TCIA A300.	3	3	0									section 015639-4
Addition and Renovation Note: section 503.1 applies to additions that increase building footprint on the lot; and to renovations that include landscape, hardscape, and outdoor living area. <b>(Additional points awarded for each strategy implemented.)</b>	1 Additional Point											
<b>503.2 Slope disturbance</b> is minimized by one or more of the following: <b>(Points awarded only if there are developable steep slopes on the lot.)</b>												Unknown, no grading plan was provided.
(1) All or a percentage of development on steep slopes is avoided.												
(a) Less than 25%	2											
(b) 25 to 75%	3											
(c) Greater than 75%	4											
(2) Hydrological/soil stability study for steep slopes is completed and used to guide the design of all buildings on the site.	5											
(3) All or a percentage of roads and parking are aligned with natural topography to reduce cut and fill.												
(a) Less than 25%	1											
(b) 25 to 75%	3											
(c) Greater than 75%	5											
(4) Long-term erosion effects are reduced through the design and implementation of terracing, retaining walls, landscaping, and stabilization techniques.	6											
(5) Underground parking uses the natural slope for parking entrances.	4											
Addition and Renovation Note: Section 503.2 applies to additions that increase building footprint on the lot; and to renovations that include landscape, hardscape, and outdoor living area. <b>(Additional points awarded for each strategy implemented.)</b>	2 Additional Points											
<b>503.3 Soil disturbance and erosion</b> are minimized by one or more of the following: (Also see Section 504.3) (Points must be taken here to claim points in 504.1)												
(1) Construction activities are scheduled to minimize length of time that soils are exposed.	5	5	0									Virginia State Soil Erosion & Control Handbook to be followed
(2) Utilities are installed using one or more alternative means:	5											
(a) tunneling instead of trenching												
(b) use of smaller (low ground pressure) equipment or geotextiles to spread the weight of construction equipment												
(c) shared utility trenches or easements												
(d) placement of utilities under paved surfaces instead of yards.												
(3) Limits of clearing and grading are demarcated on the plan.	5											
<b>503.4 Storm Water Mgmt.</b> Storm water is managed using one or more of the following low impact development techniques:												
(1) Natural water and drainage features are preserved and used.	6											
(2) A storm water management plan is developed and implemented that minimizes concentrated flows and simulates flows found in natural hydrology, e.g., vegetative swales, French drains, wetlands, drywells, and rain gardens.	6	6	0									section 015713-1 part 1.1.B
(3) All or a percentage of impervious surfaces are minimized and permeable materials are used for driveways, parking areas, walkways, and patios.												Less than 15% impervious structure/driveway to land
(a) Less than 25%	1											
(b) 25 to 75%	3											
(c) Greater than 75%	5	5	0									
(4) A minimum of 75% of the roof is vegetated (green roof)	3											
<b>503.5 Landscape plan</b> is developed to limit water and energy use while preserving or enhancing the natural environment.												
(1) A plan is formulated to restore or enhance natural vegetation that is cleared during construction. Landscaping is phased to coincide with achievement of final grades to ensure denuded areas are quickly vegetated.	5									5	520	Allowed 1/2 day for professional to develop plan that includes noted actions. Include 503.5(8) and 503.6 in plan. Plan needed for 801.7.4 points.
(2) Turf grass species, other vegetation, and trees are selected that are native or regionally appropriate for local growing conditions.	4									4	165	See 503.5(1) for plan cost. Cost of hydroseed.
(3) A percentage of all turf areas are limited.												
(a) Lot is 0% turf	4											
(b) Greater than 0% to less than 25%	3											
(c) 25% to less than 50%	2									2	222	28% mulched.
(d) 50% to 75%	1											
(4) Plants with similar watering needs are grouped (hydrozoning).	5									5	535	See 503.5(1) for plan cost. 3 trees and 5 shrubs.

ANSI National Green Building Standard™	378	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(5) Species and locations for tree planting are identified that will provide summer shading of streets, parking areas, and buildings to moderate temperatures.	5									5	0	See 503.5(1) for plan cost. Plant 3 trees from 503.5(2) to provide shade. See 505.2(1)
(6) Vegetative wind breaks or channels are designed as appropriate for local conditions.	4									4	360	See 503.5(1) for plan cost. Add 3 trees.
(7) Onsite tree trimmings or stump grinding of regionally appropriate trees are used to provide protective mulch during construction and cleared trees are recycled as saw lumber or pulp wood.	3	3	0									section 015639-5
(8) An integrated pest management plan to minimize chemical use in pesticides and fertilizers is developed.	4	4	0									section 320190-2
<b>503.6 Wildlife habitat.</b> Measures are planned that will support wildlife habitat.	4									4	175	See 503.5(1). Include additional 5 shrubs.
<b>503.7 Mixed use development</b> is incorporated.	6											
<b>503.8 Environmentally Sensitive Areas.</b>												
(1) Environmentally Sensitive Areas are avoided.	3											
(2) Compromised Environmentally Sensitive Areas are mitigated or restored.	3											
<b>503.9 Density.</b> The average density on a net developable area basis is:												
(1) 7 to less than 14 dwelling units per acre (4047 m <sup>2</sup> )	4											
(2) 14 to less than 21 dwelling units per acre	7	7	0									approximate w/ no site plan and scale
(3) 21 or greater dwelling units per acre	10											
<b>504 Lot Construction</b>												
<b>504.0 Intent.</b> Environmental impact during construction is avoided to the extent possible; impacts that do occur are minimized, and any significant impacts are mitigated.												
<b>504.1 Onsite supervision and coordination</b> is provided during clearing, grading, trenching, paving, and installation of utilities to ensure that specified green development practices are implemented (Also see Section 503.3.)	4									4	888	3 days for one person to supervise.
<b>504.2 Trees and vegetation.</b> Designated trees and vegetation are preserved by one or more of the following:												
(1) Fencing or equivalent to protect trees and other vegetation is installed.	3	3	0									section 015639-1
(2) Trenching, significant changes in grade, and compaction of soil and critical root zones in "tree save" areas are avoided.	4	4	0									section 015639-4
(3) Damage to designated existing trees and vegetation is mitigated during construction through pruning, root pruning, fertilizing, and watering.	4	4	0									section 015639-6
<b>504.3 Soil disturbance and erosion.</b> Onsite soil disturbance and erosion are minimized by one or more of the following: (also see section 503.3)												
(1) Limits of clearing and grading are staked out.	5	5	0									section 015713-3
(2) "No disturbance" zones are created using fencing or flagging to protect vegetation and sensitive areas from construction activity.	5	5	0									section 015639 and 015713
(3) Sediment and erosion controls are installed and maintained in accordance with the storm water pollution prevention plan (SWPPP), where required.	5	5	0									section 015713-4
(4) Topsoil is stockpiled and stabilized for later use to establish landscape plantings.	5	5	0									section 310000-6
(5) Soil compaction from construction equipment is reduced by distributing the weight of the equipment over a larger area (laying lightweight geogrids, mulch, chipped wood, plywood, OSB, metal plates, or other materials capable of weight distribution in the pathway of the equipment).	3											
(6) Disturbed areas that are complete or to be left unworked for greater than 21 days are stabilized within 14 days using methods as recommended by the EPA or in the approved storm water pollution prevention plan (SWPPP), where required.	3	3	0									
(7) Soil is improved with organic amendments and mulch.	3	3	0									section 329113-3
(8) Utilities are installed using one or more alternative means such as:												
tunneling instead of trenching, use of smaller equipment, use of low ground pressure equipment, use of geomats, shared utility trenches or easements.	5											See 504.1(2) and 503.3(2)
<b>505 INNOVATIVE PRACTICES</b>												
<b>505.0 Intent.</b> Innovative lot design, preparation and development practices are used to enhance environmental performance. Waivers or variances from local development regulations are obtained and innovative zoning practices are used to implement such pract												
505.1 Driveways or parking areas are shared. Waivers or variances from local development regulations are obtained to implement such practices as applicable. In a multi-unit project, parking capacity is not to exceed the local minimum requirements.	4	4	0									site plan blown up appears to have a 15 foot parking space and a 7 foot leadwalk. This would constitute shared for the two units
505.2 Heat Island Mitigation. Any combination of the following strategies are provided for a minimum of 50% of the horizontal surface area of the hardscape:	4											

ANSI National Green Building Standard™	378	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(1) Shading of hardscaping: Shade from existing or new vegetation is provided (within five years) or from trellises. Shade of hardscaping is to be measured on the summer solstice at noon.												
(2) Light colored hardscaping: Horizontal hardscaping materials are installed with a solar reflectance index of 29 or greater.												
<b>CHAPTER 6: RESOURCE EFFICIENCY</b>	<b>Base Pts.</b>	<b>99</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>28</b>	<b>0</b>	<b>20</b>	<b>4,686</b>	<b>Ch. 6 Subtotal</b>
<b>601 Quality of Construction Materials and Waste</b>	<b>Cost/Point</b>		<b>0</b>		<b>#DIV/0!</b>		<b>#DIV/0!</b>		<b>0</b>		<b>234</b>	
<b>601.0 Intent.</b> Design and construction practices that minimize the environmental impact of the building materials are incorporated; environmentally efficient building systems and materials are incorporated; and waste generated during construction is reduced.												
<b>601.1 Conditioned floor area</b> , as defined by ICC IRC calculated in												
(1) Less than or equal to 1,000 square feet	<b>15</b>											
(2) Less than or equal to 1,500 square feet	<b>12</b>	<b>12</b>	<b>0</b>									second floor is worst case - 1041 sf
(3) Less than or equal to 2,000 square feet	<b>9</b>											
(4) Less than or equal to 2,500 square feet	<b>6</b>											
(5) Greater than 4,000 square feet (373 m <sup>2</sup> )	<b>Mandatory</b>											
<b>For every 100 square feet over 4,000 sf, one point is to be added to Table 303, category 7 for each performance level.</b>												
<b>Multi-Unit Building Note:</b> For a multi-unit building, use a weighted average of the individual unit sizes in qualifying for available points.												
<b>Addition Note: Additions more than 75% of existing building.</b> Section 601.1 does not apply to additions with an area of more than 75% of the area of the existing building or dwelling unit.												
<b>Additions less than or equal to 75% of existing building.</b> Where the addition area is less than or equal to 75 percent of the existing building or dwelling unit area, points are awarded as follows:												
(1) The existing structure is 50% to 75% of total building or dwelling unit area.	<b>1 Add'l Point</b>											
(2) The existing structure is 76% to 99% of total building or dwelling unit area.	<b>3 Add'l Point</b>											
<b>Renovation Note:</b> When renovations increase the total existing building or dwelling unit area by 1 percent or less, points are awarded as follows:												
(a) The total area of the existing building or dwelling unit is less than or equal to 2500 sf.	<b>6 Add'l Points</b>											
(a) The total area of the existing building or dwelling unit is greater than 2500 sf.	<b>1 Add'l Point</b>											
<b>601.2 Material Usage.</b> Building-code-compliant structural systems or advanced framing techniques that optimize material usage are implemented. Points awarded for each system or framing technique implemented.	<b>3 pts per system (9 pts max)</b>											roof truss at 24", studs at 24", 2 stud corners
		<b>9</b>	<b>0</b>									
<b>601.3 Building dimensions and layouts are designed to reduce material cuts and waste.</b>												
(1) When used for at least 80% of floor area	<b>3</b>	<b>3</b>	<b>0</b>									Floors - 26x38
(2) When used for at least 80% of wall area	<b>3</b>							<b>3</b>	<b>0</b>			Wall precuts can be used for 1st and 2nd or panelize
(3) When used for at least 80% of roof area	<b>3</b>											
(4) When used for at least 80% of cladding or siding area	<b>3</b>											
(5) When used for at least 80% of penetrations or trim area	<b>1</b>											
<b>601.4 Detailed framing or structural plans, material quantity lists and onsite cut lists for framing, structural materials, and sheathing materials are provided.</b>	<b>4</b>									<b>4</b>	<b>1,040</b>	Have suppliers prepare use reports with their bid at no charge for joists, wall studs and rafters. Allowed 1days of professional time to prepare sheathing layouts for prints. O/H.
<b>601.5 Pre-cut or pre-assembled components, or panelized or precast assemblies are utilized for 90% for the following system or building.</b>												
(1) Floor system.	<b>4</b>	<b>4</b>	<b>0</b>									
(2) Wall system.	<b>4</b>							<b>4</b>	<b>0</b>			These should have been shipped as precuts or panels
(3) Roof system.	<b>4</b>	<b>4</b>	<b>0</b>									
(4) modular construction for the entire building located above grade.	<b>13</b>											
(5) manufactured home construction for the entire building located above grade.	<b>13</b>											
<b>601.6 Stories above grade</b> are stacked, such as in 1 1/2 and 2 story or greater structures. The area of the upper story shall be at least 50% of the area of the story below, based on areas with a minimum ceiling height of 7 feet.	<b>Max 8 points</b>											
(1) first stacked story	<b>4</b>	<b>4</b>	<b>0</b>									
(2) for each additional story	<b>2</b>											
<b>601.7 Site applied finishing materials.</b> Building materials or assemblies that do not require additional site applied material for finishing are utilized.	<b>Max 12 points</b>											
(1) 90% or more of the installed material or assembly listed below:	<b>5</b>											



ANSI National Green Building Standard™	378	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(2) 50% to less than 90% of the installed building material or assembly listed below:	2											
(a) Pigmented, stamped, decorative, or final finish concrete or masonry.												
(b) Trim not requiring paint or stain.												
(c) Window, skylight, and door assemblies not requiring paint or stain on exterior and/or interior surfaces.		5	0									vinyl windows
(d) Wall coverings or systems not requiring paint or stain or other type of finishing application.										5	3,046	spec siding to be pre finished fiber cement.
601.8 Foundations such as frost-protected shallow foundations, pier and pad foundations, post foundations and other similar foundation types are designed and constructed.	3											
601.9 One or more of the following above grade wall systems that provide sufficient structural and thermal characteristics are used for at least 75% of the gross exterior wall area of the building:	4											
(1) Adobe												
(2) Concrete/Masonry												
(3) Logs												
(4) Rammed earth												
<b>602 Enhanced Durability and Reduced Maintenance</b>												
602.0 Intent. Design and construction practices are implemented that enhance the durability of materials and reduce in-service maintenance.												
602.1 Entries at exterior door assemblies, inclusive of side lights, are covered by one of the following methods below to protect the building from the effects of precipitation and solar radiation. A projection factor of at least 0.375 is provided. Eastern and western facing entries in Climate Zones 1, 2, and 3, as determined in accordance with Figure 6(1), shall have a projection factor of at least 1.0 unless otherwise protected from direct solar radiation by other means (e.g. screen wall, vegetation).	Maximum number of points 5											
(1) Installing a porch roof or awning.												
(2) Extending the roof overhang.												
(3) Recessing the exterior door.												
Main entrance door	3	3	0									
Additional covered door assembly	1	1	0									
602.2 Roof overhangs, based on inches of rainfall in Table 602.2, are provided over at least 90% of exterior walls to protect the building envelope.	4											
Table 602.2												
Minimum Roof Overhang for One- & Two-Story Buildings												
Inches Rainfall*	Eave Overhang (Inches)	Rake Overhang (Inches)										
Less than 20	12	12										
21 to 40	12	12	4	0								12" rake and 16" eave overhangs
41 to 70	18	12										
More than 70	24	12										
<b>Addition Note:</b> Section 602.2 applies to the new construction portion of additions.	0											
<b>Renovation Note:</b> Section 602.2 applies to renovations that alter the existing roof.	1											
<b>602.3 Foundation Drainage</b>												
602.3.1 Where required by the IRC/IBC for habitable and usable spaces below grade, exterior drain tile is installed.	Mandatory	0	0									Not applicable.
602.3.2 Interior and exterior foundation perimeter drains are installed and sloped to discharge to daylight, dry well, or sump pit.	4											
602.4 Drip edge is installed at eaves and gable roof edges.	3	3	0									
602.5 A gutter and downspout system with extensions, or splash blocks and effective grading, are provided to carry water at least 5 feet away from perimeter foundation walls.	4	4	0									
602.6 Finish grade at all sides of building is sloped to provide a minimum of 6 inches of fall within 10 feet of the edge of the building. Where lot lines, walls, slopes or other physical barriers prohibit 6 inches of fall within 10 feet, the final grade	Mandatory	0	0									section 034816-1
602.7 Termite barrier. Continuous, physical, foundation termite barrier used with or without low toxicity treatment is installed in geographical areas that have subterranean termite infestation potential determined in accordance with Figure 6(3).	4											section 31000-6
602.8 Termite-resistant materials are used as follows:												
(1) In areas of slight to moderate termite infestation probability (as defined by Figure 6(3)) for the foundation, all structural walls, floors, concealed roof spaces not accessible for inspection, exterior decks, and exterior claddings within the first 2 feet above the top of the foundation.	2											

ANSI National Green Building Standard™	378	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(2) In areas of moderate to heavy termite infestation probability (as defined by Figure 6(3)) for the foundation, all structural walls, floors, concealed roof spaces not accessible for inspection, exterior decks, and exterior claddings within the first 3 feet above the top of the foundation.	4											
(3) In areas of very heavy termite infestation probability (as defined by Figure 6(3)) for the foundation, all structural walls, floors, concealed roof spaces not accessible for inspection, exterior decks, and exterior claddings.	6											
602.9 Where required by the IRC/IBC, a water-resistive barrier and/or drainage plane system is installed behind exterior veneer and/or siding.	Mandatory	0	0									section 072500
602.10 In areas where there has been a history of ice forming along the eaves causing a backup of water, an ice barrier is installed at roof eaves and is extended at least 24" inside the exterior wall line of the building, in accordance with the IRC/IBC.	Mandatory	0	0									not required in seattle residential code
602.11 Enhanced foundation waterproofing is installed:	4											Not applicable.
(1) Rubberized coating, or												
(2) Drainage mat.												
602.12 Flashing details are shown on plans and flashing is installed at all of the following locations, as applicable:	6	6	0									A7.2, A7.5, and A7.8
(1) Around exterior fenestrations, skylights and doors.												
(2) Roof valleys.												
(3) Deck/balcony to building intersections.												
(4) At roof-to-wall intersection and at roof-to-chimney intersections.												
(5) A drip cap is provided above windows and doors that are not flashed or protected by covering per Section 602.1.												
602.13 Roof Surfaces. A minimum of 90% of roof surfaces are constructed of one or both of the following:	3											
(1) Products which meet the requirements of the ENERGY STAR® cool roof certification or equivalent.												
(2) A green (landscaped) roof system.												
602.14 Recycling. Occupant recycling is facilitated by one or more of the following methods:												
(1) A built-in collection space in each kitchen and an aggregation/pick-up space in a garage, covered outdoor space or other area for recycling containers.	3									3	58	Include an under cabinet recycling container and back porch bin.
(2) Compost facility provided on-site.	3									3	72	
<b>603 Reused or Salvaged Materials</b>												
603.0 Intent. Practices that reuse or modify existing structures, salvage materials for other uses, or use salvaged materials in building's construction are implemented.												
603.1 Existing buildings and structures are reused, modified or deconstructed in lieu of demolition. (One point awarded for every 200 sq. ft., 18.5m2, of floor area.)	1 (Max 12 points)											
603.2 Reclaimed and/or salvaged materials and components are used. Total material and labor cost of salvaged materials shall equal or exceed 1% of total construction costs.	3											
603.3 Scrap Materials. Facilitation for sorting and reuse of scrap building material (e.g. provide a central storage area or dedicated bins.)	4	4	0									
<b>604 Recycled-Content Building Materials</b>												
604.1 Building materials with recycled content are used for at least two minor and/or two major components of the building. (NOTE: Does not specify PConsumer. Implication is that max. allowable is 4 materials. 9 points is max. in scoring tool. Have to use highest % to receive max pts.)	Points per Table 604.1											
Table 604.1												
Recycled Content												
Material Percentage Recycled Content	Per 2 Minor	Per 2 Major										
25% - 50%	1	2										
50% - 75%	2	4										Fiber cement siding & aggregate at construction entrance for minors.
75%	3	6						9	0			Gypsum board and cellulose insulation. Note: specify correct gypsum board.
<b>605.0 Intent. Waste generated during construction is recycled.</b>												
Note: All waste classified as hazardous shall be properly handled and disposed. (Points not awarded for hazardous waste removal.)												
605.1 A Construction Waste Management Plan is developed, implemented, and posted at the jobsite with a goal of recycling or salvaging a minimum of 50% (by weight) of construction and land-clearing waste.	6	6	0									section 017419-1
605.2 Onsite recycling measures following applicable regulations and codes are implemented, such as the following:	7											
(a) Materials are ground or otherwise safely applied onsite as soil amendment or fill. At least 50% (by weight) of construction and land-clearing waste shall be diverted from landfill.												

ANSI National Green Building Standard™	378	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(b) Other methods approved by the NAHB Research Center (the Adopting Entity).												
605.3 Recycled Construction materials: Construction materials (e.g., wood, cardboard, metals, drywall, plastic, asphalt roofing shingles, or concrete) are recycled offsite.	<b>Max 6</b>											
(1) A minimum of two types of materials are recycled.	<b>3</b>	<b>3</b>	<b>0</b>									section 017419 - asphalt, concrete, wood, glass, gypsum, paint, insulation
(2) For each additional recycled material.	<b>1</b>	<b>3</b>	<b>0</b>									
<b>606 Renewable Materials</b>												
<b>606.0 Intent.</b> Building materials derived from renewable resources are used.												
606.1 The following biobased products are used. (Note: 606.1 and 606.2 denote % of project mat'l cost req'd.)	<b>Max 8</b>											
(a) certified solid wood in accordance with Section 606.2												
(b) engineered wood												
(c) bamboo												
(d) cotton												
(e) cork												
(f) straw												
(g) natural fiber products made from crops (soy or corn-based)												
(h) products with the minimum biobased contents of the USDA 7 CFR Part 2902												
(i) other biobased materials with a minimum of 50 percent biobased content (by weight or volume).												
606.1(1) At least two types of biobased materials are used, each for more than .5% of the project's projected building material cost. <b>Combined 8 pts Max</b>	<b>3</b>	<b>2</b>	<b>0</b>									Wood cabinets and wood trim
606.1(2) At least two types of biobased materials are used, each for more than 1% of the project's projected building material cost.	<b>6</b>	<b>6</b>	<b>0</b>									engineered wood, osb walls, lv beams
606.1(3) For each additional biobased material used for more than 5% of the project's projected building material cost.	<b>1 (2 pts max)</b>											
<b>606.2 Wood-based products</b> are certified to the requirements of one of the following recognized product programs:												
(a) AFF American Tree Farm System®												
(b) Canadian Standards Association's Sustainable Forest Management System Standards (CAN/CSA Z809)												
(c) Forest Stewardship Council (FSC)												
(d) Program for Endorsement of Forest Certification Systems (PEFC)												
(e) Sustainable Forestry Initiative Program (SFI)												
(6) Other product programs mutually recognized by PEFC												
606.2(1) Where a minimum of two certified wood-based products are used for minor elements of the building, such as all trim, cabinetry, or millwork.	<b>3</b>									<b>3</b>	<b>245</b>	Specify Masonite doors for FSC certified. Estimated added cost of \$35/door. And kitchen cabinets at no cost.
606.2(2) Where a minimum of two certified wood-based products are used in major elements of the building, such as walls, floors, or roof.	<b>4</b>	<b>4</b>	<b>0</b>									section 061600 part 1.4 - sheathing FSC; section 061753 part 1.6 - trusses FSC
<b>606.3 Manufacturing Energy.</b> Materials are used for major components of the building that are manufactured using a minimum of 33% of the primary manufacturing process energy derived from renewable sources, combustible waste sources, or renewable energy credits (RECs). (2 points awarded per material.)	<b>6 pts. max.</b>							<b>2</b>	<b>0</b>	<b>2</b>	<b>225</b>	Specify that OSB comes from a mill that complies. Identify another material that complies; allowed for added cost.
<b>607 Resource-Efficient Materials</b>												
607.1 Products containing fewer materials are used to achieve the same end-use requirements as conventional products, including but not limited to: (3 points awarded for each material.)	<b>Max 9 points</b>											
(1) Lighter, thinner brick with bed depth less than 3 inches, brick with coring above 25%, or both.												
(2) Engineered wood or engineered steel products.		<b>3</b>	<b>0</b>									Engineered wood - OSB floor and roof and LVL
(3) Roof or floor trusses.		<b>6</b>	<b>0</b>									Joists and floor truss & roof truss components.
<b>608 Indigenous Materials</b>												
608.1 Indigenous materials are used for major elements of the building.	<b>10 points max.</b>											
(1) one type of material.	<b>2</b>							<b>2</b>	<b>0</b>			Use indigenous stone for driveway base.
(2) For each additional material.	<b>2</b>							<b>8</b>	<b>0</b>			Specify OSB from local mill. Deck lumber, windows and siding locally sourced.
<b>609 Life Cycle Analysis</b>												

ANSI National Green Building Standard™		378	Baseline		Bronze		Silver		Gold		Emerald		NOTES:	
			Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost		
609.1 A more environmentally preferable product or assembly for an application based upon the use of a Life Cycle Assessment (LCA) tool compliant with ISO 14044 or other recognized standards that compare the environmental impact of building materials, as														
		Max 15 points												
(1) Per product/system comparison		3												
(2) Whole building LCA analysis		15												
<b>610 Innovative Practices</b>														
<b>610.1 Manufacturer's environmental management system concepts.</b> Product manufacturer's operations and business practices include environmental management system concepts and the production facility is ISO 14001 certified or equivalent. The aggregate value of building products from ISO 14001 certified or equivalent production facilities is at least 1% or more of the estimated total building materials cost. (1 point awarded for every percent.)		Max 10 points												
<b>CHAPTER 7: ENERGY EFFICIENCY</b>		<b>Base Pts.</b>	<b>49</b>	<b>0</b>	<b>0</b>	<b>966</b>	<b>52</b>	<b>3,987</b>	<b>53</b>	<b>6,625</b>	<b>26</b>	<b>3,252</b>	<b>Ch. 7 Subtotal</b>	
701.1 Mandatory requirements. The building shall comply with either Section 702 (Performance Path) or Section 703 (Prescriptive Path). Items listed as "Mandatory" in Section 701.4 apply to both the Performance and Prescriptive Paths.		<b>Cost per point</b>	<b>0</b>		<b>#DIV/0!</b>			<b>77</b>		<b>125</b>		<b>125</b>		
<b>701.1.1 Minimum Performance Path Requirements.</b> A building complying with Section 702 shall exceed the baseline minimum performance required by the IECC by 15%, and shall include a minimum of two practices from Section 704.													Performance path selected at all levels.	
<b>701.1.2 Minimum Prescriptive Path Requirements.</b> A building complying with section 703 shall obtain a minimum of 30 points from Section 703, and shall include a minimum of two practices from Section 704.														
<b>701.1.3 Alternative Bronze Level Compliance.</b> As an alternative, any building that qualifies as an ENERGY STAR qualified home or equivalent achieves the Bronze Level for Chapter 7.		<b>30</b>	<b>0</b>	<b>(30)</b>	<b>0</b>									
<b>701.2 Emerald Level Points.</b> The Performance Path shall be used to achieve to the Emerald Level.													Performance path selected at all levels.	
<b>Mandatory Practices</b>														
701.3 A review by the Adopting Entity or designated third party shall be conducted to verify design and compliance with Chapter 7.		<b>Mandatory</b>			<b>0</b>	<b>520</b>							Review by verifier. 4 hrs at professional time. Could be blower door testing. Add'l hours allotted Ch.10.	
<b>701.4.1 HVAC SYSTEMS</b>														
701.4.1.1 Space heating and cooling system/equipment shall be sized according to heating and cooling loads calculated using ACCA Manual J or equivalent.		<b>Mandatory</b>			<b>0</b>	<b>0</b>							2006 IECC requirement.	
701.4.1.2 Where installed, as a primary heat source in the building, radiant or hydronic space heating system is designed using industry-approved guidelines (e.g. ACCA Manual J, GAMA H-22, or an accredited design professional's and manufacturer's recommen		<b>Mandatory</b>			<b>0</b>	<b>0</b>								
<b>701.4.2 DUCT SYSTEM</b>														
701.4.2.1 Ducts are sealed with tape complying with UL 181, mastic, gaskets, or an approved system as required by the ICC IRC (Section M1601.3.1, or ICC IMC Section 603.9) to reduce leakage.		<b>Mandatory</b>			<b>0</b>	<b>0</b>								
701.4.2.2 Building cavities are not used as supply ducts.		<b>Mandatory</b>			<b>0</b>	<b>0</b>								
<b>701.4.3 INSULATION and AIR SEALING</b>														
701.4.3.1 GENERAL Insulation and air sealing is in accordance with the following:														
(1) Insulation shall be installed in accordance with the manufacturer's instructions or local code, as applicable.		<b>Mandatory</b>			<b>0</b>	<b>0</b>								
(2) Shafts (duct shaft, piping shaft/penetrations, flue shaft.) Openings to unconditioned space are fully sealed with solid blocking or flashing and any remaining gaps are sealed with caulk or foam. Fire-rated collars and caulking are installed where re		<b>Mandatory</b>			<b>0</b>	<b>0</b>								
<b>701.4.3.2 FLOOR / FOUNDATION / CRAWLSPACE</b>														
(1) Floors (Including insulated floors above garages and cantilevered floors)		<b>Mandatory</b>			<b>0</b>	<b>0</b>								
(a) Insulation is installed to maintain permanent contact with the underside of the subfloor decking, enveloping any attached ductwork within the thermal envelope without compression or air gaps in the insulation. This practice does not apply to ducts or other mechanical equipment that are adjacent to the underside of the subfloor.														
(b) Batt and loose-fill insulation is held in place by permanent attachments or systems in accordance with the manufacturer's instructions.														
(2) Crawlspace. Where insulated, crawlspace wall insulation is permanently attached to the walls. Exposed earth in unvented crawlspaces is covered with continuous vapor retarder with overlapping joints taped or masticed.		<b>Mandatory</b>			<b>0</b>	<b>0</b>								
<b>701.4.3.3 WALLS</b>														
(1) Windows and Doors. Caulking, gasketing, adhesive flashing tape, foam sealant, or weatherstripping is installed forming a complete air barrier.		<b>Mandatory</b>			<b>0</b>	<b>0</b>								
(2) Band Joist and Rim Joists. Band and rim joists are insulated and air sealed.		<b>Mandatory</b>			<b>0</b>	<b>0</b>								

ANSI National Green Building Standard™	378	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
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<b>(3) Between Foundation and Sill Plate Bottom Plate</b>	<b>Mandatory</b>			<b>0</b>	<b>0</b>							
(a) Sill sealer, or other material that will expand and contract, shall be installed between foundation and sill plate.												
(b) Caulk or the equivalent is installed to seal the bottom plate of exterior walls.												
<b>(4) Skylights and kneewalls.</b> Skylight shafts and knee walls are insulated to the same level as the exterior walls.	<b>Mandatory</b>			<b>0</b>	<b>0</b>							
<b>(5) Exterior Architectural features.</b> Code required building envelope insulation and air sealing is not disrupted at exterior architectural features such as stairs and decks.	<b>Mandatory</b>			<b>0</b>	<b>0</b>							
<b>701.4.3.4 CEILINGS AND ATTICS</b>												
<b>(1) Attic access (except unvented attics).</b> Attic access, knee wall door, or drop down stair is covered with insulation and gasketed. Knee wall door is insulated unit or is covered with insulation.	<b>Mandatory</b>			<b>0</b>	<b>0</b>							
<b>(2) Recessed Lighting.</b> Recessed light fixtures that penetrate the thermal envelope are airtight, IC rated, and sealed with gasket, caulk, or foam.	<b>Mandatory</b>			<b>0</b>	<b>0</b>							
<b>Renovation Note:</b> Replace existing recessed lights that penetrate the thermal envelope with airtight, IC-rated recessed light fixtures that are sealed to drywall with gasket, caulk, or foam. <b>(Additional point per fixture)</b>	<b>1 Add'l Pt</b>											
<b>(3) Eave vents.</b> Where ceiling/attic assemblies or designs have eave vents, baffles, or other means shall be utilized to minimize air movement into or under the insulation.	<b>Mandatory</b>			<b>0</b>	<b>0</b>							
<b>Renovation Note:</b> Provide blocking or baffle at eaves to ensure ventilation over attic insulation.	<b>2 Add'l Pts</b>											
<b>701.4.4 FENESTRATION</b>												
701.4.4.1 The NFRC-certified U-factor and SHGC windows, exterior doors, skylights, and tubular daylighting devices (TDDs) are in accordance with ENERGY STAR, or equivalent, or Table 701.4.4.1. Decorative fenestration elements with a maximum area of 15 sq	<b>Mandatory</b>			<b>0</b>	<b>0</b>							
<b>Table 701.4.4.1</b>												
Fenestration Specifications												
Climate Zones	U-Factor	SHGC										
	Windows and Exterior Doors (maximum certified ratings)											
1 and 2	0.65	0.4										
3	0.4	0.4										
4 to 8	0.35	Any		<b>0</b>	<b>0</b>							
	Skylights and TDDs (max. certified ratings)											
1 to 3	0.75	0.4										
4 to 8	0.6	Any										
<b>702 Performance Path</b>												
702.1 Points from Section 702 (Performance Path) shall not be combined with points from Section 703 (Prescriptive Path).	<b>Mandatory</b>											Performance path.
702.2 Energy efficiency features are implemented to achieve energy cost performance that exceeds ICC IECC by the following. A documented analysis using software in accordance with ICC IECC, Section 404, or ICC IECC Section 506.2 through 506.5, applied a												
(1) 15%		30		<b>30</b>	<b>446</b>	<b>(30)</b>						slab insulation R5 to R10, window change to U=0.33 to 0.30 and shgc=0.40 to 0.50
(2) 30%		60				<b>60</b>	<b>3,481</b>	<b>(60)</b>				1" foam sheathing, reduce ACH50 to 3.93; upgrade boiler/hot water heater to 0.94 from 0.90, and exterior doors to u-value to 0.30 from 0.40
(3) 50%		100						<b>100</b>	<b>6,500</b>	<b>(100)</b>		Closed loop solar hot water and tighten building ACH50 from 3.93 to 2.75
(4) 60%		120								<b>120</b>	<b>3,103</b>	2" of exterior foam; triple pane u=0.22 and shgc=0.60 windows; exterior doors to u=0.18; infiltration improved toACH50=1.98; boiler eff to 0.95
<b>703 Prescriptive Path</b>												
<b>704 Additional Practices</b>												
<b>704.1 Application of Additional Practice Points.</b> Points from Section 704 can be added to points earned in Section 702 (Performance Path), Section 703 (Prescriptive Path) or Section 701.1.3 (alternative Bronze Level compliance).												
<b>704.2 Lighting and Appliances</b>												
704.2.1 Hard-wired lighting meets one of the following:												
(1) A minimum of 50% of the total hard-wired lighting fixtures, or the bulbs in those fixtures, qualify as ENERGY STAR or equivalent.		<b>4</b>										
(2) A minimum of 50% of the total hard-wired lighting fixtures qualify as ENERGY STAR or equivalent.		<b>8</b>						<b>8</b>	<b>125</b>			\$25 per fixture; 5 fixtures

ANSI National Green Building Standard™		378	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
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(3) A minimum of 80% of the exterior lighting wattage has an efficiency of at least 40 lumens per watt or be a solar powered light fixture.													
704.2.2 The number of recessed light fixtures that penetrate the thermal envelope are less than 1 per 400 square feet of total conditioned floor area and are in accordance with Section 701.4.3.4(2).		2	2	0									plans A8.1
704.2.3 Occupancy sensors are installed on indoor lights, and photo or motion sensors are installed on outdoor lights to control lighting.													
(1) 25% of lighting		2											
(2) 50% of lighting		4											
704.2.4 Tubular daylighting device (TDD) or a skylight with sealed, insulated, low-E glass is installed in rooms without windows. (Points awarded per building.)		2											
704.2.5 ENERGY STAR or equivalent appliance(s) are installed:													
(1) Refrigerator		5					5	158					
(2) Dishwasher		2	2	0									section 113100-2
(3) Washing machine		4					4	348					
704.2.6 Induction cooktop is installed.		1											
704.2.7 Occupancy sensors are installed for a minimum of 80% of hardwired lighting outlets.		1											
<b>704.3 Renewable Energy/Solar Heating and Cooling</b>													
<b>704.3.1 Solar space heating and cooling.</b>													
704.3.1.1 Sun-tempered Design: Building orientation, sizing of glazing, and design of overhangs are in accordance with all of the following:		5											
(1) The long side (or one side if of equal length) of the building faces within 20° of true south.													
(2) Vertical glazing area is between 5% and 7% of gross Conditioned Floor Area on the south face (also see Section 704.3.1.1(8)).													
(3) Vertical glazing area is less than 2% of gross Conditioned Floor Area on the west face, and glazing is ENERGY STAR compliant or equivalent.													
(4) Vertical glazing area is less than 4% of gross Conditioned Floor Area on the east face and glazing is ENERGY STAR compliant or equivalent.													
(5) Vertical glazing area is less than 8% of gross Conditioned Floor Area on the north face, and glazing is ENERGY STAR compliant or equivalent.													
(6) Skylights, where installed, are in accordance with the following:													
(a) Shades and insulated wells are used and all glazing is ENERGY STAR compliant or equivalent.													
(b) Horizontal skylights are less than 0.5 % of Finished Ceiling Area													
(c) Sloped skylights on slopes facing within 45° of true South, East or West are less than 1.5% of the Finished Ceiling area													
(7) Overhangs or adjustable canopies or awnings or trellises provide shading on south facing glass for the appropriate climate zone in accordance with Table 704.3.1.1:													
<b>Table 704.3.1.1 Southern Window Overhang Depth</b>													
<b>Climate Zone and Overhang Depth</b>		Vertical Distance between bottom of overhang and top of window sill											
1 through 3	2' 8"	≤7' 4"											
1 through 3	2' 8"	≤6' 4"											
1 through 3	2' 4"	≤5' 4"											
1 through 3	2' 0"	≤4' 4"											
1 through 3	2' 0"	≤3' 4"											
4 through 6	2' 4"	≤7' 4"											
4 through 6	2' 4"	≤6' 4"											
4 through 6	2' 0"	≤5' 4"											
4 through 6	2' 0"	≤4' 4"											
4 through 6	1' 8"	≤3' 4"											
7 and 8	2' 0"	≤7' 4"											
7 and 8	1' 8"	≤6' 4"											
7 and 8	1' 8"	≤5' 4"											
7 and 8	1' 4"	≤4' 4"											
7 and 8	1' 0"	≤3' 4"											
(8) The south face windows have a SHGC of 0.40 or higher.													
(9) Return air or transfer grilles/ducts are in accordance with Section 704.4.5.													
704.3.1.2 Automated solar protection is installed to provide shading for windows.		1											
704.3.1.3 Passive cooling design features are in accordance with three or more of the following:													
Points for three items:		3											

ANSI National Green Building Standard™	378	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
Points for one additional item:	1											
(1) Exterior shading is provided on east and west windows using one or a combination of the following strategies:												
(a) Vine covered trellises with the vegetation separated a minimum of 1 foot from face of building.												
(b) Moveable awnings or louvers												
(c) Covered porches												
(d) Attached or detached conditioned/unconditioned enclosed space that provides full shade of east and west windows (e.g., detached garage, shed or building)												
(2) Overhangs are installed to provide shading on south-facing glazing in accordance with Section 704.3.1.1(7). (Points not awarded if points are taken under 704.3.1.1.)												
(3) Windows and/or venting skylights are located to facilitate cross ventilation.												
(4) Solar reflective roof or radiant barrier is installed in Climate Zones 1, 2 or 3 and roof material meets a 3 year aged criteria of 0.50.												
(5) Internal exposed thermal mass is a minimum of three inches in thickness. Thermal mass consists of concrete, brick, and/or tile that are fully adhered to a masonry base or other masonry material and is in accordance with one or a combination of the fo												
(a) A minimum of one square foot of exposed thermal mass of floor per three square feet of gross finished floor area.												
(b) A minimum of three square feet of exposed thermal mass in interior walls or elements per square foot of gross finished floor area.												
(6) Roofing material is installed with a minimum 0.75 inch continuous air space offset from the roof deck from eave to ridge.												
704.3.1.4 Passive solar heating design. In addition to the sun-tempered design features in Section 704.3.1.1, all of the following are implemented:	4											
(1) Additional glazing, no greater than 12%, is permitted on the south wall. This additional glazing is in accordance with the requirements in Section 704.3.1.1.												
(2) Additional thermal mass for any room with south-facing glazing of more than 7% of the finished floor area is provided in accordance with the following:												
(a) Thermal mass is solid and a minimum of 3" in thickness. Where two thermal mass materials are layered together (e.g. ceramic tile on concrete base) to achieve the appropriate thickness, they are fully adhered to (touching) each other.												
(b) Thermal mass directly exposed to sunlight must be provided in the following minimum ratios:												
(i) Above latitude 35°: 5 square feet of thermal mass for every 1 square foot of south facing glazing.												
(ii) Latitude 30° to 35°: 5.5 square feet of thermal mass for every 1 square foot of south facing glazing.												
(iii) Latitude 25° to 30°: 6 square feet of thermal mass for every 1 square foot of south facing glazing.												
(c) Thermal mass not directly exposed to sunlight is permitted to be used to achieve thermal mass requirements of Section 704.3.1.4 (2) based on a ratio of 40 square feet of thermal mass for every 1 square foot of south facing glazing.												
(3) In addition to return air or transfer grilles/ducts required by Section 704.3.1.1, provisions for forced airflow to adjoining areas are implemented as needed.												
704.3.2 Solar water heating												
704.3.2.1 Solar water heater. SRCC (Solar Rating & Certification Corporation) OG 300 rated, or equivalent, solar domestic water heating system is installed. Solar Energy Factor (SEF as defined by SRCC) is in accordance with Table 704.3.2.1.												
<b>Table 704.3.2.1 - Solar Hot Water Systems</b>												
SEF - Electric Tank	SEF - Gas Tank	<b>POINTS</b>										
1.30 - 1.50	0.85 - 1.00	8										
1.51 - 1.80	1.01 - 1.20	11										
1.81 - 2.30	1.21 - 1.50	14										
2.31 - 3.00	1.51 - 2.00	17										
3.01	2.01	20										
704.3.3 Additional renewable energy options												
704.3.3.1 Photovoltaic panels are installed on the property. (Points awarded per every 100 watts DC of the rated PV system)		1										

ANSI National Green Building Standard™		378	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
			Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
704.3.3.2 Other onsite renewable energy source is installed (e.g., wind energy, onsite micro-hydro power, active solar space heating systems). (Points awarded per every 1/10 kW of the system)		0.5											
<b>704.4 Ducts</b>													
704.4.1 Duct system is sized, designed, and installed according to ACCA Manual D or equivalent.		5											
704.4.2 Space heating is provided by a system that does not include air ducts.		15	15	0									hydronic boiler w/ radiators
704.4.3 Space cooling is provided by a system that does not include air ducts.		15											
704.4.4 Ductwork is in accordance with all of the following:		12											
(1) Building cavities are not used as return ductwork.													
(2) Heating and cooling ducts and mechanical equipment are installed within the conditioned building space .													
(3) Ductwork is not installed in exterior walls													
704.4.5 Return ducts or transfer grilles are installed in every room with a door. This practice does not apply to bathrooms, kitchens, closets, pantries, and laundry rooms.		5											Plans indicate returns every room.
<b>704.5 HVAC Design and Installation</b>													
704.5.1 ACCA Manual S or equivalent is used to select heating and/or cooling equipment.		1							1	0			The code does not require Manual S, however, Manual D, code required; references
704.5.2 HVAC contractor and service technician are certified by a nationally or regionally recognized program such as North American Technician Excellence, Inc. (NATE), Building Performance Institute (BPI), Radiant Panel Association, or manufacturers' tr		1							1	0			Standard.
704.5.3 Performance of the heating/cooling system is verified by the HVAC contractor in accordance with all of the following:		3									3	0	Specify in scope.
(1) Start-up procedure is performed according to manufacturer's instructions.													Standard.
(2) Refrigerant charge is verified by super-heat and/or sub-cooling method.													Standard.
(3) Burner is set to fire at nameplate input.													Standard.
(4) Air handler setting/fan speed is set per manufacturer's instructions.													Standard.
(5) Total air flow is within 10% of design flow.													Standard.
(6) Total external system static does not exceed equipment capability at rated airflow.													149 Allow team of 2 - 2 hours at field rate.
704.5.4 HVAC equipment operates using an alternate refrigerant containing no HCFCs. (Points awarded only until January 20, 2010.)		1											Standard.
704.5.5 Manufacturer's label or printed specifications for sealed air handler (except furnaces) indicates the leakage is less than or equal to 2% of design airflow at a pressure of 1-inch w.g. (1250 Pa). Air handlers are tested with inlets, outlets, an		4											
<b>704.6 Installation and Performance Verification</b>													
704.6.1 Third party onsite inspection is conducted to verify conformance with all of the following, as applicable. Minimum of 2 inspections are performed. One inspection after insulation is installed and prior to being covered, and another inspection upon completion of the project. Where multiple building or dwelling units of the same model are built by the same builder, a representative sample inspection of a minimum of 15% of the buildings or dwelling units is permitted.		5					5	0					included in 30% verification
(1) Ducts are installed per IRC/IMC and ducts are sealed.													
(2) Building envelope air sealing is installed.													
(3) Insulation is installed in accordance with Section 703.1.2													
(4) Windows, skylights, and doors are flashed, caulked, and sealed in accordance with manufacturer's recommendations and in accordance with Section 703.2.1.													
704.6.2 Third party testing is conducted to verify performance.													
704.6.2.1 Building envelope leakage rate is demonstrated by blower door test. In addition to the test, the following practices are required:													
1. Whole building ventilation is provided in accordance with Section 902.2.													
2. Fossil fuel furnace and water heater is sealed combustion or power vented in accordance with Section 901.1.													
3. Fireplaces and Fuel Burning Appliances are in accordance with 901.2.													
<b>The maximum leakage rate is in accordance with:</b>													
(a) 5 ACH50	0.25 nat	3											
(b) 4 ACH50	0.2	6					6	0	(6)				\$ included in performance rating
(c) 3 ACH50	0.15	9							9	0	(9)	0	\$ included in performance rating



ANSI National Green Building Standard™		378	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
			Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(d) 2 ACH50	0.1	12									12	0	\$ included in performance rating
(e) 1 ACH50	0.05	15											
704.6.2.2 The entire central HVAC duct system, including air handlers and register boots, is tested for leakage at a pressure differential of 0.1 inches w.g. (25 Pa). The maximum leakage as a percent of the system design flow rate is in accordance with													
(1) 6% for ductwork entirely outside the building's thermal envelope.													
		15											
(2) 6% for ductwork entirely inside the building's thermal envelope.													
		5											
(3) 6% for ductwork both inside and outside the building thermal envelope.													
		15											
704.6.2.3 Balanced HVAC air flows are demonstrated by flow hood or other acceptable flow measurement tool. Test results in accordance with both of the following:													
(a) Measured flow at each supply and return register is within 25% of design flow.													
		8											
(b) Total airflow is within 10% of design flow.													
<b>705 Innovative Practices</b>													
<b>705.1 Energy consumption control.</b> A whole building or whole dwelling unit device is installed that controls or monitors energy consumption.													
		7 Points Max											
(1) Programmable communicating thermostat													
		2					2	0					
(2) Energy monitoring device													
		4											
(3) Energy management control system													
		7											
705.2 Renewable energy service plan is as follows:													
(1) Builder selects a renewable energy service plan provided by the local electrical utility for interim (temporary) electric service. The builder's local administrative office has renewable energy service.													
		2											
(2) The buyer of the home selects a renewable energy service plan provided by the utility prior to occupancy of the home.													
		5											
<b>CHAPTER 8: WATER EFFICIENCY</b>													
<b>801 Indoor and Outdoor Water Use</b>													
		Base Pts.	11	0	5	0	21	150	7	0	18	432	Ch. 8 Subtotal
		Cost/Point		0		0		7.142857				24	
801.0 Intent. Measures that reduce indoor and outdoor water usage are implemented.													
801.1. Indoor hot water usage is reduced by one of the following practices:													
(1) All hot water piping which runs to the plumbing fixtures in both the kitchen and bathrooms is 40-foot or less in length from the water heater and is sized in accordance with the code for the specified application.													
		2	2	0									plans A20.1
(2) All hot water piping which runs to the plumbing fixtures in both the kitchen and bathrooms is 30-foot or less from the water heater and is sized in accordance with the code for the specified application.													
		3											
(3) One of the following piping system designs is implemented:													
(a) Use of structured-type plumbing with demand controlled hot water loops, in which the volume of water contained in the pipe and fixture fittings downstream of the recirculating trunk line is a maximum of 4 cups (0.25 gallons).													
		6											
(b) Implement an engineered parallel piping system (i.e. manifold system) in which the hot water line distance from the water heater to the parallel piping system is less than 15 feet and the parallel piping to the fixture fittings contains a maximum of 8													
		6											
(c) Central core plumbing system with all plumbing fixture fittings (e.g., faucets & showerheads) located such that the volume of water contained in each pipe run between the water heater and fixture fitting is a maximum of 6 cups (0.38 gallons).													
		8											
(4) Pipe runs exceeding 40-feet from the water heater to fixture locations are aided by one of the following:													
(a) Tankless water heater is installed at point of use and is served only by cold water or a solar-assisted system.													
		1											
(b) On demand hot water recirculation system is installed.													
801.2 Energy Star® or equivalent water-conserving appliances are installed													
(1) Dishwasher													
		2	2	0									section 113100
(2) Washing machine													
		8					8	50			(8)	(50)	
(3) Washing machine with a water factor of 6.0 or less													
		12									12	100	
801.3 A minimum of one food waste disposer is installed at the primary kitchen sink.													
		1	1	0									section 22400
<b>801.4 Showerheads</b>													
801.4 (1&2) 1) The total showerhead flow rate at any point in time, for all showerheads in each shower compartment is less than 2.5 gpm, tested at 80 psi per ASME A112.18.1/CSA B125.1. 2) In addition the showerheads must be equipped with an automatic com													
		1 Point (3 Points Max)											Showerhead flow rate max. EPA is 2.5.
					1	0							
801.4 (3&4) All shower compartments in the home comply with 801.4 (1&2).													

ANSI National Green Building Standard™	378	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(3) All shower compartments installed meet the above conditions and are 2.0 to less than 2.5 gpm.	1 Add'l Pt			1	0	-1	0					
(4) All shower compartments installed meet the above conditions and are 1.6 to less than 2.0 gpm.	2 Add'l Pts					2	0					Specify lower flow rate faucet/aerator.
<b>801.5 Faucets</b>												
801.5.1 Water-efficient lavatory faucets with 1.5 gpm or less maximum flow rate when tested at 60 psi in accordance with ASME A112.18.1 are installed.												
(1) a bathroom (Points awarded for each bathroom.)	3 Pts Max			1	0							Specify low flow rate faucet/aerator.
(2) all lavatory faucets in the home meet the conditions of 801.5.1	2 Add'l Pts			2	0							
(1) Gold and Emerald Levels: All water closets and urinals are in accordance with either Section 801.6 or 802.2.	Mandatory											
(2) A water closet is installed with an effective flush volume of 1.28 gallons or less when tested in accordance with ASME A112.19.2 (all water closets) and ASME A112.19.14 (all dual flush water closets), and is in accordance with EPA WaterSense Tank-Typ	6 18 Pts Max					6	100					Install low flow toilet.
(3) A urinal is installed with a flush volume of 0.5 gallons or less when tested in accordance with ASME A112.19.2.	4 Max 4 Points											
4) All water closets and all urinals are in accordance with Section 801.6(2) or Section 801.6(3), as applicable.	6 Add'l Points					6	0					
<b>801.7 Irrigation systems</b>												
801.7.1 A low-volume, irrigation system is installed for each landscape type utilized: (Points awarded for each type of irrigation system installed.)	10 Pts. Max											
(1) High distribution uniformity (DU) rotating spray heads	2	2	0									section328400
(2) Drip irrigation	4							4				
(3) Bubblers	4									4		
(4) Drip emitters	4											
(5) Soaker hose	4											
(6) Subsurface irrigation	6											
801.7.2 Irrigation system is in accordance with both of the following:	3							3				
1) designed by a professional in accordance with EPA WaterSense requirements or equivalent												
2) installed in accordance with EPA WaterSense program or equivalent												
801.7.3 Irrigation system is zoned separately for turf and bedding areas.	2									2		
801.7.4 The irrigation system(s) is controlled by a smart controller:												
(1) Evapotranspiration (ET) based irrigation controller with a rain sensor	4	4										section 328400
(2) Soil moisture sensor based irrigation controller	4											
(3) No irrigation is installed and a landscape plan is developed in accordance with Section 503.5(1) as applicable. (Points must be taken in 503.5(1) in order to receive points for 801.7.4(3))	15											
801.8 Rainwater collection and distribution is provided.												
(1) Rainwater is collected and used	6									6	382	
(2) Rainwater is distributed using a renewable energy source or gravity.	2									2	0	Distribution by gravity.
801.9 Water Filters. Water filter is installed to improve water quality for the whole building or whole dwelling unit.	1											
802.1 Gray water (as specified in ICC IRC, Appendix O) is separated and reused, as permitted by local building code. (Points awarded for either Section 802.1(1) or 802.1(2), not both)												
(1) Each water closet flushed by reclaimed or recycled water.	4 Points (per fixture)											
(2) Irrigation from reclaimed or recycled water onsite	10											
802.2 Composting or waterless toilets and/or urinals. Composting or waterless toilets and/or urinals are in accordance with the following: (For water closets, points awarded for either Section 802.2 or 801.6, but not both)	24 Points Max											
1) Gold and emerald levels: All water closets and urinals are in accordance with either Section 802.2 or Section 801.6.	Mandatory											
2) Composting or waterless toilet and/or urinal is installed. (Points awarded per fixture)	8											
3) All toilets and urinals are in accordance with Section 802.2 (2).	8 Add'l Points											
802.3 Automatic shutoff water devices. One of the following automatic shutoff water supply devices is installed. Where a fire sprinkler system is present, installer is to ensure the device will not interfere with the operation of the fire sprinkler system	2											
(1) Excess Water Flow Shutoff												
(2) Leak Detection System												

ANSI National Green Building Standard™	378	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
<b>CHAPTER 9: INDOOR ENVIRONMENTAL QUALITY</b>	<b>Base Pts.</b>	104	0	0	0	15	0	4	44	23	147	Ch. 9 Subtotal
<b>901 Pollutant Source Control</b>	<b>Cost/Point</b>		0		#DIV/0!		0		11		6	
901.0 Intent. Pollutant sources are controlled.												
901.1 Space and water heating options												
901.1.1 Natural draft space heating or water heating equipment is not located in conditioned spaces, including conditioned crawl spaces. Natural draft equipment is permitted to be installed within the conditioned spaces if located in a mechanical room that has an outdoor air source, and is otherwise sealed and insulated to separate it from the conditioned space(s).	5											boiler
901.1.2 Air handling equipment or return ducts are not located in the garage, unless placed in isolated, air-sealed mechanical rooms with an outside air source.	5	5	0									
901.1.3 The following combustion space heating and water heating equipment is installed within conditioned space.												
(1) Direct vent furnace or boiler	5											
(2) (a) Power vent water heater	3											
(b) Direct vent water heater	5											boiler
901.1.4 The following electric equipment is installed:												
1) Heat pump air handler in unconditioned space	2											
2) Heat pump air handler in conditioned space	5											
901.2 Fireplaces and Fuel Burning Appliances (except cooking appliances, clothes dryers, water heaters, and furnaces) located in conditioned space are code compliant, vented to the outdoors, and have adequate combustion and ventilation air provided to minimize spillage or back-drafting, in accordance with the following: <u>All of the following items are mandatory, if applicable, for certification.</u>												
901.2.1(1) Natural gas and propane fireplaces that are power vented or direct vented, are equipped with permanently fixed glass fronts or gasketed doors, and comply with ANSI Z21.88/CSA 2.33a or ANSI Z21.50/CSA 2.22	7											
901.2.1(2)(a) Wood burning fireplaces are equipped with gasketed doors designed to operate with the doors closed, outside combustion air, and a means is provided for sealing the flue to minimize interior air (heat) loss when not in operation.	4											
901.2.1(2)(b) Factory-built wood burning fireplaces are in accordance with the certification requirements of UL 127 and are EPA certified.	6											
901.2.1(2)(c) Wood stove and fireplace inserts, as defined in UL 1482. Section 3.8 are in accordance with the certification requirements of UL 1482 and are in accordance with the emission requirements of the EPA Certification and the State of Washington W	6											
901.2.1(2)(d) Pellet (biomass) stoves and furnaces are in accordance with the requirements of ASTM E1509 or are EPA Certified.	6											
901.2.1(2)(e) Masonry heaters are in accordance with the definitions in ASTM E1602 and ICC IBC, Section 2112.1.	6											
901.2.2 Fireplaces, woodstoves, pellet stoves, or masonry heaters are not installed.	7	7	0									
901.3 Garages are in accordance with the following:												
901.3(1)(a) Where installed in the common wall between the attached garage and conditioned space, the door is tightly sealed and gasketed.	Mandatory 2 Points	0	0									
901.3(1)(b) A continuous air barrier is provided between walls and ceilings separating the garage space from the conditioned living spaces.	Mandatory 2 Points	0	0									
901.3(1)(c) For one and two-family dwelling unit attached garages, a 100 cfm or greater ducted, or 70 cfm or greater unducted wall exhaust fan is installed and vented to the outdoors, designed and installed for continuous operation, or has controls (e.g., motion detectors, pressure switches) that activate operation for a minimum of 1 hour when either human passage door or roll-up automatic doors are operated. For ducted exhaust fans, the fan airflow rating and duct sizing are in accordance with Appendix A. (If you claim points for 901.3(1)(c), you cannot claim points for 901.3(2).	4											
901.3(2) A carport is installed, the garage is detached from the building, or no garage is installed. (If you claim points for 901.3(2), you cannot claim points for 901.3(1)(a), 901.3(1)(b), or 901.3(1)(c).	10	10	0									
901.4(2-6) Wood Materials. A minimum of 85% of material within a product group (i.e. wood structural panels, countertops, composite trim/doors, custom woodwork, and/or component closet shelving) is manufactured in accordance with the following:	10 points max.											

ANSI National Green Building Standard™	378	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
901.4(1) Structural plywood used for floor, wall, and/or roof sheathing is compliant with DOC PS 1 and/or DOC PS 2. OSB used for floor, wall, and/or roof sheathing is compliant with DOC PS 2. The panels are made with moisture-resistant adhesives. The trademark indicates these adhesives as follows: Exposure 1 or Exterior for plywood, and Exposure 1 for OSB.	Mandatory	0	0									section 061600-2
(2) Particleboard and MDF (medium density fiberboard) is manufactured and labeled in accordance with CPA A208.1 and CPA A208.2, respectively.	2 Points per Product Group	2	0									section 064023-1 - mdf and trim
(3) Hardwood plywood is in accordance with HPVA HP-1 and HUD Title 24, Part 3280.	2 Points per Product Group	2	0									section 123530-2 - cabinets
(4) Particleboard, MDF, or hardwood plywood is in accordance with CPA 2.	3 Points per Product Group											
(5) Composite wood or agrifiber panel products contain no added urea-formaldehyde or are in accordance with the CARB Composite Wood Air Toxic Contaminant Measure Standard.	4 Points per Product Group											
(6) Non-emitting products.	4 Points per Product Group	4	0									section 064023 no added formaldehyde
<b>Renovation Note:</b> Additional points for Section 901.4 apply to renovations that replace all existing countertops, shelving, and other nonstructural products.	2 Add'l Pts											
901.5 Carpets are in accordance with the following:												
901.5(1) Wall-to-wall carpeting is not installed adjacent to water closets and bathing fixtures.	Mandatory	0	0									plans A20.1
901.5(2) A minimum of 85% of installed carpet area, carpet cushion (padding), and carpet adhesives are in accordance with the emission levels of CDPH 01350, as certified by a third-party program, such as the Carpet and Rug Institute's (CRI) Green Label Pl												
(a) Carpet	6	6	0									section 096816-1
(b) Carpet cushion	2					2	0					Specify.
(c) Carpet adhesives	2	2	0									
901.6 Hard-surface flooring. A minimum of 85% of installed hard-surface flooring is in accordance with the emission concentration limits of CDPH 01350 (using the office scenario), as certified by a third-party program, such as the RFCI's FloorScore Indoor Air Certification Program or the Greenguard Environmental Institute's Children and Schools Certification Program.	6									6		Specify hardwood, ceramic, or vinyl are in accordance
901.7 Wall coverings. A minimum of 85% of wall coverings are in accordance with the emission concentration limits of CDPH 01350 (using the office scenario), as certified by a third-party program, such as the Scientific Certification Systems (SCS) Indoor Advantage Gold Program or the Greenguard Environmental Institute's Children and Schools Certification Program.	4											
901.8 Architectural coatings. A minimum of 85% of the architectural coatings are in accordance with one of the following conditions:												
901.8.1 Site-applied interior products are in accordance with one or more of the following; not both.	5											
(1) Zero VOC, determined by EPA Method 24 (VOC content below the detection limit for the method).												
(2) CARB Suggested Control Measure for Architectural Coatings												
(3) GS-11												
(4) VOC limits in accordance with:												
(a) 50 grams/liter flat												
(b) 100 grams/liter non flat												
(c) 350 grams/liter clear wood varnish												
(d) 550 grams/liter clear wood lacquer												
901.8.2 Site-applied interior products are in accordance with the emissions levels of CDPH 01350, as certified by a third party program such as the Scientific Certification Systems (SCS) Indoor Advantage Gold Program or the Greenguard Environmental Institute's Children and Schools Certification Program.	8											
901.9 Adhesives and Sealants.												
901.9.1 For exterior low-VOC adhesives and sealants, a minimum of 85% of site-applied products used for the installation of subfloors and on the exterior of the project are in accordance with one of the following:	5									5	0	specify low voc
(1) The California Air Resources Board consumer products regulation as follows:												
a) Construction Adhesives: VOC content not to exceed 7% by weight or 75 grams/liter, whichever is greater.												
b) The VOC content of reactive sealants (i.e., silicones, polyurethanes, and hybrids, such as MS Polymer and silylated polyurethane resin or SPUR) not to exceed 4% by weight or 50 grams/liter, whichever is greater.												

ANSI National Green Building Standard™	378	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
c) The VOC content of all other caulks and sealants not to exceed 2% by weight or 30 grams/liter, whichever is greater.												
(d) The VOC content of contact adhesives not to exceed 55% by weight or 480 grams/liter, whichever is greater.												
(2) GS-36												
901.9.2 Interior Low-VOC Adhesives and Sealants. For interior low VOC adhesives and sealants, a minimum of 85% of site-applied products used within the interior of the building are in accordance with one of the following, as applicable:												
(1) CDPH 01350, as certified by a third party program, such as Scientific Certification Systems (SCS) Indoor Advantage Gold Program or the Greenguard Environmental Institute's Children and Schools Certification Program.	5									5	0	specify low voc
(2) GS-36	5											
901.10 Cabinets. A minimum of 85% of kitchen and bath vanity cabinets are in accordance with one of the following: <b>(Where more than one of the following practices is used, the practice with the fewer number of points is awarded)</b>												
(1) Kitchen and bath vanity cabinets in accordance with KCMA ESP 01, or equivalent, are installed.	2											
(2) Kitchen and bath vanity cabinets in accordance with CARB Composite Wood Air Toxic Contaminant Measure Standard are installed.	3	3	0							(3)	0	plans A8.3 and section 123530 part 2.2.C.3.b. CARB
(3) Kitchen and bath vanity cabinets are installed that contain no added urea formaldehyde or are in accordance with GGPS.EC.010.R0, ASTM D6670, or equivalent.	5									5	0	Require better specs on cabinets.
901.11 Insulation is in accordance with the following:												
(1) Formaldehyde emissions of wall, ceiling, and floor insulation materials are in accordance with the emissions levels of CDPH 01350, as certified by a third-party program, such as the GREENGUARD Environmental Institute's Children and Schools Certification Program or the Scientific Certifications Systems (SCS) Indoor Advantage Gold Program.	4					4	0					Insulation can be respec'd to meet this criteria.
(2) Formaldehyde emissions of duct insulation materials are in accordance with the emissions levels of CDPH 01350, as certified by a third-party program, such as the GREENGUARD Environmental Institute's Children and Schools Certification Program or the Scientific Certifications Systems (SCS) Indoor Advantage Gold Program.	1					1	0					Specify.
901.12 A carbon monoxide (CO) alarm is installed in a central location outside of each separate sleeping area in the immediate vicinity of the bedrooms. The CO alarm(s) is located in accordance with NFPA 720 and is hard-wired with a battery back-up. The alarm device(s) is certified by a third party for conformance with either CSA 6.19 or UL 2034.	3							3	0			
901.13 Building entrance pollutants control. Pollutants are controlled at all main building entrances by one of the following methods:												
(1) Exterior grilles or mats are installed in a fixed manner and may be removable for cleaning.	1							1	44			
(2) Interior grilles or mats are installed in a fixed manner and may be removable for cleaning.	1											
901.14 Non-smoking areas. All interior common areas of a multi-unit building are designated as non-smoking areas with posted signage.	1											
<b>902 Pollutant Control</b>												
902.0 Intent. Pollutants generated in the building are controlled.												
902.1.1 Spot ventilation is in accordance with the following:												
(1) Bathrooms (including powder rooms) are vented to the outdoors. The minimum ventilation rate is 50 cfm for intermittent operation or 20 cfm for continuous operation in bathrooms.	Mandatory	0	0									plans A20.1
(2) Clothes dryers are vented to the outdoors.	Mandatory	0	0									plans A7.8, per washington state IAQ Code
(3) Kitchen exhaust units and/or range hoods are ducted to the outdoors and have a minimum ventilation rate of 100 cfm for intermittent operation or 25 cfm for continuous operation.	8	8	0									plans A20.1
902.1.2 Bathroom and/or laundry exhaust fan is provided with an automatic timer and/or humidistat:	9 Points Max											
1) for first device	5											

ANSI National Green Building Standard™	378	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
2) For each additional device	2											
902.1.3 Kitchen range, bathroom, and laundry exhaust are verified to specification. Ventilation airflow at the point of exhaust is tested to a minimum of 100 cfm intermittent or 25 cfm continuous for kitchens, and 50 cfm intermittent or 20 cfm continuous	8	8	0									section 220000.3.4.E air balance testing
902.1.4 Exhaust fans are ENERGY STAR as applicable.	Max. 6 Points											
(1) ENERGY STAR, or equivalent, fans (Points awarded per fan)	2											
(2) ENERGY STAR, or equivalent, fans operating at or below 1 sone (Points awarded per fan)	3	6	0									section 233400-2 - verified online
902.2. Building ventilation systems.												
902.2.1 One of the following whole building ventilation systems is implemented and is in accordance with the specifications of Appendix B. (Points must be claimed in 902.2.1 to claim points in 902.2.2.)												
(1) Exhaust or supply fan(s) ready for continuous operation and with appropriately labeled controls.	8											
(2) Balanced exhaust and supply fans with supply intakes located in accordance with the manufacturer's guidelines to not introduce polluted air back into the building.	10											
(3) Heat-recovery ventilator.	15	15	0									section 233400-1
(4) Energy-recovery ventilator.	17											
902.2.2 Ventilation airflow is tested to achieve the design fan airflow at point of exhaust in accordance with Appendix B. (Points must be claimed in 902.2.1 to claim points in 902.2.2)	8	8	0									
902.2.3 MERV filters 8 or greater are installed on central air systems. Designer or installer is to verify that the HVAC equipment is able to accommodate the greater pressure drop of MERV 8 filters.	3											
902.3 Radon control. Radon control measures are in accordance with ICC IRC Appendix F. (Zones are defined in Figure 9(1).)												
902.3(1) Buildings located in Radon Zone 1 have a radon system installed.	Mandatory	0	0									zone 3
(a) A passive radon system is installed.	10											
(b) An active radon system is installed.	15											
902.3(2) Buildings located in Zone 2.												
(a) A passive radon system is installed.	10											
902.4 HVAC system protection. One of the following HVAC system protection measures is performed:												
(1) HVAC supply registers (boots), return grilles, and rough-ins are covered during construction activities to prevent dust and other pollutants from entering the system.	3	3	0									section 013513-2
(2) Prior to owner occupancy, HVAC supply registers (boots), return grilles, and duct terminations are inspected and vacuumed. In addition, the coils are inspected and cleaned and the filter is replaced if necessary.	3											
902.5 Central vacuum systems. Central vacuum system is installed and vented to the outside.	5											
902.6 Living space contaminants. The living space is sealed to prevent unwanted contaminants.												
(1) Attic access, knee wall door, or drop down stair is caulked, gasketed, or otherwise sealed.	2	2	0									plans A8.1
(2) All penetrations (e.g., top plates, HVAC register boots, recessed can lights, are sealed in the following areas:												
(a) Attic/ceiling	2					2	0					specify, and verification is done with blower door and costed their also
(b) Wall	2					2	0					specify, and verification is done with blower door and costed their also
(c) Floors	2					2	0					specify, and verification is done with blower door and costed their also
903 Moisture Management: Vapor, Rainwater, Plumbing, HVAC												
903.0 Intent. Moisture and moisture effects are controlled.												

ANSI National Green Building Standard™	378	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
903.1 Tile backing materials installed under tiled surfaces in wet areas are in accordance with ASTM C1178, C1278, C1288, or C1325.		0	0									no ceramic installed
<b>Mandatory</b>												
903.2 Capillary breaks												
903.2.1 A capillary break and vapor retarder are installed at all concrete slabs in accordance to the following:		0	0									plans A7.1
<b>Mandatory</b>												
1) A minimum 4-inch thick bed of ½ inch diameter or greater clean aggregate, covered with polyethylene or polystyrene sheeting in direct contact with the concrete slab, with the sheeting joints lapped in accordance with Section 903.3. (or)												
2) A minimum 4-inch thick uniform layer of sand, overlain with a layer or strips of geotextile drainage matting, covered with polyethylene sheeting, with the sheeting joints lapped according to Section 903.3.												
Modification for 1&2:												
a. In areas with free-draining soils, identified as Group 1 in the ICC IRC by a certified hydrologist, soil scientist, or engineer through a site visit, a gravel bed or geotextile matting is not required.												
b. In Dry climate locations, as defined by Figure 6(1), polyethylene sheeting is not required unless required for radon resistance (Section 902.3).												
903.2.2 Add a capillary break on footing to prevent moisture migration into foundation wall.		3								3	75	
903.3 Crawlspace												
903.3.1(1) Minimum 6-mil vapor retarder installed on the crawl space floor and extended up the wall sufficient to allow the material to be affixed with glue and furring strips. Joints of vapor retarder overlap a minimum of 6 inches and are taped.		6										
903.3.1(2) Damp-proof walls are provided below finished grade. Joints of vapor retarder overlap a minimum of 6 inches and are taped.		0	0									
<b>Mandatory</b>												
903.3.2 Crawlspace that is built as a conditioned area is sealed to prevent outside air infiltration and provided with conditioned air at a rate not less than 0.02 cfm per square foot of horizontal area and one of the following is implemented:												
(1) A concrete slab over lapped 6 mil polyethylene or polystyrene		10										
(2) 6-mil polyethylene sheeting, lapped a minimum of 6 inches and taped at the seams.		8										
903.4 Moisture control measures.												
903.4.1(1) Building materials with visible mold are not installed or are cleaned or encapsulated prior to concealment and closing.						2	0					Put into specs.
<b>2 Points</b>												
903.4.1(2) Walls are not enclosed (e.g. with drywall) if the insulation has a high moisture content. Wet insulation products are dry before enclosing.												
<b>Mandatory</b>												
<b>2 Points</b>		2	0									
903.4.1(3) The moisture content of lumber is sampled to ensure it does not exceed 19 % prior to the surface and/or wall cavity enclosure.		4	0									section 061000
<b>4</b>												
903.4.2 Moisture content of subfloor, substrate, or concrete slabs is in accordance with the appropriate industry standard for the finish flooring to be applied.		2	0									section 096816 and 096500
<b>2</b>												
903.5 Plumbing.												
903.5.1 Plumbing distribution lines are not installed in exterior wall cavities.		2										
<b>2</b>												
903.5.2 Cold water pipes in unconditioned spaces are insulated to a minimum of R-4 with pipe insulation or other covering that adequately prevents condensation.		2										
<b>2</b>												
903.5.3 Plumbing is not installed in unconditioned spaces.		5	5	0								
<b>5</b>												
903.6(1) Duct insulation. All HVAC ducts, plenums, and trunks in unconditioned attics, basements, and crawlspaces are insulated to a minimum of R-6. Outdoor air supplies to ventilation systems are insulated to a minimum of R-6.		0	0									section 233100-1
<b>Mandatory</b>												
903.6(2) Duct insulation. All HVAC ducts, plenums, and trunks in unconditioned attics, basements, and crawlspaces are insulated to a minimum of R-8. Outdoor air supplies to ventilation systems are insulated to a minimum of R-8.												
<b>2</b>												
903.7 Relative Humidity. In climate zones 1A, 2A, 3A, 4A, and 5A as defined by Figure 6(1), equipment is installed to maintain relative humidity (RH) at or below 60% using one of the following:												
<b>8 Points</b>												
903.9.1 In "Warm-Humid" climates as defined by Figure 6(1) equipment is installed to maintain Relative Humidity (RH) at or below 60% using one of the following:												Richmond VA is not warm/humid climate
(1) Additional dehumidification system(s)												
(2) Central HVAC system equipped with additional controls to operate in dehumidification mode.												

ANSI National Green Building Standard™	378	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
<b>904 Innovative Practices</b>												
904.1 A humidity monitoring system is installed with a mobile base unit that displays a reading of temperature and relative humidity at the base unit with a minimum of two remote units. One remote unit that is placed permanently inside the conditioned space in a central location, excluding attachment to exterior walls, and another remote unit is placed permanently outside of the conditioned space.	2									2	72	Bath fans are already triggered by humidistats.
904.2 Kitchen exhaust unit(s) that equal or exceeds 400 cfm, and make-up air is provided.	2											
<b>CHAPTER 10: OPERATION, MAINT., AND BUILDING OWNER EDUCATION</b>	<b>Base Pts.</b>	6	0	6	950	0	0	0	0	5	0	Ch. 10 Subtotal
<b>Building Owners' Manual for One- and Two-Family Dwellings</b>												
1001.0 Intent. Information on the building's use, maintenance and green components is provided.												
1001.1 A homeowner's binder is provided that includes the following, as available and applicable:	1 point per 2 items											
(Points awarded for mandatory and non-mandatory items)												
(1) A green building program certificate or completion document.	Mandatory											
(2) List of green building features (can include the national green building checklist).	Mandatory											
(3) Product manufacturer's manuals or product data sheet for installed major equipment, fixtures and appliances. If product data sheet is in the binder, manufacturer's manual shall may be attached to appliance in lieu of inclusion in the binder.	Mandatory											
(4) Information on local recycling programs.												
(5) Information about available local utility programs that purchase a portion of energy from renewable energy providers.												
(6) Explanation of the benefits of using energy efficient lighting systems (e.g., compact fluorescent light bulbs, light emitting diode (LED)) in high usage areas.												
(7) A list of practices to conserve water and energy.												
(8) Local public transportation options (if applicable).												
(9) A diagram showing the location of safety valves and controls for major building systems.												
(10) Where frost protected shallow foundations are used, notify owner of precautions, including instructions not to remove or damage insulation when modifying landscaping, to provide heat to the home as required by the IRC/IBC, and to keep base materials												
(11) A list of local service providers that offer regularly scheduled service and maintenance contracts to assure proper performance of equipment and the structure (e.g., HVAC, water heating equipment, sealants, caulks, gutter and downspout system, showe												
(12) A photo record of framing with utilities installed. Photos taken prior to installing insulation, clearly labeled, and included as part of the homeowner's binder.												
(13) Maintenance checklist.												
(14) List of common hazardous materials often used around the building and instructions for proper handling and disposal of these materials.												
(15) Information about organic pest control, fertilizers, de-icers, and cleaning products.												
(16) Information about native landscape materials and/or those that have low-water requirements.												
(17) Information about methods of maintaining the building's relative humidity in the range of 30-60%.												
(18) Instructions for inspecting the building for termite infestation.												
(19) Instructions for maintaining gutters and downspouts and importance of diverting water at least five feet away from foundation.												
(20) A narrative detailing the importance of maintenance and operation in retaining the attributes of a green-built building.												
<b>Renovations Note:</b> A building owners' manual that includes the following:	Mandatory											
(1) all mandatory items listed in Section 1001.1												
(2) a minimum of six of the non-mandatory items listed in Section 1001.1												
(3) the EPA publications "Reducing Lead Hazards When Remodeling Your Home" and "Asbestos in Your Home: A Homeowner's Guide"												
<b>1002 Education Training of Building Owners on Building Operation And Maintenance for One- and Two-Family Dwellings or Multi-Unit Buildings</b>												



ANSI National Green Building Standard™	378	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
<p>1002.1 Training of building owners. Building owners/occupants are familiarized with the green building goals and strategies implemented and the impacts of the occupants' practices on the costs of operating the building. Training is provided to the responsible party(ies) regarding all equipment operation and control systems. Systems include, but are not limited to, the following:</p> <p>(1) HVAC filters.</p> <p>(2) Thermostat operation and programming.</p> <p>(3) Lighting controls.</p> <p>(4) Appliances and settings.</p> <p>(5) Water heater settings.</p> <p>(6) Fan controls.</p>	6	0										section 017000-2
1003 Construction, Operation and Maintenance Manuals and Training for Multi-Unit Buildings												
<p><b>1003.0 Intent.</b> Manuals are provided to the responsible parties (owner, management, tenant, and/or maintenance team) regarding the construction, operation, and maintenance of the building. Paper or digital format manuals are to include information regarding those aspects of the building's construction, maintenance, and operation that are within the area of responsibilities of the respective recipient. One or more responsible parties are to receive a copy of all documentation for archival purposes.</p>												
<p><b>1003.1 Building construction manual.</b> A building construction manual, <b>including five or more of the following</b>, is compiled and distributed in accordance with Section 1003.0.</p>	1											



# APPENDIX B GREEN SCORING & COST

4 – Climate Zone #5

A. Akron, Ohio – Townhouse

HUD Green Building Comparison  
 Akron, OH - TC Project 14-A-08 - TownHouse - A unit  
 ANSI-ICC-700-2008 National Green Building Standard™  
 Lot 22 x 75' (approx.) 1,750  
 House 18 x 42' 1,371  
 Garage (att'd) 12.67' x 30' 380.1  
 End unit townhouse with front facing East. yard  
 walks & driveway pervious  
 Base rating 11/12/09  
 summit county

5. Lot Design...  
 6. Resource Efficiency  
 7. Energy Efficiency  
 8. Water Efficiency  
 9. Indoor Env. Quality  
 10. Operation, Maintenance...  
 Additional Points  
 Total

Bronze		Silver		Gold		Emerald	
Required	Actual	Required	Actual	Required	Actual	Required	Actual
39	76	66	88	93	125	119	137
45	74	79	92	113	118	146	155
30	65	60	87	100	161	120	192
14	36	26	36	41	54	60	62
36	60	65	101	100	137	140	142
8	9	10	15	11	15	12	15
50		100		100		100	
222	320	406	419	558	610	697	703

KEY  
 Points are Co-Dependant on at least one other cell  
 Overhead Cost - Dependant on subdivision size

Cummulative	Points	Cost	Points	Cost	Points	Cost	Points	Cost
Chapter 5	76	0	88	520	125	628	137	2,181
Chapter 6	74	365	92	371	118	1,561	155	4,630
Chapter 7	65	647	87	3,293	161	11,724	192	20,445
Chapter 8	36	0	36	0	54	525	62	907
Chapter 9	60	106	101	367	137	1,039	142	1,155
Chapter 10	9	950	15	1,044	15	1,044	15	1,044
Total	320	2,068	419	5,595	610	16,520	703	30,361
Cost per SF (\$)		1.51		4.08		12.05		22.15

ANSI National Green Building Standard™	269	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
	Cost/Point	Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
<b>CH. 5 LOT DESIGN, PREPARATION, AND DEVELOPMENT</b>	Rating	76	260	0	0	12	520	37	108	12	1,553	Ch. 5 Subtotal Base
500.0 Intent. This section applies to lot development for the eventual construction of residential buildings, multi-unit buildings, or additions thereto that contain dwelling units. The buildings on the lot earn their own performance level by complying with the provisions of Sections 303, 304, or 305.5, as applicable.												Because of lead impacted soil mitigation area denoted then omitted A001; may have been grey/brownfield.
501.1 The lot is selected to minimize environmental impact by one or more of the following:												
(1) An infill lot is selected.	4											
(2) A greyfield lot or an EPA-recognized brownfield lot is selected.	5	5										
(3) Addition and Renovation Note: A renovation or addition project is implemented. (Points awarded for using an existing building and infrastructure.)	5											
501.2 Mass Transportation. A range of mass transportation choices are promoted by one or more of the following:												<a href="http://www.edgewoodakron.com/communityTransportation.asp">http://www.edgewoodakron.com/communityTransportation.asp</a>
(1) A lot is selected within one-half mile of pedestrian access to a mass transit system or within five miles of a mass transit station with provisions for parking.	3	3										
(2) Walkways, street crossings, and entrances designed to promote pedestrian activity are provided. New buildings are connected to existing sidewalks and areas of development.	3	3										New urbanism - alleys and garages in back with porches and sidewalks in front. Connection to other phases of project, community center, neighborhood.
(3) A lot is selected within one-half mile of six or more community resources (e.g., recreational facilities (such as pools, tennis courts, basketball courts), parks, grocery store, post office, place of worship, community center, daycare center, bank, school, restaurant, medical/dental office, laundromat/dry cleaner.)	3	3										Park on site. Community Center and continuing education classes on site. Tennis courts across Euclid. Grocery shopping, schools, and a bar nearby.
<b>502 Project Team, Mission Statement, and Goals</b>												
502.1 A knowledgeable team is established and team member roles are identified with respect to green lot design, preparation, and development. The project's green goals and objectives are written into a mission statement.	4									4	752	
<b>Lot Design</b>												
503.0 Intent. The lot is designed to avoid detrimental environmental impacts first, minimize any unavoidable impacts, and mitigate for those impacts that do occur. The project is designed to minimize environmental impacts and to protect, restore, and enhance the natural features and environmental quality of the lot. (To be awarded points allocated for design, the intent of the design shall be implemented.)												C101 - Existing Conditions & Demolition Plan shows all trees being removed from Phase IV; subject.
503.1 Natural resources are conserved by one or more of the following:												
(1) A natural resources inventory is completed under the direction of a qualified professional.	5											
(2) A plan is implemented to conserve the elements identified by the resource inventory as high priority resources.	6											
(3) Items listed for protection in the resource inventory plan are protected under the direction of a qualified professional.	4											
(4) Basic training in tree or other natural resource protection is provided for onsite supervisor.	4									4	626	
(5) All tree pruning on site is conducted by a Certified Arborist.	2											
(6) Ongoing maintenance of vegetation during construction is in accordance with TCIA A-300.	3							3	108			
503.2 Slope disturbance is minimized by one or more of the following: (Points awarded only if there are developable steep slopes on the lot.)												
(1) All or a percentage of development on steep slopes is avoided.												
(a) Less than 25%	2											
(b) 25 to 75%	3											
(c) Greater than 75%	4											
(2) Hydrological/soil stability study for steep slopes is completed and used to guide the design of all buildings on the site.	5											
(3) All or a percentage of roads and parking are aligned with natural topography to reduce cut and fill.												Raymond St. SFDs, driveways, paths are perpendicular to slopes. No steep slopes on

ANSI National Green Building Standard™	269	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(a) Less than 25%	1											
(b) 25 to 75%	3											
(c) Greater than 75%	5											
(4) Long-term erosion effects are reduced through the design and implementation of terracing, retaining walls, landscaping, and restabilization techniques.	6											
(5) Underground parking uses the natural slope for parking entrances.	4											
Addition and Renovation Note: Section 503.2 applies to additions that increase building footprint on the lot; and to renovations that include landscape, hardscape, and outdoor living area. <b>(Additional points awarded for each strategy implemented.)</b>	2 Additional Points											
<b>503.3 Soil disturbance and erosion</b> are minimized by one or more of the following: (Also see Section 504.3) (Points must be taken here to claim points in 504.1)												
(1) Construction activities are scheduled to minimize length of time that soils are exposed.	5	5										
(2) Utilities are installed using one or more alternative means:	5	5										C503 shows sewer & water separate with front access. Storm along side. No electric.
(a) tunneling instead of trenching												
(b) use of smaller (low ground pressure) equipment or geomats to spread the weight of construction equipment												
(c) shared utility trenches or easements												
(d) placement of utilities under paved surfaces instead of yards.												
(3) Limits of clearing and grading are demarcated on the plan.	5	5										No limits are denoted on C403 - grading plan.
<b>503.4 Storm Water Mgmt.</b> Storm water is managed using one or more of the following low impact development techniques:												
(1) Natural water and drainage features are preserved and used.	6					6	0					Plan appears to be largely in place. Allowed 4 hours professional time.
(2) A storm water management plan is developed and implemented that minimizes concentrated flows and simulates flows found in natural hydrology, e.g., vegetative swales, French drains, wetlands, drywells, and rain gardens.	6					6	520					C404. SWPP notes and details. Final grade. C403. moves water around densely-built area.
(3) All or a percentage of impervious surfaces are minimized and permeable materials are used for driveways, parking areas, walkways, and patios.												Alley is impervious. Doesn't count toward lot line.
(a) Less than 25%	1											
(b) 25 to 75%	3											
(c) Greater than 75%	5											
(4) A minimum of 75% of the roof is vegetated (green roof)	3											
<b>503.5 Landscape plan</b> is developed to limit water and energy use while preserving or enhancing the natural environment.												
(1) A plan is formulated to restore or enhance natural vegetation that is cleared during construction. Landscaping is phased to coincide with achievement of final grades to ensure denuded areas are quickly vegetated.	5	5	260									C403. Nice landscape plan for green space. L201-2 covers individual. Search did not indicate these to be native. Allowed 2 prof. hrs. to make plan indigenous.
(2) Turf grass species, other vegetation, and trees are selected that are native or regionally appropriate for local growing conditions.	4							4	0			Because of density on lot there is less than 10% of impervious area.
(3) A percentage or all turf areas are limited.												
(a) Lot is 0% turf	4											
(b) Greater than 0% to less than 25%	3											
(c) 25% to less than 50%	2											
(d) 50% to 75%	1											
(4) Plants with similar watering needs are grouped (hydrozoning).	5	1						5	0			L203 indicates about 1/3 of the yard is No cost was included here because the landscape is extensive. Challenge is to incorporate native species. Professional time allowed under the plan.
(5) Species and locations for tree planting are identified that will provide summer shading of streets, parking areas, and buildings to moderate temperatures.	5	5										
(6) Vegetative wind breaks or channels are designed as appropriate for local conditions.	4							4	0			
(7) Onsite tree trimmings or stump grinding of regionally appropriate trees are used to provide protective mulch during construction and cleared trees are recycled as saw lumber or pulp wood.	3							3	0			38 trees were removed from Phase IV. Could have been mulched and reused, but 02230-4 says "dispose of off-site".
(8) An integrated pest management plan to minimize chemical use in pesticides and fertilizers is developed.	4							4	0			
Addition and Renovation Note: Section 503.5 applies to additions that address protection and renovation of existing vegetation during and after construction and the preservation or enhancement of the natural environment.	2 Additional Points											
<b>503.6 Wildlife habitat.</b> Measures are planned that will support wildlife habitat.	4									4	175	
Addition and Renovation Note: Section 503.6 applies to additions that increase building footprint on the lot; and to renovations that include landscape, hardscape, and outdoor living area. The existing landscape is either maintained to preserve a wildli												
(1) Maintain wildlife habitat.	1 Add'l Point											
(2) Expand wildlife habitat.	2 Add'l Points											
<b>503.7 Mixed use development</b> is incorporated.	6											
<b>503.8 Environmentally Sensitive Areas.</b>												
(1) Environmentally Sensitive Areas are avoided.	3											
(2) Compromised Environmentally Sensitive Areas are mitigated or restored.	3											
<b>503.9 Density.</b> The average density on a net developable area basis is:												Density based on Phase IV is 48 units on 6.14 acres = 7.8/acre (C101-102&A001)
(1) 7 to less than 14 dwelling units per acre (4047 m <sup>2</sup> )	4	4										
(2) 14 to less than 21 dwelling units per acre	7											
(3) 21 or greater dwelling units per acre	10											
<b>504 Lot Construction</b>												

ANSI National Green Building Standard™	269	Baseline		Bronze		Silver		Gold		Emerald		NOTES:	
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost		
<b>504.0 Intent.</b> Environmental impact during construction is avoided to the extent possible; impacts that do occur are minimized, and any significant impacts are mitigated.													
<b>504.1 Onsite supervision and coordination</b> is provided during clearing, grading, trenching, paving, and installation of utilities to ensure that specified green development practices are implemented (Also see Section 503.3.)	4												
<b>504.2 Trees and vegetation.</b> Designated trees and vegetation are preserved by one or more of the following:													
(1) Fencing or equivalent to protect trees and other vegetation is installed.	3	3											
(2) Trenching, significant changes in grade, and compaction of soil and critical root zones in "tree save" areas are avoided.	4							4	0			Include when formal plan is drawn.	
(3) Damage to designated existing trees and vegetation is mitigated during construction through pruning, root pruning, fertilizing, and watering.	4											02230-3. "Protect existing... and restore damaged improvements to their original condition." 02230-3 "Repair/replace trees and vegetation...damaged."	
<b>504.3 Soil disturbance and erosion.</b> Onsite soil disturbance and erosion are minimized by one or more of the following: (also see section 503.3)													
(1) Limits of clearing and grading are staked out.	5	5											
(2) "No disturbance" zones are created using fencing or flagging to protect vegetation and sensitive areas from construction activity.	5							5	0			02230-2. "Locate and clearly flag trees to remain from damage during construction." However, no trees remained on the site.	
(3) Sediment and erosion controls are installed and maintained in accordance with the storm water pollution prevention plan (SWPPP), where required.	5	5										02230-2. "No clearing until erosion & sedimentation control in place."	
(4) Topsoil is stockpiled and stabilized for later use to establish landscape plantings.	5	5										02230-4 "Stockpile topsoil... cover."	
(5) Soil compaction from construction equipment is reduced by distributing the weight of the equipment over a larger area (laying lightweight geogrids, mulch, chipped wood, plywood, OSB, metal plates, or other materials capable of weight distribution in the pathway of the equipment).	3												
(6) Disturbed areas that are complete or to be left unworked for greater than 21 days are stabilized within 14 days using methods as recommended by the EPA or in the approved storm water pollution prevention plan (SWPPP), where required.	3	3										02370-2 "owner has authority to limit erodible surface area..." "slopes that erode easily or will not be graded for 14 days [to be] temporarily seeded..."	
(7) Soil is improved with organic amendments and mulch.	3	3										02230-4 "stockpile surplus topsoil to allow for respreading..." and PM 02920-3 amend soil for 6% organic content per ASTM D5268"	
(8) Utilities are installed using one or more alternative means such as:													
tunneling instead of trenching, use of smaller equipment, use of low ground pressure equipment, use of geotextiles, shared utility trenches or easements.	5							5	0				
<b>505 INNOVATIVE PRACTICES</b>													
<b>505.0 Intent.</b> Innovative lot design, preparation and development practices are used to enhance environmental performance. Waivers or variances from local development regulations are obtained and innovative zoning practices are used to implement such practices													
<b>505.1</b> Driveways or parking areas are shared. Waivers or variances from local development regulations are obtained to implement such practices as applicable. In a multi-unit project, parking capacity is not to exceed the local minimum requirements.	4											Driveway length and sidewalk length is minimized.	
<b>505.2 Heat Island Mitigation.</b> Any combination of the following strategies are provided for a minimum of 50% of the horizontal surface area of the hardscape:	4											Sidewalks and driveways are concrete. Alley is pervious pavers- brick colored.	
(1) Shading of hardscaping: Shade from existing or new vegetation is provided (within five years) or from trellises. Shade of hardscaping is to be measured on the summer solstice at noon.													
(2) Light colored hardscaping: Horizontal hardscaping materials are installed with a solar reflectance index of 29 or greater.		4										Concrete meets index - driveway and walks.	
<b>CHAPTER 6: RESOURCE EFFICIENCY</b>		<b>Base Pts.</b>	<b>66</b>	<b>0</b>	<b>8</b>	<b>365</b>	<b>18</b>	<b>6</b>	<b>26</b>	<b>1,190</b>	<b>37</b>	<b>3,069</b>	<b>Ch. 6 Subtotal</b>
<b>601 Quality of Construction Materials and Waste</b>		<b>Cost/Point</b>											
<b>601.0 Intent.</b> Design and construction practices that minimize the environmental impact of the building materials are incorporated; environmentally efficient building systems and materials are incorporated; and waste generated during construction is reduced													
<b>601.1 Conditioned floor area,</b> as defined by ICC IRC calculated													
(1) Less than or equal to 1,000 square feet	15												
(2) Less than or equal to 1,500 square feet	12	12											1.371
(3) Less than or equal to 2,000 square feet	9												
(4) Less than or equal to 2,500 square feet	6												
(5) Greater than 4,000 square feet (373 m <sup>2</sup> )	<b>Mandatory</b>												
<b>For every 100 square feet over 4,000 sf, one point is to be added to Table 303, category 7 for each performance level.</b>													
<b>Multi-Unit Building Note:</b> For a multi-unit building, use a weighted average of the individual unit sizes in qualifying for available points.													
<b>Addition Note:</b> Additions more than 75% of existing building. Section 601.1 does not apply to additions with an area of more than 75% of the area of the existing building or dwelling unit.													
<b>Additions less than or equal to 75% of existing building.</b> Where the addition area is less than or equal to 75 percent of the existing building or dwelling unit area, points are awarded as follows:													
(1) The existing structure is 50% to 75% of total building or dwelling unit area.	1 Add'l Point												
(2) The existing structure is 76% to 99% of total building or dwelling unit area.	3 Add'l Point												

ANSI National Green Building Standard™	269	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
<b>Renovation Note:</b> When renovations increase the total existing building or dwelling unit area by 1 percent or less, points are awarded as follows:												
(a) The total area of the existing building or dwelling unit is less than or equal to 2500 sf.	<b>6 Add'l Points</b>											
(a) The total area of the existing building or dwelling unit is greater than 2500 sf.	<b>1 Add'l Point</b>											
<b>601.2 Material Usage.</b> Building-code-compliant structural systems or advanced framing techniques that optimize material usage are implemented. Points awarded for each system or framing technique implemented.	<b>3 pts per system (9 pts max)</b>	3	0			6	0					roof truss @ base level. Incorporate: single top plate, stud wall spacing @ 24". Design cost vs material cost should be equal
601.3 Building dimensions and layouts are designed to reduce material cuts and waste.												
(1) When used for at least 80% of floor area	3	3	0									
(2) When used for at least 80% of wall area	3									3	1,040	Allowed 2 days of prof. time to fine tune architectural.
(3) When used for at least 80% of roof area	3									3	0	
(4) When used for at least 80% of cladding or siding area	3									3	0	
(5) When used for at least 80% of penetrations or trim area	1											
601.4 Detailed framing or structural plans, material quantity lists and onsite cut lists for framing, structural materials, and sheathing materials are provided.	4									4	1,040	Included in architectural revision.
601.5 Pre-cut or pre-assembled components, or panelized or precast assemblies are utilized for 90% for the following system or building.												
(1) Floor system.	4	4										2nd floor is open web trusses, 12" deep, at 16" oc. A501& S101
(2) Wall system.	4											A501 assume 10-1 1/8" walls aren't precuts.
(3) Roof system.	4	4										A501 trusses at 24" oc.
(4) modular construction for the entire building located above grade.	13											
(5) manufactured home construction for the entire building located above grade.	13											
<b>601.6 Stories above grade</b> are stacked, such as in 1 1/2 and 2 story or greater structures. The area of the upper story shall be at least 50% of the area of the story below, based on areas with a minimum ceiling height of 7 feet.	<b>Max 8 points</b>											
(1) first stacked story	4	4										
(2) for each additional story	2											
<b>601.7 Site applied finishing materials.</b> Building materials or assemblies that do not require additional site applied material for finishing are utilized.	<b>Max 12 points</b>											
(1) 90% or more of the installed material or assembly listed below:	5									5	0	Use architectural redesign to included specification for siding that meets this requirement.
(2) 50% to less than 90% of the installed building material or assembly listed below:	2											
(a) Pigmented, stamped, decorative, or final finish concrete or masonry.												
(b) Trim not requiring paint or stain.												
(c) Window, skylight, and door assemblies not requiring paint or stain on exterior and/or interior surfaces.		5										Porch soffits prefinished aluminum. (A006 PM 8565-2 Windows and decorative louvre are vinyl. 08250-2 Doors are fiberglass. No A502. Walls are brick first level and fiber cement 2nd. 50% brick - prefinished.
(d) Wall coverings or systems not requiring paint or stain or other type of finishing application.		2										
601.8 Foundations such as frost-protected shallow foundations, pier and pad foundations, post foundations and other similar foundation types are designed and constructed.	3							3	1,040			Included 8 hours of engineer's time to design FPSF. Should net a savings in concrete which isn't factored here.
601.9 One or more of the following above grade wall systems that provide sufficient structural and thermal characteristics are used for at least 75% of the gross exterior wall area of the building:	4											
(1) Adobe												
(2) Concrete/Masonry												
(3) Logs												
(4) Rammed earth												
<b>602 Enhanced Durability and Reduced Maintenance</b>												
602.0 Intent. Design and construction practices are implemented that enhance the durability of materials and reduce in-service maintenance.												
602.1 Entries at exterior door assemblies, inclusive of side lights, are covered by one of the following methods below to protect the building from the effects of precipitation and solar radiation. A projection factor of at least 0.375 is provided. Eastern and western facing entries in Climate Zones 1, 2, and 3, as determined in accordance with Figure 6(1), shall have a projection factor of at least 1.0 unless otherwise protected from direct solar radiation by other means (e.g. screen wall, vegetation).	<b>Maximum number of points 5</b>											
(1) Installing a porch roof or awning.												
(2) Extending the roof overhang.												
(3) Recessing the exterior door.												
Main entrance door	3	3										
Additional covered door assembly	1	2										Side door, North, has PF of .447 and protected from solar by adjacent building
602.2 Roof overhangs, based on inches of rainfall in Table 602.2, are provided over at least 90% of exterior walls to protect the building envelope.	4											
Table 602.2												
Minimum Roof Overhang for One- & Two-Story Buildings												
Inches Rainfall*	Eave Overhang (Inches)	Rake Overhang (Inches)										36.2" average annual. 16" overhangs.
Less than 20	12	12										
21 to 40	12	12	4									
41 to 70	18	12										
More than 70	24	12										
<b>Addition Note:</b> Section 602.2 applies to the new construction portion of additions.	0											
<b>Renovation Note:</b> Section 602.2 applies to renovations that alter the existing roof.	1											
<b>602.3 Foundation Drainage</b>												

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		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
602.3.1 Where required by the IRC/IBC for habitable and usable spaces below grade, exterior drain tile is installed.	Mandatory	0										Met. No habitable below grade spaces.
602.3.2 Interior and exterior foundation perimeter drains are installed and sloped to discharge to daylight, dry well, or sump pit.	4			4	365							A501. Interior sub-slab drain not indicated.
<b>Addition Note:</b> Section 602.3.2 applies to the new construction portion of additions.	0											
<b>Renovation Note:</b> Section 602.3.2 applies to renovations that involve the demolition/reconfiguration of exterior walls and/or modification of the existing foundation drainage system.	2 Additional Points											
602.4 Drip edge is installed at eaves and gable roof edges.	3	3										A501 details drip edge. Not in roofing specs. 07311-3.
602.5 A gutter and downspout system with extensions, or splash blocks and effective grading, are provided to carry water at least 5 feet away from perimeter foundation walls.	4			4	0							07600-3. 07600-2 implies that downspout drainage boots will serve as transition to storm drain tie-in.
<b>Renovation Note:</b> Section 602.5 applies only to renovations.	1 Add'l Point											
602.6 Finish grade at all sides of building is sloped to provide a minimum of 6 inches of fall within 10 feet of the edge of the building. Where lot lines, walls, slopes or other physical barriers prohibit 6 inches of fall within 10 feet, the final grade	Mandatory			0								Not met. Specifications should be amended to include this. Site plan should be provided.
<b>Addition Note:</b> Section 602.6 applies only to additions that increase the footprint of the building.	Mandatory 0 Add'l Points											
<b>Renovation Note:</b> The additional points for Section 602.6 apply only to renovations.	2 Add'l Points											
602.7 Termite barrier. Continuous, physical foundation termite barrier used with or without low toxicity treatment is installed in geographical areas that have subterranean termite infestation potential determined in accordance with Figure 6(3).	4											Moderate to heavy zone.
<b>Addition Note:</b> Section 602.7 applies only to the new construction portion of additions.	0 Add'l Points											
<b>Renovation Note:</b> The additional points for section 602.7 applies only to renovations that alter the existing roof.												
(1) new non-chemical termite barrier is provided	1 Add'l Point											
(2) existing chemical barrier is removed and replaced with a non-chemical barrier	3 Add'l Points											
602.8 Termite-resistant materials are used as follows:												
(1) In areas of slight to moderate termite infestation probability (as defined by Figure 6(3)) for the foundation, all structural walls, floors, concealed roof spaces not accessible for inspection, exterior decks, and exterior claddings within the first 2 feet above the top of the foundation.	2											
(2) In areas of moderate to heavy termite infestation probability (as defined by Figure 6(3)) for the foundation, all structural walls, floors, concealed roof spaces not accessible for inspection, exterior decks, and exterior claddings within the first 3 feet above the top of the foundation.	4											
(3) In areas of very heavy termite infestation probability (as defined by Figure 6(3)) for the foundation, all structural walls, floors, concealed roof spaces not accessible for inspection, exterior decks, and exterior claddings.	6											
602.9 Where required by the IRC/IBC, a water-resistive barrier and/or drainage plane system is installed behind exterior veneer and/or siding.	Mandatory	0										Met. A502
<b>Addition Note:</b> Section 602.9 applies to the new construction portion of additions.	Mandatory 0 Add'l Points											
<b>Renovation Note:</b> Section 602.9 applies to renovations that include exterior veneer and/or siding replacement.	Mandatory 0 Add'l Points											
602.10 In areas where there has been a history of ice forming along the eaves causing a backup of water, an ice barrier is installed at roof eaves and is extended at least 24" inside the exterior wall line of the building, in accordance with the IRC/IBC.	Mandatory	0										Met. PM 07311-3 "Apply waterproofing underlayment at eaves...at least 36" inside exterior wall line."
602.11 Enhanced foundation waterproofing is installed:	4											PM -7190 calls for masonry sealer -
(1) Rubberized coating, or												
(2) Drainage mat.												
<b>Addition Note:</b> Section 602.11 applies to the new construction portion of additions.	0 Additional Points											
<b>Renovation Note:</b> Section 602.11 applies to renovations that involve the demolition/reconfiguration of exterior walls, modification of the foundation wall, or an effort to improve foundation waterproofing.	2 Additional Points											
602.12 Flashing details are shown on plans and flashing is installed at all of the following locations, as applicable:	6									6	0	At plan revision include all flashing details.
(1) Around exterior fenestrations, skylights and doors.												
(2) Roof valleys.												
(3) Deck/balcony to building intersections.												
(4) At roof-to-wall intersection and at roof-to-chimney intersections.												
(5) A drip cap is provided above windows and doors that are not flashed or protected by covering per Section 602.1.												
602.13 Roof Surfaces. A minimum of 90% of roof surfaces are constructed of one or both of the following:	3											Shingle color not stated.
(1) Products which meet the requirements of the ENERGY STAR® cool roof certification or equivalent.												
(2) A green (landscaped) roof system.												
<b>Renovation Note:</b> Section 602.13 applies to renovations that include roof replacement.	1 Add'l Point											
602.14 Recycling. Occupant recycling is facilitated by one or more of the following methods:												
(1) A built-in collection space in each kitchen and an aggregation/pick-up space in a garage, covered outdoor space or other area for recycling containers.	3							3	75			
(2) Compost facility provided on-site.	3							3	75			
603 Reused or Salvaged Materials												

ANSI National Green Building Standard™	269	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
603.0 Intent. Practices that reuse or modify existing structures, salvage materials for other uses, or use salvaged materials in building's construction are implemented.												
603.1 Existing buildings and structures are reused, modified or deconstructed in lieu of demolition. (One point awarded for every 200 sq. ft., 18.5m2, of floor area.)	1 (Max 12 points)											
603.2 Reclaimed and/or salvaged materials and components are used. Total material and labor cost of salvaged materials shall equal or exceed 1% of total construction costs.	3											
603.3 Scrap Materials. Facilitation for sorting and reuse of scrap building material (e.g. provide a central storage area or dedicated bins.)	4					4	6					Based on min. of 33 units.
<b>604 Recycled-Content Building Materials</b>												
604.1 Building materials with recycled content are used for at least two minor and/or two major components of the building. (NOTE: Does not specify PConsumer. Implication is that max. allowable is 4 materials. 9 points is max. in scoring tool.)	Points per Table 604.1											
Table 604.1 Recycled Content												
Material Percentage Recycled Content	Per 2 Minor	Per 2 Major										
25% - 50%	1	2				2						carpet padding and wood/plastic
50% - 75%	2	4				6						gypsum board and cellulose insulation. Note: specify correct gypsum board
75%	3	6										Mirror and s.s sink
605.0 Intent. Waste generated during construction is recycled.												
Note: All waste classified as hazardous shall be properly handled and disposed. (Points not awarded for hazardous waste removal.)												This is important in view of possible contaminated soil.
605.1 A Construction Waste Management Plan is developed, implemented, and posted at the jobsite with a goal of recycling or salvaging a minimum of 50% (by weight) of construction and land-clearing waste.	6									6	989	
<b>Addition and Renovation Note:</b> The construction waste management plan includes information on the proper handling and disposal of hazardous wastes.	Mandatory 2 Additional Points											
605.2 Onsite recycling measures following applicable regulations and codes are implemented, such as the following:	7											
(a) Materials are ground or otherwise safely applied onsite as soil amendment or fill. At least 50% (by weight) of construction and land-clearing waste shall be diverted from landfill.										7	0	Cost varies with location.
(b) Other methods approved by the NAHB Research Center (the Adopting Entity).												
<b>Addition and Renovation Note:</b> All waste classified as hazardous waste is properly handled and disposed of. The weight of this material is exempted from landfill diversion when Section 605.2 is applied to existing buildings.	Mandatory 0 Add'l Points											
605.3 Recycled Construction materials: Construction materials (e.g., wood, cardboard, metals, drywall, plastic, asphalt roofing shingles, or concrete) are recycled offsite.	Max 6											
(1) A minimum of two types of materials are recycled.	3							3	0			Recycle drywall and copper wire. Net savings
(2) For each additional recycled material.	1							2	0			Recycle cardboard and wood
<b>606 Renewable Materials</b>												
606.0 Intent. Building materials derived from renewable resources are used.												
606.1 The following biobased products are used. (Note: 606.1 and 606.2 denote % of project mat'l cost req'd.)	Max 8											
(a) certified solid wood in accordance with Section 606.2	3											
(b) engineered wood		3										OSB & Kitchen cabinets.
(c) bamboo												
(d) cotton												
(e) cork												
(f) straw												
(g) natural fiber products made from crops (soy or corn-based)												
(h) products with the minimum biobased contents of the USDA 7 CFR Part 2902 (Approx. 7%)												
(i) other biobased materials with a minimum of 50 percent biobased content (by weight or volume).												
606.1(1) At least two types of biobased materials are used, each for more than .5% of the project's projected building material cost. <b>Combined 8 pts Max</b>												
606.1(2) At least two types of biobased materials are used, each for more than 1% of the project's projected building material cost.	6		5									Interior trim package, tji floor joists, osb roof and walls, plywood floors
606.1(3) For each additional biobased material used for more than 5% of the project's projected building material cost.	1 (2 pts max)											
<b>606.2 Wood-based products are certified to the requirements of one of the following recognized product programs:</b>												
(a) AFF American Tree Farm System®												
(b) Canadian Standards Association's Sustainable Forest Management System Standards (CAN/CSA Z809)												
(c) Forest Stewardship Council (FSC)												
(d) Program for Endorsement of Forest Certification Systems (PEFC)												
(e) Sustainable Forestry Initiative Program (SFI)												
(f) Other product programs mutually recognized by PEFC												
606.2(1) Where a minimum of two certified wood-based products are used for minor elements of the building, such as all trim, cabinetry, or millwork.	3											



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606.2(2) Where a minimum of two certified wood-based products are used in major elements of the building, such as walls, floors, or roof.	4											
606.3 Manufacturing Energy. Materials are used for major components of the building that are manufactured using a minimum of 33% of the primary manufacturing process energy derived from renewable sources, combustible waste sources, or renewable energy credits (RECs). (2 points awarded per material.)	6 pts. max.							2	0			Specify that OSB comes from a mill that complies
<b>607 Resource-Efficient Materials</b>												
607.1 Products containing fewer materials are used to achieve the same end-use requirements as conventional products, including but not limited to: (3 points awarded for each material.)	Max 9 points											
(1) Lighter, thinner brick with bed depth less than 3 inches, brick with coring above 25%, or both.												
(2) Engineered wood or engineered steel products.												LVL headers and floor girder.
(3) Roof or floor trusses.		9										Roof and floor trusses.
<b>608 Indigenous Materials</b>												
608.1 Indigenous materials are used for major elements of the building.	10 points max.											
(1) one type of material.	2							2	0			stone for driveway base
(2) For each additional material.	2							8	0			osb, steel, siding and deck lumber locally sourced
<b>609 Life Cycle Analysis</b>												
609.1 A more environmentally preferable product or assembly for an application based upon the use of a Life Cycle Assessment (LCA) tool compliant with ISO 14044 or other recognized standards that compare the environmental impact of building materials, as	Max 15 points											
(1) Per product/system comparison	3											
(2) Whole building LCA analysis	15											
<b>610 Innovative Practices</b>												
610.1 Manufacturer's environmental management system concepts. Product manufacturer's operations and business practices include environmental management system concepts and the production facility is ISO 14001 certified or equivalent. The aggregate value of building products from ISO 14001 certified or equivalent production facilities is at least 1% or more of the estimated total building materials cost. (1 point awarded for every percent.)	Max 10 points											
<b>CHAPTER 7: ENERGY EFFICIENCY</b>	<b>Base Pts.</b>	<b>53</b>	<b>0</b>	<b>12</b>	<b>647</b>	<b>22</b>	<b>2,646</b>	<b>74</b>	<b>8,430</b>	<b>31</b>	<b>8,721</b>	<b>Ch. 7 Subtotal</b>
701.1 Mandatory requirements. The building shall comply with either Section 702 (Performance Path) or Section 703 (Prescriptive Path). Items listed as "Mandatory" in Section 701.4 apply to both the Performance and Prescriptive Paths.												Use 703 path.
<b>Addition Note:</b> Section 701, including mandatory items, applies only to the new construction portion of additions.												
<b>Renovation Note:</b> Section 701 applies to existing buildings as follows:												
(1) For the Green Building Path (Section 305.4), the existing building or dwelling unit shall comply with the mandatory renovation/addition practices and shall achieve the points indicated in Table 303.												
(2) For the Green Remodel Path (Section 305.5), the existing building or dwelling unit shall comply with Table 305.5												
701.11 Minimum Performance Path Requirements. A building complying with Section 702 shall exceed the baseline minimum performance required by the IECC by 15%, and shall include a minimum of two practices from Section 704.												Only 10% better in the cost approach
701.12 Minimum Prescriptive Path Requirements. A building complying with section 703 shall obtain a minimum of 30 points from Section 703, and shall include a minimum of two practices from Section 704.												
701.13 Alternative Bronze Level Compliance. As an alternative, any building that qualifies as an ENERGY STAR qualified home or equivalent achieves the Bronze Level for Chapter 7.												
701.2 Emerald Level Points. The Performance Path shall be used to achieve to the Emerald Level.												
<b>Mandatory Practices</b>												
701.3 A review by the Adopting Entity or designated third party shall be conducted to verify design and compliance with Chapter 7.	Mandatory			0	520							4 hrs. prof time assumed.
<b>701.4.1 HVAC SYSTEMS</b>												
701.4.1.1 Space heating and cooling system/equipment shall be sized according to heating and cooling loads calculated using ACCA Manual J or equivalent.	Mandatory			0								
<b>Addition and Renovation Note:</b> Section 701.4.1.1 is mandatory for both additions and renovations where new HVAC equipment is installed.	Mandatory 0 Add'l Points											
<b>Addition and Renovation Note:</b> The additional points for section 701.4.1.1 apply to additions or renovations that include one or both of the following:	2 Add'l Points											
(1) a change in heating and cooling loads												
(2) a replacement and/or addition of mechanical equipment												
701.4.1.2 Where installed, as a primary heat source in the building, radiant or hydronic space heating system is designed using industry-approved guidelines (e.g. ACCA Manual J, GAMA H-22, or an accredited design professional's and manufacturer's recommen	Mandatory	0										
<b>701.4.2 DUCT SYSTEM</b>												
701.4.2.1 Ducts are sealed with tape complying with UL 181, mastic, gaskets, or an approved system as required by the ICC IRC (Section M1601.3.1, or ICC IMC Section 603.9) to reduce leakage.	Mandatory	0										
<b>Addition and Renovation Note:</b> Section 701.4.2.1 applies only to the new portions of a duct system, except as follows:	Mandatory 0 Add'l Points											
(1) For renovations of existing buildings, the entire duct system, both existing and new, is permitted to be sealed with mastic or an aerosol spray-applied duct sealant.	0 Add'l Points											

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(2) For existing duct systems, where the existing duct system is not in accordance with Section 701.4.2.1, the overall duct system leakage is reduced by using any approved methods in Section 701.4.2.1, or aerosol spray applied duct sealant. Additional p												
(a) 25% to less than 50%	1 Add'l Pt											
(b) 50% to less than 75%	2 Add'l Pt											
(c) 75% to less than 100%	3 Add'l Pt											
(d) 100%	4 Add'l Pt											
(e) the entire system is upgraded in accordance with Section 704.6.2.2	5 Add'l Pt											
701.4.2.2 Building cavities are not used as supply ducts.	Mandatory	0										Complies. Ducts in slab on 1st floor.
<b>Addition Note:</b> Section 701.4.2.2 is mandatory for new construction portion of additions.	Mandatory	0 Add'l Pts										
<b>Renovation Note:</b> Section 701.4.2.2 applies to renovations that involve one of the following:												
(1) the demolition, reconfiguration, or addition of interior walls or a modification in the duct system of the building	1 Add'l Pt											
(2) a focused effort to solve the use of building cavities as supply ducts	2 Add'l Pt											
<b>701.4.3 INSULATION and AIR SEALING</b>												
701.4.3.1 GENERAL Insulation and air sealing is in accordance with the following:												
(1) Insulation shall be installed in accordance with the manufacturer's instructions or local code, as applicable.	Mandatory	0										PM 15250-2. Complies
(2) Shafts (duct shaft, piping shaft/penetrations, flue shaft.) Openings to unconditioned space are fully sealed with solid blocking or flashing and any remaining gaps are sealed with caulk or foam. Fire-rated collars and caulking are installed where required.	Mandatory	0										Doesn't comply.
<b>Addition and Renovation Note:</b> Section 701.4.3.1(1) is mandatory for the new construction portion of additions and renovations.	Mandatory											
<b>Renovation Note:</b> Existing openings to unconditioned spaces are sealed.												
<b>701.4.3.2 FLOOR / FOUNDATION / CRAWLSPACE</b>												
(1) Floors (Including insulated floors above garages and cantilevered floors)												
(a) Insulation is installed to maintain permanent contact with the underside of the subfloor decking, enveloping any attached ductwork within the thermal envelope without compression or air gaps in the insulation. This practice does not apply to ducts or other mechanical equipment that are adjacent to the underside of the subfloor.												
(b) Batt and loose-fill insulation is held in place by permanent attachments or systems in accordance with the manufacturer's instructions.												
<b>Renovation Note:</b> Insulate existing uninsulated floors.												
(2) Crawlspace. Where insulated, crawlspace wall insulation is permanently attached to the walls. Exposed earth in unvented crawlspaces is covered with continuous vapor retarder with overlapping joints taped or masticed.												
<b>Renovation Note:</b> In accordance with Section 701.4.3.2(2):												
(1) existing uninsulated crawlspace is insulated.												
(2) exposed earth in existing crawlspace is covered.												
(1) Windows and Doors. Caulking, gasketing, adhesive flashing tape, foam sealant, or weatherstripping is installed forming a complete air barrier.												
<b>Renovation Note:</b> Existing windows and doors are weather-stripped and sealed.												
(2) Band Joist and Rim Joists. Band and rim joists are insulated and air sealed.												
<b>Renovation Note:</b> Existing uninsulated rim and/or band joists are insulated.												
(3) Between Foundation and Sill Plate Bottom Plate												
(a) Sill sealer, or other material that will expand and contract, shall be installed between foundation and sill plate.												
(b) Caulk or the equivalent is installed to seal the bottom plate of exterior walls.												
<b>Renovation Note:</b> Existing perimeter sill plates are sealed.												
(4) Skylights and kneewalls. Skylight shafts and kneewalls are insulated to the same level as the exterior walls.												
<b>Renovation Note:</b> Existing skylight shafts and kneewalls are insulated.												
(5) Exterior Architectural features. Code required building envelope insulation and air sealing is not disrupted at exterior architectural features such as stairs and decks.												
<b>701.4.3.4 CEILINGS AND ATTICS</b>												
(1) Attic access (except unvented attics). Attic access, knee wall door, or drop down stair is covered with insulation and gasketed. Knee wall door is insulated unit or is covered with insulation.												
<b>Renovation Note:</b> Existing attic access, knee wall door, or drop-down stairs are insulated.												
(2) Recessed Lighting. Recessed light fixtures that penetrate the thermal envelope are airtight, IC rated, and sealed with gasket, caulk, or foam.												Doesn't comply. May be one recessed fixture in 2nd floor bath. No spec.
<b>Renovation Note:</b> Replace existing recessed lights that penetrate the thermal envelope with airtight, IC-rated recessed light fixtures that are sealed to drywall with gasket, caulk, or foam. (Additional point per fixture)	1 Add'l Pt											
(3) Eave vents. Where ceiling/attic assemblies or designs have eave vents, baffles, or other means shall be utilized to minimize air movement into or under the insulation.	Mandatory	0										A501 no baffle shown.

ANSI National Green Building Standard™	269	Baseline	Bronze	Silver	Gold	Emerald	NOTES:		
		Points	Cost	Points	Cost	Points	Cost		
<b>Renovation Note:</b> Provide blocking or baffle at eaves to ensure ventilation over attic insulation.	2 Add'l Pts								
<b>701.4.4 FENESTRATION</b>									
701.4.4.1 The NFRC-certified U-factor and SHGC windows, exterior doors, skylights, and tubular daylighting devices (TDDs) are in accordance with ENERGY STAR, or equivalent, or Table 701.4.4.1. Decorative fenestration elements with a maximum area of 15 square feet or 10 percent of the total glazing area, whichever is less, are not required to comply with this practice.	Mandatory	0					Complies		
<b>Table 701.4.4.1</b>									
Fenestration Specifications									
Climate Zones	U-Factor	SHGC							
	Windows and Exterior Doors (maximum certified ratings)								
1 and 2	0.65	0.4							
3	0.4	0.4							
4 to 8	0.35	Any					u=.30; shgc=.31		
	Skylights and TDDs (max. certified ratings)								
1 to 3	0.75	0.4							
4 to 8	0.6	Any							
<b>702 Performance Path</b>									
702.1 Points from Section 702 (Performance Path) shall not be combined with points from Section 703 (Prescriptive Path).	Mandatory						Comply.		
702.2 Energy efficiency features are implemented to achieve energy cost performance that exceeds ICC IECC by the following. A documented analysis using software in accordance with ICC IECC, Section 404, or ICC IECC Section 506.2 through 506.5, applied as defined in the ICC IECC, is required.									
(1) 15%	30				776		Insulate perimeter (R-10) and under slab to condition ducts. Tstat is std.		
(2) 30%	60			60	1,611	(60)	R-49 in attic; move 2x6 spacing to 24"; air seal (std.); seal ducts. Tankless w/h		
(3) 50%	100					100	7,500	(100)	92% tankless and closed loop solar hot water.
(4) 60%	120						120	8,345	R-60 w/raised heel truss; R-10 foam sheathing; 1.75ACH50; 96% heat; Wdw u=.20 shgc=.35.
<b>Renovation Note:</b> Application of Section 702.2: A baseline energy use measurement is calculated for the existing building. (Based on the reduction in whole building energy use, points are given for every increase in efficiency in accordance with Section	0 Add'l Pts								
<b>703 Prescriptive Path</b>									
703.1 Building envelope. Where the total building thermal envelope UA is less than required by ICC IECC, Section 402.1.4, the total building thermal envelope UA is in accordance with Table 703.1.1. Where insulation is used to achieve these percentages, a third-party grading of the installation as achieving Grade 1 is required. A documented analysis is performed using RES Check version 4.0.1 or later, or equivalent, based on a comparison to the ICC IECC, IRC, or IBC.	Points per Table 703.1.1								
	Sect. 703 pts.	36							
	Practices 704	6							
<b>Table 703.1.1</b>									
Total Building Thermal Envelope UA									
Climate Zone									
	Zone 2	Zone 3							
10% UA improvement	10 points	12 points							
20% UA improvement	20 points	24 points							
	Zone 4	Zone 5-6							
10% UA improvement	14 points	16 points	16		(16)		12.8% by resCheck by LwB		
20% UA improvement	28 points	32 points							
	Zone 7-8								
10% UA improvement	18 points								
20% UA improvement	36 points								
703.1.2 The insulation installation is graded by a third party and is in accordance with Sections 703.1.2.1, 703.1.2.2, 703.1.2.3, and/or 703.1.2.4, as applicable. (Points not awarded in this section if already awarded under Section 703.1.1)	Points per Table 703.1.2								
<b>Table 703.1.2</b>									
Insulation Installation Grades									
Grade	Points								
1	15								
2	10								
3	0								
703.1.2.1 Both Grade 1 and Grade 2 installations are in accordance with the following:									
(a) Grades apply to cavity fill insulation, continuous rigid insulation, and any other field-installed insulation products. Grading applies to ceilings, walls, rim joists, conditioned basements and crawlspaces, except as specifically noted. Inspection shall be conducted before insulation is covered.									
(b) Insulation is installed in accordance with the manufacturer's instructions and/or industry standards.									
(c) Wall cavity insulation is enclosed on all six sides, and is in substantial contact with the sheathing material on one or more sides (interior or exterior) of the cavity.									
703.1.2.2 Grade 1 installation in accordance with the following:									
(a) Insulation uniformly fills each cavity side-to-side and top-to-bottom, without substantial gaps or voids around obstructions (such as blocking or bridging).									
(b) Compression or incomplete fill amounts to no more than 2% or less, presuming the compression or fill is at least 70% of the intended fill thickness; occasional small gaps are acceptable.									

ANSI National Green Building Standard™	269	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(c) Exterior rigid insulation shall have substantial contact with the structural framing members or sheathing materials, and is tightly fitted at joints.												
(d) Cavity insulation is split, installed, and/or fitted tightly around wiring and other services.												
(e) Exterior sheathing is not visible from the interior through gaps in the cavity insulation.												
(f) Faced batt insulation is permitted to have side-stapled tabs, provided the tabs are stapled neatly with no buckling, and provided the batt is only compressed at the edges of each cavity, to the depth of the tab itself.												
(g) ICFs, SIPs, and other wall systems that provide integral insulation comply with "Grade 1" insulation installation requirements where properly installed.												
(h) "Grade 1" insulation must meet or exceed all requirements of "Grade 2" insulation.												
703.1.2.3 Grade 2 installation is in accordance with the following:												
(a) A maximum of 2% of the surface area of insulation is missing. Compression or incomplete fill amounts to 10 percent or less, presuming the compression or fill is a minimum of 70 percent of the intended fill thickness.												
(b) In conditioned basement or crawlspace the following apply:												
(i) insulation is installed in complete contact with the subfloor surfaces.												
(ii) Floor insulation over vented or ambient conditions is enclosed on six sides.												
(c) Floor insulation over unconditioned basements is not required to be enclosed on six sides.												
(d) Ceiling insulation is not required to be enclosed when the insulation is installed in complete contact with the drywall or plywood surfaces it is intended to insulate.												
(e) Eave baffles or equivalent construction is installed to prevent wind washing.												
(f) Installation with occasional installation defects is permitted: gaps around wiring, electrical outlets, plumbing and other intrusions; rounded edges or shoulders.												
703.1.2.4 Grade 3 installation is in accordance with the following:												
(a) Standard insulation installation not in accordance with Grade 1 or Grade 2 criteria.												
703.1.3 More than 75% of the above-grade exterior opaque wall area of the building is mass walls.		Points per Table 703.1.3										
<b>Table 703.1.3</b>												
Exterior Mass Walls												
		<b>Mass Construction</b>										
		3 in. to <6 in.										
Climate Zones 1, 2, 3, 4 except marine, and 5 dry.		4		6								
Climate Zones 4 marine, 5 except dry, and 6.		3		5								
Climate Zones 7 and 8		0		0								
<b>703.2 Insulation &amp; Air Sealing</b>												
703.2.1 Insulation and air sealing is installed in accordance with all of the following, as applicable:												
(1) Third party verification performed.		15		15		(15)						
(2) No third party verification performed.		3	3	(3)								
703.2.1.1 GENERAL												
703.2.1.1.1 Air Barrier and Thermal Barriers												
(1) Thermal insulation is installed in substantial contact with interior and exterior air barrier to provide continuous alignment of the insulation with the air barrier. The following are deemed to be their own air barrier:												
(a) Any spray or rigid foam insulation with an air permeance of 0.02 L/s-m <sup>2</sup> or less at 75 Pa.												
(b) ICFs, SIPs, and other wall systems that provide their own air barrier, except at interfaces with other materials or assemblies, or penetrations.												
(c) Spray foam that complies with the following:												
(i) continuously attached to the top, bottom and both sides of the cavity												
(ii) Continuous in the cavity without any unrepaired breaks.												
(iii) air impermeable												
(d) Air impermeable insulation.												
(2) Voids or areas of incomplete fill (less than 30% of full thickness) are 2% or less of the insulated area.												
(3) Insulation is in substantial contact with sheathing materials on one or more sides.												
(4) Any exterior rigid insulation is tightly fitted or interlocking at the joints.												
703.2.1.1.2 Plumbing and Wiring												
(1) At a minimum, insulation is placed between the outside (ceiling, wall, or floor) and the pipes.												
(2) Batt insulation is split or cut to fit around wiring and plumbing.												
(3) Sprayed insulation is installed to encapsulate pipes where the pipe temperature is 180 degrees F (82.2C) or less. Wiring is fastened in place to prevent displacement prior to spraying.												
703.2.1.1.3 Narrow cavities are filled and batts are cut to fit.												
703.2.1.1.4 HVAC register boots that penetrate the building envelope are caulked or sealed to the subfloor or drywall.												
703.2.1.1.5 Masonry fireplace equipped with gasketed doors, outside combustion air, and a chimney top damper.												
703.2.1.2 Air barrier is installed at any exterior edge of insulation at floors, foundations, and crawlspaces including insulated floors above garages and cantilevered floors.												
703.2.1.3 WALLS												

ANSI National Green Building Standard™		269	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
			Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(1) Exterior walls behind the tub/shower are insulated and include an interior and exterior air barrier.													
(2) Air sealed type electrical outlet boxes are installed or the air barrier extends completely behind the boxes. Insulation is placed between the sheathing and the rear of electrical or phone boxes located on exterior walls. Electrical outlet boxes ar													
(3) Duplex and lowhouse construction: In the common walls between dwelling units (e.g., gypsum shaft wall) an air barrier is installed to seal the gap between the common wall and the structural framing.													
(4) Skylight shafts and knee walls are air sealed. Insulation on attic knee walls and skylight shafts are physically supported by stapling in place, netting or using other mechanical attachment.													
(5) Fireplace walls: Air barrier that is aligned with insulation; any gaps are sealed with caulk or foam.													
<b>703.2.1.4 CEILINGS and ATTICS</b>													
(1) At dropped ceilings and soffits, the air barrier is substantially aligned with insulation and any gaps are sealed with caulk, foam, or tape.													
(2) Access to vented attics, including knee wall doors, and/or drop down stairs, is caulked, gasketed, or otherwise sealed.													
(3) An insulated cover is gasketed or sealed to the attic opening where a whole building or whole dwelling unit fan penetrates into the attic.													
(c) 50 percent			<b>3 Add'l Pts</b>										
<b>703.3 FENESTRATION</b>													
703.3.1 The NFRC-certified U-factor and SHGC for windows, exterior doors, skylights, and tubular daylighting devices (TDDs) are in accordance with Table 703.3.1(a) or (b). Decorative fenestration elements with a maximum of 15 square feet or 10% of the to													
			<b>Points Per Tables 703.3.1(a) or 703.3.1(b)</b>										
<b>Table 703.3.1(a) - Enhanced Fenestration Specifications</b>													
U-Factor and SHGC		Climate Zone											
Windows and Exterior Doors (maximum certified ratings)													
0.45	0.30	1 and 2	<b>8</b>										
0.35	0.30	3	<b>8</b>										
0.30	Any	4 and 5	<b>5</b>	<b>5</b>			<b>(5)</b>						
0.30	Any	6 and 8	<b>6</b>										
Skylights and TDDs (maximum certified ratings)													
0.55	0.35	1 to 3											
0.55	Any	4 to 8											
			<b>included above</b>										
<b>Table 703.3.1(b) - Enhanced Fenestration Specifications</b>													
U-Factor and SHGC		Climate Zone											
Windows and Exterior Doors (maximum certified ratings)													
0.45	0.25	1 and 2	<b>10</b>										
0.35	0.25	3	<b>10</b>										
0.25	Any	4 and 5	<b>10</b>										
0.25	Any	6 thru 8	<b>12</b>										
Skylights and TDDs (maximum certified ratings)													
0.50	0.35	1 to 3											
0.50	Any	4 to 8											
			<b>included above</b>										
<b>703.4 HVAC Equipment Efficiency</b>													
703.4.1 Combination Space Heating and Water Heating System ("Combo" System) is installed using either a coil from the water heater connected to an air handler to provide heat for the building or dwelling unit, or a space heating boiler using an indirect fired water heater. Devices shall have a combined annual efficiency of 0.80.			<b>4</b>										
703.4.2 Furnace and/or boiler efficiency is in accordance with one of the following:													
<b>(1) Table 703.4.2(1) Gas and propane heaters:</b>			<b>Points per Table 703.4.2(1)</b>										
5	≥92%		<b>12</b>	<b>12</b>			<b>(12)</b>						
5	≥83%		<b>7</b>										
5	≥90%		<b>11</b>										
5	14 (11.5)		<b>1</b>										
5	15 (12.5)		<b>2</b>										
5	17 (12.5)		<b>3</b>										
5	19 (12.5)		<b>3</b>										
703.4.7 ENERGY STAR, or equivalent, ceiling fans are installed. (Points awarded per building.)			<b>1</b>										
703.4.8 Whole building or whole dwelling unit fan(s) with insulated louvers and a sealed enclosure is installed. (Points awarded per building.)			<b>2</b>										
703.4.9 In multi-unit buildings, an advanced electric and fossil fuel submetering system is installed to monitor electricity and fossil fuel consumption for each unit. At a minimum, the information is available to the occupants on a monthly basis.													
(1) Install a device providing monthly consumption information.			<b>1</b>										
(2) Install a device that can provide near real-time energy consumption information.			<b>4</b>										
703.4.10 An ENERGY STAR, or equivalent, programmable thermostat is installed to control each heating and cooling zone. (Points awarded per dwelling unit.)			<b>1</b>										
<b>703.5 Water Heating Design, Equipment, and Installation</b>													
703.5.1 Water heater Energy Factor (EF) is equal to or greater than the following:			<b>Points Per Tables 703.5.1(1)(a) or 703.5.1(1)(b)</b>										
(1) Gas Water Heating													

ANSI National Green Building Standard™	269	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
<b>Table 703.5.1(1)(a) - Gas Water Heating</b>												
(Storage with input rate of 75,000 Btu/hr or less or instantaneous input rate of 200,000 Btu/hr or less)												
Size (gallons)	Energy Factor	<b>POINTS</b>										
30 to < 40	0.64	<b>1</b>										
40 to < 50	0.62	<b>1</b>										
50 to < 65	0.6	<b>1</b>										
65 to < 75	0.58	<b>1</b>										
75	0.56	<b>1</b>										
Any	0.8	<b>10</b>										
<b>Table 703.5.1(1)(b) - Gas Water Heating</b>												
(Storage with input rate of greater than 75,000 Btu/hr or instantaneous input rate greater than 200,000 Btu/hr)												
Size (gallons)	Thermal Efficiency	<b>POINTS</b>										
Any	82-86%	<b>1</b>										
Any	> 86%	<b>10</b>										
<b>(2) Electric Water Heating</b>												
<b>Table 703.5.1(2) - Electric Water Heating</b>												
Size (gallons)	Energy Factor	<b>POINTS</b>										
30 to < 40	0.95	<b>1</b>										
40 to < 50	0.94	<b>1</b>										
50 to < 65	0.92	<b>1</b>										
65 to < 80	0.9	<b>1</b>										
80 to < 100	0.88	<b>1</b>										
100	0.86	<b>1</b>										
<b>(3) Oil Water Heating</b>												
<b>Table 703.5.1(3) - Oil Water Heating</b>												
Size (gallons)	Energy Factor	<b>POINTS</b>										
30 to < 50	0.59	<b>1</b>										
50	0.55	<b>1</b>										
<b>(4) Heat Pump Water Heating</b>												
<b>Table 703.5.1(4) - Heat Pump Water Heating</b>												
	Energy Factor	<b>POINTS</b>										
Heat Pump	1.5	<b>7</b>										
Heat Pump	2	<b>10</b>										
703.5.2 Desuperheater, s installed by a qualified installer or is pre-installed in the factory.												
<b>Table 703.5.2 - Desuperheater</b>												
Climate Zone		<b>Points for Desuper heater</b>										
Zone 1-4		<b>5</b>										
Zone 5-8		<b>2</b>										
703.5.3 Drain-water heat recovery system is installed in multi-family units. (Points awarded per building.)												
<b>2</b>												
703.5.4 Insulating hot water pipes												
703.5.4.1 Hot water lines are insulated with a minimum of R-4 insulation.												
<b>1</b>												
703.5.4.2 Boiler supply piping is insulated in unconditioned spaces.												
<b>1</b>												
703.5.5 Indirect fired water heater storage tanks heated from boiler systems are installed.												
<b>1</b>												
<b>704 Additional Practices</b>												
<b>704.1 Application of Additional Practice Points.</b> Points from Section 704 can be added to points earned in Section 702 (Performance Path), Section 703 (Prescriptive Path) or Section 701.1.3 (alternative Bronze Level compliance).												
<b>704.2 Lighting and Appliances</b>												
704.2.1 Hard-wired lighting meets one of the following:												
(1) A minimum of 50% of the total hard-wired lighting fixtures, or the bulbs in those fixtures, qualify as ENERGY STAR or equivalent.												
<b>4</b>												
(2) A minimum of 50% of the total hard-wired lighting fixtures qualify as ENERGY STAR or equivalent.												
<b>8</b>												
(3) A minimum of 80% of the exterior lighting wattage has an efficiency of at least 40 lumens per watt or be a solar powered light fixture.												
<b>2</b>												
704.2.2 The number of recessed light fixtures that penetrate the thermal envelope are less than 1 per 400 square feet of total conditioned floor area and are in accordance with Section 701.4.3.4(2).												
<b>2</b>												
704.2.3 Occupancy sensors are installed on indoor lights, and photo or motion sensors are installed on outdoor lights to control lighting.												
(1) 25% of lighting												
<b>2</b>												
(2) 50% of lighting												
<b>4</b>												
704.2.4 Tubular daylighting device (TDD) or a skylight with sealed, insulated, low-E glass is installed in rooms without windows. (Points awarded per building.)												
<b>2</b>												
704.2.5 ENERGY STAR or equivalent appliance(s) are installed:												
(1) Refrigerator												
<b>5</b>												
(2) Dishwasher												
<b>2</b>												
(3) Washing machine												
<b>4</b>												
704.2.6 Induction cooktop is installed.												
<b>1</b>												
704.2.7 Occupancy sensors are installed for a minimum of 80% of hardwired lighting outlets.												
<b>1</b>												
<b>704.3 Renewable Energy/Solar Heating and Cooling</b>												
<b>704.3.1 Solar space heating and cooling.</b>												
704.3.1.1 Sun-tempered Design: Building orientation, sizing of glazing, and design of overhangs are in accordance with all of the following:												
<b>5</b>												
(1) The long side (or one side if of equal length) of the building faces within 20° of true south.												
(2) Vertical glazing area is between 5% and 7% of gross Conditioned Floor Area on the south face (also see Section 704.3.1.1(8)).												

ANSI National Green Building Standard™	269	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(3) Vertical glazing area is less than 2% of gross Conditioned Floor Area on the west face, and glazing is ENERGY STAR compliant or equivalent.												
(4) Vertical glazing area is less than 4% of gross Conditioned Floor Area on the east face and glazing is ENERGY STAR compliant or equivalent.												
(5) Vertical glazing area is less than 8% of gross Conditioned Floor Area on the north face, and glazing is ENERGY STAR compliant or equivalent.												
(6) Skylights, where installed, are in accordance with the following:												
(a) Shades and insulated wells are used and all glazing is ENERGY STAR compliant or equivalent.												
(b) Horizontal skylights are less than 0.5 % of Finished Ceiling Area												
(c) Sloped skylights on slopes facing within 45° of true South, East or West are less than 1.5% of the Finished Ceiling area												
(7) Overhangs or adjustable canopies or awnings or trellises provide shading on south facing glass for the appropriate climate zone in accordance with Table 704.3.1.1:												
<b>Table 704.3.1.1 Southern Window Overhang Depth</b>												
Climate Zone and Overhang Depth		Vertical Distance between bottom of overhang and top of window sill										
1 through 3	2' 8"	≤ 7' 4"										
1 through 3	2' 8"	≤ 6' 4"										
1 through 3	2' 4"	≤ 5' 4"										
1 through 3	2' 0"	≤ 4' 4"										
1 through 3	2' 0"	≤ 3' 4"										
4 through 6	2' 4"	≤ 7' 4"										
4 through 6	2' 4"	≤ 6' 4"										
4 through 6	2' 0"	≤ 5' 4"										
4 through 6	2' 0"	≤ 4' 4"										
4 through 6	1' 8"	≤ 3' 4"										
7 and 8	2' 0"	≤ 7' 4"										
7 and 8	1' 8"	≤ 6' 4"										
7 and 8	1' 8"	≤ 5' 4"										
7 and 8	1' 4"	≤ 4' 4"										
7 and 8	1' 0"	≤ 3' 4"										
(8) The south face windows have a SHGC of 0.40 or higher.												
(9) Return air or transfer grilles/ducts are in accordance with Section 704.4.5.												
704.3.1.2 Automated solar protection is installed to provide shading for windows.	<b>1</b>											
704.3.1.3 Passive cooling design features are in accordance with three or more of the following:												
Points for three items:	<b>3</b>											
Points for one additional item:	<b>1</b>											
(1) Exterior shading is provided on east and west windows using one or a combination of the following strategies:												
(a) Vine covered trellises with the vegetation separated a minimum of 1 foot from face of building.												
(b) Moveable awnings or louvers												
(c) Covered porches												
(d) Attached or detached conditioned/unconditioned enclosed space that provides full shade of east and west windows (e.g., detached garage, shed or building)												
(2) Overhangs are installed to provide shading on south-facing glazing in accordance with Section 704.3.1.1(7). (Points not awarded if points are taken under 704.3.1.1.)												
(3) Windows and/or venting skylights are located to facilitate cross ventilation.												
(4) Solar reflective roof or radiant barrier is installed in Climate Zones 1, 2 or 3 and roof material meets a 3 year aged criteria of 0.50.												
(5) Internal exposed thermal mass is a minimum of three inches in thickness. Thermal mass consists of concrete, brick, and/or tile that are fully adhered to a masonry base or other masonry material and is in accordance with one or a combination of the following:												
(a) A minimum of one square foot of exposed thermal mass of floor per three square feet of gross finished floor area.												
(b) A minimum of three square feet of exposed thermal mass in interior walls or elements per square foot of gross finished floor area.												
(6) Roofing material is installed with a minimum 0.75 inch continuous air space offset from the roof deck from eave to ridge.												
704.3.1.4 Passive solar heating design. In addition to the sun-tempered design features in Section 704.3.1.1, all of the following are implemented:	<b>4</b>											
(1) Additional glazing, no greater than 12%, is permitted on the south wall. This additional glazing is in accordance with the requirements in Section 704.3.1.1.												
(2) Additional thermal mass for any room with south-facing glazing of more than 7% of the finished floor area is provided in accordance with the following:												
(a) Thermal mass is solid and a minimum of 3" in thickness. Where two thermal mass materials are layered together (e.g. ceramic tile on concrete base) to achieve the appropriate thickness, they are fully adhered to (touching) each other.												
(b) Thermal mass directly exposed to sunlight must be provided in the following minimum ratios:												

ANSI National Green Building Standard™	269	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(i) Above latitude 35°: 5 square feet of thermal mass for every 1 square foot of south facing glazing.												
(ii) Latitude 30° to 35°: 5.5 square feet of thermal mass for every 1 square foot of south facing glazing.												
(iii) Latitude 25° to 30°: 6 square feet of thermal mass for every 1 square foot of south facing glazing.												
(c) Thermal mass not directly exposed to sunlight is permitted to be used to achieve thermal mass requirements of Section 704.3.1.4 (2) based on a ratio of 40 square feet of thermal mass for every 1 square foot of south facing glazing.												
(3) In addition to return air or transfer grilles/ducts required by Section 704.3.1.1, provisions for forced airflow to adjoining areas are implemented as needed.												
704.3.2 Solar water heating												
704.3.2.1 Solar water heater: SRCC (Solar Rating & Certification Corporation) OG 300 rated, or equivalent, solar domestic water heating system is installed. Solar Energy Factor (SEF as defined by SRCC) is in accordance with Table 704.3.2.1.												
<b>Table 704.3.2.1 - Solar Hot Water Systems</b>												
SEF - Electric Tank	SEF - Gas Tank	<b>POINTS</b>										
1.30 - 1.50	0.85 - 1.00	<b>8</b>						<b>8</b>				Cost is in performance section 702.
1.51 - 1.80	1.01 - 1.20	<b>11</b>										
1.81 - 2.30	1.21 - 1.50	<b>14</b>										
2.31 - 3.00	1.51 - 2.00	<b>17</b>										
3.01	2.01	<b>20</b>										
<b>704.3.3 Additional renewable energy options</b>												
704.3.3.1 Photovoltaic panels are installed on the property. (Points awarded per every 100 watts DC of the rated PV system)												
		<b>1</b>										
704.3.3.2 Other onsite renewable energy source is installed (e.g. wind energy, onsite micro-hydro power, active solar space heating systems). (Points awarded per every 1/10 kW of the system)												
		<b>0.5</b>										
<b>704.4 Ducts</b>												
704.4.1 Duct system is sized, designed, and installed according to ACCA Manual D or equivalent.												
		<b>5</b>										
704.4.2 Space heating is provided by a system that does not include air ducts.												
		<b>15</b>										
704.4.3 Space cooling is provided by a system that does not include air ducts.												
		<b>15</b>										
704.4.4 Ductwork is in accordance with all of the following:												
		<b>12</b>										Ducts brought inside at gold. (\$3.95 inf)
(1) Building cavities are not used as return ductwork.												
(2) Heating and cooling ducts and mechanical equipment are installed within the conditioned building space.									<b>12</b>	<b>331</b>		Approx. 20% of return system is in attic.
(3) Ductwork is not installed in exterior walls												
704.4.5 Return ducts or transfer grilles are installed in every room with a door. This practice does not apply to bathrooms, kitchens, closets, pantries, and laundry rooms.												
		<b>5</b>										2nd floor supplied by one return.
<b>704.5 HVAC Design and Installation</b>												
704.5.1 ACCA Manual S or equivalent is used to select heating and/or cooling equipment.									<b>1</b>	<b>0</b>		
		<b>1</b>										
704.5.2 HVAC contractor and service technician are certified by a nationally or regionally recognized program such as North American Technician Excellence, Inc. (NATE), Building Performance Institute (BPI), Radiant Panel Association, or manufacturers' training.									<b>1</b>			
		<b>1</b>										
704.5.3 Performance of the heating/cooling system is verified by the HVAC contractor in accordance with all of the following:									<b>3</b>			
		<b>3</b>										
(1) Start-up procedure is performed according to manufacturer's instructions.												
(2) Refrigerant charge is verified by super-heat and/or sub-cooling method.												
(3) Burner is set to fire at nameplate input.												
(4) Air handler setting/fan speed is set per manufacturer's instructions.												
(5) Total air flow is within 10% of design flow.										<b>149</b>		
(6) Total external system static does not exceed equipment capability at rated airflow.												
704.5.4 HVAC equipment operates using an alternate refrigerant containing no HCFCs. (Points awarded only until January 20, 2010.)												
		<b>1</b>										
704.5.5 Manufacturer's label or printed specifications for sealed air handler (except furnaces) indicates the leakage is less than or equal to 2% of design airflow at a pressure of 1-inch w.g. (1250 Pa). Air handlers are tested with inlets, outlets, and												
		<b>4</b>										
<b>704.6 Installation and Performance Verification</b>												
704.6.1 Third party onsite inspection is conducted to verify conformance with all of the following, as applicable. Minimum of 2 inspections are performed. One inspection after insulation is installed and prior to being covered, and another inspection upon completion of the project. Where multiple building or dwelling units of the same model are built by the same builder, a representative sample inspection of a minimum of 15% of the buildings or dwelling units is permitted.									<b>5</b>			
		<b>5</b>										
(1) Ducts are installed per IRC/IMC and ducts are sealed.									<b>260</b>			
(2) Building envelope air sealing is installed.												Cost of air sealing is in 702.
(3) Insulation is installed in accordance with Section 703.1.2												
(4) Windows, skylights, and doors are flashed, caulked, and sealed in accordance with manufacturer's recommendations and in accordance with Section 703.2.1.												



ANSI National Green Building Standard™	269	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
704.6.2 Third party testing is conducted to verify performance.												
704.6.2.1 Building envelope leakage rate is demonstrated by blower door test. In addition to the test, the following practices are required:												
1. Whole building ventilation is provided in accordance with Section 902.2.												
2. Fossil fuel furnace and water heater is sealed combustion or power vented in accordance with Section 901.1.												Need to upgrade water heater for power vent.
3. Fireplaces and Fuel Burning Appliances are in accordance with 901.2.												
The maximum leakage rate is in accordance with:												
(a) 5 ACH50	0.25 nat	3										
(b) 4 ACH50	0.2	6										
(c) 3 ACH50	0.15	9										
(d) 2 ACH50	0.1	12						9	450	(9)	12	0
(e) 1 ACH50	0.05	15										
704.6.2.2 The entire central HVAC duct system, including air handlers and register boots, is tested for leakage at a pressure differential of 0.1 inches w.g. (25 Pa). The maximum leakage as a percent of the system design flow rate is in accordance with												
(1) 6% for ductwork entirely outside the building's thermal envelope.		15										
(2) 6% for ductwork entirely inside the building's thermal envelope.		5				5						
(3) 6% for ductwork both inside and outside the building thermal envelope.		15										
704.6.2.3 Balanced HVAC air flows are demonstrated by flow hood or other acceptable flow measurement tool. Test results in accordance with both of the following:												
(a) Measured flow at each supply and return register is within 25% of design flow.		8										
(b) Total airflow is within 10% of design flow.												
<b>705 Innovative Practices</b>												
<b>705.1 Energy consumption control.</b> A whole building or whole dwelling unit device is installed that controls or monitors energy consumption.		7 Points Max										
(1) Programmable communicating thermostat		2										
(2) Energy monitoring device		4										
(3) Energy management control system		7										
<b>705.2 Renewable energy service plan is as follows:</b>												
(1) Builder selects a renewable energy service plan provided by the local electrical utility for interim (temporary) electric service. The builder's local administrative office has renewable energy service.		2										
(2) The buyer of the home selects a renewable energy service plan provided by the utility prior to occupancy of the home.		5										
<b>CHAPTER 8: WATER EFFICIENCY</b>	Base Pts.	35	0	1	0	0	0	18	525	8	382	Ch. 8 Subtotal
<b>801 Indoor and Outdoor Water Use</b>	Cost/Point											
801.0 Intent. Measures that reduce indoor and outdoor water usage are implemented.												
801.1. Indoor hot water usage is reduced by one of the following practices:												
(1) All hot water piping which runs to the plumbing fixtures in both the kitchen and bathrooms is 40-feet or less in length from the water heater and is sized in accordance with the code for the specified application.		2										
(2) All hot water piping which runs to the plumbing fixtures in both the kitchen and bathrooms is 30-feet or less from the water heater and is sized in accordance with the code for the specified application.		3	3									
(3) One of the following piping system designs is implemented:												
(a) Use of structured-type plumbing with demand controlled hot water loops, in which the volume of water contained in the pipe and fixture fittings downstream of the recirculating trunk line is a maximum of 4 cups (0.25 gallons).		6										
(b) Implement an engineered parallel piping system (i.e. manifold system) in which the hot water line distance from the water heater to the parallel piping system is less than 15 feet and the parallel piping to the fixture fittings contains a maximum of 8		6										
(c) Central core plumbing system with all plumbing fixture fittings (e.g., faucets & showerheads) located such that the volume of water contained in each pipe run between the water heater and fixture fitting is a maximum of 6 cups (0.38 gallons).		8										
(4) Pipe runs exceeding 40-feet from the water heater to fixture locations are aided by one of the following:		1										
(a) Tankless water heater is installed at point of use and is served only by cold water or a solar-assisted system.												
(b) On demand hot water recirculation system is installed.												
<b>Addition Note:</b> Section 801.1 applies only to the new construction portion of addition(s) that alter portions of a building with hot water appliances and/or fixtures.		Mandatory										
<b>Renovation Note:</b> Section 801.1 applies only to renovation projects that have the ability to meet the requirements of Section 801.1. (Renovation projects that are unable to meet the length of pipe runs indicated in Section 801.1, but are able to shorten e		Mandatory										
(1) Minimum of 25% to less than 50% reduction in total pipe length or volume.		Reduced by Half										
(2) More than or equal to 50% reduction in total pipe length or volume.		0 Add'l Pts										
<b>Addition Note - Section 801.1(3):</b> Where a new hot water system is provided in an addition, this item applies. (Points for Section 801.1(3)(a), (b), and (c).		Points Reduced by Half										

ANSI National Green Building Standard™	269	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
<b>Addition and Renovation Note - Section 801.1.1(3):</b> Section 801.1.1(3) applies only where hot water lines in the existing building are accessible. (To receive additional points, a minimum of 50 percent of the hot water lines are in accordance with Section	2 Add'l Pts											
801.2 Energy Star® or equivalent water-conserving appliances are installed												
(1) Dishwasher	2	2										
(2) Washing machine	8	8										
(3) Washing machine with a water factor of 6.0 or less	12											
<b>Addition and Renovation Note:</b> Section 801.2 applies as follows when existing appliance(s) are properly disposed of and not placed into secondary service in a dwelling unit.												
(1) Replace existing dishwasher	1 Add'l Pt											
(2) Replace existing washing machine	1 Add'l Pt											
(3) Replace existing washing machine with a water factor of 6.0 or less	1 Add'l Pt											
801.3 A minimum of one food waste disposer is installed at the primary kitchen sink.	1	1										
<b>801.4 Showerheads</b>												
<b>801.4 (1&amp;2) 1)</b> The total showerhead flow rate at any point in time, for all showerheads in each shower compartment is less than 2.5 gpm, tested at 80 psi per ASME A112.18.1/CSA B125.1. <b>2)</b> In addition the showerheads must be equipped with an automatic com	1 Point (3 Points Max)	1										Delta T13020/120/220 doesn't indicate flow rate, but this is EPA min.
<b>801.4 (3&amp;4)</b> All shower compartments in the home comply with 801.4 (1&2).												
(3) All shower compartments installed meet the above conditions and are 2.0 to less than 2.5 gpm.	1 Add'l Pt	1		-1								
(4) All shower compartments installed meet the above conditions and are 1.6 to less than 2.0 gpm.	2 Add'l Pts			2	0							
<b>Addition Note:</b> Section 801.4 applies only to additions that include a minimum of one bath or shower.	0 Add'l Pts											
<b>Renovation Note:</b> Section 801.4 applies only to renovations that include one or more bathrooms with a bath or shower. (Points awarded per fixture.)	1 Add'l Pt											
<b>Addition and Renovation Note:</b> Existing showerhead is replaced with a showerhead that has a flow rate in accordance with Section 801.4. (Points awarded per additional showerhead.)	1 Add'l Pt											
<b>801.5 Faucets</b>												
801.5.1 Water-efficient lavatory faucets with 1.5 gpm or less maximum flow rate when tested at 60 psi in accordance with ASME A112.18.1 are installed.												
(1) a bathroom (Points awarded for each bathroom.)	3 Pts Max	2										
(2) all lavatory faucets in the home meet the conditions of 801.5.1	2 Add'l Pts	2										
<b>Addition Note:</b> Section 801.5.1 applies only to additions that include a bathroom.	1 Add'l Pt											
<b>Renovation Note:</b> Section 801.5.1 applies only to renovations of existing bathrooms.	2 Add'l Pts											
<b>Addition and Renovation Note:</b> Replace all faucets in non-renovated bathrooms with faucets that are in accordance with Section 801.5.1.	2 Add'l Pts											
801.5.2 Self-closing valve, motion sensor, metering, or pedal-activated faucet is installed to enable intermittent on/off operation. (Points awarded per fixture.)	1 3 Pts Max											
<b>Renovation Note:</b> Additional points for Section 801.5.2 apply where installed.	1 Add'l Pt 6 Pts Max											
<b>801.6 Water closets and urinals.</b> Water closets and urinals are in accordance with the following: (For water closets, points awarded for either Section 801.6 or 802.2, but not both.)												
(1) Gold and Emerald Levels: All water closets and urinals are in accordance with either Section 801.6 or 802.2.	Mandatory											
(2) A water closet is installed with an effective flush volume of 1.28 gallons or less when tested in accordance with ASME A112.19.2 (all water closets) and ASME A112.19.14 (all dual flush water closets), and is in accordance with EPA WaterSense Tank-Type High-Efficiency Toilet. (Points awarded per fixture.)	6 18 Pts Max							12	525			
(3) A urinal is installed with a flush volume of 0.5 gallons or less when tested in accordance with ASME A112.19.2.	4 Max 4 Points											
4) All water closets and all urinals are in accordance with Section 801.6(2) or Section 801.6(3), as applicable.	6 Add'l Points							6	0			
<b>Addition and Renovation Note:</b> Section 801.6 applies only to additions and renovations that include bathrooms.	0 Add'l Pts											
<b>Renovation Note:</b> Renovations that do not include bathrooms receive points for replacing existing water closets with water closets in accordance with Section 801.6 (Points awarded per fixture.)	1 Add'l Pt											
<b>801.7 Irrigation systems</b>												
801.7.1 A low-volume, irrigation system is installed for each landscape type utilized. (Points awarded for each type of irrigation system installed.)	10 Pts. Max											
(1) High distribution uniformity (DU) rotating spray heads	2											
(2) Drip irrigation	4											
(3) Bubblers	4											
(4) Drip emitters	4											
(5) Soaker hose	4											
(6) Subsurface irrigation	6											
<b>Addition and Renovation Note:</b> Section 801.7.1 applies only to additions that increase the building footprint or affect the irrigation system.	1 Add'l Pt											
<b>Renovation Note:</b> Section 801.7.1 applies only to renovations of the landscape, hardscape, or outdoor living areas with existing irrigation systems or to renovations that replace the irrigation system.	2 Add'l Pts											
801.7.2 Irrigation system is in accordance with both of the following:	3											

ANSI National Green Building Standard™	269	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
1) designed by a professional in accordance with EPA WaterSense requirements or equivalent												
2) installed in accordance with EPA WaterSense program or equivalent												
<b>Addition Note:</b> Section 801.7.2 applies to additions that increase the building footprint or modify an existing irrigation system.	1 Add'l Pt											
<b>Renovation Note:</b> Section 801.7.2 applies to renovations with existing irrigation systems that are modified, or to renovations where a new irrigation system is installed or the existing irrigation system is replaced.	1 Add'l Pt											
801.7.3 Irrigation system is zoned separately for turf and bedding areas.	2											
<b>Addition Note:</b> Section 801.7.3 applies to additions that increase the building footprint or affect the irrigation system.	1 Add'l Pt											
<b>Renovation Note:</b> Section 801.7.3 applies only to renovations with existing irrigation systems that are modified, or to renovations where a new irrigation system is installed or the existing irrigation system is replaced.	2 Add'l Pts											
801.7.4 The irrigation system(s) is controlled by a smart controller.												
(1) Evapotranspiration (ET) based irrigation controller with a rain sensor	4											
(2) Soil moisture sensor based irrigation controller	4											
(3) No irrigation is installed and a landscape plan is developed in accordance with Section 503.5(1) as applicable. <b>(Points must be taken in 803.5(1) in order to receive points for 801.7.4(3))</b>	15	15	0									
801.8 Rainwater collection and distribution is provided.												
(1) Rainwater is collected and used	6									6	382	
(2) Rainwater is distributed using a renewable energy source or gravity.	2									2	0	
801.9 Water Filters. Water filter is installed to improve water quality for the whole building or whole dwelling unit.	1											
802.1 Gray water (as specified in ICC IRC, Appendix O) is separated and reused, as permitted by local building code. <b>(Points awarded for either Section 802.1(1) or 802.1(2), not both)</b>												
(1) Each water closet flushed by reclaimed or recycled water.	4 Points (per fixture)											
(2) Irrigation from reclaimed or recycled water onsite	10											
<b>Addition and Renovation Note:</b> Additional points are available for Section 802.1 as follows:												
1) each water closet flushed by reclaimed or recycled water	2 Add'l Pts											
2) irrigation from reclaimed or recycled water onsite	5 Add'l Pts											
802.2 Composting or waterless toilets and/or urinals. Composting or waterless toilets and/or urinals are in accordance with the following: <b>(For water closets, points awarded for either Section 802.2 or 801.6, but not both)</b>	24 Points Max											
1) Gold and emerald levels: All water closets and urinals are in accordance with either Section 802.2 or Section 801.6.	Mandatory											
2) Composting or waterless toilet and/or urinal is installed. (Points awarded per fixture)	8											
3) All toilets and urinals are in accordance with Section 802.2 (2).	8 Add'l Points											
802.3 Automatic shutoff water devices. One of the following automatic shutoff water supply devices is installed. Where a fire sprinkler system is present, installer is to ensure the device will not interfere with the operation of the fire sprinkler system	2											
(1) Excess Water Flow Shutoff												
(2) Leak Detection System												
<b>CHAPTER 9: INDOOR ENVIRONMENTAL QUALITY</b>	<b>Base Pts.</b>	39	0	21	106	41	261	36	672	5	116	<b>Ch. 9 Subtotal</b>
901 Pollutant Source Control	<b>Cost/Point</b>											
901.0 Intent. Pollutant sources are controlled.												
901.1 Space and water heating options												
901.1.1 Natural draft space heating or water heating equipment is not located in conditioned spaces, including conditioned crawl spaces. Natural draft equipment is permitted to be installed within the conditioned spaces if located in a mechanical room that has an outdoor air source, and is otherwise sealed and insulated to separate it from the conditioned space(s).	5											
<b>Addition Note:</b> Section 901.1.1 applies to additions that include the use of natural draft space heating or water heating equipment.	Mandatory											
<b>Renovation Note:</b> Section 901.1.1 applies to renovations that include areas where natural draft space heating or water heating equipment is located.	Mandatory											
<b>Renovation Note:</b> Additional points are available for any renovation that modifies all of the existing building's natural draft space heating or water heating equipment in accordance with Section 901.1.1	2 Additional Points											
901.1.2 Air handling equipment or return ducts are not located in the garage, unless placed in isolated, air-sealed mechanical rooms with an outside air source.	5	5										Water heater is draft.
<b>Renovation Note:</b> Section 901.1.2 applies to renovations that modify existing duct systems.	2 Additional Points											
901.1.3 The following combustion space heating and water heating equipment is installed within conditioned space.												
(1) Direct vent furnace or boiler	5	5										
(2) (a) Power vent water heater	3											
(b) Direct vent water heater	5											

ANSI National Green Building Standard™	269	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
<b>Renovation Note:</b> Section 901.1.3 applies to renovations that replace existing space heating and water heating combustion equipment with equipment in accordance with Section 901.1.3 for new construction.												
<b>2 Additional Points</b>												
901.1.4 The following electric equipment is installed:												
1) Heat pump air handler in unconditioned space	2											
2) Heat pump air handler in conditioned space	5											
901.2 Fireplaces and Fuel Burning Appliances (except cooking appliances, clothes dryers, water heaters, and furnaces) located in conditioned space are code compliant, vented to the outdoors, and have adequate combustion and ventilation air provided to minimize spillage or back-drafting, in accordance with the following: <b>All of the following items are mandatory, if applicable, for certification.</b>												
901.2.1(1) Natural gas and propane fireplaces that are power vented or direct vented, are equipped with permanently fixed glass fronts or gasketed doors, and comply with ANSI Z21.88/CSA 2.33a or ANSI Z21.50/CSA 2.22	7											
901.2.1(2)(a) Wood burning fireplaces are equipped with gasketed doors designed to operate with the doors closed, outside combustion air, and a means is provided for sealing the flue to minimize interior air (heat) loss when not in operation.	4											
901.2.1(2)(b) Factory-built wood burning fireplaces are in accordance with the certification requirements of UL 127 and are EPA certified.	6											
901.2.1(2)(c) Wood stove and fireplace inserts, as defined in UL 1482, Section 3.8 are in accordance with the certification requirements of UL 1482 and are in accordance with the emission requirements of the EPA Certification and the State of Washington W	6											
901.2.1(2)(d) Pellet (biomass) stoves and furnaces are in accordance with the requirements of ASTM E1509 or are EPA Certified.	6											
901.2.1(2)(e) Masonry heaters are in accordance with the definitions in ASTM E1602 and ICC IBC, Section 2112.1.	6											
<b>Renovation Note:</b> Removal of or rendering permanently unusable an existing fireplace and/or other fuel-burning appliances that are not in accordance with Section 901.2.1.	2 Add'l Pts											
<b>Renovation Note:</b> Additional points are awarded for the replacement of each existing fireplace that is not in accordance with Section 901.2.1 with a fireplace that is in accordance with Section 901.2.1	2 Add'l Pts											
<b>Renovation Note:</b> Additional points are available for removing or rendering permanently unusable each existing wood-burning fireplace that is not in accordance with Section 901.2.1(2)(a) in areas other than the main renovation area.	2 Add'l Pts											
901.2.2 Fireplaces, woodstoves, pellet stoves, or masonry heaters are not installed.	7	7										
901.3 Garages are in accordance with the following:												
901.3(1)(a) Where installed in the common wall between the attached garage and conditioned space, the door is tightly sealed and gasketed.	Mandatory 2 Points			2	0							Specs on door required. Assume 20 min. rating and bomber hinges (auto close)?
901.3(1)(b) A continuous air barrier is provided between walls and ceilings separating the garage space from the conditioned living spaces.	Mandatory 2 Points			2	5							Doesn't comply
901.3(1)(c) For one and two-family dwelling unit attached garages, a 100 cfm or greater ducted, or 70 cfm or greater unducted wall exhaust fan is installed and vented to the outdoors, designed and installed for continuous operation, or has controls (e.g., motion detectors, pressure switches) that activate operation for a minimum of 1 hour when either human passage door or roll-up automatic doors are operated. For ducted exhaust fans, the fan airflow rating and duct sizing are in accordance with Appendix A. <b>(If you claim points for 901.3(1)(c), you cannot claim points for 901.3(2).</b>	4											
901.3(2) A carport is installed, the garage is detached from the building, or no garage is installed. <b>(If you claim points for 901.3(2), you cannot claim points for 901.3(1)(a), 901.3(1)(b), or 901.3(1)(c).</b>	10											
<b>Addition Note:</b> Section 901.3 applies where the addition is a garage or shares a continuous air barrier with a garage.	Mandatory											
<b>Renovation Note:</b> Section 901.3 applies to renovations that involve construction adjacent to an attached garage.	1 Add'l Point											
<b>Renovation Note:</b> A focused effort to create a continuous air barrier between the garage and conditioned space, including penetrations, occurring between walls and ceilings separating the garage and conditioned space.	3 Add'l Points											
901.4(2-6) Wood Materials. A minimum of 85% of material within a product group (i.e. wood structural panels, countertops, composite trim/doors, custom woodwork, and/or component closet shelving) is manufactured in accordance with the following:	10 points max.											
901.4(1) Structural plywood used for floor, wall, and/or roof sheathing is compliant with DOC PS 1 and/or DOC PS 2. OSB used for floor, wall, and/or roof sheathing is compliant with DOC PS 2. The panels are made with moisture-resistant adhesives. The trademark indicates these adhesives as follows: Exposure 1 or Exterior for plywood, and Exposure 1 for OSB.	0											
(2) Particleboard and MDF (medium density fiberboard) is manufactured and labeled in accordance with CPA A208.1 and CPA A208.2, respectively.	2 Points per Product Group											
(3) Hardwood plywood is in accordance with HPVA HP-1 and HUD Title 24, Part 3280.	2 Points per Product Group											
(4) Particleboard, MDF, or hardwood plywood is in accordance with CPA 2.	3 Points per Product Group											

ANSI National Green Building Standard™	269	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(5) Composite wood or agrifiber panel products contain no added urea-formaldehyde or are in accordance with the CARB Composite Wood Air Toxic Contaminant Measure Standard.						4	0					Interior doors and trim and cabinets.
(6) Non-emitting products.												
<b>Renovation Note:</b> Additional points for Section 901.4 apply to renovations that replace all existing countertops, shelving, and other nonstructural products.												
901.5 Carpets are in accordance with the following: 901.5(1) Wall-to-wall carpeting is not installed adjacent to water closets and bathing fixtures.		0										
901.5(2) A minimum of 85% of installed carpet area, carpet cushion (padding), and carpet adhesives are in accordance with the emission levels of CDPH 01350, as certified by a third-party program, such as the Carpet and Rug Institute's (CRI) Green Label Pl												
(a) Carpet		6				6	0					
(b) Carpet cushion		2				2	0					
(c) Carpet adhesives		2										
<b>Renovation Note:</b> Section 901.5(2) applies to renovations where existing carpet is replaced. Remove existing carpet and perform one of the following repair methods:												
1) Existing carpeted floor area is exposed, cleaned, and finished and is used as non-carpeted finished floor.												
2) Carpet is installed in accordance with Section 901.5.												
3) New non-carpet flooring product in compliance with an approved green labeling program(s) is installed.												
901.6 Hard-surface flooring. A minimum of 85% of installed hard-surface flooring is in accordance with the emission concentration limits of CDPH 01350 (using the office scenario), as certified by a third-party program, such as the RFCI's FloorScore Indoor Air Certification Program or the Greenguard Environmental Institute's Children and Schools Certification Program.												
901.7 Wall coverings. A minimum of 85% of wall coverings are in accordance with the emission concentration limits of CDPH 01350 (using the office scenario), as certified by a third-party program, such as the Scientific Certification Systems (SCS) Indoor Advantage Gold Program or the Greenguard Environmental Institute's Children and Schools Certification Program.												Specify insulation, gypsum board and paints with low VOC and low emitting products. Cost covers paperless drywall and low VOC paint. Insulation should be at n/c.
901.8 Architectural coatings. A minimum of 85% of the architectural coatings are in accordance with one of the following conditions:												
901.8.1 Site-applied interior products are in accordance with one or more of the following:		5										
(1) Zero VOC, determined by EPA Method 24 (VOC content)												
(2) CARB Suggested Control Measure for Architectural Coatings												
(3) GS-11												
(4) VOC limits in accordance with:												
(a) 50 grams/liter flat												
(b) 100 grams/liter non flat												
(c) 350 grams/liter clear wood varnish												
(d) 550 grams/liter clear wood lacquer												
901.8.2 Site-applied interior products are in accordance with the emissions levels of CDPH 01350, as certified by a third party program such as the Scientific Certification Systems (SCS) Indoor Advantage Gold Program or the Greenguard Environmental Institute's Children and Schools Certification Program.												
<b>Addition and Renovation Note:</b> Section 901.8 applies when the building is occupied during construction.												
901.9 Adhesives and Sealants.												
901.9.1 For exterior low-VOC adhesives and sealants, a minimum of 85% of site-applied products used for the installation of subfloors and on the exterior of the project are in accordance with one of the following:		5								5		
(1) The California Air Resources Board consumer products regulation as follows:												
a) Construction Adhesives: VOC content not to exceed 7% by weight or 75 grams/liter, whichever is greater.												108
b) The VOC content of reactive sealants (i.e., silicones, polyurethanes, and hybrids, such as MS Polymer and silylated polyurethane resin or SPUR) not to exceed 4% by weight or 50 grams/liter, whichever is greater.												
c) The VOC content of all other caulks and sealants not to exceed 2% by weight or 30 grams/liter, whichever is greater.												8
(d) The VOC content of contact adhesives not to exceed 55% by weight or 480 grams/liter, whichever is greater.												
(2) GS-36												
901.9.2 Interior Low-VOC Adhesives and Sealants. For interior low VOC adhesives and sealants, a minimum of 85% of site-applied products used within the interior of the building are in accordance with one of the following, as applicable:												
(1) CDPH 01350, as certified by a third party program, such as Scientific Certification Systems (SCS) Indoor Advantage Gold Program or the Greenguard Environmental Institute's Children and Schools Certification Program.						5	0					
(2) GS-36		5										

ANSI National Green Building Standard™	269	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
901.10 Cabinets. A minimum of 85% of kitchen and bath vanity cabinets are in accordance with one of the following: (Where more than one of the following practices is used, the practice with the fewer number of points is awarded)												
(1) Kitchen and bath vanity cabinets in accordance with KCMA ESP 01, or equivalent, are installed.	2	2						(2)				
(2) Kitchen and bath vanity cabinets in accordance with CARB Composite Wood Air Toxic Contaminant Measure Standard are installed.	3											
(3) Kitchen and bath vanity cabinets are installed that contain no added urea formaldehyde or are in accordance with GGPS, EC, 010, R0, ASTM D6670, or equivalent.	5							5	0			Require better spec on cabinets
<b>Renovation Note:</b> Additional Points for Section 901.10 apply to renovations that replace all existing kitchen and bath vanity cabinets.	2 Add'l Pts											
901.11 Insulation is in accordance with the following:												
(1) Formaldehyde emissions of wall, ceiling, and floor insulation materials are in accordance with the emissions levels of CDPH 01350, as certified by a third-party program, such as the GREENGUARD Environmental Institute's Children and Schools Certification Program or the Scientific Certifications Systems (SCS) Indoor Advantage Gold Program.	4					4	0					Insulation can be respec'd to meet this criteria
(2) Formaldehyde emissions of duct insulation materials are in accordance with the emissions levels of CDPH 01350, as certified by a third-party program, such as the GREENGUARD Environmental Institute's Children and Schools Certification Program or the Scientific Certifications Systems (SCS) Indoor Advantage Gold Program.	1					1	0					Specify
901.12 A carbon monoxide (CO) alarm is installed in a central location outside of each separate sleeping area in the immediate vicinity of the bedrooms. The CO alarm(s) is located in accordance with NFPA 720 and is hard-wired with a battery back-up. The alarm device(s) is certified by a third party for conformance with either CSA 6.19 or UL 2034.	3					3	90					
901.13 Building entrance pollutants control. Pollutants are controlled at all main building entrances by one of the following methods:												
(1) Exterior grilles or mats are installed in a fixed manner and may be removable for cleaning.	1					1	44					
(2) Interior grilles or mats are installed in a fixed manner and may be removable for cleaning.	1											
901.14 Non-smoking areas. All interior common areas of a multi-unit building are designated as non-smoking areas with posted signage.	1											
901.15 <b>Renovation Note:</b> For buildings constructed prior to 1978, lead-safe work practices are used during renovation, remodeling, painting, and demolition.	Mandatory											
<b>902 Pollutant Control</b>												
902.0 Intent. Pollutants generated in the building are controlled.												
902.1.1 Spot ventilation is in accordance with the following:												
(1) Bathrooms (including powder rooms) are vented to the outdoors. The minimum ventilation rate is 50 cfm for intermittent operation or 20 cfm for continuous operation in bathrooms.	0											Complies.
(2) Clothes dryers are vented to the outdoors.	Mandatory											Complies.
(3) Kitchen exhaust units and/or range hoods are ducted to the outdoors and have a minimum ventilation rate of 100 cfm for intermittent operation or 25 cfm for continuous operation.	8											Broan 4000 has 160 CFM, 2-speed, 5.6 sones.
<b>Addition Note:</b> Section 902.1 applies only to additions that include a kitchen or bathroom.	Mandatory											
<b>Renovation Note:</b> Section 902.1 applies to renovations that include a new or existing kitchen or bathroom. (Points available for all of the following conditions)	Mandatory											
(1) Existing non-vented kitchen range or bathroom exhaust systems in an area that is undergoing renovation are replaced with equipment that is in accordance with Section 902.1.	2 Add'l Pts											
(2) Existing non-vented kitchen range or bathroom exhaust systems in an area that is not undergoing renovation are replaced with equipment that is in accordance with Section 902.1.	3 Add'l Points											
(3) New kitchen range or bathroom exhaust systems in accordance with Section 902.1 are installed where no exhaust system existed before renovation.	1 Add'l Pts											
902.1.2 Bathroom and/or laundry exhaust fan is provided with an automatic timer and/or humidistat:	9 Points Max											
1) for first device	5							5	42			timer
2) for each additional device	2							2	42			timer
902.1.3 Kitchen range, bathroom, and laundry exhaust are verified to specification. Ventilation airflow at the point of exhaust is tested to a minimum of 100 cfm intermittent or 25 cfm continuous for kitchens, and 50 cfm intermittent or 20 cfm continuous	8							8	149			2 field personnel 2 hours
902.1.4 Exhaust fans are ENERGY STAR as applicable.	Max. 6 Points											
(1) ENERGY STAR, or equivalent, fans (Points awarded per fan)	2											

ANSI National Green Building Standard™	269	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(2) ENERGY STAR, or equivalent, fans operating at or below 1 zone (Points awarded per fan)	3											
902.2. Building ventilation systems.												
902.2.1 One of the following whole building ventilation systems is implemented and is in accordance with the specifications of Appendix B. (Points must be claimed in 902.2.1 to claim points in 902.2.2.)												
(1) Exhaust or supply fan(s) ready for continuous operation and with appropriately labeled controls.	8											
(2) Balanced exhaust and supply fans with supply intakes located in accordance with the manufacturer's guidelines to not introduce polluted air back into the building.	10							10	345			
(3) Heat-recovery ventilator.	15											
(4) Energy-recovery ventilator.	17											
<b>Addition Note:</b> Section 902.2.1 is applied to an addition in accordance with one of the following:												
1) The pressure and thermal boundaries of the addition are separated from the existing building.	0 Add'l Pts											
2) If the pressure and thermal boundaries of the addition are not separated from the existing building, Section 902.2.1 is applied to the whole building.	1 Add'l Pts											
<b>Renovation Note:</b> Section 902.2.1 applies to the whole building for connected thermal and pressure boundaries.	2 Add'l Pts											
902.2.2 Ventilation airflow is tested to achieve the design fan airflow at point of exhaust in accordance with Appendix B. (Points must be claimed in 902.2.1 to claim points in 902.2.2)	8							8	94			2 techs 1 hour.
902.2.3 MERV filters 8 or greater are installed on central air systems. Designer or installer is to verify that the HVAC equipment is able to accommodate the greater pressure drop of MERV 8 filters.	3					3	0					
<b>Addition Note:</b> Section 902.2.3 applies only to additions that include a new HVAC system.	0 Add'l Pts											
<b>Renovation Note:</b> Section 902.2.3 applies only to renovations that replace an existing HVAC system.	1 Add'l Pts											
902.3 Radon control. Radon control measures are in accordance with ICC IRC Appendix F. (Zones are defined in Figure 9(1).)												
902.3(1) Buildings located in Radon Zone 1 have a radon system installed.	Mandatory	0										Summit county is zone 1
(a) A passive radon system is installed.	10			10	101							Cost of PVC to roof
(b) An active radon system is installed.	15											
902.3(2) Buildings located in Zone 2.												
(a) A passive radon system is installed.	10											
902.4 HVAC system protection. One of the following HVAC system protection measures is performed:												
(1) HVAC supply registers (boots), return grilles, and rough-ins are covered during construction activities to prevent dust and other pollutants from entering the system. <b>Note: Points not allowed for both 902.4(1) and (2)</b>	3	3										PM 15010-5 and PM 15010-9
<b>Addition and Renovation Note:</b> Section 902.4(1) does not apply to additions and renovations except as noted in Addition and Renovation Note (3) below.	0 Add'l Pts											
(2) Prior to owner occupancy, HVAC supply registers (boots), return grilles, and duct terminations are inspected and vacuumed. In addition, the coils are inspected and cleaned and the filter is replaced if necessary.	3											
<b>Addition and Renovation Note:</b> As an alternative to Section 902.4(2), one of the following options is implemented:	Mandatory											
1) During construction, a construction indoor air quality (IAQ) schedule is developed that includes, at a minimum, all of the following:	1 Add'l Pt											
a) type of construction activity												
b) ability to occupy the building or dwelling unit												
c) IAQ protections for occupant(s) of the building or dwelling unit												
d) hazardous waste removal												
e) name and age of occupants of the building or dwelling unit at a specific time												
2) The addition or renovation area is sealed off from the occupied portion of the building or dwelling unit. The same HVAC system for conditioning the air in renovated and occupied space is not used.	1 Add'l Pt											
3) The building or dwelling unit is not occupied during the entire construction period and Sections 902.4(1) and 902.4(2) are implemented.	1 Add'l Pt											
902.5 Central vacuum systems. Central vacuum system is installed and vented to the outside.	5											
902.6 Living space contaminants. The living space is sealed to prevent unwanted contaminants.												
(1) Attic access, knee wall door, or drop down stair is caulked, gasketed, or otherwise sealed.	2					2	127					
(2) All penetrations (e.g., top plates, HVAC register boots, recessed can lights, are sealed in the following areas:												
(a) Attic/ceiling	2					2	0					Included in air sealing cost 702.
(b) Wall	2					2	0					
(c) Floors	2					2	0					
903 Moisture Management: Vapor, Rainwater, Plumbing, HVAC												
903.0 Intent. Moisture and moisture effects are controlled.												
903.1 Tile backing materials installed under tiled surfaces in wet areas are in accordance with ASTM C1178, C1278, C1288, or C1325.	Mandatory	0										Doesn't comply with new 110000-2 Floor sheathing is rated for 24" oc span (23/32" OSB) and 1/4" luan BB underlayment
903.2 Capillary breaks												

ANSI National Green Building Standard™	269	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
903.2.1 A capillary break and vapor retarder are installed at all concrete slabs in accordance to the following: 1) A minimum 4-inch thick bed of ½ inch diameter or greater clean aggregate, covered with polyethylene or polystyrene sheeting in direct contact with the concrete slab, with the sheeting joints lapped in accordance with Section 903.3. (or) 2) A minimum 4-inch thick uniform layer of sand, overlain with a layer or strips of geotextile drainage matting, covered with polyethylene sheeting, with the sheeting joints lapped according to Section 903.3.	<b>Mandatory</b>	0										A501 shows aggregate and poly; just no indication of continuity under wall plate.
Modification for 1&2: a. In areas with free-draining soils, identified as Group 1 in the ICC IRC by a certified hydrologist, soil scientist, or engineer through a site visit, a gravel bed or geotextile matting is not required. b. In Dry climate locations, as defined by Figure 6(1), polyethylene sheeting is not required unless required for radon resistance (Section 902.3).												
903.2.2 Add a capillary break on footing to prevent moisture migration into foundation wall.	<b>3</b>			<b>3</b>	<b>0</b>							Add to specifications.
<b>Addition Note:</b> Section 903.2 applies only to the new construction portion of additions.	<b>Mandatory</b>											
<b>Renovation Note:</b> Section 903.2 applies only to renovations that include slab removal and/or replacement.	<b>0 Add'l Pts</b>											
903.3 Crawspaces												
903.3.1(1) Minimum 6-mil vapor retarder installed on the crawl space floor and extended up the wall sufficient to allow the material to be affixed with glue and furring strips. Joints of vapor retarder overlap a minimum of 6 inches and are taped.	<b>6</b>											
903.3.1(2) Damp-proof walls are provided below finished grade. Joints of vapor retarder overlap a minimum of 6 inches and are taped.	<b>Mandatory</b>	0										Doesn't comply. Add to specs.
<b>Renovation Note:</b> Additional Points:												
1) Additional points available for damp proofing below grade walls.	<b>1 Add'l Pt</b>											
2) Additional points available for installing a footing drainage system.	<b>2 Add'l Pts</b>											
903.3.2 Crawspace that is built as a conditioned area is sealed to prevent outside air infiltration and provided with conditioned air at a rate not less than 0.02 cfm per square foot of horizontal area and one of the following is implemented: (1) A concrete slab over lapped 6 mil polyethylene or polystyrene (2) 6-mil polyethylene sheeting, lapped a minimum of 6 inches and taped at the seams.	<b>10</b> <b>8</b>											n/a
<b>Addition Note:</b> Section 903.3.2 applies only to the new construction portion of additions.	<b>1 Add'l Pt</b>											
<b>Renovation Note:</b> Section 903.3.2 applies only to renovations that include a focused effort to convert an existing vented crawl space into an unvented, conditioned crawl space.	<b>2 Add'l Pts</b>											
903.4 Moisture control measures.												
903.4.1(1) Building materials with visible mold are not installed or are cleaned or encapsulated prior to concealment and closing.	<b>2 Points</b>			<b>2</b>	<b>0</b>							Add to specs.
903.4.1(2) Walls are not enclosed (e.g. with drywall) if the insulation has a high moisture content. Wet insulation products are dry before enclosing.	<b>Mandatory</b> <b>2 Points</b>	0										
903.4.1(3) The moisture content of lumber is sampled to ensure it does not exceed 19 % prior to the surface and/or wall cavity enclosure.	<b>4</b>					<b>4</b>	<b>0</b>					Include in site superintendents responsibilities
903.4.2 Moisture content of subfloor, substrate, or concrete slabs is in accordance with the appropriate industry standard for the finish flooring to be applied.	<b>2</b>	2	0									pm 09680.1.7 and pm 09600.3.1
<b>Addition and Renovation Note:</b> Section 903.4.1 (1) and (2) applies to new, reused, and salvaged materials only. It excludes undisturbed existing materials.												
<b>Addition Note:</b> Section 903.4.2 applies only where new finish flooring is applied.	<b>Mandatory</b>											
<b>Renovation Note:</b> Section 903.4.2 applies only where new finish flooring is applied. Additional points available only for correcting excess moisture levels in an existing subfloor and/or substrate.	<b>2 Add'l Pts</b>											
903.5 Plumbing.												
903.5.1 Plumbing distribution lines are not installed in exterior wall cavities.	<b>2</b>	2										P201.
<b>Addition Note:</b> Section 903.5.1 applies only to the new construction portion of additions.	<b>Mandatory</b>											
<b>Renovation Note:</b> Section 903.5.1 applies only to renovations that include exterior walls and plumbing lines or plumbing lines in unconditioned spaces.	<b>Mandatory</b> <b>3 Add'l Points</b>											
1) A minimum of 50 percent of exterior wall piping is removed.	<b>2 Add'l Pts</b>											
2) A minimum of 50 percent of exterior wall piping is insulated.												
903.5.2 Cold water pipes in unconditioned spaces are insulated to a minimum of R-4 with pipe insulation or other covering that adequately prevents condensation.	<b>2</b>											n/a
<b>Renovation Note:</b> The entire plumbing system between the connections of the water distribution and/or waste lines and the equipment and fixtures is replaced. This item applies if one or more of the following is implemented:												
1) Plumbing in unconditioned spaces is repaired or replaced.	<b>1 Add'l Pt</b>											
2) Plumbing in unconditioned spaces is improved.	<b>2 Add'l Pts</b>											



ANSI National Green Building Standard™	269	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
903.5.3 Plumbing is not installed in unconditioned spaces.	5	5										P201.
<b>Renovation Note:</b> The entire plumbing system between the connections of the water distribution and/or waste lines and the equipment and fixtures is replaced. This item applies if one or more of the following conditions exist: 1) poor joint connections 2) thin pipe walls 3) severely reduced water flow caused by debris buildup 4) lead or other toxic solders 5) drain, waste, and vent system is not in accordance with the ICC IPC.	2 Add'l Pts											
903.6(1) Duct insulation. All HVAC ducts, plenums, and trunks in unconditioned attics, basements, and crawlspaces are insulated to a minimum of R-6. Outdoor air supplies to ventilation systems are insulated to a minimum of R-6.	Mandatory	0										Doesn't comply. M201 duct insulation R5.5.
903.6(2) Duct insulation. All HVAC ducts, plenums, and trunks in unconditioned attics, basements, and crawlspaces are insulated to a minimum of R-8. Outdoor air supplies to ventilation systems are insulated to a minimum of R-8.	2			2	0							IRC 2006 requirement -N1103.2 Ducts. N1103.2.1 Insulation. Supply and return ducts shall be insulated to a minimum of R-8. Ducts in floor trusses shall be insulated to a minimum of R-6. Exception: Ducts or portions thereof located completely inside the building thermal envelope.
Addition Note: Section 903.6 applies only to the new construction portion of additions.	Mandatory											
<b>Renovation Note:</b> Section 903.6 applies to renovations as follows: 1) areas that include replacement or disturbance of HVAC ducts, plenums and trunk 2) in areas with specific condensation problems, remove any contaminated ductwork, remove or remediate mold-contaminated elements, and correct existing or add new insulation. 3) insulation on the existing HVAC ducts, plenums and trunks is upgraded	2 Add'l Pts 2 Add'l Pts 3 Add'l Points											
903.7 Relative Humidity. In climate zones 1A, 2A, 3A, 4A, and 5A as defined by Figure 6(1), equipment is installed to maintain relative humidity (RH) at or below 60% using one of the following: 903.9.1 In "Warm-Humid" climates as defined by Figure 6(1) equipment is installed to maintain Relative Humidity (RH) at or below 60% using one of the following: (1) Additional dehumidification system(s) (2) Central HVAC system equipped with additional controls to operate in dehumidification mode.	8 Points											n/a
904 Innovative Practices												
904.1 A humidity monitoring system is installed with a mobile base unit that displays a reading of temperature and relative humidity at the base unit with a minimum of two remote units. One remote unit that is placed permanently inside the conditioned space in a central location, excluding attachment to exterior walls, and another remote unit is placed permanently outside of the conditioned space.	2											
904.2 Kitchen exhaust unit(s) that equal or exceeds 400 cfm, and make-up air is provided.	2											
904.3 Renovation Note: Existing unsealed combustion gas dryer vents related to renovations. 1) Existing unsealed combustion gas dryer vent is replaced with a sealed exhaust vent. 2) Existing unsealed combustion gas dryer vent is replaced with a sealed exhaust vent and ducted makeup air is provided.	Mandatory 1 2											
<b>CHAPTER 10: OPERATION, MAINT., AND BUILDING OWNER EDUCATION</b>	<b>Base Pts.</b>	0	0	9	950	6	94	0	0	0	0	Ch. 10 Subtotal
<b>Building Owners' Manual for One- and Two-Family Dwellings</b>												
1001.0 Intent. Information on the building's use, maintenance and green components is provided.												
1001.1 A homeowner's binder is provided that includes the following, as available and applicable: <b>(Points awarded for mandatory and non-mandatory items)</b>	1 point per 2 items			0	100							
(1) A green building program certificate or completion document.	Mandatory			0.5	850							Allowed \$150 certification fee & 5 add'l professional hours - total 9.
(2) List of green building features (can include the national green building checklist).	Mandatory			0.5								
(3) Product manufacturer's manuals or product data sheet for installed major equipment, fixtures and appliances. If product data sheet is in the binder, manufacturer's manual shall may be attached to appliance in lieu of inclusion in the binder.	Mandatory			0.5								
(4) Information on local recycling programs.				0.5								
(5) Information about available local utility programs that purchase a portion of energy from renewable energy providers.				0.5								
(6) Explanation of the benefits of using energy efficient lighting systems (e.g., compact fluorescent light bulbs, light emitting diode (LED)) in high usage areas.				0.5								
(7) A list of practices to conserve water and energy.				0.5								
(8) Local public transportation options (if applicable).				0.5								
(9) A diagram showing the location of safety valves and controls for major building systems.				0.5								
(10) Where frost protected shallow foundations are used, notify owner of precautions, including instructions not to remove or damage insulation when modifying landscaping, to provide heat to the home as required by the IRC/IBC, and to keep base materials												

ANSI National Green Building Standard™	269	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(11) A list of local service providers that offer regularly scheduled service and maintenance contracts to assure proper performance of equipment and the structure (e.g., HVAC, water heating equipment, sealants, caulks, gutter and downspout system, shovels)				0.5								
(12) A photo record of framing with utilities installed. Photos taken prior to installing insulation, clearly labeled, and included as part of the homeowner's binder.												
(13) Maintenance checklist.				0.5								
(14) List of common hazardous materials often used around the building and instructions for proper handling and disposal of these materials.				0.5								
(15) Information about organic pest control, fertilizers, de-icers, and cleaning products.				0.5								
(16) Information about native landscape materials and/or those that have low-water requirements.				0.5								
(17) Information about methods of maintaining the building's relative humidity in the range of 30-60%.				0.5								
(18) Instructions for inspecting the building for termite infestation.				0.5								
(19) Instructions for maintaining gutters and downspouts and importance of diverting water at least five feet away from foundation.				0.5								
(20) A narrative detailing the importance of maintenance and operation in retaining the attributes of a green-built building.				0.5								
<b>Renovations Note:</b> A building owners' manual that includes the following:		Mandatory										
(1) all mandatory items listed in Section 1001.1												
(2) a minimum of six of the non-mandatory items listed in Section 1001.1												
(3) the EPA publications "Reducing Lead Hazards When Remodeling Your Home" and "Asbestos in Your Home: A Homeowner's Guide"												
<b>on Building Operation And Maintenance for</b>												
1002.1 Training of building owners. Building owners/occupants are familiarized with the green building goals and strategies implemented and the impacts of the occupants' practices on the costs of operating the building. Training is provided to the responsible party(ies) regarding all equipment operation and control systems. Systems include, but are not limited to, the following:						6	94					2 hours for walk-thru orientation.
(1) HVAC filters.		6										
(2) Thermostat operation and programming.												
(3) Lighting controls.												
(4) Appliances and settings.												
(5) Water heater settings.												
(6) Fan controls.												
<b>1003 Construction, Operation and Maintenance Manuals and Training for Multi-Unit Buildings</b>												
<b>1003.0 Intent.</b> Manuals are provided to the responsible parties (owner, management, tenant, and/or maintenance team) regarding the construction, operation, and maintenance of the building. Paper or digital format manuals are to include information regarding those aspects of the building's construction, maintenance, and operation that are within the area of responsibilities of the respective recipient. One or more responsible parties are to receive a copy of all documentation for archival purposes.				1								
<b>1003.1 Building construction manual.</b> A building construction manual, including five or more of the following, is compiled and distributed in accordance with Section 1003.0.												
(1) A narrative detailing the importance of constructing a green building, including a list of green building attributes included in the building. This narrative is included in all responsible parties' manuals.		Mandatory										
(2) A local green building program certificate as well as a copy of the <i>National Green Building Standard™</i> , as adopted by the Adopting Entity, and the individual measures achieved by the building.		Mandatory										
(3) Warranty, operation, and maintenance instructions for all equipment, fixtures, appliances, and finishes.		Mandatory										
(4) Record drawings of the building.												
(5) A record drawing of the site including stormwater management plans, utility lines, landscaping with common name and genus/species of plantings.												
(6) A diagram showing the location of safety valves and controls for major building systems.												
(7) A list of the type and wattage of light bulbs installed in light												
(8) A photo record of framing with utilities installed. Photos are taken prior to installing insulation and clearly labeled.												
<b>Addition and Renovation Note:</b> A building construction manual that includes the following:		0										
all mandatory items listed in Section 1003.1												
a minimum of two of the non-mandatory items listed in Section												
<b>1003.2 Operations manual.</b> Operations manuals are created and distributed to the responsible parties in accordance with Section 1003.0. Between all of the operation manuals, five or more of the following options are included.												
<b>(Points awarded per two items. Points awarded for both mandatory and non-mandatory items.)</b>				1								
(1) A narrative detailing the importance of operating and living in a green building. This narrative is included in all responsible parties' manuals.		Mandatory										
(2) A list of practices to conserve water and energy (e.g., turning off lights when not in use, switching the rotation of ceiling fans in changing seasons, purchasing ENERGY STAR appliances and electronics).		Mandatory										
(3) Information on methods of maintaining the building's relative humidity in the range of 30 percent to 60 percent.		Mandatory										

ANSI National Green Building Standard™	269	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(4) Information on opportunities to purchase renewable energy from local utilities or national green power providers and information on utility and tax incentives for the installation of on-site renewable energy systems.												
(5) Information on local and on-site recycling and hazardous waste disposal programs and, if applicable, building recycling and hazardous waste handling and disposal procedures.												
(6) Local public transportation options.												
(7) Explanation of the benefits of using compact fluorescent light bulbs, LEDs, or other high-efficiency lighting.												
(8) Information on native landscape materials and/or those that have low water requirements.												
(9) Information on the radon mitigation system, where applicable.												
(10) A procedure for educating tenants in rental properties on the proper use, benefits, and maintenance of green building systems including a maintenance staff notification process for improperly functioning equipment.												
<b>Addition and Renovation Note:</b> An operations manual that includes the following:	0											
all mandatory items listed in Section 1003.2												
a minimum of three of the non-mandatory items listed in Section 1003.2												
<b>1003.3 Maintenance manual.</b> Maintenance manuals are created and distributed to the responsible parties in accordance with Section 1003.0. Between all of the maintenance manuals, five or more of the following options are included.	1											
<b>(Points awarded per two items. Points awarded for both mandatory and non-mandatory items.)</b>												
(1) A narrative detailing the importance of maintaining a green building. This narrative is included in all responsible parties' manuals.	Mandatory											
(2) A list of local service providers that offer regularly scheduled service and maintenance contracts to ensure proper performance of equipment and the structure (e.g., HVAC, water-heating equipment, sealants, caulks, gutter and downspout system, shower												
(3) User-friendly maintenance checklist that includes:												
a) HVAC filters												
b) thermostat operation and programming												
c) lighting controls												
d) appliances and settings												
e) water heater settings												
f) fan controls												
(4) List of common hazardous materials often used around the building and instructions for proper handling and disposal of these materials.												
(5) Information on organic pest control, fertilizers, deicers, and cleaning products.												
(6) Instructions for maintaining gutters and downspouts and the												
(7) Instructions for inspecting the building for termite infestation.												
(8) A procedure for rental tenant occupancy turnover that												
(9) An outline of a formal green building training program for												
<b>Addition and Renovation Note:</b> A maintenance manual that includes the following:	0											
all mandatory items listed in Section 1003.3.												
a minimum of three of the non-mandatory items listed in Section 1003.3.												
<b>1004</b>												
<b>INNOVATIVE PRACTICES</b>												
<b>1004.1 (Reserved)</b>												



# APPENDIX B GREEN SCORING & COST

B. Akron, Ohio – Single Family Home

HUD Green Building Comparison D unit  
 Akron, OH - TC Project 14-A-08 - Single Family - D unit  
 ANSI-ICC-700-2008 National Green Building Standard™  
 Lot 22 x 75' (approx.) 7,500  
 Finished 1,908  
 finished bsmt 972 insulated R-13 and gyp board  
 Total conditioned 2,880  
 Garage (det'd) 12.67' x 30' 360  
 yard 5,604  
 walks & driveway 295  
 pervious 74.71%  
 Base rating 11/13/09

- 5. Lot Design...
- 6. Resource Efficiency
- 7. Energy Efficiency
- 8. Water Efficiency
- 9. Indoor Env. Quality
- 10. Operation, Maintenance...

Bronze		Silver		Gold		Emerald	
Required	Actual	Required	Actual	Required	Actual	Required	Actual
39	96	66	96	93	114	119	126
45	64	79	86	113	113	146	148
30	64	60	107	100	166	120	197
14	37	26	37	41	61	60	69
36	74	65	105	100	141	140	149
8	9	10	15	11	15	12	15
50		100		100		100	
222	344	406	446	558	610	697	704

KEY  
 Points are Co-Dependant on at least one other cell  
 Overhead Cost - Dependant on subdivision size

Cummulative	Points	Cost	Points	Cost	Points	Cost	Points	Cost
Chapter 5	96	0	96	0	114	175	126	695
Chapter 6	64	691	86	697	113	847	148	3,916
Chapter 7	64	1,175	107	2,985	166	13,010	197	23,908
Chapter 8	37	0	37	0	61	525	69	907
Chapter 9	74	140	105	274	141	945	149	1,061
Chapter 10	9	950	15	1,044	15	1,044	15	1,044
Total	344	2,956	446	5,000	610	16,546	704	31,530
Cost per SF (\$)	0.00	1.55		2.62		8.67		16.53

ANSI National Green Building Standard™	256	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
	Cost/Point	Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
<b>CH. 5 LOT DESIGN, PREPARATION, AND DEVELOPMENT</b>	Rating	72	260	24	0	0	0	18	175	12	520	Ch. 5 Subtotal Base
500.0 Intent. This section applies to lot development for the eventual construction of residential buildings, multi-unit buildings, or additions thereto that contain dwelling units. The buildings on												Because of lead impacted soil mitigation area denoted then omitted A001; may have been grey/brownfield.
501.1 The lot is selected to minimize environmental impact by one												
(1) An infill lot is selected.	4											
(2) A greyfield lot or an EPA-recognized brownfield lot is selected.	5	5										
(3) Addition and Renovation Note: A renovation or addition project	5											
501.2 Mass Transportation. A range of mass transportation choices are promoted by one or more of the following:												http://www.edgewoodakron.com/communityTransportation.asp
(1) A lot is selected within one-half mile of pedestrian access to a	3	3										
(2) Walkways, street crossings, and entrances designed to promote pedestrian activity are provided. New buildings are connected to existing sidewalks and areas of development.	3	3										New urbanism - alleys and garages in back with porches and sidewalks in front. Connection to other phases of project, community center, neighborhood.
(3) A lot is selected within one-half mile of six or more community resources (e.g., recreational facilities (such as pools, tennis courts, basketball courts), parks, grocery store, post office, place of worship, community center, daycare center, bank, school,	3	3										Park on site. Community Center and continuing education classes on site. Tennis courts across Euclid. Grocery shopping, schools, and a bar nearby.
502 Project Team, Mission Statement, and Goals												
502.1 A knowledgeable team is established and team member	4											
Lot Design												
503.0 Intent. The lot is designed to avoid detrimental environmental impacts first, minimize any unavoidable impacts, and mitigate for those impacts that do occur. The project is designed												C101 - Existing Conditions & Demolition Plan shows all trees being removed from Phase IV; subject.
503.1 Natural resources are conserved by one or more of the												
(1) A natural resources inventory is completed under the direction	5											
(2) A plan is implemented to conserve the elements identified by	6											
(3) Items listed for protection in the resource inventory plan are	4											
(4) Basic training in tree or other natural resource protection is	4											
(5) All tree pruning on site is conducted by a Certified Arborist.	2											
(6) Ongoing maintenance of vegetation during construction is in	3											
Addition and Renovation Note: section 503.1 applies to additions that increase building footprint on the lot; and to renovations that	1 Additional Point											
503.2 Slope disturbance is minimized by one or more of the following: (Points awarded only if there are developable steep slopes on the lot.)												C101 and C102 indicate slopes at Raymond St. singles. Construction entrance is brought in perpendicular to slope.
(1) All or a percentage of development on steep slopes is avoided.												
(a) Less than 25%	2											
(b) 25 to 75%	3											
(c) Greater than 75%	4											
(2) Hydrological/soil stability study for steep slopes is completed	5											
(3) All or a percentage of roads and parking are aligned with natural topography to reduce cut and fill.												Raymond St. SFDs, driveways, paths are perpendicular to slopes.
(a) Less than 25%	1											
(b) 25 to 75%	3											
(c) Greater than 75%	5											
(4) Long-term erosion effects are reduced through the design and	6											
(5) Underground parking uses the natural slope for parking	4											
Addition and Renovation Note: Section 503.2 applies to additions that increase building footprint on the lot; and to renovations that	2 Additional Points											
503.3 Soil disturbance and erosion are minimized by one or												
(1) Construction activities are scheduled to minimize length of time	5	5	0									
(2) Utilities are installed using one or more alternative means:	5											C503 shows sewer & water separate with front access. Stormwater separate. No electric or gas shown.
(a) tunneling instead of trenching		5	0									
(b) use of smaller (low ground pressure) equipment or geomatics to												
(c) shared utility trenches or easements												
(d) placement of utilities under paved surfaces instead of yards.												
(3) Limits of clearing and grading are demarcated on the plan.	5	5	0									
503.4 Storm Water Mgmt. Storm water is managed using one or												
(1) Natural water and drainage features are preserved and used.	6									6	0	
(2) A storm water management plan is developed and implemented that minimizes concentrated flows and simulates flows found in natural hydrology; e.g., vegetative swales, French	6									6	520	C401. SWPP notes and details. Final grade indicates retention of natural hydrology. It likely assists.
(3) All or a percentage of impervious surfaces are minimized and permeable materials are used for driveways, parking areas.												Alley is impervious. Doesn't count toward lot line.
(a) Less than 25%	1											
(b) 25 to 75%	3											
(c) Greater than 75%	5											
(4) A minimum of 75% of the roof is vegetated (green roof)	3											
Addition and Renovation Note: Section 503.4 applies to additions that increase the building footprint on the lot; and to renovations	1 Additional Point											

ANSI National Green Building Standard™	256	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
<b>503.5 Landscape plan</b> is developed to limit water and energy use												
(1) A plan is formulated to restore or enhance natural vegetation that is cleared during construction. Landscaping is phased to coincide with achievement of final grades to ensure denuded areas are quickly vegetated.	5	5	260									C403. Nice landscape plan for green space. L201-2 covers individual. Search did not indicate these to be native.
(2) Turf grass species, other vegetation, and trees are selected	4			4	0							In 503.5(1) plan accommodate this.
(3) A percentage of all turf areas are limited.												
(a) Lot is 0% turf	4											
(b) Greater than 0% to less than 25%	3											
(c) 25% to less than 50%	2											
(d) 50% to 75%	1	1										
(4) Plants with similar watering needs are grouped (hydrozoning).	5			5	0							
(5) Species and locations for tree planting are identified that will	5	5										
(6) Vegetative wind breaks or channels are designed as	4			4	0							
(7) Onsite tree trimmings or stump grinding of regionally appropriate trees are used to provide protective mulch during construction and cleared trees are recycled as saw lumber or pulp wood.	3			3	0							38 trees were removed from Phase IV. Could have been mulched and reused, but 02230-4 says "dispose of off-site". Change the language for next phase.
(8) An integrated pest management plan to minimize chemical use	4			4	0							
<b>Addition and Renovation Note:</b> Section 503.5 applies to additions that address protection and renovation of existing vegetation during	2 Additional Points											
<b>503.6 Wildlife habitat.</b> Measures are planned that will support	4							4	175			
<b>Addition and Renovation Note:</b> Section 503.6 applies to additions												
(1) Maintain wildlife habitat.	1 Add'l Point											
(2) Expand wildlife habitat.	2 Add'l Points											
<b>503.7 Mixed use development</b> is incorporated.	6											
<b>503.8 Environmentally Sensitive Areas.</b>												
(1) Environmentally Sensitive Areas are avoided.	3											
(2) Compromised Environmentally Sensitive Areas are mitigated or	3											
<b>503.9 Density.</b> The average density on a net developable area basis is:												Density based on Phase IV is 48 units on 6.14 acres = 7.8/acre (C101-102&A001)
(1) 7 to less than 14 dwelling units per acre (4047 m <sup>2</sup> )	4			4	0							
(2) 14 to less than 21 dwelling units per acre	7											
(3) 21 or greater dwelling units per acre	10											
<b>504 Lot Construction</b>												
<b>504.0 Intent.</b> Environmental impact during construction is avoided												
<b>504.1 Onsite supervision and coordination</b> is provided during	4	4	0									
<b>504.2 Trees and vegetation.</b> Designated trees and vegetation are												
(1) Fencing or equivalent to protect trees and other vegetation is	3	3	0									
(2) Trenching, significant changes in grade, and compaction of	4							4	0			
(3) Damage to designated existing trees and vegetation is mitigated during construction through pruning, root pruning, fertilizing, and watering.	4											02230-2 "Protect existing... and restore damaged improvements to their original condition." 02230-3 "Repair/replace trees and vegetation...damaged."
<b>504.3 Soil disturbance and erosion.</b> Onsite soil disturbance and												
(1) Limits of clearing and grading are staked out.	5	5	0									
(2) "No disturbance" zones are created using fencing or flagging to protect vegetation and sensitive areas from construction activity.	5							5	0			02230-2 "Locate and clearly flag trees to remain from damage during construction." However, few trees remained on the site.
(3) Sediment and erosion controls are installed and maintained in accordance with the storm water pollution prevention plan	5	5	0									02230-2 "No clearing until erosion & sedimentation control in place."
(4) Topsoil is stockpiled and stabilized for later use to establish	5	5	0									02230-4 "Stockpile topsoil...cover."
(5) Soil compaction from construction equipment is reduced by	3											
(6) Disturbed areas that are complete or to be left unworked for greater than 21 days are stabilized within 14 days using methods as recommended by the EPA or in the approved storm water pollution prevention plan (SWPPP), where required.	3	3	0									02370-2 "owner has authority to limit erodible surface area..." "slopes that erode easily or will not be graded for 14 days [to be] temporarily seeded..."
(7) Soil is improved with organic amendments and mulch.	3	3	0									02230-4 "stockpile surplus topsoil to allow for respreading..." and PM 02920-3 amend soil for 6% organic content per ASTM D5268".
(8) Utilities are installed using one or more alternative means such as tunneling instead of trenching, use of smaller equipment, use of	5							5	0			
<b>Addition and Renovation Note:</b> Additional points for Section 504.3 apply only where onsite construction staging and storage areas are	2 Additional Points											
<b>505 INNOVATIVE PRACTICES</b>												
<b>505.0 Intent.</b> Innovative lot design, preparation and development												
505.1 Driveways or parking areas are shared. Waivers or variances	4											
<b>Addition and Renovation Note:</b> Section 505.1 applies only where existing impervious driveway and parking area(s) are	2 Additional Points											
505.2 Heat Island Mitigation. Any combination of the following strategies are provided for a minimum of 50% of the horizontal	4											Sidewalks and driveways are concrete. Alley is pervious pavers; brick colored.
(1) Shading of hardscaping: Shade from existing or new vegetation is provided (within five years) or from trellises. Shade of												Front walks seem shaded from acer platanoides.
(2) Light colored hardscaping: Horizontal hardscaping materials are installed with a solar reflectance index of 29 or greater.	4	4	0									Concrete meets index - driveway and walks.
<b>CHAPTER 6: RESOURCE EFFICIENCY</b>	<b>Base Pts.</b>	<b>57</b>	<b>0</b>	<b>7</b>	<b>691</b>	<b>22</b>	<b>6</b>	<b>27</b>	<b>150</b>	<b>35</b>	<b>3,069</b>	<b>Ch. 6 Subtotal</b>
<b>601 Quality of Construction Materials and Waste</b>	<b>Cost/Point</b>											
<b>601.0 Intent.</b> Design and construction practices that minimize the												
601.1 <b>Conditioned floor area</b> , as defined by ICC IRC calculated												
(1) Less than or equal to 1,000 square feet	15											
(2) Less than or equal to 1,500 square feet	12											1,908
(3) Less than or equal to 2,000 square feet	9	9										
(4) Less than or equal to 2,500 square feet	6											
(5) Greater than 4,000 square feet (373 m <sup>2</sup> )	Mandatory											
<b>For every 100 square feet over 4,000 sf, one point is to be</b>												
<b>Multi-Unit Building Note:</b> For a multi-unit building, use a												
<b>Addition Note:</b> Additions more than 75% of existing building.												
<b>Additions less than or equal to 75% of existing building.</b>												
(1) The existing structure is 50% to 75% of total building or dwelling unit area.	1 Add'l Point											
(2) The existing structure is 76% to 99% of total building or dwelling unit area.	3 Add'l Point											
<b>Renovation Note:</b> When renovations increase the total existing												
(a) The total area of the existing building or dwelling unit is less than or equal to 2500 sf.	6 Add'l Points											
(a) The total area of the existing building or dwelling unit is greater than 2500 sf.	1 Add'l Point											
<b>601.2 Material Usage.</b> Building-code-compliant structural systems or advanced framing techniques that optimize material usage are implemented. Points awarded for each system or framing technique implemented.	3 pts per system (9 pts max)	3	0			6	0					roof truss @24" oc for base. Incorporate single top plate and 24" spacing. Design cost vs. mat'l savings to net to zero.
<b>601.3 Building dimensions and layouts</b> are designed to reduce												
(1) When used for at least 80% of floor area	3	3	0									

ANSI National Green Building Standard™	256	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(2) When used for at least 80% of wall area	3											
(3) When used for at least 80% of roof area	3											
(4) When used for at least 80% of cladding or siding area	3											
(5) When used for at least 80% of penetrations or trim area	1											
601.4 Detailed framing or structural plans, material quantity lists and onsite cut lists for framing, structural materials, and sheathing	4									4	1,040	Allowed 8 prof hours for architectural revision.
601.5 Pre-cut or pre-assembled components, or panelized or												
(1) Floor system.	4											2nd floor is open web trusses 12" deep, at 16' oc. A501 & S101. First floor is 2x10.
(2) Wall system.	4									4	0	9-1 1/8" walls aren't precuts. At emerald incorporate wall panels. Cost should be net zero
(3) Roof system.	4	4										A501 trusses at 24" oc.
(4) modular construction for the entire building located above	13											
(5) manufactured home construction for the entire building located	13											
601.6 Stories above grade are stacked, such as in 1 1/2 and 2 story or greater structures. The area of the upper story shall be at	Max 8 points											
(1) first stacked story	4	4										
(2) for each additional story	2											
601.7 Site applied finishing materials. Building materials or assemblies that do not require additional site applied material for	Max 12 points											
(1) 90% or more of the installed material or assembly listed below:	5											
(2) 50% to less than 90% of the installed building material or	2											
(a) Pigmented, stamped, decorative, or final finish concrete or												
(b) Trim not requiring paint or stain.												PM 07460-2 CVPVC trim is pre-finished. Porch soffits prefinished aluminum. (A006 shows vinyl soffit.) Pm 06200-2 broaden trim to Hardie, Certainteed and Techtrim. Don't know what was used.
(c) Window, skylight, and door assemblies not requiring paint or stain on exterior and/or interior surfaces.	5											PM 8565-2 Windows and decorative louvre are vinyl. 08250-2 Doors are fiberglass. No skylights.
(d) Wall coverings or systems not requiring paint or stain or other type of finishing application.										5	0	Fiber cement sided walls. Concrete foundation. Use architectural revision to spec siding that meets criteria.
601.8 Foundations such as frost-protected shallow foundations, pier and pad foundations, post foundations and other similar foundation types are designed and constructed.	3									3	1040	Install FPS foundation at walkout wall until grade changes enough to have small frost footing. Net should be a savings. 8 hrs for engineer.
601.9 One or more of the following above grade wall systems that	4											
(1) Adobe												
(2) Concrete/Masonry												
(3) Logs												
(4) Rammed earth												
602 Enhanced Durability and Reduced Maintenance												
602.0 Intent. Design and construction practices are implemented												
602.1 Entries at exterior door assemblies, inclusive of side lights, are covered by one of the following methods below to protect the building from the effects of precipitation and solar radiation. A	Maximum number of points 5											
(1) Installing a porch roof or awning.												
(2) Extending the roof overhang.												
(3) Recessing the exterior door.												
Main entrance door	3	3										
Additional covered door assembly	1	2										Side door. North side unto deck, has roof from cantilevered second deck over. Basement w/o
602.2 Roof overhangs, based on inches of rainfall in Table 602.2.	4											
Table 602.2												
Minimum Roof Overhang for One- & Two-Story Buildings												
Inches Rainfall*	Eave Overhang (Inches)	Rake Overhang (Inches)										36.2" average annual. 16" overhangs.
Less than 20	12	12										
21 to 40	12	12	4									
41 to 70	18	12										
More than 70	24	12										
portion of additions.	0											
the existing roof.	1											
602.3 Foundation Drainage												
602.3.1 Where required by the IRC/IBC for habitable and usable spaces below grade, exterior drain tile is installed.	Mandatory	0										Not met. Shown on wall section A501 for slab house, only.
602.3.2 Interior and exterior foundation perimeter drains are installed and sloped to discharge to daylight, dry well, or sump pit.	4			4	691							There aren't any good details of an in-ground basement. Added interior drain tile as per detail located on town plan.
portion of additions.	0											
involve the demolition/reconfiguration of exterior walls and/or modification of the existing foundation drainage system.	2 Additional Points											
602.4 Drip edge is installed at eaves and gable roof edges.	3	3										A501 details drip edge. Not in roofing specs. 07311-3.
602.5 A gutter and downspout system with extensions, or splash blocks and effective grading, are provided to carry water at least 5 feet away from perimeter foundation walls.	4					4	0					07600-3. 07600-2 implies that downspout drainage boots will serve as transition to storm drain tie-in.
Renovation Note: Section 602.5 applies only to renovations.	1 Add'l Point											
602.6 Finish grade at all sides of building is sloped to provide a	Mandatory	0										Not met.
Addition Note: Section 602.6 applies only to additions that increase the footprint of the building.	Mandatory 0 Add'l Points											
Renovation Note: The additional points for Section 602.6 apply only to renovations.	2 Add'l Points											
602.7 Termite barrier. Continuous, physical, foundation termite	4											Moderate to heavy zone.
Addition Note: Section 602.7 applies only to the new construction												
portion of additions.	0 Add'l Points											
Renovation Note: The additional points for section 602.7 applies												
(1) new non-chemical termite barrier is provided	1 Add'l Point											
(2) existing chemical barrier is removed and replaced with a non-chemical barrier	3 Add'l Points											
602.8 Termite-resistant materials are used as follows:												
(1) In areas of slight to moderate termite infestation probability (as	2											
(2) In areas of moderate to heavy termite infestation probability (as	4											
(3) In areas of very heavy termite infestation probability (as defined	6											
602.9 Where required by the IRC/IBC, a water-resistive barrier	Mandatory	0										Met. A502
Addition Note: Section 602.9 applies to the new construction	Mandatory 0 Add'l Points											
portion of additions.												
Renovation Note: Section 602.9 applies to renovations that include exterior veneer and/or siding replacement.	Mandatory 0 Add'l Points											
602.10 In areas where there has been a history of ice forming along the eaves causing a backup of water, an ice barrier is installed at roof eaves and is extended at least 24" inside the exterior wall line of the building, in accordance with the IRC/IBC.	Mandatory	0										Met. PM 07311-3 "Apply waterproofing underlayment at eaves...at least 36" inside exterior wall line." Detailed on roof plan.

ANSI National Green Building Standard™	256	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
602.11 Enhanced foundation waterproofing is installed: (1) Rubberized coating, or (2) Drainage mat.	4											
<b>Addition Note:</b> Section 602.11 applies to the new construction portion of additions.	0 Additional Points											
<b>Renovation Note:</b> Section 602.11 applies to renovations that involve the demolition/reconfiguration of exterior walls, modification	2 Additional Points											
602.12 Flashing details are shown on plans and flashing is (1) Around exterior fenestrations, skylights and doors. (2) Roof valleys. (3) Deck/balcony to building intersections. (4) At roof-to-wall intersection and at roof-to-chimney intersections. (5) A drip cap is provided above windows and doors that are not	6									6		0 Incorporate with plan revision.
<b>602.13 Roof Surfaces.</b> A minimum of 90% of roof surfaces are (1) Products which meet the requirements of the ENERGY (2) A green (landscaped) roof system.	3											Shingle color not stated.
<b>Renovation Note:</b> Section 602.13 applies to renovations that	1 Add'l Point											
<b>602.14 Recycling.</b> Occupant recycling is facilitated by one or more (1) A built-in collection space in each kitchen and an (2) Compost facility provided on-site.	3							3	75			
	3							3	75			
<b>603 Reused or Salvaged Materials</b>												
603.0 Intent. Practices that reuse or modify existing structures, 603.1 Existing buildings and structures are reused, modified or deconstructed in lieu of demolition. <b>(One point awarded for every 200 sq. ft., 18.5m<sup>2</sup>, of floor area.)</b> 603.2 Reclaimed and/or salvaged materials and components are 603.3 Scrap Materials. Facilitation for sorting and reuse of scrap	1 (Max 12 points) 3 4											
						4	6					Based on 48 units.
<b>604 Recycled-Content Building Materials</b>												
604.1 Building materials with recycled content are used for at least two minor and/or two major components of the building. <b>(NOTE: Table 604.1)</b>	Points per Table 604.1											
Recycled Content												
Material Percentage Recycled Content												
25% - 50%												
	Per 2 Minor	Per 2 Major										
	1	2				2	0					carpet padding complies & stainless steel
50% - 75%												
	2	4										
75%												
	3	6				6	0					cellulose insulation & gyp board
<b>Recycled Construction Waste</b>												
605.0 Intent. Waste generated during construction is recycled. <b>Note:</b> All waste classified as hazardous shall be properly handled and disposed. <b>(Points not awarded for hazardous waste)</b> 605.1 A Construction Waste Management Plan is developed, implemented, and posted at the jobsite with a goal of recycling or	6									6	989	This is important in view of possible contaminated soil. 2 people in builder's staff 1 day to develop.
<b>Addition and Renovation Note:</b> The construction waste management plan includes information on the proper handling and disposal of hazardous wastes.	Mandatory 2 Additional Points											
605.2 Onsite recycling measures following applicable regulations (a) Materials are ground or otherwise safely applied onsite as soil (b) Other methods approved by the NAHB Research Center (the	7									7	0	
<b>Addition and Renovation Note:</b> All waste classified as hazardous waste is properly handled and disposed of. The weight	Mandatory 0 Add'l Points											
605.3 Recycled Construction materials: Construction materials (1) A minimum of two types of materials are recycled. (2) For each additional recycled material.	3 1							3 2	0 0			
<b>606 Renewable Materials</b>												
606.0 Intent. Building materials derived from renewable resources 606.1 The following biobased products are used. <b>(Note: 606.1)</b> (a) certified solid wood in accordance with Section 606.2 (b) engineered wood (c) bamboo (d) cotton (e) cork (f) straw (g) natural fiber products made from crops (soy or corn-based) (h) products with the minimum biobased contents of the USDA 7 (i) other biobased materials with a minimum of 50 percent biobased	Max 8	0										
		0										
		0										
606.1(1) At least two types of biobased materials are used, each	3	2	0									LVL headers & interior trim
606.1(2) At least two types of biobased materials are used, each	6	6	0									OSB and studs
606.1(3) For each additional biobased material used for more than 5% of the project's projected building material cost.	1 (2 pts max)											Cabinets and cellulose insulation
<b>606.2 Wood-based products</b> are certified to the requirements of (a) AFF American Tree Farm System® (b) Canadian Standards Association's Sustainable Forest (c) Forest Stewardship Council (FSC) (d) Program for Endorsement of Forest Certification Systems (e) Sustainable Forestry Initiative Program (SFI) (f) Other product programs mutually recognized by PEFC												
606.2(1) Where a minimum of two certified wood-based products	3			3	0							Cabinets are KCMA
606.2(2) Where a minimum of two certified wood-based products	4											
<b>606.3 Manufacturing Energy.</b> Materials are used for major components of the building that are manufactured using a	6 pts. max.							6	0			Specify OSB to come from complying mill. Locate add'l sources that comply
<b>607 Resource-Efficient Materials</b>												
607.1 Products containing fewer materials are used to achieve the (1) Lighter, thinner brick with bed depth less than 3 inches, brick (2) Engineered wood or engineered steel products. (3) Roof or floor trusses.	Max 9 points											
		9	0									LVL headers and floor girder. Roof and floor trusses.
<b>608 Indigenous Materials</b>												
608.1 Indigenous materials are used for major elements of the building. (1) one type of material. (2) For each additional material.	10 points max. 2 2									2 8	0 0	stone for driveway base osb,steel, siding, deck & stud lumber
<b>609 Life Cycle Analysis</b>												
609.1 A more environmentally preferable product or assembly for an application based upon the use of a Life Cycle Assessment (1) Per product/system comparison (2) Whole building LCA analysis	Max 15 points 3 15											
<b>610 Innovative Practices</b>												
610.1 Manufacturer's environmental management system concepts. Product manufacturer's operations and business	Max 10 points											
<b>CHAPTER 7: ENERGY EFFICIENCY</b>												
701.1 Mandatory requirements. The building shall comply with either Section 702 (Performance Path) or Section 703 (Prescriptive Path). Items listed as "Mandatory" in Section 701.4 apply to both the Performance and Prescriptive Paths.	Base Pts.	42	0	22	1,175	43	1,810	59	10,025	31	10,897	Ch. 7 Subtotal Use 703 path.



ANSI National Green Building Standard™	256	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
<b>Addition Note:</b> Section 701, including mandatory items, applies only to the new construction portion of additions.												
<b>Renovation Note:</b> Section 701 applies to existing buildings as follows:												
(1) For the Green Building Path (Section 305.4), the existing building or dwelling unit shall comply with the mandatory renovation/addition practices and shall achieve the points indicated in Table 303.												
(2) For the Green Remodel Path (Section 305.5), the existing building or dwelling unit shall comply with Table 305.5												
<b>701.1.1 Minimum Performance Path Requirements.</b> A building complying with Section 702 shall exceed the baseline minimum performance required by the IECC by 15%, and shall include a minimum of two practices from Section 704.												
<b>701.1.2 Minimum Prescriptive Path Requirements.</b> A building complying with section 703 shall obtain a minimum of 30 points from Section 703, and shall include a minimum of two practices from Section 704.												
<b>701.1.3 Alternative Bronze Level Compliance.</b> As an alternative, any building that qualifies as an ENERGY STAR qualified home or equivalent achieves the Bronze Level for Chapter 7.												
<b>701.2 Emerald Level Points.</b> The Performance Path shall be used to achieve to the Emerald Level.												
<b>Mandatory Practices</b>												
<b>701.3</b> A review by the Adopting Entity or designated third party shall be conducted to verify design and compliance with Chapter 7.				0	520							Cost for 4 hours prof to review.
<b>701.4.1 HVAC SYSTEMS</b>												
<b>701.4.1.1</b> Space heating and cooling system/equipment shall be sized according to heating and cooling loads calculated using ACCA Manual J or equivalent.				0								Does not comply. Furnaces are sized at either 60 or 100k btu in. No Manual J spec.
<b>Addition and Renovation Note:</b> Section 701.4.1.1 is mandatory for both additions and renovations where new HVAC equipment is installed.												
<b>Addition and Renovation Note:</b> The additional points for section 701.4.1.1 apply to additions or renovations that include one or both of the following:												
(1) a change in heating and cooling loads												
(2) a replacement and/or addition of mechanical equipment												
<b>701.4.1.2</b> Where installed, as a primary heat source in the building, radiant or hydronic space heating system is designed using industry-approved guidelines (e.g. ACCA Manual J, GAMA H-22, or an accredited design professional's and manufacturer's recommen			0									n/a
<b>701.4.2 DUCT SYSTEM</b>												
<b>701.4.2.1</b> Ducts are sealed with tape complying with UL 181, mastic, gaskets, or an approved system as required by the ICC IRC (Section M1601.3.1, or ICC IMC Section 603.9) to reduce leakage.			0									Specified to max. leakage of 6% and sealing. Complies.
<b>Addition and Renovation Note:</b> Section 701.4.2.1 applies only to the new portions of a duct system, except as follows:												
(1) For renovations of existing buildings, the entire duct system, both existing and new, is permitted to be sealed with mastic or an aerosol spray-applied duct sealant.												
(2) For existing duct systems, where the existing duct system is not in accordance with Section 701.4.2.1, the overall duct system leakage is reduced by using any approved methods in Section 701.4.2.1, or aerosol spray applied duct sealant. Additional p												
(a) 25% to less than 50%												
(b) 50% to less than 75%												
(c) 75% to less than 100%												
(d) 100%												
(e) the entire system is upgraded in accordance with Section 704.6.2.2												
<b>701.4.2.2</b> Building cavities are not used as supply ducts.			0									Complies. Ducted supplies brought up outside wall. M204
<b>Addition Note:</b> Section 701.4.2.2 is mandatory for new construction portion of additions.												
<b>Renovation Note:</b> Section 701.4.2.2 applies to renovations that involve one of the following:												
(1) the demolition, reconfiguration, or addition of interior walls or a modification in the duct system of the building												
(2) a focused effort to solve the use of building cavities as supply ducts												
<b>701.4.3 INSULATION and AIR SEALING</b>												
<b>701.4.3.1</b> GENERAL Insulation and air sealing is in accordance with the following:												
(1) Insulation shall be installed in accordance with the manufacturer's instructions or local code, as applicable.			0									PM 15250-2. Complies
(2) Shafts (duct shaft, piping shaft/penetrations, flue shaft.) Openings to unconditioned space are fully sealed with solid blocking or flashing and any remaining gaps are sealed with caulk or foam. Fire-rated collars and caulking are installed where required.			0									Doesn't comply. Should be covered in PM.
<b>Addition and Renovation Note:</b> Section 701.4.3.1(1) is mandatory for the new construction portion of additions and renovations.												
<b>Renovation Note:</b> Existing openings to unconditioned spaces are sealed.												
<b>701.4.3.2 FLOOR / FOUNDATION / CRAWLSPACE</b>												
(1) Floors (Including insulated floors above garages and cantilevered floors)				0								Not met. Sections do not detail these areas well. PM 07210-2.C.Assembly R-values lacks a value for floors.

ANSI National Green Building Standard™		256	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
			Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(a) Insulation is installed to maintain permanent contact with the underside of the subfloor decking, enveloping any attached ductwork within the thermal envelope without compression or air gaps in the insulation. This practice does not apply to ducts or other mechanical equipment that are adjacent to the underside of the subfloor.													
(b) Batt and loose-fill insulation is held in place by permanent attachments or systems in accordance with the manufacturer's instructions.													
<b>Renovation Note:</b> Insulate existing uninsulated floors.		2 Add'l Pts											
<b>(2) Crawlspace.</b> Where insulated, crawlspace wall insulation is permanently attached to the walls. Exposed earth in unvented crawlspaces is covered with continuous vapor retarder with overlapping joints taped or masticed.		Mandatory	0										n/a
<b>Renovation Note:</b> In accordance with Section 701.4.3.2(2):													
(1) existing uninsulated crawlspace is insulated.		2											
(2) exposed earth in existing crawlspace is covered.		2											
<b>701.4.3.3 WALLS</b>													
<b>(1) Windows and Doors.</b> Caulking, gasketing, adhesive flashing tape, foam sealant, or weatherstripping is installed forming a complete air barrier.		Mandatory	0										Doesn't comply. No spec for air sealing.
<b>Renovation Note:</b> Existing windows and doors are weather-stripped and sealed.		1 Add'l Pt											
<b>(2) Band Joist and Rim Joists.</b> Band and rim joists are insulated and air sealed.		Mandatory	0										Doesn't comply. No spec for air sealing.
<b>Renovation Note:</b> Existing uninsulated rim and/or band joists are insulated.		1 Add'l Pt											
<b>(3) Between Foundation and Sill Plate Bottom Plate</b>		Mandatory											
(a) Sill sealer, or other material that will expand and contract, shall be installed between foundation and sill plate.					0								Doesn't comply. No spec.
(b) Caulk or the equivalent is installed to seal the bottom plate of exterior walls.					0								Doesn't comply. No spec.
<b>Renovation Note:</b> Existing perimeter sill plates are sealed.		1 Add'l Pt											
<b>(4) Skylights and kneewalls.</b> Skylight shafts and knee walls are insulated to the same level as the exterior walls.		Mandatory	0										n/a
<b>Renovation Note:</b> Existing skylight shafts and kneewalls are insulated.		1 Add'l Pt											
<b>(5) Exterior Architectural features.</b> Code required building envelope insulation and air sealing is not disrupted at exterior architectural features such as stairs and decks.		Mandatory	0										Doesn't comply. No spec.
<b>701.4.3.4 CEILINGS AND ATTICS</b>													
<b>(1) Attic access (except unvented attics).</b> Attic access, knee wall door, or drop down stair is covered with insulation and gasketed. Knee wall door is insulated unit or is covered with insulation.		Mandatory			0								Doesn't comply. Detail A009.
<b>Renovation Note:</b> Existing attic access, knee wall door, or drop-down stairs are insulated.		1 Add'l Pt											
<b>(2) Recessed Lighting.</b> Recessed light fixtures that penetrate the thermal envelope are airtight, IC rated, and sealed with gasket, caulk, or foam.		Mandatory	0										Doesn't comply. May be two recessed fixtures in 2nd floor baths. No spec.
<b>Renovation Note:</b> Replace existing recessed lights that penetrate the thermal envelope with airtight, IC-rated recessed light fixtures that are sealed to drywall with gasket, caulk, or foam. (Additional point per fixture)		1 Add'l Pt											
<b>(3) Eave vents.</b> Where ceiling/attic assemblies or designs have eave vents, baffles, or other means shall be utilized to minimize air movement into or under the insulation.		Mandatory	0										A501 no baffle shown.
<b>Renovation Note:</b> Provide blocking or baffle at eaves to ensure ventilation over attic insulation.		2 Add'l Pts											
<b>701.4.4 FENESTRATION</b>													
701.4.4.1 The NFRC-certified U-factor and SHGC windows, exterior doors, skylights, and tubular daylighting devices (TDDs) are in accordance with ENERGY STAR, or equivalent, or Table 701.4.4.1. Decorative fenestration elements with a maximum area of 15 square feet or 10 percent of the total glazing area, whichever is less, are not required to comply with this practice.		Mandatory											Complies
<b>Table 701.4.4.1</b>													
Fenestration Specifications													
Climate Zones													
			U-Factor		SHGC								
			Windows and Exterior Doors (maximum certified ratings)										
1 and 2			0.65		0.4								
3			0.4		0.4								
4 to 8			0.35		Any								u=30; shgc=.31
			Skylights and TDDs (max. certified ratings)										
1 to 3			0.75		0.4								
4 to 8			0.6		Any								
<b>702 Performance Path</b>													
702.1 Points from Section 702 (Performance Path) shall not be combined with points from Section 703 (Prescriptive Path).		Mandatory											Comply.
702.2 Energy efficiency features are implemented to achieve energy cost performance that exceeds ICC IECC by the following. A documented analysis using software in accordance with ICC IECC, Section 404, or ICC IECC Section 506.2 through 506.5, applied as defined in the ICC IECC, is required.													
(1) 15%			30		30	655	(30)						Brought ducts inside unit and tightened to 12%. (8% leakage/sf)
(2) 30%			60				60	1,810	(60)				R-49 ceiling; 2x6 at 24"; 4.5ACH50; 6% duct leakage; 92% gas tankless water heater
(3) 50%			100						100	9,803	(100)		closed loop solar; 2.6ACH50; R-5 sheathing.
(4) 60%			120								120	10,601	Raised heel R-60; R-10 sheathing; .23/.35 windows; 2ACH50; 96% heat; thermatru doors 0.18
<b>Renovation Note:</b> Application of Section 702.2: A baseline energy use measurement is calculated for the existing building. (Based on the reduction in whole building energy use, points are given for every increase in efficiency in accordance with Section		0 Add'l Pts											

ANSI National Green Building Standard™	256	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
<b>703 Prescriptive Path</b>												
703.1 Building envelope. Where the total building thermal envelope UA is less than required by ICC IECC, Section 402.1.4, the total building thermal envelope UA is in accordance with Table 703.1.1. Where insulation is used to achieve these percentages, a third-party grading of the installation as achieving Grade 1 is required. A documented analysis is performed using RES Check version 4.0.1 or later, or equivalent, based on a comparison to the ICC IECC, IRC, or IBC.	Points per Table 703.1.1											
	Sect. 703 pts.	20										
	Practices 704	6										
<b>Table 703.1.1</b>												
Total Building Thermal Envelope UA												
Climate Zone												
	Zone 2	Zone 3										
10% UA improvement	10 points	12 points										
20% UA improvement	20 points	24 points										
	Zone 4	Zone 5-6										
10% UA improvement	14 points	16 points	0									
20% UA improvement	28 points	32 points										
	Zone 7-8											
10% UA improvement	18 points											
20% UA improvement	36 points											
<b>Addition Note:</b> Section 703.1.1 applies to the new construction portion of additions.	0 Add'l Pts											
<b>Renovation Note:</b> The existing whole building thermal envelope UA is evaluated. One of the following is selected based on the evaluation.												
(1) If the overall thermal performance meets or exceeds the requirements of ICC IECC; Section 402.1.4; Section 703.1.1 applies to the renovation.	Mandatory 0 Add'l Points											
(2) If the existing overall thermal performance is below the requirements of ICC IECC; Section 402.1.4, the overall thermal performance of the whole building thermal envelope UA is improved a minimum of the following:												
(a) 15 percent	15											
(b) 30 percent	30											
(a) 45 percent, or meets the requirement of ICC IECC, Section 402.1.4	45											
703.1.2 The insulation installation is graded by a third party and is in accordance with Sections 703.1.2.1, 703.1.2.2, 703.1.2.3, and for 703.1.2.4, as applicable. (Points not awarded in this section if already awarded under Section 703.1.1)	Points per Table 703.1.2											
<b>Table 703.1.2</b>												
Insulation Installation Grades												
	Grade	Points										
	1	15										
	2	10										
	3	0										
703.1.2.1 Both Grade 1 and Grade 2 installations are in accordance with the following:												
(a) Grades apply to cavity fill insulation, continuous rigid insulation, and any other field-installed insulation products. Grading applies to ceilings, walls, rim joists, conditioned basements and crawlspaces, except as specifically noted. Inspection shall be conducted before insulation is covered.												
(b) Insulation is installed in accordance with the manufacturer's instructions and/or industry standards.												
(c) Wall cavity insulation is enclosed on all six sides, and is in substantial contact with the sheathing material on one or more sides (interior or exterior) of the cavity.												
703.1.2.2 Grade 1 installation in accordance with the following:												
(a) Insulation uniformly fills each cavity side-to-side and top-to-bottom, without substantial gaps or voids around obstructions (such as blocking or bridging).												
(b) Compression or incomplete fill amounts to no more than 2% or less, presuming the compression or fill is at least 70% of the intended fill thickness; occasional small gaps are acceptable.												
(c) Exterior rigid insulation shall have substantial contact with the structural framing members or sheathing materials, and is tightly fitted at joints.												
(d) Cavity insulation is split, installed, and/or fitted tightly around wiring and other services.												
(e) Exterior sheathing is not visible from the interior through gaps in the cavity insulation.												
(f) Faced batt insulation is permitted to have side-stapled tabs, provided the tabs are stapled neatly with no buckling, and provided the batt is only compressed at the edges of each cavity, to the depth of the tab itself.												
(g) ICFs, SIPs, and other wall systems that provide integral insulation comply with "Grade 1" insulation installation requirements where properly installed.												
(h) "Grade 1" insulation must meet or exceed all requirements of "Grade 2" insulation.												
703.1.2.3 Grade 2 installation is in accordance with the following:												
(a) A maximum of 2% of the surface area of insulation is missing. Compression or incomplete fill amounts to 10 percent or less, presuming the compression or fill is a minimum of 70 percent of the intended fill thickness.												
(b) In conditioned basement or crawlspace the following apply:												
(i) Insulation is installed in complete contact with the subfloor surfaces.												
(ii) Floor insulation over vented or ambient conditions is enclosed on six sides.												
(c) Floor insulation over unconditioned basements is not required to be enclosed on six sides.												
(d) Ceiling insulation is not required to be enclosed when the insulation is installed in complete contact with the drywall or plywood surfaces it is intended to insulate.												

ANSI National Green Building Standard™	256	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(e) Eave baffles or equivalent construction is installed to prevent wind washing.												
(f) Installation with occasional installation defects is permitted: gaps around wiring, electrical outlets, plumbing and other intrusions; rounded edges or shoulders.												
703.1.2.4 Grade 3 installation is in accordance with the following:												
(a) Standard insulation installation not in accordance with Grade 1 or Grade 2 criteria.												
703.1.3 More than 75% of the above-grade exterior opaque wall area of the building is mass walls.	Points per Table 703.1.3											
<b>Table 703.1.3</b>												
Exterior Mass Walls												
	<b>Mass Construction</b>											
	3 in. to <6 in.											
Climate Zones 1, 2, 3, 4 except marine, and 5 dry.	4	6										
Climate Zones 4 marine, 5 except dry, and 6.	3	5										
Climate Zones 7 and 8	0	0										
<b>703.2 Insulation &amp; Air Sealing</b>												
703.2.1 Insulation and air sealing is installed in accordance with all of the following, as applicable:												
(1) Third party verification performed.	15											
(2) No third party verification performed.	3	3		(3)								
<b>703.2.1.1 GENERAL</b>												
<b>703.2.1.1.1 Air Barrier and Thermal Barriers</b>												
(1) Thermal insulation is installed in substantial contact with interior and exterior air barrier to provide continuous alignment of the insulation with the air barrier. The following are deemed to be their own air barrier:												
(a) Any spray or rigid foam insulation with an air permeance of 0.02 L/s-m <sup>2</sup> or less at 75 Pa.												
(b) ICFs, SIPs, and other wall systems that provide their own air barrier, except at interfaces with other materials or assemblies, or penetrations.												
(c) Spray foam that complies with the following:												
(i) continuously attached to the top, bottom and both sides of the cavity												
(ii) Continuous in the cavity without any unrepaired breaks.												
(iii) air impermeable												
(d) Air impermeable insulation.												
(2) Voids or areas of incomplete fill (less than 30% of full thickness) are 2% or less of the insulated area.												
(3) Insulation is in substantial contact with sheathing materials on one or more sides.												
(4) Any exterior rigid insulation is tightly fitted or interlocking at the joints.												
<b>703.2.1.1.2 Plumbing and Wiring</b>												
(1) At a minimum, insulation is placed between the outside (ceiling, wall, or floor) and the pipes.												
(2) Batt insulation is split or cut to fit around wiring and plumbing.												
(3) Sprayed insulation is installed to encapsulate pipes where the pipe temperature is 180 degrees F (82.2C) or less. Wiring is fastened in place to prevent displacement prior to spraying.												
<b>703.2.1.1.3 Narrow cavities are filled and batts are cut to fit.</b>												
<b>703.2.1.1.4 HVAC register boots that penetrate the building envelope are caulked or sealed to the subfloor or drywall.</b>												
<b>703.2.1.1.5 Masonry fireplace equipped with gasketed doors, outside combustion air, and a chimney top damper.</b>												
<b>703.2.1.2 Air barrier is installed at any exterior edge of insulation at floors, foundations, and crawlspaces including insulated floors above garages and cantilevered floors.</b>												
<b>703.2.1.3 WALLS</b>												
(1) Exterior walls behind the tub/shower are insulated and include an interior and exterior air barrier.												
(2) Air sealed type electrical outlet boxes are installed or the air barrier extends completely behind the boxes. Insulation is placed between the sheathing and the rear of electrical or phone boxes located on exterior walls. Electrical outlet boxes are												
(3) Duplex and townhouse construction: In the common walls between dwelling units (e.g., gypsum shaft wall) an air barrier is installed to seal the gap between the common wall and the structural framing.												
(4) Skylight shafts and knee walls are air sealed. Insulation on attic knee walls and skylight shafts are physically supported by stapling in place, netting or using other mechanical attachment.												
(5) Fireplace walls: Air barrier that is aligned with insulation; any gaps are sealed with caulk or foam.												
<b>703.2.1.4 CEILINGS and ATTICS</b>												
(1) At dropped ceilings and soffits, the air barrier is substantially aligned with insulation and any gaps are sealed with caulk, foam, or tape.												
(2) Access to vented attics, including knee wall doors, and/or drop down stairs, is caulked, gasketed, or otherwise sealed.												
(3) An insulated cover is gasketed or sealed to the attic opening where a whole building or whole dwelling unit fan penetrates into the attic.												
<b>Addition Note:</b> Section 703.2.1 applies only to the new construction portion of additions.	0 Add'l Pts											
<b>Renovation Note:</b> The air infiltration of the existing whole building envelope is evaluated. Based on the evaluation, choose one of the following: (Additional points awarded only where third-party verification is not performed.)												
(1) Where the overall air infiltration rate is equal to or less than the requirements for new construction (as indicated in Section 704.6.2.1), this item applies to the renovation.	1 Add'l Pt											

ANSI National Green Building Standard™	256	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(2) Where the overall air infiltration rate is greater than the requirements for new construction (as indicated in Section 704.6.2.1), reduce the air infiltration of the whole building envelope by:												
(a) 15 percent				1 Add'l Pt								
(b) 30 percent				2 Add'l Pts								
(c) 50 percent				3 Add'l Pts								
<b>703.3 FENESTRATION</b>												
703.3.1 The NFRC-certified U-factor and SHGC for windows, exterior doors, skylights, and tubular daylighting devices (TDDs) are in accordance with Table 703.3.1(a) or (b). Decorative fenestration elements with a maximum of 15 square feet or 10% of the to				Points Per Tables 703.3.1(a) or 703.3.1(b)								
<b>Table 703.3.1(a) - Enhanced Fenestration Specifications</b>												
U-Factor and SHGC	Climate Zone											
Windows and Exterior Doors (maximum certified ratings)												
0.45 0.30	1 and 2	8										
0.35 0.30	3	8										
0.30 Any	4 and 5	5	5	(5)								u=.30 shgc=.31
0.30 Any	6 and 8	6										
Skylights and TDDs (maximum certified ratings)												
0.55 0.35	1 to 3											
0.55 Any	4 to 8											
	included above											
<b>Table 703.3.1(b) - Enhanced Fenestration Specifications</b>												
U-Factor and SHGC	Climate Zone											
Windows and Exterior Doors (maximum certified ratings)												
0.45 0.25	1 and 2	10										
0.35 0.25	3	10										
0.25 Any	4 and 5	10										
0.25 Any	6 thru 8	12										
Skylights and TDDs (maximum certified ratings)												
0.50 0.35	1 to 3											
0.50 Any	4 to 8											
	included above											
<b>Addition Note:</b> Section 703.3.1 applies only to the new construction portion of additions. (Points available on the basis of a ratio of new window area to total window area (new window area divided by total window area).)				0 Add'l Pts								
<b>Renovation Note:</b> Section 703.3.1 applies only to the replacement of existing windows. (Points available on the basis of a ratio of new window area to total window area (new window area divided by total window area).)				2 Add'l Pts								
<b>703.4 HVAC Equipment Efficiency</b>												
703.4.1 Combination Space Heating and Water Heating System ("Combo" System) is installed using either a coil from the water heater connected to an air handler to provide heat for the building or dwelling unit, or a space heating boiler using an indirect fired water heater. Devices shall have a combined annual efficiency of 0.80.				4								
703.4.2 Furnace and/or boiler efficiency is in accordance with one of the following:												
<b>(1) Table 703.4.2(1) Gas and propane heaters:</b>				Points per Table 703.4.2(1)								
<b>Table 703.4.2(1) - Gas / Propane Heaters</b>												
Climate Zone	AFUE	Points										
1	≥90%	0										
1	≥92%	0										
1	≥94%	0										
2	≥90%	2										
2	≥92%	2										
2	≥94%	3										
3	≥90%	5										
3	≥92%	6										
3	≥94%	7										
4	≥90%	8										
4	≥92%	9										
4	≥94%	10										
5	≥90%	11										
5	≥92%	12	12	(12)								92% unit
5	≥94%	14										
6 through 8	≥90%	14										
6 through 8	≥92%	15										
6 through 8	≥94%	17										
<b>Table 703.4.2(2) Oil Furnace:</b>				Points per Table 703.4.2(2)								
<b>Table 703.4.2(2) - Oil Furnace:</b>												
Climate Zone	AFUE	Points										
1	≥83%	0										
1	≥90%	0										
2	≥83%	1										
2	≥90%	2										
3	≥83%	3										
3	≥90%	5										
4	≥83%	3										
4	≥90%	8										
5	≥83%	7										
5	≥90%	11										
6 through 8	≥83%	7										
6 through 8	≥90%	14										
<b>(3) Gas Boiler:</b>				Points per Table 703.4.2(3)								
<b>Table 703.4.2(3) - Gas Boiler</b>												
Climate Zone	AFUE	Points										
1	≥85%	0										
1	≥90%	0										
1	≥94%	0										
2	≥85%	1										
2	≥90%	2										
2	≥94%	3										
3	≥85%	3										

ANSI National Green Building Standard™		256	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
			Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
3	≥90%	5											
3	≥94%	7											
4	≥85%	4											
4	≥90%	8											
4	≥94%	10											
5	≥85%	6											
5	≥90%	11											
5	≥94%	14											
6 through 8	≥85%	7											
6 through 8	≥90%	14											
6 through 8	≥94%	17											
<b>Table 703.4.3.2(4) Oil Boiler:</b>		Points per Table 703.4.2(4)											
<b>Table 703.4.2(4) - Oil Boiler</b>													
Climate Zone	AFUE	Points											
1	≥85%	0											
1	≥90%	0											
2	≥85%	1											
2	≥90%	2											
3	≥85%	3											
3	≥90%	5											
4	≥85%	4											
4	≥90%	8											
5	≥85%	6											
5	≥90%	11											
6 through 8	≥85%	7											
6 through 8	≥90%	14											
703.4.3 Boiler equipped with temperature reset control or burner delay control.		1											
703.4.4 Heat pump heating efficiency is in accordance with Table 703.4.4. Refrigerant charge is verified to be in conformance with manufacturer's instructions.		Points per Table 703.4.4											
<b>Table 703.4.4 - Heat Pump Heating</b>													
Climate Zone	Efficiency	Points											
1	8.2HSPF 11.5EER	0											
1	9.0HSPF 12.5EER	0											
2	8.2HSPF 11.5EER	1											
2	9.0HSPF 12.5EER	2											
3	8.2HSPF 11.5EER	2											
3	9.0HSPF 12.5EER	5											
4	8.2HSPF 11.5EER	5											
4	9.0HSPF 12.5EER	10											
5	8.2HSPF 11.5EER	7*											
5	9.0HSPF 12.5EER	11*											
6 through 8	8.2HSPF 11.5EER	7*											
6 through 8	9.0HSPF 12.5EER	12*											
*Zones 5-8 require consideration for use of resistance heat in cold climates when installing a heat pump.													
703.4.5 Cooling efficiency is in accordance with one of the following. Refrigerant charge is verified for conformance with manufacturer's instructions.		Points per Table 703.4.5(1)											
<b>Table 703.4.5(1) - Air Conditioner and Heat Pump Cooling</b>													
Climate Zone	SEER (EER)	Points											
1	14 (11.5)	8											
1	15 (12.5)	12											
1	17 (12.5)	18											
1	19 (12.5)	24											
2	14 (11.5)	6											
2	15 (12.5)	10											
2	17 (12.5)	14											
2	19 (12.5)	18											
3	14 (11.5)	2											
3	15 (12.5)	4											
3	17 (12.5)	6											
3	19 (12.5)	8											
4	14 (11.5)	2											
4	15 (12.5)	3											
4	17 (12.5)	4											
4	19 (12.5)	4											
5	14 (11.5)	1											
5	15 (12.5)	2											
5	17 (12.5)	3											
5	19 (12.5)	3											
6 through 8	14 (11.5)	1											
6 through 8	15 (12.5)	2											
6 through 8	17 (12.5)	3											
6 through 8	19 (12.5)	3											
(2) Water Source and Cooled Air Conditioners		Points per Table											
<b>Table 703.4.5(2) - Water Source and Cooled Air Conditioners</b>													
Climate Zone	EER, COP	Points											
1	15 4.0	18											
2	15 4.0	14											
3	15 4.0	6											
4	15 4.0	4											
5	15 4.0	3											
6 through 8	15 4.0	3											
703.4.6 Ground source heat pump is installed by a Certified Geothermal Service Contractor in accordance with one of the following ENERGY STAR levels:													
(1) Open loop; ≥16.2 EER and ≥ 3.6 COP		20											
(2) Closed loop; ≥14.1 EER and ≥ 3.3 COP		20											
(3) Direct expansion; ≥15.0 EER and ≥ 3.5 COP		20											
(4) Any type (open, closed or direct expansion); ≥24 EER and ≥ 4.3 COP		30											
703.4.7 ENERGY STAR, or equivalent, ceiling fans are installed. (Points awarded per building.)		1											
703.4.8 Whole building or whole dwelling unit fan(s) with insulated louvers and a sealed enclosure is installed. (Points awarded per building.)		2											

ANSI National Green Building Standard™	256	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
703.4.9 In multi-unit buildings, an advanced electric and fossil fuel submetering system is installed to monitor electricity and fossil fuel consumption for each unit. At a minimum, the information is available to the occupants on a monthly basis.												
(1) Install a device providing monthly consumption information.	1											
(2) Install a device that can provide near real-time energy consumption information.	4											
703.4.10 An ENERGY STAR or equivalent, programmable thermostat is installed to control each heating and cooling zone. (Points awarded per dwelling unit.)	1											
<b>Addition Note:</b> Section 703.4.10 applies to the new construction portion of additions.	0 Add'l Pts											
<b>Renovation Note:</b> Replace existing nonprogrammable thermostat.	1 Add'l Pt											
<b>703.5 Water Heating Design, Equipment, and Installation</b>												
703.5.1 Water heater Energy Factor (EF) is equal to or greater than the following:	Points Per Tables											
(1) Gas Water Heating	703.5.1(1)(a) or 703.5.1(1)(b)											
<b>Table 703.5.1(1)(a) - Gas Water Heating</b>												
(Storage with input rate of 75,000 Btu/hr or less or instantaneous input rate of 200,000 Btu/hr or less)												
Size (gallons)	Energy Factor	POINTS										
30 to < 40	0.64	1										59% efficient 50 gallon
40 to < 50	0.62	1										
50 to < 65	0.6	1										
65 to < 75	0.58	1										
75	0.56	1										
Any	0.8	10										
<b>Table 703.5.1(1)(b) - Gas Water Heating</b>												
(Storage with input rate of greater than 75,000 Btu/hr or instantaneous input rate greater than 200,000 Btu/hr)												
Size (gallons)	Thermal Efficiency	POINTS										
Any	82-86%	1										
Any	> 86%	10										
(2) Electric Water Heating	Points Per Tables											
<b>Table 703.5.1(2) - Electric Water Heating</b>												
Size (gallons)	Energy Factor	POINTS										
30 to < 40	0.95	1										
40 to < 50	0.94	1										
50 to < 65	0.92	1										
65 to < 80	0.9	1										
80 to < 100	0.88	1										
100	0.86	1										
(3) Oil Water Heating	Points per Table 703.5.1(3)											
<b>Table 703.5.1(3) - Oil Water Heating</b>												
Size (gallons)	Energy Factor	POINTS										
30 to < 50	0.59	1										
50	0.55	1										
(4) Heat Pump Water Heating	Points per Table 703.5.1(4)											
<b>Table 703.5.1(4) - Heat Pump Water Heating</b>												
Heat Pump	Energy Factor	POINTS										
Heat Pump	1.5	7										
Heat Pump	2	10										
703.5.2 Desuperheater, s installed by a qualified installer or is pre-installed in the factory.	Points per Table 703.5.2											
<b>Table 703.5.2 - Desuperheater</b>												
Climate Zone	Points for Desuper heater											
Zone 1-4	5											
Zone 5-9	2											
703.5.3 Drain-water heat recovery system is installed in multi-family units. (Points awarded per building.)	2											
703.5.4 Insulating hot water pipes												
703.5.4.1 Hot water lines are insulated with a minimum of R-4 insulation.	1											
703.5.4.2 Boiler supply piping is insulated in unconditioned spaces.	1											
<b>Addition Note:</b> Section 703.5.4 applies only to the new or modified plumbing associated with the addition.	0 Add'l Pts											
<b>Renovation Note:</b> Where hot water lines in the existing building are accessible, the hot water lines are insulated in accordance with Section 703.5.4. (To receive additional points, a minimum of 50 percent of the existing hot water lines are insulated.)	1 Add'l Pt											
703.5.5 Indirect fired water heater storage tanks heated from boiler systems are installed.	1											
<b>704 Additional Practices</b>												
<b>704.1 Application of Additional Practice Points.</b> Points from Section 704 can be added to points earned in Section 702 (Performance Path), Section 703 (Prescriptive Path) or Section 701.1.3 (alternative Bronze Level compliance).												
<b>704.2 Lighting and Appliances</b>												
704.2.1 Hard-wired lighting meets one of the following:												
(1) A minimum of 50% of the total hard-wired lighting fixtures, or the bulbs in those fixtures, qualify as ENERGY STAR or equivalent.	4	4										
(2) A minimum of 50% of the total hard-wired lighting fixtures qualify as ENERGY STAR or equivalent.	8											
(3) A minimum of 80% of the exterior lighting wattage has an efficiency of at least 40 lumens per watt or be a solar powered light fixture.												
<b>Addition Note:</b> Section 704.2.1 applies only to the new construction portion of additions.	0 Add'l Pts											
<b>Renovation Note:</b> A percentage of the total lighting fixtures, or the lights in those fixtures, are replaced with fixtures or lights that qualify as ENERGY STAR or equivalent.												

ANSI National Green Building Standard™	256	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(1) 50 percent	1 Add'l Pt											
(2) 75 percent	2 Add'l Pts											
(3) 100 percent	3 Add'l Pts											
704.2.2 The number of recessed light fixtures that penetrate the thermal envelope are less than 1 per 400 square feet of total conditioned floor area and are in accordance with Section 701.4.3.4(2).	2	2										May be two in 2nd floor baths.
<b>Addition Note:</b> Section 704.2.2 is mandatory for the new construction portion of additions.	Mandatory 0 Add'l Pts											
<b>Renovation Note:</b> Section 704.2.2 applies where room for installation within the conditioned envelope is available. (To receive additional points, a minimum of 50% of the total recessed ceiling lights are in accordance with Section 704.2.2.)	1 Add'l Pt											
704.2.3 Occupancy sensors are installed on indoor lights, and photo or motion sensors are installed on outdoor lights to control lighting.												
(1) 25% of lighting	2											
(2) 50% of lighting	4											
704.2.4 Tubular daylighting device (TDD) or a skylight with sealed, insulated, low-E glass is installed in rooms without windows. (Points awarded per building.)	2											
704.2.5 ENERGY STAR or equivalent appliance(s) are installed:												
(1) Refrigerator	5	5										
(2) Dishwasher	2	2										
(3) Washing machine	4	4										
<b>Addition and Renovation Note:</b> Section 704.2.5 applies as follows:												
(1) replace existing refrigerator	2 Add'l Pts											
(2) replace existing dishwasher	1 Add'l Pt											
(3) replace existing washing machine	1 Add'l Pt											
704.2.6 Induction cooktop is installed.	1											
704.2.7 Occupancy sensors are installed for a minimum of 80% of hardwired lighting outlets.	1											
<b>704.3 Renewable Energy/Solar Heating and Cooling</b>												
<b>704.3.1 Solar space heating and cooling.</b>												
704.3.1.1 Sun-tempered Design: Building orientation, sizing of glazing, and design of overhangs are in accordance with all of the following:	5											
(1) The long side (or one side if of equal length) of the building faces within 20° of true south.												
(2) Vertical glazing area is between 5% and 7% of gross Conditioned Floor Area on the south face (also see Section 704.3.1.1(8)).												
(3) Vertical glazing area is less than 2% of gross Conditioned Floor Area on the west face, and glazing is ENERGY STAR compliant or equivalent.												
(4) Vertical glazing area is less than 4% of gross Conditioned Floor Area on the east face and glazing is ENERGY STAR compliant or equivalent.												
(5) Vertical glazing area is less than 6% of gross Conditioned Floor Area on the north face, and glazing is ENERGY STAR compliant or equivalent.												
(6) Skylights, where installed, are in accordance with the following:												
(a) Shades and insulated wells are used and all glazing is ENERGY STAR compliant or equivalent.												
(b) Horizontal skylights are less than 0.5 % of Finished Ceiling Area												
(c) Sloped skylights on slopes facing within 45° of true South, East or West are less than 1.5% of the Finished Ceiling area												
(7) Overhangs or adjustable canopies or awnings or trellises provide shading on south facing glass for the appropriate climate zone in accordance with Table 704.3.1.1:												
<b>Table 704.3.1.1 Southern Window Overhang Depth</b>												
<b>Climate Zone and Overhang Depth</b>	Vertical Distance between bottom of overhang and top of window sill											
1 through 3 2' 8"	≤7' 4"											
1 through 3 2' 8"	≤6' 4"											
1 through 3 2' 4"	≤5' 4"											
1 through 3 2' 0"	≤4' 4"											
1 through 3 2' 0"	≤3' 4"											
4 through 6 2' 4"	≤7' 4"											
4 through 6 2' 4"	≤6' 4"											
4 through 6 2' 0"	≤5' 4"											
4 through 6 2' 0"	≤4' 4"											
4 through 6 1' 8"	≤3' 4"											
7 and 8 2' 0"	≤7' 4"											
7 and 8 1' 8"	≤6' 4"											
7 and 8 1' 8"	≤5' 4"											
7 and 8 1' 4"	≤4' 4"											
7 and 8 1' 0"	≤3' 4"											
(8) The south face windows have a SHGC of 0.40 or higher.												
(9) Return air or transfer grilles/ducts are in accordance with Section 704.4.5.												
<b>Addition Note:</b> Section 704.3.1.1 applies to the new construction portion of additions. (Points are available on the basis of a ratio of new building area to total building area. New building area divided by total building area.)	0 Add'l Pts											
<b>Renovation Note:</b> Section 704.3.1.1 applies to existing construction.	1 Add'l Pt											
704.3.1.2 Automated solar protection is installed to provide shading for windows.	1											
704.3.1.3 Passive cooling design features are in accordance with three or more of the following:												
Points for three items:	3											
Points for one additional item:	1											



ANSI National Green Building Standard™	256	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(1) Exterior shading is provided on east and west windows using one or a combination of the following strategies:												
(a) Vine covered trellises with the vegetation separated a minimum of 1 foot from face of building.												
(b) Movable awnings or louvers												
(c) Covered porches												
(d) Attached or detached conditioned/unconditioned enclosed space that provides full shade of east and west windows (e.g., detached garage, shed or building)												
(2) Overhangs are installed to provide shading on south-facing glazing in accordance with Section 704.3.1.1.(7). (Points not awarded if points are taken under 704.3.1.1.)												
(3) Windows and/or venting skylights are located to facilitate cross ventilation.												
(4) Solar reflective roof or radiant barrier is installed in Climate Zones 1, 2 or 3 and roof material meets a 3 year aged criteria of 0.50.												
(5) Internal exposed thermal mass is a minimum of three inches in thickness. Thermal mass consists of concrete, brick, and/or tile that are fully adhered to a masonry base or other masonry material and is in accordance with one or a combination of the following:												
(a) A minimum of one square foot of exposed thermal mass of floor per three square feet of gross finished floor area.												
(b) A minimum of three square feet of exposed thermal mass in interior walls or elements per square foot of gross finished floor area.												
(6) Roofing material is installed with a minimum 0.75 inch continuous air space offset from the roof deck from eave to ridge.												
<b>Addition Note:</b> Section 704.3.1.3 applies to the new construction portion of additions. (Points are available on the basis of a ratio of new building area to total building area. New building area divided by total building area.)	0 Add'l Pts											
<b>Renovation Note:</b> Section 704.3.1.3 applies to existing construction. A minimum of one design feature is required.	1 Add'l Pt											
704.3.1.4 Passive solar heating design. In addition to the sun-tempered design features in Section 704.3.1.1, all of the following are implemented:	4											
(1) Additional glazing, no greater than 12%, is permitted on the south wall. This additional glazing is in accordance with the requirements in Section 704.3.1.1.												
(2) Additional thermal mass for any room with south-facing glazing of more than 7% of the finished floor area is provided in accordance with the following:												
(a) Thermal mass is solid and a minimum of 3" in thickness. Where two thermal mass materials are layered together (e.g. ceramic tile on concrete base) to achieve the appropriate thickness, they are fully adhered to (touching) each other.												
(b) Thermal mass directly exposed to sunlight must be provided in the following minimum ratios:												
(i) Above latitude 35°: 5 square feet of thermal mass for every 1 square foot of south facing glazing.												
(ii) Latitude 30° to 35°: 5.5 square feet of thermal mass for every 1 square foot of south facing glazing.												
(iii) Latitude 25° to 30°: 6 square feet of thermal mass for every 1 square foot of south facing glazing.												
(c) Thermal mass not directly exposed to sunlight is permitted to be used to achieve thermal mass requirements of Section 704.3.1.4 (2) based on a ratio of 40 square feet of thermal mass for every 1 square foot of south facing glazing.												
(3) In addition to return air or transfer grilles/ducts required by Section 704.3.1.1, provisions for forced airflow to adjoining areas are implemented as needed.												
704.3.2 Solar water heating												
704.3.2.1 Solar water heater. SRCC (Solar Rating & Certification Corporation) OG 300 rated, or equivalent, solar domestic water heating system is installed. Solar Energy Factor (SEF as defined by SRCC) is in accordance with Table 704.3.2.1.												
<b>Table 704.3.2.1 - Solar Hot Water Systems</b>												
SEF - Electric Tank	SEF - Gas Tank	<b>POINTS</b>										
1.30 - 1.50	0.85 - 1.00	8						8				\$7.5K cost is included in performance upgrade 702.
1.51 - 1.80	1.01 - 1.20	11										
1.81 - 2.30	1.21 - 1.50	14										
2.31 - 3.00	1.51 - 2.00	17										
3.01	2.01	20										
<b>Addition and Renovation Note:</b> Section 704.3.2.1 applies to systems in additions and/or existing buildings.	1 Add'l Pt											
704.3.3 Additional renewable energy options												
704.3.3.1 Photovoltaic panels are installed on the property. (Points awarded per every 100 watts DC of the rated PV system)	1											
704.3.3.2 Other onsite renewable energy source is installed (e.g., wind energy, onsite micro-hydro power, active solar space heating systems). (Points awarded per every 1/10 kW of the system)	0.5											
<b>704.4 Ducts</b>												
704.4.1 Duct system is sized, designed, and installed according to ACCA Manual D or equivalent.	5											
<b>Addition Note:</b> New construction portion of additions.	Mandatory 0 Add'l Pts											
<b>Renovation Note:</b> Section 704.4.1 applies only where the duct system in the existing building is readily accessible, and the duct system is sized, designed, and installed in accordance with ACCA Manual D or equivalent. A minimum of 75% of the duct runs a	1 Add'l Pt											

ANSI National Green Building Standard™	256	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
704.4.2 Space heating is provided by a system that does not include air ducts.	15											
704.4.3 Space cooling is provided by a system that does not include air ducts.	15											
704.4.4 Ductwork is in accordance with all of the following:	12			12	0							
(1) Building cavities are not used as return ductwork.												
(2) Heating and cooling ducts and mechanical equipment are installed within the conditioned building space.												RA duct in attic.
(3) Ductwork is not installed in exterior walls.												All second floor supplies are in exterior walls.
<b>Addition Note:</b> Section 704.4.4 applies to the new construction portion of additions.	0 Add'l Pts											
<b>Renovation Note:</b> Section 704.4.4 applies to renovations that involve the demolition, reconfiguration, and/or addition of interior walls, or a modification in the duct system of the building, or an intentional effort to implement the practices in Section	2 Add'l Pts											
704.4.5 Return ducts or transfer grilles are installed in every room with a door. This practice does not apply to bathrooms, kitchens, closets, pantries, and laundry rooms.	5	5										2nd floor supplied by returns to each room via attic.
<b>Addition Note:</b> Section 704.4.5 applies to the new construction portion of additions.	0 Add'l Pts											
<b>Renovation Note:</b> Section 704.4.5 applies to renovations that involve the demolition, reconfiguration, and/or addition of interior walls, or a change in the heating, cooling, and ventilation system of the building, or a test of the building for balanced p	2 Add'l Pts											
<b>704.5 HVAC Design and Installation</b>												
704.5.1 ACCA Manual S or equivalent is used to select heating and/or cooling equipment.	1							1	0			
704.5.2 HVAC contractor and service technician are certified by a nationally or regionally recognized program such as North American Technician Excellence, Inc. (NATE), Building Performance Institute (BPI), Radiant Panel Association, or manufacturers' tr	1							1	0			
704.5.3 Performance of the heating/cooling system is verified by the HVAC contractor in accordance with all of the following:	3							3	222			
(1) Start-up procedure is performed according to manufacturer's instructions.												
(2) Refrigerant charge is verified by super-heat and/or sub-cooling method.												
(3) Burner is set to fire at nameplate input.												
(4) Air handler setting/fan speed is set per manufacturer's instructions.												
(5) Total air flow is within 10% of design flow.												
(6) Total external system static does not exceed equipment capability at rated airflow.												
704.5.4 HVAC equipment operates using an alternate refrigerant containing no HCFCs. (Points awarded only until January 20, 2010.)	1											
704.5.5 Manufacturer's label or printed specifications for sealed air handler (except furnaces) indicates the leakage is less than or equal to 2% of design airflow at a pressure of 1-inch w.g. (1250 Pa). Air handlers are tested with inlets, outlets, an	4											
<b>704.6 Installation and Performance Verification</b>												
704.6.1 Third party onsite inspection is conducted to verify conformance with all of the following, as applicable. Minimum of 2 inspections are performed. One inspection after insulation is installed and prior to being covered, and another inspection upon completion of the project. Where multiple building or dwelling units of the same model are built by the same builder, a representative sample inspection of a minimum of 15% of the buildings or dwelling units is permitted.	5					5						
(1) Ducts are installed per IRC/IMC and ducts are sealed.												Cost of duct and air infiltration sealing in 702.
(2) Building envelope air sealing is installed.												
(3) Insulation is installed in accordance with Section 703.1.2												
(4) Windows, skylights, and doors are flashed, caulked, and sealed in accordance with manufacturer's recommendations and in accordance with Section 703.2.1.												
704.6.2 Third party testing is conducted to verify performance.												
704.6.2.1 Building envelope leakage rate is demonstrated by blower door test. In addition to the test, the following practices are required:												
1. Whole building ventilation is provided in accordance with Section 902.2.												
2. Fossil fuel furnace and water heater is sealed combustion or power vented in accordance with Section 901.1.												
3. Fireplaces and Fuel Burning Appliances are in accordance with 901.2.												
<b>The maximum leakage rate is in accordance with:</b>												
(a) 5 ACH50	0.25 nat	3				3	0	(3)				
(b) 4 ACH50	0.2	6										
(c) 3 ACH50	0.15	9						9	0	(9)		
(d) 2 ACH50	0.1	12								12	0	
(e) 1 ACH50	0.05	15										
704.6.2.2 The entire central HVAC duct system, including air handlers and register boots, is tested for leakage at a pressure differential of 0.1 inches w.g. (25 Pa). The maximum leakage as a percent of the system design flow rate is in accordance with												
(1) 6% for ductwork entirely outside the building's thermal envelope.	15					5	0					
(2) 6% for ductwork entirely inside the building's thermal envelope.	5											

ANSI National Green Building Standard™	256	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(3) 6% for ductwork both inside and outside the building thermal envelope.	15											
704.6.2.3 Balanced HVAC air flows are demonstrated by flow hood or other acceptable flow measurement tool. Test results in accordance with both of the following:	8									8	296	
(a) Measured flow at each supply and return register is within 25% of design flow.												
(b) Total airflow is within 10% of design flow.												
<b>Addition Note:</b> Section 704.6.2 applies to the new construction portion of additions. (Points are available on the basis of a ratio of new area to total area.) (New area divided by total area.)	0 Add'l Pts											
<b>Renovation Note:</b> Section 704.6.2 applies as follows: Evaluate the performance features of the existing whole building envelope. Choose one of the following based on the evaluation:												
(1) The overall energy performance features of the existing building are equal to or better than the requirements for new construction.	1 Add'l Pt											
(2) If the overall energy performance features of the existing building are less than the requirements for new construction, third party testing is conducted to verify performance claimed in Sections 701.4.2.1, 703.1 and 703.2.1.	3 Add'l Pts											
<b>705 Innovative Practices</b>												
<b>705.1 Energy consumption control.</b> A whole building or whole dwelling unit device is installed that controls or monitors energy consumption.	7 Points Max											
(1) Programmable communicating thermostat	2											
(2) Energy monitoring device	4											
(3) Energy management control system	7											
<b>705.2 Renewable energy service plan</b> is as follows:												
(1) Builder selects a renewable energy service plan provided by the local electrical utility for interim (temporary) electric service. The builder's local administrative office has renewable energy service.	2											
(2) The buyer of the home selects a renewable energy service plan provided by the utility prior to occupancy of the home.	5											
<b>CHAPTER 8: WATER EFFICIENCY</b>	Base Pts.	36	0	1	0	0	0	24	525	8	382	Ch. 8 Subtotal
<b>801 Indoor and Outdoor Water Use</b>	Cost/Point											
801.0 Intent. Measures that reduce indoor and outdoor water usage are implemented.												
801.1. Indoor hot water usage is reduced by one of the following practices:												
(1) All hot water piping which runs to the plumbing fixtures in both the kitchen and bathrooms is 40-feet or less in length from the water heater and is sized in accordance with the code for the specified application.	2	2										
(2) All hot water piping which runs to the plumbing fixtures in both the kitchen and bathrooms is 30-feet or less from the water heater and is sized in accordance with the code for the specified application.	3											
(3) One of the following piping system designs is implemented:												
(a) Use of structured-type plumbing with demand controlled hot water loops, in which the volume of water contained in the pipe and fixture fittings downstream of the recirculating trunk line is a maximum of 4 cups (0.25 gallons).	6											
(b) Implement an engineered parallel piping system (i.e. manifold system) in which the hot water line distance from the water heater to the parallel piping system is less than 15 feet and the parallel piping to the fixture fittings contains a maximum of 8	6											Foundation plan indicates that a manifold is used, but P204 isometric indicates tree and branch layout.
(c) Central core plumbing system with all plumbing fixture fittings (e.g., faucets & showerheads) located such that the volume of water contained in each pipe run between the water heater and fixture fitting is a maximum of 6 cups (0.36 gallons).	8											
(4) Pipe runs exceeding 40-feet from the water heater to fixture locations are aided by one of the following:	1											
(a) Tankless water heater is installed at point of use and is served only by cold water or a solar-assisted system.												
(b) On demand hot water recirculation system is installed.												
<b>Addition Note:</b> Section 801.1 applies only to the new construction portion of addition(s) that alter portions of a building with hot water appliances and/or fixtures.	Mandatory 0 Add'l Pts											
<b>Renovation Note:</b> Section 801.1 applies only to renovation projects that have the ability to meet the requirements of Section 801.1. (Renovation projects that are unable to meet the length of pipe runs indicated in Section 801.1, but are able to shorten	Mandatory											
(1) Minimum of 25% to less than 50% reduction in total pipe length or volume.	Reduced by Half											
(2) More than or equal to 50% reduction in total pipe length or volume.	0 Add'l Pts											
<b>Addition Note - Section 801.1.1(3):</b> Where a new hot water system is provided in an addition, this item applies. (Points for Section 801.1.1(3)(a), (b), and (c).)	Points Reduced by Half											
<b>Addition and Renovation Note - Section 801.1.1(3):</b> Section 801.1.1(3) applies only where hot water lines in the existing building are accessible. (To receive additional points, a minimum of 50 percent of the hot water lines are in accordance with Section	2 Add'l Pts											
801.2 Energy Star® or equivalent water-conserving appliances are installed												
(1) Dishwasher	2	2										
(2) Washing machine	8	8										
(3) Washing machine with a water factor of 6.0 or less	12											
<b>Addition and Renovation Note:</b> Section 801.2 applies as follows when existing appliance(s) are properly disposed of and not placed into secondary service in a dwelling unit.												
(1) Replace existing dishwasher	1 Add'l Pt											
(2) Replace existing washing machine	1 Add'l Pt											
(3) Replace existing washing machine with a water factor of 6.0 or less	1 Add'l Pt											

ANSI National Green Building Standard™	256	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
801.3 A minimum of one food waste disposer is installed at the primary kitchen sink.	1	1										
<b>801.4 Showerheads</b>												
801.4 (1&2) 1) The total showerhead flow rate at any point in time, for all showerheads in each shower compartment is less than 2.5 gpm, tested at 80 psi per ASME A112.18.1/CSA B125.1. 2) In addition the showerheads must be equipped with an automatic com	1 Point (3 Points Max)	2										Delta T13020/120/220 doesn't indicate flow rate, but this is EPA min.
801.4 (3&4) All shower compartments in the home comply with 801.4 (1&2).												
(3) All shower compartments installed meet the above conditions and are 2.0 to less than 2.5 gpm.	1 Add'l Pt	1		(1)								
(4) All shower compartments installed meet the above conditions and are 1.6 to less than 2.0 gpm.	2 Add'l Pts			2	0							
<b>Addition Note:</b> Section 801.4 applies only to additions that include a minimum of one bath or shower.	0 Add'l Pts											
<b>Renovation Note:</b> Section 801.4 applies only to renovations that include one or more bathrooms with a bath or shower. (Points awarded per fixture.)	1 Add'l Pt											
<b>Addition and Renovation Note:</b> Existing showerhead is replaced with a showerhead that has a flow rate in accordance with Section 801.4. (Points awarded per additional showerhead.)	1 Add'l Pt											
<b>801.5 Faucets</b>												
801.5.1 Water-efficient lavatory faucets with 1.5 gpm or less maximum flow rate when tested at 60 psi in accordance with ASME A112.18.1 are installed.												
(1) a bathroom (Points awarded for each bathroom.)	3 Pts Max	3										
(2) all lavatory faucets in the home meet the conditions of 801.5.1	2 Add'l Pts	2										
<b>Addition Note:</b> Section 801.5.1 applies only to additions that include a bathroom.	1 Add'l Pt											
<b>Renovation Note:</b> Section 801.5.1 applies only to renovations of existing bathrooms.	2 Add'l Pts											
<b>Addition and Renovation Note:</b> Replace all faucets in non-renovated bathrooms with faucets that are in accordance with Section 801.5.1.	2 Add'l Pts											
801.5.2 Self-closing valve, motion sensor, metering, or pedal-activated faucet is installed to enable intermittent on/off operation. (Points awarded per fixture.)	1 3 Pts Max											
<b>Renovation Note:</b> Additional points for Section 801.5.2 apply where installed.	1 Add'l Pt 6 Pts Max											
<b>801.6 Water closets and urinals.</b> Water closets and urinals are in accordance with the following: (For water closets, points awarded for either Section 801.6 or 802.2, but not both.)												
(1) Gold and Emerald Levels: All water closets and urinals are in accordance with either Section 801.6 or 802.2.	Mandatory											
(2) A water closet is installed with an effective flush volume of 1.28 gallons or less when tested in accordance with ASME A112.19.2 (all water closets) and ASME A112.19.14 (all dual flush water closets), and is in accordance with EPA WaterSense Tank-Type High-Efficiency Toilet. (Points awarded per fixture.)	6 18 Pts Max							18	525			
(3) A urinal is installed with a flush volume of 0.5 gallons or less when tested in accordance with ASME A112.19.2.	4 Max 4 Points											
(4) All water closets and all urinals are in accordance with Section 801.6(2) or Section 801.6(3), as applicable.	6 Add'l Points							6	0			
<b>Addition and Renovation Note:</b> Section 801.6 applies only to additions and renovations that include bathrooms.	0 Add'l Pts											
<b>Renovation Note:</b> Renovations that do not include bathrooms receive points for replacing existing water closets with water closets in accordance with Section 801.6 (Points awarded per fixture.)	1 Add'l Pt											
<b>801.7 Irrigation systems</b>												
801.7.1 A low-volume, irrigation system is installed for each landscape type utilized: (Points awarded for each type of irrigation system installed.)	10 Pts. Max											
(1) High distribution uniformity (DU) rotating spray heads	2											
(2) Drip irrigation	4											
(3) Bubblers	4											
(4) Drip emitters	4											
(5) Soaker hose	4											
(6) Subsurface irrigation	6											
<b>Addition and Renovation Note:</b> Section 801.7.1 applies only to additions that increase the building footprint or affect the irrigation system.	1 Add'l Pt											
<b>Renovation Note:</b> Section 801.7.1 applies only to renovations of the landscape, hardscape, or outdoor living areas with existing irrigation systems or to renovations that replace the irrigation system.	2 Add'l Pts											
801.7.2 Irrigation system is in accordance with both of the following:	3											
1) designed by a professional in accordance with EPA WaterSense requirements or equivalent												
2) installed in accordance with EPA WaterSense program or equivalent												
<b>Addition Note:</b> Section 801.7.2 applies to additions that increase the building footprint or modify an existing irrigation system.	1 Add'l Pt											
<b>Renovation Note:</b> Section 801.7.2 applies to renovations with existing irrigation systems that are modified, or to renovations where a new irrigation system is installed or the existing irrigation system is replaced.	1 Add'l Pt											
801.7.3 Irrigation system is zoned separately for turf and bedding areas.	2											
<b>Addition Note:</b> Section 801.7.3 applies to additions that increase the building footprint or affect the irrigation system.	1 Add'l Pt											
<b>Renovation Note:</b> Section 801.7.3 applies only to renovations with existing irrigation systems that are modified, or to renovations where a new irrigation system is installed or the existing irrigation system is replaced.	2 Add'l Pts											
801.7.4 The irrigation system(s) is controlled by a smart controller.												

ANSI National Green Building Standard™	256	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(1) Evapotranspiration (ET) based irrigation controller with a rain sensor	4											
(2) Soil moisture sensor based irrigation controller	4											
(3) No irrigation is installed and a landscape plan is developed in accordance with Section 503.5(1) as applicable. (Points must be taken in 503.5(1) in order to receive points for 801.7.4(3))	15	15										
801.8 Rainwater collection and distribution is provided.												
(1) Rainwater is collected and used	6									6	382	
(2) Rainwater is distributed using a renewable energy source or gravity.	2									2	0	
801.9 Water Filters. Water filter is installed to improve water quality for the whole building or whole dwelling unit.	1											
802.1 Gray water (as specified in ICC IRC, Appendix O) is separated and reused, as permitted by local building code. (Points awarded for either Section 802.1(1) or 802.1(2), not both)												
(1) Each water closet flushed by reclaimed or recycled water.	4 Points (per fixture)											
(2) Irrigation from reclaimed or recycled water onsite	10											
<b>Addition and Renovation Note:</b> Additional points are available for Section 802.1 as follows:												
1) each water closet flushed by reclaimed or recycled water	2 Add'l Pts											
2) Irrigation from reclaimed or recycled water onsite	5 Add'l Pts											
802.2 Composting or waterless toilets and/or urinals. Composting or waterless toilets and/or urinals are in accordance with the following: (For water closets, points awarded for either Section 802.2 or 801.6, but not both)	24 Points Max											
1) Gold and emerald levels: All water closets and urinals are in accordance with either Section 802.2 or Section 801.6.	Mandatory											
2) Composting or waterless toilet and/or urinal is installed. (Points awarded per fixture)	8											
3) All toilets and urinals are in accordance with Section 802.2 (2).	8 Add'l Points											
802.3 Automatic shutoff water devices. One of the following automatic shutoff water supply devices is installed. Where a fire sprinkler system is present, installer is to ensure the device will not interfere with the operation of the fire sprinkler system	2											
(1) Excess Water Flow Shutoff												
(2) Leak Detection System												
<b>CHAPTER 9: INDOOR ENVIRONMENTAL QUALITY</b>	<b>Base Pts.</b>	<b>49</b>	<b>0</b>	<b>25</b>	<b>140</b>	<b>31</b>	<b>134</b>	<b>36</b>	<b>671</b>	<b>8</b>	<b>116</b>	<b>Ch. 9 Subtotal</b>
<b>901 Pollutant Source Control</b>	<b>Cost/Point</b>											
901.0 Intent. Pollutant sources are controlled.												
901.1 Space and water heating options												
901.1.1 Natural draft space heating or water heating equipment is not located in conditioned spaces, including conditioned crawl spaces. Natural draft equipment is permitted to be installed within the conditioned spaces if located in a mechanical room that has an outdoor air source, and is otherwise sealed and insulated to separate it from the conditioned space(s).	5											
<b>Addition Note:</b> Section 901.1.1 applies to additions that include the use of natural draft space heating or water heating equipment.	Mandatory											
<b>Renovation Note:</b> Section 901.1.1 applies to renovations that include areas where natural draft space heating or water heating equipment is located.	Mandatory											
<b>Renovation Note:</b> Additional points are available for any renovation that modifies all of the existing building's natural draft space heating or water heating equipment in accordance with Section 901.1.1	2 Additional Points											
901.1.2 Air handling equipment or return ducts are not located in the garage, unless placed in isolated, air-sealed mechanical rooms with an outside air source.	5	5										Water heater is draft.
<b>Renovation Note:</b> Section 901.1.2 applies to renovations that modify existing duct systems.	2 Additional Points											
901.1.3 The following combustion space heating and water heating equipment is installed within conditioned space.												
(1) Direct vent furnace or boiler	5	5										
(2) (a) Power vent water heater	3											
(b) Direct vent water heater	5					5	0					Cost of tankless is in 702.
<b>Renovation Note:</b> Section 901.1.3 applies to renovations that replace existing space heating and water heating combustion equipment with equipment in accordance with Section 901.1.3 for new construction.	2 Additional Points											
901.1.4 The following electric equipment is installed:												
1) Heat pump air handler in unconditioned space	2											
2) Heat pump air handler in conditioned space	5											
901.2 Fireplaces and Fuel Burning Appliances (except cooking appliances, clothes dryers, water heaters, and furnaces) located in conditioned spaces are code compliant, vented to the outdoors, and have adequate combustion and ventilation air provided to minimize spillage or back-drafting, in accordance with the following: <u>All of the following items are mandatory, if applicable, for certification.</u>												
901.2.1(1) Natural gas and propane fireplaces that are power vented or direct vented, are equipped with permanently fixed glass fronts or gasketed doors, and comply with ANSI Z21.88/CSA 2.33a or ANSI Z21.50/CSA 2.22	7											
901.2.1(2)(a) Wood burning fireplaces are equipped with gasketed doors designed to operate with the doors closed, outside combustion air, and a means is provided for sealing the flue to minimize interior air (heat) loss when not in operation.	4											
901.2.1(2)(b) Factory-built wood burning fireplaces are in accordance with the certification requirements of UL 127 and are EPA certified.	6											

ANSI National Green Building Standard™	256	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
901.2.1(2)(c) Wood stove and fireplace inserts, as defined in UL 1482, Section 3.8 are in accordance with the certification requirements of UL 1482 and are in accordance with the emission requirements of the EPA Certification and the State of Washington W	6											
901.2.1(2)(d) Pellet (biomass) stoves and furnaces are in accordance with the requirements of ASTM E1509 or are EPA Certified.	6											
901.2.1(2)(e) Masonry heaters are in accordance with the definitions in ASTM E1602 and ICC IRC, Section 2112.1.	6											
<b>Renovation Note:</b> Removal of or rendering permanently unusable an existing fireplace and/or other fuel-burning appliances that are not in accordance with Section 901.2.1.	2 Add'l Pts											
<b>Renovation Note:</b> Additional points are awarded for the replacement of each existing fireplace that is not in accordance with Section 901.2.1 with a fireplace that is in accordance with Section 901.2.1	2 Add'l Pts											
<b>Renovation Note:</b> Additional points are available for removing or rendering permanently unusable each existing wood-burning fireplace that is not in accordance with Section 901.2.1(2)(a) in areas other than the main renovation area.	2 Add'l Pts											
901.2.2 Fireplaces, woodstoves, pellet stoves, or masonry heaters are not installed.	7	7										
901.3 Garages are in accordance with the following: 901.3(1)(a) Where installed in the common wall between the attached garage and conditioned space, the door is tightly sealed and gasketed.	Mandatory 2 Points											Detached garage.
901.3(1)(b) A continuous air barrier is provided between walls and ceilings separating the garage space from the conditioned living spaces.	Mandatory 2 Points											Detached garage.
901.3(1)(c) For one and two-family dwelling unit attached garages, a 100 cfm or greater ducted, or 70 cfm or greater unducted wall exhaust fan is installed and vented to the outdoors, designed and installed for continuous operation, or has controls (e.g., motion detectors, pressure switches) that activate operation for a minimum of 1 hour when either human passage door or roll-up automatic doors are operated. For ducted exhaust fans, the fan airflow rating and duct sizing are in accordance with Appendix A. <b>If you claim points for 901.3(1)(c), you cannot claim points for 901.3(2).</b>	4											
901.3(2) A carport is installed, the garage is detached from the building, or no garage is installed. <b>If you claim points for 901.3(2), you cannot claim points for 901.3(1)(a), 901.3(1)(b), or 901.3(1)(c).</b>	10	10										
<b>Addition Note:</b> Section 901.3 applies where the addition is a garage or shares a continuous air barrier with a garage.	Mandatory											
<b>Renovation Note:</b> Section 901.3 applies to renovations that involve construction adjacent to an attached garage.	1 Add'l Point											
<b>Renovation Note:</b> A focused effort to create a continuous air barrier between the garage and conditioned space, including penetrations, occurring between walls and ceilings separating the garage and conditioned space.	3 Add'l Points											
901.4(2-6) Wood Materials. A minimum of 85% of material within a product group (i.e. wood structural panels, countertops, composite trim/doors, custom woodwork, and/or component closet shelving) is manufactured in accordance with the following: 901.4(1) Structural plywood used for floor, wall, and/or roof sheathing is compliant with DOC PS 1 and/or DOC PS 2. OSB used for floor, wall, and/or roof sheathing is compliant with DOC PS 2. The panels are made with moisture-resistant adhesives. The trademark indicates these adhesives as follows: Exposure 1 or Exterior for plywood, and Exposure 1 for OSB.	10 points max.											
(2) Particleboard and MDF (medium density fiberboard) is manufactured and labeled in accordance with CPA A208.1 and CPA A208.2, respectively.	2 Points per Product Group											
(3) Hardwood plywood is in accordance with HPVA HP-1 and HUD Title 24, Part 3280.	2 Points per Product Group											
(4) Particleboard, MDF, or hardwood plywood is in accordance with CPA 2.	3 Points per Product Group											
(5) Composite wood or agrifiber panel products contain no added urea-formaldehyde or are in accordance with the CARB Composite Wood Air Toxic Contaminant Measure Standard.	4 Points per Product Group											
(6) Non-emitting products.	4 Points per Product Group											
<b>Renovation Note:</b> Additional points for Section 901.4 apply to renovations that replace all existing countertops, shelving, and other nonstructural products.	2 Add'l Pts											
901.5 Carpets are in accordance with the following: 901.5(1) Wall-to-wall carpeting is not installed adjacent to water closets and bathing fixtures.	Mandatory	0										
901.5(2) A minimum of 85% of installed carpet area, carpet cushion (padding), and carpet adhesives are in accordance with the emission levels of CDPH 01350, as certified by a third-party program, such as the Carpet and Rug Institute's (CRI) Green Label Pl												
(a) Carpet	6					6	0					
(b) Carpet cushion	2					2	0					
(c) Carpet adhesives	2											
<b>Renovation Note:</b> Section 901.5(2) applies to renovations where existing carpet is replaced. Remove existing carpet and perform one of the following repair methods:	2 Add'l Pts											
1) Existing carpeted floor area is exposed, cleaned, and finished and is used as non-carpeted finished floor.	2 Add'l Pts											
2) Carpet is installed in accordance with Section 901.5.	0 Add'l Pts											
3) New non-carpet flooring product in compliance with an approved green labeling program(s) is installed.	1 Add'l Pts											

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		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
901.6 Hard-surface flooring. A minimum of 85% of installed hard-surface flooring is in accordance with the emission concentration limits of CDPH 01350 (using the office scenario), as certified by a third-party program, such as the RFCI's FloorScore Indoor Air Certification Program or the Greenguard Environmental Institute's Children and Schools Certification Program.	6											
901.7 Wall coverings. A minimum of 85% of wall coverings are in accordance with the emission concentration limits of CDPH 01350 (using the office scenario), as certified by a third-party program, such as the Scientific Certification Systems (SCS) Indoor Advantage Gold Program or the Greenguard Environmental Institute's Children and Schools Certification Program.	4											
901.8 Architectural coatings. A minimum of 85% of the architectural coatings are in accordance with one of the following conditions:												
901.8.1 Site-applied interior products are in accordance with one or more of the following:	5											
(1) Zero VOC, determined by EPA Method 24 (VOC content below the detection limit for the method).												
(2) CARB Suggested Control Measure for Architectural Coatings												
(3) GS-11												
(4) VOC limits in accordance with:												
(a) 50 grams/liter flat												
(b) 100 grams/liter non flat												
(c) 350 grams/liter clear wood varnish												
(d) 550 grams/liter clear wood lacquer												
901.8.2 Site-applied interior products are in accordance with the emissions levels of CDPH 01350, as certified by a third party program such as the Scientific Certification Systems (SCS) Indoor Advantage Gold Program or the Greenguard Environmental Institute's Children and Schools Certification Program.	8											
<b>Addition and Renovation Note:</b> Section 901.8 applies when the building is occupied during construction.	<b>Mandatory 1 Add'l Point</b>											
901.9 Adhesives and Sealants.												
901.9.1 For exterior low-VOC adhesives and sealants, a minimum of 85% of site-applied products used for the installation of subfloors and on the exterior of the project are in accordance with one of the following:	5									5		
(1) The California Air Resources Board consumer products regulation as follows:												
a) Construction Adhesives: VOC content not to exceed 7% by weight or 75 grams/liter, whichever is greater.											108	PM 06160-3 "use adhesives with a VOC content of 50 g/L or less called to 40 CFR 59.
b) The VOC content of reactive sealants (i.e., silicones, polyurethanes, and hybrids, such as MS Polymer and silylated polyurethane resin or SPUR) not to exceed 4% by weight or 50 grams/liter, whichever is greater.												PM 06200-3 "Finish Carpentry...Aliphatic or phenolic resin wood glue...for general carpentry use." Note: some white construction glues comply.
c) The VOC content of all other caulks and sealants not to exceed 2% by weight or 30 grams/liter, whichever is greater.												
d) The VOC content of contact adhesives not to exceed 55% by weight or 480 grams/liter, whichever is greater.										8		
(2) GS-36												
901.9.2 Interior Low-VOC Adhesives and Sealants. For interior low VOC adhesives and sealants, a minimum of 85% of site-applied products used within the interior of the building are in accordance with one of the following, as applicable:												
(1) CDPH 01350, as certified by a third party program, such as Scientific Certification Systems (SCS) Indoor Advantage Gold Program or the Greenguard Environmental Institute's Children and Schools Certification Program.	5					5	0					
(2) GS-36	5											
901.10 Cabinets. A minimum of 85% of kitchen and bath vanity cabinets are in accordance with one of the following: (Where more than one of the following practices is used, the practice with the fewer number of points is awarded)												
(1) Kitchen and bath vanity cabinets in accordance with KCMA ESP 01, or equivalent, are installed.	2	2							-2			
(2) Kitchen and bath vanity cabinets in accordance with CARB Composite Wood Air Toxic Contaminant Measure Standard are installed.	3											
(3) Kitchen and bath vanity cabinets are installed that contain no added urea formaldehyde or are in accordance with GGPS.EC.010.R0, ASTM D6670, or equivalent.	5							5	0			Higher cabinet performance spec required.
<b>Renovation Note:</b> Additional Points for Section 901.10 apply to renovations that replace all existing kitchen and bath vanity cabinets.	<b>2 Add'l Pts</b>											
901.11 Insulation is in accordance with the following:												
(1) Formaldehyde emissions of wall, ceiling, and floor insulation materials are in accordance with the emissions levels of CDPH 01350, as certified by a third-party program, such as the GREENGUARD Environmental Institute's Children and Schools Certification Program or the Scientific Certification Systems (SCS) Indoor Advantage Gold Program.	4					4	0					
(2) Formaldehyde emissions of duct insulation materials are in accordance with the emissions levels of CDPH 01350, as certified by a third-party program, such as the GREENGUARD Environmental Institute's Children and Schools Certification Program or the Scientific Certification Systems (SCS) Indoor Advantage Gold Program.	1					1	0					

ANSI National Green Building Standard™	256	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
901.12 A carbon monoxide (CO) alarm is installed in a central location outside of each separate sleeping area in the immediate vicinity of the bedrooms. The CO alarm(s) is located in accordance with NFPA 720 and is hard-wired with a battery back-up. The alarm device(s) is certified by a third party for conformance with either CSA 6.19 or UL 2034.	3					3	90					
901.13 Building entrance pollutants control. Pollutants are controlled at all main building entrances by one of the following methods: (1) Exterior grilles or mats are installed in a fixed manner and may be removable for cleaning. (2) Interior grilles or mats are installed in a fixed manner and may be removable for cleaning.	1 1					1	44					
901.14 Non-smoking areas. All interior common areas of a multi-unit building are designated as non-smoking areas with posted signage.	1											
901.15 <b>Renovation Note:</b> For buildings constructed prior to 1978, lead-safe work practices are used during renovation, remodeling, painting, and demolition.	Mandatory											
<b>902 Pollutant Control</b>												
902.0 Intent. Pollutants generated in the building are controlled.												
902.1 Spot ventilation is in accordance with the following: (1) Bathrooms (including powder rooms) are vented to the outdoors. The minimum ventilation rate is 50 cfm for intermittent operation or 20 cfm for continuous operation in bathrooms. (2) Clothes dryers are vented to the outdoors. (3) Kitchen exhaust units and/or range hoods are ducted to the outdoors and have a minimum ventilation rate of 100 cfm for intermittent operation or 25 cfm for continuous operation.	0 0 8											Complies. Complies. Broan 4000 has 160 CFM, 2-speed, 5.6 sones.
<b>Addition Note:</b> Section 902.1 applies only to additions that include a kitchen or bathroom.	Mandatory											
<b>Renovation Note:</b> Section 902.1 applies to renovations that include a new or existing kitchen or bathroom. (Points available for all of the following conditions)	Mandatory											
1) Existing non-vented kitchen range or bathroom exhaust systems in an area that is undergoing renovation are replaced with equipment that is in accordance with Section 902.1.	2 Add'l Pts											
2) Existing non-vented kitchen range or bathroom exhaust systems in an area that is not undergoing renovation are replaced with equipment that is in accordance with Section 902.1.	3 Add'l Points											
3) New kitchen range or bathroom exhaust systems in accordance with Section 902.1 are installed where no exhaust system existed before renovation.	1 Add'l Pts											
902.1.2 Bathroom and/or laundry exhaust fan is provided with an automatic timer and/or humidistat: 1) for first device 2) for each additional device	9 Points Max 5 2							5 2	42 42			
902.1.3 Kitchen range, bathroom, and laundry exhaust are vented to specification. Ventilation airflow at the point of exhaust is tested to a minimum of 100 cfm intermittent or 25 cfm continuous for kitchens, and 50 cfm intermittent or 20 cfm continuous	8							8	149			
902.1.4 Exhaust fans are ENERGY STAR as applicable. (1) ENERGY STAR, or equivalent, fans (Points awarded per fan) (2) ENERGY STAR, or equivalent, fans operating at or below 1 sone (Points awarded per fan)	Max. 6 Points 2 3											
902.2 Building ventilation systems.												
902.2.1 One of the following whole building ventilation systems is implemented and is in accordance with the specifications of Appendix B. (Points must be claimed in 902.2.1 to claim points in 902.2.2.) (1) Exhaust or supply fan(s) ready for continuous operation and with appropriately labeled controls. (2) Balanced exhaust and supply fans with supply intakes located in accordance with the manufacturer's guidelines to not introduce polluted air back into the building. (3) Heat-recovery ventilator. (4) Energy-recovery ventilator.	8 10 15 17							10	345			
<b>Addition Note:</b> Section 902.2.1 is applied to an addition in accordance with one of the following: 1) The pressure and thermal boundaries of the addition are separated from the existing building. 2) If the pressure and thermal boundaries of the addition are not separated from the existing building, Section 902.2.1 is applied to the whole building.	0 Add'l Pts 1 Add'l Pts											
<b>Renovation Note:</b> Section 902.2.1 applies to the whole building for connected thermal and pressure boundaries.	2 Add'l Pts											
902.2.2 Ventilation airflow is tested to achieve the design fan airflow at point of exhaust in accordance with Appendix B. (Points must be claimed in 902.2.1 to claim points in 902.2.2)	8							8	93			
902.2.3 MERV filters 8 or greater are installed on central air systems. Designer or installer is to verify that the HVAC equipment is able to accommodate the greater pressure drop of MERV 8 filters.	3			3	0							
<b>Addition Note:</b> Section 902.2.3 applies only to additions that include a new HVAC system.	0 Add'l Pts											



ANSI National Green Building Standard™	256	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
<b>Renovation Note:</b> Section 902.2.3 applies only to renovations that replace an existing HVAC system.												
902.3 Radon control. Radon control measures are in accordance with ICC IRC Appendix F. (Zones are defined in Figure 9(1)).	<b>1 Add'l Pts</b>											
902.3(1) Buildings located in Radon Zone 1 have a radon system installed.	<b>Mandatory</b>	0										
(a) A passive radon system is installed.	10			10	140							
(b) An active radon system is installed.	15											
902.3(2) Buildings located in Zone 2.												
(a) A passive radon system is installed.	10											
902.4 HVAC system protection. One of the following HVAC system protection measures is performed:												
(1) HVAC supply registers (boots), return grilles, and rough-ins are covered during construction activities to prevent dust and other pollutants from entering the system.	3	3										PM 15010-5 and PM 15010-9
<b>Addition and Renovation Note:</b> Section 902.4(1) does not apply to additions and renovations except as noted in Addition and Renovation Note (3) below.	<b>0 Add'l Pts</b>											
(2) Prior to owner occupancy, HVAC supply registers (boots), return grilles, and duct terminations are inspected and vacuumed. In addition, the coils are inspected and cleaned and the filter is replaced if necessary.	3											PM 15010-9 stipulates cleaning filter additional requirements need to be incorporated into specs.
<b>Addition and Renovation Note:</b> As an alternative to Section 902.4(2), one of the following options is implemented:	<b>Mandatory</b>											
1) During construction, a construction indoor air quality (IAQ) schedule is developed that includes, at a minimum, all of the following:	<b>1 Add'l Pt</b>											
a) type of construction activity												
b) ability to occupy the building or dwelling unit												
c) IAQ protections for occupant(s) of the building or dwelling unit												
d) hazardous waste removal												
e) name and age of occupants of the building or dwelling unit at a specific time												
2) The addition or renovation area is sealed off from the occupied portion of the building or dwelling unit. The same HVAC system for conditioning the air in renovated and occupied space is not used.	<b>1 Add'l Pt</b>											
3) The building or dwelling unit is not occupied during the entire construction period and Sections 902.4(1) and 902.4(2) are implemented.	<b>1 Add'l Pt</b>											
902.5 Central vacuum systems. Central vacuum system is installed and vented to the outside.	5											
902.6 Living space contaminants. The living space is sealed to prevent unwanted contaminants.												
(1) Attic access, knee wall door, or drop down stair is caulked, gasketed, or otherwise sealed.	2			2	0							
(2) All penetrations (e.g., top plates, HVAC register boots, recessed can lights, are sealed in the following areas:												
(a) Attic/ceiling	2			2	0							
(b) Wall	2			2	0							
(c) Floors	2			2	0							
903 Moisture Management: Vapor, Rainwater, Plumbing, HVAC												
903.0 Intent. Moisture and moisture effects are controlled.												
903.1 Tile backing materials installed under tiled surfaces in wet areas are in accordance with ASTM C1178, C1278, C1288, or C1325.	<b>Mandatory</b>	0										Doesn't Comply/Don't Know.PM 06160-2 *Floor sheathing is rated for 24" oc span (23/32" OSB) and 1/4" luan BB underlayment.
903.2 Capillary breaks												
903.2.1 A capillary break and vapor retarder are installed at all concrete slabs in accordance to the following:	<b>Mandatory</b>	0										
1) A minimum 4-inch thick bed of ½ inch diameter or greater clean aggregate, covered with polyethylene or polystyrene sheeting in direct contact with the concrete slab, with the sheeting joints lapped in accordance with Section 903.3. (or)												A501 shows aggregate and poly; just no indication of continuity under wall plate. No indication if passive radon system is installed.
2) A minimum 4-inch thick uniform layer of sand, overlain with a layer or strips of geotextile drainage matting, covered with polyethylene sheeting, with the sheeting joints lapped according to Section 903.3.												
Modification for 1&2:												
a. In areas with free-draining soils, identified as Group 1 in the ICC IRC by a certified hydrologist, soil scientist, or engineer through a site visit, a gravel bed or geotextile matting is not required.												
b. In Dry climate locations, as defined by Figure 6(1), polyethylene sheeting is not required unless required for radon resistance (Section 902.3).												
903.2.2 Add a capillary break on footing to prevent moisture migration into foundation wall.	3									3	0	
<b>Addition Note:</b> Section 903.2 applies only to the new construction portion of additions.	<b>Mandatory</b>											
<b>Renovation Note:</b> Section 903.2 applies only to renovations that include slab removal and/or replacement.	<b>0 Add'l Pts</b>											
903.3 Crawspaces												
903.3.1(1) Minimum 6-mil vapor retarder installed on the crawl space floor and extended up the wall sufficient to allow the material to be affixed with glue and furring strips. Joints of vapor retarder overlap a minimum of 6 inches and are taped.	6											
903.3.1(2) Damp-proof walls are provided below finished grade. Joints of vapor retarder overlap a minimum of 6 inches and are taped.	<b>Mandatory</b>	0										Doesn't comply. Add to specs.
<b>Renovation Note:</b> Additional Points:												
1) Additional points available for damp proofing below grade walls.	<b>1 Add'l Pt</b>											
2) Additional points available for installing a footing drainage system.	<b>2 Add'l Pts</b>											

ANSI National Green Building Standard™	256	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
903.3.2 Crawlspace that is built as a conditioned area is sealed to prevent outside air infiltration and provided with conditioned air at a rate not less than 0.02 cfm per square foot of horizontal area and one of the following is implemented:  (1) A concrete slab over lapped 6 mil polyethylene or polystyrene  (2) 6-mil polyethylene sheeting, lapped a minimum of 6 inches and taped at the seams.												n/a
	10											
	8											
<b>Addition Note:</b> Section 903.3.2 applies only to the new construction portion of additions.	1 Add'l Pt											
<b>Renovation Note:</b> Section 903.3.2 applies only to renovations that include a focused effort to convert an existing vented crawl space into an unvented, conditioned crawl space.	2 Add'l Pts											
903.4 Moisture control measures.												
903.4.1(1) Building materials with visible mold are not installed or are cleaned or encapsulated prior to concealment and closing.	2 Points			2	0							
903.4.1(2) Walls are not enclosed (e.g. with drywall) if the insulation has a high moisture content. Wet insulation products are dry before enclosing.	Mandatory 2 Points	0										Doesn't apply
903.4.1(3) The moisture content of lumber is sampled to ensure it does not exceed 19 % prior to the surface and/or wall cavity enclosure.	4					4	0					
903.4.2 Moisture content of subfloor, substrate, or concrete slabs is in accordance with the appropriate industry standard for the finish flooring to be applied.	2	2	0									
<b>Addition and Renovation Note:</b> Section 903.4.1 (1) and (2) applies to new, reused, and salvaged materials only. It excludes undisturbed existing materials.												
<b>Addition Note:</b> Section 903.4.2 applies only where new finish flooring is applied.	Mandatory											
<b>Renovation Note:</b> Section 903.4.2 applies only where new finish flooring is applied. Additional points available only for correcting excess moisture levels in an existing subfloor and/or substrate.	2 Add'l Pts											
903.5 Plumbing.												
903.5.1 Plumbing distribution lines are not installed in exterior wall cavities.	2	2	0									P204.
<b>Addition Note:</b> Section 903.5.1 applies only to the new construction portion of additions.	Mandatory											
<b>Renovation Note:</b> Section 903.5.1 applies only to renovations that include exterior walls and plumbing lines or plumbing lines in unconditioned spaces.	Mandatory											
1) A minimum of 50 percent of exterior wall piping is removed.	3 Add'l Points											
2) A minimum of 50 percent of exterior wall piping is insulated.	2 Add'l Pts											
903.5.2 Cold water pipes in unconditioned spaces are insulated to a minimum of R-4 with pipe insulation or other covering that adequately prevents condensation.	2											n/a
<b>Renovation Note:</b> The entire plumbing system between the connections of the water distribution and/or waste lines and the equipment and fixtures is replaced. This item applies if one or more of the following is implemented:												
1) Plumbing in unconditioned spaces is repaired or replaced.	1 Add'l Pt											
2) Plumbing in unconditioned spaces is improved.	2 Add'l Pts											
903.5.3 Plumbing is not installed in unconditioned spaces.	5	5	0									P204.
<b>Renovation Note:</b> The entire plumbing system between the connections of the water distribution and/or waste lines and the equipment and fixtures is replaced. This item applies if one or more of the following conditions exist:	2 Add'l Pts											
1) poor joint connections												
2) thin pipe walls												
3) severely reduced water flow caused by debris buildup												
4) lead or other toxic solders												
5) drain, waste, and vent system is not in accordance with the ICC IPC.												
903.6(1) Duct insulation. All HVAC ducts, plenums, and trunks in unconditioned attics, basements, and crawlspaces are insulated to a minimum of R-6. Outdoor air supplies to ventilation systems are insulated to a minimum of R-6.	Mandatory											Doesn't comply. M301 duct insulation R5.5.
903.6(2) Duct insulation. All HVAC ducts, plenums, and trunks in unconditioned attics, basements, and crawlspaces are insulated to a minimum of R-8. Outdoor air supplies to ventilation systems are insulated to a minimum of R-8.	2			2	0							
<b>Addition Note:</b> Section 903.6 applies only to the new construction portion of additions.	Mandatory											
<b>Renovation Note:</b> Section 903.6 applies to renovations as follows:												
1) areas that include replacement or disturbance of HVAC ducts, plenums and trunk	2 Add'l Pts											
2) in areas with specific condensation problems, remove any contaminated ductwork, remove or remediate mold-contaminated elements, and correct existing or add new insulation.	2 Add'l Pts											
3) insulation on the existing HVAC ducts, plenums and trunks is upgraded	3 Add'l Points											
903.7 Relative Humidity. In climate zones 1A, 2A, 3A, 4A, and 5A as defined by Figure 6(1), equipment is installed to maintain relative humidity (RH) at or below 60% using one of the following:	8 Points											n/a
903.9.1 In "Warm-Humid" climates as defined by Figure 6(1) equipment is installed to maintain Relative Humidity (RH) at or below 60% using one of the following:												
(1) Additional dehumidification system(s)												
(2) Central HVAC system equipped with additional controls to operate in dehumidification mode.												
904 Innovative Practices												

ANSI National Green Building Standard™	256	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
904.1 A humidity monitoring system is installed with a mobile base unit that displays a reading of temperature and relative humidity at the base unit with a minimum of two remote units. One remote unit that is placed permanently inside the conditioned space in a central location, excluding attachment to exterior walls, and another remote unit is placed permanently outside of the conditioned space.	2											
904.2 Kitchen exhaust unit(s) that equal or exceeds 400 cfm, and make-up air is provided.	2											
904.3 Renovation Note: Existing unsealed combustion gas dryer vents related to renovations.												
1) Existing unsealed combustion gas dryer vent is replaced with a sealed exhaust vent.	Mandatory											
2) Existing unsealed combustion gas dryer vent is replaced with a sealed exhaust vent and ducted make-up air is provided.	1											
	2											
<b>CHAPTER 10: OPERATION, MAINT., AND BUILDING OWNER EDUCATION</b>		0	0	9	950	6	94	0	0	0	0	Ch. 10 Subtotal
<b>Base Pts.</b>												
<b>Building Owners' Manual for One- and Two-Family Dwellings</b>												
1001.0 Intent. Information on the building's use, maintenance and green components is provided.												
1001.1 A homeowner's binder is provided that includes the following, as available and applicable:	1 point per 2 items			0.5	100							
<b>(Points awarded for mandatory and non-mandatory items)</b>												
(1) A green building program certificate or completion document.	Mandatory			0.5	850							
(2) List of green building features (can include the national green building checklist).	Mandatory			0.5								
(3) Product manufacturer's manuals or product data sheet for installed major equipment, fixtures and appliances. If product data sheet is in the binder, manufacturer's manual shall may be attached to appliance in lieu of inclusion in the binder.	Mandatory			0.5								
(4) Information on local recycling programs.				0.5								
(5) Information about available local utility programs that purchase a portion of energy from renewable energy providers.				0.5								
(6) Explanation of the benefits of using energy efficient lighting systems (e.g., compact fluorescent light bulbs, light emitting diode (LED)) in high usage areas.				0.5								
(7) A list of practices to conserve water and energy.				0.5								
(8) Local public transportation options (if applicable).				0.5								
(9) A diagram showing the location of safety valves and controls for major building systems.				0.5								
(10) Where frost protected shallow foundations are used, notify owner of precautions, including instructions not to remove or damage insulation when modifying landscaping, to provide heat to the home as required by the IRC/IBC, and to keep base materials				0.5								
(11) A list of local service providers that offer regularly scheduled service and maintenance contracts to assure proper performance of equipment and the structure (e.g., HVAC, water heating equipment, sealants, caulks, gutter and downspout system, showe				0.5								
(12) A photo record of framing with utilities installed. Photos taken prior to installing insulation, clearly labeled, and included as part of the homeowner's binder.				0.5								
(13) Maintenance checklist.				0.5								
(14) List of common hazardous materials often used around the building and instructions for proper handling and disposal of these materials.				0.5								
(15) Information about organic pest control, fertilizers, de-icers, and cleaning products.				0.5								
(16) Information about native landscape materials and/or those that have low-water requirements.				0.5								
(17) Information about methods of maintaining the building's relative humidity in the range of 30-60%.				0.5								
(18) Instructions for inspecting the building for termite infestation.				0.5								
(19) Instructions for maintaining gutters and downspouts and importance of diverting water at least five feet away from foundation.				0.5								
(20) A narrative detailing the importance of maintenance and operation in retaining the attributes of a green-built building.												
<b>Renovations Note:</b> A building owners' manual that includes the following:	Mandatory											
(1) all mandatory items listed in Section 1001.1												
(2) a minimum of six of the non-mandatory items listed in Section 1001.1												
(3) the EPA publications "Reducing Lead Hazards When Remodeling Your Home" and "Asbestos in Your Home: A Homeowner's Guide"												
<b>on Building Operation And Maintenance for</b>												
1002.1 Training of building owners. Building owners/occupants are familiarized with the green building goals and strategies implemented and the impacts of the occupants' practices on the costs of operating the building. Training is provided to the responsible party(ies) regarding all equipment operation and control systems. Systems include, but are not limited to, the following:	6					6	94					
(1) HVAC filters.												
(2) Thermostat operation and programming.												
(3) Lighting controls.												
(4) Appliances and settings.												
(5) Water heater settings.												
(6) Fan controls.												
<b>1003 Construction, Operation and Maintenance Manuals and Training for Multi-Unit Buildings</b>												

ANSI National Green Building Standard™	256	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
<b>1003.0 Intent.</b> Manuals are provided to the responsible parties (owner, management, tenant, and/or maintenance team) regarding the construction, operation, and maintenance of the building. Paper or digital format manuals are to include information regarding those aspects of the building's construction, maintenance, and operation that are within the area of responsibilities of the respective recipient. One or more responsible parties are to receive a copy of all documentation for archival purposes.												
<b>1003.1 Building construction manual.</b> A building construction manual, including five or more of the following, is compiled and distributed in accordance with Section 1003.0.	1											
(1) A narrative detailing the importance of constructing a green building, including a list of green building attributes included in the building. This narrative is included in all responsible parties' manuals.	Mandatory											
(2) A local green building program certificate as well as a copy of the <i>National Green Building Standard™</i> , as adopted by the Adopting Entity, and the individual measures achieved by the building.	Mandatory											
(3) Warranty, operation, and maintenance instructions for all equipment, fixtures, appliances, and finishes.	Mandatory											
(4) Record drawings of the building.												
(5) A record drawing of the site including stormwater management plans, utility lines, landscaping with common name and genus/species of plantings.												
(6) A diagram showing the location of safety valves and controls for major building systems.												
(7) A list of the type and wattage of light bulbs installed in light fixtures.												
(8) A photo record of framing with utilities installed. Photos are taken prior to installing insulation and clearly labeled.												
<b>Addition and Renovation Note:</b> A building construction manual that includes the following:	0											
all mandatory items listed in Section 1003.1												
a minimum of two of the non-mandatory items listed in Section 1003.1												
<b>1003.2 Operations manual.</b> Operations manuals are created and distributed to the responsible parties in accordance with Section 1003.0. Between all of the operation manuals, five or more of the following options are included.												
(Points awarded per two items. Points awarded for both mandatory and non-mandatory items.)	1											
(1) A narrative detailing the importance of operating and living in a green building. This narrative is included in all responsible parties' manuals.	Mandatory											
(2) A list of practices to conserve water and energy (e.g., turning off lights when not in use, switching the rotation of ceiling fans in changing seasons, purchasing ENERGY STAR appliances and electronics).	Mandatory											
(3) Information on methods of maintaining the building's relative humidity in the range of 30 percent to 60 percent.	Mandatory											
(4) Information on opportunities to purchase renewable energy from local utilities or national green power providers and information on utility and tax incentives for the installation of on-site renewable energy systems.												
(5) Information on local and on-site recycling and hazardous waste disposal programs and, if applicable, building recycling and hazardous waste handling and disposal procedures.												
(6) Local public transportation options.												
(7) Explanation of the benefits of using compact fluorescent light bulbs, LEDs, or other high-efficiency lighting.												
(8) Information on native landscape materials and/or those that have low water requirements.												
(9) Information on the radon mitigation system, where applicable.												
(10) A procedure for educating tenants in rental properties on the proper use, benefits, and maintenance of green building systems including a maintenance staff notification process for improperly functioning equipment.												
<b>Addition and Renovation Note:</b> An operations manual that includes the following:	0											
all mandatory items listed in Section 1003.2												
a minimum of three of the non-mandatory items listed in Section 1003.2												
<b>1003.3 Maintenance manual.</b> Maintenance manuals are created and distributed to the responsible parties in accordance with Section 1003.0. Between all of the maintenance manuals, five or more of the following options are included.												
(Points awarded per two items. Points awarded for both mandatory and non-mandatory items.)	1											
(1) A narrative detailing the importance of maintaining a green building. This narrative is included in all responsible parties' manuals.	Mandatory											
(2) A list of local service providers that offer regularly scheduled service and maintenance contracts to ensure proper performance of equipment and the structure (e.g., HVAC, water-heating equipment, sealants, caulks, gutter and downspout system, shower pan).												
(3) User-friendly maintenance checklist that includes:												
a) HVAC filters												
b) thermostat operation and programming												
c) lighting controls												
d) appliances and settings												
e) water heater settings												
f) fan controls												
(4) List of common hazardous materials often used around the building and instructions for proper handling and disposal of these materials.												
(5) Information on organic pest control, fertilizers, deicers, and cleaning products.												
(6) Instructions for maintaining gutters and downspouts and the roof.												
(7) Instructions for inspecting the building for termite infestation.												
(8) A procedure for rental tenant occupancy turnover that includes a green building checklist.												
(9) An outline of a formal green building training program for building staff.												

ANSI National Green Building Standard™	256	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
<i>Addition and Renovation Note: A maintenance manual that includes the following:</i>	0											
<i>all mandatory items listed in Section 1003.3.</i>												
<i>a minimum of three of the non-mandatory items listed in Section 1003.3.</i>												
<b>INNOVATIVE PRACTICES</b>	1004											
<b>1004.1 (Reserved)</b>												



# APPENDIX B GREEN SCORING & COST

C. Cuyahoga, Ohio

HUD Green Building Comparison  
 1 Bedroom 3rd Floor West  
 Valley View Apartments (Cuyahoga, OH)  
 City of Cleveland, OH  
 ANSI-ICC-700-2008 National Green Building Standard™  
 Zone 5 multi-family 658

- 5. Lot Design...
- 6. Resource Efficiency
- 7. Energy Efficiency
- 8. Water Efficiency
- 9. Indoor Env. Quality
- 10. Operation, Maintenance...
- Additional Points
- Total

	Bronze		Silver		Gold		Emerald		
	Required	Actual	Required	Actual	Required	Actual	Required	Actual	
	39	101	66	101	93	129	119	153	
	45	81	79	93	113	117	146	147	
	30	51	60	104	100	155	120	191	
	14	22	26	37	41	43	60	61	
	36	46	65	91	100	118	140	144	
	8	16	10	16	11	16	12	16	
	50		100		100		100		
	222	317	406	442	558	578	697	712	
<b>Cummulative</b>	<b>Points</b>	<b>Cost</b>	<b>Points</b>	<b>Cost</b>	<b>Points</b>	<b>Cost</b>	<b>Points</b>	<b>Cost</b>	
Chapter 5	101	0	101	0	129	0	153	1,378	
Chapter 6	81	0	93	55	117	384	147	4,493	
Chapter 7	51	2,882	104	5,122	155	7,639	191	8,825	
Chapter 8	22	175	37	98	43	162	61	2,227	
Chapter 9	46	0	91	0	118	395	144	4,345	
Chapter 10	16	250	16	250	16	250	16	250	
Total	317	3,307	442	5,525	578	8,830	712	21,518	
Cost per SF (\$)		5.02		8.39		13.41		32.69	

ANSI National Green Building Standard™	258	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
		Cost/Pt	0			#DIV/0!	0	0	0	57		
<b>CH. 5 LOT DESIGN, PREPARATION, AND DEVELOPMENT</b>	<b>Rating</b>	<b>96</b>	<b>0</b>	<b>5</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>28</b>	<b>0</b>	<b>24</b>	<b>1,378</b>	<b>Ch. 5 Subtotal Base</b>
500.0 Intent. This section applies to lot development for the eventual construction of residential buildings, multi-unit buildings, or additions thereto that contain dwelling units. The buildings on the lot earn their own performance level by complying with the provisions of Sections 303, 304, or 305.5, as applicable.												
501.1 The lot is selected to minimize environmental impact by one or more of the following:												
(1) An infill lot is selected.	4											
(2) A greyfield lot or an EPA-recognized brownfield lot is selected.	5											
(3) Addition and Renovation Note: A renovation or addition project is implemented. (Points awarded for using an existing building and infrastructure.)	5											
501.2 Mass Transportation. A range of mass transportation choices are promoted by one or more of the following:												
(1) A lot is selected within one-half mile of pedestrian access to a mass transit system or within five miles of a mass transit station with provisions for parking.	3	3	0									4 blocks to bus
(2) Walkways, street crossings, and entrances designed to promote pedestrian activity are provided. New buildings are connected to existing sidewalks and areas of development.	3	3	0									Connected to existing largely residential neighborhood.
(3) A lot is selected within one-half mile of six or more community resources (e.g., recreational facilities (such as pools, tennis courts, basketball courts), parks, grocery store, post office, place of worship, community center, daycare center, bank, school, restaurant, medical/dental office, laundromat/dry cleaner.)	3	3	0									
<b>502 Project Team, Mission Statement, and Goals</b>												
502.1 A knowledgeable team is established and team member roles are identified with respect to green lot design, preparation, and development. The project's green goals and objectives are written into a mission statement.	4									4	752	
<b>Lot Design</b>												
503.0 Intent. The lot is designed to avoid detrimental environmental impacts first, minimize any unavoidable impacts, and mitigate for those impacts that do occur. The project is designed to minimize environmental impacts and to protect, restore, and enhance the natural features and environmental quality of the lot. (To be awarded points allocated for design, the intent of the design shall be implemented.)												
503.1 Natural resources are conserved by one or more of the following:												
(1) A natural resources inventory is completed under the direction of a qualified professional.	5	5	0									Appears to be brownfield. Landscape plan and study results in planset for next phase of construction.
(2) A plan is implemented to conserve the elements identified by the resource inventory as high priority resources.	6	6	0									
(3) Items listed for protection in the resource inventory plan are protected under the direction of a qualified professional.	4											
(4) Basic training in tree or other natural resource protection is provided for onsite supervisor.	4									4	626	
(5) All tree pruning on site is conducted by a Certified Arborist.	2											
(6) Ongoing maintenance of vegetation during construction is in accordance with TCIA A300.	3											Looks like it was a brownfield - no vegetation to maintain.

ANSI National Green Building Standard™	258	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
<b>503.2 Slope disturbance</b> is minimized by one or more of the following: <b>(Points awarded only if there are developable steep slopes on the lot.)</b>												
(1) All or a percentage of development on steep slopes is avoided.												
(a) Less than 25%	2	2	0									Site plan indicates steep slope and terracing at entry.
(b) 25 to 75%	3											
(c) Greater than 75%	4											
(2) Hydrological/soil stability study for steep slopes is completed and used to guide the design of all buildings on the site.	5											
(3) All or a percentage of roads and parking are aligned with natural topography to reduce cut and fill.												
(a) Less than 25%	1											
(b) 25 to 75%	3											
(c) Greater than 75%	5											
(4) Long-term erosion effects are reduced through the design and implementation of terracing, retaining walls, landscaping, and stabilization techniques.	6	6	0									Terracing at entry. Considerable controlled fill goes here, as well, which may invalidate points.
(5) Underground parking uses the natural slope for parking entrances.	4											
<b>503.3 Soil disturbance and erosion</b> are minimized by one or more of the following: (Also see Section 504.3) (Points must be taken here to claim points in 504.1)	5											
(1) Construction activities are scheduled to minimize length of time that soils are exposed.	5	5	0									
(2) Utilities are installed using one or more alternative means:	5											
(a) tunneling instead of trenching								5	0			One of these methods could be employed.
(b) use of smaller (low ground pressure) equipment or geomats to spread the weight of construction equipment												
(c) shared utility trenches or easements												
(d) placement of utilities under paved surfaces instead of yards.												
(3) Limits of clearing and grading are demarcated on the plan.	5	5	0									
<b>503.4 Storm Water Mgmt.</b> Storm water is managed using one or more of the following low impact development techniques:												
(1) Natural water and drainage features are preserved and used.	6							6	0			
(2) A storm water management plan is developed and implemented that minimizes concentrated flows and simulates flows found in natural hydrology, e.g., vegetative swales, French drains, wetlands, drywells, and rain gardens.	6	6	0									See C2.2
(3) All or a percentage of impervious surfaces are minimized and permeable materials are used for driveways, parking areas, walkways, and patios.												
(a) Less than 25%	1											
(b) 25 to 75%	3											
(c) Greater than 75%	5											
(4) A minimum of 75% of the roof is vegetated (green roof)	3											
<b>503.5 Landscape plan</b> is developed to limit water and energy use while preserving or enhancing the natural environment.												
(1) A plan is formulated to restore or enhance natural vegetation that is cleared during construction. Landscaping is phased to coincide with achievement of final grades to ensure denuded areas are quickly vegetated.	5	5	0									
(2) Turf grass species, other vegetation, and trees are selected that are native or regionally appropriate for local growing conditions.	4							4	0			
(3) A percentage or all turf areas are limited.												
(a) Lot is 0% turf	4											This could be accomplished with little cost impact due to the limited green area.
(b) Greater than 0% to less than 25%	3							3	0			
(c) 25% to less than 50%	2											
(d) 50% to 75%	1											
(4) Plants with similar watering needs are grouped (hydrozoning).	5							5	0			
(5) Species and locations for tree planting are identified that will provide summer shading of streets, parking areas, and buildings to moderate temperatures.	5	5	0									
(6) Vegetative wind breaks or channels are designed as appropriate for local conditions.	4											
(7) Onsite tree trimmings or stump grinding of regionally appropriate trees are used to provide protective mulch during construction and cleared trees are recycled as saw lumber or pulp wood.	3											
(8) An integrated pest management plan to minimize chemical use in pesticides and fertilizers is developed.	4	4	0									
<b>503.6 Wildlife habitat.</b> Measures are planned that will support wildlife habitat.	4											
(1) Maintain wildlife habitat.	1 Add'l Point											



ANSI National Green Building Standard™	258	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(2) Expand wildlife habitat.												
	2 Add'l Points											
503.7 Mixed use development is incorporated.	6											
503.8 Environmentally Sensitive Areas.												
(1) Environmentally Sensitive Areas are avoided.	3											
(2) Compromised Environmentally Sensitive Areas are mitigated or restored.	3											
503.9 Density. The average density on a net developable area basis is:												
(1) 7 to less than 14 dwelling units per acre (4047 m <sup>2</sup> )	4											
(2) 14 to less than 21 dwelling units per acre	7											
(3) 21 or greater dwelling units per acre	10	10										
504 Lot Construction												
504.0 Intent. Environmental impact during construction is avoided to the extent possible; impacts that do occur are minimized, and any significant impacts are mitigated.												
504.1 Onsite supervision and coordination is provided during clearing, grading, trenching, paving, and installation of utilities to ensure that specified green development practices are implemented (Also see Section 503.3.)	4									4	0	Specs didn't cover but should have.
504.2 Trees and vegetation. Designated trees and vegetation are preserved by one or more of the following:												
(1) Fencing or equivalent to protect trees and other vegetation is installed.	3	3	0									
(2) Trenching, significant changes in grade, and compaction of soil and critical root zones in "tree save" areas are avoided.	4									4	0	Incorporate into project at planning.
(3) Damage to designated existing trees and vegetation is mitigated during construction through pruning, root pruning, fertilizing, and watering.	4									4	0	Incorporate into project at planning.
504.3 Soil disturbance and erosion. Onsite soil disturbance and erosion are minimized by one or more of the following: (also see section 503.3)												
(1) Limits of clearing and grading are staked out.	5			5	0							Should be in specs 02230.
(2) "No disturbance" zones are created using fencing or flagging to protect vegetation and sensitive areas from construction activity.	5	5	0									02230-3.3
(3) Sediment and erosion controls are installed and maintained in accordance with the storm water pollution prevention plan (SWPPP), where required.	5	5	0									02230 3.3
(4) Topsoil is stockpiled and stabilized for later use to establish landscape plantings.	5	5	0									02230 3.8C
(5) Soil compaction from construction equipment is reduced by distributing the weight of the equipment over a larger area (laying lightweight geogrids, mulch, chipped wood, plywood, OSB, metal plates, or other materials capable of weight distribution in the pathway of the equipment).	3											
(6) Disturbed areas that are complete or to be left unworked for greater than 21 days are stabilized within 14 days using methods as recommended by the EPA or in the approved storm water pollution prevention plan (SWPPP), where required.	3	3	0									
(7) Soil is improved with organic amendments and mulch.	3	3	0									02300 2.1A
(8) Utilities are installed using one or more alternative means such as:												
tunneling instead of trenching, use of smaller equipment, use of low ground pressure equipment, use of geomats, shared utility trenches or easements.	5							5	0			See 503.3.2.A
505 INNOVATIVE PRACTICES												
505.0 Intent. Innovative lot design, preparation and development practices are used to enhance environmental performance. Waivers or variances from local development regulations are obtained and innovative zoning practices are used to implement such pract												
505.1 Driveways or parking areas are shared. Waivers or variances from local development regulations are obtained to implement such practices as applicable. In a multi-unit project, parking capacity is not to exceed the local minimum requirements.	4	4	0									Common parking area.
505.2 Heat Island Mitigation. Any combination of the following strategies are provided for a minimum of 50% of the horizontal surface area of the hardscape:	4									4	0	Incorporate light paving and shading.
(1) Shading of hardscaping: Shade from existing or new vegetation is provided (within five years) or from trellises. Shade of hardscaping is to be measured on the summer solstice at noon.												
(2) Light colored hardscaping: Horizontal hardscaping materials are installed with a solar reflectance index of 29 or greater.												
<b>CHAPTER 6: RESOURCE EFFICIENCY</b>	<b>Base Pts.</b>	<b>81</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>12</b>	<b>55</b>	<b>24</b>	<b>329</b>	<b>30</b>	<b>4,109</b>	<b>Ch. 6 Subtotal</b>
<b>601 Quality of Construction Materials and Waste</b>	<b>Cost/Point</b>											
601.0 Intent. Design and construction practices that minimize the environmental impact of the building materials are incorporated; environmentally efficient building systems and materials are incorporated; and waste generated during construction is reduced												
601.1 Conditioned floor area, as defined by ICC IRC												

ANSI National Green Building Standard™	258	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(1) Less than or equal to 1,000 square feet	15	15										1BR is 658 sf; all units <1,000 sf
(2) Less than or equal to 1,500 square feet	12											
(3) Less than or equal to 2,000 square feet	9											
(4) Less than or equal to 2,500 square feet	6											
(5) Greater than 4,000 square feet (373 m <sup>2</sup> )	Mandatory											
For every 100 square feet over 4,000 sf, one point is to be added to Table 303, category 7 for each performance level.												
<b>Multi-Unit Building Note:</b> For a multi-unit building, use a weighted average of the individual unit sizes in qualifying for available points.												
<b>601.2 Material Usage.</b> Building-code-compliant structural systems or advanced framing techniques that optimize material usage are implemented. Points awarded for each system or framing technique implemented.	3 pts per system (9 pts max)	9	0									roof truss, floor truss @24" and 2x6 at 24" See S3.
601.3 Building dimensions and layouts are designed to reduce material cuts and waste.												
(1) When used for at least 80% of floor area	3									3	1,040	Allowed 24 prof. hours for redesign for these efficiencies.
(2) When used for at least 80% of wall area	3									3	1,040	
(3) When used for at least 80% of roof area	3											
(4) When used for at least 80% of cladding or siding area	3									3	1,040	
(5) When used for at least 80% of penetrations or trim area	1											
601.4 Detailed framing or structural plans, material quantity lists and onsite cut lists for framing, structural materials, and sheathing materials are provided.	4									4	0	Detailed structural plans and prefabbed floors and roofs. Missing wall details. Include in redesign for material efficiency.
601.5 Pre-cut or pre-assembled components, or panelized or precast assemblies are utilized for 90% for the following system or building.												
(1) Floor system.	4	4	0									
(2) Wall system.	4									4	0	Precut studs are used for 3rd floor units, however, 1st floor walls are 9' and there is no detail re: precuts.
(3) Roof system.	4	4	0									
(4) modular construction for the entire building located above grade.	13											
(5) manufactured home construction for the entire building located above grade.	13											
<b>601.6 Stories above grade</b> are stacked, such as in 1 1/2 and 2 story or greater structures. The area of the upper story shall be at least 50% of the area of the story below, based on areas with a minimum ceiling height of 7 feet.	Max 8 points											
(1) First stacked story	4	4	0									
(2) for each additional story	2											
<b>601.7 Site applied finishing materials.</b> Building materials or assemblies that do not require additional site applied material for finishing are utilized.	Max 12 points											
(1) 90% or more of the installed material or assembly listed below:	5	5	0									Brickfront
(2) 50% to less than 90% of the installed building material or assembly listed below:	2	2	0									Prefinished metal siding at clubhouse.
(a) Pigmented, stamped, decorative, or final finish concrete or masonry.												
(b) Trim not requiring paint or stain.												
(c) Window, skylight, and door assemblies not requiring paint or stain on exterior and/or interior surfaces.		5	0									Vinyl windows.
(d) Wall coverings or systems not requiring paint or stain or other type of finishing application.												
601.8 Foundations such as frost-protected shallow foundations, pier and pad foundations, post foundations and other similar foundation types are designed and constructed.	3											
601.9 One or more of the following above grade wall systems that provide sufficient structural and thermal characteristics are used for at least 75% of the gross exterior wall area of the building:	4											
(1) Adobe												
(2) Concrete/Masonry												
(3) Logs												
(4) Rammed earth												
<b>602 Enhanced Durability and Reduced Maintenance</b>												
602.0 Intent. Design and construction practices are implemented that enhance the durability of materials and reduce in-service maintenance.												
602.1 Entries at exterior door assemblies, inclusive of side lights, are covered by one of the following methods below to protect the building from the effects of precipitation and solar radiation. A projection factor of at least 0.375 is provided. Eastern and western facing entries in Climate Zones 1, 2, and 3, as determined in accordance with Figure 6(1), shall have a projection factor of at least 1.0 unless otherwise protected from direct solar radiation by other means (e.g. screen wall, vegetation).	Maximum number of points 5											
(1) Installing a porch roof or awning.												
(2) Extending the roof overhang.												
(3) Recessing the exterior door.												
Main entrance door	3											
Additional covered door assembly	1											Hallway entry at unit, however, main building entry is not covered.
602.2 Roof overhangs, based on inches of rainfall in Table 602.2, are provided over at least 90% of exterior walls to protect the building envelope.	4											

ANSI National Green Building Standard™			258	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
			Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost		
Table 602.2														
Minimum Roof Overhang for One- & Two-Story Buildings														
Inches Rainfall*	Eave Overhang (Inches)	Rake Overhang (Inches)												
Less than 20	12	12												38.7" annual; overhang is 1" - parapet could be extended.
21 to 40	12	12							4	248				
41 to 70	18	12												
More than 70	24	12												
<b>602.3 Foundation Drainage</b>														
602.3.1 Where required by the IRC/IBC for habitable and usable spaces below grade, exterior drain tile is installed.			Mandatory											Met. Space not below grade.
602.3.2 Interior and exterior foundation perimeter drains are installed and sloped to discharge to daylight, dry well, or sump pit.			4					4	55					Spread over 3 stories up. Plan indicates that slab has exterior footing drain only. A5.1
602.4 Drip edge is installed at eaves and gable roof edges.			3	3	0									A5.1 indicates appropriate metal coping at parapet for roof type.
602.5 A gutter and downspout system with extensions, or splash blocks and effective grading, are provided to carry water at least 5 feet away from perimeter foundation walls.			4	4	0									Roof drains detailed
602.6 Finish grade at all sides of building is sloped to provide a minimum of 6 inches of fall within 10 feet of the edge of the building. Where lot lines, walls, slopes or other physical barriers prohibit 6 inches of fall within 10 feet, the final grade			Mandatory											Met.
602.7 Termite barrier. Continuous, physical foundation termite barrier used with or without low toxicity treatment is installed in geographical areas that have subterranean termite infestation potential determined in accordance with Figure 6(3).			4											Slight to moderate zone.
(1) In areas of slight to moderate termite infestation probability (as defined by Figure 6(3)) for the foundation, all structural walls, floors, concealed roof spaces not accessible for inspection, exterior decks, and exterior claddings within the first 2 feet above the top of the foundation.			2											
(2) In areas of moderate to heavy termite infestation probability (as defined by Figure 6(3)) for the foundation, all structural walls, floors, concealed roof spaces not accessible for inspection, exterior decks, and exterior claddings within the first 3 feet above the top of the foundation.			4											
(3) In areas of very heavy termite infestation probability (as defined by Figure 6(3)) for the foundation, all structural walls, floors, concealed roof spaces not accessible for inspection, exterior decks, and exterior claddings.			6											
602.9 Where required by the IRC/IBC, a water-resistive barrier and/or drainage plane system is installed behind exterior veneer and/or siding.			Mandatory											Met. A5.1
602.10 In areas where there has been a history of ice forming along the eaves causing a backup of water, an ice barrier is installed at roof eaves and is extended at least 24" inside the exterior wall line of the building, in accordance with the IRC/IBC.			Mandatory											Met. Roofing is modified bituminous. A5.1
602.11 Enhanced foundation waterproofing is installed:			4											
(1) Rubberized coating, or														
(2) Drainage mat.														
602.12 Flashing details are shown on plans and flashing is installed at all of the following locations, as applicable:			6	6	0									Various locations.
(1) Around exterior fenestrations, skylights and doors.														
(2) Roof valleys.														
(3) Deck/balcony to building intersections.														
(4) At roof-to-wall intersection and at roof-to-chimney intersections.														
(5) A drip cap is provided above windows and doors that are not Flashed or protected by covering per Section 602.1.														
602.13 Roof Surfaces. A minimum of 90% of roof surfaces are constructed of one or both of the following:			3											Could be a detriment in winter.
(1) Products which meet the requirements of the ENERGY STAR® cool roof certification or equivalent.														
(2) A green (landscaped) roof system.														
602.14 Recycling. Occupant recycling is facilitated by one or more of the following methods:														
(1) A built-in collection space in each kitchen and an aggregation/pick-up space in a garage, covered outdoor space or other area for recycling containers.			3							3	75			Provide for recycling in trash rooms.
(2) Compost facility provided on-site.			3											Composting isn't practical on this site.
<b>603 Reused or Salvaged Materials</b>														
603.0 Intent. Practices that reuse or modify existing structures, salvage materials for other uses, or use salvaged materials in building's construction are implemented.														
603.1 Existing buildings and structures are reused, modified or deconstructed in lieu of demolition. (One point awarded for every 200 sq. ft., 18.5m2, of floor area.)			1 (Max 12 points)											
603.2 Reclaimed and/or salvaged materials and components are used. Total material and labor cost of salvaged materials shall equal or exceed 1% of total construction costs.			3	3	0									Rubber playground surface and rebound carpet pad.

ANSI National Green Building Standard™	258	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
<b>603.3 Scrap Materials.</b> Facilitation for sorting and reuse of scrap building material (e.g. provide a central storage area or dedicated bins.)	4							4	6			Based on central bins for 39 units
<b>604 Recycled-Content Building Materials</b>												
604.1 Building materials with recycled content are used for at least two minor and/or two major components of the building (NOTE: Does not specify PConsumer. Implication is that max. allowable is 4 materials. 9 points is max. in scoring tool.)	Points per Table 604.1											
Table 604.1												
Recycled Content												
Material Percentage Recycled Content	Per 2 Minor	Per 2 Major										
25% - 50%	1	2						2	0			carpet and padding see note 1
50% - 75%	2	4						6	0			gypsum board and cellulose insulation. Note: specify correct gypsum board & cellulose in lieu of fiberglass.
75%	3	6										
<b>605.0 Intent.</b> Waste generated during construction is recycled.												
Note: All waste classified as hazardous shall be properly handled and disposed. (Points not awarded for hazardous waste removal.)												
<b>605.1 A Construction Waste Management Plan</b> is developed, implemented, and posted at the jobsite with a goal of recycling or salvaging a minimum of 50% (by weight) of construction and land-clearing waste.	6									6	989	
<b>605.2</b> Onsite recycling measures following applicable regulations and codes are implemented, such as the following:	7											
(a) Materials are ground or otherwise safely applied onsite as soil amendment or fill. At least 50% (by weight) of construction and land-clearing waste shall be diverted from landfill.										7	0	Cost varies with location. Implement with 605.1
(b) Other methods approved by the NAHB Research Center (the Adopting Entity).												
<b>605.3</b> Recycled Construction materials: Construction materials (e.g., wood, cardboard, metals, drywall, plastic, asphalt roofing shingles, or concrete) are recycled offsite.	Max 6											
(1) A minimum of two types of materials are recycled.	3							3	0			Recycle drywall and copper wire. Net savings is anticipated
(2) for each additional recycled material.	1							2	0			Recycle cardboard and wood
<b>606 Renewable Materials</b>												
<b>606.0 Intent.</b> Building materials derived from renewable resources are used.												
606.1 The following biobased products are used. (Note: 606.1 and 606.2 denote % of project mat'l cost req'd.)	Max 8											
(a) certified solid wood in accordance with Section 606.2												
(b) engineered wood												
(c) bamboo												
(d) cotton												
(e) cork												
(f) straw												
(g) natural fiber products made from crops (soy or corn-based)												
(h) products with the minimum biobased contents of the USDA 7 CFR Part 2902 (Approx. 7%)												
(i) other biobased materials with a minimum of 50 percent biobased content (by weight or volume).												
<b>606.1(1)</b> At least two types of biobased materials are used, each for more than .5% of the project's projected building material cost. <b>Combined 8 pts Max</b>	3	2	0									Interior trim package and doors
<b>606.1(2)</b> At least two types of biobased materials are used, each for more than 1% of the project's projected building material cost.	6	6	0									OSB & Kitchen cabinets.
<b>606.1(3)</b> For each additional biobased material used for more than .5% of the project's projected building material cost.	1 (2 pts max)											
<b>606.2 Wood-based products</b> are certified to the requirements of one of the following recognized product programs:												
(a) AFF American Tree Farm System®												
(b) Canadian Standards Association's Sustainable Forest Management System Standards (CAN/CSA Z809)												
(c) Forest Stewardship Council (FSC)												
(d) Program for Endorsement of Forest Certification Systems (PEFC)												
(e) Sustainable Forestry Initiative Program (SFI)												
(f) Other product programs mutually recognized by PEFC												
<b>606.2(1)</b> Where a minimum of two certified wood-based products are used for minor elements of the building, such as all trim, cabinetry, or millwork.	3											
<b>606.2(2)</b> Where a minimum of two certified wood-based products are used in major elements of the building, such as walls, floors, or roof.	4											

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		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
<b>606.3 Manufacturing Energy.</b> Materials are used for major components of the building that are manufactured using a minimum of 33% of the primary manufacturing process energy derived from renewable sources, combustible waste sources, or renewable energy credits (RECs). (2 points awarded per material.)	6 pts. max.					2	0					Specify that OSB comes from a mill that complies. Or, try carpet manufacturer.
<b>607 Resource-Efficient Materials</b>												
607.1 Products containing fewer materials are used to achieve the same end-use requirements as conventional products, including but not limited to: (3 points awarded for each material.)	Max 9 points											
(1) Lighter, thinner brick with bed depth less than 3 inches, brick with coring above 25%, or both.												
(2) Engineered wood or engineered steel products.		3										steel girders
(3) Roof or floor trusses.		6										Roof and floor trusses.
<b>608 Indigenous Materials</b>												
608.1 Indigenous materials are used for major elements of the building.	10 points max.											
(1) one type of material.		2				2	0					stone for driveway base
(2) For each additional material.		2				4	0					steel and brick at base
<b>609 Life Cycle Analysis</b>												
609.1 A more environmentally preferable product or assembly for an application based upon the use of a Life Cycle Assessment (LCA) tool compliant with ISO 14044 or other recognized standards that compare the environmental impact of building materials, as	Max 15 points											
(1) Per product/system comparison		3										
(2) Whole building LCA analysis		15										
<b>610 Innovative Practices</b>												
<b>610.1 Manufacturer's environmental management system concepts.</b> Product manufacturer's operations and business practices include environmental management system concepts and the production facility is ISO 14001 certified or equivalent. The aggregate value of building products from ISO 14001 certified or equivalent production facilities is at least 1% or more of the estimated total building materials cost. (1 point awarded for every percent.)	Max 10 points											
<b>CHAPTER 7: ENERGY EFFICIENCY</b>	<b>Base Pts.</b>	<b>19</b>	<b>0</b>	<b>32</b>	<b>2,882</b>	<b>53</b>	<b>2,240</b>	<b>51</b>	<b>5,399</b>	<b>36</b>	<b>3,426</b>	<b>Ch. 7 Subtotal</b>
701.1 Mandatory requirements. The building shall comply with either Section 702 (Performance Path) or Section 703 (Prescriptive Path). Items listed as "Mandatory" in Section 701.4 apply to both the Performance and Prescriptive Paths.												Use 703 path.
<b>701.1.1 Minimum Performance Path Requirements.</b> A building complying with Section 702 shall exceed the baseline minimum performance required by the IECC by 15%, and shall include a minimum of two practices from Section 704.												Only 10% better in the cost approach
<b>701.1.2 Minimum Prescriptive Path Requirements.</b> A building complying with section 703 shall obtain a minimum of 30 points from Section 703, and shall include a minimum of two practices from Section 704.												
<b>701.1.3 Alternative Bronze Level Compliance.</b> As an alternative, any building that qualifies as an ENERGY STAR qualified home or equivalent achieves the Bronze Level for Chapter 7.												
<b>701.2 Emerald Level Points.</b> The Performance Path shall be used to achieve to the Emerald Level.												
<b>Mandatory Practices</b>												
701.3 A review by the Adopting Entity or designated third party shall be conducted to verify design and compliance with Chapter 7.	Mandatory			0	520							4 hrs. prof time assumed.
<b>701.4.1 HVAC SYSTEMS</b>												
701.4.1.1 Space heating and cooling system/equipment shall be sized according to heating and cooling loads calculated using ACCA Manual J or equivalent.	Mandatory			0	0							Not apparent. Put requirement for Manual D and S in
701.4.1.2 Where installed, as a primary heat source in the building, radiant or hydronic space heating system is designed using industry-approved guidelines (e.g. ACCA Manual J, GAMA H-22, or an accredited design professional's and manufacturer's recommen	Mandatory	0										Doesn't apply.
<b>701.4.2 DUCT SYSTEM</b>												
701.4.2.1 Ducts are sealed with tape complying with UL 181, mastic, gaskets, or an approved system as required by the ICC IRC (Section M1601.3.1, or ICC IMC Section 603.9) to reduce leakage.	Mandatory			0	0							Not apparent, however, section . Spec
701.4.2.2 Building cavities are not used as supply ducts.	Mandatory	0										complies
<b>701.4.3 INSULATION and AIR SEALING</b>												
701.4.3.1 GENERAL Insulation and air sealing is in accordance with the following:												
(1) Insulation shall be installed in accordance with the manufacturer's instructions or local code, as applicable.	Mandatory	0										PM 15250-2. Complies
(2) Shafts (duct shaft, piping shaft/penetrations, flue shaft.) Openings to unconditioned space are fully sealed with solid blocking or flashing and any remaining gaps are sealed with caulk or foam. Fire-rated collars and caulking are installed where required.	Mandatory	0										Complies.
<b>701.4.3.2 FLOOR / FOUNDATION / CRAWLSPACE</b>												
(1) Floors (Including insulated floors above garages and cantilevered floors)	Mandatory	0										Complies

ANSI National Green Building Standard™	258	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(a) Insulation is installed to maintain permanent contact with the underside of the subfloor decking, enveloping any attached ductwork within the thermal envelope without compression or air gaps in the insulation. This practice does not apply to ducts or other mechanical equipment that are adjacent to the underside of the subfloor.												
(b) Batt and loose-fill insulation is held in place by permanent attachments or systems in accordance with the manufacturer's instructions.												
(2) Crawlspaces. Where insulated, crawlspace wall insulation is permanently attached to the walls. Exposed earth in unvented crawlspaces is covered with continuous vapor retarder with overlapping joints taped or masticed.		0										does apply.
<b>701.4.3.3 WALLS</b>												
(1) Windows and Doors. Caulking, gasketing, adhesive flashing tape, foam sealant, or weatherstripping is installed forming a complete air barrier.		0										Met
(2) Band Joist and Rim Joists. Band and rim joists are insulated and air sealed.		0										Met
(3) Between Foundation and Sill Plate Bottom Plate												
(a) Sill sealer, or other material that will expand and contract, shall be installed between foundation and sill plate.		0										Met
(b) Caulk or the equivalent is installed to seal the bottom plate of exterior walls.		0										Met
(4) Skylights and kneewalls. Skylight shafts and knee walls are insulated to the same level as the exterior walls.		0										Not applicable.
(5) Exterior Architectural features. Code required building envelope insulation and air sealing is not disrupted at exterior architectural features such as stairs and decks.				0	0							Not met. See flashing details, etc., however, no airseal spec.
<b>701.4.3.4 CEILINGS AND ATTICS</b>												
(1) Attic access (except unvented attics). Attic access, knee wall door, or drop down stair is covered with insulation and gasketed. Knee wall door is insulated unit or is covered with insulation.		0										Complies. Access is from trash rooms off hallways. Units are sealed.
(2) Recessed Lighting. Recessed light fixtures that penetrate the thermal envelope are airtight, IC rated, and sealed with gasket, caulk, or foam.		0										Doesn't apply.
(3) Eave vents. Where ceiling/attic assemblies or designs have eave vents, baffles, or other means shall be utilized to minimize air movement into or under the insulation.		0										Unvented roof.
<b>701.4.4 FENESTRATION</b>												
701.4.4.1 The NFRC-certified U-factor and SHGC windows, exterior doors, skylights, and tubular daylighting devices (TDDs) are in accordance with ENERGY STAR, or equivalent, or Table 701.4.4.1. Decorative fenestration elements with a maximum area of 15 square feet or 10 percent of the total glazing area, whichever is less, are not required to comply with this practice.		0										Complies
<b>Table 701.4.4.1</b>												
Fenestration Specifications												
Climate Zones		U-Factor	SHGC									
		Windows and Exterior Doors (maximum certified ratings)										
1 and 2		0.65	0.4									
3		0.4	0.4									
4 to 8		0.35	Any									
		Skylights and TDDs (max. certified ratings)										
1 to 3		0.75	0.4									
4 to 8		0.6	Any									
<b>702 Performance Path</b>												
702.1 Points from Section 702 (Performance Path) shall not be combined with points from Section 703 (Prescriptive Path).												Comply - prescriptive for base.
702.2 Energy efficiency features are implemented to achieve energy cost performance that exceeds ICC IECC by the following. A documented analysis using software in accordance with ICC IECC, Section 404, or ICC IECC Section 506.2 through 506.5, applied as defined in the ICC IECC, is required.												
(1) 15%				30	2,362	(30)						R-60 ceiling insulation; U-value of windows =.30; ACH5=4.0; HSPF=8.2; 6% duct leakage.
(2) 30%		30					60	2,240	(60)			NOTE: Requires utility change to natural gas from electric; 1" foam sheathing; window SHGC =.30; 14SEER A/C & 96% furnace; 65% gas water heater, direct vent. (Note: may require window redesign for gas vent clearance.)
(3) 50%		60							100	5,399	(100)	R75 ceiling; ACH50=3; 3% duct leakage; 95% heating/85%water heating boiler w/16sf of closed loop solar; 14SEER; Note: estimated \$500 for extra controls of hydronics - unit cost similar to 96% furnace.
(4) 60%		100										64sf ICS; 2" foam sheathing; 16 SEER;
<b>703 Prescriptive Path</b>												
										120	2,827	

ANSI National Green Building Standard™	258	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
703.1 Building envelope. Where the total building thermal envelope UA is less than required by ICC IECC, Section 402.1.4, the total building thermal envelope UA is in accordance with Table 703.1.1. Where insulation is used to achieve these percentages, a third-party grading of the installation as achieving Grade 1 is required. A documented analysis is performed using RES Check version 4.0.1 or later, or equivalent, based on a comparison to the ICC IECC, IRC, or IBC.	Points per Table 703.1.1											
	Sect. 703 pts.	3										
	Practices 704	3										
	Table 703.1.1											
	UA											
	Climate Zone											
	Zone 2	Zone 3										
10% UA improvement	10 points	12 points										
20% UA improvement	20 points	24 points										
	Zone 4	Zone 5-6										
10% UA improvement	14 points	16 points	0	0								14.7% envelope savings over 2004 IECC
20% UA improvement	28 points	32 points										no ua improvement per Rescheck.
	Zone 7-8											
10% UA improvement	18 points											
20% UA improvement	36 points											
703.1.2 The insulation installation is graded by a third party and is in accordance with Sections 703.1.2.1, 703.1.2.2, 703.1.2.3, and/or 703.1.2.4, as applicable. (Points not awarded in this section if already awarded under Section 703.1.1)	Points per Table 703.1.2											
	Table 703.1.2											
	Insulation Installation Grades											
	Grade	Points										
	1	15										
	2	10										
	3	0										
703.1.2.1 Both Grade 1 and Grade 2 installations are in accordance with the following:												
(a) Grades apply to cavity fill insulation, continuous rigid insulation, and any other field-installed insulation products. Grading applies to ceilings, walls, rim joists, conditioned basements and crawlspaces, except as specifically noted. Inspection shall be conducted before insulation is covered.												
(b) Insulation is installed in accordance with the manufacturer's instructions and/or industry standards.												
(c) Wall cavity insulation is enclosed on all six sides, and is in substantial contact with the sheathing material on one or more sides (interior or exterior) of the cavity.												
703.1.2.2 Grade 1 installation in accordance with the following:												
(a) Insulation uniformly fills each cavity side-to-side and top-to-bottom, without substantial gaps or voids around obstructions (such as blocking or bridging).												
(b) Compression or incomplete fill amounts to no more than 2% or less, presuming the compression or fill is at least 70% of the intended fill thickness; occasional small gaps are acceptable.												
(c) Exterior rigid insulation shall have substantial contact with the structural framing members or sheathing materials, and is tightly fitted at joints.												
(d) Cavity insulation is split, installed, and/or fitted tightly around wiring and other services.												
(e) Exterior sheathing is not visible from the interior through gaps in the cavity insulation.												
(f) Faced batt insulation is permitted to have side-stapled tabs, provided the tabs are stapled neatly with no buckling, and provided the batt is only compressed at the edges of each cavity, to the depth of the tab itself.												
(g) ICFs, SIPs, and other wall systems that provide integral insulation comply with "Grade 1" insulation installation requirements where properly installed.												
(h) "Grade 1" insulation must meet or exceed all requirements of "Grade 2" insulation.												
703.1.2.3 Grade 2 installation is in accordance with the following:												
(a) A maximum of 2% of the surface area of insulation is missing. Compression or incomplete fill amounts to 10 percent or less, presuming the compression or fill is a minimum of 70 percent of the intended fill thickness.												
(b) In conditioned basement or crawlspace the following apply:												
(i) insulation is installed in complete contact with the subfloor surfaces.												
(ii) Floor insulation over vented or ambient conditions is enclosed on six sides.												
(c) Floor insulation over unconditioned basements is not required to be enclosed on six sides.												
(d) Ceiling insulation is not required to be enclosed when the insulation is installed in complete contact with the drywall or plywood surfaces it is intended to insulate.												

ANSI National Green Building Standard™	258	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(e) Eave baffles or equivalent construction is installed to prevent wind washing.												
(f) Installation with occasional installation defects is permitted: gaps around wiring, electrical outlets, plumbing and other intrusions; rounded edges or shoulders.												
703.1.2.4 Grade 3 installation is in accordance with the following:												
(a) Standard insulation installation not in accordance with Grade 1 or Grade 2 criteria.												
703.1.3 More than 75% of the above-grade exterior opaque wall area of the building is mass walls.	Points per Table 703.1.3											
<b>Table 703.1.3</b>												
Exterior Mass Walls												
	<b>Mass Construction</b>											
	3 in. to <6 in.	6 in.										
Climate Zones 1, 2, 3, 4 except marine, and 5 dry.	4	6										
Climate Zones 4 marine, 5 except dry, and 6.	3	5										
Climate Zones 7 and 8	0	0										
<b>703.2 Insulation &amp; Air Sealing</b>												
703.2.1 Insulation and air sealing is installed in accordance with all of the following, as applicable:												
(1) Third party verification performed.	15											Cost for planning in 701. Cost for inspection in Chapter 10.
(2) No third party verification performed.	3	3	0	(3)								
703.2.1.1 GENERAL												
703.2.1.1.1 Air Barrier and Thermal Barriers												
(1) Thermal insulation is installed in substantial contact with interior and exterior air barrier to provide continuous alignment of the insulation with the air barrier. The following are deemed to be their own air barrier:												
(a) Any spray or rigid foam insulation with an air permeance of 0.02 L/s-m2 or less at 75 Pa.												
(b) ICFs, SIPs, and other wall systems that provide their own air barrier, except at interfaces with other materials or assemblies, or penetrations.												
(c) Spray foam that complies with the following:												
(i) continuously attached to the top, bottom and both sides of the cavity												
(ii) Continuous in the cavity without any unrepaired breaks.												
(iii) air impermeable												
(d) Air impermeable insulation.												
(2) Voids or areas of incomplete fill (less than 30% of full thickness) are 2% or less of the insulated area.												
(3) Insulation is in substantial contact with sheathing materials on one or more sides.												
(4) Any exterior rigid insulation is tightly fitted or interlocking at the joints.												
703.2.1.1.2 Plumbing and Wiring												
(1) At a minimum, insulation is placed between the outside (ceiling, wall, or floor) and the pipes.												
(2) Batt insulation is split or cut to fit around wiring and plumbing.												
(3) Sprayed insulation is installed to encapsulate pipes where the pipe temperature is 180 degrees F (82.2C) or less. Wiring is fastened in place to prevent displacement prior to spraying.												
703.2.1.1.3 Narrow cavities are filled and batts are cut to fit.												
703.2.1.1.4 HVAC register boots that penetrate the building envelope are caulked or sealed to the subfloor or drywall.												
703.2.1.1.5 Masonry fireplace equipped with gasketed doors, outside combustion air, and a chimney top damper.												
703.2.1.2 Air barrier is installed at any exterior edge of insulation at floors, foundations, and crawlspaces including insulated floors above garages and cantilevered floors.												
703.2.1.3 WALLS												
(1) Exterior walls behind the tub/shower are insulated and include an interior and exterior air barrier.												
(2) Air sealed type electrical outlet boxes are installed or the air barrier extends completely behind the boxes. Insulation is placed between the sheathing and the rear of electrical or phone boxes located on exterior walls. Electrical outlet boxes are												
(3) Duplex and townhouse construction: In the common walls between dwelling units (e.g., gypsum shaft wall) an air barrier is installed to seal the gap between the common wall and the structural framing.												
(4) Skylight shafts and knee walls are air sealed. Insulation on attic knee walls and skylight shafts are physically supported by stapling in place, netting or using other mechanical attachment.												
(5) Fireplace walls: Air barrier that is aligned with insulation; any gaps are sealed with caulk or foam.												
703.2.1.4 CEILINGS and ATTICS												
(1) At dropped ceilings and soffits, the air barrier is substantially aligned with insulation and any gaps are sealed with caulk, foam, or tape.												



ANSI National Green Building Standard™			258	Baseline		Bronze		Silver		Gold		Emerald		NOTES:	
			Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost			
(2) Access to vented attics, including knee wall doors, and/or drop down stairs, is caulked, gasketed, or otherwise sealed.															
(3) An insulated cover is gasketed or sealed to the attic opening where a whole building or whole dwelling unit fan penetrates into the attic.															
(c) 50 percent			3 Add'l Pts												
<b>703.3 FENESTRATION</b>															
703.3.1 The NFRC-certified U-factor and SHGC for windows, exterior doors, skylights, and tubular daylighting devices (TDDs) are in accordance with Table 703.3.1(a) or (b). Decorative fenestration elements with a maximum of 15 square feet or 10% of the to			Points Per Tables 703.3.1(a) or 703.3.1(b)												
<b>Table 703.3.1(a) - Enhanced Fenestration Specifications</b>															
U-Factor and SHGC		Climate Zone													
Windows and Exterior Doors (maximum certified ratings)															
0.45	0.30	1 and 2		8											
0.35	0.30	3		8											
0.30	Any	4 and 5		5	0										
0.30	Any	6 and 8		6											
Skylights and TDDs (maximum certified ratings)															
0.55	0.35	1 to 3		included above											
0.55	Any	4 to 8													
<b>Table 703.3.1(b) - Enhanced Fenestration Specifications</b>															
U-Factor and SHGC		Climate Zone													
Windows and Exterior Doors (maximum certified ratings)															
0.45	0.25	1 and 2	10												
0.35	0.25	3	10												
0.25	Any	4 and 5	10												
0.25	Any	6 thru 8	12												
Skylights and TDDs (maximum certified ratings)															
0.50	0.35	1 to 3	included above												
0.50	Any	4 to 8													
<b>703.4 HVAC Equipment Efficiency</b>															
703.4.1 Combination Space Heating and Water Heating System ("Combo" System) is installed using either a coil from the water heater connected to an air handler to provide heat for the building or dwelling unit, or a space heating boiler using an indirect fired water heater. Devices shall have a combined annual efficiency of 0.80.			4												
703.4.2 Furnace and/or boiler efficiency is in accordance with one of the following:															
<b>(1) Table 703.4.2(1) Gas and propane heaters:</b>															
Table 703.4.2(1) - Gas / Propane Heaters		Points per Table 703.4.2(1)													
Climate Zone	AFUE	Points													
1	≥90%	0													
1	≥92%	0													
1	≥94%	0													
2	≥90%	2													
2	≥92%	2													
2	≥94%	3													
3	≥90%	5													
3	≥92%	6													
3	≥94%	7													
4	≥90%	8													
4	≥92%	9													
4	≥94%	10													
5	≥90%	11													
5	≥92%	12													
5	≥94%	14													
6 through 8	≥90%	14													
6 through 8	≥92%	15													
6 through 8	≥94%	17													
<b>Table 703.4.2(2) Oil Furnace:</b>															
Table 703.4.2(2) - Oil Furnace:		Points per Table 703.4.2(2)													
Climate Zone	AFUE	Points													
1	≥83%	0													
1	≥90%	0													
2	≥83%	1													
2	≥90%	2													
3	≥83%	3													
3	≥90%	5													
4	≥83%	3													
4	≥90%	8													
5	≥83%	7													
5	≥90%	11													
6 through 8	≥83%	7													
6 through 8	≥90%	14													
<b>(3) Gas Boiler:</b>															
Table 703.4.2(3) - Gas Boiler		Table 703.4.2(3)													

ANSI National Green Building Standard™		258	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
Climate Zone	AFUE	Points	Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
1	≥85%	0											
1	≥90%	0											
1	≥94%	0											
2	≥85%	1											
2	≥90%	2											
2	≥94%	3											
3	≥85%	3											
3	≥90%	5											
3	≥94%	7											
4	≥85%	4											
4	≥90%	8											
4	≥94%	10											
5	≥85%	6											
5	≥90%	11											
5	≥94%	14											
6 through 8	≥85%	7											
6 through 8	≥90%	14											
6 through 8	≥94%	17											
<b>Table 703.4.3.2(4) Oil Boiler:</b>		Points per Table 703.4.2(4)											
<b>Table 703.4.2(4) - Oil Boiler</b>													
Climate Zone	AFUE	Points											
1	≥85%	0											
1	≥90%	0											
2	≥85%	1											
2	≥90%	2											
3	≥85%	3											
3	≥90%	5											
4	≥85%	4											
4	≥90%	8											
5	≥85%	6											
5	≥90%	11											
6 through 8	≥85%	7											
6 through 8	≥90%	14											
703.4.3 Boiler equipped with temperature reset control or burner delay control.		1											
703.4.4 Heat pump heating efficiency is in accordance with Table 703.4.4. Refrigerant charge is verified to be in conformance with manufacturer's instructions.		Points per Table 703.4.4											
<b>Table 703.4.4 - Heat Pump Heating</b>													
Climate Zone	Efficiency	Points											
1	8.2HSPF 11.5EER	0											
1	9.0HSPF 12.5EER	0											
2	8.2HSPF 11.5EER	1											
2	9.0HSPF 12.5EER	2											
3	8.2HSPF 11.5EER	2											
3	9.0HSPF 12.5EER	5											
4	8.2HSPF 11.5EER	5											
4	9.0HSPF 12.5EER	10											
5	8.2HSPF 11.5EER	7*											
5	9.0HSPF 12.5EER	11*											
6 through 8	8.2HSPF 11.5EER	7*											
6 through 8	9.0HSPF 12.5EER	12*											
*Zones 5-8 require consideration for use of resistance heat in cold climates when installing a heat pump.													
703.4.5 Cooling efficiency is in accordance with one of the following. Refrigerant charge is verified for conformance with manufacturer's instructions.		Points per Table 703.4.5(1)											
<b>Table 703.4.5(1) - Air Conditioner and Heat Pump Cooling</b>													
Climate Zone	SEER (EER)	Points											
1	14 (11.5)	8											
1	15 (12.5)	12											
1	17 (12.5)	18											
1	19 (12.5)	24											
2	14 (11.5)	6											
2	15 (12.5)	10											
2	17 (12.5)	14											
2	19 (12.5)	18											
3	14 (11.5)	2											
3	15 (12.5)	4											
3	17 (12.5)	6											
3	19 (12.5)	8											
4	14 (11.5)	2											
4	15 (12.5)	3											
4	17 (12.5)	4											
4	19 (12.5)	4											
5	14 (11.5)	1											
5	15 (12.5)	2											
5	17 (12.5)	3											
5	19 (12.5)	3											
6 through 8	14 (11.5)	1											
6 through 8	15 (12.5)	2											
6 through 8	17 (12.5)	3											
6 through 8	19 (12.5)	3											

ANSI National Green Building Standard™	258	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(2) Water Source and Cooled Air Conditioners	<b>Points per Table</b>											
<b>Table 703.4.5(2) - Water Source and Cooled Air Conditioners</b>												
Climate Zone	EER, COP	<b>Points</b>										
1	15 4.0	<b>18</b>										
2	15 4.0	<b>14</b>										
3	15 4.0	<b>6</b>										
4	15 4.0	<b>4</b>										
5	15 4.0	<b>3</b>										
6 through 8	15 4.0	<b>3</b>										
703.4.6 Ground source heat pump is installed by a Certified Geothermal Service Contractor in accordance with one of the following ENERGY STAR levels:												
(1) Open loop; ≥16.2 EER and ≥ 3.6 COP		<b>20</b>										
(2) Closed loop; ≥14.1 EER and ≥ 3.3 COP		<b>20</b>										
(3) Direct expansion; ≥15.0 EER and ≥ 3.5 COP		<b>20</b>										
(4) Any type (open, closed or direct expansion); ≥24 EER and ≥ 4.3 COP		<b>30</b>										
703.4.7 ENERGY STAR, or equivalent, ceiling fans are installed. (Points awarded per building.)		<b>1</b>										
703.4.8 Whole building or whole dwelling unit fan(s) with insulated louvers and a sealed enclosure is installed. (Points awarded per building.)		<b>2</b>										
703.4.9 In multi-unit buildings, an advanced electric and fossil fuel submetering system is installed to monitor electricity and fossil fuel consumption for each unit. At a minimum, the information is available to the occupants on a monthly basis.												
(1) Install a device providing monthly consumption information.		<b>1</b>										
(2) Install a device that can provide near real-time energy consumption information.		<b>4</b>										
703.4.10 An ENERGY STAR, or equivalent, programmable thermostat is installed to control each heating and cooling zone. (Points awarded per dwelling unit.)		<b>1</b>										
<b>703.5 Water Heating Design, Equipment, and Installation</b>												
703.5.1 Water heater Energy Factor (EF) is equal to or greater than the following:		<b>Points Per Tables 703.5.1(1)(a) or 703.5.1(1)(b)</b>										
(1) Gas Water Heating												
<b>Table 703.5.1(1)(a) - Gas Water Heating</b>												
(Storage with input rate of 75,000 Btu/hr or less or instantaneous input rate of 200,000 Btu/hr or less)												
Size (gallons)	Energy Factor	<b>POINTS</b>										
30 to < 40	0.64	<b>1</b>										
40 to < 50	0.62	<b>1</b>										
50 to < 65	0.6	<b>1</b>										
65 to < 75	0.58	<b>1</b>										
75	0.56	<b>1</b>										
Any	0.8	<b>10</b>										
<b>Table 703.5.1(1)(b) - Gas Water Heating</b>												
(Storage with input rate of greater than 75,000 Btu/hr or instantaneous input rate greater than 200,000 Btu/hr)												
Size (gallons)	Thermal Efficiency	<b>POINTS</b>										
Any	82-86%	<b>1</b>										
Any	> 86%	<b>10</b>										
(2) Electric Water Heating		<b>Points Per Tables</b>										
<b>Table 703.5.1(2) - Electric Water Heating</b>												
Size (gallons)	Energy Factor	<b>POINTS</b>										
30 to < 40	0.95	<b>1</b>										
40 to < 50	0.94	<b>1</b>										
50 to < 65	0.92	<b>1</b>										
65 to < 80	0.9	<b>1</b>										
80 to < 100	0.88	<b>1</b>										
100	0.86	<b>1</b>										
(3) Oil Water Heating		<b>Points per Table</b>										
<b>Table 703.5.1(3) - Oil Water Heating</b>												
Size (gallons)	Energy Factor	<b>POINTS</b>										
30 to < 50	0.59	<b>1</b>										
50	0.55	<b>1</b>										
(4) Heat Pump Water Heating		<b>Points per Table</b>										
<b>Table 703.5.1(4) - Heat Pump Water Heating</b>												
Energy Factor		<b>POINTS</b>										
Heat Pump	1.5	<b>7</b>										
Heat Pump	2	<b>10</b>										
703.5.2 Desuperheater, s installed by a qualified installer or is pre-installed in the factory.		<b>Points per Table 703.5.2</b>										
<b>Table 703.5.2 - Desuperheater</b>												
Climate Zone		<b>Points for Desuper heater</b>										
Zone 1-4		<b>5</b>										
Zone 5-8		<b>2</b>										
703.5.3 Drain-water heat recovery system is installed in multi-family units. (Points awarded per building.)		<b>2</b>										
703.5.4 Insulating hot water pipes												

ANSI National Green Building Standard™	258	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
703.5.4.1 Hot water lines are insulated with a minimum of R-4 insulation.	1											
703.5.4.2 Boiler supply piping is insulated in unconditioned spaces.	1											
703.5.5 Indirect fired water heater storage tanks heated from boiler systems are installed.	1											
<b>704 Additional Practices</b>												
<b>704.1 Application of Additional Practice Points.</b> Points from Section 704 can be added to points earned in Section 702 (Performance Path), Section 703 (Prescriptive Path) or Section 701.1.3 (alternative Bronze Level compliance).												
<b>704.2 Lighting and Appliances</b>												
704.2.1 Hard-wired lighting meets one of the following:												
(1) A minimum of 50% of the total hard-wired lighting fixtures, or the bulbs in those fixtures, qualify as ENERGY STAR or equivalent.	4			4	0							incandescent and cfl bulbs cost approx. the same.
(2) A minimum of 50% of the total hard-wired lighting fixtures qualify as ENERGY STAR or equivalent.	8											
(3) A minimum of 80% of the exterior lighting wattage has an efficiency of at least 40 lumens per watt or be a solar powered light fixture. <b>Pts. not stated - under appeal 12/09</b>												
704.2.2 The number of recessed light fixtures that penetrate the thermal envelope are less than 1 per 400 square feet of total conditioned floor area and are in accordance with Section 701.4.3.4(2).	2	2	0									
704.2.3 Occupancy sensors are installed on indoor lights, and photo or motion sensors are installed on outdoor lights to control lighting.												
(1) 25% of lighting	2											
(2) 50% of lighting	4											
704.2.4 Tubular daylighting device (TDD) or skylight with sealed, insulated, low-E glass is installed in rooms without windows. (Points awarded per building.)	2											
704.2.5 ENERGY STAR or equivalent appliance(s) are installed:												
(1) Refrigerator	5											11402 2.2 all appliances to be Whirlpool EStar, however, some noted model numbers were not EStar classed.
(2) Dishwasher	2	2	0									
(3) Washing machine	4											
704.2.6 Induction cooktop is installed.	1											
704.2.7 Occupancy sensors are installed for a minimum of 80% of hardwired lighting outlets.	1											
<b>704.3 Renewable Energy/Solar Heating and Cooling</b>												
<b>704.3.1 Solar space heating and cooling.</b>												
704.3.1.1 Sun-tempered Design: Building orientation, sizing of glazing, and design of overhangs are in accordance with all of the following:	5											
(1) The long side (or one side if of equal length) of the building faces within 20° of true south.												
(2) Vertical glazing area is between 5% and 7% of gross Conditioned Floor Area on the south face (also see Section 704.3.1.1(8)).												
(3) Vertical glazing area is less than 2% of gross Conditioned Floor Area on the west face, and glazing is ENERGY STAR compliant or equivalent.												
(4) Vertical glazing area is less than 4% of gross Conditioned Floor Area on the east face and glazing is ENERGY STAR compliant or equivalent.												
(5) Vertical glazing area is less than 8% of gross Conditioned Floor Area on the north face, and glazing is ENERGY STAR compliant or equivalent.												
(6) Skylights, where installed, are in accordance with the following:												
(a) Shades and insulated wells are used and all glazing is ENERGY STAR compliant or equivalent.												
(b) Horizontal skylights are less than 0.5 % of Finished Ceiling Area												
(c) Sloped skylights on slopes facing within 45° of true South, East or West are less than 1.5% of the Finished Ceiling area												
(7) Overhangs or adjustable canopies or awnings or trellises provide shading on south facing glass for the appropriate climate zone in accordance with Table 704.3.1.1:												
<b>Table 704.3.1.1 Southern Window Overhang Depth</b>												
Climate Zone and Overhang Depth												
1 through 3 2' 8"												
1 through 3 2' 8"												
1 through 3 2' 4"												
1 through 3 2' 0"												
1 through 3 2' 0"												
4 through 6 2' 4"												
4 through 6 2' 4"												
4 through 6 2' 0"												

ANSI National Green Building Standard™			258	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
				Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
4 through 6	2' 0"	≤4' 4"												
4 through 6	1' 8"	≤3' 4"												
7 and 8	2' 0"	≤7' 4"												
7 and 8	1' 8"	≤6' 4"												
7 and 8	1' 8"	≤5' 4"												
7 and 8	1' 4"	≤4' 4"												
7 and 8	1' 0"	≤3' 4"												
(8) The south face windows have a SHGC of 0.40 or higher.														
(9) Return air or transfer grilles/ducts are in accordance with Section 704.4.5.														
704.3.1.2 Automated solar protection is installed to provide shading for windows.			1											
704.3.1.3 Passive cooling design features are in accordance with three or more of the following:														
Points for three items:			3											
Points for one additional item:			1											
(1) Exterior shading is provided on east and west windows using one or a combination of the following strategies:														
(a) Vine covered trellises with the vegetation separated a minimum of 1 foot from face of building.														
(b) Moveable awnings or louvers														
(c) Covered porches														
(d) Attached or detached conditioned/unconditioned enclosed space that provides full shade of east and west windows (e.g., detached garage, shed or building)														
(2) Overhangs are installed to provide shading on south-facing glazing in accordance with Section 704.3.1.1(7). (Points not awarded if points are taken under 704.3.1.1.)														
(3) Windows and/or venting skylights are located to facilitate cross ventilation.														
(4) Solar reflective roof or radiant barrier is installed in Climate Zones 1, 2 or 3 and roof material meets a 3 year aged criteria of 0.50.														
(5) Internal exposed thermal mass is a minimum of three inches in thickness. Thermal mass consists of concrete, brick, and/or tile that are fully adhered to a masonry base or other masonry material and is in accordance with one or a combination of the to														
(a) A minimum of one square foot of exposed thermal mass of floor per three square feet of gross finished floor area.														
(b) A minimum of three square feet of exposed thermal mass in interior walls or elements per square foot of gross finished floor area.														
(6) Roofing material is installed with a minimum 0.75 inch continuous air space offset from the roof deck from eave to ridge.														
704.3.1.4 Passive solar heating design. In addition to the sun-tempered design features in Section 704.3.1.1, all of the following are implemented:			4											
(1) Additional glazing, no greater than 12%, is permitted on the south wall. This additional glazing is in accordance with the requirements in Section 704.3.1.1.														
(2) Additional thermal mass for any room with south-facing glazing of more than 7% of the finished floor area is provided in accordance with the following:														
(a) Thermal mass is solid and a minimum of 3" in thickness. Where two thermal mass materials are layered together (e.g. ceramic tile on concrete base) to achieve the appropriate thickness, they are fully adhered to (touching) each other.														
(b) Thermal mass directly exposed to sunlight must be provided in the following minimum ratios:														
(i) Above latitude 35°: 5 square feet of thermal mass for every 1 square foot of south facing glazing.														
(ii) Latitude 30° to 35°: 5.5 square feet of thermal mass for every 1 square foot of south facing glazing.														
(iii) Latitude 25° to 30°: 6 square feet of thermal mass for every 1 square foot of south facing glazing.														
(c) Thermal mass not directly exposed to sunlight is permitted to be used to achieve thermal mass requirements of Section 704.3.1.4 (2) based on a ratio of 40 square feet of thermal mass for every 1 square foot of south facing glazing.														
(3) In addition to return air or transfer grilles/ducts required by Section 704.3.1.1, provisions for forced airflow to adjoining areas are implemented as needed.														
704.3.2 Solar water heating														
704.3.2.1 Solar water heater. SRCC (Solar Rating & Certification Corporation) OG 300 rated, or equivalent, solar domestic water heating system is installed. Solar Energy Factor (SEF as defined by SRCC) is in accordance with Table 704.3.2.1.														
<b>Table 704.3.2.1 - Solar Hot Water Systems</b>														
SEF - Electric Tank		SEF - Gas Tank	<b>POINTS</b>											

ANSI National Green Building Standard™		258	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
			Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
1.30 - 1.50	0.85 - 1.00	8							8				Cost is in performance section 702.
1.51 - 1.80	1.01 - 1.20	11											
1.81 - 2.30	1.21 - 1.50	14											
2.31 - 3.00	1.51 - 2.00	17											
3.01	2.01	20											
<b>704.3.3 Additional renewable energy options</b>													
704.3.3.1 Photovoltaic panels are installed on the property. (Points awarded per every 100 watts DC of the rated PV system)		1											
704.3.3.2 Other onsite renewable energy source is installed (e.g., wind energy, onsite micro-hydro power, active solar space heating systems). (Points awarded per every 1/10 kW of the system)		0.5											
<b>704.4 Ducts</b>													
704.4.1 Duct system is sized, designed, and installed according to ACCA Manual D or equivalent.		5					5	0					Spec
704.4.2 Space heating is provided by a system that does not include air ducts.		15											Gas boiler still uses ducts for blown air.
704.4.3 Space cooling is provided by a system that does not include air ducts.		15											
704.4.4 Ductwork is in accordance with all of the following:		12											
(1) Building cavities are not used as return ductwork.													
(2) Heating and cooling ducts and mechanical equipment are installed within the conditioned building space .			12	0									
(3) Ductwork is not installed in exterior walls													
704.4.5 Return ducts or transfer grilles are installed in every room with a door. This practice does not apply to bathrooms, kitchens, closets, pantries, and laundry rooms.		5									5	74	
<b>704.5 HVAC Design and Installation</b>													
704.5.1 ACCA Manual S or equivalent is used to select heating and/or cooling equipment.		1			1	0							Add to specs with Manual J requirement.
704.5.2 HVAC contractor and service technician are certified by a nationally or regionally recognized program such as North American Technician Excellence, Inc. (NATE), Building Performance Institute (BPI), Radiant Panel Association, or manufacturers' tr		1					1	0					Spec
704.5.3 Performance of the heating/cooling system is verified by the HVAC contractor in accordance with all of the following:		3									3		
(1) Start-up procedure is performed according to manufacturer's instructions.													
(2) Refrigerant charge is verified by super-heat and/or sub-cooling method.													
(3) Burner is set to fire at nameplate input.													
(4) Air handler setting/fan speed is set per manufacturer's instructions.													
(5) Total air flow is within 10% of design flow.													149
(6) Total external system static does not exceed equipment capability at rated airflow.													
704.5.4 HVAC equipment operates using an alternate refrigerant containing no HCFCs. (Points awarded only until January 20, 2010.)		1					1	0					Spec
704.5.5 Manufacturer's label or printed specifications for sealed air handler (except furnaces) indicates the leakage is less than or equal to 2% of design airflow at a pressure of 1-inch w.g. (1250 Pa). Air handlers are tested with inlets, outlets, an		4											
<b>704.6 Installation and Performance Verification</b>													
704.6.1 Third party onsite inspection is conducted to verify conformance with all of the following, as applicable. Minimum of 2 inspections are performed. One inspection after insulation is installed and prior to being covered, and another inspection upon completion of the project. Where multiple building or dwelling units of the same model are built by the same builder, a representative sample inspection of a minimum of 15% of the buildings or dwelling units is permitted.		5					5	0					
(1) Ducts are installed per IRC/IMC and ducts are sealed.													Cost of air sealing is in 702.
(2) Building envelope air sealing is installed.													
(3) Insulation is installed in accordance with Section 703.1.2													
(4) Windows, skylights, and doors are flashed, caulked, and sealed in accordance with manufacturer's recommendations and in accordance with Section 703.2.1.													
<b>704.6.2 Third party testing is conducted to verify performance.</b>													
704.6.2.1 Building envelope leakage rate is demonstrated by blower door test. In addition to the test, the following practices are required:													
1. Whole building ventilation is provided in accordance with Section 902.2.													
2. Fossil fuel furnace and water heater is sealed combustion or power vented in accordance with Section 901.1.													Need to upgrade water heater for power vent.
3. Fireplaces and Fuel Burning Appliances are in accordance with 901.2.													
<b>The maximum leakage rate is in accordance with:</b>													

ANSI National Green Building Standard™		258	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
			Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(a) 5 ACH50	0.25 nat	3											
(b) 4 ACH50	0.2	6					6	0	(6)				
(c) 3 ACH50	0.15	9							9	0			Costs are included in performance rating in 702
(d) 2 ACH50	0.1	12											
(e) 1 ACH50	0.05	15											
704.6.2.2 The entire central HVAC duct system, including air handlers and register boots, is tested for leakage at a pressure differential of 0.1 inches w.g. (25 Pa). The maximum leakage as a percent of the system design flow rate is in accordance with													
(1) 6% for ductwork entirely outside the building's thermal envelope.		15											
(2) 6% for ductwork entirely inside the building's thermal envelope.		5					5	0					Standard design feature.
(3) 6% for ductwork both inside and outside the building thermal envelope.		15											
704.6.2.3 Balanced HVAC air flows are demonstrated by flow hood or other acceptable flow measurement tool. Test results in accordance with both of the following:													
(a) Measured flow at each supply and return register is within 25% of design flow.		8									8	376	4 hours for a technician crew (2)
(b) Total airflow is within 10% of design flow.													
<b>705 Innovative Practices</b>													
<b>705.1 Energy consumption control.</b> A whole building or whole dwelling unit device is installed that controls or monitors energy consumption.													
		7 Points Max											
(1) Programmable communicating thermostat		2											
(2) Energy monitoring device		4											
(3) Energy management control system		7											
705.2 Renewable energy service plan is as follows:													
(1) Builder selects a renewable energy service plan provided by the local electrical utility for interim (temporary) electric service. The builder's local administrative office has renewable energy service.		2											
(2) The buyer of the home selects a renewable energy service plan provided by the utility prior to occupancy of the home.		5											
<b>CHAPTER 8: WATER EFFICIENCY</b>		<b>Base Pts.</b>	<b>10</b>	<b>0</b>	<b>12</b>	<b>175</b>	<b>15</b>	<b>(77)</b>	<b>6</b>	<b>64</b>	<b>18</b>	<b>2,065</b>	<b>Ch. 8 Subtotal</b>
<b>801 Indoor and Outdoor Water Use</b>		<b>Cost/Point</b>											
801.0 Intent. Measures that reduce indoor and outdoor water usage are implemented.													
801.1. Indoor hot water usage is reduced by one of the following practices:													
(1) All hot water piping which runs to the plumbing fixtures in both the kitchen and bathrooms is 40-feet or less in length from the water heater and is sized in accordance with the code for the specified application.		2	2	0									
(2) All hot water piping which runs to the plumbing fixtures in both the kitchen and bathrooms is 30-feet or less from the water heater and is sized in accordance with the code for the specified application.		3											B1 complies here, but other units have longer runs.
(3) One of the following piping system designs is implemented:													
(a) Use of structured-type plumbing with demand controlled hot water loops, in which the volume of water contained in the pipe and fixture fittings downstream of the recirculating trunk line is a maximum of 4 cups (0.25 gallons).		6											
(b) Implement an engineered parallel piping system (i.e. manifold system) in which the hot water line distance from the water heater to the parallel piping system is less than 15 feet and the parallel piping to the fixture fittings contains a maximum of 8		6											
(c) Central core plumbing system with all plumbing fixture fittings (e.g., faucets & showerheads) located such that the volume of water contained in each pipe run between the water heater and fixture fitting is a maximum of 6 cups (0.38 gallons).		8											
(4) Pipe runs exceeding 40-feet from the water heater to fixture locations are aided by one of the following:		1											
(a) Tankless water heater is installed at point of use and is served only by cold water or a solar-assisted system.													
(b) On demand hot water recirculation system is installed.													
801.2 Energy Star® or equivalent water-conserving appliances are installed													
(1) Dishwasher		2	2	0									
(2) Washing machine		8											
(3) Washing machine with a water factor of 6.0 or less		12									12	1300	
801.3 A minimum of one food waste disposer is installed at the primary kitchen sink.		1	1										E1.5a
<b>801.4 Showerheads</b>													
801.4 (1&2) 1) The total showerhead flow rate at any point in time, for all showerheads in each shower compartment is less than 2.5 gpm, tested at 80 psi per ASME A112.18.1/CSA B125.1. 2) In addition the showerheads must be equipped with an automatic com		1 Point (3 Points Max)	1	0									Specced flow rate is 2. gpm
801.4 (3&4) All shower compartments in the home comply with 801.4 (1&2).													
(3) All shower compartments installed meet the above conditions and are 2.0 to less than 2.5 gpm.		1 Add'l Pt	1	0									

ANSI National Green Building Standard™	258	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(4) All shower compartments installed meet the above conditions and are 1.6 to less than 2.0 gpm.	2 Add'l Pts											Respec for lower shower flow rate.
<b>801.5 Faucets</b>												
801.5.1 Water-efficient lavatory faucets with 1.5 gpm or less maximum flow rate when tested at 60 psi in accordance with ASME A112.18.1 are installed.												
(1) a bathroom (Points awarded for each bathroom.)	3 Pts Max	1	0									
(2) all lavatory faucets in the home meet the conditions of 801.5.1	2 Add'l Pts	2	0									
801.5.2 Self-closing valve, motion sensor, metering, or pedal-activated faucet is installed to enable intermittent on/off operation. (Points awarded per fixture.)	1 3 Pts Max											
<b>801.6 Water closets and urinals.</b> Water closets and urinals are in accordance with the following: (For water closets, points awarded for either Section 801.6 or 802.2, but not both.)												
(1) Gold and Emerald Levels: All water closets and urinals are in accordance with either Section 801.6 or 802.2.	Mandatory											Met at bronze.
(2) A water closet is installed with an effective flush volume of 1.28 gallons or less when tested in accordance with ASME A112.19.2 (all water closets) and ASME A112.19.14 (all dual flush water closets), and is in accordance with EPA WaterSense Tank-Type High-Efficiency Toilet. (Points awarded per fixture.)	6 18 Pts Max			6	175							Install low flow toilet
(3) A urinal is installed with a flush volume of 0.5 gallons or less when tested in accordance with ASME A112.19.2.	4 Max 4 Points											
4) All water closets and all urinals are in accordance with Section 801.6(2) or Section 801.6(3), as applicable.	6 Add'l Points			6	0							
<b>801.7 Irrigation systems</b>												
801.7.1 A low-volume, irrigation system is installed for each landscape type utilized: (Points awarded for each type of irrigation system installed.)	10 Pts. Max											
(1) High distribution uniformity (DU) rotating spray heads	2											
(2) Drip irrigation	4									4	77	Add 3K over all units in bldg.
(3) Bubblers	4											
(4) Drip emitters	4											
(5) Soaker hose	4									4		
(6) Subsurface irrigation	6											
801.7.2 Irrigation system is in accordance with both of the following:	3									3		
1) designed by a professional in accordance with EPA WaterSense requirements or equivalent												
2) installed in accordance with EPA WaterSense program or equivalent												
801.7.3 Irrigation system is zoned separately for turf and bedding areas.	2									2		
801.7.4 The irrigation system(s) is controlled by a smart controller:												
(1) Evapotranspiration (ET) based irrigation controller with a rain sensor	4									4		
(2) Soil moisture sensor based irrigation controller	4											
(3) No irrigation is installed and a landscape plan is developed in accordance with Section 503.5(1) as applicable. (Points must be taken in 503.5(1) in order to receive points for 801.7.4(3))	15					15	(77)			-15	77	There is a pop up irrigation system. It was assumed to have cost \$3,000 due to the small area of coverage. It should be omitted.
<b>801.8 Rainwater collection and distribution is provided.</b>												
(1) Rainwater is collected and used	6								6	64		\$382 per approx. 6 units; roof drainage plan not evident.
(2) Rainwater is distributed using a renewable energy source or gravity.	2									2	0	
801.9 Water Filters. Water filter is installed to improve water quality for the whole building or whole dwelling unit.	1											
<b>802.1 Gray water (as specified in ICC IRC, Appendix O) is separated and reused, as permitted by local building code. (Points awarded for either Section 802.1(1) or 802.1(2), not both)</b>												
(1) Each water closet flushed by reclaimed or recycled water.	4 Points (per fixture)											
(2) Irrigation from reclaimed or recycled water onsite	10											
<b>802.2 Composting or waterless toilets and/or urinals.</b> Composting or waterless toilets and/or urinals are in accordance with the following: (For water closets, points awarded for either Section 802.2 or 801.6, but not both)												
1) Gold and emerald levels: All water closets and urinals are in accordance with either Section 802.2 or Section 801.6.	Mandatory											
2) Composting or waterless toilet and/or urinal is installed. (Points awarded per fixture)	8											
3) All toilets and urinals are in accordance with Section 802.2 (2).	8 Add'l Points											
<b>802.3 Automatic shutoff water devices.</b> One of the following automatic shutoff water supply devices is installed. Where a fire sprinkler system is present, installer is to ensure the device will not interfere with the operation of the fire sprinkler system												
(1) Excess Water Flow Shutoff										2	611	
(2) Leak Detection System												
<b>CHAPTER 9: INDOOR ENVIRONMENTAL QUALITY</b>	<b>Base Pts.</b>	46	0	0	0	45	0	27	395	26	3,950	<b>Ch. 9 Subtotal</b>



ANSI National Green Building Standard™	258	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
<b>901 Pollutant Source Control</b>	<b>Cost/Point</b>											
901.0 Intent. Pollutant sources are controlled.												
901.1 Space and water heating options												
901.1.1 Natural draft space heating or water heating equipment is not located in conditioned spaces, including conditioned crawl spaces. Natural draft equipment is permitted to be installed within the conditioned spaces if located in a mechanical room that has an outdoor air source, and is otherwise sealed and insulated to separate it from the conditioned space(s).	5											
901.1.2 Air handling equipment or return ducts are not located in the garage, unless placed in isolated, air-sealed mechanical rooms with an outside air source.	5	5	0									not in garage.
901.1.3 The following combustion space heating and water heating equipment is installed within conditioned space. (1) Direct vent furnace or boiler (2) (a) Power vent water heater (b) Direct vent water heater	5 3 5					5 5	0 0					At switch to gas (silver), DHW must be direct vent.
901.1.4 The following electric equipment is installed: 1) Heat pump air handler in unconditioned space 2) Heat pump air handler in conditioned space	2 5											
901.2 Fireplaces and Fuel Burning Appliances (except cooking appliances, clothes dryers, water heaters, and furnaces) located in conditioned space are code compliant, vented to the outdoors, and have adequate combustion and ventilation air provided to minimize spillage or back-drafting, in accordance with the following: <b>All of the following items are mandatory, if applicable, for certification.</b>												
901.2.1(1) Natural gas and propane fireplaces that are power vented or direct vented, are equipped with permanently fixed glass fronts or gasketed doors, and comply with ANSI Z21.88/CSA 2.33a or ANSI Z21.50/CSA 2.22	7											N/A
901.2.1(2)(a) Wood burning fireplaces are equipped with gasketed doors designed to operate with the doors closed, outside combustion air, and a means is provided for sealing the flue to minimize interior air (heat) loss when not in operation.	4											N/A
901.2.1(2)(b) Factory-built wood burning fireplaces are in accordance with the certification requirements of UL 127 and are EPA certified.	6											N/A
901.2.1(2)(c) Wood stove and fireplace inserts, as defined in UL 1482, Section 3.8 are in accordance with the certification requirements of UL 1482 and are in accordance with the emission requirements of the EPA Certification and the State of Washington W	6											N/A
901.2.1(2)(d) Pellet (biomass) stoves and furnaces are in accordance with the requirements of ASTM E1509 or are EPA Certified.	6											N/A
901.2.1(2)(e) Masonry heaters are in accordance with the definitions in ASTM E1602 and ICC IBC, Section 2112.1.	6											N/A
901.2.2 Fireplaces, woodstoves, pellet stoves, or masonry heaters are not installed.	7	7	0									Met
901.3 Garages are in accordance with the following: 901.3(1)(a) Where installed in the common wall between the attached garage and conditioned space, the door is tightly sealed and gasketed. 901.3(1)(b) A continuous air barrier is provided between walls and ceilings separating the garage space from the conditioned living spaces. 901.3(1)(c) For one and two-family dwelling unit attached garages, a 100 cfm or greater ducted, or 70 cfm or greater unducted wall exhaust fan is installed and vented to the outdoors, designed and installed for continuous operation, or has controls (e.g., motion detectors, pressure switches) that activate operation for a minimum of 1 hour when either human passage door or roll-up automatic doors are operated. For ducted exhaust fans, the fan airflow rating and duct sizing are in accordance with Appendix A. (If you claim points for 901.3(1)(c), you cannot claim points for 901.3(2).)	Mandatory 2 Points  Mandatory 2 Points  4											N/A n/a
901.3(2) A carport is installed, the garage is detached from the building, or no garage is installed. (If you claim points for 901.3(2), you cannot claim points for 901.3(1)(a), 901.3(1)(b), or 901.3(1)(c).	10	10	0									
901.4(2-6) Wood Materials. A minimum of 85% of material within a product group (i.e. wood structural panels, countertops, composite trim/doors, custom woodwork, and/or component closet shelving) is manufactured in accordance with the following: 901.4(1) Structural plywood used for floor, wall, and/or roof sheathing is compliant with DOC PS 1 and/or DOC PS 2. OSB used for floor, wall, and/or roof sheathing is compliant with DOC PS 2. The panels are made with moisture-resistant adhesives. The trademark indicates these adhesives as follows: Exposure 1 or Exterior for plywood, and Exposure 1 for OSB. (2) Particleboard and MDF (medium density fiberboard) is manufactured and labeled in accordance with CPA A208.1 and CPA A208.2, respectively.	10 points max.  Mandatory  2 Points per Product Group											

ANSI National Green Building Standard™	258	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(3) Hardwood plywood is in accordance with HPVA HP-1 and HUD Title 24, Part 3280.	2 Points per Product Group											
(4) Particleboard, MDF, or hardwood plywood is in accordance with CPA 2.	3 Points per Product Group											
(5) Composite wood or agrifiber panel products contain no added urea-formaldehyde or are in accordance with the CARB Composite Wood Air Toxic Contaminant Measure Standard.	4 Points per Product Group					4	0					Interior doors and trim and cabinets.
(6) Non-emitting products.	4 Points per Product Group	4	0									
901.5 Carpets are in accordance with the following: 901.5(1) Wall-to-wall carpeting is not installed adjacent to water closets and bathing fixtures .	Mandatory	0										Complies
901.5(2) A minimum of 85% of installed carpet area, carpet cushion (padding), and carpet adhesives are in accordance with the emission levels of CDPH 01350, as certified by a third-party program, such as the Carpet and Rug Institute's (CRI) Green Label Pl												
(a) Carpet	6					6	0					
(b) Carpet cushion	2					2	0					
(c) Carpet adhesives	2					2	0					Because carpet should be specced for recycled content see that it complies here, as well.
901.6 Hard-surface flooring. A minimum of 85% of installed hard-surface flooring is in accordance with the emission concentration limits of CDPH 01350 (using the office scenario), as certified by a third-party program, such as the RFCI's FloorScore Indoor Air Certification Program or the Greenguard Environmental Institute's Children and Schools Certification Program.	6									6	1,987	Specify kitchen and baths to meet this. Currently showing SV (sheet vinyl?) on architecturals with specs not sustainable; area is approx. 321 sf. at \$2.50 differential.
901.7 Wall coverings. A minimum of 85% of wall coverings are in accordance with the emission concentration limits of CDPH 01350 (using the office scenario), as certified by a third-party program, such as the Scientific Certification Systems (SCS) Indoor Advantage Gold Program or the Greenguard Environmental Institute's Children and Schools Certification Program.	4									4	1,513	Specify gypsum to meet this; must be similar to densarmor, etc. (used manufacturer's estimate of \$2.30 for CFA for cost)
901.8 Architectural coatings. A minimum of 85% of the architectural coatings are in accordance with one of the following conditions: 901.8.1 Site-applied interior products are in accordance with one or more of the following:	5									5	329	Specify in CSIs. allowed .50/sf
(1) Zero VOC, determined by EPA Method 24 (VOC content)												
(2) CARB Suggested Control Measure for Architectural Coatings												
(3) GS-11												
(4) VOC limits in accordance with:												
(a) 50 grams/liter flat												
(b) 100 grams/liter non flat												
(c) 350 grams/liter clear wood varnish												
(d) 550 grams/liter clear wood lacquer												
901.8.2 Site-applied interior products are in accordance with the emissions levels of CDPH 01350, as certified by a third party program such as the Scientific Certification Systems (SCS) Indoor Advantage Gold Program or the Greenguard Environmental Institute's Children and Schools Certification Program.	8											
901.9 Adhesives and Sealants.												
901.9.1 For exterior low-VOC adhesives and sealants, a minimum of 85% of site-applied products used for the installation of subfloors and on the exterior of the project are in accordance with one of the following:	5								5			
(1) The California Air Resources Board consumer products regulation as follows:												
a) Construction Adhesives: VOC content not to exceed 7% by weight or 75 grams/liter, whichever is greater.										108		
b) The VOC content of reactive sealants (i.e., silicones, polyurethanes, and hybrids, such as MS Polymer and silylated polyurethane resin or SPUR) not to exceed 4% by weight or 50 grams/liter, whichever is greater.												
c) The VOC content of all other caulks and sealants not to exceed 2% by weight or 30 grams/liter, whichever is greater.										4		1/2 Case of caulk (add to base).
(d) The VOC content of contact adhesives not to exceed 55% by weight or 480 grams/liter, whichever is greater.												
(2) GS-36												
901.9.2 Interior Low-VOC Adhesives and Sealants. For interior low VOC adhesives and sealants, a minimum of 85% of site-applied products used within the interior of the building are in accordance with one of the following, as applicable:												
1) CDPH 01350, as certified by a third party program, such as Scientific Certification Systems (SCS) Indoor Advantage Gold Program or the Greenguard Environmental Institute's Children and Schools Certification Program.	5											
(2) GS-36	5											

ANSI National Green Building Standard™	258	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
901.10 Cabinets. A minimum of 85% of kitchen and bath vanity cabinets are in accordance with one of the following: <b>(Where more than one of the following practices is used, the practice with the fewer number of points is awarded)</b>												
(1) Kitchen and bath vanity cabinets in accordance with KCMA ESP 01, or equivalent, are installed.	2					2	0	(2)				Specify.
(2) Kitchen and bath vanity cabinets in accordance with CARB Composite Wood Air Toxic Contaminant Measure Standard are installed.	3											
(3) Kitchen and bath vanity cabinets are installed that contain no added urea formaldehyde or are in accordance with GGPS.EC.010.R0, ASTM D6670, or equivalent.	5							5	0			Require better spec on cabinets
901.11 Insulation is in accordance with the following:												
(1) Formaldehyde emissions of wall, ceiling, and floor insulation materials are in accordance with the emissions levels of CDPH 01350, as certified by a third-party program, such as the GREENGUARD Environmental Institute's Children and Schools Certification Program or the Scientific Certifications Systems (SCS) Indoor Advantage Gold Program.	4							4	0			Specify. Note that most ducts are in conditioned space, so duct insulation will be minimal. Note planning time is thought to be burden here- project o/h not reported.
(2) Formaldehyde emissions of duct insulation materials are in accordance with the emissions levels of CDPH 01350, as certified by a third-party program, such as the GREENGUARD Environmental Institute's Children and Schools Certification Program or the Scientific Certifications Systems (SCS) Indoor Advantage Gold Program.	1							1	0			Specify
901.12 A carbon monoxide (CO) alarm is installed in a central location outside of each separate sleeping area in the immediate vicinity of the bedrooms. The CO alarm(s) is located in accordance with NFPA 720 and is hard-wired with a battery back-up. The alarm device(s) is certified by a third party for conformance with either CSA 6.19 or UL 2034.	3					3	0					CO detector is standard, however move to bedroom vicinity.
901.13 Building entrance pollutants control. Pollutants are controlled at all main building entrances by one of the following methods:												
(1) Exterior grilles or mats are installed in a fixed manner and may be removable for cleaning.	1							1	44			
(2) Interior grilles or mats are installed in a fixed manner and may be removable for cleaning.	1											
901.14 Non-smoking areas. All interior common areas of a multi-unit building are designated as non-smoking areas with posted signage.	1					1	0					Assumption is that local legislation requires this.
<b>902 Pollutant Control</b>												
902.0 Intent. Pollutants generated in the building are controlled.												
902.1.1 Spot ventilation is in accordance with the following:												
(1) Bathrooms (including powder rooms) are vented to the outdoors. The minimum ventilation rate is 50 cfm for intermittent operation or 20 cfm for continuous operation in bathrooms.	Mandatory			0								Align specs with this.
(2) Clothes dryers are vented to the outdoors.	Mandatory	0										Complies.
(3) Kitchen exhaust units and/or range hoods are ducted to the outdoors and have a minimum ventilation rate of 100 cfm for intermittent operation or 25 cfm for continuous operation.	8											
902.1.2 Bathroom and/or laundry exhaust fan is provided with an automatic timer and/or humidistat:	9 Points Max											
1) for first device	5							5	90			timer is standard, but with a run time vent makes more sense to install humidistat, as well.
2) for each additional device	2											
902.1.3 Kitchen range, bathroom, and laundry exhaust are verified to specification. Ventilation airflow at the point of exhaust is tested to a minimum of 100 cfm intermittent or 25 cfm continuous for kitchens, and 50 cfm intermittent or 20 cfm continuous	8							8	149			2 field personell 2 hours. Note: kitchen cfm probably high for unit size.
902.1.4 Exhaust fans are ENERGY STAR as applicable.	Max. 6 Points											
(1) ENERGY STAR, or equivalent, fans (Points awarded per fan)	2											
(2) ENERGY STAR, or equivalent, fans operating at or below 1 sone (Points awarded per fan)	3											
902.2. Building ventilation systems.												
902.2.1 One of the following whole building ventilation systems is implemented and is in accordance with the specifications of Appendix B. (Points must be claimed in 902.2.1 to claim points in 902.2.2.												
(1) Exhaust or supply fan(s) ready for continuous operation and with appropriately labeled controls.	8	8	0									Runtime ventilation is standard.
(2) Balanced exhaust and supply fans with supply intakes located in accordance with the manufacturer's guidelines to not introduce polluted air back into the building.	10											
(3) Heat-recovery ventilator.	15											
(4) Energy-recovery ventilator.	17											

ANSI National Green Building Standard™	258	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
902.2.2 Ventilation airflow is tested to achieve the design fan airflow at point of exhaust in accordance with Appendix B. <b>(Points must be claimed in 902.2.1 to claim points in 902.2.2)</b>	8									8	94	2 techs 1 hour.
902.2.3 MERV filters 8 or greater are installed on central air systems. Designer or installer is to verify that the HVAC equipment is able to accommodate the greater pressure drop of MERV 8 filters.	3					3	0					
902.3 Radon control. Radon control measures are in accordance with ICC IRC Appendix F. (Zones are defined in Figure 9(1)).												
902.3(1) Buildings located in Radon Zone 1 have a radon system installed.	Mandatory	0										Cuyoga cty is moderate, zone 2
(a) A passive radon system is installed.	10											
(b) An active radon system is installed.	15											
902.3(2) Buildings located in Zone 2.												
(a) A passive radon system is installed.	10											
902.4 HVAC system protection. One of the following HVAC system protection measures is performed:												
(1) HVAC supply registers (boots), return grilles, and rough-ins are covered during construction activities to prevent dust and other pollutants from entering the system. <b>Note: Points not allowed for both 902.4(1) and (2)</b>	0											
(2) Prior to owner occupancy, HVAC supply registers (boots), return grilles, and duct terminations are inspected and vacuumed. In addition, the coils are inspected and cleaned and the filter is replaced if necessary.	3					3	0					Add to spec
902.5 Central vacuum systems. Central vacuum system is installed and vented to the outside.	5											
902.6 Living space contaminants. The living space is sealed to prevent unwanted contaminants.												
(1) Attic access, knee wall door, or drop down stair is caulked, gasketed, or otherwise sealed.	2											N/a - attic access is in public area closets - may not apply.
(2) All penetrations (e.g., top plates, HVAC register boots, recessed can lights, are sealed in the following areas:												
(a) Attic/ceiling	2					2	0					Included in air sealing cost 702.
(b) Wall	2					2	0					
(c) Floors	2					2	0					
903 Moisture Management: Vapor, Rainwater, Plumbing, HVAC												
903.0 Intent. Moisture and moisture effects are controlled.												
903.1 Tile backing materials installed under tiled surfaces in wet areas are in accordance with ASTM C1178, C1278, C1288, or C1325.	Mandatory	0										Doesn't Comply. Needs to be specified
903.2 Capillary breaks												
903.2.1 A capillary break and vapor retarder are installed at all concrete slabs in accordance to the following:	Mandatory	0										Doesn't comply - better spec needed.
1) A minimum 4-inch thick bed of ½ inch diameter or greater clean aggregate, covered with polyethylene or polystyrene sheeting in direct contact with the concrete slab, with the sheeting joints lapped in accordance with Section 903.3. (or)												
2) A minimum 4-inch thick uniform layer of sand, overlain with a layer or strips of geotextile drainage matting, covered with polyethylene sheeting, with the sheeting joints lapped according to Section 903.3.												
Modification for 1&2:												
a. In areas with free-draining soils, identified as Group 1 in the ICC IRC by a certified hydrologist, soil scientist, or engineer through a site visit, a gravel bed or geotextile matting is not required.												
b. In Dry climate locations, as defined by Figure 6(1), polyethylene sheeting is not required unless required for radon resistance (Section 902.3).												
903.2.2 Add a capillary break on footing to prevent moisture migration into foundation wall.	3									3	27	Add to specifications.
903.3 Crawlspace												
903.3.1(1) Minimum 6-mil vapor retarder installed on the crawl space floor and extended up the wall sufficient to allow the material to be affixed with glue and furring strips. Joints of vapor retarder overlap a minimum of 6 inches and are taped.	6											
903.3.1(2) Damp-proof walls are provided below finished grade. Joints of vapor retarder overlap a minimum of 6 inches and are taped.	Mandatory	0										Doesn't comply. Add to specs.
903.3.2 Crawlspace that is built as a conditioned area is sealed to prevent outside air infiltration and provided with conditioned air at a rate not less than 0.02 cfm per square foot of horizontal area and one of the following is implemented:												n/a
(1) A concrete slab over lapped 6 mil polyethylene or polystyrene	10											
(2) 6-mil polyethylene sheeting, lapped a minimum of 6 inches and taped at the seams.	8											
903.4 Moisture control measures.												
903.4.1(1) Building materials with visible mold are not installed or are cleaned or encapsulated prior to concealment and closing.	2 Points					2	0					Add to specs.

ANSI National Green Building Standard™	258	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
903.4.1(2) Walls are not enclosed (e.g. with drywall) if the insulation has a high moisture content. Wet insulation products are dry before enclosing.	Mandatory 2 Points	0	0									Add to specs. Note points were not assigned because fg batts were specced, and thus n/a was checked. Technically, any insulation must be kept of the weather, thus points might be applied here.
903.4.1(3) The moisture content of lumber is sampled to ensure it does not exceed 19 % prior to the surface and/or wall cavity enclosure.	4					4	0					Include in site superintendents responsibilities
903.4.2 Moisture content of subfloor, substrate, or concrete slabs is in accordance with the appropriate industry standard for the finish flooring to be applied.	2					2	0					Add to specs.
903.5 Plumbing.												
903.5.1 Plumbing distribution lines are not installed in exterior wall cavities.	2	2	0									P201.
903.5.2 Cold water pipes in unconditioned spaces are insulated to a minimum of R-4 with pipe insulation or other covering that adequately prevents condensation.	2											n/a
903.5.3 Plumbing is not installed in unconditioned spaces.	5	5	0									P201.
903.6(1) Duct insulation. All HVAC ducts, plenums, and trunks in unconditioned attics, basements, and crawlspaces are insulated to a minimum of R-6. Outdoor air supplies to ventilation systems are insulated to a minimum of R-6.	Mandatory	0										Complies all ducts are in conditioned.
903.6(2) Duct insulation. All HVAC ducts, plenums, and trunks in unconditioned attics, basements, and crawlspaces are insulated to a minimum of R-8. Outdoor air supplies to ventilation systems are insulated to a minimum of R-8.	2											
903.7 Relative Humidity. In climate zones 1A, 2A, 3A, 4A, and 5A as defined by Figure 6(1), equipment is installed to maintain relative humidity (RH) at or below 60% using one of the following:	8 Points											n/a
903.9.1 In "Warm-Humid" climates as defined by Figure 6(1) equipment is installed to maintain Relative Humidity (RH) at or below 60% using one of the following:												
(1) Additional dehumidification system(s)												
(2) Central HVAC system equipped with additional controls to operate in dehumidification mode.												
904 Innovative Practices												
904.1 A humidity monitoring system is installed with a mobile base unit that displays a reading of temperature and relative humidity at the base unit with a minimum of two remote units. One remote unit that is placed permanently inside the conditioned space in a central location, excluding attachment to exterior walls, and another remote unit is placed permanently outside of the conditioned space.	2											
904.2 Kitchen exhaust unit(s) that equal or exceeds 400 cfm, and make-up air is provided.	2											
<b>CHAPTER 10: OPERATION, MAINT., AND BUILDING OWNER EDUCATION</b>	<b>Base Pts.</b>	6	0	10	250	0	0	0	0	0	0	Ch. 10 Subtotal
<b>1002 TRAINING OF BUILDING OWNERS ON OPERATION AND MAINTENANCE FOR ONE- AND TWO-FAMILY</b>	<b>6</b>											
1002.1 Training of building owners. Building owners/occupants are familiarized with the green building goals and strategies implemented and the impacts of the occupants' practices on the costs of operating the building. Training is provided to the responsible party(ies) regarding all equipment operation and control systems. Systems include, but are not limited to, the	6	6	0									
(1) HVAC filters.												
(2) Thermostat operation and programming.												
(3) Lighting controls.												
(4) Appliances and settings.												
(5) Water heater settings.												
(6) Fan controls.												
<b>1003 Construction, Operation and Maintenance Manuals and Training for Multi-Unit Buildings</b>												
<b>1003.0 Intent.</b> Manuals are provided to the responsible parties (owner, management, tenant, and/or maintenance team) regarding the construction, operation, and maintenance of the building. Paper or digital format manuals are to include information regarding those aspects of the building's construction, maintenance, and operation that are within the area of responsibilities of the respective recipient. One or more responsible parties are to receive a copy of all documentation for archival purposes.												
<b>1003.1 Building construction manual.</b> A building construction manual, including five or more of the following, is compiled and distributed in accordance with Section 1003.0.	1			1	100							
(1)A narrative detailing the importance of constructing a green building, including a list of green building attributes included in the building. This narrative is included in all responsible parties' manuals.	Mandatory			0.5								
(2) A local green building program certificate as well as a copy of the <i>National Green Building Standard</i> ™, as adopted by the Adopting Entity, and the individual measures achieved by the building.	Mandatory			0.5	150							

ANSI National Green Building Standard™	258	Baseline		Bronze		Silver		Gold		Emerald		NOTES:
		Points	Cost	Points	Cost	Points	Cost	Points	Cost	Points	Cost	
(3) Warranty, operation, and maintenance instructions for all equipment, fixtures, appliances, and finishes.	Mandatory			0.5								
(4) Record drawings of the building.												
(5) A record drawing of the site including stormwater management plans, utility lines, landscaping with common name and genus/species of plantings.												
(6) A diagram showing the location of safety valves and controls for major building systems.				0.5								
(7) A list of the type and wattage of light bulbs installed in light fixtures.				0.5								
(8) A photo record of framing with utilities installed. Photos are taken prior to installing insulation and clearly labeled.												
<b>1003.2 Operations manual.</b> Operations manuals are created and distributed to the responsible parties in accordance with Section 1003.0. Between all of the operation manuals, five or more of the following options are included.												
<b>(Points awarded per two items. Points awarded for both mandatory and non-mandatory items.)</b>	1			1								
(1) A narrative detailing the importance of operating and living in a green building. This narrative is included in all responsible parties' manuals.	Mandatory			0.5								
(2) (A list of practices to conserve water and energy (e.g., turning off lights when not in use, switching the rotation of ceiling fans in changing seasons, purchasing ENERGY STAR appliances and electronics).	Mandatory			0.5								
(3) Information on methods of maintaining the building's relative humidity in the range of 30 percent to 60 percent.	Mandatory			0.5								
(4) Information on opportunities to purchase renewable energy from local utilities or national green power providers and information on utility and tax incentives for the installation of on-site renewable energy systems.				0.5								
(5) Information on local and on-site recycling and hazardous waste disposal programs and, if applicable, building recycling and hazardous waste handling and disposal procedures.				0.5								
(6) Local public transportation options.				0.5								
(7) Explanation of the benefits of using compact fluorescent light bulbs, LEDs, or other high-efficiency lighting.				0.5								
(8) Information on native landscape materials and/or those that have low water requirements.												
(9) Information on the radon mitigation system, where applicable.												
(10) A procedure for educating tenants in rental properties on the proper use, benefits, and maintenance of green building systems including a maintenance staff notification process for improperly functioning equipment.												
<b>1003.3 Maintenance manual.</b> Maintenance manuals are created and distributed to the responsible parties in accordance with Section 1003.0. Between all of the maintenance manuals, five or more of the following options are included.	1			1								
<b>(Points awarded per two items. Points awarded for both mandatory and non-mandatory items.)</b>												
(1) A narrative detailing the importance of maintaining a green building. This narrative is included in all responsible parties' manuals.	Mandatory			0.5								
(2) A list of local service providers that offer regularly scheduled service and maintenance contracts to ensure proper performance of equipment and the structure (e.g., HVAC, water heating equipment, sealants, caulks, gutter and downspout system, shower				0.5								
(3) User-friendly maintenance checklist that includes:												
a) HVAC filters												
b) thermostat operation and programming												
c) lighting controls												
d) appliances and settings												
e) water heater settings												
f) fan controls												
(4) List of common hazardous materials often used around the building and instructions for proper handling and disposal of these materials.												
(5) Information on organic pest control, fertilizers, deicers, and cleaning products.												
(6) Instructions for maintaining gutters and downspouts and the												
(7) Instructions for inspecting the building for termite infestation.												
(8) A procedure for rental tenant occupancy turnover that preserves the green features.												
(9) An outline of a formal green building training program for maintenance staff.												
<b>1004</b>												
<b>INNOVATIVE PRACTICES</b>												
<b>1004.1 (Reserved)</b>												





# APPENDIX B GREEN SCORING & COST

5 – Retrofit – climate zone #4

A. Silver Spring, Maryland

i. Unit 1



**HUD Green Remodeling Comparison  
8804 Glenville Climate Zone 4 Remodel**

2/22/2010

**ANSI-ICC-700-2008 National Green Building Standard™**

**Unit size** 485 sf  
**1 BR apt.** 2 occupants assumed  
**Energy Efficiency Minimum** e-ratio  
**Water Efficiency (gpd)**  
**IEQ Requirements**  
**Total**

Notes: e-ratio is the scale by which energy performance compares to a building constructed to IECC 2006 with 1.00 representing code min. gpd = gallons per day; occupancy is calced at number of bedrooms plus 1. Note that washer and dryer are not included. This rating is front notes compiled during one site visit with units occupied.

Baseline	Bronze	Silver	Gold	Emerald
2.15	1.72	1.42	1.23	1.08
51	41	34	29	26
Not Met	Met	Met	Met	Met

E-Ratio	1.67	1.20	1.08	0.99
Gallons	40	34	29	25
	Cost	Cost	Cost	Cost
Energy	1,387	1,400	2,743	2,329
Water	131	52	338	344
IEQ	981	0	0	0
<b>Cumulative total</b>	<b>2,499</b>	<b>3,951</b>	<b>7,032</b>	<b>9,704</b>
Cost/SF (\$)	5.15	8.15	14.50	20.01

ANSI National Green Building Standard™		Baseline	Bronze	Silver	Gold	Emerald	NOTES:
Energy Performance:	20%		1,387				Bronze. Replace both entry doors for airtight seal; reduce air infiltration to 0.90 ACHnat (a 30% improvement). Caulk or reseal windows as required, gaskets at receptacles; ducts within conditioned space (new ducting with 6% leakage and existing bulkheads). Note that there was indication that building cavities may have been used for ducts.
	34%			1,400			Silver: upgrade to 82% water heater - tankless.
	43%				2,743	(2,743)	Gold: 90% furnace; SEER 13 A/C;
	50%					5,072	Emerald: 96% furnace; SEER 16 A/C
Showerhead Flow Rate	2 gpm		79				Install 1.0 gpm showerhead
Faucet Flow Rate (bathroom)	2 gpm		52				Note: Aerators that restrict flow could reduce faucet costs.
Faucet Flow Rate (kitchen)	3 gpm			52			
Toilet Flush Rate	1.6 gpm					256	Install dual flush toilet.
EStar washer					338	(338)	New common washer in basement divided by 4 units.
EStar washer with WF<6						425	New common washer in basement divided by 4 units.

ANSI National Green Building Standard™		Baseline	Bronze	Silver	Gold	Emerald	NOTES:
901.1.1 Natural draft space heating or water heating equipment is not located in conditioned spaces, including conditioned crawl spaces. Natural draft equipment is permitted to be installed within the conditioned spaces if located in a mechanical room that has an outdoor air source, and is otherwise sealed and insulated to separate it from the conditioned space(s).	Mandatory		391				Bronze. Retrofit furnace into space provided within unit and seal with access door from laundry room. Prorata share of retrofitting laundry room with sealed room for water heaters. Or install new direct vent equipment.
901.5 Carpets are in accordance with the following:							Complies. Unit has vinyl over concrete slab.
901.5(1) Wall-to-wall carpeting is not installed adjacent to water closets and bathing fixtures .	Mandatory		0				
901.5(2) A minimum of 85% of installed carpet area, carpet cushion (padding),			0				
(a) Carpet	Mandatory		0				
(b) Carpet cushion	Mandatory		0				
(c) Carpet adhesives	Mandatory		0				
902.1.1 Spot ventilation is in accordance with the following:			0				
(1) Bathrooms (including powder rooms) are vented to the outdoors. The minimum ventilation rate is 50 cfm for intermittent operation or 20 cfm for continuous operation in bathrooms.	Mandatory		365				Install fan in bathroom. Include control. Use existing bulkheading and concrete saw through the wall. Use existing circuit?
(2) Clothes dryers are vented to the outdoors.	Mandatory		0				Complies. Dryer is not in unit.
(3) Kitchen exhaust units and/or range hoods are ducted to the outdoors and have a minimum ventilation rate of 100 cfm for intermittent operation or 25 cfm	Mandatory		134				Add 100 cfm fan at exhaust grill in kitchen.
902.1.2 Bathroom and/or laundry exhaust fan is provided with an automatic timer and/or humidistat:	Mandatory		0				See 902.1.1(1)
902.4(2) Prior to owner occupancy, HVAC supply registers (boots), return grilles, and duct terminations are inspected and vacuumed. In addition, the coils are inspected and cleaned and the filter is replaced if necessary.	Mandatory		91				Vacuum ducts, service coils and change filter. Allowed 2 hours of labor plus 1 of HVAC tech.
904.3 Renovation Note: Existing unsealed combustion gas dryer vents related to renovations.			0				
(1) Existing unsealed combustion gas dryer vent is replaced with a sealed exhaust vent.	Mandatory		0				Complies. Dryer is outside of unit and electric.





# APPENDIX B GREEN SCORING & COST

ii. Unit 2

**ANSI-ICC-700-2008 National Green Building Standard™**

**8804 Glenville Unit 2**

**Unit size**

820 sf

**2 BR apt.**

3 occupants assumed

**Energy Efficiency Minimum**

e-ratio

**Water Efficiency**

gpd

**IEQ Requirements**

**Total**

Baseline	Bronze	Silver	Gold	Emerald
1.51	1.21	1.00	0.86	0.76
43	35	29	25	22
Not Met	Met	Met	Met	Met

Notes: e-ratio is the scale by which energy performance compares to a building constructed to IECC 2006 with 1.00 representing code min. gpd = gallons per day; occupancy is calced at number of bedrooms plus 1. Note that washer and dryer are not included. This rating is front notes compiled during one site visit with units occupied.

E-Ratio	1.19	0.93	0.83	0.72
Gallons	32	27	24	22
	Cost	Cost	Cost	Cost
Energy	1,772	928	4,667	4,500
Water	390	140	0	256
IEQ	590	0	0	0
<b>Cummulative Total</b>	<b>2,752</b>	<b>3,819</b>	<b>8,486</b>	<b>13,242</b>
<b>Cost/SF (\$)</b>	<b>3.36</b>	<b>4.66</b>	<b>10.35</b>	<b>16.15</b>

ANSI National Green Building Standard™		Baseline	Bronze	Silver	Gold	Emerald	NOTES:
Energy Performance:	20%		1,772	(472)			Bronze: Replace entry doors for airtight seal; reduce air infiltration to 0.74 ACHnat (a 30% improvement). Caulk or reseal windows as required, gaskets at receptacles; ducts within conditioned space (new ducting with 6% leakage and existing bulkheads). New hot water heater with 0.60 EF Note that there was indication that building cavities may have been used for ducts.
	34%			1,400			Silver: upgrade to 82% water heater - tankless.
	43%				4,667		Gold: 9.0 heat pump; SEER 15 A/C;
	50%					4,500	Emerald: 32 sf closed loop solar dhw
Showerhead Flow Rate	1.0						
Faucet Flow Rate (bathroom)	3 gpm		52				Install 1.6 gpm faucet or aerator at bronze and 1.0 at gold
Faucet Flow Rate (kitchen)	1.5 gpm			52			Install 1.0 gpm faucet or aerator at silver
Toilet Flush Rate	1.6gpm					256	Install dual flush toilet.
EStar washer			338	(338)			New common washer in basement divided by 4 units.
EStar washer with WF<6				425			New common washer in basement divided by 4 units. EStar washer with WF<6.
901.1.1 Natural draft space heating or water heating equipment is not located in conditioned spaces, including conditioned crawl spaces. Natural draft equipment is permitted to be installed within the conditioned spaces if located in a mechanical room that has an outdoor air source, and is otherwise sealed and insulated to separate it from the conditioned space(s).	<b>Mandatory</b>						n/a heat pump or DV equipment.
901.5 Carpets are in accordance with the following:		0	0				Complies. Floor is hardwood.

901.5(1) Wall-to-wall carpeting is not installed adjacent to water closets and bathing fixtures .	<b>Mandatory</b>		<b>0</b>			
901.5(2) A minimum of 85% of installed carpet area, carpet cushion (padding),			<b>0</b>			
(a) Carpet	<b>Mandatory</b>		<b>0</b>			
(b) Carpet cushion	<b>Mandatory</b>		<b>0</b>			
(c) Carpet adhesives	<b>Mandatory</b>		<b>0</b>			
902.1.1 Spot ventilation is in accordance with the following:			<b>0</b>			
(1) Bathrooms (including powder rooms) are vented to the outdoors. The minimum ventilation rate is 50 cfm for intermittent operation or 20 cfm for continuous operation in bathrooms.	<b>Mandatory</b>		<b>365</b>			Install fan in bathroom. Include control. Use existing bulkheading and concrete saw through the wall. Use existing circuit?
(2) Clothes dryers are vented to the outdoors.	<b>Mandatory</b>		<b>0</b>			Complies. Dryer is not in unit.
(3) Kitchen exhaust units and/or range hoods are ducted to the outdoors and have a minimum ventilation rate of 100 cfm for intermittent operation or 25 cfm	<b>Mandatory</b>		<b>134</b>			Add 100 cfm fan at exhaust grill in kitchen.
902.1.2 Bathroom and/or laundry exhaust fan is provided with an automatic timer and/or humidistat:	<b>Mandatory</b>		<b>0</b>			<b>See 902.1.1(1)</b>
902.4(2) Prior to owner occupancy, HVAC supply registers (boots), return grilles, and duct terminations are inspected and vacuumed. In addition, the coils are inspected and cleaned and the filter is replaced if necessary.	<b>Mandatory</b>		<b>91</b>			Vacuum ducts, service coils and change filter. Allowed 2 hours of labor plus 1 of HVAC tech.
904.3 Renovation Note: Existing unsealed combustion gas dryer vents related			<b>0</b>			
(1) Existing unsealed combustion gas dryer vent is replaced with a sealed exhaust vent.	<b>Mandatory</b>		<b>0</b>			Complies. Dryer is outside of unit and electric.





# APPENDIX B GREEN SCORING & COST

iii. Unit 3



**ANSI-ICC-700-2008 National Green Building Standard™**

**8804 Glenville Unit 3**

**Unit size** 820 sf  
**2 BR apt.** 3 occupants assumed  
**Energy Efficiency Minimum** e-ratio  
**Water Efficiency** gpd  
**IEQ Requirements**  
**Total**

Baseline	Bronze	Silver	Gold	Emerald
1.64	1.31	1.08	0.93	0.82
46	37	30	26	23
Not Met	Met	Met	Met	Met

Notes: e-ratio is the scale by which energy performance compares to a building constructed to IECC 2006 with 1.00 representing code min. gpd = gallons per day; occupancy is calced at number of bedrooms plus 1. Note that washer and dryer are not included. This rating is front notes compiled during one site visit with units occupied.

E-Ratio	1.29	1.04	0.90	0.78
Gallons	34	27	24	22
	Cost	Cost	Cost	Cost
Energy	1,922	2,129	3,691	6,746
Water	390	52	88	256
IEQ	644	0	0	0
<b>Cumulative total</b>	<b>2,956</b>	<b>5,137</b>	<b>8,915</b>	<b>15,917</b>
Cost/SF (\$)	3.60	6.26	10.87	19.41

ANSI National Green Building Standard™		Baseline	Bronze	Silver	Gold	Emerald	NOTES:
Energy Performance:	20%		1,922	(622)			Bronze: Replace entry door for airtight seal; reduce air infiltration to 1.046 ACHnat (a 30% improvement). Caulk or reseal windows as required, gaskets at receptacles; ducts within conditioned space (new ducting with 6% leakage and existing bulkheads). New hot water heater with 0.62 EF. Note that there was indication that building cavities may have been used for ducts.
	34%			2,751	(1,351)		Silver: 82% tankless water heater. 13 SEER A/C
	43%				5,042	(2,396)	Gold: 15 SEER A/C. 96% gas furnace
	50%					9,142	Emerald: 18 SEER A/C. 32 sf close loop solar dhwh
Showerhead Flow Rate	1						
Faucet Flow Rate (bathroom)	2.5 gpm		52				Install 1.0 gpm faucet or aerator.
Faucet Flow Rate (kitchen)	2.5 gpm			52			Install 1.0 gpm faucet or aerator.
Toilet Flush Rate	1.6gpm					256	Install dual flush toilet. 1.2 gpf
EStar washer			338		(338)		New common washer in basement divided by 4 units.
EStar washer with WF<6					425		New common washer in basement divided by 4 units. EStar washer with WF<6.

ANSI National Green Building Standard™		Baseline	Bronze	Silver	Gold	Emerald	NOTES:
901.1.1 Natural draft space heating or water heating equipment is not located in conditioned spaces, including conditioned crawl spaces. Natural draft equipment is permitted to be installed within the conditioned spaces if located in a mechanical room that has an outdoor air source, and is otherwise sealed and insulated to separate it from the conditioned space(s).	Mandatory						Complies. Water heater is not in unit and furnace is DV.
901.5 Carpets are in accordance with the following:			54				Complies. Subfloor is wood. Remove bedroom and living room carpet. 2 labor hours.
901.5(1) Wall-to-wall carpeting is not installed adjacent to water closets and bathing fixtures .	Mandatory		0				
901.5(2) A minimum of 85% of installed carpet area, carpet cushion (padding), and carpet adhesives are in accordance with the emission levels of CDPH 01350, as certified by a third-party program, such as the Carpet and Rug Institute's (CRI) Green Label PI			0				
(a) Carpet	Mandatory		0				
(b) Carpet cushion	Mandatory		0				
(c) Carpet adhesives	Mandatory		0				
902.1.1 Spot ventilation is in accordance with the following:			0				
(1) Bathrooms (including powder rooms) are vented to the outdoors. The minimum ventilation rate is 50 cfm for intermittent operation or 20 cfm for continuous operation in bathrooms.	Mandatory		365				Install fan in bathroom. Include control. Use existing bulkheading and concrete saw through the wall. Use existing circuit?
(2) Clothes dryers are vented to the outdoors.	Mandatory		0				Complies. Dryer is not in unit.
(3) Kitchen exhaust units and/or range hoods are ducted to the outdoors and have a minimum ventilation rate of 100 cfm for intermittent operation or 25 cfm for continuous operation.	Mandatory		134				Add 100 cfm fan at exhaust grill in kitchen.
902.1.2 Bathroom and/or laundry exhaust fan is provided with an automatic timer and/or humidistat:	Mandatory		0				See 902.1.1(1)
902.4(2) Prior to owner occupancy, HVAC supply registers (boots), return grilles, and duct terminations are inspected and vacuumed. In addition, the coils are inspected and cleaned and the filter is replaced if necessary.	Mandatory		91				Vacuum ducts, service coils and change filter. Allowed 2 hours of labor plus 1 of HVAC tech.
904.3 Renovation Note: Existing unsealed combustion gas dryer vents related to renovations.			0				
(1) Existing unsealed combustion gas dryer vent is replaced with a sealed exhaust vent.	Mandatory		0				Complies. Dryer is outside of unit and electric.





# APPENDIX B GREEN SCORING & COST

iv. Unit 4

**ANSI-ICC-700-2008 National Green Building Standard™**

**8804 Glenville Unit 4**

**Unit size** 820 sf  
**2 BR apt.** 3 occupants assumed  
**Energy Efficiency Minimum** e-ratio  
**Water Efficiency** gpd  
**IEQ Requirements**  
**Total**

Baseline	Bronze	Silver	Gold	Emerald
1.95	1.56	1.29	1.11	0.98
53	43	35	30	27
Not Met	Met	Met	Met	Met

Notes: e-ratio is the scale by which energy performance compares to a building constructed to IECC 2006 with 1.00 representing code min. gpd = gallons per day; occupancy is calced at number of bedrooms plus 1. Note that washer and dryer are not included. This rating is front notes compiled during one site visit with units occupied.

E-Ratio	1.55	1.23	1.07	0.93
Gallons	40	33	28	26
	Cost	Cost	Cost	Cost
Energy	1,772	2,279	2,268	5,851
Water	335	104	338	88
IEQ	786	0	0	0
Cum Total	2,893	5,276	7,881	13,820
Cost/SF (\$)	3.53	6.43	9.61	16.85

ANSI National Green Building Standard™			Baseline	Bronze	Silver	Gold	Emerald	NOTES:
Energy Performance:	20%			1,772	(472)			Bronze. Replace entry door for airtight seal; reduce air infiltration to 0.924 ACHnat (a 30% improvement). Caulk or reseal windows as required, gaskets at receptacles; ducts within conditioned space (new ducting with 6% leakage and bulkheads as needed). New 0.60 EF hot water heater. Note that there was indication that building cavities may have been used for ducts.
	34%				2,751	(1,351)		82% tankless water heater. 13 SEER A/C
	43%					3,619	(3,619)	15 SEER A/C. 92% Furnace
	50%						9,470	16 SEER A/C. 96% furnace. 32 sf closed loop solar domestic hot water
Showerhead Flow Rate	2.5 gpm			79				Install 1.0 gpm showerhead
Faucet Flow Rate (bathroom)	1.75 gpm				52			Install 1.0 gpm faucet or aerator.
Faucet Flow Rate (kitchen)	2.0 gpm				52			Install 1.0 gpm faucet or aerator.
Toilet Flush Rate	2.5 gpf			256				Install low flow toilet 1.6 gpf
EStar washer						338	(338)	New common washer in basement divided by 4 units.
EStar washer with WF<6							425	New common washer in basement divided by 4 units. EStar washer with WF<6.

ANSI National Green Building Standard™		Baseline	Bronze	Silver	Gold	Emerald	NOTES:
901.1.1 Natural draft space heating or water heating equipment is not located in conditioned spaces, including conditioned crawl spaces. Natural draft equipment is permitted to be installed within the conditioned spaces if located in a mechanical room that has an outdoor air source, and is otherwise sealed and insulated to separate it from the conditioned space(s).	Mandatory		196				Air seal furnace room as needed.
901.5 Carpets are in accordance with the following:							Complies. Subfloor is wood.
901.5(1) Wall-to-wall carpeting is not installed adjacent to water closets and bathing fixtures .	Mandatory		0				
901.5(2) A minimum of 85% of installed carpet area, carpet cushion (padding),			0				
(a) Carpet	Mandatory		0				
(b) Carpet cushion	Mandatory		0				
(c) Carpet adhesives	Mandatory		0				
902.1.1 Spot ventilation is in accordance with the following:			0				
(1) Bathrooms (including powder rooms) are vented to the outdoors. The minimum ventilation rate is 50 cfm for intermittent operation or 20 cfm for continuous operation in bathrooms.	Mandatory		365				Install fan in bathroom. Include control. Use existing bulkheading and concrete saw through the wall. Use existing circuit?
(2) Clothes dryers are vented to the outdoors.	Mandatory		0				Complies. Dryer is not in unit.
(3) Kitchen exhaust units and/or range hoods are ducted to the outdoors and have a minimum ventilation rate of 100 cfm for intermittent operation or 25 cfm	Mandatory		134				Add 100 cfm fan at exhaust grill in kitchen.
902.1.2 Bathroom and/or laundry exhaust fan is provided with an automatic timer and/or humidistat:	Mandatory		0				See 902.1.1(1)
902.4(2) Prior to owner occupancy, HVAC supply registers (boots), return grilles, and duct terminations are inspected and vacuumed. In addition, the coils are inspected and cleaned and the filter is replaced if necessary.	Mandatory		91				Vacuum ducts, service coils and change filter. Allowed 2 hours of labor plus 1 of HVAC tech.
904.3 Renovation Note: Existing unsealed combustion gas dryer vents related			0				
(1) Existing unsealed combustion gas dryer vent is replaced with a sealed exhaust vent.	Mandatory		0				Complies. Dryer is outside of unit and electric.



# APPENDIX C

## ENERGY MODELS

### 1 – Climate Zone #2

- A. Baton Rouge, Louisiana
- B. Bayou LaBatre, Alabama

### 2 – Climate Zone #3

- A. Oakland, California

### 3 – Climate Zone #4

- A. Richmond, Virginia
- B. Seattle, Washington

### 4 – Climate Zone #5

- A. Akron, Ohio – Townhouse
- B. Akron, Ohio – Single Family Home
- C. Cuyahoga, Ohio

### 5 – Retrofit – climate zone #4

- A. Silver Spring, Maryland
  - i. Unit 1
  - ii. Unit 2
  - iii. Unit 3
  - iv. Unit 4







# APPENDIX C ENERGY MODELS

1 – Climate Zone #2

A. Baton Rouge, Louisiana

Summary Data for HUD green - Louisiana  
 Site Built (Steel Framing) KC - 910  
 Climate Zone 2: Baton Rouge, Louisiana

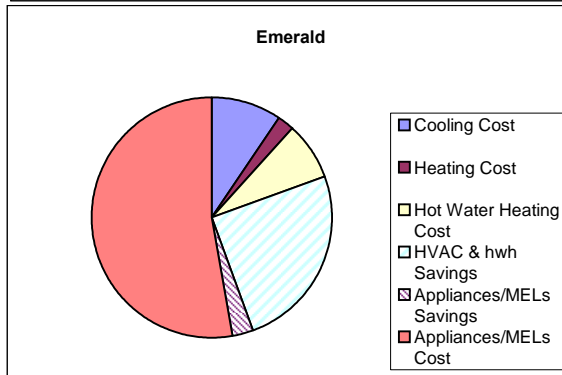
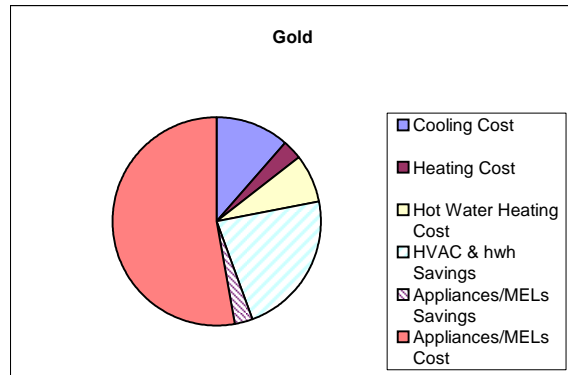
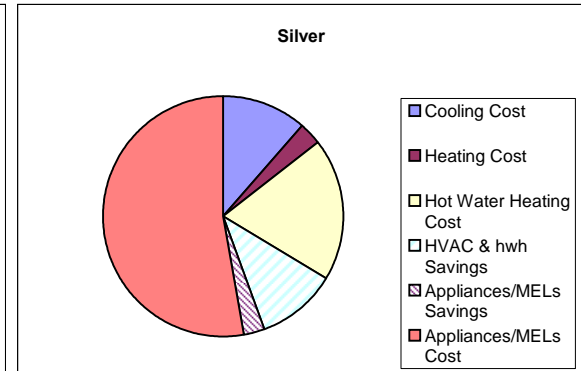
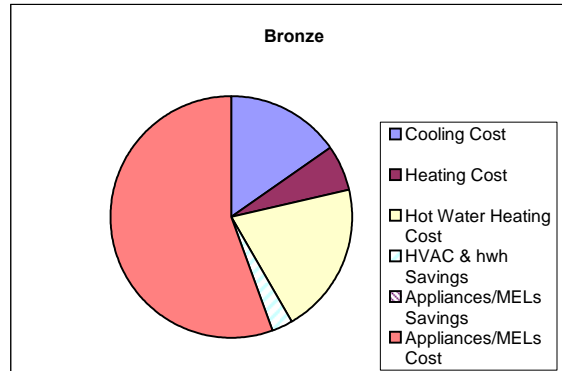
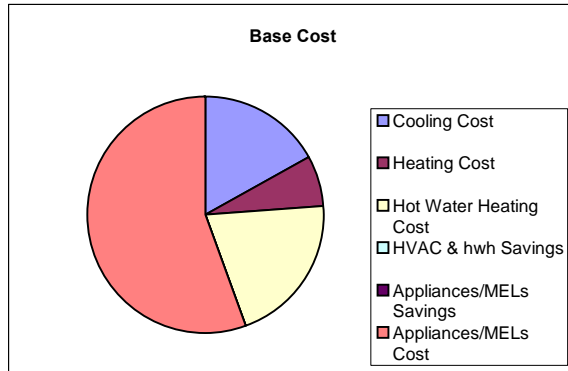
Software Output Subtitle	IECCStd2006	Base Line House		Bronze - 15%		Silver - 30%		Gold - 50%		Emerald - 60%		Emerald - 60%	
e-ratio as-built		0.90		0.85		0.70		0.46		0.46		0.41	
Hers as-built		88		85		73		62		62		57	
		<b>2006 IECC</b>	<b>Percenta ge Better than 2006 IECC</b>	<b>2006 IECC Compliance Standard Calc - 15%</b>		<b>2006 IECC Compliance Standard Calc - 30%</b>		<b>2006 IECC Compliance Standard Calc - 50%</b>		<b>2006 IECC Compliance Standard Calc - 60%</b>		<b>2006 IECC Compliance Standard Calc - 60%</b>	
<b>Site Built (Steel Framing) KC - 910</b>													
Finished Floor Area, sq. feet	910	910		910		910		910		910		910	
Total Stories	1	1		1		1		1		1		1	
Foundation Type	Raised Floor	Raised Floor		Raised Floor		Raised Floor		Raised Floor		Raised Floor		Raised Floor	
Bedrooms	3	3		3		3		3		3		3	
Baths	1	1		1		1		1		1		1	
Flat Ceiling R-value	23.97	<b>30</b>		30		<b>38</b>		38		38		38	
Wall Construction	2x wood	<b>2x6-24"oc CFS</b>		2x6-24"oc CFS		2x6-24"oc		2x6-24"oc		2x6-24"oc		2x6-24"oc	
Wall R-value (cavity/cont. sheathing)	9.85	<b>19/0</b>		19/0		<b>19/5</b>		19/5		19/5		19/5	
Floor R-value	11.34	<b>19</b>		19		<b>38</b>		38		38		38	
Wall Area, Above Grade	1,101	1,101		1,101		1,101		1,101		1,101		1,101	
Window U-value	0.75	<b>0.34</b>		0.34		0.34		0.34		0.34		0.34	
Window SHGC	0.40	<b>0.31</b>		0.31		0.31		0.31		0.31		0.31	
Window Area	146	146		145.67		145.67		145.67		145.67		145.67	
Window Area, % of Floor, CFA	16.01%	16.01%		16.01%		16.01%		16.01%		16.01%		16.01%	
Infiltration, Specific Leakage Area, SLA	0.00036	<b>0.00050</b>		0.0005		0.0005		0.0005		0.0005		0.0005	
Infiltration, ACH50	6.3	<b>8.7</b>		8.74		8.74		8.74		8.74		8.74	
Ventilation Rate, cfm - 39.1@code		none		none		none		none		none		none	
Cooling System SEER	13	14		14		<b>15</b>		15		15		<b>18</b>	
Cooling Capacity, kBtu/hr	24	24		24		24		24		24		24	
Heating System, HSPF	7.7	8.5		8.5		8.5		8.5		8.5		<b>9</b>	
Heating Capacity, kBtu/hr	18	18		18		18		18		18		18	
Duct Leakage to outside (CFM25)	not given					0		0		0		0	
Duct Loss %, DSE	20.00%	<b>12.00%</b>		<b>6.00%</b>		6.00%		6.00%		6.00%		6.00%	
Duct Insulation		<b>8</b>		8		<b>1</b>		1		1		1	
Duct Location	Inside	Attic		Attic		<b>Inside</b>		Inside		Inside		Inside	
Air Handler Location	Inside	Attic		Attic		Attic		Attic		Attic		<b>Inside</b>	
Hot Water Use, gallons/day	60	60.42		60.42		60.42		60.42		60.42		60.42	
Water Heater Energy Factor	0.92	0.92		<b>0.94</b>		<b>0.98</b>		0.98	<b>w/ ICS</b>	0.98	<b>w/ ICS</b>	0.98	<b>w/ ICS</b>
Tank size	40	40		40		<b>1</b>		1	<b>Solar</b>	1	<b>Solar</b>	1	<b>Solar</b>
Cool Set Point	78	78		78		78		78		78		78	
Heat Set Point	68	68		68		68		68		68		68	
Programmable Thermostat	No	No		<b>Yes</b>		Yes		Yes		Yes		Yes	
Cooling setback degrees; setback hours	none	2/6		2/6		2/6		2/6		2/6		2/6	
Heating setback degrees; setback hours	none	2/7		2/7		2/7		2/7		2/7		2/7	
Percentage Fluorescent Fixtures or CFLs	n/a	<b>14%</b>		14%		14%		14%		14%		14%	
Solar PV										<b>500 Watts</b>		<b>None</b>	
Cooling Energy - cost	196	155	20.92%	141	28.06%	108	44.90%	108	44.90%	108	44.90%	86	56.12%
Heating Energy - cost	100	93	7.00%	83	17.00%	42	58.00%	42	58.00%	42	58.00%	36	64.00%
Hot Water Energy - cost	216	216	0.00%	210	2.78%	201	6.94%	80	62.96%	80	62.96%	80	62.96%
Solar PV										<b>(40.00)</b>			
Subtotal Heat Cool WH	512	464	9.38%	434	15.23%	351	31.45%	230	55.08%	190	62.89%	202	60.55%

Notes:  
**Bold entries indicate upgraded features at each level.**  
 When a tankless waterheater is installed - base IECC number is manipulated to original, so saving increases over e-Ratio  
 Infiltration Defaults to 0.0005 in proposed mode when there is no added ventilation @ 0.00036 (ashrea 62.2)  
 2006 IECC standard is silent on energy savings from site generated energy and its application to an efficiency analysis. So 2 - 60% runs show improved equipment versus adding 0.5 kw solar

**Baton Rouge, Louisiana  
KC -910**

Annual Energy Summary	Base	Bronze			Silver			Gold			Emerald		
	Yr \$	Yr \$	savings	percent	Yr \$	savings	percent	Yr \$	savings	percent	Yr \$	savings	percent
Cooling Cost	177	161	16	9%	121	56	32%	121	56	32%	98	79	45%
Heating Cost	73	65	8	11%	31	42	58%	31	42	58%	26	47	64%
Hot Water Heating Cost	217	211	6	3%	203	14	6%	80	137	63%	80	137	63%
HVAC & hwh Savings	N/A	30			112			235			263		
Appliances/MELs Savings	N/A	0			31			31			31		
Appliances/MELs Cost	585	585			554			554			554		
HVAC & HWH sub-total	467	437		6%	355		24%	232		50%	204		56%
Grand Total	1052	1022		97%	909		86%	786		75%	758		72%

Data based on Energy Gauge - Annual Energy Summary. Not Compliance



# Annual Energy Summary

HUD Green

Title: KC - 910 Base  
User

TMY City: LA\_BATON\_ROUGE  
Elec Util: baton rouge fixed  
Gas Util: Louisiana Average  
Run Date: 08/05/2010 10:31:54

Baton Rouge, LA, -  
Registration #:

worst case at 315

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (24 kBtu/hr)	1883 kWh	\$151
Cooling Fan	320 kWh	\$26
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Cooling</b>	<b>2203 kWh</b>	<b>\$177</b>
Heating (18 kBtu/hr)	798 kWh	\$64
Heating Fan/Pump	115 kWh	\$9
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Heating</b>	<b>913 kWh</b>	<b>\$73</b>
Hot Water	2714 kWh	\$217
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>	<b>2714 kWh</b>	<b>\$217</b>
Ceiling Fans	0 kWh	\$0
Clothes Washer	70 kWh	\$6
Dishwasher	106 kWh	\$8
Dryer	1530 kWh	\$122
Lighting	1537 kWh	\$123
Miscellaneous	2736 kWh	\$219
Pool Pump	0 kWh	\$0
Range	909 kWh	\$73
Refrigerator	424 kWh	\$34
<hr/>		
Total (kWh)	13142 kWh	\$1052
Total (Therms)	0 Therms	\$0
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		\$1052

## Emissions (Calculated as Total - PV Produced)

SO2	34.76 Lbs.
NOX	21.88 Lbs.
CO2	7.89 Tons

# IECC-2006 Section 404 Compliance

PROJECT										
Title:	KC - 910 Base	Bedrooms:	3	Adress Type:	Street Address	Building Type:	User	Bathrooms:	1	Lot #
Owner:	HUD Green	Conditioned Area:	910	SubDivision:		# of Units:	1	Total Stories:	1	PlatBook:
Builder Name:	LKR	Worst Case:	No	Street:		Permit Office:		Rotate Angle:	315	County:
Jurisdiction:		Cross Ventilation:		City, State, Zip:	Baton Rouge ,	Family Type:	Single-family	Whole House Fan:		LA , -
New/Existing:	New (From Plans)					Comment:	worst case at 315			
Estimated Annual Energy Cost for Code Compliance										
		<b>IECC Std. Design</b>		<b>Proposed Home</b>					<b>e-Ratio</b>	
	Cooling:	\$ 196		\$ 155					0.79	
	Heating:	\$ 100		\$ 93					0.93	
	Hot Water:	\$ 216		\$ 216					1.00	
	<b>Total:</b>	<b>\$ 512</b>		<b>\$ 464</b>					<b>0.91</b>	
<h2 style="margin: 0;">PASS</h2>										
CLIMATE										
✓	Design Location	Tmy Site	Climate Zone	Design Temp 97.5 %	Design Temp 2.5 %	Int Design Temp Winter	Int Design Temp Summer	Heating Degree Days	Design Moisture	Daily Temp Range
	LA, BATON_ROUGE_RY	LA_BATON_ROUGE_RY	2	29	94	75	70	1762	54	Medium
FLOORS										
✓	#	Floor Type		R-Value		Area		Tile	Wood	Carpet
	1	Raised Floor				910 ft²	19	0	1	0
ROOF										
✓	#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch
	1	Gable or shed	Composition shingles	1094 ft²	304 ft²	Medium	0.85	No	0	33.7 deg
ATTIC										
✓	#	Type	Ventilation		Vent Ratio (1 in)	Area	RBS		IRCC	
	1	Full attic	Vented		300	910 ft²	N		N	

## IECC-2006 Section 404 Compliance

CEILING														
✓	#	Ceiling Type			R-Value	Area	Framing Frac	Truss Type						
✓	1	Under Attic (Vented)			30	910 ft²	0.09	Metal						
WALLS														
✓	#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Area	Sheathing R-Value	Framing Fraction	Solar Absor.					
✓	1	N	Exterior	Frame - Steel	19	234.75 ft²	0	0.2	0.5					
✓	2	E	Exterior	Frame - Steel	19	315.75 ft²	0	0.2	0.5					
✓	3	S	Exterior	Frame - Steel	19	234.75 ft²	0	0.2	0.5					
✓	4	W	Exterior	Frame - Steel	19	315.75 ft²	0	0.2	0.5					
DOORS														
✓	#	Wall ID	Door Type		Storms			U-Value	Area					
✓	1	N	Insulated		None			0.4	8 ft²					
✓	2	S	Insulated		None			0.4	8.89 ft²					
WINDOWS														
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.														
✓	#	Ornt	Frame	Panels	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening	
✓	1	N	Vinyl	Low-E Double	Yes	0.34	0.31	N	32 ft²	4 ft 0 in	1 ft 0 in	None	None	
✓	2	N	Vinyl	Low-E Double	Yes	0.34	0.31	N	16 ft²	4 ft 0 in	1 ft 0 in	None	None	
✓	3	E	Vinyl	Low-E Double	Yes	0.34	0.31	N	48 ft²	0 ft 0 in	0 ft 0 in	None	None	
✓	4	S	Vinyl	Low-E Double	Yes	0.34	0.31	N	10 ft²	3 ft 0 in	1 ft 0 in	None	None	
✓	5	S	Vinyl	Low-E Double	Yes	0.34	0.31	N	16 ft²	0 ft 0 in	0 ft 0 in	None	None	
✓	6	W	Vinyl	Low-E Double	Yes	0.34	0.31	N	16 ft²	0 ft 0 in	0 ft 0 in	None	None	
✓	7	W	Vinyl	Low-E Double	Yes	0.34	0.31	N	7.67 ft²	0 ft 0 in	0 ft 0 in	None	None	
INFILTRATION & VENTING														
✓	Method		SLA	CFM 50	ACH 50	ELA	EqLA	---- Forced Ventilation ----		Run Time	Fan			
✓	Proposed SLA		0.00036	859	6.30	47.2	88.7	0 cfm	0 cfm	0	20			
COOLING SYSTEM														
✓	#	System Type		Subtype			Efficiency	Capacity	Air Flow	SHR	Ductless			
✓	1	Central Unit		None			SEER: 14	24 kBtu/hr	720 cfm	0.75	False			

## IECC-2006 Section 404 Compliance

HEATING SYSTEM												
✓	#	System Type	Subtype	Efficiency	Capacity	Ductless						
	1	Electric Heat Pump	None	HSPF: 8.5	18 kBtu/hr	False						
HOT WATER SYSTEM												
✓	#	System Type	EF	Cap	Use	SetPnt	Credits					
	1	Electric	0.92	40 gal	60.42 gal	120 deg	None					
DUCTS												
✓	#	---- Supply ----			---- Return ----		Leakage Type	Air Handler	CFM 25	Percent Leakage	QN	RLF
	1	Attic	8	246 ft <sup>2</sup>	Attic	91 ft <sup>2</sup>	DSE=0.88	Attic	34.95 cfm	0.00 %	0.00	0.60
UTILITY RATES												
Fuel	Unit	Utility Name					Monthly Fixed Cost	\$/Unit				
Electricity	kWh	baton rouge fixed					0	0.08				
Natural Gas	Therm	Louisiana Average					0	1.09				
Fuel Oil	Gallon	Louisiana Default					0	1.1				
Propane	Gallon	Louisiana Default					0	1.4				



# Annual Energy Summary

HUD Green

Title: KC - 910 - 15%  
User

TMY City: LA\_BATON\_ROUGE  
Elec Util: baton rouge fixed  
Gas Util: Louisiana Average  
Run Date: 08/05/2010 10:34:29

Baton Rouge, LA, -  
Registration #:

worst case at 315

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (24 kBtu/hr)	1714 kWh	\$137
Cooling Fan	295 kWh	\$24
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Cooling</b>	<b>2009 kWh</b>	<b>\$161</b>
Heating (18 kBtu/hr)	718 kWh	\$57
Heating Fan/Pump	100 kWh	\$8
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Heating</b>	<b>818 kWh</b>	<b>\$65</b>
Hot Water	2640 kWh	\$211
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>	<b>2640 kWh</b>	<b>\$211</b>
Ceiling Fans	0 kWh	\$0
Clothes Washer	70 kWh	\$6
Dishwasher	106 kWh	\$8
Dryer	1530 kWh	\$122
Lighting	1537 kWh	\$123
Miscellaneous	2736 kWh	\$219
Pool Pump	0 kWh	\$0
Range	909 kWh	\$73
Refrigerator	424 kWh	\$34
<hr/>		
Total (kWh)	12779 kWh	\$1022
Total (Therms)	0 Therms	\$0
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
<b>Total Cost</b>		<b>\$1022</b>

## Emissions (Calculated as Total - PV Produced)

SO2	33.81 Lbs.
NOX	21.28 Lbs.
CO2	7.67 Tons

# IECC-2006 Section 404 Compliance

PROJECT																														
Title:	KC - 910 - 15%	Bedrooms:	3	Address Type:	Street Address	Building Type:	User	Bathrooms:	1	Lot #																				
Owner:	HUD Green	Conditioned Area:	910	SubDivision:		# of Units:	1	Total Stories:	1	PlatBook:																				
Builder Name:	LKR	Worst Case:	No	Street:		Permit Office:		Rotate Angle:	315	County:																				
Jurisdiction:		Cross Ventilation:		City, State, Zip:	Baton Rouge ,	Family Type:	Single-family	Whole House Fan:		LA ,	-																			
New/Existing:	New (From Plans)					Comment:	worst case at 315																							
<p>Estimated Annual Energy Cost for Code Compliance</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th><th style="text-align: center;">IECC Std. Design</th><th style="text-align: center;">Proposed Home</th><th style="text-align: center;">e-Ratio</th></tr> </thead> <tbody> <tr> <td>Cooling:</td><td style="text-align: right;">\$ 196</td><td style="text-align: right;">\$ 141</td><td style="text-align: right;">0.72</td></tr> <tr> <td>Heating:</td><td style="text-align: right;">\$ 100</td><td style="text-align: right;">\$ 83</td><td style="text-align: right;">0.83</td></tr> <tr> <td>Hot Water:</td><td style="text-align: right;">\$ 216</td><td style="text-align: right;">\$ 210</td><td style="text-align: right;">0.97</td></tr> <tr> <td><b>Total:</b></td><td style="text-align: right;"><b>\$ 512</b></td><td style="text-align: right;"><b>\$ 434</b></td><td style="text-align: right;"><b>0.85</b></td></tr> </tbody> </table> <p style="text-align: center; font-size: 2em; font-weight: bold; margin-top: 20px;">PASS</p>												IECC Std. Design	Proposed Home	e-Ratio	Cooling:	\$ 196	\$ 141	0.72	Heating:	\$ 100	\$ 83	0.83	Hot Water:	\$ 216	\$ 210	0.97	<b>Total:</b>	<b>\$ 512</b>	<b>\$ 434</b>	<b>0.85</b>
	IECC Std. Design	Proposed Home	e-Ratio																											
Cooling:	\$ 196	\$ 141	0.72																											
Heating:	\$ 100	\$ 83	0.83																											
Hot Water:	\$ 216	\$ 210	0.97																											
<b>Total:</b>	<b>\$ 512</b>	<b>\$ 434</b>	<b>0.85</b>																											
CLIMATE																														
✓	Design Location	Tmy Site	Climate Zone	Design Temp 97.5 %	Design Temp 2.5 %	Int Design Temp Winter	Int Design Temp Summer	Heating Degree Days	Design Moisture	Daily Temp Range																				
_____	LA, BATON_ROUGE_RY	LA_BATON_ROUGE_RY	2	29	94	75	70	1762	54	Medium																				
FLOORS																														
✓	#	Floor Type		R-Value		Area		Tile	Wood	Carpet																				
_____	1	Raised Floor				910 ft²	19	0	1	0																				
ROOF																														
✓	#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch																				
_____	1	Gable or shed	Composition shingles	1094 ft²	304 ft²	Medium	0.85	No	0	33.7 deg																				
ATTIC																														
✓	#	Type	Ventilation		Vent Ratio (1 in)	Area	RBS		IRCC																					
_____	1	Full attic	Vented		300	910 ft²	N		N																					

## IECC-2006 Section 404 Compliance

CEILING														
✓	#	Ceiling Type			R-Value	Area	Framing Frac	Truss Type						
✓	1	Under Attic (Vented)			30	910 ft²	0.09	Metal						
WALLS														
✓	#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Area	Sheathing R-Value	Framing Fraction	Solar Absor.					
✓	1	N	Exterior	Frame - Steel	19	234.75 ft²	0	0.2	0.5					
✓	2	E	Exterior	Frame - Steel	19	315.75 ft²	0	0.2	0.5					
✓	3	S	Exterior	Frame - Steel	19	234.75 ft²	0	0.2	0.5					
✓	4	W	Exterior	Frame - Steel	19	315.75 ft²	0	0.2	0.5					
DOORS														
✓	#	Wall ID	Door Type		Storms			U-Value	Area					
✓	1	N	Insulated		None			0.4	8 ft²					
✓	2	S	Insulated		None			0.4	8.89 ft²					
WINDOWS														
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.														
✓	#	Ornt	Frame	Panels	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening	
✓	1	N	Vinyl	Low-E Double	Yes	0.34	0.31	N	32 ft²	4 ft 0 in	1 ft 0 in	None	None	
✓	2	N	Vinyl	Low-E Double	Yes	0.34	0.31	N	16 ft²	4 ft 0 in	1 ft 0 in	None	None	
✓	3	E	Vinyl	Low-E Double	Yes	0.34	0.31	N	48 ft²	0 ft 0 in	0 ft 0 in	None	None	
✓	4	S	Vinyl	Low-E Double	Yes	0.34	0.31	N	10 ft²	3 ft 0 in	1 ft 0 in	None	None	
✓	5	S	Vinyl	Low-E Double	Yes	0.34	0.31	N	16 ft²	0 ft 0 in	0 ft 0 in	None	None	
✓	6	W	Vinyl	Low-E Double	Yes	0.34	0.31	N	16 ft²	0 ft 0 in	0 ft 0 in	None	None	
✓	7	W	Vinyl	Low-E Double	Yes	0.34	0.31	N	7.67 ft²	0 ft 0 in	0 ft 0 in	None	None	
INFILTRATION & VENTING														
✓	Method		SLA	CFM 50	ACH 50	ELA	EqLA	---- Forced Ventilation ----		Run Time	Fan			
✓	Proposed SLA		0.00036	859	6.30	47.2	88.7	0 cfm	0 cfm	0	20			
COOLING SYSTEM														
✓	#	System Type		Subtype			Efficiency	Capacity	Air Flow	SHR	Ductless			
✓	1	Central Unit		None			SEER: 14	24 kBtu/hr	720 cfm	0.75	False			

## IECC-2006 Section 404 Compliance

HEATING SYSTEM													
✓	#	System Type	Subtype				Efficiency	Capacity	Ductless				
	1	Electric Heat Pump	None				HSPF: 8.5	18 kBtu/hr	False				
HOT WATER SYSTEM													
✓	#	System Type	EF				Cap	Use	SetPnt	Credits			
	1	Electric	0.94				40 gal	60.42 gal	120 deg	None			
DUCTS													
✓	#	---- Supply ----			---- Return ----			Leakage Type	Air Handler	CFM 25	Percent Leakage	QN	RLF
	1	Attic	8	246 ft <sup>2</sup>	Attic	91 ft <sup>2</sup>	Prop. Air Leakage	Attic	43.20 cfm	6.00 %	0.05	0.60	
UTILITY RATES													
Fuel	Unit	Utility Name						Monthly Fixed Cost		\$/Unit			
Electricity	kWh	baton rouge fixed						0		0.08			
Natural Gas	Therm	Louisiana Average						0		1.09			
Fuel Oil	Gallon	Louisiana Default						0		1.1			
Propane	Gallon	Louisiana Default						0		1.4			

# Annual Energy Summary

HUD Green

Title: KC - 910 - 30%  
User

TMY City: LA\_BATON\_ROUGE  
Elec Util: baton rouge fixed  
Gas Util: Louisiana Average  
Run Date: 08/05/2010 10:36:33

Baton Rouge, LA, -  
Registration #:

worst case at 315

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (24 kBtu/hr)	1286 kWh	\$103
Cooling Fan	230 kWh	\$18
Mechanical Vent Fan	0 kWh	\$0
<b>Total Cooling</b>	<b>1516 kWh</b>	<b>\$121</b>
Heating (18 kBtu/hr)	342 kWh	\$27
Heating Fan/Pump	48 kWh	\$4
Mechanical Vent Fan	0 kWh	\$0
<b>Total Heating</b>	<b>390 kWh</b>	<b>\$31</b>
Hot Water	2535 kWh	\$203
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>	<b>2535 kWh</b>	<b>\$203</b>
Ceiling Fans	0 kWh	\$0
Clothes Washer	70 kWh	\$6
Dishwasher	106 kWh	\$8
Dryer	1530 kWh	\$122
Lighting	1144 kWh	\$92
Miscellaneous	2736 kWh	\$219
Pool Pump	0 kWh	\$0
Range	909 kWh	\$73
Refrigerator	424 kWh	\$34
<hr/>		
Total (kWh)	11360 kWh	\$909
Total (Therms)	0 Therms	\$0
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		\$909

## Emissions (Calculated as Total - PV Produced)

SO2	30.05 Lbs.
NOX	18.92 Lbs.
CO2	6.82 Tons

# IECC-2006 Section 404 Compliance

PROJECT										
Title:	KC - 910 - 30%	Bedrooms:	3	Address Type:	Street Address					
Building Type:	User	Bathrooms:	1	Lot #						
Owner:	HUD Green	Conditioned Area:	910	SubDivision:						
# of Units:	1	Total Stories:	1	PlatBook:						
Builder Name:	LKR	Worst Case:	No	Street:						
Permit Office:		Rotate Angle:	315	County:						
Jurisdiction:		Cross Ventilation:		City, State, Zip:	Baton Rouge ,					
Family Type:	Single-family	Whole House Fan:		LA ,	-					
New/Existing:	New (From Plans)									
Comment:	worst case at 315									
Estimated Annual Energy Cost for Code Compliance										
		<b>IECC Std. Design</b>		<b>Proposed Home</b>		<b>e-Ratio</b>				
	Cooling:	\$ 196		\$ 108		0.55				
	Heating:	\$ 100		\$ 42		0.42				
	Hot Water:	\$ 216		\$ 201		0.93				
	<b>Total:</b>	<b>\$ 512</b>		<b>\$ 351</b>		<b>0.69</b>				
PASS										
CLIMATE										
✓	Design Location	Tmy Site	Climate Zone	Design Temp 97.5 %	Design Temp 2.5 %	Int Design Temp Winter	Int Design Temp Summer	Heating Degree Days	Design Moisture	Daily Temp Range
	LA, BATON_ROUGE_RY	LA_BATON_ROUGE_RY	2	29	94	75	70	1762	54	Medium
FLOORS										
✓	#	Floor Type		R-Value		Area		Tile	Wood	Carpet
	1	Raised Floor				910 ft²	38	0	1	0
ROOF										
✓	#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch
	1	Gable or shed	Composition shingles	1094 ft²	304 ft²	Medium	0.85	No	0	33.7 deg
ATTIC										
✓	#	Type	Ventilation		Vent Ratio (1 in)	Area	RBS	IRCC		
	1	Full attic	Vented		300	910 ft²	N	N		

## IECC-2006 Section 404 Compliance

CEILING													
✓	#	Ceiling Type			R-Value	Area	Framing Frac	Truss Type					
✓	1	Under Attic (Vented)			38	910 ft²	0.09	Metal					
WALLS													
✓	#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Area	Sheathing R-Value	Framing Fraction	Solar Absor.				
✓	1	N	Exterior	Frame - Steel	19	234.75 ft²	5	0.2	0.5				
✓	2	E	Exterior	Frame - Steel	19	315.75 ft²	5	0.2	0.5				
✓	3	S	Exterior	Frame - Steel	19	234.75 ft²	5	0.2	0.5				
✓	4	W	Exterior	Frame - Steel	19	315.75 ft²	5	0.2	0.5				
DOORS													
✓	#	Wall ID	Door Type			Storms	U-Value	Area					
✓	1	N	Insulated			None	0.4	8 ft²					
✓	2	S	Insulated			None	0.4	8.89 ft²					
WINDOWS													
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.													
✓	#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storms	Overhang			Int Shade	Screening
✓	1	N	Vinyl	Low-E Double	Yes	0.34	0.31	N	32 ft²	4 ft 0 in	1 ft 0 in	None	None
✓	2	N	Vinyl	Low-E Double	Yes	0.34	0.31	N	16 ft²	4 ft 0 in	1 ft 0 in	None	None
✓	3	E	Vinyl	Low-E Double	Yes	0.34	0.31	N	48 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	4	S	Vinyl	Low-E Double	Yes	0.34	0.31	N	10 ft²	3 ft 0 in	1 ft 0 in	None	None
✓	5	S	Vinyl	Low-E Double	Yes	0.34	0.31	N	16 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	6	W	Vinyl	Low-E Double	Yes	0.34	0.31	N	16 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	7	W	Vinyl	Low-E Double	Yes	0.34	0.31	N	7.67 ft²	0 ft 0 in	0 ft 0 in	None	None
INFILTRATION & VENTING													
✓	Method		SLA	CFM 50	ACH 50	ELA	EqLA	---- Forced Ventilation ----			Run Time Fraction	Fan Watts	
✓	Proposed SLA		0.00036	859	6.30	47.2	88.7	0 cfm	0 cfm	0	20		
COOLING SYSTEM													
✓	#	System Type		Subtype		Efficiency		Capacity		Air Flow	SHR	Ductless	
✓	1	Central Unit		None		SEER: 15		24 kBtu/hr		720 cfm	0.75	False	

## IECC-2006 Section 404 Compliance

HEATING SYSTEM												
✓	#	System Type	Subtype	Efficiency	Capacity	Ductless						
✓	1	Electric Heat Pump	None	HSPF: 8.5	18 kBtu/hr	False						
HOT WATER SYSTEM												
✓	#	System Type	EF	Cap	Use	SetPnt	Credits					
✓	1	Electric	0.98	1 gal	60.42 gal	120 deg	None					
DUCTS												
✓	#	---- Supply ----			---- Return ----		Leakage Type	Air Handler	CFM 25	Percent Leakage	QN	RLF
✓	1	Interior	1	246 ft <sup>2</sup>	Interior	91 ft <sup>2</sup>	Prop. Air Leakage	Attic	43.20 cfm	6.00 %	0.05	0.60
UTILITY RATES												
Fuel	Unit	Utility Name					Monthly Fixed Cost	\$/Unit				
Electricity	kWh	baton rouge fixed					0	0.08				
Natural Gas	Therm	Louisiana Average					0	1.09				
Fuel Oil	Gallon	Louisiana Default					0	1.1				
Propane	Gallon	Louisiana Default					0	1.4				



# Annual Energy Summary

HUD Green

Title: KC - 910 - 50%  
User

TMY City: LA\_BATON\_ROUGE  
Elec Util: baton rouge fixed  
Gas Util: Louisiana Average  
Run Date: 08/05/2010 10:38:10

Baton Rouge, LA, -  
Registration #:

worst case at 315

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (24 kBtu/hr)	1286 kWh	\$103
Cooling Fan	230 kWh	\$18
Mechanical Vent Fan	0 kWh	\$0
<b>Total Cooling</b>	<b>1516 kWh</b>	<b>\$121</b>
Heating (18 kBtu/hr)	342 kWh	\$27
Heating Fan/Pump	48 kWh	\$4
Mechanical Vent Fan	0 kWh	\$0
<b>Total Heating</b>	<b>390 kWh</b>	<b>\$31</b>
Hot Water	1005 kWh	\$80
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>	<b>1005 kWh</b>	<b>\$80</b>
Ceiling Fans	0 kWh	\$0
Clothes Washer	70 kWh	\$6
Dishwasher	106 kWh	\$8
Dryer	1530 kWh	\$122
Lighting	1144 kWh	\$92
Miscellaneous	2736 kWh	\$219
Pool Pump	0 kWh	\$0
Range	909 kWh	\$73
Refrigerator	424 kWh	\$34
<hr/>		
Total (kWh)	9830 kWh	\$786
Total (Therms)	0 Therms	\$0
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		\$786

## Emissions (Calculated as Total - PV Produced)

SO <sub>2</sub>	26 Lbs.
NO <sub>X</sub>	16.37 Lbs.
CO <sub>2</sub>	5.9 Tons

# IECC-2006 Section 404 Compliance

PROJECT										
Title:	KC - 910 - 50%	Bedrooms:	3	Address Type:	Street Address	Building Type:	User	Bathrooms:	1	Lot #
Owner:	HUD Green	Conditioned Area:	910	SubDivision:		# of Units:	1	Total Stories:	1	PlatBook:
Builder Name:	LKR	Worst Case:	No	Street:		Permit Office:		Rotate Angle:	315	County:
Jurisdiction:		Cross Ventilation:		City, State, Zip:	Baton Rouge ,	Family Type:	Single-family	Whole House Fan:		LA , -
New/Existing:	New (From Plans)					Comment:	worst case at 315			
Estimated Annual Energy Cost for Code Compliance										
		<b>IECC Std. Design</b>		<b>Proposed Home</b>					<b>e-Ratio</b>	
	Cooling:	\$ 196		\$ 108					0.55	
	Heating:	\$ 100		\$ 42					0.42	
	Hot Water:	\$ 216		\$ 80					0.37	
	<b>Total:</b>	<b>\$ 512</b>		<b>\$ 230</b>					<b>0.45</b>	
<h2 style="margin: 0;">PASS</h2>										
CLIMATE										
✓	Design Location	Tmy Site	Climate Zone	Design Temp 97.5 %	Design Temp 2.5 %	Int Design Temp Winter	Int Design Temp Summer	Heating Degree Days	Design Moisture	Daily Temp Range
	LA, BATON_ROUGE_RY	LA_BATON_ROUGE_RY	2	29	94	75	70	1762	54	Medium
FLOORS										
✓	#	Floor Type		R-Value		Area		Tile	Wood	Carpet
	1	Raised Floor				910 ft²	38	0	1	0
ROOF										
✓	#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch
	1	Gable or shed	Composition shingles	1094 ft²	304 ft²	Medium	0.85	No	0	33.7 deg
ATTIC										
✓	#	Type	Ventilation		Vent Ratio (1 in)	Area	RBS		IRCC	
	1	Full attic	Vented		300	910 ft²	N		N	

## IECC-2006 Section 404 Compliance

CEILING														
✓	#	Ceiling Type			R-Value	Area	Framing Frac	Truss Type						
✓	1	Under Attic (Vented)			38	910 ft²	0.09	Metal						
WALLS														
✓	#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Area	Sheathing R-Value	Framing Fraction	Solar Absor.					
✓	1	N	Exterior	Frame - Steel	19	234.75 ft²	5	0.2	0.5					
✓	2	E	Exterior	Frame - Steel	19	315.75 ft²	5	0.2	0.5					
✓	3	S	Exterior	Frame - Steel	19	234.75 ft²	5	0.2	0.5					
✓	4	W	Exterior	Frame - Steel	19	315.75 ft²	5	0.2	0.5					
DOORS														
✓	#	Wall ID	Door Type			Storms	U-Value	Area						
✓	1	N	Insulated			None	0.4	8 ft²						
✓	2	S	Insulated			None	0.4	8.89 ft²						
WINDOWS														
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.														
✓	#	Ornt	Frame	Panels	NFRC	U-Factor	SHGC	Storms	Overhang		Int Shade	Screening		
✓	1	N	Vinyl	Low-E Double	Yes	0.34	0.31	N	32 ft²	4 ft 0 in	1 ft 0 in	None	None	
✓	2	N	Vinyl	Low-E Double	Yes	0.34	0.31	N	16 ft²	4 ft 0 in	1 ft 0 in	None	None	
✓	3	E	Vinyl	Low-E Double	Yes	0.34	0.31	N	48 ft²	0 ft 0 in	0 ft 0 in	None	None	
✓	4	S	Vinyl	Low-E Double	Yes	0.34	0.31	N	10 ft²	3 ft 0 in	1 ft 0 in	None	None	
✓	5	S	Vinyl	Low-E Double	Yes	0.34	0.31	N	16 ft²	0 ft 0 in	0 ft 0 in	None	None	
✓	6	W	Vinyl	Low-E Double	Yes	0.34	0.31	N	16 ft²	0 ft 0 in	0 ft 0 in	None	None	
✓	7	W	Vinyl	Low-E Double	Yes	0.34	0.31	N	7.67 ft²	0 ft 0 in	0 ft 0 in	None	None	
INFILTRATION & VENTING														
✓	Method		SLA	CFM 50	ACH 50	ELA	EqLA	---- Forced Ventilation ----			Run Time Fraction	Fan Watts		
✓	Proposed SLA		0.00036	859	6.30	47.2	88.7	0 cfm	0 cfm		0	20		
COOLING SYSTEM														
✓	#	System Type		Subtype			Efficiency	Capacity	Air Flow	SHR	Ductless			
✓	1	Central Unit		None			SEER: 15	24 kBtu/hr	720 cfm	0.75	False			

## IECC-2006 Section 404 Compliance

HEATING SYSTEM													
✓	#	System Type	Subtype				Efficiency	Capacity	Ductless				
✓	1	Electric Heat Pump	None				HSPF: 8.5	18 kBtu/hr	False				
HOT WATER SYSTEM													
✓	#	System Type	EF				Cap	Use	SetPnt	Credits			
✓	1	Electric	0.98				1 gal	60.42 gal	120 deg	Solar System			
DUCTS													
✓	#	---- Supply ----			---- Return ----			Air Handler		CFM 25	Percent Leakage	QN	RLF
✓	1	Interior	1	246 ft <sup>2</sup>	Interior	91 ft <sup>2</sup>	Prop. Air Leakage		Attic	43.20 cfm	6.00 %	0.05	0.60
UTILITY RATES													
Fuel	Unit	Utility Name						Monthly Fixed Cost		\$/Unit			
Electricity	kWh	baton rouge fixed						0		0.08			
Natural Gas	Therm	Louisiana Average						0		1.09			
Fuel Oil	Gallon	Louisiana Default						0		1.1			
Propane	Gallon	Louisiana Default						0		1.4			

# Annual Energy Summary

HUD Green

Title: KC - 910 - 60%  
User

TMY City: LA\_BATON\_ROUGE  
Elec Util: baton rouge fixed  
Gas Util: Louisiana Average  
Run Date: 08/05/2010 10:40:05

Baton Rouge, LA, -  
Registration #:

worst case at 315

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (24 kBtu/hr)	1286 kWh	\$103
Cooling Fan	230 kWh	\$18
Mechanical Vent Fan	0 kWh	\$0
<b>Total Cooling</b>	<b>1516 kWh</b>	<b>\$121</b>
Heating (18 kBtu/hr)	342 kWh	\$27
Heating Fan/Pump	48 kWh	\$4
Mechanical Vent Fan	0 kWh	\$0
<b>Total Heating</b>	<b>390 kWh</b>	<b>\$31</b>
Hot Water	1005 kWh	\$80
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>	<b>1005 kWh</b>	<b>\$80</b>
Ceiling Fans	0 kWh	\$0
Clothes Washer	70 kWh	\$6
Dishwasher	106 kWh	\$8
Dryer	1530 kWh	\$122
Lighting	1144 kWh	\$92
Miscellaneous	2736 kWh	\$219
Pool Pump	0 kWh	\$0
Range	909 kWh	\$73
Refrigerator	424 kWh	\$34
<hr/>		
Total (kWh)	9830 kWh	\$786
Total (Therms)	0 Therms	\$0
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	-501 kWh	\$-40
* Assumes net metering		
<hr/>		
Total Cost		\$746

## Emissions (Calculated as Total - PV Produced)

SO2	24.68 Lbs.
NOX	15.53 Lbs.
CO2	5.6 Tons

# IECC-2006 Section 404 Compliance

PROJECT										
Title:	KC - 910 - 60%	Bedrooms:	3	Adress Type:	Street Address					
Building Type:	User	Bathrooms:	1	Lot #						
Owner:	HUD Green	Conditioned Area:	910	SubDivision:						
# of Units:	1	Total Stories:	1	PlatBook:						
Builder Name:	LKR	Worst Case:	No	Street:						
Permit Office:		Rotate Angle:	315	County:						
Jurisdiction:		Cross Ventilation:		City, State, Zip:	Baton Rouge ,					
Family Type:	Single-family	Whole House Fan:		LA ,	-					
New/Existing:	New (From Plans)									
Comment:	worst case at 315									
Estimated Annual Energy Cost for Code Compliance										
		<b>IECC Std. Design</b>		<b>Proposed Home</b>		<b>e-Ratio</b>				
	Cooling:	\$ 196		\$ 108		0.55				
	Heating:	\$ 100		\$ 42		0.42				
	Hot Water:	\$ 216		\$ 80		0.37				
	<b>Total:</b>	<b>\$ 512</b>		<b>\$ 230</b>		<b>0.45</b>				
<h2 style="margin: 0;">PASS</h2>										
CLIMATE										
✓	Design Location	Tmy Site	Climate Zone	Design Temp 97.5 %	Design Temp 2.5 %	Int Design Temp Winter	Int Design Temp Summer	Heating Degree Days	Design Moisture	Daily Temp Range
	LA, BATON_ROUGE_RY	LA_BATON_ROUGE_RY	2	29	94	75	70	1762	54	Medium
FLOORS										
✓	#	Floor Type		R-Value		Area		Tile	Wood	Carpet
	1	Raised Floor				910 ft²	38	0	1	0
ROOF										
✓	#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch
	1	Gable or shed	Composition shingles	1094 ft²	304 ft²	Medium	0.85	No	0	33.7 deg
ATTIC										
✓	#	Type	Ventilation		Vent Ratio (1 in)	Area	RBS	IRCC		
	1	Full attic	Vented		300	910 ft²	N	N		

## IECC-2006 Section 404 Compliance

CEILING														
✓	#	Ceiling Type			R-Value	Area	Framing Frac	Truss Type						
✓	1	Under Attic (Vented)			38	910 ft²	0.09	Metal						
WALLS														
✓	#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Area	Sheathing R-Value	Framing Fraction	Solar Absor.					
✓	1	N	Exterior	Frame - Steel	19	234.75 ft²	5	0.2	0.5					
✓	2	E	Exterior	Frame - Steel	19	315.75 ft²	5	0.2	0.5					
✓	3	S	Exterior	Frame - Steel	19	234.75 ft²	5	0.2	0.5					
✓	4	W	Exterior	Frame - Steel	19	315.75 ft²	5	0.2	0.5					
DOORS														
✓	#	Wall ID	Door Type		Storms			U-Value	Area					
✓	1	N	Insulated		None			0.4	8 ft²					
✓	2	S	Insulated		None			0.4	8.89 ft²					
WINDOWS														
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.														
✓	#	Ornt	Frame	Panels	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening	
✓	1	N	Vinyl	Low-E Double	Yes	0.34	0.31	N	32 ft²	4 ft 0 in	1 ft 0 in	None	None	
✓	2	N	Vinyl	Low-E Double	Yes	0.34	0.31	N	16 ft²	4 ft 0 in	1 ft 0 in	None	None	
✓	3	E	Vinyl	Low-E Double	Yes	0.34	0.31	N	48 ft²	0 ft 0 in	0 ft 0 in	None	None	
✓	4	S	Vinyl	Low-E Double	Yes	0.34	0.31	N	10 ft²	3 ft 0 in	1 ft 0 in	None	None	
✓	5	S	Vinyl	Low-E Double	Yes	0.34	0.31	N	16 ft²	0 ft 0 in	0 ft 0 in	None	None	
✓	6	W	Vinyl	Low-E Double	Yes	0.34	0.31	N	16 ft²	0 ft 0 in	0 ft 0 in	None	None	
✓	7	W	Vinyl	Low-E Double	Yes	0.34	0.31	N	7.67 ft²	0 ft 0 in	0 ft 0 in	None	None	
INFILTRATION & VENTING														
✓	Method		SLA	CFM 50	ACH 50	ELA	EqLA	---- Forced Ventilation ----				Run Time	Fan	
✓	Proposed SLA		0.00036	859	6.30	47.2	88.7	0 cfm	0 cfm			0	20	
COOLING SYSTEM														
✓	#	System Type		Subtype			Efficiency	Capacity	Air Flow	SHR	Ductless			
✓	1	Central Unit		None			SEER: 15	24 kBtu/hr	720 cfm	0.75	False			

## IECC-2006 Section 404 Compliance

HEATING SYSTEM												
✓	#	System Type	Subtype	Efficiency	Capacity	Ductless						
	1	Electric Heat Pump	None	HSPF: 8.5	18 kBtu/hr	False						
HOT WATER SYSTEM												
✓	#	System Type	EF	Cap	Use	SetPnt	Credits					
	1	Electric	0.98	1 gal	60.42 gal	120 deg	Solar System					
DUCTS												
✓	#	---- Supply ----			---- Return ----		Leakage Type	Air Handler	CFM 25	Percent Leakage	QN	RLF
	1	Interior	1	246 ft <sup>2</sup>	Interior	91 ft <sup>2</sup>	Prop. Air Leakage	Attic	43.20 cfm	6.00 %	0.05	0.60
UTILITY RATES												
Fuel	Unit	Utility Name					Monthly Fixed Cost	\$/Unit				
Electricity	kWh	baton rouge fixed					0	0.08				
Natural Gas	Therm	Louisiana Average					0	1.09				
Fuel Oil	Gallon	Louisiana Default					0	1.1				
Propane	Gallon	Louisiana Default					0	1.4				



# Annual Energy Summary

HUD Green

Title: KC - 910 - 60% - B  
User

TMY City: LA\_BATON\_ROUGE  
Elec Util: baton rouge fixed  
Gas Util: Louisiana Average  
Run Date: 08/05/2010 10:42:03

Baton Rouge, LA, -  
Registration #:

worst case at 315

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (24 kBtu/hr)	1008 kWh	\$81
Cooling Fan	214 kWh	\$17
Mechanical Vent Fan	0 kWh	\$0
<b>Total Cooling</b>	<b>1222 kWh</b>	<b>\$98</b>
Heating (18 kBtu/hr)	288 kWh	\$23
Heating Fan/Pump	42 kWh	\$3
Mechanical Vent Fan	0 kWh	\$0
<b>Total Heating</b>	<b>330 kWh</b>	<b>\$26</b>
Hot Water	1005 kWh	\$80
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>	<b>1005 kWh</b>	<b>\$80</b>
Ceiling Fans	0 kWh	\$0
Clothes Washer	70 kWh	\$6
Dishwasher	106 kWh	\$8
Dryer	1530 kWh	\$122
Lighting	1144 kWh	\$92
Miscellaneous	2736 kWh	\$219
Pool Pump	0 kWh	\$0
Range	909 kWh	\$73
Refrigerator	424 kWh	\$34
<hr/>		
Total (kWh)	9476 kWh	\$758
Total (Therms)	0 Therms	\$0
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		\$758

## Emissions (Calculated as Total - PV Produced)

SO2	25.07 Lbs.
NOX	15.78 Lbs.
CO2	5.69 Tons

# IECC-2006 Section 404 Compliance

PROJECT										
Title:	KC - 910 - 60% - B	Bedrooms:	3	Address Type:	Street Address					
Building Type:	User	Bathrooms:	1	Lot #						
Owner:	HUD Green	Conditioned Area:	910	SubDivision:						
# of Units:	1	Total Stories:	1	PlatBook:						
Builder Name:	LKR	Worst Case:	No	Street:						
Permit Office:		Rotate Angle:	315	County:						
Jurisdiction:		Cross Ventilation:		City, State, Zip:	Baton Rouge ,					
Family Type:	Single-family	Whole House Fan:		LA ,	-					
New/Existing:	New (From Plans)									
Comment:	worst case at 315									
Estimated Annual Energy Cost for Code Compliance										
		<b>IECC Std. Design</b>		<b>Proposed Home</b>		<b>e-Ratio</b>				
	Cooling:	\$ 196		\$ 86		0.44				
	Heating:	\$ 100		\$ 36		0.36				
	Hot Water:	\$ 216		\$ 80		0.37				
	<b>Total:</b>	<b>\$ 512</b>		<b>\$ 202</b>		<b>0.39</b>				
PASS										
CLIMATE										
✓	Design Location	Tmy Site	Climate Zone	Design Temp 97.5 %	Design Temp 2.5 %	Int Design Temp Winter	Int Design Temp Summer	Heating Degree Days	Design Moisture	Daily Temp Range
	LA, BATON_ROUGE_RY	LA_BATON_ROUGE_RY	2	29	94	75	70	1762	54	Medium
FLOORS										
✓	#	Floor Type		R-Value		Area		Tile	Wood	Carpet
	1	Raised Floor				910 ft²	38	0	1	0
ROOF										
✓	#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch
	1	Gable or shed	Composition shingles	1094 ft²	304 ft²	Medium	0.85	No	0	33.7 deg
ATTIC										
✓	#	Type	Ventilation		Vent Ratio (1 in)	Area	RBS	IRCC		
	1	Full attic	Vented		300	910 ft²	N	N		

## IECC-2006 Section 404 Compliance

CEILING													
✓	#	Ceiling Type			R-Value	Area	Framing Frac	Truss Type					
✓	1	Under Attic (Vented)			38	910 ft <sup>2</sup>	0.09	Metal					
WALLS													
✓	#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Area	Sheathing R-Value	Framing Fraction	Solar Absor.				
✓	1	N	Exterior	Frame - Steel	19	234.75 ft <sup>2</sup>	5	0.2	0.5				
✓	2	E	Exterior	Frame - Steel	19	315.75 ft <sup>2</sup>	5	0.2	0.5				
✓	3	S	Exterior	Frame - Steel	19	234.75 ft <sup>2</sup>	5	0.2	0.5				
✓	4	W	Exterior	Frame - Steel	19	315.75 ft <sup>2</sup>	5	0.2	0.5				
DOORS													
✓	#	Wall ID	Door Type			Storms	U-Value	Area					
✓	1	N	Insulated			None	0.4	8 ft <sup>2</sup>					
✓	2	S	Insulated			None	0.4	8.89 ft <sup>2</sup>					
WINDOWS													
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.													
✓	#	Ornt	Frame	Panels	NFRC	U-Factor	SHGC	Storms	Overhang			Int Shade	Screening
✓	1	N	Vinyl	Low-E Double	Yes	0.34	0.31	N	32 ft <sup>2</sup>	4 ft 0 in	1 ft 0 in	None	None
✓	2	N	Vinyl	Low-E Double	Yes	0.34	0.31	N	16 ft <sup>2</sup>	4 ft 0 in	1 ft 0 in	None	None
✓	3	E	Vinyl	Low-E Double	Yes	0.34	0.31	N	48 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	4	S	Vinyl	Low-E Double	Yes	0.34	0.31	N	10 ft <sup>2</sup>	3 ft 0 in	1 ft 0 in	None	None
✓	5	S	Vinyl	Low-E Double	Yes	0.34	0.31	N	16 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	6	W	Vinyl	Low-E Double	Yes	0.34	0.31	N	16 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	7	W	Vinyl	Low-E Double	Yes	0.34	0.31	N	7.67 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
INFILTRATION & VENTING													
✓	Method		SLA	CFM 50	ACH 50	ELA	EqLA	---- Forced Ventilation ----			Run Time Fraction	Fan Watts	
✓	Proposed SLA		0.00036	859	6.30	47.2	88.7	0 cfm	0 cfm	0	20		
COOLING SYSTEM													
✓	#	System Type		Subtype		Efficiency	Capacity	Air Flow	SHR	Ductless			
✓	1	Central Unit		None		SEER: 18	24 kBtu/hr	720 cfm	0.75	False			

## IECC-2006 Section 404 Compliance

HEATING SYSTEM													
✓	#	System Type	Subtype				Efficiency	Capacity	Ductless				
✓	1	Electric Heat Pump	None				HSPF: 9	18 kBtu/hr	False				
HOT WATER SYSTEM													
✓	#	System Type	EF				Cap	Use	SetPnt	Credits			
✓	1	Electric	0.98				1 gal	60.42 gal	120 deg	Solar System			
DUCTS													
✓	#	---- Supply ----			---- Return ----			Air Handler		CFM 25	Percent Leakage	QN	RLF
✓	1	Interior	1	246 ft <sup>2</sup>	Interior	91 ft <sup>2</sup>	Prop. Air Leakage		Interior	43.20 cfm	6.00 %	0.05	0.60
UTILITY RATES													
Fuel	Unit	Utility Name						Monthly Fixed Cost		\$/Unit			
Electricity	kWh	baton rouge fixed						0		0.08			
Natural Gas	Therm	Louisiana Average						0		1.09			
Fuel Oil	Gallon	Louisiana Default						0		1.1			
Propane	Gallon	Louisiana Default						0		1.4			





# APPENDIX C ENERGY MODELS

B. Bayou LaBatre, Alabama

Summary Data for HUD green - Alabama  
**2BR-2BA (Modular Unit) AMT2356A**  
 Climate Zone 2: Bayou LaBatre, Louisiana

Software Output Subtitle	IECCStd2006	Base Line House		Bronze - 15%		Silver - 30%		Gold - 50%		Emerald - 60%	
e-ratio as-built		0.90		0.85		0.72		0.51		0.41	
Hers as-built		77		80		71		65		57	
	<b>2006 IECC</b>	<b>2006 IECC Compliance Standard Calc -Base</b>	<b>Percentage Better than 2006 IECC</b>	<b>2006 IECC Compliance Standard Calc - 15%</b>		<b>2006 IECC Compliance Standard Calc - 30%</b>		<b>2006 IECC Compliance Standard Calc - 50%</b>		<b>2006 IECC Compliance Standard Calc - 60%</b>	
<b>2BR-2BA (Modular Unit) AMT2356A</b>											
Finished Floor Area, sq. feet	967	967		967		967		967		967	
Total Stories	1	1		1		1		1		1	
Foundation Type	Crawl Space	Crawl Space		Crawl Space		Crawl Space		Crawl Space		Crawl Space	
Bedrooms	2	2		2		2		2		2	
Baths	2	2		2		2		2		2	
Flat Ceiling R-value	23.97	<b>30</b>		<b>38</b>		38		38		<b>49</b>	
Wall Construction	2x wood	<b>2x6-16"oc</b>		2x6-16"oc		2x6-24"oc		2x6-24"oc		2x6-24"oc	
Wall R-value (cavity/cont. sheathing)	9.85	<b>19/0</b>		19/0		19/0		19/0		<b>19/5</b>	
Floor R-value	11.34	<b>11</b>		11		<b>30</b>		30		38	
Wall Area, Above Grade	1,035	1,035		1,035		1,035		1,035		1,035	
Window U-value	0.75	<b>0.35</b>		0.35		0.35		0.35		0.35	
Window SHGC	0.40	<b>0.40</b>		0.40		0.40		0.40		0.40	
Window Area	90	90		90		90		90		90	
Window Area, % of Floor, CFA	9.31%	9.31%		9.31%		9.31%		9.31%		9.31%	
Infiltration, Specific Leakage Area, SLA	0.00036	<b>0.00046</b>		0.00046		0.00046		0.00046		0.00046	
Infiltration, ACH50	6.67	<b>8.53</b>		8.53		8.53		8.53		8.53	
Ventilation Rate, cfm - 39.1@code		none		none		none		none		none	
Cooling System SEER	13	13		13		<b>16</b>		<b>14</b>		<b>18</b>	
Cooling Capacity, kBtu/hr	18	24		24		24		24		24	
Heating System, HSPF	7.7	7.7		7.7		<b>8.5</b>		<b>7.7</b>		<b>9</b>	
Heating Capacity, kBtu/hr	18	18		18		18		18		18	
Duct Leakage to outside (CFM25)	not given					0		0		0	
Duct Loss %, DSE	20.00%	<b>12.00%</b>		12.00%		<b>6.00%</b>		6.00%		6.00%	
Duct Insulation	6.00%	<b>6</b>		6		<b>8</b>		8		1	
Duct Location	Inside	Attic		Attic		Attic		Attic		Inside	
Air Handler Location	Inside	Interior		Interior		Interior		Interior		Interior	
Hot Water Use, gallons/day	50	50		50		50		50		50	
Water Heater Energy Factor	0.92	0.92		<b>0.94</b>		<b>0.98</b>		0.98	<b>w/ ICS</b>	0.98	<b>w/ ICS</b>
Tank size	40	40		40		<b>1</b>		1	<b>Solar</b>	1	<b>Solar</b>
Cool Set Point	78	78		78		78		78		78	
Heat Set Point	68	68		68		68		68		68	
Programmable Thermostat	No	none		<b>Yes</b>		Yes		Yes		Yes	
Cooling setback degrees; setback hours	none	none		2/6		2/6		2/6		2/6	
Heating setback degrees; setback hours	none	none		2/7		2/7		2/7		2/7	
Percentage Fluorescent Fixtures or CFLs	n/a	<b>10%</b>		10%		10%		10%		10%	
Solar PV											
Cooling Energy - cost	165	150	9.09%	129	21.82%	95	42.42%	106	35.76%	80	51.52%
Heating Energy - cost	80	62	22.50%	52	35.00%	39	51.25%	43	46.25%	26	67.50%
Hot Water Energy - cost	183	183	0.00%	177	3.28%	168	8.20%	61	66.67%	61	66.67%
Solar PV											
Subtotal Heat Cool WH	428	395	<b>7.71%</b>	358	<b>16.36%</b>	302	<b>29.44%</b>	210	<b>50.93%</b>	167	<b>60.98%</b>

Notes:

**Bold entries indicate upgraded features at each level.**

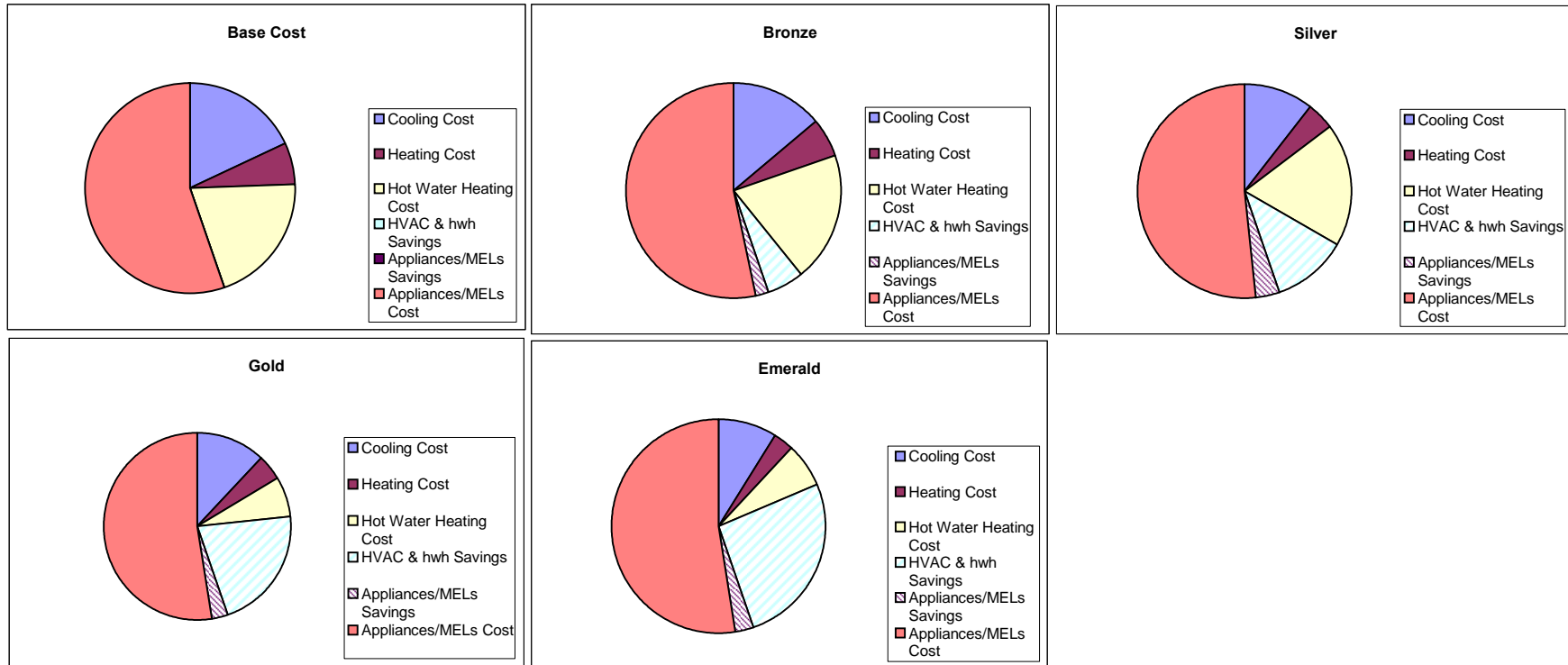
When a tankless waterheater is installed - base IECC number is manipulated to original, so saving increases over e-Ratio

Infiltration Defaults to 0.00046 in proposed mode when there is no added ventilation @ 0.00036 (ashrea 62.2)

Bayou LaBatre, Alabama  
Palm Harbor

Annual Energy Summary	Base	Bronze			Silver			Gold			Emerald		
	Yr \$	Yr \$	savings	percent	Yr \$	savings	percent	Yr \$	savings	percent	Yr \$	savings	percent
Cooling Cost	162	126	36	22%	95	67	41%	107	55	34%	81	81	50%
Heating Cost	59	52	7	12%	38	21	36%	42	17	29%	26	33	56%
Hot Water Heating Cost	183	177	6	3%	168	15	8%	61	122	67%	61	122	67%
HVAC & hwh Savings	N/A	49			103			194			236		
Appliances/MELs Savings	N/A	18			34			26			26		
Appliances/MELs Cost	500	482			466			474			474		
HVAC & HWH sub-total	404	355		12%	301		25%	210		48%	168		58%
Grand Total	904	837		93%	767		85%	684		76%	642		71%

Data based on Energy Gauge - Annual Energy Summary. Not Compliance





# Annual Energy Summary

HUD Green

Title: Palm Harbor - base  
User

TMY City: AL\_MOBILE\_REGIO  
Elec Util: bayou labatre fixed  
Gas Util: Alabama Average  
Run Date: 08/05/2010 10:45:48

Bayou LaBatre, Al, -  
Registration #:

worst case @ 90

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (13.5 kBtu/hr)	1659 kWh	\$133
Cooling Fan	365 kWh	\$29
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Cooling</b>	<b>2024 kWh</b>	<b>\$162</b>
Heating (11.8 kBtu/hr)	634 kWh	\$51
Heating Fan/Pump	99 kWh	\$8
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Heating</b>	<b>733 kWh</b>	<b>\$59</b>
Hot Water	2289 kWh	\$183
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>	<b>2289 kWh</b>	<b>\$183</b>
Ceiling Fans	0 kWh	\$0
Clothes Washer	53 kWh	\$4
Dishwasher	98 kWh	\$8
Dryer	827 kWh	\$66
Lighting	1179 kWh	\$94
Miscellaneous	2512 kWh	\$201
Pool Pump	0 kWh	\$0
Range	909 kWh	\$73
Refrigerator	672 kWh	\$54
<hr/>		
Total (kWh)	11296 kWh	\$904
Total (Therms)	0 Therms	\$0
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		\$904

## Emissions (Calculated as Total - PV Produced)

SO2	69.72 Lbs.
NOX	23.69 Lbs.
CO2	7.34 Tons

# IECC-2006 Section 404 Compliance

PROJECT										
Title:	Palm Harbor - base	Bedrooms:	2	Address Type:	Street Address	Building Type:	User	Bathrooms:	2	Lot #
Owner:	HUD Green	Conditioned Area:	967	SubDivision:		# of Units:	1	Total Stories:	1	PlatBook:
Builder Name:	Palm Harbor Homes	Worst Case:	No	Street:		Permit Office:		Rotate Angle:	90	County:
Jurisdiction:		Cross Ventilation:		City, State, Zip:	Bayou LaBatre ,	Family Type:	Single-family	Whole House Fan:		Al , -
New/Existing:	New (From Plans)					Comment:	worst case @ 90			

Estimated Annual Energy Cost for Code Compliance			
	IECC Std. Design	Proposed Home	e-Ratio
Cooling:	\$ 165	\$ 150	0.91
Heating:	\$ 80	\$ 62	0.77
Hot Water:	\$ 183	\$ 183	1.00
<b>Total:</b>	<b>\$ 428</b>	<b>\$ 395</b>	<b>0.92</b>

## PASS

CLIMATE										
✓	Design Location	Tmy Site	Climate Zone	Design Temp 97.5 %	Design Temp 2.5 %	Int Design Temp Winter	Int Design Temp Summer	Heating Degree Days	Design Moisture	Daily Temp Range
✓	AL, MOBILE_REGIONAL	AL_MOBILE_REGIONAL	2	27	91	75	70	1723.5	48	Medium

FLOORS										
✓	#	Floor Type	Exposed Perimeter	Wall Ins. R-Value	Area	Floor Joist R-Value	Tile	Wood	Carpet	
✓	1	Crawlspace	129 ft	0	967 ft²	11	0.5	0	0.5	

ROOF										
✓	#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch
✓	1	Gable or shed	Composition shingles	1019 ft²	160 ft²	Medium	0.85	No	0	18.4 deg

ATTIC							
✓	#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC
✓	1	Full attic	Vented	300	967 ft²	N	N

## IECC-2006 Section 404 Compliance

CEILING													
✓	#	Ceiling Type			R-Value	Area	Framing Frac	Truss Type					
✓	1	Under Attic (Vented)			30	967 ft²	0.14	Wood					
WALLS													
✓	#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Area	Sheathing R-Value	Framing Fraction	Solar Absor.				
✓	1	W	Exterior	Frame - Wood	19	42.67 ft²	0	0.23	0.5				
✓	2	N	Exterior	Frame - Wood	19	120 ft²	0	0.23	0.5				
✓	3	W	Exterior	Frame - Wood	19	234.67 ft²	0	0.23	0.5				
✓	4	S	Exterior	Frame - Wood	19	240 ft²	0	0.23	0.5				
✓	5	E	Exterior	Frame - Wood	19	277.33 ft²	0	0.23	0.5				
✓	6	N	Exterior	Frame - Wood	19	120 ft²	0	0.23	0.5				
DOORS													
✓	#	Wall ID	Door Type			Storms	U-Value	Area					
✓	1	W	Insulated			None	0.28	20 ft²					
✓	2	W	Insulated			None	0.28	20 ft²					
WINDOWS													
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.													
✓	#	Ornt	Frame	Panels	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening
✓	1	N	Vinyl	Low-E Double	Yes	0.35	0.4	N	15 ft²	5 ft 4 in	1 ft 0 in	None	None
✓	2	W	Vinyl	Low-E Double	Yes	0.35	0.4	N	7.5 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	3	S	Vinyl	Low-E Double	Yes	0.35	0.4	N	7.5 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	4	S	Vinyl	Low-E Double	Yes	0.35	0.4	N	30 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	5	N	Vinyl	Low-E Double	Yes	0.35	0.4	N	30 ft²	0 ft 0 in	0 ft 0 in	None	None
INFILTRATION & VENTING													
✓	Method		SLA	CFM 50	ACH 50	ELA	EqLA	---- Forced Ventilation ----		Run Time	Fan		
✓	Proposed SLA		0.00046	1168	8.53	64.1	120.6	0 cfm	0 cfm	0	20		
COOLING SYSTEM													
✓	#	System Type		Subtype			Efficiency	Capacity	Air Flow	SHR	Ductless		
✓	1	Central Unit		None			SEER: 13	24 kBtu/hr	720 cfm	0.75	False		

## IECC-2006 Section 404 Compliance

HEATING SYSTEM													
✓	#	System Type	Subtype				Efficiency	Capacity	Ductless				
	1	Electric Heat Pump	None				HSPF: 7.7	18 kBtu/hr	False				
HOT WATER SYSTEM													
✓	#	System Type	EF				Cap	Use	SetPnt	Credits			
	1	Electric	0.92				40 gal	50 gal	120 deg	None			
DUCTS													
✓	#	---- Supply ----			---- Return ----			Leakage Type	Air Handler	CFM 25	Percent Leakage	QN	RLF
	1	Attic	6	59.6 ft²	Attic	0 ft²	DSE=0.80	Interior	34.95 cfm	0.00 %	0.00	0.60	
UTILITY RATES													
Fuel	Unit	Utility Name						Monthly Fixed Cost		\$/Unit			
Electricity	kWh	bayou labatre fixed						0		0.08			
Natural Gas	Therm	Alabama Average						0		1.3			
Fuel Oil	Gallon	Alabama Default						0		1.1			
Propane	Gallon	Alabama Default						0		1.4			

# Annual Energy Summary

HUD Green

Title: Palm Harbor - 15%  
User

TMY City: AL\_MOBILE\_REGIO  
Elec Util: bayou labatre fixed  
Gas Util: Alabama Average  
Run Date: 08/05/2010 10:48:07

Bayou LaBatre, Al, -  
Registration #:

worst case @ 90

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (15.3 kBtu/hr)	1300 kWh	\$104
Cooling Fan	280 kWh	\$22
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Cooling</b>	<b>1580 kWh</b>	<b>\$126</b>
Heating (13.7 kBtu/hr)	564 kWh	\$45
Heating Fan/Pump	90 kWh	\$7
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Heating</b>	<b>654 kWh</b>	<b>\$52</b>
Hot Water	2214 kWh	\$177
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>	<b>2214 kWh</b>	<b>\$177</b>
Ceiling Fans	0 kWh	\$0
Clothes Washer	53 kWh	\$4
Dishwasher	98 kWh	\$8
Dryer	827 kWh	\$66
Lighting	1179 kWh	\$94
Miscellaneous	2512 kWh	\$201
Pool Pump	0 kWh	\$0
Range	909 kWh	\$73
Refrigerator	450 kWh	\$36
<hr/>		
Total (kWh)	10476 kWh	\$837
Total (Therms)	0 Therms	\$0
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		\$837

## Emissions (Calculated as Total - PV Produced)

SO2	64.65 Lbs.
NOX	21.97 Lbs.
CO2	6.8 Tons

# IECC-2006 Section 404 Compliance

PROJECT											
Title:	Palm Harbor - 15%	Bedrooms:	2	Address Type:	Street Address	Building Type:	User	Bathrooms:	2	Lot #	
Owner:	HUD Green	Conditioned Area:	967	SubDivision:		# of Units:	1	Total Stories:	1	PlatBook:	
Builder Name:	Palm Harbor Homes	Worst Case:	No	Street:		Permit Office:		Rotate Angle:	90	County:	
Jurisdiction:		Cross Ventilation:		City, State, Zip:	Bayou LaBatre ,	Family Type:	Single-family	Whole House Fan:		Al ,	-
New/Existing:	New (From Plans)					Comment:	worst case @ 90				
Estimated Annual Energy Cost for Code Compliance											
		<b>IECC Std. Design</b>		<b>Proposed Home</b>					<b>e-Ratio</b>		
	Cooling:	\$ 165		\$ 129					0.78		
	Heating:	\$ 80		\$ 52					0.65		
	Hot Water:	\$ 183		\$ 177					0.97		
	<b>Total:</b>	<b>\$ 428</b>		<b>\$ 358</b>					<b>0.84</b>		
<h2 style="margin: 0;">PASS</h2>											
CLIMATE											
✓	Design Location	Tmy Site	Climate Zone	Design Temp 97.5 %	Design Temp 2.5 %	Int Design Temp Winter	Int Design Temp Summer	Heating Degree Days	Design Moisture	Daily Temp Range	
_____	AL, MOBILE_REGIONAL	AL_MOBILE_REGIONAL	2	27	91	75	70	1723.5	48	Medium	
FLOORS											
✓	#	Floor Type	Exposed Perimeter	Wall Ins. R-Value	Area	Floor Joist R-Value	Tile	Wood	Carpet		
_____	1	Crawlspace	129 ft	0	967 ft²	11	0.5	0	0.5		
ROOF											
✓	#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch	
_____	1	Gable or shed	Composition shingles	1019 ft²	160 ft²	Medium	0.85	No	0	18.4 deg	
ATTIC											
✓	#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC				
_____	1	Full attic	Vented	300	967 ft²	N	N				

## IECC-2006 Section 404 Compliance

CEILING													
✓	#	Ceiling Type			R-Value	Area	Framing Frac	Truss Type					
✓	1	Under Attic (Vented)			30	967 ft²	0.14	Wood					
WALLS													
✓	#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Area	Sheathing R-Value	Framing Fraction	Solar Absor.				
✓	1	W	Exterior	Frame - Wood	19	42.67 ft²	0	0.23	0.5				
✓	2	N	Exterior	Frame - Wood	19	120 ft²	0	0.23	0.5				
✓	3	W	Exterior	Frame - Wood	19	234.67 ft²	0	0.23	0.5				
✓	4	S	Exterior	Frame - Wood	19	240 ft²	0	0.23	0.5				
✓	5	E	Exterior	Frame - Wood	19	277.33 ft²	0	0.23	0.5				
✓	6	N	Exterior	Frame - Wood	19	120 ft²	0	0.23	0.5				
DOORS													
✓	#	Wall ID	Door Type			Storms	U-Value	Area					
✓	1	W	Insulated			None	0.28	20 ft²					
✓	2	W	Insulated			None	0.28	20 ft²					
WINDOWS													
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.													
✓	#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening
✓	1	N	Vinyl	Low-E Double	Yes	0.35	0.4	N	15 ft²	5 ft 4 in	1 ft 0 in	IECC	None
✓	2	W	Vinyl	Low-E Double	Yes	0.35	0.4	N	7.5 ft²	0 ft 0 in	0 ft 0 in	IECC	None
✓	3	S	Vinyl	Low-E Double	Yes	0.35	0.4	N	7.5 ft²	0 ft 0 in	0 ft 0 in	IECC	None
✓	4	S	Vinyl	Low-E Double	Yes	0.35	0.4	N	30 ft²	0 ft 0 in	0 ft 0 in	IECC	None
✓	5	N	Vinyl	Low-E Double	Yes	0.35	0.4	N	30 ft²	0 ft 0 in	0 ft 0 in	IECC	None
INFILTRATION & VENTING													
✓	Method		SLA	CFM 50	ACH 50	ELA	EqLA	---- Forced Ventilation ----		Run Time	Fan		
✓	Proposed SLA		0.00046	1168	8.53	64.1	120.6	0 cfm	0 cfm	0	20		
COOLING SYSTEM													
✓	#	System Type		Subtype			Efficiency	Capacity	Air Flow	SHR	Ductless		
✓	1	Central Unit		None			SEER: 13	24 kBtu/hr	720 cfm	0.75	False		

## IECC-2006 Section 404 Compliance

HEATING SYSTEM												
✓	#	System Type	Subtype	Efficiency	Capacity	Ductless						
	1	Electric Heat Pump	None	HSPF: 7.7	18 kBtu/hr	False						
HOT WATER SYSTEM												
✓	#	System Type	EF	Cap	Use	SetPnt	Credits					
	1	Electric	0.94	40 gal	50 gal	120 deg	None					
DUCTS												
✓	#	---- Supply ----			---- Return ----		Leakage Type	Air Handler	CFM 25	Percent Leakage	QN	RLF
	1	Location	R-Value	Area	Location	Area	Prop. Air Leakage	Interior	86.40 cfm	12.00 %	0.09	0.60
		Attic	6	59.6 ft <sup>2</sup>	Attic	0 ft <sup>2</sup>						
UTILITY RATES												
Fuel	Unit	Utility Name					Monthly Fixed Cost	\$/Unit				
Electricity	kWh	bayou labatre fixed					0	0.08				
Natural Gas	Therm	Alabama Average					0	1.3				
Fuel Oil	Gallon	Alabama Default					0	1.1				
Propane	Gallon	Alabama Default					0	1.4				



# Annual Energy Summary

HUD Green

Title: Palm Harbor - 30%  
User

TMY City: AL\_MOBILE\_REGIO  
Elec Util: bayou labatre fixed  
Gas Util: Alabama Average  
Run Date: 08/05/2010 10:49:56

Bayou LaBatre, Al, -  
Registration #:

worst case @ 90

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (24 kBtu/hr)	1004 kWh	\$80
Cooling Fan	190 kWh	\$15
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Cooling</b>	<b>1194 kWh</b>	<b>\$95</b>
Heating (18 kBtu/hr)	416 kWh	\$33
Heating Fan/Pump	59 kWh	\$5
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Heating</b>	<b>475 kWh</b>	<b>\$38</b>
Hot Water	2105 kWh	\$168
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>	<b>2105 kWh</b>	<b>\$168</b>
Ceiling Fans	0 kWh	\$0
Clothes Washer	55 kWh	\$4
Dishwasher	98 kWh	\$8
Dryer	627 kWh	\$50
Lighting	1179 kWh	\$94
Miscellaneous	2512 kWh	\$201
Pool Pump	0 kWh	\$0
Range	909 kWh	\$73
Refrigerator	450 kWh	\$36
<hr/>		
Total (kWh)	9604 kWh	\$767
Total (Therms)	0 Therms	\$0
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		\$767

## Emissions (Calculated as Total - PV Produced)

SO2	59.27 Lbs.
NOX	20.14 Lbs.
CO2	6.24 Tons

# IECC-2006 Section 404 Compliance

PROJECT																														
Title:	Palm Harbor - 30%	Bedrooms:	2	Address Type:	Street Address	Building Type:	User	Bathrooms:	2	Lot #																				
Owner:	HUD Green	Conditioned Area:	967	SubDivision:		# of Units:	1	Total Stories:	1	PlatBook:																				
Builder Name:	Palm Harbor Homes	Worst Case:	No	Street:		Permit Office:		Rotate Angle:	90	County:																				
Jurisdiction:		Cross Ventilation:		City, State, Zip:	Bayou LaBatre ,	Family Type:	Single-family	Whole House Fan:		Al , -																				
New/Existing:	New (From Plans)					Comment:	worst case @ 90																							
<p>Estimated Annual Energy Cost for Code Compliance</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th><th style="text-align: center;">IECC Std. Design</th><th style="text-align: center;">Proposed Home</th><th style="text-align: center;">e-Ratio</th></tr> </thead> <tbody> <tr> <td>Cooling:</td><td style="text-align: right;">\$ 165</td><td style="text-align: right;">\$ 95</td><td style="text-align: right;">0.58</td></tr> <tr> <td>Heating:</td><td style="text-align: right;">\$ 80</td><td style="text-align: right;">\$ 39</td><td style="text-align: right;">0.49</td></tr> <tr> <td>Hot Water:</td><td style="text-align: right;">\$ 183</td><td style="text-align: right;">\$ 168</td><td style="text-align: right;">0.92</td></tr> <tr> <td><b>Total:</b></td><td style="text-align: right;"><b>\$ 428</b></td><td style="text-align: right;"><b>\$ 302</b></td><td style="text-align: right;"><b>0.71</b></td></tr> </tbody> </table> <p style="text-align: center; font-size: 2em; font-weight: bold; margin-top: 20px;">PASS</p>												IECC Std. Design	Proposed Home	e-Ratio	Cooling:	\$ 165	\$ 95	0.58	Heating:	\$ 80	\$ 39	0.49	Hot Water:	\$ 183	\$ 168	0.92	<b>Total:</b>	<b>\$ 428</b>	<b>\$ 302</b>	<b>0.71</b>
	IECC Std. Design	Proposed Home	e-Ratio																											
Cooling:	\$ 165	\$ 95	0.58																											
Heating:	\$ 80	\$ 39	0.49																											
Hot Water:	\$ 183	\$ 168	0.92																											
<b>Total:</b>	<b>\$ 428</b>	<b>\$ 302</b>	<b>0.71</b>																											
CLIMATE																														
✓	Design Location	Tmy Site	Climate Zone	Design Temp 97.5 %	Design Temp 2.5 %	Int Design Temp Winter	Int Design Temp Summer	Heating Degree Days	Design Moisture	Daily Temp Range																				
_____	AL, MOBILE_REGIONAL	AL_MOBILE_REGIONAL	2	27	91	75	70	1723.5	48	Medium																				
FLOORS																														
✓	#	Floor Type	Exposed Perimeter	Wall Ins. R-Value	Area	Floor Joist R-Value	Tile	Wood	Carpet																					
_____	1	Crawlspace	129 ft	0	967 ft²	19	0.5	0	0.5																					
ROOF																														
✓	#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch																				
_____	1	Gable or shed	Composition shingles	1019 ft²	160 ft²	Medium	0.85	No	0	18.4 deg																				
ATTIC																														
✓	#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC																							
_____	1	Full attic	Vented	300	967 ft²	N	N																							

## IECC-2006 Section 404 Compliance

CEILING													
✓	#	Ceiling Type			R-Value	Area	Framing Frac	Truss Type					
✓	1	Under Attic (Vented)			38	967 ft²	0.14	Wood					
WALLS													
✓	#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Area	Sheathing R-Value	Framing Fraction	Solar Absor.				
✓	1	W	Exterior	Frame - Wood	19	42.67 ft²	0	0.23	0.5				
✓	2	N	Exterior	Frame - Wood	19	120 ft²	0	0.23	0.5				
✓	3	W	Exterior	Frame - Wood	19	234.67 ft²	0	0.23	0.5				
✓	4	S	Exterior	Frame - Wood	19	240 ft²	0	0.23	0.5				
✓	5	E	Exterior	Frame - Wood	19	277.33 ft²	0	0.23	0.5				
✓	6	N	Exterior	Frame - Wood	19	120 ft²	0	0.23	0.5				
DOORS													
✓	#	Wall ID	Door Type		Storms	U-Value	Area						
✓	1	W	Insulated		None	0.28	20 ft²						
✓	2	W	Insulated		None	0.28	20 ft²						
WINDOWS													
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.													
✓	#	Ornt	Frame	Panels	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening
✓	1	N	Vinyl	Low-E Double	Yes	0.35	0.4	N	15 ft²	5 ft 4 in	1 ft 0 in	IECC	None
✓	2	W	Vinyl	Low-E Double	Yes	0.35	0.4	N	7.5 ft²	0 ft 0 in	0 ft 0 in	IECC	None
✓	3	S	Vinyl	Low-E Double	Yes	0.35	0.4	N	7.5 ft²	0 ft 0 in	0 ft 0 in	IECC	None
✓	4	S	Vinyl	Low-E Double	Yes	0.35	0.4	N	30 ft²	0 ft 0 in	0 ft 0 in	IECC	None
✓	5	N	Vinyl	Low-E Double	Yes	0.35	0.4	N	30 ft²	0 ft 0 in	0 ft 0 in	IECC	None
INFILTRATION & VENTING													
✓	Method		SLA	CFM 50	ACH 50	ELA	EqLA	---- Forced Ventilation ----		Run Time	Fan		
✓	Proposed SLA		0.00046	1168	8.53	64.1	120.6	0 cfm	0 cfm	0	20		
COOLING SYSTEM													
✓	#	System Type		Subtype		Efficiency	Capacity	Air Flow	SHR	Ductless			
✓	1	Central Unit		None		SEER: 16	24 kBtu/hr	720 cfm	0.75	False			

## IECC-2006 Section 404 Compliance

HEATING SYSTEM												
✓	#	System Type	Subtype	Efficiency	Capacity	Ductless						
	1	Electric Heat Pump	None	HSPF: 8.5	18 kBtu/hr	False						
HOT WATER SYSTEM												
✓	#	System Type	EF	Cap	Use	SetPnt	Credits					
	1	Electric	0.98	1 gal	50 gal	120 deg	None					
DUCTS												
✓	#	---- Supply ----			---- Return ----		Leakage Type	Air Handler	CFM 25	Percent Leakage	QN	RLF
	1	Location	R-Value	Area	Location	Area	Prop. Air Leakage	Interior	43.20 cfm	6.00 %	0.04	0.60
		Attic	8	59.6 ft <sup>2</sup>	Interior	0 ft <sup>2</sup>						
UTILITY RATES												
Fuel	Unit	Utility Name					Monthly Fixed Cost	\$/Unit				
Electricity	kWh	bayou labatre fixed					0	0.08				
Natural Gas	Therm	Alabama Average					0	1.3				
Fuel Oil	Gallon	Alabama Default					0	1.1				
Propane	Gallon	Alabama Default					0	1.4				

# Annual Energy Summary

HUD Green

Title: Palm Harbor - 50%  
User

TMY City: AL\_MOBILE\_REGIO  
Elec Util: bayou labatre fixed  
Gas Util: Alabama Average  
Run Date: 08/05/2010 10:51:40

Bayou LaBatre, Al, -  
Registration #:

worst case @ 90

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (24 kBtu/hr)	1148 kWh	\$92
Cooling Fan	190 kWh	\$15
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Cooling</b>	<b>1338 kWh</b>	<b>\$107</b>
Heating (18 kBtu/hr)	451 kWh	\$36
Heating Fan/Pump	73 kWh	\$6
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Heating</b>	<b>524 kWh</b>	<b>\$42</b>
Hot Water	758 kWh	\$61
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>	<b>758 kWh</b>	<b>\$61</b>
Ceiling Fans	0 kWh	\$0
Clothes Washer	55 kWh	\$4
Dishwasher	98 kWh	\$8
Dryer	627 kWh	\$50
Lighting	1179 kWh	\$94
Miscellaneous	2512 kWh	\$201
Pool Pump	0 kWh	\$0
Range	909 kWh	\$73
Refrigerator	450 kWh	\$36
<hr/>		
Total (kWh)	8450 kWh	\$676
Total (Therms)	0 Therms	\$0
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		\$676

## Emissions (Calculated as Total - PV Produced)

SO2	52.15 Lbs.
NOX	17.72 Lbs.
CO2	5.49 Tons

# IECC-2006 Section 404 Compliance

PROJECT										
Title:	Palm Harbor - 50%	Bedrooms:	2	Address Type:	Street Address					
Building Type:	User	Bathrooms:	2	Lot #						
Owner:	HUD Green	Conditioned Area:	967	SubDivision:						
# of Units:	1	Total Stories:	1	PlatBook:						
Builder Name:	Palm Harbor Homes	Worst Case:	No	Street:						
Permit Office:		Rotate Angle:	90	County:						
Jurisdiction:		Cross Ventilation:		City, State, Zip:	Bayou LaBatre ,					
Family Type:	Single-family	Whole House Fan:			Al , -					
New/Existing:	New (From Plans)									
Comment:	worst case @ 90									
Estimated Annual Energy Cost for Code Compliance										
		IECC Std. Design	Proposed Home	e-Ratio						
	Cooling:	\$ 165	\$ 106	0.64						
	Heating:	\$ 80	\$ 43	0.54						
	Hot Water:	\$ 183	\$ 61	0.33						
	<b>Total:</b>	<b>\$ 428</b>	<b>\$ 210</b>	<b>0.49</b>						
PASS										
CLIMATE										
✓	Design Location	Tmy Site	Climate Zone	Design Temp 97.5 %	Design Temp 2.5 %	Int Design Temp Winter	Int Design Temp Summer	Heating Degree Days	Design Moisture	Daily Temp Range
	AL, MOBILE_REGIONAL	AL_MOBILE_REGIONAL	2	27	91	75	70	1723.5	48	Medium
FLOORS										
✓	#	Floor Type	Exposed Perimeter	Wall Ins. R-Value	Area	Floor Joist R-Value	Tile	Wood	Carpet	
	1	Crawlspace	129 ft	0	967 ft²	19	0.5	0	0.5	
ROOF										
✓	#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch
	1	Gable or shed	Composition shingles	1019 ft²	160 ft²	Medium	0.85	No	0	18.4 deg
ATTIC										
✓	#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC			
	1	Full attic	Vented	300	967 ft²	N	N			

## IECC-2006 Section 404 Compliance

CEILING													
✓	#	Ceiling Type			R-Value	Area	Framing Frac	Truss Type					
✓	1	Under Attic (Vented)			38	967 ft²	0.14	Wood					
WALLS													
✓	#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Area	Sheathing R-Value	Framing Fraction	Solar Absor.				
✓	1	W	Exterior	Frame - Wood	19	42.67 ft²	0	0.23	0.5				
✓	2	N	Exterior	Frame - Wood	19	120 ft²	0	0.23	0.5				
✓	3	W	Exterior	Frame - Wood	19	234.67 ft²	0	0.23	0.5				
✓	4	S	Exterior	Frame - Wood	19	240 ft²	0	0.23	0.5				
✓	5	E	Exterior	Frame - Wood	19	277.33 ft²	0	0.23	0.5				
✓	6	N	Exterior	Frame - Wood	19	120 ft²	0	0.23	0.5				
DOORS													
✓	#	Wall ID	Door Type			Storms	U-Value	Area					
✓	1	W	Insulated			None	0.28	20 ft²					
✓	2	W	Insulated			None	0.28	20 ft²					
WINDOWS													
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.													
✓	#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening
✓	1	N	Vinyl	Low-E Double	Yes	0.35	0.4	N	15 ft²	5 ft 4 in	1 ft 0 in	IECC	None
✓	2	W	Vinyl	Low-E Double	Yes	0.35	0.4	N	7.5 ft²	0 ft 0 in	0 ft 0 in	IECC	None
✓	3	S	Vinyl	Low-E Double	Yes	0.35	0.4	N	7.5 ft²	0 ft 0 in	0 ft 0 in	IECC	None
✓	4	S	Vinyl	Low-E Double	Yes	0.35	0.4	N	30 ft²	0 ft 0 in	0 ft 0 in	IECC	None
✓	5	N	Vinyl	Low-E Double	Yes	0.35	0.4	N	30 ft²	0 ft 0 in	0 ft 0 in	IECC	None
INFILTRATION & VENTING													
✓	Method		SLA	CFM 50	ACH 50	ELA	EqLA	---- Forced Ventilation ----		Run Time	Fan		
✓	Proposed SLA		0.00046	1168	8.53	64.1	120.6	0 cfm	0 cfm	0	20		
COOLING SYSTEM													
✓	#	System Type		Subtype			Efficiency	Capacity	Air Flow	SHR	Ductless		
✓	1	Central Unit		None			SEER: 14	24 kBtu/hr	720 cfm	0.75	False		

## IECC-2006 Section 404 Compliance

HEATING SYSTEM													
✓	#	System Type			Subtype			Efficiency	Capacity	Ductless			
✓	1	Electric Heat Pump			None			HSPF: 7.7	18 kBtu/hr	False			
HOT WATER SYSTEM													
✓	#	System Type			EF	Cap	Use	SetPnt	Credits				
✓	1	Electric			0.98	1 gal	50 gal	120 deg	Solar System				
DUCTS													
✓	#	---- Supply ----			---- Return ----				Air Handler	CFM 25	Percent Leakage	QN	RLF
✓	1	Attic	8	59.6 ft <sup>2</sup>	Interior	0 ft <sup>2</sup>	Prop. Air Leakage	Interior	43.20 cfm	6.00 %	0.04	0.60	
UTILITY RATES													
Fuel	Unit	Utility Name						Monthly Fixed Cost		\$/Unit			
Electricity	kWh	bayou labatre fixed						0		0.08			
Natural Gas	Therm	Alabama Average						0		1.3			
Fuel Oil	Gallon	Alabama Default						0		1.1			
Propane	Gallon	Alabama Default						0		1.4			



# Annual Energy Summary

HUD Green

Title: Palm Harbor - 60%  
User

TMY City: AL\_MOBILE\_REGIO  
Elec Util: bayou labatre fixed  
Gas Util: Alabama Average  
Run Date: 08/05/2010 10:53:17

Bayou LaBatre, Al, -  
Registration #:

worst case @ 90

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (24 kBtu/hr)	839 kWh	\$67
Cooling Fan	177 kWh	\$14
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Cooling</b>	<b>1016 kWh</b>	<b>\$81</b>
Heating (18 kBtu/hr)	283 kWh	\$23
Heating Fan/Pump	42 kWh	\$3
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Heating</b>	<b>325 kWh</b>	<b>\$26</b>
Hot Water	758 kWh	\$61
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>	<b>758 kWh</b>	<b>\$61</b>
Ceiling Fans	0 kWh	\$0
Clothes Washer	55 kWh	\$4
Dishwasher	98 kWh	\$8
Dryer	627 kWh	\$50
Lighting	1179 kWh	\$94
Miscellaneous	2512 kWh	\$201
Pool Pump	0 kWh	\$0
Range	909 kWh	\$73
Refrigerator	450 kWh	\$36
<hr/>		
Total (kWh)	7929 kWh	\$634
Total (Therms)	0 Therms	\$0
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		\$634

## Emissions (Calculated as Total - PV Produced)

SO2	48.94 Lbs.
NOX	16.63 Lbs.
CO2	5.15 Tons

# IECC-2006 Section 404 Compliance

PROJECT										
Title:	Palm Harbor - 60%	Bedrooms:	2	Address Type:	Street Address					
Building Type:	User	Bathrooms:	2	Lot #						
Owner:	HUD Green	Conditioned Area:	967	SubDivision:						
# of Units:	1	Total Stories:	1	PlatBook:						
Builder Name:	Palm Harbor Homes	Worst Case:	No	Street:						
Permit Office:		Rotate Angle:	90	County:						
Jurisdiction:		Cross Ventilation:		City, State, Zip:	Bayou LaBatre ,					
Family Type:	Single-family	Whole House Fan:			Al ,					
New/Existing:	New (From Plans)									
Comment:	worst case @ 90									
Estimated Annual Energy Cost for Code Compliance										
		<b>IECC Std. Design</b>		<b>Proposed Home</b>		<b>e-Ratio</b>				
	Cooling:	\$ 165		\$ 80		0.48				
	Heating:	\$ 80		\$ 26		0.32				
	Hot Water:	\$ 183		\$ 61		0.33				
	<b>Total:</b>	<b>\$ 428</b>		<b>\$ 167</b>		<b>0.39</b>				
<h2 style="margin: 0;">PASS</h2>										
CLIMATE										
✓	Design Location	Tmy Site	Climate Zone	Design Temp 97.5 %	Design Temp 2.5 %	Int Design Temp Winter	Int Design Temp Summer	Heating Degree Days	Design Moisture	Daily Temp Range
_____	AL, MOBILE_REGIONAL	AL_MOBILE_REGIONAL	2	27	91	75	70	1723.5	48	Medium
FLOORS										
✓	#	Floor Type	Exposed Perimeter	Wall Ins. R-Value	Area	Floor Joist R-Value	Tile	Wood	Carpet	
_____	1	Crawlspace	129 ft	0	967 ft²	30	0.5	0	0.5	
ROOF										
✓	#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch
_____	1	Gable or shed	Composition shingles	1019 ft²	160 ft²	Medium	0.85	No	0	18.4 deg
ATTIC										
✓	#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC			
_____	1	Full attic	Vented	300	967 ft²	N	N			

## IECC-2006 Section 404 Compliance

CEILING													
✓	#	Ceiling Type			R-Value	Area	Framing Frac	Truss Type					
✓	1	Under Attic (Vented)			49	967 ft²	0.14	Wood					
WALLS													
✓	#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Area	Sheathing R-Value	Framing Fraction	Solar Absor.				
✓	1	W	Exterior	Frame - Wood	19	42.67 ft²	5	0.23	0.5				
✓	2	N	Exterior	Frame - Wood	19	120 ft²	5	0.23	0.5				
✓	3	W	Exterior	Frame - Wood	19	234.67 ft²	5	0.23	0.5				
✓	4	S	Exterior	Frame - Wood	19	240 ft²	5	0.23	0.5				
✓	5	E	Exterior	Frame - Wood	19	277.33 ft²	5	0.23	0.5				
✓	6	N	Exterior	Frame - Wood	19	120 ft²	5	0.23	0.5				
DOORS													
✓	#	Wall ID	Door Type		Storms	U-Value	Area						
✓	1	W	Insulated		None	0.28	20 ft²						
✓	2	W	Insulated		None	0.28	20 ft²						
WINDOWS													
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.													
✓	#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening
✓	1	N	Vinyl	Low-E Double	Yes	0.35	0.4	N	15 ft²	5 ft 4 in	1 ft 0 in	IECC	None
✓	2	W	Vinyl	Low-E Double	Yes	0.35	0.4	N	7.5 ft²	0 ft 0 in	0 ft 0 in	IECC	None
✓	3	S	Vinyl	Low-E Double	Yes	0.35	0.4	N	7.5 ft²	0 ft 0 in	0 ft 0 in	IECC	None
✓	4	S	Vinyl	Low-E Double	Yes	0.35	0.4	N	30 ft²	0 ft 0 in	0 ft 0 in	IECC	None
✓	5	N	Vinyl	Low-E Double	Yes	0.35	0.4	N	30 ft²	0 ft 0 in	0 ft 0 in	IECC	None
INFILTRATION & VENTING													
✓	Method		SLA	CFM 50	ACH 50	ELA	EqLA	---- Forced Ventilation ----		Run Time	Fan		
✓	Proposed SLA		0.00046	1168	8.53	64.1	120.6	0 cfm	0 cfm	0	20		
COOLING SYSTEM													
✓	#	System Type		Subtype		Efficiency	Capacity	Air Flow	SHR	Ductless			
✓	1	Central Unit		None		SEER: 18	24 kBtu/hr	720 cfm	0.75	False			

## IECC-2006 Section 404 Compliance

HEATING SYSTEM												
✓	#	System Type	Subtype	Efficiency	Capacity	Ductless						
	1	Electric Heat Pump	None	HSPF: 9	18 kBtu/hr	False						
HOT WATER SYSTEM												
✓	#	System Type	EF	Cap	Use	SetPnt	Credits					
	1	Electric	0.98	1 gal	50 gal	120 deg	Solar System					
DUCTS												
✓	#	---- Supply ----			---- Return ----		Leakage Type	Air Handler	CFM 25	Percent Leakage	QN	RLF
	1	Interior	1	59.6 ft <sup>2</sup>	Interior	0 ft <sup>2</sup>	Prop. Air Leakage	Interior	43.20 cfm	6.00 %	0.04	0.60
UTILITY RATES												
Fuel	Unit	Utility Name				Monthly Fixed Cost	\$/Unit					
Electricity	kWh	bayou labatre fixed				0	0.08					
Natural Gas	Therm	Alabama Average				0	1.3					
Fuel Oil	Gallon	Alabama Default				0	1.1					
Propane	Gallon	Alabama Default				0	1.4					





# APPENDIX C ENERGY MODELS

## 2 – Climate Zone #3

### A. Oakland, California

Summary Data for HUD green - Oakland, California

D-Unit Townhouse

Climate Zone 3: Oakland, California

ResCheck

Software Output Subtitle	IECCStd2006	proposed w/solar DHW	
e-ratio as-built		0.35	
Hers as-built		62	
	<b>2006 IECC</b>	<b>2006 IECC Compliance Standard Calc - 15%</b>	
<b>D-Unit Townhouse</b>			
Finished Floor Area, sq. feet	1105	1105	
Total Stories	2	2	
Foundation Type	slab	slab	
Bedrooms	2	2	
Baths	1.5	1.5	
Flat Ceiling R-value	23.97	38	
Floor over Ambient R-value	n/a	n/a	
Wall Construction	2x wood	2x6-16"oc	
Wall R-value (cavity/cont. sheathing)	9.85	19/0	
Slab/Crawl Floor/Wall R-value		0	
Wall Area, Above Grade	1,905	1,905	
Window U-value	0.65	0.35	
Window SHGC	0.40	0.41	
Window Area	169	240	
Window Area, % of Floor, CFA	15.30%	21.72%	
Infiltration, Specific Leakage Area, SLA	0.00036	0.00036	
Infiltration, ACH50	6.16	6.16	
Ventilation Rate, cfm - 47@ ashrae 62.2	0	none	
Cooling System SEER	13	none	
Cooling Capacity, kBtu/hr	13.75		
Heating System, Boiler/Hydronic - ef	0.8	0.92	
Heating Capacity, kBtu/hr	16.1	24	
Duct Leakage to outside (CFM25)	not given	ductless	
Duct Loss %, DSE	20.00%	baseboard	
Qn	n/a	boiler	
Duct Insulation	6	n/a	
Duct Location	Inside	n/a	
Air Handler Location	Inside	outdoor mech	
Hot Water Use, gallons/day	50	50	Add 32 SF
Water Heater Energy Factor	0.56	0.92	Solar DHW
Tank size	60	60	
Cool Set Point	78	78	
Heat Set Point	68	68	
Programmable Thermostat	No	No	
Cooling setback degrees; setback hours	none	none	
Heating setback degrees; setback hours	none	none	
Percentage Fluorescent Fixtures or CFLs	10	10%	
Solar PV			
Cooling Energy - cost	12	7	41.67%
Heating Energy - cost	134	73	45.52%
Hot Water Energy - cost	161	30	81.37%
Solar PV			
Subtotal Heat Cool WH	307	110	64.17%
Total Energy Cost (\$)			

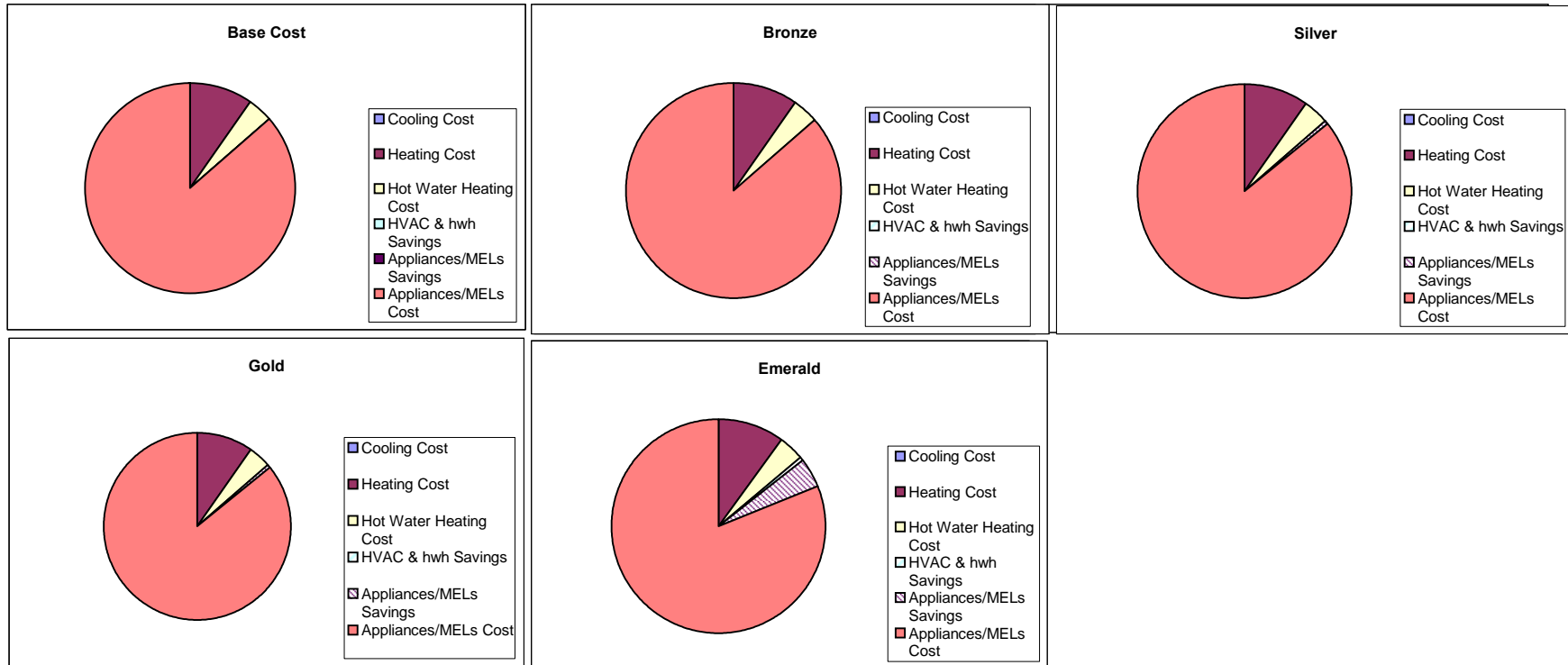
Notes:

**Bold entries indicate upgraded features at each level.**

Oakland, California

Annual Energy Summary	Base	Bronze			Silver			Gold			Emerald		
	Yr \$	Yr \$	savings	percent	Yr \$	savings	percent	Yr \$	savings	percent	Yr \$	savings	percent
Cooling Cost	0	0	0		0	0		0	0		0	0	
Heating Cost	72	72	0	0%	72	0	0%	72	0	0%	76	-4	-6%
Hot Water Heating Cost	30	30	0	0%	30	0	0%	30	0	0%	30	0	0%
HVAC & hwh Savings	N/A	0			0			0			-4		
Appliances/MELs Savings	N/A	0			4			4			33		
Appliances/MELs Cost	646	646			642			642			613		
HVAC & HWH sub-total	102	102		0%	102		0%	102		0%	106		-4%
Grand Total	748	748		100%	744		99%	744		99%	719		96%

Data based on Energy Gauge - Annual Energy Summary. Not Compliance





# Annual Energy Summary

HUD Green

Title: Oakland - base w solar DHW  
User

TMY City: CA\_OAKLAND\_MET

Oakland, CA, -  
Registration #:

Elec Util: oakland fixed

Gas Util: oakland fixed

Run Date: 08/10/2010 14:38:21

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (kBtu/hr)	0 kWh	\$0
Cooling Fan	0 kWh	\$0
Mechanical Vent Fan	0 kWh	\$0
Total Cooling		<b>\$0</b>
Heating (24 kBtu/hr)	72 Therms	\$69
Heating Fan/Pump	23 kWh	\$3
Mechanical Vent Fan	0 kWh	\$0
Total Heating		<b>\$72</b>
Hot Water	31 Therms	\$30
Hot Water Pump	0 kWh	\$0
Total Hot Water		<b>\$30</b>
Ceiling Fans	0 kWh	\$0
Clothes Washer	53 kWh	\$7
Dishwasher	128 kWh	\$17
Dryer	827 kWh	\$108
Lighting	1263 kWh	\$164
Miscellaneous	1982 kWh	\$258
Pool Pump	0 kWh	\$0
Range	38 kWh	\$5
Refrigerator	671 kWh	\$87
<hr/>		
Total (kWh)	4985 kWh	\$649
Total (Therms)	103 Therms	\$99
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		<b>\$748</b>

## Emissions (Calculated as Total - PV Produced)

SO2	0.64 Lbs.
NOX	2.74 Lbs.
CO2	2.35 Tons

# IECC-2006 Section 404 Compliance

PROJECT										
Title:	Oakland - base w solar DHW	Bedrooms:	2	Adress Type:	Street Address					
Building Type:	User	Bathrooms:	1.5	Lot #						
Owner:	HUD Green	Conditioned Area:	1105	SubDivision:						
# of Units:	1	Total Stories:	2	PlatBook:						
Builder Name:		Worst Case:	No	Street:						
Permit Office:		Rotate Angle:	0	County:						
Jurisdiction:		Cross Ventilation:		City, State, Zip:	Oakland ,					
Family Type:	Multi-family	Whole House Fan:			CA ,					
New/Existing:	New (From Plans)									
Comment:										
Estimated Annual Energy Cost for Code Compliance										
		<b>IECC Std. Design</b>		<b>Proposed Home</b>		<b>e-Ratio</b>				
	Cooling:	\$ 12		\$ 7		0.58				
	Heating:	\$ 134		\$ 73		0.54				
	Hot Water:	\$ 161		\$ 30		0.19				
	<b>Total:</b>	<b>\$ 307</b>		<b>\$ 110</b>		<b>0.36</b>				
<h2 style="margin: 0;">PASS</h2>										
CLIMATE										
✓	Design Location	Tmy Site	Climate Zone	Design Temp 97.5 %	Design Temp 2.5 %	Int Design Temp Winter	Int Design Temp Summer	Heating Degree Days	Design Moisture	Daily Temp Range
	CA, OAKLAND_METROP	CA_OAKLAND_METROP	3	39	81	75	70	2816	0	Medium
FLOORS										
✓	#	Floor Type	Perimeter	Perimeter R-Value	Area	Joist R-Value	Tile	Wood	Carpet	
	1	Slab-On-Grade Edge Insulatio	65 ft	0	528 ft²		0.5	0	0.5	
	2	Raised Floor			60 ft²	19	0	0	1	
ROOF										
✓	#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch
	1	Gable or shed	Composition shingles	645 ft²	144 ft²	Light	0.8	No	0	26.6 deg
ATTIC										
✓	#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC			
	1	Full attic	Vented	300	577 ft²	N	N			

## IECC-2006 Section 404 Compliance

CEILING													
✓	#	Ceiling Type			R-Value	Area	Framing Frac	Truss Type					
✓	1	Under Attic (Vented)			30	577 ft²	0.11	Wood					
WALLS													
✓	#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Area	Sheathing R-Value	Framing Fraction	Solar Absor.				
✓	1	E	Exterior	Frame - Wood	19	147.05 ft²	0	0.23	0.5				
✓	2	S	Neighbor	Frame - Wood	19	265.83 ft²	0	0.23	0.01				
✓	3	S	Exterior	Frame - Wood	19	36.67 ft²	0	0.23	0.5				
✓	4	W	Exterior	Frame - Wood	19	147.05 ft²	0	0.23	0.5				
✓	5	N	Exterior	Frame - Wood	19	4.58 ft²	0	0.23	0.5				
✓	6	N	Neighbor	Frame - Wood	19	116.88 ft²	0	0.23	0.1				
✓	7	N	Exterior	Frame - Wood	19	181.04 ft²	0	0.23	0.5				
✓	8	E	Exterior	Frame - Wood	19	100.07 ft²	0	0.23	0.5				
✓	9	S	Exterior	Frame - Wood	19	27.5 ft²	0	0.23	0.5				
✓	10	E	Exterior	Frame - Wood	19	71.42 ft²	0	0.23	0.5				
✓	11	S	Neighbor	Frame - Wood	19	265.83 ft²	0	0.23	0.5				
✓	12	S	Exterior	Frame - Wood	19	36.67 ft²	0	0.23	0.5				
✓	13	W	Exterior	Frame - Wood	19	147.05 ft²	0	0.23	0.5				
✓	14	N	Exterior	Frame - Wood	19	220 ft²	0	0.23	0.5				
✓	15	W	Exterior	Frame - Wood	19	27.5 ft²	0	0.23	0.5				
✓	16	N	Exterior	Frame - Wood	19	110 ft²	0	0.23	0.5				
DOORS													
✓	#	Wall ID	Door Type		Storms	U-Value	Area						
✓	1	E	Wood		None	0.46	6.67 ft²						
✓	2	W	Wood		None	0.46	6.67 ft²						
WINDOWS													
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.													
✓	#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening
✓	1	E	Vinyl	Low-E Double	Yes	0.35	0.41	N	39 ft²	3 ft 0 in	1 ft 0 in	None	None
✓	2	E	Vinyl	Low-E Double	Yes	0.35	0.41	N	13.33 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	3	W	Vinyl	Low-E Double	Yes	0.35	0.41	N	24 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	4	W	Vinyl	Low-E Double	Yes	0.35	0.41	N	13.33 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	5	N	Vinyl	Low-E Double	Yes	0.35	0.41	N	27 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	6	E	Vinyl	Low-E Double	Yes	0.35	0.41	N	33.33 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	7	S	Vinyl	Low-E Double	Yes	0.35	0.41	N	10 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	8	W	Vinyl	Low-E Double	Yes	0.35	0.41	N	33.33 ft²	0 ft 0 in	0 ft 0 in	None	None

## IECC-2006 Section 404 Compliance

<b>WINDOWS</b>													
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.													
✓	#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening
										Depth	Separation		
✓	9	N	Vinyl	Low-E Double	Yes	0.35	0.41	N	20 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	10	W	Vinyl	Low-E Double	Yes	0.35	0.41	N	6.67 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	11	N	Vinyl	Low-E Double	Yes	0.35	0.41	N	20 ft²	0 ft 0 in	0 ft 0 in	None	None

<b>INFILTRATION &amp; VENTING</b>										
✓	Method	SLA	CFM 50	ACH 50	ELA	EqLA	---- Forced Ventilation ----		Run Time	Fan
							Supply CFM	Exhaust CFM	Fraction	Watts
✓	Default	0.00050	1449	8.55	79.6	149.6	0 cfm	0 cfm	0	20

<b>COOLING SYSTEM</b>								
✓	#	System Type	Subtype	Efficiency	Capacity	Air Flow	SHR	Ductless
					kBtu/hr	cfm		

<b>HEATING SYSTEM</b>						
✓	#	System Type	Subtype	Efficiency	Capacity	Ductless
✓	1	Natural Gas Hydronic	None	AFUE: 0.92	24 kBtu/hr	True

<b>HOT WATER SYSTEM</b>							
✓	#	System Type	EF	Cap	Use	SetPnt	Credits
✓	1	Natural Gas	0.92	60 gal	50 gal	120 deg	Solar System

<b>DUCTS</b>												
✓	#	---- Supply ----			---- Return ----		Leakage Type	Air Handler	CFM 25	Percent Leakage	QN	RLF
		Location	R-Value	Area	Location	Area						
				ft²		ft²			0.00 cfm	0.00 %	0.00	0.00

<b>UTILITY RATES</b>				
Fuel	Unit	Utility Name	Monthly Fixed Cost	\$/Unit
Electricity	kWh	oakland fixed	0	0.13
Natural Gas	Therm	oakland fixed	0	0.96
Fuel Oil	Gallon	California Default	0	1.1
Propane	Gallon	California Default	0	1.4

# Annual Energy Summary

HUD Green

Title: Oakland - base w solar DHW silver  
User

TMY City: CA\_OAKLAND\_MET

Oakland, CA, -  
Registration #:

Elec Util: oakland fixed

Gas Util: oakland fixed

Run Date: 08/10/2010 14:47:13

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (kBtu/hr)	0 kWh	\$0
Cooling Fan	0 kWh	\$0
Mechanical Vent Fan	0 kWh	\$0
<b>Total Cooling</b>		<b>\$0</b>
Heating (24 kBtu/hr)	72 Therms	\$69
Heating Fan/Pump	23 kWh	\$3
Mechanical Vent Fan	0 kWh	\$0
<b>Total Heating</b>		<b>\$72</b>
Hot Water	31 Therms	\$30
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>		<b>\$30</b>
Ceiling Fans	0 kWh	\$0
Clothes Washer	55 kWh	\$7
Dishwasher	100 kWh	\$13
Dryer	1269 kWh	\$165
Lighting	1263 kWh	\$164
Miscellaneous	1982 kWh	\$258
Pool Pump	0 kWh	\$0
Range	38 kWh	\$5
Refrigerator	671 kWh	\$87
<hr/>		
Total (kWh)	5401 kWh	\$702
Total (Therms)	103 Therms	\$99
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		\$801

## Emissions (Calculated as Total - PV Produced)

SO2	0.69 Lbs.
NOX	2.88 Lbs.
CO2	2.49 Tons

# IECC-2006 Section 404 Compliance

PROJECT										
Title:	Oakland - base w solar DHW	Bedrooms:	2	Address Type:	Street Address					
Building Type:	User	Bathrooms:	1.5	Lot #						
Owner:	HUD Green	Conditioned Area:	1105	SubDivision:						
# of Units:	1	Total Stories:	2	PlatBook:						
Builder Name:		Worst Case:	No	Street:						
Permit Office:		Rotate Angle:	0	County:						
Jurisdiction:		Cross Ventilation:		City, State, Zip:	Oakland ,					
Family Type:	Multi-family	Whole House Fan:			CA ,					
New/Existing:	New (From Plans)									
Comment:										
Estimated Annual Energy Cost for Code Compliance										
		<b>IECC Std. Design</b>		<b>Proposed Home</b>		<b>e-Ratio</b>				
	Cooling:	\$ 12		\$ 7		0.58				
	Heating:	\$ 134		\$ 73		0.54				
	Hot Water:	\$ 161		\$ 30		0.19				
	<b>Total:</b>	<b>\$ 307</b>		<b>\$ 110</b>		<b>0.36</b>				
<h2 style="margin: 0;">PASS</h2>										
CLIMATE										
✓	Design Location	Tmy Site	Climate Zone	Design Temp 97.5 %	Design Temp 2.5 %	Int Design Temp Winter	Int Design Temp Summer	Heating Degree Days	Design Moisture	Daily Temp Range
	CA, OAKLAND_METROP	CA_OAKLAND_METROP	3	39	81	75	70	2816	0	Medium
FLOORS										
✓	#	Floor Type	Perimeter	Perimeter R-Value	Area	Joist R-Value	Tile	Wood	Carpet	
	1	Slab-On-Grade Edge Insulatio	65 ft	0	528 ft <sup>2</sup>		0.5	0	0.5	
	2	Raised Floor			60 ft <sup>2</sup>	19	0	0	1	
ROOF										
✓	#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch
	1	Gable or shed	Composition shingles	645 ft <sup>2</sup>	144 ft <sup>2</sup>	Light	0.8	No	0	26.6 deg
ATTIC										
✓	#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC			
	1	Full attic	Vented	300	577 ft <sup>2</sup>	N	N			

## IECC-2006 Section 404 Compliance

CEILING													
✓	#	Ceiling Type	R-Value	Area	Framing Frac	Truss Type							
✓	1	Under Attic (Vented)	30	577 ft <sup>2</sup>	0.11	Wood							
WALLS													
✓	#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Area	Sheathing R-Value	Framing Fraction	Solar Absor.				
✓	1	E	Exterior	Frame - Wood	19	147.05 ft <sup>2</sup>	0	0.23	0.5				
✓	2	S	Neighbor	Frame - Wood	19	265.83 ft <sup>2</sup>	0	0.23	0.01				
✓	3	S	Exterior	Frame - Wood	19	36.67 ft <sup>2</sup>	0	0.23	0.5				
✓	4	W	Exterior	Frame - Wood	19	147.05 ft <sup>2</sup>	0	0.23	0.5				
✓	5	N	Exterior	Frame - Wood	19	4.58 ft <sup>2</sup>	0	0.23	0.5				
✓	6	N	Neighbor	Frame - Wood	19	116.88 ft <sup>2</sup>	0	0.23	0.1				
✓	7	N	Exterior	Frame - Wood	19	181.04 ft <sup>2</sup>	0	0.23	0.5				
✓	8	E	Exterior	Frame - Wood	19	100.07 ft <sup>2</sup>	0	0.23	0.5				
✓	9	S	Exterior	Frame - Wood	19	27.5 ft <sup>2</sup>	0	0.23	0.5				
✓	10	E	Exterior	Frame - Wood	19	71.42 ft <sup>2</sup>	0	0.23	0.5				
✓	11	S	Neighbor	Frame - Wood	19	265.83 ft <sup>2</sup>	0	0.23	0.5				
✓	12	S	Exterior	Frame - Wood	19	36.67 ft <sup>2</sup>	0	0.23	0.5				
✓	13	W	Exterior	Frame - Wood	19	147.05 ft <sup>2</sup>	0	0.23	0.5				
✓	14	N	Exterior	Frame - Wood	19	220 ft <sup>2</sup>	0	0.23	0.5				
✓	15	W	Exterior	Frame - Wood	19	27.5 ft <sup>2</sup>	0	0.23	0.5				
✓	16	N	Exterior	Frame - Wood	19	110 ft <sup>2</sup>	0	0.23	0.5				
DOORS													
✓	#	Wall ID	Door Type			Storms	U-Value	Area					
✓	1	E	Wood			None	0.46	6.67 ft <sup>2</sup>					
✓	2	W	Wood			None	0.46	6.67 ft <sup>2</sup>					
WINDOWS													
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.													
✓	#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening
✓	1	E	Vinyl	Low-E Double	Yes	0.35	0.41	N	39 ft <sup>2</sup>	3 ft 0 in	1 ft 0 in	None	None
✓	2	E	Vinyl	Low-E Double	Yes	0.35	0.41	N	13.33 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	3	W	Vinyl	Low-E Double	Yes	0.35	0.41	N	24 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	4	W	Vinyl	Low-E Double	Yes	0.35	0.41	N	13.33 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	5	N	Vinyl	Low-E Double	Yes	0.35	0.41	N	27 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	6	E	Vinyl	Low-E Double	Yes	0.35	0.41	N	33.33 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	7	S	Vinyl	Low-E Double	Yes	0.35	0.41	N	10 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	8	W	Vinyl	Low-E Double	Yes	0.35	0.41	N	33.33 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None

# IECC-2006 Section 404 Compliance

<b>WINDOWS</b>													
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.													
✓	#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening
										Depth	Separation		
✓	9	N	Vinyl	Low-E Double	Yes	0.35	0.41	N	20 ft²	0 ft 0 in	0 ft 0 in	None	None
	10	W	Vinyl	Low-E Double	Yes	0.35	0.41	N	6.67 ft²	0 ft 0 in	0 ft 0 in	None	None
	11	N	Vinyl	Low-E Double	Yes	0.35	0.41	N	20 ft²	0 ft 0 in	0 ft 0 in	None	None

<b>INFILTRATION &amp; VENTING</b>										
✓	Method	SLA	CFM 50	ACH 50	ELA	EqLA	---- Forced Ventilation ----		Run Time	Fan
							Supply CFM	Exhaust CFM	Fraction	Watts
	Default	0.00050	1449	8.55	79.6	149.6	0 cfm	0 cfm	0	20

<b>COOLING SYSTEM</b>								
✓	#	System Type	Subtype	Efficiency	Capacity	Air Flow	SHR	Ductless
					kBtu/hr	cfm		

<b>HEATING SYSTEM</b>						
✓	#	System Type	Subtype	Efficiency	Capacity	Ductless
	1	Natural Gas Hydronic	None	AFUE: 0.92	24 kBtu/hr	True

<b>HOT WATER SYSTEM</b>							
✓	#	System Type	EF	Cap	Use	SetPnt	Credits
	1	Natural Gas	0.92	60 gal	50 gal	120 deg	Solar System

<b>DUCTS</b>												
✓	#	---- Supply ----			---- Return ----		Leakage Type	Air Handler	CFM 25	Percent Leakage	QN	RLF
		Location	R-Value	Area	Location	Area						
				ft²		ft²			0.00 cfm	0.00 %	0.00	0.00

<b>UTILITY RATES</b>				
Fuel	Unit	Utility Name	Monthly Fixed Cost	\$/Unit
Electricity	kWh	oakland fixed	0	0.13
Natural Gas	Therm	oakland fixed	0	0.96
Fuel Oil	Gallon	California Default	0	1.1
Propane	Gallon	California Default	0	1.4



# Annual Energy Summary

HUD Green

Title: Oakland - base w solar DHW emerald  
User

TMY City: CA\_OAKLAND\_MET

Oakland, CA, -  
Registration #:

Elec Util: oakland fixed

Gas Util: oakland fixed

Run Date: 08/10/2010 14:56:14

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (kBtu/hr)	0 kWh	\$0
Cooling Fan	0 kWh	\$0
Mechanical Vent Fan	0 kWh	\$0
Total Cooling		<b>\$0</b>
Heating (24 kBtu/hr)	76 Therms	\$73
Heating Fan/Pump	24 kWh	\$3
Mechanical Vent Fan	0 kWh	\$0
Total Heating		<b>\$76</b>
Hot Water	31 Therms	\$30
Hot Water Pump	0 kWh	\$0
Total Hot Water		<b>\$30</b>
Ceiling Fans	0 kWh	\$0
Clothes Washer	55 kWh	\$7
Dishwasher	100 kWh	\$13
Dryer	1269 kWh	\$165
Lighting	1263 kWh	\$164
Miscellaneous	1982 kWh	\$258
Pool Pump	0 kWh	\$0
Range	38 kWh	\$5
Refrigerator	450 kWh	\$58
<hr/>		
Total (kWh)	5181 kWh	\$673
Total (Therms)	107 Therms	\$103
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		<b>\$776</b>

## Emissions (Calculated as Total - PV Produced)

SO2	0.66 Lbs.
NOX	2.84 Lbs.
CO2	2.43 Tons

# IECC-2006 Section 404 Compliance

PROJECT										
Title:	Oakland - base w solar DHW	Bedrooms:	2	Adress Type:	Street Address					
Building Type:	User	Bathrooms:	1.5	Lot #						
Owner:	HUD Green	Conditioned Area:	1105	SubDivision:						
# of Units:	1	Total Stories:	2	PlatBook:						
Builder Name:		Worst Case:	No	Street:						
Permit Office:		Rotate Angle:	0	County:						
Jurisdiction:		Cross Ventilation:		City, State, Zip:	Oakland ,					
Family Type:	Multi-family	Whole House Fan:			CA ,					
New/Existing:	New (From Plans)									
Comment:										
Estimated Annual Energy Cost for Code Compliance										
		<b>IECC Std. Design</b>		<b>Proposed Home</b>		<b>e-Ratio</b>				
	Cooling:	\$ 12		\$ 7		0.58				
	Heating:	\$ 134		\$ 73		0.54				
	Hot Water:	\$ 161		\$ 30		0.19				
	<b>Total:</b>	<b>\$ 307</b>		<b>\$ 110</b>		<b>0.36</b>				
<h2 style="margin: 0;">PASS</h2>										
CLIMATE										
✓	Design Location	Tmy Site	Climate Zone	Design Temp 97.5 %	Design Temp 2.5 %	Int Design Temp Winter	Int Design Temp Summer	Heating Degree Days	Design Moisture	Daily Temp Range
	CA, OAKLAND_METROP	CA_OAKLAND_METROP	3	39	81	75	70	2816	0	Medium
FLOORS										
✓	#	Floor Type	Perimeter	Perimeter R-Value	Area	Joist R-Value	Tile	Wood	Carpet	
	1	Slab-On-Grade Edge Insulatio	65 ft	0	528 ft <sup>2</sup>		0.5	0	0.5	
	2	Raised Floor			60 ft <sup>2</sup>	19	0	0	1	
ROOF										
✓	#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch
	1	Gable or shed	Composition shingles	645 ft <sup>2</sup>	144 ft <sup>2</sup>	Light	0.8	No	0	26.6 deg
ATTIC										
✓	#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC			
	1	Full attic	Vented	300	577 ft <sup>2</sup>	N	N			

# IECC-2006 Section 404 Compliance

CEILING													
✓	#	Ceiling Type	R-Value	Area	Framing Frac	Truss Type							
✓	1	Under Attic (Vented)	30	577 ft²	0.11	Wood							
WALLS													
✓	#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Area	Sheathing R-Value	Framing Fraction	Solar Absor.				
✓	1	E	Exterior	Frame - Wood	19	147.05 ft²	0	0.23	0.5				
✓	2	S	Neighbor	Frame - Wood	19	265.83 ft²	0	0.23	0.01				
✓	3	S	Exterior	Frame - Wood	19	36.67 ft²	0	0.23	0.5				
✓	4	W	Exterior	Frame - Wood	19	147.05 ft²	0	0.23	0.5				
✓	5	N	Exterior	Frame - Wood	19	4.58 ft²	0	0.23	0.5				
✓	6	N	Neighbor	Frame - Wood	19	116.88 ft²	0	0.23	0.1				
✓	7	N	Exterior	Frame - Wood	19	181.04 ft²	0	0.23	0.5				
✓	8	E	Exterior	Frame - Wood	19	100.07 ft²	0	0.23	0.5				
✓	9	S	Exterior	Frame - Wood	19	27.5 ft²	0	0.23	0.5				
✓	10	E	Exterior	Frame - Wood	19	71.42 ft²	0	0.23	0.5				
✓	11	S	Neighbor	Frame - Wood	19	265.83 ft²	0	0.23	0.5				
✓	12	S	Exterior	Frame - Wood	19	36.67 ft²	0	0.23	0.5				
✓	13	W	Exterior	Frame - Wood	19	147.05 ft²	0	0.23	0.5				
✓	14	N	Exterior	Frame - Wood	19	220 ft²	0	0.23	0.5				
✓	15	W	Exterior	Frame - Wood	19	27.5 ft²	0	0.23	0.5				
✓	16	N	Exterior	Frame - Wood	19	110 ft²	0	0.23	0.5				
DOORS													
✓	#	Wall ID	Door Type			Storms	U-Value	Area					
✓	1	E	Wood			None	0.46	6.67 ft²					
✓	2	W	Wood			None	0.46	6.67 ft²					
WINDOWS													
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.													
✓	#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening
✓	1	E	Vinyl	Low-E Double	Yes	0.35	0.41	N	39 ft²	3 ft 0 in	1 ft 0 in	None	None
✓	2	E	Vinyl	Low-E Double	Yes	0.35	0.41	N	13.33 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	3	W	Vinyl	Low-E Double	Yes	0.35	0.41	N	24 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	4	W	Vinyl	Low-E Double	Yes	0.35	0.41	N	13.33 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	5	N	Vinyl	Low-E Double	Yes	0.35	0.41	N	27 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	6	E	Vinyl	Low-E Double	Yes	0.35	0.41	N	33.33 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	7	S	Vinyl	Low-E Double	Yes	0.35	0.41	N	10 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	8	W	Vinyl	Low-E Double	Yes	0.35	0.41	N	33.33 ft²	0 ft 0 in	0 ft 0 in	None	None

# IECC-2006 Section 404 Compliance

<b>WINDOWS</b>													
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.													
✓	#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening
										Depth	Separation		
✓	9	N	Vinyl	Low-E Double	Yes	0.35	0.41	N	20 ft²	0 ft 0 in	0 ft 0 in	None	None
	10	W	Vinyl	Low-E Double	Yes	0.35	0.41	N	6.67 ft²	0 ft 0 in	0 ft 0 in	None	None
	11	N	Vinyl	Low-E Double	Yes	0.35	0.41	N	20 ft²	0 ft 0 in	0 ft 0 in	None	None

<b>INFILTRATION &amp; VENTING</b>										
✓	Method	SLA	CFM 50	ACH 50	ELA	EqLA	---- Forced Ventilation ----		Run Time	Fan
							Supply CFM	Exhaust CFM	Fraction	Watts
	Default	0.00050	1449	8.55	79.6	149.6	0 cfm	0 cfm	0	20

<b>COOLING SYSTEM</b>								
✓	#	System Type	Subtype	Efficiency	Capacity	Air Flow	SHR	Ductless
					kBtu/hr	cfm		

<b>HEATING SYSTEM</b>						
✓	#	System Type	Subtype	Efficiency	Capacity	Ductless
	1	Natural Gas Hydronic	None	AFUE: 0.92	24 kBtu/hr	True

<b>HOT WATER SYSTEM</b>							
✓	#	System Type	EF	Cap	Use	SetPnt	Credits
	1	Natural Gas	0.92	60 gal	50 gal	120 deg	Solar System

<b>DUCTS</b>												
✓	#	---- Supply ----			---- Return ----		Leakage Type	Air Handler	CFM 25	Percent Leakage	QN	RLF
		Location	R-Value	Area	Location	Area						
				ft²		ft²			0.00 cfm	0.00 %	0.00	0.00

<b>UTILITY RATES</b>				
Fuel	Unit	Utility Name	Monthly Fixed Cost	\$/Unit
Electricity	kWh	oakland fixed	0	0.13
Natural Gas	Therm	oakland fixed	0	0.96
Fuel Oil	Gallon	California Default	0	1.1
Propane	Gallon	California Default	0	1.4





# APPENDIX C ENERGY MODELS

## 3 – Climate Zone #4

### A. Richmond, Virginia

Summary Data for HUD green - Richmond, Virginia

Blackwell - Single Family detached gar

Climate Zone 4: Richmond, VA

ResCheck

5.2 UA

Software Output Subtitle	IECCStd2006	Proposed		Silver - 30%		Gold - 50%		Emerald - 60%	
e-ratio as-built		0.85		0.70		0.46		0.40	
Hers as-built		76		65		56		51	
	<b>2006 IECC</b>	<b>2006 IECC Compliance Standard Calc -Base</b>	<b>Percentage Better than 2006 IECC</b>	<b>2006 IECC Compliance Standard Calc - 30%</b>		<b>2006 IECC Compliance Standard Calc - 50%</b>		<b>2006 IECC Compliance Standard Calc - 60%</b>	
<b>Blackwell - Single Family detached gar</b>									
Finished Floor Area, sq. feet	1656	1656		1656		1656		1656	
Total Stories	2	2		2		2		2	
Foundation Type	cond. Crawl	cond. Crawl		cond. Crawl		cond. Crawl		cond. Crawl	
Bedrooms	3	3		3		3		3	
Baths	2.5	2.5		2.5		2.5		2.5	
Flat Ceiling R-value	28.73	<b>38</b>		<b>49</b>		49		<b>60</b>	
Floor over Ambient R-value	n/a	n/a		n/a		n/a		n/a	
Wall Construction	2x wood	<b>2x6-24"oc</b>		2x6-24"oc		2x6-24"oc		2x6-24"oc	
Wall R-value (cavity/cont. sheathing)	9.85	<b>19/0</b>		<b>19/5</b>		19/5		<b>19/10</b>	
Slab/Crawl Floor/Wall R-value		10		10		10		10	
Wall Area, Above Grade	2,312	2,312		2,312		2,312		2,312	
Window U-value	0.4	<b>0.35</b>		<b>0.30</b>		0.30		<b>0.25</b>	lowE triple pane
Window SHGC	0.40	<b>0.40</b>		0.4		0.40		0.40	
Window Area	252	252		251.54		251.54		251.54	
Window Area, % of Floor, CFA	15.19%	15.19%		15.19%		15.19%		15.19%	
Infiltration, Specific Leakage Area, SLA	0.00036	<b>0.00036</b>		<b>0.0002</b>		0.0002		<b>0.00015</b>	
Infiltration, ACH50	6.67	<b>6.67</b>		<b>3.7</b>		3.7		<b>2.78</b>	
Ventilation Rate, cfm - 47@ ashrae 62.2	0	none		<b>yes</b>		yes		yes	
Cooling System SEER	13	13		<b>16</b>		16		<b>18</b>	
Cooling Capacity, kBtu/hr	25.63	24		24		24		24	
Heating System, HSPF	7.7	<b>8.0</b>		<b>9.0</b>		9.0		<b>9.5</b>	
Heating Capacity, kBtu/hr	28.1	30		30		30		30	
Duct Leakage to outside (CFM25)	not given					0		0	
Duct Loss %, DSE	20.00%	<b>5.00%</b>		5%		5%		5%	
Qn	n/a	<b>0.027</b>		0.027		0.027		0.027	
Duct Insulation	6	<b>n/a</b>		1		1		1	
Duct Location	Inside	cond. Crawl - interior		cond. Crawl - interior		cond. Crawl - interior		cond. Crawl - interior	
Air Handler Location	Inside	cond. Crawl - interior		cond. Crawl - interior		cond. Crawl - interior		cond. Crawl - interior	
Hot Water Use, gallons/day	70	70		70		70	<b>w/ 64 sf</b>	70	w/64 sf
Water Heater Energy Factor	0.92	0.92		<b>0.98</b>		0.98	<b>closed loop</b>	0.98	closed loop
Tank size	40	50		<b>1</b>		1	<b>Solar</b>	1	Solar
Cool Set Point	78	78		78		78		78	
Heat Set Point	68	68		68		68		68	
Programmable Thermostat	No	<b>Yes</b>		Yes		Yes		Yes	
Cooling setback degrees; setback hours	none	none		none		none		none	
Heating setback degrees; setback hours	none	none		none		none		none	
Percentage Fluorescent Fixtures or CFLs	10	<b>50%</b>		50%		50%		50%	
Solar PV									
Cooling Energy - cost	198	133	32.83%	107	45.96%	107	45.96%	95	52.02%
Heating Energy - cost	282	233	17.38%	172	39.01%	172	39.01%	135	52.13%
Hot Water Energy - cost	252	253	-0.40%	237	5.95%	67	73.41%	67	73.41%
Solar PV									
Subtotal Heat Cool WH	732	619	15.44%	516	29.51%	346	52.73%	297	59.43%
Total Energy Cost (\$)									

Notes:

**Bold entries indicate upgraded features at each level.**

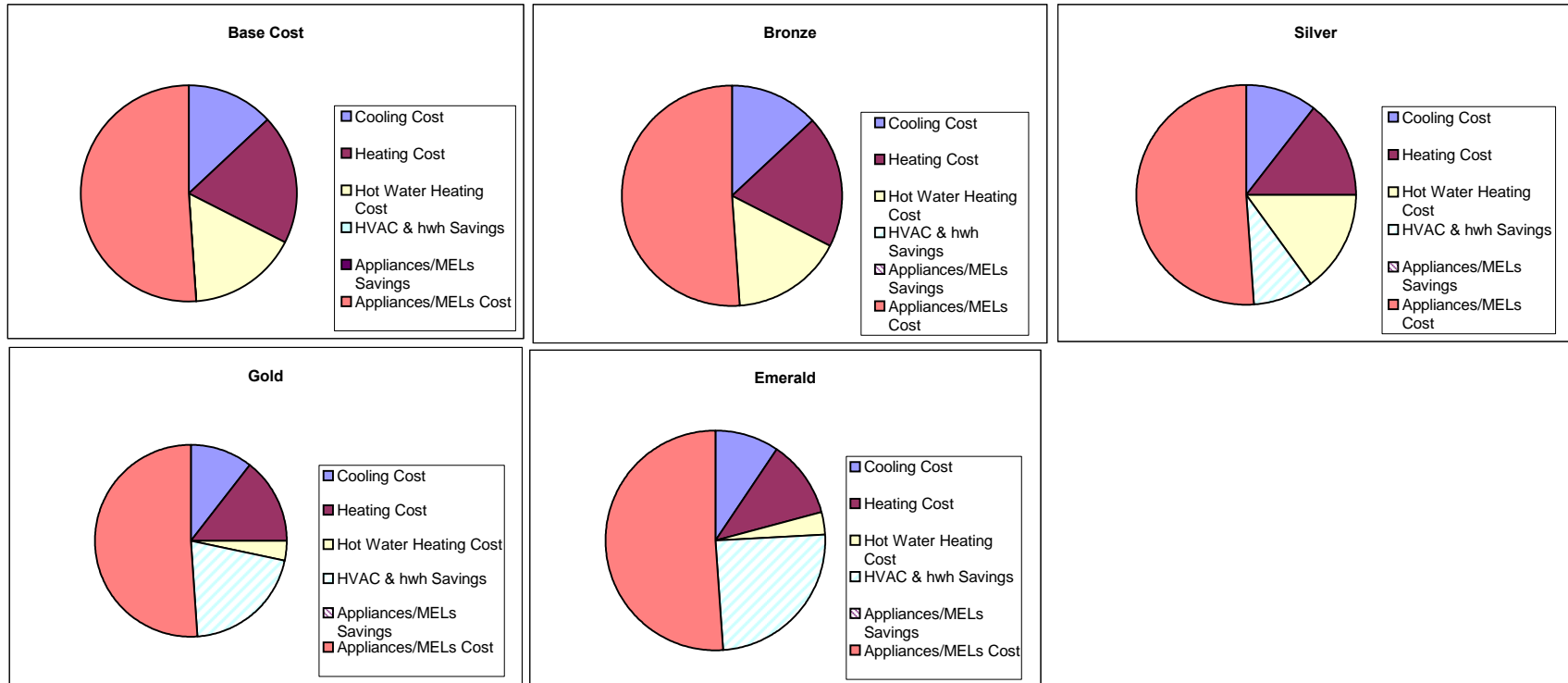
When a tankless waterheater is installed - base IECC number is manipulated to original, so saving increases over e-Ratio

Infiltration Defaults to 0.00046 in proposed mode when there is no added ventilation @ 0.00036 (ashrea 62.2)

Richmond, Virginia

Annual Energy Summary	Base	Bronze			Silver			Gold			Emerald		
	Yr \$	Yr \$	savings	percent	Yr \$	savings	percent	Yr \$	savings	percent	Yr \$	savings	percent
Cooling Cost	149	149	0	0%	121	28	19%	121	28	19%	108	41	28%
Heating Cost	221	221	0	0%	165	56	25%	165	56	25%	129	92	42%
Hot Water Heating Cost	187	187	0	0%	172	15	8%	39	148	79%	39	148	79%
HVAC & hwh Savings	N/A	0			99			232			281		
Appliances/MELs Savings	N/A	0			0			0			0		
Appliances/MELs Cost	585	585			585			585			585		
HVAC & HWH sub-total	557	557		0%	458		18%	325		42%	276		50%
Grand Total	1142	1142		100%	1043		91%	910		80%	861		75%

Data based on Energy Gauge - Annual Energy Summary. Not Compliance





# Annual Energy Summary

HUD Green

Title: Richmond - Base  
User

TMY City: VA\_RICHMOND\_INT  
Elec Util: richmond fixed  
Gas Util: Virginia Average  
Run Date: 08/12/2010 11:01:13

Richmond, VA, 23224-  
Registration #:

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (24 kBtu/hr)	1531 kWh	\$122
Cooling Fan	334 kWh	\$27
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Cooling</b>	<b>1865 kWh</b>	<b>\$149</b>
Heating (30 kBtu/hr)	2381 kWh	\$190
Heating Fan/Pump	385 kWh	\$31
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Heating</b>	<b>2766 kWh</b>	<b>\$221</b>
Hot Water	2343 kWh	\$187
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>	<b>2343 kWh</b>	<b>\$187</b>
Ceiling Fans	0 kWh	\$0
Clothes Washer	105 kWh	\$8
Dishwasher	126 kWh	\$10
Dryer	835 kWh	\$67
Lighting	1605 kWh	\$128
Miscellaneous	3061 kWh	\$245
Pool Pump	0 kWh	\$0
Range	909 kWh	\$73
Refrigerator	669 kWh	\$54
<hr/>		
Total (kWh)	14284 kWh	\$1142
Total (Therms)	0 Therms	\$0
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		\$1142

## Emissions (Calculated as Total - PV Produced)

SO2	82.97 Lbs.
NOX	28.41 Lbs.
CO2	8.65 Tons

# IECC-2006 Section 404 Compliance

PROJECT										
Title:	Richmond - Base	Bedrooms:	3	Adress Type:	Street Address					
Building Type:	User	Bathrooms:	2.5	Lot #						
Owner:	HUD Green	Conditioned Area:	1656	SubDivision:						
# of Units:	1	Total Stories:	2	PlatBook:						
Builder Name:	RRHA	Worst Case:	No	Street:						
Permit Office:		Rotate Angle:	0	County:						
Jurisdiction:		Cross Ventilation:		City, State, Zip:	Richmond ,					
Family Type:	Single-family	Whole House Fan:			VA , 23224-					
New/Existing:	New (From Plans)									
Comment:										
Estimated Annual Energy Cost for Code Compliance										
		<b>IECC Std. Design</b>		<b>Proposed Home</b>		<b>e-Ratio</b>				
	Cooling:	\$ 198		\$ 133		0.67				
	Heating:	\$ 282		\$ 233		0.83				
	Hot Water:	\$ 252		\$ 253		1.00				
	<b>Total:</b>	<b>\$ 732</b>		<b>\$ 619</b>		<b>0.85</b>				
PASS										
CLIMATE										
✓	Design Location	Tmy Site	Climate Zone	Design Temp 97.5 %	Design Temp 2.5 %	Int Design Temp Winter	Int Design Temp Summer	Heating Degree Days	Design Moisture	Daily Temp Range
	VA, RICHMOND_INTERN	VA_RICHMOND_INTERN	4	17	93	75	70	3882.5	41	Medium
FLOORS										
✓	#	Floor Type	Exposed Perimeter	Wall Ins. R-Value	Area	Floor Joist R-Value	Tile	Wood	Carpet	
	1	Crawlspace	136 ft	10	834 ft²	0	0.1	0.5	0.4	
ROOF										
✓	#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch
	1	Flat	Composition shingles	837 ft²	36 ft²	Medium	0.85	No	0	4.8 deg
ATTIC										
✓	#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC			
	1	No attic	Unvented	0	834 ft²	N	N			

## IECC-2006 Section 404 Compliance

CEILING													
✓	#	Ceiling Type	R-Value	Area	Framing Frac	Truss Type							
✓	1	Under Attic (Unvented)	38	834 ft <sup>2</sup>	0.07	Wood							
WALLS													
✓	#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Area	Sheathing R-Value	Framing Fraction	Solar Absor.				
✓	1	NW	Exterior	Frame - Wood	19	162 ft <sup>2</sup>	0	0.16	0.5				
✓	2	NE	Exterior	Frame - Wood	19	342 ft <sup>2</sup>	0	0.16	0.5				
✓	3	SE	Exterior	Frame - Wood	19	54 ft <sup>2</sup>	0	0.16	0.5				
✓	4	NE	Exterior	Frame - Wood	19	108 ft <sup>2</sup>	0	0.16	0.5				
✓	5	SE	Exterior	Frame - Wood	19	108 ft <sup>2</sup>	0	0.16	0.5				
✓	6	SW	Exterior	Frame - Wood	19	450 ft <sup>2</sup>	0	0.16	0.5				
✓	7	NW	Exterior	Frame - Wood	19	144 ft <sup>2</sup>	0	0.16	0.5				
✓	8	NE	Exterior	Frame - Wood	19	304 ft <sup>2</sup>	0	0.16	0.5				
✓	9	SE	Exterior	Frame - Wood	19	48 ft <sup>2</sup>	0	0.16	0.5				
✓	10	NE	Exterior	Frame - Wood	19	96 ft <sup>2</sup>	0	0.16	0.5				
✓	11	SE	Exterior	Frame - Wood	19	96 ft <sup>2</sup>	0	0.16	0.5				
✓	12	SW	Exterior	Frame - Wood	19	400 ft <sup>2</sup>	0	0.16	0.5				
DOORS													
✓	#	Wall ID	Door Type	Storms	U-Value	Area							
✓	1	NW	Insulated	None	0.28	20 ft <sup>2</sup>							
✓	2	SE	Insulated	None	0.28	13.33 ft <sup>2</sup>							
WINDOWS													
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.													
✓	#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening
✓	1	NW	Wood	Low-E Double	Yes	0.35	0.4	N	28.44 ft <sup>2</sup>	5 ft 4 in	1 ft 0 in	None	None
✓	2	NE	Wood	Low-E Double	Yes	0.35	0.4	N	14.22 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	3	NE	Wood	Low-E Double	Yes	0.35	0.4	N	28.44 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	4	NE	Wood	Low-E Double	Yes	0.35	0.4	N	14.22 ft <sup>2</sup>	6 ft 0 in	1 ft 0 in	None	None
✓	5	SE	Wood	Low-E Double	Yes	0.35	0.4	N	28.44 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	6	SW	Wood	Low-E Double	Yes	0.35	0.4	N	8.67 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	7	NW	Wood	Low-E Double	Yes	0.35	0.4	N	42.67 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	8	NE	Wood	Low-E Double	Yes	0.35	0.4	N	28.44 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	9	SE	Wood	Low-E Double	Yes	0.35	0.4	N	14.22 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	10	NE	Wood	Low-E Double	Yes	0.35	0.4	N	14.22 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None

## IECC-2006 Section 404 Compliance

<b>WINDOWS</b>													
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.													
✓	#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening
										Depth	Separation		
✓	11	SE	Wood	Low-E Double	Yes	0.35	0.4	N	14.22 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	12	SW	Wood	Low-E Double	Yes	0.35	0.4	N	8.67 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	13	SE	Wood	Low-E Double	Yes	0.35	0.4	N	6.67 ft²	6 ft 0 in	1 ft 0 in	None	None

<b>INFILTRATION &amp; VENTING</b>										
✓	Method	SLA	CFM 50	ACH 50	ELA	EqLA	---- Forced Ventilation ----		Run Time	Fan
							Supply CFM	Exhaust CFM	Fraction	Watts
✓	Proposed SLA	0.00036	1564	6.67	85.8	161.4	0 cfm	0 cfm	0	20

<b>COOLING SYSTEM</b>								
✓	#	System Type	Subtype	Efficiency	Capacity	Air Flow	SHR	Ductless
✓	1	Central Unit	None	SEER: 13	24 kBtu/hr	720 cfm	0.75	False

<b>HEATING SYSTEM</b>								
✓	#	System Type	Subtype	Efficiency	Capacity	Ductless		
✓	1	Electric Heat Pump	None	HSPF: 8	30 kBtu/hr	False		

<b>HOT WATER SYSTEM</b>							
✓	#	System Type	EF	Cap	Use	SetPnt	Credits
✓	1	Electric	0.92	40 gal	43.5 gal	120 deg	None

<b>DUCTS</b>												
✓	#	---- Supply ----			---- Return ----		Leakage Type	Air Handler	CFM 25	Percent Leakage	QN	RLF
		Location	R-Value	Area	Location	Area						
✓	1	Interior	6	334 ft²	Interior	133 ft²	Prop. Air Leakage	Interior	45.00 cfm	5.00 %	0.03	0.60

<b>UTILITY RATES</b>				
Fuel	Unit	Utility Name	Monthly Fixed Cost	\$/Unit
Electricity	kWh	richmond fixed	0	0.08
Natural Gas	Therm	Virginia Average	0	1.27
Fuel Oil	Gallon	Virginia Default	0	1.1
Propane	Gallon	Virginia Default	0	1.4

# Annual Energy Summary

HUD Green

Title: Richmond - 15%  
User

TMY City: VA\_RICHMOND\_INT  
Elec Util: richmond fixed  
Gas Util: Virginia Average  
Run Date: 08/12/2010 11:04:31

Richmond, VA, 23224-  
Registration #:

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (24 kBtu/hr)	1531 kWh	\$122
Cooling Fan	334 kWh	\$27
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Cooling</b>	<b>1865 kWh</b>	<b>\$149</b>
Heating (30 kBtu/hr)	2381 kWh	\$190
Heating Fan/Pump	385 kWh	\$31
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Heating</b>	<b>2766 kWh</b>	<b>\$221</b>
Hot Water	2343 kWh	\$187
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>	<b>2343 kWh</b>	<b>\$187</b>
Ceiling Fans	0 kWh	\$0
Clothes Washer	105 kWh	\$8
Dishwasher	126 kWh	\$10
Dryer	835 kWh	\$67
Lighting	1605 kWh	\$128
Miscellaneous	3061 kWh	\$245
Pool Pump	0 kWh	\$0
Range	909 kWh	\$73
Refrigerator	669 kWh	\$54
<hr/>		
Total (kWh)	14284 kWh	\$1142
Total (Therms)	0 Therms	\$0
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		\$1142

## Emissions (Calculated as Total - PV Produced)

SO2	82.97 Lbs.
NOX	28.41 Lbs.
CO2	8.65 Tons

# IECC-2006 Section 404 Compliance

PROJECT										
Title:	Richmond - 15%	Bedrooms:	3	Address Type:	Street Address					
Building Type:	User	Bathrooms:	2.5	Lot #						
Owner:	HUD Green	Conditioned Area:	1656	SubDivision:						
# of Units:	1	Total Stories:	2	PlatBook:						
Builder Name:	RRHA	Worst Case:	No	Street:						
Permit Office:		Rotate Angle:	0	County:						
Jurisdiction:		Cross Ventilation:		City, State, Zip:	Richmond ,					
Family Type:	Single-family	Whole House Fan:			VA ,	23224-				
New/Existing:	New (From Plans)									
Comment:										
Estimated Annual Energy Cost for Code Compliance										
		<b>IECC Std. Design</b>		<b>Proposed Home</b>		<b>e-Ratio</b>				
	Cooling:	\$ 198		\$ 133		0.67				
	Heating:	\$ 282		\$ 233		0.83				
	Hot Water:	\$ 252		\$ 253		1.00				
	<b>Total:</b>	<b>\$ 732</b>		<b>\$ 619</b>		<b>0.85</b>				
PASS										
CLIMATE										
✓	Design Location	Tmy Site	Climate Zone	Design Temp 97.5 %	2.5 %	Int Design Temp Winter	Summer	Heating Degree Days	Design Moisture	Daily Temp Range
	VA, RICHMOND_INTERN	VA_RICHMOND_INTERN	4	17	93	75	70	3882.5	41	Medium
FLOORS										
✓	#	Floor Type	Exposed Perimeter	Wall Ins. R-Value	Area	Floor Joist R-Value	Tile	Wood	Carpet	
	1	Crawlspace	136 ft	10	834 ft²	0	0.1	0.5	0.4	
ROOF										
✓	#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch
	1	Flat	Composition shingles	837 ft²	36 ft²	Medium	0.85	No	0	4.8 deg
ATTIC										
✓	#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC			
	1	No attic	Unvented	0	834 ft²	N	N			

# IECC-2006 Section 404 Compliance

CEILING													
✓	#	Ceiling Type			R-Value	Area	Framing Frac	Truss Type					
✓	1	Under Attic (Unvented)			38	834 ft²	0.07	Wood					
WALLS													
✓	#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Area	Sheathing R-Value	Framing Fraction	Solar Absor.				
✓	1	NW	Exterior	Frame - Wood	19	162 ft²	0	0.16	0.5				
✓	2	NE	Exterior	Frame - Wood	19	342 ft²	0	0.16	0.5				
✓	3	SE	Exterior	Frame - Wood	19	54 ft²	0	0.16	0.5				
✓	4	NE	Exterior	Frame - Wood	19	108 ft²	0	0.16	0.5				
✓	5	SE	Exterior	Frame - Wood	19	108 ft²	0	0.16	0.5				
✓	6	SW	Exterior	Frame - Wood	19	450 ft²	0	0.16	0.5				
✓	7	NW	Exterior	Frame - Wood	19	144 ft²	0	0.16	0.5				
✓	8	NE	Exterior	Frame - Wood	19	304 ft²	0	0.16	0.5				
✓	9	SE	Exterior	Frame - Wood	19	48 ft²	0	0.16	0.5				
✓	10	NE	Exterior	Frame - Wood	19	96 ft²	0	0.16	0.5				
✓	11	SE	Exterior	Frame - Wood	19	96 ft²	0	0.16	0.5				
✓	12	SW	Exterior	Frame - Wood	19	400 ft²	0	0.16	0.5				
DOORS													
✓	#	Wall ID	Door Type			Storms	U-Value	Area					
✓	1	NW	Insulated			None	0.28	20 ft²					
✓	2	SE	Insulated			None	0.28	13.33 ft²					
WINDOWS													
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.													
✓	#	Ornt	Frame	Panels	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening
✓	1	NW	Wood	Low-E Double	Yes	0.35	0.4	N	28.44 ft²	5 ft 4 in	1 ft 0 in	None	None
✓	2	NE	Wood	Low-E Double	Yes	0.35	0.4	N	14.22 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	3	NE	Wood	Low-E Double	Yes	0.35	0.4	N	28.44 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	4	NE	Wood	Low-E Double	Yes	0.35	0.4	N	14.22 ft²	6 ft 0 in	1 ft 0 in	None	None
✓	5	SE	Wood	Low-E Double	Yes	0.35	0.4	N	28.44 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	6	SW	Wood	Low-E Double	Yes	0.35	0.4	N	8.67 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	7	NW	Wood	Low-E Double	Yes	0.35	0.4	N	42.67 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	8	NE	Wood	Low-E Double	Yes	0.35	0.4	N	28.44 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	9	SE	Wood	Low-E Double	Yes	0.35	0.4	N	14.22 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	10	NE	Wood	Low-E Double	Yes	0.35	0.4	N	14.22 ft²	0 ft 0 in	0 ft 0 in	None	None

# IECC-2006 Section 404 Compliance

<b>WINDOWS</b>													
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.													
✓	#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening
										Depth	Separation		
✓	11	SE	Wood	Low-E Double	Yes	0.35	0.4	N	14.22 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	12	SW	Wood	Low-E Double	Yes	0.35	0.4	N	8.67 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	13	SE	Wood	Low-E Double	Yes	0.35	0.4	N	6.67 ft²	6 ft 0 in	1 ft 0 in	None	None

<b>INFILTRATION &amp; VENTING</b>										
✓	Method	SLA	CFM 50	ACH 50	ELA	EqLA	---- Forced Ventilation ----		Run Time	Fan
							Supply CFM	Exhaust CFM	Fraction	Watts
✓	Proposed SLA	0.00036	1564	6.67	85.8	161.4	0 cfm	0 cfm	0	20

<b>COOLING SYSTEM</b>								
✓	#	System Type	Subtype	Efficiency	Capacity	Air Flow	SHR	Ductless
✓	1	Central Unit	None	SEER: 13	24 kBtu/hr	720 cfm	0.75	False

<b>HEATING SYSTEM</b>								
✓	#	System Type	Subtype	Efficiency	Capacity	Ductless		
✓	1	Electric Heat Pump	None	HSPF: 8	30 kBtu/hr	False		

<b>HOT WATER SYSTEM</b>							
✓	#	System Type	EF	Cap	Use	SetPnt	Credits
✓	1	Electric	0.92	40 gal	43.5 gal	120 deg	None

<b>DUCTS</b>												
✓	#	---- Supply ----			---- Return ----			Air	CFM 25	Percent	QN	RLF
		Location	R-Value	Area	Location	Area	Leakage Type	Handler		Leakage		
✓	1	Interior	6	334 ft²	Interior	133 ft²	Prop. Air Leakage	Interior	45.00 cfm	5.00 %	0.03	0.60

<b>UTILITY RATES</b>				
Fuel	Unit	Utility Name	Monthly Fixed Cost	\$/Unit
Electricity	kWh	richmond fixed	0	0.08
Natural Gas	Therm	Virginia Average	0	1.27
Fuel Oil	Gallon	Virginia Default	0	1.1
Propane	Gallon	Virginia Default	0	1.4



# Annual Energy Summary

HUD Green

Title: Richmond - 30%  
User

TMY City: VA\_RICHMOND\_INT  
Elec Util: richmond fixed  
Gas Util: Virginia Average  
Run Date: 08/05/2010 11:01:33

Richmond, VA, 23224-  
Registration #:

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (24 kBtu/hr)	1207 kWh	\$97
Cooling Fan	241 kWh	\$19
Mechanical Vent Fan	62 kWh	\$ 5
<b>Total Cooling</b>	<b>1510 kWh</b>	<b>\$121</b>
Heating (30 kBtu/hr)	1715 kWh	\$137
Heating Fan/Pump	267 kWh	\$21
Mechanical Vent Fan	88 kWh	\$ 7
<b>Total Heating</b>	<b>2070 kWh</b>	<b>\$165</b>
Hot Water	2150 kWh	\$172
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>	<b>2150 kWh</b>	<b>\$172</b>
Ceiling Fans	0 kWh	\$0
Clothes Washer	105 kWh	\$8
Dishwasher	126 kWh	\$10
Dryer	835 kWh	\$67
Lighting	1605 kWh	\$128
Miscellaneous	3061 kWh	\$245
Pool Pump	0 kWh	\$0
Range	909 kWh	\$73
Refrigerator	669 kWh	\$54
<hr/>		
Total (kWh)	13040 kWh	\$1043
Total (Therms)	0 Therms	\$0
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		\$1043

## Emissions (Calculated as Total - PV Produced)

SO2	75.74 Lbs.
NOX	25.94 Lbs.
CO2	7.9 Tons

# IECC-2006 Section 404 Compliance

PROJECT										
Title:	Richmond - 30%	Bedrooms:	3	Address Type:	Street Address					
Building Type:	User	Bathrooms:	2.5	Lot #						
Owner:	HUD Green	Conditioned Area:	1656	SubDivision:						
# of Units:	1	Total Stories:	2	PlatBook:						
Builder Name:	RRHA	Worst Case:	No	Street:						
Permit Office:		Rotate Angle:	0	County:						
Jurisdiction:		Cross Ventilation:		City, State, Zip:	Richmond ,					
Family Type:	Single-family	Whole House Fan:			VA ,	23224-				
New/Existing:	New (From Plans)									
Comment:										
Estimated Annual Energy Cost for Code Compliance										
		<b>IECC Std. Design</b>		<b>Proposed Home</b>		<b>e-Ratio</b>				
	Cooling:	\$ 205		\$ 107		0.52				
	Heating:	\$ 290		\$ 172		0.59				
	Hot Water:	\$ 252		\$ 237		0.94				
	<b>Total:</b>	<b>\$ 747</b>		<b>\$ 516</b>		<b>0.69</b>				
<h2 style="margin: 0;">PASS</h2>										
CLIMATE										
✓	Design Location	Tmy Site	Climate Zone	Design Temp 97.5 %	2.5 %	Int Design Temp Winter	Summer	Heating Degree Days	Design Moisture	Daily Temp Range
	VA, RICHMOND_INTERN	VA_RICHMOND_INTERN	4	17	93	75	70	3882.5	41	Medium
FLOORS										
✓	#	Floor Type	Exposed Perimeter	Wall Ins. R-Value	Area	Floor Joist R-Value	Tile	Wood	Carpet	
	1	Crawlspace	136 ft	10	834 ft²	0	0.1	0.5	0.4	
ROOF										
✓	#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch
	1	Flat	Composition shingles	837 ft²	36 ft²	Medium	0.85	No	0	4.8 deg
ATTIC										
✓	#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC			
	1	No attic	Unvented	0	834 ft²	N	N			

## IECC-2006 Section 404 Compliance

CEILING													
✓	#	Ceiling Type			R-Value	Area	Framing Frac	Truss Type					
✓	1	Under Attic (Unvented)			49	834 ft²	0.07	Wood					
WALLS													
✓	#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Area	Sheathing R-Value	Framing Fraction	Solar Absor.				
✓	1	NW	Exterior	Frame - Wood	19	162 ft²	5	0.16	0.5				
✓	2	NE	Exterior	Frame - Wood	19	342 ft²	5	0.16	0.5				
✓	3	SE	Exterior	Frame - Wood	19	54 ft²	5	0.16	0.5				
✓	4	NE	Exterior	Frame - Wood	19	108 ft²	5	0.16	0.5				
✓	5	SE	Exterior	Frame - Wood	19	108 ft²	5	0.16	0.5				
✓	6	SW	Exterior	Frame - Wood	19	450 ft²	5	0.16	0.5				
✓	7	NW	Exterior	Frame - Wood	19	144 ft²	5	0.16	0.5				
✓	8	NE	Exterior	Frame - Wood	19	304 ft²	5	0.16	0.5				
✓	9	SE	Exterior	Frame - Wood	19	48 ft²	5	0.16	0.5				
✓	10	NE	Exterior	Frame - Wood	19	96 ft²	5	0.16	0.5				
✓	11	SE	Exterior	Frame - Wood	19	96 ft²	5	0.16	0.5				
✓	12	SW	Exterior	Frame - Wood	19	400 ft²	5	0.16	0.5				
DOORS													
✓	#	Wall ID	Door Type			Storms	U-Value	Area					
✓	1	NW	Insulated			None	0.28	20 ft²					
✓	2	SE	Insulated			None	0.28	13.33 ft²					
WINDOWS													
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.													
✓	#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening
✓	1	NW	Wood	Low-E Double	Yes	0.3	0.4	N	28.44 ft²	5 ft 4 in	1 ft 0 in	None	None
✓	2	NE	Wood	Low-E Double	Yes	0.3	0.4	N	14.22 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	3	NE	Wood	Low-E Double	Yes	0.3	0.4	N	28.44 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	4	NE	Wood	Low-E Double	Yes	0.3	0.4	N	14.22 ft²	6 ft 0 in	1 ft 0 in	None	None
✓	5	SE	Wood	Low-E Double	Yes	0.3	0.4	N	28.44 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	6	SW	Wood	Low-E Double	Yes	0.3	0.4	N	8.67 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	7	NW	Wood	Low-E Double	Yes	0.3	0.4	N	42.67 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	8	NE	Wood	Low-E Double	Yes	0.3	0.4	N	28.44 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	9	SE	Wood	Low-E Double	Yes	0.3	0.4	N	14.22 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	10	NE	Wood	Low-E Double	Yes	0.3	0.4	N	14.22 ft²	0 ft 0 in	0 ft 0 in	None	None

# IECC-2006 Section 404 Compliance

<b>WINDOWS</b>													
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.													
✓	#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening
										Depth	Separation		
✓	11	SE	Wood	Low-E Double	Yes	0.3	0.4	N	14.22 ft²	0 ft 0 in	0 ft 0 in	None	None
	12	SW	Wood	Low-E Double	Yes	0.3	0.4	N	8.67 ft²	0 ft 0 in	0 ft 0 in	None	None
	13	SE	Wood	Low-E Double	Yes	0.3	0.4	N	6.67 ft²	6 ft 0 in	1 ft 0 in	None	None

<b>INFILTRATION &amp; VENTING</b>										
✓	Method	SLA	CFM 50	ACH 50	ELA	EqLA	---- Forced Ventilation ----		Run Time	Fan
							Supply CFM	Exhaust CFM	Fraction	Watts
	Proposed SLA	0.00020	869	3.70	47.7	89.7	0 cfm	47 cfm	100	20

<b>COOLING SYSTEM</b>								
✓	#	System Type	Subtype	Efficiency	Capacity	Air Flow	SHR	Ductless
	1	Central Unit	None	SEER: 16	24 kBtu/hr	720 cfm	0.75	False

<b>HEATING SYSTEM</b>								
✓	#	System Type	Subtype	Efficiency	Capacity	Ductless		
	1	Electric Heat Pump	None	HSPF: 9	30 kBtu/hr	False		

<b>HOT WATER SYSTEM</b>							
✓	#	System Type	EF	Cap	Use	SetPnt	Credits
	1	Electric	0.98	1 gal	43.5 gal	120 deg	None

<b>DUCTS</b>												
✓	#	---- Supply ----			---- Return ----			Air	CFM 25	Percent	QN	RLF
		Location	R-Value	Area	Location	Area	Leakage Type	Handler		Leakage		
	1	Interior	6	334 ft²	Interior	133 ft²	Prop. Air Leakage	Interior	45.00 cfm	5.00 %	0.03	0.60

<b>UTILITY RATES</b>				
Fuel	Unit	Utility Name	Monthly Fixed Cost	\$/Unit
Electricity	kWh	richmond fixed	0	0.08
Natural Gas	Therm	Virginia Average	0	1.27
Fuel Oil	Gallon	Virginia Default	0	1.1
Propane	Gallon	Virginia Default	0	1.4

# Annual Energy Summary

HUD Green

Title: Richmond - 50%  
User

TMY City: VA\_RICHMOND\_INT  
Elec Util: richmond fixed  
Gas Util: Virginia Average  
Run Date: 08/05/2010 11:03:15

Richmond, VA, 23224-  
Registration #:

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (24 kBtu/hr)	1207 kWh	\$97
Cooling Fan	241 kWh	\$19
Mechanical Vent Fan	62 kWh	\$ 5
<b>Total Cooling</b>	<b>1510 kWh</b>	<b>\$121</b>
Heating (30 kBtu/hr)	1715 kWh	\$137
Heating Fan/Pump	267 kWh	\$21
Mechanical Vent Fan	88 kWh	\$ 7
<b>Total Heating</b>	<b>2070 kWh</b>	<b>\$165</b>
Hot Water	486 kWh	\$39
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>	<b>486 kWh</b>	<b>\$39</b>
Ceiling Fans	0 kWh	\$0
Clothes Washer	105 kWh	\$8
Dishwasher	126 kWh	\$10
Dryer	835 kWh	\$67
Lighting	1605 kWh	\$128
Miscellaneous	3061 kWh	\$245
Pool Pump	0 kWh	\$0
Range	909 kWh	\$73
Refrigerator	669 kWh	\$54
<hr/>		
Total (kWh)	11376 kWh	\$910
Total (Therms)	0 Therms	\$0
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		\$910

## Emissions (Calculated as Total - PV Produced)

SO2	66.07 Lbs.
NOX	22.63 Lbs.
CO2	6.89 Tons

# IECC-2006 Section 404 Compliance

PROJECT										
Title:	Richmond - 50%	Bedrooms:	3	Address Type:	Street Address					
Building Type:	User	Bathrooms:	2.5	Lot #						
Owner:	HUD Green	Conditioned Area:	1656	SubDivision:						
# of Units:	1	Total Stories:	2	PlatBook:						
Builder Name:	RRHA	Worst Case:	No	Street:						
Permit Office:		Rotate Angle:	0	County:						
Jurisdiction:		Cross Ventilation:		City, State, Zip:	Richmond ,					
Family Type:	Single-family	Whole House Fan:			VA , 23224-					
New/Existing:	New (From Plans)									
Comment:										
Estimated Annual Energy Cost for Code Compliance										
		<b>IECC Std. Design</b>		<b>Proposed Home</b>		<b>e-Ratio</b>				
	Cooling:	\$ 205		\$ 107		0.52				
	Heating:	\$ 290		\$ 172		0.59				
	Hot Water:	\$ 252		\$ 67		0.27				
	<b>Total:</b>	<b>\$ 747</b>		<b>\$ 346</b>		<b>0.46</b>				
<h1 style="font-size: 2em; margin: 0;">PASS</h1>										
CLIMATE										
✓	Design Location	Tmy Site	Climate Zone	Design Temp 97.5 %	Design Temp 2.5 %	Int Design Temp Winter	Int Design Temp Summer	Heating Degree Days	Design Moisture	Daily Temp Range
	____ VA, RICHMOND_INTERN	VA_RICHMOND_INTERN	4	17	93	75	70	3882.5	41	Medium
FLOORS										
✓	#	Floor Type	Exposed Perimeter	Wall Ins. R-Value	Area	Floor Joist R-Value	Tile	Wood	Carpet	
	____ 1	Crawlspace	136 ft	10	834 ft²	0	0.1	0.5	0.4	
ROOF										
✓	#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch
	____ 1	Flat	Composition shingles	837 ft²	36 ft²	Medium	0.85	No	0	4.8 deg
ATTIC										
✓	#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC			
	____ 1	No attic	Unvented	0	834 ft²	N	N			

# IECC-2006 Section 404 Compliance

CEILING													
✓	#	Ceiling Type	R-Value	Area	Framing Frac	Truss Type							
✓	1	Under Attic (Unvented)	49	834 ft <sup>2</sup>	0.07	Wood							
WALLS													
✓	#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Area	Sheathing R-Value	Framing Fraction	Solar Absor.				
✓	1	NW	Exterior	Frame - Wood	19	162 ft <sup>2</sup>	5	0.16	0.5				
✓	2	NE	Exterior	Frame - Wood	19	342 ft <sup>2</sup>	5	0.16	0.5				
✓	3	SE	Exterior	Frame - Wood	19	54 ft <sup>2</sup>	5	0.16	0.5				
✓	4	NE	Exterior	Frame - Wood	19	108 ft <sup>2</sup>	5	0.16	0.5				
✓	5	SE	Exterior	Frame - Wood	19	108 ft <sup>2</sup>	5	0.16	0.5				
✓	6	SW	Exterior	Frame - Wood	19	450 ft <sup>2</sup>	5	0.16	0.5				
✓	7	NW	Exterior	Frame - Wood	19	144 ft <sup>2</sup>	5	0.16	0.5				
✓	8	NE	Exterior	Frame - Wood	19	304 ft <sup>2</sup>	5	0.16	0.5				
✓	9	SE	Exterior	Frame - Wood	19	48 ft <sup>2</sup>	5	0.16	0.5				
✓	10	NE	Exterior	Frame - Wood	19	96 ft <sup>2</sup>	5	0.16	0.5				
✓	11	SE	Exterior	Frame - Wood	19	96 ft <sup>2</sup>	5	0.16	0.5				
✓	12	SW	Exterior	Frame - Wood	19	400 ft <sup>2</sup>	5	0.16	0.5				
DOORS													
✓	#	Wall ID	Door Type			Storms	U-Value	Area					
✓	1	NW	Insulated			None	0.28	20 ft <sup>2</sup>					
✓	2	SE	Insulated			None	0.28	13.33 ft <sup>2</sup>					
WINDOWS													
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.													
✓	#	Ornt	Frame	Panels	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening
✓	1	NW	Wood	Low-E Double	Yes	0.3	0.4	N	28.44 ft <sup>2</sup>	5 ft 4 in	1 ft 0 in	None	None
✓	2	NE	Wood	Low-E Double	Yes	0.3	0.4	N	14.22 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	3	NE	Wood	Low-E Double	Yes	0.3	0.4	N	28.44 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	4	NE	Wood	Low-E Double	Yes	0.3	0.4	N	14.22 ft <sup>2</sup>	6 ft 0 in	1 ft 0 in	None	None
✓	5	SE	Wood	Low-E Double	Yes	0.3	0.4	N	28.44 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	6	SW	Wood	Low-E Double	Yes	0.3	0.4	N	8.67 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	7	NW	Wood	Low-E Double	Yes	0.3	0.4	N	42.67 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	8	NE	Wood	Low-E Double	Yes	0.3	0.4	N	28.44 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	9	SE	Wood	Low-E Double	Yes	0.3	0.4	N	14.22 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	10	NE	Wood	Low-E Double	Yes	0.3	0.4	N	14.22 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None

# IECC-2006 Section 404 Compliance

<b>WINDOWS</b>													
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.													
✓	#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening
										Depth	Separation		
✓	11	SE	Wood	Low-E Double	Yes	0.3	0.4	N	14.22 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	12	SW	Wood	Low-E Double	Yes	0.3	0.4	N	8.67 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	13	SE	Wood	Low-E Double	Yes	0.3	0.4	N	6.67 ft²	6 ft 0 in	1 ft 0 in	None	None

<b>INFILTRATION &amp; VENTING</b>										
✓	Method	SLA	CFM 50	ACH 50	ELA	EqlA	---- Forced Ventilation ----		Run Time	Fan
							Supply CFM	Exhaust CFM	Fraction	Watts
✓	Proposed SLA	0.00020	869	3.70	47.7	89.7	0 cfm	47 cfm	100	20

<b>COOLING SYSTEM</b>								
✓	#	System Type	Subtype	Efficiency	Capacity	Air Flow	SHR	Ductless
✓	1	Central Unit	None	SEER: 16	24 kBtu/hr	720 cfm	0.75	False

<b>HEATING SYSTEM</b>							
✓	#	System Type	Subtype	Efficiency	Capacity	Ductless	
✓	1	Electric Heat Pump	None	HSPF: 9	30 kBtu/hr	False	

<b>HOT WATER SYSTEM</b>							
✓	#	System Type	EF	Cap	Use	SetPnt	Credits
✓	1	Electric	0.98	1 gal	43.5 gal	120 deg	Solar System

<b>DUCTS</b>												
✓	#	---- Supply ----			---- Return ----		Leakage Type	Air Handler	CFM 25	Percent Leakage	QN	RLF
		Location	R-Value	Area	Location	Area						
✓	1	Interior	6	334 ft²	Interior	133 ft²	Prop. Air Leakage	Interior	45.00 cfm	5.00 %	0.03	0.60

<b>UTILITY RATES</b>				
Fuel	Unit	Utility Name	Monthly Fixed Cost	\$/Unit
Electricity	kWh	richmond fixed	0	0.08
Natural Gas	Therm	Virginia Average	0	1.27
Fuel Oil	Gallon	Virginia Default	0	1.1
Propane	Gallon	Virginia Default	0	1.4



# Annual Energy Summary

HUD Green

Title: Richmond - 60%  
User

TMY City: VA\_RICHMOND\_INT  
Elec Util: richmond fixed  
Gas Util: Virginia Average  
Run Date: 08/05/2010 11:05:08

Richmond, VA, 23224-  
Registration #:

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (24 kBtu/hr)	1051 kWh	\$84
Cooling Fan	235 kWh	\$19
Mechanical Vent Fan	63 kWh	\$ 5
<b>Total Cooling</b>	<b>1349 kWh</b>	<b>\$108</b>
Heating (30 kBtu/hr)	1311 kWh	\$105
Heating Fan/Pump	215 kWh	\$17
Mechanical Vent Fan	85 kWh	\$ 7
<b>Total Heating</b>	<b>1611 kWh</b>	<b>\$129</b>
Hot Water	485 kWh	\$39
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>	<b>485 kWh</b>	<b>\$39</b>
Ceiling Fans	0 kWh	\$0
Clothes Washer	105 kWh	\$8
Dishwasher	126 kWh	\$10
Dryer	835 kWh	\$67
Lighting	1605 kWh	\$128
Miscellaneous	3061 kWh	\$245
Pool Pump	0 kWh	\$0
Range	909 kWh	\$73
Refrigerator	669 kWh	\$54
<hr/>		
Total (kWh)	10755 kWh	\$861
Total (Therms)	0 Therms	\$0
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		\$861

## Emissions (Calculated as Total - PV Produced)

SO <sub>2</sub>	62.47 Lbs.
NO <sub>X</sub>	21.39 Lbs.
CO <sub>2</sub>	6.51 Tons

# IECC-2006 Section 404 Compliance

PROJECT										
Title:	Richmond - 60%	Bedrooms:	3	Address Type:	Street Address					
Building Type:	User	Bathrooms:	2.5	Lot #						
Owner:	HUD Green	Conditioned Area:	1656	SubDivision:						
# of Units:	1	Total Stories:	2	PlatBook:						
Builder Name:	RRHA	Worst Case:	No	Street:						
Permit Office:		Rotate Angle:	0	County:						
Jurisdiction:		Cross Ventilation:		City, State, Zip:	Richmond ,					
Family Type:	Single-family	Whole House Fan:			VA ,	23224-				
New/Existing:	New (From Plans)									
Comment:										
Estimated Annual Energy Cost for Code Compliance										
		<b>IECC Std. Design</b>		<b>Proposed Home</b>		<b>e-Ratio</b>				
	Cooling:	\$ 205		\$ 95		0.46				
	Heating:	\$ 290		\$ 135		0.47				
	Hot Water:	\$ 252		\$ 67		0.27				
	<b>Total:</b>	<b>\$ 747</b>		<b>\$ 297</b>		<b>0.40</b>				
PASS										
CLIMATE										
✓	Design Location	Tmy Site	Climate Zone	Design Temp 97.5 %	Design Temp 2.5 %	Int Design Temp Winter	Int Design Temp Summer	Heating Degree Days	Design Moisture	Daily Temp Range
	VA, RICHMOND_INTERN	VA_RICHMOND_INTERN	4	17	93	75	70	3882.5	41	Medium
FLOORS										
✓	#	Floor Type	Exposed Perimeter	Wall Ins. R-Value	Area	Floor Joist R-Value	Tile	Wood	Carpet	
	1	Crawlspace	136 ft	10	834 ft²	0	0.1	0.5	0.4	
ROOF										
✓	#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch
	1	Flat	Composition shingles	837 ft²	36 ft²	Medium	0.85	No	0	4.8 deg
ATTIC										
✓	#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC			
	1	No attic	Unvented	0	834 ft²	N	N			

# IECC-2006 Section 404 Compliance

CEILING													
✓	#	Ceiling Type	R-Value	Area	Framing Frac	Truss Type							
✓	1	Under Attic (Unvented)	60	834 ft²	0.07	Wood							
WALLS													
✓	#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Area	Sheathing R-Value	Framing Fraction	Solar Absor.				
✓	1	NW	Exterior	Frame - Wood	19	162 ft²	10	0.16	0.5				
✓	2	NE	Exterior	Frame - Wood	19	342 ft²	10	0.16	0.5				
✓	3	SE	Exterior	Frame - Wood	19	54 ft²	10	0.16	0.5				
✓	4	NE	Exterior	Frame - Wood	19	108 ft²	10	0.16	0.5				
✓	5	SE	Exterior	Frame - Wood	19	108 ft²	10	0.16	0.5				
✓	6	SW	Exterior	Frame - Wood	19	450 ft²	10	0.16	0.5				
✓	7	NW	Exterior	Frame - Wood	19	144 ft²	10	0.16	0.5				
✓	8	NE	Exterior	Frame - Wood	19	304 ft²	10	0.16	0.5				
✓	9	SE	Exterior	Frame - Wood	19	48 ft²	10	0.16	0.5				
✓	10	NE	Exterior	Frame - Wood	19	96 ft²	10	0.16	0.5				
✓	11	SE	Exterior	Frame - Wood	19	96 ft²	10	0.16	0.5				
✓	12	SW	Exterior	Frame - Wood	19	400 ft²	10	0.16	0.5				
DOORS													
✓	#	Wall ID	Door Type			Storms	U-Value	Area					
✓	1	NW	Insulated			None	0.28	20 ft²					
✓	2	SE	Insulated			None	0.28	13.33 ft²					
WINDOWS													
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.													
✓	#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening
✓	1	NW	Wood	Low-E Triple	Yes	0.25	0.4	N	28.44 ft²	5 ft 4 in	1 ft 0 in	None	None
✓	2	NE	Wood	Low-E Triple	Yes	0.25	0.4	N	14.22 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	3	NE	Wood	Low-E Triple	Yes	0.25	0.4	N	28.44 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	4	NE	Wood	Low-E Triple	Yes	0.25	0.4	N	14.22 ft²	6 ft 0 in	1 ft 0 in	None	None
✓	5	SE	Wood	Low-E Triple	Yes	0.25	0.4	N	28.44 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	6	SW	Wood	Low-E Triple	Yes	0.25	0.4	N	8.67 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	7	NW	Wood	Low-E Triple	Yes	0.25	0.4	N	42.67 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	8	NE	Wood	Low-E Triple	Yes	0.25	0.4	N	28.44 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	9	SE	Wood	Low-E Triple	Yes	0.25	0.4	N	14.22 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	10	NE	Wood	Low-E Triple	Yes	0.25	0.4	N	14.22 ft²	0 ft 0 in	0 ft 0 in	None	None

# IECC-2006 Section 404 Compliance

## WINDOWS

Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.

	#	Ornt	Frame	Panels	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening
										Depth	Separation		
✓	11	SE	Wood	Low-E Triple	Yes	0.25	0.4	N	14.22 ft²	0 ft 0 in	0 ft 0 in	None	None
	12	SW	Wood	Low-E Triple	Yes	0.25	0.4	N	8.67 ft²	0 ft 0 in	0 ft 0 in	None	None
	13	SE	Wood	Low-E Triple	Yes	0.25	0.4	N	6.67 ft²	6 ft 0 in	1 ft 0 in	None	None

## INFILTRATION & VENTING

	Method	SLA	CFM 50	ACH 50	ELA	EqLA	---- Forced Ventilation ----		Run Time Fraction	Fan Watts
							Supply CFM	Exhaust CFM		
✓	Proposed SLA	0.00015	652	2.78	35.8	67.3	0 cfm	47 cfm	100	20

## COOLING SYSTEM

	#	System Type	Subtype	Efficiency	Capacity	Air Flow	SHR	Ductless
✓	1	Central Unit	None	SEER: 18	24 kBtu/hr	720 cfm	0.75	False

## HEATING SYSTEM

	#	System Type	Subtype	Efficiency	Capacity	Ductless
✓	1	Electric Heat Pump	None	HSPF: 9.5	30 kBtu/hr	False

## HOT WATER SYSTEM

	#	System Type	EF	Cap	Use	SetPnt	Credits
✓	1	Electric	0.98	1 gal	43.5 gal	120 deg	Solar System

## DUCTS

	#	---- Supply ----			---- Return ----		Leakage Type	Air Handler	CFM 25	Percent Leakage	QN	RLF
		Location	R-Value	Area	Location	Area						
✓	1	Interior	6	334 ft²	Interior	133 ft²	Prop. Air Leakage	Interior	45.00 cfm	5.00 %	0.03	0.60

## UTILITY RATES

Fuel	Unit	Utility Name	Monthly Fixed Cost	\$/Unit
Electricity	kWh	richmond fixed	0	0.08
Natural Gas	Therm	Virginia Average	0	1.27
Fuel Oil	Gallon	Virginia Default	0	1.1
Propane	Gallon	Virginia Default	0	1.4





# APPENDIX C ENERGY MODELS

B. Seattle, Washington

Summary Data for HUD green - Washington

Climate Zone 4c: Seattle, Washington

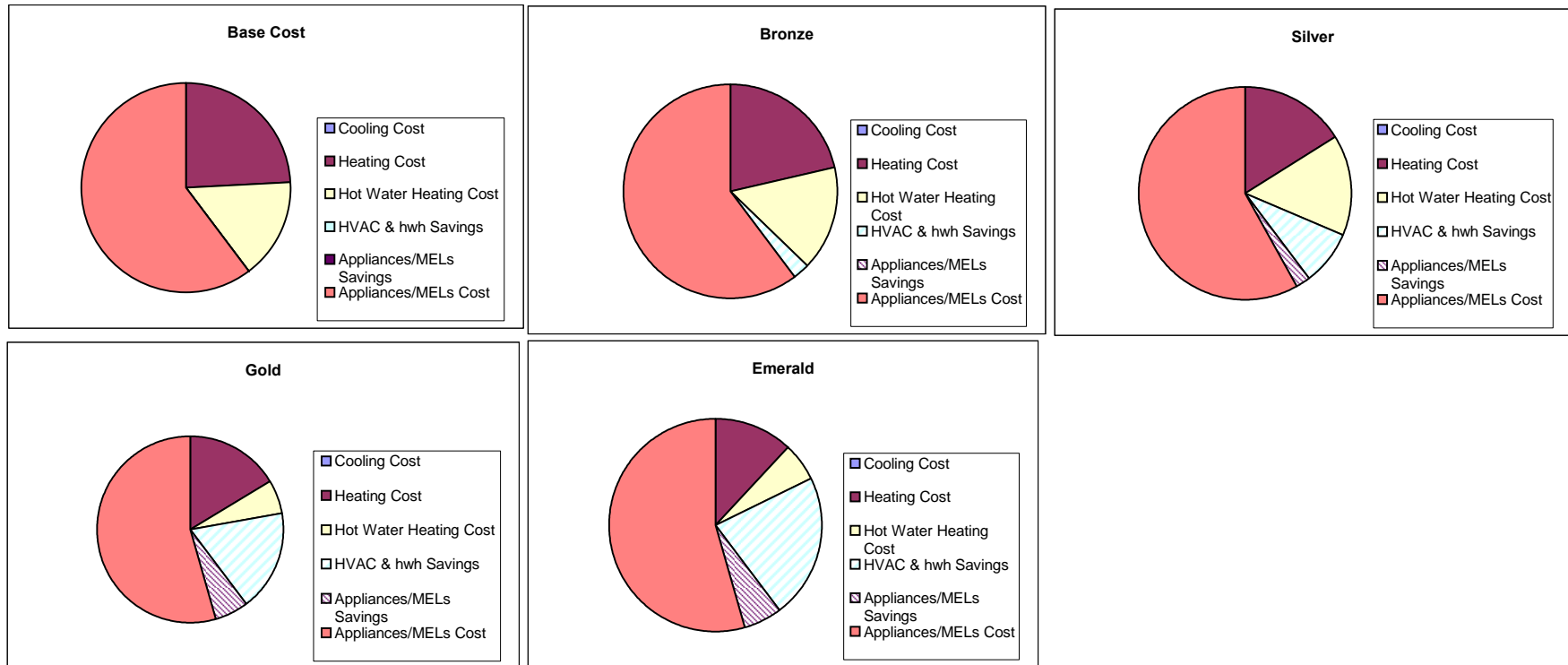
Software Output Subtitle	IECCStd2006	Base Line House		Bronze - 15%		Silver - 30%		Gold - 50%		Emerald - 60%	
e-ratio as-built		0.89		0.84		0.70		0.48		0.39	
Hers as-built		79		77		69		63		59	
	<b>2006 IECC</b>	<b>2006 IECC Compliance Standard Calc -Base</b>	<b>Percentage Better than 2006 IECC</b>	<b>2006 IECC Compliance Standard Calc - 15%</b>		<b>2006 IECC Compliance Standard Calc - 30%</b>		<b>2006 IECC Compliance Standard Calc - 50%</b>		<b>2006 IECC Compliance Standard Calc - 60%</b>	
0											
Finished Floor Area, sq. feet	946	946		946		946		946		946	
Total Stories	1	1		1		1		1		1	
Foundation Type	slab on gr	slab on gr		slab on gr		slab on gr		slab on gr		slab on gr	
Bedrooms	2	2		2		2		2		2	
Baths	1	1		1		1		1		1	
Flat Ceiling R-value	none	<b>none</b>									
Wall Construction	2x6 wood	<b>2x6-16"oc</b>		2x6-16"oc		<b>2x6-24"oc</b>		2x6-24"oc		2x6-24"oc	
Wall R-value (cavity/cont. sheathing)	9.85	<b>21/0</b>		21/0		<b>21/5</b>		21/5		<b>21/10</b>	
Floor R-value	10	<b>5</b>		<b>10</b>		10		10		10	
Wall Area, Above Grade	1,035	1,035		1,035		1,035		1,035		1,035	
Exterior Door U-value	0.40	0.40		0.40		<b>0.30</b>		0.30		<b>0.18</b>	
Window U-value	0.40	<b>0.33</b>		<b>0.30</b>		0.30		0.30		<b>0.22</b>	
Window SHGC	0.40	<b>0.40</b>		<b>0.50</b>		0.50		0.50		<b>0.60</b>	
Window Area	131	131		131.25		131.25		131.25		131.25	
Window Area, % of Floor, CFA	13.87%	13.87%		13.87%		13.87%		13.87%		13.87%	
Infiltration, Specific Leakage Area, SLA	0.00036	<b>0.00036</b>		0.00036		<b>0.0002</b>		<b>0.00014</b>		<b>0.0001</b>	
Infiltration, ACH50	7.08	<b>7.08</b>		7.08		<b>3.93</b>		<b>2.75</b>		<b>1.97</b>	
Ventilation Rate, cfm - 31.9@code	Central Air	Yes		Yes		Yes		Yes		Yes	
Cooling System SEER	13	none	Hydronic								
Cooling Capacity, kBtu/hr	8.5	none	Boiler								
Heating System, AFUE, Hydronic	0.8	0.91	conjunction with	0.91		<b>0.94</b>		0.94		<b>0.95</b>	
Heating Capacity, kBtu/hr	11.4	18		18		12		12		12	
Duct Leakage to outside (CFM25)	not given	none	Dhwh								
Duct Loss %, DSE	20.00%	none									
Duct Insulation	6	none									
Duct Location	Inside	none									
Air Handler Location	Inside	Interior		Interior		Interior		Interior		Interior	
Hot Water Use, gallons/day	50	50		50		50		50		50	
Water Heater Energy Factor	0.59	0.91		0.91		<b>0.94</b>		<b>0.94</b>	<b>w/ 64 sf</b>	<b>0.95</b>	<b>w/ 64 sf</b>
Tank size	4	4		4		4		4	<b>closed</b>	4	<b>closed</b>
Cool Set Point	78	78		78		78		78	<b>loop</b>	78	<b>loop</b>
Heat Set Point	68	68		68		68		68	<b>solar</b>	68	<b>solar</b>
Programmable Thermostat	No	<b>Yes</b>		Yes		Yes		Yes		Yes	
Cooling setback degrees; setback hours	none	none		2/6		2/6		2/6		2/6	
Heating setback degrees; setback hours	none	none		2/7		2/7		2/7		2/7	
Percentage Fluorescent Fixtures or CFLs	10	<b>10%</b>		10%		10%		10%		10%	
Solar PV											
Cooling Energy - cost	4	2	50.00%	2	50.00%	2	50.00%	2	50.00%	2	50.00%
Heating Energy - cost	178	187	-5.06%	170	4.49%	126	29.21%	121	32.02%	89	50.00%
Hot Water Energy - cost	138	97	29.71%	97	29.71%	94	31.88%	36	73.91%	35	74.64%
Subtotal Heat Cool WH	320	286	<b>10.63%</b>	269	<b>15.94%</b>	222	<b>30.63%</b>	159	<b>50.31%</b>	126	<b>60.63%</b>

Notes:  
**Bold entries indicate upgraded features at each level.**

Seattle, Washington

Annual Energy Summary	Base	Bronze			Silver			Gold			Emerald		
	Yr \$	Yr \$	savings	percent	Yr \$	savings	percent	Yr \$	savings	percent	Yr \$	savings	percent
Cooling Cost	0	0	0		0	0		0	0		0	0	
Heating Cost	148	132	16	11%	99	49	33%	101	47	32%	74	74	50%
Hot Water Heating Cost	97	97	0	0%	94	3	3%	36	61	63%	35	62	64%
HVAC & hwh Savings	N/A	16			52			108			136		
Appliances/MELs Savings	N/A	0			13			35			35		
Appliances/MELs Cost	370	370			357			335			335		
HVAC & HWH sub-total	245	229		7%	193		21%	137		44%	109		56%
Grand Total	615	599		97%	550		89%	472		77%	444		72%

Data based on Energy Gauge - Annual Energy Summary. Not Compliance





# Annual Energy Summary

Title: HUD - Seattle - base  
User

TMY City: WA\_SEATTLE\_BOEI  
Elec Util: seattle fixed  
Gas Util: seattle fixed  
Run Date: 08/05/2010 11:07:37

Seattle, WA,  
Registration #:

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (kBtu/hr)	0 kWh	\$0
Cooling Fan	0 kWh	\$0
Mechanical Vent Fan	8 kWh	\$ 0
<b>Total Cooling</b>	<b>8 kWh</b>	<b>\$0</b>
Heating (11.4 kBtu/hr)	137 Therms	\$132
Heating Fan/Pump	46 kWh	\$3
Mechanical Vent Fan	223 kWh	\$ 13
<b>Total Heating</b>		<b>\$148</b>
Hot Water	101 Therms	\$97
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>		<b>\$97</b>
Ceiling Fans	0 kWh	\$0
Clothes Washer	53 kWh	\$3
Dishwasher	133 kWh	\$8
Dryer	827 kWh	\$50
Lighting	1466 kWh	\$88
Miscellaneous	2506 kWh	\$150
Pool Pump	0 kWh	\$0
Range	32 Therms	\$31
Refrigerator	671 kWh	\$40
<hr/>		
Total (kWh)	5933 kWh	\$355
Total (Therms)	271 Therms	\$260
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		\$615

## Emissions (Calculated as Total - PV Produced)

SO2	0.97 Lbs.
NOX	5.37 Lbs.
CO2	2.65 Tons

# IECC-2006 Section 404 Compliance

PROJECT										
Title:	HUD - Seattle - base	Bedrooms:	2	Address Type:	Street Address	Building Type:	User	Bathrooms:	1	Lot #
Owner:		Conditioned Area:	946	SubDivision:		# of Units:	1	Total Stories:	1	PlatBook:
Builder Name:	HUD	Worst Case:	No	Street:		Permit Office:		Rotate Angle:	45	County:
Jurisdiction:		Cross Ventilation:		City, State, Zip:	Seattle ,	Family Type:	Multi-family	Whole House Fan:		WA ,
New/Existing:	New (From Plans)					Comment:				

Estimated Annual Energy Cost for Code Compliance			
	IECC Std. Design	Proposed Home	e-Ratio
Cooling:	\$ 4	\$ 2	0.50
Heating:	\$ 178	\$ 187	1.05
Hot Water:	\$ 138	\$ 97	0.70
<b>Total:</b>	<b>\$ 320</b>	<b>\$ 286</b>	<b>0.89</b>

## PASS

CLIMATE										
✓	Design Location	Tmy Site	Climate Zone	Design Temp 97.5 %	Design Temp 2.5 %	Int Design Temp Winter	Int Design Temp Summer	Heating Degree Days	Design Moisture	Daily Temp Range
✓	WA, SEATTLE_BOEING	WA_SEATTLE_BOEING	4	28	81	75	70	4371.5	0	Medium

FLOORS										
✓	#	Floor Type	Perimeter	R-Value	Area	Tile	Wood	Carpet		
✓	1	Slab-On-Grade Edge Insulatio	136 ft	5	946 ft²	0	0.2	0.8		

ROOF										
✓	#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch
✓	1	Hip	Composition shingles	1137 ft²	0 ft²	Medium	0.85	No	0	33.7 deg

ATTIC							
✓	#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC
✓	1	Full attic	Vented	300	946 ft²	N	N

## IECC-2006 Section 404 Compliance

WALLS												
✓	#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Area	Sheathing R-Value	Framing Fraction	Solar Absor.			
_____	1	N	Exterior	Frame - Wood	21	128 ft²	0	0.19	0.5			
_____	2	W	Exterior	Frame - Wood	21	48 ft²	0	0.19	0.5			
_____	3	N	Exterior	Frame - Wood	21	96 ft²	0	0.19	0.5			
_____	4	E	Exterior	Frame - Wood	21	48 ft²	0	0.19	0.5			
_____	5	E	Neighbor	Frame - Wood	21	60 ft²		0.19	0.01			
_____	6	N	Neighbor	Frame - Wood	21	16 ft²		0.19	0.01			
_____	7	E	Neighbor	Frame - Wood	21	56 ft²		0.19	0.01			
_____	8	S	Exterior	Frame - Wood	21	16 ft²	0	0.19	0.5			
_____	9	E	Exterior	Frame - Wood	21	140 ft²	0	0.19	0.5			
_____	10	S	Exterior	Frame - Wood	21	208 ft²	0	0.19	0.5			
_____	11	W	Exterior	Frame - Wood	21	144 ft²	0	0.19	0.5			
_____	12	S	Exterior	Frame - Wood	21	16 ft²	0	0.19	0.5			
_____	13	W	Exterior	Frame - Wood	21	112 ft²	0	0.19	0.5			

DOORS								
✓	#	Wall ID	Door Type	Storms	U-Value	Area		
_____	1	N	Insulated	None	0.4	20 ft²		
_____	2	W	Insulated	None	0.4	20 ft²		

WINDOWS													
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.													
✓	#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening
										Depth	Separation		
_____	1	N	Vinyl	Low-E Double	Yes	0.33	0.4	N	25 ft²	6 ft 0 in	1 ft 0 in	None	None
_____	2	N	Vinyl	Low-E Double	Yes	0.33	0.4	N	25 ft²	0 ft 0 in	0 ft 0 in	None	None
_____	3	E	Vinyl	Low-E Double	Yes	0.33	0.4	N	25 ft²	0 ft 0 in	0 ft 0 in	None	None
_____	4	S	Vinyl	Low-E Double	Yes	0.33	0.4	N	25 ft²	0 ft 0 in	0 ft 0 in	None	None
_____	5	W	Vinyl	Low-E Double	Yes	0.33	0.4	N	6.25 ft²	0 ft 0 in	0 ft 0 in	None	None
_____	6	W	Vinyl	Low-E Double	Yes	0.33	0.4	N	25 ft²	0 ft 0 in	0 ft 0 in	None	None

INFILTRATION & VENTING										
✓	Method	SLA	CFM 50	ACH 50	ELA	EqLA	---- Forced Ventilation ----		Run Time Fraction	Fan Watts
							Supply CFM	Exhaust CFM		
_____	Proposed SLA	0.00036	893	7.08	49.0	92.2	32 cfm	32 cfm	100	32

# IECC-2006 Section 404 Compliance

## COOLING SYSTEM

	#	System Type	Subtype	Efficiency	Capacity	Air Flow	SHR	Ductless
✓					kBtu/hr	cfm		

## HEATING SYSTEM

	#	System Type	Subtype	Efficiency	Capacity	Ductless
✓	1	Natural Gas Hydronic	None	AFUE: 0.91	18 kBtu/hr	True

## HOT WATER SYSTEM

	#	System Type	EF	Cap	Use	SetPnt	Credits
✓	1	Natural Gas	0.91	4 gal	50 gal	120 deg	None

## DUCTS

	#	---- Supply ----			---- Return ----		Leakage Type	Air Handler	CFM 25	Percent Leakage	QN	RLF
		Location	R-Value	Area	Location	Area						
✓				ft <sup>2</sup>		ft <sup>2</sup>			0.00 cfm	0.00 %	0.00	0.00

## UTILITY RATES

Fuel	Unit	Utility Name	Monthly Fixed Cost	\$/Unit
Electricity	kWh	seattle fixed	0	0.06
Natural Gas	Therm	seattle fixed	0	0.96
Fuel Oil	Gallon	Washington Default	0	1.1
Propane	Gallon	Washington Default	0	1.4

# Annual Energy Summary

Title: HUD - Seattle - bronze  
User

TMY City: WA\_SEATTLE\_BOEI  
Elec Util: seattle fixed  
Gas Util: seattle fixed  
Run Date: 08/05/2010 11:10:09

Seattle, WA,  
Registration #:

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (kBtu/hr)	0 kWh	\$0
Cooling Fan	0 kWh	\$0
Mechanical Vent Fan	7 kWh	\$ 0
<b>Total Cooling</b>	<b>7 kWh</b>	<b>\$0</b>
Heating (10.3 kBtu/hr)	122 Therms	\$117
Heating Fan/Pump	41 kWh	\$2
Mechanical Vent Fan	214 kWh	\$ 13
<b>Total Heating</b>		<b>\$132</b>
Hot Water	101 Therms	\$97
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>		<b>\$97</b>
Ceiling Fans	0 kWh	\$0
Clothes Washer	53 kWh	\$3
Dishwasher	133 kWh	\$8
Dryer	827 kWh	\$50
Lighting	1466 kWh	\$88
Miscellaneous	2506 kWh	\$150
Pool Pump	0 kWh	\$0
Range	32 Therms	\$31
Refrigerator	671 kWh	\$40
<hr/>		
Total (kWh)	5918 kWh	\$354
Total (Therms)	255 Therms	\$245
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		\$599

## Emissions (Calculated as Total - PV Produced)

SO2	0.96 Lbs.
NOX	5.22 Lbs.
CO2	2.55 Tons

# IECC-2006 Section 404 Compliance

PROJECT										
Title:	HUD - Seattle - bronze	Bedrooms:	2	Address Type:	Street Address					
Building Type:	User	Bathrooms:	1	Lot #						
Owner:		Conditioned Area:	946	SubDivision:						
# of Units:	1	Total Stories:	1	PlatBook:						
Builder Name:	HUD	Worst Case:	No	Street:						
Permit Office:		Rotate Angle:	45	County:						
Jurisdiction:		Cross Ventilation:		City, State, Zip:	Seattle ,					
Family Type:	Multi-family	Whole House Fan:			WA ,					
New/Existing:	New (From Plans)									
Comment:										
Estimated Annual Energy Cost for Code Compliance										
		<b>IECC Std. Design</b>		<b>Proposed Home</b>		<b>e-Ratio</b>				
	Cooling:	\$ 4		\$ 2		0.50				
	Heating:	\$ 178		\$ 170		0.96				
	Hot Water:	\$ 138		\$ 97		0.70				
	<b>Total:</b>	<b>\$ 320</b>		<b>\$ 269</b>		<b>0.84</b>				
<h2 style="margin: 0;">PASS</h2>										
CLIMATE										
✓	Design Location	Tmy Site	Climate Zone	Design Temp 97.5 %	Design Temp 2.5 %	Int Design Temp Winter	Int Design Temp Summer	Heating Degree Days	Design Moisture	Daily Temp Range
	WA, SEATTLE_BOEING	WA_SEATTLE_BOEING	4	28	81	75	70	4371.5	0	Medium
FLOORS										
✓	#	Floor Type	Perimeter	R-Value	Area	Tile	Wood	Carpet		
	1	Slab-On-Grade Edge Insulatio	136 ft	10	946 ft²	0	0.2	0.8		
ROOF										
✓	#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch
	1	Hip	Composition shingles	1137 ft²	0 ft²	Medium	0.85	No	0	33.7 deg
ATTIC										
✓	#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC			
	1	Full attic	Vented	300	946 ft²	N	N			

## IECC-2006 Section 404 Compliance

WALLS										
✓	#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Area	Sheathing R-Value	Framing Fraction	Solar Absor.	
_____	1	N	Exterior	Frame - Wood	21	128 ft²	0	0.19	0.5	
_____	2	W	Exterior	Frame - Wood	21	48 ft²	0	0.19	0.5	
_____	3	N	Exterior	Frame - Wood	21	96 ft²	0	0.19	0.5	
_____	4	E	Exterior	Frame - Wood	21	48 ft²	0	0.19	0.5	
_____	5	E	Neighbor	Frame - Wood	21	60 ft²		0.19	0.01	
_____	6	N	Neighbor	Frame - Wood	21	16 ft²		0.19	0.01	
_____	7	E	Neighbor	Frame - Wood	21	56 ft²		0.19	0.01	
_____	8	S	Exterior	Frame - Wood	21	16 ft²	0	0.19	0.5	
_____	9	E	Exterior	Frame - Wood	21	140 ft²	0	0.19	0.5	
_____	10	S	Exterior	Frame - Wood	21	208 ft²	0	0.19	0.5	
_____	11	W	Exterior	Frame - Wood	21	144 ft²	0	0.19	0.5	
_____	12	S	Exterior	Frame - Wood	21	16 ft²	0	0.19	0.5	
_____	13	W	Exterior	Frame - Wood	21	112 ft²	0	0.19	0.5	

DOORS						
✓	#	Wall ID	Door Type	Storms	U-Value	Area
_____	1	N	Insulated	None	0.4	20 ft²
_____	2	W	Insulated	None	0.4	20 ft²

WINDOWS													
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.													
✓	#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening
										Depth	Separation		
_____	1	N	Vinyl	Low-E Double	Yes	0.3	0.5	N	25 ft²	6 ft 0 in	1 ft 0 in	None	None
_____	2	N	Vinyl	Low-E Double	Yes	0.3	0.5	N	25 ft²	0 ft 0 in	0 ft 0 in	None	None
_____	3	E	Vinyl	Low-E Double	Yes	0.3	0.5	N	25 ft²	0 ft 0 in	0 ft 0 in	None	None
_____	4	S	Vinyl	Low-E Double	Yes	0.3	0.5	N	25 ft²	0 ft 0 in	0 ft 0 in	None	None
_____	5	W	Vinyl	Low-E Double	Yes	0.3	0.5	N	6.25 ft²	0 ft 0 in	0 ft 0 in	None	None
_____	6	W	Vinyl	Low-E Double	Yes	0.3	0.5	N	25 ft²	0 ft 0 in	0 ft 0 in	None	None

INFILTRATION & VENTING										
✓	Method	SLA	CFM 50	ACH 50	ELA	EqLA	---- Forced Ventilation ----		Run Time	Fan
							Supply CFM	Exhaust CFM	Fraction	Watts
_____	Proposed SLA	0.00036	893	7.08	49.0	92.2	32 cfm	32 cfm	100	32

## IECC-2006 Section 404 Compliance

COOLING SYSTEM												
✓	#	System Type	Subtype	Efficiency	Capacity	Air Flow	SHR	Ductless				
						kBtu/hr	cfm					
HEATING SYSTEM												
✓	#	System Type	Subtype	Efficiency	Capacity	Ductless						
	1	Natural Gas Hydronic	None	AFUE: 0.91	18 kBtu/hr	True						
HOT WATER SYSTEM												
✓	#	System Type	EF	Cap	Use	SetPnt	Credits					
	1	Natural Gas	0.91	4 gal	50 gal	120 deg	None					
DUCTS												
✓	#	---- Supply ----			---- Return ----			Air Handler	CFM 25	Percent Leakage	QN	RLF
		Location	R-Value	Area	Location	Area	Leakage Type		0.00 cfm	0.00 %	0.00	0.00
				ft <sup>2</sup>			ft <sup>2</sup>					
UTILITY RATES												
Fuel	Unit	Utility Name					Monthly Fixed Cost	\$/Unit				
Electricity	kWh	seattle fixed					0	0.06				
Natural Gas	Therm	seattle fixed					0	0.96				
Fuel Oil	Gallon	Washington Default					0	1.1				
Propane	Gallon	Washington Default					0	1.4				



# Annual Energy Summary

Title: HUD - Seattle - silver  
User

TMY City: WA\_SEATTLE\_BOEI  
Elec Util: seattle fixed  
Gas Util: seattle fixed  
Run Date: 08/05/2010 11:12:15

Seattle, WA,  
Registration #:

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (kBtu/hr)	0 kWh	\$0
Cooling Fan	0 kWh	\$0
Mechanical Vent Fan	6 kWh	\$ 0
<b>Total Cooling</b>	<b>6 kWh</b>	<b>\$0</b>
Heating (8.5 kBtu/hr)	89 Therms	\$85
Heating Fan/Pump	31 kWh	\$2
Mechanical Vent Fan	206 kWh	\$ 12
<b>Total Heating</b>		<b>\$99</b>
Hot Water	98 Therms	\$94
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>		<b>\$94</b>
Ceiling Fans	0 kWh	\$0
Clothes Washer	58 kWh	\$3
Dishwasher	133 kWh	\$8
Dryer	1275 kWh	\$76
Lighting	1466 kWh	\$88
Miscellaneous	2506 kWh	\$150
Pool Pump	0 kWh	\$0
Range	32 Therms	\$31
Refrigerator	450 kWh	\$27
<hr/>		
Total (kWh)	6131 kWh	\$366
Total (Therms)	220 Therms	\$210
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		\$576

## Emissions (Calculated as Total - PV Produced)

SO2	1 Lbs.
NOX	4.98 Lbs.
CO2	2.38 Tons

# IECC-2006 Section 404 Compliance

PROJECT										
Title:	HUD - Seattle - silver	Bedrooms:	2	Address Type:	Street Address					
Building Type:	User	Bathrooms:	1	Lot #						
Owner:		Conditioned Area:	946	SubDivision:						
# of Units:	1	Total Stories:	1	PlatBook:						
Builder Name:	HUD	Worst Case:	No	Street:						
Permit Office:		Rotate Angle:	45	County:						
Jurisdiction:		Cross Ventilation:		City, State, Zip:	Seattle ,					
Family Type:	Multi-family	Whole House Fan:			WA ,					
New/Existing:	New (From Plans)									
Comment:										
Estimated Annual Energy Cost for Code Compliance										
		<b>IECC Std. Design</b>		<b>Proposed Home</b>		<b>e-Ratio</b>				
	Cooling:	\$ 4		\$ 2		0.50				
	Heating:	\$ 178		\$ 126		0.71				
	Hot Water:	\$ 138		\$ 94		0.68				
	<b>Total:</b>	<b>\$ 320</b>		<b>\$ 222</b>		<b>0.69</b>				
<h2 style="margin: 0;">PASS</h2>										
CLIMATE										
✓	Design Location	Tmy Site	Climate Zone	Design Temp 97.5 %	Design Temp 2.5 %	Int Design Temp Winter	Int Design Temp Summer	Heating Degree Days	Design Moisture	Daily Temp Range
	WA, SEATTLE_BOEING	WA_SEATTLE_BOEING	4	28	81	75	70	4371.5	0	Medium
FLOORS										
✓	#	Floor Type	Perimeter	R-Value	Area	Tile	Wood	Carpet		
	1	Slab-On-Grade Edge Insulatio	136 ft	10	946 ft²	0	0.2	0.8		
ROOF										
✓	#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch
	1	Hip	Composition shingles	1137 ft²	0 ft²	Medium	0.85	No	0	33.7 deg
ATTIC										
✓	#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC			
	1	Full attic	Vented	300	946 ft²	N	N			

## IECC-2006 Section 404 Compliance

WALLS												
✓	#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Area	Sheathing R-Value	Framing Fraction	Solar Absor.			
_____	1	N	Exterior	Frame - Wood	21	128 ft²	5	0.16	0.5			
_____	2	W	Exterior	Frame - Wood	21	48 ft²	5	0.16	0.5			
_____	3	N	Exterior	Frame - Wood	21	96 ft²	5	0.16	0.5			
_____	4	E	Exterior	Frame - Wood	21	48 ft²	5	0.16	0.5			
_____	5	E	Neighbor	Frame - Wood	21	60 ft²		0.16	0.01			
_____	6	N	Neighbor	Frame - Wood	21	16 ft²		0.16	0.01			
_____	7	E	Neighbor	Frame - Wood	21	56 ft²		0.16	0.01			
_____	8	S	Exterior	Frame - Wood	21	16 ft²	5	0.16	0.5			
_____	9	E	Exterior	Frame - Wood	21	140 ft²	5	0.16	0.5			
_____	10	S	Exterior	Frame - Wood	21	208 ft²	5	0.16	0.5			
_____	11	W	Exterior	Frame - Wood	21	144 ft²	5	0.16	0.5			
_____	12	S	Exterior	Frame - Wood	21	16 ft²	5	0.16	0.5			
_____	13	W	Exterior	Frame - Wood	21	112 ft²	5	0.16	0.5			

DOORS						
✓	#	Wall ID	Door Type	Storms	U-Value	Area
_____	1	N	Insulated	None	0.3	20 ft²
_____	2	W	Insulated	None	0.3	20 ft²

WINDOWS													
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.													
✓	#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening
									Depth	Separation			
_____	1	N	Vinyl	Low-E Double	Yes	0.3	0.5	N	25 ft²	6 ft 0 in	1 ft 0 in	None	None
_____	2	N	Vinyl	Low-E Double	Yes	0.3	0.5	N	25 ft²	0 ft 0 in	0 ft 0 in	None	None
_____	3	E	Vinyl	Low-E Double	Yes	0.3	0.5	N	25 ft²	0 ft 0 in	0 ft 0 in	None	None
_____	4	S	Vinyl	Low-E Double	Yes	0.3	0.5	N	25 ft²	0 ft 0 in	0 ft 0 in	None	None
_____	5	W	Vinyl	Low-E Double	Yes	0.3	0.5	N	6.25 ft²	0 ft 0 in	0 ft 0 in	None	None
_____	6	W	Vinyl	Low-E Double	Yes	0.3	0.5	N	25 ft²	0 ft 0 in	0 ft 0 in	None	None

INFILTRATION & VENTING										
✓	Method	SLA	CFM 50	ACH 50	ELA	EqLA	---- Forced Ventilation ----		Run Time	Fan
							Supply CFM	Exhaust CFM	Fraction	Watts
_____	Proposed SLA	0.00020	496	3.93	27.2	51.2	32 cfm	32 cfm	100	32

## IECC-2006 Section 404 Compliance

COOLING SYSTEM														
✓	#	System Type	Subtype	Efficiency	Capacity	Air Flow	SHR	Ductless						
					kBtu/hr	cfm								
HEATING SYSTEM														
✓	#	System Type	Subtype	Efficiency	Capacity	Ductless								
		1	Natural Gas Hydronic	None	AFUE: 0.94	18 kBtu/hr	True							
HOT WATER SYSTEM														
✓	#	System Type	EF	Cap	Use	SetPnt	Credits							
		1	Natural Gas	0.94	4 gal	50 gal	120 deg	None						
DUCTS														
✓	#	---- Supply ----		---- Return ----		Leakage Type	Air Handler	CFM 25	Percent Leakage	QN	RLF			
		Location	R-Value	Area	Location	Area			ft <sup>2</sup>	ft <sup>2</sup>	0.00 cfm	0.00 %	0.00	0.00
UTILITY RATES														
Fuel	Unit	Utility Name					Monthly Fixed Cost	\$/Unit						
Electricity	kWh	seattle fixed					0	0.06						
Natural Gas	Therm	seattle fixed					0	0.96						
Fuel Oil	Gallon	Washington Default					0	1.1						
Propane	Gallon	Washington Default					0	1.4						

# Annual Energy Summary

Title: HUD - Seattle - gold  
User

TMY City: WA\_SEATTLE\_BOEI  
Elec Util: seattle fixed  
Gas Util: seattle fixed  
Run Date: 08/05/2010 11:14:40

Seattle, WA,  
Registration #:

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (kBtu/hr)	0 kWh	\$0
Cooling Fan	0 kWh	\$0
Mechanical Vent Fan	7 kWh	\$ 0
<b>Total Cooling</b>	<b>7 kWh</b>	<b>\$0</b>
Heating (8 kBtu/hr)	90 Therms	\$86
Heating Fan/Pump	31 kWh	\$2
Mechanical Vent Fan	211 kWh	\$ 13
<b>Total Heating</b>		<b>\$101</b>
Hot Water	38 Therms	\$36
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>		<b>\$36</b>
Ceiling Fans	0 kWh	\$0
Clothes Washer	58 kWh	\$3
Dishwasher	133 kWh	\$8
Dryer	1275 kWh	\$76
Lighting	1096 kWh	\$66
Miscellaneous	2506 kWh	\$150
Pool Pump	0 kWh	\$0
Range	32 Therms	\$31
Refrigerator	450 kWh	\$27
<hr/>		
Total (kWh)	5767 kWh	\$345
Total (Therms)	159 Therms	\$153
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		\$498

## Emissions (Calculated as Total - PV Produced)

SO2	0.94 Lbs.
NOX	4.08 Lbs.
CO2	1.97 Tons

# IECC-2006 Section 404 Compliance

PROJECT										
Title:	HUD - Seattle - gold	Bedrooms:	2	Address Type:	Street Address					
Building Type:	User	Bathrooms:	1	Lot #						
Owner:		Conditioned Area:	946	SubDivision:						
# of Units:	1	Total Stories:	1	PlatBook:						
Builder Name:	HUD	Worst Case:	No	Street:						
Permit Office:		Rotate Angle:	45	County:						
Jurisdiction:		Cross Ventilation:		City, State, Zip:	Seattle ,					
Family Type:	Multi-family	Whole House Fan:			WA ,					
New/Existing:	New (From Plans)									
Comment:										
Estimated Annual Energy Cost for Code Compliance										
		<b>IECC Std. Design</b>		<b>Proposed Home</b>		<b>e-Ratio</b>				
	Cooling:	\$ 4		\$ 2		0.50				
	Heating:	\$ 178		\$ 121		0.68				
	Hot Water:	\$ 138		\$ 36		0.26				
	<b>Total:</b>	<b>\$ 320</b>		<b>\$ 159</b>		<b>0.50</b>				
<h2 style="margin: 0;">PASS</h2>										
CLIMATE										
✓	Design Location	Tmy Site	Climate Zone	Design Temp 97.5 %	Design Temp 2.5 %	Int Design Temp Winter	Int Design Temp Summer	Heating Degree Days	Design Moisture	Daily Temp Range
	WA, SEATTLE_BOEING	WA_SEATTLE_BOEING	4	28	81	75	70	4371.5	0	Medium
FLOORS										
✓	#	Floor Type	Perimeter	R-Value	Area	Tile	Wood	Carpet		
	1	Slab-On-Grade Edge Insulatio	136 ft	10	946 ft²	0	0.2	0.8		
ROOF										
✓	#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch
	1	Hip	Composition shingles	1137 ft²	0 ft²	Medium	0.85	No	0	33.7 deg
ATTIC										
✓	#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC			
	1	Full attic	Vented	300	946 ft²	N	N			

## IECC-2006 Section 404 Compliance

WALLS												
✓	#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Area	Sheathing R-Value	Framing Fraction	Solar Absor.			
_____	1	N	Exterior	Frame - Wood	21	128 ft²	5	0.16	0.5			
_____	2	W	Exterior	Frame - Wood	21	48 ft²	5	0.16	0.5			
_____	3	N	Exterior	Frame - Wood	21	96 ft²	5	0.16	0.5			
_____	4	E	Exterior	Frame - Wood	21	48 ft²	5	0.16	0.5			
_____	5	E	Neighbor	Frame - Wood	21	60 ft²		0.16	0.01			
_____	6	N	Neighbor	Frame - Wood	21	16 ft²		0.16	0.01			
_____	7	E	Neighbor	Frame - Wood	21	56 ft²		0.16	0.01			
_____	8	S	Exterior	Frame - Wood	21	16 ft²	5	0.16	0.5			
_____	9	E	Exterior	Frame - Wood	21	140 ft²	5	0.16	0.5			
_____	10	S	Exterior	Frame - Wood	21	208 ft²	5	0.16	0.5			
_____	11	W	Exterior	Frame - Wood	21	144 ft²	5	0.16	0.5			
_____	12	S	Exterior	Frame - Wood	21	16 ft²	5	0.16	0.5			
_____	13	W	Exterior	Frame - Wood	21	112 ft²	5	0.16	0.5			

DOORS												
✓	#	Wall ID	Door Type	Storms	U-Value	Area						
_____	1	N	Insulated	None	0.3	20 ft²						
_____	2	W	Insulated	None	0.3	20 ft²						

WINDOWS													
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.													
✓	#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening
										Depth	Separation		
_____	1	N	Vinyl	Low-E Double	Yes	0.3	0.5	N	25 ft²	6 ft 0 in	1 ft 0 in	None	None
_____	2	N	Vinyl	Low-E Double	Yes	0.3	0.5	N	25 ft²	0 ft 0 in	0 ft 0 in	None	None
_____	3	E	Vinyl	Low-E Double	Yes	0.3	0.5	N	25 ft²	0 ft 0 in	0 ft 0 in	None	None
_____	4	S	Vinyl	Low-E Double	Yes	0.3	0.5	N	25 ft²	0 ft 0 in	0 ft 0 in	None	None
_____	5	W	Vinyl	Low-E Double	Yes	0.3	0.5	N	6.25 ft²	0 ft 0 in	0 ft 0 in	None	None
_____	6	W	Vinyl	Low-E Double	Yes	0.3	0.5	N	25 ft²	0 ft 0 in	0 ft 0 in	None	None

INFILTRATION & VENTING												
✓	Method	SLA	CFM 50	ACH 50	ELA	EqLA	---- Forced Ventilation ----		Run Time	Fan		
							Supply CFM	Exhaust CFM	Fraction	Watts		
_____	Proposed SLA	0.00014	347	2.75	19.1	35.9	32 cfm	32 cfm	100	32		

## IECC-2006 Section 404 Compliance

COOLING SYSTEM												
✓	#	System Type	Subtype	Efficiency	Capacity	Air Flow	SHR	Ductless				
					kBtu/hr	cfm						
HEATING SYSTEM												
✓	#	System Type	Subtype	Efficiency	Capacity	Ductless						
		1	Natural Gas Hydronic	None	AFUE: 0.94	18 kBtu/hr	True					
HOT WATER SYSTEM												
✓	#	System Type	EF	Cap	Use	SetPnt	Credits					
		1	Natural Gas	0.94	4 gal	50 gal	120 deg	Solar System				
DUCTS												
✓	#	---- Supply ----			---- Return ----		Leakage Type	Air Handler	CFM 25	Percent Leakage	QN	RLF
		Location	R-Value	Area	Location	Area						
				ft <sup>2</sup>			ft <sup>2</sup>					
								0.00 cfm	0.00 %	0.00	0.00	
UTILITY RATES												
Fuel	Unit	Utility Name					Monthly Fixed Cost	\$/Unit				
Electricity	kWh	seattle fixed					0	0.06				
Natural Gas	Therm	seattle fixed					0	0.96				
Fuel Oil	Gallon	Washington Default					0	1.1				
Propane	Gallon	Washington Default					0	1.4				



# Annual Energy Summary

Seattle, WA,  
Registration #:

Title: HUD - Seattle - emerald  
User

TMY City: WA\_SEATTLE\_BOEI  
Elec Util: seattle fixed  
Gas Util: seattle fixed  
Run Date: 08/05/2010 11:16:33

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (kBtu/hr)	0 kWh	\$0
Cooling Fan	0 kWh	\$0
Mechanical Vent Fan	5 kWh	\$ 0
<b>Total Cooling</b>	<b>5 kWh</b>	<b>\$0</b>
Heating (18 kBtu/hr)	65 Therms	\$61
Heating Fan/Pump	21 kWh	\$1
Mechanical Vent Fan	196 kWh	\$ 12
<b>Total Heating</b>		<b>\$74</b>
Hot Water	37 Therms	\$35
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>		<b>\$35</b>
Ceiling Fans	0 kWh	\$0
Clothes Washer	58 kWh	\$3
Dishwasher	133 kWh	\$8
Dryer	1275 kWh	\$76
Lighting	1096 kWh	\$66
Miscellaneous	2506 kWh	\$150
Pool Pump	0 kWh	\$0
Range	32 Therms	\$31
Refrigerator	450 kWh	\$27
<hr/>		
Total (kWh)	5740 kWh	\$343
Total (Therms)	133 Therms	\$127
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		\$470

## Emissions (Calculated as Total - PV Produced)

SO2	0.94 Lbs.
NOX	3.82 Lbs.
CO2	1.81 Tons

# IECC-2006 Section 404 Compliance

PROJECT										
Title:	HUD - Seattle - emerald	Bedrooms:	2	Address Type:	Street Address					
Building Type:	User	Bathrooms:	1	Lot #						
Owner:		Conditioned Area:	946	SubDivision:						
# of Units:	1	Total Stories:	1	PlatBook:						
Builder Name:	HUD	Worst Case:	No	Street:						
Permit Office:		Rotate Angle:	45	County:						
Jurisdiction:		Cross Ventilation:		City, State, Zip:	Seattle ,					
Family Type:	Multi-family	Whole House Fan:			WA ,					
New/Existing:	New (From Plans)									
Comment:										
Estimated Annual Energy Cost for Code Compliance										
		<b>IECC Std. Design</b>		<b>Proposed Home</b>		<b>e-Ratio</b>				
	Cooling:	\$ 4		\$ 2		0.50				
	Heating:	\$ 178		\$ 89		0.50				
	Hot Water:	\$ 138		\$ 35		0.25				
	<b>Total:</b>	<b>\$ 320</b>		<b>\$ 126</b>		<b>0.39</b>				
<h2 style="margin: 0;">PASS</h2>										
CLIMATE										
✓	Design Location	Tmy Site	Climate Zone	Design Temp 97.5 %	Design Temp 2.5 %	Int Design Temp Winter	Int Design Temp Summer	Heating Degree Days	Design Moisture	Daily Temp Range
	WA, SEATTLE_BOEING	WA_SEATTLE_BOEING	4	28	81	75	70	4371.5	0	Medium
FLOORS										
✓	#	Floor Type	Perimeter	R-Value	Area	Tile	Wood	Carpet		
	1	Slab-On-Grade Edge Insulatio	136 ft	10	946 ft²	0	0.2	0.8		
ROOF										
✓	#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch
	1	Hip	Composition shingles	1137 ft²	0 ft²	Medium	0.85	No	0	33.7 deg
ATTIC										
✓	#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC			
	1	Full attic	Vented	300	946 ft²	N	N			

## IECC-2006 Section 404 Compliance

WALLS													
✓	#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Area	Sheathing R-Value	Framing Fraction	Solar Absor.				
_____	1	N	Exterior	Frame - Wood	21	128 ft <sup>2</sup>	10	0.16	0.5				
_____	2	W	Exterior	Frame - Wood	21	48 ft <sup>2</sup>	10	0.16	0.5				
_____	3	N	Exterior	Frame - Wood	21	96 ft <sup>2</sup>	10	0.16	0.5				
_____	4	E	Exterior	Frame - Wood	21	48 ft <sup>2</sup>	10	0.16	0.5				
_____	5	E	Neighbor	Frame - Wood	21	60 ft <sup>2</sup>		0.16	0.01				
_____	6	N	Neighbor	Frame - Wood	21	16 ft <sup>2</sup>		0.16	0.01				
_____	7	E	Neighbor	Frame - Wood	21	56 ft <sup>2</sup>		0.16	0.01				
_____	8	S	Exterior	Frame - Wood	21	16 ft <sup>2</sup>	10	0.16	0.5				
_____	9	E	Exterior	Frame - Wood	21	140 ft <sup>2</sup>	10	0.16	0.5				
_____	10	S	Exterior	Frame - Wood	21	208 ft <sup>2</sup>	10	0.16	0.5				
_____	11	W	Exterior	Frame - Wood	21	144 ft <sup>2</sup>	10	0.16	0.5				
_____	12	S	Exterior	Frame - Wood	21	16 ft <sup>2</sup>	10	0.16	0.5				
_____	13	W	Exterior	Frame - Wood	21	112 ft <sup>2</sup>	10	0.16	0.5				
DOORS													
✓	#	Wall ID	Door Type				Storms	U-Value	Area				
_____	1	N	Insulated				None	0.18	20 ft <sup>2</sup>				
_____	2	W	Insulated				None	0.18	20 ft <sup>2</sup>				
WINDOWS													
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.													
✓	#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening
_____	1	N	Vinyl	Low-E Triple	Yes	0.22	0.6	N	25 ft <sup>2</sup>	6 ft 0 in	1 ft 0 in	None	None
_____	2	N	Vinyl	Low-E Triple	Yes	0.22	0.6	N	25 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
_____	3	E	Vinyl	Low-E Triple	Yes	0.22	0.6	N	25 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
_____	4	S	Vinyl	Low-E Triple	Yes	0.22	0.6	N	25 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
_____	5	W	Vinyl	Low-E Triple	Yes	0.22	0.6	N	6.25 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
_____	6	W	Vinyl	Low-E Triple	Yes	0.22	0.6	N	25 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
INFILTRATION & VENTING													
✓	Method	SLA	CFM 50	ACH 50	ELA	EqLA	---- Forced Ventilation ----		Run Time	Fan			
_____	Proposed SLA	0.00010	248	1.97	13.6	25.6	32 cfm	32 cfm	100	32			

## IECC-2006 Section 404 Compliance

COOLING SYSTEM												
✓	#	System Type	Subtype		Efficiency	Capacity	Air Flow	SHR	Ductless			
						kBtu/hr	cfm					
HEATING SYSTEM												
✓	#	System Type	Subtype		Efficiency	Capacity	Ductless					
		1	Natural Gas Hydronic		None	AFUE: 0.95	18 kBtu/hr	True				
HOT WATER SYSTEM												
✓	#	System Type	EF		Cap	Use	SetPnt	Credits				
		1	Natural Gas		0.95	4 gal	50 gal	120 deg	Solar System			
DUCTS												
✓	#	---- Supply ----			---- Return ----			Air Handler	CFM 25	Percent Leakage	QN	RLF
		Location	R-Value	Area	Location	Area	Leakage Type					
				ft <sup>2</sup>			ft <sup>2</sup>	0.00 cfm		0.00 %	0.00	0.00
UTILITY RATES												
Fuel	Unit	Utility Name					Monthly Fixed Cost		\$/Unit			
Electricity	kWh	seattle fixed					0		0.06			
Natural Gas	Therm	seattle fixed					0		0.96			
Fuel Oil	Gallon	Washington Default					0		1.1			
Propane	Gallon	Washington Default					0		1.4			





# APPENDIX C

## ENERGY MODELS

### 4 – Climate Zone #5

#### A. Akron, Ohio – Townhouse

Summary Data for HUD green - Akron, Ohio

Type A - Townhouse

Climate Zone 5: Akron, Ohio

ResCheck

12.8 UA

Software Output Subtitle	IECCStd2006	Proposed		Bronze - 15%		Silver - 30%		Gold - 50%		Emerald - 60%	
e-ratio as-built		0.94		0.85		0.71		0.51		0.40	
Hers as-built		89		83		64		55		48	
	<b>2006 IECC</b>	<b>2006 IECC Compliance Standard Calc -Base</b>	<b>Percentage Better than 2006 IECC</b>	<b>2006 IECC Compliance Standard Calc - 15%</b>		<b>2006 IECC Compliance Standard Calc - 30%</b>		<b>2006 IECC Compliance Standard Calc - 50%</b>		<b>2006 IECC Compliance Standard Calc - 60%</b>	
<b>Type A - Townhouse</b>											
Finished Floor Area, sq. feet	1296	1296		1296		1296		1296		1296	
Total Stories	2	2		2		2		2		2	
Foundation Type	Slab on Grade	Slab on Grade		Slab on Grade		Slab on Grade		Slab on Grade		Slab on Grade	
Bedrooms	2	2		2		2		2		2	
Baths	1.5	1.5		1.5		1.5		1.5		1.5	
Flat Ceiling R-value	28.73	<b>38</b>		38		<b>49</b>		<b>60</b>		60	raised heel truss
Wall Construction	2x wood	<b>2x6-16"oc</b>		2x6-16"oc		<b>2x6-24"oc</b>		2x6-24"oc		2x6-24"oc	
Wall R-value (cavity/cont. sheathing)	14.33	<b>19/0</b>		19/0		<b>19/0</b>		<b>19/5 siding</b>		19/5 siding	
Floor R-value	10	10		10		10		10		10	
Wall Area, Above Grade	1,969	1,969		1,969		1,969		1,969		1,969	
Exterior Doors	0.4	0.4		0.4		0.4		0.4		<b>0.2</b>	
Window U-value	0.35	<b>0.3</b>		0.30		0.30		0.30		<b>0.20</b>	lowE triple pane
Window SHGC	0.40	<b>0.31</b>		0.31		0.31		0.31		0.31	
Window Area	160	160		160.14		160.14		160.14		160.14	
Window Area, % of Floor, CFA	12.35%	12.36%		12.36%		12.36%		12.36%		12.36%	
Infiltration, Specific Leakage Area, SLA	0.00036	<b>0.00036</b>		0.00036		<b>0.0003</b>		<b>0.00014</b>		<b>0.0001</b>	
Infiltration, ACH50	6.59	<b>6.59</b>		6.59		<b>5.49</b>		<b>2.56</b>		<b>1.83</b>	
Ventilation Rate, cfm - 35@ ashrae 62.2	0	none		none		<b>yes</b>		yes		yes	
Cooling System SEER	13	13		13		13		13		<b>18</b>	
Cooling Capacity, kBtu/hr	15.75	18		18		18		18		18	
Heating System, AFUE	78%	92%		92%		92%		<b>96%</b>		<b>98%</b>	
Heating Capacity, kBtu/hr	27.1	30		30		30		30		30	
Duct Leakage to outside (CFM25)	not given					0		0		0	
Duct Loss %, DSE	20.00%	<b>12.00%</b>		12.00%		<b>6.00%</b>		6.00%		6.00%	
Duct Insulation	6	<b>5</b>		<b>1</b>		1		1		1	
Duct Location	Inside	Exterior		<b>Interior</b>		Interior		Interior		Interior	
Air Handler Location	Inside	Interior		Interior		Interior		Interior		Interior	
Hot Water Use, gallons/day	50	37.65		37.65		37.65		37.65	<b>w/ 64 sf</b>	37.65	w/64 sf
Water Heater Energy Factor	0.59	0.59		0.59		<b>0.92</b>		0.92	<b>closed loop</b>	<b>0.98</b>	closed loop
Tank size	40	40		40		<b>1</b>		1	<b>Solar</b>	1	Solar
Cool Set Point	78	78		78		78		78		78	
Heat Set Point	68	68		68		68		68		68	
Programmable Thermostat	No	No		<b>Yes</b>		Yes		Yes		Yes	
Cooling setback degrees; setback hours	none	none		2/6		2/6		2/6		2/6	
Heating setback degrees; setback hours	none	none		2/7		2/7		2/7		2/7	
Percentage Fluorescent Fixtures or CFLs	10	<b>10%</b>		10%		10%		10%		10%	
Solar PV											
Cooling Energy - cost	26	17	34.62%	16	38.46%	17	34.62%	16	38.46%	12	53.85%
Heating Energy - cost	468	434	7.26%	376	19.66%	340	27.35%	278	40.60%	224	52.14%
Hot Water Energy - cost	174	174	0.00%	175	-0.57%	108	37.93%	38	78.16%	31	82.18%
Solar PV											
Subtotal Heat Cool WH	668	625	6.44%	567	15.12%	465	30.39%	332	50.30%	267	60.03%

Notes:

**Bold entries indicate upgraded features at each level.**

When a tankless waterheater is installed - base IECC number is manipulated to original, so saving increases over e-Ratio

Infiltration Defaults to 0.00046 in proposed mode when there is no added ventilation @ 0.00036 (ashrea 62.2)

Slab ducts to be surrounded by foam insulation - thus moving them into conditioned space

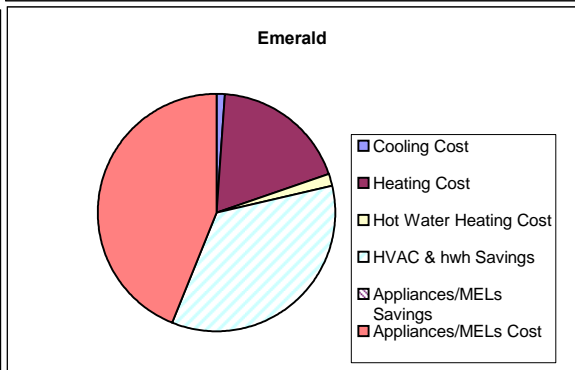
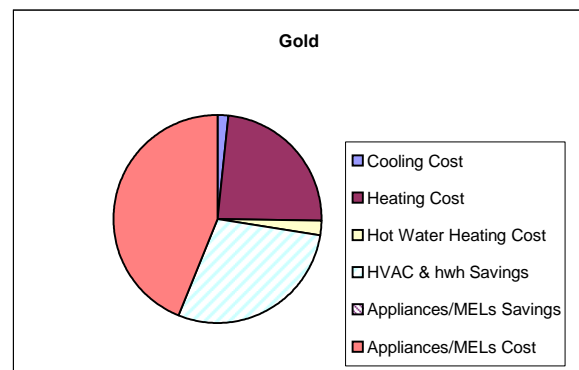
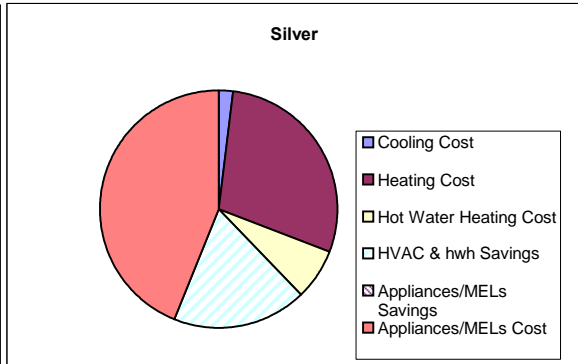
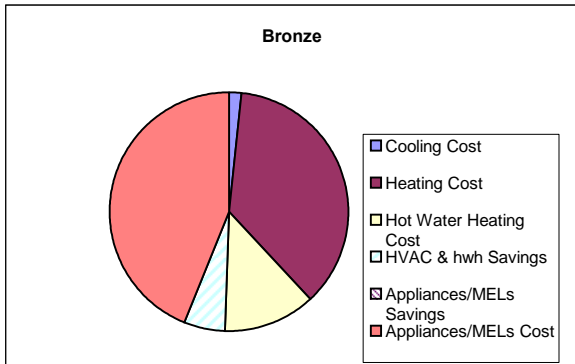
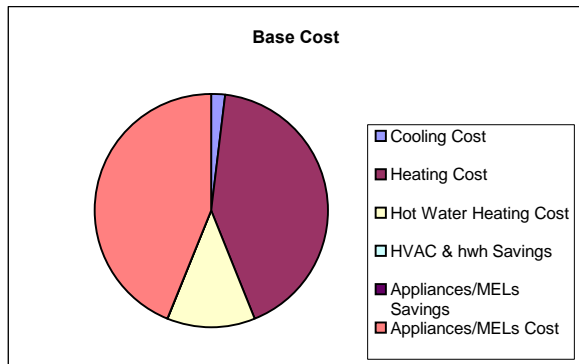
1 inch foam sheathing on exterior only on second floor exterior walls (no brick, partition or garage)

1 inch foam sheathing on interior brick walls, partition walls, and garage walls

Akron, Ohio  
A - Unit (townhouse)

Annual Energy Summary	Base	Bronze			Silver			Gold			Emerald		
	Yr \$	Yr \$	savings	percent	Yr \$	savings	percent	Yr \$	savings	percent	Yr \$	savings	percent
Cooling Cost	22	20	2	9%	21	1	5%	20	2	9%	14	8	36%
Heating Cost	485	420	65	13%	335	150	31%	273	212	44%	215	270	56%
Hot Water Heating Cost	143	144	-1	-1%	82	61	43%	24	119	83%	19	124	87%
HVAC & hwh Savings	N/A	66			212			333			402		
Appliances/MELs Savings	N/A	0			0			0			0		
Appliances/MELs Cost	508	508			508			508			508		
HVAC & HWH sub-total	650	584		10%	438		33%	317		51%	248		62%
Grand Total	1158	1092		94%	946		82%	825		71%	756		65%

Data based on Energy Gauge - Annual Energy Summary. Not Compliance





# Annual Energy Summary

HUD Green

Title: Ohio Type A - Base  
User

TMY City: OH\_AKRON\_AKRON

Elec Util: akron fixed

Gas Util: akron fixed

Akron, Oh, -  
Registration #:

Run Date: 08/05/2010 11:18:47

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (18 kBtu/hr)	231 kWh	\$18
Cooling Fan	47 kWh	\$4
Mechanical Vent Fan	0 kWh	\$0
<b>Total Cooling</b>	<b>278 kWh</b>	<b>\$22</b>
Heating (30 kBtu/hr)	447 Therms	\$456
Heating Fan/Pump	360 kWh	\$29
Mechanical Vent Fan	0 kWh	\$0
<b>Total Heating</b>	<b>\$485</b>	
Hot Water	140 Therms	\$143
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>	<b>\$143</b>	
Ceiling Fans	0 kWh	\$0
Clothes Washer	210 kWh	\$17
Dishwasher	114 kWh	\$9
Dryer	696 kWh	\$56
Lighting	1379 kWh	\$110
Miscellaneous	2611 kWh	\$209
Pool Pump	0 kWh	\$0
Range	909 kWh	\$73
Refrigerator	422 kWh	\$34
<hr/>		
Total (kWh)	6979 kWh	\$559
Total (Therms)	588 Therms	\$599
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		\$1158

## Emissions (Calculated as Total - PV Produced)

SO2	105.28 Lbs.
NOX	31.55 Lbs.
CO2	9.63 Tons

# IECC-2006 Section 404 Compliance

PROJECT										
Title:	Ohio Type A - Base	Bedrooms:	2	Address Type:	Street Address					
Building Type:	User	Bathrooms:	1.5	Lot #						
Owner:	HUD Green	Conditioned Area:	1296	SubDivision:						
# of Units:	1	Total Stories:	2	PlatBook:						
Builder Name:	Nexus Energy Homes	Worst Case:	No	Street:						
Permit Office:		Rotate Angle:	0	County:						
Jurisdiction:		Cross Ventilation:		City, State, Zip:	Akron ,					
Family Type:	Multi-family	Whole House Fan:		Oh ,	-					
New/Existing:	New (From Plans)									
Comment:										
Estimated Annual Energy Cost for Code Compliance										
		<b>IECC Std. Design</b>		<b>Proposed Home</b>		<b>e-Ratio</b>				
	Cooling:	\$ 26		\$ 17		0.65				
	Heating:	\$ 468		\$ 434		0.93				
	Hot Water:	\$ 174		\$ 174		1.00				
	<b>Total:</b>	<b>\$ 668</b>		<b>\$ 625</b>		<b>0.94</b>				
<h2 style="margin: 0;">PASS</h2>										
CLIMATE										
✓	Design Location	Tmy Site	Climate Zone	Design Temp 97.5 %	Design Temp 2.5 %	Int Design Temp Winter	Int Design Temp Summer	Heating Degree Days	Design Moisture	Daily Temp Range
_____	OH, AKRON_AKRON-CA	OH_AKRON_AKRON-CA	5	1	86	75	70	6258.5	29	Medium
FLOORS										
✓	#	Floor Type	Perimeter	R-Value	Area	Tile	Wood	Carpet		
_____	1	Slab-On-Grade Edge Insulatio	121 ft	10	751 ft²	0	0.7	0.3		
ROOF										
✓	#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch
_____	1	Hip	Composition shingles	903 ft²	0 ft²	Medium	0.85	No	0	33.7 deg
ATTIC										
✓	#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC			
_____	1	Full attic	Vented	300	751 ft²	N	N			

# IECC-2006 Section 404 Compliance

CEILING													
✓	#	Ceiling Type		R-Value	Area	Framing Frac	Truss Type						
✓	1	Under Attic (Vented)		38	751 ft <sup>2</sup>	0.11	Wood						
WALLS													
✓	#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Area	Sheathing R-Value	Framing Fraction	Solar Absor.				
✓	1	W	Exterior	Face Brick - Wood	19	162 ft <sup>2</sup>	0	0.23	0.5				
✓	2	S	Exterior	Face Brick - Wood	19	363 ft <sup>2</sup>	0	0.23	0.5				
✓	3	E	Exterior	Face Brick - Wood	19	48 ft <sup>2</sup>	0	0.23	0.5				
✓	4	S	Exterior	Face Brick - Wood	19	18 ft <sup>2</sup>	0	0.23	0.5				
✓	5	E	Garage	Frame - Wood	19	117.17 ft <sup>2</sup>	0	0.23	0.1				
✓	6	N	Neighbor	Frame - Wood	19	381 ft <sup>2</sup>	0	0.23	0.01				
✓	7	W	Exterior	Frame - Wood	19	90 ft <sup>2</sup>	0	0.23	0.5				
✓	8	S	Exterior	Frame - Wood	19	48 ft <sup>2</sup>	0	0.23	0.5				
✓	9	W	Exterior	Frame - Wood	19	54 ft <sup>2</sup>	0	0.23	0.5				
✓	10	S	Exterior	Frame - Wood	19	248 ft <sup>2</sup>	0	0.23	0.5				
✓	11	E	Exterior	Frame - Wood	19	144 ft <sup>2</sup>	0	0.23	0.5				
✓	12	N	Neighbor	Frame - Wood	19	296 ft <sup>2</sup>	0	0.23	0.01				
DOORS													
✓	#	Wall ID	Door Type		Storms	U-Value	Area						
✓	1	W	Insulated		None	0.4	20 ft <sup>2</sup>						
✓	2	S	Insulated		None	0.4	20 ft <sup>2</sup>						
✓	3	E	Insulated		None	0.4	20 ft <sup>2</sup>						
✓	4	E	Insulated		None	0.4	20 ft <sup>2</sup>						
WINDOWS													
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.													
✓	#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening
✓	1	W	Wood	Low-E Double	Yes	0.3	0.31	N	34.5 ft <sup>2</sup>	7 ft 4 in	1 ft 0 in	None	None
✓	2	W	Wood	Low-E Double	Yes	0.3	0.31	N	4 ft <sup>2</sup>	7 ft 3 in	1 ft 0 in	None	None
✓	3	W	Wood	Low-E Double	Yes	0.3	0.31	N	6.67 ft <sup>2</sup>	7 ft 4 in	1 ft 0 in	None	None
✓	4	S	Wood	Low-E Double	Yes	0.3	0.31	N	3 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	5	S	Wood	Low-E Double	Yes	0.3	0.31	N	51.75 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	6	E	Wood	Low-E Double	Yes	0.3	0.31	N	3 ft <sup>2</sup>	5 ft 4 in	1 ft 0 in	None	None
✓	7	W	Wood	Low-E Double	Yes	0.3	0.31	N	15 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	8	W	Wood	Low-E Double	Yes	0.3	0.31	N	5.44 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	9	S	Wood	Low-E Double	Yes	0.3	0.31	N	21.78 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None

# IECC-2006 Section 404 Compliance

## WINDOWS

Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.

	#	Ornt	Frame	Panels	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening
										Depth	Separation		
✓	10	E	Wood	Low-E Double	Yes	0.3	0.31	N	15 ft²	0 ft 0 in	0 ft 0 in	None	None

## INFILTRATION & VENTING

	Method	SLA	CFM 50	ACH 50	ELA	EqLA	---- Forced Ventilation ----		Run Time Fraction	Fan Watts
							Supply CFM	Exhaust CFM		
✓	Default	0.00050	1700	9.15	93.3	175.5	0 cfm	0 cfm	0	20

## GARAGE

	#	Floor Area	Ceiling Area	Exposed Wall Perimeter	Avg. Wall Height	Exposed Wall Insulation
✓	1	274.5589 ft²	274.5589 ft²	56 ft	9.33 ft	(invalid)

## COOLING SYSTEM

	#	System Type	Subtype	Efficiency	Capacity	Air Flow	SHR	Ductless
✓	1	Central Unit	None	SEER: 13	18 kBtu/hr	540 cfm	0.75	False

## HEATING SYSTEM

	#	System Type	Subtype	Efficiency	Capacity	Ductless
✓	1	Natural Gas Furnace	None	AFUE: 0.92	30 kBtu/hr	False

## HOT WATER SYSTEM

	#	System Type	EF	Cap	Use	SetPnt	Credits
✓	1	Natural Gas	0.59	40 gal	37.65 gal	120 deg	None

## DUCTS

	#	---- Supply ----			---- Return ----		Leakage Type	Air Handler	CFM 25	Percent Leakage	QN	RLF
		Location	R-Value	Area	Location	Area						
✓	1	Exterior	5	259 ft²	Interior	104 ft²	Default Leakage	Interior				

## UTILITY RATES

Fuel	Unit	Utility Name	Monthly Fixed Cost	\$/Unit
Electricity	kWh	akron fixed	0	0.08
Natural Gas	Therm	akron fixed	0	1.02
Fuel Oil	Gallon	Ohio Default	0	1.1
Propane	Gallon	Ohio Default	0	1.4

# Annual Energy Summary

HUD Green

Title: Ohio Type A - 15%  
User

TMY City: OH\_AKRON\_AKRON

Elec Util: akron fixed

Gas Util: akron fixed

Akron, Oh, -  
Registration #:

Run Date: 08/05/2010 11:20:46

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (18 kBtu/hr)	210 kWh	\$17
Cooling Fan	43 kWh	\$3
Mechanical Vent Fan	0 kWh	\$0
<b>Total Cooling</b>	<b>253 kWh</b>	<b>\$20</b>
Heating (30 kBtu/hr)	384 Therms	\$392
Heating Fan/Pump	349 kWh	\$28
Mechanical Vent Fan	0 kWh	\$0
<b>Total Heating</b>	<b>\$420</b>	
Hot Water	141 Therms	\$144
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>	<b>\$144</b>	
Ceiling Fans	0 kWh	\$0
Clothes Washer	210 kWh	\$17
Dishwasher	114 kWh	\$9
Dryer	696 kWh	\$56
Lighting	1379 kWh	\$110
Miscellaneous	2611 kWh	\$209
Pool Pump	0 kWh	\$0
Range	909 kWh	\$73
Refrigerator	422 kWh	\$34
<hr/>		
Total (kWh)	6943 kWh	\$556
Total (Therms)	525 Therms	\$536
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		\$1092

## Emissions (Calculated as Total - PV Produced)

SO2	104.74 Lbs.
NOX	30.84 Lbs.
CO2	9.23 Tons

# IECC-2006 Section 404 Compliance

PROJECT										
Title:	Ohio Type A - 15%	Bedrooms:	2	Address Type:	Street Address					
Building Type:	User	Bathrooms:	1.5	Lot #						
Owner:	HUD Green	Conditioned Area:	1296	SubDivision:						
# of Units:	1	Total Stories:	2	PlatBook:						
Builder Name:	Nexus Energy Homes	Worst Case:	No	Street:						
Permit Office:		Rotate Angle:	0	County:						
Jurisdiction:		Cross Ventilation:		City, State, Zip:	Akron ,					
Family Type:	Multi-family	Whole House Fan:		Oh ,	-					
New/Existing:	New (From Plans)									
Comment:										
Estimated Annual Energy Cost for Code Compliance										
		<b>IECC Std. Design</b>		<b>Proposed Home</b>		<b>e-Ratio</b>				
	Cooling:	\$ 26		\$ 16		0.62				
	Heating:	\$ 468		\$ 376		0.80				
	Hot Water:	\$ 174		\$ 175		1.01				
	<b>Total:</b>	<b>\$ 668</b>		<b>\$ 567</b>		<b>0.85</b>				
<h2 style="margin: 0;">PASS</h2>										
CLIMATE										
✓	Design Location	Tmy Site	Climate Zone	Design Temp 97.5 %	Design Temp 2.5 %	Int Design Temp Winter	Int Design Temp Summer	Heating Degree Days	Design Moisture	Daily Temp Range
_____	OH, AKRON_AKRON-CA	OH_AKRON_AKRON-CA	5	1	86	75	70	6258.5	29	Medium
FLOORS										
✓	#	Floor Type	Perimeter	R-Value	Area	Tile	Wood	Carpet		
_____	1	Slab-On-Grade Edge Insulatio	121 ft	10	751 ft²	0	0.7	0.3		
ROOF										
✓	#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch
_____	1	Hip	Composition shingles	903 ft²	0 ft²	Medium	0.85	No	0	33.7 deg
ATTIC										
✓	#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC			
_____	1	Full attic	Vented	300	751 ft²	N	N			

# IECC-2006 Section 404 Compliance

CEILING													
✓	#	Ceiling Type			R-Value	Area	Framing Frac	Truss Type					
✓	1	Under Attic (Vented)			38	751 ft²	0.11	Wood					
WALLS													
✓	#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Area	Sheathing R-Value	Framing Fraction	Solar Absor.				
✓	1	W	Exterior	Face Brick - Wood	19	162 ft²	0	0.23	0.5				
✓	2	S	Exterior	Face Brick - Wood	19	363 ft²	0	0.23	0.5				
✓	3	E	Exterior	Face Brick - Wood	19	48 ft²	0	0.23	0.5				
✓	4	S	Exterior	Face Brick - Wood	19	18 ft²	0	0.23	0.5				
✓	5	E	Garage	Frame - Wood	19	117.17 ft²	0	0.23	0.1				
✓	6	N	Neighbor	Frame - Wood	19	381 ft²	0	0.23	0.01				
✓	7	W	Exterior	Frame - Wood	19	90 ft²	0	0.23	0.5				
✓	8	S	Exterior	Frame - Wood	19	48 ft²	0	0.23	0.5				
✓	9	W	Exterior	Frame - Wood	19	54 ft²	0	0.23	0.5				
✓	10	S	Exterior	Frame - Wood	19	248 ft²	0	0.23	0.5				
✓	11	E	Exterior	Frame - Wood	19	144 ft²	0	0.23	0.5				
✓	12	N	Neighbor	Frame - Wood	19	296 ft²	0	0.23	0.01				
DOORS													
✓	#	Wall ID	Door Type		Storms	U-Value	Area						
✓	1	W	Insulated		None	0.4	20 ft²						
✓	2	S	Insulated		None	0.4	20 ft²						
✓	3	E	Insulated		None	0.4	20 ft²						
✓	4	E	Insulated		None	0.4	20 ft²						
WINDOWS													
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.													
✓	#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening
✓	1	W	Wood	Low-E Double	Yes	0.3	0.31	N	34.5 ft²	7 ft 4 in	1 ft 0 in	None	None
✓	2	W	Wood	Low-E Double	Yes	0.3	0.31	N	4 ft²	7 ft 3 in	1 ft 0 in	None	None
✓	3	W	Wood	Low-E Double	Yes	0.3	0.31	N	6.67 ft²	7 ft 4 in	1 ft 0 in	None	None
✓	4	S	Wood	Low-E Double	Yes	0.3	0.31	N	3 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	5	S	Wood	Low-E Double	Yes	0.3	0.31	N	51.75 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	6	E	Wood	Low-E Double	Yes	0.3	0.31	N	3 ft²	5 ft 4 in	1 ft 0 in	None	None
✓	7	W	Wood	Low-E Double	Yes	0.3	0.31	N	15 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	8	W	Wood	Low-E Double	Yes	0.3	0.31	N	5.44 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	9	S	Wood	Low-E Double	Yes	0.3	0.31	N	21.78 ft²	0 ft 0 in	0 ft 0 in	None	None

# IECC-2006 Section 404 Compliance

<b>WINDOWS</b>													
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.													
✓	#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening
										Depth	Separation		
✓	10	E	Wood	Low-E Double	Yes	0.3	0.31	N	15 ft²	0 ft 0 in	0 ft 0 in	None	None

<b>INFILTRATION &amp; VENTING</b>										
✓	Method	SLA	CFM 50	ACH 50	ELA	EqLA	---- Forced Ventilation ----		Run Time	Fan
							Supply CFM	Exhaust CFM	Fraction	Watts
✓	Default	0.00050	1700	9.15	93.3	175.5	0 cfm	0 cfm	0	20

<b>GARAGE</b>						
✓	#	Floor Area	Ceiling Area	Exposed Wall Perimeter	Avg. Wall Height	Exposed Wall Insulation
✓	1	274.5589 ft²	274.5589 ft²	56 ft	9.33 ft	(invalid)

<b>COOLING SYSTEM</b>								
✓	#	System Type	Subtype	Efficiency	Capacity	Air Flow	SHR	Ductless
✓	1	Central Unit	None	SEER: 13	18 kBtu/hr	540 cfm	0.75	False

<b>HEATING SYSTEM</b>						
✓	#	System Type	Subtype	Efficiency	Capacity	Ductless
✓	1	Natural Gas Furnace	None	AFUE: 0.92	30 kBtu/hr	False

<b>HOT WATER SYSTEM</b>							
✓	#	System Type	EF	Cap	Use	SetPnt	Credits
✓	1	Natural Gas	0.59	40 gal	37.65 gal	120 deg	None

<b>DUCTS</b>												
✓	#	---- Supply ----			---- Return ----		Leakage Type	Air Handler	CFM 25	Percent Leakage	QN	RLF
		Location	R-Value	Area	Location	Area						
✓	1	Interior	1	259 ft²	Interior	104 ft²	Default Leakage	Interior				

<b>UTILITY RATES</b>				
Fuel	Unit	Utility Name	Monthly Fixed Cost	\$/Unit
Electricity	kWh	akron fixed	0	0.08
Natural Gas	Therm	akron fixed	0	1.02
Fuel Oil	Gallon	Ohio Default	0	1.1
Propane	Gallon	Ohio Default	0	1.4



# Annual Energy Summary

HUD Green

Title: Ohio Type A - 30%  
User

TMY City: OH\_AKRON\_AKRON

Elec Util: akron fixed

Gas Util: akron fixed

Akron, Oh, -  
Registration #:

Run Date: 08/05/2010 11:22:31

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (18 kBtu/hr)	186 kWh	\$15
Cooling Fan	38 kWh	\$3
Mechanical Vent Fan	35 kWh	\$3
<b>Total Cooling</b>	<b>259 kWh</b>	<b>\$21</b>
Heating (30 kBtu/hr)	297 Therms	\$303
Heating Fan/Pump	270 kWh	\$22
Mechanical Vent Fan	119 kWh	\$10
<b>Total Heating</b>		<b>\$335</b>
Hot Water	80 Therms	\$82
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>		<b>\$82</b>
Ceiling Fans	0 kWh	\$0
Clothes Washer	210 kWh	\$17
Dishwasher	114 kWh	\$9
Dryer	696 kWh	\$56
Lighting	1379 kWh	\$110
Miscellaneous	2611 kWh	\$209
Pool Pump	0 kWh	\$0
Range	909 kWh	\$73
Refrigerator	422 kWh	\$34
<hr/>		
Total (kWh)	6989 kWh	\$561
Total (Therms)	377 Therms	\$385
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		\$946

## Emissions (Calculated as Total - PV Produced)

SO2	105.44 Lbs.
NOX	29.48 Lbs.
CO2	8.42 Tons

# IECC-2006 Section 404 Compliance

PROJECT										
Title:	Ohio Type A - 30%	Bedrooms:	2	Address Type:	Street Address					
Building Type:	User	Bathrooms:	1.5	Lot #						
Owner:	HUD Green	Conditioned Area:	1296	SubDivision:						
# of Units:	1	Total Stories:	2	PlatBook:						
Builder Name:	Nexus Energy Homes	Worst Case:	No	Street:						
Permit Office:		Rotate Angle:	0	County:						
Jurisdiction:		Cross Ventilation:		City, State, Zip:	Akron ,					
Family Type:	Multi-family	Whole House Fan:		Oh ,	-					
New/Existing:	New (From Plans)									
Comment:										
Estimated Annual Energy Cost for Code Compliance										
		<b>IECC Std. Design</b>		<b>Proposed Home</b>		<b>e-Ratio</b>				
	Cooling:	\$ 30		\$ 17		0.57				
	Heating:	\$ 476		\$ 340		0.71				
	Hot Water:	\$ 174		\$ 108		0.62				
	<b>Total:</b>	<b>\$ 680</b>		<b>\$ 465</b>		<b>0.68</b>				
<h2 style="margin: 0;">PASS</h2>										
CLIMATE										
✓	Design Location	Tmy Site	Climate Zone	Design Temp 97.5 %	Design Temp 2.5 %	Int Design Temp Winter	Int Design Temp Summer	Heating Degree Days	Design Moisture	Daily Temp Range
_____	OH, AKRON_AKRON-CA	OH_AKRON_AKRON-CA	5	1	86	75	70	6258.5	29	Medium
FLOORS										
✓	#	Floor Type	Perimeter	R-Value	Area	Tile	Wood	Carpet		
_____	1	Slab-On-Grade Edge Insulatio	121 ft	10	751 ft²	0	0.7	0.3		
ROOF										
✓	#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch
_____	1	Hip	Composition shingles	903 ft²	0 ft²	Medium	0.85	No	0	33.7 deg
ATTIC										
✓	#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC			
_____	1	Full attic	Vented	300	751 ft²	N	N			

# IECC-2006 Section 404 Compliance

CEILING													
✓	#	Ceiling Type			R-Value	Area	Framing Frac	Truss Type					
✓	1	Under Attic (Vented)			49	751 ft <sup>2</sup>	0.11	Wood					
WALLS													
✓	#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Area	Sheathing R-Value	Framing Fraction	Solar Absor.				
✓	1	W	Exterior	Face Brick - Wood	19	162 ft <sup>2</sup>	0	0.16	0.5				
✓	2	S	Exterior	Face Brick - Wood	19	363 ft <sup>2</sup>	0	0.16	0.5				
✓	3	E	Exterior	Face Brick - Wood	19	48 ft <sup>2</sup>	0	0.16	0.5				
✓	4	S	Exterior	Face Brick - Wood	19	18 ft <sup>2</sup>	0	0.16	0.5				
✓	5	E	Garage	Frame - Wood	19	117.17 ft <sup>2</sup>	0	0.16	0.1				
✓	6	N	Neighbor	Frame - Wood	19	381 ft <sup>2</sup>	0	0.16	0.01				
✓	7	W	Exterior	Frame - Wood	19	90 ft <sup>2</sup>	0	0.16	0.5				
✓	8	S	Exterior	Frame - Wood	19	48 ft <sup>2</sup>	0	0.16	0.5				
✓	9	W	Exterior	Frame - Wood	19	54 ft <sup>2</sup>	0	0.16	0.5				
✓	10	S	Exterior	Frame - Wood	19	248 ft <sup>2</sup>	0	0.16	0.5				
✓	11	E	Exterior	Frame - Wood	19	144 ft <sup>2</sup>	0	0.16	0.5				
✓	12	N	Neighbor	Frame - Wood	19	296 ft <sup>2</sup>	0	0.16	0.01				
DOORS													
✓	#	Wall ID	Door Type			Storms	U-Value	Area					
✓	1	W	Insulated			None	0.4	20 ft <sup>2</sup>					
✓	2	S	Insulated			None	0.4	20 ft <sup>2</sup>					
✓	3	E	Insulated			None	0.4	20 ft <sup>2</sup>					
✓	4	E	Insulated			None	0.4	20 ft <sup>2</sup>					
WINDOWS													
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.													
✓	#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening
✓	1	W	Wood	Low-E Double	Yes	0.3	0.31	N	34.5 ft <sup>2</sup>	7 ft 4 in	1 ft 0 in	None	None
✓	2	W	Wood	Low-E Double	Yes	0.3	0.31	N	4 ft <sup>2</sup>	7 ft 3 in	1 ft 0 in	None	None
✓	3	W	Wood	Low-E Double	Yes	0.3	0.31	N	6.67 ft <sup>2</sup>	7 ft 4 in	1 ft 0 in	None	None
✓	4	S	Wood	Low-E Double	Yes	0.3	0.31	N	3 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	5	S	Wood	Low-E Double	Yes	0.3	0.31	N	51.75 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	6	E	Wood	Low-E Double	Yes	0.3	0.31	N	3 ft <sup>2</sup>	5 ft 4 in	1 ft 0 in	None	None
✓	7	W	Wood	Low-E Double	Yes	0.3	0.31	N	15 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	8	W	Wood	Low-E Double	Yes	0.3	0.31	N	5.44 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	9	S	Wood	Low-E Double	Yes	0.3	0.31	N	21.78 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None

# IECC-2006 Section 404 Compliance

<b>WINDOWS</b>													
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.													
✓	#	Ornt	Frame	Panels	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening
_____	10	E	Wood	Low-E Double	Yes	0.3	0.31	N	15 ft²	0 ft 0 in	0 ft 0 in	None	None
<b>INFILTRATION &amp; VENTING</b>													
✓	Method	SLA	CFM 50	ACH 50	ELA	EqLA	---- Forced Ventilation ----		Run Time	Fan			
_____	Proposed SLA	0.00030	1020	5.49	56.0	105.3	Supply CFM	Exhaust CFM	Fraction	Watts			
_____	Proposed SLA	0.00030	1020	5.49	56.0	105.3	35 cfm	0 cfm	100	20			
<b>GARAGE</b>													
✓	#	Floor Area	Ceiling Area	Exposed Wall Perimeter	Avg. Wall Height	Exposed Wall Insulation							
_____	1	274.5589 ft²	274.5589 ft²	56 ft	9.33 ft	(invalid)							
<b>COOLING SYSTEM</b>													
✓	#	System Type	Subtype	Efficiency	Capacity	Air Flow	SHR	Ductless					
_____	1	Central Unit	None	SEER: 13	18 kBtu/hr	540 cfm	0.75	False					
<b>HEATING SYSTEM</b>													
✓	#	System Type	Subtype	Efficiency	Capacity	Ductless							
_____	1	Natural Gas Furnace	None	AFUE: 0.92	30 kBtu/hr	False							
<b>HOT WATER SYSTEM</b>													
✓	#	System Type	EF	Cap	Use	SetPnt	Credits						
_____	1	Natural Gas	0.92	1 gal	37.65 gal	120 deg	None						
<b>DUCTS</b>													
✓	#	---- Supply ----		---- Return ----		Leakage Type	Air Handler	CFM 25	Percent Leakage	QN	RLF		
_____	1	Interior	1	259 ft²	Interior	104 ft²	Prop. Air Leakage	Interior	36.00 cfm	6.00 %	0.03	0.60	
<b>UTILITY RATES</b>													
Fuel	Unit	Utility Name		Monthly Fixed Cost		\$/Unit							
Electricity	kWh	akron fixed		0		0.08							
Natural Gas	Therm	akron fixed		0		1.02							
Fuel Oil	Gallon	Ohio Default		0		1.1							
Propane	Gallon	Ohio Default		0		1.4							

# Annual Energy Summary

HUD Green

Title: Ohio Type A - 50%  
User

TMY City: OH\_AKRON\_AKRON

Akron, Oh, -  
Registration #:

Elec Util: akron fixed

Gas Util: akron fixed

Run Date: 08/05/2010 11:24:12

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (18 kBtu/hr)	170 kWh	\$14
Cooling Fan	34 kWh	\$3
Mechanical Vent Fan	35 kWh	\$3
<b>Total Cooling</b>	<b>239 kWh</b>	<b>\$20</b>
Heating (30 kBtu/hr)	241 Therms	\$246
Heating Fan/Pump	227 kWh	\$18
Mechanical Vent Fan	118 kWh	\$9
<b>Total Heating</b>		<b>\$273</b>
Hot Water	24 Therms	\$24
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>		<b>\$24</b>
Ceiling Fans	0 kWh	\$0
Clothes Washer	210 kWh	\$17
Dishwasher	114 kWh	\$9
Dryer	696 kWh	\$56
Lighting	1379 kWh	\$110
Miscellaneous	2611 kWh	\$209
Pool Pump	0 kWh	\$0
Range	909 kWh	\$73
Refrigerator	422 kWh	\$34
<hr/>		
Total (kWh)	6925 kWh	\$555
Total (Therms)	265 Therms	\$270
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		\$825

## Emissions (Calculated as Total - PV Produced)

SO2	104.47 Lbs.
NOX	28.04 Lbs.
CO2	7.7 Tons

# IECC-2006 Section 404 Compliance

PROJECT										
Title:	Ohio Type A - 50%	Bedrooms:	2	Adress Type:	Street Address	Building Type:	User	Bathrooms:	1.5	Lot #
Owner:	HUD Green	Conditioned Area:	1296	SubDivision:		# of Units:	1	Total Stories:	2	PlatBook:
Builder Name:	Nexus Energy Homes	Worst Case:	No	Street:		Permit Office:		Rotate Angle:	0	County:
Jurisdiction:		Cross Ventilation:		City, State, Zip:	Akron ,	Family Type:	Multi-family	Whole House Fan:		Oh , -
New/Existing:	New (From Plans)					Comment:				
Estimated Annual Energy Cost for Code Compliance										
		<b>IECC Std. Design</b>		<b>Proposed Home</b>					<b>e-Ratio</b>	
	Cooling:	\$ 30		\$ 16					0.53	
	Heating:	\$ 476		\$ 278					0.58	
	Hot Water:	\$ 174		\$ 38					0.22	
	<b>Total:</b>	<b>\$ 680</b>		<b>\$ 332</b>					<b>0.49</b>	
<h2 style="margin: 0;">PASS</h2>										
CLIMATE										
✓	Design Location	Tmy Site	Climate Zone	Design Temp 97.5 %	Design Temp 2.5 %	Int Design Temp Winter	Int Design Temp Summer	Heating Degree Days	Design Moisture	Daily Temp Range
_____	OH, AKRON_AKRON-CA	OH_AKRON_AKRON-CA	5	1	86	75	70	6258.5	29	Medium
FLOORS										
✓	#	Floor Type	Perimeter	R-Value	Area	Tile	Wood	Carpet		
_____	1	Slab-On-Grade Edge Insulatio	121 ft	10	751 ft²	0	0.7	0.3		
ROOF										
✓	#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch
_____	1	Hip	Composition shingles	903 ft²	0 ft²	Medium	0.85	No	0	33.7 deg
ATTIC										
✓	#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC			
_____	1	Full attic	Vented	300	751 ft²	N	N			

## IECC-2006 Section 404 Compliance

CEILING													
✓	#	Ceiling Type			R-Value	Area	Framing Frac	Truss Type					
✓	1	Under Attic (Vented)			60	751 ft <sup>2</sup>	0.11	Wood					
WALLS													
✓	#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Area	Sheathing R-Value	Framing Fraction	Solar Absor.				
✓	1	W	Exterior	Face Brick - Wood	19	162 ft <sup>2</sup>	0	0.16	0.5				
✓	2	S	Exterior	Face Brick - Wood	19	363 ft <sup>2</sup>	0	0.16	0.5				
✓	3	E	Exterior	Face Brick - Wood	19	48 ft <sup>2</sup>	0	0.16	0.5				
✓	4	S	Exterior	Face Brick - Wood	19	18 ft <sup>2</sup>	0	0.16	0.5				
✓	5	E	Garage	Frame - Wood	19	117.17 ft <sup>2</sup>	0	0.16	0.1				
✓	6	N	Neighbor	Frame - Wood	19	381 ft <sup>2</sup>	0	0.16	0.01				
✓	7	W	Exterior	Frame - Wood	19	90 ft <sup>2</sup>	5	0.16	0.5				
✓	8	S	Exterior	Frame - Wood	19	48 ft <sup>2</sup>	5	0.16	0.5				
✓	9	W	Exterior	Frame - Wood	19	54 ft <sup>2</sup>	5	0.16	0.5				
✓	10	S	Exterior	Frame - Wood	19	248 ft <sup>2</sup>	5	0.16	0.5				
✓	11	E	Exterior	Frame - Wood	19	144 ft <sup>2</sup>	5	0.16	0.5				
✓	12	N	Neighbor	Frame - Wood	19	296 ft <sup>2</sup>	0	0.16	0.01				
DOORS													
✓	#	Wall ID	Door Type		Storms	U-Value	Area						
✓	1	W	Insulated		None	0.4	20 ft <sup>2</sup>						
✓	2	S	Insulated		None	0.4	20 ft <sup>2</sup>						
✓	3	E	Insulated		None	0.4	20 ft <sup>2</sup>						
✓	4	E	Insulated		None	0.4	20 ft <sup>2</sup>						
WINDOWS													
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.													
✓	#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening
✓	1	W	Wood	Low-E Double	Yes	0.3	0.31	N	34.5 ft <sup>2</sup>	7 ft 4 in	1 ft 0 in	None	None
✓	2	W	Wood	Low-E Double	Yes	0.3	0.31	N	4 ft <sup>2</sup>	7 ft 3 in	1 ft 0 in	None	None
✓	3	W	Wood	Low-E Double	Yes	0.3	0.31	N	6.67 ft <sup>2</sup>	7 ft 4 in	1 ft 0 in	None	None
✓	4	S	Wood	Low-E Double	Yes	0.3	0.31	N	3 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	5	S	Wood	Low-E Double	Yes	0.3	0.31	N	51.75 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	6	E	Wood	Low-E Double	Yes	0.3	0.31	N	3 ft <sup>2</sup>	5 ft 4 in	1 ft 0 in	None	None
✓	7	W	Wood	Low-E Double	Yes	0.3	0.31	N	15 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	8	W	Wood	Low-E Double	Yes	0.3	0.31	N	5.44 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	9	S	Wood	Low-E Double	Yes	0.3	0.31	N	21.78 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None

# IECC-2006 Section 404 Compliance

<b>WINDOWS</b>													
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.													
✓	#	Ornt	Frame	Panels	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening
										Depth	Separation		
✓	10	E	Wood	Low-E Double	Yes	0.3	0.31	N	15 ft²	0 ft 0 in	0 ft 0 in	None	None

<b>INFILTRATION &amp; VENTING</b>										
✓	Method	SLA	CFM 50	ACH 50	ELA	EqLA	---- Forced Ventilation ----		Run Time	Fan
							Supply CFM	Exhaust CFM	Fraction	Watts
✓	Proposed SLA	0.00014	476	2.56	26.1	49.1	35 cfm	0 cfm	100	20

<b>GARAGE</b>						
✓	#	Floor Area	Ceiling Area	Exposed Wall Perimeter	Avg. Wall Height	Exposed Wall Insulation
✓	1	274.5589 ft²	274.5589 ft²	56 ft	9.33 ft	(invalid)

<b>COOLING SYSTEM</b>								
✓	#	System Type	Subtype	Efficiency	Capacity	Air Flow	SHR	Ductless
✓	1	Central Unit	None	SEER: 13	18 kBtu/hr	540 cfm	0.75	False

<b>HEATING SYSTEM</b>						
✓	#	System Type	Subtype	Efficiency	Capacity	Ductless
✓	1	Natural Gas Furnace	None	AFUE: 0.96	30 kBtu/hr	False

<b>HOT WATER SYSTEM</b>							
✓	#	System Type	EF	Cap	Use	SetPnt	Credits
✓	1	Natural Gas	0.92	1 gal	37.65 gal	120 deg	Solar System

<b>DUCTS</b>												
✓	#	---- Supply ----			---- Return ----		Leakage Type	Air Handler	CFM 25	Percent Leakage	QN	RLF
		Location	R-Value	Area	Location	Area						
✓	1	Interior	1	259 ft²	Interior	104 ft²	Prop. Air Leakage	Interior	36.00 cfm	6.00 %	0.03	0.60

<b>UTILITY RATES</b>				
Fuel	Unit	Utility Name	Monthly Fixed Cost	\$/Unit
Electricity	kWh	akron fixed	0	0.08
Natural Gas	Therm	akron fixed	0	1.02
Fuel Oil	Gallon	Ohio Default	0	1.1
Propane	Gallon	Ohio Default	0	1.4



# Annual Energy Summary

HUD Green

Title: Ohio Type A - 60%  
User

TMY City: OH\_AKRON\_AKRON

Elec Util: akron fixed

Gas Util: akron fixed

Akron, Oh, -

Registration #:

Run Date: 08/05/2010 11:25:49

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (18 kBtu/hr)	116 kWh	\$9
Cooling Fan	24 kWh	\$2
Mechanical Vent Fan	33 kWh	\$ 3
<b>Total Cooling</b>	<b>173 kWh</b>	<b>\$14</b>
Heating (30 kBtu/hr)	191 Therms	\$195
Heating Fan/Pump	136 kWh	\$11
Mechanical Vent Fan	116 kWh	\$ 9
<b>Total Heating</b>		<b>\$215</b>
Hot Water	19 Therms	\$19
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>		<b>\$19</b>
Ceiling Fans	0 kWh	\$0
Clothes Washer	210 kWh	\$17
Dishwasher	114 kWh	\$9
Dryer	696 kWh	\$56
Lighting	1379 kWh	\$110
Miscellaneous	2611 kWh	\$209
Pool Pump	0 kWh	\$0
Range	909 kWh	\$73
Refrigerator	422 kWh	\$34
<hr/>		
Total (kWh)	6766 kWh	\$542
Total (Therms)	210 Therms	\$214
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		\$756

## Emissions (Calculated as Total - PV Produced)

SO2	102.07 Lbs.
NOX	26.93 Lbs.
CO2	7.24 Tons

# IECC-2006 Section 404 Compliance

PROJECT										
Title:	Ohio Type A - 60%	Bedrooms:	2	Address Type:	Street Address					
Building Type:	User	Bathrooms:	1.5	Lot #						
Owner:	HUD Green	Conditioned Area:	1296	SubDivision:						
# of Units:	1	Total Stories:	2	PlatBook:						
Builder Name:	Nexus Energy Homes	Worst Case:	No	Street:						
Permit Office:		Rotate Angle:	0	County:						
Jurisdiction:		Cross Ventilation:		City, State, Zip:	Akron ,					
Family Type:	Multi-family	Whole House Fan:			Oh ,					
New/Existing:	New (From Plans)									
Comment:										
Estimated Annual Energy Cost for Code Compliance										
		<b>IECC Std. Design</b>		<b>Proposed Home</b>		<b>e-Ratio</b>				
	Cooling:	\$ 30		\$ 12		0.40				
	Heating:	\$ 476		\$ 224		0.47				
	Hot Water:	\$ 174		\$ 31		0.18				
	<b>Total:</b>	<b>\$ 680</b>		<b>\$ 267</b>		<b>0.39</b>				
<h2 style="margin: 0;">PASS</h2>										
CLIMATE										
✓	Design Location	Tmy Site	Climate Zone	Design Temp 97.5 %	Design Temp 2.5 %	Int Design Temp Winter	Int Design Temp Summer	Heating Degree Days	Design Moisture	Daily Temp Range
_____	OH, AKRON_AKRON-CA	OH_AKRON_AKRON-CA	5	1	86	75	70	6258.5	29	Medium
FLOORS										
✓	#	Floor Type	Perimeter	R-Value	Area	Tile	Wood	Carpet		
_____	1	Slab-On-Grade Edge Insulatio	121 ft	10	751 ft²	0	0.7	0.3		
ROOF										
✓	#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch
_____	1	Hip	Composition shingles	903 ft²	0 ft²	Medium	0.85	No	0	33.7 deg
ATTIC										
✓	#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC			
_____	1	Full attic	Vented	300	751 ft²	N	N			

## IECC-2006 Section 404 Compliance

CEILING													
✓	#	Ceiling Type			R-Value	Area	Framing Frac	Truss Type					
✓	1	Under Attic (Vented)			60	751 ft <sup>2</sup>	0.11	Wood					
WALLS													
✓	#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Area	Sheathing R-Value	Framing Fraction	Solar Absor.				
✓	1	W	Exterior	Face Brick - Wood	19	162 ft <sup>2</sup>	0	0.16	0.5				
✓	2	S	Exterior	Face Brick - Wood	19	363 ft <sup>2</sup>	0	0.16	0.5				
✓	3	E	Exterior	Face Brick - Wood	19	48 ft <sup>2</sup>	0	0.16	0.5				
✓	4	S	Exterior	Face Brick - Wood	19	18 ft <sup>2</sup>	0	0.16	0.5				
✓	5	E	Garage	Frame - Wood	19	117.17 ft <sup>2</sup>	5	0.16	0.1				
✓	6	N	Neighbor	Frame - Wood	19	381 ft <sup>2</sup>	0	0.16	0.01				
✓	7	W	Exterior	Frame - Wood	19	90 ft <sup>2</sup>	5	0.16	0.5				
✓	8	S	Exterior	Frame - Wood	19	48 ft <sup>2</sup>	5	0.16	0.5				
✓	9	W	Exterior	Frame - Wood	19	54 ft <sup>2</sup>	5	0.16	0.5				
✓	10	S	Exterior	Frame - Wood	19	248 ft <sup>2</sup>	5	0.16	0.5				
✓	11	E	Exterior	Frame - Wood	19	144 ft <sup>2</sup>	5	0.16	0.5				
✓	12	N	Neighbor	Frame - Wood	19	296 ft <sup>2</sup>	0	0.16	0.01				
DOORS													
✓	#	Wall ID	Door Type		Storms	U-Value	Area						
✓	1	W	Insulated		None	0.2	20 ft <sup>2</sup>						
✓	2	S	Insulated		None	0.2	20 ft <sup>2</sup>						
✓	3	E	Insulated		None	0.2	20 ft <sup>2</sup>						
✓	4	E	Insulated		None	0.2	20 ft <sup>2</sup>						
WINDOWS													
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.													
✓	#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening
✓	1	W	Wood	Low-E Triple	Yes	0.2	0.31	N	34.5 ft <sup>2</sup>	7 ft 4 in	1 ft 0 in	None	None
✓	2	W	Wood	Low-E Triple	Yes	0.2	0.31	N	4 ft <sup>2</sup>	7 ft 3 in	1 ft 0 in	None	None
✓	3	W	Wood	Low-E Triple	Yes	0.2	0.31	N	6.67 ft <sup>2</sup>	7 ft 4 in	1 ft 0 in	None	None
✓	4	S	Wood	Low-E Triple	Yes	0.2	0.31	N	3 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	5	S	Wood	Low-E Triple	Yes	0.2	0.31	N	51.75 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	6	E	Wood	Low-E Triple	Yes	0.2	0.31	N	3 ft <sup>2</sup>	5 ft 4 in	1 ft 0 in	None	None
✓	7	W	Wood	Low-E Triple	Yes	0.2	0.31	N	15 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	8	W	Wood	Low-E Triple	Yes	0.2	0.31	N	5.44 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	9	S	Wood	Low-E Triple	Yes	0.2	0.31	N	21.78 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None

# IECC-2006 Section 404 Compliance

<b>WINDOWS</b>													
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.													
✓	#	Ornt	Frame	Panels	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening
										Depth	Separation		
	10	E	Wood	Low-E Triple	Yes	0.2	0.31	N	15 ft²	0 ft 0 in	0 ft 0 in	None	None
<b>INFILTRATION &amp; VENTING</b>													
✓	Method	SLA	CFM 50	ACH 50	ELA	EqLA	---- Forced Ventilation ----		Run Time	Fan			
							Supply CFM	Exhaust CFM	Fraction	Watts			
	Proposed SLA	0.00010	340	1.83	18.7	35.1	35 cfm	0 cfm	100	20			
<b>GARAGE</b>													
✓	#	Floor Area	Ceiling Area	Exposed Wall Perimeter	Avg. Wall Height	Exposed Wall Insulation							
	1	274.5589 ft²	274.5589 ft²	56 ft	9.33 ft	(invalid)							
<b>COOLING SYSTEM</b>													
✓	#	System Type	Subtype	Efficiency	Capacity	Air Flow	SHR	Ductless					
	1	Central Unit	None	SEER: 18	18 kBtu/hr	540 cfm	0.75	False					
<b>HEATING SYSTEM</b>													
✓	#	System Type	Subtype	Efficiency	Capacity	Ductless							
	1	Natural Gas Furnace	None	AFUE: 0.98	30 kBtu/hr	False							
<b>HOT WATER SYSTEM</b>													
✓	#	System Type	EF	Cap	Use	SetPnt	Credits						
	1	Natural Gas	0.98	1 gal	37.65 gal	120 deg	Solar System						
<b>DUCTS</b>													
✓	#	---- Supply ----			---- Return ----			Air Handler	CFM 25	Percent Leakage	QN	RLF	
		Location	R-Value	Area	Location	Area	Leakage Type						
	1	Interior	1	259 ft²	Interior	104 ft²	Prop. Air Leakage	Interior	36.00 cfm	6.00 %	0.03	0.60	
<b>UTILITY RATES</b>													
Fuel	Unit	Utility Name			Monthly Fixed Cost		\$/Unit						
Electricity	kWh	akron fixed			0		0.08						
Natural Gas	Therm	akron fixed			0		1.02						
Fuel Oil	Gallon	Ohio Default			0		1.1						
Propane	Gallon	Ohio Default			0		1.4						





# APPENDIX C ENERGY MODELS

B. Akron, Ohio – Single Family Home

Summary Data for HUD green - Akron, Ohio

Type D - Single Family detached gar

Climate Zone 5: Akron, Ohio

ResCheck

12.8 UA

Software Output Subtitle	IECCStd2006	Proposed		Bronze - 15%		Silver - 30%		Gold - 50%		Emerald - 60%	
e-ratio as-built		0.88		0.82		0.71		0.50		0.40	
Hers as-built		79		76		60		51		46	
	2006 IECC	2006 IECC Compliance Standard Calc -Base	Percentage Better than 2006 IECC	2006 IECC Compliance Standard Calc - 15%		2006 IECC Compliance Standard Calc - 30%		2006 IECC Compliance Standard Calc - 50%		2006 IECC Compliance Standard Calc - 60%	
<b>Type D - Single Family detached gar</b>											
Finished Floor Area, sq. feet	1908	1908		1908		1908		1908		1908	
Total Stories	2	2		2		2		2		2	
Foundation Type	Basement	Basement		Basement		Basement		Basement		Basement	
Bedrooms	4	4		4		4		4		4	
Baths	2.5	2.5		2.5		2.5		2.5		2.5	
Flat Ceiling R-value	28.73	<b>38</b>		38		<b>49</b>		<b>60</b>		60	raised heel truss
Floor over Ambient R-value	26.01	<b>30</b>		30		30		30		30	
Wall Construction	2x wood	<b>2x6-16"oc</b>		2x6-16"oc		<b>2x6-24"oc</b>		2x6-24"oc		2x6-24"oc	
Wall R-value (cavity/cont. sheathing)	14.33	<b>19/0</b>		19/0		<b>19/0</b>		<b>19/5</b>		<b>19/10</b>	
Slab Floor R-value										10	
Wall Area, Above Grade	2,300	2,300		2,300		2,300		2,300		2,300	
Window U-value	0.35	<b>0.3</b>		0.30		0.30		0.30		<b>0.20</b>	lowE triple pane
Window SHGC	0.40	<b>0.31</b>		0.31		0.31		0.31		0.31	
Window Area	243	243		243		243		243		243	
Window Area, % of Floor, CFA	12.74%	12.74%		12.74%		12.74%		12.74%		12.74%	
Infiltration, Specific Leakage Area, SLA	0.00036	<b>0.00036</b>		0.00036		<b>0.00024</b>		<b>0.00014</b>		<b>0.0001</b>	
Infiltration, ACH50	6.8	<b>6.80</b>		6.8		<b>4.53</b>		<b>2.64</b>		<b>1.89</b>	
Ventilation Rate, cfm - 67@ ashrae 62.2	0	none		none		<b>yes</b>		yes		yes	
Cooling System SEER	13	13		13		13		13		<b>18</b>	
Cooling Capacity, kBtu/hr	24.87	30		30		30		30		<b>24</b>	
Heating System, AFUE	78%	92%		92%		92%		<b>96%</b>		<b>98%</b>	
Heating Capacity, kBtu/hr	50.4	66		66		66		<b>42</b>		<b>42</b>	
Duct Leakage to outside (CFM25)	not given					0		0		0	
Duct Loss %, DSE	20.00%	<b>12.00%</b>		<b>12.00%</b>		<b>6.00%</b>		6.00%		6.00%	
Qn	n/a	<b>n/a</b>		<b>0.083</b>		<b>0.028</b>		0.028		0.028	
Duct Insulation	6	<b>n/a</b>		<b>1</b>		1		1		1	
Duct Location	Inside	Interior		Interior		Interior		Interior		Interior	
Air Handler Location	Inside	Interior		Interior		Interior		Interior		Interior	
Hot Water Use, gallons/day	70	70		70		70		70	w/ 64 sf	70	w/64 sf
Water Heater Energy Factor	0.57	<b>0.59</b>		0.59		<b>0.92</b>		0.92	<b>closed loop</b>	<b>0.98</b>	closed loop
Tank size	50	50		40		1		1	<b>Solar</b>	1	Solar
Cool Set Point	78	78		78		78		78		78	
Heat Set Point	68	68		68		68		68		68	
Programmable Thermostat	No	No		<b>Yes</b>		Yes		Yes		Yes	
Cooling setback degrees; setback hours	none	none		2/6		2/6		2/6		2/6	
Heating setback degrees; setback hours	none	none		2/7		2/7		2/7		2/7	
Percentage Fluorescent Fixtures or CFLs	10	<b>10%</b>		10%		10%		10%		10%	
Solar PV											
Cooling Energy - cost	74	38	48.65%	35	52.70%	36	51.35%	37	50.00%	19	74.32%
Heating Energy - cost	718	635	11.56%	577	19.64%	527	26.60%	402	44.01%	329	54.18%
Hot Water Energy - cost	233	225	3.43%	226	3.00%	152	34.76%	63	72.96%	53	77.25%
Solar PV											
Subtotal Heat Cool WH	1,025	898	12.39%	838	18.24%	715	30.24%	502	51.02%	401	60.88%
Total Energy Cost (\$)											

Notes:

**Bold entries indicate upgraded features at each level.**

When a tankless waterheater is installed - base IECC number is manipulated to original, so saving increases over e-Ratio

Infiltration Defaults to 0.00046 in proposed mode when there is no added ventilation @ 0.00036 (ashrae 62.2)

Slab ducts to be surrounded by foam insulation - thus moving them into conditioned space

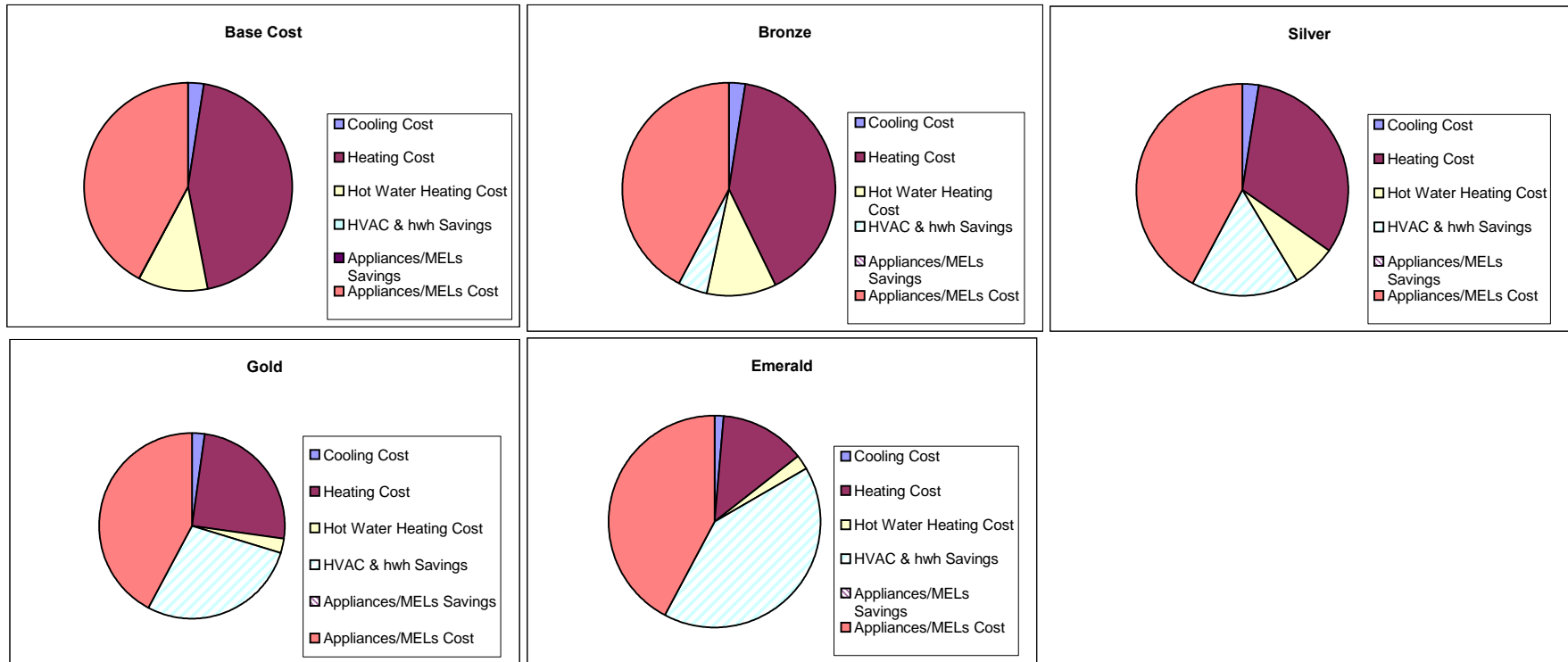
1 inch foam sheathing on exterior only on second floor exterior walls (no brick, partition or garage)

1 inch foam sheathing on interior brick walls, partition walls, and garage walls

Akron, Ohio  
D - Unit (single family home)

Annual Energy Summary	Base	Bronze			Silver			Gold			Emerald		
	Yr \$	Yr \$	savings	percent	Yr \$	savings	percent	Yr \$	savings	percent	Yr \$	savings	percent
Cooling Cost	43	40	3	7%	40	3	7%	39	4	9%	23	20	47%
Heating Cost	749	679	70	9%	543	206	28%	422	327	44%	219	530	71%
Hot Water Heating Cost	182	182	0	0%	114	68	37%	39	143	79%	39	143	79%
HVAC & hwh Savings	N/A	73			277			474			693		
Appliances/MELs Savings	N/A	0			0			0			0		
Appliances/MELs Cost	711	711			711			711			711		
HVAC & HWH sub-total	974	901		7%	697		28%	500		49%	281		71%
Grand Total	1685	1612		96%	1408		84%	1211		72%	992		59%

Data based on Energy Gauge - Annual Energy Summary. Not Compliance





# Annual Energy Summary

HUD Green

Title: Ohio Type D - Base  
User

TMY City: OH\_AKRON\_AKRON

Elec Util: akron fixed

Gas Util: akron fixed

Akron, Oh, -

Registration #:

Run Date: 08/05/2010 11:30:54

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (30 kBtu/hr)	450 kWh	\$36
Cooling Fan	92 kWh	\$7
Mechanical Vent Fan	0 kWh	\$0
<b>Total Cooling</b>	<b>542 kWh</b>	<b>\$43</b>
Heating (66 kBtu/hr)	686 Therms	\$700
Heating Fan/Pump	617 kWh	\$49
Mechanical Vent Fan	0 kWh	\$0
<b>Total Heating</b>	<b>\$749</b>	
Hot Water	178 Therms	\$182
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>	<b>\$182</b>	
Ceiling Fans	0 kWh	\$0
Clothes Washer	295 kWh	\$24
Dishwasher	159 kWh	\$13
Dryer	974 kWh	\$78
Lighting	2345 kWh	\$188
Miscellaneous	3763 kWh	\$301
Pool Pump	0 kWh	\$0
Range	909 kWh	\$73
Refrigerator	422 kWh	\$34
<hr/>		
Total (kWh)	10026 kWh	\$803
Total (Therms)	864 Therms	\$882
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		\$1685

## Emissions (Calculated as Total - PV Produced)

SO2	151.25 Lbs.
NOX	45.42 Lbs.
CO2	13.96 Tons

# IECC-2006 Section 404 Compliance

PROJECT										
Title:	Ohio Type D - Base	Bedrooms:	4	Address Type:	Street Address					
Building Type:	User	Bathrooms:	2.5	Lot #						
Owner:	HUD Green	Conditioned Area:	1908	SubDivision:						
# of Units:	1	Total Stories:	2	PlatBook:						
Builder Name:		Worst Case:	No	Street:						
Permit Office:		Rotate Angle:	0	County:						
Jurisdiction:		Cross Ventilation:		City, State, Zip:	Akron ,					
Family Type:	Single-family	Whole House Fan:			Oh ,					
New/Existing:	New (From Plans)									
Comment:										
Estimated Annual Energy Cost for Code Compliance										
		<b>IECC Std. Design</b>		<b>Proposed Home</b>		<b>e-Ratio</b>				
Cooling:		\$ 74		\$ 39		0.53				
Heating:		\$ 717		\$ 634		0.88				
Hot Water:		\$ 233		\$ 225		0.97				
<b>Total:</b>		<b>\$ 1024</b>		<b>\$ 898</b>		<b>0.88</b>				
<h2 style="margin: 0;">PASS</h2>										
CLIMATE										
✓	Design Location	Tmy Site	Climate Zone	Design Temp 97.5 %	2.5 %	Int Design Temp Winter	Summer	Heating Degree Days	Design Moisture	Daily Temp Range
	OH, AKRON_AKRON-CA	OH_AKRON_AKRON-CA	5	1	86	75	70	6258.5	29	Medium
FLOORS										
✓	#	Floor Type	Perimeter	Perimeter R-Value	Area	Joist R-Value	Tile	Wood	Carpet	
	1	Basement Finished			978 ft²		1	0	0	
	2	Raised Floor			59 ft²	30	0	0	1	
ROOF										
✓	#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch
	1	Gable or shed	Composition shingles	1246 ft²	346 ft²	Medium	0.85	No	0	33.7 deg
ATTIC										
✓	#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC			
	1	Full attic	Vented	300	1037 ft²	N	N			

## IECC-2006 Section 404 Compliance

CEILING													
✓	#	Ceiling Type			R-Value	Area	Framing Frac	Truss Type					
✓	1	Under Attic (Vented)			38	1037 ft²	0.11	Wood					
WALLS													
✓	#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Area	Sheathing R-Value	Framing Fraction	Solar Absor.				
✓	1	W	Exterior	Frame - Wood	19	54 ft²	0	0.23	0.5				
✓	2	N	Exterior	Frame - Wood	19	63 ft²	0	0.23	0.5				
✓	3	W	Exterior	Frame - Wood	19	144 ft²	0	0.23	0.5				
✓	4	S	Exterior	Frame - Wood	19	432 ft²	0	0.23	0.5				
✓	5	E	Exterior	Frame - Wood	19	144 ft²	0	0.23	0.5				
✓	6	N	Exterior	Frame - Wood	19	54 ft²	0	0.23	0.5				
✓	7	E	Exterior	Frame - Wood	19	54 ft²	0	0.23	0.5				
✓	8	N	Exterior	Frame - Wood	19	315 ft²	0	0.23	0.5				
✓	9	W	Exterior	Frame - Wood	19	88 ft²	0	0.23	0.5				
✓	10	N	Exterior	Frame - Wood	19	12 ft²	0	0.23	0.5				
✓	11	W	Exterior	Frame - Wood	19	88 ft²	0	0.23	0.5				
✓	12	S	Exterior	Frame - Wood	19	344 ft²	0	0.23	0.5				
✓	13	E	Exterior	Frame - Wood	19	176 ft²	0	0.23	0.5				
✓	14	N	Exterior	Frame - Wood	19	332 ft²	0	0.23	0.5				
DOORS													
✓	#	Wall ID	Door Type		Storms	U-Value	Area						
✓	1	W	Insulated		None	0.4	20 ft²						
✓	2	N	Insulated		None	0.4	20 ft²						
✓	3	E	Insulated		None	0.4	20 ft²						
WINDOWS													
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.													
✓	#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening
✓	1	W	Wood	Low-E Double	Yes	0.3	0.31	N	4 ft²	7 ft 4 in	1 ft 0 in	None	None
✓	2	W	Wood	Low-E Double	Yes	0.3	0.31	N	6.67 ft²	7 ft 3 in	1 ft 0 in	None	None
✓	3	W	Wood	Low-E Double	Yes	0.3	0.31	N	34.5 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	4	S	Wood	Low-E Double	Yes	0.3	0.31	N	21.78 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	5	E	Wood	Low-E Double	Yes	0.3	0.31	N	34.5 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	6	N	Wood	Low-E Double	Yes	0.3	0.31	N	3 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	7	N	Wood	Low-E Double	Yes	0.3	0.31	N	16.33 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	8	W	Wood	Low-E Double	Yes	0.3	0.31	N	15 ft²	0 ft 0 in	0 ft 0 in	None	None

# IECC-2006 Section 404 Compliance

## WINDOWS

Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.

✓	#	Ornt	Frame	Panels	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening
										Depth	Separation		
✓	9	W	Wood	Low-E Double	Yes	0.3	0.31	N	30 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	10	S	Wood	Low-E Double	Yes	0.3	0.31	N	10.89 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	11	E	Vinyl	Low-E Double	Yes	0.3	0.31	N	30 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	12	E	Vinyl	Low-E Double	Yes	0.3	0.31	N	20 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	13	N	Vinyl	Low-E Double	Yes	0.3	0.31	N	16.33 ft²	0 ft 0 in	0 ft 0 in	None	None

## INFILTRATION & VENTING

✓	Method	SLA	CFM 50	ACH 50	ELA	EqLA	---- Forced Ventilation ----		Run Time Fraction	Fan Watts
							Supply CFM	Exhaust CFM		
✓	Default	0.00050	3785	9.45	207.8	390.8	0 cfm	0 cfm	0	20

## COOLING SYSTEM

✓	#	System Type	Subtype	Efficiency	Capacity	Air Flow	SHR	Ductless
✓	1	Central Unit	None	SEER: 13	30 kBtu/hr	900 cfm	0.75	False

## HEATING SYSTEM

✓	#	System Type	Subtype	Efficiency	Capacity	Ductless
✓	1	Natural Gas Furnace	None	AFUE: 0.92	66 kBtu/hr	False

## HOT WATER SYSTEM

✓	#	System Type	EF	Cap	Use	SetPnt	Credits
✓	1	Natural Gas	0.59	50 gal	52.7 gal	120 deg	None

## DUCTS

✓	#	---- Supply ----			---- Return ----		Leakage Type	Air Handler	CFM 25	Percent Leakage	QN	RLF
		Location	R-Value	Area	Location	Area						
✓	1	Interior	5	577 ft²	Interior	231 ft²	Default Leakage	Interior				

## UTILITY RATES

Fuel	Unit	Utility Name	Monthly Fixed Cost	\$/Unit
Electricity	kWh	akron fixed	0	0.08
Natural Gas	Therm	akron fixed	0	1.02
Fuel Oil	Gallon	Ohio Default	0	1.1
Propane	Gallon	Ohio Default	0	1.4

# Annual Energy Summary

HUD Green

Title: Ohio Type D - 15%  
User

TMY City: OH\_AKRON\_AKRON

Akron, Oh, -  
Registration #:

Elec Util: akron fixed  
Gas Util: akron fixed

Run Date: 08/05/2010 11:32:48

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (30 kBtu/hr)	413 kWh	\$33
Cooling Fan	85 kWh	\$7
Mechanical Vent Fan	0 kWh	\$0
<b>Total Cooling</b>	<b>498 kWh</b>	<b>\$40</b>
Heating (66 kBtu/hr)	623 Therms	\$635
Heating Fan/Pump	555 kWh	\$44
Mechanical Vent Fan	0 kWh	\$0
<b>Total Heating</b>		<b>\$679</b>
Hot Water	178 Therms	\$182
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>		<b>\$182</b>
Ceiling Fans	0 kWh	\$0
Clothes Washer	295 kWh	\$24
Dishwasher	159 kWh	\$13
Dryer	974 kWh	\$78
Lighting	2345 kWh	\$188
Miscellaneous	3763 kWh	\$301
Pool Pump	0 kWh	\$0
Range	909 kWh	\$73
Refrigerator	422 kWh	\$34
<hr/>		
Total (kWh)	9920 kWh	\$795
Total (Therms)	802 Therms	\$817
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		\$1612

## Emissions (Calculated as Total - PV Produced)

SO2	149.65 Lbs.
NOX	44.47 Lbs.
CO2	13.5 Tons

# IECC-2006 Section 404 Compliance

PROJECT										
Title:	Ohio Type D - 15%	Bedrooms:	4	Address Type:	Street Address					
Building Type:	User	Bathrooms:	2.5	Lot #						
Owner:	HUD Green	Conditioned Area:	1908	SubDivision:						
# of Units:	1	Total Stories:	2	PlatBook:						
Builder Name:		Worst Case:	No	Street:						
Permit Office:		Rotate Angle:	0	County:						
Jurisdiction:		Cross Ventilation:		City, State, Zip:	Akron ,					
Family Type:	Single-family	Whole House Fan:			Oh ,					
New/Existing:	New (From Plans)									
Comment:										
Estimated Annual Energy Cost for Code Compliance										
		<b>IECC Std. Design</b>		<b>Proposed Home</b>		<b>e-Ratio</b>				
	Cooling:	\$ 74		\$ 35		0.47				
	Heating:	\$ 717		\$ 577		0.80				
	Hot Water:	\$ 233		\$ 226		0.97				
	<b>Total:</b>	<b>\$ 1024</b>		<b>\$ 838</b>		<b>0.82</b>				
<h2 style="margin: 0;">PASS</h2>										
CLIMATE										
✓	Design Location	Tmy Site	Climate Zone	Design Temp 97.5 %	2.5 %	Int Design Temp Winter	Summer	Heating Degree Days	Design Moisture	Daily Temp Range
	OH, AKRON_AKRON-CA	OH_AKRON_AKRON-CA	5	1	86	75	70	6258.5	29	Medium
FLOORS										
✓	#	Floor Type	Perimeter	Perimeter R-Value	Area	Joist R-Value	Tile	Wood	Carpet	
	1	Basement Finished			978 ft²		1	0	0	
	2	Raised Floor			59 ft²	30	0	0	1	
ROOF										
✓	#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch
	1	Gable or shed	Composition shingles	1246 ft²	346 ft²	Medium	0.85	No	0	33.7 deg
ATTIC										
✓	#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC			
	1	Full attic	Vented	300	1037 ft²	N	N			

## IECC-2006 Section 404 Compliance

CEILING													
✓	#	Ceiling Type			R-Value	Area	Framing Frac	Truss Type					
✓	1	Under Attic (Vented)			38	1037 ft <sup>2</sup>	0.11	Wood					
WALLS													
✓	#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Area	Sheathing R-Value	Framing Fraction	Solar Absor.				
✓	1	W	Exterior	Frame - Wood	19	54 ft <sup>2</sup>	0	0.23	0.5				
✓	2	N	Exterior	Frame - Wood	19	63 ft <sup>2</sup>	0	0.23	0.5				
✓	3	W	Exterior	Frame - Wood	19	144 ft <sup>2</sup>	0	0.23	0.5				
✓	4	S	Exterior	Frame - Wood	19	432 ft <sup>2</sup>	0	0.23	0.5				
✓	5	E	Exterior	Frame - Wood	19	144 ft <sup>2</sup>	0	0.23	0.5				
✓	6	N	Exterior	Frame - Wood	19	54 ft <sup>2</sup>	0	0.23	0.5				
✓	7	E	Exterior	Frame - Wood	19	54 ft <sup>2</sup>	0	0.23	0.5				
✓	8	N	Exterior	Frame - Wood	19	315 ft <sup>2</sup>	0	0.23	0.5				
✓	9	W	Exterior	Frame - Wood	19	88 ft <sup>2</sup>	0	0.23	0.5				
✓	10	N	Exterior	Frame - Wood	19	12 ft <sup>2</sup>	0	0.23	0.5				
✓	11	W	Exterior	Frame - Wood	19	88 ft <sup>2</sup>	0	0.23	0.5				
✓	12	S	Exterior	Frame - Wood	19	344 ft <sup>2</sup>	0	0.23	0.5				
✓	13	E	Exterior	Frame - Wood	19	176 ft <sup>2</sup>	0	0.23	0.5				
✓	14	N	Exterior	Frame - Wood	19	332 ft <sup>2</sup>	0	0.23	0.5				
DOORS													
✓	#	Wall ID	Door Type		Storms	U-Value	Area						
✓	1	W	Insulated		None	0.4	20 ft <sup>2</sup>						
✓	2	N	Insulated		None	0.4	20 ft <sup>2</sup>						
✓	3	E	Insulated		None	0.4	20 ft <sup>2</sup>						
WINDOWS													
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.													
✓	#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening
✓	1	W	Wood	Low-E Double	Yes	0.3	0.31	N	4 ft <sup>2</sup>	7 ft 4 in	1 ft 0 in	None	None
✓	2	W	Wood	Low-E Double	Yes	0.3	0.31	N	6.67 ft <sup>2</sup>	7 ft 3 in	1 ft 0 in	None	None
✓	3	W	Wood	Low-E Double	Yes	0.3	0.31	N	34.5 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	4	S	Wood	Low-E Double	Yes	0.3	0.31	N	21.78 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	5	E	Wood	Low-E Double	Yes	0.3	0.31	N	34.5 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	6	N	Wood	Low-E Double	Yes	0.3	0.31	N	3 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	7	N	Wood	Low-E Double	Yes	0.3	0.31	N	16.33 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	8	W	Wood	Low-E Double	Yes	0.3	0.31	N	15 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None

# IECC-2006 Section 404 Compliance

<b>WINDOWS</b>													
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.													
✓	#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening
										Depth	Separation		
✓	9	W	Wood	Low-E Double	Yes	0.3	0.31	N	30 ft²	0 ft 0 in	0 ft 0 in	None	None
	10	S	Wood	Low-E Double	Yes	0.3	0.31	N	10.89 ft²	0 ft 0 in	0 ft 0 in	None	None
	11	E	Vinyl	Low-E Double	Yes	0.3	0.31	N	30 ft²	0 ft 0 in	0 ft 0 in	None	None
	12	E	Vinyl	Low-E Double	Yes	0.3	0.31	N	20 ft²	0 ft 0 in	0 ft 0 in	None	None
	13	N	Vinyl	Low-E Double	Yes	0.3	0.31	N	16.33 ft²	0 ft 0 in	0 ft 0 in	None	None

<b>INFILTRATION &amp; VENTING</b>										
✓	Method	SLA	CFM 50	ACH 50	ELA	EqLA	---- Forced Ventilation ----		Run Time	Fan
							Supply CFM	Exhaust CFM	Fraction	Watts
	Default	0.00050	3785	9.45	207.8	390.8	0 cfm	0 cfm	0	20

<b>COOLING SYSTEM</b>								
✓	#	System Type	Subtype	Efficiency	Capacity	Air Flow	SHR	Ductless
	1	Central Unit	None	SEER: 13	30 kBtu/hr	900 cfm	0.75	False

<b>HEATING SYSTEM</b>						
✓	#	System Type	Subtype	Efficiency	Capacity	Ductless
	1	Natural Gas Furnace	None	AFUE: 0.92	66 kBtu/hr	False

<b>HOT WATER SYSTEM</b>							
✓	#	System Type	EF	Cap	Use	SetPnt	Credits
	1	Natural Gas	0.59	50 gal	52.7 gal	120 deg	None

<b>DUCTS</b>												
✓	#	---- Supply ----			---- Return ----			Air	CFM 25	Percent	QN	RLF
		Location	R-Value	Area	Location	Area	Leakage Type	Handler		Leakage		
	1	Interior	1	577 ft²	Interior	231 ft²	Prop. Air Leakage	Interior	158.40 cf	12.00 %	0.08	0.60

<b>UTILITY RATES</b>				
Fuel	Unit	Utility Name	Monthly Fixed Cost	\$/Unit
Electricity	kWh	akron fixed	0	0.08
Natural Gas	Therm	akron fixed	0	1.02
Fuel Oil	Gallon	Ohio Default	0	1.1
Propane	Gallon	Ohio Default	0	1.4



# Annual Energy Summary

HUD Green

Title: Ohio Type D - 30%  
User

TMY City: OH\_AKRON\_AKRON

Elec Util: akron fixed

Gas Util: akron fixed

Akron, Oh, -  
Registration #:

Run Date: 08/05/2010 11:34:46

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (30 kBtu/hr)	389 kWh	\$31
Cooling Fan	80 kWh	\$6
Mechanical Vent Fan	36 kWh	\$ 3
<b>Total Cooling</b>	<b>505 kWh</b>	<b>\$40</b>
Heating (66 kBtu/hr)	489 Therms	\$499
Heating Fan/Pump	432 kWh	\$35
Mechanical Vent Fan	113 kWh	\$ 9
<b>Total Heating</b>		<b>\$543</b>
Hot Water	112 Therms	\$114
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>		<b>\$114</b>
Ceiling Fans	0 kWh	\$0
Clothes Washer	295 kWh	\$24
Dishwasher	159 kWh	\$13
Dryer	974 kWh	\$78
Lighting	2345 kWh	\$188
Miscellaneous	3763 kWh	\$301
Pool Pump	0 kWh	\$0
Range	909 kWh	\$73
Refrigerator	422 kWh	\$34
<hr/>		
Total (kWh)	9917 kWh	\$795
Total (Therms)	601 Therms	\$613
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		\$1408

## Emissions (Calculated as Total - PV Produced)

SO2	149.61 Lbs.
NOX	42.41 Lbs.
CO2	12.32 Tons

# IECC-2006 Section 404 Compliance

PROJECT										
Title:	Ohio Type D - 30%	Bedrooms:	4	Address Type:	Street Address					
Building Type:	User	Bathrooms:	2.5	Lot #						
Owner:	HUD Green	Conditioned Area:	1908	SubDivision:						
# of Units:	1	Total Stories:	2	PlatBook:						
Builder Name:		Worst Case:	No	Street:						
Permit Office:		Rotate Angle:	0	County:						
Jurisdiction:		Cross Ventilation:		City, State, Zip:	Akron ,					
Family Type:	Single-family	Whole House Fan:			Oh ,					
New/Existing:	New (From Plans)									
Comment:										
Estimated Annual Energy Cost for Code Compliance										
		<b>IECC Std. Design</b>		<b>Proposed Home</b>		<b>e-Ratio</b>				
	Cooling:	\$ 81		\$ 37		0.46				
	Heating:	\$ 728		\$ 526		0.72				
	Hot Water:	\$ 225		\$ 152		0.68				
	<b>Total:</b>	<b>\$ 1034</b>		<b>\$ 715</b>		<b>0.69</b>				
<h2 style="margin: 0;">PASS</h2>										
CLIMATE										
✓	Design Location	Tmy Site	Climate Zone	Design Temp 97.5 %	2.5 %	Int Design Temp Winter	Summer	Heating Degree Days	Design Moisture	Daily Temp Range
	OH, AKRON_AKRON-CA	OH_AKRON_AKRON-CA	5	1	86	75	70	6258.5	29	Medium
FLOORS										
✓	#	Floor Type	Perimeter	Perimeter R-Value	Area	Joist R-Value	Tile	Wood	Carpet	
	1	Basement Finished			978 ft²		1	0	0	
	2	Raised Floor			59 ft²	30	0	0	1	
ROOF										
✓	#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch
	1	Gable or shed	Composition shingles	1246 ft²	346 ft²	Medium	0.85	No	0	33.7 deg
ATTIC										
✓	#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC			
	1	Full attic	Vented	300	1037 ft²	N	N			

# IECC-2006 Section 404 Compliance

CEILING										
✓	#	Ceiling Type	R-Value	Area	Framing Frac	Truss Type				
✓	1	Under Attic (Vented)	49	1037 ft <sup>2</sup>	0.11	Wood				

WALLS										
✓	#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Area	Sheathing R-Value	Framing Fraction	Solar Absor.	
✓	1	W	Exterior	Frame - Wood	19	54 ft <sup>2</sup>	0	0.16	0.5	
✓	2	N	Exterior	Frame - Wood	19	63 ft <sup>2</sup>	0	0.16	0.5	
✓	3	W	Exterior	Frame - Wood	19	144 ft <sup>2</sup>	0	0.16	0.5	
✓	4	S	Exterior	Frame - Wood	19	432 ft <sup>2</sup>	0	0.16	0.5	
✓	5	E	Exterior	Frame - Wood	19	144 ft <sup>2</sup>	0	0.16	0.5	
✓	6	N	Exterior	Frame - Wood	19	54 ft <sup>2</sup>	0	0.16	0.5	
✓	7	E	Exterior	Frame - Wood	19	54 ft <sup>2</sup>	0	0.16	0.5	
✓	8	N	Exterior	Frame - Wood	19	315 ft <sup>2</sup>	0	0.16	0.5	
✓	9	W	Exterior	Frame - Wood	19	88 ft <sup>2</sup>	0	0.16	0.5	
✓	10	N	Exterior	Frame - Wood	19	12 ft <sup>2</sup>	0	0.16	0.5	
✓	11	W	Exterior	Frame - Wood	19	88 ft <sup>2</sup>	0	0.16	0.5	
✓	12	S	Exterior	Frame - Wood	19	344 ft <sup>2</sup>	0	0.16	0.5	
✓	13	E	Exterior	Frame - Wood	19	176 ft <sup>2</sup>	0	0.16	0.5	
✓	14	N	Exterior	Frame - Wood	19	332 ft <sup>2</sup>	0	0.16	0.5	

DOORS						
✓	#	Wall ID	Door Type	Storms	U-Value	Area
✓	1	W	Insulated	None	0.4	20 ft <sup>2</sup>
✓	2	N	Insulated	None	0.4	20 ft <sup>2</sup>
✓	3	E	Insulated	None	0.4	20 ft <sup>2</sup>

WINDOWS													
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.													
✓	#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening
										Depth	Separation		
✓	1	W	Wood	Low-E Double	Yes	0.3	0.31	N	4 ft <sup>2</sup>	7 ft 4 in	1 ft 0 in	None	None
✓	2	W	Wood	Low-E Double	Yes	0.3	0.31	N	6.67 ft <sup>2</sup>	7 ft 3 in	1 ft 0 in	None	None
✓	3	W	Wood	Low-E Double	Yes	0.3	0.31	N	34.5 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	4	S	Wood	Low-E Double	Yes	0.3	0.31	N	21.78 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	5	E	Wood	Low-E Double	Yes	0.3	0.31	N	34.5 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	6	N	Wood	Low-E Double	Yes	0.3	0.31	N	3 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	7	N	Wood	Low-E Double	Yes	0.3	0.31	N	16.33 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	8	W	Wood	Low-E Double	Yes	0.3	0.31	N	15 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None

# IECC-2006 Section 404 Compliance

<b>WINDOWS</b>													
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.													
✓	#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening
										Depth	Separation		
✓	9	W	Wood	Low-E Double	Yes	0.3	0.31	N	30 ft²	0 ft 0 in	0 ft 0 in	None	None
	10	S	Wood	Low-E Double	Yes	0.3	0.31	N	10.89 ft²	0 ft 0 in	0 ft 0 in	None	None
	11	E	Vinyl	Low-E Double	Yes	0.3	0.31	N	30 ft²	0 ft 0 in	0 ft 0 in	None	None
	12	E	Vinyl	Low-E Double	Yes	0.3	0.31	N	20 ft²	0 ft 0 in	0 ft 0 in	None	None
	13	N	Vinyl	Low-E Double	Yes	0.3	0.31	N	16.33 ft²	0 ft 0 in	0 ft 0 in	None	None

<b>INFILTRATION &amp; VENTING</b>										
✓	Method	SLA	CFM 50	ACH 50	ELA	EqLA	---- Forced Ventilation ----		Run Time	Fan
							Supply CFM	Exhaust CFM	Fraction	Watts
	Proposed SLA	0.00024	1817	4.53	99.7	187.6	0 cfm	67 cfm	100	20

<b>COOLING SYSTEM</b>								
✓	#	System Type	Subtype	Efficiency	Capacity	Air Flow	SHR	Ductless
	1	Central Unit	None	SEER: 13	30 kBtu/hr	900 cfm	0.75	False

<b>HEATING SYSTEM</b>							
✓	#	System Type	Subtype	Efficiency	Capacity	Ductless	
	1	Natural Gas Furnace	None	AFUE: 0.92	66 kBtu/hr	False	

<b>HOT WATER SYSTEM</b>							
✓	#	System Type	EF	Cap	Use	SetPnt	Credits
	1	Natural Gas	0.92	1 gal	52.7 gal	120 deg	None

<b>DUCTS</b>												
✓	#	---- Supply ----			---- Return ----		Leakage Type	Air Handler	CFM 25	Percent Leakage	QN	RLF
		Location	R-Value	Area	Location	Area						
	1	Interior	1	577 ft²	Interior	231 ft²	Prop. Air Leakage	Interior	79.20 cfm	6.00 %	0.04	0.60

<b>UTILITY RATES</b>				
Fuel	Unit	Utility Name	Monthly Fixed Cost	\$/Unit
Electricity	kWh	akron fixed	0	0.08
Natural Gas	Therm	akron fixed	0	1.02
Fuel Oil	Gallon	Ohio Default	0	1.1
Propane	Gallon	Ohio Default	0	1.4

# Annual Energy Summary

HUD Green

Title: Ohio Type D - 50%  
User

TMY City: OH\_AKRON

Akron, Oh, -  
Registration #:

Elec Util: akron fixed  
Gas Util: akron fixed  
Run Date: 08/05/2010 11:36:23

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (30 kBtu/hr)	376 kWh	\$30
Cooling Fan	78 kWh	\$6
Mechanical Vent Fan	37 kWh	\$ 3
<b>Total Cooling</b>	<b>491 kWh</b>	<b>\$39</b>
Heating (42 kBtu/hr)	378 Therms	\$386
Heating Fan/Pump	339 kWh	\$27
Mechanical Vent Fan	113 kWh	\$ 9
<b>Total Heating</b>		<b>\$422</b>
Hot Water	38 Therms	\$39
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>		<b>\$39</b>
Ceiling Fans	0 kWh	\$0
Clothes Washer	295 kWh	\$24
Dishwasher	159 kWh	\$13
Dryer	974 kWh	\$78
Lighting	2345 kWh	\$188
Miscellaneous	3763 kWh	\$301
Pool Pump	0 kWh	\$0
Range	909 kWh	\$73
Refrigerator	422 kWh	\$34
<hr/>		
Total (kWh)	9810 kWh	\$786
Total (Therms)	415 Therms	\$425
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
<b>Total Cost</b>		<b>\$1211</b>

## Emissions (Calculated as Total - PV Produced)

SO2	147.99 Lbs.
NOX	40.09 Lbs.
CO2	11.15 Tons

# IECC-2006 Section 404 Compliance

PROJECT										
Title:	Ohio Type D - 50%	Bedrooms:	4	Address Type:	Street Address					
Building Type:	User	Bathrooms:	2.5	Lot #						
Owner:	HUD Green	Conditioned Area:	1908	SubDivision:						
# of Units:	1	Total Stories:	2	PlatBook:						
Builder Name:		Worst Case:	No	Street:						
Permit Office:		Rotate Angle:	0	County:						
Jurisdiction:		Cross Ventilation:		City, State, Zip:	Akron ,					
Family Type:	Single-family	Whole House Fan:			Oh ,					
New/Existing:	New (From Plans)									
Comment:										
Estimated Annual Energy Cost for Code Compliance										
		<b>IECC Std. Design</b>		<b>Proposed Home</b>		<b>e-Ratio</b>				
	Cooling:	\$ 78		\$ 36		0.46				
	Heating:	\$ 699		\$ 406		0.58				
	Hot Water:	\$ 225		\$ 59		0.26				
	<b>Total:</b>	<b>\$ 1002</b>		<b>\$ 501</b>		<b>0.50</b>				
<h2 style="margin: 0;">PASS</h2>										
CLIMATE										
✓	Design Location	Tmy Site	Climate Zone	Design Temp 97.5 %	Design Temp 2.5 %	Int Design Temp Winter	Int Design Temp Summer	Heating Degree Days	Design Moisture	Daily Temp Range
_____	OH, Akron-Canton	OH_AKRON	5	6	86	75	70	6224	26	Medium
FLOORS										
✓	#	Floor Type	Perimeter	Perimeter R-Value	Area	Joist R-Value	Tile	Wood	Carpet	
_____	1	Basement Finished			978 ft <sup>2</sup>		1	0	0	
_____	2	Raised Floor			59 ft <sup>2</sup>	30	0	0	1	
ROOF										
✓	#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch
_____	1	Gable or shed	Composition shingles	1246 ft <sup>2</sup>	346 ft <sup>2</sup>	Medium	0.85	No	0	33.7 deg
ATTIC										
✓	#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC			
_____	1	Full attic	Vented	300	1037 ft <sup>2</sup>	N	N			

# IECC-2006 Section 404 Compliance

CEILING													
✓	#	Ceiling Type		R-Value	Area	Framing Frac	Truss Type						
✓	1	Under Attic (Vented)		60	1037 ft <sup>2</sup>	0.11	Wood						
WALLS													
✓	#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Area	Sheathing R-Value	Framing Fraction	Solar Absor.				
✓	1	W	Exterior	Frame - Wood	19	54 ft <sup>2</sup>	5	0.16	0.5				
✓	2	N	Exterior	Frame - Wood	19	63 ft <sup>2</sup>	5	0.16	0.5				
✓	3	W	Exterior	Frame - Wood	19	144 ft <sup>2</sup>	5	0.16	0.5				
✓	4	S	Exterior	Frame - Wood	19	432 ft <sup>2</sup>	5	0.16	0.5				
✓	5	E	Exterior	Frame - Wood	19	144 ft <sup>2</sup>	5	0.16	0.5				
✓	6	N	Exterior	Frame - Wood	19	54 ft <sup>2</sup>	5	0.16	0.5				
✓	7	E	Exterior	Frame - Wood	19	54 ft <sup>2</sup>	5	0.16	0.5				
✓	8	N	Exterior	Frame - Wood	19	315 ft <sup>2</sup>	5	0.16	0.5				
✓	9	W	Exterior	Frame - Wood	19	88 ft <sup>2</sup>	5	0.16	0.5				
✓	10	N	Exterior	Frame - Wood	19	12 ft <sup>2</sup>	5	0.16	0.5				
✓	11	W	Exterior	Frame - Wood	19	88 ft <sup>2</sup>	5	0.16	0.5				
✓	12	S	Exterior	Frame - Wood	19	344 ft <sup>2</sup>	5	0.16	0.5				
✓	13	E	Exterior	Frame - Wood	19	176 ft <sup>2</sup>	5	0.16	0.5				
✓	14	N	Exterior	Frame - Wood	19	332 ft <sup>2</sup>	0	0.16	0.5				
DOORS													
✓	#	Wall ID	Door Type		Storms	U-Value	Area						
✓	1	W	Insulated		None	0.4	20 ft <sup>2</sup>						
✓	2	N	Insulated		None	0.4	20 ft <sup>2</sup>						
✓	3	E	Insulated		None	0.4	20 ft <sup>2</sup>						
WINDOWS													
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.													
✓	#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening
✓	1	W	Wood	Low-E Double	Yes	0.3	0.31	N	4 ft <sup>2</sup>	7 ft 4 in	1 ft 0 in	None	None
✓	2	W	Wood	Low-E Double	Yes	0.3	0.31	N	6.67 ft <sup>2</sup>	7 ft 3 in	1 ft 0 in	None	None
✓	3	W	Wood	Low-E Double	Yes	0.3	0.31	N	34.5 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	4	S	Wood	Low-E Double	Yes	0.3	0.31	N	21.78 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	5	E	Wood	Low-E Double	Yes	0.3	0.31	N	34.5 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	6	N	Wood	Low-E Double	Yes	0.3	0.31	N	3 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	7	N	Wood	Low-E Double	Yes	0.3	0.31	N	16.33 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
✓	8	W	Wood	Low-E Double	Yes	0.3	0.31	N	15 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None

## IECC-2006 Section 404 Compliance

<b>WINDOWS</b>													
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.													
✓	#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening
										Depth	Separation		
✓	9	W	Wood	Low-E Double	Yes	0.3	0.31	N	30 ft²	0 ft 0 in	0 ft 0 in	None	None
	10	S	Wood	Low-E Double	Yes	0.3	0.31	N	10.89 ft²	0 ft 0 in	0 ft 0 in	None	None
	11	E	Vinyl	Low-E Double	Yes	0.3	0.31	N	30 ft²	0 ft 0 in	0 ft 0 in	None	None
	12	E	Vinyl	Low-E Double	Yes	0.3	0.31	N	20 ft²	0 ft 0 in	0 ft 0 in	None	None
	13	N	Vinyl	Low-E Double	Yes	0.3	0.31	N	16.33 ft²	0 ft 0 in	0 ft 0 in	None	None

<b>INFILTRATION &amp; VENTING</b>										
✓	Method	SLA	CFM 50	ACH 50	ELA	EqLA	---- Forced Ventilation ----		Run Time	Fan
							Supply CFM	Exhaust CFM	Fraction	Watts
	Proposed SLA	0.00014	1060	2.64	58.2	109.4	0 cfm	67 cfm	100	20

<b>COOLING SYSTEM</b>								
✓	#	System Type	Subtype	Efficiency	Capacity	Air Flow	SHR	Ductless
	1	Central Unit	None	SEER: 13	30 kBtu/hr	900 cfm	0.75	False

<b>HEATING SYSTEM</b>						
✓	#	System Type	Subtype	Efficiency	Capacity	Ductless
	1	Natural Gas Furnace	None	AFUE: 0.92	42 kBtu/hr	False

<b>HOT WATER SYSTEM</b>							
✓	#	System Type	EF	Cap	Use	SetPnt	Credits
	1	Natural Gas	0.92	1 gal	52.7 gal	120 deg	Solar System

<b>DUCTS</b>												
✓	#	---- Supply ----			---- Return ----			Air	CFM 25	Percent	QN	RLF
		Location	R-Value	Area	Location	Area	Leakage Type	Handler		Leakage		
	1	Interior	1	577 ft²	Interior	231 ft²	Prop. Air Leakage	Interior	54.00 cfm	6.00 %	0.03	0.60

<b>UTILITY RATES</b>				
Fuel	Unit	Utility Name	Monthly Fixed Cost	\$/Unit
Electricity	kWh	akron fixed	0	0.08
Natural Gas	Therm	akron fixed	0	1.02
Fuel Oil	Gallon	Ohio Default	0	1.1
Propane	Gallon	Ohio Default	0	1.4



# Annual Energy Summary

HUD Green

Title: Ohio Type D - 60%  
User

TMY City: OH\_AKRON

Elec Util: akron fixed

Gas Util: akron fixed

Akron, Oh, -

Registration #:

Run Date: 08/05/2010 11:38:05

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (15.7 kBtu/hr)	235 kWh	\$19
Cooling Fan	51 kWh	\$4
Mechanical Vent Fan	0 kWh	\$0
<b>Total Cooling</b>	<b>286 kWh</b>	<b>\$23</b>
Heating (42 kBtu/hr)	200 Therms	\$204
Heating Fan/Pump	182 kWh	\$15
Mechanical Vent Fan	0 kWh	\$0
<b>Total Heating</b>		<b>\$219</b>
Hot Water	38 Therms	\$39
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>		<b>\$39</b>
Ceiling Fans	0 kWh	\$0
Clothes Washer	295 kWh	\$24
Dishwasher	159 kWh	\$13
Dryer	974 kWh	\$78
Lighting	2345 kWh	\$188
Miscellaneous	3763 kWh	\$301
Pool Pump	0 kWh	\$0
Range	909 kWh	\$73
Refrigerator	422 kWh	\$34
<hr/>		
Total (kWh)	9335 kWh	\$749
Total (Therms)	237 Therms	\$243
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		\$992

## Emissions (Calculated as Total - PV Produced)

SO2	140.83 Lbs.
NOX	36.72 Lbs.
CO2	9.69 Tons

# IECC-2006 Section 404 Compliance

## PROJECT

Title: Ohio Type D - 60%	Bedrooms: 4	Address Type: Street Address
Building Type: User	Bathrooms: 2.5	Lot #
Owner: HUD Green	Conditioned Area: 1908	SubDivision:
# of Units: 1	Total Stories: 2	PlatBook:
Builder Name: Tegrity Homes	Worst Case: No	Street:
Permit Office:	Rotate Angle: 0	County:
Jurisdiction:	Cross Ventilation:	City, State, Zip: Akron ,
Family Type: Single-family	Whole House Fan:	Oh , -
New/Existing: New (From Plans)		
Comment:		

### Estimated Annual Energy Cost for Code Compliance

	IECC Std. Design	Proposed Home	e-Ratio
Cooling:	\$ 72	\$ 21	0.29
Heating:	\$ 687	\$ 324	0.47
Hot Water:	\$ 225	\$ 59	0.26
<b>Total:</b>	<b>\$ 984</b>	<b>\$ 404</b>	<b>0.41</b>

# PASS

## CLIMATE

	Design Location	Tmy Site	Climate Zone	Design Temp 97.5 %	Design Temp 2.5 %	Int Design Temp Winter	Int Design Temp Summer	Heating Degree Days	Design Moisture	Daily Temp Range
✓	OH, Akron-Canton	OH_AKRON	5	6	86	75	70	6224	26	Medium

## FLOORS

	#	Floor Type	Perimeter	Perimeter R-Value	Area	Joist R-Value	Tile	Wood	Carpet
✓		1 Basement Finished			978 ft <sup>2</sup>		1	0	0
		2 Raised Floor			59 ft <sup>2</sup>	30	0	0	1

## ROOF

	#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch
✓		1 Gable or shed	Composition shingles	1246 ft <sup>2</sup>	346 ft <sup>2</sup>	Medium	0.85	No	0	33.7 deg

## ATTIC

	#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC
✓		1 Full attic	Vented	300	1037 ft <sup>2</sup>	N	N

## IECC-2006 Section 404 Compliance

CEILING													
✓	#	Ceiling Type			R-Value	Area	Framing Frac	Truss Type					
✓	1	Under Attic (Vented)			60	1037 ft²	0.07	Wood					
WALLS													
✓	#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Area	Sheathing R-Value	Framing Fraction	Solar Absor.				
✓	1	W	Exterior	Frame - Wood	19	54 ft²	10	0.2	0.5				
✓	2	N	Exterior	Frame - Wood	19	63 ft²	10	0.2	0.5				
✓	3	W	Exterior	Frame - Wood	19	144 ft²	10	0.2	0.5				
✓	4	S	Exterior	Frame - Wood	19	432 ft²	10	0.2	0.5				
✓	5	E	Exterior	Frame - Wood	19	144 ft²	10	0.2	0.5				
✓	6	N	Exterior	Frame - Wood	19	54 ft²	10	0.2	0.5				
✓	7	E	Exterior	Frame - Wood	19	54 ft²	10	0.2	0.5				
✓	8	N	Exterior	Frame - Wood	19	315 ft²	10	0.2	0.5				
✓	9	W	Exterior	Frame - Wood	19	88 ft²	10	0.2	0.5				
✓	10	N	Exterior	Frame - Wood	19	12 ft²	10	0.2	0.5				
✓	11	W	Exterior	Frame - Wood	19	88 ft²	10	0.2	0.5				
✓	12	S	Exterior	Frame - Wood	19	344 ft²	10	0.2	0.5				
✓	13	E	Exterior	Frame - Wood	19	176 ft²	10	0.2	0.5				
✓	14	N	Exterior	Frame - Wood	19	332 ft²	10	0.2	0.5				
DOORS													
✓	#	Wall ID	Door Type				Storms	U-Value	Area				
✓	1	W	Insulated				None	0.18	20 ft²				
✓	2	N	Insulated				None	0.18	20 ft²				
✓	3	E	Insulated				None	0.18	20 ft²				
WINDOWS													
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.													
✓	#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening
✓	1	W	Wood	Low-E Triple	Yes	0.23	0.35	N	4 ft²	7 ft 4 in	1 ft 0 in	None	None
✓	2	W	Wood	Low-E Triple	Yes	0.23	0.35	N	6.67 ft²	7 ft 3 in	1 ft 0 in	None	None
✓	3	W	Wood	Low-E Triple	Yes	0.23	0.35	N	34.5 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	4	S	Wood	Low-E Triple	Yes	0.23	0.35	N	21.78 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	5	E	Wood	Low-E Triple	Yes	0.23	0.35	N	34.5 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	6	N	Wood	Low-E Triple	Yes	0.23	0.35	N	3 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	7	N	Wood	Low-E Triple	Yes	0.23	0.35	N	16.33 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	8	W	Wood	Low-E Triple	Yes	0.23	0.35	N	15 ft²	0 ft 0 in	0 ft 0 in	None	None

# IECC-2006 Section 404 Compliance

<b>WINDOWS</b>													
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.													
✓	#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening
										Depth	Separation		
✓	9	W	Wood	Low-E Triple	Yes	0.23	0.35	N	30 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	10	S	Wood	Low-E Triple	Yes	0.23	0.35	N	10.89 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	11	E	Vinyl	Low-E Triple	Yes	0.23	0.35	N	30 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	12	E	Vinyl	Low-E Triple	Yes	0.23	0.35	N	20 ft²	0 ft 0 in	0 ft 0 in	None	None
✓	13	N	Vinyl	Low-E Triple	Yes	0.23	0.35	N	16.33 ft²	0 ft 0 in	0 ft 0 in	None	None

<b>INFILTRATION &amp; VENTING</b>										
✓	Method	SLA	CFM 50	ACH 50	ELA	EqLA	---- Forced Ventilation ----		Run Time	Fan
							Supply CFM	Exhaust CFM	Fraction	Watts
✓	Proposed SLA	0.00010	757	1.89	41.6	78.2	0 cfm	67 cfm	0	30

<b>COOLING SYSTEM</b>								
✓	#	System Type	Subtype	Efficiency	Capacity	Air Flow	SHR	Ductless
✓	1	Central Unit	None	SEER: 13	15.7 kBtu/hr	480 cfm	0.75	False

<b>HEATING SYSTEM</b>							
✓	#	System Type	Subtype	Efficiency	Capacity	Ductless	
✓	1	Natural Gas Furnace	None	AFUE: 0.96	42 kBtu/hr	False	

<b>HOT WATER SYSTEM</b>							
✓	#	System Type	EF	Cap	Use	SetPnt	Credits
✓	1	Natural Gas	0.92	1 gal	52.7 gal	120 deg	Solar System

<b>DUCTS</b>												
✓	#	---- Supply ----			---- Return ----		Leakage Type	Air Handler	CFM 25	Percent Leakage	QN	RLF
		Location	R-Value	Area	Location	Area						
✓	1	Interior	1	577 ft²	Interior	231 ft²	Prop. Air Leakage	Interior	50.40 cfm	6.00 %	0.03	0.60

<b>UTILITY RATES</b>				
Fuel	Unit	Utility Name	Monthly Fixed Cost	\$/Unit
Electricity	kWh	akron fixed	0	0.08
Natural Gas	Therm	akron fixed	0	1.02
Fuel Oil	Gallon	Ohio Default	0	1.1
Propane	Gallon	Ohio Default	0	1.4





# APPENDIX C ENERGY MODELS

C. Cuyahoga, Ohio

Summary Data for HUD green - Valley View Apts.  
 One Bedroom Apt. - B1 3rd floor, west elevation  
 Climate Zone 5: Cleveland, Ohio

Software Output Subtitle	IECCStd2006	IECCStd2006	Proposed	15% - Elect	30% - Gas	50% - Gas				
e-ratio as-built			0.96		0.84		0.71		0.49	
Cardinal Orientation			West Front-3		West Front-3		West Front-3		West Front-3	
	<b>2006 IECC with Natural Gas</b>	<b>2006 IECC</b>	<b>2006 IECC B1 3rd electric</b>	<b>%Better than 2006 IECC</b>	<b>As built 1 BR end 3rd floor</b>	<b>%Better than 2006 IECC</b>	<b>B1-3rd Natural Gas</b>	<b>%Better than 2006 IECC</b>	<b>B1-3rd Natural Gas</b>	<b>%Better than 2006 IECC</b>
<b>One Bedroom Apt. - B1 3rd floor, west el</b>										
Finished Floor Area, sq. feet	658	658	658		658		658		658	
Total Stories	1	1	1		1		1		1	
Foundation Type	Slab	Slab	frame/neighbor		fr/neigh		fr/neigh		fr/neigh	
Bedrooms	1	1	1		1		1		1	
Baths	1	1	1		1		1		1	
Flat Ceiling R-value	38	38	38/raised		<b>60/raised</b>		60/raised		<b>75/raised</b>	
Wall Construction	2x6-16	2x6-16	2x6-16*oc		2x6-16*oc		2x6-16*oc		2x6-16*oc	
Wall R-value (cavity/cont. sheathing) <sup>A</sup>	19	19	19		19		<b>19/5</b>		<b>19/0</b>	
Floor R-value	10	10	Cond. Unit		Cond. Unit		Cond. Unit		Cond. Unit	
Wall Area, Above Grade, Adj. Cond.	562	562	633		633		633		633	
Wall Area, Above Grade, ambient	320	320	362		362		362		362	
Window U-value	0.35	0.35	0.35		<b>0.30</b>		0.30		0.30	
Window SHGC	0.40	0.40	0.35		0.35		<b>0.30</b>		<b>0.35</b>	
Window Area	70	70	70		70		70		70	
Window Area, % of Floor, CFA*	10.65%	10.65%	10.65%		10.65%		10.65%		10.65%	
Infiltration, Specific Leakage Area, SLA	0.00036	0.00036	0.00036		<b>0.00035</b>		0.00035		<b>0.00015</b>	
Ventilation Rate, cfm**			<b>24</b>		24		24		12	
Cooling System SEER	13	13	13		13		<b>14</b>		14	
Cooling Capacity, kBtu/hr	9	11	18		18				12	
Heating System, hspf	0.78	78%	7.7		<b>8.2</b>		<b>94% gas</b>		<b>95% boiler</b>	
Heating Capacity, kBtu/hr	11	14	19		18					
Duct Loss %, or DSE	20.00%	20.00%	20.00%		<b>6.00%</b>		6.00%		<b>3.00%</b>	
Duct Insulation	6	6	1		1		1		1	
Duct Location	Inside	Inside	Inside		Inside		Inside		Inside	
Air Handler Location	Inside	Inside	Inside		Inside		Inside		Inside	
Hot Water Use, gallons/day	35	35	35		35		35		35	
Water Heater Energy Factor	0.59	0.59	0.92		0.92		<b>70% gas</b>		<b>85% boiler</b>	
Tank size	40	40	40		40		40		<b>w/CLS 24sf</b>	
Cool Set Point	78	78	78		78		78		78	
Heat Set Point	68	68	68		68		68		68	
Programmable Thermostat	No	No	<b>Yes</b>		Yes		Yes		Yes	
Cooling setback degrees; setback hours	none	none	2/6		2/6		2/6		2/6	
Heating setback degrees; setback hours	none	none	2/7		2/7		2/7		2/7	
Percentage Fluorescent Fixtures or CFLs			14%		14%		14%		14%	
Solar PV										
Cooling Energy - cost	79	79	78	1.27%	72	8.86%	60	24.05%	62	21.52%
Heating Energy - cost	130	163	144	11.66%	84	48.47%	68	47.69%	54	58.46%
Hot Water Energy - cost	139	291	291	0.00%	290	0.34%	115	17.27%	51	63.31%
Solar PV										
Subtotal Heat Cool WH	348	533	513	3.75%	446	16.32%	243	30.17%	167	52.01%

Notes:

**Bold entries indicate upgraded features at each level.**

\*\* Ventilation rate specified by construction documents = 30 cfm (calculated requirement for ASHRAE 62.2 compliance = 24). Run time vent is assumed, so energy penalty is negligible; however, it has been set at 24 cfm. Ventilation cost defined for 2006 IECC reference; kWh 85.05 \$10.12

<sup>A</sup> Partywalls with neighbors and hallways modeled with R-11, per plan through 30%. Higher efficiencies require R-13. With runtime ventilation tightening building below 4ACH50 and ducts below 6% doesn't appear to impact energy savings.

http://tonto.eia.doe.gov/dnav/ng/ng\_pri\_sum\_dcu\_SOH\_a.t 9.16 10.46 13 14.39 13.47 14.51 12.4983

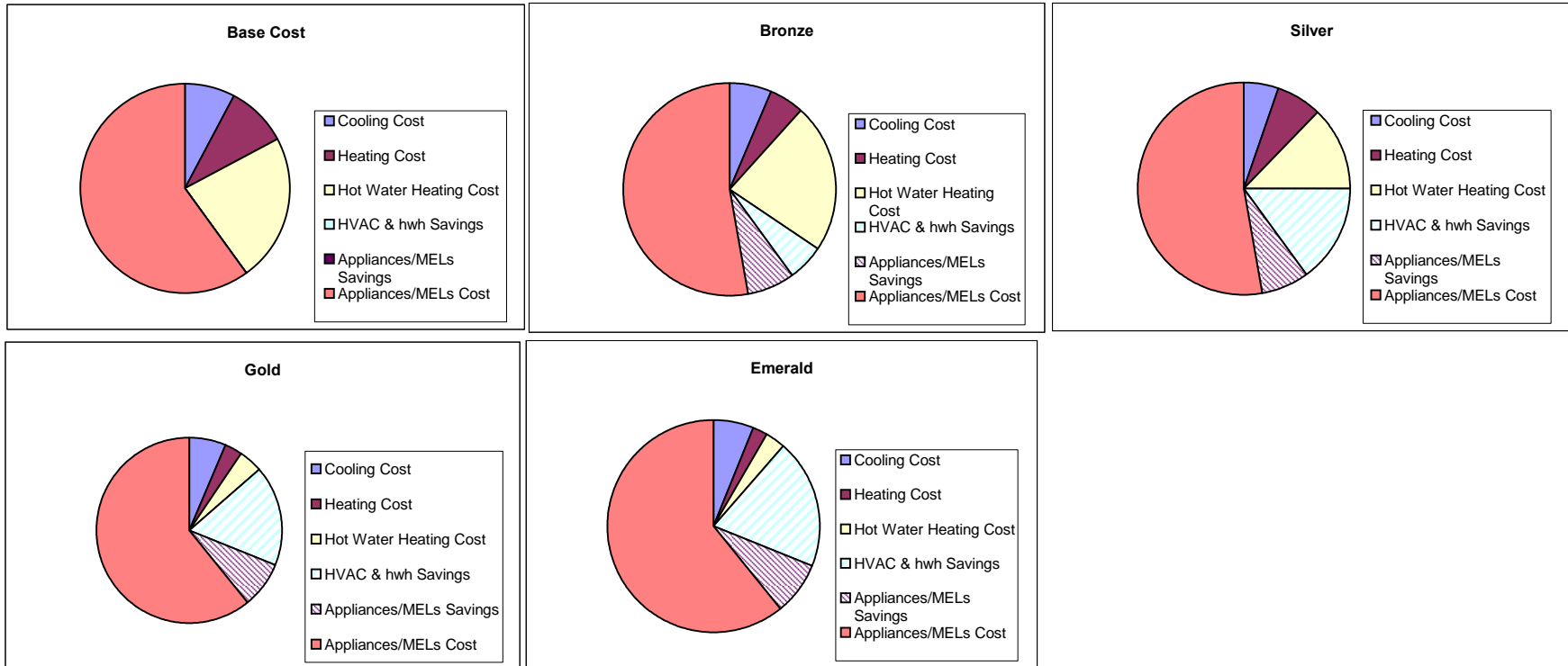
1 Cubic Foot = 1,028 Btu (based c

Cuyahoga, Ohio

Annual Energy Summary	Base		Bronze			Silver			Gold			Emerald		
	Electric Yr \$	Gas Yr \$	Yr \$	savings	percent	Yr \$	savings	percent	Yr \$	savings	percent	Yr \$	savings	percent
Cooling Cost	88	88	73	15	17%	59	29	33%	63	25	28%	60	28	32%
Heating Cost	105	83	58	47	45%	78	27	26%	29	54	65%	20	63	76%
Hot Water Heating Cost	257	132	257	0	0%	145	112	44%	42	90	68%	30	102	77%
HVAC & hwh Savings	N/A	N/A	62			168			169			193		
Appliances/MELs Savings	N/A	N/A	80			80			80			80		
Appliances/MELs Cost	673	673	593			593			593			593		
HVAC & HWH sub-total	450	303	388		14%	282		37%	134		56%	110		64%
Grand Total	1123	976	981		87%	875		78%	727		74%	703		72%

Data based on Energy Gauge - Annual Energy Summary. Not Compliance

This apartment was energy source changed from electric to gas. Compliance increase is based on same source





# Annual Energy Summary

Cuyahoga, Oh,  
Registration #:

Title: B1 3rd base  
User

TMY City: OH\_BURKE\_LAKEF  
Elec Util: OHIO Cleveland  
Gas Util: Ohio Average  
Run Date: 08/05/2010 11:40:24

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (8.5 kBtu/hr)	595 kWh	\$71
Cooling Fan	140 kWh	\$17
Mechanical Vent Fan	0 kWh	\$0
<b>Total Cooling</b>	<b>735 kWh</b>	<b>\$88</b>
Heating (12 kBtu/hr)	755 kWh	\$90
Heating Fan/Pump	129 kWh	\$15
Mechanical Vent Fan	0 kWh	\$0
<b>Total Heating</b>	<b>884 kWh</b>	<b>\$105</b>
Hot Water	2161 kWh	\$257
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>	<b>2161 kWh</b>	<b>\$257</b>
Ceiling Fans	0 kWh	\$0
Clothes Washer	43 kWh	\$5
Dishwasher	87 kWh	\$10
Dryer	662 kWh	\$79
Lighting	1335 kWh	\$159
Miscellaneous	2131 kWh	\$254
Pool Pump	0 kWh	\$0
Range	909 kWh	\$108
Refrigerator	484 kWh	\$58
<hr/>		
Total (kWh)	9431 kWh	\$1123
Total (Therms)	0 Therms	\$0
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		\$1123

## Emissions (Calculated as Total - PV Produced)

SO2	142.28 Lbs.
NOX	34.8 Lbs.
CO2	8.39 Tons

# IECC-2006 Section 404 Compliance

## PROJECT

Title: B1 3rd base	Bedrooms: 1	Adress Type: Street Address
Building Type: User	Bathrooms: 1	Lot #
Owner:	Conditioned Area: 658	SubDivision:
# of Units: 1	Total Stories: 1	PlatBook:
Builder Name: HUD	Worst Case: No	Street:
Permit Office:	Rotate Angle: 0	County:
Jurisdiction:	Cross Ventilation:	City, State, Zip: Cuyahoga ,
Family Type: Multi-family	Whole House Fan:	Oh ,
New/Existing: New (Confirmed)		
Comment:		

Estimated Annual Energy Cost for Code Compliance			
	<b>IECC Std. Design</b>	<b>Proposed Home</b>	<b>e-Ratio</b>
Cooling:	\$ 79	\$ 78	0.99
Heating:	\$ 163	\$ 144	0.88
Hot Water:	\$ 291	\$ 291	1.00
<b>Total:</b>	<b>\$ 533</b>	<b>\$ 513</b>	<b>0.96</b>

# PASS

## CLIMATE

✓	Design Location	Tmy Site	Climate Zone	Design Temp 97.5 %	2.5 %	Int Design Temp Winter	Summer	Heating Degree Days	Design Moisture	Daily Temp Range
_____	OH, BURKE_LAKEFRON	OH_BURKE_LAKEFRON	5	9	84	75	70	6068	33	Medium

## ROOF

✓	#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch
_____	1	Flat	Composition shingles	660 ft²	28 ft²	White	0.73	No	0	4.8 deg

## ATTIC

✓	#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC
_____	1	No attic	Unvented	0	658 ft²	N	N

## IECC-2006 Section 404 Compliance

CEILING														
✓	#	Ceiling Type			R-Value	Area	Framing Frac	Truss Type						
✓	1	Under Attic (Unvented)			38	658 ft²	0.07	Wood						
WALLS														
✓	#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Area	Sheathing R-Value	Framing Fraction	Solar Absor.					
✓	1	W	Exterior	Frame - Wood	19	106.67 ft²	0	0.2	0.5					
✓	2	S	Exterior	Frame - Wood	19	16 ft²	0	0.2	0.5					
✓	3	W	Exterior	Frame - Wood	19	99.33 ft²	0	0.2	0.5					
✓	4	S	Exterior	Frame - Wood	19	98 ft²	0	0.2	0.5					
✓	5	S	Neighbor	Frame - Wood	11	113.33 ft²		0.2	0.1					
✓	6	E	Neighbor	Frame - Wood	11	206 ft²		0.2	0.1					
✓	7	N	Neighbor	Frame - Wood	11	24 ft²		0.2	0.1					
✓	8	N	Neighbor	Frame - Wood	11	211.33 ft²		0.2	0.1					
DOORS														
✓	#	Wall ID	Door Type		Storms			U-Value		Area				
✓	1	E	Insulated		None			0.46		20 ft²				
WINDOWS														
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.														
✓	#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening	
✓	1	W	Vinyl	Low-E Double	Yes	0.35	0.35	N	60 ft²	0 ft 0 in	0 ft 0 in	IECC	None	
✓	2	W	Vinyl	Low-E Double	Yes	0.35	0.35	N	10 ft²	0 ft 0 in	0 ft 0 in	IECC	None	
INFILTRATION & VENTING														
✓	Method		SLA	CFM 50	ACH 50	ELA	EqLA	---- Forced Ventilation ----		Run Time	Fan			
✓	Tested Single Point BD		0.00036	620	7.07	34.0	64.0	24 cfm	0 cfm	0	0			
COOLING SYSTEM														
✓	#	System Type		Subtype			Efficiency	Capacity	Air Flow	SHR	Ductless			
✓	1	Central Unit		None			SEER: 13	18 kBtu/hr	540 cfm	0.75	False			
HEATING SYSTEM														
✓	#	System Type		Subtype			Efficiency	Capacity	Ductless					
✓	1	Electric Heat Pump		None			HSPF: 7.7	18 kBtu/hr	False					

## IECC-2006 Section 404 Compliance

HOT WATER SYSTEM												
	#	System Type	EF	Cap	Use	SetPnt	Credits					
✓	1	Electric	0.92	40 gal	35 gal	120 deg	None					
DUCTS												
	#	---- Supply ----			---- Return ----		Leakage Type	Air Handler	CFM 25	Percent Leakage	QN	RLF
✓	1	Interior	1	189.8 ft	Interior	47.45 ft	Default Leakage	Interior				
UTILITY RATES												
Fuel	Unit	Utility Name	Monthly Fixed Cost				\$/Unit					
Electricity	kWh	OHIO Cleveland	0				0.119					
Natural Gas	Therm	Ohio Average	0				1.02					
Fuel Oil	Gallon	Ohio Default	0				1.1					
Propane	Gallon	Ohio Default	0				1.4					

# Annual Energy Summary

Title: B1 3rd 15%  
User

TMY City: OH\_BURKE\_LAKEF  
Elec Util: OHIO Cleveland  
Gas Util: Ohio Average  
Run Date: 08/05/2010 11:43:02

Cuyahoga, Oh,  
Registration #:

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (7.8 kBtu/hr)	493 kWh	\$59
Cooling Fan	116 kWh	\$14
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Cooling</b>	<b>609 kWh</b>	<b>\$73</b>
Heating (18 kBtu/hr)	422 kWh	\$50
Heating Fan/Pump	66 kWh	\$8
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Heating</b>	<b>488 kWh</b>	<b>\$58</b>
Hot Water	2159 kWh	\$257
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>	<b>2159 kWh</b>	<b>\$257</b>
Ceiling Fans	0 kWh	\$0
Clothes Washer	43 kWh	\$5
Dishwasher	87 kWh	\$10
Dryer	662 kWh	\$79
Lighting	664 kWh	\$79
Miscellaneous	2131 kWh	\$254
Pool Pump	0 kWh	\$0
Range	909 kWh	\$108
Refrigerator	484 kWh	\$58
<hr/>		
Total (kWh)	8236 kWh	\$981
Total (Therms)	0 Therms	\$0
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		\$981

## Emissions (Calculated as Total - PV Produced)

SO2	124.25 Lbs.
NOX	30.39 Lbs.
CO2	7.33 Tons

# IECC-2006 Section 404 Compliance

## PROJECT

Title: B1 3rd 15%	Bedrooms: 1	Address Type: Street Address
Building Type: User	Bathrooms: 1	Lot #
Owner:	Conditioned Area: 658	SubDivision:
# of Units: 1	Total Stories: 1	PlatBook:
Builder Name: HUD	Worst Case: No	Street:
Permit Office:	Rotate Angle: 0	County:
Jurisdiction:	Cross Ventilation:	City, State, Zip: Cuyahoga ,
Family Type: Multi-family	Whole House Fan:	Oh ,
New/Existing: New (Confirmed)		
Comment:		

### Estimated Annual Energy Cost for Code Compliance

	IECC Std. Design	Proposed Home	e-Ratio
Cooling:	\$ 79	\$ 72	0.91
Heating:	\$ 163	\$ 84	0.52
Hot Water:	\$ 291	\$ 290	1.00
<b>Total:</b>	<b>\$ 533</b>	<b>\$ 446</b>	<b>0.84</b>

# PASS

## CLIMATE

✓	Design Location	Tmy Site	Climate Zone	Design Temp 97.5 %	Design Temp 2.5 %	Int Design Temp Winter	Int Design Temp Summer	Heating Degree Days	Design Moisture	Daily Temp Range
_____	OH, BURKE_LAKEFRON	OH_BURKE_LAKEFRON	5	9	84	75	70	6068	33	Medium

## ROOF

✓	#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch
_____	1	Flat	Composition shingles	660 ft²	28 ft²	White	0.73	No	0	4.8 deg

## ATTIC

✓	#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC
_____	1	No attic	Unvented	0	658 ft²	N	N

## IECC-2006 Section 404 Compliance

CEILING														
✓	#	Ceiling Type			R-Value	Area	Framing Frac	Truss Type						
✓	1	Under Attic (Unvented)			60	658 ft²	0.07	Wood						
WALLS														
✓	#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Area	Sheathing R-Value	Framing Fraction	Solar Absor.					
✓	1	W	Exterior	Frame - Wood	19	106.67 ft²	0	0.2	0.5					
✓	2	S	Exterior	Frame - Wood	19	16 ft²	0	0.2	0.5					
✓	3	W	Exterior	Frame - Wood	19	99.33 ft²	0	0.2	0.5					
✓	4	S	Exterior	Frame - Wood	19	98 ft²	0	0.2	0.5					
✓	5	S	Neighbor	Frame - Wood	11	113.33 ft²		0.2	0.1					
✓	6	E	Neighbor	Frame - Wood	11	206 ft²		0.2	0.1					
✓	7	N	Neighbor	Frame - Wood	11	24 ft²		0.2	0.1					
✓	8	N	Neighbor	Frame - Wood	11	211.33 ft²		0.2	0.1					
DOORS														
✓	#	Wall ID	Door Type		Storms			U-Value	Area					
✓	1	E	Insulated		None			0.46	20 ft²					
WINDOWS														
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.														
✓	#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening	
✓	1	W	Vinyl	Low-E Double	Yes	0.3	0.35	N	60 ft²	0 ft 0 in	0 ft 0 in	IECC	None	
✓	2	W	Vinyl	Low-E Double	Yes	0.3	0.35	N	10 ft²	0 ft 0 in	0 ft 0 in	IECC	None	
INFILTRATION & VENTING														
✓	Method		SLA	CFM 50	ACH 50	ELA	EqLA	---- Forced Ventilation ----		Run Time	Fan			
✓	Tested Single Point BD		0.00020	350	3.99	19.2	36.1	24 cfm	0 cfm	0	0			
COOLING SYSTEM														
✓	#	System Type		Subtype			Efficiency	Capacity	Air Flow	SHR	Ductless			
✓	1	Central Unit		None			SEER: 13	18 kBtu/hr	540 cfm	0.75	False			
HEATING SYSTEM														
✓	#	System Type		Subtype			Efficiency	Capacity	Ductless					
✓	1	Electric Heat Pump		None			HSPF: 8.2	18 kBtu/hr	False					

## IECC-2006 Section 404 Compliance

### HOT WATER SYSTEM

	#	System Type	EF	Cap	Use	SetPnt	Credits
✓	1	Electric	0.92	40 gal	35 gal	120 deg	None

### DUCTS

	#	---- Supply ----			---- Return ----		Leakage Type	Air Handler	CFM 25	Percent Leakage	QN	RLF
		Location	R-Value	Area	Location	Area						
✓	1	Interior	1	189.8 ft	Interior	47.45 ft	Duct Tester Results	Interior	32.00 cfm	5.93 %	0.05	0.60

### UTILITY RATES

Fuel	Unit	Utility Name	Monthly Fixed Cost	\$/Unit
Electricity	kWh	OHIO Cleveland	0	0.119
Natural Gas	Therm	Ohio Average	0	1.02
Fuel Oil	Gallon	Ohio Default	0	1.1
Propane	Gallon	Ohio Default	0	1.4



# Annual Energy Summary

Cuyahoga, Oh,  
Registration #:

Title: B1 3rd 30%  
User

TMY City: OH\_BURKE\_LAKEF  
Elec Util: OHIO Cleveland  
Gas Util: Ohio Average  
Run Date: 08/05/2010 11:45:06

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (8.1 kBtu/hr)	418 kWh	\$50
Cooling Fan	78 kWh	\$9
Mechanical Vent Fan	0 kWh	\$0
<b>Total Cooling</b>	<b>496 kWh</b>	<b>\$59</b>
Heating (18 kBtu/hr)	51 Therms	\$74
Heating Fan/Pump	34 kWh	\$4
Mechanical Vent Fan	0 kWh	\$0
<b>Total Heating</b>	<b>\$78</b>	
Hot Water	100 Therms	\$145
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>		<b>\$145</b>
Ceiling Fans	0 kWh	\$0
Clothes Washer	43 kWh	\$5
Dishwasher	87 kWh	\$10
Dryer	662 kWh	\$79
Lighting	664 kWh	\$79
Miscellaneous	2131 kWh	\$254
Pool Pump	0 kWh	\$0
Range	909 kWh	\$108
Refrigerator	484 kWh	\$58
<hr/>		
Total (kWh)	5510 kWh	\$656
Total (Therms)	152 Therms	\$219
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
<b>Total Cost</b>		<b>\$875</b>

## Emissions (Calculated as Total - PV Produced)

SO2	83.12 Lbs.
NOX	22.03 Lbs.
CO2	5.79 Tons

# IECC-2006 Section 404 Compliance

## PROJECT

Title: B1 3rd 30%	Bedrooms: 1	Address Type: Street Address
Building Type: User	Bathrooms: 1	Lot #
Owner:	Conditioned Area: 658	SubDivision:
# of Units: 1	Total Stories: 1	PlatBook:
Builder Name: HUD	Worst Case: No	Street:
Permit Office:	Rotate Angle: 0	County:
Jurisdiction:	Cross Ventilation:	City, State, Zip: Cuyahoga ,
Family Type: Multi-family	Whole House Fan:	Oh ,
New/Existing: New (Confirmed)		
Comment:		

### Estimated Annual Energy Cost for Code Compliance

	IECC Std. Design	Proposed Home	e-Ratio
Cooling:	\$ 79	\$ 60	0.76
Heating:	\$ 181	\$ 95	0.52
Hot Water:	\$ 197	\$ 164	0.83
<b>Total:</b>	<b>\$ 457</b>	<b>\$ 319</b>	<b>0.70</b>

# PASS

## CLIMATE

✓	Design Location	Tmy Site	Climate Zone	Design Temp		Int Design Temp		Heating Degree Days	Design Moisture	Daily Temp Range
				97.5 %	2.5 %	Winter	Summer			
_____	OH, BURKE_LAKEFRON	OH_BURKE_LAKEFRON	5	9	84	75	70	6068	33	Medium

## ROOF

✓	#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch
_____	1	Flat	Composition shingles	660 ft <sup>2</sup>	28 ft <sup>2</sup>	White	0.73	No	0	4.8 deg

## ATTIC

✓	#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC
_____	1	No attic	Unvented	0	658 ft <sup>2</sup>	N	N

## IECC-2006 Section 404 Compliance

CEILING													
✓	#	Ceiling Type			R-Value	Area	Framing Frac	Truss Type					
✓	1	Under Attic (Unvented)			60	658 ft²	0.07	Wood					
WALLS													
✓	#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Area	Sheathing R-Value	Framing Fraction	Solar Absor.				
✓	1	W	Exterior	Frame - Wood	19	106.67 ft²	5	0.2	0.5				
✓	2	S	Exterior	Frame - Wood	19	16 ft²	5	0.2	0.5				
✓	3	W	Exterior	Frame - Wood	19	99.33 ft²	5	0.2	0.5				
✓	4	S	Exterior	Frame - Wood	19	98 ft²	5	0.2	0.5				
✓	5	S	Neighbor	Frame - Wood	13	113.33 ft²	5	0.2	0.1				
✓	6	E	Neighbor	Frame - Wood	13	206 ft²	5	0.2	0.1				
✓	7	N	Neighbor	Frame - Wood	13	24 ft²	5	0.2	0.1				
✓	8	N	Neighbor	Frame - Wood	13	211.33 ft²	5	0.2	0.1				
DOORS													
✓	#	Wall ID	Door Type			Storms		U-Value		Area			
✓	1	E	Insulated			None		0.4		20 ft²			
WINDOWS													
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.													
✓	#	Ornt	Frame	Panels	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening
✓	1	W	Vinyl	Low-E Double	Yes	0.3	0.3	N	60 ft²	0 ft 0 in	0 ft 0 in	IECC	None
✓	2	W	Vinyl	Low-E Double	Yes	0.3	0.3	N	10 ft²	0 ft 0 in	0 ft 0 in	IECC	None
INFILTRATION & VENTING													
✓	Method		SLA	CFM 50	ACH 50	ELA	EqLA	---- Forced Ventilation ----		Run Time	Fan		
✓	Tested Single Point BD		0.00035	600	6.84	32.9	61.9	24 cfm	0 cfm	0	0		
COOLING SYSTEM													
✓	#	System Type		Subtype			Efficiency	Capacity	Air Flow	SHR	Ductless		
✓	1	Central Unit		None			SEER: 14	18 kBtu/hr	540 cfm	0.75	False		
HEATING SYSTEM													
✓	#	System Type		Subtype			Efficiency	Capacity	Ductless				
✓	1	Natural Gas Furnace		None			AFUE: 0.94	18 kBtu/hr	False				

## IECC-2006 Section 404 Compliance

HOT WATER SYSTEM												
✓	#	System Type	EF	Cap	Use	SetPnt	Credits					
✓	1	Natural Gas	0.7	30 gal	35 gal	120 deg	None					
DUCTS												
✓	#	---- Supply ----			---- Return ----		Leakage Type	Air Handler	CFM 25	Percent Leakage	QN	RLF
✓	1	Interior	1	189.8 ft	Interior	47.45 ft	Duct Tester Results	Interior	32.00 cfm	5.93 %	0.05	0.60
UTILITY RATES												
Fuel	Unit	Utility Name					Monthly Fixed Cost		\$/Unit			
Electricity	kWh	OHIO Cleveland					0		0.119			
Natural Gas	Therm	Ohio Average					0		1.452			
Fuel Oil	Gallon	Ohio Default					0		1.1			
Propane	Gallon	Ohio Default					0		1.4			

# Annual Energy Summary

Cuyahoga, Oh,  
Registration #:

Title: B1 3rd 50%  
User

TMY City: OH\_BURKE\_LAKEF  
Elec Util: OHIO Cleveland  
Gas Util: Ohio Average  
Run Date: 08/05/2010 11:47:48

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (7.2 kBtu/hr)	449 kWh	\$53
Cooling Fan	86 kWh	\$10
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Cooling</b>	<b>535 kWh</b>	<b>\$63</b>
Heating (18 kBtu/hr)	27 Therms	\$28
Heating Fan/Pump	9 kWh	\$1
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Heating</b>	<b>\$29</b>	
Hot Water	41 Therms	\$42
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>	<b>\$42</b>	
Ceiling Fans	0 kWh	\$0
Clothes Washer	43 kWh	\$5
Dishwasher	87 kWh	\$10
Dryer	662 kWh	\$79
Lighting	664 kWh	\$79
Miscellaneous	2131 kWh	\$254
Pool Pump	0 kWh	\$0
Range	909 kWh	\$108
Refrigerator	484 kWh	\$58
<hr/>		
Total (kWh)	5524 kWh	\$657
Total (Therms)	69 Therms	\$70
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		\$727

## Emissions (Calculated as Total - PV Produced)

SO2	83.33 Lbs.
NOX	21.14 Lbs.
CO2	5.31 Tons

# IECC-2006 Section 404 Compliance

## PROJECT

Title: B1 3rd 50%	Bedrooms: 1	Adress Type: Street Address
Building Type: User	Bathrooms: 1	Lot #
Owner:	Conditioned Area: 658	SubDivision:
# of Units: 1	Total Stories: 1	PlatBook:
Builder Name: HUD	Worst Case: No	Street:
Permit Office:	Rotate Angle: 0	County:
Jurisdiction:	Cross Ventilation:	City, State, Zip: Cuyahoga ,
Family Type: Multi-family	Whole House Fan:	Oh ,
New/Existing: New (Confirmed)		
Comment:		

### Estimated Annual Energy Cost for Code Compliance

	IECC Std. Design	Proposed Home	e-Ratio
Cooling:	\$ 79	\$ 62	0.78
Heating:	\$ 123	\$ 54	0.44
Hot Water:	\$ 139	\$ 51	0.37
<b>Total:</b>	<b>\$ 341</b>	<b>\$ 167</b>	<b>0.49</b>

# PASS

## CLIMATE

	Design Location	Tmy Site	Climate Zone	Design Temp 97.5 %	2.5 %	Int Design Temp Winter	Summer	Heating Degree Days	Design Moisture	Daily Temp Range
✓	OH, BURKE_LAKEFRON	OH_BURKE_LAKEFRON	5	9	84	75	70	6068	33	Medium

## ROOF

	#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch
✓	1	Flat	Composition shingles	660 ft²	28 ft²	White	0.73	No	0	4.8 deg

## ATTIC

	#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC
✓	1	No attic	Unvented	0	658 ft²	N	N

## IECC-2006 Section 404 Compliance

CEILING													
✓	#	Ceiling Type			R-Value	Area	Framing Frac	Truss Type					
✓	1	Under Attic (Unvented)			75	658 ft²	0.07	Wood					
WALLS													
✓	#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Area	Sheathing R-Value	Framing Fraction	Solar Absor.				
✓	1	W	Exterior	Frame - Wood	19	106.67 ft²	0	0.2	0.5				
✓	2	S	Exterior	Frame - Wood	19	16 ft²	0	0.2	0.5				
✓	3	W	Exterior	Frame - Wood	19	99.33 ft²	0	0.2	0.5				
✓	4	S	Exterior	Frame - Wood	19	98 ft²	0	0.2	0.5				
✓	5	S	Neighbor	Frame - Wood	13	113.33 ft²		0.2	0.1				
✓	6	E	Neighbor	Frame - Wood	13	206 ft²		0.2	0.1				
✓	7	N	Neighbor	Frame - Wood	13	24 ft²		0.2	0.1				
✓	8	N	Neighbor	Frame - Wood	13	211.33 ft²		0.2	0.1				
DOORS													
✓	#	Wall ID	Door Type			Storms	U-Value		Area				
✓	1	E	Insulated			None	0.4		20 ft²				
WINDOWS													
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.													
✓	#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening
✓	1	W	Vinyl	Low-E Double	Yes	0.3	0.35	N	60 ft²	0 ft 0 in	0 ft 0 in	IECC	None
✓	2	W	Vinyl	Low-E Double	Yes	0.3	0.35	N	10 ft²	0 ft 0 in	0 ft 0 in	IECC	None
INFILTRATION & VENTING													
✓	Method		SLA	CFM 50	ACH 50	ELA	EqLA	---- Forced Ventilation ----		Run Time	Fan		
✓	Tested Single Point BD		0.00015	260	2.96	14.3	26.8	24 cfm	0 cfm	0	0		
COOLING SYSTEM													
✓	#	System Type		Subtype			Efficiency	Capacity	Air Flow	SHR	Ductless		
✓	1	Central Unit		None			SEER: 14	18 kBtu/hr	540 cfm	0.75	False		
HEATING SYSTEM													
✓	#	System Type		Subtype			Efficiency	Capacity	Ductless				
✓	1	Natural Gas Hydronic		None			AFUE: 0.95	18 kBtu/hr	False				

## IECC-2006 Section 404 Compliance

HOT WATER SYSTEM												
✓	#	System Type	EF	Cap	Use	SetPnt	Credits					
✓	1	Natural Gas	0.85	30 gal	35 gal	120 deg	Solar System					
DUCTS												
✓	#	---- Supply ----			---- Return ----		Leakage Type	Air Handler	CFM 25	Percent Leakage	QN	RLF
✓	1	Interior	1	189.8 ft	Interior	47.45 ft	Duct Tester Results	Interior	16.00 cfm	2.96 %	0.02	0.60
UTILITY RATES												
Fuel	Unit	Utility Name					Monthly Fixed Cost	\$/Unit				
Electricity	kWh	OHIO Cleveland					0	0.119				
Natural Gas	Therm	Ohio Average					0	1.02				
Fuel Oil	Gallon	Ohio Default					0	1.1				
Propane	Gallon	Ohio Default					0	1.4				



# Annual Energy Summary

Cuyahoga, Oh,  
Registration #:

Title: B1 3rd 60%  
User

TMY City: OH\_BURKE\_LAKEF  
Elec Util: OHIO Cleveland  
Gas Util: Ohio Average  
Run Date: 08/05/2010 11:49:05

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (7.1 kBtu/hr)	409 kWh	\$49
Cooling Fan	90 kWh	\$11
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Cooling</b>	<b>499 kWh</b>	<b>\$60</b>
Heating (18 kBtu/hr)	19 Therms	\$19
Heating Fan/Pump	6 kWh	\$1
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Heating</b>	<b>\$20</b>	
Hot Water	29 Therms	\$30
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>	<b>\$30</b>	
Ceiling Fans	0 kWh	\$0
Clothes Washer	43 kWh	\$5
Dishwasher	87 kWh	\$10
Dryer	662 kWh	\$79
Lighting	664 kWh	\$79
Miscellaneous	2131 kWh	\$254
Pool Pump	0 kWh	\$0
Range	909 kWh	\$108
Refrigerator	484 kWh	\$58
<hr/>		
Total (kWh)	5485 kWh	\$654
Total (Therms)	48 Therms	\$49
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		\$703

## Emissions (Calculated as Total - PV Produced)

SO2	82.75 Lbs.
NOX	20.77 Lbs.
CO2	5.16 Tons

# IECC-2006 Section 404 Compliance

## PROJECT

Title: B1 3rd 60%	Bedrooms: 1	Address Type: Street Address
Building Type: User	Bathrooms: 1	Lot #
Owner:	Conditioned Area: 658	SubDivision:
# of Units: 1	Total Stories: 1	PlatBook:
Builder Name: HUD	Worst Case: No	Street:
Permit Office:	Rotate Angle: 0	County:
Jurisdiction:	Cross Ventilation:	City, State, Zip: Cuyahoga ,
Family Type: Multi-family	Whole House Fan:	Oh ,
New/Existing: New (Confirmed)		
Comment:		

### Estimated Annual Energy Cost for Code Compliance

	IECC Std. Design	Proposed Home	e-Ratio
Cooling:	\$ 79	\$ 57	0.72
Heating:	\$ 123	\$ 45	0.37
Hot Water:	\$ 139	\$ 36	0.26
<b>Total:</b>	<b>\$ 341</b>	<b>\$ 138</b>	<b>0.40</b>

# PASS

## CLIMATE

✓	Design Location	Tmy Site	Climate Zone	Design Temp 97.5 %	Design Temp 2.5 %	Int Design Temp Winter	Int Design Temp Summer	Heating Degree Days	Design Moisture	Daily Temp Range
✓	OH, BURKE_LAKEFRON	OH_BURKE_LAKEFRON	5	9	84	75	70	6068	33	Medium

## ROOF

✓	#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch
✓	1	Flat	Composition shingles	660 ft²	28 ft²	White	0.73	No	0	4.8 deg

## ATTIC

✓	#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC
✓	1	No attic	Unvented	0	658 ft²	N	N

## IECC-2006 Section 404 Compliance

CEILING														
✓	#	Ceiling Type			R-Value	Area	Framing Frac	Truss Type						
✓	1	Under Attic (Unvented)			75	658 ft²	0.07	Wood						
WALLS														
✓	#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Area	Sheathing R-Value	Framing Fraction	Solar Absor.					
✓	1	W	Exterior	Frame - Wood	19	106.67 ft²	10	0.2	0.5					
✓	2	S	Exterior	Frame - Wood	19	16 ft²	10	0.2	0.5					
✓	3	W	Exterior	Frame - Wood	19	99.33 ft²	10	0.2	0.5					
✓	4	S	Exterior	Frame - Wood	19	98 ft²	10	0.2	0.5					
✓	5	S	Neighbor	Frame - Wood	13	113.33 ft²		0.2	0.1					
✓	6	E	Neighbor	Frame - Wood	13	206 ft²		0.2	0.1					
✓	7	N	Neighbor	Frame - Wood	13	24 ft²		0.2	0.1					
✓	8	N	Neighbor	Frame - Wood	13	211.33 ft²		0.2	0.1					
DOORS														
✓	#	Wall ID	Door Type		Storms			U-Value		Area				
✓	1	E	Insulated		None			0.4		20 ft²				
WINDOWS														
Window orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.														
✓	#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storms	Area	Overhang		Int Shade	Screening	
✓	1	W	Vinyl	Low-E Double	Yes	0.3	0.35	N	60 ft²	0 ft 0 in	0 ft 0 in	IECC	None	
✓	2	W	Vinyl	Low-E Double	Yes	0.3	0.35	N	10 ft²	0 ft 0 in	0 ft 0 in	IECC	None	
INFILTRATION & VENTING														
✓	Method		SLA	CFM 50	ACH 50	ELA	EqLA	---- Forced Ventilation ----		Run Time	Fan			
✓	Tested Single Point BD		0.00015	260	2.96	14.3	26.8	24 cfm	0 cfm	0	0			
COOLING SYSTEM														
✓	#	System Type		Subtype			Efficiency	Capacity	Air Flow	SHR	Ductless			
✓	1	Central Unit		None			SEER: 16	18 kBtu/hr	540 cfm	0.75	False			
HEATING SYSTEM														
✓	#	System Type		Subtype			Efficiency	Capacity	Ductless					
✓	1	Natural Gas Hydronic		None			AFUE: 0.95	18 kBtu/hr	False					

## IECC-2006 Section 404 Compliance

HOT WATER SYSTEM												
✓	#	System Type	EF	Cap	Use	SetPnt	Credits					
✓	1	Natural Gas	0.85	30 gal	35 gal	120 deg	Solar System					
DUCTS												
✓	#	---- Supply ----			---- Return ----		Leakage Type	Air Handler	CFM 25	Percent Leakage	QN	RLF
✓	1	Interior	1	189.8 ft	Interior	47.45 ft	Duct Tester Results	Interior	16.00 cfm	2.96 %	0.02	0.60
UTILITY RATES												
Fuel	Unit	Utility Name					Monthly Fixed Cost	\$/Unit				
Electricity	kWh	OHIO Cleveland					0	0.119				
Natural Gas	Therm	Ohio Average					0	1.02				
Fuel Oil	Gallon	Ohio Default					0	1.1				
Propane	Gallon	Ohio Default					0	1.4				





# APPENDIX C

## ENERGY MODELS

5 – Retrofit – climate zone #4

A. Silver Spring, Maryland

i. Unit 1

HUD

8804 Glenville Unit 1

	Required		20%	34%	43%	50%			
	Unit 1 Before	Unit 1 Bronze	% Above Reference	Unit 1 Silver	% Above Reference	Unit 1 Gold	% Above Reference	Unit 1 Emerald	% Above Reference
Climate Zone 4:									
e-ratio - 2006 IECC	2.15	1.67		1.2		1.08		0.99	
Finished Floor Area, sq. feet	485	485		485		485		485	
Bedrooms	1	1		1		1		1	
Baths	1	1		1		1		1	
Floor R-value	0	0		0		0		0	
Whole Wall U-value <sup>B</sup>	0.306	0.306		0.306		0.306		0.306	
Flat Ceiling R-value	n/a	n/a		n/a		n/a		n/a	
Wall Construction	brick/CMU 6"	brick/CMU 6"		brick/CMU 6"		brick/CMU 6"		brick/CMU 6"	
Wall Area, Ambient, Above Grade	257.36	257.36		257.36		257.36		257.36	
Window U-value <sup>E</sup>	0.55	0.55		0.55		0.55		0.55	
Window SHGC <sup>E</sup>	0.60	0.60		0.60		0.60		0.60	
Window Area	59	59		59		59		59	
Window Area, % of Floor, CFA	12.06%	12.06%		12.06%		12.06%		12.06%	
Window Area % of Wall	22.73%	22.73%		22.73%		22.73%		22.73%	
Infiltration, ACHnat <sup>F</sup>	1.291	0.90		0.90		0.90		0.90	
Cooling System SEER	10	10		10		13		16	
Cooling Capacity, kBtu/hr	12	12		12		12		12	
Heating System, AFUE	0.80	0.8		0.8		0.9		0.96	
Heating Capacity, kBtu/hr	18	18		18		18		12	
DSE (HVAC Design System Efficiency)/Leakage	88.00%	6%		6%		6%		6%	
Duct Location	Inside	Inside		Inside		Inside		Inside	
Air Handler Location	Inside	Inside		Inside		Inside		Inside	
Hot Water Use, gallons/day	53	53		53		53		53	
Water Heater Energy Factor <sup>G</sup>	0.56	0.56		.82 tankless		.82 tankless		.82 tankless	
Cool Set Point	78	78		78		78		78	
Heat Set Point	68	68		68		68		68	
Programmable Thermostat	No	Yes		Yes		Yes		Yes	
Cooling setback degrees; setback hours	n/a	n/a		n/a		n/a		n/a	
Heating setback degrees; setback hours	n/a	n/a		n/a		n/a		n/a	
<b>ENERGY COST and USAGE:</b>									
Cooling Energy, cost, kWh	157	133		133		107		85	
Heating Energy, cost, therms	568	362		362		321		304	
Heating Energy, cost, kWh	44	28		28		28		21	
Water Heater, cost, therms	399	399		178		178		178	
<b>Subtotal Heating and Cooling (\$)</b>	<b>\$1,168</b>	<b>\$922</b>	<b>21.1%</b>	<b>\$701</b>	<b>40.0%</b>	<b>\$634</b>	<b>45.7%</b>	<b>\$588</b>	<b>49.7%</b>
Dishwasher, cost, kWh	\$9	\$9		\$9		\$9		\$9	
Lights, cost, kWh	\$227	\$227		\$227		\$227		\$227	
Miscellaneous, cost, kWh	\$381	\$381		\$381		\$381		\$381	
Range, cost, therms	\$59	\$59		\$59		\$59		\$59	
Refrigerator, cost, kWh	\$115	\$115		\$115		\$115		\$115	
<b>Whole House Cost (\$)<sup>A</sup></b>	<b>\$1,959</b>	<b>\$1,713</b>		<b>\$1,492</b>		<b>\$1,425</b>		<b>\$1,379</b>	

<sup>A</sup>May vary due to rounding.

<sup>B</sup>Calculation based on Table 2 of the report.

<sup>E</sup>Used Energy Gauge default value for described window.

<sup>F</sup>Average value of units 2-4; this unit was not tested.

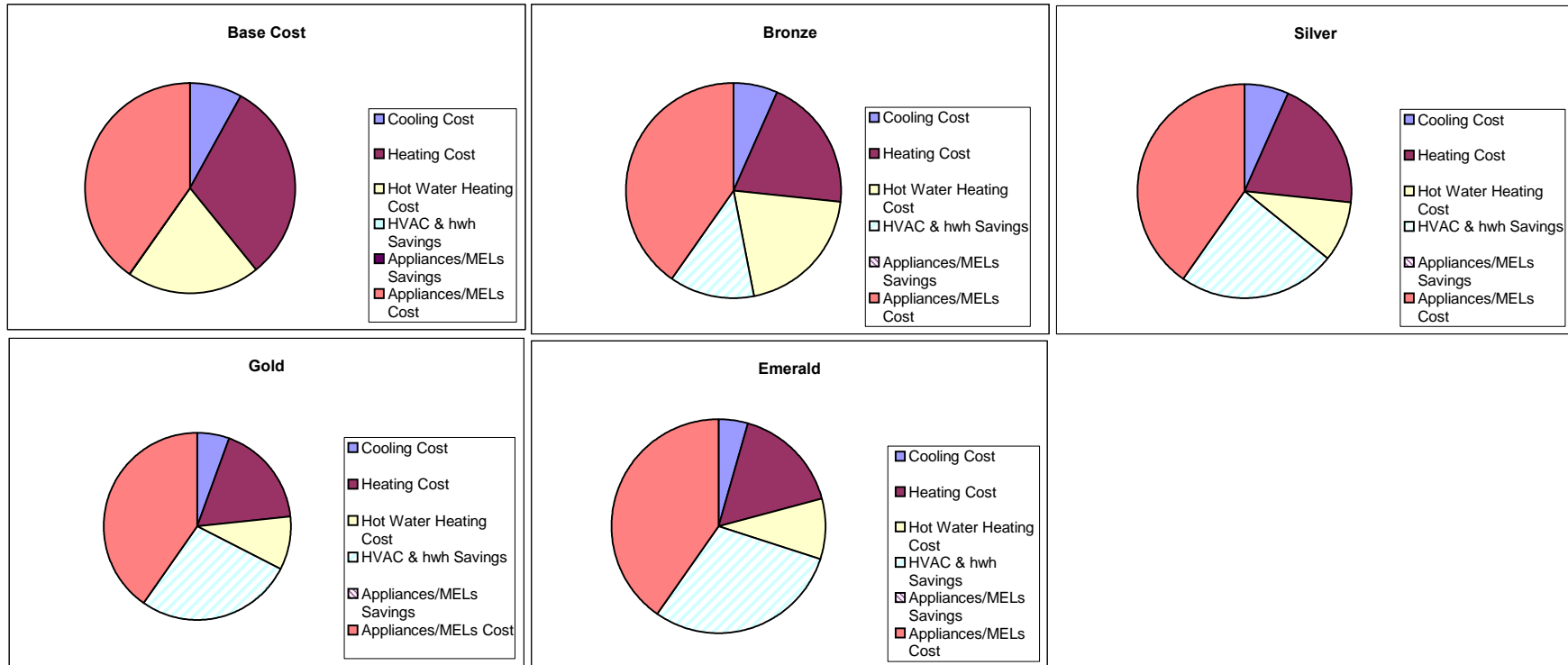
<sup>G</sup>Unknown efficiency; manufactured 1991.

Maximum infiltration increase of 30% in 1980 remodels or older

Gaithersburg, Maryland  
Rehab Unit 1

Annual Energy Summary	Base	Bronze			Silver			Gold			Emerald		
	Yr \$	Yr \$	savings	percent	Yr \$	savings	percent	Yr \$	savings	percent	Yr \$	savings	percent
Cooling Cost	157	133	24	15%	133	24	15%	107	50	32%	85	72	46%
Heating Cost	612	390	222	36%	390	222	36%	349	263	43%	325	287	47%
Hot Water Heating Cost	399	399	0	0%	178	221	55%	178	221	55%	178	221	55%
HVAC & hwh Savings	N/A	246			467			534			580		
Appliances/MELs Savings	N/A	0			0			0			0		
Appliances/MELs Cost	791	791			791			791			791		
HVAC & HWH sub-total	1168	922		21%	701		40%	634		46%	588		50%
Grand Total	1959	1713		87%	1492		76%	1425		73%	1379		70%

Data based on Energy Gauge - Annual Energy Summary. Not Compliance





# Annual Energy Summary

Title: 8804 Glenville Unit 1  
User

TMY City: MD\_BALTIMORE\_BL  
Elec Util: MD 2009  
Gas Util: MD 2008  
Run Date: 03/03/2010 08:19:05

Registration #:

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (12 kBtu/hr)	888 kWh	\$135
Cooling Fan	144 kWh	\$22
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Cooling</b>	<b>1032 kWh</b>	<b>\$157</b>
Heating (18 kBtu/hr)	364 Therms	\$568
Heating Fan/Pump	291 kWh	\$44
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Heating</b>	<b>\$612</b>	
Hot Water	256 Therms	\$399
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>		<b>\$399</b>
Ceiling Fans	0 kWh	\$0
Clothes Washer	0 kWh	\$0
Dishwasher	61 kWh	\$9
Dryer	0 kWh	\$0
Lighting	1499 kWh	\$227
Miscellaneous	2516 kWh	\$381
Pool Pump	0 kWh	\$0
Range	38 Therms	\$59
Refrigerator	756 kWh	\$115
<hr/>		
Total (kWh)	6155 kWh	\$933
Total (Therms)	658 Therms	\$1026
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		\$1959

## Emissions (Calculated as Total - PV Produced)

SO2	67.92 Lbs.
NOX	21.99 Lbs.
CO2	7.82 Tons

# Building Input Summary Report

PROJECT									
Title:	8804 Glenville Unit 1	Bedrooms:	1	Address Type:	Street Address				
Building Type:	User	Bathrooms:	1	Lot #					
Owner:		Conditioned Area:	485	SubDivision:					
# of Units:	1	Total Stories:	1	PlatBook:					
Builder Name:	Unit 1 - Existing	Worst Case:	No	Street:					
Permit Office:		Rotate Angle:	0	County:					
Jurisdiction:		Cross Ventilation:		City, State, Zip:					
Family Type:	Multi-family	Whole House Fan:							
New/Existing:	Existing (Projected)								
Comment:									
CLIMATE									
Design Location	Tmy Site	Design Temp 97.5 %	2.5 %	Int Design Temp Winter	Summer	Heating Degree Days	Design Moisture	Daily Temp Range	
MD, BALTIMORE_BLT-WA	MD_BALTIMORE_BLT-WASHNGT	13	91	70	75	4631	37	Medium	
UTILITY RATES									
Fuel	Unit	Utility Name				Monthly Fixed Cost	\$/Unit		
Electricity	kWh	MD 2009				0	0.1516		
Natural Gas	Therm	MD 2008				0	1.56		
Fuel Oil	Gallon	Maryland Default				0	1.1		
Propane	Gallon	Maryland Default				0	1.4		
SURROUNDINGS									
Ornt	Type	Shade Trees Height	Width	Distance	Exist	Adjacent Buildings Height	Width	Distance	
N	None	0 ft	0 ft	0 ft	X	35 ft	40 ft	30 ft	
NE	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft	
E	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft	
SE	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft	
S	None	0 ft	0 ft	0 ft	X	35 ft	40 ft	30 ft	
SW	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft	
W	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft	
NW	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft	
FLOORS									
#	Floor Type	Wall Perimeter	Wall Ins. R-Value	Area	Ceiling Ins. R-Value	Tile	Wood	Carpet	
1	Basement Finished			485 ft²		0	0.75	0.25	
ROOF									
#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch
1	Flat	Gravel	487 ft²	20 ft²	Dark	0.96	No	0	4.8 deg
ATTIC									
#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC			
1	No attic	Unvented	0	485 ft²	N	N			

# Building Input Summary Report

WALLS												
Wall orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.												
#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Width Ft	In	Height Ft	In	Area	Sheathing R-Value	Framing Fraction	Solar Absor.
1	N	Exterior	Face Brick - Block	0.01	11	8	4		46.67 ft <sup>2</sup>	0	0	0.5
2	E	Neighbor	Face Brick - Block	0.01	41		4		164 ft <sup>2</sup>	0	0	0.75
3	S	Exterior	Face Brick - Block	0.01	11	8	4		46.67 ft <sup>2</sup>	0	0	0.5
4	W	Exterior	Face Brick - Block	0.01	41		4		164 ft <sup>2</sup>	0	0	0.5
DOORS												
#	Ornt	Door Type	Storms	U-Value	Width Ft	In	Height Ft	In	Area			
1	N	Wood	None	0.46	3		6	8	20 ft <sup>2</sup>			
2	W	Insulated	None	0.46	3		6	8	20 ft <sup>2</sup>			
WINDOWS												
#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storm	Area	Overhang Depth	Separation	Interior Shade	Screening
1	S	Vinyl	Double (Clear)	Yes	0.55	0.6	N	12 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
2	W	Vinyl	Double (Clear)	Yes	0.55	0.6	N	12 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
3	W	Vinyl	Double (Clear)	Yes	0.55	0.6	N	4.5 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
4	W	Vinyl	Double (Clear)	Yes	0.55	0.6	N	9 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
5	W	Vinyl	Double (Clear)	Yes	0.55	0.7	N	18 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
INFILTRATION & VENTING												
Method	SLA	CFM 50	ELA	EqLA	ACH	ACH 50	---- Forced Ventilation ----			Terrain/Wind Shielding		
Proposed ACH	0.00157	4003	219.7	413.3	1.290	41.26	Supply	Exhaust	Run Time	Suburban / Suburban		
							0	0	0			
MASS												
Mass Type	Area	Thickness	Furniture Fraction									
No Added Mass	0 ft <sup>2</sup>	0 ft	0.3									
COOLING SYSTEM												
#	System Type	Subtype	Efficiency	Capacity	Air Flow	SHR	Ductless					
1	Central Unit	None	SEER: 10	12 kBtu/hr	550 cfm	0.75	False					
HEATING SYSTEM												
#	System Type	Subtype	Efficiency	Capacity	Ductless							
1	Natural Gas Furnace	None	AFUE: 0.8	18 kBtu/hr	False							
HOT WATER SYSTEM												
#	System Type	EF	Cap	Use	SetPnt	Credits						
1	Natural Gas	0.56	30 gal	53 gal	120 deg	None						

# Building Input Summary Report

SOLAR HOT WATER														
Collector Type	Collector		Surface		Absorp.	Trans	Tank	Tank	Tank	Heat	PV	Pump		
	Tilt	Azimuth	Area	Loss Coef.	Prod.	Corr.	Volume	U-Value	Surf Area	Exch Eff	Pumped	Energy		
DUCTS														
#	Location	---- Supply ----		---- Return ----			Leakage Type	Air Handler	Percent		QN	RLF		
		R-Value	Area	Location	Area	Number			CFM 25	Leakage				
1	Interior	6	164 ft <sup>2</sup>	Interior	41 ft <sup>2</sup>	(invalid)	Default Leakage	Interior	(Default)	(Default)				
TEMPERATURES														
Programable Thermostat: N						Ceiling Fans: N								
Cooling	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec		
Heating	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec		
Venting	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec		
Thermostat Schedule: HERS 2006 Reference														
Schedule Type	Hours													
	1	2	3	4	5	6	7	8	9	10	11	12		
Cooling (WD)	AM 78	78	78	78	78	78	78	78	78	78	78	78	78	78
	PM 78	78	78	78	78	78	78	78	78	78	78	78	78	78
Cooling (WEH)	AM 78	78	78	78	78	78	78	78	78	78	78	78	78	78
	PM 78	78	78	78	78	78	78	78	78	78	78	78	78	78
Heating (WD)	AM 68	68	68	68	68	68	68	68	68	68	68	68	68	68
	PM 68	68	68	68	68	68	68	68	68	68	68	68	68	68
Heating (WEH)	AM 68	68	68	68	68	68	68	68	68	68	68	68	68	68
	PM 68	68	68	68	68	68	68	68	68	68	68	68	68	68

# Building Input Summary Report

## APPLIANCES & LIGHTING

Appliance Schedule: Glenville2		Hours											
Schedule Type		1	2	3	4	5	6	7	8	9	10	11	12
Ceiling Fans (Summer)	AM	1	1	1	1	1	1	1	0.883	0.409	0.242	0.242	0.242
% Released: 100	PM	0.242	0.242	0.242	0.242	0.295	0.553	0.897	0.897	0.897	1	1	1
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Clothes Washer	AM	0.105	0.081	0.046	0.046	0.081	0.128	0.256	0.57	0.849	1	0.977	0.872
% Released: 0	PM	0.779	0.698	0.605	0.57	0.581	0.57	0.57	0.57	0.57	0.488	0.43	0.198
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Dishwasher	AM	0.139	0.05	0.028	0.024	0.029	0.09	0.169	0.303	0.541	0.594	0.502	0.443
% Released: 0	PM	0.377	0.396	0.335	0.323	0.344	0.448	0.791	1	0.8	0.597	0.383	0.281
Annual Use: 61 kWh/Yr		Peak Value: 19 Watts											
Dryer	AM	0.122	0.073	0.049	0.024	0.049	0.073	0.195	0.39	0.595	0.839	0.961	1
% Released: 0	PM	0.912	0.829	0.746	0.707	0.683	0.668	0.634	0.624	0.644	0.668	0.537	0.293
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Lighting	AM	0.063	0.063	0.063	0.063	0.188	0.391	0.438	0.391	0.172	0.117	0.117	0.117
% Released: 100	PM	0.117	0.117	0.117	0.203	0.438	0.609	0.82	0.984	1	0.688	0.383	0.156
Annual Use: 1498 kWh/Yr		Peak Value: 525 Watts											
Miscellaneous	AM	0.454	0.411	0.393	0.38	0.38	0.429	0.54	0.65	0.663	0.675	0.687	0.699
% Released: 100	PM	0.687	0.663	0.65	0.681	0.804	1	1	0.926	0.89	0.847	0.712	0.577
Annual Use: 2516 kWh/Yr		Peak Value: 436 Watts											
Pool Pump	AM	0	0	0	0	0	0	0	0	0	1	1	1
% Released: 0	PM	1	1	1	1	0	0	0	0	0	0	0	0
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Range	AM	0.047	0.047	0.024	0.024	0.047	0.071	0.165	0.283	0.307	0.321	0.283	0.33
% Released: 0	PM	0.337	0.307	0.292	0.377	0.613	1	0.778	0.401	0.236	0.165	0.104	0.071
Annual Use: 38 Therms/Yr		Peak Value: 2 kBtu/Hr											
Refrigeration	AM	0.57	0.49	0.49	0.46	0.46	0.57	0.76	0.89	0.89	0.82	0.71	0.71
% Released: 0	PM	0.64	0.58	0.58	0.58	0.73	0.59	1	1	0.96	0.96	0.86	0.71
Annual Use: 756 kWh/Yr		Peak Value: 122 Watts											
Well Pump	AM	0.05	0.05	0.05	0.05	0.05	0.05	0.1	0.1	0.1	0.1	0.1	0.1
% Released: 100	PM	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											

# Annual Energy Summary

Title: 8804 Glenville Unit 1 with 20%  
User

TMY City: MD\_BALTIMORE\_BL  
Elec Util: MD 2009  
Gas Util: MD 2008  
Run Date: 03/02/2010 13:53:54

Registration #:

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (12 kBtu/hr)	755 kWh	\$114
Cooling Fan	124 kWh	\$19
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Cooling</b>	<b>879 kWh</b>	<b>\$133</b>
Heating (18 kBtu/hr)	232 Therms	\$362
Heating Fan/Pump	182 kWh	\$28
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Heating</b>	<b>\$390</b>	
Hot Water	256 Therms	\$399
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>		<b>\$399</b>
Ceiling Fans	0 kWh	\$0
Clothes Washer	0 kWh	\$0
Dishwasher	61 kWh	\$9
Dryer	0 kWh	\$0
Lighting	1499 kWh	\$227
Miscellaneous	2516 kWh	\$381
Pool Pump	0 kWh	\$0
Range	38 Therms	\$59
Refrigerator	756 kWh	\$115
<hr/>		
Total (kWh)	5893 kWh	\$893
Total (Therms)	526 Therms	\$820
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
<b>Total Cost</b>		<b>\$1713</b>

## Emissions (Calculated as Total - PV Produced)

SO2	65.03 Lbs.
NOX	20.15 Lbs.
CO2	6.88 Tons

# Building Input Summary Report

PROJECT											
Title:	8804 Glenville Unit 1 with 20		Bedrooms:	1	Address Type:	Street Address					
Building Type:	User		Bathrooms:	1	Lot #						
Owner:			Conditioned Area:	485	SubDivision:						
# of Units:	1		Total Stories:	1	PlatBook:						
Builder Name:	Unit 1 - Existing		Worst Case:	No	Street:						
Permit Office:			Rotate Angle:	0	County:						
Jurisdiction:			Cross Ventilation:		City, State, Zip:						
Family Type:	Multi-family		Whole House Fan:								
New/Existing:	Existing (Projected)										
Comment:											
CLIMATE											
Design Location	Tmy Site		Design Temp	97.5 %	2.5 %	Int Design Temp	Winter	Summer	Heating Degree Days	Design Moisture	Daily Temp Range
MD, BALTIMORE_BLT-WA	MD_BALTIMORE_BLT-WASHNGT		13	91		70	75	4631	37	Medium	
UTILITY RATES											
Fuel	Unit	Utility Name					Monthly Fixed Cost	\$/Unit			
Electricity	kWh	MD 2009					0	0.1516			
Natural Gas	Therm	MD 2008					0	1.56			
Fuel Oil	Gallon	Maryland Default					0	1.1			
Propane	Gallon	Maryland Default					0	1.4			
SURROUNDINGS											
Ornt	Type	Shade Trees		Width	Distance	Exist	Adjacent Buildings				
		Height					Height	Width	Distance		
N	None	0 ft	0 ft	0 ft	0 ft	X	35 ft	40 ft	30 ft		
NE	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
E	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
SE	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
S	None	0 ft	0 ft	0 ft	0 ft	X	35 ft	40 ft	30 ft		
SW	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
W	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
NW	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
FLOORS											
#	Floor Type	Wall Perimeter	Wall Ins. R-Value	Area	Ceiling Ins. R-Value	Tile	Wood	Carpet			
1	Basement Finished			485 ft²		0	0.75	0.25			
ROOF											
#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch		
1	Flat	Gravel	487 ft²	20 ft²	Dark	0.96	No	0	4.8 deg		
ATTIC											
#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC					
1	No attic	Unvented	0	485 ft²	N	N					

# Building Input Summary Report

WALLS												
Wall orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.												
#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Width Ft	In	Height Ft	In	Area	Sheathing R-Value	Framing Fraction	Solar Absor.
1	N	Exterior	Face Brick - Block	0.01	11	8	4		46.67 ft <sup>2</sup>	0	0	0.5
2	E	Neighbor	Face Brick - Block	0.01	41		4		164 ft <sup>2</sup>	0	0	0.75
3	S	Exterior	Face Brick - Block	0.01	11	8	4		46.67 ft <sup>2</sup>	0	0	0.5
4	W	Exterior	Face Brick - Block	0.01	41		4		164 ft <sup>2</sup>	0	0	0.5

DOORS												
#	Ornt	Door Type	Storms	U-Value	Width Ft	In	Height Ft	In	Area			
1	N	Wood	None	0.46	3		6	8	20 ft <sup>2</sup>			
2	W	Insulated	None	0.46	3		6	8	20 ft <sup>2</sup>			

WINDOWS												
#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storm	Area	Overhang Depth	Separation	Interior Shade	Screening
1	S	Vinyl	Double (Clear)	Yes	0.55	0.6	N	12 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
2	W	Vinyl	Double (Clear)	Yes	0.55	0.6	N	12 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
3	W	Vinyl	Double (Clear)	Yes	0.55	0.6	N	4.5 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
4	W	Vinyl	Double (Clear)	Yes	0.55	0.6	N	9 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
5	W	Vinyl	Double (Clear)	Yes	0.55	0.7	N	18 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None

INFILTRATION & VENTING												
Method	SLA	CFM 50	ELA	EqLA	ACH	ACH 50	---- Forced Ventilation ----			Terrain/Wind Shielding		
							Supply	Exhaust	Run Time			
Proposed ACH	0.00110	2793	153.3	288.3	0.900	28.79	0	0	0	Suburban / Suburban		

MASS			
Mass Type	Area	Thickness	Furniture Fraction
No Added Mass	0 ft <sup>2</sup>	0 ft	0.3

COOLING SYSTEM							
#	System Type	Subtype	Efficiency	Capacity	Air Flow	SHR	Ductless
1	Central Unit	None	SEER: 10	12 kBtu/hr	550 cfm	0.75	False

HEATING SYSTEM					
#	System Type	Subtype	Efficiency	Capacity	Ductless
1	Natural Gas Furnace	None	AFUE: 0.8	18 kBtu/hr	False

HOT WATER SYSTEM						
#	System Type	EF	Cap	Use	SetPnt	Credits
1	Natural Gas	0.56	30 gal	53 gal	120 deg	None



# Building Input Summary Report

SOLAR HOT WATER														
Collector Type	Collector		Surface		Absorp. Prod.	Trans Corr.	Tank Volume	Tank U-Value	Tank Surf Area	Heat Exch Eff	PV Pumped	Pump Energy		
	Tilt	Azimuth	Area	Loss Coef.										
DUCTS														
#	Location	---- Supply ----		---- Return ----			Leakage Type	Air Handler	CFM 25	Percent Leakage	QN	RLF		
		R-Value	Area	Location	Area	Number								
1	Interior	6	164 ft²	Interior	41 ft²	(invalid)	Prop. Air Leakage	Interior	21.60 cfm	6.00 %	0.04	0.60		
TEMPERATURES														
Programable Thermostat: Y						Ceiling Fans: N								
Cooling	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec		
Heating	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec		
Venting	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec		
Thermostat Schedule: HERS 2006 Reference														
Schedule Type			1	2	3	4	5	6	7	8	9	10	11	12
Cooling (WD)	AM	78	78	78	78	78	78	78	78	78	80	80	80	80
	PM	80	80	78	78	78	78	78	78	78	78	78	78	78
Cooling (WEH)	AM	78	78	78	78	78	78	78	78	78	78	78	78	78
	PM	78	78	78	78	78	78	78	78	78	78	78	78	78
Heating (WD)	AM	66	66	66	66	66	68	68	68	68	68	68	68	68
	PM	68	68	68	68	68	68	68	68	68	68	68	66	66
Heating (WEH)	AM	66	66	66	66	66	68	68	68	68	68	68	68	68
	PM	68	68	68	68	68	68	68	68	68	68	68	66	66

# Building Input Summary Report

## APPLIANCES & LIGHTING

Appliance Schedule: Glenville2		Hours											
Schedule Type		1	2	3	4	5	6	7	8	9	10	11	12
Ceiling Fans (Summer)	AM	1	1	1	1	1	1	1	0.883	0.409	0.242	0.242	0.242
% Released: 100	PM	0.242	0.242	0.242	0.242	0.295	0.553	0.897	0.897	0.897	1	1	1
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Clothes Washer	AM	0.105	0.081	0.046	0.046	0.081	0.128	0.256	0.57	0.849	1	0.977	0.872
% Released: 0	PM	0.779	0.698	0.605	0.57	0.581	0.57	0.57	0.57	0.57	0.488	0.43	0.198
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Dishwasher	AM	0.139	0.05	0.028	0.024	0.029	0.09	0.169	0.303	0.541	0.594	0.502	0.443
% Released: 0	PM	0.377	0.396	0.335	0.323	0.344	0.448	0.791	1	0.8	0.597	0.383	0.281
Annual Use: 61 kWh/Yr		Peak Value: 19 Watts											
Dryer	AM	0.122	0.073	0.049	0.024	0.049	0.073	0.195	0.39	0.595	0.839	0.961	1
% Released: 0	PM	0.912	0.829	0.746	0.707	0.683	0.668	0.634	0.624	0.644	0.668	0.537	0.293
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Lighting	AM	0.063	0.063	0.063	0.063	0.188	0.391	0.438	0.391	0.172	0.117	0.117	0.117
% Released: 100	PM	0.117	0.117	0.117	0.203	0.438	0.609	0.82	0.984	1	0.688	0.383	0.156
Annual Use: 1498 kWh/Yr		Peak Value: 525 Watts											
Miscellaneous	AM	0.454	0.411	0.393	0.38	0.38	0.429	0.54	0.65	0.663	0.675	0.687	0.699
% Released: 100	PM	0.687	0.663	0.65	0.681	0.804	1	1	0.926	0.89	0.847	0.712	0.577
Annual Use: 2516 kWh/Yr		Peak Value: 436 Watts											
Pool Pump	AM	0	0	0	0	0	0	0	0	0	1	1	1
% Released: 0	PM	1	1	1	1	0	0	0	0	0	0	0	0
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Range	AM	0.047	0.047	0.024	0.024	0.047	0.071	0.165	0.283	0.307	0.321	0.283	0.33
% Released: 0	PM	0.337	0.307	0.292	0.377	0.613	1	0.778	0.401	0.236	0.165	0.104	0.071
Annual Use: 38 Therms/Yr		Peak Value: 2 kBTU/Hr											
Refrigeration	AM	0.57	0.49	0.49	0.46	0.46	0.57	0.76	0.89	0.89	0.82	0.71	0.71
% Released: 0	PM	0.64	0.58	0.58	0.58	0.73	0.59	1	1	0.96	0.96	0.86	0.71
Annual Use: 756 kWh/Yr		Peak Value: 122 Watts											
Well Pump	AM	0.05	0.05	0.05	0.05	0.05	0.05	0.1	0.1	0.1	0.1	0.1	0.1
% Released: 100	PM	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											

# Annual Energy Summary

Title: 8804 Glenville Unit 1 with 34%  
User

TMY City: MD\_BALTIMORE\_BL  
Elec Util: MD 2009  
Gas Util: MD 2008  
Run Date: 03/02/2010 13:05:23

Registration #:

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (12 kBtu/hr)	755 kWh	\$114
Cooling Fan	124 kWh	\$19
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Cooling</b>	<b>879 kWh</b>	<b>\$133</b>
Heating (18 kBtu/hr)	232 Therms	\$362
Heating Fan/Pump	182 kWh	\$28
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Heating</b>	<b>\$390</b>	
Hot Water	114 Therms	\$178
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>		<b>\$178</b>
Ceiling Fans	0 kWh	\$0
Clothes Washer	0 kWh	\$0
Dishwasher	61 kWh	\$9
Dryer	0 kWh	\$0
Lighting	1499 kWh	\$227
Miscellaneous	2516 kWh	\$381
Pool Pump	0 kWh	\$0
Range	38 Therms	\$59
Refrigerator	756 kWh	\$115
<hr/>		
Total (kWh)	5893 kWh	\$893
Total (Therms)	384 Therms	\$599
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		\$1492

## Emissions (Calculated as Total - PV Produced)

SO2	65.03 Lbs.
NOX	18.4 Lbs.
CO2	6.05 Tons

# Building Input Summary Report

PROJECT											
Title:	8804 Glenville Unit 1 with 34		Bedrooms:	1	Address Type:	Street Address					
Building Type:	User		Bathrooms:	1	Lot #						
Owner:			Conditioned Area:	485	SubDivision:						
# of Units:	1		Total Stories:	1	PlatBook:						
Builder Name:	Unit 1 - Existing		Worst Case:	No	Street:						
Permit Office:			Rotate Angle:	0	County:						
Jurisdiction:			Cross Ventilation:		City, State, Zip:						
Family Type:	Multi-family		Whole House Fan:								
New/Existing:	Existing (Projected)										
Comment:											
CLIMATE											
Design Location	Tmy Site		Design Temp	97.5 %	2.5 %	Int Design Temp	Winter	Summer	Heating Degree Days	Design Moisture	Daily Temp Range
MD, BALTIMORE_BLT-WA	MD_BALTIMORE_BLT-WASHNGT		13	91		70	75	4631	37	Medium	
UTILITY RATES											
Fuel	Unit	Utility Name					Monthly Fixed Cost	\$/Unit			
Electricity	kWh	MD 2009					0	0.1516			
Natural Gas	Therm	MD 2008					0	1.56			
Fuel Oil	Gallon	Maryland Default					0	1.1			
Propane	Gallon	Maryland Default					0	1.4			
SURROUNDINGS											
Ornt	Type	Shade Trees		Width	Distance	Exist	Adjacent Buildings				
		Height					Height	Width	Distance		
N	None	0 ft	0 ft	0 ft	0 ft	X	35 ft	40 ft	30 ft		
NE	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
E	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
SE	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
S	None	0 ft	0 ft	0 ft	0 ft	X	35 ft	40 ft	30 ft		
SW	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
W	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
NW	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
FLOORS											
#	Floor Type	Wall Perimeter	Wall Ins. R-Value	Area	Ceiling Ins. R-Value	Tile	Wood	Carpet			
1	Basement Finished			485 ft²		0	0.75	0.25			
ROOF											
#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch		
1	Flat	Gravel	487 ft²	20 ft²	Dark	0.96	No	0	4.8 deg		
ATTIC											
#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC					
1	No attic	Unvented	0	485 ft²	N	N					

# Building Input Summary Report

WALLS												
Wall orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.												
#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Width Ft	In	Height Ft	In	Area	Sheathing R-Value	Framing Fraction	Solar Absor.
1	N	Exterior	Face Brick - Block	0.01	11	8	4		46.67 ft <sup>2</sup>	0	0	0.5
2	E	Neighbor	Face Brick - Block	0.01	41		4		164 ft <sup>2</sup>	0	0	0.75
3	S	Exterior	Face Brick - Block	0.01	11	8	4		46.67 ft <sup>2</sup>	0	0	0.5
4	W	Exterior	Face Brick - Block	0.01	41		4		164 ft <sup>2</sup>	0	0	0.5
DOORS												
#	Ornt	Door Type	Storms	U-Value	Width Ft	In	Height Ft	In	Area			
1	N	Wood	None	0.46	3		6	8	20 ft <sup>2</sup>			
2	W	Insulated	None	0.46	3		6	8	20 ft <sup>2</sup>			
WINDOWS												
#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storm	Area	Overhang Depth	Separation	Interior Shade	Screening
1	S	Vinyl	Double (Clear)	Yes	0.55	0.6	N	12 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
2	W	Vinyl	Double (Clear)	Yes	0.55	0.6	N	12 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
3	W	Vinyl	Double (Clear)	Yes	0.55	0.6	N	4.5 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
4	W	Vinyl	Double (Clear)	Yes	0.55	0.6	N	9 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
5	W	Vinyl	Double (Clear)	Yes	0.55	0.7	N	18 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
INFILTRATION & VENTING												
Method	SLA	CFM 50	ELA	EqLA	ACH	ACH 50	---- Forced Ventilation ----			Terrain/Wind Shielding		
Proposed ACH	0.00110	2793	153.3	288.3	0.900	28.79	Supply	Exhaust	Run Time	Suburban / Suburban		
							0	0	0			
MASS												
Mass Type	Area	Thickness	Furniture Fraction									
No Added Mass	0 ft <sup>2</sup>	0 ft	0.3									
COOLING SYSTEM												
#	System Type	Subtype	Efficiency	Capacity	Air Flow	SHR	Ductless					
1	Central Unit	None	SEER: 10	12 kBtu/hr	550 cfm	0.75	False					
HEATING SYSTEM												
#	System Type	Subtype	Efficiency	Capacity	Ductless							
1	Natural Gas Furnace	None	AFUE: 0.8	18 kBtu/hr	False							
HOT WATER SYSTEM												
#	System Type	EF	Cap	Use	SetPnt	Credits						
1	Natural Gas	0.82	1 gal	53 gal	120 deg	None						

# Building Input Summary Report

SOLAR HOT WATER													
Collector Type	Collector		Surface		Absorp.	Trans	Tank	Tank	Tank	Heat	PV	Pump	
	Tilt	Azimuth	Area	Loss Coef.	Prod.	Corr.	Volume	U-Value	Surf Area	Exch Eff	Pumped	Energy	
<b>DUCTS</b>													
#	Location	---- Supply ----		---- Return ----			Leakage Type	Air Handler	CFM 25	Percent Leakage	QN	RLF	
		R-Value	Area	Location	Area	Number							
1	Interior	6	164 ft <sup>2</sup>	Interior	41 ft <sup>2</sup>	(invalid)	Prop. Air Leakage	Interior	21.60 cfm	6.00 %	0.04	0.60	
<b>TEMPERATURES</b>													
Programable Thermostat: Y				Ceiling Fans: N									
Cooling	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec	
Heating	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec	
Venting	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec	
Thermostat Schedule: HERS 2006 Reference													
Schedule Type		1	2	3	4	5	6	7	8	9	10	11	12
Cooling (WD)	AM	78	78	78	78	78	78	78	78	80	80	80	80
	PM	80	80	78	78	78	78	78	78	78	78	78	78
Cooling (WEH)	AM	78	78	78	78	78	78	78	78	78	78	78	78
	PM	78	78	78	78	78	78	78	78	78	78	78	78
Heating (WD)	AM	66	66	66	66	66	68	68	68	68	68	68	68
	PM	68	68	68	68	68	68	68	68	68	68	66	66
Heating (WEH)	AM	66	66	66	66	66	68	68	68	68	68	68	68
	PM	68	68	68	68	68	68	68	68	68	68	66	66

# Building Input Summary Report

## APPLIANCES & LIGHTING

Appliance Schedule: Glenville2		Hours											
Schedule Type		1	2	3	4	5	6	7	8	9	10	11	12
Ceiling Fans (Summer)	AM	1	1	1	1	1	1	1	0.883	0.409	0.242	0.242	0.242
% Released: 100	PM	0.242	0.242	0.242	0.242	0.295	0.553	0.897	0.897	0.897	1	1	1
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Clothes Washer	AM	0.105	0.081	0.046	0.046	0.081	0.128	0.256	0.57	0.849	1	0.977	0.872
% Released: 0	PM	0.779	0.698	0.605	0.57	0.581	0.57	0.57	0.57	0.57	0.488	0.43	0.198
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Dishwasher	AM	0.139	0.05	0.028	0.024	0.029	0.09	0.169	0.303	0.541	0.594	0.502	0.443
% Released: 0	PM	0.377	0.396	0.335	0.323	0.344	0.448	0.791	1	0.8	0.597	0.383	0.281
Annual Use: 61 kWh/Yr		Peak Value: 19 Watts											
Dryer	AM	0.122	0.073	0.049	0.024	0.049	0.073	0.195	0.39	0.595	0.839	0.961	1
% Released: 0	PM	0.912	0.829	0.746	0.707	0.683	0.668	0.634	0.624	0.644	0.668	0.537	0.293
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Lighting	AM	0.063	0.063	0.063	0.063	0.188	0.391	0.438	0.391	0.172	0.117	0.117	0.117
% Released: 100	PM	0.117	0.117	0.117	0.203	0.438	0.609	0.82	0.984	1	0.688	0.383	0.156
Annual Use: 1498 kWh/Yr		Peak Value: 525 Watts											
Miscellaneous	AM	0.454	0.411	0.393	0.38	0.38	0.429	0.54	0.65	0.663	0.675	0.687	0.699
% Released: 100	PM	0.687	0.663	0.65	0.681	0.804	1	1	0.926	0.89	0.847	0.712	0.577
Annual Use: 2516 kWh/Yr		Peak Value: 436 Watts											
Pool Pump	AM	0	0	0	0	0	0	0	0	0	1	1	1
% Released: 0	PM	1	1	1	1	0	0	0	0	0	0	0	0
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Range	AM	0.047	0.047	0.024	0.024	0.047	0.071	0.165	0.283	0.307	0.321	0.283	0.33
% Released: 0	PM	0.337	0.307	0.292	0.377	0.613	1	0.778	0.401	0.236	0.165	0.104	0.071
Annual Use: 38 Therms/Yr		Peak Value: 2 kBtu/Hr											
Refrigeration	AM	0.57	0.49	0.49	0.46	0.46	0.57	0.76	0.89	0.89	0.82	0.71	0.71
% Released: 0	PM	0.64	0.58	0.58	0.58	0.73	0.59	1	1	0.96	0.96	0.86	0.71
Annual Use: 756 kWh/Yr		Peak Value: 122 Watts											
Well Pump	AM	0.05	0.05	0.05	0.05	0.05	0.05	0.1	0.1	0.1	0.1	0.1	0.1
% Released: 100	PM	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											

# Annual Energy Summary

Title: 8804 Glenville Unit 1 with 43%  
User

TMY City: MD\_BALTIMORE\_BL  
Elec Util: MD 2009  
Gas Util: MD 2008  
Run Date: 03/03/2010 08:50:34

Registration #:

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (12 kBtu/hr)	581 kWh	\$88
Cooling Fan	124 kWh	\$19
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Cooling</b>	<b>705 kWh</b>	<b>\$107</b>
Heating (75 kBtu/hr)	206 Therms	\$321
Heating Fan/Pump	182 kWh	\$28
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Heating</b>	<b>\$349</b>	
Hot Water	114 Therms	\$178
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>		<b>\$178</b>
Ceiling Fans	0 kWh	\$0
Clothes Washer	0 kWh	\$0
Dishwasher	61 kWh	\$9
Dryer	0 kWh	\$0
Lighting	1499 kWh	\$227
Miscellaneous	2516 kWh	\$381
Pool Pump	0 kWh	\$0
Range	38 Therms	\$59
Refrigerator	756 kWh	\$115
<hr/>		
Total (kWh)	5719 kWh	\$867
Total (Therms)	359 Therms	\$558
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		\$1425

## Emissions (Calculated as Total - PV Produced)

SO2	63.11 Lbs.
NOX	17.73 Lbs.
CO2	5.79 Tons



# Building Input Summary Report

PROJECT											
Title:	8804 Glenville Unit 1 with 43		Bedrooms:	1	Address Type:	Street Address					
Building Type:	User		Bathrooms:	1	Lot #						
Owner:			Conditioned Area:	485	SubDivision:						
# of Units:	1		Total Stories:	1	PlatBook:						
Builder Name:	Unit 1 - Existing		Worst Case:	No	Street:						
Permit Office:			Rotate Angle:	0	County:						
Jurisdiction:			Cross Ventilation:		City, State, Zip:						
Family Type:	Multi-family		Whole House Fan:								
New/Existing:	Existing (Projected)										
Comment:											
CLIMATE											
Design Location	Tmy Site		Design Temp	97.5 %	2.5 %	Int Design Temp	Winter	Summer	Heating Degree Days	Design Moisture	Daily Temp Range
MD, BALTIMORE_BLT-WA	MD_BALTIMORE_BLT-WASHNGT		13	91		70	75	4631	37	Medium	
UTILITY RATES											
Fuel	Unit	Utility Name					Monthly Fixed Cost	\$/Unit			
Electricity	kWh	MD 2009					0	0.1516			
Natural Gas	Therm	MD 2008					0	1.56			
Fuel Oil	Gallon	Maryland Default					0	1.1			
Propane	Gallon	Maryland Default					0	1.4			
SURROUNDINGS											
Ornt	Type	Shade Trees		Width	Distance	Exist	Adjacent Buildings				
		Height					Height	Width	Distance		
N	None	0 ft	0 ft	0 ft	0 ft	X	35 ft	40 ft	30 ft		
NE	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
E	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
SE	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
S	None	0 ft	0 ft	0 ft	0 ft	X	35 ft	40 ft	30 ft		
SW	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
W	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
NW	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
FLOORS											
#	Floor Type	Wall Perimeter	Wall Ins. R-Value	Area	Ceiling Ins. R-Value	Tile	Wood	Carpet			
1	Basement Finished			485 ft²		0	0.75	0.25			
ROOF											
#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch		
1	Flat	Gravel	487 ft²	20 ft²	Dark	0.96	No	0	4.8 deg		
ATTIC											
#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC					
1	No attic	Unvented	0	485 ft²	N	N					

# Building Input Summary Report

WALLS												
Wall orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.												
#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Width Ft	In	Height Ft	In	Area	Sheathing R-Value	Framing Fraction	Solar Absor.
1	N	Exterior	Face Brick - Block	0.01	11	8	4		46.67 ft <sup>2</sup>	0	0	0.5
2	E	Neighbor	Face Brick - Block	0.01	41		4		164 ft <sup>2</sup>	0	0	0.75
3	S	Exterior	Face Brick - Block	0.01	11	8	4		46.67 ft <sup>2</sup>	0	0	0.5
4	W	Exterior	Face Brick - Block	0.01	41		4		164 ft <sup>2</sup>	0	0	0.5

DOORS												
#	Ornt	Door Type	Storms	U-Value	Width Ft	In	Height Ft	In	Area			
1	N	Wood	None	0.46	3		6	8	20 ft <sup>2</sup>			
2	W	Insulated	None	0.46	3		6	8	20 ft <sup>2</sup>			

WINDOWS												
#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storm	Area	Overhang Depth	Separation	Interior Shade	Screening
1	S	Vinyl	Double (Clear)	Yes	0.55	0.6	N	12 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
2	W	Vinyl	Double (Clear)	Yes	0.55	0.6	N	12 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
3	W	Vinyl	Double (Clear)	Yes	0.55	0.6	N	4.5 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
4	W	Vinyl	Double (Clear)	Yes	0.55	0.6	N	9 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
5	W	Vinyl	Double (Clear)	Yes	0.55	0.7	N	18 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None

INFILTRATION & VENTING												
Method	SLA	CFM 50	ELA	EqLA	ACH	ACH 50	---- Forced Ventilation ----			Terrain/Wind Shielding		
							Supply	Exhaust	Run Time			
Proposed ACH	0.00110	2793	153.3	288.3	0.900	28.79	0	0	0	Suburban / Suburban		

MASS			
Mass Type	Area	Thickness	Furniture Fraction
No Added Mass	0 ft <sup>2</sup>	0 ft	0.3

COOLING SYSTEM							
#	System Type	Subtype	Efficiency	Capacity	Air Flow	SHR	Ductless
1	Central Unit	None	SEER: 13	12 kBtu/hr	550 cfm	0.75	False

HEATING SYSTEM					
#	System Type	Subtype	Efficiency	Capacity	Ductless
1	Natural Gas Furnace	None	AFUE: 0.9	18 kBtu/hr	False

HOT WATER SYSTEM						
#	System Type	EF	Cap	Use	SetPnt	Credits
1	Natural Gas	0.82	1 gal	53 gal	120 deg	None

# Building Input Summary Report

SOLAR HOT WATER														
Collector Type	Collector		Surface		Absorp.	Trans	Tank	Tank	Tank	Heat	PV	Pump		
	Tilt	Azimuth	Area	Loss Coef.	Prod.	Corr.	Volume	U-Value	Surf Area	Exch Eff	Pumped	Energy		
<b>DUCTS</b>														
#	Location	---- Supply ----		---- Return ----			Leakage Type	Air Handler	CFM 25	Percent Leakage	QN	RLF		
		R-Value	Area	Location	Area	Number								
1	Interior	6	164 ft <sup>2</sup>	Interior	41 ft <sup>2</sup>	(invalid)	Prop. Air Leakage	Interior	21.60 cfm	6.00 %	0.04	0.60		
<b>TEMPERATURES</b>														
Programable Thermostat: Y						Ceiling Fans: N								
Cooling	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec		
Heating	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec		
Venting	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec		
Thermostat Schedule: HERS 2006 Reference														
Schedule Type		Hours												
		1	2	3	4	5	6	7	8	9	10	11	12	
Cooling (WD)	AM	78	78	78	78	78	78	78	78	80	80	80	80	
	PM	80	80	78	78	78	78	78	78	78	78	78	78	
Cooling (WEH)	AM	78	78	78	78	78	78	78	78	78	78	78	78	
	PM	78	78	78	78	78	78	78	78	78	78	78	78	
Heating (WD)	AM	66	66	66	66	66	68	68	68	68	68	68	68	
	PM	68	68	68	68	68	68	68	68	68	68	66	66	
Heating (WEH)	AM	66	66	66	66	66	68	68	68	68	68	68	68	
	PM	68	68	68	68	68	68	68	68	68	68	66	66	

# Building Input Summary Report

## APPLIANCES & LIGHTING

Appliance Schedule: Glenville2		Hours											
Schedule Type		1	2	3	4	5	6	7	8	9	10	11	12
Ceiling Fans (Summer)	AM	1	1	1	1	1	1	1	0.883	0.409	0.242	0.242	0.242
% Released: 100	PM	0.242	0.242	0.242	0.242	0.295	0.553	0.897	0.897	0.897	1	1	1
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Clothes Washer	AM	0.105	0.081	0.046	0.046	0.081	0.128	0.256	0.57	0.849	1	0.977	0.872
% Released: 0	PM	0.779	0.698	0.605	0.57	0.581	0.57	0.57	0.57	0.57	0.488	0.43	0.198
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Dishwasher	AM	0.139	0.05	0.028	0.024	0.029	0.09	0.169	0.303	0.541	0.594	0.502	0.443
% Released: 0	PM	0.377	0.396	0.335	0.323	0.344	0.448	0.791	1	0.8	0.597	0.383	0.281
Annual Use: 61 kWh/Yr		Peak Value: 19 Watts											
Dryer	AM	0.122	0.073	0.049	0.024	0.049	0.073	0.195	0.39	0.595	0.839	0.961	1
% Released: 0	PM	0.912	0.829	0.746	0.707	0.683	0.668	0.634	0.624	0.644	0.668	0.537	0.293
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Lighting	AM	0.063	0.063	0.063	0.063	0.188	0.391	0.438	0.391	0.172	0.117	0.117	0.117
% Released: 100	PM	0.117	0.117	0.117	0.203	0.438	0.609	0.82	0.984	1	0.688	0.383	0.156
Annual Use: 1498 kWh/Yr		Peak Value: 525 Watts											
Miscellaneous	AM	0.454	0.411	0.393	0.38	0.38	0.429	0.54	0.65	0.663	0.675	0.687	0.699
% Released: 100	PM	0.687	0.663	0.65	0.681	0.804	1	1	0.926	0.89	0.847	0.712	0.577
Annual Use: 2516 kWh/Yr		Peak Value: 436 Watts											
Pool Pump	AM	0	0	0	0	0	0	0	0	0	1	1	1
% Released: 0	PM	1	1	1	1	0	0	0	0	0	0	0	0
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Range	AM	0.047	0.047	0.024	0.024	0.047	0.071	0.165	0.283	0.307	0.321	0.283	0.33
% Released: 0	PM	0.337	0.307	0.292	0.377	0.613	1	0.778	0.401	0.236	0.165	0.104	0.071
Annual Use: 38 Therms/Yr		Peak Value: 2 kBTU/Hr											
Refrigeration	AM	0.57	0.49	0.49	0.46	0.46	0.57	0.76	0.89	0.89	0.82	0.71	0.71
% Released: 0	PM	0.64	0.58	0.58	0.58	0.73	0.59	1	1	0.96	0.96	0.86	0.71
Annual Use: 756 kWh/Yr		Peak Value: 122 Watts											
Well Pump	AM	0.05	0.05	0.05	0.05	0.05	0.05	0.1	0.1	0.1	0.1	0.1	0.1
% Released: 100	PM	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											

# Annual Energy Summary

Title: 8804 Glenville Unit 1 with 50%  
User

TMY City: MD\_BALTIMORE\_BL  
Elec Util: MD 2009  
Gas Util: MD 2008  
Run Date: 03/02/2010 13:11:45

Registration #:

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (12 kBtu/hr)	466 kWh	\$71
Cooling Fan	91 kWh	\$14
Mechanical Vent Fan	0 kWh	\$0
<b>Total Cooling</b>	<b>557 kWh</b>	<b>\$85</b>
Heating (18 kBtu/hr)	195 Therms	\$304
Heating Fan/Pump	137 kWh	\$21
Mechanical Vent Fan	0 kWh	\$0
<b>Total Heating</b>	<b>\$325</b>	
Hot Water	114 Therms	\$178
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>	<b>\$178</b>	
Ceiling Fans	0 kWh	\$0
Clothes Washer	0 kWh	\$0
Dishwasher	61 kWh	\$9
Dryer	0 kWh	\$0
Lighting	1499 kWh	\$227
Miscellaneous	2516 kWh	\$381
Pool Pump	0 kWh	\$0
Range	38 Therms	\$59
Refrigerator	756 kWh	\$115
<hr/>		
Total (kWh)	5526 kWh	\$838
Total (Therms)	347 Therms	\$541
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		\$1379

## Emissions (Calculated as Total - PV Produced)

SO2	60.98 Lbs.
NOX	17.15 Lbs.
CO2	5.6 Tons

# Building Input Summary Report

PROJECT											
Title:	8804 Glenville Unit 1 with 50		Bedrooms:	1		Address Type:	Street Address				
Building Type:	User		Bathrooms:	1		Lot #					
Owner:			Conditioned Area:	485		SubDivision:					
# of Units:	1		Total Stories:	1		PlatBook:					
Builder Name:	Unit 1 - Existing		Worst Case:	No		Street:					
Permit Office:			Rotate Angle:	0		County:					
Jurisdiction:			Cross Ventilation:			City, State, Zip:					
Family Type:	Multi-family		Whole House Fan:								
New/Existing:	Existing (Projected)										
Comment:											
CLIMATE											
Design Location	Tmy Site		Design Temp	97.5 %	2.5 %	Int Design Temp	Winter	Summer	Heating Degree Days	Design Moisture	Daily Temp Range
MD, BALTIMORE_BLT-WA	MD_BALTIMORE_BLT-WASHNGT		13	91		70	75	4631	37	Medium	
UTILITY RATES											
Fuel	Unit	Utility Name					Monthly Fixed Cost	\$/Unit			
Electricity	kWh	MD 2009					0	0.1516			
Natural Gas	Therm	MD 2008					0	1.56			
Fuel Oil	Gallon	Maryland Default					0	1.1			
Propane	Gallon	Maryland Default					0	1.4			
SURROUNDINGS											
Ornt	Type	Shade Trees					Adjacent Buildings				
		Height	Width	Distance	Exist	Height	Width	Distance			
N	None	0 ft	0 ft	0 ft	X	35 ft	40 ft	30 ft			
NE	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft			
E	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft			
SE	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft			
S	None	0 ft	0 ft	0 ft	X	35 ft	40 ft	30 ft			
SW	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft			
W	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft			
NW	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft			
FLOORS											
#	Floor Type	Wall Perimeter	Wall Ins. R-Value	Area	Ceiling Ins. R-Value	Tile	Wood	Carpet			
1	Basement Finished			485 ft²		0	0.75	0.25			
ROOF											
#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch		
1	Flat	Gravel	487 ft²	20 ft²	Dark	0.96	No	0	4.8 deg		
ATTIC											
#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC					
1	No attic	Unvented	0	485 ft²	N	N					

# Building Input Summary Report

WALLS												
Wall orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.												
#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Width Ft	In	Height Ft	In	Area	Sheathing R-Value	Framing Fraction	Solar Absor.
1	N	Exterior	Face Brick - Block	0.01	11	8	4		46.67 ft <sup>2</sup>	0	0	0.5
2	E	Neighbor	Face Brick - Block	0.01	41		4		164 ft <sup>2</sup>	0	0	0.75
3	S	Exterior	Face Brick - Block	0.01	11	8	4		46.67 ft <sup>2</sup>	0	0	0.5
4	W	Exterior	Face Brick - Block	0.01	41		4		164 ft <sup>2</sup>	0	0	0.5

DOORS												
#	Ornt	Door Type	Storms	U-Value	Width Ft	In	Height Ft	In	Area			
1	N	Wood	None	0.46	3		6	8	20 ft <sup>2</sup>			
2	W	Insulated	None	0.46	3		6	8	20 ft <sup>2</sup>			

WINDOWS												
#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storm	Area	Overhang Depth	Separation	Interior Shade	Screening
1	S	Vinyl	Double (Clear)	Yes	0.55	0.6	N	12 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
2	W	Vinyl	Double (Clear)	Yes	0.55	0.6	N	12 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
3	W	Vinyl	Double (Clear)	Yes	0.55	0.6	N	4.5 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
4	W	Vinyl	Double (Clear)	Yes	0.55	0.6	N	9 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None
5	W	Vinyl	Double (Clear)	Yes	0.55	0.7	N	18 ft <sup>2</sup>	0 ft 0 in	0 ft 0 in	None	None

INFILTRATION & VENTING												
Method	SLA	CFM 50	ELA	EqLA	ACH	ACH 50	---- Forced Ventilation ----			Run Time	Terrain/Wind Shielding	
							Supply	Exhaust				
Proposed ACH	0.00110	2793	153.3	288.3	0.900	28.79	0	0		0	Suburban / Suburban	

MASS			
Mass Type	Area	Thickness	Furniture Fraction
No Added Mass	0 ft <sup>2</sup>	0 ft	0.3

COOLING SYSTEM							
#	System Type	Subtype	Efficiency	Capacity	Air Flow	SHR	Ductless
1	Central Unit	None	SEER: 16	12 kBtu/hr	550 cfm	0.75	False

HEATING SYSTEM					
#	System Type	Subtype	Efficiency	Capacity	Ductless
1	Natural Gas Furnace	None	AFUE: 0.96	12 kBtu/hr	False

HOT WATER SYSTEM						
#	System Type	EF	Cap	Use	SetPnt	Credits
1	Natural Gas	0.82	1 gal	53 gal	120 deg	None

# Building Input Summary Report

SOLAR HOT WATER													
Collector Type	Collector		Surface		Absorp.	Trans	Tank	Tank	Tank	Heat	PV	Pump	
	Tilt	Azimuth	Area	Loss Coef.	Prod.	Corr.	Volume	U-Value	Surf Area	Exch Eff	Pumped	Energy	
<b>DUCTS</b>													
#	Location	---- Supply ----		---- Return ----			Leakage Type	Air Handler	CFM 25	Percent Leakage	QN	RLF	
		R-Value	Area	Location	Area	Number							
1	Interior	6	164 ft²	Interior	41 ft²	(invalid)	Prop. Air Leakage	Interior	21.60 cfm	6.00 %	0.04	0.60	
<b>TEMPERATURES</b>													
Programable Thermostat: Y						Ceiling Fans: N							
Cooling	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec	
Heating	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec	
Venting	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec	
Thermostat Schedule: HERS 2006 Reference													
Schedule Type		1	2	3	4	5	6	7	8	9	10	11	12
Cooling (WD)	AM PM	78 80	78 80	78 78	78 78	78 78	78 78	78 78	78 78	80 78	80 78	80 78	80 78
Cooling (WEH)	AM PM	78 78	78 78	78 78	78 78	78 78	78 78	78 78	78 78	78 78	78 78	78 78	78 78
Heating (WD)	AM PM	66 68	66 68	66 68	66 68	66 68	68 68	68 68	68 68	68 68	68 68	68 66	68 66
Heating (WEH)	AM PM	66 68	66 68	66 68	66 68	66 68	68 68	68 68	68 68	68 68	68 68	68 66	68 66



# Building Input Summary Report

## APPLIANCES & LIGHTING

Appliance Schedule: Glenville2		Hours											
Schedule Type		1	2	3	4	5	6	7	8	9	10	11	12
Ceiling Fans (Summer)	AM	1	1	1	1	1	1	1	0.883	0.409	0.242	0.242	0.242
% Released: 100	PM	0.242	0.242	0.242	0.242	0.295	0.553	0.897	0.897	0.897	1	1	1
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Clothes Washer	AM	0.105	0.081	0.046	0.046	0.081	0.128	0.256	0.57	0.849	1	0.977	0.872
% Released: 0	PM	0.779	0.698	0.605	0.57	0.581	0.57	0.57	0.57	0.57	0.488	0.43	0.198
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Dishwasher	AM	0.139	0.05	0.028	0.024	0.029	0.09	0.169	0.303	0.541	0.594	0.502	0.443
% Released: 0	PM	0.377	0.396	0.335	0.323	0.344	0.448	0.791	1	0.8	0.597	0.383	0.281
Annual Use: 61 kWh/Yr		Peak Value: 19 Watts											
Dryer	AM	0.122	0.073	0.049	0.024	0.049	0.073	0.195	0.39	0.595	0.839	0.961	1
% Released: 0	PM	0.912	0.829	0.746	0.707	0.683	0.668	0.634	0.624	0.644	0.668	0.537	0.293
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Lighting	AM	0.063	0.063	0.063	0.063	0.188	0.391	0.438	0.391	0.172	0.117	0.117	0.117
% Released: 100	PM	0.117	0.117	0.117	0.203	0.438	0.609	0.82	0.984	1	0.688	0.383	0.156
Annual Use: 1498 kWh/Yr		Peak Value: 525 Watts											
Miscellaneous	AM	0.454	0.411	0.393	0.38	0.38	0.429	0.54	0.65	0.663	0.675	0.687	0.699
% Released: 100	PM	0.687	0.663	0.65	0.681	0.804	1	1	0.926	0.89	0.847	0.712	0.577
Annual Use: 2516 kWh/Yr		Peak Value: 436 Watts											
Pool Pump	AM	0	0	0	0	0	0	0	0	0	1	1	1
% Released: 0	PM	1	1	1	1	0	0	0	0	0	0	0	0
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Range	AM	0.047	0.047	0.024	0.024	0.047	0.071	0.165	0.283	0.307	0.321	0.283	0.33
% Released: 0	PM	0.337	0.307	0.292	0.377	0.613	1	0.778	0.401	0.236	0.165	0.104	0.071
Annual Use: 38 Therms/Yr		Peak Value: 2 kBtu/Hr											
Refrigeration	AM	0.57	0.49	0.49	0.46	0.46	0.57	0.76	0.89	0.89	0.82	0.71	0.71
% Released: 0	PM	0.64	0.58	0.58	0.58	0.73	0.59	1	1	0.96	0.96	0.86	0.71
Annual Use: 756 kWh/Yr		Peak Value: 122 Watts											
Well Pump	AM	0.05	0.05	0.05	0.05	0.05	0.05	0.1	0.1	0.1	0.1	0.1	0.1
% Released: 100	PM	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											



# APPENDIX C ENERGY MODELS

ii. Unit 2

HUD

8804 - UNIT 2

	Required		20%		34%		43%		50%
	Unit 2 Before	Unit 2 Bronze	% Above Reference	Unit 2 Silver	% Above Reference	Unit 2 Gold	% Above Reference	Unit 2 Emerald	% Above Reference
Climate Zone 4:									
e-ratio - 2006 IECC	1.51	1.19		0.93		0.83		0.72	
Finished Floor Area, sq. feet	820	820		820		820		820	
Bedrooms	2	2		2		2		2	
Baths	1	1		1		1		1	
Floor R-value	0			0		0		0	
Whole Wall U-valueB	0.306	0.306		0.306		0.306		0.306	
Flat Ceiling R-value	10	10		10		10		10	
Wall Construction	brick/CMU 6"	brick/CMU 6"		brick/CMU 6"		brick/CMU 6"		brick/CMU 6"	
Wall Area, Ambient, Above Grade	648	648		648		648		648	
Window U-value	0.55	0.55		0.55		0.55		0.55	
Window SHGC	0.60	0.6		0.60		0.60		0.60	
Window Area	56	55.5		59		59		59	
Window Area, % of Floor, CFA	6.77%	6.77%		6.77%		6.77%		6.77%	
Window Area % of Wall	8.56%	8.56%		8.56%		8.56%		8.56%	
Infiltration, ACHnat	1.06	0.74		0.74		0.74		0.74	
Cooling System SEER	13	13		13		15		15	
Cooling Capacity, kBtu/hr	18	18		18		18		18	
Heating System, HSPF, AFUE	7.7	7.7		7.7		9.0		9.0	
Heating Capacity, kBtu/hr	18	18		18		18		18	
DSE (HVAC Design System Efficiency)/Leakage	88.00%	6.0%		6.00%		6.00%		6.0%	
Duct Location	Inside	Inside		Inside		Inside		Inside	
Air Handler Location	Inside	Inside		Inside		Inside		Inside	
Hot Water Use, gallons/day	53	53		53		53		53	
Water Heater Energy Factor,	0.56	0.60		.82 tankless		.82 tankless		.82 tankless	32 sf solar closed loop
Cool Set Point	78	78		78		78		78	
Heat Set Point	68	68		68		68		68	
Programmable Thermostat	No	Yes		Yes		Yes		Yes	
Cooling setback degrees; setback hours	n/a	n/a		n/a		n/a		n/a	
Heating setback degrees; setback hours	n/a	n/a		n/a		n/a		n/a	
<b>ENERGY COST and USAGE:</b>									
Cooling Energy, cost, kWh	163	144		144		121		121	
Heating Energy, cost, therms	480	348		348		307		307	
Heating Energy, cost, kWh	77	58		58		46		46	
Water Heater, cost, therms	399	348		178		178		103	
<b>Subtotal Heating and Cooling (\$)</b>	<b>\$1,119</b>	<b>\$898</b>	<b>19.7%</b>	<b>\$728</b>	<b>34.9%</b>	<b>\$652</b>	<b>41.7%</b>	<b>\$577</b>	<b>48.4%</b>
Dishwasher, cost, kWh	9	9		\$9		\$9		\$9	
Lights, cost, kWh	227	227		\$227		\$227		\$227	
Miscellaneous, cost, kWh	381	381		\$381		\$381		\$381	
Range, cost, therms	59	59		\$59		\$59		\$59	
Refrigerator, cost, kWh	115	115		\$115		\$115		\$115	
<b>Whole House Cost (\$)<sup>A</sup></b>	<b>\$1,910</b>	<b>\$1,689</b>		<b>\$1,519</b>		<b>\$1,443</b>		<b>\$1,368</b>	

<sup>A</sup>May vary due to rounding.

<sup>B</sup>Calculation based on Table 2 of the report.

[Residential Domestic Water Heating](#)

[File Format: Microsoft Excel - View as HTML](#)

The US Department of Energy has revised its efficiency standards for domestic ..... 83, Richmond, 5V40-7, 40 .56, \$126. 84, Richmond, 5V50-2, 50 .55, \$169 ...

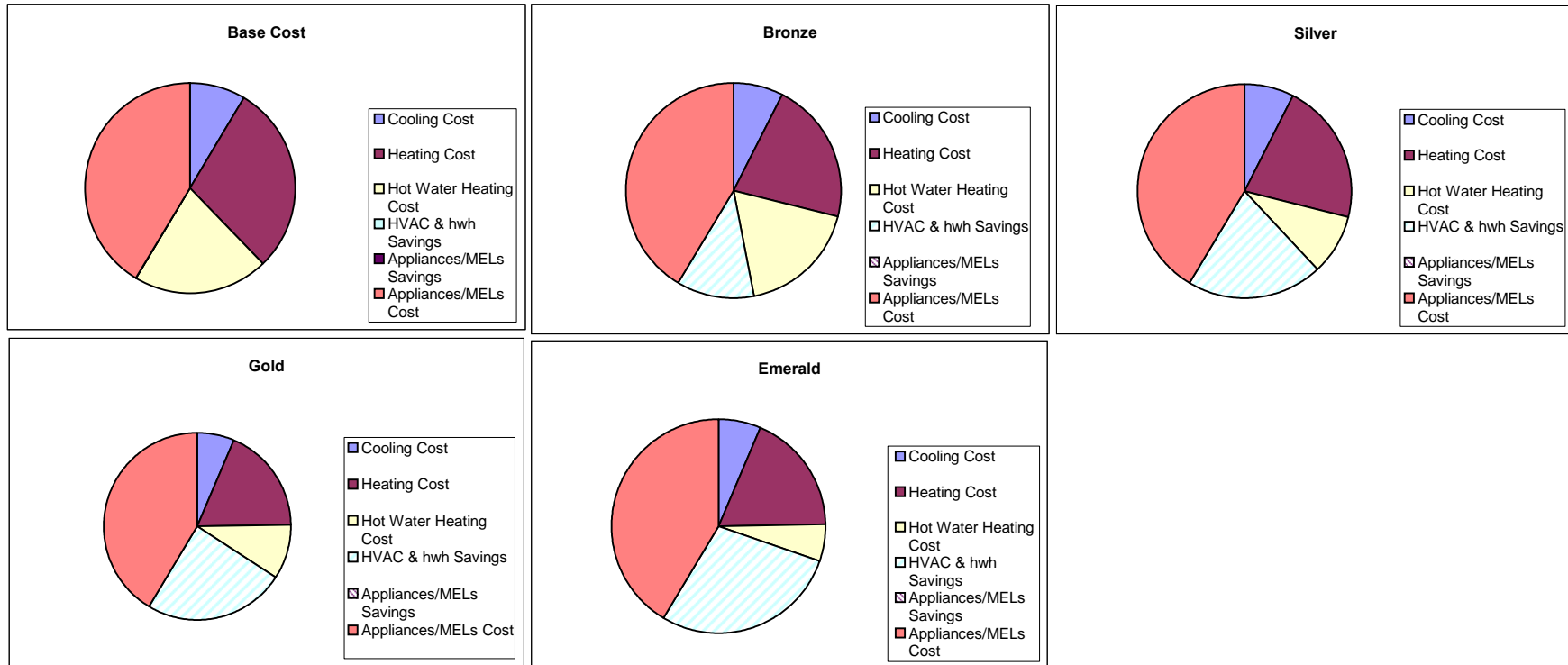
[www.nwcouncil.org/rtr/crd/eligiblemeasures/residential/resdhw.xls](http://www.nwcouncil.org/rtr/crd/eligiblemeasures/residential/resdhw.xls)

Maximum infiltration increase of 30% in 1980 remodels or older

Gaithersburg, Maryland  
Rehab Unit 2

Annual Energy Summary	Base	Bronze			Silver			Gold			Emerald		
	Yr \$	Yr \$	savings	percent	Yr \$	savings	percent	Yr \$	savings	percent	Yr \$	savings	percent
Cooling Cost	163	144	19	12%	144	19	12%	121	42	26%	121	42	26%
Heating Cost	557	406	151	27%	406	151	27%	353	204	37%	353	204	37%
Hot Water Heating Cost	399	348	51	13%	178	221	55%	178	221	55%	103	296	74%
HVAC & hwh Savings	N/A	221			391			467			542		
Appliances/MELs Savings	N/A	0			0			0			0		
Appliances/MELs Cost	791	791			791			791			791		
HVAC & HWH sub-total	1119	898		20%	728		35%	652		42%	577		48%
Grand Total	1910	1689		88%	1519		80%	1443		76%	1368		72%

Data based on Energy Gauge - Annual Energy Summary. Not Compliance



# Annual Energy Summary

Title: 8804 Glenville Unit 2  
User

TMY City: MD\_BALTIMORE\_BL  
Elec Util: MD 2009  
Gas Util: MD 2008  
Run Date: 03/03/2010 08:30:09

Registration #:

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (18 kBtu/hr)	889 kWh	\$135
Cooling Fan	187 kWh	\$28
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Cooling</b>	<b>1076 kWh</b>	<b>\$163</b>
Heating (18 kBtu/hr)	3168 kWh	\$480
Heating Fan/Pump	506 kWh	\$77
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Heating</b>	<b>3674 kWh</b>	<b>\$557</b>
Hot Water	256 Therms	\$399
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>		<b>\$399</b>
Ceiling Fans	0 kWh	\$0
Clothes Washer	0 kWh	\$0
Dishwasher	61 kWh	\$9
Dryer	0 kWh	\$0
Lighting	1499 kWh	\$227
Miscellaneous	2516 kWh	\$381
Pool Pump	0 kWh	\$0
Range	38 Therms	\$59
Refrigerator	756 kWh	\$115
<hr/>		
Total (kWh)	9582 kWh	\$1452
Total (Therms)	294 Therms	\$458
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		\$1910

## Emissions (Calculated as Total - PV Produced)

SO2	105.74 Lbs.
NOX	27.17 Lbs.
CO2	7.91 Tons

# Building Input Summary Report

PROJECT										
Title:	8804 Glenville Unit 2	Bedrooms:	2	Address Type:	Street Address					
Building Type:	User	Bathrooms:	1	Lot #						
Owner:		Conditioned Area:	820	SubDivision:						
# of Units:	1	Total Stories:	1	PlatBook:						
Builder Name:	Unit 3 - Existing	Worst Case:	No	Street:						
Permit Office:		Rotate Angle:	0	County:						
Jurisdiction:		Cross Ventilation:		City, State, Zip:						
Family Type:	Multi-family	Whole House Fan:								
New/Existing:	Existing (Projected)									
Comment:										
CLIMATE										
Design Location	Tmy Site	Design Temp	97.5 %	2.5 %	Int Design Temp	Winter	Summer	Heating Degree Days	Design Moisture	Daily Temp Range
MD, BALTIMORE_BLT-WA	MD_BALTIMORE_BLT-WASHNGT	13	91		70	75	4631	37		Medium
UTILITY RATES										
Fuel	Unit	Utility Name					Monthly Fixed Cost	\$/Unit		
Electricity	kWh	MD 2009					0	0.1516		
Natural Gas	Therm	MD 2008					0	1.56		
Fuel Oil	Gallon	Maryland Default					0	1.1		
Propane	Gallon	Maryland Default					0	1.4		
SURROUNDINGS										
Ornt	Type	Shade Trees			Adjacent Buildings					
		Height	Width	Distance	Exist	Height	Width	Distance		
N	None	0 ft	0 ft	0 ft	X	35 ft	40 ft	30 ft		
NE	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
E	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
SE	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
S	None	0 ft	0 ft	0 ft	X	35 ft	40 ft	30 ft		
SW	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
W	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
NW	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
FLOORS										
#	Floor Type	R-Value		Area	Tile		Wood	Carpet		
1	Raised Floor	60		820 ft²	0		0.75	0.25		
ROOF										
#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch	
1	Flat	Gravel	823 ft²	34 ft²	Dark	0.96	No	10	4.8 deg	
ATTIC										
#	Type	Ventilation	Vent Ratio (1 in)		Area	RBS	IRCC			
1	No attic	Unvented	0		820 ft²	N	N			

# Building Input Summary Report

<b>WALLS</b>												
Wall orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.												
#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Width Ft	In	Height Ft	In	Area	Sheathing R-Value	Framing Fraction	Solar Absor.
1	E	Exterior	Face Brick - Block	0.01	20		8		160 ft <sup>2</sup>	0	0	0.75
2	S	Neighbor	Face Brick - Block	0.01	41		8		328 ft <sup>2</sup>	0	0	0.1
3	W	Exterior	Face Brick - Block	0.01	20		8		160 ft <sup>2</sup>	0	0	0.75
4	N	Exterior	Face Brick - Block	0.01	41		8		328 ft <sup>2</sup>	0	0	0.75

<b>DOORS</b>												
#	Ornt	Door Type	Storms	U-Value	Width Ft	In	Height Ft	In	Area			
1	E	Insulated	None	0.46	3		6	8	20 ft <sup>2</sup>			

<b>WINDOWS</b>												
#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storm	Area	Overhang Depth	Separation	Interior Shade	Screening
1	E	Vinyl	Double (Clear)	Yes	0.55	0.6	N	24 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	None	None
2	W	Vinyl	Double (Clear)	Yes	0.55	0.6	N	24 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	None	None
3	N	Vinyl	Double (Clear)	Yes	0.55	0.6	N	36 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	None	None
4	N	Vinyl	Double (Clear)	Yes	0.55	0.6	N	4.5 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	None	None

<b>INFILTRATION &amp; VENTING</b>												
Method	SLA	CFM 50	ELA	EqLA	ACH	ACH 50	---- Forced Ventilation ----			Terrain/Wind Shielding		
							Supply	Exhaust	Run Time			
Proposed CFM(50)	0.00130	2792	153.3	288.3	1.064	25.54	0	0	0	Suburban / Suburban		

<b>MASS</b>												
Mass Type	Area	Thickness	Furniture Fraction									
No Added Mass	0 ft <sup>2</sup>	0 ft	0.3									

<b>COOLING SYSTEM</b>												
#	System Type	Subtype	Efficiency	Capacity	Air Flow	SHR	Ductless					
1	Central Unit	None	SEER: 13	18 kBtu/hr	540 cfm	0.75	False					

<b>HEATING SYSTEM</b>												
#	System Type	Subtype	Efficiency	Capacity	Ductless							
1	Electric Heat Pump	None	AFUE: 7.7	18 kBtu/hr	False							

<b>HOT WATER SYSTEM</b>												
#	System Type	EF	Cap	Use	SetPnt	Credits						
1	Natural Gas	0.56	30 gal	53 gal	120 deg	None						

# Building Input Summary Report

SOLAR HOT WATER														
Collector Type	Collector		Surface		Absorp.	Trans	Tank	Tank	Tank	Heat	PV	Pump		
	Tilt	Azimuth	Area	Loss Coef.	Prod.	Corr.	Volume	U-Value	Surf Area	Exch Eff	Pumped	Energy		
<b>DUCTS</b>														
#	Location	---- Supply ----		---- Return ----			Leakage Type	Air Handler	Percent		QN	RLF		
		R-Value	Area	Location	Area	Number			CFM 25	Leakage				
1	Interior	6	164 ft <sup>2</sup>	Interior	41 ft <sup>2</sup>	(invalid)	Default Leakage	Interior	(Default)	(Default)				
<b>TEMPERATURES</b>														
Programable Thermostat: Y						Ceiling Fans: N								
Cooling	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec		
Heating	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec		
Venting	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec		
Thermostat Schedule: HERS 2006 Reference														
Schedule Type		1	2	3	4	5	6	7	8	9	10	11	12	
Cooling (WD)	AM	78	78	78	78	78	78	78	78	80	80	80	80	
	PM	80	80	78	78	78	78	78	78	78	78	78	78	
Cooling (WEH)	AM	78	78	78	78	78	78	78	78	78	78	78	78	
	PM	78	78	78	78	78	78	78	78	78	78	78	78	
Heating (WD)	AM	66	66	66	66	66	68	68	68	68	68	68	68	
	PM	68	68	68	68	68	68	68	68	68	68	68	66	66
Heating (WEH)	AM	66	66	66	66	66	68	68	68	68	68	68	68	
	PM	68	68	68	68	68	68	68	68	68	68	68	66	66



# Building Input Summary Report

## APPLIANCES & LIGHTING

Appliance Schedule: Glenville2		Hours											
Schedule Type		1	2	3	4	5	6	7	8	9	10	11	12
Ceiling Fans (Summer)	AM	1	1	1	1	1	1	1	0.883	0.409	0.242	0.242	0.242
% Released: 100	PM	0.242	0.242	0.242	0.242	0.295	0.553	0.897	0.897	0.897	1	1	1
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Clothes Washer	AM	0.105	0.081	0.046	0.046	0.081	0.128	0.256	0.57	0.849	1	0.977	0.872
% Released: 0	PM	0.779	0.698	0.605	0.57	0.581	0.57	0.57	0.57	0.57	0.488	0.43	0.198
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Dishwasher	AM	0.139	0.05	0.028	0.024	0.029	0.09	0.169	0.303	0.541	0.594	0.502	0.443
% Released: 0	PM	0.377	0.396	0.335	0.323	0.344	0.448	0.791	1	0.8	0.597	0.383	0.281
Annual Use: 61 kWh/Yr		Peak Value: 19 Watts											
Dryer	AM	0.122	0.073	0.049	0.024	0.049	0.073	0.195	0.39	0.595	0.839	0.961	1
% Released: 0	PM	0.912	0.829	0.746	0.707	0.683	0.668	0.634	0.624	0.644	0.668	0.537	0.293
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Lighting	AM	0.063	0.063	0.063	0.063	0.188	0.391	0.438	0.391	0.172	0.117	0.117	0.117
% Released: 100	PM	0.117	0.117	0.117	0.203	0.438	0.609	0.82	0.984	1	0.688	0.383	0.156
Annual Use: 1498 kWh/Yr		Peak Value: 525 Watts											
Miscellaneous	AM	0.454	0.411	0.393	0.38	0.38	0.429	0.54	0.65	0.663	0.675	0.687	0.699
% Released: 100	PM	0.687	0.663	0.65	0.681	0.804	1	1	0.926	0.89	0.847	0.712	0.577
Annual Use: 2516 kWh/Yr		Peak Value: 436 Watts											
Pool Pump	AM	0	0	0	0	0	0	0	0	0	1	1	1
% Released: 0	PM	1	1	1	1	0	0	0	0	0	0	0	0
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Range	AM	0.047	0.047	0.024	0.024	0.047	0.071	0.165	0.283	0.307	0.321	0.283	0.33
% Released: 0	PM	0.337	0.307	0.292	0.377	0.613	1	0.778	0.401	0.236	0.165	0.104	0.071
Annual Use: 38 Therms/Yr		Peak Value: 2 kBtu/Hr											
Refrigeration	AM	0.57	0.49	0.49	0.46	0.46	0.57	0.76	0.89	0.89	0.82	0.71	0.71
% Released: 0	PM	0.64	0.58	0.58	0.58	0.73	0.59	1	1	0.96	0.96	0.86	0.71
Annual Use: 756 kWh/Yr		Peak Value: 122 Watts											
Well Pump	AM	0.05	0.05	0.05	0.05	0.05	0.05	0.1	0.1	0.1	0.1	0.1	0.1
% Released: 100	PM	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											

# Annual Energy Summary

Title: 8804 Glenville Unit 2 with 20%  
User

TMY City: MD\_BALTIMORE\_BL  
Elec Util: MD 2009  
Gas Util: MD 2008  
Run Date: 03/02/2010 15:43:10

Registration #:

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (18 kBtu/hr)	787 kWh	\$119
Cooling Fan	167 kWh	\$25
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Cooling</b>	<b>954 kWh</b>	<b>\$144</b>
Heating (18 kBtu/hr)	2293 kWh	\$348
Heating Fan/Pump	380 kWh	\$58
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Heating</b>	<b>2673 kWh</b>	<b>\$406</b>
Hot Water	223 Therms	\$348
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>		<b>\$348</b>
Ceiling Fans	0 kWh	\$0
Clothes Washer	0 kWh	\$0
Dishwasher	61 kWh	\$9
Dryer	0 kWh	\$0
Lighting	1499 kWh	\$227
Miscellaneous	2516 kWh	\$381
Pool Pump	0 kWh	\$0
Range	38 Therms	\$59
Refrigerator	756 kWh	\$115
<hr/>		
Total (kWh)	8459 kWh	\$1282
Total (Therms)	261 Therms	\$407
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		\$1689

## Emissions (Calculated as Total - PV Produced)

SO2	93.35 Lbs.
NOX	23.98 Lbs.
CO2	6.99 Tons

# Building Input Summary Report

PROJECT											
Title:	8804 Glenville Unit 2 with 20		Bedrooms:	2	Address Type:	Street Address					
Building Type:	User		Bathrooms:	1	Lot #						
Owner:			Conditioned Area:	820	SubDivision:						
# of Units:	1		Total Stories:	1	PlatBook:						
Builder Name:	Unit 2 - Existing		Worst Case:	No	Street:						
Permit Office:			Rotate Angle:	0	County:						
Jurisdiction:			Cross Ventilation:		City, State, Zip:						
Family Type:	Multi-family		Whole House Fan:								
New/Existing:	Existing (Projected)										
Comment:											
CLIMATE											
Design Location	Tmy Site		Design Temp	97.5 %	2.5 %	Int Design Temp	Winter	Summer	Heating Degree Days	Design Moisture	Daily Temp Range
MD, BALTIMORE_BLT-WA	MD_BALTIMORE_BLT-WASHNGT		13	91		70	75	4631	37	Medium	
UTILITY RATES											
Fuel	Unit	Utility Name					Monthly Fixed Cost				
Electricity	kWh	MD 2009					0	0.1516			
Natural Gas	Therm	MD 2008					0	1.56			
Fuel Oil	Gallon	Maryland Default					0	1.1			
Propane	Gallon	Maryland Default					0	1.4			
SURROUNDINGS											
Ornt	Type	Shade Trees		Width	Distance	Exist	Adjacent Buildings				
		Height					Height	Width	Distance		
N	None	0 ft	0 ft	0 ft	0 ft	X	35 ft	40 ft	30 ft		
NE	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
E	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
SE	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
S	None	0 ft	0 ft	0 ft	0 ft	X	35 ft	40 ft	30 ft		
SW	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
W	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
NW	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
FLOORS											
#	Floor Type			R-Value	Area			Tile	Wood	Carpet	
1	Raised Floor			60	820 ft²			0	0.75	0.25	
ROOF											
#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch		
1	Flat	Gravel	823 ft²	34 ft²	Dark	0.96	No	10	4.8 deg		
ATTIC											
#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC					
1	No attic	Unvented	0	820 ft²	N	N					

# Building Input Summary Report

WALLS												
Wall orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.												
#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Width Ft	In	Height Ft	In	Area	Sheathing R-Value	Framing Fraction	Solar Absor.
1	E	Exterior	Face Brick - Block	0.01	20		8		160 ft <sup>2</sup>	0	0	0.75
2	S	Neighbor	Face Brick - Block	0.01	41		8		328 ft <sup>2</sup>	0	0	0.1
3	W	Exterior	Face Brick - Block	0.01	20		8		160 ft <sup>2</sup>	0	0	0.75
4	N	Exterior	Face Brick - Block	0.01	41		8		328 ft <sup>2</sup>	0	0	0.75

DOORS												
#	Ornt	Door Type	Storms	U-Value	Width Ft	In	Height Ft	In	Area			
1	E	Insulated	None	0.46	3		6	8	20 ft <sup>2</sup>			

WINDOWS												
#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storm	Area	Overhang Depth	Separation	Interior Shade	Screening
1	E	Vinyl	Double (Clear)	Yes	0.55	0.6	N	24 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	None	None
2	W	Vinyl	Double (Clear)	Yes	0.55	0.6	N	24 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	None	None
3	N	Vinyl	Double (Clear)	Yes	0.55	0.6	N	36 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	None	None
4	N	Vinyl	Double (Clear)	Yes	0.55	0.6	N	4.5 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	None	None

INFILTRATION & VENTING												
Method	SLA	CFM 50	ELA	EqLA	ACH	ACH 50	---- Forced Ventilation ----			Terrain/Wind Shielding		
							Supply	Exhaust	Run Time			
Proposed ACH	0.00090	1941	106.6	200.4	0.740	17.75	0	0	0	Suburban / Suburban		

MASS												
Mass Type	Area	Thickness	Furniture Fraction									
No Added Mass	0 ft <sup>2</sup>	0 ft	0.3									

COOLING SYSTEM												
#	System Type	Subtype	Efficiency	Capacity	Air Flow	SHR	Ductless					
1	Central Unit	None	SEER: 13	18 kBtu/hr	540 cfm	0.75	False					

HEATING SYSTEM												
#	System Type	Subtype	Efficiency	Capacity	Ductless							
1	Electric Heat Pump	None	AFUE: 7.7	18 kBtu/hr	False							

HOT WATER SYSTEM												
#	System Type	EF	Cap	Use	SetPnt	Credits						
1	Natural Gas	0.6	30 gal	53 gal	120 deg	None						

# Building Input Summary Report

SOLAR HOT WATER													
Collector Type	Collector		Surface		Absorp. Prod.	Trans Corr.	Tank Volume	Tank U-Value	Tank Surf Area	Heat Exch Eff	PV Pumped	Pump Energy	
	Tilt	Azimuth	Area	Loss Coef.									
DUCTS													
#	Location	--- Supply ---		--- Return ---			Leakage Type	Air Handler	CFM 25	Percent Leakage	QN	RLF	
		R-Value	Area	Location	Area	Number							
1	Interior	6	164 ft <sup>2</sup>	Interior	41 ft <sup>2</sup>	(invalid)	Prop. Air Leakage	Interior	32.40 cfm	6.00 %	0.04	0.60	
TEMPERATURES													
Programable Thermostat: Y						Ceiling Fans: N							
Cooling	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec	
Heating	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec	
Venting	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec	
Thermostat Schedule: HERS 2006 Reference													
Schedule Type	Hours												
		1	2	3	4	5	6	7	8	9	10	11	12
Cooling (WD)	AM	78	78	78	78	78	78	78	78	80	80	80	80
	PM	80	80	78	78	78	78	78	78	78	78	78	78
Cooling (WEH)	AM	78	78	78	78	78	78	78	78	78	78	78	78
	PM	78	78	78	78	78	78	78	78	78	78	78	78
Heating (WD)	AM	66	66	66	66	66	68	68	68	68	68	68	68
	PM	68	68	68	68	68	68	68	68	68	68	66	66
Heating (WEH)	AM	66	66	66	66	66	68	68	68	68	68	68	68
	PM	68	68	68	68	68	68	68	68	68	68	66	66

# Building Input Summary Report

## APPLIANCES & LIGHTING

Appliance Schedule: Glenville2		Hours											
Schedule Type		1	2	3	4	5	6	7	8	9	10	11	12
Ceiling Fans (Summer)	AM	1	1	1	1	1	1	1	0.883	0.409	0.242	0.242	0.242
% Released: 100	PM	0.242	0.242	0.242	0.242	0.295	0.553	0.897	0.897	0.897	1	1	1
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Clothes Washer	AM	0.105	0.081	0.046	0.046	0.081	0.128	0.256	0.57	0.849	1	0.977	0.872
% Released: 0	PM	0.779	0.698	0.605	0.57	0.581	0.57	0.57	0.57	0.57	0.488	0.43	0.198
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Dishwasher	AM	0.139	0.05	0.028	0.024	0.029	0.09	0.169	0.303	0.541	0.594	0.502	0.443
% Released: 0	PM	0.377	0.396	0.335	0.323	0.344	0.448	0.791	1	0.8	0.597	0.383	0.281
Annual Use: 61 kWh/Yr		Peak Value: 19 Watts											
Dryer	AM	0.122	0.073	0.049	0.024	0.049	0.073	0.195	0.39	0.595	0.839	0.961	1
% Released: 0	PM	0.912	0.829	0.746	0.707	0.683	0.668	0.634	0.624	0.644	0.668	0.537	0.293
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Lighting	AM	0.063	0.063	0.063	0.063	0.188	0.391	0.438	0.391	0.172	0.117	0.117	0.117
% Released: 100	PM	0.117	0.117	0.117	0.203	0.438	0.609	0.82	0.984	1	0.688	0.383	0.156
Annual Use: 1498 kWh/Yr		Peak Value: 525 Watts											
Miscellaneous	AM	0.454	0.411	0.393	0.38	0.38	0.429	0.54	0.65	0.663	0.675	0.687	0.699
% Released: 100	PM	0.687	0.663	0.65	0.681	0.804	1	1	0.926	0.89	0.847	0.712	0.577
Annual Use: 2516 kWh/Yr		Peak Value: 436 Watts											
Pool Pump	AM	0	0	0	0	0	0	0	0	0	1	1	1
% Released: 0	PM	1	1	1	1	0	0	0	0	0	0	0	0
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Range	AM	0.047	0.047	0.024	0.024	0.047	0.071	0.165	0.283	0.307	0.321	0.283	0.33
% Released: 0	PM	0.337	0.307	0.292	0.377	0.613	1	0.778	0.401	0.236	0.165	0.104	0.071
Annual Use: 38 Therms/Yr		Peak Value: 2 kBtu/Hr											
Refrigeration	AM	0.57	0.49	0.49	0.46	0.46	0.57	0.76	0.89	0.89	0.82	0.71	0.71
% Released: 0	PM	0.64	0.58	0.58	0.58	0.73	0.59	1	1	0.96	0.96	0.86	0.71
Annual Use: 756 kWh/Yr		Peak Value: 122 Watts											
Well Pump	AM	0.05	0.05	0.05	0.05	0.05	0.05	0.1	0.1	0.1	0.1	0.1	0.1
% Released: 100	PM	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											

# Annual Energy Summary

Title: 8804 Glenville Unit 2 with 34%  
User

TMY City: MD\_BALTIMORE\_BL  
Elec Util: MD 2009  
Gas Util: MD 2008  
Run Date: 03/02/2010 15:44:38

Registration #:

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (18 kBtu/hr)	787 kWh	\$119
Cooling Fan	167 kWh	\$25
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Cooling</b>	<b>954 kWh</b>	<b>\$144</b>
Heating (18 kBtu/hr)	2293 kWh	\$348
Heating Fan/Pump	380 kWh	\$58
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Heating</b>	<b>2673 kWh</b>	<b>\$406</b>
Hot Water	114 Therms	\$178
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>		<b>\$178</b>
Ceiling Fans	0 kWh	\$0
Clothes Washer	0 kWh	\$0
Dishwasher	61 kWh	\$9
Dryer	0 kWh	\$0
Lighting	1499 kWh	\$227
Miscellaneous	2516 kWh	\$381
Pool Pump	0 kWh	\$0
Range	38 Therms	\$59
Refrigerator	756 kWh	\$115
<hr/>		
Total (kWh)	8459 kWh	\$1282
Total (Therms)	152 Therms	\$237
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		\$1519

## Emissions (Calculated as Total - PV Produced)

SO2	93.35 Lbs.
NOX	22.64 Lbs.
CO2	6.36 Tons

# Building Input Summary Report

PROJECT											
Title:	8804 Glenville Unit 2 with 34		Bedrooms:	2		Address Type:	Street Address				
Building Type:	User		Bathrooms:	1		Lot #					
Owner:			Conditioned Area:	820		SubDivision:					
# of Units:	1		Total Stories:	1		PlatBook:					
Builder Name:	Unit 2 - Existing		Worst Case:	No		Street:					
Permit Office:			Rotate Angle:	0		County:					
Jurisdiction:			Cross Ventilation:			City, State, Zip:					
Family Type:	Multi-family		Whole House Fan:								
New/Existing:	Existing (Projected)										
Comment:											
CLIMATE											
Design Location	Tmy Site		Design Temp	97.5 %	2.5 %	Int Design Temp	Winter	Summer	Heating Degree Days	Design Moisture	Daily Temp Range
MD, BALTIMORE_BLT-WA	MD_BALTIMORE_BLT-WASHNGT		13	91		70	75	4631	37	Medium	
UTILITY RATES											
Fuel	Unit	Utility Name					Monthly Fixed Cost	\$/Unit			
Electricity	kWh	MD 2009					0	0.1516			
Natural Gas	Therm	MD 2008					0	1.56			
Fuel Oil	Gallon	Maryland Default					0	1.1			
Propane	Gallon	Maryland Default					0	1.4			
SURROUNDINGS											
Ornt	Type	Shade Trees		Width	Distance	Exist	Adjacent Buildings				
		Height					Height	Width	Distance		
N	None	0 ft	0 ft	0 ft	0 ft	X	35 ft	40 ft	30 ft		
NE	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
E	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
SE	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
S	None	0 ft	0 ft	0 ft	0 ft	X	35 ft	40 ft	30 ft		
SW	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
W	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
NW	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
FLOORS											
#	Floor Type			R-Value	Area			Tile	Wood	Carpet	
1	Raised Floor			60	820 ft²			0	0.75	0.25	
ROOF											
#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch		
1	Flat	Gravel	823 ft²	34 ft²	Dark	0.96	No	10	4.8 deg		
ATTIC											
#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC					
1	No attic	Unvented	0	820 ft²	N	N					



# Building Input Summary Report

<b>WALLS</b>												
Wall orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.												
#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Width Ft	In	Height Ft	In	Area	Sheathing R-Value	Framing Fraction	Solar Absor.
1	E	Exterior	Face Brick - Block	0.01	20		8		160 ft <sup>2</sup>	0	0	0.75
2	S	Neighbor	Face Brick - Block	0.01	41		8		328 ft <sup>2</sup>	0	0	0.1
3	W	Exterior	Face Brick - Block	0.01	20		8		160 ft <sup>2</sup>	0	0	0.75
4	N	Exterior	Face Brick - Block	0.01	41		8		328 ft <sup>2</sup>	0	0	0.75
<b>DOORS</b>												
#	Ornt	Door Type	Storms	U-Value	Width Ft	In	Height Ft	In	Area			
1	E	Insulated	None	0.46	3		6	8	20 ft <sup>2</sup>			
<b>WINDOWS</b>												
#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storm	Area	Overhang Depth	Separation	Interior Shade	Screening
1	E	Vinyl	Double (Clear)	Yes	0.55	0.6	N	24 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	None	None
2	W	Vinyl	Double (Clear)	Yes	0.55	0.6	N	24 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	None	None
3	N	Vinyl	Double (Clear)	Yes	0.55	0.6	N	36 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	None	None
4	N	Vinyl	Double (Clear)	Yes	0.55	0.6	N	4.5 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	None	None
<b>INFILTRATION &amp; VENTING</b>												
Method	SLA	CFM 50	ELA	EqLA	ACH	ACH 50	---- Forced Ventilation ----			Terrain/Wind Shielding		
Proposed ACH	0.00090	1941	106.6	200.4	0.740	17.75	Supply	Exhaust	Run Time	Suburban / Suburban		
							0	0	0			
<b>MASS</b>												
Mass Type	Area	Thickness	Furniture Fraction									
No Added Mass	0 ft <sup>2</sup>	0 ft	0.3									
<b>COOLING SYSTEM</b>												
#	System Type	Subtype	Efficiency	Capacity	Air Flow	SHR	Ductless					
1	Central Unit	None	SEER: 13	18 kBtu/hr	540 cfm	0.75	False					
<b>HEATING SYSTEM</b>												
#	System Type	Subtype	Efficiency	Capacity	Ductless							
1	Electric Heat Pump	None	AFUE: 7.7	18 kBtu/hr	False							
<b>HOT WATER SYSTEM</b>												
#	System Type	EF	Cap	Use	SetPnt	Credits						
1	Natural Gas	0.82	1 gal	53 gal	120 deg	None						

# Building Input Summary Report

SOLAR HOT WATER														
Collector Type	Collector		Surface		Absorp.	Trans	Tank	Tank	Tank	Heat	PV	Pump		
	Tilt	Azimuth	Area	Loss Coef.	Prod.	Corr.	Volume	U-Value	Surf Area	Exch Eff	Pumped	Energy		
DUCTS														
#	Location	---- Supply ----		---- Return ----			Leakage Type	Air Handler	CFM 25	Percent Leakage	QN	RLF		
		R-Value	Area	Location	Area	Number								
1	Interior	6	164 ft²	Interior	41 ft²	(invalid)	Prop. Air Leakage	Interior	32.40 cfm	6.00 %	0.04	0.60		
TEMPERATURES														
Programable Thermostat: Y						Ceiling Fans: N								
Cooling	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec		
Heating	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec		
Venting	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec		
Thermostat Schedule: HERS 2006 Reference														
Schedule Type		Hours												
		1	2	3	4	5	6	7	8	9	10	11	12	
Cooling (WD)	AM	78	78	78	78	78	78	78	78	80	80	80	80	
	PM	80	80	78	78	78	78	78	78	78	78	78	78	
Cooling (WEH)	AM	78	78	78	78	78	78	78	78	78	78	78	78	
	PM	78	78	78	78	78	78	78	78	78	78	78	78	
Heating (WD)	AM	66	66	66	66	66	68	68	68	68	68	68	68	
	PM	68	68	68	68	68	68	68	68	68	68	66	66	
Heating (WEH)	AM	66	66	66	66	66	68	68	68	68	68	68	68	
	PM	68	68	68	68	68	68	68	68	68	68	66	66	

# Building Input Summary Report

## APPLIANCES & LIGHTING

Appliance Schedule: Glenville2		Hours											
Schedule Type		1	2	3	4	5	6	7	8	9	10	11	12
Ceiling Fans (Summer)	AM	1	1	1	1	1	1	1	0.883	0.409	0.242	0.242	0.242
% Released: 100	PM	0.242	0.242	0.242	0.242	0.295	0.553	0.897	0.897	0.897	1	1	1
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Clothes Washer	AM	0.105	0.081	0.046	0.046	0.081	0.128	0.256	0.57	0.849	1	0.977	0.872
% Released: 0	PM	0.779	0.698	0.605	0.57	0.581	0.57	0.57	0.57	0.57	0.488	0.43	0.198
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Dishwasher	AM	0.139	0.05	0.028	0.024	0.029	0.09	0.169	0.303	0.541	0.594	0.502	0.443
% Released: 0	PM	0.377	0.396	0.335	0.323	0.344	0.448	0.791	1	0.8	0.597	0.383	0.281
Annual Use: 61 kWh/Yr		Peak Value: 19 Watts											
Dryer	AM	0.122	0.073	0.049	0.024	0.049	0.073	0.195	0.39	0.595	0.839	0.961	1
% Released: 0	PM	0.912	0.829	0.746	0.707	0.683	0.668	0.634	0.624	0.644	0.668	0.537	0.293
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Lighting	AM	0.063	0.063	0.063	0.063	0.188	0.391	0.438	0.391	0.172	0.117	0.117	0.117
% Released: 100	PM	0.117	0.117	0.117	0.203	0.438	0.609	0.82	0.984	1	0.688	0.383	0.156
Annual Use: 1498 kWh/Yr		Peak Value: 525 Watts											
Miscellaneous	AM	0.454	0.411	0.393	0.38	0.38	0.429	0.54	0.65	0.663	0.675	0.687	0.699
% Released: 100	PM	0.687	0.663	0.65	0.681	0.804	1	1	0.926	0.89	0.847	0.712	0.577
Annual Use: 2516 kWh/Yr		Peak Value: 436 Watts											
Pool Pump	AM	0	0	0	0	0	0	0	0	0	1	1	1
% Released: 0	PM	1	1	1	1	0	0	0	0	0	0	0	0
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Range	AM	0.047	0.047	0.024	0.024	0.047	0.071	0.165	0.283	0.307	0.321	0.283	0.33
% Released: 0	PM	0.337	0.307	0.292	0.377	0.613	1	0.778	0.401	0.236	0.165	0.104	0.071
Annual Use: 38 Therms/Yr		Peak Value: 2 kBtu/Hr											
Refrigeration	AM	0.57	0.49	0.49	0.46	0.46	0.57	0.76	0.89	0.89	0.82	0.71	0.71
% Released: 0	PM	0.64	0.58	0.58	0.58	0.73	0.59	1	1	0.96	0.96	0.86	0.71
Annual Use: 756 kWh/Yr		Peak Value: 122 Watts											
Well Pump	AM	0.05	0.05	0.05	0.05	0.05	0.05	0.1	0.1	0.1	0.1	0.1	0.1
% Released: 100	PM	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											

# Annual Energy Summary

Title: 8804 Glenville Unit 2 with 43%  
User

TMY City: MD\_BALTIMORE\_BL  
Elec Util: MD 2009  
Gas Util: MD 2008  
Run Date: 03/02/2010 15:46:09

Registration #:

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (18 kBtu/hr)	673 kWh	\$102
Cooling Fan	123 kWh	\$19
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Cooling</b>	<b>796 kWh</b>	<b>\$121</b>
Heating (18 kBtu/hr)	2026 kWh	\$307
Heating Fan/Pump	304 kWh	\$46
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Heating</b>	<b>2330 kWh</b>	<b>\$353</b>
Hot Water	114 Therms	\$178
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>		<b>\$178</b>
Ceiling Fans	0 kWh	\$0
Clothes Washer	0 kWh	\$0
Dishwasher	61 kWh	\$9
Dryer	0 kWh	\$0
Lighting	1499 kWh	\$227
Miscellaneous	2516 kWh	\$381
Pool Pump	0 kWh	\$0
Range	38 Therms	\$59
Refrigerator	756 kWh	\$115
<hr/>		
Total (kWh)	7958 kWh	\$1206
Total (Therms)	152 Therms	\$237
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		\$1443

## Emissions (Calculated as Total - PV Produced)

SO2	87.82 Lbs.
NOX	21.4 Lbs.
CO2	6.03 Tons

# Building Input Summary Report

PROJECT											
Title:	8804 Glenville Unit 2 with 43		Bedrooms:	2		Address Type:	Street Address				
Building Type:	User		Bathrooms:	1		Lot #					
Owner:			Conditioned Area:	820		SubDivision:					
# of Units:	1		Total Stories:	1		PlatBook:					
Builder Name:	Unit 2 - Existing		Worst Case:	No		Street:					
Permit Office:			Rotate Angle:	0		County:					
Jurisdiction:			Cross Ventilation:			City, State, Zip:					
Family Type:	Multi-family		Whole House Fan:								
New/Existing:	Existing (Projected)										
Comment:											
CLIMATE											
Design Location	Tmy Site		Design Temp	97.5 %	2.5 %	Int Design Temp	Winter	Summer	Heating Degree Days	Design Moisture	Daily Temp Range
MD, BALTIMORE_BLT-WA	MD_BALTIMORE_BLT-WASHNGT		13	91		70	75	4631	37	Medium	
UTILITY RATES											
Fuel	Unit	Utility Name					Monthly Fixed Cost	\$/Unit			
Electricity	kWh	MD 2009					0	0.1516			
Natural Gas	Therm	MD 2008					0	1.56			
Fuel Oil	Gallon	Maryland Default					0	1.1			
Propane	Gallon	Maryland Default					0	1.4			
SURROUNDINGS											
Ornt	Type	Shade Trees		Width	Distance	Exist	Adjacent Buildings				
		Height					Height	Width	Distance		
N	None	0 ft	0 ft	0 ft	0 ft	X	35 ft	40 ft	30 ft		
NE	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
E	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
SE	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
S	None	0 ft	0 ft	0 ft	0 ft	X	35 ft	40 ft	30 ft		
SW	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
W	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
NW	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
FLOORS											
#	Floor Type			R-Value	Area			Tile	Wood	Carpet	
1	Raised Floor			60	820 ft²			0	0.75	0.25	
ROOF											
#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch		
1	Flat	Gravel	823 ft²	34 ft²	Dark	0.96	No	10	4.8 deg		
ATTIC											
#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC					
1	No attic	Unvented	0	820 ft²	N	N					

# Building Input Summary Report

<b>WALLS</b>												
Wall orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.												
#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Width Ft	In	Height Ft	In	Area	Sheathing R-Value	Framing Fraction	Solar Absor.
1	E	Exterior	Face Brick - Block	0.01	20		8		160 ft <sup>2</sup>	0	0	0.75
2	S	Neighbor	Face Brick - Block	0.01	41		8		328 ft <sup>2</sup>	0	0	0.1
3	W	Exterior	Face Brick - Block	0.01	20		8		160 ft <sup>2</sup>	0	0	0.75
4	N	Exterior	Face Brick - Block	0.01	41		8		328 ft <sup>2</sup>	0	0	0.75

<b>DOORS</b>												
#	Ornt	Door Type	Storms	U-Value	Width Ft	In	Height Ft	In	Area			
1	E	Insulated	None	0.46	3		6	8	20 ft <sup>2</sup>			

<b>WINDOWS</b>												
#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storm	Area	Overhang Depth	Separation	Interior Shade	Screening
1	E	Vinyl	Double (Clear)	Yes	0.55	0.6	N	24 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	None	None
2	W	Vinyl	Double (Clear)	Yes	0.55	0.6	N	24 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	None	None
3	N	Vinyl	Double (Clear)	Yes	0.55	0.6	N	36 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	None	None
4	N	Vinyl	Double (Clear)	Yes	0.55	0.6	N	4.5 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	None	None

<b>INFILTRATION &amp; VENTING</b>												
Method	SLA	CFM 50	ELA	EqLA	ACH	ACH 50	---- Forced Ventilation ----			Terrain/Wind Shielding		
							Supply	Exhaust	Run Time			
Proposed ACH	0.00090	1941	106.6	200.4	0.740	17.75	0	0	0	Suburban / Suburban		

<b>MASS</b>												
Mass Type	Area	Thickness	Furniture Fraction									
No Added Mass	0 ft <sup>2</sup>	0 ft	0.3									

<b>COOLING SYSTEM</b>												
#	System Type	Subtype	Efficiency	Capacity	Air Flow	SHR	Ductless					
1	Central Unit	None	SEER: 15	18 kBtu/hr	540 cfm	0.75	False					

<b>HEATING SYSTEM</b>												
#	System Type	Subtype	Efficiency	Capacity	Ductless							
1	Electric Heat Pump	None	AFUE: 9	18 kBtu/hr	False							

<b>HOT WATER SYSTEM</b>												
#	System Type	EF	Cap	Use	SetPnt	Credits						
1	Natural Gas	0.82	1 gal	53 gal	120 deg	None						

# Building Input Summary Report

SOLAR HOT WATER														
Collector Type	Collector		Surface		Absorp. Prod.	Trans Corr.	Tank Volume	Tank U-Value	Tank Surf Area	Heat Exch Eff	PV Pumped	Pump Energy		
	Tilt	Azimuth	Area	Loss Coef.										
DUCTS														
#	Location	---- Supply ----		---- Return ----			Leakage Type	Air Handler	CFM 25	Percent Leakage	QN	RLF		
		R-Value	Area	Location	Area	Number								
1	Interior	6	164 ft²	Interior	41 ft²	(invalid)	Prop. Air Leakage	Interior	32.40 cfm	6.00 %	0.04	0.60		
TEMPERATURES														
Programable Thermostat: Y						Ceiling Fans: N								
Cooling	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec		
Heating	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec		
Venting	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec		
Thermostat Schedule: HERS 2006 Reference														
Schedule Type	Hours													
		1	2	3	4	5	6	7	8	9	10	11	12	
Cooling (WD)	AM	78	78	78	78	78	78	78	78	80	80	80	80	
	PM	80	80	78	78	78	78	78	78	78	78	78	78	
Cooling (WEH)	AM	78	78	78	78	78	78	78	78	78	78	78	78	
	PM	78	78	78	78	78	78	78	78	78	78	78	78	
Heating (WD)	AM	66	66	66	66	66	68	68	68	68	68	68	68	
	PM	68	68	68	68	68	68	68	68	68	68	66	66	
Heating (WEH)	AM	66	66	66	66	66	68	68	68	68	68	68	68	
	PM	68	68	68	68	68	68	68	68	68	68	66	66	

# Building Input Summary Report

## APPLIANCES & LIGHTING

Appliance Schedule: Glenville2		Hours											
Schedule Type		1	2	3	4	5	6	7	8	9	10	11	12
Ceiling Fans (Summer)	AM	1	1	1	1	1	1	1	0.883	0.409	0.242	0.242	0.242
% Released: 100	PM	0.242	0.242	0.242	0.242	0.295	0.553	0.897	0.897	0.897	1	1	1
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Clothes Washer	AM	0.105	0.081	0.046	0.046	0.081	0.128	0.256	0.57	0.849	1	0.977	0.872
% Released: 0	PM	0.779	0.698	0.605	0.57	0.581	0.57	0.57	0.57	0.57	0.488	0.43	0.198
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Dishwasher	AM	0.139	0.05	0.028	0.024	0.029	0.09	0.169	0.303	0.541	0.594	0.502	0.443
% Released: 0	PM	0.377	0.396	0.335	0.323	0.344	0.448	0.791	1	0.8	0.597	0.383	0.281
Annual Use: 61 kWh/Yr		Peak Value: 19 Watts											
Dryer	AM	0.122	0.073	0.049	0.024	0.049	0.073	0.195	0.39	0.595	0.839	0.961	1
% Released: 0	PM	0.912	0.829	0.746	0.707	0.683	0.668	0.634	0.624	0.644	0.668	0.537	0.293
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Lighting	AM	0.063	0.063	0.063	0.063	0.188	0.391	0.438	0.391	0.172	0.117	0.117	0.117
% Released: 100	PM	0.117	0.117	0.117	0.203	0.438	0.609	0.82	0.984	1	0.688	0.383	0.156
Annual Use: 1498 kWh/Yr		Peak Value: 525 Watts											
Miscellaneous	AM	0.454	0.411	0.393	0.38	0.38	0.429	0.54	0.65	0.663	0.675	0.687	0.699
% Released: 100	PM	0.687	0.663	0.65	0.681	0.804	1	1	0.926	0.89	0.847	0.712	0.577
Annual Use: 2516 kWh/Yr		Peak Value: 436 Watts											
Pool Pump	AM	0	0	0	0	0	0	0	0	0	1	1	1
% Released: 0	PM	1	1	1	1	0	0	0	0	0	0	0	0
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Range	AM	0.047	0.047	0.024	0.024	0.047	0.071	0.165	0.283	0.307	0.321	0.283	0.33
% Released: 0	PM	0.337	0.307	0.292	0.377	0.613	1	0.778	0.401	0.236	0.165	0.104	0.071
Annual Use: 38 Therms/Yr		Peak Value: 2 kBTU/Hr											
Refrigeration	AM	0.57	0.49	0.49	0.46	0.46	0.57	0.76	0.89	0.89	0.82	0.71	0.71
% Released: 0	PM	0.64	0.58	0.58	0.58	0.73	0.59	1	1	0.96	0.96	0.86	0.71
Annual Use: 756 kWh/Yr		Peak Value: 122 Watts											
Well Pump	AM	0.05	0.05	0.05	0.05	0.05	0.05	0.1	0.1	0.1	0.1	0.1	0.1
% Released: 100	PM	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											



# Annual Energy Summary

Title: 8804 Glenville Unit 2 with 50%  
User

TMY City: MD\_BALTIMORE\_BL  
Elec Util: MD 2009  
Gas Util: MD 2008  
Run Date: 03/02/2010 15:50:29

Registration #:

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (18 kBtu/hr)	673 kWh	\$102
Cooling Fan	123 kWh	\$19
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Cooling</b>	<b>796 kWh</b>	<b>\$121</b>
Heating (18 kBtu/hr)	2026 kWh	\$307
Heating Fan/Pump	304 kWh	\$46
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Heating</b>	<b>2330 kWh</b>	<b>\$353</b>
Hot Water	66 Therms	\$103
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>		<b>\$103</b>
Ceiling Fans	0 kWh	\$0
Clothes Washer	0 kWh	\$0
Dishwasher	61 kWh	\$9
Dryer	0 kWh	\$0
Lighting	1499 kWh	\$227
Miscellaneous	2516 kWh	\$381
Pool Pump	0 kWh	\$0
Range	38 Therms	\$59
Refrigerator	756 kWh	\$115
<hr/>		
Total (kWh)	7958 kWh	\$1206
Total (Therms)	104 Therms	\$162
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		\$1368

## Emissions (Calculated as Total - PV Produced)

SO2	87.82 Lbs.
NOX	20.81 Lbs.
CO2	5.75 Tons

# Building Input Summary Report

PROJECT											
Title:	8804 Glenville Unit 2 with 50		Bedrooms:	2		Address Type:	Street Address				
Building Type:	User		Bathrooms:	1		Lot #					
Owner:			Conditioned Area:	820		SubDivision:					
# of Units:	1		Total Stories:	1		PlatBook:					
Builder Name:	Unit 2 - Existing		Worst Case:	No		Street:					
Permit Office:			Rotate Angle:	0		County:					
Jurisdiction:			Cross Ventilation:			City, State, Zip:					
Family Type:	Multi-family		Whole House Fan:								
New/Existing:	Existing (Projected)										
Comment:											
CLIMATE											
Design Location	Tmy Site		Design Temp	97.5 %	2.5 %	Int Design Temp	Winter	Summer	Heating Degree Days	Design Moisture	Daily Temp Range
MD, BALTIMORE_BLT-WA	MD_BALTIMORE_BLT-WASHNGT		13	91		70	75	4631	37	Medium	
UTILITY RATES											
Fuel	Unit	Utility Name					Monthly Fixed Cost	\$/Unit			
Electricity	kWh	MD 2009					0	0.1516			
Natural Gas	Therm	MD 2008					0	1.56			
Fuel Oil	Gallon	Maryland Default					0	1.1			
Propane	Gallon	Maryland Default					0	1.4			
SURROUNDINGS											
Ornt	Type	Shade Trees		Width	Distance	Exist	Adjacent Buildings				
		Height					Height	Width	Distance		
N	None	0 ft	0 ft	0 ft	0 ft	X	35 ft	40 ft	30 ft		
NE	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
E	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
SE	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
S	None	0 ft	0 ft	0 ft	0 ft	X	35 ft	40 ft	30 ft		
SW	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
W	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
NW	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
FLOORS											
#	Floor Type			R-Value	Area			Tile	Wood	Carpet	
1	Raised Floor			60	820 ft²			0	0.75	0.25	
ROOF											
#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch		
1	Flat	Gravel	823 ft²	34 ft²	Dark	0.96	No	10	4.8 deg		
ATTIC											
#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC					
1	No attic	Unvented	0	820 ft²	N	N					

# Building Input Summary Report

WALLS												
Wall orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.												
#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Width Ft	In	Height Ft	In	Area	Sheathing R-Value	Framing Fraction	Solar Absor.
1	E	Exterior	Face Brick - Block	0.01	20		8		160 ft <sup>2</sup>	0	0	0.75
2	S	Neighbor	Face Brick - Block	0.01	41		8		328 ft <sup>2</sup>	0	0	0.1
3	W	Exterior	Face Brick - Block	0.01	20		8		160 ft <sup>2</sup>	0	0	0.75
4	N	Exterior	Face Brick - Block	0.01	41		8		328 ft <sup>2</sup>	0	0	0.75

DOORS												
#	Ornt	Door Type	Storms	U-Value	Width Ft	In	Height Ft	In	Area			
1	E	Insulated	None	0.46	3		6	8	20 ft <sup>2</sup>			

WINDOWS												
#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storm	Area	Overhang Depth	Separation	Interior Shade	Screening
1	E	Vinyl	Double (Clear)	Yes	0.55	0.6	N	24 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	None	None
2	W	Vinyl	Double (Clear)	Yes	0.55	0.6	N	24 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	None	None
3	N	Vinyl	Double (Clear)	Yes	0.55	0.6	N	36 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	None	None
4	N	Vinyl	Double (Clear)	Yes	0.55	0.6	N	4.5 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	None	None

INFILTRATION & VENTING												
Method	SLA	CFM 50	ELA	EqLA	ACH	ACH 50	---- Forced Ventilation ----			Terrain/Wind Shielding		
							Supply	Exhaust	Run Time			
Proposed ACH	0.00090	1941	106.6	200.4	0.740	17.75	0	0	0	Suburban / Suburban		

MASS												
Mass Type	Area	Thickness	Furniture Fraction									
No Added Mass	0 ft <sup>2</sup>	0 ft	0.3									

COOLING SYSTEM												
#	System Type	Subtype	Efficiency	Capacity	Air Flow	SHR	Ductless					
1	Central Unit	None	SEER: 15	18 kBtu/hr	540 cfm	0.75	False					

HEATING SYSTEM												
#	System Type	Subtype	Efficiency	Capacity	Ductless							
1	Electric Heat Pump	None	AFUE: 9	18 kBtu/hr	False							

HOT WATER SYSTEM												
#	System Type	EF	Cap	Use	SetPnt	Credits						
1	Natural Gas	0.82	1 gal	53 gal	120 deg	Solar System						

# Building Input Summary Report

SOLAR HOT WATER													
Collector Type	Collector		Surface		Absorp.	Trans	Tank	Tank	Tank	Heat	PV	Pump	
	Tilt	Azimuth	Area	Loss Coef.	Prod.	Corr.	Volume	U-Value	Surf Area	Exch Eff	Pumped	Energy	
Flat Plate (Closed Loop)	4.8	180	3.00 m <sup>2</sup>	4.17 W/m <sup>2</sup>	0.75	0.96	303.0 L	0.700 W/m <sup>2</sup> /C	2.32 m <sup>2</sup>	0.88	Yes	0 W	
DUCTS													
#	Location	---- Supply ----		---- Return ----			Leakage Type	Air Handler	CFM 25	Percent Leakage	QN	RLF	
		R-Value	Area	Location	Area	Number							
1	Interior	6	164 ft <sup>2</sup>	Interior	41 ft <sup>2</sup>	(invalid)	Prop. Air Leakage	Interior	32.40 cfm	6.00 %	0.04	0.60	
TEMPERATURES													
Programable Thermostat: Y						Ceiling Fans: N							
Cooling	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec	
Heating	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec	
Venting	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec	
Thermostat Schedule: HERS 2006 Reference													
Schedule Type		1	2	3	4	5	6	7	8	9	10	11	12
Cooling (WD)	AM	78	78	78	78	78	78	78	78	80	80	80	80
	PM	80	80	78	78	78	78	78	78	78	78	78	78
Cooling (WEH)	AM	78	78	78	78	78	78	78	78	78	78	78	78
	PM	78	78	78	78	78	78	78	78	78	78	78	78
Heating (WD)	AM	66	66	66	66	66	68	68	68	68	68	68	68
	PM	68	68	68	68	68	68	68	68	68	68	66	66
Heating (WEH)	AM	66	66	66	66	66	68	68	68	68	68	68	68
	PM	68	68	68	68	68	68	68	68	68	68	66	66

# Building Input Summary Report

## APPLIANCES & LIGHTING

Appliance Schedule: Glenville2		Hours											
Schedule Type		1	2	3	4	5	6	7	8	9	10	11	12
Ceiling Fans (Summer)	AM	1	1	1	1	1	1	1	0.883	0.409	0.242	0.242	0.242
% Released: 100	PM	0.242	0.242	0.242	0.242	0.295	0.553	0.897	0.897	0.897	1	1	1
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Clothes Washer	AM	0.105	0.081	0.046	0.046	0.081	0.128	0.256	0.57	0.849	1	0.977	0.872
% Released: 0	PM	0.779	0.698	0.605	0.57	0.581	0.57	0.57	0.57	0.57	0.488	0.43	0.198
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Dishwasher	AM	0.139	0.05	0.028	0.024	0.029	0.09	0.169	0.303	0.541	0.594	0.502	0.443
% Released: 0	PM	0.377	0.396	0.335	0.323	0.344	0.448	0.791	1	0.8	0.597	0.383	0.281
Annual Use: 61 kWh/Yr		Peak Value: 19 Watts											
Dryer	AM	0.122	0.073	0.049	0.024	0.049	0.073	0.195	0.39	0.595	0.839	0.961	1
% Released: 0	PM	0.912	0.829	0.746	0.707	0.683	0.668	0.634	0.624	0.644	0.668	0.537	0.293
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Lighting	AM	0.063	0.063	0.063	0.063	0.188	0.391	0.438	0.391	0.172	0.117	0.117	0.117
% Released: 100	PM	0.117	0.117	0.117	0.203	0.438	0.609	0.82	0.984	1	0.688	0.383	0.156
Annual Use: 1498 kWh/Yr		Peak Value: 525 Watts											
Miscellaneous	AM	0.454	0.411	0.393	0.38	0.38	0.429	0.54	0.65	0.663	0.675	0.687	0.699
% Released: 100	PM	0.687	0.663	0.65	0.681	0.804	1	1	0.926	0.89	0.847	0.712	0.577
Annual Use: 2516 kWh/Yr		Peak Value: 436 Watts											
Pool Pump	AM	0	0	0	0	0	0	0	0	0	1	1	1
% Released: 0	PM	1	1	1	1	0	0	0	0	0	0	0	0
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Range	AM	0.047	0.047	0.024	0.024	0.047	0.071	0.165	0.283	0.307	0.321	0.283	0.33
% Released: 0	PM	0.337	0.307	0.292	0.377	0.613	1	0.778	0.401	0.236	0.165	0.104	0.071
Annual Use: 38 Therms/Yr		Peak Value: 2 kBtu/Hr											
Refrigeration	AM	0.57	0.49	0.49	0.46	0.46	0.57	0.76	0.89	0.89	0.82	0.71	0.71
% Released: 0	PM	0.64	0.58	0.58	0.58	0.73	0.59	1	1	0.96	0.96	0.86	0.71
Annual Use: 756 kWh/Yr		Peak Value: 122 Watts											
Well Pump	AM	0.05	0.05	0.05	0.05	0.05	0.05	0.1	0.1	0.1	0.1	0.1	0.1
% Released: 100	PM	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											



# APPENDIX C ENERGY MODELS

iii. Unit 3

HUD

8804 Glenville Unit 3

	Required		20%		34%		43%		50%	
	Unit 3 Before	Unit 3 Bronze	Comparison to Reference House	Unit 3 Silver	Comparison to Reference House	Unit 3 Gold	Comparison to Reference House	Unit 3 Emerald	Comparison to Reference House	
Climate Zone 4:										
e-ratio - 2006 IECC	1.64	1.29		1.04		0.90		0.78		
Finished Floor Area, sq. feet	820	820		820		820		820		
Bedrooms	2	2		2		2		2		
Baths	1	1		1		1		1		
Floor R-value	0	0		0		0		0		
Whole Wall U-valueB	0.306	0.306		0.306		0.306		0.306		
Flat Ceiling R-value	10	10		10		10		10		
Wall Construction	brick/CMU 6"	brick/CMU 6"		brick/CMU 6"		brick/CMU 6"		brick/CMU 6"		
Wall Area, Ambient, Above Grade	648	648		648		648		648		
Window U-value	0.55	0.55		0.55		0.55		0.55		
Window SHGC, Low e	0.60	0.6		0.6		0.6		0.6		
Window Area	56	55.5		55.5		55.5		55.5		
Window Area, % of Floor, CFA	6.77%	6.77%		6.77%		6.77%		6.77%		
Window Area % of Wall	8.56%	8.56%		8.56%		8.56%		8.56%		
Infiltration, ACHnat	1.494	1.0458		1.0458		1.0458		1.0458		
Cooling System SEER	10	10		13		15		18		
Cooling Capacity, kBtu/hr	18	18		18		18		12		
Heating System, AFUE	0.80	0.80		0.80		0.96		0.96		
Heating Capacity, kBtu/hr	18	18		18		12		12		
DSE (HVAC Design System Efficiency), Leakage	88.00%	6.00%		6.00%		6.00%		6.00%		
Duct Location	Inside	Inside		Inside		Inside		Inside		
Air Handler Location	Inside	Inside		Inside		Inside		Inside		
Hot Water Use, gallons/day	53	53		53		53		53		
Water Heater Energy Factor,	0.58	0.62		.82 tankless		.82 tankless		.82 tankless	32 sf solar	
Cool Set Point	78	78		78		78		78	closed loop	
Heat Set Point	68	68		68		68		68		
Programable Thermostat	No	Yes		Yes		Yes		Yes		
Cooling setback degrees; setback hours	n/a	2/6		2/6		2/6		2/6		
Heating setback degrees; setback hours	n/a	2/7		2/7		2/7		2/7		
<b>ENERGY COST and USAGE:</b>										
Cooling Energy, cost, kWh	214	188		150		127		102		
Heating Energy, cost, therms	722	523		523		438		438		
Heating Energy, cost, kWh	52	36		36		27		27		
Water Heater, cost, therms	373	324		178		178		103		
<b>Subtotal Heating and Cooling (\$)</b>	<b>\$1,361</b>	<b>\$1,071</b>	<b>21.31%</b>	<b>\$887</b>	<b>34.83%</b>	<b>\$770</b>	<b>43.42%</b>	<b>\$670</b>	<b>50.77%</b>	
Dishwasher, cost, kWh	9	9		9		9		9		
Lights, cost, kWh	227	227		227		227		227		
Miscellaneous, cost, kWh	381	381		381		381		381		
Range, cost, therms	59	59		59		59		59		
Refrigerator, cost, kWh	115	115		115		115		115		
<b>Whole House Cost (\$)<sup>A</sup></b>	<b>\$2,152</b>	<b>\$1,862</b>		<b>\$1,678</b>		<b>\$1,561</b>		<b>\$1,461</b>		

<sup>A</sup>May vary due to rounding.

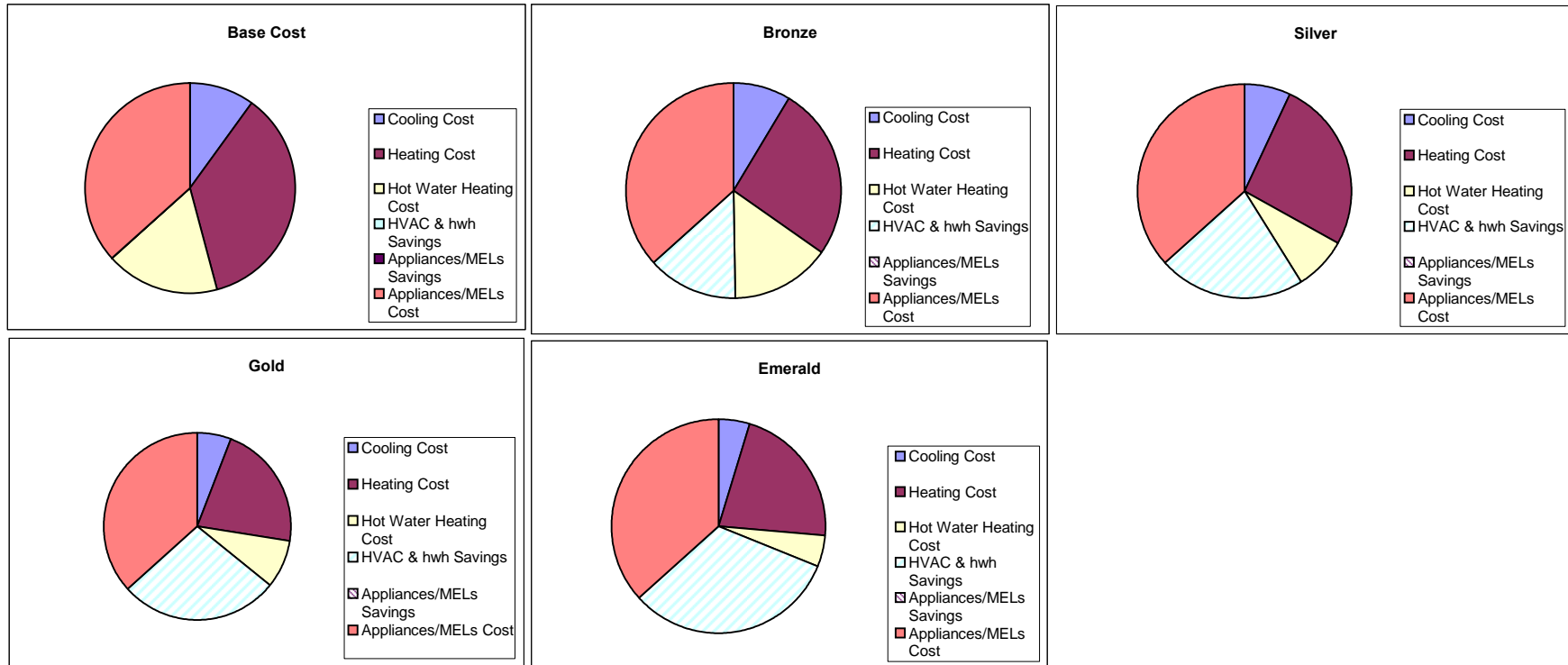
<sup>B</sup>Calculation based on Table 2 of the report.

Maximum infiltration increase of 30% in 1980 remodels or older

Gaithersburg, Maryland  
Rehab Unit 3

Annual Energy Summary	Base	Bronze			Silver			Gold			Emerald		
	Yr \$	Yr \$	savings	percent	Yr \$	savings	percent	Yr \$	savings	percent	Yr \$	savings	percent
Cooling Cost	214	188	26	12%	150	64	30%	127	87	41%	102	112	52%
Heating Cost	774	559	215	28%	559	215	28%	465	309	40%	465	309	40%
Hot Water Heating Cost	373	324	49	13%	178	195	52%	178	195	52%	103	270	72%
HVAC & hwh Savings	N/A	290			474			591			691		
Appliances/MELs Savings	N/A	0			0			0			0		
Appliances/MELs Cost	791	791			791			791			791		
HVAC & HWH sub-total	1361	1071		21%	887		35%	770		43%	670		51%
Grand Total	2152	1862		87%	1678		78%	1561		73%	1461		68%

Data based on Energy Gauge - Annual Energy Summary. Not Compliance





# Annual Energy Summary

Title: 8804 Glenville Unit 3  
User

TMY City: MD\_BALTIMORE\_BL  
Elec Util: MD 2009  
Gas Util: MD 2008  
Run Date: 03/03/2010 08:45:17

Registration #:

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (18 kBtu/hr)	1217 kWh	\$184
Cooling Fan	197 kWh	\$30
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Cooling</b>	<b>1414 kWh</b>	<b>\$214</b>
Heating (18 kBtu/hr)	463 Therms	\$722
Heating Fan/Pump	341 kWh	\$52
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Heating</b>	<b>\$774</b>	
Hot Water	239 Therms	\$373
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>		<b>\$373</b>
Ceiling Fans	0 kWh	\$0
Clothes Washer	0 kWh	\$0
Dishwasher	61 kWh	\$9
Dryer	0 kWh	\$0
Lighting	1499 kWh	\$227
Miscellaneous	2516 kWh	\$381
Pool Pump	0 kWh	\$0
Range	38 Therms	\$59
Refrigerator	756 kWh	\$115
<hr/>		
Total (kWh)	6587 kWh	\$998
Total (Therms)	741 Therms	\$1154
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		\$2152

## Emissions (Calculated as Total - PV Produced)

SO2	72.69 Lbs.
NOX	23.76 Lbs.
CO2	8.58 Tons

# Building Input Summary Report

PROJECT											
Title:	8804 Glenville Unit 3		Bedrooms:	2		Address Type:	Street Address				
Building Type:	User		Bathrooms:	1		Lot #					
Owner:			Conditioned Area:	820		SubDivision:					
# of Units:	1		Total Stories:	1		PlatBook:					
Builder Name:	Unit 3 - Existing		Worst Case:	No		Street:					
Permit Office:			Rotate Angle:	0		County:					
Jurisdiction:			Cross Ventilation:			City, State, Zip:					
Family Type:	Multi-family		Whole House Fan:								
New/Existing:	Existing (Projected)										
Comment:											
CLIMATE											
Design Location	Tmy Site		Design Temp	97.5 %	2.5 %	Int Design Temp	Winter	Summer	Heating Degree Days	Design Moisture	Daily Temp Range
MD, BALTIMORE_BLT-WA	MD_BALTIMORE_BLT-WASHNGT		13	91		70	75	4631	37	Medium	
UTILITY RATES											
Fuel	Unit	Utility Name					Monthly Fixed Cost	\$/Unit			
Electricity	kWh	MD 2009					0	0.1516			
Natural Gas	Therm	MD 2008					0	1.56			
Fuel Oil	Gallon	Maryland Default					0	1.1			
Propane	Gallon	Maryland Default					0	1.4			
SURROUNDINGS											
Ornt	Type	Shade Trees		Width	Distance	Exist	Adjacent Buildings				
		Height					Height	Width	Distance		
N	None	0 ft	0 ft	0 ft	0 ft	X	35 ft	40 ft	30 ft		
NE	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
E	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
SE	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
S	None	0 ft	0 ft	0 ft	0 ft	X	35 ft	40 ft	30 ft		
SW	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
W	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
NW	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
FLOORS											
#	Floor Type			R-Value	Area			Tile	Wood	Carpet	
1	Raised Floor			60	820 ft <sup>2</sup>			0	0.75	0.25	
ROOF											
#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch		
1	Flat	Gravel	823 ft <sup>2</sup>	34 ft <sup>2</sup>	Dark	0.96	No	10	4.8 deg		
ATTIC											
#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC					
1	No attic	Unvented	0	820 ft <sup>2</sup>	N	N					

# Building Input Summary Report

CEILING												
#	Ceiling Type			R-Value	Area	Framing Fraction	Truss Type					
1	Under Attic (Unvented)			60	820 ft <sup>2</sup>	0.11	Wood					
WALLS												
Wall orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.												
#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Width Ft	In	Height Ft	In	Area	Sheathing R-Value	Framing Fraction	Solar Absor.
1	E	Exterior	Face Brick - Block	0.5	20		8		160 ft <sup>2</sup>	0	0	0.75
2	S	Neighbor	Face Brick - Block	0.5	41		8		328 ft <sup>2</sup>	0	0	0.1
3	W	Exterior	Face Brick - Block	0.5	20		8		160 ft <sup>2</sup>	0	0	0.75
4	N	Exterior	Face Brick - Block	0.5	41		8		328 ft <sup>2</sup>	0	0	0.75
DOORS												
#	Ornt	Door Type			Storms	U-Value	Width Ft	In	Height Ft	In	Area	
1	E	Insulated			None	0.46	3		6	8	20 ft <sup>2</sup>	
WINDOWS												
#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storm	Area	Overhang		Interior Shade	Screening
1	E	Vinyl	Double (Clear)	Yes	0.55	0.6	N	24 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	None	None
2	W	Vinyl	Double (Clear)	Yes	0.55	0.6	N	24 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	None	None
3	N	Vinyl	Double (Clear)	Yes	0.55	0.6	N	36 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	None	None
4	N	Vinyl	Double (Clear)	Yes	0.55	0.6	N	4.5 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	None	None
INFILTRATION & VENTING												
Method	SLA	CFM 50	ELA	EqLA	ACH	ACH 50	---- Forced Ventilation ----			Terrain/Wind Shielding		
Proposed CFM(50)	0.00182	3919	215.1	404.6	1.494	35.84	Supply	Exhaust	Run Time	Suburban / Suburban		
							0	0	0			
MASS												
Mass Type			Area	Thickness	Furniture Fraction							
No Added Mass			0 ft <sup>2</sup>	0 ft	0.3							
COOLING SYSTEM												
#	System Type		Subtype	Efficiency	Capacity	Air Flow	SHR	Ductless				
1	Central Unit		None	SEER: 10	18 kBtu/hr	540 cfm	0.75	False				
HEATING SYSTEM												
#	System Type		Subtype	Efficiency	Capacity	Ductless						
1	Natural Gas Furnace		None	AFUE: 0.8	75 kBtu/hr	False						

# Building Input Summary Report

HOT WATER SYSTEM													
#	System Type	EF	Cap	Use	SetPnt	Credits							
1	Natural Gas	0.58	30 gal	53 gal	120 deg	None							
SOLAR HOT WATER													
Collector Type	Collector Tilt	Azimuth	Surface Area	Loss Coef.	Absorp. Prod.	Trans Corr.	Tank Volume	Tank U-Value	Tank Surf Area	Heat Exch Eff	PV Pumped	Pump Energy	
DUCTS													
#	Location	---- Supply ---- R-Value	Area	Location	---- Return ---- Area	Number	Leakage Type	Air Handler	CFM 25	Percent Leakage	QN	RLF	
1	Attic	6	164 ft <sup>2</sup>	Attic	41 ft <sup>2</sup>	(invalid)	Default Leakage	Interior	(Default)	(Default)			
TEMPERATURES													
Programable Thermostat: N						Ceiling Fans: N							
Cooling	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec	
Heating	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec	
Venting	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec	
Thermostat Schedule: HERS 2006 Reference													
Schedule Type		1	2	3	4	5	6	7	8	9	10	11	12
Cooling (WD)	AM	78	78	78	78	78	78	78	78	78	78	78	78
	PM	78	78	78	78	78	78	78	78	78	78	78	78
Cooling (WEH)	AM	78	78	78	78	78	78	78	78	78	78	78	78
	PM	78	78	78	78	78	78	78	78	78	78	78	78
Heating (WD)	AM	68	68	68	68	68	68	68	68	68	68	68	68
	PM	68	68	68	68	68	68	68	68	68	68	68	68
Heating (WEH)	AM	68	68	68	68	68	68	68	68	68	68	68	68
	PM	68	68	68	68	68	68	68	68	68	68	68	68

# Building Input Summary Report

## APPLIANCES & LIGHTING

Appliance Schedule: Glenville2		Hours											
Schedule Type		1	2	3	4	5	6	7	8	9	10	11	12
Ceiling Fans (Summer)	AM	1	1	1	1	1	1	1	0.883	0.409	0.242	0.242	0.242
% Released: 100	PM	0.242	0.242	0.242	0.242	0.295	0.553	0.897	0.897	0.897	1	1	1
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Clothes Washer	AM	0.105	0.081	0.046	0.046	0.081	0.128	0.256	0.57	0.849	1	0.977	0.872
% Released: 0	PM	0.779	0.698	0.605	0.57	0.581	0.57	0.57	0.57	0.57	0.488	0.43	0.198
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Dishwasher	AM	0.139	0.05	0.028	0.024	0.029	0.09	0.169	0.303	0.541	0.594	0.502	0.443
% Released: 0	PM	0.377	0.396	0.335	0.323	0.344	0.448	0.791	1	0.8	0.597	0.383	0.281
Annual Use: 61 kWh/Yr		Peak Value: 19 Watts											
Dryer	AM	0.122	0.073	0.049	0.024	0.049	0.073	0.195	0.39	0.595	0.839	0.961	1
% Released: 0	PM	0.912	0.829	0.746	0.707	0.683	0.668	0.634	0.624	0.644	0.668	0.537	0.293
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Lighting	AM	0.063	0.063	0.063	0.063	0.188	0.391	0.438	0.391	0.172	0.117	0.117	0.117
% Released: 100	PM	0.117	0.117	0.117	0.203	0.438	0.609	0.82	0.984	1	0.688	0.383	0.156
Annual Use: 1498 kWh/Yr		Peak Value: 525 Watts											
Miscellaneous	AM	0.454	0.411	0.393	0.38	0.38	0.429	0.54	0.65	0.663	0.675	0.687	0.699
% Released: 100	PM	0.687	0.663	0.65	0.681	0.804	1	1	0.926	0.89	0.847	0.712	0.577
Annual Use: 2516 kWh/Yr		Peak Value: 436 Watts											
Pool Pump	AM	0	0	0	0	0	0	0	0	0	1	1	1
% Released: 0	PM	1	1	1	1	0	0	0	0	0	0	0	0
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Range	AM	0.047	0.047	0.024	0.024	0.047	0.071	0.165	0.283	0.307	0.321	0.283	0.33
% Released: 0	PM	0.337	0.307	0.292	0.377	0.613	1	0.778	0.401	0.236	0.165	0.104	0.071
Annual Use: 38 Therms/Yr		Peak Value: 2 kBtu/Hr											
Refrigeration	AM	0.57	0.49	0.49	0.46	0.46	0.57	0.76	0.89	0.89	0.82	0.71	0.71
% Released: 0	PM	0.64	0.58	0.58	0.58	0.73	0.59	1	1	0.96	0.96	0.86	0.71
Annual Use: 756 kWh/Yr		Peak Value: 122 Watts											
Well Pump	AM	0.05	0.05	0.05	0.05	0.05	0.05	0.1	0.1	0.1	0.1	0.1	0.1
% Released: 100	PM	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											

# Annual Energy Summary

Title: 8804 Glenville Unit 3 with 20%  
User

TMY City: MD\_BALTIMORE\_BL  
Elec Util: MD 2009  
Gas Util: MD 2008  
Run Date: 03/02/2010 14:01:29

Registration #:

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (18 kBtu/hr)	1066 kWh	\$162
Cooling Fan	174 kWh	\$26
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Cooling</b>	<b>1240 kWh</b>	<b>\$188</b>
Heating (75 kBtu/hr)	335 Therms	\$523
Heating Fan/Pump	235 kWh	\$36
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Heating</b>		<b>\$559</b>
Hot Water	208 Therms	\$324
Hot Water Pump	0 kWh	\$ 0
<b>Total Hot Water</b>		<b>\$324</b>
Ceiling Fans	0 kWh	\$ 0
Clothes Washer	0 kWh	\$ 0
Dishwasher	61 kWh	\$9
Dryer	0 kWh	\$ 0
Lighting	1499 kWh	\$227
Miscellaneous	2516 kWh	\$381
Pool Pump	0 kWh	\$ 0
Range	38 Therms	\$59
Refrigerator	756 kWh	\$115
<hr/>		
Total (kWh)	6307 kWh	\$956
Total (Therms)	581 Therms	\$906
Total (Oil Gallons)	0 Gallons	\$ 0
Total (Propane Gallons)	0 Gallons	\$ 0
PV Produced (kWh)*	0 kWh	\$ 0
* Assumes net metering		
<hr/>		
Total Cost		\$1862

## Emissions (Calculated as Total - PV Produced)

SO2	69.6 Lbs.
NOX	21.51 Lbs.
CO2	7.46 Tons

# Building Input Summary Report

PROJECT											
Title:	8804 Glenville Unit 3 with 20		Bedrooms:	2		Address Type:	Street Address				
Building Type:	User		Bathrooms:	1		Lot #					
Owner:			Conditioned Area:	820		SubDivision:					
# of Units:	1		Total Stories:	1		PlatBook:					
Builder Name:	Unit 3 - Existing		Worst Case:	No		Street:					
Permit Office:			Rotate Angle:	0		County:					
Jurisdiction:			Cross Ventilation:			City, State, Zip:					
Family Type:	Multi-family		Whole House Fan:								
New/Existing:	Existing (Projected)										
Comment:											
CLIMATE											
Design Location	Tmy Site		Design Temp	97.5 %	2.5 %	Int Design Temp	Winter	Summer	Heating Degree Days	Design Moisture	Daily Temp Range
MD, BALTIMORE_BLT-WA	MD_BALTIMORE_BLT-WASHNGT		13	91		70	75	4631	37	Medium	
UTILITY RATES											
Fuel	Unit	Utility Name					Monthly Fixed Cost	\$/Unit			
Electricity	kWh	MD 2009					0	0.1516			
Natural Gas	Therm	MD 2008					0	1.56			
Fuel Oil	Gallon	Maryland Default					0	1.1			
Propane	Gallon	Maryland Default					0	1.4			
SURROUNDINGS											
Ornt	Type	Shade Trees		Width	Distance	Exist	Adjacent Buildings				
		Height					Height	Width	Distance		
N	None	0 ft	0 ft	0 ft	0 ft	X	35 ft	40 ft	30 ft		
NE	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
E	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
SE	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
S	None	0 ft	0 ft	0 ft	0 ft	X	35 ft	40 ft	30 ft		
SW	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
W	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
NW	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
FLOORS											
#	Floor Type			R-Value	Area			Tile	Wood	Carpet	
1	Raised Floor			60	820 ft²			0	0.75	0.25	
ROOF											
#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch		
1	Flat	Gravel	823 ft²	34 ft²	Dark	0.96	No	10	4.8 deg		
ATTIC											
#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC					
1	No attic	Unvented	0	820 ft²	N	N					

# Building Input Summary Report

CEILING												
#	Ceiling Type			R-Value	Area	Framing Fraction	Truss Type					
1	Under Attic (Unvented)			60	820 ft <sup>2</sup>	0.11	Wood					
WALLS												
Wall orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.												
#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Width Ft	In	Height Ft	In	Area	Sheathing R-Value	Framing Fraction	Solar Absor.
1	E	Exterior	Face Brick - Block	0.5	20		8		160 ft <sup>2</sup>	0	0	0.75
2	S	Neighbor	Face Brick - Block	0.5	41		8		328 ft <sup>2</sup>	0	0	0.1
3	W	Exterior	Face Brick - Block	0.5	20		8		160 ft <sup>2</sup>	0	0	0.75
4	N	Exterior	Face Brick - Block	0.5	41		8		328 ft <sup>2</sup>	0	0	0.75
DOORS												
#	Ornt	Door Type			Storms	U-Value	Width Ft	In	Height Ft	In	Area	
1	E	Insulated			None	0.46	3		6	8	20 ft <sup>2</sup>	
WINDOWS												
#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storm	Area	Overhang		Interior Shade	Screening
1	E	Vinyl	Double (Clear)	Yes	0.55	0.6	N	24 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	None	None
2	W	Vinyl	Double (Clear)	Yes	0.55	0.6	N	24 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	None	None
3	N	Vinyl	Double (Clear)	Yes	0.55	0.6	N	36 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	None	None
4	N	Vinyl	Double (Clear)	Yes	0.55	0.6	N	4.5 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	None	None
INFILTRATION & VENTING												
Method	SLA	CFM 50	ELA	EqLA	ACH	ACH 50	---- Forced Ventilation ----			Terrain/Wind Shielding		
Proposed ACH	0.00128	2743	150.6	283.2	1.046	25.09	Supply	Exhaust	Run Time	Suburban / Suburban		
							0	0	0			
MASS												
Mass Type	Area			Thickness	Furniture Fraction							
No Added Mass	0 ft <sup>2</sup>			0 ft	0.3							
COOLING SYSTEM												
#	System Type		Subtype	Efficiency	Capacity	Air Flow	SHR	Ductless				
1	Central Unit		None	SEER: 10	18 kBtu/hr	540 cfm	0.75	False				
HEATING SYSTEM												
#	System Type		Subtype	Efficiency	Capacity	Ductless						
1	Natural Gas Furnace		None	AFUE: 0.8	75 kBtu/hr	False						



# Building Input Summary Report

HOT WATER SYSTEM													
#	System Type	EF	Cap	Use	SetPnt	Credits							
1	Natural Gas	0.62	30 gal	53 gal	120 deg	None							
SOLAR HOT WATER													
Collector Type	Collector Tilt	Azimuth	Surface Area	Loss Coef.	Absorp. Prod.	Trans Corr.	Tank Volume	Tank U-Value	Tank Surf Area	Heat Exch Eff	PV Pumped	Pump Energy	
DUCTS													
#	Location	---- Supply ----		---- Return ----			Leakage Type	Air Handler	CFM 25	Percent Leakage	QN	RLF	
1	Attic	6	164 ft <sup>2</sup>	Attic	41 ft <sup>2</sup>	(invalid)	Prop. Air Leakage	Interior	90.00 cfm	6.00 %	0.11	0.60	
TEMPERATURES													
Programable Thermostat: Y						Ceiling Fans: N							
Cooling	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec	
Heating	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec	
Venting	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec	
Thermostat Schedule: HERS 2006 Reference													
Schedule Type		1	2	3	4	5	6	7	8	9	10	11	12
Cooling (WD)	AM	78	78	78	78	78	78	78	78	80	80	80	80
	PM	80	80	78	78	78	78	78	78	78	78	78	78
Cooling (WEH)	AM	78	78	78	78	78	78	78	78	78	78	78	78
	PM	78	78	78	78	78	78	78	78	78	78	78	78
Heating (WD)	AM	66	66	66	66	66	68	68	68	68	68	68	68
	PM	68	68	68	68	68	68	68	68	68	68	66	66
Heating (WEH)	AM	66	66	66	66	66	68	68	68	68	68	68	68
	PM	68	68	68	68	68	68	68	68	68	68	66	66

# Building Input Summary Report

## APPLIANCES & LIGHTING

Appliance Schedule: Glenville2		Hours											
Schedule Type		1	2	3	4	5	6	7	8	9	10	11	12
Ceiling Fans (Summer)	AM	1	1	1	1	1	1	1	0.883	0.409	0.242	0.242	0.242
% Released: 100	PM	0.242	0.242	0.242	0.242	0.295	0.553	0.897	0.897	0.897	1	1	1
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Clothes Washer	AM	0.105	0.081	0.046	0.046	0.081	0.128	0.256	0.57	0.849	1	0.977	0.872
% Released: 0	PM	0.779	0.698	0.605	0.57	0.581	0.57	0.57	0.57	0.57	0.488	0.43	0.198
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Dishwasher	AM	0.139	0.05	0.028	0.024	0.029	0.09	0.169	0.303	0.541	0.594	0.502	0.443
% Released: 0	PM	0.377	0.396	0.335	0.323	0.344	0.448	0.791	1	0.8	0.597	0.383	0.281
Annual Use: 61 kWh/Yr		Peak Value: 19 Watts											
Dryer	AM	0.122	0.073	0.049	0.024	0.049	0.073	0.195	0.39	0.595	0.839	0.961	1
% Released: 0	PM	0.912	0.829	0.746	0.707	0.683	0.668	0.634	0.624	0.644	0.668	0.537	0.293
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Lighting	AM	0.063	0.063	0.063	0.063	0.188	0.391	0.438	0.391	0.172	0.117	0.117	0.117
% Released: 100	PM	0.117	0.117	0.117	0.203	0.438	0.609	0.82	0.984	1	0.688	0.383	0.156
Annual Use: 1498 kWh/Yr		Peak Value: 525 Watts											
Miscellaneous	AM	0.454	0.411	0.393	0.38	0.38	0.429	0.54	0.65	0.663	0.675	0.687	0.699
% Released: 100	PM	0.687	0.663	0.65	0.681	0.804	1	1	0.926	0.89	0.847	0.712	0.577
Annual Use: 2516 kWh/Yr		Peak Value: 436 Watts											
Pool Pump	AM	0	0	0	0	0	0	0	0	0	1	1	1
% Released: 0	PM	1	1	1	1	0	0	0	0	0	0	0	0
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Range	AM	0.047	0.047	0.024	0.024	0.047	0.071	0.165	0.283	0.307	0.321	0.283	0.33
% Released: 0	PM	0.337	0.307	0.292	0.377	0.613	1	0.778	0.401	0.236	0.165	0.104	0.071
Annual Use: 38 Therms/Yr		Peak Value: 2 kBTU/Hr											
Refrigeration	AM	0.57	0.49	0.49	0.46	0.46	0.57	0.76	0.89	0.89	0.82	0.71	0.71
% Released: 0	PM	0.64	0.58	0.58	0.58	0.73	0.59	1	1	0.96	0.96	0.86	0.71
Annual Use: 756 kWh/Yr		Peak Value: 122 Watts											
Well Pump	AM	0.05	0.05	0.05	0.05	0.05	0.05	0.1	0.1	0.1	0.1	0.1	0.1
% Released: 100	PM	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											

# Annual Energy Summary

Title: 8804 Glenville Unit 3 with 34%  
User

TMY City: MD\_BALTIMORE\_BL  
Elec Util: MD 2009  
Gas Util: MD 2008  
Run Date: 03/02/2010 14:04:02

Registration #:

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (18 kBtu/hr)	820 kWh	\$124
Cooling Fan	174 kWh	\$26
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Cooling</b>	<b>994 kWh</b>	<b>\$150</b>
Heating (75 kBtu/hr)	335 Therms	\$523
Heating Fan/Pump	235 kWh	\$36
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Heating</b>	<b>\$559</b>	
Hot Water	114 Therms	\$178
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>		<b>\$178</b>
Ceiling Fans	0 kWh	\$0
Clothes Washer	0 kWh	\$0
Dishwasher	61 kWh	\$9
Dryer	0 kWh	\$0
Lighting	1499 kWh	\$227
Miscellaneous	2516 kWh	\$381
Pool Pump	0 kWh	\$0
Range	38 Therms	\$59
Refrigerator	756 kWh	\$115
<hr/>		
Total (kWh)	6061 kWh	\$918
Total (Therms)	487 Therms	\$760
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
<b>Total Cost</b>		<b>\$1678</b>

## **Emissions** (Calculated as Total - PV Produced)

SO2	66.88 Lbs.
NOX	19.75 Lbs.
CO2	6.76 Tons

# Building Input Summary Report

PROJECT											
Title:	8804 Glenville Unit 3 with 34		Bedrooms:	2		Address Type:	Street Address				
Building Type:	User		Bathrooms:	1		Lot #					
Owner:			Conditioned Area:	820		SubDivision:					
# of Units:	1		Total Stories:	1		PlatBook:					
Builder Name:	Unit 3 - Existing		Worst Case:	No		Street:					
Permit Office:			Rotate Angle:	0		County:					
Jurisdiction:			Cross Ventilation:			City, State, Zip:					
Family Type:	Multi-family		Whole House Fan:								
New/Existing:	Existing (Projected)										
Comment:											
CLIMATE											
Design Location	Tmy Site		Design Temp	97.5 %	2.5 %	Int Design Temp	Winter	Summer	Heating Degree Days	Design Moisture	Daily Temp Range
MD, BALTIMORE_BLT-WA	MD_BALTIMORE_BLT-WASHNGT		13	91		70	75	4631	37	Medium	
UTILITY RATES											
Fuel	Unit	Utility Name					Monthly Fixed Cost	\$/Unit			
Electricity	kWh	MD 2009					0	0.1516			
Natural Gas	Therm	MD 2008					0	1.56			
Fuel Oil	Gallon	Maryland Default					0	1.1			
Propane	Gallon	Maryland Default					0	1.4			
SURROUNDINGS											
Ornt	Type	Shade Trees		Width	Distance	Exist	Adjacent Buildings				
		Height					Height	Width	Distance		
N	None	0 ft	0 ft	0 ft	0 ft	X	35 ft	40 ft	30 ft		
NE	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
E	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
SE	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
S	None	0 ft	0 ft	0 ft	0 ft	X	35 ft	40 ft	30 ft		
SW	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
W	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
NW	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
FLOORS											
#	Floor Type			R-Value	Area			Tile	Wood	Carpet	
1	Raised Floor			60	820 ft²			0	0.75	0.25	
ROOF											
#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch		
1	Flat	Gravel	823 ft²	34 ft²	Dark	0.96	No	10	4.8 deg		
ATTIC											
#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC					
1	No attic	Unvented	0	820 ft²	N	N					

# Building Input Summary Report

CEILING												
#	Ceiling Type			R-Value	Area	Framing Fraction	Truss Type					
1	Under Attic (Unvented)			60	820 ft <sup>2</sup>	0.11	Wood					
WALLS												
Wall orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.												
#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Width Ft	In	Height Ft	In	Area	Sheathing R-Value	Framing Fraction	Solar Absor.
1	E	Exterior	Face Brick - Block	0.5	20		8		160 ft <sup>2</sup>	0	0	0.75
2	S	Neighbor	Face Brick - Block	0.5	41		8		328 ft <sup>2</sup>	0	0	0.1
3	W	Exterior	Face Brick - Block	0.5	20		8		160 ft <sup>2</sup>	0	0	0.75
4	N	Exterior	Face Brick - Block	0.5	41		8		328 ft <sup>2</sup>	0	0	0.75
DOORS												
#	Ornt	Door Type			Storms	U-Value	Width Ft	In	Height Ft	In	Area	
1	E	Insulated			None	0.46	3		6	8	20 ft <sup>2</sup>	
WINDOWS												
#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storm	Area	Overhang		Interior Shade	Screening
1	E	Vinyl	Double (Clear)	Yes	0.55	0.6	N	24 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	None	None
2	W	Vinyl	Double (Clear)	Yes	0.55	0.6	N	24 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	None	None
3	N	Vinyl	Double (Clear)	Yes	0.55	0.6	N	36 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	None	None
4	N	Vinyl	Double (Clear)	Yes	0.55	0.6	N	4.5 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	None	None
INFILTRATION & VENTING												
Method	SLA	CFM 50	ELA	EqLA	ACH	ACH 50	---- Forced Ventilation ----			Terrain/Wind Shielding		
Proposed ACH	0.00128	2743	150.6	283.2	1.046	25.09	Supply	Exhaust	Run Time	Suburban / Suburban		
							0	0	0			
MASS												
Mass Type	Area			Thickness	Furniture Fraction							
No Added Mass	0 ft <sup>2</sup>			0 ft	0.3							
COOLING SYSTEM												
#	System Type		Subtype	Efficiency	Capacity	Air Flow	SHR	Ductless				
1	Central Unit		None	SEER: 13	18 kBtu/hr	540 cfm	0.75	False				
HEATING SYSTEM												
#	System Type		Subtype	Efficiency	Capacity	Ductless						
1	Natural Gas Furnace		None	AFUE: 0.8	75 kBtu/hr	False						

# Building Input Summary Report

HOT WATER SYSTEM													
#	System Type	EF	Cap	Use	SetPnt	Credits							
1	Natural Gas	0.82	1 gal	53 gal	120 deg	None							
SOLAR HOT WATER													
Collector Type	Collector Tilt	Surface Azimuth	Area	Loss Coef.	Absorp. Prod.	Trans Corr.	Tank Volume	Tank U-Value	Tank Surf Area	Heat Exch Eff	PV Pumped	Pump Energy	
DUCTS													
#	Location	---- Supply ---- R-Value	Area	Location	---- Return ---- Area	Number	Leakage Type	Air Handler	CFM 25	Percent Leakage	QN	RLF	
1	Attic	6	164 ft <sup>2</sup>	Attic	41 ft <sup>2</sup>	(invalid)	Prop. Air Leakage	Interior	90.00 cfm	6.00 %	0.11	0.60	
TEMPERATURES													
Programable Thermostat: Y						Ceiling Fans: N							
Cooling	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec	
Heating	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec	
Venting	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec	
Thermostat Schedule: HERS 2006 Reference													
Schedule Type		1	2	3	4	5	6	7	8	9	10	11	12
Cooling (WD)	AM	78	78	78	78	78	78	78	78	80	80	80	80
	PM	80	80	78	78	78	78	78	78	78	78	78	78
Cooling (WEH)	AM	78	78	78	78	78	78	78	78	78	78	78	78
	PM	78	78	78	78	78	78	78	78	78	78	78	78
Heating (WD)	AM	66	66	66	66	66	68	68	68	68	68	68	68
	PM	68	68	68	68	68	68	68	68	68	68	66	66
Heating (WEH)	AM	66	66	66	66	66	68	68	68	68	68	68	68
	PM	68	68	68	68	68	68	68	68	68	68	66	66

# Building Input Summary Report

## APPLIANCES & LIGHTING

Appliance Schedule: Glenville2		Hours											
Schedule Type		1	2	3	4	5	6	7	8	9	10	11	12
Ceiling Fans (Summer)	AM	1	1	1	1	1	1	1	0.883	0.409	0.242	0.242	0.242
% Released: 100	PM	0.242	0.242	0.242	0.242	0.295	0.553	0.897	0.897	0.897	1	1	1
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Clothes Washer	AM	0.105	0.081	0.046	0.046	0.081	0.128	0.256	0.57	0.849	1	0.977	0.872
% Released: 0	PM	0.779	0.698	0.605	0.57	0.581	0.57	0.57	0.57	0.57	0.488	0.43	0.198
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Dishwasher	AM	0.139	0.05	0.028	0.024	0.029	0.09	0.169	0.303	0.541	0.594	0.502	0.443
% Released: 0	PM	0.377	0.396	0.335	0.323	0.344	0.448	0.791	1	0.8	0.597	0.383	0.281
Annual Use: 61 kWh/Yr		Peak Value: 19 Watts											
Dryer	AM	0.122	0.073	0.049	0.024	0.049	0.073	0.195	0.39	0.595	0.839	0.961	1
% Released: 0	PM	0.912	0.829	0.746	0.707	0.683	0.668	0.634	0.624	0.644	0.668	0.537	0.293
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Lighting	AM	0.063	0.063	0.063	0.063	0.188	0.391	0.438	0.391	0.172	0.117	0.117	0.117
% Released: 100	PM	0.117	0.117	0.117	0.203	0.438	0.609	0.82	0.984	1	0.688	0.383	0.156
Annual Use: 1498 kWh/Yr		Peak Value: 525 Watts											
Miscellaneous	AM	0.454	0.411	0.393	0.38	0.38	0.429	0.54	0.65	0.663	0.675	0.687	0.699
% Released: 100	PM	0.687	0.663	0.65	0.681	0.804	1	1	0.926	0.89	0.847	0.712	0.577
Annual Use: 2516 kWh/Yr		Peak Value: 436 Watts											
Pool Pump	AM	0	0	0	0	0	0	0	0	0	1	1	1
% Released: 0	PM	1	1	1	1	0	0	0	0	0	0	0	0
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Range	AM	0.047	0.047	0.024	0.024	0.047	0.071	0.165	0.283	0.307	0.321	0.283	0.33
% Released: 0	PM	0.337	0.307	0.292	0.377	0.613	1	0.778	0.401	0.236	0.165	0.104	0.071
Annual Use: 38 Therms/Yr		Peak Value: 2 kBtu/Hr											
Refrigeration	AM	0.57	0.49	0.49	0.46	0.46	0.57	0.76	0.89	0.89	0.82	0.71	0.71
% Released: 0	PM	0.64	0.58	0.58	0.58	0.73	0.59	1	1	0.96	0.96	0.86	0.71
Annual Use: 756 kWh/Yr		Peak Value: 122 Watts											
Well Pump	AM	0.05	0.05	0.05	0.05	0.05	0.05	0.1	0.1	0.1	0.1	0.1	0.1
% Released: 100	PM	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											

# Annual Energy Summary

Title: 8804 Glenville Unit 3 with 43%  
User

TMY City: MD\_BALTIMORE\_BL  
Elec Util: MD 2009  
Gas Util: MD 2008  
Run Date: 03/02/2010 14:11:54

Registration #:

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (18 kBtu/hr)	703 kWh	\$107
Cooling Fan	129 kWh	\$20
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Cooling</b>	<b>832 kWh</b>	<b>\$127</b>
Heating (75 kBtu/hr)	281 Therms	\$438
Heating Fan/Pump	176 kWh	\$27
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Heating</b>	<b>\$465</b>	
Hot Water	114 Therms	\$178
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>		<b>\$178</b>
Ceiling Fans	0 kWh	\$0
Clothes Washer	0 kWh	\$0
Dishwasher	61 kWh	\$9
Dryer	0 kWh	\$0
Lighting	1499 kWh	\$227
Miscellaneous	2516 kWh	\$381
Pool Pump	0 kWh	\$0
Range	38 Therms	\$59
Refrigerator	756 kWh	\$115
<hr/>		
Total (kWh)	5840 kWh	\$886
Total (Therms)	433 Therms	\$675
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		\$1561

## Emissions (Calculated as Total - PV Produced)

SO2	64.45 Lbs.
NOX	18.71 Lbs.
CO2	6.3 Tons



# Building Input Summary Report

PROJECT											
Title:	8804 Glenville Unit 3 with 43		Bedrooms:	2		Address Type:	Street Address				
Building Type:	User		Bathrooms:	1		Lot #					
Owner:			Conditioned Area:	820		SubDivision:					
# of Units:	1		Total Stories:	1		PlatBook:					
Builder Name:	Unit 3 - Existing		Worst Case:	No		Street:					
Permit Office:			Rotate Angle:	0		County:					
Jurisdiction:			Cross Ventilation:			City, State, Zip:					
Family Type:	Multi-family		Whole House Fan:								
New/Existing:	Existing (Projected)										
Comment:											
CLIMATE											
Design Location	Tmy Site		Design Temp	97.5 % 2.5 %		Int Design Temp	Winter Summer		Heating Degree Days	Design Moisture	Daily Temp Range
MD, BALTIMORE_BLT-WA	MD_BALTIMORE_BLT-WASHNGT		13	91		70	75		4631	37	Medium
UTILITY RATES											
Fuel	Unit	Utility Name					Monthly Fixed Cost	\$/Unit			
Electricity	kWh	MD 2009					0	0.1516			
Natural Gas	Therm	MD 2008					0	1.56			
Fuel Oil	Gallon	Maryland Default					0	1.1			
Propane	Gallon	Maryland Default					0	1.4			
SURROUNDINGS											
Ornt	Type	Shade Trees					Adjacent Buildings				
		Height	Width	Distance	Exist	Height	Width	Distance			
N	None	0 ft	0 ft	0 ft	X	35 ft	40 ft	30 ft			
NE	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft			
E	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft			
SE	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft			
S	None	0 ft	0 ft	0 ft	X	35 ft	40 ft	30 ft			
SW	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft			
W	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft			
NW	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft			
FLOORS											
#	Floor Type			R-Value	Area			Tile	Wood	Carpet	
1	Raised Floor			60	820 ft <sup>2</sup>			0	0.75	0.25	
ROOF											
#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch		
1	Flat	Gravel	823 ft <sup>2</sup>	34 ft <sup>2</sup>	Dark	0.96	No	10	4.8 deg		
ATTIC											
#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC					
1	No attic	Unvented	0	820 ft <sup>2</sup>	N	N					

# Building Input Summary Report

CEILING												
#	Ceiling Type			R-Value	Area	Framing Fraction	Truss Type					
1	Under Attic (Unvented)			60	820 ft <sup>2</sup>	0.11	Wood					
WALLS												
Wall orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.												
#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Width Ft	In	Height Ft	In	Area	Sheathing R-Value	Framing Fraction	Solar Absor.
1	E	Exterior	Face Brick - Block	0.5	20		8		160 ft <sup>2</sup>	0	0	0.75
2	S	Neighbor	Face Brick - Block	0.5	41		8		328 ft <sup>2</sup>	0	0	0.1
3	W	Exterior	Face Brick - Block	0.5	20		8		160 ft <sup>2</sup>	0	0	0.75
4	N	Exterior	Face Brick - Block	0.5	41		8		328 ft <sup>2</sup>	0	0	0.75
DOORS												
#	Ornt	Door Type			Storms	U-Value	Width Ft	In	Height Ft	In	Area	
1	E	Insulated			None	0.46	3		6	8	20 ft <sup>2</sup>	
WINDOWS												
#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storm	Area	Overhang		Interior Shade	Screening
1	E	Vinyl	Double (Clear)	Yes	0.55	0.6	N	24 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	None	None
2	W	Vinyl	Double (Clear)	Yes	0.55	0.6	N	24 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	None	None
3	N	Vinyl	Double (Clear)	Yes	0.55	0.6	N	36 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	None	None
4	N	Vinyl	Double (Clear)	Yes	0.55	0.6	N	4.5 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	None	None
INFILTRATION & VENTING												
Method	SLA	CFM 50	ELA	EqLA	ACH	ACH 50	---- Forced Ventilation ----			Terrain/Wind Shielding		
							Supply	Exhaust	Run Time			
Proposed ACH	0.00128	2743	150.6	283.2	1.046	25.09	0	0	0	Suburban / Suburban		
MASS												
Mass Type	Area			Thickness	Furniture Fraction							
No Added Mass	0 ft <sup>2</sup>			0 ft	0.3							
COOLING SYSTEM												
#	System Type		Subtype	Efficiency	Capacity	Air Flow	SHR	Ductless				
1	Central Unit		None	SEER: 15	18 kBtu/hr	540 cfm	0.75	False				
HEATING SYSTEM												
#	System Type		Subtype	Efficiency	Capacity	Ductless						
1	Natural Gas Furnace		None	AFUE: 0.96	75 kBtu/hr	False						

# Building Input Summary Report

HOT WATER SYSTEM														
#	System Type	EF	Cap	Use	SetPnt	Credits								
1	Natural Gas	0.82	1 gal	53 gal	120 deg	None								
SOLAR HOT WATER														
Collector Type	Collector Tilt	Surface Azimuth	Area	Loss Coef.	Absorp. Prod.	Trans Corr.	Tank Volume	Tank U-Value	Tank Surf Area	Heat Exch Eff	PV Pumped	Pump Energy		
DUCTS														
#	Location	---- Supply ---- R-Value	Area	Location	---- Return ---- Area	Number	Leakage Type	Air Handler	CFM 25	Percent Leakage	QN	RLF		
1	Attic	6	164 ft <sup>2</sup>	Attic	41 ft <sup>2</sup>	(invalid)	Prop. Air Leakage	Interior	90.00 cfm	6.00 %	0.11	0.60		
TEMPERATURES														
Programable Thermostat: Y							Ceiling Fans: N							
Cooling	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec		
Heating	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec		
Venting	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec		
Thermostat Schedule: HERS 2006 Reference														
Schedule Type	Hours													
	1	2	3	4	5	6	7	8	9	10	11	12		
Cooling (WD)	AM 78	78	78	78	78	78	78	78	80	80	80	80	80	80
	PM 80	80	78	78	78	78	78	78	78	78	78	78	78	78
Cooling (WEH)	AM 78	78	78	78	78	78	78	78	78	78	78	78	78	78
	PM 78	78	78	78	78	78	78	78	78	78	78	78	78	78
Heating (WD)	AM 66	66	66	66	66	66	68	68	68	68	68	68	68	68
	PM 68	68	68	68	68	68	68	68	68	68	68	68	66	66
Heating (WEH)	AM 66	66	66	66	66	66	68	68	68	68	68	68	68	68
	PM 68	68	68	68	68	68	68	68	68	68	68	68	66	66

# Building Input Summary Report

## APPLIANCES & LIGHTING

Appliance Schedule: Glenville2		Hours											
Schedule Type		1	2	3	4	5	6	7	8	9	10	11	12
Ceiling Fans (Summer)	AM	1	1	1	1	1	1	1	0.883	0.409	0.242	0.242	0.242
% Released: 100	PM	0.242	0.242	0.242	0.242	0.295	0.553	0.897	0.897	0.897	1	1	1
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Clothes Washer	AM	0.105	0.081	0.046	0.046	0.081	0.128	0.256	0.57	0.849	1	0.977	0.872
% Released: 0	PM	0.779	0.698	0.605	0.57	0.581	0.57	0.57	0.57	0.57	0.488	0.43	0.198
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Dishwasher	AM	0.139	0.05	0.028	0.024	0.029	0.09	0.169	0.303	0.541	0.594	0.502	0.443
% Released: 0	PM	0.377	0.396	0.335	0.323	0.344	0.448	0.791	1	0.8	0.597	0.383	0.281
Annual Use: 61 kWh/Yr		Peak Value: 19 Watts											
Dryer	AM	0.122	0.073	0.049	0.024	0.049	0.073	0.195	0.39	0.595	0.839	0.961	1
% Released: 0	PM	0.912	0.829	0.746	0.707	0.683	0.668	0.634	0.624	0.644	0.668	0.537	0.293
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Lighting	AM	0.063	0.063	0.063	0.063	0.188	0.391	0.438	0.391	0.172	0.117	0.117	0.117
% Released: 100	PM	0.117	0.117	0.117	0.203	0.438	0.609	0.82	0.984	1	0.688	0.383	0.156
Annual Use: 1498 kWh/Yr		Peak Value: 525 Watts											
Miscellaneous	AM	0.454	0.411	0.393	0.38	0.38	0.429	0.54	0.65	0.663	0.675	0.687	0.699
% Released: 100	PM	0.687	0.663	0.65	0.681	0.804	1	1	0.926	0.89	0.847	0.712	0.577
Annual Use: 2516 kWh/Yr		Peak Value: 436 Watts											
Pool Pump	AM	0	0	0	0	0	0	0	0	0	1	1	1
% Released: 0	PM	1	1	1	1	0	0	0	0	0	0	0	0
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Range	AM	0.047	0.047	0.024	0.024	0.047	0.071	0.165	0.283	0.307	0.321	0.283	0.33
% Released: 0	PM	0.337	0.307	0.292	0.377	0.613	1	0.778	0.401	0.236	0.165	0.104	0.071
Annual Use: 38 Therms/Yr		Peak Value: 2 kBtu/Hr											
Refrigeration	AM	0.57	0.49	0.49	0.46	0.46	0.57	0.76	0.89	0.89	0.82	0.71	0.71
% Released: 0	PM	0.64	0.58	0.58	0.58	0.73	0.59	1	1	0.96	0.96	0.86	0.71
Annual Use: 756 kWh/Yr		Peak Value: 122 Watts											
Well Pump	AM	0.05	0.05	0.05	0.05	0.05	0.05	0.1	0.1	0.1	0.1	0.1	0.1
% Released: 100	PM	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											

# Annual Energy Summary

Title: 8804 Glenville Unit 3 with 50%  
User

TMY City: MD\_BALTIMORE\_BL  
Elec Util: MD 2009  
Gas Util: MD 2008  
Run Date: 03/02/2010 16:09:02

Registration #:

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (12 kBtu/hr)	545 kWh	\$83
Cooling Fan	125 kWh	\$19
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Cooling</b>	<b>670 kWh</b>	<b>\$102</b>
Heating (75 kBtu/hr)	281 Therms	\$438
Heating Fan/Pump	176 kWh	\$27
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Heating</b>	<b>\$465</b>	
Hot Water	66 Therms	\$103
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>		<b>\$103</b>
Ceiling Fans	0 kWh	\$0
Clothes Washer	0 kWh	\$0
Dishwasher	61 kWh	\$9
Dryer	0 kWh	\$0
Lighting	1499 kWh	\$227
Miscellaneous	2516 kWh	\$381
Pool Pump	0 kWh	\$0
Range	38 Therms	\$59
Refrigerator	756 kWh	\$115
<hr/>		
Total (kWh)	5678 kWh	\$861
Total (Therms)	385 Therms	\$600
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		\$1461

## Emissions (Calculated as Total - PV Produced)

SO2	62.66 Lbs.
NOX	17.72 Lbs.
CO2	5.92 Tons

# Building Input Summary Report

PROJECT											
Title:	8804 Glenville Unit 3 with 50		Bedrooms:	2		Address Type:	Street Address				
Building Type:	User		Bathrooms:	1		Lot #					
Owner:			Conditioned Area:	820		SubDivision:					
# of Units:	1		Total Stories:	1		PlatBook:					
Builder Name:	Unit 3 - Existing		Worst Case:	No		Street:					
Permit Office:			Rotate Angle:	0		County:					
Jurisdiction:			Cross Ventilation:			City, State, Zip:					
Family Type:	Multi-family		Whole House Fan:								
New/Existing:	Existing (Projected)										
Comment:											
CLIMATE											
Design Location	Tmy Site		Design Temp	97.5 %	2.5 %	Int Design Temp	Winter	Summer	Heating Degree Days	Design Moisture	Daily Temp Range
MD, BALTIMORE_BLT-WA	MD_BALTIMORE_BLT-WASHNGT		13	91		70	75	4631	37	Medium	
UTILITY RATES											
Fuel	Unit	Utility Name					Monthly Fixed Cost	\$/Unit			
Electricity	kWh	MD 2009					0	0.1516			
Natural Gas	Therm	MD 2008					0	1.56			
Fuel Oil	Gallon	Maryland Default					0	1.1			
Propane	Gallon	Maryland Default					0	1.4			
SURROUNDINGS											
Ornt	Type	Shade Trees					Adjacent Buildings				
		Height	Width	Distance	Exist	Height	Width	Distance			
N	None	0 ft	0 ft	0 ft	X	35 ft	40 ft	30 ft			
NE	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft			
E	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft			
SE	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft			
S	None	0 ft	0 ft	0 ft	X	35 ft	40 ft	30 ft			
SW	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft			
W	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft			
NW	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft			
FLOORS											
#	Floor Type			R-Value	Area			Tile	Wood	Carpet	
1	Raised Floor			60	820 ft <sup>2</sup>			0	0.75	0.25	
ROOF											
#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch		
1	Flat	Gravel	823 ft <sup>2</sup>	34 ft <sup>2</sup>	Dark	0.96	No	10	4.8 deg		
ATTIC											
#	Type	Ventilation	Vent Ratio (1 in)		Area	RBS	IRCC				
1	No attic	Unvented	0		820 ft <sup>2</sup>	N	N				

# Building Input Summary Report

CEILING												
#	Ceiling Type			R-Value	Area	Framing Fraction	Truss Type					
1	Under Attic (Unvented)			60	820 ft <sup>2</sup>	0.11	Wood					
WALLS												
Wall orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.												
#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Width Ft	In	Height Ft	In	Area	Sheathing R-Value	Framing Fraction	Solar Absor.
1	E	Exterior	Face Brick - Block	0.5	20		8		160 ft <sup>2</sup>	0	0	0.75
2	S	Neighbor	Face Brick - Block	0.5	41		8		328 ft <sup>2</sup>	0	0	0.1
3	W	Exterior	Face Brick - Block	0.5	20		8		160 ft <sup>2</sup>	0	0	0.75
4	N	Exterior	Face Brick - Block	0.5	41		8		328 ft <sup>2</sup>	0	0	0.75
DOORS												
#	Ornt	Door Type			Storms	U-Value	Width Ft	In	Height Ft	In	Area	
1	E	Insulated			None	0.46	3		6	8	20 ft <sup>2</sup>	
WINDOWS												
#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storm	Area	Overhang		Interior Shade	Screening
1	E	Vinyl	Double (Clear)	Yes	0.55	0.6	N	24 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	None	None
2	W	Vinyl	Double (Clear)	Yes	0.55	0.6	N	24 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	None	None
3	N	Vinyl	Double (Clear)	Yes	0.55	0.6	N	36 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	None	None
4	N	Vinyl	Double (Clear)	Yes	0.55	0.6	N	4.5 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	None	None
INFILTRATION & VENTING												
Method	SLA	CFM 50	ELA	EqLA	ACH	ACH 50	---- Forced Ventilation ----			Terrain/Wind Shielding		
Proposed ACH	0.00128	2743	150.6	283.2	1.046	25.09	Supply	Exhaust	Run Time	Suburban / Suburban		
							0	0	0			
MASS												
Mass Type	Area			Thickness	Furniture Fraction							
No Added Mass	0 ft <sup>2</sup>			0 ft	0.3							
COOLING SYSTEM												
#	System Type		Subtype	Efficiency	Capacity	Air Flow	SHR	Ductless				
1	Central Unit		None	SEER: 18	12 kBtu/hr	360 cfm	0.75	False				
HEATING SYSTEM												
#	System Type		Subtype	Efficiency	Capacity	Ductless						
1	Natural Gas Furnace		None	AFUE: 0.96	75 kBtu/hr	False						

# Building Input Summary Report

HOT WATER SYSTEM													
#	System Type	EF	Cap	Use	SetPnt	Credits							
1	Natural Gas	0.82	1 gal	53 gal	120 deg	Solar System							
SOLAR HOT WATER													
Collector Type	Collector Tilt	Collector Azimuth	Surface Area	Surface Loss Coef.	Absorp. Prod.	Trans Corr.	Tank Volume	Tank U-Value	Tank Surf Area	Heat Exch Eff	PV Pumped	Pump Energy	
Flat Plate (Closed Loop)	4.8	180	3.00 m <sup>2</sup>	4.17 W/m <sup>2</sup>	0.75	0.96	303.0 L	0.700 W/m <sup>2</sup> /C	2.32 m <sup>2</sup>	0.88	Yes	0 W	
DUCTS													
#	Location	---- Supply ---- R-Value	Area	Location	---- Return ---- Area	Number	Leakage Type	Air Handler	CFM 25	Percent Leakage	QN	RLF	
1	Attic	6	164 ft <sup>2</sup>	Attic	41 ft <sup>2</sup>	(invalid)	Prop. Air Leakage	Interior	90.00 cfm	6.00 %	0.11	0.60	
TEMPERATURES													
Programable Thermostat: Y						Ceiling Fans: N							
Cooling	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec	
Heating	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec	
Venting	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec	
Thermostat Schedule: HERS 2006 Reference													
Schedule Type		1	2	3	4	5	6	7	8	9	10	11	12
Cooling (WD)	AM	78	78	78	78	78	78	78	78	80	80	80	80
	PM	80	80	78	78	78	78	78	78	78	78	78	78
Cooling (WEH)	AM	78	78	78	78	78	78	78	78	78	78	78	78
	PM	78	78	78	78	78	78	78	78	78	78	78	78
Heating (WD)	AM	66	66	66	66	66	68	68	68	68	68	68	68
	PM	68	68	68	68	68	68	68	68	68	68	66	66
Heating (WEH)	AM	66	66	66	66	66	68	68	68	68	68	68	68
	PM	68	68	68	68	68	68	68	68	68	68	66	66



# Building Input Summary Report

## APPLIANCES & LIGHTING

Appliance Schedule: Glenville2		Hours											
Schedule Type		1	2	3	4	5	6	7	8	9	10	11	12
Ceiling Fans (Summer)	AM	1	1	1	1	1	1	1	0.883	0.409	0.242	0.242	0.242
% Released: 100	PM	0.242	0.242	0.242	0.242	0.295	0.553	0.897	0.897	0.897	1	1	1
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Clothes Washer	AM	0.105	0.081	0.046	0.046	0.081	0.128	0.256	0.57	0.849	1	0.977	0.872
% Released: 0	PM	0.779	0.698	0.605	0.57	0.581	0.57	0.57	0.57	0.57	0.488	0.43	0.198
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Dishwasher	AM	0.139	0.05	0.028	0.024	0.029	0.09	0.169	0.303	0.541	0.594	0.502	0.443
% Released: 0	PM	0.377	0.396	0.335	0.323	0.344	0.448	0.791	1	0.8	0.597	0.383	0.281
Annual Use: 61 kWh/Yr		Peak Value: 19 Watts											
Dryer	AM	0.122	0.073	0.049	0.024	0.049	0.073	0.195	0.39	0.595	0.839	0.961	1
% Released: 0	PM	0.912	0.829	0.746	0.707	0.683	0.668	0.634	0.624	0.644	0.668	0.537	0.293
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Lighting	AM	0.063	0.063	0.063	0.063	0.188	0.391	0.438	0.391	0.172	0.117	0.117	0.117
% Released: 100	PM	0.117	0.117	0.117	0.203	0.438	0.609	0.82	0.984	1	0.688	0.383	0.156
Annual Use: 1498 kWh/Yr		Peak Value: 525 Watts											
Miscellaneous	AM	0.454	0.411	0.393	0.38	0.38	0.429	0.54	0.65	0.663	0.675	0.687	0.699
% Released: 100	PM	0.687	0.663	0.65	0.681	0.804	1	1	0.926	0.89	0.847	0.712	0.577
Annual Use: 2516 kWh/Yr		Peak Value: 436 Watts											
Pool Pump	AM	0	0	0	0	0	0	0	0	0	1	1	1
% Released: 0	PM	1	1	1	1	0	0	0	0	0	0	0	0
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Range	AM	0.047	0.047	0.024	0.024	0.047	0.071	0.165	0.283	0.307	0.321	0.283	0.33
% Released: 0	PM	0.337	0.307	0.292	0.377	0.613	1	0.778	0.401	0.236	0.165	0.104	0.071
Annual Use: 38 Therms/Yr		Peak Value: 2 kBTU/Hr											
Refrigeration	AM	0.57	0.49	0.49	0.46	0.46	0.57	0.76	0.89	0.89	0.82	0.71	0.71
% Released: 0	PM	0.64	0.58	0.58	0.58	0.73	0.59	1	1	0.96	0.96	0.86	0.71
Annual Use: 756 kWh/Yr		Peak Value: 122 Watts											
Well Pump	AM	0.05	0.05	0.05	0.05	0.05	0.05	0.1	0.1	0.1	0.1	0.1	0.1
% Released: 100	PM	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											



# APPENDIX C ENERGY MODELS

iv. Unit 4

HUD

8804 Glenville Unit 4

	Required		20%		34%		43%		50%	
	Unit 4 Before	Unit 4 Bronze	Comparison to Reference House	Unit 4 Silver	Comparison to Reference House	Unit 4 Gold <sup>1</sup>	Comparison to Reference House	Unit 4 Emerald	Comparison to Reference House	
Climate Zone 4:										
e-ratio - 2006 IECC	1.95	1.55		1.23		1.07		0.93		
Finished Floor Area, sq. feet	820	820		820		820		820		
Bedrooms	2	2		2		2		2		
Baths	1	1		1		1		1		
Floor R-value	0	0		0		0		0		
Whole Wall U-value	0.306	0.306		0.306		0.306		0.306		
Flat Ceiling R-value	10	10		10		10		10		
Wall Construction	brick/CMU 6"	brick/CMU 6"		brick/CMU 6"		brick/CMU 6"		brick/CMU 6"		
Wall Area, Ambient, Above Grade	648	648		648		648		648		
Window U-value	0.55	0.55		0.55		0.55		0.55		
Window SHGC, Low e	0.60	0.6		0.6		0.6		0.6		
Window Area	56	55.5		55.5		55.5		55.5		
Window Area, % of Floor, CFA	6.77%	6.77%		6.77%		6.77%		6.77%		
Window Area % of Wall	8.56%	8.56%		8.56%		8.56%		8.56%		
Infiltration, ACHnat	1.320	0.924		0.924		0.924		0.92		
Cooling System SEER	10	10		13		15		16		
Cooling Capacity, kBtu/hr	18	18		18		18		18		
Heating System, AFUE	0.78	0.78		0.78		0.92		0.96		
Heating Capacity, kBtu/hr	75	75		75		75		75		
DSE (HVAC Design System Efficiency), Leakage	88.00%	6.00%		6.00%		6.00%		6.00%		
Duct Location	Inside	Inside		Inside		Inside		Inside		
Air Handler Location	Inside	Inside		Inside		Inside		Inside		
Hot Water Use, gallons/day	53	53		53		53		53		
Water Heater Energy Factor,	0.54	0.60		.82 tankless		.82 tankless		.82 tankless	32 sf solar dhw	
Cool Set Point	78	78		78		78		78	closed loop	
Heat Set Point	68	68		68		68		68		
Programmable Thermostat	No	Yes		Yes		Yes		Yes		
Cooling setback degrees; setback hours	n/a	2/6		2/6		2/6		2/6		
Heating setback degrees; setback hours	n/a	2/7		2/7		2/7		2/7		
<b>ENERGY COST and USAGE:</b>										
Cooling Energy, cost, kWh	305	269		216		181		171		
Heating Energy, cost, therms	741	544		544		465		446		
Heating Energy, cost, kWh	52	37		37		28		28		
Water Heater, cost, therms	399	348		178		178		103		
<b>Subtotal Heating and Cooling (\$)</b>	<b>\$1,497</b>	<b>\$1,198</b>	<b>19.97%</b>	<b>\$975</b>	<b>34.87%</b>	<b>\$852</b>	<b>43.09%</b>	<b>\$748</b>	<b>50.03%</b>	
Dishwasher, cost, kWh	9	9		9		9		9		
Lights, cost, kWh	227	227		227		227		227		
Miscellaneous, cost, kWh	381	381		381		381		381		
Range, cost, therms	59	59		59		59		59		
Refrigerator, cost, kWh	115	115		115		115		115		
<b>Whole House Cost (\$A)</b>	<b>\$2,288</b>	<b>\$1,989</b>		<b>\$1,766</b>		<b>\$1,643</b>		<b>\$1,539</b>		

<sup>A</sup>May vary due to rounding.

<sup>B</sup>Calculation based on Table 2 of the report.

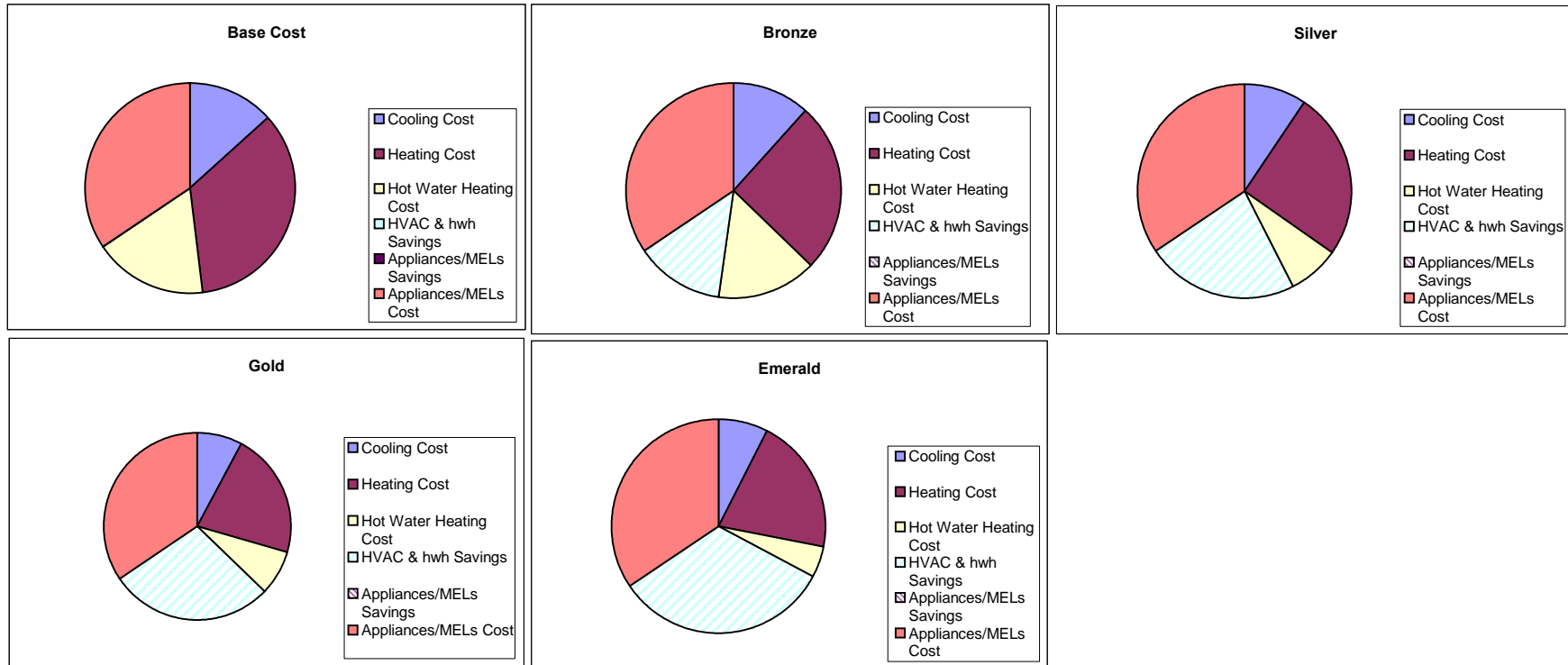
<sup>1</sup>e-ratio of 1.09 with 13 SEER complies; however, 14 SEER required at Emerald level.

Maximum infiltration increase of 30% in 1980 remodels or older

Gaithersburg, Maryland  
Rehab Unit 4

Annual Energy Summary	Base	Bronze			Silver			Gold			Emerald		
	Yr \$	Yr \$	savings	percent	Yr \$	savings	percent	Yr \$	savings	percent	Yr \$	savings	percent
Cooling Cost	305	269	36	12%	216	89	29%	181	124	41%	171	134	44%
Heating Cost	793	581	212	27%	581	212	27%	493	300	38%	474	319	40%
Hot Water Heating Cost	399	348	51	13%	178	221	55%	178	221	55%	103	296	74%
HVAC & hwh Savings	N/A	299			522			645			749		
Appliances/MELs Savings	N/A	0			0			0			0		
Appliances/MELs Cost	791	791			791			791			791		
HVAC & HWH sub-total	1497	1198		20%	975		35%	852		43%	748		50%
Grand Total	2288	1989		87%	1766		77%	1643		72%	1539		67%

Data based on Energy Gauge - Annual Energy Summary. Not Compliance



# Annual Energy Summary

Title: 8804 Glenville Unit 4  
User

TMY City: MD\_BALTIMORE\_BL  
Elec Util: MD 2009  
Gas Util: MD 2008  
Run Date: 03/03/2010 08:48:23

Registration #:

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (18 kBtu/hr)	1720 kWh	\$261
Cooling Fan	287 kWh	\$44
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Cooling</b>	<b>2007 kWh</b>	<b>\$305</b>
Heating (75 kBtu/hr)	475 Therms	\$741
Heating Fan/Pump	344 kWh	\$52
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Heating</b>	<b>\$793</b>	
Hot Water	256 Therms	\$399
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>		<b>\$399</b>
Ceiling Fans	0 kWh	\$0
Clothes Washer	0 kWh	\$0
Dishwasher	61 kWh	\$9
Dryer	0 kWh	\$0
Lighting	1499 kWh	\$227
Miscellaneous	2516 kWh	\$381
Pool Pump	0 kWh	\$0
Range	38 Therms	\$59
Refrigerator	756 kWh	\$115
<hr/>		
Total (kWh)	7183 kWh	\$1089
Total (Therms)	770 Therms	\$1199
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		\$2288

## Emissions (Calculated as Total - PV Produced)

SO2	79.27 Lbs.
NOX	25.56 Lbs.
CO2	9.13 Tons

# Building Input Summary Report

PROJECT												
Title:	8804 Glenville Unit 4			Bedrooms:	2		Address Type:	Street Address				
Building Type:	User			Bathrooms:	1		Lot #					
Owner:				Conditioned Area:	820		SubDivision:					
# of Units:	1			Total Stories:	1		PlatBook:					
Builder Name:	Unit 4 - Existing			Worst Case:	No		Street:					
Permit Office:				Rotate Angle:	0		County:					
Jurisdiction:				Cross Ventilation:			City, State, Zip:					
Family Type:	Multi-family			Whole House Fan:								
New/Existing:	Existing (Projected)											
Comment:												
CLIMATE												
Design Location	Tmy Site			Design Temp	97.5 %	2.5 %	Int Design Temp	Winter	Summer	Heating Degree Days	Design Moisture	Daily Temp Range
MD, BALTIMORE_BLT-WA	MD_BALTIMORE_BLT-WASHNGT			13	91		70	75	4631	37	Medium	
UTILITY RATES												
Fuel	Unit	Utility Name				Monthly Fixed Cost		\$/Unit				
Electricity	kWh	MD 2009				0		0.1516				
Natural Gas	Therm	MD 2008				0		1.56				
Fuel Oil	Gallon	Maryland Default				0		1.1				
Propane	Gallon	Maryland Default				0		1.4				
SURROUNDINGS												
Ornt	Type	Shade Trees			Adjacent Buildings							
		Height	Width	Distance	Exist	Height	Width	Distance				
N	None	0 ft	0 ft	0 ft	X	35 ft	40 ft	30 ft				
NE	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft				
E	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft				
SE	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft				
S	None	0 ft	0 ft	0 ft	X	35 ft	40 ft	30 ft				
SW	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft				
W	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft				
NW	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft				
ROOF												
#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch			
1	Flat	Gravel	823 ft²	34 ft²	Dark	0.96	No	10	4.8 deg			
ATTIC												
#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC						
1	No attic	Unvented	0	820 ft²	N	N						
CEILING												
#	Ceiling Type	R-Value	Area	Framing Fraction	Truss Type							
1	Under Attic (Unvented)	0.5	820 ft²	0.11	Wood							

# Building Input Summary Report

WALLS												
Wall orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.												
#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Width Ft	In	Height Ft	In	Area	Sheathing R-Value	Framing Fraction	Solar Absor.
1	E	Exterior	Face Brick - Block	0.01	20		8		160 ft²	0	0	0.75
2	S	Neighbor	Face Brick - Block	0.01	41		8		328 ft²	0	0	0.1
3	W	Exterior	Face Brick - Block	0.01	20		8		160 ft²	0	0	0.75
4	N	Exterior	Face Brick - Block	0.01	41		8		328 ft²	0	0	0.75

DOORS												
#	Ornt	Door Type	Storms	U-Value	Width Ft	In	Height Ft	In	Area			
1	E	Insulated	None	0.46	3		6	8	20 ft²			

WINDOWS												
#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storm	Area	Overhang Depth	Separation	Interior Shade	Screening
1	E	Vinyl	Double (Clear)	Yes	0.55	0.6	N	24 ft²	1 ft 6 in	1 ft 0 in	None	None
2	W	Vinyl	Double (Clear)	Yes	0.55	0.6	N	24 ft²	1 ft 6 in	1 ft 0 in	None	None
3	N	Vinyl	Double (Clear)	Yes	0.55	0.6	N	36 ft²	1 ft 6 in	1 ft 0 in	Drapes/blinds	None
4	N	Vinyl	Double (Clear)	Yes	0.55	0.6	N	4.5 ft²	1 ft 6 in	1 ft 0 in	Drapes/blinds	None

INFILTRATION & VENTING												
Method	SLA	CFM 50	ELA	EqLA	ACH	ACH 50	---- Forced Ventilation ----			Terrain/Wind Shielding		
							Supply	Exhaust	Run Time			
Proposed CFM(50)	0.00161	3466	190.3	357.8	1.321	31.70	0	0	0	Suburban / Suburban		

MASS												
Mass Type	Area			Thickness			Furniture Fraction					
No Added Mass	0 ft²			0 ft			0.3					

COOLING SYSTEM												
#	System Type	Subtype	Efficiency	Capacity	Air Flow	SHR	Ductless					
1	Central Unit	None	SEER: 10	18 kBtu/hr	540 cfm	0.75	False					

HEATING SYSTEM												
#	System Type	Subtype	Efficiency	Capacity	Ductless							
1	Natural Gas Furnace	None	AFUE: 0.78	75 kBtu/hr	False							

HOT WATER SYSTEM												
#	System Type	EF	Cap	Use	SetPnt	Credits						
1	Natural Gas	0.56	30 gal	53 gal	120 deg	None						

# Building Input Summary Report

SOLAR HOT WATER														
Collector Type	Collector		Surface		Absorp.	Trans	Tank	Tank	Tank	Heat	PV	Pump		
	Tilt	Azimuth	Area	Loss Coef.	Prod.	Corr.	Volume	U-Value	Surf Area	Exch Eff	Pumped	Energy		
<b>DUCTS</b>														
#	Location	---- Supply ----		---- Return ----			Leakage Type	Air Handler	Percent		QN	RLF		
		R-Value	Area	Location	Area	Number			CFM 25	Leakage				
1	Attic	6	164 ft <sup>2</sup>	Attic	41 ft <sup>2</sup>	(invalid)	Default Leakage	Interior	(Default)	(Default)				
<b>TEMPERATURES</b>														
Programable Thermostat: N						Ceiling Fans: N								
Cooling	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec		
Heating	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec		
Venting	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec		
Thermostat Schedule: HERS 2006 Reference														
Schedule Type	Hours													
		1	2	3	4	5	6	7	8	9	10	11	12	
Cooling (WD)	AM	78	78	78	78	78	78	78	78	78	78	78	78	78
	PM	78	78	78	78	78	78	78	78	78	78	78	78	78
Cooling (WEH)	AM	78	78	78	78	78	78	78	78	78	78	78	78	78
	PM	78	78	78	78	78	78	78	78	78	78	78	78	78
Heating (WD)	AM	68	68	68	68	68	68	68	68	68	68	68	68	68
	PM	68	68	68	68	68	68	68	68	68	68	68	68	68
Heating (WEH)	AM	68	68	68	68	68	68	68	68	68	68	68	68	68
	PM	68	68	68	68	68	68	68	68	68	68	68	68	68



# Building Input Summary Report

## APPLIANCES & LIGHTING

Appliance Schedule: Glenville2		Hours											
Schedule Type		1	2	3	4	5	6	7	8	9	10	11	12
Ceiling Fans (Summer)	AM	1	1	1	1	1	1	1	0.883	0.409	0.242	0.242	0.242
% Released: 100	PM	0.242	0.242	0.242	0.242	0.295	0.553	0.897	0.897	0.897	1	1	1
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Clothes Washer	AM	0.105	0.081	0.047	0.047	0.081	0.128	0.256	0.57	0.849	1	0.977	0.872
% Released: 0	PM	0.779	0.698	0.605	0.57	0.581	0.57	0.57	0.57	0.57	0.488	0.43	0.198
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Dishwasher	AM	0.139	0.05	0.028	0.024	0.029	0.09	0.169	0.303	0.541	0.594	0.502	0.443
% Released: 0	PM	0.377	0.396	0.335	0.323	0.344	0.448	0.791	1	0.8	0.597	0.383	0.281
Annual Use: 61 kWh/Yr		Peak Value: 19 Watts											
Dryer	AM	0.122	0.073	0.049	0.024	0.049	0.073	0.195	0.39	0.595	0.839	0.961	1
% Released: 0	PM	0.912	0.829	0.746	0.707	0.683	0.668	0.634	0.624	0.644	0.668	0.537	0.293
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Lighting	AM	0.063	0.063	0.063	0.063	0.188	0.391	0.438	0.391	0.172	0.117	0.117	0.117
% Released: 100	PM	0.117	0.117	0.117	0.203	0.438	0.609	0.82	0.984	1	0.688	0.383	0.156
Annual Use: 1498 kWh/Yr		Peak Value: 525 Watts											
Miscellaneous	AM	0.454	0.411	0.393	0.38	0.38	0.429	0.54	0.65	0.663	0.675	0.687	0.699
% Released: 100	PM	0.687	0.663	0.65	0.681	0.804	1	1	0.926	0.89	0.847	0.712	0.577
Annual Use: 2516 kWh/Yr		Peak Value: 436 Watts											
Pool Pump	AM	0	0	0	0	0	0	0	0	0	1	1	1
% Released: 0	PM	1	1	1	1	0	0	0	0	0	0	0	0
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Range	AM	0.047	0.047	0.024	0.024	0.047	0.071	0.165	0.283	0.307	0.321	0.283	0.33
% Released: 0	PM	0.337	0.307	0.292	0.377	0.613	1	0.778	0.401	0.236	0.165	0.104	0.071
Annual Use: 38 Therms/Yr		Peak Value: 2 kBtu/Hr											
Refrigeration	AM	0.57	0.49	0.49	0.46	0.46	0.57	0.76	0.89	0.89	0.82	0.71	0.71
% Released: 0	PM	0.64	0.58	0.58	0.58	0.73	0.59	1	1	0.96	0.96	0.86	0.71
Annual Use: 756 kWh/Yr		Peak Value: 122 Watts											
Well Pump	AM	0.05	0.05	0.05	0.05	0.05	0.05	0.1	0.1	0.1	0.1	0.1	0.1
% Released: 100	PM	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											

# Annual Energy Summary

Title: 8804 Glenville Unit 4 with 20%  
User

TMY City: MD\_BALTIMORE\_BL  
Elec Util: MD 2009  
Gas Util: MD 2008  
Run Date: 03/02/2010 16:12:40

Registration #:

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (18 kBtu/hr)	1516 kWh	\$230
Cooling Fan	256 kWh	\$39
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Cooling</b>	<b>1772 kWh</b>	<b>\$269</b>
Heating (75 kBtu/hr)	349 Therms	\$544
Heating Fan/Pump	244 kWh	\$37
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Heating</b>	<b>\$581</b>	
Hot Water	223 Therms	\$348
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>	<b>\$348</b>	
Ceiling Fans	0 kWh	\$0
Clothes Washer	0 kWh	\$0
Dishwasher	61 kWh	\$9
Dryer	0 kWh	\$0
Lighting	1499 kWh	\$227
Miscellaneous	2516 kWh	\$381
Pool Pump	0 kWh	\$0
Range	38 Therms	\$59
Refrigerator	756 kWh	\$115
<hr/>		
Total (kWh)	6848 kWh	\$1038
Total (Therms)	610 Therms	\$951
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		\$1989

## Emissions (Calculated as Total - PV Produced)

SO2	75.57 Lbs.
NOX	23.16 Lbs.
CO2	7.98 Tons

# Building Input Summary Report

PROJECT											
Title:	8804 Glenville Unit 4 with 20		Bedrooms:	2		Address Type:	Street Address				
Building Type:	User		Bathrooms:	1		Lot #					
Owner:			Conditioned Area:	820		SubDivision:					
# of Units:	1		Total Stories:	1		PlatBook:					
Builder Name:	Unit 4 - Existing		Worst Case:	No		Street:					
Permit Office:			Rotate Angle:	0		County:					
Jurisdiction:			Cross Ventilation:			City, State, Zip:					
Family Type:	Multi-family		Whole House Fan:								
New/Existing:	Existing (Projected)										
Comment:											
CLIMATE											
Design Location	Tmy Site		Design Temp	97.5 %	2.5 %	Int Design Temp	Winter	Summer	Heating Degree Days	Design Moisture	Daily Temp Range
MD, BALTIMORE_BLT-WA	MD_BALTIMORE_BLT-WASHNGT		13	91		70	75	4631	37	Medium	
UTILITY RATES											
Fuel	Unit	Utility Name					Monthly Fixed Cost	\$/Unit			
Electricity	kWh	MD 2009					0	0.1516			
Natural Gas	Therm	MD 2008					0	1.56			
Fuel Oil	Gallon	Maryland Default					0	1.1			
Propane	Gallon	Maryland Default					0	1.4			
SURROUNDINGS											
Ornt	Type	Shade Trees		Width	Distance	Exist	Adjacent Buildings				
		Height					Height	Width	Distance		
N	None	0 ft	0 ft	0 ft	0 ft	X	35 ft	40 ft	30 ft		
NE	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
E	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
SE	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
S	None	0 ft	0 ft	0 ft	0 ft	X	35 ft	40 ft	30 ft		
SW	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
W	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
NW	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
ROOF											
#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch		
1	Flat	Gravel	823 ft²	34 ft²	Dark	0.96	No	10	4.8 deg		
ATTIC											
#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC					
1	No attic	Unvented	0	820 ft²	N	N					
CEILING											
#	Ceiling Type	R-Value	Area	Framing Fraction	Truss Type						
1	Under Attic (Unvented)	0.5	820 ft²	0.11	Wood						

# Building Input Summary Report

<b>WALLS</b>												
Wall orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.												
#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Width Ft	In	Height Ft	In	Area	Sheathing R-Value	Framing Fraction	Solar Absor.
1	E	Exterior	Face Brick - Block	0.01	20		8		160 ft <sup>2</sup>	0	0	0.75
2	S	Neighbor	Face Brick - Block	0.01	41		8		328 ft <sup>2</sup>	0	0	0.1
3	W	Exterior	Face Brick - Block	0.01	20		8		160 ft <sup>2</sup>	0	0	0.75
4	N	Exterior	Face Brick - Block	0.01	41		8		328 ft <sup>2</sup>	0	0	0.75

<b>DOORS</b>												
#	Ornt	Door Type	Storms	U-Value	Width Ft	In	Height Ft	In	Area			
1	E	Insulated	None	0.46	3		6	8	20 ft <sup>2</sup>			

<b>WINDOWS</b>												
#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storm	Area	Overhang Depth	Separation	Interior Shade	Screening
1	E	Vinyl	Double (Clear)	Yes	0.55	0.6	N	24 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	None	None
2	W	Vinyl	Double (Clear)	Yes	0.55	0.6	N	24 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	None	None
3	N	Vinyl	Double (Clear)	Yes	0.55	0.6	N	36 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	Drapes/blinds	None
4	N	Vinyl	Double (Clear)	Yes	0.55	0.6	N	4.5 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	Drapes/blinds	None

<b>INFILTRATION &amp; VENTING</b>												
Method	SLA	CFM 50	ELA	EqLA	ACH	ACH 50	---- Forced Ventilation ----			Terrain/Wind Shielding		
							Supply	Exhaust	Run Time			
Proposed ACH	0.00113	2424	133.1	250.2	0.924	22.17	0	0	0	Suburban / Suburban		

<b>MASS</b>												
Mass Type	Area			Thickness			Furniture Fraction					
No Added Mass	0 ft <sup>2</sup>			0 ft			0.3					

<b>COOLING SYSTEM</b>												
#	System Type	Subtype			Efficiency	Capacity	Air Flow	SHR	Ductless			
1	Central Unit	None			SEER: 10	18 kBtu/hr	540 cfm	0.75	False			

<b>HEATING SYSTEM</b>												
#	System Type	Subtype			Efficiency	Capacity	Ductless					
1	Natural Gas Furnace	None			AFUE: 0.78	75 kBtu/hr	False					

<b>HOT WATER SYSTEM</b>												
#	System Type	EF	Cap	Use	SetPnt	Credits						
1	Natural Gas	0.6	30 gal	53 gal	120 deg	None						

# Building Input Summary Report

SOLAR HOT WATER														
Collector Type	Collector		Surface		Absorp.	Trans	Tank	Tank	Tank	Heat	PV	Pump		
	Tilt	Azimuth	Area	Loss Coef.	Prod.	Corr.	Volume	U-Value	Surf Area	Exch Eff	Pumped	Energy		
<b>DUCTS</b>														
#	Location	---- Supply ----		---- Return ----			Leakage Type	Air Handler	CFM 25	Percent Leakage	QN	RLF		
		R-Value	Area	Location	Area	Number								
1	Attic	6	164 ft <sup>2</sup>	Attic	41 ft <sup>2</sup>	(invalid)	Prop. Air Leakage	Interior	90.00 cfm	6.00 %	0.11	0.60		
<b>TEMPERATURES</b>														
Programable Thermostat: Y						Ceiling Fans: N								
Cooling	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec		
Heating	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec		
Venting	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec		
Thermostat Schedule: HERS 2006 Reference														
Schedule Type		Hours												
		1	2	3	4	5	6	7	8	9	10	11	12	
Cooling (WD)	AM	78	78	78	78	78	78	78	78	80	80	80	80	
	PM	80	80	78	78	78	78	78	78	78	78	78	78	
Cooling (WEH)	AM	78	78	78	78	78	78	78	78	78	78	78	78	
	PM	78	78	78	78	78	78	78	78	78	78	78	78	
Heating (WD)	AM	66	66	66	66	66	68	68	68	68	68	68	68	
	PM	68	68	68	68	68	68	68	68	68	68	68	66	66
Heating (WEH)	AM	66	66	66	66	66	68	68	68	68	68	68	68	
	PM	68	68	68	68	68	68	68	68	68	68	68	66	66

# Building Input Summary Report

## APPLIANCES & LIGHTING

Appliance Schedule: Glenville2		Hours											
Schedule Type		1	2	3	4	5	6	7	8	9	10	11	12
Ceiling Fans (Summer)	AM	1	1	1	1	1	1	1	0.883	0.409	0.242	0.242	0.242
% Released: 100	PM	0.242	0.242	0.242	0.242	0.295	0.553	0.897	0.897	0.897	1	1	1
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Clothes Washer	AM	0.105	0.081	0.046	0.046	0.081	0.128	0.256	0.57	0.849	1	0.977	0.872
% Released: 0	PM	0.779	0.698	0.605	0.57	0.581	0.57	0.57	0.57	0.57	0.488	0.43	0.198
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Dishwasher	AM	0.139	0.05	0.028	0.024	0.029	0.09	0.169	0.303	0.541	0.594	0.502	0.443
% Released: 0	PM	0.377	0.396	0.335	0.323	0.344	0.448	0.791	1	0.8	0.597	0.383	0.281
Annual Use: 61 kWh/Yr		Peak Value: 19 Watts											
Dryer	AM	0.122	0.073	0.049	0.024	0.049	0.073	0.195	0.39	0.595	0.839	0.961	1
% Released: 0	PM	0.912	0.829	0.746	0.707	0.683	0.668	0.634	0.624	0.644	0.668	0.537	0.293
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Lighting	AM	0.063	0.063	0.063	0.063	0.188	0.391	0.438	0.391	0.172	0.117	0.117	0.117
% Released: 100	PM	0.117	0.117	0.117	0.203	0.438	0.609	0.82	0.984	1	0.688	0.383	0.156
Annual Use: 1498 kWh/Yr		Peak Value: 525 Watts											
Miscellaneous	AM	0.454	0.411	0.393	0.38	0.38	0.429	0.54	0.65	0.663	0.675	0.687	0.699
% Released: 100	PM	0.687	0.663	0.65	0.681	0.804	1	1	0.926	0.89	0.847	0.712	0.577
Annual Use: 2516 kWh/Yr		Peak Value: 436 Watts											
Pool Pump	AM	0	0	0	0	0	0	0	0	0	1	1	1
% Released: 0	PM	1	1	1	1	0	0	0	0	0	0	0	0
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Range	AM	0.047	0.047	0.024	0.024	0.047	0.071	0.165	0.283	0.307	0.321	0.283	0.33
% Released: 0	PM	0.337	0.307	0.292	0.377	0.613	1	0.778	0.401	0.236	0.165	0.104	0.071
Annual Use: 38 Therms/Yr		Peak Value: 2 kBtu/Hr											
Refrigeration	AM	0.57	0.49	0.49	0.46	0.46	0.57	0.76	0.89	0.89	0.82	0.71	0.71
% Released: 0	PM	0.64	0.58	0.58	0.58	0.73	0.59	1	1	0.96	0.96	0.86	0.71
Annual Use: 756 kWh/Yr		Peak Value: 122 Watts											
Well Pump	AM	0.05	0.05	0.05	0.05	0.05	0.05	0.1	0.1	0.1	0.1	0.1	0.1
% Released: 100	PM	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											

# Annual Energy Summary

Title: 8804 Glenville Unit 4 with 34%  
User

TMY City: MD\_BALTIMORE\_BL  
Elec Util: MD 2009  
Gas Util: MD 2008  
Run Date: 03/02/2010 16:15:08

Registration #:

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (18 kBtu/hr)	1166 kWh	\$177
Cooling Fan	256 kWh	\$39
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Cooling</b>	<b>1422 kWh</b>	<b>\$216</b>
Heating (75 kBtu/hr)	349 Therms	\$544
Heating Fan/Pump	244 kWh	\$37
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Heating</b>	<b>\$581</b>	
Hot Water	114 Therms	\$178
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>	<b>\$178</b>	
Ceiling Fans	0 kWh	\$0
Clothes Washer	0 kWh	\$0
Dishwasher	61 kWh	\$9
Dryer	0 kWh	\$0
Lighting	1499 kWh	\$227
Miscellaneous	2516 kWh	\$381
Pool Pump	0 kWh	\$0
Range	38 Therms	\$59
Refrigerator	756 kWh	\$115
<hr/>		
Total (kWh)	6498 kWh	\$985
Total (Therms)	501 Therms	\$781
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		\$1766

## Emissions (Calculated as Total - PV Produced)

SO2	71.71 Lbs.
NOX	20.96 Lbs.
CO2	7.12 Tons

# Building Input Summary Report

PROJECT											
Title:	8804 Glenville Unit 4 with 34		Bedrooms:	2	Address Type:	Street Address					
Building Type:	User		Bathrooms:	1	Lot #						
Owner:			Conditioned Area:	820	SubDivision:						
# of Units:	1		Total Stories:	1	PlatBook:						
Builder Name:	Unit 4 - Existing		Worst Case:	No	Street:						
Permit Office:			Rotate Angle:	0	County:						
Jurisdiction:			Cross Ventilation:		City, State, Zip:						
Family Type:	Multi-family		Whole House Fan:								
New/Existing:	Existing (Projected)										
Comment:											
CLIMATE											
Design Location	Tmy Site		Design Temp	97.5 %	2.5 %	Int Design Temp	Winter	Summer	Heating Degree Days	Design Moisture	Daily Temp Range
MD, BALTIMORE_BLT-WA	MD_BALTIMORE_BLT-WASHNGT		13	91		70	75	4631	37	Medium	
UTILITY RATES											
Fuel	Unit	Utility Name					Monthly Fixed Cost	\$/Unit			
Electricity	kWh	MD 2009					0	0.1516			
Natural Gas	Therm	MD 2008					0	1.56			
Fuel Oil	Gallon	Maryland Default					0	1.1			
Propane	Gallon	Maryland Default					0	1.4			
SURROUNDINGS											
Ornt	Type	Shade Trees		Width	Distance	Exist	Adjacent Buildings				
		Height					Height	Width	Distance		
N	None	0 ft	0 ft	0 ft	0 ft	X	35 ft	40 ft	30 ft		
NE	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
E	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
SE	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
S	None	0 ft	0 ft	0 ft	0 ft	X	35 ft	40 ft	30 ft		
SW	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
W	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
NW	None	0 ft	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
ROOF											
#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch		
1	Flat	Gravel	823 ft²	34 ft²	Dark	0.96	No	10	4.8 deg		
ATTIC											
#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC					
1	No attic	Unvented	0	820 ft²	N	N					
CEILING											
#	Ceiling Type	R-Value	Area	Framing Fraction	Truss Type						
1	Under Attic (Unvented)	0.5	820 ft²	0.11	Wood						



# Building Input Summary Report

<b>WALLS</b>												
Wall orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.												
#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Width Ft	In	Height Ft	In	Area	Sheathing R-Value	Framing Fraction	Solar Absor.
1	E	Exterior	Face Brick - Block	0.01	20		8		160 ft <sup>2</sup>	0	0	0.75
2	S	Neighbor	Face Brick - Block	0.01	41		8		328 ft <sup>2</sup>	0	0	0.1
3	W	Exterior	Face Brick - Block	0.01	20		8		160 ft <sup>2</sup>	0	0	0.75
4	N	Exterior	Face Brick - Block	0.01	41		8		328 ft <sup>2</sup>	0	0	0.75

<b>DOORS</b>												
#	Ornt	Door Type	Storms	U-Value	Width Ft	In	Height Ft	In	Area			
1	E	Insulated	None	0.46	3		6	8	20 ft <sup>2</sup>			

<b>WINDOWS</b>												
#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storm	Area	Overhang Depth	Separation	Interior Shade	Screening
1	E	Vinyl	Double (Clear)	Yes	0.55	0.6	N	24 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	None	None
2	W	Vinyl	Double (Clear)	Yes	0.55	0.6	N	24 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	None	None
3	N	Vinyl	Double (Clear)	Yes	0.55	0.6	N	36 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	Drapes/blinds	None
4	N	Vinyl	Double (Clear)	Yes	0.55	0.6	N	4.5 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	Drapes/blinds	None

<b>INFILTRATION &amp; VENTING</b>												
Method	SLA	CFM 50	ELA	EqLA	ACH	ACH 50	---- Forced Ventilation ----			Run Time	Terrain/Wind Shielding	
							Supply	Exhaust				
Proposed ACH	0.00113	2424	133.1	250.2	0.924	22.17	0	0		0	Suburban / Suburban	

<b>MASS</b>												
Mass Type	Area	Thickness	Furniture Fraction									
No Added Mass	0 ft <sup>2</sup>	0 ft	0.3									

<b>COOLING SYSTEM</b>												
#	System Type	Subtype	Efficiency	Capacity	Air Flow	SHR	Ductless					
1	Central Unit	None	SEER: 13	18 kBtu/hr	540 cfm	0.75	False					

<b>HEATING SYSTEM</b>												
#	System Type	Subtype	Efficiency	Capacity	Ductless							
1	Natural Gas Furnace	None	AFUE: 0.78	75 kBtu/hr	False							

<b>HOT WATER SYSTEM</b>												
#	System Type	EF	Cap	Use	SetPnt	Credits						
1	Natural Gas	0.82	1 gal	53 gal	120 deg	None						

# Building Input Summary Report

SOLAR HOT WATER													
Collector Type	Collector		Surface		Absorp. Prod.	Trans Corr.	Tank Volume	Tank U-Value	Tank Surf Area	Heat Exch Eff	PV Pumped	Pump Energy	
	Tilt	Azimuth	Area	Loss Coef.									
DUCTS													
#	Location	--- Supply ---		--- Return ---			Leakage Type	Air Handler	CFM 25	Percent Leakage	QN	RLF	
		R-Value	Area	Location	Area	Number							
1	Attic	6	164 ft²	Attic	41 ft²	(invalid)	Prop. Air Leakage	Interior	90.00 cfm	6.00 %	0.11	0.60	
TEMPERATURES													
Programable Thermostat: Y						Ceiling Fans: N							
Cooling	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec	
Heating	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec	
Venting	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec	
Thermostat Schedule: HERS 2006 Reference													
Schedule Type		1	2	3	4	5	6	7	8	9	10	11	12
Cooling (WD)	AM	78	78	78	78	78	78	78	78	80	80	80	80
	PM	80	80	78	78	78	78	78	78	78	78	78	78
Cooling (WEH)	AM	78	78	78	78	78	78	78	78	78	78	78	78
	PM	78	78	78	78	78	78	78	78	78	78	78	78
Heating (WD)	AM	66	66	66	66	66	68	68	68	68	68	68	68
	PM	68	68	68	68	68	68	68	68	68	68	66	66
Heating (WEH)	AM	66	66	66	66	66	68	68	68	68	68	68	68
	PM	68	68	68	68	68	68	68	68	68	68	66	66

# Building Input Summary Report

## APPLIANCES & LIGHTING

Appliance Schedule: Glenville2		Hours											
Schedule Type		1	2	3	4	5	6	7	8	9	10	11	12
Ceiling Fans (Summer)	AM	1	1	1	1	1	1	1	0.883	0.409	0.242	0.242	0.242
% Released: 100	PM	0.242	0.242	0.242	0.242	0.295	0.553	0.897	0.897	0.897	1	1	1
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Clothes Washer	AM	0.105	0.081	0.046	0.046	0.081	0.128	0.256	0.57	0.849	1	0.977	0.872
% Released: 0	PM	0.779	0.698	0.605	0.57	0.581	0.57	0.57	0.57	0.57	0.488	0.43	0.198
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Dishwasher	AM	0.139	0.05	0.028	0.024	0.029	0.09	0.169	0.303	0.541	0.594	0.502	0.443
% Released: 0	PM	0.377	0.396	0.335	0.323	0.344	0.448	0.791	1	0.8	0.597	0.383	0.281
Annual Use: 61 kWh/Yr		Peak Value: 19 Watts											
Dryer	AM	0.122	0.073	0.049	0.024	0.049	0.073	0.195	0.39	0.595	0.839	0.961	1
% Released: 0	PM	0.912	0.829	0.746	0.707	0.683	0.668	0.634	0.624	0.644	0.668	0.537	0.293
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Lighting	AM	0.063	0.063	0.063	0.063	0.188	0.391	0.438	0.391	0.172	0.117	0.117	0.117
% Released: 100	PM	0.117	0.117	0.117	0.203	0.438	0.609	0.82	0.984	1	0.688	0.383	0.156
Annual Use: 1498 kWh/Yr		Peak Value: 525 Watts											
Miscellaneous	AM	0.454	0.411	0.393	0.38	0.38	0.429	0.54	0.65	0.663	0.675	0.687	0.699
% Released: 100	PM	0.687	0.663	0.65	0.681	0.804	1	1	0.926	0.89	0.847	0.712	0.577
Annual Use: 2516 kWh/Yr		Peak Value: 436 Watts											
Pool Pump	AM	0	0	0	0	0	0	0	0	0	1	1	1
% Released: 0	PM	1	1	1	1	0	0	0	0	0	0	0	0
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Range	AM	0.047	0.047	0.024	0.024	0.047	0.071	0.165	0.283	0.307	0.321	0.283	0.33
% Released: 0	PM	0.337	0.307	0.292	0.377	0.613	1	0.778	0.401	0.236	0.165	0.104	0.071
Annual Use: 38 Therms/Yr		Peak Value: 2 kBtu/Hr											
Refrigeration	AM	0.57	0.49	0.49	0.46	0.46	0.57	0.76	0.89	0.89	0.82	0.71	0.71
% Released: 0	PM	0.64	0.58	0.58	0.58	0.73	0.59	1	1	0.96	0.96	0.86	0.71
Annual Use: 756 kWh/Yr		Peak Value: 122 Watts											
Well Pump	AM	0.05	0.05	0.05	0.05	0.05	0.05	0.1	0.1	0.1	0.1	0.1	0.1
% Released: 100	PM	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											

# Annual Energy Summary

Title: 8804 Glenville Unit 4 with 43%  
User

TMY City: MD\_BALTIMORE\_BL  
Elec Util: MD 2009  
Gas Util: MD 2008  
Run Date: 03/03/2010 07:45:36

Registration #:

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (18 kBtu/hr)	1000 kWh	\$152
Cooling Fan	190 kWh	\$29
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Cooling</b>	<b>1190 kWh</b>	<b>\$181</b>
Heating (75 kBtu/hr)	298 Therms	\$465
Heating Fan/Pump	183 kWh	\$28
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Heating</b>	<b>\$493</b>	
Hot Water	114 Therms	\$178
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>		<b>\$178</b>
Ceiling Fans	0 kWh	\$0
Clothes Washer	0 kWh	\$0
Dishwasher	61 kWh	\$9
Dryer	0 kWh	\$0
Lighting	1499 kWh	\$227
Miscellaneous	2516 kWh	\$381
Pool Pump	0 kWh	\$0
Range	38 Therms	\$59
Refrigerator	756 kWh	\$115
<hr/>		
Total (kWh)	6205 kWh	\$941
Total (Therms)	450 Therms	\$702
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		\$1643

## Emissions (Calculated as Total - PV Produced)

SO2	68.47 Lbs.
NOX	19.77 Lbs.
CO2	6.64 Tons

# Building Input Summary Report

PROJECT										
Title:	8804 Glenville Unit 4 with 43			Bedrooms:	2		Address Type:	Street Address		
Building Type:	User			Bathrooms:	1		Lot #			
Owner:				Conditioned Area:	820		SubDivision:			
# of Units:	1			Total Stories:	1		PlatBook:			
Builder Name:	Unit 4 - Existing			Worst Case:	No		Street:			
Permit Office:				Rotate Angle:	0		County:			
Jurisdiction:				Cross Ventilation:			City, State, Zip:			
Family Type:	Multi-family			Whole House Fan:						
New/Existing:	Existing (Projected)									
Comment:										
CLIMATE										
Design Location	Tmy Site			Design Temp	97.5 %	2.5 %	Int Design Temp	Winter	Summer	Heating Degree Days
MD, BALTIMORE_BLT-WA	MD_BALTIMORE_BLT-WASHNGT			13	91		70	75	4631	Design Moisture
										37
										Daily Temp Range
										Medium
UTILITY RATES										
Fuel	Unit	Utility Name				Monthly Fixed Cost		\$/Unit		
Electricity	kWh	MD 2009				0		0.1516		
Natural Gas	Therm	MD 2008				0		1.56		
Fuel Oil	Gallon	Maryland Default				0		1.1		
Propane	Gallon	Maryland Default				0		1.4		
SURROUNDINGS										
Ornt	Type	Shade Trees			Adjacent Buildings					
		Height	Width	Distance	Exist	Height	Width	Distance		
N	None	0 ft	0 ft	0 ft	X	35 ft	40 ft	30 ft		
NE	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
E	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
SE	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
S	None	0 ft	0 ft	0 ft	X	35 ft	40 ft	30 ft		
SW	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
W	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
NW	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft		
ROOF										
#	Type	Materials		Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch
1	Flat	Gravel		823 ft²	34 ft²	Dark	0.96	No	10	4.8 deg
ATTIC										
#	Type	Ventilation		Vent Ratio (1 in)	Area	RBS	IRCC			
1	No attic	Unvented		0	820 ft²	N	N			
CEILING										
#	Ceiling Type			R-Value	Area	Framing Fraction		Truss Type		
1	Under Attic (Unvented)			0.5	820 ft²	0.11		Wood		

# Building Input Summary Report

<b>WALLS</b>												
Wall orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.												
#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Width Ft	In	Height Ft	In	Area	Sheathing R-Value	Framing Fraction	Solar Absor.
1	E	Exterior	Face Brick - Block	0.01	20		8		160 ft <sup>2</sup>	0	0	0.75
2	S	Neighbor	Face Brick - Block	0.01	41		8		328 ft <sup>2</sup>	0	0	0.1
3	W	Exterior	Face Brick - Block	0.01	20		8		160 ft <sup>2</sup>	0	0	0.75
4	N	Exterior	Face Brick - Block	0.01	41		8		328 ft <sup>2</sup>	0	0	0.75

<b>DOORS</b>												
#	Ornt	Door Type	Storms	U-Value	Width Ft	In	Height Ft	In	Area			
1	E	Insulated	None	0.46	3		6	8	20 ft <sup>2</sup>			

<b>WINDOWS</b>												
#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storm	Area	Overhang Depth	Separation	Interior Shade	Screening
1	E	Vinyl	Double (Clear)	Yes	0.55	0.6	N	24 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	None	None
2	W	Vinyl	Double (Clear)	Yes	0.55	0.6	N	24 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	None	None
3	N	Vinyl	Double (Clear)	Yes	0.55	0.6	N	36 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	Drapes/blinds	None
4	N	Vinyl	Double (Clear)	Yes	0.55	0.6	N	4.5 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	Drapes/blinds	None

<b>INFILTRATION &amp; VENTING</b>												
Method	SLA	CFM 50	ELA	EqLA	ACH	ACH 50	---- Forced Ventilation ----			Run Time	Terrain/Wind Shielding	
							Supply	Exhaust				
Proposed ACH	0.00113	2424	133.1	250.2	0.924	22.17	0	0	0	0	Suburban / Suburban	

<b>MASS</b>												
Mass Type	Area	Thickness	Furniture Fraction									
No Added Mass	0 ft <sup>2</sup>	0 ft	0.3									

<b>COOLING SYSTEM</b>												
#	System Type	Subtype	Efficiency	Capacity	Air Flow	SHR	Ductless					
1	Central Unit	None	SEER: 15	18 kBtu/hr	540 cfm	0.75	False					

<b>HEATING SYSTEM</b>												
#	System Type	Subtype	Efficiency	Capacity	Ductless							
1	Natural Gas Furnace	None	AFUE: 0.92	75 kBtu/hr	False							

<b>HOT WATER SYSTEM</b>												
#	System Type	EF	Cap	Use	SetPnt	Credits						
1	Natural Gas	0.82	1 gal	53 gal	120 deg	None						

# Building Input Summary Report

SOLAR HOT WATER													
Collector Type	Collector		Surface		Absorp. Prod.	Trans Corr.	Tank Volume	Tank U-Value	Tank Surf Area	Heat Exch Eff	PV Pumped	Pump Energy	
	Tilt	Azimuth	Area	Loss Coef.									
DUCTS													
#	Location	--- Supply ---		--- Return ---			Leakage Type	Air Handler	CFM 25	Percent Leakage	QN	RLF	
		R-Value	Area	Location	Area	Number							
1	Attic	6	164 ft <sup>2</sup>	Attic	41 ft <sup>2</sup>	(invalid)	Prop. Air Leakage	Interior	90.00 cfm	6.00 %	0.11	0.60	
TEMPERATURES													
Programable Thermostat: Y						Ceiling Fans: N							
Cooling	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec	
Heating	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec	
Venting	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec	
Thermostat Schedule: HERS 2006 Reference													
Schedule Type		1	2	3	4	5	6	7	8	9	10	11	12
Cooling (WD)	AM PM	78 80	78 80	78 78	78 78	78 78	78 78	78 78	78 78	80 78	80 78	80 78	80 78
Cooling (WEH)	AM PM	78 78	78 78	78 78	78 78	78 78	78 78	78 78	78 78	78 78	78 78	78 78	78 78
Heating (WD)	AM PM	66 68	66 68	66 68	66 68	66 68	68 68	68 68	68 68	68 68	68 68	68 66	68 66
Heating (WEH)	AM PM	66 68	66 68	66 68	66 68	66 68	68 68	68 68	68 68	68 68	68 68	68 66	68 66

# Building Input Summary Report

## APPLIANCES & LIGHTING

Appliance Schedule: Glenville2		Hours											
Schedule Type		1	2	3	4	5	6	7	8	9	10	11	12
Ceiling Fans (Summer)	AM	1	1	1	1	1	1	1	0.883	0.409	0.242	0.242	0.242
% Released: 100	PM	0.242	0.242	0.242	0.242	0.295	0.553	0.897	0.897	0.897	1	1	1
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Clothes Washer	AM	0.105	0.081	0.046	0.046	0.081	0.128	0.256	0.57	0.849	1	0.977	0.872
% Released: 0	PM	0.779	0.698	0.605	0.57	0.581	0.57	0.57	0.57	0.57	0.488	0.43	0.198
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Dishwasher	AM	0.139	0.05	0.028	0.024	0.029	0.09	0.169	0.303	0.541	0.594	0.502	0.443
% Released: 0	PM	0.377	0.396	0.335	0.323	0.344	0.448	0.791	1	0.8	0.597	0.383	0.281
Annual Use: 61 kWh/Yr		Peak Value: 19 Watts											
Dryer	AM	0.122	0.073	0.049	0.024	0.049	0.073	0.195	0.39	0.595	0.839	0.961	1
% Released: 0	PM	0.912	0.829	0.746	0.707	0.683	0.668	0.634	0.624	0.644	0.668	0.537	0.293
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Lighting	AM	0.063	0.063	0.063	0.063	0.188	0.391	0.438	0.391	0.172	0.117	0.117	0.117
% Released: 100	PM	0.117	0.117	0.117	0.203	0.438	0.609	0.82	0.984	1	0.688	0.383	0.156
Annual Use: 1498 kWh/Yr		Peak Value: 525 Watts											
Miscellaneous	AM	0.454	0.411	0.393	0.38	0.38	0.429	0.54	0.65	0.663	0.675	0.687	0.699
% Released: 100	PM	0.687	0.663	0.65	0.681	0.804	1	1	0.926	0.89	0.847	0.712	0.577
Annual Use: 2516 kWh/Yr		Peak Value: 436 Watts											
Pool Pump	AM	0	0	0	0	0	0	0	0	0	1	1	1
% Released: 0	PM	1	1	1	1	0	0	0	0	0	0	0	0
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Range	AM	0.047	0.047	0.024	0.024	0.047	0.071	0.165	0.283	0.307	0.321	0.283	0.33
% Released: 0	PM	0.337	0.307	0.292	0.377	0.613	1	0.778	0.401	0.236	0.165	0.104	0.071
Annual Use: 38 Therms/Yr		Peak Value: 2 kBTU/Hr											
Refrigeration	AM	0.57	0.49	0.49	0.46	0.46	0.57	0.76	0.89	0.89	0.82	0.71	0.71
% Released: 0	PM	0.64	0.58	0.58	0.58	0.73	0.59	1	1	0.96	0.96	0.86	0.71
Annual Use: 756 kWh/Yr		Peak Value: 122 Watts											
Well Pump	AM	0.05	0.05	0.05	0.05	0.05	0.05	0.1	0.1	0.1	0.1	0.1	0.1
% Released: 100	PM	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											



# Annual Energy Summary

Title: 8804 Glenville Unit 4 with 50%  
User

TMY City: MD\_BALTIMORE\_BL  
Elec Util: MD 2009  
Gas Util: MD 2008  
Run Date: 03/02/2010 16:22:27

Registration #:

<u>End-Use</u>	<u>Energy Consumption</u>	<u>Annual Cost</u>
Cooling (18 kBtu/hr)	938 kWh	\$142
Cooling Fan	190 kWh	\$29
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Cooling</b>	<b>1128 kWh</b>	<b>\$171</b>
Heating (75 kBtu/hr)	286 Therms	\$446
Heating Fan/Pump	183 kWh	\$28
Mechanical Vent Fan	0 kWh	\$ 0
<b>Total Heating</b>		<b>\$474</b>
Hot Water	66 Therms	\$103
Hot Water Pump	0 kWh	\$0
<b>Total Hot Water</b>		<b>\$103</b>
Ceiling Fans	0 kWh	\$0
Clothes Washer	0 kWh	\$0
Dishwasher	61 kWh	\$9
Dryer	0 kWh	\$0
Lighting	1499 kWh	\$227
Miscellaneous	2516 kWh	\$381
Pool Pump	0 kWh	\$0
Range	38 Therms	\$59
Refrigerator	756 kWh	\$115
<hr/>		
Total (kWh)	6143 kWh	\$931
Total (Therms)	390 Therms	\$608
Total (Oil Gallons)	0 Gallons	\$0
Total (Propane Gallons)	0 Gallons	\$0
PV Produced (kWh)*	0 kWh	\$0
* Assumes net metering		
<hr/>		
Total Cost		\$1539

## Emissions (Calculated as Total - PV Produced)

SO2	67.79 Lbs.
NOX	18.91 Lbs.
CO2	6.24 Tons

# Building Input Summary Report

PROJECT												
Title:	8804 Glenville Unit 4 with 50			Bedrooms:	2		Address Type:	Street Address				
Building Type:	User			Bathrooms:	1		Lot #					
Owner:				Conditioned Area:	820		SubDivision:					
# of Units:	1			Total Stories:	1		PlatBook:					
Builder Name:	Unit 4 - Existing			Worst Case:	No		Street:					
Permit Office:				Rotate Angle:	0		County:					
Jurisdiction:				Cross Ventilation:			City, State, Zip:					
Family Type:	Multi-family			Whole House Fan:								
New/Existing:	Existing (Projected)											
Comment:												
CLIMATE												
Design Location	Tmy Site			Design Temp	97.5 %	2.5 %	Int Design Temp	Winter	Summer	Heating Degree Days	Design Moisture	Daily Temp Range
MD, BALTIMORE_BLT-WA	MD_BALTIMORE_BLT-WASHNGT			13	91		70	75	4631	37	Medium	
UTILITY RATES												
Fuel	Unit	Utility Name				Monthly Fixed Cost		\$/Unit				
Electricity	kWh	MD 2009				0		0.1516				
Natural Gas	Therm	MD 2008				0		1.56				
Fuel Oil	Gallon	Maryland Default				0		1.1				
Propane	Gallon	Maryland Default				0		1.4				
SURROUNDINGS												
Ornt	Type	Shade Trees			Adjacent Buildings							
		Height	Width	Distance	Exist	Height	Width	Distance				
N	None	0 ft	0 ft	0 ft	X	35 ft	40 ft	30 ft				
NE	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft				
E	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft				
SE	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft				
S	None	0 ft	0 ft	0 ft	X	35 ft	40 ft	30 ft				
SW	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft				
W	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft				
NW	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft				
ROOF												
#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	Tested	Deck Insul.	Pitch			
1	Flat	Gravel	823 ft²	34 ft²	Dark	0.96	No	10	4.8 deg			
ATTIC												
#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC						
1	No attic	Unvented	0	820 ft²	N	N						
CEILING												
#	Ceiling Type	R-Value	Area	Framing Fraction	Truss Type							
1	Under Attic (Unvented)	0.5	820 ft²	0.11	Wood							

# Building Input Summary Report

<b>WALLS</b>												
Wall orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.												
#	Ornt	Adjacent To	Wall Type	Cavity R-Value	Width Ft	In	Height Ft	In	Area	Sheathing R-Value	Framing Fraction	Solar Absor.
1	E	Exterior	Face Brick - Block	0.01	20		8		160 ft <sup>2</sup>	0	0	0.75
2	S	Neighbor	Face Brick - Block	0.01	41		8		328 ft <sup>2</sup>	0	0	0.1
3	W	Exterior	Face Brick - Block	0.01	20		8		160 ft <sup>2</sup>	0	0	0.75
4	N	Exterior	Face Brick - Block	0.01	41		8		328 ft <sup>2</sup>	0	0	0.75

<b>DOORS</b>												
#	Ornt	Door Type	Storms	U-Value	Width Ft	In	Height Ft	In	Area			
1	E	Insulated	None	0.46	3		6	8	20 ft <sup>2</sup>			

<b>WINDOWS</b>												
#	Ornt	Frame	Panes	NFRC	U-Factor	SHGC	Storm	Area	Overhang Depth	Separation	Interior Shade	Screening
1	E	Vinyl	Double (Clear)	Yes	0.55	0.6	N	24 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	None	None
2	W	Vinyl	Double (Clear)	Yes	0.55	0.6	N	24 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	None	None
3	N	Vinyl	Double (Clear)	Yes	0.55	0.6	N	36 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	Drapes/blinds	None
4	N	Vinyl	Double (Clear)	Yes	0.55	0.6	N	4.5 ft <sup>2</sup>	1 ft 6 in	1 ft 0 in	Drapes/blinds	None

<b>INFILTRATION &amp; VENTING</b>												
Method	SLA	CFM 50	ELA	EqLA	ACH	ACH 50	---- Forced Ventilation ----			Run Time	Terrain/Wind Shielding	
							Supply	Exhaust				
Proposed ACH	0.00113	2424	133.1	250.2	0.924	22.17	0	0	0	0	Suburban / Suburban	

<b>MASS</b>												
Mass Type	Area	Thickness	Furniture Fraction									
No Added Mass	0 ft <sup>2</sup>	0 ft	0.3									

<b>COOLING SYSTEM</b>												
#	System Type	Subtype	Efficiency	Capacity	Air Flow	SHR	Ductless					
1	Central Unit	None	SEER: 16	18 kBtu/hr	540 cfm	0.75	False					

<b>HEATING SYSTEM</b>												
#	System Type	Subtype	Efficiency	Capacity	Ductless							
1	Natural Gas Furnace	None	AFUE: 0.96	75 kBtu/hr	False							

<b>HOT WATER SYSTEM</b>												
#	System Type	EF	Cap	Use	SetPnt	Credits						
1	Natural Gas	0.82	1 gal	53 gal	120 deg	Solar System						

# Building Input Summary Report

SOLAR HOT WATER													
Collector Type	Collector		Surface		Absorp.	Trans	Tank	Tank	Tank	Heat	PV	Pump	
	Tilt	Azimuth	Area	Loss Coef.	Prod.	Corr.	Volume	U-Value	Surf Area	Exch Eff	Pumped	Energy	
Flat Plate (Closed Loop)	4.8	180	3.00 m <sup>2</sup>	4.17 W/m <sup>2</sup>	0.75	0.96	303.0 L	0.700 W/m <sup>2</sup> /C	2.32 m <sup>2</sup>	0.88	Yes	0 W	
DUCTS													
#	Location	---- Supply ----		---- Return ----			Leakage Type	Air Handler	CFM 25	Percent Leakage	QN	RLF	
		R-Value	Area	Location	Area	Number							
1	Attic	6	164 ft <sup>2</sup>	Attic	41 ft <sup>2</sup>	(invalid)	Prop. Air Leakage	Interior	90.00 cfm	6.00 %	0.11	0.60	
TEMPERATURES													
Programable Thermostat: Y						Ceiling Fans: N							
Cooling	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec	
Heating	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec	
Venting	<input checked="" type="checkbox"/> Jan	<input checked="" type="checkbox"/> Feb	<input checked="" type="checkbox"/> Mar	<input checked="" type="checkbox"/> Apr	<input checked="" type="checkbox"/> May	<input checked="" type="checkbox"/> Jun	<input checked="" type="checkbox"/> Jul	<input checked="" type="checkbox"/> Aug	<input checked="" type="checkbox"/> Sep	<input checked="" type="checkbox"/> Oct	<input checked="" type="checkbox"/> Nov	<input checked="" type="checkbox"/> Dec	
Thermostat Schedule: HERS 2006 Reference													
Schedule Type		1	2	3	4	5	6	7	8	9	10	11	12
Cooling (WD)	AM PM	78 80	78 80	78 78	78 78	78 78	78 78	78 78	78 78	80 78	80 78	80 78	80 78
Cooling (WEH)	AM PM	78 78	78 78	78 78	78 78	78 78	78 78	78 78	78 78	78 78	78 78	78 78	78 78
Heating (WD)	AM PM	66 68	66 68	66 68	66 68	66 68	68 68	68 68	68 68	68 68	68 68	68 66	68 66
Heating (WEH)	AM PM	66 68	66 68	66 68	66 68	66 68	68 68	68 68	68 68	68 68	68 68	68 66	68 66

# Building Input Summary Report


## APPLIANCES & LIGHTING

Appliance Schedule: Glenville2		Hours											
Schedule Type		1	2	3	4	5	6	7	8	9	10	11	12
Ceiling Fans (Summer)	AM	1	1	1	1	1	1	1	0.883	0.409	0.242	0.242	0.242
% Released: 100	PM	0.242	0.242	0.242	0.242	0.295	0.553	0.897	0.897	0.897	1	1	1
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Clothes Washer	AM	0.105	0.081	0.046	0.046	0.081	0.128	0.256	0.57	0.849	1	0.977	0.872
% Released: 0	PM	0.779	0.698	0.605	0.57	0.581	0.57	0.57	0.57	0.57	0.488	0.43	0.198
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Dishwasher	AM	0.139	0.05	0.028	0.024	0.029	0.09	0.169	0.303	0.541	0.594	0.502	0.443
% Released: 0	PM	0.377	0.396	0.335	0.323	0.344	0.448	0.791	1	0.8	0.597	0.383	0.281
Annual Use: 61 kWh/Yr		Peak Value: 19 Watts											
Dryer	AM	0.122	0.073	0.049	0.024	0.049	0.073	0.195	0.39	0.595	0.839	0.961	1
% Released: 0	PM	0.912	0.829	0.746	0.707	0.683	0.668	0.634	0.624	0.644	0.668	0.537	0.293
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Lighting	AM	0.063	0.063	0.063	0.063	0.188	0.391	0.438	0.391	0.172	0.117	0.117	0.117
% Released: 100	PM	0.117	0.117	0.117	0.203	0.438	0.609	0.82	0.984	1	0.688	0.383	0.156
Annual Use: 1498 kWh/Yr		Peak Value: 525 Watts											
Miscellaneous	AM	0.454	0.411	0.393	0.38	0.38	0.429	0.54	0.65	0.663	0.675	0.687	0.699
% Released: 100	PM	0.687	0.663	0.65	0.681	0.804	1	1	0.926	0.89	0.847	0.712	0.577
Annual Use: 2516 kWh/Yr		Peak Value: 436 Watts											
Pool Pump	AM	0	0	0	0	0	0	0	0	0	1	1	1
% Released: 0	PM	1	1	1	1	0	0	0	0	0	0	0	0
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Range	AM	0.047	0.047	0.024	0.024	0.047	0.071	0.165	0.283	0.307	0.321	0.283	0.33
% Released: 0	PM	0.337	0.307	0.292	0.377	0.613	1	0.778	0.401	0.236	0.165	0.104	0.071
Annual Use: 38 Therms/Yr		Peak Value: 2 kBtu/Hr											
Refrigeration	AM	0.57	0.49	0.49	0.46	0.46	0.57	0.76	0.89	0.89	0.82	0.71	0.71
% Released: 0	PM	0.64	0.58	0.58	0.58	0.73	0.59	1	1	0.96	0.96	0.86	0.71
Annual Use: 756 kWh/Yr		Peak Value: 122 Watts											
Well Pump	AM	0.05	0.05	0.05	0.05	0.05	0.05	0.1	0.1	0.1	0.1	0.1	0.1
% Released: 100	PM	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											

# Endnotes

- 1 – American Institute of Architects (AIA) Cincinnati, *Comparison of LEED for Homes and the National Green Building Standard* (January 2010), 11. [http://www.aiacincinnati.org/community/LEED\\_NAHB\\_Final.pdf](http://www.aiacincinnati.org/community/LEED_NAHB_Final.pdf). ..... xvi
- 2 – The Green Remodel Path applies to buildings constructed before 1980, ICC 700-2008, page 14. .... xvi
- 3 – In 2009, the American National Standards Institute approved the NGBS, which was codeveloped by the National Association of Home Builders and the International Code Council. The consensus committee for the NGBS included 42 members representing building code officials, architects, construction professionals, regulatory entities, federal agencies, environmental organizations, and product manufacturers. Thirteen of the members represented local, state, or federal government agencies, including the U.S. Department of Energy and U.S. Environmental Protection Agency. Five members represented other green building organizations, including the U.S. Green Building Council (the developers of the Leadership in Energy & Environmental Design [LEED] green building rating system). Three members were home builders. .... xxi
- 4 – [http://www.whitehouse.gov/omb/circulars\\_a119/](http://www.whitehouse.gov/omb/circulars_a119/) ..... xxi
- 5 – EPA. <http://www.epa.gov/greenbuilding/pubs/about.htm>. October 2010. .... 1
- 6 – EPA. <http://www.epa.gov/greenbuilding/pubs/whybuild.htm>. October 2010. .... 1
- 7 – Greening a New Home. <http://www.toolbase.org/Field-Evaluations/lancaster-county-career>. January 2008. .... 1
- 8 – NAHB Green. <http://www.nahbgreen.org/About/default.aspx>. November 2009. .... 3
- 9 – Economic Database in Support of ASHRAE 90.2 (Energy-Efficient Design of Low-Rise Residential Buildings), 1481 RP. .... 5
- 10 – R.S. Means Company, Inc. Kingston, MA. *Residential Construction Data, 2009. Site Work and Landscape Data, 2009*. .... 5
- 11 – Bureau of Labor Statistics 2008. [http://www.bls.gov/oes/2008/may/oes\\_nat.htm#b00-0000](http://www.bls.gov/oes/2008/may/oes_nat.htm#b00-0000) ..... 5
- 12 – The baseline rating is defined as the NGBS rating of the original design. All incremental green improvements (that is, Bronze, Silver, Gold, and Emerald) are developed from the original design, not from the previous green rating. .... 7
- 13 – Mandatory requirements are defined in detailed within Appendix B and within the case study section (section 3) of this report. .... 10
- 14 – 2006 International Energy Conservation Code (IECC), Section 404, page 22. .... 11
- 15 – Energy Gauge/USRCBBv2.8 software is used for energy modeling in this study. .... 11

16 – <a href="http://www.energystar.gov/">http://www.energystar.gov/</a> .....	12
17 – Department of Energy, Proposed Climate Zone FAQs, <a href="http://www.energycodes.gov/implement/climatezones_04_faq.stm">http://www.energycodes.gov/</a> implement/climatezones_04_faq.stm.....	18
18 – CDH is the cooling degree hours based on 74 °F as defined by REM/Rate™ software.....	18
19 – HDD is the heating degree days based on 65 °F as defined by REM/Rate™ software.....	18
20 – This one-time cost to the builder is based on an estimated 3 weeks of labor at the administrative rate of \$47/hr.....	21
21 – This one-time cost to the builder is based on an estimated 3 weeks of labor at the administrative rate of \$47/hr.....	31
22 – This one-time cost to the builder is based on an estimated 3 weeks of labor at the administrative rate of \$47/hr.....	42
23 – This one-time cost to the builder is based on an estimated 3 weeks of labor at the administrative rate of \$47/hr.....	54
24 – This one-time cost to the builder is based on an estimated 3 weeks of labor at the administrative rate of \$47/hr.....	64
25 – This one-time cost to the builder is based on an estimated 3 weeks of labor at the administrative rate of \$47/hr.....	75
26 – This one-time cost to the builder is based on an estimated 3 weeks of labor at the administrative rate of \$47/hr.....	86
27 – This one-time cost to the builder is based on an estimated 3 weeks of labor at the administrative rate of \$47/hr.....	97
28 – The Green Remodel Path applies to buildings constructed before 1980 (ICC 700-2008, page 14). .....	106
29 – We base the simple payback periods for energy and water efficiency on the current cost estimates and projected savings and do not consider future rate increases, inflation, replacement costs, or other conditions over the 30-year evaluation period.....	129
30 – The Green Remodel Path applies to buildings constructed before 1980 (ICC 700-2008, page 14). .....	130
31 – 2006 International Energy Conservation Code (IECC), Section 404, page 22.....	131
32 – MEL = miscellaneous electrical loads (such as lighting, televisions, computers, and other equipment, other than appliances, that use electricity). .....	132
33 – 2006 International Energy Conservation Code (IECC), Section 404, page 22.....	133
34 – MEL = miscellaneous electrical loads (such as lighting, televisions, computers, and other equipment, other than appliances, that use electricity).....	134



35 – <http://www.waterplowpress.com/>.....135

36 – “gpd/occu” = gallons per day per occupant.....135



U.S. Department of Housing and Urban Development  
Office of Policy Development and Research  
Washington, DC 20410-6000



October 2012