

A REPORT ON THE **FEASIBILITY** OF **DECONSTRUCTION:**

an investigation of deconstruction activity in four cities



PATH (Partnership for Advancing Technology in Housing) is a new private/public effort to develop, demonstrate, and gain widespread market acceptance for the "Next Generation" of American housing. Through the use of new or innovative technologies, the goal of PATH is to improve the quality, durability, environmental efficiency, and affordability of tomorrow's homes.

PATH, initiated jointly by the Administration and Congress, is managed and supported by the Department of Housing and Urban Development (HUD). In addition, all Federal Agencies that engage in housing research and technology development are PATH Partners, including the Departments of Energy and Commerce, as well as the Environmental Protection Agency (EPA) and the Federal Emergency Management Agency (FEMA). State and local governments and other participants from the private sector are also partners in PATH. Product manufacturers, home builders, insurance companies, and lenders represent private industry in the PATH Partnership.

To learn more about PATH, please contact:



451 7th Street, SW
Suite B 133
Washington, DC 20410
202-708-4250 (fax)
email: pathnet@pathnet.org
website: www.pathnet.org

Visit PD&R's Web Site
www.huduser.org
to find this report and others sponsored by
HUD's Office of Policy Development and Research (PD&R).

Other services of HUD USER, PD&R's Research Information Service, include listservs; special interest, bimonthly publications (best practices, significant studies from other sources); access to public use databases; hotline 1-800-245-2691 for help accessing the information you need.

**REPORT ON THE FEASIBILITY
OF DECONSTRUCTION:**
an investigation of deconstruction activity in four cities

Prepared for:
U.S. Department of Housing and Urban Development
Office of Policy Development and Research
Washington, D.C.

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

January 2001

Contract OPC-21289
Task Order T0004

Disclaimer

This report was prepared by the NAHB Research Center, Inc., which makes no warranty, express or implied, and assumes no legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, and makes no representation that its use would not infringe on privately owned rights. The contents of this report are the views of the contractor and do not necessarily reflect the views or policies of the U.S. Department of Housing and Urban Development, the U.S. Government, or any other person or organization. Trade or manufacturers' names herein appear solely because they are considered essential to the objective of this report.

Acknowledgements

This report was prepared by the NAHB Research Center, Inc. for the U.S. Department of Housing and Urban Development. The principal authors were David Neun and Michael Grothe; contributing staff included Rich Dooley, Federico Garcia Lopez, Kevin Powell, and Jeannie Leggett Sikora.

Special thanks are extended to HUD Staff: Richard Allan, Ron Ashford, Donald Green, Kris Sarri, and Ed Stromberg; EPA Staff: Robin Snyder; and the Resource Group: Craig Collins (NAVFAC); Leo Gannon (Laborers-Employers Cooperation and Education Trust); Russ Hawkins (Allied Demolition); Michael Krause (The Green Institute); Tracy Mumma and Steve Loken (Center for Resourceful Building Technology); Tiffany Wilmot (Wilmot & Assoc.); and Peter Yost (Environmental Building News), and Brad Guy (University of Florida-Center for Construction and the Environment). The Research Center staff would also like to extend a special thanks to Stan Cook of the Fort Ord Reuse Authority for the comments and direction he provided in his review of our final report.

Appreciation is extended to the many individuals and organizations in the four target cities contacted during the course of this study who provided valuable input including, but not limited to, the following:

El Paso, TX:

City of El Paso (Matthew D. Briones, Natividad Campos, Fred Carson, Said Larbi-Cherif, James E. Fraser, Mark E. Grissom, J.S. Gallardo, Tom Maguire, Veronica Rosales, Roberto Soto); El Paso Collaborative (Angie Briones Sosa); El Paso Community Foundation (Carlos Gallinar, Nestor A. Valencia); Ft. Bliss: Directorate of Public Works and Logistics (Michael C. Lockamy); Housing Authority of the City of El Paso (Arlene Alarcon, Joe Hernandez); McKinney Wrecking (Daniel Robles); Southwestern Furnishings, Inc. (Mike Rodriguez); Studio 4 Designs (Irma Fernandez); Texas Workforce Program (Maria Acosta); and, The 2nd Hand Store (Leonard Hall).

Miami, FL:

Absolute Demolition (Todd Melgaard); American Salvage, Inc. (Terence Waldron); Dade County Department of Solid Waste Management (Bill Thorne); Florida Wood Recycling (Jerry Rimoin); Floors to Doors, Inc. (David Beem); Garcia Door and Window (Leonardo Garcia); Greater Miami Local Initiative Support Corporation (Charles Dabney); H.J. Russel & Company (Rickey D. Johnson); Liberty Recycling (Michael S. Savino); Little Haiti Housing Association (Antoine Auguste); Metro-Dade Housing Agency (Robert L. Levis, Joe Scafuti); Miami-Dade County (Theodore Berman, Jaime M. Eisen); Miami-Dade Neighborhood Housing Services (Claude C. Greenleaf); Port of Miami (Bernard List); Terry Allen, Inc. (Terry Allen); Tools for Change (Murkel B. Coppins); and, World Relief Corporation – Miami (Tom Willey).

Milwaukee, WI:

Architectural Antiques & Salvage (Pete Gaitan); Barrett of Wisconsin, Inc. (David M. Ahern); City of Milwaukee (Ronald W. Roberts, Tracy C. Williams); Deconstructors, Inc.; Design Coalition (Lou Host-Jablonski); Energy Center of Wisconsin (Craig Schepp); Glenville Timberwrights (Tom Holmes); Harambee Ombudsman Project, Inc. (Sherman L. Hill); Home Source, Neighborhood Development (Robin Hix); Housing Authority of the City of Milwaukee (David Flores); IM Salvage Company (Ralph “Bones” Gollnick); Lisbon Storm and Screen (David Wilhelm, Jeff Wilhelm); Milwaukee Community Service Corps (Antonio M. “Tony” Perez); Northwest Side Community Development Corp (Howard Snyder); ReeHouse (Herbert Simmons); Ron’s Flooring and Design (Ron Romero); The Brickyard, Inc. (Arthur R. Leinweber); University of Wisconsin (Welford G. Sanders); Waste Cap Wisconsin (Jenna Kunde); and, Wisconsin State Office of HUD (David Balcer, Marcia Bergeson, Caroline Clayton, Dale Darrow, Michael Martin, Jerry Willholt).

Nashville, TN:

Aegis Environmental, Inc. (Matthew T. Oddo); Affordable Housing Resources, Inc. (Steve Neighbors, Travis Provencher); Bank of America (Michael G. Whalen); Hailey New & Used Building Materials (Judith Haley); Hailey Salvage (Charles Evans); Lang Environmental Services (Gary J. Lang); Metropolitan Development and Housing Agency (Joseph B. Cain, Mike Clinard, Ed Shewmaker); Metropolitan Government of Nashville and Davidson County (Karen P. Nicely, Robert L. Ramsey, W. Tim Walker); Middle Tennessee Career Center (Pearl Sims); Mid South Wrecking Company (Bill Sauve); Re-Use Center (David Hamilton); Riverside Antiques (Dwight & Delores Lynch, Jodie Orman); Union Station Brick & Materials Company (Chad Cline); and, Wilmot Associates (Tiffany Wilmot).

National Contacts:

Appreciation is also extended to the following individuals and organizations that provided valuable input on deconstruction activities around the United States including, but not limited to, the following: Austin Habitat for Humanity ReStore, Austin, TX (Bill Bowman); Forest Products Lab, Madison, WI (Bob Falk); Goodwin Heart Pine Company, Marathon, FL (Carol Goodwin); Hartford Housing Authority, Hartford, CT (Greg Lick); Jefferson Recycled Woodworks (Richard McFarland); Rebuilding Center, Portland, OR (Jim Prindall); San Diego Habitat for Humanity ReStore, San Diego, CA (Lloyd Morris); Tampa Habitat for Humanity ReStore, Tampa, FL (Lew Frazer); UBMA, Halifax, NS CANADA (Joy McPherson); Construction Materials Recycling Association, Lisle, IL (William Turley); and, Boulder Energy Conservation Corps, Boulder, CO (Kurt Buss).

FOREWORD

Deconstruction is an innovative tool intended to contribute to a community's revitalization. Deconstruction is actually a new term to describe an old process—the selective dismantling or removal of materials from buildings before or instead of demolition. What is innovative and exciting is how communities can potentially use this process—deconstruction—to support and complement other community objectives. Deconstruction has the potential to (1) create job training and job opportunities for unskilled and unemployed workers, (2) foster the creation and expansion of small businesses to handle the salvaged material from deconstruction projects, and (3) benefit the environment by diverting valuable resources from crowded landfills into profitable uses, which in turn would enable deconstruction to pay for itself by generating revenues and reducing landfill and disposal costs.

A Study of the Feasibility of Deconstruction provides a brief, but cogent, analysis of the feasibility of deconstruction. This report is based on a study of four urban communities and lessons from other local deconstruction initiatives. It describes the conditions under which deconstruction is likely to work, and the barriers—economic, organizational, and public policy—that must be overcome for it to be a viable part of a community revitalization strategy. While this report is especially timely for public housing authorities implementing modernization and HOPE VI strategies, it is also intended for community leaders who may want to consider deconstruction as a way to enhance and improve their community revitalization efforts.

Lawrence L. Thompson
General Deputy Assistant Secretary
for Policy Development and Research

TABLE OF CONTENTS

LIST OF TABLES.....	iii
EXECUTIVE SUMMARY	v
INTRODUCTION.....	1
OBJECTIVES AND STRUCTURE OF THE REPORT	2
PROJECT METHODOLOGY	3
SUMMARY OF RESULTS	4
Structural and Non-Structural Deconstruction	4
Salvaged Building Material Market.....	6
Deconstruction Activity.....	10
Public Sector Involvement.....	15
Major Issues.....	21
CONCLUSIONS	31
RECOMMENDED ACTIONS	33
Local Metropolitan Government	33
State Government	34
Federal Government	35
Private Sector.....	36
Topics for Additional Research.....	36
APPENDIX A: TERMINOLOGY	A-1
APPENDIX B: PROJECT METHODOLOGY	B-1
APPENDIX C: TECHNICAL BRIEFING PAPER.....	C-1
APPENDIX D: DISCUSSION OF TECHNICAL BRIEFING PAPER PREMISES	D-1
Deconstruction.....	D-1

Demolition	D-3
Renovation	D-4
APPENDIX E: CITY PROFILES	E-1
Miami, Florida	E-1
El Paso, Texas	E-2
Milwaukee, Wisconsin	E-4
Nashville, Tennessee	E-7
APPENDIX F: TRIP SUMMARIES	F-1
Miami, Florida - February 7-11, 2000	F-1
Miami, Florida - July 12-14, 2000	F-4
El Paso, Texas - March 13-17, 2000	F-9
El Paso, Texas - July 25-28, 2000	F-12
Milwaukee, Wisconsin - May 1-5, 2000	F-17
Milwaukee, Wisconsin - August 7-11, 2000	F-20
Nashville, Tennessee - June 19-21, 2000	F-29
Nashville, Tennessee - August 28-September 1, 2000	F-32
APPENDIX G: LARSEN ENERGY WALL TRUSS SYSTEM	G-1

LIST OF TABLES

TABLE 1. Description of Structural and Non-Structural Deconstruction	6
TABLE 2. Relationship between Deconstruction Type, Project Schedule Description, and Priority of Material Recovery.....	22
TABLE 3. Percentage of Units Presumed to Contain Lead-Based Paint	25
TABLE 4. Asbestos Activities Related to Deconstruction Work	27
TABLE 5. Building/Dwelling Codes	29

EXECUTIVE SUMMARY

The NAHB Research Center was contracted to perform a study of the feasibility of using deconstruction as a vehicle for economic development. Deconstruction is building disassembly of both the structural and non-structural components and material salvage. Deconstruction involves carefully taking apart sections of a building or removing their contents with the primary goal of reuse. This report is a qualitative investigation of deconstruction-related activity in primarily four cities: Miami, El Paso, Milwaukee, and Nashville. The four cities provide broad data on the nature of deconstruction on a national level. These cities provide information that is suggestive of conditions or patterns affecting deconstruction activity in other metropolitan areas.

Deconstruction is being used, on a limited scale, as an economic development tool. Deconstruction may create job training and job opportunities for unskilled and unemployed workers. Towards this end, deconstruction has been incorporated as a component of workforce development training to enhance the skills and marketability of program participants towards construction-related employment. Deconstruction may also create small businesses to handle the salvaged material from deconstruction projects. Further, older properties in some communities may provide useful structural and non-structural building materials. Deconstruction, where it has been used, diverts these materials from landfills into productive, profitable reuse in building maintenance, renovation, and other applications.

Deconstruction practices and used building material markets were present in the four cities. The majority of deconstruction-related activities are small, often informal, and limited by an inconsistent supply of recovered building materials. Deconstruction has been incorporated into renovation and remodeling projects by private sector contractors and non-profit organizations. Some private deconstruction operations subcontract their services to demolition contractors; however, this practice was widely described as a highly competitive market with minor growth potential. Non-profit organizations have had some success working in the field of deconstruction due to grant funding and the ability to provide tax deductions to building owners for salvaged materials. Non-profit Used Building Material Retail Operations (UBMROs) are an emerging market nationwide, although most individual stores operate at a small-scale level. The economic strength of UBMROs, both private and non-profit, varies depending on local and regional conditions.

The feasibility of deconstruction as an economic development vehicle depends on the type of deconstruction activity and the market for recovered materials. In this report, two different types of deconstruction activity were identified: non-structural and structural deconstruction. Non-structural deconstruction, i.e., the salvaging of non-structural components and materials such as flooring, cabinetry and appliances, is a mature industry with consistent used building material markets in multiple regions across the United States. Structural deconstruction, which consists of salvaging structural components such as joists and beams, can be described as an emerging market.

Non-structural deconstruction supports small Used Building Material Retail Operations (UBMROs), many of which are located in or near disadvantaged communities. A diverse group of construction industry participants were found to perform non-structural deconstruction activities, including building maintenance, renovation, and demolition. Non-structural deconstruction is not reliant on public sector initiatives or demolition activities to exist; however, public sector incentives can assist in the development of this industry.

Based on the information provided by the four cities, there are a limited number of metropolitan areas where structural deconstruction is feasible as an economic development program. Housing preservation policy, environmental contamination, code issues, and project time constraints have a major impact on the feasibility of structural deconstruction. Structural deconstruction is highly dependent on the demolition market. Only high-end structural deconstruction used material markets, in rare, high quality brick and timbers, were seen to be consistent. The best candidates for structural deconstruction initiatives were metropolitan areas with a surplus of vacant, deteriorated properties, many of which were constructed prior to 1950.

In the four cities, there was a limited amount of public sector financial involvement in deconstruction-related activities. Milwaukee had the most public sector initiatives involving both non-structural and structural deconstruction. The limited amount of public sector support for deconstruction-related activities in the four cities may be attributed to one or several factors including:

- public agencies demonstrating a greater interest in supporting established businesses and markets instead of UBMROs or deconstruction practitioners;
- public agency concerns with building material reuse related to environmental contamination and building code issues;
- local housing policies that do not incorporate or support deconstruction;
- the impact of demolition markets with tight project constraints; and/or
- a limited awareness of the benefits of deconstruction.

The barriers to deconstruction vary based on the type of deconstruction activity that is involved. While redevelopment pressures and associated project time constraints are a major barrier to both types of deconstruction within a metropolitan area, structural deconstruction is more negatively affected by this factor than non-structural. Structural deconstruction is a labor-intensive industry that is heavily dependent upon local demolition and housing construction markets. The additional labor needed for structural deconstruction needs to be offset by a higher volume of consistently valued recovered building materials. Access to structural building materials is often limited by time constraints that are found on private sector redevelopment. Environmental concerns, building codes requirements, and housing preservation policies also limit the supply of recoverable building materials for structural deconstruction enterprises. Due to these factors, some level of public sector assistance is often required to finance the additional costs incurred by structural deconstruction activity.

Military base dismantlement is, in contrast to civilian housing markets, a more feasible environment for structural deconstruction. Favorable conditions for structural deconstruction on military dismantlement projects include:

- control over project time constraints due to a lack of redevelopment pressure;
- consistent volume of similar building materials often installed prior to 1950; and
- reduced impact of local housing policies on existing structures.

Military base deconstruction projects can be structured to avoid redevelopment pressures that are more likely to affect civilian deconstruction projects. In addition, the consistency and volume of building materials found on a large military base dismantlement project are often greater than those found with housing in a metropolitan area. Military base dismantlement projects are often unaffected by local housing conditions and policies that have a major impact on deconstruction within the civilian housing market.

Non-structural deconstruction was commonly found as a waste reduction technique in the renovation, demolition, and building maintenance industry. The success of non-structural deconstruction is due in part to the limited influence of the barriers that affect structural deconstruction. Non-structural deconstruction activity is minimally affected by code issues, project time constraints, and local housing policies. Environmental concerns such as lead-based paint and asbestos-containing materials are likely to have a greater impact on structural deconstruction than non-structural deconstruction.

The information provided by the four cities demonstrates that deconstruction occurs in metropolitan areas with one or more of the following conditions:

- a large number of vacant, deteriorated properties that are constructed prior to 1950;
- a strong accessible reuse market including export markets and large metropolitan areas with a consistent demand for used building materials; and
- non-profit programs that are focused on achieving both social and environmental objectives.

Milwaukee has the most deconstruction-related activities of all the four cities due to these three conditions. Strong reuse markets exist within Milwaukee and the nearby cities of Chicago and Madison. Milwaukee has a large number of vacant, deteriorated housing in the central city area. An extensive network of non-profit organizations exists within Milwaukee. While the majority of these groups in Milwaukee are focused on housing issues, a minority of non-profit organizations provides environmental and social services to the community. Both public and private sector deconstruction activities were found within this metropolitan area. The other three cities did not have an extensive supply of vacant, deteriorated housing that was suitable for deconstruction. Two of the cities, Miami and El Paso, have strong export-based reuse markets. Limited deconstruction activity exists in Nashville, supported by a consistent reuse market and limited number of non-profit programs utilizing deconstruction-related activity.

Non-structural deconstruction can succeed in cities without a large number of vacant, deteriorated properties, whereas structural deconstruction is likely to succeed only in

cities with a large volume of these types of properties. Reuse markets for non-structural materials and high-end structural materials were consistent in all of the cities surveyed for this report. Some inner city neighborhoods have incorporated deconstruction into renovation, remodeling, and demolition as a component of an overall revitalization strategy. The vertical integration of deconstruction into construction-related workforce development programs such as *Step-Up*, *Fresh Start* and *YouthBuild* can teach basic construction skills as a precursor to more advanced trade training and reduce the amount of waste going to local landfills.

This study found a small number of metropolitan areas that have incorporated deconstruction programs with HUD Section 3 or Community Development Block Grants (CDBG) programs. HUD Section 3 requires that whenever HUD financial assistance is given for housing and community development, economic opportunities will be given to local residents and businesses. HUD Community Block Development Grants are provided to communities to support local programs aimed at increasing economic development and resolving community concerns such as affordable housing. In select communities, HUD Section 3 and CDBG deconstruction-related programs have supported small UMBROs and other used building material enterprises. These small community development programs have assisted the overall economic development of a city through micro-enterprise creation and increased employment opportunities within disadvantaged areas.

The future of deconstruction, as an economic development tool, is dependent upon public support. Public sector involvement is often necessary for the initial start-up of economic development deconstruction-related programs. The sustainability of deconstruction-related economic development programs is often unlikely without continued support of public assistance. The following actions could facilitate the use of deconstruction as an economic development strategy:

- State and local metropolitan agencies can identify suitable areas for deconstruction activities. Potential cities and areas suitable for deconstruction are primarily major cities, urban areas, and military bases with a significant volume of vacant, deteriorated structures, or areas expected to require large-scale redevelopment. To heighten the effectiveness of deconstruction activities, cities can identify additional areas containing building stock targeted for rehabilitation, such as historic districts, that could benefit by reusing salvaged materials.
- State and local metropolitan agencies could consider the development of local resource recovery parks where companies and organizations involved in building material reuse and deconstruction-related activities could receive financial incentives, including reduced transportation costs, to promote and strengthen their development. The development of businesses and organizations involved in the reuse of building materials in furniture, housing, and other alternative uses may stimulate new job opportunities in urban areas and additional small business development.

- Workforce development training programs could incorporate deconstruction as both a waste reduction technique and as a way of introducing trainees to the terminology, mechanics, tools and techniques of construction. Combining deconstruction with remodeling and renovation training programs will provide students with the basic skills necessary for new construction, where there are serious and growing shortages of trained workers throughout the United States. Community service training programs can be targeted in areas where deconstruction may be sustainable, currently available, or projected to occur in the future. These programs could be incorporated into community development efforts to renovate or rehabilitate existing properties.
- Local government agencies could consider implementing a grant and award system to create deconstruction incentives on projects identified as favorable for deconstruction because of a lack of redevelopment pressures. This system would allot bonus points for contract and grant proposal bids that incorporate deconstruction. This can provide job training, small business, and employment opportunities in areas that have a favorable environment for deconstruction.

It is difficult to predict the future growth of the deconstruction industry. The feasibility of the deconstruction market does not necessarily depend only on a local supply of used materials, but rather on the demand and economy of the region. As the demand for used building materials increases, especially for low-end materials, i.e., low-quality materials, the future development of deconstruction may become stronger. If the demand for low-end materials remains at a small-scale local level, then the opportunity for market growth remains limited. In the short-term, communities with a large number of vacant, deteriorated properties or strong reuse markets can continue to utilize some level of deconstruction activity.

INTRODUCTION

Deconstruction can be defined as the selective dismantlement or removal of materials from buildings for reuse or recycling.¹ Deconstruction is being used, on a limited scale, as an economic development tool. Deconstruction involves carefully taking apart sections of a building or removing its contents with the primary goal of reuse. Deconstruction may create job training and job opportunities for unskilled and unemployed workers. Deconstruction may also create small businesses to handle the salvaged material from deconstruction projects.

The NAHB Research Center, Inc. (Research Center) was contracted to perform a nationwide deconstruction feasibility study by the U.S. Department of Housing and Urban Development (HUD). A central mission of HUD policy is to provide community development assistance. The report is a qualitative investigation focused primarily on four cities with the objectives of:

- examining current deconstruction activity; and
- assessing the feasibility of deconstruction for use as an economic development vehicle.

A resource group of deconstruction industry participants was assembled to monitor the progress of the study. A qualitative investigation of the deconstruction-related activities in several pilot cities was chosen as the best method for identifying predominant influences on the deconstruction market. The following four cities were selected for the study:

- Miami, Florida
- El Paso, Texas
- Milwaukee, Wisconsin
- Nashville, Tennessee

The four selected cities provided broad data on the nature of the deconstruction industry on a national level. As a result, these cities can provide information that is suggestive of conditions or patterns affecting deconstruction activity in other metropolitan areas. This report may serve as a baseline for further investigation on national or regional patterns of deconstruction-related activity.

A total of eight on-site research trips, two for each of the four cities, were completed. In addition, published resources and national deconstruction experts were consulted to add perspective on the information gathered from the four cities.

¹For more information on terminology, see Appendix A.

OBJECTIVES AND STRUCTURE OF THE REPORT

The objectives of the study on the feasibility of deconstruction were as follows:

- characterize the nature of the building stock and its suitability for deconstruction;
- assess the market potential for salvaged building materials;
- assess the potential for workforce training and placement needs related to deconstruction;
- discuss conventional demolition practices and their relationship to deconstruction;
- characterize public and private sector roles in the development of deconstruction; and
- describe scenarios for job creation and business opportunities related to deconstruction.

A comprehensive identification and inventory of influences that may affect the feasibility of deconstruction within each city is not within the scope of this report. This report is designed to address, to the fullest extent possible, major trends and issues affecting the feasibility of deconstruction in metropolitan areas. The report is structured around the major sections described below.

INTRODUCTION	A brief discussion of the background and history of the report.
OBJECTIVES AND STRUCTURE OF THE REPORT	Description of the basic objectives and organization of the report.
PROJECT METHODOLOGY	A discussion of the qualitative approach to studying the feasibility of deconstruction.
SUMMARY OF RESULTS	A description and discussion of the deconstruction market and public sector activities discovered through a qualitative investigation of four cities.
CONCLUSIONS	A discussion of major issues affecting the feasibility of deconstruction, and an assessment of the feasibility of structural and non-structural deconstruction.
RECOMMENDATIONS	A discussion of recommended actions for non-structural and structural deconstruction policy initiatives and recommendations for future research on this topic.
APPENDICES	Detailed information on selected topics has been placed in appendices to maintain the flow of the report.

PROJECT METHODOLOGY

The Research Center studied the feasibility of deconstruction using the following five steps. For more information on the project methodology see Appendix B.

Step 1: Develop Research Strategy

A comprehensive research approach was developed using a technical resource group composed of deconstruction industry experts. This group was responsible for reviewing the research plan and trip updates. A technical briefing paper (see Appendix C) was created and reviewed by the research group to develop a clear strategy for performing a national study of deconstruction. Discussion of the technical briefing paper premise is included in Appendix D.

Step 2: Identify Representative Metropolitan Areas of Study

As part of the study, the Research Center and HUD were responsible for selecting the four cities for deconstruction feasibility research. The primary criteria used to select the candidates were: geographic location, size of the city, economic conditions, and the ability to quickly establish contacts within the local public housing authority and building salvage market. The Research Center and HUD selected the recommended candidates for their ability to provide important information on the feasibility of deconstruction for the future development of policy and initiatives. A profile of each of the four cities is included in Appendix E.

Step 3: Develop Research Aids

The Research Center developed several tools to gather and organize data including a comprehensive task list, discussion guides and trip summaries. Interview and discussion guides were also developed to gather information from individuals and groups that are involved in deconstruction-related activities. A trip summary was used to present significant information gathered from each on-site visit, citing key references, contacts and observations. For more information on the trip summaries see Appendix F.

Step 4: Identify Information Sources

A combination of research methods was used to identify information sources for each city including Internet resources, a review of relevant deconstruction-related data, and consultations and interviews with representatives of various sectors that influence deconstruction activity.

Step 5: Perform On-Site Investigation of the Feasibility of Deconstruction

Two on-site visits, typically three to five days in length, were made to each city. Prior to each on-site investigation, key deconstruction participants were identified and contacted. A detailed schedule was developed to organize the number of interviews and research activities to be conducted during each visit.

SUMMARY OF RESULTS

The summary of results is divided into two sections. The first section will:

- define two types of deconstruction, structural and non-structural; and
- describe the market for salvaged building materials.

The second section will:

- characterize deconstruction activity in the four cities;
- describe public sector involvement in deconstruction activity for the four cities; and
- discuss major issues affecting deconstruction activities.

Structural and Non-Structural Deconstruction

There are two basic types of deconstruction that provide the supply of recovered materials, non-structural deconstruction and structural deconstruction. In general, non-structural deconstruction (also known as “soft-stripping” or “high-grading”) can be accomplished with few tools, typical job-site safety considerations, and in a matter of hours or days. Structural deconstruction involves a range of tools, mechanization, heightened safety considerations, and a time frame of days or weeks. Table 1 provides a detailed definition of these two approaches to deconstruction.

Building owners commonly grant contractors rights to building material salvage. This was documented through conversations with demolition contractors in all four cities. Demolition contractors use a variety of methods to lower their disposal costs and achieve profit margins with building material salvage, including the use of structural and non-structural deconstruction. The amount of building salvage that is performed depends heavily on the labor and time constraints that exist on the project. In general, non-structural deconstruction is more likely to be performed in the majority of demolition projects prior to mechanical demolition. Structural deconstruction was often limited to used brick recovery unless there was a potential to recover highly valued wood building materials such as rare species of Douglas Fir, Southern Yellow Pine, Cedar, and other hardwood materials.

Non-structural deconstruction can be described as a mature market. The salvage and resale of used windows, doors and appliances was found in all of the cities surveyed for this report. On a broad scale, structural deconstruction can be described as an emerging market, one that has existed for some time but has not gained a consistent presence throughout the country.

Non-structural deconstruction has both high-end and low-end markets.² High-end markets include architectural antiques and salvage. This can include custom-made cabinetry and rare items such as recovered Cuban tile. Low-end markets include materials that are commonly used for maintenance and replacement purposes by property managers. Every city visited for this report had one or several low-end used building material retail operations that focused on materials such as recovered doors and windows, and fixtures such as toilets and sinks.

Structural deconstruction does include specific high-end sectors of the market that can be described as mature industries. These sectors include used brick, architectural antiques and rare or extinct wood materials. Of these industries, used brick was found to be the most successful due to high consumer demand, exterior storage capability and relative ease of dismantlement (used brick is commonly dismantled by mechanical methods and processed manually).

Structural deconstruction, especially with regard to low-end materials, can be described as an emerging market. Low-end sectors of structural deconstruction typically include common wood materials such as dimensional lumber whose removal costs compete ineffectively with new materials on the open market. Conversations with demolition contractors and building salvage firms revealed that many low-end wood materials are either disposed of in a landfill or recycled.

Findings from the Four Cities

- Used brick was a major market in all four cities. Prices varied depending on the amount of demolition activity and the type of brick that was being recovered.
- Miami has a rare type of wood known as “Dade-County Pine” that is highly valued on the recovered wood market. This material is becoming harder to find as older buildings in Miami have been removed.
- Recovered doors and windows are a major non-structural market. These materials were recovered on both demolition and renovation projects. Major customers for this market were property management clients, do-it-yourselfers and exporters.

²For the purpose of this report, high-end markets sell materials for approximately the same price as new if not significantly higher. Low-end markets sell materials for less than the cost of new, if not significantly lower. The distinction between high-end and low-end markets may vary depending on regional economies and characteristics (generally, high-end materials will not sell for less than 85% of new).

Table 1. Description of Structural and Non-Structural Deconstruction

Deconstruction Type	Definition	Characteristics	Types of Materials Salvaged
Non-structural	Non-structural deconstruction involves the removal for salvage/reuse of any building components or contents that are not a part of or whose removal is not dependent on the structural integrity of the building.	Usually light, can be salvaged relatively easily and with minimum safety concerns. Material can be viewed without much destructive access. Typically does not require support or bracing to salvage.	Finish flooring Appliances/mechanical Cabinetry Windows/doors Trim Fixtures/hardware Fireplace mantels
Structural	Structural deconstruction involves the removal for salvage/reuse of building components that are an integral part of the building or contribute to the structural integrity of the building.	Disassembling a structure to salvage the structural building components such as beams, joist, and brick. Materials are typically large, rough products that are to be reused as building materials or remanufactured into value added products such as chairs, tables, and surface coverings.	Framing Sheathing Roof systems Brick/Masonry Wood timbers/beams Wood rafters Floor joist system

Salvaged Building Material Market

Material recovered through structural or non-structural deconstruction will enter the reuse market through one of three methods:

- sales through a used building material retail operation;
- on-site sales; and
- direct reuse.

Used Building Material Retail Operations (UBMROs)

Deconstruction is heavily dependent on a used building material retail operation (UBMRO) to obtain and sell recovered materials. The relationship between deconstruction agents and UBMRO can take several forms. The most common deconstruction market relationship identified in this study was a UBMRO receiving material from a deconstruction agent. The deconstruction agent could be a deconstruction contractor, demolition contractor, renovation contractor, property management firm or private individual. Materials can either be purchased through on-site sales or recovered directly from the building slated for demolition or renovation. Some private building deconstruction agents subcontract their services to demolition contractors.

Interviews with deconstruction agents in the four cities revealed that those who use building salvage as a stand-alone enterprise often encounter a highly competitive marketplace. In a traditional private sector relationship a retail operation buys recovered material from a deconstruction agent for a wholesale price and then resells this material to a consumer for a higher retail price. A UBMRO can receive recovered materials from several sources allowing them to obtain the best wholesale price. Demolition firms that subcontract deconstruction services often charge deconstruction agents for the recovered material. Stand alone deconstruction agents therefore must negotiate prices between the demolition contractor and the UBMRO. One demolition contractor in Milwaukee stated that the prices for used material costs are established and that since anyone can purchase materials from a demolition contractor, gaining access to the material is a function of timing as well as pricing. These factors often have a negative impact on the feasibility of private sector stand-alone deconstruction business structures.

UBMROs and deconstruction agents may be combined. A UBMRO with a deconstruction service was found in three of the four cities investigated for this report. This vertically integrated business relationship eliminates the need for a deconstruction agent to negotiate with a retail operation. The retail business is based on high up-front costs for the purchase and for labor to remove or ship the material. However, there is no guarantee that recovered used materials will sell or that the purchase price will cover the invested up-front costs of the business. The vertical integration of a stand-alone deconstruction business with an UBMRO also involves additional operating expenses including storage and retail labor costs.

A UBMRO and deconstruction agent can either be a non-profit or a private for-profit enterprise. The private or non-profit status of the UBMRO can affect the overall feasibility of the enterprise and can indirectly affect the overall deconstruction market. Non-profit organizations have had success working in the field of deconstruction due to grant funding capability and the ability of charitable organizations to provide tax deductions to suppliers. The majority of non-profit based UBMROs encountered in this study received some level of grant funding. Non-profit retail operations were found in Milwaukee and Nashville. Both operations were relatively small and sold primarily low-end materials to a smaller customer base, often low-income populations, than similar private sector UBMROs in the same city. Grant support and a non-profit organizational structure can support labor and administrative costs and in some cases allow

organizations to offer below market pricing. One Community Block Development Grant (CBDG) recipient in Milwaukee sold recovered materials to the local community at approximately 25 percent of the cost of similar new materials.

Non-profit UBMROs that are charitable organizations benefit from the ability to provide tax deductions to donors of used building materials. One non-profit UBMRO in Nashville received the bulk of his materials from renovation contractors in exchange for tax deductions (and reduced waste disposal costs). A number of non-profit UBMRO programs do not rely on grant support and have been very successful in selling recovered building materials across the nation through the use of tax deductions. Habitat for Humanity International, a housing non-profit organization, has more than 45 Habitat ReStores across the nation that specialize in the resell of donated used building materials. Interviews with non-profit UBMROs in cities that were not selected for investigation revealed that tax deductions were a key incentive for building owners to choose structural deconstruction over mechanical demolition.

UBMROs that specialized in structural materials tended to serve a high-end market versus the non-structural low-end market. The retail price of recovered structural materials includes the added labor and time expense required for this type of deconstruction. The retail price of recovered materials can vary depending upon whether the UBMRO is private or non-profit. Non-profits often price materials to be affordable whereas private UBMROs often price the material to maximize profit.

Most UBMROs receive recovered material from a variety of sources including renovation contractors, private individuals and demolition contractors. Structural materials such as brick and used wood are often received from demolition contractors and to a lesser extent, renovation contractors. Some UBMROs received the bulk of their supply from demolition contractors while other retail operations within the same vicinity received the bulk of their materials from renovation contractors and private individuals. Non-profit UBMROs may receive their materials through vertically integrated deconstruction services. Examples of this type of relationship are the ReUse Center, a program of the Green Building Institute in Minnesota, and the ReBuilding Center in Oregon. In Milwaukee, one CBDG recipient partnered with a local Habitat for Humanity representative to receive recovered materials that were gleaned from a non-structural deconstruction project using sweat-equity labor and community service volunteers.

UBMROs are dependent on a variety of factors to market used building materials.³ The presentation of materials was found to be more important for high-end UBMROs than for low-end operations. Of the four cities, El Paso had the most favorable conditions for UBMROs including:

- a thriving non-structural deconstruction industry;

³Factors affecting salvage value or marketability of materials include: type of materials sold, climate and geographic location, local economic conditions, current retail building material pricing and presentation. These factors were identified in *Deconstruction - Building Disassembly and Material Salvage: The Riverdale Case Study* (NAHB Research Center, 1997).

- a year-round desert climate that allowed for outside storage;
- a weak economy that supported the reuse of building materials in local renovation activities; and
- a close proximity to the Mexican border.

On-site Sales

On-site sales of recovered material is a common approach to reducing waste disposal costs and/or generating income for deconstruction agents including deconstruction, demolition, and renovation contractors. The majority of demolition contractors in the four cities stated that on-site sales of recovered materials was the most cost effective option outside of recycling the materials. Demolition contractors provide deconstruction agents with the cost and a time frame to remove materials from a building slated for demolition. This allows the demolition contractor to lower waste disposal costs while incurring no extra labor charges or liability expenses. Time constraints are a major limitation for on-site sales.

Direct Reuse

Renovation contractors salvage and reuse building materials to reduce the cost of waste disposal. Renovation and rehabilitation contractors were identified during interviews with UBMRO owners as both a major supplier and customer. The use of recovered materials can provide a renovation contractor with the capacity to match unique historic requirements that may be difficult to replicate with newer materials. The ongoing reuse of recovered material is a cost-effective way to achieve a more accurate look in historical preservation projects. This approach was found to be common to almost all of the cities. Storage issues can be a major limitation to the recovery of materials from one job for their reuse on another project.

The reuse of recovered building materials in new construction can be described as an emerging market. The reuse of structural wood in new construction was only found in the Milwaukee area. In Milwaukee and Chicago there are a large quantity of buildings, both residential and commercial, with large timbers and high quality wood members slated for either demolition or major revitalization. One builder purchased recovered wood timbers through a deconstruction contractor and used these materials to create high-end timber frame houses in northern Wisconsin. These high-end timbers were recovered from old commercial warehouses in Chicago. Due to the intensely competitive nature of the supply and demand market for these high-end timbers, the builder declined to name the deconstruction source. Another use of recovered structural wood materials in new construction was found in the central city of Milwaukee. A microenterprise deconstruction contractor, in partnership with several non-profit organizations that receive funding from State and local sources, uses recovered wood to create a Larsen energy wall truss system for use in new construction (see Appendix G).

Findings from the Four Cities

- In Milwaukee, REEHouse, Inc., uses community service workers to perform structural deconstruction on residential dwellings provided by a subcontract relationship with a local demolition firm. These recovered materials are then reused to build affordable housing in downtown Milwaukee.

- Recovered building material, mainly non-structural, is provided by a variety of sources. This was seen in El Paso, Texas with the two largest UBMROs. One UBMRO is a subsidiary of a major local demolition contractor and receives the bulk of its material from this relationship. Another UBMRO receives the bulk of its materials (mainly non-structural materials) from renovation contractors, private individuals and, to a lesser extent, demolition contractors. This pattern was repeated in the other cities.
- In Nashville, one non-profit UBMRO provided tax deductions to contractors who donated recovered building material. In addition, work release participants were used to lower labor costs in performing warehouse duties and retail operations. Milwaukee also demonstrated community service corps support for deconstruction-related activities.

Deconstruction Activity

Non-structural deconstruction was found to have a mature market in all four cities investigated for this study. El Paso and Miami had consistent non-structural deconstruction activity that was supported by both renovation work and export markets in Mexico, the Caribbean and Central America. Structural deconstruction was seen to be an emerging market with limited activity occurring in three of the four cities, and focused mainly on high-end recovered brick and wood materials. Milwaukee ranked number one in deconstruction related activity due to a more consistent structural deconstruction market. Milwaukee has a large stock of abandoned buildings and benefits from local policies that support both structural and non-structural deconstruction.

Structural deconstruction was limited in the other three cities for varying reasons. As an example, housing preservation issues affected the supply of potential structural deconstruction candidates in both El Paso and Nashville. Structural deconstruction activity was limited in Miami due to the predominance of concrete block construction in this region.⁴

Structural deconstruction was limited to brick recovery and some wood recovery in the majority of the cities. Demolition contractors were the primary source for these materials using on-site sales, deconstruction subcontract relationships or direct UBMRO relationships. These materials were often shipped to other regions of the country for processing or redistribution. Recovered brick was found to have both a strong local and national market. Interviews with demolition and UBMRO owners revealed that high-end wood materials tended to be more of a national, even international, market.

Wood recovery was performed if the price of the salvaged material justified the extra time and labor necessary for recovery. In the majority of cases, demolition contractors stated that wood was not suitable for recovery. Recycling of wood was preferred to reuse

⁴Conversations with several deconstruction sources in Florida reveal that Miami's construction is atypical of other types of construction in the state. As an example, there is a successful Habitat ReStore in Tampa, Florida that is located next to a historical district with a high number of Victorian wood houses.

in most situations. Certain rare types of wood, such as Miami’s Dade County Pine, were highly valued. The value of this wood was increased due to a limited supply.⁵ Commercial buildings generally provided a greater stock of structural material that justified recovery – large timbers and brick were commonly found in these buildings. Overall, with the exception of used brick, structural material recovery was more variable and erratic than non-structural recovery.

Used brick was a major market in all four cities visited.⁶ Used brick has a strong high-end market with brick selling between \$250 and \$450 per 1,000 bricks. Many retailers we spoke to stated that they did not have enough used brick in their inventory to meet the demand. Recovered brick was used for non-structural exterior uses (patios, driveways and exterior finishes). In Nashville, used brick materials were used in new residential construction. Mechanical and manual methods are easily incorporated into used brick recovery creating a distinct advantage over the structural deconstruction and recovery of wood materials. Brick materials were sold based on their color and history. “Cream City” brick, found almost exclusively in the Milwaukee area, was in demand on a local and national level.

Non-structural renovation related activity was consistent in all four cities. Non-structural material markets, especially low-end markets, tended to cater to the local metropolitan area. High-end materials were seen to have a greater national presence. Individuals and renovation and demolition contractors supported the reuse market through the recovery of non-structural materials in each of the cities investigated for this study.

Non-structural building material recovery was the predominant deconstruction activity found in all four cities. The following is a discussion of the three reasons why this may have been found:

Structural deconstruction is more adversely affected by time constraints than non-structural deconstruction.

Time constraints were identified as the number one limitation on both non-structural and structural building material recovery. Time constraints are often created through the building permit process and interest-based financing. Non-structural building salvage often occurs prior to demolition, and in many instances prior to the issuing of the demolition permit. Structural deconstruction is often performed as a supplement to mechanical demolition. Structural deconstruction is, therefore, more dependent on the demolition permit process than non-structural. Since demolition contracts often include strict timeframes for project completion, there is a limited window of time allotted for deconstruction activity.

⁵One UBMRO in California was selling a supply of 2” x 8” tongue and groove Douglas Fir. Conventional lumberyards must special order this material new.

⁶A “major market” can be defined, for the purposes of this report, as one or more business enterprises with an excess of \$150,000 in annual gross revenue.

Interest-based financing rewards participants that meet or exceed the project schedule. This financing mechanism can become an obstacle to deconstruction activity in both private and public projects. In discussions with demolition contractors, it was found that commercial projects often have stricter project schedules, due to interest-based financing and redevelopment pressures (including occupancy concerns), than smaller residential projects. Large-scale commercial or public projects often provide a more consistent volume of recoverable building material than small-scale residential projects.

Structural deconstruction is heavily dependent on demolition activity, whereas non-structural deconstruction can be performed independently.

Structural deconstruction is usually performed in a property that would otherwise be considered for demolition. Structural deconstruction always involved some type of mechanical demolition activity, at a minimum, for excavation purposes. Mechanical methods are also used to recover brick materials by pulling the exterior walls away from the structure.

A combination of factors related to demolition activity creates an erratic supply of recovered building materials. Demolition contractors often operate within tight project schedules due to redevelopment pressures limiting the amount of material that can be recovered. Metropolitan area demolition activity is dependent on public work projects, private development initiatives, and local housing policies. The supply of building materials recovered from structural deconstruction is further affected by the internal influences of the buildings slated for demolition including the condition of the material, type of construction and potential environmental contamination issues. These and other factors often reduce the potential supply of recovered building materials and weaken the strength of the structural deconstruction market.

El Paso is a good example of lack of used building materials supply. One major demolition contractor in the area was dismantling wood residential housing as a part of a road expansion project in the city. A local furniture maker would purchase wood recovered from this demolition contractor, process it into furniture, and sell it to a regional high-end market. When the road expansion project was completed, the supply of wood diminished. The local furniture maker, to meet the demands of business, is currently purchasing recovered wood from New Mexico and Arizona. Given the limited number of demolitions currently performed in El Paso, structural deconstruction is not considered feasible for this area.

In contrast, non-structural deconstruction is very popular in El Paso and is supported by a culture that values reuse. Interior studs are salvaged from the small number of abandoned properties in the city. The local public housing department auctions off recovered appliances and fixtures. Renovation contractors are prime customers of the local UBMROs and use the materials to lower costs in a competitive environment. Demolition work in El Paso is more often performed on large public or commercial projects. Renovation work is performed on all types of properties, many of which are unaffected by financing constraints and/or tight project deadlines.

Housing preservation, environmental concerns, and code approval issues impact non-structural deconstruction to a lesser extent than structural deconstruction.

Housing preservation policies can limit the number of houses that are available for structural deconstruction. Housing preservation can be associated with areas experiencing tight housing markets, a shortage of affordable housing, or historic building districts. Metropolitan revitalization programs can either work to preserve housing and reduce the number of properties for dismantlement or can increase the number of houses available for dismantlement to create room for new housing. In either case, non-structural items will be recovered either by renovation contractors who are working on modifying existing structures or through demolition contractors who will be dismantling existing structures to make room for new construction. Conserving the existing metropolitan area housing stock in combination with historical preservation initiatives can support non-structural deconstruction efforts by providing a ready market for recovered materials.

Environmental concerns can affect the supply of recovered building materials. The disturbance of environmental hazards varies greatly with the type of recovered building material. For example, finish flooring (hardwood flooring) is a non-structural material that, when removed, will have a minimal impact on the presence of environmental hazards. Many appliances, fixtures and hardware may also be free of environmental contamination. Common environmental hazards include lead-based paint and/or asbestos-containing materials and may exist in a pre-1980s buildings.

Materials coated with lead-based paint may be reused directly but many materials are prohibited for resale by Federal law.⁷ Lead-based paint is commonly found on non-structural recovery items including windows, doors, and trim. High-end non-structural materials including architectural antiques may be valuable enough to warrant encapsulation or chemical stripping of the lead-based paint. Low-end materials are often disposed of as construction and demolition debris.

Asbestos-containing material could be encountered in structural deconstruction efforts aimed at removing framing members or structural sheathing. To a lesser extent, non-structural deconstruction is affected by the presence of asbestos-containing material hazards. The non-structural recovery of cabinets could disturb asbestos-containing material or lead-based paint in a plaster wall. Asbestos-containing materials may also be found in certain fixtures including ovens and boilers. All asbestos-containing materials should be abated prior to reuse.

Code restrictions do not apply to many non-structural items including appliances, cabinetry, flooring, fixtures and hardware. Even in situations where codes are stringent and do apply, as in Miami, many contractors continue to use recovered windows despite

⁷Consumer Product Safety Commission, 16 CFR Part 1303.

restrictions.⁸ Recovered building materials that are reused for structural purposes are more likely to directly involve the approval of local code officials. The state of Wisconsin is unusual because it does not follow a national code; this unique approach has facilitated the reuse of structural materials. Conversely, El Paso, which follows BOCA and has a major substandard housing issue (homes are often constructed with individually salvaged material), clearly does not endorse the reuse of structural building materials.

Grading requirements of local codes currently present a restriction on the reuse of recovered structural wood materials. Grading of recovered wood is not required for non-structural purposes. Therefore, non-structural items such as hardwood flooring, cabinets and wood mantles are unaffected by grading requirements. The reuse of recovered wood for structural purposes is negatively affected by a lack of a nationally accepted grading system for recovered wood products.

The USDA/FS - Forest Products Laboratory is in the process of developing a certification for used wood materials. This certification process could then be adopted on both local and national levels, removing a potential obstacle to structural material reuse. Currently, there is a project in Milwaukee that demonstrates a structural reuse of recovered wood in a wall truss system. This Larsen energy wall truss system may be an effective end use for recovered wood materials in new construction.⁹

Findings from the Four Cities

- Renovation contractors who used recovered materials were identified in all four cities. The type and amount of materials that were reused depended on local and regional conditions including the local economy, type of building construction and customer base. El Paso had a strong reuse market, mainly for non-structural purposes, due to a weak economy that made renovation a more likely choice for consumers than new housing.
- In Miami and El Paso there was a strong export market for used building materials. The market was mainly for non-structural, due to an erratic structural materials market.
- In Milwaukee, several private deconstruction contractors and UBMROs created a mature market for both high-end structural and non-structural materials. Many of these items were shipped to Chicago and other cities.
- Landfill rates were found to have a minor influence on the feasibility of deconstruction in the selected cities. While high landfill fees may serve as an incentive to deconstruction, low landfill fees did not appear to have a negative influence on deconstruction activity. As an example, El Paso has one of the lowest landfill rates in the nation. However, building material reuse and associated deconstruction activity were found to be a strong market in this city.

⁸There is a thriving export market in Miami. The vast majority of materials shipped overseas were non-structural items including appliances, doors, windows and cabinets.

⁹For more information on the Larsen energy wall truss system, see Appendix G.

Public Sector Involvement

Public sector involvement in deconstruction-related activities was found in the following:

- state and local funding support for deconstruction activities;
- state and local use of deconstruction in workforce training programs;
- HUD Section 3 and Community Block Development Grant (CBDG) support for deconstruction activity; and
- metropolitan public housing non-structural deconstruction activities for building maintenance purposes.

State and local funding support for deconstruction-related activities was implemented through economic development and environmental initiatives. In Nashville, a UBMRO was initially created and supported through a local government grant as a part of a community service worker program. In Milwaukee, community service worker programs were used to provide labor for a microenterprise deconstruction project and as a component of an overall urban rehabilitation project using HOPE VI funding. State funding in Wisconsin supported Waste-Cap Wisconsin, a non-profit clearinghouse that promotes deconstruction and other waste reduction initiatives on a statewide level.

The sustainability of deconstruction-related projects without local or state funding support varies depending on the type of program. UBMRO programs initially supported by state and local funding were found to be self-sustaining based on the local market for recovered materials. One small non-profit UBMRO in Nashville uses volunteer labor and the revenue generated from recovered material sales to support their existence without state or local funding. This non-profit was originally started with a grant from the city of Nashville. Another non-profit UBMRO was identified in Milwaukee that received continued funding through a Community Block Development Grant.

Deconstruction was often incorporated as a component of larger construction or maintenance training programs. Non-structural and structural deconstruction techniques were integrated as a component of construction training programs. In Milwaukee, structural deconstruction training was integrated into a new construction and renovation program. In Miami, the Miami-Dade Public Schools has utilized a deconstruction approach for their adult education programs in restoration and renovation, and their building maintenance tract. Primarily non-structural deconstruction techniques were incorporated as a component of these training programs.

Deconstruction can be most effective when included as a standard module in construction training programs. Training programs should be targeted at markets aimed at revitalizing metropolitan areas that are sustainable, currently available, or projected to be strong in the future. Sustainable markets include renovation for accessibility, renovation or rehabilitation activities to restore urban areas, and renovation or rehabilitation associated with lead-based paint hazard control initiatives. The integration of deconstruction-related activities into renovation-based training programs enhances the skills and marketability of program participants. In addition, renovation and remodeling training programs provide students with basic skills that are necessary for new construction. The use of

deconstruction techniques can reduce the waste disposal costs for these organizations, allowing more funding to be directed toward the training programs.

The U.S. Department of Health and Human Services has effectively described the importance of integrating deconstruction into construction training programs:

“Building deconstruction offers new opportunities for career and new enterprises and provides an excellent training ground for employment in the wider construction field where there are serious and growing shortages of trained workers throughout the United States. It also offers opportunities for significant, vertically integrated enterprise development through materials salvage, recycling, re-use and remanufacturing.”¹⁰

Deconstruction may be easier to incorporate into training programs when the property and buildings are owned or financed by the federal government, especially HUD homes and military projects. Military construction and demolition projects usually involve a substantial amount of buildings and material that could serve as a base for various types of hands-on training programs. Training is an essential component of the HOPE IV public housing redevelopment program and deconstruction could be incorporated into this training. As one property manager in Miami stated, “Training is essential to the success of the HOPE IV project. It must involve the participation of the residents in the rebuilding.”

Deconstruction training programs were usually dependent on state, local government or private foundation funding support. A combination of state or local government support covered transportation, supervision, and other administrative costs related to one non-profit structural deconstruction-related training program in Milwaukee. Non-structural deconstruction training programs were seen to be slightly less reliant on local government financial support than structural deconstruction.

Deconstruction is a low priority for workforce development training programs. High priority workforce development needs were in skilled professions in construction and other areas such as manufacturing, technology or service industries. In cities where there was high unemployment including El Paso and Miami, there was a surplus of individuals who were able to perform low-skill non-structural deconstruction. Local workforce development programs are often focused on moving individuals from low-skill employment into higher skill positions in technology, manufacturing or service industries. The labor-intensive nature of deconstruction can make this occupation or skill less attractive than competing employment opportunities in more comfortable air-conditioned environments. A common statement made by workforce development providers was that if a potential trainee had the opportunity to work outside recovering material in an unconditioned building or to work inside making comparable (or higher) wages in a service industry, the trainee would choose the service industry.

¹⁰FY 2000 and 2001, “Urban and Rural Community Economic Development Discretionary Grants Program”.

In general, the following reasons were seen as obstacles to stand-alone deconstruction training as a workforce development program:

- unskilled nature of non-structural deconstruction;
- the relationship between structural deconstruction and demolition;
- greater demand for labor in service, manufacturing and higher skill construction markets; and
- liability concerns from potential employers.

A high skill level is unnecessary for recovery of non-structural building materials, thereby reducing the need for workforce development training. The low skill level necessary for deconstruction allows a wide range of participants. One program in Milwaukee utilized volunteer labor to perform non-structural deconstruction on residential housing in association with a local Habitat for Humanity chapter.¹¹ While non-structural deconstruction is a mature market, the large number of competing participants who provide this labor, and the low value of most of the materials recovered, creates a low wage environment. The opportunities for individuals to use non-structural deconstruction skills as a stand-alone source of income are limited. Competing opportunities in construction trades related to new construction and/or renovation further limit the need for non-structural deconstruction training. There is no perceived need to train individuals in non-structural deconstruction due to the low skill level and limited income potential associated with it.

Structural deconstruction requires a greater skill level from participants than non-structural deconstruction. However, structural deconstruction is closely tied to the demolition market, and this market can vary greatly depending on local and regional conditions. The tight schedules commonly found with large volume demolition projects create an additional constraint on the opportunity for individuals to utilize structural deconstruction skills. The current movement towards increased mechanization in the demolition industry is in part a response to a market demand for faster and more efficient demolition. Demolition contractors spoke of a need for high skill mechanical operators as opposed to manual laborers to perform deconstruction. Limited opportunities for structural deconstruction in a metropolitan environment create an inconsistent employment market for individuals who are trained in these skills. Renovation contractors may have greater opportunity to perform structural deconstruction for their direct use of material.

Liability was mentioned by a wide range of deconstruction industry participants as a potential obstacle to using workforce development trainees. Safety and environmental issues and workers compensation costs were mentioned as the primary reasons for liability concerns. The ability to supervise and have control over the employment status of trainees was also mentioned by potential employers as a prerequisite for using individuals as part of a job training program. In general, these issues were seen as

¹¹Habitat for Humanity International is a United States based non-profit organization that provides low-income housing using volunteer labor and a “sweat-equity” program of participant involvement.

potential obstacles to using job trainees in the deconstruction, demolition and UBMRO industries.

One exception was found in a government subsidized deconstruction-related training program in Milwaukee. A 1998 HOPE VI project to revitalize properties in the Milwaukee downtown area utilized deconstruction. This HOPE VI project was a collaboration between the local Laborers Union and the Milwaukee Community Service Corps (MCSC). MCSC is dependent on a variety of sponsors for their programs including local government and private foundation support. Several of the trainees have moved on to become apprentices in the Milwaukee Laborers Union. The ability of the Laborers Union to combine deconstruction with a pre-apprenticeship program increased the probability of success for this training program.

Community Block Development Grant support of deconstruction activities was not found in three of the four cities surveyed. Only Milwaukee utilized CBDG funding to support deconstruction. CBDG funding supported a portion of administrative costs for a microenterprise structural deconstruction project as well as a non-profit UBMRO specializing in mainly non-structural items in the central city of Milwaukee. The reason that CBDG funding was not utilized in the other cities may be due to the limited amount of structural deconstruction occurring in those metropolitan areas and a lack of recognition given to non-structural deconstruction activities.

Non-structural deconstruction activities were commonly found with local public housing agencies (PHAs). Local PHAs performed on-site sales of recovered appliances and fixtures in Nashville and El Paso. Routine inventory and storage of recovered materials was used to offset replacement costs in Miami. Although no organized efforts to recover materials in Milwaukee public housing was seen, it is likely that this occurred on an informal basis. The main reason for non-structural deconstruction activities in public housing was to reduce waste disposal and replacement costs. These activities were not formally recognized as “deconstruction” by the participants and instead were seen as common practices for cost-effective property maintenance.

Deconstruction was not used as a component of Section 3 training in Miami, El Paso and Nashville. Section 3 of the HUD Act of 1968 states that whenever HUD financial assistance is given for housing or community development, economic opportunities will be given, whenever feasible, to residents and businesses in that area. This can be attributed to one or several factors including: a greater interest in supporting established businesses and markets instead of UBMROs or deconstruction practitioners; local housing policies; a demolition market with tight project constraints; local building construction practices; and a limited awareness of non-structural deconstruction. In Miami, deconstruction is being considered for a HOPE VI project. The predominant construction in Miami is concrete block and the extensive termite damage found in wood trusses or floor joists may limit the amount of building material to be recovered through structural deconstruction. In El Paso, code officials strongly discouraged the structural reuse of recovered materials due to a major problem with substandard housing in the region.

The issue of affordable housing was described in both El Paso and Nashville as a primary concern for local housing policies. In Nashville, a local housing policy memorandum stated that deconstruction was not suitable for the city. The memorandum describes how affordable housing issues limit the effectiveness of deconstruction for Nashville:

“ This type of program [deconstruction] is not suitable for the Nashville housing market...In some cases, removal of these abandoned buildings is beneficial to the community. This approach is also valid in cities such as Baltimore, where the major housing problem is the decay of 40,000 vacant units to the extent that they pose a health hazard to neighborhood residents...

The housing needs in Nashville are starkly different. The issue in Davidson County is a tight housing market in which the shortage of affordable housing units of all kinds prevents residents from becoming homeowners and has resulted in a severe housing cost burden for low- and moderate- income households...Nashville does not need to demolish older homes and cannibalize their historic components. Existing affordable housing units must be preserved for Nashville families...

...Demolition of any kind, including deconstruction, is not mentioned in these [Nashville-Davidson County] Planning Department documents as a way to address Nashville’s housing affordability problems. Indeed the General Plan states that ‘Demolition of housing should be seen as a last resort, when rehabilitation is wholly unfeasible.’¹²

The Milwaukee public sector was the most involved in deconstruction-related activities for economic development including Section 3 and Community Development Block Grant projects. This can be attributed to the following factors:

- an abundance of abandoned and vacant housing in the city;
- a large volume of residential and commercial building structures constructed prior to 1950 that often used wood and masonry materials;
- an existing structural deconstruction market in the Milwaukee and Chicago area;
- a large and extensive housing revitalization non-profit network in Milwaukee;
- a housing policy that is supportive of a deconstruction approach to dismantling abandoned and vacant housing; and
- a local code system that is supportive of building material reuse.

Non-structural deconstruction is not as dependent on the factors listed above and was a mature market in each of the four cities investigated for this study. While Milwaukee currently supports both structural and non-structural deconstruction, a change in housing conditions and/or housing policy from dismantlement to preservation could reduce the potential for structural deconstruction.

¹²Email correspondence, Nashville-Davidson County Planning Department (September, 2000).

The most consistent source of properties for structural deconstruction is when the use of an area has been changed due to major publicly supported development or redevelopment. An example of an area affected by major public redevelopment would be road expansion into a residential neighborhood. Any buildings in an area slated for road expansion need to be dismantled. These properties can be prime candidates for deconstruction. In addition, materials recovered from these properties can be reused in areas of the city where housing is preserved for historical or community reasons. Community programs that are aimed at revitalizing existing housing can incorporate the use of deconstructed materials in their efforts. An approach that utilizes deconstruction-related activities will serve as a source of recovered materials for existing or historic districts.

Public projects that do not involve redevelopment provide more time for deconstruction activities. Habitat for Humanity, International, a national non-profit organization, is focusing their deconstruction efforts on publicly owned buildings where traditional redevelopment time constraints can be avoided. Military bases often prove to be good candidates for this approach due to:

- a large supply of buildings that can be deconstructed;
- the potential value and volume of material to be recovered;
- a public agency supported capacity to extend construction schedules in areas that do not have a redevelopment concern; and
- large open areas suited for staging materials and equipment.

The Fort Ord deconstruction program implemented through the Fort Ord Reuse Authority provides a good example of how deconstruction can promote economic development through entry level jobs and training. It is estimated that Fort Ord deconstruction efforts will create the largest single market for construction/building materials in the Monterey, California area for the next twenty years.¹³

In general, structural deconstruction was found to be more feasible when it is incorporated as a part of a military base dismantlement project, and less feasible in a metropolitan location. Redevelopment pressures are generally greater within a metropolitan area. The consistency and volume of building materials within a metropolitan area that could be recovered through deconstruction are more inconsistent than those found on a large military base dismantlement project due to greater variation in the history of construction. Military bases usually have large volumes of similarly constructed buildings. Housing conditions and policy have a major impact on deconstruction within a metropolitan area whereas these issues have a lesser impact on military base deconstruction efforts. Military base deconstruction projects have a greater capacity for structural deconstruction than their metropolitan area deconstruction counterparts.

¹³Fort Ord Reuse Authority Pilot Deconstruction Report (FORA, 1997).

Findings from the Four Cities

- The Milwaukee Department of Housing and Urban Development has nominated the Harambee Ombudsman Project, Inc., a community block development grantee, for a best practice award for their support of a microenterprise deconstruction contractor (REEHouse, Inc.).
- Miami-Dade Public Housing Authority subcontracts to a property management firm that routinely stores salvage material for replacement parts a part of their property maintenance duties.
- In Nashville, one non-profit UBMRO receives recovered building materials from donations for resale. This UBMRO also reconditions appliances with labor provided by the local community service system.
- El Paso Housing Authority routinely inventories excess water heaters and appliances that are scheduled for removal. These materials are then collected and auctioned off every month. Furnaces are not auctioned due to liability concerns.

Major Issues

The following issues were found to have an influence on the feasibility of deconstruction in the cities researched for this report:

- project time constraints;
- housing preservation;
- lead-based paint;
- asbestos-containing materials;
- market perception of used building materials;
- code issues;
- used building material markets and the Internet;
- export markets; and
- alternative applications for used building materials.

Project Time Constraints

The vast majority of demolition and deconstruction contractors surveyed for this report stated that time was the primary limitation on deconstruction activity and the most influential factor on reducing the amount of material recovered from buildings. Since deconstruction is a labor-intensive approach that requires a longer time frame than mechanical demolition, time constraints create a severe limitation on deconstruction-related activities. One deconstruction contractor in Milwaukee stated that, sometimes, 16 to 24 hour workdays were necessary to recover architectural antiques and other salvage materials out of buildings prior to demolition.

Project time constraints create a priority system for deconstruction agents in the type and volume of material recovered from a building. Table 2 describes this prioritization process. Shaded rows describe what materials will be removed within the time constraints of the project schedule.

Table 2. Relationship between Deconstruction Type, Project Schedule Description, and Priority of Material Recovery

Deconstruction Type	Tight Project Schedule	Moderate Project Schedule	Soft Project Schedule
Non-structural	High-End Materials	High-End Materials	High-End Materials
Non-structural		Low-End Materials	Low-End Materials
Structural		High-End Materials	High-End Materials
Structural			Low-End Materials

Interest-bearing loans reward projects that have reduced timeframes and penalize projects with longer timeframes. These financing mechanisms serve as an obstacle to deconstruction activity for both private and public projects. In discussions with demolition contractors, it was found that commercial projects were more likely to have time constraints associated with financing than residential projects. However, a more consistent stream of material is provided by larger commercial or residential projects that are likely to be financed with interest-bearing loans.

Many organizations focus deconstruction efforts on publicly owned buildings where traditional redevelopment time constraints do not apply.¹⁴ Military bases are good candidates for this type of approach due to the large supply of buildings that can be deconstructed, the potential value and volume of the material to be recovered, and the capacity to extend construction schedules in areas that do not have a redevelopment concern.

Housing Preservation

Metropolitan areas are often concerned with preservation of the existing housing stock. Deterioration of metropolitan properties can affect the deconstruction market in two ways. First, severely deteriorated housing can create an unsafe environment for deconstruction due to the danger of structural collapse. Second, houses that are not severely deteriorated are potential candidates for revitalization rather than removal.

Structural deconstruction relies heavily on the local building stock that is slated for dismantlement. Housing preservation policies and initiatives directly impact the feasibility of structural deconstruction. Housing preservation policies impact non-structural deconstruction less than structural deconstruction. Non-structural

¹⁴Habitat for Humanity International, a national housing non-profit organization, is currently performing several large-scale deconstruction demonstration projects focused on military properties. In addition, Habitat ReStores sell used building materials to provide financial assistance for their affordable housing mission.

deconstruction can increase as a part of the construction activity that preservation policy and initiatives may provide through rehabilitation or renovation programs.

The concern for housing preservation is closely linked to the need for affordable housing. Availability of housing is a key issue since any movement to preserve the existing housing in our nation's cities will have an effect on the supply and sustainability of houses available for deconstruction. Housing officials cited a lack of affordable housing as a significant problem in the majority of the four cities. In response to this issue, housing policy initiatives varied between removing properties to create "green spaces" or new development, and/or preserving and revitalizing the existing housing stock.

A common goal of many metropolitan housing policy initiatives is the revitalization of existing housing stock to create more affordable housing. Revitalization projects commonly center on inner city neighborhoods with older housing that has deteriorated. Inner city housing, often constructed prior to 1950, usually fits the necessary criteria for successful deconstruction projects. These houses commonly contain little or no engineered wood products and composite materials that are often difficult to disassemble and have low salvage value.¹⁵

The issue of affordable housing can directly influence the supply of buildings for structural deconstruction either positively or negatively depending on local housing policy initiatives and the condition of the local building stock. The relationship between affordable housing policy and the issue of housing preservation varies greatly, depending on local conditions. The following discussion describes how housing preservation and affordable housing policy initiatives affect the deconstruction market in each of the four cities.

Miami

Although affordable housing is central to the City of Miami's needs and demolition is expected to increase, other factors create a hostile environment for successful deconstruction. According to the 2000 City of Miami Consolidated Plan, the housing development strategy for the City of Miami aims to increase affordable housing through the implementation of new infill housing initiatives in distressed neighborhoods. Miami Neighborhood Enhancement Teams, who generally seek to demolish and remove properties within a year after a complaint has been filed, target vacant residential properties for removal. One demolition contractor predicted that demolition activity would increase prior to the next wave of infill construction because of geographic limitations on the expansion of the Miami area. However, structural deconstruction activity in Miami is very limited due to the predominant use of concrete block system construction and extensive problems with termite damage. Non-structural deconstruction is a common and informal market providing high-end and low-end materials to the local area and international markets.

¹⁵*Deconstruction – Building Disassembly and Material Salvage: The Riverdale Case Study*, (NAHB Research Center, 1997).

El Paso

Two major concerns in El Paso are overcrowded housing conditions and a large amount of substandard housing. Much of the older housing stock is in need of rehabilitation to bring it into compliance with building codes and to make it accessible for persons with disabilities. El Paso has experienced dramatic growth in the housing construction industry, but only a small percentage has been directed toward low-income households.¹⁶

During the period of 1995 to 1999, the city of El Paso, through various grants and other funding, rehabilitated 510 single-family homes and 542 rental housing units (mostly multi-family housing). During the same five-year period however, only 46 single-family homes and four duplexes were demolished.¹⁷ These figures indicate that there is a limited supply of housing for deconstruction activities in El Paso.

In El Paso there is a positive perception of the reuse of building material among contractors and individual consumers. Code officials have a negative perception of building material reuse due to the construction of substandard housing, called “colonias” with recovered and surplus building materials. However, these negative perceptions have a limited influence on the overall feasibility of structural deconstruction in El Paso where the primary factor is lack of supply. In addition, historic preservation and revitalization efforts limit the supply of buildings for structural deconstruction. Non-structural deconstruction is very active in El Paso and provides materials for local renovation and rehabilitation efforts and the Mexican export market.

Milwaukee

Currently, the importance of affordable housing to the City of Milwaukee is a synergistic factor in supporting local deconstruction efforts. Affordable housing is a major priority for the Community Planning Division of the Wisconsin HUD Office in Milwaukee. There are a large number of abandoned properties in Milwaukee, of which the majority are wood-framed Victorian structures. Housing policy initiatives in Milwaukee have focused on a combination of removal and rehabilitation.¹⁸ Housing initiatives comprise the largest block of funding for Community Block Development Grants administered in Milwaukee. Deconstruction is viewed positively by community development organizations, private industry and local government. There is an active used building material market in and around the Milwaukee area including several private building salvage operations. In Milwaukee, affordable housing and deconstruction initiatives coexist and complement each other as recovered materials are reused in revitalization projects.

¹⁶Consolidated Plan for the City of El Paso, Texas 2000-2005, June, 2000, City of El Paso Community and Human Development.

¹⁷Consolidated Plan for the City of El Paso.

¹⁸Milwaukee has a large number of Polish flats and German duplexes that, when rehabilitated can provide affordable housing (FieldWorks, July 2000). However, these properties, when abandoned, are currently being removed through demolition. Many of these properties are in fair condition and are good candidates for deconstruction. Moreover, they may also be good candidates for rehabilitation if current housing goals change.

Nashville

The City of Nashville is promoting preservation rather than demolition in its affordable housing efforts. The City of Nashville seeks to preserve the existing housing stock and increase affordable housing in the area. According to a Nashville housing market analysis there are a small number of dilapidated properties in Nashville.¹⁹ Rehabilitation of owner-occupied properties is the top priority and demolition of existing structures is seen as a last resort. As a consequence, promoting structural deconstruction is not seen as a viable option for the city's housing situation.²⁰ Regardless of the current preservation policies of the city, some deconstruction-related activities, mainly non-structural, were incorporated as a component of renovation in Nashville. Some renovation contractors in Nashville sought out recovered materials for reuse in historical preservation work.

Lead-based Paint

Toxic effects of elevated levels of lead in the blood system affect nearly 1 million children nationwide. The cause of lead poisoning is attributed to different factors, including deteriorating lead-based paint in housing and lead-contaminated soil. In 1999, the American Housing Survey estimated that there are 24 million housing units at risk of lead-paint hazards, with the majority of these occupied by low-income families.²¹

The presence of lead-based paint in older property negatively affects the feasibility of both structural and non-structural deconstruction through increased investments in worker safety, increased project time for paint removal, and a decreased supply of recoverable materials.²² Disposal of materials contaminated with lead-based paint is a more cost-effective approach with regard to deconstruction activities than paint removal. Each of the cities visited for this report contains residential housing built prior to 1978 that is at risk for containing lead-based paint. Table 3 describes the percentage of housing units in each city that are estimated to contain lead-based paint.

Table 3. Percentage of Units Presumed to Contain Lead-Based Paint

Miami	El Paso	Milwaukee	Nashville
33%	40%	77%	33%

Lead-based paint can negatively affect the reuse of building materials coated with the toxic substance. Currently, Consumer Product Safety Commission (CPSC) regulations define lead-based paint as paint that contains more than 0.06 percent lead. Lead-based paint was often used on exterior applications and is commonly found on older windows and doors. Lead-based paint was also commonly used for interior applications on housing constructed prior to 1950. The CPSC bans the resale of lead-containing paint, lead-paint

¹⁹Nashville Housing Market Analysis, (February 2000).

²⁰Memorandum from Nashville-Davidson County Metropolitan Planning Department (September 2000).

²¹President's Task Force on Environmental Health Risks and Safety Risks to Children (February 2000).

²²For more complete discussion on the impact of lead-based paint on deconstruction activities see *Deconstruction – Building Disassembly and Material Salvage: The Riverdale Case Study*, Appendix B, (NAHB Research Center, 1997).

covered materials intended for use by children, and furniture items that contain lead paint. Furthermore, the CPSC urges manufacturers to eliminate lead in consumer products to avoid the risk of lead poisoning. The Department of Housing and Urban Development Office of Lead Hazard Control states that as a ground rule, materials coated with lead-based paint should not be reused. In principle, recovered building material can be stripped of lead-based paint before the material is placed on the market, but this is seldom practical.

One major federal government priority is the national reduction of lead-based paint hazards. This reduction is being targeted through the training of thousands of workers who perform rehabilitation, renovation, remodeling and maintenance operations in lead-safe work practices.²³ Through this program, it is estimated that 5.6 million housing units will have reduced lead paint hazards through substantial renovation or demolition. Deconstruction can be used to recover materials that are not contaminated with lead-based paint as a component of housing revitalization initiatives. These recovered materials can be reused in the revitalization of additional properties. In Milwaukee, local HUD officials expressed great interest in incorporating deconstruction or used building material reuse as part of a lead-paint hazard control strategy.

Asbestos-Containing Material

Asbestos-containing material (ACM) is presumed to be in buildings constructed prior to 1981. ACMs are more likely to be disturbed through structural deconstruction than non-structural deconstruction. Environmental remediation regulations and their associated compliance costs are the same for mechanical demolition and manual deconstruction efforts.

The exposure of workers to asbestos in the workplace is regulated by the Occupational Safety and Health Administration (OSHA 29 CFR 1926.1101). Response actions to the presence of asbestos can range from avoiding contact to complete abatement of the hazard. Any disturbance of ACM (with isolated exceptions) involves respiratory and personal protective equipment for the workers combined with routine exposure monitoring and increased disposal costs.

In addition to OSHA requirements, the U.S. Environmental Protection Agency requires the identification of ACM prior to renovation and demolition work. This agency also lists specific ACM waste disposal requirements under the National Emission Standard for Hazardous Air Pollutants (40 CFR Part 61). Table 4 describes activities related to asbestos-containing materials and deconstruction work.

²³President's Task Force on Environmental Health Risks and Safety Risks to Children (February 2000).

Table 4. Asbestos Activities Related to Deconstruction Work

	Areas of Contact	Identification Process	Worker Training	Response Actions	Investment
Non-Structural	Walls Floors Ceilings Mechanical Electrical Appliances Finishing	Accredited inspector collecting samples or presuming the presence of asbestos	2-HR Asbestos Awareness OSHA Class IV training	Avoid contact	Low cost (training and inspection only)
Structural	Walls Floors Ceilings Mechanical Electrical Appliances Roofing Finishing	Accredited inspector collecting samples or presuming the presence of asbestos	16-HR OSHA Class III training	Small-scale disturbance <25 ft ²	Moderate cost
			32-40HR OSHA Class I-II training	Abatement	Significant cost

The vertical integration of asbestos abatement services was commonly found with demolition contractors interviewed for this report. Building salvage operations often occurred either prior to or immediately after asbestos abatement. Demolition contractors maintained an understanding that the subcontractor should not disturb ACM during building material recovery activities. Asbestos contamination as a result of improper building salvage operations was not described by any of the industry participants interviewed for this report. In general, more concern was raised over lead-based paint than asbestos. One reason for the concern may be that asbestos is a more mature industry that has been a part of the construction industry for several decades, whereas lead-based paint is an evolving issue. In addition, enforcement of asbestos regulations is more common on commercial projects than on residential projects.

The use of manual methods to remove building materials in properties constructed prior to 1981 can serve as a “double-edged sword” with regards to asbestos-containing materials. Deconstruction efforts, on one hand, often can involve a thorough building inspection that may uncover previously missed ACM that reduces the potential for worker exposure. On the other hand, manual deconstruction efforts can bring workers in closer proximity to ACM than conventional mechanical demolition methods. In either case, a thorough asbestos inspection involving invasive sampling should be performed prior to either deconstruction or demolition.

Market Perception of Used Building Materials

Consumer perception of used building materials has a strong influence on the feasibility of deconstruction. These perceptions are influenced by local conditions. The following discussion on market perception of used material recovery and reuse, based on interviews and discussions with a broad range of deconstruction industry participants, covers:

- negative perception of recovery and reuse; and
- positive perception of recovery and reuse.

Negative Perception of Recovery and Reuse

Contractors view the recovery of building materials negatively for the following reasons:

- *expense* - too expensive due to labor costs, transportation, and storage issues;
- *economy of scale* - not cost effective for demolition contractors unless there is a large quantity of material that can be resold;
- *market* - inconsistent resale market for materials;
- *safety and environmental concerns* - handling material manually may increase company worker compensation rates and liability; and
- *competition* - demolition contractors and salvage businesses compete over project time and the revenue generated from material salvage.

A fundamental problem with building material reuse raised by many contractors is that customers do not want used material in new buildings. Other common problems concerning building material reuse include:

- *dimension problems* - rehabilitating a house may require finding the right cabinet to fit existing walls. Locating reused materials that fit into an existing space may be more difficult than purchasing a new product;
- *inconsistency in supply* - building new houses with used materials requires customization, which results in extra costs due to the varying dimensions and characteristics of used materials;
- *time and cost* - matching cabinets, doors, or other materials requires extra time and labor. This is impractical for low-income housing projects;
- *appearance* - lack of matching colors and decors will lead to a lower perception of the home's value; and
- *code acceptance* - not feasible due to strict code requirements.²⁴

Positive Perception of Recovery and Reuse

Construction industry participants view the recovery of building materials for reuse as beneficial for the following reasons:

- *profit* - recovery can allow the contractor to either win a job and/or maximize profit;
- *lower disposal costs* - building salvage lowers overall disposal cost;
- *competency* - several demolition firms viewed their high recovery rates as demonstrating their professionalism with regard to the competition; and

²⁴This was especially true in Miami due to hurricane codes.

- *environmental responsibility* - several demolition contractors stated that, given the financial opportunity to make a choice, they would increase their recycling and recovery efforts.
- *lower cost for replacement materials* - property management companies incorporate reuse programs to save costs;
- *dimension and appearance* - renovation and remodeling contractors often replace doors and windows due to the ability to match sizes and appearance with the existing structure. “Aged” appearance can create value especially with the used wood flooring and used brick market;
- *low cost for renovation* - in El Paso, one remodeling contractor described the residential market as having the view that “cheaper is better”;
- *exclusivity* - high-end customers of architectural antiques seek materials that are unique, with a historical value that cannot be replicated; and
- *environmental benefits* - one timberwright in Wisconsin exemplifies the idea of sustainable reuse in his construction practice by using only recovered wood and creating zero wood waste on the jobsite.

Code Approval

The impact of building codes on material reuse depends on how local building codes regulate used materials. The following table lists the code requirements for each of the four cities.

Table 5. Building/Dwelling Codes

	Miami	El Paso	Milwaukee	Nashville
Code Model	South Florida Building Code, Dade County Edition	SBC 1994	Wisconsin Administrative Code, Chapters 50-64	SBC 1997 (Nashville Code of Laws, Title 16)

In El Paso, building officials are attempting to address problems with substandard housing and, accordingly, code officials do not endorse building material reuse.²⁵ In Milwaukee, local code officials are supportive of the reuse of recovered building materials provided that conventional residential construction framing methods are employed.²⁶ In general, there is confusion in the construction industry over the correct usage of recovered building materials for structural purposes. There is a need for clearer guidance on a local and regional level on how used building materials can be successfully integrated into renovation and new construction for structural purposes.

One major obstacle to reusing recovered wood materials is inaccurate or nonexistent grading of the reclaimed lumber. Currently, the USDA/FS - Forest Products Laboratory is in the process of developing a grade stamp certification specific to reclaimed lumber.²⁷

²⁵Interview with El Paso Building Codes Department.

²⁶Interview with City of Milwaukee, Department of Neighborhood Services.

²⁷Phone conversation with Bob Falk, USDA/FS - Forest Products Laboratory.

Preliminary testing results indicate that recovered wood materials have their grade reduced by one. Damage to smaller dimension lumber is greater than larger timbers. Once completed, this certification could then be adopted on a national level, removing a potential obstacle to building material reuse.

Used Building Material Markets and the Internet

The Internet has created an additional medium to obtain and sell used building materials. Interviews with UBMROs and deconstruction agents revealed that the majority of deconstruction-related businesses either have Internet access or are planning on Internet access in the near future. However, most UBMROs interviewed in the four cities reported that Internet sales currently accounted for less than 10% of their sales. The hands-on nature of the reuse industry may serve as a constraint to purchases on-line. Internet sales have the potential to change existing market relationships by allowing end users to purchase materials at reduced prices from sources other than their traditional supplier. This impact from the Internet may be limited due to shipping and transportation costs, and a current reliance on existing relationships to provide a consistent quality and volume of material.

In general, high-end materials are more likely to sell over the Internet due to their unique characteristics or quality. The intense demand for high-end materials, such as wood timbers, is increased due to an Internet-based national and international market for these materials as opposed to the pre-Internet demand that was limited to a local or regional level. The increased capacity for marketing and networking that the Internet provides creates an incentive for non-structural and structural deconstruction activities to fulfill the increasing demand for rare high-end materials.

Low-end materials are more likely to be purchased locally for property maintenance or renovation projects. Low-end materials may not benefit at this stage from the Internet due to shipping and handling costs that can be avoided by using a local supplier. If the demand for these materials begins to outgrow the local and regional market, there may be an increased potential for larger regional UBMROs to meet this demand.

Export Markets

Export markets in border and port cities create an additional market for the sale of used building material and for the diversion of waste from landfills. Non-profit organizations have shipped donated used building materials to other countries for disaster relief efforts and rebuilding projects.²⁸ Small businesses that process and resell recovered materials could help support economic development in metropolitan areas. Export markets provide a large consumer base for both high-end and low-end structural and non-structural materials.

²⁸One example of this is the ReBuilding Center in Portland, Oregon, a deconstruction non-profit, that has partnered with another charitable organization, Mercy Corps, to ship donated used building materials to assist in international development efforts.

Export markets have their own obstacles including high import tariffs and trade agreement limitations. In addition, environmental contamination issues may eventually threaten the informal trade in used building materials, especially if the materials present a health hazard abroad. These obstacles are currently seen to have a minor impact on the flow of used materials across the border. An increasing impediment to the used building material trade is the growing international presence of large U.S. retail hardware stores in Mexico. One deconstruction participant who was familiar with the cross-border used building material market stated that low retail prices for new materials were beginning to reduce the demand for used building materials in Mexico.

Export of used building materials is a strong market in the Miami area, and exporters were identified as being a major customer base. Several used building material markets sell approximately half of their material to exporters from Central American and Caribbean countries. One exporter to Belize sends a truck to purchase materials from one used building material retail operation on a monthly basis. Another exporter to the Dominican Republic sends a truck to the same retail operation six times per year. Top selling items include windows, doors, iron bars, awnings, shutters, cabinets, toilets, and sinks.

In El Paso, local government officials embraced the idea of creating a national recovery and recycling industry where used building materials could be processed and distributed to national and international markets. One city planner expressed hopes of increasing economic development in El Paso via the development of a used building material processing industry. El Paso, originally built as a railroad town, is a major rail transportation hub. It is conceivable that rail and truck could be used to transport large volumes of materials to El Paso. In turn, these materials could be processed into housing, components, furniture, or recycled into composites. Private business interests and incentives from city, state, and federal governments could create favorable conditions to promote this scenario.

Alternative Applications for Used Building Materials

Furniture, art, and other materials can be created from recovered materials, thereby creating new jobs and business opportunities. In El Paso, several companies create furniture out of recovered wood. All types and sizes of used wood can serve as feedstock for the construction of furniture including studs ranging in size from 2" x 4" through 2" x 12". Material, with or without nails, is purchased directly from demolition sites. One company posted gross revenues of approximately \$1,000,000 last year from the manufacture of furniture made from used wood.

CONCLUSIONS

The feasibility of deconstruction as an economic development vehicle depends on the type of deconstruction activity performed and the market for recovered materials. Materials recovered through deconstruction support either high-end or low-end used building material markets. In this report, two different types of deconstruction activity were identified: non-structural and structural.

Non-structural deconstruction activities and accompanying high-end and low-end used building material markets were found in each of the cities surveyed for this report. Structural deconstruction activities were found to a lesser degree in the four cities. The structural deconstruction activity that did occur usually supported the high-end used building material market for recovered brick and timbers. Milwaukee was the only city in the study where structural deconstruction activity supported both high-end and low-end used building material markets.

Non-structural deconstruction was found to be a mature industry with consistent used building material markets in multiple regions across the United States. Non-structural deconstruction can be considered a feasible approach for increasing economic development within metropolitan areas. Non-structural deconstruction supports small business UBMROs, many of which are located in or near underprivileged communities. A diverse group of construction industry participants were found to perform non-structural deconstruction activities, including building maintenance, renovation, and demolition contractors.

Structural deconstruction can be described as an emerging market. The feasibility of structural deconstruction as an economic development approach depends on local and regional conditions. Housing preservation policy, environmental contamination, code issues and project time constraints have a major impact on the feasibility of structural deconstruction. Structural deconstruction is highly dependent on the demolition market. Markets for structural used materials existed for rare, high quality brick and timbers, and were found to be consistent. Structural deconstruction is heavily reliant on public sector funding when used as an economic development vehicle. As a result, the number of metropolitan areas that would benefit from structural deconstruction economic development programs is limited. The best candidates for structural deconstruction initiatives are metropolitan areas with a surplus of abandoned properties, many of which were constructed prior to 1950.

It is difficult to predict the future growth of the deconstruction industry. The feasibility of the deconstruction market is not necessarily dependent only on a local supply of used materials, but rather on the demand and economy of the region. As the demand for used building materials increases, especially for low-end materials, the future development of deconstruction may become stronger. If the demand for low-end materials remains at a small-scale local level, then the opportunity for market growth remains limited. In the short-term, communities with a large number of vacant, deteriorated properties or strong reuse markets can continue to utilize some level of deconstruction activity.

Deconstruction and used building material markets can provide both economic and environmental benefits. Environmental benefits include the reduction of construction and demolition waste that is sent to landfills. Economic benefits could include employment opportunities, workforce development training, building material affordability and small business development in economically depressed areas. Public sector involvement in deconstruction is focused on increasing the economic development or environmental

benefits to this approach. In the four cities surveyed for this report, it was found that public sector involvement to increase the economic development benefits of deconstruction was limited. Milwaukee was the only city with public sector initiatives supporting both structural and non-structural deconstruction activities.

The feasibility of deconstruction is increased when it is utilized as a component of established economic development programs. Many inner city neighborhoods could benefit from the incorporation of deconstruction activity in renovation, remodeling and demolition as a component of an overall revitalization strategy. The vertical integration of deconstruction into construction-related workforce development programs such as *Step-Up*, *Fresh Start* and *YouthBuild* can teach basic construction skills as a precursor to more advanced training in the construction trades and will provide environmental benefits to the local community.

The use of relevant deconstruction programs with HUD Section 3 or Community Development Block Grants could increase the supply of materials and labor to support small UBMROs and other used building material enterprises. These small businesses would support an overall economic development program through micro-enterprise creation and increased employment opportunities in disadvantaged communities. In addition, revitalization efforts that incorporate deconstruction will benefit from an increased emphasis on environmental stewardship and historic preservation practices.

RECOMMENDED ACTIONS

As demonstrated in this report, the feasibility of deconstruction within a metropolitan community is dependent on the involvement of both the public and private sector. The following actions may be useful for both public and private sector entities to further the development of deconstruction as a vehicle for economic development.

Local Metropolitan Government

- Consider creating a list of both private and non-profit UBMROs and building material reuse outlets in the metropolitan area. This list could be posted on a publicly available website. Contractors and non-profit organizations could be encouraged to support these businesses.
- Consider the development of local resource recovery parks. These are business parks where companies and organizations involved in building material reuse and deconstruction-related activities can receive tax or other financial incentives. In El Paso, city government officials were interested in developing an area that would utilize the local rail system to serve a used building material processing and distribution center for both national and international markets. Businesses and organizations specializing in the reuse of used building materials in furniture, panelized/manufactured housing systems, arts and crafts and other alternative uses could benefit from the establishment of a resource recovery park.

- Encourage local construction-related training programs focusing on renovation, building maintenance and demolition to incorporate applicable non-structural and structural deconstruction techniques.
- Identify neighborhoods that will be undergoing large-scale redevelopment including revitalization and road expansion projects. Consider developing incentives to facilitate deconstruction-related activities on these projects including:
 - ◆ Developing contract bids that provide additional time for non-structural and structural deconstruction. Provide contractors with a list of UBMROs and other reuse outlets where recovered building material can be sent.
 - ◆ Create bidding requirements that award bonus points for contractors who use non-structural and structural deconstruction techniques to recover materials.
 - ◆ Award additional points for contractors who use trainees enrolled in established construction training programs that incorporate deconstruction.
- Consider providing public sector funding to assist the development of construction training programs that incorporate deconstruction (including training grants for labor unions that incorporate deconstruction as a component of related pre-apprenticeship and/or apprenticeship programs).
- Consider providing public sector funding to assist the development of UBMROs and other reuse outlets.
- Consider incentives to encourage demolition and renovation contractors to use non-structural and structural deconstruction. One example of an incentive would be to revise local demolition permit procedures to increase the time allowed for deconstruction-related activities.

State Government

- Consider expanding statewide recycling and reuse associations to increase the awareness of non-structural and structural deconstruction techniques. Deconstruction activity could be promoted through the use of conferences and Internet web sites that advertise organizations and businesses involved in building material recovery and reuse.
- Identify metropolitan areas that are good candidates for deconstruction-related economic development initiatives such as resource recovery parks or large public redevelopment programs that could benefit from associated deconstruction-related activity. Identify military base closures that are good candidates for both structural and non-structural deconstruction and encourage the use of contracts that will reward deconstruction activity.
- Consider creating financial incentives to reduce the costs of transporting of construction and demolition waste to businesses that will reuse recovered building material. Identify and eliminate regulatory obstacles to the processing and reuse of construction and demolition debris that are unnecessary and do not affect public safety.

- Consider expanding tax deductions for the private sector recovery of used building materials. Currently, non-profit charitable organizations can provide tax deductions to businesses or property owners who donate used building materials. Similar incentives could be created for private UBMRO business to encourage their development.

Federal Government

- Consider methods to expand the number of construction-related training programs that incorporate deconstruction. Training grants could be awarded to national labor unions that incorporate deconstruction as a component of related apprenticeship programs.
- Consider funding the development and dissemination of guidance documents on how to incorporate deconstruction in renovation/remodeling and building maintenance.
- Consider updating HUD Section 3 materials to include information on how deconstruction could be incorporated as waste reduction technique in related construction trades. Government matching funding could increase the public awareness of deconstruction and the local recovery and reuse programs via web sites such as www.earths911.org.
- Consider the provision of grant funds to support the integration of deconstruction into existing construction-training programs administered by existing non-profit organizations or local government agencies. Established construction training could include programs on environmental remediation, new construction, and renovation including, but not limited to: *Community Service Corps*, *Youthbuild*, *Habitat for Humanity*, and *Step-Up*.
- Incorporate financial incentives into federal redevelopment programs such as *HOPE VI*, *Home Investment Partnership Program*, *Empowerment Zones*, and *Enterprise Communities*. Grant funding can also use this bonus point system to create incentives for non-profit and local government agencies that incorporate deconstruction-related activities or building material reuse into proposals. Programs that could incorporate this approach include *Community Block Development Grants*, *Self-Help Homeownership Opportunity Program Grants*, and *Homeownership Zones Initiative*.
- In areas that are suitable for both structural or non-structural deconstruction, consider promoting deconstruction activity through financial incentives. Deconstruction candidates may increase economic development in these metropolitan areas through job creation and enhanced employment training. There are several incentives for deconstruction-related activities that could be created for Federal contracts and grants. Contract bids could award bonus points for proposals that incorporate deconstruction. Financial incentives could be provided to businesses that develop alternative uses for recovered materials, especially low-end structural materials such as wood.
- The EPA's "Buy-Recycled" program could be expanded to include recovered building materials for reuse. Under an expanded program, the Government Purchasing Office would consider the purchase of used materials or items that

contain recovered residential or commercial building materials. Small businesses specializing in this market could benefit from this deconstruction-related economic development due to increased demand.

- Deconstruction incentives could be incorporated into new programs and initiatives as described in the Department of Housing and Urban Development annual budget request. These programs can reduce waste costs by reusing materials and, additionally, provide enhanced construction-related training. A time and material component could be incorporated in government contract language to assist the hiring of deconstruction trainees by private sector employers. Critical areas may be identified for training subsidies, including liability insurance, wages, and transportation.
- Promote building codes that incorporate building material reuse. The development of building codes that incorporate building material reuse may assist the feasibility of deconstruction for use as an economic development vehicle. Federal and local government initiatives could work to address code issues by incorporating language into current regulations that specifically address “used building materials” and their re-use in new construction, remodeling, and manufactured housing. Clear guidelines for the re-use of all construction materials including mechanical equipment and appliances could be established.

Private Sector

- Consider methods to utilize deconstruction activities in demolition, renovation and building maintenance to reduce waste disposal costs. Support local UBMROs and waste recycling businesses.
- Investigate methods of educating building owners, general contractors, and others on the benefits of deconstruction and building material reuse. Consider joining recycling and reuse associations to learn about and promote deconstruction.
- Encourage financial incentives and regulations that could make deconstruction activities a feasible alternative to landfilling building materials.
- Explore new alternatives to building material reuse and support businesses that create value out of recovered materials.
- Consider employing trainees and others who are familiar with building material reuse.
- Consider methods to design and construct buildings using recovered materials and recycled products.

Topics for Additional Research

This report raised many unanswered questions associated with the deconstruction industry. Further research may be necessary to specifically address those areas that are beyond the scope of this report. Recommended actions could include:

- Developing a better understanding and definition of tax credits and the role they play in providing an incentive or disincentive for incorporating deconstruction

into redevelopment programs for public and private entities. A comprehensive resource listing of all available incentives and grants applicable to deconstruction could be developed. This guide may include instructions and guidelines on how to apply and incorporate tax credits to assist local deconstruction efforts.

- Developing a better understanding of the economic markets for specific materials and types, and the emergence of these markets in specific areas of the U.S. or internationally.
- Performing an economic and financial feasibility study on a large scale recycling and reuse industry, such as the resource recovery park scenario conceived for the El Paso, Texas area.
- Developing a comprehensive metropolitan deconstruction feasibility model. A separate research project could be performed to further develop a metropolitan deconstruction feasibility model based on findings from this study and associated industry research. The model could be used to further the development of deconstruction industry cost estimation software.

APPENDIX A: TERMINOLOGY

The following terms are defined to provide a better understanding of the report.²⁹

- Asbestos:** Chrysotile, amosite, crocidolite, tremolite asbestos, anthophyllite asbestos, actinolite asbestos, and any of these minerals that have been chemically treated and/or altered. Under OSHA 29 CFR 1926.1101, “asbestos” includes presumed asbestos-containing material (PACM).
- Deconstruction:** Manual dismantling of a building for the purpose of building material recovery. Deconstruction can include non-structural and structural recovery of building materials.³⁰
- Demolition:** The removal of existing structures and utilities as required to clear the construction site. The removal of the facilities proposed for destruction in the justification for the new construction. Demolition can include mechanical and manual methods.
- Lead-based Paint:** Paint or other surface coatings that contain lead equal to or in excess of 1.0 mg/cm² or more than 0.5% by weight.
- Recovery** The diversion of building materials from the waste stream for either reuse or recycling.
- Recycling:** The result of a series of activities by which materials that would become or otherwise remain waste are diverted from the solid waste stream by collection, separation, and processing and are used as raw materials in the manufacture of goods sold or distributed in commerce or the reuse of such materials as substitutes for goods made of virgin materials.
- Reuse:** The use of a product more than once in its same form for the same purpose.

²⁹These definitions are based on the information provided in *Concepts for Reuse and Recycling of Construction and Demolition Waste* (USA CERL Technical Report 97/58, 1999).

³⁰In the research for this study, it was found that the definitions for **building salvage** and **deconstruction** were dependent on the region and industry affiliation of the participants involved in dismantling buildings to recover materials. Different deconstruction industry participants, including private sector contractors and non-profit organizations, have attempted to define a distinction between these two terms. These terms have been used to describe a perceived difference between conventional building salvage that takes place prior to mechanical demolition and non-conventional manual deconstruction. In conversations with industry participants, the Research Center could not identify specific distinguishing characteristics to differentiate these two terms. As a result, in this report the terms **building salvage** and **deconstruction** are used interchangeably.

APPENDIX B: PROJECT METHODOLOGY

The Research Center studied the feasibility of deconstruction on a national level using the following five steps.

Step 1: Develop Research Strategy

Resource Group

A Resource Group was created to review material and aid in the development of the study. In addition to the NAHB Research Center Project Team and HUD representatives, the following experts contributed to the project:

- Michael Krause – Green Institute, Minneapolis, MN
- Tiffany Wilmot – Wilmot & Assoc., Nashville, TN
- Russell Hawkins – Allied Demolition, Denver, CO
- Craig Collins – NAVFAC, Washington, DC
- Leo Gannon – Laborers-Employers Cooperation & Education Trust, Washington, DC
- Tracy Mumma – Center for Resourceful Building Technology, Missoula, MT
- Robin Snyder – Environmental Protection Agency, Washington, DC
- Peter Yost – Environmental Building News, Brattleboro, VT

Email Discussion List

An email discussion list was created with permission members of the Resource Group and project team. The Research Center hosted the “HUD_Decon@nahbrc.org” exchange so that all members of the list could exchange ideas, results, questions, deliverable drafts, and reports via email. This listserve was the primary communication vehicle for the project, supplemented by conference calls at key points where an interactive exchange was required.

Technical Briefing Paper

In consultation with the Resource Group and HUD, the Research Center determined that a comprehensive study on the feasibility of deconstruction should explore a complex series of topic areas including:

- demolition,
- remodeling,
- community planning,
- workforce education,
- building design and maintenance,
- public housing administration,
- labor issues,
- waste management,
- building code enforcement,
- housing finance,
- non-profit administration, and
- international trade.

A technical briefing paper was created to develop a clear strategy for performing a national study of deconstruction. The technical briefing paper was distributed to the Resource Group and their comments were incorporated into the draft. The technical briefing paper was also sent to the National Association of Demolition Contractors (NADC), the Construction Materials Recycling Association (CMRA), and the Used

Building Materials Association (UBMA) for comments and to engage these entities in the project.

The purpose of the technical briefing paper was to:

- Present a series of basic premises concerning deconstruction and demolition based on a broad review of resources and case studies from around the country. These premises were used to direct the investigation of deconstruction's feasibility in terms of HUD's policies and continuing investments in affordable housing and public housing redevelopment.
- Organize deconstruction activity into four basic elements and underlying options. This organization is useful in identifying patterns of deconstruction activity in a given area. The four main elements required for deconstruction within a particular region or locality are labor source, deconstruction business structure, used material source, and a used material market. These elements were used in the trip summary reports to provide information on deconstruction activities within each city.
- Present several methods of survey for physical property assessment in a given area. The technical briefing paper discussed several survey methods that could be used to quantitatively assess the supply of buildings that were suitable for deconstruction and the potential supply of used building materials. It was later determined that the research should be qualitative and non-statistical in nature.³¹

Step 2: Identify Representative Metropolitan Areas of Study.

The Research Center and HUD were responsible for selecting the four cities for deconstruction feasibility research. In the fall of 1999, HUD presented the NAHB Research Center with twenty-three cities as potential research candidates. These cities were classified under four regional subdivisions: Midwestern city, Border/Port city, East Coast city, and Southern city. Based on the information provided by HUD, the Research Center began a preliminary process of selecting candidates that would best meet the attributes defined in the City Selection Matrix. The primary criteria used to select the candidates were: geographic location, size of the city, economic conditions and the ability to quickly establish contacts within the local Peoria Housing Authority and building salvage market.

Comprehensive employment training program information was not used as a selection criterion because this information was difficult to obtain for each metropolitan area due to the large number of training programs and funding sources that are available. There are numerous federal education and training programs administered through each of the agencies at the state, county and local government level, which made gathering information on employment training difficult.

³¹The *District of Columbia Deconstruction Feasibility Report* (NAHB Research Center, 1999) indicated that a quantitative study of deconstruction activity would be less effective at identifying deconstruction market influences than a qualitative approach. HUD and the NAHB Research Center agreed that a qualitative approach would be used in this study.

Table B-1 provides basic information about the selected cities.³² Each of the four cities has an existing building salvage market with established relationships with one or several local demolition companies. Public housing building characteristics for all the cities include a variety of housing types, from single-family dwellings to high-rise construction.

Table B-1. Description of Selected Cities

City	Location	Size
Miami, FL	Port City	Large
El Paso, TX	Western/Border City	Small
Milwaukee, WI	Midwestern City	Medium
Nashville, TN	Southern City	Medium

The Research Center and HUD selected the recommended candidates for their diversity and ability to provide important information on the feasibility of deconstruction in various and representative locations. This information can be used for the future development of policy and initiatives.

Step 3: Develop Research Aids

The Research Center developed the following major research aids to gather and organize data:

- comprehensive task list,
- interview and discussion guides, and
- trip summary.

A comprehensive task list was developed to organize the research topics for the study. This task list was developed by the Research Center and reviewed by representatives of the Resource Group and HUD. After incorporating revisions provided by the Resource Group and HUD, the comprehensive task list was used as a primary research aid for the study.

Several interview and discussion guides were developed by the Research Center to gather information from individuals and groups that are involved in deconstruction related activities. Several questionnaires were created to gather information on:

- demolition practices,
- training providers, and
- community development practices.

A demolition practices questionnaire was created that focused on demolition industry techniques, trends, perceptions, and business profile. It was used as an interview discussion guide. A training provider questionnaire was developed to attain information

³²Unless otherwise indicated, data for this report were compiled from discussions with key participants in the selected metropolitan areas, the NAHB Home Builders Forecast (7/99), and U.S. Census Data.

from training providers about programs, student participants and experience with deconstruction. Information from community development organizations about programs, funding sources, and experience with job creation/small business development was gathered via the community development questionnaire.

A trip summary presented significant findings from each on-site visit to the cities. These summaries were posted on the listserve for review by HUD and the Resource Group. Trip summaries cite key references, contacts and observations on:

- used building material sources,
- used building material markets,
- deconstruction business structures,
- labor sources, and
- building assessments.

Step 4: Identify Information Sources.

The following methods were used to identify information sources for each city:

- utilization of Internet resources to identify potential research participants and resources,
- consultations and interviews with representatives of varying sectors that influence deconstruction activity, and
- review of relevant data concerning local deconstruction-related conditions and trends.

The Internet was used extensively to identify research participant organizations and individuals that could provide information on a wide range of deconstruction related topics. Experts in the field of building salvage, demolition, public housing, community development, job training, and deconstruction were identified at both the local and national level.

In preparation for an on-site investigation, the Research Center project team identified and reviewed relevant data sources that impact local deconstruction related conditions and trends. Relevant *American Housing Survey* and *Solid Waste Annual Management Report* data was reviewed in preparation for the on-site investigations of the four cities.

Walkthrough building assessments were arranged with research participants that had access to properties slated for demolition or under renovation. Buildings that were assessed were chosen based on their ability to serve as potential candidates for future deconstruction activities. It is important to note that many buildings that could serve as candidates for deconstruction could also serve as candidates for renovation.³³

Step 5: Perform On-Site Investigation of the Feasibility of Deconstruction.

A series of two on-site visits, each visit typically three to five days in length, were made to each city. A total of eight on-site visits were performed for the study. In addition, the

³³This method was documented in the report entitled Investigation of Deconstruction Feasibility in the District of Columbia (NAHB Research Center, 1999).

Research Center also attended a local pre-bid conference for the Turner Elementary HOPE VI project in Washington, D.C.

Prior to each on-site investigation, key deconstruction industry participants were identified and contacted. Interview subjects were selected based on their knowledge of conditions or trends that affect the feasibility of deconstruction on a local level. Interviews were conducted either in person or by telephone. Additional leads or resources were contacted, as necessary, to gain additional information. Contingency arrangements were developed in advance for meeting cancellations or other changes to the meeting schedule.

APPENDIX C: TECHNICAL BRIEFING PAPER

**Technical Briefing Paper:
Feasibility of Deconstruction**

February 2000

**NAHB Research Center, Inc.
400 Prince George's Boulevard
Upper Marlboro, MD 20774
(301) 249-4000**

Statement of Purpose

This technical briefing paper defines the research approach of the NAHB Research Center, Inc. for the *Deconstruction as an Economic Development Strategy* study. This paper presents basic premises concerning deconstruction and demolition, develops an organization of deconstruction activity, and presents survey methods for the physical assessment of property.

INTRODUCTION

Deconstruction can be strictly defined as the selective dismantlement or removal of materials from buildings for salvage and reuse. The term has, however, significantly different connotations and extended meanings for a variety of groups and interests. This white paper:

1. Presents a series of basic premises concerning deconstruction and demolition based on a broad review of resources and case studies from around the country (see the Appendix). The premises will be used to direct the investigation of deconstruction's feasibility in terms of HUD's policies and continuing investments in affordable housing and public housing redevelopment.
2. Organizes deconstruction activity into four basic elements and underlying options. This organization is useful in identifying patterns of deconstruction activity in a given area.
3. Presents several methods of survey for physical property assessment in a given area.

BASIC PREMISES

Deconstruction almost always involves less than complete building removal. Consequently, some relationship between conventional demolition techniques and deconstruction must occur.

Deconstruction techniques are effective for the dismantling of many building components; however, this process cannot effectively handle excavation, foundations, and environmental remediation issues. Demolition techniques and equipment are needed to handle final disposition of the property.

Demolition firms strive to maximize cost-effective total recovery—recycling and reuse.

Many demolition firms are highly mechanized and seek to minimize manual labor for a variety of economic factors, resulting in a predisposition towards recycling over reuse. This may result in an opportunity for increasing salvage and reuse by way of innovative contract language, public policy, or public-private labor and business initiatives.

Deconstruction can involve “soft-stripping” and/or varying levels of structural disassembly.

There are two basic types of deconstruction, Non-structural Deconstruction and Structural Deconstruction. In general, non-structural deconstruction (also known as “soft-stripping” or “high-grading”) can be accomplished with few tools, limited and typical job-site safety considerations, and in a matter of hours or days. Structural deconstruction involves a range of tools and equipment, heightened safety considerations, and a time

frame of days or weeks. Table 1.0. describes characteristics of these two deconstruction approaches.

Table 1.0 Types of Deconstruction

	DEFINITION	TYPES OF MATERIALS SALVAGED
Non-structural Deconstruction	Removal for salvage/reuse of any building components or contents that are not a part of or whose removal is not dependent on the structural integrity of the building.	<ul style="list-style-type: none"> • Finish flooring • Appliances/mechanicals • Cabinetry • Windows/doors • Trim • Fixtures/hardware
Structural Deconstruction	Structural deconstruction involves the removal for salvage/reuse of building components that are an integral part of the building or contribute to the structural integrity of the building.	<ul style="list-style-type: none"> • Framing • Structural sheathing • Exterior siding • Roof truss system • Floor truss system

Deconstruction can involve manual labor exclusively or a combination of manual and mechanical techniques.

There are successful deconstruction firms that service primarily smaller buildings, such as single-family structures, that accomplish structural deconstruction using manual labor and little to no heavy machinery. There are also successful deconstruction firms that use heavy machinery at the building site and manual labor at a remote location to accomplish large building structural disassembly.

Workers involved in deconstruction activity routinely face the same if not greater environmental and safety hazards as demolition workers.

Environmental hazards, such as asbestos-containing materials or lead-based paint, are commonly encountered on properties constructed prior to 1981. The use of traditional manual dismantling procedures can place deconstruction workers in closer proximity to

these hazards. This means that deconstruction work must often be linked more closely to environmental remediation, providing either an added business opportunity or a requirement for close coordination and scheduling with another contractor.

Labor costs, time restrictions, and construction/demolition tipping fees are the most influential factors on the feasibility of deconstruction for a given property.

Labor rates for deconstruction work vary depending on project size, location and complexity. Structural deconstruction is often more expensive than mechanical demolition methods due to increased labor costs, worker compensation rates, project timelines, and the relationship among disposal, recycling and salvage rates. Job training programs can be used to lower the cost of labor but can also extend the project timeline. Historically, deconstruction activities have occurred in properties owned or managed by public agencies, due to their greater ability to extend or alter project timelines.

The socioeconomic factors of deconstruction strongly influence the feasibility of deconstruction.

Socioeconomic factors that affect the feasibility of deconstruction within a geographic area include the rate of unemployment and residential vacancy, the vitality of the housing market, the type and magnitude of urban reinvestment initiatives, waste disposal costs and tipping fees, material transportation and storage costs, and the existing stock of abandoned properties. The combination of high unemployment and an abundance of abandoned residential property is a favorable environment for job-training deconstruction programs. In this environment, deconstruction efforts are more easily supported through lower labor costs and increased assistance from federal or local agencies.

Materials that are recovered from buildings through deconstruction activities can either be reused or recycled.

Building material recovery includes two very different possibilities: reuse and recycling. The reuse of building materials involves some level of protection and retention of the item's functional value. The recycling of building materials involves mechanical processing and reduction of components into commodity materials. The methods, products and markets for the two are entirely different.

The local market structure for salvaged building materials is often erratic, decentralized, and variable over time, making determination of its full potential difficult.

Geographic location and economic factors heavily influence the success of building salvage markets. Discussions with demolition contractors and building material salvage operations in several cities have clearly identified geographic and local economic trends affecting the building material salvage market. Proximity to borders and major ports does/will influence salvage and deconstruction feasibility.

Building salvage markets are not solely dependent on deconstruction activity.

Building salvage markets handle a wide variety of materials, including new materials that are surplus or slightly damaged as well as used materials that have been recovered from existing buildings. Building salvage markets receive their materials from a variety of sources, including retailers, distributors, new construction firms, demolition contractors, deconstruction firms, remodelers and the do-it-yourself market.

Deconstruction can provide both environmental and socioeconomic benefits to society.

There are several environmental benefits to deconstruction. Deconstruction reduces the amount of construction and demolition waste that is sent to landfills. Also, the reuse of building materials reduces the demand for new building materials and therefore lowers the amount of energy and resources used in their production. The socioeconomic benefits of deconstruction can include increased employment opportunities, job training, historic preservation, building materials affordability, and small business development in economically depressed areas.

DECONSTRUCTION ACTIVITY ORGANIZATION

There are four main elements substantially required for deconstruction within a particular region or locality:

- **Labor Source**
- **Deconstruction Business Structure**
- **Used Material Source**
- **Used Material Market.**

Table 2.0 expresses the options for each and all of the main elements. This organization is used to establish deconstruction patterns within a city by identifying major deconstruction elements and deconstruction group relationships. For examples of this organization's employment, see the Appendix.

Table 2.0 Four Major Elements of Deconstruction and Associated Groups

Labor	Deconstruction Business Structure
<ul style="list-style-type: none"> • Employment training programs-federal • Employment training programs-non-profit • Employment training programs-private • Union apprenticeship programs • Union membership • Demolition contractor laborers • Temporary agency laborers • Other private labor source • Other non-profit/volunteer labor source • Public employees 	<ul style="list-style-type: none"> • Demolition contractors • General contractors • Union contractors • Non-profit deconstruction group • Public housing agency • Public-private partnerships including any of the above
Used Material Source	Used Material Market
<ul style="list-style-type: none"> • Private sector housing • Public sector housing • Government housing • Commercial housing • Commercial properties-light construction • Commercial properties-industrial construction • Public properties-light construction • Public properties-industrial construction 	<ul style="list-style-type: none"> • Non-profit salvage market-retail • Salvage market-retail • Public agency salvage market-retail • Auction • Used building material broker • Public agency reuse • Private sector reuse • Non-US market

METHODS OF SURVEY FOR PHYSICAL PROPERTY ASSESSMENT

The potential for deconstruction activity is a function of both economic and physical factors.

Physical factors include:

- Building type
- Property condition
- Building materials
- Property access

Economic factors include:

- New construction/renovation activity in the area
- Neighborhood economic infrastructure
- Employment market
- Neighborhood housing conditions

The methods for physical property assessment involve the use of a drive-by visual assessment and a detailed building assessment.³⁴ A metropolitan area is broken into four quadrants (wedges or sections, if applicable). A representative number of houses are assessed in each quadrant based on the census tracts per quadrant. Each property selected is evaluated based on a drive-by visual assessment. A detailed assessment of representative properties is performed to inventory the type and amount of salvageable materials.

There are several methods for selecting properties for research in a metropolitan area. Each method is designed to focus on a specific aspect of deconstruction: physical conditions, socioeconomic conditions, or abandoned housing conditions.

Method 1 Random Selection

Properties in a metropolitan area are selected randomly without bias to residential vacancy rates, unemployment levels, public housing units or any other socioeconomic characteristic. This method focuses on the physical potential for deconstruction given the entire stock of residential housing in a given city.

³⁴In the Washington, DC *Deconstruction Feasibility Study*, a maximum of 25 properties was visually assessed in a day and each detailed assessment of a property took approximately 8 hours.

Method 2 Socioeconomic Selection

Specific neighborhoods are chosen based on available census tract economic data such as: relative property value, unemployment levels and median income. Economically depressed areas of the city are identified and surveyed using this approach.

Method 3 Abandoned Property Selection

Properties are selected based on a list of abandoned properties created from condemnation lists, demolition permits, and/or other sources. This approach focuses on abandoned housing and provides information that can guide housing policy.

APPENDIX

Deconstruction Case Study Resources

The following case studies have been used to establish the major elements of deconstruction and associated groups.

<i>Project Title</i>	Fort Ord Military Reservation
<i>Contact Information</i>	Fort Ord Reuse Authority (FORA) 831-883-3672

Elements of Deconstruction

Labor:	Non-profit employment training program Demolition contractor laborers
Deconstruction Business Structure:	Non-profit deconstruction group General contractor Demolition Contractor
Used Material:	Public property –light construction
Used Material Market:	Public agency reuse Salvage market –retail Private sector reuse

Deconstruction Project Summary

The Fort Ord Military Reservation created a pilot deconstruction project using 8 properties to examine the potential for material salvage or recycling of approximately 1,200 buildings that are slated for dismantlement. Buildings that are slated for dismantlement include barrack and housing structures. A goal of the project is to train a crew of 30 local workers in deconstruction techniques. This comprehensive project incorporated training, community outreach, research, and deconstruction bid development. Environmental remediation issues were examined in depth and deconstruction crew personnel were certified as Lead Workers. For more information, log on to www.fora.org/1999l.html.

Project Title

Fort McCoy

Contact Information

Fort McCoy

Department of Public Works (DPW)

608-388-3386

Elements of Deconstruction

Labor:

Other private labor source

Deconstruction Business Structure:

General contractor

Used Material:

Public property-light construction

Used Material Market:

Auction

Used building material broker

Salvage market

Deconstruction Project Summary

Fort McCoy DPW created a service-type contract under which individuals or small groups offered prices to dismantle and haul off buildings. Over 250 bids were offered and 73 buildings were salvaged under the program. Environmental remediation and concrete debris was removed through a separate DPW contract. For more information, log on to www.smartgrowth.org/library/ft_mccoy.html.

Project Title

Hartford Housing Authority

Contact Information

John Wardlaw, Executive Director

Hartford Housing Authority

860-896-8697

Elements of Deconstruction

Labor:

Public housing residents

Deconstruction Business Structure:

Union apprenticeship program

Non-profit training group

Demolition contractor

Public housing agency

Used Material:

Public sector housing

Used Material Market:

Private sector reuse

Deconstruction Project Summary

Public housing residents deconstructed six housing units in an 8,250 square foot 3-story building in Hartford, Connecticut. Training was provided through an alliance of a union apprenticeship program, non-profit training programs and small for-profit deconstruction group. Building materials recovered from this project were sold to a demolition company involved in the project. A resident-owned deconstruction business was created in partnership with the local housing authority and a demolition company. State and local grants were provided to the resident-owned business to support the deconstruction business and create a building salvage business. For more information, log on to www.hartnet.org.

Project Title

Peoria Housing Authority (PHA)

Contact Information

Roger John, Director

Peoria Housing Authority

(309) 676-8736

Elements of Deconstruction

Labor:

PHA residents

Deconstruction Business Structure:

Union apprenticeship program

Demolition contractor

Public housing agency

Used Material:

Public sector housing

Used Material Market:

Private sector reuse

Public sector reuse

Deconstruction Project Summary

Project involved soft-stripping by PHA maintenance staff, demolition by private contractor, and environmental remediation of asbestos and buried fuel oil tanks by specialty contractors. Public housing personnel were certified as Building Maintenance Repairers through a job-training program established through the Peoria Housing Authority and a local union apprenticeship program. This certification documented that public housing personnel were adequately trained to safely salvage and reuse used building materials. For more information, contact the Peoria Housing Authority.

Project Title

R.W. Rhine Demolition Company

Contact Information

Chris Christoch

R.W. Rhine Demolition Company

(206) 326-5507

Elements of Deconstruction

Labor:

Demolition laborers

Deconstruction Business Structure:

Demolition contractor

Used Material:

Private sector-industrial

Used Material Market:

Non-US market

Public sector reuse

Deconstruction Project Summary

To dismantle buildings, R.W. Rhine uses mechanical methods on their job site and manual disassembly at their company yard, thereby avoiding safety and time issues involved with manual deconstruction/demolition. Materials recovered from the buildings are later cleaned and stored at a warehouse facility owned by R.W. Rhine. These materials are later sold at retail salvage markets or shipped overseas to non-U.S. markets. For more information, contact R.W. Rhine Demolition.

Project Title **Norwest Motor Inn, Crystal Lake, Illinois**

Contact Information Cornerstone Material Recovery

Steve Clemens

Ringwood, Illinois

815-653-1972

Elements of Deconstruction

Labor: Demolition laborers

Deconstruction Business Structure: Demolition contractor

Used Material: Private sector-light commercial

Used Material Market: Private sector reuse

Deconstruction Project Summary

A 30,000 square foot, single-story “L” shaped hotel was dismantled. The new site owner reused 900 2x10 foot wood rafters recovered from the building. Sign posts, windows, plywood and metal I-beams were sold at retail salvage markets or reused by Cornerstone Material Recovery. Concrete, reinforcing bar, and swimming pool water filters recovered from the site were recycled. For more information, log onto www.csmrinc.com.

APPENDIX D: DISCUSSION OF TECHNICAL BRIEFING PAPER PREMISES

The disposition of metropolitan building stock occurs through four actions. The four areas of action are:

- deconstruction,
- demolition,
- renovation, and
- maintenance.

The following examines the first three actions described above through a discussion of premises developed in the Technical Briefing Paper.

Deconstruction

Deconstruction can be strictly defined as the selective dismantling or removal of materials from buildings for salvage and reuse. The following premises define some basic aspects of deconstruction.

Deconstruction can involve manual labor exclusively or a combination of manual and mechanical techniques.

There are successful deconstruction firms that service primarily smaller buildings, such as single-family structures, that accomplish structural deconstruction using manual labor and little to no heavy machinery. There are also successful deconstruction firms that use heavy machinery at the building site and manual labor at a remote location to accomplish large building structural disassembly. The majority of deconstruction methods employed involved manual labor with minimal use of mechanized methods. One exception was the mechanical demolition of brick walls for reuse. Brick was retrieved post-demolition and transported to a separate sorting location away from the jobsite. Cranes were used to handle recovered material in several cities.

Workers involved in deconstruction activity routinely face the same, if not greater, environmental and safety hazards as demolition workers.

Environmental hazards, such as asbestos-containing materials or lead-based paint, are commonly encountered on properties constructed prior to 1981. Due to the large number of structures having environmental hazards, demolition contractors in the four cities commonly had a vertical integration of asbestos and lead abatement services. Demolition firms that did not vertically integrate these services used subcontractors.

The primary reason for using mechanical methods on demolition is speed and, therefore, cost effectiveness. The secondary reason is safety; there are fewer laborers in potentially unsafe areas. Deconstruction work can be linked closely to environmental remediation, providing either an added business opportunity for the same firm or a requirement for close coordination and scheduling with another contractor.

Labor costs, time restrictions, and construction/demolition tipping fees are the most influential factors on the feasibility of deconstruction for a given property.

Labor rates for deconstruction work depend on project size, location and complexity. Manual deconstruction is often more expensive than mechanical demolition methods because of increased labor costs, worker compensation rates, project timelines, and the relationship between disposal, recycling and salvage rates. Demolition firms subcontract the majority of building salvage operations.

Job training programs can lower the cost of labor but can also extend the project timeline. Historically, deconstruction activities have occurred in properties owned or managed by public agencies, primarily due to the public agencies' ability to extend or alter project timelines. Interviews with private demolition contractors reflect an interest in job training programs (especially for smaller projects) tempered by industry concerns with training programs that do not provide employee control, or that increase contractor liability.

The socioeconomic factors of deconstruction strongly influence the feasibility of deconstruction.

One important consideration in determining the feasibility of deconstruction is the supply of affordable housing in a city. Houses that are structurally sound are more appropriate for renovation and rehabilitation. Materials for renovation can be provided through the deconstruction of properties slated for demolition by local officials. Redevelopment efforts must be consistent in their approach to housing preservation, rehabilitation and demolition. In locations where green spaces are needed, planned deconstruction projects can be implemented.

The combination of high unemployment and an abundance of abandoned residential property is a favorable environment for job-training deconstruction programs. In this environment, deconstruction efforts are more easily supported by low labor costs and increased assistance from federal or local agencies.

Deconstruction can provide both environmental and socioeconomic benefits to society.

There are several environmental benefits to deconstruction. Deconstruction reduces the amount of construction and demolition waste that is sent to landfills. The socioeconomic benefits of deconstruction can range from increased employment opportunities, job training, historic preservation, building materials affordability, and small business development in economically depressed areas. The integration of deconstruction into construction-related workforce development programs such as YouthBuild can provide both socioeconomic and environmental benefits. Many inner city neighborhoods can benefit from the incorporation of deconstruction activity such as lead hazard control, renovation, remodeling and demolition as a component of an overall revitalization strategy. This process will also aid the development of private used building material markets and building salvage businesses by increasing the supply of materials and labor.

Demolition

Demolition is the act of disassembling or destroying a structure. Demolition can incorporate deconstruction as a method of pulling down a structure. The following premises describe the interrelationship between deconstruction and demolition.

Deconstruction almost always involves less than complete building removal. Consequently, some relationship between conventional demolition techniques and deconstruction must occur.

Deconstruction techniques are effective for the dismantling of many building components; however, this process cannot effectively handle excavation, foundations, and environmental remediation issues. Demolition techniques and equipment are needed to handle final disposition of a property. According to interviews with industry participants, all structural deconstruction activities in the four cities used mechanical demolition for the final disposition of the property.

Demolition firms strive to maximize cost-effective total recovery—recycling and reuse.

Many demolition firms, because they are highly mechanized and seek to minimize manual labor costs, are predisposed to select recycling over reuse. Demolition contractors commonly subcontract building salvage to smaller firms because time and labor costs are more efficiently controlled through this arrangement. Demolition contractors in all of the four cities referred to building material recovery as a concern for establishing profit when bidding a project.

The approach to building material recovery varies widely both on a company and project level. The most common methods for a demolition contractor to incorporate recovery of building materials into their demolition process is through the following:

- vertical integration of building material recovery and sales,
- on-site sales of recovered material, and
- building material recovery sub-contracts.

The recognition and incorporation of the above methods in innovative contract language and project management can increase the salvage and reuse of building materials.

Materials that are recovered from buildings through deconstruction activities can either be reused or recycled.

Recovered building materials can be used in two ways: reuse or recycling. The reuse of building materials involves some level of protection and retention of the item's functional value. The recycling of building materials involves mechanical processing and reduction of components into commodity materials. The methods, products and markets for reuse and recycling are different. Recycling takes less time and labor than reuse. Demolition contractors also perceive recycling as a more consistent market than the reuse market. This perception leads to reuse being seen by demolition contractors as a secondary landfill diversion market with recycling being the primary diversion market. Deconstruction firms are seeking an inverse relationship, with reuse being the primary diversion market and recycling second.

The local market structure for salvaged building materials is often erratic, decentralized, and variable over time, making determination of its full potential difficult.

The supply of used building materials is heavily dependent on the overall construction market. The majority of used building material markets were small operations in part due to this inconsistent nature of the used building material market. While interviews often described the demand for used building materials as consistent, the ability to supply these materials to customers for a profitable return was often erratic. Used building material markets that focus on specific materials such as used wood flooring or used brick were more established, however, these operations were either vertically integrated and/or aimed at extreme high- or low-end markets. The combination of geographic location and local economic factors has a major influence on the success of building salvage markets. Proximity to borders and major ports can influence salvage and deconstruction feasibility by providing additional outlets for material reuse.

One emerging trend in the used building material market is the growth of Habitat for Humanity ReStores. The ReStore program helps to fund the construction of low-income housing through Habitat's volunteer building program by the sale of recovered and surplus building materials. Some local Habitat chapters have begun to use deconstruction as 'sweat equity' with program participants. Successful ReStore programs receive donations of recovered material from a variety of sources including individuals, renovation and demolition contractors and local industry.

Renovation

Renovation involves the changing of a structure to either restore it to a former better condition or to revive the structure.³⁵ This definition includes alterations such as remodeling and retrofitting to bring the structure into compliance with current building codes. The following premises describe the interrelationship between deconstruction and demolition.

Deconstruction can involve “soft-stripping” and/or varying levels of structural disassembly.

There are two basic types of deconstruction, non-structural deconstruction and structural deconstruction. In general, non-structural deconstruction (also known as “soft-stripping” or “high-grading”) can be accomplished with few tools, limited and typical job-site safety considerations, and in a matter of hours or days. Structural deconstruction involves a range of tools and equipment, heightened safety considerations, and a time frame of days or weeks. The following table describes characteristics of these two deconstruction approaches.

³⁵This definition was found in several sources including the Merriam-Webster Collegiate Dictionary and the 1993 American Heritage College Dictionary (Houghton-Mifflin Company, New York).

Table D-1. Types of Deconstruction

	Definition	Types of Materials Salvaged
Non-structural	Removal for salvage/reuse of any building components or contents that are not a part of or whose removal does not affect the structural integrity of the building.	Finish flooring Appliances/mechanical Cabinetry Windows/doors Trim Fixtures/hardware
Structural	Structural deconstruction involves the removal for salvage/reuse of building components that are an integral part of the building or contribute to the structural integrity of the building.	Framing Structural sheathing Exterior siding Roof truss system Floor truss system Masonry

Renovation contractors are a good source and customer for both structural and non-structural materials. The ability to customize areas of a structure to incorporate used material provides an opportunity for cabinetry, and fixtures that may have dimension limitations. In addition, recovered wood materials can be used create new floors, non-load bearing walls, or load bearing wall trusses in existing housing.³⁶ Used building material markets depend on both structural and non-structural materials.

Building salvage markets are not solely dependent on deconstruction activity.

Building salvage markets handle a wide variety of materials, including new materials that are surplus or slightly damaged, and used materials that have been recovered from existing buildings. Habitat for Humanity ReStores often sells both used and surplus materials. In the more established operations, as much as 80 to 85% of the sales are recovered materials as opposed to new surplus or ‘scratch and dent’ materials. Building salvage markets receive their materials from a variety of sources, including retailers, distributors, new construction firms, demolition contractors, deconstruction firms, remodelers and the do-it-yourself market.

Research in the four cities revealed two types of used building material markets:

- specialty markets, and
- general building salvage.

³⁶Larsen Wall Systems created out of recovered wood has been used in Milwaukee by a deconstruction microenterprise.

Specialty used building material markets focus on specific materials and customer markets. The most common specialty materials that appeal to high-end markets are brick, hardwood flooring, and, architectural antiques. Specialty retail operations appealing to low-end markets sell primarily windows and doors.

General building salvage markets focus mainly on low-end markets, but offer some high-end materials as they become available. As one deconstruction contractor in Milwaukee stated, “post-1960 buildings are your bread and butter,” while high-end materials increase your profitability. Due to the inconsistent nature supply of valued used building materials, surplus and “scratch and dent” new materials may be used to even out sales. Storage is also an issue; some used building material retail operations have materials that have not sold for several years. The key to a successful operation is throughput - the ability to sell the material quickly after it has been recovered. One method used by retail operations to increase the turnover rate of their materials is to create customer “wish lists” and query contractors for projects that have these materials.

APPENDIX E: CITY PROFILES

Miami, Florida

Physical Conditions

Almost 57% of the housing stock in Miami was built after 1970, and most construction occurred after 1955. The primary building construction type in Miami is concrete block systems (CBS). Termite damage, a major problem in Miami, reduces the supply of salvageable lumber. Roof assemblies in older homes provide the bulk of salvageable lumber in Miami. Aluminum-frame windows are commonly reused for maintenance or, illegally, for renovation.

Cuban tile was used on the roofs of many older homes and is sought after for replacement purposes in affluent neighborhoods. Many old Miami buildings, circa 1900, were built with Dade County Pine, an older wood species that is resistant to termites and environmental decay. Dade County Pine is an extremely rare and valuable high-end structural material. The majority of recovered building material in Miami is non-structural: doors, windows, flooring, appliances and fixtures.

Housing deterioration is a major problem in Miami. Code officials are stepping up enforcement activity through neighborhood enhancement teams to identify severe housing violations and stimulate the rehabilitation of substandard housing.

Community Conditions

Immigration, especially from Latin America and the Caribbean, is a major factor in Miami. It is estimated that over 60 percent of the population are foreign born. The city of Miami seeks to encourage those who live in the inner city, and middle-income city employees who left the city, to reinvest in the city. Through HUD funding, the city has concentrated on several revitalization programs. The city has identified Community Revitalization Districts, Homeownership, and Economic Opportunity Zones as target areas for redevelopment. In addition, a large numbers of job training programs exist for both English and non-English speaking persons in Miami. Non-structural deconstruction has been incorporated into the construction training programs offered by the Miami-Dade Public Schools Office of Workforce Development.

Building salvage operations in the Miami area range from specialty high-end used material markets such as brick to primarily low-end retail operations that sell a wide range of used building materials. Property managers often incorporate reused building materials for building maintenance purposes. The majority of used building materials are used in maintenance and renovating. Strict hurricane codes are seen as a limiting factor for potential material reuse. About one third of Miami's households have the potential for lead based hazards.

Economic Conditions

The city of Miami has a population of approximately 2 million people. It is a relatively new city with the majority of the growth occurring post-1950. Immigration affects the unemployment rate for the city—approximately 6 percent—and there is an abundance of unskilled labor. Miami is expanding upward and demolition and rebuilding will likely be the next wave of construction. The majority of labor in Miami is non-union and wage rates for manual demolition laborers are approximately \$7 an hour. Demolition contractors report that landfill or “tipping fees” are moderate at approximately \$6-\$7 per yard.

The city of Miami consolidated plan illustrates a “housing development strategy to promote and expand the development of affordable homeownership through the implementation of new in-fill housing initiatives in the city’s distressed neighborhoods.” Affordable housing is in demand in the Miami area and housing associations in Miami are seeking to renovate or remodel existing units. Under the Consolidated Plan, units that are determined to require in excess of \$40,000 for renovation are considered for demolition. Aligned with this strategy are grant/loan programs that allow \$40,000 loan caps for renovation.

Export of materials including used building materials to Latin America and the Caribbean is a major market and one that is expected to increase in Miami. Many island countries charge a higher import duty fare that serves as a disincentive.

Geographic Conditions

Miami has a hot moist climate conducive to termite and water damage. Hurricanes are common and are responsible for the adoption of stringent building codes. Miami is a major port with strong established routes to the Caribbean and Latin America.

Deconstruction Potential

The predominant use of concrete block construction along with an extensive termite problem significantly limits the potential for structural deconstruction in Miami. High-end materials such as Dade County pine are the exception, but there are few older buildings left available for the recovery of these materials. Primarily non-structural used building material markets exist in Miami mainly in recovered windows, doors, cabinets, and kitchen and bathroom fixtures. A substantial export market exists for shipping used materials overseas to Latin America and Haiti.

El Paso, Texas

Physical Conditions

Building construction in El Paso consists of varied materials including wood, brick, concrete block systems (CBS) and adobe materials. Most of the houses are built on concrete slab foundations. In newer homes, windows are mainly aluminum framed. Approximately half of El Paso’s housing was built between 1940 and 1979. Some older houses in El Paso date back to the 1600s.

It is estimated that only half of the residents own a home. There is a huge problem with substandard housing, especially in the outskirts of the city.

Community Conditions

Affordable housing is in great demand in the El Paso area and the general housing practice is to renovate or remodel existing units. There is a problem with substandard housing in neighborhoods, known as “colonias,” where families construct houses piece-by-piece over time. Code officials are wary of building material reuse and see alternative building materials such as adobe and straw bale as having more potential than deconstruction for resolving the affordable housing problem. The city seeks to preserve its historical landmarks and has created nine historical districts, including over 2,500 buildings.³⁷ The crime rate in El Paso is low, and the community widely accepts building salvage and reuse due in part to a large market for used materials across the border in Mexico.

A wide range of job training programs is available in El Paso, although construction-related programs are limited. Construction training is low on the list of workplace education priorities due to low wages, instability and a saturated labor market with little room for advancement.³⁸ There are multiple programs to support affordable housing and training listed in El Paso’s Consolidated Plan.

Economic Conditions

The city of El Paso has as a population of approximately 700,000. Immigration from Mexico is a major influence on the labor market in the city. Immigration affects the unemployment rate for the city, estimated at 8.5 percent in the fall of 2000, and there is an abundance of unskilled labor. The per capita income in El Paso County was \$15,216 with the median family income estimated at \$34,700 in 1999. The majority of labor in El Paso is non-union and wage rates for manual demolition laborers are approximately \$7 per hour.³⁹

Export to Mexico is a major market for used building materials. Used building material processors stated that barriers to export include the requirement to use non-U.S. trucks to cross the border. Building salvage is common; there are several building salvage operations in the El Paso area that sell a wide range of mainly non-structural used building materials. The small percentage of abandoned buildings that do exist are often completely stripped of any usable material including drywall and interior studs.⁴⁰ Lead-based paint is estimated to affect approximately 40 percent of El Paso houses built prior to 1979; however, the city has not found a significant problem with lead poisoning. Texas has the lowest landfill fees in the south central region of the United States and the lowest tipping fees in the nation.⁴¹

³⁷www.eppa.org/landmark.html.

³⁸El Paso Collaborative for Community and Economic Development interview, July 27, 2000.

³⁹www.elpaso.org/economics/index.htm.

⁴⁰El Paso Building Services Department interview July 25, 2000.

⁴¹Municipal Solid Waste Management in Texas: Status Report, 1997, TNRCC.

El Paso has experienced dramatic growth in the housing construction industry, however little of the activity is directed toward the low-to-moderate income households. Citywide the housing occupancy rate is 92 percent, and low-income families are effectively priced out of the rental housing market. Housing affordable to the 23 percent of households who fall into the 0 to 50 percent Median Family Income (MFI) category comprises less than 5% of the houses for sale in El Paso. Time on the public housing waiting lists average about two years. A lack of affordable housing within the city over several decades has led to the proliferation of colonias outside the city limits, which are subdivisions that lack infrastructure and are often occupied by substandard housing.⁴²

The major market for used building materials is in the renovation and remodeling market. Because of El Paso's weak economy, it is cheaper for the bulk of its residents to remodel than invest in a new home. Incorporating used materials into renovation can create savings. Renovation and remodeling activities in El Paso are extensive. Licensing for remodeling contractors is not required and the market is competitive.

Geographic Conditions

El Paso's climate is hot and dry, making it ideal for outside storage of used materials year round. El Paso's border with Mexico promotes export of low cost building materials and salvage into Juarez.

Deconstruction Potential

Although the existing housing market and supply isn't conducive for structural deconstruction, the economy and labor force is ideal for used material retail and processing. A large non-structural deconstruction market exists, supported by the local renovation and remodeling industry. El Paso has a small number of abandoned or condemned properties and a shortage of affordable housing. Code officials do not endorse the reuse of used building materials because of their extensive reuse in substandard housing. Ongoing demolition at Ft. Bliss offers some materials, primarily windows, doors, fixtures and appliances. Lead-based paint issues have limited the recovery of these materials from the base.

Milwaukee, Wisconsin

Physical Conditions

Housing in Milwaukee exhibits a strong European architectural influence, including Polish flats and German duplexes with two-family occupancy and separate entrances. The majority of housing stock in the Milwaukee area was built prior to 1960. Approximately 70 percent of all the houses in 1998 were owner occupied.⁴³ Milwaukee housing stock has undergone a rapid deterioration, especially on the North side. From a deconstruction standpoint, the wall and roof systems in most of the older homes may provide a considerable amount of wood (due to large dimensional sizes and structural design).

⁴²www.hud.gov/cpes/tx/elpasotx.html.

⁴³Consolidated Plan, State of Wisconsin, 2000.

Building assessments of Milwaukee housing reveal a large amount of dimensional lumber in good condition.

Salvageable components in Milwaukee houses include dimensional lumber, wood sheathing and flooring, solid wood staircases and banisters, doors, windows, hardware and fixtures. Antique features such as turn-of-the-century door handles and bath furnishings were also common.

Community Conditions

The population of Milwaukee is approximately 600,000. Between 1960 and 1996, Milwaukee lost 20.2 percent of its population.⁴⁴ A rapid deterioration in inner city housing has resulted in a surplus of abandoned housing. Many deteriorating houses are wood-framed Victorians between 2,000-3,000 square feet. The housing market is extremely fragmented with multi-story houses in good condition ranging in price from the hundreds of dollars to over \$800,000, depending on location. Milwaukee has a strong preservation model as exemplified by downtown renewal.

There is an interest in deconstruction from many city government agencies, including codes and housing. Milwaukee is home to several deconstruction/building salvage companies; materials are reused in Milwaukee or are sent to the larger reuse market in Chicago. There is concern by deconstruction participants over market competition between private companies and non-profit supported micro-enterprises, due to a limited supply of properties available for deconstruction. There are also three stores and several deconstruction firms that sell materials on-site. In addition, there is a concern that an increased focus on deconstruction will increase demand without increasing supply thereby destabilizing an already small margin industry.

Milwaukee has its own set of building codes, which do not specifically address the use of used building materials. However, code officials have set guidelines for the use of used wood. Building inspectors can use these guidelines on residential projects to determine if the material is acceptable for structural purposes. In general, there are no restrictions for the use of non-structural used materials. Commercial projects over 10,000 square feet must have an architect approve the use of used building materials. Concerns over the use of used building materials are addressed in the plan review process.

Deconstruction job training has a history in Milwaukee. The Laborers Union worked collaboratively with a deconstruction and rehabilitation contractor, REEHouse, Inc., and the Milwaukee Community Service Corps (MCSC) to train HOPE VI youth in rehabilitating inner city houses. Deconstruction was a component of the training. Currently, REEHouse, Inc. trains Wisconsin Conservation Corps parolees as part of their deconstruction demonstration project. MCSC is interested in pursuing deconstruction in the Milwaukee area in future projects. Milwaukee's 2000 Consolidated Plan covers their housing and community development strategic plan and lists numerous housing and community development programs that offer assistance through grants and loans.

⁴⁴<http://www.uwm.edu/Dept/CED/publications/milwecon/contents.html>.

Lead-based paint hazards are a big concern for the State of Wisconsin and the city of Milwaukee. In fact, Milwaukee has one of the highest lead poisoning rates in the country. The following passage from the 2000 Consolidated Plan for the State of Wisconsin describes the relationship between lead-based paint hazards and the supply of affordable housing: “Lead based paint hazards in pre-1978 housing units continue to limit the availability of safe and affordable housing units. Property managers, lenders insurance providers and housing agencies are increasingly leery about lead based paint tainted housing stock.”

Economic Conditions

The history of Milwaukee’s economy is based on heavy industry. From 1968 to 1992, a reduction in industrial activity occurred, eliminating many jobs. As a result much of the housing in the inner city is vacant today. Currently the economy is recovering and the unemployment rate in the central city is 4.6 percent.⁴⁵

There is an extensive network of non-profit organizations that are funded as micro-incubators for deconstruction. Some On-the-Job Training programs provide low wages, whereas union wage rates are higher and serve as an incentive to trainees. Environmental concerns are an issue in Milwaukee due to the age of the housing stock. Approximately 77% of Milwaukee County homes are estimated to contain lead-based paint, which is the highest percentage for any county in the state of Wisconsin.⁴⁶

Landfill tipping fees in Milwaukee are relatively inexpensive at approximately \$30 per ton.

Geographic Conditions

Milwaukee’s climate is typically continental with some modification by Lakes Michigan and Superior. Because of its northern location and average weather conditions, termite damage is insignificant. High average snowfalls and cold winter conditions necessitate the use of larger wood members in the roof and wall systems of the local housing.

Deconstruction Potential

Milwaukee has a large supply of abandoned and dilapidated properties that are good candidates for structural and non-structural deconstruction. Code officials are supportive of deconstruction activity and have developed guidelines for the reuse of recovered wood in residential and commercial buildings. There are several non-profit and private sector deconstruction programs locally and a perceived need by deconstruction industry participants to increase the supply of properties for deconstruction activity.

⁴⁵<http://stats.bls.gov>.

⁴⁶Consolidated Plan, State of Wisconsin, 2000, p.56.

Nashville, Tennessee

Physical Conditions

The oldest homes in Nashville date back to 1799. Many of Nashville's earliest homes were modeled after the kinds of houses that settlers had known in Virginia and North and South Carolina. Log structures were Nashville's earliest examples of residential architecture and the first brick houses were built at the end of the eighteenth century.⁴⁷

Many of the houses in Nashville-Davidson County are built on crawlspace foundations because indigenous limestone "rock" base is typically encountered about 18 inches below the surface of the soil. Original building materials found in Nashville housing includes wood, brick, stone, terra cotta, cast stone and concrete.

Many homes contain dimensional lumber, and most are wood-frame with 2" x 4" wall systems. Brick or wood clapboard exterior finishes are common. Some of the most common wood species found in older construction are oak, poplar and pine. Salvageable components in Nashville houses include dimensional lumber, wood sheathing and flooring, brick, antique mantles, doors, trim work, leg tubs, hardware, and fixtures.

Community Conditions

The lack of affordable housing is one of the most critical housing problems in the Nashville metropolitan area. The Metropolitan Government is focused on preserving the existing affordable housing stock in Nashville-Davidson County. Nashville is actively engaging non-profits, private for-profits and lending institutions to help finance and redevelop blighted areas of the city.

There are several organizations in Nashville that promote deconstruction. The RE-USE Center, a local non-profit material reuse organization, relies upon the free labor provided by community service workers. David Hamilton, director of the center, said the program is gaining recognition, and he looks to expand the organization and possibly open another location. The Affordable Housing Resources Group, Inc., targets homes for renovation, employs its own workforce and incorporates workers from city sponsored construction training programs. The Bank of America purchases and redevelops distressed properties in the inner city to help establish a community and small business infrastructure.

Nashville has numerous historic districts, in which there is an emphasis on preserving existing structures. Nashville's oldest historic downtown district, Second Avenue, is lined with two-to-five-story Victorian facade warehouses that date from 1870 to 1890.⁴⁸

Economic Conditions

The city of Nashville has a population of approximately 500,000 people. The economic base is diverse and expanding, and is currently enjoying heavy outside investment and consistent job growth. The Nashville workforce is primarily employed in the services,

⁴⁷Historic Sites of Nashville and Davidson County, Metropolitan Historical Commission.

⁴⁸Second Avenue Design, Metropolitan Historic Zoning Commission.

retail/wholesale trades, and manufacturing areas. Vanderbilt University and Medical Center is the largest employer in the city. The area benefits from low unemployment (approximately 3 percent), consistent job growth, substantial outside investment and expansion, and a well-trained growing labor force.⁴⁹ The 1999 estimated per capita income in Davidson County was \$22,273, and the median family income was estimated at \$53,700.

According to a Nashville housing market analysis, there are approximately 251,319 housing units in Nashville-Davidson County. It is estimated that approximately 88,546 of those were built after 1980. Over 83 percent of the total 251,319 housing units in Nashville-Davidson County are estimated to be in sound condition.⁵⁰ Moreover, approximately one-third of the total housing stock is estimated to contain a lead-based paint hazard.⁵¹ The homeownership rate in Nashville is approximately 69 percent.⁵²

The Nashville Consolidated Plan for Housing and Community Development lists three overall priority needs that the Metropolitan Development and Housing Authority has recognized. They are:

- provide decent housing,
- establish and maintain a suitable living environment, and
- expand economic opportunities.

Numerous programs have been identified within each of the above-listed areas to help provide assistance to Nashville residents. These programs are listed in the Nashville Consolidated Plan.⁵³

There are several building salvage operations in the Nashville area with an abundance of small independent antique shops; however, one salvage store proprietor is considering liquidating her business due to slow sales. Many contractors involved in demolition and building salvage foresee a reduction in demolition activities in Nashville. Current construction and demolition waste disposal fees range from \$7 to \$9 per yard.

Geographic Conditions

Nashville has a moderate moist climate that sustains termites and fungus, making wood structures susceptible to termite and moisture damage.

Deconstruction Potential

Nashville has a housing stock that is suitable for structural deconstruction. A strong political environment, however, favors the preservation of existing historical buildings and affordable housing units which limits the potential for structural deconstruction.

⁴⁹ www.nashvillechamber.com.

⁵⁰ Housing Market Analysis, Nashville-Davidson County, Feb 2000, MDHA.

⁵¹ Consolidated Plan for Housing and Community Development, Nashville-Davidson County, Feb 2000, MDHA.

⁵² Home Builders Forecast, July 2000, NAHB.

⁵³ Consolidated Plan for Housing and Community Development, Nashville-Davidson County, Feb 2000, MDHA.

There are additional opportunities for incorporating both non-structural and limited structural deconstruction into the renovation of existing structures as part of the city's preservation policy. A reduction in demolition activity reduces the volume of recovered material for the current used building material market.

APPENDIX F: TRIP SUMMARIES

Miami, Florida – February 7-11, 2000

Purpose

Members of the NAHB Research Center visited the city of Miami to identify four key elements required for deconstruction within a particular region or locality. The key elements were:

- used building material source,
- used building material market,
- deconstruction business structure, and
- labor source.

References

- Miami Deconstruction Notes, Feb 7-11, 2000
- Detailed Building Assessment, 2125 NW 68th Street, Feb 9, 2000
- 1999 Solid Waste Management Annual Report, Florida Department of Environmental Protection
- Wrecking and Demolition Contractors, 1997 Economic Census, U.S. Census Bureau
- Slash Pine Technical Fact Sheet, USDA Forest Service
- Miami Comprehensive Task List

Contacts

Personal interviews and discussions were conducted with the following representatives:

Public Housing Administrators

Joe Scafuti, HOPE VI Coordinator
Robert Levis, Special Projects Administrator

Property Management Services

Rickey Johnson, H.J. Russell & Company

Port of Miami

Bernard List, Assistant Port Director

Used Building Material Dealers

Leonardo Garcia, Garcia Door & Window, Inc.
Terence Waldron, American Salvage Incorporated

Demolition and Recycling Contractors

Todd Melgaard, Absolute Demolition
Nick Thomas, Liberty Recycling
Michael Savino, Liberty Recycling
Jerry Rimoin, Florida Wood Recycling

In working with the above individuals, other leads were discovered. Research Center staff contacted these leads through phone interviews and on-site visits. Several unique characteristics to the Miami area were identified, such as: “Dade County Pine,” commonly used for construction in older buildings; export traffic originating from the South River, and an extensive termite problem throughout Dade county.

Key Observations

Used Building Material Source

- Buildings in Miami are predominantly constructed using Concrete Block Systems, otherwise known as CBS construction.
- Many of South Florida’s oldest buildings were built with Dade County Pine, a highly desirable dense lumber used for framing members and flooring.
- Termite damage is extensive throughout the city; evident in all the buildings we examined, and minimized the potential for structural wood salvage.
- Roof assemblies, along with the framing members in older buildings, provide the bulk of salvageable lumber in Miami.
- Windows are exclusively aluminum-frame constructed. They are re-used in the export trade, sold for maintenance and repair purposes or recycled.
- Stainless steel and ceramic sinks, kitchen cabinets, and wooden doors are often reused, dependent upon the condition and value of the material.

Used Building Material Market

- Strict hurricane resistant building codes preclude the use of older building materials in new construction or remodeling.
- A significant amount of used building material is exported to Latin America, primarily Haiti, by way of ocean transport companies located on Miami’s South River.
- A current fad is to use brick pavers for driveways and sidewalks. Northern used brick is very popular for this application.
- Property managers and do-it-yourselfers commonly purchase used plumbing fixtures, windows, doors and finish materials to facilitate the maintenance of their property.

Deconstruction Business Structure

- Demolition contractors identified two factors that will improve deconstruction potential in the Miami area; more time to separate materials and additional non-landfill resources for disposing waste.
- Demolition contractors utilize salvage companies to remove selected building materials prior to demolition. Salvageable materials are often stripped-out prior to the demolition project by unauthorized personnel.

Labor Source

- Interior demolition work can be accomplished with unskilled labor, whereas skilled operators are required to run the equipment necessary for exterior or

structural demolition. According to the president of one demolition firm, unskilled labor is readily available, but finding qualified individuals who are willing to work is difficult. Turnover for new employees is high.

- One demolition contractor stated that on-the-job training (OJT) programs that give supervisory authority to the contractor would work best for the demolition industry.
- A property supervisor for Scott Homes, viewed training as an essential component to the HOPE IV public housing redevelopment program.

Detailed Building Assessment

Research Center staff performed detailed building assessments within the Scott/Carver Public Housing Complex. These buildings were constructed in the late 1950's. The buildings were originally used as Army barracks and all 850 two-story units are constructed with concrete block walls and wood truss/sheathing roofing systems. There is an estimated 130,000 board feet of 1 x 6 tongue and groove wood sheathing and over 2,000 wood trusses in the twenty buildings of Sector 1. Wood components in the roof assemblies have the most value and highest quantity of any salvageable material; however, termite damage throughout the development may drastically limit the total potential for wood salvage.

Exterior walls – All units in both developments are constructed with 4" concrete block systems. Stucco is applied to both sides of the wall.

Floor assemblies – All units are built on concrete slabs. Concrete is used for the flooring on both levels. Floor covering consists of one to two layers of vinyl tiles that may contain asbestos.

Interior walls and ceilings – All interior partition walls are 4 ½" cinder block with a stucco finish. The ceilings are either plaster or stucco applied over a reinforced wire membrane.

Roof system – Gable; constructed with prefab wood truss assemblies (2 x 4 webbing), 1 x 6 T&G wooden sheathing and asphalt shingles. Termite damage was evident in the building we assessed.

Finish materials – The interiors of these buildings are in poor condition. Maintenance personnel typically salvage all usable components and use them to maintain other units. Components that are typically salvaged are appliances, water heaters, gas space heaters, aluminum-framed windows, cabinets, stainless-steel sinks and plumbing fixtures.

Walk-Through Building Assessments

Miami Beach

- Collins Avenue – Low-Rise commercial renovation
- Washington Avenue – Historic Hotel Renovation

Research Center staff performed walk-through assessments of several buildings undergoing renovation in the Miami Beach area. These buildings were approximately 50 to 75 years old and represented the typical construction of that era. These buildings have concrete or cinder block exteriors with wood joists, rafters, partition walls and flooring. We could see evidence of termite damage and decay throughout these buildings; however, it appeared that the contractors were removing the damaged sections and leaving or repairing the other wood found to be in good condition.

Miami, Florida – July 12-14, 2000

Purpose

Members of the NAHB Research Center visited the city of Miami to identify four key elements required for deconstruction within a particular region or locality. The key elements were:

- used building material source,
- used building material market,
- deconstruction business structure, and
- labor source.

References

- Miami Deconstruction Notes, July 12-14, 2000
- Miami Comprehensive Task List
- Detailed Building Assessment, Little Haiti residential rehab, July 14, 2000
- Home Ownership Training Program, Little Haiti Housing Association
- 1999 Solid Waste Management Annual Report, Florida Department of Environmental Protection
- Revised Business Plan for the Florida Academy of Construction Trades
- Architectural Styles of Miami Beach, Historic Preservation, Planning and Design, City of Miami Beach
- Guidelines for Administration and Accreditation, National Center for Construction Education and Research
- Fax transmission of demolition and restoration contract notes, Bruno-Elias & Associates Inc.
- Dun & Bradstreet Business Background Report – American Salvage, Inc.
- Florida Department of Education Curriculum Framework and Student Performance Standards for Building Maintenance Program, Miami-Dade County Public Schools Office of Workforce Development
- List of Lands, Miami-Dade County Tax Deed Section

Contacts

Personal interviews and discussions were conducted with the following representatives:

Used Building Material Dealers

David Beem, Floors to Doors, Inc.

Exporters

Trimline Design Center
Tom Willey, World Relief Corporation

General, Commercial, Residential, and Remodeling Contractors

Patti DePonte, Redden Construction
David Candy, David Candy Construction
Terry Allen, Terry Allen, Inc. (Little Haiti Housing Association)
Barry Rutenberg, Home Builders Association of Florida

Community Development Corporations

Claude Greenleaf, Neighborhood Housing Services
Murkel Coppins, Black Economic Development Coalition
Dr. Antoine Auguste, Little Haiti Housing Association

Deconstruction Firms

David Beem, Floors to Doors, Inc.

Employment Training Organizations

Murkel B. Coppins, Tools for Change
Luis Cerezo, Miami Job Corps
David Schleiden, Miami-Dade Public Schools Office of Workforce Development
Maria Sierra, South Florida Training and Employment Consortium
Russ Smith, Florida Academy of Construction Training

Public Housing Architects and Engineers

Arnold Zweibal, Bruno-Elias & Associates Inc.

Building Codes Department

Jamie Eisen, Miami-Dade County Building Code Compliance Office

Non-Profit Foundations

Charles Daffney, Greater Miami Local Initiative Support Corporation

Landfills

Bill Thorne, Dade-County Department of Solid Waste Management

Key Observations

Several unique characteristics to the Miami area were identified, such as the use of “Cuban tile,” the age of buildings (most growth in Miami occurred post-1955), a building code that is perceived to discourage the reuse of building material, and used material retail operations that are supported by exporters.

Used Building Material Source

- Cuban tile was brought over by Cuban immigrants in the 1950s and 1960s, and is valued by high-end remodelers for its appearance. However, many of these

tiles (used in roofing and flooring) are used now to replace existing tile versus for whole floor or roof systems.

- Typical building material types in Miami: masonry, plywood, and lumber.
- High humidity, termites, and environmental hazards (lead-based paint and asbestos) are major factors affecting the supply of used building materials in Miami.
- Wood salvage is a low priority in Miami because it is difficult to sell and requires significant labor for removal. However, there is an existing market for heart pine, which includes the rare but valuable Dade County pine. Dade County pine was described as extremely rare by one remodeler and non-existent by a building code official.
- Used older lumber is rough sawn and dimensional, limiting its uses and adaptability in new construction.
- One common practice is to reuse plywood sheets from concrete forms as roof sheathing in new construction.
- No language in Miami building code restricts the reuse of lumber. Lumber needs to be stamped/graded. Code officials mentioned interest in used wood certification and inspection procedures.
- Currently, used lumber in non-load bearing applications requires only visual inspection of the overall condition of the wood.
- Miami Code 2704.1 states, “ Second-hand masonry units shall not be used unless they conform to the requirements of this Code, are sound and have been thoroughly cleaned and are approved for use by the Building Official.”
- Used mechanical equipment must meet minimum Energy Efficiency Ratio (EER) and/or be approved by an engineer in commercial applications. Code officials expressed a concern for guarantee and warranty issues.
- Windows and other exterior items must have a product approval number (meets or exceeds current impact standards), decreasing the possibility of building material reuse.
- There is a strong demand for Chicago and St. Louis brick for driveway, patio, and wall applications.

Used Building Material Market

- Contractors have a generally negative perception of building material reuse for the following reasons:
 - Code requirements – Building codes in Miami have been strengthened since hurricane Andrew. Contractors see used building materials as not being acceptable or requiring additional inspections from building officials, and as a result, increasing the time and cost of a project.
 - Customer demand – In new or rehabilitated housing, contractors see a difficulty in reusing building materials because of appearance, dimension, and increased time/cost factors.
- Installation of used building materials requires extra time and labor to match cabinets, doors, and other materials. Clashing colors or appearances will potentially lower the perception of a home’s value. This seems to be especially

true with low to moderate income housing; people who purchase high-end housing often value a unique look.

- Export of used building materials is a strong market in the Miami area. This trip identified exporters as being a major customer base. Floors to Doors, Inc. sells approximately half of their material to exporters from Central American and Caribbean countries. One exporter to Belize sends a truck to purchase materials every month from Floors to Doors, Inc. Another exporter to the Dominican Republic receives merchandise from Floors to Doors, Inc. six times a year.
- Top selling items at Floors to Doors, Inc. includes windows, doors, iron bars, awnings, shutters, cabinets, toilets, and sinks. Incidentally, Dr. Auguste of the Little Haiti Housing Association identified many of these items as being in great demand in Haiti.
- Many Caribbean islands charge a high import duty fee. This flat import fee is seen as a disincentive to the export of used building materials.
- Used building material retail is described as a difficult business, based on buying materials at a low cost from contractors who wish to avoid landfill fees, estate liquidators, and other individuals. The material is later sold at a higher cost to customers. The retail business is based on high up-front costs for the purchase and labor to remove or ship the material. However, there is no guaranteed market that recovered used materials will sell or that the purchase price will cover the invested up-front costs of the business.
- A salvage business owner describes used building material retail as difficult. The owner of one salvage business stated that the business, which has a gross income of \$200,000 per year, was unprofitable for the first four of seven years of incorporation.

Deconstruction Business Structure

- One salvage contractor performs deconstruction, including non-structural and structural. This contractor has a staff of between 5 and 6 workers who perform warehouse duties in addition to building salvage.
- Additional temporary laborers are hired as necessary. Seven dollars per hour is the going wage for this type of labor.
- Work is described as “non-skilled, grunt and groan.”
- An average of three to four jobs per week supports the retail end of the business. Jobs range from estate liquidations of residential and commercial buildings to contractors who allow salvagers to remove materials, thereby reducing landfill costs.

Labor Source

- Little Haiti has no shortage of unskilled labor and there are enough skilled construction laborers to meet the current demand, according to Terry Allen of the Little Haiti Housing Association.
- Tools for Change, a member company of the Black Economic Development Coalition, is a non-profit firm that provides customized job training and placement. Training participants include low-income, ex-felons and other

disadvantaged. Tools for Change receives funding from state and federal Workforce Investment Act monies.

- The company Tools for Change offers training classes in communication (fiber-optic) cable construction and is interested in developing training in computers and microprocessors. Approximately 100 business partners are involved with Tools for Change, including cable companies that usually have jobs ready for students when training is completed.
- One workforce development-training firm was unfamiliar with deconstruction training. “Why raise peoples expectations for a position that is low paying and has limited employment opportunities? Focus on technology.”
- Miami Jobs Corps offers workforce-training programs. Forty percent of those programs are construction related (based on an analysis of performance outcomes). Performance outcomes include completion rates, average wages at placement, graduate placement and job training matches. Deconstruction has not been discussed as a training program.
- The Florida Academy of Construction Trades (FACT) is a non-profit corporation whose mission is to provide skilled construction labor in the state of Florida. FACT has a relationship with the University of Florida M.E. Ringer Sr. School of Building Construction in Gainesville, Florida.
- The University of Florida School of Building Construction states that deconstruction is an effective hands-on training approach that can be incorporated into existing craft or safety training.
- The University of Florida Center for Construction and the Environment is actively involved in deconstruction research. The center has discussed the incorporation of deconstruction into the curriculum of the National Center for Construction Education and Research (NCCER). NCCER is a nationally recognized construction-skills training provider. NCCER has not yet adopted deconstruction into their curriculum.
- Miami-Dade Public Schools, Office of Workforce Development has 42 adult education programs across the city—half are dedicated to construction skills training. Construction programs cover all trade apprenticeships and are coordinated through unions, the Home Building Institute (HBI), Association of General Contractors (AGC), and other trade groups.
- Miami-Dade Public Schools (MDPS) utilizes a deconstruction approach in a Restoration and Renovation course. Due to the stringency of curriculum requirements, the addition of a deconstruction component works most effectively in a building maintenance tract.
- The Building Maintenance tract is attractive to students because they can attend specific modules without having to take the entire program (unlike conventional trade apprenticeships).
- A meeting was held between MDHA, Florida Academy of Construction Trades (FACT), and MDPS to discuss resident training programs for the HOPE VI Liberty Heights project. Deconstruction was considered but declined in favor of other construction training programs using clear lots.

Building Assessment

Members of the Research Center performed building assessments of several one-story residential properties undergoing renovation. These homes were located in the “Little Haiti” district, were approximately 55 years old, and represented the typical construction characteristics of post WWII residential housing in Miami. The interiors of the houses were gutted, exposing the structural components of the building.

Observations

Exterior walls – Concrete block, otherwise known as CBS construction. Stucco applied to the exterior.

Foundation – Concrete block with a crawlspace. Water heater and heating/cooling system located in crawlspace.

Floor assemblies – Wood floor joists (2x10 rough sawn) imbedded at each end into the concrete block. Sub-flooring consists of 1x8 pine board. Many of the floor joists were deteriorated or water damaged, especially under the kitchen and bathroom areas.

Interior walls and ceiling – Partition walls are 2x4 wood framed. Finish is plaster or stucco over wood lathe. Wood lathe is nailed directly to furring strips on the walls, and to the joists in the ceilings.

Roof System – Asphalt sloped roof over T&G wood sheathing. Ceiling joists were 2x10’s and imbedded into the concrete block for support.

Finish Materials – Most of the salvageable components in these buildings are in poor condition. These components include aluminum-framed windows, cabinets, stainless steel sinks and plumbing fixtures.

El Paso, Texas– March 13-17, 2000

Purpose

Members of the NAHB Research Center visited the city of El Paso to identify four key elements required for deconstruction within a particular region or locality. The key elements were:

- used building material source,
- used building material market,
- deconstruction business structure, and
- labor source.

References

- El Paso Deconstruction Notes, March 13-17, 2000
- Fort Bliss Army Family Housing Long Range Plan Project List
- 1997 Municipal Solid Waste Management in Texas Status Report, Texas Natural Resource Conservation Commission

- Wrecking and Demolition Contractors, 1997 Economic Census, U.S. Census Bureau
- El Paso Region Demographics Packet, March 2000, City of El Paso, Texas
- El Paso Comprehensive Task List

Contacts

Personal interviews and discussions were conducted with the following representatives:

Public Housing Administrators

Joe Hernandez, Housing Authority, City of El Paso

City of El Paso Department of Community and Human Development

Robert Soto, Housing Program Administrator

City of El Paso Department of Planning, Research and Development

Natividad Campos, Executive Assistant to the Mayor

Jim Fraser, Urban Planner

Matthew Briones, City Planner

Fort Bliss

Michael Lockamy, Department of Public Works and Logistics

Used Building Material Dealers

Daniel Robles, McKinney Wrecking

Leonard Hall, The 2nd Hand Store

Demolition and Recycling Contractors

David Robles, Robles & Sons, Inc.

Frederico Fernandez, F&F General Contractors

Design/Build Remodeling Company

Irma Fernandez, Studio4Designs

Training Programs

Maria Acosta, Texas Workforce Program

Mary Ortega, Learning Center

Tito Gomez, Academy of Science and Technology

Landfills

Rich Dominguez, El Paso Solid Waste

Key Observations

In working with the above individuals, other leads were discovered. Research Center staff followed-up on these leads with phone interviews and on-site visits. Several unique characteristics to the El Paso area were identified, such as: a dry climate that allows for open air storage and assists in the preservation of used material; retail operations that make furniture out of used wood and export into Juarez, Mexico.

Used Building Material Source

- Buildings in El Paso are composed of a wide variety of building materials.
- A shortage of affordable housing fuels a strong remodeling market. It is cheaper for many families to remodel than invest in a new house.
- Termite damage is not a major problem in the city. Douglas Fir is the most common type of wood used for structural construction in El Paso.
- Most of the residential buildings are constructed on slab.
- Windows are mainly aluminum-frame constructed with some older wood frames. They are re-used, sold for maintenance and repair purposes, or exported. There is no wood recycling industry in El Paso, although at least one demolition contractor is considering this alternative.
- Brick, wood, stainless steel and ceramic sinks, kitchen cabinets, mechanical appliances, and doors are often reused dependent upon the condition and value of the material.
- Lead-based paint and asbestos-containing materials are common on Fort Bliss. This diminishes the potential reuse of building materials from the base.

Used Building Material Market

- El Paso has many historical districts, creating a demand for used building materials.
- Tight margins in the remodeling market create an incentive to reuse building material.
- The need for a historical look, greater project savings and a cultural acceptance of salvage encourages the use of older building materials.
- A significant amount of used building materials are exported to Mexico, although trade is limited by custom practices in Mexico.
- The El Paso Housing Authority holds monthly auctions of used building materials they have soft-stripped.
- Property managers, remodelers and do-it-yourselfers commonly purchase used plumbing fixtures, windows, doors, timbers and finish materials to improve, add to, or maintain their property.
- Remodelers use used lumber for bracing and jack studs on their projects.
- There are two major used building material retail operations in El Paso. One receives their supply from an in-house demolition business; the second receives material from a wide network of contractors and remodelers.
- There are several businesses in El Paso that create furniture out of used wood.
- The typical profile of a used building material retail customer is a remodeling contractor from the El Paso area.

Deconstruction Business Structure

- Time is the main factor that will improve the deconstruction potential in the El Paso area, according to demolition contractors that were interviewed.
- Demolition contractors either perform building material salvage in-house or contract this work out to other contractors or individuals.

- Remodeling contractors often salvage used building materials to avoid landfill fees and generate extra profit.
- Informal building salvage by individuals is common.
- On-site salvage sales are a popular option because it decreases the cost of transportation and warehouse storage.

Labor Source

- Cost of labor in El Paso is very low. The low cost of labor increases the potential for deconstruction activity.
- Training programs often have problems with high turnover. Individuals will quickly acquire new skills and move on.
- Overall the population in El Paso is transient with immigration continually replacing the people who leave.
- There is no license requirement for remodelers or general contractors, leading to tight profit margins in the remodeling market.
- Interior demolition work can be accomplished with unskilled labor whereas; skilled operators are required to run the equipment necessary for exterior or structural demolition. Unskilled labor is readily available, but finding skilled individuals can be difficult.
- The loss of an experienced labor force accustomed to saving used building materials is due to the turnover rate in the demolition industry and the increased use of mechanical methods.
- El Paso will be starting a three-year apprenticeship program for demolition contractors that will aid the larger companies. Licensed workers will be required on certain demolition projects. Under the apprenticeship program, trainees will lose any completed hours if they drop out.

Detailed Building Assessment

Research Center staff were not able to perform a detailed building assessment on this visit. Arrangements were made to coordinate building assessments with the Housing Authority of El Paso at a later time.

El Paso, Texas– July 25-28, 2000

Purpose

Members of the NAHB Research Center visited the city of El Paso to identify four key elements required for deconstruction within a particular region or locality. The key elements were:

- used building material source,
- used building material market,
- deconstruction business structure, and
- labor source.

References

- El Paso Deconstruction Notes, July 25-28, 2000
- Workplace Solutions – Centro del Obrero Fronterizo for La Mujer Obrera
- Levi Strauss – U.S. Local Community Grants List 1998
- Catholic Campaign for Human Development – Current Funded Groups 1999-2000
- Texas Low Income Housing Information Service – Texas Colonia Profile
- El Paso Collaborative for Community and Economic Development 1996-1998 Progress Report
- Design Guidelines for Historical Districts, City of El Paso, Department of Planning, Research and Development
- El Paso Comprehensive Task List

Contacts

Personal interviews and discussions were conducted with the following representatives:

Public Housing Administrators

Joe Hernandez, Housing Authority, City of El Paso

City of El Paso Department of Building Services

Said Larbi-Cherif, P.E., Technical Compliance Manager

Mark E. Grissom CBO, Chief Inspector

Tom Maguire CBO, Building Inspector Code Enforcement

Fred Carson, Customer Service Manager

J.S. Gallardo, Plumbing Inspector Supervisor

Community Development Corporations

Nestor A. Valencia, AICP, El Paso Community Foundation

Carlos Gallinar, El Paso Community Foundation

Angie Briones Sosa, El Paso Collaborative for Community and Economic Development

Hector Gasquet, El Paso Habitat for Humanity

Don Seely, El Paso Habitat for Humanity

Used Building Material Reuse

Mike Rodriguez, Southwestern Furnishings, Inc.

Key Observations

In working with the above individuals, other leads were discovered. Research Center staff followed-up on these leads with phone interviews and on-site visits. Several unique characteristics to the El Paso area were identified, such as: extensive problems with substandard housing in underdeveloped neighborhoods (Colonias); Mexico: local support for alternative housing approaches such as adobe and straw bale construction; unendorsed and/or underground reuse of building materials.

Used Building Material Source

- Abandoned buildings in El Paso are often gutted for reusable building materials—when left alone. These materials include drywall and interior 2x's, as well as metals and fixtures.
- A shortage of affordable housing creates a strong interest in efficient and cost effective construction approaches including adobe and straw bale. There is a projected shortage of approximately 25,000 units in El Paso according to the City of El Paso Consolidated Plan 2000-2005.
- The City of El Paso does not endorse the reuse of used building material primarily due to its extensive reuse in substandard housing in “colonias.” On both sides of the border.
- There is difficulty in obtaining wood for furniture making operations. There is a need for wood materials greater than 6 feet in length. There is a limited supply of large projects locally that provides wood. Historically, transportation expansion that involves the removal of structures and Fort Bliss demolition projects have traditionally been a good supply of used wood in the El Paso area.
- El Paso has a small number of abandoned or condemned properties. El Paso Division of Building Services estimated the number to be at 1,000-2,000.
- Lead-based paint and asbestos-containing materials are common on Fort Bliss.
- According to several sources, lead-based paint is rare in public housing and not common to many buildings in the area.
- Energy efficiency limits the potential for window reuse.

Used Building Material Market

- One wood furniture maker has been in business for 12 years designing and creating furniture out of reclaimed wood. This style of furniture is called “Rustica.”
- One wood furniture maker, purchases used wood locally and from California and Arizona. All types of used wood are used in the construction of furniture including 2x4's through 2x12's. Material is purchased directly from demolition sites with or without nails.
- One wood furniture maker only uses softwood (usually Douglas fir and some Southern pine).
- There are three major rustic furniture manufacturers in the area. There are approximately 11 smaller operations.
- One wood furniture maker posted gross revenues of approximately \$1,000,000 last year from the manufacture of furniture created out of used wood.
- One wood furniture maker has a production facility in Juarez with 10 master carpenters and 50 employees overall.
- Rustic furniture customers are national with some overseas customers. One wood furniture maker maintains a 6-month supply of used wood material.
- Building materials are commonly reused in all types of housing, ranging from colonias to moderate income. Local economic conditions makes used material more cost effective than new.

Deconstruction Business Structure

- Used wood furniture manufacturer would consider maintaining a salvage crew as a side business if there was a consistent supply of material.
- According to one wood furniture maker, it is illegal to export used wood to Mexico—only a Mexican national who is a licensed salvager can bring the material across the border to Juarez.
- There are two large resellers of used building materials in the El Paso area.
- Used building materials are commonly found in the colonias, where individuals reuse the material to create a house. A colonia house will evolve from substandard conditions over a period of 30-40 years.
- Local code officials described the used building material market as, “very large and underground.”

Labor Source

- Most of the training programs in El Paso are focused on manufacturing. Manufacturing and health care are the two strongest industries in the area.
- There is a large supply of unskilled construction labor in El Paso. There are almost no construction training programs in the El Paso area. Job stability, and the availability of unskilled and skilled labor, lowers the attractiveness of a construction skills training program.
- There is a perception that entry-level construction training will not guarantee advancement in the construction trades.
- La Mujer Obrera is one of the largest Community Development Corporations in El Paso. La Mujer Obrera was created to assist in the economic redevelopment of communities that had the largest number of NAFTA dislocated workers. La Mujer Obrera has an entrepreneurial incubator program, a bilingual integrated training program, and the El Puente Community Development Corporation that supports housing. Currently, El Puente and the El Paso Collaborative for Community and Economic Development are investigating the potential for a residential construction-training program to assist in the development of affordable housing and placing women in non-traditional workplaces. They hope to spin off micro-enterprises.
- La Mujer Obrera currently has several micro-enterprise programs including childcare, restaurant, catering, and clerical. Computer, ESL, ABE, and GED training is provided through La Mujer Obrera as well.
- El Paso Housing Association has several employment opportunities for residents including childcare, laundromats, waste removal, and landscaping.
- Public housing Section 3 requirement programs for residents include painting, waste hauling, and automotive maintenance. Time completion requirements can make it difficult to incorporate resident programs.
- Public housing in-house maintenance has an OJT program that utilizes 17-35 residents at any given time.
- Liability issues may present a problem with deconstruction training programs that incorporate environmental training.

- Currently an in-house reuse program for public housing exists, so residents involved in the OJT maintenance program are informed on how the process works.
- The El Paso Community College develops custom training programs mainly for manufacturing clients.
- Unions are seeking to increase their apprenticeship programs.

Building Assessments

Members of the Research Center performed building assessments of several public housing units and one residential single-family property undergoing renovation. The public housing units were attached two-story brick units built in 1973. These units are located in the Salazar community; 77 of the units are scheduled for demolition to create greenscape and additional parking. The single-family residential structure is a two-story brick house with a basement, located near downtown El Paso. It has a two-story covered open-air brick front porch extension with walkouts on each level. This home was approximately 80 years old.

Public Housing Units – Salazar Development

Exterior walls – 2x4 wood frame construction with brick exterior. Brick is painted on all buildings.

Foundation – Concrete slab, on-grade.

Floor assemblies – wood joists and flooring, upper level, covered with 12x12 linoleum tiles. Concrete slab, lower level, with 12x12 linoleum tiles. Sheet vinyl flooring in the bathrooms. Flooring adhesive reportedly contains asbestos.

Interior walls and ceilings – 2x4 wood frame partition walls with drywall finish. Drywall mastic reportedly contains asbestos.

Roof System – Wood truss system. Asphalt shingles over wood sheathed gable roof.

Salvageable components include wood framing, brick, aluminum-framed windows, kitchen cabinets, stainless steel sinks, plumbing fixtures, water heaters, HVAC equipment and solid wood staircases.

Single-Family Home - 3204 Montana Street

Exterior walls – Wood framed (true dimensional) construction with brick exterior. Stone lintels and sills above and below all window openings.

Foundation – Stone foundation with basement exposed two feet above grade.

Floor assemblies – Wood floor joists (2x12 true dimensional). Plywood overlaid original 1x4 sub-floor.

Interior walls and ceilings – 2x4 (true dimensional) partition walls. Original wood lath and plaster on the walls and ceilings was removed. Replaced with new drywall.

Roof system – Wood rafter (2x10) structural system, gable design, 1x6 T&G sheathing with asphalt shingles.

Salvageable components in this house would include dimensional lumber, wood sheathing and flooring, brick, stone (rocks and lintels), solid wood staircases and banisters. All of the original materials appeared to be in good condition.

Milwaukee, Wisconsin – May 1-5, 2000

Purpose

Members of the NAHB Research Center visited the city of Milwaukee to identify four key elements required for deconstruction within a particular region or locality. The key elements were:

- used building material source,
- used building material market,
- deconstruction business structure, and
- labor source.

References

- HACM Report on Milwaukee’s Community Building Model
- HomeSource Deconstruction Flyer
- Milwaukee Deconstruction Contacts
- Milwaukee Comprehensive Task List
- Milwaukee Deconstruction Field Notes
- *Milwaukee Journal Sentinel*, “Where the Scrappy Should Tread,” 10/6/1996
- *Milwaukee Journal Sentinel*, “Spare Parts: Salvage Heaven a Handyman’s Paradise,” 9/17/99
- WasteCap Wisconsin Construction and Demolition Debris Briefing Paper, “Reducing, Reusing and Recycling”
- WasteCap Wisconsin Talk and Tour Evaluation
- Wrecking and Demolition Contractors, 1997 Economic Census, U.S. Census Bureau

Contacts

Personal interviews and discussions were conducted with the following representatives:

City of Milwaukee, Department of Neighborhood Services

Tracy C. Williams, Supervisor, Commercial/Condemnation/Zoning
Ronald W. Roberts, Condemnation Assistant Supervisor

Energy Center of Wisconsin

Craig Schepp, Project Manager

University of Wisconsin

Welford G. Sanders, Adjunct Assistant Professor

WasteCap Wisconsin

Jenna Kunde, Executive Director

HomeSource, Neighborhood Development

Robin Hix, Manager

Deconstruction Contractors

Herbert Simmons, REEHouse

Tim Hansen, Salvage Heaven

Used Building Material Dealers

Arthur R. Leinweber, The Brickyard, Inc.

Tim Hansen, Salvage Heaven

Ralph “Bones” Gollnick, I.M. Salvage Company

Pete Gaitan, Architectural Antiques and Salvage

Used Building Material Installers

Ron Romero, Ron’s Flooring and Design

Demolition and Recycling Contractors

David M. Ahern PE, Barrett of Wisconsin, Inc.

Several unique characteristics to the Milwaukee area were identified, such as: “Cream City Brick,” a light colored brick commonly found in commercial and residential buildings throughout the city, an abundance of duplex housing with a first floor-second floor split, a range of deconstruction projects performed by non-profit and private companies. The city and state government encourages and promotes recycling and reuse efforts.

Key Observations

Used Building Material Source

- A diverse architectural influence is evident in the housing in Milwaukee.
- The housing stock in Milwaukee contains a vast inventory of different types of building materials.
- Brick, stone, wood rafters, wood sheathing and framing, hardwood flooring and cabinetry are commonly found in the structures of Milwaukee.
- “Cream City Brick” and “Chicago Pink” are two common types of brick found in Milwaukee.
- Milwaukee construction utilizes a variety of lumber types including oak, yellow pine, and Douglas fir.
- Residential roofing systems are predominately constructed with wooden rafters and sheathing.

- The Milwaukee county stadium is slated for demolition and would yield a large amount of old brick.
- The inner city area of Milwaukee has an abundance of older dilapidated properties that would be good deconstruction candidates.
- Milwaukee is a good supply source for used building materials.

Used Building Material Market

- There are a variety of used building material retail operations in Milwaukee and surrounding areas.
- The following types of used building material retail operations were identified in Milwaukee:
 - used building material brokers
 - used building material store that receives most of its supply from one demolition contractor
 - nonprofit used building material and supply store that receives its materials from local contractors and individuals
 - used building material store owned by a deconstruction contractor
 - specialty used building material stores
- Soft-stripped materials such as doors, toilets, and cabinets also have a consistent market.
- Demand is from general contractors, architects, homeowners, remodelers, and specialty retail.
- Demand for used wood flooring in Milwaukee area is low; however, Madison and Chicago have a greater demand for this look.
- One contractor shipped approximately 100-150 boxcars of used brick out of Milwaukee last year to other brick distributors.
- Used wood and brick are big sellers.
- There is an established market for used building materials in the Milwaukee, Madison and Chicago metropolitan areas.

Deconstruction Business Structure

- One building salvage operation partners with one of the larger demolition firms in Milwaukee.
- One independent deconstruction contractor has a salvage store and provides broker services.
- Another deconstruction contractor works with non-profit organizations and state programs to dismantle structures and incorporate used building materials into remodeling, fire restoration and commercial renovation projects. REEHouse is currently conducting a deconstruction demonstration project to incorporate used building materials in new construction.
- Architectural Antiques & Salvage, a deconstruction contractor and broker from Chicago, performs most of their deconstruction work in Milwaukee.
- Community Block Development Grant (CBDG) funded non-profit organization sponsors a volunteer non-structural deconstruction program.

- One specialty salvage operation has crews in Milwaukee and Chicago that salvage and clean used brick. It has an extensive network of local demolition contractors who use their service.
- One local demolition contractor sees a benefit in using small deconstruction subcontractors such as REEHouse to offset the cost of waste disposal.

Labor Source

- REEHouse, a deconstruction contractor, trains inner city residents in deconstruction through a partnership with the Wisconsin Conservation Corps. REEHouse has a full-time deconstruction crew in addition to the trainees. The Wisconsin Department of Corrections, neighborhood non-profit organizations and the city, provide additional assistance to this program.
- Habitat for Humanity volunteers achieve “sweat equity” through volunteer deconstruction projects sponsored by HomeSource.
- One salvage operation has approximately 10 pickers who are paid per 1000 brick, cleaned and stored.
- Another building salvage company pays the crews on an hourly basis. They normally maintain a crew of 3 with larger jobs increasing to 14 workers.

Detailed Building Assessment

A detailed building assessment was not performed on this trip.

Milwaukee, Wisconsin – August 7-11, 2000

Purpose

Members of the NAHB Research Center visited the city of Milwaukee to identify four key elements required for deconstruction within a particular region or locality. The key elements were:

- used building material source,
- used building material market,
- deconstruction business structure, and
- labor source.

References

- Milwaukee Community Service Corps (MCSC) Packet.
- REEHouse HUD Best Practices 2000 Nomination.
- HOPE VI drawings and photographs from Housing Authority of the City of Milwaukee (HACM).
- House specifications and brochure from Glenville Timberwrights.
- Publication: Youth Corps: Promising Strategies for Young People and Their Communities (ABT Associates, Inc., 1997).
- HACM and MCSC step-up Program
- Wisconsin Conservation Corp: Corps News Release – September 1999.

Contacts

Personal interviews and discussions were conducted with the following representatives:

Wisconsin State Office of HUD Community Planning and Development Division

Marcia Bergenson, Senior Community Planning and Development
Representative
Dale Darrow, Community Builder
Michael Martin, Community Builder
Jerry Wilholt, Community Builder
David Balcer, Community Builder
Caroline Clayton, Field Management Assistant

Community Development Corporations

Sherman Hill, Harambee Ombudsman Project, Inc.
Howard Snyder, Northwest Side Community Development Corporation

Workforce Training Programs

Antonio Perez, Milwaukee Community Service Corps
Kathy Markwiese, Private Industry Council/Workforce Development Board
Narcarci Feaster, Laborers Local No. 113
Wisconsin Laborers District Council

Housing Authority of the City of Milwaukee

Antonio Perez, Executive Director
David Flores, Senior Administrative Specialist

Architects

Joel Krueger, Kubala Washatko Architects
Lou Host-Jablonski, Design Coalition

Builder

Tom Holmes, Glenville Timberwrights

City of Milwaukee

Ronald W. Roberts, Department of Neighborhood Services
Karen Taylor, Department of City Development

University of Wisconsin

Welford G. Sanders, Adjunct Assistant Professor

Deconstruction Contractors

Herbert Simmons, REEHouse
Pete Gaitan, Architectural Antiques and Salvage
Tim Hanson, Salvage Heaven

Demolition Contractors

Henry R. Marohl Inc.
Deconstruction, Inc.

Restoration Contractors

Jen-Chris Company
Cream City Building Restoration Company

Several characteristics to the Milwaukee area were identified, including:

- a consistent concern for the existing used building material market over competition and material availability,
- conflict between a non-profit sponsored deconstruction company and private salvage companies,
- many abandoned inner city houses and lead-based paint poisoning cases, and
- an extensive network of non-profits operating in the city.

Key Observations

Used Building Material Source

- Lead-based paint (LBP) is very common on all types of buildings in Milwaukee.
- LBP is a major issue in Milwaukee and the city has one of the highest lead poisoning rates in the country. Any method of incorporating lead-paint control methods with deconstruction or building material reuse would be of great interest to HUD.
- President's council on lead has made lead hazard control policies a major priority in the next ten years. Money for lead hazard control has increased while rehabilitation of inner city housing has decreased by 1/2 to 1/3 due to a shift in priorities.
- Milwaukee housing stock has undergone a rapid deterioration, especially on the North side of the city. Typical housing structures in this area are 2-3000 square feet.
- Currently the rate of housing abandonment has stabilized in Milwaukee.
- At least one architect stated that it was not difficult to obtain used building materials for use in construction.
- One timberwright uses mainly recovered Douglass fir. Gets material from Chicago industrial warehouses that were constructed with post and beam. Material arrives by semi-load in 15,000-18,000 board feet range.
- A professor involved in the REEHouse project, noted that out of 500 houses released for demolition by the city, only 20% had materials in good enough condition for reuse to make deconstruction feasible when considering the labor and processing time involved. He also stated that commercial demolition projects are a better source for material. In some of the wealthier areas of the city, smaller houses are being "torn down" to be replaced by new and larger houses. These "tear-downs" are a better source of salvageable material than the condemned or foreclosed properties released by the city.
- One building salvage contractor stated that the most valuable properties are Department of Defense and State-owned properties. Public housing was described as having materials with low resale value.

Used Building Material Market

- Wisconsin is now importing waste due to lower landfill fees. These lower landfill fees lower the incentive for building salvage.
- One salvage contractor stated that 75% of demolition companies perform salvage, including wood and brick.
- In a discussion with REEHouse demonstration project participants, a strong concern was raised over the interchangeability of the terms “building salvage” and “deconstruction”. Building salvage was described as “opportunistic endeavor” versus deconstruction as “holistic approach”. One participant elaborated on the concern with salvage companies seemingly exploiting workers with temporary, low wage work. Labor rates for deconstruction (REEHouse) are kept low through publicly funded workforce development training programs.
- Several building salvage contractors we contacted reacted negatively to the idea of deconstruction as being different than building salvage and instead discussed deconstruction as pre-1970’s manual demolition. A concern was raised over non-profit supported deconstruction firms threatening an existing established private sector market that has limited room for expansion.
- One salvage operation states that buildings from the 40’s-60’s are mediocre in the salvage value, however, they can be called the bread and butter of the industry. 45% of the buildings he works on are residential. Value items for resale include timbers, brick, and architectural antiques. Windows have minor resale value. Cabinets constructed prior to 1930 are valuable.
- Pre-1940 buildings have more value and historical preservation increases the resale market.
- Building material salvage of wood, bricks, doors, windows, etc. is not a ready market like scrap steel. One contractor feels that the market has not yet reached its potential. Customers for recovered material range from remodelers, restoration contractors, homeowners, historical groups, artists, and architects.
- One salvage contractor plans to open a retail store in Chicago and sees it as more profitable than selling on-site or negotiating with existing salvage retail operations. Sees the Internet (uses E-bay as an example) as good for awareness but lowering the value of recovered material through cheaper prices.
- Safety and liability issues add to the cost of recovering material and thereby affect pricing of the material.
- Both building salvage contractors and deconstruction firms recover structural members of the properties. Recovery of non-structural material depends on the market and access to a retail operation.
- According to one demolition contractor, most demo contractors do not have their crews perform salvage due to time and cost; instead, individuals or ‘salvage companies’ take materials. Steel, brick, masonry and soft-stripped material salvage stays mostly in Milwaukee, while wood salvage goes all over the place.
- One demolition contractor stated that he has not seen an efficient building salvage (deconstruction) company that can operate profitably due to the nature of the market. This contractor was aware of many of the building salvage operators we had contacted and mentioned that there were probably three others

that he knew of. Would not provide names of these firms due to a concern that other demolition firms would find out who he was using.

- Factors operating against efficiency in this market are: (1) labor and overhead costs for building material removal, transportation, processing, and storage; (2) strong competition from individuals, and small companies (including antique shops); (3) fixed prices for reused materials, and; (4) an inconsistent supply of building materials.
- One HUD community developer discussed historical preservation as a leverage to increase reuse.
- The development of minority retail operations that could sell used lumber and compete effectively with the large chains (or become a specialty supplier to them) was also mentioned in a meeting with the Wisconsin HUD office.
- One architect with Kubala Washatko Architects stated that Milwaukee has a consistent market for architectural artifacts. He also stated that it is not difficult to find material either in Milwaukee or on the Internet. Historical renovation and preservation of commercial properties is a large market for the firm. Projects that have used recovered materials include the Harley-Davidson Museum, Brewers Hill Bed and Breakfast, and revitalization work in the Third Ward of Milwaukee.
- From an architects perspective the reuse of building material has four issues:
 - clients perspective
 - project type (hospitals no, hospitality yes)
 - budget
 - schedule
- Based on Kubala Washatko Architects experience, the following list describes the customer market for used building materials:
Used building material with the best appeal to clients:
 - wood
 - structural members
 - masonry, brick
 - wood flooring
 - toilets
 - light fixtures
 - doorsUsed building materials with low appeal to clients:
 - glass
 - windows
 - carpet
 - hardware
- A timberwright sells used wood cut-offs to other remodeling contractors for their projects. Materials also sold are case molding, stringers, stair treads, and spindles.
- Glenville Timberwrights builds 8-10 houses a year using recovered wood. Most of these houses sell in the \$250,000-\$300,000 range. Recovered wood is re-

milled into 6x9's and 6x12's for constructing timberframe units known as 'bents'.

- In Ontario, Wisconsin there is a mill that turns 1" boards into softwood flooring. They sell this material for approximately \$2.25 per square foot (not installed). This material is good for low traffic areas and some finishes can increase the durability of the floor.
- REEHouse is a deconstruction firm with non-profit support. It is deconstructing residential and commercial properties in the inner city of Milwaukee, providing training to at-risk individuals and reusing the material in the rehabilitation of existing housing and construction of new infill housing.
- REEHouse is constructing houses designed by Design Coalition, Inc. out of Madison, Wisconsin that use Larsen wall trusses created out of recovered wood. A component of their rehabilitation and house construction work is oriented toward housing for the disabled (this was identified as a need in the community). The houses have been designed for energy efficiency and sustainability.

Deconstruction Business Structure

- REEHouse Company has been nominated for the 2000 HUD Best Practices.
- A discussion with the Wisconsin HUD office raised a potential scenario that could include elements of both CBDG, Urban Main Street, deconstruction of abandoned properties, lead hazard control, rehabilitation and job training.
- The Wisconsin HUD office raised the following points:
 - Milwaukee does not fund micro-enterprises (such as REEHouse) directly; instead non-profits are funded as incubators.
 - The effective method of funding programs through local governments or through a national approach is subject to debate.
 - Credits can be provided to communities that deconstruct, allowing more time for non-profits to perform this work.
- One issue is that small private companies perceive a negative impact from public/private ventures into deconstruction/building salvage market by losing material that they are currently gleaning from condemned properties. Competition between non-profits and private companies was raised by many organizations and companies encountered in the Milwaukee area.
- According to one REEHouse participant, there are four main options for REEHouse with regards to deconstruction:
 - deconstruction services with worker training,
 - processing recovered material and reuse material in new homebuilding,
 - processing recovered material and reuse material in remodeling, and
 - selling used building materials.
- REEHouse pays an operating engineer to take care of the foundations for buildings they deconstruct.
- REEHouse has received \$150,000 grant from the Wisconsin Department of Natural Resources (DNR). The Wisconsin DNR will develop a Guidebook to Deconstruction based in part on the REEHouse demonstration project (expected to be released in 2001).

- One timberwright hires a crew of 8-9 people to de-nail the wood material they receive from a salvage broker. De-nailing is performed approximately two weeks out of the year (major shipments of wood usually last six months).
- One contractor has been manually dismantling buildings and recovering materials for 13 years. Demolition contractors provide him with 2 weeks to a month to recover material. This contractor states that 80% of buildings could be recycled or recovered.
- Storage space and time are major issues. One contractor sees a benefit in giving credit for deconstruction over conventional demolition (sees his company as a deconstruction company). States that experienced manual demolition workers are rare, but their techniques are 40% more effective than start up companies.
- According to one contractor, the first step that the government should take is to expand the supply of buildings for deconstruction. He also stated that it makes sense to develop a partnership between existing building salvage companies and non-profit sponsored deconstruction firms.

Labor Source

- 60-70 nonprofits receive funding through the City's Neighborhood Strategic Plan (NSP). Job training, youth training, community organizing, neighborhood minor rehabilitation and housing programs receive funding through the NSP.
- The Wisconsin HUD office discussed the following as important aspects concerning deconstruction training:
 - Deconstruction is seen as being effective as a job readiness training mechanism. YouthBuild was cited as an example.
 - Youth training programs could include refinishing the material (lead removal, de-nailing, dimension changes) to meet code or demand.
 - Deconstruction training could serve as pre-apprenticeship training with construction unions. Milwaukee is a strong union town.
- REEHouse is interested in the Fresh Start project concept (work based GED program for at-risk youth ages 16-24):
 - Will use 8-10 individuals at a time.
 - Fresh Start will allow the individual to re-up (similar to YouthBuild).
 - Will serve as a resource to place individuals in new jobs.
 - Will use deconstruction as a stepping stone to carpentry and other construction skills.
- Approximately 15 people have been trained through REEHouse.
- Milwaukee Community Service Corps uses a work-to-school program for youth ages 18-24 that enrolls students in quarterly to one-year terms of service. MCSC uses grant funds to leverage their programs including AmeriCorps, EPA Brownfields Remediation Job Training Programs, Youthbuild, Youth Apprenticeship program and the Wisconsin Fresh Start program. Over the last 10 years MCSC has hired 980 youths in their program. MCSC public work projects have been valued at \$8,380,000. The MCSC executive director believes that deconstruction fits the mission of the Corps and has discussed incorporating deconstruction in the Fresh Start program with Welford Sanders of REEHouse.

- The following needs were identified for MCSC to become involved in deconstruction activities:
 - Education and technical assistance – MCSC needs a deconstruction outreach workshop to raise awareness of the benefits of deconstruction. MCSC develops programs at the request of various community foundations. Currently, these funding organizations have little to no knowledge of deconstruction. MCSC needs assistance in being able to “sell” deconstruction as a community development program to the foundations that support them. In addition, MCSC project managers need training on how to run a deconstruction project.
 - Funding for deconstruction infrastructure requirements such as warehouse space to store tools and materials.
 - Funding to pick up any additional program costs.
- The former director of MCSC states that there needs to be a greater awareness from potential participants in a deconstruction-related project:
 - What you are going to do with the salvaged material?
 - Where it is going to be reused?
 - How are the materials going to be stored until the reuse?
- In addition, a concern was raised over the deconstruction of residential units where it may affect the stock of affordable housing. One scenario that may be effective is the reuse of material in the rehabilitation of the inner city housing stock or the creation of new infill housing. From a public housing perspective-large demolition projects could incorporate deconstruction as a means to provide a large quantity of material to the market and utilize resident employment through Section 3.
- Private Industry Council (PIC) is now the Workforce Development Board (WDB) for Milwaukee.
- Typically, training for construction (trades) has occurred through three methods:
 - customized skills training (job readiness, life skills),
 - OJT contract – has to be employed during training (assumed job readiness) with a minimum wage of \$8.00 or whatever is greater, and
 - individual training accounts - training vendor.
- There is a concern with the seasonal and transient nature of construction for job training programs. Under the Workforce Investment Act, retention is the top priority and is measured by employment for a minimum of six months.
- Laborers Local 113 developed a Public Housing Apprenticeship Demonstration Program in the Construction Trades that incorporated deconstruction into this program with MCSC as part of a HOPE VI initiative. The thirty day program with pre-employment preparation, trade classes and hands-on activities included support services such as bus passes, child care, and GED prep as well as job placement with union contractors, non-profit housing agencies or other private contractors. Deconstruction was utilized along with housing rehabilitation. 20 students were brought into the program with 4 now currently working in the Laborers trade. The District Council of the Wisconsin Laborers was unaware of

deconstruction activities but receptive to the concept of combining this with pre-apprenticeship.

Detailed Building Assessment

Research Center staff performed building assessments of three houses slated for demolition. Two single-family houses were inspected; both were constructed in the early 1900's. A large duplex unit constructed in 1907 was also inspected. The houses ranged in size from 900–2500 square feet with front porch extensions. All of the homes were wood-frame constructed. All homes had some form of wood flooring. Some exhibited custom built-in cabinetry and casing work.

It is also important to note that the housing in Milwaukee exhibits a strong European architectural influence, including Polish flats and German duplexes with two-family occupancy and separate entrances. From a deconstruction standpoint, the wall and roof systems in most of the older homes may provide considerably more wood [larger dimensional sizes] due to their structural design and the aspect of climate. Building assessments of Milwaukee housing revealed a large amount of dimensional lumber in good condition.

Salvageable components in these houses would include dimensional lumber, wood sheathing and flooring, solid wood staircases and banisters, doors, windows, hardware and fixtures. All of the original lumber appeared to be in good condition. Antique features such as turn-of-the-century door handles and bath furnishings were noted.

Common characteristics found in the assessed houses were:

Exterior Walls – 2x4 and 2x6 rough sawn wood-framed (true-dimensional) construction. Exterior finishes included wood lathe and traditional stucco, wood sheathing or wood clapboard. Additional finishes applied over these included fiberboard siding, imitation brick asphalt shingles or vinyl siding.

Floor Assemblies – Wood floor joists, 2x10 or 2x12, rough sawn and true dimensional. A variety of wood flooring (hardwood and yellow pine) was installed, and in various widths. Bathrooms had tile or vinyl floors. Attic floors were finished with 1x6 wood planks.

Interior Walls and Ceilings – 2x4 or 2x6 true dimensional rough sawn wood partition walls, wood lathe and plaster on walls and ceilings. Imitation wood paneling installed over the plaster walls was found in one house.

Roof Systems – Wood rafter (2x6, 2x10 or 2x12) structural system, with dormers. Asphalt shingles over various widths of wood sheathing.

Finish Materials – Solid wood paneled doors, leg tubs, cabinets, antique hardware, wood and metal-framed windows and solid wood staircases.

Nashville, Tennessee – June 19-21, 2000

Purpose

Members of the NAHB Research Center visited the city of Nashville to identify four key elements required for deconstruction within a particular region or locality. The key elements were:

- used building material source,
- used building material market,
- deconstruction business structure, and
- labor source.

References

- Nashville Deconstruction Contacts
- Nashville Comprehensive Task List
- Nashville Deconstruction Field Notes
- Report on Community Service Workers Productivity at the Re-Use Center, Nashville Re-Use Center
- Community Service Workers Handbook, Nashville Re-Use Center
- C&D Debris Recycling Feasibility Study for MDHA Hope VI Project
- Housing Market Analysis, Nashville, TN, MDHA
- Consolidated Plan for Housing & Community Development, MDHA, Feb 2000

Contacts

Personal interviews and discussions were conducted with the following representatives:

Public Housing Administrators

Mike Clinard, Hope VI Director

Paul Johnson, Assistant Director for Community Development

Re-Use Center, Nashville Non-Profit Recycler

David Hamilton, Director

Used Building Material Dealers

Charles Evans, Hailey Salvage

John Poses III, Hailey Salvage

Deconstruction Contractors

Walter Odom, Southeastern Maintenance Company

Metro Historical Commission

Bill Kelley, Historic Zoning Administrator

Demolition and Recycling Contractors

Tiffany Wilmot, Wilmot & Associates, Inc.

Rochelle Center, Training & Housing for Mentally Disabled
Paul Medlin, Executive Director

Used Building Material Source

- A Nashville housing ‘windshield’ survey prepared by the MDHA showed that out of 2,439 structures surveyed, only 11.9 percent had major deficiencies and 2.6 percent were considered to be dilapidated.
- It is estimated that approximately 80,000 housing units in Nashville-Davidson County may contain a lead based paint hazard. This number represents approximately one-third of the estimated 229,000 housing units in Nashville-Davidson County in 1990.
- An established used building material operation, receives the bulk of their materials from small demolition contractors, auctions, individuals performing remodeling and “scrappers.”
- “Lots of theft involved with building salvage. Once a house or building goes vacant, it gets cleaned out.”
- Language written into demolition contracts typically gives contractor “rights to all materials.”
- Wilmont & Associates:
 - does not allow employees or other individuals to take away valued salvage;
 - Nashville Stadium project: estimated a loss of \$80,000 due to vagrant salvaging; and
 - homeless people and other individuals remove large amounts of salvage, especially from abandoned properties.
- Must use older brick – hand made – in historical renovations.

Used Building Material Market

- Large demand for older doors, architectural artifacts and used brick in the Nashville area.
- Architects in California have a preference for large wooden beams.
- Sought after wood from Nashville includes oak and heart pine. Flooring companies have an interest in these species.
- One salvage operation estimates total revenue at \$500,000 a year.
- Metro Historical Commission – no knowledge of organized effort (large-scale) re-use of used building materials.
- Property managers buy significant amounts of used materials. Haileys Salvage reports that some of their property management customers have 30-day accounts.
- Some investors look to purchase and renovate older buildings and use them for Section 8 rentals.
- One salvage operation has some materials that have been sitting in storage for decades. Much of the material is hard to reach or not accessible at all.
- A non-profit used building material retail operation has the following customer breakdown:

- desperately poor, mothers with children – basically gives away – 5%
- churches, schools, non-profits – 10%
- remodelers, contractors – 50%
- rental property owners/managers – 10%
- homeowners – 20%
- artists, craftspeople – 5%

Deconstruction Business Structure

- One non-profit used building material retail operation:
 - is dedicated to reducing the waste of reusable building materials, and to provide quality used building materials to low income families, churches and schools;
 - is located next to railroad tracks and close to public housing;
 - reconditions appliances and has a tool loaner program;
 - states that performing deconstruction would require another supervisor and additional funding; and
 - discussed training possibilities that include leadership, inventory and mechanical skills.
- One salvage company pays laborers “off-the-street” 5¢ a brick to clean and stack. He employs only several people full time that basically just “sell and load.” Not much organization or inventory control.
- One demolition company performs deconstruction to offset the cost of buying new building materials. Uses older lumber for shoring purposes and plywood to protect road surfaces from heavy equipment use.
- One demolition company uses Internet to sell material. Thinks Internet will have a significant impact on the salvage and demolition industry in the next ten years.
- A feasibility study for the recycling and reuse of demolition materials was performed for an MDHA Hope IV redevelopment project. This report recommends cleaning and resale of unbroken brick using experienced brick cleaners or “welfare-to-work” trainees that are supervised. Recycling was seen as the most cost effective option for wood, metals, asphalt and concrete.
- The perception exists that the code department will not allow used building materials in new construction.
- MDHA does strip-out some material from their sites prior to demolition. Pulls out furnaces and other materials to maintain units.

Labor Source

- A non-profit organization relies on community service workers and volunteers to provide manpower.
- Contractors oppose being involved with training due to liability issues.
- MHDA is involved with HBI for training in new construction. HBI and contractors prefer single-family houses for training purposes. Could subsidize more training with HUD funding.

- New construction is declining as a result of rising interest rates. If this continues, skilled workers may have to take “what they can get” and take-on lesser skilled jobs.
- Wilmot & Associates:
 - does not see training as feasible due to cost effectiveness. Would perform deconstruction training if the program was made to be cost effective;
 - believes there may be an opportunity for training in “sorting” or inventory control of used materials; and
 - training possibilities for lead paint and asbestos abatement.

Detailed Building Assessment

A detailed building assessment was not performed on this trip.

Nashville, Tennessee – Aug 28–Sep 1, 2000

Purpose

Members of the NAHB Research Center visited the city of Nashville to identify four key elements required for deconstruction within a particular region or locality. The key elements were:

- used building material source,
- used building material market,
- deconstruction business structure, and
- labor source.

References

- Affordable Housing Resources, Inc. Packet
- Statements, Policies and Plan Documents Relevant to Deconstruction, Metro Planning Commission
- Nashville Labor Market Report, 1999, Nashville Career Advancement Center
- Middle Tennessee Career Center Packet
- Historic Zoning District Handbook and Design Guidelines, Metro Historic Zoning Commission
- Second Avenue Design Guidelines, Metro Historic Zoning Commission
- Historic Sites of Nashville and Davidson County, Metro Historic Zoning Commission

Contacts

Personal interviews and discussions were conducted with the following representatives:

Metropolitan Planning Commission

Karen P. Nicely, Assistant Executive Director

Metropolitan Development and Housing Agency

Ed Shewmaker, Modernization Coordinator

Joseph B. Cain, Senior Real Estate Officer

Metropolitan Government of Nashville and Davidson County

Robert L. Ramsey, Building Inspection Chief, Department of Codes
Administration

W. Tim Walker, Metropolitan Historic Zoning Commission

Community Development Corporations

Steve Neighbors, Affordable Housing Resources, Inc.

Travis Provencher, Affordable Housing Resources, Inc.

Michael G. Whalen, Senior Vice President, Bank of America

Nashville Career Advancement Center

Pearl Sims, Middle Tennessee Career Center

Demolition and Recycling Contractors

Bill Sauve, Mid-South Wrecking Company, Inc.

Gary J. Lang, P.E., Lang Environmental Services

Aegis Environmental, Inc.

Matthew T. Oddo, President

Used Building Material Dealers

Chad Cline, Union Station Brick and Materials Company

Judith Hailey, Hailey New & Used Building Material

Jodie Orman, Riverside Antiques

Several key characteristics to the Nashville area were identified, such as: a tight housing market, a shortage of affordable housing, a 3% unemployment rate, and a move to preserve their existing housing stock.

Used Building Material Source

- The Metropolitan Planning Commission is in a “Preservation” mode. Goal is to preserve existing housing stock. This attitude will limit demolition efforts and affect the supply (stock) of older buildings and material available for deconstruction.
- Nashville Metropolitan Historic Zoning Commission said there is a move to create more historical conservation districts. The Historic Commissions position is “repair before replace.”
- The source for used brick is dwindling in Nashville. Some brick was recovered after the tornado damage. Much of the used brick is currently coming from other cities, such as Chattanooga.
- The Affordable Housing Resource group retains as much original material as possible when renovating homes. This helps to minimize cost. Material is only replaced if unusable, such as termite, fire or water damage. Windows are usually replaced with energy efficient replicas—same dimension as original.
- Designating a property “Historic” protects property value.
- Many homes built between 1900-1930 still exist in the inner city.
- Very few brick residential rowhouses in Nashville.

- Brick walls in old commercial buildings and factories are sometimes up to 8 courses deep.
- One salvage operation is considering liquidating and closing down. Cited a bad location for the store and said, “demo has dried-up around here.” Competition from larger local demolition contractors “who act as brokers” was also a factor. Opinion was that cities like Detroit, St. Louis and Atlanta are better resources for demolition work.
- Affordable Housing Resources, Inc. said that the process to identify owners or heirs of abandoned property is lengthy. After condemnation, it usually takes 2-3 years before actual demolition occurs. Opinion was that the codes department makes it easy to comply with codes. Abandoned property can remain standing and unoccupied as long as it is boarded-up.
- Termite damage is a problem in Davidson County.
- Most used brick out of Nashville comes from industrial and commercial sites, not from residential “tear-downs.”
- A demolition contractor stated, “The amount of used brick recovered from Nashville demolition projects has dramatically dropped over the last year.”
- “Bungalows” are the most common housing design found in Nashville.

Used Building Material Market

- Large demand for used brick. Used brick is very popular with builders. Used brick is being sold to contractors for use in new home construction.
- One local demolition contractor, with an estimated $\frac{3}{4}$ of a million used brick, said he could sell all of them to an outside broker “today,” but prefers to keep them for local customers to use within the city.
- He also explained that by pushing brick to the outside or perimeter of a structure during demolition minimizes mixing it with other debris, reducing the time necessary for recovery. He said that knowledgeable demolition contractors know how to selectively dismantle a building for maximum salvage. In his opinion some contractors don’t know what they’re doing and just “go in and knock it down.”
- Used brick is expensive. Used brick is \$400-450 per 1000 versus new brick at approximately \$250/1000. Hand-made used brick is selling for one dollar per brick. One brick distributor receives brick wall samples from demolished buildings in other cities before buying their brick in bulk.
- Historical Commission refers owners and contractors to Hailey Salvage and the Re-Use center for older material.
- Codes department follows SBC 1997. Nashville and Davidson County Department of Codes Administration said the residential buildings in Nashville are exclusively (98%) wood frame construction (2x4 walls). The rest of the residential sites are masonry.
- Used lumber accepted by code officials in new construction or rehab. Must be identifiable–grade stamped. Used hardwood floors do not need to be certified. Structural work requires a permit.
- Older dimensional rough-sawn wood is often used to match-up with the original wall and floor systems in renovation work on older homes.

- Historical property value is actually reduced by using material other than period correct. One example is placing vinyl siding over original wood clapboard.
- One salvage operation said property owners (low-income housing landlords) used to be her biggest client.

Deconstruction Business Structure

- One brick salvage operation commented that transporting bundled used brick by truck is preferred over transporting it by rail. Rail transportation provides a rougher ride, which tends to increase the risk for damaged brick and its packaging.
- Abundance of small “mom-and-pop” antique shops in the Nashville area. Individuals off the street, “Pickers,” supply/provide some materials. Much of the antique ornamental and architectural material is found outside of Davidson County.
- One salvage operation was originally created as a result of the abundance of used material from buildings removed during Interstate road construction in the 60’s and 70’s.
- One renovation group incorporates used building materials into their renovations. They will shop at the local salvage stores. Many of their renovations require historic replication. Some of the materials are replicated in their shop. Any excess used materials removed during the renovation are saved and re-circulated from job-to-job. Used materials removed from one job are often used on future renovations.
- MDHA would like to see long term goals. New administrations and political agenda effect consistency at both Federal and local levels.
- Issues that create limitations to deconstruction activity:
 - environmental concerns including lead-based paint and asbestos found in buildings constructed before 1981,
 - budget and timeframe constraints, and
 - concern with receiving an effective return on investment with deconstruction increasing the up-front costs of property redevelopment.
- Discussions with MDHA, demolition, and abatement contractors brought up the need for a greater communication of lead and asbestos regulations and their enforcement by architects, code and government officials.
- One contractor stated, “Usually, a contractor has only two weeks to respond between an RFP, “bid out,” and the deadline for submission.” In his opinion, that’s not a sufficient amount of time to identify a market for the salvage material.”
- Nashville and Davidson County Department of Codes Administration stated that: “Time constraints and cost play a role in limiting deconstruction activity in Nashville.”
- Nashville is actively engaging non-profits, private for-profits and lending institutions to help finance and redevelop blighted areas. The focus is on affordable housing and community development.
- A large financial lending institution:
 - targets inner city,

- purchases distressed properties,
- for-profit Community Development Corporation, partners with local government;
- makes funding available so that non-profits are not reliant on grant money,
- attempts to salvage materials off of redevelopment projects; donates the material to charitable organizations, such as the Salvation Army. As an example: made available several single-family houses to any non-profit organization that was interested. The houses had to be removed off the redevelopment site and the site had to be brought back to grade. One non-profit organization expressed an interest in the houses but was unable to remove them within a reasonable time-frame because:
 - the organization did not have, and could not find, the land to move the houses to; and
 - the organization did not have the capacity to do the work.

Labor Source

- High Tech companies such as Dell and Hewlett Packard are moving into Nashville, creating a demand for technology based jobs and training.
- Nashville is experiencing 3% unemployment.
- Due to the labor shortage job seekers can pick and choose. One comment, “What is a job seeker going to choose, an air-conditioned office job at \$9/hr or a hard labor job at \$9/hr working outside.”
- One workforce training group suggested getting people into construction via high skills and high wages “quickly,” instead of taking 4 years to get people into higher wage jobs.
- The Affordable Housing Resource group employs workers from MDHA training programs (HBI). The workers are involved with renovating older houses. Renovating older homes requires deconstruction, demolition, replication (creating new pieces to match) and new construction (additions to old).
- Response from demolition and abatement contractors interviewed, on training:
 - Sounds good in theory. Realistically - doesn’t work due to:
 - individuals work a couple of days, and then leave for another higher paying job, and
 - fraudulent workers comp claims.
- One contractor commented on how expensive it is to train and “certify” abatement workers. He said that his cost was approximately \$1,200 to train, certify and insure each worker. He favors a T&M (time and material) component in contracts that include training scenarios. A T&M component would compensate for any “low productivity” from trainees.
- One salvage operation does not think deconstruction training is feasible. “It’s ‘grunt’ work.” Reasoning is that deconstruction, and demolition, are very labor intensive and the work is sporadic.
- Cleaning brick is very labor intensive and not skill-based.

Detailed Building Assessment

Members of the Research Center performed a building assessment of a 1500 sq. ft. single-family, one-story, Victorian home undergoing a “gut-rehab.” The home was dated to approximately 1850-1880, and represented many of the homes built in Nashville of that era. The property was wood-frame constructed, had three fireplaces, and showed signs of termite and water damage. It was built over a crawlspace, and was originally supported with rectangular locust posts buried 6 ft. into the ground. Due to extensive termite and water damage of the wood foundation, Travis Provencher, with the Affordable Housing Group, jacked-up the house and replaced the bottom support plates with pressure-treated lumber. The house was then lowered onto a new perimeter block foundation. Many of the original components, such as the brick chimney top and front porch supports were replaced or reconstructed with used brick.

4810 Illinois Avenue

Exterior Walls – 2x4 rough-sawn (true-dimensional) oak wood-frame construction. The exterior finish included asbestos shingles over the original 1x6 Tulip Poplar clapboards.

Floor Assemblies – 1x4 T&G Pine over 2x8 rough-sawn (true-dimensional) floor joists.

Interior Walls and Ceilings – 2x4 (oak) interior partition walls. 2x6 (oak) ceiling joist, both rough-sawn and true dimensional. The original interior finish was wood lathe and plaster.

Roof System – 2x6 (oak) rough-sawn true dimensional rafter system. One-by-four wood sheathing covered with asphalt shingles. The original roof consisted of 16" cedar shakes over 1x4 purlins.

Foundation – The house was original supported with 4x6 locust posts. The new foundation consists of aggregate blocks simulated to look like cut stone.

Finish Materials – Solid wood paneled doors, antique hardware and trim work, fireplace mantles.

Salvageable components in this house would include dimensional oak lumber, wood sheathing and flooring, brick, antique mantles, trim work, doors, hardware and fixtures.

APPENDIX G: LARSEN ENERGY WALL TRUSS SYSTEM

REEHouse is constructing houses designed by Design Coalition, Inc. out of Madison, Wisconsin that use Larsen wall trusses created out of recovered wood. Additional information on the Larsen energy wall truss system is available from the Design Coalition, Inc. website at www.designcoalition.org. A component of their rehabilitation and house construction work is oriented toward housing for the disabled (this was identified as a need in the community). The houses have been designed for energy efficiency and sustainability. A local community block development grantee has been nominated for the 2000 HUD Best Practices for their work with REEHouse, Inc. (For more information, see the Best Practices website at <http://bpkms.hud.gov/po/i/bpkms>.)

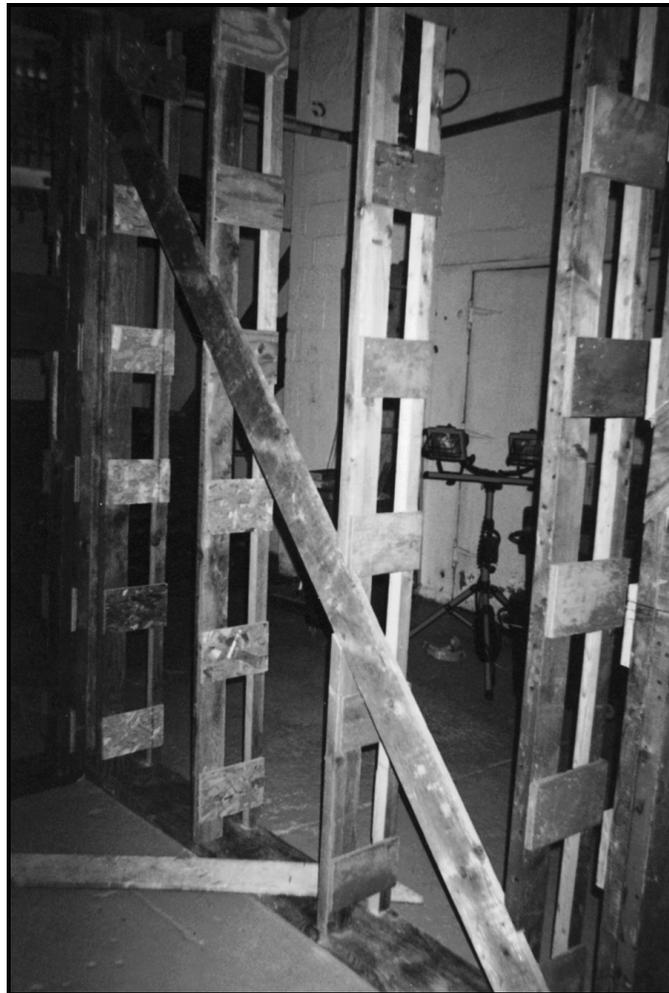


Figure G-1. Larsen energy wall systems constructed by REEHouse

