NAHB RESEARCH FOUNDATION, INC.

Prepared for
U.S. Department of Housing and Urban Development
Office of Policy Development and Research

The Affordable Housing Demonstration

a Case Study

Crittenden County Arkansas

The Joint Venture for Affordable Housing

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Crittenden County, Arkansas

Prepared for:
U.S. Department of
Housing and Urban Development

By:
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P.O. Box 1627
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Summary

The success of the Affordable Housing Demonstration Program depends on the ability of participating builders and local governments to build housing at lower costs through innovative construction methods and reduced regulation. Lessons learned in individual projects are then transferred to other communities and builders throughout the country. In order for this process to work effectively, selecting builders and communities with a commitment to reduced housing costs is a key element.

Rex Rogers, a builder from Marion, Arkansas, is nationally recognized for innovative building techniques. Crittenden County is a community eager to contain housing costs. The builder, the county, and state regulatory interests joined in the creation of Harvard Yard, an attractive and affordable subdivision.

The project, Harvard Yard, consists of 104 units on 12.52 acres. Unit size ranges from a 504-square-foot efficiency model to a 968-square-foot model with three bedrooms and two bathrooms. Prices range from $26,885 to $35,040. The available options include loft space which varies depending on the model from 384 square feet to 528 square feet.

Construction costs were reduced through efficient design. Exterior framing was in two-foot modules to take advantage of material dimensions and to reduce scrap, waste, and labor. Plumbing was clustered to reduce the lengths of supply, drain, waste, and vent piping. Electrical wiring was installed to code, but care was taken to minimize circuits, outlets and switches. The Federal Housing Administration (FHA) allowed some modifications of the HUD Minimum Property Standards which further reduced direct construction costs. Taken together, these modifications resulted in cost savings of $1,505 per unit.

The regulatory variances allowed by the State and Crittenden County coupled with Rogers's innovative land development techniques resulted in a project savings of $498,096 or $4,789 per unit. When added to the direct construction savings, the total savings per unit were $6,294, approximately 20 percent of the average selling price.

Preface

THE SECRETARY OF HOUSING AND URBAN DEVELOPMENT
WASHINGTON, D.C. 20410

In January 1982 I announced the formation of the Joint Venture for Affordable Housing, a public-private partnership established to combat the problem of high housing costs. The President's Commission on Housing and the HUD Task Force on Affordable Housing both found that this problem results largely from outdated and unnecessary building and land use regulations.

One of the most important elements of the Joint Venture program is the series of affordable housing demonstrations now under way in twenty States. These demonstrations are being carried out through the cooperative efforts of builders, developers, and local officials to show how regulatory reform can cut housing costs.

This case study reports on one of the first group of demonstration projects to have units ready for sale. Each project has its own story to tell. The individual case studies describe various ways that innovative site planning and development, and new methods and materials of construction, have cut the cost of the demonstration housing by as much as twenty percent. I urge you to read these studies and to use the ideas described in them to reduce the cost of housing in your communities. It can be done ... we've proved it!

Very sincerely yours,

Samuel R. Pierce, Jr.

The Joint Venture for Affordable Housing

Housing costs have risen dramatically in recent years, so that many people have been unable to buy a home. Part of this cost increase was due to the high rate of interest on home mortgages, which reached almost 20 percent in some areas of the country before dropping under 14 percent in 1983.

A large part of the increase, however, was due to other factors -- inflation in the cost of materials and labor, a reduction in the amount of land available for housing which has drastically increased lot prices, and changes in market patterns leading to larger homes on larger lots. Recent studies by the President's Commission on Housing and by a special U.S. Department of Housing and Urban Development (HUD) Task Force on Housing Costs confirm the findings of earlier studies which show that ways exist to cut the cost of housing, if they are used. Too often, these studies show, out-of-date regulations and building practices prevent these ideas from being applied. In fact, the studies pointed out that many builders and local officials do not even know about many of the ways that exist to reduce housing costs.

The Joint Venture for Affordable Housing was initiated by HUD Secretary Samuel R. Pierce, Jr., to correct this situation. Since affordable housing is a problem which involves all levels of government as well as the rest of the housing industry, finding an answer requires the participation of all of these elements. The Joint Venture, therefore, is a real partnership of the following organizations, all of whom have an interest in making housing more affordable:

American Planning Association
Council of State Community Affairs Agencies
International City Management Association
National Association of Counties
National Conference of State Legislatures
National Governors' Association
Urban Land Institute
National Association of Home Builders and the NAHB Research Foundation
U. S. Department of Housing and Urban Development

Through conferences, workshops, demonstrations, publications, and similar activities, each of these organizations is helping to identify ways to cut construction costs through more effective and efficient planning, site development, and building procedures, and to provide this information to its members.

The Affordable Housing Demonstrations

Home builders learn from other builders; successful ideas are copied and used in new ways by other builders in many different areas of the country. The affordable housing demonstrations have been developed to test ideas for reducing housing costs in real projects and to provide information on the cost savings that resulted.

The central theme of the demonstration program is that a builder and those local officials responsible for regulatory approval can, together, identify ways to reduce the cost of housing and to modify or interpret local building codes and site development regulations so that these methods can be used. In the demonstration program, no Federal funds are provided either to the builder or to the community to support the demonstration projects. HUD and the

NAHB Research Foundation do provide technical assistance through various publications documenting previous research studies and through suggestions to the project designers, but it is the builder's responsibility to develop a list of possible cost-cutting ideas and it is the responsibility of local officials to accept those which are reasonable for that community.

Participating builders and communities were selected for the demonstration program in several ways. Before the Joint Venture was announced in January 1982, HUD approached a number of communities which had already demonstrated, in other activities, a willingness to modify regulations and to take other steps to encourage local development. As these communities agreed to participate in the program, the National Association of Home Builders worked through its local associations to identify builders in the communities with reputations for quality and records of innovation. Following announcement of the first twelve communities and builders selected to participate in the demonstration program, many other communities and other builders expressed interest in joining the program. In each case, HUD required a formal commitment by the highest elected official that the local government would support the program.

Once a project was accepted, HUD and the NAHB Research Foundation assisted the builder to identify cost-cutting ideas and to develop a workable, attractive site plan. The cost-cutting measures used in the various demonstrations vary widely. In some projects, unit densities were increased to reduce the impact of land cost on the final price, while good site planning and design made this increased density acceptable to the community. In other projects, street widths, street design standards, and utility system requirements were changed to reduce costs. Housing materials and construction methods were changed in many projects. In addition to these changes in materials and methods, many projects benefited from improvements in local administrative procedures which reduced the time and effort needed to obtain building and land use approvals.

The Case Study Approach

Each project undertaken as an Affordable Housing Demonstration during 1982 and 1983 as part of the Joint Venture for Affordable Housing is being described in a case study report. The case studies are intended to be learning tools to help homebuilders, local officials, and others concerned about affordable housing to recognize and seize opportunities to reduce housing costs through regulatory reform and the use of innovative planning and construction techniques.

Information on the changes and their impact on costs has been collected by the NAHB Research Foundation. Each case study describes the community, outlines the builder's experience, and discusses the specific project characteristics and history. Where possible, the cost savings resulting from the use of the various procedural, planning, development, and construction changes are calculated and reported in the case studies.

The following material provides this information on the Affordable Housing Demonstration project in Crittenden County, Arkansas.

Chapter 1

Project Description

County Profile

Crittenden County is located in Northeastern Arkansas directly across the Mississippi River from Memphis, Tennessee, and within the Memphis Standard Metropolitan Statistical Area (SMSA). The County is experiencing very slow growth, with a population increase from 48,106 in 1970 to 49,499 in 1980.

Most of the County's land area is farmed, and farming is the main occupation of the work force. Other employment opportunities include light manufacturing, service, and retail industries. About 30 percent of the labor force works in Memphis.

As shown in Figure 1, per capita income in Crittenden County is well below national and state averages. However, housing values and new home prices, while considerably below national levels, are higher than the state

FIGURE 1
Statistical Information

	Crittenden County	State of Arkansas	U.S.
Average persons per household	3.14	2.74	2.75
Per capita income	$4,942	$5,615	$7,298
Median value of housing stock	$33,100	$31,100	$48,000
Median sales price of new homes	$35,800	$33,200	$64,500
Vacancy rate of:			
Owner-occupied units	0.9 %	1.6 %	1.4 %
Rental units	5.1 %	8.8 %	5.4 %
Percent of housing stock in rental units	39.7 %	29.5 %	32.1 %

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average. The reasons for this, although more complex than the analysis offered here, include the proximity of Crittenden County to the higher cost city of Memphis and the greater demand for housing which is reflected in Crittenden County's low vacancy rate. There are more persons per household and a much higher percentage of rental units in Crittenden County than in the state. Young families simply cannot afford to purchase new homes at the existing sales price. These facts illustrate the need for more affordable housing in Crittenden County.

County Government

The chief administrative position in Crittenden County is the County Judge, an elected position with a 2-year term. This position is currently held by Jack Brawley, an ardent supporter of increasing the County's affordable housing stock. Judge Brawley recognizes the importance of supplying housing at a price young families can afford, providing them with an alternative to renting.

The County's legislative body is the 12-member Quorum Court. The court is an elected body with representatives from each of the County's cities, towns, and unincorporated districts. The Quorum Court will make the final decision on any permanent regulatory changes recommended by the Planning Commission.

The Crittenden County Joint Planning Commission has 18 commissioners, 6 appointed by the County Judge and the remainder by the mayors of the cities and towns within the County. The Planning Commission was first established in 1975 by the Quorum Court to hear appeals and requests for variances. The builder first presented the demonstration project concept to the planning commission.

The Builder - Rex Rogers

Rex Rogers, building as Rex Rogers' Homes, Inc., is a nationally known and

Rex Rogers, Brian Williams (project coordinator for Judge Brawley) and Judge Brawley (l. to r.)

well respected builder and developer. For this project, he acted as developer of the site as well as builder of many of the units. Other area builders, Don Butler and Bud Haney, are also building in the subdivision on lots purchased from Rogers, using the same plans.

Rogers' innovative construction techniques first received national attention in the early 1970s with the Arkansas House, one of the first designs to provide energy efficiency using available technology. Rogers still uses this energy efficient design in all his homes. Although it does not reduce the initial price of the houses, it reduces the operating costs and increases the quality.

Prior to his involvement in the Affordable Housing Demonstration project, Rogers had been building two- and three-bedroom single family homes on lot sizes of approximately 7,000 square feet and above. Most of his building is within Crittenden County, both in towns such as Marion and in unincorporated areas.

In addition to his direct building and development experience, Rogers has served as consultant to such corporations as Arkansas Power and Light, Centennial Homes Division of Weyerhauser, Kingsberry Homes Division of Boise-Cascade, and Owens-Corning Fiberglas Company. Builders from across the country have also consulted with him to learn more about the Arkansas House Plan. He served as Director of the Arkansas Home Builders Association for 7 years.

Rogers has been working for several years to design a home meeting the needs of young families and empty nesters. He believes the homes in this project provide the low prices and operating costs needed by these groups. Besides the initial construction savings documented in this case study, the homes all have energy saving features to reduce operating costs.

The Site - Harvard Yard

The demonstration project site is on 12.52 acres located in an unincorporated area of Crittenden County, just north of Marion, Arkansas. The total project of 104 units will include a mix of detached units and duplexes. The project is within the County's Urban Development Zoning District. This district was set up to "provide for and encourage the urbanization of the rural area in those localities where the provision of urban services are or can be made available at a cost and practicality consistent to that experienced within the urban areas."*

The site topography is very flat making storm water control a major design consideration. This is an area where Rogers was able to cut land development costs by modifying his typical storm-drainage plan. Figure 2 shows part of the storm-drainage system used for the Harvard Yard development. The sloped street channels storm water into a concrete-lined swale located in the street right-of-way. The swale channels the storm water into a public park in the middle of the development (see Land Plan, Figure 3). This drainage system eliminates curb, gutter, and storm sewer piping. In addition, the concrete swale doubles as a sidewalk.

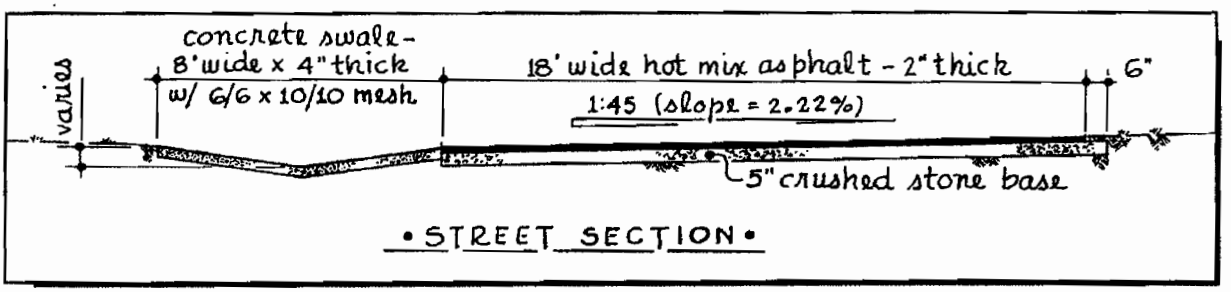


Figure 2. Street Section

*Zoning Regulation for Crittenden County, Arkansas 1975, p. 34.

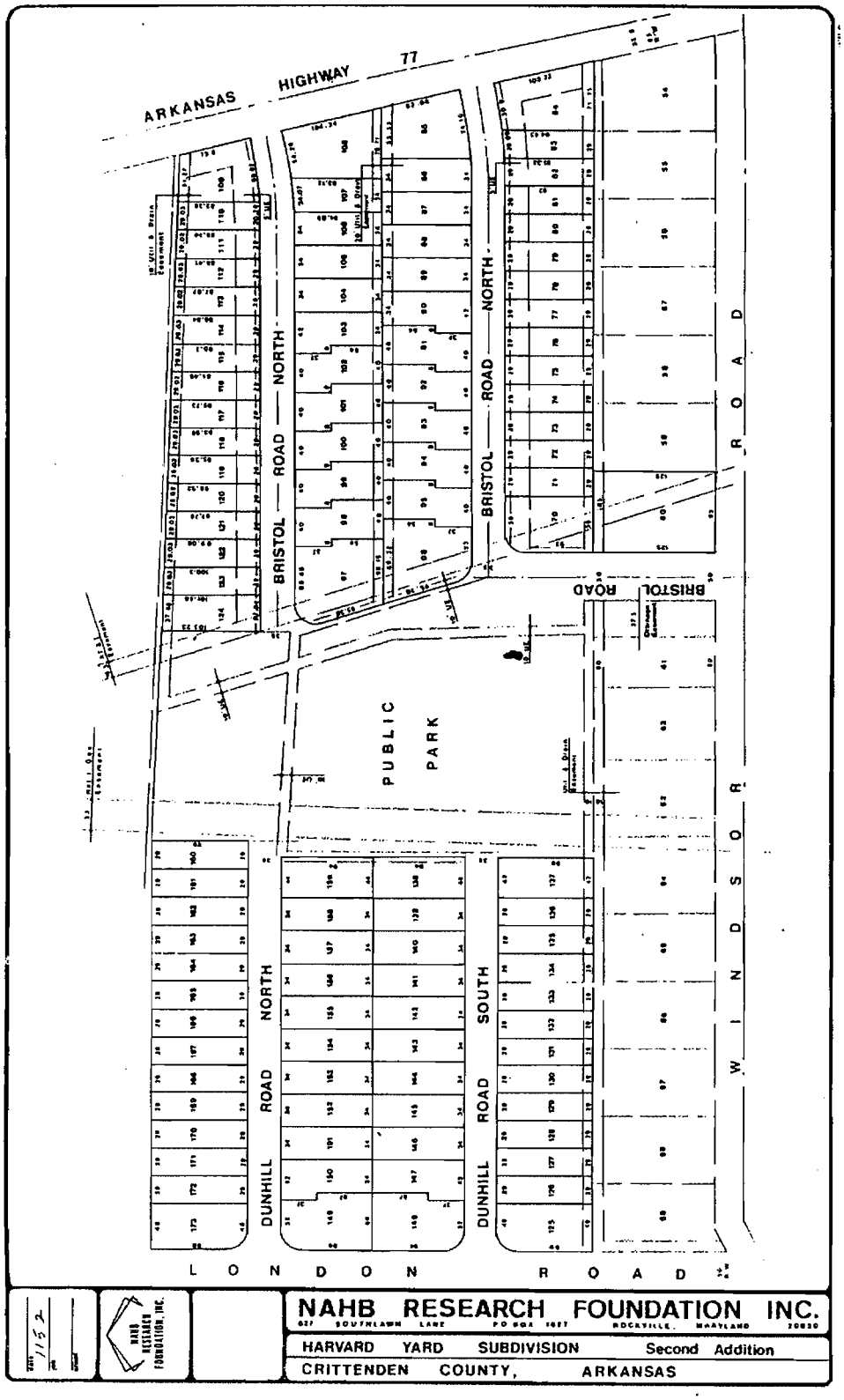


Figure 3. Land Plan

The Land Plan, shown in Figure 3, is a cost-effective layout for a standard subdivision. Changes to this plan were offered by the NAHB and HUD technical assistance team. Their suggested design would place units on cul-de-sacs and provide interspersed open space by clustering. These ideas were rejected. Although a more varied land plan might add to the subdivision's overall attractiveness, Rogers believed the market he was trying to serve would benefit more from the reduced cost per unit inherent in the initial land plan. All open space in the final plan is concentrated in one area which also serves to collect and dispense storm water. The streets are straight with units on both sides for cost-effective construction and installation of off-site improvements.

The Houses

The units are being built from presales, so the final mix of units by size and house type will be determined by demand. Three models illustrate the range of units offered: an efficiency unit and 2- and 3-bedroom units, shown in Figure 4. The basic floor plans for the larger units allow buyers another option, that of increasing square footage by adding a loft. This is proving to be a popular option with the buyers at a cost ranging from $5,100 for 384 square feet to $5,900 for 528 square feet of loft space.

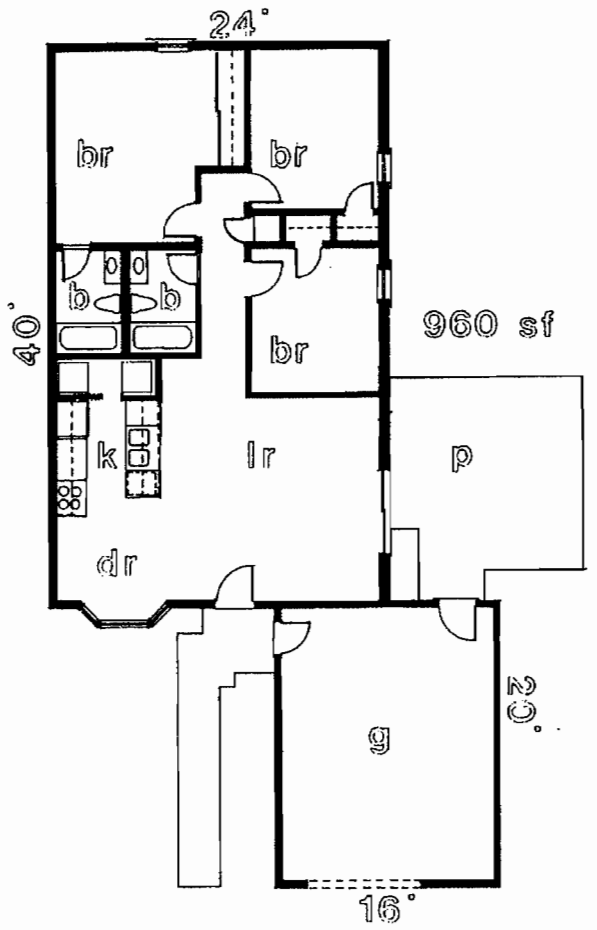
The floor plans offered in Harvard Yard have proven to be very marketable in other areas of Arkansas as well. Similar developments are under construction in Lonoke, Jacksonville, El Dorado, Jonesboro, Harrison, and Tyronza.

As discussed in Chapter 3, "Changes and Their Impact on Costs", Rogers uses the Optimum Value Engineering (OVE) System for housing construction which cuts cost significantly. Polybutylene plumbing, allowed by the State Code and adopted by Crittenden County, is being used in this project. Some cities and towns within the County have more restrictive codes than the State Code and prohibit polybutylene supply piping.

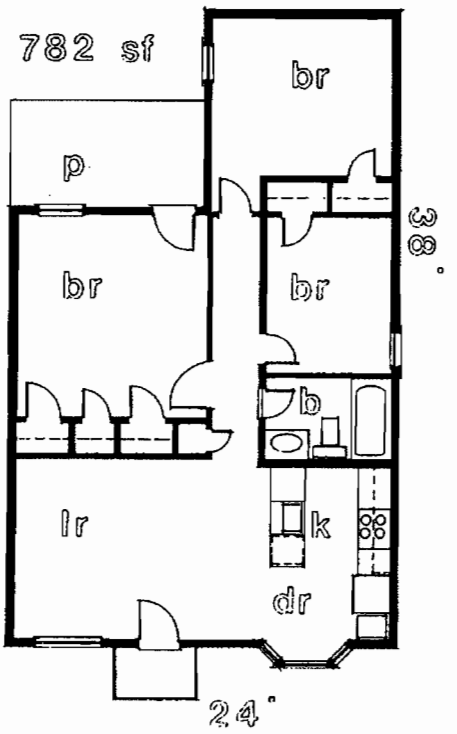
Standard Features

- Baseboard heater and air conditioning
- Garbage disposal
- Decorator floor tile
- Bay windows - square and 45-degree
- Smoke detector
- Custom-built medicine cabinet
- Light fixtures in all bedrooms
- Kitchen and bath exhaust fans
- Formica cabinet tops
- Choice of applicable interior colors
- Two-car concrete parking area
- Garbage can rack
- Extensive landscaping:
  - Solid sod front yard
  - Large trees (8' to 10')
- Color-coordinated streetscape
- Large recreation area and play area
- Cable television prewiring
- Rex Rogers Arkansas Plan energy saving package

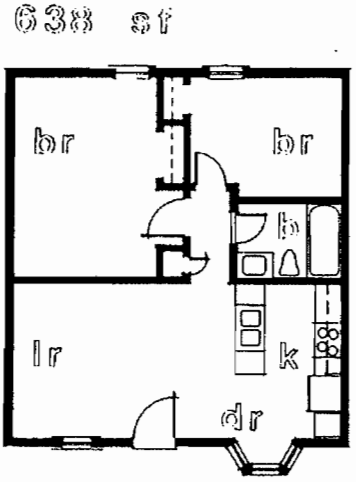
Figure 4. Floor Plans



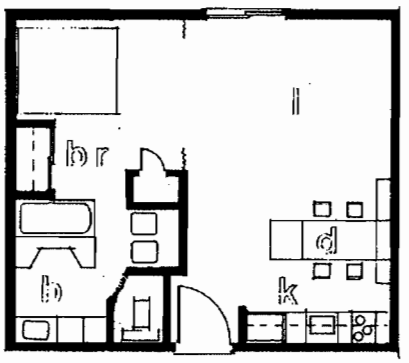
$35,040



$31,569



$26,885



504 sf

Note:
This unit was built as a model to demonstrate the features available in small size units. Current pricing information not available.

Marketing

The plans for Harvard Yard are based on a neighboring subdivision previously designed and built by Rogers. The buyer profile for that subdivision was the basis of the demonstration's marketing.

The buyer profile indicated a strong market for small homes on small lots with the lowest possible maintenance requirements. Based on this information, Rex Rogers decided to design Harvard Yard with units as small as 504 square feet and the largest a 960-square-foot, three bedroom design. Additionally, all the buyers in the earlier subdivision were first-time homebuyers moving from rental units.

A follow-up survey indicated the buyers were coming primarily from the incorporated areas of Crittenden County. This information enabled Rogers to develop a marketing effort targeted toward a specific population.

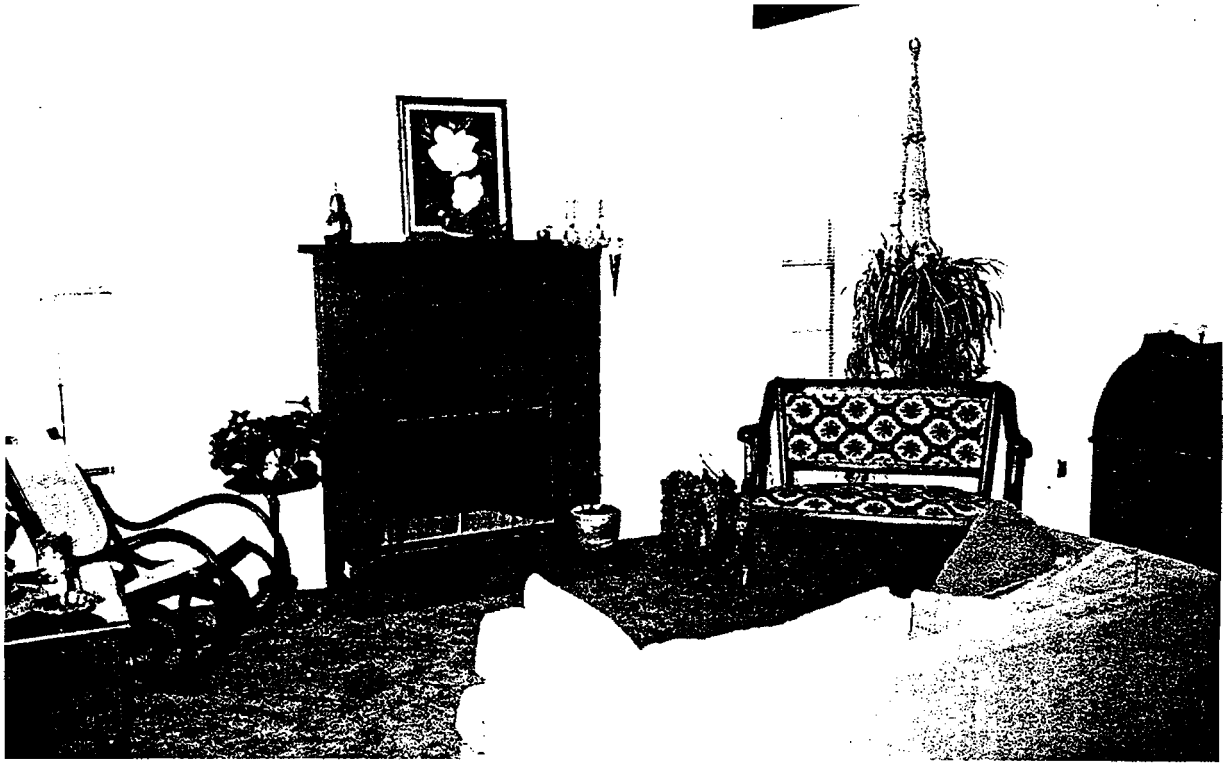
Beginning with a well publicized ground-breaking on April 17, 1983, which attracted hundreds of local people, Rogers has kept the project in the public eye through weekly advertisements in local papers. This marketing approach is supplemented by direct mail at a rate of 200 pieces per month to renters within the Memphis SMSA. The response to his marketing has been positive, resulting in presales of 31 units in a 3-month period.

FIGURE 5

Buyer Profile

Average square feet purchased	760
Average number in household	2.26
Average number of bedrooms	2.51
Average number of school children	0.39
Average number of preschool children	0.16
Average number of automobiles	1.45
Average age of head of household	31.6
Average college degree per household	0.77
Average annual family income	$27,500
Percent of families renting prior purchase of home	100 %

Exterior of 3-bedroom unit.



Interior of 2-bedroom unit.

Chapter 2

Project History

Several factors are considered in selecting sites in the Joint Venture for Affordable Housing Demonstration Program. Foremost among these factors is builder enthusiasm and willingness to consider innovations. Arkansas builder Rex Rogers has these qualities.

When first contacted in August 1982 about participating in the Affordable Housing Demonstration, Rogers responded with enthusiasm. He immediately met with Judge Brawley and his staff to get their reaction to having a demonstration in Crittenden County. Judge Brawley believed County participation would be beneficial and recommended the concept be presented to the Planning Commission. On September 28, 1982, Rogers presented the concept to members of the Crittenden County Joint Planning Commission and received their wholehearted support. County officials believed the time was right to test the validity of their development regulations and zoning ordinances. Participation in this program offered that opportunity.

State and federal regulations were also modified for this demonstration site, unlike some other sites where the focus was upon local changes only. Because Crittenden County is not heavily regulated, attention to state and federal regulations was comparable to that given local codes. The increased state role was due to its responsibility for water and sewer regulations, which officials were willing to modify. Cost saving modifications to the Minimum Property Standards were allowed by a very helpful HUD Area Office.

Rex Rogers is one of the most innovative builders in the country, so design and construction changes were refinements of previous site and construction plans rather than major modifications. As standard construction practice

Rogers uses 24-inch on center framing, metal drywall back-up clips, two-stud corners, single-layer plywood siding, single-layer plywood floor sheathing in optional lofts, and polybutylene plumbing -- construction innovations which are not standard with most builders, but result in significant cost reductions. A breakdown of these savings is included in Chapter 3.

Discussions between Rogers and the technical assistance team revealed a number of innovations, particularly in the area of land development, which he was not currently using. Regulatory waivers would be required in order to implement some of these innovations. For others, it was just a matter of refining his normal building practices. Eager to try new cost-saving techniques, Rogers developed a list of subdivision requirements he would like the Planning Commission to consider changing.

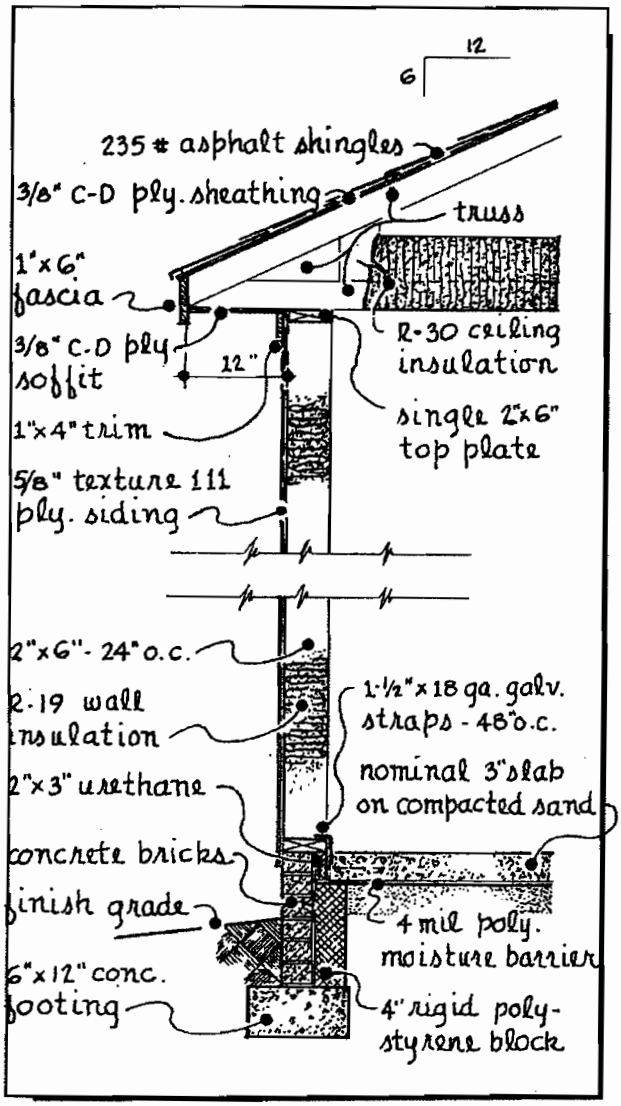


Figure 6. Typical Wall Section

County Role

Crittenden County is not nearly as heavily regulated as some areas of the country. Prior to the adoption of a Comprehensive Plan and zoning regulations in 1975, the only County requirement for residential development was recording a plat for tax purposes. The Comprehensive Plan and zoning regulations were adopted to prevent sporadic growth, not to stop growth or increase housing costs. County officials believed that participating in this demonstration would help them identify regulations not required for the protection of health and safety, which only drive up housing costs.

On October 26, 1982, County officials appointed a special committee to work with Rogers on his list of requested changes. The negotiation process took about four months and each item was discussed in detail. The results were County variances from existing

subdivision regulations for each request, although some of the changes were modifications of the builder's request. The allowed variances (labelled "Allowed Changes", Figure 7, Chapter 3) illustrate the results obtainable when two parties, a developer and the County Planning Commission, often perceived as in conflict with each other, are willing to keep open minds and consider different viewpoints. The success of this demonstration will determine whether or not the changes become permanent.

State Role

The degree to which state requirements impact on land development and the provision of housing varies considerably. In Arkansas, the primary state role is through the State Department of Health which has review and approval authority over public water supply and sewer, plumbing, and natural gas supply.

Prior to beginning construction on water and sewer, builders must have complete engineering plans and specifications reviewed by the Department of Health for compliance with State Codes. This process usually takes 2 to 4 weeks. In lieu of on-site inspections by state officials during construction, the builder must provide a written statement with his plan submittal designating someone responsible for construction inspection. This cannot be the builder, but it is typically the builder's engineering firm or someone operating with that firm's authority.

In keeping with the concept of reducing regulatory requirements to cut housing costs, Rex Rogers approached the Department of Health with a list of variances he would like from the State Code regulations governing water supply, sewer, and plumbing.

State officials and staff from the Arkansas Health Department met with Rogers and HUD representatives to discuss his requests in January 1983. Each of the requested variances was discussed and the state agreed to consider changes. On further review of the requested changes, the State Health Department determined they could allow three of Rogers' requests. These were:

- increased spacing requirements between manholes contingent upon the locality's ability to maintain;
- substitution of cleanout plugs for manholes on straight lines; and,
- use of PVC materials for drainage, waste, and venting in three- to eight-plexes without the eight-hour firewall requirements.

According to Harold Seifert, Assistant Director of Engineering, the Department of Health's decision to grant only three changes was based on a belief that savings on the other proposed items (see Chapter 3, Figure 8) would either be offset by increased maintenance costs, or that the cost savings did not justify the risk involved. He cited as an example that a shallow cover (less than 30 inches) over PVC sewer pipe was not allowed, since the pipe might be cracked if driven over, thereby increasing maintenance costs. The State also took the position that they imposed minimum standards and had no authority to grant waivers. The changes accepted did not require official review because they were within the Department's approval authority. Any additional changes would need to be reviewed by the State Board of Health under the Administrative Procedures Act, a time-consuming procedure which could take 6 to 12 months.

Federal Housing Administration Role

The HUD/FHA office servicing Crittenden County is in Little Rock, headed by HUD Area Office Manager John Suskie. A former builder, John Suskie realizes the importance of lowering housing costs and instructed his staff to be as cooperative and flexible as possible. HUD staff and Rogers agreed on several items required by the Minimum Property Standards that could be waived for this project with no adverse impact on health, safety, or quality of construction. These are described in Chapter 3.

Rex Rogers, John Suskie and Dick Eudaly, H.U.D. Regional Administrator (l. to r.)

Chapter 3

Changes and Their Impact on Costs

Variances and the Approval Process

The Harvard Yard subdivision project was granted variances from three governmental bodies with approval authority over the building process: Crittenden County, the Arkansas State Department of Health, and the HUD Area Office at Little Rock.

In Crittenden County it took approximately 4 months to complete the negotiating process on the regulatory changes. County officials carefully considered each request and came to an agreement with the builder on variances which could be granted for this demonstration. As shown in Figure 7, for each requirement where Rogers requested a variance, some change was allowed. In some cases, the negotiation process actually resulted in a greater change from the standard than requested. In others, the County Planning Commission reached an agreement with Rogers to allow a change in the standard somewhat less than requested.

During the 4-month approval period, site plans and engineering plans were being developed, and the process for obtaining variances from State and HUD/FHA offices was underway. Therefore, this 4-month time period did not cause delay.

The typical process for plan approval and the issuance of permits is often time-consuming. In Crittenden County, the process is informal so no time or cost comparison can be made between the process used for this project versus any other. The approval process is generally handled in a timely manner.

FIGURE 7

Requested Subdivision Changes

Requirement	Builder request	Allowed changes
60' right-of-way	35' right-of-way	35' right-of-way
24' surface width	18' surface width	18' surface width
25' building line setback from right-of-way	20' building line setback from pavement	25-1/2' building line setback from pavement for garages; 33-1/2' for homes (See Figure 8 for detail)
7,500 sq. ft. minimum lot size for detached units	3,000 sq. ft. minimum lot size	2,400 sq. ft. minimum lot size with average lot of 3,000 sq. ft.
70' front footage width	Reduced front footage to 34' for detached and 29' for attached units	29' front footage width for attached and detached homes and with buildings a minimum of 10' apart
20' minimum width utility easement for any or all utilities	Reduce to practical need if for only one utility or when 20' easement not really necessary	Allowed as requested except 20' easement required across rear of abutting lots (10' on each lot)

Footnote:

These variances were permitted only for the Joint Venture for Affordable Housing Demonstration Program, Harvard Yard Subdivision, with the understanding that if the planning commission and the developer are satisfied with the results, the commission may be asked to make these variances permanent.

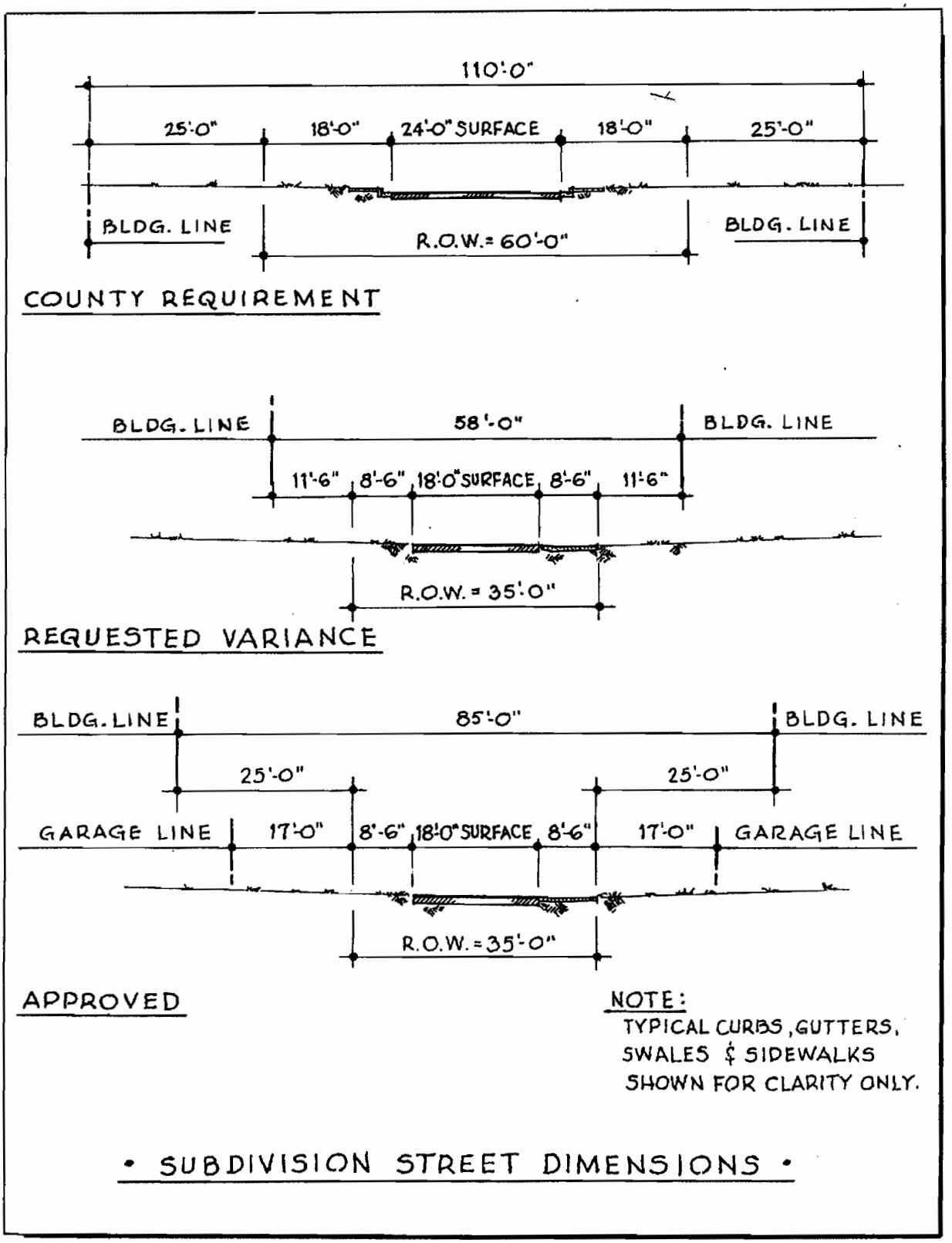


Figure 8. Subdivision Street Dimensions and Setback Changes

The process for State approval of plumbing, water, and sewer plans is documentable but not time-consuming, averaging 2 to 4 weeks. However, the process for getting variances from Arkansas State regulations is so lengthy that it is almost impossible to get any modifications for a single project. In most cases, variances may only be granted by the State Board of Health through a formal submission process which takes from 6 to 12 months with no predictability of success. Figure 9 shows the list of requested changes as submitted to the State Department of Health. As indicated, only three of these requests were approved. These changes did not require Board approval, but were within the discretion of the staff to allow.

Rogers requested as separate items increased spacing between manholes, and substitution of cleanout plugs for manholes. Both were approved. However, by allowing the substitution of cleanouts it was not necessary for Rogers to also increase manhole spacing. Both items were requested so that if cleanouts were not allowed, the project could reduce costs by the increased spacing.

FIGURE 9

List of Requested Changes for Arkansas State Board of Health

1. REDUCE MANHOLE COSTS BY:
   a. Allowing increased spacing*
   b. Reducing diameter of shallow manholes
   c. Allowing cleanout plugs to be used in lieu of manholes*
2. MINIMIZE SEWER PIPE COST BY:
   a. Allowing pipes to be installed on flatter slope (use gradients as recommended by pipe manufacturer)
   b. Reducing the 30" minimum soil cover over sewer mains to 12"
3. MINIMIZE WATER PIPE COST BY:
   a. Making adjustments for reduced flow requirement due to:
      1. smaller households
      2. water-saving fixtures
4. MINIMIZE COST OF HOUSE PLUMBING SYSTEM BY:
   a. Omitting fixtures supply valves
   b. Reducing size of pipe required for venting the drainage and waste systems
   c. Allowing use of vacuum breakers at isolated fixture locations
   d. Allowing the use of PVC materials for drainage waste and venting in 3 to 8 plexes without the 8-hour firewall requirement*
   e. Omitting requirement of air gap on dishwasher drain when air gap is on supply side
   f. Allowing reduction of water pipe sizing

*Approved Items

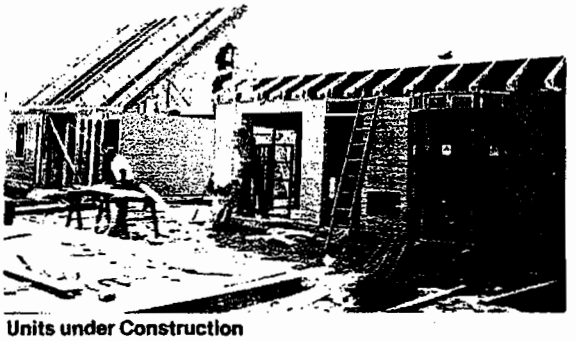
In addition to County and State regulatory changes, the Harvard Yard project also benefited from the flexibility shown by the HUD Little Rock office. In response to a letter from the Federal Housing Commissioner asking all local FHA offices to waive any "unnecessary or burdensome requirements which do not affect health or safety," the HUD/FHA staff met with Rogers and agreed to allow the following changes:

- reduce the house slab from a nominal 4-inch to 3-inch thickness;
- reduce slab compressive strength from 2500 to 2000 psi;
- eliminate felt under seal tab shingles;
- down size the water heater by 10 gallons;
- eliminate heater requirement in windowless bathroom because of small size and energy efficiency;
- allow use of ship ladder in lieu of stairway to optional loft; and
- reduce sidewalk widths from 3 feet to 2 feet 6 inches.

The only requirement for which a waiver was requested and not allowed was the firewall requirement for duplex units. Rogers requested that the 8-hour firewall requirement in duplexes only apply to the common wall and stop at the ceiling, rather than continue to the underside of the roof. The HUD Area Office believed this would compromise health and safety and denied that one request.

Site Planning and Land Development Changes

The 12.52-acre site is unusually flat making adequate storm drainage difficult. The County subdivision ordinance



Units under Construction

is flexible on drainage, requiring only that the system be adequate for the site being developed and "provide continuity with natural or man-made drainage-way adjacent to the area."

In most cases, providing adequate drainage for such a flat site would necessitate the use of curb and gutter at a minimum. In many communities piping would also be required. The storm drainage for the Harvard Yard project avoided curb and gutter and piping. Instead Rogers used an 8-foot concrete swale on one side of the street and graded the street so that storm water was channeled to that side. The swale is only slightly angled and doubles as a sidewalk.

The cost savings for this drainage system versus curb and gutter on both sides of the street are $7.50 per lineal foot of drainage system. This translates into a project savings of $13,778 or $132 per unit -- a conservative estimate as it does not include piping costs should they have been required.

The variances from regulations allowed by Crittenden County and the State of Arkansas enabled the builder to substantially cut land development costs in Harvard Yard.

For sanitary sewer service, the Arkansas Department of Health allowed the substitution of 11 cleanouts for manholes reducing the number of manholes from 17 to 6. The resultant savings for the project was $10,692, or $103 per unit.

Street widths were reduced from 24 feet to 18 feet for a total project cost savings of $5,634, or $54 per unit. In addition, rights-of-way were reduced from 60 to 35 feet creating an average increase in buildable land area of 835 square feet per unit and reducing driveway lengths by 12.5 feet per house.

The County Planning Commission also allowed a reduction in minimum lot size for the demonstration from 7,500 to 3,000 square feet. For this reason, and because of decreased rights-of-way and narrower streets, the builder was able to reduce his development costs by $468,000 and his developed lot costs by $4,500.

The following table shows all land development cost reductions.

Land Development Cost Savings

	Total Savings	Savings per Unit
Lot size reduction	$468,000	$4,500
Sanitary sewer	10,692	103
Streets	5,634	54
Drainage	13,770	132
TOTALS	$498,096	$4,789

Building Design and Construction Changes

The units offered in Harvard Yard are efficiently laid out to optimize use of interior space and minimize partitions. The floor plans have been so well accepted that the same basic plans are being used by at least six other builders in the state.

Labor and material cost efficiency are maximized by designing the dimensions in two-foot increments. This provides for efficient use of framing and sheathing materials. Rogers also uses the Optimum Value Engineering system for construction which includes such things as:

- plywood box headers;
- 2-stud corners;
- 2" x 3" in interior partitions;
- single top plate;
- eliminating soffit over kitchen cabinets;
- eliminating rake overhang;
- plumbing in trough above slab so plumber does not have to come twice;
- clustered plumbing;
- standardized plumbing tree;
- polybutylene piping;
- prefabricated plumbing wall; and
- furred down hall instead of duct work in houses with central air conditioning.

Use of most of these items is allowed in many communities (polybutylene being the biggest exception), but often they are not used by builders unaware of the cost-saving potential. Although not great in their individual savings, when combined in a well designed and efficiently built unit like these in Harvard Yard, the savings are significant.

In this case, for a 760-square-foot unit in Harvard Yard the savings were as follows:

Framing	$ 495
Sheathing	266
Plumbing	182
Air conditioning*	119
Drywall	50
TOTAL	$1,112

*In units with central air conditioning

Additional savings in unit construction were realized from reduced requirements of the Minimum Property Standards. The following modifications were allowed which reduced cost as shown:

Reduce nominal slab thickness from 4" to 3"	$114
Reduce slab strength from 2,500 to 2,000 psi	46
Omit felt under seal tab roofing shingles	33
Omit heater in windowless bathroom	51
Down-size water heater by 10-gallons	20
Use ship ladder in lieu of stairway to loft	120
Reduce front walk width from 36" to 30"	9
TOTAL	$393

Total savings for building design and construction: $1,505 per unit.

Cost Saving Summary

One of the more important aspects of cost reduction in Harvard Yard was not documentable -- design of the units. The homes were small, ranging from 504 to 968 square feet, and were efficient to build. Exterior framing was laid out on a 2-foot module to take maximum advantage of material dimensions and to reduce scrap, waste, and labor. Whenever practical, plumbing was clustered to reduce length of supply, drain, waste, and vent piping. Electrical wiring was installed to code, but care was taken to minimize circuits, outlets, and switches. When the extra-efficient designs and land plan were combined with innovative land development and construction techniques, Rex Rogers was able to deliver housing at prices almost unheard of since the late 1960s.

Had the same designs been built to existing standards and more conventional construction techniques, they would have cost the builder, on the average, an additional $6,294 per unit. Following is a summary of cost savings.

	Savings per Unit
Lot size reduction	$4,500
Sanitary sewer	103
Streets	54
Drainage	132
Framing	495
Sheathing	266
Plumbing	182
Air conditioning	119
Drywall	50
Minimum Property Standards	393
TOTAL	$6,294

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