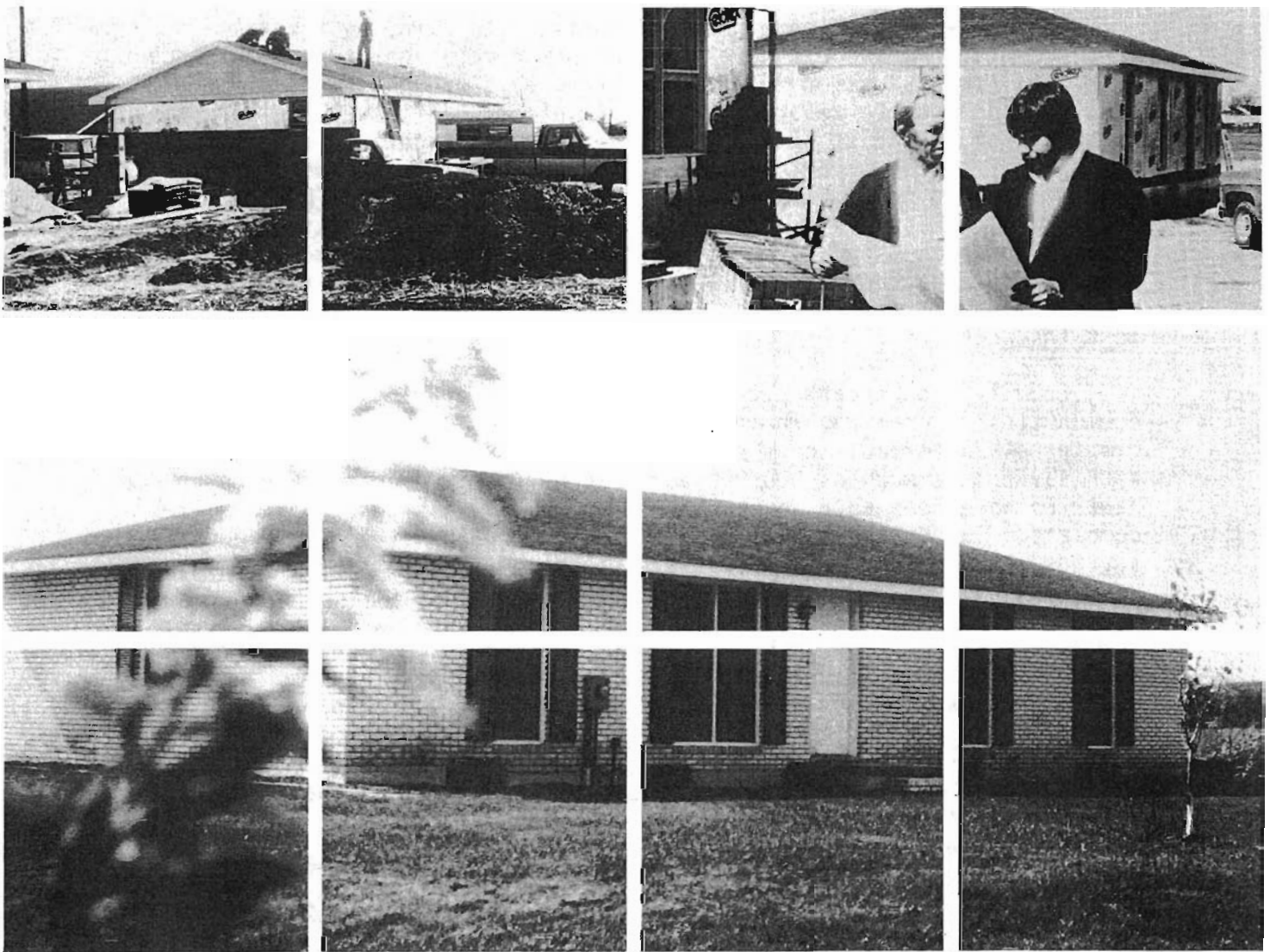


Christian County, Kentucky

The Affordable Housing Demonstration A Case Study



The Joint
Venture for
Affordable
Housing



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

January 1986

Four years have gone by since I announced the formation of the Joint Venture for Affordable Housing as a public-private partnership to make homeownership available to more people by combating the problem of high housing costs due to outdated and unnecessary building and land use regulations. Much has been accomplished toward this goal.

We in the Federal government can point with pride to several achievements. Mortgage interest rates, which were approaching 20 percent when this Administration took office, have been brought down by the President's economic recovery program by almost half; they are generally ranging from 10 1/2 to 11 1/2 percent in most parts of the country. At the same time, the Department of Housing and Urban Development's Federal Housing Administration has made it much easier for builders to obtain project approvals both by streamlining mortgage insurance processing and by simplifying HUD's own regulatory requirements; rather than impose a second set of rules in the Minimum Property Standards, HUD's Field Offices now accept projects meeting local building codes in most instances.

Equally significant progress has been made by many local communities. Local government officials and builders have cooperated to create new "affordable housing demonstrations" all across the country. With savings as much as \$10,000 per home in some projects, many more families have been able to buy their own homes. As these projects are completed, put on the market, and often sold out, their history and the savings which have been achieved are described in case study reports.

This is one of several new reports describing projects completed during the past year. Each project is different, and each case study has its own story to tell. I urge you to read this case study and the other new reports, as well as the 12 which preceded them, and to use the ideas described therein as they apply to your situation in your community. These ideas will help bring the cost of new housing in your community down to levels where more people can afford housing, and that is what we all want to happen.

Very sincerely yours,

A handwritten signature in dark ink, appearing to read "Samuel R. Pierce, Jr.", is written over the typed name. The signature is fluid and cursive, with a large initial "S" and "P".

Samuel R. Pierce, Jr.

The Affordable Housing
Demonstration
A Case Study

Christian County, Kentucky

Prepared for:
U.S. Department of
Housing and Urban Development,
Division of Building Technology

By:
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December 1985

This report was produced by the NAHB Research Foundation, Inc., for the United States Department of Housing and Urban Development. The views and conclusions contained herein are those of the authors and should not be interpreted as necessarily representing the official view or policies of the United States Government.

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Summary

Christian County, site of Kentucky's Affordable Housing Demonstration, is located in the southwestern part of the state. Its 69,888 residents live in the third poorest MSA in the nation, which had a median household income in 1980 of \$16,238.

Robertson-Tomberlin Homes built the demonstration project called Hermitage Hill. Norris G. "Pup" Robertson and Richard Tomberlin wanted to build housing to appeal to baby boom couples who were renting, as well as singles, older couples whose children had left home, and single-parent families.

Begun in 1985, Hermitage Hill is a 21-acre development of 73 single-family detached homes being

built in two phases. The development offers a two-bedroom model (800 square feet) at \$28,000; a three-bedroom model (1,025 square feet) at \$32,000; and a four-bedroom model (1,325 square feet) at \$37,400. Concrete driveways are a standard feature, as are gas forced-air heat, insulation to TVA standards, double plane wood tilt-in windows, and concrete patios.

Variations to typical building practice yielded a savings of \$8,886 for the entire project.

By December 1985 Hermitage Hill sales were well ahead of construction. Eleven homes were complete, five more had been started, and 29 sales contracts had been signed.



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 13 percent in 1985.

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 Commissioners 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 illustrate 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 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, 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 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 home builders, local officials, and others concerned about affordable housing 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 Christian County, Kentucky.

Project Description

The Community - Christian County, Kentucky

Christian County is located in southwestern Kentucky on the Tennessee border. In 1985 its estimated population was 69,888, while that of Hopkinsville, the county seat and most populous city, was 28,547. Hopkinsville is 72 miles north of Nashville, Tennessee, and 70 miles east of Paducah, Kentucky.

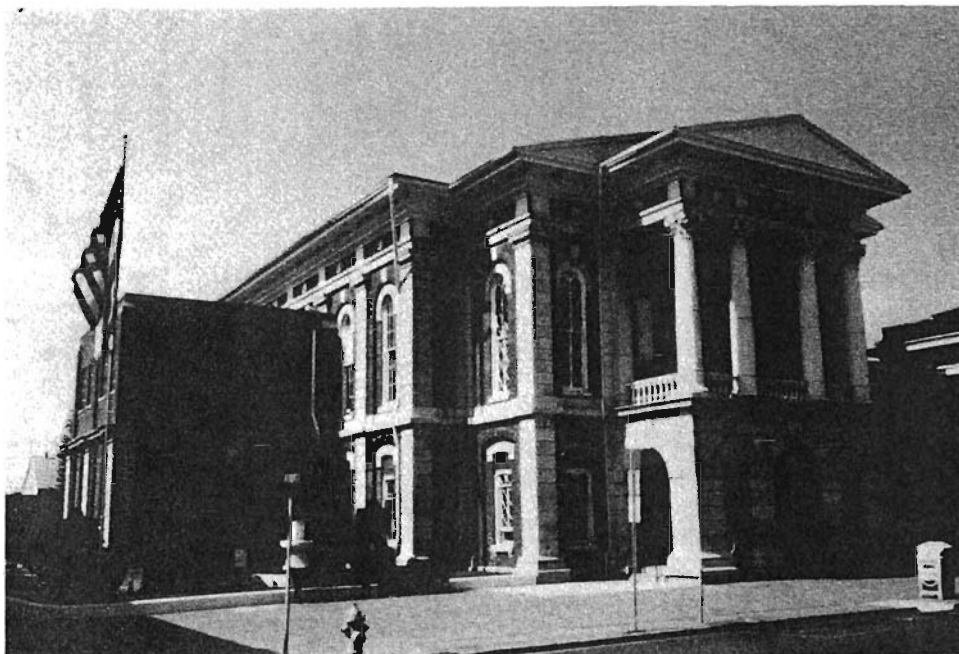
Land Between The Lakes, a large recreational area located between Kentucky Lake and Lake Barkley, is 30 miles west of Hopkinsville. The Tennessee Valley Authority (TVA) created the lakes by building hydroelectric dams across the Tennessee and Cumberland Rivers.

The birthplace of Jefferson Davis, the only President of the Confederate States of America, is marked by the tallest concrete obelisk in the

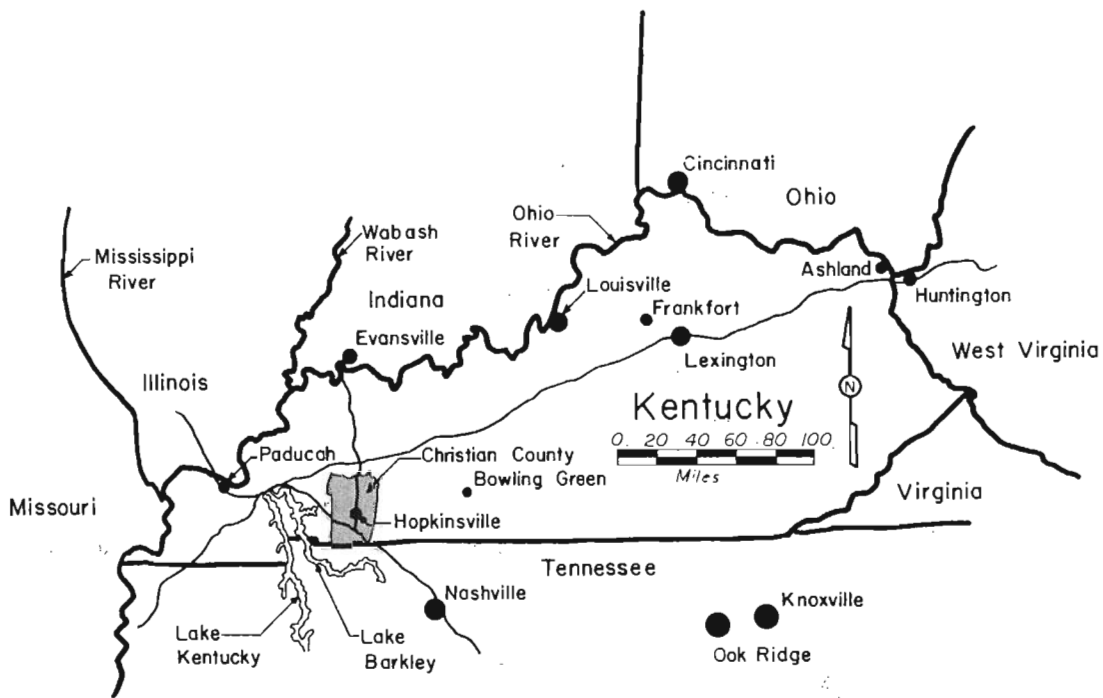
world, 351 feet high, 15 miles east of Hopkinsville in Fairview, Kentucky. The birthplace of Abraham Lincoln is less than 100 miles to the northeast in Hodgenville, Kentucky.

Christian County occupies gently rolling farmland in the Pennyroyal Region of southwestern Kentucky. Barns with open doors and slats for drying tobacco are a common sight, and tobacco is the major cash crop. Other major crops include soybeans, wheat, and corn. Grain storage, milling, feed and flour processing, rail loading, farm equipment sales, and tobacco storage are major Hopkinsville agri-businesses. Cattle, milk, and swine are important sources of farm income. Most farms in the county are between 50 and 179 acres.

Hopkinsville is the financial, medical, retail, and government center of Christian County.



Christian County, Kentucky, Courthouse

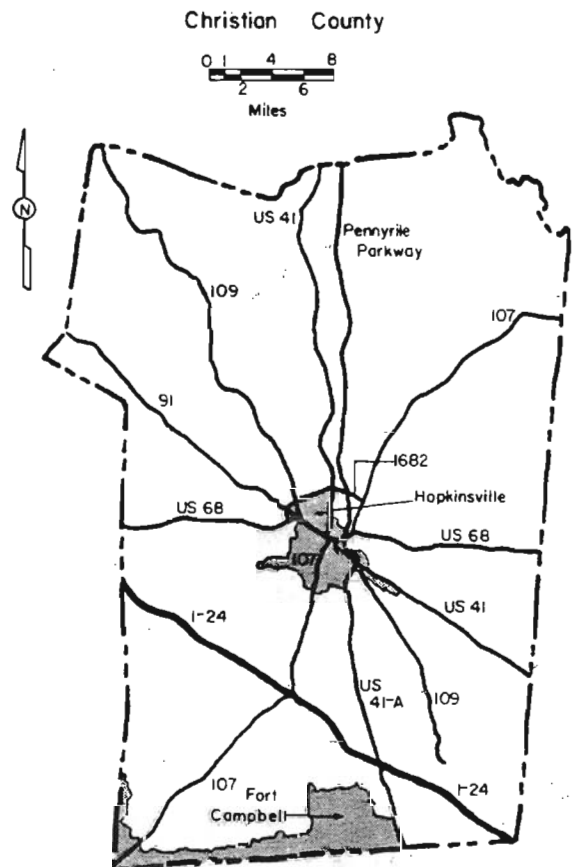


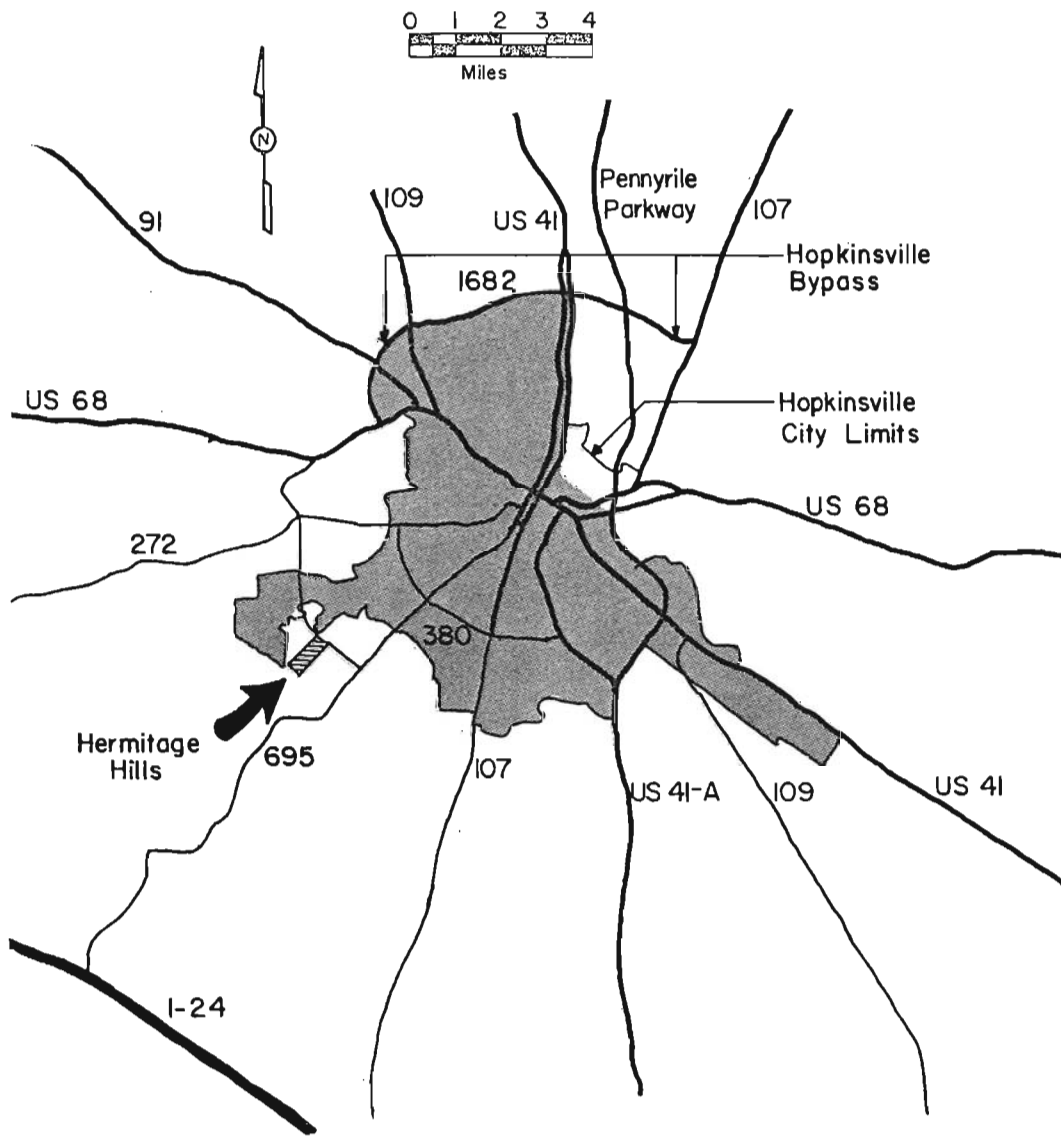
Factories produce car bumpers, lighting fixtures, blue jeans, and magnetic wire. The nation's largest producer of bowling balls is in Hopkinsville. Fort Campbell, The Jennie Stuart Medical Center, public and private schools, and Hopkinsville Community College are other major employers.

Hopkinsville is part of a Metropolitan Statistical Area (MSA) which includes Fort Campbell, Kentucky, 15 miles south of Hopkinsville, and Clarksville, Tennessee, 10 miles farther south.

In 1981 the Hopkinsville-Clarksville MSA was the third poorest in the nation, based on a per capita income of \$7,716; that of Hopkinsville itself was \$6,142 and the remainder of the county, \$5,240. The median household income in 1980 was \$16,238, while family income in the remaining part of the county was \$13,464.

The climate of Christian County is mild with an average annual





temperature of 59°F, a record high of 107°F and record low of -15°F. Normal precipitation is 46 inches, with a mean annual snowfall of 12 inches. Average relative humidity is 70 percent.

In 1983 the median price for existing homes in Christian County was \$27,100; in Hopkinsville it was \$30,000. Only 14 new single-family homes were built in 1983, with an average price of \$54,000. During the first 10 months of 1984, 24 new homes

were built at an average of \$64,000. Fort Campbell has more than 4,100 housing units, about 18 percent of the county total. Excluding Fort Campbell and Hopkinsville, 67 percent of county residents own homes; 64 percent of Hopkinsville residents own homes.

Christian County is governed by an elected Fiscal Court and County Judge. The judge is chief executive of the county. He administers county law, directs programs, and approves

expenditures within specified limits. The Fiscal Court, consisting of one magistrate elected from each of the eight districts in the county, passes or rejects all county legislation and approves expenditures exceeding the limits of the County Judge.

The City-County Planning Commission is composed of eight members including one member of Hopkinsville City Council, one member of the County Fiscal Court, three members appointed by the City Council, and three appointed by the Fiscal Court. The commission approves or disapproves all land use requests for both the city and county.

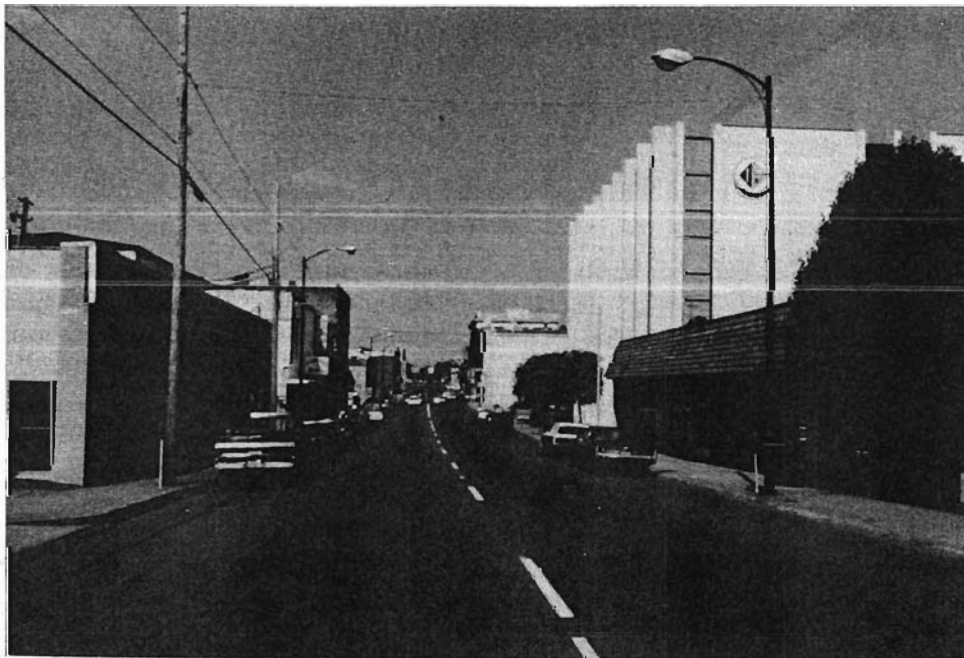
The Builder - Robertson-Tomberlin Homes

Norris Glenn "Pup" Robertson and Richard Tomberlin formed Robertson-Tomberlin Homes in August 1984 to develop land Tomberlin owned adjacent to the Hopkinsville city limits in Christian County. Prior to this venture, Tomberlin was active in real estate sales and cable TV.

Pup Robertson, in a building career spanning 27 years, has built 750 houses, 60 apartment units, a small shopping center, an office building, and has developed 1,200 lots for other builders.

The builder generally buys all material himself and arranges to have construction performed on a piecework or hourly, rather than subcontract, basis. In this way he eliminates the 30 percent subcontractor markup on labor and material. The furnace installer is paid so much per register; plumber, per fixture; brickmasons, per 1,000 bricks; roofers, per square; gypsum wallboard, per 1,000 square feet. Excavation, concrete block, and electrician labor are paid by the hour. In addition, Robertson employs seven carpenter-painters for house layout, carpentry, painting, and clean up.

Robertson designs and engineers his houses but subcontracts subdivision planning and engineering of streets, sewers, storm water drainage, and



Hopkinsville, Kentucky



Pup Robertson

other site improvements.

Robertson-Tomberlin Homes are the only houses in Christian County that carry a 10-year Home Owners Warranty (HOW).

Since 1960 Robertson has been active in the National Association of Home Builders on the local, state, and national levels. He founded the Christian County Home Builders Association (HBA) in 1962 and served as its president three times. He won election as president of the Kentucky HBA in 1965 and was a national director for 10 years. In 1967 he was named Young Man of the Year by Christian County Jaycees and won the Civitan Citizenship Award. In 1972, he received the Kentucky Builder of the Year Award.

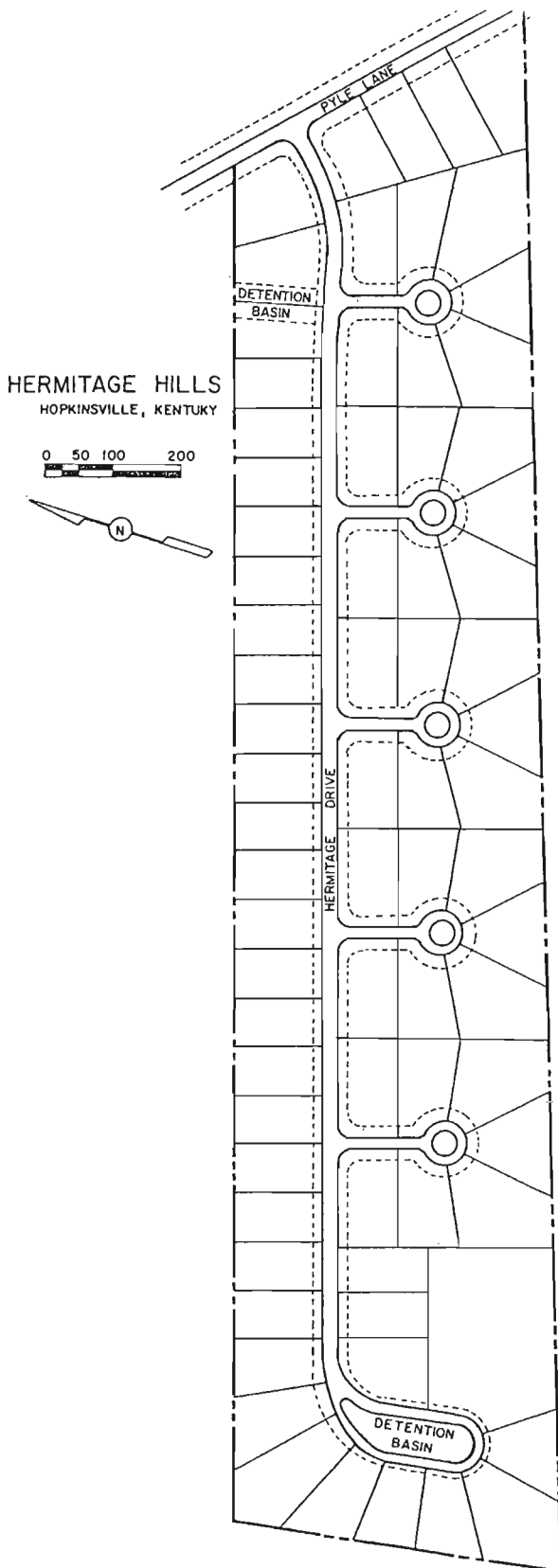
The Project - Hermitage Hill

Hermitage Hill is a 21-acre, single-family detached housing development on a gently sloping site adjacent to the Hopkinsville city line in Christian County. The plot

is a long, narrow rectangle with the short side fronting on Pyle Lane, a two-lane paved road, three miles from downtown Hopkinsville.

The demonstration includes a total of 73 units with a density of 3.5 units per acre. In Phase I, begun in March 1985, 37 units will be built. Phase II will have an additional 36 units plus a playground-picnic area. The 73 units are nearly twice the number of single-family detached houses that were produced in Hopkinsville by all builders in 1983 and 1984 combined.

Three basic models are offered: 2-bedroom (BR) 800 square feet (SF), \$28,000; 3-BR 1,025 SF, \$32,000; 4-BR 1,325 SF, \$37,400. Brick veneer is standard, sometimes with small portions done in wood siding for accent. Because of a high water table, the houses are built on crawlspace foundations instead of basements. Concrete driveways are standard, as are gas forced-air heat, insulation to TVA standards, double pane wood tilt-in windows, and concrete patios. Optional extras



include an additional 1/2 bath, air conditioning, carport or garage, and dishwasher.

Robertson's plans feature an open living space with a cabinet bar dividing the kitchen from the living room. A pantry with built-in shelves is conveniently located behind bar room doors at one end of the kitchen corridor. The bathroom features a one-piece fiberglass tub-shower unit and vanity with a cultured marble top.

Simplicity, quality, and high value are hallmarks of Robertson-Tomberlin homes. The developers are offering new three-bedroom, all-brick homes including the lot for half the average new-home price in the Hopkinsville market area and barely more than the price of average used homes, as reported in the 1980 Census.

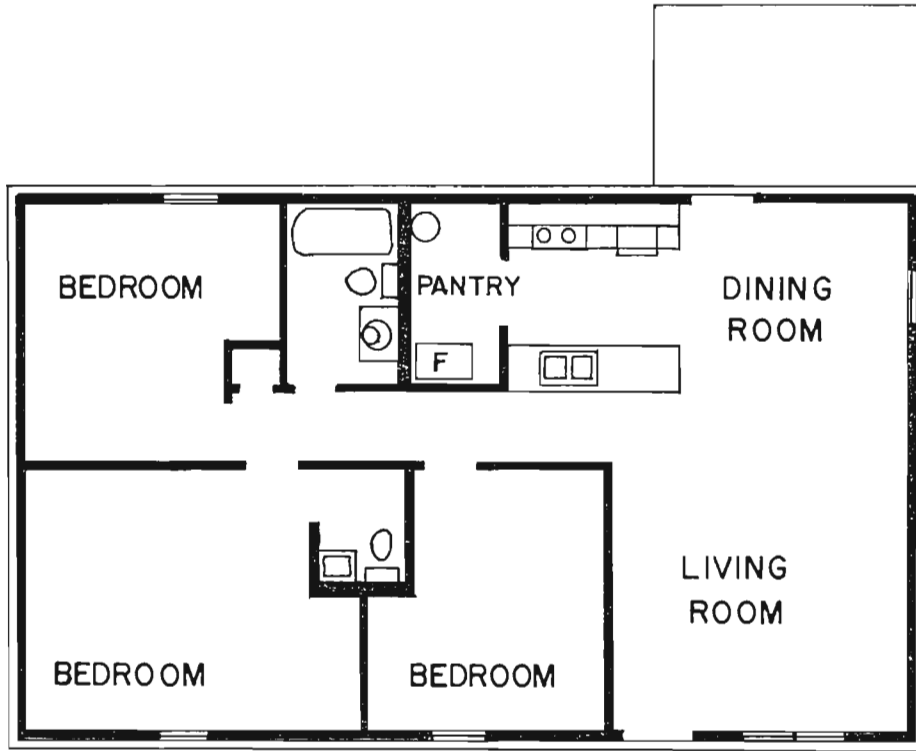
Most homes in Hermitage Hill are on short cul-de-sacs branching off the main street. No parking space is provided on the streets, but concrete driveways to each house afford two spaces per unit.

Storm water flows from grassy swales beside the roads through culverts into detention ponds.

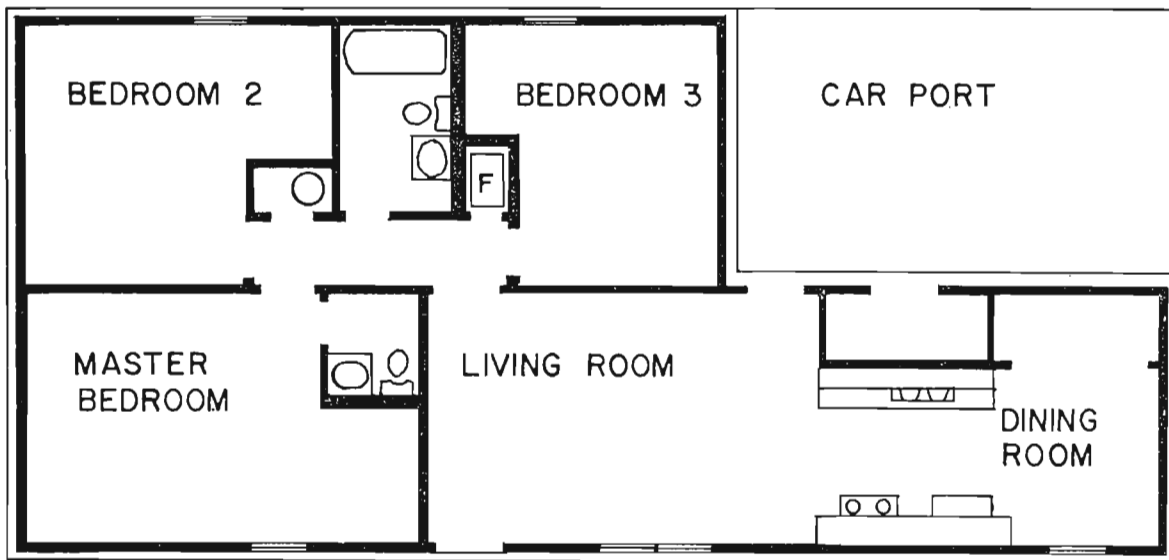
A playground-picnic area will be provided in Phase II of the development.



House exterior



Standard 3 BR



Optional 3 BR with carport



Living room, dining room



Kitchen and pantry



House exterior



**Storm water detention
basin**

Project History

Subdivision Planning

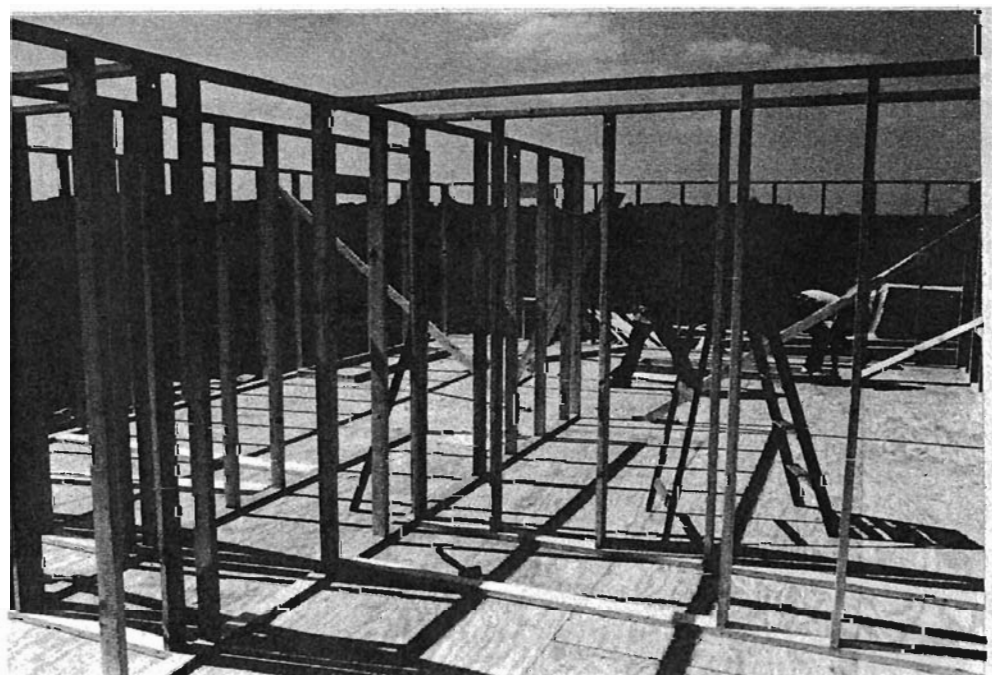
In August 1984 Pup Robertson and Richard Tomberlin formed Robertson-Tomberlin Homes. Their first project was to develop a 21-acre site, owned by Tomberlin, outside but contiguous to the city of Hopkinsville. This site was located on a paved county road and, since it was across the road from an established Hopkinsville subdivision, the possibility existed for connection to the Hopkinsville water and sewer systems. This would save the cost of wells and septic systems and allow twice as many houses to be built on the same acreage.

Moreover, since it was outside city limits, city zoning and flood control ordinances did not apply. Furthermore, the Kentucky Court of Appeals had ruled the state subdivision ordinance illegal because the state adopted it before adopting a comprehensive plan; consequently, no subdivision requirements were in effect.

The lack of building codes and inspections further simplified building by reducing construction regulation. In August 1981 Kentucky offered cities and counties the choice of adopting the state single-family building code or having no code. Hopkinsville and Christian County opted for no code. Therefore, only plumbing and electrical installations are inspected in Christian County.

Robertson and Tomberlin felt that a low-density, single-family detached subdivision would succeed on the site if unit prices could be held within a range near \$30,000. This range would tap the many baby boom couples who were renting, as well as singles, older couples whose children had left home, and single-parent families. Robertson, himself the father of seven adult children, felt a special need to help young couples find affordable housing.

Richard Tomberlin purchased the site in 1981 and sold it to the



- OVE System**
- No partition backers
 - Single top plates
 - In-line framing, 2' o.c."

newly-formed Robertson-Tomberlin Homes on August 18, 1984.

A week later, Pup Robertson learned from the Kentucky HBA about the Affordable Housing Demonstration sponsored by the Department of Housing and Urban Development (HUD), the National Association of Home Builders (NAHB), and the NAHB Research Foundation.

He liked the demonstration's underlying premise that safe, quality housing can be made affordable to many more people without resorting to government subsidy, but rather by using more efficient planning, development, and construction techniques and by accelerating administrative processing.

The affordable housing concept fit Robertson's market, personal goals, and previous experience in reducing construction costs through careful engineering. Throughout his career, Robertson had been a student of engineered construction innovations and had developed several of his own cost-saving techniques.

In late August Robertson contacted HUD to show his interest, and on August 30, Christian County Judge/Executive Frank M. Gary sent a letter to HUD expressing county support for the demonstration.

By mid-September Robertson had forwarded to HUD the complete plans and information for participation. In October HUD selected Hermitage Hill by Robertson-Tomberlin Homes as an Affordable Housing Demonstration site, and, on November 2, HUD announced the selection in a news release that was reported on Hopkinsville radio, TV, and on the front page of the Hopkinsville, Kentucky, New Era daily newspaper.

Storm Water System Delay

According to Robertson, in August 1984, prior to forming the partnership with Richard Tomberlin to develop Tomberlin's land, the Hopkinsville Sewer and Water Works Commission (Hermitage Hill) told him that he could connect to Hopkinsville's water and sewer systems, making no mention of storm water management. In October, the City-County Planning Commission told Robertson they had no jurisdiction over his storm water management because no subdivision ordinance was in effect.

In December, after neighbors in an adjacent subdivision complained to Mayor Sherry Jeffers that runoff from Hermitage Hill would increase the probability of flooding in their homes, the SWWC decided to require that Robertson satisfy the city storm water ordinance before connecting with the water and sewer systems. This decision delayed construction three months.

Robertson began construction on March 2, 1985 and by mid-July had completed five homes.

In August 1985, responding to continued pressure from neighbors, the SWWC changed its requirements and required Robertson to increase his storm water detention system capacity and halted construction until it was done. This delayed Robertson one more month in addition to the three-month delay of the previous winter.

County Support

County Judge/Executive Frank M. Gary agreed to work with the Department of Housing and Urban Development (HUD), the NAHB Research Foundation (NAHB/RF), and Robertson-Tomberlin Homes to produce an affordable housing development through more



County Judge/Executive
Frank M. Gary

effective and efficient site development and building procedures.

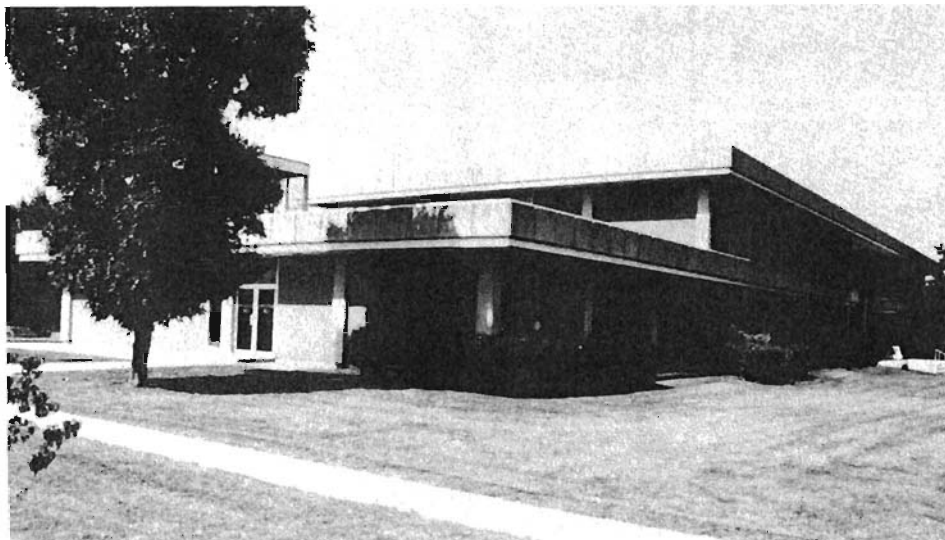
Judge Gary expressed support for Hermitage Hill on August 30, 1984. (See Appendix I for complete schedule.) HUD designated the project an official demonstration and announced Robertson-Tomberlin Homes' participation on November 2, 1984.

Because of the lack of zoning and building codes and inspections, Robertson was unusually free to pursue a wide variety of cost-reduction techniques, discussed in Chapter 3.

Marketing

Robertson and Tomberlin's study of the Hopkinsville housing market revealed an urgent need for housing for young, married first-time home buyers, retired military personnel, singles, and one-parent families. Fort Campbell buyers were gravitating to Clarksville, Tennessee, which had more housing available at lower housing prices than did Hopkinsville. As a result, although Clarksville has a population about twice that of Hopkinsville, in 1983 it issued 580 single-family building permits to Hopkinsville's 14.

Robertson felt that if he could offer single-family houses with monthly payments close to the prevailing rents in the area, he would attract more Ft. Campbell families. He also hoped to attract a large number of potential buyers who were renting but wanted to buy single-family homes. He offered FHA, VA and Kentucky



Christian County/Hopkinsville
Administrative Building

Housing Corporation financing as well as conventional mortgages.

For direct sales, Robertson and Tomberlin employed one straight-commission salesman who sold from two model homes. So much publicity was generated that Robertson and Tomberlin minimized advertising, using only classified newspaper ads and brochures passed out at the models. By November 1985 the developers had spent less than \$1,000 on advertising.

Publicity included local media coverage of HUD's announcement of the

demonstration and the ribbon-cutting ceremony on May 2 attended by Shirley McVey Wiseman, then HUD General Deputy Assistant Secretary of Housing and Acting FHA Housing Commissioner. In addition, the city's decision to turn off water to Hermitage Hill residents made front-page news in the New Era. (See Appendix I, page 38).

By December 1985 Hermitage Hill sales were well ahead of construction. Eleven homes were complete, five more started, and 29 sales contracts signed.

**DON'T BE
FOOLED**

You can own a new brick home. Payments as low as rent. Quality construction. 10 years written warranty.

CALL NOW
Robertson-
Tomberlin
Homes

885-████ 886-████

**APARTMENT
RENTER**

Don't Be sorry! Let your rent payments pay for a new brick home.

CALL NOW
Roberson-Tomberlin
Homes

885-████ 886-████

Classified ads

Changes and Their Impact on Costs

One purpose of the Affordable Housing Demonstration is to collect and evaluate sound cost data on residential development practices and construction techniques, and to show how innovations and changes in administrative processing affect the cost of houses.

Administrative and Processing Changes

Since no building code or subdivision ordinance was in effect in Christian County, Robertson was able to work at his own pace, except for a four-month delay caused by Hopkinsville's changing storm water management requirements. This delay resulted in higher indirect expenses, carrying charges and labor and material costs due to inflation during the delay. The total cost increase due to the delay was \$400 per unit.

Site Planning and Development Changes

Because governmental construction regulation was minimal, the developers were able to make numerous development changes, each based on careful engineering, that reduced costs of developing land.

Due to the market's demand for large lots and relative inexpensiveness of land, Robertson and Tomberlin did not increase density to reduce costs. They divided the 21-acre site into 73 lots, achieving an average gross density of 3.5 houses per acre. This is similar to densities of other new developments in the area which are served by metropolitan water and sewer systems.

Robertson-Tomberlin Homes reduced street pavement widths from 26 feet to 22 feet on the main collector street, 18 feet on those running to the cul-de-sacs, and 14 feet around

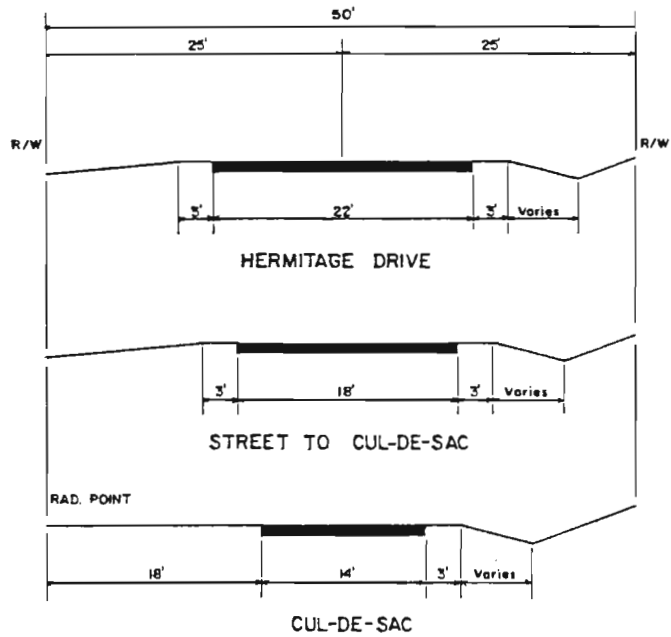
the cul-de-sacs themselves. These changes substantially reduced paving costs. Robertson-Tomberlin Homes also reduced pavement specifications based on lower expected traffic flows within the development. The standard was 6 inches of dense grade aggregate, 2 inches of bituminous asphalt, and 1 inch of surface asphalt. Instead, Hermitage Hill has 5 inches of dense grade aggregate, 1-1/2 inches of bituminous asphalt, and 3/4 inch of surface. The reductions in street widths and pavement specifications saved Robertson a total of \$126,982 for 73 units.

By eliminating the curbs and gutters usually built in new subdivisions, Robertson saved \$57,881.

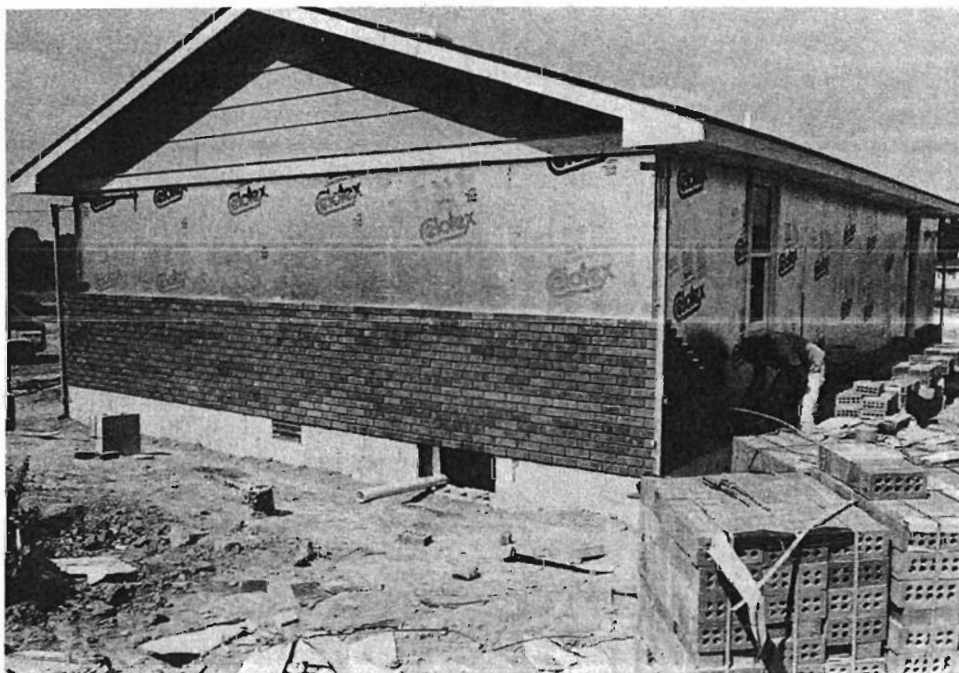
Four-foot-wide sidewalks were normally installed on both sides of the street in new Hopkinsville subdivisions. Robertson-Tomberlin eliminated them altogether and saved \$40,348.

In the sanitary sewer system, Robertson-Tomberlin gained substantial savings by using polyvinylchloride (PVC) instead of clay for 8-inch mains and 6-inch laterals and by replacing seven of the manholes with clean-outs. A total of \$35,779 was saved on the sanitary sewer system installation.

Prior to Hermitage Hill, storm water management systems were not required in low-density subdivisions outside Hopkinsville city limits. The city, however, made Robertson-Tomberlin meet the city storm water management requirements by refusing the developers water and sewer service until they complied. The resultant cost of the storm water system, therefore, was higher than normal. Costs were increased \$22,000 on storm



CUL-DE-SAC
 Grade, Drain And Paving Using
 5" Dense Graded Aggregate Base
 1 1/2" Binder
 3/4" Surface



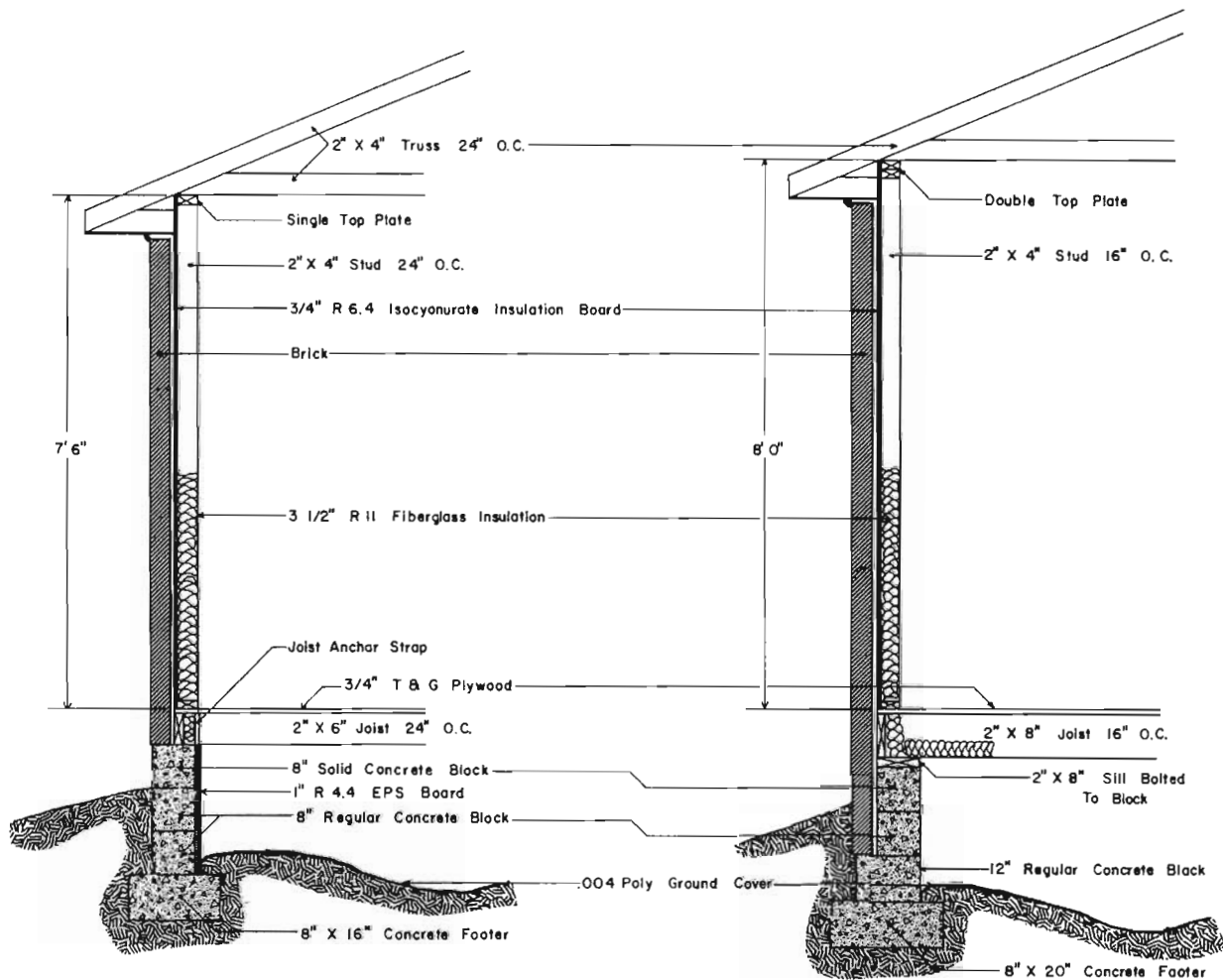
Brick house under construction

water drainage in addition to the increases due to delays.

Building Design and Construction

Robertson used many building design and construction techniques to reduce the cost of his homes.

Brick is the preferred construction material in the Christian County market area. Robertson believed that, in Kentucky, its total cost, including maintenance for the life of the dwelling, was lower than other sidings, even though its initial installation cost was higher.



ROBERTSON WALL SECTION

NORMAL WALL SECTION

Robertson felt he would have a distinct marketing advantage for the moderate-income buyer if he offered brick veneer.

To do this, he devised several methods of reducing the installation cost of brick. He used 8-inch concrete blocks above and below grade to support the wood floor system and brick veneer, instead of using 12-inch block below grade and 8-inch block plus brick above. This technique allowed a small portion of block to show, but this can be disguised with paint and hidden with landscaping. In addition to the savings on block, this technique eliminated an average of six courses of brick around the entire house. Use of the 8-inch block permitted construction of footers 4 inches narrower than those required with 12-inch block, reducing concrete quantities by approximately 20 percent. Robertson eliminated gable brickwork by using wood lap siding on gables and by using hip roofs. Finally, by building interior wall height 7'-6" instead of 8'-0", he eliminated two more courses of brick.

Robertson estimates that, for an average house in Hermitage Hill, he reduced his brick usage by more than a third--5,500 bricks instead of 8,500 bricks. In addition, Robertson bought his brick at lower-than-normal prices. Area brickyards had some brick styles and colors available that they were having difficulty selling because the quantities were insufficient to cover an entire house. Since Robertson's houses required less brick than normal, he frequently was able to buy these odd lots at substantial savings. Robertson saved \$130,407 on his brick veneer cost.

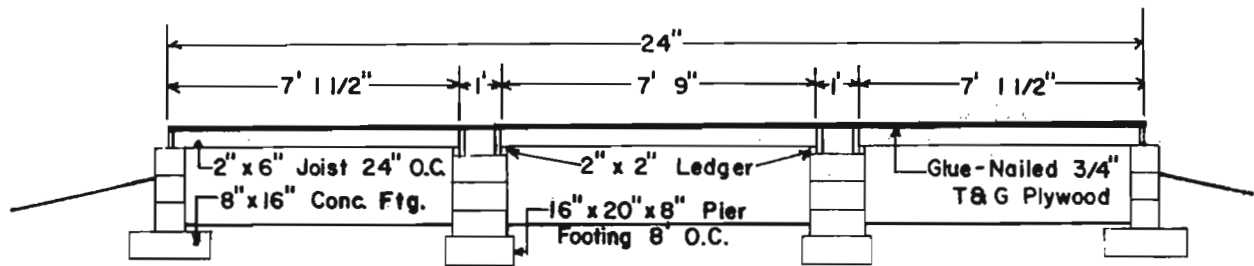
Robertson further reduced his crawlspace foundation costs by having his carpentry crew stack the concrete

blocks and bind them together with fiberglass-reinforced surface-bonding cement, instead of hiring more expensive masonry labor to lay them using traditional joint mortar. In this manner, Robertson saved a total of \$6,424 on the 73 foundations.

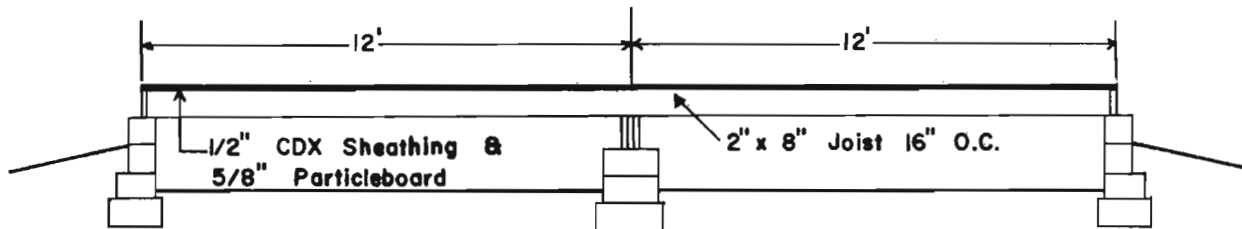
A unique floor system designed by Robertson saved \$21,507. This system uses two box-beams to support the floor joists. The beams are made of two 2x8's separated by 9-inch 2x8 blocks and are supported by four concrete block piers. Nailed to the bottom edge of the beams were 2x2 ledgers supporting 2x6 joists, laid 2 feet apart. The maximum span on the joists is 7'-7". Tongue and groove plywood subfloor underlayment 3/4" thick is glue-nailed to the joists.

Robertson saved money and created a warmer, dryer crawlspace with less chance of frozen pipes by insulating the walls with R-4.4 EPS (expanded polystyrene) board, instead of insulating the wood floor system, commonly done with R-11 blankets. The natural insulating value of the earth beneath the house, although low per unit of thickness, is high in total. At the center of the foundation, 12 feet from the outside wall, heat from the house traveling a semicircular path to the cold atmosphere would encounter a resistance of nearly 40 feet of earth. At R 1.25 per foot, the total R at the center is nearly 50, and the average for the foundation, over 20. By insulating the walls instead of the floors, Robertson reduced his buyers' heating bills and, on the total project, saved \$20,440.

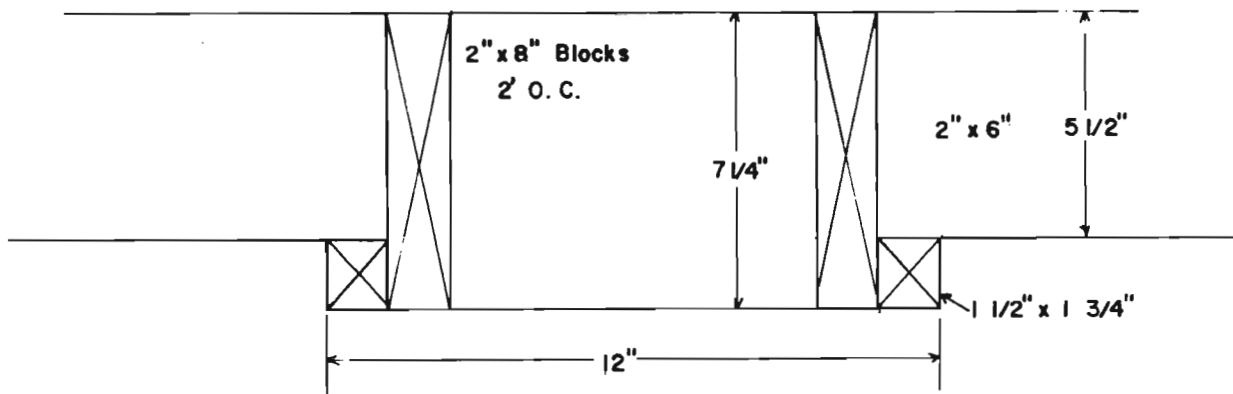
Additional savings in the crawlspace came from running heat ducts directly from the furnace to the register location, diagonally, like spokes on a wheel, instead of using one large trunk line through the center of the crawlspace with lateral ducts,



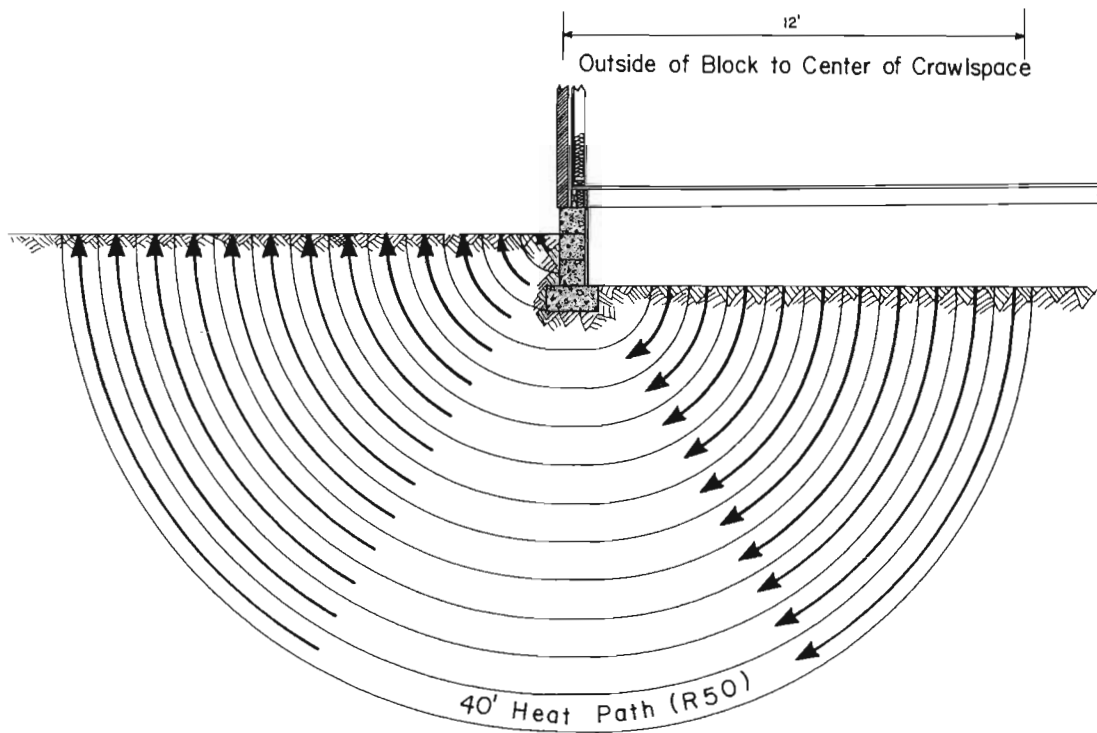
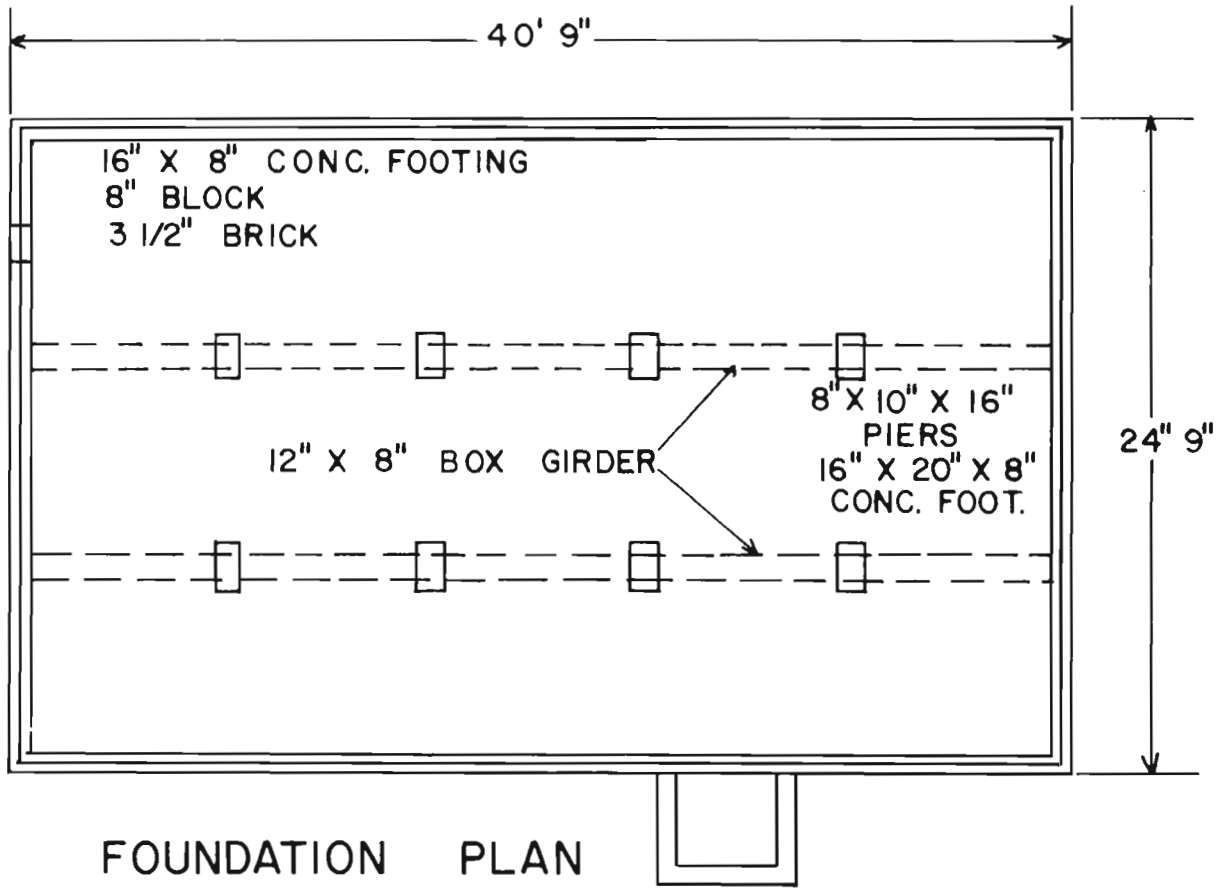
Two Box Girders
 Each 2-2" x 8" With 9" 2" x 8" Blocks 2' O.C.
ROBERTSON FLOOR SYSTEM



One Beam 3- 2" x 10"
COMMON FLOOR SYSTEM



DETAIL OF BOX GIRDERS



Heat loss paths from crawlspace

leaving the trunk at right angles and leading to the registers.

Robertson's duct system saved a total of \$9,125 for the 73 houses in the development. See duct drawing in Chapter 4.

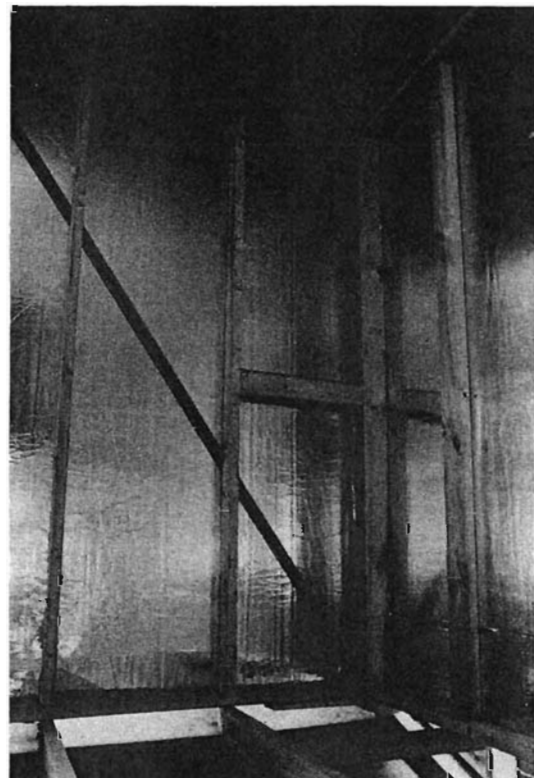
Robertson employed many OVE (Optimum Value Engineered) techniques developed by NAHB Research Foundation. He eliminated sill plates, fastening the joists to the foundation with metal straps. He placed joists, studs, and trusses in-line and 2 feet apart instead of the usual 16-inch spacing; this saved nearly one-third of his joists and studs. Understanding that on most houses, including his, the exterior corners carry little more than half as much of the roof weight as that carried by a normal stud, and, on the hip-roof models carry practically no weight at all, Robertson used two-stud exterior corners instead of normal three-stud corners. Also, since in in-line framing the weight of each truss is carried directly to the stud beneath it, there is no need of a double plate to carry weight from the truss to the stud; therefore, Robertson used single top plates. He eliminated jack studs and headers on openings in nonload-bearing walls and used scrap blocks and metal gypsum board clips instead of wall-corner and ceiling nailers. Finally, building his ceilings 7'-6" high instead of 8'-0" saved two courses of brick (savings mentioned above), about 6 percent of his wall insulation, 3 percent of his painting material and labor, and 6 percent of his studding lumber. Savings accrued by Robinson's cutting two 7'-4" studs from each 16' 2x4, leaving 16"-long blocks he used for ceiling and corner drywall backers. These savings in material and labor more than offset the extra labor to cut the studs and 6 inches from the top of the gypsum wallboard. Robertson saved \$32,708

by using OVE techniques in Hermitage Hill.

Robertson saved \$7,665 by using PVC hot and cold water lines instead of copper and saved additionally by using PVC drain and waste instead of cast iron.

Robertson's largest savings accrued from his purchasing and employment procedures. He bought all material himself and employed workmen on an hourly or piecework rate instead of on a subcontract basis. In this way he eliminated the approximately 30 percent of subcontractor markup on material and labor. Robertson estimates that he saved \$3 per square foot, which totals \$210,240 for the entire development.

All together, Robertson saved a total of \$438,516 in building design and construction, or \$6,007 per unit.



OVE System
● Two-stud corner
● Single-top plates
● In-line framing, 2' O.C.

Details of Changes and Their Costs

In this chapter, an analysis of costs of each change in Christian County standards and/or in the typical practices of Robertson-Tomberlin Homes is discussed and compared to the method used in the demonstration project. The analysis shows how costs were reduced by comparing the cost of building Hermitage Hill to its cost if built to existing standards and practices. Throughout the chapter, total costs are for 73 units.

Administrative and Processing Changes

The changes and increases in Hopkinsville's storm water management

requirements delayed construction for four months. (See Chapter 3, Administrative and Processing Changes, for details.)

This four-month delay increased Robertson's and Tomberlin's indirect expenses and carrying charges, and resulted in labor and material cost increases due to inflation during the four months that were passed on to customers in the form of higher prices. A total of \$400 per unit was added to the Hermitage Hill project through administrative and processing delays.

Increase in Administrative and Processing Costs

	<u>Cost Of Delay</u>	
	<u>Annual Cost</u>	<u>4-Month Delay Cost</u>
Interest on land (12% of \$73,500)	\$ 8,820	\$ 2,940
Interest on land planning, architectural & engineering costs & permits (12% of \$15,000)	1,800	600
Indirect salaries, office overhead & expenses	15,429	5,143
Office overhead	2,700	900
Model home carrying cost (3 homes)	10,286	857*
Legal and accounting	2,500	833
Liability insurance on land	1,100	367
Real estate taxes on land	6,000	2,000
Labor and material inflation (73 units x \$16,000 x 4% inflation rate)	46,720	15,573
TOTALS		\$29,213
 Delay Cost Per Unit		 \$ 400

*1-Month Delay Only--August 1985

Site Planning and Development Changes

analyses of each development phase follow.

Following is a summary of land development cost savings. Detailed

Land Development Cost Summary				
	<u>Demonstration</u>	<u>Comparison</u>	<u>Total Savings</u>	<u>Savings Per Unit</u>
Raw land	\$290,000	\$290,000	\$ -0-	\$ -0-
Street width/pavement	61,128	188,110	126,982	1,739
Curbs	-0-	57,881	57,881	793
Sidewalks	-0-	40,348	40,348	558
Sanitary sewer	68,725	104,504	35,779	490
Storm water drainage	<u>22,000</u>	<u>-0-</u>	<u>(22,000)</u>	<u>(301)</u>
TOTALS	\$441,853	\$680,843	\$238,990	
Cost Per Unit	\$ 6,053	\$ 9,327		\$ 3,279*

*Figures do not total due to rounding.

Streets

Robertson-Tomberlin Homes reduced street pavement widths from 26 feet to 22 feet on the main collector street, from 26 feet to 18 feet on those running to the cul-de-sacs, and from 26 to 14 feet around the cul-de-sacs. They eliminated 27,892 square feet of pavement. They also

reduced pavement specifications for dense grade aggregate, from 6 inches to 5; bituminous asphalt, from 2 inches to 1-1/2; and surface asphalt from 1 inch to 3/4 inch. These changes saved \$126,982 or \$1,740 per unit.

Street Cost Summary			
	<u>Demonstration</u>	<u>Comparison</u>	<u>Savings</u>
TOTALS*	\$ 61,128	\$188,110	\$126,982
Cost Per Unit	\$ 837	\$ 2,577	\$ 1,740

* Includes cost differentials from both area and specifications

Curbing

By eliminating curbs and gutters usually built in new subdivisions, Robertson saved \$57,881.

Curbing Cost Summary			
	<u>Demonstration</u>	<u>Comparison</u>	<u>Savings</u>
TOTALS	\$ -0-	\$57,881	\$57,881
Cost Per Unit	\$ -0-	\$ 793	\$ 793

Sidewalks

Four-foot-wide sidewalks were normally installed on both sides of the street in new Hopkinsville subdivisions. Robertson-Tomberlin eliminated them altogether and saved \$40,348.

Sidewalk Cost Summary			
	<u>Demonstration</u>	<u>Comparison</u>	<u>Savings</u>
Sidewalks	\$ -0-	\$40,348	\$40,348
Cost Per Unit	\$ -0-	\$ 558	\$ 558

Sanitary Sewer

In their sanitary sewer system, Robertson-Tomberlin gained substantial savings by using polyvinylchloride (PVC) instead of clay for 8-inch mains and 6-inch

laterals and by substituting cleanouts for manholes whenever possible. A total of \$35,779 was saved on the sanitary sewer system installation.

Sanitary Sewer Cost Comparison			
	<u>Demonstration</u>	<u>Comparison</u>	<u>Savings</u>
PVC pipe instead of clay			
8-inch	\$46,360	\$64,904	\$18,544
6-inch	8,120	11,600	3,480
Manholes	14,000	28,000	14,000
Cleanouts	245	-0-	(245)
 Total	 \$68,725	 \$104,504	 \$35,779
 Cost Per Unit	 \$ 941	 \$ 1,432	 \$ 491

Storm Water Drainage

Prior to Hermitage Hill, storm water management systems were not required in low-density subdivisions outside Hopkinsville city limits. The city, however, made Robertson-Tomberlin

comply by refusing them water and sewer service until they met the city storm water management requirements. The final system cost, therefore, was \$22,000 higher than normal for such a project. (See the administrative processing section.)

Storm Water Drainage Cost Summary			
	<u>Demonstration</u>	<u>Comparison</u>	<u>Savings</u>
Engineering fees	\$ 7,000	\$ -0-	(\$ 7,000)
Construction costs	15,000	-0-	(15,000)
 TOTALS	 \$22,000	 \$ -0-	 (\$22,000)
 Cost Per Unit	 \$ 301	 \$ -0-	 (\$ 301)

Building Design and Construction Changes

construction totaling \$438,516 or \$6,007 per unit. Detailed analyses of each change follow.

Summarized below are cost savings from changes in building design and

Construction Cost Savings			
<u>Demonstration</u>	<u>Comparison</u>	<u>Cost Savings</u>	
		<u>Total</u>	<u>Per Unit</u>
Brick	Brick	\$ 130,407	\$1,786
Block: surface-bonded	Block: joint-mortared	6,424	88
2x6 Floor system 2'O.C.	2x8 Floor system 16"O.C.	21,507	295
R-4 EPS foundation wall	R-11 blankets	20,440	280
"Radial" ducting	Trunk + 900 lateral	9,125	125
OVE framing system	Conventional framing	32,708	448
PVC hot & cold water	Copper water lines	7,665	105
Piecework & hourly employment	Subcontracted employment	210,240	2,880
	TOTALS	\$ 438,516	\$ 6,007

Brick Veneer

Robertson used several techniques to effect reduced costs so he could offer brick veneer to his market. He used 8-inch concrete blocks above and below grade instead of 12-inch block below grade and 8-inch block plus brick above. He used concrete footers 16 inches wide instead of 20 inches. He eliminated gable brick by

using hip roofs and siding. Finally, he built his interior wall height 7'-6" instead of 8'-0". Robertson estimates that he saved 3,000 bricks per house, and, since each house required less brick than normal, he often bought odd-lot quantities at substantial savings. Robertson saved \$130,407 on his total brick veneer cost.

Brick Veneer Cost Summary			
	<u>Demonstration</u>	<u>Comparison</u>	<u>Savings</u>
8" block vs. 12"	\$ 12,191	\$ 16,060	\$ 3,869
16"-wide footer vs. 20"	13,812	17,345	3,533
Brick (quantity and price)	168,630	291,635	123,005
TOTALS	\$194,633	\$325,040	\$130,407
Cost Per Unit	\$ 2,666	\$ 4,453	\$ 1,786

Concrete Block Bonding

Robertson further reduced his crawlspace foundation costs by having his carpentry crew stack the concrete blocks and bind them together with

fiberglass-reinforced surface-bonding cement, instead of hiring more expensive masonry labor to lay them using traditional joint mortar. In this manner, Robertson saved a total of \$6,424 on the 73 foundations.

Concrete Block Bonding Cost Comparison			
	<u>Demonstration</u>	<u>Comparison</u>	<u>Savings</u>
Surface-bonding instead of conventional mortar	\$10,294	\$16,717	\$ 6,424
Cost per unit	\$ 141	\$ 229	\$ 88

Wood Floor System Construction Changes

A unique floor system designed by Robertson saved \$21,507. This system uses two box-beams to support the floor joists, each of which is supported by four concrete block piers. The beams are made of

2-2x8's separated by 12-inch 2x8 blocks, with 3/4" plywood glue-nailed on top. Nailed to the bottom of the edge of the beams were 2x2 ledgers supporting 2x6 joists, laid 2 feet apart. The maximum span on the joists is 7'-7". Tongue and groove plywood subfloor-underlayment 3/4" thick is glue-nailed to the joists.

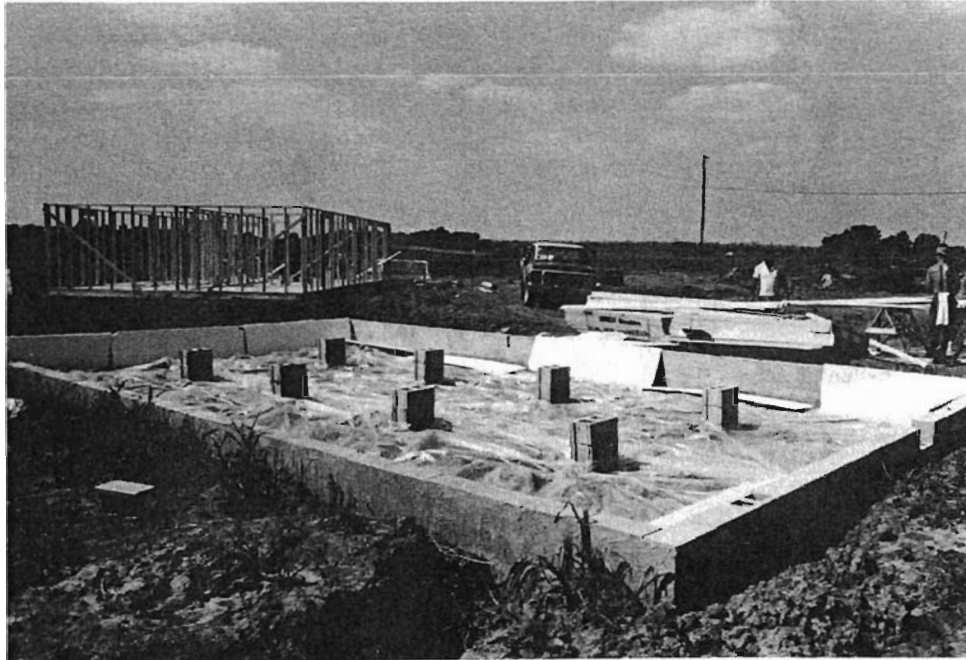
Wood Floor System Cost Summary			
	<u>Demonstration</u>	<u>Comparison</u>	<u>Savings</u>
Piers: 8 vs. 3	\$ 6,132	\$ 3,066	\$(3,066)
Beam: two 2-2x8 vs. one 3-2x10	4,906	4,906	-
Joists: 2x6 24' O.C. vs. 2x8 16" O.C.	10,624	25,019	14,395
3/4" T&G plywood & glue vs. 1/2" CDX + 5/8" P-bd.	<u>34,797</u>	<u>37,349</u>	<u>2,552</u>
TOTALS	\$ 56,459	\$ 70,340	\$ 13,881
Cost Per Unit	\$ 773	\$ 964	\$ 191

Crawlspace Insulation

Robertson saved money and created a warmer, dryer crawlspace with less chance of frozen pipes by insulating

the walls with R4.4 EPS (expanded polystyrene) board instead of the wood floor system with batts or blankets. Total project savings were \$20,440.

	<u>Demonstration</u>	<u>Comparison</u>	<u>Savings</u>
R-4.4 EPS crawlspace wall vs. R-11 floor blanket	\$ 5,100	\$25,500	\$ 20,440
Cost per unit	\$ 70	\$ 350	\$ 280



Crawlspace foundation with insulated walls

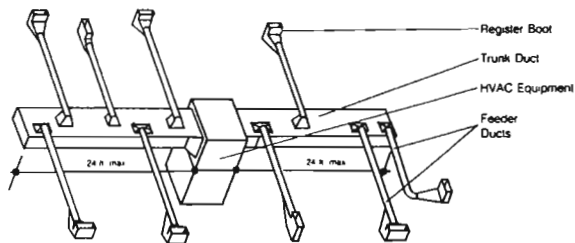
Furnace With "Radial" Ductwork

Additional savings in the crawlspace came from running heat ducts directly from the furnace to the register location, radially, instead of using

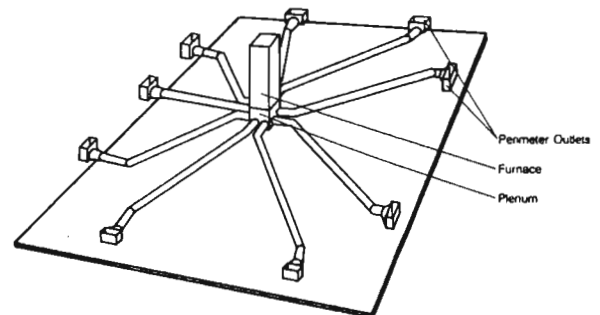
one large trunk line through the center of the crawlspace with lateral ducts leaving the trunk at right angles and leading to the registers. Robertson's duct system saved a total of \$9,125 in the development.

"Radial" Duct Cost Comparison

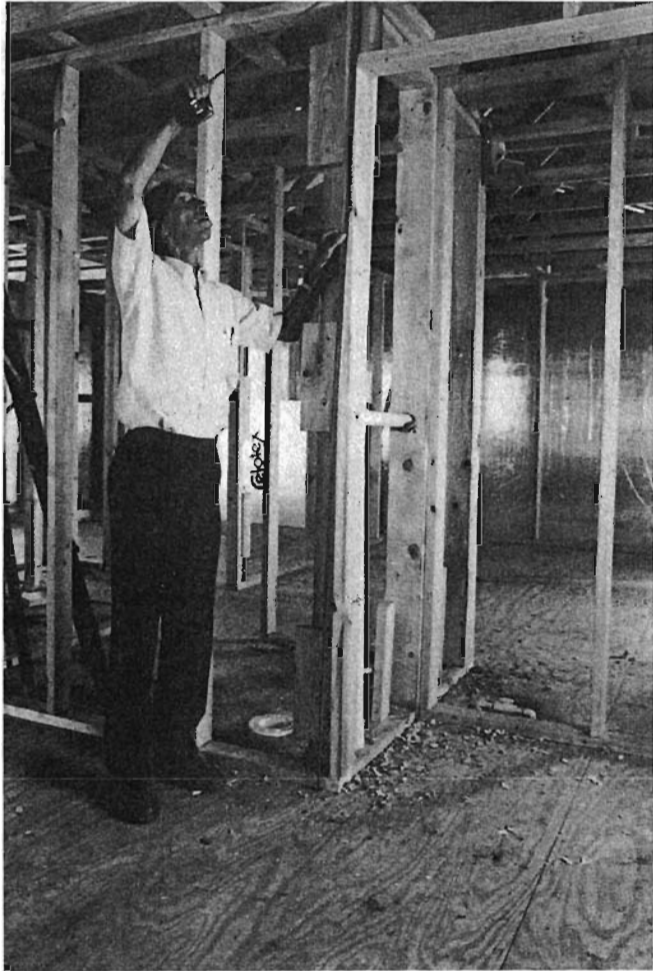
	<u>Demonstration</u>	<u>Comparison</u>	<u>Savings</u>
Furnace with "radial" ducts vs. trunk + 90° lateral ducts	\$41,975	\$51,100	\$ 9,125
Cost per unit	\$ 575	\$ 700	\$ 125



Plenum duct



Radial duct



OVE Techniques

Robertson employed many OVE (Optimum Value Engineered) techniques developed by NAHB Research Foundation. He eliminated sill plates. He placed joists, studs and trusses in line 2 feet apart. He used single top plates and two-stud exterior corners, instead of normal three-stud corners. He eliminated jack studs and headers on openings in nonload-bearing walls. He used scrap blocks and metal gypsum board clips, instead of wall-corner and ceiling nailers and reduced the ceiling height from 8'-0" to 7'-6". Use of OVE techniques saved him \$32,708.

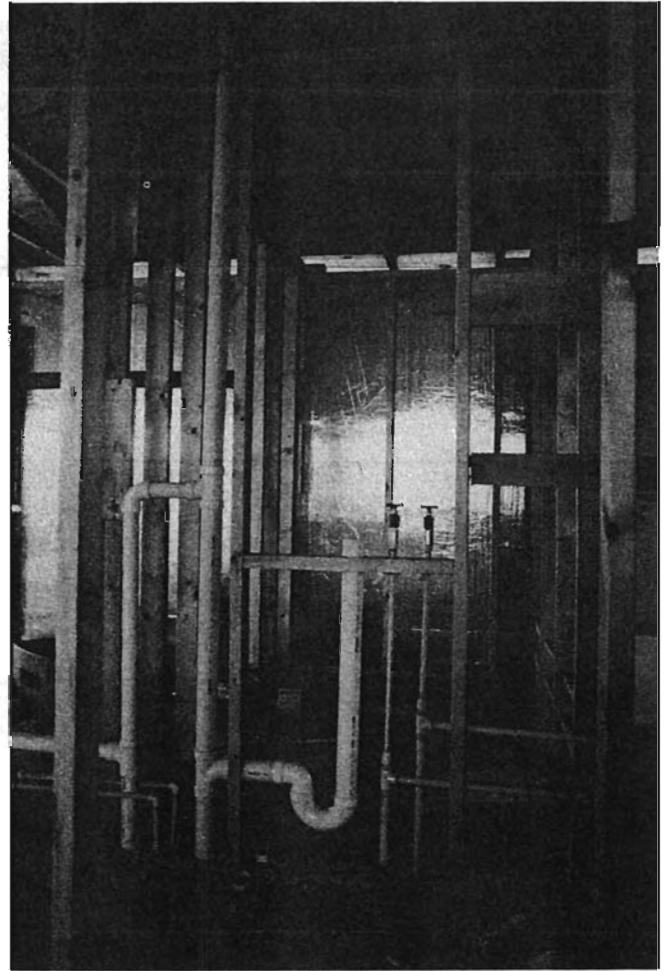
Pup Robertson measures 7'-6" ceiling

OVE Cost Summary

	<u>Demonstration</u>	<u>Comparison</u>	<u>Savings</u>
No sill plate vs. 2x6 sill	\$ -0-	\$ 7,994	\$ 7,994
Studs 24" O.C. vs. 16"	12,195	18,290	6,095
2-Stud ext. corners vs. 3	3,429	5,145	1,716
Single top plate vs. double	-0-	3,048	3,048
Headers & jacks in nonload-bearing walls: Yes/No	-0-	5,382	5,382
Metal gypsum clips vs. ceiling & corner backers	1,067	8,422	7,355
7'-6" studs vs. 8'	-0-	1,168	1,168
TOTALS	\$16,691	\$49,399	\$32,708
Cost Per Unit	\$ 229	\$ 677	\$ 448

Water Lines

Robertson saved \$7,665 by using PVC hot and cold water lines instead of copper.



PVC plumbing -
hot, cold, DWV

Water Lines	<u>Demonstration</u>	<u>Comparison</u>	<u>Savings</u>
PVC hot & cold vs. copper water lines	\$12,483	\$20,148	\$ 7,665
Cost per unit	\$ 171	\$ 276	\$ 105

Purchasing/Employment Procedures

Robertson saved money by buying all material himself and by employing workmen on an hourly or piecework rate instead of on a subcontract basis. In this way he eliminated the approximate 30 percent subcontractor markup on material and labor.

As an example, an electrical wiring installation costing \$2200 from a subcontractor who buys the material and marks up his labor and material

by 30 percent, might have cost Robertson only about \$1,700 because he was able to buy the material himself at wholesale prices and employ an electrician on an hourly basis. Robertson, saved \$500 on the installation.

By adding all savings gained in this manner on construction of each house, Robertson estimates that he saved \$3 per square foot, which totals approximately \$210,240, for the 73 units in the entire development.

Employment Technique Cost Comparison	
	<u>Demonstration Savings</u>
Piecework or hourly vs. subcontract employment	\$210,240
Cost per unit	\$ 2,880

Cost Savings Summary

Following is a summary of cost savings per unit in Hermitage Hill

due to builder/developer variations to typical practice and net of losses incurred through delays in administrative processing.

	<u>Cost Savings Per Unit</u>
Administrative and processing	\$ (400)
Land development	3,279
Direct construction	<u>6,007</u>
TOTAL	\$ 8,886

Project Schedule

August, 1984 - Malcolm R. King, Manager of the Hopkinsville Sewerage and Water Works Commission (SWWC) gave Robertson verbal approval for water and sewage service.

August 18, 1984 - Robertson-Tomberlin Homes purchased land from Richard Tomberlin. Developers began detailed planning of the 21-acre Hermitage Hill site.

August 25, 1984 - Robertson first learned of the Affordable Housing Demonstration through the Kentucky Home Builders Association. Robertson called HUD to indicate his interest in joining the demonstration.

August 30, 1984 - Frank M. Gary, Judge and Chief Executive of Christian County, Kentucky, sent letter of county support to HUD.

October, 1984 - HUD selected Robertson-Tomberlin Homes for participation in the Affordable Housing Demonstration.

October 10, 1984 - Malcolm King, Manager of the Sewerage and Water Works Commission (SWWC), sent letter to Steven R. Bourne, Director of the Hopkinsville-Christian County Planning Commission stating that water and sewer service "can be constructed" to serve Hermitage Hill but must be designed and built to commission specifications.

October 27, 1984 - The Planning Commission determined they had no jurisdiction over Hermitage Hill because in 1982 the Kentucky Subdivision Ordinance had been ruled illegal by the Kentucky Court of Appeals.

November 2, 1984 - HUD announced the Christian County Affordable Housing Demonstration in a press release carried on Hopkinsville, Kentucky, radio and TV and on the front page of the Hopkinsville New Era daily newspaper.

November, 1984 - Neighbors formed the Pyle Lane Homeowners Association to fight Hermitage Hill, fearing the development would increase the probability and severity of flooding in a subdivision across Pyle Lane from Hermitage Hill.

November 27, 1984 - Robertson-Tomberlin formally applied for water and sewer service to the SWWC.

Early December, 1984 - SWWC withheld water and sewer approvals until Robertson agreed to comply with the city storm water ordinance requiring no increase in runoff due to the development.

January 4, 1985 - Robertson signed the agreement that he would implement the city storm water ordinance for the entire development prior to receiving water and sewer service at Hermitage Hill. This was the first time the city had extended its authority over storm water control beyond its boundaries.

January-March, 1985 - Robertson's hydraulic engineers designed the retention basin system. Development plans were redrawn to accommodate the system.

March 2, 1985 - Robertson began construction.

April 27, 1985 - Robertson completed two models on Pyle Lane.

May 2, 1985 - Robertson held ribbon-cutting ceremonies attended by Shirley McVey Wiseman, then HUD General Deputy Assistant Secretary of Housing and Acting FHA Housing Commissioner.

July 15, 1985 - First family moved in.

Late July, 1985 - Hopkinsville turned off water to residents of Hermitage Hill for one week until Robertson-Tomberlin agreed to

increase his storm water detention basin capacity.

August 9, 1985 - Robertson-Tomberlin signed an agreement that they would satisfy the new requirements within 30 days.

Sept. 9, 1985 - Sewerage and Water Works Commission inspected and approved enlarged basin.

Sept. 27, 1985 - Road paving complete.

Letter From Christian County Judge Supporting Affordable Housing Demonstration



EXECUTIVE OFFICES

CHRISTIAN COUNTY

COUNTY COURT HOUSE
HOPKINSVILLE, KENTUCKY 42240

FRANK GARY
COUNTY JUDGE EXECUTIVE

TELEPHONE
502-887-4100

August 30, 1984

Mr. Fred Porterfield
Manager, United States
Department HUD
P.O. Box 1044
Louisville, KY 40201

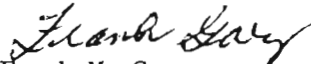
Dear Mr. Porterfield:

I am writing you to express Christian County's support for a proposed development on Pyle Lane.

Mr. Richard Tomberlin and Mr. Norris G. Robertson plan to build houses in a joint venture for affordable homes. Our county is in need of this type of housing. We have Ft. Campbell in our county and many live in Hopkinsville, Christian County. The area of the proposed development seems a perfect site, since it is convenient to town, but has a country atmosphere.

We urge your favorable consideration of their application and would be pleased to provide any further information you desire. Do not hesitate to contact my office anytime.

Sincerely,


Frank M. Gary
County Judge/Executive

FMG:dg



J.S. Department of Housing and Urban Development
Washington, D.C. 20410

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April 1986
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