PARTNERSHIP FOR ADVANCING TECHNOLOGY IN HOUSING

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

Boosting Efficiency in Colonia Homes

Cameron Park Colonia in Brownsville, Texas

TECHNOLOGY HIGHLIGHTS

A new standard for affordable homebuilding has been set in Brownsville, Texas. Colonias, the neighborhoods of immigrants that dot the border with Mexico, are known for having some of the most substandard housing in the state. Shacks without plumbing or basic equipment suffer under the wind and heat of south Texas.

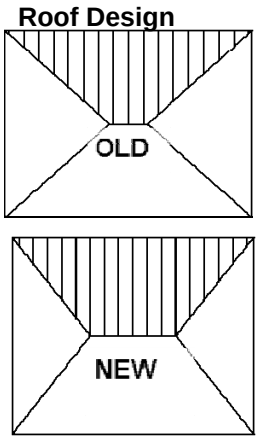
The Community Development Corporation of Brownsville (CDCB) has been working hard to improve the quality of life in these colonias. Each year the CDCB builds between 24 and 40 cost-effective three-bedroom homes on land owned by homeowners who qualify for the low-interest loans. A new prototype home developed with technical assistance from the Partnership for Advancing Technology in Housing (PATH) used a number of advanced building technologies to achieve comfort, durability, and resource efficiency. PATH, administered by the U.S. Department of Housing and Urban Development, collaborated with the CDCB and the Rio Grande Valley Multibank to achieve common goals of building economical and energy-efficient homes for people in need.

This particular colonia, Cameron Park, is the largest and oldest colonia settlement in the U.S. The demonstration home is the first colonia house to incorporate PATH technologies for high-performance homes. From an improved framework design to energy-saving appliances, selected building strategies will benefit homeowners in need by providing safety, durability, and reduced energy costs. The CDCB plans to include the PATH technologies in its future homes, setting a new and improved standard for colonia

housing.

Advanced Technologies

It is the goal of the U.S. Department of Housing and Urban Development's PATH program to accelerate the development and use of technologies that radically improve the quality, durability, energy efficiency, environmental performance, and affordability of America's housing market. The Cameron Park Colonia Demonstration Home features several of these technologies, carefully planned and implemented to yield performance and cost benefits to both the builder and the homeowner. Highlighted below are the PATH technologies used in this project.



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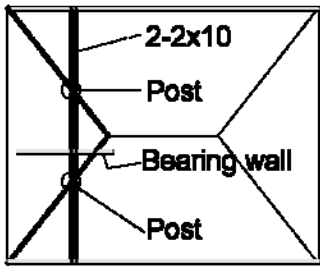
Value-Optimized Framing Innovations

The technical advisors to the project wanted to incorporate Optimum Value Engineered (OVE) framing techniques to reduce the lumber and labor needed to build the house. However, some typical OVE practices were determined to be incompatible with the high wind design loading criteria of the area: a three-second gust at 110 miles/hour. With careful consideration of the specific site requirements, the designers were able to specify an economical, structurally sound framing system for a remarkably well-insulated low-income prototype home that cost only $30,000.



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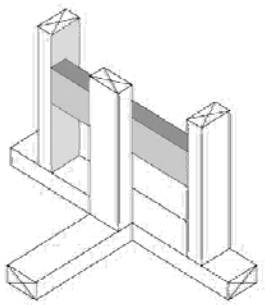
Dual Pitch Roof (1)—To balance aesthetics with the need for cost savings, the architect designed a steeper roof pitch (6-3/4 in 12) on the short sides of the hipped roof than on the longer sides (5 in 12). This raises the apparent height of the roof from the front view and increases the ridge line from 5 to 12 feet. Now 40% of the home is framed like a gable roof. The new design resulted in a stronger structure, a more efficient layout of roof sheathing that minimizes waste, and a modular framing layout that carries throughout most of the home.

Simplified Ridge Supports (2)**—**Hip ridges carry a large load and the clear span would require two 11-7/8 inch Microlams at 18 feet long. Consultants revised the design to use two 2x10s at the ceiling to support a single 2x10 ridge at the center, saving construction cost and time.

24-Inch-On-Center Framing—Rafters and ceiling joists are aligned with interior studs, all spaced at 24 inches on-center. This creates a direct load path while substantially reducing lumber and labor costs for interior studs, which are traditionally spaced at 16 inches on-center. Exterior walls retain 16-inch stud spacing to meet wind load requirements. In future homes, the builder plans to use only a single stud at door jambs for further savings.



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Ladder Bracing at "T" intersections —Flat horizontal blocking is placed between studs to secure partition framing (3). Three scrap pieces are set horizontally at in the wall cavity to replace two studs typically used at a "T" intersection. The joint is stiffened by the horizontal blocking, and 1-1/2 stud lengths of lumber are saved. Most importantly, exterior wall insulation can continue uninterrupted around the building envelope with no uninsulated hidden cavities. The ladders initially conflicted with the required gypsum board nailing pattern, so PATH

technical advisors made minor plan changes to accommodate the requirements.

Energy Efficiency Innovations

The harsh Texas climate combined with anticipated income level of occupants made energy efficiency and reduced utility bills a prime consideration for the project. The home was designed to exceed the Model Energy Code by 30% or more, and tests for envelope and duct leakage helped verify that the home meets the requirements for ENERGY STAR® Homes (4).

Low-E Double-Glazed Windows —These efficient double-glazed windows are now required by Texas code (5). They are extensively used in housing nationwide because they are effective in reducing cooling load of solar heat gain.

Improved Envelope Insulation—Installing higher levels of envelope insulation demonstrates a small but noticeable effect in reducing the total energy used by the house while increasing the comfort of the home. R-13 insulation was used in the walls, and R-30 insulation was used in attic spaces. Technical advisors gave consideration to insulation needs when designing the framing system to avoid difficult-to-insulate gaps and cavities.

Right-Sized Mechanical Equipment—Technical support engineers used "Manual J" to correctly size the "Right-Sized" mechanical equipment – 1.5 tons of cooling. Common practice results in oversized air conditioners, which consume excess energy and can potentially create mold problems. Manual J is a simple-to-use design tool, available for hand calculation or in a user-friendly computerized version.

High Efficiency Air Conditioner—Specifying a higher efficiency air-conditioning unit with a higher Seasonal Energy Efficiency Rating (SEER) rating saves energy and results in greater indoor comfort. Although a SEER 14 was selected for this job, the unit was unavailable when needed so a SEER 12 was used instead.

Mastic-Sealed Ducts—Air leakage from duct joints and connections causes significant energy losses and affects pressurization, air distribution, and indoor air quality. Duct tape traditionally used to seal ductwork eventually loses its powers of adhesion and falls off. Mastic is a putty-like sealant used to fill cracks and crevices that does not harden and crack but rather remains flexible over time, resulting in a much better air seal and improved energy performance.

Duct Insulation—Increasing the insulation of the ducts also exhibits a small but noticeable effect in increased energy savings and whole house comfort. 1-1/2-inch R-6.5 ductboard insulation was installed.

Intake-Only Ventilation —A small, well-insulated home needs mechanical ventilation, but exhaust ventilation is not desirable in hot, humid climates because it sucks hot, humid air into contact with cool walls and ceilings, which can create condensation and mold. Intake-only ventilation is provided by a 6-inch duct from outside to the air conditioning fan (6). When the fan runs, it pulls ventilation air in, filters it, and cools it, providing mechanical ventilation without mold and

Money Isn't All You're Saving

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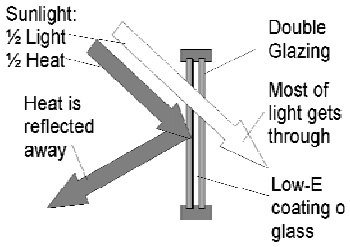

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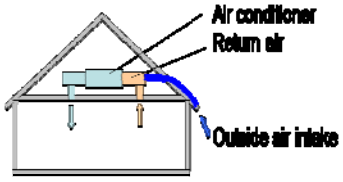
"We at HUD hope this demonstration home transforms the way houses are constructed in the colonias and in the rest of the Rio Grande Valley."

-Cynthia Leon, HUD



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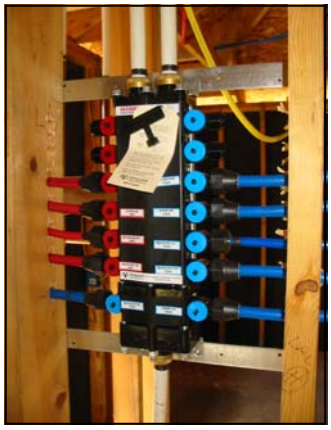
moisture problems. The simplified ventilation strategy also saves energy.
ENERGY STAR® Appliances—An ENERGY STAR® refrigerator selected for the home will yield savings of $35/year, offsetting the initial price increase in a short time.

Compact Flourescent Lighting—Fluorescent lighting saves 70% of the cost of incandescent lighting. New fluorescent lamps don't hum or flicker, and have excellent color rendition.



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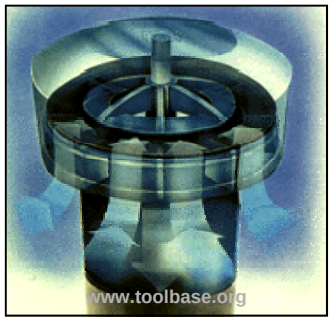
Plumbing Innovations

PEX Tubing—Cross-linked Polyethylene, or PEX, is an innovative but proven system being used nationwide. The tubing replaces copper in household water supplies. It is extremely durable, more flexible to work with than copper or PVC, and it cannot kink. PEX is particularly desirable for Brownsville, which has highly corrosive water. Using PEX, the water will not attack the tubing. A crimped fitting system is used to make joints. At one point, the project was delayed because the builder did not initially have the proper crimping tool available.

Manifold Water Distribution—The innovative manifold system (7), which distributes water directly to plumbing fixtures, is unique because the plastic manifold presents no corrosion problems. The system uses 14 ports (half for hot water and half for cold) and color-coded tubing for easy installation. PEX tubing runs straight from manifold to fixture. The manifold has shut-off valves for every fixture in a central location. There are no hidden joints or fittings; every line has a joint at the end only. Also, 3/8-inch lines cut down on the wait time for hot water at remote fixtures, thereby increasing the whole home comfort.



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Air Admittance Valves—Plumbing "waste pipes" are typically vented through pipes penetrating the rooftop, admitting fresh air and releasing sewer gases. The prototype home uses reliable air admittance valves (8) at plumbing fixtures to let air in to the plumbing as needed to maintain pressures, but keep sewer gases from escaping into the home. A single waste vent can be used to dispel sewer gases, reducing the number of roof penetrations (prone to leakage) and the amount of piping required.

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Conclusion

Efficient construction techniques and careful materials selection combined to reduce the purchase price and long-term utility bills at the Cameron Park Colonia Demonstration Site. The project was a success by all accounts, and the CDBC has continued to implement PATH technologies on its subsequent projects, incorporating even more high performance materials and techniques with time. Although the closing date was delayed several times while waiting for loan confirmation for the homeowner, a family is now living in the new home and enjoying the added comfort and durability. The project also served to bolster community on a number of levels, both by improving the quality of life in the colonia and by offering unique learning opportunities to community members. The Cameron Park project was completed with help from the CDCB's YouthBuild program (9), which provides work opportunities for local low-income youth who have dropped out of school. Twenty-five homes in the Brownsville colonia have been built thus far with YouthBuild workers.