

Habitat Dekalb High Performance Homes

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The prime directive of Habitat for Humanity is to build simple, decent homes. At Habitat Dekalb, we do that and a lot more. By practical application of the principles of building science, we also strive to make our homes healthy, safe, comfortable, durable and energy efficient. We look at the house as a single system in which a change to one component can dramatically affect the performance of another. Our homes incorporate leading edge products and practices, from Optimum Value Engineered plans which minimize wood use and maximize insulation, to properly sized and installed Heating Ventilation and Air Conditioning (HVAC) systems which condition air more effectively for less money, to low-e insulated windows which improve comfort and allow us to use a smaller HVAC system, lowering operating costs further.

We are an Energy Star builder and adhere to the principles of Masco's Environments for Living program. All of our homes are duct blaster, blower door and pressure tested to confirm performance. We are also an EarthCraft House builder, meaning our homes are built environmentally friendly, minimizing waste during construction and conserving water and energy for the useful life of the home, which should be 100 years or more. Our goal is to heat and cool these homes for \$20 to \$25 per month, which lowers operating costs for the people living in them and frees up money for more useful purposes.

Our homes also meet guidelines set for the by the American Lung Association for their ALA Home program, which strives to make indoor air quality as healthy as possible. Practices such as minimizing carpet use, utilizing fresh air ventilation strategies and installing a radon evacuation system are a few of the things that lower the potential for a poor indoor environment. The homes are designed and built to be accessible to people with physical disabilities, incorporating wide doors throughout, wider halls and open bathrooms and kitchens. Habitat Dekalb homes also are low maintenance, with sturdy vinyl siding, vinyl windows and aluminum wrapped fascia boards.

The Results

Performance testing has confirmed the effectiveness of our practices. 1971 Brown Place is an 1144 square foot, three bedroom, one bath home with eight foot ceilings throughout (except the hallway, which is seven feet to allow the ductwork to be inside the conditioned space). Manual J and D calculations were done to insure proper sizing of the HVAC equipment and ductwork. The home was designed to be all-electric to eliminate minimum service charges for gas usage.

Blower door testing by Environments for Living and Southface Energy Institute show building envelope leakage to be 1.5 square inches leakage per 100 square feet of envelope (walls, ceiling, crawlspace walls, ground vapor barrier). Very little

unconditioned, unfiltered outside air will enter the home and not much conditioned air will leak out. For comparison, the average new home might have 8 to 12 square inches of air leakage per 100 square feet of building envelope.

Duct blaster testing shows 96 cfm leakage, which is 8.4% cfm leakage per square foot of the floor plan. This is a little high, but acceptable as all HVAC and ductwork is inside the building envelope. The average new home might have 25% to 30% duct leakage. If the leak is on the supply side, money is wasted heating and cooling the attic, basement or crawlspace. If the leak is on the return side, unfiltered air can be sucked into the home from the attic, basement or crawlspace.

Room pressure testing shows each room less than 3 pascals pressure (with respect to the main area of the home) with each room door closed and the HVAC fan running. This means there will be no over- or under-pressurization in any room, which could lead to conditioned air being blown out through cracks or unfiltered outside air being sucked in. This is accomplished by the use of return air pathways that allow unimpeded airflow from any room back to the central return.

Energy use analysis done on Rem/Rate software indicates the home should have annual heating cost of \$138 and cooling cost of \$101, which would be \$19.91 month. The home achieved an Energy Star rating of 88, 2 points above the 86 needed to earn the designation.

Habitat Dekalb would like to thank the following companies who have donated or discounted products and services to allow us to build superior homes:

Styro Systems (Dow)- Styrofoam insulated sheathing, Styrofoam sill sealer
Styro Systems (W.R. Meadows)-Sealtight Vapor Mat crawlspace vapor retarder,
Meadow-Pruf Seamless waterproof membrane
Whirlpool- electric range and Energy Star refrigerator
Simpson Strong-Tie- drywall stops, structural connectors
Cooper Carry- architectural services
Lennox- heat pump
All Seasons Heating and Air- HVAC installation and ductwork
Robert Heard Associates/Plymart (Atrium)- low-e windows
Southface Energy Institute- environmental and energy services
Pulley and Associates (Delta)- faucets
Packer Industries- construction waste grinding (mulch)
EFI (Panasonic)- Energy Star bath fan, timer switch
Delco (Tyco)- Polyken self-adhesive window flashing membrane
Quality Insulation- gutters, wire mesh closet shelving, Hilti foam, fiberglass insulation
AirCycler- ventilation timer control
Seisco- electric tankless water heater
Sprite Industries- filtered showerheads
Hilti- foam gun

The Future

We constantly strive to improve our construction practices and procedures. We look for new products and new applications. We do our best to evaluate results to see if what we are doing needs to be changed. This open-minded attitude coupled with an understanding of building science principles and a healthy curiosity, allow us to continue to improve our product and the benefits offered to the homeowner.

Anything worth doing is worth doing right, especially for a home that will shelter and protect a family for many generations. Habitat Dekalb homes are built as well as (or better than) any home in Atlanta. We take great pride in our work and it shows.

“The truly successful are often not those who are wealthy or brilliant, but those who are genuinely good at what they do and who take great pleasure in it.”

Leon Rogers Basic Construction Management-The Superintendent's Job

Habitat Dekalb High Performance Homes Features

Habitat Dekalb builds using the principles of building science. Our primary goal is to design and build homes that are decent and affordable while being healthy, safe, comfortable, durable and energy efficient. We also strive to achieve value, always asking if the benefit is worth the cost.

We view the house as a system, insuring that all components work together.

All homes will adhere to the following standards (The Magnificant Seven):

- Tight construction
- Improved thermal systems
- Fresh air ventilated
- HVAC sized and installed properly
- Pressure balanced
- Combustion safety standards
- Internal moisture management

A few of the many products and practices that make our homes perform to very high standards follow.

Framing

- Optimum Value Engineered Plans and Advanced Framing- homes designed to minimize material waste and excess lumber and maximize insulation. The goal is to prevent waste and minimize thermal bridging. (Note: Dekalb County code requires OSB sheathing on all exterior walls)
- Building envelope defined as drywall ceiling, exterior sheathing, crawlspace walls and vapor barrier on crawlspace floor
- All plan dimensions in 2' increments
- Floor joists, 2x4 wall studs and ceiling joists in-line (stacked) and 24" O.C.



- Energy efficient corners and ladder blocking for T-walls
- No cripples under window openings and replace jack studs with header hangers
- Bottom plates and lower 2' of studs sprayed with borate solution for termite protection



- Double 2x4 window headers in load bearing walls, stick framed headers on non-load bearing walls and interior walls
- Drywall clips instead of blocking for drywall nailing
- Raised heel, engineered roof trusses with 24" overhang
- All exterior sheathing caulked or glued to walls on top and bottom plate, at seams and around doors and windows
- Sill plate anchor straps embedded in crawlspace wall concrete 48" O.C.
- TGI floor joists
- AdvanTech advanced OSB subflooring
- Window and door rough openings flashed with self-adhering 6" membrane flashing tape, caulked under top and sides of flanges with membrane flashing on exterior sides and top of flanges

Insulation and air sealing

- Exterior wall OSB/crawlwall seam sealed with foam/caulk
- 3/4" T&G Dow extruded polystyrene insulated sheathing on all exterior sheathed walls with seams taped
- Air sealing package: exterior walls caulked at bottom plate, all vertical and horizontal penetrations caulked/foamed, drain opening under tub sealed, OSB seams in corners caulked, window and door/rough opening gaps foamed with non-expanding foam, all top plates sealed with foam from attic, all ceiling penetrations sealed from attic, airspace between OSB sheathing and all exterior switch and outlet boxes foamed

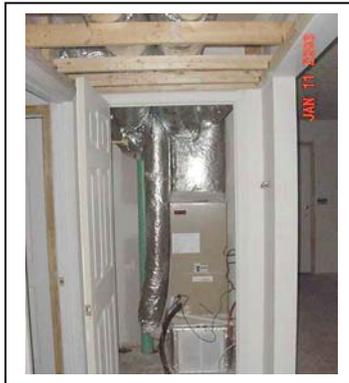


- R-13 cellulose insulation blown into walls and R-38 blown into attic

- 10" OSB insulation dam built around attic access opening
- Attic access cover insulated to R-30 and weatherstripped
- 24" foam vents attached beneath roof sheathing above exterior walls
- Batt insulation cut to fit between exterior walls and foam vents to prevent attic insulation from spilling into eaves and prevent wind infiltration into attic insulation
- Atrium windows, aluminum with thermal break frame, low-e glass .34 SHGC, .53 U value

HVAC and hot water

- 1.5 ton heat pump with 12 SEER and 8 HSPF
- Manual J room by room load calculations performed
- Manual D duct calculations performed



- All R-6 ductwork inside conditioned space (chase in top part of hallway)
- Central return in HVAC closet with return air pathways in every room
- Honeywell programmable thermostat
- AirCycler fresh air ventilation timer
- 6" R-6 fresh air duct connected to return side of air handler with manual damper and inlet above front porch
- All supply ducts have manual dampers at air handler plenum
- High efficiency filter installed
- Seisco instantaneous tankless electrical hot water heater
- Panasonic Energy Star bath fans vented to outside with light/fan timer switch installed
- Range hood fan vented to the outside
- All hot water lines and all water lines outside conditioned space wrapped with foam insulation
- Ceiling fans installed in all major rooms

Crawlspace

- Crawlspace sealed from outside (nonvented)



- W.R. Meadows Sealtight Vapor Mat 10 covers crawlspace floor, runs 6" up crawlspace walls and fixed to walls and piers with mastic, double caulked and taped at seams (6" overlap)
- Allied Foam R-8 2" EPS borate treated rigid foam insulation mechanically fixed to crawlspace walls, 4" clearance between foam and ground
- Weatherstripped trapdoor to crawlspace in closet floor
- R-19 batt insulation installed in band joist area
- Passive radon/soil gas evacuation system installed; vented field line installed in H pattern under Vapor Mat
- Crawlspace wall and pier footings covered with Vapor Mat before concrete blocks installed to act as capillary break
- Foundation drainage system installed
- W.R Meadows Sealtight Seamless Waterproofing Membrane applied to all below grade crawlspace and pier wall surfaces
- Portable commercial-grade dehumidifier operated in crawlspace continuously for one month prior to occupation

Indoor Air Quality

- Hard flooring throughout home (no carpet); laminate flooring throughout, except bath and kitchen, which have vinyl sheet flooring



- Low VOC paint used on all interior surfaces
- Kitchen cabinets solid wood, no particle board
- All particle board sealed with paint or wood sealer
- Fresh air ventilation

Environmental Conservation

- Minimize construction waste by use of OVE design
- Packer Industries grinder allows construction waste to be used as mulch
- Xeriscape landscape planning



Resource Savers

- Flourescent lighting used wherever possible
- Whirlpool Energy Star rated refrigerator
- All plumbing fixtures will be low consumption
- All blinds vinyl, cloth or wood, no metal
- 9" SunPipe tubular skylight in hall/bathroom
- Larson storm doors on all exterior doors
- Borate powder sprinkled in all unaccessable areas (under cabinets, under tub) for insect control



Note: Ray Ivy, VP Construction for Habitat Dekalb, is also Atlanta Manager of the Masco Environments for Living program. He has a passion for building high performance homes and welcomes all comments, questions or discussion about said subject. He can be reached via email at raivy@aol.com or ray.ivy@masco-csc.com.