

GreenCraft Builders 2008 Greenspoint House Prototype

Case Study
Prosper, Texas



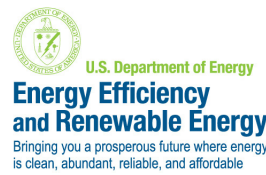
OVERVIEW

BSC collaborated with Greencraft Builders in Prosper, TX on a 2008 prototype house called the Greenspoint House. This house demonstrates the energy efficiency and durability upgrades that Greencraft has been promoting for years. The architect for the Greenspoint house was William Peck and Associates, out of Lewisville, TX. The Greenspoint house is located in Prosper, TX.

BSC provided consulting services for Greencraft and recommended numerous efficiency and durability improvements. Key upgrades include an unvented roof with low density spray foam insulation and supplemental dehumidification. Other upgrades that contributed to increased building efficiency and durability are LoE³ next generation spectrally selective glazing treatment and a high efficiency HVAC system.

ENCLOSURE DESIGN

Greencraft employed full advanced framing throughout the enclosure. This includes 2x6 at 24" o.c. with stacked framing through the floor joists and roof rafters. A single top plate and 2 stud energy corners minimize thermal bridging in the wall system. The wall and roof are insulated with low density spray foam. One-half inch OSB sheets are installed at the



PROJECT PROFILE

Project Team: Greencraft Builders, LLC, Building Science Corporation

Location: Prosper, Texas

Description:
3,323 ft² one-story single family home

Completion Date:
January, 2009

Estimated Annual Energy Savings:
Average 52.7% projected source energy savings relative to the 2008 Building America Benchmark

Project Website:
www.greencraftbuilders.com/greenspointhouse.html



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BUILDER PROFILE



GreenCraft Builders L.L.C. is the culmination of more than 30 years of experience building and remodeling homes in the Dallas/Fort Worth metroplex. Since 2004, Chris Miles, principal of GreenCraft, has been recognized as a leader in the North Texas green building industry, first as a producer and project manager, and now as a builder with his company, GreenCraft Builders L.L.C.

PARTICIPATING PROGRAMS & CERTIFICATIONS



U.S. Department of Energy's Building America Program



U.S. Green Building Council LEED® for Homes



U.S. Environmental Protection Agency ENERGY STAR® Program

Masco Environments for Living®



NAHB National Green Building Program™



corners for structural integrity. Three-quarters of an inch of unfaced XPS is installed as insulating sheathing on the walls. The enclosure does not contain any impermeable components and this allows accumulated moisture to dry out via vapor diffusion and prevent wetting and subsequent mold.

The Greenspoint house was able to procure, with help from BSC, vinyl framed windows with state of the art LoE³ spectrally selective glazing coating. This resulted in an NFRC SHGC rating of 0.21 as well as a U-value of 0.35. This glazing coating, coupled with extensive overhangs in the floor plan, results in a greatly reduced cooling peak load and annual cooling energy use.

MECHANICAL DESIGN

A high efficiency duel fuel heat pump/sealed combustion gas furnace (15 SEER/8.5 HSPF-93% AFUE) is installed along with a stand-alone dehumidifier in the unvented roof. The duel fuel heating will allow the heating system to switch from the air source heat pump to the gas furnace when the outdoor temperature drops below 40 °F to maintain a high level of heating efficiency.

The entire duct system is located in the unvented conditioned attic is sealed extremely tight. Jump ducts provide passive returns from the bedrooms. High efficiency exhaust ducts are installed at all the bathrooms and at the kitchen hood.

Greencraft Builders utilizes Central Fan Integrated Supply (CFIS) ventilation that draws outside air via a 6" flex duct to the return plenum of the HVAC system. This allows for the introduction of outside air to the living space whenever space conditioning is already operating. The SCI ERV Super thermostat has fan cycling included in its circuitry. Fan cycling will turn on the fan at a 33% duty cycle (10 minutes on, 20 minutes off) in order to provide outside air during periods of no space conditioning. A

manual damper is installed on the 6" duct to allow the installer to reduce flow to the recommended 50 CFM if needed during commissioning. A 6" mechanical damper is also installed on the 6" outside air duct. This is controlled by the fan cycler and will close off the outside air duct during periods of constant space conditioning to prevent over ventilation of the living space.

Bathroom exhaust fans plus a kitchen hood are installed to provide spot ventilation when necessary. These are all routed to the outside and are not re-circulating fans. One of the bathroom fans is rated to provide ASHRAE 62.2 ventilation so that the house can be operated at that rate if needed.

QUALITY ASSURANCE & QUALITY CONTROL

- Design follows BSC Building America Performance Criteria
- Manual J8 analysis ensures right-sized mechanical systems and ductwork

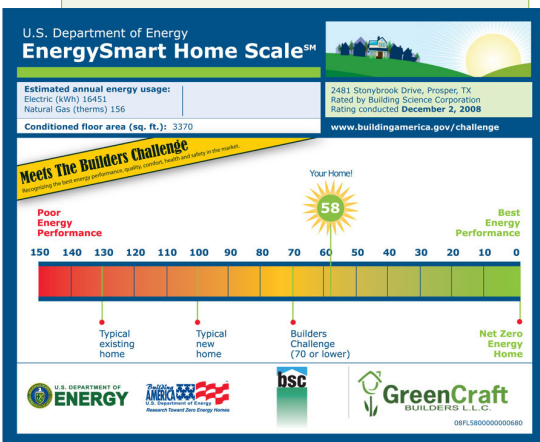
SYSTEM TESTING

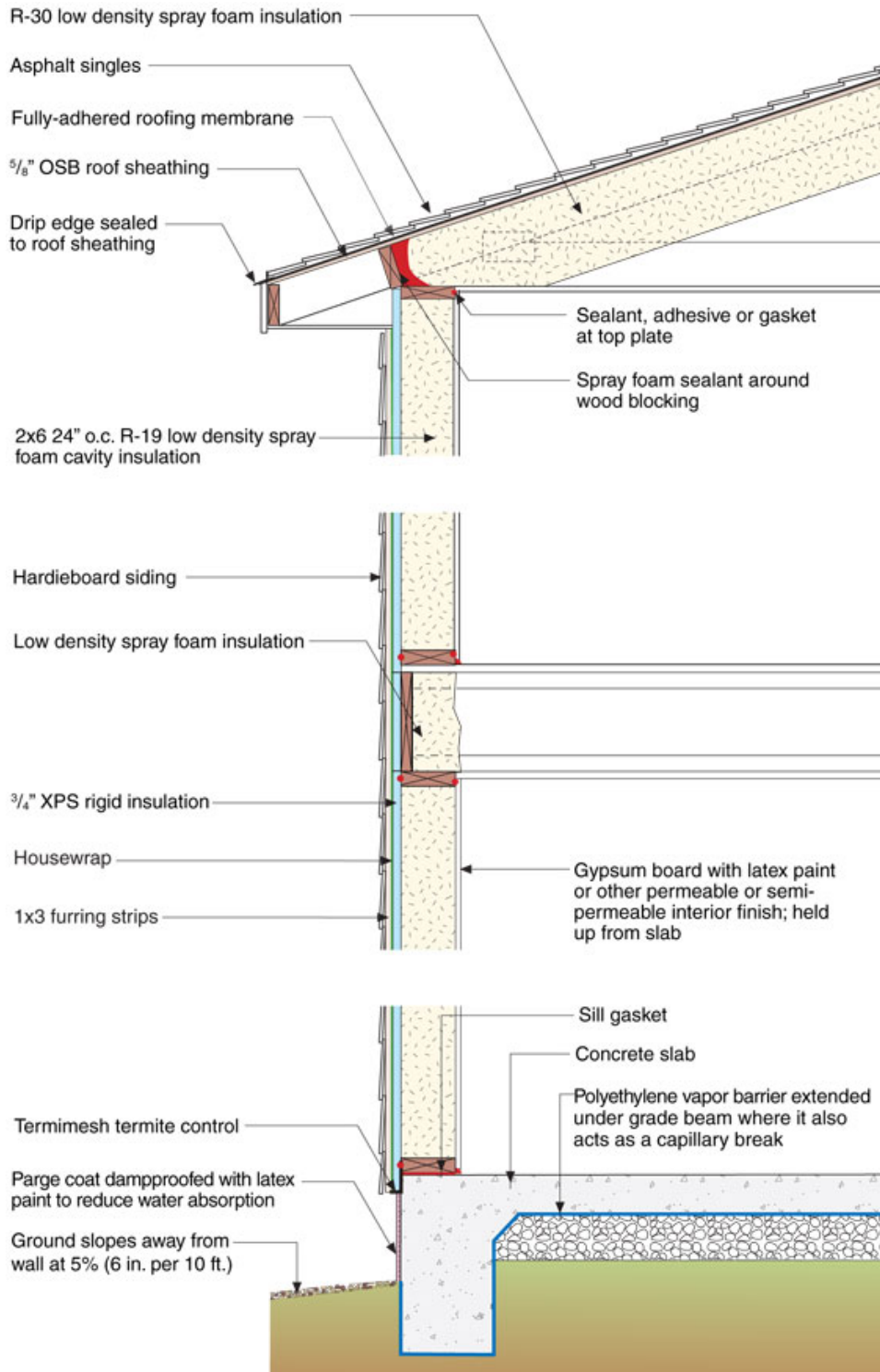
Testing and commissioning of the building enclosure and mechanical systems was performed to ensure the house will operate as designed. The following tests were performed:

- Air leakage
- Duct leakage
- Local air flows
- System external static pressure
- Outside air duct air flow
- Proper configuration of SCI Super ERV thermostat with fan cycling control

MONITORING

Monitoring plans have not been discussed at length as of this time. Building Science Corporation may install a monitoring system similar to the Bannister 2007 house. This would include T/RH HOBOS installed throughout the house and unvented attic plus HVAC run time monitoring.





BUILDING ENCLOSURE

1 Roof Insulation: Unvented conditioned attic the 8 1/2" R-30 low density spray foam installed to the underside of the roof deck and on vertical gable end walls

Wall Insulation: 2x6 walls at 24" o.c. with 5 1/2" R-19 low density spray foam insulation installed in the stud by onto 3/4" exterior OSB

2 Window Specifications: Vinyl frame Lo-E³; U=0.33, SHGC=0.21

Air Sealing: Enclosure air sealing is provided via low density spray foam being installed on all walls and roof of the building. Low expanding spray foam is installed around windows and penetrations. Sealants and adhesives used between framing components.

3 Uninsulated Slab: Uninsulated slab-on-grade with sloping gradient and mulch for proper drainage

4 Drainage Plane: Tyvek[®] ThermaWrap[™] spun housewrap serves as a drainage plane behind fiber cement clapboard

Infiltration: 2.5 in² leakage area per 100 ft² envelope



MECHANICAL DESIGN

HERS Index Score: 58

Heating: Dual fuel 9.5 HSPF heat pump/sealed combustion 93% AFUE gas furnace

Cooling: 16 SEER heat pump

1 Supplemental Dehumidification: GeneralAire Model 1300 whole house dehumidifier configured to draw air from main living space and supply dehumidified air to the supply plenum. This allows for dehumidified air to be distributed throughout the house and for the dehumidifier to run only when dehumidification is needed.

Ventilation: Central Fan Integrated Supply Ventilation controlled by Aprilaire 8126 Ventilation Control System (VCS)

Return Pathways: Jump ducts at bedrooms

3 Ducts: R-8 flex ducts in unvented conditioned attic; leak-free to outside (5% or less)

DHW: Natural gas 0.82 EF instantaneous gas hot water heater

Appliances: Energy Star dishwasher, refrigerator and clothes washer

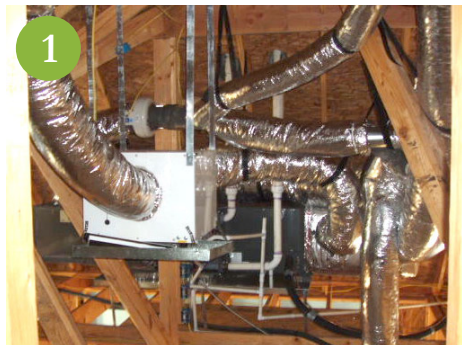
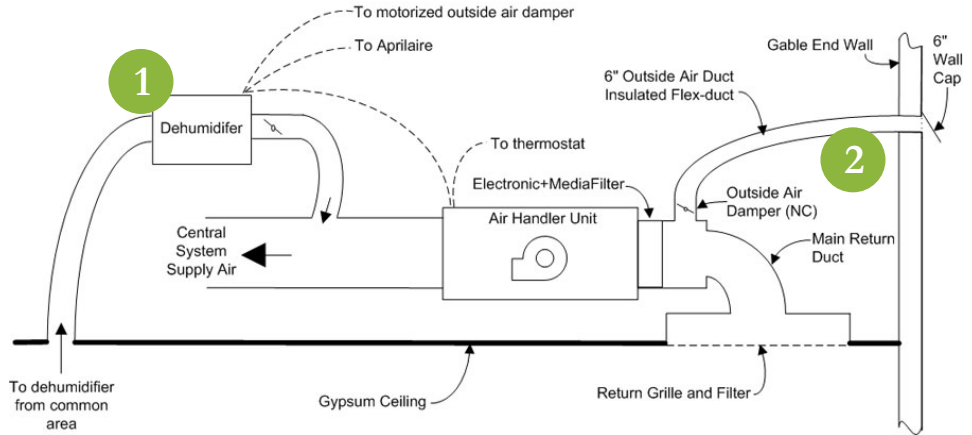
Lighting: 100% Energy Star CFLs

Site Generated Power: None

WATER MANAGEMENT

Landscape Plan: Plan minimizes water run-off from the site

Plumbing Fixtures: Very high efficiency—faucets, showerheads and toilets



LESSONS LEARNED & FUTURE PROJECTS

Greencraft first observed incorrect installation of the Tyvek® ThermaWrap™ drainage plane over the window headers. The housewrap was initially lapped



behind the nailing flange rather than over it. The installers had to come back and install a cut piece of housewrap over the header with acrylic based adhesive backed polypropylene tape (Tyvek® Tape). The installers have been instructed how to properly install the housewrap in future Greencraft homes.

TECHNOLOGY GAPS & BARRIERS

- Increasing insulating sheathing levels: Greencraft plans on upgrading the 3/4" XPS sheathing to a full inch in future homes.

This case study has been prepared by Building Science Corporation for the Department of Energy's Building America Program, a private/public partnership that develops energy solutions for new and existing homes. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States government or any agency thereof.

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Energy Efficiency & Renewable Energy