

Cost Saving System Trade-Offs for Mixed Climates

Building America is an industry-driven program sponsored by the U.S. Department of Energy (DOE) for applying system engineering approaches that accelerate the development and adoption of innovative building processes and technologies. The goal of the program is to produce energy efficient, environmentally sensitive, affordable, and adaptable residences on a community scale. Field support is provided by the National Renewable Energy Laboratory (NREL).

Building America focuses on reducing a builder's number one headache--warranty and callback expenses. System strategies reduce drywall cracking, nail pops, paint and trim problems, dust marking of carpets and comfort complaints

Uninsulated foundation, ductwork in unconditioned spaces, standard gas furnace and water heater, no ventilation system

vs.

Insulated foundation, ductwork in conditioned space, integrated hot water/space heating system, supply ventilation system

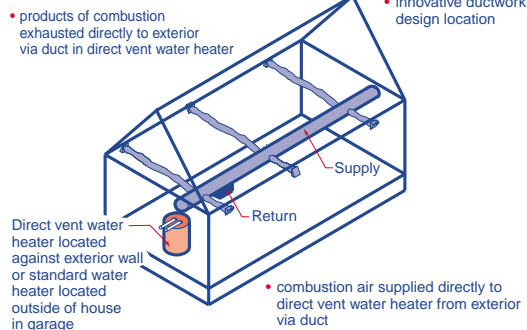
Building energy-efficient homes usually involves upgrading materials or equipment to increase the energy efficiency of a home. These changes normally add to the initial cost of a home. Economically, the increased energy efficiency is often justified to the home buyer/owner based on the cost savings that result for the energy-efficient features.

The project shown here, uses "break points," where the cost of the energy-efficient features are balanced by the reductions of other construction costs. These break points involve levels of energy efficiency that allow a specific component of a building to be downsized or deleted. Construction costs are reduced by changes and improvements to the building envelope.

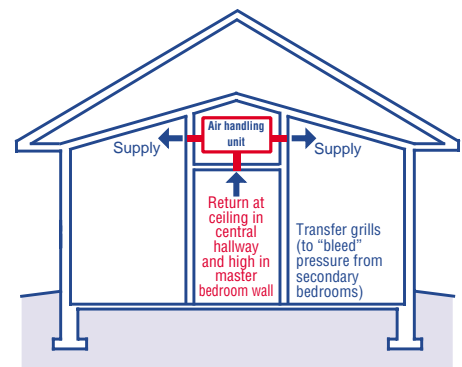
Improved building envelope performance allows the mechanical equipment to be downsized accordingly. The initial construction savings offset the increase associated with the addition of a controlled mechanical ventilation system.

The construction cost savings occur by applying sophisticated energy conservation technology (building envelope, mechanical systems, lighting, appliances). Those cost savings are then applied to offset the increased costs associated with "healthy housing" and resource efficiency. The end result becomes a home that is healthier, safer, more comfortable, durable and affordable, with no increased cost to the builder or home buyer. Systems approaches are the key element used in integrating and optimizing the home-building system to create these break points. The project showed 50% reduction in energy use while saving \$550 compared to standard construction costs.

Air Distribution System



By using thicker walls with more insulation and tighter construction, the size of the HVAC system was reduced. The size of the distribution system could then be reduced. Since the exterior wall system was improved, fewer, smaller ducts now deliver conditioned air in shorter runs.



STANDARD CONSTRUCTION vs BUILDING AMERICA

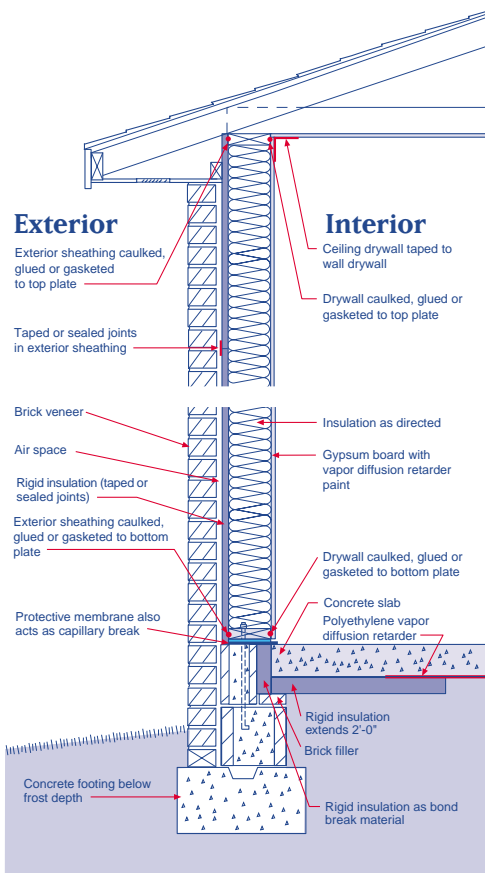


BUILDINGS FOR THE 21ST CENTURY

Buildings that are more energy-efficient, comfortable, and affordable ... that's the goal of DOE's Office of Building Technology, State and Community Programs (BTS). To accelerate the development and wide application of energy efficiency measures, BTS:

- Conducts R&D on technologies and concepts for energy efficiency, working closely with the building industry and with manufacturers of materials, equipment, and appliances
- Promotes energy/money saving opportunities to both builders and buyers of homes and commercial buildings
- Works with State and local regulatory groups to improve building codes, appliance standards, and guidelines for efficient energy use
- Provides support and grants to States and communities for deployment of energy-efficient technologies and practices

- Uninsulated foundation
- 2x4 @ 16" o.c. exterior walls
- 1/2" EPS (R-1.7) foil-faced insulation
- Building paper
- R-11 kraft paper faced insulation in walls
- R-30 blown insulation in attic
- Standard gas fired furnace
- Standard gas fired hot water heater
- Ductwork in unconditioned spaces
- 0.5 ACH



- Insulated foundation
- 2x6 @ 24" o.c. exterior walls
- 1" XPS (R-5) rigid insulation with all joints taped, glued/sealed at all openings and plate locations
- Drywall sealed at all openings and plate locations
- Drywall clips at corners and intersecting partitions
- R-19 unfaced insulation in walls
- R-38 blown insulation in attic
- Integrated hot water/space heating system
- Foam/seal all penetrations of air barrier system
- Supply ventilation system
- Ductwork in conditioned space
- 50% tighter construction/50% reduction in design heat loss and heat gain
- 0.35 ACH

BASECASE COST TRADE-OFFS *

| | |
|------------------------------------------------------------|----------------|
| Advanced framing: 2x6s with R-20 instead of 2x4s with R-11 | \$ -250 |
| Insulating sheathing | +300 |
| No housewrap | -300 |
| High performance solar control windows | +300 |
| Savings on duct system | -300 |
| Savings on air conditioning system | -500 |
| Air flow retarder system | +300 |
| Controlled ventilation system | +100 |
| Integrated heating DHW system in place of furnace | -100 |
| Total Incremental Cost (+)/Savings (1) | \$ -550 |

*Actual costs vary depending upon features selected by the builder/developer team.

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May 1999 NREL/FS-550-26536