

DID YOU KNOW THAT BUILDING GREEN IS GREAT FOR THE ENVIRONMENT AND YOUR BUDGET?

THE HEALTHY HIGH PERFORMANCE HOME



A guide to renovation and new construction



"RIBBON HOUSE" before renovation

RENOVATION



1 AIR SEAL BUILDING ENVELOPE
Perform blower door test to find leakage points. Increase comfort and decrease drafts by weather stripping doors and windows, seal gaps at baseboards and mechanical chases into attics.



2 INSTALL ATTIC INSULATION
R38 attic insulation provides comfort and energy savings for the resident. Blown cellulose insulation may be applied over existing insulation or directly on the attic floor.



3 CLEAN, SEAL AND INSULATE DUCT SYSTEM
New duct systems should be installed within the building envelope, not in the attic or an unconditioned crawl space. Test duct systems for leakage with a duct blaster test.



4 REPLACE WATER HEATER
(electric: 92% efficiency, gas: 62% efficiency) For efficiency, water heaters should be installed within conditioned space and wrapped in insulation. Gas appliances should be in air sealed closets and must be properly vented to the outdoors.



5 REPLACE UN-VENTED GAS FIREPLACES WITH SEALED COMBUSTION, DIRECT VENT UNITS
For health and safety, sealed combustion units vent combustion gases to the outdoors.



6 REPLACE HEAT PUMP WITH A VARIABLE SPEED UNIT
Use R410A coolant, 14 SEER or greater condensing unit. Air handlers operate more efficiently in conditioned space; gas units need to be vented directly to the outdoors.



7 REPLACE inefficient refrigerator, dishwasher, washing machine, bath fans and light fixtures with Energy Star appliances.



8 INSTALL LOW-E WINDOWS
Low-E windows reduce solar heat gain in summer and keep heat inside in the winter.



9 WALL INSULATION
Blown-cellulose insulation provides thermal and sound insulation and reduces air infiltration. It should be installed in walls with sheathing and siding, insulation in walls with no sheathing will cause paint to crack and peel.



10 DONATE, recycle or refurbish old appliances and building materials.



"RIBBON HOUSE" after renovation

Resources

EarthCraft Virginia

EarthCraft House
Implements EarthCraft single-family and multi-family programs for affordable housing and market rate projects for Virginia
(804) 225-9843 • www.earthcraftvirginia.org

ENERGY STAR® for Homes

U.S. Environmental Protection Agency
Energy efficiency certification for appliances and houses
(888)782-7937 (hotline)
www.energystar.gov

Southface Energy Institute

Sustainable land development and construction: Guidelines for the Southeast
Technical assistance for building science and environmental design, consumer education, free factsheets on green construction.
(404) 872-3549 • info@southface.org
www.southface.org

Virginia Sustainable Building Network

Promotes environmentally sound, green building practices for Virginia
(703) 486-2966 • www.vsbnet.org

Home Builders Association of Virginia

Promotes the building industry by educating and interacting with government agencies
(804) 643-2797 • www.hbav.com

Low Impact Development Center

Information and resources on low impact development
(301) 982-5559
www.lowimpactdevelopment.org

Residential Energy Services Network

(RESNET) and Home Energy Raters (HERS)
RESNET is a national network of mortgage companies, real estate brokers, builders, appraisers, utilities, and energy professionals

working towards improving the energy efficiency of the nation's housing stock. Search their Certified Rater Directory for a listing of certified home energy raters by state
(760) 806-3448
info@natresnet.org • www.natresnet.org

Home Performance Power

Fannie Mae's Guide to Buying and Maintaining a Green Home
Provider of Energy Efficient mortgages for new and renovated homes
(800) 732-6643

Frederick P. Rose Architectural Fellowship

Creates partnerships between emerging architects and community based organizations.
www.rosefellowship.org

Building Material Reuse Association

Facilitates building deconstruction and reuse/recycling of recovered building materials
(800) 990-2672 • www.ubma.org

Building Science Corporation

Builder's Guide to Mixed Climates
Building consultant firm provides energy analysis and design development
(508) 589-5100
info@buildingscience.com
www.buildingscience.com

Greenspec Directory

Information on 2000 screened building materials listed by CSI number within 250 categories
www.buildinggreen.com

Environmental Building News

Monthly green building journal
(802) 257-7300 • www.buildinggreen.com

Recycling resources in the state of Virginia

Virginia Department of Environmental Quality

Waste Management and Recycling Programs
Provides guidance on regulations and codes in the state as well as local and regional recycling program contacts
(804) 698-4000 • www.deq.state.va.us/waste/

Virginia Recycling Association

(888)867-1923 • www.vrarecycles.org

Virginia Tech – Cooperative Extension Service

www.ext.vt.edu
Xeriscape –Creating a Water-Wise Landscape
A guide to understanding and planning for a water efficient landscape

Habitat Re:Store

Re-sells donated construction material and will collect old appliances and excess building materials- affiliated with local Habitat for Humanity organizations in the USA
<http://www.habitat.org/cd/env/restore.aspx>

Charlottesville Community Design Center

Brings together citizens and design resources to create equitable, sustainable and beautiful communities
(434) 984-2232 • www.cvilledesign.org

Funding and Financing

The Home Depot Foundation

Affordable green building and tree planting
(866) 593-7019
www.homedepotfoundation.org

Green Communities Initiative

Enterprise Community Partners
Affordable green building grants and financing
(410) 715-7433
www.greencommunitiesonline.org

Local Initiative Support Corporation

Affordable green building grants and financing
(804) 644-0548 • www.virginialisc.org

U.S. Environmental Protection Agency

www.epa.gov/greenbuilding/tools/funding.htm

Sponsors:

Local Initiatives Support Corporation would like to thank the Home Depot Foundation, the Virginia Housing and Development Authority and DuPont for investing in the project and contributing to an important area of study that will encourage continued dialogue among many stakeholders.

For more information please contact Joshua Galloway at j.galloway@betterhousingcoalition.org



Frederick P. Rose Architectural Fellowship



How much more does it cost to build a healthy, high performance home?

It all depends on what you currently build. To upgrade from a basic, code-built home to a home like the one described here would cost three to five percent more. But once you factor in the decreased costs of ownership, it can be far less expensive. Utility costs are lower, and there are lower repair and replacement costs due to the durable methods and materials used in green building. But even beyond construction and maintenance costs, green homes make financial sense. They may be easier to sell and may fetch a higher price. An environmentally sensitive project can attract positive attention and help differentiate your homes from your competitors.

What are the best ways to save money with green building?

Work with experienced professionals from the beginning of the design process, they can help you avoid waste and make smart choices. Trying to retrofit existing plans can cost more and take longer. Some of the things experienced architects and builders can help with are material choices, advanced framing, efficient dimensions, and compliance with Energy Star specifications that can help the home qualify for an Energy Efficient Mortgage (EEM).

Is it worth just making a few small changes, or do you have to completely revamp a plan in order for a green building to work?

Yes, even a few small changes can improve the performance of a home. Many systems in a building affect each other in complex ways (for example, insulation and ventilation), and a professional who is familiar with healthy, high-performance building can help you figure out a way to proceed that makes sense for your specific project and budget.

What is advanced framing? Is it safe?

Advanced framing practices, which are allowed by the International Residential Code (IRC) 2003, are a safe and sustainable way to build. They save lumber and allow insulation to be installed at wall intersections that traditionally aren't insulated. Leaving these areas uninsulated can lead to moisture problems and mold growth, as well as heat loss.

Why is it important to air seal a house?

Air-sealing the inside of a house with a 50-year latex caulk prevents drafts and keeps outside moisture from entering through the walls. Many insulation contractors offer a caulk and seal package prior to insulation.

Can the house be built too tight?

Not if the house is ventilated right. If spray foam insulation, Structural Insulated Panels (SIPs) or Insulated Concrete Forms (ICF) are used the home can be very airtight and require fresh-air ventilation. This may be done with an Energy Recovery Ventilator (ERV) or a dedicated duct that brings fresh outdoor air into the air handler where it is conditioned prior to distribution in the house.

Why is sealing ductwork important?

Leaky ductwork often accounts for 10-30 percent of total heating and cooling costs. While that cost is significant, protecting health and safety is the most important reason to seal ducts. Leaky ducts can draw air from crawl spaces into the home, and that air may be contaminated with dust, mold, and other potential toxins.

Don't crawl spaces need to be ventilated?

No. Sealed and conditioned crawl spaces act like mini-basements, which prevent moisture build-up, protect the floor framing, and help equipment and ductwork in the crawl space operate efficiently.

What is EarthCraft?

EarthCraft House is a green building program that serves as a blueprint for healthy, comfortable homes that reduce utility bills and protect the environment. EarthCraft House is a partnership between the Greater Atlanta Home Builders Association, Southface, and government and industry partners. EarthCraft Virginia is the local provider for the EarthCraft House multi-family and single-family programs. Staff will guide builders through the process of designing, building and testing EarthCraft certified homes.

Why is maintenance important?

A high performance home requires periodic maintenance to continue to be healthy and energy-efficient. Properly maintained heating and cooling equipment operates efficiently, providing a comfortable environment and lower operating costs. Keeping water away from the building with a good water management system makes the building last longer and helps maintain indoor air quality.

It's important to preserve the historic character of my area. Can new or renovated green homes fit into a historic neighborhood?

You can build sustainably in any architectural style, and new construction and renovation can both incorporate green technology. Whether you prefer cutting-edge contemporary or classic colonial, everyone appreciates increased natural light, good air quality, and lower maintenance and utility costs.

THE HEALTHY HIGH PERFORMANCE HOME

What is visitability? How is it different than accessibility?
 Visitability makes it possible for people with impaired mobility to get in and out of a house and use the bathroom: the essentials for visiting a home. It also makes it easier for residents to stay in their homes if they develop a temporary or permanent mobility impairment. Accessibility often refers to public buildings that require a 36" clear path throughout the building and a 5' diameter circle of clear floor space in the bathroom. To qualify as visitable, a home must have:

- One zero-step entrance
- All main floor interior doors with a 32" clear opening (at least a 34" door)
- A bath on the main floor with a 30"x48" clear space in front of the toilet and sink.
- A bedroom or convertible study on the main floor

Source: www.concretechange.org

NEW CONSTRUCTION

Engineered wood structural framing lumber made of ground wood and glue uses smaller trees and is stronger than dimensional lumber

Low/ no-VOC paint
 interior paint with low levels of volatile organic compounds
www.epa.gov/iaq/voc.html

Energy Star light fixtures
 light fixtures designed for optimum energy efficiency and compact fluorescent bulbs

Air sealing
 seal all seams and joints between materials in exterior walls with water based caulk to prevent drafts and moisture leakage

Low-flow water fixtures
 water fixtures designed for water conservation 2.0 gal/min faucets, 1.6 gallon toilets

Open web joists
 resource efficient structural support that allows easy access for installation and of ductwork, wiring and plumbing

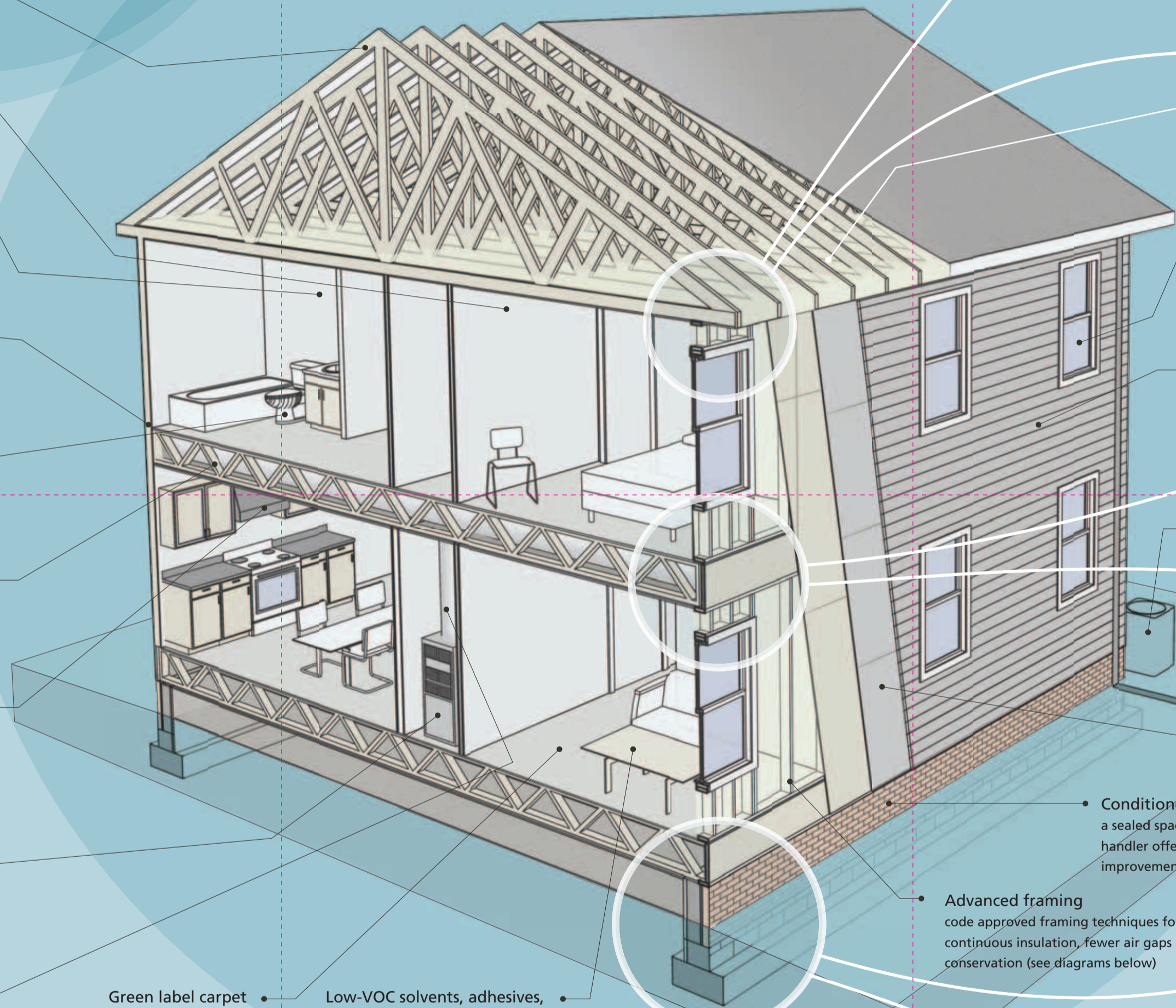
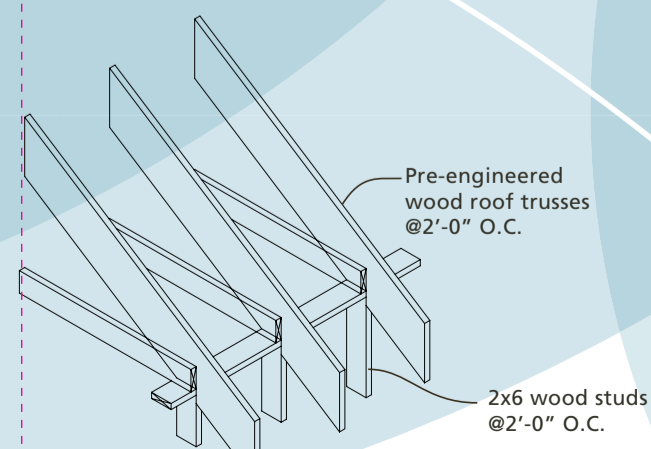
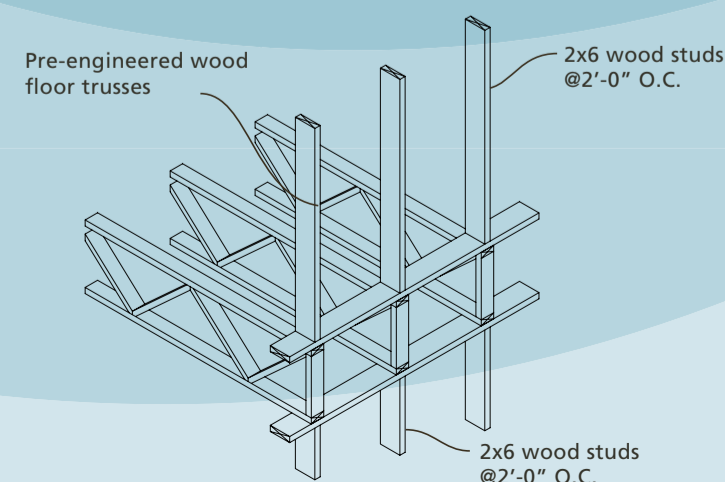
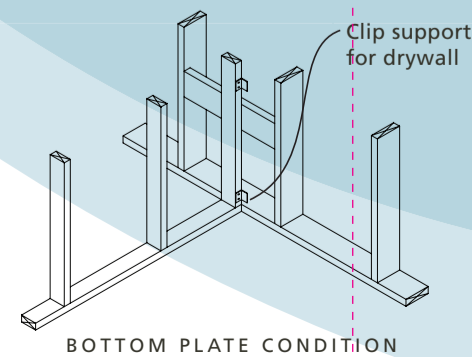
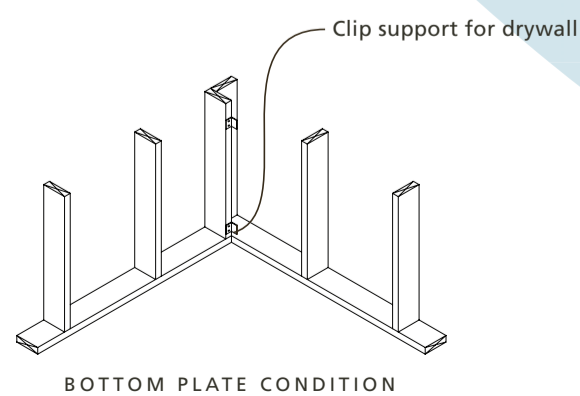
Energy Star rating
 Environmental Protection Agency and Department of Energy program to label energy efficient appliances, products and homes, 5-star energy rating denotes an energy efficient home

Heating & cooling in conditioned space
 heat pump and duct work within the building envelope improves efficiency, reduces potential for condensation and mold growth

Sealed duct system
 tight ducts improve energy efficiency of the system and the comfort of the residents; mastic sealed ducts should have less than 5% leakage; duct blaster tests duct tightness

Green label carpet
 Carpet and Rug Institute (CRI) low VOC content; some manufacturers offer recycled and recyclable carpet and pad

Low-VOC solvents, adhesives, finishes, cleaning products
 protects laborers' and occupants' health and reduces chemicals introduced into our air and water



Blown cellulose insulation
 recycled newspaper, treated for insect and fire resistance. Custom fit for every wall cavity, thermal mass and good sound attenuation

Low-E windows
 energy efficient windows that block ultraviolet rays, summer heat gain and winter heat loss

Pre-finished cement board siding
 mix of cement and wood cellulose, durable, low-maintenance with a 15 year finish guarantee, 50 year product guarantee

Proper Heating & Cooling Unit Size
 calculate heat load/heat gain during design phase to ensure proper moisture control

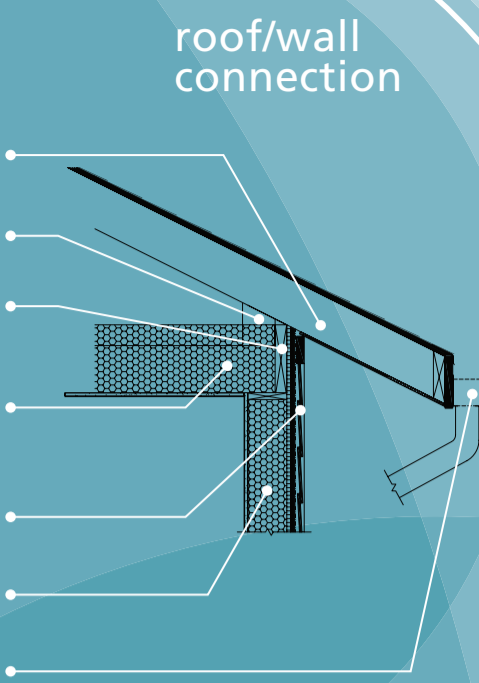
House wrap
 a vapor permeable material used as a drainage plane to protect the structure of the home from water. All seams are taped to prevent leakage of water onto sheathing or framing

Conditioned crawl space
 a sealed space with no vents, 50 CFM supply duct from air handler offers a moisture control strategy for significant improvement in energy efficiency

Advanced framing
 code approved framing techniques for more continuous insulation, fewer air gaps and lumber conservation (see diagrams below)

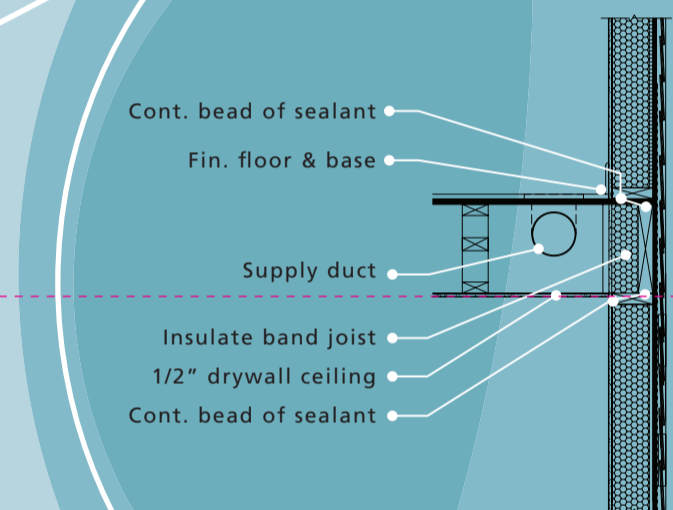
roof/wall connection

- Top chord truss extension
- Raised energy heel
- Provide 2x truss bracing/insul. stop
- Loose fill cellulose insulation typical
- Smooth fiber cement lap siding w/6" exposure
- Damp spray cellulose insulation
- Aluminum gutter & downspout



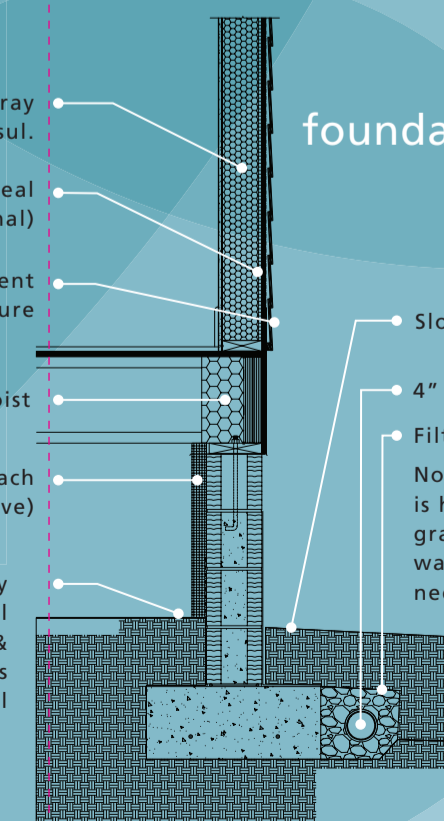
band joist

- Cont. bead of sealant
- Fin. floor & base
- Supply duct
- Insulate band joist
- 1/2" drywall ceiling
- Cont. bead of sealant



foundation

- Damp spray cellulose insul.
- 1/2" foam air seal (optional)
- smooth fiber cement lap siding w/6" exposure
- Insulate band joist
- 2" XPS rigid insul. (attach w/water-based adhesive)
- 6 mil. poly vaporbarrier-seal @ all walls/penetrations & tape/lap @ all edges joints typical
- Slope grade 5% Min.
- 4" perf. foundation drain
- Filter fabric
- Note: if exterior grade is higher than interior grade, foundation waterproofing is needed



typical two stud corner

typical intersection at interior wall

typical stack framing