



Virginia **Sustainable
Building** Network

EarthCraft House™

Single Family Program in Virginia

Presented to MWCOG

December 13, 2007





Virginia Sustainable Building Network

- **Established in 1995**
- **Non-profit organization**
- **Mission: Promote environmentally sound building practices in Virginia**





Virginia Sustainable Building Network

Program Highlights

- **Rebuild America Program**
- **Building America Program**
- **Sustainable Building Resource Directory**
- **Construction Materials Recovery Coalition- NCR**
- **Green Building Events**
- **Virginia's Sustainable Future Conference**



Earthcraft House Virginia Single Family Program

Developed by :
**Virginia Sustainable Building
Network**

In Partnership with:

- **The Greater Atlanta Home Builders Association**
- **Southface Energy Institute**
- **Home Builders Association of Virginia**



Technical Support

- Technical Support for EarthCraft House in Virginia is supplied by:

The Energy Consortium, Charles Bowles



Support for EarthCraft House Virginia Single Family Program

- Building America- U.S. Department of Energy
- Virginia Department of Mines, Minerals, and Energy
- Private foundation
- Icynene, Inc.
- Nelligan Insulation



Southface Energy Institute

responsible solutions for environmental living

- Education and Research
- Energy Policy
- Green Building Services:
 - commercial
 - residential
 - communities



www.southface.org



EarthCraft House™



- Began in 1999
- NAHB 2004 green Building Program of the Year
- New Homes
- Renovations
- Multifamily
- Communities
- Builders in GA, AL, VA, TN and SC

EarthCraft House

- Habitat for Humanity
- Production Homes
- Custom Homes



Builder Advantages

- Higher profits
- Fewer callbacks
- Better subcontractor performance
- Recognition as industry leader
- Unbiased advice



Advantages to HBA

- Increases eligible home buyers
- Attracts new members and sponsors
- Builds partnerships with government and industry leaders
- Expands member services
- Recruits talented staff
- Positive public relations



EarthCraft House

Home Buyer Benefits

- Higher quality
- Less cost
- Healthier home
- More comfortable



EarthCraft House™

Pilot Program Builders

with the Blue Ridge Home Builders Association

Artisan Construction, Inc. * Contact: Doug Lowe, President

Kingma Developers Inc. * Contact: Doug Kingma, President

MacFarlane Homes, Inc. * Contact: Duncan MacFarlane,
Owner

The Quarries LLC * Contact: Linda Lloyd, Principal

Piedmont Housing Alliance * Contact: Mark Watson



EarthCraft House Virginia



EarthCraft House Virginia



EarthCraft House is a partnership between the Greater Atlanta Home Builders Association, Southface, government and industry partners.



Southface

Responsible Solutions for Environmental Living

And In Virginia in Association with



Virginia Sustainable
Building Network

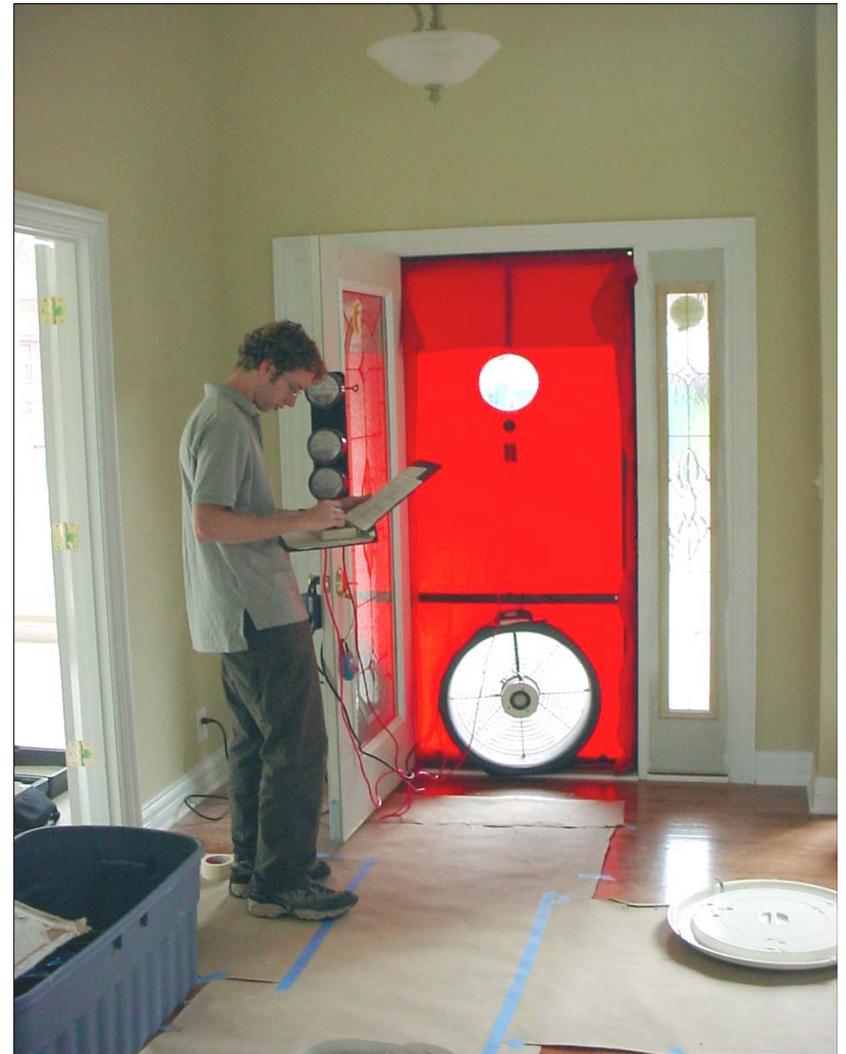


EarthCraft House Sponsor Partners



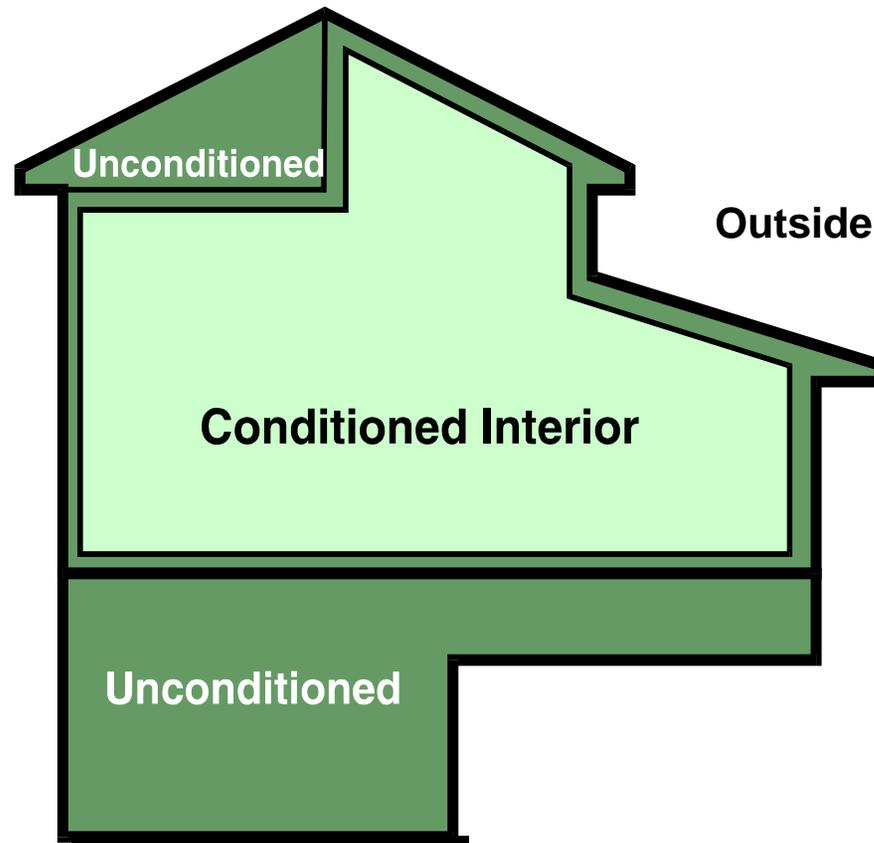
How EarthCraft House™ Works

- Training
- Design Review
- Preliminary Inspections
- Final Inspections



The House as a System

- **Building Envelope**
 - Continuous Air Barrier
 - Complete Insulation Coverage
- **Proper Heating and Cooling Systems**
- **Controlled Ventilation**
- **Moisture Management**



The Fundamentals of Building Science

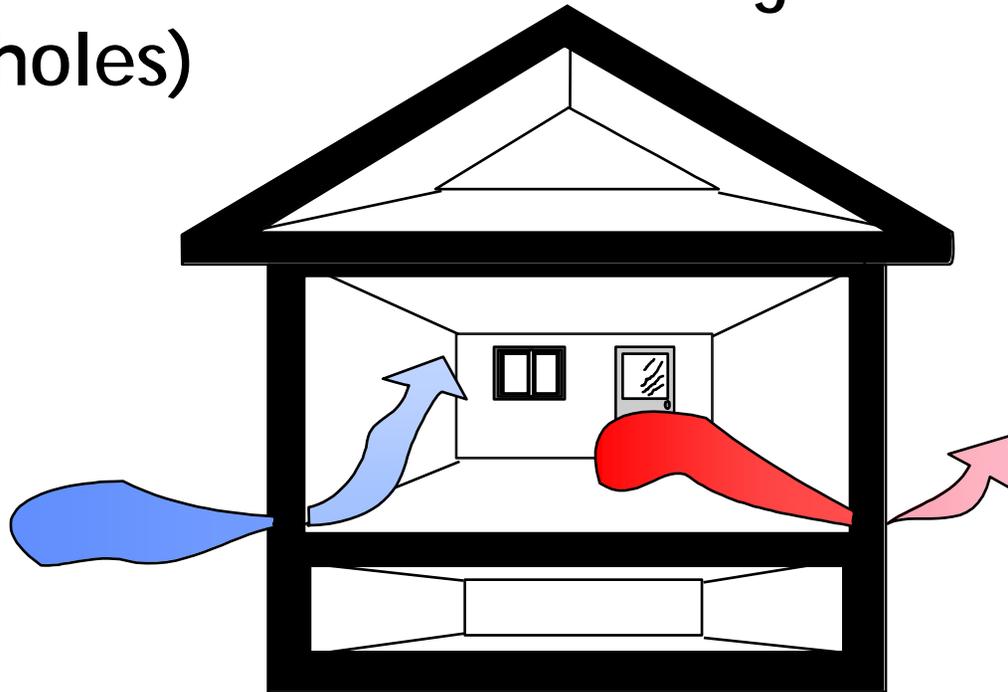
Understanding the movement of
heat, air, & moisture



Air Movement

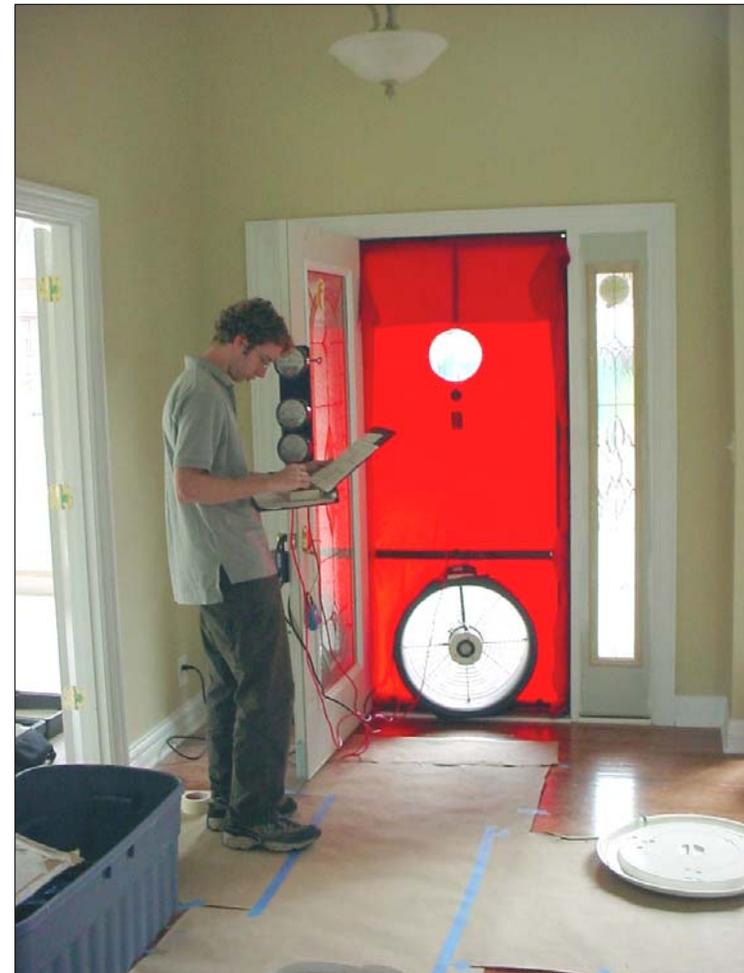
Conditions for Air Infiltration

- Pressure difference (high to low)
- Penetrations in building envelope (holes)



How EarthCraft House™ Works

- Design Review



EarthCraft House Categories

- Site Planning
- Building Envelope and Systems
- Appliances/Lighting
- Resource Efficient Design
- Resource Efficient Materials
- Waste Management
- Indoor Air Quality
- Indoor Water Conservation
- Homeowner Education
- Outdoor Water Conservation
- Builder Operations
- Bonus Points



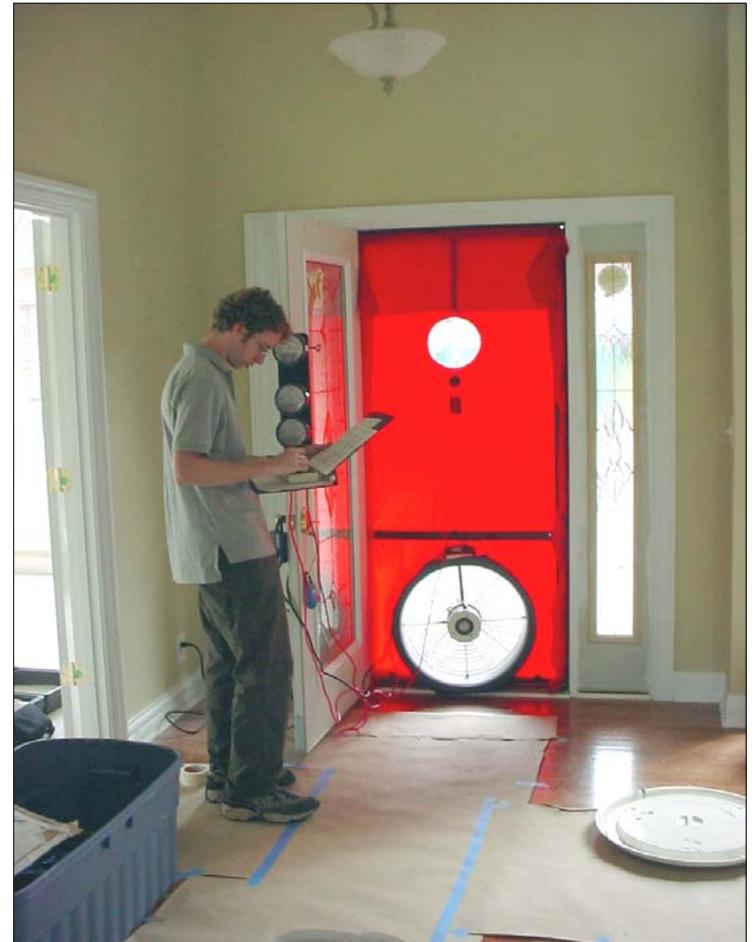
Scoring a House

- 12 categories
- Minimum total of 150 points (75 points required from Building Envelope and Systems category)
- Combination of energy efficiency and environmentally responsible practices
- Innovation encouraged



How EarthCraft House™ Works

- Preliminary Inspections (pre-drywall)



Air Sealing Before Drywall

- Chases
- Top & bottom plates
- Tubs & showers
- Plumbing penetrations
- Window & door rough openings
- HVAC penetrations
- Electrical penetrations
- Exterior wall penetrations
- Band joists
- Kneewalls



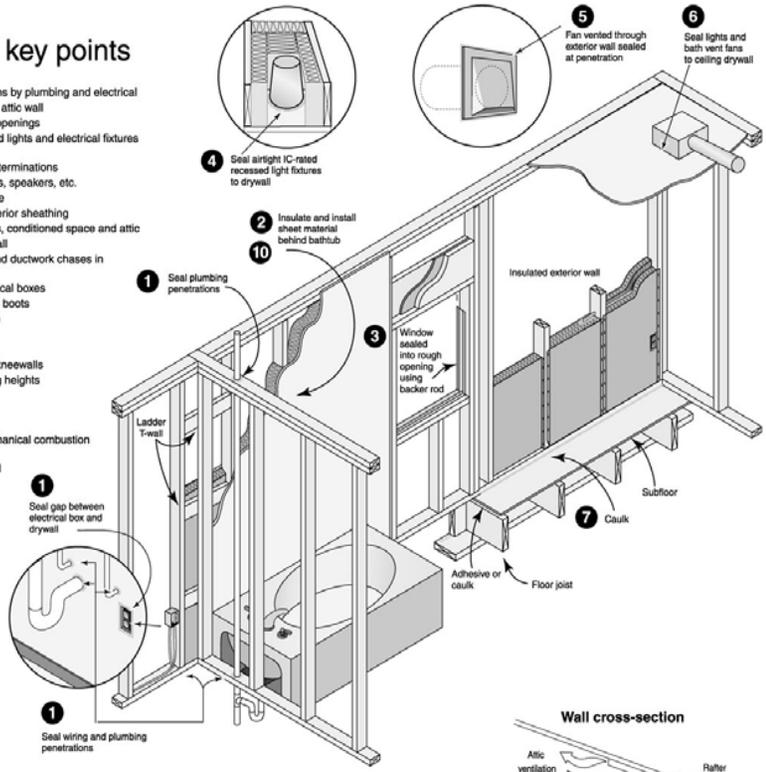
Key Points of Air Sealing

Poster-size version:
www.southface.org

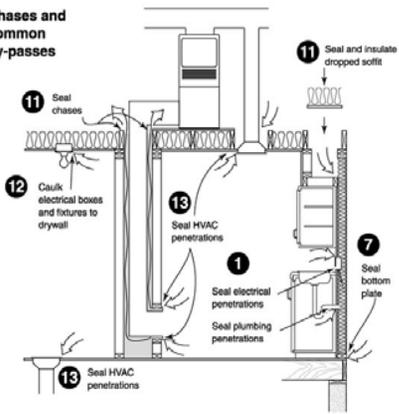
Appendix

Air sealing key points

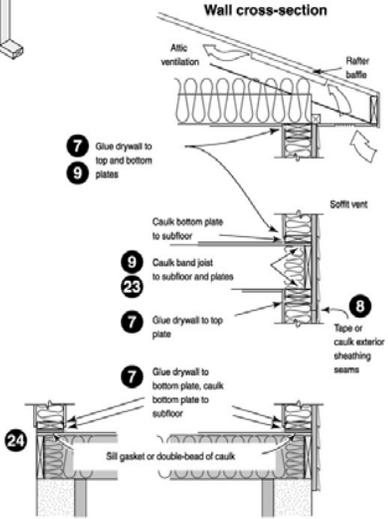
1. Plate and wall penetrations by plumbing and electrical
2. Tub/shower on outside or attic wall
3. Window and door rough openings
4. Airtight, IC-rated recessed lights and electrical fixtures exposed to attic
5. Exterior wall exhaust fan terminations
6. Ceiling mounted bath fans, speakers, etc.
7. Bottom plate and top plate
8. Seams between rigid exterior sheathing
9. Band area between floors, conditioned space and attic
10. Garden tub on exterior wall
11. Mechanical equipment and ductwork chases in attics, crawlspaces
12. Ceiling/crawlspace electrical boxes
13. Ceiling/crawlspace HVAC boots
14. Shower and tub drain line
15. Fireplace inserts
16. Attic kneewall doors
17. Joist cavities under attic kneewalls
18. Transition between ceiling heights (e.g., 10' to 8')
19. Attic scuttle hole
20. Attic pull-down stairs
21. Wall penetrations of mechanical combustion closets
22. Thresholds at mechanical combustion closet doors
23. Band joint exposed to exterior
24. Band area exposed to unconditioned space (such as basement or garage)
25. Exterior wall penetrations for refrigeration lines, condensate line, etc.



Chases and common by-passes



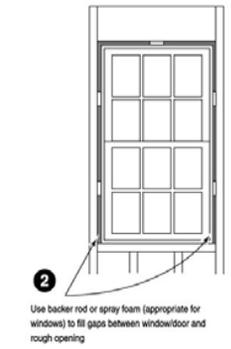
Wall cross-section



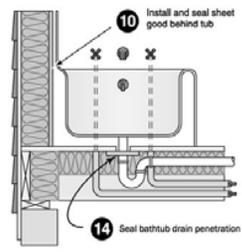
Appendix

Air sealing key points continued

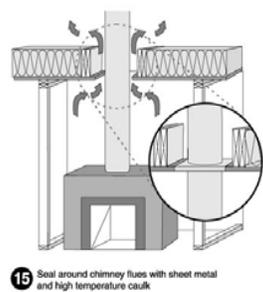
Window rough opening



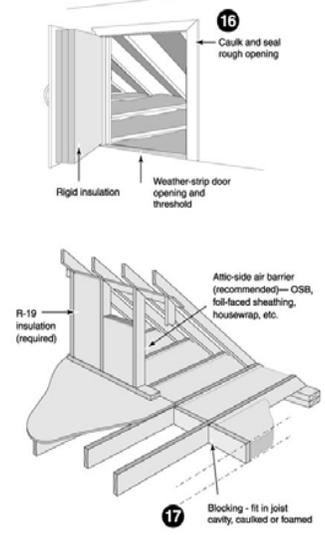
Shower/tub drain rough opening



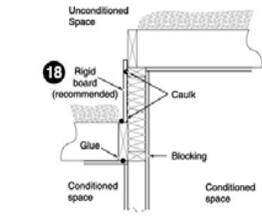
Combustion chase penetrations



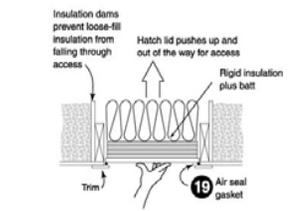
Attic knee-walls



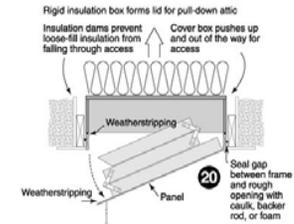
Two-level attic



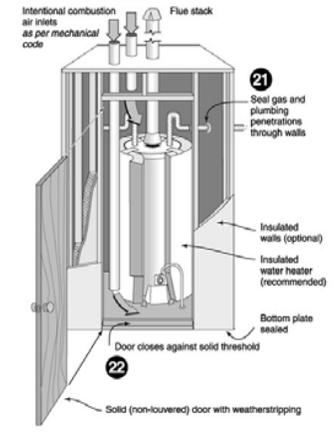
Attic scuttle



Attic pull-down stairs



Combustion closet



Exterior penetrations



Disclaimer:
 This document is intended solely to help graphically demonstrate the air leakage provisions of section 502.1.4 of the 2000 IECC. It does not cover all airsealing locations or techniques. Other code provisions may be applicable as well.

Duct Sealing

Required

- Duct tape is NOT allowed by modern codes
- Duct system connections and seams must be sealed with mastic or mastic tape (not UL 181 tape)
- Code approved solid connector for all flex to flex connections



Minimum Insulation

Mixed Humid Climate

- Exterior walls R13
- Flat ceilings R30
- Cantilevered floors R30
- Framed floors R19
- Foundation walls R10
- Attic kneewalls R19



Insulation: Complete Coverage is key

- Spray applied insulation
- Insulated wall sheathing
- Band joist R-19
- Headers
- Two stud Corners
- T-walls



How EarthCraft House™ Works

- Final Inspections



Duct Work & Air Handler

Required & Point Items

- Duct leakage 6% or less of conditioned floor area



Air Leakage Test

EarthCraft House measures the amount of air that leaks through the building envelope with a blower door test.

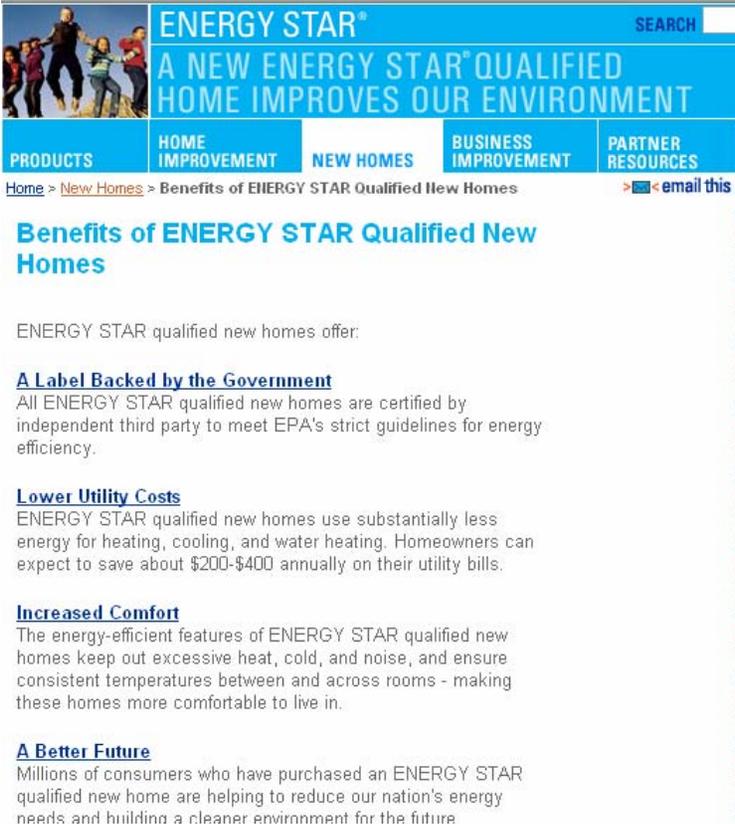
- Maximum leakage $\text{cfm}_{50} / \text{sfbe} < 0.40$
- sfbe is square footage of building envelope surface area
- Address ventilation



ENERGY STAR Homes

- 15% more efficient than IECC 2004
- Requires energy modeling or Builder Option Package (BOP) with blower door and duct blaster tests

www.energystar.gov



The screenshot shows the ENERGY STAR website interface. At the top, there is a blue header with the ENERGY STAR logo and a search bar. Below the header, a navigation menu includes links for PRODUCTS, HOME IMPROVEMENT, NEW HOMES, BUSINESS IMPROVEMENT, and PARTNER RESOURCES. The main content area is titled "Benefits of ENERGY STAR Qualified New Homes" and lists three key benefits:

- A Label Backed by the Government**: All ENERGY STAR qualified new homes are certified by independent third party to meet EPA's strict guidelines for energy efficiency.
- Lower Utility Costs**: ENERGY STAR qualified new homes use substantially less energy for heating, cooling, and water heating. Homeowners can expect to save about \$200-\$400 annually on their utility bills.
- Increased Comfort**: The energy-efficient features of ENERGY STAR qualified new homes keep out excessive heat, cold, and noise, and ensure consistent temperatures between and across rooms - making these homes more comfortable to live in.
- A Better Future**: Millions of consumers who have purchased an ENERGY STAR qualified new home are helping to reduce our nation's energy needs and building a cleaner environment for the future.



EarthCraft House Virginia Single Family Program Implementation

- Training to over 700 builders and related businesses and building code officials
- Over 45 builders enrolled; 150 houses projected by end of year.
- Roll out started in Charlottesville and Roanoke areas, Richmond and Hampton Roads





Virginia **Sustainable**
Building Network

EarthCraft Virginia

Contact:

KC McGurren

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