


Conservation Services Group




Selecting Products for Insulation & Air Sealing


W-1 BEST Solutions for Success, ACI-NY
February 01, 2006

Bruce Harley, Technical Director
Conservation Services Group

© 2006 Conservation Services Group



Conservation Services Group



Course Objectives

- Insulation (and Air sealing)
 - How to evaluate fiber and foam insulation products?
 - How to determine if a product is appropriate for a specific application?
- Issues: (fire safety), durability, moisture
- Improve your ability to select a product for a specific application
- Understand specifications and standards that relate to these products
- (Know where to get additional information)

© 2006 Conservation Services Group




Conservation Services Group




Insulation Properties

- R-value
 - R-value per inch
 - R-value per dollar
- Permeability
 - Air permeability
 - Vapor permeance
- Applications
 - Preferences / Limitations / Availability

© 2006 Conservation Services Group




Conservation Services Group




Permeance of Materials

• Housewraps	30-60
• Gypsum board	50
• Low density spray foam	8-15
• Extruded polystyrene	1 (1")
• 15-lb felt paper	1.0 - 4.0
• Exterior plywood / OSB	0.8
• Kraft facing on batt	0.4
• High density spray foam	0.05-0.5 (?)
• Polyethylene (6-mil)	0.06

© 2006 Conservation Services Group



Conservation Services Group



Insulation Materials

- Fiberglass
- Cellulose
- Foam

© 2006 Conservation Services Group



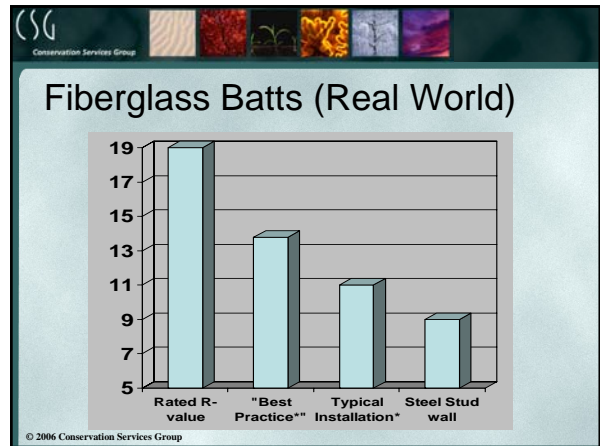
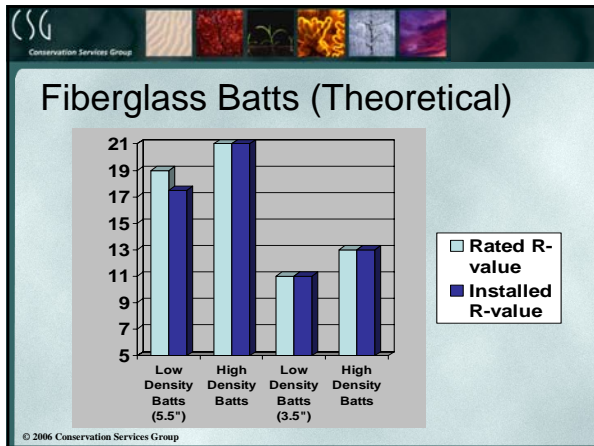
Conservation Services Group



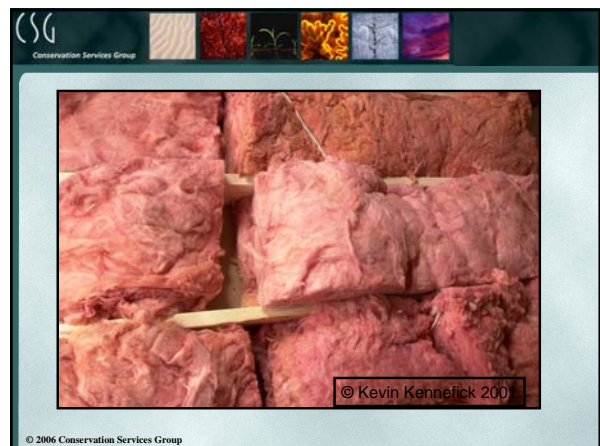
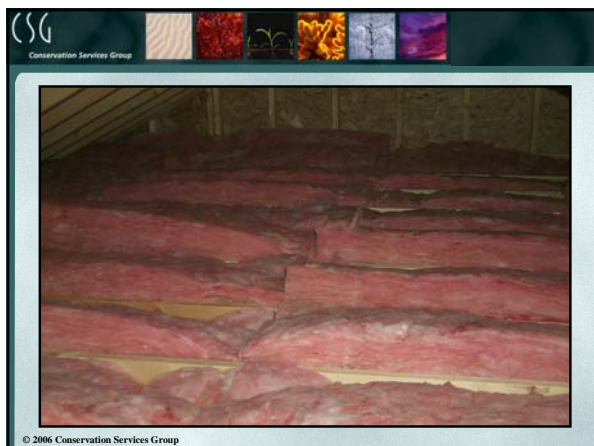
Installation Methods

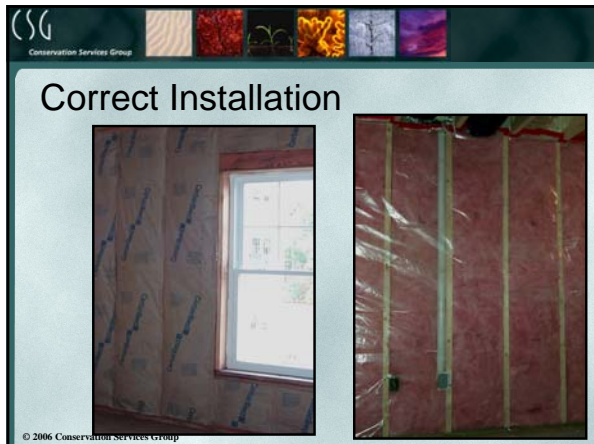
- Batts and blankets
- Loose fill
- "Blown in Blanket" (BIB)
- Open cavity spray
- Rigid board

© 2006 Conservation Services Group



- CSG Conservation Services Group
- ### Why is it So Bad?
- The gaps and spaces dominate the heat loss
 - No matter how much insulation you pile up next to a gap, the heat loss through the gap is not reduced at all
 - The larger the initial R-value, the greater the effect
- © 2006 Conservation Services Group





CSG
Conservation Services Group

Batts and Blankets

- Inexpensive
 - \$0.75-1.00/s.f. in 2x6
- Easy to find
- “Easy” to install
 - New construction
 - Open attics
- Moderate R/inch ~3.4
 - High density available: easier to install well
- Difficult to install well
 - Adds \$\$
- Very air permeable
 - **DOES NOT STOP AIR**
- Very vapor permeable
- Not good for retrofit in closed cavities
- Don’t use below grade
 - Unless supplemented with rigid foam

© 2006 Conservation Services Group

CSG
Conservation Services Group

Loose Fill Fiberglass Methods

- Blown in—open attics
 - Desired R-value achieved by installing the number of bags specified by the manufacturer (by square feet)
- Blown in Blanket (BIB) system
 - Loose fill fiberglass installed behind netting stapled over framing members
 - Installed R-value dependent on density
 - Typical for a 2x6 wall is R-21 to R-23

© 2006 Conservation Services Group

CSG
Conservation Services Group

Loose Fiberglass

- Inexpensive
- Easy to find in some markets
- “Easy” to install
 - Open attics
- Moderate R/inch 2.5-3
- Retrofit: can be blown into cavities
- Extremely air permeable
- Extremely vapor permeable
- Easy to “fluff” (low density = low R-value)

© 2006 Conservation Services Group



CSG
Conservation Services Group

Blown-in Blanket (BIB) Fiberglass



© 2006 Conservation Services Group

CSG
Conservation Services Group

“BIB” Fiberglass

- Mid-priced
- Harder to find
- Easy to install well
- R/inch 3.5+
- Very air permeable
 - Even at high densities
- Extremely vapor permeable
- Niche market

© 2006 Conservation Services Group

CSG
Conservation Services Group


Cellulose Insulation Methods

- Blown in open attics
 - Desired R-value achieved by installing the number of bags specified by the manufacturer (by square feet)
- Dense-Pack systems (similar to BIB)
- Open Cavity Damp Spray
 - Typical for a 2x6 wall is R-21 to R-23

© 2006 Conservation Services Group

CSG
Conservation Services Group

Blown Cellulose Insulation



© 2006 Conservation Services Group

CSG
Conservation Services Group

Loose Cellulose

- Relatively inexpensive
- Easy to find in some markets
- Easy to install
 - Open attics
- Retrofit: can be blown into cavities
 - Less air permeable at high densities
- R/inch = 3.5 – 4.0
- Moderately air permeable
- Very vapor permeable
- Can be “fluffed”

© 2006 Conservation Services Group

CSG
Conservation Services Group

Damp spray cellulose



© 2006 Conservation Services Group

CSG
Conservation Services Group

Finished Product

© 2006 Conservation Services Group

CSG
Conservation Services Group

Damp spray cellulose

- Mid-priced
- Harder to find
- Good installation
 - Fills cavities well
 - But takes experience to get the moisture right
- R/inch 3.5+
- Slightly less air permeable
 - Still not an air barrier!
- Very vapor permeable
- Not suited to retrofit
- Introduces construction moisture

© 2006 Conservation Services Group

CSG
Conservation Services Group

Dense-packed Cellulose

© 2006 Conservation Services Group

CSG
Conservation Services Group

Close-up

© 2006 Conservation Services Group

CSG
Conservation Services Group

© 2006 Conservation Services Group

CSG
Conservation Services Group

Dense-packed cellulose

- Mid-priced (more material)
- Harder to find
- Takes practice to install well
- R/inch 3.5+
- Less air permeable
 - Can significantly reduce airflow through leaky assemblies
- Still not an air barrier!
- Very vapor permeable
- Used in new or retrofit

© 2006 Conservation Services Group

CSG
Conservation Services Group

Foam Insulation

- Rigid foams
 - Expanded polystyrene: R-4 per inch
 - Extruded polystyrene: R-5 per inch
 - Isocyanurate: R-7 per inch
- Not suited for most retrofit
 - Can add R-value to renovation of walls or roof
- Most need to be covered for fire rating
- Air barrier material for spanning attic openings
 - May not meet fire-blocking requirements for some building assembly types

© 2006 Conservation Services Group

CSG
Conservation Services Group

© Kevin Kennefick 2001




© 2006 Conservation Services Group

CSG
Conservation Services Group



© 2006 Conservation Services Group

CSG
Conservation Services Group



© 2006 Conservation Services Group

CSG
Conservation Services Group

Rigid foams:


- Expanded: lowest \$ / R-value / square ft.
 - More vapor permeable
 - Least R/ inch
- Extruded:
 - 1" or more is a vapor retarder by current code
 - (And for zone 6 + in upcoming codes)
- Polyisocyanurate: high R/inch, most \$
 - Vapor barrier (foil faced)
 - Some are rated for exposure (smoke/flame)

© 2006 Conservation Services Group

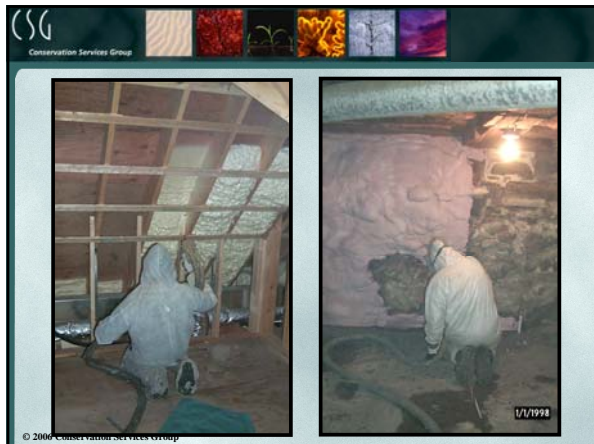
CSG
Conservation Services Group

Spray Foams

- Spray Foams:
 - Urethane: R3.5 to 7 per inch (low/high density)
 - Retrofit usually limited to basements, attics
- Excellent air sealing characteristics
- Excellent "fit" because it expands to fill spaces and glues itself to surfaces



© 2006 Conservation Services Group



CSG Conservation Services Group

Low density foam (“Open cell”)

- Getting easier to find
- Good installation
 - Fills cavities well
- R/inch ~3.5
- Good air barrier
 - Where present
- Some types can be used in retrofit for wall cavities (not common)
- High-priced
- Moderate vapor permeability
- Careful with cold weather installs
 - Temperature, condensation
- Cover for fire rating

© 2006 Conservation Services Group

CSG Conservation Services Group

High density foam (“Closed cell”)

- Getting easier to find
- Good installation
 - Fills cavities well
- R/inch ~6
 - When space really matters
- Good air barrier
 - Where present
- Low vapor permeability
 - Lowest risk
- Highest priced
- Careful with cold weather installs (?)
 - Temperature, condensation
- Cover for fire rating

© 2006 Conservation Services Group

CSG Conservation Services Group

Targeted Spray Foam

- Band joist area
- Rafter / ceiling joist / wall intersection
- Difficult areas
 - Dormers
 - Odd framing bays
 - Unvented roofs
- Ducts in attic

© 2006 Conservation Services Group

CSG Conservation Services Group

Foam/ Cellulose weakness:

© 2006 Conservation Services Group

CSG Conservation Services Group

Don't be fooled:

- “Radiant” insulation products
 - Can reduce cooling gains in attics if applied to roof sheathing
 - But overrated by manufacturers
 - Somewhere between overstated and ridiculous
- Foil-faced bubble wrap, “insulation paint”
- Also
 - “Thermal mass” (ICF's)
 - “Equivalent” R-value

© 2006 Conservation Services Group