ENCLOSURE DESIGN
WALLS and Windows

Heat Flow
Thermally Efficient Assemblies
• Structure only where needed
• Insulating sheathing
• Blown insulations that fill the entire void
Vapor Flow
Classes of Vapor Retarders

- **Class I**
  - .1 perm or less (sheet polyethylene, non-perforated aluminum foil)

- **Class II**
  - .1 perm to 1 perm (kraft faced fiberglass batts)

- **Class III**
  - 1 perm to 10 perm (latex or enamel paint)

2007 Supplement to 2006 IRC and IBC and IECC
2009 IRC and IBC revised for consistency
Allowable Interior Vapor Resistance Requirements by Class Climate Zone

<table>
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<tr>
<th>Sheathing</th>
<th>Climate Zone</th>
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<tbody>
<tr>
<td>Marine 4 5 6 7</td>
<td>Class I, II, III</td>
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<tr>
<td>OSB Class I, II, III</td>
<td>Class I, II, III</td>
</tr>
<tr>
<td>Plywood Class I, II, III</td>
<td>Class I, II</td>
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<tr>
<td>Gypsum Class I, II</td>
<td>Class I, II, III</td>
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</tbody>
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**Insulating Sheathing**

- Class I, II, III (R-2.5 or greater)
- Class I, II, III (R-5 or greater)
- Class I, II, III (R-7.5 or greater)
- Class I, II, III (R-10 or greater)

**Exterior Covering**

- Ventilated
- Other

**Notes:**

1. When insulating sheathing is installed over other sheathing, requirements for insulating sheathing shall govern.
2. Insulating sheathing R-values shown in parenthesis are for 2x4 wall construction. 2x6 walls require insulating sheathing R-values to be increased 50%.
3. When insulating sheathing has a vapor permeance of greater than Class III, requirements for gypsum sheathing shall govern.
4. When insulating sheathing having a vapor permeance of greater than Class III is installed over other sheathing, requirements for insulating sheathing shall govern.
5. Stucco (3/8 inch clear airspace with 3/8 inch continuous slot vent openings at the top and bottom of each wall)
6. Brick (2 inch clear airspace with 3/8 inch x 2.5 inch openings (or equivalent net free area per opening) every 3rd brick at the bottom and top course of each wall)
7. Stone/Masonry Veneer (2 inch clear airspace with 1 square inch of vent opening every 24 inches of wall length at the bottom and top of each wall)
8. Wood/Wood Based/Fiber Cement Siding (1/4 inch clear airspace or alternatively, 1/4 inch gap between horizontal siding laps)
9. Panel Siding (3/8 inch clear airspace with 3/8 inch continuous slot vent openings at the top and bottom of each wall)
New Windows

Design Towards Zero Energy

ENCLOSURE DESIGN

ROOFS

Duct and Air Handler Location
Unvented Roof Design:
Rigid insulation on Top of Deck /
Air Permeable Insulation under Deck

The colder the climate, the more R-value is needed

- Zone 2B, 3B Tile Roof: none required
- Zone 1 - 3: R-5
- Zone 4: R-10 to 15
- Zone 5: R-20
- Zone 6: R-25
- Zone 7: R-30
- Zone 8: R-35

Notes:
1. Air impermeable insulation must be installed in direct contact with the underside of the roof deck
2. Massachusetts is in Zone 5

Unvented Roof Design:
Requirements for Vapor Diffusion

Low Density (open cell) Foam
- Zone 1 - 4: (no minimum perm rating required)

Low Density Foam (open cell)
- Zone 5 - 7 require 1 perm or less (in foam sheathing or some other strategy to reduce permeability) in direct contact with the underside of the foam
- High Density Foam (closed cell)
- meets min. perm requirements in all zones

Low Density Foam - Zones (5) 6, 7

This works in Massachusetts and is the way our Somerville office is designed
Exclude the Water