Life Is Tough Enough As It Is…
Life Is Tough Enough As It Is…
It’s Harder When You Are Stupid…
Life Is Tough Enough As It Is…
It’s Harder When You Are Stupid…
Don’t Do Stupid Things…
Hydrostatic pressure
<table>
<thead>
<tr>
<th>Pascals</th>
<th>mph</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 Pa</td>
<td>20 mph</td>
</tr>
<tr>
<td>100 Pa</td>
<td>30 mph</td>
</tr>
<tr>
<td>150 Pa</td>
<td>35 mph</td>
</tr>
<tr>
<td>250 Pa</td>
<td>45 mph</td>
</tr>
<tr>
<td>500 Pa</td>
<td>65 mph</td>
</tr>
<tr>
<td>1,000 Pa</td>
<td>90 mph</td>
</tr>
</tbody>
</table>

Wind Speed (mph) vs. Stagnation Pressure (Pa)
Rain Screen
Beer Screen?
Rain enters cup due to momentum ("kinetic energy")

Cup drains water to exterior
Rain enters cup due to momentum ("kinetic energy")

Wind enters cup—pressurizing cup; no rain entry due to wind driven rain

Entire wind pressure taken here

Cup can still drain water to exterior
Baffle to deflect raindrops hitting face of cup due to momentum ("kinetic energy")

Pressure in cup is same as pressure outside on face of baffle

Momentum driving force converted to gravity—water drains away

Wind enters cup—pressurizing cup; no rain entry due to wind driven rain

Cup can still drain water to exterior

Entire wind pressure taken here
Insulating glass unit

Seal (gasket)

Seal (tape)

Setting block (typically two per unit)

Hole providing drainage and pressurization

Frame

Rough opening
Outer seal sees water but not pressure; no pressure difference across this seal, therefore no rain entry.

Key seal is interior seal as it takes maximum wind load but it does not see water.

Pressure in chamber is same as pressure outside on face of assembly.

 Entire wind pressure taken here.

Air enters and pressurizes chamber.

Pressure chamber.
Intent of sealant is to limit this lateral flow of water between sheathing and building wrap.
Brick veneer/stone veneer
Drained cavity
Exterior rigid insulation — extruded polystyrene, expanded polystyrene, isocyanurate, rock wool, fiberglass
Membrane or trowel-on or spray applied drainage plane, air barrier and vapor retarder
Non paper-faced exterior gypsum sheathing, plywood or oriented strand board (OSB)
Insulated steel or wood stud cavity
Gypsum board
Latex paint or vapor semi-permeable textured wall finish

Vapor Profile
Brick veneer/stone veneer
Drained and vented cavity
Thermal control layer - exterior rigid insulation - rock wool or fiberglass
Membrane or trowel-on or spray applied or liquid applied water control layer and air control layer
Non paper-faced exterior gypsum sheathing, plywood or oriented strand board (OSB)
Insulated wood stud cavity
Gypsum board
Latex paint or vapor semi-permeable textured wall finish

Figure 2c
Vapor Profile
Outside

Dewpoint
(50% RH, 70°F)

Location of condensation and frost

Exterior sheathing

Inside

70°F

0°F
Simple linearized energy-temperature relation for water
From Straube & Burnett, 2005
The inside face of the exterior sheathing is the condensing surface of interest.

- Wood-based siding
- Building paper
- Exterior sheathing
- R-19 cavity insulation in wood frame wall
- Gypsum board with any paint or wall covering

Graph showing:
- Temperature (°F)
- Mean monthly outdoor temperature
- Dew point temp. at 50% R.H., 70°F
- Dew point temp. at 35% R.H., 70°F
- Dew point temp. at 20% R.H., 70°F

Potential for condensation shaded area.
The inside face of the insulating sheathing is the condensing surface of interest.

Wood-based siding

R-7.5 rigid insulation

R-13 cavity insulation in wood frame wall

Gypsum board with any paint or wall covering

Temperature (°F)

Month

Insulation/sheathing interface temperature (R-7.5 sheathing, R-13 cavity insulation as shown in adjacent drawing)

Mean monthly outdoor temperature

Potential for condensation

Dew point temp. at 35% R.H., 70°F
Figure 8-7. Outside vapour pressure, saturated vapour pressure and inside vapour pressure for Winnipeg.
Roof insulation

Insulation wind baffle
2” minimum space

Water protection membrane

Continuous soffit vent

Vinyl or aluminum siding

Rigid insulation
(taped or sealed joints)

Unfaced cavity insulation,
cellulose or low-density spray-applied foam

Continuous ridge ventilation

Attic ventilation

Gypsum board with vapor semi-permeable (latex) paint

Consider increasing depth of insulation by using deeper trusses or oversized (longer) trusses

Caulking or sealant

Gypsum board with permeable (latex) paint
Note: Colored shading depicts the building’s thermal barrier and pressure boundary. The thermal barrier and pressure boundary enclose the conditioned space.
Note: Colored shading depicts the building’s thermal barrier and pressure boundary. The thermal barrier and pressure boundary enclose the conditioned space.
Shingles

Roofing paper

Minimum R-50 rigid insulation in two or more layers with horizontal and vertical joints staggered

Nail base for shingles (plywood or OSB) screwed through rigid insulation to wood decking or timber rafters

Air barrier membrane

Wood decking

Timber rafter or exposed joist
Minimum R-50 rigid insulation in two or more layers with horizontal and vertical joints staggered.

Roof sheathing

Roofing membrane

Vented space

Air barrier membrane

Wood decking

Timber rafter or exposed joist

Roof sheathing

Roofing paper

Shingles
Low density spray foam insulation

Asphalt shingles

Roofing paper

Roof sheathing

Raised heel truss

Rigid foam, or comparable, as backdamp

Soffit

Roof underlayment sealed to drip edge

Non-occupiable space

Gypsum board with latex paint (acts as thermal barrier separating occupiable space from non-occupiable space)
Leaky air handling unit and supply ducts

Note: Colored shading depicts the building’s thermal barrier and pressure boundary. The thermal barrier and pressure boundary enclose the conditioned space.
Figure A
- leaky subfloor
- poor ground cover
- stack effect vents crawl space through house
- contaminants in crawl space migrate into house

Figure B
- excellent ground cover
- conditioned crawl space connected to house with transfer grilles and supplied with air from heating supply duct
(This is really a mini-basement and is already allowed by many code departments — i.e. Ft. Collins)

Figure C
- excellent ground cover
- conditioned crawl space via transfer air from occupied space
- continuously operating exhaust fan in crawl space vents house through crawl space
(This is not considered by the code but should be)
When rigid insulation is not installed on the exterior of the rim joist, it must be installed on the interior to control condensation on the rim joist in all climates.