

STRUCTURAL

PART 3: Building Code Compliance

- **Structural**

- Sheathing /Wind Pressure
- Cladding Attachment
- Window Attachment
- Vinyl Siding over Foam / Wind Pressure
- Foam sheathing with PC Stucco
- Foam sheathing with Wood Shakes/Shingles
- Wall Bracing

Structural Code Requirements are No Different for Walls with CI

- Integration with Wall Bracing ([IRC R602.10](#))
 - *Must have bracing with or without CI (no difference)*
- Integration with framing requirements -- stud sizing, connections, wind uplift load path, etc.
 - *Must meet all framing requirements with or without CI (no difference)*
- Wind pressure resistance of exterior wall covering assemblies ([IRC R703.1.2](#))
 - *All must provide wind pressure resistance*

Wind Pressure Resistance

703.1.2 Wind resistance. Wall coverings, backing materials and their attachments shall be capable of resisting wind loads in accordance with Tables R301.2(2) and R301.2(3). Wind-pressure resistance of the siding and backing materials shall be determined by ASTM E 330 or other applicable standard test methods. Where wind-pressure resistance is determined by design analysis, data from approved design standards and analysis conforming to generally accepted engineering practice shall be used to evaluate the siding and backing material and its fastening. All applicable failure modes including bending rupture of siding, fastener withdrawal and fastener head pull-through shall be considered in the testing or design analysis. Where the wall covering and the backing material resist wind load as an assembly, use of the design capacity of the assembly shall be permitted. [\(Link to code\)](#)

- NOTE: This 2009/2012 IRC code provision was proposed by ACC-FSC to ensure all sheathing materials and claddings used as wall coverings meet code

All Wall Coverings or Sheathings are Subject to Wind Damage



Wood structural panels



Fiber board



Foam sheathing

Foam Sheathing Wind Pressure Requirements

- New in IBC & IRC 2015

2603.10 Wind resistance. Foam plastic insulation complying with ASTM C 578 and ASTM C 1289 and used as exterior wall sheathing on framed wall assemblies shall comply with ANSI/FS 100 for wind pressure resistance.

R316.8 Wind resistance. Foam plastic insulation complying with ASTM C 578 and ASTM C 1289 and used as *exterior wall* sheathing on framed wall assemblies shall comply with SBCA FS 100 for wind pressure resistance unless installed directly over a sheathing material that is separately capable of resisting the wind load or otherwise exempted from the scope of SBCA FS 100.

Foam Sheathing Wind Pressure Requirements

- Foam sheathing must resist wind pressure as part of a wall covering assembly:
 - Cladding/furring secures foam to resist negative design wind pressure
 - Typical fasteners intended for temporary wind conditions
 - Foam sheathing material must:
 - Span between studs
 - Have adequate bending strength
 - Foam sheathing attachments can be designed for permanent wind load resistance

Code Compliance Resources (wind pressure)

- [ANSI/SBCA/FS 100–2012](#)
 - Provides path for code compliance and building official approval
 - Referenced in 2015 IBC and IRC
 - Exception: Foam sheathing does not need to comply if used as oversheathing over structural sheathing



Vinyl Siding Over Foam Sheathing (wind pressure)

- IRC 2009/2012/2015:

R703.11.2 Foam plastic sheathing. Vinyl siding and insulated vinyl siding used with foam plastic sheathing shall be installed in accordance with Section R703.11.2.1, R703.11.2.2 or R703.11.2.3.

Exception: Where the foam plastic sheathing is applied directly over wood structural panels, fiberboard, gypsum sheathing or other *approved* backing capable of independently resisting the design wind pressure, the vinyl siding shall be installed in accordance with Section R703.11.1.

[Link to code](#)

DOE/IBHS/ACC-FSC/NAHB-RC /VSI Whole Building Wind Tunnel Test



Results – OSB/wrap/vinyl

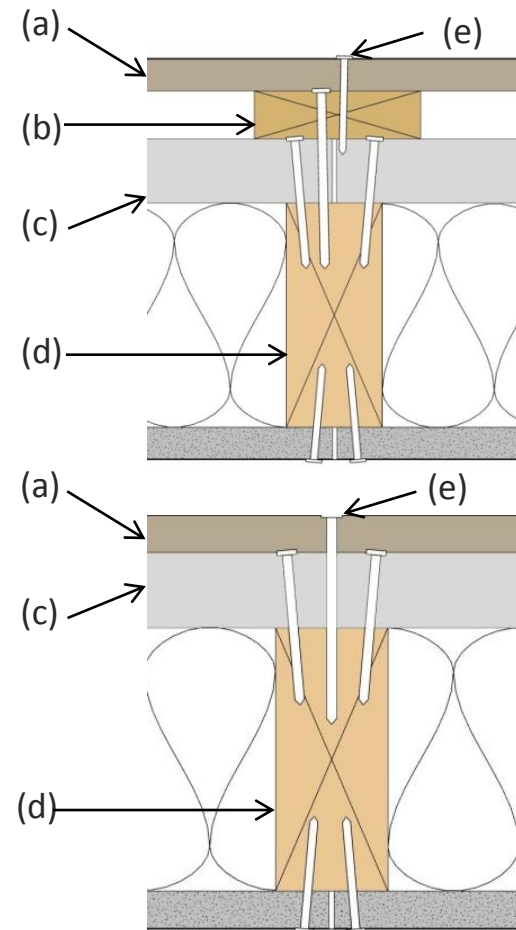


Results – Cl/vinyl (vinyl removed)



Cladding Attachment

- ACC-FSC, NYSERDA, DOE and SFA funded research
 - Adopted in NY energy code (effective Dec 2010)
 - Referenced in IBC Section 2603.11 (masonry/concrete) and 2603.12 (steel framing)
 - Referenced in IRC Section 703.15 (wood framing); R703.16 (steel framing); R703.17 (concrete/masonry)
- [TER No. 1006-01](#)
- Code compliant guidance for generic applications
 - Must be minimum 15 psi compressive strength FPIS per ASTM standards for XPS, EPS, or Polyiso
- Proprietary fasteners or connectors and cladding/CI systems also available
- Siding fastener embedment must be maintained with all thicknesses of foam
- Also refer to siding manufacturer's installation requirements



(a) cladding (b) furring or WSP (optional)
(c) FPIS (d) wall framing (e) fastener

Flanged Window Attachment

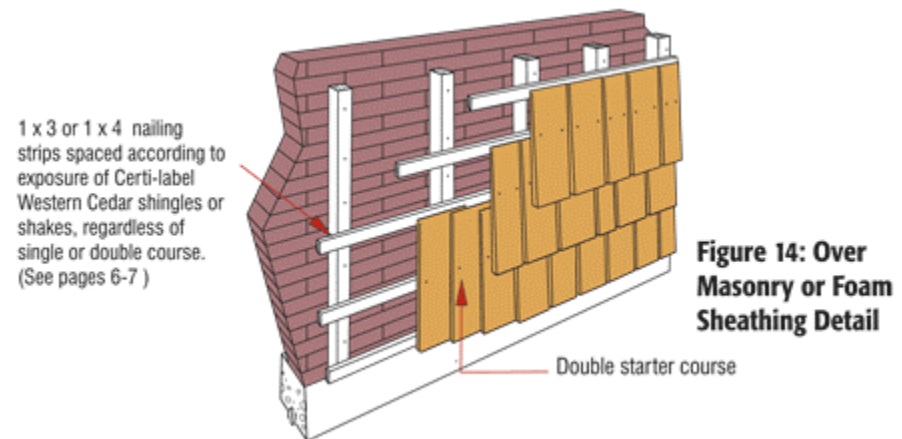
- [TER No. 1304-01](#)
- Attachments for typical window flanges placed over FPIS up to 2” thick
 - Must be minimum 15psi compressive strength foam (XPS, EPS, or Polyiso meeting ASTM standards).
- See [TER No. 1205-05](#) for details with window bucks to allow unlimited foam thickness.

Foam Sheathing and PC Stucco

- [IBC 2510.6](#) & [IRC R703.6.3](#)
 - Exception Statement from IRC
 - **Exception:** Where the water-resistive barrier that is applied over wood-based sheathing has a water resistance equal to or greater than that of 60-minute Grade D paper and is separated from the stucco by an intervening, substantially nonwater-absorbing layer or designed drainage space.

Foam Sheathing and Wood Shakes/Shingles

- [IRC R703.5](#)
 - Requires double layer lattice of furring
 - Not based on evidence or science
- [BC Cedar Shake & Shingle Guide](#)
- FSC Case Study Report



Wall Bracing

- Many building design factors impact wall bracing decisions which impact sheathing/insulation decisions.
- Refer to ACC-FSC Wall Bracing Guide (<http://fsc.americanchemistry.com>)
- Code-compliant bracing methods include:
 - Use of foam over continuous sheathing (e.g., OSB, structural fiberboard, etc.)
 - Use of foam between and/or over intermittent braced wall panels (e.g. OSB, let-in, structural fiberboard, hardboard, etc.)
- All bracing methods have limitations, advantages, and disadvantages (not unique to CI applications)

Wall bracing – integration with FPIS

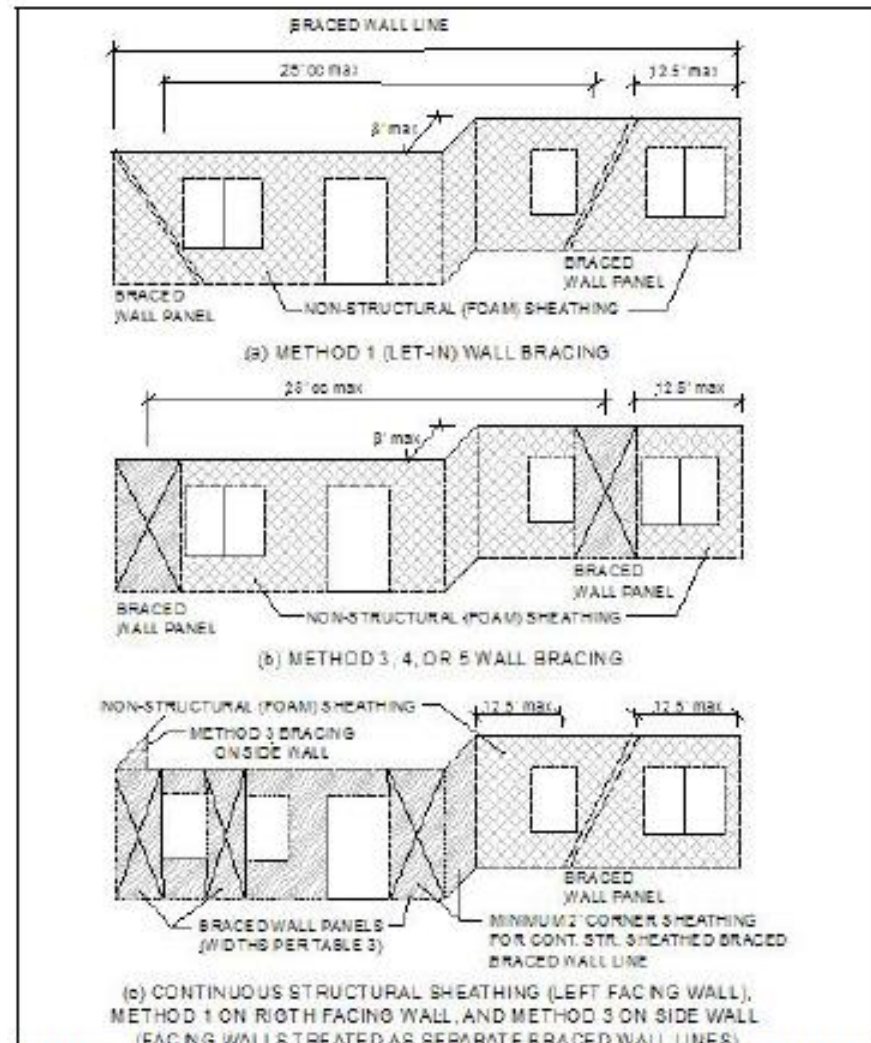


Figure 10: Illustration of Bracing Methods with Foam Sheathing