Windows Installed into Walls with FPIS and Wood Framing

*Picture Frame Method*

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Background

- There are many acceptable ways to mount and detail windows for support and weather resistance.
- This installation best practice provides only a representative solution for integrating windows with Foam Plastic Insulating Sheathing (FPIS).
- It is the responsibility of the user to verify the appropriateness of any specific detail for their specific conditions.
Scope

• The installation approach featured in this presentation:
  – Is a “picture frame” installation concept with window flanges mounted directly to the picture frame.
  • Represents a common method for installing windows typically used for foam thicknesses of ¾ inch to 1½ inches to match common lumber dimensions.
Scope

• The installation approach featured in this presentation:
  – Uses FPIS as the water-resistive barrier (WRB).
    • Refer to DrJ DRR 1410-05 and the FPIS manufacturer’s installation instructions.
    • Use of a separate WRB material layer is also common and acceptable with appropriate installation and detailing.
Scope

• The installation approach shown includes windows with integral mounting flanges.

• Integral mounting flange windows:
  - Are sometimes referred to as “integral nailing flange,” “integral fin,” or “integral mounting fin.”
  - An integral flange is extruded with the frame and forms one continuous piece around the perimeter.
  - A mounting flange is typically about 1½” wide and is set back about 1” from exterior window face. Fasteners are installed through the pre-punched holes in the flange.
About FPIS

• Three types of FPIS:
  – Expanded Polystyrene (EPS) - ASTM C578
  – Extruded Polystyrene (XPS) - ASTM C578
  – Polyisocyanurate (Polyiso) - ASTM C1289

• R-values ranging from R-4 to more than R-6 per inch.

• Come in many thicknesses, compressive strengths, and densities.
Typical FPIS Applications

• Often used as exterior **continuous insulation (ci)** on buildings to comply with energy codes or for improved performance.
  – Can be used as an **air-barrier (AB)** and **water-resistive barrier (WRB)** per manufacturer’s code approvals and instructions.
  – Proprietary FPIS products are also available as a structural insulating sheathing composite for **wall bracing**.
Installation Guidance

- **DrJ Best Practices**
- Window, FPIS, WRB, or Flashing manufacturer’s installation instructions
- An approved design
- The following general installation guidelines
Key Principles

• The intent of any acceptable detail for integrating windows with FPIS is:
  – To provide adequate structural support to the window unit.
  – To prevent water penetration at the window-wall interface by flashing to direct water onto the exterior surface of the WRB layer and/or cladding and away from the window opening.
  – To provide adequate drainage at the window sill for any incidental leakage of water that may still penetrate into the rough opening.
Framing Methods

• There are four typical methods for window framing.
• This program covers the “Picture Frame” method.
Picture Frame Installation - Sill

- Window Unit (Shim as required at sill)
- Sealant
- Shims
- Sealant (backdam)
- Extended window jamb or drywall return
- Trim
- 'Picture Frame'
- Framing
- Window nailing flange with bedding joint
- Sealant (intermittent for sill pan drainage) and sill pan flange sealed continuously to drainage plane
- FPIS fastener
- Sill pan flashing (recommended for all installations)
- Interior finish
- Drainage plane
- FPIS/WRB
- WSP sheathing (optional as required for bracing or other purposes)
- Siding
Picture Frame Installation - Jambs

- **TRIM**
- **EXTENDED WINDOW JAMB OR DRYWALL RETURN**
- **FRAMING**
- **INTERIOR FINISH**
- **SEALANT**
- **FRAMING NAIL FASTENER MUST PENETRATE 1-1/2” INTO WOOD FRAMING**
- **SHIMS**
- **WSP SHEATHING (OPTIONAL AS REQUIRED FOR BRACING OR OTHER PURPOSES)**
- **'PICTURE FRAME'**
- **FP15 / WRB**
- **DRAINAGE PLANE**
- **STANDARD WINDOW FLASHING PER WINDOW MANUFACTURER INSTALLATION INSTRUCTIONS**
- **FP15 FASTENER**
- **WINDOW NAILING FLANGE WITH BEDDING JOINT SEALANT (INTERMITTENT FOR SILL PAN DRAINAGE) AND SILL PAN FLANGE SEALED CONTINUOUSLY TO DRAINAGE PLANE**
- **SIDING**
- **WINDOW UNIT (SHIM AS REQUIRED AT JAMB)**
Picture Frame Installation - Header

- Termination Joint Tape (Acrylic or Equal)
- Adhered Flexible Head Flashing (Butyl or Equal) (Continuous to Nail Flange)
- Interior Finish
- Sheathing/Drainage WRB (FPIS)
- WSP Sheathing (Optional as required for bracing or other purposes)
- 'Picture Frame' Opening (Same thickness as FPIS)
- Framing Nail. Must penetrate 1-3/4" into wood framing
- Framing
- Trim
Step 1: Frame Window Opening

- Frame walls as required by the applicable code.
- Ensure window rough opening is square and true.
- Ensure appropriate framing in accordance with window installation method selected and support for FPIS edges is provided.
Step 1: Frame Window Opening

• Frame exterior side of window opening with a “picture frame”.
• Use material that is the same thickness of the FPIS that will be installed.
• Picture frame material should be at least 1-1/2” wide to allow for support of the window flanges and to prevent splitting from the fasteners.
• Fastener size and spacing to be designed to support the weight of the window and accessories as well as to provide resistance to wind loads transverse to the wall surface.
• Picture frame member may be placed only at sill if just needed for added sill support.
Step 2: Verify and install FPIS

• FPIS material must comply with:
  – ASTM C578 (EPS, XPS)
  – ASTM C1289 (Polyiso)

• Wind pressure resistance
  – See ANSI/SBCA FS-100 for guidance
  – Only required when FPIS not used as oversheathing

ASTM D 1621
Step 2: Verify and Install FPIS

• Drive nails flush and snug with the surface of the insulation board.
• Do not overdrive nails.
• Do not underdrive nails.
• Many FPIS manufacturers recommend use of cap nails.
Step 2: Verify and Install FPIS

- Follow manufacturer’s installation guidelines
- While not prohibited, avoid placing vertical joints in the sheathing over a window head where practical.
- See “FPIS Installation Instructions” program.
Step 3: Verify Flashing and Sealant Materials

• Ensure chemical compatibility of all sealants and flashings with intended substrates; refer to sealant and flashing manufacturer’s data.

• Use flashing tape and sealants recommended by the window and FPIS/WRB manufacturers.
Step 4: Apply Sill Flashing

- Apply all flashings in shingle fashion (e.g., jamb flashing overlaps sill flashing and head flashing overlaps jam flashing).
- Overlap and seal sill flashing at center of sill if a multi-piece sill or pan flashing is used.
Step 4: Apply Sill Flashing

- Alternatively, use a manufactured sill pan to simplify sill drainage installation.
Step 5: Apply Jamb Flashing

- Apply flashing at jambs
Step 6: Apply Head Flashing

- Apply flashing at head
Step 7: Apply Sealant

- Apply sealant at jambs and head (or as required by manufacturer’s install instructions).
- Sill is left open to allow the cavity below the window to drain to the exterior.
Step 8: Install Window Shims at Sill

• Apply setting blocks and/or shims between the rough opening and window frame.
• The window frame must be anchored to the wood rough opening as required by the window manufacturer or in accordance with an approved design for sill support.
Step 9: Install Window

- Install window plumb, level, and square per manufacturer’s instructions.
Step 9: Install Window

- The window frame must adequately bear on the wood sill particularly if using a non-structural flange window.
- Providing adequate sill support is good practice and often required by window manufacturer installation instructions.
Step 10: Verify Window Fasteners

- Window flange fasteners must penetrate a minimum of 1¼” into framing members per IRC 2015.
- Follow manufacturer installation requirements for size and spacing.
Step 11: Install Window Shims

• Apply shims between the rough opening and window frame.
• Anchor the window per the manufacturer’s installation instructions.
Step 12: Apply Jamb Flashing

- Install flashing over the nailing flanges of the jambs to provide a final layer of protection against water intrusion.
- The sill is not sealed, allowing for drainage of the rough opening, back to the exterior.
- Where applicable, install drip cap per manufacturer.
Step 13: Apply Head Flashing

• Apply head flashing.
  – Typically, butyl flashing tapes are used for this purpose.

• Overlap window head flange and jamb flashing.
Step 14: Tape Head Flashing

- For extra durability and protection, terminate the top edge of the head flashing tape with the FPIS manufacturer’s approved joint tape.
- Typically, acrylic tapes are used for this purpose.
Step 15: Apply Sealant

- Air seal window around entire perimeter on the interior with sealant or expanding foam made for this purpose.
Step 16: Install Cladding

• See Installation Instructions
  “Attachment of Exterior Wall Coverings Through Foam Plastic Insulating Sheathing (FPIS) to Wood or Steel Wall Framing.”
Additional Reading

• *Fastening Systems for Continuous Insulation*, New York State Energy Research and Development Authority (NYSERDA), April 2010.


• *ASHRAE Journal*, “Windows can be a pain,” Lstiburek, April 2015.