Integrating DuPont™ Tyvek® Weatherization Systems with Exterior Rigid Foam Insulation

INSTALLATION BULLETIN

DuPont has both the products and the building science expertise to help builders meet the new code and certification requirements for building durable, long lasting high R-value walls contributing to more energy efficient and comfortable homes.
Introduction
The purpose of this bulletin is to provide guidance and information for integrating DuPont™ Tyvek® Weatherization System Products with exterior rigid foam insulation on buildings less than 5 stories. This bulletin contains information on the following:

- General Considerations
- Fastening Considerations
- Interfaces/dissimilar materials
- Fire Warnings
- Material Compatibility
- Facade Considerations
- Installation Considerations and Sequences

General considerations
Many foam sheathings are vapor barriers with vapor permeabilities < 1 perm. In these cases, extra care must be taken to insure water will not enter the wall, and insulation R-values are sufficient to prevent potential condensation within the wall cavity. Use of vapor barrier sheathings will reduce the ability of the wall system to dry, especially when used in wall systems with interior vapor barriers.

To ensure the best water management, DuPont™ Tyvek® weather-resistant barriers (WRB) should be installed on the same plane as the window flanges for easier integration with the flashing, which helps provide the most effective performance. Exterior foam insulation can be installed under or over DuPont™ Tyvek® wraps. In new construction or in remodeling projects where the existing windows will be replaced, the WRB installation procedure will be determined based on whether the windows will be aligned with the exterior wall of the house or recessed from it. For remodeling projects where the existing windows will be retained, the alignment of the windows is already determined by the current placement.

Depending on the window’s position relative to the foam, the window’s depth may need to be extended either internally or externally (jamb extensions). If extensions are located on the exterior, an exterior grade material should be used. Extensions in the exterior sill should be sloped to the outside.
Windows aligned with outside of exterior insulation
In this case the WRB should be installed over the foam sheathing. Prepare window and door openings before installing foam and housewrap. Use furring strips ripped to the thickness of the rigid-foam insulation to create a solid nailing surface around the window and door openings. Install 2 1/2” wide furring strips around all sides of the openings.

Windows aligned with inside of exterior insulation
In this case the WRB should be installed under the foam sheathing. DuPont™ Tyvek® DrainWrap™ is recommended for enhanced drainage. Windows should be flashed and integrated with the wrap. The window will be recessed and the surrounding foam must be protected in a manner similar to that of a recessed window.

Fastening requirements
Rigid foam sheathing has little or no nail-holding power and should not be used as a nailing base. When the WRB is applied over the exterior foam sheathing, the WRB should be fastened through the foam into the studs or underlying nail-base sheathing. Nail lengths must be increased by the thickness of the exterior insulation, as shown in Figures 1 and 2 below for New Construction and Residing scenarios, respectively. Avoid over-driving nails, which can result in dimpling of the siding due to the compressible nature of the foam sheathing. Extra caution is necessary if power-driven nails are used for attachment.

Interfaces Between Sheathing Materials
Foam insulation is not a structural material. Adequate diagonal and lateral bracing for structural framing is required in accordance with job and service load conditions and all applicable building codes. Many different types of bracing and sheathing materials may be used on a single dwelling. Continuity is maintained by integrating the wrap over the foam sheathing, as shown in Figure 3 below.

Care must be taken to maintain the continuity of the air and water-resistive barrier across the dissimilar sheathing material interfaces. Figure 4 below details an alternate example where a portion of a wall uses only foam sheathing, and the other portion of the wall uses wood sheathing to provide structural support. The wrap should be installed continuously to integrate the sheathing materials and provide a continuous air and water-resistive barrier.
FireWarnings
Consult foam insulation manufacturer and/or your local building codes for additional details, as installation of ½” gypsum wallboard or other approved thermal barrier material on the inside surface of the wall may be required for fire protection when foam sheathing is used.

Compatibility
Foam insulation is subject to attack by petroleum-based solvents. Care should be taken to prevent contact between insulation and these solvents or their vapors. Wood siding is occasionally treated with water repellents or wood preservatives. If siding has been treated, check to insure that the treatment is dry to avoid solvent or chemical reaction with the foam insulation or DuPont™ Tyvek® WRB. Sealants and self-adhered flashings should be checked for compatibility with foam insulation prior to use.

FacadeConsiderations
Stucco
When stucco is installed over wood-based sheathing, the 2009 International Building Code (Section 2510.6) and the 2009 International Residential Code (Section R703.6.3) require “a water-resistive vapor-permeable barrier with a performance at least equivalent to two layers of Grade D paper” or a layer of water-resistive barrier that is separated from the stucco by an “intervening layer”.

When DuPont™ Tyvek® water-resistive barriers are used behind stucco, they should be separated from the stucco by a second layer of Tyvek® water-resistive barrier, a layer of Grade D building paper, felt, rigid foam board or the paper backing of paper-backed lath. The first layer (directly over sheathing or studs) serves as the wall system’s water-resistive barrier and is integrated with window and door flashings, the weep screed at the bottom of the wall and any through-wall flashings or expansion joints. Lath should be installed over the intervening layer in accordance with ASTM C1063-08 Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster and applicable codes.

Rigid foam board, when installed over Tyvek® water-resistant barrier as an intervening layer, will provide enhanced structural support to the Tyvek® layer and, if installed within 24 hours of the Tyvek® layer, may reduce the required number of fasteners used for the attachment of the Tyvek® water-resistant barrier. DuPont™ Tyvek® StuccoWrap®, DuPont™ Tyvek® DrainWrap® or DuPont™ Tyvek® CommercialWrap® D is recommended for this application and meets drainage requirements for one-coat stucco and EIFS systems.

Brick
The 2009 International Residential Code (Section R703.7.4.2) requires a minimum 1” airspace separating the brick from the water-resistive barrier. The Brick Industry Association recommends a 1” airspace in front of wood stud construction and a 2” airspace in front of steel stud construction. Consistent with these requirements and recommendations, foam and Tyvek® water-resistive barriers shall be separated from the brick veneer by a 1” airspace.

Window and door flashing and through-wall flashing shall be integrated with the Tyvek® layer, ensuring proper shingling. For maximum moisture management and drying of the wall system, the airspace in front of the foam and Tyvek® should be vented to the exterior at the top and bottom of the wall.

Stone Veneer
The 2009 International Building Code (Section 1405.7) requires two layers of water-resistive barrier behind stone veneers over wood frame construction. When used behind stone veneer, Tyvek® water-resistant barriers should be installed in a similar manner as they are installed behind stucco. Tyvek® water-resistant barriers should be separated from the stone and mortar by a second layer of Tyvek® water-resistive barrier, a layer of grade D building paper, felt, rigid foam board or the paper backing of paper-backed lath. The first layer (directly over sheathing or studs) serves as the wall system’s water-resistive barrier and should be integrated with window and door flashings, the weep screed at the bottom of the wall and any through-wall flashings or expansion joints. When rigid foam board is used as the second layer, it is installed in front of the Tyvek® wrap. DuPont™ Tyvek® StuccoWrap®, DuPont™ Tyvek® DrainWrap® or DuPont™ Tyvek® CommercialWrap® D is recommended for this application.

WoodSiding
Tyvek® water-resistant barriers, foam insulation and wood siding should be installed according to the manufacturer’s instructions, industry standards and applicable codes. As recommended by the Western Red Cedar Lumber Association and U.S. Forest Product Laboratory, wood siding should be primed on all six sides before installation. Foam sheathing panels often have low vapor permeability, and therefore can cause moisture to accumulate on the back of siding and cause staining, buckling and damage to finish coats. As a result, the Western Red Cedar Lumber Association and other wood siding manufacturers recommend that furring strips are used to create an air space between foam sheathing and siding. Other recommendations that should be followed to minimize potential problems are:

- Use thicker siding patterns in widths of 8” or less. Thick, narrow siding is more stable than thinner, wider patterns and better able to resist dimensional changes.
- Use kiln-dried siding over rigid foam sheathing.
- Proper prefinishing is essential.
• Use light color finish coats to maximize heat reflection and reduce dimensional movement.
• In all cases it is recommended that house wrap, such as DuPont™ Tyvek® DrainWrap®, be applied over the foam sheathing.

**Fiber Cement Siding**
DuPont™ Tyvek® water-resistive barriers and wood siding should be installed according to the manufacturer’s instructions and industry standards. In high-exposure installations, enhanced drainage and water management may be provided by using Tyvek® DrainWrap™ or by creating rainscreen cladding with a larger airspace behind the siding using furring strips. In high-wind areas at gable end walls, FEMA recommends fiber cement siding be installed over wood sheathing rather than over plastic foam sheathing.

**Vinyl Siding**
Vinyl siding is installed directly over Tyvek® water-resistive barriers. Vinyl siding should be installed in accordance with the manufacturer’s instructions and industry guidelines, including ASTM D4756-06 Standard Practice for Installation of Rigid Poly (Vinyl Chloride) (PVC) Siding and Soffit. In high-wind areas at gable end walls, FEMA recommends vinyl siding be installed over wood sheathing rather than over plastic foam sheathing.

---

**DuPont™ Tyvek® Weather Resistant Barriers Plus Foam Sheathing - Installation Considerations and Sequences**
As noted earlier in this bulletin, the WRB should be installed on the same plane as the window flanges for easier integration with the flashing, which helps provide the most effective performance. In new construction, or in remodeling projects where the existing windows will be replaced, the WRB installation procedure will be determined based on whether the windows will be aligned with the exterior wall of the house or recessed from it. For remodeling projects when existing windows will be retained, the alignment of the windows is already determined by the current placement. The following guidelines detail the implications involved with each scenario and help provide the appropriate corresponding installation sequence.

---

**New Construction or Remodeling with New Windows**

<table>
<thead>
<tr>
<th>Windows installed BEFORE the WRB?</th>
<th>AND</th>
<th>Placement of Window</th>
<th>Requires</th>
<th>Placement of WRB vs Foam Sheathing</th>
<th>AND</th>
<th>Installation Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>YES, Windows installed BEFORE the Tyvek® WRB</strong></td>
<td>+</td>
<td>Windows Aligned with the exterior wall of the house</td>
<td>+</td>
<td>WRB OVER Foam</td>
<td>+</td>
<td>SEE Section 1</td>
</tr>
<tr>
<td></td>
<td>+</td>
<td>Windows Recessed from the exterior wall of the house</td>
<td>+</td>
<td>WRB UNDER Foam</td>
<td>+</td>
<td>SEE Section 2</td>
</tr>
<tr>
<td><strong>NO, Windows installed AFTER the Tyvek® WRB</strong></td>
<td>+</td>
<td>Windows Aligned with the exterior wall of the house</td>
<td>+</td>
<td>WRB OVER Foam</td>
<td>+</td>
<td>SEE Section 3</td>
</tr>
<tr>
<td></td>
<td>+</td>
<td>Windows Recessed from the exterior wall of the house</td>
<td>+</td>
<td>WRB UNDER Foam</td>
<td>+</td>
<td>SEE Section 4</td>
</tr>
</tbody>
</table>

* Table also used for Residing when BOTH siding and windows are being removed and replaced.
Section 1: Windows installed BEFORE the WRB - Windows aligned with exterior wall

If the windows will be installed BEFORE the WRB and they will be aligned with the exterior wall, then the WRB must be installed OVER the foam sheathing. Follow these steps:

NOTE: Check compatibility of DuPont self-adhered flashing with foam to ensure adequate adhesion.

1. Prepare window opening - install solid nailing surface (wood buck)
2. Install foam per manufacturer’s guidelines. Do not tape foam seams.
3. Protect window sill per current DuPont™ Flashing installation guidelines.*
   NOTE: DuPont™ Flashing installation guidelines require 2” to 3” DuPont™ FlexWrap™ NF onto the face of the wall. Depending on the thickness of the foam, consider using 9” DuPont™ FlexWrap™ NF.
4. Install window per manufacturer’s guidelines.
5. Flash window per current DuPont™ Flashing installation guidelines.* Use DuPont™ Residential Sealant for interior seal.
6. Install DuPont™ Tyvek® WRB per current DuPont™ Tyvek® Water Resistive Barriers Installation Guidelines
   *Reference Integral Flanged Window (BEFORE INSTALLATION OF WRB) or, Brick Mold, Non-Flanged and Field Applied Flanged Window (BEFORE INSTALLATION OF WRB)

(1) DuPont™ Flashing Tape can be substituted for DuPont™ StraightFlash™
Section 2: Windows installed BEFORE the WRB - Windows recessed from exterior wall

If the windows will be installed BEFORE the WRB and will be recessed from the exterior wall, then the WRB must be installed UNDER the foam sheathing. Follow these steps:

1. Protect window sill per current DuPont™ Flashing installation guidelines.*
2. Install window per manufacturer’s guidelines.
3. Flash window per current DuPont™ Flashing installation guidelines.* Use DuPont™ Residential Sealant for interior seal.
4. Install DuPont™ Tyvek® WRB per current DuPont™ Tyvek® Water Resistive Barriers Installation Guidelines. DuPont™ Tyvek® DrainWrap™ is recommended for enhanced drainage.
5. Install foam per manufacturer’s guidelines. Do not tape foam seams.

*Reference: Integral Flanged Window (BEFORE INSTALLATION OF WRB) or, Brick Mold, Non-Flanged and Field Applied Flanged Window (BEFORE INSTALLATION OF WRB)
Section 3: Windows installed AFTER the WRB - Windows aligned with exterior wall

If the windows will be installed AFTER the WRB and they will be aligned with the exterior wall, then the WRB must be installed OVER the foam sheathing. Follow these steps:

NOTE: Check compatibility of DuPont self-adhered flashing with foam to ensure adequate adhesion.

1. Prepare window opening - install solid nailing surface (wood buck)
2. Install foam per manufacturer’s guidelines. Do not tape foam seams.
3. Install DuPont® Tyvek® WRB per current DuPont™ Tyvek® Water Resistive Barriers Installation Guidelines
4. Protect window sill per current DuPont™ Flashing installation guidelines. *

NOTE: DuPont™ Flashing installation guidelines require 2” to 3” DuPont™ FlexWrap™ NF onto the face of the wall. Depending on the thickness of the foam, consider using 9” DuPont™ FlexWrap™ NF.

5. Install window per manufacturer’s guidelines.

*Reference: Integral Flanged Window (AFTER INSTALLATION OF WRB) or, Brick Mold, Non-Flanged and Field Applied Flanged Window (AFTER INSTALLATION OF WRB)

(1) DuPont™ Flashing Tape can be substituted for DuPont™ StraightFlash™
Section 4: Windows installed AFTER the WRB - Windows recessed from exterior wall

If the windows will be installed AFTER the WRB and they will be recessed from the exterior wall, then the WRB must be installed UNDER the foam sheathing. Follow these steps:

1. Install DuPont™ Tyvek® WRB per current DuPont™ Tyvek® Water Resistive Barriers Installation Guidelines. DuPont™ Tyvek® DrainWrap™ is recommended for enhanced drainage.
2. Protect window sill per current DuPont™ Flashing installation guidelines.*
3. Install window per manufacturer’s guidelines.
5. Install foam per manufacturer’s guidelines. Do not tape foam seams.

*Reference: Integral Flanged Window (AFTER INSTALLATION OF WRB) or, Brick Mold, Non-Flanged and Field Applied Flanged Window (AFTER INSTALLATION OF WRB)
Remodeling with existing windows
The most effective installation of the weatherization system is accomplished if the windows are installed in conjunction with the WRB installation and the water resistive barrier is installed in the same plane as the windows.

However, if the existing windows are not being replaced, the installer should examine the existing window flashing details and integrate them with the new WRB using sealant, tape and flashing so that water and air management are achieved. If there are signs of existing water leakage or damage, it’s recommended that the windows be removed. Repair damaged materials, install and flash the windows per DuPont™ Flashing Systems Installation Guidelines.

When installing additional layers of foam sheathing, the installer may choose to install the WRB either over or under the foam. The following items should be considered in making the decision:

- The placement of the WRB over or under the foam will impact how the WRB and existing flashing integration is accomplished.
- If the existing siding is retained and leveling board is installed the WRB should be installed over the foam.
- If the WRB is installed under the foam, consider using DuPont™ Tyvek® DrainWrap™ for enhanced drainage.

DuPont™ Tyvek® Specialist Network
A national group of highly trained field representatives is available to assist you with your installations. From the latest updates on building codes, to keeping up with current trends and challenges, your local DuPont™ Tyvek® Specialist can provide on-site consulting and training to help make sure the job gets done right.

Limited Warranty
DuPont™ Tyvek® water resistive barriers and DuPont™ Flashing System products are backed by a limited warranty. For more information please contact us.

DuPont™ Tyvek® Certified Installers
The DuPont Certified Installer Program is one more way to put the building science expertise of DuPont right at your fingertips. Your DuPont™ Tyvek® Certified installer provides trained installation services to help seal the building envelope.

To locate a certified installer in your area, please visit www.construction.tyvek.com.

Complete system of products
For optimal protection on all your building projects, use the complete line of DuPont™ Weatherization Systems products:

DuPont™ Tyvek® HomeWrap®
DuPont™ Tyvek® StuccoWrap®
DuPont™ Tyvek® DrainWrap™
DuPont™ Tyvek® ThermaWrap™
DuPont™ RoofLiner
DuPont™ FlexWrap™ NF
DuPont™ StraightFlash™
DuPont™ StraightFlash™ VF
DuPont™ Flashing Tape
DuPont™ Tyvek® Tape
DuPont™ Residential Sealant
DuPont™ Tyvek® Wrap Caps