

# Integrating DuPont Building Envelope Solutions Products in Extended Plate Construction

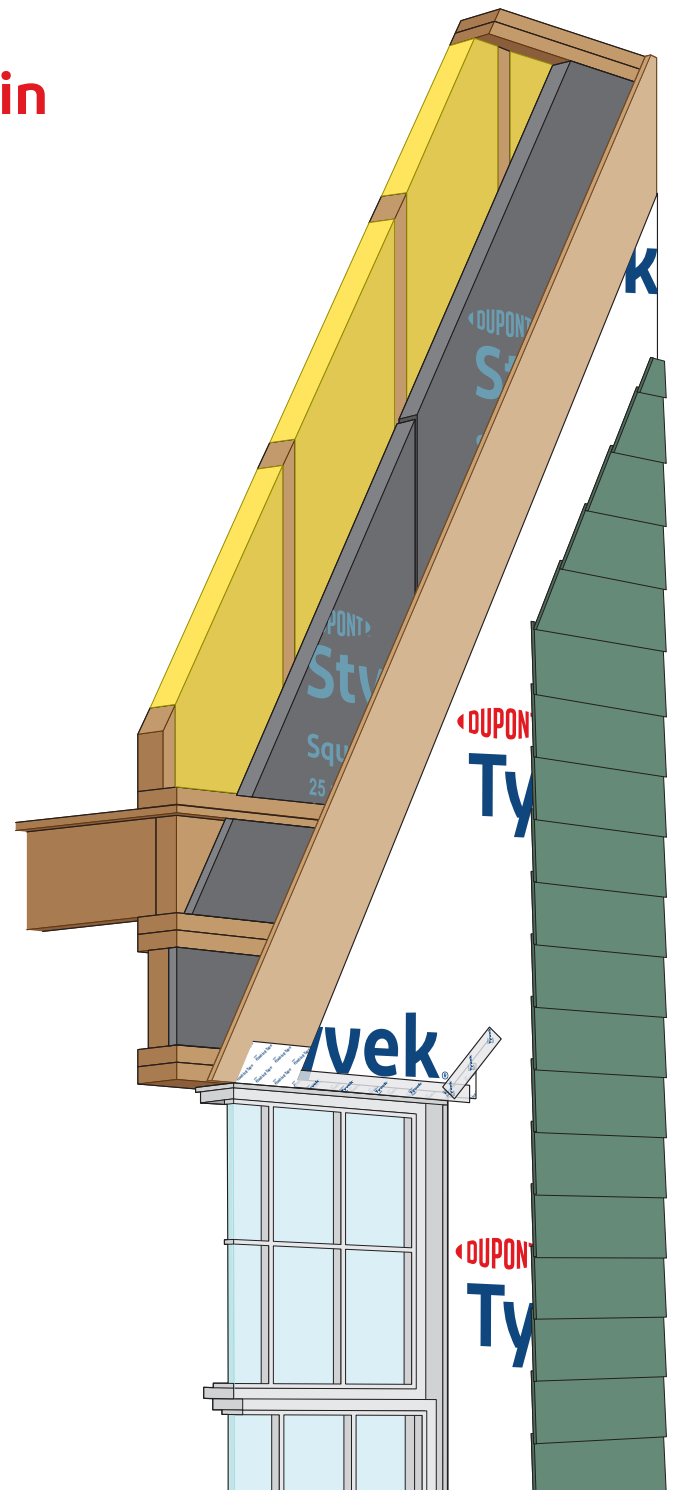
For Single-Family Residential Buildings

## Introduction

Extended Plate (EP) is an advanced wall system developed by Home Innovation Research Labs as part of the Building America Research Program. This innovative configuration has been tested in the lab and in four different demonstration buildings in climate zones 4, 5, and 6. EP is based on tried-and-true lumber construction methodologies, integrating rigid foam sheathing with standard framing practices into a system that preserves many conventional construction features and minimizes builder risk. The EP wall system is composed of familiar wall materials installed in a different configuration.

- The EP wall system uses 2"x 4" studs, with 2"x 6" top and bottom plate extensions, lowering the cost of wood framing needed to build 2"x 6" walls.
- The 2" continuous insulation (c.i.) exterior to the wall cavity, interior to the wood structure panel (WSP), allow trades to weatherize and clad homes using similar methods to how they are installed today.
- More than 95% of the wall area is free from thermal bridging improving thermal performance.
- Common methods and materials are used for framing, air-sealing, insulation, drainage plane and cladding attachment.
- The double rim board (beam) is also a header and is inset to provide space for a c.i. thermal break.

This guide contains the information you need to build a high-performing wall that meets or exceeds energy code prescriptive insulation requirements for all U.S. climate zones.



## Applicable Products

### DuPont™ Tyvek® Water-Resistive and Air Barriers (WRB)

- DuPont™ Tyvek® HomeWrap®
- DuPont™ Tyvek® StuccoWrap®
- DuPont™ Tyvek® DrainWrap™
- DuPont™ Tyvek® ThermaWrap® LE
- DuPont™ Tyvek® CommercialWrap®
- DuPont™ Tyvek® CommercialWrap® D

### DuPont Self-Adhered Flashing Products

- DuPont™ FlexWrap™ EZ
- DuPont™ FlexWrap™
- DuPont™ Flashing Tape
- DuPont™ StraightFlash™

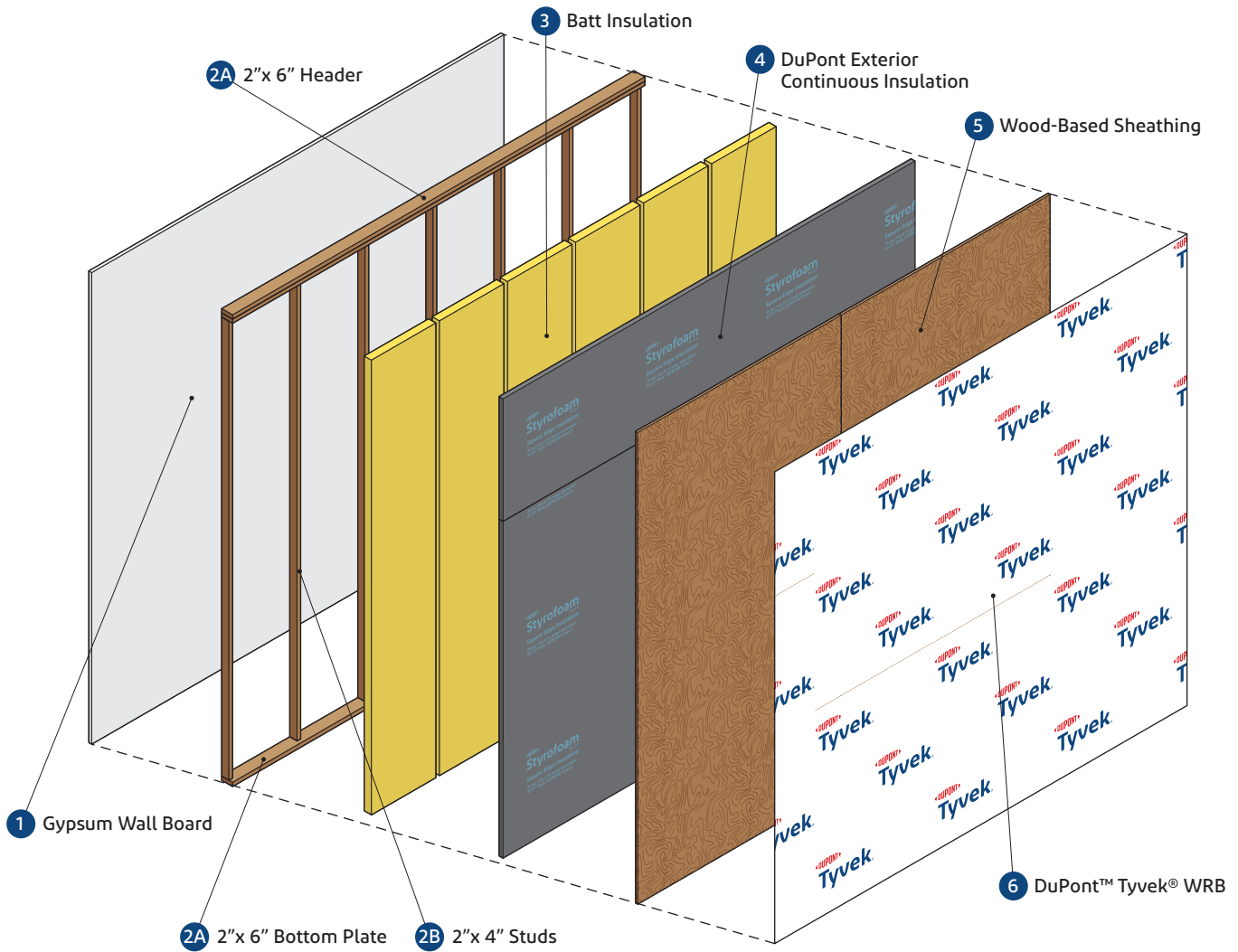
### DuPont Exterior Continuous Insulation (CI)

- DuPont™ Styrofoam™ Brand Extruded Polystyrene (XPS) Insulation
- DuPont™ Thermax™ Brand Insulation
- DuPont™ Tuff-R™ Polyisocyanurate Insulation
- DuPont™ Super Tuff-R™ Polyisocyanurate Insulation

**Table 1: EP Changes to Standard Light Frame Wall Construction.**

| Design                   | Standard 2"x 4" Frame Wall  | Extended Plate  |
|--------------------------|---|---|
| Wall plates              | Bottom and top plates all 2"x 4"  | Bottom and top plates all 2"x 6"  |
| Wall studs               | 2"x 4"  | 2"x 4"  |
| Wood structural panel    | Exterior to the studs. Horizontal breaks in the wall plane require blocking.                      | Exterior to foam sheathing. Continuous vertical sheathing is required—no horizontal breaks are allowed in the wall plane between the top and bottom plates. Use plywood or OSB of 3/8" to 15/16" thickness.   |
| Insulating sheathing     | Optional, exterior to (or in place of) the structural sheathing.                                  | Standard, exterior to the 2"x 4" studs, interior to the structural wood sheathing. Install vertically, staggering foam board joints with OSB joints.  |
| Drainage plane           | WRB over the wood structural sheathing. If FPIS is used, either exterior or interior to the FPIS. | WRB over the wood structural sheathing  |
| Sheathing attachment     | 2.5" nails Panel Edge: 6" spacing Panel Field: 12" spacing  | 3.5" nails Panel Edge: 3" spacing Panel Field: 6" spacing   |
| Rim Board, foundation    | Typical rim, per IRC  | Double rim if flush; single or double rim where inset 1" for c.i. (2" if WSP is installed continuously from top plate to sill plate, lapping the rim, and fastened to the sill plate per the schedule.)   |
| Rim board between floors | Typical rim, per IRC  | Double rim if flush; single or double rim if inset 1". A double rim may act as a beam header, eliminating headers and allowing for additional insulation. Use joist hangers above openings with rim beam header. Single rims require traditional window and door headers per IRC. |
| Roof                     | Trusses Typical, per IRC  | Typical, per IRC. Unlike with traditional c.i. installed as oversheathing, single engineered roof trusses may be used with an EP wall no modification at gable ends.  |

**Figure 1: Installation Sequences for EP Wall Systems with a DuPont™ Tyvek® WRB and DuPont Exterior Continuous Insulation**



1. Gypsum Wall Board
2. Frame wall using 2" x 6" lumber for all bottom and top plates and 2" x 4" lumber for wall studs
3. Install batt insulation in each stud bay
4. Install 2" DuPont Exterior Continuous Insulation
5. Install structural wall sheathing
6. Install Tyvek® WRB per current DuPont™ Tyvek® Water-Resistive and Air Barriers Installation Guidelines

**NOTE:** An interior vapor retarder (not shown) may be required in some regions.

# Installation Sequences and Window Flashing Considerations for Wall Systems with a DuPont™ Tyvek® WRB and DuPont Exterior Continuous Insulation

To ensure optimum water management, the DuPont™ Tyvek® 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 in which the existing windows will be replaced, the Tyvek® WRB can be installed under or over the DuPont Exterior Continuous Insulation based on whether the windows will be aligned with the exterior finished wall or recessed from it.

Depending on the window's position relative to the CI, jamb extensions may be needed during window finishing. 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.

The following installation sequences and diagrams are based on installation of integral flanged windows; however, the general concepts can be applied to integral flanged doors, brick mold windows and doors, and non-flanged windows and doors. Refer to the applicable [DuPont Self-Adhered Flashing Products Installation Guidelines](#) available at [building.dupont.com](http://building.dupont.com) for more information.

## Windows Aligned with Exterior Finished Wall

- Prepare window and door openings before installing the CI and the Tyvek® WRB by first installing wood bucks the thickness of the CI to create a solid nailing surface around window and door openings.\*

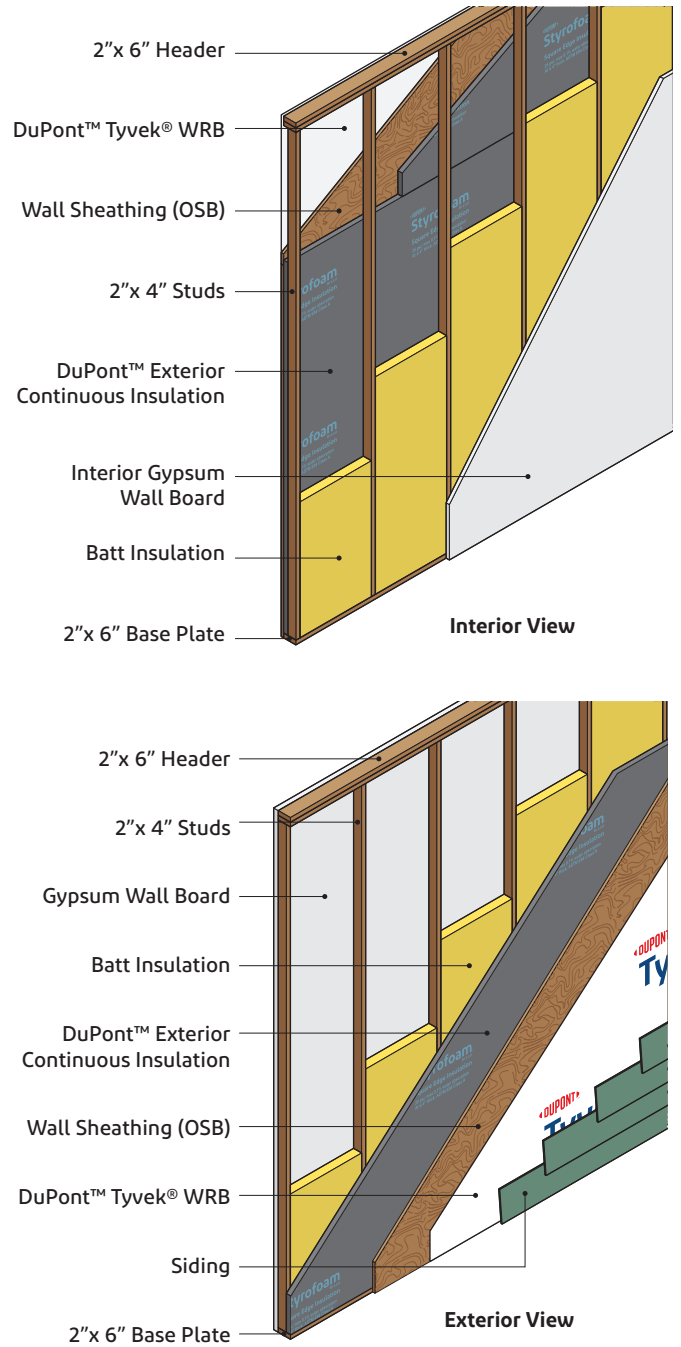
Refer to the Installation Bulletin: [Integrating DuPont Building Envelope Solutions Products with DuPont Exterior Continuous Insulation](#) for different window flashing examples.

## Interfaces Between Sheathing Materials

DuPont Exterior Continuous Insulation Products are 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 sheathing materials may be used on a single dwelling. Continuity is maintained by integrating the Tyvek® WRB over the continuous insulation product, as shown in Figure 2.

**Figure 2: Interior and Exterior Views of an EP Wall System**



### EP Fastening Requirements

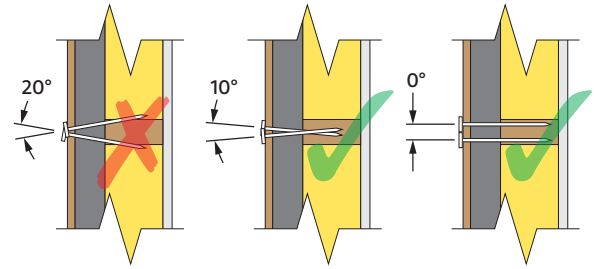
When installing DuPont Exterior Continuous Insulation Products, secure insulation boards to framing with printed side facing to the exterior. Insulation boards may be installed horizontally or vertically. Abut boards tightly together, ensuring vertical board joints align with studs. Common practice is to stagger boards, but it is not required.

Insulation boards can be installed using 3/8" head galvanized nails, 1" crown galvanized staples, or 1" head plastic cap nails or equivalent fasteners long enough to penetrate framing a minimum of 3/4".

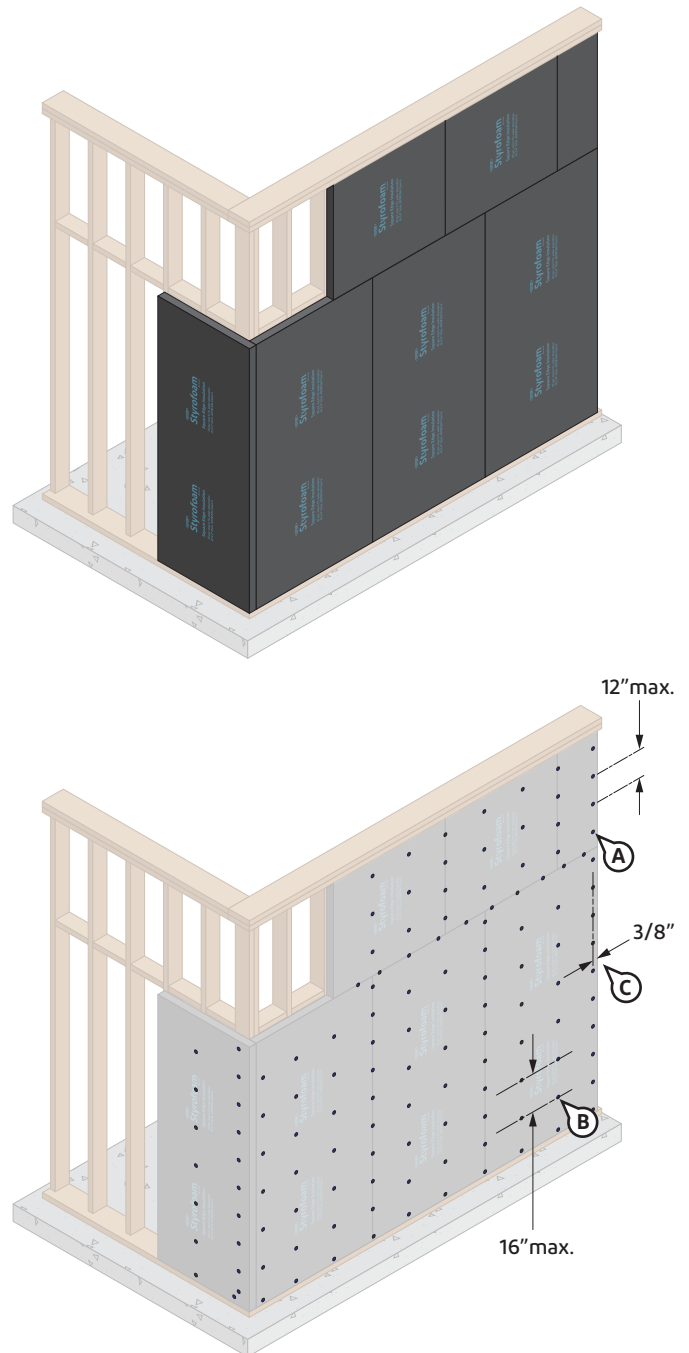
Refer to Figure 4. Fasten insulation boards maximum 12" on center at wall perimeters (A), and fasten insulation boards maximum 16" on center into framing around openings and along stud lines in field of the wall (B). Set back perimeter fasteners 3/8" from board edges and ends (C).

For fasteners with caps/washers 1" in diameter or greater, one fastener can be used at the intersection of 2 boards, but use at least 2 fasteners at the intersection of 3 or more boards. For multifamily buildings, a larger cap may be necessary when using one fastener at the intersection of 2 boards.

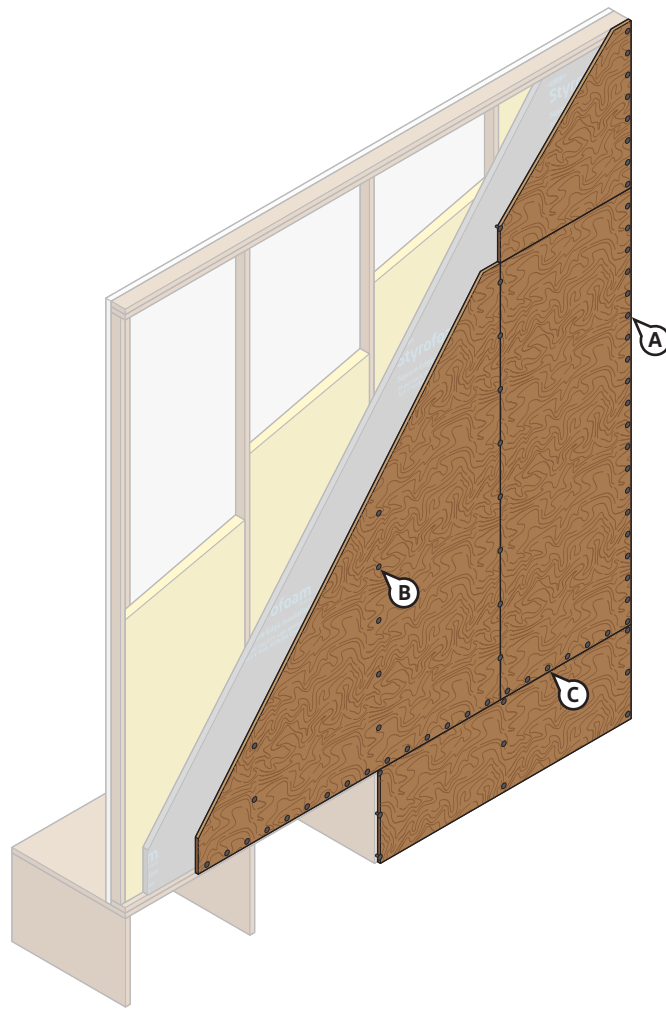
### Figure 3: Nailing Angle for Wood Structure Panel (WSP) Attachment



### Figure 4: DuPont Exterior Continuous Insulation Products Fastening Schedule



**Figure 5: Sheathing Fastener Placement**



**Table 3: Sheathing Fastening Requirements**

| Connection  | Fasteners                                     | Schedule       |
|---|---|----------------|
| <b>A</b> EP Perimeter of Sheathing  | 3.5" x 0.131" (framing nail gun for EP)       | 3" o.c.        |
| <b>B</b> EP Field of Sheathing  | 3.5" x 0.131" (framing nail gun for EP)       | 6" o.c.        |
| <b>C</b> Top Plate to Top Plate (face nail)   | 10d box (nail gun: 3.5" x 0.131")             | 12" o.c.       |
| Top/Bottom Plate to Stud (end nail)   | 16d box or 10d box (nail gun: 3.5" x 0.131")  | Three per stud |
| Stud-to-Stud Braced Wall Panels (face nail)   | 16d box (nail gun: 3.5" x 0.131")             | 12" o.c.       |
| Corner studs in direct contact with each other  | 16d box (nail gun: 3.5" x 0.131")             | 12" o.c.       |
| Corners: WSP from both intersecting walls nailed directly to a common 2x framing member | 2.5" x 0.131" nails (nail gun: 3.5" x 0.131") | 6" o.c.        |
| Corner studs separated by up to 2" of rigid foam sheathing insulation, two options:     | 5" x 0.135" nails                             | 6" o.c.        |
|   | 6" x 0.190" structural insulated panel screws | 12" o.c.       |

\* Notes: Staples are NOT an acceptable substitute for nails in the EP wall system. Table identifies potential opportunities ( ) to substitute with the 3.5" nail required for EP sheathing attachment, for economy of me.

Table adapted from IRC 2021 Table R602.3(1). This table does not supersede local code requirements for general framing and fastening.

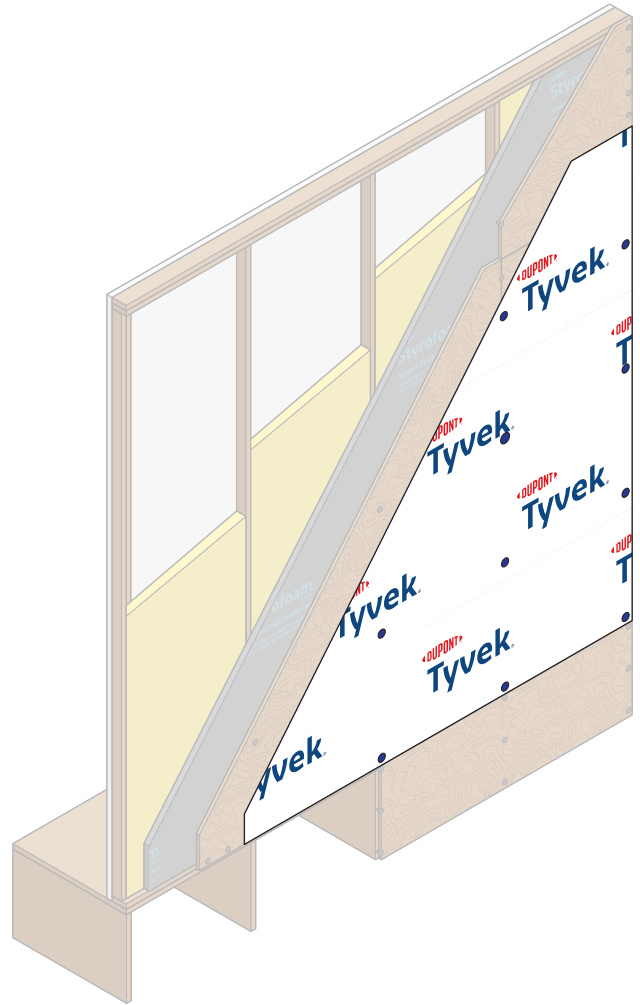
## Recommended Fasteners for DuPont™ Tyvek® WRBs

For increased holding power and for higher air and water holdout performance, DuPont recommends fasteners of sufficient length to penetrate securely into the stud. Secure Tyvek® WRB to the stud or other nail-base material, i.e., wood sheathing. Cap nail and/or cap staple fasteners should be placed no closer than 6" and no farther than 18" on vertical stud lines. Securing along stud lines will assist in maintaining fastening pattern. Penetrating band board or other horizontal members may be necessary to maintain fastening pattern. Do not install fasteners within 6" of the sills and jambs and within 9" of the head of the window rough openings. Use one or more of the recommended fasteners below for use with Tyvek® WRBs:

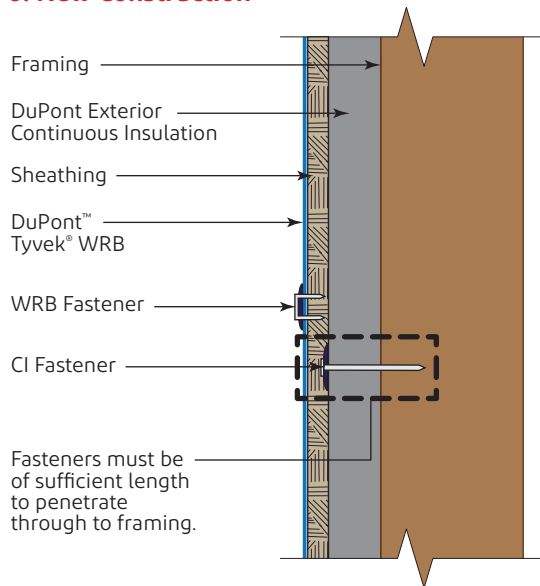
- DuPont™ Tyvek® Wrap Cap Staples or other cap staples for Stinger® Cap Stapler
- DuPont™ Tyvek® Wrap Cap Nails
- 2" DuPont™ Tyvek® Wrap Cap Screws
- TRUFAST® Walls Grip-Deck® screws with Thermal-Grip FastCap™ washers installed at 16" vertical spacing along stud lines for 16" o.c. framing (approved for use with Tyvek® WRBs). Install fasteners with standard hand drill or Grip-Lok® Autofeed Fastening System<sup>1</sup> with modified nose adaptor.

### Wood frame construction:

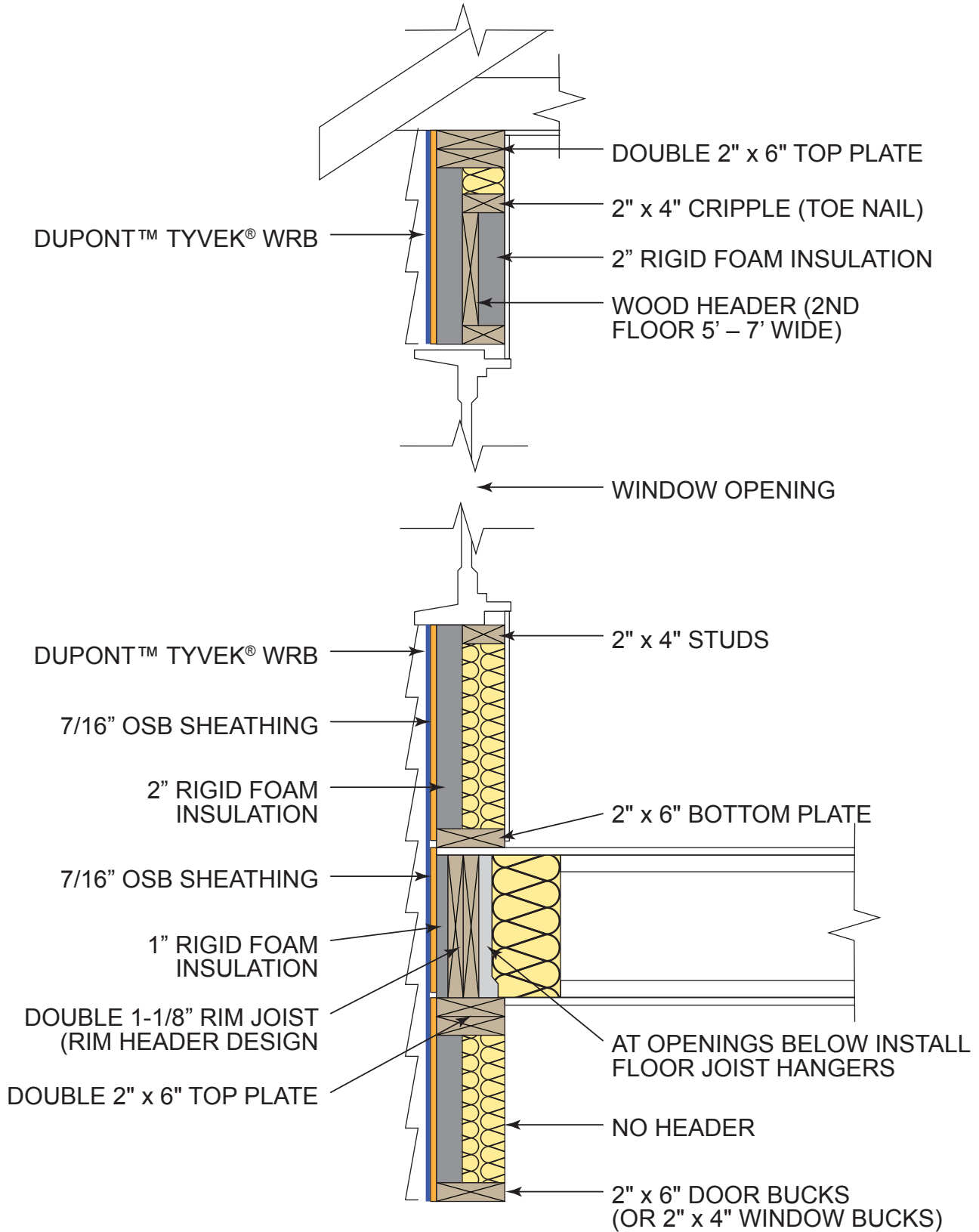
- 1-5/8" – 6" TRUFAST® Walls Grip-Deck® HiLo Thread Screws with 2" Thermal-Grip FastCap™ washer
- 1-5/8", 2", 2-1/2", and 3" screws can be installed with standard hand drill or Grip-Lok® Autofeed Fastening System with modified nose adaptor
- 3-1/2" to 6" screws should be installed with standard hand drill.
- Other manufacturers' equivalent fasteners.



**Figure 6: New Construction**

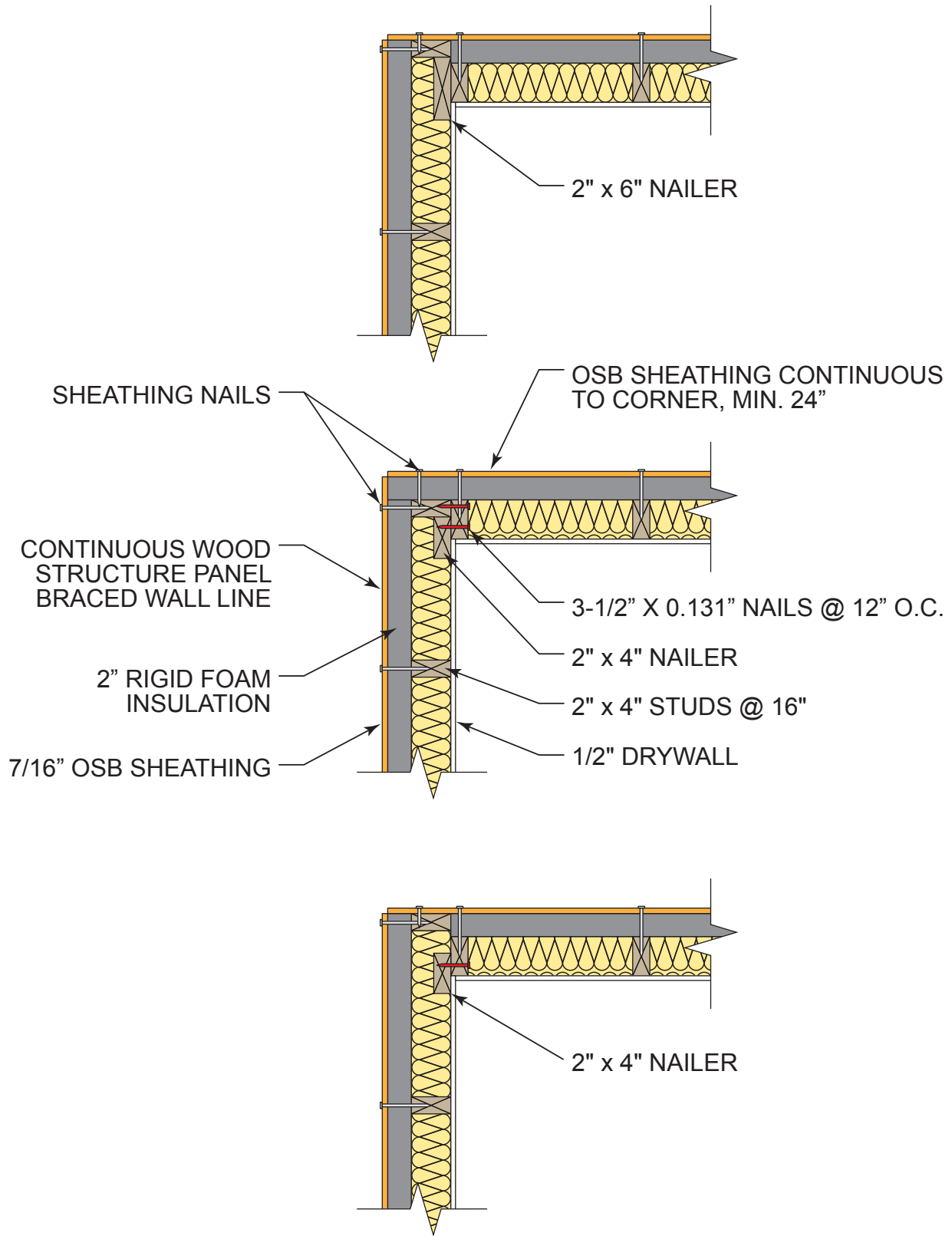


<sup>1</sup> For more information about the Grip-Lok® Autofeed Fastening System, refer to manufacturer's instructions and contact your local DuPont™ Tyvek® Specialist.

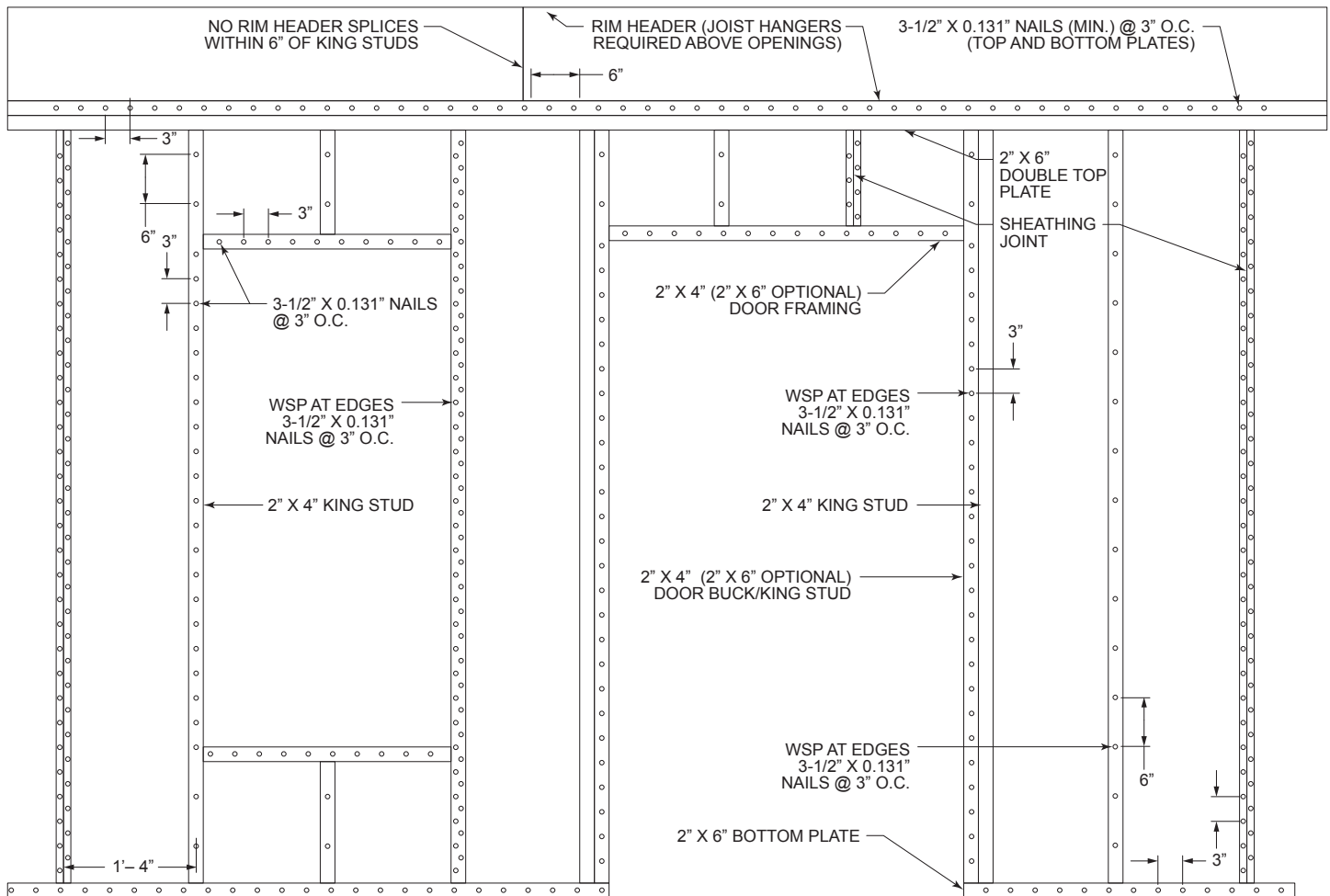




Corner Section Views



## Framing



**EP Wall Elevation – Joists attached to the double rim beam above wall openings require joist hangers. Use 3" nail spacing for all edges of wood sheathing panels, including at openings. No rim header splices are allowed within 6" of king studs.**

## Façade Considerations

Water-resistive barrier performance is dependent upon the ability of the facade to drain. The following must be considered for specific facades.

### Stucco

When stucco is installed over wood-based sheathing, the 2018 International Building Code (Section 2510.6) requires a water-resistive vapor-permeable barrier with a performance at least equivalent to two layers of water resistive barrier complying with ASTM E2556, Type I, or a water resistive barrier which is separated from the stucco by an intervening, substantially non-water-absorbing layer or drainage space. When stucco is installed over wood-based sheathing, the 2018 International Residential Code (Section R703.7.3) requires a water-resistive vapor-permeable barrier with a performance at least equivalent to two layers of Grade D paper or a water-resistive barrier which is separated from the stucco by an intervening, substantially non-water-absorbing layer or designed drainage space. The individual layers shall be installed independently such that each layer provides a separate continuous plane and any flashing intended to drain to the water-resistive barrier is directed between the layers. DuPont™ Tyvek® WRBs used behind stucco should be separated from the stucco by a second layer of Tyvek®

WRB, a layer of Grade D building paper, felt, rigid foam board or the paper backing of paper-backed lath. DuPont™ Tyvek® DrainVent™ Rainscreen can also be used as the intervening layer over the WRB. 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 shall be installed over the intervening layer in accordance with ASTM C1063-03 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® WRB as an intervening layer, will provide enhanced structural support to the Tyvek® WRB and may reduce the required number of fasteners used for the attachment of the Tyvek® WRB if installed as soon as practically possible. DuPont™ Tyvek® StuccoWrap®, Tyvek® DrainWrap™ or Tyvek® CommercialWrap® D is recommended for this application, since these products provide >98% drainage efficiency when tested in accordance with ASTM E2273. Tyvek® HomeWrap® and Tyvek® CommercialWrap® provide >90% drainage efficiency when tested in accordance with ASTM E2273. DuPont Self-Adhered Flashing Products or recommended alternate may be required for high performance installations.

### **Brick (or Other Stacked/Anchored Masonry Veneers)**

The 2018 International Residential Code (Section R703.8.4) requires a nominal 1" air space separating the brick from the water-resistive barrier (WRB). The Brick Industry Association recommends a 1" air space in front of wood stud construction and a 2" air space in front of steel stud construction. Consistent with these requirements and recommendations, Tyvek® WRBs shall be separated from the brick veneer by a nominal 1" air space. Window and door flashing, and through wall flashing shall be integrated with the Tyvek® WRB layer ensuring proper shingling. For maximum moisture management and drying of the wall system the air space in front of the Tyvek® WRB shall be vented to the exterior at the top and bottom of the wall. Some types of brick ties will act as additional fasteners for Tyvek® WRBs, and, if installed as soon as practically possible after the Tyvek® WRB, may reduce the required number of fasteners used for the initial attachment of the Tyvek® WRB.

### **Stone Veneer (or Other Adhered Masonry Veneers)**

The 2018 International Building Code (Section 1404.7) requires two layers of air and water barrier behind stone veneers over wood frame construction. When used behind stone veneer, Tyvek® WRBs shall be installed in a similar manner as they are installed behind stucco. The Tyvek® WRB should be separated from the stone and mortar by a second layer of Tyvek® WRB, a layer of grade D building paper, felt, exterior continuous foam insulation or the paper backing of paper-backed lath. Tyvek® DrainVent™ Rainscreen can also be used as the intervening layer over the WRB. The first layer (directly over sheathing or studs) serves as the wall system's air and water barrier and shall be integrated with window and door flashings, the weep screed at the bottom of the wall and any through wall flashing or expansion joints. Lath shall be installed over the intervening layer (second layer) in accordance with ASTM C1063-03 Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster and applicable codes. When exterior continuous foam insulation is used as the second layer, it is installed over the Tyvek® WRB. Tyvek® StuccoWrap®, Tyvek® DrainWrap™ or Tyvek® CommercialWrap® D is recommended for this application, since these products provide >98% drainage efficiency when tested in accordance with ASTM E2273. Tyvek® HomeWrap® and Tyvek® CommercialWrap® provide >90% drainage efficiency when tested in accordance with ASTM E2273. DuPont Self-Adhered Flashing Products or recommended alternate patch is required for high performance installations

### **Wood Siding**

The Tyvek® WRB and wood siding shall be installed according to 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. When installed over exterior continuous insulation, 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 inches 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 pre-finishing is essential.
- Use light color finish coats to maximize heat reflection and reduce dimensional movement.
- Tyvek® StuccoWrap®, Tyvek® DrainWrap™ or Tyvek® CommercialWrap® D applied over the foam sheathing is recommended for this application.

In high exposure installations, enhanced drainage and water management may be provided by using Tyvek® StuccoWrap®, Tyvek® DrainWrap™ or Tyvek® CommercialWrap® D, by installing Tyvek® DrainVent™ Rainscreen or other drainage mesh over the water-resistive barrier, or by creating rainscreen cladding with a larger air space behind the siding using furring strips. If furring is installed over the Tyvek® WRB to create a rainscreen, the primary fastener spacing can exceed 18". DuPont™ Tyvek® HomeWrap® and Tyvek® CommercialWrap® provide >90% drainage efficiency, and Tyvek® DrainWrap™, Tyvek® StuccoWrap®, and Tyvek® CommercialWrap® D provide >98% drainage efficiency when tested in accordance with ASTM E2273.

### **Fiber Cement Siding**

DuPont™ Tyvek® WRBs and fiber cement siding shall be installed according to manufacturer's instructions and industry standards. In high exposure installations, enhanced drainage and water management may be provided by using DuPont™ Tyvek® StuccoWrap®, Tyvek® DrainWrap™ or Tyvek® CommercialWrap® D, by installing DuPont™ Tyvek® DrainVent™ Rainscreen or other drainage mesh over the water-resistive barrier, or by creating rainscreen cladding with a larger air space behind the siding using furring strips. If furring is installed over the Tyvek® WRB to create a rainscreen, the primary fastener spacing can exceed 18". In high wind areas at gable end walls, FEMA recommends fiber cement siding be installed over wood sheathing rather than over plastic foam sheathing. Tyvek® WRBs and fiber cement siding shall be installed according to manufacturer's instructions, industry standards and applicable codes. Tyvek® HomeWrap® and Tyvek® CommercialWrap® provide >90% drainage efficiency, and Tyvek® DrainWrap™, Tyvek® StuccoWrap®, and Tyvek® CommercialWrap® D provide >98% drainage efficiency when tested in accordance with ASTM E2273

## Vinyl Siding

Vinyl Siding is installed directly over Tyvek® WRBs. Vinyl siding shall be installed in accordance with manufacturer's instructions, industry standards and applicable codes, including ASTM D4756-15 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.

## EIFS

Tyvek® WRBs and EIFS cladding shall be installed according to manufacturer's instructions and industry standards. In order to promote drainage, it is recommended that Tyvek® StuccoWrap®, Tyvek® DrainWrap™ or Tyvek® CommercialWrap® D be installed behind the exterior insulation. Window and door flashing, and through wall flashing shall be integrated with the Tyvek® WRB layer ensuring proper shingling. The successful installation and performance of EIFS cladding is dependent upon the proper design and construction of the adjacent materials and systems of the structure. Tyvek® HomeWrap® and Tyvek® CommercialWrap® provide >90% drainage efficiency, and Tyvek® DrainWrap™, Tyvek® StuccoWrap®, and Tyvek® CommercialWrap® D provide >98% drainage efficiency when tested in accordance with ASTM E2273

## Metal Panel

Tyvek® WRBs and metal panel cladding systems shall be installed according to manufacturer's instructions and industry standards. DuPont™ StraightFlash™, DuPont™ Flashing Tape, or recommended alternate patch can be installed behind all metal installation brackets and hat-channels fasteners for additional air and water infiltration resistance. NOTE: The maximum in-service temperature for Tyvek® WRBs, DuPont Self-Adhered Flashing Products, and DuPont™ Tyvek® Fluid Applied Products is 180°F.

For more information visit  
[building.dupont.com](https://building.dupont.com)  
or call 1-833-338-7668



This bulletin is limited to the installation details outlined herein. Please refer to the applicable DuPont Performance Building Solutions Installation Guidelines available at [building.dupont.com](https://building.dupont.com) for details not included in this bulletin.

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