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DIVISION: 07 00 00 – THERMAL AND MOISTURE PROTECTION
Section: 07 21 00 – Thermal Insulation

REPORT HOLDER:
DuPont de Nemours, Inc.
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REPORT SUBJECT:
Thermax™ Polyisocyanurate Insulation Boards:
Thermax™ SHEATHING;
Thermax™ LIGHT DUTY;
Thermax™ HEAVY DUTY;
Thermax™ METAL BUILDING;
Thermax™ WHITE FINISH;
Thermax™ ci EXTERIOR INSULATION; and
Thermax XARMOR™ (ci) EXTERIOR INSULATION

1.0 SCOPE OF EVALUATION

1.1 This Research Report addresses compliance with the following Codes:

- 2021, 2018, 2015, 2012, 2009 *International Building Code*® (IBC)
- 2021, 2018, 2015, 2012, 2009 *International Residential Code*® (IRC)
- 2021, 2018, 2015, 2012, 2009 *International Energy Conservation Code*® (IECC)
- 2021, 2018, 2015, 2012 *International Green Construction Code* (IGCC)
- 2022 California Building Code
- 2022 *California Green Building Standards Code*
- 2014, 2011 ANSI/ASHRAE/USGBC/IES Standard 189.1
- 2020 ICC 700 National Green Building Standard
- 2013 Abu Dhabi International Building Code (ADIBC)

NOTE: This report references the most recent Code editions cited. Section numbers in earlier editions may differ.

1.2 The Thermax insulation boards have been evaluated for the following properties (see also Table 1):

- Physical properties
- Surface-burning characteristics
- Thermal resistance
- Water-vapor transmission
- Air permeability

1.3 The Thermax insulation boards have been evaluated for the following uses (see also Table 1):

- Non-structural thermal insulation in wall, ceiling, or floor assemblies
- Alternatives to thermal barriers
- Alternatives to ignition barriers in attics and crawl spaces
- Air-impermeable insulation
- Alternative to water-resistive barriers
- Use in Types I, II, III, IV, and V construction

2.0 STATEMENT OF COMPLIANCE

Thermax Insulation Boards comply with the Codes listed in Section 1.1, for the properties stated in Section 1.2, and uses stated in Section 1.3, when installed as described in this report, including the Conditions of Use stated in Section 6.0.

3.0 DESCRIPTION

3.1 Thermax Insulation Boards: Thermax insulation boards [Sheathing, Light Duty, Heavy Duty, Metal Building, White Finish, ci Exterior and XARMOR™ (ci)] have a polyisocyanurate foam plastic core, a glass-fiber mat reinforcement, and aluminum facers adhered on both sides. The boards are available in thicknesses between 0.5 and 4 inches and in various widths and lengths.

4.0 PERFORMANCE CHARACTERISTICS

4.1 Physical Properties: The insulation boards comply with ASTM C1289, Type I, Class 2.

4.2 Surface Burning Characteristics: The insulation boards have a flame spread index of 25 or less and a smoke-developed index of 450 or less when tested (core, slit, and



faced) at a maximum thickness of 4 inches in accordance with UL 723 (ASTM E84).

4.3 Thermal Resistance: The insulation boards have a thermal resistance (*R*-value) shown in Tables 2A and 2B.

4.4 Water-vapor Permeance: The insulation boards, at a minimum thickness of 1/2 inch, have a water-vapor permeance less than 0.1 perm when tested in accordance with ASTM E96 (desiccant method) (Procedure A) and qualify as a Class I vapor retarder.

4.5 Air Permeability: The insulation boards, at a minimum thickness of 1/2 inch, have an air permeance less than 0.02 L/s-m² and are considered air-impermeable based on testing in accordance with ASTM E283 and E2178.

5.0 INSTALLATION

5.1 General: Thermax Insulation Boards must be installed in accordance with the manufacturer's published installation instructions, the applicable Code, and this Research Report. A copy of the manufacturer's instructions must be available on the jobsite during installation.

Thermax™ insulation boards, at a maximum thickness of 4 inches, may be used as non-structural insulating material without a thermal barrier on any wall and/or floor/ceiling assemblies in any type of structure. For exterior wall applications, the insulation boards must be attached with fasteners spaced a maximum of 16 inches on center in the field and 12 inches on center on the perimeter. For cementitious exterior wall coating applications, fasteners for insulation boards thicker than 1-1/2 inches must be considered for lateral resistance to ensure support for the exterior wall coatings. For interior applications, the insulation boards must be attached with fasteners spaced a maximum of 24 inches on center along the width of the board and a maximum of 48 inches on center along the length of the board.

5.2 Air Barrier Material: When used as an air barrier material in accordance with IECC Section C402.5.1.3, the insulation boards must be installed in accordance with the manufacturer's installation instructions and other applicable requirements of this report.

5.3 Air Barrier Assembly: When used as an air barrier assembly in accordance with IECC Section C402.5.1.4, the insulation boards must be installed in accordance with this

section, and other applicable requirements of this report. See Figures 5 through 10.

The insulation boards are installed horizontally or vertically with joints butted tightly. Boards must be installed against framing, sheathing, concrete, or CMU. Fasteners must have minimum 2-inch-diameter plastic caps or washers, and fasteners must penetrate framing a minimum of 0.45 inch for steel framing and 0.75 inch for wood framing. Insulation must be a minimum of 1-inch-thick and joints and penetrations must be sealed using one of the following:

- LiquidArmor™ CM applied at a thickness of 45 wet mils thick in a minimum 2-inch-wide band centered on the joint
- LiquidArmor™ LT applied at a thickness of 25 wet mils in a minimum 1-inch-wide band centered on the joint
- LiquidArmor™ QS applied at a thickness of 45 wet mils in a minimum 2-inch-wide band centered on the joint
- For all joints and penetrations:
 - Great Stuff Gaps & Cracks: Gaps greater than 1/4 inch must be filled using Great Stuff™ Pro Gaps & Cracks, prior to flashing the insulation; other sealants acceptable to Dupont may be used.

5.4 Water-resistive Barrier: Thermax insulation boards may be used as an alternative to the water-resistive barrier requirements in IBC Section 1403.2 and IRC Section R703.2, when installed as described in this section.

Insulation boards are installed horizontally or vertically with edges in substantial contact and backed by framing. Fasteners must have minimum 2-inch-diameter plastic caps or washers, and fasteners must penetrate framing a minimum of 0.45 inch for steel framing and 0.75 inch for wood framing. Joints must be covered with one of the following:

- Minimum 2-7/8-inch-wide DuPont™ Styrofoam™ Brand Tape
- LiquidArmor™ CM applied at a thickness of 45 wet mils in a minimum 2-inch-wide band centered on the joint
- LiquidArmor™ LT applied at a thickness of 25 wet mils in a minimum 1-inch-wide band centered on the joint
- LiquidArmor™ QS applied at a thickness of 45 wet mils in a minimum 2-inch-wide band centered on the joint
- For all joints:
 - Great Stuff Gaps & Cracks: Gaps greater than 1/4 inch must be filled using Great Stuff™ Pro Gaps and Cracks prior to flashing the insulation; other sealants



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acceptable to Dupont may be used.

Flashing of penetrating items must be sealed with Great Stuff Gaps & Cracks sealant and covered with one of the following:

- LiquidArmor™ CM Flashing
- LiquidArmor™ QS Flashing
- LiquidArmor™ LT Flashing
- An elastomeric sealant

See Figures 5 through 10.

5.5 Thermal Barrier: Thermax insulation boards may be installed without the thermal barrier required by IBC Section 2603.4 and IRC Section R316.4.

5.6 Attics and Crawl Spaces: Thermax insulation boards may be installed in attics and crawl spaces without the prescriptive ignition barrier required by IBC Section 2603.4.1.6 or IRC Sections R316.5.3 or R316.5.4, when all of the following conditions are met:

- Attic ventilation is provided when required by IBC Section 1202.2 or IRC Section R806, as applicable.
- Under-floor (crawl space) ventilation is provided that complies with IBC Section 1202.4 or IRC Section R408.1, as applicable.
- Combustion air is provided in accordance with IMC (*International Mechanical Code*®) Section 701.

5.7 Exterior Walls Required to be of Types I, II, III, or IV Construction: Thermax insulation boards may be used in exterior walls of one-story buildings complying with IBC Section 2603.4.1.4 and in buildings of any height when installed as described in Table 3. Thermax insulation boards have a potential heat of 1865 Btu/ft² per inch of thickness.

Assemblies described in Table 3 are based on data submitted to Intertek. Other constructions may be considered when justified to the satisfaction of the building official.

5.8 Use as Foam Sheathing: The Thermax insulation boards are certified by DrJ for compliance with ANSI/FS 100, as referenced in IBC Section 2603.10. See Technical Report TER-1506-03.

6.0 CONDITIONS OF USE

6.1 Installation must comply with this Research Report, the manufacturer's published installation instructions, and the applicable Code. In the event of a conflict, this report governs.

6.2 Exterior walls must be protected by a water-resistive barrier complying with IBC Section 1403.2 or IRC Section R703.2, except when installed in accordance with Section 5.4, and by wall coverings that provide the necessary structural wind and seismic resistance between the wall framing members.

6.3 The insulation boards must not be used as a nailing base for siding materials. All fasteners must penetrate through the insulation into the wall framing or structural sheathing as required by the wall covering manufacturer's instructions or by the applicable Code.

6.4 Labeling and installation of the insulation boards must comply with IRC Section N1101.10 and IECC Sections R303.1 and C303.1, as applicable.

6.5 Use of the insulation boards in areas where the probability of termite infestation is "very heavy" must be in accordance with IRC Section R318.4 or IBC Section 2603.8, as applicable.

6.6 Thermax Insulation Boards are manufactured under a quality control program with inspections by Intertek Testing Services NA, Inc.

7.0 SUPPORTING EVIDENCE

7.1 Data in accordance with ICC-ES Acceptance Criteria for Foam Plastic Insulation (AC12), dated June 2015 (editorially revised October 2017).

7.2 Data in accordance with the ICC-ES Acceptance Criteria for Foam Plastic Sheathing Panels Used as Water-resistive Barriers (AC71), dated February 2003 (editorially revised January 2018).

7.3 Reports of tests in accordance with ASTM E96, ASTM E283, ASTM E2178, ASTM E2357, NFPA 259, NFPA 285, NFPA 286, UL 723 (ASTM E84) and UL 1715.

7.4 Engineering analyses extending results of NFPA 285 testing.





7.5 Intertek Listing Report "DuPont de Nemours, Inc., Thermax Polyisocyanurate Insulation Boards", on the [Intertek Directory of Building Products](#).

8.0 IDENTIFICATION

Thermax Insulation Boards are identified by a label on the packaging with the manufacturer's name (DuPont de Nemours, Inc.), the product name, the plant code or address, the Intertek Mark as shown below, and the Code Compliance Research Report number (CCRR-0435).



9.0 OTHER CODES AND STANDARDS

9.1 2022 California Building Code: When installed in accordance with this report, the Thermax insulation boards comply with the 2022 *California Building Code*, *California Residential Code* and *California Energy Code*, excluding CBC Chapter 7A and CRC Section R337.

9.2 2022 California Green Building Standard Code, Title 24 Part 11: When installed as described in Section 5.4 of this report for use as a water-resistive barrier, the Thermax insulation boards conform with the provisions of CALGreen Section 5.407.1 for water-resistive barriers.

9.3 2021 International Green Construction Code: When installed as described in Section 5.2 or 5.3 of this report for use as an air barrier, the Thermax insulation boards conform with the provisions of IgCC Section 605.1.2.1 for air barriers.

9.4 2020 ICC 700 National Green Building Standard: When

installed as described in Section 5.4 of this report for use as a water-resistive barrier, the Thermax insulation boards conform with the provisions of ICC 700 Sections 602.1.8, 11.602.1, and 11.602.1.8 for water barriers.

9.5 2014 ANSI/ASHRAE/USGBC/IEC Standard 189.1: When installed as described in Section 5.2 or 5.3 of this report for use as an air barrier, the Thermax insulation boards conform with the provisions of Standard 189.1, Section 7.3.1.1 for air barriers.

9.6 2013 Abu Dhabi International Building Code: When installed in accordance with Sections 3 through 8 of this report, the Thermax insulation boards comply with the 2013 Abu Dhabi International Building Code.

10.0 CODE COMPLIANCE RESEARCH REPORT USE

10.1 Approval of building products and/or materials can only be granted by a building official having legal authority in the specific jurisdiction where approval is sought.

10.2 Code Compliance Research Reports shall not be used in any manner that implies an endorsement of the product by Intertek.

10.3 Reference to the <https://bpdirectory.intertek.com> is recommended to ascertain the current version and status of this report.

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TABLE 1 – PROPERTIES EVALUATED

PROPERTY	2021 IBC	2021 IRC	2021 IECC
Physical properties	Table 1508.2	R906.2	N/A
Surface burning characteristics	2603.3	R316.3	N/A
Thermal resistance	1301	N1101.10.4 N1102	C303.1 R303.1
Water-resistive barrier	1403.2	R703.2	N/A
Air barrier	1301	R202 N1101.10.5	R303.1.5 C402.5.1.3 C402.5.1.4
Type I – IV construction	2603.5	N/A	N/A
Thermal barrier / ignition barrier	2603.4	R316.4	N/A

TABLE 2A – THERMAL RESISTANCE

NOMINAL THICKNESS (inches)	R-VALUE (°F.ft ² .h/Btu) at 75°F Mean Temperature
0.5	3.7
1.0	6.8
2.0	13
3.0	19
4.0	25

TABLE 2B – THERMAL RESISTANCE

NOMINAL THICKNESS (inches)	R-VALUE (°F.ft ² .h/Btu) at 40°F Mean Temperature	R-VALUE (°F.ft ² .h/Btu) at 110°F Mean Temperature
1.0	7.2	6.1
2.0	14	NA



TABLE 3 – NFPA 285 COMPLYING WALL ASSEMBLIES

Base wall system – Use either 1, 2, 3 or 4	<ol style="list-style-type: none"> 1. Concrete wall 2. Concrete masonry unit (CMU) wall 3. Standard clay brick wall 4. Steel studs: minimum 3½-inch depth, minimum 20-gauge at a maximum of 24-inch oc with lateral bracing every 4 ft. vertically with: <ol style="list-style-type: none"> a) One layer of ½ or ⅝-inch thick Type X gypsum wallboard on interior face of studs. Gypsum wallboard joints shall receive at a minimum a Level 2 finish with all fasteners covered with joint compound, or b) GCP Applied Technologies Monokote Z-3306 installed at a minimum ⅜-inch thickness over Thermax™, or Cavity Insulation Item 2; or c) International Cellulose Corporation Ure-K Thermal Barrier System installed at a minimum of 1¼-inch thickness over Thermax™
Floor line firestopping	4 lb./cu. ft. mineral wool (e.g., Thermafiber) in each stud cavity and at each floor line – friction fit in cavity, attached with Z-clips, or equivalent. See Figure 11.
Cavity Insulation – Use either 1, 2, or 3 or combination of 2 and 3	<ol style="list-style-type: none"> 1. None 2. Maximum 2-inch thickness of BASF SPRAYTITE® 81206 SPF (CCRR-1031) or BASF Walltite LWP (CCRR-0374) applied using sheathing or insulation as substrate and covering the width of the cavity and inside the stud flange. Must cover the SPRAYTITE® 81206 or Walltite LWP above any window, louver or door opening with minimum 2-inch thickness of mineral wool insulation (1-1/2-inch mineral wool cover in 3-1/2-inch-deep studs). The mineral wool insulation must be installed from top of opening to bottom of floor deck above. Additionally, a special construction of the header must be used (see Figures 1, 2, 3 and 4). 3. Fiberglass blown-in or batt insulation (faced or unfaced) or mineral wool blown-in or batt insulation (faced or unfaced)
Exterior sheathing – Use either 1, 2 or 3	<ol style="list-style-type: none"> 1. None 2. ½-inch thick, exterior gypsum sheathing 3. ⅝-inch thick, Type X exterior gypsum sheathing <p>Note: Exterior sheathing is not required for Base wall systems 1, 2 or 3 above</p>
Exterior insulation	Thermax™ Brand Rigid Insulation – Total thickness to be a minimum of 5/8-inch and a maximum of 4 inches for exterior veneers 1, 2, 3, 4 and 5 and a maximum of 3 inches for exterior veneer 6.
WRB materials applied to exterior sheathing 2 or 3 – Use either 1 or 2	<ol style="list-style-type: none"> 1. None 2. Any water-resistive barrier complying with IBC Section 1403.2 or IRC Section 703.2 and shown to have both of the following: <ul style="list-style-type: none"> • a peak heat release rate of less than 150 W/m², a total heat release of less than 20 MJ/m² and an effective heat of combustion of less than 18 MJ/kg when tested on specimens at the thickness intended for use, in accordance with ASTM E1354, in the horizontal orientation and at an incident radiant heat flux of 50 kW/m² • a flame spread index of 25 or less and a smoke-developed index of 450 or less when tested in accordance with ASTM E84 of UL 723, with test specimen preparation in accordance with ASTM E2404

Table 3 continues on the following page.



TABLE 3 – NFPA 285 COMPLYING WALL ASSEMBLIES (CONTINUED)

Flashing	<p>Flash all exterior insulation joints and veneer tie penetrations with one of the following:</p> <ul style="list-style-type: none"> a) DuPont™ LiquidArmor™ - CM Flashing and Sealant – max. 60-mil wet thickness, max. 5-inch width b) DuPont™ LiquidArmor™ - LT Flashing and Sealant – max. 35-mil wet thickness, max. 5-inch width. c) DuPont™ LiquidArmor™ - QS Flashing and Sealant – max. 60-mil wet thickness, max. 5-inch width d) DuPont™ Tyvek® Fluid Applied Flashing & Joint Compound – max. 25-mil wet thickness, max. 3-inch width e) DuPont™ WeatherMate™ Flashing – max. 4-inch width f) None - when a separate WRB is installed over the insulation. <p>DuPont™ Great Stuff Pro™ - Use on joints that are greater than 1/4 inch, vertical joints must be staggered and remove significant excess from the face of the Thermax™</p> <p>Note: With either a) or b), spray primer may be used to aid in adhesion; maximum 5-inch width.</p>
Exterior Veneer ¹ – Use either 1, 2, 3, 4, 5 or 6	<ol style="list-style-type: none"> 1. Brick – Standard type brick veneer anchors, installed a maximum of 24-inches oc vertically on each stud. A maximum 2-inch air gap between the exterior insulation and the brick. Use standard nominal 4-inch-thick clay bricks. 2. Stucco – Minimum 3/4-inch thick exterior cement plaster and lath. An optional secondary water-resistive barrier may be installed between the exterior insulation and the lath. The secondary water-resistive barrier may be 1 or 2 layers of asphalt building paper but shall not be full-coverage asphalt or butyl-based self-adhered membranes. 3. Minimum 2-inch-thick limestone or natural stone veneer. Any standard non-open-joint installation technique (e.g., shiplap) may be used. 4. Cast artificial stone complying with ICC-ES AC51. Minimum 1-1/2-inch-thick installed using any standard non-open-joint technique (e.g., shiplap). 5. Terracotta cladding – Minimum 1-1/4-inch-thick terracotta cladding system. Any non-open-joint installation technique (e.g., shiplap) may be used. 6. MCM System – use any MCM system that has been successfully tested by the panel manufacturer via the NFPA 285 test method. Acceptable NFPA 285 testing shall consist of test results on a wall assembly incorporating a comparable thickness and potential heat of combustible foam insulation behind the ACM.

¹Base wall system must be designed for applicable loads due to cladding and wind loads. Fasteners for cladding must be to the structural system.



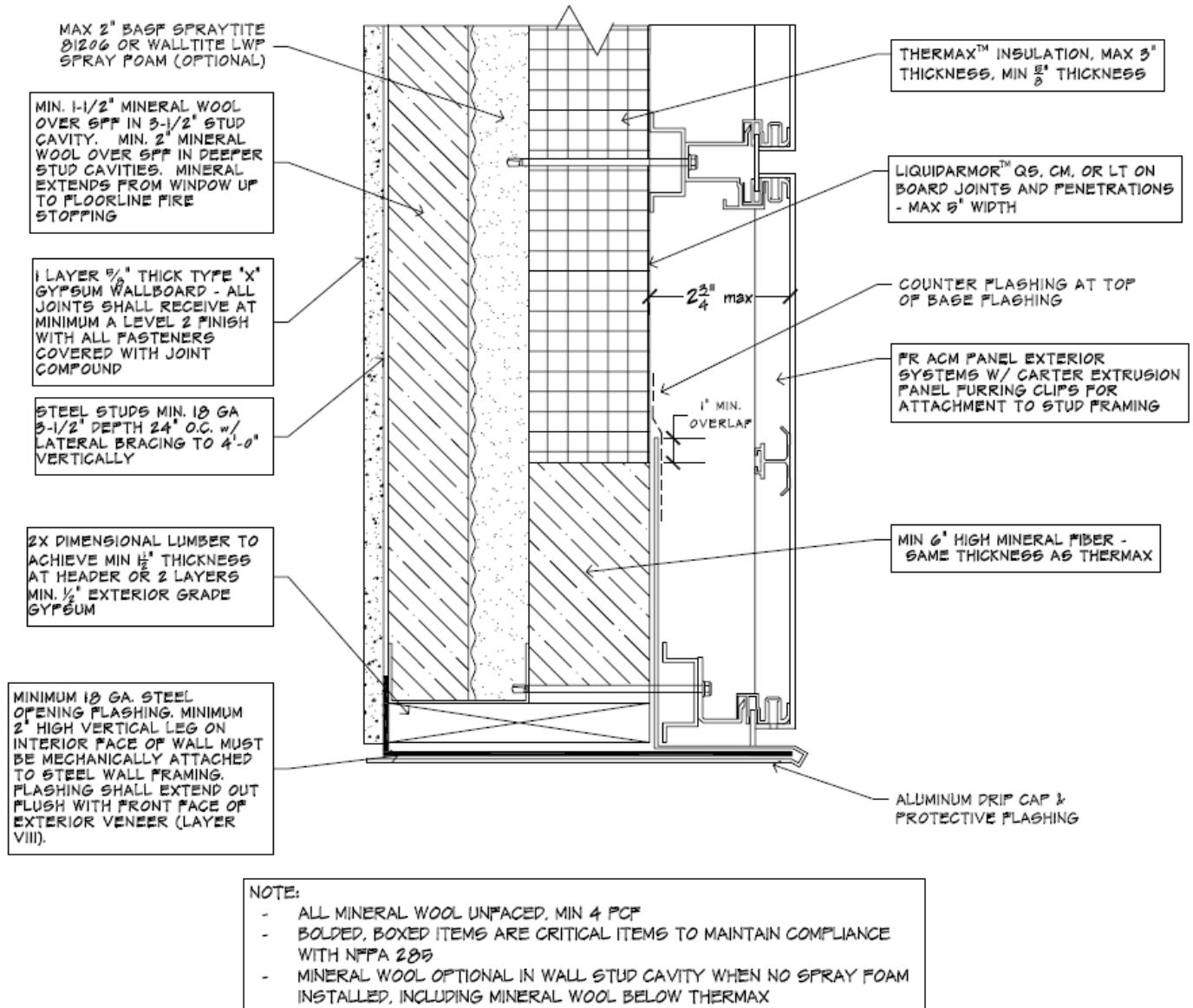
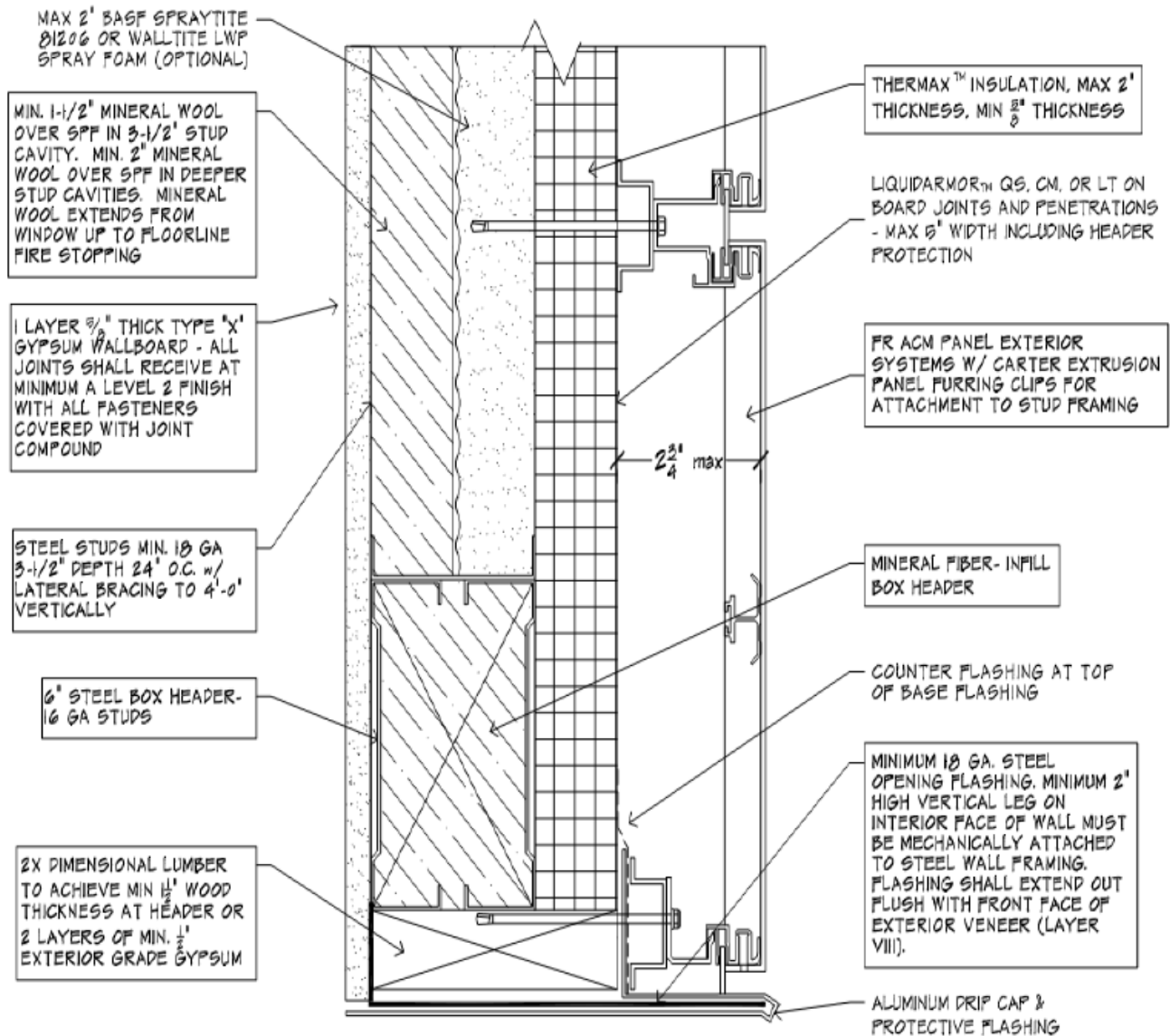


FIGURE 1 – Required Opening Head Protection When BASF Foam Insulation is used in the Cavity – Option 1



NOTE:

- ALL MINERAL WOOL UNFACED, MIN 4 PCF
- **BOLDED, BOXED** ITEMS ARE CRITICAL ITEMS TO MAINTAIN COMPLIANCE WITH NFPA 285
- MINERAL WOOL OPTIONAL IN WALL STUD CAVITY WHEN NO SPRAY FOAM INSTALLED, INCLUDING MINERAL WOOL BELOW THERMAX

FIGURE 2 – Required Opening Head Protection When BASF Foam Insulation is used in the Cavity – Option 2

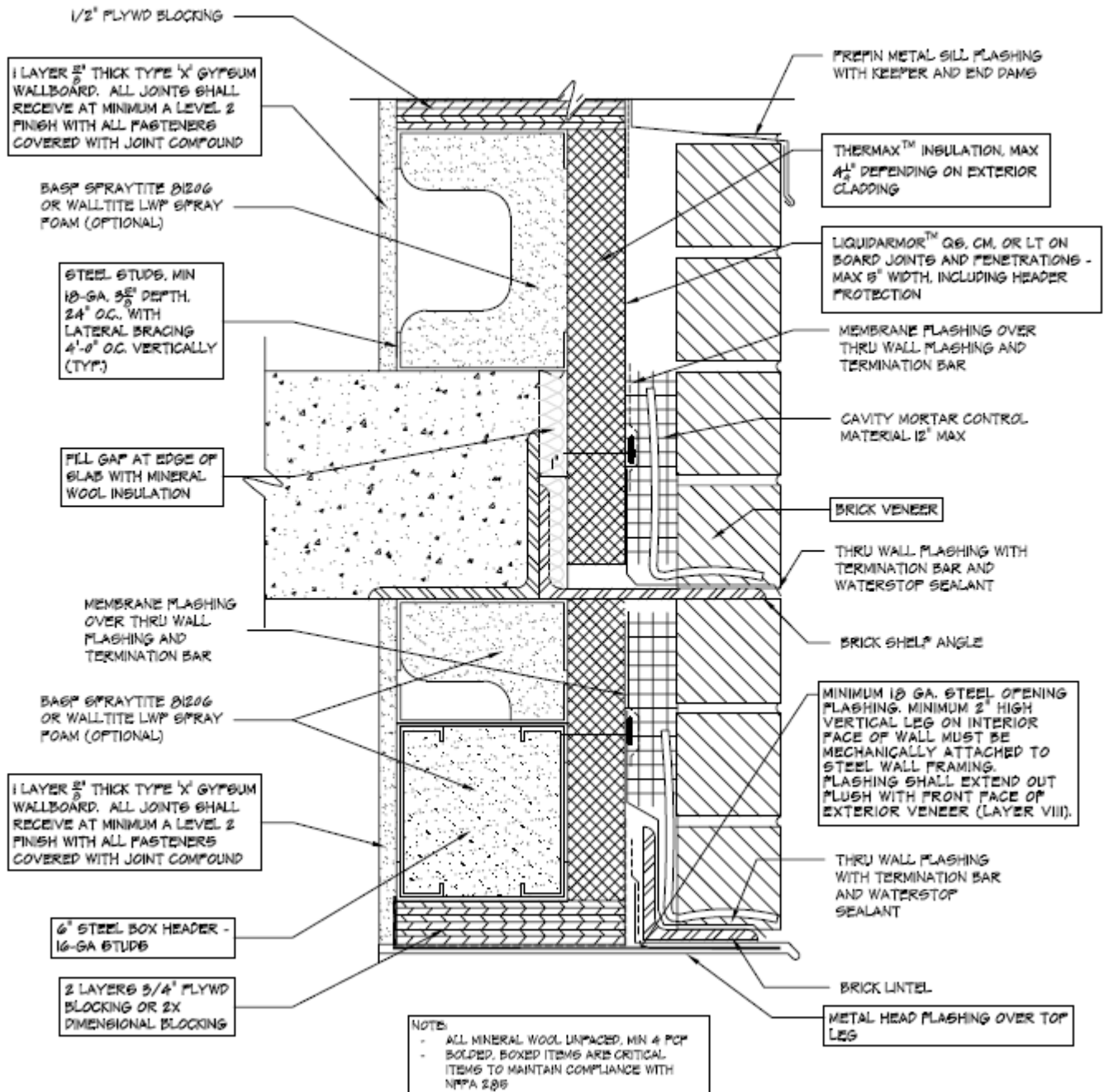


FIGURE 3 – Required Opening Head Protection When BASF Foam is used in the Cavity (Infill Wall Construction with Brick Façade)

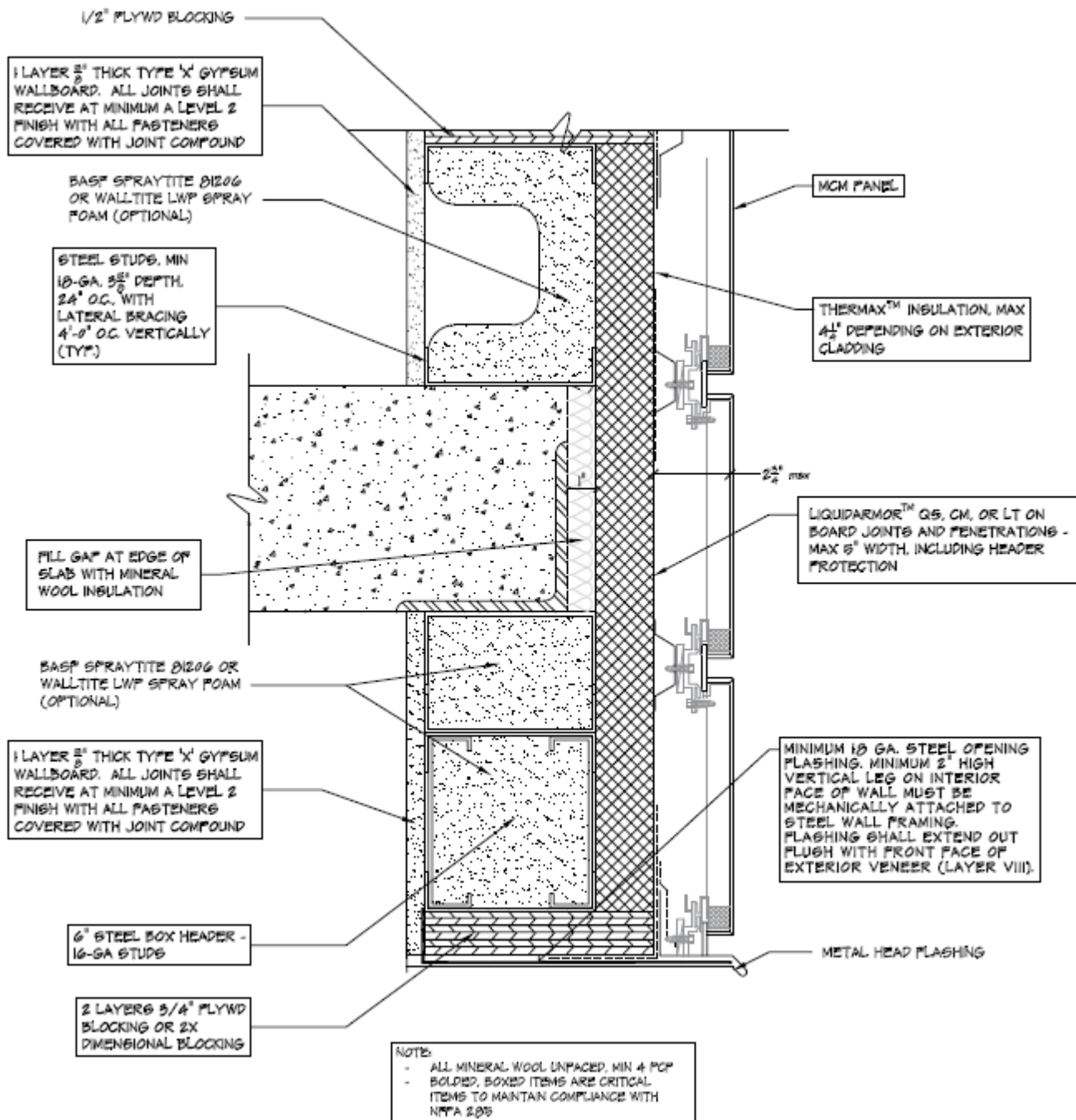


FIGURE 4 – Required Opening Head Protection When BASF Foam is used in the Cavity (Infill Wall Construction with ACM Façade)

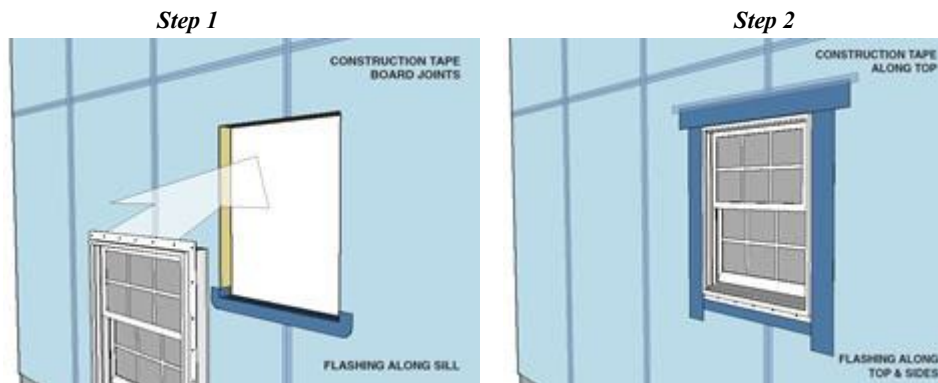


FIGURE 5—TYPICAL WINDOW FLASHING DETAIL

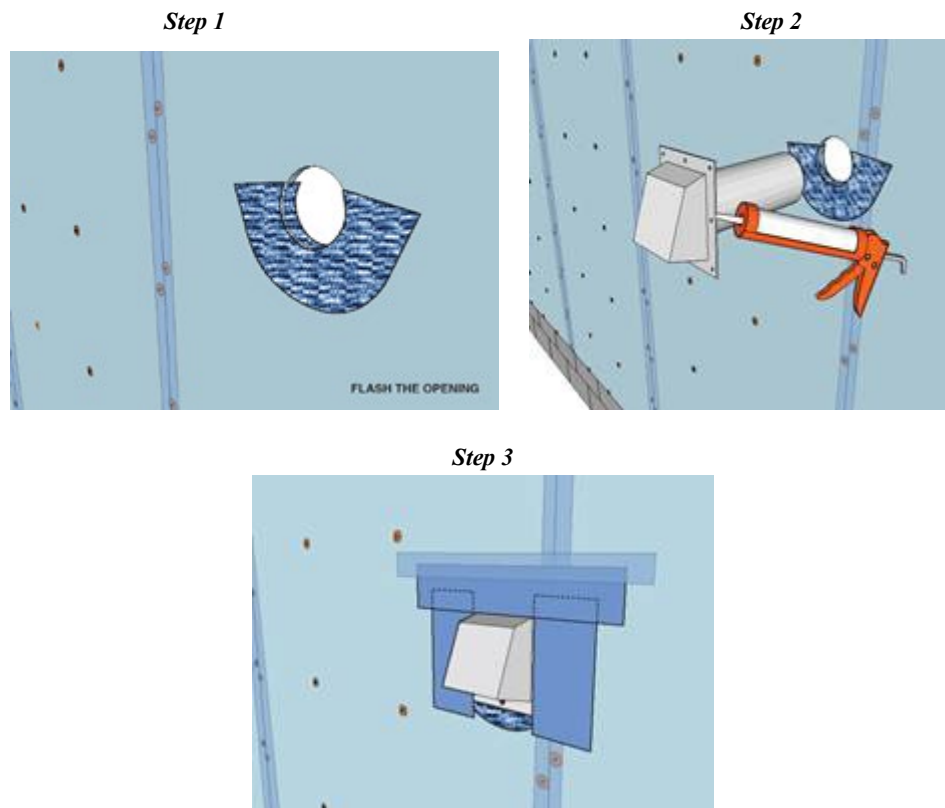


FIGURE 6—TYPICAL PENETRATION FLASHING DETAIL—FLANGED

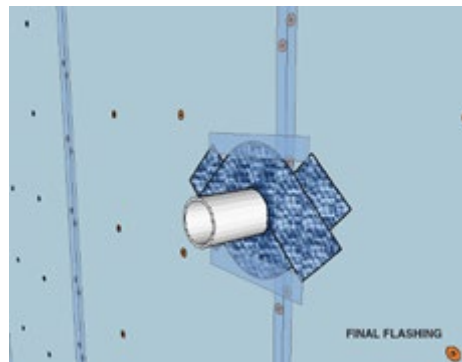


FIGURE 7—TYPICAL FLASHING DETAIL—UNFLANGED

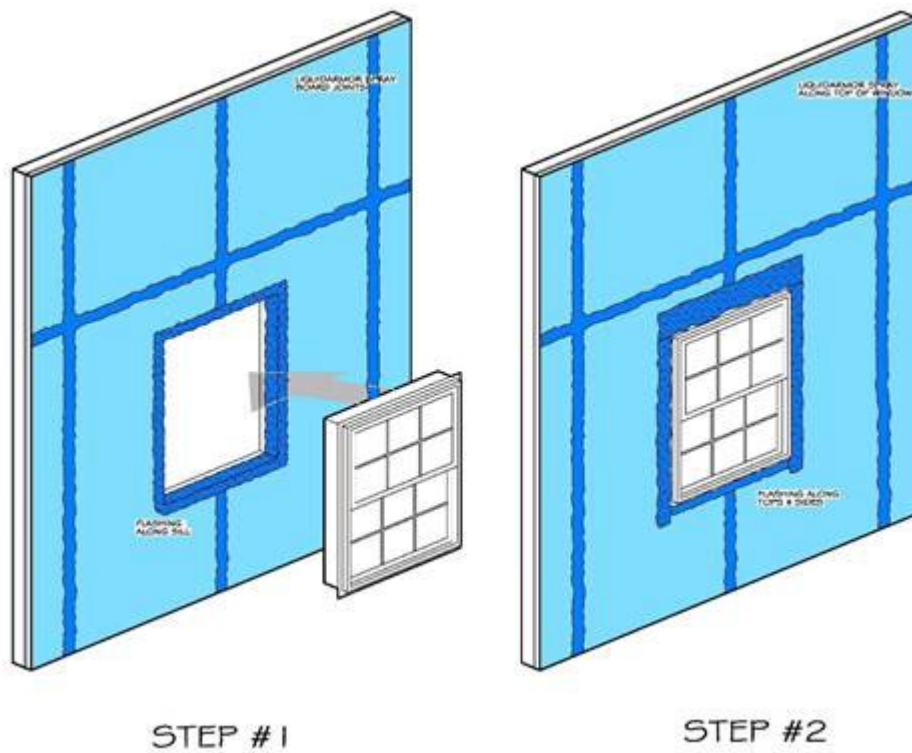


FIGURE 8—TYPICAL WINDOW FLASHING DETAIL

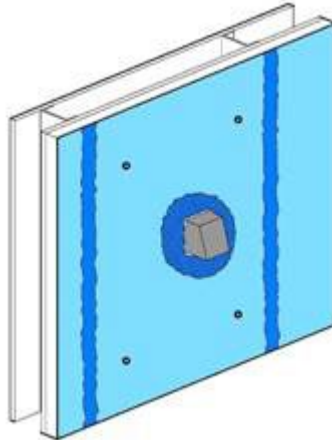


FIGURE 9—TYPICAL PENETRATION FLASHING DETAIL—FLANGED

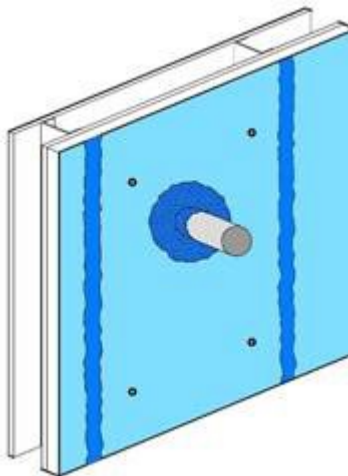


FIGURE 10—TYPICAL FLASHING DETAIL—UNFLANGED

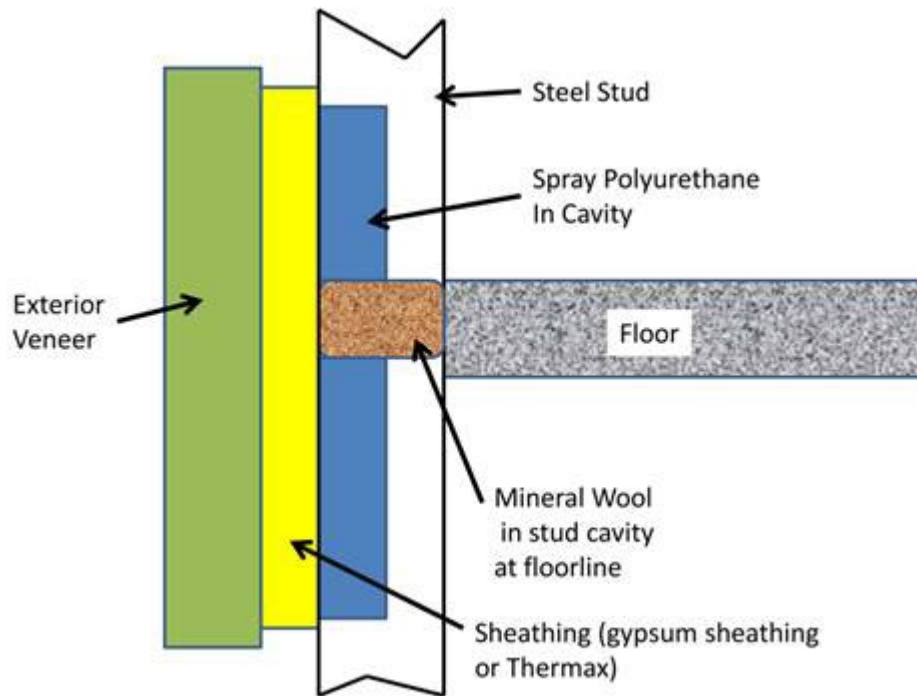


FIGURE 11—FIRESTOPPING DETAIL AT FLOOR LINES FOR TYPES I–IV CONSTRUCTION