Code Compliance Research Report
CCRR-0435

Issue Date: 06-01-2022
Revision Date: 06-19-2026
Renewal Date: 06-30-2027

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

REPORT HOLDER:
DuPont de Nemours, Inc.
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Midland, Michigan 48674
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REPORT SUBJECT:
DuPont™ Thermax™ Polyisocyanurate Insulation Boards:
Thermax™ XARMOR™ (ci) Exterior Insulation;
Thermax™ Metal Building Board;
Thermax™ Sheathing Insulation; and
Thermax™ Heavy Duty Insulation

1.0 SCOPE OF EVALUATION

1.1 This Research Report addresses compliance with the following Codes:

- 2024, 2021, 2018, 2015, 2012, 2009 *International Building Code®* (IBC)
- 2024, 2021, 2018, 2015, 2012, 2009 *International Residential Code®* (IRC)
- 2024, 2021, 2018, 2015, 2012, 2009 *International Energy Conservation Code®* (IECC)
- 2024, 2021, 2018, 2015, 2012 *International Green Construction Code* (IGCC)
- 2025, 2022 California Building Code
- 2025, 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.

2.1 2024 IBC and IRC Evaluation Reports: The Intertek CCRR is an *Evaluation Report* for approval of an alternate material, design, or method of construction in accordance with Section 104.2.3.6.1 of the 2024 IBC and Section R104.2.2.6.1 of the 2024 IRC.

3.0 DESCRIPTION

3.1 Thermax Insulation Boards: Thermax insulation boards [XARMOR™ (ci), Metal Building Board, Sheathing, and Heavy Duty] 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 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. Multiple layers of insulation board may be used to achieve the R-value, however the R-value for the layer's thickness shall not exceed the value shown in Table 2A.

4.4 Water-vapor Permeance: The insulation boards, at a minimum thickness of 1 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-m^2 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 C402.6.2.3.1, the insulation boards must be installed in accordance with this section, and other applicable requirements of this report. See Figures 19 through 23.

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™ 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™ 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 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™ QS Flashing

- LiquidArmor™ LT Flashing
- An elastomeric sealant

See Figures 19 through 23.

5.5 Thermal Barrier: Thermax insulation boards may be installed without the thermal barrier required by IBC Section 2603.4 and IRC Section R303.4.

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 R303.5.3 or R316.5.4R303.5.4, 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 in buildings of any height when installed as described in Table 3. Thermax insulation boards have a potential heat of 2033 Btu/ft^2 per inch of thickness.

Assemblies described in Tables 3, 4 and 5 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 R305.4 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 March 2021).

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 2025, 2022 California Building Code: When installed in accordance with this report, the Thermax insulation boards comply with the 2025 and 2022 *California Building Code, California Residential Code* and *California Energy Code*, excluding the 2025 California Wildland-Urban Interface Code, 2022 CBC Chapter 7A and 2022 CRC Section R337.

9.2 2025, 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 2024, 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 301.2 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, 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	2024 IBC	2024 IRC	2024 IECC
Physical properties	Table 1508.2 2603.10	R906.2	N/A
Surface burning characteristics	2603.3	R303.3	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 C402.6.2.3.1 C402.6.2.3.2
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	3.4
1.0	7.0
2.0	13
3.0	19
4.0	24

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	7.1	6.5

Table 3 – Maximum 3-inch DuPont™ Thermax™ Brand Insulation with Combustible Claddings

Base wall system – Use either 1, 2, 3 or 4	1. Concrete wall 2. Concrete masonry unit (CMU) wall 3. Steel studs: minimum 3-5/8-inch depth, minimum 20-gauge at a maximum of 24-inch oc with: a. One layer of 5/8-inch thick Type X gypsum wallboard complying with ASTM E1396 installed continuously from top of structural floor below to underside of structural floor above on interior face of studs. Interior gypsum wallboard panels must extend above drop or lay in ceilings to underside of the floor/ceiling structure above. Gypsum wallboard joints shall receive at a minimum a Level 2 finish with all fasteners covered with joint compound. 4. Wood Stud Framing – Nominal 2 × 4-inch or greater Fire-Retardant Treated (FRT) wood studs spaced at a maximum of 24-inch OC. Minimum two top plates at top of wall. a. Wood Stud Framing requires a minimum of one layer 5/8-inch thick Type X gypsum wallboard on interior and exterior sides of wall framing. Any thickness of plywood or OSB sheathing may be installed on the exterior face of wood studs under exterior gypsum sheathing. b. Wood Stud Framing does not permit Spray Polyurethane Foam Stud Cavity Insulation.
Floor line firestopping	5. Infill Wall Construction: Minimum 4 lb/ft^3 mineral wool insulation installed between the edge of concrete floor slab and the interior face of Thermax for full slab depth. Gaps less than 1/4-inch measured from the slab edge face to interior face of Thermax do not require mineral wool (see Figure 1). 6. Platform-Framed Construction: Exposed Thermax foam in floor interstitial space to be covered by minimum 4-inch thick, minimum 4 lb/ft^3 mineral wool insulation mechanically attached to floor framing or by minimum 1-3/4-inch thick rim joist. (see Figure 2). 7. Curtainwall and Balloon-Framed Construction: Minimum 4 lb/ft^3 mineral wool friction fit in each stud cavity, at each floor line, full slab depth from the between the edge of concrete floor slab and the interior face of Thermax (see Figures 3 and 4). When applicable, perimeter fire barrier/containment system required to be installed in linear gap between edge of slab and interior face of exterior wall as required by 2024 IBC Section 715.4. 8. Concrete or CMU Base Wall Systems. Floorline firestopping not required. Perimeter fire barrier/containment system is still required to be installed where a linear gap between edge of slab and interior face Concrete or CMU base walls exists, as required by 2024 IBC Section 715.4.
Interior Air and Vapor Control Layer	9. None 10. Interior Air and Vapor Control Membrane: Any maximum 6-mil thick film of polyethylene (PE), polyamide, polyethylene terephthalate (PET) installed per manufacturer's recommendations to interior face of framing.
Cavity Insulation – Use either 11,12,13 or 14	11. None. Screw end of fasteners that protrude into the stud cavity may be covered with a maximum of 1-1/2-inch diameter plug of DuPont™ Froth-Pak (Class A rated per ASTM E84). 12. Fiberglass: blown-in or batt insulation (faced or unfaced) 13. Mineral Wool: blown-in or batt insulation (faced or unfaced) 14. Closed-Cell Spray Polyurethane Foam (ccSPF): Spray Polyurethane Foam is not permitted with Wood Stud Framing Base Wall System. Where permitted, a minimum 1-3/4-inch thickness of ccSPF with ccSPF applied using exterior sheathing or insulation as substrate and covering the width of the wall stud cavity and inside of the stud flange. Approved products include: a. BASF WALLTITE LWP or MAX ccSPF per Intertek CCRR-0374 b. Huntsman Building Solutions Heatlok HFO Pro ccSPF per IAPMO UES Evaluation Report No. ER-565

	Notes: When cc-SPF is included in the stud cavity the following installation details shall be followed: 1. Minimum 4 lb/ft^3 mineral wool insulation required to be installed over SPF to completely fill wall stud cavity over all opening headers up to floor line firestopping for full opening width (refer to Figure 5, 6, or 7). 2. Minimum 6-inch-high, minimum 4 lb/ft^3 mineral wool insulation (same thickness as Thermax Brand Insulation) required to be installed over all opening headers for full length of header in lieu of Exterior Insulation (refer to Figure 5, 6, or 7).
Exterior sheathing – Use either 15, 16 or 17	15. None: Exterior sheathing is not required for Base wall systems 1 and 2, or over steel framing. 16. FRTW framing: one layer of 5/8-inch thick, Type X exterior gypsum sheathing on the exterior side of studs. Notes: a. Any thickness of plywood or OSB may be installed on exterior face of stud framing under min. 1/2-in. Type X exterior gypsum sheathing complying with ASTM C1177. b. Exterior Gypsum sheathing panels may include a factory applied water-resistive barrier (WRB) where it complies with WRB Materials, Item 18.
Air Barrier and WRB materials applied to exterior sheathing or over exterior insulation – Use either 18 or 19	17. None 18. Air and water-resistive barriers: a. Tyvek CommercialWrap b. Tyvek Commercial Wrap D c. Any other air or water-resistive barrier having a peak heat release rate less than 141 W/m^2, a total heat release rate of 6.2 MJ/m^2 and an effective heat of combustion of less than 6.5 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/m^2
Exterior insulation	19. Thermax™ Brand Rigid Insulation – Total thickness to be a minimum of 5/8-inch and a maximum of 3 inches.
Joint treatment	20. Flash all exterior insulation joints and veneer tie penetrations with one of the following: a) DuPont™ LiquidArmor™ - LT Flashing and Sealant – max. 35-mil wet thickness, max. 4-inch width. b) DuPont™ LiquidArmor™ - QS Flashing and Sealant – max. 50-mil wet thickness, max. 5-inch width c) DuPont™ Tyvek® Fluid Applied Flashing & Joint Compound+ – max. 25-mil wet thickness, max. 3-inch width d) Great Stuff Pro™ - Use on joints that are no greater than 1/4 inch, vertical joints must be staggered and remove significant excess from the face of the Thermax™ Note: With either a) or b), spray primer may be used to aid in adhesion; maximum 4-inch width.
Exterior Veneer	21. **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.
Flashing of Windows, Doors, and Other Exterior Wall Penetrations	22. Air and water protection around wall openings shall be installed per manufacturers installation instructions utilizing allowable available material which does not extend more than 6-inches onto the exterior face of the assembly.

Opening Perimeter Protection	23. All wall openings (windows, doors, etc.) are required to be protected with one of the following details to protect the head, jamb and sill (sill is optional for door openings) of all openings extending from the inside face of the Base Wall System to the exterior face of the Exterior Veneer a. One layer of 5/8-inch thick Type X gypsum wallboard covering stud framing and cut edges of Thermax insulation (header and jambs only) with a minimum 18-gauge "L" shaped steel flashing spanning full wall depth (header, jambs, and sill), see Figure 5. b. Two layers of 5/8-inch Type X gypsum wallboard covering stud framing and extending out to interior face of exterior cladding, see Figure 6. c. One layer of nominal 2x lumber or two layers of 3/4-inch thick FRT plywood covering stud framing and extending out to be flush with exterior cladding, see Figure 7. Inclusion of ccSPF in exterior wall assembly requires additional opening protection to include: i. 6-inch 4-pcf mineral wool at the opening head condition for the length of the opening to replace the Exterior Continuous Insulation -AND- 4pcf mineral wool in the stud cavity to fill cavity between ccSPF and interior gypsum wall board from the opening head condition to the underside of the floor or roof line above. ii. For instances where the window head is 12-inches or less below the underside of the floor or roof line above, no additional protection is required (refer to Figure 15).

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

Table 4 – Maximum 3-inch DuPont™ Thermax™ Brand Insulation with Noncombustible Claddings

Base wall system – Use either 1, 2, 3 or 4	1. Concrete wall 2. Concrete masonry unit (CMU) wall 3. Steel studs: minimum 3⅝-inch depth, minimum 20-ga. at a maximum of 24-in. oc with: a. One layer of 5/8-inch thick Type X gypsum wallboard complying with ASTM E1396 installed continuously from top of structural floor below to underside of structural floor above on interior face of studs. Interior gypsum wallboard panels must extend above drop or lay in ceilings to underside of the floor/ceiling structure above. Gypsum wallboard joints shall receive at a minimum a Level 2 finish with all fasteners covered with joint compound. 4. Wood Stud Framing – Nominal 2 × 4-inch or greater Fire-Retardant Treated (FRT) wood studs spaced at a maximum of 24-inch OC. Minimum two top plates at top of wall. a. Wood Stud Framing requires a minimum of one layer 5/8-inch thick Type X gypsum wallboard on interior and exterior sides of wall framing. Any thickness of plywood or OSB sheathing may be installed on the exterior face of wood studs under exterior gypsum sheathing. b. Wood Stud Framing does not permit Spray Polyurethane Foam Stud Cavity Insulation.
Floor line firestopping	5. Infill Wall Construction: Minimum 4 lb/ft^3 mineral wool insulation installed between the edge of concrete floor slab and the interior face of Thermax for full slab depth. Gaps less than 1/4-inch measured from the slab edge face to interior face of Thermax do not require mineral wool (see Figure 1). 6. Platform-Framed Construction: Exposed Thermax foam in floor interstitial space to be covered by minimum 4-inch thick, minimum 4 lb/ft^3 mineral wool insulation mechanically attached to floor framing or by minimum 1-3/4-inch thick rim joist. (see Figure 2). 7. Curtainwall and Balloon-Framed Construction: Minimum 4 lb/ft^3 mineral wool friction fit in each stud cavity, at each floor line, full slab depth from the between the edge of concrete floor slab and the interior face of Thermax (see Figures 3 and 4). When applicable, perimeter fire barrier/containment system required to be installed in linear gap between edge of slab and interior face of exterior wall as required by 2024 IBC Section 715.4. 8. Concrete or CMU Base Wall Systems. Floorline firestopping not required. Perimeter fire barrier/containment system is still required to be installed where a linear gap between edge of slab and interior face Concrete or CMU base walls exists, as required by 2024 IBC Section 715.4.
Interior Air and Vapor Control Layer	9. None 10. Interior Air and Vapor Control Membrane: Any maximum 6-mil thick film of polyethylene (PE), polyamide, polyethylene terephthalate (PET) installed per manufacturer's recommendations to interior face of framing.
Cavity Insulation – Use either 11, 12, 13 or 14	11. None. Screw end of fasteners that protrude into the stud cavity may be covered with a maximum of 1-1/2-inch diameter plug of DuPont™ Froth-Pak (Class A rated per ASTM E84). 12. Fiberglass: blown-in or batt insulation (faced or unfaced) 13. Mineral Wool: blown-in or batt insulation (faced or unfaced) 14. Closed-Cell Spray Polyurethane Foam (ccSPF): Spray Polyurethane Foam is not permitted with Wood Stud Framing Base Wall System. Where permitted, a minimum 1-3/4-inch thickness of ccSPF with ccSPF applied using exterior sheathing or insulation as substrate and covering the width of the wall stud cavity and inside of the stud flange. Approved products include: a. BASF WALLTITE LWP or MAX ccSPF (Intertek CCRR-0374) b. Huntsman Building Solutions Heatlok HFO Pro ccSPF (IAPMO UES Evaluation Report ER-565)

Exterior sheathing – Use either 15, 16 or 17	15. None: Exterior sheathing is not required for Base wall systems 1 and 2 above, or over steel framing. 16. FRTW framing: one layer of 5/8-inch thick, Type X exterior gypsum sheathing on the exterior side of studs. Notes: a. Any thickness of plywood or OSB may be installed on exterior face of stud framing under exterior gypsum sheathing. b. Exterior Gypsum sheathing panels may include a factory applied water-resistive barrier (WRB) where it complies with WRB Materials, Item 18.
Air Barrier and WRB materials applied to exterior sheathing or over exterior insulation – Use either 18 or 19	17. None 18. Air and water-resistive barriers: a. DuPont™ Tyvek® CommercialWrap® b. DuPont™ Tyvek® CommercialWrap® D c. Any other air or water-resistive barrier having a peak heat release rate less than 141 W/m^2, a total heat release rate of 6.2 MJ/m^2 and an effective heat of combustion of less than 6.5 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/m^2
Exterior insulation	19. Thermax™ Brand Rigid Insulation – Total thickness to be a minimum of 5/8-inch and a maximum of 3 inches.
Joint Treatment	20. Flash all exterior insulation joints and veneer tie penetrations with one of the following: a) DuPont™ LiquidArmor™ - LT Flashing and Sealant – max. 35-mil wet thickness, max. 4-inch width. b) DuPont™ LiquidArmor™ - QS Flashing and Sealant – max. 50-mil wet thickness, max. 5-inch width c) DuPont™ Tyvek® Fluid Applied Flashing & Joint Compound+ – max. 25-mil wet thickness, max. 3-inch width d) Great Stuff Pro™ - Use on joints that are no greater than 1/4 inch, vertical joints must be staggered and remove significant excess from the face of the Thermax™ Note: With either a) or b), spray primer may be used to aid in adhesion; maximum 4-inch width.
Exterior Veneer	21. Brick: Standard nominal 4-inch thick, clay brick with standard brick veneer anchors, installed maximum 24-inches OC vertically on each stud. Air gap between exterior insulation and brick to be a maximum of 2-1/2-inches. Any standard non-open jointed installation technique can be used. 22. Concrete or Precast Concrete Panels: Minimum 1-1/2-inch thick panel. Air gap between exterior insulation and concrete or precast concrete panels to be a maximum of 2-inches. Any standard non-open jointed installation technique can be used. 23. Concrete Masonry Units (CMU): Minimum 4-inch thick CMU, with a maximum 2-inch air gap between exterior insulation and the interior face of the CMU. Any standard non-open jointed installation technique can be used. 24. Natural Stone or Artificial Stone Veneer: Minimum 2-inch thick natural stone veneer or minimum 1-1/2-inch thick cast artificial stone veneer. Air gap between exterior insulation and natural or artificial stone cladding to be a maximum of 2-inches. Any standard non-open jointed installation technique can be used. 25. Adhered Natural Stone or Artificial Stone: Minimum ¾-inch thick fully adhered stone set in nominal 3/8-inch thick bed of cement plaster (stucco) and lath. A secondary water-resistive barrier may be installed between the exterior insulation and lath where it is not an asphalt or butyl-based self-adhered membrane.

	26. Stucco: Minimum 3/4-inch thick, 3-coat exterior cement plaster (stucco) and lath. A 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. 27. Terra cotta Cladding: Minimum 11/4-inch thick terra cotta cladding system. Air gap between exterior insulation and terra cotta cladding to be a maximum of 2-inches. Any standard non-open jointed installation technique can be used. 28. Fiber Cement: Minimum 5/16-inch thick fiber cement panel installed with butted joints or lap siding with a minimum 1-1/4-inch overlap. Fiber cement panel may be installed over maximum 7/8-inch deep, minimum 20-gauge hat channels. 29. Thin Brick: Minimum 3/4-inch thick mortared clay brick adhesively bonded / adhered to steel, gypsum backing, fiber cement board, or other tested and approved substrate by the manufacturer. Maximum 1/2-inch deep/thick drainage gap or drainage material permitted. A secondary water-resistive barrier can be installed where it is not an asphalt or butyl-based self-adhered membrane. 30. Single Skin or Plate Metal Panels: Metal exterior wall coverings including steel (minimum 0.0179-inch thick), aluminum (minimum 0.080-inch thick), or copper (minimum 0.0179-inch thick). Air gap between exterior insulation and metal wall covering to be a maximum of 2-inches. Any standard non-open jointed installation technique can be used. 31. Porcelain and Ceramic tile: Minimum ⅜-inch thick, bonded using non-combustible mortar adhesive to minimum ½-inch thick cement board or gypsum sheathing
Flashing of Windows, Doors, and Other Exterior Wall Penetrations	32. Air and water protection around wall openings shall be installed per manufacturers installation instructions utilizing allowable available material which does not extend more than 6-inches onto the exterior face of the assembly.
Opening Perimeter Protection	33. All wall openings (windows, doors, etc.) are required to be protected with one of the following details to protect the head, jamb, and sill (sill is optional for door openings) of all openings extending from the inside face of the Base Wall System to the exterior face of the Exterior Veneer a. One layer of 5/8-inch thick Type X gypsum wallboard covering stud framing and cut edges of Thermax insulation (header and jambs only) with a minimum 18-gauge “L” shaped steel flashing spanning full wall depth (header, jambs, and sill), see Figure 8. b. Two layers of 5/8-inch Type X gypsum wallboard covering stud framing and extending out to interior face of exterior cladding, see Figure 9. c. One layer of nominal 2x lumber or two layers of 3/4-inch thick FRT plywood covering stud framing and extending out to be flush with exterior cladding, see Figure 10.

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

Table 5 – Maximum 4-1/4-inch-Thick Thermax™ Brand Insulation and Non-Combustible Cladding

Base wall system – Use either 1, 2, 3 or 4	1. Concrete wall 2. Concrete masonry unit (CMU) wall 3. Steel studs: minimum 35/8-inch depth, minimum 20-gauge at a maximum of 24-inch oc with: a. One layer of 5/8-inch thick Type X gypsum wallboard complying with ASTM E1396 installed continuously from top of structural floor below to underside of structural floor above on interior face of studs. Interior gypsum wallboard panels must extend above drop or lay in ceilings to underside of the floor/ceiling structure above. Gypsum wallboard joints shall receive at a minimum a Level 2 finish with all fasteners covered with joint compound. 4. Wood Stud Framing – Nominal 2 × 4-inch or greater Fire-Retardant Treated (FRT) wood studs spaced at a maximum of 24-inch OC. Minimum two top plates at top of wall. a. Wood Stud Framing requires a minimum of one layer 5/8-inch thick Type X gypsum wallboard on interior and exterior sides of wall framing. Any thickness of plywood or OSB sheathing may be installed on the exterior face of wood studs under exterior gypsum sheathing. b. Wood Stud Framing does not permit Spray Polyurethane Foam Stud Cavity Insulation.
Floor line firestopping	5. Infill Wall Construction: Minimum 4 lb/ft^3 mineral wool insulation installed between the edge of concrete floor slab and the interior face of Thermax for full slab depth. Gaps less than 1/4-inch measured from the slab edge face to interior face of Thermax do not require mineral wool (see Figure 1). 6. Platform-Framed Construction: Exposed Thermax foam in floor interstitial space to be covered by minimum 4-inch thick, minimum 4 lb/ft^3 mineral wool insulation mechanically attached to floor framing or by minimum 1-3/4-inch thick rim joist. (see Figure 2). 7. Curtainwall and Balloon-Framed Construction: Minimum 4 lb/ft^3 mineral wool friction fit in each stud cavity, at each floor line, full slab depth from the between the edge of concrete floor slab and the interior face of Thermax (see Figures 3 and 4). When applicable, perimeter fire barrier/containment system required to be installed in linear gap between edge of slab and interior face of exterior wall as required by 2024 IBC Section 715.4. 8. Concrete or CMU Base Wall Systems. Floorline firestopping not required. Perimeter fire barrier/containment system is still required to be installed where a linear gap between edge of slab and interior face Concrete or CMU base walls exists, as required by 2024 IBC Section 715.4.
Interior Air and Vapor Control Layer	9. None 10. Interior Air and Vapor Control Membrane: Any maximum 6-mil thick film of polyethylene (PE), polyamide, polyethylene terephthalate (PET) installed per manufacturer's recommendations to interior face of framing.
Cavity Insulation – Use either 11, 12, 13 or 14	11. None. Screw end of fasteners that protrude into the stud cavity may be covered with a maximum of 1-1/2-inch diameter plug of DuPont™ Froth-Pak (Class A rated per ASTM E84). 12. Fiberglass: blown-in or batt insulation (faced or unfaced) 13. Mineral Wool: blown-in or batt insulation (faced or unfaced) 14. Closed-Cell Spray Polyurethane Foam (ccSPF): Spray Polyurethane Foam is not permitted with Wood Stud Framing Base Wall System. Where permitted, a minimum 1-3/4-inch thickness of ccSPF with ccSPF applied using exterior sheathing or insulation as substrate and covering the width of the wall stud cavity and inside of the stud flange. Approved products include: a. BASF WALLTITE LWP or MAX ccSPF (Intertek CCRR-0374) b. Huntsman Building Solutions Heatlok HFO Pro ccSPF (IAPMO UES Evaluation Report ER-565)

Exterior sheathing – Use either 15 or 16	15. None: Exterior sheathing is not required for Base wall systems 1 and 2 above, or over steel framing 16. FRTW framing: one layer of 5/8-inch thick, Type X exterior gypsum sheathing on the exterior side of studs. Notes: a. Any thickness of plywood or OSB may be installed on exterior face of stud framing under exterior gypsum sheathing. b. Exterior Gypsum sheathing panels may include a factory applied water-resistive barrier (WRB) where it complies with WRB Materials, Item 18
Air Barrier and WRB materials applied to exterior sheathing or over exterior insulation – Use either 18 or 19	17. None 18. Air and water-resistive barriers: a. DuPont™ Tyvek® CommercialWrap® b. DuPont™ Tyvek® CommercialWrap® D c. Any other air or water-resistive barrier having a peak heat release rate less than 141 W/m^2, a total heat release rate of 6.2 MJ/m^2 and an effective heat of combustion of less than 6.5 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/m^2
Exterior insulation	19. Thermax™ Brand Rigid Insulation – Total thickness to be a minimum of 5/8-inch and a maximum of 4-1/4 inches.
Flashing	20. Flash all exterior insulation joints and veneer tie penetrations with one of the following: a) DuPont™ LiquidArmor™ - LT Flashing and Sealant – max. 35-mil wet thickness, max. 4-inch width. b) DuPont™ LiquidArmor™ - QS Flashing and Sealant – max. 50-mil wet thickness, max. 5-inch width c) DuPont™ Tyvek® Fluid Applied Flashing & Joint Compound+ – max. 25-mil wet thickness, max. 3-inch width d) Great Stuff Pro™ - Use on joints that are no greater than 1/4 inch, vertical joints must be staggered and remove significant excess from the face of the Thermax™ Note: With either a) or b), spray primer may be used to aid in adhesion; maximum 4-inch width.
Drainage Mat Applied to Continuous Insulation	21. None. 22. Mortar Collection - Mortar drop and drainage nets and meshes can be installed at base of wall and at shelf angles to permit water drainage. Maximum 12-inch high installed only over wall openings (i.e. shall not be full wall coverage).
Exterior Veneer	23. Brick: Standard nominal 4-inch thick, clay brick with standard brick veneer anchors, installed maximum 24-inches OC vertically on each stud. Air gap between exterior insulation and brick to be a maximum of 2-1/2-inches. Any standard non-open jointed installation technique can be used. 24. Concrete or Precast Concrete Panels: Minimum 1-1/2-inch thick panel. Air gap between exterior insulation and concrete or precast concrete panels to be a maximum of 2-inches. Any standard non-open jointed installation technique can be used. 25. Concrete Masonry Units (CMU): Minimum 4-inch thick CMU, with a maximum 2-inch air gap between exterior insulation and the interior face of the CMU. Any standard non-open jointed installation technique can be used. 26. Natural Stone or Artificial Stone Veneer: Minimum 2-inch thick natural stone veneer or minimum 1-1/2-inch thick cast artificial stone veneer. Air gap between exterior insulation and natural or artificial stone cladding to be a maximum of 2-inches. Any standard non-open jointed installation technique can be used.

	27. Adhered Natural Stone or Artificial Stone: Minimum 3/4-inch thick fully adhered stone set in nominal 3/8-inch thick bed of cement plaster (stucco) and lath. A secondary water-resistive barrier may be installed between the exterior insulation and lath where it is not an asphalt or butyl-based self-adhered membrane. 28. Stucco: Minimum 3/4-inch thick, 3-coat exterior cement plaster (stucco) and lath. A 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. 29. Terra cotta Cladding: Minimum 11/4-inch thick terra cotta cladding system. Air gap between exterior insulation and terra cotta cladding to be a maximum of 2-inches. Any standard non-open jointed installation technique can be used.
Flashing of Windows, Doors, and Other Exterior Wall Penetrations	30. Air and water protection around wall openings shall be installed per manufacturer's installation instructions utilizing allowable available material which does not extend more than 6-inches onto the exterior face of the assembly.
Opening Perimeter Protection	31. All wall openings (windows, doors, etc.) are required to be protected with one of the following details to protect the head, jamb, and sill (sill is optional for door openings) of all openings extending from the inside face of the Base Wall System to the exterior face of the Exterior Veneer a. One layer of 5/8-inch thick Type X gypsum wallboard covering stud framing and cut edges of Thermax insulation (header and jambs only) with a minimum 18-gauge "L" shaped steel flashing spanning full wall depth (header, jambs, and sill), see Figure 11. b. Two layers of 5/8-inch Type X gypsum wallboard covering stud framing and extending out to interior face of exterior cladding, see Figure 12. c. One layer of nominal 2x lumber or two layers of 3/4-inch thick FRT plywood covering stud framing and extending out to be flush with exterior cladding, see Figure 13. d. One layer of nominal 2x lumber or two layers of 3/4-inch thick FRT plywood covering stud framing and cut edges of Thermax insulation and min 4-inch depth or 4-pcf mineral wool compressed and filling the gap between Thermax insulation and interior face of exterior cladding, see Figure 14.

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

IN-FILL FRAMED
Concrete Floor

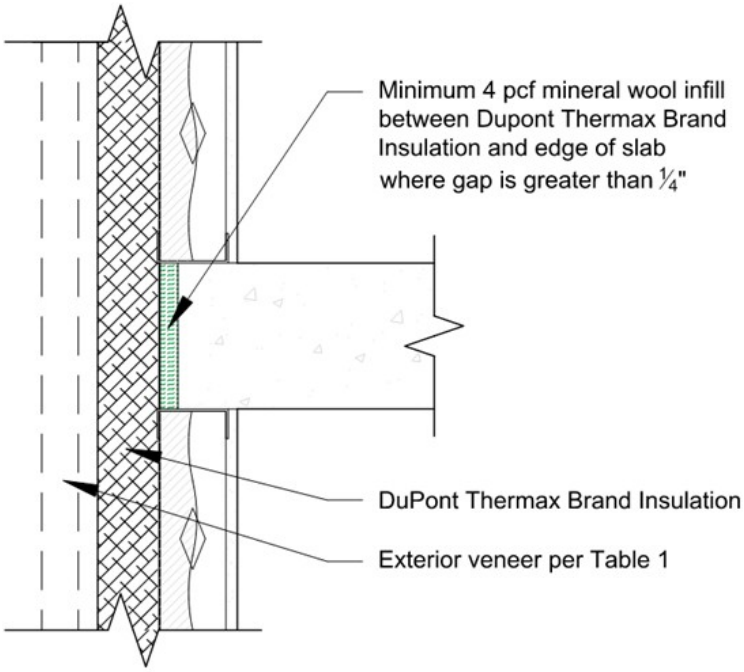


Figure 1 – In-fill Frame Construction Floor Line Condition

PLATFORM FRAMED
FRT Wood Framing

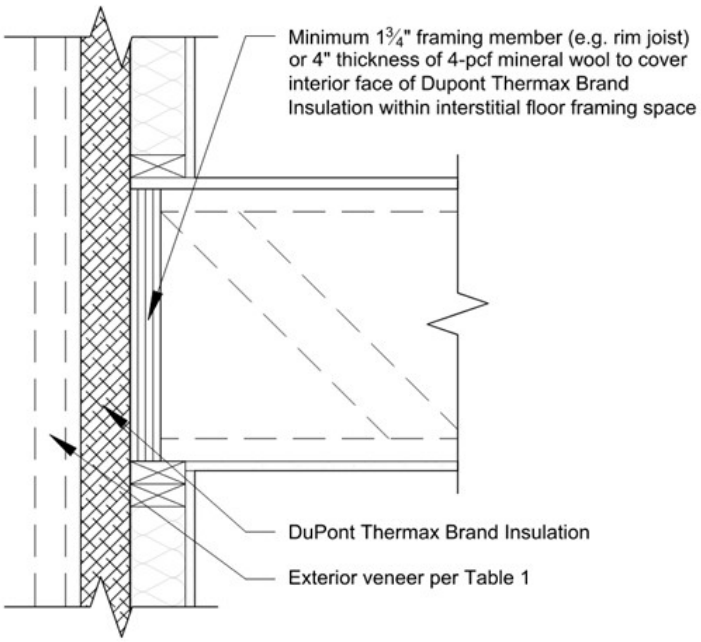


Figure 2 – Platform frame construction floor line condition

CURTAINWALL FRAMED
Concrete Floor

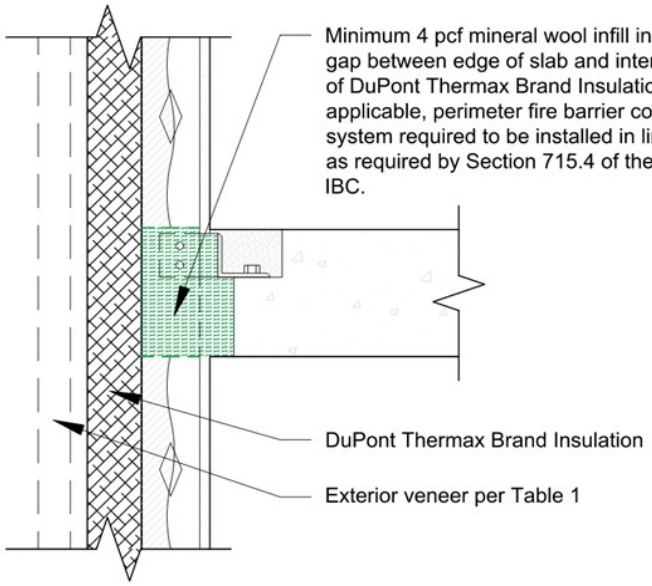


Figure 3 – Curtain wall frame construction floor line condition

CURTAINWALL/BALLOON FRAMED
Steel Framing

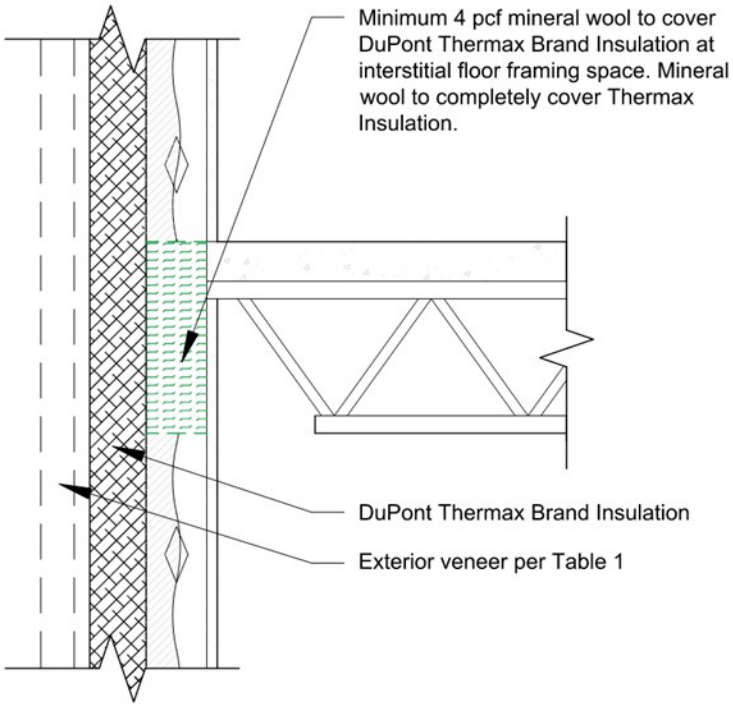


Figure 4 – Balloon frame construction floor line condition

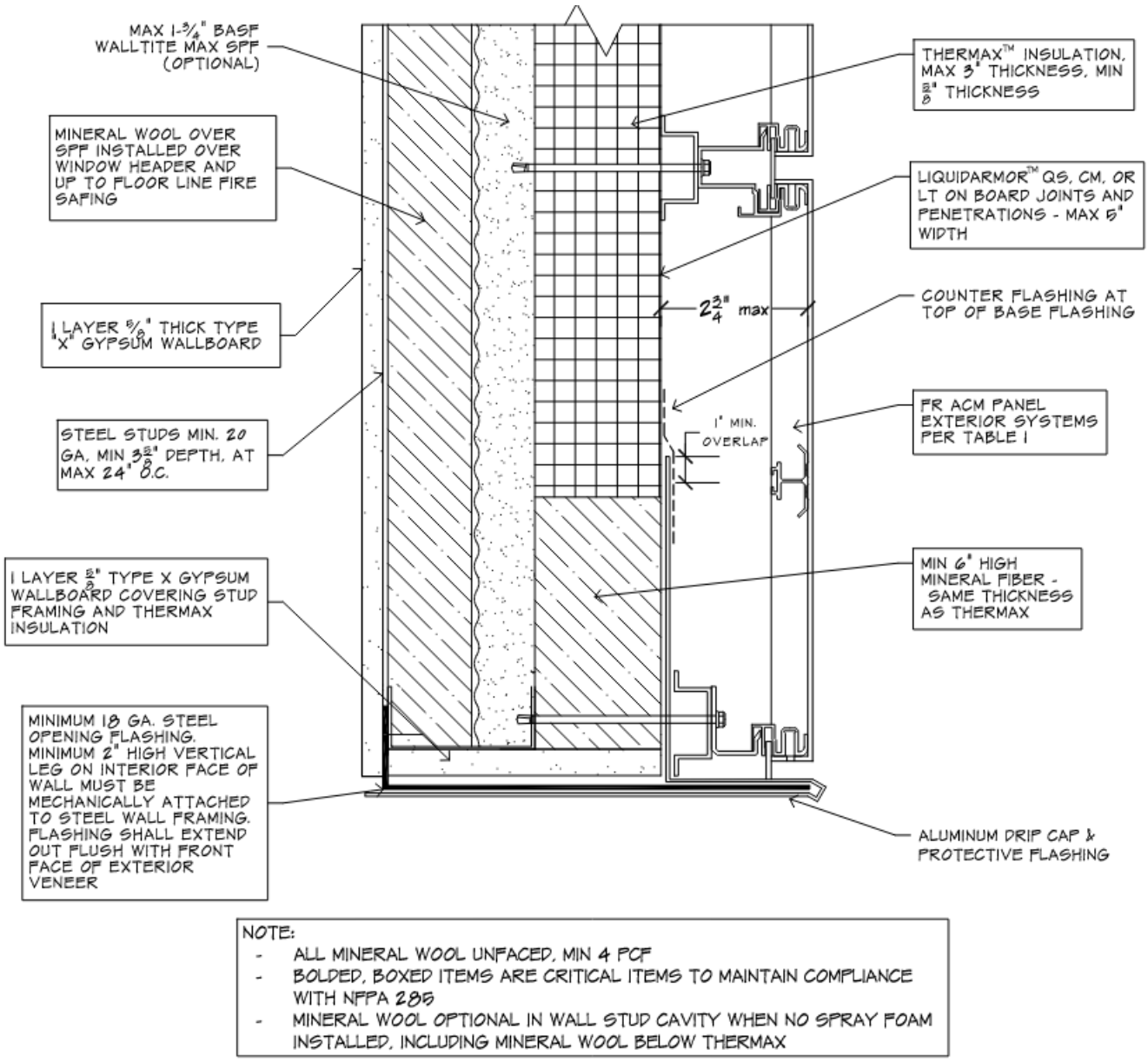


Figure 5 – Wall opening protection (header shown) – 5/8-in.-thick Type X gypsum wallboard at header and jambs, 18-ga. steel flashing at header, jambs and sill – Table 3, Item 23a

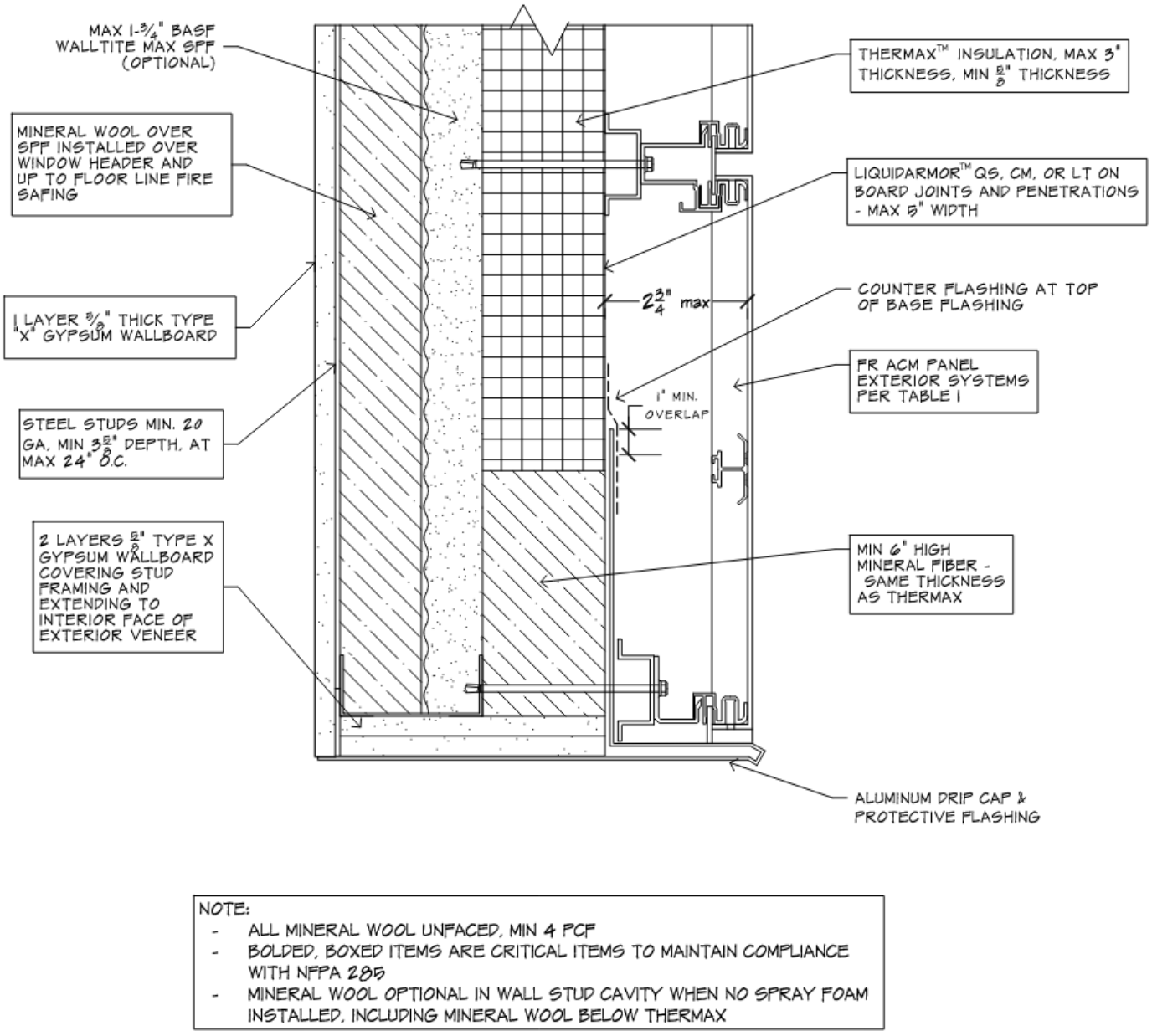


Figure 6 – Wall opening perimeter protection (header shown) – 5/8-in.-thick Type X gypsum wallboard at header, jambs and sill – Table 3, Item 23b

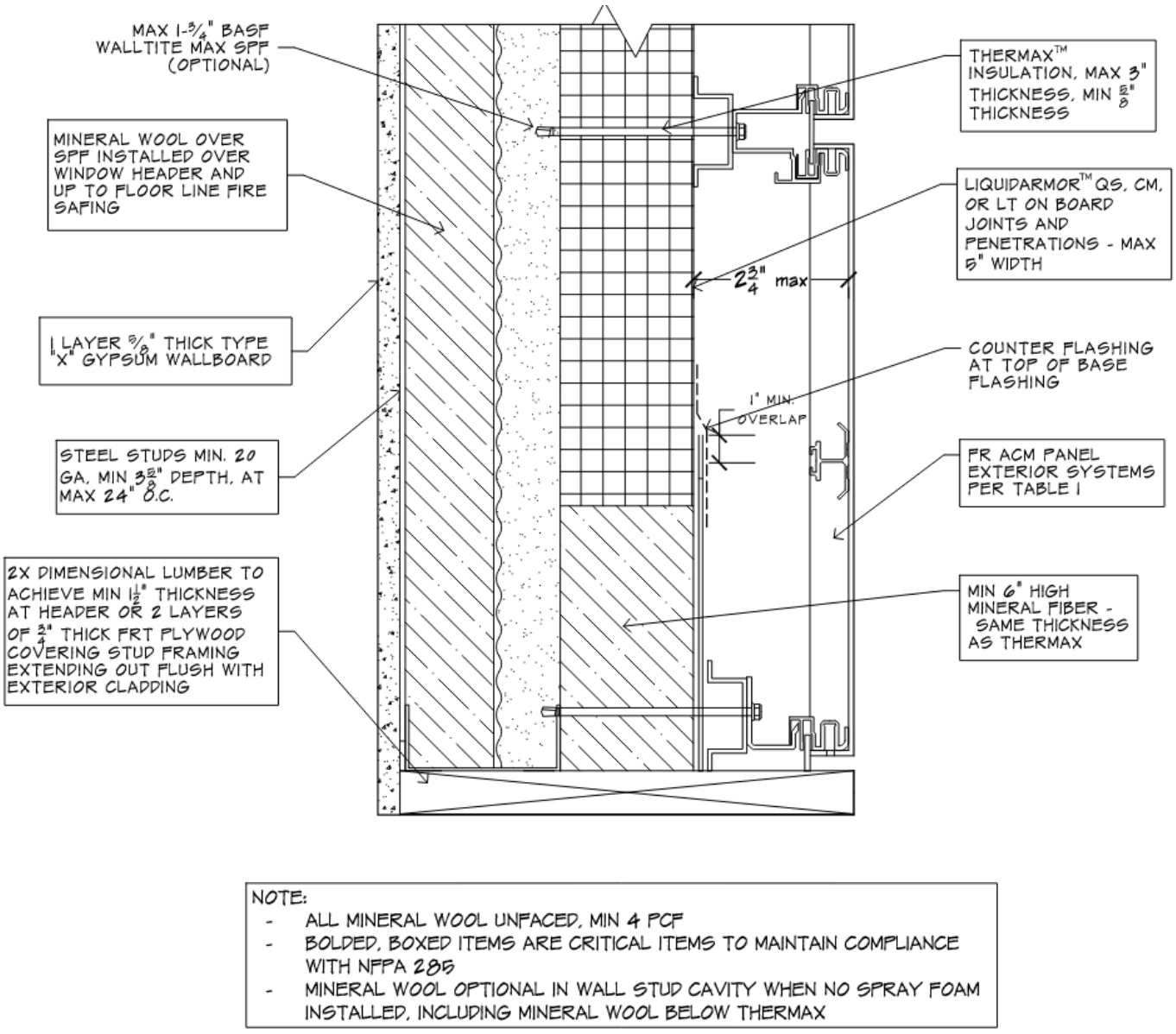


Figure 7 – Wall opening perimter protection (header shown) – 2x dimensional lumber or double 3/4-in. FRT plywood at header, jambs and sill – Table 3, Item 23c

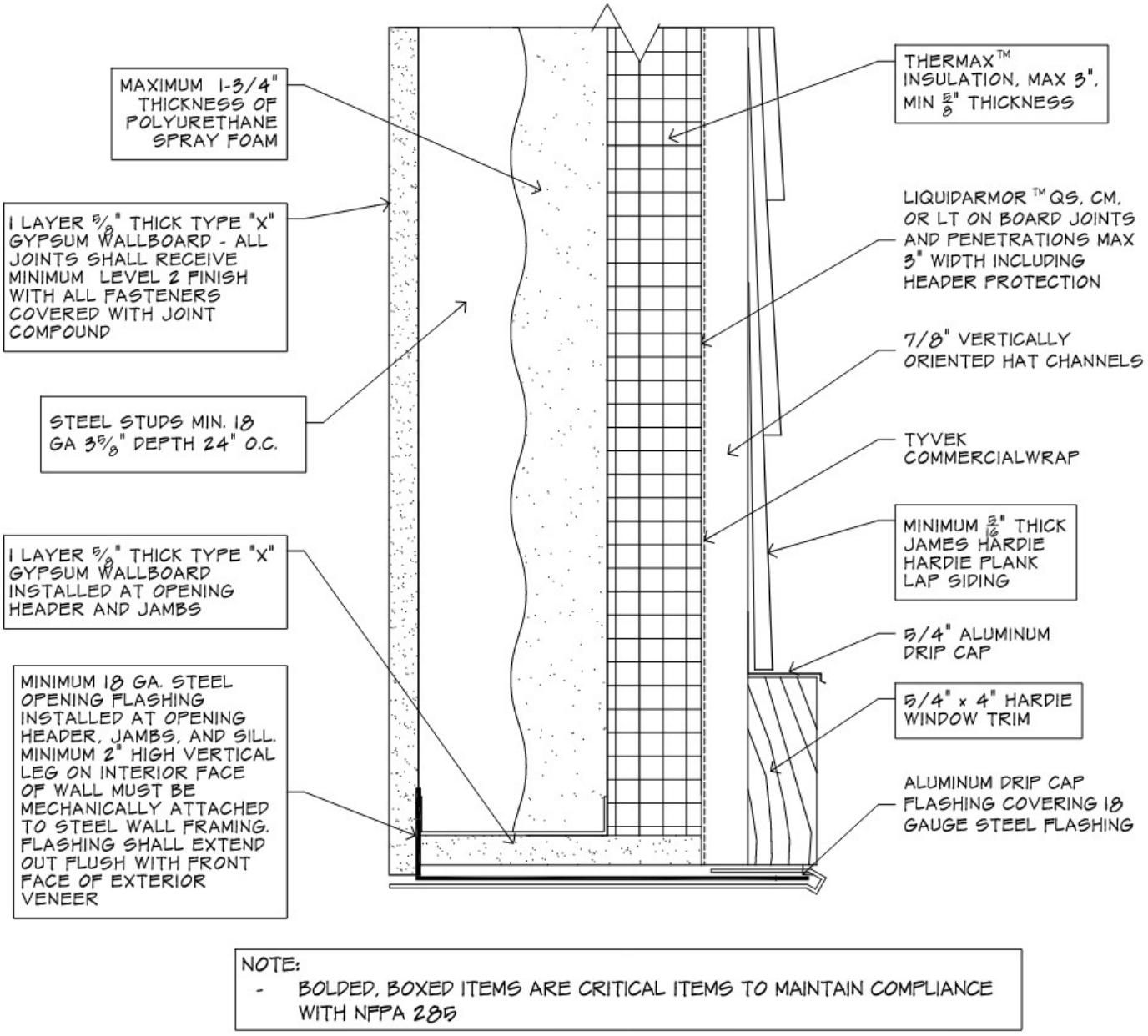


Figure 8 – Wall opening protection (header shown) – 5/8-in.-thick Type X gypsum wallboard covering stud framing and exposed edge of Thermax insulation with 18-ga. steel flashing at header, jambs and sill – Table 4, Item 33a

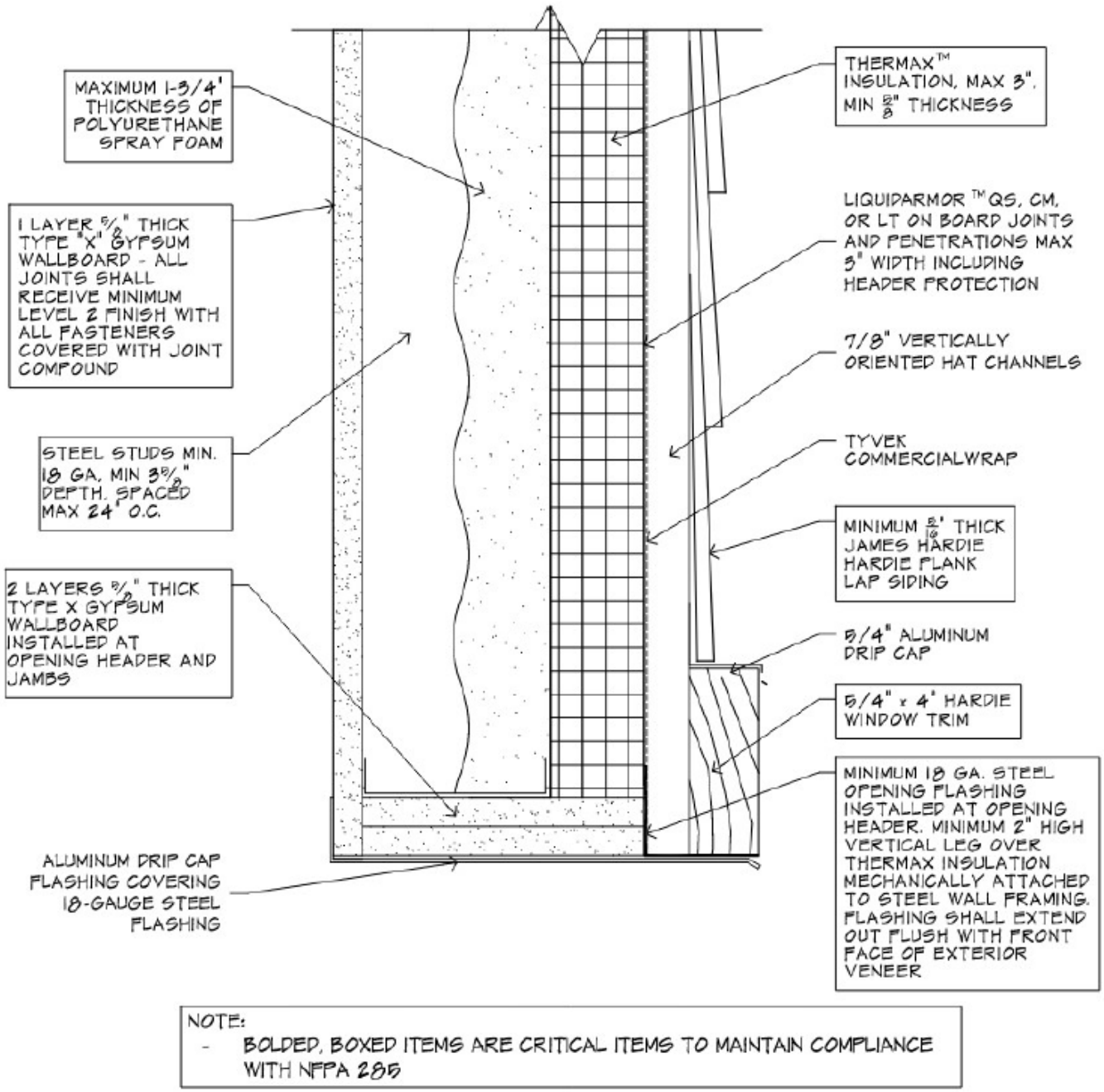


Figure 9 – Wall opening perimeter protection (header shown) – two layers of 5/8-in.-thick Type X gypsum wallboard covering steel framing and exposed edge of Thermax insulation with 18-ga. steel flashing continuing outboard to exteior cladding – Table 4, Item 33b.

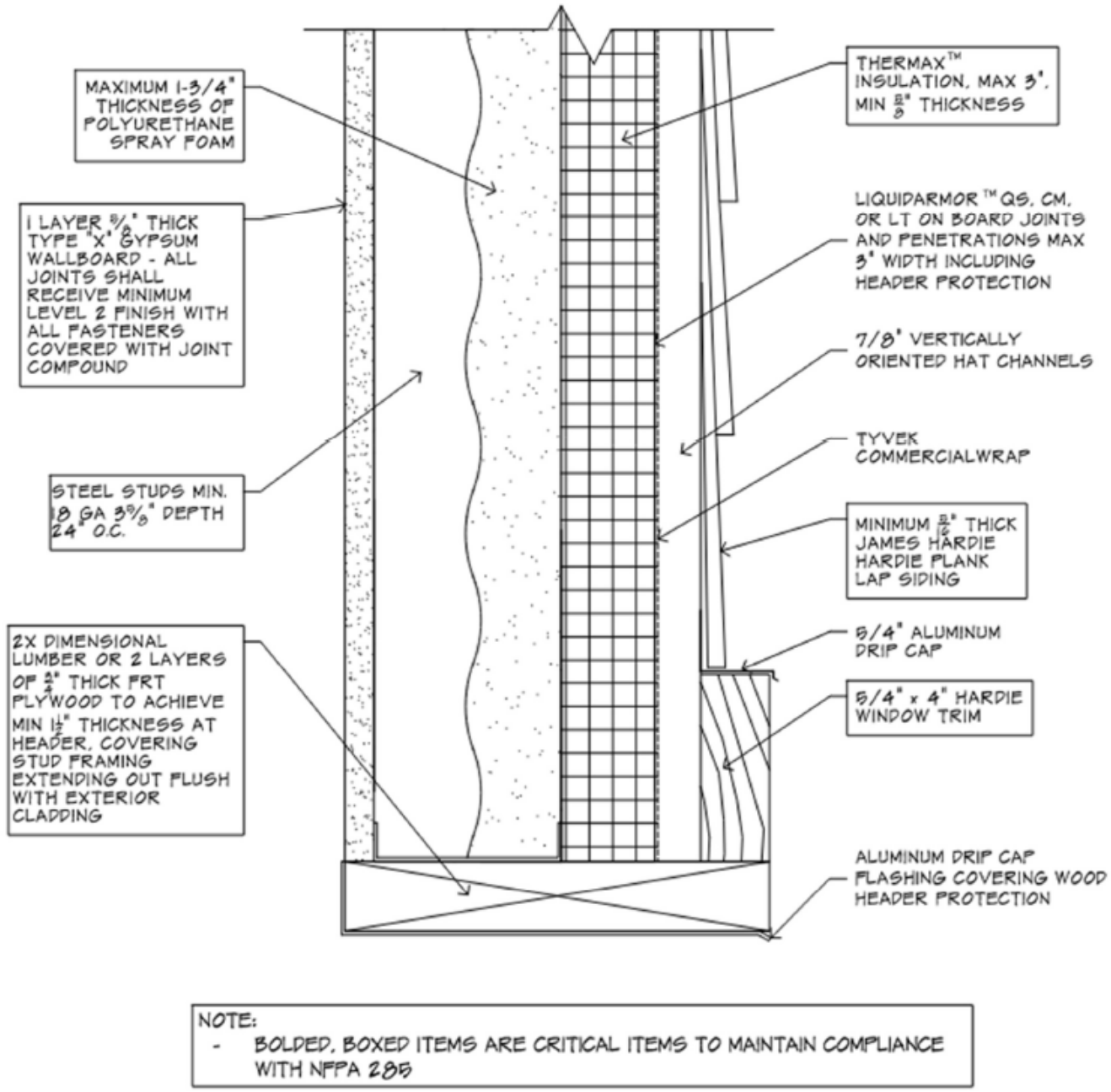


Figure 10 – Wall opening perimeter protection (header shown) – one layer of nominal 2x lumber of two layers of 3/4-in.-thick FRT plywood covering full depth of wall system – Table 4, Item 33c

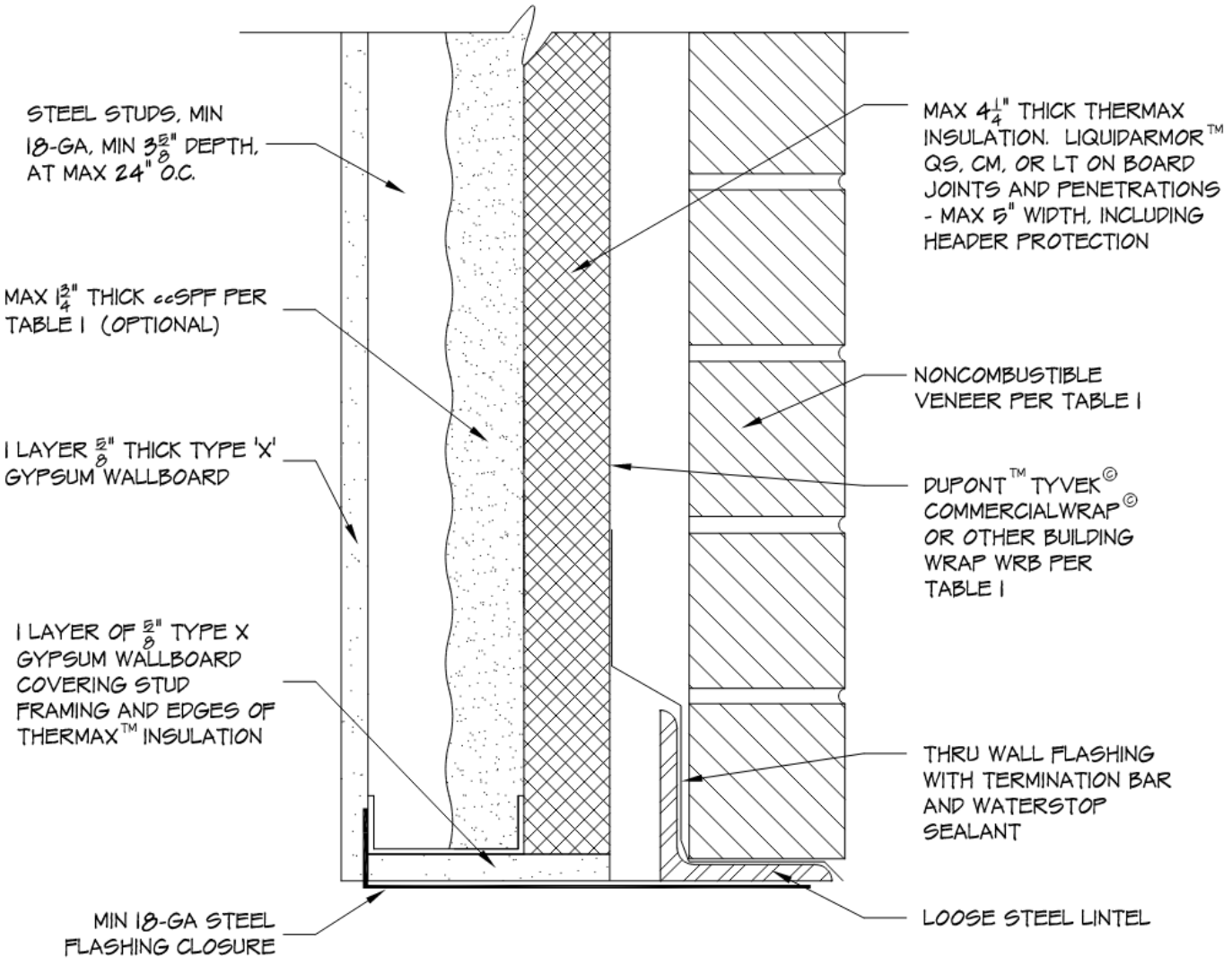


Figure 11 – Exterior wall construction – Thermax and ccSPF spray foam – Table 5 Opening Protection Item 31a

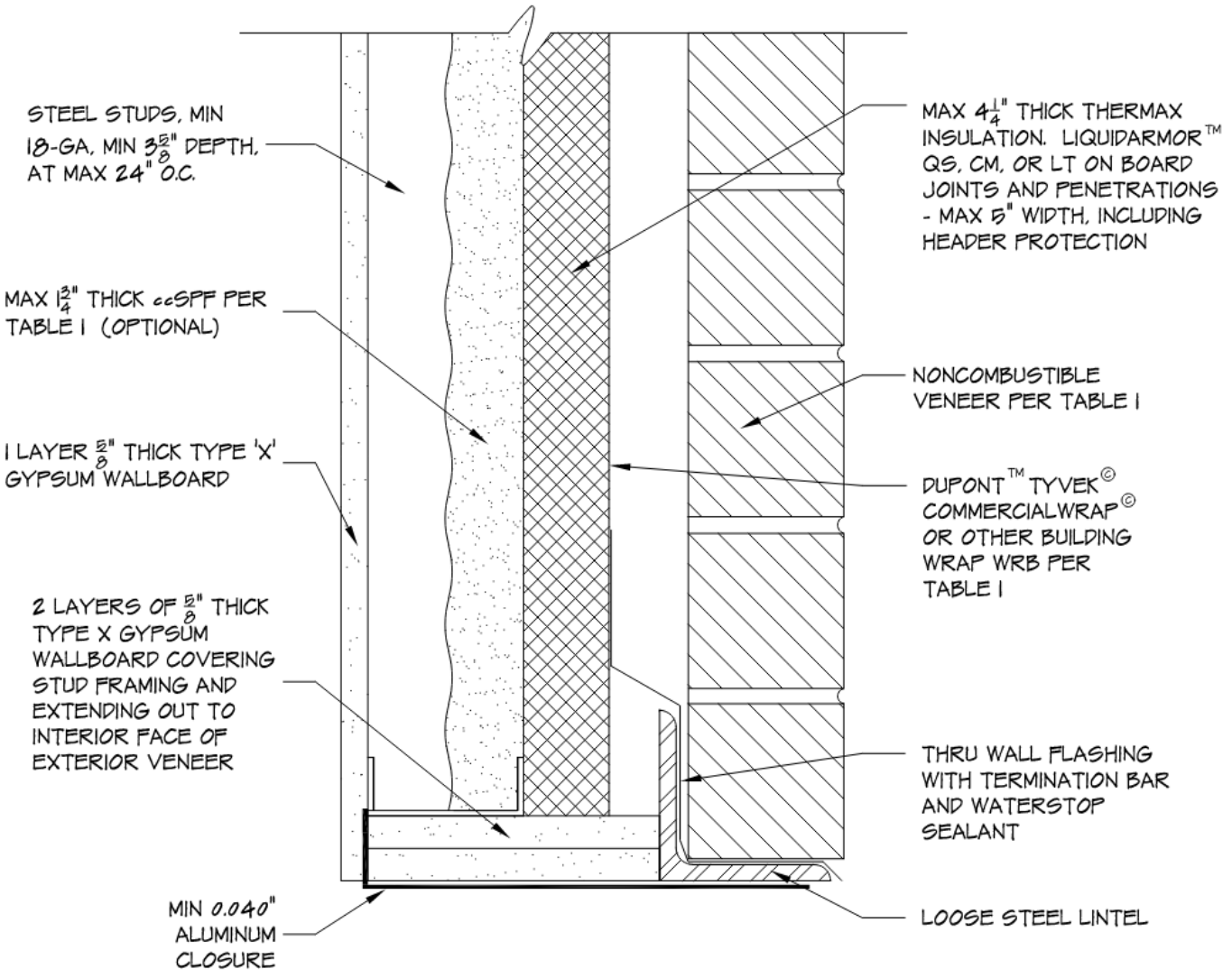


Figure 12 – Exterior wall construction – Thermax and ccSPF spray foam – Table 5 Opening Protection Item 31b

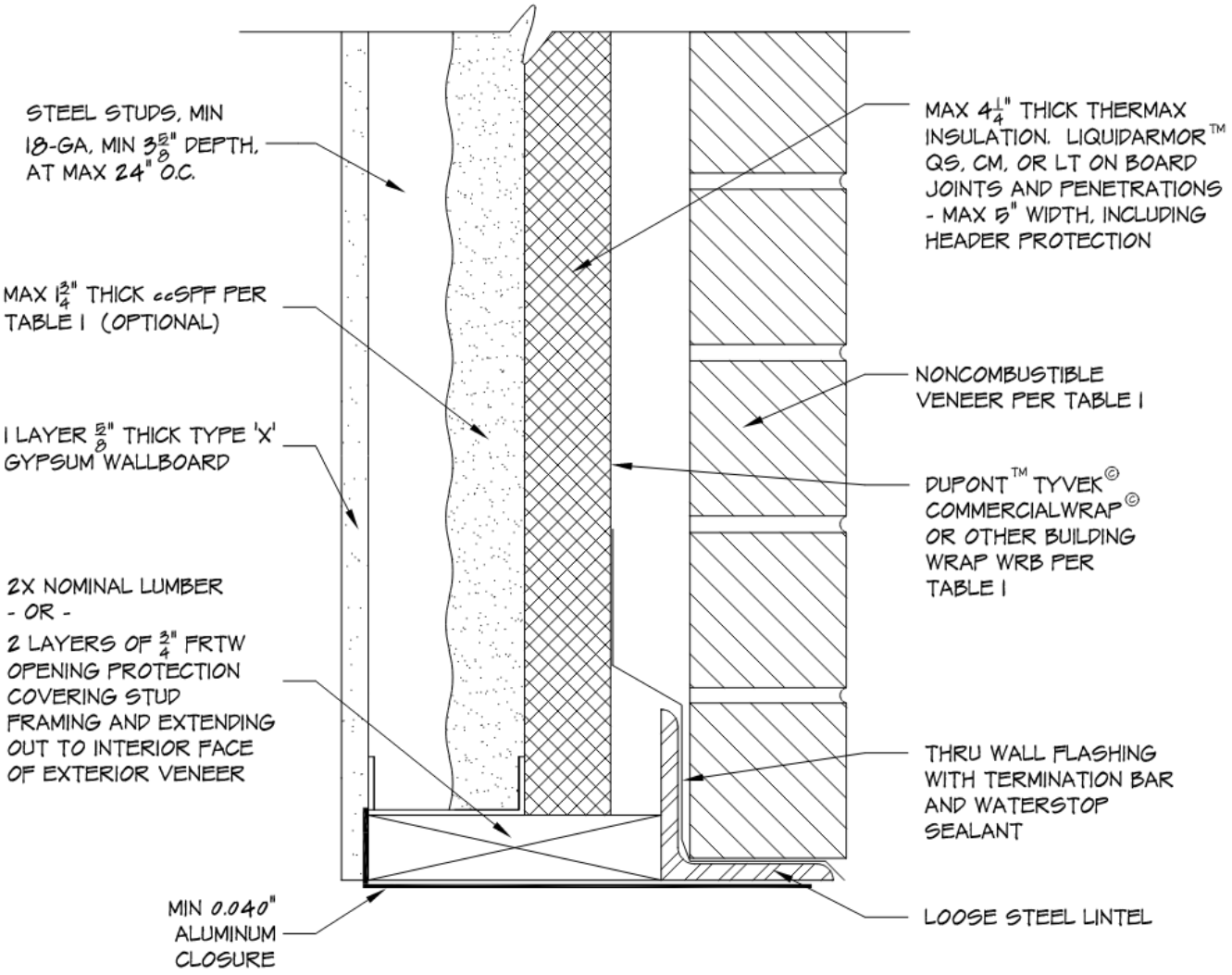


Figure 13 – Exterior wall construction – Thermax and ccSPF spray foam – Table 5 Opening Protection Item 31c

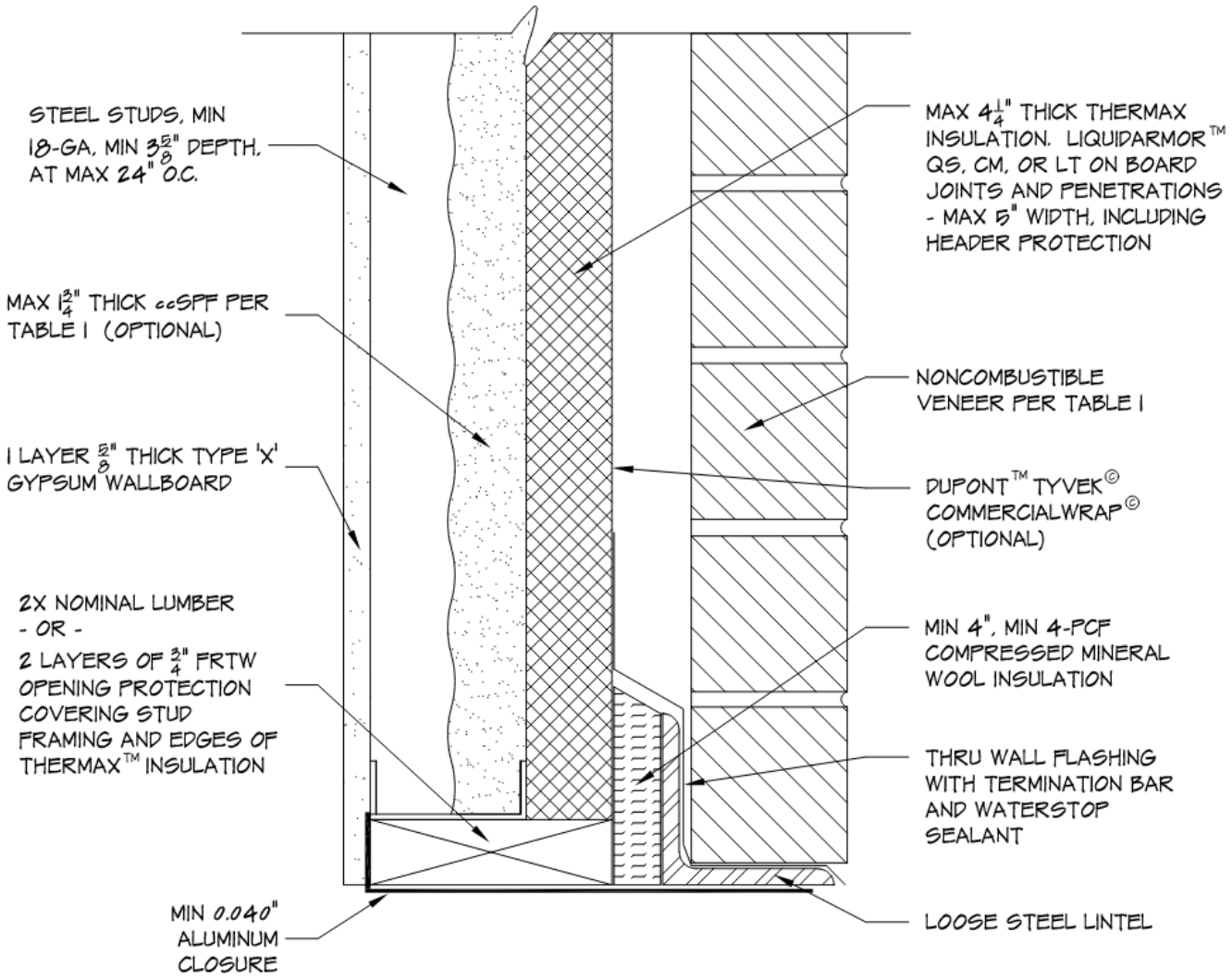


Figure 14 – Exterior wall construction – Thermax and ccSPF spray foam – Table 5 Opening Protection Item 31d

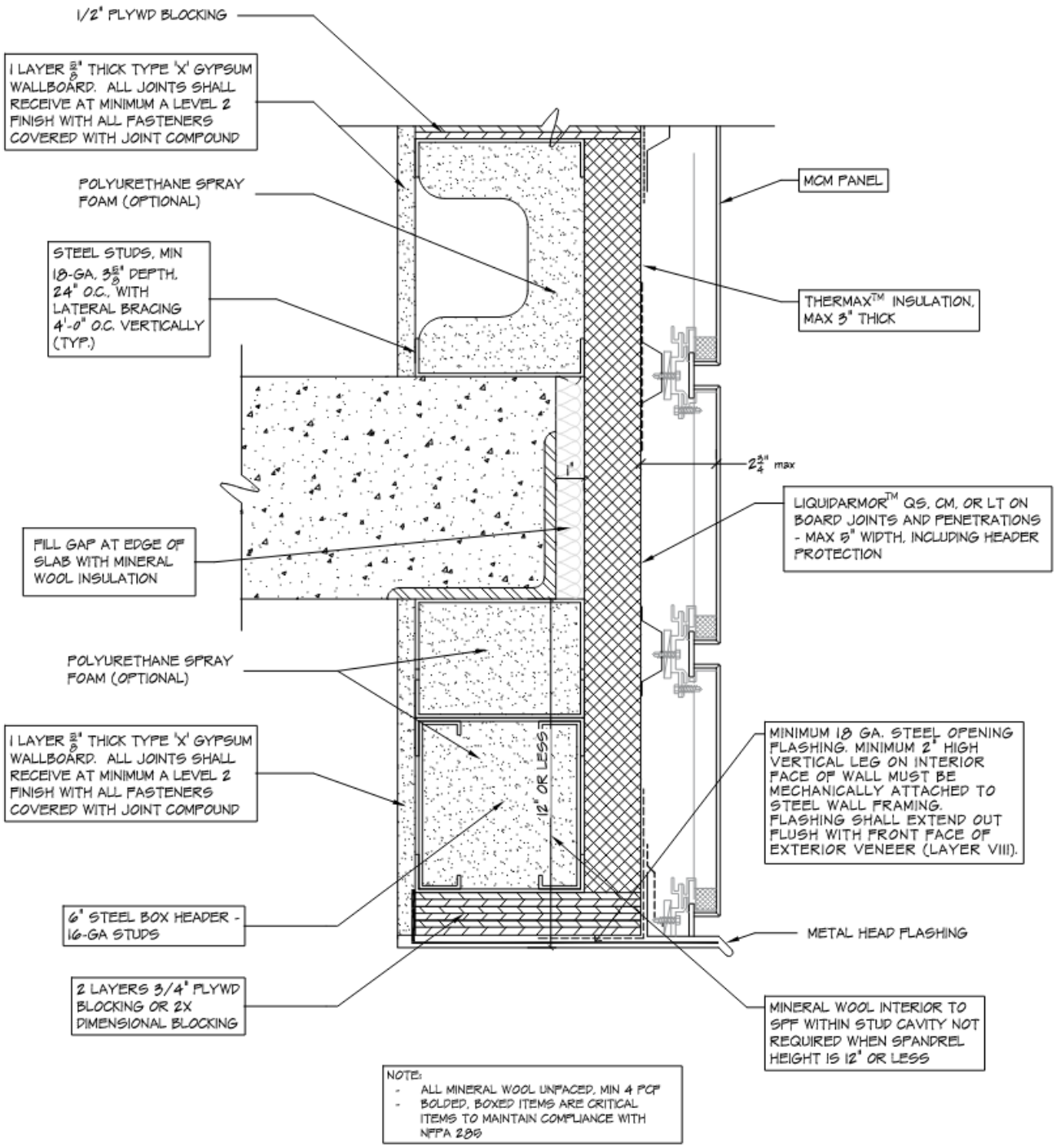


Figure 15 – Required opening head protection for infill wall construction with ACM Façade – Table 3

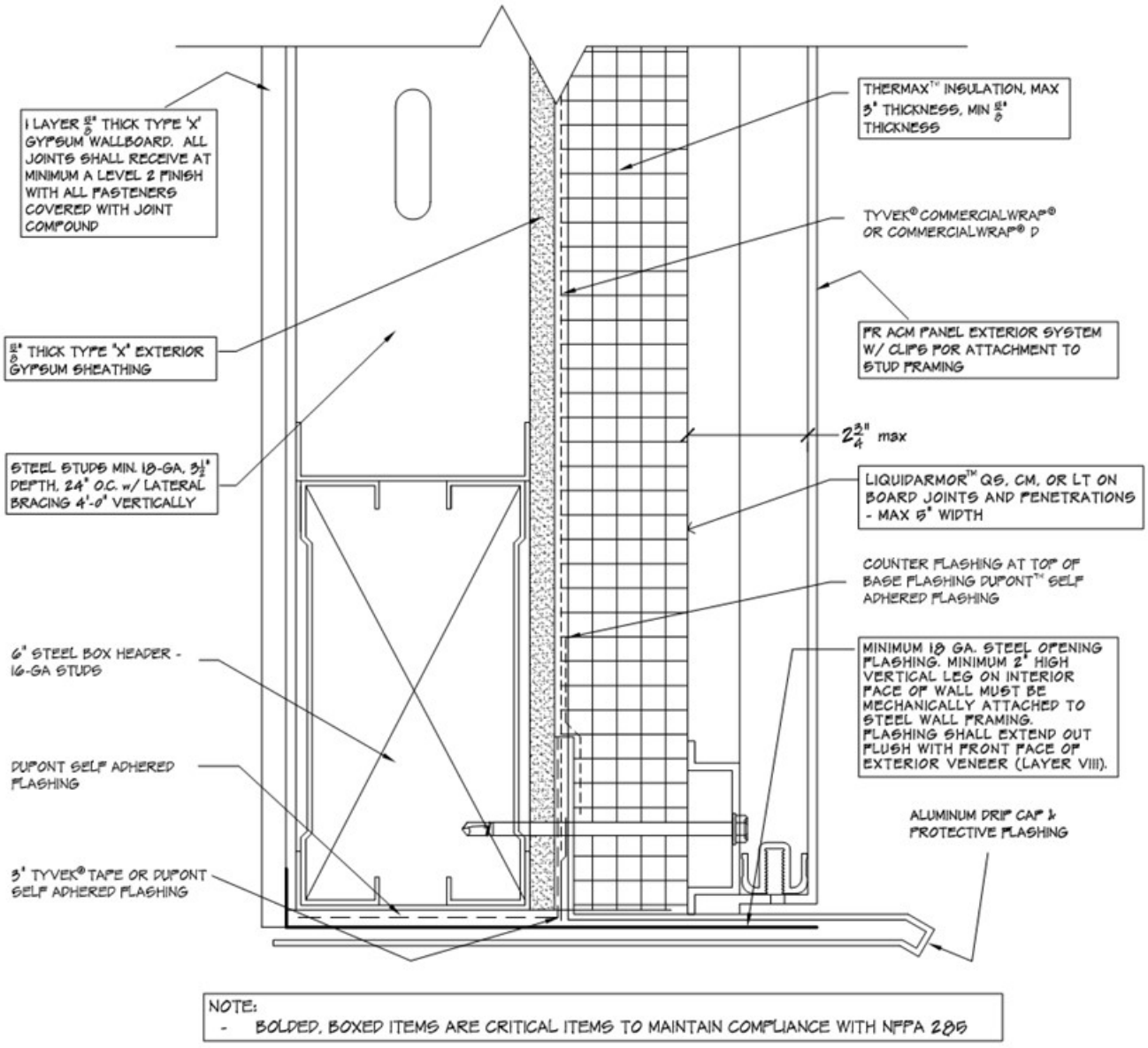


Figure 16 – Use of water-resistive barrier behind Thermax insulation – Table 3

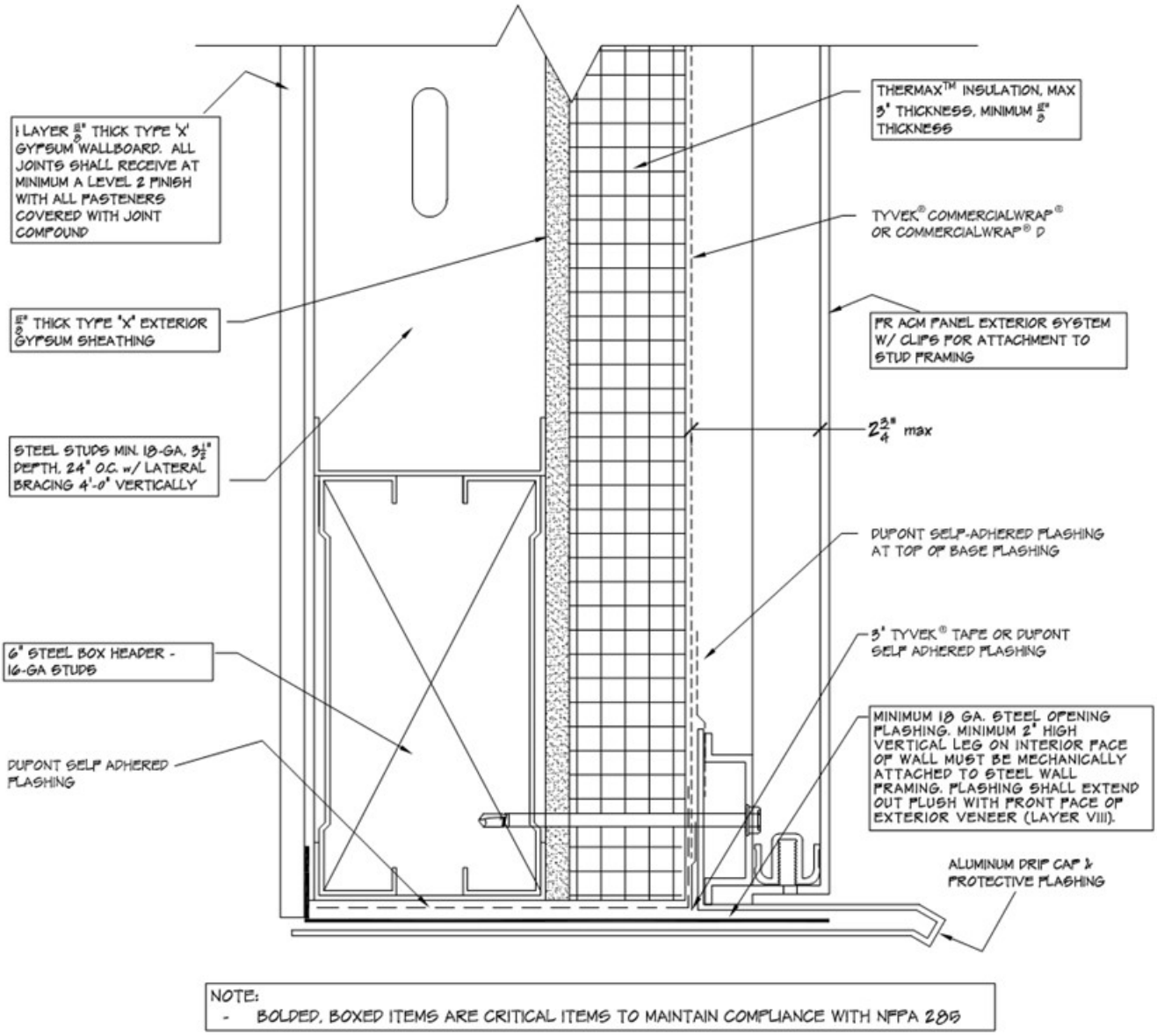


Figure 17 – Use of water-resistive barrier over Thermax insulation – Table 3

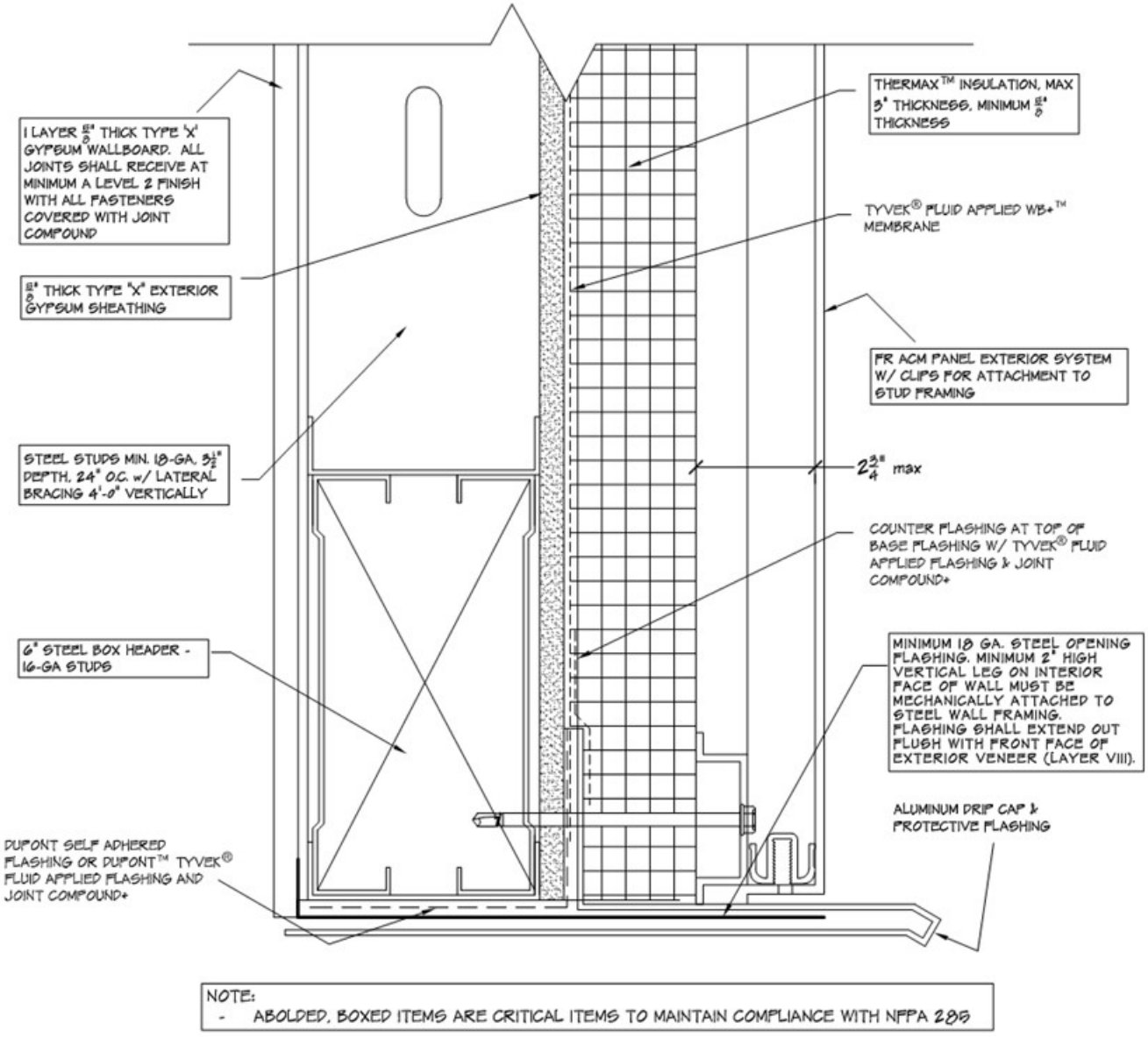


Figure 18 – Use of fluid-applied water-resistive coating behind Thermax insulation – Table 3

Step 1 *Step 2*

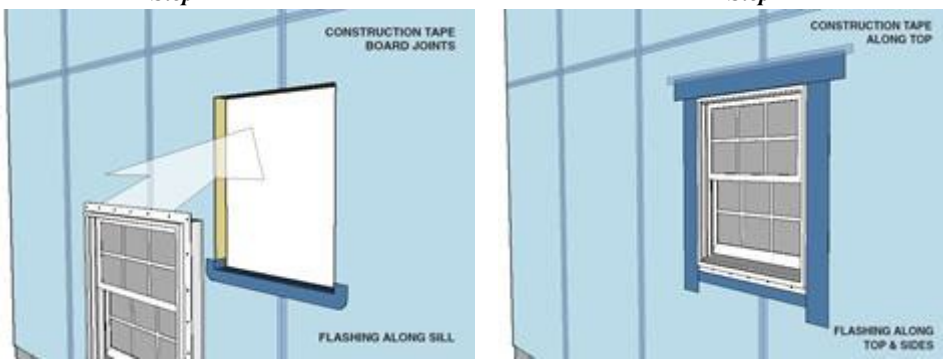
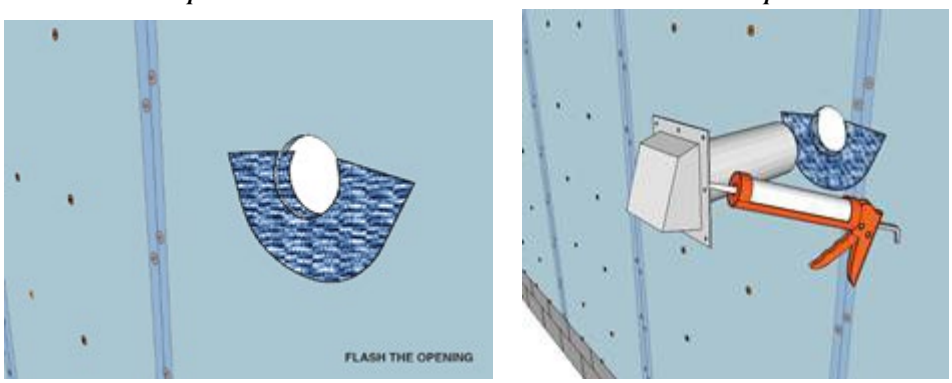


FIGURE 19—TYPICAL WINDOW FLASHING DETAIL

Step 1 *Step 2*



Step 3

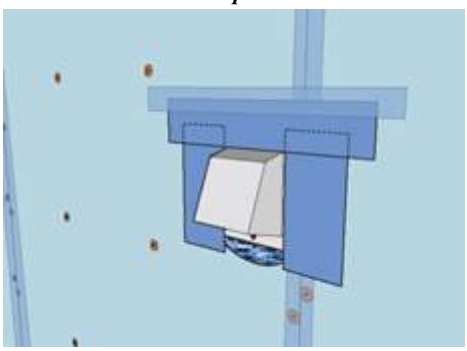


FIGURE 19—TYPICAL PENETRATION FLASHING DETAIL—FLANGED

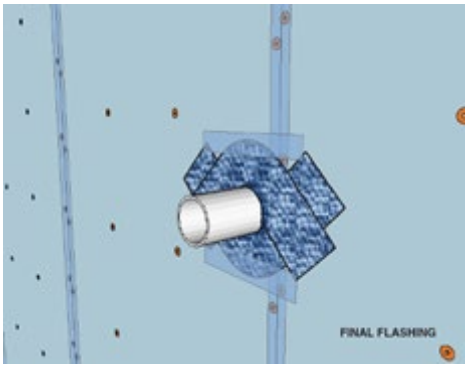


FIGURE 20—TYPICAL FLASHING DETAIL—UNFLANGED

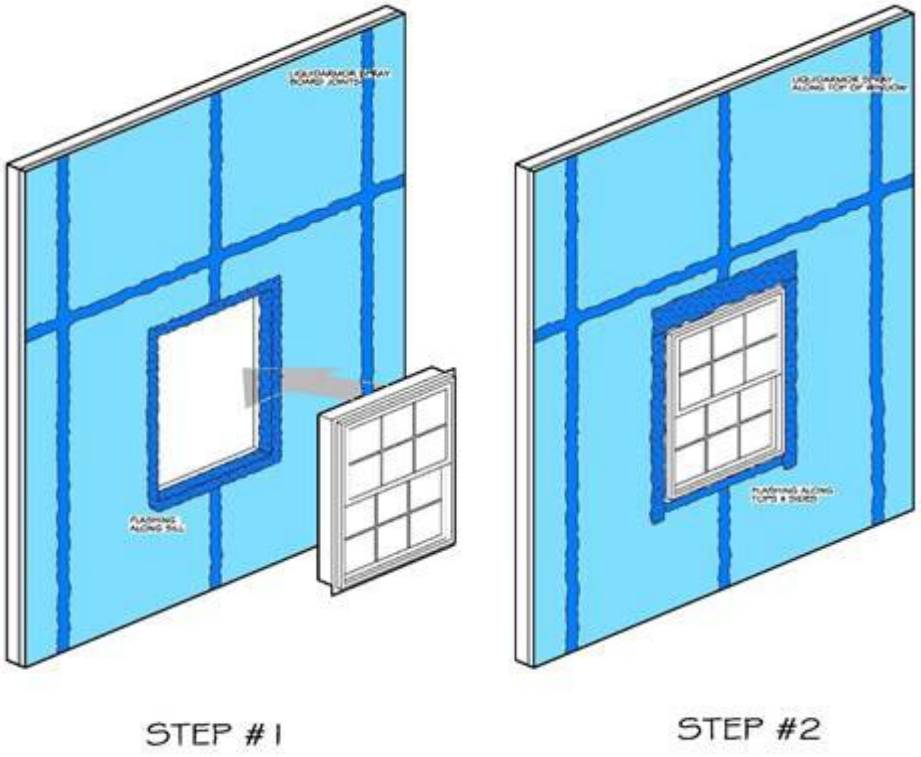


FIGURE 21—TYPICAL WINDOW FLASHING DETAIL

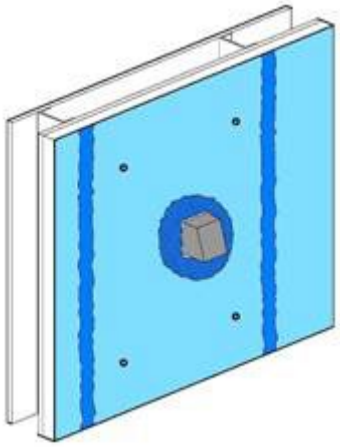


FIGURE 22—TYPICAL PENETRATION FLASHING DETAIL—FLANGED

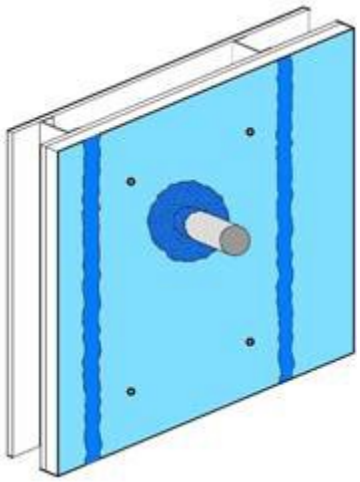


FIGURE 23—TYPICAL FLASHING DETAIL—UNFLANGED