

October 24, 2025

Renewal Scheduled: October 24, 2026

DuPont Performance Building Solutions
1501 Larkin Center Drive
Midland, MI 48642

RE: DuPont™ ArmorWall™ Systems – NFPA 285 Compliant Exterior Wall Constructions Technical
Justification
Jensen Hughes Project No. 1JJB05306.011

To Whom It May Concern:

Compliance with NFPA 285, *Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components*, (2023 Edition) is required by the building codes for exterior wall assemblies containing combustible materials to ensure excessive vertical and lateral exterior flame spread will not occur during a fire event. Use of a foam plastic insulation in an exterior wall assembly, such as the DuPont™ ArmorWall™ System, is a trigger requiring compliance with NFPA 285. Specifically, Section 2603.5.5 of the 2024 and prior editions of the International Building Code (IBC) require exterior wall systems of any height incorporating foam plastic insulation materials to meet the requirements of NFPA 285 on buildings of Types I, II, III, and IV construction.

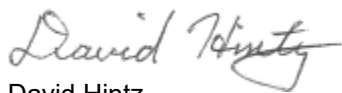
DuPont™ has conducted successful NFPA 285 testing on exterior wall assemblies incorporating the ArmorWall system with various exterior cladding systems. The NFPA 285 test reports listed in the “Test References” section in Appendix A are the basis for the NFPA 285 compliance table herein.

Based on Dupont’s™ NFPA 285 testing data and our experience in conducting and witnessing NFPA 285 tests, it is our opinion that the various exterior wall configurations described in Table 1 with the floorline firestopping details as shown in Figures 1 through 4 will meet the performance requirements of NFPA 285 when installed in accordance with the manufacturer’s installation instructions.

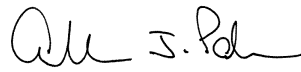
This analysis is based on the specific construction materials tested in the manner described in the referenced test report(s). Changes or modifications to the construction or materials used in the tested assemblies may result in a different fire performance and may change this analysis.

We trust this engineering analysis will be of use to DuPont™. Should you have any questions regarding our analysis, please contact us at 443-313-9891 or at aparker@jensenhughes.com.

Sincerely,



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Lead Engineer



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Table 1 –DuPont™ ArmorWall™ NFPA 285 Compliant Exterior Wall Constructions

Wall Component	Materials (Select only one item per wall component row)
Interior Wall Covering	1. Interior Gypsum Wallboard Panel: Minimum 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 and is required for all compliant Steel Stud Framing or Wood Stud Framing Base Wall Systems. 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. 2. None: Interior gypsum wallboard not required for Concrete or CMU Base Wall Systems.
Base Wall System	3. Concrete 4. Concrete Masonry Unit (CMU) 5. Steel Stud Framing: Minimum 35/8-inch depth, minimum 20-gauge at a maximum spacing of 24-inch on center. 6. FRT Wood Stud Framing: Nominal 2-inch × 4-inch or greater fire retardant treated (FRT) wood studs spaced at a maximum of 24-inch OC. Minimum two top plates at the top of the wall. Wood Stud Framing <u>does not permit</u> Spray Polyurethane Foam Stud Cavity Insulation.
Floor Line Firestopping Required	7. Infill Wall Construction – Minimum 4 lb/ft³ mineral wool insulation installed between the edge of concrete floor slab and the interior face of DuPont™ ArmorWall™ for full slab depth. Gaps less than 1/4-inch measured from the slab edge face to interior face of DuPont™ ArmorWall™ do not require mineral wool (see Figure 1). 8. Platform-Framed Construction – Exposed foam of DuPont™ ArmorWall™ foam in floor interstitial space to be covered by minimum 4-inch thick, minimum 4 lb/ft³ mineral wool insulation mechanically attached to floor framing or minimum 13/4-inch thick rim joist. DuPont™ ArmorWall™ SP Plus system does not require additional protection on the interior face (see Figure 2). 9. Curtainwall and Balloon-Framed Construction – Minimum 4 lb/ft³ 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 DuPont™ ArmorWall™ Plus or DuPont™ ArmorWall™ SP Plus (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 Section 715.4 of the 2024 IBC.
Interior Air and Vapor Control Layer	10. None 11. 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.
Stud Cavity Insulation	12. None 13. Fiberglass - blown-in or batt insulation (faced or unfaced) 14. Mineral Wool - blown-in or batt insulation (faced or unfaced) 15. Closed-Cell Spray Polyurethane Foam (ccSPF) – Minimum 13/4-inch thickness of ccSPF applied using interior faces of DuPont™ ArmorWall™ Plus or DuPont™ ArmorWall™ SP Plus as substrate and covering the width of the wall stud cavity and inside of the stud flange. Approved products include: • BASF WALLTITE LWP or MAX ccSPF per Intertek CCRR-0374; or • Huntsman Building Solutions Heatlok HFO Pro ccSPF per IAPMO UES Evaluation Report No. ER-565
Exterior Sheathing	16. None 17. Exterior Gypsum Sheathing: Minimum 5/8-inch thick, Type X exterior gypsum sheathing panels complying with ASTM C1177. 18. Fire Retardant Treated Wood Sheathing: Any thickness of FRT plywood or FRT OSB may be installed on exterior face of stud framing.
Fire-Rated Structural Insulated Sheathing	19. DuPont™ ArmorWall™ Plus – maximum 33/4-inch thick sheathing panels (1/2-inch thick magnesium oxide board fused to 31/4-inch thick polyurethane foam plastic insulation) with integrated water-resistive barrier installed vertically or horizontally and attached directly to

Wall Component	Materials (Select only one item per wall component row)
	framing with the insulation facing inward. DuPont™ LiquidArmor™ used at all panel edges, seams, and fasteners installed per manufacturer's installation guide (max 4-inch width, max 50 mils dry film thickness). 20. DuPont™ ArmorWall™ SP Plus – maximum 4¼-inch thick sheathing panels (¾-inch thick polyurethane foam plastic insulation core with one layer of ½-inch thick magnesium oxide board fused to each side of the polyurethane foam) with integrated water-resistive barrier installed vertically or horizontally and attached directly to framing with the uncoated sheathing layer facing inward. DuPont™ LiquidArmor™ used at all panel edges, seams, and fasteners installed per manufacturer's installation guide (max 4-inch width, max 50 mils dry film thickness).
Drainage Material Applied Over DuPont™ ArmorWall™	21. None 22. DuPont™ ArmorDry™ – Permitted for use behind any noncombustible Exterior Veneers. Noncombustible veneer to be installed with air gap that matches the overall thickness of the DuPont™ ArmorDry™ drainage mat (i.e. ArmorDry™ shall fully fill the air cavity between the Exterior veneer and the DuPont™ Armorwall™ Plus / SP Plus panel). A minimum 18-ga steel "L" flashing shall be installed at opening headers with the vertical leg secured to the exterior face of DuPont™ Armorwall™ Plus panels and horizontal leg extending underneath the ArmorDry™ drainage mat to the exterior face of the exterior veneer (refer to Figure 5). 23. DuPont™ ArmorDry™ and Lath– Permitted for use behind any noncombustible Exterior Veneers. Noncombustible veneer to be installed with air gap that matches the overall thickness of the DuPont™ ArmorDry™ drainage mat. A minimum 18-ga steel "L" flashing shall be installed at opening headers, as described above in the ArmorDry™ line item (refer to Figure 5). 24. 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). Masonry veneer only or use with other claddings Note: Drainage material not permitted under combustible claddings (e.g., HPL, MCM, Stone/Aluminum Honeycomb, EIFS) unless as successfully tested in accordance with NFPA 285.
Exterior Veneer	25. Brick - Standard nominal 4-inch thick clay brick with brick veneer anchors, installed maximum 24-inches OC vertically on each stud. Air gap between exterior insulation and brick to be a maximum of 2½-inches. Any standard non-open jointed installation technique can be used. 26. Concrete or Precast Concrete Panels – Minimum 1½-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. 27. 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. 28. Natural Stone or Artificial Stone Veneer – Minimum 2-inch thick natural stone veneer or minimum 1½-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. 29. Adhered Natural Stone, Artificial Stone, or Thin Brick – Minimum ¾-inch thick fully adhered stone set in nominal ¾-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. 30. Stucco – Minimum ¾-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 installed between the exterior insulation and lath where it is not an asphalt or butyl-based self-adhered membrane.

Wall Component	Materials (Select only one item per wall component row)
	31. Terracotta Cladding: a. Minimum 1¼-inch thick terracotta 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. b. Minimum ⅞-inch thick terracotta cladding system directly applied to DuPont™ Armorwall™ Plus or DuPont™ Armorwall™ SP Plus panel. 32. Fiber Cement - Minimum 5/16-inch thick fiber cement panel installed with butted joints or lap siding. Fiber cement panel may be installed over maximum ⅞-inch deep, minimum 20-gauge hat channels. 33. Thin Brick - Minimum ¾-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 ½-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. 34. 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. 35. Porcelain and Ceramic Tile: a. Minimum ⅝-inch thick, bonded using non-combustible mortar adhesive to minimum ½-inch thick cement board or gypsum sheathing. b. Minimum 6-mm thick Neolith porcelain tiles with maximum 3½-inch air cavity. 36. Metal Composite Material (MCM) Wall Panels – Use any Metal Composite Material (MCM) system that has been successfully tested by the panel manufacturer via the NFPA 285 test method. 37. Stone/Aluminum Honeycomb Composite Building Panels – Use any stone/aluminum honeycomb system that has been successfully tested in accordance with NFPA 285. Installed using standard installation techniques. Maximum air gap between fire-rated structural insulated sheathing and cladding shall be determined by successful testing in accordance with NFPA 285. 38. Autoclaved Aerated Concrete (AAC) Panels – Use any AAC panel system that has been successfully tested in accordance with NFPA 285. Installed using standard installation techniques. Maximum air gap between fire-rated structural insulated sheathing and cladding shall be determined by successful testing in accordance with NFPA 285. 39. Exterior Insulation Finishing Systems (EIFS) – Use any non-panelized, field installed EIFS installed using any standard installation techniques successfully tested in accordance with NFPA 285. Cladding Partner Specific Approvals: 40. Abet Laminati – 10-mm Meg FR Face fastened HPL system with maximum 1-inch air cavity space. ccSPF not permitted in exterior wall with HPL cladding system. DuPont™ ArmorBoard™ opening protection required around entire wall opening perimeter (header, jambs, and sill) with 18-ga steel “L” flashing installed at header only, as shown in Figure 6.
Opening Protection	41. No additional protection is required around windows, doors, and/or other openings in the wall, unless otherwise noted above.
Flashing of Windows, Doors, and Other Exterior Wall Penetrations	42. 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.

IN-FILL FRAMED Concrete Floor

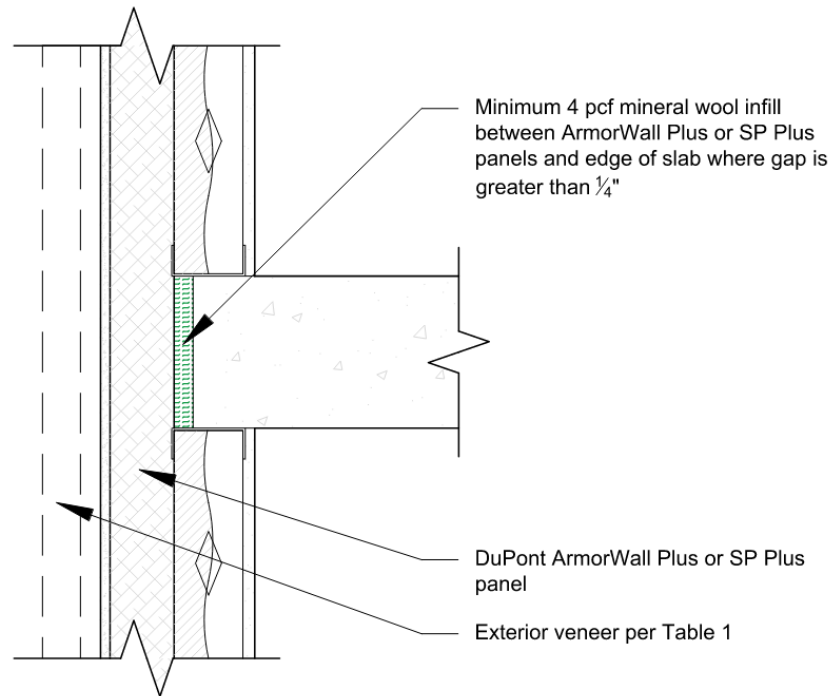


Figure 1. In-fill frame construction floor lining condition

PLATFORM FRAMED FRT Wood Framing

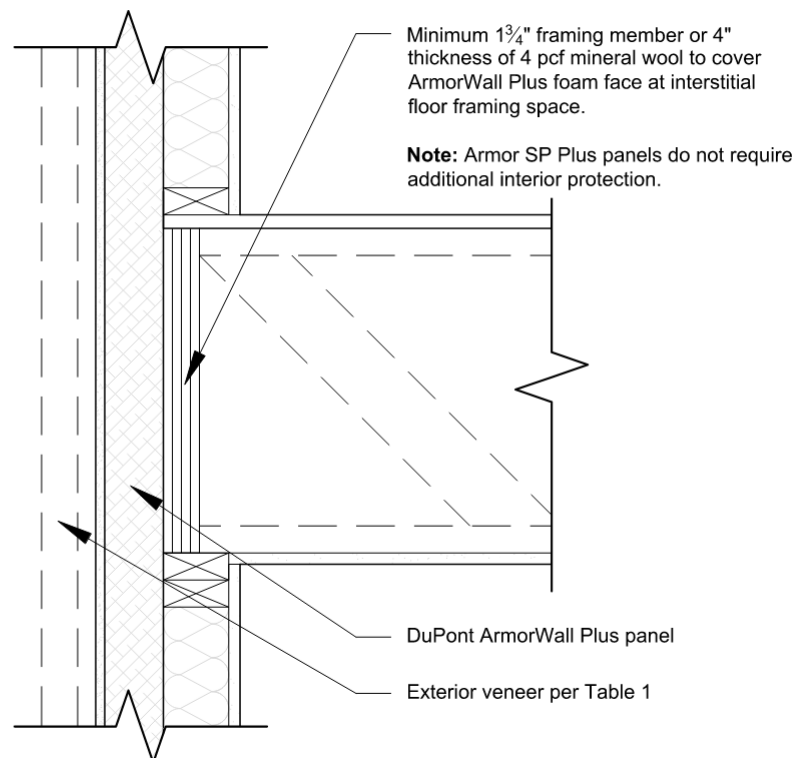


Figure 2. Platform frame construction floor line condition

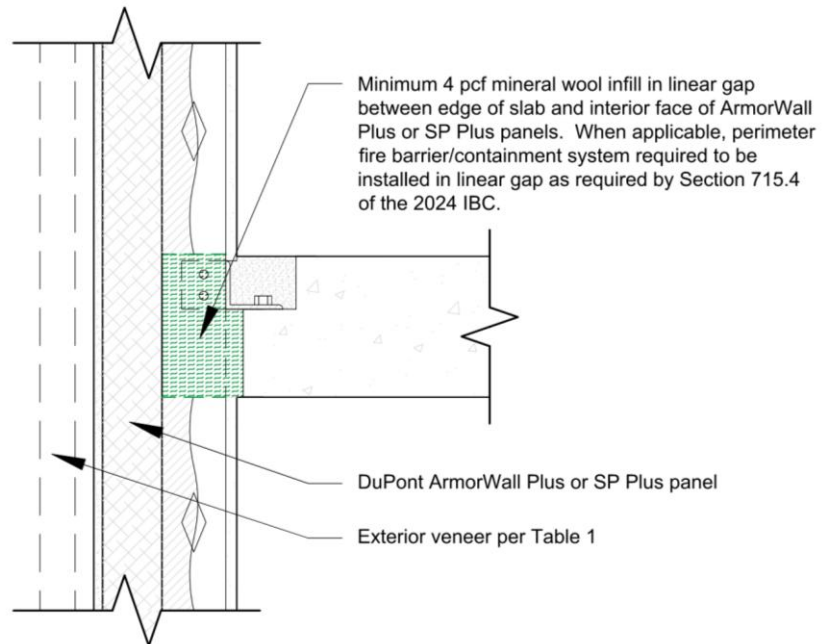
CURTAINWALL FRAMED
Concrete Floor

Figure 3. Curtain wall frame construction floor line condition

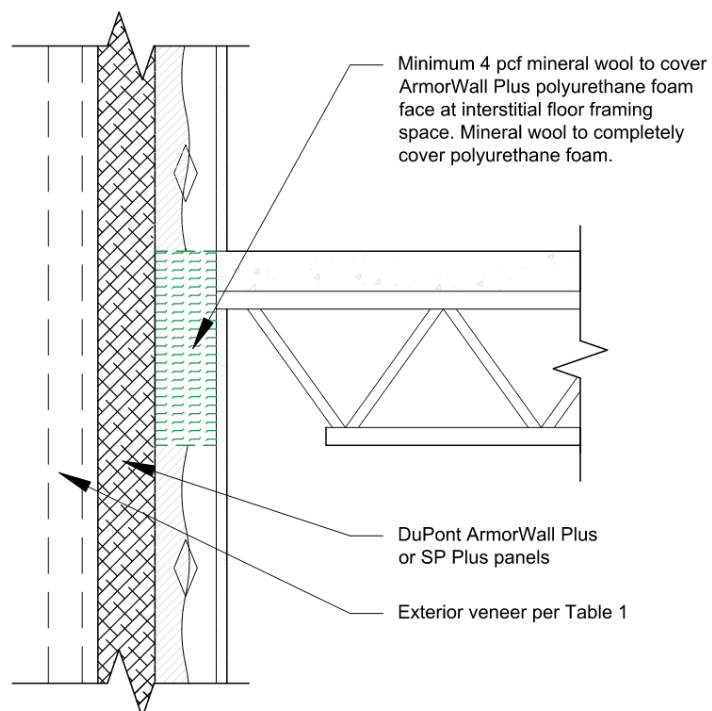
CURTAINWALL/BALLOON FRAMED
Steel Framing

Figure 4. Balloon frame construction floor line condition

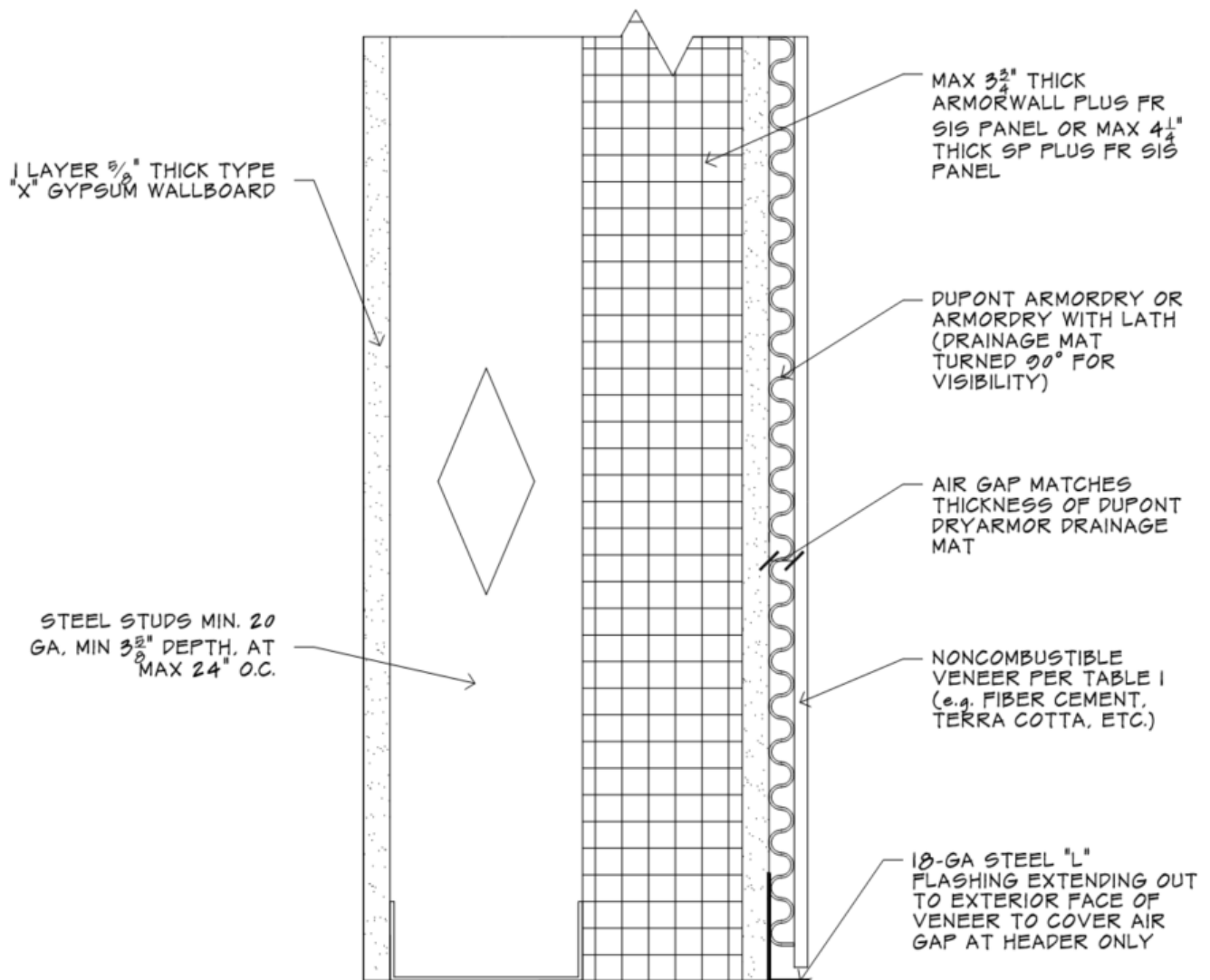


Figure 5. Header protection detail when DuPont™ ArmorDry™ (Table 1 Items 22 or 23) is used.

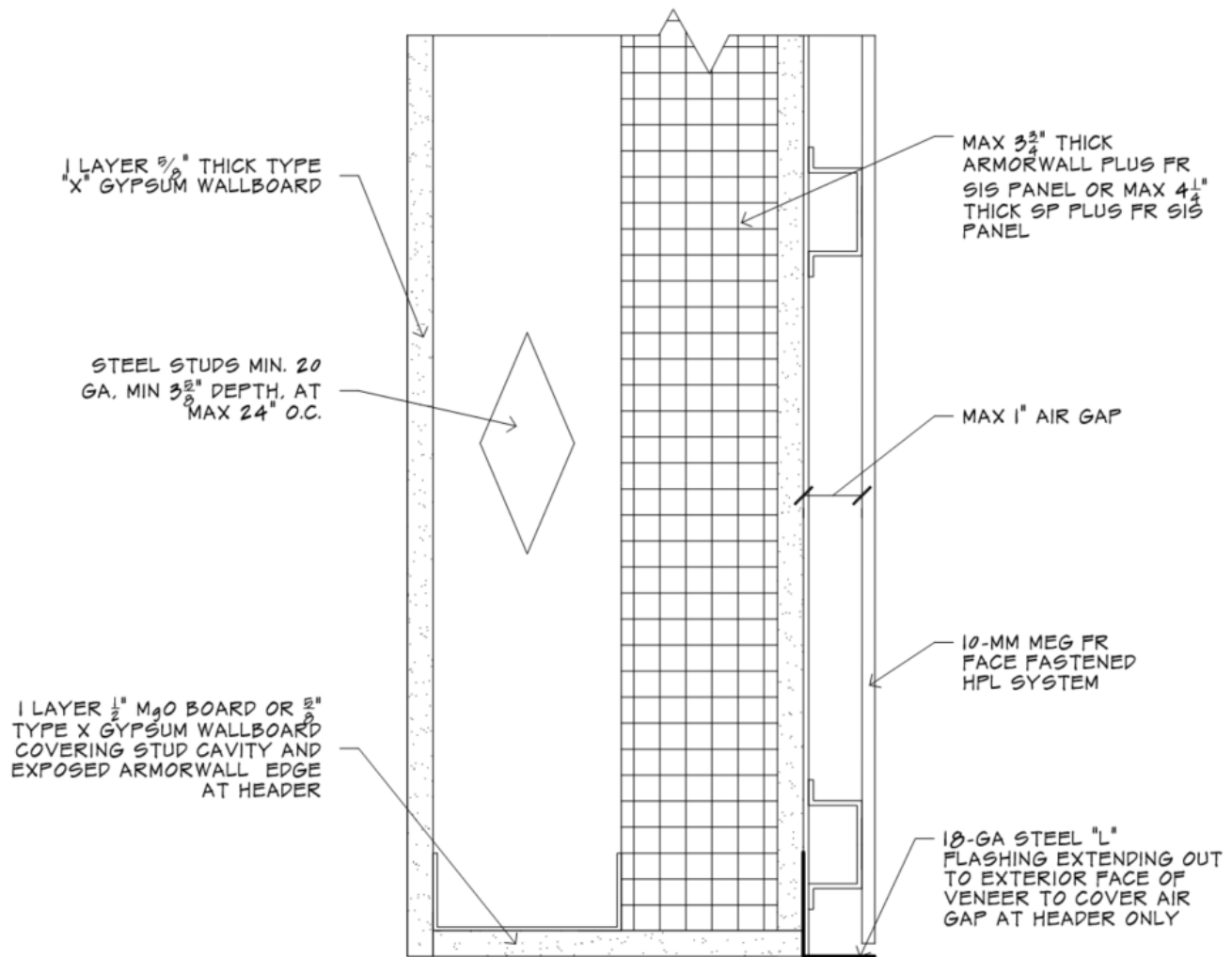


Figure 6. Header protection detail when Abet Laminati (Table 1 Item 40) cladding used.

Appendix A – NFPA 285 Compliance Engineering Analysis Technical justification

Jensen Hughes has reviewed the NFPA 285 test reports of the DuPont™ ArmorWall™ system listed in the *Report References* section of this letter. Based on an analysis of the test results and our experience with NFPA 285, alternate compliant exterior wall constructions have been developed and are contained in Table 1. The technical justification for these alternate wall constructions maintaining compliance with NFPA 285 is provided below.

1. Base Wall Assemblies

1.1. MASONRY BASE WALLS

The majority of the referenced NFPA 285 test assemblies used DuPont™ ArmorWall™ Plus installed over the exterior face of steel studs with a single layer of 5/8-inch thick Type X gypsum wallboard installed continuously over the interior face of the studs. In this installation scenario the only material protecting the combustible polyurethane face of the DuPont™ ArmorWall™ is the interior 5/8-inch thick Type X gypsum wallboard. Concrete and concrete masonry unit (CMU) walls are included as acceptable alternate base wall assemblies in Table 1 as they will provide improved interior face protection to the foam face of the DuPont™ Armorwall compared to the single gypsum wallboard.

Table 1 of the Concrete Masonry & Hardscapes Association (CMHA) TEK 07-01D, *Fire Resistance Ratings of Concrete Masonry Assemblies* [T1], provides minimum concrete thicknesses for various hourly fire-resistance ratings. A normal calcareous or siliceous gravel concrete wall with a minimum thickness of 2-inches will provide a 30-minute fire-resistance rating; a rating equal to the duration of the NFPA 285 test. Exterior wall assemblies will typically require a concrete wall thickness greater than 2-inches for structural reasons. Table 2 of CMHA TEK 07-01D states that the equivalent thickness of nominal typical 4-inch-thick hollow CMU blocks is 2.7 inches and increases for blocks of greater nominal thickness. Based on these typical thicknesses of concrete and CMU block walls, and the fire resistance performance of a concrete or CMU block base wall assembly will provide the same or better fire performance than the typical test condition of steel studs with a single interior layer of 5/8-inch-thick Type X gypsum wallboard. Therefore, cast concrete or CMU block walls are an acceptable alternate base wall construction to maintain compliance with NFPA 285.

1.2. STEEL STUD FRAMED BASE WALLS

The typical DuPont™ ArmorWall™ test condition [R2, R4, R5, R6, R7, R8] consisted of steel stud wall assemblies utilizing 35/8-inch deep, 20-gauge steel stud spaced at 24 inches on center with a single layer of 5/8-inch thick Type X gypsum wallboard covering the interior face of the studs. A steel stud/gypsum wallboard base wall assembly incorporating heavier gauge studs, decreased stud spacing, and/or deeper studs will provide improved fire performance of the wall assembly. Commentary in the front of the UL Fire Resistance Directory as well as Section 12.5 of ASTM E2032, *Standard Guide for Extension of Data from Fire Endurance Tests*, supports this conclusion. Therefore, Table 1 allows for studs of greater depth than 35/8 inches, gauge thicknesses of 20-gauge or greater, and stud spacings of maximum 24-inches on center.

The steel stud framed test assemblies were either protected on the interior side with one layer of 5/8-inch thick Type X gypsum wallboard, or one layer of 1/2-inch thick DuPont™ ArmorBoard™ (MgO board). Type X gypsum wallboard is the standard interior sheathing material that is included in many NFPA 285 compliant wall constructions. In referenced test report [R1] 1/2-inch thick DuPont™ ArmorBoard™ was used as the interior sheathing over the fire-retardant treated (FRT) 2x4 wood stud framing and DuPont™ ArmorWall™ Plus panels. The DuPont™ ArmorBoard™ demonstrated the ability to protect the combustible insulation of the DuPont™ ArmorWall™ and the framing for the 30-minute test period sufficiently to comply with NFPA 285. Therefore, one layer of 1/2-inch DuPont™ ArmorBoard™ is also approved for use in steel stud wall assemblies in Table 1.

1.1. WOOD STUD-FRAMED BASE WALLS

Referenced test report [R1] used 2×4 dimensional fire-retardant treated (FRT) wood studs, spaced 24 inches on center, and was protected on the interior face with one layer of ½-inch thick layer of ArmorBoard. The wall framing was constructed with a triple header/footer plate splice at the horizontal centerline of the assembly, which coincided approximately with the location of the apparatus floor line. Post-test photos with the interior gypsum board removed showed charring/discoloration of the vertical studs in the immediate area of exposure in the first-story occurred, but there was no observable damage to the studs above the triple plate splice. The bottom-most plate of the splice showed minor charring and discoloration but did not exhibit significant charring indicating consumption of the wood. The second and third plates of the splice showed no appreciable thermal damage. Based on this tested base wall condition, Table 1 allows for base walls constructed of 2×4 FRT wood framing with the option to use one layer of ½-inch thick ArmorBoard or one layer of ⅝-inch thick Type X gypsum wallboard on the interior face of the stud framing. Table 1 allows for the use of double top plates at the header of walls based on the minimal damage observed to the underside of the triple plate splice of the assembly in the referenced test report. Also, a double top plate is more consistent with code requirements.

2. Floor Line Firestopping

Section 718.2 of the 2021 version of the International Building Code (IBC) requires concealed combustible spaces in walls to be fireblocked to close off concealed draft openings. Specifically, Section 718.2.2 requires in walls with parallel studs, that fireblocking be provided “*vertically at the ceiling and floor levels*”. The performance criteria of NFPA 285 mirrors this code requirement, as one of the pass/fail criteria is that flame cannot be observed above the floor line on the interior side of the wall. NFPA 285 test assemblies typically include either a 4- or 8-inch depth of mineral wool friction fit between the edge of the apparatus slab edge and the exterior sheathing (i.e. filling the stud cavity) demonstrating an acceptable method of complying with this code requirement.

Figures 1 through 4, supplementary to this document, show various slab edge conditions which satisfy Section 718.2 of the IBC, and will also maintain the NFPA 285 compliance of the exterior wall assembly. Additionally, per Section 715.4 of the IBC, when a void exists between the edge of the slab and the exterior wall (e.g. as shown in Figure 4), an hourly rated perimeter fire barrier system complying with ASTM E2307 must be installed at the slab edge. Jensen Hughes does not purport that the Figures 1 through 4 slab edge conditions provide hourly F-ratings. This document only supports that these conditions will satisfy Section 718.2 of the code.

2.1. IN-FILL FLOOR LINE CONDITION

The in-fill framing slab edge conditions are shown in Figure 1. In this condition, the concrete floor slab penetrates either partially or completely through the wall stud cavity and minimum 4-pcf mineral wool is friction fit between the interior foam insulation surface of the DuPont™ ArmorWall™ system and the edge of the floor assembly construction. The interruption of the stud cavity by the floor slab creates a more conservative condition with regards to potential flame spread through the stud cavity as the concrete slab will aid in stopping flame spread. The interruption of the stud cavity introduces runner track at the top and bottom surfaces of the floor slab, which aids in retaining the mineral wool insulation in place by sitting atop the top runner track of a steel stud wall, or the top plate of a wood stud framed wall.

Gaps between the polyurethane foam of the DuPont™ ArmorWall™ system and the edge of the concrete floor slab less than ¼-inch do not require additional mineral wool insulation to be installed at the slab edge to close off the gap. When a very small gap exists, the installation of mineral wool insulation within such a small gap is problematic from a practical constructability perspective. However, the runner track of the tops/bottoms of walls are made of light-gauge steel, which will form a barrier that will not allow flames to pass during the 30-minute NFPA 285 test. Therefore, it is the opinion of Jensen Hughes that the installation shown in Figure 1 satisfies Section 718.2 of the code and will maintain NFPA 285 compliance of wall assemblies installed in as described above.

2.2. PLATFORM FRAME FLOOR LINE CONDITION

Figure 2 depicts a platform frame condition where, similar to the in-fill construction, the floor assembly completely interrupts the exterior wall framing. As such, the top plates and sole plates of the interrupted wall create a termination in the combustible concealed space. A minimum 1¾-inch thick framing member (typically a rim joist) is specified to be installed at the interface of the floor assembly with the interior face of the DuPont™ ArmorWall™ Plus / SP Plus.

This construction scenario relies on the experimentally determined char/burn rate of wood as determined by the US Department of the Agriculture's Forest Products Laboratory (FPL). Testing of various species of wood demonstrated that the char rate for wood is approximately 1½ in./hr when subjected to the ASTM E119/UL 263 fire exposure [T5]. This study was performed on various types of wood, and although the char rates varied slightly, the study concluded that the char rate of 1½ in./hr was accurate and independent of the species of wood. Combined with the knowledge that wood begins to char within a temperature range of 536 to 572°F [T6], it can be concluded on the amount of protection that a wood member will provide to a concealed material beneath. Since the NFPA 285 test is a 30-minute test, that would correlate to approximately ¾-inch of char formation on the interior face of the floor assembly perimeter rim board, which will prevent an interior fire from involving the foam face of the DuPont™ ArmorWall™ Plus panels. It is the opinion of Jensen Hughes that it is also acceptable to install a 4-inch thickness of minimum 4-pcf mineral wool insulation at the interior face of the DuPont™ ArmorWall™ Panels in the interstitial floor space of an assembly, in lieu of a 1¾-inch thick wood framing member. Mineral wool insulation is required to be mechanically attached to floor and wall framing.

In a potential fire scenario, the gypsum wallboard ceiling of the compartment would provide significant fire resistance performance to stop vertical flame spread from occurring (approximately) 20 to 25 minutes of protection to the floor assembly interstitial space, depending on the rating of the floor and the type of wallboard used for the ceiling membrane). In the case where fire bypasses the gypsum ceiling, any void space below the continuation of the wall above that exists in the interstitial space of the floor assembly should be filled with the 1¾-inch wood framing member or 4-pcf mineral wool insulation. The top plates of the interrupted wall, combined with the wood framing/mineral wool insulation satisfy Section 718.2 of the code, and will maintain the NFPA 285 compliance of the exterior wall. Therefore, it is the opinion of Jensen Hughes that floor/exterior wall interfaces constructed in accordance with Figure 2 for platform framed construction will maintain NFPA 285 compliance of the exterior wall.

2.3. CURTAIN WALL FRAME FLOOR LINE CONDITION

Figure 3 depicts a typical curtain wall installation. When the steel wall framing bypasses the edge of the concrete floor slab with no linear gap (representative of the NFPA 285 testing), minimum 4 pcf mineral wool insulation is required to be friction fit into each exterior wall cavity space at the floorline. The mineral wool shall be equal to the depth of the concrete floor slab, down to a minimum of 4 inches and up to a maximum of 8 inches.

Typically, the exterior wall framing bypasses the edge of the concrete floor slab and a linear gap exists to accommodate construction tolerances in the floor slab construction as well as allow for differential movement of the wall due to environmental conditions. In this scenario, the linear gap between the interior surface of the exterior wall and the edge of the fire-resistance rated floor slab is required to be filled with an hourly rated perimeter fire barrier joint system with a rating equal to the fire-resistance rating of the floor assembly. Perimeter joints are typically achieved by compressing a minimum 4-inch depth of mineral wool between the exterior wall and the edge of the slab. The ability of the perimeter fire barrier joint system to achieve an hourly rating depends on the filling material and the ability of the exterior wall to continue to provide the compression to the filling material to retain it in place. Figure 3 provides a solution to comply with Section 718.2 of the code but does not claim that the installation condition shown will achieve an hourly perimeter fire barrier joint rating, as required by Section 715.4. Additional testing and analysis is required to support this unique edge of slab joint condition.

2.4. BALLOON-FRAMED FLOOR LINE CONDITION

Figure 4 is also similar to the NFPA 285 test assembly configuration when installed on the test apparatus as the interior gypsum wallboard is continuous to the concrete floor slab both on the underside and top side of the concrete floor assembly. Like the curtainwall-framed scenario, if a gap exists between the interior face of the exterior wall and the edge of the concrete slab, a fire-rated perimeter fire containment system must be installed at this location. However, if mineral wool fire stopping is fit within the stud cavities of the exterior wall, this scenario does not differ from the tested condition and the NFPA 285 compliance of the exterior wall will be maintained.

3. Stud Cavity Insulation Materials

3.1. FIBERGLASS, MINERAL WOOL, OR OTHER NON-COMBUSTIBLE BATT INSULATION MATERIALS

The majority of the referenced tested wall assemblies contained no stud cavity insulation. The inclusion of any fiberglass, mineral wool, or other noncombustible insulation installed in the wall stud cavity will not adversely impact the NFPA 285 performance of the wall assemblies. Testing experience has indicated that the inclusion of fiberglass, mineral wool, or other noncombustible insulation in the stud cavity of a wall assembly typically improves the assembly fire performance. The presence of noncombustible insulation materials in the stud cavities will further protect the concealed foam face of the DuPont™ ArmorWall™ panels from an interior fire exposure and thus will prevent potential involvement of the DuPont™ ArmorWall™ foam face in a fire to a greater degree.

The fiberglass or mineral wool insulation can be faced or unfaced. The minimal amount of fuel loading added to the assembly by these materials is very low and the facers are protected on both faces by the interior gypsum wallboard or the exterior gypsum sheathing.

3.2. CLOSED CELL SPRAY POLYURETHANE FOAM (CCSPF)

Referenced test reports [R3, R4, R5, R6, R7] contained combustible closed cell (CC) spray polyurethane foam (SPF) insulation applied to the interior face of the DuPont™ ArmorWall™ panels (i.e. within the stud cavities). Test Report 3 [R3] contained a full stud cavity fill (3 $\frac{5}{8}$ -inches) of Huntsman Building Solutions' Heatlok HFO Pro foam (nominal 2 pcf), and Test reports 4, 5, 6, and 7 [R4, R5, R6, R7] contained a nominal half stud cavity fill (1 $\frac{3}{4}$ -inches) of BASF Walltite MAX foam. Jensen Hughes conducted a proprietary analysis on behalf of BASF comparing the fire performance of the Walltite MAX and Walltite LWP SPF products. Based on this proprietary testing and analysis, it was concluded that the Walltite LWP and Walltite MAX ccSPF products have similar fire performance characteristics when assessed under the criteria of NFPA 285 and either ccSPF can be used with the DuPont™ ArmorWall™ wall panels.

Based on the inclusion of these two tested ccSPF products in the successful NFPA 285 wall assemblies with the DuPont™ ArmorWall™ product and the subsequent Jensen Hughes alternate ccSPF analysis, Table 1 allows either one of the three ccSPF products to be installed up to a maximum of 3 $\frac{5}{8}$ -inch thickness, with a minimum of 1 $\frac{3}{4}$ -inches. Should a stud greater than 3 $\frac{5}{8}$ -inch deep be used on a project, the maximum allowable stud cavity foam installation thickness shall still be 3 $\frac{5}{8}$ -inch, as Section 2603.5.3 requires that the maximum fuel loading of a wall assembly be a tested condition, and the greatest thickness of foam tested between Test report 3 [R3] is a full stud cavity fill on 3 $\frac{5}{8}$ -inch deep studs.

4. Fire-Rated Structural Insulated Sheathing (i.e. DuPont™ ArmorWall™ Systems)

4.1. DUPONT™ ARMORWALL™ PLUS

The DuPont™ ArmorWall™ Plus System consists of polyurethane foam insulation of varying thicknesses laminated to magnesium oxide board (MgO) on one or both faces. All referenced test reports used the DuPont™

ArmorWall™ Plus product at a total thickness of 3¾ inches. To comply with Section 2063.5.3 of the code, with regards to fuel loading, the product is limited to this thickness for installation on Buildings of Types I through IV construction, where NFPA 285 compliance is required.

4.2. DUPONT™ ARMORWALL™ SP PLUS

The DuPont™ ArmorWall™ SP Plus has one layer of ½-inch thick MgO board applied to each side of the foam plastic core. The extra MgO board facer will significantly improve the fire performance of this board with respect to flame spread, as there will be no exposed foam face during a fire event. The only areas of exposed foam would occur at exterior wall openings, where exposed edges of foam would exist at openings. Several of the referenced test reports had no protection of the exposed foam edges provided during the test, and these assemblies were conservatively compliant with NFPA 285. Therefore, it is the opinion of Jensen Hughes that the use of DuPont™ ArmorWall™ SP Plus are allowed in all applications where the DuPont™ ArmorWall™ Plus is allowed.

5. Drainage Materials

DuPont™ conducted a successful NFPA 285 test of the DuPont™ ArmorWall™ system covered by the Masonry Technology Inc. (MTI) 3/16-inch Sure Cavity corrugated plastic drainage product on the Stucco Lath (which is not the DuPont™ ArmorDry & Lath product). The wall assembly was clad with a fiber cement cladding [R6] and was tested where the drainage mat product was sandwiched in between the DuPont™ Tyvek® CommercialWrap® (i.e. effectively the exterior MgO board face of the DuPont™ ArmorWall™ panels) and the interior face of the cladding. There was no additional air gap included in the configuration, aside from the air spaces created by the corrugations of the drainage product.

Jensen Hughes conducted ASTM E1354 Cone Calorimeter testing of various MTI drainage products [T7]. The results of this testing indicated that the DuPont™ ArmorDry™ & Lath (MTI 3/16-inch Sure Cavity drainage product on the Stucco Lath) had the highest flammability parameters of the standard MTI drainage products evaluated. This testing qualified the use of the DuPont™ Armor Dry™ drainage product which is the MTI Sure Cavity drainage product.

6. Exterior Veneer Materials

Based on the NFPA 285 testing conducted on the DuPont™ ArmorWall™ product, various exterior veneer materials are approved for use with the DuPont™ ArmorWall™ System other than those tested. The following sections address specific groups of materials.

5.1 HEAVY MASONRY AND OTHER NON/LIMITED COMBUSTIBLE VENEERS

The NFPA 285 testing of the DuPont™ ArmorWall™ Plus wall panels comprised several NFPA 285 tests that used no exterior cladding. In these tests the exterior MgO ArmorBoard with the factory-applied WRB material was directly exposed to the exterior flame plume and remained in-place and protected the combustible foam core on the interior of the wall (i.e. both the integral DuPont™ ArmorWall™ polyurethane foam and the stud cavity CC SPF in tests where it was included) from contribution to any progressive flame spread up the wall. Also, the factory-applied WRB material on the exterior face of the DuPont™ ArmorWall™ did not allow for progressive vertical or lateral flame spread, despite being directly subjected to the exterior flame plume of the NFPA 285 test.

Based on the performance of the DuPont™ ArmorWall™ Plus in these “base wall tests” it is the opinion of Jensen Hughes that many nominally non-combustible masonry type or metal products may be used over the DuPont™ ArmorWall™ Systems. These veneers will not add fuel loading to the wall assembly and will only add to the overall fire performance of wall assemblies, as they provide a physical barrier between any exterior flame exposure and the underlying DuPont™ ArmorWall™. Noncombustible/masonry products include:

- Common 3⅝-inch clay brick
- Minimum 2-inch-thick cast concrete or precast concrete
- Minimum 4-inch-thick concrete masonry unit (CMU) block
- Minimum 2-inch-thick natural or artificial stone materials
- Minimum 2-inch-thick artificial cast stone
- Adhered natural or artificial stone
- Thin brick
- Stucco
- Terracotta
- Fiber cement board (NFPA 285 testing for specific fiber cement board product required)
- Single skin or plate metal panels
- Porcelain and/or Ceramic Tile
- Autoclaved aerated concrete (AAC) panels

6.2. MCM WALL PANELS

Metal composite material (MCM) panel systems, including the common aluminum composite material (ACM) panels, are approved for use in Table 1 based off the successful NFPA 285 Test Reference 5 [R5]. The exterior wall assembly described in reference 5 was conducted to confirm a combustible exterior cladding material installed over the DuPont™ ArmorWall™ Plus wall panel system would comply with NFPA 285. The results of the test demonstrated limited interaction between the DuPont™ ArmorWall™ Plus wall panel system and the ACM along with a significant safety margin in terms of measured temperatures and the NFPA 285 performance limits.

While this test supported the installation of an ACM over the DuPont™ ArmorWall™ wall panel system, it should be noted that although ACM/MCM panels are similar in their combustible core composition, their compositions do differ between manufacturers and products. Consequently, the flammability of the cores and their resulting fire performance in an NFPA 285 test differ from one another. Table 1 does not limit the use of DuPont™ ArmorWall™ wall panel system to only the manufacturer with which successful test results have been obtained. However, in acknowledging the variation of panel flammability between manufacturers, Table 1 requires that an ACM/MCM panel system to have been successfully tested in accordance with NFPA 285 to be acceptable for use with DuPont™ ArmorWall™ system.

6.3. EXTERIOR INSULATION FINISH SYSTEMS (EIFS)

Similar to the MCM panel product category, EIFS are similar to one another in terms of typical components that make up the EIFS. EIFS typically include a weather barrier and/or adhesive coat used to adhere insulation boards to the exterior sheathing of a wall. The insulation is then covered with a Portland cement/base coat mixture and a reinforcing fiberglass mesh is embedded in the base coat mixture. The system then receives a finish coat for weather protection and aesthetic value.

EIFS are typically used with expanded polystyrene foam (EPS) thermoplastic insulation as the insulation material in the wall system. EPS is a thermoplastic material, which melts at relatively low temperatures (~230 °F), which occurs during NFPA 285 tests of EIFS. Post-test observations of EIFS shows that the EPS insulation melts out above the window opening all the way up to the top of the assembly, leaving an open air cavity between the EIFS membrane (consisting of the dried base coat, reinforcing mesh, and finish coat), and the exterior sheathing. To comply with NFPA 285, the EIFS membrane must remain intact to prevent flame impingement on the EPS residue, which would result in vertical flame spread and failure of the test. The exterior EIFS membrane also must not sustain flame propagation such that flame propagates up the EIFS membrane itself.

It is the opinion of Jensen Hughes that an EIFS containing a thermoplastic foam plastic insulation material (typically EPS) that has been successfully tested in accordance with NFPA 285 may also be installed over the DuPont™ ArmorWall™ system. Since the DuPont™ ArmorWall™ system does not promote flame spread when

directly exposed to fire, covering the DuPont™ ArmorWall™ with an additional membrane that does not support flame spread itself, and is able to prevent ignition and flame spread of EPS foam, will maintain the NFPA 285 compliance of a wall assembly incorporating the DuPont™ ArmorWall™ panel system.

6.4. STONE/ALUMINUM HONEYCOMB COMPOSITE BUILDING PANELS

Stone and aluminum honeycomb composition building panels typically consist of an aluminum sheet or stone facer adhesively fused to a rigid core panel consisting of “honeycomb” shaped aluminum. These products typically incorporate adhesive that holds the honeycomb core panel together and must demonstrate the ability to comply with NFPA 285 since they incorporate combustible adhesive.

Similar to the MCM panels and EIFS justifications, it is the opinion of Jensen Hughes that stone or aluminum honeycomb composite panels that have demonstrated compliance with NFPA 285 in other tests may also be used in conjunction with DuPont™ ArmorWall™ panel system.

7. Summary

DuPont™ has performed successful NFPA 285 fire tests on exterior wall systems that incorporated DuPont™ ArmorWall™ Plus exterior insulation and sheathing material. Based on successful testing, alternative wall constructions were developed as shown in Table 1. The additional wall construction features will result in wall assemblies which will still meet NFPA 285 and provide a comparable level of fire performance as the tested wall assemblies. The technical justification for the use of additional wall system components is provided above to support their use in an exterior wall assembly which will continue to meet the conditions of acceptance of NFPA 285.

8. NFPA 285 Test Report References

These NFPA 285 compliance tables are generated based on the following test reports:

- R1. ICC-NTA Test Report No. MI070120-305. Dated February 5, 2021. (DuPont™ ArmorWall™ Plus over FRT Wood Framing and ½” ArmorBoard, No Cladding)
- R2. ICC-NTA Test Report No. MI021721-40. Dated February 23, 2021. (NFPA 285 R&D Insert Test: DuPont™ ArmorWall™ Plus over Steel Studs, No Cladding)
- R3. ICC-NTA Test Report No. MI070120-85. Dated June 1, 2021. (DuPont™ ArmorWall™ Plus over Steel Studs and cc-SPF in Stud Cavity, No Cladding)
- R4. Intertek Testing Final Report No. Q4710.01-121-24, dated April 29, 2024. (Argeton Terra cotta cladding over DuPont™ ArmorWall™ Plus)
- R5. Intertek Testing Final Report No. Q4710.02-121-24, dated April 29, 2024. (3A Composites Alucobond Plus ACM cladding over DuPont™ ArmorWall™ Plus)
- R6. Intertek Report No. S1277.03-121-24 R0, August 25, 2025 (Fiber Cement Board over MTI Sure Cavity Black drainage mat and DuPont™ ArmorWall™ Plus)
- R7. Intertek Report No. S1277.02-121-24 R0, dated April 7, 2025 (Neolith Porcelain Tile assembly test)
- R8. Intertek Report No. S1277.01-121-24 R0, dated August 25, 2025 (Abet Laminati HPL assembly test)

9. Technical Literature References

- T1. Concrete Hardscapes Masonry Association (CHMA) TEK 07-01D, “Fire Resistance Ratings of Concrete Masonry Assemblies,” Herndon, VA, 2018.

- T2. Concrete and Masonry Industry Fire Safety Committee, “The Fire Protection Planning Report, No. 13 (SR267.01B)”, Skokie, IL.
- T3. National Fire Protection Association, Appendix B, The SFPE Handbook of Fire Protection Engineering, Fourth Edition, DiNenno, P.J. (ed.), National Fire Protection Association, Quincy, MA, 2008, pp. A-32 to A-33.
- T4. Sultan, M.A., “Fire Resistance Furnace Temperature Measurements: Plate Thermometer vs. Shielded Thermocouples,” Fire Technology, 42, pp 253-267, 2006.
- T5. Forest Products Laboratory, General Technical Report FPL-GTR-113, “Wood Handbook – Wood as An Engineering Material,” Madison, WI, U.S. Department of Agriculture, p17-10
- T6. Kodur, V. K. R. and Harmathy, T.Z., “Properties of Building Materials,” The SFPE Handbook of Fire Protection Engineering, P.J. DiNenno editor, Bethesda, MD, pg. 1-164, 2002.
- T7. Jensen Hughes Project No. 1JJB05305.011, “*Sure Cavity WRB Product Cone Calorimeter Test Report (Rev 1)*”, revision dated January 29, 2025.