

July 11, 2022

Ms. Gabriela Riegler
May Riegler Properties
SVP Development
2201 Wisconsin Ave, NW Suite 200
Washington, DC 20007

RE: Engineering Analysis for NFPA 285 Compliance of Exterior Wall Assembly at Steamboat
Basecamp Area (Phase 1B), Steamboat Springs, CO
Jensen Hughes Project No. 1AJP22016.000

Dear Ms. Riegler:

Jensen Hughes, Inc. has completed our engineering analysis demonstrating compliance of the exterior wall assembly proposed for the Steamboat Basecamp Area (Phase 1B) project in Steamboat Springs, CO with NFPA 285, *Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components*. The exterior wall assembly which is the subject of this engineering analysis contains combustible materials including combustible wall framing, the water-resistive barrier (WRB) materials, the LP Building Solutions LP Flameblock product (i.e., the exterior sheathing), and the DuPont Thermax foam plastic insulation.

Use of these combustible materials in an exterior wall assembly requires compliance with NFPA 285 by the applicable building code requirements to ensure excessive vertical and lateral exterior flame spread will not occur during a fire event. Specifically, Section 1403.5 of the 2018 IBC requires exterior wall assemblies on buildings of Types I, II, III, or IV construction that are greater than 40-feet above grade plane to comply with NFPA 285 if they incorporate a combustible WRB material and Section 2603.5.5 requires buildings of Type I, II, III, or IV construction of any height that incorporate foam plastic insulation into the walls to demonstrate compliance with NFPA 285. While not specifically addressed in the IBC, the use of the combustible LP Building Solutions LP FlameBlock within the exterior wall assembly adds additional combustible materials within the wall assembly which increases the overall wall flammability and could result in non-compliance with NFPA 285.

Building Specific Information

PROJECT INFORMATION AND DESCRIPTION

The Steamboat Basecamp Area (Phase 1B) building is being constructed at 1901 Curve Plaza in Steamboat Springs, CO. The project consists of a new 5-story Residential Group R-2 building of Type IIIB construction. The Building Code of Record for this project is the 2018 International Building Code (IBC) as adopted by Routt County and the City of Steamboat Springs, CO. The building will be fully sprinklered, with the automatic sprinkler system installed in accordance with NFPA 13.

EXTERIOR WALL TYPES CONSTRUCTION DESCRIPTION

The exterior wall assembly evaluated in this engineering analysis is shown in Detail 4 on Drawing A0902 (see Figure 1) and will be constructed as follows (interior to exterior):

1. Two layers of 5/8-inch thick Type X gypsum wallboard continuous over the entire interior surface of the exterior wall assembly
2. 2x6 Fire Retardant Treated (FRT) wood studs spaced 12-inches OC on the 1st floor and 16-inches OC on all upper floors
3. R-20 mineral fiber batt insulation in all wall stud cavities
4. One layer of 3/4-inch thick one-sided LP Building Products LP Flameblock
5. One layer of 1/2-inch thick glass mat exterior gypsum sheathing
6. WRB material applied over 1/2-inch thick gypsum sheathing (specific products discussed in later section)
7. 1-inch of DuPont Thermax polyisocyanurate (polyiso) foam plastic insulation
8. Minimum 24-gauge steel Berridge S-deck corrugated exterior wall panels

NFPA 285 Compliance Analysis

NFPA 285 compliance for the exterior wall assembly at the Steamboat Basecamp project is demonstrated in the following sections through comparative analyses using testing data on similarly constructed and tested exterior wall assemblies incorporating DuPont's Thermax foam plastic insulation material. DuPont has conducted numerous NFPA 285 tests on exterior wall assemblies incorporating DuPont Thermax polyiso foam plastic insulation with other combustible components, including FRT wood studs and sheathing. Using these successful NFPA 285 tests, Jensen Hughes has prepared the following two engineering analysis letters which form the basis for this engineering evaluation.

1. DuPont™ Thermax™ With or Without BASF SPRAYTITE® 81206 or Walltite LWP Spray Polyurethane Foam - Various NFPA 285 Complying Exterior Wall Constructions, dated February 4, 2022 (Jensen Hughes Project No. 1JJB05306.011)¹
2. Engineering Analysis for Exterior Wall Assemblies Constructed using Fire Retardant Treated Wood (FRTW) Framing (Revision 3), dated April 19, 2022 (Jensen Hughes Project No. 1JJB05306.011)²

LP FLAMEBLOCK

Except for the LP Building Solutions LP FlameBlock, all materials of the exterior wall construction are accounted for in the referenced Jensen Hughes NFPA 285 compliance analysis letters.

The use of the LP Building Solutions LP FlameBlock product is covered under ICC-ES ESR-1365 and is described as an OSB or plywood substrate protected with a layer of noncombustible Pyrolite coating factory-applied to one or both sides of the wood base. For this project, the 1-sided application product is specified for installation directly over the FRTW stud framing. The LP FlameBlock product is listed by UL for use in various fire-resistance rated wall assemblies, however, LP Building Solutions has not conducted any testing of their product to demonstrate compliance with NFPA 285 for use in exterior wall assemblies. Therefore, as a conservative installation to ensure NFPA 285 compliant performance of the exterior wall assemblies, it is our

¹ <https://www.dupont.com/content/dam/dupont/amer/us/en/performance-building-solutions/public/documents/en/ej-thermax-with-or-without-spf-nfpa-285-43-D100784-enUS.pdf>

² <https://www.dupont.com/content/dam/dupont/amer/us/en/performance-building-solutions/public/documents/en/ej-analysis-for-exterior-wall-assemblies-constructed-using-fire-retardant-treated-wood.pdf>

opinion that the exterior LP FlameBlock product must be covered by a minimum ½-inch thick exterior gypsum sheathing applied directly over the exterior face of the LP FlameBlock product with no air gap in between.

Both Jensen Hughes engineering analysis letters support the use of FTR wood wall framing in the NFPA 285 compliant exterior wall assembly. In particular, the April 19, 2022 analysis report was based on a tested wall assembly that contained FRT wood wall framing members. The February 4, 2022 Jensen Hughes engineering analysis report also supports the use of FRTW stud framing, and requires that when FRTW studs are used that gypsum wallboard must be installed over both the interior and exterior faces of the stud framing. Through Jensen Hughes' experience from conducting and witnessing NFPA 285 tests, we have observed that when wood studs are used within a base wall assembly that has ⅝-inch thick, Type X interior and exterior gypsum coverings, that minimum char damage is sustained by the wood studs throughout an NFPA 285 test.

Since the wood studs only experience minimal char damage during an NFPA 285 test, vertical and lateral flame propagation does not occur from the compartment of fire origin such that failure criteria are observed. Therefore, if LP FlameBlock were installed directly over the wood studs, it is the opinion of Jensen Hughes that minimum damage would be sustained by the FlameBlock from the interior fire exposure, just the same as has been observed of the performance of wood studs protected by an interior fire exposure from a single layer of ⅝-inch thick, Type X gypsum wallboard. However, the exterior side of the wood sheathing must be protected, as the exterior sheathing is susceptible to fire exposure both from the interior and exterior faces. Application of the exterior gypsum sheathing over the LP FlameBlock will ensure no involvement of the LP FlameBlock product will occur and compliance with NFPA 285 for the wall assemblies will be maintained.

WALL ASSEMBLY EXTERIOR TO GYPUSM SHEATHING

The remainder of the exterior wall assembly components of the Steamboat Basecamp project are covered by the previously referenced February 4, 2022 DuPont NFPA 285 compliance letter, and will result in an NFPA 285 compliant exterior wall assembly.

WRB Materials

The Steamboat Basecamp project WRB specification lists several WRBs for use over the ½-inch exterior gypsum sheathing, which will then be covered by 1-inch of Thermax polyiso foam plastic insulation and minimum 24-gauge steel Berridge S-deck corrugated exterior wall panels.

Of the specified WRB materials in project specification, only the Henry Blueskin VP160 and Henry MetalClad are listed as acceptable WRB materials for use in the referenced Jensen Hughes letters. Therefore, these two products are acceptable for use on the Steamboat Basecamp project exterior wall detail to maintain compliance with NFPA 285. These products are determined to be acceptable for maintaining NFPA 285 compliance based on comparative fire performance properties developed by testing conducted by Jensen Hughes in accordance with ASTM E1354 (Cone Calorimeter apparatus) or by test reports provided to Jensen Hughes from various WRB manufacturers who performed testing at accredited third-party laboratories. Alternate WRB products having similar or better flammability properties as the WRB tested in an NFPA 285 are approved for installation over exterior sheathing and under Thermax sheathing. Given that these alternate materials would be expected to perform similarly based on comparative fire performance properties, it is our engineering opinion that the Henry Blueskin VP160 and Henry MetalClad will not adversely impact the overall wall fire performance and will maintain compliance with NFPA 285.

Insulation and Exterior Cladding

The referenced Jensen Hughes engineering analysis letters approve the use of the Thermax insulation between ⅝-inch minimum and 3-inch maximum based on NFPA 285 tests conducted with aluminum composite Panel (ACM) panel systems covering Thermax insulation at a maximum 3-inch thickness. The Steamboat Basecamp

project proposes to use 1-inch thick Thermax insulation in the exterior walls, which falls within the acceptable range of thicknesses established by the engineering analysis letters.

The DuPont Thermax insulation has shown in numerous successful NFPA 285 tests when covered by a combustibile ACM panel system to meet the requirements of NFPA 285. Throughout these tests, typically the ACM panel melts, since the NFPA 285 test exposure temperatures exceed that of melting point of aluminum (approximately 1220°F). When the ACM panels melt, the combustibile core of the ACM panel burns and also exposes the Thermax insulation beneath, subsequently allowing it to ignite and burn. However, the Thermax polyiso insulation is a thermoset plastic, which means it will burn and leave behind an insulative char layer. This char layer will provide some protection to the underlying combustibile materials (i.e., the WRB). The numerous success NFPA 285 tests demonstrated that the combined burning of the ACM panel and the underlying Thermax insulation was not enough to constitute failure conditions, and this combination of materials complies with the performance criteria of NFPA 285.

The Steamboat Basecamp project proposes to use minimum 24-gauge Berridge S-deck corrugated steel exterior wall panels. The referenced Jensen Hughes NFPA 285 analysis letters both support the use of steel panels over the Thermax polyiso insulation. During any fire exposure, the fire plume exiting an exterior wall opening will impinge directly on the exterior wall surface, heating the exterior steel panels. As the fire exposure continues, heat will transfer through the steel panels and the underlying Thermax insulation will begin to pyrolyze. Ignition of the foam plastic insulation may occur during a 30-minute NFPA 285 fire exposure test, however due to the significantly higher melting point of sheet steel compared to aluminum, steel will remain in-place for the duration of the test and act as a flame barrier, preventing direct flame impingement on the Thermax polyiso insulation.

Based on the observed fire performance characteristics of the Thermax insulation in NFPA 285 tests with ACM panel exterior wall coverings and the known fire performance of sheet steel in fire tests, it is our engineering opinion that this project exterior wall assembly will maintain compliance with NFPA 285.

Wall Opening Protection

The previous sections' analysis explained that the steel exterior wall panel material will prevent direct flame impingement to the Thermax insulation from the exterior fire exposure source in the field of the wall. However, the common path for fire and hot gases to enter the wall assembly and cause failure in an NFPA 285 test is through any wall opening (rough framed window opening in the NFPA 285 test).

Per the referenced February 4, 2022 Jensen Hughes engineering analysis report, all wall openings (doors, windows, etc.) shall be covered with a minimum 18 gauge steel "L" angle opening flashing as shown in Figures 3, 4, 5, 6, and 7 in the February 4, 2022 Jensen Hughes engineering analysis report. The steel opening flashing shall have a minimum 2-inch high vertical leg which is installed up against and mechanically attached to the steel wall framing (attached by the gypsum wallboard sheet metal screws). The flashing shall extend out a minimum to be flush with the corrugated steel wall panels. A protective aluminum drip cap can be installed over the steel "L" angle. Steel "L" opening flashing shall be installed at all wall opening headers, jambs, and sill.

When installed as described above, the window treatment will prevent fire and hot gases from entering the air cavity space behind the exterior cladding material and maintain compliance with NFPA 285.

Conclusion

Jensen Hughes has completed our analysis of the exterior wall assembly at the Steamboat Basecamp Area (Phase 1B) project. Based on our review of the proposed exterior wall assembly construction, applicable test reports, and our experience with conducting NFPA 285 tests, it is our engineering opinion that the proposed wall assembly described herein will comply with NFPA 285. This conclusion is based on the LP FlameBlock product

being protected with a minimum ½-inch thick layer of exterior gypsum sheathing material to provide protection to the underlying combustible product as no NFPA 285 fire performance testing data is available for exterior walls incorporating the LP FlameBlock product.

Wall opening (windows, doors, etc.) protection requirements have also been provided to ensure fire and hot gases do not enter any air cavity spaces behind the cladding materials and ignite the WRB materials. The minimum 18 gauge steel wall opening flashing is required to be installed at the header, jambs, and sill of all wall openings.

This analysis is based on the specific construction materials installed in the manner described in the referenced test report(s) and drawings. Changes or modifications to the construction and/or materials used in the tested assembly may result in a different fire performance and may change this analysis. This analysis also does not address performance characteristics such as weatherability, durability or structural issues.

Jensen Hughes appreciates the opportunity to assist May Riegler Properties. We trust this engineering analysis letter will be acceptable to the Authority Having Jurisdiction (AHJ) for this project. If you have any questions, please contact us at 443-313-9891 or at aparker@jensenhughes.com.

Submitted by,

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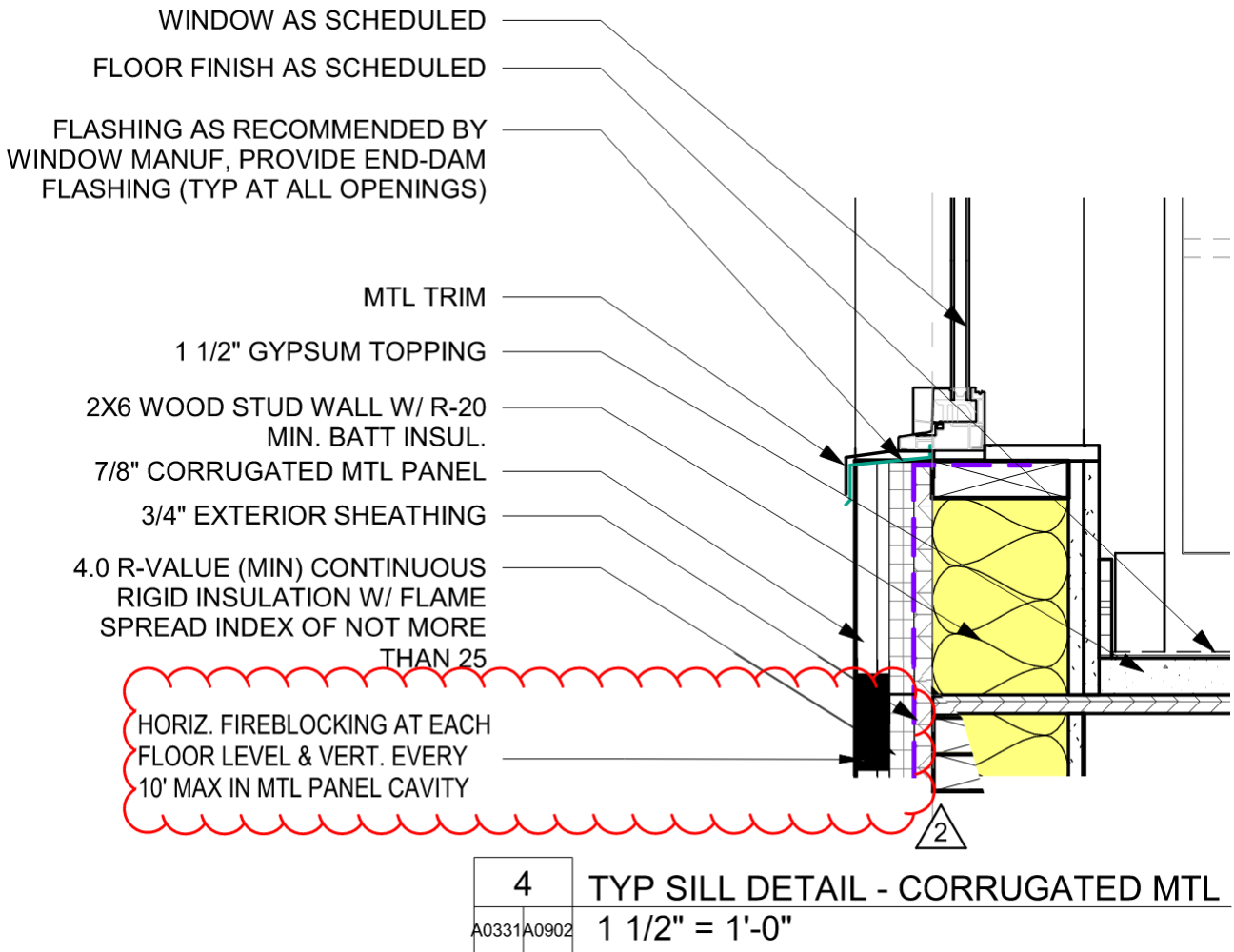


Figure 1. Exterior wall assembly construction (Detail 4 on Drawing A0902)

(Note: 1/2-inch thick exterior gypsum wallboard over LP Flameblock required for NFPA 285 compliance is not shown in detail)