PRIEST & ASSOCIATES CONSULTING, LLC

ENGINEERING EVALUATION

Engineering Evaluation of SFS NVELOPE Cladding Attachment

Systems for Compliance to NFPA 285-12

Project No. 10446A, Revision 3

Prepared for:

SFS Group USA
1045 Spring Street
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March 19, 2024

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Abstract

SFS Group USA manufactures various types of cladding attachment systems for exterior walls. These incorporate designs that minimize thermal transmission through exterior walls and separate dead load from wind load using separate attachment clips for some designs. The systems reviewed are the NVELOPE NV1, NV3, NH3, and NVF2F systems. Attachment systems are not considered the main component being evaluated in an NFPA 285 test. However, after analyzing the various systems, it is evident that these attachment systems will not detract from approved NFPA 285 wall designs with specific limitations.

This evaluation's conclusions are true and correct, within the bounds of sound engineering practice. This document contains all the reasoning for our decisions.

Submitted by,

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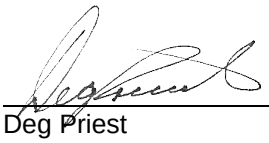
210-601-0655

March 19, 2024

Reviewed and approved,



Deg Priest
Chief Executive Officer

March 19, 2024

INTRODUCTION

Attachment systems are not considered the main component being evaluated in an NFPA 285 test. Typically, combustible cladding systems, insulation, or weather barriers are evaluated. Since the test is not a component test, manufacturers normally test worst-case wall assemblies so that alternate wall components can replace the tested components used on real construction projects. The reason for this is that there are dozens of choices for each wall component (interior sheathing, studs, cavity insulation, exterior sheathing, WRB, exterior insulation, air gap, cladding, and attachment systems), and it is impractical to test every combination. Based on this, most approvals for alternate constructions (DRJ Evaluation Reports, ICC-ES ER Reports, Intertek Listings and CCRR reports, UL Listings and ER reports, IAPMO evaluation reports, etc.) are based on worst-case system testing. In most cases, typical generic attachment systems are used. For this evaluation, we will consider whether the NVELOPE attachment systems will or will not affect test results.

Most approvals for insulation or weather barriers are based on tests with brick or ACM claddings. These two claddings are the accepted baseline claddings from which most others can be approved. All other claddings are evaluated as improvements to the tested design (or equivalent or deemed not to affect results). For combustible cladding approvals (ACM, HPL, etc.), these are typically tested with mineral fiber insulation but may, in some cases (for ACM only) be tested with combustible insulation and WRB materials. HPL claddings are normally only used with mineral fiber insulation covering a combustible WRB material.

REFERENCE DOCUMENTS

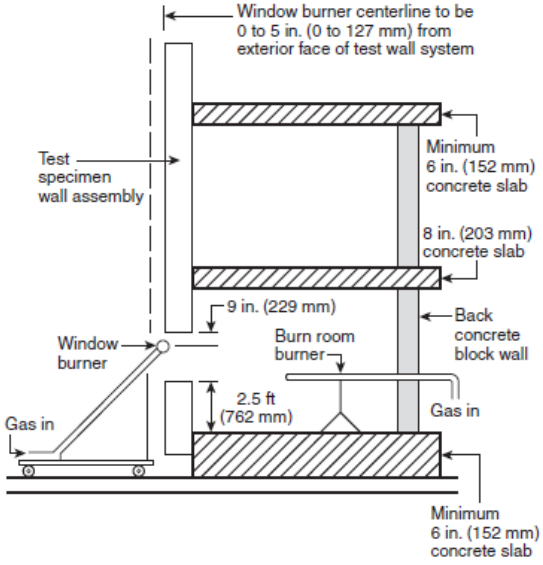
1) *NVELOPE Brochure*
2) *NVELOPE Thermal Isolator Product Data Sheet*
3) *Hughes Associates Letter 1JJB00024.002 StoneLite Panel NFPA 285 Test with NVELOPE Rain-screen Thermal Isolation System*
4) *NFPA 285-12 Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-loadbearing Wall Assemblies Containing Combustible Components*
5) *SWRI Report 01.19577.01.610(1) NFPA 285 Test on StoneLite Panel System with NVELOPE Attachment System*
6) *Dow Thermax ESR 1659*

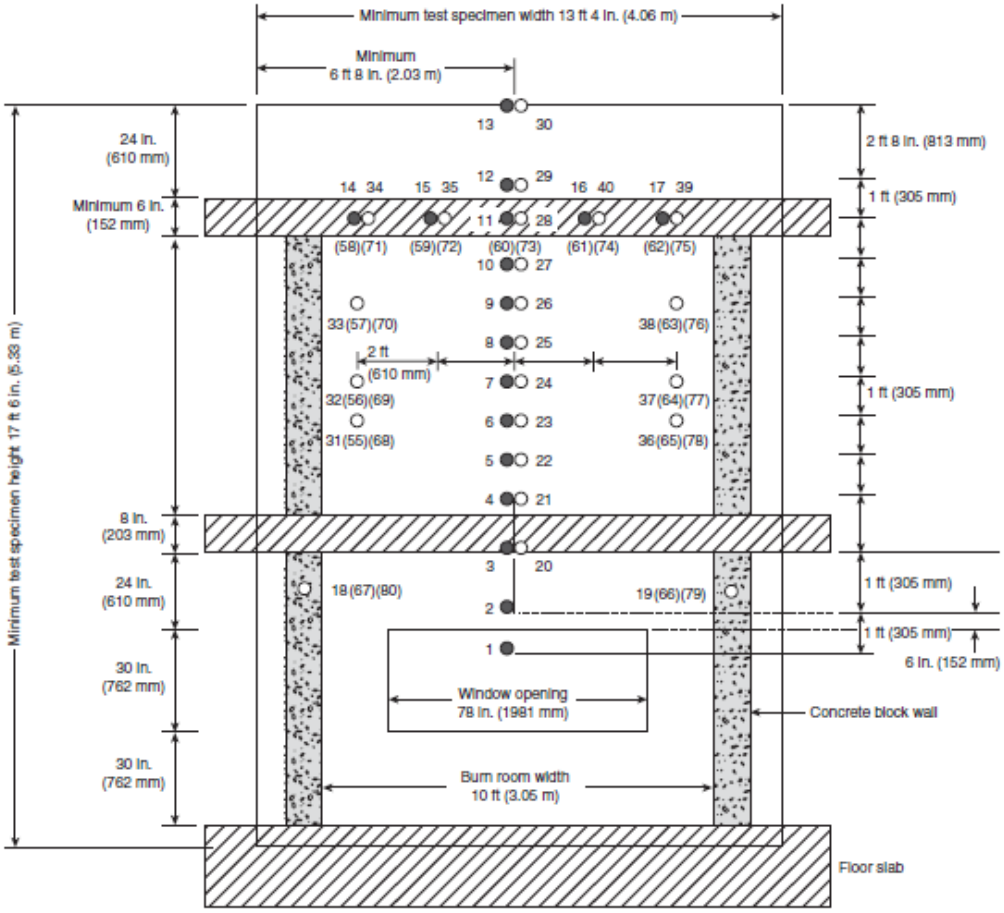
EVALUATION METHOD

NFPA 285 Criteria

The NFPA 285 fire test (Ref. 4) tests the flame spread properties of exterior walls containing combustible components. Two noncombustible rooms are stacked to simulate two stories of a multi-story building. The wall assembly is then attached to the exterior face of the rooms. A typical test wall measures 14 ft x 18 ft with a 30 in. x 78 in. window opening placed on the bottom floor.

Two burners are ignited to produce a specific time-temperature profile in the room and on the exterior face of the wall. Thermocouples are placed strategically to monitor temperature as an indicator of flame spread. In the depiction below, Thermocouples 1 - 10 and 20 - 27 are not used for compliance. The remainders are used to monitor flame spread.

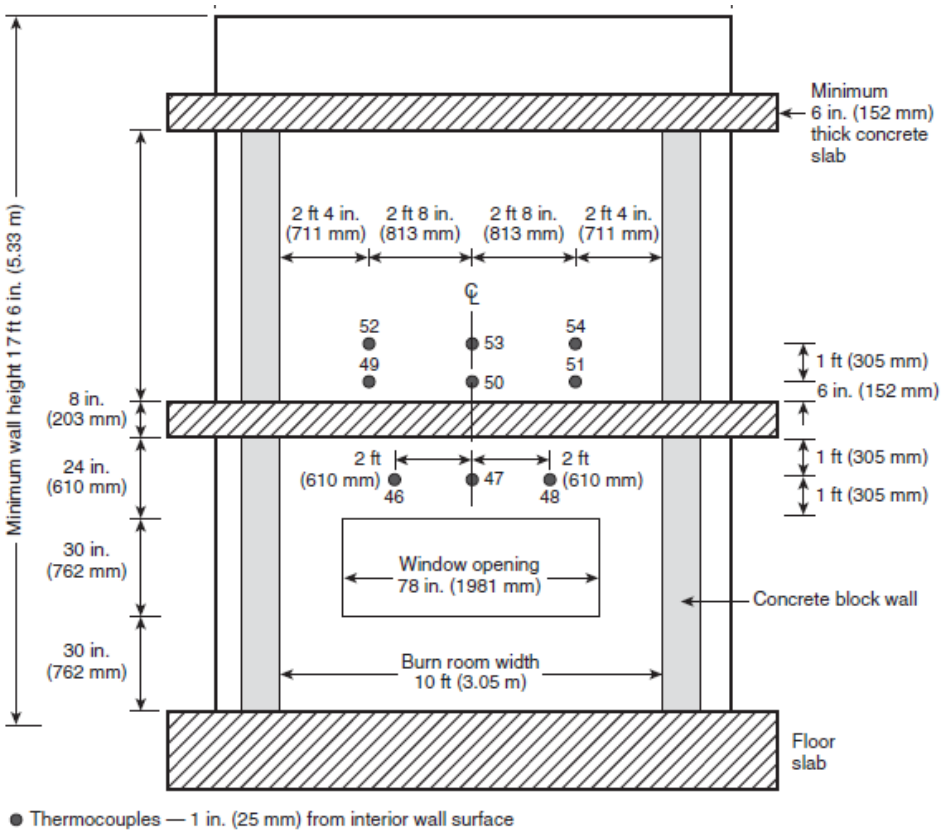




● Thermocouples — 1 in. (25 mm) from exterior wall surface

○ Thermocouples — in the wall cavity air space or the insulation, or both, as shown in Figure 6.1(b) Details A through I.

( ) Thermocouples — Additional thermocouples in the insulation or the stud cavity, or both, where required for the test specimen construction being tested, as shown in Figure 6.1(b) Details C through I.



During a test, a calibrated fire starts in the bottom room. After 5 minutes, the exterior burner is ignited to produce a specific heat flux/temperature pattern on the exterior of the wall. Both burners remain ignited during the remainder of the 30-minute test. Personnel monitor flame spread visually during the test. A computer data acquisition system monitors and records the thermocouple temperatures. The criteria for passing (Ref. 4) are as follows (reworded in simpler terms for this analysis):

1) Flames shall not spread vertically 10 ft above the window opening as determined visually or by thermocouples at the 10 ft level. Failure occurs when Thermocouples 11 or 14 - 17 exceed 1000 °F.
2) Flames shall not spread (visually) horizontally 5 ft on either side of the centerline of the window opening.
3) Flames shall not spread inside the wall cavity as determined by thermocouples placed within the wall cavity insulation and air gaps if present. Failure occurs when Thermocouples 28, 31 - 40, or 55 - 65 and 68 - 79 exceed 750 °F above ambient.
4) Flames shall not spread horizontally within the wall cavity past the interior room dimension as determined by wall cavity thermocouples. Failure occurs when Thermocouples 18 - 19, 66 - 67, or 79 - 80 exceed 750 °F above ambient.
5) Flames shall not spread to the second-story room as determined by interior wall surface thermocouples. Failure occurs when Thermocouples 49 - 54 exceed 500 °F above ambient.
6) Flames shall not occur in the second story (visually).
7) Flames shall not escape (visually) from the interior to the exterior at the wall/wall intersection of the bottom story room.

Analysis of Typical Wall Test Components

When analyzing flammability comparisons of NFPA 285 wall systems, the elements that could potentially cause increased flame spread should be considered. Justifications are established for interchanging/removing/adding brands/types/models of components for each element.

1) **Interior Gypsum Wallboard** – Most approvals list ⅝ inch type X gypsum wallboard as the only option. Our experience has shown that using ½ inch regular gypsum wallboard causes failures of Thermocouples 18 and 19 (Foam Core Thermocouples). Therefore, using ½-inch regular gypsum board is not permitted as the interior sheathing.
2) **Steel Studs** – Most NFPA 285 tests use 3⅝ in. deep 20 GA. steel studs spaced 24 inch OC with lateral horizontal bracing every 4 ft as the worst case. Field applications typically use 16 or 24-inch spacing. Wider spacing is the worst case since the wall is potentially more flexible and prone to warping. Therefore, based on testing the worst case, thicker studs, deeper stud depth, and 16-inch spacing are allowed. Testing with steel stud base walls enables using concrete or CMU masonry base walls as replacements.
3) **Cavity Insulation** – Some tests incorporate stud cavity insulation. Various types, such as SPF foam, fiberglass matt, or mineral fiber, are used. Typically, testing with none allows faced or unfaced fiberglass or mineral wool matt or sheets. Testing with SPF will allow less-flammable SPF brands or models based on cone calorimeter flammability data analysis or previous NFPA 285 base wall tests insulated with SPF insulation.
4) **Exterior Sheathing** – Tests usually incorporate ½ and ⅝ inch thick gypsum or glass matt sheathing such as Densglass Gold. The exterior sheathing may be replaced with any other tested, listed, or approved exterior sheathings of the same thickness or greater. Some approvals allow none based on tests with no sheathing. However, using no exterior sheathing may allow the exterior insulation to burn from both sides or ignite combustible cavity insulations. For the case of allowing no exterior sheathing, specific approvals (such as Ref. 6, ESR 1659) should be followed carefully.
   Note: Our opinion is that the base wall reacts independently of the products exterior to the base wall when the wall is sheathed with gypsum board on both sides. The gypsum layer prevents the direct ignition of the cavity insulation and prevents flames from spreading vertically when floor line fire stopping is used.

5) **WRB Over Exterior Sheathing** - Some tests incorporate a WRB product over the exterior sheathing. Testing with a WRB will allow less-flammable WRB brands or models based on cone calorimeter flammability data analysis.
6) **Exterior Insulation** – Some tests incorporate exterior insulation. Various types include mineral fiber, SPF, Polyisocyanurate, EPS, and XPS. Typically, interchanging insulation types is not allowed. However reducing the thickness of a combustible insulation is permitted since the wall has less fuel load than the tested system. However, removing the insulation may expose the WRB product to direct flame exposure (for light, low melting point claddings). Some WRB products are more flammable than the overlying foam insulation. Because of this, we do not allow "none" to be an option for insulation in wall designs incorporating WRBs unless that WRB has been proven not to cause failures with tests on ACM-clad walls. However, some WRBs are less flammable than the overlying foam insulation or do not combust under NFPA 285 heating conditions. These cases must be addressed case-by-case using cone calorimeter analysis of the foam and/or WRB.
7) **Exterior WRB** - Some tests incorporate a WRB product over the exterior insulation. Testing with a WRB will allow less-flammable WRB brands or models based on cone calorimeter flammability data analysis.
8) **Air Gap** –Testing with ACM or brick incorporates an air gap. For brick, the tested air gap is typically 2 inches. For ACM, the air gap is typically between ½ inch and 2¼ inches. It is important that the air gap not be greater than what was tested.
9) **Exterior Cladding** – As previously stated, most approvals for insulation or weather barriers are based on tests with brick or ACM claddings. These two claddings are the accepted baseline claddings from which most others can be approved. All other claddings are evaluated as improvements to the tested design (or equivalent or deemed not to affect results). These are typically tested with mineral fiber insulation for combustible cladding approvals (ACM, HPL, etc.).
10) **Attachment System**
    As previously stated, most tests incorporate generic cladding attachment systems. For brick tests, common brick ties are used. Testing with brick allows the use of other heavy masonry systems. Since these products are durable under fire conditions, the attachment system never gets exposed to direct flames from the test. However, suppose the window header fails, melts, falls

apart, or allows heat to ignite wall core combustibles. A test failure can occur if the foam insulation burns severely enough to trigger thermocouple failures (Usually TC #28). It has been our experience that wall core temperature failures occur before exposing the attachment system to enough heat to cause cladding collapse. We have never witnessed a cladding collapse in the hundreds of tests we've personally seen (or reports we've read).

For ACM, there is no common attachment system. Most ACM manufacturers do not manufacture attachment systems. But they sell their product to ACM fabricators who cut, bend and create attachment systems. Most approvals do not list attachment systems only because it is impractical to include every possible cladding attachment that would qualify. There are too many to list. However, engineering evaluations (such as this report) are written to qualify these details on a case-by-case basis.

Testing with ACM is considered the worst-case since ACM can melt and ignite and typically utilize semi-open joint designs. During a fire test, as the ACM melts, this creates a simulated open joint design in the worst possible location – the fire source. The melt pattern for NFPA 285 fire tests on ACM is usually large (approx 3 ft wide x 3 ft tall in a triangular pattern). Because of this extreme opening size, we allow any cladding with superior fire properties than ACM as an alternative using any commonly approved attachment system.

An NVELOPE system was tested in an NFPA 285 assembly with heavy combustible cladding (Ref. 5). In that test, the attachment system performed well with rainsceen joints (considered worst case), exposing the attachment points to significant heat from the NFPA 285 fire test. See post-test photos and temperature data below.

Figure C-15. Close-up of Window Opening immediately after Exposure.

Figure C-16. Post Test Assembly Dissection – Exterior Surface of Mineral Wool Layer after Exposure.

Figure C-17. Post Test Assembly Dissection – Interior Surface of *StoneLite® Panels (SP-1-10-3)* Panels following Exposure.

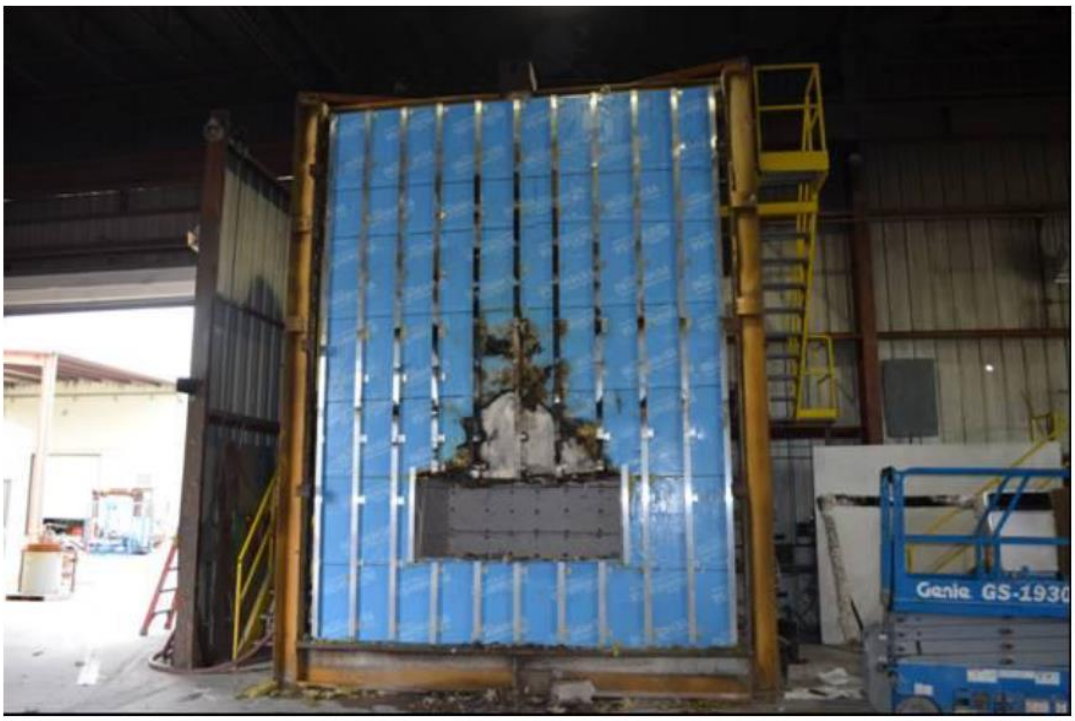


Figure C-18. Post Test Assembly Dissection – Mineral Wool Removed. Condition of Henry Blueskin following Exposure.

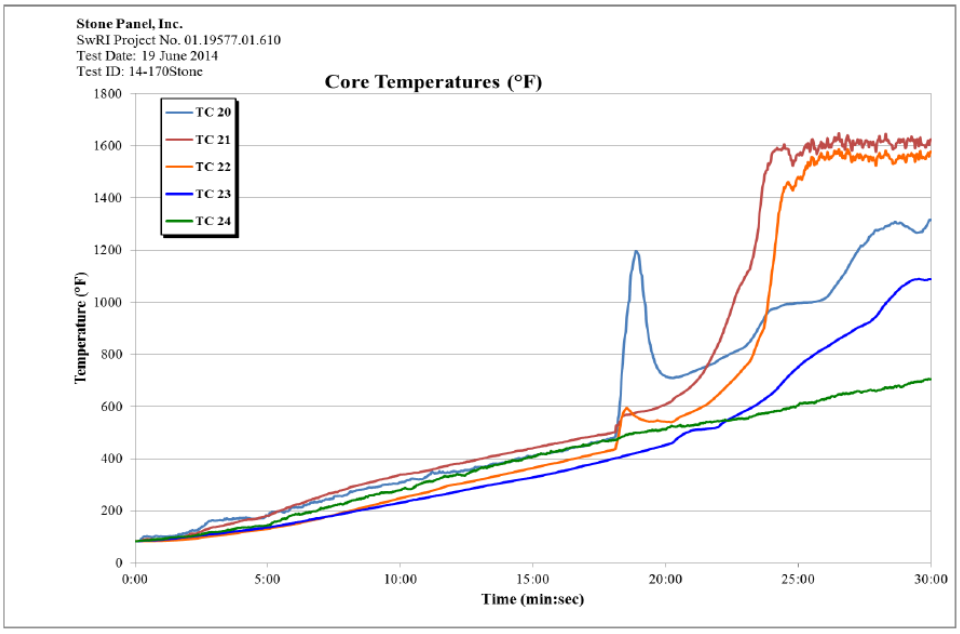


Figure D-5. *StoneLite® Panels (SP-1-10-3)* Wall Panel Assembly Core Temperatures (TCs 20–24).

The fire test results (Ref. 5) indicate that the attachment system remained intact, held the heavy cladding panels in place, and did not contribute to flame spread.

Analysis of SFS Group USA Attachment Systems

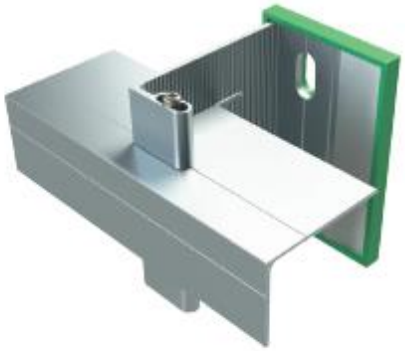
SFS Group USA submitted designs of their NVELOPE attachment systems for evaluation in this report (see Appendix A and Refs. 1 & 2). These are the NVELOPE NV1, NV3, NH3, and NVF2F systems. It should be noted that an NVELOPE System has been previously tested (Ref. 5) and evaluated for use (Ref. 3) in various NFPA 285 assemblies incorporating StoneLite panel systems. The various systems are listed below (Ref. 1, 2)

NVELOPE brackets, rails and systems

NV1 – Vertically running rail system
Adjustable main support system for horizontally-attached rainscreen cladding applications. Mechanical face fastened panels.

NV3 – Hidden mechanical fastened system
Adjustable system for hidden fastened applications. Cladding panels mechanically attached.

NH3 – Horizontally running rail system
Subframe system used to support vertical elements. Mechanical face fastened panels.



NVF2F – Floor to floor system
Brackets and rails provide a vertical back frame system for floor to floor spanning.

All of the N-series systems use metallic construction, with some having a thin plastic thermal isolator cover (on the interior side) to reduce thermal transmission of the attachment system. These systems do not incorporate combustible components except for the thermal isolator (see Appendix A). From a fire performance point of view, they are manufactured from mostly metal components in sufficient thickness and mass to be similar to most of the attachment systems we've seen tested. These attachment systems are assumed to have undergone wind load testing for structural performance. However, structural integrity is outside the scope of this evaluation. The small amount of material used for thermal isolation is not considered to cause NFPA 285 test failures for the following reasons:

1) The thermal isolator (closest to the interior side) is behind the exterior insulation. The insulation's flame spread is expected to occur before the fire exposes the cap. If enough insulation burns to expose the cap, a test failure due to foam flame spread will happen before the cap has time to melt or ignite.
2) The thermal isolators are discontinuous over the wall surface area. If an isolator ignition occurs, the burning is localized and cannot spread flame on its own. It is common to allow flammable joint tapes for foam board joints. These are permitted due to the discontinuous installation and staggered joints. These products cannot spread flame uncontrollably due to the small amount of material used and the discontinuous application. If these products are allowed, we judge that the thermal isolators have even less potential for flame spread due to their small size.

Joint Location
All known NFPA 285-12 approvals do not limit the position of joints. This report will be consistent with that philosophy. If an approval lists specific joint limitations, those limitations will apply.

Air Gaps Behind Cladding

- The maximum air gap for noncombustible cladding is not limited for mineral wool.
- For approved combustible insulation – Max. Air gap 2 in. with noncombustible claddings or no larger than tested or approved air gap for ACM or other combustible claddings.
- For mineral wool, the maximum air gap for ACM or other combustible cladding can be larger than was tested or approved air gap.

CONCLUSIONS
Based on the information above, we have determined that previously approved NFPA 285 wall systems may use the NVELOPE NV1, NV3, NH3, and NVF2F systems and can meet the criteria of NFPA 285 with specific limitations as per the table below.

Allowed NFPA 285 Assemblies
Walls not requiring NFPA 285 compliance (per the International Building Code) may use NVELOPE NV1, NV3, NH3, and NVF2F systems since these components will not contribute to the flame spread of noncombustible constructions.

NFPA 285 Compliance Requirements: Items listed below must be a part of the wall assembly in order for the assembly with the NVELOPE NVELOPE NV1, NV3, NH3, and NVF2F systems to be NFPA 285 compliant. Refer to foam or WRB manufacturer NFPA 285 approval tables for allowances other than those shown below. *This report considers approval from DrJ Engineering, ICC-ES, Intertek, UL, and IAPMO valid.*

NFPA 285 Table of Allowed Components

Wall Component	Specific Component
Base Wall Use 1, 2 or 3	1) Concrete 2) CMU 3) One layer of ⅝ inch thick type X gypsum wallboard installed on the interior side of a minimum 3⅝ in. deep (min.), minimum 20 gauge galvanized steel studs spaced a maximum of 24 inches on center, a minimum of 1 layer of ½ in. thick exterior gypsum sheathing installed on the exterior side. Lateral bracing installed minimum every 4 ft vertically or as required.

Fire Stopping in Stud Cavity at Floor Lines	4 in., 4 pcf mineral wool (e.g., Thermafiber) in each stud cavity at each floor line. The insulation is friction fit between studs or installed with Z clips.
Cavity Insulation Use 1, 2, 3, 4 or 5 *Note 1. This report considers approval from DrJ Engineering, ICC-ES, Intertek, UL, and IAPMO valid.* *Note 2: See the special requirement below if exterior sheathing is not used.*	1) None (see note 2) 2) Fiberglass (faced or unfaced) 3) Mineral wool insulation (faced or unfaced) 4) Any other noncombustible insulation material (faced or unfaced) 5) Any approved SPF spray foam insulation approved for use in stud cavities in NFPA 285 compliant assemblies. *See Note 1 for approval agencies.*
Exterior Sheathing *Note. Specific approvals require specific minimum exterior sheathings and brands/types.*	1) Minimum ½ or ⅝ inch thick listed or certified exterior-type gypsum sheathing (see Note). 2) NONE - only for those approvals that allow no exterior sheathing and specific cavity insulations (including no cavity insulation). *In cases where no exterior sheathing is allowed, use the specific cavity insulation in the approval.*
WRB over Base Wall Use 1, 2 or 3 *Note. This report considers approval from DrJ Engineering, ICC-ES, Intertek, UL, and IAPMO valid.*	1) None 2) Any WRB / AVB barrier approved for use in an NFPA 285 compliant assembly paired with mineral wool, Polyisocyanurate, EPS, or XPS insulation. See Note for approval agencies. 3) Any WRB that meets the 2015 IBC Exceptions for WRBs (Only for walls where the WRB is the only combustible).
Exterior Insulation – Use either 1, 2, 3 or 4 *Note. This report considers approval from DrJ Engineering, ICC-ES, Intertek, UL, and IAPMO valid.*	1) None – For constructions requiring a WRB, the construction must incorporate a WRB or AVB that meets the 2015 IBC exceptions for WRBs. These WRBs can only be used with noncombustible claddings and insulations per the 2015 code exceptions. 2) 2-inch thick (min.) 4 pcf mineral fiber insulation allowed for use with WRB item 2 or 3 above (Note - WRB Item 3 must use Cladding 1a below) 3) Any Polyisocyanurate, EPS, or XPS insulation that has been approved (see Note) to be used in an NFPA 285 compliant assembly paired with the WRBs in item 2 above) 4) Any closed-cell SPF insulation approved (see Note) to be used in an NFPA 285-compliant assembly that has also qualified to be an effective WRB.
Exterior Cladding - Use 1 or 2 with the cladding installation technique shown for NVELOPE Wall Systems *Note. This report considers approval from DrJ Engineering, ICC-ES, Intertek, UL, and*	1) Claddings below may only be used with noncombustible exterior insulation Item 2 above (mineral fiber). a. Any noncombustible cladding. Any standard installation technique can be used. (Such as stone, terra cotta, fiber cement, concrete, solid metal, etc.) b. Combustible cladding. Use any cladding successfully tested by the panel manufacturer (or fabricator) via the NFPA 285 test method. Any standard installation technique can be used. c. Adhered Masonry (minimum ¾ inch thick clay brick or stone; ⅜ inch thick tile) bonded with cementitious mortar (standard or polymer-modified) to a minimum ½ inch thick cement board or gypsum sheathing.

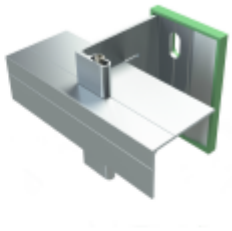
IAPMO valid. Important – see Air Gap note.	2) Claddings below may be used with any approved (see Note) combustible exterior insulation. Any cladding (combustible or noncombustible) that has been approved for use in an NFPA 285-compliant assembly paired with approved Polyisocyanurate, EPS, XPS, or SPF insulation. Each insulation must be specifically approved for the exact cladding types listed in the approval. Cladding Installation Technique All claddings listed above (or in the approvals in the Note) may use NVELOPE NV1, NV3, NH3, and NVF2F systems. **Air Gaps Behind Cladding** • A maximum air gap for noncombustible cladding is not limited for mineral wool. • For approved combustible insulation - Max Air gap 2 in. with noncombustible claddings or no larger than tested or approved air gap for ACM or other combustible claddings. • A maximum air gap for mineral wool for ACM or other combustible cladding can be no larger than the tested or approved air gap. **IMPORTANT**: For specific insulation types that require special detailing, see the next item (Window/Door Header/Jamb details).
Window/Door Headers/Jambs .	Must use approved design for specific system being considered (see Note) *Note. EPS and XPS require specific door/window header and jamb details to be compliant to NFPA 285. Polyiso and SPF may or may not require specific header/jamb details. See approvals from DRJ Engineering, ICC-ES, Intertek, UL and IAPMO for the specific header/jamb detail required for each insulation type*

APPENDIX A

SFS NVELOPE Attachment Systems

Horizontally running rail system for face-fastened vertical panels





Features

- This product allows horizontal L profiles to be directly inserted into the brackets.
- The bracket is secured to the substrate; either steel frame, block work, or timber. The horizontal slot of the bracket is then ready to receive an L or lipped L rail.
- The L and lipped L rail can be adjusted for line and level and secured using fixed and sliding positions to allow for expansion and contraction.
- This system is suitable for face-fastened panel applications.

NVELOPE NH3 is the system used to support vertical elements, allowing for varied façade design options. The system has a number of advantages over the NH2 system, making it faster and easier to install.

Material

The selection of materials to use in the construction of a subframe system within a rainscreen facade is of paramount importance. Material choice can also affect the thermal performance of the overall rainscreen in addition to engineering assurance.

NVELOPE system are manufactured from extruded aluminum alloy 6005A-T6 which provides superior strength and performance over and above other commonly used aluminum.

Approval

- British Board of Agreement
- Meets the compliance requirements of ASHRAE 90.1 and NFPA 285

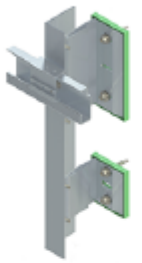
Options

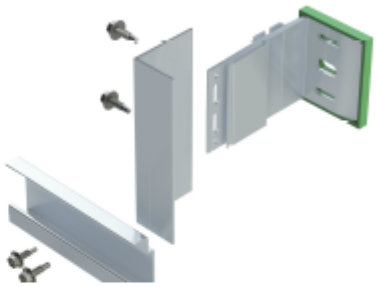
- NVELOPE brackets: allows adjustment between the face of the primary support to outer face of vertical profile
- Thermal isolators: hard PVC isolator assembled as standard (located between the NVELOPE bracket and the primary structural support system).

Mechanical fastened system

NV3 is the NVELOPE system for concealed fastening/mechanically attached applications

NV3 elements—fiber cement, high-pressure laminate (HPL), ceramic, thin stone etc. Horizontal NVELOPE channel profiles are attached to the vertical profiles. Rainscreen panels are hung from and secured with hangers.





Features

- NV3 is the NVELOPE system for concealed fastening/mechanically attached applications—vertical cladding applications.
- Secured using hangers and undercut stud anchors or screws to provide a concealed attachment.
- Horizontal NVELOPE channel profiles are secured to the vertical profiles. Rainscreen panels are hung from and secured to the horizontal profiles with hangers and adjustable hangers.
- NVELOPE 'T' and 'L' profiles are secured using NVELOPE support brackets, attached through a series of fixed and flexible points.
- NVELOPE fixed point brackets absorb both vertical dead loads.
- NVELOPE bracket spacing is determined by cladding options such as the dimensions and weight of the facade cladding, and local wind loads.
- NVELOPE flexible point brackets absorb wind loading and allow for expansion and contraction.

Material

- Manufactured from extruded aluminum alloy 6005A-T6.

Approvals

- British Board of Agrément (BBA) - 09/4678.
- Meets the compliance requirements of ASHRAE 90.1 and NFPA 285.

Options

- NVELOPE brackets: allows adjustment between the face of the primary support to outer face of vertical profile.
- Thermal isolators: hard PVC isolator assembled as standard (located between the NVELOPE bracket and the primary structural support system).

fastened system

NV1 is the NVELOPE back frame system for vertical cladding applications

NV1 provides optimal support for face-attachment and rivet-attachment cladding elements including fiber cement, high-pressure laminate (HPL), ACM and metal rainscreen panels. NV1 is the basis of all NVELOPE support systems.

Features

- NV1 is the NVELOPE back frame for vertical cladding applications.
- NVELOPE 'T' and 'L' profiles are attached using NVELOPE support brackets, secured through a series of fixed and flexible points.
- NVELOPE flexible point brackets absorb wind loading and allow for expansion and contraction.
- NVELOPE fixed point brackets absorb both vertical dead loads.
- NVELOPE bracket spacing is determined by cladding options such as the dimensions and weight of the facade cladding, local wind loads, and cladding zone.

Material

- Manufactured from extruded aluminum alloy 6005A-T6.

Approvals/Compliance

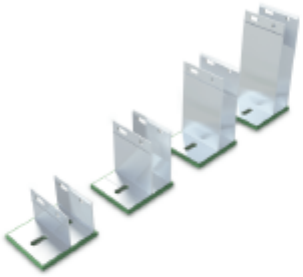
- British Board of Agreement
- Meets the compliance requirements of ASHRAE 90.1 and NFPA 285.

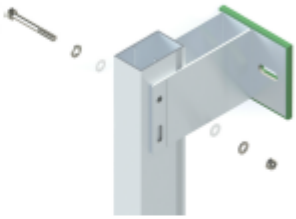
Options

- NVELOPE brackets: allows adjustment between the face of the primary support to outer face of vertical profile.
- Thermal isolators: hard PVC isolator assembled as standard (located between the NVELOPE bracket and the primary structural support system).

NVF2F is the NVELOPE subframe system suitable for vertical floor to floor cladding applications

NVELOPE floor to floor (NVF2F) brackets and framework provide a framing system capable of larger spans than other bracket systems. Brackets are anchored to the building using primary fasteners, and each bracket allows for final alignment and adjustment to suit the external cladding. Suitable for supporting fiber cement, high-pressure laminate (HPL), aluminum composite material (ACM), and metal rainscreen panels.





Features

- NVF2F is a vertical back frame system for floor to floor spanning.
- Floor to floor (mullion) box 'T' profiles are fixed using support brackets. Our brackets absorb wind loading and allow for expansion and contraction, and vertical dead loads.
- Bracket spacing is determined by factors such as the dimensions and weight of the facade cladding, local wind loads, and cladding zone.

Material and standards

Manufactured from extruded aluminum alloys conforming to EN573-3 (material) and EN755 production standards.

Options

NVELOPE brackets: allow adjustment between the face of the primary support to outer face of vertical profile.

Thermal isolators: hard PVC isolator assembled as standard (located between the bracket and the primary structural support system) are available. The isolators allow rainscreen installations to benefit from the low thermal conductivity values associated with reduced thermal bridging within the design.

Approvals

British Board of Agreement

~~~ End of Report ~~~
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