PRIEST & ASSOCIATES CONSULTING, LLC

March 19, 2024

Brian Sharlow
SFS Group USA
1045 Spring Street
Wyomissing, PA 19610

Re: Engineering Judgment 10446B, Revision 2
Use of NVELOPE NV1, NV3, NH3, and NVF2F systems in NFPA 285-Approved Assemblies

Dear Mr. Sharlow,

This letter provides our Engineering Judgment on using NVELOPE NV1, NV3, NH3, and NVF2F systems in approved NFPA 285 assemblies.

For this application, the only items of concern are as follows:

1) Will the products contribute to flame spread?
2) Will the system degrade thermally, allowing panels to fall off during a flame spread event in NFPA 285 tests?

Per the manufacturer's designs, each system is used to attach exterior insulation and various claddings in a manner as to minimize thermal transmission through exterior walls.

Attachment systems are not normally considered the main component 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 for real construction projects. This is because 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.

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.

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. 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. 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. But, we write engineering evaluations (such as this report) 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 superior to ACM as an alternative using any commonly approved attachment system.

All of the N-series systems use metallic construction with a thin plastic thermal isolator cover (on the interior side) to reduce the thermal transmission of the attachment system. These systems do not incorporate any combustible components except for the thermal isolator. 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 flame spread of the insulation 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 use of 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.

An NVELOPE system was tested in an NFPA 285 assembly with heavy combustible cladding (Ref. 5 in EEV 10446A). 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. The results of the NVELOPE product clearly do not contribute to a wall assembly's overall flame spread nor degrade thermally to a state such that the cladding system attachment is diminished.

Based on the observations of these tests and a full analysis of the NVELOPE systems (Ref. EEV 10446A), it is our expert opinion that NVELOPE NV1, NV3, NH3, and NVF2F systems may be used as an attachment system for any approved NFPA 285 assembly per the limitations listed below.

1) *This report considers approval from DrJ Engineering, ICC-ES, Intertek, UL and IAPMO valid.*
2) *Special requirement - In cases without exterior sheathing, use the specific cavity insulation in the approval.*
3) *Specific approvals require a particular minimum of exterior sheathings and brands / types.*
4) *EPS and XPS require specific door / window header and jamb details to comply with NFPA 285. Polyiso and SPF may or may not require particular header / jamb details. See approvals from DrJ Engineering, ICC-ES, Intertek, UL, and IAPMO for the specific header/jamb detail necessary for each insulation type.*

Additionally, any of these NFPA 285-approved designs may replace the insulation board with noncombustible mineral fiber insulation (minimum 2 inches thick) since this reduces the flame spread potential by reducing the fuel load of the wall assembly.

Air Gaps

- 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 no larger than the tested or approved air gap.

Please let us know if you have any comments or questions.

Submitted by,

Javier Trevino
Associate Engineer
210-601-0655

March 19, 2024

Reviewed and approved,

Deg Priest
Chief Executive Officer

March 19, 2024