



**PRIEST & ASSOCIATES
CONSULTING, LLC**

November 19, 2015

Martins V. Pecholcs
Covestro
2400 Spring Stuebner Road
Spring, Texas 77389

Re: Project No. 10343
NFPA 285 Analysis of a Wall Design
68-74 Charlton Street, New York, NY

Dear Mr. Pecholcs:

The purpose of this Engineering Letter is to determine if a specific wall exterior wall system incorporating Bayer spray polyurethane foam (SPF) on the interior surface of a noncombustible CMU base wall will meet the requirements of NFPA 285. This request for analysis came from Covestro as prompted by Anthony Tedesco, Capital Interiors Construction Corporation spraying Covestro Bayseal CCX/CCXP.

A representative wall section is depicted in the drawing in the attachment to this letter.

The proposed wall system components are summarized as follows (beginning from the interior):

1. Interior $\frac{5}{8}$ in. type X gypsum wallboard (GWB)
2. $1\frac{1}{8}$ in. steel studs filled with batt insulation
3. SPF applied to the interior surface of the base wall at an indicated thickness of 3 in.
4. 6 in. CMU base wall, mounted to concrete floor
5. Exterior vapor/air barrier (WRB), unspecified
6. Air gap
7. Nominal 4 in. brick veneer

Covestro proposes the use of Bayseal CCX/CCXP (ICC ESR-2072) or EcoBay CC/ CCP (ESR-3076) SPF for Item No. 3 as listed above.

Background

In cases when foam plastic insulation is used in an exterior wall assembly subject to the conditions of IBC Chapter 14 "Exterior Walls", the requirement for NFPA 285 compliance is triggered when the insulation is incorporated *within* the base wall, applied as continuous insulation on the *exterior surface* of the wall, or both. Chapter 26 "Plastic" requires that the foam plastic be separated from the interior of a building by an approved thermal barrier of $\frac{1}{2}$ in. GWB or equivalent.

The NFPA 285 test (and its predecessors, UBC 26-4 and UBC 26-9) was instituted to address the concern over the use of foam plastic insulation and other combustible materials in exterior walls on noncombustible construction (Types I, II, III and IV). This concern centered on the potential for vertical and horizontal spread of fire over the combustible faces or through the combustible cores¹.

¹ See explanatory material provided in NFPA 285 Annex A, A.1.1.

Paragraph A.1.1.2 of Annex A includes the following statement:

A.1.1.2 *This standard addresses fire exposures from interior fires that reach flashover, break exterior windows, and expose the building facade. It is not intended to address fire exposures that originate from the building's exterior.*

Furthermore, Section 1.3 “Application” of the standard explains the intent of the test standard as follows:

1.3 Application.

1.3.1 *This standard shall be used to evaluate the fire propagation characteristics of exterior non-load-bearing wall assemblies and panels used as components of curtain wall assemblies that are constructed using combustible materials or that incorporate combustible components within the wall assemblies as specified in the following:*

- (1) *The ability of the wall assembly to resist flame propagation over the exterior face of the wall assembly*
- (2) *The ability of the wall assembly to resist vertical flame propagation within the combustible components from one story to the next*
- (3) *The ability of the wall assembly to resist vertical flame propagation over the interior surface of the wall assembly from one story to the next*
- (4) *The ability of the wall assembly to resist lateral flame propagation from the compartment of fire origin to adjacent compartments or spaces.*

NFPA 285 provides for the testing of foam plastic insulation for use in wall cavities and as exterior continuous insulation using a framing system consisting of steel studs. Both ESR-2072 for Bayseal™ and ESR-3076 for Ecobay™ closed cell SPFs show comparable allowances for use of these foams within and on the outside of exterior walls. The base wall assembly in the tests supporting these allowances included 5/8 in. type X GWB on the interior side of the studs and either 1/2 in. or 5/8 in. gypsum sheathing on the exterior. The recognized allowances from ESR-2072 Table 2 are given below:

TABLE 2—NFPA 285 COMPLYING EXTERIOR WALL ASSEMBLIES

WALL COMPONENT	MATERIALS
Base Wall System – Use either 1, 2 or 3	1 – Concrete wall 2 – Concrete masonry wall 3 – 1 layer 5/8-inch-thick Type X gypsum wallboard complying with ASTM C36 or C1396 on the interior, installed over minimum 3 7/8-inch-deep, No. 20 gage, C-shaped steel studs, spaced a maximum of 24 inches on center with lateral bracing every 4 feet vertically. Gypsum wallboard must be attached with No. 6, 1 1/4-inch-long self-tapping screws located 8 inches on center along the perimeter and in the field of wallboard. Gypsum wallboard joints must be taped and treated with joint compound in accordance with ASTM C840 or GA-216
Floorline Firestopping	4 pcf mineral wool (e.g., Thermafiber) in each stud cavity at each floorline, attached with Z-clips
Cavity Insulation – Use either 1, 2 or 3	1 – None 2 – Fiberglass batt insulation (faced or unfaced) 3 – Bayseal closed cell or open cell insulation
Exterior Sheathing – Use either 1 or 2	1 – 1/2-inch-thick, exterior-type gypsum sheathing 2 – 5/8-inch-thick, exterior-type gypsum sheathing
Exterior Insulation	Bayseal™ closed cell SPF, up to a maximum nominal thickness of 3 inches
Exterior Wall Covering – Use either 1, 2 or 3	1 – Brick - standard nominally 4-inch-thick clay brick; brick veneer anchors – standard types installed a maximum of 24 inches OC vertically on each stud – Maximum 2-inch air gap between exterior insulation and brick 2 – Stucco - minimum 3/4-inch-thick, exterior cement plaster and lath. A secondary water-resistive barrier may be installed between the exterior insulation and the lath. The secondary water-resistive barrier must not be full-coverage asphalt or butyl- based self-adhered membranes 3 – Minimum 2-inch-thick limestone. Any standard non-open-jointed installation technique such as ship-lap, etc., may be used



The base wall assembly described for the Charlton Street project incorporates 6 in. CMU and nominal 4 in. brick as the exterior cladding and is considered much more robust than the tested base wall. The base wall and the brick veneer separate the SPF from the fire exposure of the NFPA 285 test conditions. The IBC assigns 1 hour fire resistance to standard 4 in. brick, and Table 1 of the National Concrete Masonry Association (NCMA) TEK Guide 7-1C provides 1 hour of fire resistance to nominal 6 in. CMU. These hourly ratings are assigned on the basis of documented performance when tested in accordance with ASTM E119. This means that the maximum temperature rise on the interior surface of the CMU wall would not exceed 325°F for a period of 2 hours. The fire exposure conditions in the E119 test are much more severe than the fire exposure in the NFPA 285 test. In an NFPA 285 test, only the exterior portion of the wall assembly immediately above the window opening is exposed to the fire conditions from the burn room and the window burner. The ASTM E119 test of a wall assembly produces approximately 88 kW/m² of heat flux after 30 minutes of exposure, while the exposed surface heat flux after 30 minutes of exposure during the NFPA 285 test is approximately 40 kW/m². This indicates that the temperature on the unexposed surface of the CMU wall would barely begin to register any increase above ambient, if at all.

From this, it can safely be concluded that the type and thickness of the SPF applied to the interior surface of the wall system would not be limited. In addition, the thermal barrier requirement of Section 2603.4 for separation of the SPF from the interior of the building is met. As an aside, it should also be noted that the construction as described in the attachment can be considered to be outside of the scope of requirements triggering NFPA 285 compliance, since the only combustible element in the exterior wall assembly is the WRB.

Therefore, the installation of either Covestro Bayseal™ or Ecobay™ SPF on the interior of the proposed wall assembly would not detract from the performance of the wall assembly when tested in accordance with NFPA 285.

Respectfully submitted,



Howard Stacy
Sr. Scientist/Principal
360-957-0311

Attachment



Attachment

