
DATE: Wednesday, January 06, 2016

TO: David Nickerson
CBIS/Korfil
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FROM: Ben Muscente, P.E.

RE: KORFIL INSULATION PRODUCT

- Review of Building Code Compliance

Mr. Nickerson,

As requested, Howe Engineers has reviewed the insulation material information and fire test data for the Korfil Insulation project manufactured by Concrete Block Insulation Systems (CBIS) in West Brookfield, Massachusetts. The purpose of our review was to evaluate whether the product meets the requirements of the International Building Code to be used within an exterior wall assembly.

The Korfil product is a molded expanded polystyrene insert that is designed to be installed within the core of concrete masonry units. The Korfil product reviewed as part of this analysis is approximately 1 inch thick with an average density of 1.2 lb/ft³. Since the Korfil product is considered foam plastic insulation it is required to comply with Section 2603 of the International Building Code, 2015 Edition.

Section 2603 provides the requirements for foam insulation when used within buildings. For ease of reference, the requirements of Section 2603 are provided below with our professional opinion on how they relate to the Korfil Insulation product based on our review.

- Product must be labeled of an approved agency (IBC Section 2603.2)
 - The product packaging was not included as part of our review. It is assumed the proper labels are provided for the Korfil product. To be confirmed by manufacturer.
- Foam plastic cores shall have a flame spread index of not more than 75 and a smoke-developed index of not more than 450 where tested in the maximum thickness in accordance with ASTM E 84 or UL 723, or meet one of the exceptions listed in Section 2603.3.

- A UL test was provided to our office for review which provides the flame spread and smoke-developed indexes for the foam plastic used to form the Korfil product intended for use (approximately 1 inch thick at a density of 1.2 lb/ft³) is compliant with the flame spread and smoke-developed indexes of this section.
- Foam plastic must be separated from the interior of the building by an approved thermal barrier of ½-inch gypsum wallboard or equivalent thermal barrier material (IBC Section 2603.4).
 - As stated in Section 2603.4.1.1, a thermal barrier is not required for foam plastic installed within a masonry or concrete wall where the insulation is covered by minimum 1-inch thickness of masonry or concrete. Therefore, thermal barrier is not required since the Korfil insulation will be installed within the core of grouted concrete masonry unites.
 - In addition, since a thermal barrier is not required, the remaining requirements of Section 2603.4 do not apply.
- IBC Sections 2603.5.1 through 2603.5.7 provide additional requirements for foam plastics used on exterior walls. As stated in the building code commentary for Section 2603.5, the intent of this section is to regulate foam plastics on exterior walls when an insulating envelope is created over the exterior structure (See commentary below). This insulating envelope can create a wall cavity and/or exterior façade that may allow the passage of fire to adjacent floors. Therefore, the material used to create the exterior building envelope must be regulated to limit the combustibility and flame spread potential.
 - It is important to note the building code commentary phrasing in this section. The commentary specifically describes the requirements of this section as applying to the materials of the building envelope installed beyond the exterior building structure. The commentary specifically refers to the exterior façade when constructed of foam material (see highlighted section below). Again, the intent being to limit the use of materials that would allow the spread of fire up an exterior wall cavity or exterior façade.

As discussed above, wall assemblies using the Korfil insulation are constructed of grouted concrete masonry units and the foam inserts are installed within the block cores. The insulation material is encapsulated within the exterior wall assembly, it is not intended to function as an exterior façade or located beyond the exterior block wall to create a building envelope or curtain wall assembly. Since the insulation cores are encapsulated in grouted masonry block there is very limited, if any, exposure hazard and potential for the foam insulation to spread fire to adjacent floors or up the exterior wall of the building. This interpretation is further supported by the NFPA 285 scope description and annex, as shown in the figures below. The scope of NFPA 285 specifically states the fire tests of the standard

apply to curtain wall assemblies. Several figures are provided throughout the NFPA 285 standard that shows example test assemblies. These test assemblies display curtain wall assemblies installed beyond concrete block exterior walls and clearly indicate the curtain wall is the specimen to be tested. In addition, Annex A states the intent of the fire tests is to determine the hazard from the interior fires breaking windows and exposing the exterior façade.

2603.5 Exterior walls of buildings of any height. *Exterior walls of buildings of Type I, II, III or IV construction of any height shall comply with Sections 2603.5.1 through 2603.5.7. Exterior walls of cold storage buildings required to be constructed of noncombustible materials, where the building is more than one story in height, shall also comply with the provisions of Sections 2603.5.1 through 2603.5.7. Exterior walls of buildings of Type V construction shall comply with Sections 2603.2, 2603.3 and 2603.4.*

❖ All foam plastics used on exterior walls of all types of buildings, except wood frame, are to be installed in accordance with Sections 2603.5.1 through 2603.5.7. Installations on one-story, noncombustible walls of cold storage buildings are required to also comply with the provisions of Sections 2603.5.1 through 2603.5.7. Foam plastics used on exterior walls of Type V buildings are required to comply with Sections 2603.2, 2603.3 and 2603.4. **The intent is to regulate the use of an insulating envelope over the exterior of a structure when the envelope provides no structural support other than the transfer of wind loads. It is recognized that some envelopes will be constructed in place by installing a rigid foam plastic and covering it with an exterior finish while others will be installed as prefabricated panels complete with exterior finish.**

Figure 1: International Building Code Commentary

1.1* Scope.

1.1.1* **This standard provides a test method for determining the fire propagation characteristics of exterior non-load-bearing wall assemblies and panels used as components of curtain wall assemblies, constructed using combustible materials or that incorporate combustible components, that are intended to be installed on buildings required to have exterior walls of noncombustible construction.**

Figure 2: NFPA 285 Scope Description

A.1.1.2 NFPA 285 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.

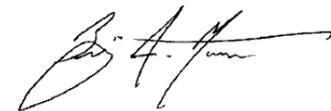
Figure 3: NFPA 285 Annex Description on Purpose of Fire Test

- Section 2306.6 is not applicable since the insulation will not be installed within a roof assembly.
- Section 2306.7 is not applicable since the insulation will not be installed within a plenum.
- Section 2306.8 provides requirements for termite protection. Howe Engineers did not require for compliance with this section.
- Section 2306.9 is provided as a compliance alternative to Sections 2306.4 through 2306.7.

The Korfil insulation product has also been tested in accordance with ASTM E119. The ASTM E119 test results were provided and reviewed by our office. The test report indicates a 10' x 10' wall assembly constructed with grouted 8" x 8" x 16" block and Korfil foam inserts was tested with a live structural load throughout the test duration (up to 85 psi live load). The testing results state the tested wall assembly resisted the passage of flame and hot gases for minimum 2-hour duration (a 2-hour fire rating) with no flames occurring to the foam inserts within the block cavity.

Based on the information above, the results of our review indicate the proposed Korfil foam insulation inserts meet the intent of IBC Section 2603. The inserts comply with the flame spread and smoke-develop indexes; are compliant with the thermal barrier requirements, and are encapsulated in concrete masonry units to resist the exposure hazard of a fire. It is our professional opinion the proposed Korfil inserts are permitted within exterior wall assemblies in accordance with the International Building Code.

Prepared by,



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Associate Principal