WHITE PAPER

Is My Exterior Wall Material Truly Noncombustible?

OVERVIEW

One would think that the separation between combustible and noncombustible material would be simple, however it is far more complicated than it would appear when referencing the 2024 International Building Code (IBC). The test standards used to determine a noncombustible material are ASTM E136 or ASTM E2652, using the acceptance criteria prescribed by ASTM E136. (IBC 703.3.1). (ASTM E2652 was added as an alternate test in the last couple of years due to equipment changes used to run the test, however the performance levels remain the same as the original ASTM E136.) ASTM E136 is recognized as a pass/fail test for material combustibility, but the IBC has an exception where a product is recognized as noncombustible even though it doesn't pass ASTM E136.

ASTM E136 specifically states that it "does not apply to laminated or coated materials", however there are no alternative tests to determine noncombustibility.

IBC Section 703.3.1 has an exception to ASTM E136 that has been used by some panel cladding suppliers that have a noncombustible core; however this does not address the exterior cladding flame spread issues that have plagued the cladding industry for years however, this condition was specifically addressed in the 2024 IBC Section 1402.7.

MCA understands the important need for Section 703.3.1; however, they remain concerned with cladding flame spread performance shown by other testing throughout the world. By supporting the addition of NFPA 285 testing for these materials/assemblies, real-world flame spread performance is addressed.

DISCUSSION

- Will a product or material burn?
- Is a product considered flammable?
- Is a product (or assembly) truly non-combustible?

These are common questions, and the typical answer should be a simple yes or no. The answer is often not quite that clear.

Virtually any material will burn under the right conditions. National standards organizations and the building codes have defined performance for noncombustible material. What is surprising is the differences in the definition of "noncombustible" around the world.

In North America, the building codes recognize "noncombustible" materials, while in Europe terms like A1, A2, B1 and B2 describe material combustibility and differing levels of non-combustibility.

Historically, the IBC, simply defined a material as noncombustible based on the results of the ASTM E136 "Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C". This test requires a 1 $inch^3$ material sample is exposed to a furnace temperature of ~1500 ºF. The sample cannot:

1. Show visible flaming beyond the first 30 seconds
2. Raise the temperature of the furnace by more than 54 ºF (30 ºC)
3. Lose more than 50% of the total mass

All three criteria must be met for a material to be defined as "noncombustible".

Three issues with ASTM E136 for composite or laminate materials are:

1. The test standard states that the procedure is not applicable to composite or laminate materials
2. Materials only available in a thickness <1" must be "stacked" to provide an adequate sample thickness. This could impact the accuracy of the test method.
3. The test only applies to individual materials and does not account for any interaction between products that make up an assembly.

The European Union test for non-combustibility is EN 13501: Classification of Construction Materials According to their Reaction to Fire. Material classification from this standard is designated as A1, A2, B1, B2, etc. (A's being less combustible and B's being more combustible, etc.) The standard defines levels of combustibility, from less combustible (A1) to more combustible (D), however it does not define "noncombustible". These designations do not correspond directly with the existing IBC definition of noncombustibility.

Non-Combustibility in Building Construction

It is easy to confuse the use of "non-combustible materials" and "non-combustible construction". In the United States, construction is divided into different types (Type I, II, III, IV, and V). Commercial construction, Type I or II, typically requires noncombustible structural elements. This includes load bearing elements such as beams, columns, and floors. Nonstructural wall elements, such as cladding, are allowed to be of any construction material however, there are additional fire performance requirements to show that the overall wall assembly will not promote vertical flame spread. The test for this flame spread in the IBC is NFPA 285 "Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components".

A general rule for "code complying cladding" would be that NFPA 285 compliance must be shown for cladding assemblies used when the height of the installation is greater than 40' above grade.

Since the IBC adoption of NFPA 285, there have been no major fire events identified when the wall assembly actually used has met the performance requirements of NFPA 285.

What does the IBC Actually say about non-combustible materials?

There is no definition in the IBC for the term "non-combustible". The reader is forced to go to Chapter 7 on Fire and Smoke Protection Features to learn more about non-combustibility. Section 703.3 describes the required non-combustible performance testing.

> "A material shall not be classified as a non-combustible building construction material if it is subject to an increase in combustibility or flame spread beyond the limitations herein established through the effects of age, moisture or other atmospheric conditions."

Section 703.3.1 goes on to state that elementary materials defined as noncombustible shall meet the performance requirements defined in ASTM E136.

Exception to ASTM E136

However, there is an exception in the 2024 IBC where a product is recognized as "noncombustible" even though it doesn't pass ASTM E136 or ASTM E2652. The exception shown in Section 703.3.1 allows a material "having a noncombustible structural base, determined in accordance with ASTM E136, or ASTM E2652 using the acceptance criteria prescribed by ASTM E136, with a surfacing that is less than 0.125" in thickness having a flame spread index not greater than 50 when tested in accordance with ASTM E84 or UL 723 shall be acceptable as noncombustible." This

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exception was put in place to address products like gypsum sheathing with a paper facing. The paper might burn, but the volume of combustibles is limited, and the flame spread is within a specific range.

The problem with the exception was that it does not address those products with a noncombustible structural base that may have a facing, either combustible or noncombustible, that is held in place using combustible adhesive material. These combustible adhesives have been shown in several large-scale tests around the world to be enough fuel to spread flames and propagate fire vertically up the sample.

For this reason, Section 1402.7 was added to the code requiring these types of materials to also be tested to NFPA 285.

MCA Comment

While the IBC correctly recognizes the exception to ASTM E136 described above, it would seem reasonable to ensure that the vertical flame spread of the wall assembly be acceptable through NFPA 285 testing.

Wall cladding materials consisting of combustible elements including core materials, adhesives, or combustible facer materials such as fiberglass resin mesh used to hold thin veneers such as granite or wood products in place should be tested to identify flame spread performance to ensure safety for the building and inhabitants of high-rise construction.

SUMMARY

There is no question regarding the value of noncombustible materials in construction. The value of noncombustible materials to limit vertical flame spread is well documented. Those products that are considered noncombustible through IBC Section 703.3.1 that do burn or promote flame spread beyond the prescribed limits of ASTM E136 should also be tested to show compliance with NFPA 285 to prove an acceptable performance as required by the code.

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