

Navigating Wall Assembly Fire Testing

NFPA 285 primer addresses burning questions about this important test

Sponsored by DuPont Building Innovations | *By Barbara Horwitz-Bennett*

From the popularity of building certification programs to net-zero energy building initiatives to the active building enclosure movement, expectations continue to increase for building performance, facility life, and occupant health and safety. Because two of the most critical aspects of high-performance buildings are air/water tightness and the enclosure's thermal performance, the necessity of using more insulation, and high-quality air/water barrier and flashing materials, will continue to increase as the industry trends toward highly energy-efficient building envelopes.

While market demand for insulations, dedicated air and water barriers, and other combustible envelope materials are at an all-time high, a little-known code-required fire test standard called National Fire Protection Association (NFPA) 285 has suddenly been cast into the spotlight. Truth be told, this *Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components* has been around for a couple of decades, but its relevance has significantly increased with additional



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Learning Objectives

After reading this article, you should be able to:

1. Recognize the impact of NFPA 285 test requirements in the context of the International Building Code.
2. Apply the NFPA 285 components and parameters for successful test performance.
3. Identify combustible components in a noncombustible wall assembly that requires NFPA 285 testing.
4. Design building envelope systems that are NFPA 285 compliant.

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Now subject to NFPA 285 testing per the International Building Code, foam plastic insulation, combustible exterior claddings, and water-resistive barriers must demonstrate limited fire propagation.

Photo courtesy of DuPont Building Innovations

combustible components included in more recent International Building Code (IBC) updates.

Consequently, it behooves architects to fully understand the history, relevance, and application of this important standard.

THE HISTORY OF NFPA 285

Dating back to the 1970 energy crisis, the plastics industry began encouraging the building industry to start using foam plastic insulation on exterior walls to increase energy efficiency. However, four of the five types of construction listed in the building codes had noncombustible requirements, so the proposal was outright rejected.

Not willing to give up so quickly, the Society of the Plastics Industry (SPI) sat down with code and fire officials and asked what it would take to convince them that putting foam insulation in the walls would not present a fire hazard. The officials then responded with a challenge.

“The plastics group was charged to design a test which would show that if a wall was fully burning, that the flames would not travel a significant distance, vertically or laterally, because of the foam plastic,” explains Jesse J. Beitel, a senior scientist/principal with the Baltimore-based fire protection engineering and code consulting firm Hughes Associates. “That’s how the first, two-story outdoor test was developed, but it still took another eight years before the codes adopted it.”

Finally, in 1988, the Uniform Building Code (UBC) adopted the test method and allowed the use of foam plastics on the exterior walls of all construction types based upon the successful performance of several foam plastic insulated wall systems.

“However, it was an expensive test, plus one was at the mercy of the weather, so the plastics industry went about reducing the scale of the test and moving it indoors,” he continues. “That test was then adopted in the UBC in 1992.”

The test was then submitted to the NFPA Committee on Fire Tests and, in 1998, was published as the NFPA 285 fire test method that is used today.

BEYOND FOAM PLASTIC

While the original push was to include foam plastic insulation in exterior walls, more recently, combustible exterior claddings and water-resistive barriers (WRB) have been incorporated into the codes. In particular, the International Building Code included exterior insulation finishing systems (EIFS) in 2000, metal composite materials (MCM) in 2003, fiber-reinforced plastics (FRP) in 2009, and high-pressure laminates (HPL) in 2012, as combustible components within noncombustible wall assemblies requiring

History of NFPA 285

Energy Crisis:
Leads to increased exterior insulation applications

1988:
Uniform Building Code adopts UBC 17-6

1997:
Uniform Building Code adopts UBC 26-9

2000:
IBC begins requiring NFPA 285 testing

1970s

1980s

1990s

2000s

2010s

Late 70s:
SPI develops full-scale test

1998:
NFPA adopts UBC 26-9 as NFPA 285

2012:
IBC expands NFPA 285 testing to WRB

From its official adoption to the Uniform Building Code in 1988 to the 2012 International Building Code, fire testing is required for combustible components in wall assemblies.

Source: DuPont Building Innovations

NFPA 285 testing.

Also, in 2012, the IBC added WRBs as components requiring testing before their use would be permitted in Type I, II, III, and IV buildings over 40 feet above grade (see sidebar “International Building Code Construction Categories” on the next page). This provision was recently added in as testing discovered that assemblies which passed NFPA 285, later failed with the addition of a WRB.

It seems that these newer developments were, in part, driven by increasing concerns about life safety issues in high-rise structures. For example, according to NFPA research, from 2005 to 2009, an estimated 15,700 annually reported fires in high-rise buildings resulted in an average of 53 civilian deaths, 546 civilian injuries, and \$235 million in direct property damage per year.

In addition, a number of building fires in the U.S. and China in 2010 proved that a small ignition source can rapidly spread to engulf the entire exterior of a building. Of course, this is particularly dangerous in high-rise buildings with limited rescue and evacuation capabilities.

Although the process of states adopting the latest version of the IBC will take time, and often states and local jurisdictions choose not to adopt the model code in its entirety, but rather use it as a basis for developing their codes, experts anticipate that the issue of designing and specifying NFPA 285-compliant wall assemblies is becoming more critical.

Buyer Beware

While some manufacturers and associations have been quite proactive in terms of testing their wall assemblies in-house to ensure NFPA 285 compliance, other products have only begun showing up in wall assemblies in recent years and have not been tested together with many component variations.

“So now NFPA 285 is rearing its ugly head

for some, and architects are frustrated that they can’t always design wall assemblies the way they want to as not all products pass this test,” points out Beitel.

Furthermore, Tracy (Golinveaux) Vecchiarelli, associate fire protection engineer, National Fire Protection Association, Quincy, Massachusetts, points out that NFPA 285 is a full assembly test. “This means that all of the wall components need to be tested together and then the entire assembly is given credit for passing the test. However, the individual components of the wall cannot be considered ‘compliant’ just because they were part of a tested assembly,” she explains.

Consequently, NFPA 285 is proving to be quite a source of confusion among architects.

Earlier versions of the IBC contained ambiguous language, so it appeared that most construction types were exempted from NFPA 285, explains Richard Keleher, AIA, CSI, LEED AP, senior architect, Thompson & Lichtner, Cambridge, Massachusetts. But now that the language in the IBC has been clarified, and NFPA 285 compliance is anticipated to be more fully applied and enforced, architects have been taken by surprise. “In fact, in my 45 years of professional practice. I have not seen a single issue that has given architects such uncertainty,” he states.

Offering his perspective, David W. Altenhofen, AIA, East Coast director, The Façade Group, Philadelphia, notes that for decades, so many buildings have been constructed, without question, with foam plastic insulation in the cavity behind brick veneer.

“As the construction industry incorporated more and more drained cavity rain screen wall systems with veneers of metal panels, aluminum composite materials, terra cotta, etc., it was a natural transition to just keep using the foam plastic insulation in the cavity,” he says. “At the same time, code officials did not seem to be

2012 IBC NFPA 285 Testing Requirements

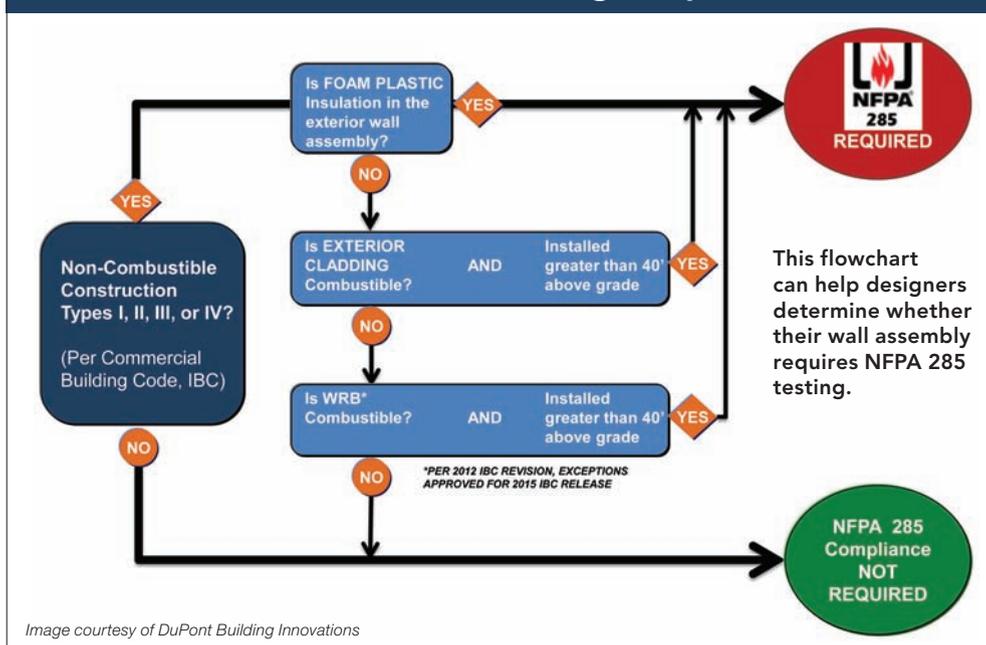


Image courtesy of DuPont Building Innovations

IBC CONSTRUCTION CATEGORIES

The International Building Code divides construction materials into five types as follows:

Type V: Combustible Construction
Structural elements, exterior walls, and interior walls are made from any materials permitted by code. Wood-based framing and sheathing is common.

Type IV: Heavy Timber Construction
Exterior walls consist of noncombustible materials and the interior building elements are solid or laminated wood without concealed spaces. Wood members have minimum dimensions for Heavy Timber classification.

Type III: Noncombustible Exterior
Exterior walls are made from noncombustible materials and the interior building elements are constructed with any material permitted by code. Steel studs, fire-retardant-treated (FRT) wood framing, and gypsum sheathing are common.

Type II: Noncombustible Exterior and Components
Exterior walls, floors, and roof are composed of noncombustible materials. Steel, masonry, and cementitious products are common.

Type I: Noncombustible Materials and Structure
All exterior and structural components require fire-rated assemblies. Fire-protected steel and concrete assemblies are common.

aware of the NFPA 285 requirements and weren't challenging architects. Now the industry is on a steep learning curve to catch up."

PASSING NFPA 285

Of course, the first step in dealing with NFPA 285 is determining if, in fact, the specified assembly requires testing. For starters, the noncombustible components in the wall assembly—including the base wall structure, interior drywall, and exterior sheathing—are not test triggers, but they must be considered as part of the complete wall assembly. This is because the noncombustible members can influence the overall results by interacting with the combustible components in the test.

"The key thing to keep in mind is that the NFPA 285 test is not a material test. The intention of the test is to assess the fire performance of a specific wall assembly, as a system," explains Jason Martin, P.E., commercial building technical R&D leader, DuPont Building Innovations, Richmond, Virginia.

However, it's the foam plastic insulation on buildings of any height, other than construction type V, and air and water barriers and combustible claddings—EIFS, MCM, FRP, and HPL—on buildings taller than 40 feet above grade, which are categorized as construction types I-IV, that will subject an assembly to NFPA 285 testing.

Incidentally, it's important to note that the 2012 IBC also prescribes that these components meet the following ASTM requirements:

- ▶ Flame Spread Index \leq 25 (ASTM E84)
- ▶ Smoke Development Index \leq 450 (ASTM E84)
- ▶ Maintain assembly fire rating (ASTM E119/UL 263)

In terms of the NFPA 285 test itself, Vecchiarelli explains, "the intent of the test is to evaluate the fire propagation characteristics of exterior non-load-bearing wall assemblies. The two-story test involves two burners, one placed inside the first-story test room, and the other in a first-story window opening.

"The test runs for 35 minutes," she continues. "Test results include flame propagation measurements, thermocouple temperatures, and observations made during the test."

In order to pass the test, the wall assembly may not allow any flame propagation to the second-story room and none of the thermocouples, which are placed throughout the wall assembly, can exceed 1,000°F. Externally, the flames cannot propagate 10 feet above the top of the window, nor can they travel more than 5 feet laterally from the centerline of the window.

Some of the thermocouples are placed on the exterior wall surface, while others are positioned in the wall cavity air space or insulation, or both. Additional thermocouples are positioned in the insulation or the stud cavity, or both. As for the test specimen itself, the minimum height is 18 feet and the minimum width runs 13 feet, 4 inches.

COMBUSTIBLE COMPONENTS IN A NONCOMBUSTIBLE WALL ASSEMBLY

While noncombustible cladding—including brick, masonry, stone, terra cotta, concrete, cementitious stucco, fiber cement boards and panels—do not alone trigger NFPA 285 testing, they are generally heavier, more expensive materials.

Taking a closer look at combustible cladding types, MCM cladding systems are available in open and closed joint systems and run between 3 millimeters and 25 millimeters in panel thickness. Factory bonded with a metal face and plastic core, the full system is made up of joints, a substructure, and an attachment mechanism. Because different manufacturers utilize different core materials, it's important to note that fire performance characteristics will vary. And even if the product looks the same as an NFPA 285-tested MCM and bears a similar product name, if a different core material is utilized, that specific product requires a separate NFPA 285

NFPA 285 Fire Test Parameters



No flame propagation in second-floor room



Inside wall assembly, thermocouples shall not exceed 1,000°F during the 35-minute test.



Externally, flames shall not reach 10 feet above the window's top.

Externally, flames shall not reach 5 feet laterally from the window's centerline.

Images courtesy of DuPont Building Innovations

test within the wall assembly configuration.

Using MCM below 40 feet, while not triggering an NFPA 285 test, is limited to 10 percent of the wall area when the building separation is less than 5 feet. MCM cladding use above 40 feet, but below 75 feet, may not require an NFPA 285 assembly test, depending on a complex assessment of: installation area, panel sizes, horizontal and vertical separations, presence of a whole-building sprinkler system, building separation distance, and whether the cladding self-ignites below 650°F, per ASTM D1929.

EIFS systems are regulated by the IBC under foam plastic requirements, and must meet ASTM E2568, which includes, but is not limited to, accelerated weathering, freeze/thaw, salt spray resistance, tensile bond adhesion, water penetration, and resistance testing.

Like EIFS, FRPs and MCMs with foam cores must also comply with IBC foam plastic requirements. When FRPs are installed in a condition not requiring an NFPA 285 assembly

test, the cladding's flame spread index must be no more than 200, per ASTM E84, and prescribed cavity fireblocking is required. In this case, FRPs—which are composite materials made from reinforcing fibers impregnated with a polymer, molded into the desired shape and laminated onto a wood or plastic core—are limited to 10 percent of the surface area when the building separation is less than 10 feet.

HPLs also come as open and closed joint systems and run between 4 millimeters and 15 millimeters in panel thickness. In conditions not requiring an NFPA 285 assembly test, they are limited to a 10 percent area when the building separation is less than 5 feet, and similar to MCMs, the different core materials which different products are made from will have varying fire performance characteristics. HPLs are decorative exterior grade panels with cellulose fibrous material bonded with a thermosetting resin by a high-pressure process.

One noted exception for HPLs with regards to NFPA 285 is the cladding is allowed to rise up to 50 feet in areas of 300 square feet or less, per 4-foot vertical separation, and does not require NFPA 285 testing as long as the cladding doesn't self-ignite below 650°F, per ASTM D1929.

As for air and water barriers, referred to in the IBC as WRBs, generally all product types are considered combustible including: building wraps, self-adhered building wraps, self-adhered membranes, and fluid-applied membranes. Although the 2012 IBC does require that all WRBs go through testing, significant revisions and exceptions, based on material properties and fuel load potential, have been included in the 2015 IBC.

Because WRBs are a new NFPA 285 assembly test trigger in 2012, this means that the vast majority of products have not been tested. And although some manufacturers may claim that they have an NFPA 285 test report, buyer beware

that the product may have only passed one test in one specific wall assembly configuration, which significantly limits designers.

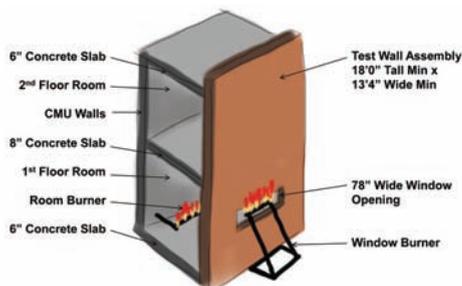
It's also important to keep in mind that WRBs can be installed both under the insulation and over the insulation, and each positioning of the barrier requires a separate test.

For example, specifiers often choose to place the barrier under the insulation in order to increase the product's durability and longevity because it is protected by the foam. Also, in cases where the finish system is applied directly to the outside of the foam, the WRB must be located under the insulation. One other advantage to this approach is the specifier's ability to provide a drainage plane behind the foam for better moisture/condensation management.

On the other hand, some reasons why the architects may choose to install mechanically fastened building wraps over the exterior insulation are: ease of installation, lack of blind penetrations behind the insulation, and the protection of the insulation seams from air/water exposure. Also, when fluid-applied or self-adhered membrane products are installed on the exterior face of the continuous insulation, it is important that they have adequate adhesion to the surface of the insulation and that the insulation facer is sufficiently bonded to the insulation.

As mentioned, insulation levels in building enclosures have been steadily rising thanks to the green building movement and the energy codes. For example, in the 2012 IECC and ASHRAE 90.1 2012, the mandated use of continuous insulation (c.i.) increased for every climate zone. Insulation is considered continuous when it is installed on the exterior side of the base wall in order to reduce the effect of thermal bridging on the overall R-value of the wall assembly.

NFPA 285 Fire Test Components



This diagram shows the testing structure for NFPA 285.

Image courtesy of DuPont Building Innovations

With ample studies effectively showing the extent to which thermal bridges compromise R-values by providing a means of high heat flow conductance through the building envelope, this has helped spur the newer c.i. requirements. To avoid de-rated R-values of between 40 percent and 60 percent, insulation must continuously run across all structural members without thermal bridges, outside of fasteners and service openings.

Putting things into perspective, Meyer points out that this new code development essentially eliminates the “choice” of whether or not to use continuous insulation and virtually mandates foam on exterior walls.

Although there are insulation alternatives to foam, and some specifiers are opting to go with these materials in an attempt to avoid NFPA 285, at the same time, they are compromising on the higher thermal performance of foam.

For instance, mineral wool has a nominal R-value of about 4 per inch of material, and the type of foam plastic insulation recommended for exterior walls, namely extruded polystyrene, has an R-value of 5. For an even higher R-value, polyisocyanurate insulation is rated at 5.6 per inch.

The benefit of mineral wool insulation is that it is noncombustible and will not prompt a NFPA 285 test. In addition to noncombustibility, mineral wool differs from foam plastics due to its high vapor permeability. This directly increases the wall’s ability to dry out if water gets into the wall assembly through a penetration leak or condensation from air transported moisture.

Essentially, the increasing use of exterior continuous insulation contributes to the growing complexity of designing exterior wall systems. Thickness, permeability, and location of the insulation in the wall assembly have an

effect on how it responds to thermal air and moisture loads. There is no one single perfect wall design. The building science aspects of material properties, their locations in the wall assembly, the attachment methods, assembly performance requirements, constructability, and climate conditions must all be considered in a high performance building envelope.

DESIGNING NFPA 285-COMPLIANT BUILDING ENVELOPE SYSTEMS

Another wrinkle in the NFPA 285 testing process is the fact that only three laboratories are currently equipped to do the testing. These include Intertek and Southwest Research Institute, both in San Antonio, Texas, and Architectural Testing in York, Pennsylvania. So not only does the cost of \$50,000 to \$60,000 per test (*Journal of Building Enclosure Design*, Summer 2012) quickly add up, but the standard lead time of 8 to 10 weeks can delay a project’s design and construction schedule.

Fortunately, a fourth testing facility should be coming on line within the year, which may speed things up, although concrete and masonry systems will still require a 4- to 6-week curing time.

At one point, NFPA looked at trying to reduce the scale of the test to reduce the cost and lead time, but such an undertaking would have required a significant investment of time, money and resources, so that work was set aside, according to Beitel.

As mentioned, every configuration requires a separate test. So even if a specific WRB, cladding and insulation type were to pass the test, if the designer decides to swap out even one of the components, an entirely new test must be conducted.

For example, there are many types of foam plastics and performance varies, explains Beitel.

“Based upon the wall assembly you put them into, some will pass and some will fail. That is the problem that the architects perceive they have. They want to use a given foam with a given veneer, but it has to pass the test.

“None of the foams have a perfect track record and that’s the confusing part here,” he adds.

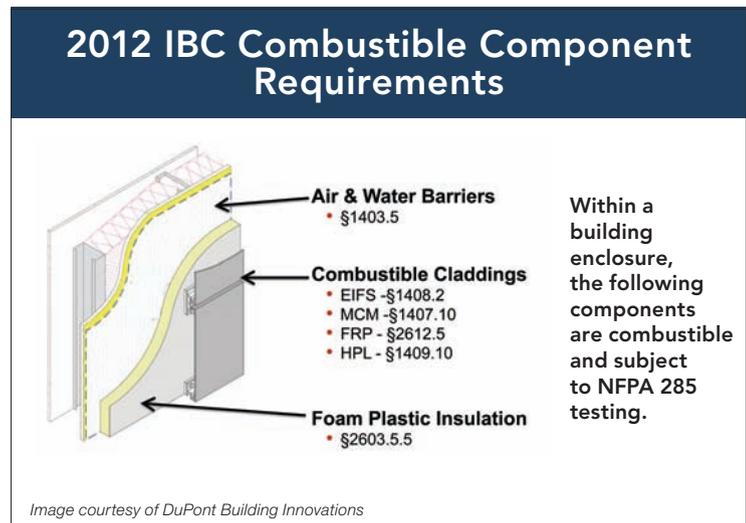
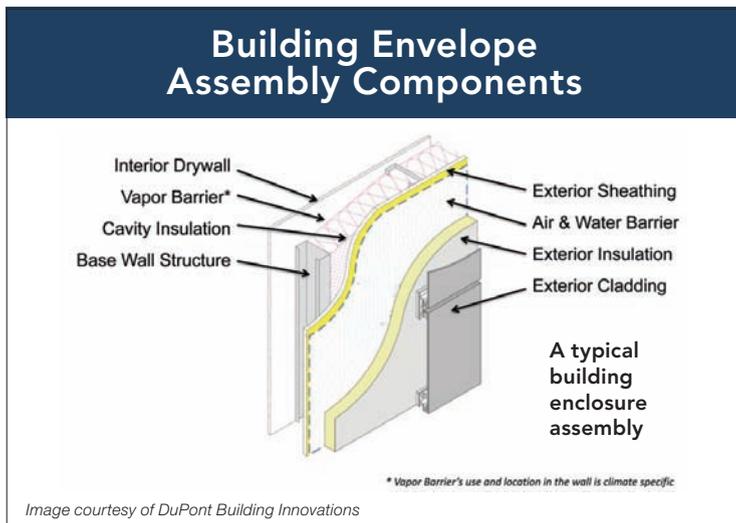
In some cases, manufacturers who have tested various combinations of their products in wall assemblies, can be very helpful. So specifying a specific wall assembly which has already been tested by the manufacturer will obviously spare the architect the time and money for testing, which can amount to a savings of thousands of dollars, according to Vecchiarelli.

However, this means that every element of the wall assembly must be exactly the same as when it was tested and this, in turn, forces wall assemblies into a proprietary status, rendering them un-biddable. Consequently, to get around this, architects must now design their walls with multiple 285-compliant assemblies in mind.

Making the situation even more complicated, NFPA 285 test results are owned exclusively by the manufacturer and at present, there is no catalog of compliant assemblies that architects can reference.

“In fact, some manufacturers are not publishing their information in this regard for fear of their competitors copying them,” notes Keleher. “This makes it exceeding difficult to find compliant assemblies that suit individual projects.”

Recognizing this complexity, some initial efforts are being made to compile a database of 285 fire-tested assemblies. Meanwhile some proactive material manufactures are trying to offer a large selection of compliant assemblies that use their products for designers to choose from.



Source: *Assembly U-Factors for Steel-Frame Walls*, ASHRAE 90.1-2007; image courtesy of DuPont Building Innovations

Impact of Thermal Bridging on Effective Installed R-Value for Steel-Framed Walls		
Actual Cavity Depth, inch	Rated R-Value	Effective R-Value
3.5 in. depth	R-11	R-5.5
	R-13	R-6.0
	R-15	R-6.4
6.0 in. depth	R-19	R-7.1
	R-21	R-7.4
3.5 in. depth	R-11	R-6.6
	R-13	R-7.2
	R-15	R-7.8
6.0 in. depth	R-19	R8.6
	R-21	R 9.0

Because thermal bridging so significantly compromises the effective installed R-value in wall assemblies, continuous insulation code requirements have come about.

“This is what the architects need at the end of the day,” affirms Beitel. “How soon and how that will come about, I don’t know as it is not a simple process, but the construction industry understands that we have to get that together.”

One tool which architects can potentially use is an engineering judgment analysis letter furnished by a reputable code expert. This involves bringing in such a consultant and inquiring as to whether individual products

which passed NFPA 285 in separate tests, could be combined together in one assembly and not officially require testing, based upon the expert’s opinion that the new combination would theoretically provide acceptable life safety levels.

“It is possible and reasonable to make such judgments,” notes Beitel. “For example, if a steel stud gypsum wall was tested and passed, and now the architect wants to put it on a concrete

masonry unit, the code officials would probably accept this.”

At the same time, such an engineering analysis must come from a consultant who is intimately familiar with the 285 test and is knowledgeable in the field. And secondly, the onus lies on the architect and consultant to convince the local AHJs that the NFPA 285 test can be bypassed in this instance.

“This can save a considerable amount of money over a custom 285 test. Of course, if a full test is going to be required, fire safety consultants are essential to get to approval without experimenting with the materials too much,” adds Altenhofen.

Since the legal responsibility doesn’t fall on the code officials, but rather the consultant and the party who commissioned the consultant, the AHJs are often willing to consider such well-founded exemptions, or specific exemptions which will be included in future versions of the IBC, such as the WRB exemptions in the 2015 IBC.

Other than recruiting the services of such a consultant, as mentioned, architects don’t have the benefit of a “cheat sheet” at this time and are really being forced to do their homework. At the same time, some manufacturers are more progressive than others in providing specifiers with such a chart instructing how to build a NFPA 285 compliant wall assembly based upon their testing data.

IBC FIRE-RELATED TEST AND REPORTS

In addition to the NFPA 285 wall assembly test, relevant combustible components must also pass a series of material tests, per the International Building Code.

“It is important to understand the how material tests differ from assembly tests on how they are performed and how they are required by code,” says Benjamin Meyer, science architect, DuPont Building Innovations, Richmond, Virginia.

While, in many cases, the manufacturers take care of these tests, architects need to be familiar with the various ASTM tests and double check that a given product is compliant.

ASTM E84—Surface Burning Characteristics

Comparatively measures product surface flame spread and smoke density. Products are then classified as A, B, or C based upon their flame spread index, with Class A offering the lowest flame spread levels. It’s important to note that this test does not measure heat transmission, determine an assembly’s flame spread behavior, nor classify a material as noncombustible.

ASTM E1354—Cone Calorimeter Test

A small sample specimen is taken and measured for heat of combustion, mass loss rate, time to sustained flaming, and smoke production. The test applies to various categories of products and is not limited to representing a single fire scenario.

ICC ES Reports

These evaluation reports are used to help determine if a building is code compliant and helps agencies enforce building regulations. Manufacturers also use these reports to provide that their products meet code requirements and warrant regulatory approval. This is particularly important for new and innovative products.

ASTM E119/UL 263/IBC 703.2

Provides assembly measurement of the transmission of heat and hot gases while determining the load carrying ability during the test exposure. The test does not simulate scalability or fire behavior between building elements such as floor-wall or wall-wall connections. Nor does it measure the generation and movement of smoke through the assembly, generation of toxic gases, or flame spread over the surface.

NFPA 268—Radiant Ignitability of Assemblies

NFPA 268 tests for ignition of an exterior wall assembly by exposing it to a specified radiant heat flux for 20 minutes. The test is not used to evaluate a wall assembly’s fire endurance, surface flame spread, or the effect of fires originating from within the building, exterior wall assembly, or at the openings.

Case in point, Beitel was recently called in on a project where half of a 22-story high rise was already erected and the team discovered that the wall assembly hadn't been tested and there was some question as to whether it would pass. Consequently, the wall had to be tested on site, and failed, so it had to be taken down, re-designed, and reconstructed.

"You have to think about what you're doing beforehand and have your ducks in a row to make sure you have a compliant wall system," emphasizes Beitel.

This involves going back to the manufacturers and asking for information about specific products. Granted, some companies may be more forthcoming with information than others, so it may be in the best interest of architects to work with manufacturers who are willing to help them navigate the NFPA 285 situation.

"Architects need to talk to the manufacturers; that's the best advice I can give," states Beitel. "If they can't provide information or don't want to provide it, it may be necessary to use other products." Offering a few general guidelines with regards to different cladding and insulation types, Keleher has observed that MCMs are having the most difficulty passing NFPA 285, and so far, asphalt-based WRBs haven't been able to pass, although some interpretations are allowing asphalt-based flashings.

"The tried and true 40 mil modified asphalt air barrier sheets and similar spray applied products, unfortunately, are some of the less likely products to be included in NFPA compliant assemblies as they add a substantial fuel load," says Altenhofen.

While a lot of EIFS have passed NFPA 285, Altenhofen points out that there are some coated foam plastic trim and accent products that look like EIFS, but may not comply with NFPA 285.

As for FRPs and HPLs, he recommends carefully evaluating the plastic panel products because they are often organic based, making them more prone to combustion.

Altenhofen has also observed polyisocyanurate insulation as typically being less flammable than extruded or expanded polystyrene, but the product has some other performance issues that require evaluation.

DESIGNING WITHOUT NFPA 285

As noted earlier, if a wall assembly is designed without foam plastics and is less than 40 feet above grade, then NFPA 285 testing is not required. In addition, NFPA 285 compliance is not required for Type V Combustible Wall construction as the IBC gives prescriptive requirements instead. Previously, NFPA 285 compliance was not required for a wall of any

Although the IBC was not willing to fully exempt WRBs from NFPA 285, the following exceptions were included in the 2015 IBC:
If the WRB is the only combustible wall component and the wall has a noncombustible covering.
Windows and doors, and flashing around windows and doors are excluded.
If the WRB is the only combustible wall component and the following test parameters are met:
ASTM E84 Product Test:
▶ Flame spread index of 25 or less
▶ Smoke-developed index of 450
ASTM E1354 (Cone Calorimeter) Product Test:
▶ Incident radiant heat flux of 50 kW/m ²
▶ Effective Heat of Combustion of less than 18 MJ/kg
▶ Peak Heat Release Rate less than 150 kW/m ²
▶ Total Heat Release of less than 20 MJ/m ²

height, comprised entirely of noncombustible materials, but the recent addition of the WRB trigger to the 2012 IBC has put a logistical hold on this option.

In terms of the WRB exceptions coming up in the 2015 IBC, although this code version won't be adopted for some time—in fact, as late as 2018 in some jurisdictions—the document is available for reference at this time and some local authorities may choose to implement it, particularly those who are approached by the National Institute of Building Science and the Building Enclosure Technology and Environment Council—with support from the American Institute of Architects—who are actively lobbying the IBC and local AHJs that wall assemblies can be built to acceptable life safety standards without the full requirements of NFPA 285.

In particular, the group proposed changes to the foam insulation and WRB sections of NFPA 285 for the 2015 IBC. Although the foam proposals were rejected, the group achieved partial success with WRBs.

The specific claim made by NIBS/BETEC in the WRB proposal reads as follows:

There are materials that are available, tried and tested by long-term proven history of performance as weather barriers that are not able to meet the standards in this test. Section 1403.2 of the IBC requires weather-resistive barriers while Section 1403.5 requires them to be tested to a standard if they contain a combustible water resistive barrier that many materials that are traditionally used and have proven their value can't meet.

Section 2603.5 establishes requirements for protection and testing of combustible water resistive barriers that include foam plastic insulation, so Section 1403.5 is not necessary for

those products. Given that 75% of construction litigation relates to water leakage suggests that this paragraph should be deleted or we are likely to face significant problems in the future with the failure of exterior water barriers.

A NEW REALITY

Although NIBS and BETEC are planning to continue lobbying the IBC, and it will take time until all the local AHJs update their codes to incorporate the 2012 IBC, or at least base their next commercial building code on the latest IBC, the fact remains that the construction industry is entering a new NFPA 285 reality. These stringent fire protection provisions coupled with stricter energy codes are anticipated to shake things up in terms of the way wall assemblies will be specified moving forward.

Tasked with this challenge, architects will need to be knowledgeable about the standard, how it works, when it is applied, and when it can be avoided. Meanwhile, manufacturers who want their products to be specified will have to work as an ally to designers by taking on the onus of testing, where possible, and openly furnish architects with test-compliant information.

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1. **Who developed the first test for flame propagation of foam insulation in exterior walls?**
 - a. National Fire Protection Association
 - b. Uniform Building Code
 - c. Society of the Plastics Industry
 - d. International Building Code
2. **Which exterior cladding type is considered noncombustible?**
 - a. Exterior insulation finishing systems
 - b. Fiber cement boards
 - c. Fiber-reinforced plastics
 - d. High-pressure laminates
3. **Exterior walls are potentially subject to NFPA 285 testing once a building exceeds _____ above grade.**
 - a. 40 feet
 - b. 50 feet
 - c. 100 feet
 - d. 200 feet
4. **For how long is the wall assembly exposed to two directed flames during the NFPA 285 test?**
 - a. 20 minutes
 - b. 30 minutes
 - c. 35 minutes
 - d. 45 minutes
5. **For which material will the 2015 IBC include significant revisions and exceptions to NFPA 285 testing?**
 - a. Foam insulation
 - b. Metal composite materials
 - c. Water-resistive barriers
 - d. None of the above
6. **Which insulation type offers the highest R-value per inch of material?**
 - a. Polyisocyanurate
 - b. Extruded polystyrene
 - c. Mineral wool
 - d. All of the above
7. **When planning to perform the NFPA 285 test at a qualified testing facility, how much time should be allotted?**
 - a. 4 to 6 weeks
 - b. 8 to 10 weeks
 - c. 6 months
 - d. 1 year
8. **Once a specific configuration of an exterior cladding type, foam insulation type, and water-resistive barrier passed NFPA 285, it's acceptable to swap out the foam insulation for another type without needing to re-test.**
 - a. True
 - b. False
9. **What is an engineering judgment letter?**
 - a. A letter written by the Authority Having Jurisdiction to enforce NFPA 285
 - b. A letter written by a building products manufacturer stating that their product passed NFPA 285
 - c. A letter written by the International Building Council code committee explaining the parameters of NFPA 285
 - d. A letter written by an expert consultant vouching for the life safety level of a specific wall assembly in lieu of NFPA 285 testing
10. **Which construction type NEVER requires NFPA 285 compliance?**
 - a. Type V – Combustible Construction
 - b. Type III – Noncombustible Exterior
 - c. Type II – Noncombustible Exterior and Components
 - d. Type I – Noncombustible Materials and Structure



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