

# Behind every UL label there's a carefully tested system

The classification of roofing products by Underwriters Laboratories (UL) is a complex and often perplexing topic. It can leave contractors asking questions such as:

- How important is UL labeling and classification of roofing membranes?
- What criteria is used to determine which UL classifications will be awarded to a membrane product?
- Why do some roofing manufacturers display the UL label on their product packaging while other manufacturers don't?
- How can I achieve maximum protection for myself and my customers?

For the contractor or specifier who wants to comply with codes and standards, these are important questions. They must be answered before any roofing materials are purchased to ensure that materials meeting these standards will be used.

## What the UL label means

The primary function of UL testing and labeling is to assure that a recognized standard of quality and safety has been met in the manufacture of a product. While many manufacturers display the UL label in their advertisements and promotional materials, it is important to note that *unless the UL label appears on the product or its packaging, there is no assurance that the product in the contractor's hand is the same product that UL tested.* Roofing membranes may vary from batch to batch, due to differences in each batch's formulation or manufacturing process. A UL classification states only that a sample of the manufacturer's roofing product was once tested, met specified standards, and was awarded a UL classification. It does not mean that each batch is tested.



If there is a UL label on product packaging, however, it means the manufacturer has met stringent, predetermined manufacturing specifications and quality control procedures. To ensure that the product being produced has the same properties as the sample that was UL tested, UL requires roofing manufacturers that display the UL classification marking on their products to participate in UL's follow-up service program. This program gives UL the freedom to send one of its 500 inspectors—unannounced—to the roofing manufacturing facility any time labeled materials are being produced. The inspector then verifies that these products are manufactured according to the same specifications as the original product samples that were tested. Should the inspector find that the product's ingredients or construction vary from the tested product, UL can refuse to allow the manufacturer to apply the classification marking to the product in question.

Each manufacturer using the UL classification marking is visited by a UL inspector at least once every quarter. If the manufacturer produces large quantities of UL labeled prod-



*Richard Courtney is technical product manager at J.P. Stevens & Co., and is an individual industry representative on the UL Advisory Conference for Roof Covering Materials.*

If there is a UL label on product packaging, it means the manufacturer has had an independent, third-party testing procedure.

ucts, the manufacturing facility may be visited as often as three times a week.

Specifying that only UL-labeled materials be delivered to the job is the only way to ensure that the roofing materials actually installed meet the stated UL classification. To comply with this UL labeling requirement, manufacturers that do not normally UL-label all of their product will have to have a UL inspector visit and approve the production run for the job.

### Entire assembly tested

Insisting on UL-labeled materials may seem like a lot of trouble, but it is well worth the effort. A UL classification is backed by the laboratory's long experience in evaluating materials. The company has been testing roofing products for fire resistance for more than 80 years, and for wind resistance for more than 25 years. Additionally, it is the best and least expensive form of third-party quality control that a roof buyer or designer can specify.

To classify roofing materials, UL currently uses four basic tests, which gauge the roofing assembly's resistance to fire or wind. Three of the UL tests are for fire resistance; the other is for wind-uplift resistance. Each test uses the latest technologies and equipment available. The model building codes in the United States are specified around these test methods.

UL tests the *entire* roofing assembly, which includes the membrane, fasteners, insulation and roof deck, rather than just the individual membrane or insulation. If another material is substituted for any of the assembly's original components after a classification has been established, the UL classification can be negated. UL will classify an assembly containing a substituted component only after it has evaluated the substitution and found it acceptable. For this reason roofing manufacturers test their membranes over a variety of insulation types so owners and specifiers will have a choice of assemblies.

### Three tests measure fire resistance

The three UL fire tests are: UL 790 for resistance to external fire exposure, UL 263 for interior fire resistance, and UL 1256 for flame spread beneath the deck.

The test for external fire resistance is the most common of the three fire tests. This test is designed to evaluate roofing assemblies' resistance to external building fires as well as to burning objects that may fall or be blown onto the roof from adjacent buildings. Based on these test results, UL rates a roof assembly's fire resistance as either Class A, B, or C.

To evaluate an assembly's resistance to external fire exposure, UL subjects the assembly to three separate tests. These are the spread of flame test, the intermittent flame test and the burning brand test.

If the deck is non-combustible, then only the spread of flame test applies. In the Class A or B flame spread test, the roofing assembly is subjected to a 1,400 F flame, driven by a 12-mph wind, for 10 minutes. If the flame spread is contained to 6 feet or less, a Class A rating is awarded. If the flame spread is limited to 8 feet, then a Class B rating is given. Membranes that contain the flame spread to 13 feet in four minutes are given Class C ratings. (The flame temperature is also reduced to 1,300 F in the Class C test.)

The burning brand and intermittent flame test are performed only when the roof assembly is going over a combustible deck. These tests are used to determine if the fire will penetrate the roofing membrane and any insulation used, and then ignite the deck below. The intermittent flame test measures the roofing material's ability to resist flame penetration when flames are not constant. For Class A and B tests, the roof assembly is subjected to a 1,400 F flame, which is turned on and off in cycles. (One cycle consists of two minutes on, two minutes off.) A Class A rating is given if two successive roof assemblies do not burn through after 15 cycles and no glowing embers drop to the floor underneath. A Class B rating is given when samples successfully pass eight cycles. A Class C rating is given when the membrane survives three cycles of 1,300 F flame turned on for

*Ratings derived from the test correlate directly to miles per hour of wind velocity.*

UL 263 also specifies a maximum surface temperature for the assembly. This temperature is measured in nine locations during the test, and cannot exceed an average of 250 F or a high of 325 F in any single location. The surface temperature of structural supports cannot exceed an average of 1,100 F or 1,300 F at any single point.

After a ceiling assembly is rated using the UL 263 test, the results are published in UL's *Fire Resistance Directory* underneath the assembly's design number, which for roof/ceiling assemblies is preceded by the letter "P." The designs listed in this directory are only for assemblies constructed of UL-labeled components. Component substitutions are forbidden unless there is written approval from UL because changes in components can alter the assembly's fire resistance.

The third UL fire test, UL 1256, measures an assembly's resistance to interior fire spread by determining how fast and how far a fire can spread on the underside of a roof deck. This is particularly important in buildings with large areas of open interior space.

This test is conducted by exposing the underside of a roof deck to fire with a simulated wind for 30 minutes. Materials pass the test if the flame does not spread more than 10 feet during the first 10 minutes and 14 feet during the entire 30-minute test.

### **Wind resistance also tested by UL**

With its UL 580 test, UL evaluates an assembly's resistance to wind uplift, which occurs when wind passing over a building makes the air pressure outside the structure less than the air pressure inside. UL 580 is based on the principle of positive/negative pressure gusting. Ratings derived from the test correlate directly to miles per hour of wind velocity. A Class 30 rating simulates a wind speed of 100 mph, a Class 60 rating corresponds to a 140-mph wind speed and a Class 90 rating corresponds to a 170-mph wind speed.

During the UL 580 test, a 10-foot-square roof sample, complete with supports, decking, roofing covering and insulation, is subjected to positive pressure from the underside for 80 minutes. An oscillating negative pressure is applied to the topside for the middle 60-minute segment of the test. This oscillating external negative pressure on the topside, combined with the positive pressure underneath, simulates the effects of wind gusting.

If the roof remains in place for 80 minutes during this test, a Class 30 rating is awarded. A Class 60 rating is attained if the same deck assembly is successfully tested a second time for another 80 minutes at a correspondingly higher pressure. The highest rating, Class 90, is awarded when the same deck assembly is tested a third and final time for another 80 minutes at a pressure simulating a wind speed of 170 mph. In other words, in order to achieve a Class 90 rating, a roof assembly has to withstand three hours of oscillating pressure and four hours of combined pressure without failing.

Understanding UL's classification and labeling system is crucial for roofing contractors who are seeking quality products that satisfy the local building codes or specifications. Equally important is making sure that the products actually being installed have been classified by UL. By always specifying that only products bearing UL labels be delivered to the jobsite, roofing contractors can be assured that the roofing materials meet the laboratory's stringent, third-party, quality assurance specifications.

