TPOs face a changing landscape

ASTM International mulls changes to its TPO standard, including product differentiation

by Mark S. Graham

Recently, ASTM International's task force responsible for maintaining and revising the U.S. product standard for TPO single-ply roof membranes has been discussing more expeditious testing and exploring some useful differentiation among TPO membrane products.

ASTM D6878

The U.S. product standard for TPO roof membranes is ASTM D6878, "Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing." ASTM D6878 originally was published in 2003 based on 45-mil-thick products. ASTM D6878 has been revised several times since its original publication, and the current edition is ASTM D6878-13, which was published in 2013.

ASTM D6878-11 (and -11a) represented a significant upgrade from the previous editions by including an increase in the minimum allowable thickness over scrim from 12 mils to 15 mils. Also, the duration of test specimen heat aging before aged physical property testing increased from 28 days at 240 F to 224 days at 240 F.

In ASTM D6878-13, an additional thickness over scrim requirement

was added; currently, a thickness of coating over scrim on the weathering side of the sheet must be at least 30 percent of a sheet's nominal thickness. This revision is the first acknowledgment within ASTM D6878 of the widespread use of 60-mil-thick and thicker TPO membrane sheets.

For example, a 60-mil-thick sheet has a minimum thickness over scrim requirement of 18 mils, and an 80-mil-thick sheet has a minimum thickness over scrim requirement of 24 mils.

Additional revisions

With the 2011 revision of ASTM D6878 that included an eight-fold increase in specimen heat aging before aged physical property testing, the duration of heat aging lengthened from four weeks to 32 weeks. This change has resulted in increased testing costs and, more important, a significantly longer time to get test results. Both can be considered undesirable.

To address this, the ASTM D6878 Task Force is considering allowing heat aging at a higher temperature (275 F) but for a shorter time period (56 days or eight weeks) to be used as an alternative. This heat-aging conditioning is said to be equivalent to heat aging at 240 F for 224 days (32 weeks).

At this point, several TPO membrane manufacturers oppose this approach. At least one TPO membrane manufacturer has cited the increased heat-aging temperature during testing adversely could affect a TPO membrane's performance during testing.

When considering heat-aging temperatures, it is important to realize the temperatures are not intended to indicate actual rooftop temperatures. Actual rooftop surface temperatures for white membranes seldom will exceed 120 F to 160 F. When conducting laboratory heat aging of roofing products, hotter temperatures often are used to accelerate the aging process for testing and evaluation purposes.

Another revision being considered is the addition of type classifications to ASTM D6878 to differentiate among various TPO membrane products based on extended heat-aging testing. As proposed, Type I would be based on ASTM D6878's current heat aging; Type II would be based on more stringent heat aging of 240 F for 494 days (or 275 F for 90 days); and Type III would be based on even more stringent heat of 240 F for 750 days (or 275 F for 150 days). To date, the ASTM D6878 Task Force has not agreed to this proposal.

Also, during a presentation at the 2017 International Roofing Expo,® a TPO membrane manufacturer suggested including type classifications within ASTM D6878 to differentiate among specific TPO membrane types.

For example, Type I could address scrim-reinforced TPO membrane sheets; Type II could address nonreinforced (flashing) membrane products; and Type III could address fleece-backed TPO membrane sheets. Additional classifications may be necessary for the Type III designation to address various fleece thicknesses and weights currently available.

Type classification differentiation already occurs with the ASTM International product standards for PVC and EPDM single-ply membrane sheets. ASTM D4434, "Standard Specification for Poly (Vinyl Chloride) Sheet Roofing," has Type II (fiber-reinforced), Type III (fabric-reinforced) and Type IV (fabric-reinforced with fabric backing) classifications. Similarly, ASTM D4637, "Standard Specification for EPDM Sheet Used in Single-Ply Roof Membrane," has Type I (nonreinforced), Type II (scrim- or fabric-reinforced) and Type III (fabric-backed) classifications.

At this point, the proposal for type classifications differentiating TPO products has not been brought to the ASTM D6878 Task Force for consideration.

Closing thoughts

Although the U.S. product standard for TPO membrane products has been revised and improved since it originally was published, additional changes are being considered by the ASTM D6878 Task Force. But even more changes are needed.

ASTM D6878's current physical properties are based on 45-mil-thick TPO membranes and are not necessarily representative of thicker membrane sheets, such as 60-mil-thick membrane sheets. Thicker TPO membranes should exhibit greater puncture resistance and breaking strength values than 45-mil-thick sheets. Given the increased use of 60-mil-thick and thicker TPO membranes, ASTM D6878's physical properties need to be updated to better represent products currently in the U.S. marketplace.

For an article related to this topic, see "Developments with TPO," November 2011 issue, page 12.

As an active participant in the ASTM International process, I am encouraged to see some enhancements to ASTM D6878 being considered. It also is interesting to see some TPO membrane manufacturers' posturing when these enhancements are discussed. Some manufacturers clearly are interested in differentiating among various TPO products in the U.S. marketplace. Presumably, this will put some TPO manufacturers at an advantage. However, other TPO membrane manufacturers appear to be reluctant to allow this type of differentiation.

MARK S. GRAHAM IS NRCA'S VICE PRESIDENT OF TECHNICAL SERVICES.

@MarkGrahamNRCA