SPRI WD-1

by Mark S. Graham

SPRI recently published ANSI/SPRI WD-1, "Wind Design Practice for Roofing Assemblies." This standard provides a recognized consensus-developed methodology for designing wind-uplift resistances for low-slope built-up, polymer-modified bitumen and single-ply membrane roof systems that do not rely on aggregate or paver ballast to provide their wind resistances.

Two-part methodology

ANSI/SPRI WD-1 is divided into two primary parts. The first part addresses how to determine design wind-uplift loads. The second part discusses choosing an appropriate roof system by comparing factored, tested wind-uplift resistance capacities with the design wind-uplift loads determined in the first part.

In ANSI/SPRI WD-1, determining design wind-uplift loads is accomplished using 21 tables based on Building Category II, surface roughness (exposure category), building height (mean roof height) and peak gust wind zone (basic wind speed).

The tables provide design wind-uplift load values for the field, perimeter and corner regions of the roof area being evaluated. A modification factor multiplier is provided and should be applied to the tables' values if Building Category I (multiplier of 0.85) or Building Categories III or IV (multiplier of 1.15) apply to the building being evaluated.

SPRI reports the tables were developed using ASCE 7-05, "Minimum Design Loads for Buildings and Other Structures," which is referenced in most current building codes as the basis for determining design wind-uplift loads.

In the second part of ANSI/SPRI WD-1, an appropriate roof system can be selected by comparing its factored, tested wind-uplift resistance capacity with the design wind-uplift loads determined in the first part.

The standard indicates tested wind-uplift resistance capacity values need to be determined using FM 4450, "Approval Standard for Class 1 Insulated Steel Roof Decks"; FM 4470, "Approval Standard for Class 1 Roof Covers"; ANSI/FM 4474, "Evaluating the Simulated Wind Uplift Resistance of Roof Assemblies Using Static Positive and/or Negative Differential Pressures"; UL 580, "Standard for Tests for Uplift Resistance of Roof Assemblies"; UL 1897, "Standard for Uplift Tests for Roof Covering Systems"; or CSA A123.21-04, "Standard Test Method for the Dynamic Wind Uplift Resistance of Mechanically Attached Membrane Roofing Systems."

ANSI/SPRI WD-1 applies a safety factor of 2.0 to tested wind-uplift capacity values to arrive at a factored, tested wind-uplift load capacity value.

When the factored, tested wind-uplift load capacity value meets or exceeds the design wind-uplift load for a roof area's field, a roof system is suitable for use.

The factored, tested wind-uplift load capacity value then is compared with the design wind-uplift loads for the perimeter and corner regions of the roof area being evaluated. When the factored, tested wind-uplift load capacity meets or exceeds these values, the roof system, as tested, is suitable for use over the entire roof area (field, perimeter and corners) being evaluated.

Extrapolation method

ANSI/SPRI WD-1 provides for an "extrapolation method" that may be used when the factored, tested wind-uplift load capacity exceeds the design wind-uplift load for the area being evaluated but is less than the design wind-uplift loads for the perimeter and corner regions.

With certain limitations, extrapolation procedures are provided for adhered and mechanically fastened roof assemblies with mechanically attached insulation or ribbon/bead adhesive-attached insulation.

For example, the extrapolation method can be used for roof assemblies that have insulation that is mechanically attached or attached with ribbon/bead adhesive only when the design wind-uplift load for a roof area's field is 53 pounds per square foot or less. In addition, the test chamber used for determining tested wind-uplift resistance capacity must be of sufficient size to allow for side-by-side positioning of at least three full-size insulation boards.

ANSI/SPRI WD-1 also provides a basic wind speed map of the U.S. and insulation board fastening patterns for 4- by 4-foot and 4- by 8-foot insulation boards.

Closing thoughts

If you are involved in the design of low-slope membrane roof systems, consider obtaining a copy of ANSI/SPRI WD-1. It is available for free at SPRI's Web site, www.spri.org.

Mark S. Graham is NRCA's associate executive director of technical services.