Q & A

Stone ballast size gradation is explained

by **Mark S. Graham**

Q: *When performing a final inspection on a newly installed, ballasted single-ply membrane roof system, I found that a large portion of the stone ballast was smaller than the nominal 1½-inch (38-mm) size specified. While I do not expect every stone on the roof to have a 1½-inch (38-mm) diameter, I found the size variability surprising. Are there any industry standards governing the size variability of stone ballast?*

A: For nearly all ballasted single-ply membrane installations, the aggregate ballast is not supplied directly by the membrane material manufacturer, but, typically, is obtained from a local aggregate supplier or quarry. For this reason, the actual type and appearance of aggregate ballast varies considerably throughout the United States based on the local availability.



Most single-ply membrane manufacturers who have ballasted systems, as well as most of the wind design guidelines applicable to ballasted roof systems, specify that stone ballast be smooth, river bottom stone with a nominal 1½-inch (38-mm) diameter. Often, this stone size is defined further as Size No. 4, as specified in American Society for Testing and Materials (ASTM) D 448 "Standard Classification for Sizes of Aggregate for Road and Bridge Construction."

The type and appearance of aggregate ballast varies throughout the United States.

Alternatively, aggregate Size Nos. 3, 24, 2 or 1 often are permitted when Size No. 4 stone is not available locally. In some situations, such as in certain high-wind regions, larger-sized aggregate ballast—nominal 2½-inch (64-mm) aggregate in accordance with ASTM D 448 Size No. 2 or Size No. 1—is specified.

ASTM D 448 provides a gradation of aggregate sizes within a particular size designation. For example, Size No. 4 aggregate actually is classified by the ASTM designation as a 1½- to ¾-inch (38- to 19-mm) nominal size. The standard provides the following aggregate size gradation: up to 10 percent of the aggregate to be between 1½ and 2 inches (38 to 50 mm); 90 to 100 percent to be less than 1½ inches (38 mm); 20 to 55 percent to be less than 1 inch (25 mm); and 0 to 15 percent to be less than ¾ of an inch (19 mm).

These percentages are based on aggregate weight according to the ASTM standard. The gradation percentages vary somewhat for different aggregate sizes. Aggregate size is determined by ASTM C 136 "Standard Method for Sieve Analysis of Fine and Coarse Aggregates."

Additional aggregate ballast considerations, including appropriate weight tolerances for ballast placement, are included in July 1993's "Tech Transfer."

Editor's note: *ASTM D 448 and C 136 appear in ASTM's* Annual Book of Standards, Volume 04.02, Concrete and Aggregates *and* Volume 04.03, Road and Paving Materials. *These volumes, or reprints of the individual standards, are available from ASTM; telephone (215) 299-5585.*

Q: *I am installing a conventional three-tab asphalt shingle roof system and intend to use the closed-cut method of installing the valleys at several locations. Are there any recommendations as to which side of the valley should be cut?*

A: For asphalt strip shingle roofs where the slope of the deck is the same on both sides of the valley, shingles first should be laid on the side of the valley with the shortest distance to the ridge; this is the side that will experience the lowest volume of water runoff. These shingles should continue through the valley and extend at least 12 inches (300 mm) onto the adjoining side of the valley; only full-width shingles (not cut shingles) should be used to extend through a valley. Then, the shingles should be laid on the other side of the valley and trimmed back about 2 inches (50 mm) from the valley centerline.

In applications where the slope of the roof deck is different on each side of the valley, such as is often the case at dormers, shingles first should be laid on the side of the valley with the lowest slope and extend at least 12 inches (300 mm) onto the adjoining side of the valley. Then, the shingles should be laid on the other side of the valley and trimmed back as indicated previously.

In both situations, when the shingle installation is complete, the visible, cut shingle side of the valley should appear on the side of the valley with the longest distance to the ridge or the steepest slope.

The rationale for this orientation of the shingles and the cut edge is to minimize the volume and/or velocity of the runoff water that will cross, or "buck," the cut edge of the shingles along the valley.

The complete process for installing closed-cut valleys, as well as other methods of shingle valley construction, is explained in detail in *The NRCA Steep Roofing Manual.* PR

Each month in this column, Terrance R. Simmons, RRC, or Mark S. Graham, both NRCA deputy directors of technology and research, will answer readers' technical questions. If you have a specific question that you would like answered in this column, send it to Professional Roofing, *10255 W. Higgins Road, Suite 600, Rosemont, Ill. 60018-5607; or fax (708) 299-1183.*