q&a

Providing slope

by **Tom Bollnow**

Each month in this column, one of NRCA's technical services staff members will answer readers' technical questions. If you have a specific question you would like answered in this column, send it to Professional Roofing *magazine, 10255 W. Higgins Road, Suite 600, Rosemont, IL 60018-5607.*

Q: How can I create slope and maximize drainage in low-slope roof assemblies?

A: The Roofing Industry Educational Institute, Asphalt Roofing Manufacturers Association and several other roofing industry organizations recommend a minimum ¼-inch-per-foot (1.2-degree) slope for low-slope roof assemblies and ⅛-inch-per-foot (0.6-degree) slope for coal-tar-pitch roof systems. Although NRCA does not have a minimum-slope guideline, *The NRCA Roofing and Waterproofing Manual, Fourth Edition,* states it is a roof system designer's responsibility to provide positive slope design for a roof assembly by doing one or more of the following:

- Sloping a roof assembly's structural framing or deck (e.g., sloping roof purlins or trusses, varying column heights)
- Designing a factory- or field-tapered board insulation system
- Using poured-in-place concrete or thermosetting insulating fill to create slope

These provisions, as well as deck type, roof membrane and building layout, should be considered during a roof assembly's design phase.

The NRCA Roofing and Waterproofing Manual, Fourth Edition, also states that proper positive drainage slope is characterized by the absence of standing water on a roof surface 48 hours after rain during optimum drying conditions. However, even when one or more positive slope design provisions are used, roofing contractors often are held responsible for standing water on new or re-covered roof assemblies.

Note that imperfect slope configurations can result from various external sources. Structural framing and deck deflections can result in concave roof system surface areas. Live loads (e.g., snow, rain, ice, rooftop traffic) and dead loads (e.g., topside and underside mechanical equipment, overlayments, roof membranes, insulation, ballast) also can cause concave roof surface areas.

In addition, low-slope roof assembly surfaces inevitably contain humps and depressions resulting from various construction irregularities, such as column-foundation settlement; plane surface variations; elevation differentials at structural members' top flanges caused by inaccurate fabrication or field-finishing of precast slabs (e.g., concrete, gypsum) and poured concrete toppings; and dimensional variations in insulation thickness. Irregularities in aggregate surfacing and variations in interply mopping and flood-coating thicknesses also can form dams and pockets that impede drainage in modified bitumen and built-up roof systems.

Lightweight insulating concrete, thermosetting insulating fill and spray polyurethane foam (SPF) can be installed over level or irregular roof assembly surfaces to achieve positive slope. These tapered systems eliminate ponded water on roof assemblies. However, a building's geographical location, structural design and roof system type determine the feasibility of using lightweight insulating fill or SPF on a roof assembly.

If an existing roof assembly has ponded water, try installing a temporary roof over the deck and water testing the roof assembly to determine location, size and depth of ponded water. Level these areas according to a roof system designer's or specifier's recommendations before installing flat or tapered insulation and a membrane. Installing tapered insulation without leveling a deck's surface may not eliminate ponded water—ponded water areas that have slope and depth conditions greater than the design slope will be smaller and more shallow. Installing a temporary roof and water testing a roof assembly are expensive and time-consuming but can help avoid the detrimental, long-term effects of ponded water.

Generally, it is not a roofing contractor's responsibility to determine precise roof deck or surface elevations and eliminate all visible ponded water on a roof system's surface. For new construction, a roof system designer and roof deck installer should be responsible for a roof deck's proper design and installation, including positive slope. For a reroofing situation, it is imperative to establish precise specifications and procedures outlining a roof system designer's and roofing contractors's intents, expectations and responsibilities with regard to ponded water.

Tom Bollnow is an NRCA director of technical services.