

The importance of proper roof slope

by Mark S. Graham

Providing proper slope to aid in timely drainage is an important consideration when designing and installing quality, long-lasting, low-slope membrane roof assemblies.

This month, I will review guidelines and requirements for minimum roof slope applicable to low-slope membrane roof assemblies.

NRCA guidelines

In *The NRCA Roofing and Waterproofing Manual, Fifth Edition*, NRCA recommends all roofs be designed and built to have “positive drainage.” NRCA defines positive drainage as the drainage condition in which consideration has been made during design for all loading deflections of a deck and additional roof slope has been provided to ensure drainage of a roof area within 48 hours following rainfall under conditions conducive to drying.

NRCA has chosen the performance-based approach to positive drainage and not a prescriptive minimum roof slope value, such as ¼-in-12 (1.2 degrees), because specific project conditions often affect roof assemblies’ abilities to drain properly in a timely manner. For example, for buildings constructed with roof decks that truly are flat, installation of a ½-in-12 (0.6-degree) tapered installation system may be adequate to provide positive drainage.

On the other hand, roof structures and decks constructed with marginal finish tolerances, built-in camber or excessive load deflection may require more than ¼-in-12 (1.2-degree) slope to achieve positive drainage.

Code requirements

Most building codes contain prescriptive provisions mandating minimum roof

slope, particularly for new construction. For example, the *International Building Code, 2003 Edition*, (IBC) indicates, “... roofs shall have a design slope of a minimum of one-fourth unit vertical in 12 units horizontal (2 percent slope) for drainage except for coal-tar built-up roofs that shall have a design slope of a minimum of one-eighth unit vertical in 12 units horizontal (1 percent slope).”

The reason building codes typically have prescriptive definitions for minimum roof slope is building code officials want to readily identify adequate roof slope when reviewing plans before actual building construction.

For reroofing operations, some building codes allow for performance-based measures of positive drainage for defining required minimum roof slope. For example, IBC’s Section 1510.1-Exception indicates, “Reroofing shall not be required to meet the minimum design slope requirement of one-quarter unit vertical in 12 units horizontal (2 percent slope) in Section 1507 for roofs that provide positive roof drainage.” IBC has adopted NRCA’s definition for positive drainage.

One item to be aware of when providing a roof slope less than ¼-in-12 (1.2 degrees) is most codes then require a roof structure be designed to account for ponding instability. IBC’s Section 1611.2-Ponding Instability indicates: “... Roofs with slopes less than one-fourth unit vertical in 12 units horizontal (2 percent slope) shall be investigated by structural analysis to ensure they possess adequate stiffness to preclude progressive deflection (i.e., instability). ... The larger of the snow load or rain load shall be used for this analysis. The primary drainage system within the area subjected to ponding shall be considered blocked in this

analysis.” ASCE 7, “Minimum Design Loads for Building and Other Structures,” provides additional guidelines about how to conduct this analysis.

The reasons

There are several reasons why providing proper slope is important. Ponded water is detrimental to most low-slope roof membrane types and likely will result in premature roof surfacing and membrane deterioration and debris accumulation. In addition, vegetation and fungal growth in ponded areas can result in membrane deterioration and deck deflection because ponded water may cause structural deformations.

Also, ponded water can cause ice formation and resulting membrane degradation or damage, tensile splitting with some membrane types, difficulties in making repairs and water entry into a building if leaks occur.

NRCA’s Project Pinpoint, a database of problem roofing projects submitted by NRCA-member roofing contractors, reveals some compelling data supporting the importance of proper roof slope for low-slope membrane roof systems. More than two-thirds of all problem job reports in Project Pinpoint had roof slopes reported to be less than ¼-in-12 (1.2 degrees). This single attribute is by far the largest correlating attribute of all the problems reported in Project Pinpoint.

From this, one reasonably can conclude providing for adequate roof drainage is the most important consideration in designing and installing quality, long-lasting, low-slope membrane roof assemblies.

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