The new **steep-slope** manual

The latest **NRCA roofing manual** addresses steep-slope roof system design, materials and application

by **Maciek Rupar**


*The NRCA Roofing Manual: Steep-slope Roof Systems—2009* updates and revises the steep-slope roof systems section of *The NRCA Roofing and Waterproofing Manual, Fifth Edition*. It provides proven best practice guidelines—created by experienced roofing contractors—for designing and installing quality steep-slope roof systems throughout the U.S. Roofing professionals, building owners and property managers can find useful information about all major steep-slope roof system types, including asphalt shingle, clay and concrete tile, metal shingle and synthetic component, slate, wood shake and wood shingle.

As with the preceding two volumes in the series update, NRCA contractor members received a free copy of *The NRCA Roofing Manual: Steep-slope Roof Systems—2009* as a membership benefit.

Following is an overview of the manual series’ latest volume.
Format

The NRCA Roofing Manual: Steep-slope Roof Systems—2009 begins with an introduction about the history of NRCA’s roofing manual series, which extends back to 1970. Following the introduction are five sections that focus on specific steep-slope roof system types: Asphalt Shingle Roof Systems, Clay and Concrete Tile Roof Systems, Metal Shingles and Synthetic Component Roof Systems, Slate Roof Systems, and Wood Shake and Wood Shingle Roof Systems. A pair of appendixes containing a list of reference organizations and unit conversion tables is at the end of the manual.

Each section is divided into four chapters so the manual easily can be used as a reference text. Chapter 1 discusses roof decks; Chapter 2 addresses underlayments; Chapter 3 focuses on primary roof coverings for each roof system type; and Chapter 4 provides construction details.

Chapter 1 of each section explores topics related to roof substrates; for example, it offers extensive information applicable to new construction installations, as well as installing over existing substrates that are undamaged and suitable for the roof system type.

Structural roof decks and roof substrates installed over structural roof components for the purpose of roof system attachment, together with roof system components, comprise roof assemblies. For new construction work involving steep-slope roof systems, roof substrate installation typically is not within a roofing contractor’s scope of work. Instead, a roofing contractor evaluates the existing roof substrate’s surface to determine whether it is suitable for installing a new roof system.

Chapter 2 of each section recommends underlayments (and interlayments in the case of wood shake roof systems), which almost universally are included in steep-slope roof assemblies. The chapter includes information about underlayment materials and design and installation guidelines; concepts such as underlayment configuration illustrated with figures; and sources for underlayment-related information the manual does not address.

Chapter 3 of each section provides information about the primary roof covering materials and best industry practices for each roof system type’s design and installation. Tables and figures are used throughout to illustrate design concepts and installation guidelines.

Chapter 4 consists of construction details (except in the Metal Shingles and Synthetic Component Roof Systems section, which does not include construction details because of the wide variety of materials and shapes available). There are significantly more construction details included in the current manual compared with The NRCA Roofing and Waterproofing Manual, Fifth Edition’s Steep-slope Roofing section; more details have been provided to help roofing contractors prepare submittal packages. Each section’s introduction supplements the notes regarding the individual construction details.

Most chapters also reference other NRCA technical manuals for additional information.

Asphalt shingles

Chapter 1 of the Asphalt Shingle Roof Systems section discusses wood panel (plywood and oriented strand board [OSB]) decks and wood board and plank decks appropriate for asphalt shingle attachment. It also contains guidelines for designing and/or selecting appropriate nailable substrates to install over structural framing and decks that are inappropriate for direct fastening of asphalt shingle roof systems.

Asphalt shingle roof systems require continuous nailable substrates that possess adequate minimum slope. A roof deck or substrate appropriate for asphalt shingle installation supports roof system components and any additional design loads, provides requisite fastener withdrawal resistance and is substantially sloped to shed water quickly and effectively.

Chapter 2 discusses recommended underlayment options. The range of available materials includes organic (cellulose fiber)- and fiberglass-based asphalt-saturated felts, synthetic-sheet underlayments, polymer-modified bitumen sheets designed for use as steep-slope underlayments, and self-adhering water and ice-dam protection membranes.

It also includes numerous underlayment configurations recommended for various applications and climatic conditions, as well as drip edge metal recommendations. New drawings addressing alternative underlayment configurations for asphalt shingle roof system eaves have been added to Chapter 4—Construction Details. When a principal construction detail has more than one acceptable alternative, a letter designation following the detail number identifies NRCA’s order of preference for addressing the detail condition (no letter is appended for the preferred detail); see Figure 1.

Chapter 3 discusses the standards and design and installation guidelines for asphalt shingle roof systems and includes the most current industry test standard and rating information for wind resistance and impact resistance. Maps of wind speeds and hail exposures in the U.S. have been added.

The chapter also includes recommendations for fastener locations, shingle offset patterns and eave starter applications used with common asphalt shingle product designs; detailed method and material recommendations used for asphalt shingle valley and flashing detail constructions; and information about fasteners, roof cements, flashing materials and accessories.

Chapter 4 offers asphalt shingle roof system construction detail drawings that have been revised and updated to reflect NRCA’s latest best practice guidelines. The number of construction details has increased from eight to 18 with a few that present alternative detailing options.
Clay and concrete tile

Roof tiles commonly are classified by profile (the height-to-width ratio), mode of installation (interlocking tile and lug-hung tile) and raw material composition. There are many different tile types, and various preferences and practices for roof tile installation depending on geographic location. Different methods have been found to work best with locally available tile products.

The new manual’s Clay and Concrete Tile Roof Systems section presents NRCA’s design and installation recommendations for several popular yet diverse clay and concrete tile roof system types.

Because of clay and concrete tile roof systems’ typical longevity and heavier weight, this manual section recommends using durable roof substrates, fastening, underlayment and flashing materials for roof tile installations. It also recommends verifying the load-bearing capacities of roof decks and other structural roof components, particularly for heavyweight tile installations.

The manual recommends mechanical attachment for installation over appropriate wood substrates and batten systems. Recommendations for adhesive-set tile roof system decks include installation over non-nailable substrates—such as concrete or gypsum—provided an adhered underlayment is applied directly to the substrate.

Chapter 3 provides information about tiles with various profiles—plain, pan and cover, interlocking, S-tile—including common dimensions and weights; head lap dimensions; materials and processes used during manufacturing; applicable product and performance standards; and illustrations of common tile profiles. Nail, screw, wire-tied, clip, lug-hung and adhesive-set securement guidelines and applicable material recommendations also are provided.

Various roof tile system detail conditions in Chapter 3 are illustrated with figures within the text.

In Chapter 4, four profile-specific roof tile sets of 16 principal construction details—some with multiple detail options—offer ample reference drawings of time-tested constructions.

Metal shingles and synthetics

The Metal Shingle and Synthetic Component Roof Systems section is new to NRCA’s updated roofing manual.

Metal shingle and synthetic component roof systems are assembled by interlocking or butting and overlapping individual components in a “shingled course” manner similar to that used with asphalt shingles, wood shingles or slate.

The manual defines metal shingles as interlocking metal sheets with a weather exposure less than 3 square feet per installed
component; this definition matches that in the International Code Council’s International Building Code (IBC) and International Residential Code (IRC). Metal shingles are smaller than architectural metal panels and typically are not mechanically field-seamed. Products may be designed to mimic the appearance of other roof system types or aim for a unique look.

Synthetic component steep-slope roof coverings currently marketed in the U.S. are based primarily on thermoplastic and thermoset polymers, typically incorporating inert fillers, noncellulosic fibrous additives, dyes and anti-degradants, and, in some cases, recycled polymer content.

Most Chapter 1 recommendations for metal shingle and synthetic component roof system substrates mirror the information in the asphalt shingle section’s corresponding chapter. Because some systems are designed for installation over battens—or battens and counterbattens—those substrates also are discussed. The recommendations are similar to those proposed for batten-supported tile and slate.

Chapter 2’s underlayment design and installation guidelines carry over from the manual’s asphalt shingle section with one exception: They recommend using self-adhering polymer-modified underlayments, such as water and ice-dam protection membranes, designed for service at high temperatures with metal shingle roof systems.

Chapter 3 includes a primer about naturally weathering metals and metal-coated steels used for roofing. Numerous protective coatings and finishes used for metal roof components also are surveyed regarding the advantages they offer and levels of performance and longevity that can be expected based on observations of performance in service.

With the exception of fiber-cement products, there currently are no ASTM International standards that apply to synthetic component roof coverings, and synthetics are not sanctioned by IBC and IRC.

Chapter 3 also provides an overview of raw material compositions and other significant product characteristics for major synthetic roof covering product categories. It references information sources regarding the building codes’ alternative approval provisions used by some synthetic component roof system suppliers to substantiate their products’ code compliance to the code authorities.

Chapters 3 and 4 draw on roof system installation and detailing guidelines from the sections applicable to the more traditional steep-slope roof system types to provide guidance for metal shingle and synthetic component roof system installations. As mentioned previously, NRCA chose not to provide construction details in the Metal Shingle and Synthetic Component Roof Systems section because of the wide variety of materials and shapes available in these categories. The manual recommends consulting construction details specific to the roof system types these products are intended to replicate, as well as manufacturers’ product literature, for product-specific installation instructions when developing appropriate construction details.

**Slate**

Slate roof systems are known for their long service lives; there are functioning slate roof systems that are hundreds of years old.

So it is appropriate the manual’s Slate Roof Systems section recommends the most durable materials and construction practices for roof systems incorporating slate. Also, slate roof systems require a structure capable of supporting loads greater than those imposed by most other steep-slope roof system types.

Adequate substrates for direct attachment of slate consist of continuous structural wood sheathing (plywood or OSB), wood planks or closely spaced wood boards thick enough to support the system’s expected weight. These substrates provide suitable load-bearing capacity and fastener withdrawal resistance for slate roof systems, as well as uninterrupted support for underlayment, which is necessary and recommended for slate roof systems.

When selecting underlayment materials and designing flashing details for slate roof systems, Chapter 2 of the manual advises considering the most resilient products and robust construction methods used for steep-slope roof systems because slate commonly outlasts other roof system components.

Chapter 3 opens with information about the origins and properties of the mineral slate that make it desirable for roofing applications. Slate is characterized by its thickness, weight, size and color. Discussion includes sizing and roof area coverage—according to an established commercial standard—and slate classification based on ASTM International test methods. Reference tables with typical physical property values are provided.

Chapter 3 also explains and illustrates various slated eave, hip, ridge and valley details (see Figure 2), as well as metal ridge and valley details, and common flashing details such as roof-to-wall transitions, penetrations and associated counterflashings.

There are 18 principal construction details—including three with multiple options—in Chapter 4 of the Slate Roof Systems section.

**Wood shakes and wood shingles**

Once the prevailing roof covering materials in North America, wood shakes and wood shingles remain viable in some regions where they typically occupy a segment of the premium steep-slope roofing market.

The Wood Shake and Wood Shingle Roof Systems section begins by defining the terms “shake” and “shingle” and describing the wood species and manufacturing processes used to produce them.

Chapter 1 discusses materials and constructions used for continuous (or closely spaced) wood panel, wood board and wood
plank roof substrates, and spaced (also referred to as "skipped") wood board and wood plank roof sheathing applications. Continuous and spaced wood sheathing applications are appropriate for attaching wood shake and wood shingle roof systems provided certain design conditions are met. For example, the manual recommends that spaced sheathing boards not exceed nominal 6-inch width and their on-center spacing match the installed weather exposure of the shakes or shingles.


With wood shakes and wood shingles, underlayments are recommended over continuous (or closely spaced) roof substrates. Interlayments—sometimes referred to as shake liner or shake felt—are necessary to produce triple-layer water-shedding coverage in wood shake roof systems because wood shakes are installed at double-coverage exposures. Interlayments are not used with wood shingles, and underlayments are not necessary when installing wood shingles over suitable spaced substrates because wood shingles are installed at exposures that create triple-layer shingle coverage throughout the roof system.

Chapter 3 includes extensive coverage of wood shake and wood shingle materials. It contains a survey of all wood shake and wood shingle grading rules and product standards currently used in North America, including standards from the Canadian Standard Association and American Wood Protection Association (formerly the American Wood-Preservers’ Association).

Wood shake and wood shingle product size and coverage reference tables are provided with guidelines for available methods of starter course application, field-of-roof pattern application, valley construction and ridge covering, which are some wood roof system construction options illustrated in Chapter 3.

Roofing contractors and designers specifying wood shake and wood shingle roof systems will find Chapter 4’s four sets of 16 principal details helpful; two sets of details are provided for wood shakes and two sets for wood shingles. Within each pair, the first set applies to applications over continuous or closely spaced decks; the second set is for applications over spaced decks.

Learn more

For more information, NRCA encourages roofing contractors, designers, specifiers and building owners to access free online versions of *The NRCA Roofing Manual: Steep-slope Roof Systems—2009* and other recent volumes from NRCA’s roofing manual series at NRCA’s Web site, www.nrca.net; free Web site registration is required. The manuals also can be purchased at shop.nrca.net.

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