

INTRODUCTION

The Construction Details section of *The NRCA Roofing and Waterproofing Manual, Fifth Edition*, has been written to provide technical information concerning the design and installation of construction details for quality low- and steep-slope roof systems. This introduction is intended to supplement the special notes on the individual construction details.

Roof systems can generally be divided into two categories: low-slope and steep-slope. The incline or slope of a roof is the primary factor in determining into which of these categories a particular roof system falls. *The NRCA Roofing and Waterproofing Manual, Fifth Edition*, defines these categories as follows:

Low-slope roofs: a category of roofs that generally includes weatherproof membrane types of roof systems installed on slopes at or less than 3:12 (14 degrees).

Steep-slope roofs: a category of roofs that generally includes water-shedding types of roof coverings installed on slopes greater than 3:12 (14 degrees).

In some instances, roof systems designed for low-slope applications are used when roof slopes are greater than 3:12 (14 degrees). Some steep-slope roofing materials are used when roof slopes are less than 3:12 (14 degrees). For either application, it is important to realize certain design modifications may be necessary.

In the Construction Details section of *The NRCA Roofing and Waterproofing Manual, Fifth Edition*, construction details are provided for the following roof system types:

Low-slope membrane roof systems:

- Built-up membrane
- Polymer-modified bitumen sheet membrane
- Thermoset single-ply membrane
- Thermoplastic single-ply membrane
- Steep-slope roof systems:
 - Asphalt shingle
 - Slate
 - Clay and concrete tile
 - Wood shake and shingle
- Sheet metal
- Architectural metal panel roof systems
- Structural metal panel roof systems
- Spray polyurethane foam-based roof systems
- Waterproofing systems

The information contained in this manual is intended to deal primarily with new construction situations. When considering reroofing projects, the Reroofing Manual section of *The NRCA Roofing and Waterproofing Manual, Fifth Edition*, should be consulted regarding the decision to re-cover or remove existing roof systems and for general information applicable to reroofing of low- and steep-slope roof systems. Once a decision to re-cover or remove existing roof systems is made, most information contained within the Construction Details section of *The NRCA Roofing and Waterproofing Manual, Fifth Edition*, can apply to reroofing.

Because of the wide variety of roofing products, this manual cannot address all the different methods and practices for designing and installing all the products available to designers, contractors and building owners.

In this manual, the National Roofing Contractors Association (NRCA) attempts to present a consensus of opinions from professional roofing contractors throughout North America as to the principles of good roofing practice. Where this manual provides specific suggestions or recommendations, it should be noted that these may be a more conservative approach than may be commonly provided by individual product manufacturers, roof designers or roofing contractors. The roof system design and application procedures included in this manual generally are recognized to be sound and time-proven and apply throughout North America.

The recommendations contained in the Construction Details section of *The NRCA Roofing and Waterproofing Manual, Fifth Edition*, should not be construed as the only methods for designing and installing roof systems. Some design

criteria and application techniques may vary according to climatic conditions, and some geographical areas employ “area practices” that are sound and time-proven. NRCA does not mean to imply by any statement or exclusion that time-tested and proven area practices are unsatisfactory. Users of this manual are encouraged to contact NRCA members in the geographical area for specific advice concerning area practices and current technical information.

NRCA suggests the Construction Details section of *The NRCA Roofing and Waterproofing Manual, Fifth Edition*, be used in the design of roof systems only after a number of criteria have been carefully considered, including:

- Climate and geographic location
- A building’s intended use and design life expectancy
- Exterior and interior temperature and humidity conditions
- Code requirements
- Type of roof deck
- Slope and drainage
- A roof’s configuration
- Building movement
- Fire, wind and impact resistance
- Type and amount of insulation needed
- Need for ventilation
- Maintenance, repair and reroofing
- Compatibility with adjacent components, including potential material discharge onto a roof
- Construction sequencing
- Worker safety
- Potential building additions
- Odors, noise and dust generated by certain system application methods
- Rooftop traffic

These criteria play important roles in the success or failure of every roof assembly and must be considered by a designer to determine the appropriate components of a roof assembly, applicable specification and construction details to be used.

In addition, specific to a roof system’s construction details, NRCA recommends designers consider the following factors:

Other components. Components that may be provided or installed by other trades that are integrated into roof systems can be critical to the watertight integrity of completed roof systems. These components may include:

- Metal counterflashings at curbs and other penetrations
- Lead flashings and drains and plumbing vent stacks
- Drain heads/clamps/strainers
- Sheet metal vents
- Sheet metal pitch pans
- Thru-wall flashings
- Skylight components and flashings
- Expansion joints and related components
- Wood blocking and attachment
- Pipe or conduit supports
- Crickets
- Siding or cladding
- Chimney caps
- Wall flashing
- Permanent safety anchors or guardrails

Definition of responsibility for the above components should be determined prior to job initiation.

Wood nailers and blocking. Many of the construction details illustrated in this manual depict wood nailers and blocking at roof edges and other points of roof termination. Integral wood nailers and blocking should be preservative pressure-treated wood or decay-resistant wood, such as cedar or redwood. Among other advantages, the nailers provide protection for the edges of rigid board insulation and provide a substrate for anchoring flashing materials. To provide an adequate base, nailers should be securely attached to a roof deck, wall and/or structural framing. In the design of specific details for a project, a designer should describe and clearly indicate the manner in which wood nailers and/or blocking should be incorporated into construction details. A designer should specify the means of attachment, as well as the fastening schedule for all wood nailers and blocking.

Job-site-fabricated components. A majority of the construction details illustrated in this manual depict job-site-fabricated construction. Many roof system manufacturers offer prefabricated flashing components or have guidelines that permit the use of materials other than those indicated in these details. Flashing materials may vary greatly; individual manufacturer's requirements should be examined and evaluated for construction compatibility.

Metal flashing components. Because metals have thermal expansion and contraction characteristics that differ from most other roof covering materials, it is advisable to isolate metal flashings from the primary roof covering and flashing when possible. Embedding or sandwiching metal flashing flanges into a roof membrane or membrane flashing may fatigue the membrane materials and eventually cause splits, tears or cracks in the membrane as a result of differential movement. NRCA suggests avoiding, where possible, flashing details that require rigid metal flanges to be embedded or sandwiched into roof membranes.

Illustrations of metal component joinery, such as concealed or cover plates, are located in the sheet-metal portion (Details SM-1 to SM-26) of the Construction Details section of this manual. NRCA does not recommend caulking the joint between the bottom of the exterior vertical face of a coping cap or metal edge flashing and building exterior because it does not add to the waterproofing integrity of the assembly and it may, in fact, hinder the ability of the wall construction to dissipate moisture. Proper gauge, girth and continuous cleat fastening should minimize wind-uplift damage.

Rooftop equipment and associated flashing. NRCA does not recommend using a roof as a location for heating, ventilating and air-conditioning (HVAC) equipment. Weatherproofing-related problems may be encountered because of the design of an HVAC unit. There is often a lack of clearly defined responsibility for the weatherproofing of HVAC units among the parties involved, such as contractors, material suppliers and manufacturers. In an effort to minimize rooftop penetrations, run conduits and pipes within the interior of rooftop curbs.

Many weatherproofing problems related to HVAC equipment may be attributed to one or more of the following:

- Improper design of the equipment's exterior shell or housing. This may allow water to enter the building directly through the unit.
- Improper design or penetration of condensate pans or drainage lines. This may allow water to enter the building below the HVAC equipment.
- Improper design of premanufactured HVAC equipment curbs. There are often no means to properly attach base flashings.
- Inadequate design of the structural framing or roof deck intended to support the weight of HVAC units. This may result in excessive roof deflection and subsequent ponding water.
- Improper flashing of the penetration(s), such as pipes, conduits and drain lines, that extend through the roof to service the HVAC equipment.
- Lack of service walkways to and around mechanical equipment for rooftop traffic.

Parapet walls and roof decks. Parapet walls and deck/wall intersections often require specific additional components to accommodate vertical flashings or coping caps. These items can take various forms and be made of various materials.

- Tapered, continuous, rigid shims for top of parapet walls provide positive slope for drainage and may be composed of wood, insulation, metal or other compatible material.
- Tapered cants at bases of wall include preservative-treated wood, perlite, fiberboard or appropriate poured-in-place material.
- Flashing substrate materials on vertical walls and backsides of parapets may include brick or concrete masonry, precast or poured-in-place concrete, wood and gypsum board.

- Through-wall flashing materials, weepholes and masonry caulking are typically furnished and installed by masonry contractors. Sheet-metal receivers are often furnished by a sheet-metal contractor and installed by masonry and wall-cladding contractors.
- Prior to installing metal caps, parapet walls may be covered by a sheet membrane liner in lieu of installing the flashing up and over the parapet wall.
- Concrete, masonry, metal and gypsum board walls should be primed in preparation for bituminous membrane flashings. Any combustible surfaces should have a first ply fastened or adhered and a second ply adhered prior to applying torch-grade flashing membranes.

Penetrations. Roof drains, pitch pockets and vertical sides of curbs often have particular installation or attachment requirements, which follow:

- Interior roof drain bowls and under-deck clamps are typically furnished and installed by others. Clamping rings and dome strainers are generally furnished by others and installed by a roofing contractor.
- Prefabricated flashing, metal sleeves and curbs with premolded pipe flashings are preferred for sealing pipes or irregularly shaped support legs. Pitch pockets or pitch pans are acceptable as a last alternative. Pourable sealer is the recommended top fill material for pitch pockets. Modified bitumen roofing cement may be acceptable as a top fill material for pitch pockets in bituminous roof systems.
- Vertical wood curb nailers may be secured to a structural member or the roof deck using additional wood blocking, metal angle supports or a combination of wood and metal. Curbs may consist of prefabricated (insulated where appropriate) metal curbs and, when securing flashing is necessary, should have nailers at the top edge.

Membrane flashing and stripping plies. The type of membrane system, substrate and surfacing method usually dictates the number, type and method of attachment for backer plies, flashing sheets and stripping plies.

- Specific configuration of backer plies and/or membrane flashing may vary with the individual roof system. Installation of membrane flashing may entail lacing field and flashing plies for a modified bitumen system or using one or two backer plies for torch-applied modified bitumen flashing, depending on the substrate and other application possibilities. Consult the roof system manufacturer's specific requirements for membrane flashing.
- A recommended maximum membrane flashing height may no longer be applicable for certain roof membrane types. Polymer-modified bitumen sheets applied in a strapped configuration and single-ply membranes are acceptable for vertical installations. However, it is suggested a separator consisting of a sheet-metal receiver and removable sheet or cladding be installed to separate the roof flashing from the wall covering.
- Mineral-surfaced polymer-modified membrane sheets should be degranulated (heated with granules pressed into the membrane bitumen) at tie-ins of end laps, flashing base laps or stripping ply overlaps.
- Stripping plies for BUR and modified bitumen systems may consist of two plies of ply sheet, one ply of field ply sheet, and one ply of modified bitumen sheet or one ply of heavyweight reinforced polymer modified bitumen sheet.
- Stripping plies for single-ply roof systems may consist of the same membrane as the roof system; a self-adhering membrane strip; or an unreinforced, uncured membrane sheet.

Roof assembly components — deck, insulation and membrane. In all the construction details, unless otherwise noted, the primary components of each construction detail are illustrated as generic components. In addition, NRCA recommends designers consider the following:

- Rigid board roof insulation depicted in the details is generic and represents a base layer and top layer. The base layer may consist of single layer, double layer or tapered insulation system composed of one or a combination of the materials described in the Rigid Board Roof Insulation section of the Low-Slope Membrane Roofing section of the manual. The top layer of an insulation system should be an appropriate cover board.
- Some single-ply membranes may require a slip sheet beneath the membrane when installed over some insulations or substrates. Such slip sheets are not depicted in the construction details for clarity. Consult the membrane system manufacturer for specific recommendations regarding slip sheets.