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USACE / NAVFAC / AFCEC / NASA | UFGS-07 31 13 (August 2016)
Change 2 - 08/18

Preparing Activity: NAVFAC | Superseding
UFGS-07 31 13 (November 2011)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated July 2023
****

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08/16, CHG 2: 08/18

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USACE / NAVFAC / AFCEC / NASA	**UFGS-07 31 13 (August 2016)** **Change 2 - 08/18** **----------**
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****

SECTION 07 31 13

ASPHALT SHINGLES
08/16, CHG 2: 08/18

****
NOTE: This guide specification covers the requirements for asphalt shingle roofing, surfaced with mineral granules, including roofing felt, ridge vents, underlayments, and flashings.

Adhere to UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable item(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments, suggestions and recommended changes for this guide specification are welcome and should be submitted as a Criteria Change Request (CCR).
****

****
NOTE: Design exterior envelope to meet the requirements of UFC 1-200-02, "High Performance and Sustainable Building Requirements" which invokes the requirements within UFC 3-101-01, "Architecture". UFC 1-200-02 and UFC 3-101-01 make references throughout to various ASHRAE documents governing energy efficiency and requirements for the components of building envelope design including moisture control and thermal performance.
****

****
NOTE: For a more detailed description of asphalt shingle roofing and requirements for asphalt shingle reroofing over existing asphalt shingles, wood

shingles, roll roofing, or built-up roofing, see the "Residential Asphalt Roofing Manual," published by Asphalt Roofing Manufacturers Association (ARMA) and "The NRCA Steep Roofing Manual," published by the National Roofing Contractors Association (NRCA). Avoid reroofing with asphalt shingles over more than one layer of existing roofing material.

****

****

NOTE: On the drawings, show:

1. Pitch of substrate/shingle roofing

2. Detail of crickets and flashings at chimneys

3. Detail at eave/rake corner of roof including underlayment, drip edge, starter strip, shingle exposure, shingle courses, and fastener placement.

****

****

NOTE: Where project involves tear-off of existing asphalt roofing materials and it is desired for the Contractor to salvage roofing materials for milling and recycling, include this requirement in UFGS 02 41 00 [DEMOLITION][AND][DECONSTRUCTION].

****

PART 1 GENERAL

1.1 REFERENCES

****

NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a Reference Identifier (RID) outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.

****

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM D41/D41M	(2011; R 2016) Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing
ASTM D226/D226M	(2017) Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
ASTM D1970/D1970M	(2019) Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
ASTM D3018/D3018M	(2011; R 2017) Standard Specification for Class A Asphalt Shingles Surfaced With Mineral Granules
ASTM D3161/D3161M	(2020) Standard Test Method for Wind-Resistance of Steep Slope Roofing Products (Fan-Induced Method)
ASTM D3462/D3462M	(2019) Standard Specification for Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules
ASTM D4586/D4586M	(2007; R 2018) Asphalt Roof Cement, Asbestos-Free
ASTM D4869/D4869M	(2016a) Standard Specification for Asphalt-Saturated Organic Felt Underlayment Used in Steep Slope Roofing
ASTM D6380/D6380M	(2003; E 2013; R 2013) Standard Specification for Asphalt Roll Roofing (Organic Felt)
ASTM D7158/D7158M	(2016) Standard Test Method for Wind Resistance of Asphalt Shingles (Uplift Force/Uplift Resistance Method)

NATIONAL ROOFING CONTRACTORS ASSOCIATION (NRCA)

NRCA 0437	(2017) The NRCA Roofing Manual: Steep-slope Roof Systems

U.S. DEPARTMENT OF ENERGY (DOE)

Energy Star	(1992; R 2006) Energy Star Energy Efficiency Labeling System (FEMP)

UNDERWRITERS LABORATORIES (UL)

UL 790	(2022) UL Standard for Safety Test Methods for Fire Tests of Roof Coverings
UL 2218	(2010; Reprint Nov 2022) UL Standard for Safety Impact Resistance of Prepared Roof

1.2 DEFINITIONS

1.2.1 Top Lap

That portion of shingle overlapping shingle in course below.

1.2.2 Head Lap

The triple coverage portion of top lap which is the shortest distance from the butt edge of an overlapping shingle to the upper edge of a shingle in the second course below.

1.2.3 Exposure

That portion of a shingle exposed to the weather after installation.

1.3 SUBMITTALS

****

NOTE: Review Submittal Description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list, and corresponding submittal items in the text, to reflect only the submittals required for the project. The Guide Specification technical editors have classified those items that require Government approval, due to their complexity or criticality, with a "G." Generally, other submittal items can be reviewed by the Contractor's Quality Control System. Only add a "G" to an item if the submittal is sufficiently important or complex in context of the project.

For Army projects, fill in the empty brackets following the "G" classification, with a code of up to three characters to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

The "S" classification indicates submittals required as proof of compliance for sustainability Guiding Principles Validation or Third Party Certification and as described in Section 01 33 00 SUBMITTAL PROCEDURES.

Choose the first bracketed item for Navy, Air Force, and NASA projects, or choose the second bracketed item for Army projects.

****

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are

[for Contractor Quality Control approval.][for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Shingles

Energy Star Label for Asphalt Shingle; S

[Heat Island Reduction; S

][SD-04 Samples

****
NOTE: Select color according to local practice, except use light-reflective colors for air conditioned buildings. Where color is specified in paragraph entitled "Asphalt Shingles," delete the requirement for submittal of color charts.
****

Shingles; G[, [_____]]

Full shingle sample and manufacturer's standard size samples of materials and products requiring color or finish selection.

[Color Charts; G[, [_____]]

]] SD-08 Manufacturer's Instructions

Application

SD-11 Closeout Submittals

Manufacturer's Warranty

Contractor's Warranty

1.4 DELIVERY AND STORAGE

Deliver materials in the manufacturer's unopened bundles and containers bearing the manufacturer's brand name. Keep materials dry, completely covered, and protected from the weather. Store according to manufacturer's written instructions. Store roll goods on end in an upright position or in accordance with manufacturer's recommendations. Immediately before laying, store roofing felt for 24 hours in an area maintained at a temperature not lower than 10 degrees C 50 degrees F.

1.5 WARRANTIES

****
NOTE: The warranty clauses in this guide specification have been approved by the Government. The paragraphs may be used without any request for waiver.
****

Warranties must begin on the date of Government acceptance of the work.

1.5.1 Manufacturer's Warranty

****
NOTE: Specify 30-year warranty for projects remotely located and subject to severe wind loadings; for example, in Bermuda. Specify the 25-year warranty for other projects. Minimum warranty period must extend beyond one year.
****

Furnish the asphalt shingle manufacturer's standard [25 year] [30 year] [other] warranty for the asphalt shingles. The warranty must run directly to the Government.

1.5.2 Contractor's Warranty

Provide warranty for 5 years that the asphalt shingle roofing system, as installed, is free from defects in workmanship. When repairs due to defective workmanship are required during the Contractor's warranty period, the Contractor must make such repairs within 72 hours of notification. When repairs are not performed within the specified time, emergency repairs performed by others will not void the warranty.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Shingles

****
NOTE: For structures located adjacent to Air Force Facilities, high light reflectance colors should not be used where resultant glare would be objectionable to pilots.

Edit this paragraph for the correct weight of shingle required for the project. Heavyweight inorganic mat type shingles will be used for ARHOC 81 Barracks or similar designs for permanent construction which utilize shingles. Omit fungus resistance if not required.

Hip and ridge shingles may be made from the strip shingle tabs or may be of a separate design. Generally, hip and ridge shingles cut from self-sealing individual full shingle tabs perform best.
****

****
NOTE: For projects located in coastal high wind areas, use the bracketed requirement for 14.2 kilogram 290 pound per 100 square feet shingles. The 290 pounds per 100 square feet is equivalent to 2.9 pounds per square foot.
****

****
NOTE: Specify fungus-resistant shingles for projects located in climates having high humidity most of the time.
****

****
NOTE: In geographical areas of the United States prone to severe hail events, specify impact resistant shingles.
****

****
NOTE: Structural aspects for the designer should be addressed in accordance with ASCE 7-16, Minimum Design Loads for Buildings and Other Structures. With respects to the wind resistance class options below, the Class F option is for 110 miles per hour resistance. The Class H option is for 150 miles per hour resistance.
****

****
NOTE: Certain roofing products are required to conform to public law (PL) 109-58 - Energy Policy Act of 2005 (EPAct05) by meeting or exceeding Energy Star or FEMP efficiency requirements at "energy-efficient products" at http://energy.gov/eere/femp/energy-and-water-efficient-products.
****

****
NOTE: Facilities with dominant cooling loads and/or in mild or warm climate zones are required to meet "cool roofing" requirements of FEMP. Cool roof design must follow the requirements in UFC 3-110-03 Roofing, Appendix B and ASHRAE 90.1 Chapter 5, for the design of insulation and energy performance of the building. The roofing system will need to include a top surface layer that meets the Energy Star criteria for Cool Roof Products see http://www.energystar.gov/products/certified-products/detail/roof-products.

NOTE: If a cool roof is not selected in ASHRAE zones 1 thru 3, design must meet one of the exception requirements listed in ASHRAE 90.1 Chapter 5 or provide thermal insulation above the deck with an R value of 33 or greater. Coordinate these requirements with insulation design and specifications.

Retain the next to last bracketed note for project with cool roof requirement. Retain the last bracketed sentence for project with sustainable third party certification credit requirement for reduced heat island effect.
****

Mineral granule-surfaced asphalt shingles, self-sealing, square tab, strip

[, fungus-resistant] [impact resistant shingles conforming to UL 2218, Class 4.][ASTM D3018/D3018M, Type I, and ASTM D3462/D3462M] [, weighing not less than 10.3 kilograms per square meter 210 pounds per 100 square feet] [, architectural shingles weighing not less than 14.2 kilograms per square meter 290 pounds per 100 square feet]. Shingles must meet the fire resistance requirements of UL 790 for Class A and the wind resistance requirements of [ASTM D3161/D3161M, Class F][ASTM D7158/D7158M, Class H]. Color must be [_____] [as selected from the manufacturer's standard color charts]. Shingle color must be [in accordance with COLOR SCHEDULE] [_____]. Provide asphalt shingle that is Energy Star labeled. Provide data identifying Energy Star label for asphalt shingle product.[Provide solar reflectance product with an initial solar reflectance greater than or equal to 0.25 and a solar reflectance greater than or equal to 0.15 three years after installation under normal conditions.][Provide emittance and reflectance percentages, solar reflectance index values, [and] slopes [_____], to meet sustainable third party certification requirements for Heat Island Reduction.]

2.1.2 Mineral-Surfaced Asphalt Roll Roofing

ASTM D6380/D6380M.

2.1.3 Smooth-Surfaced Asphalt Roll Roofing

ASTM D6380/D6380M, Type II.

2.1.4 Underlayment

****
NOTE: Choose Type I or Type II from the text below. Type I is the minimum accepted. Type II is a heavy duty felt. Edit according to project requirements.
****

Asphalt-saturated felt conforming to ASTM D4869/D4869M or ASTM D226/D226M, [Type I, number 15,] [Type II, number 30,] without perforations or other material specified by the shingle manufacturer for use as underlayment.

2.1.4.1 Leak Barrier Underlayment

Self-adhering leak barrier or ice dam underlayment must comply with ASTM D1970/D1970M for sealability around nails.

2.1.5 Self-Adhering Membrane

Self-adhering rubberized asphaltic membrane, a minimum of 1 mm 40 mils thick, and recommended by the shingle manufacturer for use as eaves flashing.

2.1.6 Nails for Applying Shingles and Asphalt-Saturated Felt

Aluminum or hot-dipped galvanized steel or equivalent corrosion resistant with sharp points and flat heads 10 to 11 mm 3/8 to 7/16 inch in diameter. Shank diameter of nails must be a minimum of 2.67 mm 0.105 inch and a maximum of 3.43 mm 0.135 inch with garb or otherwise deformed for added pull-out resistance. Nails must be long enough to penetrate completely through or extend a minimum of 20 mm 3/4 inch into roof deck, whichever is less, when driven through materials to be fastened.

2.1.7 Asphalt Roof Cement

ASTM D4586/D4586M, Type II.

2.1.8 Asphalt Primer

ASTM D41/D41M.

2.1.9 Ventilators

****

NOTE: Drawings should detail type of ridge vent required. For aluminum ridge vents, see Section 07 60 00 FLASHING AND SHEET METAL.

Ventilation should be required with a total net free ventilating area of not less than 1 to 150 of the area of the space ventilated. The total area is permitted to be reduced to 1 to 300, provided at least 50 percent and not more than 80 percent of the required ventilating area is provided by ventilators located in the upper portion of the ventilated space at least 914 mm 3 feet above eave or cornice vents, with the balance of required ventilation provided by eave or cornice vents. As an alternative, the net free cross-ventilation area may be reduced to 1 to 300 when a vapor barrier having a transmission rate not exceeding 1 perm is located on warm side of the attic insulation.

****

2.1.9.1 Nailable Plastic Shingle Over Type Ridge Vents

Ridge vents must be constructed of UV stabilized nailable rigid polypropylene material, approximately 0.30 m 1 foot wide and 25 mm 1 inch thick, and must be in 1.2 m 4 foot long interlocking sections with self-aligning ends or corrugated polyethylene rigid roll or rigid strip ridge vent with aluminum wind deflectors on each side. Vents must be designed to prevent infiltration of insects, rain, and snow.

2.1.9.2 Nailable Mesh Shingle Over Type Ridge Vents

Ridge vents must be constructed of UV stabilized nailable polyester mesh material, approximately 0.30 m 1 foot wide. Vents must be designed to prevent infiltration of insects, rain, and snow.

PART 3 EXECUTION

3.1 VERIFICATION OF CONDITIONS

Do not install building construction materials that show visual evidence of biological growth.

Ensure that roof deck is smooth, clean, dry, and without loose knots. Roof surfaces must be firm and free from loose boards, large cracks, and projecting ends that might damage the roofing. Vents and other projections through roofs must be properly flashed and secured in position, and projecting nails must be driven flush with the deck.

3.2 SURFACE PREPARATION

Cover knotholes and cracks with sheet metal nailed securely to sheathing. Flash and secure vents and other roof projections, and drive projecting nails firmly home.

3.3 APPLICATION

Apply roofing materials as specified herein unless specified or recommended otherwise by shingle manufacturer's written instructions [or by NRCA 0437].

3.3.1 Underlayment

****
NOTE: Select the applicable paragraph(s) from the following.
****

****
The installation of asphalt strip shingles at maximum exposure is not recommended on roofs having a slope of less than 1:4.

In locations where the January mean temperature is minus 1 degree C 30 degrees F or less, a leak barrier underlayment membrane should be used. The leak barrier underlayment membrane may consist of: two plies of No. 15 asphalt saturated felt, one nailed to the deck and the second set in Type III or Type IV hot asphalt or asphalt lap cement; a heavyweight coated base sheet nailed to the deck and another felt ply or plysheet set in hot asphalt or asphalt lap cement; or a self adhering modified bitumen membrane.

NOTE: In locations where the average daily January temperature is minus 4 degrees C 25 degrees F or below, use the second optional paragraph instead of the first optional paragraph.
****

[Provide for roof slopes 1 in 3 4 inches per foot and greater. Apply one layer of shingle underlayment to roof deck. Lay underlayment parallel to roof eaves, starting at eaves. Provide minimum 50 mm 2 inch head laps, 100 mm 4 inch end laps, and 150 mm 6 inch laps from both sides over hips and ridges. Nail sufficiently to hold until shingles are applied. Turn up vertical surfaces a minimum of 100 mm 4 inches.
]

****
NOTE: These requirements are intended primarily for roof slopes between 1 in 6 and 1 in 3 2 and 4 inches per foot. They should not be specified for roof slopes 1 in 3 4 inches per foot and greater unless the condition of the note above is met. Delete bracketed sentence unless eave flashing is required.
****

[Provide for roof slopes [between 1 in 6 2 inches per foot and 1 in 3 4

inches per foot] [1 in 34 inches per foot and greater]. Apply two layers to roof deck. Provide a 480 mm 19 inch wide strip as starter sheet to maintain specified number of layers throughout roof. Lay parallel to eaves, starting at eaves. Provide minimum 480 mm 19 inch head laps, 150 mm 6 inch laps from both sides over hips and ridges, and 300 mm 12 inch end laps in the field of the roof. Nail sufficiently to hold until shingles are applied. Turn up vertical surfaces a minimum of 100 mm 4 inches. [When a self-adhering membrane is used for eave flashing, start underlayment from upper edge of eave flashing.]

]3.3.2 Drip Edges

****
NOTE: Specify 100 mm 4 inch spacing for nails for roofs in high wind areas.
****

Provide metal drip edges as specified in Section 07 60 00 FLASHING AND SHEET METAL applied directly on the wood deck at eaves and over the underlayment at rakes. Extend back from edge of deck a minimum of 75 mm 3 inches, and secure with nails spaced a maximum of [100] [250] millimeters [4] [10] inches o.c. along inner edge.

3.3.3 Starter Strip

****
NOTE: Delete the first bracketed phrase unless eave flashing is specified. Otherwise, delete the second bracketed phrase.
****

****
NOTE: Include the next to last bracketed sentence and delete the last bracketed sentence unless the project is located in Bermuda.
****

Apply starter strip at eaves, using 225 mm 9 inch wide strip of mineral-surfaced roll roofing of a color to match shingles. Optionally, use a row of shingles with tabs removed and trimmed to ensure that joints are not exposed at shingle cutouts. Apply starter strip along eaves, [overlaying and finishing even with lower edge of eave flashing strip] [overhanging the metal drip edge at eaves and rake edges 6 to 10 mm 1/4 inch to 3/8 inch]; fasten in a line parallel to and 75 to 100 mm 3 to 4 inches above eave edge. Place nails so top of nail is not exposed in cutouts of first course of shingles. [When roll roofing is provided, seal tabs of first course of shingles with asphalt roof cement.] [Fasten with 6 nails per strip of shingles or space nails at 150 mm 6 inches o.c. for roll roofing. Seal tabs of first course of shingles with asphalt roof cement as specified below.]

3.3.4 Shingle Courses

****
NOTE: Shingles with the correct recommended exposure must be applied in accordance with the manufacturer's printed instructions as they appear on the bundle wrapping.
****

Start first course with full shingle, and apply succeeding courses with joints staggered at thirds or halves. Butt-end joints of shingles must not align vertically more often than every fourth course. Apply shingle courses as follows:

a. Fastening: Do not drive fasteners into or above the factory-applied adhesive unless adhesive is located 16 mm 5/8 inch or closer to top of cutouts. Place fasteners so they are concealed by shingle top lap and penetrate the head lap.

****
NOTE: At the text below, for application of shingles on mansard roofs and other steep roofs with slopes more than 1.75 in 1 21 inches per foot, require that tabs be cemented with asphalt roof cement.
****

****
NOTE: Delete item "b" and include items "c" and "d" for projects located in Bermuda and where:

1. Basic wind speed is 161 kilometers per hour (kph) 100 miles per hour (mph) and eave is 6100 mm 20 feet or higher above grade; or

2. Basic wind speed is 177 kph 110 mph.
****

b. Shingles applied with nails: Nominal 125 mm 5 inch exposure. Apply each shingle with minimum of four nails. Place one nail 25 mm 1 inch from each end, and evenly space nails on a horizontal line a minimum of 16 mm 5/8 inch above top of cutouts. [Cement each tab with one spot of asphalt roof cement placed 25 to 50 mm 1 to 2 inches from bottom edge of shingle.]

[c. Nailing: Apply shingles with nominal 125 mm 5 inch exposure. Apply each shingle with minimum of six nails. Place one nail 25 mm 1 inch from each end and one nail on each side of each cutout, on a horizontal line 16 mm 5/8 inch above cutouts.

][d. Sealing: Seal each tab with continuous, 225 mm 9 inchlong, 6 mm 1/4 inch diameter bead of asphalt roof cement, applied to the surface of course below. Place bead on horizontal line 16 mm 5/8 inch above cutouts so bead will be 25 mm 1 inch from bottom edge of tab to be sealed and so bead will not show through cutouts. After nailing each shingle, press tabs down to ensure spreading and bonding of asphalt roof cement.

]3.3.5 Hips and Ridges

Form with 225 by 300 mm 9 by 12 inch individual shingles or with 300 by 300 mm 12 by 12 inch shingles cut from 300 by 900 mm 12 by 36 inch strip shingles. Bend shingles lengthwise down center with equal exposure on each side of hip or ridge. Lap shingles to provide a maximum 125 mm 5 inch exposure, and nail each side in unexposed area 140 mm 5-1/2 inches from butt and 25 mm 1 inch in from edge.

3.3.6 Valleys

****
NOTE: Closed cut and woven valleys are preferred method for strip shingles, but open roll roofing and open sheet metal valleys may also be specified as Contractor options.
****

[Provide either closed cut, woven, open roll roofing, or open sheet metal valleys.

]3.3.6.1 Closed Cut Valleys

Provide 900 mm 36 inch wide valley lining of single layer of smooth-surfaced or mineral-surfaced roll roofing, with mineral-surface facing down, for full length of valley as follows:

a. Center lining in valley over underlayment. Provide minimum 300 mm 12 inch end laps in the lining and seal laps with asphalt roof cement. Fasten lining to hold it in place until shingles are applied.

b. Apply first regular course of shingles along eaves of one of the intersecting roof planes and across valley. Extend course at least 300 mm 12 inches onto adjoining roof.

c. Apply succeeding courses in same manner as first course, extending across valley and onto adjoining roof.

d. Press shingles tightly into valley and nail in normal manner, except apply nails not closer than 150 mm 6 inches to valley centerline, and apply additional nail in top corner of each shingle crossing valley.

e. Apply shingles on the adjoining roof plane, starting along eaves and across valley onto previously applied shingles. Trim overlapping courses back to a line parallel to and a minimum of 50 mm 2 inches back from valley centerline.

f. Trim 25 mm 1 inch on a 45 degree angle from upper corner of each end shingle. Embed end shingles in a 75 mm 3 inch wide band of asphalt roof cement.

3.3.6.2 Woven Valleys

Provide valley lining as specified for closed cut valley. Lay valley shingles over lining by either of the following methods:

a. Method I: Apply regular shingles on both roofs simultaneously. Weave each course in turn over the valley. Lay the first regular course of shingles along eaves of roof up to and over valley. Extend course along adjoining roof deck at least 300 mm 12 inches. Carry first regular course of shingles of adjoining roof over valley on top of previously applied shingles. Lay succeeding courses alternately, weaving valley shingles over each other for full length of valley.

b. Method II: Apply regular shingles on each roof surface separately to a line about 900 mm 3 feet from center of valley, and weave valley shingles in place later, as specified for Method I.

In following either method, press shingles tightly into valley, and fasten in normal manner; except apply nails not closer than 150 mm 6 inches to valley centerline, and apply additional nail in top corner of terminal shingle on both sides of valley.

3.3.6.3 Open Roll Roofing Valleys

Provide 450 mm 18 inch wide strip of mineral-surfaced asphalt roll roofing, of a color to blend with asphalt shingles, and with granular surface facing down, for the full length of valley as follows:

a. Center roll roofing strip in valley over underlayment. Lay centered in valley over felt underlayment and with granular face down. Nail strip only enough to hold in place. Apply nails in rows 25 mm 1 inch from each edge. As fastening along second side proceeds, press strip firmly into valley.

b. Center second strip 900 mm 36 inches wide in valley and lay it over first strip with granular face exposed and nail as specified for 450 mm 18 inch strip.

c. Before applying roofing shingles, snap two chalk lines for full length of valley. Locate each line 75 mm 3 inches from centerline of valley at top, and increase width between lines by 25 mm for each 2440 mm 1 inch for each 8 feet of valley length, continuing to eaves.

d. Apply a 50 mm 2 inch band of asphalt roof cement along each edge of 900 mm 36 inch strip from edge to chalk line. Cut regular shingle courses true along valley chalk lines, and nail in normal manner.

3.3.6.4 Open Sheet Metal Valleys

Sheet metal flashing for valleys is specified in Section 07 60 00 FLASHING AND SHEET METAL. Before installing and fastening flashing in place with metal cleats:

a. Install single layer of 900 mm 36 inch wide, asphalt-saturated felt, centered on valley and extending entire length of valley over felt underlayment.

b. Cut regular shingle courses on each roof on true line 50 mm 2 inches from valley centerline at top of valley, and increase width between lines by 25 mm for each 2440 mm 1 inch for each 8 feet of valley length, continuing to eaves.

c. Apply 50 mm 2 inch band of asphalt roof cement over flashing, along and under side of shingles adjoining valley.

d. Press shingles tightly into cement, and nail in normal manner, except apply nails not closer than 125 mm 5 inches to valley centerline. Do not drive nails through valley flashing.

e. Provide a 100 mm 4 inch band of asphalt roof cement for fastening shingle tabs down along open metal gutters.

3.3.7 Flashing

3.3.7.1 Eave Flashing

****
NOTE: Select the applicable paragraph(s) from the following.
****

****
NOTE: Where the average daily January temperature is minus 4 degrees C 25 degrees F or below or where there is the chance of ice dams forming along the eaves, use the second optional paragraph instead of the first optional paragraph. In areas where the architect/engineer has determined that eave flashing is not commonly provided, do not include either paragraph.
****

[Provide for roof slopes 1 in 3 4 inches per foot and greater. Provide eave flashing strips consisting of smooth-surfaced roll roofing. Flashing strips must overhang metal drip edge 6 to 10 mm 1/4 inch to 3/8 inch and extend up the slope far enough to cover a point 300 mm 12 inches inside interior face of exterior wall. Where overhangs require flashings wider than 900 mm 36 inches, locate laps outside exterior wall face. Laps must be at least 50 mm 2 inches wide and cemented with asphalt roof cement over entire length of lap. Lap end 300 mm 12 inches and cement.
]

****
NOTE: The requirements below are intended primarily for roof slopes between 1 in 6 and 1 in 3 2 and 4 inches per foot. They should not be specified for roof slopes 1 in 3 4 inches per foot and greater unless the condition of note above is met.
****

[Provide for roof slopes [between 1 in 6 and 1 in 3 2 inches per foot and 4 inches per foot] [1 in 34 inches per foot and greater]. Provide either of the following types of eave flashing:

a. From the eaves to a point 600 mm 24 inches inside interior wall line, apply solid coating of asphalt roof cement between overlapping layers of underlayment. Spread cement to a uniform thickness at rate of 7.5 liters per 10 square meters 2 gallons per 100 square feet of cemented roof area.

b. From the eaves to a point 600 mm 24 inches inside interior wall line, apply one layer of self-adhering membrane. Follow membrane manufacturer's printed installation instructions.

]3.3.7.2 Stepped Flashing

For sloping roofs which abut vertical surfaces, provide stepped metal flashing as specified in Section 07 60 00 FLASHING AND SHEET METAL.

3.3.7.3 Vent and Stack Flashing

Apply shingles up to point where vent or stack pipe projects through roof,

and cut nearest shingle to fit around pipe. Before applying shingles beyond pipe, prepare flange of metal pipe vent flashing as specified in Section 07 60 00 FLASHING AND SHEET METAL, by applying a 3 mm 1/8 inch thick coating of asphalt roof cement on bottom side of flashing flange. Slip flashing collar and flange over pipe, and set coated flange in 2 mm 1/16 inch coating of asphalt roof cement. After applying flashing flange, continue shingling up roof. Lap lower part of flange over shingles. Overlap flange with side and upper shingles. Fit shingles around pipe, and embed in 2 mm 1/16 inch thick coating of asphalt roof cement where shingles overlay flange.

[3.3.7.4 Chimney Flashing

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NOTE: Delete this paragraph unless a chimney is indicated on the project drawings. Coordinate with Sections 06 10 00 ROUGH CARPENTRY and 07 60 00 FLASHING AND SHEET METAL to ensure that crickets and metal chimney flashing are specified.
****

Provide treated wood crickets as specified in Section 06 10 00 ROUGH CARPENTRY. Provide metal base and counterflashing as specified in Section 07 60 00 FLASHING AND SHEET METAL. Uniformly coat masonry surfaces which are to receive flashing with asphalt primer applied at rate of 4 liters per 10 square meters 1 gallon per 100 square feet. Apply shingles over underlayment up to front face of chimney. Apply metal front base flashing with lower section extending at least 100 mm 4 inches over shingles. Set base flashing in a 2 mm 1/16 inch coating of asphalt roof cement on shingles and chimney face. Apply metal step flashing at sides in a coating of asphalt roof cement. Embed end shingles in each course that overlaps step flashing with asphalt roof cement. Apply metal rear base flashing over cricket and back of chimney in coating of asphalt roof cement. Apply end shingles in each course up to cricket, and cement in place. Lap base flashing minimum of 75 mm 3 inches with metal counterflashing.

] -- End of Section --