
USACE / NAVFAC / AFCEC UFGS-07 32 13 (August 2025)

Preparing Activity: NAVFAC

Superseding:
UFGS-07 32 13 (April 2006)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated October 2025

SECTION TABLE OF CONTENTS

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

SECTION 07 32 13

CONCRETE TILE ROOFING REPLACEMENT OR REPAIR

08/25

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 COORDINATION
- 1.3 SUBMITTALS
- 1.4 QUALITY CONTROL
 - 1.4.1 Concrete Tile Roofing System
 - 1.4.2 Qualifications of Roofing Personnel
 - 1.4.3 Pre-roofing Conference
 - 1.4.4 Solar Reflectance
- 1.5 DELIVERY AND STORAGE
- 1.6 PROJECT/SITE CONDITIONS
 - 1.6.1 Environmental Requirements
 - 1.6.2 Progress of Work
 - 1.6.3 Availability of Materials
- 1.7 WARRANTIES
 - 1.7.1 Contractor's Warranty
 - 1.7.2 Manufacturer's Warranty
- 1.8 EXTRA STOCK
- 1.9 ROOF INFORMATION CARD

PART 2 PRODUCTS

- 2.1 MATERIALS
 - 2.1.1 Existing Concrete Tile
 - 2.1.2 New Concrete Tile
 - 2.1.2.1 Colors
 - 2.1.2.2 Fittings
 - 2.1.3 Underlayment Membrane
 - 2.1.3.1 Elastomeric Membrane Underlayment
 - 2.1.3.2 Elastomeric Membrane Accessories
 - 2.1.4 Substrate Panels (For Application Over Structural Metal Deck)
 - 2.1.4.1 Fiberglass-Faced Gypsum Roof Board
 - 2.1.5 Fasteners for Installation of Tile

- 2.1.5.1 Nails
- 2.1.5.2 Threaded Fasteners
- 2.1.5.3 Miscellaneous Fasteners
- 2.1.6 Flashing
- 2.1.7 Sheet Metal Birdstop For Concrete Tile
- 2.1.8 Mortar
- 2.1.9 Asphalt Plastic Cement
- 2.1.10 Sealant
- 2.1.11 Wood Strips
- 2.1.12 Roof Tile Adhesive
- 2.1.13 Snow Guards

PART 3 EXECUTION

- 3.1 EXAMINATION
- 3.2 PREPARATION
 - 3.2.1 Preparation of Surfaces
 - 3.2.2 Protection of Roof Surfaces
 - 3.2.3 Tile Removal (Reroof Applications)
 - 3.2.4 Protection of Elastomeric Membranes
- 3.3 INSTALLATION
 - 3.3.1 Substrate Panels
 - 3.3.2 Elastomeric Membrane Underlayment
 - 3.3.2.1 Valley and Ridge Application
 - 3.3.2.2 Vertical Membrane Flashings
 - 3.3.2.3 Protection
 - 3.3.3 Metal Flashing
 - 3.3.4 Concrete Roofing Tile (General)
 - 3.3.4.1 Repair and Replacement
 - 3.3.4.2 Installation (General)
 - 3.3.5 Roof Decks and Fastening
 - 3.3.5.1 Poured Concrete Deck
 - 3.3.5.2 Chalk Lines
 - 3.3.6 One-Piece Barrel Tile Application
 - 3.3.6.1 Wood Strips
 - 3.3.6.2 Tile Application
 - 3.3.7 Two-Piece Barrel Tile Application
 - 3.3.7.1 Wood Strips
 - 3.3.7.2 Tile Application
 - 3.3.8 Flat Shingle Tile Application
 - 3.3.8.1 Wood Strips
 - 3.3.8.2 Tile Application
 - 3.3.9 Interlocking Shingle Tile Application
 - 3.3.9.1 Wood Strips
 - 3.3.9.2 Tile Application
 - 3.3.10 Post Installation Cleaning

-- End of Section Table of Contents --

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SECTION 07 32 13

CONCRETE TILE ROOFING REPLACEMENT OR REPAIR 08/25

NOTE: This guide specification covers the requirements for clay and concrete roofing tiles and underlayments.

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: "The NRCA Steep Roofing Manual," National Roofing Contractors Association, 6250 River Road, Rosemont, IL 60018, may be consulted by the designer for a more detailed description of the tile roofing installation.

NOTE: On the drawings, show:

1. Pitch of substrate/tile roofing.
2. Roof edge, rake, ridge, valley, and intersections with vertical surfaces.

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 A240/A240M	(2025a) Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
ASTM A480/A480M	(2025b) Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip
ASTM B101	(2022) Standard Specification for Lead-Coated Copper Sheet and Strip for Building Construction
ASTM B370	(2022) Standard Specification for Copper Sheet and Strip for Building Construction
ASTM C67/C67M	(2025) Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile
ASTM C1029	(2020) Standard Specification for Spray-Applied Rigid Cellular Polyurethane Thermal Insulation
ASTM C1177/C1177M	(2024) Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing
ASTM C1184	(2023) Standard Specification for

Structural Silicone Sealants

ASTM C1329/C1329M	(2025) Standard Specification for Mortar Cement
ASTM C1492	(2022) Standard Specification for Concrete Roof Tiles
ASTM D146/D146M	(2004; R 2020) Sampling and Testing Bitumen-Saturated Felts and Woven Fabrics for Roofing and Waterproofing
ASTM D412	(2016; R 2021) Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension
ASTM D4586/D4586M	(2007; R 2018) Standard Specification for Asphalt Roof Cement, Asbestos-Free
ASTM E108	(2025) Standard Test Methods for Fire Tests of Roof Coverings

FM GLOBAL (FM)

FM 4473	(2005) Specification Test Standard for Impact Resistance Testing of Rigid Roofing Materials by Impacting with Freezer Ice Balls
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NATIONAL ROOFING CONTRACTORS ASSOCIATION (NRCA)

NRCA RoofMan	(2025) The NRCA Roofing Manual
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UL SOLUTIONS (UL)

UL 2218	(2010; Reprint May 2024) UL Standard for Safety Impact Resistance of Prepared Roof Covering Materials
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1.2 COORDINATION

Coordinate with the installation of flashing and gutters provided under Section 07 60 00 FLASHING AND SHEET METAL to ensure proper sequencing. Do not install roofing materials until vent stacks and other penetrations through roof deck have been installed.

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 and Air Force 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.

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. Submittals not having a "G" or "S" classification are 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-01 Preconstruction Submittals

Sample Warranty Certificates; G, [_____]

SD-02 Shop Drawings

Concrete Tile Roofing System

SD-03 Product Data

Concrete Tile

[Heat Island Reduction; S

] Underlayment Membrane

Fiberglass-Faced Gypsum Roof Board

SD-04 Samples

[Manufacturer's Color Charts for Concrete Tile; G, [_____]

] Colors

SD-06 Test Reports

Elastomeric Membrane Underlayment

Fiberglass-Faced Gypsum Roof Board

SD-07 Certificates

Qualifications of Roofing Personnel

SD-08 Manufacturer's Instructions

Installation

SD-11 Closeout Submittals

Contractor's Warranty

Manufacturer's Warranty

Extra Stock

Roof Information Card

1.4 QUALITY CONTROL

1.4.1 Concrete Tile Roofing System

Submit shop drawings showing concrete tile installation and appearance details, flashing details, and fastening details for the tiles.

1.4.2 Qualifications of Roofing Personnel

Submit documentation showing qualifications of personnel proposed to perform the roofing work and a listing identifying prior installations completed by the Contractor.

1.4.3 Pre-roofing Conference

After approval of submittals and before performing roofing system installation work, hold a pre-roofing conference to review the following:

- a. Drawings, specifications, and submittals related to the roof work;
- b. Roof system components installation;
- c. Procedure for the roof manufacturer's technical representative's onsite inspection and acceptance of the roofing substrate, the name of the manufacturer's technical representatives, the frequency of the onsite visits, distribution of copies of the inspection reports from the manufacturer's technical representative;
- d. Contractor's plan for coordination of the work of the various trades involved in providing the roofing system and other components impacting the roof;
- e. Quality control plan for the roof system installation;
- f. Property protection measures;
- g. Safety requirements.

Coordinate and schedule a pre-roofing conference coordinated with the Contracting Officer and attended by the Contractor, the Contracting

Officer's designated personnel, personnel directly responsible for the installation of roof system, related sheet metal work, [[mechanical][and][electrical] work], other trades interfacing with the roof work, and a representative of the tile materials manufacturer. Before beginning roofing work, provide a copy of meeting notes and action items to all attending parties. Note action items requiring resolution prior to start of roof work.

[1.4.4 Solar Reflectance

NOTE: Facilities with dominant cooling loads or in mild or warm climate zones are required to meet "cool roofing" requirements of FEMP. Design cool roofs following the requirements in UFC 3-110-03 Roofing and ASHRAE 90.1 Chapter 5, for the design of insulation and energy performance of the building. Design insulation for cool roofs to meet at a minimum the ASHRAE 90.1 Chapter 5 zone requirements.

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.

Cool roofs will have color limitations from various manufacturers. Designers must confirm adequate availability of products meeting these requirements prior to including this section in the project specification.

Retain the first bracketed sentence for projects with cool roof requirement. Retain the last bracketed sentence for projects with sustainable third party certification credit requirement for reduced heat island effect.

[The roofing system is required to meet the criteria for Cool Roof Products.][Provide emittance and reflectance percentages, solar reflectance index values, [and] slopes [____], to meet sustainable third party certification requirements for [Heat Island Reduction](#).]

]1.5 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.

Do not store materials on roof decks in such a manner as to overstress [and][or] damage the deck and supporting structure. Avoid placing loads at midspans of framing. Superimposed loads are required to be well distributed.

1.6 PROJECT/SITE CONDITIONS

1.6.1 Environmental Requirements

Proceed with concrete tile roofing work when existing and forecasted weather conditions permit work to be performed in accordance with manufacturer's recommendations and warranty requirements.

1.6.2 Progress of Work

Proceed with work, including removal of existing materials, preparation of existing surfaces and application of underlayment and nailers, and related temporary and/or permanent flashing in such a manner that it can be completed prior to the end of each working day.

1.6.3 Availability of Materials

Provide and maintain materials on the site at all times for temporary roofing, flashing, and other protection when delays and/or changed weather conditions do not permit completion of each unit of work prior to the end of each working day. Remove and discard all which have been used for temporary roofing, flashing and other protection.

1.7 WARRANTIES

Warranties must begin on the date of Government acceptance of the work. Submit [sample warranty certificates](#) during the pre-construction phase to prove all warranty requirements will be achieved.

1.7.1 Contractor's Warranty

The Contractor is required to warrant for one year that the tile roofing system, as installed, is free from leaks and defects in workmanship. When repairs due to defective workmanship are required during the Contractor's warranty period, the Contractor is to make such repairs within 72 hours of notification at no cost to the Government.

1.7.2 Manufacturer's Warranty

Provide manufacturer's no dollar limit (NDL) material and labor warranty against defects in material and workmanship that affect the appearance, leak resistance, and attachment of tile roof assembly, including related metal flashing, for a minimum period of 20 years from date of final acceptance of the work.

1.8 EXTRA STOCK

Provide an extra two percent of each type and color of slate used in clean marked containers. In the extra stock provided, include hip, ridge, and other special shapes in the same proportion as used on the project.

1.9 ROOF INFORMATION CARD

Provide a typewritten information card for facility records and an engraved aluminum or dense plastic plaque containing the roof assembly type and makeup, system installer, system manufacturer, installation completion date and warranty period. Display at interior roof access points or an exterior location if no such interior access point exists.

PART 2 PRODUCTS

2.1 MATERIALS

NOTE: Roofing systems specified in this section
have a life expectancy in excess of 50 years.
Flashing materials should be selected with similar
life expectancy.

2.1.1 Existing Concrete Tile

Salvage and reuse intact and serviceable existing concrete tiles whenever possible. Ensure new concrete tiles being incorporated into existing concrete tile roofs match existing tiles as closely as possible. Use concrete tiles from the same manufacturer as the original if possible.

2.1.2 New Concrete Tile

NOTE: Use only concrete roof tiles with integral
color in areas where freeze/thaw cycles exceed 30
per year.

Include bracketed sentence requiring impact
resistance requirements when project is located in a
hail-prone area.

ASTM C67/C67M, ASTM E108, ASTM C1492 Extruded, interlocking concrete roofing tile units, shapes as indicated, with[integral color][color slurry coat on exposed surfaces].[Tile must meet UL 2218 or FM 4473, Class 4, impact resistance requirements.] Include specially shaped, color-matched units as indicated or required for ridges, rakes and hips. Provide with cast-in anchor lugs, transverse weather checks and fastening holes.

2.1.2.1 Colors

Concrete tile color to be selected from manufacturer's standard samples. Submit one representative tile for each type to illustrate the full range of colors and surface finish.

2.1.2.2 Fittings

Provide concrete tile fittings of the following types as required by manufacturer's instructions: eave -[eave closure][under eave]; gable -[end band][gable rake]; ridge -[ridge][closed ridge end][ridge/hip terminal]; hip -[cut hip][hip roll][hip starter][ridge/hip terminal]; valley -[cut valley][closed valley].

2.1.3 Underlayment Membrane

Provide underlayment membrane on surfaces scheduled to be covered with tile consisting of high strength elastomeric self-adhering membrane.

2.1.3.1 Elastomeric Membrane Underlayment

Elastomeric membrane is required to be a cold applied composite self-adhering membrane, minimum 1.02 mm 0.040 inch thick, high strength polyethylene film with slip resistant embossing, coated on one side with a thick layer of adhesive-consistency rubberized asphalt, interwound with a disposable silicone coated release sheet. Ensure the tensile strength and elongation values are not less than 1724 kPa 250 psi when tested in accordance with ASTM D412 and pliability is to be unaffected when tested in accordance with ASTM D146/D146M.

2.1.3.2 Elastomeric Membrane Accessories

Two-component urethane, mastic, and primer as approved by the membrane manufacturer. Flashing, expansion joint covers, temporary UV protection and corner fillets as recommended by the membrane manufacturer.

2.1.4 Substrate Panels (For Application Over Structural Metal Deck)

2.1.4.1 Fiberglass-Faced Gypsum Roof Board

ASTM C1177/C1177M, non-structural, fiberglass faced, silicone treated core gypsum panels, 1200 by 2400 by 13 mm 48 by 96 by 1/2 inch thickness.

2.1.5 Fasteners for Installation of Tile

2.1.5.1 Nails

Use solid copper or stainless steel, minimum 10 gauge nails, minimum 9.5 mm 3/8 inch head of sufficient length to adequately penetrate the nailing surface. Verify that chemicals used in pressure treatment of ridge and hip boards are compatible with copper nails.

2.1.5.2 Threaded Fasteners

Use stainless steel, Number 10, minimum 9.5 mm 3/8 inch head of sufficient length to adequately penetrate the nailing surface.

2.1.5.3 Miscellaneous Fasteners

Miscellaneous fasteners may include but are not limited to: wind locks, hurricane clips, tile attachment brackets, tile nails, twisted wire (tile-tie), deck anchor systems, and flashing cleats. Provide fasteners made of solid copper or stainless steel.

2.1.6 Flashing

Provide a minimum 0.57 kg 20 ounce, light cold-rolled temper (H00) copper conforming to ASTM B370, minimum 0.57 kg 20 ounce lead-coated copper conforming to ASTM B101, or minimum 26 gauge .018 inch stainless steel conforming to ASTM A240/A240M and ASTM A480/A480M. Use like metals on all components of fastening systems and flashing in order to avoid galvanic action. Provide flashing in accordance with the requirements as specified in Section 07 60 00 FLASHING AND SHEET METAL.

2.1.7 Sheet Metal Birdstop For Concrete Tile

Formed 0.5 mm 26 gage stainless steel "L" section with 75 mm 3 inch wide horizontal leg and vertical leg cut to conform with bottom profile of

tile. Provide pre-finished to match tile color with drain holes punched in vertical leg prior to application of finish.

2.1.1.8 Mortar

Use Type M mortar per [ASTM C1329/C1329M](#) for filling the openings of cut valley tiles consisting of one part portland cement to three parts damp plaster sand colored to the nearest possible match with the color of the tile.

2.1.1.9 Asphalt Plastic Cement

Use plastic cement for gable rakes, hip rolls, ridges, stringers and other conditions that is non-running, heavy body plastic cement composed of ingredients complying with [ASTM D4586/D4586M](#), Type I.

2.1.1.10 Sealant

Use silicone sealant in accordance with [ASTM C1184](#) (when used in lieu of plastic cement).

2.1.1.11 Wood Strips

Ensure wood strips for nailers, battens, cant strips, and eave strips are fabricated of foundation grade redwood or preservative treated Douglas fir. Provide sizes and lengths per tile manufacturer's installation details.

2.1.1.12 Roof Tile Adhesive

Use single-component, spray-applied polyurethane adhesive conforming to [ASTM C1029](#) for securing individual roof tiles if required by manufacturer for special, high-wind applications.

2.1.1.13 Snow Guards

Provide guards which are compatible with the roof tile as indicated.

PART 3 EXECUTION

3.1 EXAMINATION

Examine structural roof deck for compliance with requirements of selected system. Verify that roof penetrations and openings are installed in their proper location.

3.2 PREPARATION

3.2.1 Preparation of Surfaces

Ensure roof deck surfaces are smooth, clean, firm, dry, and free from loose boards, large cracks, and projecting ends that might damage the roofing. Clean foreign particles from all interlocking areas to ensure proper seating and to prevent water damming. Prior to installation of tile, vents and other projections through roofs are to be properly flashed and secured in position, and projecting nails driven firmly home.

3.2.2 Protection of Roof Surfaces

Use equipment (such as padded ridge ladders) and techniques which prevent damage to roof as a result of foot or material traffic. The Contractor is responsible for controlling breakage of new or existing tile beyond what is indicated. Lay out the progression of work and present to the Project Superintendent to prevent other trades from working on or above completed roofing. Ensure personnel who are working on the roof have proper shoes which does not further damage tiles and have shoe soles made of a material which aids in preventing falls.

3.2.3 Tile Removal (Reroof Applications)

Where work involves partial replacement or repair of roof, verify each tile for tightness and continued use. Mark tiles which have been identified for replacement or re-installation for approval within 30 days of Notice to Proceed. Mark tiles identified for removal with a non-destructive color mark which can be easily removed. Re-fasten tiles fastened with non-copper fasteners with proper copper fasteners.

3.2.4 Protection of Elastomeric Membranes

Do not leave elastomeric membrane underlayment exposed to sunlight. Cover exposed membrane with clay tile roofing as soon as possible, not to exceed the maximum exposure limit published by the manufacturer, and in no case longer than 120 days. Patch membrane damaged due to exposure to sunlight prior to the application of final roof covering.

3.3 INSTALLATION

Comply with manufacturer's installation instructions and recommendations, but not less than recommended by the [NRCA RoofMan](#). Comply with local building code requirements for special fastening requirements such as wind locks and hurricane clips in high wind areas.

3.3.1 Substrate Panels

Install fiberglass-faced gypsum roof boards over corrugated metal structural deck as recommended by panel manufacturer.

3.3.2 Elastomeric Membrane Underlayment

Apply self-adhering membrane over[wood deck][concrete deck][substrate panels] in accordance with manufacturers recommendations. Provide manufacturer recommended primer for application on concrete surfaces. Cover pine wood decks with minimum **6 mm 1/4 inch** plywood prior to receiving membrane coverage. Peel the release paper back **300 to 600 mm 1 to 2 feet** and align on the lower edge of the roof and the first **300 to 600 mm 1 to 2 feet**. Pull the release paper under the membrane and peel from the membrane. Press the membrane in place. Roll lower edges firmly with a wallpaper or hand roller. For ice dam protection, apply membrane to reach a point above the highest expected level of ice dams. Overlap ends and edges a minimum of **150 mm 6 inches**. Folded membrane onto the exposed face of the roof edge to be trim as necessary to prevent the edge of the membrane from showing after the permanent edge metal flashing is installed.

3.3.2.1 Valley and Ridge Application

Peel and center release paper over the valley or ridge, drape and press in

place working from the center of the valley or ridge outward in each direction. For valleys, apply starting at the low point and work upwards. Overlap sheets a minimum of 150 mm 6 inches.

3.3.2.2 Vertical Membrane Flashings

Apply primer to vertical wall installations prior to the application of membrane at a coverage rate of 6-9 sq. meters/L. 250-350 sq. ft./gal. Turn up walls and dormers as indicated on the drawings. Mechanically fasten vertical membrane terminations. Apply troweling of mastic to vertical terminations as approved by the membrane manufacturer. It is allowable for the membrane to be folded onto the fascia, so long as it is covered by a gutter metal edge or other material.

3.3.2.3 Protection

Do not leave elastomeric membrane underlayment exposed to sunlight. Cover exposed membrane with tile roofing as soon as possible, not to exceed the maximum exposure limit published by the manufacturer, and in no case longer than 120 days. Patch membrane damaged due to exposure to sunlight prior to the application of final roof covering.

3.3.3 Metal Flashing

Install metal flashing as shown at intersections of vertical or projecting surfaces through the roof or against which the roof abuts, such as walls, parapets, dormers, and sides of chimneys in accordance with Section 07 60 00 FLASHING AND SHEET METAL.

3.3.4 Concrete Roofing Tile (General)

3.3.4.1 Repair and Replacement

Intermingle existing reusable clay tiles removed from the repair area with new clay tiles to provide a smooth visual transition between new and existing areas.

3.3.4.2 Installation (General)

Tiles are to be applied over indicated underlayment on solid decking. On extremely steep or vertical applications, set the butt of each tile with mastic, foam adhesive, or sealant, and place in a manner to not be visible. The mastic or sealant is not allowed to stain the surface of the tile. Hurricane clips may be installed instead of using mastic, adhesive, or sealant, but adhere to the manufacturer's recommended installation instructions.

3.3.5 Roof Decks and Fastening

Fasten tile to roof deck in accordance with the manufacturer's tested assembly instructions.

3.3.5.1 Poured Concrete Deck

Ensure poured concrete decks have embedded 25 by 50 mm 1 by 2 inch beveled wood strips, extending from eave to ridge, spaced 500 mm 20 inches on centers. Concrete is to be smooth and flush with strips. Fasten felts weighing 23 kg per 9.3 sq. meters 50 lbs. per 100 square feet with lath nailed over embedded strips. Install 25 by 50 mm 1 by 2 inch wood strips,

spaced to suit tile, horizontally across lath. Lay out tile as directed for a sheathed roof.

3.3.5.2 Chalk Lines

Chalk horizontal and vertical guide lines on the membrane to assure proper appearance. Space the chalk lines by measuring the delivered tiles for average length and width exposures. Ensure the exposure length of 6 mm 1/4 inch beyond the average is not exceeded.

3.3.6 One-Piece Barrel Tile Application

3.3.6.1 Wood Strips

Apply wood stringers, 25 mm 1 inch wide and of proper height, on hips and ridges to carry hip roll and ridge. Apply a 25 by 50 mm 1 by 2 inch strip for end bands. Apply a 25 by 50 mm 1 by 2 inch cant strip at eaves if eave closures are not specified.

3.3.6.2 Tile Application

- a. Install eave closures first.
- b. Lay tiles to straight lines parallel to ground level and lap 75 mm 3 inches vertically.
- c. Fasten each tile with the quantity of fasteners, adhesive, and clips recommended by the manufacturer for the specified roof slope, building height, and wind velocity.
- d. Ensure fasteners on tiles overlapping sheet metal work do not puncture the sheet metal. Fasten tiles overlapping sheet metal with wire and plastic cement.
- e. Adhere gable rakes to field tiles and fasten.
- f. Adhere hip rolls in laps and fasten.
- g. Adhere ridges and fasten laps where they rest on roof tiles.
- h. Ensure where tiles join hip stringers, they are made waterproof with flashing cement.
- i. When hip starter and closed ridge end fittings have not been specified, fill the voids at ends of hips and ridges with mortar colored to nearest match of tile color.
- j. Immerse tile in contact with cement mortar in water for at least 2 minutes before laying.
- k. When ridge angles and hip/ridge terminals are not otherwise specified, they are to be mitered on site.
- l. When short course tiles are not otherwise specified for rafters which do not accommodate full courses, cut and drill on site unless a plus or minus 25 mm 1 inch adjustment of regular tile overhang at eave is sufficient.

3.3.7 Two-Piece Barrel Tile Application

3.3.7.1 Wood Strips

Apply wood stringers, 25 mm 1 inch wide and of proper height, on hips and ridges to carry hip roll and ridge. Apply a 25 by 88 mm 1 by 3-1/2 inch strip and space appropriately for covers. When covers are laid at random exposure, use 25 by 100 mm 1 by 4 inch strips. At first row of cover tile after gable roll, apply a regular nailing strip with an adjacent 50 by 50 mm 2 by 2 inch nailing strip along rake side. Apply a 25 by 50 mm 1 by 2 inch cant strip at eaves if eave closures are not specified.

3.3.7.2 Tile Application

- a. Install eave closures first.
- b. Lay tiles to straight lines parallel to ground level, and 75 mm 3 inches vertically.
- c. Fasten each tile with the quantity of fasteners, adhesive, and clips recommended by the manufacturer for the specified roof slope, building height, and wind velocity.
- d. Ensure fasteners on tiles overlapping sheet metal work do not puncture the sheet metal. Fasten tiles overlapping sheet metal with wire and plastic cement.
- e. When tile is applied tight method, install short course covers over regular pans at eave and regular covers over short course pans at ridge. Abut top edge of covers to bottom edge of pans in the succeeding course throughout the roof.
- f. When covers are laid at random exposure, use 10 percent extra covers in the first three courses at eave to avoid horizontal and diagonal lines and maintain this effect throughout roof.
- g. Adhere gable rakes to field tiles and fasten.
- h. Adhere hip rolls in laps and fasten.
- i. Adhere ridges and fasten in laps and where they rest on roof tiles.
- j. Waterproof where tiles join hip stringers with flashing cement.
- k. When hip starter and closed ridge end fittings have not been specified, fill the voids at ends of hips and ridges with mortar colored to nearest match of tile color.
- l. Immerse tile in contact with cement mortar in water for at least 2 minutes before laying.
- m. When ridge angles and hip/ridge terminals have not been specified, they are required to be mitered on site.
- n. When short course tiles are not otherwise specified for rafters which do not accommodate full courses, cut and drill on site unless a plus or minus 25 mm 1 inch adjustment of regular tile overhang at eave is sufficient.

3.3.8 Flat Shingle Tile Application

3.3.8.1 Wood Strips

Apply wood stringers, 25 mm 1 inch wide and of proper height, on hips and ridges to carry hip roll and ridge. Apply a 18 by 25 mm 3/4 by 1 inch cant strip at eaves.

3.3.8.2 Tile Application

- a. Lay tiles to straight lines parallel to ground level, lapped 75 mm 3 inches vertically.
- b. Fasten each tile with the quantity of fasteners, adhesive, and clips recommended by the manufacturer for the specified roof slope, building height, and wind velocity.
- c. Ensure fasteners on tiles overlapping sheet metal work do not puncture the sheet metal. Fasten tiles overlapping sheet metal with wire and plastic cement.
- d. Adhere gable rakes to field tiles and fasten.
- e. Adhere hip rolls and fasten with 50 mm 2 inch nails in laps.
- f. Adhere ridges and fasten in laps and where they rest on roof tiles.
- g. Waterproof where tiles join hip stringers with flashing cement.
- h. Fill voids at ends of hips and ridges with mortar colored to nearest match of tile color.
- i. Immerse tile in contact with cement mortar in water for at least 2 minutes before laying.
- j. Ridge angles and hip/ridge terminals are required to be mitered on site.
- k. When short course tiles are not otherwise specified for rafters which do not accommodate full courses, cut and drill on site unless a plus or minus 25 mm 1 inch adjustment of regular tile overhang at eave is sufficient.

3.3.9 Interlocking Shingle Tile Application

3.3.9.1 Wood Strips

Apply wood stringers, 25 mm 1 inch wide and of proper height, on hips and ridges to carry hip roll and ridge. Apply a 22 by 25 mm 7/8 by 1 inch cant strip at eaves.

3.3.9.2 Tile Application

- a. Lay tiles to straight lines parallel to ground level, lapped 75 mm 3 inches vertically.
- b. Fasten each tile with the quantity of fasteners, adhesive, and clips recommended by the manufacturer for the specified roof slope, building height, and wind velocity.

- c. Ensure fasteners on tiles overlapping sheet metal work do not puncture the sheet metal. Fasten tiles overlapping sheet metal with wire and plastic cement.
- d. Adhere gable rakes to field tiles and fasten.
- e. Adhere hip rolls and fasten with 50 mm 2 inch nails in laps.
- f. Adhere ridges and fasten in laps and where they rest on roof tiles.
- g. Waterproof where tiles join hip stringers with flashing cement.
- h. Fill voids at ends of hips and ridges with mortar colored to nearest match of tile color.
- i. Immerse tile in contact with cement mortar in water for at least 2 minutes before laying.
- j. Ridge angles and hip/ridge terminals are required to be mitered on site.
- k. When short course tiles are not otherwise specified for rafters which do not accommodate full courses, cut and drill on site unless a plus or minus 25 mm 1 inch adjustment of regular tile overhang at eave is sufficient.

3.3.10 Post Installation Cleaning

Remove mortar and asphalt plastic cement spatter from exposed surfaces of tiles. Upon completion of work, remove excess materials and all refuse generated by the work of this section.

-- End of Section --