SECTION 07 3213 - CLAY ROOF TILES

Maintain Section format, including the UH master spec designation and version date in **bold** in the center columns of the header and footer. Complete the header and footer with Project information.

Revise this Section by deleting and inserting text as needed to meet Project-specific requirements.

Verify that Section titles referenced in this Section are correct for this Project's Specifications; Section titles may have changed.

Delete hidden text after this Section has been edited for the Project.

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. The Contractor's attention is specifically directed, but not limited, to the following documents for additional requirements:

1. The current version of the *Uniform General Conditions for Construction Contracts*, State of Texas, available on the web site of the Texas Facilities Commission.
2. The University of Houston's *Supplemental General Conditions and Special Conditions for Construction.*

1.2 SUMMARY

A. Section Includes:

1. Clay roof tiles.
2. Underlayment.

1.3 DEFINITIONS

A. Roofing Terminology: See ASTM D 1079, glossaries in TRI/WSRCA's "Concrete and Clay Roof Tile Design Criteria Installation Manual for Moderate Climate Regions," and NRCA's "The NRCA Roofing and Waterproofing Manual" for definitions of terms related to roofing work in this Section.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

Retain paragraph B and associated subparagraphs below if Project is to be LEED v4 certified.

B. LEED Action Submittals (Project Authorized for LEED certification only):

1. Building Product Disclosure and Optimization:

a. Leadership Extraction Practices

1) Extended Producer Responsibility (EPR): Submit documentation indicating that manufacturers have a take back or recycling program for the product purchased.
2) Wood Products: Certified by Forest Stewardship Council or USGBC approved equivalent.

a) Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
b) Chain-of-Custody Qualification Data: For manufacturer and vendor.

3) Provide details of biobased material per Sustainable Agriculture Network's Sustainable Agriculture Standard or USDA certified biobased product. Indicate cost, location of extraction, manufacture, and purchase of material.
4) Recycled Content: For products having recycled content, indicate percentages by weight of post-consumer and pre-consumer recycled content.

a) Include statement indicating costs for each product having recycled content.

b. Sourcing of Raw Materials: For products that are required to comply with requirements for regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material.

1) Include statement indicating distance to Project, cost for each regional material and the fraction by weight that is considered regional.
2) Product Certificates: For materials manufactured within 100 miles of Project, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each raw material.

2. Laboratory Test Reports: For installation adhesives indicating compliance with requirements for low-emitting materials.

C. Samples for Initial Selection: For each type of clay roof tile and accessory tile indicated.

1. Include similar Samples of trim and accessories involving color selection.

D. Samples for Verification: For the following products, in manufacturer's standard sizes:

1. Clay Roof Tile: Full size.
2. Accessory Tile: Full size, each type.
3. Fastenings: Wire-tie system components, 12 inches long.

1.5 INFORMATIONAL SUBMITTALS

A. Material Test Reports: For each type of clay roof tile.

Retain paragraph B and associated subparagraphs below if Project is to be LEED v4 certified.

B. LEED Informational Submittals:

1. Building Product Disclosure and Optimization - Sourcing of Raw Materials:

a. Raw Material Sources and Extraction Reporting: Submit Raw materials supplier corporate Sustainability Reports (CSRs); documenting responsible extraction; including extraction locations, long term ecologically responsible land use, commitment to reducing environmental harms from extraction and manufacturing processes, and a commitment to meeting applicable standards or programs that address responsible sourcing criteria

1) Submit manufacturers' self-declared reports
2) Submit third party verified corporate sustainability reports (CSR) using one of the following frameworks"

a) Global Reporting Initiative (GRI) Sustainability Report
b) Organization for Economic Co-operation and Development (OECD)
c) Guidelines for Multinational Enterprises
d) UN Global Compact
e) ISO 26000
f) USGBC approved program.

2. Building Product Disclosure and Optimization - Material Ingredients

a. Material Ingredient Optimization: Submit manufacturer's Environmental Product Declaration (EPD) or at least one of the following:

1) GreenScreen V1.2 Benchmark: Third party report prepared by a licensed GreenScreen List Translator, or a full GreenScreen Assessment.
2) Cradle to Cradle: Manufacturer's published literature for the product bearing the Cradle to Cradle logo.
3) International Alternative Compliance Path - REACH Optimization
4) Declare: Manufacturer's completed Product Declaration Form
5) Other programs approved by USGBC

b. Product Manufacturer Supply Chain Optimization: Submit documentation from manufacturers for products that go beyond material ingredient optimization as follows:

1) Are sourced from product manufacturers who engage in validated and robust safety, health, hazard, and risk programs which at a minimum document at least 99 percent (by weight) of the ingredients used to make the building product or building material, and

2) Are sourced from product manufacturers with independent third party verification of their supply chain that at a minimum verifies:

a) Processes are in place to communicate and transparently prioritize chemical ingredients along the supply chain according to available hazard, exposure and use information to identify those that require more detailed evaluation
b) Processes are in place to identify, document, and communicate information on health, safety and environmental characteristics of chemical ingredients
c) Processes are in place to implement measures to manage the health, safety and environmental hazard and risk of chemical ingredients
d) Processes are in place to optimize health, safety and environmental impacts when designing and improving chemical ingredients
e) Processes are in place to communicate, receive and evaluate chemical ingredient safety and stewardship information along the supply chain
f) Safety and stewardship information about the chemical ingredients is publicly available from all points along the supply chain.

C. Warranties: Sample of special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing, to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Clay Roof Tiles: 100 sq. ft. of each type, in unbroken bundles.

1.8 QUALITY ASSURANCE

A. Source Limitations: Obtain clay roof tiles and accessory tiles from single source from single manufacturer.

1. Exterior Fire-Test Exposure: Class A; UL 790 or ASTM E 108, for application and roof slopes indicated.

B. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockups for clay roof tiles including related roofing materials.

a. Size: 48 inches long by 48 inches wide.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

C. Preinstallation Conference: Conduct conference at Project site.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Store underlayment rolls on end, on pallets or other raised surfaces. Do not double stack rolls.

1. Handle, store, and place roofing materials in a manner to avoid significant or permanent damage to roof deck or structural supporting members.

B. Protect unused underlayment from weather, sunlight, and moisture when left overnight or when roofing work is not in progress.

1.10 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing to be performed according to manufacturer's written instructions and warranty requirements.

1. Install self-adhering sheet underlayment within the range of ambient and substrate temperatures recommended by manufacturer.

1.11 WARRANTY

A. Special Warranty: Standard form in which manufacturer agrees to repair or replace clay roof tiles that fail in materials within specified warranty period.

1. Materials-Only Warranty Period: 50 years from date of Substantial Completion.

B. Special Project Warranty: Roofing Installer's Warranty, on warranty form at end of this Section, signed by roofing Installer, covering Work of this Section, in which roofing Installer agrees to repair or replace components of roofing that fail in materials or workmanship within the following warranty period:

1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CLAY ROOF TILES

A. Clay Roof Tiles: ASTM C 1167, molded- or extruded-clay roof tile units of shape and configuration indicated, kiln fired to vitrification, and free of surface imperfections. Provide with fastening holes pre-punched at factory before firing.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Gladding, McBean
   b. Ludowici Roof Tile.
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. Gladding, McBean.
   b. Ludowici Roof Tile.
3. Substitutions: Not allowed.
4. Durability: Grade 2.
5. High-Profile Shape: Type I, Spanish or "S."
6. Finish and Texture: Match existing campus buildings.
7. Color: Match existing campus buildings.
8. High Profile-Shape Accessory Tiles: Ridge end hip and hip starter header course roll rake edge starter end band terminal eave closure and top fixture units, in color matching clay roof tiles.

2.2 ACCESSORIES

A. Elastomeric Sealant: ASTM C 920, elastomeric silicone-based joint sealant; Type M or Type S, Grade NS, Class 25, Use NT related to exposure, and, as applicable to joint substrates indicated, Use O.

B. Asphalt Roofing Cement: ASTM D 4586, Type II, asbestos free

C. Wood Nailers, Beveled Cant Strips and Wood Battens: Comply with requirements for pressure-preservative-treated wood in Section 06 1053 "Miscellaneous Rough Carpentry."

D. Mesh Fabric: 18-by-14 mesh of PVC-coated, glass-fiber thread.

E. Mortar: ASTM C 270, Type M masonry cement, natural color

F. Eave Closure: Manufacturer's standard tile eave closure formed to shape of clay roof tile

2.3 FASTENERS

A. Roofing Nails: ASTM F 1667, stainless steel, 0.135-inch- diameter shank, sharp-pointed, conventional roofing nails with barbed shanks; minimum 3/8-inch diameter head; of sufficient length to penetrate 3/4 inch into roof-deck sheathing.

   1. Where nails are in contact with metal flashing, use nails made from same metal as flashing.

B. Wood Batten Nails: ASTM F 1667; common or box, steel wire, flat head, and smooth shank.

C. Wire Ties: Stainless steel, 0.083-inch minimum diameter.

D. Hook Nails: One-piece wind lock and clay roof tile fastener system, minimum 0.135-inch-diameter 304 stainless steel wire, for direct deck nailing.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Newport Tool & Fastener Company, Inc.
   b. Wire Works, Inc
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. Newport Tool & Fastener Company, Inc.
   b. Wire Works, Inc.
3. Substitutions: See Section 01 2500 “Substitution Procedures.”

E. Tile Locks: Stainless-steel, 0.1-inch- diameter wire device designed to secure butt edges of overlaid clay roof tiles.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Newport Tool & Fastener Company, Inc.
   b. Wire Works, Inc.
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. Newport Tool & Fastener Company, Inc.
   b. Wire Works, Inc.
3. Substitutions: See Section 01 2500 “Substitution Procedures.”

F. Storm Clips: Stainless-steel strap-type, 0.04-by-1/2-inch, L-shaped retainer clips designed to secure side edges of clay roof tiles. Provide with two fastener holes in base flange.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Newport Tool & Fastener Company, Inc.
   b. Wire Works, Inc.

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. Newport Tool & Fastener Company, Inc.
   b. Wire Works, Inc.
3. Substitutions: See Section 01 2500 “Substitution Procedures.”

2.4 UNDERLAYMENT MATERIALS

A. Self-Adhering Sheet Underlayment, Polyethylene Faced: ASTM D 1970, a minimum of 40-mil-thick, slip-resisting, polyethylene-film-reinforced top surface laminated to SBS-modified asphalt adhesive, with release paper backing; cold applied. Provide primer for adjoining concrete or masonry surfaces to receive underlayment.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Grace, W. R. & Co.
   b. Henry Company.
   c. Johns Manville.
   d. Owens Corning.
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. W.R. Grace & Co.
   b. Henry Company.
   c. Johns Manville.
   d. Owens Corning.
3. Substitutions: Not allowed.

2.5 METAL FLASHING AND TRIM

A. General: Comply with requirements in Section 07 6200 "Sheet Metal Flashing and Trim."

1. Sheet Metal: Stainless steel.

B. Fabricate sheet metal flashing and trim to comply with recommendations that apply to design, dimensions, metal, and other characteristics of the item in SMACNA's "Architectural Sheet Metal Manual."

1. Apron Flashings: Fabricate with lower flange extending a minimum of 6 inches over and 4 inches beyond each side of downslope tile roofing and 6 inches up the vertical surface.
2. Step Flashings: Fabricate with a head lap of 3 inches and a minimum extension of 6 inches up the vertical surface.
3. Channel Flashings: Fabricate with vertical surface extending a minimum of 6 inches above the clay roof tile and 6 inches beneath the tile roofing, with a 2-inch high vertical return to form a runoff channel.
4. Rake Pan Flashings: Fabricate with vertical surface extending over fasciae and 6 inches beneath the tile roofing, with a 2-inch high vertical return to form a runoff channel.
5. Cricket Flashings: Fabricate with concealed flange extending a minimum of 24 inches beneath upslope tile roofing, 6 inches beyond each side of projection, and 6 inches above the roof plane.
6. Closed Valley Flashings: Fabricate in lengths not exceeding 10 feet, with 1-inch high, inverted-V profile at center of valley and with equal flange widths of 12 inches.
7. Drip Edges: Fabricate in lengths not exceeding 10 feet, with 2-inch roof-deck flange and 1-1/2-inch fascia flange with 3/8-inch drip at lower edge.

C. Vent-Pipe Flashings: ASTM B 749, Type L51121, at least 1/16 inch thick. Provide lead sleeve sized to slip over and turn down into pipe, soldered to skirt at slope of roof and extending at least 4 inches from pipe onto roof.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Examine roof sheathing to verify that sheathing joints are supported by framing and blocking or metal clips and that installation is within flatness tolerances.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and completely anchored and that provision has been made for flashings and penetrations through roofing.

B. Prepare written report, endorsed by installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

A. General: Comply with clay roof tile manufacturer's written instructions and recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual."

1. Cover ridge wood nailers with underlayment strips.

B. Self-Adhering Sheet Underlayment: Install wrinkle free; comply with low-temperature installation restrictions of underlayment manufacturer if applicable. Install at locations indicated on Drawings, lapped in direction to shed water. Lap sides not less than 3-1/2 inches. Lap ends not less than 6 inches, staggered 24 inches between succeeding courses. Roll laps with roller. Cover underlayment with clay roof tiles within seven days.

1. Prime concrete and masonry surfaces to receive self-adhering sheet underlayment.
2. Extend self-adhering sheet underlayment over entire roof deck.

C. Double-Layer Felt/Self-Adhering Sheet Underlayment:

1. Install single layer of felt underlayment on roof deck parallel with and starting at the eaves. Lap sides a minimum of 2 inches over underlying course. Lap ends a minimum of 4 inches. Stagger end laps between succeeding courses at least 72 inches. Fasten with roofing nails.
2. Install self-adhering sheet underlayment, wrinkle free, on felt underlayment. Comply with low-temperature installation restrictions of underlayment manufacturer if applicable. Lap sides not less than 3-1/2 inches in direction to shed water. Lap ends not less than 6 inches, staggered 24 inches between succeeding courses. Roll laps with roller. Cover underlayment with clay roof tiles within seven days.

D. Metal-Flashed, Open-Valley Underlayment: Install two layers of 36-inch- wide felt underlayment centered in valley. Stagger end laps between layers at least 72 inches. Lap ends of each layer at least 12 inches in direction to shed water, and seal with asphalt roofing cement. Fasten each layer to roof deck with felt underlayment nails.

1. Lap roof-deck felt underlayment over first layer of valley felt underlayment at least 6 inches.

3.3 METAL FLASHING INSTALLATION

A. General: Install metal flashings and other sheet metal to comply with requirements in Section 07 6200 "Sheet Metal Flashing and Trim."

1. Install metal flashings according to clay roof tile manufacturer's written instructions and recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual."

B. Apron Flashings: Extend lower flange over and beyond each side of downslope tile roofing and up the vertical surface.

C. Step Flashings: Install with a head lap of 3 inches and extend both horizontally and vertically. Install with lower edge of flashing just upslope of, and concealed by, butt of overlying tile. Fasten to roof deck only.

D. Cricket Flashings: Install against roof-penetrating elements, extending concealed flange beneath upslope tile roofing and beyond each side.

E. Open-Valley Flashings: Install centrally in valleys, lapping ends at least 8 inches in direction to shed water. Fasten upper end of each length to roof deck beneath overlap.

1. Secure hemmed flange edges into metal cleats spaced 12 inches apart and fastened to roof deck.

F. Channel Flashings: Install over underlayment and fasten to roof deck.

G. Rake Pan Flashings: Install over underlayment and fasten to roof deck.

H. Rake Drip Edges: Install over underlayment and fasten to roof deck.

I. Eave Drip Edges: Install beneath underlayment and fasten to roof deck.

J. Pipe Flashings: Form flashing around pipe penetrations and tile roofing. Fasten and seal to tile roofing.

K. Sheet Metal Ridge Vents: Install centrally, and mechanically fasten to wood ridge. Adhere each side to clay roof tile with elastomeric sealant.

1. Install fabric mesh over roof-deck air ventilation gaps to prevent insect entry.

3.4 WOOD NAILERS AND BATTENS

A. Install wood nailers at ridges and securely fasten to roof deck.

B. Install beveled wood cant at eaves and securely fasten to roof deck.

C. Install nominal 1-by-2-inch wood battens horizontally over 1/2-inch high, pressure-preservative-treated wood lath strips in 48-inch lengths with ends separated by ½-inch, at spacing required by clay roof tile manufacturer, and fasten securely to roof deck.

3.5 CLAY ROOF TILE INSTALLATION

A. General: Install clay roof tiles according to manufacturer's written instructions, to recommendations in TRI/WSRCA's "Concrete and Clay Roof Tile Design Criteria Installation Manual for Moderate Climate Regions," and to NRCA's "The NRCA Roofing and Waterproofing Manual."

1. Maintain uniform exposure and coursing of clay roof tiles throughout roof.
2. Extend tiles 2 inches over eave fasciae.
3. Nail Fastening: Drive nails to clear the clay roof tile so the tile hangs from the nail and is not drawn up.
    a. Install wire through nail holes of cut tiles that cannot be nailed directly to roof deck, and fasten to nails driven into deck.
4. Wire-Tie Fastening: Install wire-tie systems and fasten clay roof tiles according to manufacturer's written instructions.
5. Mortar Setting: Install clay roof tile according to TRI/FRSA's "Concrete and Clay Roof Tile Installation Manual."
6. Install storm clips to capture edges of longitudinal sides of clay roof tiles and securely fasten to roof deck.
7. Install clay roof tile locks to support and lock overlying tile butts to underlying tiles.
8. Cut and fit clay roof tiles neatly around roof vents, pipes, ventilators, and other projections through roof. Fill voids with mortar.
9. Install clay roof tiles with color blend approved by Architect.

B. Flat Shingle Clay Roof Tile Installation:

1. Maintain 2-inch head lap between succeeding courses of clay roof tiles.
2. Offset joints by half the clay roof tile width in succeeding courses.
3. Extend clay roof tiles 1 inch over fasciae at rakes.
4. Install ridge tiles in saddle configuration with laps facing away from prevailing wind. Seal laps with elastomeric sealant.
    a. Close voids where ridge tiles meet clay roof tiles with ridge closure tiles.
5. Install hip tiles in saddle configuration. Seal laps with elastomeric sealant.
    a. Fill voids with mortar where hip tiles meet clay roof tiles, and strike mortar flush with face of hip cover tiles.

C. Low-Profile, Interlocking Clay Roof Tile Installation:

1. Provide minimum 3-inch lap between succeeding courses of clay roof tiles.
2. Install L-shaped rake tiles.
3. Install ridge tiles with laps facing away from prevailing wind. Seal laps with elastomeric sealant.

D. High-Profile Clay Roof Tile Installation:

1. Install tile eave closure.
2. Provide minimum 3-inch lap between succeeding courses of clay roof tiles.
3. Install L-shaped rake tiles.
4. Install ridge tiles with laps facing away from prevailing wind. Seal laps with elastomeric sealant.

E. Open Valleys: Cut clay roof tiles at open valleys to form straight lines. Maintain uniform width of exposed open valley from highest to lowest point.

1. Drill or notch cut valley tiles and wire-tie to fastener placed clear of valley metal flashings.
2. Do not nail tiles to metal flashings.

F. Closed Valleys: Cut clay roof tiles at closed valleys to form straight lines, trimming upper concealed corners of tiles. Maintain uniform gap at centerline of valley of 1/2 to 3/4 inch.

1. Drill or notch cut valley tiles and wire-tie to fastener placed clear of valley metal flashings.
2. Do not nail tiles to metal flashings.

3.6 ADJUSTING AND CLEANING

A. Remove and replace damaged or broken clay roof tiles.

B. Remove excess clay roof tiles and debris from Project site.

END OF SECTION 07 3213