

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions, and Division 0 and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Provide all labor, equipment, materials and services required to perform the work of this Section as indicated on the Drawings and specified herein.
- B. This Section includes, but is not limited to, the following:
 - 1. Removal of existing slate shingles and installation of new slate shingles.
 - 2. Installation of new underlayments.
 - 3. Such other Work as specified herein or shown in the Drawings.
- C. Related Sections:
 - 1. Section 061053 – Miscellaneous Rough Carpentry
 - 2. Section 076200 – Sheet Metal Flashing and Trim
 - 3. Section 077253 – Snow Guards
 - 4. Section 264113 – Lightning Protection for Structures

1.3 REFERENCES AND STANDARDS

- A. Comply with applicable requirements of the most recent editions of the following standards and others referenced in this Section. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
 - 1. National Slate Association – *Slate Roofs: Design and Installation Manual*, 2010 Edition.
 - 2. ASTM C406 – Standard Specification for Roofing Slate.
 - 3. ASTM D226 – Standard Specification for Asphalt-Saturated Organic Felt Used in roofing and waterproofing.
 - 4. ASTM D4869 – Standard Specification for Asphalt-Saturated Organic Felt Underlayment Used in Steep Slope Roofing.
 - 5. ASTM D1970 – Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
 - 6. ASTM E108 / UL 790 - Standard Test Methods for Fire Tests of Roof Coverings.

7. ASTM E96 – Standard Test Methods for Water Vapor Transmission of Materials.
8. ASTM D3161 – Standard Test Method for Wind-Resistance of Steep Slope Roofing Products.
9. FM Approvals 4473 Impact Resistance Testing of Rigid Roofing Materials by Impacting with Freezer Ice Balls.
10. FM Approvals 4475, Class 1 Steep Slope Roof Covers, Section 4.1.1 – Approved Wind Speed Categories for Roof Covers.

1.4 SUBMITTALS

- A. Submittals shall be made in accordance with Section 013300.
- B. Product Data
 1. Underlayment(s) and underlayment fasteners. Product data for the roof underlayment must include the ASTM Standard to which it complies.
 2. Slate shingles and slating nails.
 3. ASTM C406 test results for specified slate (including ASTM C120, *Flexure Testing of Slate (Breaking Load)*, ASTM C121, *Water Absorption of Slate*, and ASTM C217, *Weather Resistance of Slate*).
 - a. Testing must be conducted in accordance with the most recent version of these standards.
 - b. Test results must be less than 2-years old and be conducted on slate from the quarry from which the slate is to be obtained.
 - c. Testing shall be conducted by and reported on the letterhead of an NSA approved testing laboratory – see NSA’s website, www.slateassociation.org for approved labs.
 4. Provide Letter of Confirmation from the quarry/distributor certifying that slate being provided was produced in the region specified in Part 2 of this Section.
- C. Samples
 1. Three slate shingles of each color, showing the full, natural range of color variation to be expected in the finished work.
 2. Slating nails.
- D. Shop drawings

1.5 QUALITY ASSURANCE

- A. Work of this Section shall comply with applicable standards indicated or implied.
- B. Provide products in each color from a single quarry during the course of the Work for consistency of quality and appearance.
- D. Slate roofing contractor shall have at least 10-years experience in the installation of new slate roofing/repair of existing slate roofing and shall have successfully completed at least three slate

roofing projects within the past five years similar in scope and scale to the Project specified herein. Foreman or superintendent shall have similar experience and shall provide full-time supervision of installers.

1.6 TEST PANELS

- A. Prepare the following slate roofing test panels in an area and size designated by the Architect, or as indicated below, to verify selections made under sample submittals and to demonstrate aesthetic effects and quality standards of materials and execution.
 - 1. Installation of slate shingles at roof eave (starter, first, second, and third course), including underlayments, drip edge metal, and cant for slate, 5 linear feet.
 - 2. Installation of slate shingles at open valley, 3 to 4 courses at 1 valley.
 - 3. Slate shingle roofing, 100 square feet.
 - a. This test panels shall be completed only after the test panels listed above are reviewed and approved by the Design Professional.
 - 4. Hip slates with copper hip-cap, 3 to 4 linear feet of hip.
 - 5. Ridge slates with copper ridge-roll, 3 to 4 linear feet of ridge.
- B. Modify test panels as required to produce acceptable work in compliance with this specification and meeting the approval of Design Professional.
- C. Do not proceed with remaining work until test panels are approved, in writing, by the Design Professional.
 - 1. Approved test panels shall be left in place and incorporated into the final construction.
- D. Approval of test panels does not constitute approval of deviations from the Contract Documents contained in the panels, unless such deviations are specifically approved, in writing, by the Design Professional.
- E. Coordinate test panels specified herein with each other and with those specified in other sections as required.
- F. Group test panels to the maximum extent possible such that Architect may review multiple test panels from this and other specification sections in the course of a single site visit.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Ensure the availability of adequate off-loading equipment and manpower at the job site for the mode of delivery used, and storage space for the quantity of slate shingles to be received.
- B. Deliver slate shingles to project site in pallets with each labelled with the source, size, quantity and color contained in each pallet.
- C. Slate shingles shall be packaged on edge and separated by wood lath or other rigid material if rows are stacked vertically in the pallet.
- D. During extended periods of storage on site, tarp or otherwise cover the pallets to keep the shingles clean and prevent them from freezing together during cold weather.

- E. Store pallets at site on a solid, level surface and handle shingles to prevent chipping breakage, soiling or other damage.
- F. Load slate shingles on the building in a manner to avoid damage to the roof deck, structural supporting members, staging and scaffolding.
- G. Store accessory materials including nails, slate hooks, underlayment, and ice dam protection membrane according to the manufacturer's recommended storage instructions.

1.8 PROJECT/SITE CONDITIONS

- A. Prior to beginning work, Contractor shall secure approval from the Owner for the following:
 - 1. Areas permitted for personnel parking.
 - 2. Access to the site and hours for construction activity.
 - 3. Areas permitted for storage of materials and debris.
 - 4. Areas permitted for the location of cranes, hoists, and chutes for loading and unloading materials to and from the roof.
- B. Interior stairs or elevators may not be used for removing debris or delivering materials to the roof or ground.
- C. Contractor employee access shall not be permitted to the interior of the building. Building access approval shall be obtained from the Owner.
- D. Exterior sanitary facilities are required and shall be provided by the Contractor.
- E. An exterior water source and electricity shall be provided by the Owner.
- F. The buildings shall remain occupied during construction. During the full course of the Work, the Contractor shall ensure that all pedestrian access points, including all entrances, foot paths, sidewalks, emergency means of egress, and vehicle access routes, shall be protected and display clear signage where barricades and construction fencing are employed. Do not block fire exits or impede ADA access.
- G. If discrepancies are discovered between the existing conditions and those noted on the Drawings, immediately notify the Architect in writing and obtain written approval prior to commencing the Work. All necessary steps shall be taken to make the building watertight until the discrepancies are resolved.
- H. Proceed with the Work as weather conditions permit and/or as required by manufacturer's installation instructions or warranty requirements.
- I. Proceed with slate shingle roofing installation only after substrate construction, vent stacks, and other roof penetrations are complete, when substrate materials are dry, and weather conditions are appropriate.
- J. The Contractor shall ensure that work areas as well as the entire building are completely protected from water infiltration and remain watertight throughout the course of the project and water does not flow beneath any completed sections of the slate roof system.

- K. The Contractor shall be responsible for all slate breakage on the project, prior to project closeout. After project closeout, the slate repair responsibilities of the Contractor shall be as set forth in the project contract and warranty documents.
- L. All exterior means of access required to perform the Work on the subject building as described in the project documents, shall be the responsibility of the roofing contractor. All access shall fully comply with all local, state, and OSHA safety codes and requirements.

1.9 SEQUENCING/SCHEDULING

- A. Schedule and execute work to prevent leaks and excessive traffic on completed roof sections. Coordinate work of this Section with interfacing, adjoining, and related roofing work for proper sequencing of each installation.
- B. Do not disrupt activities in occupied spaces.
- C. When multiple trades are accessing the same work area, coordinate the work sequence so as not to hinder the project schedule or detract from the quality of the work.
- D. The Owner shall reserve the right to close the jobsite to construction activities if those activities conflict with building schedules. The Owner shall provide as much notice as possible for any work disruptions.

1.10 WARRANTY

- A. **Slate Shingle Supplier Warranty:** Submit slate shingle supplier warranty, signed by the supplier and covering the slate shingles described in this Section, in which the supplier agrees to replace slate shingles that fail in materials and deliver the replacement slate to the original point of destination. The duration of this warranty shall be 75 years from date of original supply.
- B. **Roofing Installer Warranty:** Submit roofing installer warranty, signed by roofing installer and covering Work of this Section, in which the roofing installer agrees to repair or replace slate roofing that fails in materials or workmanship within the following warranty period.
 - 1. **Warranty Period:** Five years from date of substantial completion
- C. **Additional Roofing Installer Warranty:** The roofing installer agrees to return to the job site one year from the date of substantial completion of the to replace any broken or missing slates created as a result of normal, installation-related, shedding.

1.11 EXTRA MATERIAL

- A. Provide an additional one square of field slates, twenty pieces of starter slate, and thirty pieces of hip and ridge slates for Owner's use in future roof maintenance.
- B. Place extra material in storage in a location designated by the Owner.

PART 2 – PRODUCTS

2.1 SLATE SHINGLES

- A. Standard: New slate shall comply with ASTM C406, *Standard Specification for Roofing Slate*, Grade S-1; hard, dense, and sound natural stone, with chamfered edges. No broken or cracked slates will be accepted and no broken exposed corners exceeding 1" will be allowed. Broken covered corners shall not prevent the laying of a weathertight roof and the slate shall not be installed when either the base or leg of the right triangle broken off exceeds 1-1/2".
1. Acceptable suppliers include those shown on the current list of National Slate Association member quarries and distributors at www.slateassociation.org or alternate submitted and approved by the Architect.
- B. Source and Color of Slate:
1. Vermont & New York
- a. Semi-Weathering Gray/Green (Sea Green) – 40%
 - b. Semi-Weathering Purple (Royal Purple) – 20%
 - c. Unfading Gray/Green – 40%
- C. Shape of slate: (p.11)
1. Rectangle
- D. Size:
1. Length
- a. Single length 18"
2. Width:
- a. Random widths from 9" to 12"
 - b. Wider slates as needed for approach slates and slates adjacent to valleys, hips, vertical walls, rakes, etc. Wider slates shall measure 14" in width.
3. Thickness:
- a. Single thickness: nominal 1/4"
4. Starter slates: 20" L x 11" W x 1/4" Thick
- E. Nail Holes:
1. Punch or drill two nail holes in each slate, located one-quarter to one-third down the slate length, measured from the head of the slate, and 1/4" to 1/2" in from each side edge. Nail holes shall be located on the thinner end of the slate.
2. Hip, ridge, and approach slates may be supplied unpunched. These slates shall be punched or drilled on site.
3. Starter slates may be supplied punched or unpunched. If supplied unpunched, these slates shall be punched or drilled on site.

2.2 SLATING NAILS

- A. Slating Nails shall be sharp-pointed with a 3/8-inch diameter flat head.
 - 1. Material: Solid copper.
 - 2. Thickness/Shank Diameter: 10-gauge (.134")
 - 3. Length: 1-3/4" long
 - 4. Shank: Smooth

2.3 UNDERLAYMENTS (p.54, 64-69)

- A. Fiberglass reinforced SBS base sheet meeting the requirements of ASTM D6163, Type I, Grade S, or equal.
 - 1. Products
 - a. "Boral Ply 40" by Boral.
 - b. "Right Start UDL" by Malarkey
 - c. "Dynabase" by Johns Manville, or approved equal.
 - 2. Underlayment Accessories
 - a. Corrosion resistant, large head fasteners (or plastic cap nails) of sufficient length to prevent blow-off, or as recommended by underlayment manufacturer.
- B. Ice Dam Protection Membrane Self-Adhering Underlayment, polyethylene faced for ice dam protection at eaves and where shown in the Detail Drawings: ASTM D 1970, minimum of 30 mils thick; slip-resistant, polyethylene-film or granule surfaced laminated to SBS-modified asphalt adhesive, with release-sheet backing; cold applied.
 - 1. Products
 - a. "Grace Ice & Water Shield HT," GCP Applied Technologies, Inc., Cambridge, MA 02140, (617) 876-1400 or (877) 423-6491
 - b. "WeatherLock G," Owens Corning, Toledo, OH 43659, (800) 438-7465
 - c. approved equal

2.4 ACCESSORIES

- A. Slate hooks for slate repair work: For slates with a 3" headlap and measuring up to 3/8" thick, 3" long, solid copper, Type 304 stainless steel, or Type 304 stainless steel powder coated black or bronze.
- B. Nail head covers (bibs) for slate repair work: 16 oz. or 20 oz. copper, Grade H00 (cold rolled), complying with ASTM B370, or lead coated copper complying with ASTM B101, Type 1, Class A. Bibs shall measure 3" to 4" wide by 8" long. Snip bibs along their long sides to form barbs and/or bend to a slightly concave or S-shape prior to insertion to help prevent the bibs from sliding out.
- C. Cants for starter course of slate shingles: Wood cants, standard 3/16"-1/4" thick plaster lath, tapered horse feather shims, or ripped rot-resistant lumber. Fabricate to height and width required to permit first and subsequent courses of slate to lie flat atop underlying courses.
 - 1. Where shown in the Detail Drawings, brake inverted V-shaped cants directly into metal drip edge flashings and gutter liners located at the roof eaves. Fabricate cant to height required to permit first and subsequent courses of slate to lie flat atop underlying courses.

- D. Wire used for hanging slates to avoid nailing thru underlying flashings: 99.99% pure copper wire conforming to ASTM B3, 0.051" diameter, minimum.
- E. Sealant adhesive for use as adhesive dabs below hip and ridge slates: Exterior, non-sag, gun grade, single-component, sealant adhesive complying with ASTM C 920, Type S, Grade NS, Class 12.5, use group NT, I, M, and O, or Design Professional approved alternate sealant adhesive. Color shall be manufacturer's standard color matching that of the slate as closely as possible.
- F. Wood Nailers: See Section 061053.

2.5 FLASHING MATERIALS

- A. See Section 076200 for flashings, gutters, and leaders (downspouts).

2.6 LIGHTNING PROTECTION MATERIALS

- A. See Section 264113 for materials and fasteners to be used for securing lightning protection conductor cables and air terminals to slate shingle roofs.

2.7 SLATER'S TOOLS

- A. The following traditional slating tools shall be used for installation of the slate shingles:
 - 1. Slate hammer for punching and nailing slate shingles.
 - 2. Ripper for removing slate shingles.
 - 3. Slate cutter or a slater's stake and slate hammer for trimming and cutting slate shingles.
 - 4. Steel punch for forming holes in delicate or small pieces of slate.
- B. Slates trimmed or cut on site shall have a bevel-edge similar to that produced at the quarry. Note that a grinder or saw shall not be used for cutting/trimming field slates as they will not produce a beveled edge similar to that produced at the quarry.
- C. The use of nail guns for installing slate shingles shall not be permitted.

PART 3 – EXECUTION

3.1 GENERAL

- A. Examine the roof deck and verify that it is satisfactory condition and ready to receive the new roof underlayment and slate shingle system.
 - 1. Verify that the roof deck is well secured to the roof framing, free of warping or cupping, free of projecting fasteners, and the edges between boards are flush.
 - 2. Verify that the roof deck is clean, dry, and free of dew, frost, or other contaminants that might interfere with the laying or long-term durability of the slate roof system.
 - 3. Report deficiencies in the roof deck to the Design Professional prior to commencing work.
- B. Slating shall begin at the roof eave and progress toward the ridge/top of the roof slope.

- C. Sorting: Sort slate shingles for thickness prior to installation on the roof. Sort shingles by hand into three thicknesses as follows:
1. Thin: For use in slate courses closest to the ridge.
 2. Thicker: For use in slate courses in "middle" courses.
 3. Thickest: For use in the slate courses closest to the eave.
 - a. The goal is to create a roof of smooth, uniform appearance. Slate of different thicknesses shall not be used adjacent to each other.
 - b. Transitions between the different thicknesses of slate shall occur at hips, ridges, vertical walls, and other non-conspicuous locations, and not in the field of the roof.
- D. Blending: To help account for the natural variation in the coloration of the slate shingles, blend slates from several different pallets as it is brought to the roof surface to help provide for a more uniform overall appearance.
1. Blending may occur prior to, or in association with sorting.
- E. Culling: No broken or cracked slate shall be used. Sound each slate for defects by tapping with a slate hammer or other metal object as it is being installed. Reject and dispose of all slates that do not emit a sharp, clear ring when tapped, or set aside for potential review by Supplier.
1. Cull and discard, or set aside for potential review by Supplier, warped and cupped slate shingles, those that are out of square, those with knots, knurls, or cramps on their unexposed faces, and slates with visible inclusions of iron pyrite.
 2. Cull slates that are unusually thin or thick; i.e., in a roof where a smooth, planar appearance is desired, slates that will be subject to breakage, cause shadow lines, or cause the butt ends of overlying slates to stick up, as well as those with curvature or twist greater than 1/8" in 12" across the width of the slate.
- F. Nail holes made on site in slates shall be punched or drilled from the back of the slate to produce a small recess, or countersink, on the exposed face of the slate to accept the nail head.
1. Drill nail holes in slates where a nail used to secure a clip, cleat, or lock strip associated with a flashing must pass through an underlying slate. Similarly, drill nail holes in slates that taper to a point or have a small nailing area, such as hip slates.
- G. Slates cut on site shall be cut from the back of the slate to maintain a beveled edge on the exposed face.
- H. Slate Order: As work progresses, check that the quantity of slate remaining on site is sufficient to complete the Project. Order additional quantities of slate in a timely manner, as required, so as not to delay final completion of the project and to allow proper blending of the slate.

3.2 REMOVAL OF EXISTING SLATE SHINGLES

- A. Slate Roof Replacement - Disposal
1. Remove all slate shingles and associated underlayments down to the roof deck.
 - a. Pull/remove (do not drive-in) all slating nails and fasteners associated with existing underlayments.
 - b. Deck irregularities: Identify broken, warped, cracked, rotted, or otherwise deteriorated or irregular roof decking and framing that would make the substrate unsuitable as a

substrate for new underlayments and new slate roofing, and report to the Design Professional.

- c. During the course of the Work, protect from damage all roofing, flashings, rainwater conduction systems, and other building and site elements scheduled to remain. Protect interior finishes and contents from moisture damage during the course of the Work.
- d. Lower demolition debris to grade using enclosed chutes or other means. Plan method of removal from elevated heights. Remove in a controlled manner. Do not throw demolition debris off of the roof.
- e. Clean work area and surrounding areas at grade to remove all slate chips, roofing nails, and other debris on a daily basis and at the end of project. The site shall be left clean.
- f. Remove no more slate than can be reinstalled or made weathertight by the end of the day.

3.3 UNDERLAYMENT INSTALLATION

- A. Verify that the roof deck is ready to accept the roof underlayment. Notify Design Professional in writing of any unsuitable conditions, such as voids, damage, or unsupported areas.
 1. Mechanical fasteners used to secure the roof decking shall be set flush with the surface of the decking and fastened into solid blocking or framing members.
 2. All surfaces shall be clean, dry, and free of oil, grease, dirt, frost, dew, and other contaminants that could cause damage to the roof underlayment.
 3. Decking shall be smooth, planar, continuous, and have adjacent edges set flush.
- B. Ice Dam Protection Membrane: Install ice dam protection membrane 6-foot wide at eaves.
 1. Install ice dam protection membrane full length of valleys and in crickets as shown in the Detail Drawings, lapping bottom end on top of ice dam protection membrane installed at the roof eave.
 2. Install ice dam protection membrane stripping along the top edge of metal gutter liners and crickets as shown in the Detail Drawings.
 3. At vertical walls, dormer cheek walls, party walls, chimneys, etc., extend ice dam protection membrane up the vertical surface 4 inches, minimum, or as shown in the Detail Drawings.
 - a. See Paragraph C., below, for flashing of pipe penetrations.
 4. Prior to installation of ice dam protection membrane, vacuum roof deck to remove all dust and debris. Install ice dam protection membrane directly to the roof deck in accordance with membrane manufacturer's instructions. Lap sides 3-1/2", minimum, in direction to shed water. Lap ends 6" minimum. Roll all laps with roller.
 - a. Prime roof deck as recommended by the ice dam protection membrane manufacturer if good adhesion is not obtained and when temperatures fall below 50 degrees Fahrenheit.
 5. Cover ice dam protection membrane with roof underlayment as outlined below.

C. Underlayment

1. Install single layer of specified underlayment in horizontal courses in shingle fashion to shed water, beginning at eave line and covering entire roof area. Install each course such that it laps the previous course 2". Lap ends 6", minimum. Stagger end laps of adjacent courses a minimum of 6 feet. Secure along laps, ends, and in field of felt with specified fasteners as necessary to properly hold the felt in place and protect the building from water infiltration until covered with slate shingles. Fasteners placed along laps shall be spaced at no more than 36" on center.
2. Underlayment shall lap hips and ridges 12" to form double thickness.
3. At vertical walls, extend felt underlayment up the vertical surface 4" minimum, unless otherwise shown in the Detail Drawings.
4. Flash penetrations through the roof using specified ice dam protection membrane to provide for a secure and watertight assembly. Ensure ice dam protection membrane target flashing is large enough to permit top edge of metal flashing to be installed to be striping-in with ice dam protection membrane (i.e., stripping to be centered on top edge of metal flashing and be installed directly to the metal flashing and directly to previously installed ice dam protection membrane).
5. At roof eaves, the underlayment shall lap on top of the metal drip edge. At rakes, underlayment shall be covered by the metal drip edge.
6. Cover roof underlayment with slate shingles as soon as possible. Remove and replace underlayment that has become wrinkled or damaged, or has been exposed on the roof for more than 60 days.

3.4 SLATE INSTALLATION

A. Protection of Roof Surfaces

1. The roof is to be properly staged to allow safe work surfaces, such as brackets and planks, that prevent unnecessary foot traffic on the slates.
2. Where foot traffic is unavoidable, roof ladders, hook ladders, chicken ladders, foam pads, or other such devices shall be used to protect the slates.
3. Workers are to avoid walking on the slate surfaces during, and after, installation.

B. Laying Out the Roof

1. Check that the eave is straight and level, the ridge is parallel to the eave,
2. Snap a line for locating the starter course equal to the vertical dimension of the starter slate minus the specified overhang (1½"). Set the starter course parallel to the eave. If the eave is not straight, make small adjustments in successive courses until the course lines are straight and parallel.
3. Chalk the line for the first course by measuring up from the eave the length of the slate, minus the specified overhang.
4. Chalk the line for the last full course at the ridge (finishing course), making sure it has an exposure of 7-1/2". Adjust the exposure of the courses approaching the ridge in small increments to obtain the required exposure of the finishing course (see subparagraph 5).

5. Snap horizontal lines based on the exposure of the slate, making small adjustments as needed so the courses end up parallel to the ridge and the exposure remains within $\frac{1}{4}$ " of adjacent courses. When within 5 to 10 feet of top of slope, re-measure, and adjust the exposure in the remaining courses in small increments ($\frac{1}{8}$ " to $\frac{1}{4}$ " per course) as needed for proper coursing. Do not reduce the headlap; always decrease the exposure so as to increase the headlap. (This same procedure applies to the laying out of courses at bottom and top of dormers to assure that the courses line up)
6. If the eave and/or ridge are not horizontal, establish a level line as a reference for snapping the course lines. Slate courses shall run horizontally. Treatment of special conditions shall be incorporated in the Test Panels under Paragraph 1.6, above.

C. Eave

1. The starter course of slates shall be laid horizontally (with the long edge perpendicular to the roof slope) with the bevel-edged side facing down, and be canted to allow the starter slates to be tilted to the same angle as the field slates.
2. The starter slates shall have nail-holes 1" to 1½" down from the top, long edge of the slate, and approximately 1½" in from each short edge.
3. Eave slates shall be laid to provide the specified overhang (1½"), or as shown in detail drawings) beyond the furthest extent of the fascia, cornice, crown molding, metal drip edge, trim, or other construction material at the eaves.
4. Slates at the eaves shall be doubled by first installing a slate starter course. The first course of slate shall be laid over the starter course so that the butt edges of both courses align. The first course of slate shall break side joints with the starter course side joints by not less than 3". The second course of slates must overlap the starter course by at least the headlap of the field slates along the eaves.

D. Field Slates

1. Exposure and Headlap
 - a. All standard field slates shall be installed with a minimum 3" headlap.
2. Offset: Slate side joints shall be positioned as near the mid-point of the underlying slates as possible, and not less than 3" from the underlying joints.
3. Joint Spacing: Slates shall be laid nearly touching side-to-side, or with a gap of approximately $\frac{1}{8}$ " between slates). Small adjustments can be made in joint spacing and/or slate width as needed when approaching rakes or walls to avoid use of excessively narrow slates; no slate shall measure less than 6" in width.
4. Fastening – Nailing and Wiring
 - a. Secure each slate to the roof deck with two nails set in holes pre-punched or drilled at the quarry, or punched by hand on site.
 - b. Set each nail with the head set in the countersink left by the punching of the nail hole; nails must not be over-driven, nor under-driven; nail heads shall touch the slate lightly, without producing strain on the slate and such that the slates hang from the nails.
 - d. Slates located adjacent to flashings shall be nailed to avoid puncturing the flashing material. Move one or both of the nails up, or closer to the center of the slate; secure the slate with a second nail placed one above the other on one side of the slate; or,

secure the slate with copper wire fastened to the roof deck upslope of the top edge of the flashing.

5. Shapes: The slate shape shall be rectangular.

F. Valleys

1. Valleys shall be open
 - a. Open Valleys
 - i. Slates at the edges of valleys shall be cut in neat and straight lines.
 - ii. Valley slates are to be cut from the back of the slate to maintain a beveled slate edge.
 - iii. Clip the upper corner of valley slates to allow the slate to lay correctly and to direct moisture toward the valley centerline.
 - iv. For fabrication of valley flashing, see section 076200.
 - v. Lay slate a minimum of 3"-4" each side of the valley centerline. Taper outward 1/16" per foot from top to bottom to allow for release of ice.
 - vi. When fastening slates, do not puncture valley flashing with nails. Use wider slates as needed; place two nails, one above the other along the edge of the slate farthest from the valley centerline; or, hang slates from copper wire secured above the top edge of the valley flashing.
 - vii. Adjust width of slates approaching a valley to avoid the need to cut slate to a point at the valley; width of the butt of the valley slate shall be 3" minimum.

G. Penetrations (p.182-191)

1. Slate shall be neatly fitted around pipes, ventilators, and other roof penetrations.
 - a. Do not nail through flashings.
 - b. Trim slates neatly.
 - c. See Section 076200 for flashings.

H. Flashings

1. Integrate flashings as slates are being installed.
 - a. See section 076200, Sheet Metal Flashing and Trim.
 - b. Flashing shall be installed where there are roof plane intersections, where the roof abuts walls, parapets, dormers and chimneys, at roof penetrations, and where shown on the Drawings.

J. Slate Repair

1. Where individual slates that must be installed in the field of the roof after the installation is complete, such as where a roof bracket has been removed or where a broken slate must be removed and replaced, such installation shall be made in accordance with the slate repair procedures specified in Paragraph 3.7, below.

- K. Coordinate slate installation with the installation of snow retention devices specified in Section 077253.

3.5 RIDGE SLATES

- A. Install ridge slates (finishing course slates) in coordination with installation of new copper ridge flashings (see Section 076200) and associated wood blocking.

1. Ensure roof underlayment is whole and overlaps the ridge a minimum of 12" in each direction.

3.6 HIP SLATES

- A. Install hip slates in coordination with installation of new copper hip flashings (see Section 076200) and associated wood blocking.
 - 1. Ensure roof underlayment is whole and overlaps the hip a minimum of 12" in each direction.

3.7 SLATE SHINGLE REPAIR

- A. Replacement slates shall match the existing.
- C. Remove existing broken slates and associated slating nails using a slate ripper. If the head of a slate cannot be removed in this manner, carefully remove adjacent slates as required to remove fragments and clear space for the replacement slate.
- D. Replacement slates shall be fastened using one of the following methods:
 - 1. Nail-and-Bib Method:
 - a. Slide replacement slate into position.
 - b. Punch or drill a nail-hole through the replacement slate approximately 3/4" to 1" below the butt of the slate two courses above, in the bond line between the slates in the course immediately above.
 - c. Fasten the slate with a single copper slating nail.
 - d. Insert a copper sheet-metal bib under the course above to cover the head of the nail. Push the bib past the butt end of the slates in the course above such that the bottom edge of the bib is no longer exposed and the bib provides for the same headlap as the slate. Pre-bend and/or notch the edges of the bib to prevent it from sliding out.
 - 2. Slate Hook Method:
 - a. Install the slate hook prior to sliding the replacement slate into position.
 - b. Drive the slate hook into the roof deck through the joint between the slates in the course below with the hook aligned with the desired position of the butt of the replacement slate.
 - c. Slide the replacement slate up into position, past the hook, and then pull it back down to engage the butt end in the hook.
 - d. Do not use slate hooks when replacing multiple adjacent slates in the same course.

3.8 SNOW GUARDS AND SNOW RAILS

- A. See Section 077253, Snow Guards, for new snow retention systems.
- B. Coordinate installation of new snow retention systems with installation of slate shingles.
 - 1. See Roof Plan for required locations for new snow retention devices.

3.9 LIGHTNING PROTECTION SYSTEMS

- A. See Section 264113, Lightning Protection for Structures, for new lightning protection system requirements.
- B. Coordinate installation of new lightning protection system with installation of slate shingles.
 - 1. Do not permit lightning protection system components to be secured with fasteners set directly through slate shingles or associated flashings.

2. See Section 264113 for fasteners to be used to secure lightning protection system components in the field of the slate roof. These hook on to the nails used to secure the slate shingles and may be installed by the slate roof installer. The lightning protection installer must be on site to supervise the work.
3. Discuss all lightning protection items to be secured to the roof, flashings, and gutters with the Design Professional prior to commencing work.

3.10 CLEAN-UP AND ADJUSTMENT

- A. Maintain work areas and grounds in a clean and neat manner throughout the course of the work.
- B. Remove debris from gutters and downspouts (if any) at the end of each work day and upon completion of the work to ensure unrestricted flow of water from the roof.
- C. Upon completion of work, remove all roofing equipment, excess material, and debris from all roof surfaces and grounds.
- D. While removing equipment, material, and debris from roof surfaces, inspect all work to ensure completeness, aesthetics, and undamaged workmanship. Broom clean slate shingles as roof jacks and planks (or other means of access) are being removed from the roof.
- E. Dispose of debris in accordance with all local, state, and federal regulations or in the manner as stated elsewhere in the Contract Documents.
- F. Remedy any incomplete work and replace any damaged, broken, poorly lying, or otherwise offending roofing slates using the repair methods specified in Paragraph 3.7, above.
- G. Upon completion of clean up and adjustments, advise the Architect that the work is ready for final inspection and/or punch listing.

END OF SECTION 073126