

# STEEP-SLOPE ROOFING

## SECTION 4 - SLATE TILE ROOFING

### 4.1 DECKS

#### 4.1.1 General

- .1 Slate tile roofing may be applied to wood decking or to wood battens fastened to metal or concrete decks. For batten installations follow manufacturer's written application guidelines.
- .2 For reroofing the decking shall be minimum 16 mm (5/8") thick plywood sheathing. The surface of the plywood shall conform to a sheathing grade under C.S.A. Standards.
- .3 For new construction, ARCA recommends minimum 19 mm (3/4") thick plywood sheathing to provide a solid nailing surface free of bounce.
- .4 When using thicker, larger or heavier weight slates, the structural capacity and thickness of the wood sheathing/decking may have to be increased from the recommended minimum thicknesses.

#### 4.1.2 Strength

- .1 The roof framing and decking shall be designed of sufficient strength so that they will support all anticipated loads, such as construction loads. The roof deck shall be free of damaged, deteriorated or decayed wood.
- .2 When reroofing with slate tiles a letter from a registered structural engineer shall be made available for the Regulation Authority. The design shall be in accordance with the National Building Code and the letter shall state that the roof will support the dead and live loads imposed.

#### 4.1.3 Surface

- .1 The surface of all roof decks to which a roofing system is to be applied shall be sufficiently clean and dry so that proper attachment may take place.
- .2 Roofing over existing roofing material is not permitted, tear off old materials to expose the decking.
- .3 Repair damaged or deteriorated decking with similar materials prior to reroofing.

#### 4.1.4 Slope

- .1 For the issuance of the Warranty Certificate the following requirements apply:

Less than 4:12 (1:3)	Not warranted (See ARCA Manual, Division 1, Slope Chart for system type acceptance)
4:12 (1:3) to 6:12 (1:2)	Use minimum 75mm (3") head laps.
Greater than 6:12 (1:2)	Use minimum 50 mm (2") head laps.

## 4.2 ROOFING MATERIALS

### 4.2.1 Slate Tiles

- .1 Roofing slates shall conform to current ASTM Standard C406, Standard Specification For Roofing Slate, Grade S1, having a minimum porosity of approximately 0.15 percent.
- .2 Commercial roofing slates shall be minimum 4 mm (3/16") thick, machine punched for two (2) nails when applied with standard 75 mm (3") head laps, weighing approximately 41 kg/m<sup>2</sup> (850 lbs/square).
- .3 Slate is a natural product and variations in colour and texture should be expected.

### 4.2.2 Protection and Storage

- .1 Slates shall be stacked on edge and covered to protect slates.
- .2 Slates should be handled with care and placed to avoid excessive handling of the material at the job site.
- .3 Other roofing materials shall be protected from moisture which would result in their moisture content being above the manufacturer's published moisture equilibrium for that material.
- .4 Rolls of felt shall be stored on end, covered and out of danger of water penetration.

### 4.2.3 Application Limitations

- .1 No roofing material shall be applied when the weather or the condition of its substrate is such that the required installation procedure could not be followed or which would jeopardize the performance of the roofing system.
- .2 **Cautionary Note:** Due to the variations and complexities of construction, obtain ARCA approval for application variations not specifically identified by ARCA Minimum Requirements.
- .3 Follow tile manufacturer's written application guidelines which exceed specified ARCA Minimum Requirements.

#### **4.2.4 Nails**

- .1 Solid copper ten (10) gauge slating nails are recommended for slate applications due to the long service life of slate.
- .2 Other fasteners approved by the slate tile manufacturer may be substituted for the solid copper slating nails.
- .3 For most applications, standard sized copper slating nails with 9 mm (3/8") large flat heads shall be used. The length of the slate nails will vary according to the thickness and exposure of the slate being used.
- .4 Slating nails shall penetrate through the plywood or wood sheathing or a minimum distance of 25 mm (1") into lumber decks or battens.
- .5 Standard-sized slates shall be nailed with a minimum of two (2) nails driven home with their heads just clear of the slate surface so that the slate hangs on the nails.

### **4.3 FLASHING AT INTERSECTIONS**

#### **4.3.1 Materials**

- .1 Sheet metal flashing shall consist of not less than
  - a) 15 kg/m<sup>2</sup> (3 P.S.F.) thick lead sheet,
  - b) 0.68 mm (20 oz.) thick copper sheet,
  - c) or approved non-corrosive alternates.

#### **4.3.2 Valley Flashing**

- .1 Open valleys should be used where sloping surfaces of slate roofs intersect to form a valley.
- .2 Open valleys shall be flashed with not less than one layer of sheet metal not less than 600mm (2') wide covering a minimum one (1) ply self adhering S.B.S. modified bituminous membrane.
- .3 Centre minimum 914 mm (36") wide sections of S.B.S. membrane over valley centre line and uniformly adhere to a clean and dry deck surface. Overlap and seal membrane end laps a minimum distance of 150 mm (6").
- .4 Centre minimum 600 mm (2') wide sections of 20 oz copper sheet in the valley angle overlapping valley metal lengths a minimum distance of 200mm (8").
- .5 Strip in the edges of the copper valley flashing with continuous 200mm (8") wide strips of self adhering S.B.S. modified bituminous membrane adhered 100mm (4") onto both the S.B.S. modified bitumen valley flashing and the primed copper valley flashing.
- .6 Lap the slates over the sheet metal on either side, leaving a space between the edges of each slate to channel water down the valley angle. The width of the valley, or the amount of space provided between the slate edges, shall increase uniformly down the valley (taper).

- .7 Valley slate application shall start a minimum distance of 50 mm (2") on either side of the valley center line at the ridge and shall taper away from the center at the rate of 25 mm (1") for every 2440 mm (8 lineal feet) of valley length towards the eaves.
- .8 When adjoining roof areas differ in pitch, metal valley flashings shall contain a 25mm (1") high centre crimp.
- .9 The upper corner of field slates adjoining the valley line shall be trimmed to reduce the possibility of water migrating back under each course of slates.

#### **4.3.3 Flashing at Vertical Junctions**

- .1 Intersection of slate tile roofing with walls, chimneys and vertical surfaces shall be protected with copper step flashings in accordance with the Alberta Building Code.

#### **4.3.4 Crickets or Saddle Flashings**

- .1 Where a chimney or other vertical surface projects through the roof surface at a right angle to the slope of the roof, a cricket or saddle shall be built into the roof to divert water away from the back of the vertical member. If the roof is constructed of wood, the cricket shall be of light rafter construction covered with plywood sheathing, valley flashing and slated the same as the adjacent roof areas. Open valleys shall be formed with the main roof. The size and slope of the cricket is largely determined by the roof condition. The slope of the cricket shall be approximately the same as the adjacent roof slopes.

#### **4.3.5 Perimeter Drip Edge Flashings**

- .1 The installation shall include 20 oz. copper rake and eaves drip edge flashings.
- .2 The deck flange shall extend a minimum distance of 75 mm (3") on to the roof decking and shall be nailed at maximum 254 mm (10") centres. Space vertical flange a minimum distance of 6 mm (1/4") from face of fascia board.
- .3 All exposed flashing edges shall be hemmed.

### **4.4 EAVE PROTECTION AND UNDERLAYMENT**

#### **4.4.1 Eave Protection**

- .1 Eave protection shall extend from the roof edge a minimum distance of 900 mm (3') up the roof slope to a line not less than 300 mm (1') inside the inner face of the exterior wall. (See ARCA Technical Bulletin on Ice Dam protection).
- .2 Eave protection is not required
  - (a) over unheated garages, carports and porches
  - (b) where the roof overhang exceeds 900 mm (3 ft) measured along the roof slope from the edge of the roof to the inner face of the exterior wall
  - (c) on roofs with slopes of 1 in 1.5 (8:12) or greater.

#### **4.4.1.1 Materials**

- .1 Eave protection shall be laid along the eave edge and shall consist of one of the following materials:
  - (a) No. 30 asphalt-saturated organic felt laid in two plies lapped 480 mm (19") and cemented together with lap cement.
  - (b) No. 40 glass fiber coated base sheet
  - (c) Self adhering S.B.S. modified bituminous membranes.

#### **4.4.2 Underlayment**

- .1 The field of the decking shall be completely covered with a minimum of one ply of CSA No. 30 non-perforated asphalt saturated organic felt prior to application of the slates.
- .2 The underlay shall be installed parallel to the eaves with head and end laps not less than 100 mm (4") staggered and offset from adjacent felts.
- .3 Over hips and ridges, felts shall extend at least 300 mm (1') beyond to form a double thickness of felt.

#### **4.4.2.1 Materials**

- .1 Underlayment shall consist of one of the following materials:
  - (a) One ply No. 30 asphalt saturated organic felt.
  - (b) One ply No. 40 glass fiber coated base sheet
  - (c) A self adhering S.B.S. modified bituminous membrane.
  - (d) or approved alternates.

### **4.5 BEDDING AND SEALANTS**

#### **4.5.1 Asphalt Roofing Cement**

- .1 Asphalt roofing cement may be used under slates at hip and ridge locations to help secure slates where nailing strengths and wind uplift are a concern or as a joint sealer.

#### **4.5.2 Polyurethane Sealant**

- .1 Polyurethane sealant may be used as a tile bedding or joint sealant at hips and ridges locations. Exposed fasteners shall be coated with sealant.

### **4.6 VENTILATION**

- .1 Every roof space or attic above an insulated ceiling shall be ventilated with openings to the exterior to provide an unobstructed vent area of not less than 1/300 of the insulated ceiling area. Vents may be roof type, eave type, soffit type, gable-end type or any combination thereof, and shall be uniformly distributed on opposite sides of the building.

- .2 Roof vents shall be equally distributed so that approximately 50 percent of the required vent area is located near the lower part of the roof and approximately 50 percent of the required vent area is near the ridge. For exceptions see Alberta Building Code, Section 9.19.1, Venting.

## **4.7 SLATE APPLICATION**

### **4.7.1 General**

- .1 The tiles shall be set out with courses straight and parallel with tiles in each course or in alternate courses kept in alignment so that the finished roof presents a regular and even appearance.
- .2 The cutting of tiles at hips, ridges, valleys and abutments shall be clean and straight to provide a regular and even appearance.
- .3 Test each slate for soundness prior to its application.
- .4 No through joints shall occur from the roof surface to the felt. The joints in each course shall be well separated from underlying courses as follows:
  - (a) Where slates of random width are used, the overlapping slate shall be jointed as near the center of the underlying slate as possible but not less than 75 mm (3") from any underlying joint.
  - (b) Where slates are of one width, this requirement is attained by starting every other course with a half-slate or, where available and practical, with a slate that is one and one-half times the width of the field slates.
- .5 Employ the standard 75 mm (3") head lap for most slate tile roofing applications.
- .6 For steeper roofs, such as the mansard roof and other roofs nearly vertical in plane, a minimum 50 mm (2") head lap may be satisfactory.
- .7 Employing a head lap less than 75 mm (3") reduces the amount of material over which water may be blown and may increase the possibility of leaks occurring in the roof.
- .8 Slates shall be fastened with a minimum of two (2) copper slating nails per tile. The length and number of slating nails will vary according to the thickness and exposure of the slates being used. Slating nails should be driven just clear of the slate's surface so that the slate hangs on the nails. Improperly driven fasteners will damage or break the slate tiles.

### **4.7.2 Exposure**

- .1 The "exposure" of a slate is the portion not covered by the next course of slate above and is the length of the unit exposed to the weather. The proper exposure to use for a particular length of slate is calculated by deducting the head lap from the length of the slate and dividing by two.

- .2 For example, the proper exposure for a 508 mm (20") slate is:  
 $508 \text{ mm (20")} - 75 \text{ mm (3")} = 433 \text{ mm (17")} / 2 = 216 \text{ mm (8.5")}$

#### 4.7.3 Starter Course

- .1 The starter course's primary function is to shed water that might migrate through the joints of the slates in the overlying first course. The starter slates are applied over the ice-dam protection membrane installed along the eaves.
- .2 The length of the starter course is calculated by adding 75 mm (3") to the proper exposure of the field slates. The width of the starter slate is either the width of the field slate or twice the width of the field slates.
- .3 Starter slates should be laid to extend approximately 25 to 50 mm (1" to 2") beyond the eave and rake edges. Where cutters or eaves trough are used the overhang may be reduced to 25 mm (1") from the fascia board.
- .4 To establish the proper angle for the field slates, fasten a tapered wooden cant or lath to the roof deck over the ice dam protection, just upslope of the eave edge. The lath or cant's thickness will vary depending upon the slate's thickness and exposure dimension specified.
- .5 Punch holes and fasten the starter course with a minimum of two (2) copper slating nails along a line parallel to and approximately 25 to 38 mm (1" to 1-1/2") below the top edge of the starter slates.

#### 4.7.4 Field Slates

- .1 Align the butts of the first course of field slates with the butts of the starter slates. Ensure joints are offset a minimum distance of 75 mm (3") from the joints in the underlying starter course. Fasten slates to the substrate with a minimum of two (2) copper slating nails.
- .2 Succeeding courses of field slates are generally started with alternating half-width and full width slates to achieve an offset application pattern. Most slate patterns are established by jointing or offsetting slate courses as close as possible to the centre of the slate below or by a minimum distance of 75 mm (3").

#### 4.7.5 Ridges

- .1 The field slates are continued to a point near the ridge but held back from the ridge apex to allow installation of wood lath and nailers. The wood lath and nailers shall be the same thickness as the abutting field slates and shall be installed just down slope from the ridge.
- .2 So all nails are covered, fasten ridge slates so their joints overlap and break the joints of the slates in the underlying course.
- .3 An optional copper or felt ridge flashing may be installed along the ridge line prior to application of ridge slates.
- .4 The nails of the finishing slate shall be covered with sealant.

- .5 The ridge slates may be bedded in asphaltic roofing cement or polyurethane sealant along the ridge joint.

#### **4.7.6 Hips**

##### **4.7.6.1 Saddle Hips**

- .1 Saddle hips are formed by fastening a two-piece wood lath or an 89 mm (3-1/2") wide wood cant strip to the wood decking over the underlayment along the apex of the hip. Field slates are installed up to the wood lath or cant strip.
- .2 Mitered hip slates, which are usually the same width and exposure as the adjacent field slates, are fastened to and on top of the wood lath or cant strips. The mitered tile edges shall align along the hip centre line with butts aligning with the field courses.
- .3 Fasten hip slates with a minimum of two (2) slating nails per unit.
- .4 The bedding and sealing of hip slates in asphaltic roofing cement or polyurethane sealant is optional.

##### **4.7.6.2 Mitered Hip**

- .1 Mitered hips are formed with field slates. Field slates are applied up to the hip, then hip slates are miter cut so the mitered edges butt along the hip centre line on both sides of the hip.
- .2 After cutting, trial fit hip slates to ensure finished miter joints will be tight. Fasten each mitered hip slate with a minimum of two (2) copper slating nails per unit.
- .3 To improve the long term water shedding of a mitered hip application, an optional copper hip soaker flashing may be woven into each course of mitered hips.
- .4 Bedding and sealing of hip slates in asphaltic roofing cement or polyurethane sealant is optional.