The Basics of Tile Roofing

Rooftop Quality Assurance
Tiles are used in all construction designs.

Tile has been documented back centuries in Europe.
Developed by the Roof Tile Institute and the Western States Roofing Contractors Association

Concrete and Clay Tile Design Criteria for Cold and Snow Regions

CAN/CSA-A220 Series-06
(approved November 2007)
Concrete roof tiles

Resources
Tiles

Come in many styles
Roof Tile Profiles

Flat Profile

Low Profile

High Profile
Tile Features

Top Side

Underside
History of Tile

- Concrete tile roofs date back over the last century.
- Originally found in Europe and Asia.
- Tiles originally made over a century ago by hand in Europe.
Features & Benefits

• Strength - permanent vs. disposable
• Fireproof - Class A fire rating
• Wind resistant - hurricane tested
• Hail resistant - lifetime warranty
• Appearance - Curb appeal, status
• Affordability - Low life cycle cost
• Energy efficient - Dead air space
• Seismic - USC testing
Misconceptions

• Clay tile = Concrete tile
• Unable to walk on tile roof
• Fiber cement tiles = Concrete tiles
Code Requirements

• CAN/CSA-A220.06, *Performance of concrete roof tiles*

• Physical Properties
  • Transverse strength
  • Water Permeability  Water absorption
  • Freeze / thaw resistance  Fire rating

• Installation guidelines
Engineering Criteria

• Dead Load - Roofing, sheathing, framing - permanent weight - static load
• Live Load - Same for all materials - accounts for short term loads such as foot traffic, rain (water absorption), wind
• Combined Load = Dead + Live Load
• Structure designed to support Combined Load
# Unicrete Weights

## TILE SPECIFICATIONS

<table>
<thead>
<tr>
<th>Tile Type</th>
<th>Thickness</th>
<th>Weight per Tile (g)</th>
<th>Weight per Tile (lbs)</th>
<th>Tile per 100 Sq Ft</th>
<th>Installed weight 100 sq ft</th>
<th>Installed weight lbs/sq ft</th>
<th>Installed weight Kg/m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estate Tile</td>
<td>11.5 mm body 25 mm butt</td>
<td>4400 g</td>
<td>9.7</td>
<td>90/SQ 192/P</td>
<td>873 lbs</td>
<td>8.73</td>
<td>42.6</td>
</tr>
<tr>
<td>Estate Tile Lightweight</td>
<td>9.5 mm body 23 mm butt</td>
<td>3900 g</td>
<td>8.59 lbs</td>
<td>90/SQ 210/P</td>
<td>773 lbs</td>
<td>7.73</td>
<td>37.7</td>
</tr>
<tr>
<td>Slate Tile</td>
<td>16 mm body 31 mm butt</td>
<td>5400 g</td>
<td>11.89 lbs</td>
<td>90/SQ 192/P</td>
<td>1070 lbs</td>
<td>10.7</td>
<td>52.35</td>
</tr>
<tr>
<td>Split Shake Tile</td>
<td>16 mm body 31 mm butt</td>
<td>5400 g</td>
<td>11.89 lbs</td>
<td>90/SQ 192/P</td>
<td>1070 lbs</td>
<td>10.7</td>
<td>52.35</td>
</tr>
</tbody>
</table>

Note: All weights and measurements subject to allowable tolerances set out in CSA-A220.0-SERIES-06
Pallet weight approx. 40 lbs
Roof Deck
The Basics of Tile Roofing

1. BEDDING
2. CHIMNEY (CHASE)
3. RIDGE TILE
4. RIDGE BOARD
5. INTERSECTION OF VALLEY HEADS
6. ROOF TILE (FIELD TILE)
7. VENT PIPE (LEAD FLASHING)
8. RIDGE

9. RAKE TILE
10. SKYLIGHT
11. ASHMENTS
12. VALLEY
13. GABLE
14. UNDERLAYMENT
15. EAVE PROTECTION & VALLEY
16. FASCIA
17. COUNTER (BATTEN) STRAPPING
18. TILE (BATTEN) NAILING STRIP
19. HIP
20. HIP TILE
21. HIP BOARDS (2"x2")
## Table 1
Underlayment performance requirements
(See Clauses 4.4.2.1.1, 4.4.2.1.4, 4.4.2.1.5, 4.4.2.2, 4.4.5.2, 4.4.6.2, 4.4.6.4.2, 4.4.6.6.2, and 4.4.6.8.)

(a) For use throughout Canada

<table>
<thead>
<tr>
<th>Test</th>
<th>Clause</th>
<th>Over solid sheathing</th>
<th>Under spaced sheathing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rigidity</td>
<td>4.4.6.2</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Water permeability</td>
<td>4.4.6.3</td>
<td>No dampness permitted</td>
<td>No dripping permitted</td>
</tr>
<tr>
<td>Tensile</td>
<td></td>
<td>3.5 kN/m</td>
<td>3.5 kN/m</td>
</tr>
<tr>
<td>Machine direction</td>
<td>4.4.6.4</td>
<td>3.5 kN/m</td>
<td>12.0 kN/m</td>
</tr>
<tr>
<td>Cross direction</td>
<td>4.4.6.4</td>
<td>3.5 kN/m</td>
<td>5.0 kN/m</td>
</tr>
<tr>
<td>Pliability</td>
<td>4.4.6.5</td>
<td>No cracking or delamination</td>
<td>No cracking or delamination</td>
</tr>
<tr>
<td>Puncture</td>
<td>4.4.6.6</td>
<td>≥ 0.34 J</td>
<td>≥ 0.34 J</td>
</tr>
<tr>
<td>Long-term sag</td>
<td>4.4.6.7</td>
<td>N/A</td>
<td>≤ 5%</td>
</tr>
<tr>
<td>Linear dimensional changes</td>
<td>4.4.6.8</td>
<td>≤ 3%</td>
<td>N/A</td>
</tr>
</tbody>
</table>

(b) For use in areas having 3500 degree days or less below 18 °C

<table>
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<tr>
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<th>Clause</th>
<th>Under spaced sheathing</th>
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<tr>
<td>Rigidity</td>
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*As defined in the NBCC.

Note: N/A = not applicable.
Underlayment

Roof Slope 2 ½ /12 to 4 /12

• minimum self adhesive membrane over entire roof; or full approved low slope roofing system installed under the tile.
Underlayment

Roof Slope 4 in 12 and up

- main roof underlay
  - min. #30 felt as per CSA 123.3
- or approved upgrades
  - polypropylene,
  - base sheet,
  - peel and stick
Battens
Counter Battens

Not more than 1 in 4 on any rafter

Staggered joints

Batten alignment
## Fasteners

### Fastening required for standard weight tiles

**Standard conditions**

<table>
<thead>
<tr>
<th>Roof slope</th>
<th>Fastening for tile</th>
<th>Perimeter fastening at eaves, gables, hips, and ridges</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\geq 1.3 \leq 1:1.7$</td>
<td>Nail or clip tiles every third course</td>
<td>Nail or clip (a) first two courses along eaves; (b) first two courses or tiles each side of hips or ridges; and (c) first two rows in from gables</td>
</tr>
<tr>
<td>$&gt; 1:1.7 \leq 1:1$</td>
<td>Nail or clip tiles every second course</td>
<td></td>
</tr>
<tr>
<td>$&gt; 1:1 \leq 1.25:1$</td>
<td>Nail or clip every tile</td>
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## Fasteners

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**Seismic zone 4 or greater**

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<th>Perimeter fastening at eaves, gables, hips, and ridges</th>
</tr>
</thead>
</table>
| ≥ 1:3 ≤ 1:1.7  | Nail or clip tiles every third course | Nail or clip  
|                |                                   | (a) first three courses along eaves;  
|                |                                   | (b) first three courses or tiles each side of hips or  
|                |                                   | ridges; and  
|                |                                   | (c) first three rows in from gables |
| > 1:1.7 ≤ 1:1 | Nail or clip tiles every second course | Nail and clip every tile |
| > 1:1          | Nail and clip every tile          | Nail and clip every tile |

![Seismicity database used to determine Canadian seismic hazard](image)
# Fasteners

## Fastening for standard weight tiles — High wind areas

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<tbody>
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<td>Nail and clip tiles every third course</td>
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<tr>
<td>$&gt; 1:1.7 \leq 1:1$</td>
<td>Nail and clip tiles every second course</td>
<td></td>
</tr>
<tr>
<td>$&gt; 1:1$</td>
<td>Nail and clip every tile</td>
<td>Nail and clip every tile</td>
</tr>
</tbody>
</table>
Flashings

- Minimum of 30 ga. galvanized Z275 (G90) metal, pre-painted preferred
- Over-lapped a minimum of 150 mm (6")
- A flashings are counter-flashed by the cladding material or a second caulked counter-flashing
Ribbed Valley Metal

• Best all-purpose valley metal design
• Elevates battens and tiles
• Allows for uninhibited water flow
• Controls water flow and prevent lateral diversion
• Makes closed valley application feasible
• Available for tile pan as well
Valleys

Open valley

Closed valley
Pipe Flashings
Pipe Flashings
First Strap

19mm x 89mm NAILING STRIPS
COUNTER 10mm x 38mm NAILING STRIPS
10mm SHEATHING
335mm
38mm x 38mm NAILING STRIPS
STARTER FLASHING (MINIMUM 12mm PAST FACIA)
DRIP EDGE FLASHING OR VENTED EAVE CLOSURE (ON ESTATE PROFILE ONLY)

TILE (MINIMUM 75mm HEAD LAP)
EAVE PROTECTION (ICE & WATER SHIELD) AS PER 9.26.5.2 N.B.C.

FIRST STRAP DETAIL
SCALE 1:10

Closure Strip
Gables, Rakes

GABLE, RAKE DETAIL
SCALE 1:10
Field Tile

• 75 mm (3”) minimum head (tiles are 420 mm [16.5” long])
• Flat tiles laid in either a staggered course or a random spacing pattern.
S-profile tiles are usually laid in a direct bond, soldier course fashion with rain seals all lined up.
Tile Fittings

Ridge and hip board size and location
Bedding, Caulking, & Closures

Note: Bedding may be applied at site A or B.

Bedding of roof tiles and hip and ridge tiles
Bedding, Caulking, & Closures

Hip and ridge tile lap and caulking
Ventilation

Not Vented

Vented
Ventilation
Snow Retention
Weatherblocking

- Prevents water flow beneath tile.
- Provides finished appearance.
- Protects underlayment and flashings.
- Increases overall life and performance.
- Mortar, mastic, pre-formed plastic or metal, pressure-sensitive roll adhesives, polyurethane foamed.
Snow Retention

Snow Bracket
Roof Loading
The method of roof loading shown on this page represents the method of tile placement for efficient application but is not intended to suggest that this is the only method that will work. Each applicator will have personal preferences for the slack location and spacing. The important aspect of the tile loading is to spread the load evenly across the roof while using the proper increments that assure that the proper amount of tile is loaded on roof.
Job Specification

• Match components to task
• Consider slope, complexity and climate
• Spell out requirements
• Specify size, type, brand name
• Confirm compliance
• Pre-job meetings, inspections, sign-offs
Total Roof System

• Underlayment suitable for climate
• Elevated batten system
• Ribbed tile pan and valley metal
• Venting
• Weatherblocking
Where can we find more information?

• www.tileroofing.org
• Source of all new information and technical bulletins
• Technical Seminars
Questions and Discussion