DIVISION: 07 00 00—THERMAL AND MOISTURE PROTECTION
Section: 07 31 16—Metal Shingles
Section: 07 41 13—Metal Roof Panels

REPORT HOLDER:
DELTA BUILDING PRODUCTS LTD.

EVALUATION SUBJECT:
DELTA ROOF PANELS: SHAKE, TILE AND HIDDEN FASTENER TILE
DELTA ROOF SHINGLES: SHINGLE, SLATE AND DIAMOND

1.0 EVALUATION SCOPE
1.1 Compliance with the following codes:
- 2009 International Building Code® (IBC)
- 2009 International Residential Code® (IRC)
- Other Codes (See Section 8.0)

Properties evaluated:
- Roof covering fire classification
- Wind uplift resistance
- Weather resistance

1.2 Evaluation to the following green code:
- 2016 California Green Building Standards Code (CALGreen), Title 24, Part 11

Attributes verified:
- See Section 2.0

2.0 USES
Delta steel and aluminum roof panels and shingles comply with IBC Section 1507.5 and IRC Section R905.4. The panels and shingles are recognized as Class A or Class B roof coverings on new and over existing roofs, when installed in accordance with Section 4.4 of this report.

The attributes of the roofing panels and shingles have been verified as conforming to the provisions of CALGreen Section A5.406.1.2 for reduced maintenance. Note that decisions on compliance for those areas rest with the user of this report. The user is advised of the project-specific provisions that may be contingent upon meeting specific conditions, and the verification of those conditions is outside the scope of this report. These codes or standards often provide supplemental information as guidance.

3.0 DESCRIPTION

3.1 Roofing Panels and Shingles:
3.1.1 Aluminum Shingle, Slate and Diamond: The Shingle, Slate and Diamond aluminum roof shingles are cold-press-formed from 3105-H24 aluminum alloy complying with ASTM B209. The base-metal thickness of the aluminum is 0.019 inch (0.483 mm), and the total thickness of the coated aluminum is 0.0205 inch (0.521 mm). Shingle and Slate measure 9.44 inches long (240 mm) by 18.12 inches (206 mm), and have formed edges that act as interlocking seals with adjacent shingles. The aluminum Shingle and Slate shingles have an installed weight of 0.41 psf (2.0 kg/m²).

The Diamond roof shingle measures 13.875 inches (352 mm) by 21.375 inches (543 mm). The sides of each Diamond shingle incorporate formed edges that act as interlocks with adjacent diamonds. The aluminum Delta Diamond has an installed weight of 0.41 psf (2.0 kg/m²). See Figure 1 for shingle profile.

3.1.2 Aluminum Shake, Tile and Hidden Fastener Tile Panels: The Delta Shake, Tile and Hidden Fastener Tile aluminum roofing panels are cold-press-formed from 3003-H24 or 3105-H24 aluminum alloy complying with ASTM B209. The base-metal thickness of the aluminum is 0.0276 inch (0.701 mm), and the total thickness of the coated aluminum is 0.029 inch (0.737 mm).

The overall panel size of the Shake panel is 13 1/2 inches by 50 inches (343 mm by 1270 mm), and the installed exposure is 12 1/2 inches by 47 inches (317.5 mm by 1194 mm). The right side of each panel incorporates a 3-inch-wide (76.2 mm) side lap. The panels consist of six modules of varying widths by 12 1/2 inches long (317.5 mm). The panels have formed edges on the top and bottom edges of the panel that interlock when installed. The installed weight of the Delta Shake aluminum roofing panels is approximately 0.58 psf (2.83 kg/m²). See Figure 2 for panel profile.

Delta Tile panels measure 43.5 inches (1105 mm) wide with an installed exposure of 39.3 inches (998 mm). The panels consist of six modules, each 7.8 inches (198 mm) wide and 15 inches (381 mm) long with panel lengths up to 30 feet (9144 mm). The aluminum Delta Tile panels have an installed weight of 0.54 psf (2.63 kg/m²). See Table 3 for the profile.

The Delta Hidden Fastener Tile panel measures 21 1/2 inches (546 mm) wide with an installed exposure of 18 inches (457 mm). The panels consist of two modules, each 9 inches (229 mm) wide and 15 inches (381 mm) long, with panel lengths from 16 1/4 inches to 91 1/4 inches (413 mm to 2318 mm). Delta Hidden Fastener Tile has an
installed weight of 0.59 psf (2.88 kg/m²) for aluminum. See Figure 3 for the profile.

3.1.3 Steel Shingle, Slate and Diamond: The Steel Shingle, Slate and Diamond are cold-press-formed from sheet steel complying with ASTM A653, SS, Grade 33, and having a G90 galvanized coating. The total thickness of the galvanized steel is 0.0140 inch (0.356 mm), and the total G90 galvanized coating thickness is 0.0015 inch (0.038 mm). The Steel Shingle, Slate and Diamond shingles are cold-press-formed into the same shape and dimensions as the Aluminum Shingle, Slate and Diamond shingles, respectively. The installed weight of the Steel Shingle and Slate shingles is 0.86 psf (4.2 kg/m²). The installed weight of the steel Diamond shingle is 0.85 psf (4.2 kg/m²).

3.1.4 Steel Shake, Tile and Hidden Fastener Tile Panels: The Delta Shake, Tile and Hidden Fastener Tile steel roofing panels are cold-press-formed from sheet steel complying with ASTM A653, SS, Grade 33, and have a G90 galvanized coating. The total thickness of the galvanized steel is 0.0190 inch (0.483 mm), and the total G90 galvanized coating thickness is 0.0015 inch (0.038 mm). The steel Shake and Tile panels are cold-press-formed into the same shape and dimensions as the aluminum Shake and Tile panels. The installed weight of the steel Shake roofing panels is approximately 1.16 psf (5.66 kg/m²). The installed weight of the steel Tile roofing panels is approximately 1.04 psf (5.07 kg/m²). The installed weight of the steel Delta Hidden Fastener Tile is 1.16 psf (5.66 kg/m²). See Figure 2 for panel profiles.

3.1.5 Accessories: The eave starter, gable and collar trim, and ridge and hip caps are manufactured of the same steel and aluminum materials and with the same gage thicknesses and finishes as described above, except for the aluminum Hidden Fastener Tile and Tile gable trim and ridge cap, which are manufactured from aluminum alloy 5182 H0, having a minimum base thickness of 0.022 inch (0.559 mm).

3.1.6 Aluminum and Steel Roof Coating: The panels are coated with a fluorocarbon paint to a minimum thickness of 1.0 mil (0.0254 mm) on the top exterior surface. The panels are painted to a minimum thickness of 0.5 mil (0.0127 mm) on the bottom surface.

3.2 Fasteners:

Fasteners must be installed as required in Tables 1 through 4 of this report. The fasteners must penetrate the sheathing a minimum of 1/2 inch (12.7 mm). The fasteners are supplied by Delta Building Products, Ltd.

Fasteners for aluminum Shingle, Slate, and Diamond shingles, and as an alternative for Shake shingles, are aluminum ring Shank nails having a 0.144-inch-diameter (3.66 m) Shank and a 1/2-inch-diameter (12.7 mm) head.

Fasteners for steel Shingle, Slate and Diamond shingles, and as an alternative for Shake shingles, are hot-dipped galvanized ring Shank steel nails having a 0.135-inch-diameter (3.43 mm) Shank and a 1/4-inch-diameter (9.52 mm) head.

Fasteners for aluminum Hidden Fastener Tile and Delta Tile panels, and as an alternative for Delta Shake panels, are No. 10 stainless steel screws [0.155 inch diameter Shank (3.94 mm)], 1/4-inch hex head (6.4 mm), having both a 0.59-inch (15 mm) stainless steel washer and a butyl rubber washer.

Fasteners for steel Hidden Fastener Tile and Delta Tile panels, and as an alternative for Delta Shake panels, are No. 10 galvanized steel screws [0.155 inch diameter Shank (3.94 mm)], 1/4-inch-diameter head (6.4 mm), having both a 0.47-inch (12 mm) galvanized steel washer and a butyl rubber washer.

3.3 Underlayment:

Underlayment must comply with Section 1507.5.3 of the IBC or Section R905.4.3 of the IRC, as applicable. On construction permitted to be nonclassified roofing, underlayments may be used that are recognized in an ICC-ES evaluation report as alternatives to the ASTM D226, Type I and Type II, underlayments specified in Chapter 15 of the IBC and Chapter 9 of the IRC.

4.0 INSTALLATION

4.1 Roof Slope:

The panels must be installed on minimum roof slopes of 3:12 (25%).

4.2 Installation—New Construction:

Delta roofing panels and shingles must be installed on minimum 15/32-inch-thick (11.9 mm) plywood sheathing complying with the applicable code. Delta Hidden Fastener Tile and Delta Tile may also be installed over spaced sheathing as indicated in Section 4.7. Underlayment, as described in Section 3.3 of this report, must be applied per the applicable code.

Delta Shingle, Slate and Diamond shingles are installed with one nail in the nailing tab. Additional clips and nails may be required in accordance with local wind conditions, based on the design uplift wind pressure as determined in accordance with IBC Section 1605.9.1 and IRC Section R301.2.1. See Table 1. The first row of shingles hook into the lip of the eave starter flashing. The formed shingle edges interlock with the adjacent shingles.

Delta Shake panels must be placed over the underlayment and must start at the eave. The front of the panels in the first course must be hooked into the lip of the eave starter flashing. The panels overlap on the right side of each panel by 3 inches (76.2 mm). The rear of each panel must be fastened to the sheathing with clips and fasteners as described in Table 2. The clips must be equally spaced along the panel. The next course must hook into the lip of the course below it.

Delta Tile panels are overlapped with adjacent panels a minimum of 4 1/2 inches (108 mm) and are fastened to the sheathing using fasteners described in Section 3.2, using the fastening pattern described in Table 3.

Delta Hidden Fastener panels interlock and are installed from right to left, and are fastened on the left to the sheathing using fasteners described in Section 3.2, using the fastening pattern described in Table 4.

Panels must be cut and formed at valleys. As an alternative, a Delta Building Products Ltd.—supplied valley flashing may be installed and the panels may be cut and slotted into either side of the open valley flashing.

Valley flashings must comply and be installed in accordance with Section 1507.5.7 of the IBC or Section R905.4.6 of the IRC. Other flashing must comply with Section 1503.2.1 of the IBC or Section R903.2.1 of the IRC. Valley flashing is attached with nails, installed four per side every 10 feet (3048 mm). Valley flashing end laps must be a minimum of 4 inches (102 mm). The valley flashing must have one layer of underlayment, at least 36 inches (914 mm) wide, directly under the full flashing length.

Penetrations through the roof covering must be flashed by installing standard roof jacks which drain over the panel immediately below the penetration. The lower edge of the
panel containing the jack must be notch-cut-out to allow water drainage from the jack to the top of the panel below. Delta Tile and Delta Hidden Fastener Tile panels must be flashed with prefabricated roof flashings for pipe penetrations recognized in an ICC-ES evaluation report. Openings through the roofing for air vents must be adequately weatherproofed and supported by additional blocking or roof framing as necessary in accordance with the manufacturer’s published installation instructions.

4.3 Installation—Reroofing:

The existing roof covering must be completely removed and the panels installed in accordance with Section 4.2 of this report, except over asphalt shingle roofs as described in this section. The panels may be installed over existing spaced sheathing provided the space between boards is filled with lumen as necessary to provide a base for fastening. The fill lumen shall be of the same thickness as the existing spaced sheathing. The Delta Shake roofing panels may be installed over existing asphalt shingle roofs, provided the roof slope complies with Section 4.1 of this report and the requirements of IBC Section 1510 or IRC Section R907 are met. The panels must be fastened through the existing roof covering to the roof sheathing in the same manner as described in Section 4.2, with screws or nails of sufficient length to penetrate through the sheathing a minimum of 1/2 inch (12.7 mm). Existing flashings must be removed and replaced with new flashing, vents, valleys and chimneys in accordance with this report and the applicable code. Raised perimeters must be covered by the Delta Shake panel roofing system.

4.4 Fire Classification:

Delta shingles and panels installed in accordance with Section 4.2 or 4.3 of this report are recognized as Class A or Class B roof assemblies under IBC Sections 1505.2 and 1505.3 and IRC Section R902.1 when the roof assemblies incorporate GAF Elk Versashield™ Fire-Resistant Roof Deck Protection and are installed in accordance with ICC-ES evaluation report ESR-2053.

4.5 Wind Resistance:

Delta Shake, Shingle, Slate, Diamond, Hidden Fastener Tile and Tile installed in accordance with Section 4.0, using the fasteners, clips and roof deck specified in Tables 1 through 4 are acceptable on any portion of the roof having the maximum allowable uplift loads specified in the tables. The design wind pressure must be determined in accordance with IBC Section 1609.5 and IRC Section R301.2.1.

4.6 Severe Climate Areas:

In jurisdictions enforcing the IBC or IRC, an ice barrier must be provided in accordance with IBC Section 1507.5.4 or IRC Section R905.4.3.1.

4.7 Positive Loads:

Positive (gravity) loads are limited to the adequacy of the supporting structural framing and sheathing except when installation is on spaced sheathing. When installation is on spaced sheathing, the Delta Tile and Delta Hidden Fastener Tile aluminum panels are limited to the lesser of the adequacy of the structural framing and sheathing or the allowable panel load. The Delta Tile steel and aluminum panels have an allowable load of 100 psf (4.8 kPa) and the Delta Hidden Fastener Tile steel and aluminum panels have an allowable load of 52 psf (2.5 kPa) when the supporting framing is spaced at a maximum of 15 inches (381 mm) on center.

5.0 CONDITIONS OF USE

The Delta Roofing Panels and shingles described in this report comply with, or are suitable alternatives to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

5.1 The panels are manufactured, identified and installed in accordance with this report, the applicable code and the manufacturer’s published installation instructions. In the event of a conflict between this report and the manufacturer’s installation instructions, this report governs.

6.0 EVIDENCE SUBMITTED

Data in accordance with the ICC-ES Acceptance Criteria for Metal Roof Coverings (AC166), dated October 2012.

7.0 IDENTIFICATION

7.1 A label bearing the manufacturer’s name (Delta Building Products Ltd.) and address, the product name and the evaluation report number (ESR-1790) is affixed to each pallet or bundle.

7.2 The report holder’s contact information is the following:

DELTA BUILDING PRODUCTS LTD.
9969 RIVER WAY
DELTA, BRITISH COLUMBIA V4G 1M8
CANADA
(604) 953-1000

8.0 OTHER CODES

In addition to the codes referenced in Section 1.0, the products described in this report were evaluated for compliance with requirements of the 2006 International Building Code® (IBC) and the 2006 International Residential Code® (IRC). The products comply with, or are suitable alternatives to what is specified in, the 2006 IBC and the 2006 IRC. Recognition under these codes is just as described in Section 2.0 through 7.0 of this report, except that an ice barrier must be provided in accordance with 2006 IBC Section 1507.5.3 or 2006 IRC Section R905.4.3.
<table>
<thead>
<tr>
<th>SYSTEM NO.</th>
<th>DECK</th>
<th>SHINGLE</th>
<th>CLIPS</th>
<th>FASTENERS</th>
<th>FASTENERS PER CLIP</th>
<th>FASTENERS PER SHINGLE TAB</th>
<th>ALLOWABLE UPLIFT LOAD (psf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Minimum 15/32-inch APA rated Plywood</td>
<td>None</td>
<td>1 per panel equally spaced (for Diamond, in center of one side)</td>
<td>N/A</td>
<td>1</td>
<td>30.0</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Aluminum or Steel</td>
<td>None</td>
<td>Nails as described in Section 3.2 for appropriate metal shingle</td>
<td>1</td>
<td>1</td>
<td>70.0</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Minimum 15/32-inch APA rated Plywood</td>
<td>2 per panel equally spaced (for Diamond, in center of both sides)</td>
<td>1</td>
<td>1</td>
<td>105.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Minimum 15/32-inch APA rated Plywood</td>
<td>3 per panel equally spaced (for Diamond, in center of one side and two equally spaced in other side)</td>
<td>2</td>
<td>1</td>
<td>180.0</td>
<td></td>
<td></td>
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</table>

For SI: 1psf = 0.04788 kPa.
### TABLE 2—DELTA SHAKE PANELS (SEE SECTIONS 3.1.2 AND 3.1.4)

<table>
<thead>
<tr>
<th>SYSTEM NO.</th>
<th>DECK</th>
<th>PANEL</th>
<th>CLIPS</th>
<th>FASTENERS (See Section 3.2)</th>
<th>FASTENERS PER CLIP</th>
<th>ALLOWABLE UPLIFT LOAD (psf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td></td>
<td>Aluminum</td>
<td>4 per panel equally spaced</td>
<td>Aluminum nails</td>
<td>1</td>
<td>37.5</td>
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<tr>
<td>6</td>
<td></td>
<td>Aluminum</td>
<td>3 per panel equally spaced</td>
<td>Stainless Steel Screws</td>
<td>1</td>
<td>45.0</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>Aluminum</td>
<td>4 per panel equally spaced</td>
<td>Aluminum nails</td>
<td>2</td>
<td>80.0</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>Aluminum</td>
<td>4 per panel equally spaced</td>
<td>Stainless Steel Screws</td>
<td>2</td>
<td>115.00</td>
</tr>
<tr>
<td>13</td>
<td></td>
<td>Steel</td>
<td>4 per panel equally spaced</td>
<td>Stainless Steel Screws</td>
<td>1</td>
<td>37.5</td>
</tr>
<tr>
<td>14</td>
<td></td>
<td>Steel</td>
<td>3 per panel equally spaced</td>
<td>Galvanized Steel Screws</td>
<td>1</td>
<td>45.0</td>
</tr>
<tr>
<td>15</td>
<td></td>
<td>Steel</td>
<td>4 per panel equally spaced</td>
<td>Galvanized Steel Screws</td>
<td>2</td>
<td>80.0</td>
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<tr>
<td>16</td>
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<td>Steel</td>
<td>4 per panel equally spaced</td>
<td>Galvanized Steel Screws</td>
<td>2</td>
<td>115.0</td>
</tr>
</tbody>
</table>

Minimum \(\frac{15}{32}\)-inch APA rated Plywood

For SI: 1 psf = 0.04788 kPa.

### TABLE 3—DELTA TILE PANELS (SEE SECTIONS 3.1.2 AND 3.1.4)

<table>
<thead>
<tr>
<th>SYSTEM NUMBER</th>
<th>DECK</th>
<th>PANEL</th>
<th>FASTENERS</th>
<th>FASTENER PLACEMENT</th>
<th>ALLOWABLE UPLIFT LOAD (psf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>52.5</td>
</tr>
<tr>
<td>18</td>
<td></td>
<td>Aluminum or Steel</td>
<td>3-inch-long Stainless Steel screw for Aluminum panels as described in Section 3.2 or galvanized Steel Screw for Steel panels as described in Section 3.2</td>
<td></td>
<td>104.5</td>
</tr>
<tr>
<td>19</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>157.5</td>
</tr>
</tbody>
</table>

Minimum \(\frac{15}{32}\)-inch APA rated Plywood

For SI: 1 inch = 25.4 mm, 1 psf = 0.04788 kPa
**TABLE 4—DELTA HIDDEN FASTENER TILE PANELS (SEE SECTIONS 3.1.2 AND 3.1.4)**

<table>
<thead>
<tr>
<th>SYSTEM NUMBER</th>
<th>DECK</th>
<th>PANEL</th>
<th>FASTENERS</th>
<th>FASTENER PLACEMENT</th>
<th>ALLOWABLE UPLIFT LOAD (psf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>Minimum 15/32-inch APA rated Plywood</td>
<td>Aluminum or Steel</td>
<td>Minimum 2 1/4 inch long at left edge and 3-inch long at bottom right Stainless steel screws for aluminum panels as described in Section 3.2 or Galvanized Steel screw for steel panels as described in Section 3.2</td>
<td>See Pattern 1</td>
<td>53.0</td>
</tr>
<tr>
<td>21</td>
<td>Nominal 1-by-4 sheathing spaced at 15 inches o.c. Minimum specific gravity of 0.51</td>
<td>Aluminum or Steel</td>
<td></td>
<td>See Pattern 2</td>
<td>64.5</td>
</tr>
<tr>
<td>22</td>
<td>Minimum 15/32-inch APA rated Plywood</td>
<td></td>
<td></td>
<td>See Pattern 2</td>
<td>92.0</td>
</tr>
<tr>
<td>23</td>
<td>Minimum 15/32-inch APA rated Plywood</td>
<td></td>
<td></td>
<td>See Pattern 3</td>
<td>142.5</td>
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</table>

For SI: 1 inch = 25.4 mm, 1 psf = 0.04788 kPa

**FIGURE 3—HIDDEN FASTENER TILE FASTENING PATTERN**