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ICC-ES Evaluation Report

ESR-3422

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Reissued 09/2017

This report is subject to renewal 09/2018.

DIVISION: 07 00 00—THERMAL AND MOISTURE PROTECTION
SECTION: 07 41 13—METAL ROOF PANELS

REPORT HOLDER:

FIRESTONE BUILDING PRODUCTS COMPANY, LLC

**250 WEST 96TH STREET
INDIANAPOLIS, INDIANA 46240-1316**

EVALUATION SUBJECT:

**UNA-CLAD[®] STANDING SEAM METAL ROOF PANELS
UC-3, UC-4, UC-6, UC-6 HD, AND UC-14**



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A Subsidiary of the International Code Council®

DIVISION: 07 00 00—THERMAL AND MOISTURE PROTECTION

Section: 07 41 13—Metal Roof Panels

REPORT HOLDER:

FIRESTONE BUILDING PRODUCTS COMPANY, LLC
250 WEST 96TH STREET
INDIANAPOLIS, INDIANA 46240-1316
(800) 428-4442
www.firestonebpco.com

EVALUATION SUBJECT:

UNA-CLAD® STANDING SEAM METAL ROOF PANELS UC-3, UC-4, UC-6, UC-6 HD, AND UC-14

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2012 and 2009 *International Building Code*® (IBC)
- 2012 and 2009 *International Residential Code*® (IRC)

Properties evaluated:

- Weather resistance
- Fire classification
- Wind uplift resistance

1.1 Evaluation to the following green code:

- 2016 California Green Building Standards Code (CALGreen), Title 24, Part 11

Attributes verified:

- See Section 3.1

2.0 USES

UNA-CLAD® Standing Seam Metal Roof Panels are used as roof coverings and are recognized for use as Class A or Class B roof coverings when installed in accordance with this report.

3.0 DESCRIPTION

3.1 General:

UNA-CLAD® Standing Seam Metal Roof Panels are available in preformed standing seam profiles produced from steel, aluminum, and copper sheet. Materials used in panel fabrication conform to the following specifications:

Aluminum: ASTM B209; minimum 0.032 inch thick (0.81 mm); F_y = minimum 21 ksi.

Galvanized Steel: ASTM A653 G90; minimum 24 gauge [0.025 inch thick (0.64 mm)]; F_y = minimum 50 ksi.

Galvalume® Steel: ASTM A792 AZ50; minimum 24 gauge [0.025 inch thick (0.64 mm)]; F_y = minimum 50 ksi.

Copper: ASTM B370; minimum 16 oz./sq.ft. (0.0416 kg/m²); F_y = minimum 38 ksi.

The panel profiles are as follows:

- **UC-3:** Formed to 8-inch- to 20-inch-wide (203 mm to 508 mm) panels, with 1.0-inch- or 1.5-inch-high (25 mm or 38 mm) mechanically locking seams. See Figure 1.
- **UC-4:** Formed to 9.75-inch- to 17.75-inch-wide (248 mm to 451 mm) panels, with 1.5-inch-high (38 mm) snap-locking seams. See Figure 2.
- **UC-6:** Formed to 8-inch- to 24-inch-wide (203 mm to 610 mm) panels, with 1.5-inch- or 2.0-inch-high (38 mm or 51 mm) mechanically locking seams. See Figure 3.
- **UC-6 HD:** Formed to 12-inch- to 22-inch-wide (305 mm to 559 mm) panels, with 1.5-inch- or 2.0-inch-high (38 mm or 51 mm) mechanically locking seams. See Figure 4.
- **UC-14:** Formed to 8-inch- to 18-inch-wide (203 mm to 457 mm) panels, with 1.75-inch-high (44 mm) snap-locking seams. See Figure 5.

The attributes of the metal roofing panels 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.

3.2 Roof Deck:

Solid or closely fitted decking must be minimum ¹⁵/₃₂-inch-thick (11.9 mm) plywood or lumber sheathing, or non-veneer APA rated minimum ⁷/₁₆-inch-thick (11.1 mm) oriented-strand board (OSB) complying with IBC Section 2304.7.2 or IRC Section R803, or minimum No. 22 gauge [0.030 inch thick (0.76 mm)] steel complying with IBC Section 2210.1.1.2.

3.3 Underlayment and Flashing:

Underlayment must be in accordance with IBC Section 1507.4.5 or IRC Section R905.10.5, as applicable. Where specified in Table 1, the underlayment is Firestone Building Products CLAD-GARD SAFR underlayment (ESR-3979).

Flashing must be in accordance with IBC Section 1503.2 or IRC Section R903.2, as applicable.

3.4 Insulation:

Foam plastic insulation, where used, must have a flame-spread index of not more than 75 in accordance with ASTM E84 or UL 723 when tested at the maximum thickness intended for use. Polyisocyanurate and polystyrene foam plastic insulation must comply with ASTM C1289 and ASTM C578, respectively. See Tables 1 and 2 for insulations used with specific roof systems.

3.5 Panel Clips and Bearing Plates:

Panel clips are fabricated as described below. Dimensional drawings are shown in Figure 6.

- **UC-3 Fixed Clip:** ASTM A653 G90, minimum 24 gauge [0.024 inch thick (0.61 mm)]; or 300 series stainless steel, minimum No. 26 gauge [0.018 inch thick (0.46 mm)].
- **UC-3 Expansion Clip:** 300 series stainless steel, minimum No. 28 gauge [0.016 inch thick (0.41 mm)].
- **UC-3 Super Clip:** ASTM A653 G90 or 300 series stainless steel; G90, minimum No. 22 gauge [0.031 inch thick (0.79 mm)] base with 24 gauge [0.025 (0.64 mm)] tab. Stainless steel, minimum No. 24 gauge [0.024 inch thick (0.61 mm)] base with 26 gauge [0.018 inch thick (0.46 mm)] tab.
- **UC-6 Fixed Clip:** ASTM A653 G90 steel, minimum No. 24 gauge [0.023 inch thick (0.58 mm)].
- **UC-6 Low-Float Clip:** ASTM A653 G90 or 300 series stainless steel; G90, minimum No. 16 gauge [0.058 inch thick (1.47 mm)] base with No. 22 gauge [0.031 inch thick (0.79 mm)] tab. Stainless steel, minimum No. 22 gauge [0.031 inch thick (0.79 mm)] tab.
- **UC-6 Super Clip:** ASTM A653 G90 or 300 series stainless steel; G90, minimum No. 22 gauge [0.031 inch thick (0.79 mm)] base with No. 24 gauge [0.025 inch (0.64 mm)] tab. Stainless steel, minimum No. 24 gauge [0.024 inch thick (0.61 mm)] base with 26 gauge [0.018 inch thick (0.46 mm)] tab.
- **UC-14 Clip:** ASTM A653 G90 or 300 series stainless steel, minimum No. 18 gauge [0.050 inch thick (1.27 mm)].
- **UC Bearing Plate:** ASTM A653 G90 or 300 series stainless steel; minimum No. 20 gauge [0.037 inch thick (0.94 mm)] and No. 22 gauge [0.032 inch thick (0.82 mm)], respectively.

3.6 Fasteners:

- Tru-Fast Corp T-17: No.10-12 by 1-inch self-drilling fasteners with a 0.435-inch-diameter (11 mm) pancake head. Available in galvanized and stainless steel.
- Firestone Drill Point Fasteners: #12-13 self-drilling fasteners with 0.435-inch-diameter (11 mm) pancake head. Firestone Drill Point Fasteners, as specified in the manufacturer's published installation instructions, are made from carbon steel and have a red epoxy coating.

4.0 DESIGN AND INSTALLATION:

4.1 General:

Installation of the UNA-CLAD[®] standing seam metal roof panels must be in accordance with this report, IBC Section 1507.4 or IRC Section R905.10, as applicable, and the manufacturer's published installation instructions. The manufacturer's installation instructions must be available on the jobsite at all times during installation.

The roof panels must be installed on solid or closely fitted decking or steel decking, as specified in Section 3.2, having a minimum roof slope of 3:12 (25 percent). Penetrations and terminations of the panels must be flashed and made weathertight in accordance with the manufacturer's published installation instructions and IBC Section 1503.2 or IRC Section R903.2, as applicable.

4.2 Fire Classification:

The steel, copper, and aluminum roof panels are components of roof assemblies classified as Class A or B roof assemblies in accordance with ASTM E108 or UL 790 when installed as specified in Table 1.

Under the 2012 IBC or 2012 IRC, copper and steel roof panels are considered Class A roof coverings, when installed, without insulation, as described in Section 4.1 of this report on steel roof decks in accordance with Exception 2 to IBC Section 1505.2 and Exception 2 to IRC Section R902.1. The copper roof panels are considered Class A roof coverings, when installed, without insulation, as described in Section 4.1 of this report in accordance with Exception 3 to IBC Section 1505.2 and Exception 3 to IRC Section R902.1.

Under the 2009 IBC or 2009 IRC, copper and steel roof panels are considered Class A roof coverings, when installed as described in Section 4.1 of this report, without insulation, on steel roof decks in accordance with Exception 2 to IBC Section 1505.2 and Exception 2 to IRC Section R902.1.

4.3 Wind Uplift Resistance:

The allowable wind uplift pressures for UNA-CLAD[®] Standing Seam Metal Roof Panels are provided in Table 2.

5.0 CONDITIONS OF USE

The UNA-CLAD[®] standing seam metal roof panels 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 Installation must comply with the applicable code, this report and the manufacturer's published installation instructions. In the event of conflicts between this report and the manufacturer's instructions, this report governs.
- 5.2 The metal panels must be installed only by applicators approved by Firestone Building Products Company, LLC.
- 5.3 Foam plastic insulation must be separated from the interior of the building by an approved thermal barrier in accordance with IBC Section 2603.4.1.5 or IRC Section R316.5.2, as applicable.
- 5.4 Foam plastic insulation, where used, must bear the label of an approved agency indicating that the foam plastic has a flame-spread index of not more than 75 when tested at the maximum thickness intended for use in accordance with ASTM E84 or UL 723, subject to the approval of the code official.
- 5.5 Above-deck thermal insulation must comply with the applicable standard specified in IBC Table 1508.2 or IRC Table R906.2, as applicable.
- 5.6 Design wind uplift pressure on any roof area, including edge and corner zones, must not exceed the allowable wind pressure for the system. Refer to the allowable wind uplift pressure for the metal panels as listed in Table 1.

- 5.7 The allowable wind uplift pressures listed in Table 2 are for the roof covering only. The deck and framing to which the roof covering is attached must be designed for the applicable components and cladding wind loads in accordance with the IBC or IRC, as applicable.
- 5.8 Calculations demonstrating that the required wind resistance is less than the allowable wind resistance must be submitted to the code official.
- 5.9 The panels are manufactured in Anoka, Minnesota, under a quality control program with inspections by ICC-ES.

6.0 EVIDENCE SUBMITTED

Data in accordance with the ICC-ES Acceptance Criteria for Metal Roof Coverings (AC166), dated October 2012 (editorially revised June 2015).

7.0 IDENTIFICATION

The panels are identified with a label bearing the product name, the material type, the manufacturer's name (Firestone Building Products Company, LLC), and the evaluation report number (ESR-3422).



FIGURE 1—UNA-CLAD® UC-3

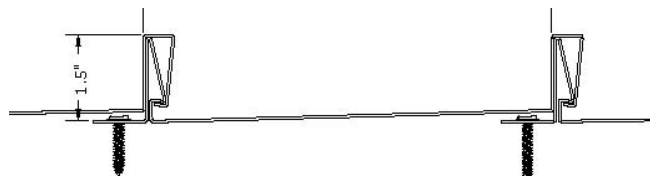


FIGURE 2—UNA-CLAD® UC-4

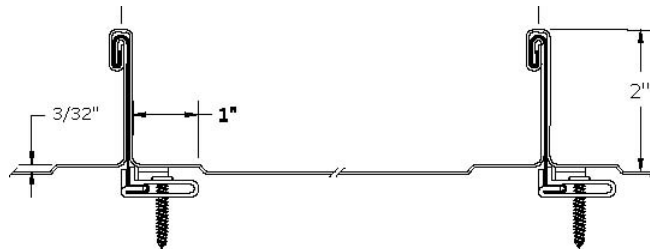


FIGURE 3—UNA-CLAD® UC-6

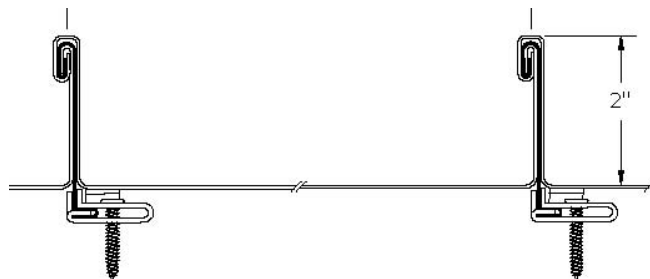


FIGURE 4—UNA-CLAD® UC-6 HD

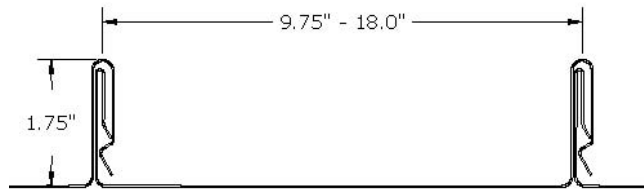


FIGURE 5—UNA-CLAD® UC-14

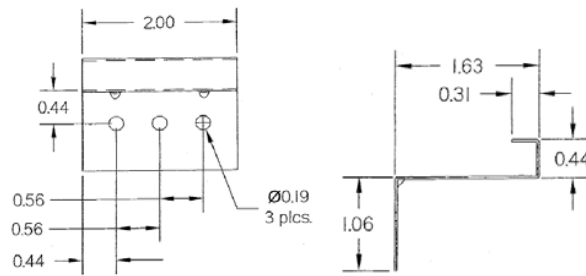


FIGURE 6—UNA-CLAD® UC-3 FIXED CLIP

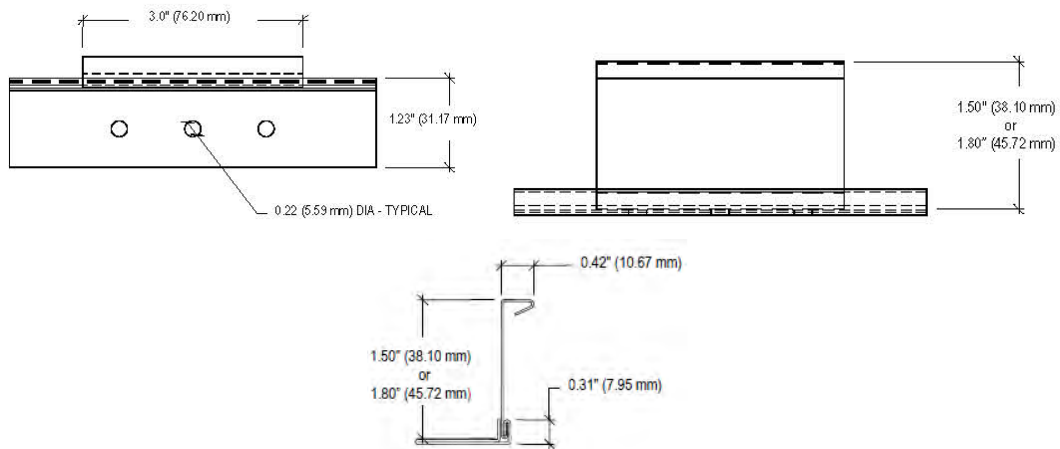


FIGURE 7—UNA-CLAD® UC-3 SUPER CLIP

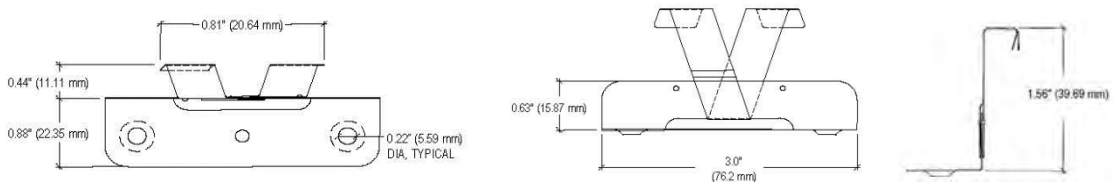


FIGURE 8—UNA-CLAD® UC-3 EXPANSION CLIP

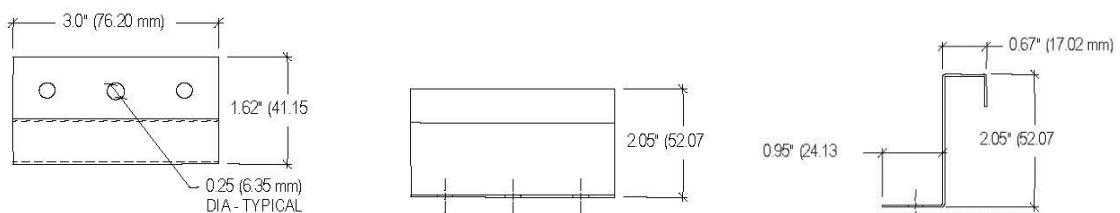


FIGURE 9—UNA-CLAD® UC-6 FIXED CLIP

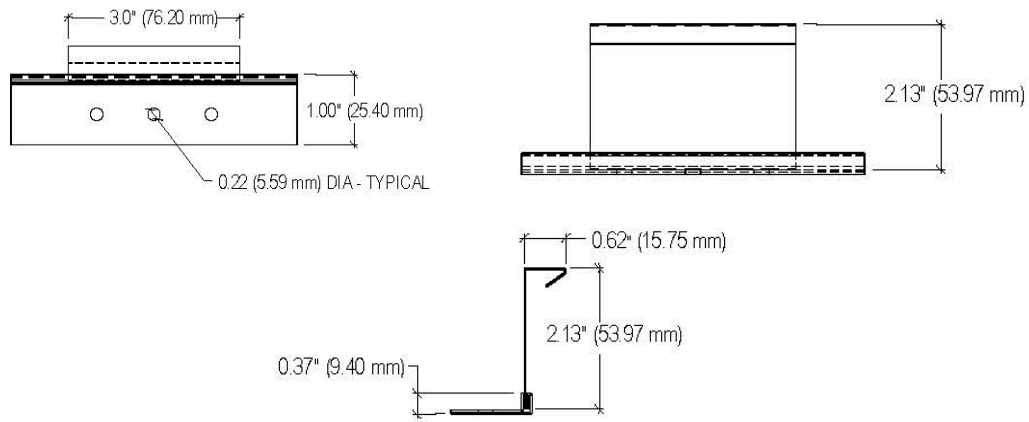


FIGURE 10—UNA-CLAD® UC-6 SUPER CLIP

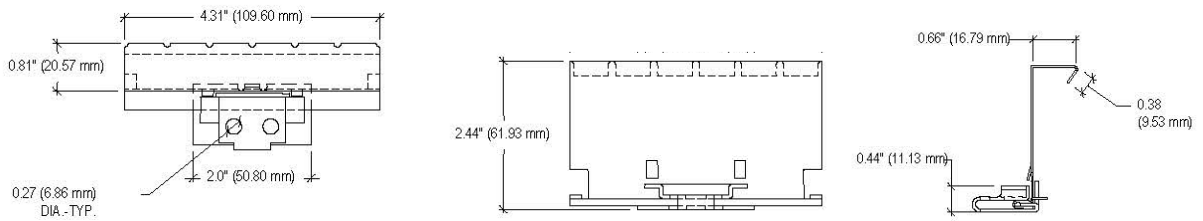


FIGURE 11—UNA-CLAD® UC-6 LOW-FLOAT CLIP

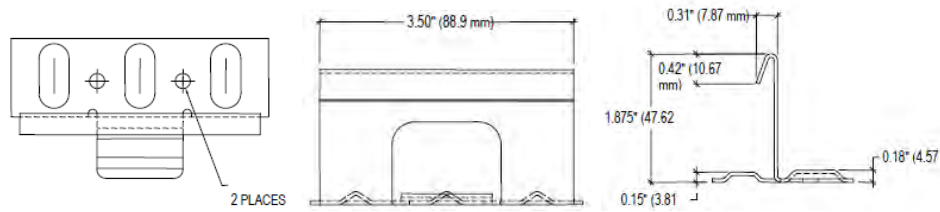


FIGURE 12—UNA-CLAD® UC-14 CLIP

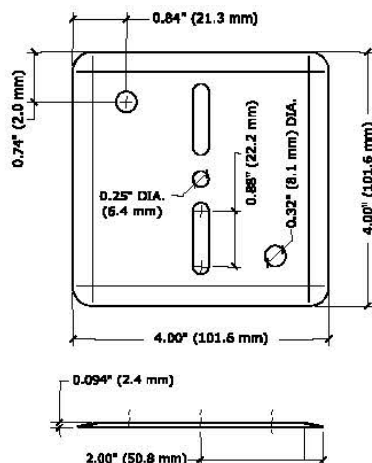


FIGURE 13—UNA-CLAD® UC BEARING PLATE

TABLE 1—FIRE CLASSIFICATION ASSEMBLIES

| SYSTEM NO. | ROOF CLASS | SUBSTRATE ¹ | MAX. ROOF SLOPE | ASSEMBLY DETAIL ^{2,3,4} | |
|------------|------------|------------------------|-----------------|---------------------------------------|--|
| 1 | A | Combustible | Unlimited | Insulation (Optional): | Any thickness Firestone "ISO 95+GL" |
| | | | | Cover Board: | G-P Products "DensDeck [®] ", 1/4 in. thick min, or 1/2 in. thick min UL Classified gypsum board with joints in barrier board offset 6 in. with joints in deck. |
| | | | | Ply Sheet (Optional): | Any UL Classified Type G1, G2 or G3 base/ply sheet, Type 15, 20 or 30 felt or equivalent UL Classified Prepared Roofing Accessory. |
| | | | | Panel: | UC-3, UC-4, UC-6, UC-6 HD, and UC-14 in steel, copper, or aluminum. |
| 2 | A | Combustible | Unlimited | Barrier Board: | G-P Products "DensDeck [®] ", 1/4 in. thick min, or 1/2 in. thick min UL Classified gypsum board with joints in barrier board offset 6 in. with joints in deck. |
| | | | | Insulation (Optional): | Any thickness Firestone "ISO 95+ GL" or "HailGard". |
| | | | | Ply Sheet (Optional): | Any UL Classified Type G1, G2 or G3 base/ply sheet, Type 15, 20 or 30 felt or equivalent UL Classified Prepared Roofing Accessory. |
| | | | | Panel: | UC-3, UC-4, UC-6, UC-6 HD, and UC-14 in steel, copper, or aluminum. |
| 3 | A | Combustible | Unlimited | Barrier Board: | G-P Products "DensDeck [®] ", 1/4 in. thick min, or 1/2 in. thick min UL Classified gypsum board with joints in barrier board offset 6 in. with joints in deck, or minimum one layer Firestone Building Products CLAD-GARD SA-FR Underlayment. |
| | | | | Insulation (Optional): | Any thickness Firestone "ISO 95+ GL" or "HailGard". |
| | | | | Ply Sheet (Optional): | Any UL Classified Type G1, G2 or G3 base/ply sheet, Type 15, 20 or 30 felt or equivalent UL Classified Prepared Roofing Accessory. |
| | | | | Panel: | UC-3, UC-4, UC-6, UC-6 HD, and UC-14 in steel. |
| 4 | A | Combustible | Unlimited | Barrier Board: | G-P Products "DensDeck [®] ", 1/4 in. thick min, or 1/2 in. thick min UL Classified gypsum board with joints in barrier board offset 6 in. with joints in deck, or minimum one layer of Firestone Building Products CLAD-GARD SA-FR Underlayment. |
| | | | | Insulation (Optional): | Any thickness Firestone "ISO 95+ GL" or "HailGard". |
| | | | | Ply Sheet: | Any UL Classified Type G2 or G3 base/ply sheet, Type 30 felt or equivalent UL Classified Prepared Roofing Accessory. |
| | | | | Panel: | UC-3, UC-4, UC-6, UC-6 HD, and UC-14 in copper. |
| 5 | A | Combustible | Unlimited | Underlayment or Barrier Board: | One layer Firestone Building Products CLAD-GARD SA-FR Underlayment self-adhered. |
| | | | | Ply Sheet: | One layer Firestone Building Products CLAD-GARD SA-FR Underlayment self-adhered |
| | | | | Insulation (Optional): | Any thickness Firestone "ISO 95+ GL", "ISOGARD HD" or "HailGard". |
| | | | | Ply Sheet (Optional): | Any UL Classified Type G1, G2 or G3 base/ply sheet, Type 15, 20 or 30 felt or equivalent UL Classified Prepared Roofing Accessory. |
| | | | | Panel: | UC-3, UC-4, UC-6, UC-6 HD, and UC-14 in steel or copper. |
| 6 | A | Combustible | Unlimited | Underlayment or Barrier Board: | Two layers of Firestone Building Products CLADGARD SA-FR Underlayment self-adhered. |
| | | | | Insulation (Optional): | Any thickness Firestone "ISO 95+ GL", "ISOGARD HD" or "HailGard". |
| | | | | Ply Sheet (Optional): | Any UL Classified Type G1, G2 or G3 base/ply sheet, Type 15, 20 or 30 felt or equivalent UL Classified Prepared Roofing Accessory. |
| | | | | Panel: | UC-3, UC-4, UC-6, UC-6 HD, and UC-14 in aluminum. |
| 7 | A | Combustible | Unlimited | Barrier Board: | One or more plies of Firestone Building Products CLAD-GARD SA-FR Underlayment self-adhered. |
| | | | | Insulation (Optional): | Any thickness Firestone "ISO 95+ GL", "ISOGARD HD" or "HailGard". |
| | | | | Ply Sheet (Optional): | Any UL Classified Type G1, G2 or G3 base/ply sheet, Type 15, 20 or 30 felt or equivalent UL Classified Prepared Roofing Accessory. |
| | | | | Panel: | UC-3, UC-4, UC-6, UC-6 HD, and UC-14 in steel. |
| 8 | A | Combustible | Unlimited | Barrier Board: | One or more plies of Firestone Building Products CLAD-GARD SA-FR Underlayment self-adhered. |
| | | | | Insulation (Optional): | Any thickness Firestone "ISO 95+ GL", "ISOGARD HD" or "HailGard". |
| | | | | Ply Sheet: | Any UL Classified Type G2 or G3 base/ply sheet, Type 30 felt or equivalent UL Classified Prepared Roofing Accessory. |
| | | | | Panel: | UC-3, UC-4, UC-6, UC-6 HD, and UC-14 in copper. |
| 9 | A | Combustible | Unlimited | Barrier Board: | One or more plies of Firestone Building Products CLAD-GARD SA-FR Underlayment self-adhered. |
| | | | | Insulation (Optional): | Any thickness Firestone "ISO 95+ GL", "ISOGARD HD" or "HailGard". |
| | | | | Ply Sheet (Optional): | Any UL Classified Type G1, G2 or G3 base/ply sheet, Type 15, 20 or 30 felt or equivalent UL Classified Prepared Roofing Accessory. |
| | | | | Panel: | UC-3, UC-4, UC-6, UC-6 HD, and UC-14 in steel, fastened to 2x2 wood battens. |

TABLE 1—FIRE CLASSIFICATION ASSEMBLIES (Continued)

| SYSTEM NO. | ROOF CLASS | SUBSTRATE ¹ | MAX. ROOF SLOPE | ASSEMBLY DETAIL ^{2,3,4} | |
|------------|------------|------------------------|-----------------|--------------------------------------|---|
| 10 | A | Combustible | Unlimited | Insulation (Optional): | Firestone "ISO 95+ GL." |
| | | | | Barrier Board or Cover Board: | G-P Products "DensDeck" [®] , 1/4 in. thick min, or 1/2 in. thick min UL Classified gypsum board with joints in barrier board offset 6 in. with joints in deck, or minimum one layer Firestone Building Products CLAD-GARD SAFR Underlayment. |
| | | | | Panel: | UC-3, UC-4, UC-6, UC-6 HD, and UC-14 in steel. |
| 11 | A | Combustible | Unlimited | Insulation (Optional): | Firestone "ISO 95+ GL." |
| | | | | Barrier Board or Cover Board: | G-P Products "DensDeck" [®] , 1/4 in. thick min, or 1/2 in. thick min UL Classified gypsum board with joints in barrier board offset 6 in. with joints in deck or minimum one layer Firestone Building Products CLAD-GARD SAFR Underlayment and one layer of any UL Classified Type 30 felt or Type G2 base/ply sheet. |
| | | | | Panel: | UC-3, UC-4, UC-6, UC-6 HD, and UC-14 in copper. |
| 12 | A | Combustible | Unlimited | Insulation (Optional): | Firestone "ISO 95+ GL." |
| | | | | Barrier Board or Cover Board: | G-P Products "DensDeck" [®] , 1/4 in. thick min, or 1/2 in. thick min UL Classified gypsum board with joints in barrier board offset 6 in. with joints in deck, or minimum two layers Firestone Building Products CLAD-GARD SA-FR Underlayment. |
| | | | | Panel: | UC-3, UC-4, UC-6, UC-6 HD, and UC-14 in aluminum. |
| 13 | A | Combustible | Unlimited | Insulation (Optional): | Firestone "ISO 95+GL", "ISOGARD HD" or "HailGard". |
| | | | | Barrier Board or Cover Board: | One layer Firestone Building Products CLAD-GARD SA-FR Underlayment self-adhered. |
| | | | | Ply Sheet (Optional): | One layer Type 30 base sheet or one layer Firestone Building Products CLAD-GARD SA-FR Underlayment self-adhered. |
| | | | | Panel: | UC-3, UC-4, UC-6, UC-6 HD, and UC-14 in steel. |
| 14 | A | Combustible | Unlimited | Insulation (Optional): | Firestone "ISO 95+GL", "ISOGARD HD" or "HailGard". |
| | | | | Barrier Board or Cover Board: | One layer Firestone Building Products CLAD-GARD SA-FR Underlayment self-adhered |
| | | | | Ply Sheet: | One layer Type 30 base sheet or one layer Firestone Building Products CLAD-GARD SAFR Underlayment self-adhered. |
| | | | | Panel: | UC-3, UC-4, UC-6, UC-6 HD, and UC-14 in copper. |
| 15 | A | Combustible | Unlimited | Insulation (Optional): | Firestone "ISO 95+GL", "ISOGARD HD" or "HailGard". |
| | | | | Underlayment or Cover Board: | Two or more layers Firestone Building Products CLAD-GARD SAFR Underlayment. |
| | | | | Panel: | UC-3, UC-4, UC-6, UC-6 HD, and UC-14 in aluminum. |
| 16 | A | Combustible | Unlimited | Insulation (Optional): | Any thickness Firestone "ISO 95+GL", "ISOGARD HD" or "HailGard". |
| | | | | Underlayment or Cover Board: | One or more plies of Firestone Building Products CLAD-GARD SA-FR Underlayment self-adhered. |
| | | | | Panel: | UC-3, UC-4, UC-6, UC-6 HD, and UC-14 in steel. |
| 17 | A | Combustible | Unlimited | Insulation (Optional): | Any thickness Firestone "ISO 95+GL", "ISOGARD HD" or "HailGard". |
| | | | | Underlayment or Cover Board: | Two or more plies of Firestone Building Products CLAD-GARD SAFR Underlayment self-adhered. |
| | | | | Panel: | UC-3, UC-4, UC-6, UC-6 HD, and UC-14 in copper. |
| 18 | A | Combustible | Unlimited | Insulation (Optional): | Firestone "ISO 95+GL", "ISOGARD HD" or "HailGard". |
| | | | | Underlayment or Cover Board: | One or more layers of Firestone Building Products CLAD-GARD SA-FR Underlayment self-adhered. |
| | | | | Panel: | UC-3, UC-4, UC-6, UC-6 HD, and UC-14 in steel, fastened to 2x2 wood battens. |
| 19 | A | Noncombustible | Unlimited | Insulation (Optional): | Any thickness Firestone "ISO 95+GL", Resista, Firestone HailGard, Any UL Classified insulation any thickness. |
| | | | | Cover Board (Optional): | Firestone ISOGARD HD, G-P Products "DensDeck" [®] , 1/4 in. thick min, 7/16 inch OSB, 1/2 in. high density wood fiber board or 15/32 in. plywood. |
| | | | | Ply Sheet: | Firestone Clad Gard SA-N, Clad-Gard SA-S, Clad Gard R, CLAD-GARD SA FR or Clad-Gard MA (not UL Classified). |
| | | | | Panel: | UC-3, UC-4, UC-6, UC-6 HD, and UC-14 in steel, copper, or aluminum. |
| 20 | B | Combustible | Unlimited | Underlayment: | One layer of Firestone Building Products CLAD-GARD SAFR Underlayment self-adhered. |
| | | | | Panel: | UC-3, UC-4, UC-6, UC-6 HD, and UC-14 in steel, copper, or aluminum. |

For SI: 1 inch = 25.4 mm.

¹Wood deck must be a minimum of 15/32-inch-thick (11.9 mm) plywood or non-veneer APA-rated 7/16-inch-thick (11.1 mm) oriented-strand board (OSB). Steel deck must be a minimum of No. 22 gauge galvanized steel [0.030 inch (0.76 mm)].

²All foam plastic insulation must be UL-classified foam plastic for roofing systems, and must be limited to the maximum thickness noted.

³Barrier or cover boards, ply sheets, underlayments, and panels must be UL-classified for roofing systems.

⁴Firestone Building Products CLAD-GARD SA-FR underlayment is recognized in ICC-ES evaluation report ESR-3979.

TABLE 2—WIND RESISTANCE ASSEMBLIES

| System No. | Deck ¹ | Insulation ² | Barrier or Cover Board ⁶ | Under-layment | Panel | | Allowable Uplift Pressure (psf) |
|------------|-------------------|-------------------------|-------------------------------------|---------------|--|--|---------------------------------|
| | | | | | Type | Attachment ^{3, 4, 5} | |
| W-1 | Plywood or OSB | Optional | Optional | Section 3.3 | Minimum 24 ga. steel UC-3 with 1½-inch seam (max. 16-inch wide) | UC-3 Super Clip at 36 inches o.c. attached with (2) #10-12 x 1½-inch Pancake Head screws | 30 |
| W-2 | Plywood or OSB | Optional | Optional | Section 3.3 | Minimum 24 ga. steel UC-3 with 1½-inch seam (max. 16-inch wide) | UC-3 Super Clip at 30 inches o.c. attached with (2) #10-12 x 1½-inch Pancake Head screws | 67.5 |
| W-3 | Plywood or OSB | Optional | Optional | Section 3.3 | Minimum 24 ga. steel UC-3 with 1½-inch seam (max. 16-inch wide) | UC-3 Expansion Clip SS at 24 inches o.c. attached with (2) #10-12 x 1.5 inch Pancake Head screws | 75 |
| W-4 | Plywood | Optional | Optional | Section 3.3 | Minimum 24 gauge steel UC-3 with 1½-inch seam (max. 16-inch wide) | UC-3 Expansion Clips at 18 inches o.c. attached with (2) #10-12 x 1-inch Pancake Head wood screws | 79 |
| W-5 | Plywood | Optional | Optional | Section 3.3 | Minimum 24 gauge steel UC-3 with 1½-inch seam (max. 16-inch wide) | UC-3 Expansion Clips at 12 inches o.c. attached with (2) #10-12 x 1-inch Pancake Head screws | 86 |
| W-6 | Plywood | Optional | Optional | Section 3.3 | Minimum 24 gauge steel UC-3 with 1½-inch seam (max. 16-inch wide) | UC-3 Expansion Clips at 8 inches o.c. attached with (2) #10-12 x 1-inch Pancake Head wood screws | 101 |
| W-7 | Plywood | Optional | Optional | Section 3.3 | Minimum 24 gauge steel UC-3 with 1½-inch seam (max. 16-inch wide) | UC-3 Super Clips at 6 inches o.c. attached with (2) #10-12 x 1½-inch Pancake Head screws | 129 |
| W-8 | Plywood or OSB | Optional | Optional | Section 3.3 | Minimum 0.032 Aluminum UC-3 1½-inch seams (max. 16-inch wide) | UC-3 Expansion Clip SS at 24 inches o.c. attached with (2) #10-12 x 1½-inch Pancake Head screws | 45 |
| W-9 | Plywood or OSB | Optional | Optional | Section 3.3 | Minimum 0.032 Aluminum UC-3 with 1½-inch seams (max. 16-inch wide) | UC-3 Super Clip at 24 inches o.c. attached with (2) #10-12 x 1½-inch Pancake Head screws | 52.5 |
| W-10 | Plywood or OSB | Optional | Optional | Section 3.3 | Minimum 0.032 Aluminum UC-3 with 1½-inch seams (max. 16-inch wide) | UC-3 Expansion Clip SS at 18 inches o.c. attached with (2) #10-12 x 1½-inch Pancake Head screws | 75 |
| W-11 | Plywood | Optional | Optional | Section 3.3 | Minimum 0.032 Aluminum UC-3 with 1½-inch seam (max. 20-inch wide) | UC-3 Super Clips at 18 inches o.c. attached with (2) #10-12 x 1½-inch Pancake Head wood screws | 111 |
| W-12 | Plywood | Optional | Optional | Section 3.3 | Minimum 0.032 Aluminum UC-3 with 1½-inch seam (max. 20-inch wide) | UC-3 Super Clips at 12-inches o.c. attached with (2) #10-12 x 1½-inch Pancake Head wood screws | 129 |
| W-13 | Plywood | Optional | Optional | Section 3.3 | Minimum 16 oz. Copper UC-3 with 1½-inch seam (max. 20-inch wide) | UC-3 Super Clips at 12-inches o.c. attached with (2) #10-12 x 1½-inch Pancake Head wood screws | 77 |
| W-14 | 5/8-inch Plywood | Optional | Optional | Section 3.3 | Minimum 26 gauge steel UC-4 (max. 9¾-inch wide) | (2) #10-12 x 1-inch PH wood screws with washers at 12-inch o.c. | 53 |
| W-15 | 5/8-inch Plywood | Optional | Optional | Section 3.3 | Minimum 24 gauge steel UC-4 (max. 18-inch wide) | (2) #10-12 x 1-inch PH wood screws with washers at 18 inch o.c. | 53 |
| W-16 | Plywood | Optional | Optional | Section 3.3 | Minimum 0.032 Aluminum UC-4 (max. 9¾-inch wide) | (2) #10-12 x 1-inch Pancake Head wood screws at 12 inch o.c. | 109 |
| W-17 | Plywood or OSB | Optional | Optional | Section 3.3 | Minimum 24 ga. steel UC-4 (max. 18-inch wide) | Two (2) #10-12 x 1½-inch Pancake Head screws with nylon washers spaced 1-inch, fastened 30 inches o.c. along each nail strip | 45 |

TABLE 2—WIND RESISTANCE ASSEMBLIES (Continued)

| System No. | Deck ¹ | Insulation ² | Barrier or Cover Board ⁶ | Under-layment | Panel | | Allowable Uplift Pressure (psf) |
|------------|-------------------|-------------------------|-------------------------------------|---------------|---|---|---------------------------------|
| | | | | | Type | Attachment ^{3, 4, 5} | |
| W-18 | Plywood or OSB | Optional | Optional | Section 3.3 | Minimum 24 ga. steel UC-4 (max. 18-inch wide) | Two (2) #10-12 x 1 1/2-inch Pancake Head screws with nylon washers spaced 1-inch, fastened 24 inches o.c. along each nail strip | 75 |
| W-19 | Plywood or OSB | Optional | Optional | Section 3.3 | Minimum 24 ga. steel UC-4 (max. 18-inch wide) | Two (2) #10-12 x 1 1/2-inch Pancake Head screws with nylon washers spaced 1-inch, fastened 18 inches o.c. along each nail strip | 90 |
| W-20 | Plywood or OSB | Optional | Optional | Section 3.3 | Minimum 0.032 Aluminum UC-4 (max. 18-inch wide) | Two (2) #10-12 x 1 1/2-inch Pancake Head screws with nylon washers spaced 1-inch, fastened 24 inches o.c. along each nail strip | 45 |
| W-21 | Plywood or OSB | Optional | Optional | Section 3.3 | Minimum 0.032 Aluminum UC-4 (max. 18-inch wide) | Two (2) #10-12 x 1 1/2-inch Pancake Head screws with nylon washers spaced 1-inch, fastened 12 inches o.c. along each nail strip | 52.5 |
| W-22 | Plywood or OSB | Optional | Optional | Section 3.3 | Minimum 0.032 Aluminum UC-4 (max. 18-inch wide) | Two (2) #10-12 x 1 1/2-inch Pancake Head screws with nylon washers spaced 1-inch, fastened 18 inches o.c. along each nail strip | 67.5 |
| W-23 | 3/4-inch Plywood | Optional | Optional | Section 3.3 | Minimum 16 oz. Copper UC-4 (max. 14-inch wide) | #10-12 x 1-inch PH wood screws at 9 inch o.c. | 53 |
| W-24 | OSB | Optional | Optional | Section 3.3 | Minimum 24 gauge steel UC-6 or UC-6 HD (max. 18-inch wide) | UC-6 Clip at 30 inches o.c. attached with (2) #12-12 x 2-inch Pancake Head wood screws | 53 |
| W-25 | OSB | Optional | Optional | Section 3.3 | Minimum 24 ga. steel UC-6 with 1 1/2-inch seam (max. 18-inch wide) | UC-6 Low-Float clip at 30 inches o.c. attached with two (2) #10-12 x 1 1/2-inch Pancake Head wood screws | 41.5 |
| W-26 | OSB | Optional | Optional | Section 3.3 | Minimum 24 ga. steel UC-6 (max. 18-inch wide) | UC-6 Low Float Clip at 24 inches o.c. attached with (2) #10-12 x 1 1/2-inch Pancake Head screws | 60 |
| W-27 | 5/8-inch Plywood | Optional | Optional | Section 3.3 | Minimum 0.032 Aluminum UC-6 or UC-6 HD (max. 18-inch wide) | UC-6 Clip at 30 inches o.c. attached with (2) #12-12 x 2-inch Pancake Head wood screws | 53 |
| W-28 | Plywood or OSB | Optional | Optional | Section 3.3 | Minimum 0.032 Aluminum UC-6 (max. 18-inch wide) | UC-6 Low Float Clip at 24 inches o.c. attached with (2) #10-12 x 1 1/2-inch Pancake Head screws | 52.5 |
| W-29 | Plywood or OSB | Optional | Optional | Section 3.3 | Minimum 0.032" Aluminum UC-6 with 1 1/2-inch seam (max. 18-inch wide) | UC-6 Low-Float clip at 30 inches o.c. attached with two (2) #10-12 x 1 1/2-inch Pancake Head wood screws | 30 |
| W-30 | Plywood or OSB | Optional | Optional | Section 3.3 | Minimum 0.032 Aluminum UC-6 with 1 1/2-inch seam (max. 18-inch wide) | UC-6 Low Float Clip at 30 inches o.c. attached with (2) #10-12 x 1 1/2-inch Pancake Head screws | 45 |
| W-31 | Plywood or OSB | Optional | Optional | Section 3.3 | Minimum 24 ga. steel UC-14 (max. 18-inch wide) | UC-14 Clip at 24 inches o.c. attached with (2) #10-12 x 1 1/2-inch Pancake Head screws | 67.5 |

TABLE 2—WIND RESISTANCE ASSEMBLIES (Continued)

| System No. | Deck ¹ | Insulation ² | Barrier or Cover Board ⁶ | Under-layment | Panel | | Allowable Uplift Pressure (psf) |
|------------|-------------------|-------------------------|--|---------------|--|---|---------------------------------|
| | | | | | Type | Attachment ^{3, 4, 5} | |
| W-32 | 5/8-inch Plywood | Optional | Optional | Section 3.3 | Minimum 24 gauge Steel UC-14 (max. 16-inch wide) | UC-14 Clip at 12 inches o.c. attached with (2) #10-12 x 1-inch Pancake Head wood screws | 79 |
| W-33 | 5/8-inch Plywood | Optional | Optional | Section 3.3 | Minimum 24 gauge Steel UC-14 (max. 16-inch wide) | UC-14 Clip at 6 inches o.c. attached with (2) #10-12 x 1-inch Pancake Head wood screws | 100 |
| W-34 | Plywood or OSB | Optional | Optional | Section 3.3 | Minimum 0.032 Aluminum UC-14 (max. 18-inch wide) | UC-14 Clip at 18 inches o.c. attached with (2) #10-12 x 1 1/2-inch Pancake Head screws | 52.5 |
| W-35 | 5/8-inch Plywood | Optional | Optional | Section 3.3 | Minimum 0.032 Aluminum UC-14 (max. 16-inch wide) | UC-14 Clip at 12 inches o.c. attached with (2) #10-12 x 1-inch Pancake Head wood screws | 74 |
| W-36 | 5/8-inch Plywood | Optional | Optional | Section 3.3 | Minimum 0.032 Aluminum UC-14 (max. 16-inch wide) | UC-14 Clip at 6 inches o.c. attached with (2) #10-12 x 1-inch Pancake Head wood screws | 86 |
| S-1 | Steel | Optional | Optional | Section 3.3 | Minimum 24 gauge steel UC-3 with 1 1/2-inch seam (max. 16-inch wide) | UC-3 Super Clip with (2) #12-13 PH screws at 30-inch o.c. | 53 |
| S-2 | Steel | Optional | Optional | Section 3.3 | Minimum 24 gauge steel UC-3 with 1 1/2-inch seam (max. 16-inch wide) | UC-3 Expansion Clip with (2) #12-13 PH screws at 24-inch o.c. | 53 |
| S-3 | Steel | Optional | 1/16-inch-thick OSB installed with Firestone HD HailGuard Fasteners at a rate of 24 per 4 ft x 8 ft board | Section 3.3 | Minimum 24 gauge UC-3 with 1 1/2-inch seam (max. 20-inch wide) | UC-3 Expansion Clip at 12 inches o.c. attached to the cover board with (2) Firestone UNA-CLAD #10 fasteners | 53 |
| S-4 | Steel | Optional | Optional | Section 3.3 | Minimum 24 gauge steel UC-3 with 1 1/2-inch seam (max. 20-inch wide) | UC-3 Expansion Clip at 12 inches o.c. attached with (2) Firestone UNA-CLAD #12 Drill Point Fasteners. Firestone Bearing Plates are placed under each clip prior to installing the screws. | 53 |
| S-5 | Steel | Optional | 1/16-inch-thick OSB installed with Firestone All-Purpose Fasteners and Insulation Fastening Plates at rate of 16 per 4 ft x 8 ft board | Section 3.3 | Minimum 24 gauge steel UC-3 with 1 1/2-inch seam (max. 20-inch wide) | UC-3 Expansion Clip at 12 inches o.c. attached with (2) Firestone UNA-CLAD #10-12 x 1-inch screws secured to cover board. | 60 |
| S-6 | Steel | Optional | Optional | Section 3.3 | Minimum 24 gauge steel UC-3 with 1 1/2-inch seam (max. 16-inch wide) | UC-3 Super Clips at 12 inches o.c. attached with (2) #12-13 Pancake Head SMS screws | 81 |
| S-7 | Steel | Optional | 1-1/2" HailGuard Composite Board installed with HailGuard Fasteners at a rate of 8 per 4 ft x 8 ft board | Section 3.3 | Minimum 0.032 Aluminum UC-3 with 1 1/2-inch seam (max 16-inch wide) | UC-3 Super Clip at 24 inches o.c. attached with (2) #10-12 x 1 1/2-inch Pancake Head screws | 45 |
| S-8 | Steel | Optional | 1-1/2" HailGuard Composite Board installed with HailGuard Fasteners at a rate of 8 per 4 ft x 8 ft board | Section 3.3 | Minimum 0.032 Aluminum UC-3 with 1 1/2-inch seam (max 16-inch wide) | UC-3 Expansion Clip SS at 18 inches o.c. attached with (2) #10-12 x 1 1/2-inch Pancake Head screws | 52.5 |
| S-9 | Steel | Optional | 1/16-inch-thick OSB installed with HD HailGuard Fasteners at rate of 24 per 4 ft x 8 ft board | Section 3.3 | Minimum 0.032 Aluminum UC-3 with 1 1/2-inch seam (max. 20-inch wide) | UC-3 Expansion Clips at 12 inches o.c. attached with (2) #10-12 x 1-inch Pancake Head screws secured to cover board | 53 |

TABLE 2—WIND RESISTANCE ASSEMBLIES (Continued)

| System No. | Deck ¹ | Insulation ² | Barrier or Cover Board ⁶ | Under-layment | Panel | | Allowable Uplift Pressure (psf) |
|------------|-------------------|-------------------------|--|---------------|--|---|---------------------------------|
| | | | | | Type | Attachment ^{3, 4, 5} | |
| S-10 | Steel | Optional | Optional | Section 3.3 | Minimum 0.032 Aluminum UC-3 with 1 1/2-inch seam (max. 20-inch wide) | UC-3 Expansion Clip with (2) #12-13 PH screws at 12 inches o.c. | 53 |
| S-11 | Steel | Optional | 1-1/2" HailGard Composite Board installed with HailGard Fasteners at a rate of 12 per 4 ft x 8 ft board | Section 3.3 | Minimum 0.032 Aluminum UC-3 with 1 1/2-inch seam (max 16-inch wide) | UC-3 Expansion Clip SS at 18 inches o.c. attached with (2) #10-12 x 1 1/2-inch Pancake Head screws | 67.5 |
| S-12 | Steel | Optional | Optional | Section 3.3 | Minimum 0.040 Aluminum UC-3 with 1 1/2-inch seam (max. 12-inch wide) | UC-3 Super Clip at 18 inches o.c. attached with (2) #12-13 Pancake Head screws | 134 |
| S-13 | Steel | Optional | Optional | Section 3.3 | Minimum 0.040 Aluminum UC-3 with 1 1/2-inch seam (max. 12-inch wide) | UC-3 Super Clip at 12 inches o.c. attached with (2) #12-13 Pancake Head screws | 150 |
| S-14 | Steel | Optional | Optional | Section 3.3 | Minimum 16 oz. Copper UC-3 with 1 1/2-inch seam (max. 20-inch wide) | UC-3 Super Clip at 8 inches o.c. attached with (2) #12-13 Pancake Head screws | 84 |
| S-15 | Steel | Optional | 1/16-inch-thick OSB installed with Firestone All-Purpose Fasteners and Insulation Fastening Plates at rate of 16 per 4 ft x 8 ft board | Section 3.3 | Minimum 24 gauge steel UC-4 (max. 9 3/4-inch wide) | (2) Firestone UNA-CLAD #10-12 Fasteners with washers at 12 inches o.c. secured to cover board | 53 |
| S-16 | Steel | Optional | Optional | Section 3.3 | Minimum 24 gauge steel UC-4 (max. 18-inch wide) | (2) #12-15 PH screws with washers at 18 inches o.c. | 53 |
| S-17 | Steel | Optional | Optional | Section 3.3 | Minimum 24 gauge steel UC-4 (max. 9 3/4-inch wide) | (2) Firestone UNA-CLAD #12 Drill Point Fasteners with washers at 12 inches o.c. Firestone Bearing Plates are placed under the metal panels at each bearing attachment point prior to installing the screws. | 83 |
| S-18 | Steel | Optional | Optional | Section 3.3 | Minimum 0.040 Aluminum UC-4 (max. 18-inch wide) | (2) #12-15 PH screws with washers at 18 inches o.c. | 53 |
| S-19 | Steel | Optional | 1/16-inch-thick OSB installed with Firestone All-Purpose Fasteners and Insulation Fastening Plates at rate of 16 per 4 ft x 8 ft board | Section 3.3 | Minimum 24 gauge UC-6 (max. 18-inch wide) | UC-6 Super Clip at 12 inches o.c. attached with (2) Firestone UNA-CLAD #10-12 x 1-inch fasteners to cover board | 45 |
| S-20 | Steel | Optional | N/A | Section 3.3 | Minimum 24 gauge steel UC-6 or UC-6 HD (max. 18-inch wide) | UC-6 Low Float Clip or UC-6 Super Clip with (2) #14-13 Pancake Head screws at 30-inch o.c. Firestone Bearing Plates are placed under each clip prior to installing the screws. | 53 |
| S-21 | Steel | Optional | Optional | Section 3.3 | Minimum 24 gauge steel UC-6 or UC-6 HD (max. 18-inch wide) | UC-6 Low Float Clip or UC-6 Super Clip at 30-inches o.c. attached with (2) #14 Pancake Head screws. Firestone Bearing Plates are placed under each clip prior to installing the screws. | 53 |

TABLE 2—WIND RESISTANCE ASSEMBLIES (Continued)

| System No. | Deck ¹ | Insulation ² | Barrier or Cover Board ⁶ | Under-layment | Panel | | Allowable Uplift Pressure (psf) |
|------------|-------------------|-------------------------|--|---------------|--|---|---------------------------------|
| | | | | | Type | Attachment ^{3, 4, 5} | |
| S-22 | Steel | Optional | Optional | Section 3.3 | Minimum 24 gauge steel UC-6 (max. 18-inch wide) | UC-6 Super Clip at 12-inches o.c. attached with (2) Firestone UNA-CLAD #12 Drill Point Fasteners. Firestone Bearing Plates are placed under each clip prior to installing the screws. | 68 |
| S-23 | Steel | Optional | 1 1/2" HailGard Composite Board installed with HailGard Fasteners at a rate of 8 per 4 ft x 8 ft board | Section 3.3 | Minimum 0.032" Aluminum UC-6 (max 18" wide) | UC-6 Low Float Clip at 24-inches o.c. attached with two (2) #10-12 x 1 1/2-inch Pancake Head screws to the cover board | 45 |
| S-24 | Steel | Optional | 7/16-inch-thick OSB installed with Firestone HD HailGard Fasteners at rate of 24 per 4-ft x 8-ft board | Section 3.3 | Minimum 0.032 Aluminum UC-6 or UC-6 HD (max. 18-inch wide) | UC-6 Low Float Clip or UC-6 Super Clip at 24-inches o.c. attached with (2) #10-12 x 1-inch Pancake Head screws to the cover board | 53 |
| S-25 | Steel | Optional | 1 1/2" HailGard Composite Board installed with HailGard Fasteners at a rate of 8 per 4 ft x 8 ft board | Section 3.3 | Minimum 0.032" Aluminum UC-6 (max. 18-inch wide) | UC-6 Low Float Clip at 18-inches o.c. attached with two (2) #10-12 x 1 1/2-inch Pancake Head screws to the cover board | 52.5 |
| S-26 | Steel | Optional | 1 1/2" HailGard Composite Board installed with HailGard Fasteners at a rate of 8 per 4 ft x 8 ft board | Section 3.3 | Minimum 24 gauge steel UC-14 (max. 18" wide) | UC-14 Clip with (2) #10-12 x 1 1/2-inch PH screws at 18-inch o.c. secured to cover board | 52.5 |
| S-27 | Steel | Optional | 7/16-inch-thick OSB installed with Firestone HD HailGard Fasteners at rate of 24 per 4-ft x 8-ft board | Section 3.3 | Minimum 24 gauge steel UC-14 (max. 18-inch wide) | UC-14 Clips with (2) #10-12 x 1-inch PH screws at 36-inch o.c. secured to cover board | 53 |
| S-28 | Steel | Optional | 7/16-inch-thick OSB installed with Firestone HD HailGard Fasteners at rate of 24 per 4-ft x 8-ft board | Section 3.3 | Minimum 0.032 Aluminum UC-14 (max. 16-inch wide) | UC-14 Clips with (2) #10-12 x 1-inch PH screws at 18-inch o.c. secured to cover board | 53 |
| S-29 | Steel | Optional | Optional | Section 3.3 | Minimum 0.032 Aluminum UC-14 (max. 18-inch wide) | UC-14 Clips at 18-inches o.c. attached with (2) #12-13 Pancake Head screws. Firestone Bearing Plates are placed under each clip prior to installing the screws | 53 |

For SI: 1 inch = 25.4 mm; 1 ft = 0.305 m; 1 psf = 47.88 Pa.

¹Wood deck must be a minimum 15/32-inch-thick (11.9 mm) plywood or non-veneer APA-rated minimum 7/16-inch-thick (11.1 mm) oriented-strand board (OSB), unless otherwise noted in this report. Steel deck must be a minimum No. 22 gauge galvanized steel [0.030 inch (0.76 mm)].

²All foam plastic insulation must be limited to lesser of 10-inch maximum thickness or the maximum thickness for which the flame spread index (in accordance with ASTM E84 or UL 723) is no greater than 75.

³All installations over foam plastic insulation require use of UC Bearing Plate.

⁴Fastener spacing is the maximum allowable for the rated pressure.

⁵Minimum penetration through the deck for fasteners is 1 inch for wood decks and 3/4 inch for steel decks.

⁶Optional barrier board to be minimum 7/16 inch-thick OSB installed with HD Hailgard Fasteners at a rate of 24 per 4 ft x 8 ft board, where applicable.