

# ICC-ES Evaluation Report

**ESR-3185**

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**DIVISION: 07 00 00—THERMAL AND MOISTURE  
PROTECTION**
**Section: 07 53 23—Ethylene-Propylene-Diene-Monomer  
Roofing**
**Section: 07 54 19—Polyvinyl-Chloride Roofing**
**Section: 07 54 23—Thermoplastic-Polyolefin Roofing**
**REPORT HOLDER:**

2001 COMPANY, INC., dba KELLY COMPANY-2001 INC.  
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**EVALUATION SUBJECT:**

2001 COMPANY INC. EPDM, PVC AND TPO SINGLE-PLY  
ROOFING MEMBRANES

**1.0 EVALUATION SCOPE**
**Compliance with the following codes:**

- 2006 *International Building Code*® (IBC)
- 2006 *International Residential Code*® (IRC)
- Other Codes (see Section 8.0)

**Properties evaluated:**

- Weather resistance
- Roof covering fire classification
- Wind uplift resistance
- Impact resistance

**2.0 USES**

2001 Company Inc. ethylene propylene diene monomer (EPDM), polyvinyl chloride (PVC) and thermoplastic polyolefin (TPO) single-ply roofing membranes are used as roof coverings in adhered and mechanically fastened membrane roofing systems.

**3.0 DESCRIPTION**
**3.1 General:**

The EPDM, PVC and TPO Membrane Roofing Systems described in this report consist of single-ply roofing membranes, insulation where used, barrier board or slip sheet where used, flashing, mechanical fasteners and adhesives that are installed on a combustible or noncombustible deck.

**3.2 EPDM Membranes:**

**3.2.1 C-EPDM:** C-EPDM is a black, nonreinforced EPDM membrane available in 45-, 60- and 90-mil (1.14, 1.52, and 2.29 mm) thicknesses.

**3.2.2 C-EPDM-C TYPE 1:** C-EPDM-C TYPE 1 is a black, nonreinforced EPDM membrane with fire retardants, available in 45-, 60- and 90-mil (1.14, 1.52, and 2.29 mm) thicknesses.

**3.2.3 C-EPDM-WHITE:** C-EPDM-WHITE is a white, nonreinforced EPDM membrane available in a 60- and 90-mil (1.52 and 2.29 mm) thickness.

**3.2.4 C-EPDM-C TYPE 2:** C-EPDM TYPE 2 is a black, reinforced membrane consisting of a polyester reinforcement encapsulated between two EPDM membrane plies. It is available in 45- to 75-mil (1.14 to 1.90 mm) thicknesses.

**3.2.5 C-EPDM-C REINFORCED:** C-EPDM-C REINFORCED is a black, reinforced membrane consisting of a polyester reinforcement encapsulated between two EPDM membrane plies with fire retardants. It is available in 45 to 60-mil (1.14 to 1.52 mm) thickness.

**3.2.6 C-EPDM-FB:** C-EPDM-FB is a 45-, 60- or 90 -mil (1.14, 1.52 or 2.29 mm) non-reinforced EPDM bonded to a 5.5-ounce-per-square-yard (0.18 kg/m<sup>2</sup>) polyester fleece.

**3.2.7 C-EPDM-FB WHITE:** C-EPDM-FB WHITE is a 60- or 90-mil (1.52 or 2.29 mm) nonreinforced white EPDM bonded to a 5.5-ounce-per-square-yard (0.18 kg/m<sup>2</sup>) polyester fleece.

**3.2.8 C-EPDM-AFX:** C-EPDM-AFX is a 45-, 60- or 90-mil (1.14, 1.52 or 2.29 mm) non-reinforced EPDM bonded to a 7.5-ounce-per-square-yard (0.25 kg/m<sup>2</sup>) polyester fleece.

**3.2.9 C-EPDM-AFX PLUS:** C-EPDM-AFX PLUS is a 60-mil (1.52 mm) non-reinforced EPDM bonded to a 7.5-ounce-per-square-yard (0.25 kg/m<sup>2</sup>) polyester fleece.

**3.3 PVC Membranes:**

**3.3.1 C-PVC:** C-PVC are 50-, 60-, or 80-mil (1.27, 1.52, or 2.03 mm) membranes consisting of a polyester reinforcement encapsulated between two plies of PVC. The membrane is available in white, gray or custom colors.

**3.3.2 C-PVC-FRS:** C-PVC-FRS are 50-, 60-, or 80-mil (1.27, 1.52, or 2.03 mm) membranes consisting of a fiberglass reinforcement encapsulated between two plies of PVC. The membrane is available in white, gray or custom colors.

**3.3.3 C- PVC-FRS-FB:** C- PVC-FRS-FB is the C-PVC-FRS membrane, described in Section 3.3.2, with a laminated 5.5-ounce-per-square-yard (0.18 kg/m<sup>2</sup>) polyester fleece backing.

### 3.4 TPO Membranes:

**3.4.1 TPO-K:** TPO-K is a 45- or 60-mil (1.14 or 1.52 mm) membrane consisting of a polyester reinforcement encapsulated between two plies of TPO. The membrane is available in white, gray, tan or custom colors.

**3.4.2 TPO-K-FR:** TPO-K-FR is the TPO-K membrane formulated with an additional flame retardant for fire resistance at higher slopes. It is manufactured in 45- and 60-mil (1.14 or 1.52 mm) thicknesses, and is available in white, gray, tan or custom colors.

**3.4.3 TPO-K-SAT:** SAT-TPO is a self-adhered version of TPO-K-FR membrane with adhesive.

**3.4.4 TPO-K-EXTRA or TPO-K-PLUS:** TPO-K-EXTRA or TPO-K-PLUS is the same formulation as the TPO-K membrane but comes in 72- and 80-mil (1.83 and 2.03 mm) thicknesses.

**3.4.5 TPO-K FR Extra:** TPO-K FR Extra is the same formulation as the TPO-K-FR membrane but comes in 72- and 80-mil (1.83 and 2.03 mm) thicknesses.

**3.4.6 TPO-K-FB:** TPO-K-FB is the TPO-K-FR membrane, 45 or 60 mils (1.14 or 1.52 mm) thick, with a laminated 5.5-ounce-per-square-yard (0.18 kg/m<sup>2</sup>) polyester fleece backing.

**3.4.7 TPO-K-AFX:** TPO-K-AFX is the 45-mil (1.14 mm) TPO-K-FR membrane with a laminated 10-ounce-per-square-yard (0.34 kg/m<sup>2</sup>) polyester fleece backing.

**3.4.8 TPO-K-AFX Plus:** TPO-K-AFX Plus is the 60-mil (1.52 mm) TPO-K-FR membrane with a laminated 10-ounce-per-square-yard (0.34 kg/m<sup>2</sup>) polyester fleece backing.

**3.4.9 TPO-K-Bright:** TPO-K-Bright is the TPO-K membrane, described in Section 3.4.1, and TPO-K-EXTRA or TPO-K-PLUS membrane, described in Section 3.4.4, formulated with a brighter white color. It is manufactured in 45-, 60-, 72- or 80-mil (1.14-, 1.52-, 1.83- or 2.03-mm) thicknesses.

**3.4.10 TPO-K-Bright-FB:** TPO-K-Bright-FB is the TPO-K-Bright with a laminated 5.5-ounce-per-square-yard (0.18 kg/m<sup>2</sup>) polyester fleece backing.

### 3.5 Insulation:

See Tables 1 through 3 for insulations for use with specific roofing systems. Foam plastic insulation, where used, must have a flame-spread index of not more than 75 when tested at the maximum thickness intended for use in accordance with ASTM E 84.

### 3.6 Barrier Board:

Barrier board, where used, must be either minimum 1/4-inch-thick (6.4 mm) G-P Gypsum Corporation "DensDeck," minimum 1/4-inch-thick (6.4 mm) Owens Corning "Strataguard," minimum 1/4-inch-thick (6.4 mm) USG "Securock," or minimum 1/2-inch-thick (12.7 mm) gypsum board. Barrier board must be UL- listed for roofing applications or UL-classified gypsum board.

### 3.7 Slip Sheet:

The slip sheet, where used, must include Carlisle Syntec Incorporated "FR Base Sheet 1S or 2S," Elk "VersaShield Underlayment," Elk "VersaShield FB-1S or FB-2S, or Atlas FR 10 or FR 50."

### 3.8 Flashing:

Flashing must be provided in accordance with IBC Section 1503.2 or IRC Section R903.2, as applicable. Where flashing is of metal, the metal must be corrosion-resistant, minimum No. 26 gage [0.019 inch (0.483 mm)] galvanized steel.

### 3.9 Fasteners:

Fasteners, used to mechanically attach insulation and membranes to the roof deck, must be corrosion-resistant, and must be Carlisle Syntec Incorporated fasteners, plates or fastening bars, unless otherwise noted in this report. Refer to Table 3 for spacing of fasteners.

**3.9.1 Sure-Seal HP Fastener:** This is an epoxy-coated steel screw used in combination with Carlisle Syntec Incorporated fastening plates or bars to mechanically attach roofing insulation and membranes to steel or wood substrate. Fastener length must be selected to penetrate through the steel deck a minimum of 3/4 inch (19.1 mm), and into the wood deck a minimum of 1 inch (25.4 mm).

**3.9.2 Sure-Seal HP Purlin Fastener:** This is an epoxy-coated steel screw used in combination with Carlisle Syntec Incorporated fastening plates or bars to mechanically attach roofing insulation and membranes to structural steel members. Fastener length must be selected to penetrate through the steel member a minimum of 3/4 inch (19.1 mm).

**3.9.3 Sure-Seal HD 14-10 Fastener:** This is a heavy-duty, epoxy-coated steel screw used in combination with Carlisle Syntec Incorporated fastening plates or bars to mechanically attach roofing insulation and membranes to concrete roof deck. Fastener length must be selected to penetrate into the concrete deck a minimum of 1 inch (25.4 mm).

**3.9.4 Sure-Seal HP Polymer Seam Plate:** This is a 2-inch-diameter (50 mm) polymer plate designed to be used with Sure-Seal HP and Sure-Seal HD 14-10 fasteners to mechanically attach roofing membranes to the roof deck.

**3.9.5 Sure-Tite Fastener and ST Fastening Bar:** This is a heavy-duty, epoxy-coated steel screw and bar used to secure reinforced EPDM membranes to steel or wood deck. The bar is 1-inch-wide-by-0.040-inch-thick-by-10-foot-long (25.4 mm by 1.1 mm by 3.1 m) galvalume-coated steel with prepunched holes 6 inches (150 mm) on center.

**3.9.6 HP-X Fastener:** This is an epoxy-coated carbon steel screw used in combination with the Piranha Fastening Plate to mechanically attach TPO membranes to steel or wood substrate. Fastener length must be selected to penetrate through the steel deck a minimum of 3/4 inch (19.1 mm), and into the wood deck a minimum of 1 inch (25.4 mm).

**3.9.7 Piranha Fastening Plate:** This is a 2<sup>3/8</sup>-inch-diameter galvalume-coated steel plate designed to be used with HP-X fasteners to mechanically attach PVC and TPO membranes to the roof deck.

**3.9.8 HP-XTRA Fastener:** This is an epoxy-coated carbon steel screw used in combination with the Piranha XTRA Fastening Plate to mechanically attach PVC and TPO membranes to steel or wood substrate. Fastener length must be selected to penetrate through the steel deck a minimum of 3/4 inch (19.1 mm) and into the wood deck a minimum of 1 inch (25.4 mm).

**3.9.9 Piranha XTRA Fastening Plate:** This is a 2<sup>3/8</sup>-inch-diameter galvalume-coated steel plate designed to be used with HP-XTRA fasteners to mechanically attach PVC and TPO membranes to the roof deck.

**3.9.10 OMG Inc. RhinoBond Plate:** The RhinoBond Plate is a 3-inch-diameter (76.2 mm), 0.028-inch-thick (0.7 mm) galvalume-coated steel plate, coated with a proprietary adhesive and used with the HP-X fastener to mechanically attach PVC and TPO membranes to the roof deck. The adhesive bonds the plate to the underside of the membrane.

### 3.10 Adhesives:

The following adhesives are Carlisle Syntec Incorporated Adhesives:

**3.10.1 Sure-Seal 90-8-30A:** Sure-Seal 90-8-30A is a high-strength, solvent-based contact adhesive used to adhere EPDM membranes to the insulation or substrate. It has a coverage rate of approximately 60 square feet per gallon (1.5 m<sup>2</sup>/L). The adhesive is supplied in 5-gallon (18.9 L) containers and has a shelf life of one year.

**3.10.2 Sure-Seal Aqua Base 120:** Sure-Seal Aqua Base 120 is a high-strength, water-based contact adhesive used to adhere EPDM and TPO membranes to the insulation or substrate. It has a coverage rate of approximately 120 square feet per gallon (3 m<sup>2</sup>/L). The adhesive is supplied in 5-gallon (18.9 L) containers and has a shelf life of one year.

**3.10.3 Sure-Flex PVC Bonding Adhesives:** Sure-Flex PVC and Sure-Flex Low VOC PVC Bonding Adhesives are high-strength, solvent-based contact adhesives used to adhere PVC membranes to an insulation or substrate. They have a coverage rate of approximately 60 square feet per gallon (1.5 m<sup>2</sup>/L). The adhesives are supplied in 5-gallon (18.9 L) containers with a shelf life of one year.

**3.10.4 Sure-Weld Bonding Adhesive:** Sure-Weld Bonding Adhesive is a high-strength, solvent-based contact adhesive used to adhere TPO membranes to an insulation or substrate. It has a coverage rate of approximately 60 square feet per gallon (1.5 m<sup>2</sup>/L). The adhesive is supplied in 5-gallon (18.9 L) containers with a shelf life of one year.

**3.10.5 Low VOC Bonding Adhesive:** Low VOC Bonding Adhesive is a high-strength, solvent-based contact adhesive used to adhere membranes to an insulation or substrate. It has a coverage rate of approximately 60 square feet per gallon (1.5 m<sup>2</sup>/L). The adhesive is supplied in 5-gallon (18.9 L) containers with a shelf life of one year.

**3.10.6 FAST Adhesives:** FAST 100, FAST 100LV, FAST Adhesive Dual Cartridge, FAST Adhesive Box Sets, Flexible FAST and FAST Bag-in-a-Box Adhesives are two-component polyurethane adhesives used to adhere FleeceBACK membranes and insulations to various substrates. The adhesives have a coverage rate of approximately 100 square feet per gallon (2.5 m<sup>2</sup>/L). The adhesives are supplied in 15-gallon (56.7 L) and 50-gallon (189 L) drums, cartridge tubes or cylinders, and have a shelf life of one year.

### 3.11 Impact Resistance:

The EPDM, PVC, and TPO roofing membranes described in this report meet requirements for impact resistance in IBC Section 1504.7, based on testing in accordance with FM 4470.

## 4.0 INSTALLATION

### 4.1 General:

Installation of the EPDM, PVC, and TPO roofing membranes described in this report must comply with the applicable code, the manufacturer's published installation instructions and this report. The manufacturer's published installation instructions must be available at all times on the jobsite during installation.

The substrate to which the membrane is to be applied must be clean, dry, and free of frost, loose fasteners, and other protrusions or contaminants that will interfere with the adhesion or attachment of the membrane or that will puncture the membrane. All materials must be protected against contact with incompatible materials. Where gypsum board is used as barrier board in the roofing

assembly, weather protection must be provided to prevent damage to the gypsum board prior to application of the roofing membrane.

The slope of the roof on which the single-ply membranes are installed must not be more than the maximum slope indicated for the particular assembly as listed in Tables 1 and 2.

Penetrations and terminations of the roof covering must be flashed and made weather tight in accordance with the requirements of the membrane manufacturer and the applicable code.

### 4.2 Fire Classification:

**4.2.1 New Construction:** The adhered and mechanically fastened EPDM, PVC, and TPO single-ply membrane roofing systems, when installed in accordance with this report, are Class A, B or C roof covering systems in accordance with ASTM E 108 and UL 790, as noted in Tables 1 and 2.

**4.2.2 Reroofing:** The existing deck must be inspected to verify that the structure to be reroofed is structurally sound and adequate to support and secure the roofing membrane. Prior to installation of new roof coverings, inspection by and written approval from the code official having jurisdiction must be required.

Class A, B or C roof covering systems may be installed over existing classified roof covering systems under the following conditions without additional roof classification tests, provided the resulting classification is the lower of the new or existing roofing classification:

- New uninsulated systems installed only over existing uninsulated assemblies.
- New insulated systems installed over existing uninsulated systems only.

### 4.3 Wind Resistance:

**4.3.1 New Construction:** The allowable wind uplift pressures for the EPDM, PVC, and TPO roofing membranes as parts of roof assemblies are noted in Table 3.

Metal edge securement for roofing systems must be designed in accordance with ANSI/SPRI ES-1, complying with IBC Section 1504.5. The edge securement for mechanically attached membranes was tested in accordance with ANSI/SPRI ES-1 Test RE-1, using Carlisle SecurEdge 300 [0.050-inch (1.27 mm) 3003 aluminum] and Carlisle SecurEdge 3000 [0.040-inch (1.02 mm) 3003 aluminum] fascia systems. The maximum allowable load for Carlisle SecurEdge 300 is 234 plf (348 kg/m). The maximum allowable load for Carlisle SecurEdge 3000 is 200 plf (298 kg/m).

**4.3.2 Reroofing:** Mechanically anchored systems may be accepted based on the adequacy of anchors penetrating through existing roof coverings into structural substrates. Since the composition and/or condition of any particular existing underlying material may vary widely, reroofing with adhered systems is outside the scope of this report.

## 5.0 CONDITIONS OF USE

The single-ply EPDM, PVC, and TPO roofing membranes 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, the manufacturer's published installation instructions and this report. The instructions within this report must govern if there are any conflicts between the manufacturer's installation instructions and this report.

- 5.2 The adhered and mechanically fastened single-ply membrane roofing systems must be installed by professional roofing contractors who are trained and approved by the manufacturer.
- 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 R314.4, 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 E 84, subject to the approval of the code official.
- 5.5 Design wind uplift pressure on any roof area, including edge and corner zones, must not exceed the allowable wind uplift pressure for the system installed in that particular area. Refer to allowable wind uplift pressures for systems as listed in Table 3.
- 5.6 The allowable wind uplift pressures listed in Table 3 are for the roof covering system only. The deck and framing to which the system is attached must be designed for the applicable components and cladding wind loads in accordance with the applicable code.
- 5.7 When application is over existing roofs, documentation of the wind-uplift resistance of the composite roof construction must be submitted to the code official for approval at the time of permit application.
- 5.8 The roofing membranes are manufactured at Carlisle, Pennsylvania; Greenville, Illinois; Tooele, Utah; and Senatobia, Mississippi, under a quality control program with inspections by Underwriters Laboratories Inc. (AA-668).
- 5.9 For buildings under the IBC, above-deck thermal insulation board must comply with the applicable standards listed in Table 1508.2 of the IBC.

**6.0 EVIDENCE SUBMITTED**

Data in accordance with ICC-ES Acceptance Criteria for Membrane Roof Covering Systems (AC75), dated April 2007, (corrected December 2008).

**7.0 IDENTIFICATION**

Each roll of the roofing membrane must bear a label noting the product name, the report holder's name (2001

Company Inc.), the report holder's address or plant code, the ICC-ES evaluation report number (ESR-3185), and the name or label of the inspection agency (Underwriters Laboratories Inc.).

**8.0 OTHER CODES**

In addition to the codes referenced in Section 1.0, the products in this report were evaluated for compliance with the requirements of the following codes:

- BOCA® *National Building Code*/1999 (BNBC)
- 1999 *Standard Building Code*® (SBC)
- 1997 *Uniform Building Code*™ (UBC)

For compliance under the above codes, see Sections 2.0 through 7.0 of this report, except revise the following sections to read as follows:

**3.8 Flashing:**

Flashing must be provided in accordance with SBC Section 1503.2, BNBC Section 1508.1 and UBC Section 1509, as applicable. Where flashing is of metal, the metal must be corrosion-resistant, minimum No. 26 gage [0.019 inch (0.483 mm)] galvanized steel.

**3.11 Impact Resistance:**

The EPDM, PVC, and TPO roofing membranes described in this report meet requirements for impact resistance in BNBC Section 1505.4.2, and SBC Section 1504.6, based on testing in accordance with FM 4470.

**4.3.1 New Construction:** The allowable wind uplift pressures for the EPDM, PVC, and TPO roofing membranes as parts of roof assemblies are noted in Tables 3 and 4.

**5.0 CONDITIONS OF USE**

The single-ply EPDM, PVC, and TPO roofing membranes described in this report comply with, or are suitable alternatives to what is specified in, those codes listed in Section 8.0 of this report, subject to the following conditions:

See Sections 5.1 through 5.8, except revise Section 5.3 to read as follows:

5.3 Foam plastic insulation must be separated from the interior of the building by an approved thermal barrier in accordance with BNBC Section 2603.4.1.5, SBC Section 2603.5.1.5, and UBC Sections 2602.4 and 2602.5.3, as applicable.

**Option 1**



Membrane for Roofing Systems  
as to External Fire Exposure  
See UL Directory of Products Certified for Canada  
and UL Roofing Materials and Systems Directory  
60P6

**Option 2**



Membrane for Roofing Systems  
as to External Fire Exposure  
See UL Directory of Products Certified for Canada  
and UL Roofing Materials and Systems Directory  
60P6

**FIGURE 1—INSPECTION AGENCY LABEL**

TABLE 1—FIRE CLASSIFICATION ASSEMBLIES—ADHERED ROOFING SYSTEMS<sup>2,5</sup>

| SYSTEM NO. | ROOF CLASS | DECK   | BARRIER BOARD OR SLIP SHEET   | INSULATION <sup>1</sup>   | MEMBRANE/MAX. ROOF SLOPE   |
|------------|------------|--|---|---|--|
| 1          | A          | Noncombustible   | —   | Any of the following insulations, 1-inch min. to 6-inch max. thickness: Carlisle “SecurShield Polyiso”, “Polyiso HP-H”, Hunter Panels “H-Shield” or “H-Shield-CG”   | TPO-K, TPO-K-Bright: <sup>1</sup> / <sub>4</sub> :12<br>C-EPDM, C-EPDM-C Type 2, C-EPDM White, C-EPDM-FB, TPO-K FR, TPO-K-SAT, TPO-K-FB, TPO-K-Bright-FB <sup>1</sup> / <sub>2</sub> :12<br>C-EPDM-FB White, C-PVC, C-PVC-FRS <sup>3</sup> / <sub>4</sub> :12          |
| 2          | A          | Noncombustible   | —   | <sup>1</sup> / <sub>2</sub> -inch-thick fiberboard <sup>4</sup> , <sup>1</sup> / <sub>2</sub> -inch-thick fiberboard <sup>4</sup> or barrier board (see Section 3.6) over 5-inch max Insulfoam EPS <sup>3</sup> , <sup>1</sup> / <sub>2</sub> -inch-thick fiberboard or barrier board (see Section 3.6) over System No. 1 insulations | C-EPDM-FB White <sup>3</sup> / <sub>4</sub> :12<br>C-EPDM, C-EPDM-C Type 2 -1:12<br>C-EPDM-White, C-EPDM-FB, TPO-K, TPO-K-Bright, TPO-K-FR, TPO-K-SAT, TPO-K-FB, TPO-K-Bright-FB, , C-PVC-FRS - <sup>1</sup> / <sub>2</sub> :12  |
| 3          | A          | Noncombustible or Combustible - min. <sup>15</sup> / <sub>32</sub> -inch-thick plywood or min. <sup>7</sup> / <sub>16</sub> -inch-thick OSB. | Barrier board (see Section 3.6)   | —   | C-EPDM-FB White <sup>3</sup> / <sub>4</sub> :12<br>C-EPDM-White, C-EPDM-FB <sup>1</sup> / <sub>2</sub> :12<br>C-EPDM-C Type 2, TPO-K, TPO-K-Bright, TPO-K-FB, TPO-K-Bright-FB - 3:12<br>TPO-K FR, TPO-K-SAT- 4:12<br>C-EPDM-C Type 1, C-PVC, C-PVC-FRS—unlimited slope |
| 4          | A          | Combustible - min. <sup>15</sup> / <sub>32</sub> -inch-thick plywood or min. <sup>7</sup> / <sub>16</sub> -inch-thick OSB.                   | Barrier board (see Section 3.6) or Slip sheet: 2 layers (see Section 3.7) | Any of the following insulations, 1-inch min. to 6-inch max. thickness: Carlisle “SecurShield Polyiso”, Polyiso HP-H”, Hunter Panels “H-Shield” or “H-Shield-CG”  | TPO-K,-TPO-K-Bright <sup>1</sup> / <sub>4</sub> :12<br>C-EPDM, C-EPDM-C Type 2, C-EPDM-White, C-EPDM-FB, TPO-K FR, TPO-K-SAT, TPO-K-FB, TPO-K-Bright-FB - <sup>1</sup> / <sub>2</sub> :12<br>C-EPDM-FB White, C-PVC, C-PVC-FRS— <sup>3</sup> / <sub>4</sub> :12        |
| 5          | C          | Combustible - min. <sup>15</sup> / <sub>32</sub> -inch-thick plywood or min. <sup>7</sup> / <sub>16</sub> -inch-thick OSB.                   | —   | Any of the following insulations, 2-inch min. to 6-inch max. thickness: Carlisle “Polyiso HP-H” or Hunter Panels “H-Shield”   | TPO-K, TPO-K-Bright, TPO-K-FR, TPO-K-SAT, C-PVC, C-PVC-FRS-unlimited slope   |
| 6          | A          | Combustible  | —   | Single layer of minimum 3.0" or double layer of minimum 1.5" Carlisle “SecurShield Polyiso” or Hunter Panels “H-Shield-CG”  | EPDM, PVC, and TPO Membranes - <sup>1</sup> / <sub>2</sub> :12   |
| 7          | B          | Combustible  | —   | Single layer of minimum 1.9" Carlisle “SecurShield Polyiso” or Hunter Panels “H-Shield-CG”  | EPDM, PVC, and TPO Membranes - <sup>1</sup> / <sub>2</sub> :12   |

For SI: 1 inch = 25.4 mm.

<sup>1</sup> All foam plastic insulation must be UL-classified foam plastic for roofing systems, and must be limited to the maximum thickness in accordance with Section 5.4 of this report or the maximum thickness in accordance with this table, whichever is less.

<sup>2</sup> See Section 3.10 for adhesive application rate.

<sup>3</sup> UL Classified EPS may be installed below min. 1-inch-thick Carlisle or Hunter Panels polyisocyanurate insulations (max slope 1:12) or below min. <sup>1</sup>/<sub>2</sub>-inch-thick Carlisle SecurShield HD or Hunter Panels H-Shield HD (max slope 2:12) on noncombustible decks.

<sup>4</sup> Carlisle SecurShield HD or Hunter Panels H-Shield HD may replace fiberboard and may be used as a coverboard over any insulation. When these two boards are used directly below the TPO-K membrane, the slope is limited to max. <sup>1</sup>/<sub>2</sub>:12.

<sup>5</sup> When these systems are used for reroofing or recovering, installation must be in accordance with Sections 4.2.2 and 5.7 of this report, and IBC Section 1510, IRC Section R907, BNBC Section 1512, SBC Section 1510 or UBC Appendix to Chapter 15, as applicable.

TABLE 2—FIRE CLASSIFICATION ASSEMBLIES—MECHANICALLY FASTENED ROOFING SYSTEMS<sup>4</sup>

| SYSTEM NO. | ROOF CLASS | DECK   | BARRIER BOARD OR SLIP SHEET  | INSULATION <sup>1</sup>  | MEMBRANE/MAX. ROOF SLOPE   |
|------------|------------|--|--|--|--|
| 1          | A          | Noncombustible   | —  | Any of the following insulations, 1-inch min. to 6-inch max. thickness: Carlisle “SecurShield Polyiso” or “Polyiso HP-H”, Hunter Panels “H-Shield” or “H-Shield-CG”  | C-EPDM-C Type 2, TPO-K, TPO-K- Bright, C-PVC, C-PVC-FRS - 1/2:12<br>TPO-K FR- 1 1/2:12<br>C-EPDM-C Reinforced- 2:12      |
| 2          | A          | Noncombustible   | —  | 1/2-inch-thick fiberboard <sup>3</sup> , 1/2-inch-thick fiberboard <sup>4</sup> or barrier board (see Section 3.6) over 5-inch max Insulfoam EPS <sup>2</sup> , 1/2-inch-thick fiberboard or barrier board (see Section 3.6) over System No. 1 insulations | C-EPDM-C Type 2, TPO-K FR, C-PVC, C-PVC-FRS - 1:12<br>TPO-K, TPO-K- Bright - 1 1/2:12<br>C-EPDM-C Reinforced - 3 1/2:12  |
| 3          | A          | Noncombustible   | —  | To 5-inch max: Insulfoam SP  | TPO-K, TPO-K- Bright, TPO-K FR, C-PVC, C-PVC-FRS 1/2:12  |
| 4          | A          | Noncombustible or Combustible - min. 15/32-inch-thick plywood or min. 7/16-inch-thick OSB. | Barrier board (see Section 3.6)  | —  | C-EPDM-C Type 2, TPO-K, TPO-K- Bright - 3:12<br>C-EPDM-C Reinforced - 3 1/2:12<br>TPO-K FR, C-PVC, C-PVC-FRS - unlimited |
| 5          | A          | Combustible - min. 15/32-inch-thick plywood or min. 7/16-inch-thick OSB.                   | Barrier board (see Section 3.6) or Slip sheet: 2 layers, (see Section 3.7) | Any of the following insulations, 1-inch min. to 6-inch max. thickness: Carlisle “SecurShield Polyiso” or “Polyiso HP-H”, Hunter Panels “H-Shield” or “H-Shield-CG”  | C-EPDM-C Type 2, TPO-K, TPO-K- Bright, C-PVC, C-PVC-FRS - 1/2:12<br>TPO-K FR, 1 1/2:12<br>C-EPDM-C Reinforced - 2:12     |
| 6          | A          | Combustible - min. 15/32-inch-thick plywood or min. 7/16-inch-thick OSB.                   | Slip sheet, 2 layers (see Section 3.7)                                     | —  | C-EPDM-C Type 2- 1:12<br>C-EPDM-C Reinforced, TPO-K, TPO-K- Bright, TPO-K FR, C-PVC, C-PVC-FRS - 1 1/2:12                |
| 7          | B          | Combustible - min. 15/32-inch-thick plywood or min. 7/16-inch-thick OSB.                   | Slip sheet, 1 layer (see Section 3.7)                                      | —  | C-EPDM-C Type 2, C-EPDM-C Reinforced, TPO-K, TPO-K- Bright, TPO-K FR, C-PVC, C-PVC-FRS - 1 1/2:12                        |
| 8          | C          | Combustible - min. 15/32-inch-thick plywood or min. 7/16-inch-thick OSB.                   | —  | Any of the following insulations, 2-inch min. to 6-inch max. thickness: Carlisle “SecurShield Polyiso” or “Polyiso HP-H”, Hunter Panels “H-Shield” or H-Shield CG”   | TPO-K, TPO-K- Bright, TPO-K FR, C-PVC, C-PVC-FRS - unlimited   |
| 9          | A          | Combustible  | —  | Single layer of minimum 3-inch or double layer of minimum 1.5-inch Carlisle “SecurShield Polyiso” or Hunter Panels “H-Shield-CG”   | EPDM, PVC, and TPO Membranes - 1/2:12  |
| 10         | B          | Combustible  | —  | Single layer of minimum 1.9-inch Carlisle “SecurShield Polyiso” or Hunter Panels “H-Shield-CG” or single layer of an inverted G3 cap sheet.  | EPDM, PVC, and TPO Membranes - 1/2:12  |

For SI: 1 inch = 25.4 mm.

<sup>1</sup>All foam plastic insulation must be UL-classified foam plastic for roofing systems, and must be limited to the maximum thickness in accordance with Section 5.4 of this report or the maximum thickness in accordance with this table, whichever is less.

<sup>2</sup>UL Classified EPS may be installed below min. 1-inch-thick Carlisle or Hunter Panels polyisocyanurate insulations (max slope 1:12) or below min. 1/2-inch-thick Carlisle SecurShield HD or Hunter Panels H-Shield HD (max slope 2:12) on noncombustible decks.

<sup>3</sup>Carlisle SecurShield HD or Hunter Panels H-Shield HD may replace fiberboard and may be used as a coverboard over any insulation. When these two boards are used directly below the TPO-K membrane, the slope is limited to 1/2:12.

<sup>4</sup>When these systems are used for reroofing or recovering, installation must be in accordance with Sections 4.2.2 and 5.7 of this report, and IBC Section 1510, IRC Section R907, BNBC Section 1512, SBC Section 1510 or UBC Appendix to Chapter 15, as applicable.

TABLE 3—WIND RESISTANCE - MECHANICALLY FASTENED ASSEMBLIES<sup>4,7</sup>

| SYSTEM NO. | MAXIMUM ALLOWABLE WIND UPLIFT (psf) | DECK <sup>3</sup> | INSULATION <sup>5</sup>  | MEMBRANE  | MEMBRANE FASTENING   | MAXIMUM FASTENER SPACING (inches) | MAXIMUM FASTENER ROW SPACING <sup>8</sup> |
|------------|-------------------------------------|-------------------|--|---|--|-----------------------------------|---|
| 1          | 45                                  | Noncombustible    | Foam plastic insulation <sup>1,2</sup> ,<br>1/2-inch-thick fiberboard <sup>6</sup><br>or<br>barrier board<br>(See Sect. 3.6) | C-EPDM-C Type 2   | HP-X Fastener &<br>Metal Fastening Bar                                 | 12                                | 6 ft 6 inches                             |
| 2          | 75                                  | Noncombustible    | Same as System No. 1   | C-EPDM-C Type 2   | HP-X Fastener &<br>Metal Fastening Bar                                 | 6                                 | 6 ft 6 inches                             |
| 3          | 52                                  | Noncombustible    | Same as System No. 1   | C-EPDM-C Type 2   | HP Fastener &<br>Polymer Seam Plate                                    | 6                                 | 9 ft 6 inches                             |
| 4          | 45                                  | Noncombustible    | Same as System No. 1   | C-EPDM-C Type 2   | Sure-Tite Fastener &<br>ST Fastening Bar                               | 12                                | 9 ft 6 inches                             |
| 5          | 30                                  | Noncombustible    | Same as System No. 1   | C-EPDM-C Type 2<br>(75 mil)                                   | HP Fastener &<br>Polymer Seam Plate                                    | 12                                | 9 ft 6 inches                             |
| 6          | 60                                  | Noncombustible    | Same as System No. 1   | C-EPDM-C Type 2<br>(75 mil)                                   | HP Fastener &<br>Polymer Seam Plate                                    | 6                                 | 9 ft 6 inches                             |
| 7          | 45                                  | Noncombustible    | Same as System No. 1   | TPO-K,<br>TPO-K- EXTRA or<br>TPO-K-Plus 1, or<br>TPO-K-Bright | HP-X or HP-Xtra<br>Fasteners with Piranha<br>or Piranha Xtra Plates    | 12                                | 7 ft 6 inches                             |
| 8          | 45                                  | Noncombustible    | Same as System No. 1   | TPO-K,<br>TPO-K- EXTRA or<br>TPO-K-Plus 1, or<br>TPO-K-Bright | HP-Xtra Fasteners with<br>Piranha Xtra Plates                          | 12                                | 9 ft 6 inches                             |
| 9          | 60                                  | Noncombustible    | Same as System No. 1   | TPO-K,<br>TPO-K- EXTRA or<br>TPO-K-Plus 1, or<br>TPO-K-Bright | HP-X or HP-Xtra<br>Fasteners with<br>Piranha or Piranha Xtra<br>Plates | 6                                 | 9 ft 6 inches                             |
| 10         | 67                                  | Noncombustible    | Same as System No. 1   | TPO-K,<br>TPO-K- EXTRA or<br>TPO-K-Plus 1, or<br>TPO-K-Bright | HP-X or HP-Xtra<br>Fasteners with Piranha<br>or Piranha Xtra Plates    | 6                                 | 7 ft 6 inches                             |
| 11         | 30                                  | Noncombustible    | Same as System No. 1   | TPO-K,<br>TPO-K- EXTRA or<br>TPO-K-Plus 1, or<br>TPO-K-Bright | HP-X or HP-Xtra<br>Fasteners with Piranha<br>or Piranha Xtra Plates    | 12                                | 11 ft 6 inches                            |
| 12         | 60                                  | Noncombustible    | Same as System No. 1   | TPO-K,<br>TPO-K- EXTRA or<br>TPO-K-Plus 1, or<br>TPO-K-Bright | HP-X or HP-Xtra<br>Fasteners with Piranha<br>or Piranha Xtra Plates    | 6                                 | 11 ft 6 inches                            |
| 13         | 53                                  | Noncombustible    | Same as System No. 1   | C-PVC   | HP-X Fasteners with<br>Piranha Plates                                  | 6                                 | 6 ft 4 inches                             |
| 14         | 83                                  | Noncombustible    | Same as System No. 1   | C-PVC   | HP-X Fasteners with<br>Piranha Plates                                  | 6                                 | 2 ft 11 inches                            |
| 15         | 30                                  | Noncombustible    | Same as System No. 1   | C-PVC   | HP-X or HP-Xtra<br>Fasteners with Piranha<br>or Piranha Xtra Plates    | 18                                | 6 ft 4 inches                             |
| 16         | 45                                  | Noncombustible    | Same as System No. 1   | C-PVC   | HP-X or HP-Xtra<br>Fasteners with Piranha<br>or Piranha Xtra Plates    | 12                                | 6 ft 4 inches                             |
| 17         | 53                                  | Noncombustible    | Same as System No. 1   | C-PVC   | HP-X Fasteners with<br>Piranha Plates                                  | 12                                | 2 ft 11 inches                            |
| 18         | 45                                  | Noncombustible    | Same as System No. 1   | TPO-K   | HP-X Fasteners with<br>OMG RhinoBond Plates                            | 1 per 5.3 ft <sup>2</sup>         | N/A                                       |
| 19         | 60                                  | Noncombustible    | Same as System No. 1   | TPO-K   | HP-X Fasteners with<br>OMG RhinoBond Plates                            | 1 per 4 ft <sup>2</sup>           | N/A                                       |

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

<sup>1</sup>Foam plastic insulation must be any of the following (1-inch min. to 6-inch max. thickness): Carlisle “SecurShield Polyiso”, “Polyiso HP-H” Hunter Panels “H-Shield” or Hunter Panels “H-Shield- CG”.

<sup>2</sup>All foam plastic insulation must be UL-classified foam plastic for roofing systems, and must be limited to the maximum thickness in accordance with Section 5.4 of this report or the maximum thickness in accordance with this table, whichever is less.

<sup>3</sup>Steel deck must be minimum No. 22 gage galvanized steel [base-metal thickness 0.030 inch (0.76 mm)]. Concrete must have a minimum compressive strength (*f*<sub>c</sub>) of 2500 psi. See Section 5.6 of this report.

<sup>4</sup>For existing metal roofing, the assemblies listed must be installed by fastening through the roofing and into structural members (purlins, angle iron, beams, etc.) capable of resisting all expected loads. The maximum allowable wind uplift (field) pressures are shown in Column 2.

Table 4 footnotes cont'd:

<sup>5</sup>UL Classified EPS may be installed below min. 1-inch-thick Carlisle or Hunter Panels polyisocyanurate insulations (max slope 1:12) or below min. 1/2-inch-thick Carlisle SecurShield HD or Hunter Panels H-Shield HD (max slope 2:12) on noncombustible decks.

<sup>6</sup>Carlisle SecurShield HD or Hunter Panels H-Shield HD may replace fiberboard and may be used as a coverboard over any insulation. When these two boards are used directly below the Sure-Weld membrane, the slope is limited to 1/2:12.

<sup>7</sup>When these systems are used for reroofing or recovering, installation must be in accordance with Sections 4.2.2 and 5.7 of this report, and IBC Section 1510, IRC Section R907, BNBC Section 1512, SBC Section 1510 or UBC Appendix to Chapter 15, as applicable.

<sup>8</sup>Fastener row spaces shown are for field of roof only. See Section 4.3 for recognized fascia systems for mechanically fastened roof assemblies. The maximum allowable load for Carlisle SecurEdge 300 is 234 plf (348 kg/m). The maximum allowable load for Carlisle SecurEdge 3000 is 200 plf (298 kg/m). Distance between the edge of the roof and the first row of fasteners must be determined accordingly.

TABLE 4—WIND RESISTANCE – ADHERED ASSEMBLIES<sup>5</sup>

| SYSTEM NO. | ALLOWABLE WIND UPLIFT (FIELD) (psf) | DECK <sup>2</sup>             | INSULATION / MIN. THICKNESS <sup>1,3</sup>  | INSULATION FASTENING RATE | MEMBRANE TYPE   |
|------------|-------------------------------------|-------------------------------|---|---------------------------|---|
| 1          | 45                                  | Combustible or Noncombustible | 1/2 inch fiberboard <sup>4</sup> , 15/32 inch OSB, or barrier board (See Section 3.6)   | 1 per 2 ft <sup>2</sup>   | EPDM, PVC and TPO Membranes                                   |
| 2          | 45                                  | Combustible or Noncombustible | Carlisle "Polyiso HP-H" or "SecurShield Polyiso"; Hunter Panels "H-Shield" or "H-Shield-CG" / 1.4 inch with 1/2-inch Securock coverboard (optional) | 1 per 3.2 ft <sup>2</sup> | EPDM, PVC and TPO Membranes                                   |
| 3          | 45                                  | Combustible or Noncombustible | Carlisle "Polyiso HP-H" or "SecurShield Polyiso"; Hunter Panels "H-Shield" or "H-Shield-CG" / 2.0 inch with 5/8-inch Securock coverboard (optional) | 1 per 4 ft <sup>2</sup>   | EPDM, PVC and TPO Membranes                                   |
| 4          | 68                                  | Combustible or Noncombustible | Carlisle "Polyiso HP-H" or "SecurShield Polyiso"; Hunter Panels "H-Shield" or "H-Shield-CG" / 1.0 inch  | FAST Adhesive             | Polyester Fleece Backed Membranes                             |
| 5          | 75                                  | Combustible or Noncombustible | Carlisle "Polyiso HP-H" or "SecurShield Polyiso"; Hunter Panels "H-Shield" or "H-Shield-CG" / 2.0 inch with 1/2-inch Securock coverboard (optional) | 1 per 1.6 ft <sup>2</sup> | EPDM, PVC and TPO Membranes                                   |
| 6          | 120                                 | Combustible or Noncombustible | Carlisle "Polyiso HP-H" or "SecurShield Polyiso"; Hunter Panels "H-Shield" or "H-Shield-CG" / 2.0 inch  | 1 per 1 ft <sup>2</sup>   | TPO Membranes; EPDM membranes (with noncombustible deck only) |
| 7          | 128                                 | Combustible or Noncombustible | Carlisle "Polyiso HP-H" or "SecurShield Polyiso"; Hunter Panels "H-Shield" or "H-Shield-CG" / 2.0 inch with 1/2-inch Securock coverboard (optional) | 1 per 1 ft <sup>2</sup>   | EPDM and TPO Membranes  |
| 8          | 135                                 | Combustible or Noncombustible | Carlisle "Polyiso HP-H" or "SecurShield Polyiso"; Hunter Panels "H-Shield" or "H-Shield-CG" / 2.0 inch with 1/2-inch Securock coverboard (optional) | 1 per 1 ft <sup>2</sup>   | Polyester Fleece Backed Membranes                             |
| 9          | 143                                 | Combustible or Noncombustible | 1/2 inch DensDeck Prime   | 1 per 1 ft <sup>2</sup>   | Polyester Fleece Backed Membranes                             |

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

<sup>1</sup>All foam plastic insulation must be UL-classified foamed plastic for roofing systems, and must be limited to the maximum thickness in accordance with Section 5.4 of this report or the maximum thickness in accordance with this table, whichever is less.

<sup>2</sup>Steel deck must be minimum No. 22 gage galvanized steel [base-metal thickness 0.030 inch (0.76 mm)]. Concrete must have a minimum compressive strength (f<sub>c</sub>) of 2500 psi. See Section 5.6 of this report.

<sup>3</sup>UL Classified EPS may be installed below min. 1-inch-thick Carlisle or Hunter Panels polyisocyanurate insulations (max slope 1:12) or below min. 1/2-inch-thick Carlisle SecurShield HD or Hunter Panels H-Shield HD (max slope 2:12) on noncombustible decks.

<sup>4</sup>Carlisle SecurShield HD or Hunter Panels H-Shield HD may replace fiberboard and may be used as a coverboard over any insulation. When these two boards are used directly below the TPO-K membrane, the slope is limited to 1/2:12.

<sup>5</sup>When application is over existing roofs, documentation of the wind-uplift resistance of the composite roof construction must be submitted to the code official for approval at the time of permit application. For reroofing or recovering, installation must be in accordance with IBC Section 1510, IRC Section R907, BNBC Section 1512, SBC Section 1510 or UBC Appendix to Chapter 15, as applicable.