ICC-ES Evaluation Report

ESR-3839

Reissued November 2024

Subject to renewal November 2026

This report also contains:

- **City of LA Supplement**
- **CA Supplement**

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DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES Section: 06 05 23—Wood, Plastic and Composite Fastenings	REPORT HOLDER: PERMACITY CORPORATION	EVALUATION SUBJECT: SOLAR STRAP™ ATTACHMENT SYSTEM	

1.0 EVALUATION SCOPE

Compliance with the following codes:

■ 2018, 2015, 2012, and 2009 *International Building Code®* (IBC)

Property evaluated:

■ Structural (connection capacity)

2.0 USES

The Solar Strap Attachment System is used to connect the Solar Strap photovoltaic (PV) module racking support system to single-membrane roof assembly systems. The scope of this evaluation report is to evaluate the attachment (uplift and lateral) capacity of the Solar Strap One Piece connected to a single-ply membrane roof assembly using Single-ply Cap and Single-ply Tie Down components.

3.0 DESCRIPTION

3.1 General:

The Solar Strap One Piece, described in Section 3.2, is attached to the single-ply membrane roof assembly using the Single-ply Cap and Single-ply Tie Down components described in Section 3.3. In addition to the cap and tie-down components, a fastening plate with screws, as described in Section 3.4, must also be installed at the attachment points where the Solar Strap One Piece will be attached to the roof assembly. See Figure 1 for a typical installation.

3.2 Solar Strap One Piece:

The Solar Strap One Piece must be made from 5052-H32 aluminum measuring 3 inches (76 mm) wide by 57 inches (1448 mm) long by 0.125-inch-thick (3.2 mm). The Solar Strap includes six pressure fitted threaded studs measuring $^{1}/_{4}$-20-by-$^{3}/_{4}$-inch-long (6.3 by 19 mm). The racking system connects to the Solar Strap One Piece by using matching hex nuts and washers. See Figure 2 of this report.

3.3 Single-Ply Cap and Tie-Down Components:

The Solar Strap Single-ply Cap and Single-ply Tie Down components are made from 60-mil-thick (1.52 mm) Carlisle Syntec Systems Sure-Weld TPO membrane and Sure-Flex PVC membrane recognized in ESR-1463. The components must be used with the same TPO or PVC membrane roof covering recognized in ESR-1463.

The single-ply cap measures 11.5-inch-diameter (292 mm). The tie-down measures 5-inch-by-8-inch (127 by 203 mm).

3.4 Carlisle Syntec Systems HP-X Fastener with Piranha Fastening Plate:

The Piranha Fastening Plate described in ESR-1463 must be used at the attachment point where the Solar Strap will be tie down to the roof assembly. The Piranha fastening plate must be used with the HP-X fastener described in ESR-1463.

4.0 DESIGN AND INSTALLATION

4.1 Design:

The tabulated connection capacities shown in Table 1 of this report are based on allowable stress design (ASD). The Solar Strap One Piece and the PV module racking system must be designed by a registered designed professional and must not induce a load at the attachment point that exceeds the tabulated allowable load values in Table 1 of this report. The roof assembly, including the roof deck must be designed by registered design professional to resist the applied loads coming from the attachment system.

4.2 Installation:

The Solar Strap must be installed over a Carlisle Syntec Systems Sure-Weld TPO and Sure-Flex PVC membrane roof covering systems recognized in ESR-1463. Prior to installation of the single-ply cap component, two fastening plates described in Section 3.4 of this report must be installed over the TPO or PVC membrane roof using the HP-X fasteners at each attachment location. The fastener length of the screw must be selected to penetrate through the steel or wood deck a minimum of $^{3}/_{4}$-inch (19.1 mm).The wood deck must be minimum $^{15}/_{32}$-inch-thick (11.9 mm) plywood. Steel deck thickness must be determined by registered design professional to have equivalent fastener capacity to comply with Table 1 tabulated values. The single-ply cap component must then be heat-welded to the TPO or PVC membrane roof, as applicable. The tie-down is placed through the threaded studs of the Solar Strap One Piece and heat-welded to the singly-ply cap component. The connection between the threaded studs and a connecting element must be secure with matching hex nuts and washers. The spacing and location of the attachment system must be determined by a registered design professional.

5.0 CONDITIONS OF USE:

The Solar Strap Attachment System described in this report complies with, or is a suitable alternative to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

5.1 The Solar Strap Attachment System must be installed in accordance with this report and the manufacturer's published installation instructions. In the event of a conflict between this report and the manufacturer's published installation instructions, this report governs.

5.2 Calculations showing compliance with this report must be submitted to the code official. The calculations must be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.

5.3 Periodic special inspections must be required for the installation of the attachment system onto the roof assemblies as required by the provisions of the 2018, 2015 and 2012 IBC Section 1705.11 (2009 IBC Section 1705.4) for wind resistance and in accordance with 2018, 2015, 2012 IBC Section 1705.1.1 (2009 IBC Section 1704.15) in Seismic Design Categories D, E and F. The duties of the special inspector are to verify that the fasteners are connected to the roof deck and that the tie-down and caps are properly heat-welded to the roof membrane.

5.4 The attachment system must be flashed in accordance with accepted recommend practice to the roof membrane manufacturer.

5.5 The location of the PV array on a roof must be established by local jurisdiction, based on consideration of access by fire personnel, roof vents and other roof features.

5.6 The PV mounting system must be installed in accordance with the installation instructions of the PV modules and PV mounting system manufacturer.

5.7 PV modules connected to the PV mounting system must comply with applicable sections in Chapter 15 of the IBC.

5.8 Installation of PV modules must comply with the 2018 International Fire Code (IFC) Section 1204 (2015 and 2012 IFC Section 605.11).

6.0 EVIDENCE SUBMITTED

Data in accordance with ICC-ES Acceptance Criteria for Proprietary Attachment Systems of Photovoltaic (PV) Arrays to Roof Assemblies (AC467), dated June 2016 (editorially revised July 2019).

7.0 IDENTIFICATION

7.1 The Solar Strap Single-ply Cap and Single-ply Tie Down connectors are identified with a label bearing the report holder's name (Permacity Corporation), product name or designation and the evaluation report number (ESR-3839).

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

PERMACITY CORPORATION
710 WILSHIRE BOULEVARD, SUITE 305
SANTA MONICA, CALIFORNIA 90401
(323) 692-9264
www.permacity.com
jport@permacity.com

TABLE 1—ALLOWABLE LOAD VALUES OF ATTACHMENT SYSTEM TO SINGLE-PLY MEMBRANE ROOF COVERING[1]

Single-ply Cap and Tie-Down Component	Single-ply Membrane Roof	Fastening plates attached Roof Deck	Allowable Uplift Load (lbf)	Allowable Lateral Load (lbf)
Sure-Weld TPO	Sure-Weld TPO	Two fastening plates with screws described in Section 3.4 attached to minimum $^{15}/_{32}$-inch-thick plywood	124	88
Sure-Flex PVC	Sure-Flex PVC		142	100

For SI: 1 inch= 25. 4 mm, 1 lbf= 4.45 N.

[1]Attachment sytem must be installed in accordance with Section 4.2 of this report.
[2]Single-ply Cap and Tie-down components must comply with Section 3.3 of this report.
[3]Single-ply membrane roof must comply with ESR-1463.
[4]Tabulated load values based on ultimate test load divided by safety factor of five. No further increases permitted.

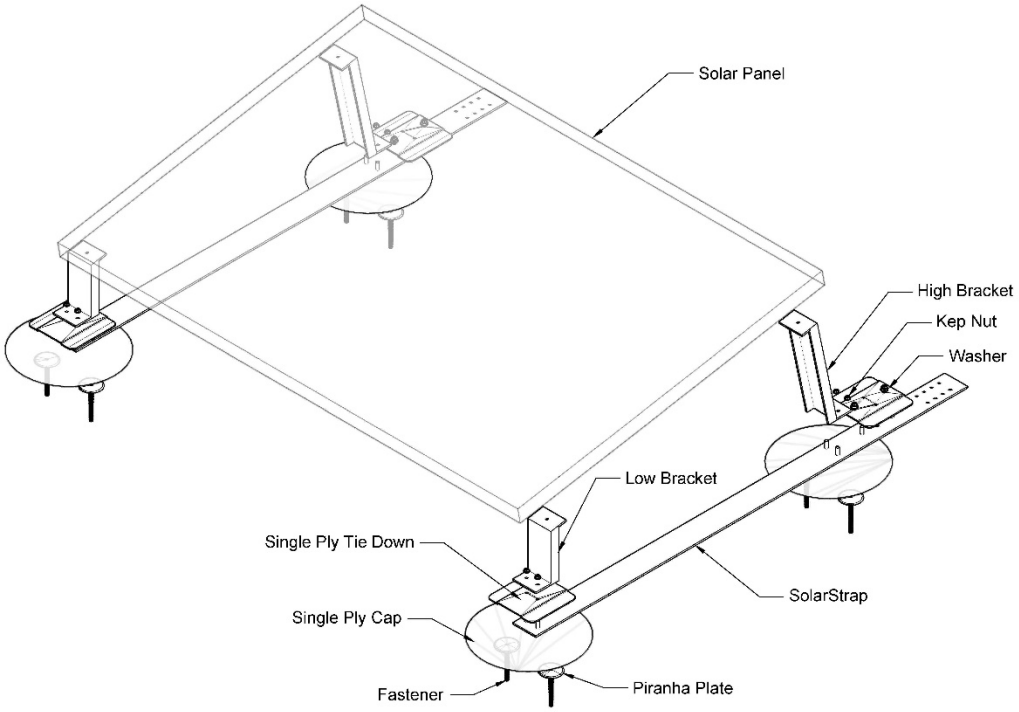

FIGURE 1—TYPICAL INSTALLATION FOR SOLAR STRAP

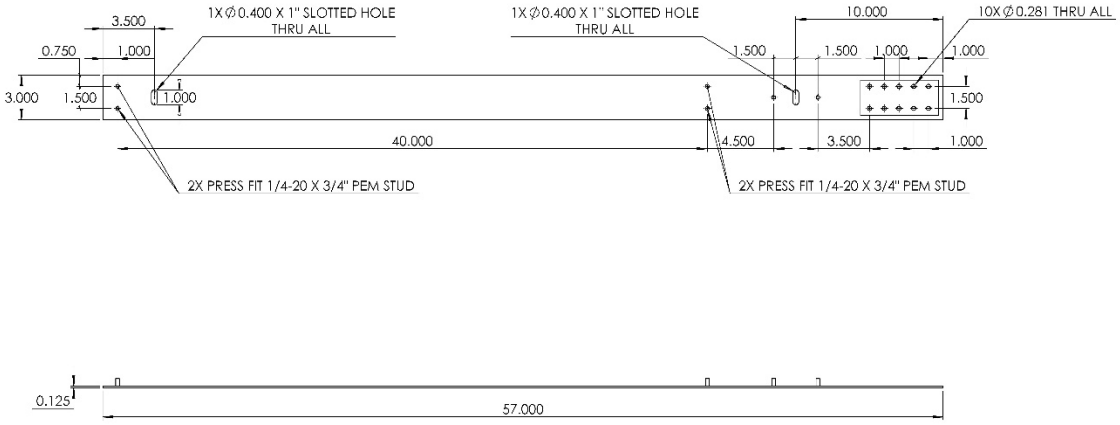

FIGURE 2—SOLAR STRAP ONE PIECE

DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES
Section: 06 05 23—Wood, Plastic and Composite Fastenings

REPORT HOLDER:

PERMACITY CORPORATION

EVALUATION SUBJECT:

SOLAR STRAP™ ATTACHMENT SYSTEM

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that the Solar Strap Attachment System, described in ICC-ES evaluation report ESR-3839, has also been evaluated for compliance with the code noted below as adopted by the Los Angeles Department of Building and Safety (LADBS).

Applicable code edition:

2017 *City of Los Angeles Building Code (LABC)*

2.0 CONCLUSIONS

The Solar Strap Attachment System, described in Sections 2.0 through 7.0 of the evaluation report ESR-3839, complies with the LABC Chapter 15, and is subject to the conditions of use described in this supplement.

3.0 CONDITIONS OF USE

The Solar Strap Attachment System described in this evaluation report must comply with all of the following conditions:

- All applicable sections in the evaluation report ESR-3839.
- The design, installation, conditions of use and identification of the Solar Strap Attachment System are in accordance with the 2015 *International Building Code®* (2015 IBC) provisions noted in the evaluation report ESR-3839.
- The design, installation and inspection are in accordance with additional requirements of LABC Chapters 15, 16 and 17, as applicable.
- Roof slope must not exceed 4:12.
- Solar photovoltaic system installation must comply with Los Angeles Fire Department Requirement No. 96.

This supplement expires concurrently with the evaluation report, reissued November 2024.

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Purpose:

The purpose of this evaluation report supplement is to indicate that the Solar Strap Attachment System, described in ICC-ES evaluation report ESR-3839, has also been evaluated for compliance with the code noted below.

Applicable code edition:

2016 *California Building Code*® (CBC)

For evaluation of applicable chapters adopted by the California Office of Statewide Health Planning and Development (OSHPD) AKA: California Department of Health Care Access and Information (HCAI) and the Division of State Architect (DSA), see Sections 2.1.1 and 2.1.2 below.

2.0 CONCLUSIONS

2.1 CBC:

The Solar Strap Attachment System, described in Sections 2.0 through 7.0 of the evaluation report ESR-3839, complies with CBC Chapter 15, provided the design and installation are in accordance with the 2015 *International Building Code*® (IBC) provisions noted in the evaluation report and the additional requirements of the CBC Chapters 15, 16. And 17, as applicable.

2.1.1 OSHPD:

The Solar Strap Attachment described in Sections 2.0 through 7.0 of the evaluation report ESR-3839, complies with CBC Chapter 15 [OSHPD 2] and CBC Chapter 15 with amendments [OSHPD 1 & 4] provided the design and installation are in accordance with CBC Chapter 15, 16, 16A, 17, and 17A as applicable.

2.1.2 DSA:

The Solar Strap Attachment described in Sections 2.0 through 7.0 of the evaluation report ESR-3839, complies with CBC Chapter 15 with amendments [DSA SS& DSA SS/CC] provided the design and installation are in accordance with CBC Chapter 15, 16, 16A, 17, and 17A, as applicable. In addition, design of solar photovoltaic systems must comply with California Department of General Services Division of State Architect Interpretation of Regulations Document for Solar Photovoltaic and Thermal Systems Review and Approval Requirements (IR 16-8).

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