

ICC-ES Evaluation Report ESR-4239

Reissued April 2023

This report is subject to renewal April 2025.

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

REPORT HOLDER:

PERMA-COLUMN, LLC

EVALUATION SUBJECT:

STURDI-WALL® (SW) SERIES AND STURDI-WALL® PLUS (SWP) SERIES ANCHOR BRACKETS

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2018 and 2015 *International Building Code*® (IBC)
- 2018 and 2015 *International Residential Code*® (IRC)

Property evaluated:

Structural

2.0 USES

The Perma-Column’s SW Series and SWP Series anchor brackets described in this evaluation report are used as wood framing anchors in accordance with IBC Section 2304.10.3, and are used to resist lateral and net induced uplift forces at the bottom end of wood posts or columns in accordance with IBC Section 2304.9.7, and to prevent lateral displacement at the bottom end of wood posts or columns in accordance with IRC Section R407.3. The anchor brackets may also be used in structures regulated under the IRC when an engineered design is submitted in accordance with IRC Section R301.1.3.

3.0 DESCRIPTION

3.1 General:

The Perma-Column’s SW Series, except for SW60C, SW60 and SW80, and SWP Series anchor brackets described in this evaluation report are welded anchor brackets. SW60C, SW60 and SW80 are L-shaped anchor brackets, fabricated from single steel plate. Perma-Column’s SW Series and SWP Series anchor brackets are used to install wood posts or glued-laminated (glulam) timber columns anchored to

concrete complying with the IBC or IRC, as applicable, by using post-installed bolts and cast-in-place steel rebars, respectively. The design of anchor bolts into the concrete,

and the design of concrete are outside the scope of this evaluation report. A concrete foundation or footing larger than the maximum required by IBC Section 1809, or IRC Section R403 may be necessary to meet anchorage to concrete requirements.

3.1.1 SW Series: The Perma-Column’s SW60C, SW60 and SW80 anchor brackets are L-shaped angle brackets design for installations with post-installed bolts into concrete. The SW4X/5X/6X and SW8X anchor brackets consist of two vertical steel plates that are factory-welded to a steel base plate. The anchor brackets are designed for post-installation into concrete. The anchor brackets are pre-drilled with holes for installations of wood screws and through-bolts into the wood posts and columns, and anchor bolts into concrete. The anchor brackets are powder coated with a proprietary powder chemistry. Table 1 lists the anchor bracket dimensions, fastener types, size and numbers, post/column sizes, and allowable lateral and uplift loads. Figure 1 depicts an illustration of SW Series anchor brackets and loading directions.

3.1.2 SWP Series: The Perma-Column’s SWP Series anchor brackets consist of a U-shaped steel bracket and four (4) straight, deformed steel rebars described in Section 3.2.2 that are factory-welded onto a steel plate that is welded to the bottom surface of U-shaped brackets. The SWP anchor brackets are designed for cast-in-place installations into concrete. The anchor brackets are pre-drilled with holes for installations of screws and through-bolts into the wood posts and columns. The anchor brackets are powder coated with a proprietary powder chemistry. Table 2 list the anchor bracket dimensions, fastener type, size and numbers, post/column sizes, and allowable lateral and uplift loads. Figure 2 depicts an illustration of SWP Series anchor bracket and loading directions.

3.2 Materials:

3.2.1 Steel: The Perma-Column’s SW Series and SWP Series anchor brackets are manufactured from nominally 1/4-inch-thick (6.35 mm) hot-rolled steel plate, complying with ASTM A1018, SS designation, Grade 40 steel, with a minimum yield strength, F_y , of 40,000 psi (276 MPa) and a minimum tensile strength, F_u , of 55,000 psi (379 MPa).

3.2.2 Steel Rebars: Steel rebars used with Perma-Column’s SWP Series anchor brackets are minimum No. 4 for SWP46 and SWP6X brackets and No. 5 for SWP8X brackets, respectively. Steel rebars are ASTM A706, Grade 60, deformed steel bars and are 18 inches (457 mm) in

length. The rebar placement geometry is shown in Figure 3 and the rebar center to center spacing is shown in Table 3.

3.2.3 Wood: Wood posts or columns with which the anchor brackets are used must be made of either dimension lumber or glued-laminated (glulam) timber, having a minimum specific gravity of 0.55 as defined in the NDS and a maximum in-service moisture content of 19 percent, except as noted in Section 4.1.

3.2.4 Fasteners:

3.2.4.1 Screws: The screws used to install wood posts and columns to anchor brackets are partially threaded carbon or stainless steel screws, having a minimum specified bending yield strength, F_{yb} , of 164,000 psi (1130 MPa), provided with the brackets, or evaluated in a current ICC-ES evaluation report. The unthreaded portion of the screws must have an actual shank diameter of 0.24 inch (6.1 mm) and a length between 1 inch (25.4 mm) and 1½ inches (38.1 mm). The screws must be minimum 3 inches (76.2 mm) in length.

3.2.4.2 Through-bolts: The through-bolts used to install wood posts or columns to anchor brackets must comply with SAE J429 Grade 5, having a minimum tensile yield strength, F_y , of 92,000 psi (635 MPa) and a minimum tensile strength, F_u , of 120,000 psi (830 MPa). The bolts and finish must comply with the coating requirement in ASTM F1470. The minimum diameter of the bolts is ½ inches (12.7 mm).

3.2.5 Fasteners and anchor brackets used in contact with preservative-treated or fire-retardant-treated lumber must comply with IBC Section 2304.10.5 and IRC Section R317.3, as applicable. The lumber treater or this evaluation report holder (Perma-Column, LLC), or both, must be contacted for recommendations on the appropriate coating or material to specify for the fasteners as well as the connection capacities of fasteners used with the specific proprietary preservative-treated or fire-retardant-treated lumber.

4.0 DESIGN AND INSTALLATION

4.1 Design:

4.1.1 Wood Post to Anchor Brackets: The reference design values provided in Tables 1 and 2 of this evaluation report are for Allowable Stress Design (ASD) method and Load and Resistance Factor Design (LRFD) method. The load duration factor, C_D , (ASD) and the Time Effect Factor, λ , (LRFD), have been applied to the corresponding loads in accordance with the *National Design Specification for Wood Construction* (NDS) and its supplement. The minimum allowable fastener spacing, and end and edge distances set forth in NDS must be met. The SW Series anchor brackets are not designed to resist moments.

The ASD and LRFD strength design values apply to anchor brackets connected to wood posts or columns that are used under dry conditions and where sustained temperatures are 100°F (37.8°C) or less. When anchor brackets are installed in wood that will experience sustained exposure to temperatures exceeding 100°F (37.8°C), the allowable loads in this report must be adjusted by the applicable temperature factor, C_t , specified in the NDS. When anchor brackets are installed in wood having a moisture content greater than 19 percent, or where wet service is expected, the allowable loads must be adjusted by the wet service factor, C_M , specified in the NDS for dowel-type fasteners. Wood posts or columns must be analyzed for load-carrying capacity at the connection in accordance with this evaluation report and the NDS.

4.1.2 SW Series Anchor Bracket to Concrete: The SW Series anchor bracket shall be anchored to reinforced concrete using post-installed bolts in uncracked concrete. The reinforced concrete, uncracked concrete and bolts are beyond the scope of this report and must be designed by a registered design professional in accordance with the IBC, IRC, ACI 318 and an ICC-ES evaluation report, as applicable.

4.1.3 SWP Series Anchor Bracket to Concrete: The SWP Series anchor bracket shall be anchored to reinforced concrete using development length of the rebar described in Section 3.2.2. The reinforced concrete and development length of the rebar are beyond the scope of this report and must be designed by a registered design professional in accordance with the IBC, IRC and Section 25.4 of ACI 318, as applicable.

4.2 Installation:

The Perma-Column's SW Series and SWP Series anchor brackets must be installed in accordance with Perma-Column's published installation instructions, the applicable code, and this evaluation report. In the event of a conflict between the published installation instructions and this evaluation report, this evaluation report governs.

5.0 CONDITIONS OF USE

The Perma-Column's SW Series and SWP Series anchor brackets described in this evaluation report comply with, or are suitable alternatives to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

- 5.1** The anchor brackets must be manufactured, identified and installed in accordance with this evaluation report, the manufacturer's published installation instructions, and applicable codes. A copy of the instructions must be available at the jobsite at all times during installation.
- 5.2** Complete plans and calculations demonstrating compliance with this evaluation report must be submitted to the code official for approval when required. The calculations and details 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** Adjustment factors noted in Section 4.1 and the applicable codes must be considered, where applicable.
- 5.4** Wood posts and columns, and fasteners must comply, respectively, with Sections 3.2.3 and 3.2.4 of this evaluation report.
- 5.5** Use of Perma-Column's SW Series and SWP Series anchor brackets and fasteners with preservative treated or fire retardant treated lumber must be in accordance with Section 3.2.5 of this evaluation report.
- 5.6** The anchorage of anchor brackets to concrete foundations or footings has not been evaluated and must be designed by a registered design professional in accordance with applicable code requirements.
- 5.7** The anchorage to concrete and concrete are beyond the scope of this evaluation report and must be designed by a registered design professional in accordance with applicable code requirements to the satisfaction of the code official.

- 5.8 The Perma-Column's SW Series and SWP Series anchor brackets must not be field modified (e.g. cut, drilled, torched, etc.) in any way.
- 5.9 The Perma-Column's SW Series and SWP Series anchor brackets are manufactured at the Perma-Column LLC's facility located in Ossian, Indiana, under an approved quality control program with inspections by ICC-ES.

6.0 EVIDENCE SUBMITTED

- 6.1 Reports of F_{uplift} and F_1 load tests of SW Series and SWP Series in accordance with ICC-ES Acceptance Criteria for Joist Hangers and Similar Devices (AC13), dated October 2018 as required in Section 1.2.4 of ICC-ES Acceptance Criteria for Steel Connectors for Connecting Light-Frame Construction Members to Concrete (AC398), dated February 2020.
- 6.2 Reports of the moment load tests in accordance with the ICC-ES Acceptance Criteria for Steel Connectors for Connecting Light-Frame Construction Members to Concrete (AC398), dated February 2020.
- 6.3 Engineering calculations of SW and SWP anchorage to concrete in accordance with ACI 318 and AISC 360

as required in Section 1.2.4 of ICC-ES Acceptance Criteria for Steel Connectors for Connecting Light-Frame Construction Members to Concrete (AC398), dated February 2020.

7.0 IDENTIFICATION

- 7.1 Product labeling shall include, the name of the report holder or listee, and the ICC-ES mark of conformity. The listing or evaluation report number (ICC-ES ESR-4239) may be used in lieu of the mark of conformity. Each Perma-Column Sturdi-Wall® SW and SWP Series anchor bracket must bear the name of the report holder (Perma-Column, LLC), the model number, and the evaluation report number (ESR-4239).
- 7.2 The report holder's contact information is the following:

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TABLE 1—REFERENCE DESIGN VALUES FOR STURDI-WALL® SW SERIES ANCHOR BRACKETS^{1,2,3}

MODEL NO.	BRACKET DIMENSIONS				POST SIZE	FASTENERS ⁴ (Quantity-Type)		ASD (C _D = 1.6)		LRFD (λ = 1.0)	
	W (in.)	D (in.)	H (in.)	B (in.)		Screws	Bolts	F ₁ ⁵ (lbf)	F _{uplift} (lbf)	F ₁ ⁵ (lbf)	F _{uplift} (lbf)
SW60C ⁶	-	5	13	3 1/2	4x6	6	0	1,120	1,300	1,510	1,950
SW60 ⁷	-	5	15	3 1/2	6x6 ⁸	4	2	2,100	3,400	2,830	5,110
SW80 ⁷	-	7	18	3 1/2	8x8 ⁸	8	2	3,030	4,500	4,080	6,760
SW46	3 5/8	5	13	12 1/8	4x6	4	2	2,100	2,970	2,830	4,460
SW55	4 5/8	5	13	12 1/8	5x5	4	2	2,100	3,330	2,830	5,010
SW63	4 5/8	5	13	12 1/8	3-ply 2x6	4	2	2,100	3,680	2,830	5,530
SW64	6 1/8	5	13	13 5/8	4-ply 2x6	4	2	2,100	3,620	2,830	5,450
SW65	7 5/8	5	13	15 1/8	5-ply 2x6	4	2	2,100	3,440	2,830	5,170
SW66	5 5/8	5	13	13 5/8	6x6	4	2	2,100	3,640	2,830	5,470
SW83	4 5/8	7	18	12 1/8	3-ply 2x8	8	2	3,030	4,980	4,080	7,480
SW84	6 1/8	7	18	13 5/8	4-ply 2x8	8	2	3,030	4,880	4,080	7,330
SW85	8 1/8	7	18	15 1/8	5-ply 2x8	8	2	3,030	4,820	4,080	7,240
SW88	8 1/8	7	18	15 1/8	8x8	8	2	3,030	4,800	4,080	7,210

For SI: 1 inch = 25.4 mm, 1 lbf = 4.45 N.

¹The reference design values are for Allowable Strength Design (ASD) method and the Load and Resistance Factor Design (LRFD) method and have been increased for wind or earthquake loading with no further increase allowed. The ASD values must be reduced when other load durations govern.

²The reference design values do not apply to the anchorage to concrete. Anchorage to concrete must be designed, by a registered design professional, to resist all loads and forces transferred from the post or column to the anchor brackets.

³Download shall be checked and limited by the design capacity of the post or column.

⁴Screws and bolts must comply with Section 3.2.4 of this evaluation report and used together in order to achieve the tabulated allowable loads.

⁵Lateral load, F₁, is perpendicular to the axis of the fasteners.

⁶SW6C anchor bracket is for a wall corner installation and must be installed in pairs on the adjacent faces of a column or a post in order to achieve the tabulated reference design values.

⁷SW60 and SW80 anchor brackets must be installed in pairs on the opposite faces of the column or post in order to achieve the tabulated reference design values.

⁸Posts can be made from minimum 3 plies of 2x6 and 2x8 sawn lumber, complying with Section 3.2.3 of this evaluation report, for SW60 and SW80 anchor brackets, respectively.

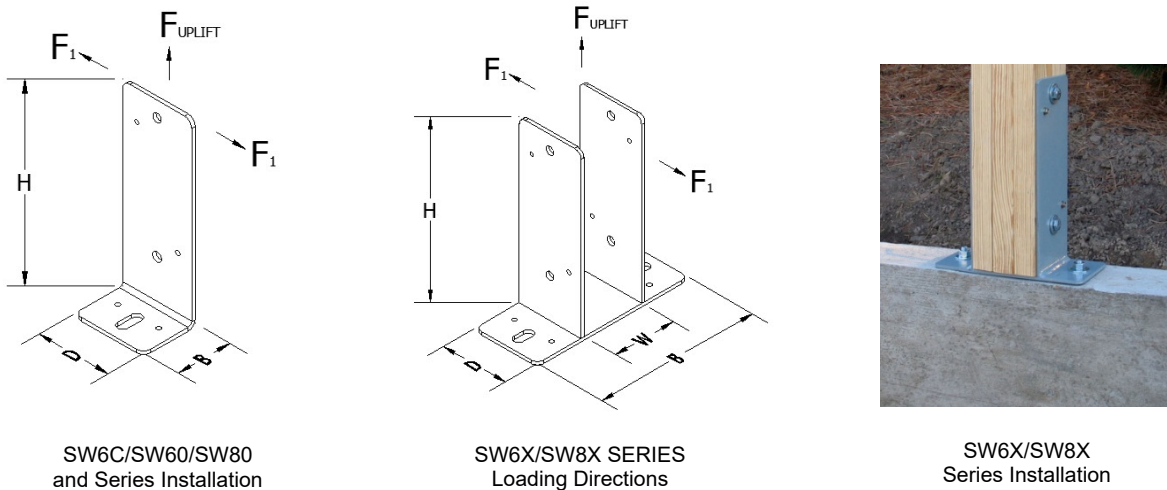


FIGURE 1—STURDI-WALL® (SW) SERIES ANCHOR BRACKET AND TYPICAL INSTALLATION

TABLE 2—REFERENCE DESIGN VALUES STURDI-WALL® PLUS SWP SERIES ANCHOR BRACKETS^{1,2,3}

MODEL NO.	BRACKET DIMENSIONS			POST SIZE	FASTENERS ⁴ (Quantity-Type)		ASD (C _D = 1.6)			LRFD (λ = 1.0)			ROTATIONAL STIFFNESS
	W (in.)	D (in.)	H (in.)		Screw	Bolt	F ₁ ⁵ (lbf)	F _{uplift} (lbf)	M _Z (lbf-ft)	F ₁ ⁵ (lbf)	F _{uplift} (lbf)	M _Z (lbf-ft)	M/θ (lbf-ft/deg)
SWP46	3 ⁵ / ₈	5	13	4x6	4	2	2,100	4,835	2,080	2,830	6,515	2,800	2,900
SWP63	4 ⁵ / ₈	5	13	3-ply 2x6	4	2	2,100	4,835	2,080	2,830	6,515	2,800	2,900
SWP64	6 ¹ / ₈	5	18	4-ply 2x6	4	2	2,380	4,835	2,600	3,200	6,515	3,900	3,780
SWP66	5 ⁵ / ₈	5	13	6x6	4	2	2,100	4,835	2,080	2,830	6,515	2,800	2,960
SWP83	4 ⁵ / ₈	7	18	3-ply 2x8	8	2	3,030	8,490	4,120	4,080	11,450	5,550	6,930
SWP84	6 ¹ / ₈	7	18	4-ply 2x8	8	2	3,030	8,490	4,120	4,080	11,450	5,550	6,640
SWP85	7 ⁵ / ₈	7	18	5-ply 2x8	8	2	3,030	8,210	4,120	4,080	11,450	5,550	6,520
SWP88	7 ⁵ / ₈	7	18	8x8	8	2	3,030	8,010	4,120	4,080	11,450	5,550	6,500

For SI: 1 inch = 25.4 mm, 1 lbr = 4.45 N, 1 lbf-ft = 1.356 N-m, and 1 lbf-ft/deg = 1.356 N-m/deg.

¹The reference design values are for Allowable Strength Design (ASD) method and the Load and Resistance Factor Design (LRFD) method and have been increased for wind or earthquake loading with no further increase allowed. The ASD values must be reduced when other load durations govern.

²The reference design values do not apply to the anchorage to concrete. Anchorage to concrete must be designed, by a registered design professional, resist all loads and forces transferred from the post or column anchor brackets.

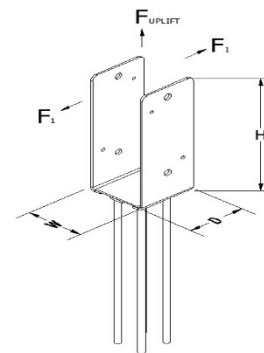
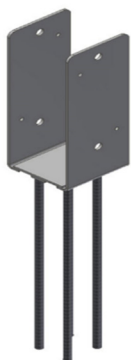
³Download shall be checked and limited by the design capacity of the post or column.

⁴Screws and bolts must comply with Section 3.2.4 of this evaluation report and used together in order to achieve the tabulated allowable loads.

⁵Lateral load, F₁, is perpendicular to the axis of the fasteners.

⁶The tabulated allowable moment values are based on the test results of Perma-Column SWP Series products installed in concrete, having a minimum concrete compression stress of 3,000 psi.

⁷The tabulated rotational stiffness are based on the tabulated moments, and account for the rotation within the connections, deflection of the bracket, fastener slip and post deformation. The additional deflection of the post above the connection due to the post rotation and bending must be accounted in design.



Loading Directions

FIGURE 2—STURDI-WALL® PLUS (SWP) SERIES POST/COLUMN ANCHOR BRACKET AND TYPICAL INSTALLATION

TABLE 3—REBAR PLACEMENT GEOMETRY FOR SWP SERIES ANCHOR BRACKETS^{1,2,3}

MODEL NO.	S ₁	S ₂
	(in.)	(in.)
SWP46	2 ¹ / ₄	2 ⁷ / ₁₆
SWP63	2 ¹ / ₄	2 ⁷ / ₁₆
SWP64	3 ³ / ₄	2 ⁷ / ₁₆
SWP66	3 ¹ / ₄	2 ⁷ / ₁₆
SWP83	2 ³ / ₁₆	4 ¹ / ₁₆
SWP84	3 ¹¹ / ₁₆	4 ¹ / ₁₆
SWP85	5 ³ / ₁₆	4 ¹ / ₁₆
SWP88	5 ³ / ₁₆	4 ¹ / ₁₆

For SI: 1 inch = 25.4 mm

¹Refer to Figure 3 for the rebar placement geometry and the definitions of S₁ and S₂.

²A minimum edge distance between steel rebars and plate in S₁ direction is 0.69 inch for SWP models.

³A minimum edge distance between steel rebars and plate in S₂ direction is 1.28 inches for SWP models.

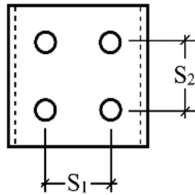


FIGURE 3—SWP46/SWP6X/SWP8X SERIES, REBAR PLACEMENT GEOMETRY, AND INSTALLATION

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

REPORT HOLDER:

PERMA-COLUMN, LLC

EVALUATION SUBJECT:**STURDI-WALL® (SW) SERIES AND STURDI-WALL® PLUS (SWP) SERIES ANCHOR BRACKETS****1.0 REPORT PURPOSE AND SCOPE****Purpose:**

The purpose of this evaluation report supplement is to indicate that Perma-Column Sturdi-Wall® (SW) Series and Sturdi-Wall® Plus (SWP) Series anchor brackets evaluated in the ICC-ES evaluation report ESR-4239, have also been evaluated for compliance with the codes noted below.

Applicable code editions:

- 2019 and 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 and 2.2 below.

- 2019 and 2016 *California Residential Code (CRC)*

2.0 CONCLUSIONS

The Perma-Column SW Series and SWP Series anchor brackets, described in Sections 2.0 through 7.0 of the ICC-ES evaluation report ESR-4239, comply with CBC Chapter 23 and CRC Section R301.1.3 provided the design and installation are in accordance with the 2018 and 2015 *International Building Code® (IBC)* provisions noted in the ICC-ES evaluation report ESR-4239 and the additional requirements of the CBC Chapters 16, 17, 18 and 19, as applicable.

2.1 OSHPD:

The applicable OSHPD Sections of the CBC are beyond the scope of this evaluation report supplement.

2.2 DSA:

The applicable DSA Sections of the CBC are beyond the scope of this evaluation report supplement.

3.0 CONDITIONS OF USE

The Perma-Column Sturdi-Wall® SW Series and Sturdi-Wall® Plus SWP Series anchor brackets, described in this evaluation report supplement must comply with the following condition:

- The ASD capacities described in the ICC-ES evaluation report ESR-4239 must not be increased for seismic or wind load combinations.

This supplement expires concurrently with the evaluation report ESR-4239, reissued April 2023.

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STURDI-WALL® (SW) SERIES AND STURDI-WALL® PLUS (SWP) SERIES ANCHOR BRACKETS

1.0 REPORT PURPOSE AND SCOPE**Purpose:**

The purpose of this evaluation report supplement is to indicate that Perma-Column Sturdi-Wall® SW Series and Sturdi-Wall® Plus SWP Series anchor brackets, evaluated in the ICC-ES evaluation report ESR-4239, have also been evaluated for compliance with the codes noted below.

Applicable code editions:

- 2017 *Florida Building Code—Building*
- 2017 *Florida Building Code—Residential*

2.0 CONCLUSIONS

The Perma-Column SW Series and SWP Series anchor brackets, described in Sections 2.0 through 7.0 of the ICC-ES evaluation report ESR-4239, complies with the *Florida Building Code—Building* and *Florida Building Code—Residential*, provided the design and installation are in accordance with the 2015 *International Building Code*® provisions noted in the master report.

Use of the Perma-Column SW Series and SWP Series anchor brackets has also been found to be in compliance with the High-Velocity Hurricane Zone provisions of the *Florida Building Code—Building* and *Florida Building Code—Residential*.

For products falling under Florida Rule 9N-3, verification that the report holder's quality assurance program is audited by a quality assurance entity approved by the Florida Building Commission for the type of inspections being conducted is the responsibility of an approved validation entity (or the code official, when the report holder does not possess an approval by the Commission).

This supplement expires concurrently with the evaluation report ESR-4239, reissued April 2023.