ICC-ES Evaluation Report

ESR-2607

Reissued January 2024

This report also contains:

- LABC Supplement

Subject to renewal January 2025

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DIVISION: 06 00 00—WOOD, PLASTICS, AND COMPOSITES **Section: 06 05 23—Wood, Plastic, and Composite Fastenings**	**REPORT HOLDER: SIMPSON STRONG-TIE COMPANY INC.**	**EVALUATION SUBJECT: SIMPSON STRONG-TIE® CONNECTORS FOR PANELIZED ROOF CONSTRUCTION**	

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2021, 2018, 2015, 2012 and 2009 *International Building Code®* (IBC)
- 2021, 2018, 2015, 2012 and 2009 *International Residential Code®* (IRC)

For evaluation for compliance with codes adopted by the *Los Angeles Department of Building and Safety* (LADBS), see ESR-2607 LABC and LARC Supplement.

Property evaluated:

Structural

2.0 USES

Simpson Strong-Tie® connectors for panelized roof construction are used as wood framing connectors in accordance with Section 2304.10.4 of the 2021 IBC (Section 2304.10.3 of the 2018 and 2015 IBC; Section 2304.9.3 for the 2012 and 2009 IBC). The products may also be used in structures regulated under the IRC when an engineered design is submitted in accordance with Section R301.1.3 of the IRC.

3.0 DESCRIPTION

3.1 HCA and HCCTA Hinge Connectors:

The HCA hinge connectors support the end of a wood beam to the opposing end of another wood beam of the same width and top elevation. The supporting beam must be at least as deep as the supported beam. An HCCTA hinge connector is identical to an HCA connector, except it has slotted holes along its centerline permitting bolts to be installed in both beams to transfer wind and seismic forces in drag strut applications. The connectors consist of No. 7 gage steel side plates and factory-welded steel top and bottom bearing plates having thicknesses from $^{3}/_{4}$ inch to $1^{1}/_{2}$ inches (19 mm to 38 mm). The top and bottom portions of the connector side plates have holes for installing the required rotation bolts, which resist rotation resulting from the connection offset and resulting load eccentricity between top and bottom bearing plates. See Table 1 hinge connector model numbers, dimensions, required fasteners, and allowable downloads. See Figure 1 for drawings of HCA and HCCTA hinge connectors.

3.2 F and HFN Series Hangers:

The F series joist hangers are engineered components for panelized construction only. The hangers are fabricated from No. 18 gage galvanized steel. See Table 2 for hanger model numbers, hanger dimensions, required fasteners, and allowable downloads. See Figure 2 for drawings of the F26N hanger and a typical hanger installation where the joist member is used as a stiffener for the wood-based structural-use panels. The HFN series hangers are designed for panelized roof construction. They are die-formed from No. 18 gage galvanized steel. See Table 2 for header nailing schedules, hanger dimensions and allowable loads. See Figure 3 for a typical HFN hanger.

3.3 SA Strap Anchors:

The SA strap anchors connect in-line wood beams to each other where they are separated by a supporting wood beam or

girder and transfer axial tension and compression forces induced by wind or seismic loading from one purlin to the other. The SA36 strap anchor is formed from No. 12 gage galvanized steel. See Table 3 for model numbers, strap anchor dimensions, required fasteners, and allowable loads. See Figure 4 for a drawing of typical installations of the SA purlin strap ties.

3.4 VB Knee Braces:

The VB knee braces provide lateral support of beams to prevent rotation or lateral displacement, or both, at the point of connection to the beam. The knee braces are not designed for use as a connector to transfer axial tension forces induced by wind or seismic loading. The braces are fabricated from No. 12 gage galvanized steel. See Table 4 for model numbers, range of beam depths permitted for each model, brace strap length, required fasteners, and allowable tension loads. See Figure 5 for a typical installation of a VB knee brace.

3.5 Materials:

3.5.1 Steel: The galvanized connectors described in this report are fabricated from galvanized sheet steel complying with ASTM A653, SS designation, Grade 33, with a minimum yield strength, F_y, of 33,000 psi (227 MPa) and a minimum tensile strength, F_u, of 45,000 psi (310 MPa). The galvanized coating conforms to ASTM A653 with a G90 designation. The ungalvanized sheet steel connectors are fabricated from ASTM A1011, SS designation, Grade 33, steel with a minimum yield strength of 33,000 psi (227 MPa) and a minimum tensile strength of 52,000 psi (359 MPa). The HCA hinge connector side plates have a minimum yield strength of 36,000 psi, and the top and bottom bearing plates are ASTM A36 steel with a minimum yield strength of 36,000 psi (227 MPa) and a minimum tensile strength of 58,000 psi (310 Mpa).

Some models (designated with a model number ending with Z) are available with a G185 zinc coating specification in accordance with ASTM A653. Some models (designated with a model number ending with HDG) are available with a hot-dip galvanization (also known as “batch” galvanization) in accordance with ASTM A123, with a minimum specified coating weight of 2.0 ounces of zinc per square foot of surface area (610 g/m^2) total for both sides. Model numbers in this report do not include the Z or HDG ending, but the information provided herein applies. HCA hinge connectors have either a painted or powder coated finish and may also be available with the HDG finish. The lumber treater and the holder of this report (Simpson Strong-Tie Company) should be contacted for recommendations on the appropriate coating or material to specify for use of the steel connectors in contact with the specific proprietary preservative-treated or fire retardant-treated lumber.

The base-metal thicknesses for the connectors in this report are as follows:

NOMINAL THICKNESS (Gage)	MINIMUM BASE-METAL THICKNESS (inch)
18	0.0445
12	0.0975
7	0.1705

For **SI:** 1 inch = 25.4 mm.

3.5.2 Wood: Wood members with which the connectors are used must be either sawn lumber or engineered wood lumber having a minimum specific gravity of 0.50 (minimum equivalent specific gravity of 0.50 for engineered lumber), except as noted in Section 4.1. The thickness of the supporting wood member must be

equal to or greater than the length of the fasteners specified in the tables in this report, or as required by wood member design, whichever is greater. For installation in engineered wood members, minimum allowable nail spacing and end and edge distances, as specified in the applicable evaluation report for the engineered wood product, must be met.

3.5.3 Fasteners: Nails used with connectors described in this report must comply with the material requirements, physical properties, tolerances, workmanship, protective coating and finishes, certification, and packaging and package marking requirements specified in ASTM F1667. The nails must have the following minimum fastener dimensions and bending yield strengths (F_{yb}):

ASTENER	SHANK DIAMETER (inch)	LENGTH (inches)	F_{yb} (psi)
10d x $2^1/_8$	0.148	$2^1/_8$	90,000
10d	0.148	3	90,000
16d	0.162	$2^1/_2$	90,000
N54A	0.250	$2^1/_2$	90,000

For **SI:** 1 inch = 25.4 mm, 1 psi = 6.895 kPa.

At a minimum, bolts must comply with ASTM A36 or A307, and have a bending yield strength (F_{yb}) of 45,000 psi (310 MPa).

Nails and bolts used in contact with preservative treated or fire retardant treated lumber must comply with Section 2304.10.6 of the 2021 IBC, Section 2304.10.5 of the 2018 and 2015 IBC, Section 2304.9.5 of the 2012 and 2009 IBC or Section R317.3 of the IRC, as applicable. For use with treated lumber, the lumber treater or this report holder (Simpson Strong-Tie Company), or both, should 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:

The tabulated allowable loads shown in the product tables of this report are based on Allowable Stress Design (ASD) and include the load duration factor, C_D, corresponding with the applicable loads in accordance with the National Design Specification® for Wood Construction and its supplement (NDS).

Tabulated allowable loads apply to products connected to wood used under dry conditions and where sustained temperatures are 100ºF (37.8ºC) or less. When products are installed to wood having a moisture content greater than 19 percent (16 percent for engineered wood products), 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. When connectors are installed in wood that will experience sustained exposure to temperatures exceeding 100ºF (37.8ºC), the allowable loads in this report must be adjusted by the temperature factor, C_t, specified in the NDS. Connected wood members must be analyzed for load-carrying capacity at the connection in accordance with the NDS.

4.2 Installation:

Installation of the connectors must be in accordance with this evaluation report and the manufacturer's published installation instructions. Bolts and nails must be installed in accordance with the applicable provisions in the NDS. In the event of a conflict between this report and the manufacturer's published installation instructions, this report governs.

4.3 Special Inspection:

4.3.1 Main Wind-force-resisting Systems under the IBC: Where required and not exempted by the IBC, periodic special inspection must be conducted for components within the main wind-force-resisting system in accordance with Sections 1704.2 and 1705.12 of the 2021 IBC, Sections 1704.2 and 1705.11 of the 2018 and 2015 IBC, Sections 1704.2 and 1705.10 of the 2012 IBC and Sections 1704 and 1706 of the 2009 IBC.

4.3.2 Seismic-Force-resisting Systems under the IBC: Where required and not exempted by the IBC, periodic special inspection must be conducted for components within the seismic-force-resisting system in accordance with Sections 1704.2 and 1705.13 for the 2021 IBC, Sections 1704.2 and 1705.12 of the 2018 and 2015 IBC, Sections 1704.2 and 1705.11 of the 2012 IBC, and Sections 1704 and 1707 of the 2009 IBC.

4.3.3 Installations under the IRC: Special inspections are normally not required for connectors used in structures regulated under the IRC. However, for components and systems requiring an engineered design in accordance with IRC Section R301, periodic special inspections must be in accordance with Sections 4.3.1 and 4.3.2 of this report.

5.0 CONDITIONS OF USE:

The Simpson Strong-Tie products described in this report comply with, or are suitable alternatives to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

5.1 The connectors must be manufactured, identified and installed in accordance with this report and the manufacturer's published installation instructions. A copy of the instructions must be available at the jobsite at all times during installation.

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 statues 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 Connected wood members and fasteners must comply, respectively, with Sections 3.5.2 and 3.5.3 of this report.

5.5 Use of connectors with preservative-treated or fire retardant-treated lumber must be in accordance with Section 3.5.1 of this report. Use of fasteners with preservative-treated or fire retardant-treated lumber must be in accordance with Section 3.5.3 of this report.

5.6 Welded connectors are manufactured under a quality control program with inspections by ICC-ES.

6.0 EVIDENCE SUBMITTED

Data in accordance with the ICC-ES Acceptance Criteria for Joist Hangers and Similar Devices (AC13), dated October 2018 (editorially updated December 2020).

7.0 IDENTIFICATION

7.1 The ICC-ES mark of conformity, electronic labeling, or the evaluation report number (ICC-ES ESR-2607) along with the name, registered trademark, or registered logo of the report holder [and/or listee] must be included in the product label. [Electronic labeling is the ICC-ES web address (www.icc-es.org); specific URL related to the report; or the ICC-ES electronic display of conformity placed on the aforementioned items.]

7.2 In addition, the products described in this report are identified with a die-stamped label or an adhesive label, indicating the name of the manufacturer (Simpson Strong-Tie), the model number, and the number of an index evaluation report (ESR-2523) that is used as an identifier for the products recognized in this report.

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

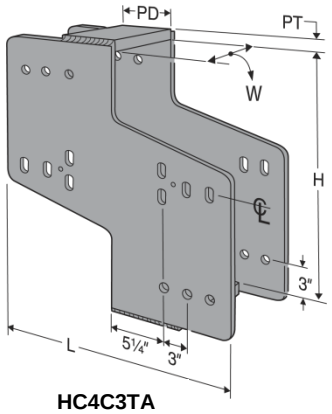
SIMPSON STRONG-TIE COMPANY INC.
5956 WEST LAS POSITAS BOULEVARD
PLEASANTON, CALIFORNIA 94588
(800) 999-5099
www.strongtie.com

TABLE 1—HCA AND HCCTA SERIES HINGE CONNECTORS[1,2]

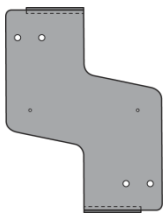
MODEL NO.	DIMENSIONS (inches)			BOLT DIA. (in.)	TWO ROTATION BOLTS[3] PER BEAM		THREE ROTATION BOLTS[3] PER BEAM	
	Width for Beams (W)	Bearing Plate[4]			Minimum Connector Height, H[5,6] (in.)	Allowable Downloads[7,8,9] C_D = 1.25 (lbs)	Minimum Connector Height, H[5,6] (in.)	Allowable Downloads[7,8,9] C_D = 1.25 (lbs)
		Thickness (PT)	Length (PD)					
HCA3.62-5	3 1/2	3/4	5	3/4	15	13,125[10]	12	13,125[10]
HCA3.62-9			9	3/4	34	23,625[10]	25	23,625[10]
HCA5-5	5 1/4	3/4	5	3/4	17	16,015	13	16,015
HCA5-7			7	3/4	27	22,420	20	22,420
HCA5-9			9	3/4	40	28,830	29	28,830
HCA5.37-5	5 1/4	1	5	3/4	19	19,690[10]	15	19,690[10]
HCA5.37-9			9	3/4	40	29,605[10]	34	35,440[10]
HCA5.62-5	5 1/2	3/4	5	3/4	18	17,190[10]	14	17,190[10]
HCA5.62-7			7	3/4	28	24,065[10]	21	24,065[10]
HCA7-5	6 7/8	1	5	3/4	20	21,095	16	21,095
HCA7-7			7	3/4	33	29,530	24	29,530
HCA7-9			9	3/4	40	29,600	36	37,890
HCA7.12-5	7	1 1/4	5	3/4	23	26,250[10]	18	26,250[10]
HCA7.12-9			9	3/4	40	29,600[10]	40	44,330[10]
HCA9-5	8 7/8	1 1/4	5	3/4	23	27,345	18	27,345
HCA9-7			7	3/4	40	37,900	29	36,280
HCA9-9			9	3/4	40	29,600	40	44,320
HCA11-5	10 7/8	1 1/2	5	3/4	28	33,595	21	33,595
HCA11-7			7	3/4	40	37,900	35	47,030
HCA11-9			9	3/4	40	29,600	40	44,325

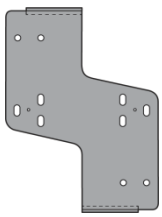
For **SI:** 1 inch = 25.4 mm, 1 psi = 6.89 kPa, 1 lbs = 4.45 N.

[1]The depth of the hinge connector varies as the depth of the supported beam. Supporting and supported beams must be the same width. Supporting beam needs to be at least as deep as the supported beam.
[2]Tabulated allowable downloads shown for the HCA hinge connectors are also applicable to the HCCTA hinge connectors, which have additional bolt holes about the centerline to resist horizontal loads if the beams are part of the continuous lateral load path.
[3]Rotation bolts must be used to resist rotation resulting from the connection offset and resulting load eccentricity between top and bottom bearing plates.
[4]When hinge connectors are installed, the bearing plates will protrude beyond the top of the beams, which may interfere with the installation of wood-based structural panels and other finish material. The connector may be made flush with the beams by dapping (notching) a recess into the beams to accommodate the bearing plates, which reduces the effective height of the beam by the thickness of the bearing plate (PT).
[5]Where minimum depth of wood beam being carried exceeds the dimension shown, allowable loads are not subject to an increase in value. For minimum depth of wood beams smaller than the tabulated depths, allowable loads must be decreased in direct proportion to the two depths. Minimum supported beam depth is 8 inches.
[6]Allowable loads are increased for seven-day duration roof loads, and no further increase is permitted.
[7]No uplift loads are permitted on the connectors.
[8]Loads must be reduced where member shear capacity results in lower values.
[9]Allowable loads are based on an allowable compression perpendicular-to-grain, $F_{c\perp}$, value of 625 psi for Douglas-Fir wood beams and 750 psi for engineered wood lumber beams.



HC4C3TA


HCA


HCCTA

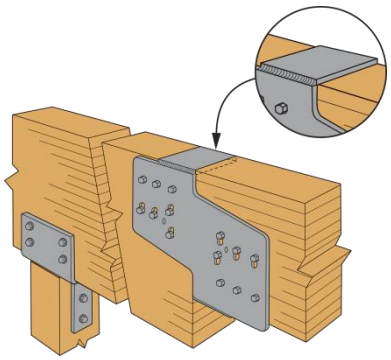

Typical HC4C3TA Installation with Beam Top Dapped

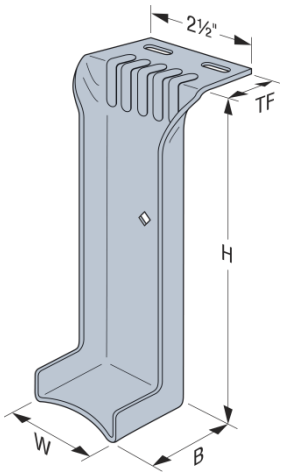
FIGURE 1—HCA AND HCCTA HINGE CONNECTORS

TABLE 2—F SERIES HANGERS[1]

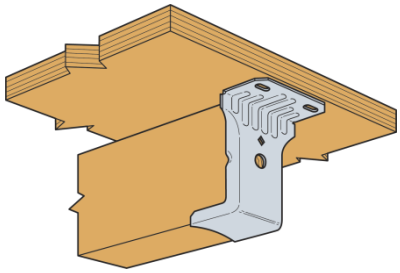
MODEL NO.	HANGER DIMENSIONS (inches)				FASTENERS[4] (Quantity-Size)	ALLOWABLE DOWNLOADS[2] (lbs)
	Hanger Seat Width for Joist (W)	Hanger Height (H)	Hanger Seat Depth for Joist (B)	Top Flange Width (TF)	Into Header	C_D = 1.0 C_D = 1.15 C_D = 1.25
HF24N	$1^{17}/_{32}$	$3^3/_8$		$1^1/_4$	2 -10d x $2^1/_8$	580
HF26N	$1^{17}/_{32}$	$5^3/_8$		$1^1/_4$	2 -10d x $2^1/_8$	635
HF34N	$2^{\ 9}/_{16}$	$3^3/_8$		$1^1/_4$	2 -10d x $2^1/_8$	690
HF36N	$2^{\ 9}/_{16}$	$5^3/_8$		$1^1/_4$	2 -10d x $2^1/_8$	725
F26-2	$3^1/_4$	$5^3/_8$	$1^1/_4$	$1^3/_{16}$	2–10d	675
F44[3]	$3^9/_{16}$	$3^7/_{16}$	$1^1/_4$	$1^1/_2$	2–10d	765
F46[3]	$3^9/_{16}$	$5^3/_8$	$1^1/_8$	$1^7/_{16}$	2–10d	675

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

[1]F hangers are only for panelized roof construction where the joist member is used as a panel stiffener for the structural wood-based panel.
[2]Tabulated allowable downloads must be selected based on duration of load as permitted by the applicable building code.
[3]The F44 and F46 models have one or two dimples on each flange to aid in fabrication of panelized construction.
[4]The F Series fasteners have not be evaluated for use with stainless steel smooth shank nails.



F26N Hanger (others similar)



Typical Installation of a hanger used only for panelized roof construction.

FIGURE 2—F HANGERS

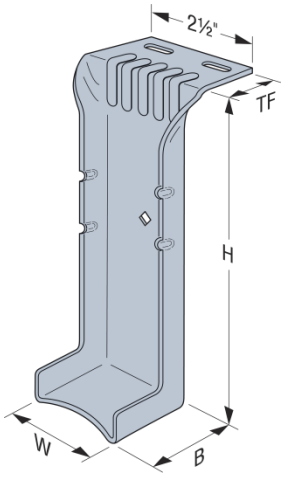


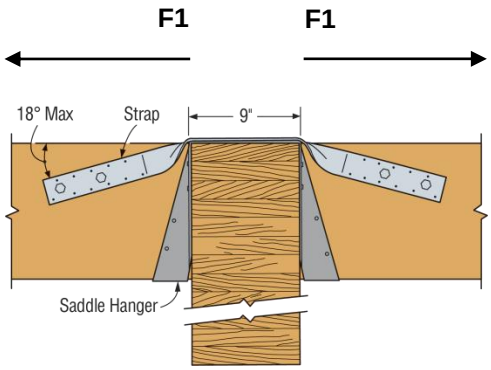
FIGURE 3—HFN HANGER

TABLE 3—SA PURLIN STRAP TIES

MODEL NO.	STRAP DIMENSIONS (inches)		NAILS (Total Quantity – Size)	ALLOWABLE TENSION (F1) LOADS[1,2,3,4] (lbs)
	Width	Length		C_D = 1.6
				Nails
SA36	$2^1/_{16}$	36	22 –16d x $2^1/_2$	2,390

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

[1]Tabulated allowable tension load (F1) must be selected based on duration of load as permitted by the applicable building code.
[2]The F1 tension loads have been increased for wind or earthquake loading with no further increase allowed. Allowable loads must be reduced when other load durations govern.
[3]Straps should be installed in pairs at opposite sides of the connected purlins to reduce eccentricity. When only one strap is installed, the design of the purlins needs to consider bending moment about their weak axis induced by an unsymmetrical arrangement of the connection (see Section 3.1.3 of the NDS).
[4]Allowable loads assume a restrained purlin member having a minimum $3^1/_2$-inch.



Typical SA Purlin Strap Tie Installation

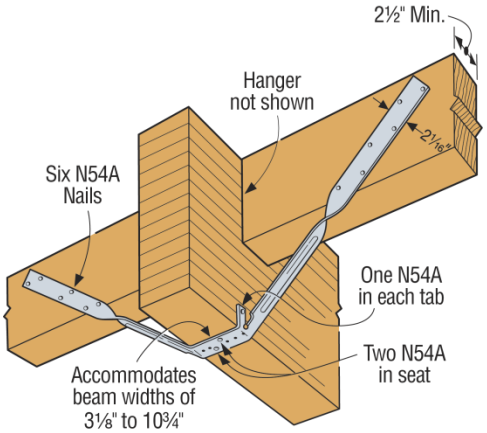
FIGURE 4—SA PURLIN STRAP TIES

TABLE 4—VB KNEE BRACES

MODEL NO.	BEAM DEPTH (inches)		LENGTH (feet)	FASTENERS (Total Quantity – Size)	ALLOWABLE TENSION LOADS[1,2,3,4,5] (lbs)		
	Minimum	Maximum			C_D = 1.0	C_D = 1.25	C_D = 1.6
VB-5	10	15	5	16 – N54A	1,195	1,440	1,790
VB-7	15	22 1/2	7	16 – N54A	1,195	1,440	1,790
VB-8	22 1/2	28 1/2	8	16 – N54A	1,195	1,440	1,790
VB-10	28 1/2	36	10	16 – N54A	1,195	1,440	1,790
VB-12	36	42	12	16 – N54A	1,195	1,440	1,790

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

[1]Tabulated allowable tension loads must be selected based on duration of load as permitted by the applicable building code.
[2]The allowable tension loads have been increased for wind or earthquake loading with no further increase allowed. Allowable loads must be reduced when other load durations govern.
[3]Use of the VB Knee Brace to resist compression loads is outside the scope of this report.
[4]The tabulated allowable tension loads are based on braces installed at an approximate 45-degree angle, with a minimum 1 3/8-inch (35 mm) edge distance for nails.
[5]Allowable loads apply to tensile loads along the length of the knee brace strap.



Typical Installation of a VB Knee Brace: All nail holes at each end of the strap must be filled with the required nails, and four nails must be installed into the bottom of the beam to provide a positive connection.

FIGURE 5—VB KNEE BRACE

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

REPORT HOLDER:

SIMPSON STRONG-TIE COMPANY INC.

EVALUATION SUBJECT:

SIMPSON STRONG-TIE® CONNECTORS FOR PANELIZED ROOF CONSTRUCTION

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that Simpson Strong-Tie® connectors for panelized roof construction, described in ICC-ES evaluation report ESR-2607, have also been evaluated for compliance with the codes noted below as adopted by the Los Angeles Department of Building and Safety (LADBS).

Applicable code editions:

- 2023 *City of Los Angeles Building Code* (LABC)
- 2023 *City of Los Angeles Residential Code* (LARC)

2.0 CONCLUSIONS

The Simpson Strong-Tie® connectors for panelized roof construction, described in Sections 2.0 through 7.0 of the evaluation report ESR-2607, comply with the LABC Chapter 23, and the LARC, and are subjected to the conditions of use described in this supplement.

3.0 CONDITIONS OF USE

The Simpson Strong-Tie® connectors for panelized roof construction, described in this evaluation report supplement must comply with all of the following conditions:

- All applicable sections in the evaluation report ESR-2607.
- The design, installation, conditions of use and identification are in accordance with the 2021 *International Building Code®* (2021 IBC) provisions noted in the evaluation report ESR-2607.
- The design, installation and inspection are in accordance with additional requirements of LABC Chapters 16 and 17, as applicable.
- The supported end of joist or beam must be within $^1/_4$-inch from the supporting member.
- Solid blocking must be required for all joist hangers supporting roof joists having one end twisted more than one-half degree per foot of length relative to the other end, except as specifically noted in the evaluation report.
- Under the LARC, an engineered design in accordance with LARC Section R301.1.3 must be submitted.

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