ICC-ES Evaluation Report

ESR-1988

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This report also contains:

- LABC Supplement

- CBC Supplement

- FBC Supplement

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DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES Section: 06 17 53—Shop-Fabricated Wood Trusses	REPORT HOLDER: MITEK INC.	EVALUATION SUBJECT: MITEK® METAL TRUSS CONNECTOR PLATES AND HINGE PLATE CONNECTORS	

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2024, 2021, 2018, 2015, 2012 *International Building Code®* (IBC)
- 2024, 2021, 2018, 2015, 2012 *International Residential Code®* (IRC)

For evaluation for compliance with codes adopted by the *Los Angeles Department of Building and Safety* (LADBS), see ESR-1988 LABC and LARC Supplement.

Property evaluated:

Structural

2.0 USES

MiTek metal truss connector plates are used as joint connector components of light wood-frame trusses. MiTek metal hinge plate connectors are used to connect wood chord members end-to-end in prefabricated wood trusses.

3.0 DESCRIPTION

3.1 MII 16, MT18HS®, M18AHS, M18SHS™, MT20®, and MT20HS® Metal Truss Connector Plates:

MiTek metal truss connector plates described in this report are manufactured from steel meeting the requirements of ASTM A653, with a G60 galvanization coating. Slots are punched along the perpendicular axis of the plate to form teeth in pairs formed at right angles to the face of the parent metal, so that two teeth per hole occur along the length of the plate. See Figure 1 of this report for details of connector, teeth, and slot dimensions and locations. See Table 4 of this report for connector steel properties including gage, metal thickness, designation, and corrosion resistant finishes.

3.2 MTH18 and SMH18 Metal Hinge Plate Connectors:

MiTek MTH18 and SMH18 metal hinge plate connectors are manufactured from ASTM A653 SS steel with a G60 galvanization coating. Each half plate is connected with a hinge and includes an area composed of integral teeth that are punched at right angles to the plate. See Figure 2 of this report for details of the connector, hinge, and teeth. See Table 4 of this report for connector steel properties including gage, metal thickness, designation, and corrosion resistant finishes.

4.0 DESIGN AND INSTALLATION

4.1 General:

All MiTek metal truss connector plates and hinge plate connectors are pressed into the wood for the full depth of their teeth by hydraulic-platen embedment presses, multiple roller presses that use partial embedment followed by full-embedment rollers, or combinations of partial embedment roller presses and hydraulic-platen presses that feed trusses into a stationary finish roller press. Trusses must be assembled within the tolerances provided by the Truss Plate Institute's (TPI) Quality Criteria for

the Manufacture of Metal Plate Connected Wood Trusses, shown as Chapter 3 in ANSI/TPI 1 National Design Standard for Metal Plate Connected Wood Truss Construction.

4.1.1 Metal Truss Connector Plates: MiTek metal truss connector plates must be installed in pairs on opposite faces of truss members.

4.1.2 Metal Hinge Plate Connectors: MiTek metal hinge plate connectors must be installed in pairs in the 180-degree position on opposite faces of truss top chord members, which must be braced by sheathing installed at the jobsite. The sheathing must comply with and be installed in accordance with Section 5.9 of this report and the applicable code. The chords must be composed of sawn wood lumber with a minimum specific gravity of 0.42.

4.2 Allowable Design Values

4.2.1 Metal Truss Connector Plates: Allowable design values for MiTek metal truss connector plates to be used in the design of metal plate connected wood roof and floor trusses are shown in Tables 1 and 2. Allowable design values are applicable when the connection is made with identical plates on opposite sides of the joint. This evaluation report is limited to the evaluation of connection capacity of the MiTek metal truss connector plates listed in this report. The design, manufacture, and installation of trusses employing the truss plates have not been evaluated.

Allowable values shown in Tables 1 and 2 have not been adjusted for metal truss connector plates embedded in fire-retardant-treated or preservative-treated lumber. Proper adjustments must be made in accordance with the requirements indicated in a current ICC-ES evaluation report issued to the chemical treatment manufacturer. If the evaluation report does not contain information on the adjustments, the chemical manufacturer must be contacted for this information. Compliance with Section 2304.10.6 of the 2024 and 2021 IBC [Section 2304.10.5 of the 2018 and 2015 IBC (Section 2304.9.5 of the 2012 IBC)] and Section R304.3 of the 2024 IRC (Section R317.3 of the 2021, 2018, 2015, and 2012 IRC) is also required.

4.2.2 Metal Hinge Plate Connectors: Allowable shear, tension and compression design values for the MiTek MTH18 and SMH18 metal hinge plate connectors are given in Table 3. Imposed forces at the joint and internal stresses within the truss containing the joint must be determined using a structural model with a pin at the hinge joint location. The design load, due to combined shear and axial loads, must not exceed the allowable load using the Hankinson formula as follows:

$F_\Theta \le P_\Theta$

where:

F_Θ = Imposed combined shear and axial load, lbf

= $(F_a^2 + F_v^2)^{0.5}$.

P_Θ = Allowable combined shear and axial load, lbf

= $(P_a \times P_v) / ((P_a \times (\sin \Theta)^2 + (P_v \times (\cos \Theta)^2))$.

F_a = Imposed axial force, lbf.

F_v = Imposed shear force, lbf.

P_a = Allowable axial force, lbf. (in compression or tension corresponding to imposed axial force).

P_v = Allowable shear load, lbf.

Θ = Angle between F_Θ and the length of the plate.

5.0 CONDITIONS OF USE:

The MiTek metal truss connector plates and metal hinge plate connectors 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 This evaluation report and the manufacturer's published installation instructions, when required by the code official, must be submitted at the time of permit application. In the event of a conflict between the manufacturer's published installation instructions and this document, the more restrictive governs.

5.2 Each application for a building permit, using these truss connector plates, must be accompanied by documentation showing that the design, manufacture, and proposed installation conform to the requirements of the applicable code.

5.3 This report establishes plate design values only. For items not covered by this report, such as truss design, fabrication, quality assurance and special inspection, refer to ANSI/TPI 1, engineering drawings and the applicable code.

5.4 The design values (lateral resistance values, effective tension strength ratios, and effective shear resistance ratios) used in the design of trusses, using MiTek metal truss connector plates, must not exceed those listed in Tables 1 and 2 of this report. The allowable design values used in the design of trusses using MiTek metal hinge plate connectors are for a pair of hinge plate connectors installed on the opposite faces of the truss members, and must not exceed the values given in Table 3. Load combination reductions must be in accordance with the applicable code.

5.5 All lumber used in the fabrication of trusses using MiTek metal truss connector plates and metal hinge plate connectors must be graded in compliance with the applicable building code. Tabulated design values are for connections in wood having a moisture content not exceeding 19 percent at the time of assembly. Wet service factors from ANSI/TPI 1 Section 6.4 must be applied to the table values when the in-service moisture content in lumber is expected to exceed this value.

5.6 Galvanized G60 metal truss plate connectors subject to corrosive environments must be protected in accordance with Section 6.5 of ANSI/TPI 1.

5.7 MiTek metal truss connector plates and metal hinge plate connectors are manufactured under a quality control program with inspections by ICC-ES.

Note – The following conditions of use apply only to the MTH18 and SMH18 Metal Hinge Plate Connectors:

5.8 The final installation of the MiTek MTH18 and SMH18 metal hinge plate connectors is limited to applications of the connectors, installed in pairs to truss top chord members, where the connectors are installed in the 180-degree position. The MiTek MTH18 metal hinge plate connectors must be installed with a maximum 1-inch (25.4 mm) gap between truss chord members. The MiTek SMH18 metal hinge plate connectors must be installed with a maximum $1^1/_2$-inch (38.1 mm) gap between truss chord members. Installation in other configurations is beyond the scope of this report.

5.9 Lateral translation of the truss chords across the hinge joints must be prevented by sheathing attached to the truss chord members continuously across the joint as prescribed by the applicable code, or by other means acceptable to the code official

5.10 Due to the rotation provided at the joint of the MiTek MTH18 and SMH18 metal hinge plate connectors, the truss design must be modeled with a pin at the hinge joint location. In the final installed condition, shear loads must be applied within the plane of the hinge plate connector, at a 90-degree angle to the long axis.

5.11 Design of diaphragms with trusses manufactured with the MiTek MTH18 and SMH18 metal hinge plate connectors is outside the scope of this report.

5.12 Use of the MiTek MTH18 and SMH18 metal hinge plate connectors is limited to prefabricated trusses and must be in compliance with IBC Section 2303.4 or 2024 IRC Sections R502.12 and R802.10 (2021, 2018, 2015 and 2012 IRC Sections R502.11 and R802.10), as applicable. Field installation is prohibited.

6.0 EVIDENCE SUBMITTED

6.1 Data in accordance with the National Design Standard for Metal Plate Connected Wood Truss Construction, ANSI/TPI 1-2007, -2014 and -2022.

6.2 Data in accordance with the ICC-ES Acceptance Criteria for Metal Hinge Plate Connectors for Wood Trusses (AC283), dated November 2015 (Editorially revised February 2024).

6.3 Manufacturer's descriptive literature.

6.4 A quality control manual.

7.0 IDENTIFICATION

7.1 MiTek metal truss connector plates and hinge plate connectors are identified by an imprint of the plate name embossed into the surface of the plate (for example, the MT20® connector plate is embossed "MT20"). Additionally, boxes containing the connector plates are labeled with the MiTek name, the metal connector plate model, and either the evaluation report number (ESR-1988) or the number of the ICC-ES index evaluation report for MiTek (ESR-2685).

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

MITEK INC.
16023 SWINGLEY RIDGE ROAD
CHESTERFIELD, MISSOURI 63017
(800) 328-5934
www.mitek-us.com

TABLE 1—ALLOWABLE LATERAL RESISTANCE VALUES, HYDRAULIC-PLATEN EMBEDMENT (lb/in^2/PLATE)

LUMBER SPECIES	SG	AA	EA	AE	EE
MII 16					
Southern pine	0.55	174	126	147	122
Douglas fir-larch	0.50	176	121	137	126
Hem-fir	0.43	119	64	102	98
Spruce-pine-fir	0.42	127	82	75	107
MT18HS®, M18SHS™, and MT20®					
Southern pine	0.55	266	220	183	177
Douglas fir–larch	0.50	242	200	166	161
Hem-fir	0.43	208	172	143	138
Spruce-pine-fir	0.42	203	168	140	135
MT20HS®					
Southern pine	0.55	187	143	138	150
Douglas fir-larch	0.50	165	146	135	143
Hem-fir	0.43	139	111	97	109
Spruce-pine-fir	0.42	148	108	107	103
M18AHS					
Southern pine	0.55	186	179	138	160
Douglas fir–larch	0.50	169	162	125	145
Hem-fir	0.43	145	140	108	125
Spruce-pine-fir	0.42	142	136	105	122

For **SI:** 1lb/in^2 = 6.9 kPa.

NOTES:

[1]Tooth-holding units = psi for a single plate (double for plates on both faces when applying to area on only one face). To achieve values, plates must be installed on opposite sides of joint.

[2]AA = Plate parallel to load, wood grain parallel to load.
EA = Plate perpendicular to load, wood grain parallel to load.
AE = Plate parallel to load, wood grain perpendicular to load.
EE = Plate perpendicular to load, wood grain perpendicular to load.

TABLE 2—EFFECTIVE TENSION AND SHEAR RESISTANCE ALLOWABLE DESIGN VALUES

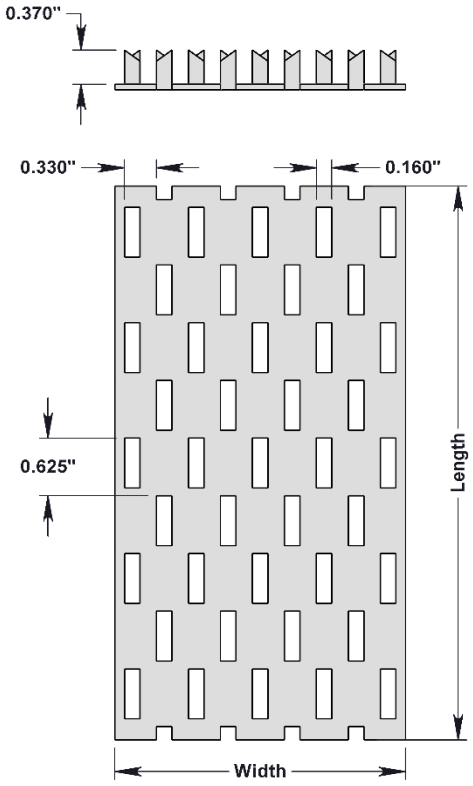
PROPERTY FORCE DIRECTION	MII 16		MT18HS®		M18SHS™		MT20®		MT20HS®		M18AHS	
	Efficiency	Pounds/ inch/Pair of Connector Plates	Efficiency	Pounds/ inch/Pair of Connector Plates	Efficiency	Pounds/ inch/Pair of Connector Plates	Efficiency	Pounds/ inch/Pair of Connector Plates	Efficiency	Pounds/ inch/Pair of Connector Plates	Efficiency	Pounds/ inch/Pair of Connector Plates
Tension values in accordance with Section 5.4.4.2 of TPI-1 (Minimum Net Section over the joint)[1]												
Tension @ 0°	0.694	1,982	0.538	1,809	0.532	2,299	0.499	873	0.624	1,590	0.643	2,161
Tension @ 90°	0.300	857	0.550	1,847	0.533	2,301	0.492	860	0.523	1,333	0.574	1,928
Tension Values in Accordance with Section 5.4.4.2.1 of TPI-1 (Maximum Net Section Over the Joint)[2]												
Tension @ 0° SG=0.42	---	---	0.613	2,060	0.579	2,502	0.629	1,100	0.671	1,712	0.708	2,380
Tension @ 0° SG=0.50	---	---	0.623	2,094	0.584	2,522	0.654	1,144	0.697	1,778	0.725	2,435
Shear Values												
Shear @ 0°	0.54	1,041	0.55	1,099	0.45	1,170	0.55	637	0.43	761	0.61	1,229
Shear @ 30°	0.61	1,173	0.57	1,153	0.49	1,272	0.76	888	0.61	1,085	0.65	1,309
Shear @ 60°	0.73	1,402	0.74	1,492	0.60	1,549	0.81	941	0.67	1,184	0.82	1,651
Shear @ 90°	0.55	1,055	0.52	1,052	0.34	869	0.46	534	0.45	792	0.50	1,011
Shear @ 120°	0.48	914	0.40	802	0.36	921	0.44	509	0.34	608	0.47	940
Shear @ 150°	0.35	672	0.37	745	0.29	745	0.51	596	0.30	537	0.42	837

For **SI:** 1 lb/inch = 0.175 N/mm, 1 inch = 25.4 mm.

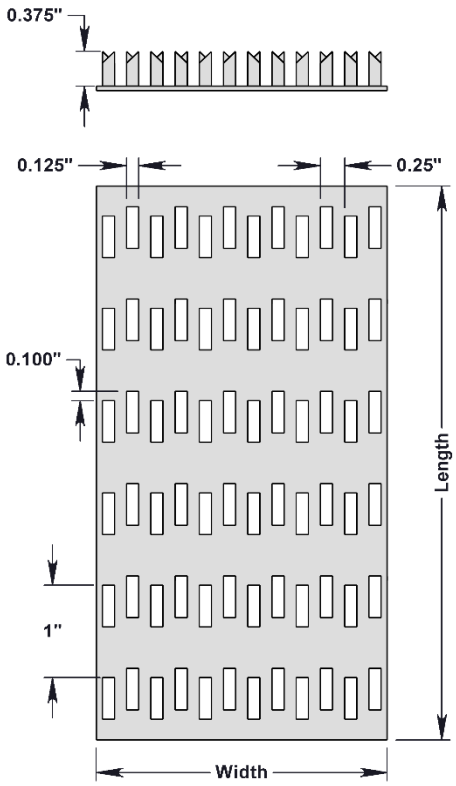
NOTES:

[1]Minimum Net Section – A line through the plate's tooth pattern with the minimum amount of steel for a specified orientation. For these plates, this line passes through a line of holes.

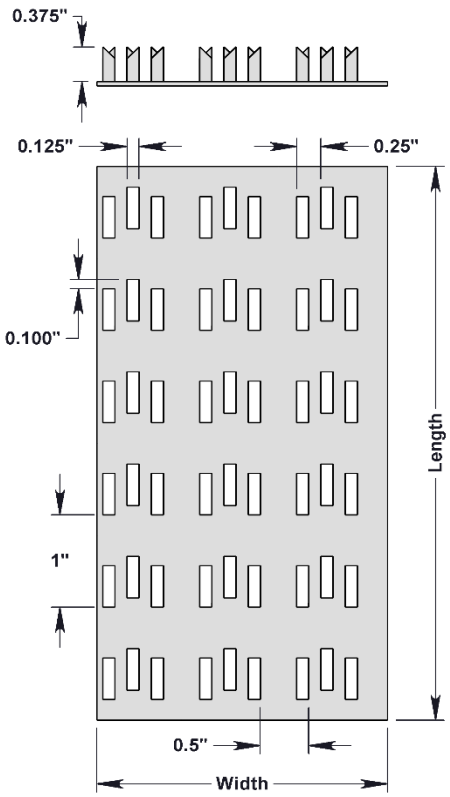
[2]Maximum Net Section – A line through the plate's tooth pattern with the maximum amount of steel for a specified orientation. For these plates, this line passes through a section of the plate with no holes



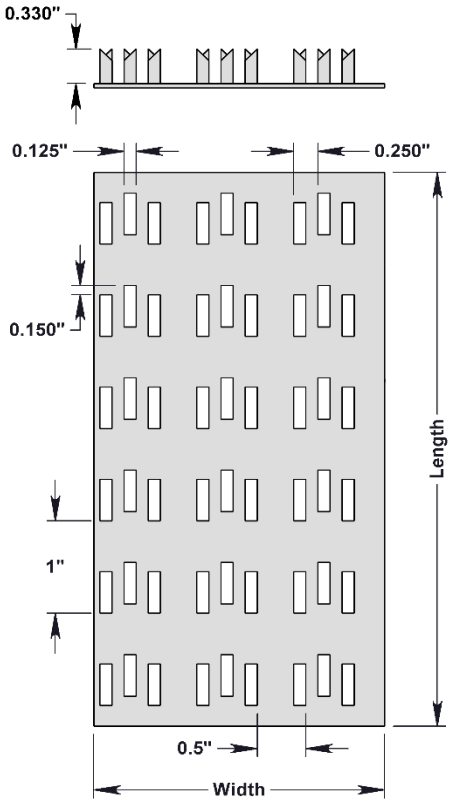
MII 16



MT18HS, M18SHS, and MT20



M18AHS



MT20HS

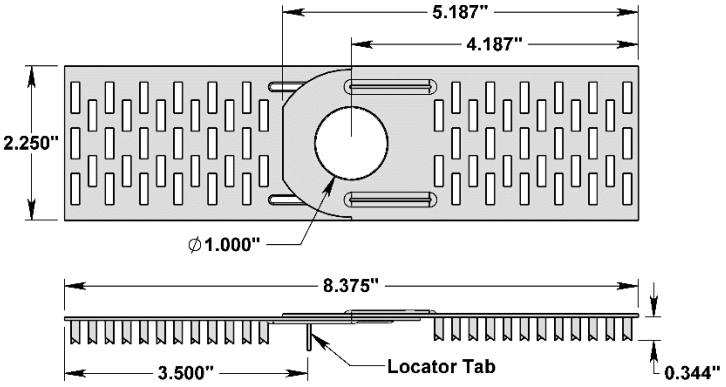
FIGURE 1—APPROXIMATE DIMENSIONS OF MITEK CONNECTOR PLATE MODELS

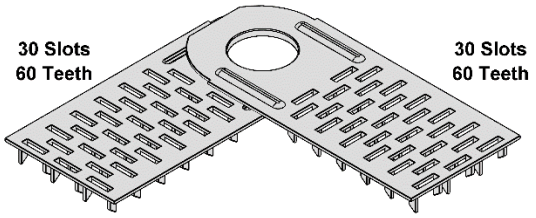
TABLE 3—ALLOWABLE DESIGN VALUES FOR THE MTH18 AND SMH18 HINGE PLATE CONNECTORS[1,2]

PROPERTY	ALLOWABLE DESIGN VALUE (lbf)	
	MTH18	SMH18
Shear (P_v)	950	637
Tension (P_a)	1,624	1,135
Compression (P_a)	1,624	1,135

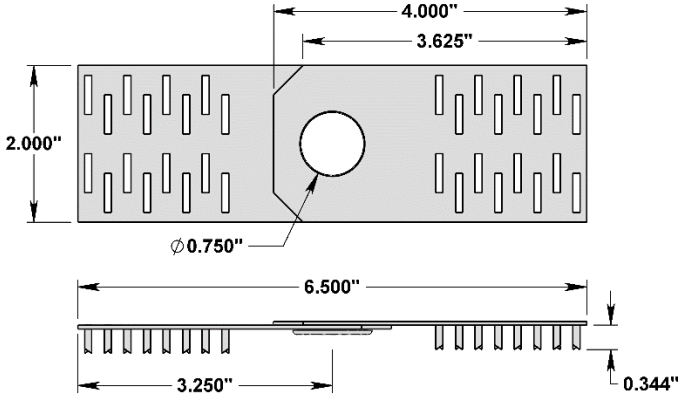
For **SI:** 1lbf = 4.448 N.

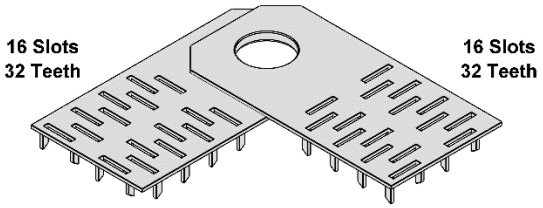
[1]Allowable design values are applicable to application of the metal hinge plate connectors installed in pairs to truss chord members.
[2]The allowable design values used in the design of trusses must not exceed the values listed in this Table. Load combination must be in accordance with the applicable code. No adjustments for duration of load are permitted





MTH18 Hinge Plate





SMH18 Hinge Plate

FIGURE 2 – APPROXIMATE DIMENSIONS OF MITEK HINGE PLATE MODELS

TABLE 4 – PLATE STEEL PROPERTIES

STOCK NO.	STEEL GAGE	TEETH PER SQUARE INCH	MINIMUM BASE-STEEL THICKNESS (inch)	TOTAL METAL THICKNESS (inch)	STEEL GRADE	FINISH
MII 16	16	4.8	0.0565	0.0575	ASTM A653 SS, Grade 40	G60
MT18HS®	18	8	0.0456	0.0466	ASTM A653 HSLAS, Grade 60	G60
M18AHS	18	6	0.0456	0.0466	ASTM A653 HSLAS, Grade 60	G60
M18SHS™	18	8	0.0456	0.0466	ASTM A653 SS, Grade 80	G60
MT20®	20	8	0.0346	0.0356	ASTM A653 SS, Grade 40	G60
MT20HS®	20	6	0.0346	0.0356	ASTM A653 HSLAS-F, Grade 60	G60
MTH18	18	5	0.0456	0.0466	ASTM A653 SS, Grade 50	G60
SMH18	18	4.6	0.0456	0.0466	ASTM A653 SS, Grade 50	G60

DIVISION: 06 00 00—WOOD, PLASTICS, AND COMPOSITES
Section: 06 17 53—Shop-Fabricated Wood Trusses

REPORT HOLDER:

MITEK INC.

EVALUATION SUBJECT:

MITEK® METAL TRUSS CONNECTOR PLATES AND HINGE PLATE CONNECTORS

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that the MiTek Metal Truss Connector Plates and Hinge Plate Connectors, described in ICC-ES evaluation report ESR-1988, 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 MiTek Metal Truss Connector Plates and Hinge Plate Connectors, described in Sections 2.0 through 7.0 of the evaluation report ESR-1988, 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 MiTek Metal Truss Connector Plates and Hinge Plate Connectors, described in this evaluation report supplement must comply with all of the following conditions:

- All applicable sections in the evaluation report ESR-1988.
- The design, installation, conditions of use and labeling are in accordance with the 2021 *International Building Code®* (IBC) provisions noted in the evaluation report ESR-1988.
- The design, installation and inspection are in accordance with additional requirements of LABC Chapters 16, 17 and 23, and LARC Section R802, as applicable.
- Metal connector plate teeth within $^1/_2$ inch (12.7 mm) of the ends of truss wood members must be considered ineffective to carry any load.
- 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 ESR-1988, reissued December 2022 and revised June 2024.

DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES
Section: 06 17 53—Shop-Fabricated Wood Trusses

REPORT HOLDER:

MITEK INC.

EVALUATION SUBJECT:

MITEK® METAL TRUSS CONNECTOR PLATES AND HINGE PLATE CONNECTORS

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that the Mitek Metal Truss Connector Plates and Hinge Plate Connectors, described in ICC-ES evaluation report ESR-1988, have also been evaluated for compliance with the codes noted below.

Applicable code editions:

- 2022 *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.

- 2022 *California Residential Code* (CRC)

2.0 CONCLUSIONS

2.1 CBC:

The Mitek Metal Truss Connector Plates and Hinge Plate Connectors, described in Sections 2.0 through 7.0 of the evaluation report ESR-1988, comply with CBC Chapter 23, provided the design and installation are in accordance with the 2021 *International Building Code*® (IBC) provisions noted in the evaluation report, and the additional requirements of CBC Chapters 16, 17 and 23, as applicable.

2.1.1 OSHPD: The applicable OSHPD Sections of the CBC are beyond the scope of this supplement.

2.1.2 DSA: The applicable DSA Sections of the CBC are beyond the scope of this supplement.

2.2 CRC:

The Mitek Metal Truss Connector Plates and Hinge Plate Connectors, described in Sections 2.0 through 7.0 of the evaluation report ESR-1988, comply with CRC Sections R502.11 and R802.10, provided the design and installation are in accordance with the 2021 *International Residential Code*® (2018 IRC) provisions noted in the evaluation report and the additional requirements of CRC Chapters 5 and 8, as applicable.

This supplement expires concurrently with the evaluation report ESR-1988, reissued December 2022 and revised June 2024.

DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES
Section: 06 17 53—Shop-Fabricated Wood Trusses

REPORT HOLDER:

MITEK INC.

EVALUATION SUBJECT:

MITEK® METAL TRUSS CONNECTOR PLATES AND HINGE PLATE CONNECTORS

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that MiTek Metal Truss Connector Plates and Hinge Plate Connectors, described in ICC-ES evaluation report ESR-1988, have also been evaluated for compliance with the codes noted below.

Applicable code editions:

- 2023 and 2020 *Florida Building Code—Building*
- 2023 and 2020 *Florida Building Code—Residential*

2.0 CONCLUSIONS

The MiTek Metal Truss Connector Plates and Hinge Plate Connectors**,** described in Sections 2.0 through 7.0 of the evaluation report ESR-1988, comply with the *Florida Building Code—Building* and the *Florida Building Code—Residential.* The design requirements must be determined in accordance with the *Florida Building Code—Building* or the *Florida Building Code—Residential,* as applicable. The installation requirements noted in ICC-ES evaluation report ESR-1988 for the 2021 *International Building Code®* meet the requirements of the *Florida Building Code—Building* or the *Florida Building Code—Residential,* as applicable, with the following condition:

a) Compliance with Section 2304.10.5 of the *Florida Building Code—Building* and Section R317.3 of the *Florida Building Code—Residential* is required as described in Section 4.2 of the evaluation report ESR-1988.

Use of the MiTek Metal Truss Connector Plates and Hinge Plate Connectors have also been found to be in compliance with the High-Velocity Hurricane Zone provisions of the *Florida Building Code—Building* and the *Florida Building Code—Residential* with the following condition:

a) For connections subject to uplift, the connection must be designed for no less than 700 pounds (3114 N).

For products falling under Florida Rule 61G20-3, 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-1988, reissued December 2022 and revised June 2024.