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ICC-ES Evaluation Report

ESR-1311

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This report is subject to renewal 06/2019.

DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES
SECTION: 06 17 53—SHOP-FABRICATED WOOD TRUSSES

REPORT HOLDER:

MITEK USA, INC.

16023 SWINGLEY RIDGE ROAD
CHESTERFIELD, MISSOURI 63017

EVALUATION SUBJECT:

MITEK® TRUSS CONNECTOR PLATES: M-16, MII 16, M-20, MII 20, M-20 HS, MII 20 HS AND MT20HS™

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

REPORT HOLDER:

MITEK USA, INC.
16023 SWINGLEY RIDGE ROAD
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(314) 434-1200
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EVALUATION SUBJECT:

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1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2018, 2015, 2012, 2009 and 2006 *International Building Code®* (IBC)
- 2018, 2015, 2012, 2009 and 2006 *International Residential Code®* (IRC)

Property evaluated:

Structural

2.0 USES

MiTek® metal truss connector plates are used as joint connector components of light wood frame trusses.

3.0 DESCRIPTION

3.1 MiTek® M-16 and MII 16:

Model M-16 and Model MII 16 metal truss connector plates are manufactured from minimum No. 16 gage [0.0575 inch total thickness (1.46 mm)], ASTM A653 SS, Grade 40 steel, with a G60 galvanization coating [0.0005 inch thickness on each side (0.013 mm)] and having a base-metal thickness of 0.0565 inch (1.44 mm). Slots 0.54 inch (13.7 mm) in length are punched along the perpendicular axis of the plates. The metal displaced by the slot is lanced and formed into two opposing teeth, protruding at right angles from the flat plate. Each tooth is diagonally cut, thereby forming a sharp point. The teeth are additionally shaped into a twisted concave form, facing the slot cutout area. Teeth are 0.16 inch (4.1 mm) wide and 0.37 inch (9.4 mm) long, and there are 4.8 teeth per square inch (0.0074 teeth per square millimeter) of plate area. Plates are available in 1-inch (25.4 mm) width increments, up to 12 inches (305 mm), and lengthwise in $1^{1}/_{4}$-inch (31.7 mm) multiples. See Figure 1 of this report for details.

3.2 MiTek® M-20 and MII 20:

Model M-20 and Model MII 20 metal truss connector plates are manufactured from minimum No. 20 gage [0.0356 inch total thickness (0.9 mm)], ASTM A653 SS, Grade 40 steel, with a G60 galvanization coating [0.0005 inch thickness on each side (0.013 mm)] and having a base-metal thickness of 0.0346 inch (0.88 mm). The plates have repeating 1-inch-square (25 mm) modules of teeth stamped out and formed at right angles to the face of the parent metal. Each module has four slots, 0.45 inch (11.4 mm) long and 0.125 inch (3.2 mm) wide, fabricated by punching two teeth out of each slot and resulting in each module having eight teeth. The transverse centerlines of adjacent slots are staggered 0.15 inch (3.8 mm) in a longitudinal direction. Longitudinal centerlines of slots are spaced 0.25 inch (6.4 mm). Each slot has a 0.33-inch-long (8.4 mm) tooth at each end. Each tooth is formed with a symmetrical V-shaped cross section at its base, and twists approximately 22 degrees to its point. See Figure 1 of this report for details.

3.3 MiTek® M-20 HS, MII 20 HS, and MT20HS™:

Models M-20 HS, MII 20 HS, and MT20HS™ metal truss connector plates are manufactured from minimum No. 20 gage [0.0356 inch total thickness (0.9 mm)], ASTM A653 Grade 60, high-strength, low-alloy steel with improved formability (HSLAS-F), with a G60 galvanization coating [0.0005 inch thickness on each side (0.013 mm)] and having a base-metal thickness of 0.0346 inch (0.88 mm). Repeating $^{3}/_{4}$-inch-by-1-inch (19 mm by 25.4 mm) modules of teeth are stamped out and formed at right angles to the face of the parent metal. Each module has three slots, 0.45 inch (11.4 mm) long and 0.125 inch (3.2 mm) wide, fabricated by punching two teeth out of each slot area, and resulting in each module having six teeth. Each module is separated by a 0.25-inch-wide (6.4 mm) strip of unpunched steel. The transverse centerlines of adjacent slots are staggered 0.15 inch (3.8 mm) in the longitudinal direction. Longitudinal centerlines of slots are spaced 0.25 inch (6.4 mm). Each slot has a 0.33-inch-long (8.4 mm) tooth at each end. Each tooth is additionally shaped, twisting an approximate 22 degrees to its point. See Figure 1 of this report for details.

4.0 DESIGN AND INSTALLATION

4.1 General:

All truss plates 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 specified in ANSI/TPI 1, Chapter 3, Quality Criteria for the Manufacture of Metal-Plate-Connected Wood Trusses.

4.2 Allowable Design Values:

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 of this report. 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 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 2304.10.5 of the 2018 and 2015 IBC (Section 2304.9.5 of the 2012, 2009 and 2006 IBC) and Section R317.3 of the 2018, 2015, 2012 and 2009 IRC (Section R319.3 of the 2006 IRC) is also required.

5.0 CONDITIONS OF USE

The MiTek® metal truss connector plates 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 instructions in this document govern.

5.2 Each application for a building permit, using these metal truss connector plates, must be accompanied by documentation showing that the design, manufacture, and proposed installation conforms with 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 the applicable version of ANSI/TPI 1, engineering drawings and the applicable code.

5.4 The design values (allowable lateral resistance values and effective tension and shear resistance allowable design values) 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. 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 must be graded in compliance with the applicable building code and must have 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 lumber moisture content exceeds 19 percent.

5.6 Metal truss connector plates must be installed in pairs, on opposite faces of truss members.

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

5.8 MiTek® metal truss connector plates are manufactured in Saint Charles, Missouri; Tolleson, Arizona; Tampa, Florida; Edenton, North Carolina; and Bradford, Ontario, Canada, under a quality-control program with inspections by ICC-ES.

6.0 EVIDENCE SUBMITTED

6.1 Data in accordance with the National Design Standard for Metal Plate Connected Wood Truss Construction, ANSI/TPI 1-2002, 2007 and 2014.

6.2 Manufacturer's descriptive literature.

6.3 A quality control manual.

7.0 IDENTIFICATION

The MiTek® connectors are identified by an imprint of the plate name embossed into the surface of the plate (for example, the M-16 plate is embossed "M-16"). Additionally, boxes containing the connector plates must be labeled with the MiTek® name, the metal connector plate model, and the evaluation report number (ESR-1311).

TABLE 1—ALLOWABLE LATERAL RESISTANCE VALUES, HYDRAULIC-PLATEN EMBEDMENT[3] (lb/in^2/PLATE)

LUMBER SPECIES	SG	AA	EA	AE	EE
M–16 AND MII 16					
Douglas fir–larch	0.50	176	121	137	126
Hem-flr	0.43	119	64	102	98
Spruce-pine-fir	0.42	127	82	75	107
Southern pine	0.55	174	126	147	122
M–20 and MII 20					
Douglas fir–larch	0.50	220	195	180	190
Hem-fir	0.43	185	148	129	145
Spruce-pine-fir	0.42	197	144	143	137
Southern pine	0.55	249	190	184	200
M–20 HS, MII 20 HS and MT20HS					
Douglas fir–larch	0.50	165	146	135	143
Hem-flr	0.43	139	111	97	109
Spruce-pine-fir	0.42	148	108	107	103
Southern pine	0.55	187	143	138	150

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

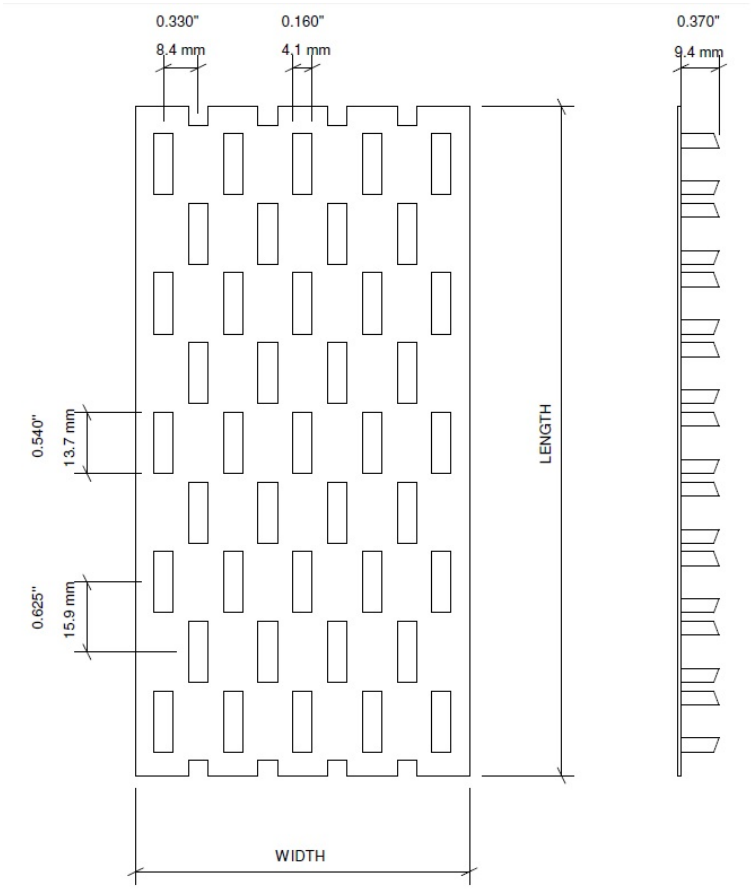
NOTES:
[1]Tooth holding units = psi for a single plate (double for plates on both faces when applying to area on only one face). To achieve values, plates must be installed on opposite sides of joint.
[2]AA = Plate parallel to load, wood grain parallel to load
EA = Plate perpendicular to load, wood grain parallel to load
AE = Plate parallel to load, wood grain perpendicular to load
EE = Plate perpendicular to load, wood grain perpendicular to load
[3]All truss plates 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.

TABLE 2—EFFECTIVE TENSION AND SHEAR RESISTANCE ALLOWABLE DESIGN VALUES

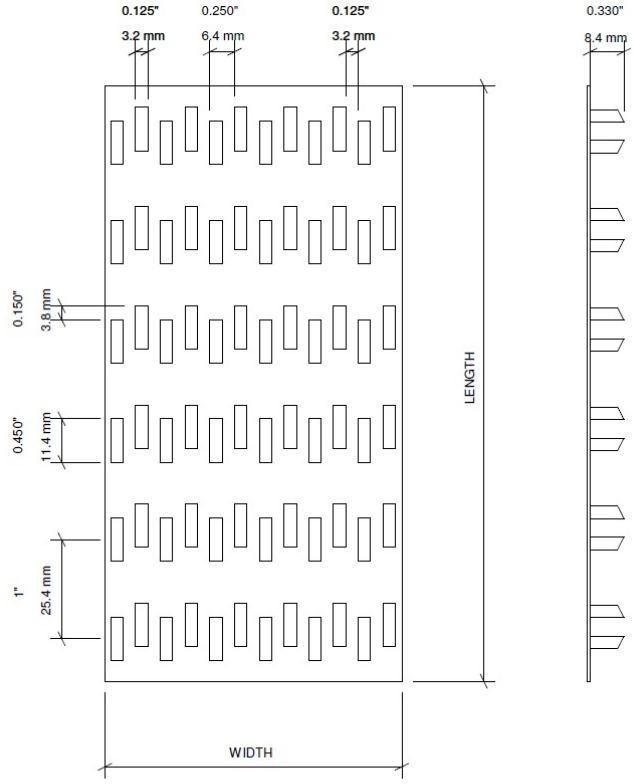
PROPERTY FORCE DIRECTION	M–16 AND MII 16		M–20 AND MII 20		M–20 HS, MII 20HS AND MT20HS	
	Efficiency	Pounds/inch/Pair of Connector Plates	Efficiency	Pounds/inch/Pair of Connector Plates	Efficiency	Pounds/inch/Pair of Connector Plates
Tension Values in Accordance with Section 5.4.4.2 of TPI-1 (Minimum Net Section over the Joint)[1]						
Tension @ 0º	0.694	1982	0.50	880	0.624	1590
Tension @ 90º	0.300	857	0.47	820	0.523	1333
Tension Values in Accordance with Section 5.4.4.2.1 of TPI-1 (Maximum Net Section Over the Joint)[2]						
Tension @ 0º SG=0.42	—	—	—	—	0.671	1712
Tension @ 0º SG=0.50	—	—	—	—	0.697	1778
Shear Values						
Shear @ 0º	0.54	1041	0.49	574	0.43	761
Shear @ 30º	0.61	1173	0.63	738	0.61	1085
Shear @ 60º	0.73	1402	0.79	936	0.67	1184
Shear @ 90º	0.55	1055	0.55	645	0.45	792
Shear @ 120º	0.48	914	0.42	490	0.34	608
Shear @ 150º	0.35	672	0.46	544	0.3	537

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 theseplates, this line passes through a section of the plate with no holes.

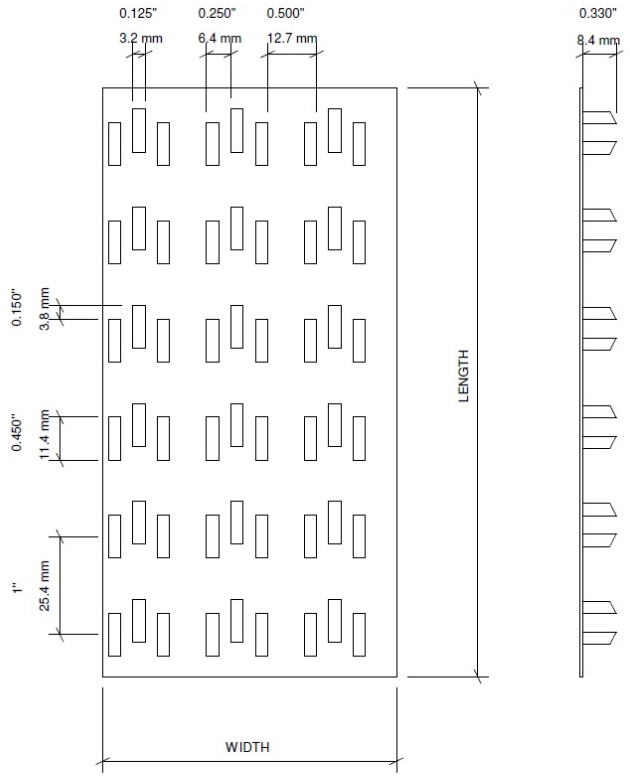


M-16, MII16



M-20, MII 20

FIGURE 1—APPROXIMATE DIMENSIONS OF MiTEK CONNECTOR PLATES (in inches)



M-20 HS, MII 20 HS,
MT20HS

FIGURE 1—APPROXIMATE DIMENSIONS OF MiTEK CONNECTOR PLATES (in inches) (Continued)

ICC-ES Evaluation Report

ESR-1311 CBC AND CRC Supplement

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

REPORT HOLDER:

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EVALUATION SUBJECT:

MiTek® TRUSS CONNECTOR PLATES: M-16, MII 16, M-20, MII 20, M-20 HS, MII 20 HS, AND MT20HS™

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that MiTek® Truss connector plates M-16, MII 16, M-20, MII 20, M-20 HS, MII 20 HS, and MT20HS™, recognized in ICC-ES master evaluation report ESR-1311, have also been evaluated for compliance with the codes noted below.

Applicable code editions:

- 2016 California *Building Code* (CBC)
- 2016 California *Residential Code* (CRC)

2.0 CONCLUSIONS

2.1 CBC:

The MiTek® Truss connector plates M-16, MII 16, M-20, MII 20, M-20 HS, MII 20 HS, and MT20HS™, described in Sections 2.0 through 7.0 of the master evaluation report ESR-1311, comply with CBC Chapter 23, provided the design and installation are in accordance with the 2015 *International Building Code®* (2015 IBC) provisions noted in the master report and the additional requirements of CBC Chapters 16, 16A, 17, 17A and 23, as applicable.

2.2 CRC:

The MiTek® Truss connector plates M-16, MII 16, M-20, MII 20, M-20 HS, MII 20 HS, and MT20HS™, described in Sections 2.0 through 7.0 of the master evaluation report ESR-1311, comply with CRC Sections R502.11 and R802.10, provided the design and installation are in accordance with the 2015 *International Residential Code®* (2015 IRC) provisions noted in the master report.

This supplement expires concurrently with the master evaluation report, reissued June 2017, revised October 2017.

ICC-ES Evaluation Report

ESR-1311 FBC Supplement

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Section: 06 17 53—Shop-Fabricated Wood Trusses

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EVALUATION SUBJECT:

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1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that MiTek® Truss Connector Plates M-16, MII 16, M-20, MII 20, M-20 HS, MII 20 HS, and MT20HS™, recognized in ICC-ES master report ESR-1311, 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 MiTek® Truss Connector Plates M-16, MII 16, M-20, MII 20, M-20 HS, MII 20 HS, and MT20HS™, described in Sections 2.0 through 7.0 of the master evaluation report ESR-1311, comply with the *Florida Building Code—Building* and the *Florida Building Code—Residential*, provided the design and installation are in accordance with the 2015 *International Building Code®* (IBC) provisions noted in the master report.

Use of the MiTek® Truss Connector Plates M-16, MII 16, M-20, MII 20, M-20 HS, MII 20 HS, and MT20HS™ has 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*.

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 master report, reissued June 2017, revised October 2017.