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DIVISION: 06—WOOD AND PLASTICS
Section: 06090—Wood and Plastic Fastenings

REPORT HOLDER:

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EVALUATION SUBJECT:

USP STRUCTURAL CONNECTORS: LTTI31 STRAP ANCHOR, MUGT15 TRUSS ANCHOR, PAU POST BASE CONNECTOR AND TFL WOOD I-JOIST HANGER

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2003 *International Building Code*® (IBC)
- 2003 *International Residential Code*® (IRC)
- 1997 *Uniform Building Code*™ (UBC)

Properties evaluated:

Structural

2.0 USES

USP structural connectors are used as wood framing connectors.

3.0 DESCRIPTION

3.1 LTTI31 Strap Anchor:

The LTTI31 Strap Anchor is designed to be installed on top of open web trusses and provide resistance and anchorage to superimposed tension forces with masonry or concrete construction. The LTTI31 Strap Anchor is cold-formed from No. 18 gage steel. The load transfer plate is fabricated from No. 3 gage hot-rolled steel. The LTTI31 Strap Anchor is prepunched for 10d common nails or 10d by 1¹/₂-inch (37 mm) nails. See Table 4 and Figure 1 of this report for product dimensions, fastener schedule and allowable loads.

3.2 MUGT15 Truss Anchor:

The MUGT15 Truss Anchor is designed to secure trusses to the top of a wall system, in a face-mounted or wrapped configuration. The MUGT15 is cold-formed from No. 12 gage steel. The load transfer plate is fabricated from 3¹/₈-inch-thick (9.5 mm), cold-rolled, hot dipped galvanized steel. The MUGT15 Truss Anchor is prepunched for 10d common nails, and the load transfer plate is prepunched for a 5¹/₈-inch-diameter (15.9 mm) bolt. See Table 5 and Figure 2 for product dimensions, fastener schedule and allowable loads.

3.3 PAU Post Base Connector:

The PAU Post Base Connector is designed to transfer direct loads and resist uplift loads for nominally 8-by-8-inch (203 by 203 mm) regular and rough sawn lumber posts. The PAU Post Base Connector is cold-formed from No. 12 gage steel and prepunched for 16d common nails and 5¹/₈-inch-diameter (15.9 mm) anchor bolts. The device is site-assembled from three separate components: (1) the support standoff; (2) the washers; and (3) the support or base cover. The base cover component is set on the 5¹/₈-inch-diameter (15.9 mm) anchor bolts which have been previously cast-in-place in concrete and fastened with a nut and the provided washers. The standoff support is then set over the anchor bolts and nuts, and a post is set on top of this and fastened to the cover unit with nails. See Table 6 and Figure 3 for product dimensions, fastener schedule and allowable loads.

3.4 TFL Wood I-Joist Hanger:

The TFL Wood I-Joist Hanger is cold-formed from No. 18 gage steel. The TFL Wood I-Joist Hanger is prepunched for 10d or 16d common nails. See Table 7 and Figure 4 for product dimensions, fastener schedule and allowable loads.

3.5 Materials:

3.5.1 Steel: The specific types of steel and corrosion protection for each product are described in Table 8. Minimum steel base-metal thicknesses for the different gages are shown in Table 2.

3.5.2 Wood: Wood members shall be nominal-dimensional lumber with a minimum specific gravity of 0.50, and shall have a moisture content not exceeding 19 percent (16 percent for engineered wood products). Refer to Section 3.5.4 of this report for issues related to chemically treated wood.

3.5.3 Fasteners:

3.5.3.1 Bolts: Bolts shall comply with ASTM A 307 and shall have a minimum bending yield strength of 45,000 lbf/in² (310 MPa).

3.5.3.2 Threaded Rod: Threaded rod shall comply with ASTM A 307 and shall have a minimum bending yield strength of 45,000 lbf/in² (310 MPa).

3.5.3.3 Nails: Steel wire nails shall conform to the nominal sizes specified in ASTM F 1667, unless otherwise noted, and shall have the nominal dimensions and bending yield strengths shown in Table 3 of this report.

3.5.4 Use in Treated Wood: In general, connectors, including anchors and fasteners, installed in corrosive environments or exposed to corrosive materials or chemicals, can be damaged, possibly resulting in the reduction of load values. Fasteners used in treated wood, such as preservative-treated or fire-retardant-treated wood, are outside the scope of this report. The wood treater should be contacted for recommendations on minimum corrosion

resistance of fasteners and connectors used with the specific treated wood.

3.5.5 Corrosion Resistance: Corrosion resistance of products is provided by either zinc coating in accordance with ASTM A 653 or hot-dipped galvanizing in accordance with ASTM A 153. See Table 8 of this report for the specific method utilized for each product.

4.0 DESIGN AND INSTALLATION

4.1 Design:

The allowable load capacities in Tables 4 through 7 are based on allowable stress design. The use of the allowable design values for the LTTI31 Strap Anchor, MUGT15 Truss Anchor, PAU Post Base Connector and TFL Wood I-Joist Hanger shall comply with this report. Tabulated allowable loads are for normal duration and short duration, based on load duration factors, C_D , in accordance with Section 10.3.2 of the NDS. Tabulated allowable loads are for connections in wood seasoned to a maximum moisture content of 19 percent (16 percent for engineered wood products) or less, used under continuously dry conditions and where sustained temperatures are limited to 100°F (37.8°C) or less. When connectors are installed in wood having a moisture content greater than 19 percent, or where wet service is expected, the allowable loads in this evaluation report shall be adjusted by the wet service factor, C_M , specified in Section 10.3.3 of the NDS. When connectors are installed in wood that will experience sustained exposure to temperatures exceeding 100°F (37.7°C), the allowable loads in this evaluation report shall be adjusted by the temperature factor, C_t , specified in Section 10.3.4 of the NDS. Group action factor, C_g , has been accounted for, in accordance with Section 10.3.6 of the NDS, in the tabulated loads, where applicable. Connected wood members shall be checked for load-carrying capacity at the connection in accordance with Section 10.1.2 of the NDS.

4.2 Installation:

Installation of the connectors shall be in accordance with this evaluation 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 shall govern.

5.0 CONDITIONS OF USE

The USP Structural 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 The connectors shall be manufactured, identified and installed in accordance with this report and the manufacturer's published installation instructions. A copy of the instructions shall be available at the jobsite at all times during installation.
- 5.2 Design loads shall be less than the allowable loads indicated in Tables 4 through 7 of this report.
- 5.3 Connected lumber shall comply with Section 3.5.2 of this report.
- 5.4 Adjustment factors noted in Section 4.1 of this report and the applicable codes shall be considered, where applicable.
- 5.5 Fasteners shall comply with Section 3.5.3 of this report.
- 5.6 Use of connectors with treated lumber, such as preservative-treated and fire-retardant-treated lumber, is outside the scope of this report.
- 5.7 The LTTI31 Strap Anchor, MUGT15 Truss Anchor, PAU Post Base Connector and TFL Wood I-Joist Hanger shall be produced in the facilities indicated in the notes to Table 1 of this report.

6.0 EVIDENCE SUBMITTED

- 6.1 Manufacturer's published installation instructions and descriptive literature.
- 6.2 Data in accordance with the ICC-ES Acceptance Criteria for Joist Hangers and Similar Devices (AC13), dated October 2003.
- 6.3 A quality control manual.

7.0 IDENTIFICATION

Each connector described in this report shall be identified by the product model number, the ICC-ES evaluation report number (ESR-1178), and by one or more of the following designations: USP, or United Steel Products Company.

TABLE 1—CROSS REFERENCE OF PRODUCT NAMES WITH APPLICABLE REPORT SECTIONS, TABLES AND FIGURES

PRODUCT NAME	REPORT SECTION	TABLE NO.	FIGURE NO.
LTTI31 Strap Anchor ²	3.1	4	1
MUGT15 Truss Anchor ¹	3.2	5	2
PAU Post Base Connector ¹	3.3	6	3
TFL Wood I-Joist Hanger ^{2,3}	3.4	7	4

¹Manufactured at the USP Largo facility.

²Manufactured at the USP Livermore facility.

³Manufactured at the USP Montgomery facility.

TABLE 2—STANDARD STEEL GAGE EQUIVALENT DIMENSIONS

GAGE NO.	MINIMUM BASE-METAL THICKNESS (inch)
18	0.044
12	0.099
3	0.239

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

TABLE 3—NAIL SIZES AND BENDING YIELD STRENGTHS

COMMON NAIL PENNYWEIGHT	NAIL SHANK DIAMETER (inch)	F_{yb} (lbf/in ²)
10d	0.148	90000
16d	0.162	90000
10d × 1 ¹ / ₂	0.148	90000

For **SI**: 1 inch = 25.4 mm, 1 lbf/in² = 6.89 kPa.

TABLE 4—LTTI31 STRAP ANCHOR DESIGN LOADS

STOCK NO.	STEEL GA.		DIMENSIONS (in.)				FASTENER SCHEDULE ^{1,2}				ALLOWABLE LOADS (lbs.) ³		
	STRAP	PLATE	W	D	CL	L	Nails		Anchor Bolt		Nails		
							Qty	Type	Qty	Dia.	100%	133%	160%
LTTI31	18	3	3 ³ / ₄	2 ⁵ / ₈	1 ³ / ₈	31	18	10d × 1 ¹ / ₂	1	5/ ₈	2015	2680	2825

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

¹A 10d × 1¹/₂-inch nail is a common nail 1¹/₂ inches long and 0.148 inch in diameter.

²The appropriate embedment depth of the anchor bolt with the diameter listed in the table shall be specified by the others to resist the required tension load.

³Allowable loads have been increased 33¹/₃% (UBC) or 60% (IBC or IRC) for wind and seismic loads; no further increase shall be permitted.

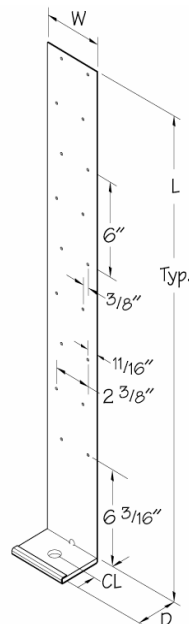


FIGURE 1—LTTI31 STRAP ANCHOR

TABLE 5—MUGT15 TRUSS ANCHOR DESIGN LOADS

STOCK NUMBER	STEEL GA.	CONNECTOR DIMENSIONS (in.)				MOUNTING CONDITION ¹	FASTENERS ²						ALLOWABLE LOADS	
		Width	Depth	Unbent Height	Strap Width		Rafter/Truss			Anchor		Uplift		
							Top	Face	Back	Type	Qty	Dia.	133%	160%
MUGT15	12	3 ¹¹ / ₁₆	2 ⁵ / ₁₆	14 ⁵ / ₈	1 ³ / ₄	Face-Max	-	28	-	10d	1	⁵ / ₈	4495	4495
MUGT15	12	3 ¹¹ / ₁₆	2 ⁵ / ₁₆	14 ⁵ / ₈	1 ³ / ₄	Top-Min	4	6	12	10d	1	⁵ / ₈	4165	4165

For SI: 1 inch = 25.4 mm, 1 lbf = 4.45 N, 1 lbf/inch² = 6.89 kPa.

¹Mounting Condition: Face-Max: All rafter/truss nails installed into the wide face of the rafter/truss.

Top-Min: The hanger is applied in a top mount condition with at least six nails installed on the rafter/truss face, four nails on top of the rafter/truss, and twelve nails into the back face.

²A 10d has a diameter of 0.148 inch and a length of 3 inches.

³Allowable loads have been increased 33¹/₃% (UBC) or 60% (IBC or IRC) for wind and seismic loads; no further increase shall be permitted.

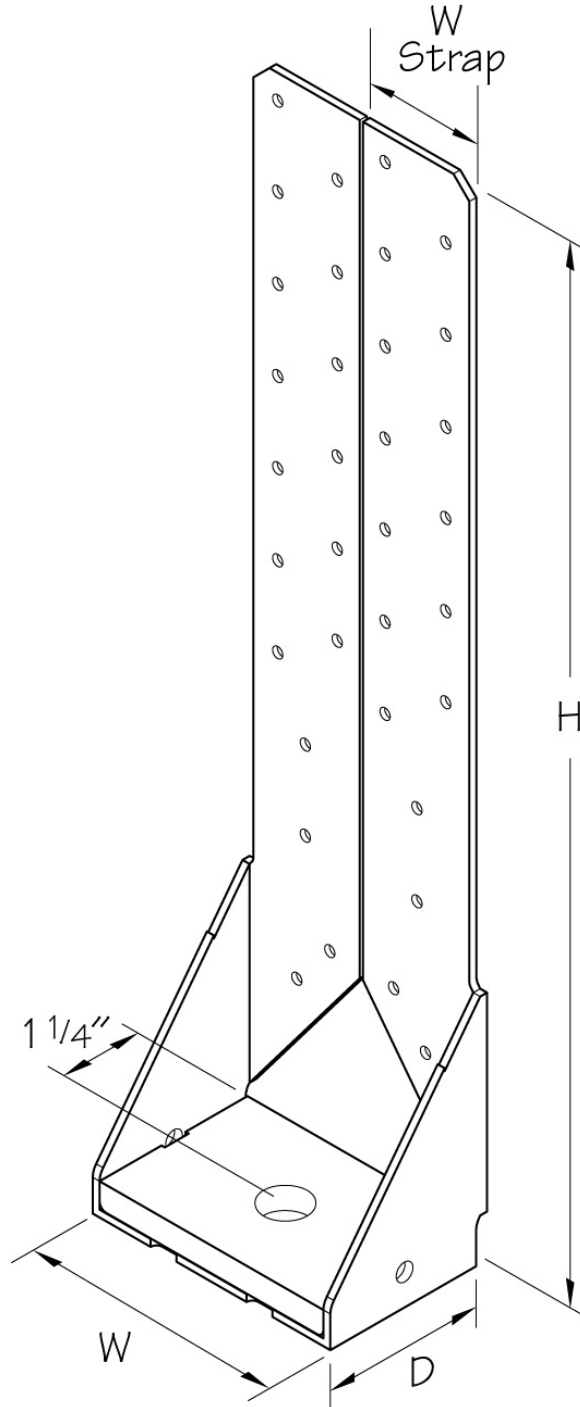


FIGURE 2—MUGT15 TRUSS ANCHOR

TABLE 6—PAU POST BASE CONNECTOR DESIGN LOADS

STOCK NUMBER	STEEL GA.		DIMENSIONS (in.)			FASTENERS				ALLOWABLE LOADS ³		
	Strap	Base	W1	W2	H	Nails		Anchor Bolts		Uplift ¹		Bearing ²
						Qty	Type	Qty	Dia.	133%	160%	100%
PAU88	12	12	7 ¹ / ₂	7 ¹ / ₁₆	7 ³ / ₁₆	14	16d	2	5/8	2780	3185	24900
PAU88R	12	12	8 ¹ / ₁₆	7 ¹ / ₁₆	6 ¹⁵ / ₁₆	14	16d	2	5/8	2780	3185	24900

For SI: 1 inch = 25.4 mm, 1 lbf = 4.45 N, 1 lbf/inch² = 6.89 kPa.

¹Allowable loads have been increased 33¹/₃% (UBC) or 60% (IBC or IRC) for wind and seismic loads; no further increase shall be permitted.

²Bearing loads on the PAU devices shall not be increased.

³PAU device has zero moment capacity, and shall not be used in fixed post applications.

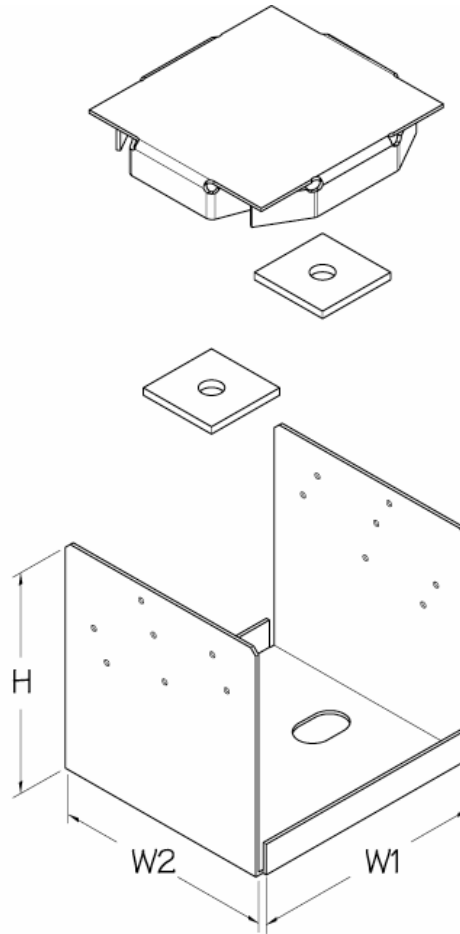


FIGURE 3—PAU POST BASE CONNECTOR

TABLE 7—TFL WOOD I-JOIST HANGER DESIGN LOADS

STOCK NUMBER	STEEL GAGE	DIMENSIONS (in.)				NAIL SCHEDULE ¹				ALLOWABLE LOADS (lbs.) ²								
		W	H	D	TF	Header		Joist		F _{c⊥} = 460 psi			F _{c⊥} = 625 psi			Uplift		
						Top	Face	Type	Qty	Type	100%	115%	125%	100%	115%	125%	133%	160%
TFL15xxx	18	1 ⁹ / ₁₆	9 ¹ / ₄ - 20	2	1 ¹ / ₂	4	2	10d	2	10d × 1 ¹ / ₂	1320	1355	1380	1600	1600	1600	300	360
	18	1 ⁹ / ₁₆	9 ¹ / ₄ - 20	2	1 ¹ / ₂	4	2	16d	2	10d × 1 ¹ / ₂	1365	1410	1435	1760	1760	1760	300	360
TFL16xxx	18	1 ¹¹ / ₁₆	9 ¹ / ₄ - 20	2	1 ¹ / ₂	4	2	10d	2	10d × 1 ¹ / ₂	1320	1355	1380	1600	1600	1600	300	360
	18	1 ¹¹ / ₁₆	9 ¹ / ₄ - 20	2	1 ¹ / ₂	4	2	16d	2	10d × 1 ¹ / ₂	1365	1410	1435	1760	1760	1760	300	360
TFL17xxx	18	1 ¹³ / ₁₆	9 ¹ / ₄ - 20	2	1 ¹ / ₂	4	2	10d	2	10d × 1 ¹ / ₂	1320	1355	1380	1600	1600	1600	300	360
	18	1 ¹³ / ₁₆	9 ¹ / ₄ - 20	2	1 ¹ / ₂	4	2	16d	2	10d × 1 ¹ / ₂	1365	1410	1435	1760	1760	1760	300	360
TFL20xxx	18	2 ¹ / ₈	9 ¹ / ₄ - 20	2	1 ¹ / ₂	4	2	10d	2	10d × 1 ¹ / ₂	1320	1355	1380	1600	1600	1600	300	360
	18	2 ¹ / ₈	9 ¹ / ₄ - 20	2	1 ¹ / ₂	4	2	16d	2	10d × 1 ¹ / ₂	1365	1410	1435	1760	1760	1760	300	360
TFL23xxx	18	2 ³ / ₈	9 ¹ / ₄ - 20	2	1 ¹ / ₂	4	2	10d	2	10d × 1 ¹ / ₂	1320	1355	1380	1600	1600	1600	300	360
	18	2 ³ / ₈	9 ¹ / ₄ - 20	2	1 ¹ / ₂	4	2	16d	2	10d × 1 ¹ / ₂	1365	1410	1435	1760	1760	1760	300	360
TFL25xxx	18	2 ⁹ / ₁₆	9 ¹ / ₄ - 20	2	1 ¹ / ₂	4	2	10d	2	10d × 1 ¹ / ₂	1320	1355	1380	1600	1600	1600	300	360
	18	2 ⁹ / ₁₆	9 ¹ / ₄ - 20	2	1 ¹ / ₂	4	2	16d	2	10d × 1 ¹ / ₂	1365	1410	1435	1760	1760	1760	300	360
TFL26xxx	18	2 ¹¹ / ₁₆	9 ¹ / ₄ - 20	2	1 ¹ / ₂	4	2	10d	2	10d × 1 ¹ / ₂	1320	1355	1380	1600	1600	1600	300	360
	18	2 ¹¹ / ₁₆	9 ¹ / ₄ - 20	2	1 ¹ / ₂	4	2	16d	2	10d × 1 ¹ / ₂	1365	1410	1435	1760	1760	1760	300	360
TFL35xxx	18	3 ⁹ / ₁₆	9 ¹ / ₄ - 20	2	1 ¹ / ₂	4	2	10d	2	10d × 1 ¹ / ₂	1320	1355	1380	1600	1600	1600	300	360
	18	3 ⁹ / ₁₆	9 ¹ / ₄ - 20	2	1 ¹ / ₂	4	2	16d	2	10d × 1 ¹ / ₂	1365	1410	1435	1760	1760	1760	300	360

For SI: 1 inch = 25.4 mm, 1 lbf = 4.45 N, 1 lbf/inch² = 6.89 kPa.

¹The 10d × 1¹/₂-inch nail is 9 ga. wire (0.148 inch in diameter) by 1¹/₂ inches long.

²Allowable loads have been increased 33¹/₃% (UBC) or 60% (IBC or IRC) for wind and seismic loads; no further increase shall be permitted.

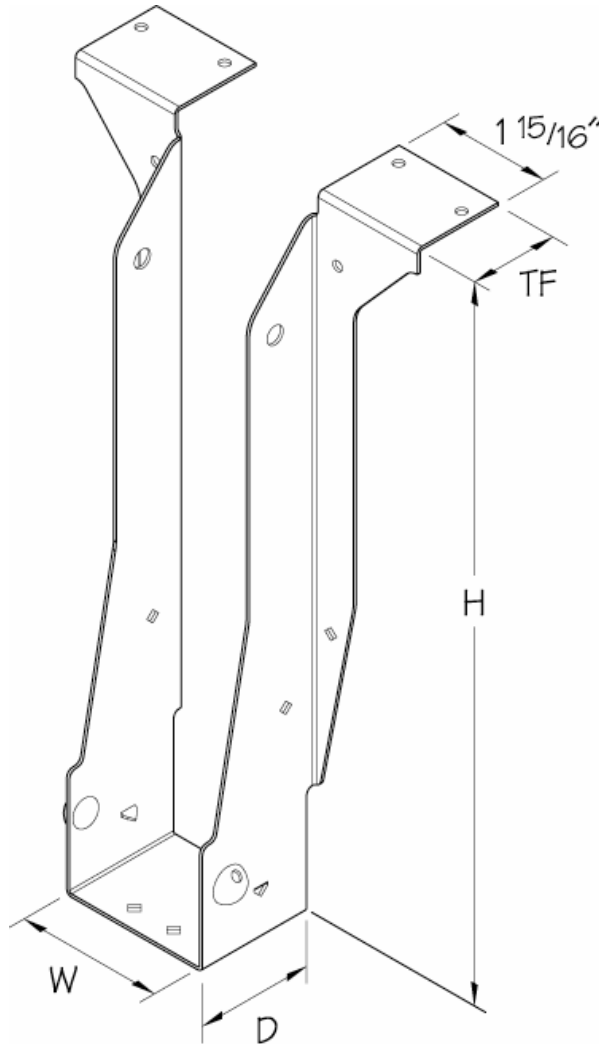


FIGURE 4—TFL WOOD I-JOIST HANGERS

TABLE 8—STEEL TYPE, STRENGTH AND CORROSION RESISTANCE

PRODUCT	STEEL	F_y (lbf/in ²)	F_u (lbf/in ²)	CORROSION PROTECTION
LTTI31 Strap Anchor	ASTM A 653, SS Grade 33	33000	45000	G90 ²
	ASTM A36 (load transfer plate)	36000	58000	Hot dipped ¹
MUGT15 Truss Anchor	ASTM A 653, SS Grade 40	42000	56000	G90 ²
	ASTM A108, type 1018 (load transfer plate)	36000	58000	Hot dipped ¹
PAU Post Base Connector	ASTM A 653, SS Grade 33	33000	45000	G90 ²
TFL Wood I-Joist Hangers	ASTM A 653, SS Grade 33	33000	45000	G90 ²

For **SI**: 1 lbf/in² = 6.89 kPa.

¹Corrosion protection is a minimum 1.0 ounce of zinc per square foot as determined in accordance with ASTM A 153.

²Corrosion protection is a zinc coating in accordance with ASTM A 653.