

ICC-ES Evaluation Report**ESR-1078**

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

REPORT HOLDER:

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EVALUATION SUBJECT:

FASTENMASTER® SERIES THREADED WOOD FASTENERS

1.0 EVALUATION SCOPE**Compliance with the following codes:**

- 2006 *International Building Code*® (IBC)
- 2006 *International Residential Code*® (IRC)

Properties evaluated:

Structural

2.0 USES

The FastenMaster Series fasteners described in this report are alternate dowel-type threaded fasteners used for wood-to-wood connections.

3.0 DESCRIPTION**3.1 General:**

The FastenMaster Series fasteners described in this report are manufactured using a standard cold-forming process and are heat-treated. The fasteners have a proprietary coating with a lubricious clear top coat. The FastenMaster series includes three different fastener diameters that are available in lengths ranging from 2¹/₂ to 16 inches (63.5 to 406.4 mm), inclusive of thread. (See Tables 1A through 1D of this report for fastener dimensions.) The fasteners have a hex-head design with integral washer, rolled threads and a gimlet point.

These fasteners depart from ANSI B18.2.1 and B18.6.1 in thread design, exceed the bending yield strengths documented in Table 5 of American Forest & Paper Association (AF&PA) Technical Report 12, and are not installed with lead holes in accordance with the National Design Specification for Construction (NDS).

3.2 Materials:

The fasteners are made of carbon steel grade 1022 wire, conforming to ASTM A 510, with a minimum ultimate tensile strength of 60 ksi (414 MPa), and have a proprietary finish. Minimum bending yield strengths of the fasteners are listed in Tables 1A, 1B, 1C and 1D of this report.

4.0 DESIGN AND INSTALLATION**4.1 Design:**

Design values for withdrawal connections are specified in Table 2 of this report. Design values for pull-through shall be as specified in Table 3 of this report. Design values for lateral resistance in wood-to-wood connections loaded parallel and perpendicular to the grain, are noted in Tables 4A and 4B of this report, using the applicable fastener diameter (minor thread diameter).

The allowable load for a single-screw connection in which the screw is subject to tension is the least of: (a) the reference withdrawal design value given in Table 2, adjusted by all applicable adjustment factors; (b) the reference head pull-through design value given in Table 3, adjusted by all applicable adjustment factors; and (c) the allowable screw tension strength, calculated from the allowable stress values given in Tables 1A, 1B, 1C and 1D.

The allowable lateral load for a single-screw connection is the lesser of: (a) the reference lateral design value given in Tables 4A and 4B, adjusted by all applicable adjustment factors, and (b) the allowable screw shear strength, calculated from the allowable stress values given in Tables 1A, 1B, 1C and 1D.

When designing a connection, the structural members must be checked for load-carrying capacity in accordance with Section 10.1.2 of the NDS, and local stresses within multiple-fastener connections must be checked against Appendix E of the NDS to ensure the capacity of the connection and fastener group. Connections containing multiple screws must also be designed in accordance with Sections 10.2.2 and 11.6 of the NDS.

Where the screws are subjected to combined lateral and withdrawal loads, connections shall be designed in accordance with Section 11.4.1 of the NDS.

4.2 Installation:

The fasteners must be installed with a ¹/₂-inch (12.7 mm), low RPM/high torque electric drill (450 rpm) using the special hex-head driver bit included in each box. Lead holes are not required at the minimum end and edge distances listed in Table 5 of this report. When use is in

structural composite lumber (SCL) products, the minimum fastener end and edge distances and spacing must be in accordance with Table 5 of this report or in accordance with the recommendations of the SCL manufacturer, whichever is more restrictive.

5.0 CONDITIONS OF USE

The fasteners 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 When the capacity of a connection is controlled by fastener metal strength, rather than wood strength, allowable strength of the connection are not permitted to be multiplied by the adjustment factors specified in the NDS.
- 5.2 This evaluation report does not address fastener corrosion when the fastener is installed in chemically treated wood.

5.3 The fasteners are produced by OMG, Inc. at their facility located in Agawam, Massachusetts; under a quality control program with inspections by FM Approvals (AA-653).

6.0 EVIDENCE SUBMITTED

Data and test reports in accordance with the ICC-ES Acceptance Criteria for Alternate Dowel-type Threaded Fasteners (AC233), dated June 2011.

7.0 IDENTIFICATION

The fasteners are identified by the designation “TrussLok®,” “TrussLok-Z®,” “TimberLok®,” “LedgerLok®,” or “OlyLog®,” on the packaging. Head markings consist of “F” followed by the length of the fastener. Each container of fasteners must have a label noting OMG’s name and address, fastener size, inspection agency name (FM Approvals) and the evaluation report number (ICC-ES ESR-1078).

TABLE 1A—FASTENER SPECIFICATIONS: OLYLOG AND TIMBERLOK FASTENERS

OLYLOG® / TIMBERLOK® FASTENER DESIGNATION	HEAD MARKING	OVERALL LENGTH ¹ (inches)	LENGTH OF THREAD (inches) ^{2,5}	UNTHREADED SHANK DIAMETER ³ (inch)	MINOR THREAD (ROOT) DIAMETER (inch)	ALLOWABLE STEEL STRENGTH		
						Bending Yield (Fyb, psi) ^{4,6}	Tensile (psi)	Single Shear (psi)
TLOK212 or LOG212	F2.5	2 1/2	1 1/4	0.189 [0.187 - 0.189]	0.172 (design diameter)	189,700	45,600	29,900
TLOK04 or LOG004	F4.0	4	2					
TLOK06 or LOG006	F6.0	6	2					
TLOK08 or LOG008	F8.0	8	2					
LOG009	F9.0	9	2					
TLOK10 or LOG010	F10.0	10	2					
LOG012	F12.0	12	2					
LOG014	F14.0	14	2					
LOG016	F16.0	16	2					

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

NOTES:

- ¹For purposes of measuring overall fastener length, fasteners must be measured from the underside of head to bottom of tip.
- ²Length of thread includes tip. See detailed illustration.
- ³Unthreaded shank diameters are shown in table with manufacturing tolerances in brackets [].
- ⁴Bending yield strength determined per methods specified in ASTM D 1575 and based on the minor thread diameter.
- ⁵Fastener installation and design values require complete threaded portion to be embedded in the main member.
- ⁶Fastener bending yield strength is determined by the 5% diameter (0.05D) offset method of analyzing load-displacement curves developed from bending tests.

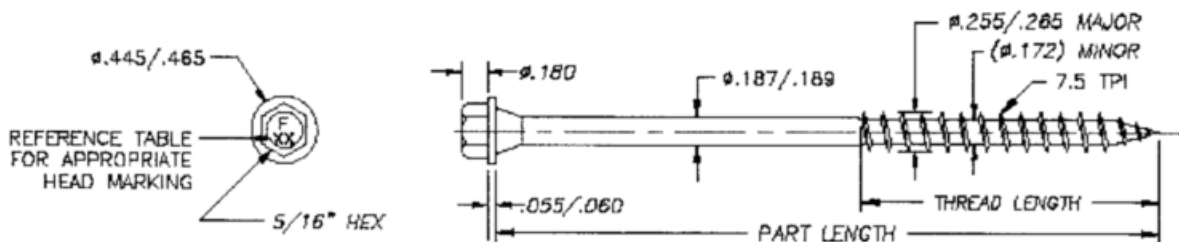


TABLE 1B—FASTENER SPECIFICATIONS: LEDGERLOK FASTENERS

LEDGERLOK® FASTENER DESIGNATION	HEAD MARKING	OVERALL LENGTH ¹ (inches)	LENGTH OF THREAD (inches) ^{2,5}	UNTHREADED SHANK DIAMETER ³ (inch)	MINOR THREAD (ROOT) DIAMETER (inch)	ALLOWABLE STEEL STRENGTH		
						Bending Yield (Fyb, psi) ^{4,6}	Tensile (psi)	Single Shear (psi)
LL358	F3.6	3 ⁵ / ₈	2	0.228	0.202 (design diameter)	200,700	49,800	32,800
LL005	F5.0	5	3	[.227 - 0.229]				

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

NOTES:

¹For purposes of measuring overall fastener length, fasteners must be measured from the underside of head to bottom of tip.

²Length of thread includes tip. See detailed illustration.

³Unthreaded shank diameters are shown in table with manufacturing tolerances in brackets [].

⁴Bending yield strength determined per methods specified in ASTM D 1575 and based on the minor thread diameter.

⁵Fastener installation and design values require complete threaded portion to be embedded in the main member.

⁶Fastener bending yield strength is determined by the 5% diameter (0.05D) offset method of analyzing load-displacement curves developed from bending tests.

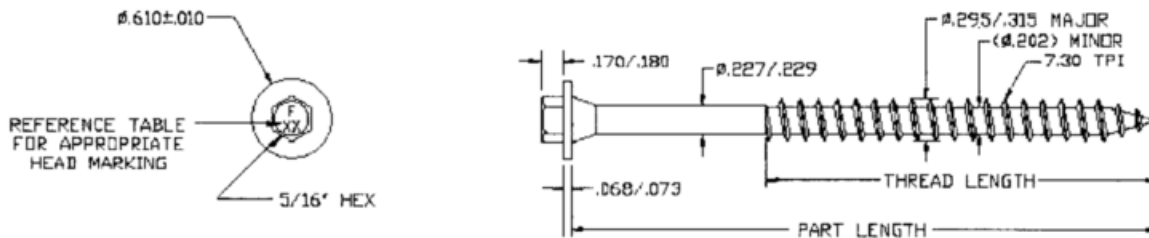


TABLE 1C—FASTENER SPECIFICATIONS: TRUSSLOK FASTENERS

TRUSSLOK® FASTENER DESIGNATION	HEAD MARKING	OVERALL LENGTH ¹ (inches)	LENGTH OF THREAD (inches) ^{2,5}	UNTHREADED SHANK DIAMETER ³ (inch)	MINOR THREAD (ROOT) DIAMETER (inch)	ALLOWABLE STEEL STRENGTH		
						Bending Yield (Fyb, psi) ^{4,6}	Tensile (psi)	Single Shear (psi)
EWS338	F3.3	3 ³ / ₈	1 ¹ / ₂	0.228 [0.227 - 0.229]	0.215 (design diameter)	202,200	49,800	32,800
EWS005	F5.0	5						
EWS670	F6.7	6.7						

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

NOTES:

¹For purposes of measuring overall fastener length, fasteners must be measured from the underside of head to bottom of tip.

²Length of thread includes tip. See detailed illustration.

³Unthreaded shank diameters are shown in table with manufacturing tolerances in brackets [].

⁴Bending yield strength determined per methods specified in ASTM D 1575 and based on the minor thread diameter.

⁵Fastener installation and design values require complete threaded portion to be embedded in the main member.

⁶Fastener bending yield strength is determined by the 5% diameter (0.05D) offset method of analyzing load-displacement curves developed from bending tests.

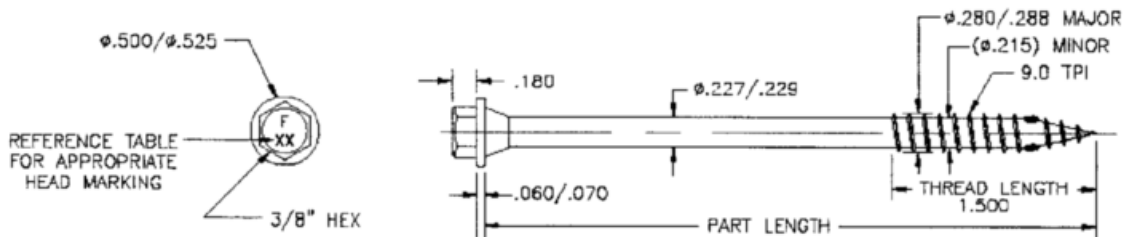


TABLE 1D—FASTENER SPECIFICATIONS: TRUSSLOK-Z FASTENERS

TRUSSLOK-Z® FASTENER DESIGNATION	HEAD MARKING	OVERALL LENGTH ¹ (inches)	LENGTH OF THREAD (inches) ^{2,5}	UNTHREADED SHANK DIAMETER ³ (inch)	MINOR THREAD (ROOT) DIAMETER (inch)	ALLOWABLE STEEL STRENGTH		
						Bending Yield (Fyb, psi) ^{4,6}	Tensile (psi)	Single Shear (psi)
TSLZ278	F2.8	2 ⁷ / ₈	1 ¹ / ₄	0.228 [0.227 - 0.229]	0.202 (design diameter)	236,300	49,800	32,800
TSLZ412	F4.5	4 ¹ / ₂						
TSLZ006	F6.0	6						

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

NOTES:

- ¹For purposes of measuring overall fastener length, fasteners must be measured from the underside of head to bottom of tip.
- ²Length of thread includes tip. See detailed illustration.
- ³Unthreaded shank diameters are shown in table with manufacturing tolerances in brackets [].
- ⁴Bending yield strength determined per methods specified in ASTM D 1575 and based on the minor thread diameter.
- ⁵Fastener installation and design values require complete threaded portion to be embedded in the main member.
- ⁶Fastener bending yield strength is determined by the 5% diameter (0.05D) offset method of analyzing load-displacement curves developed from bending tests.

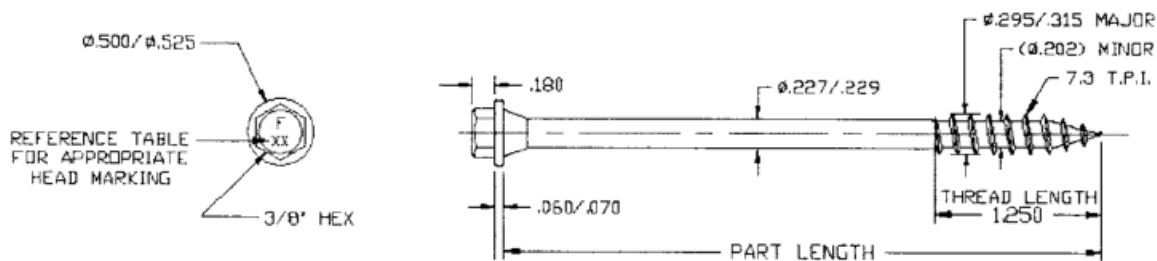


TABLE 2—DIRECT WITHDRAWAL DESIGN VALUES (W)

[Tabulated withdrawal design values (W) are in pounds per inch of thread penetration into side grain of main member]

FASTENER DESIGNATION		THREAD LENGTH, L (inches)	W (lbs./in.) FOR SPECIFIC GRAVITIES OF:								
			0.67	0.57	0.55	0.5	0.46	0.43	0.42	0.36	0.31
OlyLog® / TimberLok® fasteners	TLOK212 or LOG212	1.25	264	207	196	170	150	136	131	104	83
	All other lengths	2									
Wet Service Factor, C_m, for withdrawal loads			0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.6	0.7
LedgerLok® fasteners	LL358	2	297	233	221	192	169	153	148	117	94
	All other lengths	3									
TrussLok®	All lengths	1 ¹ / ₂	—	—	—	153	—	—	—	—	—
TrussLok-Z®	All lengths	1 ¹ / ₄	—	233	221	192	169	153	148	117	—
Wet Service Factor, C_m, for withdrawal loads			0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7
NDS equation used to calculate design values			11.2-1	11.2-1	11.2-1	11.2-1	11.2-1	11.2-1	11.2-1	11.2-1	11.2-1

For SI: 1 inch = 25.4 mm, 1 pound = 4.448 kPa.

NOTES:

- ¹Values must be multiplied by all applicable adjust factors (see NDS).
- ²Embedded thread length is that portion held by the main member (including tip).

TABLE 3—PULL-THROUGH DESIGN VALUES (P)

FASTENER DESIGNATION		THREAD LENGTH, L (inches)	P (lbs./in.) FOR SPECIFIC GRAVITIES OF:								
			0.67	0.57	0.55	0.5	0.46	0.43	0.42	0.36	0.31
OlyLog® / TimberLok® fasteners	TLOK212 or LOG212	1.25	334	218	200	158	130	112	107	79	62
	All other lengths	2									
LedgerLok® fasteners	LL358	2	471	323	299	243	206	181	173	133	108
	All other lengths	3									
TrussLok®	All lengths	1½	—	—	—	264	—	—	—	—	—
TrussLok-Z®	All lengths	1¼	—	366	327	248	199	168	159	114	—

For SI: 1 inch = 25.4 mm, 1 pound = 4.448 kPa.

NOTES:

- ¹Values must be multiplied by all applicable adjustment factors (see NDS).
- ²Embedded thread length is that portion held by the main member (including tip).
- ³Tabulated pull-through design values (P) are in pounds per inch through side member.

TABLE 4A—LATERAL DESIGN VALUES (Z) FOR SINGLE SHEAR (TWO-MEMBER) CONNECTIONS WITH LOADING PARALLEL TO GRAIN

[Tabulated lateral design values (Z) are in pounds per fastener into sawn lumber or SCL³ with both members of identical specific gravity]

FASTENER DESIGNATION		SIDE MEMBER THICKNESS, t _s (inches)	FASTENER PENETRATION, p (inches)	Z (lbs.) FOR SINGLE SHEAR (TWO-MEMBER) CONNECTIONS LOADED PARALLEL TO THE GRAIN FOR SPECIFIC GRAVITIES OF:								
				0.67	0.57	0.55	0.5	0.46	0.43	0.42	0.36	0.31
OlyLog® / TimberLok® fasteners	TLOK212 or LOG212	1½	1	265	224	217	203	191	181	179	161	143
	TLOK04 or LOG006	1½	2½	299	268	263	251	240	231	228	228	1788
	TLOK06 or LOG006	4	2						232	230	213	197
	TLOK08 or LOG008	6	2									
	LOG009	7	2									
	TLOK10 or LOG010	8	2									
	LOG012	10	2									
	LOG014	12	2									
LOG016	14	2										
LedgerLok® fasteners	LL358	1½	2⅛	373	325	315	292	274	259	255	229	204
	LL005	1½	3½					274	259		229	204
TrussLok®	EWS338	¾	⅝	—	—	—	318	—	—	—	—	—
	EWS005	¾	¾				333					
	EWS670	¾	5				333					
TrussLok-Z®	TSLZ278	1½	⅜	—	306	294	268	246	229	225	194	—
	TSLZ412	1½	3		336	326	303	285	270	266	239	
	TSL006	1½	4½		336	326	303	285	270	266	239	

For SI: 1 inch = 25.4 mm, 1 pound = 4.448 kPa.

NOTES:

- ¹Values must be multiplied by all applicable adjustment factors (see NDS).
- ²Embedded thread length is that portion held by the main member (including tip).
- ³SCL is structural composite lumber (laminated veneer lumber is LVL, and parallel strand lumber is PSL). This group also includes all OSB, structural I plywood, and marine-grade plywood panels.
- ⁴p = depth of fastener penetration into wood member, in inches.
- ⁵Tabulated values are results of calculations per NDS Section 11.3, where D = minor thread diameter.

TABLE 4B—LATERAL DESIGN VALUES (Z) FOR SINGLE SHEAR (TWO-MEMBER) CONNECTIONS WITH LOADING PERPENDICULAR TO GRAIN

[Tabulated lateral design values (Z) are in pounds per fastener into sawn lumber or SCL³ with both members of identical specific gravity]

FASTENER DESIGNATION		SIDE MEMBER THICKNESS, t_s (inches)	FASTENER PENETRATION, p (inches)	Z (lbs.) FOR SINGLE SHEAR (TWO-MEMBER) CONNECTIONS LOADED PARALLEL TO THE GRAIN FOR SPECIFIC GRAVITIES OF:								
				0.67	0.57	0.55	0.5	0.46	0.43	0.42	0.36	0.31
OlyLog® / TimberLok® fasteners	TLOK212 or LOG212	1½	1	265	219	211	191	175	164	160	133	106
	TLOK04 or LOG006	1½	2½	299	264	257	240	222	206	200	168	142
	TLOK06 or LOG006	4	2					226	216	212	190	166
	TLOK08 or LOG008	6	2									
	LOG009	7	2									
	TLOK10 or LOG010	8	2									
	LOG012	10	2									
	LOG014	12	2									
LOG016	14	2										
LedgerLok® fasteners	LL358	1½	2⅛	373	305	290	255	233	216	212	179	145
	LL005	1½	3½			290	255	233	216		180	157
TrussLok®	EWS338	¾	⅝	—	—	—	267	—	—	—	—	—
	EWS005	¾	¾				290					
	EWS670	¾	5				290					
TrussLok-Z®	TSLZ278	1½	⅜	—	282	265	225	198	179	174	139	—
	TSLZ412	1½	3		316	301	266	243	227	222	190	
	TSL006	1½	4½		316	301	266	243	227	222	190	

For **SI**: 1 inch = 25.4 mm, 1 pound = 4.448 kPa.

NOTES:

¹Values must be multiplied by all applicable adjustment factors (see NDS).

²Embedded thread length is that portion held by the main member (including tip).

³SCL is structural composite lumber (laminated veneer lumber is LVL, and parallel strand lumber is PSL). This group also includes all OSB, structural I plywood, and marine-grade plywood panels.

⁴ p = depth of fastener penetration into wood member, in inches.

⁵Tabulated values are results of calculations per NDS Section 11.3, where D = minor thread diameter.

TABLE 5—CONNECTION GEOMETRY

CONNECTION GEOMETRY/CRITERIA	DIAMETERS	OLYLOG® / TIMBERLOK® FASTENERS (inches)	LEDGERLOK® / TRUSSLOK® / TRUSSLOK-Z® FASTENERS (inches)
Minimum edge distance (2.5 diameters per NDS Commentary Table C11.4-1):	8	1½	1¾
From edge (4 diameters per NDS Table 11.5.1A), loaded edge:	8	1½	1¾
Minimum end distance, tension load parallel to grain (per NDS Commentary Table C11.4-1):	16	3	3¾
Compression load parallel to grain (NDS Commentary Table C11.4-1):	10	2	2⅞
Spacing (pitch) between fasteners in a row, parallel to grain:	15	2¾	3½
Perpendicular to grain:	10	2	2⅞
Spacing (gage) between rows of fasteners, in-line:	5	1	1¼
Spacing (gage) between rows of fasteners, staggered:	2.5	½	⅝
Minimum penetration into the main member for single shear connections	6	1¼	1⅞

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