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RESEARCH REPORT: RR 25886
(CSI #05 05 23)

Expires: October 1, 2020

Issued Date: October 1, 2018

Code: 2017 LABC

GENERAL APPROVAL – Renewal and Clerical Modification - Elco Bi-Flex and Hilti Bi-Metal Kwik-Flex Structural Fasteners for cold-formed steel, structural steel and aluminum.

DETAILS

Elco Bi-Flex and Hilti Bi-Metal Kwik-Flex Structural Fasteners are approved to resist tension and shear loads in cold-formed steel, structural steel and aluminum metal-to-metal connections, as tabulated in Attachment. The fasteners are manufactured to ASTM F593 Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs, using series 300 stainless steel alloys, furnished in the cold-worked condition.

Elco Bi-Flex and Hilti Bi-Metal Kwik-Flex Structural Fasteners are identical in design and manufacture except for the product name identification.

Self-drilling fasteners are installed without pre-drilling holes in the receiving member of the connection. The drilling function of the fastener must be completed prior to the lead threads of the fastener engaging the metal. This is accomplished by the fastener pre-drilling a clearance hole in the component being connected to the receiving member. Fasteners must be installed perpendicular to the work surface with a 1,800 to 2,500 rpm screw gun incorporating a depth-sensitive or torque-limiting nose piece. Installed fasteners must protrude through the connected members, with the high-hardness drill point and lead threads extending beyond the connected members.

The approval is subject to the following conditions:

RR 25886
Page 1 of 3

Elco Construction Products

RE: Elco Drill-Flex and Hilti Kwik-Flex Structural Fasteners for Cold-Formed Steel and Aluminum.

1. Steel members shall have a minimum ultimate tensile strength of 58 ksi. Cold-formed steel shall have a minimum yield strength of 60ksi and ultimate strength of 75ksi.
2. The applied tension and shear service (allowable strength design) loads shall not exceed the allowable nominal tension and shear strengths for fasteners as tabulated in Table 1 and Table 2 as shown on the attached sheet.
3. The minimum spacing and edge distance for fasteners shall comply with Table 3 shown on the attached sheet. For steel connections, the minimum spacing distance is three times the diameter of the screw, and the minimum edge distance is 1.5 times the diameter of the screws. For aluminum connections, the minimum spacing distance is four times the nominal diameter of the screw, and the minimum edge distance is two times the nominal diameter of the screws.
4. Calculations demonstrating the applied loads are less than the allowable loads prepared by a California licensed civil or structural engineer or architect must be submitted to the structural plan check section.
5. The allowable loads shall not be increased for wind or seismic forces.
6. Calculations shall be in accordance with the Cold Formed Steel Design Manual, AISI S100-2007. Engineer shall consider all loading conditions acting on connection assembly. Comply with Section 4.5 of the AISI S100-2007 for screws subject to combined shear and pull-over.
7. The nominal strength values contained in this report are not approved for the design of structural diaphragms used to resist wind, seismic and other in-plane lateral loads.
8. Fasteners are to be installed in accordance with the manufacturer's published installation instructions and this report.
9. The screws are identified with a raised circle around a "flag" logo on top of the fastener head.
10. The screws are identified with a number "3" above a flag logo on the top of the fastener head.

DISCUSSION

Elco Construction Products

RE: Elco Drill-Flex and Hilti Kwik-Flex Structural Fasteners for Cold-Formed Steel and Aluminum.

The clerical modification is to change the address of the petitioning organization and update the report to the 2017 Los Angeles City Building Code.

The report is in compliance with the 2017 Los Angeles City Building Code.

The approval is based on tests and calculations.

Addressee to whom this Research Report is issued is responsible for providing copies of it, complete with any attachments indicated, to architects, engineers and builders using items approved herein in design or construction which must be approved by Department of Building and Safety Engineers and Inspectors.

This general approval of an equivalent alternate to the Code is only valid where an engineer and/or inspector of this Department has determined that all conditions of this approval have been met in the project in which it is to be used.

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Attachment: 1-page: Tables of Allowable Tension and Shear Service Loads and Minimum Spacing and Edge Distance.

TABLE 1 - ALLOWABLE NOMINAL TENSION STRENGTH, P_{ts}, FOR ELCO BI-FLEX and HILTI BI-METAL KWIK-FLEX FASTENERS¹

SCREW SIZE	SCREW TYPE	DRILL POINT TYPE	DRILL CAP. (inch) ²	TENSION (pounds)								
				COLD-FORMED STEEL GAGE ³ (F _v = 60 ksi MIN.)					STEEL (A36 MIN.)		ALUMINUM 6063-T5 (F _y = 16 ksi)	
				18 Ga	16 Ga	14 Ga	12 Ga	1/8"	3/16"	1/4"	1/8"	1/4"
10-16	Self-drill	2	0.150	152	196	264	465	635	-	-	218	-
10-16		3	0.187	-	205	228	414	435	509	-	152	-
12-14		2	0.187	176	250	297	512	867	838	-	173	-
12-14		3	0.210	139	226	267	457	469	672	-	173	372
12-24		5	0.500	-	-	-	-	-	-	747	-	374
1/4-14		2	0.210	206	295	361	610	850	1178	-	200	-
1/4-20		3	0.375	-	227	260	481	749	1228	1356	200	487
1/4-20		5	0.500	-	-	-	-	-	-	-	-	487

1. Nominal strengths are based on laboratory tests and calculations in accordance with American Iron and Steel Institute Standard North American Specification for the Design of Cold-Formed Steel Structural Members, 2007 Edition, and are the minimum of pull-over, pull-out or fastener tension strength.

2. The drill capacity is the maximum metal thickness the fastener can self-drill.

3. The base-metal design thickness of 18 Gage steel is 0.0451"; 16 Gage is 0.0566"; 14 Gage is 0.0713"; and 12 Gage is 0.1017".

TABLE 2 - ALLOWABLE NOMINAL SHEAR STRENGTH, P_{ss}, FOR ELCO BI-FLEX and HILTI BI-METAL KWIK-FLEX FASTENERS¹

SCREW SIZE	SCREW TYPE	DRILL POINT TYPE	DRILL CAP. (inch) ²	SHEAR (pounds)								
				COLD-FORMED STEEL GAGE ³ (F _v = 60 ksi MIN.)					STEEL (A36 MIN.)		ALUMINUM 6063-T5 (F _y = 16 ksi)	
				18 Ga	16 Ga	14 Ga	12 Ga	1/8"	3/16"	1/4"	1/8"	1/4"
10-16	Self-drill	2	0.150	427	427	427	427	427	-	-	348	697
10-16		3	0.187	-	427	427	427	427	427	-	348	697
12-14		2	0.187	467	650	650	650	650	650	-	396	792
12-14		3	0.210	467	650	650	650	650	650	-	396	792
12-24		5	0.500	-	-	-	-	-	-	761	396	792
1/4-14		2	0.210	503	707	892	892	892	892	-	458	917
1/4-20		3	0.375	-	707	954	954	954	954	954	458	917
1/4-20		5	0.500	-	-	-	-	-	-	-	458	917

1. Nominal strengths are based on laboratory tests, calculated in accordance with American Iron and Steel Institute Standard North American Specification for the Design of Cold-Formed Steel Structural Members, 2007 Edition.

2. The drill capacity is the maximum metal thickness the fastener can self-drill.

3. Designer shall use the shear value corresponding to the thinner of the connected materials. The base-metal design thickness of 18 Gage steel is 0.0451"; 16 Gage is 0.0566"; 14 Gage is 0.0713"; and 12 Gage is 0.1017".

TABLE 3 - MINIMUM FASTENER SPACING AND EDGE DISTANCE

SCREW SIZE (DIAMETER)	FASTENED MATERIAL	MINIMUM SPACING	MINIMUM EDGE DISTANCE
No. 10 (0.190")	Steel	9/16"	9/32"
	Aluminum	25/32"	13/32"
No. 12 (0.216")	Steel	11/16"	3/8"
	Aluminum	7/8"	7/16"
1/4"	Steel	3/4"	3/8"
	Aluminum	1"	1/2"



FIGURE 1 - TYPICAL IDENTIFICATION: HEAD MARKING