

DATE: _____ PROJECT: _____

TO: _____ FROM: _____

SUBJECT: HILTI X-ENP-19, X-HSN 24 or X-U POWDER-ACTUATED FASTENER SUBSTITUTION REQUEST

SPECIFICATION TITLE: _____

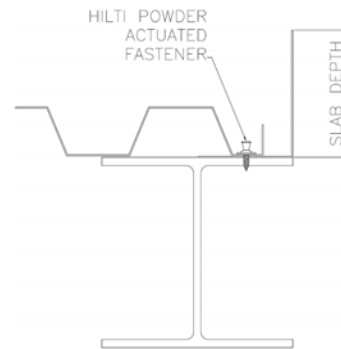
SECTION: _____ PAGE: _____ ARTICLE/PARAGRAPH: _____

DESCRIPTION: _____

DESIGN DETAIL NO.: _____

PROPOSED SUBSTITUTION: Use HILTI X-ENP-19, X-HSN 24 or X-U instead of fillet weld or arc spot puddle weld

PRODUCT DESCRIPTION: The Hilti X-ENP-19, X-HSN 24 or X-U Powder-Actuated Fasteners are designed as high performance solutions for attachment of cold-formed steel pourstops to structural steel supports as an alternative to welding. The Hilti powder-actuated fasteners come in single or collated configurations to maximize productivity.



SUBMITTED BY: _____

SUPPORTING DATA ATTACHED:

- HILTI PRODUCT TECHNICAL GUIDE 2015
- ICC EVALUATION SERVICE REPORT PAGES
- FASTENER LOAD COMPARISON TABLES
- SAMPLES
- TEST REPORTS
- PRICING INFORMATION

A/E REVIEW AND ACTION:

- SUBSTITUTION APPROVED
- SUBSTITUTION APPROVED AS NOTED
- SUBSTITUTION REJECTED

COMMENTS: _____

SIGNED BY: _____

DATE: _____

Table 1 - Allowable Weld Design Values Pounds Per Inch of Fillet Weld or Per Hilti Powder-Actuated Fastener

Pourstop Thickness (GA)	Pourstop Steel Fu (ksi)	Fillet Weld ¹	X-ENP-19		X-HSN 24		X-U	
		Tension or Shear	Pullover	Shear	Pullover	Shear	Pullover	Shear
20	45	689	755	640	560	600	360	445
18	45	919	875	840	725	785	490	525
16	45	1149	940	1050	865	975	685	720
14	45	1438	1125	1050	865	975	825	1085
12	45	2013	1125	1050	865	975	935	1085
10	45	2587	1125	1050	-	-	-	-
20	65	996	755	640	560	600	360	445
18	65	1328	875	840	725	785	490	525
16	65	1660	940	1050	865	975	685	720
14	65	2077	1125	1050	865	975	825	1085
12	65	2906	1125	1050	865	975	935	1085
10	65	3736	1125	1050	-	-	-	-

1.) Based upon AISI Manual for Cold-Formed Steel Design, 2008 Edition Table IV-1 assuming the transverse condition, which is the highest capacity.

Table 2 - Allowable Load Capacities for Hilti Powder-Actuated Fasteners from ICC-ES ESR-2776 and ESR-2269

Fastener Designation	Base Steel Thickness											
	1/8"		3/16"		1/4"		3/8"		1/2"		3/4"	
	Tension	Shear	Tension	Shear	Tension	Shear	Tension	Shear	Tension	Shear	Tension	Shear
X-ENP-19	-	-	-	-	905	1050	1125	1050	1010	1050	965	1050
X-HSN 24	435	975	635	975	750	975	750	975	-	-	-	-
X-U	-	-	535	720	775	720	935	720	900	720	350	375

1.) Reference Tables 10 and 11 of ESR-2776 and Table 2 of ESR-2269 for complete details regarding the load values provided in this table.

Weld Length #1
Weld Length #2
Weld Length #3
Weld Length #4

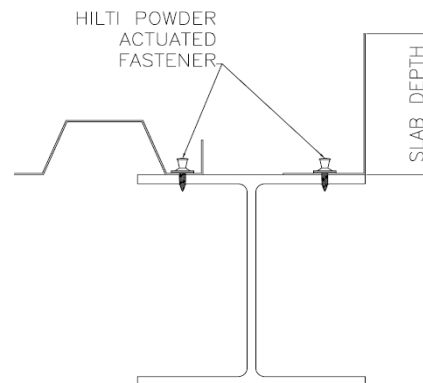
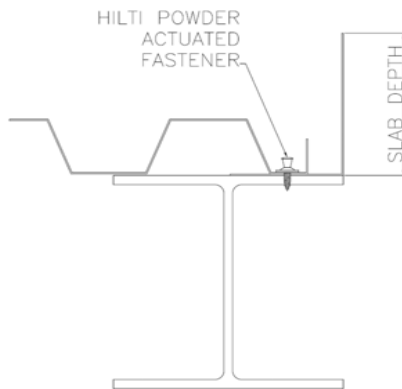
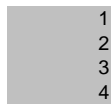


Table 3 - Hilti X-ENP-19 vs. Fillet Weld (Tension)^{1,2,3,4,5}

Pourstop Gauge (Fu)	Inch of Fillet Weld			
	1	2	3	4
# of X-ENP-19 fasteners in 1/8" thick base steel (Fy = 50.8 ksi)				
20 GA (45 ksi)	-	-	-	-
18 GA (45 ksi)	-	-	-	-
16 GA (45 ksi)	-	-	-	-
14 GA (45 ksi)	-	-	-	-
12 GA (45 ksi)	-	-	-	-
10 GA (45 ksi)	-	-	-	-
20 GA (65 ksi)	-	-	-	-
18 GA (65 ksi)	-	-	-	-
16 GA (65 ksi)	-	-	-	-
14 GA (65 ksi)	-	-	-	-
12 GA (65 ksi)	-	-	-	-
10 GA (65 ksi)	-	-	-	-
# of X-ENP-19 fasteners in 3/16" thick base steel (Fy = 36 ksi)				
20 GA (45 ksi)	-	-	-	-
18 GA (45 ksi)	-	-	-	-
16 GA (45 ksi)	-	-	-	-
14 GA (45 ksi)	-	-	-	-
12 GA (45 ksi)	-	-	-	-
10 GA (45 ksi)	-	-	-	-
20 GA (65 ksi)	-	-	-	-
18 GA (65 ksi)	-	-	-	-
16 GA (65 ksi)	-	-	-	-
14 GA (65 ksi)	-	-	-	-
12 GA (65 ksi)	-	-	-	-
10 GA (65 ksi)	-	-	-	-
# of X-ENP-19 fasteners in 1/4" thick base steel (Fy = 36 ksi)				
20 GA (45 ksi)	0.91	1.83	2.74	3.65
18 GA (45 ksi)	1.05	2.10	3.15	4.20
16 GA (45 ksi)	1.27	2.54	3.81	5.08
14 GA (45 ksi)	1.59	3.18	4.77	6.36
12 GA (45 ksi)	2.22	4.45	6.67	8.90
10 GA (45 ksi)	2.86	5.72	8.58	11.43
20 GA (65 ksi)	1.32	2.64	3.96	5.28
18 GA (65 ksi)	1.52	3.04	4.55	6.07
16 GA (65 ksi)	1.83	3.67	5.50	7.34
14 GA (65 ksi)	2.30	4.59	6.89	9.18
12 GA (65 ksi)	3.21	6.42	9.63	12.84
10 GA (65 ksi)	4.13	8.26	12.38	16.51

Pourstop Gauge (Fu)	Inch of Fillet Weld			
	1	2	3	4
# of X-ENP-19 fasteners in 3/8" thick base steel (Fy = 36 ksi)				
20 GA (45 ksi)	0.91	1.83	2.74	3.65
18 GA (45 ksi)	1.05	2.10	3.15	4.20
16 GA (45 ksi)	1.22	2.44	3.67	4.89
14 GA (45 ksi)	1.28	2.56	3.83	5.11
12 GA (45 ksi)	1.79	3.58	5.37	7.16
10 GA (45 ksi)	2.30	4.60	6.90	9.20
20 GA (65 ksi)	1.32	2.64	3.96	5.28
18 GA (65 ksi)	1.52	3.04	4.55	6.07
16 GA (65 ksi)	1.77	3.53	5.30	7.06
14 GA (65 ksi)	1.85	3.69	5.54	7.38
12 GA (65 ksi)	2.58	5.17	7.75	10.33
10 GA (65 ksi)	3.32	6.64	9.96	13.28
# of X-ENP-19 fasteners in 1/2" thick base steel (Fy = 36 ksi)				
20 GA (45 ksi)	0.91	1.83	2.74	3.65
18 GA (45 ksi)	1.05	2.10	3.15	4.20
16 GA (45 ksi)	1.22	2.44	3.67	4.89
14 GA (45 ksi)	1.42	2.85	4.27	5.70
12 GA (45 ksi)	1.99	3.99	5.98	7.97
10 GA (45 ksi)	2.56	5.12	7.68	10.25
20 GA (65 ksi)	1.32	2.64	3.96	5.28
18 GA (65 ksi)	1.52	3.04	4.55	6.07
16 GA (65 ksi)	1.77	3.53	5.30	7.06
14 GA (65 ksi)	2.06	4.11	6.17	8.23
12 GA (65 ksi)	2.88	5.75	8.63	11.51
10 GA (65 ksi)	3.70	7.40	11.10	14.80
# of X-ENP-19 fasteners in ≥ 3/4" thick base steel (Fy = 36 ksi)				
20 GA (45 ksi)	0.91	1.83	2.74	3.65
18 GA (45 ksi)	1.05	2.10	3.15	4.20
16 GA (45 ksi)	1.22	2.44	3.67	4.89
14 GA (45 ksi)	1.49	2.98	4.47	5.96
12 GA (45 ksi)	2.09	4.17	6.26	8.34
10 GA (45 ksi)	2.68	5.36	8.04	10.72
20 GA (65 ksi)	1.32	2.64	3.96	5.28
18 GA (65 ksi)	1.52	3.04	4.55	6.07
16 GA (65 ksi)	1.77	3.53	5.30	7.06
14 GA (65 ksi)	2.15	4.30	6.46	8.61
12 GA (65 ksi)	3.01	6.02	9.03	12.05
10 GA (65 ksi)	3.87	7.74	11.61	15.49

- 1.) X-ENP-19 fasteners installed into 1/2-inch or thicker steel require a 1/2-inch minimum penetration. All other steel thicknesses are based upon through penetration. In 1/2-inch or thicker steel, for an embedment less than 1/2-inch, but more than 3/8-inch, multiply the number of fasteners by 1.6.
- 2.) Comparisons between weld and powder-actuated fasteners are based upon the fasteners only and do not consider other failure modes (e.g. sheet steel failure)
- 3.) Loads are assumed to act about the centroid of the fastener group or weld length and do not consider prying forces.
- 4.) Fastener totals do not take into account the capacities of the pourstop itself and or the capability of the pourstop to have the number of fasteners provided installed through it. Minimum fastener spacing and edge distance without reduction in powder-actuated fastener performance is 1" and 1/2", respectively.
- 5.) Trial installations are recommended.

Table 4 - Hilti X-ENP-19 vs. Fillet Weld (Shear)^{1,2,3,4,5}

Pourstop Gauge (Fu)	Inch of Fillet Weld			
	1	2	3	4
# of X-ENP-19 fasteners in 1/8" thick base steel (Fy = 50.8 ksi)				
20 GA (45 ksi)	-	-	-	-
18 GA (45 ksi)	-	-	-	-
16 GA (45 ksi)	-	-	-	-
14 GA (45 ksi)	-	-	-	-
12 GA (45 ksi)	-	-	-	-
10 GA (45 ksi)	-	-	-	-
20 GA (65 ksi)	-	-	-	-
18 GA (65 ksi)	-	-	-	-
16 GA (65 ksi)	-	-	-	-
14 GA (65 ksi)	-	-	-	-
12 GA (65 ksi)	-	-	-	-
10 GA (65 ksi)	-	-	-	-
# of X-ENP-19 fasteners in 3/16" thick base steel (Fy = 36 ksi)				
20 GA (45 ksi)	-	-	-	-
18 GA (45 ksi)	-	-	-	-
16 GA (45 ksi)	-	-	-	-
14 GA (45 ksi)	-	-	-	-
12 GA (45 ksi)	-	-	-	-
10 GA (45 ksi)	-	-	-	-
20 GA (65 ksi)	-	-	-	-
18 GA (65 ksi)	-	-	-	-
16 GA (65 ksi)	-	-	-	-
14 GA (65 ksi)	-	-	-	-
12 GA (65 ksi)	-	-	-	-
10 GA (65 ksi)	-	-	-	-
# of X-ENP-19 fasteners in 1/4" thick base steel (Fy = 36 ksi)				
20 GA (45 ksi)	1.08	2.15	3.23	4.31
18 GA (45 ksi)	1.09	2.19	3.28	4.38
16 GA (45 ksi)	1.09	2.19	3.28	4.38
14 GA (45 ksi)	1.37	2.74	4.11	5.48
12 GA (45 ksi)	1.92	3.83	5.75	7.67
10 GA (45 ksi)	2.46	4.93	7.39	9.86
20 GA (65 ksi)	1.56	3.11	4.67	6.23
18 GA (65 ksi)	1.58	3.16	4.74	6.32
16 GA (65 ksi)	1.58	3.16	4.74	6.32
14 GA (65 ksi)	1.98	3.96	5.93	7.91
12 GA (65 ksi)	2.77	5.54	8.30	11.07
10 GA (65 ksi)	3.56	7.12	10.67	14.23

Pourstop Gauge (Fu)	Inch of Fillet Weld			
	1	2	3	4
# of X-ENP-19 fasteners in 3/8" thick base steel (Fy = 36 ksi)				
20 GA (45 ksi)	1.08	2.15	3.23	4.31
18 GA (45 ksi)	1.09	2.19	3.28	4.38
16 GA (45 ksi)	1.09	2.19	3.28	4.38
14 GA (45 ksi)	1.37	2.74	4.11	5.48
12 GA (45 ksi)	1.92	3.83	5.75	7.67
10 GA (45 ksi)	2.46	4.93	7.39	9.86
20 GA (65 ksi)	1.56	3.11	4.67	6.23
18 GA (65 ksi)	1.58	3.16	4.74	6.32
16 GA (65 ksi)	1.58	3.16	4.74	6.32
14 GA (65 ksi)	1.98	3.96	5.93	7.91
12 GA (65 ksi)	2.77	5.54	8.30	11.07
10 GA (65 ksi)	3.56	7.12	10.67	14.23
# of X-ENP-19 fasteners in 1/2" thick base steel (Fy = 36 ksi)				
20 GA (45 ksi)	1.08	2.15	3.23	4.31
18 GA (45 ksi)	1.09	2.19	3.28	4.38
16 GA (45 ksi)	1.09	2.19	3.28	4.38
14 GA (45 ksi)	1.37	2.74	4.11	5.48
12 GA (45 ksi)	1.92	3.83	5.75	7.67
10 GA (45 ksi)	2.46	4.93	7.39	9.86
20 GA (65 ksi)	1.56	3.11	4.67	6.23
18 GA (65 ksi)	1.58	3.16	4.74	6.32
16 GA (65 ksi)	1.58	3.16	4.74	6.32
14 GA (65 ksi)	1.98	3.96	5.93	7.91
12 GA (65 ksi)	2.77	5.54	8.30	11.07
10 GA (65 ksi)	3.56	7.12	10.67	14.23
# of X-ENP-19 fasteners in ≥ 3/4" thick base steel (Fy = 36 ksi)				
20 GA (45 ksi)	1.08	2.15	3.23	4.31
18 GA (45 ksi)	1.09	2.19	3.28	4.38
16 GA (45 ksi)	1.09	2.19	3.28	4.38
14 GA (45 ksi)	1.37	2.74	4.11	5.48
12 GA (45 ksi)	1.92	3.83	5.75	7.67
10 GA (45 ksi)	2.46	4.93	7.39	9.86
20 GA (65 ksi)	1.56	3.11	4.67	6.23
18 GA (65 ksi)	1.58	3.16	4.74	6.32
16 GA (65 ksi)	1.58	3.16	4.74	6.32
14 GA (65 ksi)	1.98	3.96	5.93	7.91
12 GA (65 ksi)	2.77	5.54	8.30	11.07
10 GA (65 ksi)	3.56	7.12	10.67	14.23

- 1.) X-ENP-19 fasteners installed into 1/2-inch or thicker steel require a 1/2-inch minimum penetration. All other steel thicknesses are based upon through penetration. In 1/2-inch or thicker steel, for an embedment less than 1/2-inch, but more than 3/8-inch, multiply the number of fasteners by 1.6.
- 2.) Comparisons between weld and powder-actuated fasteners are based upon the fasteners only and do not consider other failure modes (e.g. sheet steel failure)
- 3.) Loads are assumed to act about the centroid of the fastener group or weld length and do not consider prying forces.
- 4.) Fastener totals do not take into account the capacities of the pourstop itself and or the capability of the pourstop to have the number of fasteners provided installed through it. Minimum fastener spacing and edge distance without reduction in powder-actuated fastener performance is 1" and 1/2", respectively.
- 5.) Trial installations are recommended.

Table 5 - Hilti X-HSN 24 vs. Fillet Weld (Tension)^{1,2,3,4,5,6}

Pourstop Gauge (Fu)	Inch of Fillet Weld			
	1	2	3	4
# of X-HSN 24 fasteners in 1/8" thick base steel (Fy = 50 ksi)				
20 GA (45 ksi)	1.58	3.17	4.75	6.34
18 GA (45 ksi)	2.11	4.23	6.34	8.45
16 GA (45 ksi)	2.64	5.28	7.92	10.57
14 GA (45 ksi)	3.31	6.61	9.92	13.22
12 GA (45 ksi)	4.63	9.26	13.88	18.51
10 GA (45 ksi)	5.95	11.89	17.84	23.79
20 GA (65 ksi)	2.29	4.58	6.87	9.16
18 GA (65 ksi)	3.05	6.11	9.16	12.21
16 GA (65 ksi)	3.82	7.63	11.45	15.26
14 GA (65 ksi)	4.77	9.55	14.32	19.10
12 GA (65 ksi)	6.68	13.36	20.04	26.72
10 GA (65 ksi)	-	-	-	-
# of X-HSN 24 fasteners in 3/16" thick base steel (Fy = 36 ksi)				
20 GA (45 ksi)	1.23	2.46	3.69	4.92
18 GA (45 ksi)	1.45	2.89	4.34	5.79
16 GA (45 ksi)	1.81	3.62	5.43	7.24
14 GA (45 ksi)	2.26	4.53	6.79	9.06
12 GA (45 ksi)	3.17	6.34	9.51	12.68
10 GA (45 ksi)	4.07	8.15	12.22	16.30
20 GA (65 ksi)	1.78	3.56	5.34	7.11
18 GA (65 ksi)	2.09	4.18	6.27	8.37
16 GA (65 ksi)	2.61	5.23	7.84	10.46
14 GA (65 ksi)	3.27	6.54	9.81	13.08
12 GA (65 ksi)	4.58	9.15	13.73	18.31
10 GA (65 ksi)	-	-	-	-
# of X-HSN 24 fasteners in 1/4" thick base steel (Fy = 36 ksi)				
20 GA (45 ksi)	1.23	2.46	3.69	4.92
18 GA (45 ksi)	1.27	2.54	3.80	5.07
16 GA (45 ksi)	1.53	3.06	4.60	6.13
14 GA (45 ksi)	1.92	3.83	5.75	7.67
12 GA (45 ksi)	2.68	5.37	8.05	10.74
10 GA (45 ksi)	3.45	6.90	10.35	13.80
20 GA (65 ksi)	1.78	3.56	5.34	7.11
18 GA (65 ksi)	1.83	3.66	5.50	7.33
16 GA (65 ksi)	2.21	4.43	6.64	8.85
14 GA (65 ksi)	2.77	5.54	8.31	11.08
12 GA (65 ksi)	3.87	7.75	11.62	15.50
10 GA (65 ksi)	-	-	-	-

Pourstop Gauge (Fu)	Inch of Fillet Weld			
	1	2	3	4
# of X-HSN 24 fasteners in 3/8" thick base steel (Fy = 36 ksi)				
20 GA (45 ksi)	1.23	2.46	3.69	4.92
18 GA (45 ksi)	1.27	2.54	3.80	5.07
16 GA (45 ksi)	1.53	3.06	4.60	6.13
14 GA (45 ksi)	1.92	3.83	5.75	7.67
12 GA (45 ksi)	2.68	5.37	8.05	10.74
10 GA (45 ksi)	3.45	6.90	10.35	13.80
20 GA (65 ksi)	1.78	3.56	5.34	7.11
18 GA (65 ksi)	1.83	3.66	5.50	7.33
16 GA (65 ksi)	2.21	4.43	6.64	8.85
14 GA (65 ksi)	2.77	5.54	8.31	11.08
12 GA (65 ksi)	3.87	7.75	11.62	15.50
10 GA (65 ksi)	-	-	-	-
# of X-HSN 24 fasteners in 1/2" thick base steel (Fy = 36 ksi)				
20 GA (45 ksi)	-	-	-	-
18 GA (45 ksi)	-	-	-	-
16 GA (45 ksi)	-	-	-	-
14 GA (45 ksi)	-	-	-	-
12 GA (45 ksi)	-	-	-	-
10 GA (45 ksi)	-	-	-	-
20 GA (65 ksi)	-	-	-	-
18 GA (65 ksi)	-	-	-	-
16 GA (65 ksi)	-	-	-	-
14 GA (65 ksi)	-	-	-	-
12 GA (65 ksi)	-	-	-	-
10 GA (65 ksi)	-	-	-	-
# of X-HSN 24 fasteners in ≥ 3/4" thick base steel (Fy = 36 ksi)				
20 GA (45 ksi)	-	-	-	-
18 GA (45 ksi)	-	-	-	-
16 GA (45 ksi)	-	-	-	-
14 GA (45 ksi)	-	-	-	-
12 GA (45 ksi)	-	-	-	-
10 GA (45 ksi)	-	-	-	-
20 GA (65 ksi)	-	-	-	-
18 GA (65 ksi)	-	-	-	-
16 GA (65 ksi)	-	-	-	-
14 GA (65 ksi)	-	-	-	-
12 GA (65 ksi)	-	-	-	-
10 GA (65 ksi)	-	-	-	-

- 1.) Based upon powder-actuated fastener point through point penetration.
- 2.) Comparisons between weld and powder-actuated fasteners are based upon the fasteners only and do not consider other failure modes (e.g. sheet steel failure)
- 3.) Loads are assumed to act about the centroid of the fastener group or weld length and do not consider prying forces.
- 4.) Fastener totals do not take into account the capacities of the pourstop itself and or the capability of the pourstop to have the number of fasteners provided installed through it. Minimum fastener spacing and edge distance without reduction in powder-actuated fastener performance is 1" and 1/2", respectively.
- 5.) Trial installations are recommended.

Table 6 - Hilti X-HSN 24 vs. Fillet Weld (Shear)^{1,2,3,4,5,6}

Pourstop Gauge (Fu)	Inch of Fillet Weld			
	1	2	3	4
# of X-HSN 24 fasteners in 1/8" thick base steel (Fy = 50 ksi)				
20 GA (45 ksi)	1.15	2.30	3.45	4.59
18 GA (45 ksi)	1.17	2.34	3.51	4.68
16 GA (45 ksi)	1.18	2.36	3.54	4.71
14 GA (45 ksi)	1.47	2.95	4.42	5.90
12 GA (45 ksi)	2.06	4.13	6.19	8.26
10 GA (45 ksi)	2.65	5.31	7.96	10.61
20 GA (65 ksi)	1.66	3.32	4.98	6.64
18 GA (65 ksi)	1.69	3.38	5.08	6.77
16 GA (65 ksi)	1.70	3.41	5.11	6.81
14 GA (65 ksi)	2.13	4.26	6.39	8.52
12 GA (65 ksi)	2.98	5.96	8.94	11.92
10 GA (65 ksi)	-	-	-	-
# of X-HSN 24 fasteners in 3/16" thick base steel (Fy = 36 ksi)				
20 GA (45 ksi)	1.15	2.30	3.45	4.59
18 GA (45 ksi)	1.17	2.34	3.51	4.68
16 GA (45 ksi)	1.18	2.36	3.54	4.71
14 GA (45 ksi)	1.47	2.95	4.42	5.90
12 GA (45 ksi)	2.06	4.13	6.19	8.26
10 GA (45 ksi)	2.65	5.31	7.96	10.61
20 GA (65 ksi)	1.66	3.32	4.98	6.64
18 GA (65 ksi)	1.69	3.38	5.08	6.77
16 GA (65 ksi)	1.70	3.41	5.11	6.81
14 GA (65 ksi)	2.13	4.26	6.39	8.52
12 GA (65 ksi)	2.98	5.96	8.94	11.92
10 GA (65 ksi)	-	-	-	-
# of X-HSN 24 fasteners in 1/4" thick base steel (Fy = 36 ksi)				
20 GA (45 ksi)	1.15	2.30	3.45	4.59
18 GA (45 ksi)	1.17	2.34	3.51	4.68
16 GA (45 ksi)	1.18	2.36	3.54	4.71
14 GA (45 ksi)	1.47	2.95	4.42	5.90
12 GA (45 ksi)	2.06	4.13	6.19	8.26
10 GA (45 ksi)	2.65	5.31	7.96	10.61
20 GA (65 ksi)	1.66	3.32	4.98	6.64
18 GA (65 ksi)	1.69	3.38	5.08	6.77
16 GA (65 ksi)	1.70	3.41	5.11	6.81
14 GA (65 ksi)	2.13	4.26	6.39	8.52
12 GA (65 ksi)	2.98	5.96	8.94	11.92
10 GA (65 ksi)	-	-	-	-

Pourstop Gauge (Fu)	Inch of Fillet Weld			
	1	2	3	4
# of X-HSN 24 fasteners in 3/8" thick base steel (Fy = 36 ksi)				
20 GA (45 ksi)	1.15	2.30	3.45	4.59
18 GA (45 ksi)	1.17	2.34	3.51	4.68
16 GA (45 ksi)	1.18	2.36	3.54	4.71
14 GA (45 ksi)	1.47	2.95	4.42	5.90
12 GA (45 ksi)	2.06	4.13	6.19	8.26
10 GA (45 ksi)	2.65	5.31	7.96	10.61
20 GA (65 ksi)	1.66	3.32	4.98	6.64
18 GA (65 ksi)	1.69	3.38	5.08	6.77
16 GA (65 ksi)	1.70	3.41	5.11	6.81
14 GA (65 ksi)	2.13	4.26	6.39	8.52
12 GA (65 ksi)	2.98	5.96	8.94	11.92
10 GA (65 ksi)	-	-	-	-
# of X-HSN 24 fasteners in 1/2" thick base steel (Fy = 36 ksi)				
20 GA (45 ksi)	-	-	-	-
18 GA (45 ksi)	-	-	-	-
16 GA (45 ksi)	-	-	-	-
14 GA (45 ksi)	-	-	-	-
12 GA (45 ksi)	-	-	-	-
10 GA (45 ksi)	-	-	-	-
20 GA (65 ksi)	-	-	-	-
18 GA (65 ksi)	-	-	-	-
16 GA (65 ksi)	-	-	-	-
14 GA (65 ksi)	-	-	-	-
12 GA (65 ksi)	-	-	-	-
10 GA (65 ksi)	-	-	-	-
# of X-HSN 24 fasteners in ≥ 3/4" thick base steel (Fy = 36 ksi)				
20 GA (45 ksi)	-	-	-	-
18 GA (45 ksi)	-	-	-	-
16 GA (45 ksi)	-	-	-	-
14 GA (45 ksi)	-	-	-	-
12 GA (45 ksi)	-	-	-	-
10 GA (45 ksi)	-	-	-	-
20 GA (65 ksi)	-	-	-	-
18 GA (65 ksi)	-	-	-	-
16 GA (65 ksi)	-	-	-	-
14 GA (65 ksi)	-	-	-	-
12 GA (65 ksi)	-	-	-	-
10 GA (65 ksi)	-	-	-	-

- 1.) Based upon powder-actuated fastener point through point penetration.
- 2.) Comparisons between weld and powder-actuated fasteners are based upon the fasteners only and do not consider other failure modes (e.g. sheet steel failure)
- 3.) Loads are assumed to act about the centroid of the fastener group or weld length and do not consider prying forces.
- 4.) Fastener totals do not take into account the capacities of the pourstop itself and or the capability of the pourstop to have the number of fasteners provided installed through it. Minimum fastener spacing and edge distance without reduction in powder-actuated fastener performance is 1" and 1/2", respectively.
- 5.) Trial installations are recommended.

Table 7 - Hilti X-U vs. Fillet Weld (Tension)^{1,2,3,4,5}

Pourstop Gauge (Fu)	Inch of Fillet Weld			
	1	2	3	4
# of X-U fasteners in 1/8" thick base steel (Fy = 50 ksi)				
20 GA (45 ksi)	-	-	-	-
18 GA (45 ksi)	-	-	-	-
16 GA (45 ksi)	-	-	-	-
14 GA (45 ksi)	-	-	-	-
12 GA (45 ksi)	-	-	-	-
10 GA (45 ksi)	-	-	-	-
20 GA (65 ksi)	-	-	-	-
18 GA (65 ksi)	-	-	-	-
16 GA (65 ksi)	-	-	-	-
14 GA (65 ksi)	-	-	-	-
12 GA (65 ksi)	-	-	-	-
10 GA (65 ksi)	-	-	-	-
# of X-U fasteners in 3/16" thick base steel (Fy = 50 ksi)				
20 GA (45 ksi)	1.91	3.83	5.74	7.66
18 GA (45 ksi)	1.88	3.75	5.63	7.50
16 GA (45 ksi)	2.15	4.30	6.44	8.59
14 GA (45 ksi)	2.69	5.38	8.06	10.75
12 GA (45 ksi)	3.76	7.53	11.29	15.05
10 GA (45 ksi)	4.84	9.67	14.51	19.34
20 GA (65 ksi)	2.77	5.53	8.30	11.07
18 GA (65 ksi)	2.71	5.42	8.13	10.84
16 GA (65 ksi)	3.10	6.21	9.31	12.41
14 GA (65 ksi)	3.88	7.76	11.65	15.53
12 GA (65 ksi)	5.43	10.86	16.30	21.73
10 GA (65 ksi)	-	-	-	-
# of X-U fasteners in 1/4" thick base steel (Fy = 50 ksi)				
20 GA (45 ksi)	1.91	3.83	5.74	7.66
18 GA (45 ksi)	1.88	3.75	5.63	7.50
16 GA (45 ksi)	1.68	3.35	5.03	6.71
14 GA (45 ksi)	1.86	3.71	5.57	7.42
12 GA (45 ksi)	2.60	5.19	7.79	10.39
10 GA (45 ksi)	3.34	6.68	10.01	13.35
20 GA (65 ksi)	2.77	5.53	8.30	11.07
18 GA (65 ksi)	2.71	5.42	8.13	10.84
16 GA (65 ksi)	2.42	4.85	7.27	9.69
14 GA (65 ksi)	2.68	5.36	8.04	10.72
12 GA (65 ksi)	3.75	7.50	11.25	15.00
10 GA (65 ksi)	-	-	-	-

Pourstop Gauge (Fu)	Inch of Fillet Weld			
	1	2	3	4
# of X-U fasteners in 3/8" thick base steel (Fy = 50 ksi)				
20 GA (45 ksi)	1.91	3.83	5.74	7.66
18 GA (45 ksi)	1.88	3.75	5.63	7.50
16 GA (45 ksi)	1.68	3.35	5.03	6.71
14 GA (45 ksi)	1.74	3.49	5.23	6.97
12 GA (45 ksi)	2.15	4.31	6.46	8.61
10 GA (45 ksi)	2.77	5.53	8.30	11.07
20 GA (65 ksi)	2.77	5.53	8.30	11.07
18 GA (65 ksi)	2.71	5.42	8.13	10.84
16 GA (65 ksi)	2.42	4.85	7.27	9.69
14 GA (65 ksi)	2.52	5.04	7.55	10.07
12 GA (65 ksi)	3.11	6.22	9.32	12.43
10 GA (65 ksi)	-	-	-	-
# of X-U fasteners in 1/2" thick base steel (Fy = 50 ksi)				
20 GA (45 ksi)	1.91	3.83	5.74	7.66
18 GA (45 ksi)	1.88	3.75	5.63	7.50
16 GA (45 ksi)	1.68	3.35	5.03	6.71
14 GA (45 ksi)	1.74	3.49	5.23	6.97
12 GA (45 ksi)	2.24	4.47	6.71	8.95
10 GA (45 ksi)	2.87	5.75	8.62	11.50
20 GA (65 ksi)	2.77	5.53	8.30	11.07
18 GA (65 ksi)	2.71	5.42	8.13	10.84
16 GA (65 ksi)	2.42	4.85	7.27	9.69
14 GA (65 ksi)	2.52	5.04	7.55	10.07
12 GA (65 ksi)	3.23	6.46	9.69	12.92
10 GA (65 ksi)	-	-	-	-
# of X-U fasteners in ≥ 3/4" thick base steel (Fy = 50 ksi)				
20 GA (45 ksi)	1.97	3.94	5.91	7.87
18 GA (45 ksi)	2.63	5.25	7.88	10.50
16 GA (45 ksi)	3.28	6.57	9.85	13.13
14 GA (45 ksi)	4.11	8.22	12.33	16.43
12 GA (45 ksi)	5.75	11.50	17.25	23.01
10 GA (45 ksi)	7.39	14.78	22.17	29.57
20 GA (65 ksi)	2.85	5.69	8.54	11.38
18 GA (65 ksi)	3.79	7.59	11.38	15.18
16 GA (65 ksi)	4.74	9.49	14.23	18.97
14 GA (65 ksi)	5.93	11.87	17.80	23.74
12 GA (65 ksi)	8.30	16.61	24.91	33.21
10 GA (65 ksi)	-	-	-	-

- 1.) X-U fasteners installed into 3/4-inch or thicker steel require 1/2-inch minimum penetration. All other steel thicknesses are based upon through penetration. In 3/4-inch or thicker steel, for an embedment less than 1/2-inch, but more than 3/8-inch, multiply number of needed fasteners by 1.25.
- 2.) Comparisons between weld and powder-actuated fasteners are based upon the fasteners only and do not consider other failure modes (e.g. sheet steel failure)
- 3.) Loads are assumed to act about the centroid of the fastener group or weld length and do not consider prying forces.
- 4.) Fastener totals do not take into account the capacities of the pourstop itself and or the capability of the pourstop to have the number of fasteners provided installed through it. Minimum fastener spacing and edge distance without reduction in powder-actuated fastener performance is 1" and 1/2", respectively.
- 5.) Trial installations are recommended.

Table 8 - Hilti X-U vs. Fillet Weld (Shear)^{1,2,3,4,5}

Pourstop Gauge (Fu)	Inch of Fillet Weld			
	1	2	3	4
# of X-U fasteners in 1/8" thick base steel (Fy = 50 ksi)				
20 GA (45 ksi)	-	-	-	-
18 GA (45 ksi)	-	-	-	-
16 GA (45 ksi)	-	-	-	-
14 GA (45 ksi)	-	-	-	-
12 GA (45 ksi)	-	-	-	-
10 GA (45 ksi)	-	-	-	-
20 GA (65 ksi)	-	-	-	-
18 GA (65 ksi)	-	-	-	-
16 GA (65 ksi)	-	-	-	-
14 GA (65 ksi)	-	-	-	-
12 GA (65 ksi)	-	-	-	-
10 GA (65 ksi)	-	-	-	-
# of X-U fasteners in 3/16" thick base steel (Fy = 50 ksi)				
20 GA (45 ksi)	1.55	3.10	4.64	6.19
18 GA (45 ksi)	1.75	3.50	5.25	7.00
16 GA (45 ksi)	1.60	3.19	4.79	6.38
14 GA (45 ksi)	2.00	3.99	5.99	7.99
12 GA (45 ksi)	2.80	5.59	8.39	11.18
10 GA (45 ksi)	3.59	7.19	10.78	14.37
20 GA (65 ksi)	2.24	4.48	6.71	8.95
18 GA (65 ksi)	2.53	5.06	7.59	10.12
16 GA (65 ksi)	2.31	4.61	6.92	9.22
14 GA (65 ksi)	2.88	5.77	8.65	11.54
12 GA (65 ksi)	4.04	8.07	12.11	16.14
10 GA (65 ksi)	-	-	-	-
# of X-U fasteners in 1/4" thick base steel (Fy = 50 ksi)				
20 GA (45 ksi)	1.55	3.10	4.64	6.19
18 GA (45 ksi)	1.75	3.50	5.25	7.00
16 GA (45 ksi)	1.60	3.19	4.79	6.38
14 GA (45 ksi)	2.00	3.99	5.99	7.99
12 GA (45 ksi)	2.80	5.59	8.39	11.18
10 GA (45 ksi)	3.59	7.19	10.78	14.37
20 GA (65 ksi)	2.24	4.48	6.71	8.95
18 GA (65 ksi)	2.53	5.06	7.59	10.12
16 GA (65 ksi)	2.31	4.61	6.92	9.22
14 GA (65 ksi)	2.88	5.77	8.65	11.54
12 GA (65 ksi)	4.04	8.07	12.11	16.14
10 GA (65 ksi)	-	-	-	-

Pourstop Gauge (Fu)	Inch of Fillet Weld			
	1	2	3	4
# of X-U fasteners in 3/8" thick base steel (Fy = 50 ksi)				
20 GA (45 ksi)	1.55	3.10	4.64	6.19
18 GA (45 ksi)	1.75	3.50	5.25	7.00
16 GA (45 ksi)	1.60	3.19	4.79	6.38
14 GA (45 ksi)	2.00	3.99	5.99	7.99
12 GA (45 ksi)	2.80	5.59	8.39	11.18
10 GA (45 ksi)	3.59	7.19	10.78	14.37
20 GA (65 ksi)	2.24	4.48	6.71	8.95
18 GA (65 ksi)	2.53	5.06	7.59	10.12
16 GA (65 ksi)	2.31	4.61	6.92	9.22
14 GA (65 ksi)	2.88	5.77	8.65	11.54
12 GA (65 ksi)	4.04	8.07	12.11	16.14
10 GA (65 ksi)	-	-	-	-
# of X-U fasteners in 1/2" thick base steel (Fy = 50 ksi)				
20 GA (45 ksi)	1.55	3.10	4.64	6.19
18 GA (45 ksi)	1.75	3.50	5.25	7.00
16 GA (45 ksi)	1.60	3.19	4.79	6.38
14 GA (45 ksi)	2.00	3.99	5.99	7.99
12 GA (45 ksi)	2.80	5.59	8.39	11.18
10 GA (45 ksi)	3.59	7.19	10.78	14.37
20 GA (65 ksi)	2.24	4.48	6.71	8.95
18 GA (65 ksi)	2.53	5.06	7.59	10.12
16 GA (65 ksi)	2.31	4.61	6.92	9.22
14 GA (65 ksi)	2.88	5.77	8.65	11.54
12 GA (65 ksi)	4.04	8.07	12.11	16.14
10 GA (65 ksi)	-	-	-	-
# of X-U fasteners in ≥ 3/4" thick base steel (Fy = 50 ksi)				
20 GA (45 ksi)	1.84	3.67	5.51	7.35
18 GA (45 ksi)	2.45	4.90	7.35	9.80
16 GA (45 ksi)	3.06	6.13	9.19	12.26
14 GA (45 ksi)	3.83	7.67	11.50	15.34
12 GA (45 ksi)	5.37	10.74	16.10	21.47
10 GA (45 ksi)	6.90	13.80	20.70	27.59
20 GA (65 ksi)	2.66	5.31	7.97	10.62
18 GA (65 ksi)	3.54	7.08	10.62	14.17
16 GA (65 ksi)	4.43	8.85	13.28	17.71
14 GA (65 ksi)	5.54	11.08	16.62	22.15
12 GA (65 ksi)	7.75	15.50	23.25	31.00
10 GA (65 ksi)	-	-	-	-

- 1.) X-U fasteners installed into 3/4-inch or thicker steel require 1/2-inch minimum penetration. All other steel thicknesses are based upon through penetration. In 3/4-inch or thicker steel, for an embedment less than 1/2-inch, but more than 3/8-inch, multiply number of needed fasteners by 1.25.
- 2.) Comparisons between weld and powder-actuated fasteners are based upon the fasteners only and do not consider other failure modes (e.g. sheet steel failure)
- 3.) Loads are assumed to act about the centroid of the fastener group or weld length and do not consider prying forces.
- 4.) Fastener totals do not take into account the capacities of the pourstop itself and or the capability of the pourstop to have the number of fasteners provided installed through it. Minimum fastener spacing and edge distance without reduction in powder-actuated fastener performance is 1" and 1/2", respectively.
- 5.) Trial installations are recommended.

X-ENP-19 for Fastening Deck to Structural Steel 3.5.3

3.5.3.1 Product Description

The Hilti structural steel deck fastening system consists of powder-actuated tools which are primarily used with one fastener: the X-ENP-19 L15, which is available either collated or non-collated.

For most structural steel decking jobs, the tool of choice is the DX 860-ENP-L tool. This self-contained stand up decking tool is powered by 0.27 caliber long cartridges, which are loaded into the tool in strips of 40. The cartridges drive the X-ENP-19 L15 MXR fastener (collated version) into almost any type of steel deck and base steel thicknesses greater than or equal to 1/4". These

fasteners are available in collated strips of 10. Four of these strips are loaded into the DX 860-ENP-L tool along with the cartridge strip, and enable the operator to fasten at a rate of up to 1,000 quality fastenings per hour.

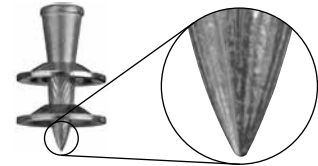
Other tools include the hand held DX 76-MX, a semi-automatic magazine tool. Other configurations of the DX 76 include a single fastener guide variation of the tool for miscellaneous use.

Hilti X-ENP-19 steel deck fasteners comply with ANSI/SDI RD1.0, C1.0 and NC1.0 standards.

- 3.5.3.1 Product Description
- 3.5.3.2 Material Specifications
- 3.5.3.3 Technical Data
- 3.5.3.4 Ordering Information



X-ENP-19 L15 MX and MXR



X-ENP-19 L15

3.5.3.2 Material Specifications

Fastener	Fastener material	Fastener plating	Nominal fastener hardness
X-ENP-19 L15	Carbon Steel	5 µm Zinc ¹	58 HRC

¹ ASTM B633, SC 1, Type III. Reference Section 2.3.3.1 for more information.

3.5.3.3 Technical Data

Allowable pullout loads for attachments to steel base material lb (kN)^{1, 2, 3}

Fastener	Base material thickness (in.)			
	1/4	3/8	1/2 ⁴	≥ 5/8 ⁴
X-ENP-19 L15	905 (4.03)	1125 (5.00)	1010 (4.49)	965 (4.29)

- 1 These values represent testing performed in ASTM A36 plate steel.
- 2 The values must be compared with allowable tensile pullover values.
- 3 Allowable values based on safety factor of 5.0.
- 4 Allowable values are based on minimum 1/2" penetration depth through or into base steel. For 3/8" penetration depth into 1/2" and thicker steels, reduce the allowable load capacity to 635 lb (2.79 kN).

Allowable pullover and shear bearing loads for attaching steel deck^{1,2,3}

Fastener	Steel deck gauge (in.)											
	16 (0.0598)		18 (0.0474)		20 (0.0358)		22 (0.0295)		24 (0.0239)		26 (0.0179)	
	Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)
X-ENP-19 L15	940 (4.14)	1050 (4.62)	875 (3.85)	840 (3.70)	755 (3.32)	640 (2.82)	665 (2.93)	535 (2.35)	400 (1.78)	440 (1.94)	185 (0.81)	335 (1.47)

- 1 Minimum base steel thickness must be greater than or equal to 1/4" (6 mm).
- 2 Allowable values are based on a safety factor of 3.0.
- 3 Loads based on ASTM A1008, or minimum ASTM A653 SQ33 steel deck.

Approvals/Listings

ICC-ES (International Code Council)
ESR-2776, ESR-2197, ESR-1116, ESR-1169, ESR-1414

COLA (City of Los Angeles)
RR 25877, RR 25296

FM (Factory Mutual)

For attaching Class 1 Steel Roof Decks with 1-60 and 1-90 wind uplift ratings. Listed for higher wind uplift ratings with FM Approved Lightweight Insulating Concrete Roof Deck Assemblies. Refer to FM RoofNav for specific assembly listings.

UL (Underwriters Laboratories)

Fasteners for attaching steel roof deck (uplift and fire classification)

ABS (American Bureau of Shipping)



X-HSN 24 for Fastening Deck to Bar Joist 3.5.2

3.5.2.1 Product Description

The Hilti bar joist deck fastening system consists of powder-actuated tools that are primarily used with the X-HSN 24 fasteners, which are available in a collated version.

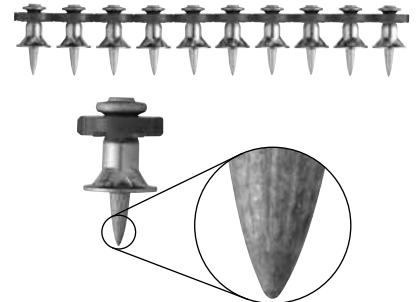
For many bar joist decking projects, the tool of choice is the DX 860-HSN tool. This self-contained stand up decking tool is powered by 0.27 caliber short cartridges, which are loaded into the tool in strips of 40. The cartridges drive the X-HSN 24 fasteners into almost any type of steel deck profile and base steel thicknesses of 1/8" to 3/8". These fasteners are available in collated strips of 10. Four of these strips are loaded

into the DX 860-HSN tool, along with the cartridge strip, and enable the operator to fasten at a rate of up to 1,000 quality fastenings per hour. Additionally, this tool offers punch through resistance in cases where the base material is inadvertently missed.

Other tools include the hand held DX 460-SM, a semi-automatic magazine tool for use on smaller jobs or in tandem with the DX 860-HSN.

Hilti X-HSN 24 steel deck fasteners comply with ANSI/SDI RD1.0, C1.0 and NC1.0 standards.

- 3.5.2.1 Product Description
- 3.5.2.2 Material Specifications
- 3.5.2.3 Technical Data
- 3.5.2.4 Ordering Information



X-HSN 24

3.5.2.2 Material Specifications

Fastener designation	Fastener material	Fastener plating	Nominal fastener hardness
X-HSN 24	Carbon Steel	5 µm Zinc ¹	55.5 HRC

1 ASTM B633, SC 1, Type III. Reference Section 2.3.3.1 for more information.

3.5.2.3 Technical Data

Allowable pullout loads for attachments to steel base material lb (kN)^{1, 2, 3}

Fastener	Base material thickness (in.)			
	1/8	3/16	1/4	3/8
X-HSN 24	435 (1.95)	635 (2.82)	750 (3.34)	750 (3.34)

- 1 These values represent testing performed in ASTM A36 plate steel.
- 2 The values must be compared with allowable tensile pullover values.
- 3 Allowable values based on safety factor of 5.0.

Allowable pullover and shear bearing loads for attaching steel deck^{1,2,3}

Fastener	Steel deck gauge (in.)											
	16 (0.0598)		18 (0.0474)		20 (0.0358)		22 (0.0295)		24 (0.0239)		26 (0.0179)	
	Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)
X-HSN 24 ¹	865 (3.85)	975 (4.29)	725 (3.22)	785 (3.45)	560 (2.49)	600 (2.64)	500 (2.22)	500 (2.20)	450 (2.00)	410 (1.80)	415 (1.85)	310 (1.36)

- 1 For base steel thickness 1/8" (3 mm) to 3/8" (10 mm).
- 2 Allowable values are based on a safety factor of 3.0.
- 3 Loads based on ASTM A1008, or minimum ASTM A653 SQ33 steel deck.

Approvals/Listings

ICC-ES (International Code Council)
 ESR-3592, ESR-2776, ESR-2197, ESR-1116, ESR-1735P, ESR-1414, ESR-2408

COLA (City of Los Angeles)
 RR 25974, RR 25877, RR 25296

FM (Factory Mutual)
 For attaching Class 1 Steel Roof Decks with 1-60 and 1-90 wind uplift ratings.

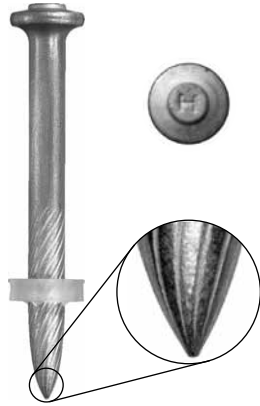
Refer to FM RoofNav for specific assembly listings.

UL (Underwriters Laboratories)
 Fasteners for attaching steel roof deck (uplift and fire classification)



3.2.3 X-U Universal Knurled Shank Fasteners

- 3.2.3.1 Product Description
- 3.2.3.2 Material Specifications
- 3.2.3.3 Technical Data
- 3.2.3.4 Ordering Information



3.2.3.1 Product Description

The Hilti X-U universal knurled shank fastener is designed as a high performance solution to simplify powder-actuated fastener selection. The X-U is one fastener type that performs equally well on both high and standard strength concrete and steel.

To help ensure reliable fastenings, the X-U fastener has matched tolerance to all Hilti powder-actuated tools using 8 mm fastener guides and drive pistons through an 8 mm nail head diameter and an 8 mm plastic guidance washer set near the nail tip. The X-U program also includes fasteners with pre-mounted steel washers of 15 mm or 36 mm.

Product Features

- A 0.157" shank diameter for high performance in both tension and shear applications
- Unique knurling design offering higher pullout strength and anchorage in concrete and steel
- Full range of fasteners in single or collated configurations to maximize productivity
- No requirement for unique drive pistons or special equipment
- Recognized for horizontal wood deck diaphragms subjected to wind or seismic forces (Reference ICC-ES ESR-2269)

Listings/Approvals

ICC-ES (International Code Council)
ESR-2269

COLA (City of Los Angeles)
RR 25675



3.2.3.2 Material Specifications

Fastener Designation	Fastener Material	Fastener Plating	Fastener Hardness
X-U	Carbon Steel	5 µm Zinc ¹	58 HRC

¹ ASTM B633, SC 1, Type III. Refer to Section 2.3.3.1 for more information.

3.2.3.3 Technical Data

Allowable Loads in Normal Weight Concrete¹

Fastener	Shank Diameter in. (mm)	Minimum Embedment in. (mm)	Concrete Compressive Strength					
			2000 psi		4000 psi		6000 psi	
			Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)
X-U	0.157 (4.0)	3/4 (19)	100 (0.44)	125 (0.57)	100 (0.44)	125 (0.57)	105 (0.47)	205 (0.91)
		1 (25)	165 (0.73)	190 (0.85)	170 (0.76)	225 (1.00)	110 (0.49)	280 (1.25)
		1-1/4 (32)	240 (1.07)	310 (1.38)	280 (1.25)	310 (1.38)	180 (0.80)	425 (1.89)
		1-1/2 (38)	275 (1.22)	420 (1.87)	325 (1.45)	420 (1.87)	-	-

¹ The tabulated allowable load values are for the low-velocity fasteners only, using a safety factor that is greater than or equal to 5.0, calculated in accordance with ICC-ES AC70. Wood or steel members connected to the substrate must be investigated in accordance with accepted design criteria.

Allowable Loads in Normal Weight Concrete Using DX-Kwik^{1,2}

Fastener	Shank Diameter in. (mm)	Minimum Embedment in. (mm)	Concrete Compressive Strength			
			4000 psi		6000 psi	
			Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)
X-U 47 P8 w/DX-KWIK	0.157 (4.0)	1-1/2 (38)	395 (1.76)	405 (1.80)	360 (1.60)	570 (2.54)

¹ X-U Fastener is installed using the DX-KWIK drilled pilot hole installation procedure shown in Section 3.2.1.1.10.

² The tabulated allowable load values are for the low-velocity fasteners only, using a safety factor that is greater than or equal to 5.0, calculated in accordance with ICC-ES AC70. Wood or steel members connected to the substrate must be investigated in accordance with accepted design criteria.

X-U Universal Knurled Shank Fasteners 3.2.3

Allowable Loads in Minimum $f'_c = 3000$ psi Structural Lightweight Concrete^{1,4}

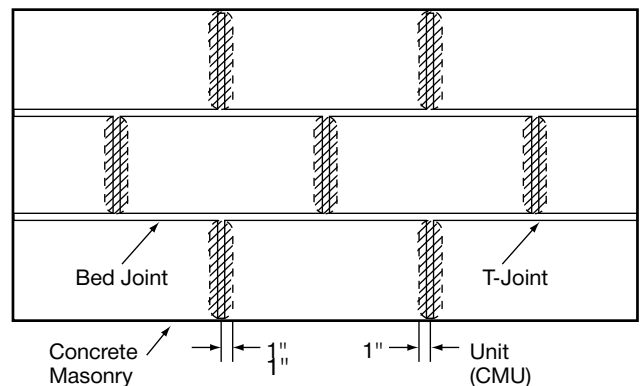
Fastener	Shank Dia. in. (mm)	Minimum Embed. in. (mm)	Fastener Location							
			Installed into Concrete		Installed Through Metal Deck into Concrete					
			Tension lb (kN)	Shear lb (kN)	3 Inch Deep Composite Floor Deck ²		1-1/2 Inch Deep Composite Floor Deck ³			
					Tension lb (kN)	Shear lb (kN)	Upper Flute		Lower Flute	
X-U	0.157 (4.0)	3/4 (19)	125 (0.56)	115 (0.51)	130 (0.58)	95 (0.42)	245 (1.09)	95 (0.42)	95 (0.42)	370 (1.65)
		1 (25)	205 (0.91)	260 (1.16)	215 (0.96)	155 (0.69)	330 (1.47)	125 (0.56)	125 (0.56)	415 (1.85)
		1-1/4 (32)	315 (1.40)	435 (1.93)	295 (1.31)	200 (0.89)	375 (1.67)	-	-	-
		1-1/2 (38)	425 (1.89)	475 (2.11)	400 (1.78)	260 (1.16)	430 (1.91)	-	-	-

- The tabulated allowable load values are for the low-velocity fasteners only, using a safety factor that is greater than or equal to 5.0, calculated in accordance with ICC-ES AC70. Wood or steel members connected to the substrate must be investigated in accordance with accepted design criteria.
- The steel deck profile for the 3" deep composite floor deck has a minimum thickness of 20 gauge (0.0358") and a minimum $F_y = 33$ ksi. Lower and upper flute width must be a minimum of 3-7/8". Figure 1 in Section 3.2.1.1.6 shows the nominal flute dimensions, fastener locations and load orientations for the deck profile. Structural lightweight concrete fill above top of steel deck must be minimum 3-1/4".
- The steel deck profile for the 1-1/2" deep composite floor deck has a minimum thickness of 20 gauge (0.0358") and a minimum $F_y = 33$ ksi. Lower flute and upper flute widths must be a minimum of 1-3/4" and 3-1/2", respectively. This deck may also be inverted as shown in Figure 3 in Section 3.2.1.1.6. Figures 2 and 3 in Section 3.2.1.1.6 show the nominal flute dimensions, fastener locations and load orientations for the deck profile. Structural lightweight concrete fill above top of steel deck must be minimum 2-1/2".
- Multiple fasteners are recommended for any attachment.

Allowable Loads in Concrete Masonry Units^{1,2,3,4,5,10}

Fastener	Shank Dia. in. (mm)	Minimum Embed. in. (mm)	Hollow CMU				Grout-Filled CMU					
			Face Shell ⁶		Mortar Joint ⁶		Face Shell ⁶		Mortar Joint ⁶		Top of Grouted Cell ⁸	
			Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear ⁷ lb (kN)	Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear ⁷ lb (kN)	Tension lb (kN)	Shear ⁹ lb (kN)
X-U	0.157 (4.0)	1 (25)	70 (0.31)	85 (0.38)	25 (0.11)	70 (0.31)	225 (1.00)	220 (0.98)	150 (0.67)	190 (0.85)	165 (0.73)	240 (1.07)

- The tabulated allowable load values are for the low-velocity fastener into concrete masonry units only, using a safety factor equal to or greater than 5.0, calculated in accordance with ICC-ES AC70. Wood or steel members connected to the substrate must be investigated in accordance with accepted design criteria.
- The tabulated allowable load values are for low-velocity fasteners installed in normal weight or lightweight concrete masonry units conforming to ASTM C90.
- The tabulated allowable load values are for low-velocity fasteners installed in concrete masonry units with mortar conforming to ASTM C270, Type S.
- The tabulated allowable load values are for low-velocity fasteners installed in concrete masonry units with grout conforming to ASTM C476.
- The tabulated allowable load values are for one low-velocity fastener installed in an individual masonry unit cell and at least 4" from the edge of the wall.
- Fastener can be located anywhere on the face shell or mortar joints as shown in the figure to the right.
- Shear load direction can be horizontal or vertical (Bed Joint or T-Joint) along the CMU wall plane.
- Fastener located in center of grouted cell installed vertically.
- Shear load can be in any direction in top of grouted cell application.
- Multiple fasteners are recommended for any attachment.



Acceptable Locations (NON-SHADED AREAS) for X-U Universal Knurled Shank Fasteners in CMU Walls

Allowable Loads in Minimum ASTM A36 ($F_y \geq 36$ ksi; $F_u \geq 58$ ksi) Steel^{1,2,4}

Fastener	Shank Dia. in. (mm)	Steel Thickness in.									
		3/16		1/4		3/8		1/2		$\geq 3/4$ ³	
		Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)
X-U	0.157 (4.0)	535 (2.38)	720 (3.20)	775 (3.45)	720 (3.20)	935 (4.16)	720 (3.20)	900 (4.00)	720 (3.20)	350 (1.56)	375 (1.67)

- The tabulated allowable load values are for the low-velocity fasteners only, using a safety factor that is greater than or equal to 5.0, calculated in accordance with ICC-ES AC70. Wood or steel members connected to the substrate must be investigated in accordance with accepted design criteria.
- Low-velocity fasteners shall be driven to where the point of the fastener penetrates the steel base material, except as noted.
- Tabulated allowable load values provided for $\geq 3/4$ " steel are based upon minimum point penetration of 1/2". If 1/2" point penetration is not achieved, but a point penetration of at least 3/8" is obtained, the tabulated tension value should be reduced by 20 percent and the tabulated shear load should be reduced by 8 percent.
- Multiple fasteners are recommended for any attachment.

3.2.3 X-U Universal Knurled Shank Fasteners

Allowable Tensile Pullover and Shear Bearing Load Capacities for Steel Framing with X-U Powder-Actuated Fasteners^{1,2,3,4}

Fastener Description	Fastener	Head Dia. in. (mm)	Sheet Steel Thickness													
			14 ga.		16 ga.		18 ga.		20 ga.		22 ga.		24 ga.		25/26 ga	
			Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)
0.157" shank with or w/o plastic washers or MX collation	X-U	0.322 (8.2)	825 (3.67)	1,085 (4.83)	685 (3.05)	720 (3.20)	490 (2.18)	525 (2.34)	360 (1.60)	445 (1.98)	300 (1.33)	330 (1.47)	205 (0.91)	255 (1.13)	120 (0.53)	145 (0.64)

- 1 Allowable load values are based on a safety factor of 3.0 in accordance with the AISI S100.
- 2 Allowable pullover capacities of sheet steel should be compared to allowable fastener tensile load capacities in concrete, steel, or masonry to determine controlling resistance load.
- 3 Allowable shear load bearing capacities of sheet steel should be compared to allowable fastener shear capacities in concrete, steel or masonry to determine controlling resistance load.
- 4 Data is based on the following minimum sheet steel properties, $F_y = 33$ ksi, $F_u = 45$ ksi (ASTM A653 material).

3.2.3.4 Ordering Information

Fastener Description	Shank Length in. (mm)	Shank Ø in. (mm)	Washer Ø	Packaging Qty
X-U 16	5/8 (16)	0.157 (4.0)	Plastic 8 mm or collated	100 pcs / box
X-U 19	3/4 (19)	0.157 (4.0)	Plastic 8 mm or collated	100 pcs / box
X-U 22	7/8 (22)	0.157 (4.0)	Plastic 8 mm or collated	100 pcs / box
X-U 27	1 (27)	0.157 (4.0)	Plastic 8 mm or collated	100 pcs / box
X-U 32	1-1/4 (32)	0.157 (4.0)	Plastic 8 mm or collated	100 pcs / box
X-U 37	1-1/2 (37)	0.157 (4.0)	Plastic 8 mm or collated	100 pcs / box
X-U 42	1-5/8 (42)	0.157 (4.0)	Plastic 8 mm or collated	100 pcs / box
X-U 47	1-7/8 (47)	0.157 (4.0)	Plastic 8 mm or collated	100 pcs / box
X-U 52	2 (52)	0.157 (4.0)	Plastic 8 mm or collated	100 pcs / box
X-U 57	2-1/4 (57)	0.157 (4.0)	Plastic 8 mm or collated	100 pcs / box
X-U 62	2-1/2 (62)	0.157 (4.0)	Plastic 8 mm or collated	100 pcs / box
X-U 72	2-7/8 (72)	0.157 (4.0)	Plastic 8 mm or collated	100 pcs / box

Fastener Description	Shank Length in. (mm)	Shank Ø in. (mm)	Washer Ø	Packaging Qty
X-U 22 P8 S15	7/8 (22)	0.157 (4.0)	Plastic 8 mm & Steel 15 mm	100 pcs / box
X-U 27 P8 S15	1 (27)	0.157 (4.0)	Plastic 8 mm & Steel 15 mm	100 pcs / box
X-U 32 P8 S15	1-1/4 (32)	0.157 (4.0)	Plastic 8 mm & Steel 15 mm	100 pcs / box
X-U 32 P8 S36	1-1/4 (32)	0.157 (4.0)	Plastic 8 mm & Steel 36 mm	100 pcs / box
X-U 72 P8 S36	2-7/8 (72)	0.157 (4.0)	Plastic 8 mm & Steel 36 mm	100 pcs / box

Fastener Description	Shank Length in. (mm)	Shank Ø in. (mm)	Washer Ø	Packaging Qty
X-U 16 P8 TH	5/8 (16)	0.157 (4.0)	8 mm plastic & metal "tophat"	100 pcs / box
X-U 19 P8 TH	3/4 (19)	0.157 (4.0)	8 mm plastic & metal "tophat"	100 pcs / box
X-U 27 P8 TH	1 (27)	0.157 (4.0)	8 mm plastic & metal "tophat"	100 pcs / box

