IFI

PROJECTION WELD STUDS (THREADED)

IFI Note:

During the early 1970s, ASME Standards Committee B18 undertook development of a dimensional standard for threaded projection weld studs. A proposed standard incorporating basic requirements was drafted. When circulated for public review, it became apparent that the preponderance of weld studs then in use were uniquely designed for individual applications and to include all would be impractical. Despite the Committee's sincere efforts, reaching consensus on the contents of a single document for national recognition was unachievable and the project was discontinued.

IFI also recognizes the impracticality of developing a national standard for threaded projection weld studs. However, it considers the earlier efforts of Committee B18 have merit and are worth preserving. Consequently, with the sole intent of providing useful guidance to designers and engineers when considering the use of weld studs, the contents of the 1970 draft standard, editorially modified to be information only, are presented here.

1. Introductory Notes.

1.1 Scope.

1.1.1 This document covers general and dimensional data for various types of weld studs having one or more integrally formed projections under or on top of the head suitable for resistance welding.

1.1.2 The inclusion of dimensional data in this standard is not intended to imply that only the products described are commercially available. Consumers are requested to consult with manufacturers concerning other designs and sizes.

1.2 Head Types.

The types of heads covered in this document are classified by the location, quantity and/or configuration of the weld projection or projections and consist of the following:

1.2.1 *Type U3.* The Type U3 head defined in Table 1 is cylindrical and has flat, parallel surfaces. The underside welding surface has three integrally formed hemispheroidal shaped weld projections equally spaced on a locating circle concentric with the shank.

1.2.2 *Type T3.* The Type T3 head defined in Table 2 is cylindrical and has flat, parallel surfaces. The top welding surface has three integrally formed hemispheroidal shaped weld projections equally spaced on a locating circle concentric with the shank.

1.2.3 *Type TD.* The Type TD head defined in Table 3 is cylindrical and has flat, parallel surfaces. The top welding surface has a single integrally formed spherical segment shaped weld projection centered on the welding surface.

1.2.4 *Type UR.* The Type UR head defined in Table 4 is cylindrical and has flat, parallel surfaces. The underside welding surface has an integrally formed annular ring weld projection on a locating circle concentric with the shank.

1.2.5 *Type US3.* The Type US3 head defined in Table 5 is cylindrical and has flat, parallel surfaces. The underside welding surface has three integrally formed sausage shaped weld projections equally spaced on a locating circle concentric with the shank.

1.2.6 *Type UC4.* The Type UC4 head defined in Table 6 is cylindrical and has flat, parallel surfaces. The underside welding surface has four integrally formed hemispheroidal shaped weld projections equally spaced on a locating circle concentric with the shank. Formed integrally, and protruding on the same side as the weld projections and around the periphery of the head, is a rim.

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1.2.7 *Type TC4.* The Type TC4 head defined in Table 7 is cylindrical and has flat, parallel surfaces. The top welding surface has four integrally formed hemispheroidal shaped weld projections equally spaced on a locating circle. Formed integrally, and protruding on the same side as the weld projections and around the periphery of the head, is a rim.

1.3 Dimensions.

All dimensions are given in inches, unless otherwise stated.

1.4 Terminology.

For definitions of terms relating to fasteners or component features, refer to ANSI/ASME B18.12, page M-1.

2. General Data.

2.1 Heads.

2.1.1 *Height of Head.* The height of head is measured, parallel to the axis of the stud, from the welding surface to the opposite head surface and does not include the projection height.

2.1.2 *Welding Surface.* The welding surface of a weld stud is the spotting or locating surface excluding the projections with respect to the part to which it is welded. The welding surface should be at right angles to the axis of the threaded shank within 2 degrees.

2.1.3 *Eccentricity.* Eccentricity is defined as one-half of the full indicator reading.

2.1.3.1 *Eccentricity of Head.* The heads on weld studs should not be eccentric with the axis of the threaded shank by more than 3 percent (6 percent FIR) of the maximum head diameter determined from one diameter length of shank underhead.

2.2 Length.

2.2.1 *Measurement.* The length of a weld stud is measured parallel to the axis of the shank from the welding surface of the head to the end of the shank, excluding the projections.

2.2.2 *Tolerance on Length.* The recommended tolerance on length of weld studs is tabulated below:

Nominal Stud Length	Tolerance on Length
Up to 1 in., incl.	-0.03
Over 1 to 2 in., incl.	-0.06
Over 2 in.	-0.09

2.3 Threads.

Threads on weld studs are recommended to be UNRC or UNRF Class 2A, in conformance with ANSI/ASME B1.1, page A-26.

2.4 Length of Thread.

Weld studs having nominal lengths of 2 inches and shorter should have threads extending to within one pitch (thread) of the underside of the head or the top of weld projection, whichever is applicable. Weld studs over 2 inches in length should have a minimum full form thread length of 1.75 inches.

2.5 Points.

Weld studs are normally furnished with plain sheared ends. Header points are obtainable as defined on page I-33.

2.6 Diameter of Body.

The diameter of the unthreaded body should not be less than the minimum pitch diameter of the thread nor greater than the basic major diameter of the thread.

2.7 Material.

Weld studs are normally supplied in weldable grades of low carbon steel (refer to ASTM A307, Supplementary Requirement S1, page B-61) and corrosion resistant steel.

2.8 Finish.

Weld studs should be supplied with a naturally bright unplated or uncoated finish.

2.9 Defects.

Weld studs should be free from defects,

such as burrs or loose scale, that might affect their usability.

2.10 Designation.

Where specifying weld studs, the following data should be included in the designation and should appear in the following sequence: nominal size (number, fraction or decimal equivalent), threads per inch, length of thread shank (fractions or decimal equivalents), head type, material, point (if other than plain point), and finish (if other than plain). See examples below:

10-32 x 1¼ Type U3 Weld Stud, Steel

.250 — 20 x 1.50 Type US3 Weld Stud, Steel, Header Point, Zinc Plate

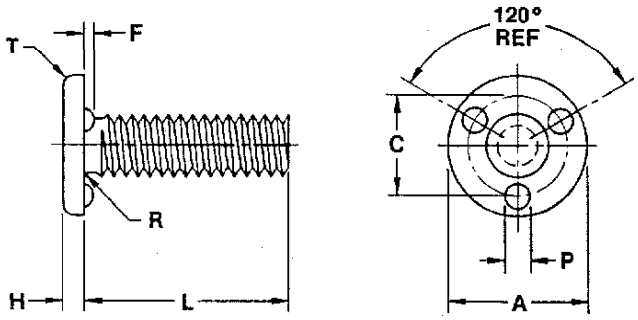

Table 1 Type U3 Projection Weld Studs

Nominal Size or Basic Stud Diameter		A		H		P		F		C	T	R
		Head Diameter		Head Height		Projection Diameter		Projection Height		Locating Circle	Radius on Edge of Head	Fillet Radius
		Max	Min	Max	Min	Max	Min	Max	Min	Dia Ref	Max	Max
4	0.1120	0.260	0.240	0.046	0.036	0.045	0.035	0.017	0.013	0.180	0.015	0.015
6	0.1380	0.323	0.303	0.052	0.042	0.055	0.045	0.022	0.018	0.226	0.025	0.020
8	0.1640	0.385	0.365	0.068	0.058	0.075	0.065	0.027	0.023	0.268	0.035	0.025
10	0.1900	0.448	0.428	0.068	0.058	0.085	0.075	0.032	0.028	0.312	0.040	0.030
1/4	0.2500	0.575	0.550	0.083	0.073	0.105	0.095	0.042	0.038	0.406	0.050	0.040
5/16	0.3125	0.755	0.725	0.099	0.089	0.125	0.115	0.047	0.043	0.531	0.055	0.045
3/8	0.3750	0.880	0.850	0.114	0.104	0.135	0.125	0.052	0.048	0.625	0.065	0.050
1/2	0.5000	1.005	0.975	0.146	0.136	0.155	0.145	0.062	0.058	0.750	0.085	0.060
See Notes 1		3		2								

NOTES:

1. Where specifying nominal size in decimals, zeros preceding decimal and in the fourth decimal place should be omitted.
2. The total variation in head height of any one weld stud should not exceed 0.005 in.
3. A slight radius should be permissible at junction of projections and welding surface.
4. See General Data on page C-75.

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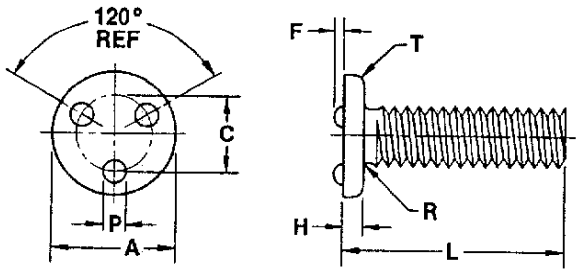

Table 2 Type T3 Projection Weld Studs

Nominal Size or Basic Stud Diameter		A		H		P		F		C	T	R
		Head Diameter		Head Height		Projection Diameter		Projection Height		Locating Circle	Radius on Edge of Head	Fillet Radius
		Max	Min	Max	Min	Max	Min	Max	Min	Dia Ref	Max	Max
4	0.1120	0.228	0.208	0.036	0.026	0.045	0.035	0.017	0.013	0.128	0.015	0.015
6	0.1380	0.260	0.240	0.046	0.036	0.055	0.045	0.022	0.018	0.156	0.025	0.020
8	0.1640	0.323	0.303	0.052	0.042	0.075	0.065	0.027	0.023	0.203	0.035	0.025
10	0.1900	0.385	0.365	0.068	0.058	0.085	0.075	0.032	0.028	0.250	0.040	0.030
1/4	0.2500	0.510	0.485	0.083	0.073	0.105	0.095	0.042	0.038	0.312	0.050	0.040
5/16	0.3125	0.630	0.605	0.099	0.089	0.125	0.115	0.047	0.043	0.390	0.055	0.045
3/8	0.3750	0.755	0.725	0.114	0.104	0.135	0.125	0.052	0.048	0.485	0.065	0.050
1/2	0.5000	1.005	0.975	0.146	0.136	0.155	0.145	0.062	0.058	0.660	0.085	0.060
See Notes 1				2								

NOTES:

1. Where specifying nominal size in decimals, zeros preceding decimal and in the fourth decimal place should be omitted.
2. The total variation in head height of any one weld stud should not exceed 0.005 in.
3. A slight radius should be permissible at junction of projections and welding surface.
4. See General Data on page C-75.

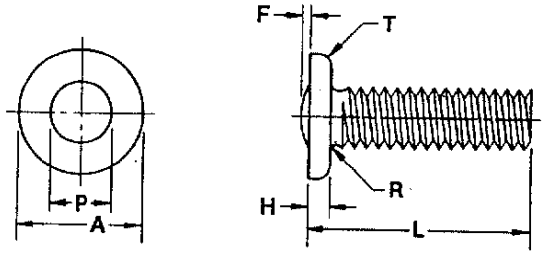

Table 3 Type TD Projection Weld Studs

Nominal Size or Basic Stud Diameter		A		H		P		F		T	R
		Head Diameter		Head Height		Projection Diameter		Projection Height		Radius on Edge of Head	Fillet Radius
		Max	Min	Max	Min	Max	Min	Max	Min	Max	Max
6	0.1380	0.260	0.240	0.046	0.036	0.143	0.133	0.027	0.022	0.025	0.020
8	0.1640	0.323	0.303	0.052	0.042	0.169	0.159	0.028	0.023	0.035	0.025
10	0.1900	0.385	0.365	0.068	0.058	0.195	0.185	0.028	0.023	0.040	0.030
1/4	0.2500	0.510	0.485	0.083	0.073	0.255	0.245	0.031	0.026	0.050	0.040
5/16	0.3125	0.630	0.605	0.099	0.089	0.317	0.307	0.031	0.026	0.055	0.045
3/8	0.3750	0.755	0.725	0.114	0.104	0.380	0.370	0.033	0.028	0.065	0.050
1/2	0.5000	1.005	0.975	0.146	0.136	0.505	0.495	0.035	0.030	0.085	0.060
See Notes 1				2							

NOTES:

1. Where specifying nominal size in decimals, zeros preceding decimal and in the fourth decimal place should be omitted.
2. The total variation in head height of any one weld stud should not exceed 0.005 in.
3. A slight radius should be permissible at junction of projections and welding surface.
4. See General Data on page C-75.

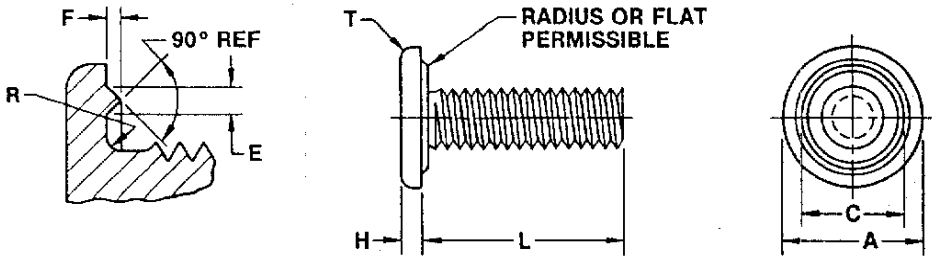

Table 4 Type UR Projection Weld Studs

Nominal Size or Basic Stud Diameter		A		H		C	F		E	T	R
		Head Diameter		Head Height		Projection Ring Dia	Projection Ring Height		Ring Width	Radius on Edge of Head	Fillet Radius
		Max	Min	Max	Min	Ref	Max	Min	Ref	Max	Max
4	0.1120	0.260	0.240	0.046	0.036	0.195	0.013	0.008	0.022	0.015	0.015
6	0.1380	0.323	0.303	0.052	0.042	0.219	0.015	0.010	0.025	0.025	0.020
8	0.1640	0.385	0.365	0.068	0.058	0.266	0.018	0.013	0.031	0.035	0.025
10	0.1900	0.448	0.428	0.068	0.058	0.328	0.020	0.015	0.035	0.040	0.030
1/4	0.2500	0.575	0.550	0.083	0.073	0.422	0.027	0.021	0.048	0.050	0.040
5/16	0.3125	0.755	0.725	0.099	0.089	0.531	0.033	0.027	0.060	0.055	0.045
3/8	0.3750	0.880	0.850	0.114	0.104	0.641	0.037	0.031	0.068	0.065	0.050
1/2	0.5000	1.005	0.975	0.146	0.136	0.734	0.047	0.041	0.088	0.085	0.060
See Notes 1				2							

NOTES:
1. Where specifying nominal size in decimals, zeros preceding decimal and in the fourth decimal place should be omitted.
2. The total variation in head height of any one weld stud should not exceed 0.005 in.
3. A slight radius should be permissible at junction of projections and welding surface.
4. See General Data on page C-75.

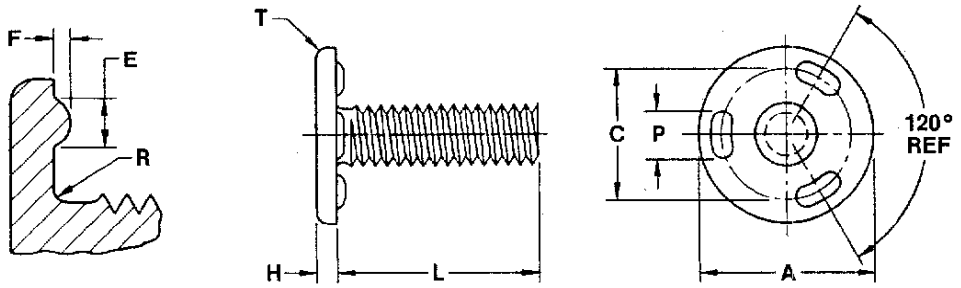

Table 5 Heavy Duty Type US3 Projection Weld Studs

Nominal Size or Basic Stud Diameter		A		H		P		E		F		C	T	R
		Head Diameter		Head Height		Projection Length		Projection Width		Projection Height		Locating Circle Dia	Radius on Edge of Head	Fillet Radius
		Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Ref	Max	Max
1/4	0.2500	0.717	0.687	0.083	0.073	0.210	0.170	0.100	0.080	0.035	0.030	0.540	0.050	0.040
5/16	0.3125	0.780	0.750	0.098	0.088	0.270	0.230	0.100	0.080	0.035	0.030	0.600	0.055	0.045
3/8	0.3750	0.905	0.875	0.114	0.104	0.270	0.230	0.130	0.110	0.040	0.035	0.700	0.065	0.050
7/16	0.4375	0.967	0.937	0.161	0.151	0.330	0.290	0.130	0.110	0.050	0.045	0.760	0.075	0.055
1/2	0.5000	1.030	1.000	0.161	0.151	0.330	0.290	0.130	0.110	0.050	0.045	0.820	0.085	0.060
See Notes 1				2										

NOTES:
1. Where specifying nominal size in decimals, zeros preceding decimal and in the fourth decimal place should be omitted.
2. The total variation in head height of any one weld stud should not exceed 0.005 in.
3. A slight radius should be permissible at junction of projections and welding surface.
4. See General Data on page C-75.

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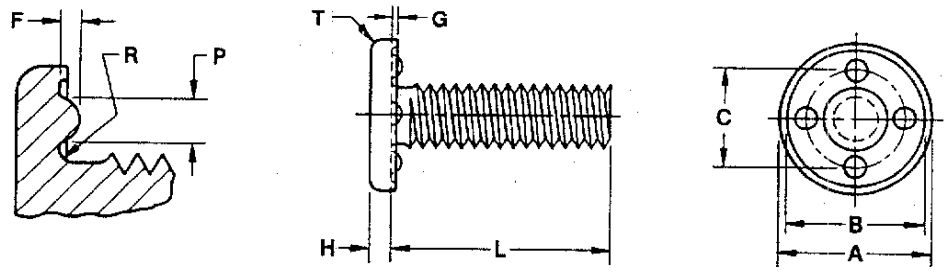

Table 6 Type UC4 Projection Weld Studs

Nominal Size or Basic Stud Diameter		A Head Diameter		B Inside Rim Diameter		H Head Height		G Rim Depth		P Projection Diameter		F Projection Height		C Locating Circle	T Radius on Edge of Head	R Fillet Radius
		Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Dia Ref	Max	Max
2	0.0860	0.225	0.205	0.195	0.175	0.042	0.032	0.005	0.002	0.035	0.025	0.016	0.012	0.130	0.015	0.010
4	0.1120	0.275	0.255	0.240	0.220	0.046	0.036	0.006	0.003	0.045	0.035	0.017	0.013	0.164	0.015	0.015
6	0.1380	0.340	0.320	0.300	0.280	0.052	0.042	0.007	0.004	0.055	0.045	0.022	0.018	0.208	0.025	0.020
8	0.1640	0.400	0.380	0.355	0.335	0.068	0.058	0.008	0.005	0.065	0.055	0.027	0.023	0.244	0.035	0.025
10	0.1900	0.445	0.425	0.385	0.375	0.068	0.058	0.009	0.006	0.075	0.065	0.032	0.028	0.282	0.040	0.030
1/4	0.2500	0.580	0.555	0.525	0.500	0.083	0.073	0.010	0.007	0.095	0.085	0.042	0.038	0.375	0.050	0.040
5/16	0.3125	0.780	0.750	0.715	0.690	0.099	0.089	0.012	0.008	0.125	0.115	0.047	0.043	0.500	0.055	0.045
3/8	0.3750	0.900	0.870	0.830	0.805	0.114	0.104	0.013	0.009	0.145	0.135	0.052	0.048	0.594	0.065	0.050
1/2	0.5000	1.125	1.095	1.050	1.025	0.146	0.136	0.014	0.010	0.175	0.165	0.062	0.058	0.750	0.085	0.060
See Notes 1						2										

NOTES:
1. Where specifying nominal size in decimals, zeros preceding decimal and in the fourth decimal place should be omitted.
2. The variation in head height of any one weld stud should not exceed 0.005 in.
3. A slight radius should be permissible at junction of projections and rim with the welding surface.
4. See General Data on page C-75.

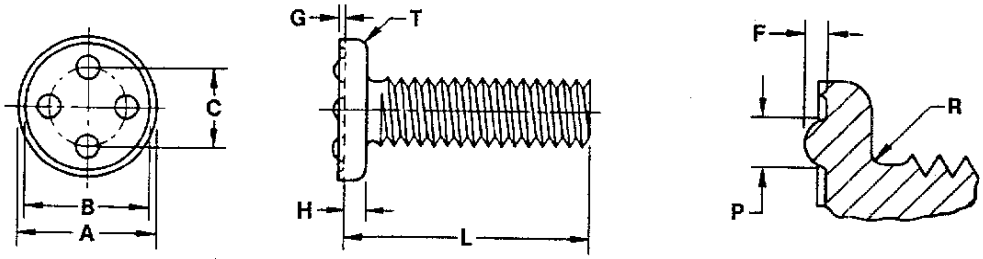

Table 7 Type TC4 Projection Weld Studs

Nominal Size or Basic Stud Diameter		A Head Diameter		B Inside Rim Diameter		H Head Height		G Rim Depth		P Projection Diameter		F Projection Height		C Locating Circle	T Radius on Edge of Head	R Fillet Radius
		Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Dia Ref	Max	Max
2	0.0860	0.200	0.180	0.170	0.150	0.036	0.026	0.005	0.002	0.035	0.025	0.016	0.012	0.100	0.015	0.010
4	0.1120	0.250	0.230	0.215	0.195	0.036	0.026	0.006	0.003	0.045	0.035	0.017	0.013	0.130	0.015	0.015
6	0.1380	0.310	0.290	0.270	0.250	0.046	0.036	0.007	0.004	0.055	0.045	0.022	0.018	0.170	0.025	0.020
8	0.1640	0.350	0.330	0.305	0.285	0.052	0.042	0.008	0.005	0.065	0.055	0.027	0.023	0.190	0.035	0.025
10	0.1900	0.400	0.380	0.350	0.331	0.068	0.058	0.009	0.006	0.075	0.065	0.032	0.028	0.220	0.040	0.030
1/4	0.2500	0.510	0.485	0.455	0.430	0.083	0.073	0.010	0.007	0.095	0.085	0.042	0.038	0.282	0.050	0.040
5/16	0.3125	0.635	0.610	0.570	0.545	0.099	0.089	0.012	0.008	0.125	0.115	0.047	0.043	0.312	0.055	0.045
3/8	0.3750	0.760	0.730	0.690	0.665	0.114	0.104	0.013	0.009	0.145	0.135	0.052	0.048	0.375	0.065	0.050
1/2	0.5000	0.945	0.915	0.870	0.845	0.146	0.136	0.014	0.010	0.175	0.165	0.062	0.058	0.500	0.085	0.060
See Notes 1						2										

NOTES:
1. Where specifying nominal size in decimals, zeros preceding decimal and in the fourth decimal place should be omitted.
2. The total variation in head height of any one weld stud should not exceed 0.005 in.
3. A slight radius should be permissible at junction of projections and rim with the welding surface.
4. See General Data on page C-75.