ICC EVALUATION SERVICE®

ICC-ES Evaluation Report

ESR-2577

Reissued October 2024

Subject to renewal October 2026

This report also contains:

- **CA Supplement**
- **City of LA Supplement**

DIVISION: 03 00 00—CONCRETE Section: 03 15 00—Concrete Accessories	REPORT HOLDER: TRU-WELD DIVISION, TFP CORPORATION	EVALUATION SUBJECT: TRU-WELD STEEL HEADED STUD ANCHORS	

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2021, 2018, 2015, 2012, 2009 and 2006 *International Building Code®* (IBC)
- 2013 *Abu Dhabi International Building Code* (ADIBC)†

†The ADIBC is based on the 2009 IBC. 2009 IBC code sections referenced in this report are the same sections in the ADIBC.

Property evaluated:

- Structural

2.0 USES

Tru-Weld Steel Headed Stud Anchors are intended for use as shear connectors in steel and concrete composite construction.

3.0 DESCRIPTION

Tru-Weld Steel Headed Stud Anchors are manufactured from ASTM A29, Grades 1010 through 1020, cold-drawn steel, and are Type B studs conforming to the requirements of AWS D1.1-2015 and Sections A3.6 and I8 of the 2016 AISC Specification for Structural Steel Buildings (ANSI/AISC 360-16). The steel headed stud anchors are provided in $^1/_2$-, $^5/_8$-, $^3/_4$-, $^7/_8$-, and 1-inch (12.7 mm, 15.9 mm, 19.1 mm, 22.2 mm, and 25.4 mm) diameters.

4.0 DESIGN AND INSTALLATION

4.1 Design:

The nominal horizontal shear strength of steel headed stud anchors is given in Table 3-21 of the AISC Steel Construction Manual (15th edition), in accordance with AISC 360. Alternatively, the nominal shear strength of one steel headed stud anchor may be calculated in accordance with AISC 360-16 Section I8.2 for the 2021 and 2018 IBC, AISC 360-10 Section I8.2 for the 2015 and 2012 IBC, and AISC 360-05 Sections I2.1g and I3.2d(3) for the 2009 and 2006 IBC. The design of composite members with shear connectors must comply with the provisions of Sections 2202, 2203, 2204, 2205, and 2206 of the 2021 and 2018 IBC (Sections 2203, 2204, 2205 and 2206 of the 2015 and 2012 IBC and Sections 2203, 2204 and 2205 of the 2009 and 2006 IBC) and Chapter I of AISC 360.

4.2 Installation:

Tru-Weld Steel Headed Stud Anchors are automatically end-welded directly to steel shapes (for all stud sizes described in Section 3.0 of this report) or through steel deck panels (for $^3/_4$-inch diameter studs) with equipment

and in accordance with procedures recommended by Tru-Weld Division, Tru-Fit Corporation. Welding must comply with AWS D1.1. Steel deck material must be galvanized steel complying with ASTM A653 SS Grade 40, unless field qualification tests in accordance with AWS D1.1 are conducted to the satisfaction of the code official. Base-metal thickness of the deck must conform to Section 7.2.7 of AWS D1.1. Prior to welding, steel deck surfaces and supporting beams must be prepared to comply with the requirements of Section 5.14 of AWS D1.1. The surfaces must be clean, unpainted, and free of heavy rust and mill scale, dirt, sand, oil, water, or other deleterious materials. The deck material must be tightly secured on the top flange of beams. No air gaps are permitted at welded areas. The ambient temperature must be above 32°F (0°C). No welding is permitted at temperatures below 0°F (–21.3°C). At temperatures between 0°F and 32°F (-21.3°C to 0°C), detailed welding instructions in the Tru-Weld applications manual must be followed.

The following through-steel-deck welding applications are recognized in this report:

1. Three-quarter-inch-diameter (19.1 mm) stud through one layer of No. 20 gage thick steel deck panels with a maximum 0.8-ounce-per-square-foot (244 g/m^2) galvanizing.
2. Three-quarter-inch-diameter (19.1 mm) stud through one layer of No. 16 gage thick steel deck panels with a maximum 1.15-ounce-per-square-foot (351 g/m^2) galvanizing.
3. Three-quarter-inch-diameter (19.1 mm) stud through two layers of No. 18 gage thick steel deck panels with maximum 1.15-ounce-per-square-foot (351 g/m^2) galvanizing on each deck panel layer.
4. Three-quarter-inch-diameter (19.1 mm) stud through two layers of No. 20 gage thick steel deck panels with 0.8-ounce-per-square-foot (244 g/m^2) maximum galvanizing on each deck panel layer.

4.3 Special Inspection:

Special inspection during installation of steel headed stud anchors is required in accordance with IBC Sections 1705.2 and 1705.3 and Chapter N of AISC 360 (2009 and 2006 IBC Sections 1704.3 and 1704.4). Inspector responsibilities include verifying:

1. Identification of studs.
2. Concrete mix design.
3. Quality of concrete.
4. Stud bracing.
5. Stud clearances between edges, base, and adjacent studs.
6. Stud size.
7. Concrete placement.
8. Concrete testing.
9. Sampling materials.
10. Welder qualifications.
11. Weld-joint preparation.
12. Weld procedure and process.
13. Tolerances.

5.0 CONDITIONS OF USE:

The Tru-Weld Steel Headed Stud Anchors described in this report comply with the code noted in Section 1.0, subject to the following conditions:

5.1 Installation must comply with this report and the manufacturer's instructions. In the event of a conflict between this report and the manufacturer's installation instructions, this report governs.

5.2 Nominal shear strength of steel headed stud anchors must be designed in accordance with references given in Section 4.1 of this report.

5.3 Designs of composite beams and concrete slabs on formed steel deck panels must comply with the provisions of Section 4.1 of this report.

5.4 Design of composite construction consisting of concrete slabs on formed steel deck panels connected to steel beams is limited to steel headed stud anchors 3/4 inch (19 mm) or less in diameter.

5.5 The base metals (steel beams) to which the steel headed stud anchors are welded are limited to steels listed in AWS D1.1-2015, Table 3.1, Groups I and II.

5.6 Special inspection must take place in accordance with Section 4.3 of this report.

5.7 Tru-Weld Steel Headed Stud Anchors are manufactured under an approved quality control program by ICC-ES.

6.0 EVIDENCE SUBMITTED

6.1 Reports of tests specified in AWS D1.1-2015 and the manufacturer's product data.

6.2 Quality documentation.

7.0 IDENTIFICATION

7.1 The ICC-ES mark of conformity, electronic labeling, or the evaluation report number (ICC-ES ESR-XXXX) along with the name, registered trademark, or registered logo of the report holder [and/or listee] must be included in the product label.

7.2 In addition, the label on the packages of Tru-Weld Steel Headed Stud Anchors displays the name and address of Tru-Weld Division, TFP Corporation; product name, size, and heat number; and the ICC-ES evaluation report number (ESR-2577). In addition, the steel headed stud anchors are identified by the Tru-Weld logo (see Figure 1) inscribed in an indented circle on the head of each connector.

7.3 The report holder's contact information is the following:

TRU-WELD DIVISION, TFP CORPORATION
460 LAKE ROAD
MEDINA, OHIO 44256
(330) 725-7741
www.tfpcorp.com

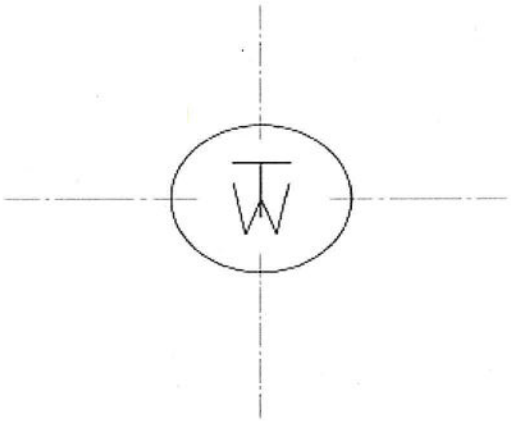

FIGURE 1—IDENTIFICATION OF A TRU WELD STEEL HEADED STUD ANCHOR

DIVISION: 03 00 00—CONCRETE
Section: 03 15 00—Concrete Accessories

REPORT HOLDER:

TRU-WELD DIVISION, TFP CORPORATION

EVALUATION SUBJECT:

TRU-WELD STEEL HEADED STUD ANCHORS

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that Tru-Weld Steel Headed Stud Anchors, described in ICC-ES evaluation report ESR-2577, have also been evaluated for compliance with the codes noted below as adopted by the Los Angeles Department of Building and Safety (LADBS).

Applicable code edition:

- 2020 *City of Los Angeles Building Code (LABC)*

2.0 CONCLUSIONS

The Tru-Weld Steel Headed Stud Anchors, described in Sections 2.0 through 7.0 of the evaluation report ESR-2577, comply with the LABC Chapter 22, and are subject to the conditions of use described in this supplement.

3.0 CONDITIONS OF USE

The Tru-Weld Steel Headed Stud Anchors described in this evaluation report supplement must comply with all of the following conditions:

- All applicable sections in the evaluation report ESR-2577.
- The design, installation, conditions of use and identification of the Tru-Weld Steel Headed Stud Anchors are in accordance with the 2018 *International Building Code®* (IBC) provisions noted in the evaluation report ESR-2577.
- The design, installation and inspection are in accordance with additional requirements of LABC Chapters 16 and 17, as applicable.

This supplement expires concurrently with the evaluation report, reissued October 2024.

ICC-ES Evaluation Report

ESR-2577 CA Supplement

Reissued October 2024

This report is subject to renewal October 2026.

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DIVISION: 03 00 00—CONCRETE
Section: 03 15 00—Concrete Accessories

REPORT HOLDER:

TRU-WELD DIVISION, TFP CORPORATION

EVALUATION SUBJECT:

TRU-WELD STEEL HEADED STUD ANCHORS

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that Tru-Weld Steel Headed Stud Anchors, described in ICC-ES evaluation report ESR-2577, have also been evaluated for compliance with the code noted below.

Applicable code edition:

- 2022 *California Building Code (CBC)*

For evaluation of applicable chapters adopted by the California Office of Statewide Health Planning and Development (OSHPD) AKA: California Department of Health Care Access and Information (HCAI) and the Division of State Architect (DSA), see Sections 2.1.1 and 2.1.2 below.

2.0 CONCLUSIONS

2.1 CBC:

The Tru-Weld Steel Headed Stud Anchors, described in Sections 2.0 through 7.0 of the evaluation report ESR-2577, comply with CBC Chapter 22, provided the design and installation are in accordance with the 2021 *International Building Code®* (IBC) provisions noted in the evaluation report and the additional requirements of CBC Chapters 16, 17 and 22, as applicable.

2.1.1 OSHPD:

The Tru-Weld Steel Headed Stud Anchors, described in Sections 2.0 through 7.0 of the evaluation report ESR-2577, comply with CBC Chapter 22 and amendments [OSHPD 1R, 2, 3 & 5], and Chapter 22A [OSHPD 1 & 4], provided the design and installation are in accordance with the 2021 *International Building Code®* (IBC) provisions noted in the evaluation report and the additional requirements in Sections 2.1.1.1 and 2.1.1.2 of this supplement:

2.1.1.1 Verification Test Requirements: The installation verification tests shall be in accordance with Section 2213.2 [OSHPD 1R, 2 & 5] or 2213A.2 [OSHPD 1 & 4] of the CBC, as applicable.

2.1.1.2 Special Inspection Requirements: The special inspections shall be in accordance with Section 1705.2.5 [OSHPD 1R, 2 & 5] or 1705A.2.5 [OSHPD 1 & 4] of the CBC, as applicable.

2.1.2 DSA:

The Tru-Weld Steel Headed Stud Anchors, described in Sections 2.0 through 7.0 of the evaluation report ESR-2577, comply with CBC amended Chapter 22 [DSA-SS/CC], and Chapter 22A [DSA-SS], provided the design and installation are in accordance with the 2021 *International Building Code®* (IBC) provisions noted in the evaluation report and the additional requirements in Sections 2.1.2.1 and 2.1.2.2 of this supplement:

2.1.2.1 Verification Test Requirements: The installation verification tests shall be in accordance with Section 2212.6.2 [DSA-SS/CC] or 2213A.2 [DSA-SS] of the CBC, as applicable.

2.1.2.1 Special Inspection Requirements: The special inspections shall be in accordance with Section 1705A.2.5 [DSA-SS and DSA-SS/CC] of the CBC.

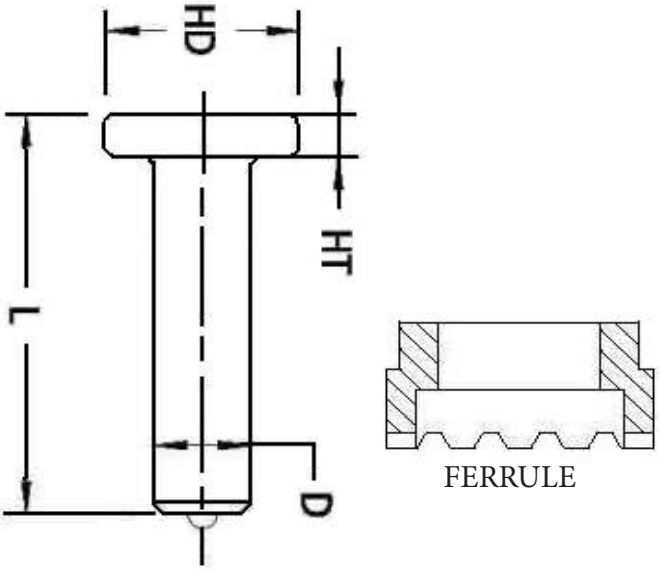
This supplement expires concurrently with the evaluation report, reissued October 2024.

STUD WELDING PRODUCTS, INC.

your number one stud

HEADED CONCRETE ANCHOR STUD

DIAMETERS AVAILABLE: 3/4", 7/8", 1"



FERRULE

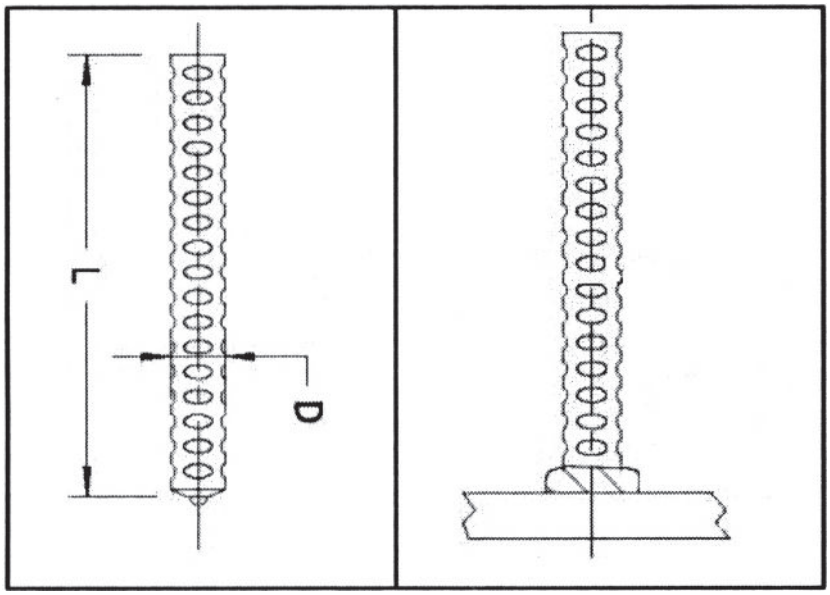
MECHANICAL PROPERTY REQUIREMENTS		
	TYPE A	TYPE B
TENSILE STRENGTH	61,000 psi min	65,000 psi min
YIELD STRENGTH	49,000 psi min	51,000 psi min
ELONGATION (%IN 2")	17%min	20% min
ELONGATION (% IN 5X DIA)	14% min	15% min
REDUCTION OF AREA	50% min	50% min

TYPE A studs are general purpose studs
TYPE B studs are headed, bent, or of other configuration that are used as essential component in composite beam design.

STUD SPECIFICATIONS	
MATERIAL	LOW CARBON STEEL (1010-1020) ASTM A29 ASTM A108
STUD DIAMETER (D)	34", 78", 1"
STUD LENGTH	Varies from2" - 18-3/16"
STUD HEAD DIAMETER (HD)	3/4" = 1-1/4" 7/8" = 1-3/8" 1" = 1-5/8"
STUD HEAD THICKNESS (HT)	3/4" = 3/8" 7/8" = 3/8" 1" = 1/2"

DEFORMED BAR ANCHORS

DIAMETERS AVAILABLE: 3/8", 1/2", 5/8", 3/4"

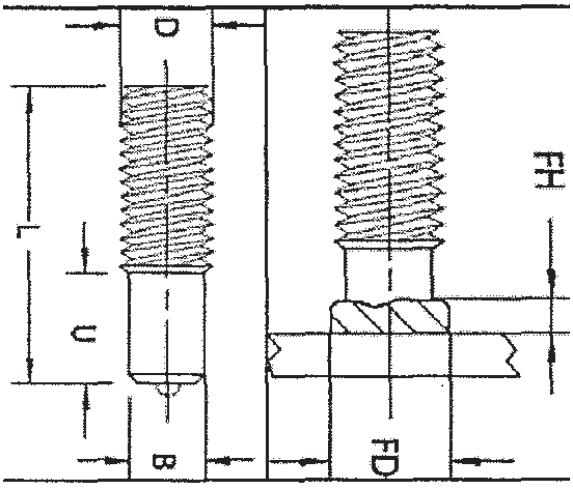


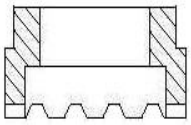
MECHANICAL PROPERTY REQUIREMENTS	
	TYPE C
TENSILE STRENGTH	80,000 psi min (552 MPa)
YIELD STRENGTH (0.5% OFFSET)	70,000 psi min (485 MPa)

Type C studs are cold-worked deformed steel bars manufactured in accordance with specification ASTM A1064-18 (ASTM A496 has been withdrawn) having a minimal diameter equivalent to the diameter of a plain wire having the same weight per foot as the deformed wire. ASTM A1064-18(ASTM A496 has been withdrawn) specifies a maximum diameter of 0.628 in. (16 mm) maximum. Any bar supplied above that diameter must have the same physical characteristics regarding deformations as required by ASTM A1064-18 (ASTM A496 has been withdrawn)

PARTIAL THREADED STUDS

DIAMETERS AVAILABLE:1/4', 5/16", 3/8", 1/2", 5/8", 3/4", 7/8", 1"





LOW CARBON MECHANICAL PROPERTY REQUIRMENTS	
TENSTILSTRENGTH	61,000 psi min
YEILD STRENGTH	49,000 psi min
ELONGATION (%IN 2')	17% min
ELONGATION (% IN 5X DIA)	14% min
REDUCTION OF AREA	50% min

Procedures for Stud Welding 3/4" Shear Connectors Through Metal Deck

In order to achieve good results in any shear connector weld-thru deck job, it is imperative the following procedures be Followed.

1. Top Flange of Beam
The top flange of all beams to be welded should be free of paint, excessive rust or mill scale, dirt, moisture and all other Foreign materials these materials are contaminants to any welding process, especially stud welding due to the short Duration of the weld cycle. Do not stud weld to galvanized beams.

2. Fit-Up Between Beam Flange and Deck
When installing the material deck and tacking it in place, it is important that the decking be held as tight as possible to the Beam flange. A gam between the deck and flange will cause an inconsistent arch length and also allow the molten metal to escape the weld area, thereby resulting in inconsistent welds.

3. Deck Placement
Whenever flashing is used as a closure on spanderal beams, care should be taken to butt the deck to the flashing as Opposed to lapping. In most cases, the flashing is made of hot dipped galvanized sheet without controls on the amount of zinc. Most deck manufactures limit the deck coating to 1-¼ oz/sq ft. The welding of studs should be avoided at Lapped points due to the lack of proper nesting, resulting in gaps between the sheets. If it is necessary to weld in a Lapped area, it is recommended that a portion of the top sheet be removed, especially in the case of hot dipped galvanized Decking.

4. Deck Conditions Prior to Welding
Prior to welding, the deck surface should be Swept to remove all dirt, sand, or other foreign materials that has accumulated during construction. The deck must be dry. Under wet conditions, it may be necessary to heat or blow dry each stud location in order to remove moisture from between the deck and beam flange.

5. Structural Ground
It is always recommended that the welding ground be attached to a spot on a beam that has been ground clean. Poor or inadequate ground connections can result in loss of weld current and therefore, effect the weld quality.

6. Power Requirement for Operating Power Source
Consult either the manufacture or manual for the recommended fusing, primary wire size and primary wire length for the power source to be used. Inadequate primary power or incorrect wire size ore length can contribute to a reduction in weld current when some rectifier type power sources are used. Inadequate power or fusing can also hamper the starting and output current for a motor generator.

7. Welding Current
It is essential to have the correct weld current for this application, normally between 1,500 and 1,900 amps. When excessive cable lengths are used the result will be a reduction in weld currents. This can contribute to weld inconsistency or even weld failure. Always use 4/0 cables in the welding circuit. The amount of cable totally depends upon the power source being used. It may be necessary in some cases to parallel cable when long runs are needed.

8. Weld Settings

Exact weld settings cannot be given because no two jobs are the same. Actual settings will depend upon sob site conditions, deck thickness,s type of deck used,a mount of galvanizing and ambient temperature. Listed below are approximate settings, minimum and maximum. Most jobs will fall within these settings. Light gauge, lightly galvanized or phosphotized/painted black iron deck of single thickness should fall close to the minimum setting. Double thickness and heavily galvanized deck will be close to the maximum setting.

Weld Time	0.8 to 1.6 sec (48-96 cycles)
Weld Current	1,500-1,900 amps DC
Lift	1/8”
Plunge	¼ “- 1/2”
Polarity	Straight
ferrule	WTD

9. Gun Set-Up

Gun lift should be measured with a stud and ferrule in place and the gun compressed to weld, but on an isolated piece of material, such as piece of wood. The controlled plunge jet (brass screw) should be removed from the stud gun.

Accessories:

Legs B-0109-18 18” Long
Footpiece B-0021 Foot Extension Assembly
Grip B-0060-1
Chuck Ch-075

Weld current should be check by using a time current monitor. It should be monitored periodically due to cable heating which can cause a reduction in weld current. **NOTE: The above settings are for 3/4” diameter shear connectors only.**

10. Testing of Weld Studs

All pre-productions and productions testing should be done in accordance with American Welding Society Structural Welding Code D1.1. (in severe cold weather conditions, the testing should be done before the stud is cold but yet not while it is hot, preferable when the stud is worm to the touch. Reference: Weld Test Procedure Report.

11. Visual Inspection

Visual inspection should be allowed and should show a full 360 degree weld fillet, not necessarily the same fillet height around the circumference of the stud. And undercut at the weld interface will be cause for rejection. If the fillet is something less than 360 degree,s the stud should be tested by hammer blow or bending with a pipe to 15 degrees. The bending method is preferred. If a failure does not occur, the weld should be considered good and left in the bent condition. If the weld fails, the studs should be replaced.

8. General Information

A) Keep ferrules dry; wet ferruled cannot be used

B) Keep stud dry; rusty studs cause welding problems and premature chuck failure

C) Do not weld when the temperature of the bas material is below 0 degrees F per AWS D1.1, Section 7.5.4 " Welding shall not be done when the base metal temperature is below 0 degrees F)-18 Degrees C) or when the surface is wet and exposed to falling rain or snow. When the temperature of the base metal is below 32 degrees F (0 degrees C) one additional stud in each 100 studs welded shall be tested by methods specified in 7.7.1.3 and 7.7.1.4, except that the angle of testing shall be approximately 15 degrees. This is in addition to the first two studs tested for each start of a new production period or change in set-up.

D) Do not attempt to weld through more than 2 thickness of galvanized decking

E) Don not weld where water is present on the weld surface.

F) Do not weld through dirt, sand or other foreign material.

G) Beam flanges should be free of paint, rust and any other foreign material.

H) If welding thru deck, deck must be tight against beam flange.

I) Weld studs in the center of beam flange whenever possible to eliminate arc blow.

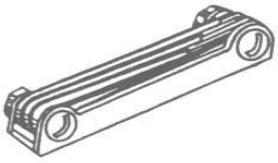
J) Hod gun perpendicular to base material.

K) Test weld set-up at the start of each day and every half hour.

L) Do Not weld to galvanized beams.

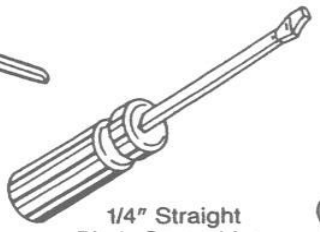
Gun Set-up

TOOLS REQUIRED

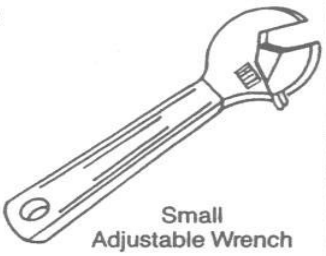


Allen Wrench Set

Chuck Ejector Key



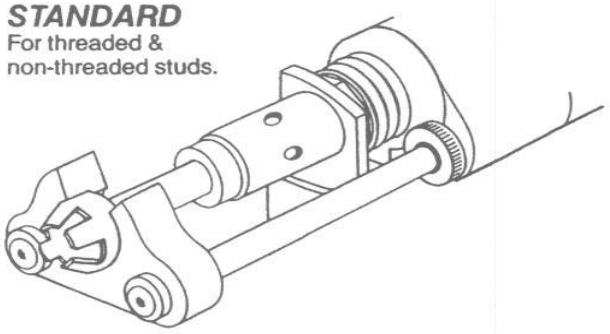
1/4" Straight Blade Screwdriver



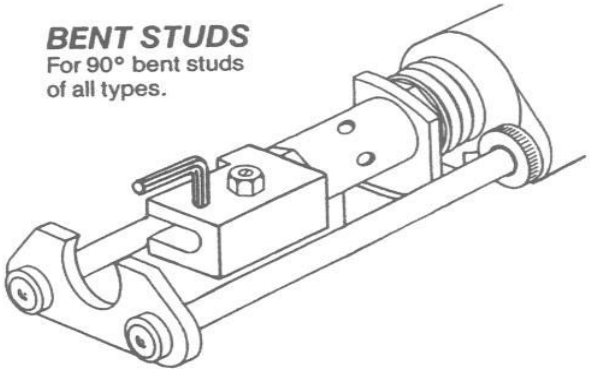
Small Adjustable Wrench

SET-UPS

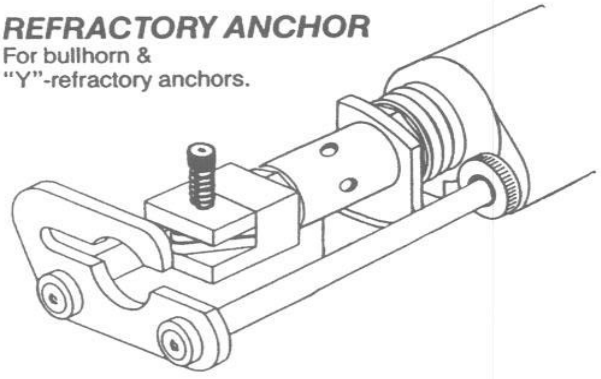
STANDARD
For threaded & non-threaded studs.



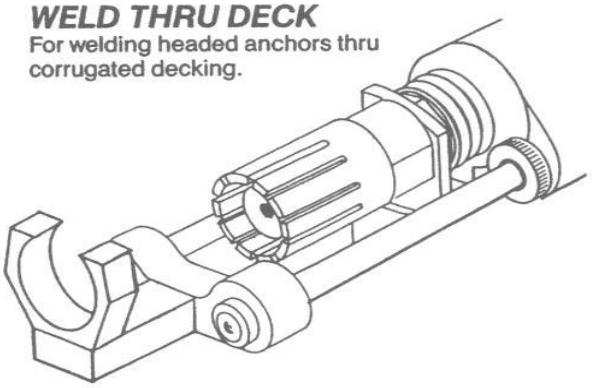
BENT STUDS
For 90° bent studs of all types.



REFRACTORY ANCHOR
For bullhorn & "Y"-refractory anchors.



WELD THRU DECK
For welding headed anchors thru corrugated decking.



STUD WELDING PRODUCTS 1-800-252-1919

STUD WELDING PRODUCTS

1-800-252-1919

APPROXIMATE STUD WELD SETTING FOR MILD AND STAINLESS STEEL STUDS TO MILD AND STAINLESS BASE MATERIALS.

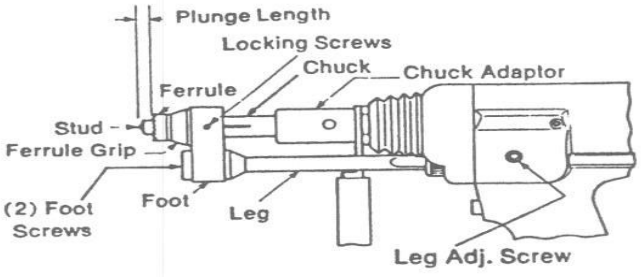
DIA-METER	DOWN HAND WELD AMPS	SEC. TIME	CYCLE TIME	OVERHEAD WELD AMP	SEC. TIME	CYCLE TIME	VERTICAL WELD AMPS	SEC. TIME	CYCLE TIME	INSIDE ANGLE WELD AMPS	SEC. TIME	CYCLE TIME
1/4	450	.18	11	450	.17	11	450	.17	11	490	.19	12
5/16	500	.25	15	500	.25	15	500	.25	15			
3/8	550	.33	20	550	.33	20	600	.33	20	660	39	23
7/16	675	.41	25	675	.41	25	750	.33	20			
1/2	800	.55	33	800	.55	33	875	.47	28	900	.52	32
5/8	1200	.66	40	1200	.66	40	1275	.60	36	1320	.66	40
3/4	1500	.85	53	1500	.85	53	1700	.73	50	1750	.80	55
7/8	1700	1.05	63	1700	1.05	63	NOT RECOMMENDED			NOT RECOMMENDED		
1	1900	1.42	85	2050	1.20	72	NOT RECOMMENDED			NOT RECOMMENDED		

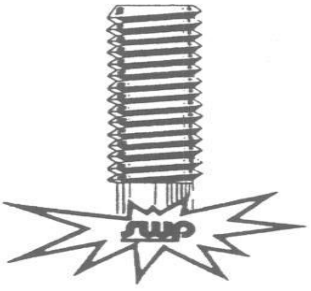
STUD STICK OUT PAST FERRULE (PLUNGE LENGTH)

DOWNHAND ,OVERHEAD,VERTICAL DIAMETER	SICKOUT	INSIDE ANGLE DIAMETER	STICKOUT
1/4-1/2	1/8	1/4-1/2	1/4
5/8-3/4	3/16	5/8-3/4	1/4-3/8
7/8-1	1/4		

SETTINGS ARE APPROXIMATE AND WILL VARY SLIGHTLY DUE TO SIZE AND LENGTH OF WELD CABLE, INCOMING POWER SUPPLIED AND CONDITION OR THICKNESS OF BASE MATERIAL.

THRU-DECK 3/4
AMPS = 1600 - 2000
TIME = .08 -1.4
STICK OUT = 3/8 - 1/2
SETTING WILL VARY DEPENDING ON GAUGE OF DECK AND AMOUNT OF CABLE





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