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ICC-ES Evaluation Report

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ESR-2577

Reissued 10/2018
This report is subject to renewal 10/2020.

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

ICC ES | ICC ES PMG | ICC ES LISTED

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ICC-ES Evaluation Report

ESR-2577

Reissued October 2018

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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 EVALUATION SCOPE

Compliance with the following codes:

- 2015 *International Building Code®* (2015 IBC)
- 2012 *International Building Code®* (2012 IBC)
- 2009 *International Building Code®* (2009 IBC)
- 2006 *International Building Code®* (2006 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 D1.1-2010 and Sections A3.6 and I8 of the 2010 AISC Specification for Structural Steel Buildings (ANSI/AISC 360-10). 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 (14th edition), in accordance with AISC 360. Alternatively, the nominal shear strength of one steel headed stud anchor may be calculated in accordance with AISC 360-10 Section I8.2 for the 2015 and 2012 IBC (Sections I2.1g and I3.2d(3) of AISC 360-05 for the 2009 and 2006 IBC). The design of composite members with shear connectors must comply with the provisions of Sections 2203, 2204, 2205 and 2206 of the 2015 and 2012 IBC (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 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 2015 and 2012 IBC Sections 1705.2 and 1705.3, Tables 1705.2.2 and 1705.3, and Chapter N of AISC 360-10 (2009 and 2006 IBC Sections 1704.3 and 1704.4 and IBC Tables 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 D1.1-2010, Table 3.1, Groups I and II.

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

6.0 EVIDENCE SUBMITTED

6.1 Reports of tests specified in AWS D1.1-2010 and the manufacturer's product data.

6.2 Quality documentation.

7.0 IDENTIFICATION

7.1 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.

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

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

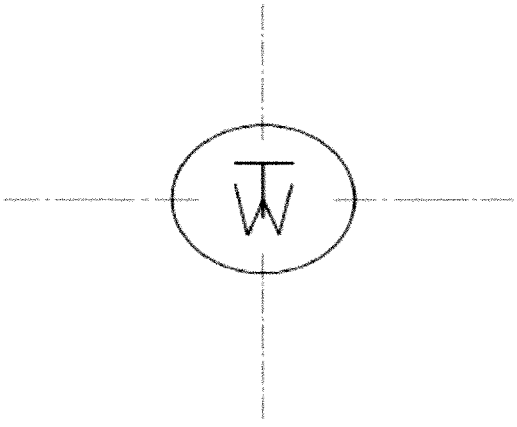

FIGURE 1—IDENTIFICATION OF A TRU WELD STEEL HEADED STUD ANCHOR

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ESR-2823

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Reissued 12/2018

This report is subject to renewal 12/2020.

DIVISION: 03 00 00—CONCRETE

SECTION: 03 15 00—CONCRETE ACCESSORIES

REPORT HOLDER:

TRU-WELD DIVISION, TFP CORPORATION

EVALUATION SUBJECT:

DEFORMED BAR ANCHORS

ICC-ES PMG LISTED

"2014 Recipient of Prestigious Western States Seismic Policy Council (WSSPC) Award in Excellence"

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ICC-ES Evaluation Report

ESR-2823

Reissued December 2018

This report is subject to renewal December 2020.

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

REPORT HOLDER:

TRU-WELD DIVISION, TFP CORPORATION

EVALUATION SUBJECT:

DEFORMED BAR ANCHORS

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2015 *International Building Code®* (2015 IBC)
- 2012 *International Building Code®* (2012 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

The deformed bar anchors are used to resist static tension and shear loads in uncracked normal-weight concrete. The anchors are alternatives to cast-in-place anchors described in Section 1901.3 of the 2015 IBC and Section 1908 of the 2012 IBC. Deformed bar anchors may be used for concrete connections such as shear keys, bearing plates, base plates, beam-to-column connections, panel connections, angles, and column-to-column connections.

3.0 DESCRIPTION

3.1 General:

The deformed bar anchor studs are produced from deformed steel wire. Embedded lengths range from 15 to 96 inches (381 to 2438 mm), with diameters including $^3/_8$ inch, $^1/_2$ inch, $^5/_8$ inch and $^3/_4$ inch (9.5, 12.7, 15.9 and 19.1 mm).

3.2 Material:

3.2.1 Deformed Bar Anchors: The anchors are produced from deformed steel wire conforming to ASTM A496 and the requirements for Type C studs in accordance with American Welding Society D1.1-2010 (AWS D1.1). The minimum yield strength is 70,000 psi (485 MPa) and the minimum tensile strength is 80,000 psi (550 MPa).

3.2.2 Steel Member: Steel plate material for deformed bar anchor stud welding must comply with one of the prequalified Group 1 or Group 2 base metals specified in Table 3.1 of AWS D1.1. The length and width of the steel plate may vary depending on specification requirements. The minimum thickness must be 0.5 times the deformed bar anchor diameter.

4.0 DESIGN AND INSTALLATION

4.1 Design:

The allowable tension and shear load values shown in Tables 1 and 2, respectively, are to be used in allowable stress design as indicated in IBC Section 1908. Allowable loads for deformed bar anchors subjected to combined shear and tension forces can be determined by the following equation:

$$\left(\frac{P_s}{P_t}\right)+\left(\frac{V_s}{V_t}\right)\le 1$$

where:

P_s = Applied service tension load.

P_t = Table 1 allowable tension load.

V_s = Applied service tension load.

V_t = Table 1 allowable shear load.

4.2 Installation:

The anchor locations must comply with the approved plans and specifications. The anchors must be welded to the plates in accordance with Chapter 7 of AWS D1.1, using a stud welding gun. Typical installation parameters are noted in Table 1. The anchors must be clean and free of oil, dirt and excess rust. The anchors must be placed in position before the concrete is cast, to fully embed the anchors, and must be adequately secured to prevent displacement during concrete placement. The welding of the deformed bar anchor to the steel plate must be done prior to concrete placement.

4.3 Special Inspection:

Continuous special inspection is required during installation in accordance with Sections 1705.2 and 1705.3 of the IBC. Inspectors' responsibilities include verifying:

1. Identification of anchors, and cleanliness
2. Concrete mix design
3. Quality of concrete
4. Anchor tying and bracing
5. Anchor clearances between edges, base and adjacent anchors

6. Anchor 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 deformed bar anchors described in this report comply with, or are suitable alternatives to what is specified in, the code listed in Section 1.0 of this report, subject to the following conditions:

5.1 Anchors are produced and installed in accordance with this report and the manufacturer's instructions. In case of conflict between this report and the installation instructions, this report governs. Allowable loads must be as set forth in this report.

5.2 Calculations and details justifying that the applied loads comply with this report must be submitted to the code official for approval. The calculations and details must be prepared by a registered design professional when required by the statutes of the jurisdiction in which the project is to be constructed.

5.3 The use of the anchors subjected to fatigue, shock, or vibratory loads, such as those generated by reciprocating engines and crane loads, and moving loads due to vehicles, is outside the scope of this report.

5.4 The use of the anchors is limited to installation in uncracked concrete. The use of the anchors in cracked concrete applications is outside the scope of this report. Cracking occurs when $f_t > f_r$ due to service loads or deformations.

5.5 Use of the anchors to resist seismic loads is beyond the scope of this report.

5.6 When using the basic load combinations in accordance with IBC Section 1605.3.1.1, allowable tension and shear loads shown in Table 1 of this report are not permitted to be increased for wind loading.

5.7 When using the alternative basic load combinations in accordance with IBC Section 1605.3.2, that include wind loads, allowable tension and shear loads shown in Table 1 of this report are not permitted to be increased.

5.8 Anchors are limited to nonfire-resistive construction unless appropriate data, demonstrating acceptable anchor performance in fire-resistive situations, is submitted to the code official for approval.

5.9 Special inspection is provided according to Section 4.3.

5.10 When used in exterior moist locations, the deformed bar anchors must be shown to comply with ACI 318-11, Section 7.7.6 (as referenced by IBC Section 1901.2) to the satisfaction of the code official.

6.0 EVIDENCE SUBMITTED

6.1 Data in accordance with applicable sections of the ICC-ES Acceptance Criteria for Fiber-reinforced Composite Connectors Anchored in Concrete (AC320), dated October 2015, including ASTM E488 tests and analysis.

6.2 Data in accordance with applicable sections of the ICC-ES Acceptance Criteria for Mechanical Anchors in Concrete Elements (AC193), dated October 2015.

6.3 Data in accordance with AWS D1.1-2010 and ASTM A496.

6.4 Quality documentation.

7.0 IDENTIFICATION

7.1 Deformed Bar Anchor Studs manufactured by Tru-Weld Division, TFP Corporation, are shipped in containers bearing the name of the report holder (Tru-Weld Division, TFP Corporation), the deformed bar diameter and length, the evaluation report number (ESR-2823), and the heat number, part number, lot number and number of pieces enclosed. In addition, each deformed bar is marked with the Tru-Weld logo (see Figure 1).

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

TRU-WELD DIVISION, TFP CORPORATION
460 LAKE ROAD
MEDINA, OHIO 44258
(330) 725-7741
http://www.tfpcorp.com
mdeeks@tfpcorp.com

TABLE 1—ALLOWABLE TENSION LOADS AND INSTALLATION DIMENSIONS FOR DEFORMED BAR ANCHORS IN NORMAL-WEIGHT CONCRETE

PARAMETER	VALUE			
Anchor diameter (inch)	3/8	1/2	5/8	3/4
Minimum embedment (inches)	15	21	26	30
Minimum anchor spacing (inches)	3	3 1/4	3 5/8	3
Minimum edge distance (inches)	2 1/8	4	4	4
Allowable tension load (lbf)	2210[1]	3415[1]	6135[2]	7915[2]

For **SI:** 1 inch = 25.4 mm; 1lbf = 48.93 N; 1 psi = 6.89 kPa.

[1]Allowable tension values based on deformed bar anchor cast in concrete having a minimum compressive strength of 3000 psi [minimum of 24 MPa is required under ADIBC Appendix L, Section 5.1.1].
[2]Allowable tension values based on deformed bar anchor cast in concrete having a minimum compressive strength of 5000 psi.

TABLE 2—ALLOWABLE SHEAR LOADS AND INSTALLATION DIMENSIONS FOR DEFORMED BAR ANCHORS IN NORMAL WEIGHT CONCRETE[1,2]

PARAMETER	VALUE			
Anchor diameter (inch)	3/8	1/2	5/8	3/4
Minimum embedment (inches)	15	21	26	30
Minimum anchor spacing (inches)	9	12 3/4	9 1/2	17 3/4
Minimum edge distance (inches)	4	6 1/4	1 3/4	8
Allowable shear load (lbf)	755[1]	605[1]	645[2]	830[2]

For **SI:** 1 inch = 25.4 mm; 1lbf = 48.93 N; 1 psi = 6.89 kPa.

[1]Allowable shear values based on deformed bar anchor cast in concrete having a minimum compressive strength of 3000 psi [minimum of 24 MPa is required under ADIBC Appendix L, Section 5.1.1].
[2]Allowable shear values based on deformed bar anchor cast in concrete having a minimum compressive strength of 5000 psi.

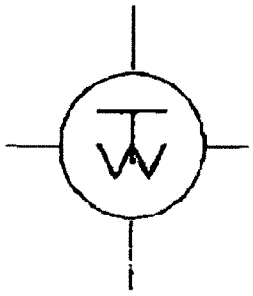

FIGURE 1—TRU-WELD LOGO

CITY OF LOS ANGELES
CALIFORNIA

TFP Corporation
Tru-Weld Division
460 Lake Road
Medina, OH 44256

Attn: Steven A, Kern
(330) 725-7741

RESEARCH REPORT: RR 24330
(CSI #03153)

BASED UPON ICC EVALUATION SERVICE
REPORT NO. ESR-2577

REEVALUATION DUE
DATE August 1, 2018
Issued Date: October 1, 2016
Code: 2014 LABC

GENERAL APPROVAL – Renewal/Clerical Modification - Tru-Weld Stud Connectors of 1/2", 5/8", 3/4", 7/8" and 1" diameter.

DETAILS

The above assemblies and/or products are approved when in compliance with the description, use, identification and findings of Report No. ESR-2577 reissued October, 2014 of the ICC Evaluation Service, Incorporated. The report in its entirety is attached and made part of this general approval.

The parts of Report No. ESR-2577 which are excluded on the attached copy have been removed by the City of Los Angeles Building and Safety Department as not being included in this approval.

Tru-Weld Stud Connectors of 1/2", 5/8", 3/4", 7/8" and 1" diameters are approved for use as shear connectors for steel-concrete composite beams.

The approval is subject to the following requirements:

1. Each container of studs is required to be certified in writing by the manufacturer certifying that the studs in the container complies with the requirements of Section 2204.1 of the 2014 City of Los Angeles Building Code. The manufacturing shall furnish the certificate to the Department inspector.

2. Installation of the studs and design of steel-concrete composite beams using the studs shall be in accordance with Department Information Bulletin P/BC 2014-46. Concrete shall have a minimum of $F'_c = 3000$ psi.

3. Installation of the studs shall also comply to the following:

   a. The studs shall be installed only by operators qualified in accordance with AWS D1.1 Section 7.7.4 and who are thoroughly familiar with the installation equipment. A copy of the operating instructions for the equipment shall be at the job site at all times.

   b. Any stud with weld showing less than a 360 degree flash around the perimeter of the stud shall be replaced or repaired in accordance with AWS D1.1 Section 7.7.3 and 7.7.5. Before welding a new stud where a defective one has been removed, the area shall be ground smooth and flush, or in the case of a pullout of the base metal, the pocket shall be filled with weld metal using the shielded metal arc process with low hydrogen welding electrodes and then ground off flush.

   c. Where the studs are to be welded through steel deck units, the following limitations apply:

Stud Size	Max. Material Thickness	Max. Amount Galvanized (oz./sq ft.)
¾"	Single No. 20 ga	.80
¾	Double No. 20 ga	.81
¾"	Single No. 16 ga.	1.15
¾"	Double No. 18 ga.	1.16

   The amount of galvanizing shall be determined in accordance with ASTM A525. Lesser thickness deck material may be used in each case.

4. The approval includes Tru-Weld threaded studs with the same geometry, flux, arc shield, and of the same diameters (and diameters smaller by not less than 1/8-inch) specified in the attached ICC-ES evaluation report. Allowable loads shall be determined in accordance with the Los Angeles Building Code. Special Inspection as specified in Section 4.3 of the attached ICC-ES evaluation report shall be provided.

DISCUSSION

The clerical modification is to update the report to 2014 LABC.

This report is in compliance with the 2014 City of Los Angeles Building code.

The approval is based on Manufacturer's Stud Base Qualification Tests specified in AWS D1.1.

This general approval will remain effective provided the Evaluation Report is maintained valid and unrevised with the issuing organization. Any revisions to the report must be submitted to this Department, with appropriate fee, for review in order to continue the approval of the revised report.

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.

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.

QUAN NGHIEM, Chief
Engineering Research Section
201 N. Figueroa St., Room 880
Los Angeles, CA 90012
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Fax- 213-202-9943

QN
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R008/01/16
TLB1600200 and 295
2204

Attachments: ICC ES Evaluation Report No. ESR-2577 (2 Pages)

CITY OF LOS ANGELES
CALIFORNIA

DEPARTMENT OF
BUILDING AND SAFETY
201 NORTH FIGUEROA STREET
LOS ANGELES, CA 90012

RAYMOND S. CHAN, C.E., S.E.
GENERAL MANAGER

FRANK BUSH
EXECUTIVE OFFICER

Tru-Weld Division.
TFP Corp.
460 Lake Road
Medina, Ohio 44256

Attn: Steven A. Kern
(330) 725-7741 x202

RESEARCH REPORT: RR 25887
(CSI # 03 15 00)

BASED UPON ICC EVALUATION SERVICE
REPORT NO. ESR-2823

REEVALUATION DUE
DATE: January 1, 2018
Issued Date: February 1, 2016
Code: 2014 LABC

GENERAL APPROVAL – Reevaluation- Deformed Bar Anchors

DETAILS

The above assemblies and/or products are approved when in compliance with the use, description, design, installation, conditions of use, and identification of ICC Evaluation Services Report No. ESR-2823, reissued December 1, 2014, revised June 2015, of the ICC Evaluation Service, Incorporated. The report in its entirety is attached and made part of this general approval.

The approval is subject to the following conditions:

1. Use of the anchors is limited to installation in uncracked concrete and non-seismic applications

2. Use of the anchors subjected to fatigue, shock, or vibratory loads is not covered under this approval

3. Allowable tension and shear loads, for 3/8" and 1/2" anchors, given on Table 1 and Table 2, respectively, of the ICC-ES Evaluation Report ESR 2823 are valid when the anchors are installed in normal weight concrete having a minimum concrete strength of 3,000 psi

4. Allowable tension and shear loads, for 5 /8" and 3/4" anchors, given on Table 1 and Table 2, respectively, of the ICC-ES Evaluation Report ESR 2823 are valid when the anchors are installed in normal weight concrete having a minimum concrete strength of 5,000 psi

5. Continuous inspection by Deputy Inspectors shall be provided during installations of the Deformed Bar Anchors in accordance with Section 1704 of the 2014 Los Angeles City Building Code.

6. Deformed Bar Anchors locations shall be fully detailed on the plans and approved by Plan check engineer. The calculations for Deformed Bar Anchors shall be prepared by a Civil or Structural Engineer registered in the State of California.

7. The fabricator, in processing steel for the Deformed Bar Anchors through his works, shall maintain identity of the material and shall maintain suitable procedures and records attesting that the specified grade has been furnished in conformity with the applicable ASTM Standard. The ASTM or other specification designation shall be included near the erection mark on each shipping assembly or important construction component over any shop coat of paint prior to shipment from the fabricator's plant. The fabricator's identification mark system shall be established and on record prior to fabrication.

8. Steel which is not readily identifiable as to grade from marking and test records shall be tested to determine conformity to such standard. The fabricator shall, when requested, furnish an affidavit of compliance with such standard. Test data shall be provided upon request.

9. Except as specified herein, installation of the Deformed Bar Anchors shall be in accordance with the manufacturer's specifications. A copy of the specifications shall be provided at the job site and be made available to all Deputy Inspectors on the job.

DISCUSSION

This report is in compliance with the 2014 Los Angeles City Building Code.

The approval is based on data in accordance with applicable sections of the ICC ES Acceptance Criteria for Fiber-Reinforced Composite Connectors Anchored in Concrete (AC 320), dated July 2014, including ASTM E 488 tests and analysis; Mechanical Anchors in Concrete Elements (AC 193), dated June 2012 (Editorially revised April 2015); and AWS D1.1-2010 and ASTM A 496.

This general approval will remain effective provided the Evaluation Report is maintained valid and unrevised with the issuing organization. Any revision to the report must be submitted to this Department for review with appropriate fee to continue the approval of the revised report.

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.

QUAN NGHIEM, Chief
Engineering Research Section
201 N. Figueroa St., Room 880
Los Angeles, CA 90012
Phone- 213-202-9812
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R01/01/16
TLB1500276/8
5A1/1911

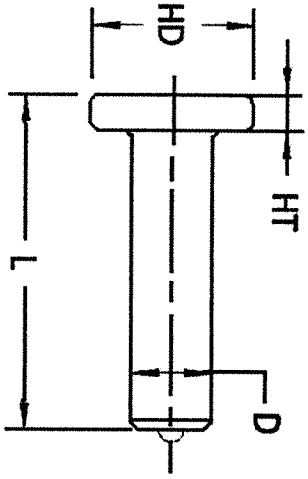
Attachment: ICC ES Report No. ESR-2823 (3 Pages)

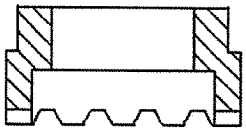
STUD WELDING PRODUCTS, INC

your number one stud

HEADED CONCRETE ANCHOR STUD

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





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)	3/4", 7/8", 1"
STUD LENGTH	Varies from 2" -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"

Visit our website at www.StudWeldProd.com or email Info@StudWeldProd.com

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Downey CA 90242
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Fax: 562-862-3022

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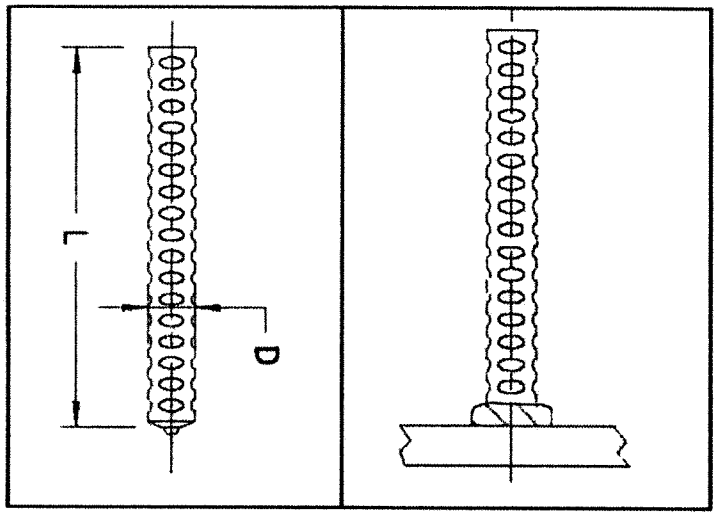
STUD WELDING PRODUCTS, INC

your number one stud

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/A496 having nominal diameter equivalent to the diameter of a plain wire having the same weight per foot as the deformed wire. ASTM A1064/A496 specifies a maximum diameter of 0.628 in. (16mm). Any bar supplied above that diameter must have the same physical characteristics regarding deformations as required by ASTM A1064/A496.

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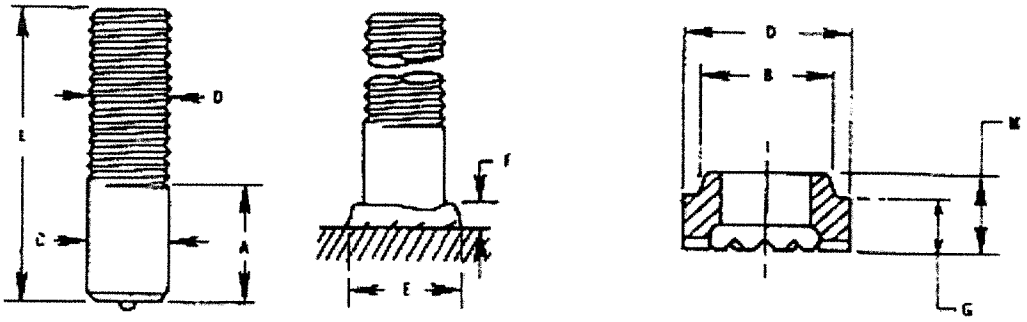
PARTIAL THREADED STUDS

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



LOW CARBON MECHANICAL PROPERTY REQUIREMENTS	
TENSIL STRENGTH	61,000 psi min.
YIELD STRENGTH	49,000 psi min.
ELONGATION (% IN 2")	17% MIN
ELONGATION (% IN 5X DIA)	14% MIN
REDUCTION OF AREA	50% MIN

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STUD WELDING PRODUCTS, INC.

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.

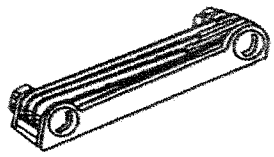
J) Hod gun perpendicular to base material.

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

L) Do Not weld to galvanized beams.

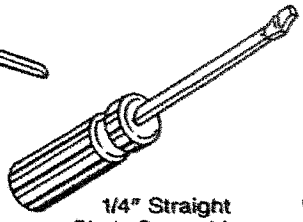
Gun Set-up

TOOLS REQUIRED

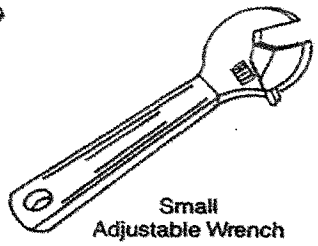


Allen Wrench Set

Chuck Ejector Key



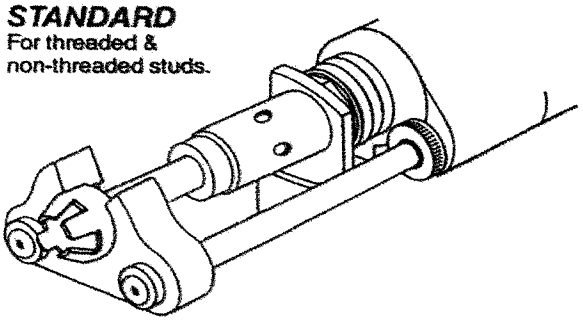
1/4" Straight Blade Screwdriver



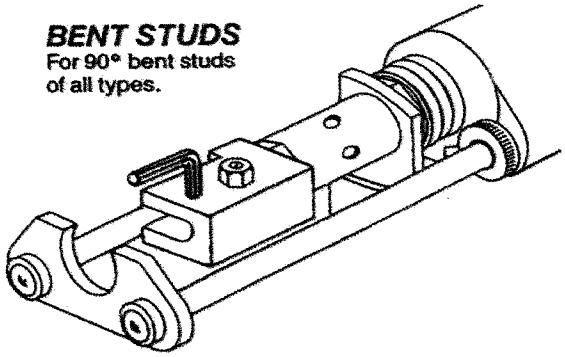
Small Adjustable Wrench

SET-UPS

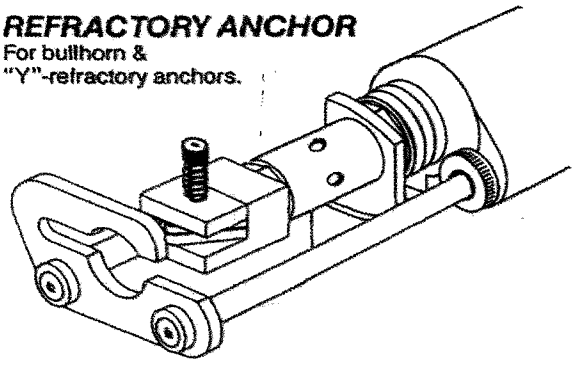
STANDARD
For threaded & non-threaded studs.



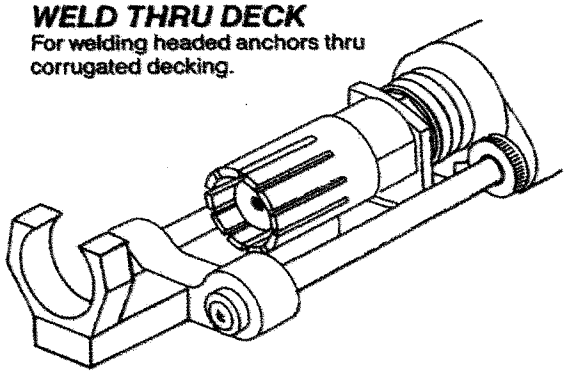
BENT STUDS
For 90° bent studs of all types.



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



WELD THRU DECK
For welding headed anchors thru corrugated decking.



STUD WELDING PRODUCTS 1-800-252-1919

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1-800-252-1919

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

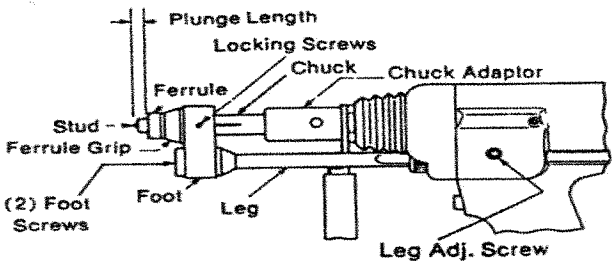
DIA-METER	DOWN HAND WELD AMPS	SEC. TIME	CYCLE TIME	OVERHEAD WELD AMP	SEC. TIME	CYCLE TIME	VERTICAL WELD AMPS	SEC. TIME	CYCLE TIME	INSIDE ANGLE WELD AMPS	SEC. TIME	CYCLE TIME
1/4	450	.18	11	450	.17	11	450	.17	11	490	.19	12
5/16	500	.25	15	500	.25	15	500	.25	15			
3/8	550	.33	20	550	.33	20	600	.33	20	660	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		

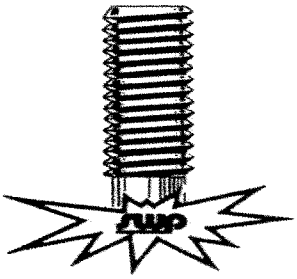
STUD STICK OUT PAST FERRULE (PLUNGE LENGTH)

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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