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

BASED UPON ICC EVALUATION SERVICE  
REPORT NO. ESR-2823

REEVALUATION DUE

DATE: January 1, 2022

Issued Date: March 1, 2020

Code: 2017 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 2018, of the ICC Evaluation Service, LLC. 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

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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 2017 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 2017 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 October 2015, 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.

Tru-Weld Division, TFP Corporation  
RE: Deformed Bar Anchors

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

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

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



# 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  $\frac{3}{8}$  inch,  $\frac{1}{2}$  inch,  $\frac{5}{8}$  inch and  $\frac{3}{4}$  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:

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

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](mailto:mdeeks@tfpcorp.com)

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

PARAMETER	VALUE			
Anchor diameter (inch)	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$
Minimum embedment (inches)	15	21	26	30
Minimum anchor spacing (inches)	3	$3\frac{1}{4}$	$3\frac{5}{8}$	3
Minimum edge distance (inches)	$2\frac{1}{8}$	4	4	4
Allowable tension load (lbf)	2210 <sup>1</sup>	3415 <sup>1</sup>	6135 <sup>2</sup>	7915 <sup>2</sup>

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

<sup>1</sup>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].

<sup>2</sup>Allowable tension values based on deformed bar anchor cast in concrete having a minimum compressive strength of 5000 psi.

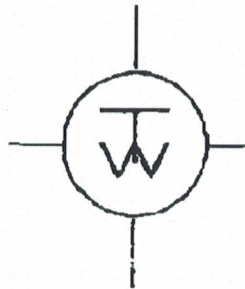
**TABLE 2—ALLOWABLE SHEAR LOADS AND INSTALLATION DIMENSIONS  
FOR DEFORMED BAR ANCHORS IN NORMAL WEIGHT CONCRETE<sup>1,2</sup>**

PARAMETER	VALUE			
Anchor diameter (inch)	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$
Minimum embedment (inches)	15	21	26	30
Minimum anchor spacing (inches)	9	$12\frac{3}{4}$	$9\frac{1}{2}$	$17\frac{3}{4}$
Minimum edge distance (inches)	4	$6\frac{1}{4}$	$1\frac{3}{4}$	8
Allowable shear load (lbf)	755 <sup>1</sup>	605 <sup>1</sup>	645 <sup>2</sup>	830 <sup>2</sup>

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

<sup>1</sup>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].

<sup>2</sup>Allowable shear values based on deformed bar anchor cast in concrete having a minimum compressive strength of 5000 psi.

**FIGURE 1—TRU-WELD LOGO**