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# ICC-ES Report

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**ESR-1163**

Reissued 12/2016
This report is subject to renewal 12/2017.

**DIVISION: 03 00 00—CONCRETE**
**SECTION: 03 21 00—REINFORCING STEEL**

**REPORT HOLDER:**

## SAS STRESSTEEL INC.

**100 NEW DUTCH LANE**
**FAIRFIELD, NEW JERSEY 07004**

**EVALUATION SUBJECT:**

## SAS STRESSTEEL GRADE 97 THREAD BAR STEEL REINFORCING BARS AND COUPLERS

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# ICC-ES Evaluation Report

**ESR-1163**

*Reissued December 2016*
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**DIVISION: 03 00 00—CONCRETE**
**Section: 03 21 00—Reinforcing Steel**

**REPORT HOLDER:**

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**EVALUATION SUBJECT:**

**SAS STRESSTEEL GRADE 97 THREAD BAR STEEL REINFORCING BARS AND COUPLERS**

## 1.0 EVALUATION SCOPE

**Compliance with the following code:**

- 2015, 2012 and 2009 *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

The SAS Stressteel Grade 97 Thread Bars are deformed steel reinforcing bars used as longitudinal reinforcement in concrete structural members, such as foundations, columns and walls. The bars are an alternative to deformed reinforcement complying with ACI 318. The SAS Stressteel couplers are used as tension and compression mechanical splices of the Grade 97 Thread Bar reinforcing bars. Refer to Figure 1 for a typical installed assembly.

## 3.0 DESCRIPTION

### 3.1 SAS Stressteel Grade 97 Thread Bars:

SAS Stressteel Grade 97 Thread Bars are steel reinforcing bars with continuous protrusions in a threaded orientation to permit connections with the SAS Stressteel couplers. The right-hand oriented protrusions also permit bar interlock with cast concrete. Available bar sizes and properties are provided in Table 1 of this report. Galvanizing, epoxy coatings, or other coatings are not permitted within the scope of application in this report.

### 3.2 SAS Stressteel TR 3003 Couplers:

The SAS Stressteel couplers are used as mechanical splices for the SAS Stressteel Grade 97 Thread Bars. The couplers are formed from carbon steel and comply with the descriptions and product material specifications in the approved quality documentation. Produced in a hollow cylindrical configuration, the couplers receive bars at each end through internal threads in a pattern matching the bars. As an option, each coupler may have two set screws, one near each end. Coupler dimensions and available bar sizes are described in Table 1 of this report. The couplers comply as Type 1 mechanical splices in accordance with ACI 318.

## 4.0 DESIGN AND INSTALLATION

### 4.1 Design: SAS Stressteel Grade 97 Thread Bars:

The bars must be designed as longitudinal reinforcement for normal-weight concrete in accordance with ACI 318, as amended in Chapter 19 of the IBC, using Table 1. The specified yield strength for design, $f_y$, used with ACI 318 calculations is 97,000 psi (670 MPa) in lieu of the limits set forth in ACI 318. . The following limitations also apply:

1. The high-strength bars shall not be used in beams or slabs.
2. The bars must be used in buildings assigned to Seismic Design Category A or B only.
3. Welding of the bars is prohibited.
4. The bending of the bars is limited to No's. 6, 7, 8, 9, 10, 11, and 14 only. Bending procedures must comply with ACI 318.
5. The specified concrete compressive strength must range from 6,000 psi (41.3 MPa) to 12,000 psi (82.7 MPa).

### 4.2 Installation:

**4.2.1 SAS Stressteel Grade 97 Thread Bars:** The bars and couplers must be located in the structure as set forth in the approved plans and specifications. Reinforcement details, including surface conditions, bar placement, clear spacing, offsets, spirals and ties, must comply with the applicable provisions in ACI 318.. Bar development and mechanical splices must comply with ACI 318, except as modified by Section 4.2.2 of this report.

**4.2.2 SAS Stressteel Couplers:** The thread bar ends must be machined flat to within 1.5 degrees of a right angle to the axis of the bars. Each bar end must be marked one-

half the coupler length plus $^1/_2$ inch (12.7 mm) from the ends. The coupler must be threaded onto the end of one reinforcing bar. The second bar must be positioned to full end bearing with the first bar, and the coupler is reverse-threaded until the marks on each bar are exposed. The resulting splice must be tightened with a calibrated torque wrench applied to the second reinforcing bar until the torque in Table 2 of this report is attained. After torquing, the optional screws in the coupler, when provided, must be set.

### 4.3 Special Inspection:

Special inspection is required in accordance with Section 1705 of the 2015 IBC and 2012 IBC (Section 1704 of the 2009 IBC). The special inspector must, at a minimum, verify the following:

1. The high-strength steel reinforcing bars are of the type, grade and size specified, and are labeled in accordance with this report.
2. The coupler identification is in accordance with this report.
3. The installation of high-strength steel reinforcing bars and couplers, including field preparation and assembly of components, field preparation of reinforcing bar ends, bar surface conditions, bending, locations, spacing, protection (cover), embedment, and installation torque, complies with the IBC, ACI 318, approved construction documents and this report.

## 5.0 CONDITIONS OF USE

The SAS Stressteel Grade 97 Thread Bars and Couplers described in this report comply with, or are suitable alternatives to what is specified in, the code indicated in Section 1.0 of this report, subject to the following conditions:

**5.1** The bars and couplers must be installed in accordance with the applicable code, the manufacturer's instructions and this report. In case of conflict between the manufacturer's published instructions and this report, the most restrictive governs.

**5.2** Mechanical splice locations must comply with applicable code requirements and be noted on plans approved by the code official.

**5.3** Prior to installation, calculations and details demonstrating compliance with this report must be submitted to the building official. The calculations and details must be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.

**5.4** Special inspection of the bars and couplers must be provided in accordance with Section 4.3 of this report.

**5.5** For couplers, minimum concrete cover must be in accordance with the IBC, and must be measured to the outer surface of the coupler.

## 6.0 EVIDENCE SUBMITTED

**6.1** Data in accordance with the ICC-ES Acceptance Criteria for Threaded High-strength Steel Bars for Concrete Reinforcement (AC237), dated October 2016.

**6.2** Data in accordance with the ICC-ES Acceptance Criteria for Mechanical Connectors for Steel Bar Reinforcement (AC133), dated October 2015.

## 7.0 IDENTIFICATION

Each bar is identified by the thread pattern and the mark "SAS 670." The bar bundles are identified by tags bearing the manufacturer's name (Stahlwerk Annahuette), the report holder's name (SAS Stressteel, Inc.), the grade, the number of bars in the bundle, the nominal bar diameter, bar length, heat number and the evaluation report number (ESR-1163). The couplers are identified by imprinted identification codes shown as "SAS TR XXXX-YY ZZZ" with the product name, report holder's name (SAS Stressteel, Inc.), and the evaluation report number (ESR-1163) on packaging.

**TABLE 1—SAS STRESSTEEL GRADE 97 THREAD BAR DIMENSIONS AND PROPERTIES**

| BAR NUMBER | NOMINAL DIAMETER (in) | MINIMUM SPECIFIED YIELD STRENGTH (psi)[1] | MINIMUM SPECIFIED TENSILE STRENGTH (psi) | CROSS SECTIONAL AREA ($in^2$) | MINIMUM ELONGATION (percent)[2] | WEIGHT (lb/ft) |
|---|---|---|---|---|---|---|
| 6 | $^3/_4$ | 97,000 | 116,000 | 0.39 | 7 | 1.34 |
| 7 | $^7/_8$ | 97,000 | 116,000 | 0.59 | 7 | 2.00 |
| 8 | 1 | 97,000 | 116,000 | 0.76 | 7 | 2.59 |
| 9 | $1^1/_8$ | 97,000 | 116,000 | 0.95 | 6 | 3.25 |
| 10 | $1^1/_4$ | 97,000 | 116,000 | 1.10 | 6 | 3.73 |
| 11 | $1^3/_8$ | 97,000 | 116,000 | 1.49 | 6 | 5.07 |
| 14 | $1^3/_4$ | 97,000 | 116,000 | 2.25 | 6 | 7.66 |
| 18 | $2^1/_4$ | 97,000 | 116,000 | 4.03 | 6 | 13.7 |
| 20 | $2^1/_2$ | 97,000 | 116,000 | 4.91 | 6 | 16.7 |

For **SI:** 1 inch = 25.4 mm, 1 psi = 0.006894757 MPa, 1 lb/ft = 14.6 N/m.

[1]The minimum specified yield strength may be used for tension or compression reinforcement and is taken as the stress corresponding to a strain of 0.35 percent.
[2]Elongation measured along an 8-inch length.

**TABLE 2—SAS STRESSTEEL GRADE 97 TR 3003 COUPLER DIMENSIONS AND TORQUE REQUIREMENTS**

| BAR NUMBER SIZE | OUTSIDE DIAMETER (in) | LENGTH (in) | TORQUE (ft-lb) |
|---|---|---|---|
| 7 | 1.57 | 3.94 | 120 |
| 8 | 1.77 | 4.72 | 140 |
| 9 | 1.97 | 5.51 | 160 |
| 10 | 2.17 | 5.91 | 180 |
| 11 | 2.36 | 6.69 | 200 |
| 14 | 3.15 | 7.87 | 230 |
| 18 | 4.02 | 9.84 | 260 |
| 20 | 4.25 | 10.24 | 300 |

For **SI:** 1 inch = 25.4 mm, 1 ft-lb = 1.356 N-m.

**TABLE 3—APPLICABLE SECTIONS OF ACI 318 UNDER EACH EDITION OF THE IBC**

| ACI 318-14 (2015 IBC) | ACI 318-11 (2012 IBC) | ACI 318-08 (2009 IBC) |
|---|---|---|
| 20.2.1.1 – 20.2.1.3 | 3.5.3.2 | 3.5.3.2 |
| 20.2.2.4 and Table 20.2.2.4a | 9.4 | 9.4 |
| | 11.4.2 | 11.4.2 |
| | 11.5.3.4 | 11.5.3.4 |
| | 11.6.6 | 11.6.6 |
| 20.6 | 7.7 | 7.7 |
| 25.4.2 | 12.2 | 12.2 |
| 25.5.7 | 12.14.3<br>12.15.4<br>12.15.6<br>12.16.3 | 12.14.3<br>12.15.4<br>12.15.6<br>12.16.3 |

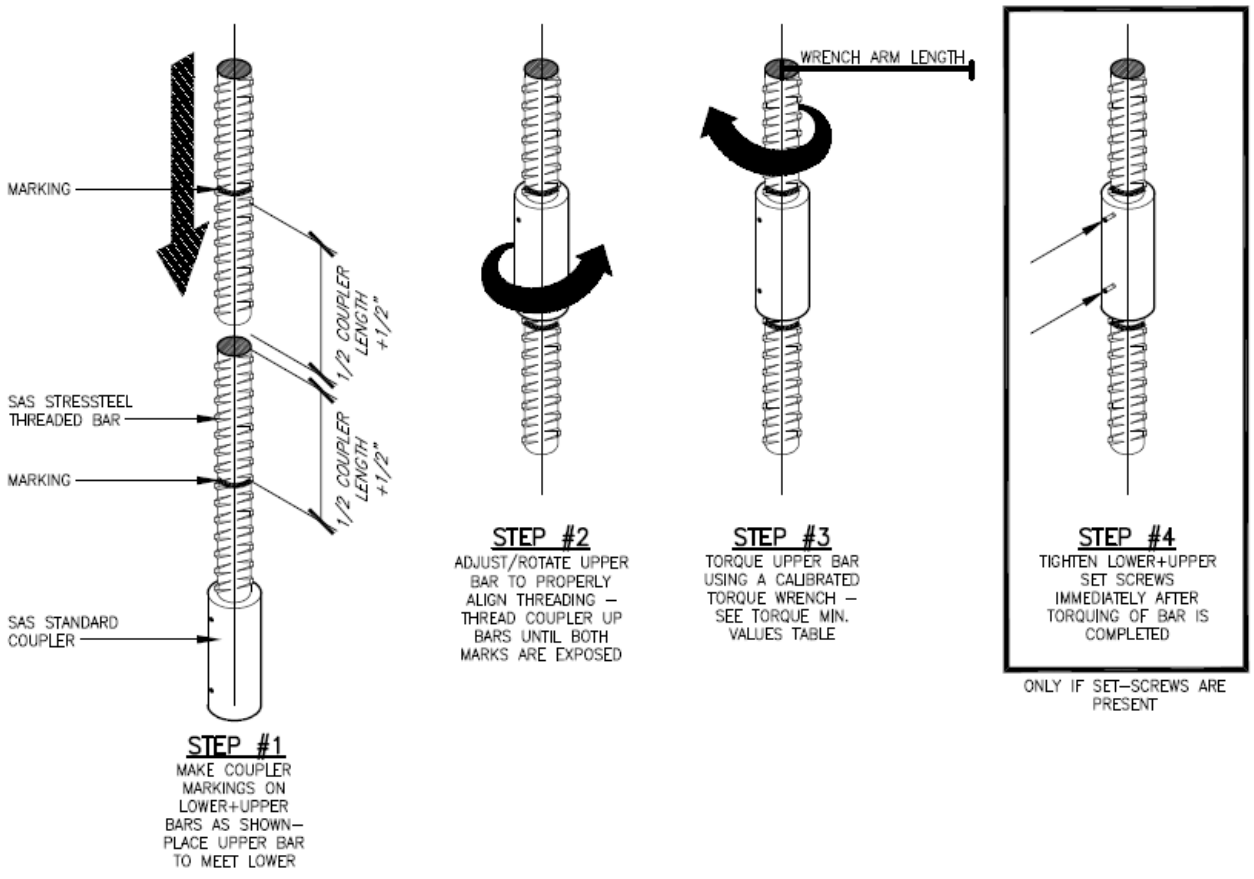


**FIGURE 1—ASSEMBLED SAS STRESSTEEL GRADE 97 THREAD BAR AND COUPLER**