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Attn: Christine McCain  
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RESEARCH REPORT: RR 25815  
(CSI # 03 21 00)

BASED UPON IAPMO EVALUATION  
REPORT NO. ER-0177

REEVALUATION DUE

DATE: March 01, 2020

Issued date: March 01, 2018

Code: 2017 LABC

**GENERAL APPROVAL** – Reevaluation - HRC 555 Series Headed Reinforcing Bars and 670 Series T-Head (HEADLOCK™) Headed Ends of Concrete Reinforcement

**DETAILS**

The above assemblies and/or products are approved when in compliance with the use, description, design, installation, conditions of approval, and identification of Evaluation Report No. ER- 0177, originally issued November 24, 2010, revised November 30, 2017 of the IAPMO-UES Evaluation Services, Incorporated. The report, in its entirety, is attached and made part of this general approval.

The parts of the UES Report, ER-0177, which are stricken out on the attached copy have been removed by the Los Angeles Building Department as not being included in this approval.

**The approval is subject to the following conditions:**

1. Continuous inspection by Deputy Inspectors shall be provided during installations of the headed steel reinforcing bars.

RR 25815  
Page 1 of 3

Headed Reinforcement Corporation

RE: HRC 555 Headed Reinforcing Bars and 670 T-Head Headed Ends of Concrete Reinforcement

2. The fabricator, in processing steel for the headed steel reinforcing bars 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. 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.
3. Except as specified herein, installation of the headed steel reinforcing bars 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.
4. Headed steel reinforcing bars locations shall be fully detailed on the plans and approved by the Structural Plan Check Section. The calculations for headed steel reinforcing bars shall be prepared by a Civil or Structural Engineer registered in the State of California.
5. Requirements for concrete cover, space between bars or sleeves, and minimum anchor length shall be applicable to headed steel reinforcing bars.
6. Headed steel reinforcing bars shall not be used on compression reinforcement and epoxy and other coated bars.
7. The design of anchorage to concrete shall comply with section 4.1.2 of attached IAPMO-UES Evaluation Report, ER-0177.
7. For use as reinforcement resisting earthquake-induced flexural and axial forces in frame members and boundary elements of special structural walls, the reinforcing bar component of the headed bars shall comply with Section 20.2 of ACI 318-14.
8. The use of headed and mechanical anchored deformed reinforcement for lap splices is outside the scope of this approval.
9. Special inspections shall be as required per Sections 1704.4 and 1705.3 of the 2017 Los Angeles Building Code. The special inspector is responsible for verifying identification of the headed deformed reinforcing bars, grade and size of reinforcing bars, installation of reinforcing bar splices to the headed deformed reinforcing bars, as well as placement of the headed bars.

Headed Reinforcement Corporation  
RE: HRC 555 Headed Reinforcing Bars and 670 T-Head Headed Ends of Concrete  
Reinforcement

## **DISCUSSION**

The reevaluation is to recognize HRC 670 Series T-Head (HEADLOCK™) Headed Ends and IAPMO U.E.S. ER-0177 as part of this general approval.

This report is in compliance with the 2017 City of Los Angeles Building Code.

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.

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BKR  
RR 25815  
TLB1800036  
R02/19/2018  
ACI 318-14, Section 25.4

Attachment: IAPMO-UES Report No. ER-0177 (7 Pages)



Originally Issued: 11/24/2010

Revised: 11/30/2017

Valid Through: 11/30/2018

## EVALUATION SUBJECT: HRC® 555 SERIES (XTENDER®) AND HRC® 670 SERIES T-HEAD (HEADLOCK™) HEADED ENDS OF CONCRETE REINFORCEMENT

**REPORT HOLDER:**  
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CSI DIVISION: 03 – CONCRETE  
CSI Section: 03210 – Reinforcing Steel

### 1.0 SCOPE OF EVALUATION

#### 1.1 Compliance to the following codes & regulations:

- 2015, 2012, 2009 and 2006 International Building Code® (IBC)
- \* • 2015, 2012, 2009 and 2006 International Residential Code® (IRC)

#### 1.2 Evaluated in accordance with:

- IAPMO ES EC 006-2016

#### 1.3 Properties assessed:

- Structural

### 2.0 PRODUCT USE

The HRC® 555 Series headed reinforcing bars are Class HA headed deformed bars in tension. The HRC® 670 is an attachable head for deformed reinforcing bars in tension. Both products comply with Section 25.4.4 of ACI 318-14 and Section 12.6 of ACI 318-11 for use as mechanical anchorage in normal weight concrete as an alternative to standard hooks or development lengths of straight deformed reinforcing bars.

### 3.0 PRODUCT DESCRIPTION

#### 3.1 Product information:

**3.1.1 HRC® 555:** The HRC® 555 Series are Class HA headed deformed bars complying with the requirements of ASTM A970. HRC® 555 Series are integrally factory-forged where the heads are produced by deforming the bar end(s) in a hot forging process. The headed reinforcing steel bars are available in No.4 (13 mm) through No. 11 (35 mm) sizes. The net head bearing area,  $A_{brg}$ , of the HRC 555 headed devices exceed four (4) times the nominal cross-sectional area,  $A_b$ , of the reinforcing bar. The dimensions of the HRC® 555 headed reinforcing bars are shown in Table 2 and Figure 1 of this report.

**3.1.2 HRC® 670:** The HRC® 670 Series is a field installed T-Head used mainly for retrofits and field repairs. The HRC® 670 Series, when connected to the specified reinforcing bars, comply as Class HA in accordance with ASTM A970. HRC® 670 uses a wedged grip system with a spring and tension bolt that is installed on the end of a torch cut, sheared or saw cut rebar. The product is available in sizes for use with No. 5 (16 mm) through No.11 (35 mm) reinforcing bar. The T-Head has a net bearing surface area of at least  $4A_b$  as specified in ACI 318. The dimensions of the HRC® 670 headed reinforcing bars are shown in Table 4 and Figure 2 of this report.

### 3.2 Material information

**3.2.1 Headed Ends:** HRC® 555 headed ends are manufactured from ASTM A615 or ASTM A706 steel reinforcing bars listed in Table 1 of this report. HRC® 670 T-Heads are manufactured from AISI 1141 and AISI 8620 steels, which are used for the housing and springs; and include a rubber O-ring.

### 4.0 DESIGN AND INSTALLATION

#### 4.1 Design

**4.1.1 Development Length:** Development lengths shall be determined in accordance with Section 25.4.4 of ACI 318-14 or Section 12.6 of ACI 318-11 or -08 for bar sizes No.4 through No.11, Grade 60 only. When utilizing the equation in Section 25.4.4.2 of ACI 318-14 or Section 12.6.2 of ACI 318-11 and ACI 318-08 to calculate development length of deformed bars in tension, the design professional shall verify the proposed heads conform with ASTM A970-13a, the maximum compressive design strength of the concrete used in the calculation is 6,000 psi (41.4 MPa), and those conditions referenced in Section 25.4.4.1 of ACI 318-14 or Section 12.6.1 of ACI 318-11 have been achieved.

The development length,  $l_{dt}$ , shall be measured from the critical section as shown in Figure R25.4.4.2a of ACI 318-14 or Figure R12.6(a) of ACI-318-11.

Development lengths specified for the development and splices of reinforcement shall not be subject to a strength reduction factor in accordance with Section 9.3.3 of ACI 318.

**Termination of Headed Bars:** When designed in accordance with Section 25.4.4 of ACI 318-14 or Section 12.6.2 of ACI 318-11, longitudinal headed deformed bars extending from a beam or a slab terminating at a support member, such as a column shall extend through the joint to the far face of the confined supporting member in accordance with Figure R25.4.4.2b of ACI 318-14 or Figure R12.6 (b) of ACI 318-11.

The product described in this Uniform Evaluation Service (UES) Report has been evaluated as an alternative material, design or method of construction in order to satisfy and comply with the intent of the provision of the code, as noted in this report, and for at least equivalence to that prescribed in the code in quality, strength, effectiveness, fire resistance, durability and safety, as applicable, in accordance with IBC Section 104.11. This document shall only be reproduced in its entirety.

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\* Deleted by City of Los Angeles





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Splices of reinforcement to headed deformed reinforcing bars in tension shall comply with Sections 25.5.1 and 25.5.2 of ACI 318-14 or Sections 12.14 and 12.15 of ACI 318-11.

**4.1.2 Design of Anchorage to Concrete:** For compliance with Section 1909 of the IBC and Chapter 17 of ACI 318-14 or ACI 318-11 and -08 Appendix D as anchorage, additional data needs to be prepared by a registered design professional and approved by the building official to justify how the headed bars are substantiated in accordance with Section 17.1.3 of ACI 318-14 or Section D.2.3 of ACI 318-11 or comply with ANSI/ASME B1.1, B18.2.1 and B18.2.6.

ASTM A970 Class A requires the head-to-bar connection to exceed the minimum specified tensile strength of the reinforcing steel. ASTM A970-13a Class B requires the head-to-bar connection to exceed the minimum tensile strength and minimum elongation of the reinforcing steel. ASTM A970 Class HA requires the head dimensions conform to requirements in Annex A1.

**4.2 Installation:** The HRC<sup>®</sup> 555 and HRC<sup>®</sup> 670 shall be installed in accordance with HRC's fabrication instructions, applicable code sections of ACI 318 and this evaluation report. In the event of a conflict, the more restrictive governs. The HRC<sup>®</sup> 555 (forged) head is fixed and requires no field assembly.

The HRC<sup>®</sup> 670 shall be installed by cutting the reinforcing bar in a square cut to the desired length and cleaning the debris and concrete off of the bar end. Any burrs or other imperfections shall be grinded down. Next, the HRC<sup>®</sup> 670 shall be pushed onto the bar with the bolt removed. The bar end shall be against the bolt hole. Finally, the bolt shall be reinserted and torqued until the bolt head breaks off.

**4.3 Special Inspection:** Special inspection of the headed bars shall be provided at the jobsite as required by Sections 1704.4 and 1705.3 of the 2015 and 2012 IBC (Section 1704.4 and 1709.1 of the 2009 and 2006 IBC), as applicable. The special inspector is responsible for verifying identification of the headed deformed reinforcing bars, grade and size of reinforcing bars, installation of reinforcing bar splices to the headed deformed reinforcing bars, as well as placement of the headed bars.

## 5.0 LIMITATIONS

The HRC<sup>®</sup> 555 and HRC<sup>®</sup> 670 headed bars described in this report comply with, or are suitable alternatives to what is specified in, the codes listed in Section 1.0 of this report, subject to the following limitations:

**5.1.** The headed bars shall be installed in accordance with the applicable code, manufacturer's installation instructions, and this report. In the event of a conflict, the more restrictive governs.

**5.2** Anchorage system calculations and installation details shall be designed in conformance with the IBC and ACI 318 by the registered design professional and approved by the building official.

**5.3** Special inspections shall be provided in accordance with Section 4.3 of this report.

**5.4** Minimum concrete cover shall be in accordance with Section 25.4.4.1 of ACI 318-14 or Section 7.7 of ACI 318-11 and shall be measured from the outer surface of the HRC<sup>®</sup> 555 or HRC<sup>®</sup> 670 reinforcing bar's head, as applicable.

**5.5** Fabricators and fabrication facilities shall be qualified and approved by HRC.

**5.6** For structures regulated by ACI 318 Chapter 18 as required by the 2015 IBC as required by Section 1905.1 or Chapter 21, as required by 2012 IBC Section 1905.1 (2009 IBC Section 1908.1), where the HRC<sup>®</sup> 555 or HRC<sup>®</sup> 670 headed reinforcing bars resisting earthquake-induced flexure, axial force, or both, in special moment frames, special structural walls, and all components of special structural walls including coupling beams and wall piers, mill certificates shall be submitted to the code official as evidence that the steel reinforcing bars comply with Section 20.2.2.5 of ACI 318-14 or Section 21.1.5.2 of ACI 318-11 and -08.

**5.7** The use of headed and mechanical anchored deformed reinforcement for lap splices is outside the scope of this criteria.

## 6.0 SUBSTANTIATING DATA

Data in accordance with IAPMO UES Evaluation Criteria for Headed and Mechanically Anchored Deformed Reinforcement Bars in Tension (EC 006-2016), approved April 2014. Test results are from laboratories in compliance with ISO/IEC 17025.

## 7.0 IDENTIFICATION

HRC 555 headed ends are packaged with a label bearing the manufacturer's name (Headed Reinforcement Corporation), address, model and size., HRC<sup>®</sup> 670 T-Heads shall include a marking etched on the top of the product that includes the manufacturer's name, address and the size of the reinforcing bar the head is to be used with. Both products shall include the unique heat code identification the letter "H" to indicate that the product has been produced to the ASTM A970 Annex A1 specification one of the IAPMO Uniform ES Mark of Conformities shown below and the Uniform Evaluation Report Number (ER-177). Products prepared by officially licensed fabricators, may have additional unique identifiers that corresponds to the fabricator.



# EVALUATION REPORT

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® or ™  
IAPMO UES ER #177

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For additional information about this evaluation report please visit  
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**TABLE 1: HRC 555 Mechanical Properties with Various Reinforcing Bar Grades.**

ASTM Compliant	Reinforcement material (ASTM)	Bar Size	Min. Tensile Strength	Minimum Elongation in 8"	Failure of head or head-bar connection
A970-06	A706	#4-#6 #7-#11	80,000 psi	14% 12%	NO
A970-13a Class A	A706 Gr. 60 A615 Gr. 60 A615 Gr. 75 <sup>2</sup>	#4-#11 <sup>1</sup> #4-#11 <sup>1</sup> #8-#11 <sup>1</sup>	80,000 psi 90,000 psi 100,000 psi	N/A	YES
A970-13a Class B	A706 Gr. 60 A615 Gr. 60	#4-#11 #4-#11	80,000 psi 90,000 psi	12-14% 7-9%	YES

For SI: 1 inch = 25.4 mm, 1 psi = 6.895 kPa

<sup>1</sup> Note: For compliance with the IBC and ACI 318-14 Chapter 17 or ACI 318-11 Appendix D as anchorage, additional data needs to be prepared by the registered design professional and approved by the building official to justify how the headed bars are substantiated in accordance with Section 17.1.3 of ACI 318-14 or Section D.2.3 of ACI 318-11 or comply with ANSI/ASME B1.1, B18.2.1 and B18.2.6.

<sup>2</sup> Note: In accordance with Section 25.4.4.1 of ACI 318-14 or Section 12.6 of ACI 318-11, the use of Grade 75 bars for development length is outside the scope of this report.

**TABLE 2 – DIMENSIONS OF HRC 555 HEADED REINFORCING BARS**

Dimensions	Bar size	#4	#5	#6	#7	#8	#9	#10	#11
Rebar	Diameter [in]	0.50 0	0.625	0.750	0.875	1.000	1.128	1.270	1.410
	Area [sq.in.]	0.20	0.31	0.44	0.60	0.79	1.00	1.27	1.56
Head	*T <sub>min</sub> [in]	0.25	0.31	0.38	0.44	0.50	0.56	0.64	0.70
	D [in]	1.14	1.42	1.69	1.97	2.25	2.56	2.87	3.19
	A <sub>brg</sub> [sq.in]	0.82	1.27	1.80	2.45	3.18	4.14	5.20	6.43

For SI: 1 inch = 25.4 mm, 1 sq.in. = 645 mm<sup>2</sup>, 1 foot = 305 mm. \* Head thickness shall be no larger than bar diameter



**TABLE 3: HRC 670 Mechanical Properties with Various Reinforcing Bar Grades.**

ASTM Compliant	Reinforcement material (ASTM)	Bar Size	Min. Tensile Strength	Minimum Elongation in 8"	Failure of head or head-bar connection
A970-06	A706	#5-#6 #7-#11	80,000 psi	14% 12%	NO
A970-13a Class A	A706 Gr. 60 A615 Gr. 60 A706 Gr. 80 <sup>1</sup> A615 Gr. 80 <sup>1</sup>	#5-#11 #5-#11 #5-#11 #5-#11	80,000 psi 90,000 psi 100,000 psi 105,000 psi	N/A	YES
A970-13a Class B	A706 Gr. 60 A615 Gr. 60	#5-#11 #5-#11	80,000 psi 90,000 psi	12-14% 7-9%	YES

For SI: 1 inch = 25.4 mm, 1 psi = 6.895 kPa

<sup>1</sup> Note: For compliance with the IBC and ACI 318-14 Chapter 17 or ACI 318-11 Appendix D as anchorage, additional data needs to be prepared by the registered design professional and approved by the building official to justify how the headed bars are substantiated in accordance with Section 17.1.3 of ACI 318-14 or Section D.2.3 of ACI 318-11 or comply with ANSI/ASME B1.1, B18.2.1 and B18.2.6.

<sup>2</sup> Note: In accordance with Section 25.4.4.1 of ACI 318-14 or Section 12.6 of ACI 318-11, the use of Grade 80 bars for development length is outside the scope of this report.

**TABLE 4 – DIMENSIONS OF HRC 670 T-HEAD FOR USE WITH REINFORCING BARS**

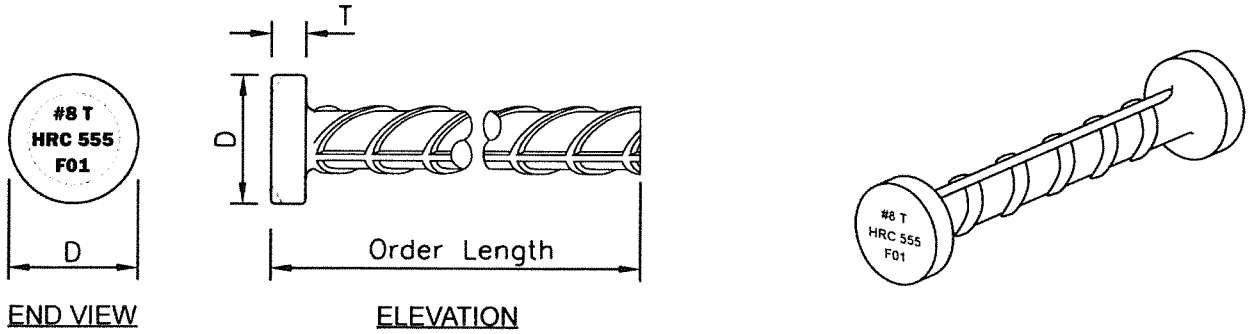
Dimensions	Bar Size	#5	#6	#7	#8	#9	#10	#11
Rebar	Diameter (inches)	0.625	0.75	0.875	1.0	1.128	1.27	1.41
	Area (square inches)	0.31	0.44	0.60	0.79	1.00	1.27	1.56
Head	D <sub>1</sub> (inches)	1.5	1.75	2.00	2.375	2.625	3.0	3.5
	D <sub>2</sub> (inches)	1.75	1.875	2.25	2.5	2.75	3.25	3.5
	D <sub>L</sub> (inches)	2.0	2.5	2.875	3.25	3.625	4.0	4.5
	L (inches)	2.0	2.313	2.75	3.125	3.375	3.5	4.0
	X (inches)	0.5	0.5	0.625	0.625	0.75	0.875	1.0
	Bolt Socket Size (inches)	<sup>3</sup> / <sub>4</sub>	<sup>3</sup> / <sub>4</sub>	<sup>3</sup> / <sub>4</sub>	1	1	1 <sup>1</sup> / <sub>4</sub>	1 <sup>1</sup> / <sub>4</sub>

For SI: 1 inch = 25.4 mm, 1 sq.in. = 645 mm<sup>2</sup>, 1 foot = 305 mm. \* Head thickness shall be no larger than bar diameter

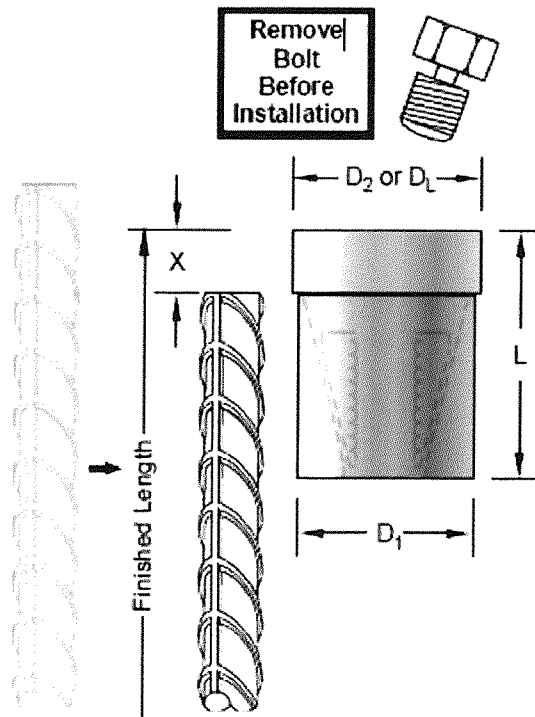




**FIGURE 1 – HRC® 555 HEADED REINFORCING BARS**



**FIGURE 2 - HRC® 670 T-HEAD**





**UBC Supplement**

**EVALUATION SUBJECT:**

**HRC® 555 SERIES (XTENDER®) HEADED ENDS OF CONCRETE REINFORCEMENT**

**REPORT HOLDER:**  
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**CSI DIVISION: 03 – CONCRETE**  
**CSI Section: 03210 – Reinforcing Steel**

**1.0 Compliance with the Following Codes**

- 1997 Uniform Building Code™ (UBC)
- 2011 American Concrete Institute® 318 (ACI)
- 2008 American Concrete Institute® 318 (ACI)
- 2005 American Concrete Institute® 318 (ACI)
- 2002 American Concrete Institute® 318 (ACI)

**2.0 ADDITIONAL REQUIREMENTS**

**2.1 UBC**

**2.1.1** Special inspection is required in accordance with UBC Section 1701.

\*

### 3.0 SUBSTANTIATING DATA

Data in accordance with IAPMO ES EC 006-2016 Evaluation Criteria for Headed and Mechanically Anchored Deformed Reinforcement Bars in Tension.

For additional information about this evaluation report please visit [www.uniform-es.org](http://www.uniform-es.org) or email at [info@uniform-es.org](mailto:info@uniform-es.org)

\* Deleted by City of Los Angeles