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BUTTONHEAD BNH AND BNX HEADED DEVICE FOR REINFORCEMENT BARS IN TENSION

CSI Section:

03 21 00 Reinforcing Steel

1.0 RECOGNITION

The ButtonHead BNH and BNX Headed Devices for Reinforcing Bars in Tension are recognized in this report for use as mechanical anchorage in concrete. The structural properties of the ButtonHead BNH and BNX Headed Devices were evaluated for compliance with the following codes and editions:

- 2018, 2015 and 2012 International Building Code® (IBC)
- 2018, 2015 and 2012 International Residential Code® (IRC)
- 2017 City of Los Angeles Building Code (LABC) – attached Supplement
- 2017 City of Los Angeles Residential Code (LARC) – attached Supplement

2.0 LIMITATIONS

Use of the Buttonhead BNH and BNX Headed Devices recognized in this report is subject to the following limitations:

2.1 The Buttonhead BNH and BNX Headed Devices shall be installed in accordance with the applicable code, the manufacturer's installation instructions, and this report. In the event of a conflict, the more restrictive governs.

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

2.3 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.

2.4 For structures regulated by ACI 318-14 Chapter 18 (ACI 318-11 or -08 Chapter 21), as required by 2018, 2015 and 2012 IBC Section 1905.1, where the ButtonHead BNH and BNX Headed reinforcing bars are designed to resist 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 building official as evidence that the steel reinforcing bars comply with Section 18.2.6 of ACI 318-14 and Section 21.1.5.2 of ACI 318-11 and -08.

2.5 Special inspections shall be provided in accordance with Section 3.4 of this report.

2.6 Minimum concrete cover shall be in accordance with Section 20.6.1 of ACI 318-14, or Section 7.7 of ACI 318-11 or -08, as applicable, and IBC Section 721. Concrete cover shall be measured from the outer surface of the ButtonHead reinforcing bar's head.

2.7 The Buttonhead BNH and BNX Headed Devices recognized in this report are produced in Dayton, OH.

3.0 PRODUCT USE

3.1 The ButtonHead BNH and BNX Headed Device for Reinforcing Bars in Tension are Class HA headed deformed bars complying with Section 25.4.4 or 25.4.5 of ACI 318-14 and Section 12.6 of ACI 318-11 and -08 for use as mechanical anchorage to develop steel reinforcing bars in tension in normal-weight concrete as an alternative to standard hooks or development lengths of straight deformed reinforcing bars in reinforced concrete.

3.2 Design: 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 only for bar sizes No.4 through No.11. For BNH bar sizes No.14 and No.18, development length is outside the scope of this report. 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 proposed heads conforms 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.



Development lengths specified for the development and splices of reinforcement shall not be subject to a strength reduction factor in accordance with Section 25.4.1.3 of ACI 318-14 or Section 9.3.3 of ACI 318-11 or -08.

When designed in accordance with Section 25.4.4.2 of ACI 318-14 or Section 12.6.2 of ACI 318-11 or -08, 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 per Figure R25.4.4.2b of ACI 318-14 Commentary or Figure R12.6 (b) of the ACI 318-11 or -08 Commentary.

Splices of reinforcement to headed deformed reinforcing bars in tension shall comply with Section 18.10.2.3 of ACI 318-14 or Sections 12.14 and 12.15 of ACI 318-11 or -08.

3.2.1 Design of Anchorage to Concrete: For compliance with Section 1901.3 of the 2018 IBC, or Section 1909 of the 2015 and 2012 IBC, ACI 318-14 Chapter 17, or ACI 318-11 or -08 Appendix D as anchorage, additional data shall be prepared by a registered design professional and approved by the building official to justify how the No.14 and No.18 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.

3.3 Installation: The ButtonHead BNH and BNX Headed Devices shall be installed in accordance with the IBC, ACI 318, this evaluation report and the manufacturer’s installation instructions. Where conflicts occur the more restrictive shall govern.

The ButtonHead BNH and BNX Headed Device System consists of two general components: one piece of reinforcing bar and a donut-shaped headed end. One end of the reinforcing bar is fully inserted into the central hole of the headed end. Final assembly take place in the field or are factory assembled, by swaging the headed end on the reinforcing bar using the hydraulically-actuated press.

3.4 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 2018, 2015 or 2012 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.

4.0 PRODUCT DESCRIPTION

4.1 Product information: The ButtonHead BNH and BNX Headed Devices for Reinforcing Bar in Tension are Class HA headed deformed bars complying with the requirements ASTM A970 Annex 1A. The BNH headed devices are composed of No. 4 through No.18 size reinforcing steel bars and the BNX are composed of No. 4 through No. 11 size reinforcing steel bars with a cold-swaged headed devices that are field, or factory assembled at one end or both ends of the reinforcing bar using the hydraulically-actuated press. Use of other headed devices that fit onto deformed bar ends in lieu of cold-swaging process shall comply with Section 5.1.8 of EC 006-2018.

The net bearing area of the BNH and BNX headed systems exceed four times the nominal cross-sectional area of the reinforcing bar. Dimensions and illustrations are shown in Table 1 and Figure 1 of this report.

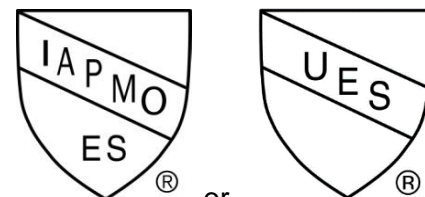
4.2 Material information

4.2.1 Headed Ends: The ButtonHead BNH and BNX headed devices are formed from steel conforming to ASTM A108 or ASTM A576.

4.2.2 Steel Reinforcing Bars: Steel reinforcing bars shall be uncoated, deformed reinforcing bars complying with ASTM A615 Grades 60, 75 or 80, or ASTM A706 Grades 60 or 80.

5.0 IDENTIFICATION

All ButtonHead BNH and BNX Headed Devices are packaged with a label bearing the manufacturer’s name (BarSplice Products, Inc.), address, model, size, the IAPMO Uniform ES Mark of Conformity and the Uniform Evaluation Report Number (ER-331). The heads are permanently marked with the letter “H” to indicate that the product has been produced to the ASTM A970 Annex A1 specification. Products prepared by officially licensed fabricators, may have additional unique identifiers that corresponds to the fabricator. Either Mark of Conformity may be used as shown below:



IAPMO UES ER-331



6.0 SUBSTANTIATING DATA

Data in accordance with IAPMO UES Evaluation Criteria for Headed and Mechanically Anchored Deformed Reinforcement Bars in Tension (EC 006-2018), approved June 2018.

7.0 STATEMENT OF RECOGNITION

This evaluation report describes the results of research carried out by IAPMO Uniform Evaluation Service on The ButtonHead BNH and BNX Headed Devices for Reinforcing Bars in Tension to assess conformance to the codes shown in Section 1.0 of this report and serves as documentation of the product certification. Products are manufactured at locations noted in Section 2.7 of this report under a quality control program with periodic inspection under the supervision of IAPMO UES.

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For additional information about this evaluation report please visit
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TABLE 1 – Dimensions of ButtonHead BNH and BNX Headed Devices

BUTTONHEAD HEADED DEVICES EVALUATED							
		REBAR		HEAD			
Bar Size	Head Type	Diameter, d_b (in)	Area, A_b (in)	B_{min} (in)	D (in)	A_{brg} (in ²)	$A_{brg} > 4A_b$
No. 4	BNH	0.500	0.20	0.875	1.375	1.28	YES
No. 5	BNH	0.625	0.31	0.938	1.750	2.10	YES
No. 6	BNH	0.750	0.44	1.250	1.875	2.32	YES
No. 7	BNH	0.875	0.60	1.375	2.375	3.83	YES
No. 8	BNH	1.000	0.79	1.500	2.750	5.15	YES
No. 9	BNH	1.128	1.00	1.750	2.875	5.49	YES
No. 10	BNH	1.270	1.27	1.875	3.375	7.68	YES
No. 11	BNH	1.410	1.56	2.125	3.813	9.86	YES
No. 14 ^{1,2}	BNH	1.693	2.25	2.875	3.875	9.54	YES
No. 18 ^{1,2}	BNH	2.257	4.00	4.375	5.045	16.0	YES

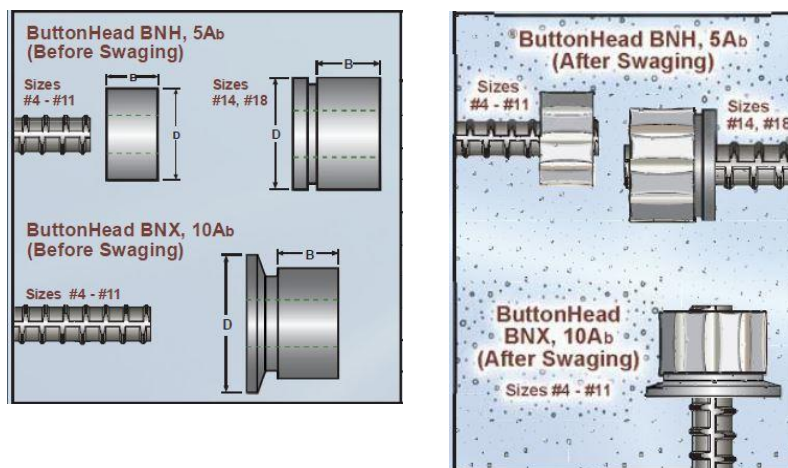
Bar Size	Head Type	Diameter, d_b (in)	Area, A_b (in)	B_{min} (in)	D (in)	A_{brg} (in ²)	$A_{brg} > 9A_b$
No. 4	BNX	0.500	0.20	0.875	1.750	2.21	YES
No. 5	BNX	0.625	0.31	0.938	2.188	3.45	YES
No. 6	BNX	0.750	0.44	1.250	2.375	3.99	YES
No. 7	BNX	0.875	0.60	1.375	2.875	5.89	YES
No. 8	BNX	1.000	0.79	1.500	3.250	7.51	YES
No. 9	BNX	1.128	1.00	1.750	3.570	9.01	YES
No. 10	BNX	1.270	1.27	1.875	4.030	11.5	YES
No. 11	BNX	1.410	1.56	2.125	4.500	14.3	YES

For **SI**: 1 inch = 25.4 mm, 1 sq.in. = 645 mm², 1 foot = 305 mm

¹ Note: For compliance with Section 901.3 of the 2018 IBC and Section 1909 of the 2015 and 2012 IBC, ACI 318-14 Chapter 17, and ACI 318-11 and -08 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 No.14 and No.18 headed bars are substantiated per 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.

² In accordance with Section 25.4.4 of ACI 318-14 and Section 12.6 of ACI 318-11 or -08 the use of the No.14 and No.18 bars for development length is outside the scope of this report.

FIGURE 1— ButtonHead BNH and BNX Headed Devices





CITY OF LOS ANGELES SUPPLEMENT

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1.0 RECOGNITION

The ButtonHead BNH and BNX Headed Device for Reinforcing Bars in Tension described in ER-331 and this 2017 LABC and LARC supplemental report have been evaluated for use as mechanical anchorage in concrete. The ButtonHead BNH and BNX Headed Device for Reinforcing Bars in Tension have been evaluated for structural performance properties, subject to the requirements in ER-331 and this 2017 LABC and LARC supplemental report. The ButtonHead BNH and BNX Headed Device for Reinforcing Bars in Tension were evaluated for compliance with the following codes and regulations:

- 2017 City of Los Angeles Building Code (LABC)
- 2017 City of Los Angeles Residential Code (LARC)

2.0 LIMITATIONS

Use of the ButtonHead BNH and BNX Headed Device for Reinforcing Bars in Tension recognized in this supplement is subject to the following limitations in addition to the limitations shown in the master ER-331:

2.1 Calculations and specifications verifying compliance with the ButtonHead BNH and BNX Headed Device for Reinforcing Bars in Tension shall be submitted to plan check engineer at the time of permit application. The ButtonHead BNH and BNX Headed Devices calculations shall be prepared by a Civil or Structural Engineer registered in the State of California.

2.2 Periodic special inspection shall be provided by The Registered Deputy Inspector in accordance with Section 1705 of the 2017 LABC during installations of the

ButtonHead BNH and BNX Headed Device for Reinforcing Bars in Tension.

2.3 The use of headed and mechanical anchored deformed reinforcement for lap splices is outside the scope of this report.

2.4 Minimum concrete cover shall be provided in accordance with Section 1808.8.2 of the 2017 LABC. Concrete cover shall be measured from the outer surface of the ButtonHead reinforcing bar's head.

2.5 The ButtonHead BNH and BNX Headed Device for Reinforcing Bars in Tension shall be installed in accordance with the LABC or LARC, as applicable, manufacturer's installation instructions, and this supplement. A copy of the manufacturer's installation instructions shall be available on site for all Registered Deputy Inspectors. Where conflicts occur, the more restrictive shall govern.

2.6 The ButtonHead BNH and BNX Headed Device for Reinforcing Bars in Tension listed in this supplement shall include the unique heat code identification, and the letter "H" to indicate that the product has been produced to the ASTM A970 Annex A1 specification. Products prepared by officially licensed fabricators, may have additional unique identifiers that corresponds to the fabricator.

2.7 Minimum concrete cover and spacing between bars or sleeves shall be provided in accordance with Section 1808.8.2 of the 2017 LABC.

2.8 Headed steel reinforcing bars shall not be used on compression reinforcement, epoxy and other coated bars.

2.9 The cold-swaged headed device shall be fabricated by a City of Los Angeles approved fabricator.

2.10 The clear spacing between bars shall be at least $4d_b$ in accordance with Section 25.4.4.1 (g) of ACI 318-14 and Section 12.6.1 (f) of ACI 318-11.

For additional information about this evaluation report please visit www.uniform-es.org or email us at info@uniform-es.org