



EVALUATION SUBJECT: THE BUTTONHEAD BNH AND BNX HEADED DEVICE FOR REINFORCEMENT BARS IN TENSION

REPORT HOLDER:
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CSI Division: 03 CONCRETE
CSI Section: 032100 Reinforcing Steel

1.0 SCOPE OF EVALUATION

1.1 Compliance to the following codes & regulations:

- 2012 and 2009 International Building Code® (IBC)
- 2012 and 2009 International Residential Code® (IRC)

1.2 Evaluated in accordance with:

- IAPMO UES EC 006-2016

1.3 Properties assessed:

- Structural

2.0 PRODUCT USE

The ButtonHead BNH and BNX Headed Device for Reinforcing Bars in Tension are Class HA headed deformed bars complying with Section 12.6 of ACI 318-11 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.

3.0 PRODUCT DESCRIPTION

3.1 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. 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 device at one end or both ends of the bar. 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.

3.2 Material information

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

3.2.2 Steel Reinforcing Bars: Steel reinforcing bars shall be uncoated, Grade 60 deformed reinforcing bars complying with ASTM A615 or ASTM A706.

4.0 DESIGN AND INSTALLATION

4.1 General: 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.

4.2 Design

4.2.1 Development Length: When utilizing the equation in 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 A970-09, 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 12.6.1 of ACI 318-11 have been achieved.

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

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

4.2.2 Design of Anchorage to Concrete: For compliance with Section 1909 of the IBC and ACI 318 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 No.14 and No.18 headed bars are substantiated per Section D.2.3 of ACI 318-11 or comply with ANSI/ASME B1.1, B18.2.1 and B18.2.6.

4.2.3 Termination of Headed Bars: When designed in accordance with 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 per ACI 318 Figure R12.6 (b).



4.3 Special Inspection: Special inspection of the headed bars shall be provided at the jobsite as required by Sections 1704 and 1705 of the 2012 IBC (Section 1704 of the 2009 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 Buttonhead BNH and BNX Headed Devices 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 conditions:

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

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

5.3 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.

5.4 For structures regulated by ACI 318 Chapter 21, as required by 2012 IBC Section 1905.1 (2009 IBC Section 1908.1), where the ButtonHead BNH and BNX 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 21.1.5.2 of ACI 318.

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

5.6 Minimum concrete cover shall be in accordance with Section 7.7 of ACI 318-11, and shall be measured from the outer surface of the ButtonHead reinforcing bar's head.

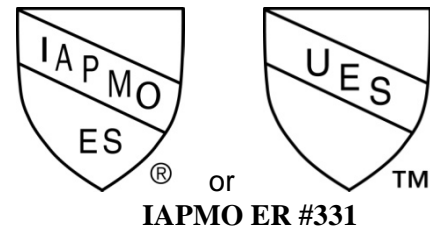
6.0 SUBSTANTIATING DATA

Data in accordance with IAPMO UES Evaluation Criteria for Headed and Mechanically Anchored Deformed Reinforcement Bars in Tension (EC 006-2016), approved

January 2016.

7.0 IDENTIFICATION

All Buttonhead BNH and BNX 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.



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

TABLE 1 – Dimensions of ButtonHead BNH and BNX Headed Devices

BUTTONHEAD HEADED DEVICES EVALUATED							
		REBAR		HEAD			
Bar Size	Head Type	Diameter, db (in)	Area, Ab (in)	Bmin (in)	D (in)	Abrg (in ²)	Abrg > 4Ab
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	BNH	1.693	2.25	2.875	3.875	9.54	YES
No. 18 ¹	BNH	2.257	4.00	4.375	5.045	16.0	YES

Bar Size	Head Type	Diameter, db (in)	Area, Ab (in)	Bmin (in)	D (in)	Abrg (in ²)	Abrg > 9Ab
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

¹Note: For compliance with the IBC and ACI 318 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 D.2.3 of ACI 318-11 or comply with ANSI/ASME B1.1, B18.2.1 and B18.2.6.

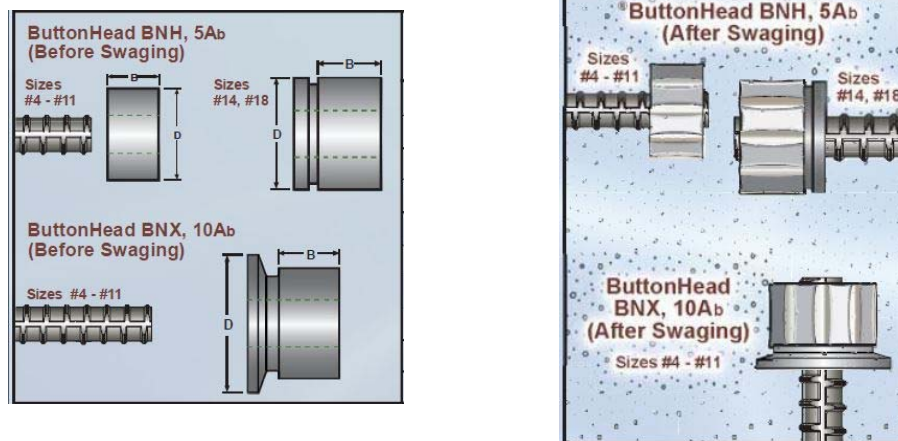


FIGURE 1— ButtonHead BNH and BNX Headed Devices