BarSplice PRODUCTS INC.

ButtonHead™

GRADE 60

COLD-SWAGED STEEL HEADED DEFORMED BARS FOR GRADE 60 REINFORCEMENT

PERFORMANCE TEST DATA

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INTRODUCTION

Barsplice Products, Inc. has conducted a series of in-air tests on the ButtonHead system of headed deformed bars, sizes No. 4 through No. 18. The purpose of this testing is to ensure that they are manufactured to the quality standards of BPI's ISO 9001 Quality System and are capable of exceeding various Building Codes strength requirements.

Two head diameter designs are available, depending on application requirements, and test results for both are included. Heads with a cross-sectional area exceeding 5x the rebar area (BNH) are designated as $5A_b$ and heads with a cross-sectional area exceeding 10x the rebar area (BNX) are designated as $10A_b$.

TENSILE TEST PROCEDURE

Test specimens were loaded monotonically in tension to failure to determine the capability of the ButtonHead headed bar system. The tests were conducted in accordance with ASTM A370, "Standard Test Methods and Definitions for Mechanical Testing of Steel Products" and ASTM A1034, " Standard Test Methods for Testing Mechanical Splices for Steel Reinforcing Bars." Loads were applied through the bearing area of the head. The testing was performed to exceed the headed deformed bar strength requirements of ACI (American Concrete Institute) 318-19 Chapter 25.4.5.1 and ASTM A970, Class A & Class HA.

All monotonic tension tests were carried out in a 600 kip Forney universal testing machine, located at the Barsplice manufacturing facility. Current calibration certificates for the test machine are on file.

The reinforcing steel used in these tests conforms to the requirements of uncoated ASTM A615 Grade 60, ASTM A706 Grade 60, and epoxy coated ASTM A775.

TEST RESULTS

Results of the ButtonHead tension testing described above are summarized in Table 1 and represented in Chart 1.

SUMMARY

Tension test specimens exceeded the strength requirements of ACI 318-19*, namely 100% x specified yield strength of Grade 60 reinforcement, specifically 60,000 psi (420 MPa).

Additionally, the tension test specimens exceeded the strength requirements stated in ASTM A970, Class A and Class HA, namely the specified tensile strength of Grade 60 bar, specifically 80,000 psi (550 MPa).

* In meeting the strength requirements of ACI-318, the ButtonHead system complies with IBC 2018 Section 1901.3.

TABLE 1: BUTTONHEAD™ TENSILE TEST RESULTS

BAR SIZE	HEAD TYPE	TEST LAB ID # & REF #		PEAK STRENGTH MAX STRESS (psi)	PEAK STRENGTH % SPEC. TENSILE GR. 60
No. 4	BNH 5Ab	4T792	4A	115,750	145%
			4B	116,150	145%
		4T1237	4A	109,600	137%
			4B	110,350	138%
		4T2356	4A	109,800	137%
			4B	105,900	132%
	BNX 10Ab	4T3015 *A706	4A	97,950	122%
			4B	97,250	122%
No. 5	BNH 5Ab	5T3060	5A	109,710	137%
			5B	111,290	139%
		5T5994	5A	107,871	135%
			5B	108,161	135%
		5T6150 *EPOXY	5A	105,581	132%
			5B	106,903	134%
	BNX 10Ab	5T6151 *A706	5A	102,065	128%
			5B	101,387	127%
No. 6	BNH 5Ab	6T2694	6A	103,005	129%
			6B	102,766	128%
		6T4744	6A	109,682	137%
			6B	109,568	137%
		6T8819	6A	107,349	134%
		6T8864	6A	110,454	138%
		6T8980*	6A	110,241	138%
		6T8990*	6A	115,836	145%
	BNX 10Ab	6T4873 *A706	6A	95,659	120%
			6B	98,295	123%
No. 7	BNH 5Ab	7T1077	7A	106,850	134%
			7B	105,317	132%
		7T1292	7A	104,752	131%
			7B	105,305	132%
			7C	107,053	134%
		7T2016	7A	112,467	141%
			7B	105,733	132%
		7T4400*	7A	115,251	144%
	BNX 10Ab	7T2308 *A706	7A	96,950	121%
			7B	94,300	118%
No. 8	BNH 5Ab	8T1709	8A	104,734	131%
			8B	103,101	129%
		8T2107	8A	106,772	133%
			8B	107,304	134%
		8T3518 *A706	8A	98,139	123%
			8B	99,899	125%
		8T5533*	8A	110,466	138%
	BNX 10Ab	8T2762	8A	108,304	135%
			8B	107,025	134%

BAR SIZE	HEAD TYPE	TEST LAB ID # & REF #		PEAK STRENGTH MAX STRESS (psi)	PEAK STRENGTH % SPEC. TENSILE GR. 60
No. 9	BNH 5Ab	9T1298	9A	101,780	127%
			9B	101,500	127%
		9T1710	9A	108,460	136%
			9B	115,490	144%
		9T1932 *A706	9A	95,430	119%
			9B	96,650	121%
		9T3570*	9A	112,868	141%
	BNX 10Ab	9T1812	9A	106,780	133%
			9B	108,720	136%
No. 10	BNH 5Ab	10T1279	10A	104,268	130%
			10B	105,874	132%
		10T1489	10A	106,402	133%
			10B	103,220	129%
		10T1678	10A	106,803	134%
			10B	109,598	137%
		10T3055*	10B	115,694	145%
	BNX 10Ab	10T2097 *A706	10A	100,220	125%
			10B	98,780	123%
No. 11	BNH 5Ab	11T2213	11A	105,853	132%
			11B	106,128	133%
		11T2639	11A	107,449	134%
			11B	108,571	136%
		11T3455	11A	114,167	143%
			11B	105,083	131%
		11T3939 *A706	11A	98,340	123%
			11B	95,558	119%
		11T5683*	11A	108,073	135%
	BNX 10Ab	11T3323	11A	111,436	139%
			11B	110,679	138%
No. 14	BNH 5Ab	14T658	14A	100,742	126%
		14T757	14A	111,484	139%
			14B	112,609	141%
		14T770	14A	111,076	139%
			14B	109,249	137%
		14T1203*	14A	108,427	136%
		14T1412 *A706	14A	106,244	133%
			14B	104,724	131%
No. 18	BNH 5Ab	18T507 *A706	18A	99,344	124%
			18B	97,240	122%
		18T648	18A	104,978	131%
			18B	103,178	129%
		18T651	18A	102,832	129%
			18B	103,118	129%
		18T816	18A	105,598	132%
			18B	105,955	132%
		18T1029	18A	111,145	139%
			18B	113,748	142%

* Test conducted on ASTM A706 Grade 60 reinforcement bar

* Test conducted on Epoxy Grade 60 reinforcement bar

CHART 1: BUTTONHEAD™ TENSILE TEST RESULTS