

**NATIONAL TECHNICAL SYSTEMS**  
**V50 BALLISTIC LIMIT TEST**

Date Received: 11/17/16  
 Via: Hand Carry  
 Returned Via: Hand Carry

Record No.: HHV16004-1  
 Test Date: 11/17/16  
 Customer: Hard Head Veterans

**Sample**

Manufacturer: Hard Head Veterans  
 Size: M/L  
 Weight (lbs.): 2.253  
 Style: High Cut  
 Type: HHV ATE BALLISTIC  
 Serial No.: N/A  
 DoM.: 22-AUG-16  
 Conditioning: Ambient

**Threat**

Projectile: 17gr FSP  
 Weight: 17 gr.  
 Powder: Bullseye  
 Barrel: 22" .223 Sabot  
 Obliquity: 0°  
 Yaw: ≤ 5°  
 Test Spec.: AR/PD 10-02 Rev. A  
 with Change 6  
 16 December 2013,  
 IAW ATC (IOP) PED-003  
 7 March 2012

**Range 4**

Muzzle to Screen 1: 4.81 ft.  
 Screen 1 - 4: 5.00 ft.  
 Screen 2 - 3: 4.09 ft.  
 Screen 4 - Target: 4.43 ft.  
 Target to Witness: 0.25 ft.  
 \*Midpoint to Target: 6.93 ft.  
 Witness Panel: 2024-T3 Alum.  
 Temperature: 69 °F  
 Humidity: 55 %

Quote No.: OP0207444-01, Date: 11/1/16

SHOT INFORMATION		CHRONOGRAPHS 1 - 4		CHRONOGRAPHS 2 - 3		AVERAGE		LOSS	STRIKING	PENETRATION RESULTS		
Shot Number	Powder Charge	TIME	VELOCITY	TIME	VELOCITY	VELOCITY	VELOCITY	VELOCITY	VELOCITY	IMPACT LOCATION	Shot Included	Complete Partial
		sx-5	ft/s	sx-5	ft/s	ft/s	ft/s					
1	6.0	171.9	2909	140.4	2910	2909	102	2807	Crown	N	C	
2	5.5	198.9	2514	162.5	2514	2514	89	2424	Front	Y	P	
3	5.7	198.1	2524	161.8	2525	2524	90	2435	Right	Y	C	
4	5.5	200.3	2496	163.6	2497	2497	89	2408	Back	Y	C	
5	5.3	208.1	2403	170.0	2403	2403	86	2317	Left	Y	C	
6	5.1	187.7	2664	153.4	2663	2663	94	2569	Crown	N	C	
7	5.0	217.1	2303	177.4	2303	2303	82	2221	Front	N	P	
8	5.2	203.7	2455	166.4	2455	2455	87	2367	Right	Y	P	
9	5.3	207.3	2412	169.4	2411	2412	86	2326	Back	Y	P	

This test was performed in accordance with the specification requirements and the results properly reflect the ballistic performance of the listed sample.	V50 VELOCITY	HIGH PARTIAL	LOW COMPLETE	RANGE OF RESULTS	RANGE OF MIXED RESULTS
	<b>2380</b>	<b>2424</b>	<b>2317</b>	<b>117</b>	<b>107</b>
<b>REMARKS/NOTES</b> *Muzzle to target measured for each shot to calculate velocity loss. *Helmet tested as an unfinished helmet shell with pads and retention/suspension system removed.	*MINIMUM REQUIRED V50	TEST RESULTS			
	<b>2200</b>	<b>PASS</b>			
		*Per Section 3.9.1, Table II			

**V50 Impact Locations/Calculation:**  
 \*Starting Velocity: 2800 ft/s  
 •V50 based on three partial and three complete penetrations with a range of results at or below 150 ft/s

Crawford/Nguyen

**NATIONAL TECHNICAL SYSTEMS**  
**RTP / BTD TEST**

Date Received: 11/17/16  
Via: UPS  
Returned Via: UPS

Record No.: HHV16004-2  
Test Date: 11/17/16  
Customer: Hard Head Veterans

**Sample**

Manufacturer: Hard Head Veterans  
Size: M/L  
Weight (lbs.): 3.151  
Crown Thickness: 0.325"  
Style: High Cut  
Type: HHV ATE BALLISTIC  
No.: 83-544-22AUG16  
Sample No.: 1  
DoM: 22 August 2016  
Conditioning: Hot

**Threat**

Projectile: 9mm FMJ RN  
Weight: 124 gr.  
Powder: Universal  
Barrel: 10"  
Obliquity: 0°  
Yaw: ≤ 5°  
Test Spec.: LW-ACH  
AR/PD 10-02 Revision A  
with Change 6  
16 December 2013,  
IAW TOP 10-2-217  
21 March 2016  
IAW ATC-MMTB-IOP 051  
28 October 2014  
ICW Geomagic Control 2014 Software

**Range 4**

Muzzle to Screen 1: 5.00 ft.  
Screen 1 - 4: 5.00 ft.  
Screen 2 - 3: 4.09 ft.  
Screen 4 - Target: 5.09 ft.  
Target to Witness: 0 ft.  
\*Midpoint to Target: 7.59 ft.  
Witness: Clay Headform  
Temperature: 70 °F  
Humidity: 55 %

SHOT NO.	POWDER CHARGE	CHRONOGRAPH 1 - 4		CHRONOGRAPH 2 - 3		AVERAGE VELOCITY ft/s	LOSS VELOCITY ft/s	STRIKING VELOCITY ft/s	IMPACT LOCATION	TEST RESULTS FARO® BTD (mm)
		TIME sx-5	VELOCITY ft/s	TIME sx-5	VELOCITY ft/s					
1	7.2	353.1	1416	288.4	1416	1416	10	1407	Crown	13.028
2	7.3	345.1	1449	281.9	1449	1449	10	1439	Left	16.329
3	7.3	345.8	1446	282.4	1447	1446	10	1436	Right	13.876
4	7.3	349.6	1430	285.6	1430	1430	10	1420	Front	15.903
5	7.3	346.5	1443	283.0	1443	1443	10	1433	Back	10.585

This test was performed in accordance with the specification requirements and the results properly reflect the ballistic performance of the listed sample.

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**REMARKS/NOTES**

\*Muzzle to Target measured for each shot to calculate loss.  
•Required Velocity (IAW Section 3.9.2): 1400 + 50, -0 ft/s  
•Helmet tested as a finished helmet:  
Pad / Component Configuration:  
Black Soft Pads, Retention/Suspension System with Chinstrap and Accessory Rail Connectors, \*\*NVG Shroud removed prior to testing

Headform/Block Calibration:  
NTS Calibration Block #: 1  
NTS Headform #: 3  
NTS Headform Temp.: 99.8 °F  
NTS Block Temp. #1: 100.2 °F  
NTS Block Temp. #2: 100.3 °F

Calibration Drops 1: 25.35, 26.15, 26.68 mm  
Calibration Start Time: 13:30 PM  
Calibration End Time: 17:30 PM

**Crown Offset Determination / Calculation:**

•Three (3) individual crown thicknesses from (1) individual size M/L helmet used to determine average crown thickness for crown offset measurement:  
**•0.325" = 8.26mm** (Rounded to nearest 0.5mm) = **8.50mm**  
(High Cut Helmet, Size Medium) 27.0mm + 8.50mm = **35.50mm +/- 0.5mm**

Crown Offset: 35.46 mm  
*(Requirement 35.0 - 36.0mm)*  
Left X-Axis Offset: 23.99 mm  
Adjusted X-Axis Offset: N/A mm  
Right X-Axis Offset: 24.29 mm  
Adjusted X-Axis Offset: N/A mm  
*(Requirement ≥ 22.50mm)*

**Impact Locations / Shot Order:**

•Impact Locations per LW-ACH, AR/PD 10-02 (Section 4.9.11.4.3)  
\*Shot order per customer request.  
a) Crown: Approximate intersection of the mid-sagittal and coronal planes  
b) Left: 65mm (+5mm / -0mm) above the earflap (20mm above accessory rail connector)  
b) Right: 65mm (+5mm / -0mm) above the earflap (20mm above accessory rail connector)  
c) Front: 65mm (+5mm / -0mm) from the front edge and at a minimum of 1.5" from NVG hole (if applicable)  
d) Back: 75mm (+5mm / -0mm) from the rear edge of the finished helmet

**NATIONAL TECHNICAL SYSTEMS**  
**HELMET: TOP TO BOTTOM COMPRESSION TEST**

Date Received: 11/17/16  
 Via: Hand  
 Returned Via: Hand

Record No: HHV16004-3  
 Test Date: 11/17/16  
 Customer: Hard Head Veterans

**Sample Information:**

Manufacturer: Hard Head Veterans  
 Size: Large/X-Large  
 Weight (lbs.): 2.280  
 Model No.: ATE  
 Style: N/A  
 Serial No.: N/A  
 DoM: N/A  
 Helmet No.: 3 of 6  
 Conditioning: Ambient

**Test Spec.:**

Light Weight ACH  
 AR/PD 10-02 with Change 6  
 16 December 2013

Test Type: Top to Bottom Compression  
 Test Requirement: 3.12.11  
 Test Procedure: 4.9.14.11

**Test Conditions:**

Temperature: 71 °F  
 Humidity: 53 %

**Test Machine:**

Lloyd Instruments LR10K Plus  
 NEXYGEN Plus 3 Software

**RESULTS**

Test Description	Measurements (in.)				Results (in.) (lbs.)	Pass Fail
	#1	#2	#3	#4		
Maximum Pre-Test Width (On Crown):	0.000	0.000	0.000	0.000	0.000	
Maximum Load on Helmet: Test Date: 11/17/16 Test Time: 11:05					401.52	
<u>After 5 min.:</u> Maximum Post-Test Width (On Crown): Difference: Test Date: 11/17/16 Test Time: 11:10	0.009	0.007	0.007	0.006	0.007	<b>PASS</b>
<u>After 24 hrs.:</u> Maximum Post-Test Width (On Crown): Difference: Test Date: N/A Test Time: N/A	N/A	N/A	N/A	N/A	N/A	<b>N/A</b>
Visible delamination, ply separation, o distortion after testing was completed:						<b>PASS</b>

This test was performed in accordance with the specification requirements and the results properly reflect the performance of the listed sample.

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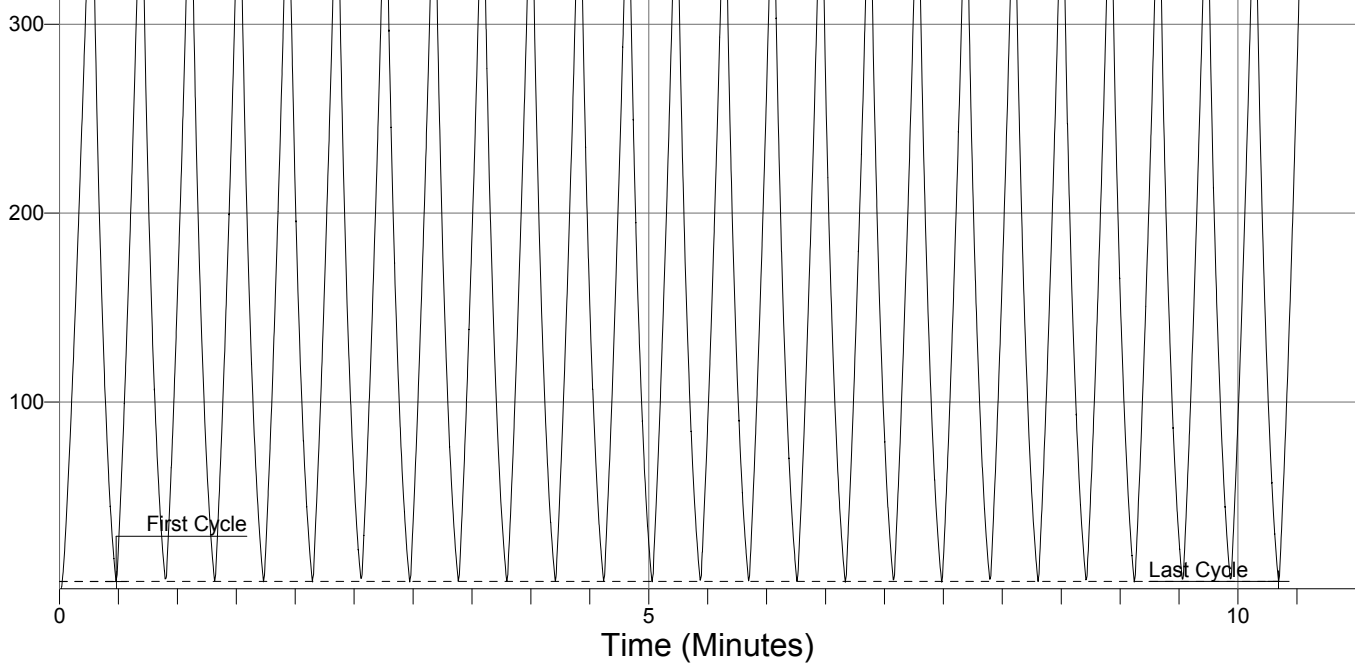
**REMARKS/NOTES:**

- \*Sample was impacted at the apex of the crown.
- \*Sample must meet a 0.020" dimensional change within 5 min.
- \*Customer waived the 24hr measurement requirements.

Zerger

Load (lbf)

Report No.: HHV16001-3  
Model No.: N/A  
Sample No.: N/A  
Lot No.: N/A  
Peak: 401.52 lbf  
Test Type: Top to Bottom







**NATIONAL TECHNICAL SYSTEMS**  
**NIJ 0106.01 HELMET**  
**BALLISTIC PENETRATION TEST**

Date Received: 11/17/16  
 Via: Hand Carry  
 Returned Via: UPS

Record No.: HHV16004-5  
 Test Date: 11/17/16  
 Customer: Hard Head Veterans

**Test Conditions**

Temperature: 69 °F  
 Humidity: 47 %  
 Test Spec.: NIJ Standard 0106.01 for Ballistic Helmets  
 December 1981  
 Threat Level: NIJ 0101.06 Level IIIA, Threat 1  
 Conditioning: Dry

**Range 2**

Muzzle to Screen 1: 5.34 ft.  
 Screen 1 - 2: 5.71 ft.  
 Screen 2 - Target: 5.35 ft.  
 Midpoint to Target: 8.20 ft.  
 Target to Witness: 0.25 ft.  
 Headform Size: 7 1/4  
 Witness Plate: 2024-T3 Alum.  
 Barrel Length: 4 in.

Sample Description				Test / Ammunition Description					Chronograph		Test Results
Helmet Model No.	Helmet Sample No.	Helmet Size	Helmet Weight (lbs.)	Shot No.	Impact Location	Degree Obliquity	Caliber	Bullet Weight (gr.) / Type	TIME sx-5	VELOCITY ft/s	Penetration No Penetration
HHV ATE BALLISTIC	1	L / XL	3.15	1	Front	0°	.357 Sig	125 / TMJ	393.7	1450	No Penetration
HHV ATE BALLISTIC	1	L / XL	3.15	2	Back	0°	.357 Sig	125 / TMJ	384.4	1485	No Penetration
HHV ATE BALLISTIC	1	L / XL	3.15	3	Left	0°	.357 Sig	125 / TMJ	390.9	1460	No Penetration
HHV ATE BALLISTIC	1	L / XL	3.15	4	Right	0°	.357 Sig	125 / TMJ	388.0	1471	No Penetration

This test was performed in accordance with the specification requirements and the results properly reflect the ballistic performance of the listed sample.

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**REMARKS / NOTES:**

- Sample tested as received as a finished helmet with styrofoam pads, suspension / retention system, NVG shroud, exterior velcro and accessory rail connectors.
- Penetration Test Headforms used are IAW the dimensions and sizes per Section 5.1.5 and Figure 4.

**Test Round Used:**

NIJ 0101.06 Level IIIA: Speer .357 Sig 125 gr. TMJ (4362) bullet @ NIJ 0101.06 Level IIIA, Threat 1 Velocity of 1470 +/- 30 ft/s

**Impact Locations:**

Sagittal Penetration Test Headform

Shot No. 1: Front (65mm from edge): Impact ≤ 9cm (3.5") above the basic plane and ≤ 5cm (2.0") from the mid-sagittal plane  
 Shot No. 2: Back (75mm from edge): Impact within the area diametrically opposite the front impact area (Shot 1)

Coronal Penetration Test Headform

Shot No. 3: Left Side (50mm from edge): Impact ≤ 5cm (2.0") above the basic plane and ≤ 7.5cm (3.0") from the coronal plane  
 Shot No. 4: Right Side (50mm from edge): Impact ≤ 5cm (2.0") above the basic plane and ≤ 7.5cm (3.0") from the coronal plane

**Test Results / Remarks / Notes:**

Shot No. 1: No Perforation of the helmet; No Perforation of the witness plate by any part of the test specimen or bullet  
 Shot No. 2: No Perforation of the helmet; No Perforation of the witness plate by any part of the test specimen or bullet  
 Shot No. 3: No Perforation of the helmet; No Perforation of the witness plate by any part of the test specimen or bullet  
 Shot No. 4: No Perforation of the helmet; No Perforation of the witness plate by any part of the test specimen or bullet

**Sample Tested:**

Manufacturer: Hard Head Veterans  
 Style: High-Cut  
 Type: HHV ATE BALLISTIC  
 No: 83-544-22AUG16  
 Sample No.: 1  
 Size: L / XL  
 Weight (lbs.): 3.15  
 Threat Level: (NIJ 0106.01 & 0108.01): IIIA

Nold/Zerger

**NATIONAL TECHNICAL SYSTEMS**  
**NIJ 0106.01 HELMET**  
**BALLISTIC PENETRATION TEST**

Date Received: 11/17/16  
 Via: Hand Carry  
 Returned Via: UPS

Record No.: HHV16004-6  
 Test Date: 11/17/16  
 Customer: Hard Head Veterans

**Test Conditions**

Temperature: 69 °F  
 Humidity: 47 %  
 Test Spec.: NIJ Standard 0106.01 for Ballistic Helmets  
 December 1981  
 Threat Level: NIJ 0101.06 Level IIIA, Threat 2  
 Conditioning: Dry

**Range 2**

Muzzle to Screen 1: 5.34 ft.  
 Screen 1 - 2: 5.71 ft.  
 Screen 2 - Target: 5.35 ft.  
 Midpoint to Target: 8.20 ft.  
 Target to Witness: 0.25 ft.  
 Headform Size: 7 1/4  
 Witness Plate: 2024-T3 Alum.  
 Barrel Length: 10 in.

Sample Description				Test / Ammunition Description					Chronograph		Test Results
Helmet Model No.	Helmet Sample No.	Helmet Size	Helmet Weight (lbs.)	Shot No.	Impact Location	Degree Obliquity	Caliber	Bullet Weight (gr.) / Type	TIME sx-5	VELOCITY ft/s	Penetration No Penetration
HHV ATE BALLISTIC	2	L / XL	3.17	1	Front	0°	.44 Mag.	240 / JHP	410.8	1390	No Penetration
HHV ATE BALLISTIC	2	L / XL	3.17	2	Back	0°	.44 Mag.	240 / JHP	408.8	1397	No Penetration
HHV ATE BALLISTIC	2	L / XL	3.17	3	Left	0°	.44 Mag.	240 / JHP	415.3	1375	No Penetration
HHV ATE BALLISTIC	2	L / XL	3.17	4	Right	0°	.44 Mag.	240 / JHP	408.3	1398	No Penetration

This test was performed in accordance with the specification requirements and the results properly reflect the ballistic performance of the listed sample.

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**REMARKS / NOTES:**

- Sample tested as received as a finished helmet with styrofoam pads, suspension / retention system, NVG shroud, exterior velcro and accessory rail connectors.
- Penetration Test Headforms used are IAW the dimensions and sizes per Section 5.1.5 and Figure 4.

**Test Round Used:**

NIJ 0101.06 Level IIIA: Speer .44 Magnum 240 gr. JHP (4453) bullet @ NIJ 0101.06 Level IIIA, Threat 2 Velocity of 1400 +/- 30 ft/s

**Impact Locations:**

Sagittal Penetration Test Headform

Shot No. 1: Front (65mm from edge): Impact ≤ 9cm (3.5") above the basic plane and ≤ 5cm (2.0") from the mid-sagittal plane  
 Shot No. 2: Back (75mm from edge): Impact within the area diametrically opposite the front impact area (Shot 1)

Coronal Penetration Test Headform

Shot No. 3: Left Side (50mm from edge): Impact ≤ 5cm (2.0") above the basic plane and ≤ 7.5cm (3.0") from the coronal plane  
 Shot No. 4: Right Side (50mm from edge): Impact ≤ 5cm (2.0") above the basic plane and ≤ 7.5cm (3.0") from the coronal plane

**Test Results / Remarks / Notes:**

Shot No. 1: No Perforation of the helmet; No Perforation of the witness plate by any part of the test specimen or bullet  
 Shot No. 2: No Perforation of the helmet; No Perforation of the witness plate by any part of the test specimen or bullet  
 Shot No. 3: No Perforation of the helmet; No Perforation of the witness plate by any part of the test specimen or bullet  
 Shot No. 4: No Perforation of the helmet; No Perforation of the witness plate by any part of the test specimen or bullet

**Sample Tested:**

Manufacturer: Hard Head Veterans  
 Style: High Cut  
 Type: HHV ATE BALLISTIC  
 No: 83-544-22AUG16  
 Sample No.: 2  
 Size: L / XL  
 Weight (lbs.): 3.17  
 Threat Level: (NIJ 0106.01 & 0108.01): IIIA

Nold/Zerger



**NATIONAL TECHNICAL SYSTEMS**  
**HELMET: SIDE TO SIDE COMPRESSION TEST**

Date Received: 11/17/16  
 Via: Hand  
 Returned Via: Hand

Record No: HHV16004-7  
 Test Date: 11/17/16  
 Customer: Hard Head Veterans

**Sample Information:**

Manufacturer: Hard Head Veterans  
 Size: Large/X-Large  
 Weight (lbs.): 2.280  
 Model No.: ATE  
 Style: N/A  
 Serial No.: N/A  
 DoM: N/A  
 Helmet No.: 3 of 6  
 Conditioning: Ambient

**Test Spec.:**

Per Customer Request

**Test Conditions:**

Temperature: 71 °F  
 Humidity: 53 %

**Test Machine:**

Lloyd Instruments LR10K Plus  
 NEXYGEN Plus 3 Software

**RESULTS**

Test Description	Measurements (in.)				Results (in.) (lbs.)	Pass Fail
	#1	#2	#3	#4		
Maximum Pre-Test Width (Inside Helmet):	N/A	N/A	N/A	N/A	N/A	
Maximum Load on Helmet: <i>Test Date: 11/17/16</i> <i>Test Time: 11:30</i>					<b>982.64</b>	
<u>After 5 min.:</u> Maximum Post-Test Width (Inside Helmet): Difference: <i>Test Date: N/A</i> <i>Test Time: N/A</i>	N/A	N/A	N/A	N/A	N/A	<b>N/A</b>
<u>After 24 hrs.:</u> Maximum Post-Test Width (Inside Helmet): Difference: <i>Test Date: N/A</i> <i>Test Time: N/A</i>	N/A	N/A	N/A	N/A	N/A	<b>N/A</b>
Visible delamination, ply separation, o distortion after testing was completed:						<b>N/A</b>

This test was performed in accordance with the specification requirements and the results properly reflect the performance of the listed sample.

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**REMARKS/NOTES:**

\*Customer requested Side to Side compression until failure. Due to machine and load cell capabilities, testing was cut short. Sample tested is expected to meet or exceed 982 lbs.

Zerger

Load (lbf)

Report No.: HHV16004-7  
Model No.: N/A  
Sample No.: N/A  
Lot No.: N/A  
Peak: 982.64 lbf  
Test Type: Side to Side

