



**Protection Group Danmark
Modified/Abbreviated NIJ 0106.01/STANAG 2920 and
NIJ 0101.06
Testing**

Prepared By:

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NTS Labs- Wichita Division

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PGD23001

1. Introduction

Protection Group Denmark provided five helmet samples and six hard armor samples for testing in accordance with NIJ 0106.01, STANAG 2920 and NIJ 0101.06.

2. Threats and Instrumentation

2.1. Threats

- 9mm 124 gr. FMJ
- 44 Mag. 240 gr. LSWCGC
- 44 Mag. 240 gr. JHP
- 357 Sig 125 gr. FMJ (TMJ)
- 17 gr. FSP
- 7.62mm 147 gr. M80
- 30 Cal. 166 gr. APM2
- 5.56mm 62 gr. M855 (SS109)
- 7.62x39mm 123 gr. MSC
- 7.62x39mm 119 API-BZ
- 7.62x54R 150 gr. B32

2.2 Instrumentation

Projectile velocity measurements were obtained using Oehler Research Model 57 infrared screens with Oehler Research Model 34 chronographs. Penetration was determined by visual examination of the aluminum witness sheet or Roma Clay. BFS measurement were obtained using a calibrated digital depth gauge.

3. Details of Test

The objective of this project was to determine if the samples provided met the P-BFS requirements of NIJ 0106.01 and NIJ 0101.06 and to determine ballistic limit.

Conditioning, velocity, range length and results are noted on the data sheets. The samples were secured to the helmet test rig or clay block using elastic straps with hook and loop fastening. The witness material was inspected after each impact for penetration.

Please refer to NTS Labs, LLC- Wichita Record Number **PGD23001** for details.



4. Summary of Results

Table 1. Summary of Helmet Penetration Testing

Test Record	Conditioned	Threat	Shot Number	Velocity (m/s)	Penetration (Y/N)
PGD23001-1	Wet	44 Mag. LSWC-GC	1	431.4	N
			2	419.6	N
			3	412.1	N
			4	433.9	N
PGD23001-2	Wet	9mm FMJ	1	439.1	N
			2	432.3	N
			3	417.9	N
			4	412.4	N
PGD23001-3	Wet	44 Mag. JHP	1	427.5	N
			2	429.1	N
			3	431.0	N
			4	427.7	N
PGD23001-4	Wet	357 Sig TMJ	1	449.2	N
			2	447.3	N
			3	449.4	N
			4	459.3	N

Table 2. Summary of Helmet V50 Testing

Test Record	Conditioned	Threat	V50 (m/s)	Range of Results	Mixed Range of Results
PGD23001-5	Ambient	17 gr. FSP	659.8	27.4	27.4



NATIONAL TECHNICAL SYSTEMS
NIJ 0106.01 HELMET:
BALLISTIC PENETRATION TEST

Date Received: February 18, 2023
 Via: Fed Ex
 Returned Via: Fed Ex

Record No.: PGD23001-1
 Test Date: March 16, 2023
 Customer: Protection Group Danmark

Test Conditions

Temperature: 21.1 °C
 Humidity: 40 %

Range 2

Muzzle to Screen 1: 1.52 m
 Screen 1 - 2: 1.52 m
 Screen 2 - Target: 1.83 m
 Midpoint to Target: 2.59 m

Test Standard: Modified / Abbreviated NIJ Standard 0106.01 for Ballistic Helmets
 December 1981

Test Method: IAW Paragraph 5.2 Ballistic Penetration Test
 Test Ammunition: IAW NIJ Standard 0108.01, September 1985
 Threat Level: IIIA
 Conditioning: Wet

Headform Size: 7 1/4
 Witness Plate: 2024-T3 Alum.
 Barrel Length: 25.4 cm

Sample Tested Description		Test / Ammunition Description					Chronograph		Test Results
		Shot No.	Impact Location	Degree Obliquity	Caliber	Bullet Weight (gr.) / Type	TIME sx-5	VELOCITY m/s	Penetration
Manufacturer:	Protection Group Danmark								No Penetration
Model No.:	ARCH HIGH CUT								No Penetration
Size:	L	1	Front	0°			353.3	431.4	No Penetration
Serial No.:	22081817	2	Back	0°	.44 Mag.	240 / LSWC GC	363.2	419.6	No Penetration
Lot No.:	3777	3	Right	0°			369.8	412.1	No Penetration
Weight (kg.):	1.360	4	Left	0°			351.2	433.9	No Penetration
Protection Level:	NIJ IIIA								No Penetration

Notes:

•Helmet tested as received from customer with retention / suspension system, chinstrap and pads.

Conditioning:

•Helmet tested at ambient conditions 20 - 28 °C (68 - 82°F) and 30% - 70% RH

Test Ammunition / Velocity Information:

Test Round: .44 Magnum 240 gr. Lead Semi-Wadcutter Gas Checked (LSWCGC)
 Test Velocity: 426 +/- 15 m/s (1400 +/- 50 ft/s)

Technician (s): Wilson / Zerger

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NIJ 0106.01 HELMET:
BALLISTIC PENETRATION TEST

Date Received: February 18, 2023
 Via: Fed Ex
 Returned Via: Fed Ex

Record No.: PGD23001-2
 Test Date: March 16, 2023
 Customer: Protection Group Danmark

Test Conditions

Temperature: 20.6 °C
 Humidity: 40 %

Range 2

Muzzle to Screen 1: 1.52 m
 Screen 1 - 2: 1.52 m
 Screen 2 - Target: 1.83 m
 Midpoint to Target: 2.59 m

Test Standard: Modified / Abbreviated NIJ Standard 0106.01 for Ballistic Helmets
 December 1981

Test Method: IAW Paragraph 5.2 Ballistic Penetration Test
 Test Ammunition: IAW NIJ Standard 0108.01, September 1985
 Threat Level: IIIA
 Conditioning: Wet

Headform Size: 7 1/4
 Witness Plate: 2024-T3 Alum.
 Barrel Length: 25.4 cm

Sample Tested Description		Test / Ammunition Description				Chronograph		Test Results	
		Shot No.	Impact Location	Degree Obliquity	Caliber	Bullet Weight (gr.) / Type	TIME sx-5	VELOCITY m/s	Penetration
Manufacturer:	Protection Group Danmark	1	Front	0°			347.1	439.1	No Penetration
Model No.:	ARCH HIGH CUT	2	Back	0°			352.5	432.3	No Penetration
Size:	L	3	Right	0°	9mm	124 / FMJ	364.7	417.9	No Penetration
Serial No.:	2208108	4	Left	0°			369.5	412.4	No Penetration
Lot No.:	3777R								
Weight (kg.):	1.381								
Protection Level:	NIJ IIIA								

Notes:

•Helmet tested as received from customer with retention / suspension system, chinstrap and pads.

Conditioning:

•Helmet tested at ambient conditions 20 - 28 °C (68 - 82°F) and 30% - 70% RH

Test Ammunition / Velocity Information:

Test Round: Remington (23558), 9mm 124 gr. FMJ RN
 Test Velocity: 426 +/- 15 m/s (1400 +/- 50 ft/s)

Technician (s): Wilson / Zerger

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NIJ 0106.01 HELMET:
BALLISTIC PENETRATION TEST

Date Received: February 18, 2023
 Via: Fed Ex
 Returned Via: Fed Ex

Record No.: PGD23001-3
 Test Date: March 16, 2023
 Customer: Protection Group Danmark

Test Conditions

Temperature: 21.7 °C
 Humidity: 40 %

Range 2

Muzzle to Screen 1: 1.52 m
 Screen 1 - 2: 1.52 m
 Screen 2 - Target: 1.83 m
 Midpoint to Target: 2.59 m

Test Standard: Modified / Abbreviated NIJ Standard 0106.01 for Ballistic Helmets
 December 1981

Test Method: IAW Paragraph 5.2 Ballistic Penetration Test
 Test Ammunition: IAW NIJ Standard 0101.06, July 2008
 Threat Level: IIIA
 Conditioning: Wet

Headform Size: 7 1/4
 Witness Plate: 2024-T3 Alum.
 Barrel Length: 25.4 cm

Sample Tested Description		Test / Ammunition Description					Chronograph		Test Results
		Shot No.	Impact Location	Degree Obliquity	Caliber	Bullet Weight (gr.) / Type	TIME sx-5	VELOCITY m/s	Penetration
Manufacturer:	Protection Group Danmark								No Penetration
Model No.:	ARCH HIGH CUT								No Penetration
Size:	L	1	Front	0°			356.5	427.5	No Penetration
Serial No.:	22081775	2	Back	0°	.44 Mag.	240 / JHP	355.2	429.1	No Penetration
Lot No.:	3777	3	Right	0°			353.6	431.0	No Penetration
Weight (kg.):	1.361	4	Left	0°			356.3	427.7	No Penetration
Protection Level:	NIJ IIIA								No Penetration

Notes:

•Helmet tested as received from customer with retention / suspension system, chinstrap and pads.

Conditioning:

•Helmet tested at ambient conditions 20 - 28 °C (68 - 82°F) and 30% - 70% RH

Test Ammunition / Velocity Information:

Test Round: Speer (4453 or 4736), .44 Magnum 240 gr. Jacketed Hollow Point (JHP)
 Test Velocity: 436 +/- 10 m/s (1430 +/- 30 ft/s)

Technician (s): Wilson / Zerger

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NIJ 0106.01 HELMET:
BALLISTIC PENETRATION TEST

Date Received: February 18, 2023
 Via: Fed Ex
 Returned Via: Fed Ex

Record No.: PGD23001-4
 Test Date: March 16, 2023
 Customer: Protection Group Danmark

Test Conditions

Temperature: 21.1 °C
 Humidity: 37 %

Range 2

Muzzle to Screen 1: 1.52 m
 Screen 1 - 2: 1.52 m
 Screen 2 - Target: 1.83 m
 Midpoint to Target: 2.59 m

Test Standard: Modified / Abbreviated NIJ Standard 0106.01 for Ballistic Helmets
 December 1981

Test Method: IAW Paragraph 5.2 Ballistic Penetration Test
 Test Ammunition: IAW NIJ Standard 0101.06, July 2008
 Threat Level: IIIA
 Conditioning: Wet

Headform Size: 7 1/4
 Witness Plate: 2024-T3 Alum.
 Barrel Length: 25.4 cm

Sample Tested Description		Test / Ammunition Description					Chronograph		Test Results
		Shot No.	Impact Location	Degree Obliquity	Caliber	Bullet Weight (gr.) / Type	TIME sx-5	VELOCITY m/s	Penetration
Manufacturer:	Protection Group Danmark								No Penetration
Model No.:	ARCH HIGH CUT								No Penetration
Size:	L	1	Front	0°			339.3	449.2	No Penetration
Serial No.:	22081533	2	Back	0°	.357 Sig	125 / TMJ	340.4	447.7	No Penetration
Lot No.:	3777	3	Right	0°			339.1	449.4	No Penetration
Weight (kg.):	1.353	4	Left	0°			331.8	459.3	No Penetration
Protection Level:	NIJ IIIA								No Penetration

Notes:

•Helmet tested as received from customer with retention / suspension system, chinstrap and pads.

Conditioning:

•Helmet tested at ambient conditions 20 - 28 °C (68 - 82°F) and 30% - 70% RH

Test Ammunition / Velocity Information:

Test Round: Speer (4362), .357 Sig 125 gr. TMJ
 Test Velocity: 448 +/- 10 m/s (1430 +/- 30 ft/s)

Technician (s): Wilson / Zerger

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V50 BALLISTIC LIMIT TEST

Date Received: February 18, 2023
 Via: Fed Ex
 Returned Via: Fed Ex

Record No.: PGD23001-5
 Test Date: March 16, 2023
 Customer: Protection Group Denmark

Test Conditions

Temperature: 20.5 °C
 Humidity: 51 %

Threat

Projectile: Fragment Simulating Projectile
 Weight: 1.1 g (17 gr.)
 Type: Type 2 (HRC 27 +/- 3)
 Powder: Bullseye
 Barrel Length: 60.96 cm
 Obliquity: 0°
 Yaw: ≤ 5°

Range 2

Muzzle to Screen 1: 1.36 m
 Screen 1 - 4: 1.52 m
 Screen 2 - 3: 1.25 m
 Screen 4 - Target: 2.35 m
 Midpoint to Target: 3.11 m

Sample Description

Manufacturer: Protection Group Denmark
 Model No.: ARCH HIGH CUT
 Size: L
 Serial No.: 22081474
 Lot No.: 3777
 Weight (kg.): 1.365
 Protection Level: NIJ IIIA

Test Standard / Specification

STANAG 2920, Edition 2
 31 July 2013
 Target: Helmet Shell
 Conditioning: Ambient

Witness Information

Witness Sheet: 0.5mm Aluminum Alloy
 Target to Witness: 5 cm

Shot No.	Powder Charge (gr.)	CHRONOGRAPHS 1 - 4		CHRONOGRAPHS 2 - 3		AVERAGE VELOCITY m/s	LOSS VELOCITY m/s	STRIKING VELOCITY m/s	TEST RESULTS		
		TIME sx-5	VELOCITY m/s	TIME sx-5	VELOCITY m/s				IMPACT LOCATION	Shot Included Y or N	Complete - C Partial - P
1	4.7	204.0	747.1	166.2	749.1	748.1	38.7	709.4	Crown	N	C
2	4.4	214.3	711.2	174.6	713.1	712.1	36.7	675.4	Front	Y	P
3	4.6	211.9	719.2	172.5	721.7	720.5	37.2	683.2	Right	N	C
4	4.4	223.4	682.2	181.9	684.4	683.3	35.4	648.0	Back	Y	C
5	4.2	219.6	694.0	178.9	695.9	695.0	35.9	659.0	Left	Y	C
6	4.1	232.1	656.6	189.1	658.4	657.5	33.9	623.6	Crown	N	P
7	4.2	221.4	688.3	180.3	690.5	689.4	35.5	653.9	Front	Y	P
8	4.3	215.2	708.2	175.3	710.2	709.2	36.7	672.5	Right	Y	C
9	4.2	222.6	684.6	181.3	686.7	685.7	35.5	650.2	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		
				659.8 m/s	675.4 m/s	648.0 m/s	27.4 m/s		27.4 m/s		

Notes:

- Helmet was tested as a finished helmet shell with retention/suspension system removed for V50 consistency.
- Helmet Shell secured using helmet V50 fixture IAW Annex E to STANAG 2920, Figures E1 and E2.

Projectile Used:

.22 Caliber, 1.1g +/- 0.03g (17 gr.) Chisel Nose Fragment Simulating Projectile (FSP)
 IAW Appendix 1 to Annex A - Category A2: Type 2 (27 +/- 3 HRC) IAW Figure A1a

Starting Velocity / V50 Calculation:

- Starting Velocity: 700 m/s
- V50 based on (6) fair impacts using (3) partial and (3) complete penetrations with a range of results ≤ 40 m/s.