

# NTS Technical Systems Test Report for Ballistic Resistance Testing

**Project No.:** PH00005754    **Tested:** 13 and 27 March 2023    **P.O. No.:** Signed Quote

**Prepared For**

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Further dissemination only as directed by Optima Ballistic Glass Colombia S.A.S., 11 April 2023.

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**Revision History**

<b>Rev.</b>	<b>Description</b>	<b>Issue Date</b>
0	Initial Release	30 March 2023
1	To correct the listed threat per customer request	11 April 2023

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## 1 Introduction

Optima Ballistic Glass Colombia S.A.S. provided three armor samples to NTS-Belcamp for ballistic resistance testing on 13 and 27 March 2023.

## 2 Threats and Instrumentation

### 2.1 Threats\*

- 7.62 x 63-mm, 180-grain semi jacketed soft point (SJSP) projectiles

\*The projectiles were fired from a universal receiver which was fitted with the appropriate barrel and mounted on an NTS-Belcamp mount.

The threat projectiles were required to have no greater than 5° total yaw. Projectile yaw was measured to ensure that the test impacts were within this constraint by placing a yaw card at the appropriate gun-to-target range during velocity verification shots.

### 2.2 Instrumentation

Projectile velocity measurements were obtained using Oehler Research model No. 57 infrared screens with Y.I.S. Cowden Group Chrono-USB chronographs. Calibration data is provided in Attachment A. A digital still camera was used to document the test, photographs are presented in Attachment B.

## 3 Details of Test

The objective of this test was to conduct a ballistic resistance test on the armor samples in accordance with NOM-142-SCFI-2000 Level D Class 4 and the customer's request. Shot spacing between multiple impacts on each sample was 3 shots on 120 mm triangle. Shots against the armor samples were performed at 0.0° obliquity and ambient range temperature ( $20 \pm 1$  °C).

For each shot, the target was mounted in a rigid frame and clamped to a rigid test fixture. A piece of 0.0254 mm thick (0.001 in) aluminum foil was mounted along the shotline, approximately 50.800 mm  $\pm$  13 mm (2 in  $\pm$  0.5 in) behind the target, to verify complete penetrations. A complete penetration was scored only when the witness material was perforated (i.e., light was visible through the material). All firings were conducted at 14.996 m from the target. The projectile velocities used for the test were in accordance with the referenced performance standard.

## 4 Summary of Results

The results of the ballistic resistance test are shown in Table 1. The round-by-round data sheets for all testing performed are provided on the following pages.

**Table 1. Summary of Ballistic Resistance Test**

Project No.	Sample No.	Size (mm)	Weight (kg)	Threat	Target Obliq. (deg)	Shot No.	Penetration Data	
							Velocity (m/s)	Result
PH00005754-1	15321-101	406.4 x 406.4	15.490	7.62 x 63-mm, 180-grain SJSP	0.0	1	827.84	None
						2	826.92	None
						3	822.96	None
PH00005754-2	15321-103	406.4 x 406.4	15.400	7.62 x 63-mm, 180-grain SJSP	0.0	1	828.75	None
						2	825.4	None
						3	823.87	None
PH00005754-3	15320-101	406.4 x 406.4	15.480	7.62 x 63-mm, 180-grain SJSP	0.0	1	822.96	None
						2	830.28	None
						3	833.02	None

# BALLISTIC RESISTANCE TEST

**NTS-Belcamp**  
 4603B Compass Point Road  
 Belcamp, MD 21017

Client: Optima Ballistic Glass Colombia S.A.S.  
 Project No.: PH00005754-1  
 Test Date: 03/13/2023  
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**Test Panel** Description: Glass sample. D-1

**Manufacturer:** Optima Ballistic Glass Colombia S.A. **Sample No.:** (Grand Slam, V0) 15321-101

Size: 406.4 x 406.4 mm  
 Avg. Thickness: 43.447 mm  
 Thicknesses: 43.383 mm, 43.383 mm, 43.485 mm, 43.536 mm

Weight: 15.490 kg  
 Plies/Laminates: N/A

Date Received: 02/06/2023  
 Received Via: FEDEX, Express Saver  
 Returned Via: FEDEX, Express Saver

## Setup

Shot Spacing: 3 shots on 120 mm triangle  
 Witness Panel: .001 in Aluminum foil  
 Backing Material: N/A  
 Condition: Ambient

Primary Vel. Screens (m): 3.050, 3.150, 5.990, 6.100  
 Primary Vel. Location (m): 4.573  
 Range to Target (m): 14.996  
 Target to Witness (mm): 50.800

Range No.: Range 6  
 Temp: 20.3 °C  
 BP: 30 inHg  
 RH: 41 %  
 Barrel/Gun: WC060518  
 Gunner: Cody Schilling  
 Recorder: William Ellis

## Ammunition

Projectile	Lot No.	Manufacturer	Powder
(1) 7.62 x 63-mm, 180-grain SJSP	NA	Speer	N133

## Applicable Standards or Procedures

- (1) NOM-142-SCFI-2000 Level D Class 4
- (2) Customer Request

Shot No.	Ammo	Powder/ Seating	Weight (gr)	Time 1 (µs)	Vel. 1 (m/s)	Time 2 (µs)	Vel. 2 (m/s)	Avg. Vel. (m/s)	Penetration	Obliq. (°)	Footnotes
1	1	42.3	179.7	3681	828.1	3438	827.5	827.84	None	0.0	
2	1	42.3	179.7	3685	827.2	3442	826.6	826.92	None	0.0	
3	1	42.3	180.0	3702	823.3	3459	822.4	822.96	None	0.0	

Remarks:  
 Required Velocity: 822-837 m/s  
 Projectile Yaw Check: 0° Yaw on all Impacts.  
 Sample tested in a rigid frame

Footnotes:  
 N/A

# BALLISTIC RESISTANCE TEST

**NTS-Belcamp**  
 4603B Compass Point Road  
 Belcamp, MD 21017

Client: Optima Ballistic Glass Colombia S.A.S.  
 Project No.: PH00005754-2  
 Test Date: 03/13/2023  
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**Test Panel** Description: Glass Sample. D-1

**Manufacturer:** Optima Ballistic Glass Colombia S.A. **Sample No.:** (Grand Slam, V0) 15321-103

Size: 406.4 x 406.4 mm  
 Avg. Thickness: 43.212 mm  
 Thicknesses: 43.180 mm, 43.129 mm, 43.256 mm, 43.282 mm

Weight: 15.400 kg  
 Plies/Laminates: N/A

Date Received: 02/06/2023  
 Received Via: FEDEX, Express Saver  
 Returned Via: FEDEX, Express Saver

## Setup

Shot Spacing: 3 shots on 120 mm triangle  
 Witness Panel: .001 in Aluminum foil  
 Backing Material: N/A  
 Condition: Ambient

Primary Vel. Screens (m): 3.050, 3.150, 5.990, 6.100  
 Primary Vel. Location (m): 4.573  
 Range to Target (m): 14.996  
 Target to Witness (mm): 50.800

Range No.: Range 6  
 Temp: 20.5 °C  
 BP: 30 inHg  
 RH: 40 %  
 Barrel/Gun: WC060518  
 Gunner: Cody Schilling  
 Recorder: William Ellis

## Ammunition

Projectile	Lot No.	Manufacturer	Powder
(1) 7.62 x 63-mm, 180-grain SJSP	NA	Speer	N133

## Applicable Standards or Procedures

- (1) NOM-142-SCFI-2000 Level D Class 4
- (2) Customer Request

Shot No.	Ammo	Powder/ Seating	Weight (gr)	Time 1 (µs)	Vel. 1 (m/s)	Time 2 (µs)	Vel. 2 (m/s)	Avg. Vel. (m/s)	Penetration	Obliq. (°)	Footnotes
1	1	42.6	180.3	3676	829.1	3433	828.8	828.75	None	0.0	
2	1	42.6	180.3	3689	826.3	3451	824.2	825.4	None	0.0	
3	1	42.6	180.4	3698	824.2	3455	823.3	823.87	None	0.0	

Remarks:  
 Required Velocity: 822-837 m/s  
 Projectile Yaw Check: 0° Yaw on all Impacts.  
 Sample tested in a rigid frame

Footnotes:  
 N/A

# BALLISTIC RESISTANCE TEST

**NTS-Belcamp**  
4603B Compass Point Road  
Belcamp, MD 21017

Client: Optima Ballistic Glass Colombia S.A.S.  
Project No.: PH00005754-3  
Test Date: 03/27/2023  
Page 1 of 1

**Test Panel** Description: Glass sample. D-2

**Manufacturer:** Optima Ballistic Glass Colombia S.A.

**Sample No.:** (Grand Slam, V0) 15320-101

Size: 406.4 x 406.4 mm  
Avg. Thickness: 43.396 mm  
Thicknesses: 43.358 mm, 43.409 mm, 43.409 mm, 43.409 mm

Weight: 15.480 kg  
Plies/Laminates: N/A

Date Received: 02/06/2023  
Received Via: FEDEX, Express Saver  
Returned Via: FEDEX, Express Saver

## Setup

Shot Spacing: 3 shots on 120 mm triangle  
Witness Panel: .001 in Aluminum foil  
Backing Material: N/A  
Condition: Ambient

Primary Vel. Screens (m): 3.050, 3.150, 5.990, 6.100  
Primary Vel. Location (m): 4.573  
Range to Target (m): 14.996  
Target to Witness (mm): 50.800

Range No.: Range 6  
Temp: 19.4 °C  
BP: 34 inHg  
RH: 44 %  
Barrel/Gun: WC060518  
Gunner: Cody Schilling  
Recorder: William Ellis

## Ammunition

Projectile	Lot No.	Manufacturer	Powder
(1) 7.62 x 63-mm, 180-grain SJSP	NA	Speer	N133

## Applicable Standards or Procedures

- (1) NOM-142-SCFI-2000 Level D Class 4  
(2) Customer Request

Shot No.	Ammo	Powder/ Seating	Weight (gr)	Time 1 (µs)	Vel. 1 (m/s)	Time 2 (µs)	Vel. 2 (m/s)	Avg. Vel. (m/s)	Penetration	Obliq. (°)	Footnotes
1	1	41.3	180.3	3705	822.7	3456	823.3	822.96	None	0.0	
2	1	41.5	180.0	3670	830.6	3426	830.3	830.28	None	0.0	
3	1	41.5	180.2	3661	832.4	3414	833.3	833.02	None	0.0	

### Remarks:

Required Velocity: 822-837 m/s  
Projectile Yaw Check: 0° Yaw on all Impacts.  
Sample tested in a rigid frame

### Footnotes:

N/A

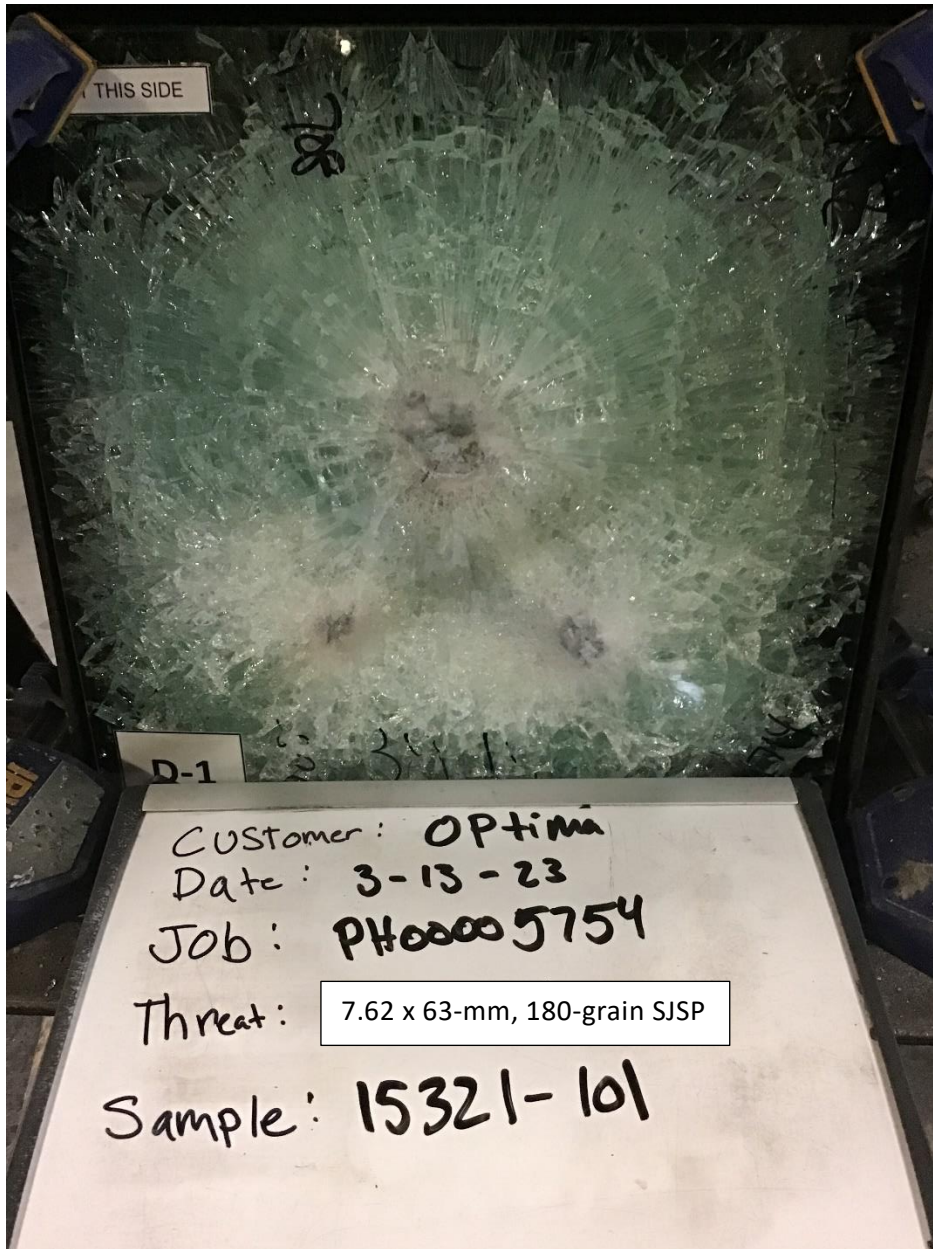


## ATTACHMENT A CALIBRATION DATA

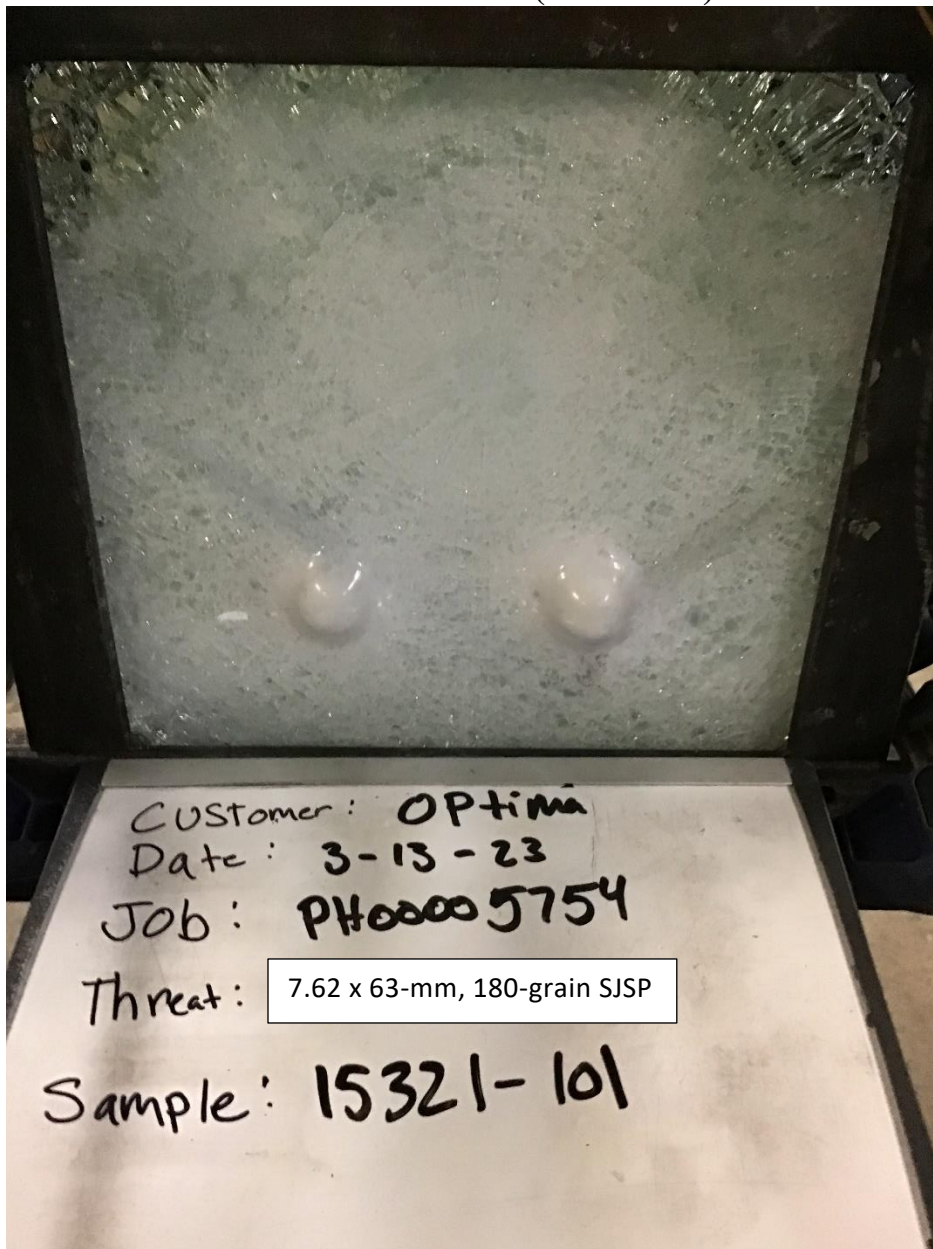
**NCR = No Calibration Required.**

Asset Number	Asset Type	Manufacturer	Model	Calibrated	Due
WC024531	Barrel (gun)	Bill Wiseman & Company	N/A	NCR	NCR
WC060805	Range (shooting)	N/A	N/A	NCR	NCR
WC079392	Gauge (Depth)	Starrett	3753A-6/150	07/13/2022	NCR
WC067374	Chronograph 1	YIS/Cowden Group, Inc	Chrono USB	8/4/2022	8/4/2023
WC067375	Chronograph 2	YIS/Cowden Group, Inc	Chrono USB	8/4/2022	8/4/2023
WC074968	Powder Scale	RCBS	1500	4/28/2022	4/28/2023
WC060530	Floor scale	Ohaus	CD-33	1/9/2023	1/9/2024
WC079301	Scale (Digital Balance)	Ohaus	SPX6201	8/31/2022	8/31/2023
WC075050	Therm. Clock. Humidity Monitor	Control Company	4040	10/28/2022	10/28/2023
WC064333	100 ft Tape Measure	Starrett	530-100	2/24/2022	2/24/2024
WC074970	25 ft Tape Measure	Dewalt Industrial Tool	DWHT33373	6/25/2021	6/25/2023
WC078618	25 ft Tape Measure	Craftsman	CMHT37525	6/25/2021	6/25/2023
WC079364	Thermometer	Control Company	4378	11/4/2021	11/4/2023
WC075099	BFD Tool	Starrett	3753A-6/150	12/14/2022	12/14/2023
WC079241	BFD Bridge	Starrett	3753A-6/150	10/28/2022	10/28/2023
WC027072	Angle Block	SPI	91-316-0	1/8/2022	1/8/2024

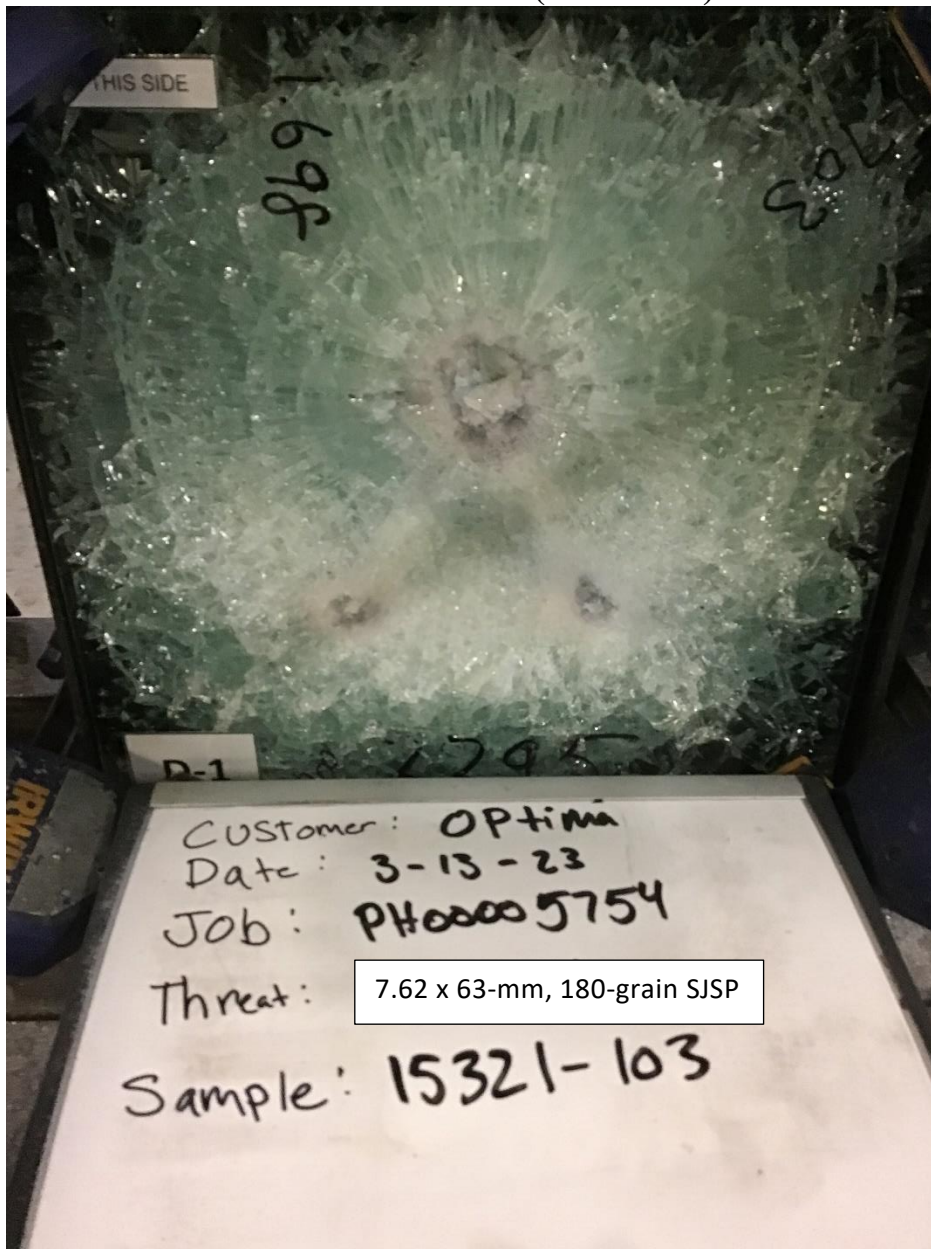
**ATTACHMENT B  
PHOTOGRAPHS**



**ATTACHMENT B  
PHOTOGRAPHS (continued)**

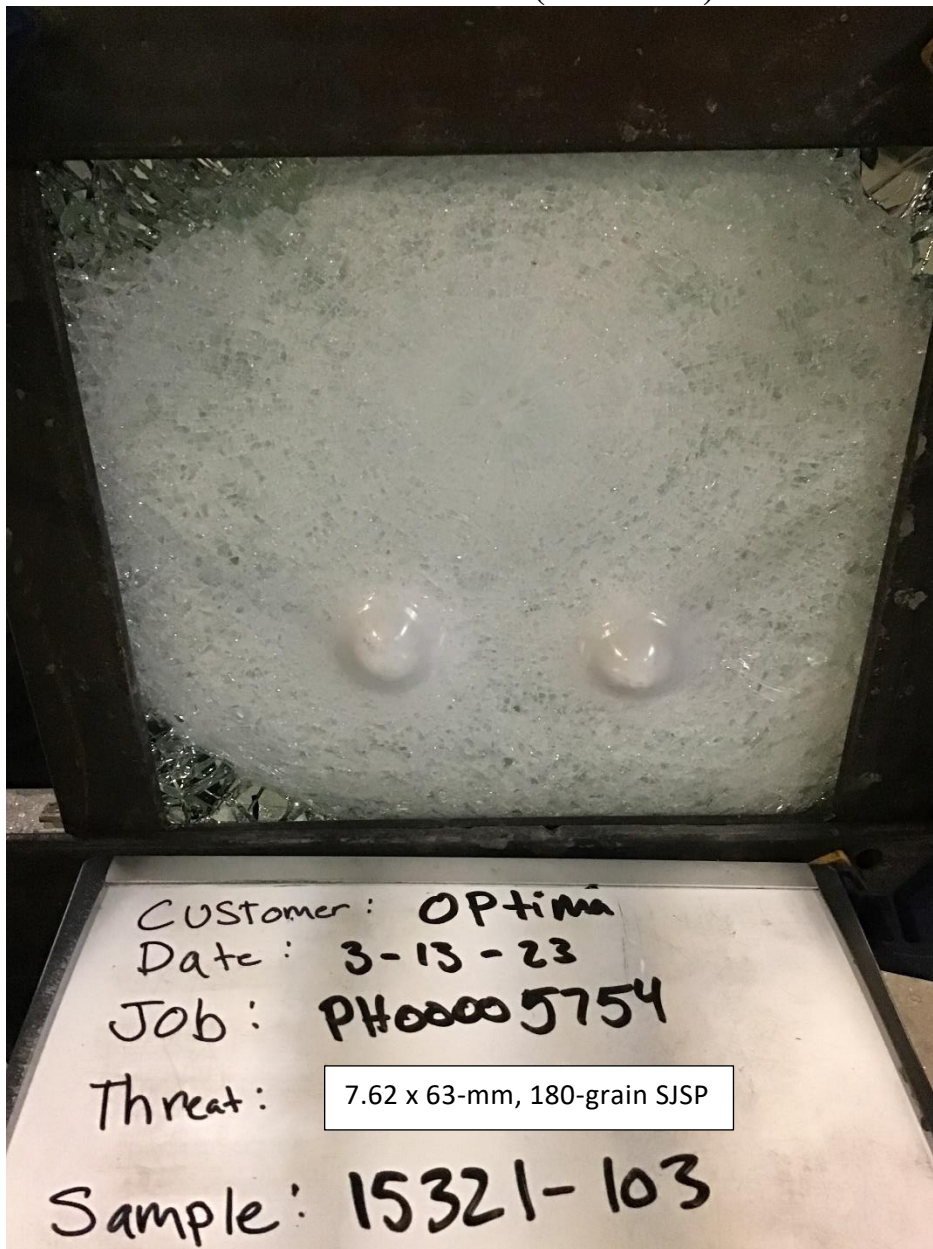


**ATTACHMENT B  
PHOTOGRAPHS (continued)**

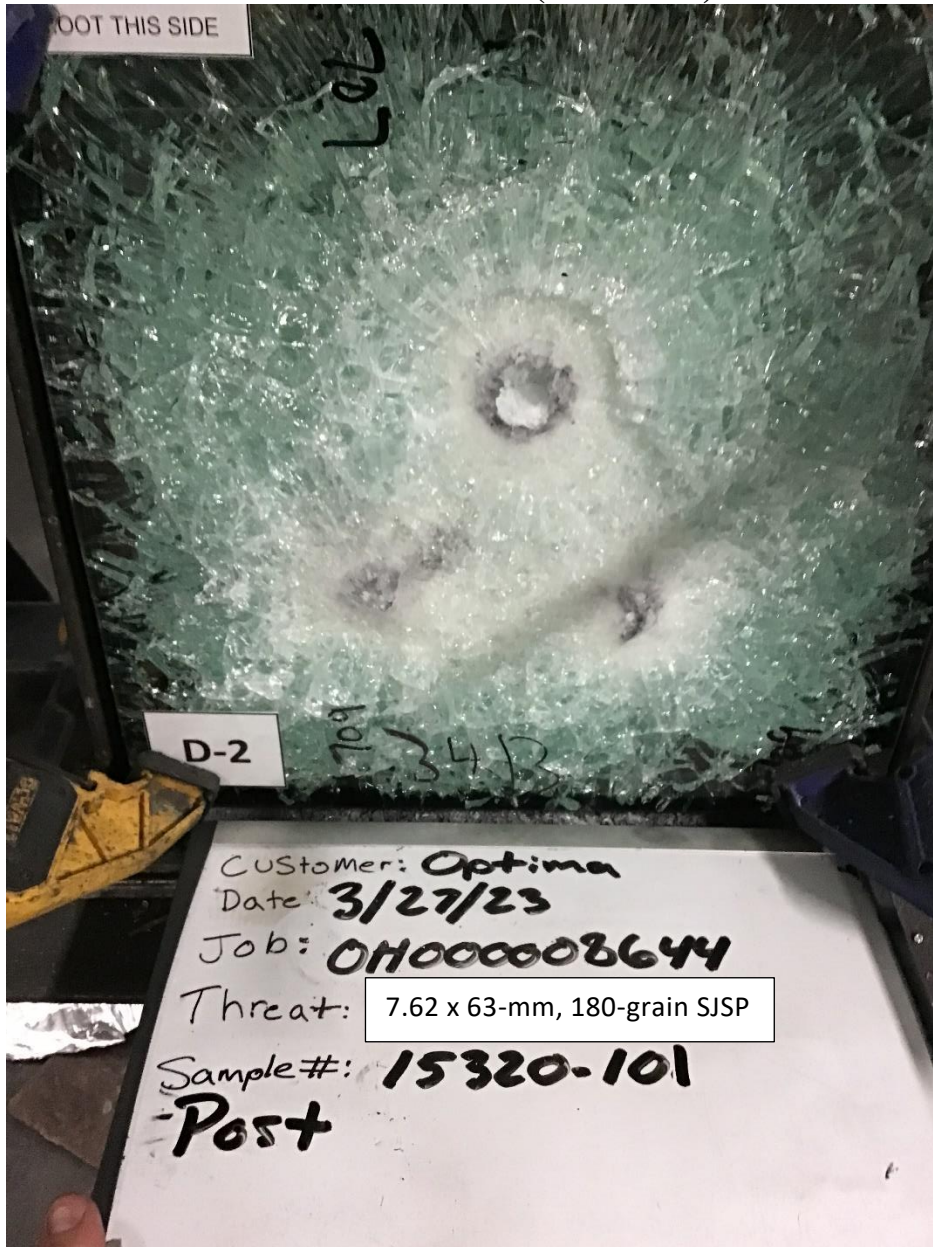




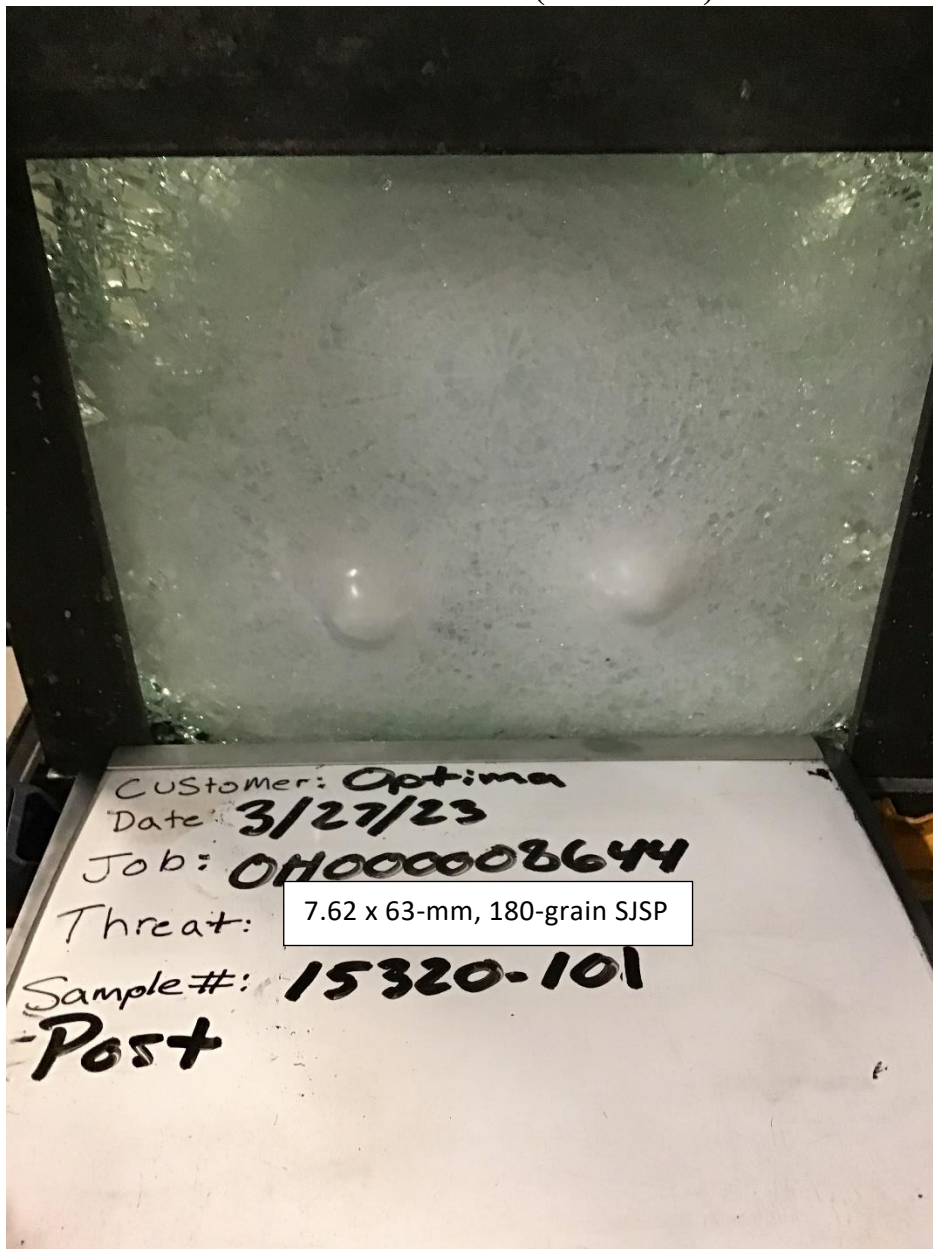
**ATTACHMENT B**  
**PHOTOGRAPHS (continued)**



**ATTACHMENT B  
PHOTOGRAPHS (continued)**



**ATTACHMENT B  
PHOTOGRAPHS (continued)**



**END OF REPORT**