

NTS Technical Systems Test Report for Ballistic Resistance Testing

Project No.: OH000010185 Tested: 9 May 2023 P.O. No.: TBD

Prepared For

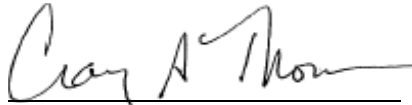
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Further dissemination only as directed by VERSARE, May 2023.

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VERSARE PROPRIETARY INFORMATION

Revision History

Rev.	Description	Issue Date
0	Initial Release	10 May 2023

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1 Introduction

VERSARE provided 2 samples armor samples to NTS-Belcamp for ballistic resistance testing on 9 May 2023.

2 Threats and Instrumentation

2.1 Threats*

- 7.62 x 51-mm, 149-grain M80 full metal jacketed (FMJ) projectile

*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 3° 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 NIJ-STD-0108.01 Level III. Shot spacing between multiple impacts on a single sample was in accordance with the referenced performance standard. Shots against the armor samples were performed at 0° obliquity and ambient range temperature (69.7°F).

For each shot, the target was clamped to a rigid test fixture. A piece of 0.508 mm thick (0.020 in) type 2024 T3 aluminum was mounted along the shotline, approximately 152 mm ±13 mm (6 in ±0.5 in) behind the inside surface of the strike face, 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 50.000 ft 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 Results

Project No.	Sample No.	Size (in)	Weight (lbs)	Threat	Target Obliq. (deg)	Shot No.	Penetration Data	
							Velocity (ft/s)	Result
OH000010185-1	Whiteboard 5 Layer	45.75 x 26.50	52.180	7.62 x 51-mm, 149-grain M80 FMJ	0	1	2730	None
						2	2657 ^a	None
						3	2762	None
						4	2742	None
						5	2679 ^a	None
						6	2762	None
						7	2730	None
OH000010185-2	Fabric Board 5 Layer	26.25 x 26.25	24.890	7.62 x 51-mm, 149-grain M80 FMJ	0	1	2742	None
						2	2701	None
						3	2725	None
						4	2720	None
						5	2703	None

^a Insufficient Velocity.

BALLISTIC RESISTANCE TEST

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

Client: VERSARE
 Project No.: OH000010185-1
 Test Date: 05/09/2023
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Test Panel Description: Ballistic whiteboard

Manufacturer: VERSARE

Sample No.: (M80, V50) Whiteboard 5 Layer

Size: 45.75 x 26.50 in
 Avg. Thickness: 1.903 in
 Thicknesses: 1.900 in, 1.910 in,
 1.900 in, 1.900 in

Weight: 52.180 lbs
 Plies/Laminates: N/A

Date Received: 05/09/2023
 Received Via: UPS, 2 Day, AM
 Delivery
 Returned Via: UPS, 2 Day, AM
 Delivery

Setup

Shot Spacing: NIJ-STD-0108.01
 Level III
 Witness Panel: 0.02 in 2024-T3 Al
 Backing Material: N/A
 Condition: Ambient

Primary Vel. Screens (ft): 6.500, 9.500
 Primary Vel. Location (ft): 8.000
 Range to Target (ft): 50.000
 Target to Witness (in): 6.000

Range No.: Range 5
 Temp: 69.7 °F
 BP: 30.4 inHg
 RH: 41 %
 Barrel/Gun: WC024524
 Gunner: Vincent Johnson
 Recorder: Joseph Gerdes

Ammunition

Projectile	Lot No.	Manufacturer	Powder
(1) 7.62 x 51-mm, 149-grain M80 FMJ	lc/14	Military	N133

Applicable Standards or Procedures

(1) NIJ-STD-0108.01 Level III

Shot No.	Ammo	Powder/ Seating	Weight (gr)	Time 1 (µs)	Vel. 1 (ft/s)	Time 2 (µs)	Vel. 2 (ft/s)	Avg. Vel. (ft/s)	Penetration	Obliq. (°)	Footnotes
1	1	39.8	146.9	1099	2730	1099	2730	2730	None	0	
2	1	39.8	146.9	1129	2657	1129	2657	2657	None	0	(a)
3	1	40.2	146.9	1086	2762	1086	2762	2762	None	0	
4	1	40.2	147.0	1094	2742	1094	2742	2742	None	0	
5	1	40.2	147.0	1120	2679	1120	2679	2679	None	0	(a)
6	1	40.2	147.0	1086	2762	1086	2762	2762	None	0	
7	1	40.2	147.0	1099	2730	1099	2730	2730	None	0	

Remarks:

Required velocity: 2700 - 2800 ft/s.
 Projectile Yaw Check: 0° on all impacts.

Footnotes:

(a) Insufficient Velocity.

BALLISTIC RESISTANCE TEST

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

Client: VERSARE
 Project No.: OH000010185-2
 Test Date: 05/09/2023
 Page 1 of 1

Test Panel Description: Ballistic fabric board

Manufacturer: VERSARE

Sample No.: (M80, V50) Fabric Board 5 Layer

Size: 26.25 x 26.25 in
 Avg. Thickness: 1.888 in
 Thicknesses: 1.890 in, 1.890 in,
 1.890 in, 1.880 in

Weight: 24.890 lbs
 Plies/Laminates: N/A

Date Received: 05/09/2023
 Received Via: UPS, 2 Day, AM
 Delivery
 Returned Via: UPS, 2 Day, AM
 Delivery

Setup

Shot Spacing: NIJ-STD-0108.01
 Level III
 Witness Panel: 0.02 in 2024-T3 Al
 Backing Material: N/A
 Condition: Ambient

Primary Vel. Screens (ft): 6.500, 9.500
 Primary Vel. Location (ft): 8.000
 Range to Target (ft): 50.000
 Target to Witness (in): 6.000

Range No.: Range 5
 Temp: 69.7 °F
 BP: 30.4 inHg
 RH: 41 %
 Barrel/Gun: WC024524
 Gunner: Vincent Johnson
 Recorder: Joseph Gerdes

Ammunition

Projectile	Lot No.	Manufacturer	Powder
(1) 7.62 x 51-mm, 149-grain M80 FMJ	lc/14	Military	N133

Applicable Standards or Procedures

(1) NIJ-STD-0108.01 Level III

Shot No.	Ammo	Powder/ Seating	Weight (gr)	Time 1 (µs)	Vel. 1 (ft/s)	Time 2 (µs)	Vel. 2 (ft/s)	Avg. Vel. (ft/s)	Penetration	Obliq. (°)	Footnotes
1	1	40.2	147.3	1094	2742	1094	2742	2742	None	0	
2	1	40.2	147.3	1112	2698	1109	2705	2701	None	0	
3	1	40.2	147.3	1103	2720	1099	2730	2725	None	0	
4	1	40.3	147.3	1103	2720	1103	2720	2720	None	0	
5	1	40.3	147.3	1110	2703	1110	2703	2703	None	0	

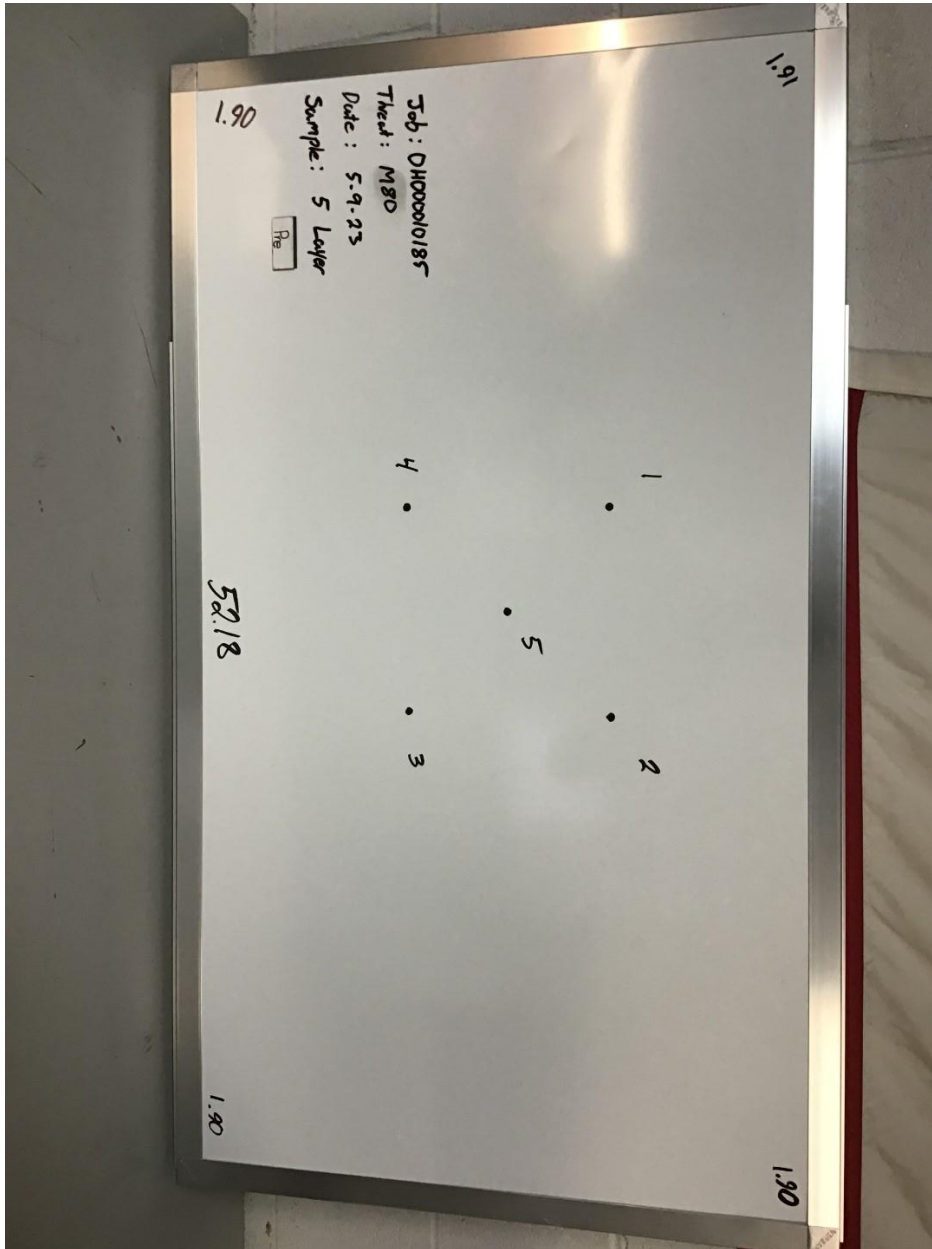
Remarks:
 Required velocity: 2700 - 2800 ft/s.
 Projectile Yaw Check: 0° on all impacts.

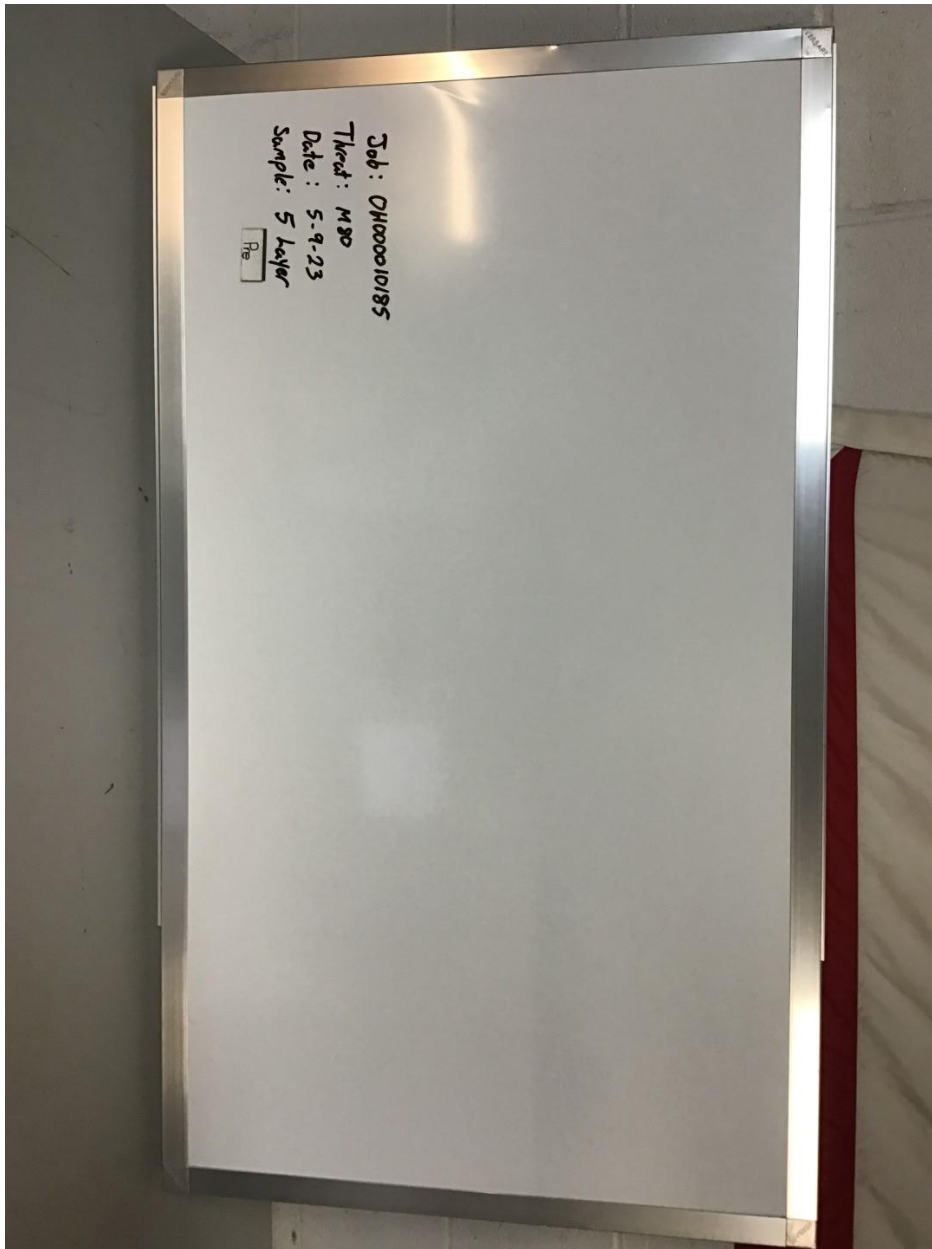
Footnotes:
 N/A

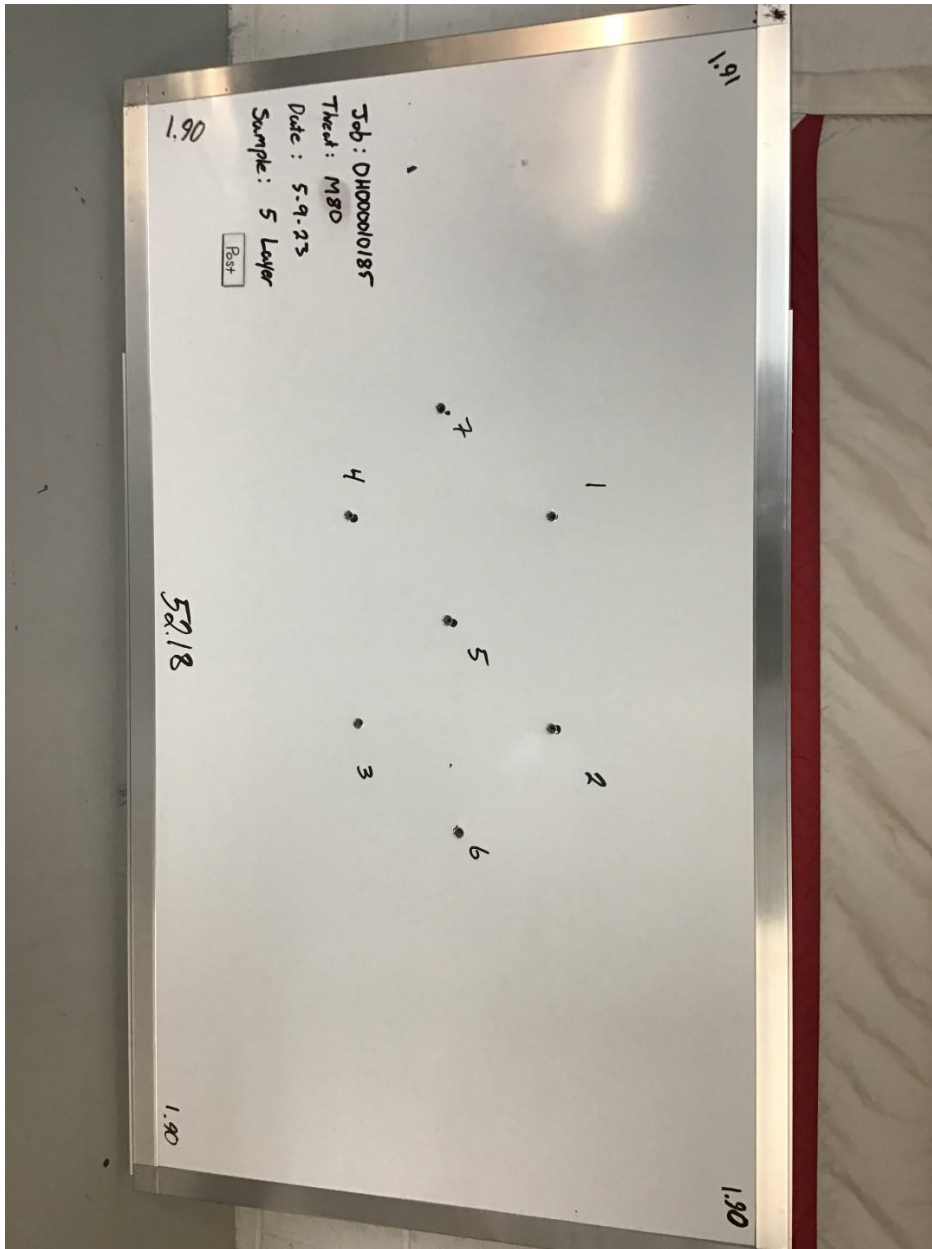
ATTACHMENT A CALIBRATION DATA

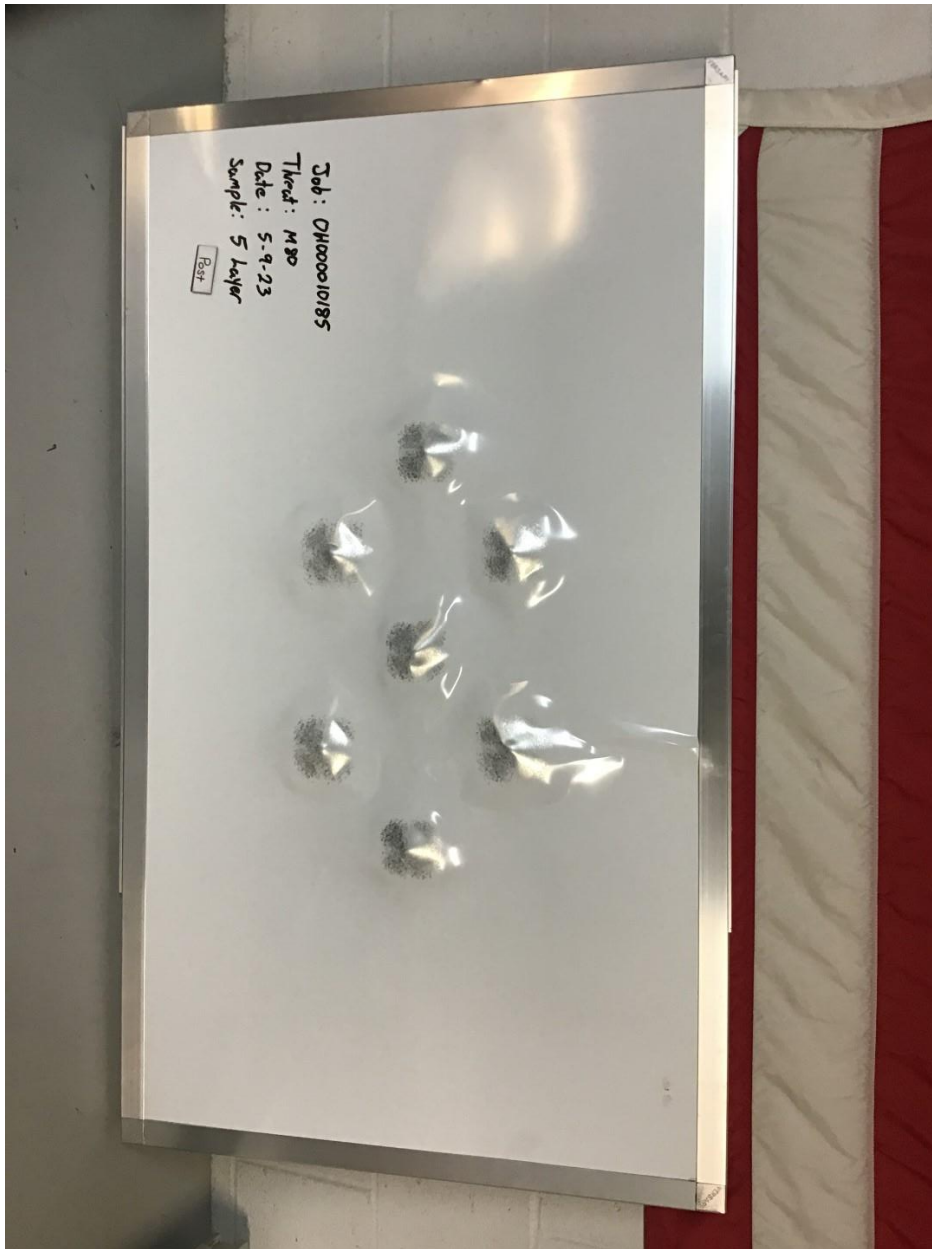
EQUIPMENT INVENTORY							
Work Center #	Serial Number	Make	Model	Description	Assigned To	Calibration Date	Calibration Due Date
WC079409	240	YIS/Cowden Group, Inc	Chrono USB	Chronograph 1	Range 5	7/21/2022	7/21/2023
WC079410	238	YIS/Cowden Group, Inc	Chrono USB	Chronograph 2	Range 5	7/21/2022	7/21/2023
WC079245	A21106927	RCBS	1500	Powder Scale	Range 5	11/6/2022	11/6/2023
WC060370	26059102	Sartorius	Combics	Floor scale	Range 5	1/9/2023	1/9/2024
WC067383	192291247	Control Company	4040	Therm./Clock/ Humidity Monitor	Range 5	10/28/2022	10/28/2023
WC060658	WC060658	Starrett	530-100	100 ft Tape Measure	Range 5	7/26/2022	7/26/2024
WC078616	WC0678616	Craftsman	CMHT37525	25 ft Tape Measure	Range 5	6/25/2021	6/25/2023
WC074990	WC074990	Dewalt Industrial Tool	DWHT36107	25 ft Tape Measure	Range 5	8/18/2021	8/18/2023
WC075095	WC075095	Control Company	4378	Thermometer	Range 5	11/16/2022	11/16/2024
WC079405	21/320074	Starrett	3753A-6/150	BFD Tool	Range 5	7/29/2022	7/29/2023
WC079238	21/090033	Starrett	3753A-6/150	BFD Bridge	Range 5	10/27/2022	10/27/2023
WC060415	841	SPI	S501-201	Angle Block	Range 5	10/15/2021	10/15/2023

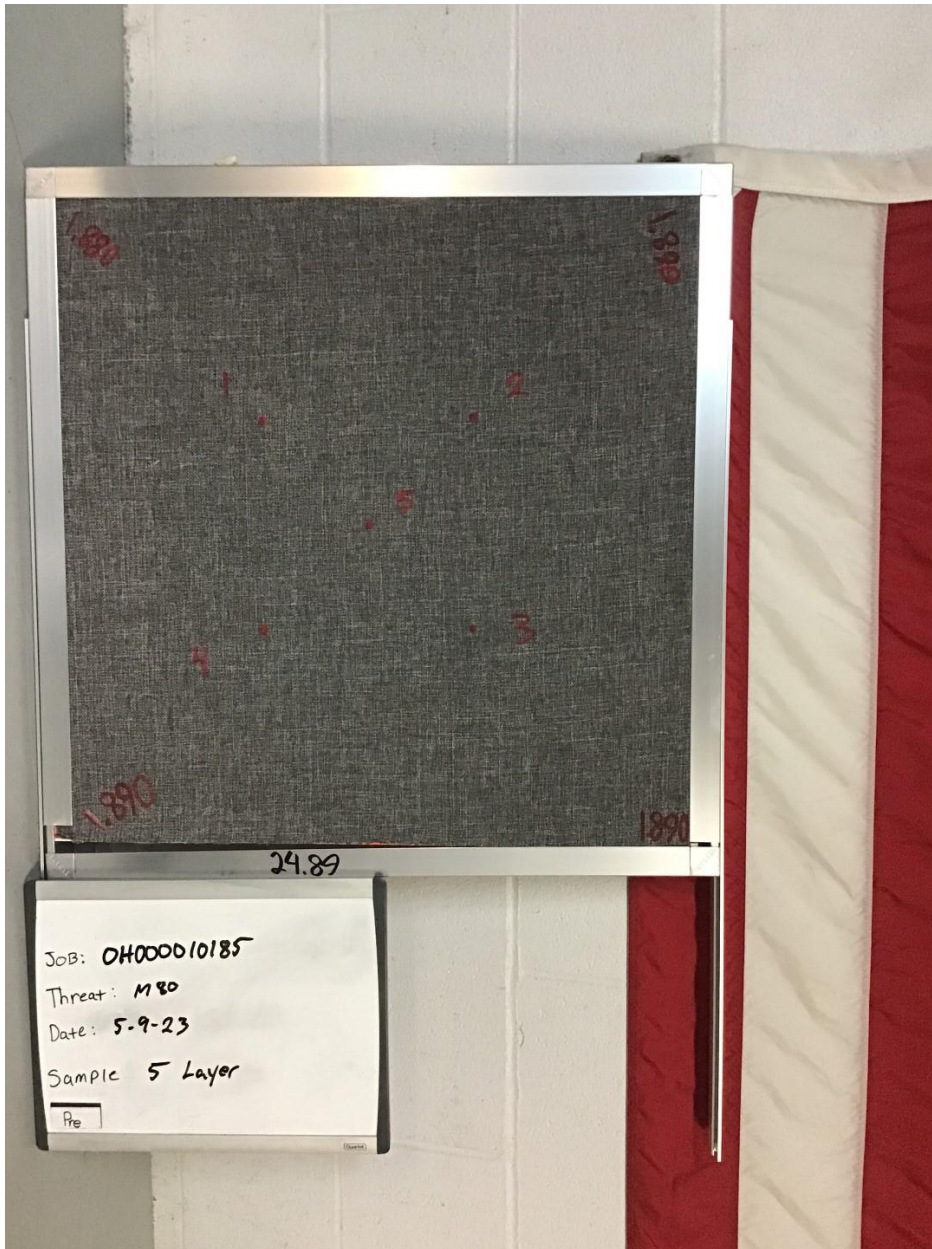
**ATTACHMENT B
PHOTOGRAPHS**

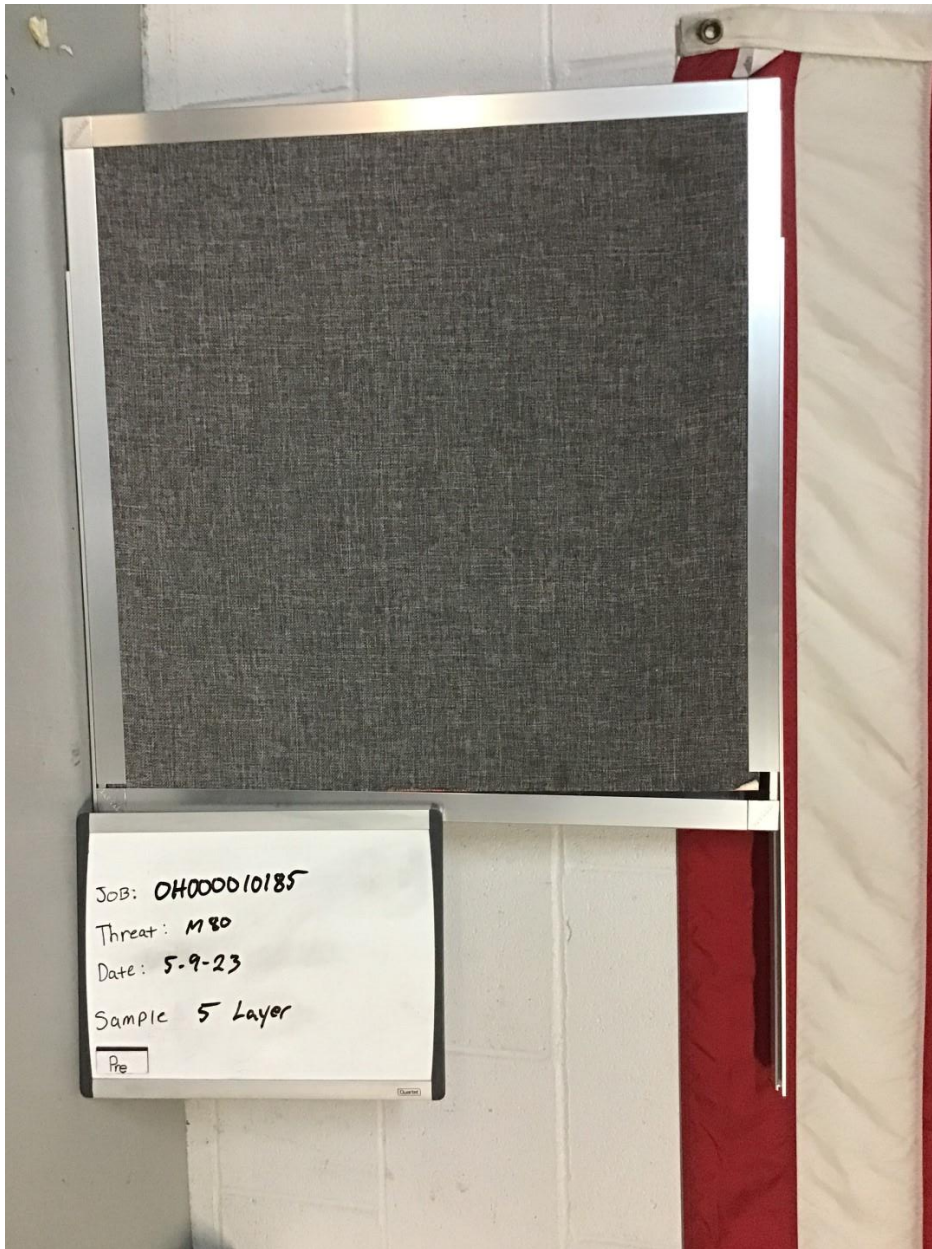


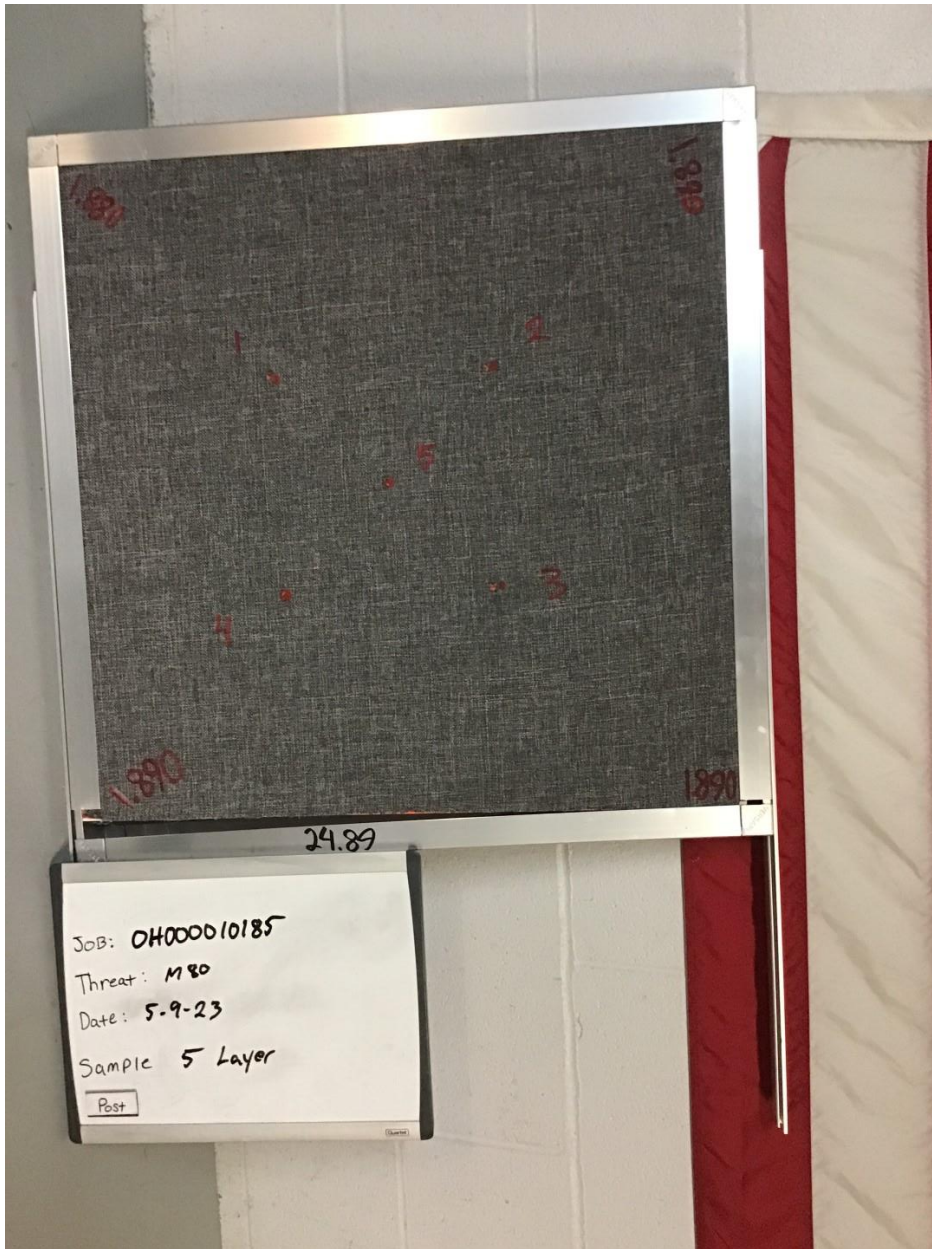


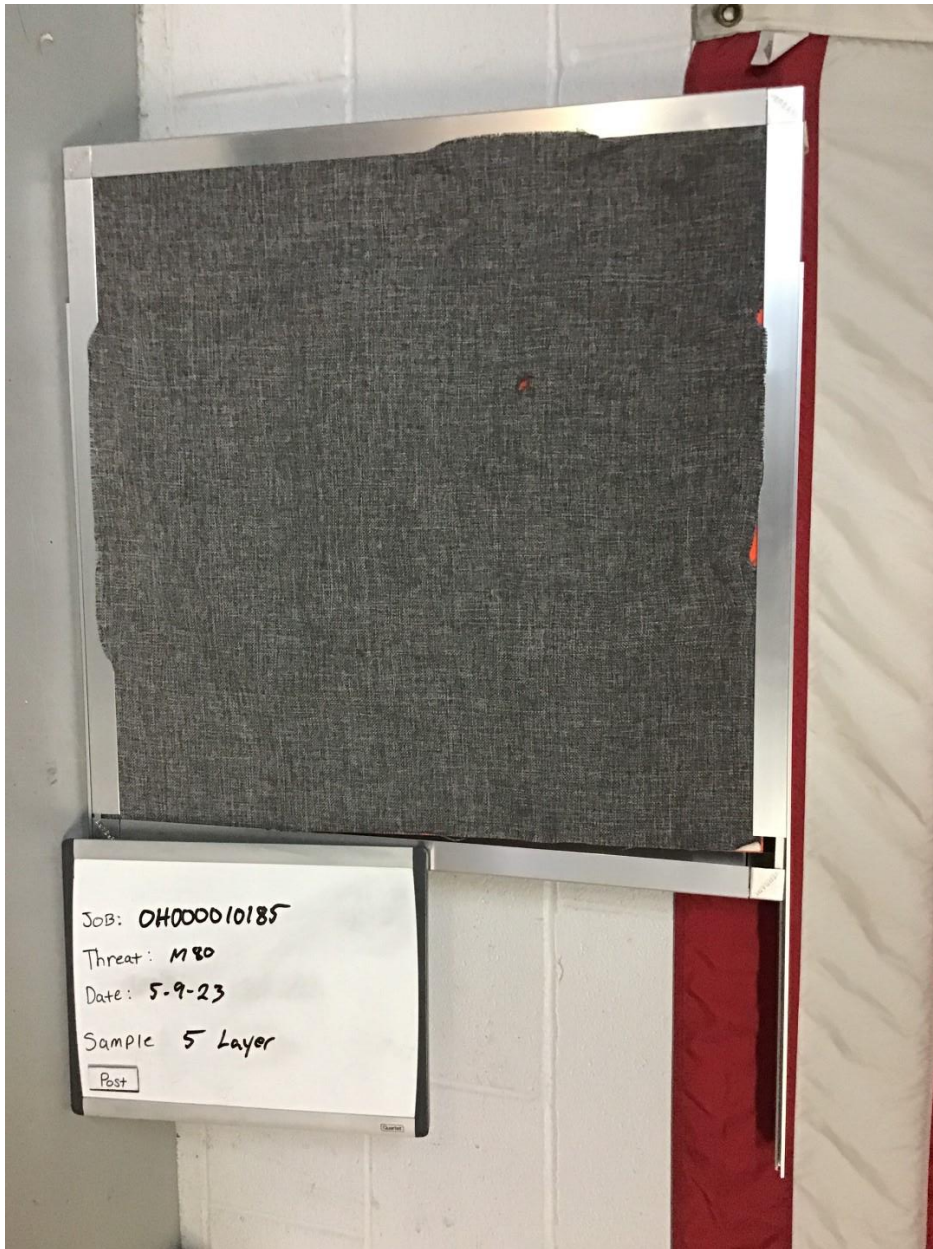












END OF REPORT