RIT | Golisano Institute for Sustainability

Final Report for:

Elven Technologies

Rancho Cordova, CA

Vertical Flammability Testing

January 6, 2023

Prepared for:
Vamekh Kherkheulidze
Engineer, Founder & CEO
Elven Technologies
2155 Pantages Circle, Rancho Cordova, CA 95670
Phone: (279)208-8791
Email: vk@elventech.net

Prepared by:
Jeremy Siegfried
Golisano Institute for Sustainability
Rochester Institute of Technology
190 Lomb Memorial Drive
SUS/Building 81
Rochester, New York 14623-0426
Phone: (585) 475-4049
E-mail: jjsgis@rit.edu
Website: https://www.rit.edu/sustainabilityinstitute/

Disclaimer

This technical report is prepared consistent with the terms and purposes of the Research Agreement between Elven Technologies (the "Company") and Rochester Institute of Technology (RIT) on behalf of the Golisano Institute for Sustainability (GIS) dated December 13, 2022. This report is the product of work conducted by RIT for a project entitled, "Vertical Flammability Testing." All conclusions herein are subject to the warranty, indemnification, and liability limitations, and other provisions, described in the Project Form agreement executed by RIT and Elven Technologies (the "Parties").

RIT and GIS cannot endorse any particular product or service. This report is the result of the tests and/or studies conducted and described; it is not to be interpreted as any type of specific endorsement of Company's product or service.

This report is intended for Elven Technologies internal use only. Elven Technologies may use the report externally if used in its entirety. Any other use of less than a complete version of this report is allowed only if Elven Technologies first obtains the written permission of RIT.

Table of Contents

A. Executive Summary

The Golisano Institute for Sustainability (GIS) at Rochester Institute of Technology (RIT) conducted a project entitled, “Vertical Flammability Testing” for Elven Technologies.

For this project, GIS tested 10 samples of multilayer material as supplied by Elven Technologies following ASTM D6413 as a guideline for Vertical Flammability Testing. Five (5) of the samples were prepared by Elven Technologies with the fabric portion of the sample taken from the width of the roll and 5 of the samples were prepared by Elven Technologies with the fabric portion of the sample taken from the length of the material and labeled with a “W” and “L” respectively.

The results of the work performed include the afterglow time, the char length as measured on the front and back of the samples, the soot length as measured on the front and back of the samples, and post-test images of the samples.

B. Summary of Work Performed

Some portions of ASTM D6413 were not followed as the samples being tested did not conform to the standard requirements given the composition of the material and the sample’s response during testing. Samples were tested as received from Elven Technologies with no alteration or conditioning. The exact composition and nature of the samples received were not disclosed to GIS, but they were multilayer samples with a seamed edge and GIS was instructed to ensure flame application occurred to the seam of the samples.

The testing was completed using a Deatak Model VC-2 Vertical Flammability Tester with a 38 mm flame height, the bottom of the sample seam positioned 19 mm above the burner, and an exposure time of 12 s as specified in ASTM D6413.

The as received samples were labeled with a “W” and an “L” to indicate the width and length sections as produced from the fabric roll and were labeled by GIS 1W – 5W and 1L – 5L respectively. Each sample was clamped into the sample holder on the left and right sides of the sample at the top and the bottom. The sample was placed in the chamber and the chamber door was closed prior to flame exposure. The samples were each exposed to the flame for 12 seconds and after exposure the samples were monitored for any afterflame or afterglow as a result of the exposure. The samples were then removed from the chamber and the char length and soot length were measured on the front and back of each sample and they were photographed.

C. Results

Following exposure to the flame, the samples did not have a detectable afterflame to measure so no time was reported. Due to the discoloration from soot generated during the flame application, an alternative measurement of the soot length was also documented on each sample which is not part of the ASTM D6413 standard. The char length was indicated by the melting or degradation of the material while the soot length was indicated by the white discoloration of the material. The weight application to measure the char length, as directed by ASTM D6413, was not utilized due to the sample size and geometry.

1. Afterglow Time, Char Length and Soot Length

Sample ID	After Glow (s)	Back Char Length (in)	Front Char Length (in)	Back Soot Length (in)	Front Soot Length (in)
1L	20	0.35	0.0	12.0	5.5
2L	2	0.17	0.0	6.0	4.5
3L	2	0.13	0.0	4.3	3.3
4L	6	0.20	0.0	5.5	3.8
5L	4	0.28	0.0	7.0	2.8
1W	0	0.06	0.0	3.8	1.5
2W	0	0.16	0.0	6.0	1.3
3W	1	0.13	0.0	4.3	2.8
4W	2	0.25	0.0	6.0	1.3
5W	2	0.18	0.0	4.5	2.5

2. Post Test Images

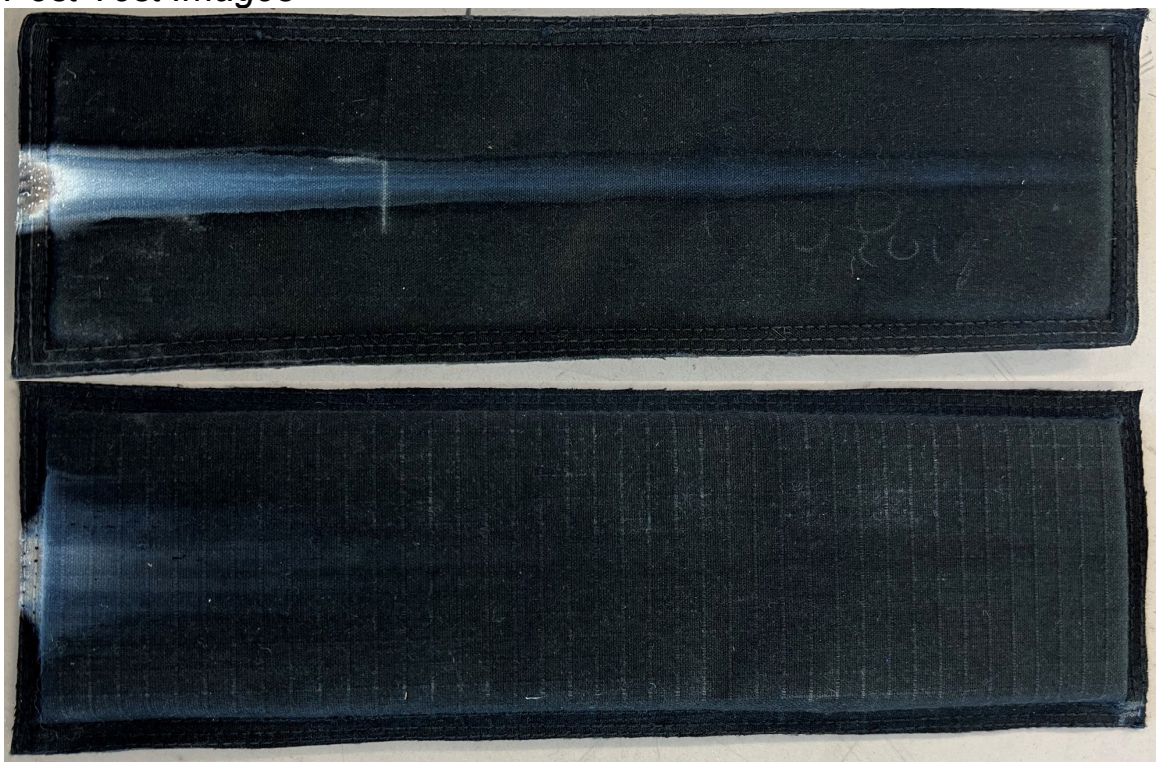

Figure 1: Sample 1L Post Test Back (Top) and Front (Bottom) Images.

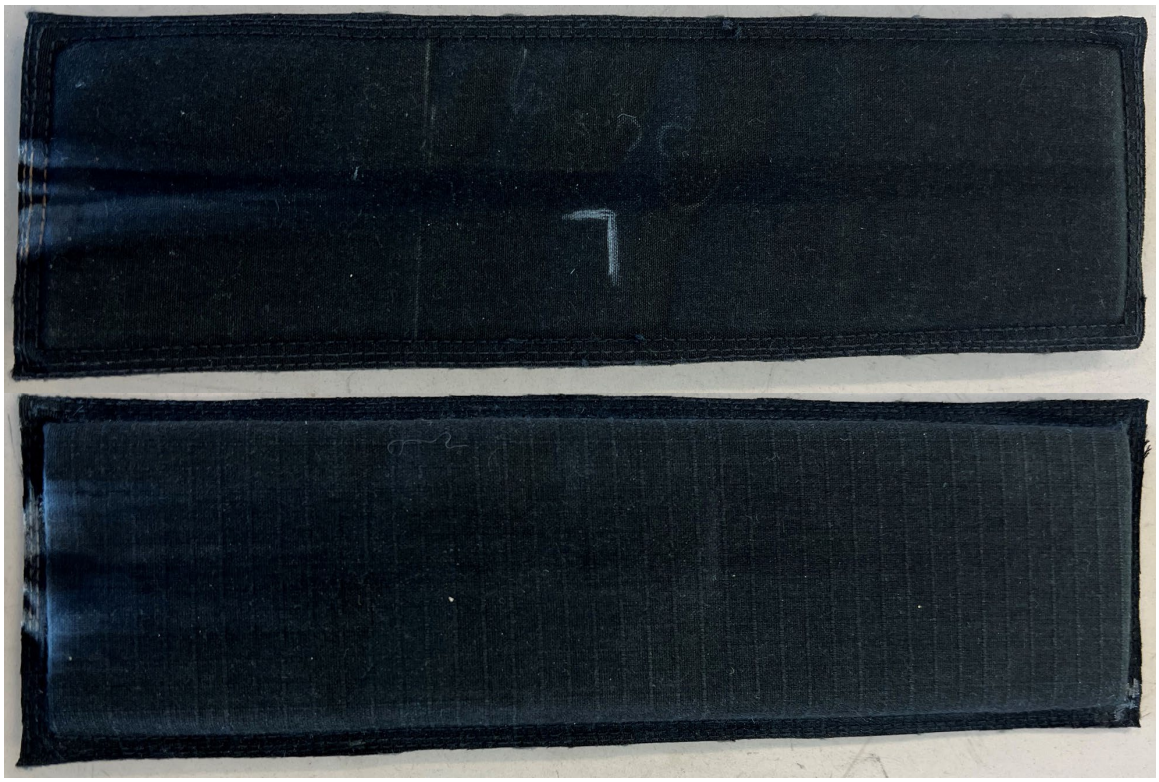

Figure 2: Sample 2L Post Test Back (Top) and Front (Bottom) Images.

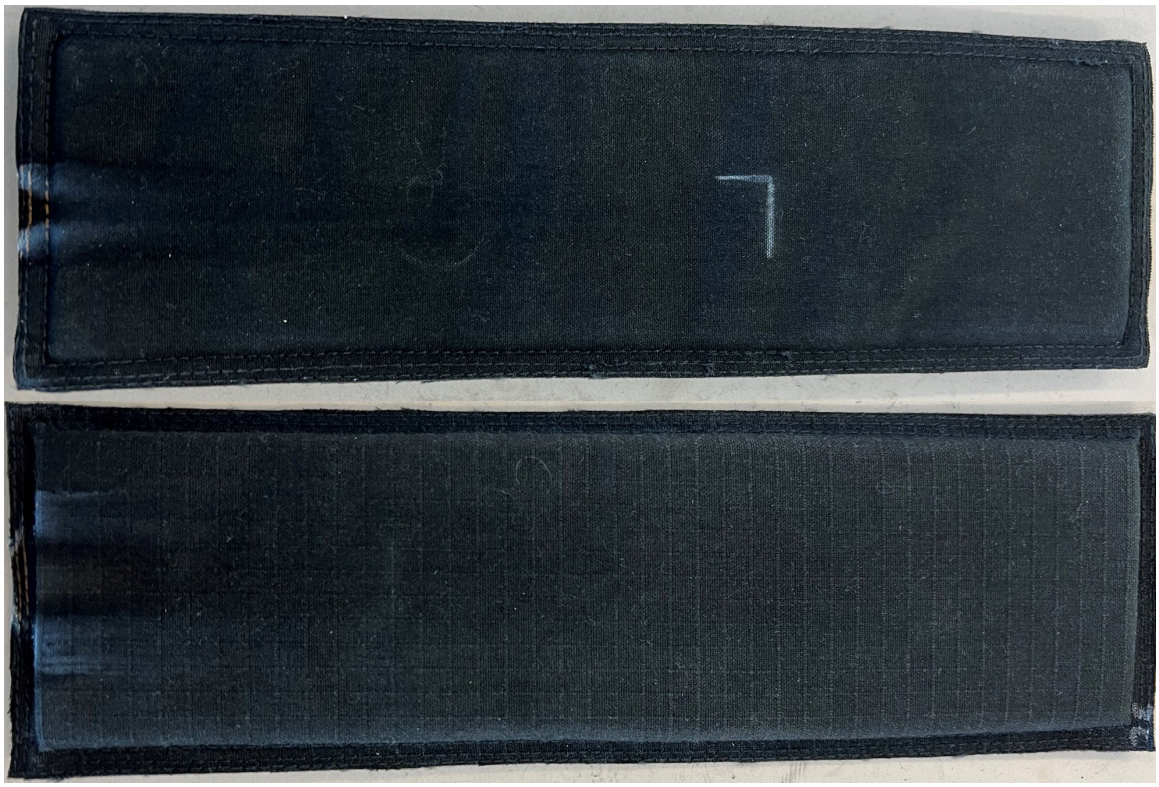

Figure 3: Sample 3L Post Test Back (Top) and Front (Bottom) Images.

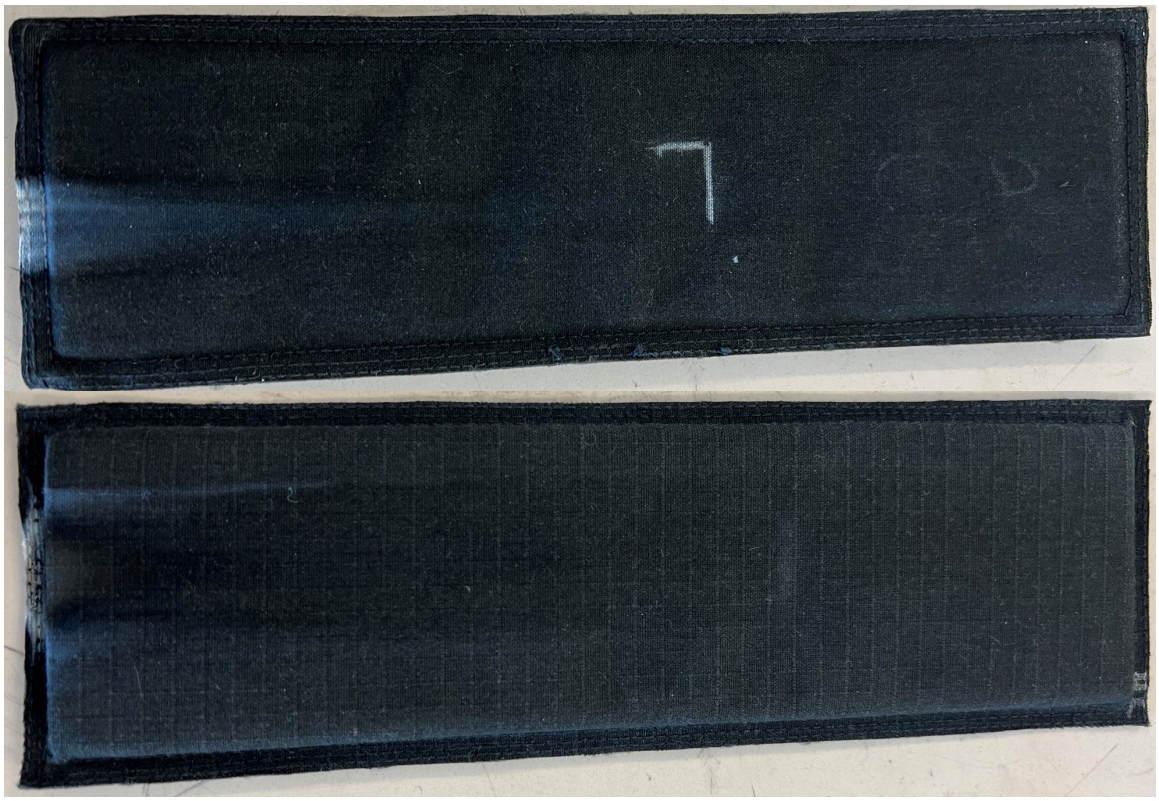

Figure 4: Sample 4L Post Test Back (Top) and Front (Bottom) Images.

Figure 5: Sample 5L Post Test Back (Top) and Front (Bottom) Images.

Figure 6: Sample 1W Post Test Back (Top) and Front (Bottom) Images.

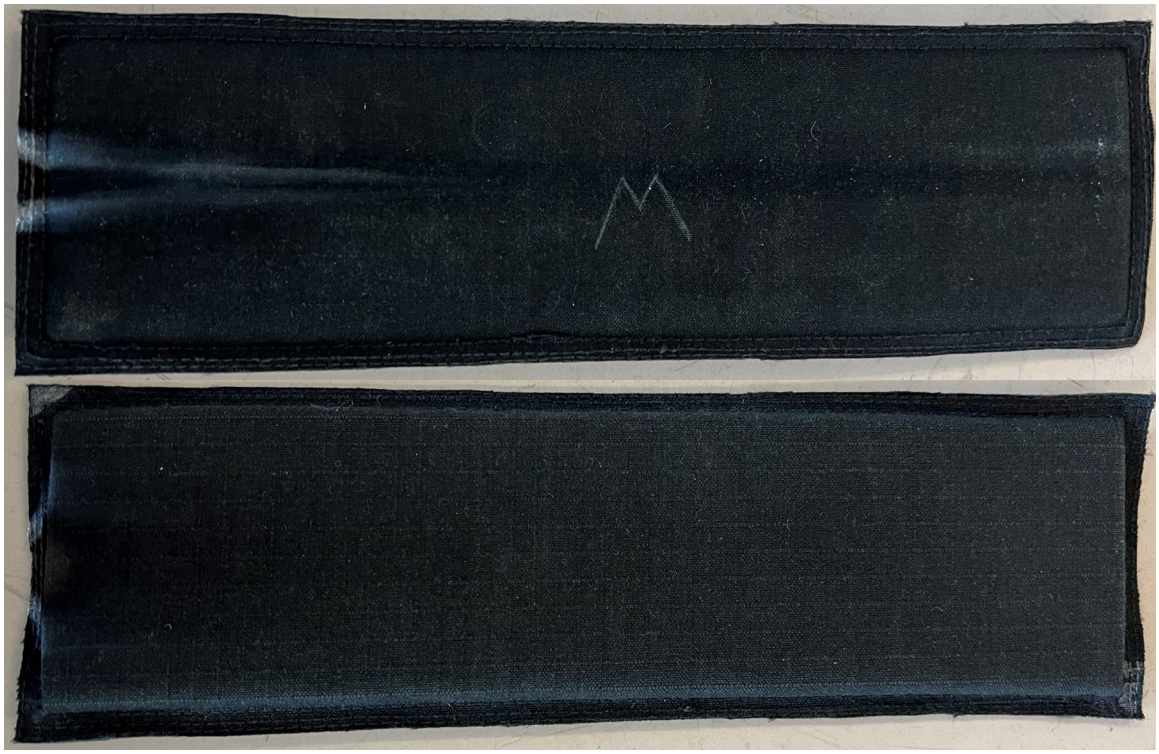

Figure 7: Sample 2W Post Test Back (Top) and Front (Bottom) Images.

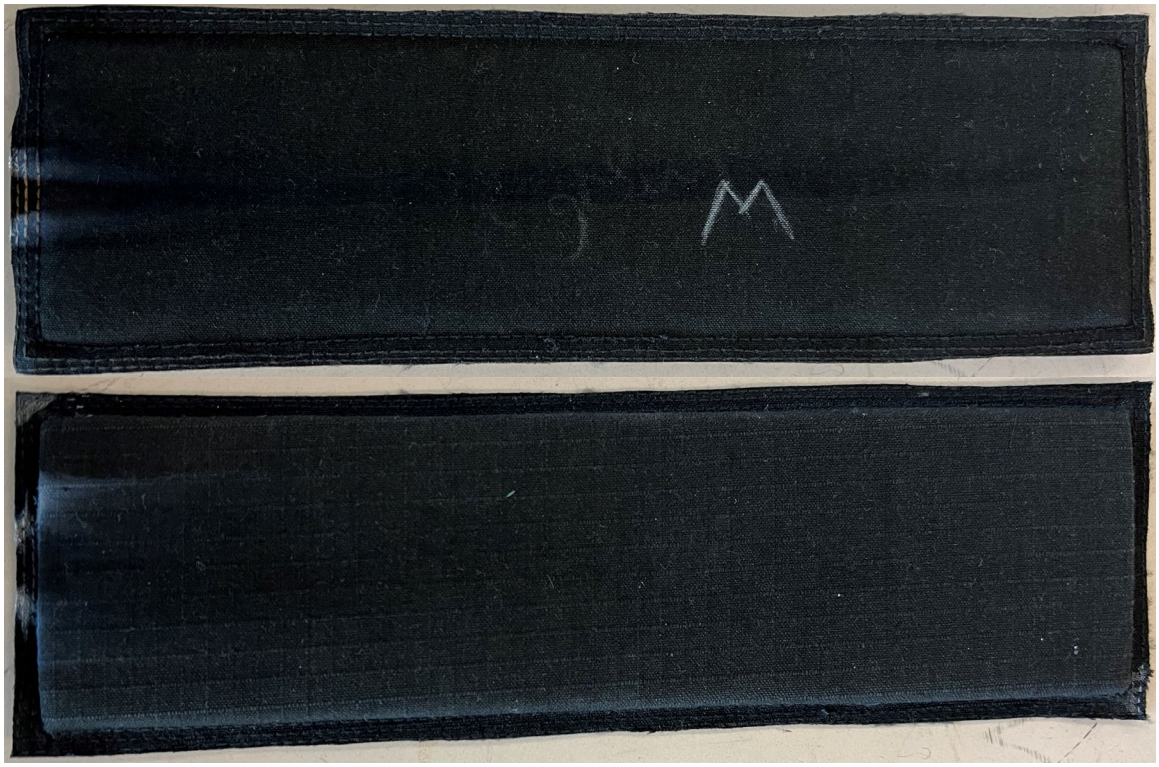

Figure 8: Sample 3W Post Test Back (Top) and Front (Bottom) Images.

Figure 9: Sample 4W Post Test Back (Top) and Front (Bottom) Images.

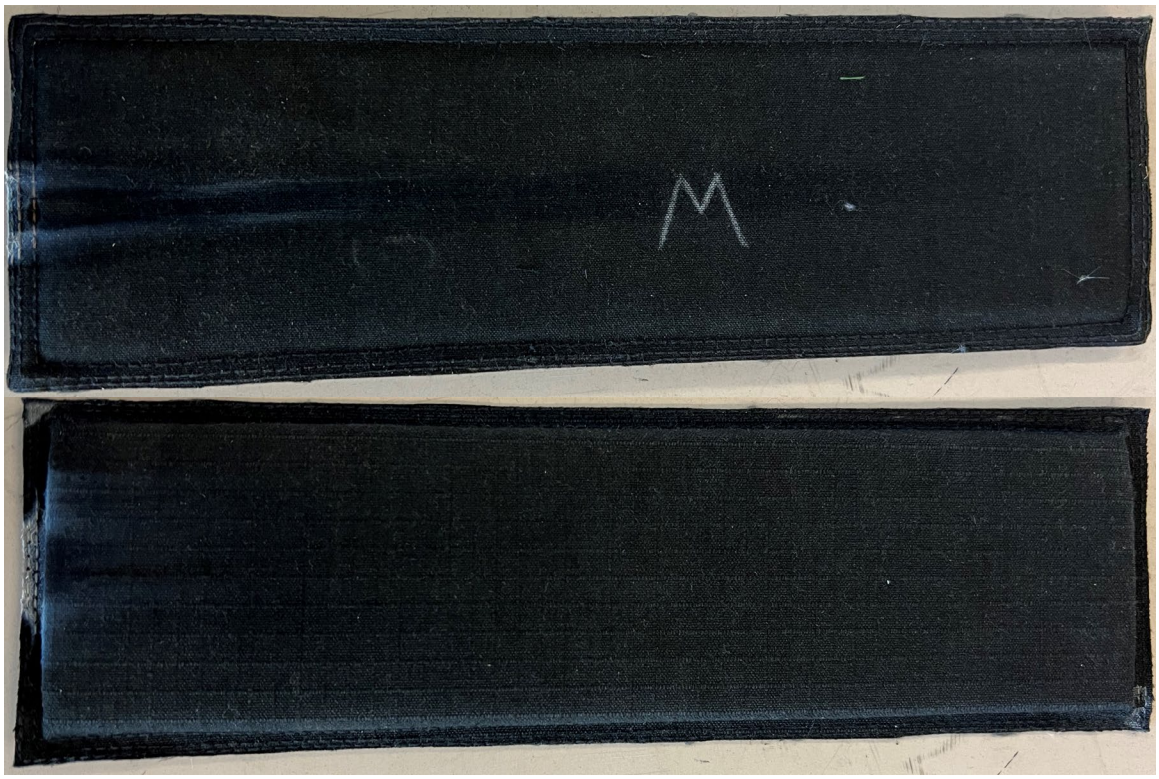

Figure 10: Sample 5W Post Test Back (Top) and Front (Bottom) Images.