ASSESSMENT OF TENSILE STRENGTH, PUNCTURE RESISTANCE, AND CUT RESISTANCE OF ELVEN FLAMEPROOF COMPOSITE

Report: ELVEN-20230511

Prepared for

Elven Technologies
2155 Pantages Circle
Rancho Cordova, CA 95670

Prepared by:

Rui Li, PhD
Manager for Labs and Special Projects

Laboratories for Functional Textiles and Protective Clothing
1078/2094 LeBaron Hall
626 Morrill Road
Ames, Iowa 50011
Phone 515-294-2086
FAX 515-294-6364

May 11th, 2023

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OBJECTIVE OF THE WORK

The objective of the project was to evaluate the tensile strength, puncture resistance, and cut resistance of a flameproof composite provided by the customer in a standard lab environment.

PROCEDURES

Standard Test Methods:

ASTM D5034-21 Standard Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test)

ASTM F1342/F1342M-05 (2022) Standard Test Method for Protective Clothing Material Resistance to Puncture

ASTM F1790/F1790M-15 (2021) Standard Test Method for Measuring Cut Resistance of Materials Used in Protective Clothing with CPP Test Equipment

Sample Assessed:
Material 1: FLAMEPROOF COMPOSITE

All samples were conditioned in standard environment 21ºC RH 65% for 24 hours before test. All samples were tested "as received", no further treatment was applied.

Testing and report completed by:

Rui Li, Ph.D.
Manager for Labs and Special Projects
Laboratories for Functional Textiles
and Protective Clothing
College of Human Sciences
Iowa State University

Testing and report approved by:

Guowen Song, Ph.D.
Professor and Noma Scott Lloyd Chair in
Textiles and Clothing
Department of Apparel, Events and
Hospitality Management (AESHM)
College of Human Sciences
Center for Multiphase Flow Research and
Education (CoMFRE)
(https://comfre.iastate.edu/)
Iowa State University

SUMMARY OF RESULTS

Table 1. Tensile strength

Sample	Load at break (N)	% Elongation at break (mm/mm)	Extension at break (mm)	NFPA PPE requirement (N)
1	2289.53	0.13	9.83	>623

Table 2. Puncture resistance

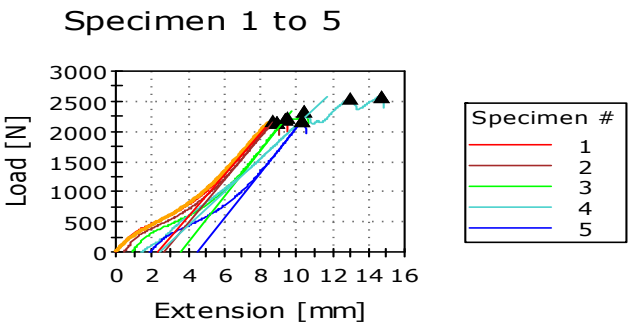
Sample	Load at break (N)	Compressive strain at break (mm/mm)	Compressive stress at break (MPa)	NFPA PPE requirement (N)
1	94.80	1.13	9.48	>40

Table 3. Cut resistance

Sample	Load (N)	Blade travel distance (mm)	Cut results	NFPA PPE requirement
1	26	31.27	Cut through	>22mm @ 3N

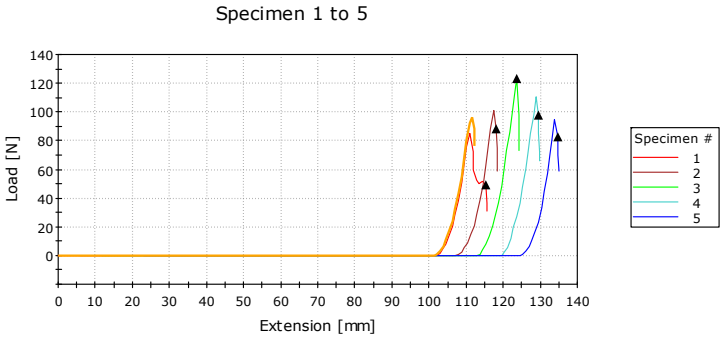
DATA AND DATA ANALYSIS

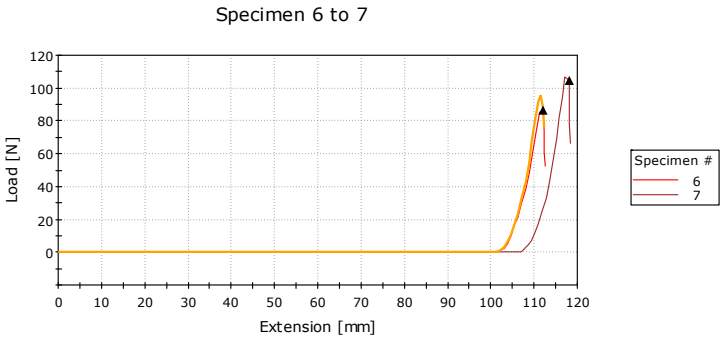
Tensile test



Specimen	Load at break (N)	% Elongation at break (mm/mm)	Extension at break (mm)
1	2196.47607	0.12398	9.44705
2	2148.89697	0.11085	8.44713
3	2336.19189	0.12398	9.44701
4	2585.17188	0.17516	13.34707
5	2180.90112	0.11086	8.44717
Mean	2289.52759	0.12896	9.82708
SD	180.152	0.027	2.030

Puncture test





Specimen	Load at break (N)	Compressive strain at break (mm/mm)	Compressive stress at break (MPa)
1	80.15273	1.15292	8.01527
2	88.27079	1.12447	8.82708
3	123.61388	1.11964	12.36139
4	97.70690	1.12122	9.77069
5	82.59369	1.11614	8.25937
6	86.81327	1.12064	8.68133
7	104.41638	1.12414	10.44164
Mean	94.79538	1.12560	9.47954
SD	15.28136	0.01237	1.52814

Cut test

Specimen	Load (N)	Blade travel distance (mm)	Cut results
1	6	>50	No cut through
2	8	>50	No cut through
3	10	>50	No cut through
4	15	>50	No cut through
5	20	>50	No cut through
6	26	32.1	Cut through
7	26	26.7	Cut through
8	26	35.01	Cut through
Mean	-	31.27	-
SD	-	4.22	-