

Hugh Hoagland Consulting, Inc.

ArcWear.com

Electric Arc Exposure Tests

Material System

Layer 1

8.0 oz/yd² 271 g/m² 2x1 LH Twill, 65% Modacrylic 35% N317

Style: 85917 - Protera 180

Color: Navy-10057Q

Actual Areal Density (AAD): 8.0 oz/yd² 271 g/m²

Layer 2

6.5 oz/yd² 220 g/m² Interlock Knit, 88% Cotton 12% Nylon

Style: S130 Indura Ultra Soft

Color: Orange

Actual Areal Density (AAD): 7.2 oz/yd² 244 g/m²

Report Number: 1102P83, Revision: 00

April, 2011

Tests Conducted by Kinectrics High Current Laboratory
Toronto, Ontario, Canada

Essential test data and test results are presented in the table below and on the attached data pages as follows:

- arc rating ATPV or EBT or both and plots of the burn injury probability (ATPV) or breakopen probability (EBT) or both versus E_i
- test specimen description and order of layer
- distance from an arc center line to the panel surface
- subjective evaluation
- heat attenuation factor (HAF) and plot of HAF on E_i
- ignition probability value (if determined during testing)

Rating

Material system specified in the table below received arc rating as

(ATPV) = 41.9 cal/cm²

Customer	CE&Y ^æEJ {
Layer 1	
Material design	8.0 oz/yd ² 271 g/m ² 2x1 LH Twill, 65% Modacrylic 35% N317
Style	85917 - Protera 180
Color	Navy-10057Q
Actual Areal Density (AAD) as tested	8.0 oz/yd ² 271 g/m ²
Layer 2	
Material design	6.5 oz/yd ² 220 g/m ² Interlock Knit, 88% Cotton 12% Nylon
Style	S130 Indura Ultra Soft
Color	Orange
Actual Areal Density (AAD) as tested	7.2 oz/yd ² 244 g/m ²

The order of layering is numbered starting from the outer layer listed first.

Requested by: ~~CE&Y ^æEJ {~~

Approved by Hugh Hoagland
Arcwear.com

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- assumes any liabilities with respect to the use of, or for damages resulting from the use of, any information, apparatus, method, or process disclosed in this report

Date:
Wed, Apr 20, 2011

Ref #
K-418310

FR Fabric Arc Test Summary



Client Information

Client Name
Street Address
(XXXXXXXXXX)
Y

Fabric description

Two Layers, Style 85917 - Protera 180 8.0 oz/yd² 271 g/m² 2x1 LH Twill, 65% Modacrylic
35% N317, Navy 10057Q, AAD 8.0 oz/yd² 271 g/m² over Style S130 Indura Ultra Soft 6.5 oz/yd² 220 g/m²
Interlock Knit, 88% Cotton 12% Nylon, Orange, AAD 7.2 oz/yd² 244 g/m², ArcWear# 1102P83

Reference Standard

ASTM F1959/F1959M-06ae1 Standard Test Method for Determining the Arc Rating of Materials for Clothing

Test Parameters:

Test current: kA

Number of samples analysed: 21

Distance to Fabric: 12 inches

Incident Energy Range: 19 to 58 cal/cm²

Arc Gap: 12 inches

Summary

The arc rating of this material is intended for use as flame resistant clothing for workers exposed to electric arcs. The material used in this test method are in the form of flat specimens, actual performance of the complete garment may vary depending on the final design and assembly of the garment. This test method does not apply to the electrical contact or electrical shock hazard.

Based on the data obtained and analysed in accordance with the latest version of the applicable standards, the following Arc Rating was calculated.

Arc Thermal Performance Value, ATPV = 41.9 Cal/cm²
Heat Attenuation Factor, HAF = 93.3%

The measured data and observations of the test samples after the arc exposure were collected and summarized in the attached table. The graphs and statistics on the attached sheets provide more detailed information to better understand the Arc Rating assigned to this item. The client shall review this full report, the video recordings of the arc exposure and the photographs of the samples after the test to determine if the material meets the intended specification.

Test arranged by

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hugh@arcwear.com

Test performed at

Kinectrics Inc
Toronto, ON Canada
416.207.6305
hc@kinectrics.com

ASTM F1959/F1959M-06ae1

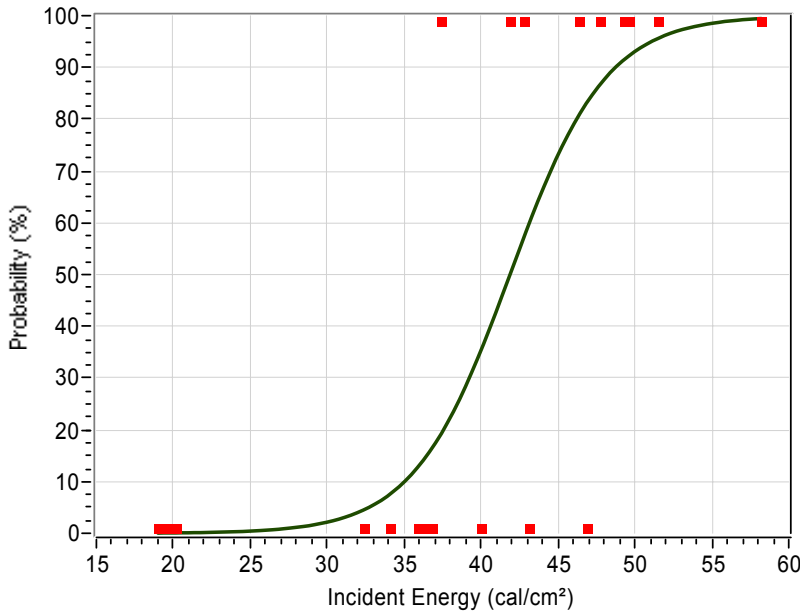
Standard Test Method for Determining the Arc Rating of Materials for Clothing



Client: X
X
(X)
X

Fabric: Two Layers, Style 85917 - Protera 180 8.0 oz/yd² 271 g/m² 2x1 LH Twill, 65% Modacrylic
Description: 35% N317, Navy 10057Q, AAD 8.0 oz/yd² 271 g/m² over Style S130 Indura Ultra Soft 6.5 oz/yd² 220 g/m² Interlock Knit, 88% Cotton 12% Nylon, Orange, AAD 7.2 oz/yd² 244 g/m², ArcWear# 1102P83

Determination of ATPV, 50% Probability of 2nd Degree Burn

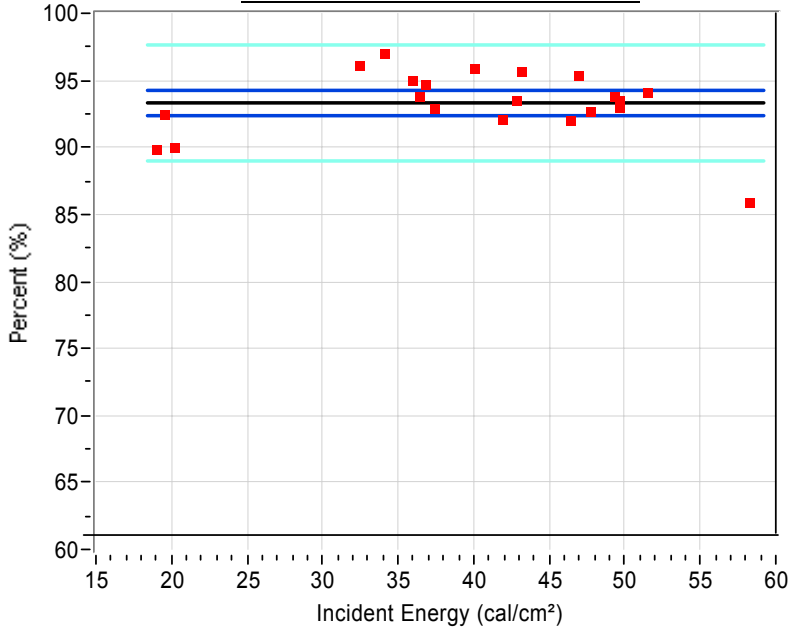


ATPV = 41.9 cal/cm²

Probability of Burn	Ei
5%	32.7
10%	35.0
20%	37.6
30%	39.2
40%	40.6
50%	41.9
60%	43.1
70%	44.5
80%	46.2
90%	48.7

- # Pts = 21
- # Pts above Stoll = 10
- # Pts Break-Open = 8
- # Pts always >STOLL = 6
- # Pts always <STOLL = 8
- # Pts within 20% = 15
- # Pts in mix zone = 7

Determination of Heat Attenuation Factor



HAF = 93.3 %

Confidence Intervals
95% CI = 92.4 , 94.3

- Data pts
- Best Fit
- 95% CI
- 95% CI pts

Ref#: K-418310

Wed, Apr 20, 2011

ASTM F1959/F1959M-06ae1
Standard Test Method for Determining the Arc Rating of Materials for Clothing

Client: X
X
(X)
X



Fabric Description: Two Layers, Style 85917 - Protera 180 8.0 oz/yd² 271 g/m² 2x1 LH Twill, 65% Modacrylic 35% N317, Navy 10057Q, AAD 8.0 oz/yd² 271 g/m² over Style S130 Indura Ultra Soft 6.5 oz/yd² 220 g/m² Interlock Knit, 88% Cotton 12% Nylon, Orange, AAD 7.2 oz/yd² 244 g/m², ArcWear# 1102P83

Test #	Panel	Test Current A	Cycles of 60Hz	Ei Cal/cm ²	SCD Cal/cm ²	HAF %	Break Open Y/N	Break Open Y/N	Ablation Y/N	After Flame sec.	Omit Y/N	Comment
1	K-418310-2266	A	8236	25.2	19.0	-0.89	89.9	No	-	-	-	No
2	K-418310-2266	B	8236	25.2	20.2	-0.8	90.0	No	-	-	-	No
3	K-418310-2266	C	8236	25.2	19.5	-1.0	92.5	No	-	Y	1	No
4	K-418310-2267	A	8172	45.2	32.4	-1.10	96.1	No	-	Y	-	No
5	K-418310-2267	B	8172	45.2	34.1	-1.1	97.0	No	-	Y	-	No
6	K-418310-2267	C	8172	45.2	37.4	0.3	92.9	Yes	-	Y	-	No
7	K-418310-2268	A	8193	50.2	35.9	-0.61	95.0	No	-	Y	-	No
8	K-418310-2268	B	8193	50.2	36.8	-0.4	94.7	No	-	Y	-	No
9	K-418310-2268	C	8193	50.2	36.4	-0.1	93.8	No	-	Y	-	No
10	K-418310-2269	A	8165	55.2	43.1	-0.65	95.7	No	-	Y	-	No
11	K-418310-2269	B	8165	55.2	40.0	-0.9	95.9	No	-	Y	-	No
12	K-418310-2269	C	8165	55.2	41.9	1.1	92.1	Yes	-	Y	1	No
13	K-418310-2270	A	8159	60.2	42.8	0.52	93.5	Yes	Y	Y	-	No
14	K-418310-2270	B	8159	60.2	46.9	-0.4	95.4	No	-	Y	-	No
15	K-418310-2270	C	8159	60.2	47.7	1.5	92.7	Yes	Y	Y	1.5	No
16	K-418310-2271	A	8160	65.2	49.6	1.51	93.0	Yes	Y	Y	1.5	No
17	K-418310-2271	B	8160	65.2	49.3	0.6	93.8	Yes	Y	Y	1	No
18	K-418310-2271	C	8160	65.2	46.4	1.8	92.0	Yes	Y	Y	2	No
19	K-418310-2273	A	8174	70.2	51.5	0.75	94.1	Yes	Y	Y	1.5	No
20	K-418310-2273	B	8174	70.2	49.6	0.9	93.5	Yes	Y	Y	1	No
21	K-418310-2273	C	8174	70.2	58.2	6.4	85.9	Yes	Y	Y	1	No
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