



September 15, 2017

Mr. Riaz Rashid
CONCORDIA TEXTILES
Flanders Fieldweg 37
Waregem, 8790
Belgium

Page 1 of 17

Subject: Letter Report for Project 4788030510 – Evaluation of 1 Moisture Barrier, 1 Thermal Barrier and 1 Composite per NFPA 1971 – 2018 Edition (Second Draft)

Dear Mr. Riaz Rashid,

Per your request, we conducted the below testing in accordance with NFPA 1971, Standard on Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting, 2018 edition, second draft on the following products:

Moisture Barrier: Diana 80AQ, 1 layer woven with a membrane (88% Nomex Comfort + Absorbent Monolithic Polyester)

- Cleaning Shrinkage Resistance,
- Flame Resistance,
- Heat and Thermal Shrinkage Resistance,
- Light Degradation Resistance,
- Liquid Penetration Resistance,
- Method For Mass Per Unit Area (Weight) Of Fabric
- Tear Resistance,
- Viral Penetration Resistance,
- Water Penetration

Thermal Barrier: NVL120+2L NK70N, 3 Layers Quilted: 2 layers Non-Woven Thermal Barrier needle punched (80% Aramid/ 20% MetaAramid), 1 layer Woven Lining (50% Aramid/ 50% Viscose FR)

- Cleaning Shrinkage Resistance,
- Flame Resistance,
- Heat and Thermal Shrinkage Resistance,
- Method For Mass Per Unit Area (Weight) Of Fabric
- Tear Resistance

Composites: Contains the Moisture Barrier and Thermal Barrier Identified above and includes Outer Shell ADVT240rsi, 39% Nomex/60% Kevlar/1% Antistatic

- Thermal Protective Performance (TPP),
- Total Heat Loss (THL)

Testing results were compliant with the requirements of NPFA 1971-2018 second draft except for the following:

Test Name	Standard Clause	Compliance Criteria	Product	Page Reference
Flame Resistance	8.2	Average char length less than or equal to 100 mm and after flame duration less than or equal to 2.0 seconds	Moisture Barrier	6
Light Degradation Resistance	8.62	No water visible on surface during exposure period	Moisture Barrier	15

A copy of all testing is attached to this letter for your reference.

Project 4788030510 Letter Report

UL did not select the samples, determine whether the samples were representative of production samples, witness the production of the test samples, or were we provided with information relative to the formulation or identification of component materials used in the test samples. The test results apply only to the actual samples tested.

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This letter will serve to report that all tests on the subject product have been completed.

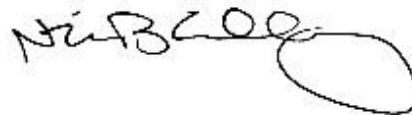
If you have any questions or comments pertaining to the above, please do not hesitate in contacting the undersigned.

Regards,



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Project 4788030510 Letter Report – Test Data

CLEANING SHRINKAGE RESISTANCE TEST	NFPA 1971-2018, SECTION 8.24
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Item Type	Garment Materials Other than Wristlets	
Description	Thermal Barrier: NVL120+2L NK70N, 3 Layers Quilted: 2 layers Non-Woven Thermal Barrier needle punched (80% Aramid/ 20% MetaAramid), 1 layer Woven Lining (50% Aramid/ 50% Viscose FR)	
Color	Yellow/Gold	
DO SPECIMENS	COMPLY WITH THE REQUIREMENTS OF THE STANDARD [YES/NO]	YES

Conditioning	Direction	Specimen	Percent Shrinkage			
			1	2	3	Specimen Average
After 5 Launderings	Warp (Wales)	1	-3.0	-3.0	-3.0	-3.0
		2	-4.0	-4.0	-4.0	-4.0
		3	-4.0	-4.0	-4.0	-4.0
Average of all 3 Specimens						-4
After 5 Launderings	Fill (Courses)	1	-2.0	-2.0	-2.0	-2.0
		2	-1.0	-1.0	-1.0	-1.0
		3	-2.0	-2.0	-2.0	-2.0
Average of all 3 Specimens						-2
Requirement						≥ -5

Project 4788030510 Letter Report – Test Data

CLEANING SHRINKAGE RESISTANCE TEST (CONT'D)	NFPA 1971-2018, SECTION 8.24
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Item Type	Garment Materials Other than Wristlets	
Description	Moisture Barrier: Diana 80AQ, 1 layer woven with a membrane (88% Nomex Comfort + Absorbent Monolithic Polyester)	
Color	White	
DO SPECIMENS COMPLY WITH THE REQUIREMENTS OF THE STANDARD [YES/NO]	YES	

Conditioning	Direction	Specimen	Percent Shrinkage			
			1	2	3	Specimen Average
After 5 Launderings	Warp (Wales)	1	-2.0	-2.5	-2.0	-2.2
		2	-2.5	-3.0	-2.5	-2.7
		3	-3.0	-2.5	-2.5	-2.7
Average of all 3 Specimens						-3
After 5 Launderings	Fill (Courses)	1	-4.0	-4.0	-4.0	-4.0
		2	-4.0	-4.0	-4.0	-4.0
		3	-4.0	-4.0	-4.0	-4.0
Average of all 3 Specimens						-4
Requirement						≥ -5

Project 4788030510 Letter Report – Test Data

FLAME RESISTANCE TEST 1	NFPA 1971-2018, SECTION 8.2
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Item Type	Garment Fabric Materials	
Description	Thermal Barrier: NVL120+2L NK70N, 3 Layers Quilted: 2 layers Non-Woven Thermal Barrier needle punched (80% Aramid /20% MetaAramid), 1 layer Woven Lining (50% Aramid/ 50% Viscose FR)	
Color	Yellow/Gold	
Weight	7.80	
DO SPECIMENS COMPLY WITH THE REQUIREMENTS OF THE STANDARD [YES/NO]	YES	

Conditioning	Specimen	Warp (Wales)			Fill (Courses)		
		Afterflame (s)	Char Length	Melt [Y/N]	Afterflame (s)	Char Length	Melt [Y/N]
As Received	1	0.00	0	N	0.00	15	N
	2	0.00	0	N	0.00	15	N
	3	0.00	12	N	0.00	21	N
	4	0.00	15	N	0.00	0	N
	5	0.00	4	N	0.00	21	N
	Average	0	6		0	14	
After 5 Launderings	1	0.00	8	N	0.00	13	N
	2	0.00	9	N	0.00	14	N
	3	0.00	12	N	0.00	8	N
	4	0.00	13	N	0.00	13	N
	5	0.00	13	N	0.00	13	N
	Average	0	11		0	12	
Requirement		< 2.0	< 100	N	< 2.0	< 100	N

Project 4788030510 Letter Report – Test Data

FLAME RESISTANCE TEST 1 (CONT'D)		NFPA 1971-2018, SECTION 8.2
Item Type	Garment Fabric Materials	
Description	Moisture Barrier: Diana 80AQ, 1 layer woven with a membrane (88% Nomex Comfort + Absorbent Monolithic Polyester)	
Color	White	
Weight	7.80	
DO SPECIMENS COMPLY WITH THE REQUIREMENTS OF THE STANDARD [YES/NO]	NO	

Conditioning	Specimen	Warp (Wales)			Fill (Courses)		
		Afterflame (s)	Char Length	Melt [Y/N]	Afterflame (s)	Char Length	Melt [Y/N]
As Received	1	13.20	305	N	11.72	305	N
	2	13.52	305	N	13.19	305	N
	3	11.49	305	N	12.18	305	N
	4	13.11	305	N	12.06	305	N
	5	11.60	305	N	12.24	305	N
	Average	13	305		12	305	
After 5 Launderings	1	15.14	305	N	14.65	305	N
	2	15.69	305	N	14.66	305	N
	3	0.00	104	N	19.64	305	N
	4	15.49	305	N	14.63	305	N
	5	12.98	305	N	15.92	305	N
	Average	12	265		16	305	
Requirement		≤ 2.0	≤ 100	N	≤ 2.0	≤ 100	N

Project 4788030510 Letter Report – Test Data

HEAT AND THERMAL SHRINKAGE RESISTANCE TEST	NFPA 1971-2018, SECTION 8.6
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Item Type	Thermal Barrier		
Description	NVL120+2L NK70N, 3 Layers Quilted: 2 layers Non-Woven Thermal Barrier needle punched (80% Aramid/ 20% MetaAramid), 1 layer Woven Lining (50% Aramid/ 50% Viscose FR)		
Color	Yellow/Gold		
DO SPECIMENS COMPLY WITH THE REQUIREMENTS OF THE STANDARD [YES/NO]	YES		

Conditioning	Specimen	Warp Percent Shrinkage			Average Percent Shrinkage	Fill Percent Shrinkage			Average Percent Shrinkage
		1	2	3		1	2	3	
As Received	1	-3.5	-3.5	-3.5	-3.5	-3.0	-3.5	-3.0	-3.17
	2	-3.5	-4.0	-4.0	-3.8	-3.5	-3.5	-3.5	-3.50
	3	-3.5	-3.5	-4.0	-3.7	-3.5	-3.0	-3.5	-3.33
Average					-4	Average			-3.33
Requirement					≥ -10	Requirement			≥ -10
After 5 Launderings	1	-4.0	-5.0	-4.0	-4.33	-4.5	-4.5	-4.5	-4.5
	2	-4.5	-4.5	-4.5	-4.5	-4.5	-5.0	-5.0	-4.83
	3	-5.0	-4.5	-5.0	-4.83	-5.0	-5.0	-5.0	-5
Average					-4.56	Average			-4.78
Requirement					≥ -10	Requirement			≥ -10
Conditioning	As Received				After 5 Launderings				
Observation [Y/N]	Specimen	1	2	3	Specimen	1	2	3	
	Drip	N	N	N	Drip	N	N	N	
	Separate	N	N	N	Separate	N	N	N	
	Ignite	N	N	N	Ignite	N	N	N	
Requirement		N	N	N		N	N	N	

Project 4788030510 Letter Report – Test Data

HEAT AND THERMAL SHRINKAGE RESISTANCE TEST (CONT'D)	NFPA 1971-2018, SECTION 8.6
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Item Type	Moisture Barrier	
Description	Diana 80AQ, 1 layer woven with a membrane (88% Nomex Comfort + Absorbent Monolithic Polyester)	
Color	White	
DO SPECIMENS	COMPLY WITH THE REQUIREMENTS OF THE STANDARD [YES/NO]	YES

Conditioning	Specimen	Warp Percent Shrinkage			Average Percent Shrinkage	Fill Percent Shrinkage			Average Percent Shrinkage
		1	2	3		1	2	3	
As Received	1	-5.0	-6.0	-5.0	-5.3	-6.0	-6.5	-6.5	-6.33
	2	-6.0	-5.5	-6.0	-5.8	-7.0	-7.0	-6.5	-6.83
	3	-5.5	-6.0	-6.0	-5.8	-6.5	-7.0	-7.0	-6.83
Average					-6	Average			-6.67
Requirement					≥ -10	Requirement			≥ -10
After 5 Launderings	1	-6.0	-6.0	-5.5	-5.83	-6.5	-6.5	-6.0	-6.33
	2	-6.5	-7.0	-6.5	-6.67	-7.0	-7.0	-7.0	-7
	3	-6.0	-6.0	-7.0	-6.33	-6.5	-6.5	-7.0	-6.67
Average					-6.28	Average			-6.67
Requirement					≥ -10	Requirement			≥ -10
Conditioning	As Received				After 5 Launderings				
Observation [Y/N]	Specimen	1	2	3	Specimen	1	2	3	
	Drip	N	N	N	Drip	N	N	N	
	Separate	N	N	N	Separate	N	N	N	
	Ignite	N	N	N	Ignite	N	N	N	
Requirement		N	N	N		N	N	N	

Project 4788030510 Letter Report – Test Data

TEAR RESISTANCE TEST	NFPA 1971-2018, SECTION 8.12
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Item Type	Thermal Barrier	
Description	NVL120+2L NK70N, 3 Layers Quilted : 2 layers Non-Woven Thermal Barrier needle punched (80%Aramid/20%MetaAramid) 1 layer Woven Lining (50% Aramid/ 50% Viscose FR)	
DO SPECIMENS COMPLY WITH THE REQUIREMENTS OF THE STANDARD [YES/NO]	Yes	

Specimen	Tear Resistance Strength (N)			
	As Received		After 5 Launderings	
	Warp Average	Fill Average	Warp Average	Fill Average
1	308.9	288.6	259.1	306.6
2	240.7	315.6	248.2	343.2
3	311.9	306.5	238.8	285.8
4	258.6	280.4	252.4	371.7
5	280.7	243.1	268.7	304.4
Average	280	287	253	322
Requirement	22	22	22	22

Project 4788030510 Letter Report – Test Data

TEAR RESISTANCE TEST (CONT'D)	NFPA 1971-2018, SECTION 8.12
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Item Type	Moisture Barrier		
Description	Diana 80AQ, 1 layer woven with a membrane (88% Nomex Comfort + Absorbent Monolithic Polyester)		
DO SPECIMENS COMPLY WITH THE REQUIREMENTS OF THE STANDARD [YES/NO]	YES		

Specimen	Tear Resistance Strength (N)			
	As Received		After 5 Launderings	
	Warp Average	Fill Average	Warp Average	Fill Average
1	65.0	61.9	71.1	62.6
2	68.8	60.9	67.9	64.6
3	71.5	64.5	69.1	64.9
4	64.3	61.3	73.4	67.5
5	69.4	63.7	66.3	61.5
Average	68	62	70	64
Requirement	22	22	22	22

Project 4788030510 Letter Report – Test Data

THERMAL PROTECTIVE PERFORMANCE TEST	NFPA 1971-2018, SECTION 8.10
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Item Type	Garment Composites		
ID	Outer Shell	Moisture Barrier	Thermal Barrier
D	ADVT240rsi	Diana 80AQ	NVL120+2L NK70N
DO SPECIMENS COMPLY WITH THE REQUIREMENTS OF THE STANDARD [YES/NO]			YES

Specimen	TPP Rating	
	As Received	After 5 Launderings
1	36.5	50.8
2	37.7	50.4
3	35.7	47.9
Average	36.6	49.7
Requirement	≥ 35.0	≥ 35.0
Results within 8% of the Average [Y/N]	Y	Y

LEM ID#81128

Project 4788030510 Letter Report – Test Data

TOTAL HEAT LOSS TEST	NFPA 1971-2018, SECTION 8.33
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Item Type	Garment Composites		
ID	Outer Shell	Moisture Barrier	Thermal Barrier
C	ADVT240rsi	Diana 80AQ	NVL120+2L NK70N
DO SPECIMENS COMPLY WITH THE REQUIREMENTS OF THE STANDARD [YES/NO]			Yes

Conditioning	Specimen	DBP Avg (K•m2 /W)	WBP Avg (Pa•m2 /W)	Rct (K•m2 /W) (Obs)	Rcf (K•m2 /W) (Cal)	ARet (Pa•m2 /W) (Obs)	ARef (kPa•m2 /W) (Cal)	Qt (W/m2)
As Received	1	0.0735	5.8350	0.1471	0.0736	24.3490	0.0185	250.2
	2	0.0735	5.8350	0.1470	0.0735	25.2520	0.0194	243.9
	3	0.0735	5.8350	0.1506	0.0771	24.3230	0.0185	247.8
Average					0.0747		0.0188	247.3
Requirement								≥ 205

LEM ID#80951

Project 4788030510 Letter Report – Test Data

WATER PENETRATION RESISTANCE TEST	NFPA 1971-2018, SECTION 8.26
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Item Type	Garment Moisture Barriers	
Description	Diana 80AQ, 1 layer woven with a membrane (88% Nomex Comfort + Absorbent Monolithic Polyester)	
Exposure Side	Non-laminated side	
DO SPECIMENS COMPLY WITH THE REQUIREMENTS OF THE STANDARD [YES/NO]	YES	

Specimen	Appearance of Any Water at 172 kPa [Y/N]	
	As Received	After 5 Launderings/Convective Heat
1	N	N
2	N	N
3	N	N
4	N	N
5	N	N
Requirement	N	N

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METHOD FOR MASS PER UNIT AREA (WEIGHT) OF FABRIC	ASTM D3776, SECTION 9
Fabric Identification	Measured Weight (oz/yd ²)
A: NVL120+2L NK70N	7.80
B: Diana 80AQ	3.48

Project 4788030510 Letter Report – Test Data

LIGHT DEGRADATION RESISTANCE TEST	NFPA 1971-2018, SECTION 8.62
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Item Type	Moisture Barrier Materials	
Description	Diana80aq, 1 layer woven with a membrane (88% Nomex Comfort + Absorbent Monolithic Polyester)	
Exposure Side	Non-laminated side	
DO SPECIMENS COMPLY WITH THE REQUIREMENTS OF THE STANDARD [YES/NO]	NO	

Conditioning	Specimen	Water visible on Surface During Exposure Period [Y/N]
Laundering/Convective Heat/UV Exposure	1	Y
	2	Y
	3	Y
	4	Y
Requirement		N

Lab Tech Comments	Water was observed on surface of membrane.
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Project 4788030510 Letter Report – Test Data

LIQUID PENETRATION RESISTANCE TEST	NFPA 1971-2018, SECTION 8.27
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Item Type	Moisture Barrier [Materials]	
Description	Diana80aq, 1 layer woven with a membrane (88% Nomex Comfort + Absorbent Monolithic Polyester)	
Exposure Side	Non-laminated side	
DO SPECIMENS COMPLY WITH THE REQUIREMENTS OF THE STANDARD [YES/NO]	YES	

Conditioning	Chemical	Specimen	Liquid Penetration [Y/N]	
Laundering/ Convective Heat	AFFF	1	N	
		2	N	
		3	N	
	Battery Acid	1	N	
		2	N	
		3	N	
	Hydraulic Fluid	1	N	
		2	N	
		3	N	
	Fuel H	1	N	
		2	N	
		3	N	
	Chlorine	1	N	
		2	N	
		3	N	
	Antifreeze	1	N	
		2	N	
		3	N	
	Requirement			N

Project 4788030510 Letter Report – Test Data

VIRAL PENETRATION RESISTANCE TEST	NFPA 1971-2018, SECTION 8.28
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Item Type	Garment Moisture Barriers	
Description	Diana80aq, 1layer woven with a membrane (88% Nomex Comfort + Absorbent Monolithic Polyester)	
Exposure Side	Non-laminated Side	
Nelson Lab #	986693-S01	
DO SPECIMENS	COMPLY WITH THE REQUIREMENTS OF THE STANDARD [YES/NO]	YES

Conditioning	Laundering/Convective Heat				
Specimen	Pre-challenge Concentration (PFU/mL)	Post-challenge Concentration (PFU/mL)	Assay Titer (PFU/mL)	Visual Penetration	Test Result [Pass/Fail]
1	1.5 x 10 ⁸	1.4 x 10 ⁸	<1	None Seen	Pass
2	1.5 x 10 ⁸	1.4 x 10 ⁸	<1	None Seen	Pass
3	1.5 x 10 ⁸	1.4 x 10 ⁸	<1	None Seen	Pass
Requirement				None Seen	Pass

Values of <1 PFU/mL is reported for assay plates showing no plaques.
 PFU = Plaque Forming Units