Appendix F

GEOMEMBRANE QA/QC

TABLE OF CONTENTS

1. Geomembrane Product Information

2. Geomembrane Manufacturers Quality Control Testing

3. Interface Friction Testings

4. Geomembrane Panel Placement Log

5. Geomembrane Seam Tracking and Testing

6. Geomembrane Repair Log

7. Geomembrane Destructive Sample Log and Field Test Results

8. Geomembrane Destructive Sample Quality Control Testing

9. Geomembrane Subgrade Acceptance

10. Geomembrane Trial Weld Testing

11. Geomembrane Welding Rod Manufactures Certification

1. Geomembrane Product Information

TECHNICAL DATA SHEET

LLDPE Series, 60 mils

Black, Textured

Solmax, 2801 Boul. Marie-Victorin, Varennes, Qc, Canada, J3X 1P7
Tel.: (450) 929-1234 Fax: (450) 929-2550 www.solmax.com

PROPERTY	TEST METHOD	FREQUENCY (1)	UNIT Imperial	1006798-58065-1
SPECIFICATIONS				
Nominal Thickness	-	-	mils	60.0
Thickness (min. avg.)	ASTM D-5994	Every roll	mils	60.0
Lowest ind. for 10 out of 10 values			mils	54.0
Asperity Height (min. avg.) (3)	ASTM D-7466	Every roll	mils	20
Resin Density	ASTM D-1505	1/Batch	g/cc	< 0.926
Melt Index - 190/2.16 (max.)	ASTM D-1238	1/Batch	g/10 min	1.0
Sheet Density (8)	ASTM D-792	Every 10 rolls	g/cc	≤ 0.939
Carbon Black Content (9)	ASTM D-4218	Every 2 rolls	%	2.0 - 3.0
Carbon Black Dispersion	ASTM D-5596	Every 10 rolls	Category	Cat. 1 & Cat. 2
OIT - standard (avg.)	ASTM D-3895	1/Batch	min	100
Tensile Properties (min. avg) (2)	ASTM D-6693	Every 2 rolls		
Strength at Break			ppi	132
Elongation at Break			%	400
2% Modulus (max.)	ASTM D-5323	Per formulation	ppi	3,600
Tear Resistance (min. avg.)	ASTM D-1004	Every 5 rolls	lbf	37
Puncture Resistance (min. avg.)	ASTM D-4833	Every 5 rolls	lbf	90
Dimensional Stability	ASTM D-1204	Certified	%	± 2
Multi-Axial Tensile (min.)	ASTM D-5617	Per formulation	%	30
Oven Aging - % retained after 90 days	ASTM D-5721	Per formulation		
STD OIT (min. avg.)	ASTM D-3895		%	35
HP OIT (min. avg.)	ASTM D-5885		%	60
UV Res. - % retained after 1600 hr	ASTM D-7238	Per formulation		
HP-OIT (min. avg.)	ASTM D-5885		%	35
Low Temperature Brittleness	ASTM D-746	Certified	°F	-106
SUPPLY SPECIFICATIONS (Roll dimensions may vary ±1%)				
Roll Dimension - Width	-		ft	22.3
Roll Dimension - Length	-		ft	520
Area (Surface/Roll)	-		sf	11,596

NOTES

1. Testing frequency based on standard roll dimensions and one batch is approximately 180,000 lbs (or one railcar).
2. Machine Direction (MD) and Cross Machine Direction (XMD or TD) average values should be on the basis of 5 specimens each direction.
3. ASTM D7466 is identical to GRI-GM12.
8. Correlation table is available for ASTM D792 vs ASTM D1505. Both methods give the same results.
9. Correlation table is available for ASTM D1603 vs ASTM D4218. Both methods give the same results.

* All values are nominal test results, except when specified as minimum or maximum.
* The information contained herein is provided for reference purposes only and is not intended as a warranty of guarantee. Final determination of suitability for use contemplated is the sole responsability of the user. SOLMAX assumes no liability in connection with the use of this information.

Solmax is not a design professional and has not performed any design services to determine if Solmax's goods comply with any project plans or specifications, or with the application or use of Solmax's goods to any particular system, project, purpose, installation or specification.

2. Geomembrane Manufacturers Quality Control Testing

LIST OF GEOMEMBRANE ROLLS

SOLMAX

Solmax, 2801 Boul. Marie-Victorin, Varennes, Qc, Canada, J3X 1P7
Tél.: 1-450-929-1234 • Fax.: 1-450-929-2547 • www.solmax.com

SOLMAX APPROVED Quality Assurance

Project Name : Iron Horse Park - Billerica, M

Project Number : 3919, 3953

Reference Number : 112229

Packing Slip Number : PRE-112229

Roll Number	Product Code	Resin Lot Number	Manufactured Date	Resin Melt Index 190/2.16 g/10 min D1238	Resin Density g/cc D1505	OIT Spec Result min D3895	HPOIT Spec Result min D5885	ESCR SP-NCTL Spec Roll Tested hours D5397
LLDPE 60 mils Black RT								
5-39809	1006798-58065-1	CJE810170	31-Oct-18	0.35	0.919	*100* > 120		N/A
5-39810	1006798-58065-1	CJE810170	31-Oct-18	0.35	0.919	*100* > 120		N/A
5-39811	1006798-58065-1	CJE810170	31-Oct-18	0.35	0.919	*100* > 120		N/A
5-39813	1006798-58065-1	CJE810170	31-Oct-18	0.35	0.919	*100* > 120		N/A
5-39814	1006798-58065-1	CJE810170	31-Oct-18	0.35	0.919	*100* > 120		N/A
5-39815	1006798-58065-1	CJE810170	31-Oct-18	0.35	0.919	*100* > 120		N/A
5-39816	1006798-58065-1	CJE810170	31-Oct-18	0.35	0.919	*100* > 120		N/A
5-39817	1006798-58065-1	CJE810170	31-Oct-18	0.35	0.919	*100* > 120		N/A
5-39818	1006798-58065-1	CJE810170	31-Oct-18	0.35	0.919	*100* > 120		N/A
5-39819	1006798-58065-1	CJE810170	31-Oct-18	0.35	0.919	*100* > 120		N/A
5-39820	1006798-58065-1	CJE810170	31-Oct-18	0.35	0.919	*100* > 120		N/A
5-39821	1006798-58065-1	CJE810170	31-Oct-18	0.35	0.919	*100* > 120		N/A
5-39822	1006798-58065-1	CJE810170	01-Nov-18	0.35	0.919	*100* > 120		N/A
5-39823	1006798-58065-1	CJE810170	01-Nov-18	0.35	0.919	*100* > 120		N/A
5-39825	1006798-58065-1	CJE810170	01-Nov-18	0.35	0.919	*100* > 120		N/A
5-39826	1006798-58065-1	CJE810170	01-Nov-18	0.35	0.919	*100* > 120		N/A

Quantity (rolls) : 16

Solmax is not a design professional and has not performed any design services to determine if Solmax's goods comply with any project plans or specifications, or with the application or use of Solmax's goods to any particular system, project, purpose, installation or specification.

MANUFACTURING QUALITY CONTROL

Test Results - Rolls

Solmax, 2801 Boul. Marie-Victorin, Varennes, Qc, Canada, J3X 1P7
Tél.: 1-450-929-1234 • Fax.: 1-450-929-2547 • www.solmax.com

Project Name Iron Horse Park - Billerica, M

Reference Number : 112229

Project Number : 3919, 3953

Packing Slip Number : PRE-112229

SOLMAX APPROVED Quality Assurance

Product 1006798-58065-1

LLDPE 60 mils Black RT

CE Certificate = LL-60-TT-BB

Properties		Thickness ave / min.	Geo-membrane Density	Carbon Black Content	Carbon Black Dispersion	Tensile Yield Strength	Tensile Yield Elong.	Tensile Break Strength	Tensile Break Elong.	Tear Resist.	Puncture Resist.	Dimension. Stability	Asperity Height in / out
Unit		mils	g/cc	%	Cat. 1 and 2	ppi	%	ppi	%	lbs	lbs	%	mils
Test Method		D5994	D1505/D792	D4218 / D1603	D5596	D6693				D1004	D4833	D1204	D7466
Frequency		Each roll		1/2 ro	1/10 ro	1/2 ro				1/5 ro	1/5 ro	Certied	Each roll
Specification		60.0 / 54.0	≤ 0.939	2.0 - 3.0	Cat. 1 - Cat. 2			132	400	37	90	± 2	20
5-39809	MD	60.0 / 56	0.935	2.36	10 /10 Views			222	598	43.4	124.3		22.6 / 24.7
	XD							191	549	46.9			
5-39810	MD	60.9 / 57	0.935	2.52	10 /10 Views			192	506	43.4	124.3		24.8 / 26.0
	XD							183	507	46.9			
5-39811	MD	60.8 / 58	0.935	2.52	10 /10 Views			192	506	43.4	124.3		22.3 / 23.6
	XD							183	507	46.9			
5-39813	MD	60.5 / 56	0.935	2.42	10 /10 Views			197	512	43.4	124.3		21.9 / 22.3
	XD							200	546	46.9			
5-39814	MD	61.1 / 57	0.935	2.42	10 /10 Views			197	512	45.0	129.8		21.2 / 21.9
	XD							200	546	44.9			
5-39815	MD	60.1 / 58	0.935	2.39	10 /10 Views			216	573	45.0	129.8		21.5 / 22.2
	XD							187	515	44.9			
5-39816	MD	60.1 / 56	0.935	2.39	10 /10 Views			216	573	45.0	129.8		21.7 / 23.0
	XD							187	515	44.9			
5-39817	MD	60.7 / 57	0.937	2.51	10 /10 Views			214	565	45.8	129.4		22.8 / 23.3
	XD							174	491	46.9			
5-39818	MD	60.5 / 58	0.937	2.51	10 /10 Views			214	565	45.8	129.4		24.2 / 24.8
	XD							174	491	46.9			
5-39819	MD	61.0 / 56	0.937	2.47	10 /10 Views			222	596	45.8	129.4		23.9 / 24.0
	XD							182	519	46.9			
5-39820	MD	60.6 / 58	0.937	2.47	10 /10 Views			222	596	45.8	129.4		25.1 / 25.8
	XD							182	519	46.9			
5-39821	MD	60.5 / 59	0.937	2.46	10 /10 Views			205	561	45.8	129.4		22.8 / 21.8
	XD							176	502	46.9			
5-39822	MD	60.5 / 58	0.937	2.46	10 /10 Views			205	561	46.0	124.5		24.1 / 24.1
	XD							176	502	49.0			
5-39823	MD	60.1 / 57	0.937	2.59	10 /10 Views			199	539	46.0	124.5		23.0 / 24.2
	XD							185	528	49.0			
5-39825	MD	60.5 / 56	0.937	2.59	10 /10 Views			199	539	46.0	124.5		23.5 / 24.6
	XD							185	528	49.0			
5-39826	MD	61.1 / 57	0.937	2.49	10 /10 Views			215	545	46.0	124.5		24.1 / 26.0
	XD							191	508	49.0			

Solmax is not a design professional and has not performed any design services to determine if Solmax's goods comply with any project plans or specifications, or with the application or use of Solmax's goods to any particular system, project, purpose, installation or specification.

CoA Date: 08/29/2018

Certificate of Analysis

Shipped To: SOLMAX
2801 BOUL MARIE-VICTORIN
VARENNES QC J3X 1P7
CANADA

Recipient: Marcotte
Fax:

Delivery #: 89735593
PO #: 117257
Weight: 187350.000 LB
Ship Date: 08/29/2018
Package: BULK
Mode: Hopper Car
Car #: CPCX814603
Seal No: 114958

Product:
MARLEX 7104 POLYETHYLENE in Bulk
Additive levels have been tested and meet minimum the specification for this lot.
As a result, Standard OIT (by ASTM D 3895) is greater than 120 minutes (nominal value, not tested on every lot).

Lot Number: CJE810170

Property	Test Method	Value	Unit
Melt Index	ASTM D1238	0.35	g/10min
Density	D1505	0.919	g/cm3

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP (CPChem).
However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.

T. KEVIN AYRES
QUALITY ASSURANCE SUPERINTENDENT

Page 1 of 1

MATERIAL CONFORMITY CERTIFICATE
ISSUED BY THE MANUFACTURER

Varennes, December 3, 2018

Project Name:	Iron Horse LF - Billerica, MA
Customer PO:	3919
Solmax Order:	112229
ATTN:	Mr. Carl Burdick

To whom it may concern,

Solmax International hereby certifies that *product code* ***1006798-58065-1*** (*LLDPE 60 mils Black RT*) geomembrane supplied for the above-mentioned project complies with the project's specifications 02713 *considering all individual exception made upon quotation #58065.* Regarding the Dimensional Stability, the Quotation # 58065 and the Solmax Technical Datasheet ("TDS") mentioned the following:

- Quotation : "*Exception for the standard testing frequencies as shown on material* ***data sheet*** *vs every 100,000 sf on client's specification.* "
- Solmax TDS : "Dimensional Stability, ASTM D1204, **Certified** ± 2%"

Please find attached the test report for Dimensional Stability on roll produced using the same resin formulation that has been used to manufacture the above product.

Please note : According to Note 5 of part 5.1 of the industry standard GRI GM17 : "*There are several tests sometimes included in other LLDPE geomembrane specifications which are omitted from this standard because they are outdated, irrelevant or generate information that is not necessary to evaluate on a routine MQC basis. The following tests have been purposely omitted: … Dimensional Stability…*"

Hoping the above information is satisfactory. Please, do not hesitate to contact us if you require any additional information.

Sincerely,

Daniel Laflamme
Technical Support Specialist
Solmax International Inc.

DIMENSIONAL STABILITY ASTM D1204 - CERTIFICATION REPORT

GEOMEMBRANE TEST RESULTS

GAI LAP Accreditation No.: 51-05

Identification :

Type of Material :	LLDPE
Roll Number :	2-74949
Production Date :	2013-09-27
Resin Type :	Chevron 7104
Lot Number :	CDG810150
Formulation :	LL01-13
Certification Date :	2013-09-27

Dimensional Stability (ASTM 1204) - Test Results

Testing Requirements	Testing Results	
	MD	TD
≤ ± 2 %	-0.4 %	-0.05 %

Daniel Laflamme
Technical Support Specialist
Solmax International Inc.

Claude Cormier
QA Coordinator
Solmax International Inc.

TECHNICAL DATA SHEET

LLDPE Series, 60 mils

Black, Textured

Solmax, 2801 Boul. Marie-Victorin, Varennes, Qc, Canada, J3X 1P7
Tel.: (450) 929-1234 Fax: (450) 929-2550 www.solmax.com

PROPERTY	TEST METHOD	FREQUENCY (1)	UNIT Imperial	1006798-58065-1
SPECIFICATIONS				
Nominal Thickness	-	-	mils	60.0
Thickness (min. avg.)	ASTM D-5994	Every roll	mils	60.0
Lowest ind. for 10 out of 10 values			mils	54.0
Asperity Height (min. avg.) (3)	ASTM D-7466	Every roll	mils	20
Resin Density	ASTM D-1505	1/Batch	g/cc	< 0.926
Melt Index - 190/2.16 (max.)	ASTM D-1238	1/Batch	g/10 min	1.0
Sheet Density (8)	ASTM D-792	Every 10 rolls	g/cc	≤ 0.939
Carbon Black Content (9)	ASTM D-4218	Every 2 rolls	%	2.0 - 3.0
Carbon Black Dispersion	ASTM D-5596	Every 10 rolls	Category	Cat. 1 & Cat. 2
OIT - standard (avg.)	ASTM D-3895	1/Batch	min	100
Tensile Properties (min. avg) (2)	ASTM D-6693	Every 2 rolls		
Strength at Break			ppi	132
Elongation at Break			%	400
2% Modulus (max.)	ASTM D-5323	Per formulation	ppi	3,600
Tear Resistance (min. avg.)	ASTM D-1004	Every 5 rolls	lbf	37
Puncture Resistance (min. avg.)	ASTM D-4833	Every 5 rolls	lbf	90
Dimensional Stability	ASTM D-1204	Certified	%	± 2
Multi-Axial Tensile (min.)	ASTM D-5617	Per formulation	%	30
Oven Aging - % retained after 90 days	ASTM D-5721	Per formulation		
STD OIT (min. avg.)	ASTM D-3895		%	35
HP OIT (min. avg.)	ASTM D-5885		%	60
UV Res. - % retained after 1600 hr	ASTM D-7238	Per formulation		
HP-OIT (min. avg.)	ASTM D-5885		%	35
Low Temperature Brittleness	ASTM D-746	Certified	°F	-106
SUPPLY SPECIFICATIONS (Roll dimensions may vary ±1%)				
Roll Dimension - Width	-		ft	22.3
Roll Dimension - Length	-		ft	520
Area (Surface/Roll)	-		sf	11,596

NOTES

1. Testing frequency based on standard roll dimensions and one batch is approximately 180,000 lbs (or one railcar).
2. Machine Direction (MD) and Cross Machine Direction (XMD or TD) average values should be on the basis of 5 specimens each direction.
3. ASTM D7466 is identical to GRI-GM12.
8. Correlation table is available for ASTM D792 vs ASTM D1505. Both methods give the same results.
9. Correlation table is available for ASTM D1603 vs ASTM D4218. Both methods give the same results.

* All values are nominal test results, except when specified as minimum or maximum.
* The information contained herein is provided for reference purposes only and is not intended as a warranty of guarantee. Final determination of suitability for use contemplated is the sole responsability of the user. SOLMAX assumes no liability in connection with the use of this information.

Solmax is not a design professional and has not performed any design services to determine if Solmax's goods comply with any project plans or specifications, or with the application or use of Solmax's goods to any particular system, project, purpose, installation or specification.

QUOTATION 58065 - 148118

PROJECT: Iron Horse Park - Billerica, MA

R/T Number: 58065-1

Date: 07/09/2018

CLIENT

Name:	CHENANGO CONTRACTING INC.	Address:	29 ARBUTUS ROAD
Contact:	Nick Brechko		
Phone:	607 729 8500		JOHNSON CITY, NY
Fax:	607 729 2415		13790, USA

PRODUCTS

Product code	Product Description	Dimensions	UOM	Quantity	Unit Price
1006798-58065-1	LLDPE 60 mils Black RT	22.3 ft x 520 ft	sf.	185,536	[redacted]

PROJECT INFORMATION

Currency:	USD	Estimated Transit Time:	1 Days
Taxes:	EXTRA	Terms of Delivery:	DDP-BILLERICA-MA-USA
Duties:		Loading Details:	
Payment Terms:	Net 60 Days	Method of Transport:	2-AXLE TRUCK
Purchase Order Before:	07/10/2018	Warranty:	5 YEARS PRORATED
Delivery within 30 days after reception of a purchase order		Additional Testing?	☐ Specifications? ☒
Unloading and Inspection Costs Excluded		All terms of delivery are as per Incoterms 2000	
Note: Roll width and length may vary ± 1%		Final routing is at Solmax's discretion	

NOTES

Solmax meets the specifications provided with the following exceptions:

EXCEPTION NOTES BY PRODUCT

1006798-58065-1

Interface shear strength: Solmax cannot certify to any friction angle requirement since the results depend on the type of material in contact with our Geomembrane and the load applied. If any friction values are specified, it is the responsibility of the customer and/or the engineer to perform the interface friction test at their own expense and get approval before the order is put into production and Solmax will certify the asperity heights of the supplied sample.

Exception: LLDPE resin density is < 0.926 g/cc (GRI GM17 Specification) vs > 0.940 g/cc on client's specifications.

Exception : Values according to Solmax technical data sheet are minimum averages (MARV - with exception for the one specified minimum or maximum). Specification specifies that, unless otherwise mentioned, the values correspond to the minimum acceptable values.

Exception for Solmax standard warranty terms.

Exception for the standard testing frequencies as shown on material data sheet vs every 100,000 sf on client's specification.

2801 Marie-Victorin Blvd., Varennes, (Quebec), Canada, J3X 1P7
Tel : (450) 929-1234 or (800) 571-3904 | Telec : (450) 929-2547 | www.solmax.com

Solmax Representative	Opening Bank and Address
Submitted by: Michael Winterbourne Email: mwinterbourne@solmax.com	National Bank of Canada 2020 René-Gauthier, Varennes, Quebec, Canada, J3X 1N9 Please contact our credit department for more details.

Unless otherwise specified herein above, prices quoted are firm for acceptance within the validity date specified in the Purchase Order Before section of this quotation. Outstanding quotations that have exceeded the validity date will require a new quotation based on shipment requirements. Acceptance of your purchase order is expressly made conditional on Solmax's approval of your credit worthiness and on your acceptance of the terms and conditions herein attached. Price quoted is based on the current resin price. If the price of resin changes after the validity date bid hold period, the prices reflected herein shall be modified to reflect the increase in resin prices.

This offer is **expressly limited** to the terms of this offer set forth on these pages hereof, including the Solmax Terms and Conditions. Buyer agrees that any terms and/or conditions in Buyer's purchase order which differ or add to the quotation shall not become part of the contract between Solmax and Buyer.

3. Interface Friction Testings

Client:	Chenango Contracting, Inc.		
Project Name:	Iron Horse Park		
Project Location:	Billerica, MA		
GTX #:	309168		
Start Date:	11/21/18	Tested By:	est
End Date:	11/21/18	Checked By:	bfs
Geosynthetic ID: TOP	Geocomposite: Roll #131557033		
Description: TOP	Geocomposite: Black, 350 mil GSE double-sided nonwoven biplanar		
Geosynthetic ID: BOTTOM	Geomembrane: Roll #5-39817		
Description: BOTTOM	Geomembrane: Black, 60 mil Solmax textured LLDPE		

Interface Shear Test Series by ASTM D5321

Test Series #:	1		
Test Profile - Top to Bottom:	steel plate / GEOCOMPOSITE / GEOMEMBRANE / textured gripping surface		
Geosynthetic Preparation:	Test set-up saturated at normal load for 4 hours prior to shear. The geomembrane was placed against the side of the geocomposite with grooves parallel to machine direction.		
Test Equipment:	Top box = 12 in x 12 in; Bottom box = 12 in x 12 in; Load cells and LVDTs connected to data acquisition system for shear force, normal load and horizontal displacement readings; Flat plate clamping device; surface area = 144 in^2		
Horizontal Displacement, in/min:	0.04	Test Condition:	inundated

Parameter	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6
Normal Compressive Stress, psf	100	300	500	---	---	---
Peak Shear Stress, psf	148	272	451	---	---	---
Post Peak Shear Stress, psf	83.8	166	266	---	---	---
Peak Secant Friction Angle, °	55.9	42.2	42.0	---	---	---
Post-Peak Secant Friction Angle, °	40.0	29.0	28.0	---	---	---
Pre-Test: Average Asperity, mils	31.2	29.1	30.3	---	---	---
Post-Test: Average Asperity, mils	30.6	27.9	28.4	---	---	---

NOTES: Asperity measurements taken on side of membrane involved in shear plane in general accordance with ASTM D7466. Six measurements taken at the same locations before and after test.

Peak Friction Angle:	**37.1**	**degrees**
Peak Adhesion:	**63**	**psf**
Post Peak Friction Angle:	**24.5**	**degrees**
Post Peak Adhesion:	**35**	**psf**

Figure a. Shear Force vs. Horizontal Displacement

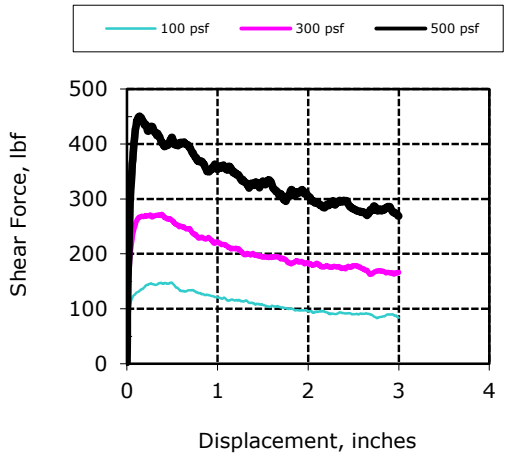
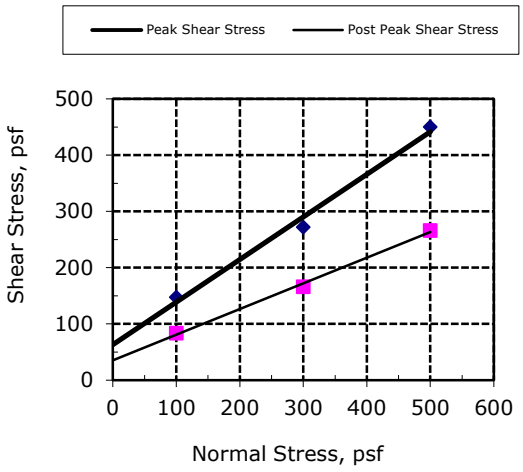


Figure b. Shear Stress vs. Normal Stress



Notes: These results apply only to the sample tested for the specific test conditions. The test procedures employed follow accepted industry practice and the indicated test method. GeoTesting Express has no specific knowledge as to conditioning, origin, sampling procedure or intended use of the material. Values for cohesion and friction angle determined from best-fit straight line to the data for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site-specific conditions.

Client:	Chenango Contracting, Inc.		
Project Name:	Iron Horse Park		
Project Location:	Billerica, MA		
GTX #:	309168		
Start Date:	11/27/18	Tested By:	est
End Date:	11/27/18	Checked By:	bfs
Geosynthetic ID: TOP	Geotextile: Roll #(11/16/18)		
Description: TOP	Geotextile: Black, 8 ounce non-woven		
Geosynthetic ID: BOTTOM	Geomembrane: Roll #5-39817		
Description: BOTTOM	Geomembrane: Black, 60 mil Solmax textured LLDPE		

Interface Shear Test Series by ASTM D5321

Test Series #:	4		
Test Profile - Top to Bottom:	steel plate / GEOTEXTILE / GEOMEMBRANE / textured gripping surface		
Geosynthetic Preparation:	Test set-up saturated at normal load for 4 hours prior to shear.		
Test Equipment:	Top box = 12 in x 12 in; Bottom box = 12 in x 12 in; Load cells and LVDTs connected to data acquisition system for shear force, normal load and horizontal displacement readings; Flat plate clamping device; surface area = 144 in^2		
Horizontal Displacement, in/min:	0.04	Test Condition:	inundated

Parameter	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6
Normal Compressive Stress, psf	100	300	500	---	---	---
Peak Shear Stress, psf	137	262	482	---	---	---
Post Peak Shear Stress, psf	91	174	273	---	---	---
Peak Secant Friction Angle, °	53.9	41.1	43.9	---	---	---
Post-Peak Secant Friction Angle, °	42.2	30.1	28.6	---	---	---
Pre-Test: Average Asperity, mils	29.5	29.9	35.5	---	---	---
Post-Test: Average Asperity, mils	28.9	28.9	33.7	---	---	---

NOTES: Asperity measurements taken on side of membrane involved in shear plane in general accordance with ASTM D7466. Six measurements taken at the same locations before and after test.

Peak Friction Angle:	**40.8**	**degrees**
Peak Adhesion:	**35**	**psf**
Post Peak Friction Angle:	**24.5**	**degrees**
Post Peak Adhesion:	**43**	**psf**

Figure a. Shear Force vs. Horizontal Displacement

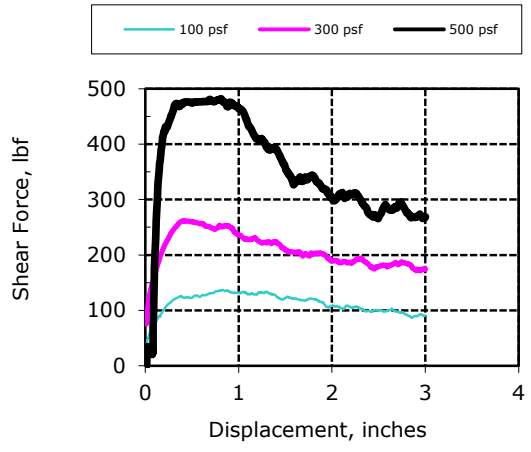
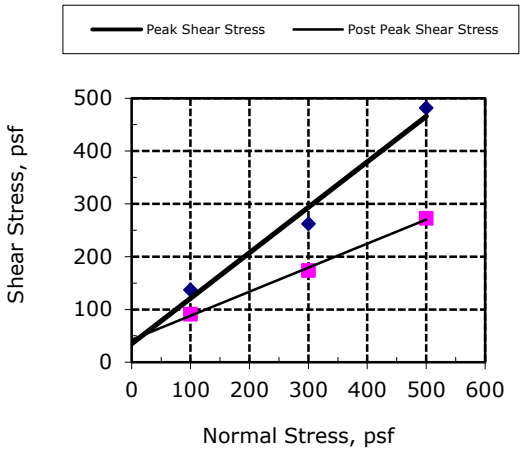


Figure b. Shear Stress vs. Normal Stress



Notes: These results apply only to the sample tested for the specific test conditions. The test procedures employed follow accepted industry practice and the indicated test method. GeoTesting Express has no specific knowledge as to conditioning, origin, sampling procedure or intended use of the material. Values for cohesion and friction angle determined from best-fit straight line to the data for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site-specific conditions.

Client:	Chenango Contracting, Inc.		
Project Name:	Iron Horse Park		
Project Location:	Billerica, MA		
GTX #:	309168		
Start Date:	11/27/18	Tested By:	est
End Date:	11/28/18	Checked By:	bfs
Soil ID:	Existing Site Soil		
Soil Description:	Moist, very dark brown silty sand with organics		
Geomembrane ID:	Roll #5-39817		
Geomembrane Description:	Black, 60 mil Solmax textured LLDPE		

Interface Shear Test Series by ASTM D5321

Test Series #:	2		
Test Profile - Top to Bottom:	steel plate / SOIL / GEOMEMBRANE / textured gripping surface		
Soil Preparation:	Soil compacted USING moderate effort at the as-received moisture content		
Compaction Characteristics:	Maximum Dry Density	--- pcf	
	Optimum Moisture Content	--- %	
	Compaction Test Method	---	
Geosynthetic Preparation:	Test set-up saturated at normal load for 24 hours prior to shear.		
Test Equipment:	Top box = 12 in x 12 in; Bottom box = 12 in x 12 in; Load cells and LVDTs connected to data acquisition system for shear force, normal load and horizontal displacement readings; Flat plate clamping device; surface area = 144 in^2		
Horizontal Displacement, in/min:	0.04	Test Condition:	inundated

Parameter	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6
Initial Moisture Content, %	13.7	13.3	13.8	---	---	---
Initial Dry Density, pcf	88.6	89.0	88.5	---	---	---
Percent Compaction, %	---	---	---	---	---	---
Final Moisture Content, %	31.5	28.3	27.0	---	---	---
Normal Compressive Stress, psf	100	300	500	---	---	---
Peak Shear Stress, psf	84.0	217	410	---	---	---
Post Peak Shear Stress, psf	81.1	200	366	---	---	---
Peak Secant Friction Angle, °	40.0	35.9	39.4	---	---	---
Post-Peak Secant Friction Angle, °	39.0	33.6	36.2	---	---	---
Pre-Test: Average Asperity, mils	30.4	30.0	29.5	---	---	---
Post-Test: Average Asperity, mils	30.1	29.5	28.5	---	---	---

NOTES: Asperity measurements taken on side of membrane involved in shear plane in general accordance with ASTM D7466. Six measurements taken at the same locations before and after test.

Peak Friction Angle:	**39.2**	**degrees**
Peak Adhesion:	**0**	**psf**
Post Peak Friction Angle:	**35.5**	**degrees**
Post Peak Adhesion:	**2**	**psf**

Figure a. Shear Force vs. Horizontal Displacement

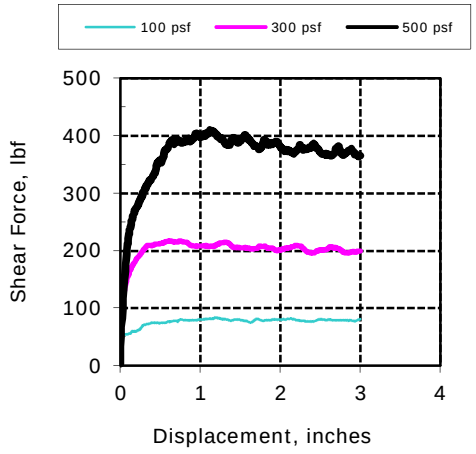
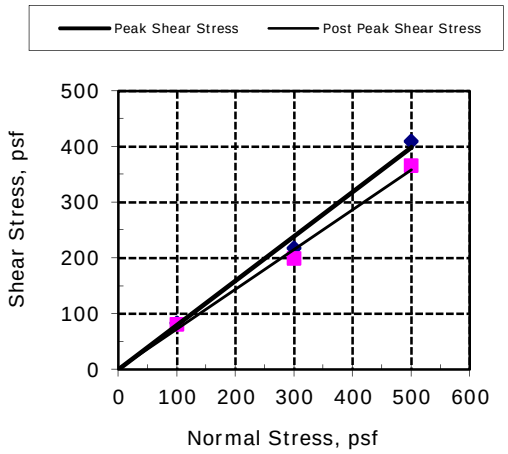


Figure b. Shear Stress vs. Normal Stress



Notes: These results apply only to the sample tested for the specific test conditions. The test procedures employed follow accepted industry practice and the indicated test method. GeoTesting Express has no specific knowledge as to conditioning, origin, sampling procedure or intended use of the material. Values for cohesion and friction angle determined from best-fit straight line to the data for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site-specific conditions.

Client:	Chenango Contracting, Inc.		
Project Name:	Iron Horse Park		
Project Location:	Billerica, MA		
GTX #:	309168		
Start Date:	11/29/18	Tested By:	est
End Date:	11/30/18	Checked By:	bfs
Soil ID:	Newport 3/8 CS		
Soil Description:	Moist, brownish gray sand with silt and gravel		
Geocomposite ID:	Roll #131557033		
Geocomposite Description:	Black, 350 mil GSE double-sided nonwoven biplanar		

Interface Shear Test Series by ASTM D5321

Test Series #:	5		
Test Profile - Top to Bottom:	steel plate / SOIL / GEOCOMPOSITE / textured gripping surface		
Soil Preparation:	Target Compaction: 85% of the maximum dry density at the optimum moisture content (-1% to +3%). Values specified by client.		
Compaction Characteristics:	Maximum Dry Density	127.1 pcf	
	Optimum Moisture Content	9.1 %	
	Compaction Test Method	---	
Geosynthetic Preparation:	Test set-up saturated at normal load for 24 hours prior to shear. The soil was placed against the side of the geocomposite with grooves diagonal to machine direction.		
Test Equipment:	Top box = 12 in x 12 in; Bottom box = 12 in x 12 in; Load cells and LVDTs connected to data acquisition system for shear force, normal load and horizontal displacement readings; Flat plate clamping device; surface area = 144 in^2		
Horizontal Displacement, in/min:	0.04	Test Condition:	inundated

Parameter	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6
Initial Moisture Content, %	8.5	8.5	8.5	---	---	---
Initial Dry Density, pcf	108.3	108.2	108.3	---	---	---
Percent Compaction, %	85.2	85.2	85.2	---	---	---
Final Moisture Content, %	15.8	15.0	14.1	---	---	---
Normal Compressive Stress, psf	100	300	500	---	---	---
Peak Shear Stress, psf	107	280	540	---	---	---
Post Peak Shear Stress, psf	85.8	214	399	---	---	---
Peak Secant Friction Angle, °	47.0	43.0	47.2	---	---	---
Post-Peak Secant Friction Angle, °	40.6	35.5	38.6	---	---	---

NOTES:

Peak Friction Angle:	**47.2**	**degrees**
Peak Adhesion:	**0**	**psf**
Post Peak Friction Angle:	**38.0**	**degrees**
Post Peak Adhesion:	**0**	**psf**

Figure a. Shear Force vs. Horizontal Displacement

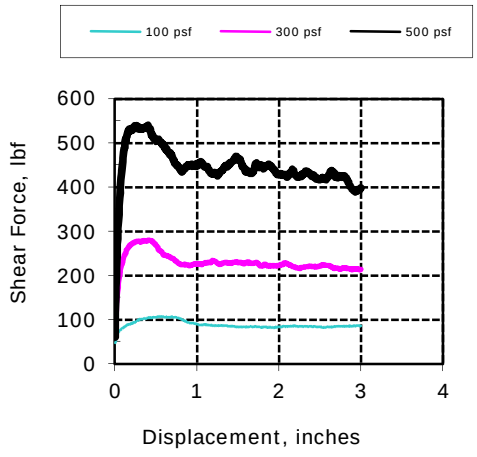
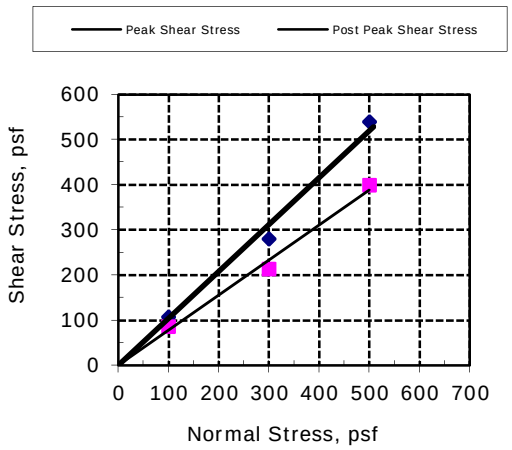


Figure b. Shear Stress vs. Normal Stress



Notes: These results apply only to the sample tested for the specific test conditions. The test procedures employed follow accepted industry practice and the indicated test method. GeoTesting Express has no specific knowledge as to conditioning, origin, sampling procedure or intended use of the material. Values for cohesion and friction angle determined from best-fit straight line to the data for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site-specific conditions.

Client:	Chenango Contracting, Inc.		
Project Name:	Iron Horse Park		
Project Location:	Billerica, MA		
GTX #:	309168		
Start Date:	11/28/18	Tested By:	est
End Date:	11/29/18	Checked By:	bfs
Soil ID:	Newport Structural 3/4		
Soil Description:	Moist, yellowish brown gravel with silt and sand		
Geomembrane ID:	Roll #5-39817		
Geomembrane Description:	Black, 60 mil Solmax textured LLDPE		

Interface Shear Test Series by ASTM D5321

Test Series #:	3		
Test Profile - Top to Bottom:	steel plate / SOIL / GEOMEMBRANE / textured gripping surface		
Soil Preparation:	Soil compacted with moderate effort at the as-received moisture content		
Compaction Characteristics:	Maximum Dry Density	--- pcf	
	Optimum Moisture Content	--- %	
	Compaction Test Method	---	
Geosynthetic Preparation:	Test set-up saturated at normal load for 24 hours prior to shear.		
Test Equipment:	Top box = 12 in x 12 in; Bottom box = 12 in x 12 in; Load cells and LVDTs connected to data acquisition system for shear force, normal load and horizontal displacement readings; Flat plate clamping device; surface area = 144 in^2		
Horizontal Displacement, in/min:	0.04	Test Condition:	inundated

Parameter	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6
Initial Moisture Content, %	6.3	6.5	6.3	---	---	---
Initial Dry Density, pcf	104.3	104.1	104.3	---	---	---
Percent Compaction, %	---	---	---	---	---	---
Final Moisture Content, %	13.2	12.9	10.9	---	---	---
Normal Compressive Stress, psf	100	300	500	---	---	---
Peak Shear Stress, psf	78.5	193	388	---	---	---
Post Peak Shear Stress, psf	73.2	161	346	---	---	---
Peak Secant Friction Angle, °	38.1	32.7	37.8	---	---	---
Post-Peak Secant Friction Angle, °	36.2	28.1	34.7	---	---	---
Pre-Test: Average Asperity, mils	29.0	32.1	33.2	---	---	---
Post-Test: Average Asperity, mils	28.6	31.4	32.1	---	---	---

NOTES: Asperity measurements taken on side of membrane involved in shear plane in general accordance with ASTM D7466. Six measurements taken at the same locations before and after test.

Peak Friction Angle:	**37.7**	**degrees**
Peak Adhesion:	**0**	**psf**
Post Peak Friction Angle:	**34.3**	**degrees**
Post Peak Adhesion:	**0**	**psf**

Figure a. Shear Force vs. Horizontal Displacement

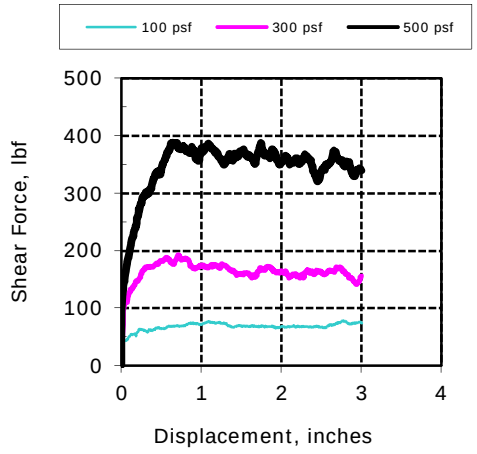
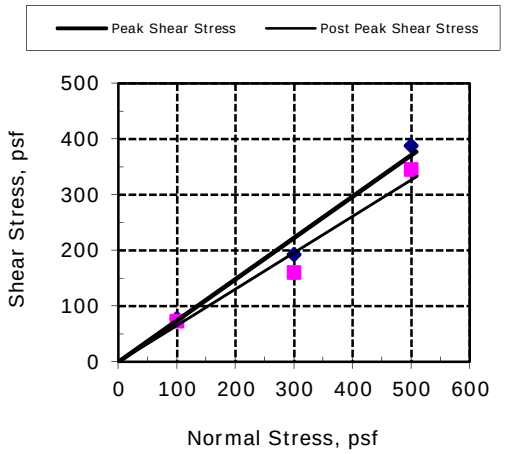


Figure b. Shear Stress vs. Normal Stress



Notes: These results apply only to the sample tested for the specific test conditions. The test procedures employed follow accepted industry practice and the indicated test method. GeoTesting Express has no specific knowledge as to conditioning, origin, sampling procedure or intended use of the material. Values for cohesion and friction angle determined from best-fit straight line to the data for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site-specific conditions.

4. Geomembrane Panel Placement Log

Panel PLACEMENT LOG

Project Name: **IHP Superfund Site - AOC 3** Installer: **Chenango**
Project Number: **0476110**
Site Location: **Billerica, MA** Product Type: **60-mil LLDPE**

General Location Description (if necessary): AOC 3B

Date	Time	Panel ID	Roll No.	Placement Location Comments	Approx. Width (ft)	Approx. Length (ft)	Approx. Area (ft^2)
4/11/2019	7:45	P1	815	West Slope @ sheet wall	22	61	1342
4/11/2019	7:47	P2	815	West Slope-N of P1	22	62	1364
4/11/2019	7:50	P3	815	West Slope- N of P2	22	63	1386
4/11/2019	7:55	P4	815	West Slope- N of P3	22	66	1452
4/11/2019	7:57	P5	815	West Slope- N of P4	22	66	1452
4/11/2019	8:00	P6	815	Northwest Corner	22	30	660
4/11/2019	8:05	P7	815	North Slope- NW Corner	22	35	770
4/11/2019	8:10	P8A	815	North Slope- E of P7	22	30	660
4/11/2019	8:15	P9	815	North Slope- E of P8	22	37	814
4/11/2019	8:20	P10	815	North Slope- E of P9	22	35	770
4/11/2019	8:30	P11	819	Top Panel above P10	22	98	2156
4/11/2019	8:35	P12	819	North Slope- E of P10	22	146	3212
4/11/2019	9:20	P13	819	North Slope- E of P12	22	142	3124
4/11/2019	9:40	P14	819	North Slope- E of P13	22	135	2970
4/11/2019	9:50	P15	821	North Slope- E of P14	22	133	2926
4/11/2019	8:15	P8B	815	Northwest Corner- next to 8A	4	8	32
4/11/2019	9:55	P16	821	North Slope- E of P15	22	69	1518
4/11/2019	10:00	P17	821	N Slope- E of P18	22	23	506
4/11/2019	10:00	P18	821	N Slope- E of P16	22	112	2464
4/11/2019	10:05	P19	821	N Slope- E of P17	22	96	2112
4/11/2019	10:15	P20	821	N Slope- E of P19	22	82	1804
4/11/2019	10:30	P21	822	N Slope- E of P20	22	65	1430
4/11/2019	10:40	P22	822	N Slope- E of P21	22	52	1144
4/11/2019	10:50	P23	822	NE Slope- E of P22	22	26	572
4/11/2019	13:20	P25	822	E Slope- S of P24	22	63	1386
4/11/2019	13:35	P26	810	Top Panel, S of P24, W of P25	22	231	5082
4/11/2019	13:10	P24	822	Top Panel, Furthest North	22	300	6600
4/11/2019	14:10	P27	810	Top Panel, S of P25 and P26	22	233	5126
4/11/2019	14:25	P28	809	Top Panel, S of P27 and P29	22	300	6600
4/11/2019	14:35	P29	809	Toe of E Slope, E of P27	22	7	154
4/11/2019	14:45	P30	809	Top Panel, S of P28	22	209	4598
4/11/2019	14:50	P31	825	E Slope, E of P30	22	95	2090
						Total area this page:	68,276

Notes:

Approximate Area

This page: 68,276 ft^2
This page: 7,586 yd^2
Accumulated: 68,276 ft^2
Accumulated: 7,586 yd^2

Reviewed By: Alec Randall

Panel PLACEMENT LOG

Project Name: **IHP Superfund Site - AOC 3**
Installer: **Chenango**
Project Number: **0476110**
Site Location: **Billerica, MA**
Product Type: **60-mil LLDPE**

General Location Description (if necessary): AOC 3B

Date	Time	Panel ID	Roll No.	Placement Location Comments	Approx. Width (ft)	Approx. Length (ft)	Approx. Area (ft^2)
4/11/2019	15:10	P32	825	Top Panel, S of P30 and P31	22	306	6732
4/11/2019	15:15	P33	825	W Slope, S of P32, W of P34	22	52	1144
4/11/2019	15:20	P34	825	Top Panel, S of P32, E of P33	22	54	1188
4/11/2019	15:35	P35	813	Top Panel, E of P34	22	137	3014
4/11/2019	15:50	P36	813	Top Panel, S of P35	22	318	6996
4/11/2019	16:25	P37	820	Top Panel, S of P36	22	318	6996
4/11/2019	16:40	P38	820	Top Panel, S of P37	22	200	4400
4/12/2019	8:15	P39	814	E Slope, E of P38	22	123	2706
4/12/2019	8:30	P40	814	Top Panel, S of P38 and P39	22	324	7128
4/12/2019	8:40	P41	814	W Slope, S of P40	22	75	1650
4/12/2019	8:50	P42	811	Top Panel, S of P40, W of P41	22	225	4950
4/12/2019	9:05	P43	811	Top Panel, S of P41 and P42	22	286	6292
4/12/2019	9:15	P44	826	Top Panel, S of P43	22	254	5588
4/12/2019	9:35	P45	826	Top Panel, S of P44	22	200	4400
4/12/2019	9:45	P46	826	SW Edge of Cap, S of P45, W of P48	12	42	504
4/12/2019	10:00	P47	826	SE Corner, E of P48, S of P45	22	19	418
4/12/2019	10:10	P48	816	Top Panel, S of P45, W of P47, E of P46	22	102	2244
4/12/2019	10:20	P49	816	S edge, S of P48, E of P51, W of P50	11	81	891
4/12/2019	10:45	P50	816	SE Corner, S of P47 and P48, E of P49	3	19	57
4/12/2019	10:50	P51	816	S edge of cap, S of P46, W of P49	4	13	52
4/12/2019	9:20	P44A	826	SE Corner, S of P43, E of P44	6	13	78
						Total area this page:	67,428

Notes:

Approximate Area

This page: 67,428 ft^2
This page: 7,492 yd^2
Accumulated: 135,704 ft^2
Accumulated: 15,078 yd^2

Reviewed By: Alec Randall

Panel PLACEMENT LOG

Project Name: **IHP Superfund Site - AOC 3** Installer: **Chenango**
Project Number: **0476110**
Site Location: **Billerica, MA** Product Type: **60-mil LLDPE**

General Location Description (if necessary): AOC 3A

Date	Time	Panel ID	Roll No.	Placement Location Comments	Approx. Width (ft)	Approx. Length (ft)	Approx. Area (ft^2)
4/23/2019	12:40	P52	816	S Slope, Middle of Slope	22	45	990
4/23/2019	12:50	P53	816	S Slope, E of P52	22	45	990
4/23/2019	13:00	P54	816	S Slope, E of P53	22	43	946
4/23/2019	13:05	P55	816	SE Corner, E of P54	22	9	198
4/23/2019	13:07	P56	816	E Slope, N of P55	22	6	132
4/23/2019	13:10	P57	816	S Slope, E of P52	22	42	924
4/23/2019	13:13	P58	816	SW Corner, S of P59, W of P57	22	16	352
4/23/2019	13:15	P59	816	W Slope, N of P58	22	26	572
4/23/2019	13:20	P60	816	Top Panel, N of P52-P59	22	86	1892
4/23/2019	13:23	P61	818	E Slope, E of P60	22	23	506
4/23/2019	13:28	P62	818	Top Panel, N of P60 and P61	22	107	2354
4/23/2019	13:35	P63	818	Top Panel N of P62	22	102	2244
4/23/2019	13:40	P64	818	Top Panel N of P63	22	110	2420
4/23/2019	13:45	P65	818	Top Panel, N of P64	22	109	2398
4/23/2019	13:50	P66	818	Top Panel, N of P65	12	64	768
4/23/2019	14:00	P67	817	Top Panel, N of P65	22	60	1320
4/23/2019	14:10	P68	817	Top Panel, N of P66 and P67	22	105	2310
4/23/2019	14:30	P69	817	Slope Panel @ sheet wall end	22	30	660
4/23/2019	14:40	P70	817	Top Panel at end of North 3A	22	80	1760
						Total area this page:	23,736

Notes:

Approximate Area
This page: 23,736 ft^2
This page: 2,637 yd^2
Accumulated: 159,440 ft^2
Accumulated: 17,715 yd^2

Reviewed By: Alec Randall

NOTES:

1. PANEL LOCATIONS, PATCH REPAIR LOCATIONS, AND DESTRUCTIVE SAMPLE LOCATIONS ALL BASED ON POINTS PROVIDED BY CHARTER CONTRACTING COMPANY FROM AN ON-THE-GROUND SURVEY DATED APRIL OF 2019. DURING THE INSTALLATION.

LEGEND:
SYMBOLS AND ABBREVIATIONS SHOWN ON THIS PLAN

GEOMEMBRANE PANEL LABEL	P10
PATCH REPAIR	R-10
DESTRUCTIVE SAMPLE	DS-10

40 0 20 40 80 160
(IN FEET)
1 inch = 40 ft.

PROFESSIONAL LAND SURVEYOR

GEOMEMBRANE PANELS
PAN AM RAILWAYS
IRON HORSE PARK
BILLERICA, MASSACHUSETTS

DANA F. PERKINS, Inc.
Consulting Engineers & Land Surveyors
1057 EAST STREET ~ TEWKSBURY, MASSACHUSETTS 01876
TEL: 978-858-0080 FAX: 978-640-0237
DANAFPERKINS.COM

PREPARED FOR:
CHARTER CONTRACTING COMPANY
500 HARRISON AVENUE, SUITE #4R
BOSTON, MA

SCALE: 1" = 40' | DATE: APRIL 29, 2019 | JOB NO. 51905 | SHEET 1 OF 1

COPYRIGHT © 2019 BY DANA F. PERKINS, Inc.

5. Geomembrane Seam Tracking and Testing

SEAM SUMMARY LOG

Project Name: **IHP Superfund Site - AOC 3**
Project Number: **0476110**
Site Location: **Billerica, MA**

Installer: **Chenango**
Specs: Air Pressure Testing for Fusion Welds - pump to ≥ 30 psi, then max drop of 4 psi after 5 min, then cut far end
Vacuum Testing for Extrusion Welds - 10 seconds in 4-8 psi vacuum, no bubbles through seam

General Location Description (if necessary):

Seam							Non-Destructive Test						
Date	Time	Seam ID	Seam Type	Machine ID	Oper. ID	Seam Length (ft), before testing	Test Type	Air Pressure (psi) Start	Air Pressure (psi) Finish	Test Details	Oper. ID	Pass	Fail
11-Apr	9:00	P1/P2	F	W49	LS	61	A	30	30	9:15-9:20 4/11	LPS	Y	
11-Apr	8:45	P2/P3	F	W49	LS	62	A	30	30	9:15-9:20 4/11	LPS	Y	
11-Apr	8:50	P3/P4	F	W34	CS	63	A	30	29	9:16-9:21 4/11	LPS	Y	
11-Apr	9:00	P4/P5	F	W34	CS	66	A	30	30	10:15-10:20 4/11	LPS	Y	
11-Apr	9:11	P5/P6	F	W49	LS	23	A	30	28	10:16-10:21 4/11	LPS	Y	
11-Apr	9:33	P6/P8A	F	W49	LS	31	A	30	29	10:50-10:55 4/16	AT	Y	
11-Apr	9:40	P8A/P8B	F	W49	LS	8	V	5	5	4/17	ZR	Y	
11-Apr	9:20	P8A/P7	F	W49	LS	35	A	30	30	10:16-10:29 4/11	AT	Y	
11-Apr	9:10	P7/P9	F	W34	CS	37	A	30	29	10:51-10:56 4/16	AT	Y	
11-Apr	9:25	P9/P10	F	W34	CS	37	A	30	30	10:31-10:36 4/16	AT	Y	
11-Apr	9:45	P10/P11	F	W34	CS	22	A	30	30	10:21-10:26 4/16	AT	Y	
11-Apr	10:05	P7/P5	F	W34	CS	22	A	30	30	10:51-10:56 4/16	AT	Y	
11-Apr	10:05	P9/P5	F	W34	CS	22	A	30	30	10:31-10:36 4/16	AT	Y	
11-Apr	10:30	P10/P5	F	W34	CS	10	A	30	30	10:32-10:37 4/16	AT	Y	
11-Apr	10:37	P5/P11	F	W34	CS	10	A	30	30	10:22-10:27 4/16	AT	Y	
11-Apr	10:37	P4/P11	F	W34	CS	22	A	30	30	10:11-10:16 4/16	AT	Y	
11-Apr	10:37	P3/P11	F	W34	CS	22	A	30	30	10:11-10:16 4/16	AT	Y	
11-Apr	10:37	P2/P11	F	W34	CS	22	A	30	30	10:11-10:16 4/16	AT	Y	
11-Apr	10:37	P1/P11	F	W34	CS	22	A	30	30	10:05-10:10 4/16	AT	Y	
						Total length this page: 597							

Seam Types: E = Extrusion, F = Fusion
Test Types: A = Air Pressure, V = Vacuum

Seam Length Totals
This page: 597 ft
Accumulated: 597 ft

Notes:

Reviewed By:

SEAM SUMMARY LOG

Project Name: **IHP Superfund Site - AOC 3**
Project Number: **0476110**
Site Location: **Billerica, MA**

Installer: **Chenango**
Specs: Air Pressure Testing for Fusion Welds - pump to ≥ 30 psi, then max drop of 4 psi after 5 min, then cut far end
Vacuum Testing for Extrusion Welds - 10 seconds in 4-8 psi vacuum, no bubbles through seam

General Location Description (if necessary):

Seam							Non-Destructive Test						
Date	Time	Seam ID	Seam Type	Machine ID	Oper. ID	Seam Length (ft), before testing	Test Type	Air Pressure (psi) Start	Air Pressure (psi) Finish	Test Details	Oper. ID	Pass	Fail
11-Apr	10:00	P10/P12	F	W17	SR	47	V	5	5	4/17	PW	Y	
11-Apr	10:00	P12/P13	F	W49	LS	145	V	5	5	4/17	PW	Y	
11-Apr	10:25	P13/P14	F	W49	LS	138	A	30	30	9:30-9:35 4/16	AT	Y	
11-Apr	10:50	P14/P15	F	W49	LS	122	A	30	30	8:50-8:55 4/16	AT	Y	
11-Apr	11:00	P16/P15	F	W26	LPS	83	A	30	30	8:51-8:56 4/16	AT	Y	
11-Apr	11:00	P18/P16	F	W34	CS	38	A	30	30	9:15-9:20 4/16	AT	Y	
11-Apr	11:15	P17/P18	F	W34	CS	36	A	30	30	9:15-9:20 4/16	AT	Y	
11-Apr	11:11	P17/P19	F	W49	LS	103	A	30	30	8:33-8:38 4/16	AT	Y	
11-Apr	11:20	P19/P20	F	W26	LPS	86	A	30	30	8:20-8:25 4/16	AT	Y	
11-Apr	11:30	P20/P21	F	W49	LS	72	A	30	30	8:00-8:05 4/16	AT	Y	
11-Apr	11:35	P21/P22	F	W26	LPS	54	A	30	30	8:01-8:06 4/16	AT	Y	
11-Apr	11:40	P22/P23	F	W34	CS	33	A	30	30	7:43-7:48 4/16	AT	Y	
11-Apr	11:15	P16/P17	F	W34	CS	36	A	30	30	9:16-9:21 4/16	AT	Y	
11-Apr	11:15	P15/P17	F	W34	CS	37	A	30	29	8:50-8:55 4/16	AT	Y	
11-Apr	11:15	P14/P17	F	W34	CS	8	V	5	5	4/17	ZR	Y	
11-Apr	13:35	P1/P24	F	W49	LS	62	A	30	30	10:05-10:10 4/16	AT	Y	
11-Apr	13:35	P11/P24	F	W49	LS	22	A	30	30	9:50-9:55 4/16	AT	Y	
11-Apr	13:35	P12/P24	F	W49	LS	22	A	30	30	9:50-9:55 4/16	AT	Y	
11-Apr	13:35	P13/P24	F	W49	LS	22	A	30	30	9:30-9:35 4/16	AT	Y	
11-Apr	13:35	P14/P24	F	W49	LS	22	A	30	30	8:42-8:47 4/16	AT	Y	
						Total length this page: 1188							

Seam Types: E = Extrusion, F = Fusion
Test Types: A = Air Pressure, V = Vacuum

Seam Length Totals
This page: 1188 ft
Accumulated: 1785 ft

Notes:

Reviewed By: Alec Randall

SEAM SUMMARY LOG

Project Name: **IHP Superfund Site - AOC 3**
Project Number: **0476110**
Site Location: **Billerica, MA**

Installer: **Chenango**
Specs: Air Pressure Testing for Fusion Welds - pump to ≥ 30 psi, then max drop of 4 psi after 5 min, then cut far end
Vacuum Testing for Extrusion Welds - 10 seconds in 4-8 psi vacuum, no bubbles through seam

General Location Description (if necessary):

Seam							Non-Destructive Test						
Date	Time	Seam ID	Seam Type	Machine ID	Oper. ID	Seam Length (ft), before testing	Test Type	Air Pressure (psi) Start	Air Pressure (psi) Finish	Test Details	Oper. ID	Pass	Fail
11-Apr	13:35	P17/P24	F	W49	LS	23	A	30	30	8:33-8:39 4/16	AT	Y	
11-Apr	13:35	P19/P24	F	W49	LS	27	A	30	30	8:21-8:26 4/16	AT	Y	
11-Apr	13:35	P20/P24	F	W49	LS	28	A	30	30	8:20-8:25 4/16	AT	Y	
11-Apr	13:35	P21/P24	F	W49	LS	28	A	30	30	8:01-8:06 4/16	AT	Y	
11-Apr	13:35	P22/P24	F	W49	LS	27	A	30	30	7:44-7:49 4/16	AT	Y	
11-Apr	13:35	P23/P24	F	W49	LS	18	A	30	30	7:43-7:48 4/16	AT	Y	
11-Apr	13:45	P25/P26	F	W26	LPS	22	A	30	29	7:21-7:26 4/16	AT	Y	
11-Apr	14:00	P24/P25	F	W26	LPS	67	A	30	30	7:30-7:35 4/16	AT	Y	
11-Apr	14:00	P24/P26	F	W26	LPS	281	A	30	30	7:20-7:25 4/16	AT	Y	
11-Apr	14:09	P26/P27	F	W34	CS	290	A	30	30	10:41-10:46 4/12	AT	Y	
11-Apr	14:30	P28/P27	F	W49	LS	293	A	30	29	10:40-10:45 4/12	AT	Y	
11-Apr	14:40	P29/P27	F	W26	LPS	22	A	30	30	10:40-10:45 4/12	AT	Y	
11-Apr	14:30	P29/P28	F	W26	LPS	7	A	30	30	10:55-11:00 4/12	AT	Y	
11-Apr	14:09	P25/P29	F	W34	CS	6	A	30	30	10:55-11:00 4/12	AT	Y	
11-Apr	14:09	P25/P27	F	W34	CS	63	A	30	30	7:20-7:25 4/16	AT	Y	
11-Apr	15:00	P30/P31	F	W34	CS	22	A	30	30	9:45-9:50 4/12	AT	Y	
11-Apr	15:00	P28/P30	F	W26	LPS	209	A	30	30	10:10-10:15 4/12	AT	Y	
11-Apr	15:00	P28/P31	F	W26	LPS	95	A	30	30	9:46-9:51 4/12	AT	Y	
11-Apr	15:10	P31/P32	F	W34	CS	95	A	30	30	9:45-9:50 4/12	AT	Y	
11-Apr	15:10	P30/P32	F	W34	CS	211	A	30	30	10:10-10:15 4/12	AT	Y	
					Total length this page:	1834							

Seam Types: E = Extrusion, F = Fusion
Test Types: A = Air Pressure, V = Vacuum

Seam Length Totals
This page: 1834 ft
Accumulated: 3619 ft

Notes:

Reviewed By: Alec Randall

SEAM SUMMARY LOG

Project Name: **IHP Superfund Site - AOC 3**
Project Number: **0476110**
Site Location: **Billerica, MA**

Installer: **Chenango**
Specs: Air Pressure Testing for Fusion Welds - pump to ≥ 30 psi, then max drop of 4 psi after 5 min, then cut far end
Vacuum Testing for Extrusion Welds - 10 seconds in 4-8 psi vacuum, no bubbles through seam

General Location Description (if necessary):

Seam							Non-Destructive Test						
Date	Time	Seam ID	Seam Type	Machine ID	Oper. ID	Seam Length (ft), before testing	Test Type	Air Pressure (psi) Start	Air Pressure (psi) Finish	Test Details	Oper. ID	Pass	Fail
11-Apr	15:22	P32/P33	F	W49	LS	54	A	30	30	9:05-9:10 4/12	AT	Y	
11-Apr	15:40	P32/P34	F	W49	LS	52	A	30	30	9:05-9:10 4/12	AT	Y	
11-Apr	15:33	P33/P34	F	W49	LS	22	A	30	30	8:50-8:55 4/12	AT	Y	
11-Apr	15:40	P32/P35	F	W49	LS	198	A	30	30	9:22-9:27 4/12	AT	Y	
11-Apr	15:40	P34/P35	F	W26	LPS	22	A	30	30	9:23-9:28 4/12	AT	Y	
11-Apr	16:00	P34/P36	F	W26	LPS	52	A	30	30	8:35-8:40 4/12	AT	Y	
11-Apr	16:00	P35/P36	F	W26	LPS	137	A	30	29	9:23-9:28 4/12	AT	Y	
11-Apr	16:00	P33/P36	F	W26	LPS	58	A	30	30	8:35-8:40 4/12	AT	Y	
11-Apr	16:25	P36/P37	F	W34	CS	318	A	30	29	8:20-8:25 4/12	AT	Y	
11-Apr	16:42	P37/P38	F	W49	LS	200	A	30	30	8:00-8:05 4/12	AT	Y	
12-Apr	8:45	P37/P39	F	W49	LS	123	A	30	30	11:20-11:25 4/12	AT	Y	
12-Apr	8:40	P38/P39	F	W49	LS	22	A	30	30	11:20-11:25 4/12	AT	Y	
12-Apr	8:50	P38/P40	F	W34	CS	200	A	30	30	11:40-11:45 4/12	AT	Y	
12-Apr	8:50	P39/P40	F	W34	CS	119	A	30	30	11:21-11:26 4/12	AT	Y	
12-Apr	9:21	P40/P41	F	W49	LS	52	A	30	30	14:00-14:05 4/12	AT	Y	
12-Apr	9:21	P40/P42	F	W49	LS	231	A	30	30	14:30-14:35 4/12	AT	Y	
12-Apr	9:12	P41/P42	F	W49	LS	22	A	30	30	14:31-14:36 4/12	AT	Y	
12-Apr	9:40	P43/P41	F	W34	CS	75	A	30	30	13:50-13:55 4/12	AT	Y	
12-Apr	9:40	P43/P42	F	W34	CS	210	A	30	29	14:37-14:42 4/12 (Split into 3 segments)	AT	Y	
					Total length this page:	2167							

Seam Types: E = Extrusion, F = Fusion
Test Types: A = Air Pressure, V = Vacuum

Seam Length Totals
This page: 2167 ft
Accumulated: 5786 ft

Notes:

Reviewed By: Alec Randall

SEAM SUMMARY LOG

Project Name: **IHP Superfund Site - AOC 3**
Project Number: **0476110**
Site Location: **Billerica, MA**

Installer: **Chenango**
Specs: Air Pressure Testing for Fusion Welds - pump to ≥ 30 psi, then max drop of 4 psi after 5 min, then cut far end
Vacuum Testing for Extrusion Welds - 10 seconds in 4-8 psi vacuum, no bubbles through seam

General Location Description (if necessary):

Seam							Non-Destructive Test						
Date	Time	Seam ID	Seam Type	Machine ID	Oper. ID	Seam Length (ft), before testing	Test Type	Air Pressure (psi) Start	Air Pressure (psi) Finish	Test Details	Oper. ID	Pass	Fail
12-Apr	10:05	P43/P44	F	W49	LS	262	A	30	30	13:50-13:55 4/12	AT	Y	
12-Apr	10:30	P44/P45	F	W34	CS	231	A	30	30	13:12-13:17 4/12	AT	Y	
12-Apr	10:40	P46/P48	F	W49	LS	19	A	30	30	12:40-12:45 4/12	AT	Y	
12-Apr	11:00	P45/P47	F	W49	LS	20	A	30	30	13:01-13:06 4/12	AT	Y	
12-Apr	11:00	P45/P48	F	W49	LS	102	A	30	30	12:41-12:46 4/12	AT	Y	
12-Apr	11:00	P48/P47	F	W34	CS	22	A	30	30	13:01-13:06 4/12	AT	Y	
12-Apr	11:15	P48/P49	F	W34	CS	74	A	30	30	12:56-13:01 4/12	AT	Y	
12-Apr	11:08	P47/P50	F	W34	CS	13	V	5	5	4/16	ZR	Y	
12-Apr	11:08	P48/P50	F	W34	CS	6	V	5	5	4/16	ZR	Y	
12-Apr	11:12	P48/P51	F	W49	LS	12	A	30	30	12:56-13:01 4/12	AT	Y	
12-Apr	11:21	P49/P51	F	W49	LS	5	V	5	5	4/16	ZR	Y	
12-Apr	10:47	P45/P46	F	W49	LS	43	A	30	30	12:40-12:45 4/12	AT	Y	
12-Apr	10:05	P43/P44A	F	W49	LS	13	A	30	30	13:11-13:16 4/12	AT	Y	
12-Apr	10:33	P44/P44A	F	W49	LS	5	V	5	5	4/16	AT	Y	
23-Apr	13:45	P52/P57	F	W34	PNW	42	A	30	30	14:38-14:43 4/23	AT	Y	
23-Apr	13:30	P52/P53	F	W34	PNW	43	A	30	29	14:37-14:42 4/23	AT	Y	
23-Apr	13:30	P52/P60	F	W49	LS	22	A	30	30	14:38-14:43 4/23	AT	Y	
23-Apr	14:01	P53/P60	F	W49	LS	22	A	30	30	15:00-15:05 4/23	AT	Y	
23-Apr	13:30	P53/P54	F	W49	LS	47	A	30	30	15:00-15:05 4/23	AT	Y	

Total length this page: 1003

Seam Types: E = Extrusion, F = Fusion
Test Types: A = Air Pressure, V = Vacuum

Seam Length Totals
This page: 1003 ft
Accumulated: 6789 ft

Notes:

Reviewed By: Alec Randall

SEAM SUMMARY LOG

Project Name: **IHP Superfund Site - AOC 3**
Project Number: **0476110**
Site Location: **Billerica, MA**

Installer: **Chenango**
Specs: Air Pressure Testing for Fusion Welds - pump to ≥ 30 psi, then max drop of 4 psi after 5 min, then cut far end
Vacuum Testing for Extrusion Welds - 10 seconds in 4-8 psi vacuum, no bubbles through seam

General Location Description (if necessary):

Seam							Non-Destructive Test						
Date	Time	Seam ID	Seam Type	Machine ID	Oper. ID	Seam Length (ft), before testing	Test Type	Air Pressure (psi) Start	Air Pressure (psi) Finish	Test Details	Oper. ID	Pass	Fail
23-Apr	14:01	P54/P61	F	W49	LS	17	A	30	30	15:01-15:06 4/23	AT	Y	
23-Apr	13:45	P54/P55	F	W49	LS	21	A	30/30	29/30	15:11-15:16, 15:10-15:15 (Two Segments)	AT	Y	
23-Apr	13:51	P54/P56	F	W49	LS	21	A	30	30	15:20-15:25	AT	Y	
23-Apr	13:41	P55/P56	F	W49	LS	5	V	5	5	4/24 No Issues	AT	Y	
24-Apr	13:20	P56/P61	E	X6	LS	3	V	5	5	4/24 No Issues	AT	Y	
23-Apr	14:24	P57/P58	F	W34	LS	15	A	30	29	14:35-14:40 4/23	AT	Y	
23-Apr	14:08	P57/P59	F	W34	PNW	24	A	30	29	14:27-14:32 4/23	AT	Y	
23-Apr	14:05	P57/P60	F	W49	LS	18	A	30	30	14:26-14:31 4/23	AT	Y	
23-Apr	14:10	P58/P59	F	W49	LS	17	A	30	30	14:35-14:40 4/23	AT	Y	
23-Apr	14:15	P59/P60	F	W49	LS	26	A	30	30	14:26-14:31 4/23	AT	Y	
23-Apr	14:01	P60/P61	F	W34	PNW	22	A	30	29	15:40-15:45 4/23	AT	Y	
23-Apr	14:12	P60/P62	F	W34	PNW	89	A	30	30	15:41-15:46 4/23	AT	Y	
23-Apr	14:30	P61/P62	F	W34	PNW	88	A	30	30	15:40-15:45 4/23	AT	Y	
23-Apr	14:32	P62/P63	F	W34	PNW	102	A	30/30	30/29	15:54-15:59, 15:50-15:55, 4/23 (Two Segments)	AT	Y	
23-Apr	14:36	P63/P64	F	W49	LS	103	A	30	30	15:56-16:01 4/23	AT	Y	
23-Apr	14:55	P64/P65	F	W34	LS	109	A	30	30	15:56-16:01 4/23	AT	Y	
23-Apr	15:00	P65/P66	F	W49	LS	62	A	30	30	16:21-16:26 4/23	AT	Y	
23-Apr	15:05	P65/P67	F	W49	LS	53	A	30	30	16:30-16:35 4/23	AT	Y	
23-Apr	14:55	P66/P67	F	W49	LS	22	A	30	30	16:21-16:26 4/23	AT	Y	
23-Apr	15:17	P66/P68	F	W34	PNW	64	A	30	30	16:20-16:25 4/23	AT	Y	
						Total length this page: 881							

Seam Types: E = Extrusion, F = Fusion
Test Types: A = Air Pressure, V = Vacuum

Seam Length Totals
This page: 881 ft
Accumulated: 7670 ft

Notes:

Reviewed By: Alec Randall

Project Name: **IHP Superfund Site - AOC 3**
Project Number: **0476110**
Site Location: **Billerica, MA**

Installer: **Chenango**
Specs: Air Pressure Testing for Fusion Welds - pump to ≥ 30 psi, then max drop of 4 psi after 5 min, then cut far end
Vacuum Testing for Extrusion Welds - 10 seconds in 4-8 psi vacuum, no bubbles through seam

General Location Description (if necessary):

Seam							Non-Destructive Test						
Date	Time	Seam ID	Seam Type	Machine ID	Oper. ID	Seam Length (ft), before testing	Test Type	Air Pressure (psi) Start	Air Pressure (psi) Finish	Test Details	Oper. ID	Pass	Fail
23-Apr	15:17	P67/P68	F	W34	PNW	58	A	30	30	16:30-16:35 4/23	AT	Y	
23-Apr	15:30	P68/P69	F	W49	LS	22	A	30	30	16:50-16:55 4/23	AT	Y	
23-Apr	15:27	P68/P70	F	W49	LS	105	A	30	30	16:51-16:56 4/23	AT	Y	
23-Apr	15:50	P69/P70	F	W49	LS	19	A	30	30	16:51-16:56 4/23	AT	Y	
23-Apr	13:45	P54/P54	F	W49	LS	6	A	30	30	15:10-15:15 4/23	AT	Y	
					Total length this page:	210							

Seam Length Totals
This page: 210 ft
Accumulated: 7880 ft

Seam Types: E = Extrusion, F = Fusion
Test Types: A = Air Pressure, V = Vacuum

Notes:

Reviewed By: Alec Randall

6. Geomembrane Repair Log

REPAIR SUMMARY LOG

Project Name: **IHP Superfund Site - AOC 3**
Project Number: **0476110**
Site Location: **Billerica, MA**

Installer: **Chenango**
Specs: Air Pressure Testing for Fusion Welds - pump to ≥ 30 psi, then max drop of 4 psi after 5 min, then cut end
Vacuum Testing for Extrusion Welds - 10 seconds in 4-8 psi vacuum, no bubbles through Seam

Repair									Non-Destructive Test						
Date	Seam ID	Panel ID(s)	Location Description	Repair No. & Code [1]	Repair Type [2]	Description, Size, etc. (optional)	Mach. No.	Oper. ID	Test Type [3]	Air Pressure (psi) Start	Air Pressure (psi) Finish	Test Details	Oper. ID	Pass	Fail
12-Apr	48/47/50	48/47/50	3-way	R1-C	E	2'x2' 13:25	X6	CS	V	5	5	Pass	ZR	Y	
12-Apr	48/49/51	48/49/51	3-way	R2-C	E	3'x1' 13:15	X6	CS	V	5	5	Pass	ZR	Y	
12-Apr	45/46/48	45/46/48	3-way	R3-C	E	2'x1' 13:05	X6	CS	V	5	5	Pass	ZR	Y	
12-Apr	45/48	45/48	Middle of Seam	R4-C	E	3'x1' 13:09	X6	CS	V	5	5	Pass	ZR	Y	
16-Apr	45/48	45/48	DS-1	R5-DS	E	2'x5'	X6	LS	V	5	5	Pass	ZR	Y	
12-Apr	45/47/48	45/47/48	3-Way	R6-C	E	2'x2' 13:35	X6	CS	V	5	5	Pass	ZR	Y	
12-Apr	44/45	44/45	East section	R7-C	E	3'x2' 13:45	X6	CS	V	5	5	Pass	ZR	Y	
16-Apr	44/45	44/45	DS-2	R8-DS	E	2'x5'	X6	LS	V	5	5	Pass	TS	Y	
12-Apr	44/45	44/45	West Section	R9-C	E	2'x1' 15:40	X6	CS	V	5	5	Pass	TS	Y	
12-Apr	44/43/44A	44/43/44A	3-Way	R10-C	E	2'x1' 14:00	X6	CS	V	5	5	Pass	ZR	Y	
12-Apr	41/42/43	41/42/43	3-Way	R12-C	E	2'x2.5' 14:50	X6	CS	V	5	5	Pass	TS	Y	
16-Apr	41/42	41/42	DS-3	R13-DS	E	2'x5'	X6	LS	V	5	5	Pass	TS	Y	
16-Apr	40/41	40/41	West Slope	R14-C	E	4'x15' Power Pole Boot	X6	LS	V	5	5	Pass	TS	Y	
12-Apr	40/41/42	40/41/42	3-Way	R15-C	E	2'x3' 15:00	X6	CS	V	5	5	Pass	TS	Y	
12-Apr	38/39/30	38/39/30	3-Way	R16-C	E	2'x2' 14:15	X6	CS	V	5	5	Pass	ZR	Y	
12-Apr	38/40	38/40	Middle	R17-C	E	4'x2' 14:35	X6	CS	V	5	5	Pass	TS	Y	
16-Apr	38/40	38/40	DS-4	R18-DS	E	2'x5'	X6	LS	V	5	5	Pass	TS	Y	
16-Apr	37/38	37/38	Toe of W Slope	R19-C	E	2'x4'	X6	LS	V	5	5	Pass	TS	Y	
16-Apr	37/38	37/38	W Slope	R20-C	E	2'x4'	X6	LS	V	5	5	Pass	TS	Y	

[1] Repair No.: Repairs should be numbered sequentially
Repair Codes: P = Patch, C = Cap, S = Anchor Trench Extension, DS = Destructive Sample, G = Grind & Weld, T = Topping Along Fusion Seam, R = Reconstruction

[2] Repair Types: E = Extrusion, F = Fusion

[3] Test Types: A = Air Pressure, V = Vacuum

Notes:

Reviewed By: Alec Randall

REPAIR SUMMARY LOG

Project Name: **IHP Superfund Site - AOC 3**
Project Number: **0476110**
Site Location: **Billerica, MA**

Installer: **Chenango**
Specs: Air Pressure Testing for Fusion Welds - pump to ≥ 30 psi, then max drop of 4 psi after 5 min, then cut end
Vacuum Testing for Extrusion Welds - 10 seconds in 4-8 psi vacuum, no bubbles through Seam

Repair									Non-Destructive Test						
Date	Seam ID	Panel ID(s)	Location Description	Repair No. & Code [1]	Repair Type [2]	Description, Size, etc. (optional)	Mach. No.	Oper. ID	Test Type [3]	Air Pressure (psi) Start	Air Pressure (psi) Finish	Test Details	Oper. ID	Pass	Fail
12-Apr	37/38/39	37/38/39	3-way	R21-C	E	2'x2' 14:25	X6	CS	V	5	5	Pass	ZR	Y	
16-Apr	42/43	42/43	East side	R11-C	E	2'x3'	X6	LS	V	5	5	Pass	ZR	Y	
16-Apr	36/37	36/37	East Slope	R22-C	E	1'x2'	X18	AS	V	5	5	Pass	ZR	Y	
16-Apr	11/12	11/12	Full Seam	R23-C	E	1.5'x143'	X18	AS	V	5	5	Pass	TS	Y	
16-Apr	33/36	33/36	West Slope	R24-C	E	1.5'x2'	X6	LS	V	5	5	Pass	TS	Y	
16-Apr	33/36	33/36	West Slope	R25-C	E	1'x2'	X6	LS	V	5	5	Pass	TS	Y	
16-Apr	33/36	33/36	Under power pole	R26-P	E	2'x2' Guy Wire	X6	LS	V	5	5	Pass	TS	Y	
16-Apr	34/36/33	34/36/33	Under power Pole	R27-P	E	2'x2' Guy Wire	X6	LS	V	5	5	Pass	TS	Y	
16-Apr	35/36	35/36	Middle Seam	R29-DS	E	5'x2' DS-5	X6	LS	V	5	5	Pass	TS	Y	
16-Apr	32/35	32/35	East Slope	R30-DS	E	2'x5' DS-6	X6	LS	V	5	5	Pass	ZR	Y	
16-Apr	32/35/34	32/35/34	3-way	R31-C	E	2'x2.5'	X6	LS	V	5	5	Pass	TS	Y	
16-Apr	34/33/32	34/33/32	Under power pole	R32-C	E	4'x2' Guy Wire	X6	LS	V	5	5	Pass	TS	Y	
16-Apr	30/32	30/32	Middle Seam	R34-DS	E	2'x5' DS-8	X6	LS	V	5	5	Pass	TS	Y	
16-Apr	31/30/32	31/30/32	Middle of Seam	R35-C	E	2'x1'	X18	AS	V	5	5	Pass	ZR	Y	
16-Apr	31/32	31/32	East side	R36-C	E	1'x2'	X18	AS	V	5	5	Pass	ZR	Y	
16-Apr	31/28	31/28	East side	R37-C	E	1'x2'	X18	AS	V	5	5	Pass	ZR	Y	
16-Apr	30/31	30/31	East side	R38-C	E	2'x5' DS-7	X6	LS	V	5	5	Pass	ZR	Y	
16-Apr	31/30/28	31/30/28	East side	R39-C	E	1'x2'	X18	AS	V	5	5	Pass	ZR	Y	

[1] Repair No.: Repairs should be numbered sequentially
Repair Codes: P = Patch, C = Cap, S = Anchor Trench Extension, DS = Destructive Sample, G = Grind & Weld, T = Topping Along Fusion Seam, R = Reconstruction

[2] Repair Types: E = Extrusion, F = Fusion

[3] Test Types: A = Air Pressure, V = Vacuum

Notes:

Reviewed By: Alec Randall

REPAIR SUMMARY LOG

Project Name: **IHP Superfund Site - AOC 3**
Project Number: **0476110**
Site Location: **Billerica, MA**

Installer: **Chenango**
Specs: Air Pressure Testing for Fusion Welds - pump to ≥ 30 psi, then max drop of 4 psi after 5 min, then cut end
Vacuum Testing for Extrusion Welds - 10 seconds in 4-8 psi vacuum, no bubbles through Seam

Repair									Non-Destructive Test						
Date	Seam ID	Panel ID(s)	Location Description	Repair No. & Code [1]	Repair Type [2]	Description, Size, etc. (optional)	Mach. No.	Oper. ID	Test Type [3]	Air Pressure (psi) Start	Air Pressure (psi) Finish	Test Details	Oper. ID	Pass	Fail
16-Apr	35/34/36	35/34/36	3-way	R28-C	E	1'x2' 3-way	X6	LS	V	5	5	Pass	TS	Y	
16-Apr	33/34	33/34	Wooden pole	R33-P	E	4'x5' wooden pole boot	X6	LS	V	5	5	Pass	TS	Y	
16-Apr	28/30	28/30	DS-9	R40-DS	E	2'x6' DS-9	X6	LS	V	5	5	Pass	TS	Y	
16-Apr	28/30	28/30	West Slope	R41-C	E	1'x1' Burn out	X6	LS	V	5	5	Pass	TS	Y	
16-Apr	27/28	27/28	West Slope	R42-C	E	2'x3' Burn out	X6	LS	V	5	5	Pass	TS	Y	
16-Apr	27/28	27/28	DS-10	R43-DS	E	1'x6' DS-10	X6	LS	V	5	5	Pass	TS	Y	
16-Apr	27/28/29	27/28/29	3-way	R44-C	E	1'x3' 3-way	X18	AS	V	5	5	Pass	ZR	Y	
16-Apr	25/27/29	25/27/29	3-way	R45-C	E	1'x3' 3-way	X18	AS	V	5	5	Pass	ZR	Y	
16-Apr	27/26/25	27/26/25	3-way	R46-C	E	2'x3' 3-way	X18	AS	V	5	5	Pass	ZR	Y	
16-Apr	24/26	24/26	DS-11	R47-DS	E	2'x7' DS-11	X6	LS	V	5	5	Pass	TS	Y	
16-Apr	24/25/26	24/25/26	3-way	R48-C	E	1'x3' 3-Way	X18	AS	V	5	5	Pass	ZR	Y	
16-Apr	22/23/24	22/23/24	3-way	R49-C	E	1'x3' 3-way	X18	AS	V	5	5	Pass	ZR	Y	
16-Apr	21/22/24	21/22/24	3-way	R50-C	E	1'x2' 3-way	X18	AS	V	5	5	Pass	ZR	Y	
16-Apr	20/21/24	20/21/24	3-way	R51-C	E	1'x2' 3-way	X18	AS	V	5	5	Pass	ZR	Y	
16-Apr	19/20/24	19/20/24	3-way	R52-C	E	2'x3' 3-way	X18	AS	V	5	5	Pass	ZR	Y	
16-Apr	17/19/24	17/19/24	3-way	R53-C	E	1'x2' 3-way	X18	AS	V	5	5	Pass	ZR	Y	
16-Apr	17/14/24	17/14/24	3-way	R54-C	E	1'x2' 3-way	X18	AS	V	5	5	Pass	ZR	Y	
16-Apr	13/14/24	13/14/24	3-way	R55-C	E	1'x2' 3-way	X18	AS	V	5	5	Pass	TS	Y	
16-Apr	12/13/24	12/13/24	3-way	R56-C	E	1'x3' 3-way	X18	AS	V	5	5	Pass	TS	Y	
16-Apr	19/20	19/20	DS-12	R57-DS	E	2'x7' DS-12	X6	LS	V	5	5	Pass	ZR	Y	

[1] Repair No.: Repairs should be numbered sequentially
Repair Codes: P = Patch, C = Cap, S = Anchor Trench Extension, DS = Destructive Sample, G = Grind & Weld, T = Topping Along Fusion Seam, R = Reconstruction

[2] Repair Types: E = Extrusion, F = Fusion

[3] Test Types: A = Air Pressure, V = Vacuum

Notes:

Reviewed By: Alec Randall

REPAIR SUMMARY LOG

Project Name: **IHP Superfund Site - AOC 3**
Project Number: **0476110**
Site Location: **Billerica, MA**

Installer: **Chenango**
Specs: Air Pressure Testing for Fusion Welds - pump to ≥ 30 psi, then max drop of 4 psi after 5 min, then cut end
Vacuum Testing for Extrusion Welds - 10 seconds in 4-8 psi vacuum, no bubbles through Seam

Repair									Non-Destructive Test						
Date	Seam ID	Panel ID(s)	Location Description	Repair No. & Code [1]	Repair Type [2]	Description, Size, etc. (optional)	Mach. No.	Oper. ID	Test Type [3]	Air Pressure (psi) Start	Air Pressure (psi) Finish	Test Details	Oper. ID	Pass	Fail
16-Apr	18/16	18/16	Toe drain	R58-S	E	6'x2'	X18	AS	V	5	5	Pass	ZR	Y	
16-Apr	16/17/18	16/17/18	3-way	R59-C	E	4'x1'	X18	AS	V	5	5	Pass	ZR	Y	
16-Apr	15/16/17	15/16/17	3-way	R60-C	E	2'x3'	X18	AS	V	5	5	Pass	ZR	Y	
16-Apr	15/17	15/17	DS-13	R61-DS	E	2'x6'	X6	LS	V	5	5	Pass	TS	Y	
16-Apr	14/15/17	14/15/17	3-way	R62-C	E	2'x5'	X18	AS	V	5	5	Pass	TS	Y	
16-Apr	--	12	Hole	R65-P	E	1x'1'	X6	LS	V	5	5	Pass	TS	Y	
16-Apr	11/23	11/23	DS-15	R64-DS	E	2'x6'	X6	LS	V	5	5	Pass	TS	Y	
16-Apr	1/11/24	1/11/24	3-way	R65-C	E	2'x2'	X6	LS	V	5	5	Pass	TS	Y	
16-Apr	1/11	1/11	Burn out	R66-C	E	2'x2'	X6	LS	V	5	5	Pass	TS	Y	
16-Apr	11/1/2	11/1/2	Wooden pole	R67-P	E	6'x6'	X6	LS	V	5	5	Pass	TS	Y	
16-Apr	11/2/3	11/2/3	3-way	R68-C	E	2'x2'	X6	LS	V	5	5	Pass	ZR	Y	
16-Apr	11/3/4	11/3/4	3-way	R69-C	E	2'x2'	X6	LS	V	5	5	Pass	ZR	Y	
16-Apr	11/4/5	11/4/5	3-way	R70-C	E	2'x2'	X6	LS	V	5	5	Pass	ZR	Y	
16-Apr	5/11/10	5/11/10	3-way	R71-C	E	2'x6'	X6	LS	V	5	5	Pass	ZR	Y	
16-Apr	9/5/10	9/5/10	3-way	R72-C	E	2'x3'	X6	LS	V	5	5	Pass	ZR	Y	
16-Apr	9/7/5	9/7/5	3-way	R73-C	E	2'x2'	X6	LS	V	5	5	Pass	ZR	Y	
16-Apr	5/7/6/8A	5/7/6/8A	4-way	R74-C	E	3'x3'	X6	LS	V	5	5	Pass	ZR	Y	
16-Apr	6/8A/8B	6/8A/8B	3-way	R75-C	E	1'x1'	X6	LS	V	5	5	Pass	TS	Y	
16-Apr	2/3	2/3	DS-14	R76-DS	E	2'x6'	X6	LS	V	5	5	Pass	TS	Y	
17-Apr	1/2	1/2	Sheet wall	R77-P	E	1'x1'	X18	AS	V	5	5	Pass	PW	Y	

[1] Repair No.: Repairs should be numbered sequentially
Repair Codes: P = Patch, C = Cap, S = Anchor Trench Extension, DS = Destructive Sample, G = Grind & Weld, T = Topping Along Fusion Seam, R = Reconstruction

[2] Repair Types: E = Extrusion, F = Fusion

[3] Test Types: A = Air Pressure, V = Vacuum

Notes:

Reviewed By: Alec Randall

REPAIR SUMMARY LOG

Project Name: **IHP Superfund Site - AOC 3**
Project Number: **0476110**
Site Location: **Billerica, MA**

Installer: **Chenango**
Specs: Air Pressure Testing for Fusion Welds - pump to ≥ 30 psi, then max drop of 4 psi after 5 min, then cut end
Vacuum Testing for Extrusion Welds - 10 seconds in 4-8 psi vacuum, no bubbles through Seam

Repair									Non-Destructive Test						
Date	Seam ID	Panel ID(s)	Location Description	Repair No. & Code [1]	Repair Type [2]	Description, Size, etc. (optional)	Mach. No.	Oper. ID	Test Type [3]	Air Pressure (psi) Start	Air Pressure (psi) Finish	Test Details	Oper. ID	Pass	Fail
17-Apr	1/24	1/24	Sheet wall	R78-P	E	1'x1' Air testing	X18	AS	V	5	5	Pass	PW	Y	
17-Apr	24/26	24/26	Sheet wall	R79-P	E	4'x4' Air testing	X18	AS	V	5	5	Pass	PW	Y	
17-Apr	26/27	26/27	Sheet wall	R80-P	E	1'x3' Air testing	X18	AS	V	5	5	Pass	PW	Y	
17-Apr	24/26	24/26	No pole boot	R81-P	E	16' diameter, NG boot	X18	AS	V	5	5	Pass	PW	Y	
17-Apr	24/26	24/26	Sheet wall	R82-P	E	3'x4' air testing	X18	AS	V	5	5	Pass	PW	Y	
23-Apr	--	68	Well boots	R83-DS	E	5'x15' well boot	X18	AS	V	5	5	Pass	TS	Y	
23-Apr	DS-19	68	DS-19	R84-DS	E	2'x5' DS-19	X18	AS	V	5	5	Pass	TS	Y	
23-Apr	68/69/70	68/69/70	3-way	R85-C	E	2'x3' 3-way	X18	AS	V	5	5	Pass	TS	Y	
23-Apr	68/69	68/69	Mid Seam	R86-C	E	2'x2'	X18	AS	V	5	5	Pass	TS	Y	
24-Apr	--	68	Sheet wall	R87-S	E	2'x5' DS-19	X18	AS	V	5	5	Pass	TS	Y	
24-Apr	68/67	68/67	Sheet wall	R88-S	E	1'x1'	X18	AS	V	5	5	Pass	TS	Y	
24-Apr	66/67/68	66/67/68	3-way	R89-C	E	1'x2'	X18	AS	V	5	5	Pass	TS	Y	
24-Apr	66/67	66/67	DS-18	R90-P	E	2'x6'	X18	AS	V	5	5	Pass	TS	Y	
24-Apr	65/66/67	65/66/67	3-way	R91-C	E	2'x2'	X18	AS	V	5	5	Pass	TS	Y	
23-Apr	66/67	66/67	Sheet wall	R92-P	E	4'x4'+1'x1'	X18	AS	V	5	5	Pass	TS	Y	
23-Apr	66/67	66/67	Sheet wall	R93-S	E	1'x2'	X18	AS	V	5	5	Pass	TS	Y	
24-Apr	64/65	64/65	Sheet wall	R94-S	E	1'x1' Air testing	X18	AS	V	5	5	Pass	TS	Y	
24-Apr	63/64	63/64	Sheet wall	R95-S	E	1'x4' Air testing	X6	LS	V	5	5	Pass	TS	Y	
24-Apr	--	63	Sheet wall NG	R96-P	E	3'x8' SW and NG Pole	X6	LS	V	5/5	4/5	Air bubbles, rewelded	TS	Y	
24-Apr	--	63	NG Boot	R97-P	E	2'x30' NG boot	X6	LS	V	5	5	Pass	TS	Y	

[1] Repair No.: Repairs should be numbered sequentially
Repair Codes: P = Patch, C = Cap, S = Anchor Trench Extension, DS = Destructive Sample, G = Grind & Weld, T = Topping Along Fusion Seam, R = Reconstruction

[2] Repair Types: E = Extrusion, F = Fusion

[3] Test Types: A = Air Pressure, V = Vacuum

Notes:

Reviewed By: Alec Randall

REPAIR SUMMARY LOG

Project Name: **IHP Superfund Site - AOC 3**
Project Number: **0476110**
Site Location: **Billerica, MA**

Installer: **Chenango**
Specs: Air Pressure Testing for Fusion Welds - pump to ≥ 30 psi, then max drop of 4 psi after 5 min, then cut end
Vacuum Testing for Extrusion Welds - 10 seconds in 4-8 psi vacuum, no bubbles through Seam

Repair									Non-Destructive Test						
Date	Seam ID	Panel ID(s)	Location Description	Repair No. & Code [1]	Repair Type [2]	Description, Size, etc. (optional)	Mach. No.	Oper. ID	Test Type [3]	Air Pressure (psi) Start	Air Pressure (psi) Finish	Test Details	Oper. ID	Pass	Fail
24-Apr	63/64	63/64	DS-7	R98-DS	E	DS-7 top of LF	X18	AS	V	5	5	Pass	TS	Y	
24-Apr	62/63	62/63	West Slope	R99-C	E	West Slope	X18	AS	V	5	5	Pass	TS	Y	
24-Apr	60/62	60/62	West Slope DS-16	R100-DS	E	DS-16	X18	AS	V	5	5	Pass	TS	Y	
24-Apr	62/53	62/53	Sheet wall	R101-C	E	Sheet wall air testing	X6	LS	V	5	5	Pass	TS	Y	
24-Apr	61/62/63	61/62/63	3-way	R102-C	E	East Slope air testing	X18	AS	V	5	5	Pass	TS	Y	
24-Apr	--	61	Middle	R103-C	E	Sand bag removal	X18	AS	V	5	5	Pass	TS	Y	
24-Apr	54/56/61	54/56/61	3-way	R104-C	E	West Slope	X6	LS	V	5	5	Pass	TS	Y	
24-Apr	54/53/60/61	54/53/60/61	4-way	R105-C	E	East Slope air testing	X18	AS	V	5	5	Pass	TS	Y	
24-Apr	52/53/60	52/53/60	3-way	R106-C	E	Top of Landfill	X18	AS	V	5	5	Pass	TS	Y	
24-Apr	52/57/60	52/57/60	3-way	R107-C	E	Top of Landfill	X18	AS	V	5	5	Pass	TS	Y	
24-Apr	57/59/60	57/59/60	3-way	R108-C	E	West Slope	X18	AS	V	5	5	Pass	TS	Y	
24-Apr	57/58/59	57/58/59	3-way	R109-C	E	Southwest Slope	X18	AS	V	5	5	Pass	TS	Y	
24-Apr	--	2/23/1900	Wooden Pole	R110-P	E	South Slope	X18	AS	V	5	5	Pass	TS	Y	
24-Apr	54/53	54/53	Mid Seam	R111-C	E	South Slope	X18	AS	V	5	5	Pass	TS	Y	
24-Apr	54/55/56	54/55/56	3-way	R112-C	E	East Slope	X18	AS	V	5	5	Pass	TS	Y	
24-Apr	--	56	Toe of Slope	R113-C	E	Toe of East Slope	X6	LS	V	5	5	Pass	TS	Y	
24-Apr	--	54	Top of landfill	R114-C	E	Top of Landfill	X18	AS	V	5	5	Pass	TS	Y	
24-Apr	--	54	Sheet wall	R115-C	E	East of Sheet wall	X18	AS	V	5	5	Pass	TS	Y	

[1] Repair No.: Repairs should be numbered sequentially
Repair Codes: P = Patch, C = Cap, S = Anchor Trench Extension, DS = Destructive Sample, G = Grind & Weld, T = Topping Along Fusion Seam, R = Reconstruction

[2] Repair Types: E = Extrusion, F = Fusion

[3] Test Types: A = Air Pressure, V = Vacuum

Notes:

Reviewed By: Alec Randall

7. Geomembrane Destructive Sample Log and Field Test Results

DESTRUCTIVE TEST LOG

Project Name: **IHP Superfund Site - AOC 3**
Project Number: **0476110**
Site Location: **Billerica, MA**

Installer: **Chenango**

General Location Description (if necessary): _____
Sample Distribution: Contractor: X Owner's Rep.: X Owner: __ Other: _____

Sample Data								Field Data							Laboratory Data						
				Location				Peel (ppi/psi)								Avg Peel (ppi/psi)					
Sample ID	Track Type[1]	Seam Type[2]	Material Type[3]	Seam ID	Location Description	Mach. ID	Oper. ID	Inside	Outside	Shear (ppi/psi)	Pass	Fail	Dates: Cut/Shipped/Field Tested	Tens. ID	Date of Results	Inside	Outside	Avg Shear (ppi/psi)	Pass	Fail	Re-Test
DS-1	D	F	S/S	45/48	3B South Slope	W49	LS	117	127	142	Y		16-Apr	120	17-Apr	110	124	147	Y		
								131	123	141	Y					111	120	147	Y		
								108	134	138	Y					131	123	141	Y		
								-	-	-						111	123	143	Y		
								-	-	-						113	122	150	Y		
DS-2	D	F	S/S	44/45	3B South Slope	W34	CS	120	115	135	Y		16-Apr	120	17-Apr	108	119	146	Y		
								127	114	110	Y					120	98	147	Y		
								125	116	132	Y					117	124	132	Y		
								-	-	-						115	120	145	Y		
								-	-	-						114	118	148	Y		
DS-3	D	F	T/T	41/42	3B East Slope	W49	LS	136	129	134	Y		16-Apr	120	17-Apr	151	141	163	Y		
								140	141	150	Y					142	144	168	Y		
								141	142	148	Y					147	141	169	Y		
								-	-	-						140	142	159	Y		
								-	-	-						139	144	167	Y		
DS-4	D	F	S/S	38/40	3B East Slope	W34	CS	122	130	129	Y		16-Apr	120	17-Apr	120	115	143	Y		
								122	122	129	Y					120	115	144	Y		
								121	112	140	Y					120	123	142	Y		
																122	119	145	Y		
																123	117	148	Y		
DS-5	D	F	S/S	35/36	3B West Slope	W26	LPS	124	118	133	Y		16-Apr	120	17-Apr	120	125	147	Y		
								118	127	129	Y					111	116	148	Y		
								121	122	135	Y					115	117	147	Y		
								-	-	-						128	117	145	Y		
								-	-	-						129	128	149	Y		
DS-6	D	F	S/S	32/35	3B East slope	W49	LS	111	120	131	Y		16-Apr	120	17-Apr	118	123	143	Y		
								113	122	125	Y					129	117	150	Y		
								105	115	140	Y					131	117	150	Y		
																132	116	148	Y		
																132	118	150	Y		
DS-7	D	F	T/T	31/30	3B East Slope	W34	CS	132	123	126	Y		16-Apr	120	17-Apr	138	146	160	Y		
								120	136	120	Y					138	136	160	Y		
								135	119	130	Y					142	146	160	Y		
								-	-	-						137	141	163	Y		
								-	-	-						143	134	155	Y		
DS-8	D	F	S/S	31/30	3B West Slope	W34	CS	132	106	123	Y		16-Apr	120	17-Apr	120	129	150	Y		
								124	118	125	Y					117	121	148	Y		
								121	112	140	Y					130	138	140	Y		
								-	-	-						119	120	144	Y		
								-	-	-						115	134	147	Y		

[1] Track Types: S = Single, D= Double
[2] Seam Types: E = Extrusion, F = Fusion;
[3] Material: Smooth/Smooth (S/S), Smooth/Textured (S/T), or Textured/Textured (T/T)

Notes: _____

Reviewed By: Alec Randall

DESTRUCTIVE TEST LOG

Project Name: **IHP Superfund Site - AOC 3**
Project Number: **0476110**
Site Location: **Billerica, MA**

Installer: **Chenango**

General Location Description (if necessary): _____
Sample Distribution: Contractor: X Owner's Rep.: X Owner: __ Other: _____

Sample Data								Field Data							Laboratory Data						
				Location				Peel (ppi/psi)								Avg Peel (ppi/psi)					
Sample ID	Track Type[1]	Seam Type[2]	Material Type[3]	Seam ID	Location Description	Mach. ID	Oper. ID	Inside	Outside	Shear (ppi/psi)	Pass	Fail	Dates: Cut/Shipped/Field Tested	Tens. ID	Date of Results	Inside	Outside	Avg Shear (ppi/psi)	Pass	Fail	Re-Test
DS-9	D	F	S/S	28/30	3B West Slope	W26	LPS	113	112	107	Y		16-Apr	120	17-Apr	134	118	144	Y		
								112	116	110	Y					129	114	144	Y		
								119	116	120	Y					129	117	145	Y		
								-	-	-						128	115	141	Y		
								-	-	-						129	113	144	Y		
DS-10	D	F	S/S	27/28	3B West Slope	W49	LS	111	118	122	Y		16-Apr	120	17-Apr	134	120	147	Y		
								120	122	130	Y					129	120	147	Y		
								103	123	131	Y					131	115	145	Y		
								-	-	-						125	118	141	Y		
								-	-	-						129	125	147	Y		
DS-11	D	F	S/S	24/26	3B West Slope	W26	LPS	117	105	117	Y		16-Apr		17-Apr	113	111	150	Y		
								123	124	130	Y					105	111	149	Y		
								115	114	120	Y					123	122	146	Y		
								-	-	-						108	113	142	Y		
								-	-	-						102	113	147	Y		
DS-12	D	F	S/S	19/20	3B North Slope	W26	LPS	131	106	120	Y		16-Apr		17-Apr	127	123	151	Y		
								118	111	116	Y					121	105	148	Y		
								116	129	121	Y					121	125	144	Y		
								-	-	-						127	136	147	Y		
								-	-	-						128	121	145	Y		
DS-13	D	F	S/T	15/17	3B North Slope	W34	CS	124	123	127	Y				17-Apr	132	131	149	Y		
								115	118	117	Y					131	125	152	Y		
								113	113	135	Y					132	126	149	Y		
								-	-	-						136	133	147	Y		
								-	-	-						135	128	146	Y		
DS-14	D	F	S/S	2/3	3B West Slope	W49	LS	110	110	124	Y		16-Apr		17-Apr	121	123	146	Y		
								120	110	124	Y					116	122	146	Y		
								122	110	123	Y					110	119	146	Y		
								-	-	-						117	126	144	Y		
								-	-	-						114	119	146	Y		
DS-15	S	E	T/T	11/R23	3B North Top	X18	AS	132	-	134	Y		16-Apr		17-Apr	133	-	152	Y		
								136	-	133	Y					129	-	162	Y		
								127	-	127	Y					119	-	153	Y		
								-	-	-						128	-	159	Y		
								-	-	-						139	-	157	Y		
DS-16	D	F	S/S	60/62	3A West Slope	W34	PNW	113	115	119	Y		16-Apr		24-Apr	127	116	144	Y		
								111	117	112	Y					117	120	146	Y		
								118	103	109	Y					120	123	147	Y		
								-	-	-						120	117	143	Y		
								-	-	-						122	119	141	Y		

[1] Track Types: S = Single, D= Double
[2] Seam Types: E = Extrusion, F = Fusion;
[3] Material: Smooth/Smooth (S/S), Smooth/Textured (S/T), or Textured/Textured (T/T)

Notes: _____

Reviewed By: Alec Randall

DESTRUCTIVE TEST LOG

Project Name: **IHP Superfund Site - AOC 3**
Project Number: **0476110**
Site Location: **Billerica, MA**

Installer: **Chenango**

General Location Description (if necessary): _____
Sample Distribution: Contractor: X Owner's Rep.: X Owner: __ Other: _____

Sample Data								Field Data							Laboratory Data						
Sample ID	Track Type[1]	Seam Type[2]	Material Type[3]	Location: Seam ID	Location: Location Description	Mach. ID	Oper. ID	Peel (ppi/psi): Inside	Peel (ppi/psi): Outside	Shear (ppi/psi)	Pass	Fail	Dates: Cut/Shipped/Field Tested	Tens. ID	Date of Results	Avg Peel (ppi/psi): Inside	Avg Peel (ppi/psi): Outside	Avg Shear (ppi/psi)	Pass	Fail	Re-Test
DS-17	D	F	S/S	63/64	3A Top of Cap	W49	LS	132	132	141	Y				24-Apr	116	129	147	Y		
								110	123	141	Y					125	132	148	Y		
								134	122	138	Y					128	127	153	Y		
								-	-	-						137	110	153	Y		
								-	-	-						105	118	158	Y		
DS-18	D	F	T/T	66/67	3A Top of Cap	W49	LS	151	148	148	Y				24-Apr	148	141	149	Y		
								155	151	142	Y					135	134	153	Y		
								154	143	152	Y					94	139	151	Y		
								-	-	-						138	143	150	Y		
								-	-	-						140	143	144	Y		
DS-19	S	E	T/T	68/R83	NE Well Cluster	X18	AS	146	-	159	Y				24-Apr	144	-	148	Y		
								151	-	158	Y					141	-	156	Y		
								148	-	161	Y					143	-	152	Y		
								-	-	-						148	-	149	Y		
								-	-	-						142	-	153	Y		

[1] Track Types: S = Single, D= Double
[2] Seam Types: E = Extrusion, F = Fusion;
[3] Material: Smooth/Smooth (S/S), Smooth/Textured (S/T), or Textured/Textured (T/T)

Notes: _____

Reviewed By: Alec Randall

8. Geomembrane Destructive Sample Quality Control Testing

AOC 3A Destructive Samples

Client:	Chenango Contracting, Inc.		
Project Name:	Iron Horse Park		
Project Location:	Billerica, MA		
Installer:	---		
GTX #:	309168		
Test Date:	04/24/19		
Tested By:	dln/trm	Report #:	2
Checked By:	bfs	Page:	1 of 4

Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods by ASTM D6392

peel & shear destructive test

Upper Geomembrane:	60 mil textured LLDPE (smooth edge)	Testing Machine:	Instron 1123
Lower Geomembrane:	60 mil textured LLDPE (smooth edge)	Testing Speed:	20 in/min
Seaming Method:	Dual Hot Wedge Weld	Grips:	ATS pneumatic
		Specimen Size:	1 in x 8 in

Sample ID:	DS-16	Machine ID:	---
Seam ID:	---/---	Welder ID:	---
		Date Sampled:	---

Specimen Number	Peel Strength						Shear Strength		
	Weld A			Weld B					
	lb./in	Seam Separation, %	Failure Type	lb./in	Seam Separation, %	Failure Type	lb./in	Elongation, %	Rupture Mode
1	127	---	SE1	116	---	SE1	144	650	Lower
2	117	---	SE1	120	---	SE1	146	450	Upper
3	120	---	SE1	123	---	SE1	147	1000	Both
4	120	---	SE1	117	---	SE1	143	900	Both
5	122	---	SE1	119	---	SE1	141	450	Both
Average	121	---	---	119	---	---	144	---	---

Comments:

Estimate of seam separation visually determined based upon area of separated bond to the nearest 5%.

Shear test halted for HDPE and LMDPE materials once specimen has elongated 50%.
Shear test halted for PVC, fPP, LLDPE, VFPE and VLDPE once specimen has elongated past machine capacity.

Rupture mode for specimens with >50% elongation (HDPE and LMDPE) or > machine capacity (PVC, fPP, LLDPE, VFPE and VLDPE) interpreted as occurring in the membrane that exhibits yielding.

Notes: These results apply only to the sample tested for the specific test conditions. The test procedures employed follow accepted industry practice and the indicated test method. GeoTesting Express has no specific knowledge as to conditioning, origin, sampling procedure or intended use of the material.

Client:	Chenango Contracting, Inc.		
Project Name:	Iron Horse Park		
Project Location:	Billerica, MA		
Installer:	---		
GTX #:	309168		
Test Date:	04/24/19		
Tested By:	est/trm	Report #:	2
Checked By:	bfs	Page:	2 of 4

Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods by ASTM D6392

peel & shear destructive test

Upper Geomembrane:	60 mil textured LLDPE (smooth edge)	Testing Machine:	Instron 1123
Lower Geomembrane:	60 mil textured LLDPE (smooth edge)	Testing Speed:	20 in/min
Seaming Method:	Dual Hot Wedge Weld	Grips:	ATS pneumatic
		Specimen Size:	1 in x 8 in

Sample ID:	DS-17	Machine ID:	---
Seam ID:	---/---	Welder ID:	---
		Date Sampled:	---

Specimen Number	Peel Strength						Shear Strength		
	Weld A			Weld B					
	lb./in	Seam Separation, %	Failure Type	lb./in	Seam Separation, %	Failure Type	lb./in	Elongation, %	Rupture Mode
1	116	---	SE1	129	---	SE1	147	300	Upper
2	125	---	SE1	132	---	SE1	148	350	Lower
3	128	---	SE1	127	---	SE1	153	400	Lower
4	137	---	SE1	110	---	SE1	153	200	Upper
5	105	---	SE1	118	---	SE1	158	100	Upper
Average	122	---	---	123	---	---	152	---	---

Comments:

Estimate of seam separation visually determined based upon area of separated bond to the nearest 5%.

Shear test halted for HDPE and LMDPE materials once specimen has elongated 50%.
Shear test halted for PVC, fPP, LLDPE, VFPE and VLDPE once specimen has elongated past machine capacity.

Rupture mode for specimens with >50% elongation (HDPE and LMDPE) or > machine capacity (PVC, fPP, LLDPE, VFPE and VLDPE) interpreted as occurring in the membrane that exhibits yielding.

Notes: These results apply only to the sample tested for the specific test conditions. The test procedures employed follow accepted industry practice and the indicated test method. GeoTesting Express has no specific knowledge as to conditioning, origin, sampling procedure or intended use of the material.

Client:	Chenango Contracting, Inc.		
Project Name:	Iron Horse Park		
Project Location:	Billerica, MA		
Installer:	---		
GTX #:	309168		
Test Date:	04/24/19		
Tested By:	est/trm	Report #:	2
Checked By:	bfs	Page:	3 of 4

Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods by ASTM D6392

peel & shear destructive test

Upper Geomembrane:	60 mil textured LLDPE	Testing Machine:	Instron 1123
Lower Geomembrane:	60 mil textured LLDPE	Testing Speed:	20 in/min
Seaming Method:	Dual Hot Wedge Weld	Grips:	ATS pneumatic
		Specimen Size:	1 in x 8 in

Sample ID:	DS-18	Machine ID:	---
Seam ID:	---/---	Welder ID:	---
		Date Sampled:	---

Specimen Number	Peel Strength						Shear Strength		
	Weld A			Weld B					
	lb./in	Seam Separation, %	Failure Type	lb./in	Seam Separation, %	Failure Type	lb./in	Elongation, %	Rupture Mode
1	148	---	SE1	141	---	SE1	149	700	Upper
2	135	---	SE1	134	---	SE1	153	650	Upper
3	94	---	SE1	139	---	SE1	151	500	Upper
4	138	---	SE1	143	---	SE1	150	800	Upper
5	140	---	SE1	143	---	SE1	144	750	Upper
Average	131	---	---	140	---	---	149	---	---

Comments:

Estimate of seam separation visually determined based upon area of separated bond to the nearest 5%.

Shear test halted for HDPE and LMDPE materials once specimen has elongated 50%.
Shear test halted for PVC, fPP, LLDPE, VFPE and VLDPE once specimen has elongated past machine capacity.

Rupture mode for specimens with >50% elongation (HDPE and LMDPE) or > machine capacity (PVC, fPP, LLDPE, VFPE and VLDPE) interpreted as occurring in the membrane that exhibits yielding.

Notes: These results apply only to the sample tested for the specific test conditions. The test procedures employed follow accepted industry practice and the indicated test method. GeoTesting Express has no specific knowledge as to conditioning, origin, sampling procedure or intended use of the material.

Client:	Chenango Contracting, Inc.		
Project Name:	Iron Horse Park		
Project Location:	Billerica, MA		
Installer:	---		
GTX #:	309168		
Test Date:	04/24/19		
Tested By:	est/trm	Report #:	2
Checked By:	bfs	Page:	4 of 4

Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods by ASTM D6392

peel & shear destructive test

Upper Geomembrane:	60 mil textured LLDPE	Testing Machine:	Instron 1123
Lower Geomembrane:	60 mil textured LLDPE	Testing Speed:	20 in/min
Seaming Method:	Fillet Extrusion Weld	Grips:	ATS pneumatic
		Specimen Size:	1 in x 8 in

Sample ID:	DS-19	Machine ID:	---
Seam ID:	---/---	Welder ID:	---
		Date Sampled:	---

Specimen Number	Peel Strength						Shear Strength		
	Weld A			Weld B					
	lb./in	Seam Separation, %	Failure Type	lb./in	Seam Separation, %	Failure Type	lb./in	Elongation, %	Rupture Mode
1	144	---	SE3	---	---	---	148	500	Upper
2	141	---	SE3	---	---	---	156	850	Upper
3	143	---	SE3	---	---	---	152	750	Upper
4	148	---	SE3	---	---	---	149	600	Upper
5	142	---	SE3	---	---	---	153	550	Upper
Average	144	---	---	---	---	---	152	---	---

Comments:

Estimate of seam separation visually determined based upon area of separated bond to the nearest 5%.

Shear test halted for HDPE and LMDPE materials once specimen has elongated 50%.
Shear test halted for PVC, fPP, LLDPE, VFPE and VLDPE once specimen has elongated past machine capacity.

Rupture mode for specimens with >50% elongation (HDPE and LMDPE) or > machine capacity (PVC, fPP, LLDPE, VFPE and VLDPE) interpreted as occurring in the membrane that exhibits yielding.

Notes: These results apply only to the sample tested for the specific test conditions. The test procedures employed follow accepted industry practice and the indicated test method. GeoTesting Express has no specific knowledge as to conditioning, origin, sampling procedure or intended use of the material.

PEEL AND SHEAR TEST RESULTS

ASTM D-6392

JLT

Client:	ERM	Job No.:	19LG3769
Project:	Iron Horse Park Landfill	Date Tested:	04/25/2019
Material:	60 mil HDPE	Technician:	AE / MLB
Manufacturer:	Not Provided	Checked By:	JBJr
Weld Type:	Double Wedge Weld	Machine:	ATC 1000
		Calib Chk :	02/16/2019

Sample No.: **DS-16**
Seam: P60 / P62
Operator: PNW
Machine: W34

Crosshead Speed
Peel: 2 in/min.
Shear: 2 in/min.
Specimen Width = 1 inch

Peel Adhesion Test Data

Replicate No.	WELD A				WELD B			
	Peak Load (lbs/in)	Rupture Mode	Seam Sep. (1) (%)	Gage Length (in)	Peak Load (lbs/in)	Rupture Mode	Seam Sep. (1) (%)	Gage Length (in)
1	113.0	SE1 FTB	0	1.0	112.0	SE1 FTB	0	1.0
2	116.0	SE1 FTB	0	1.0	113.0	SE1 FTB	0	1.0
3	113.0	SE1 FTB	0	1.0	115.0	SE1 FTB	0	1.0
4	115.0	SE1 FTB	0	1.0	113.0	SE1 FTB	0	1.0
5	114.0	SE1 FTB	0	1.0	115.0	SE1 FTB	0	1.0
Average	114.2				113.6			

Bonded Seam (Shear) Test Data

Replicate No.	Peak Load (lbs/in)	Rupture Mode	Elonga (2) (%)	Gage Length (in)
1	143.0	FTB	> 50	1
2	139.0	FTB	> 50	1
3	142.0	FTB	> 50	1
4	138.0	FTB	> 50	1
5	140.0	FTB	> 50	1
Average	140.4			

(1) *Reported to nearest 25%.*
(2) *Elongation = L/Lo x 100%.*
(3) *INA (Information Not Available) .*

Values obtained from Client

Shear		min. 100 ppi and FTB
Peel	Fusion	min. 70 ppi and FTB
Peel	Extrusion	min. 50 ppi and FTB

JLT Laboratories, Inc. 938 S. Central Avenue, Canonsburg, PA 15317 Tel: (724) 746-4441 / Fax: (724) 745-4261

PEEL AND SHEAR TEST RESULTS

ASTM D-6392

JLT

Client:	ERM	Job No.:	19LG3769
Project:	Iron Horse Park Landfill	Date Tested:	04/25/2019
Material:	60 mil HDPE	Technician:	AE / MLB
Manufacturer:	Not Provided	Checked By:	JBJr
Weld Type:	Double Wedge Weld	Machine:	ATC 1000
		Calib Chk :	02/16/2019

Sample No.: **DS-17**
Seam: P63 / P64
Operator: LS
Machine: W49

Crosshead Speed
Peel: 2 in/min.
Shear: 2 in/min.
Specimen Width = 1 inch

Peel Adhesion Test Data

Replicate No.	WELD A				WELD B			
	Peak Load (lbs/in)	Rupture Mode	Seam Sep. (1) (%)	Gage Length (in)	Peak Load (lbs/in)	Rupture Mode	Seam Sep. (1) (%)	Gage Length (in)
1	126.0	SE1 FTB	0	1.0	114.0	SE1 FTB	0	1.0
2	121.0	SE1 FTB	0	1.0	118.0	SE1 FTB	0	1.0
3	123.0	SE1 FTB	0	1.0	114.0	SE1 FTB	0	1.0
4	125.0	SE1 FTB	0	1.0	114.0	SE1 FTB	0	1.0
5	129.0	SE1 FTB	0	1.0	115.0	SE1 FTB	0	1.0
Average	124.8				115.0			

Bonded Seam (Shear) Test Data

Replicate No.	Peak Load (lbs/in)	Rupture Mode	Elonga (2) (%)	Gage Length (in)
1	158.0	FTB	> 50	1
2	153.0	FTB	> 50	1
3	152.0	FTB	> 50	1
4	150.0	FTB	> 50	1
5	158.0	FTB	> 50	1
Average	154.2			

(1) *Reported to nearest 25%.*
(2) *Elongation = L/Lo x 100%.*
(3) *INA (Information Not Available) .*

Values obtained from Client

Shear		min. 100 ppi and FTB
Peel	Fusion	min. 70 ppi and FTB
Peel	Extrusion	min. 50 ppi and FTB

JLT Laboratories, Inc. 938 S. Central Avenue, Canonsburg, PA 15317 Tel: (724) 746-4441 / Fax: (724) 745-4261

PEEL AND SHEAR TEST RESULTS

ASTM D-6392

JLT

Client:	ERM	Job No.:	19LG3769
Project:	Iron Horse Park Landfill	Date Tested:	04/25/2019
Material:	60 mil HDPE	Technician:	AE / MLB
Manufacturer:	Not Provided	Checked By:	JBJr
Weld Type:	Double Wedge Weld	Machine:	ATC 1000
		Calib Chk :	02/16/2019

Sample No.: **DS-18**
Seam: P67 / P68
Operator: LS
Machine: W49

Crosshead Speed
Peel: 2 in/min.
Shear: 2 in/min.
Specimen Width = 1 inch

Peel Adhesion Test Data

Replicate No.	WELD A				WELD B			
	Peak Load (lbs/in)	Rupture Mode	Seam Sep. (1) (%)	Gage Length (in)	Peak Load (lbs/in)	Rupture Mode	Seam Sep. (1) (%)	Gage Length (in)
1	128.0	SE1 FTB	0	1.0	130.0	SE1 FTB	0	1.0
2	129.0	SE1 FTB	0	1.0	131.0	SE1 FTB	0	1.0
3	126.0	SE1 FTB	0	1.0	132.0	SE1 FTB	0	1.0
4	131.0	SE1 FTB	0	1.0	136.0	SE1 FTB	0	1.0
5	132.0	SE1 FTB	0	1.0	130.0	SE1 FTB	0	1.0
Average	129.2				131.8			

Bonded Seam (Shear) Test Data

Replicate No.	Peak Load (lbs/in)	Rupture Mode	Elonga (2) (%)	Gage Length (in)
1	152.0	FTB	> 50	1
2	150.0	FTB	> 50	1
3	153.0	FTB	> 50	1
4	152.0	FTB	> 50	1
5	151.0	FTB	> 50	1
Average	151.6			

(1) *Reported to nearest 25%.*
(2) *Elongation = L/Lo x 100%.*
(3) *INA (Information Not Available) .*

Values obtained from Client

Shear		min. 100 ppi and FTB
Peel	Fusion	min. 70 ppi and FTB
Peel	Extrusion	min. 50 ppi and FTB

JLT Laboratories, Inc. 938 S. Central Avenue, Canonsburg, PA 15317 Tel: (724) 746-4441 / Fax: (724) 745-4261

PEEL AND SHEAR TEST RESULTS

ASTM D-6392

JLT

Client:	ERM	Job No.:	19LG3769
Project:	Iron Horse Park Landfill	Date Tested:	04/25/2019
Material:	60 mil HDPE	Technician:	AE / MLB
Manufacturer:	Not Provided	Checked By:	JBJr
Weld Type:	Extrusion Weld	Machine:	ATC 1000
		Calib Chk :	02/16/2019

Sample No.: **DS-19**
Seam: R83
Operator: AS
Machine: X18

Crosshead Speed
Peel: 2 in/min.
Shear: 2 in/min.
Specimen Width = 1 inch

Peel Adhesion Test Data

Replicate No.	WELD A			
	Peak Load (lbs/in)	Rupture Mode	Seam Sep. (1) (%)	Gage Length (in)
1	128.0	SE1 FTB	0	1.0
2	131.0	SE1 FTB	0	1.0
3	134.0	SE1 FTB	0	1.0
4	131.0	SE1 FTB	0	1.0
5	132.0	SE1 FTB	0	1.0
Average	131.2			

Bonded Seam (Shear) Test Data

Replicate No.	Peak Load (lbs/in)	Rupture Mode	Elonga (2) (%)	Gage Length (in)
1	152.0	FTB	> 50	1
2	148.0	FTB	> 50	1
3	147.0	FTB	> 50	1
4	149.0	FTB	> 50	1
5	150.0	FTB	> 50	1
Average	149.2			

(1) *Reported to nearest 25%.*
(2) *Elongation = L/Lo x 100%.*
(3) *INA (Information Not Available) .*

Values obtained from Client

Shear		min. 100 ppi and FTB
Peel	Fusion	min. 70 ppi and FTB
Peel	Extrusion	min. 50 ppi and FTB

JLT Laboratories, Inc. 938 S. Central Avenue, Canonsburg, PA 15317 Tel: (724) 746-4441 / Fax: (724) 745-4261

AOC 3B Destructive Samples

Client:	Chenango Contracting, Inc.		
Project Name:	Iron Horse Park		
Project Location:	Billerica, MA		
Installer:	---		
GTX #:	309168		
Test Date:	04/17/19		
Tested By:	dln/trm	Report #:	1
Checked By:	bfs	Page:	1 of 15

Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods by ASTM D6392

peel & shear destructive test

Upper Geomembrane:	60 mil textured LLDPE (smooth edge)	Testing Machine:	Instron 1123
Lower Geomembrane:	60 mil textured LLDPE (smooth edge)	Testing Speed:	20 in/min
Seaming Method:	Dual Hot Wedge Weld	Grips:	ATS pneumatic
		Specimen Size:	1 in x 8 in

Sample ID:	DS-1	Machine ID:	---
Seam ID:	---/---	Welder ID:	---
		Date Sampled:	---

Specimen Number	Peel Strength						Shear Strength		
	Weld A			Weld B					
	lb./in	Seam Separation, %	Failure Type	lb./in	Seam Separation, %	Failure Type	lb./in	Elongation, %	Rupture Mode
1	110	---	SE1	124	---	SE1	147	400	Lower
2	111	---	SE1	120	---	SE1	147	650	Upper
3	131	---	SE1	123	---	SE1	141	100	Lower
4	111	---	SE1	123	---	SE1	143	400	Lower
5	113	---	SE1	122	---	SE1	150	300	Lower
Average	115	---	---	122	---	---	146	---	---

Comments:

Estimate of seam separation visually determined based upon area of separated bond to the nearest 5%.

Shear test halted for HDPE and LMDPE materials once specimen has elongated 50%.
Shear test halted for PVC, fPP, LLDPE, VFPE and VLDPE once specimen has elongated past machine capacity.

Rupture mode for specimens with >50% elongation (HDPE and LMDPE) or > machine capacity (PVC, fPP, LLDPE, VFPE and VLDPE) interpreted as occurring in the membrane that exhibits yielding.

Notes: These results apply only to the sample tested for the specific test conditions. The test procedures employed follow accepted industry practice and the indicated test method. GeoTesting Express has no specific knowledge as to conditioning, origin, sampling procedure or intended use of the material.

Client:	Chenango Contracting, Inc.		
Project Name:	Iron Horse Park		
Project Location:	Billerica, MA		
Installer:	---		
GTX #:	309168		
Test Date:	04/17/19		
Tested By:	dln/trm	Report #:	1
Checked By:	bfs	Page:	2 of 15

Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods by ASTM D6392

peel & shear destructive test

Upper Geomembrane:	60 mil textured LLDPE (smooth edge)	Testing Machine:	Instron 1123
Lower Geomembrane:	60 mil textured LLDPE (smooth edge)	Testing Speed:	20 in/min
Seaming Method:	Dual Hot Wedge Weld	Grips:	ATS pneumatic
		Specimen Size:	1 in x 8 in

Sample ID:	DS-2	Machine ID:	---
Seam ID:	---/---	Welder ID:	---
		Date Sampled:	---

Specimen Number	Peel Strength						Shear Strength		
	Weld A			Weld B					
	lb./in	Seam Separation, %	Failure Type	lb./in	Seam Separation, %	Failure Type	lb./in	Elongation, %	Rupture Mode
1	108	---	SE1	119	---	SE1	146	400	Lower
2	120	---	SE1	98	---	SE1	147	450	Upper
3	117	---	SE1	124	---	SE1	132	450	Upper
4	115	---	SE1	120	---	SE1	145	800	Both
5	114	---	SE1	118	---	SE1	148	850	Both
Average	115	---	---	116	---	---	144	---	---

Comments:

Estimate of seam separation visually determined based upon area of separated bond to the nearest 5%.

Shear test halted for HDPE and LMDPE materials once specimen has elongated 50%.
Shear test halted for PVC, fPP, LLDPE, VFPE and VLDPE once specimen has elongated past machine capacity.

Rupture mode for specimens with >50% elongation (HDPE and LMDPE) or > machine capacity (PVC, fPP, LLDPE, VFPE and VLDPE) interpreted as occurring in the membrane that exhibits yielding.

Notes: These results apply only to the sample tested for the specific test conditions. The test procedures employed follow accepted industry practice and the indicated test method. GeoTesting Express has no specific knowledge as to conditioning, origin, sampling procedure or intended use of the material.

Client:	Chenango Contracting, Inc.		
Project Name:	Iron Horse Park		
Project Location:	Billerica, MA		
Installer:	---		
GTX #:	309168		
Test Date:	04/17/19		
Tested By:	dln/trm	Report #:	1
Checked By:	bfs	Page:	3 of 15

Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods by ASTM D6392

peel & shear destructive test

Upper Geomembrane:	60 mil textured LLDPE	Testing Machine:	Instron 1123
Lower Geomembrane:	60 mil textured LLDPE	Testing Speed:	20 in/min
Seaming Method:	Dual Hot Wedge Weld	Grips:	ATS pneumatic
		Specimen Size:	1 in x 8 in

Sample ID:	DS-3	Machine ID:	---
Seam ID:	---/---	Welder ID:	---
		Date Sampled:	---

Specimen Number	Peel Strength						Shear Strength		
	Weld A			Weld B					
	lb./in	Seam Separation, %	Failure Type	lb./in	Seam Separation, %	Failure Type	lb./in	Elongation, %	Rupture Mode
1	151	---	SE1	141	---	SE1	163	450	Lower
2	142	---	SE1	144	---	SE1	168	800	Both
3	147	---	SE1	141	---	SE1	169	700	Both
4	140	---	SE1	142	---	SE1	159	400	Lower
5	139	---	SE1	144	---	SE1	167	750	Both
Average	144	---	---	142	---	---	165	---	---

Comments:

Estimate of seam separation visually determined based upon area of separated bond to the nearest 5%.

Shear test halted for HDPE and LMDPE materials once specimen has elongated 50%.
Shear test halted for PVC, fPP, LLDPE, VFPE and VLDPE once specimen has elongated past machine capacity.

Rupture mode for specimens with >50% elongation (HDPE and LMDPE) or > machine capacity (PVC, fPP, LLDPE, VFPE and VLDPE) interpreted as occurring in the membrane that exhibits yielding.

Notes: These results apply only to the sample tested for the specific test conditions. The test procedures employed follow accepted industry practice and the indicated test method. GeoTesting Express has no specific knowledge as to conditioning, origin, sampling procedure or intended use of the material.

Client:	Chenango Contracting, Inc.		
Project Name:	Iron Horse Park		
Project Location:	Billerica, MA		
Installer:	---		
GTX #:	309168		
Test Date:	04/17/19		
Tested By:	dln/trm	Report #:	1
Checked By:	bfs	Page:	4 of 15

Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods by ASTM D6392

peel & shear destructive test

Upper Geomembrane:	60 mil textured LLDPE (smooth edge)	Testing Machine:	Instron 1123
Lower Geomembrane:	60 mil textured LLDPE (smooth edge)	Testing Speed:	20 in/min
Seaming Method:	Dual Hot Wedge Weld	Grips:	ATS pneumatic
		Specimen Size:	1 in x 8 in

Sample ID:	DS-4	Machine ID:	---
Seam ID:	---/---	Welder ID:	---
		Date Sampled:	---

Specimen Number	Peel Strength						Shear Strength		
	Weld A			Weld B					
	lb./in	Seam Separation, %	Failure Type	lb./in	Seam Separation, %	Failure Type	lb./in	Elongation, %	Rupture Mode
1	120	---	SE1	115	---	SE1	143	1150	Both
2	120	---	SE1	115	---	SE1	144	600	Upper
3	120	---	SE1	123	---	SE1	142	500	Lower
4	122	---	SE1	119	---	SE1	145	550	Upper
5	123	---	SE1	117	---	SE1	148	800	Both
Average	121	---	---	118	---	---	144	---	---

Comments:

Estimate of seam separation visually determined based upon area of separated bond to the nearest 5%.

Shear test halted for HDPE and LMDPE materials once specimen has elongated 50%.
Shear test halted for PVC, fPP, LLDPE, VFPE and VLDPE once specimen has elongated past machine capacity.

Rupture mode for specimens with >50% elongation (HDPE and LMDPE) or > machine capacity (PVC, fPP, LLDPE, VFPE and VLDPE) interpreted as occurring in the membrane that exhibits yielding.

Notes: These results apply only to the sample tested for the specific test conditions. The test procedures employed follow accepted industry practice and the indicated test method. GeoTesting Express has no specific knowledge as to conditioning, origin, sampling procedure or intended use of the material.

Client:	Chenango Contracting, Inc.		
Project Name:	Iron Horse Park		
Project Location:	Billerica, MA		
Installer:	---		
GTX #:	309168		
Test Date:	04/17/19		
Tested By:	dln/trm	Report #:	1
Checked By:	bfs	Page:	5 of 15

Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods by ASTM D6392

peel & shear destructive test

Upper Geomembrane:	60 mil textured LLDPE (smooth edge)	Testing Machine:	Instron 1123
Lower Geomembrane:	60 mil textured LLDPE (smooth edge)	Testing Speed:	20 in/min
Seaming Method:	Dual Hot Wedge Weld	Grips:	ATS pneumatic
		Specimen Size:	1 in x 8 in

Sample ID:	DS-5	Machine ID:	---
Seam ID:	---/---	Welder ID:	---
		Date Sampled:	---

Specimen Number	Peel Strength						Shear Strength		
	Weld A			Weld B					
	lb./in	Seam Separation, %	Failure Type	lb./in	Seam Separation, %	Failure Type	lb./in	Elongation, %	Rupture Mode
1	120	---	SE1	125	---	SE1	147	1150	Both
2	111	---	SE1	116	---	SE1	148	1200	Both
3	115	---	SE1	117	---	SE1	147	1050	Both
4	128	---	SE1	117	---	SE1	145	1150	Both
5	129	---	SE1	128	---	SE1	149	1150	Both
Average	121	---	---	121	---	---	147	---	---

Comments:

Estimate of seam separation visually determined based upon area of separated bond to the nearest 5%.

Shear test halted for HDPE and LMDPE materials once specimen has elongated 50%.
Shear test halted for PVC, fPP, LLDPE, VFPE and VLDPE once specimen has elongated past machine capacity.

Rupture mode for specimens with >50% elongation (HDPE and LMDPE) or > machine capacity (PVC, fPP, LLDPE, VFPE and VLDPE) interpreted as occurring in the membrane that exhibits yielding.

Notes: These results apply only to the sample tested for the specific test conditions. The test procedures employed follow accepted industry practice and the indicated test method. GeoTesting Express has no specific knowledge as to conditioning, origin, sampling procedure or intended use of the material.

Client:	Chenango Contracting, Inc.		
Project Name:	Iron Horse Park		
Project Location:	Billerica, MA		
Installer:	---		
GTX #:	309168		
Test Date:	04/17/19		
Tested By:	dln/trm	Report #:	1
Checked By:	bfs	Page:	6 of 15

Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods by ASTM D6392

peel & shear destructive test

Upper Geomembrane:	60 mil textured LLDPE (smooth edge)	Testing Machine:	Instron 1123
Lower Geomembrane:	60 mil textured LLDPE (smooth edge)	Testing Speed:	20 in/min
Seaming Method:	Dual Hot Wedge Weld	Grips:	ATS pneumatic
		Specimen Size:	1 in x 8 in

Sample ID:	DS-6	Machine ID:	---
Seam ID:	---/---	Welder ID:	---
		Date Sampled:	---

Specimen Number	Peel Strength						Shear Strength		
	Weld A			Weld B					
	lb./in	Seam Separation, %	Failure Type	lb./in	Seam Separation, %	Failure Type	lb./in	Elongation, %	Rupture Mode
1	118	---	SE1	123	---	SE1	143	900	Both
2	129	---	SE1	117	---	SE1	150	400	Lower
3	131	---	SE1	117	---	SE1	150	650	Upper
4	132	---	SE1	116	---	SE1	148	400	Lower
5	132	---	SE1	118	---	SE1	150	600	Upper
Average	128	---	---	118	---	---	148	---	---

Comments:

Estimate of seam separation visually determined based upon area of separated bond to the nearest 5%.

Shear test halted for HDPE and LMDPE materials once specimen has elongated 50%.
Shear test halted for PVC, fPP, LLDPE, VFPE and VLDPE once specimen has elongated past machine capacity.

Rupture mode for specimens with >50% elongation (HDPE and LMDPE) or > machine capacity (PVC, fPP, LLDPE, VFPE and VLDPE) interpreted as occurring in the membrane that exhibits yielding.

Notes: These results apply only to the sample tested for the specific test conditions. The test procedures employed follow accepted industry practice and the indicated test method. GeoTesting Express has no specific knowledge as to conditioning, origin, sampling procedure or intended use of the material.

Client:	Chenango Contracting, Inc.		
Project Name:	Iron Horse Park		
Project Location:	Billerica, MA		
Installer:	---		
GTX #:	309168		
Test Date:	04/17/19		
Tested By:	dln/trm	Report #:	1
Checked By:	bfs	Page:	7 of 15

Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods by ASTM D6392

peel & shear destructive test

Upper Geomembrane:	60 mil textured LLDPE	Testing Machine:	Instron 1123
Lower Geomembrane:	60 mil textured LLDPE	Testing Speed:	20 in/min
Seaming Method:	Dual Hot Wedge Weld	Grips:	ATS pneumatic
		Specimen Size:	1 in x 8 in

Sample ID:	DS-7	Machine ID:	---
Seam ID:	---/---	Welder ID:	---
		Date Sampled:	---

Specimen Number	Peel Strength						Shear Strength		
	Weld A			Weld B					
	lb./in	Seam Separation, %	Failure Type	lb./in	Seam Separation, %	Failure Type	lb./in	Elongation, %	Rupture Mode
1	138	---	SE1	146	---	SE1	160	450	Upper
2	138	---	SE1	136	---	SE1	160	750	Both
3	142	---	SE1	146	---	SE1	160	1050	Both
4	137	---	SE1	141	---	SE1	163	700	Both
5	143	---	SE1	134	---	SE1	155	400	Lower
Average	140	---	---	141	---	---	160	---	---

Comments:

Estimate of seam separation visually determined based upon area of separated bond to the nearest 5%.

Shear test halted for HDPE and LMDPE materials once specimen has elongated 50%.
Shear test halted for PVC, fPP, LLDPE, VFPE and VLDPE once specimen has elongated past machine capacity.

Rupture mode for specimens with >50% elongation (HDPE and LMDPE) or > machine capacity (PVC, fPP, LLDPE, VFPE and VLDPE) interpreted as occurring in the membrane that exhibits yielding.

Notes: These results apply only to the sample tested for the specific test conditions. The test procedures employed follow accepted industry practice and the indicated test method. GeoTesting Express has no specific knowledge as to conditioning, origin, sampling procedure or intended use of the material.

Client:	Chenango Contracting, Inc.		
Project Name:	Iron Horse Park		
Project Location:	Billerica, MA		
Installer:	---		
GTX #:	309168		
Test Date:	04/17/19		
Tested By:	dln/trm	Report #:	1
Checked By:	bfs	Page:	8 of 15

Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods by ASTM D6392

peel & shear destructive test

Upper Geomembrane:	60 mil textured LLDPE (smooth edge)	Testing Machine:	Instron 1123
Lower Geomembrane:	60 mil textured LLDPE (smooth edge)	Testing Speed:	20 in/min
Seaming Method:	Dual Hot Wedge Weld	Grips:	ATS pneumatic
		Specimen Size:	1 in x 8 in

Sample ID:	DS-8	Machine ID:	---
Seam ID:	---/---	Welder ID:	---
		Date Sampled:	---

Specimen Number	Peel Strength						Shear Strength		
	Weld A			Weld B					
	lb./in	Seam Separation, %	Failure Type	lb./in	Seam Separation, %	Failure Type	lb./in	Elongation, %	Rupture Mode
1	120	---	SE1	129	---	SE1	150	350	Lower
2	117	---	SE1	121	---	SE1	148	450	Lower
3	130	---	SE1	138	---	SE1	140	550	Lower
4	119	---	SE1	120	---	SE1	144	450	Lower
5	115	---	SE1	134	---	SE1	147	450	Lower
Average	120	---	---	128	---	---	146	---	---

Comments:

Estimate of seam separation visually determined based upon area of separated bond to the nearest 5%.

Shear test halted for HDPE and LMDPE materials once specimen has elongated 50%.
Shear test halted for PVC, fPP, LLDPE, VFPE and VLDPE once specimen has elongated past machine capacity.

Rupture mode for specimens with >50% elongation (HDPE and LMDPE) or > machine capacity (PVC, fPP, LLDPE, VFPE and VLDPE) interpreted as occurring in the membrane that exhibits yielding.

Notes: These results apply only to the sample tested for the specific test conditions. The test procedures employed follow accepted industry practice and the indicated test method. GeoTesting Express has no specific knowledge as to conditioning, origin, sampling procedure or intended use of the material.

Client:	Chenango Contracting, Inc.		
Project Name:	Iron Horse Park		
Project Location:	Billerica, MA		
Installer:	---		
GTX #:	309168		
Test Date:	04/17/19		
Tested By:	dln/trm	Report #:	1
Checked By:	bfs	Page:	9 of 15

Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods by ASTM D6392

peel & shear destructive test

Upper Geomembrane:	60 mil textured LLDPE (smooth edge)	Testing Machine:	Instron 1123
Lower Geomembrane:	60 mil textured LLDPE (smooth edge)	Testing Speed:	20 in/min
Seaming Method:	Dual Hot Wedge Weld	Grips:	ATS pneumatic
		Specimen Size:	1 in x 8 in

Sample ID:	DS-9	Machine ID:	---
Seam ID:	---/---	Welder ID:	---
		Date Sampled:	---

Specimen Number	Peel Strength						Shear Strength		
	Weld A			Weld B					
	lb./in	Seam Separation, %	Failure Type	lb./in	Seam Separation, %	Failure Type	lb./in	Elongation, %	Rupture Mode
1	134	---	SE1	118	---	SE1	144	800	Both
2	129	---	SE1	114	---	SE1	144	500	Upper
3	129	---	SE1	117	---	SE1	145	1000	Both
4	128	---	SE1	115	---	SE1	141	900	Both
5	129	---	SE1	113	---	SE1	144	450	Upper
Average	130	---	---	115	---	---	144	---	---

Comments:

Estimate of seam separation visually determined based upon area of separated bond to the nearest 5%.

Shear test halted for HDPE and LMDPE materials once specimen has elongated 50%.
Shear test halted for PVC, fPP, LLDPE, VFPE and VLDPE once specimen has elongated past machine capacity.

Rupture mode for specimens with >50% elongation (HDPE and LMDPE) or > machine capacity (PVC, fPP, LLDPE, VFPE and VLDPE) interpreted as occurring in the membrane that exhibits yielding.

Notes: These results apply only to the sample tested for the specific test conditions. The test procedures employed follow accepted industry practice and the indicated test method. GeoTesting Express has no specific knowledge as to conditioning, origin, sampling procedure or intended use of the material.

Client:	Chenango Contracting, Inc.		
Project Name:	Iron Horse Park		
Project Location:	Billerica, MA		
Installer:	---		
GTX #:	309168		
Test Date:	04/17/19		
Tested By:	dln/trm	Report #:	1
Checked By:	bfs	Page:	10 of 15

Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods by ASTM D6392

peel & shear destructive test

Upper Geomembrane:	60 mil textured LLDPE (smooth edge)	Testing Machine:	Instron 1123
Lower Geomembrane:	60 mil textured LLDPE (smooth edge)	Testing Speed:	20 in/min
Seaming Method:	Dual Hot Wedge Weld	Grips:	ATS pneumatic
		Specimen Size:	1 in x 8 in

Sample ID:	DS-10	Machine ID:	---
Seam ID:	---/---	Welder ID:	---
		Date Sampled:	---

Specimen Number	Peel Strength						Shear Strength		
	Weld A			Weld B					
	lb./in	Seam Separation, %	Failure Type	lb./in	Seam Separation, %	Failure Type	lb./in	Elongation, %	Rupture Mode
1	134	---	SE1	120	---	SE1	147	500	Both
2	129	---	SE1	120	---	SE1	147	600	Upper
3	131	---	SE1	115	---	SE1	145	900	Both
4	125	---	SE1	118	---	SE1	141	1000	Both
5	129	---	SE1	125	---	SE1	147	800	Both
Average	130	---	---	120	---	---	145	---	---

Comments:

Estimate of seam separation visually determined based upon area of separated bond to the nearest 5%.

Shear test halted for HDPE and LMDPE materials once specimen has elongated 50%.
Shear test halted for PVC, fPP, LLDPE, VFPE and VLDPE once specimen has elongated past machine capacity.

Rupture mode for specimens with >50% elongation (HDPE and LMDPE) or > machine capacity (PVC, fPP, LLDPE, VFPE and VLDPE) interpreted as occurring in the membrane that exhibits yielding.

Notes: These results apply only to the sample tested for the specific test conditions. The test procedures employed follow accepted industry practice and the indicated test method. GeoTesting Express has no specific knowledge as to conditioning, origin, sampling procedure or intended use of the material.

Client:	Chenango Contracting, Inc.		
Project Name:	Iron Horse Park		
Project Location:	Billerica, MA		
Installer:	---		
GTX #:	309168		
Test Date:	04/17/19		
Tested By:	dln/trm	Report #:	1
Checked By:	bfs	Page:	11 of 15

Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods by ASTM D6392

peel & shear destructive test

Upper Geomembrane:	60 mil textured LLDPE (smooth edge)	Testing Machine:	Instron 1123
Lower Geomembrane:	60 mil textured LLDPE (smooth edge)	Testing Speed:	20 in/min
Seaming Method:	Dual Hot Wedge Weld	Grips:	ATS pneumatic
		Specimen Size:	1 in x 8 in

Sample ID:	DS-11	Machine ID:	---
Seam ID:	---/---	Welder ID:	---
		Date Sampled:	---

Specimen Number	Peel Strength						Shear Strength		
	Weld A			Weld B					
	lb./in	Seam Separation, %	Failure Type	lb./in	Seam Separation, %	Failure Type	lb./in	Elongation, %	Rupture Mode
1	113	---	SE1	111	---	SE1	150	350	Lower
2	105	---	SE1	111	---	SE1	149	300	Lower
3	123	---	SE1	122	---	SE1	146	350	Lower
4	108	---	SE1	113	---	SE1	142	350	Lower
5	102	---	SE1	113	---	SE1	147	300	Lower
Average	110	---	---	114	---	---	147	---	---

Comments:

Estimate of seam separation visually determined based upon area of separated bond to the nearest 5%.

Shear test halted for HDPE and LMDPE materials once specimen has elongated 50%.
Shear test halted for PVC, fPP, LLDPE, VFPE and VLDPE once specimen has elongated past machine capacity.

Rupture mode for specimens with >50% elongation (HDPE and LMDPE) or > machine capacity (PVC, fPP, LLDPE, VFPE and VLDPE) interpreted as occurring in the membrane that exhibits yielding.

Notes: These results apply only to the sample tested for the specific test conditions. The test procedures employed follow accepted industry practice and the indicated test method. GeoTesting Express has no specific knowledge as to conditioning, origin, sampling procedure or intended use of the material.

Client:	Chenango Contracting, Inc.		
Project Name:	Iron Horse Park		
Project Location:	Billerica, MA		
Installer:	---		
GTX #:	309168		
Test Date:	04/17/19		
Tested By:	dln/trm	Report #:	1
Checked By:	bfs	Page:	12 of 15

Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods by ASTM D6392

peel & shear destructive test

Upper Geomembrane:	60 mil textured LLDPE (smooth edge)	Testing Machine:	Instron 1123
Lower Geomembrane:	60 mil textured LLDPE (smooth edge)	Testing Speed:	20 in/min
Seaming Method:	Dual Hot Wedge Weld	Grips:	ATS pneumatic
		Specimen Size:	1 in x 8 in

Sample ID:	DS-12	Machine ID:	---
Seam ID:	---/---	Welder ID:	---
		Date Sampled:	---

Specimen Number	Peel Strength						Shear Strength		
	Weld A			Weld B					
	lb./in	Seam Separation, %	Failure Type	lb./in	Seam Separation, %	Failure Type	lb./in	Elongation, %	Rupture Mode
1	127	---	SE1	123	---	SE1	151	350	Lower
2	121	---	SE1	105	---	SE1	148	500	Both
3	121	---	SE1	125	---	SE1	144	500	Lower
4	127	---	SE1	136	---	SE1	147	450	Lower
5	128	---	SE1	121	---	SE1	145	400	Lower
Average	125	---	---	122	---	---	147	---	---

Comments:

Estimate of seam separation visually determined based upon area of separated bond to the nearest 5%.

Shear test halted for HDPE and LMDPE materials once specimen has elongated 50%.
Shear test halted for PVC, fPP, LLDPE, VFPE and VLDPE once specimen has elongated past machine capacity.

Rupture mode for specimens with >50% elongation (HDPE and LMDPE) or > machine capacity (PVC, fPP, LLDPE, VFPE and VLDPE) interpreted as occurring in the membrane that exhibits yielding.

Notes: These results apply only to the sample tested for the specific test conditions. The test procedures employed follow accepted industry practice and the indicated test method. GeoTesting Express has no specific knowledge as to conditioning, origin, sampling procedure or intended use of the material.

Client:	Chenango Contracting, Inc.		
Project Name:	Iron Horse Park		
Project Location:	Billerica, MA		
Installer:	---		
GTX #:	309168		
Test Date:	04/17/19		
Tested By:	dln/trm	Report #:	1
Checked By:	bfs	Page:	13 of 15

Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods by ASTM D6392

peel & shear destructive test

Upper Geomembrane:	60 mil textured LLDPE	Testing Machine:	Instron 1123
Lower Geomembrane:	60 mil textured LLDPE (smooth edge)	Testing Speed:	20 in/min
Seaming Method:	Dual Hot Wedge Weld	Grips:	ATS pneumatic
		Specimen Size:	1 in x 8 in

Sample ID:	DS-13	Machine ID:	---
Seam ID:	---/---	Welder ID:	---
		Date Sampled:	---

Specimen Number	Peel Strength						Shear Strength		
	Weld A			Weld B					
	lb./in	Seam Separation, %	Failure Type	lb./in	Seam Separation, %	Failure Type	lb./in	Elongation, %	Rupture Mode
1	132	---	SE1	131	---	SE1	149	400	Lower
2	131	---	SE1	125	---	SE1	152	400	Lower
3	132	---	SE1	126	---	SE1	149	400	Lower
4	136	---	SE1	133	---	SE1	147	450	Lower
5	135	---	SE1	128	---	SE1	146	400	Lower
Average	133	---	---	129	---	---	149	---	---

Comments:

Estimate of seam separation visually determined based upon area of separated bond to the nearest 5%.

Shear test halted for HDPE and LMDPE materials once specimen has elongated 50%.
Shear test halted for PVC, fPP, LLDPE, VFPE and VLDPE once specimen has elongated past machine capacity.

Rupture mode for specimens with >50% elongation (HDPE and LMDPE) or > machine capacity (PVC, fPP, LLDPE, VFPE and VLDPE) interpreted as occurring in the membrane that exhibits yielding.

Notes: These results apply only to the sample tested for the specific test conditions. The test procedures employed follow accepted industry practice and the indicated test method. GeoTesting Express has no specific knowledge as to conditioning, origin, sampling procedure or intended use of the material.

Client:	Chenango Contracting, Inc.		
Project Name:	Iron Horse Park		
Project Location:	Billerica, MA		
Installer:	---		
GTX #:	309168		
Test Date:	04/17/19		
Tested By:	dln/trm	Report #:	1
Checked By:	bfs	Page:	14 of 15

Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods by ASTM D6392

peel & shear destructive test

Upper Geomembrane:	60 mil textured LLDPE (smooth edge)	Testing Machine:	Instron 1123
Lower Geomembrane:	60 mil textured LLDPE (smooth edge)	Testing Speed:	20 in/min
Seaming Method:	Dual Hot Wedge Weld	Grips:	ATS pneumatic
		Specimen Size:	1 in x 8 in

Sample ID:	DS-14	Machine ID:	---
Seam ID:	---/---	Welder ID:	---
		Date Sampled:	---

Specimen Number	Peel Strength						Shear Strength		
	Weld A			Weld B					
	lb./in	Seam Separation, %	Failure Type	lb./in	Seam Separation, %	Failure Type	lb./in	Elongation, %	Rupture Mode
1	121	---	SE1	123	---	SE1	146	350	Lower
2	116	---	SE1	122	---	SE1	146	250	Upper
3	110	---	SE1	119	---	SE1	146	750	Upper
4	117	---	SE1	126	---	SE1	144	400	Lower
5	114	---	SE1	119	---	SE1	146	250	Lower
Average	116	---	---	122	---	---	146	---	---

Comments:

Estimate of seam separation visually determined based upon area of separated bond to the nearest 5%.

Shear test halted for HDPE and LMDPE materials once specimen has elongated 50%.
Shear test halted for PVC, fPP, LLDPE, VFPE and VLDPE once specimen has elongated past machine capacity.

Rupture mode for specimens with >50% elongation (HDPE and LMDPE) or > machine capacity (PVC, fPP, LLDPE, VFPE and VLDPE) interpreted as occurring in the membrane that exhibits yielding.

Notes: These results apply only to the sample tested for the specific test conditions. The test procedures employed follow accepted industry practice and the indicated test method. GeoTesting Express has no specific knowledge as to conditioning, origin, sampling procedure or intended use of the material.

Client:	Chenango Contracting, Inc.		
Project Name:	Iron Horse Park		
Project Location:	Billerica, MA		
Installer:	---		
GTX #:	309168		
Test Date:	04/17/19		
Tested By:	dln/trm	Report #:	1
Checked By:	bfs	Page:	15 of 15

Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods by ASTM D6392

peel & shear destructive test

Upper Geomembrane:	60 mil textured LLDPE	Testing Machine:	Instron 1123
Lower Geomembrane:	60 mil textured LLDPE	Testing Speed:	20 in/min
Seaming Method:	Fillet Extrusion Weld	Grips:	ATS pneumatic
		Specimen Size:	1 in x 8 in

Sample ID:	DS-15	Machine ID:	---
Seam ID:	---/---	Welder ID:	---
		Date Sampled:	---

Specimen Number	Peel Strength						Shear Strength		
	Weld A			Weld B					
	lb./in	Seam Separation, %	Failure Type	lb./in	Seam Separation, %	Failure Type	lb./in	Elongation, %	Rupture Mode
1	133	---	SE3	---	---	---	152	300	Upper
2	129	---	SE3	---	---	---	162	250	Lower
3	119	---	SE3	---	---	---	153	500	Lower
4	128	---	SE3	---	---	---	159	300	Lower
5	139	---	SE3	---	---	---	157	400	Both
Average	130	---	---	---	---	---	157	---	---

Comments:

Estimate of seam separation visually determined based upon area of separated bond to the nearest 5%.

Shear test halted for HDPE and LMDPE materials once specimen has elongated 50%.
Shear test halted for PVC, fPP, LLDPE, VFPE and VLDPE once specimen has elongated past machine capacity.

Rupture mode for specimens with >50% elongation (HDPE and LMDPE) or > machine capacity (PVC, fPP, LLDPE, VFPE and VLDPE) interpreted as occurring in the membrane that exhibits yielding.

Notes: These results apply only to the sample tested for the specific test conditions. The test procedures employed follow accepted industry practice and the indicated test method. GeoTesting Express has no specific knowledge as to conditioning, origin, sampling procedure or intended use of the material.

JLT Laboratories, Inc.

Geotechnical, Geosynthetic and Materials Testing and Research

938 South Central Avenue
Canonsburg, Pennsylvania, 15317
Tel: 724-746-4441 Fax: 724-745-4261
e-mail: jboschuk@jltlabs.com
www.jltlabs.com

April 18, 2019
19LG3769

ERM
75 Valley Stream Parkway
Suite 200
Malvern, PA 19355

Attn: Michael Pettit

RE: PEEL & SHEAR TEST RESULTS
IRON HORSE PARK LANDFILL
ERM PROJECT NO: 0476110

Dear Mr. Pettit:

Submitted herein are the results of Peel & Shear tests performed on fifteen (15) 60 mil LLDPE samples identified as DS-1 through DS-15 from the above referenced project. Testing was performed per ASTM D-6392 while subject to JLT's internal QA / QC and data validation procedures.

We appreciate the opportunity to provide our services and look forward to working with you again. Should you have any questions, comments or require additional information, please do not hesitate to call. Thank you.

Sincerely,

JLT LABORATORIES, INC.

John Boschuk, Jr., P.E., C.F.E.
President

cc: S. Lindsay & AP North

Enclosures
JB\mlb
MSWord\letter\1979
Inv# 7244

PEEL AND SHEAR TEST RESULTS

ASTM D-6392

Client:	ERM	Job No.:	19LG3769
Project:	Iron Horse Park Landfill	Date Tested:	04/18/2019
Material:	60 mil LLDPE	Technician:	AE / MLB
Manufacturer:	GSE Textured	Checked By:	JBJr
Weld Type:	Double Wedge Weld	Machine:	ATC 1000
		Calib Date :	10/10/2018

Sample No.: DS-1
Seam: P45 / P46
Operator: LS
Machine: 49

Crosshead Speed
Peel: 20 in/min.
Shear: 20 in/min.
Specimen Width = 1 inch

Peel Adhesion Test Data

Replicate No.	WELD A				WELD B			
	Peak Load (lbs/in)	Rupture Mode	Seam Sep. (1) (%)	Gage Length (in)	Peak Load (lbs/in)	Rupture Mode	Seam Sep. (1) (%)	Gage Length (in)
1	117.0	SE1 FTB	0	1.0	109.0	SE1 FTB	0	1.0
2	115.0	SE1 FTB	0	1.0	116.0	SE1 FTB	0	1.0
3	104.0	SE1 FTB	0	1.0	112.0	SE1 FTB	0	1.0
4	118.0	SE1 FTB	0	1.0	111.0	SE1 FTB	0	1.0
5	116.0	SE1 FTB	0	1.0	110.0	SE1 FTB	0	1.0
Average	114.0				111.6			

Bonded Seam (Shear) Test Data

Replicate No.	Peak Load (lbs/in)	Rupture Mode	Elonga (2) (%)	Gage Length (in)
1	144.0	FTB	> 50	1
2	143.0	FTB	> 50	1
3	142.0	FTB	> 50	1
4	142.0	FTB	> 50	1
5	135.0	FTB	> 50	1
Average	141.2			

(1) *Reported to nearest 25%.*
(2) *Elongation = L/Lo x 100%.*
(3) *INA (Information Not Available) .*

Values obtained from Client

Shear		min. 100 ppi and FTB
Peel	Fusion	min. 70 ppi and FTB
Peel	Extrusion	min. 50 ppi and FTB

JLT Laboratories, Inc. 938 S. Central Avenue, Canonsburg, PA 15317 Tel: 724-746-4441 / Web: www.jltlabs.com

PEEL AND SHEAR TEST RESULTS

ASTM D-6392

Client:	ERM	Job No.:	19LG3769
Project:	Iron Horse Park Landfill	Date Tested:	04/18/2019
Material:	60 mil LLDPE	Technician:	AE / MLB
Manufacturer:	GSE Textured	Checked By:	JBJr
Weld Type:	Double Wedge Weld	Machine:	ATC 1000
		Calib Date :	10/10/2018

Sample No.: DS-2
Seam: P45 / P44
Operator: CS
Machine: 34

Crosshead Speed
Peel: 20 in/min.
Shear: 20 in/min.
Specimen Width = 1 inch

Peel Adhesion Test Data

Replicate No.	WELD A				WELD B			
	Peak Load (lbs/in)	Rupture Mode	Seam Sep. (1) (%)	Gage Length (in)	Peak Load (lbs/in)	Rupture Mode	Seam Sep. (1) (%)	Gage Length (in)
1	114.0	SE1 FTB	0	1.0	118.0	SE1 FTB	0	1.0
2	111.0	SE1 FTB	0	1.0	117.0	SE1 FTB	0	1.0
3	114.0	SE1 FTB	0	1.0	116.0	SE1 FTB	0	1.0
4	115.0	SE1 FTB	0	1.0	113.0	SE1 FTB	0	1.0
5	115.0	SE1 FTB	0	1.0	113.0	SE1 FTB	0	1.0
Average	113.8				115.4			

Bonded Seam (Shear) Test Data

Replicate No.	Peak Load (lbs/in)	Rupture Mode	Elonga (2) (%)	Gage Length (in)
1	143.0	FTB	> 50	1
2	145.0	FTB	> 50	1
3	142.0	FTB	> 50	1
4	139.0	FTB	> 50	1
5	135.0	FTB	> 50	1
Average	140.8			

(1) *Reported to nearest 25%.*
(2) *Elongation = L/Lo x 100%.*
(3) *INA (Information Not Available) .*

Values obtained from Client

Shear		min. 100 ppi and FTB
Peel	Fusion	min. 70 ppi and FTB
Peel	Extrusion	min. 50 ppi and FTB

JLT Laboratories, Inc. 938 S. Central Avenue, Canonsburg, PA 15317 Tel: 724-746-4441 / Web: www.jltlabs.com

PEEL AND SHEAR TEST RESULTS

ASTM D-6392

Client:	ERM	Job No.:	19LG3769
Project:	Iron Horse Park Landfill	Date Tested:	04/18/2019
Material:	60 mil LLDPE	Technician:	AE / MLB
Manufacturer:	GSE Textured	Checked By:	JBJr
Weld Type:	Double Wedge Weld	Machine:	ATC 1000
		Calib Date :	10/10/2018

Sample No.: DS-3
Seam: P41 / P42
Operator: LS
Machine: 49

Crosshead Speed
Peel: 20 in/min.
Shear: 20 in/min.
Specimen Width = 1 inch

Peel Adhesion Test Data

Replicate No.	WELD A				WELD B			
	Peak Load (lbs/in)	Rupture Mode	Seam Sep. (1) (%)	Gage Length (in)	Peak Load (lbs/in)	Rupture Mode	Seam Sep. (1) (%)	Gage Length (in)
1	130.0	SE1 FTB	0	1.0	131.0	SE1 FTB	0	1.0
2	130.0	SE1 FTB	0	1.0	124.0	SE1 FTB	0	1.0
3	132.0	SE1 FTB	0	1.0	136.0	SE1 FTB	0	1.0
4	130.0	SE1 FTB	0	1.0	135.0	SE1 FTB	0	1.0
5	131.0	SE1 FTB	0	1.0	131.0	SE1 FTB	0	1.0
Average	130.6				131.4			

Bonded Seam (Shear) Test Data

Replicate No.	Peak Load (lbs/in)	Rupture Mode	Elonga (2) (%)	Gage Length (in)
1	164.0	FTB	> 50	1
2	160.0	FTB	> 50	1
3	150.0	FTB	> 50	1
4	159.0	FTB	> 50	1
5	159.0	FTB	> 50	1
Average	158.4			

(1) *Reported to nearest 25%.*
(2) *Elongation = L/Lo x 100%.*
(3) *INA (Information Not Available) .*

Values obtained from Client

Shear		min. 100 ppi and FTB
Peel	Fusion	min. 70 ppi and FTB
Peel	Extrusion	min. 50 ppi and FTB

JLT Laboratories, Inc. 938 S. Central Avenue, Canonsburg, PA 15317 Tel: 724-746-4441 / Web: www.jltlabs.com

PEEL AND SHEAR TEST RESULTS

ASTM D-6392

Client:	ERM	Job No.:	19LG3769
Project:	Iron Horse Park Landfill	Date Tested:	04/18/2019
Material:	60 mil LLDPE	Technician:	AE / MLB
Manufacturer:	GSE Textured	Checked By:	JBJr
Weld Type:	Double Wedge Weld	Machine:	ATC 1000
		Calib Date :	10/10/2018

Sample No.: DS-4
Seam: P38 / P40
Operator: CS
Machine: 34

Crosshead Speed
Peel: 20 in/min.
Shear: 20 in/min.
Specimen Width = 1 inch

Peel Adhesion Test Data

Replicate No.	WELD A				WELD B			
	Peak Load (lbs/in)	Rupture Mode	Seam Sep. (1) (%)	Gage Length (in)	Peak Load (lbs/in)	Rupture Mode	Seam Sep. (1) (%)	Gage Length (in)
1	119.0	SE1 FTB	0	1.0	115.0	SE1 FTB	0	1.0
2	117.0	SE1 FTB	0	1.0	111.0	SE1 FTB	0	1.0
3	117.0	SE1 FTB	0	1.0	110.0	SE1 FTB	0	1.0
4	113.0	SE1 FTB	0	1.0	111.0	SE1 FTB	0	1.0
5	110.0	SE1 FTB	0	1.0	114.0	SE1 FTB	0	1.0
Average	115.2				112.2			

Bonded Seam (Shear) Test Data

Replicate No.	Peak Load (lbs/in)	Rupture Mode	Elonga (2) (%)	Gage Length (in)
1	144.0	FTB	> 50	1
2	141.0	FTB	> 50	1
3	138.0	FTB	> 50	1
4	134.0	FTB	> 50	1
5	145.0	FTB	> 50	1
Average	140.4			

(1) *Reported to nearest 25%.*
(2) *Elongation = L/Lo x 100%.*
(3) *INA (Information Not Available) .*

Values obtained from Client

Shear		min. 100 ppi and FTB
Peel	Fusion	min. 70 ppi and FTB
Peel	Extrusion	min. 50 ppi and FTB

JLT Laboratories, Inc. 938 S. Central Avenue, Canonsburg, PA 15317 Tel: 724-746-4441 / Web: www.jltlabs.com

PEEL AND SHEAR TEST RESULTS

ASTM D-6392

Client:	ERM	Job No.:	19LG3769
Project:	Iron Horse Park Landfill	Date Tested:	04/18/2019
Material:	60 mil LLDPE	Technician:	AE / MLB
Manufacturer:	GSE Textured	Checked By:	JBJr
Weld Type:	Double Wedge Weld	Machine:	ATC 1000
		Calib Date :	10/10/2018

Sample No.:	DS-5	Crosshead Speed		
Seam:	P35 / P36	Peel:	20	in/min.
Operator:	LPS	Shear:	20	in/min.
Machine:	26	Specimen Width = 1 inch		

Peel Adhesion Test Data

Replicate No.	WELD A				WELD B			
	Peak Load (lbs/in)	Rupture Mode	Seam Sep. (1) (%)	Gage Length (in)	Peak Load (lbs/in)	Rupture Mode	Seam Sep. (1) (%)	Gage Length (in)
1	108.0	SE1 FTB	0	1.0	114.0	SE1 FTB	0	1.0
2	110.0	SE1 FTB	0	1.0	118.0	SE1 FTB	0	1.0
3	109.0	SE1 FTB	0	1.0	111.0	SE1 FTB	0	1.0
4	114.0	SE1 FTB	0	1.0	114.0	SE1 FTB	0	1.0
5	114.0	SE1 FTB	0	1.0	113.0	SE1 FTB	0	1.0
Average	111.0				114.0			

Bonded Seam (Shear) Test Data

Replicate No.	Peak Load (lbs/in)	Rupture Mode	Elonga (2) (%)	Gage Length (in)
1	142.0	FTB	> 50	1
2	145.0	FTB	> 50	1
3	144.0	FTB	> 50	1
4	140.0	FTB	> 50	1
5	145.0	FTB	> 50	1
Average	143.2			

(1) *Reported to nearest 25%.*
(2) *Elongation = L/Lo x 100%.*
(3) *INA (Information Not Available) .*

Values obtained from Client

Shear		min. 100 ppi and FTB
Peel	Fusion	min. 70 ppi and FTB
Peel	Extrusion	min. 50 ppi and FTB

JLT Laboratories, Inc. 938 S. Central Avenue, Canonsburg, PA 15317 Tel: 724-746-4441 / Web: www.jltlabs.com

PEEL AND SHEAR TEST RESULTS

ASTM D-6392

Client:	ERM	Job No.:	19LG3769
Project:	Iron Horse Park Landfill	Date Tested:	04/18/2019
Material:	60 mil LLDPE	Technician:	AE / MLB
Manufacturer:	GSE Textured	Checked By:	JBJr
Weld Type:	Double Wedge Weld	Machine:	ATC 1000
		Calib Date :	10/10/2018

Sample No.:	DS-6	Crosshead Speed		
Seam:	P32 / P35	Peel:	20	in/min.
Operator:	LS	Shear:	20	in/min.
Machine:	49	Specimen Width = 1 inch		

Peel Adhesion Test Data

Replicate No.	WELD A				WELD B			
	Peak Load (lbs/in)	Rupture Mode	Seam Sep. (1) (%)	Gage Length (in)	Peak Load (lbs/in)	Rupture Mode	Seam Sep. (1) (%)	Gage Length (in)
1	114.0	SE1 FTB	0	1.0	110.0	SE1 FTB	0	1.0
2	117.0	SE1 FTB	0	1.0	113.0	SE1 FTB	0	1.0
3	116.0	SE1 FTB	0	1.0	112.0	SE1 FTB	0	1.0
4	114.0	SE1 FTB	0	1.0	112.0	SE1 FTB	0	1.0
5	115.0	SE1 FTB	0	1.0	113.0	SE1 FTB	0	1.0
Average	115.2				112.0			

Bonded Seam (Shear) Test Data

Replicate No.	Peak Load (lbs/in)	Rupture Mode	Elonga (2) (%)	Gage Length (in)
1	142.0	FTB	> 50	1
2	140.0	FTB	> 50	1
3	139.0	FTB	> 50	1
4	146.0	FTB	> 50	1
5	144.0	FTB	> 50	1
Average	142.2			

(1) *Reported to nearest 25%.*
(2) *Elongation = L/Lo x 100%.*
(3) *INA (Information Not Available) .*

Values obtained from Client

Shear		min. 100 ppi and FTB
Peel	Fusion	min. 70 ppi and FTB
Peel	Extrusion	min. 50 ppi and FTB

JLT Laboratories, Inc. 938 S. Central Avenue, Canonsburg, PA 15317 Tel: 724-746-4441 / Web: www.jltlabs.com

PEEL AND SHEAR TEST RESULTS

ASTM D-6392

Client:	ERM	Job No.:	19LG3769
Project:	Iron Horse Park Landfill	Date Tested:	04/18/2019
Material:	60 mil LLDPE	Technician:	AE / MLB
Manufacturer:	GSE Textured	Checked By:	JBJr
Weld Type:	Double Wedge Weld	Machine:	ATC 1000
		Calib Date :	10/10/2018

Sample No.: **DS-7**
Seam: P30 / P31
Operator: CS
Machine: 34

Crosshead Speed
Peel: 20 in/min.
Shear: 20 in/min.
Specimen Width = 1 inch

Peel Adhesion Test Data

Replicate No.	WELD A				WELD B			
	Peak Load (lbs/in)	Rupture Mode	Seam Sep. (1) (%)	Gage Length (in)	Peak Load (lbs/in)	Rupture Mode	Seam Sep. (1) (%)	Gage Length (in)
1	123.0	SE1 FTB	0	1.0	131.0	SE1 FTB	0	1.0
2	129.0	SE1 FTB	0	1.0	130.0	SE1 FTB	0	1.0
3	129.0	SE1 FTB	0	1.0	125.0	SE1 FTB	0	1.0
4	128.0	SE1 FTB	0	1.0	128.0	SE1 FTB	0	1.0
5	127.0	SE1 FTB	0	1.0	125.0	SE1 FTB	0	1.0
Average	127.2				127.8			

Bonded Seam (Shear) Test Data

Replicate No.	Peak Load (lbs/in)	Rupture Mode	Elonga (2) (%)	Gage Length (in)
1	154.0	FTB	> 50	1
2	157.0	FTB	> 50	1
3	155.0	FTB	> 50	1
4	156.0	FTB	> 50	1
5	157.0	FTB	> 50	1
Average	155.8			

(1) *Reported to nearest 25%.*
(2) *Elongation = L/Lo x 100%.*
(3) *INA (Information Not Available) .*

Values obtained from Client

Shear		min. 100 ppi and FTB
Peel	Fusion	min. 70 ppi and FTB
Peel	Extrusion	min. 50 ppi and FTB

JLT Laboratories, Inc. 938 S. Central Avenue, Canonsburg, PA 15317 Tel: 724-746-4441 / Web: www.jltlabs.com

PEEL AND SHEAR TEST RESULTS

ASTM D-6392

Client:	ERM	Job No.:	19LG3769
Project:	Iron Horse Park Landfill	Date Tested:	04/18/2019
Material:	60 mil LLDPE	Technician:	AE / MLB
Manufacturer:	GSE Textured	Checked By:	JBJr
Weld Type:	Double Wedge Weld	Machine:	ATC 1000
		Calib Date :	10/10/2018

Sample No.:	DS-8	Crosshead Speed		
Seam:	P30 / P32	Peel:	20	in/min.
Operator:	CS	Shear:	20	in/min.
Machine:	34	Specimen Width = 1 inch		

Peel Adhesion Test Data

Replicate No.	WELD A				WELD B			
	Peak Load (lbs/in)	Rupture Mode	Seam Sep. (1) (%)	Gage Length (in)	Peak Load (lbs/in)	Rupture Mode	Seam Sep. (1) (%)	Gage Length (in)
1	119.0	SE1 FTB	0	1.0	111.0	SE1 FTB	0	1.0
2	119.0	SE1 FTB	0	1.0	111.0	SE1 FTB	0	1.0
3	118.0	SE1 FTB	0	1.0	110.0	SE1 FTB	0	1.0
4	119.0	SE1 FTB	0	1.0	111.0	SE1 FTB	0	1.0
5	120.0	SE1 FTB	0	1.0	112.0	SE1 FTB	0	1.0
Average	119.0				111.0			

Bonded Seam (Shear) Test Data

Replicate No.	Peak Load (lbs/in)	Rupture Mode	Elonga (2) (%)	Gage Length (in)
1	131.0	FTB	> 50	1
2	127.0	FTB	> 50	1
3	135.0	FTB	> 50	1
4	128.0	FTB	> 50	1
5	129.0	FTB	> 50	1
Average	130.0			

(1) *Reported to nearest 25%.*
(2) *Elongation = L/Lo x 100%.*
(3) *INA (Information Not Available) .*

Values obtained from Client

Shear		min. 100 ppi and FTB
Peel	Fusion	min. 70 ppi and FTB
Peel	Extrusion	min. 50 ppi and FTB

JLT Laboratories, Inc. 938 S. Central Avenue, Canonsburg, PA 15317 Tel: 724-746-4441 / Web: www.jltlabs.com

PEEL AND SHEAR TEST RESULTS

ASTM D-6392

Client:	ERM	Job No.:	19LG3769
Project:	Iron Horse Park Landfill	Date Tested:	04/18/2019
Material:	60 mil LLDPE	Technician:	AE / MLB
Manufacturer:	GSE Textured	Checked By:	JBJr
Weld Type:	Double Wedge Weld	Machine:	ATC 1000
		Calib Date :	10/10/2018

Sample No.:	DS-9	Crosshead Speed		
Seam:	P28 / P30	Peel:	20	in/min.
Operator:	LPS	Shear:	20	in/min.
Machine:	26	Specimen Width = 1 inch		

Peel Adhesion Test Data

Replicate No.	WELD A				WELD B			
	Peak Load (lbs/in)	Rupture Mode	Seam Sep. (1) (%)	Gage Length (in)	Peak Load (lbs/in)	Rupture Mode	Seam Sep. (1) (%)	Gage Length (in)
1	112.0	SE1 FTB	0	1.0	116.0	SE1 FTB	0	1.0
2	114.0	SE1 FTB	0	1.0	113.0	SE1 FTB	0	1.0
3	115.0	SE1 FTB	0	1.0	114.0	SE1 FTB	0	1.0
4	112.0	SE1 FTB	0	1.0	112.0	SE1 FTB	0	1.0
5	115.0	SE1 FTB	0	1.0	112.0	SE1 FTB	0	1.0
Average	113.6				113.4			

Bonded Seam (Shear) Test Data

Replicate No.	Peak Load (lbs/in)	Rupture Mode	Elonga (2) (%)	Gage Length (in)
1	138.0	FTB	> 50	1
2	130.0	FTB	> 50	1
3	134.0	FTB	> 50	1
4	129.0	FTB	> 50	1
5	130.0	FTB	> 50	1
Average	132.2			

(1) *Reported to nearest 25%.*
(2) *Elongation = L/Lo x 100%.*
(3) *INA (Information Not Available) .*

Values obtained from Client

Shear		min. 100 ppi and FTB
Peel	Fusion	min. 70 ppi and FTB
Peel	Extrusion	min. 50 ppi and FTB

JLT Laboratories, Inc. 938 S. Central Avenue, Canonsburg, PA 15317 Tel: 724-746-4441 / Web: www.jltlabs.com

PEEL AND SHEAR TEST RESULTS

ASTM D-6392

Client:	ERM	Job No.:	19LG3769
Project:	Iron Horse Park Landfill	Date Tested:	04/18/2019
Material:	60 mil LLDPE	Technician:	AE / MLB
Manufacturer:	GSE Textured	Checked By:	JBJr
Weld Type:	Double Wedge Weld	Machine:	ATC 1000
		Calib Date :	10/10/2018

Sample No.:	DS-10	Crosshead Speed		
Seam:	P27 / P28	Peel:	20	in/min.
Operator:	LS	Shear:	20	in/min.
Machine:	49	Specimen Width = 1 inch		

Peel Adhesion Test Data

Replicate No.	WELD A				WELD B			
	Peak Load (lbs/in)	Rupture Mode	Seam Sep. (1) (%)	Gage Length (in)	Peak Load (lbs/in)	Rupture Mode	Seam Sep. (1) (%)	Gage Length (in)
1	110.0	SE1 FTB	0	1.0	117.0	SE1 FTB	0	1.0
2	113.0	SE1 FTB	0	1.0	116.0	SE1 FTB	0	1.0
3	110.0	SE1 FTB	0	1.0	114.0	SE1 FTB	0	1.0
4	113.0	SE1 FTB	0	1.0	113.0	SE1 FTB	0	1.0
5	110.0	SE1 FTB	0	1.0	114.0	SE1 FTB	0	1.0
Average	111.2				114.8			

Bonded Seam (Shear) Test Data

Replicate No.	Peak Load (lbs/in)	Rupture Mode	Elonga (2) (%)	Gage Length (in)
1	139.0	FTB	> 50	1
2	136.0	FTB	> 50	1
3	135.0	FTB	> 50	1
4	127.0	FTB	> 50	1
5	130.0	FTB	> 50	1
Average	133.4			

(1) *Reported to nearest 25%.*
(2) *Elongation = L/Lo x 100%.*
(3) *INA (Information Not Available) .*

Values obtained from Client

Shear		min. 100 ppi and FTB
Peel	Fusion	min. 70 ppi and FTB
Peel	Extrusion	min. 50 ppi and FTB

JLT Laboratories, Inc. 938 S. Central Avenue, Canonsburg, PA 15317 Tel: 724-746-4441 / Web: www.jltlabs.com

PEEL AND SHEAR TEST RESULTS

ASTM D-6392

Client:	ERM	Job No.:	19LG3769
Project:	Iron Horse Park Landfill	Date Tested:	04/18/2019
Material:	60 mil LLDPE	Technician:	AE / MLB
Manufacturer:	GSE Textured	Checked By:	JBJr
Weld Type:	Double Wedge Weld	Machine:	ATC 1000
		Calib Date :	10/10/2018

Sample No.:	DS-11	Crosshead Speed		
Seam:	P24 / P26	Peel:	20	in/min.
Operator:	LPS	Shear:	20	in/min.
Machine:	26	Specimen Width = 1 inch		

Peel Adhesion Test Data

Replicate No.	WELD A				WELD B			
	Peak Load (lbs/in)	Rupture Mode	Seam Sep. (1) (%)	Gage Length (in)	Peak Load (lbs/in)	Rupture Mode	Seam Sep. (1) (%)	Gage Length (in)
1	109.0	SE1 FTB	0	1.0	113.0	SE1 FTB	0	1.0
2	108.0	SE1 FTB	0	1.0	110.0	SE1 FTB	0	1.0
3	110.0	SE1 FTB	0	1.0	115.0	SE1 FTB	0	1.0
4	107.0	SE1 FTB	0	1.0	115.0	SE1 FTB	0	1.0
5	107.0	SE1 FTB	0	1.0	110.0	SE1 FTB	0	1.0
Average	108.2				112.6			

Bonded Seam (Shear) Test Data

Replicate No.	Peak Load (lbs/in)	Rupture Mode	Elonga (2) (%)	Gage Length (in)
1	135.0	FTB	> 50	1
2	133.0	FTB	> 50	1
3	132.0	FTB	> 50	1
4	132.0	FTB	> 50	1
5	130.0	FTB	> 50	1
Average	132.4			

(1) *Reported to nearest 25%.*
(2) *Elongation = L/Lo x 100%.*
(3) *INA (Information Not Available) .*

Values obtained from Client

Shear		min. 100 ppi and FTB
Peel	Fusion	min. 70 ppi and FTB
Peel	Extrusion	min. 50 ppi and FTB

JLT Laboratories, Inc. 938 S. Central Avenue, Canonsburg, PA 15317 Tel: 724-746-4441 / Web: www.jltlabs.com

PEEL AND SHEAR TEST RESULTS

ASTM D-6392

Client:	ERM	Job No.:	19LG3769
Project:	Iron Horse Park Landfill	Date Tested:	04/18/2019
Material:	60 mil LLDPE	Technician:	AE / MLB
Manufacturer:	GSE Textured	Checked By:	JBJr
Weld Type:	Double Wedge Weld	Machine:	ATC 1000
		Calib Date :	10/10/2018

Sample No.:	DS-12	Crosshead Speed		
Seam:	P19 / P20	Peel:	20	in/min.
Operator:	LPS	Shear:	20	in/min.
Machine:	26	Specimen Width = 1 inch		

Peel Adhesion Test Data

Replicate No.	WELD A				WELD B			
	Peak Load (lbs/in)	Rupture Mode	Seam Sep. (1) (%)	Gage Length (in)	Peak Load (lbs/in)	Rupture Mode	Seam Sep. (1) (%)	Gage Length (in)
1	124.0	SE1 FTB	0	1.0	114.0	SE1 FTB	0	1.0
2	122.0	SE1 FTB	0	1.0	107.0	SE1 FTB	0	1.0
3	106.0	SE1 FTB	0	1.0	114.0	SE1 FTB	0	1.0
4	121.0	SE1 FTB	0	1.0	105.0	SE1 FTB	0	1.0
5	120.0	SE1 FTB	0	1.0	105.0	SE1 FTB	0	1.0
Average	118.6				109.0			

Bonded Seam (Shear) Test Data

Replicate No.	Peak Load (lbs/in)	Rupture Mode	Elonga (2) (%)	Gage Length (in)
1	135.0	FTB	> 50	1
2	130.0	FTB	> 50	1
3	131.0	FTB	> 50	1
4	134.0	FTB	> 50	1
5	135.0	FTB	> 50	1
Average	133.0			

(1) *Reported to nearest 25%.*
(2) *Elongation = L/Lo x 100%.*
(3) *INA (Information Not Available) .*

Values obtained from Client

Shear		min. 100 ppi and FTB
Peel	Fusion	min. 70 ppi and FTB
Peel	Extrusion	min. 50 ppi and FTB

JLT Laboratories, Inc. 938 S. Central Avenue, Canonsburg, PA 15317 Tel: 724-746-4441 / Web: www.jltlabs.com

PEEL AND SHEAR TEST RESULTS

ASTM D-6392

Client:	ERM	Job No.:	19LG3769
Project:	Iron Horse Park Landfill	Date Tested:	04/18/2019
Material:	60 mil LLDPE	Technician:	AE / MLB
Manufacturer:	GSE Textured	Checked By:	JBJr
Weld Type:	Double Wedge Weld	Machine:	ATC 1000
		Calib Date :	10/10/2018

Sample No.:	DS-13	Crosshead Speed		
Seam:	P15 / P17	Peel:	20	in/min.
Operator:	CS	Shear:	20	in/min.
Machine:	34	Specimen Width = 1 inch		

Peel Adhesion Test Data

Replicate No.	WELD A				WELD B			
	Peak Load (lbs/in)	Rupture Mode	Seam Sep. (1) (%)	Gage Length (in)	Peak Load (lbs/in)	Rupture Mode	Seam Sep. (1) (%)	Gage Length (in)
1	120.0	SE1 FTB	0	1.0	119.0	SE1 FTB	0	1.0
2	118.0	SE1 FTB	0	1.0	116.0	SE1 FTB	0	1.0
3	116.0	SE1 FTB	0	1.0	116.0	SE1 FTB	0	1.0
4	119.0	SE1 FTB	0	1.0	115.0	SE1 FTB	0	1.0
5	115.0	SE1 FTB	0	1.0	115.0	SE1 FTB	0	1.0
Average	117.6				116.2			

Bonded Seam (Shear) Test Data

Replicate No.	Peak Load (lbs/in)	Rupture Mode	Elonga (2) (%)	Gage Length (in)
1	147.0	FTB	> 50	1
2	126.0	FTB	> 50	1
3	142.0	FTB	> 50	1
4	130.0	FTB	> 50	1
5	144.0	FTB	> 50	1
Average	137.8			

(1) *Reported to nearest 25%.*
(2) *Elongation = L/Lo x 100%.*
(3) *INA (Information Not Available) .*

Values obtained from Client

Shear		min. 100 ppi and FTB
Peel	Fusion	min. 70 ppi and FTB
Peel	Extrusion	min. 50 ppi and FTB

JLT Laboratories, Inc. 938 S. Central Avenue, Canonsburg, PA 15317 Tel: 724-746-4441 / Web: www.jltlabs.com

PEEL AND SHEAR TEST RESULTS

ASTM D-6392

Client:	ERM	Job No.:	19LG3769
Project:	Iron Horse Park Landfill	Date Tested:	04/18/2019
Material:	60 mil LLDPE	Technician:	AE / MLB
Manufacturer:	GSE Textured	Checked By:	JBJr
Weld Type:	Double Wedge Weld	Machine:	ATC 1000
		Calib Date :	10/10/2018

Sample No.:	DS-14	Crosshead Speed		
Seam:	P2 / P3	Peel:	20	in/min.
Operator:	LS	Shear:	20	in/min.
Machine:	49	Specimen Width = 1 inch		

Peel Adhesion Test Data

Replicate No.	WELD A				WELD B			
	Peak Load (lbs/in)	Rupture Mode	Seam Sep. (1) (%)	Gage Length (in)	Peak Load (lbs/in)	Rupture Mode	Seam Sep. (1) (%)	Gage Length (in)
1	107.0	SE1 FTB	0	1.0	114.0	SE1 FTB	0	1.0
2	122.0	SE1 FTB	0	1.0	118.0	SE1 FTB	0	1.0
3	101.0	SE1 FTB	0	1.0	124.0	SE1 FTB	0	1.0
4	115.0	SE1 FTB	0	1.0	114.0	SE1 FTB	0	1.0
5	110.0	SE1 FTB	0	1.0	117.0	SE1 FTB	0	1.0
Average	111.0				117.4			

Bonded Seam (Shear) Test Data

Replicate No.	Peak Load (lbs/in)	Rupture Mode	Elonga (2) (%)	Gage Length (in)
1	147.0	FTB	> 50	1
2	147.0	FTB	> 50	1
3	151.0	FTB	> 50	1
4	147.0	FTB	> 50	1
5	145.0	FTB	> 50	1
Average	147.4			

(1) *Reported to nearest 25%.*
(2) *Elongation = L/Lo x 100%.*
(3) *INA (Information Not Available) .*

Values obtained from Client

Shear		min. 100 ppi and FTB
Peel	Fusion	min. 70 ppi and FTB
Peel	Extrusion	min. 50 ppi and FTB

JLT Laboratories, Inc. 938 S. Central Avenue, Canonsburg, PA 15317 Tel: 724-746-4441 / Web: www.jltlabs.com

PEEL AND SHEAR TEST RESULTS

ASTM D-6392

Client:	ERM	Job No.:	19LG3769
Project:	Iron Horse Park Landfill	Date Tested:	04/18/2019
Material:	60 mil LLDPE	Technician:	AE / MLB
Manufacturer:	GSE Textured	Checked By:	JBJr
Weld Type:	Extrusion Weld	Machine:	ATC 1000
		Calib Date :	10/10/2018

Sample No.:	DS-15	Crosshead Speed		
Seam:	P11 / R23	Peel:	20	in/min.
Operator:	AS	Shear:	20	in/min.
Machine:	18	Specimen Width = 1 inch		

Peel Adhesion Test Data

Replicate No.	EXTRUSION WELD			
	Peak Load (lbs/in)	Rupture Mode	Seam Sep. (1) (%)	Gage Length (in)
1	122.0	SE1 FTB	0	1.0
2	124.0	SE1 FTB	0	1.0
3	127.0	SE1 FTB	0	1.0
4	120.0	SE1 FTB	0	1.0
5	122.0	SE1 FTB	0	1.0
Average	123.0			

Bonded Seam (Shear) Test Data

Replicate No.	Peak Load (lbs/in)	Rupture Mode	Elonga (2) (%)	Gage Length (in)
1	157.0	FTB	> 50	1
2	150.0	FTB	> 50	1
3	159.0	FTB	> 50	1
4	150.0	FTB	> 50	1
5	161.0	FTB	> 50	1
Average	155.4			

(1) *Reported to nearest 25%.*
(2) *Elongation = L/Lo x 100%.*
(3) *INA (Information Not Available) .*

Values obtained from Client

Shear		min. 100 ppi and FTB
Peel	Fusion	min. 70 ppi and FTB
Peel	Extrusion	min. 50 ppi and FTB

JLT Laboratories, Inc. 938 S. Central Avenue, Canonsburg, PA 15317 Tel: 724-746-4441 / Web: www.jltlabs.com

9. Geomembrane Subgrade Acceptance

CERTIFICATE OF ACCEPTANCE OF SUBGRADE SURFACE

Project Name: **IHP Superfund Site - AOC 3**

Project Number: **0476110**

Site Location: **Billerica, MA**

Installer: ~~Chenago~~ Chenango

I, the undersigned, duly authorized representative of Chenango do hereby accept the surface on which the geosynthetics will be installed and shall be responsible for maintaining the suitability of this surface, in accordance with the project specifications. (i.e., The contractor shall not install the geosynthetics until the subgrade surface is acceptable. Installation of the geosynthetics will be considered acceptance of the subgrade.)

Date	Description of Subgrade Area / Comments	Installer Authorized Name and Signature
4/11/2019	IHP AO3 B North, west, east slopes and top of landfill. South Area not included. NO ISSUES.	
4/12/2019	IHP AO3D south end slopes and top of landfill. No issues.	
4/23/2019	IHP AOC 3A All areas including top, side slopes and sheet wall No issues	

Reviewed By: _____

CERTIFICATE OF ACCEPTANCE OF SUBGRADE SURFACE

Project Name: **IHP Superfund Site - AOC 3**

Project Number: **0476110**

Site Location: **Billerica, MA**

Installer: ~~Chenago~~ Chenango

I, the undersigned, duly authorized representative of Chapter do hereby accept the surface on which the geosynthetics will be installed and shall be responsible for maintaining the suitability of this surface, in accordance with the project specifications. (i.e., The contractor shall not install the geosynthetics until the subgrade surface is acceptable. Installation of the geosynthetics will be considered acceptance of the subgrade.)

Date	Description of Subgrade Area / Comments	Installer Authorized Name and Signature
4/11/2019	IHP AO3B North, West, east slopes and top of landfill. south area not included No issues.	[illegible]
4/12/2019	IHP AO3B South end slopes and top of Landfill, No issues.	[illegible]
4/22/2019	IHP AO3A All areas including top, side slopes and street wall No issues	[illegible]

Reviewed By: _____

CHENANGO CONTRACTING, INC.

29 ARBUTUS RD, JOHNSON CITY, NY 13790
TEL. (607) 729-8500 FAX (607) 729-2415

CERTIFICATE OF ACCEPTANCE OF SOIL SUBGRADE

PROJECT NAME: Iron Horse LF Cap
PROJECT NUMBER: 18034

DATE: 4/11/19
QC REP.: P. Ward

AREA TO BE ACCEPTED: The area covered by geomembrane panels P-1 through P-38.

I, THE UNDERSIGNED, THE AUTHORIZED REPRESENTATIVE OF CHENANGO CONTRACTING INC., DO HEREBY ACCEPT THE SOIL SUBGRADE SURFACE TO BE FREE OF VISIBLE ROCKS OR PROTRUSIONS WHICH COULD DAMAGE THE LINER. I DO NOT ACCEPT ANY RESPONSIBILITY FOR THE CONDITIONS OR CHARACTER OF THE SUBSURFACE SOIL, OR ANY EFFECTS THE SUBSURFACE SOIL OR CONDITIONS MAY HAVE ON THE LINER SYSTEM.

EXCEPTIONS: None.

SIGNATURE	QC REPRESENTATIVE TITLE	4/11/19 DATE

CHENANGO CONTRACTING, INC.

29 ARBUTUS RD, JOHNSON CITY, NY 13790
TEL. (607) 729-8500 FAX (607) 729-2415

CERTIFICATE OF ACCEPTANCE OF SOIL SUBGRADE

PROJECT NAME: Iron Horse LF Cap
PROJECT NUMBER: 18034

DATE: 4/12/19
QC REP.: P. Ward

AREA TO BE ACCEPTED: The area covered by geomembrane panels P-39 through P-51.

I, THE UNDERSIGNED, THE AUTHORIZED REPRESENTATIVE OF CHENANGO CONTRACTING INC., DO HEREBY ACCEPT THE SOIL SUBGRADE SURFACE TO BE FREE OF VISIBLE ROCKS OR PROTRUSIONS WHICH COULD DAMAGE THE LINER. I DO NOT ACCEPT ANY RESPONSIBILITY FOR THE CONDITIONS OR CHARACTER OF THE SUBSURFACE SOIL, OR ANY EFFECTS THE SUBSURFACE SOIL OR CONDITIONS MAY HAVE ON THE LINER SYSTEM.

EXCEPTIONS: None.

SIGNATURE	TITLE	DATE
	QC REPRESENTATIVE	4/12/19

CHENANGO CONTRACTING, INC.

29 ARBUTUS RD, JOHNSON CITY, NY 13790
TEL. (607) 729-8500 FAX (607) 729-2415

CERTIFICATE OF ACCEPTANCE OF SOIL SUBGRADE

PROJECT NAME: Iron Horse LF Cap
PROJECT NUMBER: 18034

DATE: 4/23/19
QC REP.: P. Ward

AREA TO BE ACCEPTED: The area covered by geomembrane panels P-52 through P-70.

I, THE UNDERSIGNED, THE AUTHORIZED REPRESENTATIVE OF CHENANGO CONTRACTING INC., DO HEREBY ACCEPT THE SOIL SUBGRADE SURFACE TO BE FREE OF VISIBLE ROCKS OR PROTRUSIONS WHICH COULD DAMAGE THE LINER. I DO NOT ACCEPT ANY RESPONSIBILITY FOR THE CONDITIONS OR CHARACTER OF THE SUBSURFACE SOIL, OR ANY EFFECTS THE SUBSURFACE SOIL OR CONDITIONS MAY HAVE ON THE LINER SYSTEM.

EXCEPTIONS: None.

SIGNATURE	TITLE	DATE
	QC REPRESENTATIVE	4/23/19

10. Geomembrane Trial Weld Testing

TRIAL SEAM LOG - Fusion

Project Name: **IHP Superfund Site - AOC 3** Installer: **Chenango**
Project Number: **0476110** Specifications: Peel ≥ 70 ppi; Shear ≥ 100 ppi
Site Location: **Billerica, MA** Tensiometer Desc.: 167

						Fusion		Test Results				
Date	Time	Trial Seam No.	Machine ID	Oper. ID	Material Descrip. (1)	Wedge (Set/°C/°F)	Measured Speed (ft./min.)	Peel (ppi/psi) Inside	Peel (ppi/psi) Outside	Shear (ppi/psi)	Pass	Fail
11-Apr	8:26	1	W49	LS	S/S	460	600	124	118	146	Y	
								114	122	156	Y	
								111	115	153	Y	
11-Apr	8:30	2	W49	LS	T/T	460	600	144	136	168	Y	
								126	133	164	Y	
								122	144	156	Y	
11-Apr	8:30	3	W34	CS	S/S	450	600	124	138	157	Y	
								134	129	140	Y	
								135	135	156	Y	
11-Apr	8:30	4	W34	CS	T/T	450	500	163	145	170	Y	
								144	140	150	Y	
								137	141	172	Y	
11-Apr	9:30	5	W34	CS	T/S	450	400	129	136	139	Y	
								112	118	140	Y	
								115	134	142	Y	
11-Apr	10:45	6	W26	LPS	S/S	450	600	108	108	123	Y	
								100	105	111	Y	
								111	112	119	Y	
11-Apr	12:45	7	W49	LS	S/S	460	600	109	101	111	Y	
								102	109	108	Y	
								110	109	113	Y	
11-Apr	12:50	8	W49	LS	T/T	460	500	108	109	133	Y	
								117	131	139	Y	
								113	129	125	Y	
11-Apr	12:55	9	W49	LS	S/T	460	500	114	119	115	Y	
								114	119	118	Y	
								115	115	119	Y	
11-Apr	13:40	10	W26	LPS	S/S	450	600	90	111	131	Y	
								95	119	124	Y	
								96	100	126	Y	

(1) Material Description refers to either Smooth/Smooth (S/S), Smooth/Textured (S/T), or Textured/Textured (T/T)

Notes:

Reviewed By: Alec Randall

Project Name: **IHP Superfund Site - AOC 3** Installer: **Chenango**
Project Number: **0476110** Specifications: Peel ≥ 70 ppi; Shear ≥ 100 ppi
Site Location: **Billerica, MA** Tensiometer Desc.: 167

						Fusion		Test Results				
Date	Time	Trial Seam No.	Machine ID	Oper. ID	Material Descrip. (1)	Wedge (Set/°C/°F)	Measured Speed (ft./min.)	Peel (ppi/psi) Inside	Peel (ppi/psi) Outside	Shear (ppi/psi)	Pass	Fail
11-Apr	13:40	11	W26	LPS	T/T	450	450	121	126	138	Y	
								116	120	140	Y	
								128	133	129	Y	
11-Apr	13:40	12	W26	LPS	S/T	450	450	115	127	132	Y	
								127	133	127	Y	
								121	127	129	Y	
11-Apr	13:45	13	W34	CS	S/S	450	500	112	102	129	Y	
								113	110	113	Y	
								108	113	125	Y	
11-Apr	13:45	14	W34	CS	S/T	450	400	123	121	126	Y	
								116	113	138	Y	
								124	124	126	Y	
11-Apr	13:45	15	W34	CS	T/T	450	400	125	116	115	Y	
								114	114	121	Y	
								116	109	113	Y	
12-Apr	8:00	16	W49	LS	S/S	460	600	126	118	149	Y	
								129	120	146	Y	
								138	123	148	Y	
12-Apr	8:05	17	W49	LS	T/T	460	500	143	134	153	Y	
								133	134	158	Y	
								139	146	137	Y	
12-Apr	8:10	18	W49	LS	T/S	460	500	135	120	146	Y	
								135	122	144	Y	
								138	139	159	Y	
12-Apr	8:20	19	W34	CS	S/S	450	500	116	117	148	Y	
								122	121	149	Y	
								120	124	150	Y	
12-Apr	8:20	20	W34	CS	T/T	450	400	148	134	156	Y	
								141	138	158	Y	
								138	138	161	Y	
12-Apr	8:20	21	W34	CS	S/T	450	400	121	139	149	Y	
								120	121	149	Y	
								127	135	153	Y	

(1) Material Description refers to either Smooth/Smooth (S/S), Smooth/Textured (S/T), or Textured/Textured (T/T)

Notes:

Reviewed By: Alec Randall

TRIAL SEAM LOG - Fusion

Project Name: **IHP Superfund Site - AOC 3** Installer: **Chenango**
Project Number: **0476110** Specifications: Peel ≥ 70 ppi; Shear ≥ 100 ppi
Site Location: **Billerica, MA** Tensiometer Desc.: 167

						Fusion		Test Results				
Date	Time	Trial Seam No.	Machine ID	Oper. ID	Material Descrip. (1)	Wedge (Set/°C/°F)	Measured Speed (ft./min.)	Peel (ppi/psi) Inside	Peel (ppi/psi) Outside	Shear (ppi/psi)	Pass	Fail
23-Apr	13:00	22	W49	LS	S/S	460	500	110	100	126	Y	
								110	117	101	Y	
								103	109	113	Y	
23-Apr	13:05	23	W49	LS	S/T	460	400	119	117	113	Y	
								105	111	127	Y	
								124	106	118	Y	
23-Apr	13:10	24	W49	LS	T/T	460	400	129	130	130	Y	
								130	112	141	Y	
								129	123	146	Y	
23-Apr	13:15	25	W34	PNW	S/S	450	600	105	110	120	Y	
								103	108	108	Y	
								113	112	122	Y	
23-Apr	13:15	26	W34	PNW	T/T	450	600	110	115	125	Y	
								124	126	116	Y	
								117	117	120	Y	

(1) Material Description refers to either Smooth/Smooth (S/S), Smooth/Textured (S/T), or Textured/Textured (T/T)

Notes:

Reviewed By: Alec Randall

TRIAL SEAM LOG - Extrusion

Project Name: **IHP Superfund Site - AOC 3** Installer: **Chenango**
Project Number: **0476110** Specifications: Peel ≥ 50 ppi; Shear ≥ 100 ppi
Site Location: **Billerica, MA** Tensiometer Desc.: #120

						Extrusion		Test Results			
Date	Time	Trial Seam No.	Machine ID	Oper. ID	Material Descrip. [1]	Preheat (Set/°C/°F)	Barrel (°C/°F)	Peel (ppi/psi)	Shear (ppi/psi)	Pass	Fail
12-Apr	13:00	1	X6	CS	T/T	500	500	122	163	Y	
								99	158	Y	
								116	157	Y	
16-Apr	7:40	2	X6	LS	T/T	500	500	124	155	Y	
								135	161	Y	
								141	163	Y	
16-Apr	10:15	3	X18	AS	T/T	500	525	105	151	Y	
								107	145	Y	
								115	149	Y	
16-Apr	12:40	4	X6	LS	T/T	500	500	128	141	Y	
								134	148	Y	
								147	144	Y	
16-Apr	13:00	5	X18	AS	T/T	500	525	100	151	Y	
								103	141	Y	
								123	147	Y	
17-Apr	8:00	6	X18	AS	T/T	500	525	133	134	Y	
								108	139	Y	
								108	137	Y	
17-Apr	8:05	7	X6	LS	T/T	500	500	123	135	Y	
								130	148	Y	
								122	156	Y	
17-Apr	12:49	8	X6	LS	T/T	500	500	109	123	Y	
								110	127	Y	
								108	109	Y	
23-Apr	15:30	9	X18	AS	T/T	500	525	103	126	Y	
								102	122	Y	
								110	125	Y	
24-Apr	7:50	10	X18	AS	T/T	500	525	96	115	Y	
								112	137	Y	
								106	138	Y	
24-Apr	8:00	11	X6	LS	T/T	500	500	107	152	Y	
								108	158	Y	
								113	157	Y	

[1] Material Description refers to either Smooth/Smooth (S/S), Smooth/Textured (S/T), or Textured/Textured (T/T)

Notes:

Reviewed By: Alec Randall

11. Geomembrane Welding Rod Manufactures Certification

SOLMAX

MANUFACTURING QUALITY CONTROL

Test Results ROD

Solmax, 2801 Boul. Marie-Victorin, Varennes, Qc, Canada, J3X 1P7
Tél.: 1-450-929-1234 • Fax.: 1-450-929-2547 • www.solmax.com

PROJECT INFORMATION

Project Name : Broome Co. LF - Binghamton, NY **Reference Number :** 108010

Project Number : 2854 **Packing Slip Number :** 217377

SOLMAX Quality Assurance

Quantity (spools) : 84

Product Code	Spool No.	Type	Resin Lot	Density (g/cc)	Carbon Black Content (%)
ROD-LL-5-B	30282A	LLDPE	CFB810770	0.929	2.47
ROD-LL-5-B	30282C	LLDPE	CFB810770	0.929	2.47
ROD-LL-5-B	30283A	LLDPE	CFB810770	0.929	2.47
ROD-LL-5-B	30283B	LLDPE	CFB810770	0.929	2.47
ROD-LL-5-B	30283C	LLDPE	CFB810770	0.929	2.47
ROD-LL-5-B	30283D	LLDPE	CFB810770	0.929	2.47
ROD-LL-5-B	30284A	LLDPE	CFB810770	0.929	2.88
ROD-LL-5-B	30284B	LLDPE	CFB810770	0.929	2.88
ROD-LL-5-B	30284C	LLDPE	CFB810770	0.929	2.88
ROD-LL-5-B	30284D	LLDPE	CFB810770	0.929	2.88
ROD-LL-5-B	30285A	LLDPE	CFB810770	0.929	2.88
ROD-LL-5-B	30285B	LLDPE	CFB810770	0.929	2.88
ROD-LL-5-B	30285C	LLDPE	CFB810770	0.929	2.88
ROD-LL-5-B	30285D	LLDPE	CFB810770	0.929	2.88
ROD-LL-5-B	30286A	LLDPE	CFB810770	0.929	2.39
ROD-LL-5-B	30286B	LLDPE	CFB810770	0.929	2.39
ROD-LL-5-B	30286C	LLDPE	CFB810770	0.929	2.39
ROD-LL-5-B	30286D	LLDPE	CFB810770	0.929	2.39
ROD-LL-5-B	30287A	LLDPE	CFB810770	0.929	2.39
ROD-LL-5-B	30287B	LLDPE	CFB810770	0.929	2.39
ROD-LL-5-B	30287C	LLDPE	CFB810770	0.929	2.39
ROD-LL-5-B	30287D	LLDPE	CFB810770	0.929	2.39
ROD-LL-5-B	30288A	LLDPE	CFB810770	0.928	2.37
ROD-LL-5-B	30288B	LLDPE	CFB810770	0.928	2.37
ROD-LL-5-B	30288C	LLDPE	CFB810770	0.928	2.37
ROD-LL-5-B	30288D	LLDPE	CFB810770	0.928	2.37
ROD-LL-5-B	30289A	LLDPE	CFB810770	0.928	2.37
ROD-LL-5-B	30289B	LLDPE	CFB810770	0.928	2.37
ROD-LL-5-B	30289C	LLDPE	CFB810770	0.928	2.37

SOLMAX

MANUFACTURING QUALITY CONTROL

Test Results ROD

Solmax, 2801 Boul. Marie-Victorin, Varennes, Qc, Canada, J3X 1P7
Tél.: 1-450-929-1234 • Fax.: 1-450-929-2547 • www.solmax.com

PROJECT INFORMATION

Project Name : Broome Co. LF - Binghamton, NY **Reference Number :** 108010

Project Number : 2854 **Packing Slip Number :** 217377

SOLMAX Quality Assurance

Quantity (spools) : 84

Product Code	Spool No.	Type	Resin Lot	Density (g/cc)	Carbon Black Content (%)
ROD-LL-5-B	30289D	LLDPE	CFB810770	0.928	2.37
ROD-LL-5-B	30290A	LLDPE	CFB810770	0.928	2.40
ROD-LL-5-B	30290B	LLDPE	CFB810770	0.928	2.40
ROD-LL-5-B	30290C	LLDPE	CFB810770	0.928	2.40
ROD-LL-5-B	30290D	LLDPE	CFB810770	0.928	2.40
ROD-LL-5-B	30291A	LLDPE	CFB810770	0.928	2.40
ROD-LL-5-B	30291B	LLDPE	CFB810770	0.928	2.40
ROD-LL-5-B	30291C	LLDPE	CFB810770	0.928	2.40
ROD-LL-5-B	30291D	LLDPE	CFB810770	0.928	2.40
ROD-LL-5-B	30292A	LLDPE	CFB810770	0.928	2.21
ROD-LL-5-B	30292B	LLDPE	CFB810770	0.928	2.21
ROD-LL-5-B	30292C	LLDPE	CFB810770	0.928	2.21
ROD-LL-5-B	30292D	LLDPE	CFB810770	0.928	2.21
ROD-LL-5-B	30815A	LLDPE	CFB810600	0.932	2.89
ROD-LL-5-B	30815B	LLDPE	CFB810600	0.932	2.89
ROD-LL-5-B	30815C	LLDPE	CFB810600	0.932	2.89
ROD-LL-5-B	30815D	LLDPE	CFB810600	0.932	2.89
ROD-LL-5-B	30816A	LLDPE	CFB810600	0.932	2.81
ROD-LL-5-B	30816B	LLDPE	CFB810600	0.932	2.81
ROD-LL-5-B	30816C	LLDPE	CFB810600	0.932	2.81
ROD-LL-5-B	30816D	LLDPE	CFB810600	0.932	2.81
ROD-LL-5-B	30817A	LLDPE	CFB810600	0.929	2.44
ROD-LL-5-B	30817B	LLDPE	CFB810600	0.929	2.44
ROD-LL-5-B	30817C	LLDPE	CFB810600	0.929	2.44
ROD-LL-5-B	30817D	LLDPE	CFB810600	0.929	2.44
ROD-LL-5-B	30818A	LLDPE	CFB810600	0.929	2.44
ROD-LL-5-B	30818B	LLDPE	CFB810600	0.929	2.44
ROD-LL-5-B	30818C	LLDPE	CFB810600	0.929	2.44
ROD-LL-5-B	30818D	LLDPE	CFB810600	0.929	2.44

SOLMAX

MANUFACTURING QUALITY CONTROL

Test Results ROD

Solmax, 2801 Boul. Marie-Victorin, Varennes, Qc, Canada, J3X 1P7
Tél.: 1-450-929-1234 • Fax.: 1-450-929-2547 • www.solmax.com

PROJECT INFORMATION

Project Name : Broome Co. LF - Binghamton, NY **Reference Number :** 108010

Project Number : 2854 **Packing Slip Number :** 217377

SOLMAX Quality Assurance

Quantity (spools) : 84

Product Code	Spool No.	Type	Resin Lot	Density (g/cc)	Carbon Black Content (%)
ROD-LL-5-B	30819A	LLDPE	CFB810600	0.929	2.42
ROD-LL-5-B	30819B	LLDPE	CFB810600	0.929	2.42
ROD-LL-5-B	30819C	LLDPE	CFB810600	0.929	2.42
ROD-LL-5-B	30819D	LLDPE	CFB810600	0.929	2.42
ROD-LL-5-B	30820A	LLDPE	CFB810600	0.929	2.42
ROD-LL-5-B	30820B	LLDPE	CFB810600	0.929	2.42
ROD-LL-5-B	30820C	LLDPE	CFB810600	0.929	2.42
ROD-LL-5-B	30820D	LLDPE	CFB810600	0.929	2.42
ROD-LL-5-B	30821A	LLDPE	CFB810600	0.929	2.49
ROD-LL-5-B	30821B	LLDPE	CFB810600	0.929	2.49
ROD-LL-5-B	30821C	LLDPE	CFB810600	0.929	2.49
ROD-LL-5-B	30821D	LLDPE	CFB810600	0.929	2.49
ROD-LL-5-B	30822A	LLDPE	CFB810600	0.929	2.49
ROD-LL-5-B	30822B	LLDPE	CFB810600	0.929	2.49
ROD-LL-5-B	30822C	LLDPE	CFB810600	0.929	2.49
ROD-LL-5-B	30822D	LLDPE	CFB810600	0.929	2.49
ROD-LL-5-B	30823A	LLDPE	CFB810600	0.927	2.57
ROD-LL-5-B	30823B	LLDPE	CFB810600	0.927	2.57
ROD-LL-5-B	30823C	LLDPE	CFB810600	0.927	2.57
ROD-LL-5-B	30823D	LLDPE	CFB810600	0.927	2.57
ROD-LL-5-B	30824A	LLDPE	CFB810600	0.927	2.57
ROD-LL-5-B	30824B	LLDPE	CFB810600	0.927	2.57
ROD-LL-5-B	30824C	LLDPE	CFB810600	0.927	2.57
ROD-LL-5-B	30824D	LLDPE	CFB810600	0.927	2.57
ROD-LL-5-B	30825C	LLDPE	CFB810600	0.927	2.71
ROD-LL-5-B	30825D	LLDPE	CFB810600	0.927	2.71

CoA Date: 03/01/2015

Certificate of Analysis

Shipped To: SOLMAX
2801 BOUL MARIE-VICTORIN
VARENNES QC J3X 1P7
CANADA

Recipient: Giguere
Fax:

Delivery #: 89013619
PO #: 112911-0
Weight: 180750 LB
Ship Date: 03/01/2015
Package: BULK
Mode: Hopper Car
Car #: SHPX463965
Seal No: 17003

Product: PE 7104 BULK
Additive levels have been tested and meet minimum the specification for this lot.
As a result, Standard OIT (by ASTM D 3895) is greater than 120 minutes (nominal value, not tested on every lot).

Lot Number: CFB810770

Property	Test Method	Value	Unit
Melt Index	ASTM D1238	0.37	g/10mi
Density	D1505 or D4883	0.918	g/cm3

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP (CPChem).
However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.

Kevin Ayres
Quality Control Supervisor

For CoA questions contact Customer Service Representative at 800-231-1212

Page 1 of 1

CoA Date: 03/13/2015

Certificate of Analysis

Shipped To: SOLMAX
2801 BOUL MARIE-VICTORIN
VARENNES QC J3X 1P7
CANADA

Recipient: Giguere
Fax:

Delivery #: 89021100
PO #: 112911-0
Weight: 180300 LB
Ship Date: 03/13/2015
Package: BULK
Mode: Hopper Car
Car #: CHVX898158
Seal No: 20946

Product: PE 7104 BULK
Additive levels have been tested and meet minimum the specification for this lot.
As a result, Standard OIT (by ASTM D 3895) is greater than 120 minutes (nominal value, not tested on every lot).

Lot Number: CFB810600

Property	Test Method	Value	Unit
Melt Index	ASTM D1238	0.35	g/10ml
Density	D1505 or D4883	0.919	g/cm3

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP (CPChem).
However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.

Kevin Ayres
Quality Control Supervisor

For CoA questions contact Customer Service Representative at 800-231-1212