-2739

DEPARTMENT OF ENERGY
UNITED STATES OF AMERICA

APPENDIX H

MANUFACTURER'S QUALITY CONTROL DOCUMENTATION

FDF/MANUFACTURER SUBMITTALS

2739

GEOSYNTHETIC CLAY LINER

SUPPLIER DOCUMENT SUBMITTAL

FDFPROJECT NO: 20100	CONTRACT NO: 1440	SUBMITTAL NO: 001	REV: 1	DATE: May 8 1999	PAGE 1 OF 1

FROM: GSE Lining Technologies

SIGNATURE:

TO: FDF ENGINEERING/CONSTRUCTION DOCUMENT CONTROL, MS 52-7

RECEIVED BY: (8)

			DOCUMENT FAMILY (12)							RESUBMITTAL (13)			SUBMITTAL TYPE (15)			SUBMITTAL ACTION (17)		
QTY. (9)	DOCUMENT NUMBER (10)	REV (11)	PRO	H&S	MED	TRG	CON	ENG	QAC	YES	NO	TITLE DESCRIPTION (14)	CFC	INF	ASSOCIATED SPECIFICATION (16)	A	B	C
8	1440-02772P-2	0						X		X		Manufacturer's Daily Production Cap		X	02772P, Rev. 2, Sect. 1.04.A.2	X		
8	1440-02772P-4	0						X		X		Mfgr's Geotextile Requirements	X		02772P, Rev. 2, Sect. 1.04.A.4		X	
8	1440-02772P-5	0							X	X		Geotextile Component Certification	X		02772P, Rev. 2, Sect. 1.04.A.5		X	
8	1440-02772P-6	0							X	X		Certification of Minimum Average Roll Values	X		02772P, Rev. 2, Sect. 1.04.A.7	X		
8	1440-02772P-10	0						X		X		Completed Form GCL-1	X		02772P, Rev. 2, Sect. 1.04.A.11	X		

DISTRIBUTION

REVIEW DISTRIBUTION				CFC DISTRIBUTION			
DISTRIBUTION (18)	MS (19)	DISTRIBUTION (18)	MS (19)	DISTRIBUTION (18)	MS (19)	DISTRIBUTION (18)	MS (19)
Jim Jenkins, FDF, Eng. (Approver)	64						
Jim Burnett, GeoSynt[illegible]	38						
Rick Holbrook, FDF, Procurement	64						
Gregg Johnson, FDF, Safety & Health	64						
Jim Turner, FDF, QA	64						
Bill Zeblck, FDF, Construction	64						

RECEIVED MAY 10 1999 KBT

RECEIVED BY: (20) [signature]
(SIGN/DATE AND RETURN A COPY TO ECDC, MS52-7)

DATE: 5/12/99 NO COMMENTS: ____ (21) COMMENTS ATTACHED X

Comments: (22) COMMENTS DISCUSSED WITH FDF ON 5/11/99

SUBMITTAL ACTION CODE: (BY SUPPLIER)

CFC - CERTIFIED FOR CONSTRUCTION
INF - INFORMATION/RECORD
"X" APPROPRIATE SUBMITTAL ACTION ABOVE

SUPPLIER ACTION CODE: (ECDC) SUPPLIER ACTION ABOVE

A - ACCEPTED DOCUMENT: CONFORMS WITH REQUIREMENTS
B - MINOR COMMENTS: REVISE AND RESUBMIT AS CFC OR INF
C - REVISE AND RESUBMIT

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FS-F-4955
Rev. 2: 01/18/98

CETCO -2739
COLLOID ENVIRONMENTAL TECHNOLOGIES COMPANY
1500 W. Shure Drive • Arlington Heights, IL 60004 • USA
(847) 392-5800 • FAX (847) 506-8195

May 7, 1999

~~GSE~~
~~Karen Louie~~
~~19103 Gundle Rd.~~
Houston, TX 77073

TO: Rick Holbrook
(513) 648-4661
Page 1 of 4

Subject: FLOUR DANIEL (FERNALD) GCL SUBMITTALS

Dear Karen:

Per your request, this letter is to address Fernald's review comment sheet regarding the GCL submittal.

Our responses are as follows:

1. CETCO will produce Bentomat "ST" GCL dedicated to the Fernald project at a minimum rate of 50,000 square feet per day.

2. Attached are the manufacturing requirements/certifications for the geotextile components

3. Attached is a revised copy of the Table GCL-1 which indicates our conformance to Minimum Average Roll Values. Some properties are certified at Min. or Max. Please note that this is a higher standard than Min. or Max. Average Roll Values.

4. Table GCL-1 incorrectly lists the specified ASTM method for hydraulic conductivity as ASTM D5887. ASTM D5887 is a test for the Index Flux of GCLs. The Hydraulic Conductivity test for GCLs is ASTM D5084. CETCO performs and certifies to both tests using the proper ASTM designations.

CETCO appreciates the opportunity to provide our comments and looks forward to providing our materials. If you have any questions or need additional information, please do not hesitate to contact me at (248) 853-0280.

Sincerely,

Tom Hauck

Tom Hauck – Northern GeoSystems

=-2739

CETCO
NONWOVEN GEOTEXTILE
MANUFACTURER'S CERTIFICATION

CETCO hereby affirms and certifies that the non-woven geotextile in the Geosynthetic Clay Liner product for the above project will be manufactured with polypropylene fibers to meet the following physical properties:

PROPERTY	TEST METHOD	MINIMUM VALUE
Mass Per Unit Area	ASTM D-5261	6.0 oz./square yard
Grab Strength	ASTM D-4632	6.0 lbs. ?

James T. Olsta

James T. Olsta
Technical Manager
COLLOID ENVIRONMENTAL TECHNOLOGIES CO. (CETCO)

MANUFACTURER TO CHECK MINIMUM VALUE FOR GRAB STRENGTH. CONFIRM IF 6 LBS OR NOT?

5/12/99

SYNTHETIC INDUSTRIES
Geosynthetic Products Division

F-2739

GEOTEX™ 12TEX Woven Geotextile

GEOTEX 12TEX is a woven slit film geotextile manufactured specifically for CETCO at one of Synthetic Industries' facilities that has achieved ISO-9002 certification for its systematic approach to quality. The individual slit films are woven together in such a manner as to provide dimensional stability relative to each other. The geotextile is resistant to ultraviolet degradation and to biological and chemical environments normally found in soils. GEOTEX 12TEX conforms to the property values listed below[1] which have been derived from quality control testing performed by one of Synthetic Industries' GAI-LAP accredited laboratories.

PROPERTY	TEST METHOD	MINIMUM AVERAGE ROLL VALUES[2] English	Metric
Mechanical			
Grab Tensile Strength	ASTM D4632	135 x 135 lbs	600 x 600 N
Grab Elongation	ASTM D4632	15 x 15 %	15 x 15 %
Puncture Strength	ASTM D4833	70 lbs	310 N
Mullen Burst	ASTM D3786	265 psi	1820 kPa
Trapezoidal Tear	ASTM D4533	45 x 45 lbs	200 x 200 N
Hydraulic			
Apparent Opening Size (AOS)	ASTM D4751	40 US Std Sieve	0.425 mm
Permittivity	ASTM D4491	0.08 sec^{-1}	0.08 sec^{-1}
Water Flow Rate	ASTM D4491	6 gpm/ft^2	240 $l/min/m^2$
Physical			
Mass Per Unit Area	ASTM D5261	3.2 oz/sy	105 g/m^2
Thickness	ASTM D5199	16 mils	0.3 mm
Endurance			
UV Resistance (% retained after 150 hours)	ASTM D4355	90%	90%

Standard Roll Size: Master Rolls - 184" wide

NOTES:

1 The property values listed above are effective 12/31/97 and are subject to change without notice.
2 Indicates minimum average roll values. Minimum average roll values are calculated as the typical minus two standard deviations. Statistically, it yields a 97.7% degree of confidence that any samples taken from quality assurance testing will exceed the value reported.

[illegible]

Synthetic Industries, Inc.
4019 Industry Drive • Chattanooga, Tennessee • 37416 • USA
Telephone • 423-698-0444 • Fax • 423-899-7619 • 1-800-621-6444

THIS HAS TO BE SIGNED.

000008

5/12/99

2739

LE GCL-1 TECHNICAL INFORMATION GEOSYNTHETIC CLAY LINER

REFER TO SECTION 02772P

SOLICITATION # F99P301726

SUBMIT THE FOLLOWING INFORMATION WITH THE PROPOSAL

SPECIFIED REQUIREMENT	SPECIFIED ASTM METHOD	SPECIFIED REQUIREMENT	CONFORMS TO SPECS YES / NO	REMARKS DOCUMENTATION OF COMPLIANCE WITH THESE REQUIREMENTS TO BE SUBMITTED WITH THE BIDS
BENTONITE CONTENT	D5261	1.0 LB/SF MIN	YES	MARY
BENTONITE MOISTURE CONTENT	D4643	28% MAX	YES	Max Avg. Roll Value
BENTONITE FREE SWELL	D5890	24 ML/2G MIN	YES	MIN.
HYDRAULIC CONDUCTIVITY	D5887	5X10 -9 CM/SEC MAX	YES	MAX
WIDE WIDTH TENSILE STRENGTH	D4595	35LB/IN MIN.	Yes	MARY
PEEL STRENGTH	D4632	15 LB	YES	MARY
SHEAR STRENGTH (INTERNAL & INTERFACE)	D5321	SEE 02772P, 2.01 . G.3	YES	[illegible]
POLYMER COMPOSITION		95%POLY MIN	YES	MIN
BENTONITE FLUID LOSS	D 5891	15 ML MAX	YES	MAX
ROLL WIDTH		15 FT MIN	YES	MIN
ROLL LENGTH		100 FT MIN	YES	MIN
LOT SIZE		> 100,000 Sq. Ft.	YES	
[illegible]MATION REQUIRED TO BE PROVIDED WITH PROPOSAL				
[illegible]UCT NAME				
[illegible]E AND PHONE # OF CONTACT PERSON				
DAILY PRODUCTION CAPACITY				
MANUFACTURERS QC PROCEDURES				
MANUFACTURERS GEOTEXTILE REQUIREMENTS				
CERTIFICATION OF MARV AND TEST PROCEDURES FOR GCL				
RECOMMENDED INSTALLATION PROCEDURES				
(INCLUDING NEED FOR POWDERED BENTONITE AT SEAMS)				
RECOMMENDED STORAGE REQUIREMENTS				
MATERIAL SAFETY DATA SHEETS				
TESTING INTERVAL	MAX			
BENTONITE AND MOISTURE CONTENT	1/40,000 SF		YES	
FREE SWELL	1/40,000 SF		YES	
HYDRAULIC CONDUCTIVITY	1/40,000 SF		YES	
PEEL	1/40,000 SF		YES	
SHEAR STRENGTH (INTERNAL & INTERFACE)	1/100,000 SF		YES	
SIGNATURE				
NAME OF OFFEROR: [signature]				DATE: 2/16/99

REVISED: 01/21/99

All rolls in All lots should meet or exceed these required values.

[signature] 5/4/99

Gsyntheticstab98.123

SUPPLIER DOCUMENT SUBMITTAL

FDF PROJECT NO.: (1) 20102

CONTRACT NO: (2) 1440

SUBMITTAL NO.:(3) 005

REV.:(4) 1

DATE:(5) 6/17/99

Page 1 of 34 (6)

FROM: GSE Lining Technologies

(7)

SIGNATURE: _____

TO: FDF ENGINEERING/CONSTRUCTION
DOCUMENT CONTROL (ECDC), MS 52-7
(8)

RECEIVED BY: _____ DATE: _____

QTY	DOCUMENT NUMBER	REV	DOCUMENT FAMILY: PRO	H&S	MED	TRG	CON	ENG	QAC	OPER	TITLE/DESCRIPTION	SUBMITTAL TYPE: DRFT	CFC	INF	ASSOCIATED SPECIFICATION	SUBMITTAL ACTION: A	B	C
(9)	(10)	(11)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(13)	(14)	(14)	(14)	(15)	(16)	(16)	(16)
8	1440-005E	1							X		Certification of Geotextile Component		X		02772P.1.04.A.5	X		

REVIEW DISTRIBUTION

NAME (17)	MS (18)	NAME (17)	MS (18)	NAME (17)	MS (18)
Jim Jenkins, FDF, Eng., Approver	64				
Kwasi Badu-Tweneboah, GeoSyntec, Eng.	38				
Kathy Fisher, FDF, Procurement	64				
Gregg Johnson, FDF, Health and Safety	64				
Jim Turner, FDF, QA	64				
Chuck Van Arsdale, FDF, Eng.	64				

RECEIVED JUN 18 1999

NO COMMENTS: _____ COMMENTS: (PLEASE USE SPACE BELOW FOR COMMENTS OR INDICATE IF ATTACHMENTS) (19)

RECEIVED BY: (20) DATE: 6/28/99

(SIGN/DATE AND RETURN A COPY TO ECDC, MS 52-7)

SUBMITTAL TYPE: (BY SUPPLIER)
CFC - CERTIFIED FOR CONSTRUCTION
INF - INFORMATION/RECORD
DRFT - DRAFT/PRELIMINARY

SUBMITTAL ACTION CODE: (BY FDF)
A - Conforms to the Subcontract Requirements
B - Minor Comments - Incorporate and Resubmit
C - Revise and Resubmit (SEE COMMENTS)

000010

12736

FS-F-4955
Rev. 4: 04/??/1999

1440-005 Rev. 1 p. 2 of 34
6-17-99

SYNTHETIC INDUSTRIES

Geosynthetic Products Division

June 1, 1999

-2739

American Colliod/WY-Cetco
Lovell WY Plant
Noe Garcia
PO Box 428
Lovell WY 82431
PO#76577
BOL#627429

This is to certify that Product GEOTEX™ 650, a nonwoven polypropylene geotextile produced by Synthetic Industries will meet the following certifiable minimum average roll values when tested in accordance with the proper ASTM test methods. A minimum average roll value is calculated as the mean minus two standard deviations, yielding a 97.5 percent confidence level.

PHYSICAL PROPERTY	TEST METHOD	U.S. UNITS
Weight	ASTM D-5261	6.0 oz/yd^2
Thickness	ASTM D-5199	120 mils
Tensile Strength	ASTM D-4632	45 lbs
Elongation	ASTM D-4632	90 %
Trapezoidal Tear	ASTM D-4533	25 lbs
Mullen Burst	ASTM D 3786	190 psi
Puncture Strength	ASTM D-4833	50 lbs

Sincerely,

Sid Weiser
Technical Manager
Performance Nonwovens Division

Sorry, I just Received some of these Certs --
Thanks
Noe

Seller makes no warranty, express or implied, concerning the product furnished hereunder other than as set forth herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND, TO THE EXTENT THAT IT IS CONTRARY TO THE FOREGOING SENTENCE ANY IMPLIED WARRANTY OF MERCHANTABILITY IS EXPRESSLY EXCLUDED. Any recommendations made by the Seller concerning uses or applications of said product are believed reliable and Seller makes no warranty of results to be obtained. If the product does not meet Synthetic Industries current published specifications, and the Customer gives notice to Synthetic Industries before installing the product, then Synthetic Industries will replace the product without charge or refund the purchase price. This Data Sheet supersedes all previous Data Sheets for this style and is subject to change without notice. The effective date for this product data is 02/1/97

Synthetic Industries, Inc.
4019 Industry Drive • Post Office Box 22788 • Chattanooga, Tennessee • 37422 • USA
Telephone • 423-899-0444 • Fax • 423-899-7619 • 1-800-621-0444

6/3/99 #2739

Synthetic Industries

Individual Roll Data
Bill of Lading 627429

000012

Roll #	Style	Batch	Weight	Thick	Tensile		Elongation		T.Tear		Burst	Punct
					MD	XMD	MD	XMD	MD	XMD		
			Osy	mils	lbs	lbs	%	%	lbs	lbs	psi	lbs
			D5261	D5199	D4632	D4632	D4632	D4632	D4533	D4533	D3786	D4833
B822404A	650	80163	6.5	151	54	87	128	114	30	25	213	61
B822417A	650	80163	7.1	163	71	114	120	107	38	60	229	61
B822427A	650	80163	7.1	159	63	139	108	112	41	44	244	71
B822430A	650	80163	7.2	136	69	116	120	115	38	41	237	70

Synthetic Industries' current standard manufacturing quality control (MQC) testing frequency for GEOTEX nonwoven geotextiles is one (1) test per 90,000 sf (8,360 sm) for index properties (mass per unit area, thickness, grab tensile and elongation, trapezoidal tear, mullen burst and puncture resistance) for styles heavier than 601 and one (1) test per 162,000 sf (15,000 sm) for index properties for style 601 and lighter. Although we strive to test our nonwoven geotextiles for apparent opening size (AOS) and Permittivity/permeability/water flow rate approximately once every 540,000 sf (50,160 sm), the actual frequency of testing for performance properties will vary depending upon production schedules, product availability, customer requirements, job specifications or other agreements arranged with Synthetic Industries prior to the time of purchase. If additional testing is needed to meet higher frequencies required by the project specifications it is the purchaser's responsibility to notify Synthetic Industries and ask for assistance in calculating the costs for the additional tests.

Once rolls of nonwoven geotextiles are produced, inspected and the test results from the frequency stated above indicates that materials produced during the production run meets our published minimum average roll values, approved rolls are shipped for storage until an order requires the material to be shipped. Since rolls are located at the warehouse independent of production sequence test results listed above may include date from rolls which were not shipped. However, the date provided is from the same production run as the rolls actually shipped on this bill of lading.

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Exhibit 4005 Rev. 1 p. 3 of 34
6-17-99

1440-005 Rev.1 p.4 of 34
6-17-99

SYNTHETIC INDUSTRIES

Geosynthetic Products Division

May 25, 1999

F-2739

American Colliod/WY-Cetco
Lovell WY Plant
Noe Garcia
PO Box 428
Lovell WY 82431
PO#76574
BOL#627367

This is to certify that Product GEOTEX™ 650, a nonwoven polypropylene geotextile produced by Synthetic Industries will meet the following certifiable minimum average roll values when tested in accordance with the proper ASTM test methods. A minimum average roll value is calculated as the mean minus two standard deviations, yielding a 97.5 percent confidence level.

PHYSICAL PROPERTY	TEST METHOD	U.S. UNITS
Weight	ASTM D-5261	6.0 oz/yd^2
Thickness	ASTM D-5199	120 mils
Tensile Strength	ASTM D-4632	45 lbs
Elongation	ASTM D-4632	90 %
Trapezoidal Tear	ASTM D-4533	25 lbs
Mullen Burst	ASTM D-3786	190 psi
Puncture Strength	ASTM D-4833	50 lbs

Sincerely,

Sid Weiser

Sid Weiser
Technical Manager
Performance Nonwovens Division

Seller makes no warranty, express or implied, concerning the product furnished hereunder other than at the time of delivery it shall be of the quality and specifications stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND, TO THE EXTENT THAT IT IS CONTRARY TO THE FOREGOING SENTENCE ANY IMPLIED WARRANTY OF MERCHANTABILITY IS EXPRESSLY EXCLUDED. Any recommendations made by the Seller concerning uses or applications of said product are believed reliable and Seller makes no warranty of results to be obtained. If the product does not meet Synthetic Industries current published specifications, and the Customer gives notice to Synthetic Industries before installing the product, then Synthetic Industries will replace the product without charge or refund the purchase price. This Data Sheet supersedes all previous Data Sheets for this style and is subject to change without notice. The effective date for this product data is 02/1997

Synthetic Industries, Inc.
4019 Industry Drive • Post Office Box 22788 • Chattanooga, Tennessee • 37422 • USA
Telephone • 423-899-0444 • Fax • 423-899-7619 • 1-800-821-0444

000014

1440-005 Rev. 1 p. 5 of 34
6-17-99

5/25/99

Page 1

Synthetic Industries

Individual Roll Data
Bill of Lading 627367

Roll #	Style	Batch	Weight	Thick	Tensile		Elongation		T.Tear		Burst	Punct
					MD	XMD	MD	XMD	MD	XMD		
			Osy	mils	lbs	lbs	%	%	lbs	lbs	psi	lbs
			D5261	D5199	D4632	D4632	D4632	D4632	D4533	D4533	D3786	D4833
B822320A	650	80163	6	123	54		126		25		190	
B822497A	650	80163	7	140	72	135	125	122	40	60	204	66

Bill Weiss

Synthetic Industries' current standard manufacturing quality control (MQC) testing frequency for GEOTEX nonwoven geotextiles is one (1) test per 90,000 sf (8,360 sm) for index properties (mass per unit area, thickness, grab tensile and elongation, trapezoidal tear, mullen burst and puncture resistance) for styles heavier than 601 and one (1) test per 162,000 sf (15,000 sm) for index properties for style 601 and lighter. Although we strive to test our nonwoven geotextiles for apparent opening size (AOS) and Permittivity/permeability/water flow rate approximately once every 540,000 sf (50,160 sm), the actual frequency of testing for performance properties will vary depending upon production schedules, product availability, customer requirements, job specifications or other agreements arranged with Synthetic Industries prior to the time of purchase. If additional testing is needed to meet higher frequencies required by the project specifications, it is the purchaser's responsibility to notify Synthetic Industries and ask for assistance in calculating the costs for the additional tests.

Once rolls of nonwoven geotextiles are produced, inspected and the test results from the frequency stated above indicates that materials produced during the production run meets our published minimum average roll values, approved rolls are shipped for storage until an order requires the material to be shipped. Since rolls are loaded at the warehouse independent of production sequence test results listed above may include date from rolls which were not shipped. However, the date provided is from the same production run as the rolls actually shipped on this bill of lading.

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SYNTHETIC INDUSTRIES

1440-005 Rev. 1 p. 6 of 34
6-17-99

Geosynthetic Products Division

June 7, 1999

=-2739

American Colliod/WY-Cetco
Lovell WY Plant
Noe Garcia
PO Box 428
Lovell WY 82431
PO#76572
BOL#627478

This is to certify that Product GEOTEX™ 650, a nonwoven polypropylene geotextile produced by Synthetic Industries will meet the following certifiable minimum average roll values when tested in accordance with the proper ASTM test methods. A minimum average roll value is calculated as the mean minus two standard deviations, yielding a 97.5 percent confidence level.

PHYSICAL PROPERTY	TEST METHOD	U.S. UNITS
Weight	ASTM D-5261	6.0 oz/yd^2
Thickness	ASTM D-5199	120 mils
Tensile Strength	ASTM D-4632	45 lbs
Elongation	ASTM D-4632	90 %
Trapezoidal Tear	ASTM D-4533	25 lbs
Mullen Burst	ASTM D-3786	190 psi
Puncture Strength	ASTM D-4833	50 lbs

Sincerely,

Sid Weiser
Technical Manager
Performance Nonwovens Division

Seller makes no warranty, express or implied, concerning the product furnished hereunder other than at the time of delivery it shall be of the quality and specifications stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND, TO THE EXTENT THAT IT IS CONTRARY TO THE FOREGOING SENTENCE ANY IMPLIED WARRANTY OF MERCHANTABILITY IS EXPRESSLY EXCLUDED. Any recommendations made by the Seller concerning uses or applications of said product are believed reliable and Seller makes no warranty of results to be obtained. If the product does not meet Synthetic Industries current published specifications, and the Customer gives notice to Synthetic Industries before installing the product, then Synthetic Industries will replace the product without charge or refund the purchase price. This Data Sheet supersedes all previous Data Sheets for this style and is subject to change without notice. The effective date for this product data is 02/1997

Synthetic Industries, Inc.
4019 Industry Drive • Post Office Box 22788 • Chattanooga, Tennessee • 37422 • USA
Telephone • 423-899-0444 • Fax • 423-899-7619 • 1-800-621-0444

6/7/99

Synthetic Industries

Individual Roll Data
Bill of Lading 627478

Roll #	Style	Batch	Weight	Thick	Tensile		Elongation		T.Tear		Burst	Punct
					MD	XMD	MD	XMD	MD	XMD		
			Osy	mils	lbs	lbs	%	%	lbs	lbs	psi	lbs
			D5261	D5199	D4632	D4632	D4632	D4632	D4533	D4533	D3786	D4833
B822286A	650	80163	6.8	146	63	107	131	122	37	38	217	62
B822289A	650	80163	7	150	56	120	133	120	33	39	207	60
B822292A	650	80163	7.2	144	67	127	133	120	30	40	213	58
B822303A	650	80163	6.6	150	60	107	132	132	29	36	201	53
B822307A	650	80163	6.6	131	60	103	128	118	34	35	224	68

Synthetic Industries' current standard manufacturing quality control (MQC) testing frequency for GEOTEX nonwoven geotextiles is one (1) test per 90,000 sf (8,360 sm) for index properties (mass per unit area, thickness, grab tensile and elongation, trapezoidal tear, mullen burst and puncture resistance) for styles heavier than 601 and one (1) test per 162,000 sf (15,000 sm) for index properties for style 601 and lighter. Although we strive to test our nonwoven geotextiles for apparent opening size (AOS) and Permittivity/permeability/water flow rate approximately once every 540,000 sf (50,160 sm), the actual frequency of testing for performance properties will vary depending upon production schedules, product availability, customer requirements, job specifications or other agreements arranged with Synthetic Industries prior to the time of purchase. If additional testing is needed to meet higher frequencies required by the project specifications, it is the purchaser's responsibility to notify Synthetic Industries and ask for assistance in calculating the costs for the additional tests.

Once rolls of nonwoven geotextiles are produced, inspected and the test results from the frequency stated above indicates that materials produced during the production run meets our published minimum average roll values, approved rolls are shipped for storage until an order requires the material to be shipped. Since rolls are loaded at the warehouse independent of production sequence test results listed above may include date from rolls which were not shipped. However, the date provided is from the same production run as the rolls actually shipped on this bill of lading.

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1440-005 Rev. 1 p. 7 of 34.
6-17-99

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000016

SYNTHETIC INDUSTRIES

Geosynthetic Products Division

~~2739~~

May 20, 1999

1440-005 Rev. 1 p. 8 of 34
6-17-99

American Colliod/WY-Cetco
Lovell WY Plant
Noe Garcia
PO Box 428
Lovell WY 82431
PO#76567
BOL#627245, 627247

This is to certify that Product GEOTEX™ 650, a nonwoven polypropylene geotextile produced by Synthetic Industries will meet the following certifiable minimum average roll values when tested in accordance with the proper ASTM test methods. A minimum average roll value is calculated as the mean minus two standard deviations, yielding a 97.5 percent confidence level.

PHYSICAL PROPERTY	TEST METHOD	U.S. UNITS
Weight	ASTM D-5261	6.0 oz/yd^2
Thickness	ASTM D-5199	120 mils
Tensile Strength	ASTM D 4632	45 lbs
Elongation	ASTM D-4632	90 %
Trapezoidal Tear	ASTM D-4533	25 lbs
Mullen Burst	ASTM D-3786	190 psi
Puncture Strength	ASTM D-4833	50 lbs

Sincerely,

Sid Weiser

Sid Weiser
Technical Manager
Performance Nonwovens Division

Seller makes no warranty, express or implied, concerning the product furnished hereunder other than at the time of delivery it shall be of the quality and specifications stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND, TO THE EXTENT THAT IT IS CONTRARY TO THE FOREGOING SENTENCE ANY IMPLIED WARRANTY OF MERCHANTABILITY IS EXPRESSLY EXCLUDED. Any recommendations made by the Seller concerning uses or applications of said product are believed reliable and Seller makes no warranty of results to be obtained. If the product does not meet Synthetic Industries current published specifications, and the Customer gives notice to Synthetic Industries before installing the product, then Synthetic Industries will replace the product without charge or refund the purchase price. This Data Sheet supersedes all previous Data Sheets for this style and is subject to change without notice. The effective date for this product data is 02/1/97

Synthetic Industries, Inc.
4019 Industry Drive • Post Office Box 22788 • Chattanooga, Tennessee • 37422 • USA
Telephone • 423-899-0444 • Fax • 423-899-7619 • 1-800-621-0444

000018

5/21/99

Synthetic Industries

Individual Roll Data
Bill of Lading 627245

Page 1

Roll #	Style	Batch	Weight	Thick	Tensile		Elongation		T.Tear		Burst	Punct
					MD	XMD	MD	XMD	MD	XMD		
			Osy	mils	lbs	lbs	%	%	lbs	lbs	psi	lbs
			D5261	D5199	D4632	D4632	D4632	D4632	D4533	D4533	D3786	D4833
B822199A	650	80160	6.5	149	60	100	120	113	35	41	204	57
B822207A	650	30936	7.7	163	63	135	127	116	39	49	239	70
B822210A	650	80160	6.9	151	70	119	126	114	36	38	225	64

Synthetic Industries' current standard manufacturing quality control (MCC) testing frequency for GEOTEX nonwoven geotextiles is one (1) test per 90,000 sf (8,360 sm) for index properties (mass per unit area, thickness, grab tensile and elongation, trapezoidal tear, mullen burst and puncture resistance) for styles heavier than 601 and one (1) test per 162,000 sf (15,000 sm) for index properties for style 601 and lighter. Although we strive to test our nonwoven geotextiles for apparent opening size (AOS) and Permittivity/permeability/water flow rate approximately once every 540,000 sf (50,160 sm), the actual frequency of testing for performance properties will vary depending upon production schedules, product availability, customer requirements, job specifications or other agreements arranged with Synthetic Industries prior to the time of purchase. If additional testing is needed to meet higher frequencies required by the project specifications, it is the purchaser's responsibility to notify Synthetic Industries and ask for assistance in calculating the costs for the additional tests.

Once rolls of nonwoven geotextiles are produced, inspected and the test results from the frequency stated above indicates that materials produced during the production run meets our published minimum average roll values, approved rolls are shipped for storage until an order requires the material to be shipped. Since rolls are loaded at the warehouse independent of production sequence test results listed above may include date from rolls which were not shipped. However, the date provided is from the same production run as the rolls actually shipped on this bill of lading.

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6-17-99

2739

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6-17-99

SYNTHETIC INDUSTRIES

Geosynthetic Products Division

May 20, 1999 F-2739

American Colliod/WY-Cetco
Lovell WY Plant
Noe Garcia
PO Box 428
Lovell WY 82431
PO#76572
BOL#627267

This is to certify that Product GEOTEX™ 650, a nonwoven polypropylene geotextile produced by Synthetic Industries will meet the following certifiable minimum average roll values when tested in accordance with the proper ASTM test methods. A minimum average roll value is calculated as the mean minus two standard deviations, yielding a 97.5 percent confidence level.

PHYSICAL PROPERTY	TEST METHOD	U.S. UNITS
Weight	ASTM D-5261	6.0 oz/yd^2
Thickness	ASTM D-5199	120 mils
Tensile Strength	ASTM D-4632	45 lbs
Elongation	ASTM D-4632	90 %
Trapezoidal Tear	ASTM D-4533	25 lbs
Mullen Burst	ASTM D-3786	190 psi
Puncture Strength	ASTM D-4833	50 lbs

Sincerely,

Sid Weiser
Technical Manager
Performance Nonwovens Division

Seller makes no warranty, express or implied, concerning the product furnished hereunder other than at the time of delivery it shall be of the quality and specifications stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND, TO THE EXTENT THAT IT IS CONTRARY TO THE FOREGOING SENTENCE ANY IMPLIED WARRANTY OF MERCHANTABILITY IS EXPRESSLY EXCLUDED. Any recommendations made by the Seller concerning uses or applications of said product are believed reliable and Seller makes no warranty of results to be obtained. If the product does not meet Synthetic Industries current published specifications, and the Customer gives notice to Synthetic Industries before installing the product, then Synthetic Industries will replace the product without charge or refund the purchase price. This Data Sheet supersedes all previous Data Sheets for this style and is subject to change without notice. The effective date for this product data is 02/1997

Synthetic Industries, Inc.
4019 Industry Drive • Post Office Box 22788 • Chattanooga, Tennessee • 37422 • USA
Telephone • 423-899-0444 • Fax • 423-899-7619 • 1-800-621-0444

020000

5/21/99

Synthetic Industries

Individual Roll Data

Bill of Lading 627267

Roll #	Style	Batch	Weight	Thick	Tensile		Elongation		T.Tear		Burst	Punct
					MD	XMD	MD	XMD	MD	XMD		
			Osy	mils	lbs	lbs	%	%	lbs	lbs	psi	lbs
			D5261	D5199	D4632	D4632	D4632	D4632	D4533	D4533	D3786	D4833
B822169A	650	80159	6.6	135	63	101	121	121	39	29	190	56
B822216A	650	80160	7.2	157	69	125	125	117	30	48	239	72
B822234A	650	80162	7	152	69	122	109	117	41	45	244	71
B822242A	650	80162	7.3	151	70	135	125	125	37	46	239	60

Bid Wuser

Synthetic Industries' current standard manufacturing quality control (MQC) testing frequency for GEOTEX nonwoven geotextiles is one (1) test per 90,000 sf (8,360 sm) for index properties (mass per unit area, thickness, grab tensile and elongation, trapezoidal tear, mullen burst and puncture resistance) for styles heavier than 601 and one (1) test per 162,000 sf (15,000 sm) for index properties for style 601 and lighter. Although we strive to test our nonwoven geotextiles for apparent opening size (AOS) and Permittivity/permeability/water flow rate approximately once every 540,000 sf (50,160 sm), the actual frequency of testing for performance properties will vary depending upon production schedules, product availability, customer requirements, job specifications or other agreements arranged with Synthetic Industries prior to the time of purchase. If additional testing is needed to meet higher frequencies required by the project specifications, it is the purchaser's responsibility to notify Synthetic Industries and ask for assistance in calculating the costs for the additional tests.

Once rolls of nonwoven geotextiles are produced, inspected and the test results from the frequency stated above indicates that materials produced during the production run meets our published minimum average roll values, approved rolls are shipped for storage until an order requires the material to be shipped. Since rolls are loaded at the warehouse independent of production sequence test results listed above may include date from rolls which were not shipped. However, the date provided is from the same production run as the rolls actually shipped on this bill of lading.

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6-17-99
-- 2739

SYNTHETIC INDUSTRIES

Geosynthetic Products Division

May 13, 1999

--2739

American Colliod/WY-Cetco
Lovell WY Plant
Noe Garcia
PO Box 428
Lovell WY 82431
BOL#627205

This is to certify that Product GEOTEX™ 650, a nonwoven polypropylene geotextile produced by Synthetic Industries will meet the following certifiable minimum average roll values when tested in accordance with the proper ASTM test methods. A minimum average roll value is calculated as the mean minus two standard deviations, yielding a 97.5 percent confidence level.

PHYSICAL PROPERTY	TEST METHOD	U.S. UNITS
Weight	ASTM D-5261	6.0 oz/yd^2
Thickness	ASTM D-5199	120 mils
Tensile Strength	ASTM D-4632	45 lbs
Elongation	ASTM D-4632	90 %
Trapezoidal Tear	ASTM D-4533	25 lbs
Mullen Burst	ASTM D-3786	190 psi
Puncture Strength	ASTM D-4833	50 lbs

Sincerely,

Sid Weiser
Technical Manager
Performance Nonwovens Division

Seller makes no warranty, express or implied, concerning the product furnished hereunder other than at the time of delivery it shall be of the quality and specifications stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND, TO THE EXTENT THAT IT IS CONTRARY TO THE FOREGOING SENTENCE ANY IMPLIED WARRANTY OF MERCHANTABILITY IS EXPRESSLY EXCLUDED. Any recommendations made by the Seller concerning uses or applications of said product are believed reliable and Seller makes no warranty of results to be obtained. If the product does not meet Synthetic Industries current published specifications, and the Customer gives notice to Synthetic Industries before installing the product, then Synthetic Industries will replace the product without charge or refund the purchase price. This Data Sheet supersedes all previous Data Sheets for this style and is subject to change without notice. The effective date for this product data is [illegible]

Synthetic Industries, Inc.
4019 Industry Drive • Post Office Box 22788 • Chattanooga, Tennessee • 37422 • USA
Telephone • 423-899-0444 • Fax • 423-899-7619 • 1-800-621-0444

5/17/99

Synthetic Industries

Individual Roll Data
Bill of Lading 627205

000022

Roll #	Style	Batch	Weight	Thick	Tensile		Elongation		T.Tear		Burst	Punct
					MD	XMD	MD	XMD	MD	XMD		
			Osy	mils	lbs	lbs	%	%	lbs	lbs	psi	lbs
			D5261	D5199	D4632	D4632	D4632	D4632	D4533	D4533	D3786	D4833
B822131A	650	80159	7.2	155	74	146	131	120	35	51	224	66
B822144A	650	80159	7.2	157	58	125	116	122	34	45	233	65
B822146A	650	80159	7	153	69	124	130	120	33	41	206	63
B822149A	650	80159	7.1	153	65	114	132	139	33	43	210	57

Synthetic Industries' current standard manufacturing quality control (MQC) testing frequency for GEOTEX nonwoven geotextiles is one (1) test per 90,000 sf (8,360 sm) for index properties (mass per unit area, thickness, grab tensile and elongation, trapezoidal tear, mullen burst and puncture resistance) for styles heavier than 601 and one (1) test per 162,000 sf (15,000 sm) for index properties for style 601 and lighter. Although we strive to test our nonwoven geotextiles for apparent opening size (AOS) and Permittivity/permeability/water flow rate approximately once every 540,000 sf (50,160 sm), the actual frequency of testing for performance properties will vary depending upon production schedules, product availability, customer requirements, job specifications or other agreements arranged with Synthetic Industries prior to the time of purchase. If additional testing is needed to meet higher frequencies required by the project specifications, it is the purchaser's responsibility to notify Synthetic Industries and ask for assistance in calculating the costs for the additional tests.

Once rolls of nonwoven geotextiles are produced, inspected and the test results from the frequency stated above indicates that materials produced during the production run meets our published minimum average roll values, approved rolls are shipped for storage until an order requires the material to be shipped. Since rolls are loaded at the warehouse independent of production sequence test results listed above may include date from rolls which were not shipped However, the date provided is from the same production run as the rolls actually shipped on this bill of lading.

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6-17-99

SYNTHETIC INDUSTRIES

1440-005 Rev. 1 p. 14 of 34

Geosynthetic Products Division

June 7, 1999 6-17-99

-- 2739

American Colliod/WY-Cetco
Lovell WY Plant
Noe Garcia
PO Box 428
Lovell WY 82431
PO#76577
BOL#627503

This is to certify that Product GEOTEX™ 650, a nonwoven polypropylene geotextile produced by Synthetic Industries will meet the following certifiable minimum average roll values when tested in accordance with the proper ASTM test methods. A minimum average roll value is calculated as the mean minus two standard deviations, yielding a 97.5 percent confidence level.

PHYSICAL PROPERTY	TEST METHOD	U.S. UNITS
Weight	ASTM D-5261	6.0 oz/yd^2
Thickness	ASTM D-5199	120 mils
Tensile Strength	ASTM D-4632	45 lbs
Elongation	ASTM D-4632	90 %
Trapezoidal Tear	ASTM D-4533	25 lbs
Mullen Burst	ASTM D-3786	190 psi
Puncture Strength	ASTM D-4833	50 lbs

Sincerely,

Sid Weiser
Technical Manager
Performance Nonwovens Division

Seller makes no warranty, express or implied, concerning the product furnished hereunder other than at the time of delivery it shall be of the quality and specifications stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND, TO THE EXTENT THAT IT IS CONTRARY TO THE FOREGOING SENTENCE ANY IMPLIED WARRANTY OF MERCHANTABILITY IS EXPRESSLY EXCLUDED. Any recommendations made by the Seller concerning uses or applications of said product are believed reliable and Seller makes no warranty of results to be obtained. If the product does not meet Synthetic Industries current published specifications, and the Customer gives notice to Synthetic Industries before installing the product, then Synthetic Industries will replace the product without charge or refund the purchase price. This Data Sheet supersedes all previous Data Sheets for this style and is subject to change without notice. The effective date for this product data is 02/1997

Synthetic Industries, Inc.
4019 Industry Drive • Post Office Box 22788 • Chattanooga, Tennessee • 37422 • USA
Telephone • 423-899-0444 • Fax • 423-899-7619 • 1-800-621-0444

6/7/99

Synthetic Industries

Individual Roll Data
Bill of Lading 627503

000024

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Roll #	Style	Batch	Weight	Thick	Tensile		Elongation		T.Tear		Burst	Punct
					MD	XMD	MD	XMD	MD	XMD		
			Osy	mils	lbs	lbs	%	%	lbs	lbs	psi	lbs
			D5261	D5199	D4632	D4632	D4632	D4632	D4533	D4533	D3786	D4833
B822109A	650	80159	6.7	138	57	100	122	118	31	31	224	58
B822118A	650	80159	6.5	151	59	89	136	121	27	31	203	55
B822140A	650	80159	6.8	138	61		123		31		226	56

Synthetic Industries' current standard manufacturing quality control (MQC) testing frequency for GEOTEX nonwoven geotextiles is one (1) test per 90,000 sf (8,360 sm) for index properties (mass per unit area, thickness, grab tensile and elongation, trapezoidal tear, mullen burst and puncture resistance) for styles heavier than 601 and one (1) test per 162,000 sf (15,000 sm) for index properties for style 601 and lighter. Although we strive to test our nonwoven geotextiles for apparent opening size (AOS) and Permittivity/permeability/water flow rate approximately once every 540,000 sf (50,160 sm), the actual frequency of testing for performance properties will vary depending upon production schedules, product availability, customer requirements, job specifications or other agreements arranged with Synthetic Industries prior to the time of purchase. If additional testing is needed to meet higher frequencies required by the project specifications, it is the purchaser's responsibility to notify Synthetic Industries and ask for assistance in calculating the costs for the additional tests.

Once rolls of nonwoven geotextiles are produced, inspected and the test results from the frequency stated above indicates that materials produced during the production run meets our published minimum average roll values, approved rolls are shipped for storage until an order requires the material to be shipped. Since rolls are loaded at the warehouse independent of production sequence test results listed above may include data from rolls which were not shipped. However, the data provided is from the same production run as the rolls actually shipped on this bill of lading.

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6-17-99

SYNTHETIC INDUSTRIES

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Geosynthetic Products Division

May 11, 1999

1440-005 Rev. 1 p. 16 of 34
6-17-99

American Colliod/WY-Cetco
Lovell WY Plant
Noe Garcia
PO Box 428
Lovell WY 82431
BOL#627194

This is to certify that Product GEOTEX™ 650, a nonwoven polypropylene geotextile produced by Synthetic Industries will meet the following certifiable minimum average roll values when tested in accordance with the proper ASTM test methods. A minimum average roll value is calculated as the mean minus two standard deviations, yielding a 97.5 percent confidence level.

PHYSICAL PROPERTY	TEST METHOD	U.S. UNITS
Weight	ASTM D-5261	6.0 oz/yd²
Thickness	ASTM D-5199	120 mils
Tensile Strength	ASTM D-4632	45 lbs
Elongation	ASTM D-4632	90 %
Trapezoidal Tear	ASTM D-4533	25 lbs
Mullen Burst	ASTM D-3786	190 psi
Puncture Strength	ASTM D-4833	50 lbs

Sincerely,

Sid Weiser

Sid Weiser
Technical Manager
Performance Nonwovens Division

Seller makes no warranty, express or implied, concerning the product furnished hereunder other than at the time of delivery it shall be of the quality and specifications stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND, TO THE EXTENT THAT IT IS CONTRARY TO THE FOREGOING SENTENCE ANY IMPLIED WARRANTY OF MERCHANTABILITY IS EXPRESSLY EXCLUDED. Any recommendations made by the Seller concerning uses or applications of said product are believed reliable and Seller makes no warranty of results to be obtained. If the product does not meet Synthetic Industries current published specifications, and the Customer gives notice to Synthetic Industries before installing the product, then Synthetic Industries will replace the product without charge or refund the purchase price. This Data Sheet supersedes all previous Data Sheets for this style and is subject to change without notice. The effective date for this product data is 02/1997

Synthetic Industries, Inc.
4019 Industry Drive • Post Office Box 22788 • Chattanooga, Tennessee • 37422 • USA
Telephone • 423-899-0444 • Fax • 423-899-7619 • 1-800-621-0444

5/17/99

Synthetic Industries

Individual Roll Data
Bill of Lading 627194

Roll #	Style	Batch	Weight	Thick	Tensile		Elongation		T.Tear		Burst	Punct
					MD	XMD	MD	XMD	MD	XMD		
			Osy	mils	lbs	lbs	%	%	lbs	bs	psi	lbs
			D5261	D5199	D4632	D4632	D4632	D4632	D4533	D4533	D3786	D4833
BB22125A	650	80159	7.2	157	58	115	126	115	36	41	207	60
K907324A	650	90088	7.2	157	79	138	114	139	46	43	234	69

Fred Weir

-- 2739

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6-17-99

Synthetic Industries' current standard manufacturing quality control (MQC) testing frequency for GEOTEX nonwoven geotextiles is one (1) test per 90,000 sf (8,360 sm) for index properties (mass per unit area, thickness, grab tensile and elongation, trapezoidal tear, mullen burst and puncture resistance) for styles heavier than 601 and one (1) test per 162,000 sf (15,000 sm) for index properties for style 601 and lighter. Although we strive to test our nonwoven geotextiles for apparent opening size (AOS) and Permittivity/permeability/water flow rate approximately once every 540,000 sf (50,160 sm), the actual frequency of testing for performance properties will vary depending upon production schedules, product availability, customer requirements job specifications or other agreements arranged with Synthetic Industries prior to the time of purchase. If additional testing is needed to meet higher frequencies required by the project specifications, it is the purchaser's responsibility to notify Synthetic Industries and ask for assistance in calculating the costs for the additional tests.

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SYNTHETIC INDUSTRIES

Geosynthetic Products Division

-2739

May 11, 1999

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6-17-99

American Colliod/WY-Cetco
Lovell WY Plant
Noe Garcia
PO Box 428
Lovell WY 82431
BOL#627188

This is to certify that Product GEOTEX™ 650, a nonwoven polypropylene geotextile produced by Synthetic Industries will meet the following certifiable minimum average roll values when tested in accordance with the proper ASTM test methods. A minimum average roll value is calculated as the mean minus two standard deviations, yielding a 97.5 percent confidence level.

PHYSICAL PROPERTY	TEST METHOD	U.S. UNITS
Weight	ASTM D-5261	6.0 oz/yd^2
Thickness	ASTM D-5199	120 mils
Tensile Strength	ASTM D-4632	45 lbs
Elongation	ASTM D-4632	90 %
Trapezoidal Tear	ASTM D-4533	25 lbs
Mullen Burst	ASTM D-3786	190 psi
Puncture Strength	ASTM D-4833	50 lbs

Sincerely,

Sid Weiser
Technical Manager
Performance Nonwovens Division

Seller makes no warranty, express or implied, concerning the product furnished hereunder other than at the time of delivery it shall be of the quality and specifications stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR *PURPOSE IS EXPRESSLY EXCLUDED AND, TO THE EXTENT THAT IT IS CONTRARY TO THE FOREGOING SENTENCE ANY IMPLIED WARRANTY OF MERCHANTABILITY IS EXPRESSLY EXCLUDED. Any recommendations made by the Seller concerning uses or applications of said product are believed reliable and Seller makes no warranty of results to be obtained. If the product does not meet Synthetic Industries current published specifications, and the Customer gives notice to Synthetic Industries before installing the product, then Synthetic Industries will replace the product without charge or refund the purchase price. This Data Sheet supersedes all previous Data Sheets for this style and is subject to change without notice. The effective date for this product data is 02/1897*

Synthetic Industries, Inc.
4019 Industry Drive • Post Office Box 22788 • Chattanooga, Tennessee • 37422 • USA
Telephone • 423-899-0444 • Fax • 423-899-7619 • 1-800-621-0444

Synthetic Industries

Individual Roll Data
Bill of Lading 627188

Roll #	Style	Batch	Weight	Thick	Tensile		Elongation		T.Tear		Burst	Punct
					MD	XMD	MD	XMD	MD	XMD		
			Osy	mils	lbs	lbs	%	%	lbs	lbs	psi	lbs
			D5261	D5199	D4632	D4632	D4632	D4632	D4533	D4533	D3786	D4833
B822081A	650	80157	6.6	145	51	99	130	114	26	26	199	50
B822084A	650	80157	6.9	157	65	105	126	128	37	45	224	71
K901952A	650	90030	6.7	136	86	130	112	132	45	39	226	64
K901955A	650	90030	7	136	83	152	110	129	49	45	243	62
K901958A	650	90030	7	146	86	146	107	134	48	47	241	69

000028

-2739

Synthetic Industries' current standard manufacturing quality control (MQC) testing frequency for GEOTEX nonwoven geotextiles is one (1) test per 90,000 sf (8,360 sm) for index properties (mass per unit area, thickness, grab tensile and elongation, trapezoidal tear, mullen burst and puncture resistance) for styles heavier than 601 and one (1) test per 162,000 sf (15,000 sm) for index properties for style 601 and lighter. Although we strive to test our nonwoven geotextiles for apparent opening size (AOS) and Permittivity/permeability/water flow rate approximately once every 540,000 sf (50,160 sm), the actual frequency of testing for performance properties will vary depending upon production schedules, product availability, customer requirements, job specifications or other agreements arranged with Synthetic Industries prior to the time of purchase. If additional testing is needed to meet higher frequencies required by the project specifications, it is the purchaser's responsibility to notify Synthetic Industries and ask for assistance in calculating the costs for the additional tests.

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6-17-99

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6-17-99

SYNTHETIC INDUSTRIES

Geosynthetic Products Division

May 25, 1999

2739

American Colliod/WY-Cetco
Lovell WY Plant
Noe Garcia
PO Box 428
Lovell WY 82431
PO#76574
BOL#627366

This is to certify that Product GEOTEX™ 650, a nonwoven polypropylene geotextile produced by Synthetic Industries will meet the following certifiable minimum average roll values when tested in accordance with the proper ASTM test methods. A minimum average roll value is calculated as the mean minus two standard deviations, yielding a 97.5 percent confidence level.

PHYSICAL PROPERTY	TEST METHOD	U.S. UNITS
Weight	ASTM D-5261	6.0 oz/yd^2
Thickness	ASTM D-5199	120 mils
Tensile Strength	ASTM D-4632	45 lbs
Elongation	ASTM D-4632	90 %
Trapezoidal Tear	ASTM D-4533	25 lbs
Mullen Burst	ASTM D-3786	190 psi
Puncture Strength	ASTM D-4833	50 lbs

Sincerely,

Sid Weiser

Sid Weiser
Technical Manager
Performance Nonwovens Division

Seller makes no warranty, express or implied, concerning the product furnished hereunder either than at the time of delivery it shall be of the quality and specifications stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND, TO THE EXTENT THAT IT IS CONTRARY TO THE FOREGOING SENTENCE ANY IMPLIED WARRANTY OF MERCHANTABILITY IS EXPRESSLY EXCLUDED. Any recommendations made by the Seller concerning uses or applications of said product are believed reliable and Seller makes no warranty of results to be obtained. If the product does not meet Synthetic Industries current published specifications, and the Customer gives notice to Synthetic Industries before installing the product, then Synthetic Industries will replace the product without charge or refund the purchase price. This Data Sheet supercedes all previous Data Sheets for this style and is subject to change without notice. The effective date for this product data is 02/1997

Synthetic Industries, Inc.
4019 Industry Drive • Post Office Box 22788 • Chattanooga, Tennessee • 37422 • USA
Telephone • 423-899-0444 • Fax • 423-899-7019 • 1-800-621-0444

000030

5/25/99

Page 1

Synthetic Industries

Individual Roll Data
Bill of Lading 627366

Roll #	Style	Batch	Weight	Thick	Tensile		Elongation		T.Tear		Burst	Punct
					MD	XMD	MD	XMD	MD	XMD		
			Osy	mils	lbs	lbs	%	%	lbs	lbs	psi	lbs
			D5261	D5199	D4632	D4632	D4632	D4632	D4533	D4533	D3786	D4833
B822500A	650	80163	6.3	138	58	88	117	125	29	33	236	58
B822503A	650	80163	7	152	60	121	125	117	36		246	63
B822506A	650	80163	6.6	141	57	96	128	122	35	36	229	58
B822509A	650	80163	7.4	150	65	132	126	125	43		240	69

Synthetic Industries' current standard manufacturing quality control (MQC) testing frequency for GEOTEX nonwoven geotextiles is one (1) test per 90,000 sf (8,360 sm) for index properties (mass per unit area, thickness, grab tensile and elongation, trapezoidal tear, mullen burst and puncture resistance) for styles heavier than 601 and one (1) test per 162,000 sf (15,000 sm) for index properties for style 601 and lighter. Although we strive to test our nonwoven geotextiles for apparent opening size (AOS) and Permittivity/permeability/water flow rate approximately once every 540,000 sf (50,160 sm), the actual frequency of testing for performance properties will vary depending upon production schedules, product availability, customer requirements, job specifications or other agreements arranged with Synthetic Industries prior to the time of purchase. If additional testing is needed to meet higher frequencies required by the project specifications, it is the purchasers responsibility to notify Synthetic Industries and ask for assistance in calculating the costs for the additional tests.

Once rolls of nonwoven geotextiles are produced, inspected and the test results from the frequency stated above indicates that materials produced during the production run meets our published minimum average roll values, approved rolls are shipped for storage until an order requires the material to be shipped. Since rolls are loaded at the warehouse independent of production sequence test results listed above may include data from rolls which were not shipped. However, the data provided is from the same production run as the rolls actually shipped on this bill of lading.

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6-17-99

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2739

SYNTHETIC INDUSTRIES

1440-005 Rev. 1 p. 22 of 34
6-17-99

Geosynthetic Products Division

May 25, 1999

=-2739

American Colliod/WY-Cetco
Lovell WY Plant
Noe Garcia
PO Box 428
Lovell WY 82431
PO#76572
BOL#627369

This is to certify that Product GEOTEX™ 650, a nonwoven polypropylene geotextile produced by Synthetic Industries will meet the following certifiable minimum average roll values when tested in accordance with the proper ASTM test methods. A minimum average roll value is calculated as the mean minus two standard deviations, yielding a 97.5 percent confidence level.

PHYSICAL PROPERTY	TEST METHOD	U.S. UNITS
Weight	ASTM D-5261	6.0 oz/yd^2
Thickness	ASTM D-5199	120 mils
Tensile Strength	ASTM D-4632	45 lbs
Elongation	ASTM D-4632	90 %
Trapezoidal Tear	ASTM D-4533	25 lbs
Mullen Burst	ASTM D-3786	190 psi
Puncture Strength	ASTM D-4833	50 lbs

Sincerely,

Sid Weiser

Sid Weiser
Technical Manager
Performance Nonwovens Division

Seller makes no warranty, express or implied, concerning the product furnished hereunder other than at the time of delivery it shall be of the quality and specifications stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND, TO THE EXTENT THAT IT IS CONTRARY TO THE FOREGOING SENTENCE ANY IMPLIED WARRANTY OF MERCHANTABILITY IS EXPRESSLY EXCLUDED. Any recommendations made by the Seller concerning uses or applications of said product are believed reliable and Seller makes no warranty of results to be obtained. If the product does not meet Synthetic Industries current published specifications, and the Customer gives notice to Synthetic Industries before installing the product, then Synthetic Industries will replace the product without charge or refund the purchase price. This Data Sheet supersedes all previous Data Sheets for this style and is subject to change without notice. The effective date for this product data is 02/1997

Synthetic Industries, Inc.
4019 Industry Drive • Post Office Box 22788 • Chattanooga, Tennessee • 37422 • USA
Telephone • 423-899-0444 • Fax • 423-899-7619 • 1-800-621-0444

5/25/99

Synthetic Industries

Individual Roll Data
Bill of Lading 627369

Roll #	Style	Batch	Weight	Thick	Tensile		Elongation		T.Tear		Burst	Punct
					MD	XMD	MD	XMD	MD	XMD		
			Osy	mils	lbs	lbs	%	%	lbs	lbs	psi	lbs
			D5261	D5199	D4632	D4632	D4632	D4632	D4533	D4533	D3786	D4833
B822493A	650	80153	7	139	63	131	117	115	37	45	277	101

Bill Weiser

-- 2739

1440-005 Rev. 1 p. 23 of 34
6-17-99

Synthetic Industries' current standard manufacturing quality control (MQC) testing frequency for GEOTEX nonwoven geotextiles is one (1) test per 90,000 sf (8,360 sm) for index properties (mass per unit area, thickness, grab tensile and elongation, trapezoidal tear, mullen burst and puncture resistance) for styles heavier than 601 and one (1) test per 162,000 sf (15,000 sm) for index properties for style 601 and tighter. Although we strive to test our nonwoven geotextiles for apparent opening size (AOS) and Permittivity/permeability/water flow rate approximately once every 540,000 sf (50,160 sm), the actual frequency of testing for performance properties will vary depending upon production schedules, product availability, customer requirements, job specifications or other agreements arranged with Synthetic Industries prior to the time of purchase. If additional testing is needed to meet higher frequencies required by the project specifications, it is the purchaser's responsibility to notify Synthetic Industries and ask for assistance in calculating the costs for the additional tests.

Once rolls of nonwoven geotextiles are produced, inspected and the test results from the frequency stated above indicates that materials produced during the production run meets our published minimum average roll values, approved rolls are shipped for storage until an order requires the material to be shipped. Since rolls are loaded at the warehouse independent of production sequence test results listed above may include date from rolls which were not shipped, However, the date provided is from the same production run as the rolls actually shipped on this bill of lading.

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SYNTHETIC INDUSTRIES

-- 2739

Geosynthetic Products Division

May 25, 1999

1440-005 Rev. 1 p. 24 of 34
6-17-99

American Colliod/WY-Cetco
Lovell WY Plant
Noe Garcia
PO Box 428
Lovell WY 82431
PO#76574
BOL#627346

This is to certify that Product GEOTEX™ 650, a nonwoven polypropylene geotextile produced by Synthetic Industries will meet the following certifiable minimum average roll values when tested in accordance with the proper ASTM test methods. A minimum average roll value is calculated as the mean minus two standard deviations, yielding a 97.5 percent confidence level.

PHYSICAL PROPERTY	TEST METHOD	U.S. UNITS
Weight	ASTM D-5261	6.0 oz/yd^2
Thickness	ASTM D-5199	120 mils
Tensile Strength	ASTM D-4632	45 lbs
Elongation	ASTM D-4632	90 %
Trapezoidal Tear	ASTM D-4533	25 lbs
Mullen Burst	ASTM D-3786	190 psi
Puncture Strength	ASTM D-4833	50 lbs

Sincerely,

Sid Weiser

Sid Weiser
Technical Manager
Performance Nonwovens Division

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Synthetic Industries, Inc.
4019 Industry Drive • Post Office Box 22788 • Chattanooga, Tennessee • 37422 • USA
Telephone • 423-899-0444 • Fax • 423-899-7619 • 1-800-621-0444

SYNTHETIC INDUSTRIES

14440-005 Rev. 1 p.26 of 34
6-17-99

Geosynthetic Products Division

May 11, 1999 2739

American Colliod/WY-Cetco
Lovell WY Plant
Noe Garcia
PO Box 428
Lovell WY 82431
BOL#627196

This is to certify that Product GEOTEX™ 650, a nonwoven polypropylene geotextile produced by Synthetic Industries will meet the following certifiable minimum average roll values when tested in accordance with the proper ASTM test methods. A minimum average roll value is calculated as the mean minus two standard deviations, yielding a 97.5 percent confidence level.

PHYSICAL PROPERTY	TEST METHOD	U.S. UNITS
Weight	ASTM D-5261	6.0 oz/yd^2
Thickness	ASTM D-5199	120 mils
Tensile Strength	ASTM D-4632	45 lbs
Elongation	ASTM D-4632	90 %
Trapezoidal Tear	ASTM D-4533	25 lbs
Mullen Burst	ASTM D-3786	190 psi
Puncture Strength	ASTM D-4833	50 lbs

Sincerely,

Sid Weiser
Technical Manager
Performance Nonwovens Division

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Synthetic Industries, Inc.
4019 Industry Drive • Post Office Box 22788 • Chattanooga, Tennessee • 37422 • USA
Telephone • 423-899-0444 • Fax • 423-899-7619 • 1-800-621-0444

Individual Roll Data
Bill of Lading 627346

Roll #	Style	Batch	Weight	Thick	Tensile		Elongation		T.Tear		Burst	Punct
					MD	XMD	MD	XMD	MD	XMD		
			Osy	mils	lbs	lbs	%	%	lbs	lbs	psi	lbs
			D5261	D5199	D4632	D4632	D4632	D4632	D4533	D4533	D3786	D4833
B822458A	650	80163	7	151	62	107	121	125	34	41	233	65
B822464A	650	80163	7.6	150	68	118	124	135	35	43	244	74
B822467A	650	80163	6.8	144	57	102	124	122	34	28	233	66

Sid Wiesi

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6-17-99

Synthetic Industries' current standard manufacturing quality control (MQC) testing frequency for GEOTEX nonwoven geotextiles is one (1) test per 90,000 sf (8,360 sm) for index properties (mass per unit area, thickness, grab tensile and elongation, trapezoidal tear, mullen burst and puncture resistance) for styles heavier than 601 and one (1) test per 162,000 sf (15,000 sm) for index properties for style 601 and lighter. Although we strive to test our nonwoven geotextiles for apparent opening size (AOS) and Permittivity/permeability/water flow rate approximately once every 540,000 sf (50,160 sm), the actual frequency of testing for performance properties will vary depending upon production schedules, product availability, customer requirements, job specifications or other agreements arranged with Synthetic Industries prior to the time of purchase. If additional testing is needed to meet higher frequencies required by the project specifications, it is the purchaser's responsibility to notify Synthetic Industries and ask for assistance in calculating the costs for the additional tests.

Once rolls of nonwoven geotextiles are produced, inspected and the test results from the frequency stated above indicates that materials produced during the production run meets our published minimum average roll values, approved rolls are shipped for storage until an order requires the material to be shipped. Since rolls are loaded at the warehouse independent of production sequence test results listed above may include date from rolls which were not shipped. However, the date provided is from the same production run as the rolls actually shipped on this bill of lading.

SYNTHETIC INDUSTRIES

1440-005 Rev. 1 p. 28 of 34
6-17-99

Geosynthetic Products Division

May 7, 1999

-2739

Cetco / Fairmount
Cynthia Willix
PO Box 88
Fairmount GA 30139
BoL: 627098 PO 76562

This is to certify that Product GEOTEX™ 650, a nonwoven polypropylene geotextile produced by Synthetic Industries will meet the following certifiable minimum average roll values when tested in accordance with the proper ASTM test methods. A minimum average roll value is calculated as the mean minus two standard deviations, yielding a 97.5 percent confidence level.

PHYSICAL PROPERTY	TEST METHOD	U.S. UNITS
Weight	ASTM D-5261	6.0 oz/yd²
Thickness	ASTM D-5199	120 mils
Tensile Strength	ASTM D-4632	45 lbs
Elongation	ASTM D-4632	90 %
Trapezoidal Tear	ASTM D-4533	25 lbs
Mullen Burst	ASTM D-3786	190 psi
Puncture Strength	ASTM D-4833	50 lbs

Sincerely,

Sid Weiser
Technical Manager
Performance Nonwovens Division

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Synthetic Industries, Inc.
4019 Industry Drive • Post Office Box 22788 • Chattanooga, Tennessee • 37422 • USA
Telephone • 423-899-0444 • Fax • 423-899-7619 • 1-800-621-0444

Syntheti[illegible]ustries

Individual Roll Data

Bill of Lading 627196

Roll #	Style	Batch	Weight	Thick	Tensile		Elongation		T.Tear		Burst	Punct
					MD	XMD	MD	XMD	MD	XMD		
			Osy	mils	lbs	lbs	%	%	lbs	lbs	psi	lbs
			D5261	D5199	D4632	D4632	D4632	D4632	D4533	D4533	D3786	D4833
B822063A	650	80155	7	151	73	131	122	123	37	40	244	61
B822087A	650	80157	7	159	65	115	123	115	37	45	221	68
B822106A	650	80159	6.9	146	58	109	131	123	33	40	206	62

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6-17-99

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Synthetic Industries' current standard manufacturing quality control (MQC) testing frequency for GEOTEX nonwoven geotextiles is one (1) test per 90,000 sf (8,360 sm) for index properties (mass per unit area, thickness, grab tensile and elongation, trapezoidal tear, mullen burst and puncture resistance) for styles heavier than 601 and one (1) test per 162,000 sf (15,000 sm) for index properties for style 601 and lighter. Although we strive to test our nonwoven geotextiles for apparent opening size (AOS) and Permittivity/permeability/water flow rate approximately once every 540,000 sf (50,160 sm), the actual frequency of testing for performance properties will vary depending upon production schedules, product availability, customer requirements, job specifications or other agreements arranged with Synthetic Industries prior to the time of purchase. If additional testing is needed to meet higher frequencies required by the project specifications, it is the purchaser's responsibility to notify Synthetic Industries and ask for assistance in calculating the costs for the additional tests.

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Synthetic Industries

Individual Roll Data

Bill of Lading 627098

Roll #	Style	Batch	Weight	Thick	Tensile		Elongation		T.Tear		Burst	Punct
			Osy	mils	lbs	lbs	%	%	lbs	lbs	psi	lbs
			D5261	D5199	D4632	D4632	D4632	D4632	D4533	D4533	D3786	D4833
K901991A	650	90031	7 4	160	97	178	116	135	40	47	240	65
5164343A	650	50981	6 1	120	80	106	100	117	47		249	79
5164354A	650	50981	6 6	130	72	134	99	125	44	37	246	69

Sid Kiner

000038

Synthetic Industries' current standard manufacturing quality control (MQC) testing frequency for GEOTEX nonwoven geotextiles is one (1) test per 90,000 sf (8,360 sm) for index properties (mass per unit area, thickness, grab tensile and elongation, trapezoidal tear, mullen burst and puncture resistance) for styles heavier than 601 and one (1) test per 162,000 sf (15,000 sm) for index properties for style 601 and lighter. Although we strive to test our nonwoven geotextiles for apparent opening size (AOS) and Permittivity/permeability/water flow rate approximately once every 540,000 sf (50,160 sm), the actual frequency of testing for performance properties will vary depending upon production schedules, product availability, customer requirements, job specifications or other agreements arranged with Synthetic Industries prior to the time of purchase. If additional testing is needed to meet higher frequencies required by the project specifications, it is the purchaser's responsibility to notify Synthetic Industries and ask for assistance in calculating the costs for the additional tests.

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2739 6-17-99

1440-005 Rev. 1 p. 30 of 34
6-17-99

SYNTHETIC INDUSTRIES

Geosynthetic Products Division

January 19, 1999

F-2739

American Colliod/WY-Cetco
Lovell WY Plant
Noe Garcia
PO Box 428
Lovell WY 82431
BoL; 626319, 626327 PO 76522

This is to certify that Product GEOTEX™ 650, a nonwoven polypropylene geotextile produced by Synthetic Industries will meet the following certifiable minimum average roll values when tested in accordance with the proper ASTM test methods. A minimum average roll value is calculated as the mean minus two standard deviations, yielding a 97.5 percent confidence level.

PHYSICAL PROPERTY	TEST METHOD	U.S. UNITS
Weight	ASTM D-5261	6.0 oz/yd^2
Thickness	ASTM D-5199	120 mils
Tensile Strength	ASTM D-4632	45 lbs
Elongation	ASTM D-4632	90 %
Trapezoidal Tear	ASTM D-4533	25 lbs
Mullen Burst	ASTM D-3786	190 psi
Puncture Strength	ASTM D-4833	50 lbs

Sincerely,

Sid Weiser
Technical Manager
Performance Nonwovens Division

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Synthetic Industries, Inc.
4019 Industry Drive • Post Office Box 22788 • Chattanooga, Tennessee • 37422 • USA
Telephone • 423-899-0444 • Fax • 423-899-7619 • 1-800-621-0444

1/26/99

Synthetic Industries

Page 1

Individual Roll Data
Bill of Lading 626327

Roll #	Style	Batch	Weight	Thick	Tensile		Elongation		T-Tear		Burst	Punct
			Osy	mils	lbs	lbs	%	%	lbs	lbs	psi	lbs
			D5261	D5199	D4632	D4632	D4632	D4632	D4533	D4533	D3786	D4833
5164185A	650	50981	6.8	121					33			69
5164235A	650	50981	7.1	127	104	177	98	121	47	56	264	91

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1440-005 Rev. 1 p. 31 of 34
6-17-99

Synthetic Industries' current standard manufacturing quality control (MQC) testing frequency for GEOTEX nonwoven geotextiles is one (1) test per 90,000 sf (8,360 sm) for index properties (mass per unit area, thickness, grab tensile and elongation, trapezoidal tear, mullen burst and puncture resistance) for styles heavier than 601 and one (1) test per 162,000 sf (15,000 sm) for index properties for style 601 and lighter. Although we strive to test our nonwoven geotextiles for apparent opening size (AOS) and Permittivity/permeability/water flow rate approximately once every 540,000 sf (50,160 sm), the actual frequency of testing for performance properties will vary depending upon production schedules, product availability, customer requirements, job specifications or other agreements arranged with Synthetic Industries prior to the time of purchase. If additional testing is needed to meet higher frequencies required by the project specifications, it is the purchaser's responsibility to notify Synthetic Industries and ask for assistance in calculating the costs for the additional tests.
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Synthetic Industries

Individual Roll Data
Bill of Lading 626319

Roll #	Style	Batch	Weight	Thick	Tensile		Elongation		T Tear		Burst	Punct
			Osy	mils	lbs	lbs	%	%	lbs	lbs	psi	lbs
			D5261	D5199	D4632	D4632	D4632	D4632	D4533	D4533	D3786	D4833
5164243A	650	50981	6.3	126	93	140	99	111	38	44	247	80
5164244A	650	50981	6.5	131	75	139	105	105	47	55	277	86
5164310A	650	50981	6.7	126	77	157	92	119	45	38	239	73

Tit Dwin

Synthetic Industries' current standard manufacturing quality control (MQC) testing frequency for GEOTEX nonwoven geotextiles is one (1) test per 90,000 sf (8,360 sm) for index properties (mass per unit area, thickness, grab tensile and elongation, trapezoidal tear, mullen burst and puncture resistance) for styles heavier than 601 and one (1) test per 162,000 sf (15,000 sm) for index properties for style 601 and lighter. Although we strive to test our nonwoven geotextiles for apparent opening size (AOS) and Permittivity/permeability/water flow rate approximately once every 540,000 sf (50,160 sm), the actual frequency of testing for performance properties will vary depending upon production schedules, product availability, customer requirements, job specifications or other agreements arranged with Synthetic Industries prior to the time of purchase. If additional testing is needed to meet higher frequencies required by the project specifications, it is the purchaser's responsibility to notify Synthetic Industries and ask for assistance in calculating the costs for the additional tests.
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6-17-99

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SYNTHETIC INDUSTRIES

1440-005 Rev. 1 p. 33 of 34
6-17-99

Geosynthetic Products Division

May 7, 1999

2739

Cetco / Fairmount
Cynthia Willix
PO Box 88
Fairmount GA 30139
BoL; 627144 PO 76562

This is to certify that Product GEOTEX™ 650, a nonwoven polypropylene geotextile produced by Synthetic Industries will meet the following certifiable minimum average roll values when tested in accordance with the proper ASTM test methods. A minimum average roll value is calculated as the mean minus two standard deviations, yielding a 97.5 percent confidence level.

PHYSICAL PROPERTY	TEST METHOD	U.S. UNITS
Weight	ASTM D-5261	6.0 oz/yd^2
Thickness	ASTM D-5199	120 mils
Tensile Strength	ASTM D-4632	45 lbs
Elongation	ASTM D-4632	90 %
Trapezoidal Tear	ASTM D-4533	25 lbs
Mullen Burst	ASTM D-3786	190 psi
Puncture Strength	ASTM D-4833	50 lbs

Sincerely,

Sid Weiser
Technical Manager
Performance Nonwovens Division

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Synthetic Industries, Inc.
4019 Industry Drive • Post Office Box 22788 • Chattanooga, Tennessee • 37422 • USA
Telephone • 423-899-0444 • Fax • 423-899-7619 • 1-800-621-0444

Synthetic Industries

Individual Roll Data
Bill of Lading 627144

Roll #	Style	Batch	Weight Osy D5261	Thick mils D5199	Tensile lbs D4632	Tensile lbs D4632	Elongation % D4632	Elongation % D4632	T.Tear lbs D4533	T.Tear lbs D4533	Burst psi D3786	Punct lbs D4833
5164216A	650	50981	6.6	125	76		115		33	37	224	60
5164219A	650	50981	7.2	138	90	144	114	125	42	54	244	79
5164223A	650	50981	7.3	143	99	179	103	110	47	55	270	92

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Synthetic Industries' current standard manufacturing quality control (MQC) testing frequency for GEOTEX nonwoven geotextiles is one (1) test per 90,000 sf (8,360 sm) for index properties (mass per unit area, thickness, grab tensile and elongation, trapezoidal tear, mullen burst and puncture resistance) for styles heavier than 601 and one (1) test per 162,000 sf (15,000 sm) for index properties for style 601 and lighter. Although we strive to test our nonwoven geotextiles for apparent opening size (AOS) and Permittivity/permeability/water flow rate approximately once every 540,000 sf (50,160 sm), the actual frequency of testing for performance properties will vary depending upon production schedules, product availability, customer requirements, job specifications or other agreements arranged with Synthetic Industries prior to the time of purchase. If additional testing is needed to meet higher frequencies required by the project specifications, it is the purchaser's responsibility to notify Synthetic Industries and ask for assistance in calculating the costs for the additional tests.

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1444-005 Rev. 1 p. 34 of 34
6-17-99

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SUPPLIER DOCUMENT SUBMITTAL

DF PROJECT NO.: (1) 20102	CONTRACT NO: (2) 1440	SUBMITTAL NO.:(3) 005	REV.:(4) 2	DATE:(5) 6/28/99	Page 1 of 3 (6)

ROM: GSE Lining Technologies

(7) RECORD

IGNATURE: _____

TO: FDF ENGINEERING/CONSTRUCTION
DOCUMENT CONTROL (ECDC), MS 52-7
(8)

RECEIVED BY: _____ DATE: _____

QTY	DOCUMENT NUMBER	REV	DOCUMENT FAMILY PRO	H&S	MED	TRG	CON	ENG	QAC	OPER	TITLE/DESCRIPTION	SUBMITTAL TYPE DRFT	CFC	INF	ASSOCIATED SPECIFICATION	SUBMITTAL ACTION A	B	C
(9)	(10)	(11)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(13)	(14)	(14)	(14)	(15)	(16)	(16)	(16)
8	1440-005E	1							X		Certification of Geotextile Component		X		02772P.1.04.A.5	X		

REVIEW DISTRIBUTION

NAME	MS	NAME	MS	NAME	MS
(17)	(18)	(17)	(18)	(17)	(18)
Jim Jenkins, FDF, Eng., Approver	64				
Kwasi Badu-Twenebosh, GeoSyntec, Eng.	38				
Kathy Fisher, FDF, Procurement	64				
Gregg Johnson, FDF, Health and Safety	64				
Jim Turner, FDF, QA	64				
Chuck Van Arsdale, FDF, Eng.	64				

RECEIVED JUN 28 1999 EBT

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NO COMMENTS: _____ COMMENTS: (PLEASE USE SPACE BELOW FOR COMMENTS OR INDICATE IF ATTACHMENTS) (19)

2739

RECEIVED BY: K Badu (20) DATE: 6/28/99

(SIGN/DATE AND RETURN A COPY TO ECDC, MS 52-7)

SUBMITTAL TYPE: (BY SUPPLIER)
CFC - CERTIFIED FOR CONSTRUCTION
INF - INFORMATION/RECORD
DRFT - DRAFT/PRELIMINARY

SUBMITTAL ACTION CODE: (BY FDF)
A - Conforms to the Subcontract Requirements
B - Minor Comments - Incorporate and Resubmit
C - Revise and Resubmit (SEE COMMENTS)

FS-F-4955
Rev. 4: 04/22/1999

1440-005 Rev. 2
6-28-99
p. 2 of 3

SYNTHETIC INDUSTRIES — 2739

Geosynthetic Products Division

June 25, 1999

American Colliod/WY-Cetco
Lovell WY Plant
Jim Turner
PO Box 428
Lovell WY 82431
Cover Roll Numbers 5164373A, 5164374A, B822188A

RECORD

This is to certify that Product GEOTEX™ 650, a nonwoven polypropylene geotextile produced by Synthetic Industries will meet the following certifiable minimum average roll values when tested in accordance with the proper ASTM test methods. A minimum average roll value is calculated as the mean minus two standard deviations, yielding a 97.5 percent confidence level.

PHYSICAL PROPERTY	TEST METHOD	U.S. UNITS
Weight	ASTM D-5261	6.0 oz/yd^2
Thickness	ASTM D-5199	120 mils
Tensile Strength	ASTM D-4632	45 lbs
Elongation	ASTM D-4632	90 %
Trapezoidal Tear	ASTM D-4533	25 lbs
Mullen Burst	ASTM D-3786	190 psi
Puncture Strength	ASTM D-4833	50 lbs

Sincerely,

Sid Weiser
Technical Manager
Performance Nonwovens Division

Seller makes no warranty, express or implied, concerning the product furnished hereunder other than at the time of delivery it shall be of the quality and specifications stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND, TO THE EXTENT THAT IT IS CONTRARY TO THE FOREGOING SENTENCE ANY IMPLIED WARRANTY OF MERCHANTABILITY IS EXPRESSLY EXCLUDED. Any recommendations made by the Seller concerning uses or applications of said product are believed reliable and Seller makes no warranty of results to be obtained. If the product does not meet Synthetic Industries current published specifications, and the Customer gives notice to Synthetic Industries before installing the product, then Synthetic Industries will replace the product without charge or refund the purchase price. This Data Sheet supersedes all previous Data Sheets for this style and is subject to change without notice. The effective date for this product data is 02/1997

000045

Synthetic Industries, Inc.
4019 Industry Drive • Post Office Box 22788 • Chattanooga, Tennessee • 37422 • USA
Telephone • 423-899-0444 • Fax • 423-899-7619 • 1-800-621-0444

6/25/99

Synthetic In[illegible]tries

Individual R[illegible]ata

Bill of Lading 627196

Roll #	Style	Batch	Weight	Thick	Tensile		Elongation		T.Tear		Burst	Punct
					MD	XMD	MD	XMD	MD	XMD		
			Osy	mils	lbs	lbs	%	%	lbs	lbs	psi	lbs
			D5261	D5199	D4632	D4632	D4632	D4632	D4533	D4533	D3786	D4833
5164375A	650	50981	6.4	129	64		100		43		241	66
B822187A	650	80159	6.6	148	57	96	127	124	33	33	201	59

Ted Weiss

RECORD

-2739

1440-005 Rev. 2
6-28-99 p. 3 of 3

000046

Synthetic Industries' current standard manufacturing quality control (MQC) testing frequency for GEOTEX nonwoven geotextiles is one (1) test per 90,000 sf (8,360 sm) for index properties (mass per unit area, thickness, grab tensile and elongation, trapezoidal tear, mullen burst and puncture resistance) for styles heavier than 601 and one (1) test per 162,000 sf (15,000 sm) for index properties for style 601 and lighter. Although we strive to test our nonwoven geotextiles for apparent opening size (AOS) and Permittivity/permeability/water flow rate approximately once every 540,000 sf (50,160 sm), the actual frequency of testing for performance properties will vary depending upon production schedules, product availability, customer requirements, job specifications or other agreements arranged with Synthetic Industries prior to the time of purchase. If additional testing is needed to meet higher frequencies required by the project specifications, it is the purchaser's responsibility to notify Synthetic Industries and ask for assistance in calculating the costs for the additional tests.

Once rolls of nonwoven geotextiles are produced, inspected and the test results from the frequency stated above indicates that materials produced during the production run meets our published minimum average roll values, approved rolls are shipped for storage until an order requires the material to be shipped. Since rolls are loaded at the warehouse independent of production sequence test results listed above may include data from rolls which were not shipped. However, the data provided is from the same production run as the rolls actually shipped on this bill of lading.

mm

SUPPLIER DOCU[illegible] SUBMITTAL

FDF PROJECT NO.: (1) 20102	CONTRACT NO: (2) 1440	SUBMITTAL NO.:(3) 006	REV.:(4) 0	DATE:(5) 6/8/99	Page _1_ of _1_(6)

FROM: **GSE Lining Technologies**

(7)

SIGNATURE: _____

TO: **FDF ENGINEERING/CONSTRUCTION**
DOCUMENT CONTROL (ECDC), MS 52-7
(8)

RECEIVED BY: _____ DATE: _____

QTY	DOCUMENT NUMBER	REV	DOCUMENT FAMILY: PRO	H&S	MED	TRG	CON	ENG	QAC	OPER	TITLE/DESCRIPTION	SUBMITTAL TYPE: DRFT	CFC	INF	ASSOCIATED SPECIFICATION	SUBMITTAL ACTION: A	B	C
(9)	(10)	(11)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(13)	(14)	(14)	(14)	(15)	(16)	(16)	(16)
8	1440-006B	0							X		Quality Control Certificates		X		02772P.1.04.B			X

REVIEW DISTRIBUTION

NAME	MS	NAME	MS	NAME	MS
(17)	(18)	(17)	(18)	(17)	(18)
Jim Jenkins, FDF, Eng., Approver	64				
Kwasi Badu-Tweneboah, GeoSyntec, Eng.	38				
Kathy Fisher, FDF, Procurement	64				
Gregg Johnson, FDF, Health and Safety	64				
Jim Turner, FDF, QA	64				
Chuck Van Arsdale, FDF, Eng.	64				

000047

RECEIVED
JUN 08 1999
KBT

-2739

NO COMMENTS: _____ COMMENTS: (PLEASE USE SPACE BELOW FOR COMMENTS OR INDICATE IF ATTACHMENTS) (19)

- Missing hydraulic conductivity (ASTM D 5887); bentonite fluid loss (D 5891); and bentonite free swell (D 589.0) test results at 1 per 40,000 ft² frequency.
- MQC sampling and testing at 1 per 40,000 ft² frequency intervals not met.

RECEIVED BY: [signature] (20) DATE: 6/28/99

(SIGN/DATE AND RETURN A COPY TO ECDC, MS 52-7)

SUBMITTAL TYPE: (BY SUPPLIER)
CFC - CERTIFIED FOR CONSTRUCTION
INF - INFORMATION/RECORD
DRFT - DRAFT/PRELIMINARY

SUBMITTAL ACTION CODE: (BY FDF)
A - Conforms to the Subcontract Requirements
B - Minor Comments - Incorporate and Resubmit
C - Revise and Resubmit (SEE COMMENTS)

FS-F-4955
Rev. 4: 04/77/1999

1999 FERNALD SHEAR TESTS
CLIENT: GSE LINING TECHNOLOGY

INTERNAL SHEAR OF GCL (CETCO)

Precision Labs

SAMPLE #	Control #	Roll #			Date of Arrival	Hydration Period	Consolidation Period	TESTING	REPORTING
1	38093	5012			28-May-99	May 28-June 4	June 4- June 6	June 7-8	9-Jun
2	38094	5056			28-May	May 30- June 6	June 6- June 8	June 9-10	11-Jun
3	38095	5100			28-May	June 1-June 8	June 8-June 10	June 11-12	13-Jun
4	38196	5232			1-Jun	June 3-June 10	June 10-June 12	June 13-14	15-Jun
5	38201	5358			1-Jun	June 5-June 12	June 12-June 14	June 15-16	17-Jun
6	38198	5320			1-Jun	June 7-June14	June 14-June 16	June 17-18	19-Jun
7	38197	5276			1-Jun	June 9-June 16	June 16-June 18	June 19-20	21-Jun
8	38200	5188			1-Jun	June 11-June 18	June 18-June 20	June 21-22	23-Jun
9	38199	5144			1-Jun	June 13-June 20	June 20-June 22	June 23-24	25-Jun

INTERFACE SHEAR OF GCL & 80 MIL HDT (CETCO/GSE)

VECTOR

SAMPLE #	GCL Control #	GCL Roll #	HDT Control #	HDT Roll #	Latest Date of Arrival	Hydration Period	Consolidation Period	TESTING	REPORTING
1		5027	STOP		28-May-99	May 28-June 4	June 4- June 6	June 7-8	9-Jun
2		5072		114101743	28-May	May 30- June 6	June 6- June 8	June 9-10	11-Jun
3		5115		114101753	28-May	June 1-June 8	June 8-June 10	June 11-12	13-Jun
4		5359		114101774	28-May	June 3-June 10	Jun10-June 12	June 13-14	15-Jun
5		5335		114101783	1-Jun	June 5-June 12	June 12-June 14	June 15-16	17-Jun
6		5291		114101794	1-Jun	June 7-June14	June 14-June 16	June 17-18	19-Jun
7		5247		114101806	1-Jun	June 9-June 16	June 16-June 18	June 19-20	21-Jun
8		5203		114101807	1-Jun	June 11-June 18	June 18-June 20	June 21-22	23-Jun
9		5159		114102816	1-Jun	June 13-June 20	June 20-June 22	June 23-24	25-Jun
10				114101734		June 15-June 22	June 22-June 24	June 24-25	26-Jun

ASTM D5321
Standard Test method for Determining the Coefficient of Soil & Geosynthetic or Geosynthetic & Geosynthetic Friction by Direct Shear Method

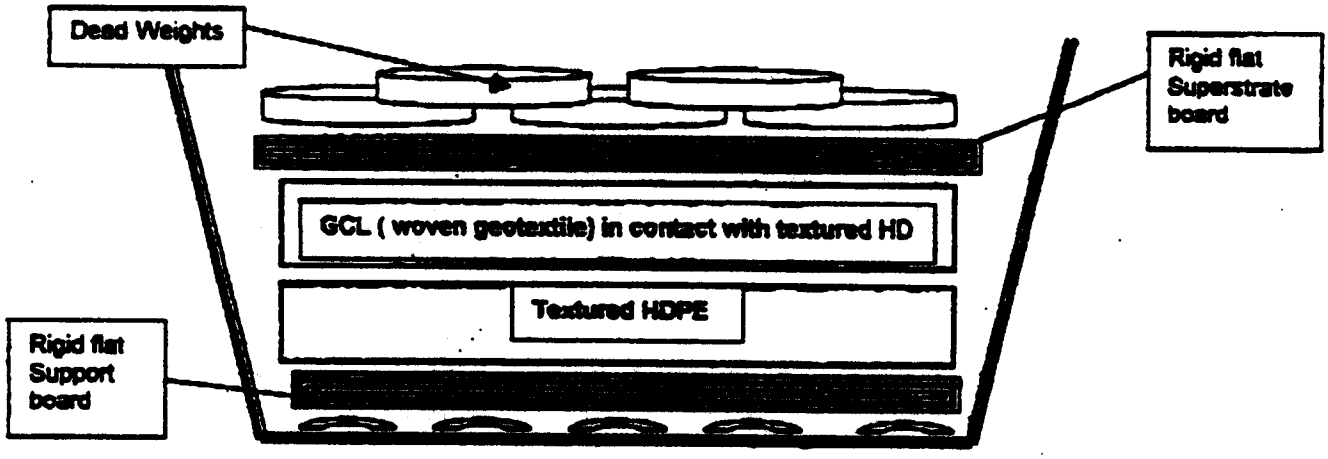
GCL & Textured HDPE

Sample Preparation

1. Each specimen of the HDPE is cut to approx. 14" x 20" dimensions
2. Each specimen of the GCL is cut to 20" x 20" dimensions & wrapped around the rasp board secured with staples.

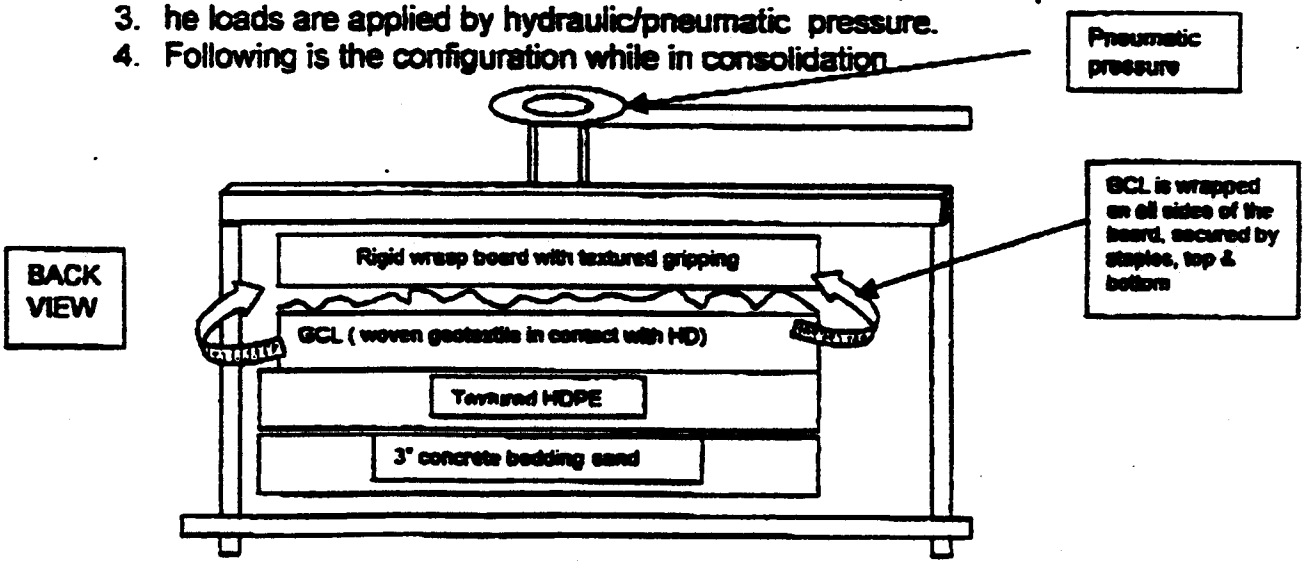
Hydration

1. Each set of specimen is hydrated for 7 days at 3 psi using dead weights. There will be three(3) sets for three loads.
2. Following is the configuration while in Hydration



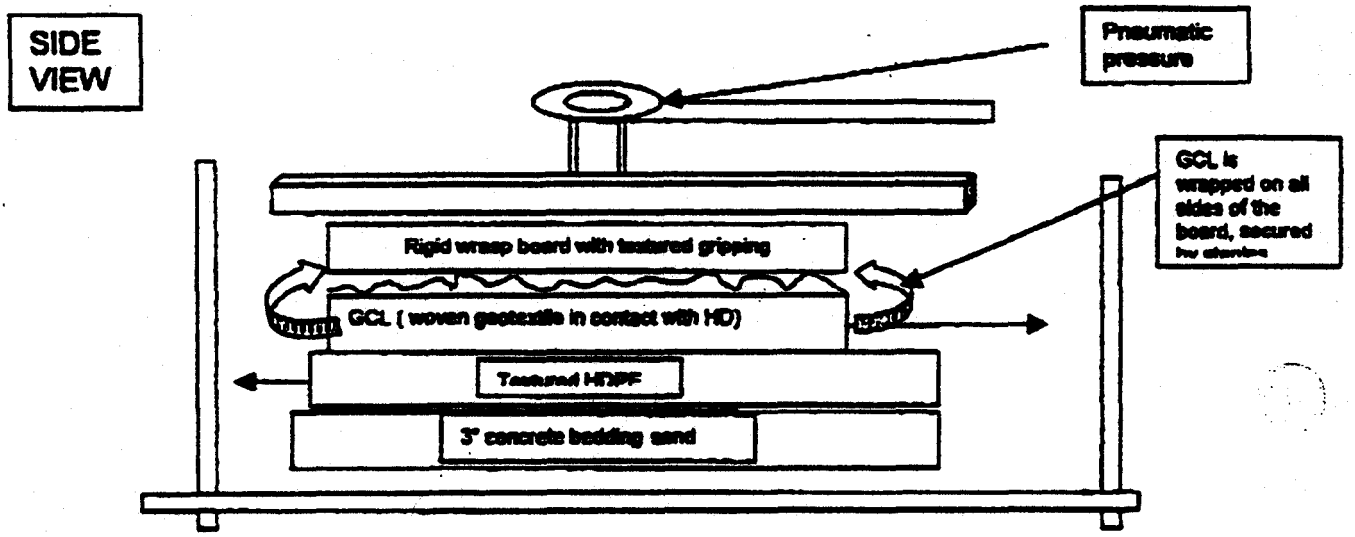
Consolidation

1. Hydrated Specimens are transferred to the shear box for consolidation. The activity is within 15 mins.
2. Each set of specimen is consolidated for 48 hrs at 5, 20 & 45 psi.
3. he loads are applied by hydraulic/pneumatic pressure.
4. Following is the configuration while in consolidation



Shear Test

1. Shear test is conducted at a rate of 0.004 in/min
2. The samples will be sheared at a minimum of 2 in. horizontal displacement.
3. Samples will be sheared under 5,20 & 45 psi.
4. The test specimens are flooded during testing.
5. Test are performed in general accordance with ASTM procedure D5321-92 Method A using Brainard-Kilman LG-112 direct shear machine with an effective area of 12in x 12 in.



Reporting

1. Graph of the horizontal displacement vs shear stress for each normal stress applied.
2. Normal Stress vs Shear Stress strength envelope graph, both peak & residual.
3. Resulting Friction Angle, for both peak & residual
4. Description of the failure interface.
5. Picture of the failure interface.

ASTM D5321
Standard Test method for Determining the Coefficient of Soil & Geosynthetic or Geosynthetic & Geosynthetic Friction by Direct Shear Method

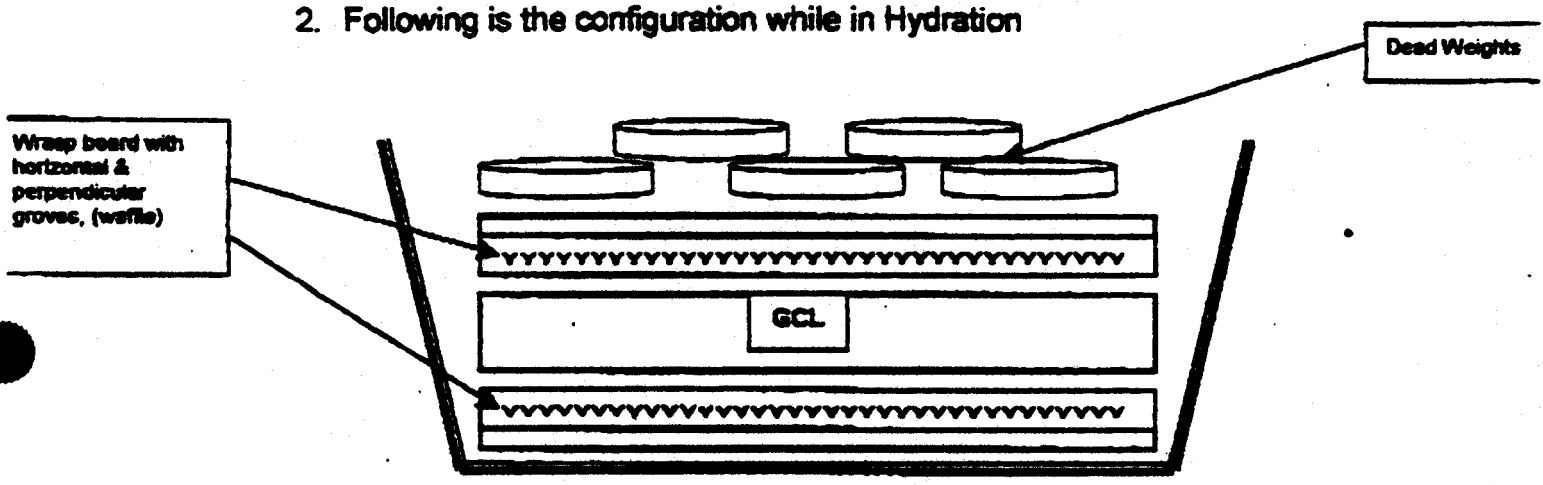
Internal Shear of GCL

Sample Preparation

1. Each specimen of the GCL is cut to 20" x 20".

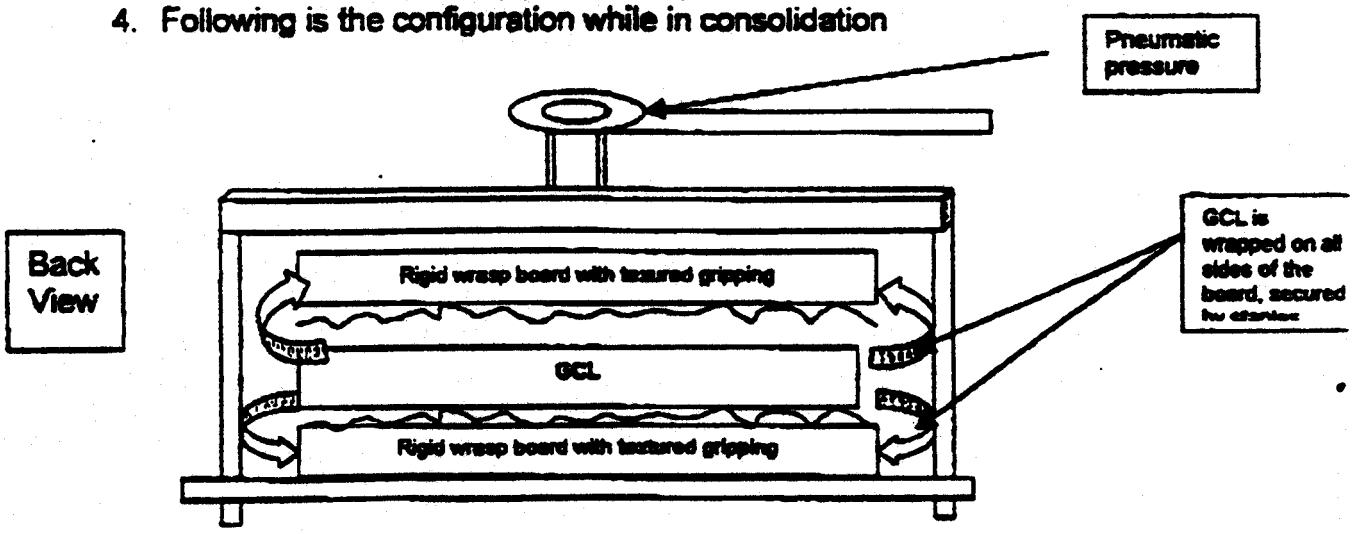
Hydration

1. Each set of specimen is hydrated for 7 days at 3 psi using dead weights. There will be three (3) sets for three loads.
2. Following is the configuration while in Hydration



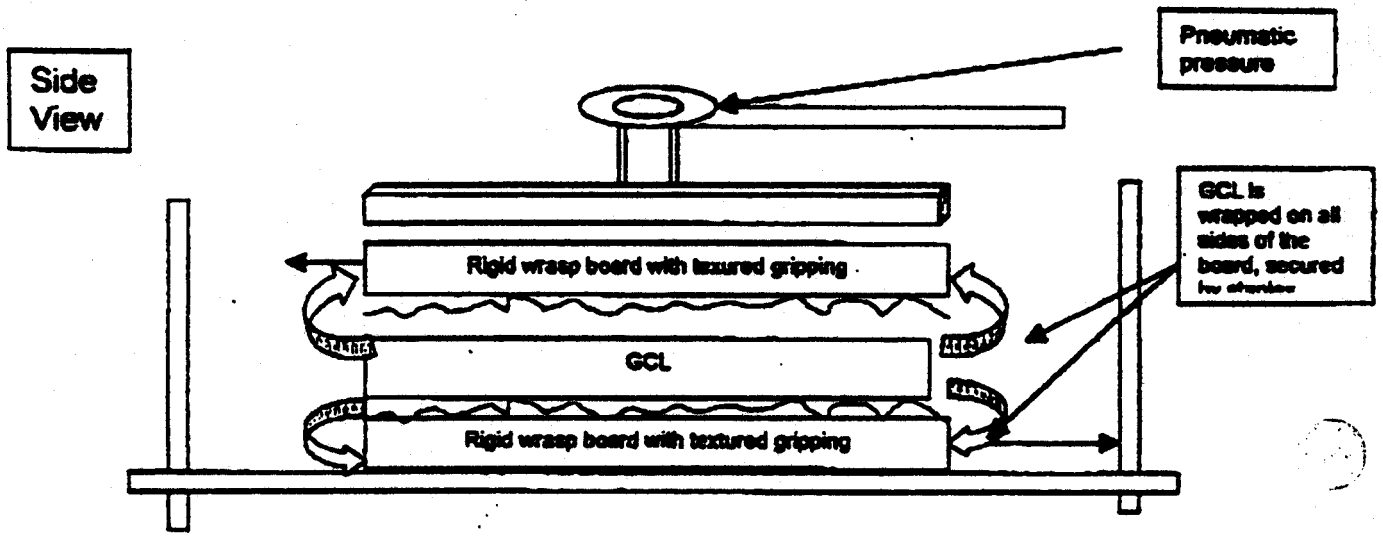
Consolidation

1. Hydrated Specimens are transferred to the shear box for consolidation. The activity is within 10 mins.
2. Each set of specimen is consolidated for 48 hrs at 5, 20 & 45 psi.
3. The loads are applied by pneumatic pressure.
4. Following is the configuration while in consolidation



Shear Test

1. Shear test is conducted at a rate of 0.004 in/min
2. The samples will sheared at aminimum of 2" horizontal displacement.
3. Samples will sheared under normal pressure of 5,20, & 45 psi.
4. The test specimens are flooded during testing.
5. Test are performed in general accordance with ASTM procedure D5321-92 Method A using Brainard-Kilman LG-112 direct shear machine with an effective area of 12in x 12 in.



Reporting

1. Graph of the horizontal displacement vs shear stress for each normal stress applied.
2. Normal Stress vs. Shear Stress strength envelope graph, both peak & residual.
3. Resulting Friction Angle, for both peak & residual.
4. Description of the failure condition
5. Picture of the failure condition.

CETCO
COLLOID ENVIRONMENTAL TECHNOLOGIES COMPANY
P.O. Box 428 • Lovell, Wyoming 82431
(307) 548-6521 • Fax (307) 548-6413

-- 2739

Date: 1-Jun
PO: 2292-000-OD Order # 6761S0
Order #: 108309

Mr. Eric Reed,
GSE Lining Technology, Inc.
19103 Gundle Road
Houston, TX. 77073
800-435-2008

Dear Mr. Eric Reed,

Please find enclosed the MQA/MQC Data Package for BENTOMAT ST shipments to GSE Lining Technology, Inc. . These shipments left our CETCO - Lovell, Wy. plant on PRESCAN .

If you have any questions regarding the enclosed QA/QC information, please contact Mr. Moses Briseno @ 800-322-1149 (Ext: 421).

Sincerely,

Noe Garcia
Quality Assurance

000053

BENTOMAT ST

MANUFACTURING
QA / QC DATA PACKAGE

PROJECT NAME: Fluor Daniel Fernald Dept. Of Energy

CUSTOMER P.O.: 2292-000-OD Order # 6761S0

JOB NUMBER:

PREPARED FOR: GSE Lining Technology, Inc.
19103 Gundle Road
Houston, TX. 77073

Telephone # : 800-435-2008

PREPARED BY:

Noe Garcia
Quality Assurance
CETCO
P.O. Box 428
92 Hwy. 37
Lovell, Wy. 82431

Telephone #: 800-322-1149 (Ext. 423)
Fax #: (307)548-6927, (307)548-6413
E-Mail: ngarc@cetco.com

BENTOMAT ST

DAILY MANUFACTURING
QA / QC DATA

FOR ALL GCL MANUFACTURED ON:

Project Name:	Fluor Daniel Fernald Dept. Of Energy
Prepared For:	GSE Lining Technology, Inc.
Job Number:	
Customer PO:	2292-000-OD Order # 6761S0
Order Number:	108309
Ship Date:	PRESCAN

CONTENTS:

1. DAILY GCL PRODUCTION CERTIFICATION
2. NEEDLE DETECTION CERTIFICATION
3. BENTONITE CLAY CERTIFICATION
4. WOVEN GEOTEXTILE MANUFACTURER'S CERTIFICATION
5. NON-WOVEN GEOTEXTILE MANUFACTURER'S CERTIFICATION
6. GCL MANUFACTURING CERTIFICATION AND TEST RESULTS
7. GCL MQA TRACKING FORM

DAILY BENTOMAT ST PRODUCTION PRODUCTION CERTIFICATION

BENTOMAT ST
MANUFACTURING CERTIFICATION

Project Name:	Fluor Daniel Fernald Dept. Of Energy
Prepared For:	GSE Lining Technology, Inc.
Job Number:	
Customer PO:	2292-000-OD Order # 6761S0
Order Number:	108309
Ship Date:	PRESCAN

Colloid Environmental Technologies Company (CETCO) hereby affirms and certifies that all of the BENTOMAT ST manufactured in this lot achieves the physical and chemical criteria listed on the attached analysis sheet.

Steve Wilkerson
Production Coordinator

Subscribed and sworn to before me this 1st day of June 1999

A. Christine Somer
Notary-Public

A. CHRISTINE SOMER - Notary Public
County of Big Horn
State of Wyoming
My Commission Expires 8-22-2002

NEEDLE DETECTION CERTIFICATION

CERTIFICATION STATEMENT

Project Name:	Fluor Daniel Fernald Dept. Of Energy
Prepared For:	GSE Lining Technology, Inc.
Job Number:	
Customer PO:	2292-000-OD Order # 6761S0
Order Number:	108309
Ship Date:	PRESCAN

This statement is to certify that all components of the BENTOMAT ST manufactured for the above project have been inspected continually for the presence of broken needles through the use of a magnetic removal system.

COLLOID ENVIRONMENTAL TECHNOLOGIES CO. (CETCO)

Subscribed and sworn to before me this 1st day of June 19 99.

A. Christine Somer
NOTARY PUBLIC

A. CHRISTINE SOMER - Notary Public
County of Big Horn
State of Wyoming
My Commission Expires 8-22-2002

BENTONITE CLAY CERTIFICATIONS

TECHNICAL DATA SHEET

ORIGIN INFORMATION

BENTONITE

Manufacturer: **Colloid Environmental Technologies Co.**

PRODUCTION

Facility: **Colloid Environmental Technologies Co.**
92 HWY. 37
Lovell, WY 82431

Contact: Jay Bischoff (800)-322-1159

Brand Name: CG 50

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: **GSE Lining Technology, Inc.** DATE: **5/25/99**

ATTN: **Mr. Eric Reed,**

Dear Customer:
The BENTONITE that is used to produce our GCL is **CG 50** from CETCO, Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **052599B** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ROLL # Daily Results ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**27.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**14.4**
Moisture	ASTM D 2216	12.0 % (MAX)	**7.6**
Passing 200 Mesh	ASTM D 421	1 % (Max)	**0.8**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: **RP, SF, MG.**

Approved By: **Noe Garcia**

In any correspondence regarding this shipment, please refer to our Order Numbers listed below.
108309

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: GSE Lining Technology, Inc. DATE: 5/25/99

ATTN: Mr. Eric Reed,

Dear Customer:
The BENTONITE that is used to produce our GCL is CG 50 from CETCO, Order Number See Below

A sample of the CG 50 was tested from Lot Number 052599C and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ROLL # Daily Results ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	0
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	26.0
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	16.0
Moisture	ASTM D 2216	12.0 % (MAX)	8.0
Passing 200 Mesh	ASTM D 421	1 % (Max)	0.3

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: RP, SF, MG.

Approved By: Noe Garcia

In any correspondence regarding this shipment, please refer to our Order Numbers listed below.
108309

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: GSE Lining Technology, Inc. DATE: 5/25/99

ATTN: Mr. Eric Reed,

Dear Customer:
The BENTONITE that is used to produce our GCL is CG 50 from CETCO, Order Number See Below

A sample of the CG 50 was tested from Lot Number 052599D and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ROLL # Daily Results ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	0
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	27.0
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	15.6
Moisture	ASTM D 2216	12.0 % (MAX)	8.6
Passing 200 Mesh	ASTM D 421	1 % (Max)	0.4

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures.
Product made in the U.S.A.

Tests Conducted By: RP, SF, MG.

Approved By: Noe Garcia

In any correspondence regarding this shipment, please refer to our Order Numbers listed below.
108309

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: GSE Lining Technology, Inc. DATE: 5/26/99

ATTN: Mr. Eric Reed,

Dear Customer:
The BENTONITE that is used to produce our GCL is CG 50 from CETCO, Order Number See Below

A sample of the CG 50 was tested from Lot Number 052699A and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ROLL # Daily Results ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	0
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	29.0
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	14.6
Moisture	ASTM D 2216	12.0 % (MAX)	9.4
Passing 200 Mesh	ASTM D 421	1 % (Max)	0.8

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures.
Product made in the U.S.A.

Tests Conducted By: RP, SF, MG.

Approved By: Noe Garcia

In any correspondence regarding this shipment, please refer to our Order Numbers listed below.
108309

2739

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: GSE Lining Technology, Inc. DATE: 5/26/99

ATTN: Mr. Eric Reed;

Dear Customer:
The BENTONITE that is used to produce our GCL is CG 50 from CETCO, Order Number See Below

A sample of the CG 50 was tested from Lot Number 052699B and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ROLL # Daily Results ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	0
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	27.0
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	14.6
Moisture	ASTM D 2216	12.0 % (MAX)	8.8
Passing 200 Mesh	ASTM D 421	1 % (Max)	0.6

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures.
Product made in the U.S.A.

Tests Conducted By: RP, SF, MG.

Approved By: Noe Garcia

In any correspondence regarding this shipment, please refer to our Order Numbers listed below.
108309

F-2739

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: GSE Lining Technology, Inc. DATE: 5/26/99

ATTN: Mr. Eric Reed,

Dear Customer:
The BENTONITE that is used to produce our GCL is CG 50 from CETCO, Order Number See Below

A sample of the CG 50 was tested from Lot Number 052699C and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ROLL # Daily Results ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	0
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	26.0
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	15.8
Moisture	ASTM D 2216	12.0 % (MAX)	7.8
Passing 200 Mesh	ASTM D 421	1 % (Max)	0.6

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures.
Product made in the U.S.A.

Tests Conducted By: RP, SF, MG.

Approved By: Noe Garcia

In any correspondence regarding this shipment, please refer to our Order Numbers listed below.
108309

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: **GSE Lining Technology, Inc.** DATE: **5/26/99**

ATTN: **Mr. Eric Reed,**

Dear Customer:
The BENTONITE that is used to produce our GCL is **CG 50** from CETCO, Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **052699D** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ROLL # Daily Results ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**25.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**15.4**
Moisture	ASTM D 2216	12.0 % (MAX)	**8.4**
Passing 200 Mesh	ASTM D 421	1 % (Max)	**0.5**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures.
Product made in the U.S.A.

Tests Conducted By: **RP, SF, MG.**

Approved By: **Noe Garcia**

In any correspondence regarding this shipment, please refer to our Order Numbers listed below.
108309

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: GSE Lining Technology, Inc. DATE: 5/27/99

ATTN: Mr. Eric Reed,

Dear Customer:
The BENTONITE that is used to produce our GCL is CG 50 from CETCO, Order Number See Below

A sample of the CG 50 was tested from Lot Number 052799A and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ROLL # Daily Results ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	0
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	27.0
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	14.6
Moisture	ASTM D 2216	12.0 % (MAX)	7.6
Passing 200 Mesh	ASTM D 421	1 % (Max)	0.6

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: RP, SF, MG.

Approved By: Noe Garcia

In any correspondence regarding this shipment, please refer to our Order Numbers listed below.
108309

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: **GSE Lining Technology, Inc.** DATE: **5/27/99**

ATTN: **Mr. Eric Reed,**

Dear Customer:
The BENTONITE that is used to produce our GCL is **CG 50** from CETCO, Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **052799B** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ROLL # Daily Results ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**26.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**16.2**
Moisture	ASTM D 2216	12.0 % (MAX)	**8.0**
Passing 200 Mesh	ASTM D 421	1 % (Max)	**0.8**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: **RP, SF, MG.**

Approved By: **Noe Garcia**

In any correspondence regarding this shipment, please refer to our Order Numbers listed below.
108309

WOVEN GEOTEXTILE MANUFACTURER'S CERTIFICATION

TECHNICAL DATA SHEET

ORIGIN INFORMATION

WOVEN GEOTEXTILE

Manufacturer: **Synthetic Industries Inc.**

PRODUCTION

Facility: **Synthetic Industries**
4019 Industry Drive
Chattanooga, TN. 37416

Contact: Randy Johnson

Brand Name: 82 Tex.

SYNTHETIC INDUSTRIES

Geosynthetic Products Division

ISO 9002 CERTIFIED World Class Quality

2739

May 21, 1999

American Colloid/WY-CETCO
P.O. Box 428
Lovell, WY Plant
Lovell, WY 82431

RE: Bill Of Lading #187146
PO #76574

This is to certify that Style 82 Tex, a woven polypropylene fabric produced by Synthetic Industries, will meet the following certifiable minimum average values when tested in accordance with the proper ASTM test methods. A minimum average roll value is calculated as the mean minus two standard deviations, yielding a 97.5 percent confidence level.

PHYSICAL PROPERTY	TEST METHOD	U.S. UNITS	S.I. UNITS
MASS PER UNIT AREA	ASTM D-5261	3.2 oz/yd^2	105 g/m^2
THICKNESS	ASTM D-5261	16 mils	0.4 mm
TENSILE STRENGTH	ASTM D-4632	135 X 135 LBS	600 X 600 N
ELONGATION	ASTM D-4632	15 X 15 %	
PUNCTURE STRENGTH	ASTM D-4833	70 LBS	310 N
MULLEN BURST	ASTM D-3786	265 PSI	1820 kPa
TRAPEZOIDAL TEAR	ASTM D-4533	45 X 45 LBS	200 X 200 N
A.O.S.	ASTM D-4751	40 US STD SIEVE	0.425 mm
PERMITTIVITY	ASTM D-4491	0.08 SEC^{-1}	
PERMEABILITY	ASTM D-4491	0.004 cm/sec	
UV RESISTANCE	ASTM D-4355	90 %	

(Strength Retained After 150 Hours Xenon Arc Weatherometer)

Sincerely,

Warren Sickler
Technical Manager, Woven Geotextile Products

Seller makes no warranty, express or implied, concerning the product furnished hereunder other than at the time of delivery it shall be of the quality and specifications stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND, TO THE EXTENT THAT IT IS CONTRARY TO THE FOREGOING SENTENCE ANY IMPLIED WARRANTY OF MERCHANTABILITY IS EXPRESSLY EXCLUDED. Any recommendations made by the Seller concerning uses or applications of said product are believed reliable and Seller makes no warranty of results to be obtained. If the product does not meet Synthetic Industries current published specifications, and the Customer gives notice to Synthetic Industries before installing the product, then Synthetic Industries will replace the product without charge or refund the purchase price. This Data Sheet supersedes all previous Data Sheets for this style and is subject to change without notice. The effective date for this product data is 04/19/96.

Synthetic Industries, Inc.
4019 Industry Drive • Post Office Box 22788 • Chattanooga, Tennessee • 37422 • USA
Telephone • 423-899-0444 • Fax • 423-899-7619 • 1-800-621-0444

TECHNICAL DATA SHEET

ORIGIN INFORMATION

NON-WOVEN GEOTEXTILE

Manufacturer: **Synthetic Industries Inc.**

PRODUCTION
FACILITY: **Synthetic Industries**
4019 Industry Drive
Chattanooga, TN. 37416

CONTACT: Sid Weiser

BRAND NAME: Geotex 650

SYNTHETIC INDUSTRIES

F-2739

Geosynthetic Products Division

May 25, 1999

American Colliod/WY-Cetco
Lovell WY Plant
Noe Garcia
PO Box 428
Lovell WY 82431
PO#76574
BOL#627367

This is to certify that Product GEOTEX™ 650, a nonwoven polypropylene geotextile produced by Synthetic Industries will meet the following certifiable minimum average roll values when tested in accordance with the proper ASTM test methods. A minimum average roll value is calculated as the mean minus two standard deviations, yielding a 97.5 percent confidence level.

PHYSICAL PROPERTY	TEST METHOD	U.S. UNITS
Weight	ASTM D-5261	6.0 oz/yd^2
Thickness	ASTM D-5199	120 mils
Tensile Strength	ASTM D-4632	45 lbs
Elongation	ASTM D-4632	90 %
Trapezoidal Tear	ASTM D-4533	25 lbs
Mullen Burst	ASTM D-3786	190 psi
Puncture Strength	ASTM D-4833	50 lbs

Sincerely,

Sid Weiser
Technical Manager
Performance Nonwovens Division

Seller makes no warranty, express or implied, concerning the product furnished hereunder other than at the time of delivery it shall be of the quality and specifications stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND, TO THE EXTENT THAT IT IS CONTRARY TO THE FOREGOING SENTENCE ANY IMPLIED WARRANTY OF MERCHANTABILITY IS EXPRESSLY EXCLUDED. Any recommendations made by the Seller concerning uses or applications of said product are believed reliable and Seller makes no warranty of results to be obtained. If the product does not meet Synthetic Industries current published specifications, and the Customer gives notice to Synthetic Industries before installing the product, then Synthetic Industries will replace the product without charge or refund the purchase price. This Data Sheet supersedes all previous Data Sheets for this style and is subject to change without notice. The effective date for this product data is 02/16/97

Synthetic Industries, Inc.
4019 Industry Drive • Post Office Box 22788 • Chattanooga, Tennessee • 37422 • USA
Telephone • 423-899-0444 • Fax • 423-899-7619 • 1-800-621-0444

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5/25/99

Page 1

Synthetic Industries

Individual Roll Data
Bill of Lading 627367

Roll #	Style	Batch	Weight	Thick	Tensile		Elongation		T.Tear		Burst	Punct
					MD	XMD	MD	XMD	MD	XMD		
			Osy	mils	lbs	lbs	%	%	lbs	lbs	psi	lbs
			D5261	D5199	D4632	D4632	D4632	D4632	D4533	D4533	D3786	D4833
6822320A	650	80163	6	123	54		126		25		190	
6822497A	650	80163	7	140	72	135	125	122	40	60	204	66

Bill Weiss

Synthetic Industries' current standard manufacturing quality control (MQC) testing frequency for GEOTEX nonwoven geotextiles is one (1) test per 90,000 sf (8,360 sm) for index properties (mass per unit area, thickness, grab tensile and elongation, trapezoidal tear, mullen burst and puncture resistance) for styles heavier than 601 and one (1) test per 162,000 sf (15,000 sm) for index properties for style 601 and lighter. Although we strive to test our nonwoven geotextiles for apparent opening size (AOS) and Permittivity/permeability/water flow rate approximately once every 540,000 sf (50,160 sm), the actual frequency of testing for performance properties will vary depending upon production schedules, product availability, customer requirements, job specifications or other agreements arranged with Synthetic Industries prior to the time of purchase. If additional testing is needed to meet higher frequencies required by the project specifications, it is the purchaser's responsibility to notify Synthetic Industries and ask for assistance in calculating the costs for the additional tests.

Once rolls of nonwoven geotextiles are produced, inspected and the test results from the frequency stated above indicates that materials produced during the production run meets our published minimum average roll values, approved rolls are shipped for storage until an order requires the material to be shipped. Since rolls are loaded at the warehouse independent of production sequence test results listed above may include date from rolls which were not shipped. However, the date provided is from the same production run as the rolls actually shipped on this bill of lading.

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SYNTHETIC INDUSTRIES

2739

Geosynthetic Products Division

May 25, 1999

American Colliod/WY-Cetco
Lovell WY Plant
Noe Garcia
PO Box 428
Lovell WY 82431
PO#76574
BOL#627366

This is to certify that Product GEOTEX™ 650, a nonwoven polypropylene geotextile produced by Synthetic Industries will meet the following certifiable minimum average roll values when tested in accordance with the proper ASTM test methods. A minimum average roll value is calculated as the mean minus two standard deviations, yielding a 97.5 percent confidence level.

PHYSICAL PROPERTY	TEST METHOD	U.S. UNITS
Weight	ASTM D-5261	6.0 oz/yd^2
Thickness	ASTM D-5199	120 mils
Tensile Strength	ASTM D-4632	45 lbs
Elongation	ASTM D-4632	90 %
Trapezoidal Tear	ASTM D-4533	25 lbs
Mullen Burst	ASTM D-3786	190 psi
Puncture Strength	ASTM D-4833	50 lbs

Sincerely,

Sid Weiser
Technical Manager
Performance Nonwovens Division

Seller makes no warranty, express or implied, concerning the product furnished hereunder other than at the time of delivery it shall be of the quality and specifications stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND, TO THE EXTENT THAT IT IS CONTRARY TO THE FOREGOING SENTENCE ANY IMPLIED WARRANTY OF MERCHANTABILITY IS EXPRESSLY EXCLUDED. Any recommendations made by the Seller concerning uses or applications of said product are believed reliable and Seller makes no warranty of results to be obtained. If the product does not meet Synthetic Industries current published specifications, and the Customer gives notice to Synthetic Industries before installing the product, then Synthetic Industries will replace the product without charge or refund the purchase price. This Data Sheet supersedes all previous Data Sheets for this style and is subject to change without notice. The effective date for this product data is 02/1997

Synthetic Industries, Inc.
4019 Industry Drive • Post Office Box 22788 • Chattanooga, Tennessee • 37422 • USA
Telephone • 423-899-0444 • Fax • 423-899-7019 • 1-800-621-0444

5/25/99

Synthetic Industries

Individual Roll Data
Bill of Lading 627366

Roll #	Style	Batch	Weight	Thick	Tensile		Elongation		T.Tear		Burst	Punct
					MD	XMD	MD	XMD	MD	XMD		
			Osy	mils	lbs	lbs	%	%	lbs	lbs	psi	lbs
			D5261	D5199	D4632	D4632	D4632	D4632	D4533	D4533	D3786	D4833
B822500A	650	80163	6.3	138	58	88	117	125	29	33	236	58
B822503A	650	80163	7	152	60	121	125	117	36		246	63
B822506A	650	80163	6.6	141	57	96	128	122	35	36	229	58
B822509A	650	80163	7.4	150	65	132	126	123	43		240	69

Fred Wieser

Synthetic Industries' current standard manufacturing quality control (MQC) testing frequency for GEOTEX nonwoven geotextiles is one (1) test per 90,000 sf (8,360 sm) for index properties (mass per unit area, thickness, grab tensile and elongation, trapezoidal tear, mullen burst and puncture resistance) for styles heavier than 601 and one (1) test per 162,000 sf (15,000 sm) for index properties for style 601 and lighter. Although we strive to test our nonwoven geotextiles for apparent opening size (AOS) and Permittivity/permeability/water flow rate approximately once every 540,000 sf (50,160 sm), the actual frequency of testing for performance properties will vary depending upon production schedules, product availability, customer requirements, job specifications or other agreements arranged with Synthetic Industries prior to the time of purchase. If additional testing is needed to meet higher frequencies required by the project specifications, it is the purchasers responsibility to notify Synthetic Industries and ask for assistance in calculating the costs for the additional tests.

Once rolls of nonwoven geotextiles are produced, inspected and the test results from the frequency stated above indicates that materials produced during the production run meets our published minimum average roll values, approved rolls are shipped for storage until an order requires the material to be shipped. Since rolls are loaded at the warehouse independent of production sequence test results listed above may include data from rolls which were not shipped. However, the data provided is from the same production run as the rolls actually shipped on this bill of lading.

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SYNTHETIC INDUSTRIES

2739

Geosynthetic Products Division

May 25, 1999

American Colliod/WY-Cetco
Lovell WY Plant
Noe Garcia
PO Box 428
Lovell WY 82431
PO#76572
BOL#627369

This is to certify that Product GEOTEX™ 650, a nonwoven polypropylene geotextile produced by Synthetic Industries will meet the following certifiable minimum average roll values when tested in accordance with the proper ASTM test methods. A minimum average roll value is calculated as the mean minus two standard deviations, yielding a 97.5 percent confidence level.

PHYSICAL PROPERTY	TEST METHOD	U.S. UNITS
Weight	ASTM D-5261	6.0 oz/yd^2
Thickness	ASTM D-5199	120 mils
Tensile Strength	ASTM D-4632	45 lbs
Elongation	ASTM D-4632	90 %
Trapezoidal Tear	ASTM D-4533	25 lbs
Mullen Burst	ASTM D-3786	190 psi
Puncture Strength	ASTM D-4833	50 lbs

Sincerely,

Sid Weiser

Sid Weiser
Technical Manager
Performance Nonwovens Division

Seller makes no warranty, express or implied, concerning the product furnished hereunder other than at the time of delivery it shall be of the quality and specifications stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND, TO THE EXTENT THAT IT IS CONTRARY TO THE FOREGOING SENTENCE ANY IMPLIED WARRANTY OF MERCHANTABILITY IS EXPRESSLY EXCLUDED. Any recommendations made by the Seller concerning uses or maintenance of sale product are believed reliable and Seller makes no warranty of results to be obtained. If the product does not meet Synthetic Industries current published specifications, and the Customer gives notice to Synthetic Industries before installing the product, then Synthetic Industries will replace the product without charge or refund the purchase price. This Data Sheet supersedes all previous Data Sheets for this style and is subject to change without notice. The effective date for this product data is 02/1997

Synthetic Industries, Inc.
4019 Industry Drive • Post Office Box 22788 • Chattanooga, Tennessee • 37422 • USA
Telephone • 423-899-0444 • Fax • 423-899-7619 • 1-800-621-0444

5/25/99

Synthetic Industries

Page 1

Individual Roll Data
Bill of Lading 627369

Roll #	Style	Batch	Weight	Thick	Tensile		Elongation		T.Tear		Burst	Punct
					MD	XMD	MD	XMD	MD	XMD		
			Oay	mils	lbs	lbs	%	%	lbs	bs	psi	lbs
			D5261	D5199	D4632	D4632	D4632	D4632	D4533	D4533	D3786	D4833
B822493A	650	80183	7	139	63	131	117	115	37	45	277	101

Bill Weaver

Synthetic Industries' current standard manufacturing quality control (MQC) testing frequency for GEOTEX nonwoven geotextiles is one (1) test per 90,000 sf (8,360 sm) for index properties (mass per unit area, thickness, grab tensile and elongation, trapezoidal tear, mullen burst and puncture resistance) for styles heavier than 601 and one (1) test per 182,000 sf (16,000 sm) for index properties for style 601 and lighter. Although we strive to test our nonwoven geotextiles for apparent opening size (AOS) and Permittivity/permeability/water flow rate approximately once every 540,000 sf (50,160 sm), the actual frequency of testing for performance properties will vary depending upon production schedules, product availability, customer requirements, job specifications or other agreements arranged with Synthetic Industries prior to the time of purchase. If additional testing is needed to meet higher frequencies required by the project specifications, it is the purchaser's responsibility to notify Synthetic Industries and ask for assistance in calculating the costs for the additional tests.

Once rolls of nonwoven geotextiles are produced, inspected and the test results from the frequency stated above indicates that materials produced during the production run meets our published minimum average roll values, approved rolls are shipped for storage until an order requires the material to be shipped. Since rolls are loaded at the warehouse independent of production sequence test results listed above may include data from rolls which were not shipped. However, the data provided is from the same production run as the rolls actually shipped on this bill of lading.

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SYNTHETIC INDUSTRIES

=- 2739

Geosynthetic Products Division

May 7, 1999

Cetco / Fairmount
Cynthia Willix
PO Box 88
Fairmount GA 30139
BoL: 627098 PO 76562

This is to certify that Product GEOTEX™ 650, a nonwoven polypropylene geotextile produced by Synthetic Industries will meet the following certifiable minimum average roll values when tested in accordance with the proper ASTM test methods. A minimum average roll value is calculated as the mean minus two standard deviations, yielding a 97.5 percent confidence level.

PHYSICAL PROPERTY	TEST METHOD	U.S. UNITS
Weight	ASTM D-5261	6.0 oz/yd²
Thickness	ASTM D-5199	120 mils
Tensile Strength	ASTM D-4632	45 lbs
Elongation	ASTM D-4632	90 %
Trapezoidal Tear	ASTM D-4533	25 lbs
Mullen Burst	ASTM D-3786	190 psi
Puncture Strength	ASTM D-4833	50 lbs

Sincerely,

Sid Weiser
Technical Manager
Performance Nonwovens Division

Seller makes no warranty, express or implied, concerning the product furnished hereunder other than at the time of delivery it shall be of the quality and specifications stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND, TO THE EXTENT THAT IT IS CONTRARY TO THE FOREGOING SENTENCE ANY IMPLIED WARRANTY OF MERCHANTABILITY IS EXPRESSLY EXCLUDED. Any recommendations made by the Seller concerning uses or applications of said product are believed reliable and Seller makes no warranty of results to be obtained. If the product does not meet Synthetic Industries current published specifications, and the Customer gives notice to Synthetic Industries before installing the product, then Synthetic Industries will replace the product without charge or refund the purchase price. This Data Sheet supersedes all previous Data Sheets for this style and is subject to change without notice. The effective date for this product data is 02/18/97

Synthetic Industries, Inc.
4019 Industry Drive • Post Office Box 22788 • Chattanooga, Tennessee • 37422 • USA
Telephone • 423-899-0444 • Fax • 423-899-7619 • 1-800-621-0444

Synth[illegible]ndustries

Individu[illegible] Roll Data

Bill of Lading 627098

Roll #	Style	Batch	Weight	Thick	Tensile		Elongation		T.Tear		Burst	Punct
			Osy	mils	lbs	lbs	%	%	lbs	lbs	psi	lbs
			D5261	D5199	D4632	D4632	D4632	D4632	D4533	D4533	D3786	D4833
K901991A	650	90031	7 4	160	97	178	116	135	40	47	240	65
5164343A	650	50981	6 1	120	80	106	100	117	47		249	79
5164354A	650	50981	6 6	130	72	134	99	125	44	37	246	69

Bid Weiss

000082

Synthetic Industries' current standard manufacturing quality control (MQC) testing frequency for GEOTEX nonwoven geotextiles is one (1) test per 90,000 sf (8,360 sm) for index properties (mass per unit area, thickness, grab tensile and elongation, trapezoidal tear, mullen burst and puncture resistance) for styles heavier than 601 and one (1) test per 162,000 sf (15,000 sm) for index properties for style 601 and lighter. Although we strive to test our nonwoven geotextiles for apparent opening size (AOS) and Permittivity/permeability/water flow rate approximately once every 540,000 sf (50,160 sm), the actual frequency of testing for performance properties will vary depending upon production schedules, product availability, customer requirements, job specifications or other agreements arranged with Synthetic Industries prior to the time of purchase. If additional testing is needed to meet higher frequencies required by the project specifications, it is the purchaser's responsibility to notify Synthetic Industries and ask for assistance in calculating the costs for the additional tests.

Once rolls of nonwoven geotextiles are produced, inspected and the test results from the frequency stated above indicates that materials produced during the production run meets our published minimum average roll values, approved rolls are shipped for storage until an order requires the material to be shipped Since rolls are loaded at the warehouse independent of production sequence test results listed above may include date from rolls which were not shipped However, the date provided is from the same production run as the rolls actually shipped on this bill of lading

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SYNTHETIC INDUSTRIES

-2739

Geosynthetic Products Division

May 7, 1999

Cetco / Fairmount
Cynthia Willix
PO Box 88
Fairmount GA 30139
BoL; 627144 PO 76562

This is to certify that Product GEOTEX™ 650, a nonwoven polypropylene geotextile produced by Synthetic Industries will meet the following certifiable minimum average roll values when tested in accordance with the proper ASTM test methods. A minimum average roll value is calculated as the mean minus two standard deviations, yielding a 97.5 percent confidence level.

PHYSICAL PROPERTY	TEST METHOD	U.S. UNITS
Weight	ASTM D-5261	6.0 oz/yd^2
Thickness	ASTM D-5199	120 mils
Tensile Strength	ASTM D-4632	45 lbs
Elongation	ASTM D-4632	90 %
Trapezoidal Tear	ASTM D-4533	25 lbs
Mullen Burst	ASTM D-3786	190 psi
Puncture Strength	ASTM D-4833	50 lbs

Sincerely,

Sid Weiser
Technical Manager
Performance Nonwovens Division

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Synthetic Industries, Inc.
4019 Industry Drive • Post Office Box 22788 • Chattanooga, Tennessee • 37422 • USA
Telephone • 423-899-0444 • Fax • 423-899-7619 • 1-800-621-0444

Individual Roll Data
Bill of Lading 627144

Roll #	Style	Batch	Weight	Thick	Tensile		Elongation		T.Tear		Burst	Punct
			Osy	mils	lbs	lbs	%	%	lbs	lbs	psi	lbs
			D5261	D5199	D4632	D4632	D4632	D4632	D4533	D4533	D3786	D4833
5164216A	650	50981	6.6	125	76		115		33	37	224	60
5164219A	650	50981	7.2	138	90	144	114	125	42	54	244	79
5164223A	650	50981	7.3	143	99	179	103	110	47	55	270	92

Synthetic Industries' current standard manufacturing quality control (MQC) testing frequency for GEOTEX nonwoven geotextiles is one (1) test per 90,000 sf (8,360 sm) for index properties (mass per unit area, thickness, grab tensile and elongation, trapezoidal tear, mullen burst and puncture resistance) for styles heavier than 601 and one (1) test per 162,000 sf (15,000 sm) for index properties for style 601 and lighter. Although we strive to test our nonwoven geotextiles for apparent opening size (AOS) and Permittivity/permeability/water flow rate approximately once every 540,000 sf (50,160 sm), the actual frequency of testing for performance properties will vary depending upon production schedules, product availability, customer requirements, job specifications or other agreements arranged with Synthetic Industries prior to the time of purchase. If additional testing is needed to meet higher frequencies required by the project specifications, it is the purchaser's responsibility to notify Synthetic Industries and ask for assistance in calculating the costs for the additional tests.

Once rolls of nonwoven geotextiles are produced, inspected and the test results from the frequency stated above indicates that materials produced during the production run meets our published minimum average roll values, approved rolls are shipped for storage until an order requires the material to be shipped. Since rolls are loaded at the warehouse independent of production sequence test results listed above may include date from rolls which were not shipped. However, the date provided is from the same production run as the rolls actually shipped on this bill of lading.

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SYNTHETIC INDUSTRIES

Geosynthetic Products Division

2739

May 20, 1999

American Colliod/WY-Cetco
Lovell WY Plant
Noe Garcia
PO Box 428
Lovell WY 82431
PO#76567
BOL#627245, 627247

This is to certify that Product GEOTEX™ 650, a nonwoven polypropylene geotextile produced by Synthetic Industries will meet the following certifiable minimum average roll values when tested in accordance with the proper ASTM test methods. A minimum average roll value is calculated as the mean minus two standard deviations, yielding a 97.5 percent confidence level.

PHYSICAL PROPERTY	TEST METHOD	U.S. UNITS
Weight	ASTM D-5261	6.0 oz/yd^2
Thickness	ASTM D-5199	120 mils
Tensile Strength	ASTM D 4632	45 lbs
Elongation	ASTM D-4632	90 %
Trapezoidal Tear	ASTM D-4533	25 lbs
Mullen Burst	ASTM D-3786	190 psi
Puncture Strength	ASTM D-4833	50 lbs

Sincerely,

Sid Weiser
Technical Manager
Performance Nonwovens Division

Seller makes no warranty, express or implied, concerning the product furnished hereunder other than at the time of delivery it shall be of the quality and specifications stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND, TO THE EXTENT THAT IT IS CONTRARY TO THE FOREGOING SENTENCE ANY IMPLIED WARRANTY OF MERCHANTABILITY IS EXPRESSLY EXCLUDED. Any recommendations made by the Seller concerning uses or applications of said product are believed reliable and Seller makes no warranty of results to be obtained. If the product does not meet Synthetic Industries current production specifications and the Customer gives notice to Synthetic Industries before installing the product, then Synthetic Industries will replace the product without charge or refund the purchase price. This Data Sheet supersedes all previous Data Sheets for this style and is subject to change without notice. The effective date for this product data is 03/1997

Synthetic Industries, Inc.
4019 Industry Drive • Post Office Box 22788 • Chattanooga, Tennessee • 37422 • USA
Telephone • 423-899-0444 • Fax • 423-899-7619 • 1-800-621-0444

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2739

5/21/99

Page 1

Synthetic Industries

Individual Roll Data
Bill of Lading 627245

Roll #	Style	Batch	Weight	Thick	Tensile		Elongation		T.Tear		Burst	Punct
					MD	XMD	MD	XMD	MD	XMD		
			Osy	mils	lbs	lbs	%	%	lbs	lbs	psi	lbs
			D5261	D5199	D4632	D4632	D4632	D4632	D4533	D4533	D3786	D4833
B822199A	650	80160	6.5	149	60	100	120	113	35	41	204	57
B822207A	650	30936	7.7	163	63	135	127	116	39	49	235	70
B822210A	650	80160	6.9	151	70	119	126	114	36	38	226	64

Synthetic Industries' current standard manufacturing quality control (MCC) testing frequency for GEOTEX nonwoven geotextiles is one (1) test per 90,000 sf (8,360 sm) for index properties (mass per unit area, thickness, grab tensile and elongation, trapezoidal tear, mullen burst and puncture resistance) for styles heavier than 601 and one (1) test per 162,000 sf (15,000 sm) for index properties for style 601 and lighter. Although we strive to test our nonwoven geotextiles for apparent opening size (AOS) and Permittivity/permeability/water flow rate approximately once every 540,000 sf (50,160 sm), the actual frequency of testing for performance properties will vary depending upon production schedules, product availability, customer requirements, job specifications or other agreements arranged with Synthetic Industries prior to the time of purchase. If additional testing is needed to meet higher frequencies required by the project specifications, it is the purchaser's responsibility to notify Synthetic Industries and ask for assistance in calculating the costs for the additional tests.

Once rolls of nonwoven geotextiles are produced, inspected and the test results from the frequency stated above indicates that materials produced during the production run meets our published minimum average roll values, approved rolls are shipped for storage until an order requires the material to be shipped. Since rolls are loaded at the warehouse independent of production sequence test results listed above may include date from rolls which were not shipped. However, the date provided is from the same production run as the rolls actually shipped on this bill of lading.

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SYNTHETIC INDUSTRIES

--2739

Geosynthetic Products Division

May 13, 1999

American Colliod/WY-Cetco
Lovell WY Plant
Noe Garcia
PO Box 428
Lovell WY 82431
BOL#627205

This is to certify that Product GEOTEX™ 650, a nonwoven polypropylene geotextile produced by Synthetic Industries will meet the following certifiable minimum average roll values when tested in accordance with the proper ASTM test methods. A minimum average roll value is calculated as the mean minus two standard deviations, yielding a 97.5 percent confidence level

PHYSICAL PROPERTY	TEST METHOD	U.S. UNITS
Weight	ASTM D-5261	6.0 oz/yd²
Thickness	ASTM D-5199	120 mils
Tensile Strength	ASTM D-4632	45 lbs
Elongation	ASTM D-4632	90 %
Trapezoidal Tear	ASTM D-4533	25 lbs
Mullen Burst	ASTM D-3786	190 psi
Puncture Strength	ASTM D-4833	50 lbs

Sincerely,

Sid Weiser
Technical Manager
Performance Nonwovens Division

Seller makes no warranty, express or implied, concerning the product furnished hereunder other than at the time of delivery it shall be of the quality and specifications [illegible] herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND [illegible] EXTENT THAT IT IS [illegible] FOREGOING SENTENCE ANY IMPLIED WARRANTY OF MERCHANTABILITY IS EXPRESSLY EXCLUDED. Any recommendations made by the Seller [illegible] publications of said product are believed reliable and Seller makes no warranty of results to be obtained. If the product does not meet Synthetic Industries current [illegible] specifications, and the Customer gives notice to Synthetic Industries before installing the product, then Synthetic Industries will replace the product without [illegible] purchase price. This Data Sheet supersedes all previous Data Sheets for this style and is subject to change without notice. The effective date for this product data [illegible]

Synthetic Industries, Inc.
4019 Industry Drive • Post Office Box 22788 • Chattanooga, Tennessee • 37422 • USA
Telephone • 423-899-0444 • Fax • 423-899-7619 • 1-800-621-0444

Synthetic Industries

Individual Roll Data
Bill of Lading 627205

Roll #	Style	Batch	Weight	Thick	Tensile		Elongation		T.Tear		Burst	Punct
					MD	XMD	MD	XMD	MD	XMD		
			Osy	mils	lbs	lbs	%	%	lbs	lbs	psi	lbs
			D5261	D5199	D4632	D4632	D4632	D4632	D4533	D4533	D3786	D4833
B822131A	650	80159	7 2	155	74	146	131	120	35	51	224	66
B822144A	650	80159	7 2	157	58	125	116	122	34	45	233	65
B822146A	650	80159	7	153	69	124	130	120	33	41	206	63
B822149A	650	80159	7 1	153	65	114	132	139	33	43	210	57

Sid Weiss

000088

Synthetic Industries' current standard manufacturing quality control (MQC) testing frequency for GEOTEX nonwoven geotextiles is one (1) test per 90,000 sf (8,360 sm) for index properties (mass per unit area, thickness, grab tensile and elongation, trapezoidal tear, mullen burst and puncture resistance) for styles heavier than 601 and one (1) test per 162,000 sf (15,000 sm) for index properties for style 601 and lighter. Although we strive to test our nonwoven geotextiles for apparent opening size (AOS) and Permittivity/permeability/water flow rate approximately once every 540,000 sf (50,160 sm), the actual frequency of testing for performance properties will vary depending upon production schedules, product availability, customer requirements, job specifications or other agreements arranged with Synthetic Industries prior to the time of purchase If additional testing is needed to meet higher frequencies required by the project specifications, it is the purchaser's responsibility to notify Synthetic Industries and ask for assistance in calculating the costs for the additional tests

Once rolls of nonwoven geotextiles are produced, inspected and the test results from the frequency stated above indicates that materials produced during the production run meets our published minimum average roll values, approved rolls are shipped for storage until an order requires the material to be shipped Since rolls are loaded at the warehouse independent of production sequence test results listed above may include date from rolls which were not shipped However the date provided is from the same production run as the rolls actually shipped on this bill of lading

2739

SYNTHETIC INDUSTRIES

2739

Geosynthetic Products Division

May 11, 1999

American Colliod/WY-Cetco
Lovell WY Plant
Noe Garcia
PO Box 428
Lovell WY 82431
BOL#627194

This is to certify that Product GEOTEX™ 650, a nonwoven polypropylene geotextile produced by Synthetic Industries will meet the following certifiable minimum average roll values when tested in accordance with the proper ASTM test methods. A minimum average roll value is calculated as the mean minus two standard deviations, yielding a 97.5 percent confidence level.

PHYSICAL PROPERTY	TEST METHOD	U.S. UNITS
Weight	ASTM D-5261	6.0 oz/yd^2
Thickness	ASTM D-5199	120 mils
Tensile Strength	ASTM D-4632	45 lbs
Elongation	ASTM D-4632	90 %
Trapezoidal Tear	ASTM D-4533	25 lbs
Mullen Burst	ASTM D-3786	190 psi
Puncture Strength	ASTM D-4833	50 lbs

Sincerely,

Sid Weiser
Technical Manager
Performance Nonwovens Division

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Synthetic Industries, Inc.
4019 Industry Drive • Post Office Box 22788 • Chattanooga, Tennessee • 37422 • USA
Telephone • 423-899-0444 • Fax • 423-899-7619 • 1-800-621-0444

Synthetic Industries

Individual Roll Data
Bill of Lading 627194

Roll #	Style	Batch	Weight	Thick	Tensile		Elongation		T.Tear		Burst	Punct
					MD	XMD	MD	XMD	MD	XMD		
			Osy	mils	lbs	lbs	%	%	lbs	lbs	psi	lbs
			D5261	D5199	D4632	D4632	D4632	D4632	D4533	D4533	D3786	D4833
B822125A	650	80159	7.2	157	58	115	126	115	36	41	207	60
K907324A	650	90088	7 2	157	79	138	114	139	46	43	234	69

Sid Wen

Synthetic Industries' current standard manufacturing quality control (MQC) testing frequency for GEOTEX nonwoven geotextiles is one (1) test per 90,000 sf (8,360 sm) for index properties (mass per unit area, thickness, grab tensile and elongation, trapezoidal tear, mullen burst and puncture resistance) for styles heavier than 601 and one (1) test per 162,000 sf (15,000 sm) for index properties for style 601 and lighter. Although we strive to test our nonwoven geotextiles for apparent opening size (AOS) and Permittivity/permeability/water flow rate approximately once every 540,000 sf (50,160 sm), the actual frequency of testing for performance properties will vary depending upon production schedules, product availability, customer requirements, job specifications or other agreements arranged with Synthetic Industries prior to the time of purchase. If additional testing is needed to meet higher frequencies required by the project specifications, it is the purchaser's responsibility to notify Synthetic Industries and ask for assistance in calculating the costs for the additional tests.

Once rolls of nonwoven geotextiles are produced, inspected and the test results from the frequency stated above indicates that materials produced during the production run meets our published minimum average roll values, approved rolls are shipped for storage until an order requires the material to be shipped. Since rolls are loaded at the warehouse independent of production sequence test results listed above may include date from rolls which were not shipped. However, the date provided is from the same production run as the rolls actually shipped on this bill of lading

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SYNTHETIC INDUSTRIES

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Geosynthetic Products Division

May 11, 1999

American Colliod/WY-Cetco
Lovell WY Plant
Noe Garcia
PO Box 428
Lovell WY 82431
BOL#627188

This is to certify that Product GEOTEX™ 650, a nonwoven polypropylene geotextile produced by Synthetic Industries will meet the following certifiable minimum average roll values when tested in accordance with the proper ASTM test methods. A minimum average roll value is calculated as the mean minus two standard deviations, yielding a 97.5 percent confidence level.

PHYSICAL PROPERTY	TEST METHOD	U.S. UNITS
Weight	ASTM D-5261	6.0 oz/yd^2
Thickness	ASTM D-5199	120 mils
Tensile Strength	ASTM D-4632	45 lbs
Elongation	ASTM D-4632	90 %
Trapezoidal Tear	ASTM D-4533	25 lbs
Mullen Burst	ASTM D-3786	190 psi
Puncture Strength	ASTM D-4833	50 lbs

Sincerely,

Sid Weiser
Technical Manager
Performance Nonwovens Division

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Synthetic Industries, Inc.
4019 Industry Drive • Post Office Box 22788 • Chattanooga, Tennessee • 37422 • USA
Telephone • 423-899-0444 • Fax • 423-899-7619 • 1-800-621-0444

Synthetic Industries

Individual Roll Data
Bill of Lading 627188

Roll #	Style	Batch	Weight	Thick	Tensile		Elongation		T.Tear		Burst	Punct
					MD	XMD	MD	XMD	MD	XMD		
			Osy	mils	lbs	lbs	%	%	lbs	lbs	psi	lbs
			D5261	D5199	D4632	D4632	D4632	D4632	D4533	D4533	D3786	D4833
B822081A	650	80157	6.6	145	51	99	130	114	26	26	199	50
B822084A	650	80157	6 9	157	65	105	126	128	37	45	224	71
K901952A	650	90030	6 7	136	86	130	112	132	45	39	226	64
K901955A	650	90030	7	136	83	152	110	129	49	45	243	62
K901958A	650	90030	7	146	86	146	107	134	48	47	241	69

Synthetic Industries' current standard manufacturing quality control (MQC) testing frequency for GEOTEX nonwoven geotextiles is one (1) test per 90,000 sf (8,360 sm) for index properties (mass per unit area, thickness, grab tensile and elongation, trapezoidal tear, mullen burst and puncture resistance) for styles heavier than 601 and one (1) test per 162,000 sf (15,000 sm) for index properties for style 601 and lighter. Although we strive to test our nonwoven geotextiles for apparent opening size (AOS) and Permittivity/permeability/water flow rate approximately once every 540,000 sf (50,160 sm), the actual frequency of testing for performance properties will vary depending upon production schedules, product availability, customer requirements, job specifications or other agreements arranged with Synthetic Industries prior to the time of purchase. If additional testing is needed to meet higher frequencies required by the project specifications, it is the purchaser's responsibility to notify Synthetic Industries and ask for assistance in calculating the costs for the additional tests.

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SYNTHETIC INDUSTRIES

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Geosynthetic Products Division

May 11, 1999

American Colliod/WY-Cetco
Lovell WY Plant
Noe Garcia
PO Box 428
Lovell WY 82431
BOL#627196

This is to certify that Product GEOTEX™ 650, a nonwoven polypropylene geotextile produced by Synthetic Industries will meet the following certifiable minimum average roll values when tested in accordance with the proper ASTM test methods. A minimum average roll value is calculated as the mean minus two standard deviations, yielding a 97.5 percent confidence level.

PHYSICAL PROPERTY	TEST METHOD	U.S. UNITS
Weight	ASTM D-5261	6.0 oz/yd^2
Thickness	ASTM D-5199	120 mils
Tensile Strength	ASTM D-4632	45 lbs
Elongation	ASTM D-4632	90 %
Trapezoidal Tear	ASTM D-4533	25 lbs
Mullen Burst	ASTM D-3786	190 psi
Puncture Strength	ASTM D-4833	50 lbs

Sincerely,

Sid Weiser
Technical Manager
Performance Nonwovens Division

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Synthetic Industries, Inc.
4019 Industry Drive • Post Office Box 22788 • Chattanooga, Tennessee • 37422 • USA
Telephone • 423-899-0444 • Fax • 423-899-7619 • 1-800-621-0444

Synthetic Industries

Individual Roll Data
Bill of Lading 627196

000094

Roll #	Style	Batch	Weight	Thick	Tensile		Elongation		T.Tear		Burst	Punct
					MD	XMD	MD	XMD	MD	XMD		
			Osy	mils	lbs	lbs	%	%	lbs	lbs	psi	lbs
			D5261	D5199	D4632	D4632	D4632	D4632	D4533	D4533	D3786	D4833
B822063A	650	80155	7	151	73	131	122	123	37	40	244	61
B822087A	650	80157	7	159	65	115	123	115	37	45	221	68
B822106A	650	80159	6 9	146	58	109	131	123	33	40	206	62

E-2739

Ted Wan

Synthetic Industries' current standard manufacturing quality control (MQC) testing frequency for GEOTEX nonwoven geotextiles is one (1) test per 90,000 sf (8,360 sm) for index properties (mass per unit area, thickness, grab tensile and elongation, trapezoidal tear, mullen burst and puncture resistance) for styles heavier than 601 and one (1) test per 162,000 sf (15,000 sm) for index properties for style 601 and lighter. Although we strive to test our nonwoven geotextiles for apparent opening size (AOS) and Permittivity/permeability/water flow rate approximately once every 540,000 sf (50,160 sm), the actual frequency of testing for performance properties will vary depending upon production schedules, product availability, customer requirements, job specifications or other agreements arranged with Synthetic Industries prior to the time of purchase. If additional testing is needed to meet higher frequencies required by the project specifications, it is the purchaser's responsibility to notify Synthetic Industries and ask for assistance in calculating the costs for the additional tests.

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2739

DAILY BENTOMAT ST PRODUCTION PRODUCTION CERTIFICATION

BENTOMAT ST
MANUFACTURING CERTIFICATION

Project Name:	Fluor Daniel Fernald Dept. Of Energy
Prepared For:	GSE Lining Technology, Inc.
Job Number:	
Customer PO:	2292-000-OD Order # 6761S0
Order Number:	108309
Ship Date:	PRESCAN

Colloid Environmental Technologies Company (CETCO) hereby affirms and certifies that all of the BENTOMAT ST manufactured in this lot achieves the physical and chemical criteria listed on the attached analysis sheet.

Steve Wilkerson
Production Coordinator

Subscribed and sworn to before me this 1st day of June 1999

A. Christine Somer
Notary-Public

A. CHRISTINE SOMER - Notary Public
County of Big Horn
State of Wyoming
My Commission Expires 8-22-2002

PACKING LIST

2739

COLLOID ENVIRONMENTAL TECH CO
1500 WEST SHURE DRIVE
ARLINGTON HEIGHTS IL 60004

ORDER NO:.. 000108309
ORDER DATE: 5/18/0019
SHIP DATE:. 6/0199

SOLD TO: 001376
GSE LINING TECHNOLOGY. INC.
19103 GUNDLE ROAD

HOUSTON TX 77073

SHIP FROM:. LOVELL
FRT TERMS:. PREPAID & ADD
SHIP VIA:.. NATIONWIDE

SHIP TO: 46
FLUOR DANIEL FERNALD
DEPARTMENT OF ENERGY
7400 WILLEY ROAD

HARRISON OH 45030

PO: 2292-000-OD ORDER #6761S0

PRODUCT	SIZE U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
020-BENTOMAT ST	SFT SF	199922020	00005003	150.0	15.0	2250.0	2724.0
020-BENTOMAT ST	SFT SF	199922020	00005004	150.0	15.0	2250.0	2718.0
020-BENTOMAT ST	SFT SF	199922020	00005005	150.0	15.0	2250.0	2697.0
020-BENTOMAT ST	SFT SF	199922020	00005006	150.0	15.0	2250.0	2702.0
020-BENTOMAT ST	SFT SF	199922020	00005007	150.0	15.0	2250.0	2688.0
020-BENTOMAT ST	SFT SF	199922020	00005008	150.0	15.0	2250.0	2680.0
020-BENTOMAT ST	SFT SF	199922020	00005009	150.0	15.0	2250.0	2674.0
020-BENTOMAT ST	SFT SF	199922020	00005010	150.0	15.0	2250.0	2683.0
020-BENTOMAT ST	SFT SF	199922020	00005011	150.0	15.0	2250.0	2687.0
020-BENTOMAT ST	SFT SF	199922020	00005012	150.0	15.0	2250.0	2682.0
020-BENTOMAT ST	SFT SF	199922020	00005013	150.0	15.0	2250.0	2684.0
020-BENTOMAT ST	SFT SF	199922020	00005014	150.0	15.0	2250.0	2690.0
020-BENTOMAT ST	SFT SF	199922020	00005015	150.0	15.0	2250.0	2693.0
020-BENTOMAT ST	SFT SF	199922020	00005016	150.0	15.0	2250.0	2685.0
020-BENTOMAT ST	SFT SF	199922020	00005033	150.0	15.0	2250.0	2766.0
020-BENTOMAT ST	SFT SF	199922020	00005034	150.0	15.0	2250.0	2777.0
020-BENTOMAT ST	SFT SF	199922020	00005035	150.0	15.0	2250.0	2767.0
020-BENTOMAT ST	SFT SF	199922020	00005036	150.0	15.0	2250.0	2718.0
020-BENTOMAT ST	SFT SF	199922020	00005037	150.0	15.0	2250.0	2760.0

PACKING LIST

2739

COLLOID ENVIRONMENTAL TECH CO
500 WEST SHURE DRIVE
ARLINGTON HEIGHTS IL 60004

ORDER NO:.. 000108309
ORDER DATE: 5/18/0019
SHIP DATE:. 6/0199

SOLD TO: 001376
GSE LINING TECHNOLOGY. INC.
19103 GUNDLE ROAD

HOUSTON TX 77073

SHIP FROM:. LOVELL
FRT TERMS:. PREPAID & ADD
SHIP VIA:.. NATIONWIDE

SHIP TO: 46
FLUOR DANIEL FERNALD
DEPARTMENT OF ENERGY
7400 WILLEY ROAD

HARRISON OH 45030

PO: 2292-000-OD ORDER #6761S0

PRODUCT	SIZE U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
020-BENTOMAT ST	SFT SF	199922020	00005038	150.0	15.0	2250.0	2744.0
020-BENTOMAT ST	SFT SF	199922020	00005039	150.0	15.0	2250.0	2710.0
020-BENTOMAT ST	SFT SF	199922020	00005040	150.0	15.0	2250.0	2812.0
020-BENTOMAT ST	SFT SF	199922020	00005041	150.0	15.0	2250.0	2838.0
020-BENTOMAT ST	SFT SF	199922020	00005042	150.0	15.0	2250.0	2784.0
020-BENTOMAT ST	SFT SF	199922020	00005043	150.0	15.0	2250.0	2790.0
020-BENTOMAT ST	SFT SF	199922020	00005044	150.0	15.0	2250.0	2726.0
020-BENTOMAT ST	SFT SF	199922020	00005045	150.0	15.0	2250.0	2754.0
020-BENTOMAT ST	SFT SF	199922020	00005046	150.0	15.0	2250.0	2753.0
020-BENTOMAT ST	SFT SF	199922020	00005047	150.0	15.0	2250.0	2761.0
020-BENTOMAT ST	SFT SF	199922020	00005048	150.0	15.0	2250.0	2746.0
020-BENTOMAT ST	SFT SF	199922020	00005049	150.0	15.0	2250.0	2725.0
020-BENTOMAT ST	SFT SF	199922020	00005050	150.0	15.0	2250.0	2715.0
020-BENTOMAT ST	SFT SF	199922020	00005051	150.0	15.0	2250.0	2716.0
020-BENTOMAT ST	SFT SF	199922020	00005052	150.0	15.0	2250.0	2727.0
020-BENTOMAT ST	SFT SF	199922020	00005053	150.0	15.0	2250.0	2728.0
020-BENTOMAT ST	SFT SF	199922020	00005054	150.0	15.0	2250.0	2734.0
020-BENTOMAT ST	SFT SF	199922020	00005055	150.0	15.0	2250.0	2773.0
020-BENTOMAT ST	SFT SF	199922020	00005056	150.0	15.0	2250.0	2775.0

PACKING LIST

=- 2739

COLLOID ENVIRONMENTAL TECH CO
1500 WEST SHURE DRIVE
ARLINGTON HEIGHTS IL 60004

ORDER NO:.. 000108309
ORDER DATE: 5/18/0019
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19103 GUNDLE ROAD

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SHIP FROM:. LOVELL
FRT TERMS:. PREPAID & ADD
SHIP VIA:.. NATIONWIDE

SHIP TO: 46
FLUOR DANIEL FERNALD
DEPARTMENT OF ENERGY
7400 WILLEY ROAD

HARRISON OH 45030

PO: 2292-000-OD ORDER #6761S0

PRODUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
020-BENTOMAT ST		SFT	SF	199922020	00005057	150.0	15.0	2250.0	2765.0
020-BENTOMAT ST		SFT	SF	199922020	00005058	150.0	15.0	2250.0	2756.0
020-BENTOMAT ST		SFT	SF	199922020	00005059	150.0	15.0	2250.0	2750.0
020-BENTOMAT ST		SFT	SF	199922020	00005060	150.0	15.0	2250.0	2717.0
020-BENTOMAT ST		SFT	SF	199922020	00005061	150.0	15.0	2250.0	2711.0
020-BENTOMAT ST		SFT	SF	199922020	00005062	150.0	15.0	2250.0	2720.0
020-BENTOMAT ST		SFT	SF	199922020	00005063	150.0	15.0	2250.0	2799.0
020-BENTOMAT ST		SFT	SF	199922020	00005064	150.0	15.0	2250.0	2732.0
020-BENTOMAT ST		SFT	SF	199922020	00005065	150.0	15.0	2250.0	2742.0
020-BENTOMAT ST		SFT	SF	199922020	00005066	150.0	15.0	2250.0	2731.0
020-BENTOMAT ST		SFT	SF	199922020	00005067	150.0	15.0	2250.0	2770.0
020-BENTOMAT ST		SFT	SF	199922020	00005068	150.0	15.0	2250.0	2743.0
020-BENTOMAT ST		SFT	SF	199922020	00005069	150.0	15.0	2250.0	2719.0
020-BENTOMAT ST		SFT	SF	199922020	00005070	150.0	15.0	2250.0	2703.0
020-BENTOMAT ST		SFT	SF	199922020	00005071	150.0	15.0	2250.0	2716.0
020-BENTOMAT ST		SFT	SF	199922020	00005072	150.0	15.0	2250.0	2779.0
020-BENTOMAT ST		SFT	SF	199922020	00005073	150.0	15.0	2250.0	2775.0
020-BENTOMAT ST		SFT	SF	199922020	00005074	150.0	15.0	2250.0	2775.0
020-BENTOMAT ST		SFT	SF	199922020	00005075	150.0	15.0	2250.0	2712.0

PACKING LIST

2739

COLLOID ENVIRONMENTAL TECH CO
1500 WEST SHURE DRIVE
ARLINGTON HEIGHTS IL 60004

ORDER NO:.. 000108309
ORDER DATE: 5/18/0019
SHIP DATE:. 6/0199

SOLD TO: 001376
GSE LINING TECHNOLOGY. INC.
19103 GUNDLE ROAD

HOUSTON TX 77073

SHIP FROM:. LOVELL
FRT TERMS:. PREPAID & ADD
SHIP VIA:.. NATIONWIDE

SHIP TO: 46
FLUOR DANIEL FERNALD
DEPARTMENT OF ENERGY
7400 WILLEY ROAD

HARRISON OH 45030

PO: 2292-000-OD ORDER #6761S0

PRODUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
020-BENTOMAT ST		SFT	SF 199922020	00005076	150.0	15.0	2250.0	2731.0
020-BENTOMAT ST		SFT	SF 199922020	00005077	150.0	15.0	2250.0	2722.0
020-BENTOMAT ST		SFT	SF 199922020	00005078	150.0	15.0	2250.0	2697.0
020-BENTOMAT ST		SFT	SF 199922020	00005079	150.0	15.0	2250.0	2812.0
020-BENTOMAT ST		SFT	SF 199922020	00005080	150.0	15.0	2250.0	2721.0
020-BENTOMAT ST		SFT	SF 199922020	00005081	150.0	15.0	2250.0	2689.0
020-BENTOMAT ST		SFT	SF 199922020	00005082	150.0	15.0	2250.0	2675.0
020-BENTOMAT ST		SFT	SF 199922020	00005083	150.0	15.0	2250.0	2677.0
020-BENTOMAT ST		SFT	SF 199922020	00005084	150.0	15.0	2250.0	2676.0
020-BENTOMAT ST		SFT	SF 199922020	00005085	150.0	15.0	2250.0	2685.0
020-BENTOMAT ST		SFT	SF 199922020	00005086	150.0	15.0	2250.0	2691.0
020-BENTOMAT ST		SFT	SF 199922020	00005087	150.0	15.0	2250.0	2686.0
020-BENTOMAT ST		SFT	SF 199922020	00005088	150.0	15.0	2250.0	2650.0
020-BENTOMAT ST		SFT	SF 199922020	00005089	150.0	15.0	2250.0	2660.0
020-BENTOMAT ST		SFT	SF 199922020	00005090	150.0	15.0	2250.0	2690.0
020-BENTOMAT ST		SFT	SF 199922020	00005091	150.0	15.0	2250.0	2655.0
020-BENTOMAT ST		SFT	SF 199922020	00005092	150.0	15.0	2250.0	2651.0
020-BENTOMAT ST		SFT	SF 199922020	00005093	150.0	15.0	2250.0	2718.0
020-BENTOMAT ST		SFT	SF 199922020	00005094	150.0	15.0	2250.0	2694.0

PACKING LIST

2739

COLLOID ENVIRONMENTAL TECH CO
1500 WEST SHURE DRIVE
ARLINGTON HEIGHTS IL 60004

ORDER NO:.. 000108309
ORDER DATE: 5/18/0019
SHIP DATE:. 6/0199

SOLD TO: 001376
GSE LINING TECHNOLOGY. INC.
19103 GUNDLE ROAD

HOUSTON TX 77073

SHIP FROM:. LOVELL
FRT TERMS:. PREPAID & ADD
SHIP VIA:.. NATIONWIDE

SHIP TO: 46
FLUOR DANIEL FERNALD
DEPARTMENT OF ENERGY
7400 WILLEY ROAD

HARRISON OH 45030

PO: 2292-000-OD ORDER #6761S0

PRODUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
020-BENTOMAT ST		SFT	SF	199922020	00005095	150.0	15.0	2250.0	2724.0
020-BENTOMAT ST		SFT	SF	199922020	00005096	150.0	15.0	2250.0	2699.0
020-BENTOMAT ST		SFT	SF	199922020	00005097	150.0	15.0	2250.0	2722.0
020-BENTOMAT ST		SFT	SF	199922020	00005098	150.0	15.0	2250.0	2720.0
020-BENTOMAT ST		SFT	SF	199922020	00005099	150.0	15.0	2250.0	2716.0
020-BENTOMAT ST		SFT	SF	199922020	00005100	150.0	15.0	2250.0	2725.0
020-BENTOMAT ST		SFT	SF	199922020	00005101	150.0	15.0	2250.0	2724.0
020-BENTOMAT ST		SFT	SF	199922020	00005102	150.0	15.0	2250.0	2724.0
020-BENTOMAT ST		SFT	SF	199922020	00005103	150.0	15.0	2250.0	2728.0
020-BENTOMAT ST		SFT	SF	199922020	00005104	150.0	15.0	2250.0	2716.0
020-BENTOMAT ST		SFT	SF	199922020	00005105	150.0	15.0	2250.0	2668.0
020-BENTOMAT ST		SFT	SF	199922020	00005106	150.0	15.0	2250.0	2671.0
020-BENTOMAT ST		SFT	SF	199922020	00005107	150.0	15.0	2250.0	2634.0
020-BENTOMAT ST		SFT	SF	199922020	00005108	150.0	15.0	2250.0	2663.0
020-BENTOMAT ST		SFT	SF	199922020	00005109	150.0	15.0	2250.0	2765.0
020-BENTOMAT ST		SFT	SF	199922020	00005110	150.0	15.0	2250.0	2739.0
020-BENTOMAT ST		SFT	SF	199922020	00005111	150.0	15.0	2250.0	2764.0
020-BENTOMAT ST		SFT	SF	199922020	00005112	150.0	15.0	2250.0	2786.0
020-BENTOMAT ST		SFT	SF	199922020	00005113	150.0	15.0	2250.0	2814.0

PACKING LIST

2739

COLLOID ENVIRONMENTAL TECH CO
1500 WEST SHURE DRIVE
ARLINGTON HEIGHTS IL 60004

ORDER NO:.. 000108309
ORDER DATE: 5/18/0019
SHIP DATE:. 6/0199

SOLD TO: 001376
GSE LINING TECHNOLOGY. INC.
19103 GUNDLE ROAD

HOUSTON TX 77073

SHIP FROM:. LOVELL
FRT TERMS:. PREPAID & ADD
SHIP VIA:.. NATIONWIDE

SHIP TO: 46
FLUOR DANIEL FERNALD
DEPARTMENT OF ENERGY
7400 WILLEY ROAD

HARRISON OH 45030

PO: 2292-000-OD ORDER #6761S0

PRODUCT	SIZE U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
020-BENTOMAT ST	SFT SF	199922020	00005114	150.0	15.0	2250.0	2819.0
020-BENTOMAT ST	SFT SF	199922020	00005115	150.0	15.0	2250.0	2835.0
020-BENTOMAT ST	SFT SF	199922020	00005116	150.0	15.0	2250.0	2831.0
020-BENTOMAT ST	SFT SF	199922020	00005117	150.0	15.0	2250.0	2812.0
020-BENTOMAT ST	SFT SF	199922020	00005118	150.0	15.0	2250.0	2827.0
020-BENTOMAT ST	SFT SF	199922020	00005119	150.0	15.0	2250.0	2822.0
020-BENTOMAT ST	SFT SF	199922020	00005120	150.0	15.0	2250.0	2824.0
020-BENTOMAT ST	SFT SF	199922020	00005121	150.0	15.0	2250.0	2831.0
020-BENTOMAT ST	SFT SF	199922020	00005122	150.0	15.0	2250.0	2826.0
020-BENTOMAT ST	SFT SF	199922020	00005123	150.0	15.0	2250.0	2796.0
020-BENTOMAT ST	SFT SF	199922020	00005124	150.0	15.0	2250.0	2777.0
020-BENTOMAT ST	SFT SF	199922020	00005125	150.0	15.0	2250.0	2973.0
020-BENTOMAT ST	SFT SF	199922020	00005126	150.0	15.0	2250.0	2971.0
020-BENTOMAT ST	SFT SF	199922020	00005127	150.0	15.0	2250.0	2972.0
020-BENTOMAT ST	SFT SF	199922020	00005128	150.0	15.0	2250.0	2975.0
020-BENTOMAT ST	SFT SF	199922020	00005129	150.0	15.0	2250.0	2950.0
020-BENTOMAT ST	SFT SF	199922020	00005130	150.0	15.0	2250.0	2863.0
020-BENTOMAT ST	SFT SF	199922020	00005131	150.0	15.0	2250.0	2825.0
020-BENTOMAT ST	SFT SF	199922020	00005132	150.0	15.0	2250.0	2841.0

PACKING LIST

2739

COLLOID ENVIRONMENTAL TECH CO
1500 WEST SHURE DRIVE
ARLINGTON HEIGHTS IL 60004

ORDER NO:.. 000108309
ORDER DATE: 5/18/0019
SHIP DATE:. 6/0199

SOLD TO: 001376
GSE LINING TECHNOLOGY. INC.
19103 GUNDLE ROAD

HOUSTON TX 77073

SHIP FROM:. LOVELL
FRT TERMS:. PREPAID & ADD
SHIP VIA:.. NATIONWIDE

SHIP TO: 46
FLUOR DANIEL FERNALD
DEPARTMENT OF ENERGY
7400 WILLEY ROAD

HARRISON OH 45030

PO: 2292-000-OD ORDER #6761SO

PRODUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
020-BENTOMAT ST		SFT	SF 199922020	00005133	150.0	15.0	2250.0	2841.0
020-BENTOMAT ST		SFT	SF 199922020	00005134	150.0	15.0	2250.0	2828.0
020-BENTOMAT ST		SFT	SF 199922020	00005135	150.0	15.0	2250.0	2795.0
020-BENTOMAT ST		SFT	SF 199922020	00005136	150.0	15.0	2250.0	2765.0
020-BENTOMAT ST		SFT	SF 199922020	00005137	150.0	15.0	2250.0	2771.0
020-BENTOMAT ST		SFT	SF 199922020	00005138	150.0	15.0	2250.0	2751.0
020-BENTOMAT ST		SFT	SF 199922020	00005139	150.0	15.0	2250.0	2738.0
020-BENTOMAT ST		SFT	SF 199922020	00005140	150.0	15.0	2250.0	2739.0
020-BENTOMAT ST		SFT	SF 199922020	00005141	150.0	15.0	2250.0	2731.0
020-BENTOMAT ST		SFT	SF 199922020	00005142	150.0	15.0	2250.0	2749.0
020-BENTOMAT ST		SFT	SF 199922020	00005143	150.0	15.0	2250.0	2719.0
020-BENTOMAT ST		SFT	SF 199922020	00005144	150.0	15.0	2250.0	2746.0
020-BENTOMAT ST		SFT	SF 199922020	00005145	150.0	15.0	2250.0	2735.0
020-BENTOMAT ST		SFT	SF 199922020	00005146	150.0	15.0	2250.0	2731.0
020-BENTOMAT ST		SFT	SF 199922020	00005147	150.0	15.0	2250.0	2744.0
020-BENTOMAT ST		SFT	SF 199922020	00005148	150.0	15.0	2250.0	2752.0
020-BENTOMAT ST		SFT	SF 199922020	00005149	150.0	15.0	2250.0	2745.0
020-BENTOMAT ST		SFT	SF 199922020	00005150	150.0	15.0	2250.0	2744.0
020-BENTOMAT ST		SFT	SF 199922020	00005151	150.0	15.0	2250.0	2749.0

PACKING LIST

2739

COLLOID ENVIRONMENTAL TECH CO
1500 WEST SHURE DRIVE
ARLINGTON HEIGHTS IL 60004

ORDER NO:.. 000108309
ORDER DATE: 5/18/0019
SHIP DATE:. 6/0199

SOLD TO: 001376
GSE LINING TECHNOLOGY, INC.
19103 GUNDLE ROAD

HOUSTON TX 77073

SHIP FROM:. LOVELL
FRT TERMS:. PREPAID & ADD
SHIP VIA:.. NATIONWIDE

SHIP TO: 46
FLUOR DANIEL FERNALD
DEPARTMENT OF ENERGY
7400 WILLEY ROAD

HARRISON OH 45030

PO: 2292-000-OD ORDER #6761S0

PRODUCT	SIZE U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
020-BENTOMAT ST	SFT SF	199922020	00005152	150.0	15.0	2250.0	2753.0
020-BENTOMAT ST	SFT SF	199922020	00005153	150.0	15.0	2250.0	2760.0
020-BENTOMAT ST	SFT SF	199922020	00005154	150.0	15.0	2250.0	2753.0
020-BENTOMAT ST	SFT SF	199922020	00005155	150.0	15.0	2250.0	2733.0
020-BENTOMAT ST	SFT SF	199922020	00005156	150.0	15.0	2250.0	2710.0
020-BENTOMAT ST	SFT SF	199922020	00005157	150.0	15.0	2250.0	2703.0
020-BENTOMAT ST	SFT SF	199922020	00005158	150.0	15.0	2250.0	2699.0
020-BENTOMAT ST	SFT SF	199922020	00005159	150.0	15.0	2250.0	2755.0
020-BENTOMAT ST	SFT SF	199922020	00005160	150.0	15.0	2250.0	2693.0
020-BENTOMAT ST	SFT SF	199922020	00005161	150.0	15.0	2250.0	2684.0
020-BENTOMAT ST	SFT SF	199922020	00005162	150.0	15.0	2250.0	2697.0
020-BENTOMAT ST	SFT SF	199922020	00005163	150.0	15.0	2250.0	2685.0
020-BENTOMAT ST	SFT SF	199922020	00005164	150.0	15.0	2250.0	2683.0
020-BENTOMAT ST	SFT SF	199922020	00005165	150.0	15.0	2250.0	2682.0
020-BENTOMAT ST	SFT SF	199922020	00005166	150.0	15.0	2250.0	2681.0
020-BENTOMAT ST	SFT SF	199922020	00005167	150.0	15.0	2250.0	2674.0
020-BENTOMAT ST	SFT SF	199922020	00005168	150.0	15.0	2250.0	2655.0
020-BENTOMAT ST	SFT SF	199922020	00005169	150.0	15.0	2250.0	2769.0
020-BENTOMAT ST	SFT SF	199922020	00005170	150.0	15.0	2250.0	2787.0

PACKING LIST

2739

COLLOID ENVIRONMENTAL TECH CO
1500 WEST SHURE DRIVE
ARLINGTON HEIGHTS IL 60004

ORDER NO:.. 000108309
ORDER DATE: 5/18/0019
SHIP DATE:. 6/0199

SOLD TO: 001376
GSE LINING TECHNOLOGY. INC.
19103 GUNDLE ROAD

HOUSTON TX 77073

SHIP FROM:. LOVELL
FRT TERMS:. PREPAID & ADD
SHIP VIA:.. NATIONWIDE

SHIP TO: 46
FLUOR DANIEL FERNALD
DEPARTMENT OF ENERGY
7400 WILLEY ROAD

HARRISON OH 45030

PO: 2292-000-OD ORDER #676150

PRODUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
020-BENTOMAT ST		SFT	SF 199922020	00005171	150.0	15.0	2250.0	2745.0
020-BENTOMAT ST		SFT	SF 199922020	00005172	150.0	15.0	2250.0	2740.0
020-BENTOMAT ST		SFT	SF 199922020	00005173	150.0	15.0	2250.0	2739.0
020-BENTOMAT ST		SFT	SF 199922020	00005174	150.0	15.0	2250.0	2746.0
[illegible]-BENTOMAT ST		SFT	SF 199922020	00005175	150.0	15.0	2250.0	2730.0
020-BENTOMAT ST		SFT	SF 199922020	00005176	150.0	15.0	2250.0	2744.0
020-BENTOMAT ST		SFT	SF 199922020	00005177	150.0	15.0	2250.0	2715.0
020-BENTOMAT ST		SFT	SF 199922020	00005178	150.0	15.0	2250.0	2700.0
020-BENTOMAT ST		SFT	SF 199922020	00005179	150.0	15.0	2250.0	2712.0
020-BENTOMAT ST		SFT	SF 199922020	00005180	150.0	15.0	2250.0	2708.0
020-BENTOMAT ST		SFT	SF 199922020	00005181	150.0	15.0	2250.0	2706.0
020-BENTOMAT ST		SFT	SF 199922020	00005182	150.0	15.0	2250.0	2694.0
020-BENTOMAT ST		SFT	SF 199922020	00005183	150.0	15.0	2250.0	2691.0
020-BENTOMAT ST		SFT	SF 199922020	00005184	150.0	15.0	2250.0	2691.0
020-BENTOMAT ST		SFT	SF 199922020	00005185	150.0	15.0	2250.0	2720.0
020-BENTOMAT ST		SFT	SF 199922020	00005186	150.0	15.0	2250.0	2732.0
[illegible]-BENTOMAT ST		SFT	SF 199922020	00005187	150.0	15.0	2250.0	2694.0
[illegible]-BENTOMAT ST		SFT	SF 199922020	00005188	150.0	15.0	2250.0	2754.0
020-BENTOMAT ST		SFT	SF 199922020	00005189	150.0	15.0	2250.0	2715.0

PACKING LIST

-- 2739

COLLOID ENVIRONMENTAL TECH CO
1500 WEST SHURE DRIVE
ARLINGTON HEIGHTS IL 60004

ORDER NO:.. 000108309
ORDER DATE: 5/18/0019
SHIP DATE:. 6/0199

SOLD TO: 001376
GSE LINING TECHNOLOGY. INC.
19103 GUNDLE ROAD

HOUSTON TX 77073

SHIP FROM:. LOVELL
FRT TERMS:. PREPAID & ADD
SHIP VIA:... NATIONWIDE

SHIP TO: 46
FLUOR DANIEL FERNALD
DEPARTMENT OF ENERGY
7400 WILLEY ROAD

HARRISON OH 45030

PO: 2292-000-OD ORDER #6761S0

PRODUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
020-BENTOMAT ST		SFT	SF 199922020	00005190	150.0	15.0	2250.0	2727.0
020-BENTOMAT ST		SFT	SF 199922020	00005191	150.0	15.0	2250.0	2695.0
020-BENTOMAT ST		SFT	SF 199922020	00005192	150.0	15.0	2250.0	2736.0
020-BENTOMAT ST		SFT	SF 199922020	00005193	150.0	15.0	2250.0	2729.0
020-BENTOMAT ST		SFT	SF 199922020	00005194	150.0	15.0	2250.0	2723.0
020-BENTOMAT ST		SFT	SF 199922020	00005195	150.0	15.0	2250.0	2739.0
020-BENTOMAT ST		SFT	SF 199922020	00005196	150.0	15.0	2250.0	2727.0
020-BENTOMAT ST		SFT	SF 199922020	00005197	150.0	15.0	2250.0	2745.0
020-BENTOMAT ST		SFT	SF 199922020	00005198	150.0	15.0	2250.0	2749.0
020-BENTOMAT ST		SFT	SF 199922020	00005199	150.0	15.0	2250.0	2733.0
020-BENTOMAT ST		SFT	SF 199922020	00005200	150.0	15.0	2250.0	2740.0
020-BENTOMAT ST		SFT	SF 199922020	00005201	150.0	15.0	2250.0	2763.0
020-BENTOMAT ST		SFT	SF 199922020	00005202	150.0	15.0	2250.0	2741.0
020-BENTOMAT ST		SFT	SF 199922020	00005203	150.0	15.0	2250.0	2750.0
020-BENTOMAT ST		SFT	SF 199922020	00005204	150.0	15.0	2250.0	2778.0
020-BENTOMAT ST		SFT	SF 199922020	00005205	150.0	15.0	2250.0	2784.0
020-BENTOMAT ST		SFT	SF 199922020	00005206	150.0	15.0	2250.0	2801.0
020-BENTOMAT ST		SFT	SF 199922020	00005207	150.0	15.0	2250.0	2805.0
020-BENTOMAT ST		SFT	SF 199922020	00005208	150.0	15.0	2250.0	2814.0

PACKING LIST

2739

COLLOID ENVIRONMENTAL TECH CO
500 WEST SHURE DRIVE
ARLINGTON HEIGHTS IL 60004

ORDER NO:.. 000108309
ORDER DATE: 5/18/0019
SHIP DATE:. 6/0199

SOLD TO: 001376
GSE LINING TECHNOLOGY, INC.
19103 GUNDLE ROAD

HOUSTON TX 77073

SHIP FROM:. LOVELL
FRT TERMS:. PREPAID & ADD
SHIP VIA:.. NATIONWIDE

SHIP TO: 46
FLUOR DANIEL FERNALD
DEPARTMENT OF ENERGY
7400 WILLEY ROAD

HARRISON OH 45030

PO: 2292-000-OD ORDER #6761S0

PRODUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
020-BENTOMAT ST		SFT	SF	199922020	00005209	150.0	15.0	2250.0	2840.0
020-BENTOMAT ST		SFT	SF	199922020	00005210	150.0	15.0	2250.0	2850.0
020-BENTOMAT ST		SFT	SF	199922020	00005211	150.0	15.0	2250.0	2860.0
020-BENTOMAT ST		SFT	SF	199922020	00005212	150.0	15.0	2250.0	2854.0
020-BENTOMAT ST		SFT	SF	199922020	00005213	150.0	15.0	2250.0	2840.0
020-BENTOMAT ST		SFT	SF	199922020	00005214	150.0	15.0	2250.0	2835.0
020-BENTOMAT ST		SFT	SF	199922020	00005215	150.0	15.0	2250.0	2833.0
020-BENTOMAT ST		SFT	SF	199922020	00005216	150.0	15.0	2250.0	2822.0
020-BENTOMAT ST		SFT	SF	199922020	00005217	150.0	15.0	2250.0	2833.0
020-BENTOMAT ST		SFT	SF	199922020	00005218	150.0	15.0	2250.0	2816.0
020-BENTOMAT ST		SFT	SF	199922020	00005219	150.0	15.0	2250.0	2819.0
020-BENTOMAT ST		SFT	SF	199922020	00005220	150.0	15.0	2250.0	2840.0
020-BENTOMAT ST		SFT	SF	199922020	00005221	150.0	15.0	2250.0	2845.0
020-BENTOMAT ST		SFT	SF	199922020	00005222	150.0	15.0	2250.0	2830.0
020-BENTOMAT ST		SFT	SF	199922020	00005223	150.0	15.0	2250.0	2795.0
020-BENTOMAT ST		SFT	SF	199922020	00005224	150.0	15.0	2250.0	2790.0
020-BENTOMAT ST		SFT	SF	199922020	00005225	150.0	15.0	2250.0	2791.0
020-BENTOMAT ST		SFT	SF	199922020	00005226	150.0	15.0	2250.0	2718.0
020-BENTOMAT ST		SFT	SF	199922020	00005227	150.0	15.0	2250.0	2727.0

PACKING LIST

2739

COLLOID ENVIRONMENTAL TECH CO
1500 WEST SHURE DRIVE
ARLINGTON HEIGHTS IL 60004

ORDER NO:.. 000108309
ORDER DATE: 5/18/0019
SHIP DATE:. 6/0199

SOLD TO: 001376
GSE LINING TECHNOLOGY. INC.
19103 GUNDLE ROAD

HOUSTON TX 77073

SHIP FROM:. LOVELL
FRT TERMS:. PREPAID & ADD
SHIP VIA:.. NATIONWIDE

SHIP TO: 46
FLUOR DANIEL FERNALD
DEPARTMENT OF ENERGY
7400 WILLEY ROAD

HARRISON OH 45030

PO: 2292-000-OD ORDER #6761S0

PRODUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
020-BENTOMAT ST		SFT	SF 199922020	00005228	150.0	15.0	2250.0	2715.0
020-BENTOMAT ST		SFT	SF 199922020	00005229	150.0	15.0	2250.0	2724.0
020-BENTOMAT ST		SFT	SF 199922020	00005230	150.0	15.0	2250.0	2730.0
020-BENTOMAT ST		SFT	SF 199922020	00005231	150.0	15.0	2250.0	2741.0
020-BENTOMAT ST		SFT	SF 199922020	00005232	150.0	15.0	2250.0	2750.0
020-BENTOMAT ST		SFT	SF 199922020	00005233	150.0	15.0	2250.0	2696.0
020-BENTOMAT ST		SFT	SF 199922020	00005234	150.0	15.0	2250.0	2699.0
020-BENTOMAT ST		SFT	SF 199922020	00005235	150.0	15.0	2250.0	2759.0
020-BENTOMAT ST		SFT	SF 199922020	00005236	150.0	15.0	2250.0	2720.0
020-BENTOMAT ST		SFT	SF 199922020	00005237	150.0	15.0	2250.0	2721.0
020-BENTOMAT ST		SFT	SF 199922020	00005238	150.0	15.0	2250.0	2713.0
020-BENTOMAT ST		SFT	SF 199922020	00005239	150.0	15.0	2250.0	2735.0
020-BENTOMAT ST		SFT	SF 199922020	00005240	150.0	15.0	2250.0	2725.0
020-BENTOMAT ST		SFT	SF 199922020	00005241	150.0	15.0	2250.0	2741.0
020-BENTOMAT ST		SFT	SF 199922020	00005242	150.0	15.0	2250.0	2738.0
020-BENTOMAT ST		SFT	SF 199922020	00005243	150.0	15.0	2250.0	2738.0
020-BENTOMAT ST		SFT	SF 199922020	00005244	150.0	15.0	2250.0	2740.0
020-BENTOMAT ST		SFT	SF 199922020	00005245	150.0	15.0	2250.0	2861.0
020-BENTOMAT ST		SFT	SF 199922020	00005246	150.0	15.0	2250.0	2749.0

PACKING LIST

COLLOID ENVIRONMENTAL TECH CO
1500 WEST SHURE DRIVE
ARLINGTON HEIGHTS IL 60004

ORDER NO:.. 000108309 -- 2739
ORDER DATE: 5/18/0019
SHIP DATE:. 6/0199

SOLD TO: 001376
GSE LINING TECHNOLOGY, INC.
19103 GUNDLE ROAD

HOUSTON TX 77073

SHIP FROM:. LOVELL
FRT TERMS:. PREPAID & ADD
SHIP VIA:.. NATIONWIDE

SHIP TO: 46
FLUOR DANIEL FERNALD
DEPARTMENT OF ENERGY
7400 WILLEY ROAD

HARRISON OH 45030

PO: 2292-000-OD ORDER #6761S0

PRODUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
020-BENTOMAT ST		SFT	SF 199922020	00005247	150.0	15.0	2250.0	2840.0
020-BENTOMAT ST		SFT	SF 199922020	00005248	150.0	15.0	2250.0	2831.0
020-BENTOMAT ST		SFT	SF 199922020	00005249	150.0	15.0	2250.0	2820.0
020-BENTOMAT ST		SFT	SF 199922020	00005250	150.0	15.0	2250.0	2810.0
020-BENTOMAT ST		SFT	SF 199922020	00005251	150.0	15.0	2250.0	2795.0
020-BENTOMAT ST		SFT	SF 199922020	00005252	150.0	15.0	2250.0	2812.0
020-BENTOMAT ST		SFT	SF 199922020	00005253	150.0	15.0	2250.0	2746.0
020-BENTOMAT ST		SFT	SF 199922020	00005254	150.0	15.0	2250.0	2818.0
020-BENTOMAT ST		SFT	SF 199922020	00005255	150.0	15.0	2250.0	2828.0
020-BENTOMAT ST		SFT	SF 199922020	00005256	150.0	15.0	2250.0	2798.0
020-BENTOMAT ST		SFT	SF 199922020	00005257	150.0	15.0	2250.0	2995.0
020-BENTOMAT ST		SFT	SF 199922020	00005258	150.0	15.0	2250.0	3021.0
020-BENTOMAT ST		SFT	SF 199922020	00005259	150.0	15.0	2250.0	2915.0
020-BENTOMAT ST		SFT	SF 199922020	00005260	150.0	15.0	2250.0	2729.0
020-BENTOMAT ST		SFT	SF 199922020	00005261	150.0	15.0	2250.0	2766.0
020-BENTOMAT ST		SFT	SF 199922020	00005262	150.0	15.0	2250.0	2730.0
020-BENTOMAT ST		SFT	SF 199922020	00005263	150.0	15.0	2250.0	2761.0
020-BENTOMAT ST		SFT	SF 199922020	00005264	150.0	15.0	2250.0	2744.0
020-BENTOMAT ST		SFT	SF 199922020	00005265	150.0	15.0	2250.0	2747.0

PACKING LIST

=-2739

COLLOID ENVIRONMENTAL TECH CO
1500 WEST SHURE DRIVE
ARLINGTON HEIGHTS IL 60004

ORDER NO:.. 000108309
ORDER DATE: 5/18/0019
SHIP DATE:. 6/0199

SOLD TO: 001376
GSE LINING TECHNOLOGY. INC.
19103 GUNDLE ROAD

HOUSTON TX 77073

SHIP FROM:. LOVELL
FRT TERMS:. PREPAID & ADD
SHIP VIA:.. NATIONWIDE

SHIP TO: 46
FLUOR DANIEL FERNALD
DEPARTMENT OF ENERGY
7400 WILLEY ROAD

HARRISON OH 45030

PO: 2292-000-OD ORDER #6761S0

PRODUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
020-BENTOMAT ST		SFT	SF	199922020	00005266	150.0	15.0	2250.0	2712.0
020-BENTOMAT ST		SFT	SF	199922020	00005267	150.0	15.0	2250.0	2715.0
020-BENTOMAT ST		SFT	SF	199922020	00005268	150.0	15.0	2250.0	2706.0
020-BENTOMAT ST		SFT	SF	199922020	00005269	150.0	15.0	2250.0	2733.0
020-BENTOMAT ST		SFT	SF	199922020	00005270	150.0	15.0	2250.0	2745.0
020-BENTOMAT ST		SFT	SF	199922020	00005271	150.0	15.0	2250.0	2740.0
020-BENTOMAT ST		SFT	SF	199922020	00005272	150.0	15.0	2250.0	2730.0
020-BENTOMAT ST		SFT	SF	199922020	00005273	150.0	15.0	2250.0	2698.0
020-BENTOMAT ST		SFT	SF	199922020	00005274	150.0	15.0	2250.0	2737.0
020-BENTOMAT ST		SFT	SF	199922020	00005275	150.0	15.0	2250.0	2730.0
020-BENTOMAT ST		SFT	SF	199922020	00005276	150.0	15.0	2250.0	2741.0
020-BENTOMAT ST		SFT	SF	199922020	00005277	150.0	15.0	2250.0	2694.0
020-BENTOMAT ST		SFT	SF	199922020	00005278	150.0	15.0	2250.0	2696.0
020-BENTOMAT ST		SFT	SF	199922020	00005279	150.0	15.0	2250.0	2689.0
020-BENTOMAT ST		SFT	SF	199922020	00005280	150.0	15.0	2250.0	2705.0
020-BENTOMAT ST		SFT	SF	199922020	00005281	150.0	15.0	2250.0	2699.0
020-BENTOMAT ST		SFT	SF	199922020	00005282	150.0	15.0	2250.0	2683.0
020-BENTOMAT ST		SFT	SF	199922020	00005283	150.0	15.0	2250.0	2724.0
020-BENTOMAT ST		SFT	SF	199922020	00005284	150.0	15.0	2250.0	2709.0

PACKING LIST

2739

COLLOID ENVIRONMENTAL TECH CO
500 WEST SHURE DRIVE
ARLINGTON HEIGHTS IL 60004

ORDER NO:.. 000108309
ORDER DATE: 5/18/0019
SHIP DATE:. 6/0199

SOLD TO: 001376
GSE LINING TECHNOLOGY. INC.
19103 GUNDLE ROAD

HOUSTON TX 77073

SHIP FROM:. LOVELL
FRT TERMS:. PREPAID & ADD
SHIP VIA:.. NATIONWIDE

SHIP TO: 46
FLUOR DANIEL FERNALD
DEPARTMENT OF ENERGY
7400 WILLEY ROAD

HARRISON OH 45030

PO: 2292-000-OD ORDER #6761S0

PRODUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
020-BENTOMAT ST		SFT	SF 199922020	00005285	150.0	15.0	2250.0	2715.0
020-BENTOMAT ST		SFT	SF 199922020	00005286	150.0	15.0	2250.0	2707.0
020-BENTOMAT ST		SFT	SF 199922020	00005287	150.0	15.0	2250.0	2710.0
020-BENTOMAT ST		SFT	SF 199922020	00005288	150.0	15.0	2250.0	2677.0
020-BENTOMAT ST		SFT	SF 199922020	00005289	150.0	15.0	2250.0	2691.0
020-BENTOMAT ST		SFT	SF 199922020	00005290	150.0	15.0	2250.0	3102.0
020-BENTOMAT ST		SFT	SF 199922020	00005291	150.0	15.0	2250.0	2763.0
020-BENTOMAT ST		SFT	SF 199922020	00005292	150.0	15.0	2250.0	2761.0
020-BENTOMAT ST		SFT	SF 199922020	00005293	150.0	15.0	2250.0	2687.0
020-BENTOMAT ST		SFT	SF 199922020	00005294	150.0	15.0	2250.0	2710.0
020-BENTOMAT ST		SFT	SF 199922020	00005295	150.0	15.0	2250.0	2694.0
020-BENTOMAT ST		SFT	SF 199922020	00005296	150.0	15.0	2250.0	2687.0
020-BENTOMAT ST		SFT	SF 199922020	00005297	150.0	15.0	2250.0	2668.0
020-BENTOMAT ST		SFT	SF 199922020	00005298	150.0	15.0	2250.0	2680.0
020-BENTOMAT ST		SFT	SF 199922020	00005299	150.0	15.0	2250.0	2676.0
020-BENTOMAT ST		SFT	SF 199922020	00005300	150.0	15.0	2250.0	2709.0
020-BENTOMAT ST		SFT	SF 199922020	00005301	150.0	15.0	2250.0	2698.0
020-BENTOMAT ST		SFT	SF 199922020	00005302	150.0	15.0	2250.0	2694.0
020-BENTOMAT ST		SFT	SF 199922020	00005303	150.0	15.0	2250.0	2687.0

PACKING LIST

2739

COLLOID ENVIRONMENTAL TECH CO
1500 WEST SHURE DRIVE
ARLINGTON HEIGHTS IL 60004

ORDER NO:.. 000108309
ORDER DATE: 5/18/0019
SHIP DATE:. 6/0199

SOLD TO: 001376
GSE LINING TECHNOLOGY, INC.
19103 GUNDLE ROAD

HOUSTON TX 77073

SHIP FROM:. LOVELL
FRT TERMS:. PREPAID & ADD
SHIP VIA:.. NATIONWIDE

SHIP TO: 46
FLUOR DANIEL FERNALD
DEPARTMENT OF ENERGY
7400 WILLEY ROAD

HARRISON OH 45030

PO: 2292-000-OD ORDER #6761S0

PRODUCT	SIZE U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
020-BENTOMAT ST	SFT SF	199922020	00005304	150.0	15.0	2250.0	2685.0
020-BENTOMAT ST	SFT SF	199922020	00005305	150.0	15.0	2250.0	2667.0
020-BENTOMAT ST	SFT SF	199922020	00005306	150.0	15.0	2250.0	2712.0
020-BENTOMAT ST	SFT SF	199922020	00005307	150.0	15.0	2250.0	2720.0
020-BENTOMAT ST	SFT SF	199922020	00005308	150.0	15.0	2250.0	2679.0
020-BENTOMAT ST	SFT SF	199922020	00005309	150.0	15.0	2250.0	2681.0
020-BENTOMAT ST	SFT SF	199922020	00005310	150.0	15.0	2250.0	2679.0
020-BENTOMAT ST	SFT SF	199922020	00005311	150.0	15.0	2250.0	2686.0
020-BENTOMAT ST	SFT SF	199922020	00005312	150.0	15.0	2250.0	2681.0
020-BENTOMAT ST	SFT SF	199922020	00005313	150.0	15.0	2250.0	2702.0
020-BENTOMAT ST	SFT SF	199922020	00005314	150.0	15.0	2250.0	2710.0
020-BENTOMAT ST	SFT SF	199922020	00005315	150.0	15.0	2250.0	2724.0
020-BENTOMAT ST	SFT SF	199922020	00005316	150.0	15.0	2250.0	2795.0
020-BENTOMAT ST	SFT SF	199922020	00005317	150.0	15.0	2250.0	2765.0
020-BENTOMAT ST	SFT SF	199922020	00005318	150.0	15.0	2250.0	2758.0
020-BENTOMAT ST	SFT SF	199922020	00005319	150.0	15.0	2250.0	2769.0
020-BENTOMAT ST	SFT SF	199922020	00005320	150.0	15.0	2250.0	2777.0
020-BENTOMAT ST	SFT SF	199922020	00005321	150.0	15.0	2250.0	2751.0
020-BENTOMAT ST	SFT SF	199922020	00005322	150.0	15.0	2250.0	2762.0

PACKING LIST

2739

COLLOID ENVIRONMENTAL TECH CO
500 WEST SHURE DRIVE
LINGTON HEIGHTS IL 60004

ORDER NO:.. 000108309
ORDER DATE: 5/18/0019
SHIP DATE:. 6/0199

SOLD TO: 001376
GSE LINING TECHNOLOGY. INC.
19103 GUNDLE ROAD

HOUSTON TX 77073

SHIP FROM:. LOVELL
FRT TERMS:. PREPAID & ADD
SHIP VIA:...NATIONWIDE

SHIP TO: 46
FLUOR DANIEL FERNALD
DEPARTMENT OF ENERGY
7400 WILLEY ROAD

HARRISON OH 45030

PO: 2292-000-OD ORDER #6761S0

PRODUCT	SIZE U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
020-BENTOMAT ST	SFT SF	199922020	00005323	150.0	15.0	2250.0	2757.0
020-BENTOMAT ST	SFT SF	199922020	00005324	150.0	15.0	2250.0	2799.0
020-BENTOMAT ST	SFT SF	199922020	00005325	150.0	15.0	2250.0	2790.0
020-BENTOMAT ST	SFT SF	199922020	00005326	150.0	15.0	2250.0	2797.0
020-BENTOMAT ST	SFT SF	199922020	00005327	150.0	15.0	2250.0	2783.0
020-BENTOMAT ST	SFT SF	199922020	00005328	150.0	15.0	2250.0	2791.0
020-BENTOMAT ST	SFT SF	199922020	00005329	150.0	15.0	2250.0	2788.0
020-BENTOMAT ST	SFT SF	199922020	00005330	150.0	15.0	2250.0	2774.0
020-BENTOMAT ST	SFT SF	199922020	00005331	150.0	15.0	2250.0	2772.0
020-BENTOMAT ST	SFT SF	199922020	00005332	150.0	15.0	2250.0	2763.0
020-BENTOMAT ST	SFT SF	199922020	00005333	150.0	15.0	2250.0	2685.0
020-BENTOMAT ST	SFT SF	199922020	00005334	150.0	15.0	2250.0	2796.0
020-BENTOMAT ST	SFT SF	199922020	00005335	150.0	15.0	2250.0	2785.0
020-BENTOMAT ST	SFT SF	199922020	00005336	150.0	15.0	2250.0	2791.0
020-BENTOMAT ST	SFT SF	199922020	00005337	150.0	15.0	2250.0	2788.0
020-BENTOMAT ST	SFT SF	199922020	00005338	150.0	15.0	2250.0	2842.0
020-BENTOMAT ST	SFT SF	199922020	00005339	150.0	15.0	2250.0	2824.0
020-BENTOMAT ST	SFT SF	199922020	00005340	150.0	15.0	2250.0	2852.0
020-BENTOMAT ST	SFT SF	199922020	00005341	150.0	15.0	2250.0	2844.0

PACKING LIST

--2739

COLLOID ENVIRONMENTAL TECH CO
1500 WEST SHURE DRIVE
ARLINGTON HEIGHTS IL 60004

ORDER NO:.. 000108309
ORDER DATE: 5/18/0019
SHIP DATE:. 6/0199

SOLD TO: 001376
GSE LINING TECHNOLOGY. INC.
19103 GUNDLE ROAD

HOUSTON TX 77073

SHIP FROM:. LOVELL
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SHIP TO: 46
FLUOR DANIEL FERNALD
DEPARTMENT OF ENERGY
7400 WILLEY ROAD

HARRISON OH 45030

PO: 2292-000-OD ORDER #6761S0

PRODUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
020-BENTOMAT ST		SFT	SF 199922020	00005342	150.0	15.0	2250.0	2846.0
020-BENTOMAT ST		SFT	SF 199922020	00005343	150.0	15.0	2250.0	2814.0
020-BENTOMAT ST		SFT	SF 199922020	00005344	150.0	15.0	2250.0	2831.0
020-BENTOMAT ST		SFT	SF 199922020	00005345	150.0	15.0	2250.0	2805.0
020-BENTOMAT ST		SFT	SF 199922020	00005346	150.0	15.0	2250.0	2808.0
020-BENTOMAT ST		SFT	SF 199922020	00005347	150.0	15.0	2250.0	2823.0
020-BENTOMAT ST		SFT	SF 199922020	00005348	150.0	15.0	2250.0	2800.0
020-BENTOMAT ST		SFT	SF 199922020	00005349	150.0	15.0	2250.0	2796.0
020-BENTOMAT ST		SFT	SF 199922020	00005350	150.0	15.0	2250.0	2788.0
020-BENTOMAT ST		SFT	SF 199922020	00005351	150.0	15.0	2250.0	2795.0
020-BENTOMAT ST		SFT	SF 199922020	00005352	150.0	15.0	2250.0	2779.0
020-BENTOMAT ST		SFT	SF 199922020	00005353	150.0	15.0	2250.0	2778.0
020-BENTOMAT ST		SFT	SF 199922020	00005354	150.0	15.0	2250.0	2782.0
020-BENTOMAT ST		SFT	SF 199922020	00005355	150.0	15.0	2250.0	2786.0
020-BENTOMAT ST		SFT	SF 199922020	00005356	150.0	15.0	2250.0	2789.0
020-BENTOMAT ST		SFT	SF 199922020	00005357	150.0	15.0	2250.0	2792.0
020-BENTOMAT ST		SFT	SF 199922020	00005358	150.0	15.0	2250.0	2785.0
020-BENTOMAT ST		SFT	SF 199922020	00005359	150.0	15.0	2250.0	2794.0
020-BENTOMAT ST		SFT	SF 199922020	00005360	150.0	15.0	2250.0	2791.0

P A C K I N G L I S T

=-2739

COLLOID ENVIRONMENTAL TECH CO
500 WEST SHURE DRIVE
LINGTON HEIGHTS IL 60004

ORDER NO:.. 000108309
ORDER DATE: 5/18/0019
SHIP DATE:. 6/0199

SOLD TO: 001376
GSE LINING TECHNOLOGY, INC.
19103 GUNDLE ROAD

HOUSTON TX 77073

SHIP FROM:. LOVELL
FRT TERMS:. PREPAID & ADD
SHIP VIA:.. NATIONWIDE

SHIP TO: 46
FLUOR DANIEL FERNALD
DEPARTMENT OF ENERGY
7400 WILLEY ROAD

HARRISON OH 45030

PO: 2292-000-OD ORDER #6761S0

PRODUCT	SIZE	U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
020-BENTOMAT ST		SFT	SF 199922020	00005361	150.0	15.0	2250.0	2781.0
020-BENTOMAT ST		SFT	SF 199922020	00005362	150.0	15.0	2250.0	2784.0
020-BENTOMAT ST		SFT	SF 199922020	00005363	150.0	15.0	2250.0	2781.0
020-BENTOMAT ST		SFT	SF 199922020	00005364	150.0	15.0	2250.0	2786.0

ORDER TOTALS..... 778500.0 952416.0

TOTAL ITEMS..... 346

QCGBFT2 QCTBFT2
6/01/99 11:35:55

COLLOID ENVIRONMENTAL TECH CO

GCL QUALITY DATA

LOVELL
PO BOX 428
LOVELL NY 02431

SHIP TO: FLUOR DANI
DEPARTMENT
HARRISON

O R D E R # 000108309

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB STRENGTH 90 lbs ASTM D 4632	PEEL STRENGTH 15 lbs ASTM D 4632	MOISTURE 25% Typical ASTM D 4643
020-BENTOMAT ST	199922020	00005208	1.11	192.20	29.00	22.90
020-BENTOMAT ST	199922020	00005207	1.11	192.20	29.00	22.90
020-BENTOMAT ST	199922020	00005206	1.11	192.20	29.00	22.90
020-BENTOMAT ST	199922020	00005205	1.11	192.20	29.00	22.90
020-BENTOMAT ST	199922020	00005204	1.11*	192.20	29.00*	22.90*
020-BENTOMAT ST	199922020	00005203	1.13	192.20	35.10	23.70
020-BENTOMAT ST	199922020	00005202	1.13	192.20	35.10	23.70
020-BENTOMAT ST	199922020	00005201	1.13	192.20	35.10	23.70
020-BENTOMAT ST	199922020	00005200	1.13*	192.20*	35.10*	23.70*
020-BENTOMAT ST	199922020	00005199	1.13	204.20	23.70	23.00
020-BENTOMAT ST	199922020	00005198	1.13	204.20	23.70	23.00
020-BENTOMAT ST	199922020	00005197	1.13	204.20	23.70	23.00
020-BENTOMAT ST	:99922020	00005196	1.13	204.20	23.70	23.00
020-BENTOMAT ST	199922020	00005195	1.13	204.20	23.70	23.00
020-BENTOMAT ST	199922020	00005194	1.13	204.20	23.70	23.00
020-BENTOMAT ST	199922020	00005193	1.13	204.20	23.70	23.00
020-BENTOMAT ST	199922020	00005192	1.13	204.20	23.70	23.00
020-BENTOMAT ST	199922020	00005191	1.13	204.20	23.70	23.00
020-BENTOMAT ST	199922020	00005190	1.13	204.20	23.70	23.00
020-BENTOMAT ST	199922020	00005189	1.13	204.20	23.70	23.00
020-BENTOMAT ST	199922020	00005188	1.13	204.20	23.70	23.00
020-BENTOMAT ST	199922020	00005187	1.13	204.20	23.70	23.00
020-BENTOMAT ST	199922020	00005186	1.13	204.20	23.70	23.00
020-BENTOMAT ST	199922020	00005185	1.13*	204.20	23.70*	23.00*
020-BENTOMAT ST	199922020	00005184	1.12	204.20	32.90	23.50
020-BENTOMAT ST	199922020	00005183	1.12	204.20	32.90	23.50
020-BENTOMAT ST	199922020	00005182	1.12	204.20	32.90	23.50
020-BENTOMAT ST	199922020	00005181	1.12	204.20	32.90	23.50
020-BENTOMAT ST	199922020	00005180	1.12	204.20	32.90	23.50
020-BENTOMAT ST	199922020	00005179	1.12	204.20	32.90	23.50
020-BENTOMAT ST	199922020	00005178	1.12	204.20	32.90	23.50
020-BENTOMAT ST	199922020	00005177	1.12	204.20	32.90	23.50
020-BENTOMAT ST	199922020	00005176	1.12	204.20	32.90	23.50
020-BENTOMAT ST	199922020	00005175	1.12	204.20	32.90	23.50
020-BENTOMAT ST	199922020	00005174	1.12	204.20	32.90	23.50
020-BENTOMAT ST	199922020	00005173	1.12	204.20	32.90	23.50
020-BENTOMAT ST	199922020	00005172	1.12	204.20	32.90	23.50
020-BENTOMAT ST	199922020	00005171	1.13	204.20	32.90	23.50
020-BENTOMAT ST	199922020	00005170	1.12	204.20	[illegible]	23.50

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COLLOID ENVIRONMENTAL TECH CO

GCL QUALITY DATA

LOVELL
PO BOX 628
LOVELL MY 62431

SHIP TO: FLUOR DANI
DEPARTMENT
HARRISON

O R D E R # 000108389

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB STRENGTH 90 lbs ASTM D 4632	PEEL STRENGTH 15 lbs ASTM D 4632	MOISTURE 25% Typical ASTM D 4643
020-BENTOMAT ST	199922020	00005169	1.12*	204.20	32.90*	23.50*
020-BENTOMAT ST	199922020	00005168	1.13	204.20	32.50	21.10
020-BENTOMAT ST	199922020	00005167	1.13	204.20	32.50	21.10
020-BENTOMAT ST	199922020	00005166	1.13	204.20	32.50	21.10
020-BENTOMAT ST	199922020	00005165	1.13	204.20	32.50	21.10
020-BENTOMAT ST	199922020	00005164	1.13	204.20	32.50	21.10
020-BENTOMAT ST	199922020	00005163	1.13	204.20	32.50	21.10
020-BENTOMAT ST	199922020	00005162	1.13	204.20	32.50	21.10
020-BENTOMAT ST	199922020	00005161	1.13	204.20	32.50	21.10
020-BENTOMAT ST	199922020	00005160	1.13	204.20	32.50	21.10
020-BENTOMAT ST	199922020	00005159	1.13	204.20	32.50	21.10
020-BENTOMAT ST	199922020	00005158	1.13	204.20	32.50	21.10
020-BENTOMAT ST	199922020	00005157	1.13	204.20	32.50	21.10
020-BENTOMAT ST	199922020	00005156	1.13	204.20	32.50	21.10
020-BENTOMAT ST	199922020	00005155	1.13	204.20	32.50	21.10
020-BENTOMAT ST	199922020	00005154	1.13	204.20	32.50	21.10
020-BENTOMAT ST	199922020	00005153	1.13*	204.20*	32.50*	21.10*
020-BENTOMAT ST	199922020	00005152	1.11	130.90	32.70	22.70
020-BENTOMAT ST	199922020	00005151	1.11	130.90	32.70	22.70
020-BENTOMAT ST	199922020	00005150	1.11	130.90	32.70	22.70
020-BENTOMAT ST	199922020	00005149	1.11	130.90	32.70	22.70
020-BENTOMAT ST	199922020	00005148	1.11	130.90	32.70	22.70
020-BENTOMAT ST	199922020	00005147	1.11	130.90	32.70	22.70
020-BENTOMAT ST	199922020	00005146	1.11	130.90	32.70	22.70
020-BENTOMAT ST	199922020	00005145	1.11	130.90	32.70	22.70
020-BENTOMAT ST	199922020	00005144	1.11	130.90	32.70	22.70
020-BENTOMAT ST	199922020	00005143	1.11	130.90	32.70	22.70
020-BENTOMAT ST	199922020	00005142	1.11	130.90	32.70	22.70
020-BENTOMAT ST	199922020	00005141	1.11	130.90	32.70	22.70
020-BENTOMAT ST	199922020	00005140	1.11	130.90	32.70	22.70
020-BENTOMAT ST	199922020	00005139	1.11	130.90	32.70	22.70
020-BENTOMAT ST	199922020	00005138	1.11	130.90	32.70	22.70
020-BENTOMAT ST	199922020	00005137	1.11*	130.90	32.70*	22.70*
020-BENTOMAT ST	199922020	00005136	1.10	130.90	23.70	23.10
020-BENTOMAT ST	199922020	00005135	1.10	130.90	23.70	23.10
020-BENTOMAT ST	199922020	00005134	1.10	130.90	23.70	23.10
020-BENTOMAT ST	199922020	00005133	1.10	130.90	23.70	23.10
020-BENT[illegible] ST	199922020	00005132	1.10	130.90	23.70	23.10
020-BE[illegible]T	199922020	00005131	1.10	130.90	[illegible]	23.10

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COLLOID ENVIRONMENTAL TECH CO

GCL QUALITY DATA

LOVELL
PO BOX 428
LOVELL WY 82431

SHIP TO: FLUOR DANI
DEPARTMENT
HARRISON

O R D E R # 000108309

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB STRENGTH 90 lbs ASTM D 4632	PEEL STRENGTH 15 lbs ASTM D 4632	MOISTURE 25% Typical ASTM D 4643
020-BENTOMAT ST	199922020	00005364	1.12	138.30	28.10	24.70
020-BENTOMAT ST	199922020	00005363	1.12	138.30	28.10	24.70
020-BENTOMAT ST	199922020	00005362	1.12	138.30	28.10	24.70
020-BENTOMAT ST	199922020	00005361	1.12	138.30	28.10	24.70
020-BENTOMAT ST	199922020	00005360	1.12	138.30	28.10	24.70
020-BENTOMAT ST	199922020	00005359	1.12	138.30	28.10	24.70
020-BENTOMAT ST	199922020	00005358	1.12	138.30	28.10	24.70
020-BENTOMAT ST	199922020	00005357	1.12	138.30	28.10	24.70
020-BENTOMAT ST	199922020	00005356	1.12	138.30	28.10	24.70
020-BENTOMAT ST	199922020	00005355	1.12	138.30	28.10	24.70
020-BENTOMAT ST	199922020	00005354	1.12*	138.30*	28.10*	24.70*
020-BENTOMAT ST	199922020	00005353	1.20	152.70	29.20	23.10
020-BENTOMAT ST	199922020	00005352	1.20	152.70	29.20	23.10
020-BENTOMAT ST	199922020	00005351	1.20	152.70	29.20	23.10
020-BENTOMAT ST	199922020	00005350	1.20	152.70	29.20	23.10
020-BENTOMAT ST	199922020	00005349	1.20	152.70	29.20	23.10
020-BENTOMAT ST	199922020	00005348	1.20	152.70	29.20	23.10
020-BENTOMAT ST	199922020	00005347	1.20	152.70	29.20	23.10
020-BENTOMAT ST	199922020	00005346	1.20	152.70	29.20	23.10
020-BENTOMAT ST	199922020	00005345	1.20	152.70	29.20	23.10
020-BENTOMAT ST	199922020	00005344	1.20	152.70	29.20	23.10
020-BENTOMAT ST	199922020	00005343	1.20	152.70	29.20	23.10
020-BENTOMAT ST	199922020	00005342	1.20	152.70	29.20	23.10
020-BENTOMAT ST	199922020	00005341	1.20	152.70	29.20	23.10
020-BENTOMAT ST	199922020	00005340	1.20	152.70	29.20	23.10
020-BENTOMAT ST	199922020	00005339	1.20	152.70	29.20	23.10
020-BENTOMAT ST	199922020	00005338	1.20*	152.70	29.20*	23.10*
020-BENTOMAT ST	199922020	00005337	1.14	152.70	27.20	23.50
020-BENTOMAT ST	199922020	00005336	1.14	152.70	27.20	23.50
020-BENTOMAT ST	199922020	00005335	1.14	152.70	27.20	23.50
020-BENTOMAT ST	199922020	00005334	1.14	152.70	27.20	23.50
020-BENTOMAT ST	199922020	00005333	1.14	152.70	27.20	23.50
020-BENTOMAT ST	199922020	00005332	1.14	152.70	27.20	23.50
020-BENTOMAT ST	199922020	00005331	1.14	152.70	27.20	23.50
020-BENTOMAT ST	199922020	00005330	1.14	152.70	27.20	23.50
020-BENTOMAT ST	199922020	00005329	1.14	152.70	27.20	23.50
020-BENTOMAT ST	199922020	00005328	1.14	152.70	27.20	23.50
020-BENTOMAT ST	199922020	00005327	1.14*	152.70	27.20*	23.50*
020-BENTOMAT ST	199922020	00005326	1.03	152.70	[illegible]	22.40

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COLLOID ENVIRONMENTAL TECH CO

GCL QUALITY DATA

LOVELL
PO BOX 428
LOVELL MT 82431

SHIP TO: FLUOR DANI
DEPARTMENT
HARRISON

O R D E R # 000108309

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB STRENGTH 90 lbs ASTM D 4632	PEEL STRENGTH 15 lbs ASTM D 4632	MOISTURE 25% Typical ASTM D 4641
020-BENTOMAT ST	199922020	00005325	1.02	152.70	31.90	22.40
020-BENTOMAT ST	199922020	00005324	1.02	152.70	31.90	22.40
020-BENTOMAT ST	199922020	00005323	1.02	152.70	31.90	22.40
020-BENTOMAT ST	199922020	00005322	1.02	152.70	31.90	22.40
020-BENTOMAT ST	199922020	00005321	1.02	152.70	31.90	22.40
020-BENTOMAT ST	199922020	00005320	1.02	152.70	31.90	22.40
020-BENTOMAT ST	199922020	00005319	1.02	152.70	31.90	22.40
020-BENTOMAT ST	199922020	00005318	1.02	152.70	31.90	22.40
020-BENTOMAT ST	199922020	00005317	1.02	152.70	31.90	22.40
020-BENTOMAT ST	199922020	00005316	1.02	152.70	31.90	22.40
020-BENTOMAT ST	199922020	00005315	1.02	152.70	31.90	22.40
020-BENTOMAT ST	199922020	00005314	1.02	152.70	31.90	22.40
020-BENTOMAT ST	199922020	00005313	1.02	152.70	31.90	22.40
020-BENTOMAT ST	199922020	00005312	1.02	152.70	31.90	22.40
020-BENTOMAT ST	199922020	00005311	1.02	152.70	31.90	22.40
020-BENTOMAT ST	199922020	00005310	1.02	152.70	31.90	22.40
020-BENTOMAT ST	199922020	00005309	1.02	152.70	31.90	22.40
020-BENTOMAT ST	199922020	00005308	1.02	152.70	31.90	22.40
020-BENTOMAT ST	199922020	00005307	1.02	152.70	31.90	22.40
020-BENTOMAT ST	199922020	00005306	1.02*	152.70	31.90*	22.40*
020-BENTOMAT ST	199922020	00005305	1.11	152.70	40.20	24.90
020-BENTOMAT ST	199922020	00005304	1.11	152.70	40.20	24.90
020-BENTOMAT ST	199922020	00005303	1.11	152.70	40.20	24.90
020-BENTOMAT ST	199922020	00005302	1.11	152.70	40.20	24.90
020-BENTOMAT ST	199922020	00005301	1.11	152.70	40.20	24.90
020-BENTOMAT ST	199922020	00005300	1.11	152.70	40.20	24.90
020-BENTOMAT ST	199922020	00005299	1.11	152.70	40.20	24.90
020-BENTOMAT ST	199922020	00005298	1.11	152.70	40.20	24.90
020-BENTOMAT ST	199922020	00005297	1.11	152.70	40.20	24.90
020-BENTOMAT ST	199922020	00005296	1.11	152.70	40.20	24.90
020-BENTOMAT ST	199922020	00005295	1.11	152.70	40.20	24.90
020-BENTOMAT ST	199922020	00005294	1.11	152.70	40.20	24.90
020-BENTOMAT ST	199922020	00005293	1.11	152.70	40.20	24.90
020-BENTOMAT ST	199922020	00005292	1.11	152.70	40.20	24.90
020-BENTOMAT ST	199922020	00005291	1.11	152.70	40.20	24.90
020-BENTOMAT ST	199922020	00005290	1.11*	152.70	40.20*	24.90*
020-BENTOMAT ST	199922020	00005289	1.16	152.70	22.10	23.50
020-BE[illegible] ST	199922020	00005288	1.16	152.70	22.10	23.50
020-B[illegible] ST	199922020	00005287	1.16	152.70	[illegible]	23.50

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COLLOID ENVIRONMENTAL TECH CO

GCL QUALITY DATA

LOVELL
PO BOX 428
LOVELL WY 82431

SHIP TO: FLUOR DANI
DEPARTMENT
HARRISON

O R D E R # 000108309

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 8.75 lb/sqft ASTM D 5993	GRAB STRENGTH 90 lbs ASTM D 4632	PEEL STRENGTH 15 lbs ASTM D 4632	MOISTURE 25% Typical ASTM D 4643
020-BENTOMAT ST	199922020	00005286	1.16	152.70	22.10	23.50
020-BENTOMAT ST	199922020	00005285	1.16	152.70	22.10	23.50
020-BENTOMAT ST	199922020	00005284	1.16	152.70	22.10	23.50
020-BENTOMAT ST	199922020	00005283	1.16	152.70	22.10	23.50
020-BENTOMAT ST	199922020	00005282	1.16	152.70	22.10	23.50
020-BENTOMAT ST	199922020	00005281	1.16	152.70	22.10	23.50
020-BENTOMAT ST	199922020	00005280	1.16	152.70	22.10	23.50
020-BENTOMAT ST	199922020	00005279	1.16	152.70	22.10	23.50
020-BENTOMAT ST	199922020	00005278	1.16	152.70	22.10	23.50
020-BENTOMAT ST	199922020	00005277	1.16	152.70	22.10	23.50
020-BENTOMAT ST	199922020	00005276	1.16	152.70	22.10	23.50
020-BENTOMAT ST	199922020	00005275	1.16	152.70	22.10	23.50
020-BENTOMAT ST	199922020	00005274	1.16*	152.70*	22.10*	23.50*
020-BENTOMAT ST	199922020	00005273	1.13	135.30	19.80	22.90
020-BENTOMAT ST	199922020	00005272	1.13	135.30	19.80	22.90
020-BENTOMAT ST	199922020	00005271	1.13	135.30	19.80	22.90
020-BENTOMAT ST	199922020	00005270	1.13	135.30	19.80	22.90
020-BENTOMAT ST	199922020	00005269	1.13	135.30	19.80	22.90
020-BENTOMAT ST	199922020	00005268	1.13	135.30	19.80	22.90
020-BENTOMAT ST	199922020	00005267	1.13	135.30	19.80	22.90
020-BENTOMAT ST	199922020	00005266	1.13	135.30	19.80	22.90
020-BENTOMAT ST	199922020	00005265	1.13	135.30	19.80	22.90
020-BENTOMAT ST	199922020	00005264	1.13	135.30	19.80	22.90
020-BENTOMAT ST	199922020	00005263	1.13	135.30	19.80	22.90
020-BENTOMAT ST	199922020	00005262	1.13	135.30	19.80	22.90
020-BENTOMAT ST	199922020	00005261	1.13*	135.30	19.80*	22.90*
020-BENTOMAT ST	199922020	00005260	1.18	135.30	21.90	22.60
020-BENTOMAT ST	199922020	00005259	1.18	135.30	21.90	22.60
020-BENTOMAT ST	199922020	00005258	1.18	135.30	21.90	22.60
020-BENTOMAT ST	199922020	00005257	1.18	135.30	21.90	22.60
020-BENTOMAT ST	199922020	00005256	1.18	135.30	21.90	22.60
020-BENTOMAT ST	199922020	00005255	1.18	135.30	21.90	22.60
020-BENTOMAT ST	199922020	00005254	1.18	135.30	21.90	22.60
020-BENTOMAT ST	[illegible]	00005253	1.18	135.30	21.90	22.60
020-BENTOMAT ST	199922020	00005252	1.18	135.30	21.90	22.60
020-BENTOMAT ST	199922020	00005251	1.18	135.30	21.90	22.60
020-BENTOMAT ST	199922020	00005250	1.18	135.30	21.90	22.60
020-BENTOMAT ST	199922020	00005249	1.18	135.30	21.90	22.60
020-BENTOMAT ST	199922020	00005248	1.18	135.30	[illegible]	22.60

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COLLOID ENVIRONMENTAL TECH CO

GCL QUALITY DATA

LOVELL
PO BOX 428
LOVELL MT 82431

SHIP TO: FLUOR DANI
DEPARTMENT
HARRISON

O R D E R # 000108309

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB STRENGTH 90 lbs ASTM D 4632	PEEL STRENGTH 15 lbs ASTM D 4632	MOISTURE 25% Typical ASTM D 4643
020-BENTOMAT ST	199922020	00005247	1.18	135.30	21.90	22.60
020-BENTOMAT ST	199922020	00005246	1.18	135.30	21.90	22.60
020-BENTOMAT ST	199922020	00005245	1.18*	135.30*	21.90*	22.60*
020-BENTOMAT ST	199922020	00005244	1.07	192.20	19.90	21.80
020-BENTOMAT ST	199922020	00005243	1.07	192.20	19.90	21.80
020-BENTOMAT ST	199922020	00005242	1.07	192.20	19.90	21.80
020-BENTOMAT ST	199922020	00005241	1.07	192.20	19.90	21.80
020-BENTOMAT ST	199922020	00005240	1.07	192.20	19.90	21.80
020-BENTOMAT ST	199922020	00005239	1.07	192.20	19.90	21.80
020-BENTOMAT ST	199922020	00005238	1.07	192.20	19.90	21.80
020-BENTOMAT ST	199922020	00005237	1.07	192.20	19.90	21.80
020-BENTOMAT ST	199922020	00005236	1.07*	192.20	19.90*	21.80*
020-BENTOMAT ST	199922020	00005235	1.19	192.20	19.20	24.10
020-BENTOMAT ST	199922020	00005234	1.19	192.20	19.20	24.10
020-BENTOMAT ST	199922020	00005233	1.19	192.20	19.20	24.10
020-BENTOMAT ST	199922020	00005232	1.19	192.20	19.20	24.10
020-BENTOMAT ST	199922020	00005231	1.19	192.20	19.20	24.10
020-BENTOMAT ST	199922020	00005230	1.19	192.20	19.20	24.10
020-BENTOMAT ST	199922020	00005229	1.19	192.20	19.20	24.10
020-BENTOMAT ST	199922020	00005228	1.19	192.20	19.20	24.10
020-BENTOMAT ST	199922020	00005227	1.19	192.20	19.20	24.10
020-BENTOMAT ST	199922020	00005226	1.19	192.20	19.20	24.10
020-BENTOMAT ST	199922020	00005225	1.19	192.20	19.20	24.10
020-BENTOMAT ST	199922020	00005224	1.19	192.20	19.20	24.10
020-BENTOMAT ST	199922020	00005223	1.19	192.20	19.20	24.10
020-BENTOMAT ST	199922020	00005222	1.19	192.20	19.20	24.10
020-BENTOMAT ST	199922020	00005221	1.19	192.20	19.20	24.10
020-BENTOMAT ST	199922020	00005220	1.19*	192.20	19.20*	24.10*
020-BENTOMAT ST	199922020	00005219	1.11	192.20	29.00	22.90
020-BENTOMAT ST	199922020	00005218	1.11	192.20	29.00	22.90
020-BENTOMAT ST	199922020	00005217	1.11	192.20	29.00	22.90
020-BENTOMAT ST	199922020	00005216	1.11	192.20	29.00	22.90
020-BENTOMAT ST	199922020	00005215	1.11	192.20	29.00	22.90
020-BENTOMAT ST	199922020	00005214	1.11	192.20	29.00	22.90
020-BENTOMAT ST	199922020	00005213	1.11	192.20	29.00	22.90
020-BENTOMAT ST	199922020	00005212	1.11	192.20	29.00	22.90
020-BE[illegible]T ST	199922020	00005211	1.11	192.20	29.00	22.90
020-B[illegible] ST	199922020	00005210	1.11	192.20	[illegible]	22.90
020-B[illegible] ST	199922020	00005209	1.11	192.20	[illegible]	22.90

000121

2739

QCGSFT2 QCTSFT2
6/01/99 11:35:55

COLLOID ENVIRONMENTAL TECH CO

GCL QUALITY DATA

LOVELL
PO BOX 428
LOVELL WY 82431

SHIP TO: FLUOR DANI
DEPARTMENT
HARRISON

O R D E R # 000100309

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB STRENGTH 90 lbs ASTM D 4632	PEEL STRENGTH 15 lbs ASTM D 4632	MOISTURE 25% Typical ASTM D 4643
020-BENTOMAT ST	199922020	00005130	1.10	130.90	23.70	23.10
020-BENTOMAT ST	199922020	00005129	1.10	130.90	23.70	23.10
020-BENTOMAT ST	199922020	00005128	1.10	130.90	23.70	23.10
020-BENTOMAT ST	199922020	00005127	1.10	130.90	23.70	23.10
020-BENTOMAT ST	199922020	00005126	1.10	130.90	23.70	23.10
020-BENTOMAT ST	199922020	00005125	1.10	130.90	23.70	23.10
020-BENTOMAT ST	199922020	00005124	1.10	130.90	23.70	23.10
020-BENTOMAT ST	199922020	00005123	1.10	130.90	23.70	23.10
020-BENTOMAT ST	199922020	00005122	1.10	130.90	23.70	23.10
020-BENTOMAT ST	199922020	00005121	1.10*	130.90	23.70*	23.10*
020-BENTOMAT ST	199922020	00005120	1.04	130.90	32.70	24.40
020-BENTOMAT ST	199922020	00005119	1.04	130.90	32.70	24.40
020-BENTOMAT ST	199922020	00005118	1.04	130.90	32.70	24.40
020-BENTOMAT ST	199922020	00005117	1.04	130.90	32.70	24.40
020-BENTOMAT ST	199922020	00005116	1.04	130.90	32.70	24.40
020-BENTOMAT ST	199922020	00005115	1.04	130.90	32.70	24.40
020-BENTOMAT ST	199922020	00005114	1.04	130.90	32.70	24.40
020-BENTOMAT ST	199922020	00005113	1.04	130.90	32.70	24.40
020-BENTOMAT ST	199922020	00005112	1.04	130.90	32.70	24.40
020-BENTOMAT ST	199922020	00005111	1.04	130.90	32.70	24.40
020-BENTOMAT ST	199922020	00005110	1.04	130.90	32.70	24.40
020-BENTOMAT ST	199922020	00005109	1.04	130.90	32.70	24.40
020-BENTOMAT ST	199922020	00005108	1.04	130.90	32.70	24.40
020-BENTOMAT ST	199922020	00005107	1.04	130.90	32.70	24.40
020-BENTOMAT ST	199922020	00005106	1.04	130.90	32.70	24.40
020-BENTOMAT ST	199922020	00005105	1.04*	130.90*	32.70*	24.40*
020-BENTOMAT ST	199922020	00005104	1.06	178.50	24.60	25.70
020-BENTOMAT ST	199922020	00005103	1.06	178.50	24.60	25.70
020-BENTOMAT ST	199922020	00005102	1.06	178.50	24.60	25.70
020-BENTOMAT ST	199922020	00005101	1.06	178.50	24.60	25.70
020-BENTOMAT ST	199922020	00005100	1.06	178.50	24.60	25.70
020-BENTOMAT ST	199922020	00005099	1.06	178.50	24.60	25.70
020-BENTOMAT ST	199922020	00005098	1.06	178.50	24.60	25.70
020-BENTOMAT ST	199922020	00005097	1.06	178.50	24.60	25.70
020-BENTOMAT ST	199922020	00005096	1.06	178.50	24.60	25.70
020-BENTOMAT ST	199922020	00005095	1.06	178.50	24.60	25.70
020-BENTOMAT ST	199922020	00005094	1.06	178.50	24.60	25.70
020-BENTOMAT ST	199922020	00005093	1.06	178.50	24.60	25.70
020-BENTOMAT ST	199922020	00005092	1.06	178.50	[illegible]	25.70

000122

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QCG8FT2 QCT8FT2
6/01/99 11:35:55

COLLOID ENVIRONMENTAL TECH CO

GCL QUALITY DATA

LOVELL
PO BOX 428
LOVELL WY 82431

SHIP TO: FLUOR DANI
DEPARTMENT
HARRISON

O R D E R # 000108309

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB STRENGTH 90 lbs ASTM D 4632	PEEL STRENGTH 15 lbs ASTM D 4632	MOISTURE 25% Typical ASTM D 4643
020-BENTOMAT ST	199922020	00005091	1.06	178.50	24.60	25.70
020-BENTOMAT ST	199922020	00005090	1.06	178.50	24.60	25.70
020-BENTOMAT ST	199922020	00005089	1.06*	178.50	24.60*	25.70*
020-BENTOMAT ST	199922020	00005088	1.16	178.50	30.50	25.50
020-BENTOMAT ST	199922020	00005087	1.16	178.50	30.50	25.50
020-BENTOMAT ST	199922020	00005086	1.16	178.50	30.50	25.50
020-BENTOMAT ST	199922020	00005085	1.16	178.50	30.50	25.50
020-BENTOMAT ST	199922020	00005084	1.16	178.50	30.50	25.50
020-BENTOMAT ST	199922020	00005083	1.16	178.50	30.50	25.50
020-BENTOMAT ST	199922020	00005082	1.16	178.50	30.50	25.50
020-BENTOMAT ST	199922020	00005081	1.16	178.50	30.50	25.50
020-BENTOMAT ST	199922020	00005080	1.16	178.50	30.50	25.50
020-BENTOMAT ST	199922020	00005079	1.16	178.50	30.50	25.50
020-BENTOMAT ST	199922020	00005078	1.16	178.50	30.50	25.50
020-BENTOMAT ST	199922020	00005077	1.16	178.50	30.50	25.50
020-BENTOMAT ST	199922020	00005076	1.16	178.50	30.50	25.50
020-BENTOMAT ST	199922020	00005075	1.16	178.50	30.50	25.50
020-BENTOMAT ST	199922020	00005074	1.16	178.50	30.50	25.50
020-BENTOMAT ST	199922020	00005073	1.16*	178.50*	30.50*	25.50*
020-BENTOMAT ST	199922020	00005072	1.10	180.10	23.20	25.30
020-BENTOMAT ST	199922020	00005071	1.10	180.10	23.20	25.30
020-BENTOMAT ST	199922020	00005070	1.10	180.10	23.20	25.30
020-BENTOMAT ST	199922020	00005069	1.10	180.10	23.20	25.30
020-BENTOMAT ST	199922020	00005068	1.10	180.10	23.20	25.30
020-BENTOMAT ST	199922020	00005067	1.10	180.10	23.20	25.30
020-BENTOMAT ST	199922020	00005066	1.10	180.10	23.20	25.30
020-BENTOMAT ST	199922020	00005065	1.10	180.10	23.20	25.30
020-BENTOMAT ST	199922020	00005064	1.10	180.10	23.20	25.30
020-BENTOMAT ST	199922020	00005063	1.10	180.10	23.20	25.30
020-BENTOMAT ST	199922020	00005062	1.10	180.10	23.20	25.30
020-BENTOMAT ST	199922020	00005061	1.10	180.10	23.20	25.30
020-BENTOMAT ST	199922020	00005060	1.10	180.10	23.20	25.30
020-BENTOMAT ST	199922020	00005059	1.10	180.10	23.20	25.30
020-BENTOMAT ST	199922020	00005058	1.10	180.10	23.20	25.30
020-BENTOMAT ST	199922020	00005057	1.10*	180.10	23.20*	25.30*
020-BENTOMAT ST	199922020	00005056	1.15	180.10	25.90	24.60
020-BENTOMAT ST	199922020	00005055	1.15	180.10	25.90	24.60
020-BE[illegible] ST	199922020	00005054	1.15	180.10	[illegible]	24.60
020-B[illegible] ST	199922020	00005053	1.15	180.10	[illegible]	24.60

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000133

E-2739

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QCGBFT2 QCTBFT2
6/01/99 11:35:55

COLLOID ENVIRONMENTAL TECH CO

GCL QUALITY DATA

LOVELL
PO BOX 428
LOVELL WY 82431

SHIP TO: FLUOR DANI
DEPARTMENT
HARRISON

O R D E R # 000108309

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB STRENGTH 90 lbs ASTM D 4632	PEEL STRENGTH 15 lbs ASTM D 4632	MOISTURE 25% Typical ASTM D 4643
020-BENTOMAT ST	199922020	00005052	1.15	180.10	25.90	24.60
020-BENTOMAT ST	199922020	00005051	1.15	180.10	25.90	24.60
020-BENTOMAT ST	199922020	00005050	1.15	180.10	25.90	24.60
020-BENTOMAT ST	199922020	00005049	1.15	180.10	25.90	24.60
020-BENTOMAT ST	199922020	00005048	1.15	180.10	25.90	24.60
020-BENTOMAT ST	199922020	00005047	1.15	180.10	25.90	24.60
020-BENTOMAT ST	199922020	00005046	1.15	180.10	25.90	24.60
020-BENTOMAT ST	199922020	00005045	1.15	180.10	25.90	24.60
020-BENTOMAT ST	199922020	00005044	1.15	180.10	25.90	24.60
020-BENTOMAT ST	199922020	00005043	1.15	180.10	25.90	24.60
020-BENTOMAT ST	199922020	00005042	1.15	180.10	25.90	24.60
020-BENTOMAT ST	199922020	00005041	1.15*	180.10	25.90*	24.60*
020-BENTOMAT ST	199922020	00005040	1.15	180.10	21.70	24.50
020-BENTOMAT ST	199922020	00005039	1.15	180.10	21.70	24.50
020-BENTOMAT ST	199922020	00005038	1.15	180.10	21.70	24.50
020-BENTOMAT ST	199922020	00005037	1.15	180.10	21.70	24.50
020-BENTOMAT ST	199922020	00005036	1.15	180.10	21.70	24.50
020-BENTOMAT ST	199922020	00005035	1.15	180.10	21.70	24.50
020-BENTOMAT ST	199922020	00005034	1.15	180.10	21.70	24.50
020-BENTOMAT ST	199922020	00005033	1.15*	180.10	21.70*	24.50*
020-BENTOMAT ST	199922020	00005016	1.15	153.50	29.40	24.10
020-BENTOMAT ST	199922020	00005015	1.15	153.50	29.40	24.10
020-BENTOMAT ST	199922020	00005014	1.15	153.50	29.40	24.10
020-BENTOMAT ST	199922020	00005013	1.15	153.50	29.40	24.10
020-BENTOMAT ST	199922020	00005012	1.15	153.50	29.40	24.10
020-BENTOMAT ST	199922020	00005011	1.15	153.50	29.40	24.10
020-BENTOMAT ST	199922020	00005010	1.15	153.50	29.40	24.10
020-BENTOMAT ST	199922020	00005009	1.15	153.50	29.40	24.10
020-BENTOMAT ST	199922020	00005008	1.15	153.50	29.40	24.10
020-BENTOMAT ST	199922020	00005007	1.15	153.50	29.40	24.10
020-BENTOMAT ST	199922020	00005006	1.15	153.50	29.40	24.10
020-BENTOMAT ST	199922020	00005005	1.15	153.50	29.40	24.10
020-BENTOMAT ST	199922020	00005004	1.15	153.50	29.40	24.10
020-BENTOMAT ST	199922020	00005003	1.15	153.50	29.40	24.10

NOTE:

An asterisk indicates the actual test done on the roll and the roll tested.
If an asterisk is not present, test results are based on the previous roll test
Mass/Area and Moisture content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
[illegible] of every 40,000sf

BENTOMAT ST
MQA TRACKING FORMS

QCG#TF1 QCT#TF1
6/01/99 11:35:54

COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

CETCO LOVELL PLANT
PO BOX [illegible]
LOVELL WY 82431

SHIP TO: FLUOR DANIEL FERNALD
DEPARTMENT OF ENERGY
HARRISON OH

ORDER NUMBER 000108309

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOTEXTILE TOP LOT#	GEOTEXTILE TOP ROLL#	GEOTEXTILE BOTTOM LOT#	GEOTEXTILE BOTTOM ROLL#	CLAY LOT#
LOT# 199922020									
00005003	020-BENTOMAT ST	150	2250	2724	7740688		B822468A		0525998
00005004	020-BENTOMAT ST	150	2250	2718	7740688		B822468A		0525998
00005005	020-BENTOMAT ST	150	2250	2697	7740688		B822468A		0525998
00005006	020-BENTOMAT ST	150	2250	2702	7740688		B822468A		0525998
00005007	020-BENTOMAT ST	150	2250	2688	7740688		B822468A		0525998
00005008	020-BENTOMAT ST	150	2250	2680	7740688		B822468A		0525998
00005009	020-BENTOMAT ST	150	2250	2674	7726443		B822468A		0525998
00005010	020-BENTOMAT ST	150	2250	2683	7726443		B822466A		0525998
00005011	020-BENTOMAT ST	150	2250	2687	7726443		B822466A		0525998
00005012	020-BENTOMAT ST	150	2250	2682	7726443		B822466A		0525998
00005013	020-BENTOMAT ST	150	2250	2684	7726443		B822466A		0525998
00005014	020-BENTOMAT ST	150	2250	2690	7726443		B822466A		0525998
00005015	020-BENTOMAT ST	150	2250	2693	7726443		B822466A		0525998
00005016	020-BENTOMAT ST	150	2250	2685	7726443		B822466A		0525998
00005033	020-BENTOMAT ST	150	2250	2766	7740687		B822465A		0525990
00005034	020-BENTOMAT ST	150	2250	2777	7740687		B822465A		0525990
00005035	020-BENTOMAT ST	150	2250	2767	7740687		B822465A		0525990
00005036	020-BENTOMAT ST	150	2250	2718	7740687		B822207A		0525990
00005037	020-BENTOMAT ST	150	2250	2760	7740687		B822207A		0525990
00005038	020-BENTOMAT ST	150	2250	2744	7740687		B822207A		0525990
00005039	020-BENTOMAT ST	150	2250	2710	7740687		B822207A		0525990

0001126

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QCG#TF1 QCT#TF1
6/01/99 11:35:54

COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: FLUOR DANIEL FERNALD
DEPARTMENT OF ENERGY
HARRISON OH

ORDER NUMBER 000108309

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOTEXTILE TOP LOT#	GEOTEXTILE TOP ROLL#	GEOTEXTILE BOTTOM LOT#	GEOTEXTILE BOTTOM ROLL#	CLAY LOT#
00005040	020-BENTOMAT ST	150	2250	2812	7740687		B822207A		052599C
00005041	020-BENTOMAT ST	150	2250	2838	7740687		B822207A		052599C
00005042	020-BENTOMAT ST	150	2250	2784	7740687		B822207A		052599C
00005043	020-BENTOMAT ST	150	2250	2790	7740687		B822207A		052599C
00005044	020-BENTOMAT ST	150	2250	2726	7740687		B822456A		052599C
00005045	020-BENTOMAT ST	150	2250	2754	7740687		B822456A		052599C
00005046	020-BENTOMAT ST	150	2250	2753	7740687		B822456A		052599C
00005047	020-BENTOMAT ST	150	2250	2761	7740687		B822456A		052599C
00005048	020-BENTOMAT ST	150	2250	2746	7740687		B822456A		052599C
00005049	020-BENTOMAT ST	150	2250	2725	7740687		B822456A		052599C
00005050	020-BENTOMAT ST	150	2250	2715	7740687		B822456A		052599C
00005051	020-BENTOMAT ST	150	2250	2716	7740685		B822456A		052599C
00005052	020-BENTOMAT ST	150	2250	2727	7740685		B822456A		052599C
00005053	020-BENTOMAT ST	150	2250	2728	7740685		B822147A		052599C
00005054	020-BENTOMAT ST	150	2250	2734	7740685		B822147A		052599C
00005055	020-BENTOMAT ST	150	2250	2773	7740685		B822147A		052599C
00005056	020-BENTOMAT ST	150	2250	2775	7740685		B822147A		052599C
00005057	020-BENTOMAT ST	150	2250	2765	7740685		B822147A		052599C
00005058	020-BENTOMAT ST	150	2250	2756	7740685		B822147A		052599C
00005059	020-BENTOMAT ST	150	2250	2750	7740685		B822147A		052599D
00005[illegible]	020-BENTOMAT ST	150	2250	2717	7740685		B822147A		052599D

000127

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CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: FLUOR DANIEL FERNALD
DEPARTMENT OF ENERGY
HARRISON OH

ORDER NUMBER 000108309

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOTEXTILE TOP LOT#	GEOTEXTILE TOP ROLL#	GEOTEXTILE BOTTOM LOT#	GEOTEXTILE BOTTOM ROLL#	CLAY LOT#
00005061	020-BENTOMAT ST	150	2250	2711	7740685		B822147A		052599D
00005062	020-BENTOMAT ST	150	2250	2720	7740685		B822087A		052599D
00005063	020-BENTOMAT ST	150	2250	2799	7740685		B822087A		052599D
00005064	020-BENTOMAT ST	150	2250	2732	7740685		B822087A		052599D
00005065	020-BENTOMAT ST	150	2250	2742	7740685		B822087A		052599D
00005066	020-BENTOMAT ST	150	2250	2731	7740685		B822087A		052599D
00005067	020-BENTOMAT ST	150	2250	2770	7740685		B822087A		052599D
00005068	020-BENTOMAT ST	150	2250	2743	7740685		B822087A		052599D
00005069	020-BENTOMAT ST	150	2250	2719	7740685		B822087A		052599D
00005070	020-BENTOMAT ST	150	2250	2703	7740685		B822087A		052599D
00005071	020-BENTOMAT ST	150	2250	2716	7740685		B822205A		052599D
00005072	020-BENTOMAT ST	150	2250	2779	7740685		B822205A		052599D
00005073	020-BENTOMAT ST	150	2250	2775	7740685		B822205A		052599D
00005074	020-BENTOMAT ST	150	2250	2775	7743276		B822205A		052599D
00005075	020-BENTOMAT ST	150	2250	2712	7743276		B822205A		052599D
00005076	020-BENTOMAT ST	150	2250	2731	7743276		B822205A		052599D
00005077	020-BENTOMAT ST	150	2250	2722	7743276		B822205A		052599D
00005078	020-BENTOMAT ST	150	2250	2697	7743276		B822205A		052599D
00005079	020-BENTOMAT ST	150	2250	2812	7743276		B822205A		052599D
00005080	020-BENTOMAT ST	150	2250	2721	7743276		B822459A		052599D
00005081	020-BENTOMAT ST	150	2250	2689	7743276		B822459A		052599D

000128

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CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: FLUOR DANIEL FERNALD
DEPARTMENT OF ENERGY
HARRISON OH

ORDER NUMBER 000108309

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOTEXTILE TOP LOT#	GEOTEXTILE TOP ROLL#	GEOTEXTILE BOTTOM LOT#	GEOTEXTILE BOTTOM ROLL#	CLAY LOT#
00005082	020-BENTOMAT ST	150	2250	2675	7743276		B822459A		052599D
00005083	020-BENTOMAT ST	150	2250	2677	7743276		B822459A		052599D
00005084	020-BENTOMAT ST	150	2250	2676	7743276		B822459A		052599D
00005085	020-BENTOMAT ST	150	2250	2685	7743276		B822459A		052599D
00005086	020-BENTOMAT ST	150	2250	2691	7743276		B822459A		052599D
00005087	020-BENTOMAT ST	150	2250	2686	7743276		B822459A		052599D
00005088	020-BENTOMAT ST	150	2250	2650	7743276		B822459A		052599D
00005089	020-BENTOMAT ST	150	2250	2660	7743276		B822458A		052599D
00005090	020-BENTOMAT ST	150	2250	2690	7743276		B822458A		052599D
00005091	020-BENTOMAT ST	150	2250	2655	7743276		B822458A		052599D
00005092	020-BENTOMAT ST	150	2250	2651	7743276		B822458A		052599D
00005093	020-BENTOMAT ST	150	2250	2718	7743276		B822458A		052599D
00005094	020-BENTOMAT ST	150	2250	2694	7743277		B822458A		052599D
00005095	020-BENTOMAT ST	150	2250	2724	7743277		B822458A		052599D
00005096	020-BENTOMAT ST	150	2250	2699	7743277		B822458A		052599D
00005097	020-BENTOMAT ST	150	2250	2722	7743277		B822062A		052599D
00005098	020-BENTOMAT ST	150	2250	2720	7743277		B822062A		052599D
00005099	020-BENTOMAT ST	150	2250	2716	7743277		B822062A		052599D
00005100	020-BENTOMAT ST	150	2250	2725	7743277		B822062A		052599D
00005101	020-BENTOMAT ST	150	2250	2724	7743277		B822062A		052599D
0000[illegible]	020-BENTOMAT ST	150	2250	2724	7743277		B822062A		052599D

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: FLUOR DANIEL FERNALD
DEPARTMENT OF ENERGY
HARRISON OH

ORDER NUMBER 000108309

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOTEXTILE TOP LOT#	GEOTEXTILE TOP ROLL#	GEOTEXTILE BOTTOM LOT#	GEOTEXTILE BOTTOM ROLL#	CLAY LOT#
00005103	020-BENTOMAT ST	150	2250	2728	7743277		B822062A		052599D
00005104	020-BENTOMAT ST	150	2250	2716	7743277		B822062A		052599D
00005105	020-BENTOMAT ST	150	2250	2668	7743277		K901955A		052699A
00005106	020-BENTOMAT ST	150	2250	2671	7743277		K901955A		052699A
00005107	020-BENTOMAT ST	150	2250	2634	7743277		K901955A		052699A
00005108	020-BENTOMAT ST	150	2250	2663	7743277		K901955A		052699A
00005109	020-BENTOMAT ST	150	2250	2765	7743277		K901955A		052699A
00005110	020-BENTOMAT ST	150	2250	2739	7743277		K901955A		052699A
00005111	020-BENTOMAT ST	150	2250	2764	7736475		K901955A		052699A
00005112	020-BENTOMAT ST	150	2250	2786	7736475		K901955A		052699A
00005113	020-BENTOMAT ST	150	2250	2814	7736475		B822188A		052699A
00005114	020-BENTOMAT ST	150	2250	2819	7736475		B822188A		052699A
00005115	020-BENTOMAT ST	150	2250	2835	7736475		B822188A		052699A
00005116	020-BENTOMAT ST	150	2250	2831	7736475		B822188A		052699A
00005117	020-BENTOMAT ST	150	2250	2812	7736475		B822188A		052699A
00005118	020-BENTOMAT ST	150	2250	2827	7736475		B822188A		052699A
00005119	020-BENTOMAT ST	150	2250	2822	7736475		B822188A		052699A
00005120	020-BENTOMAT ST	150	2250	2824	7736475		B822188A		052699A
00005121	020-BENTOMAT ST	150	2250	2831	7736475		B822188A		052699A
00005122	020-BENTOMAT ST	150	2250	2826	7736475		K901957A		052699A
00005123	020-BENTOMAT ST	150	2250	2796	7736475		K901957A		052699A

000130

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COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: FLUOR DANIEL FERNALD
DEPARTMENT OF ENERGY
HARRISON OH

ORDER NUMBER 000108309

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOTEXTILE TOP LOT#	GEOTEXTILE TOP ROLL#	GEOTEXTILE BOTTOM LOT#	GEOTEXTILE BOTTOM ROLL#	CLAY LOT#
00005124	020-BENTOMAT ST	150	2250	2777	7736475		K901957A		052699A
00005125	020-BENTOMAT ST	150	2250	2973	7736475		K901957A		052699A
00005126	020-BENTOMAT ST	150	2250	2971	7736475		K901957A		052699A
00005127	020-BENTOMAT ST	150	2250	2972	7736475		K901957A		052699A
00005128	020-BENTOMAT ST	150	2250	2975	7736475		K901957A		052699A
00005129	020-BENTOMAT ST	150	2250	2950	7736475		B822104A		052699A
00005130	020-BENTOMAT ST	150	2250	2863	7749791		B822104A		052699A
00005131	020-BENTOMAT ST	150	2250	2825	7749791		B822104A		052699A
00005132	020-BENTOMAT ST	150	2250	2841	7749791		B822104A		052699A
00005133	020-BENTOMAT ST	150	2250	2841	7749791		B822104A		052699A
00005134	020-BENTOMAT ST	150	2250	2828	7749791		B822104A		052699A
00005135	020-BENTOMAT ST	150	2250	2795	7749791		B822104A		052699A
00005136	020-BENTOMAT ST	150	2250	2765	7749791		B822104A		052699A
00005137	020-BENTOMAT ST	150	2250	2771	7749791		B822104A		052699A
00005138	020-BENTOMAT ST	150	2250	2751	7749791		5164339A		052699A
00005139	020-BENTOMAT ST	150	2250	2738	7749791		5164339A		052699A
00005140	020-BENTOMAT ST	150	2250	2739	7749791		5164339A		052699A
00005141	020-BENTOMAT ST	150	2250	2731	7749791		5164339A		052699A
00005142	020-BENTOMAT ST	150	2250	2749	7749791		5164339A		052699A
00005143	020-BENTOMAT ST	150	2250	2719	7749791		5164339A		052699A
0000[illegible]	020-BENTOMAT ST	150	2250	2746	7749791		5164339A		052699A

000131

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COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: FLUOR DANIEL FERNALD
DEPARTMENT OF ENERGY
HARRISON OH

ORDER NUMBER 000108309

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOTEXTILE TOP LOT#	GEOTEXTILE TOP ROLL#	GEOTEXTILE BOTTOM LOT#	GEOTEXTILE BOTTOM ROLL#	CLAY LOT#
00005145	020-BENTOMAT ST	150	2250	2735	7749791		5164339A		052699A
00005146	020-BENTOMAT ST	150	2250	2731	7749791		5164339A		052699A
00005147	020-BENTOMAT ST	150	2250	2744	7749791		5164339A		052699A
00005148	020-BENTOMAT ST	150	2250	2752	7749791		8822467A		052699A
00005149	020-BENTOMAT ST	150	2250	2745	7749791		8822467A		052699A
00005150	020-BENTOMAT ST	150	2250	2744	7736472		8822467A		052699A
00005151	020-BENTOMAT ST	150	2250	2749	7736472		8822467A		052699A
00005152	020-BENTOMAT ST	150	2250	2753	7736472		8822467A		052699A
00005153	020-BENTOMAT ST	150	2250	2760	7736472		8822467A		052699B
00005154	020-BENTOMAT ST	150	2250	2753	7736472		8822467A		052699B
00005155	020-BENTOMAT ST	150	2250	2733	7736472		8822467A		052699B
00005156	020-BENTOMAT ST	150	2250	2710	7736472		5164374A		052699B
00005157	020-BENTOMAT ST	150	2250	2703	7736472		5164374A		052699B
00005158	020-BENTOMAT ST	150	2250	2699	7736472		5164374A		052699B
00005159	020-BENTOMAT ST	150	2250	2755	7736472		5164374A		052699B
00005160	020-BENTOMAT ST	150	2250	2693	7736472		5164374A		052699B
00005161	020-BENTOMAT ST	150	2250	2684	7736472		5164374A		052699B
00005162	020-BENTOMAT ST	150	2250	2697	7736472		5164374A		052699B
00005163	020-BENTOMAT ST	150	2250	2685	7736472		5164374A		052699B
00005164	020-BENTOMAT ST	150	2250	2683	7736472		5164374A		052699B
00005165	020-BENTOMAT ST	150	2250	2682	7736472		5164230A		052699B

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: FLUOR DANIEL FERNALD
DEPARTMENT OF ENERGY
HARRISON OH

ORDER NUMBER 000108309

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOTEXTILE TOP LOT#	GEOTEXTILE TOP ROLL#	GEOTEXTILE BOTTOM LOT#	GEOTEXTILE BOTTOM ROLL#	CLAY LOT#
00005166	020-BENTOMAT ST	150	2250	2681	7736472		5164230A		0526998
00005167	020-BENTOMAT ST	150	2250	2674	7736472		5164230A		0526998
00005168	020-BENTOMAT ST	150	2250	2655	7736472		5164230A		0526998
00005169	020-BENTOMAT ST	150	2250	2769	7742790		5164230A		0526998
00005170	020-BENTOMAT ST	150	2250	2787	7742790		5164230A		0526998
00005171	020-BENTOMAT ST	150	2250	2745	7742790		5164230A		0526998
00005172	020-BENTOMAT ST	150	2250	2740	7742790		5164230A		0526998
00005173	020-BENTOMAT ST	150	2250	2739	7742790		5164230A		0526998
00005174	020-BENTOMAT ST	150	2250	2746	7742790		5164223A		0526998
00005175	020-BENTOMAT ST	150	2250	2730	7742790		5164223A		0526998
00005176	020-BENTOMAT ST	150	2250	2744	7742790		5164223A		0526998
00005177	020-BENTOMAT ST	150	2250	2715	7742790		5164223A		0526998
00005178	020-BENTOMAT ST	150	2250	2700	7742790		5164223A		0526998
00005179	020-BENTOMAT ST	150	2250	2712	7742790		5164223A		0526998
00005180	020-BENTOMAT ST	150	2250	2708	7742790		5164223A		0526998
00005181	020-BENTOMAT ST	150	2250	2706	7742790		5164223A		0526998
00005182	020-BENTOMAT ST	150	2250	2694	7742790		5164223A		0526998
00005183	020-BENTOMAT ST	150	2250	2691	7742790		K901959A		0526998
00005184	020-BENTOMAT ST	150	2250	2691	7742790		K901959A		0526998
00005185	020-BENTOMAT ST	150	2250	2720	7742790		K901959A		0526998
0000[illegible]	020-BENTOMAT ST	150	2250	2732	7742790		K901959A		0526998

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: FLUOR DANIEL FERNALD
DEPARTMENT OF ENERGY
HARRISON OH

ORDER NUMBER 000108309

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOTEXTILE TOP LOT#	GEOTEXTILE TOP ROLL#	GEOTEXTILE BOTTOM LOT#	GEOTEXTILE BOTTOM ROLL#	CLAY LOT#
00005187	020-BENTOMAT ST	150	2250	2694	7742790		K901959A		0526998
00005188	020-BENTOMAT ST	150	2250	2754	7743605		K901959A		0526998
00005189	020-BENTOMAT ST	150	2250	2715	7743605		K901959A		0526998
00005190	020-BENTOMAT ST	150	2250	2727	7743605		K901959A		0526998
00005191	020-BENTOMAT ST	150	2250	2695	7743605		K901959A		0526998
00005192	020-BENTOMAT ST	150	2250	2736	7743605		B822516A		0526998
00005193	020-BENTOMAT ST	150	2250	2729	7743605		B822516A		0526998
00005194	020-BENTOMAT ST	150	2250	2723	7743605		B822516A		0526998
00005195	020-BENTOMAT ST	150	2250	2739	7743605		B822516A		0526998
00005196	020-BENTOMAT ST	150	2250	2727	7743605		B822516A		0526998
00005197	020-BENTOMAT ST	150	2250	2745	7743605		B822516A		0526998
00005198	020-BENTOMAT ST	150	2250	2749	7743605		B822516A		0526998
00005199	020-BENTOMAT ST	150	2250	2733	7743605		B822516A		0526990
00005200	020-BENTOMAT ST	150	2250	2740	7743605		B822516A		0526990
00005201	020-BENTOMAT ST	150	2250	2763	7743605		B822453A		0526990
00005202	020-BENTOMAT ST	150	2250	2741	7743605		B822453A		0526990
00005203	020-BENTOMAT ST	150	2250	2750	7743605		B822453A		0526990
00005204	020-BENTOMAT ST	150	2250	2778	7743605		B822453A		0526990
00005205	020-BENTOMAT ST	150	2250	2784	7743605		B822453A		0526990
00005206	020-BENTOMAT ST	150	2250	2801	7740686		B822453A		0526990
00005207	020-BENTOMAT ST	150	2250	2805	7740686		B822453A		0526990

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: FLUOR DANIEL FERNALD
DEPARTMENT OF ENERGY
HARRISON OH

ORDER NUMBER 000108309

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOTEXTILE TOP LOT#	GEOTEXTILE TOP ROLL#	GEOTEXTILE BOTTOM LOT#	GEOTEXTILE BOTTOM ROLL#	CLAY LOT#
00005208	020-BENTOMAT ST	150	2250	2814	7740686		B822517A		052699C
00005209	020-BENTOMAT ST	150	2250	2840	7740686		B822517A		052699C
00005210	020-BENTOMAT ST	150	2250	2850	7740686		B822517A		052699C
00005211	020-BENTOMAT ST	150	2250	2860	7740686		B822517A		052699C
00005212	020-BENTOMAT ST	150	2250	2854	7740686		B822517A		052699C
00005213	020-BENTOMAT ST	150	2250	2840	7740686		B822517A		052699C
00005214	020-BENTOMAT ST	150	2250	2835	7740686		B822517A		052699C
00005215	020-BENTOMAT ST	150	2250	2833	7740686		B822517A		052699C
00005216	020-BENTOMAT ST	150	2250	2822	7740686		B822517A		052699C
00005217	020-BENTOMAT ST	150	2250	2833	7740686		B822511A		052699C
00005218	020-BENTOMAT ST	150	2250	2816	7740686		B822511A		052699C
00005219	020-BENTOMAT ST	150	2250	2819	7740686		B822511A		052699C
00005220	020-BENTOMAT ST	150	2250	2840	7740686		B822511A		052699C
00005221	020-BENTOMAT ST	150	2250	2845	7740686		B822511A		052699C
00005222	020-BENTOMAT ST	150	2250	2830	7740686		B822511A		052699C
00005223	020-BENTOMAT ST	150	2250	2795	7740686		B822511A		052699C
00005224	020-BENTOMAT ST	150	2250	2790	7740686		B822511A		052699C
00005225	020-BENTOMAT ST	150	2250	2791	7740686		B822108A		052699C
00005226	020-BENTOMAT ST	150	2250	2718	7736478		B822108A		052699C
00005227	020-BENTOMAT ST	150	2250	2727	7736478		B822108A		052699C
0000[illegible]	020-BENTOMAT ST	150	2250	2715	7736478		B822108A		052699C

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: FLUOR DANIEL FERNALD
DEPARTMENT OF ENERGY
HARRISON OH

ORDER NUMBER 000108309

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOTEXTILE TOP LOT#	GEOTEXTILE TOP ROLL#	GEOTEXTILE BOTTOM LOT#	GEOTEXTILE BOTTOM ROLL#	CLAY LOT#
00005229	020-BENTOMAT ST	150	2250	2724	7736478		B822108A		052699C
00005230	020-BENTOMAT ST	150	2250	2730	7736478		B822108A		052699C
00005231	020-BENTOMAT ST	150	2250	2741	7736478		B822108A		052699C
00005232	020-BENTOMAT ST	150	2250	2750	7736478		B822108A		052699C
00005233	020-BENTOMAT ST	150	2250	2696	7736478		B822108A		052699C
00005234	020-BENTOMAT ST	150	2250	2699	7736478		B822515A		052699C
00005235	020-BENTOMAT ST	150	2250	2759	7736478		B822515A		052699C
00005236	020-BENTOMAT ST	150	2250	2720	7736478		B822515A		052699C
00005237	020-BENTOMAT ST	150	2250	2721	7736478		B822515A		052699C
00005238	020-BENTOMAT ST	150	2250	2713	7736478		B822515A		052699D
00005239	020-BENTOMAT ST	150	2250	2735	7736478		B822515A		052699D
00005240	020-BENTOMAT ST	150	2250	2725	7736478		B822515A		052699D
00005241	020-BENTOMAT ST	150	2250	2741	7736478		B822515A		052699D
00005242	020-BENTOMAT ST	150	2250	2738	7736478		B822515A		052699D
00005243	020-BENTOMAT ST	150	2250	2738	7736478		B822514A		052699D
00005244	020-BENTOMAT ST	150	2250	2740	7736478		B822514A		052699D
00005245	020-BENTOMAT ST	150	2250	2861	7724455		B822514A		052699D
00005246	020-BENTOMAT ST	150	2250	2749	7724455		B822514A		052699D
00005247	020-BENTOMAT ST	150	2250	2840	7724455		B822514A		052699D
00005248	020-BENTOMAT ST	150	2250	2831	7724455		B822514A		052699D
00005249	020-BENTOMAT ST	150	2250	2820	7724455		B822514A		052699D

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: FLUOR DANIEL FERNALD
DEPARTMENT OF ENERGY
HARRISON OH

ORDER NUMBER 000108309

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOTEXTILE TOP LOT#	GEOTEXTILE TOP ROLL#	GEOTEXTILE BOTTOM LOT#	GEOTEXTILE BOTTOM ROLL#	CLAY LOT#
00005250	020-BENTOMAT ST	150	2250	2810	7724455		B822514A		052699D
00005251	020-BENTOMAT ST	150	2250	2795	7724455		B822497A		052699D
00005252	020-BENTOMAT ST	150	2250	2812	7724455		B822497A		052699D
00005253	020-BENTOMAT ST	150	2250	2746	7724455		B822497A		052699D
00005254	020-BENTOMAT ST	150	2250	2818	7724455		B822497A		052699D
00005255	020-BENTOMAT ST	150	2250	2828	7724455		B822497A		052699D
00005256	020-BENTOMAT ST	150	2250	2798	7724455		B822497A		052699D
00005257	020-BENTOMAT ST	150	2250	2995	7724455		B822497A		052699D
00005258	020-BENTOMAT ST	150	2250	3021	7724455		B822497A		052699D
00005259	020-BENTOMAT ST	150	2250	2915	7724455		B822497A		052699D
00005260	020-BENTOMAT ST	150	2250	2729	7724455		B822081A		052699D
00005261	020-BENTOMAT ST	150	2250	2766	7724455		B822081A		052699D
00005262	020-BENTOMAT ST	150	2250	2730	7724455		B822081A		052699D
00005263	020-BENTOMAT ST	150	2250	2761	7736473		B822081A		052699D
00005264	020-BENTOMAT ST	150	2250	2744	7736473		B822081A		052699D
00005265	020-BENTOMAT ST	150	2250	2747	7736473		B822081A		052699D
00005266	020-BENTOMAT ST	150	2250	2712	7736473		B822081A		052699D
00005267	020-BENTOMAT ST	150	2250	2715	7736473		B822081A		052699D
00005268	020-BENTOMAT ST	150	2250	2706	7736473		B822081A		052699D
00005269	020-BENTOMAT ST	150	2250	2733	7736473		B822107A		052699D
00005[illegible]	020-BENTOMAT ST	150	2250	2745	7736473		B822107A		052699D

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CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: FLUOR DANIEL FERNALD
DEPARTMENT OF ENERGY
HARRISON OH

ORDER NUMBER 000108309

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOTEXTILE TOP LOT#	GEOTEXTILE TOP ROLL#	GEOTEXTILE BOTTOM LOT#	GEOTEXTILE BOTTOM ROLL#	CLAY LOT#
00005271	020-BENTOMAT ST	150	2250	2740	7736473		B822107A		052699D
00005272	020-BENTOMAT ST	150	2250	2730	7736473		B822107A		052699D
00005273	020-BENTOMAT ST	150	2250	2698	7736473		B822107A		052699D
00005274	020-BENTOMAT ST	150	2250	2737	7736473		B822107A		052799A
00005275	020-BENTOMAT ST	150	2250	2730	7736473		B822107A		052799A
00005276	020-BENTOMAT ST	150	2250	2741	7736473		B822107A		052799A
00005277	020-BENTOMAT ST	150	2250	2694	7736473		B822107A		052799A
00005278	020-BENTOMAT ST	150	2250	2696	7736473		B822488A		052799A
00005279	020-BENTOMAT ST	150	2250	2689	7736473		B822488A		052799A
00005280	020-BENTOMAT ST	150	2250	2705	7736473		B822488A		052799A
00005281	020-BENTOMAT ST	150	2250	2699	7736473		B822488A		052799A
00005282	020-BENTOMAT ST	150	2250	2683	7729819		B822488A		052799A
00005283	020-BENTOMAT ST	150	2250	2724	7729819		B822488A		052799A
00005284	020-BENTOMAT ST	150	2250	2709	7729819		B822488A		052799A
00005285	020-BENTOMAT ST	150	2250	2715	7729819		B822317A		052799A
00005286	020-BENTOMAT ST	150	2250	2707	7729819		B822317A		052799A
00005287	020-BENTOMAT ST	150	2250	2710	7729819		B822317A		052799A
00005288	020-BENTOMAT ST	150	2250	2677	7729819		B822320A		052799A
00005289	020-BENTOMAT ST	150	2250	2691	7729819		B822320A		052799A
00005290	020-BENTOMAT ST	150	2250	3102	7729819		B822320A		052799A
00005291	020-BENTOMAT ST	150	2250	2763	7729819		B822061A		052799A

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: FLUOR DANIEL FERNALD
DEPARTMENT OF ENERGY
HARRISON OH

ORDER NUMBER 000108309

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOTEXTILE TOP LOT#	GEOTEXTILE TOP ROLL#	GEOTEXTILE BOTTOM LOT#	GEOTEXTILE BOTTOM ROLL#	CLAY LOT#
00005292	020-BENTOMAT ST	150	2250	2761	7729819		B822061A		052799A
00005293	020-BENTOMAT ST	150	2250	2687	7729819		B822061A		052799A
00005294	020-BENTOMAT ST	150	2250	2710	7729819		B822061A		052799A
00005295	020-BENTOMAT ST	150	2250	2694	7729819		B822061A		052799A
00005296	020-BENTOMAT ST	150	2250	2687	7729819		B822061A		052799A
00005297	020-BENTOMAT ST	150	2250	2668	7729819		B822061A		052799A
00005298	020-BENTOMAT ST	150	2250	2680	7729819		B822401A		052799A
00005299	020-BENTOMAT ST	150	2250	2676	7729819		B822401A		052799A
00005300	020-BENTOMAT ST	150	2250	2709	7729819		B822401A		052799A
00005301	020-BENTOMAT ST	150	2250	2698	7719136		B822401A		052799A
00005302	020-BENTOMAT ST	150	2250	2694	7719136		5164229A		052799A
00005303	020-BENTOMAT ST	150	2250	2687	7719136		5164229A		052799A
00005304	020-BENTOMAT ST	150	2250	2685	7719136		5164229A		052799A
00005305	020-BENTOMAT ST	150	2250	2667	7719136		5164229A		052799A
00005306	020-BENTOMAT ST	150	2250	2712	7719136		5164229A		052799A
00005307	020-BENTOMAT ST	150	2250	2720	7719136		5164229A		052799A
00005308	020-BENTOMAT ST	150	2250	2679	7719136		5164229A		052799A
00005309	020-BENTOMAT ST	150	2250	2681	7719136		5164229A		052799A
00005310	020-BENTOMAT ST	150	2250	2679	7719136		5164229A		052799A
00005311	020-BENTOMAT ST	150	2250	2686	7719136		5164373A		052799A
00005[illegible]	020-BENTOMAT ST	150	2250	2681	7719136		5164373A		052799A

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: FLUOR DANIEL FERNALD
DEPARTMENT OF ENERGY
HARRISON OH

ORDER NUMBER 000108309

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOTEXTILE TOP LOT#	GEOTEXTILE TOP ROLL#	GEOTEXTILE BOTTOM LOT#	GEOTEXTILE BOTTOM ROLL#	CLAY LOT#
00005313	020-BENTOMAT ST	150	2250	2702	7719136		5164373A		052799A
00005314	020-BENTOMAT ST	150	2250	2710	7719136		5164373A		052799A
00005315	020-BENTOMAT ST	150	2250	2724	7719136		5164373A		052799A
00005316	020-BENTOMAT ST	150	2250	2795	7719136		5164373A		052799A
00005317	020-BENTOMAT ST	150	2250	2765	7719136		5164373A		052799A
00005318	020-BENTOMAT ST	150	2250	2758	7719136		5164217A		052799A
00005319	020-BENTOMAT ST	150	2250	2769	7719136		5164217A		052799A
00005320	020-BENTOMAT ST	150	2250	2777	7719136		5164217A		052799A
00005321	020-BENTOMAT ST	150	2250	2751	7719136		5164217A		052799A
00005322	020-BENTOMAT ST	150	2250	2762	7719136		5164217A		052799B
00005323	020-BENTOMAT ST	150	2250	2757	7719136		5164217A		052799B
00005324	020-BENTOMAT ST	150	2250	2799	7719135		5164217A		052799B
00005325	020-BENTOMAT ST	150	2250	2790	7719135		5164217A		052799B
00005326	020-BENTOMAT ST	150	2250	2797	7719135		5164217A		052799B
00005327	020-BENTOMAT ST	150	2250	2783	7719135		K901958A		052799B
00005328	020-BENTOMAT ST	150	2250	2791	7719135		K901958A		052799B
00005329	020-BENTOMAT ST	150	2250	2788	7719135		K901958A		052799B
00005330	020-BENTOMAT ST	150	2250	2774	7719135		K901958A		052799B
00005331	020-BENTOMAT ST	150	2250	2772	7719135		K901958A		052799B
00005332	020-BENTOMAT ST	150	2250	2763	7719135		K901958A		052799B
00005333	020-BENTOMAT ST	150	2250	2685	7719135		K901958A		052799B

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: FLUOR DANIEL FERNALD
DEPARTMENT OF ENERGY
HARRISON OH

ORDER NUMBER 000108309

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOTEXTILE TOP LOT#	GEOTEXTILE TOP ROLL#	GEOTEXTILE BOTTOM LOT#	GEOTEXTILE BOTTOM ROLL#	CLAY LOT#
00005334	020-BENTOMAT ST	150	2250	2796	7719135		K901958A		0527998
00005335	020-BENTOMAT ST	150	2250	2785	7719135		K901958A		0527998
00005336	020-BENTOMAT ST	150	2250	2791	7719135		B822490A		0527998
00005337	020-BENTOMAT ST	150	2250	2788	7719135		B822490A		0527998
00005338	020-BENTOMAT ST	150	2250	2842	7719135		B822490A		0527998
00005339	020-BENTOMAT ST	150	2250	2824	7719135		B822490A		0527998
00005340	020-BENTOMAT ST	150	2250	2852	7719135		B822490A		0527998
00005341	020-BENTOMAT ST	150	2250	2844	7719135		B822490A		0527998
00005342	020-BENTOMAT ST	150	2250	2846	7719135		B822490A		0527998
00005343	020-BENTOMAT ST	150	2250	2814	7719135		B822490A		0527998
00005344	020-BENTOMAT ST	150	2250	2831	7719135		B822495A		0527998
00005345	020-BENTOMAT ST	150	2250	2805	7719135		B822495A		0527998
00005346	020-BENTOMAT ST	150	2250	2808	7719135		B822495A		0527998
00005347	020-BENTOMAT ST	150	2250	2823	7719135		B822495A		0527998
00005348	020-BENTOMAT ST	150	2250	2800	7750580		B822495A		0527998
00005349	020-BENTOMAT ST	150	2250	2796	7750580		B822495A		0527998
00005350	020-BENTOMAT ST	150	2250	2788	7750580		B822495A		0527998
00005351	020-BENTOMAT ST	150	2250	2795	7750580		B822495A		0527998
00005352	020-BENTOMAT ST	150	2250	2779	7750580		B822495A		0527998
00005353	020-BENTOMAT ST	150	2250	2778	7750580		B822495A		0527998
0000[illegible]	020-BENTOMAT ST	150	2250	2782	7750580		B822498A		0527998

COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: FLUOR DANIEL FERNALD
DEPARTMENT OF ENERGY
HARRISON OH

ORDER NUMBER 000108309

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOTEXTILE TOP LOT#	GEOTEXTILE TOP ROLL#	GEOTEXTILE BOTTOM LOT#	GEOTEXTILE BOTTOM ROLL#	CLAY LOT#
00005355	020-BENTOMAT ST	150	2250	2786	7750580		B822498A		0527998
00005356	020-BENTOMAT ST	150	2250	2789	7750580		B822498A		0527998
00005357	020-BENTOMAT ST	150	2250	2792	7750580		B822498A		0527998
00005358	020-BENTOMAT ST	150	2250	2785	7750580		B822498A		0527998
00005359	020-BENTOMAT ST	150	2250	2794	7750580		B822498A		0527998
00005360	020-BENTOMAT ST	150	2250	2791	7750580		B822498A		0527998
00005361	020-BENTOMAT ST	150	2250	2781	7750580		B822498A		0527998
00005362	020-BENTOMAT ST	150	2250	2784	7750580		B822498A		0527998
00005363	020-BENTOMAT ST	150	2250	2781	7750580		B822493A		0527998
00005364	020-BENTOMAT ST	150	2250	2786	7750580		B822493A		0527998

TOTAL SQUARE FEET..... 778,500

TOTAL PAGES 17

SUPPLIER DOC[illegible]T SUBMITTAL

FDF PROJECT NO.: (1) 20102	CONTRACT NO: (2) 1440	SUBMITTAL NO.:(3) 006	REV.:(4) 1	DATE:(5) 6/16/99	Page _1_ of _12_(6)

FROM: **GSE Lining Technologies**

(7)

SIGNATURE: _____

TO: **FDF ENGINEERING/CONSTRUCTION**
DOCUMENT CONTROL (ECDC), MS 52-7

(8)

RECEIVED BY: _____ DATE: _____

QTY	DOCUMENT NUMBER	REV	DOCUMENT FAMILY PRO	H&S	MED	TRG	CON	ENG	QAC	OPER	TITLE/DESCRIPTION	SUBMITTAL TYPE DRFT	CFC	INF	ASSOCIATED SPECIFICATION	SUBMITTAL ACTION A	B	C
(9)	(10)	(11)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(13)	(14)	(14)	(14)	(15)	(16)	(16)	(16)
8	1440-006A	0						X			GCL Internal and Interface Shear Strength Test Results		X		02772P.1.04.B		X	

REVIEW DISTRIBUTION

NAME	MS	NAME	MS	NAME	MS
(17)	(18)	(17)	(18)	(17)	(18)
Jim Jenkins, FDF, Eng., Approver	64				
Kwasi Badu-Tweneboah, GeoSyntec, Eng.	38				
Kathy Fisher, FDF, Procurement	64				
Gregg Johnson, FDF, Health and Safety	64				
Jim Turner, FDF, QA	64				
Chuck Van Arsdale, FDF, Eng.	64				

RECEIVED
JUN 23 1999
KBT

000143

2739

NO COMMENTS: _____ COMMENTS: (PLEASE USE SPACE BELOW FOR COMMENTS OR INDICATE IF ATTACHMENTS) (19)

- Test results for the first three series (Rpurs) of tests are okay (meet specifications). Still need more tests to be completed
- Test results need to be signed by QC Manager

RECEIVED BY: [signature] (20) DATE: 7/2/99

(SIGN/DATE AND RETURN A COPY TO ECDC, MS 52-7)

SUBMITTAL TYPE: (BY SUPPLIER)
CFC - CERTIFIED FOR CONSTRUCTION
INF - INFORMATION/RECORD
DRFT - DRAFT/PRELIMINARY

SUBMITTAL ACTION CODE: (BY FDF)
A - Conforms to the Subcontract Requirements
B - Minor Comments - Incorporate and Resubmit
C - Revise and Resubmit (SEE COMMENTS)

FS-F-4955
Rev. 4: 04/77/1999

SUPPLIER DOCUMENT SUBMITTAL

FDF PROJECT NO.: (1) 20102	CONTRACT NO: (2) 1440	SUBMITTAL NO.:(3) 006	REV.:(4) 0	DATE:(5) 6/16/99	Page 1 of ~~1~~ 12 (6)

FROM: **GSE Lining Technologies**

(7)

SIGNATURE: _____

TO: **FDF ENGINEERING/CONSTRUCTION**
DOCUMENT CONTROL (ECDC), MS 52-7
(8)

JTT 6-16-99

RECEIVED BY: _____ DATE: _____

QTY	DOCUMENT NUMBER	REV	DOCUMENT FAMILY: PRO	H&S	MED	TRG	CON	ENG	QAC	OPER	TITLE/DESCRIPTION	SUBMITTAL TYPE: DRFT	CFC	INF	ASSOCIATED SPECIFICATION	SUBMITTAL ACTION: A	B	C
(9)	(10)	(11)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(13)	(14)	(14)	(14)	(15)	(16)	(16)	(16)
8	1440-006B	0							X		Quality Control Certificates		X		02772P.1.04.B			

REVIEW DISTRIBUTION

NAME	MS	NAME	MS	NAME	MS
(17)	(18)	(17)	(18)	(17)	(18)
Jim Jenkins, FDF, Eng., Approver	64				
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Kathy Fisher, FDF, Procurement	64				
Gregg Johnson, FDF, Health and Safety	64				
Jim Turner, FDF, QA	64				
Chuck Van Arsdale, FDF, Eng.	64				

RECEIVED
JUN 18 1999
KBT

NO COMMENTS: _____ COMMENTS: (PLEASE USE SPACE BELOW FOR COMMENTS OR INDICATE IF ATTACHMENTS) (19)

000144

2739

RECEIVED BY: _____ (20) _____ DATE: _____
(SIGN/DATE AND RETURN A COPY TO ECDC, MS 52-7)

SUBMITTAL TYPE: (BY SUPPLIER)
CFC - CERTIFIED FOR CONSTRUCTION
INF - INFORMATION/RECORD
DRFT - DRAFT/PRELIMINARY

SUBMITTAL ACTION CODE: (BY FDF)
A - Conforms to the Subcontract Requirements
B - Minor Comments - Incorporate and Resubmit
C - Revise and Resubmit (SEE COMMENTS)

FS-F-4955
Rev. 4: 04/??/1999

1144-006 Rev 0 p. 2 of 12
6-16-99

Precision Geosynthetic Laboratories 1742 West Katella Ave., Suite 4, Orange, CA 92867

2739

2739

FAX

Date: 6/16/99

Number of pages including cover sheet: 11

To: Jim Turner
ERIC REED
Jim Olsta

RE:

c/o:

Phone: 281-230-8663

Fax phone: 847-506-6150

CC: 513-648-5767

From: Cora B. Queja

Phone: 714-744-4599

Fax phone: 714-744-0357

CompuServe: 102402,3642

Internet: precisionlab.earthlink.net

REMARKS: ☐ Urgent ☒ For your review ☐ Reply ASAP ☐ Please comment

RE: FERNALD
Internal Shear + Interface Shear
1st — 3 Samples/Pairs

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w:/fax4

1999 FERNALD SHEAR TESTS
CLIENT: GSE LINING TECHNOLOGY

INTERNAL SHEAR OF GCL (CETCO)

Precision Labs

SAMPLE #	Control #	Roll #	Date reported		Date of Arrival	Hydration Period	Consolidation Period	TESTING	REPORTING
1	38093	5012	6/10		28-May-99	May 28-June 4	June 4- June 6	June 7-8	9-Jun
2	38094	5056	6/11		28-May	May 30- June 6	June 6- June 8	June 9-10	11-Jun
3	38095	5100	6/15		28-May	June 1-June 8	June 8-June 10	June 11-12	13-Jun
4	38196	5232			1-Jun	June 3-June 10	June 10-June 12	June 13-14	15-Jun
5	38201	5358			1-Jun	June 5-June 12	June 12-June 14	June 15-16	17-Jun
6	38198	5320			1-Jun	June 7-June14	June 14-June 16	June 17-18	19-Jun
7	38197	5276			1-Jun	June 9-June 16	June 16-June 18	June 19-20	21-Jun
8	38200	5188			1-Jun	June 11-June 18	June 18-June 20	June 21-22	23-Jun
9	38199	5144			1-Jun	June 13-June 20	June 20-June 22	June 23-24	25-Jun

INTERFACE SHEAR OF GCL & 80 MIL HDT-(CETCO/GSE)

VECTOR

SAMPLE #	GCL Control #	GCL Roll #	Date Reported HDT Control #	HDT Roll #	Latest Date of Arrival	Hydration Period	Consolidation Period	TESTING	REPORTING
1		5027	STOP		28-May-99	May 28-June 4	June 4- June 6	June 7-8	9-Jun
2		5072	6/10	114101743	28-May	May 30- June 6	June 6- June 8	June 9-10	11-Jun
3		5115	6/12	114101753	28-May	June 1-June 8	June 8-June 10	June 11-12	13-Jun
4		5359	6/15	114101774	28-May	June 3-June 10	Jun10-June 12	June 13-14	15-Jun
5		5335		114101783	1-Jun	June 5-June 12	June 12-June 14	June 15-16	17-Jun
6		5291		114101794	1-Jun	June 7-June14	June 14-June 16	June 17-18	19-Jun
7		5247		114101806	1-Jun	June 9-June 16	June 16-June 18	June 19-20	21-Jun
8		5203		114101807	1-Jun	June 11-June 18	June 18-June 20	June 21-22	23-Jun
9		5159		114102816	1-Jun	June 13-June 20	June 20-June 22	June 23-24	25-Jun
10				114101734		June 15-June 22	June 22-June 24	June 24-25	26-Jun

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6-16-99

-2739

000146

1440-046 Rev. 0 p 4 of 12

6-16-99

TABLE 1.
MATERIAL PROPERTIES
FERNALD OSDF

FOR: GSE LINING TECHNOLOGY
(Reference: PGL Job No. 990501)

2739

June 8, 1999

INTERNAL SHEAR TEST RESULT (ASTM D6243)

TEST CONDITIONS:

SAMPLE PREPARATION

1. Specimens were cut to 20" x 20"

HYDRATION:

1. Hydrated for 7 days at 3 psi using dead weights

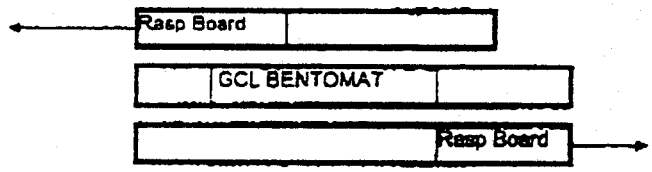
CONSOLIDATION:

1. Each set of specimen was consolidated for 48 hrs at 5, 20, & 45 psi.
2. Loads were applied by pneumatic pressure.

SHEAR TEST:

1. Shear test was conducted at 0.004 in/ min
2. Sheared at minimum 2 inch horizontal displacement.
3. The test specimens were flooded during testing.
4. Tests were performed in general accordance with ASTM D5321-93 Method A using Brainard- Kilman LG-112 Direct Shear machine with effective area of 12 in x 12 in.

TEST CONFIGURATION



SAMPLE IDENTIFICATION:
PGL C# 38093, GCL Roll # 5012

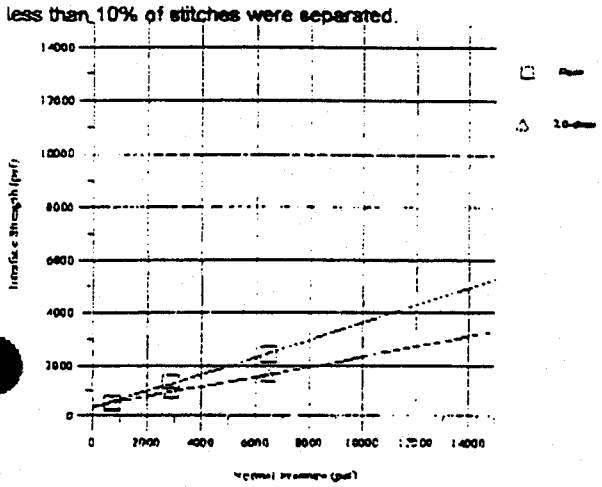
TEST RESULTS:

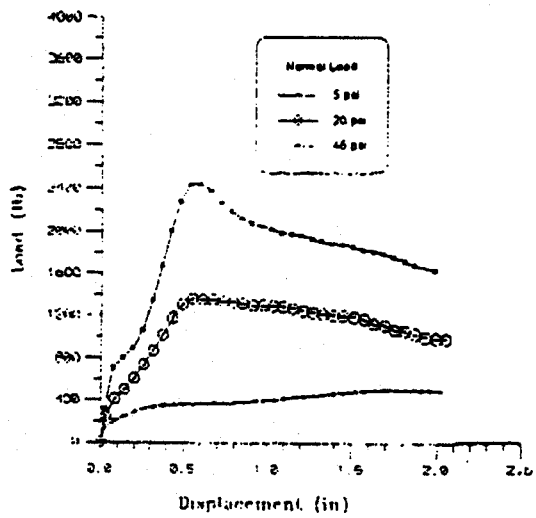
STRENGTH

SAMPLE ID	NORMAL STRESS (psi)	NORMAL STRESS (psf)	Moisture Content (%)	PEAK STRENGTH SHEAR STRESS (psf)	PEAK STRENGTH PEAK SECANT ANGLE	2" DISPLACEMENT SHEAR STRESS (psf)	2" DISPLACEMENT 2" DISPLACEMENT SECANT ANGLE
C# 38093	5	720	148.78	502	35	492	34
	20	2880	110.49	1353	25	988	19
	45	6480	69.87	2430	21	1623	14
	COHESION:			316		381	

OBSERVATIONS:

Stitiches of specimens sheared at 20 and 45 psi normal stresses were completely separated from woven side at 2" displacement. For 5 psi normal load, less than 10% of stitches were separated.





1440-006 Rev. 0 p. 5 of 1

6-16 99

TABLE . 2
MATERIAL PROPERTIES
FERNALD OSDF

FOR: GSE LINING TECHNOLOGY 2739
(Reference: PGL Job No. 990501)

June 10, 1999

INTERNAL SHEAR TEST RESULT (ASTM D5321)

TEST CONDITIONS:

SAMPLE PREPARATION

1. Specimens were cut to 20" x 20"

HYDRATION:

1 Hydrated for 7 days at 3 psi using dead weights

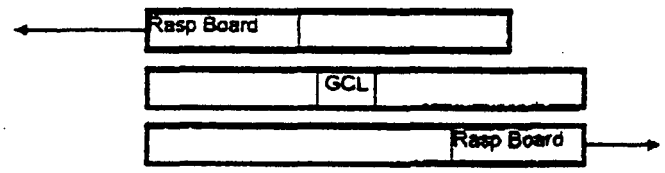
CONSOLIDATION:

1 Each set of specimen was consolidated for 48 hrs at 5, 20, & 45 psi.
2. Loads were applied by pneumatic pressure.

SHEAR TEST:

1. Shear test was conducted at 0.004 in/ min
2 Sheared at minimum 2 inch horizontal displacement.
3. The test specimens were flooded during testing.
4. Tests were performed in general accordance with ASTM D5321-93 Method A using Brainard- Kilman LG-112 Direct Shear machine with effective area of 12 in x 12 in.

TEST CONFIGURATION



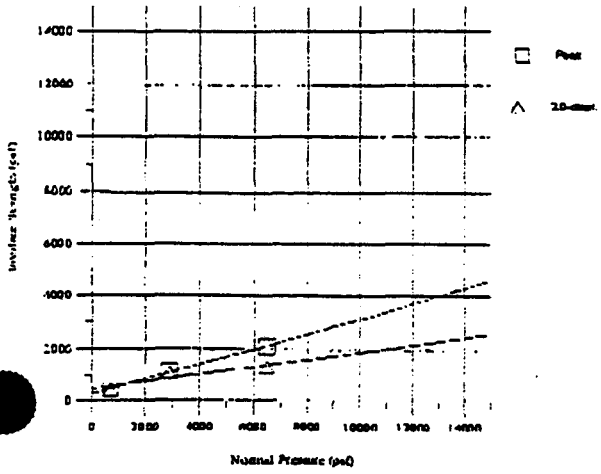
SAMPLE IDENTIFICATION:
PGL C# 38094, GCL Roll # 5056

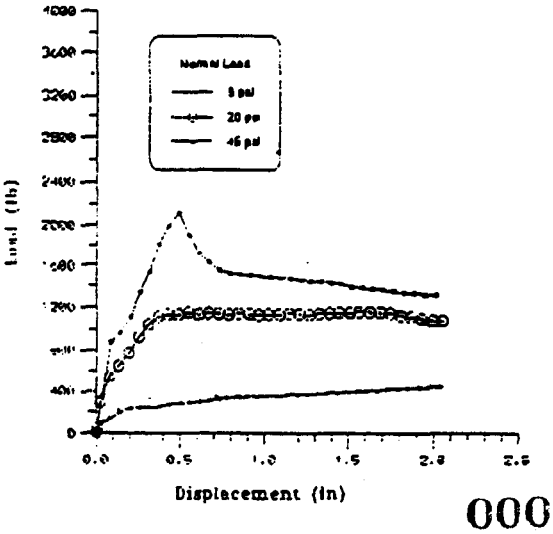
TEST RESULTS:

SAMPLE ID	NORMAL STRESS (psi)	NORMAL STRESS (psf)	Moisture Content (%)	PEAK STRENGTH SHEAR STRESS (psf)	PEAK STRENGTH PEAK SECANT ANGLE	2" DISPLACEMENT SHEAR STRESS (psf)	2" DISPLACEMENT 2" DISPLACEMENT SECANT ANGLE
C# 38094	5	720	141.02	441	31	441	31
	20	2880	109.21	1153	22	1069	20
	45	6480	75.22	2109	18	1308	11
	COHESION:			357		462	

OBSERVATIONS:

Stitches of specimens sheared at 45 psi normal stresses was completely separated from woven side at 2 " displacement . For 5 psi normal load, less than 10% of stitches were separated and for 20 psi, about 50% .





1440-006 Rev. 4 p. 6 of 12

F-2739

TABLE . 3
MATERIAL PROPERTIES
FERNALD OSDF

FOR: GSE LINING TECHNOLOGY
(Reference: PGL Job No. 990501)

June 13, 1999

INTERNAL SHEAR TEST RESULT (ASTM D5321)

TEST CONDITIONS:

SAMPLE PREPARATION

1. Specimens were cut to 20" x 20"

HYDRATION:

1. Hydrated for 7 days at 3 psi using dead weights

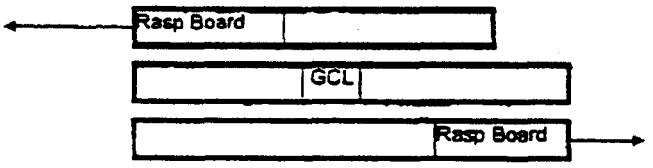
CONSOLIDATION:

1. Each set of specimen was consolidated for 48 hrs at 5, 20, & 45 psi
2. Loads were applied by pneumatic pressure.

SHEAR TEST:

1. Shear test was conducted at 0.004 in/ min
2. Sheared at minimum 2 inch horizontal displacement.
3. The test specimens were flooded during testing.
4. Tests were performed in general accordance with ASTM D5321-93 Method A using Brainard- Kilman LG-112 Direct Shear machine with effective area of 12 in x 12 in.

TEST CONFIGURATION



SAMPLE IDENTIFICATION:

PGL C# 38095, GCL Roll # 5100

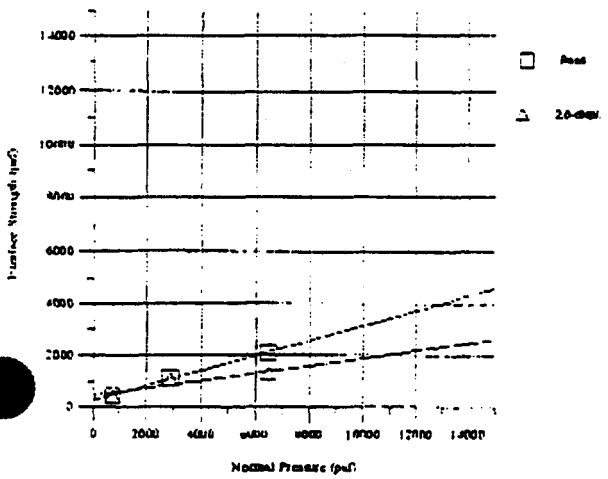
TEST RESULTS:

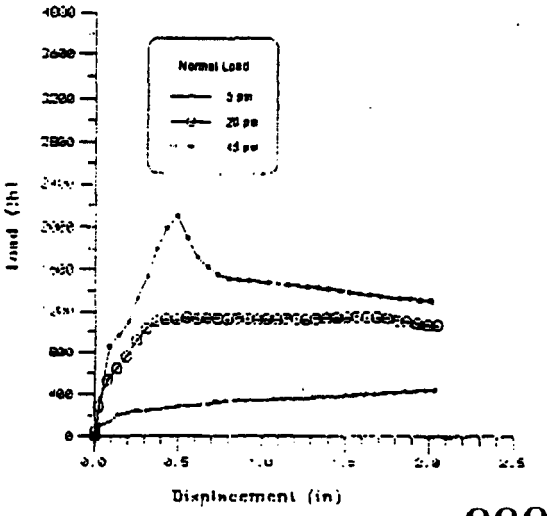
STRENGTH

SAMPLE ID	NORMAL STRESS (psi)	NORMAL STRESS (psf)	Moisture Content (%)	PEAK STRENGTH SHEAR STRESS (psf)	PEAK STRENGTH PEAK SECANT ANGLE	2" DISPLACEMENT SHEAR STRESS (psf)	2" DISPLACEMENT 2" DISPLACEMENT SECANT ANGLE
C# 38095	5	720	132.20	426	31	426	31
	20	2880	98.34	968	19	779	15
	45	6480	59.11	2221	19	1092	10
	COHESION:			357		462	

OBSERVATIONS:

Stitiches of specimens sheared at 45 psi normal stresses was completely separated from woven side at 2 " displacement . For 5 psi normal load, less than 10% of stitches were separated and for 20 psi, about 50% .





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(530) 272-2448 Fax:(530) 272-8553

LARGE SCALE DIRECT SHEAR REPORT

Test Method D-6243-B

1440-006 Rev. 0 p. 7 of 12
6-16-99

2739

Client Name: PRECISION LABORATORIES Project Name: FERNALD SUPERFUND SITE Project No: 943022.37

Superstrate: ⇦ Board Spacers

Material 1: ⇦ Cetco Bentomat ST; Lot #19992020; Roll #5115 LSN: BDW Rasp Board

Material 2: ⇨ GSE 80 mil HDPE Textured/Textured; Roll #114101753 LSN: BEG Clamped

Substrate: ⇨ Concrete Board with Sand Layer

PEAK STRENGTH

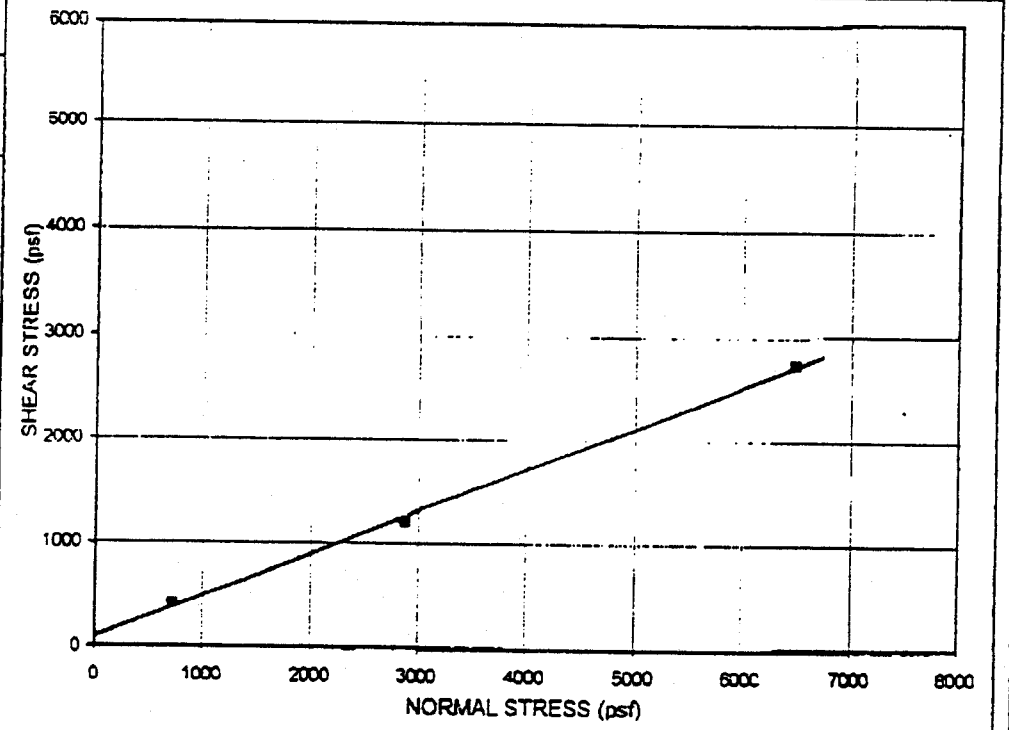
Test Point	Normal Stress psi	Normal Stress psf	Shear Stress psf	Secant Friction Angle
1.	5.0	720	420	30
2.	20.0	2880	1210	23
3.	45.0	6480	2740	23

Adhesion: 100 psf

Friction Angle 22 degrees

Coefficient of Friction: 0.4

NOTE: GRAPH NOT TO SCALE



STRENGTH ENVELOPE

(at 2.5 in. displacement)

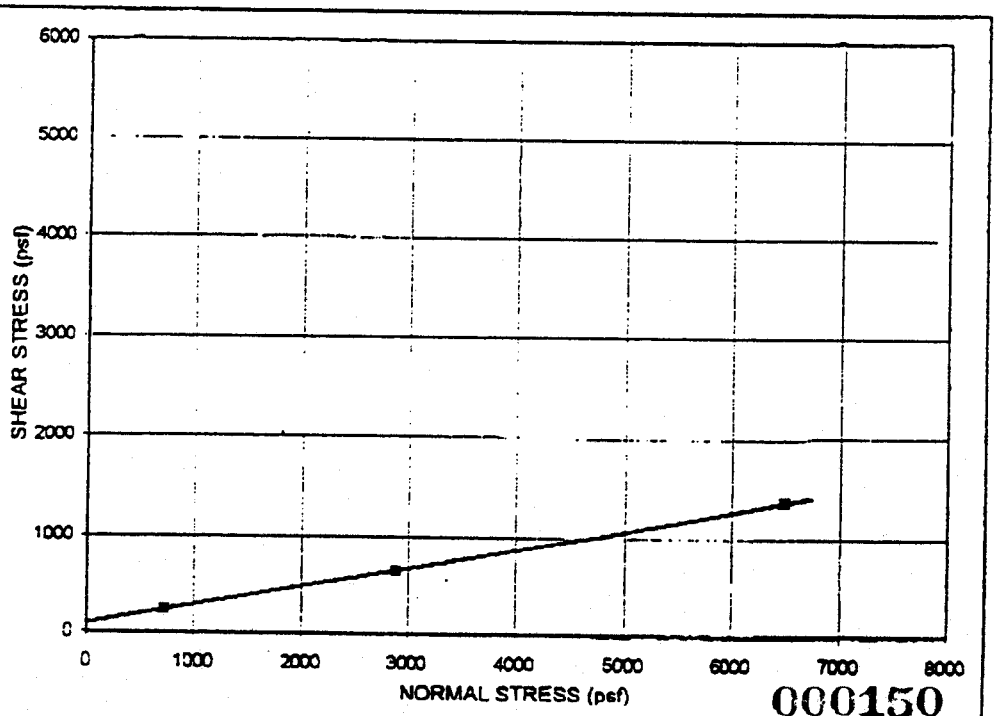
Test Point	Normal Stress psi	Normal Stress psf	Shear Stress psf	Secant Friction Angle
1.	5.0	720	230	18
2.	20.0	2880	660	13
3.	45.0	6480	1370	12

Adhesion: 90 psf

Friction Angle: 11 degrees

Coefficient of Friction: 0.2

NOTE: GRAPH NOT TO SCALE



000150

NOTE: The Friction Angle and Adhesion (or Cohesion) results given here are based on a mathematically determined best fit line. Further interpretation should be conducted by a qualified professional experienced in geosynthetic and geotechnical engineering.

By accepting the data and result represented on this page, Client agrees to limit the liability of Vector Engineering, Inc. from client and all other parties for claims arising out of use of this data to the cost for the respective test(s) represented hereon, and Client agrees to indemnify and hold harmless Vector from and against all liability in excess of the aforementioned limit.

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LARGE SCALE DIRECT SHEAR REPORT

2739 Test Method D-6243-B

1444-006 Rev. 0 p. 8 of 12
6-16-99

Client Name: PRECISION LABORATORIES Project Name: FERNALD SUPERFUND SITE Project No: 943022.37

Superstrate: ⇦ Board Spacers

Material 1: ⇦ Cetco Bentomat ST; Lot #19992020; Roll #5115 LSN: BDW Rasp Board

Material 2: ⇨ GSE 80 mil HDPE Textured/Textured; Roll #114101753 LSN: BEG Clamped

Substrate: ⇨ Concrete Board with Sand Layer

DISPLACEMENT vs. SHEAR STRESS

Test Point	Normal Stress psi	Normal Stress psf
1.	5.0	720
2.	20.0	2880
3.	45.0	6480

MOISTURE DATA:

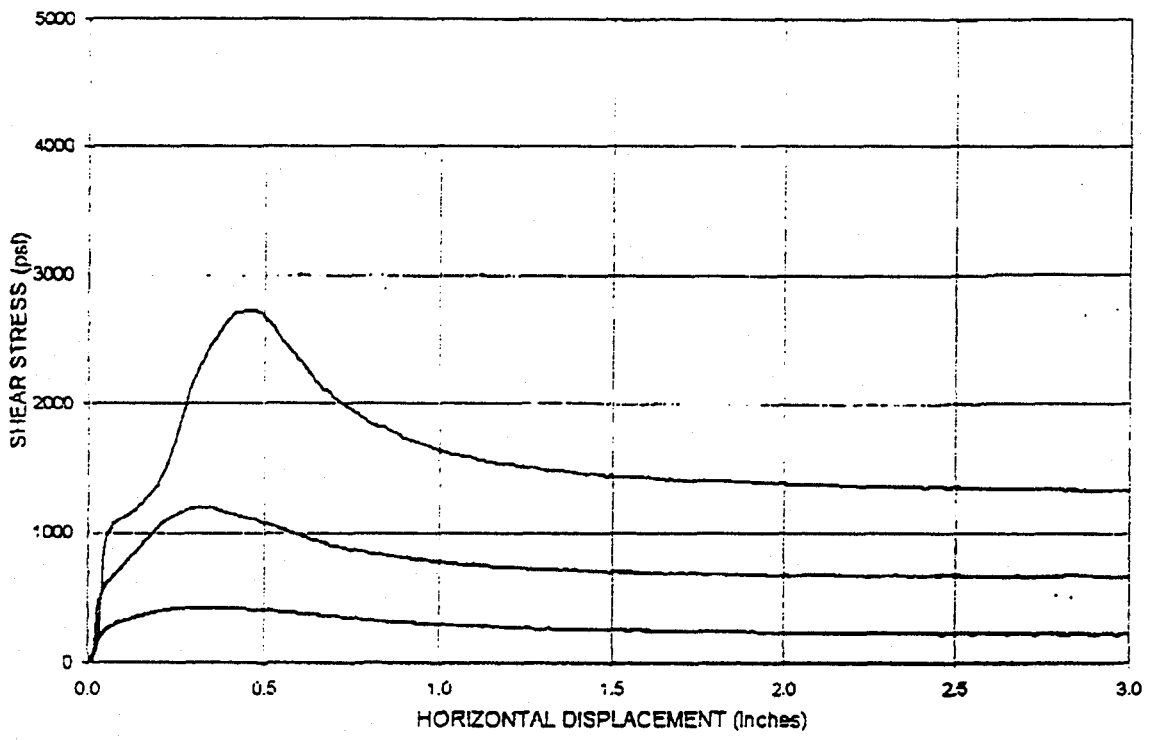
(GCL)

Initial Water Content: 23.4%

Initial Dry Density: NA pcf

Final Water Content:(%)

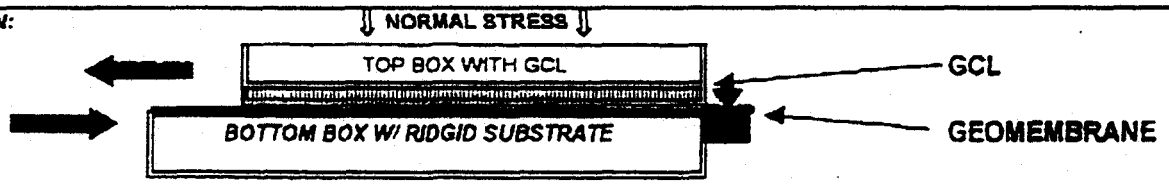
1.	2.	3.
118.5	89.7	69.5



STANDARD CONDITIONS: **SHEAR DISPLACEMENT RATE: 0.004 in/min**

1. The "gap" between shear boxes was set at 80 mil (2.0 mm)
2. The test specimens were flooded during testing unless otherwise noted.
3. High Normal Stresses, >5psi (35 kPa) was applied using air pressure.
4. Low Normal Stresses, <5psi (35 kPa) was applied using dead weights.
5. The tests were terminated after 3.0"(75 mm) of displacement unless otherwise noted.
6. Tests were performed in general accordance with ASTM procedure D-6243 using a Brainard-Killman LG-112 direct shear machine with an effective area of 12" x 12" (300 x300 mm).

TEST ORIENTATION:



SPECIAL TEST NOTES:

1. Each specimen of HDPE was cut to 14" x 20" and clamped to the lower box.
2. The textile portions of the GCL were wrapped around a 12"x12" rasp board in the upper box.
3. Each GCL specimen was hydrated for 7 days at 3 psi, in contact with the textured HDPE.
4. After hydration, each GCL / HDPE specimen was consolidated at the specified normal stress for 48 hrs. then sheared.
5. The woven textile side of the GCL was tested against the HDPE
6. Shearing occurred at the interface between the textured HDPE and GCL specimen.
7. Minor stretching of the GCL fabric occurred in point 3.

Vector Engineering Inc.

Laboratory Services

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LARGE SCALE DIRECT SHEAR REPORT

Test Method D-6243-B

= 2739 1440-006 Rev. 0 p. 9 of 12 6-16-99

Client Name: PRECISION LABORATORIES Project Name: FERNALD SUPERFUND SITE Project No: 943022.37

Superstrate: ⇦ Board Spacers

Material 1: ⇦ CETCO Bentomat ST Lot#199922020 Roll # 5359 LSN: BEO Rasp Board

Material 2: ⇨ 80 mil GSE HDPE Textured/Textured Roll # 114101774 LSN: BEI Clamped

Substrate: ⇨ Concrete Board with Sand Layer

PEAK STRENGTH

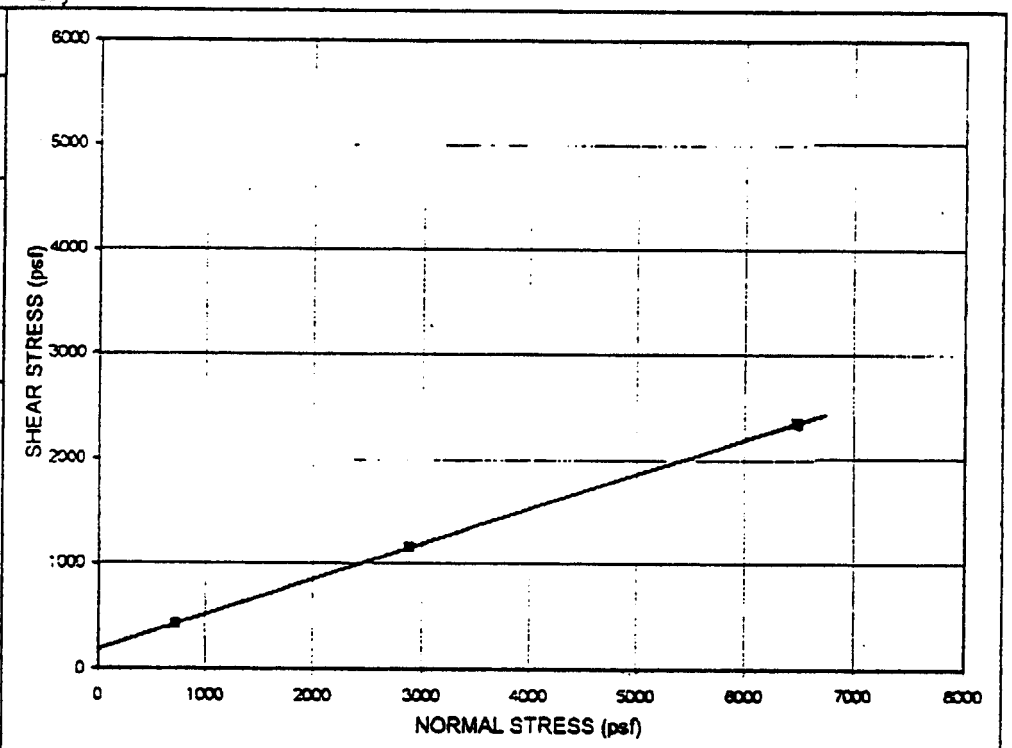
Test Point	Normal Stress psi	Normal Stress psf	Shear Stress psf	Secant Friction Angle
1.	5.0	720	430	31
2.	20.0	2880	1160	22
3.	45.0	6480	2350	20

Adhesion: 190 psf

Friction Angle: 18 degrees

Coefficient of Friction: 0.33

NOTE: GRAPH NOT TO SCALE



STRENGTH ENVELOPE

(at 2.5 in. displacement)

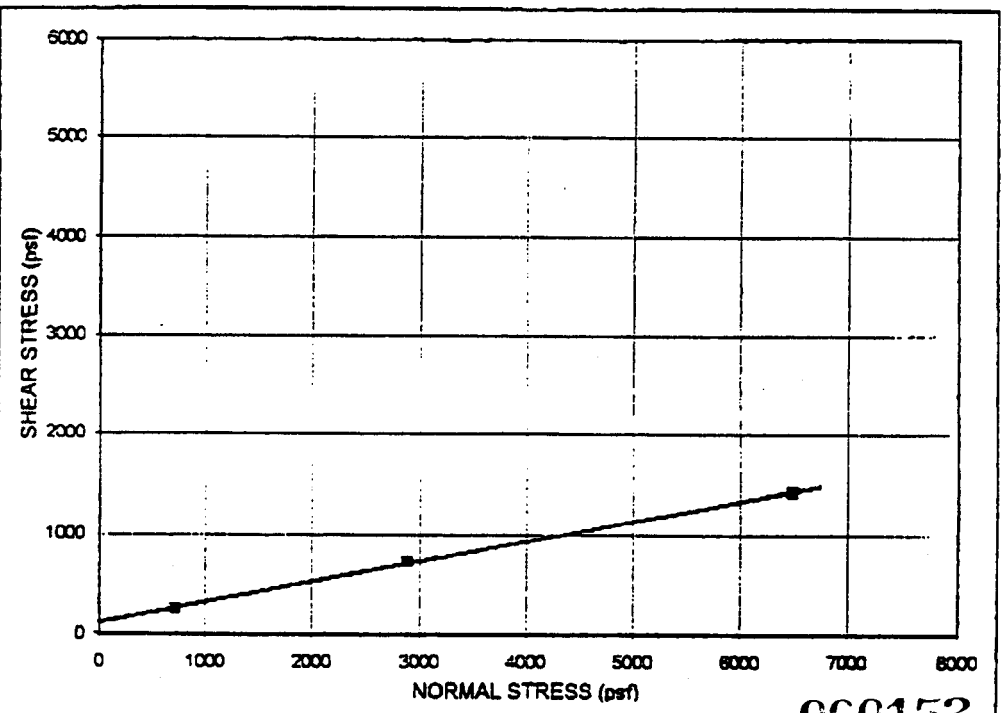
Test Point	Normal Stress psi	Normal Stress psf	Shear Stress psf	Secant Friction Angle
1.	5.0	720	250	19
2.	20.0	2880	720	14
3.	45.0	6480	1430	12

Adhesion: 110 psf

Friction Angle: 12 degrees

Coefficient of Friction: 0.2

NOTE: GRAPH NOT TO SCALE



000152

NOTE: The Friction Angle and Adhesion (or Cohesion) results given here are based on a mathematically determined best fit line. Further interpretation should be conducted by a qualified professional experienced in geosynthetic and geotechnical engineering.

By accepting the data and result represented on this page, Client agrees to limit the liability of Vector Engineering, Inc. from client and all other parties for claims arising out of use of this data to the cost for the respective test(s) represented hereon, and Client agrees to indemnify and hold harmless Vector from and against all liability in excess of the aforementioned limit

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LARGE SCALE DIRECT SHEAR REPORT

Test Method D-6243-B

-- 2739

1440-006 Rev. 4
p. 14 of 12 6-16-97

Client Name: PRECISION LABORATORIES Project Name: FERNALD SUPERFUND SITE Project No: 943022.37

Superstrate: ⟸ Board Spacers

Material 1: ⟸ CETCO Bentomat ST Lot#199922020 Roll # 5359 LSN: BEO Rasp Board

Material 2: ⟹ 80 mil GSE HDPE Textured/Textured Roll # 114101774 LSN: BEI Clamped

Substrate: ⟹ Concrete Board with Sand Layer

DISPLACEMENT vs. SHEAR STRESS

Test Point	Normal Stress psi	Normal Stress psf
1.	5.0	720
2.	20.0	2880
3.	45.0	6480

MOISTURE DATA:

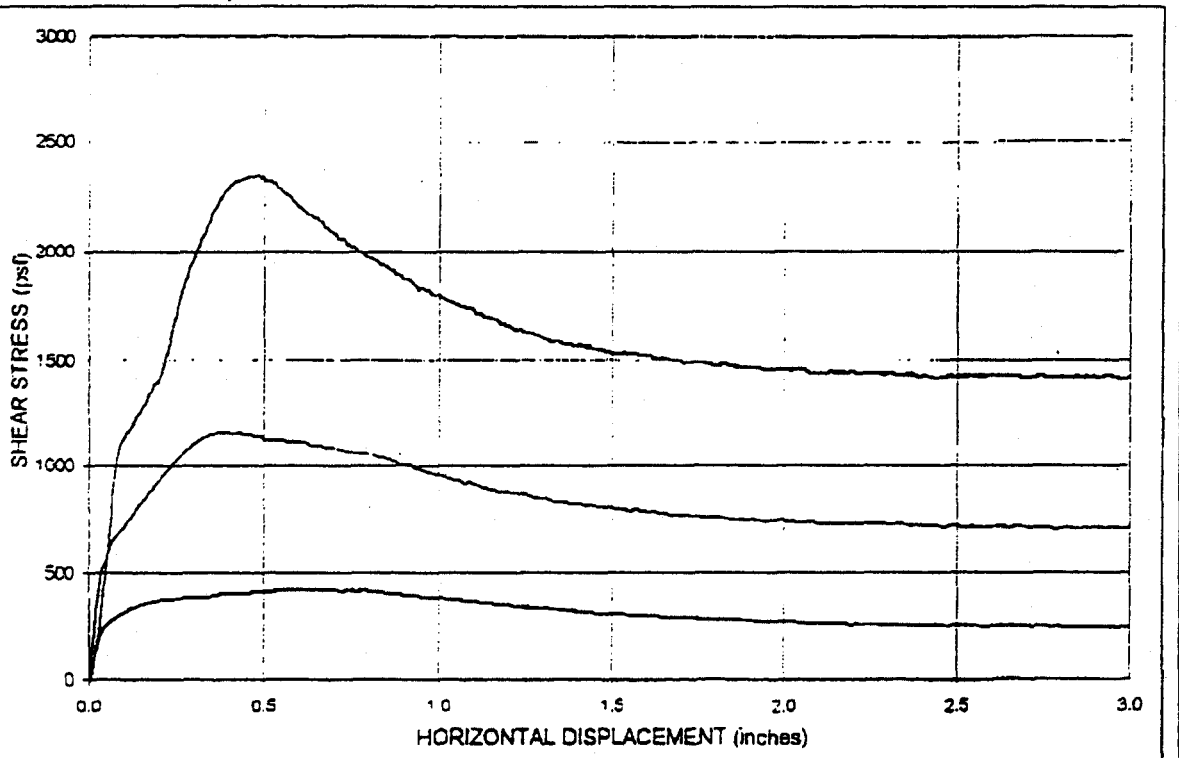
(GCL)

Initial Water Content: 20.2%

Initial Dry Density: N/A pcf

Final Water Content:(%)

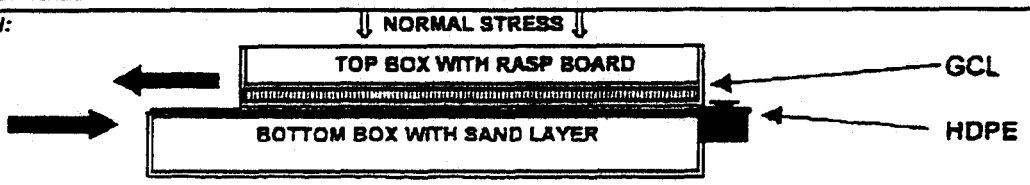
1	2.	3.
108.6	97.3	80.9



STANDARD CONDITIONS: **SHEAR DISPLACEMENT RATE: 0.004 in/min**

1. The "gap" between shear boxes was set at 80 mil (2.0 mm)
2. The test specimens were flooded during testing unless otherwise noted.
3. High Normal Stresses. >5psi (35 kPa) was applied using air pressure.
4. Low Normal Stresses. <5psi (35 kPa) was applied using dead weights.
5. The tests were terminated after 3.0"(75 mm) of displacement unless otherwise noted.
6. Tests were performed in general accordance with ASTM procedure D-6243 using a Brainard-Killman LG-112 direct shear machine with an effective area of 12" x 12" (300 x300 mm).

TEST ORIENTATION:



SPECIAL TEST NOTES:

1. Each specimen of HDPE was cut to 14" x 20" and clamped to the lower box
2. The textile portions of the GCL were wrapped around a 12"x12" rasp board in the upper box.
3. The GCL specimens were hydrated for 7 days at 3 psi, in contact with the textured HDPE.
4. After hydration each GCL / HDPE soil specimen was consolidated at the specified normal stress for 48 hrs.. then sheared.
5. The woven textile side of the GCL was tested against the HDPE
6. Shearing occurred at the interface between the textured HDPE and GCL specimens
7. Minor stretching of the GCL occurred on the normal stress points 1 and 2.

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LARGE SCALE DIRECT SHEAR REPORT

Test Method D-6243-B

2739

1444-446 Rev 4 p. 11 of 12
6-16-99

Client Name: PRECISION LABORATORIES Project Name: FERNALD SUPERFUND SITE Project No: 943022 37

Superstrate: ⇦ Board Spacers

Material 1: ⇦ CETCO Bentomat DN Lot#19992020 Roll#5072 LSN: BDV Rasp Board

Material 2: ⇨ 80 mil GSE HDPE Textured/Textured Roll#114101743 LSN: BEF Clamped

Substrate: ⇨ Concrete Board with Sand Layer

PEAK STRENGTH

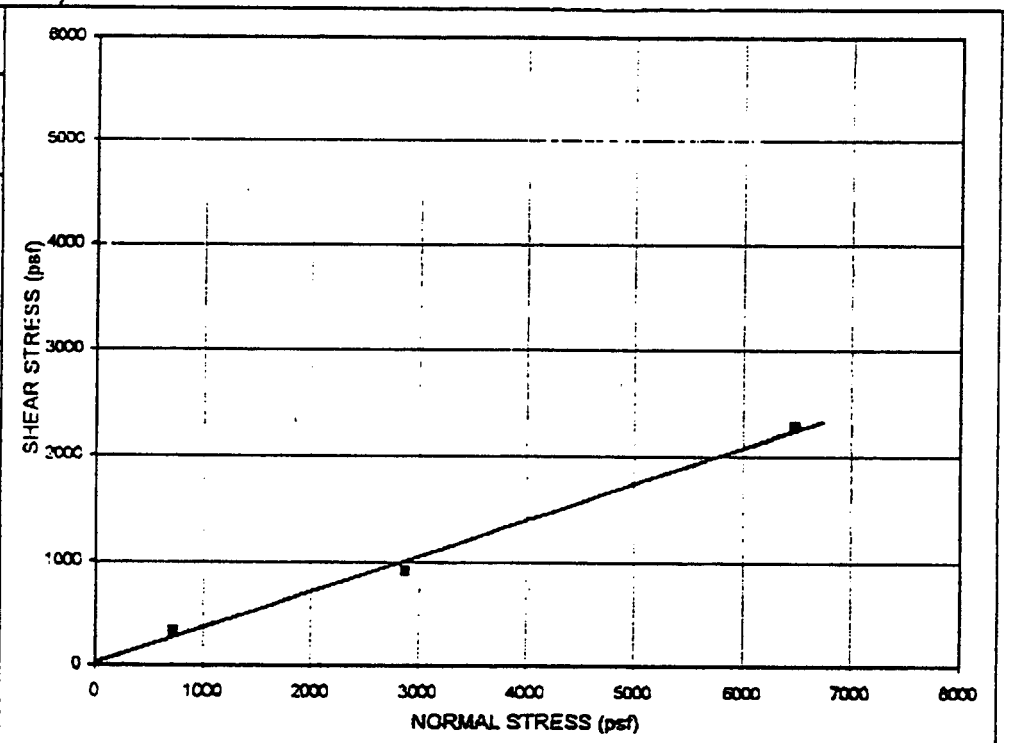
Test Point	Normal Stress psi	Normal Stress psf	Shear Stress psf	Secant Friction Angle
1.	5.0	720	330	25
2.	20.0	2880	910	18
3.	45.0	6480	2290	19

Adhesion: 20 psf

Friction Angle: 19 degrees

Coefficient of Friction: 0.34

NOTE: GRAPH NOT TO SCALE



STRENGTH ENVELOPE

(at 2.5 in. displacement)

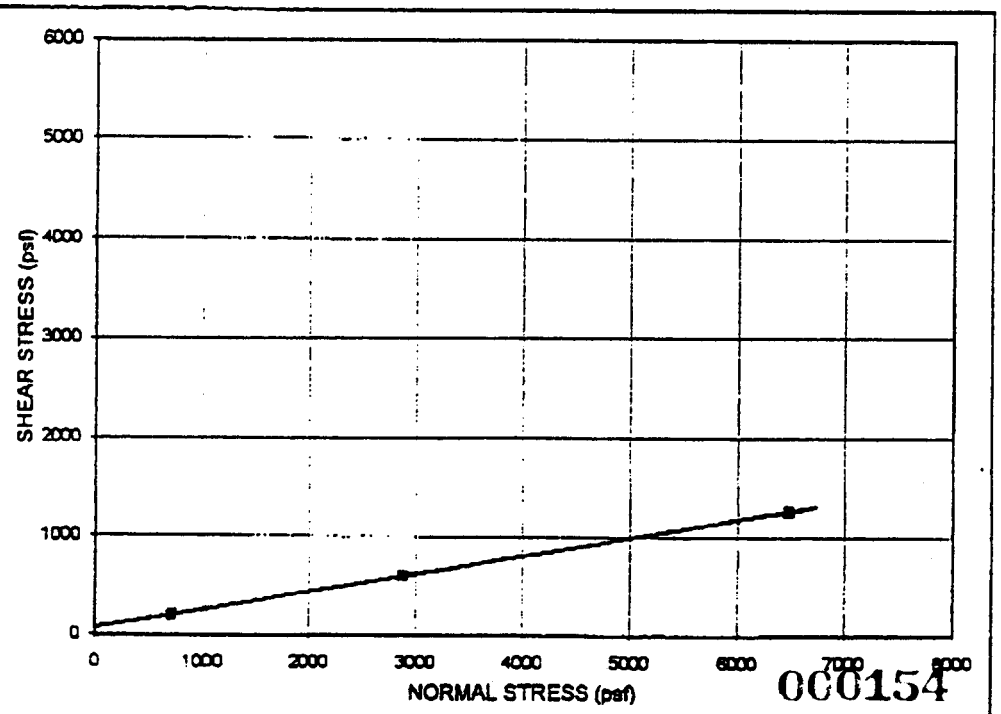
Test Point	Normal Stress psi	Normal Stress psf	Shear Stress psf	Secant Friction Angle
1.	5.0	720	200	16
2.	20.0	2880	610	12
3.	45.0	6480	1260	11

Adhesion: 70 psf

Friction Angle: 10 degrees

Coefficient of Friction: 0.18

NOTE: GRAPH NOT TO SCALE



000154

NOTE: The Friction Angle and Adhesion (or Cohesion) results given here are based on a mathematically determined best fit line. Further interpretation should be conducted by a qualified professional experienced in geosynthetic and geotechnical engineering.

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LARGE SCALE DIRECT SHEAR REPORT

Test Method D-6243-B

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6-16-99

Client Name: PRECISION LABORATORIES Project Name: FERNALD SUPERFUND SITE Project No. 943022 37

Superstrate: ⇦ Board Spacers

Material 1: ⇦ CETCO Bentomat DN Lot#19992020 Roll#5072 LSN: BDV Rasp Board

Material 2: ⇨ 80 mil GSE HDPE Textured/Textured Roll#114101743 LSN: BEF Clamped

Substrate: ⇨ Concrete Board with Sand Layer

DISPLACEMENT vs. SHEAR STRESS

Test Point	Normal Stress psi	Normal Stress psf
1.	5.0	720
2.	20.0	2880
3.	45.0	6480

MOISTURE DATA:

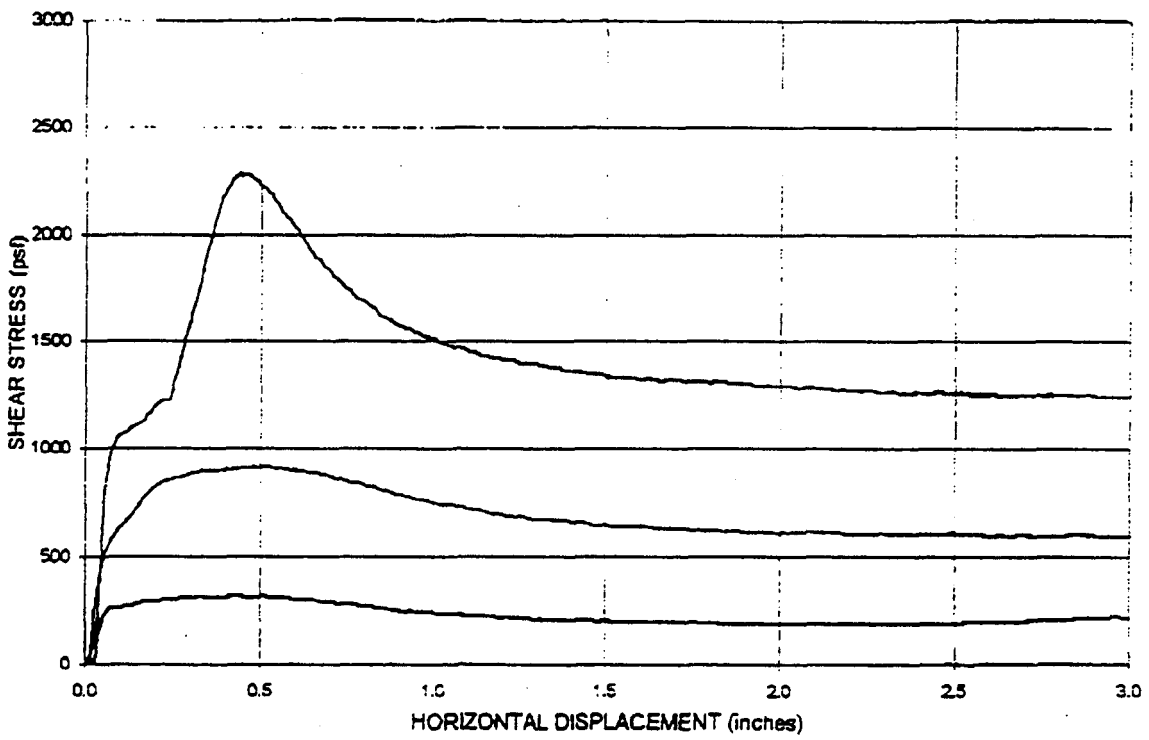
(GCL)

Initial Water Content: 22%

Initial Dry Density: N/A pcf

Final Water Content:(%)

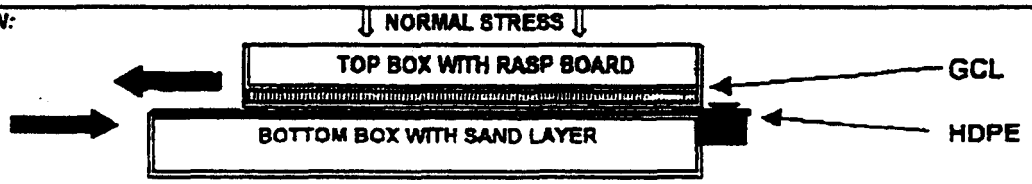
1.	2.	3.
102.4	94.0	71.1



STANDARD CONDITIONS: **SHEAR DISPLACEMENT RATE: 0.004 in/min**

1. The "gap" between shear boxes was set at 80 mil (2.0 mm)
2. The test specimens were flooded during testing unless otherwise noted.
3. High Normal Stresses, >5psi (35 kPa) was applied using air pressure.
4. Low Normal Stresses, <5psi (35 kPa) was applied using dead weights.
5. The tests were terminated after 3.0"(75 mm) of displacement unless otherwise noted.
6. Tests were performed in general accordance with ASTM procedure D-6243 using a Brainard-Killman LG-112 direct shear machine with an effective area of 12" x 12" (300 x300 mm).

TEST ORIENTATION:



SPECIAL TEST NOTES:

1. Each specimen of HDPE was cut to 14" x 20" and clamped to the lower box
2. The textile portions of the GCL were wrapped around a 12"x12" rasp board in the upper box.
3. The GCL specimens were hydrated for 7 days at 3 psi, in contact with the textured HDPE.
4. After hydration each GCL / HDPE soil specimen was consolidated at the specified normal stress for 48 hrs., then sheared.
5. The woven textile side of the GCL was tested against the HDPE
6. Shearing occurred at the interface between the textured HDPE and GCL specimens
7. Stretching or deformation of the GCL or HDPE was not observed.

SUPPLIER DOCUMENT SUBMITTAL

FDF PROJECT NO.: (1) 20102	CONTRACT NO: (2) 1440	SUBMITTAL NO.:(3) 006	REV.:(4) 2	DATE:(5) 6/29/99	Page 1 of 31 (6)

FROM: GSE Lining Technologies (7)

RECORD

SIGNATURE: _____

TO: FDF ENGINEERING/CONSTRUCTION
DOCUMENT CONTROL (ECDC), MS 52-7 (8)

RECEIVED BY: _____ DATE: _____

			DOCUMENT FAMILY									SUBMITTAL TYPE				SUBMITTAL ACTION		
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(9)	(10)	(11)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(13)	(14)	(14)	(14)	(15)	(16)	(16)	(16)
8	1440-006B	1							X		Quality Control Certificates		X		02772P.1.04.B		X	

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RECEIVED JUL 01 1999 KBT

0001156

NO COMMENTS: _____ COMMENTS: (PLEASE USE SPACE BELOW FOR COMMENTS OR INDICATE IF ATTACHMENTS) (19)

- Test results are not signed by QC Manager
- Wide width tensile and interface shear strength missing

1-27139

RECEIVED BY: [signature] (20) DATE: 7/1/99

(SIGN/DATE AND RETURN A COPY TO ECDC, MS 52-7)

SUBMITTAL TYPE: (BY SUPPLIER)
CFC - CERTIFIED FOR CONSTRUCTION
INF - INFORMATION/RECORD
DRFT - DRAFT/PRELIMINARY

SUBMITTAL ACTION CODE: (BY FDF)
A - Conforms to the Subcontract Requirements
B - Minor Comments - Incorporate and Resubmit
C - Revise and Resubmit (SEE COMMENTS)

FS-F-4955
Rev. 4: 04/??/1999

1440-006 Rev. 2
6-29-99
Doc 1440-006B
p. 2 of 31

CETCO
COLLOID ENVIRONMENTAL TECHNOLOGIES COMPANY
1350 West Shure Drive • Arlington Heights, IL 60004-1440 • USA
(847) 392-5800 • Fax (847) 506-6150
http://www.cetco.com

FAX MEMO

-2739

June 21, 1999

Pages: 30, including cover

To: Eric Reed
GSE
fax (281) 230-5891

From: Jim Olsta

cc:

RECORD

Subject: Fluor Daniel Fernald MQC Test Data

Dear Eric:

CETCO has completed the Bentomat ST MQC hydraulic conductivity, swell index and fluid loss for the Fluor Daniel Fernald project for lot 199922020. Wide width tensile testing is being performed by STS Consultants and test data is completed for rolls 5307, 5323, 5339 and 5355. The other GCL MQC test results were sent directly from CETCO's Lovell, Wyoming plant.

Sincerely,

Jim Olsta

Jim Olsta
Technical Manager
Lining Technology Group

- Width test incomplete
- Interface and internal shear test results not provided.

LBT
7-1-99

000157

1440-006 Rev. 2
6-29-99 p.3 of 31
Doc. 1440-006B

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2739

Standard Test Method for Swell Index and Fluid Loss of Clay Component of Geosynthetic Clay Liner

ASTM D 5890-95 & ASTM 5891-95

Project: Fluor Daniel Fernald

Proj. No.: 99-072

Sample ID: Lot # 199922020
Roll# 5003-5355

Date: 6/6/99

RECORD

Requested by: Jerry Darlington

Roll Number	Free Swell	Fluid Loss
5003	28	14.4
5018	27	14.4
5034	28	14.3
5041	27	14.4
5058	29	14.3
5074	29	14.4
5090	28	14.5
5106	27	14.5
5122	28	14.3
5138	29	14.3
5154	29	14.5
5170	27	14.6
5186	28	14.5
5201	29	14.5
5221	27	14.6
5237	29	14.5
5253	28	14.4
5269	28	14.4
5275	28	14.5
5292	29	14.5
5307	27	14.6
5323	27	14.6
5339	28	14.5
5355	27	14.6

No QC signature
KBT 7-1-99

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TCO 1350 W. Shure Dr. Arlington Hgts., IL Co[illegible]ation Sheet:GRI Accredited ASTM D-5887, Index Flux

Sample: Bentomat ST
Lot#: 199922020 **Roll#:** 5003
Project #: 99-072 **Fluor Daniel Fernald**

Permeability equation : ((0.879*Thickness)/(2*Pi*r^2*Time))*ln(Change in Head)

Flux equation : ((Inflow+Outflow)/200)/Pi*r^2/Time

Initial Thickness : 0.74 cm. **Hydration :** 48hrs **Permeant :** De-aired DI Water

Test Position : 303 **Initial Head :** 2psi 140.6 cm. **Analyst :** NP **Date:** 6/3/99

Cell Size : 4 in. **Max. Effective Stress :** 5psi 34.5kPa **Requested by :** JO **Date Started:** 5/28/99

Final Thickness : 0.72 cm. * indicates value meets Flux Ratio ASTM termination criteria

Conversions : 1 psi = 2.307 feet of head 1 foot of head = 30.48 cm 1 psi = 70.32 cm Flux (English) = Flux * 9.2366E+10

Date	Time (min)	Reading In	X	Reading Out	Y	X-Y	Head (cm)	H (cm)	Initial K (cm/sec)	Initial Flux ($m^3/m^2/sec$)		Avg Flux ($m^3/m^2/sec$)	Final K (cm/sec)	Final Flux (Gal/Acre /Day)	Inflow to Outflow Ratio
6/1/99	0	0.0	24.0	24.0	0.0	24.0	140.63	164.63							
	72	0.9	23.1	23.4	0.6	22.5	140.63	163.13	8.50E-09	2.14E-08			8.27E-9		1.50
	222	1.7	22.3	23.2	0.8	21.5	140.63	162.13	2.74E-09	6.85E-09			2.67E-9		4.00
	313	2.5	21.5	22.7	1.3	20.2	140.63	160.83	5.91E-09	1.47E-08			5.75E-9		1.60
6/2/99	1289	4.6	19.4	20.8	3.2	16.2	140.63	156.83	1.73E-09	4.21E-09			1.68E-9		1.11
	1387	4.7	19.3	20.7	3.3	16.0	140.63	156.63	8.71E-10	2.10E-09			8.47E-10		1.00
	1485	4.9	19.1	20.5	3.5	15.6	140.63	156.23	1.74E-09	4.20E-09			1.70E-9		1.00
	1599	5.1	18.9	20.3	3.7	15.2	140.63	155.83	1.50E-09	3.61E-09	*		1.46E-9		1.00
	1743	5.3	18.7	20.1	3.9	14.8	140.63	155.43	1.19E-09	2.86E-09	*		1.16E-9		1.00
6/3/99	2805	6.6	17.4	18.8	5.2	12.2	140.63	152.83	1.06E-09	2.52E-09	*		1.03E-9		1.00
	2947	6.8	17.2	18.6	5.4	11.8	140.63	152.43	1.23E-09	2.90E-09	*	2.76E-09	1.20E-9	255	1.00

Final Flux 2.8E-9 $m^3/m^2/sec$

Final Hydraulic Conductivity 1.1E-9 cm/s

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File Name: 99-072

Final Results

TCO 1350 W. Shure Dr. Arlington Hgts., IL **Computation Sheet:GRI Accredited ASTM D-5887, Index Flux**

Sample: Bentomat ST **Permeability equation :** ((0.879*Thickness)/(2*Pi*r^2*Time))*ln(Change in Head)

Lot#: 199922020 Roll#: 5018

Project # : 99-072 -4 Fluor Daniel Fernald **Flux equation :** ((Inflow+Outflow)/200)/Pi*r^2/Time

Initial Thickness : 0.84 cm. **Hydration :** 48hrs **Permeant :** De-aired DI Water

Test Position : 310 **Initial Head :** 2psi 140.6 cm. **Analyst :** NP **Date:** 6/3/99

Cell Size : 4 in. **Max. Effective Stress :** 5psi 34.5kPa **Requested by :** JO **Date Started:** 5/28/99

Final Thickness : 0.88 cm. *** indicates value meets Flux Ratio ASTM termination criteria**

Conversions : 1 psi = 2.307 feet of head 1 foot of head = 30.48 cm 1 psi = 70.32 cm Flux (English) = Flux * 9.2366E+10

Date	Time (min)	Reading In	X	Reading Out	Y	X-Y	Head (cm)	H (cm)	Initial K (cm/sec)	Initial Flux ($m^3/m^2/sec$)		Avg Flux ($m^3/m^2/sec$)	Final K (cm/sec)	Final Flux (Gal/Acre /Day)	Inflow to Outflow Ratio
6/1/99	0	0.0	24.0	24.0	0.0	24.0	140.63	164.63							
	72	0.3	23.7	24.0	0.0	23.7	140.63	164.33	1.92E-09	4.28E-09			2.01E-9		
	222	0.5	23.5	23.9	0.1	23.4	140.63	164.03	9.24E-10	2.06E-09			9.69E-10		2.00
	313	1.3	22.7	23.8	0.2	22.5	140.63	163.13	4.59E-09	1.02E-08			4.81E-9		8.00
6/2/99	1289	3.4	20.6	22.2	1.8	18.8	140.63	159.43	1.78E-09	3.90E-09			1.87E-9		1.31
	1387	3.6	20.4	22.0	2.0	18.4	140.63	159.03	1.95E-09	4.20E-09	*		2.04E-9		1.00
	1445	3.7	20.3	21.9	2.1	18.2	140.63	158.83	1.65E-09	3.54E-09	*		1.73E-9		1.00
	1599	3.9	20.1	21.7	2.3	17.8	140.63	158.43	1.24E-09	2.67E-09	*		1.30E-9		1.00
	1723	4.1	19.9	21.5	2.5	17.4	140.63	158.03	1.55E-09	3.32E-09	*		1.62E-9		1.00
6/3/99	2845	6.5	17.5	19.4	4.6	12.9	140.63	153.53	1.95E-09	4.12E-09	*		2.05E-9		1.14
	2927	6.7	17.3	19.2	4.8	12.5	140.63	153.13	2.41E-09	5.01E-09	*	4.15E-09	2.53E-9	383	1.00

Final Flux 4.2E-9 $m^3/m^2/sec$

Final Hydraulic Conductivity 2.1E-9 cm/s

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TCO 1350 W. Shure Dr. Arlington Hgts., IL Col[illegible]ation Sheet:GRI Accredited ASTM D-5887, Index Flux

Sample: Bentomat ST
Lot#: 199922020 **Roll#:** 5034
Project # : 99-072 -22 Fluor Daniel Fernald

Permeability equation : ((0.879*Thickness)/(2*Pi*r^2*Time))*ln(Change in Head)
Flux equation : ((Inflow+Outflow)/200)/Pi*r^2/Time

Initial Thickness : 0.81 cm. **Hydration :** 48hrs **Permeant :** De-aired DI Water

Test Position : 309 **Initial Head :** 2psi 140.6 cm. **Analyst :** NP **Date:** 6/15/99

Cell Size : 4 in. **Max. Effective Stress :** 5psi 34.5kPa **Requested by :** JO **Date Started:** 6/9/99

Final Thickness : 0.80 cm. * indicates value meets Flux Ratio ASTM termination criteria

Conversions : 1 psi = 2.307 feet of head 1 foot of head = 30.48 cm 1 psi = 70.32 cm Flux (English) = Flux * 9.2366E+10

Date	Time (min)	Reading In	X	Reading Out	Y	X-Y	Head (cm)	H (cm)	Initial K (cm/sec)	Initial Flux ($m^3/m^2/sec$)		Avg Flux ($m^3/m^2/sec$)	Final K (cm/sec)	Final Flux (Gal/Acre /Day)	Inflow to Outflow Ratio
6/13/99	0	0.0	24.0	24.0	0.0	24.0	140.63	164.63							
	1210	3.8	20.2	22.3	1.7	18.5	140.63	159.13	2.06E-09	4.67E-09			2.03E-9		2.24
	1291	4.0	20.0	22.1	1.9	18.1	140.63	158.73	2.27E-09	5.08E-09	*		2.25E-9		1.00
	1386	4.2	19.8	21.9	2.1	17.7	140.63	158.33	1.94E-09	4.33E-09	*		1.92E-9		1.00
	1450	4.3	19.7	21.8	2.2	17.5	140.63	158.13	1.45E-09	3.21E-09			1.43E-9		1.00
6/14/99	2406	6.4	17.6	20.4	3.6	14.0	140.63	154.63	1.71E-09	3.76E-09	*		1.69E-9		1.50
	2505	6.6	17.4	20.2	3.8	13.6	140.63	154.23	1.91E-09	4.15E-09	*		1.89E-9		1.00
	2600	6.8	17.2	20.0	4.0	13.2	140.63	153.83	2.00E-09	4.33E-09	*		1.98E-9		1.00
	2715	7.0	17.0	19.8	4.2	12.8	140.63	153.43	1.66E-09	3.58E-09	*		1.64E-9		1.00
	2863	7.3	16.7	19.5	4.5	12.2	140.63	152.83	1.94E-09	4.17E-09	*		1.91E-9		1.00
6/15/99	3838	9.1	14.9	18.0	6.0	8.9	140.63	149.53	1.64E-09	3.48E-09	*	3.74E-09	1.62E-9	345	1.20

Final Flux 3.7E-9 $m^3/m^2/sec$
Final Hydraulic Conductivity 1.7E-9 cm/s

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TCO 1350 W. Shure Dr. Arlington Hgts., IL Computation Sheet:GRI Accredited ASTM D-5887, Index Flux

Sample: Bentomat ST
Lot#: 199922020 **Roll#:** 5041
Project #: 99-072 -14 Fluor Daniel Fernald

Permeability equation : ((0.879*Thickness)/(2*Pi*r^2*Time))*ln(Change in Head)
Flux equation : ((Inflow+Outflow)/200)/Pi*r^2/Time

Initial Thickness : 0.58 cm. **Hydration :** 48hrs **Permeant :** De-aired DI Water

Test Position : 311 **Initial Head :** 2psi 140.6 cm. **Analyst :** NP **Date:** 6/8/99

Cell Size : 4 in. **Max. Effective Stress :** 5psi 34.5kPa **Requested by :** JO **Date Started:** 6/3/99

Final Thickness : 0.61 cm. * indicates value meets Flux Ratio ASTM termination criteria

Conversions : 1 psi = 2.307 feet of head 1 foot of head = 30.48 cm 1 psi = 70.32 cm Flux (English) = Flux * 9.2366E+10

Date	Time (min)	Reading In	X	Reading Out	Y	X-Y	Head (cm)	H (cm)	Initial K (cm/sec)	Initial Flux ($m^3/m^2/sec$)		Avg Flux ($m^3/m^2/sec$)	Final K (cm/sec)	Final Flux (Gal/Acre /Day)	Inflow to Outflow Ratio
6/6/99	0	0.0	24.0	24.0	0.0	24.0	140.63	164.63							
	60	0.5	23.5	23.6	0.4	23.1	140.63	163.73	4.79E-09	1.54E-08			5.04E-9		1.25
	148	1.1	22.9	23.0	1.0	21.9	140.63	162.53	4.38E-09	1.40E-08	*		4.61E-9		1.00
6/7/99	1287	6.9	17.1	17.5	6.5	10.6	140.63	151.23	3.32E-09	1.02E-08			3.49E-9		1.05
	1374	7.2	16.8	17.2	6.8	10.0	140.63	150.63	2.39E-09	7.09E-09			2.52E-9		1.00
	1465	7.4	16.6	17.0	7.0	9.6	140.63	150.23	1.53E-09	4.52E-09			1.61E-9		1.00
	1570	7.7	16.3	16.7	7.3	9.0	140.63	149.63	2.00E-09	5.87E-09			2.10E-9		1.00
	1728	8.2	15.8	16.2	7.8	8.0	140.63	148.63	2.22E-09	6.51E-09	*		2.34E-9		1.00
6/8/99	2725	12.2	11.8	12.8	11.2	0.6	140.63	141.23	2.68E-09	7.63E-09	*		2.82E-9		1.18
	2867	12.6	11.4	12.4	11.6	-0.2	140.63	140.43	2.10E-09	5.79E-09	*		2.20E-9		1.00
	3019	13.0	11.0	12.0	12.0	-1.0	140.63	139.63	1.97E-09	5.41E-09	*	6.28E-09	2.07E-9	580	1.00

Final Flux 6.3E-9 $m^3/m^2/sec$
Final Hydraulic Conductivity 2.4E-9 cm/s

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TCO 1350 W. Shure Dr. Arlington Hgts., IL Co[illegible]tation Sheet:GRI Accredited ASTM D-5887, Index Flux

Sample: Bentomat ST
Lot#: 199922020 Roll#: 5058
Project # : 99-072 -3 Fluor Daniel Fernald

Permeability equation : ((0.879*Thickness)/(2*Pi*r^2*Time))*ln(Change in Head)
Flux equation : ((Inflow+Outflow)/200)/Pi*r^2/Time

Initial Thickness : 0.70 cm. Hydration : 48hrs Permeant : De-aired DI Water

Test Position : 309 Initial Head : 2psi 140.6 cm. Analyst : NP Date: 6/3/99

Cell Size : 4 in. Max. Effective Stress : 5psi 34.5kPa Requested by : JO Date Started: 5/28/99

Final Thickness : 0.73 cm. * indicates value meets Flux Ratio ASTM termination criteria

Conversions : 1 psi = 2.307 feet of head 1 foot of head = 30.48 cm 1 psi = 70.32 cm Flux (English) = Flux * 9.2366E+10

Date	Time (min)	Reading In	X	Reading Out	Y	X-Y	Head (cm)	H (cm)	Initial K (cm/sec)	Initial Flux ($m^3/m^2/sec$)		Avg Flux ($m^3/m^2/sec$)	Final K (cm/sec)	Final Flux (Gal/Acre /Day)	Inflow to Outflow Ratio
6/1/99	0	0.0	24.0	24.0	0.0	24.0	140.63	164.63							
	117	1.6	22.4	22.8	1.2	21.2	140.63	161.83	9.27E-09	2.46E-08			9.67E-9		1.33
	209	2.1	21.9	22.0	2.0	19.9	140.63	160.53	5.54E-09	1.45E-08			5.78E-9		0.62
6/2/99	1183	6.5	17.5	18.7	5.3	12.2	140.63	152.83	3.19E-09	8.13E-09			3.33E-9		1.33
	1283	6.7	17.3	18.5	5.5	11.8	140.63	152.43	1.66E-09	4.11E-09			1.73E-9		1.00
	1371	6.9	17.1	18.3	5.7	11.4	140.63	152.03	1.89E-09	4.67E-09	*		1.97E-9		1.00
	1495	7.2	16.8	18.0	6.0	10.8	140.63	151.43	2.02E-09	4.97E-09	*		2.10E-9		1.00
	1618	7.5	16.5	17.7	6.3	10.2	140.63	150.83	2.04E-09	5.01E-09	*		2.13E-9		1.00
6/3/99	2692	9.7	14.3	15.5	8.5	5.8	140.63	146.43	1.74E-09	4.21E-09	*		1.82E-9		1.00
	2813	10.0	14.0	15.2	8.8	5.2	140.63	145.83	2.15E-09	5.10E-09	*	4.77E-09	2.24E-9	441	1.00

Final Flux 4.8E-9 $m^3/m^2/sec$

Final Hydraulic Conductivity 2.1E-9 cm/s

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ETCO 1350 W. Shure Dr. Arlington Hgts., IL Con[illegible]tation Sheet:GRI Accredited ASTM D-5887, Index Flux

Sample: Bentomat ST
Lot#: 199922020 Roll#: 5074
Project # : 99-072 -13 Fluor Daniel Fernald

Permeability equation : ((0.879*Thickness)/(2*Pi*r^2*Time))*ln(Change in Head)
Flux equation : ((Inflow+Outflow)/200)/Pi*r^2/Time

Initial Thickness : 0.71 cm. Hydration : 48hrs Permeant : De-aired DI Water

Test Position : 310 Initial Head : 2psi 140.6 cm. Analyst : NP Date: 6/9/99

Cell Size : 4 in. Max. Effective Stress : 5psi 34.5kPa Requested by : JO Date Started: 6/3/99

Final Thickness : 0.78 cm. * indicates value meets Flux Ratio ASTM termination criteria

Conversions : 1 psi = 2.307 feet of head 1 foot of head = 30.48 cm 1 psi = 70.32 cm Flux (English) = Flux * 9.2366E+10

Date	Time (min)	Reading In	X	Reading Out	Y	X-Y	Head (cm)	H (cm)	Initial K (cm/sec)	Initial Flux ($m^3/m^2/sec$)		Avg Flux ($m^3/m^2/sec$)	Final K (cm/sec)	Final Flux (Gal/Acre /Day)	Inflow to Outflow Ratio
6/5/99	0	0.0	24.0	24.0	0.0	24.0	140.63	164.63							
	66	0.6	23.4	23.9	0.1	23.3	140.63	163.93	4.14E-09	1.09E-08			4.55E-9		6.00
6/6/99	1109	4.1	19.9	22.9	1.1	18.8	140.63	159.43	1.71E-09	4.43E-09			1.88E-9		3.50
	1229	4.3	19.7	22.7	1.3	18.4	140.63	159.03	1.34E-09	3.43E-09	*		1.48E-9		1.00
6/7/99	2400	7.0	17.0	21.0	3.0	14.0	140.63	154.63	1.54E-09	3.86E-09	*		1.69E-9		1.59
	2496	7.2	16.8	20.8	3.2	13.6	140.63	154.23	1.73E-09	4.28E-09	*		1.90E-9		1.00
	2705	7.5	16.5	20.5	3.5	13.0	140.63	153.63	1.20E-09	2.95E-09			1.31E-9		1.00
	2872	7.8	16.2	20.2	3.8	12.4	140.63	153.03	1.50E-09	3.69E-09			1.65E-9		1.00
6/8/99	3888	9.6	14.4	18.9	5.1	9.3	140.63	149.93	1.29E-09	3.14E-09	*		1.42E-9		1.38
	4001	9.8	14.2	18.7	5.3	8.9	140.63	149.53	1.52E-09	3.64E-09	*		1.67E-9		1.00
	4133	10.0	14.0	18.5	5.5	8.5	140.63	149.13	1.30E-09	3.11E-09	*		1.43E-9		1.00
	4245	10.2	13.8	18.3	5.7	8.1	140.63	148.73	1.54E-09	3.67E-09	*		1.69E-9		1.00
6/9/99	5274	11.9	12.1	16.9	7.1	5.0	140.63	145.63	1.31E-09	3.10E-09	*	3.29E-09	1.44E-9	304	1.21

Final Flux 3.3E-9 $m^3/m^2/sec$

Final Hydraulic Conductivity 1.5E-9 cm/s

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TCO 1350 W. Shure Dr. Arlington Hgts., IL Co[illegible]tation Sheet:GRI Accredited ASTM D-5887, Index Flux

Sample: Bentomat ST
Lot#: 199922020 Roll#: 5090
Project # : 99-072 -2 Fluor Daniel Fernald

Permeability equation : ((0.879*Thickness)/(2*Pi*r^2*Time))*ln(Change in Head)
Flux equation : ((Inflow+Outflow)/200)/Pi*r^2/Time

Initial Thickness : 0.74 cm. Hydration : 48hrs Permeant : De-aired DI Water

Test Position : 306 Initial Head : 2psi 140.6 cm. Analyst : NP Date: 6/3/99

Cell Size : 4 in. Max. Effective Stress : 5psi 34.5kPa Requested by : JO Date Started: 5/28/99

Final Thickness : 0.76 cm. * indicates value meets Flux Ratio ASTM termination criteria

Conversions : 1 psi = 2.307 feet of head 1 foot of head = 30.48 cm 1 psi = 70.32 cm Flux (English) = Flux * 9.2366E+10

Date	Time (min)	Reading In	X	Reading Out	Y	X-Y	Head (cm)	H (cm)	Initial K (cm/sec)	Initial Flux ($m^3/m^2/sec$)		Avg Flux ($m^3/m^2/sec$)	Final K (cm/sec)	Final Flux (Gal/Acre /Day)	Inflow to Outflow Ratio
6/1/99	0	0.0	24.0	24.0	0.0	24.0	140.63	164.63							
	72	1.3	22.7	23.4	0.6	22.1	140.63	162.73	1.08E-08	2.71E-08			1.11E-8		2.17
	222	2.2	21.8	23.0	1.0	20.8	140.63	161.43	3.57E-09	8.91E-09			3.67E-9		2.25
	313	3.3	20.7	22.4	1.6	19.1	140.63	159.73	7.78E-09	1.92E-08			7.99E-9		1.83
6/2/99	1289	6.8	17.2	19.7	4.3	12.9	140.63	153.53	2.71E-09	6.53E-09			2.79E-9		1.30
	1397	7.1	16.9	19.4	4.6	12.3	140.63	152.93	2.42E-09	5.71E-09	*		2.49E-9		1.00
	1475	7.3	16.7	19.2	4.8	11.9	140.63	152.53	2.24E-09	5.27E-09	*		2.31E-9		1.00
	1569	7.6	16.4	18.9	5.1	11.3	140.63	151.93	2.80E-09	6.56E-09	*		2.88E-9		1.00
	1723	8.1	15.9	18.4	5.6	10.3	140.63	150.93	2.87E-09	6.67E-09	*		2.94E-9		1.00
6/3/99	2815	11.1	12.9	15.9	8.1	4.8	140.63	145.43	2.27E-09	5.18E-09	*		2.33E-9		1.20
	2917	11.3	12.7	15.7	8.3	4.4	140.63	145.03	1.81E-09	4.03E-09	*	5.29E-09	1.85E-9	489	1.00

Final Flux 5.3E-9 $m^3/m^2/sec$

Final Hydraulic Conductivity 2.4E-9 cm/s

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ETCO 1350 W. Shure Dr. Arlington Hgts., IL Co[illegible]tation Sheet:GRI Accredited ASTM D-5887, Index Flux

Sample: Bentomat ST
Lot#: 199922020 Roll#: 5106
Project # : 99-072 -15 Fluor Daniel Fernald

Permeability equation : ((0.879*Thickness)/(2*Pi*r^2*Time))*ln(Change in Head)
Flux equation : ((Inflow+Outflow)/200)/Pi*r^2/Time

Initial Thickness : 0.66 cm. Hydration : 48hrs Permeant : De-aired DI Water

Test Position : 312 Initial Head : 2psi 140.6 cm. Analyst : NP Date: 6/8/99

Cell Size : 4 in. Max. Effective Stress : 5psi 34.5kPa Requested by : JO Date Started: 6/3/99

Final Thickness : 0.71 cm. * indicates value meets Flux Ratio ASTM termination criteria

Conversions : 1 psi = 2.307 feet of head 1 foot of head = 30.48 cm 1 psi = 70.32 cm Flux (English) = Flux * 9.2366E+10

Date	Time (min)	Reading In	X	Reading Out	Y	X-Y	Head (cm)	H (cm)	Initial K (cm/sec)	Initial Flux ($m^3/m^2/sec$)		Avg Flux ($m^3/m^2/sec$)	Final K (cm/sec)	Final Flux (Gal/Acre /Day)	Inflow to Outflow Ratio
6/6/99	0	0.0	24.0	24.0	0.0	24.0	140.63	164.63							
	60	0.3	23.7	23.8	0.2	23.5	140.63	164.13	3.02E-09	8.57E-09			3.25E-9		1.50
	148	0.5	23.5	23.6	0.4	23.1	140.63	163.73	1.65E-09	4.67E-09			1.78E-9		1.00
6/7/99	1287	3.4	20.6	21.5	2.5	18.1	140.63	158.73	1.62E-09	4.51E-09	*		1.75E-9		1.38
	1374	3.6	20.4	21.3	2.7	17.7	140.63	158.33	1.73E-09	4.73E-09	*		1.86E-9		1.00
	1465	3.8	20.2	21.1	2.9	17.3	140.63	157.93	1.66E-09	4.52E-09	*		1.78E-9		1.00
	1570	4.0	20.0	20.9	3.1	16.9	140.63	157.53	1.44E-09	3.92E-09	*		1.55E-9		1.00
	1728	4.3	19.7	20.6	3.4	16.3	140.63	156.93	1.44E-09	3.90E-09	*		1.55E-9		1.00
6/8/99	2725	6.1	17.9	19.1	4.9	13.0	140.63	153.63	1.27E-09	3.40E-09	*		1.37E-9		1.20
	2857	6.3	17.7	18.9	5.1	12.6	140.63	153.23	1.18E-09	3.11E-09	*		1.27E-9		1.00
	3019	6.6	17.4	18.6	5.4	12.0	140.63	152.63	1.44E-09	3.81E-09	*	3.44E-09	1.55E-9	318	1.00

Final Flux 3.4E-9 $m^3/m^2/sec$

Final Hydraulic Conductivity 1.4E-9 cm/s

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TCO 1350 W. Shure Dr. Arlington Hgts., IL Co[illegible]tation Sheet:GRI Accredited ASTM D-5887, Index Flux

Sample: Bentomat ST
Lot#: 199922020 Roll#: 5122
Project # : 99-072 -1 Fluor Daniel Fernald

Permeability equation : ((0.879*Thickness)/(2*Pi*r^2*Time))*ln(Change in Head)
Flux equation : ((Inflow+Outflow)/200)/Pi*r^2/Time

Initial Thickness : 0.69 cm. Hydration : 48hrs Permeant : De-aired DI Water

Test Position : 305 Initial Head : 2psi 140.6 cm. Analyst : NP Date: 6/3/99

Cell Size : 4 in. Max. Effective Stress : 5psi 34.5kPa Requested by : JO Date Started: 5/28/99

Final Thickness : 0.72 cm. * Indicates value meets Flux Ratio ASTM termination criteria

Conversions : 1 psi = 2.307 feet of head 1 foot of head = 30.48 cm 1 psi = 70.32 cm Flux (English) = Flux * 9.2366E+10

Date	Time (min)	Reading In	X	Reading Out	Y	X-Y	Head (cm)	H (cm)	Initial K (cm/sec)	Initial Flux ($m^3/m^2/sec$)		Avg Flux ($m^3/m^2/sec$)	Final K (cm/sec)	Final Flux (Gal/Acre /Day)	Inflow to Outflow Ratio
6/1/99	0	0.0	24.0	24.0	0.0	24.0	140.63	164.63							
	72	1.3	22.7	22.8	1.2	21.5	140.63	162.13	1.32E-08	3.57E-08			1.38E-8		1.08
	222	3.3	20.7	22.3	1.7	19.0	140.63	159.63	6.46E-09	1.71E-08			6.74E-9		4.00
	313	3.5	20.5	22.0	2.0	18.5	140.63	159.13	2.15E-09	5.65E-09			2.24E-9		0.67
6/2/99	1289	5.7	18.3	20.6	3.4	14.9	140.63	155.53	1.46E-09	3.79E-09			1.53E-9		1.57
	1387	5.9	18.1	20.4	3.6	14.5	140.63	155.13	1.64E-09	4.20E-09	*		1.71E-9		1.00
	1485	6.1	17.9	20.2	3.8	14.1	140.63	154.73	1.64E-09	4.20E-09	*		1.71E-9		1.00
	1599	6.3	17.7	20.0	4.0	13.7	140.63	154.33	1.42E-09	3.61E-09	*		1.48E-9		1.00
	1743	6.6	17.4	19.7	4.3	13.1	140.63	153.73	1.69E-09	4.28E-09	*		1.76E-9		1.00
6/3/99	2805	8.4	15.6	17.9	6.1	9.5	140.63	150.13	1.39E-09	3.48E-09	*		1.45E-9		1.00
	2947	8.6	15.4	17.7	6.3	9.1	140.63	149.73	1.17E-09	2.90E-09	*	3.55E-09	1.22E-9	328	1.00

Final Flux 3.6E-9 $m^3/m^2/sec$

Final Hydraulic Conductivity 1.5E-9 cm/s

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ETCO 1350 W. Shure Dr. Arlington Hgts., IL **Computation Sheet:GRI Accredited ASTM D-5887, Index Flux**

Sample: Bentomat ST **Permeability equation :** ((0.879*Thickness)/(2*Pi*r^2*Time))*ln(Change in Head)

Lot#: 199922020 Roll#: 8138

Project # : 99-072 -5 Fluor Daniel Fernald **Flux equation :** ((Inflow+Outflow)/200)/Pi*r^2/Time

Initial Thickness : 0.75 cm. **Hydration :** 48hrs **Permeant :** De-aired DI Water

Test Position : 311 **Initial Head :** 2psi 140.6 cm. **Analyst :** NP **Date:** 6/3/99

Cell Size : 4 in. **Max. Effective Stress :** 5psi 34.5kPa **Requested by :** JO **Date Started:** 5/28/99

Final Thickness : 0.78 cm. *** indicates value meets Flux Ratio ASTM termination criteria**

Conversions : 1 psi = 2.307 feet of head 1 foot of head = 30.48 cm 1 psi = 70.32 cm Flux (English) = Flux * 9.2366E+10

Date	Time (min)	Reading In	X	Reading Out	Y	X-Y	Head (cm)	H (cm)	Initial K (cm/sec)	Initial Flux ($m^3/m^2/sec$)		Avg Flux ($m^3/m^2/sec$)	Final K (cm/sec)	Final Flux (Gal/Acre /Day)	Inflow to Outflow Ratio
6/1/99	0	0.0	24.0	24.0	0.0	24.0	140.63	164.63							
	117	2.4	21.6	22.5	1.5	20.1	140.63	160.73	1.39E-08	3.43E-08			1.44E-8		1.60
	209	3.1	20.9	22.1	1.9	19.0	140.63	159.63	5.06E-09	1.23E-08			5.26E-9		1.75
6/2/99	1183	6.2	17.8	20.1	3.9	13.9	140.63	154.53	2.26E-09	5.38E-09			2.35E-9		1.55
	1283	6.4	17.6	19.9	4.1	13.5	140.63	154.13	1.76E-09	4.11E-09	*		1.83E-9		1.00
	1371	6.6	17.4	19.7	4.3	13.1	140.63	153.73	2.00E-09	4.67E-09	*		2.08E-9		1.00
	1495	6.9	17.1	19.4	4.6	12.5	140.63	153.13	2.14E-09	4.97E-09	*		2.22E-9		1.00
	1598	7.1	16.9	19.2	4.8	12.1	140.63	152.73	1.72E-09	3.99E-09	*		1.79E-9		1.00
6/3/99	2702	10.0	14.0	16.8	7.2	6.8	140.63	147.43	2.17E-09	4.93E-09	*		2.25E-9		1.21
	2813	10.2	13.8	16.6	7.4	6.4	140.63	147.03	1.66E-09	3.70E-09	*	4.21E-09	1.72E-9	389	1.00

Final Flux 4.2E-9 $m^3/m^2/sec$

Final Hydraulic Conductivity 1.9E-9 cm/s

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TCO 1350 W. Shure Dr. Arlington Hgts., IL Co[illegible]tation Sheet:GRI Accredited ASTM D-5887, Index Flux

Sample: Bentomat ST
Lot#: 199922020 Roll#: 5154
Project # : 99-072 -23 Fluor Daniel Fernald

Permeability equation : ((0.879*Thickness)/(2*Pi*r^2*Time))*ln(Change in Head)
Flux equation : ((Inflow+Outflow)/200)/Pi*r^2/Time

Initial Thickness : 0.71 cm. Hydration : 48hrs Permeant : . De-aired DI Water

Test Position : 310 Initial Head : 2psi 140.6 cm. Analyst : NP Date: 6/15/99

Cell Size : 4 in. Max. Effective Stress : 5psi 34.5kPa Requested by : JO Date Started: 6/9/99

Final Thickness : 0.75 cm. * indicates value meets Flux Ratio ASTM termination criteria

Conversions : 1 psi = 2.307 feet of head 1 foot of head = 30.48 cm 1 psi = 70.32 cm Flux (English) = Flux * 9.2366E+10

Date	Time (min)	Reading In	X	Reading Out	Y	X-Y	Head (cm)	H (cm)	Initial K (cm/sec)	Initial Flux ($m^3/m^2/sec$)		Avg Flux ($m^3/m^2/sec$)	Final K (cm/sec)	Final Flux (Gal/Acre /Day)	Inflow to Outflow Ratio
6/13/99	0	0.0	24.0	24.0	0.0	24.0	140.63	164.63							
	1210	3.7	20.3	21.5	2.5	17.8	140.63	158.43	2.04E-09	5.27E-09			2.15E-9		1.48
	1291	3.9	20.1	21.3	2.7	17.4	140.63	158.03	2.00E-09	5.08E-09	*		2.11E-9		1.00
	1386	4.1	19.9	21.1	2.9	17.0	140.63	157.63	1.71E-09	4.33E-09	*		1.81E-9		1.00
	1450	4.3	19.7	20.9	3.1	16.6	140.63	157.23	2.55E-09	6.42E-09			2.69E-9		1.00
6/14/99	2406	6.5	17.5	18.9	5.1	12.4	140.63	153.03	1.82E-09	4.52E-09			1.92E-9		1.10
	2495	6.7	17.3	18.7	5.3	12.0	140.63	152.63	1.89E-09	4.62E-09	*		1.99E-9		1.00
	2620	7.0	17.0	18.4	5.6	11.4	140.63	152.03	2.02E-09	4.93E-09	*		2.14E-9		1.00
	2715	7.2	16.8	18.2	5.8	11.0	140.63	151.63	1.78E-09	4.33E-09	*		1.88E-9		1.00
	2883	7.6	16.4	17.8	6.2	10.2	140.63	150.83	2.02E-09	4.89E-09	*		2.13E-9		1.00
6/15/99	3838	9.6	14.4	16.0	8.0	6.4	140.63	147.03	1.71E-09	4.09E-09	*	4.44E-09	1.81E-9	410	1.11

Final Flux 4.4E-9 $m^3/m^2/sec$

Final Hydraulic Conductivity 1.9E-9 cm/s

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ETCO 1350 W. Shure Dr. Arlington Hgts., IL Co[illegible]tation Sheet:GRI Accredited ASTM D-5887, Index Flux

Sample: Bentomat ST
Lot#: 199922020 **Roll#:** 5170
Project #: 99-072 -20 Fluor Daniel Fernald

Permeability equation : ((0.879*Thickness)/(2*Pi*r^2*Time))*ln(Change in Head)
Flux equation : ((Inflow+Outflow)/200)/Pi*r^2/Time

Initial Thickness : 0.66 cm. **Hydration :** 48hrs **Permeant :** De-aired DI Water

Test Position : 307 **Initial Head :** 2psi 140.6 cm. **Analyst :** NP **Date:** 6/15/99

Cell Size : 4 in. **Max. Effective Stress :** 5psi 34.5kPa **Requested by :** JO **Date Started:** 6/9/99

Final Thickness : 0.71 cm. * Indicates value meets Flux Ratio ASTM termination criteria

Conversions : 1 psi = 2.307 feet of head 1 foot of head = 30.48 cm 1 psi = 70.32 cm Flux (English) = Flux * 9.2366E+10

Date	Time (min)	Reading In	X	Reading Out	Y	X-Y	Head (cm)	H (cm)	Initial K (cm/sec)	Initial Flux ($m^3/m^2/sec$)		Avg Flux ($m^3/m^2/sec$)	Final K (cm/sec)	Final Flux (Gal/Acre /Day)	Inflow to Outflow Ratio
6/13/99	0	0.0	24.0	24.0	0.0	24.0	140.63	164.63							
	1210	4.8	19.2	20.6	3.4	15.8	140.63	156.43	2.52E-09	6.97E-09			2.71E-9		1.41
	1291	5.0	19.0	20.4	3.6	15.4	140.63	156.03	1.88E-09	5.08E-09			2.03E-9		1.00
	1386	5.3	18.7	20.1	3.9	14.8	140.63	155.43	2.42E-09	6.49E-09			2.60E-9		1.00
	1450	5.4	18.6	20.0	4.0	14.6	140.63	155.23	1.20E-09	3.21E-09			1.29E-9		1.00
6/14/99	2406	7.6	16.4	18.0	6.0	10.4	140.63	151.03	1.71E-09	4.52E-09			1.84E-9		1.10
	2495	7.8	16.2	17.8	6.2	10.0	140.63	150.63	1.78E-09	4.62E-09	*		1.91E-9		1.00
	2620	8.1	15.9	17.5	6.5	9.4	140.63	150.03	1.90E-09	4.93E-09	*		2.05E-9		1.00
	2715	8.3	15.7	17.3	6.7	9.0	140.63	149.63	1.68E-09	4.33E-09	*		1.80E-9		1.00
	2883	8.7	15.3	16.9	7.1	8.2	140.63	148.83	1.90E-09	4.89E-09	*		2.05E-9		1.00
6/15/99	3838	10.7	13.3	15.0	9.0	4.3	140.63	144.93	1.66E-09	4.20E-09	*	**4.47E-09**	1.78E-9	413	1.05

Final Flux 4.5E-9 $m^3/m^2/sec$

Final Hydraulic Conductivity 1.9E-9 cm/s

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ETCO 1350 W. Shure Dr. Arlington Hgts., IL Computation Sheet:GRI Accredited ASTM D-5887, Index Flux

Sample: Bentomat ST
Lot#: 199922020 **Roll#:** 5186
Project #: 99-072 -10 Fluor Daniel Fernald

Permeability equation : ((0.879*Thickness)/(2*Pi*r^2*Time))*ln(Change in Head)
Flux equation : ((Inflow+Outflow)/200)/Pi*r^2/Time

Initial Thickness : 0.72 cm. **Hydration :** 48hrs **Permeant :** De-aired DI Water

Test Position : 307 **Initial Head :** 2psi 140.6 cm. **Analyst :** NP **Date:** 6/9/99

Cell Size : 4 in. **Max. Effective Stress :** 5psi 34.5kPa **Requested by :** JO **Date Started:** 6/3/99

Final Thickness : 0.75 cm. * indicates value meets Flux Ratio ASTM termination criteria

Conversions : 1 psi = 2.307 feet of head 1 foot of head = 30.48 cm 1 psi = 70.32 cm Flux (English) = Flux * 9.2366E+10

Date	Time (min)	Reading In	X	Reading Out	Y	X-Y	Head (cm)	H (cm)	Initial K (cm/sec)	Initial Flux ($m^3/m^2/sec$)		Avg Flux ($m^3/m^2/sec$)	Final K (cm/sec)	Final Flux (Gal/Acre /Day)	Inflow to Outflow Ratio
6/5/99	0	0.0	24.0	24.0	0.0	24.0	140.63	164.63							
	66	1.0	23.0	23.7	0.3	22.7	140.63	163.33	7.81E-09	2.02E-08			8.14E-9		3.33
6/6/99	1109	6.4	17.6	20.5	3.5	14.1	140.63	154.73	3.37E-09	8.48E-09			3.51E-9		1.69
	1229	6.7	17.3	20.2	3.8	13.5	140.63	154.13	2.11E-09	5.14E-09			2.19E-9		1.00
6/7/99	2400	10.9	13.1	16.7	7.3	5.8	140.63	146.43	2.85E-09	6.76E-09			2.97E-9		1.20
	2496	11.1	12.9	16.5	7.5	5.4	140.63	146.03	1.85E-09	4.28E-09			1.93E-9		1.00
	2705	11.6	12.4	16.0	8.0	4.4	140.63	145.03	2.14E-09	4.92E-09	*		2.23E-9		1.00
	2872	12.0	12.0	15.6	8.4	3.6	140.63	144.23	2.15E-09	4.92E-09	*		2.24E-9		1.00
6/8/99	3888	14.8	9.2	13.2	10.8	-1.6	140.63	139.03	2.35E-09	5.26E-09	*		2.45E-9		1.17
	3981	15.0	9.0	13.0	11.0	-2.0	140.63	138.63	2.02E-09	4.42E-09	*		2.10E-9		1.00
	4133	15.4	8.6	12.6	11.4	-2.8	140.63	137.83	2.48E-09	5.41E-09	*		2.58E-9		1.00
	4245	15.7	8.3	12.3	11.7	-3.4	140.63	137.23	2.53E-09	5.51E-09	*		2.64E-9		1.00
6/9/99	5274	19.4	4.6	9.2	14.8	-10.2	140.63	130.43	3.21E-09	6.79E-09	*	5.90E-09	3.35E-9	545	1.19

Final Flux 5.9E-9 $m^3/m^2/sec$
Final Hydraulic Conductivity 2.9E-9 cm/s

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ETCO 1350 W. Shure Dr. Arlington Hgts., IL Computation Sheet:GRI Accredited ASTM D-5887, Index Flux

Sample: Bentomat ST
Lot#: 199922020 Roll#: 5201
Project # : 99-072 -9 Fluor Daniel Fernald

Permeability equation : ((0.879*Thickness)/(2*Pi*r^2*Time))*ln(Change in Head)
Flux equation : ((Inflow+Outflow)/200)/Pi*r^2/Time

Initial Thickness : 0.71 cm. Hydration : 48hrs Permeant : De-aired DI Water

Test Position : 306 Initial Head : 2psi 140.6 cm. Analyst : NP Date: 6/8/99

Cell Size : 4 in. Max. Effective Stress : 5psi 34.5kPa Requested by : JO Date Started: 6/3/99

Final Thickness : 0.75 cm. * indicates value meets Flux Ratio ASTM termination criteria

Conversions : 1 psi = 2.307 feet of head 1 foot of head = 30.48 cm 1 psi = 70.32 cm Flux (English) = Flux * 9.2366E+10

Date	Time (min)	Reading In	X	Reading Out	Y	X-Y	Head (cm)	H (cm)	Initial K (cm/sec)	Initial Flux ($m^3/m^2/sec$)		Avg Flux ($m^3/m^2/sec$)	Final K (cm/sec)	Final Flux (Gal/Acre /Day)	Inflow to Outflow Ratio
6/5/99	0	0.0	24.0	24.0	0.0	24.0	140.63	164.63							
	66	1.0	23.0	23.7	0.3	22.7	140.63	163.33	7.71E-09	2.02E-08			8.14E-9		3.33
6/6/99	1109	6.4	17.6	20.5	3.5	14.1	140.63	154.73	3.33E-09	8.48E-09			3.51E-9		1.69
	1229	6.7	17.3	20.2	3.8	13.5	140.63	154.13	2.08E-09	5.14E-09			2.19E-9		1.00
6/7/99	2400	10.9	13.1	16.7	7.3	5.8	140.63	146.43	2.81E-09	6.76E-09			2.97E-9		1.20
	2496	11.1	12.9	16.5	7.5	5.4	140.63	146.03	1.83E-09	4.28E-09			1.93E-9		1.00
	2705	11.6	12.4	16.0	8.0	4.4	140.63	145.03	2.11E-09	4.92E-09	*		2.23E-9		1.00
	2872	12.0	12.0	15.6	8.4	3.6	140.63	144.23	2.12E-09	4.92E-09	*		2.24E-9		1.00
6/8/99	3888	14.8	9.2	13.2	10.8	-1.6	140.63	139.03	2.32E-09	5.26E-09	*		2.45E-9		1.17
	3981	15.0	9.0	13.0	11.0	-2.0	140.63	138.63	1.99E-09	4.42E-09	*		2.10E-9		1.00
	4133	15.4	8.6	12.6	11.4	-2.8	140.63	137.83	2.44E-09	5.41E-09	*		2.58E-9		1.00
	4245	15.7	8.3	12.3	11.7	-3.4	140.63	137.23	2.50E-09	5.51E-09	*	5.11E-09	2.64E-9	472	1.00

Final Flux 5.1E-9 $m^3/m^2/sec$

Final Hydraulic Conductivity 2.4E-9 cm/s

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TCO 1350 W. Shure Dr. Arlington Hgts., IL Co[illegible]ation Sheet:GRI Accredited ASTM D-5887, Index Flux

Sample: Bentomat ST **Permeability equation :** ((0.879*Thickness)/(2*Pi*r^2*Time))*ln(Change in Head)

Lot#: 199922020 **Roll#:** 5221

Project # : 99-072 -18 **Fluor Daniel Fernald** **Flux equation :** ((Inflow+Outflow)/200)/Pi*r^2/Time

Initial Thickness : 0.73 cm. **Hydration :** 48hrs **Permeant :** De-aired DI Water

Test Position : 305 **Initial Head :** 2psi 140.6 cm. **Analyst :** NP **Date:** 6/15/99

Cell Size : 4 in. **Max. Effective Stress :** 5psi 34.5kPa **Requested by :** JO **Date Started:** 6/9/99

Final Thickness : 0.76 cm. *** Indicates value meets Flux Ratio ASTM termination criteria**

Conversions : 1 psi = 2.307 feet of head 1 foot of head = 30.48 cm 1 psi = 70.32 cm Flux (English) = Flux * 9.2366E+10

Date	Time (min)	Reading In	X	Reading Out	Y	X-Y	Head (cm)	H (cm)	Initial K (cm/sec)	Initial Flux ($m^3/m^2/sec$)		Avg Flux ($m^3/m^2/sec$)	Final K (cm/sec)	Final Flux (Gal/Acre /Day)	Inflow to Outflow Ratio
6/13/99	0	0.0	24.0	24.0	0.0	24.0	140.63	164.63							
	78	0.4	23.6	23.6	0.4	23.2	140.63	163.83	4.12E-09	1.05E-08			4.29E-9		1.00
	174	0.7	23.3	23.3	0.7	22.6	140.63	163.23	2.52E-09	6.42E-09			2.62E-9		1.00
	240	1.0	23.0	23.0	1.0	22.0	140.63	162.63	3.68E-09	9.34E-09			3.83E-9		1.00
6/14/99	1193	4.3	19.7	20.5	3.5	16.2	140.63	156.83	2.51E-09	6.26E-09			2.62E-9		1.32
	1282	4.5	19.5	20.3	3.7	15.8	140.63	156.43	1.89E-09	4.62E-09			1.97E-9		1.00
	1405	4.8	19.2	20.0	4.0	15.2	140.63	155.83	2.06E-09	5.01E-09	*		2.15E-9		1.00
	1502	5.0	19.0	19.8	4.2	14.8	140.63	155.43	1.75E-09	4.24E-09	*		1.82E-9		1.00
	1669	5.4	18.6	19.4	4.6	14.0	140.63	154.63	2.04E-09	4.92E-09	*		2.12E-9		1.00
6/15/99	2624	8.5	15.5	16.8	7.2	8.3	140.63	148.93	2.59E-09	6.13E-09	*	5.10E-09	2.70E-9	471	1.19

Final Flux 5.1E-9 $m^3/m^2/sec$

Final Hydraulic Conductivity 2.2E-9 cm/s

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ETCO 1350 W. Shure Dr. Arlington Hgts., IL **Computation Sheet:GRI Accredited ASTM D-5887, Index Flux**

Sample: Bentomat ST **Permeability equation :** ((0.879*Thickness)/(2*Pi*r^2*Time))*ln(Change in Head)

Lot#: 199922020 Roll#: 5237

Project # : 99-072 -6 Fluor Daniel Fernald **Flux equation :** ((Inflow+Outflow)/200)/Pi*r^2/Time

Initial Thickness : 0.66 cm. **Hydration :** 48hrs **Permeant :** De-aired DI Water

Test Position : 303 **Initial Head :** 2psi 140.6 cm. **Analyst :** NP **Date:** 6/8/99

Cell Size : 4 in. **Max. Effective Stress :** 5psi 34.5kPa **Requested by :** JO **Date Started:** 6/3/99

Final Thickness : 0.68 cm. *** indicates value meets Flux Ratio ASTM termination criteria**

Conversions : 1 psi = 2.307 feet of head 1 foot of head = 30.48 cm 1 psi = 70.32 cm Flux (English) = Flux * 9.2366E+10

Date	Time (min)	Reading In	X	Reading Out	Y	X-Y	Head (cm)	H (cm)	Initial K (cm/sec)	Initial Flux ($m^3/m^2/sec$)		Avg Flux ($m^3/m^2/sec$)	Final K (cm/sec)	Final Flux (Gal/Acre /Day)	Inflow to Outflow Ratio
6/6/99	0	0.0	24.0	24.0	0.0	24.0	140.63	164.63							
	60	0.5	23.5	23.4	0.6	22.9	140.63	163.53	6.66E-09	1.88E-08			6.86E-9		0.83
	148	1.0	23.0	22.9	1.1	21.9	140.63	162.53	4.16E-09	1.17E-08			4.28E-9		1.00
6/7/99	1287	6.6	17.4	17.8	6.2	11.2	140.63	151.83	3.57E-09	9.66E-09	*		3.67E-9		1.10
	1374	7.0	17.0	17.4	6.6	10.4	140.63	151.03	3.62E-09	9.45E-09	*		3.73E-9		1.00
	1465	7.3	16.7	17.1	6.9	9.8	140.63	150.43	2.61E-09	6.78E-09			2.69E-9		1.00
	1580	7.7	16.3	16.7	7.3	9.0	140.63	149.63	2.76E-09	7.15E-09	*		2.85E-9		1.00
	1758	8.4	15.6	16.0	8.0	7.6	140.63	148.23	3.15E-09	8.08E-09	*		3.24E-9		1.00
6/8/99	2725	11.9	12.1	12.8	11.2	0.9	140.63	141.53	2.85E-09	7.12E-09	*		2.94E-9		1.09
	2867	12.3	11.7	12.4	11.6	0.1	140.63	140.73	2.38E-09	5.79E-09	*		2.45E-9		1.00
	3019	12.7	11.3	12.0	12.0	-0.7	140.63	139.93	2.24E-09	5.41E-09	*	**6.11E-09**	2.30E-9	564	1.00

Final Flux 6.1E-9 $m^3/m^2/sec$

Final Hydraulic Conductivity 2.6E-9 cm/s

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TCO 1350 W. Shure Dr. Arlington Hgts., IL Co tation Sheet:GRI Accredited ASTM D-5887, Index Flux

Sample: Bentomat ST
Lot#: 199922020 Roll#: 5253
Project # : 99-072 -16 Fluor Daniel Fernald

Permeability equation : ((0.879*Thickness)/(2*Pi*r^2*Time))*ln(Change in Head)

Flux equation : ((Inflow+Outflow)/200)/Pi*r^2/Time

Initial Thickness : 0.63 cm. Hydration : 48hrs Permeant : De-aired DI Water

Test Position : 303 Initial Head : 2psi 140.6 cm. Analyst : NP Date: 6/15/99

Cell Size : 4 in. Max. Effective Stress : 5psi 34.5kPa Requested by : JO Date Started: 6/9/99

Final Thickness : 0.61 cm.

* Indicates value meets Flux Ratio ASTM termination criteria

Conversions : 1 psi = 2.307 feet of head 1 foot of head = 30.48 cm 1 psi = 70.32 cm Flux (English) = Flux * 9.2366E+10

Date	Time (min)	Reading In	X	Reading Out	Y	X-Y	Head (cm)	H (cm)	Initial K (cm/sec)	Initial Flux ($m^3/m^2/sec$)		Avg Flux ($m^3/m^2/sec$)	Final K (cm/sec)	Final Flux (Gal/Acre /Day)	Inflow to Outflow Ratio
6/13/99	0	0.0	24.0	24.0	0.0	24.0	140.63	164.63							
	78	0.7	23.3	23.3	0.7	22.6	140.63	163.23	6.23E-09	1.84E-08			6.03E-9		1.00
	174	1.6	22.4	22.4	1.6	20.8	140.63	161.43	6.57E-09	1.93E-08	*		6.37E-9		1.00
	240	2.2	21.8	21.8	2.2	19.6	140.63	160.23	6.43E-09	1.87E-08	*		6.23E-9		1.00
6/14/99	1193	9.0	15.0	15.8	8.2	6.8	140.63	147.43	4.97E-09	1.38E-08			4.81E-9		1.13
	1282	9.4	14.6	15.4	8.6	6.0	140.63	146.63	3.48E-09	9.24E-09			3.37E-9		1.00
	1395	9.9	14.1	14.9	9.1	5.0	140.63	145.63	3.45E-09	9.10E-09	*		3.34E-9		1.00
	1512	10.5	13.5	14.4	9.6	3.9	140.63	144.53	3.69E-09	9.66E-09	*		3.57E-9		1.20
	1669	11.2	12.8	13.7	10.3	2.5	140.63	143.13	3.53E-09	9.17E-09	*		3.42E-9		1.00
6/15/99	2624	15.6	8.4	9.8	14.2	-5.8	140.63	134.83	3.56E-09	8.93E-09	*	9.25E-09	3.45E-9	855	1.13

Final Flux 9.3E-9 $m^3/m^2/sec$

Final Hydraulic Conductivity 3.5E-9 cm/s

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TCO 1350 W. Shure Dr. Arlington Hgts., IL Computation Sheet:GRI Accredited ASTM D-5887, Index Flux

Sample: Bentomat ST
Lot#: 199922020 Roll#: 5269
Project # : 99-072 -17 Fluor Daniel Fernald

Permeability equation : ((0.879*Thickness)/(2*Pi*r^2*Time))*ln(Change in Head)
Flux equation : ((Inflow+Outflow)/200)/Pi*r^2/Time

Initial Thickness : 0.63 cm. Hydration : 48hrs Permeant : De-aired DI Water

Test Position : 304 Initial Head : 2psi 140.6 cm. Analyst : NP Date: 6/15/99

Cell Size : 4 in. Max. Effective Stress : 5psi 34.5kPa Requested by : JO Date Started: 6/9/99

Final Thickness : 0.71 cm. * indicates value meets Flux Ratio ASTM termination criteria

Conversions : 1 psi = 2.307 feet of head 1 foot of head = 30.48 cm 1 psi = 70.32 cm Flux (English) = Flux * 9.2366E+10

Date	Time (min)	Reading In	X	Reading Out	Y	X-Y	Head (cm)	H (cm)	Initial K (cm/sec)	Initial Flux ($m^3/m^2/sec$)		Avg Flux ($m^3/m^2/sec$)	Final K (cm/sec)	Final Flux (Gal/Acre /Day)	Inflow to Outflow Ratio
6/13/99	0	0.0	24.0	24.0	0.0	24.0	140.63	164.63							
	78	0.3	23.7	23.7	0.3	23.4	140.63	164.03	2.66E-09	7.91E-09			3.00E-9		1.00
	174	0.6	23.4	23.4	0.6	22.8	140.63	163.43	2.17E-09	6.42E-09	*		2.45E-9		1.00
	240	0.9	23.1	23.1	0.9	22.2	140.63	162.83	3.17E-09	9.34E-09			3.57E-9		1.00
6/14/99	1193	4.2	19.8	20.3	3.7	16.1	140.63	156.73	2.28E-09	6.58E-09			2.57E-9		1.18
	1282	4.4	19.6	20.1	3.9	15.7	140.63	156.33	1.63E-09	4.62E-09			1.84E-9		1.00
	1395	4.7	19.3	19.8	4.2	15.1	140.63	155.73	1.94E-09	5.46E-09	*		2.18E-9		1.00
	1512	5.0	19.0	19.5	4.5	14.5	140.63	155.13	1.88E-09	5.27E-09	*		2.12E-9		1.00
	1669	5.4	18.6	19.1	4.9	13.7	140.63	154.33	1.87E-09	5.24E-09	*		2.11E-9		1.00
6/15/99	2624	8.0	16.0	16.8	7.2	8.8	140.63	149.43	1.92E-09	5.27E-09	*	5.26E-09	2.17E-9	486	1.13

Final Flux 5.3E-9 $m^3/m^2/sec$

Final Hydraulic Conductivity 2.1E-9 cm/s

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TCO 1350 W. Shure Dr. Arlington Hgts., IL Co tation Sheet:GRI Accredited ASTM D-5887, Index Flux

Sample: Bentomat ST
Lot#: 199922020 **Roll#:** 5275
Project #: 99-072 -8 **Fluor Daniel Fernald**

Permeability equation : ((0.879*Thickness)/(2*Pi*r^2*Time))*ln(Change in Head)

Flux equation : ((Inflow+Outflow)/200)/Pi*r^2/Time

Initial Thickness : 0.79 cm. **Hydration :** 48hrs **Permeant :** De-aired DI Water

Test Position : 305 **Initial Head :** 2psi 140.6 cm. **Analyst :** NP **Date:** 6/8/99

Cell Size : 4 in. **Max. Effective Stress :** 5psi 34.5kPa **Requested by :** JO **Date Started:** 6/3/99

Final Thickness : 0.82 cm. * indicates value meets Flux Ratio ASTM termination criteria

Conversions : 1 psi = 2.307 feet of head 1 foot of head = 30.48 cm 1 psi = 70.32 cm Flux (English) = Flux * 9.2366E+10

Date	Time (min)	Reading In	X	Reading Out	Y	X-Y	Head (cm)	H (cm)	Initial K (cm/sec)	Initial Flux ($m^3/m^2/sec$)		Avg Flux ($m^3/m^2/sec$)	Final K (cm/sec)	Final Flux (Gal/Acre /Day)	Inflow to Outflow Ratio
6/6/99	0	0.0	24.0	24.0	0.0	24.0	140.63	164.63							
	60	0.5	23.5	23.8	0.2	23.3	140.63	163.93	5.07E-09	1.20E-08			5.26E-9		2.50
	148	0.8	23.2	23.5	0.5	22.7	140.63	163.33	2.97E-09	7.01E-09			3.09E-9		1.00
6/7/99	1287	4.3	19.7	20.5	3.5	16.2	140.63	156.83	2.54E-09	5.87E-09	*		2.64E-9		1.17
	1374	4.5	19.5	20.3	3.7	15.8	140.63	156.43	2.10E-09	4.73E-09	*		2.17E-9		1.00
	1465	4.7	19.3	20.1	3.9	15.4	140.63	156.03	2.01E-09	4.52E-09	*		2.08E-9		1.00
	1580	5.0	19.0	19.8	4.2	14.8	140.63	155.43	2.39E-09	5.36E-09	*		2.48E-9		1.00
	1758	5.4	18.6	19.4	4.6	14.0	140.63	154.63	2.07E-09	4.62E-09	*		2.15E-9		1.00
6/8/99	2725	7.6	16.4	17.3	6.7	9.7	140.63	150.33	2.08E-09	4.57E-09	*		2.16E-9		1.05
	2867	7.9	16.1	17.0	7.0	9.1	140.63	149.73	2.01E-09	4.34E-09	*		2.09E-9		1.00
	3019	8.2	15.8	16.7	7.3	8.5	140.63	149.13	1.89E-09	4.06E-09	*	**4.32E-09**	1.96E-9	399	1.00

Final Flux 4.3E-9 $m^3/m^2/sec$

Final Hydraulic Conductivity 2.1E-9 cm/s

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0001277

TCO 1350 W. Shure Dr. Arlington Hgts., IL Com[illegible]ation Sheet:GRI Accredited ASTM D-5887, Index Flux

Sample: Bentomat ST
Lot#: 199922020 Roll#: 5292
Project # : 99-072 -12 Fluor Daniel Fernald

Permeability equation : ((0.879*Thickness)/(2*Pi*r^2*Time))*ln(Change in Head)
Flux equation : ((Inflow+Outflow)/200)/Pi*r^2/Time

Initial Thickness : 0.67 cm. Hydration : 48hrs Permeant : De-aired DI Water

Test Position : 309 Initial Head : 2psi 140.6 cm. Analyst : NP Date: 6/8/99

Cell Size : 4 in. Max. Effective Stress : 5psi 34.5kPa Requested by : JO Date Started: 6/3/99

Final Thickness : 0.70 cm. * Indicates value meets Flux Ratio ASTM termination criteria

Conversions : 1 psi = 2.307 feet of head 1 foot of head = 30.48 cm 1 psi = 70.32 cm Flux (English) = Flux * 9.2366E+10

Date	Time (min)	Reading In	X	Reading Out	Y	X-Y	Head (cm)	H (cm)	Initial K (cm/sec)	Initial Flux ($m^3/m^2/sec$)		Avg Flux ($m^3/m^2/sec$)	Final K (cm/sec)	Final Flux (Gal/Acre /Day)	Inflow to Outflow Ratio
6/6/99	0	0.0	24.0	24.0	0.0	24.0	140.63	164.63							
	60	0.4	23.6	23.6	0.4	23.2	140.63	163.83	4.91E-09	1.37E-08			5.13E-9		1.00
	148	0.9	23.1	23.1	0.9	22.2	140.63	162.83	4.21E-09	1.17E-08	*		4.40E-9		1.00
6/7/99	1287	6.7	17.3	17.8	6.2	11.1	140.63	151.73	3.75E-09	1.00E-08	*		3.92E-9		1.09
	1374	7.0	17.0	17.5	6.5	10.5	140.63	151.13	2.76E-09	7.09E-09			2.88E-9		1.00
	1465	7.3	16.7	17.2	6.8	9.9	140.63	150.53	2.65E-09	6.78E-09	*		2.76E-9		1.00
	1580	7.6	16.4	16.9	7.1	9.3	140.63	149.93	2.10E-09	5.36E-09	*		2.20E-9		1.00
	1728	8.0	16.0	16.5	7.5	8.5	140.63	149.13	2.19E-09	5.56E-09	*		2.29E-9		1.00
6/8/99	2725	11.5	12.5	13.5	10.5	2.0	140.63	142.63	2.71E-09	6.70E-09	*		2.83E-9		1.17
	2867	11.9	12.1	13.1	10.9	1.2	140.63	141.83	2.40E-09	5.79E-09	*		2.51E-9		1.00
	3019	12.3	11.7	12.7	11.3	0.4	140.63	141.03	2.25E-09	5.41E-09	*	5.97E-09	2.35E-9	551	1.00

Final Flux 6.0E-9 $m^3/m^2/sec$

Final Hydraulic Conductivity 2.6E-9 cm/s

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TCO 1350 W. Shure Dr. Arlington Hgts., IL Co[illegible]tation Sheet:GRI Accredited ASTM D-5887, Index Flux

Sample: Bentomat ST
Lot#: 199922020 Roll#: 5307
Project # : 99-072 -21 Fluor Daniel Fernald

Permeability equation : ((0.879*Thickness)/(2*Pi*r^2*Time))*ln(Change in Head)
Flux equation : ((Inflow+Outflow)/200)/Pi*r^2/Time

Initial Thickness : 0.81 cm. Hydration : 48hrs Permeant : De-aired DI Water

Test Position : 308 Initial Head : 2psi 140.6 cm. Analyst : NP Date: 6/15/99

Cell Size : 4 in. Max. Effective Stress : 5psi 34.5kPa Requested by : JO Date Started: 6/9/99

Final Thickness : 0.82 cm. * indicates value meets Flux Ratio ASTM termination criteria

Conversions : 1 psi = 2.307 feet of head 1 foot of head = 30.48 cm 1 psi = 70.32 cm Flux (English) = Flux * 9.2366E+10

Date	Time (min)	Reading In	X	Reading Out	Y	X-Y	Head (cm)	H (cm)	Initial K (cm/sec)	Initial Flux ($m^3/m^2/sec$)		Avg Flux ($m^3/m^2/sec$)	Final K (cm/sec)	Final Flux (Gal/Acre /Day)	Inflow to Outflow Ratio
6/13/99	0	0.0	24.0	24.0	0.0	24.0	140.63	164.63							
	1210	5.6	18.4	20.6	3.4	15.0	140.63	155.63	3.40E-09	7.65E-09			3.44E-9		1.65
	1291	5.8	18.2	20.4	3.6	14.6	140.63	155.23	2.33E-09	5.08E-09			2.35E-9		1.00
	1386	6.1	17.9	20.1	3.9	14.0	140.63	154.63	2.98E-09	6.49E-09			3.02E-9		1.00
	1450	6.2	17.8	20.0	4.0	13.8	140.63	154.43	1.48E-09	3.21E-09			1.50E-9		1.00
6/14/99	2406	8.6	15.4	18.1	5.9	9.5	140.63	150.13	2.16E-09	4.62E-09			2.19E-9		1.26
	2505	8.8	15.2	17.9	6.1	9.1	140.63	149.73	1.97E-09	4.15E-09	*		2.00E-9		1.00
	2600	9.0	15.0	17.7	6.3	8.7	140.63	149.33	2.06E-09	4.33E-09	*		2.09E-9		1.00
	2715	9.3	14.7	17.4	6.6	8.1	140.63	148.73	2.56E-09	5.36E-09	*		2.59E-9		1.00
	2863	9.6	14.4	17.1	6.9	7.5	140.63	148.13	2.00E-09	4.17E-09	*		2.02E-9		1.00
6/15/99	3838	11.5	12.5	15.4	8.6	3.9	140.63	144.53	1.85E-09	3.80E-09	*	4.44E-09	1.87E-9	410	1.12

Final Flux 4.4E-9 $m^3/m^2/sec$

Final Hydraulic Conductivity 2.2E-9 cm/s

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TCO 1350 W. Shure Dr. Arlington Hgts., IL Computation Sheet:GRI Accredited ASTM D-5887, Index Flux

Sample: Bentomat ST
Lot#: 199922020 **Roll#:** 5323
Project #: 99-072 -7 Fluor Daniel Fernald

Permeability equation : ((0.879*Thickness)/(2*Pi*r^2*Time))*ln(Change in Head)

Flux equation : ((Inflow+Outflow)/200)/Pi*r^2/Time

Initial Thickness : 0.77 cm. **Hydration :** 48hrs **Permeant :** De-aired DI Water

Test Position : 304 **Initial Head :** 2psi 140.6 cm. **Analyst :** NP **Date:** 6/8/99

Cell Size : 4 in. **Max. Effective Stress :** 5psi 34.5kPa **Requested by :** JO **Date Started:** 6/3/99

Final Thickness : 0.79 cm. * indicates value meets Flux Ratio ASTM termination criteria

Conversions : 1 psi = 2.307 feet of head 1 foot of head = 30.48 cm 1 psi = 70.32 cm Flux (English) = Flux * 9.2366E+10

Date	Time (min)	Reading In	X	Reading Out	Y	X-Y	Head (cm)	H (cm)	Initial K (cm/sec)	Initial Flux ($m^3/m^2/sec$)		Avg Flux ($m^3/m^2/sec$)	Final K (cm/sec)	Final Flux (Gal/Acre /Day)	Inflow to Outflow Ratio
6/5/99	0	0.0	24.0	24.0	0.0	24.0	140.63	164.63							
	66	0.7	23.3	23.7	0.3	23.0	140.63	163.63	6.42E-09	1.56E-08			6.59E-9		2.33
6/6/99	1109	4.7	19.3	21.2	2.8	16.5	140.63	157.13	2.70E-09	6.41E-09			2.77E-9		1.60
	1229	5.0	19.0	20.9	3.1	15.9	140.63	156.53	2.22E-09	5.14E-09	*		2.28E-9		1.00
6/7/99	2400	7.8	16.2	18.8	5.2	11.0	140.63	151.63	1.89E-09	4.30E-09	*		1.94E-9		1.33
	2496	8.0	16.0	18.6	5.4	10.6	140.63	151.23	1.91E-09	4.28E-09	*		1.96E-9		1.00
	2705	8.4	15.6	18.2	5.8	9.8	140.63	150.43	1.77E-09	3.93E-09	*		1.81E-9		1.00
	2872	8.7	15.3	17.9	6.1	9.2	140.63	149.83	1.66E-09	3.69E-09	*		1.71E-9		1.00
6/8/99	3888	10.8	13.2	16.1	7.9	5.3	140.63	145.93	1.81E-09	3.95E-09	*		1.85E-9		1.17
	3981	11.0	13.0	15.9	8.1	4.9	140.63	145.53	2.05E-09	4.42E-09	*		2.11E-9		1.00
	4123	11.3	12.7	15.6	8.4	4.3	140.63	144.93	2.02E-09	4.34E-09	*		2.08E-9		1.00
	4245	11.6	12.4	15.3	8.7	3.7	140.63	144.33	2.37E-09	5.06E-09	*	4.61E-09	2.43E-9	425	1.00

Final Flux 4.6E-9 $m^3/m^2/sec$

Final Hydraulic Conductivity 2.2E-9 cm/s

RECORD

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6-29-99 p. 25 of 31
Doc. 1440-006 B

000180

TCO 1350 W. Shure Dr. Arlington Hgts., IL Co[illegible]ation Sheet:GRI Accredited ASTM D-5887, Index Flux

Sample: Bentomat ST
Lot#: 199922020 Roll#: 5339
Project # : 99-072 -19 Fluor Daniel Fernald

Permeability equation : ((0.879*Thickness)/(2*Pi*r^2*Time))*ln(Change in Head)
Flux equation : ((Inflow+Outflow)/200)/Pi*r^2/Time

Initial Thickness : 0.64 cm. Hydration : 48hrs Permeant : De-aired DI Water

Test Position : 306 Initial Head : 2psi 140.6 cm. Analyst : NP Date: 6/15/99

Cell Size : 4 in. Max. Effective Stress : 5psi 34.5kPa Requested by : JO Date Started: 6/9/99

Final Thickness : 0.69 cm. * indicates value meets Flux Ratio ASTM termination criteria

Conversions : 1 psi = 2.307 feet of head 1 foot of head = 30.48 cm 1 psi = 70.32 cm Flux (English) = Flux * 9.2366E+10

Date	Time (min)	Reading In	X	Reading Out	Y	X-Y	Head (cm)	H (cm)	Initial K (cm/sec)	Initial Flux ($m^3/m^2/sec$)		Avg Flux ($m^3/m^2/sec$)	Final K (cm/sec)	Final Flux (Gal/Acre /Day)	Inflow to Outflow Ratio
6/13/99	0	0.0	24.0	24.0	0.0	24.0	140.63	164.63							
	78	0.2	23.8	23.7	0.3	23.5	140.63	164.13	2.25E-09	6.59E-09			2.43E-9		0.67
	174	0.5	23.5	23.4	0.6	22.9	140.63	163.53	2.21E-09	6.42E-09	*		2.38E-9		1.00
	240	0.7	23.3	23.2	0.8	22.5	140.63	163.13	2.15E-09	6.23E-09	*		2.31E-9		1.00
6/14/99	1193	3.0	21.0	21.0	3.0	18.0	140.63	158.63	1.70E-09	4.85E-09	*		1.83E-9		1.05
	1282	3.2	20.8	20.8	3.2	17.6	140.63	158.23	1.64E-09	4.62E-09	*		1.77E-9		1.00
	1395	3.4	20.6	20.6	3.4	17.2	140.63	157.83	1.30E-09	3.64E-09	*		1.40E-9		1.00
	1532	3.7	20.3	20.3	3.7	16.6	140.63	157.23	1.61E-09	4.50E-09	*		1.73E-9		1.00
	1669	4.0	20.0	20.0	4.0	16.0	140.63	156.63	1.61E-09	4.50E-09	*		1.74E-9		1.00
6/15/99	2624	6.0	18.0	18.2	5.8	12.2	140.63	152.83	1.49E-09	4.09E-09	*	4.36E-09	1.60E-9	403	1.11

Final Flux 4.4E-9 $m^3/m^2/sec$

Final Hydraulic Conductivity 1.7E-9 cm/s

RECORD

=-2739 1440-006 Rev. 2
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Doc. 1440-006B

000181

TCO 1350 W. Shure Dr. Arlington Hgts., IL Computation Sheet:GRI Accredited ASTM D-5887, Index Flux

Sample: Bentomat ST
Lot#: 199922020 **Roll#:** 5355
Project #: 99-072 -11 **Fluor Daniel Fernald**

Permeability equation : ((0.879*Thickness)/(2*Pi*r^2*Time))*ln(Change in Head)
Flux equation : ((Inflow+Outflow)/200)/Pi*r^2/Time

Initial Thickness : 0.67 cm. **Hydration :** 48hrs **Permeant :** De-aired DI Water

Test Position : 308 **Initial Head :** 2psi 140.6 cm. **Analyst :** NP **Date:** 6/8/99

Cell Size : 4 in. **Max. Effective Stress :** 5psi 34.5kPa **Requested by :** JO **Date Started:** 6/3/99

Final Thickness : 0.74 cm. * indicates value meets Flux Ratio ASTM termination criteria

Conversions : 1 psi = 2.307 feet of head 1 foot of head = 30.48 cm 1 psi = 70.32 cm Flux (English) = Flux * 9.2366E+10

Date	Time (min)	Reading In	X	Reading Out	Y	X-Y	Head (cm)	H (cm)	Initial K (cm/sec)	Initial Flux ($m^3/m^2/sec$)		Avg Flux ($m^3/m^2/sec$)	Final K (cm/sec)	Final Flux (Gal/Acre /Day)	Inflow to Outflow Ratio
6/6/99	0	0.0	24.0	24.0	0.0	24.0	140.63	164.63							
	60	0.4	23.6	23.8	0.2	23.4	140.63	164.03	3.68E-09	1.03E-08			4.07E-9		2.00
	148	0.7	23.3	23.5	0.5	22.8	140.63	163.43	2.52E-09	7.01E-09			2.78E-9		1.00
6/7/99	1287	4.9	19.1	20.1	3.9	15.2	140.63	155.83	2.53E-09	6.86E-09	*		2.80E-9		1.24
	1374	5.2	18.8	19.8	4.2	14.6	140.63	155.23	2.68E-09	7.09E-09	*		2.96E-9		1.00
	1465	5.4	18.6	19.6	4.4	14.2	140.63	154.83	1.72E-09	4.52E-09			1.90E-9		1.00
	1580	5.7	18.3	19.3	4.7	13.6	140.63	154.23	2.04E-09	5.36E-09	*		2.26E-9		1.00
	1758	6.1	17.9	18.9	5.1	12.8	140.63	153.43	1.77E-09	4.62E-09	*		1.95E-9		1.00
6/8/99	2725	8.8	15.2	16.3	7.7	7.5	140.63	148.13	2.20E-09	5.63E-09	*		2.43E-9		1.04
	2867	9.1	14.9	16.0	8.0	6.9	140.63	147.53	1.73E-09	4.34E-09	*		1.91E-9		1.00
	3019	9.5	14.5	15.6	8.4	6.1	140.63	146.73	2.17E-09	5.41E-09	*	5.13E-09	2.39E-9	474	1.00

Final Flux 5.1E-9 $m^3/m^2/sec$

Final Hydraulic Conductivity 2.2E-9 cm/s

RECORD

E-2739

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Doc. 1440-006B

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=-2739

1440-006 Rev. 2
6-29-99 p. 28 of 31
Doc. 1440-006B

STS CONSULTANTS, LTD LABORATORY SERVICES
STS PROJECT NUMBER 29139-A
FLOUR DANIEL FERNALD PROJECT

ASTM D 4595 WIDE WIDTH TENSILE STRENGTH

Test type: WIDE WIDTH TEST OF BENTOMAT ST

Operator name: LO

Sample Identification: CET5307
Interface Type: 1011 Series
Machine Parameters of test:
Sample Rate (pts/sec): 20.000
Crosshead Speed (in/min): .4000

Instron Corporation
Series IX Automated Materials Testing System 1.09
Test Date: 15 Jun 1999

Sample Type: GCL

Humidity (%): 52
Temperature (deg. F): 71

ROLL NUMBER 5307
DIRECTION TESTED: MACHINE
CONDITION TESTED: DRY

Dimensions:

	Sample
Width (in)	8.0000
Thickness (in)	.26500
Spec gauge len (in)	4.0000
Grip distance (in)	6.0000

RECORD

Out of 5 specimens, 0 excluded.

Specimen Number	Load at Max.Load (lbs)	Displcment at Max.Load (in)	% Strain at Max.Load (%)	Load/Width at Max.Load (lbs/in)
1	402.3	.4800	12.000	50.29
2	363.1	.4698	11.740	45.39
3	334.0	.3900	9.750	41.75
4	382.7	.4552	11.380	47.84
5	325.9	.4300	10.750	40.74
Mean:	361.6	.4450	11.130	45.20
Standard Deviation:	32.2	.0360	.901	4.02

No QC signature
KBT
7/1/99

=-2739 1440-006 Rev. 2
6-29-99 p. 29 of 31
Doc. 1440-006B

STS CONSULTANTS, LTD LABORATORY SERVICES
STS PROJECT NUMBER 29139-A
FLOUR DANIEL FERNALD PROJECT

ASTM D 4595 WIDE WIDTH TENSILE STRENGTH

Test type: WIDE WIDTH TEST OF BENTOMAT ST

Operator name: LO

Sample Identification: CET5323
Interface Type: 1011 Series
Machine Parameters of test:
Sample Rate (pts/sec): 20.000
Crosshead Speed (in/min): .4000

Instron Corporation
Series IX Automated Materials Testing System 1.09
Test Date: 15 Jun 1999

Sample Type: GCL

Humidity (%): 52
Temperature (deg. F): 71

ROLL NUMBER 5323
DIRECTION TESTED: MACHINE
CONDITION TESTED: DRY

RECORD

Dimensions:

	Sample
Width (in)	8.0000
Thickness (in)	.24500
Spec gauge len (in)	4.0000
Grip distance (in)	4.0000

Out of 5 specimens, 0 excluded.

Specimen Number	Load at Max.Load (lbs)	Displcment at Max.Load (in)	% Strain at Max.Load (%)	Load/Width at Max.Load (lbs/in)
1	531.9	.6700	16.75	66.49
2	462.2	.6000	15.00	57.78
3	479.2	.6400	16.00	59.91
4	467.1	.7300	18.25	58.39
5	468.5	.6600	16.50	58.56
Mean:	481.8	.6600	16.50	60.22
Standard Deviation:	28.7	.0474	1.19	3.59

000184

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Doc. 1440-006 B

STS CONSULTANTS, LTD LABORATORY SERVICES
STS PROJECT NUMBER 29139-A
FLOUR DANIEL FERNALD PROJECT

ASTM D 4595 WIDE WIDTH TENSILE STRENGTH

Test type: WIDE WIDTH TEST OF BENTOMAT ST

Operator name: LO

Sample Identification: CETS339
Interface Type: 1011 Series
Machine Parameters of test:
Sample Rate (pts/sec): 20.000
Crosshead Speed (in/min): .4000

Instron Corporation
Series IX Automated Materials Testing System 1.09
Test Date: 15 Jun 1999

Sample Type: GCL

Humidity (%): 52
Temperature (deg. F): 71

ROLL NUMBER 5339
DIRECTION TESTED: MACHINE
CONDITION TESTED: DRY

RECORD

Dimensions:

	Sample
Width (in)	8.0000
Thickness (in)	.24500
Spec gauge len (in)	4.0000
Grip distance (in)	4.0000

Out of 5 specimens, 0 excluded.

Specimen Number	Load at Max.Load (lbs)	Displacement at Max.Load (in)	% Strain at Max.Load (%)	Load/Width at Max.Load (lbs/in)
1	271.9	.4300	10.750	33.99
2	298.4	.3900	9.750	37.29
3	270.0	.5200	13.000	33.75
4	263.9	.4500	11.250	32.99
5	299.7	.4100	10.250	37.46
Mean:	280.8	.4400	11.000	35.10
Standard Deviation:	16.9	.0500	1.250	2.12

=-2739

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6-29-99 p. 31 of 31
Doc. 1440-006B

STS CONSULTANTS, LTD LABORATORY SERVICES
STS PROJECT NUMBER 29139-A
FLOUR DANIEL FERNALD PROJECT

ASTM D 4595 WIDE WIDTH TENSILE STRENGTH

Test type: WIDE WIDTH TEST OF BENTOMAT ST

Operator name: LO

Sample Identification: CET5355
Interface Type: 1011 Series
Machine Parameters of test:
Sample Rate (pts/sec): 20.000
Crosshead Speed (in/min): .4000

Instron Corporation
Series IX Automated Materials Testing System 1.09
Test Date: 15 Jun 1999

Sample Type: GCL

Humidity (%): 52
Temperature (deg. F): 71

ROLL NUMBER 5355
DIRECTION TESTED: MACHINE
CONDITION TESTED: DRY

RECORD

Dimensions:

	Sample
Width (in)	8.0000
Thickness (in)	.24500
Spec gauge len (in)	4.0000
Grip distance (in)	4.0000

Out of 5 specimens, 0 excluded.

Specimen Number	Load at Max.Load (lbs)	Displacement at Max.Load (in)	% Strain at Max.Load (%)	Load/Width at Max.Load (lbs/in)
1	337.5	.4800	12.00	42.19
2	335.3	.4200	10.50	41.92
3	376.6	.5100	12.75	47.08
4	394.2	.5000	12.50	49.28
5	367.7	.5000	12.50	45.97
Mean:	362.3	.4820	12.05	45.29
Standard Deviation:	25.5	.0363	.91	3.18

SUPPLIER DOCUMENT SUBMITTAL

FDF PROJECT NO.: (1) 20102	CONTRACT NO: (2) 1440	SUBMITTAL NO.:(3) 006	REV.:(4) 3	DATE:(5) 7/1/99	Page 1 of 5 (6)

FROM: GSE Lining Technologies (7)

RECORD

SIGNATURE: _____

TO: FDF ENGINEERING/CONSTRUCTION
DOCUMENT CONTROL (ECDC), MS 52-7 (8)

RECEIVED BY: _____ DATE: _____

			DOCUMENT FAMILY									SUBMITTAL TYPE				SUBMITTAL ACTION		
QTY	DOCUMENT NUMBER	REV	PRO	H&S	MED	TRG	CON	ENG	QAC	OPER	TITLE/DESCRIPTION	DRFT	CFC	INF	ASSOCIATED SPECIFICATION	A	B	C
(9)	(10)	(11)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(13)	(14)	(14)	(14)	(15)	(16)	(16)	(16)
8	1440-006B	1							X		Quality Control Certificates		X		02772P.1.04.B		X	

REVIEW DISTRIBUTION

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Kathy Fisher, FDF, Procurement	64				
Gregg Johnson, FDF, Health and Safety	64				
Jim Turner, FDF, QA	64				
Chuck Van Arsdale, FDF, Eng.	64				

RECEIVED JUL 01 1999

000187

F-2739

NO COMMENTS: _____ COMMENTS: (PLEASE USE SPACE BELOW FOR COMMENTS OR INDICATE IF ATTACHMENTS) (19)

Test Results should be from STS Consultants per Submittal No. 006 (Rev 2), Document 1440-006B

RECEIVED BY: [signature] (20) DATE: 7/1/99

(SIGN/DATE AND RETURN A COPY TO ECDC, MS 52-7)

SUBMITTAL TYPE: (BY SUPPLIER)
CFC - CERTIFIED FOR CONSTRUCTION
INF - INFORMATION/RECORD
DRFT - DRAFT/PRELIMINARY

SUBMITTAL ACTION CODE: (BY FDF)
A - Conforms to the Subcontract Requirements
B - Minor Comments - Incorporate and Resubmit
C - Revise and Resubmit (SEE COMMENTS)

FS-F-4955
Rev. 4: 04/??/1999

CETCO
COLLOID ENVIRONMENTAL TECHNOLOGIES COMPANY
1350 West Shure Drive • Arlington Heights, IL 60004-1440 • USA
(847) 392-5600 • Fax (847) 506-6150
http://www.cetco.com

1440-006 Rev. 6
7-1-99 p. 2
Document Number 1440-006B

FAX MEMO

received
DISTRIBUTED
6/30/99

June 24, 1999 Pages: 2, including cover

To: Eric Reed
GSE
fax (281) 230-5891

From: Jim Olsta

2739

cc:

Subject: Fluor Daniel Fernald MQC Test Data

Dear Eric:

CETCO has completed the Bentomat ST MQC wide width tensile testing for the Fluor Daniel Fernald project for lot 199922020 rolls 5221-5292. The other GCL MQC test results for these rolls were sent previously.

Sincerely,

Jim Olsta
Technical Manager
Lining Technology Group

RECORD

Jul 01 99 10:21a Dealer Sales 281-230-8663 p.2

CETCO

COLLOID ENVIRONMENTAL TECHNOLOGIES COMPANY

RECORD

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Doc # 1440-006B

Standard Test Method for Tensile Properties
of Geotextiles by the Wide-Width Strip Method

ASTM D4595

Project: Fluor Daniel Fernald

Proj. No.: 99-072

Sample ID: Lot # 199922020
Roll# 5221-5292

Date: 6/22/99

Requested by: Jim Olsta

	Load/Width at Max.Load (lbs./in)					
Specimen Number	Roll 5221	Roll 5237	Roll 5253	Roll 5269	Roll 5275	Roll 5292
1	43.4	58.2	42.9	55.8	56.1	40.8
2	41.1	54.6	43.9	47.2	51.2	34.8
3	56.0	54.6	45.7	49.2	55.0	32.8
4	51.5	52.0	42.1	46.7	52.9	30.5
5	52.4	58.0	47.6	42.1	52.3	32.5
6	57.8	49.2	50.6	48.5	60.8	41.2
Average	50.4	54.4	45.5	48.2	54.7	35.4

2739

No QC Manager's
Signature
LCBT 7-1-99

000169

CETCO
COLLOID ENVIRONMENTAL TECHNOLOGIES COMPANY
1350 West Shore Drive • Arlington Heights, IL 60004-1440 • USA
(847) 392-5800 • Fax (847) 506-6150
http://www.cetco.com

2739

1440-006 Rev. 3
7-1-99 p. 4 of 5
Doc # 1440-006B

FAX MEMO

June 25, 1999

Pages: 2, including cover

received

To: Eric Reed
GSE
fax (281) 230-5891

From: Jim Olsta

cc

Subject: Fluor Daniel Fernald MQC Test Data

Dear Eric:

CETCO has completed the Bentomat ST MQC wide width tensile testing for the Fluor Daniel Fernald project for lot 199922020 rolls 5122-5201. The other GCL MQC test results for these rolls were sent previously.

Sincerely,

Jim Olsta

Jim Olsta
Technical Manager
Lining Technology Group

RECORD

CETCO

COLLOID ENVIRONMENTAL TECHNOLOGIES COMPANY

RECORD

1440-006 Re
7-1-99 p.5 of 5
Doc # 1440-006B

Standard Test Method for Tensile Properties
of Geotextiles by the Wide-Width Strip Method

ASTM D4595

Project: Fluor Daniel Fernald

Proj. No. 99-072

Sample ID: Lot # 199922020
Roll# 5122-5201

Date: 6/24/99

Requested by: Jim Olsta

Specimen Number	Load/Width at Max.Load (lbs./in) Roll 5122	Roll 5138	Roll 5154	Roll 5170	Roll 5186	Roll 5201
1	55.2	66.0	66.4	36.6	54.7	62.1
2	47.3	65.9	62.4	39.5	50.6	62.1
3	52.0	64.8	66.2	37.2	52.1	55.7
4	47.3	53.6	62.1	38.9	61.4	58.6
5	48.3	66.7	64.9	36.0	49.3	56.7
6	60.5	65.5	72.4	45.4	63.2	68.1
Average	51.8	63.8	65.7	38.9	55.2	60.6

No QC Manager's signature.

2739

000191

1999 FERNALD SHEAR TESTS
CLIENT: GSE LINING TECHNOLOGY

INTERNAL SHEAR OF GCL (CETCO) — **Precision Labs**

SAMPLE #	Control #	Roll #			Date of Arrival	Hydration Period	Consolidation Period	TESTING	REPORTING
1	38093	5012			28-May-99	May 28-June 4	June 4- June 6	June 7-8	9-Jun
2	38094	5058			28-May	May 30- June 6	June 6- June 8	June 9-10	11-Jun
3	38095	5100			28-May	June 1-June 8	June 8-June 10	June 11-12	13-Jun
4	38196	5232			1-Jun	June 3-June 10	June 10-June 12	June 13-14	15-Jun
5	38201	5358			1-Jun	June 5-June 12	June 12-June 14	June 15-16	17-Jun
6	38198	5320			1-Jun	June 7-June14	June 14-June 16	June 17-18	19-Jun
7	38197	5276			1-Jun	June 9-June 16	June 16-June 18	June 19-20	21-Jun
8	38200	5188			1-Jun	June 11-June 18	June 18-June 20	June 21-22	23-Jun
9	38199	5144			1-Jun	June 13-June 20	June 20-June 22	June 23-24	25-Jun

INTERFACE SHEAR OF GCL & 80 MIL HDT (CETCO/GSE) — **VECTOR**

SAMPLE #	GCL Control #	GCL Roll #	HDT Control #	HDT Roll #	Latest Date of Arrival	Hydration Period	Consolidation Period	TESTING	REPORTING
1		5027	STOP		28-May-99	May 28-June 4	June 4- June 6	June 7-8	9-Jun
2		5072		114101743	28-May	May 30- June 6	June 6- June 8	June 9-10	11-Jun
3		5115		114101753	28-May	June 1-June 8	June 8-June 10	June 11-12	13-Jun
4		5359		114101774	28-May	June 3-June 10	Jun10-June 12	June 13-14	15-Jun
5		5335		114101783	1-Jun	June 5-June 12	June 12-June 14	June 15-16	17-Jun
6		5291		114101794	1-Jun	June 7-June14	June 14-June 16	June 17-18	19-Jun
7		5247		114101806	1-Jun	June 9-June 16	June 16-June 18	June 19-20	21-Jun
8		5203		114101807	1-Jun	June 11-June 18	June 18-June 20	June 21-22	23-Jun
9		5159		114102816	1-Jun	June 13-June 20	June 20-June 22	June 23-24	25-Jun
10				114101734		June 15-June 22	June 22-June 24	June 24-25	26-Jun

Not used
EMT 7-7-99

2739

000192

SUPPLIER DOCUMENT SUBMITTAL

FDF PROJECT NO.: (1) 20102	CONTRACT NO: (2) 1440	SUBMITTAL NO.:(3) 006	REV.:(4) 4	DATE:(5) 7/6/99	Page 1 of 30 (6)

FROM: GSE Lining Technologies (7)

RECORD

SIGNATURE: _____

TO: FDF ENGINEERING/CONSTRUCTION
DOCUMENT CONTROL (ECDC), MS 52-7 (8)

RECEIVED BY: _____ DATE: _____

QTY	DOCUMENT NUMBER	REV	DOCUMENT FAMILY: PRO	H&S	MED	TRG	CON	ENG	QAC	OPER	TITLE/DESCRIPTION	SUBMITTAL TYPE: DRFT	CFC	INF	ASSOCIATED SPECIFICATION	SUBMITTAL ACTION: A	B	C
(9)	(10)	(11)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(13)	(14)	(14)	(14)	(15)	(16)	(16)	(16)
8	1440-006A	1						X			GCL Internal and Interface Shear Strength Test Results		X		02772P.1.04.B		X	

REVIEW DISTRIBUTION

NAME	MS	NAME	MS	NAME	MS
(17)	(18)	(17)	(18)	(17)	(18)
Jim Jenkins, FDF, Eng., Approver	64				
Kwasi Badu-Tweneboah, GeoSyntec, Eng.	38				
Kathy Fisher, FDF, Procurement	64				
Gregg Johnson, FDF, Health and Safety	64				
Jim Turner, FDF, QA	64				
Chuck Van Aradale, FDF, Eng.	64				

RECEIVED AUG 18 1999

27139

NO COMMENTS: _____ COMMENTS: (PLEASE USE SPACE BELOW FOR COMMENTS OR INDICATE IF ATTACHMENTS) (19)

Interface shear tests performed by Vector used ASTM D 6321 test procedures. Part 2.01G, Section 02772P requires tests to be performed using ASTM D 5321

0001193

RECEIVED BY: James C Jenkins (20) DATE: 7/13/99

(SIGN/DATE AND RETURN A COPY TO ECDC, MS 52-7)

SUBMITTAL TYPE: (BY SUPPLIER)
CFC - CERTIFIED FOR CONSTRUCTION
INF - INFORMATION RECORD
DRFT - DRAFT/PRELIMINARY

ENTERED

SUBMITTAL ACTION CODE: (BY FDF)
A - Conforms to the Subcontract Requirements
B - Minor Comments - Incorporate and Resubmit
C - Revise and Resubmit (SEE COMMENTS)

FS-F-4955
Rev. 4: 04/??/1999

=-2739

PRECISION GEOSYNTHETIC LABORATORIES
1742 West Katella Suite #4, Orange, CA 92867

FAX RECORD

Date: 7/3/99
Number of pages including cover sheet: 29

To: Jim Turner
ERIC Reed
re: Final Report
FERNALD.
Phone: 281-230-8663
Fax phone: 513-648-5767
CC:

From: Cora Guy
Phone: 714-744-4599
Fax phone:

[ ] A - Conforms to the Subcontract Requirements
[X] B - Minor Comment - Incorporate and Resubmit
[ ] C - Revise and Resubmit
Sign: J C Jenkins Date: 7/8/99

REMARKS: ☐ Urgent ☐ For your review ☐ Reply ASAP ☐ Please comment

ERIC,
You should receive 3 orig copies of the report Thursday via Fedex.

Jim,
Sorry for the delays. I tried to contact you last Friday to get your FedEx address. However I FedEx 3 orig copies to ERIC. If you need more let me know.
Many Thanks. Cora.

INFORMATION ONLY

F-2739

Precision Geosynthetic Laboratories

July 1, 1999

RECORD

Mr. Eric Reed
GSE LINING TECHNOLOGY, INC.
19103 Gundle Road
Houston, Texas 77073

Dear Mr. Reed: RE: Fernald Superfund Site

Thank you for consulting Precision Geosynthetic Laboratories for your material testing needs.

Enclosed is the laboratory report for the testing of seventeen (17) Bentomat ST GCL and nine (9) 80 mil textured HDPE samples received May 28 and June 1, 1999.

It should be noted that the test specimen and test sample used for this report was believed to be representative of the material produced under the designation herein stated. However, these results are indicative of only the specimens that were actually tested. The testing herein is based upon accepted industry practice as well as the test method listed Precision Geosynthetic Laboratories neither accepts responsibility for nor makes claims to the final use and purpose of the material.

By accepting the data and results represented on this report, Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims arising out of the use of this data to the cost for the respective test(s) represented in this report, and Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liability in excess of the aforementioned limit.

The test data and all associated project information shall be held in confidence and disclosed to other parties only with the authorization of Client or Precision Geosynthetic Laboratories.

If you have any questions or if we Maybe of further service, please do not hesitate to call at 800-522-4599.

Sincerely,

PRECISION GEOSYNTHETIC LABORATORIES

Cora B. Queja
Quality Assurance

Ronald E. Belanger
Technical Director

Enclosure: (Job No. 990501)

000195

1742 West Katella Ave., Suite #4, Orange, CA 92867 TEL : (714) 744-4599 FAX : (714) 744-0357

2739

RECORD

July 1, 1999

VERIFICATION OF MATERIAL PROPERTIES
Geosynthetic Samples
FERNALD SUPERFUND SITE

FOR: GSE LINING TECHNOLOGY, INC.
(Reference: PGL Job No. 990501)

MATERIAL DESCRIPTION: 17- Bentomat ST GCL and 9- 80 mil textured HDPE geomembrane **No. of MATERIALS:** (26)

MANUFACTURER: CETCO / Lovell, WY, GSE, Houston, TX

DATE RECEIVED: May 28 and June 1, 1999 **SHIPPER:** Federal Express.

SAMPLE IDENTIFICATIONS:

SAMPLE ID	PRECISION CONTROL NUMBER
Bentomat ST GCL Samples Received By Precision Geosynthetic Laboratories:	
Roll #5012 Lot #199922020	C #38093
Roll #5056 Lot #199922020	C #38094
Roll #5100 Lot #199922020	C #38095
Roll #5232 Lot #199922020	C #38196
Roll #5276 Lot #199922020	C #38197
Roll #5320 Lot #199922020	C #38198
Roll #5144 Lot #199922020	C #38199
Roll #5188 Lot #199922020	C #38200
Roll #5358 Lot #199922020	C #38201
Bentomat ST GCL Samples Received By Vector Engineering, Inc.:	
Roll #5072 Lot #199922020	
Roll #5115 Lot #199922020	
Roll #5359 Lot #199922020	
Roll #5335 Lot #199922020	
Roll #5291 Lot #199922020	
Roll #5247 Lot #199922020	
Roll #5203 Lot #199922020	
Roll #5159 Lot #199922020	
80 mil Textured HDPE Geomembrane Samples Received By Vector Engineering, Inc.:	
Roll #114101743	
Roll #114101753	
Roll #114101774	
Roll #114101783	
Roll #114101794	
Roll #114101806	
Roll #114101807	
Roll #114102816	
R[illegible]734	

2739

Precision Geosynthetic Laboratories

Page 2
FOR: GSE LINING TECHNOLOGY, INC.
Reference: PGL Job No. 990501
Date: July 1,1999

RECORD

TEST REQUIRED:

DESCRIPTION	TEST METHOD
Internal Shear	ASTM D5321
Interface Shear	ASTM D5321

TEST CONDITIONS: The samples were conditioned for a minimum one hour in the laboratory at 22 ± 2°C (71.6 ± 3.6°F) and at 60 ± 10% relative humidity prior to test.

TEST RESULTS:

The test results are summarized in Tables 1 through 9. The units in which the data are reported are included on the tables.

PRECISION GEOSYNTHETIC LABORATORIES

Cora B. Queja
Quality Assurance

Ronald E. Belanger
Technical Director

000197

1742 West Katella Ave., Suite #4, Orange, CA 92867 TEL : (714) 744-4599 FAX : (714) 744-0357

TABLE 1.
MATERIAL PROPERTIES
FERNALD OSDF

- 2739

FOR: GSE LINING TECHNOLOGY
(Reference: PGL Job No. 990501)

June 8, 1999

INTERNAL SHEAR TEST RESULT (ASTM D6243)

TEST CONDITIONS:

RECORD

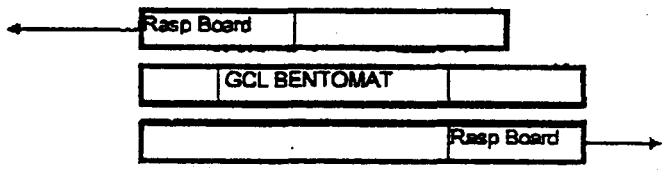
SAMPLE PREPARATION
1. Specimens were cut to 20" x 20"

HYDRATION:
1. Hydrated for 7 days at 3 psi using dead weights

CONSOLIDATION:
1. Each set of specimen was consolidated for 48 hrs at 5, 20, & 45 psi.
2. Loads were applied by pneumatic pressure.

SHEAR TEST:
1. Shear test was conducted at 0.004 in/ min
2. Sheared at minimum 2 inch horizontal displacement.
3. The test specimens were flooded during testing.
4. Tests were performed in general accordance with ASTM D5321-93 Method A using Brainard- Kilman LG-112 Direct Shear machine with effective area of 12 in x 12 in.

TEST CONFIGURATION



SAMPLE IDENTIFICATION:
PGL C# 38093, GCL Roll # 5012

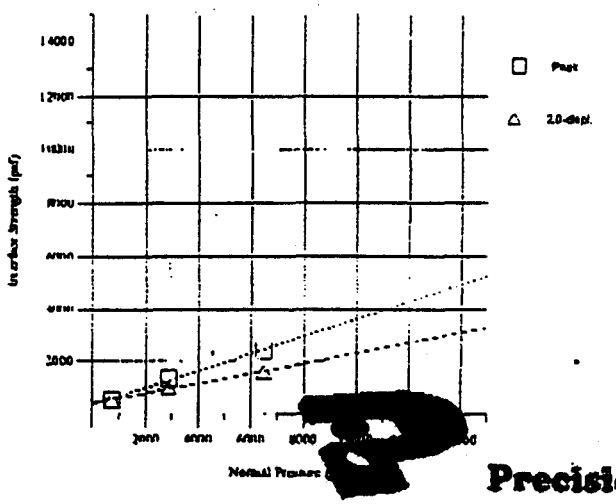
TEST RESULTS:

STRENGTH

SAMPLE ID	NORMAL STRESS (psi)	NORMAL STRESS (psf)	Moisture Content (%)	PEAK STRENGTH SHEAR STRESS (psf)	PEAK STRENGTH PEAK SECANT ANGLE	2" DISPLACEMENT SHEAR STRESS (psf)	2" DISPLACEMENT 2" DISPLACEMENT SECANT ANGLE
C# 38093	5	720	148.78	502	35	492	34
	20	2880	110.49	1353	25	988	19
	45	6480	69.87	2430	21	1623	14
	COHESION:			316		381	

OBSERVATIONS:

Stitches of specimens sheared at 20 and 45 psi normal stresses were completely separated from woven side at 2 " displacement . For 5 psi normal load, less than 10% of stitches were separated.



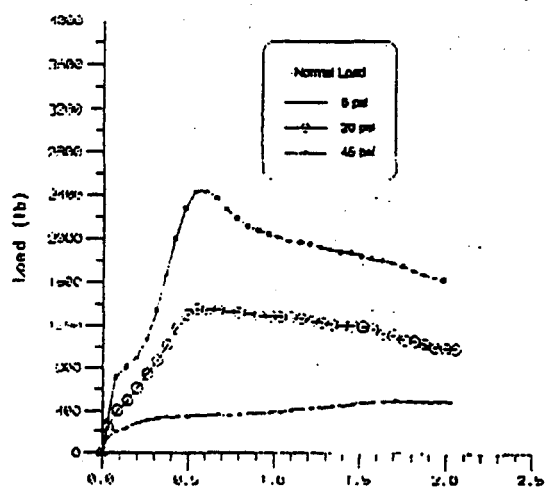


TABLE 2.
MATERIAL PROPERTIES
FERNALD OSDF

-- 2739

FOR: GSE LINING TECHNOLOGY
(Reference: PGL Job No. 990501)

June 10, 1999

INTERNAL SHEAR TEST RESULT (ASTM D5321)

TEST CONDITIONS:

RECORD

SAMPLE PREPARATION

1. Specimens were cut to 20" x 20"

HYDRATION:

1. Hydrated for 7 days at 3 psi using dead weights

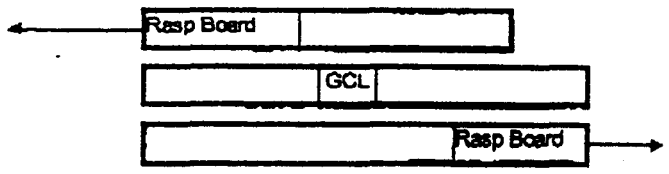
CONSOLIDATION:

1. Each set of specimen was consolidated for 48 hrs at 5, 20, & 45 psi.
2. Loads were applied by pneumatic pressure.

SHEAR TEST:

1. Shear test was conducted at 0.004 in/ min
2. Sheared at minimum 2 inch horizontal displacement.
3. The test specimens were flooded during testing.
4. Tests were performed in general accordance with ASTM D5321-93 Method A using Brainard- Kilman LG-112 Direct Shear machine with effective area of 12 in x 12 in.

TEST CONFIGURATION



SAMPLE IDENTIFICATION:

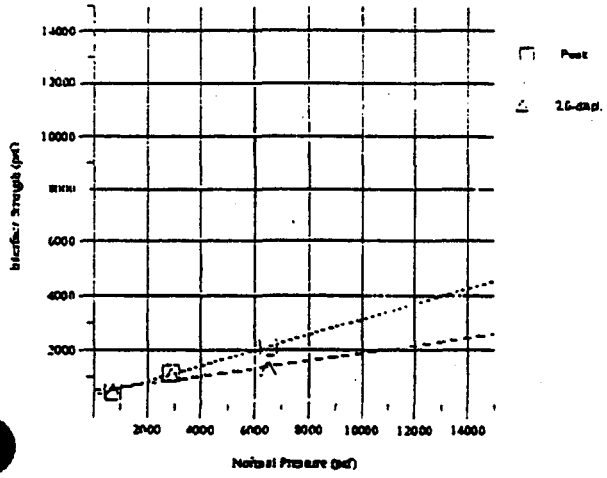
PGL C# 38094. GCL Roll # 5056

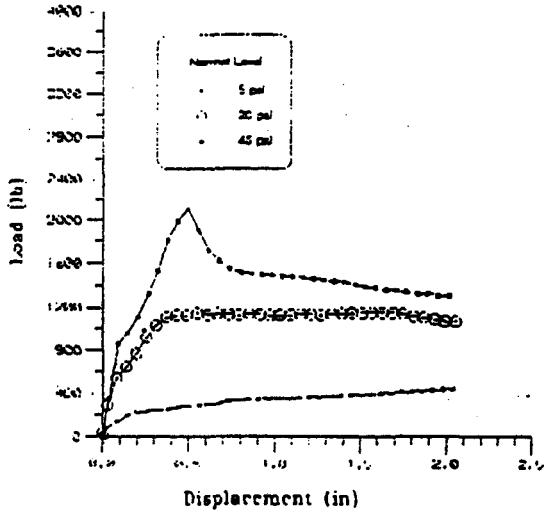
TEST RESULTS:

SAMPLE ID	NORMAL STRESS (psi)	NORMAL STRESS (psf)	Moisture Content (%)	PEAK STRENGTH: SHEAR STRESS (psf)	PEAK STRENGTH: PEAK SECANT ANGLE	2" DISPLACEMENT STRENGTH: SHEAR STRESS (psf)	2" DISPLACEMENT STRENGTH: 2" DISPLACEMENT SECANT ANGLE
C# 38094	5	720	141.02	441	31	441	31
	20	2880	109.21	1153	22	1069	20
	45	6480	75.22	2109	18	1308	11
COHESION:				357		462	

OBSERVATIONS:

Stitiches of specimens sheared at 45 psi normal stresses was completely separated from woven side at 2" displacement. For 5 psi normal load, less than 10% of stitches were separated and for 20 psi, about 50%.





Precision Geosynthetic Laboratories

TABLE 3
MATERIAL PROPERTIES
FERNALD OSDF

-- 2739

FOR: GSE LINING TECHNOLOGY
(Reference: PGL Job No. 990501)

June 13, 1999

INTERNAL SHEAR TEST RESULT (ASTM D5321)

TEST CONDITIONS:

RECORD

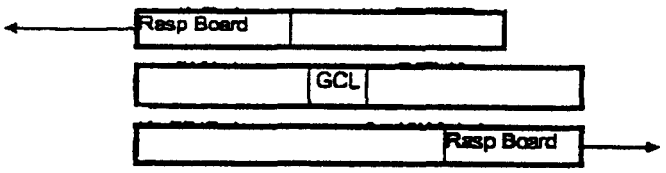
SAMPLE PREPARATION
1. Specimens were cut to 20" x 20"

HYDRATION:
1. Hydrated for 7 days at 3 psi using dead weights

CONSOLIDATION:
1. Each set of specimen was consolidated for 48 hrs at 5, 20, & 45 psi.
2. Loads were applied by pneumatic pressure.

SHEAR TEST:
1. Shear test was conducted at 0.004 in/ min
2. Sheared at minimum 2 inch horizontal displacement.
3. The test specimens were flooded during testing.
4. Tests were performed in general accordance with ASTM D5321-93 Method A using Brainard- Kilman LG-112 Direct Shear machine with effective area of 12 in x 12 in.

TEST CONFIGURATION



SAMPLE IDENTIFICATION:
PGL C# 38095. GCL Roll # 5100

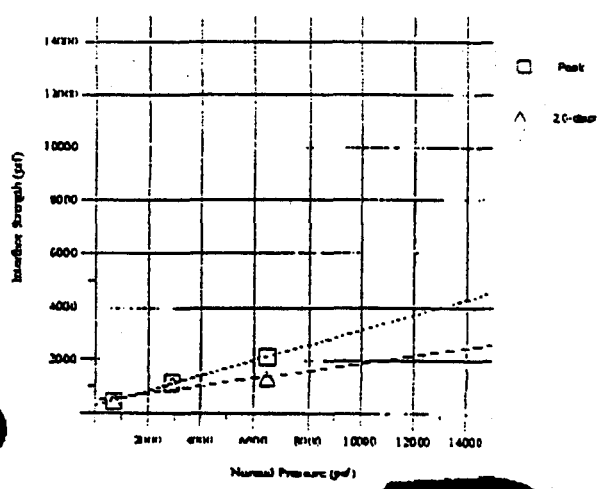
TEST RESULTS:

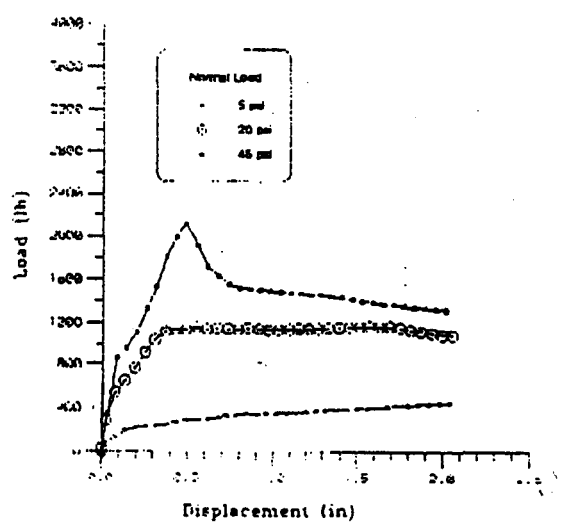
STRENGTH

SAMPLE ID	NORMAL STRESS (psi)	NORMAL STRESS (psf)	Moisture Content (%)	SHEAR STRESS (psf) PEAK STRENGTH	PEAK SECANT ANGLE	SHEAR STRESS (psf) 2" DISPLACEMENT	2" DISPLACEMENT SECANT ANGLE
C# 38095	5	720	132.20	426	31	426	31
	20	2880	98.34	968	19	779	15
	45	6480	59.11	2221	19	1092	10
	COHESION:			357		462	

OBSERVATIONS:

Stitches of specimens sheared at 45 psi normal stresses was completely separated from woven side at 2" displacement. Specimens for 5 psi normal load, less than 10% of stitches were separated and for 20 psi, about 50%.





Precision Geosynthetic Laboratories

TABLE 4.
MATERIAL PROPERTIES
FERNALD OSDF

2739

FOR: GSE LINING TECHNOLOGY
(Reference: PGL Job No. 990501)

June 25, 1999

INTERNAL SHEAR TEST RESULT (ASTM D5321)

TEST CONDITIONS:

RECORD

SAMPLE PREPARATION

1. Specimens were cut to 20" x 20"

HYDRATION:

1. Hydrated for 7 days at 3 psi using dead weights

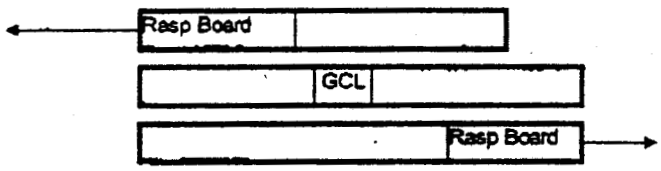
CONSOLIDATION:

1. Each set of specimen was consolidated for 48 hrs at 5, 20, & 45 psi.
2. Loads were applied by pneumatic pressure.

SHEAR TEST:

1. Shear test was conducted at 0.004 in/ min
2. Sheared at minimum 2 inch horizontal displacement.
3. The test specimens were flooded during testing.
4. Tests were performed in general accordance with ASTM D5321-93 Method A using Brainard- Kilman LG-112 Direct Shear machine with effective area of 12 in x 12 in.

TEST CONFIGURATION



SAMPLE IDENTIFICATION:

PGL C# 38096, GCL Roll # 5232

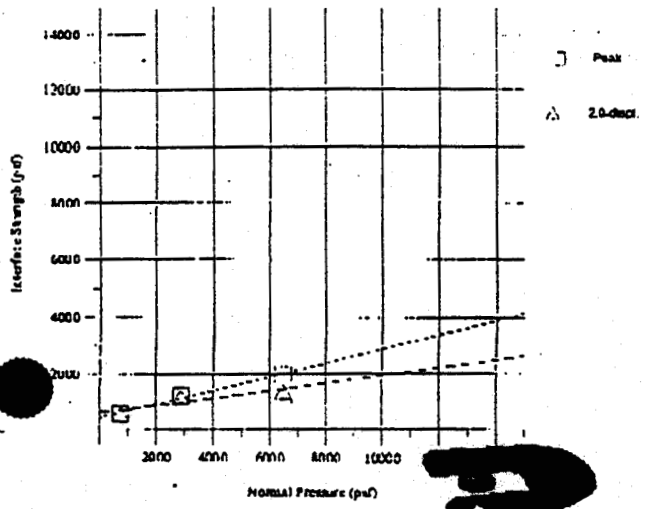
TEST RESULTS:

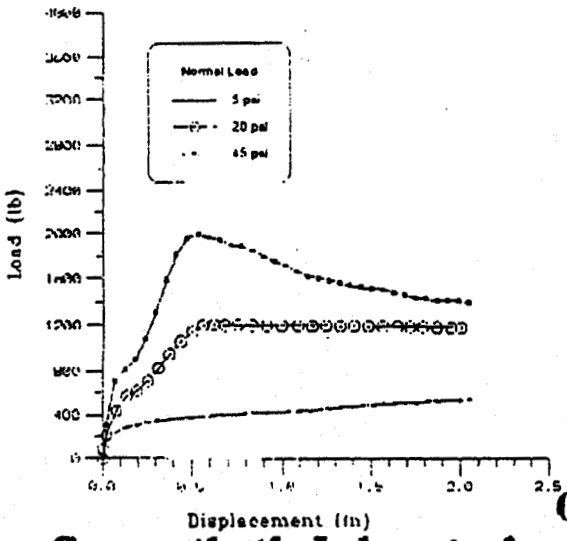
STRENGTH

SAMPLE ID	NORMAL STRESS (psi)	NORMAL STRESS (psf)	Moisture Content (%)	SHEAR STRESS (psf)	PEAK SECANT ANGLE	SHEAR STRESS (psf)	2" DISPLACEMENT SECANT ANGLE
				PEAK STRENGTH		2" DISPLACEMENT	
C# 38196	5	720	122.20	540	37	540	37
	20	2880	91.34	1204	23	1174	22
	45	6480	56.11	1996	17	1395	12
	COHESION:			409		567	

OBSERVATIONS:

Stitches of specimen sheared at 45 psi normal stresses was completely seperated from woven side at 2 " displacement . Specimens for 5 and 20 psi normal loads, less than 10% of stitches were separated .





Precision Geosynthetic Laboratories

TABLE 5.
MATERIAL PROPERTIES
FERNALD OSDF

2739

FOR: GSE LINING TECHNOLOGY
(Reference: PGL Job No. 990501)

June 25, 1999

INTERNAL SHEAR TEST RESULT (ASTM D5321)

TEST CONDITIONS:

RECORD

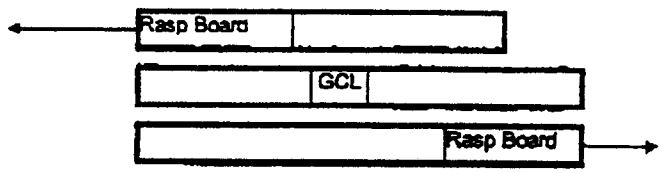
SAMPLE PREPARATION
1 Specimens were cut to 20" x 20"

HYDRATION:
1. Hydrated for 7 days at 3 psi using dead weights

CONSOLIDATION:
1. Each set of specimen was consolidated for 48 hrs at 5, 20, & 45 psi.
2. Loads were applied by pneumatic pressure.

SHEAR TEST:
1. Shear test was conducted at 0.004 in/ min
2. Sheared at minimum 2 inch horizontal displacement.
3. The test specimens were flooded during testing.
4. Tests were performed in general accordance with ASTM D5321-93 Method A using Brainard- Kilman LG-112 Direct Shear machine with effective area of 12 in x 12 in.

TEST CONFIGURATION



SAMPLE IDENTIFICATION:
PGL C# 38201, GCL Roll # 5358

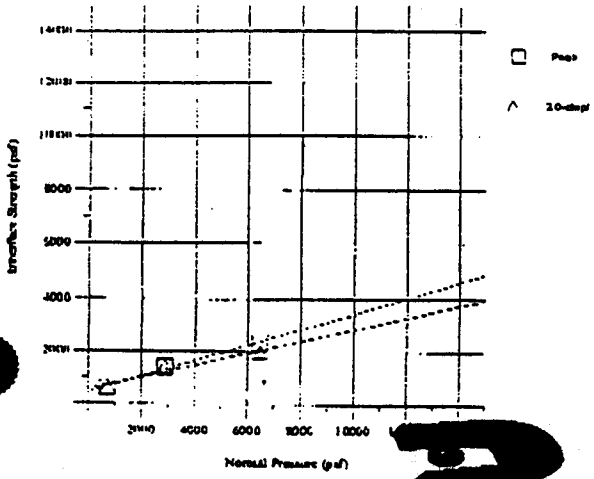
TEST RESULTS:

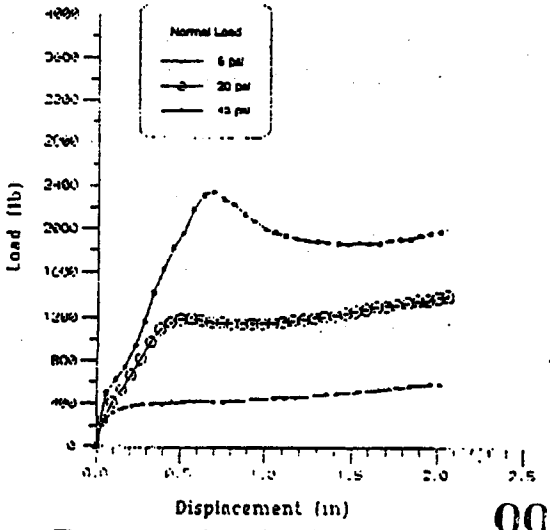
STRENGTH

SAMPLE ID	NORMAL STRESS (psi)	NORMAL STRESS (psf)	Moisture Content (%)	PEAK STRENGTH SHEAR STRESS (psf)	PEAK STRENGTH PEAK SECANT ANGLE	2" DISPLACEMENT SHEAR STRESS (psf)	2" DISPLACEMENT 2" DISPLACEMENT SECANT ANGLE
C# 38201	5	720	135.11	595	40	595	40
	20	2880	88.22	1397	26	1397	26
	45	6480	61.72	2340	20	1958	17
	COHESION:			440		549	

OBSERVATIONS:

Stitches of specimens sheared at 45 psi normal stresses was completely seperated from woven side at 2 " displacement . Specimens for 5 and 20 psi normal loads, less than 10% of stitches were separated .





Precision Geosynthetic Laboratories

TABLE 6
MATERIAL PROPERTIES
FERNALD OSDF

-2739

FOR: GSE LINING TECHNOLOGY
(Reference: PGL Job No. 990501)

July 1, 1999

INTERNAL SHEAR TEST RESULT (ASTM D5321)

TEST CONDITIONS:

RECORD

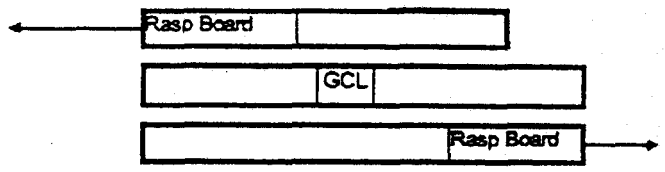
SAMPLE PREPARATION
1. Specimens were cut to 20" x 20"

HYDRATION:
1. Hydrated for 7 days at 3 psi using dead weights

CONSOLIDATION:
1. Each set of specimen was consolidated for 48 hrs at 5, 20, & 45 psi.
2. Loads were applied by pneumatic pressure.

SHEAR TEST:
1. Shear test was conducted at 0.004 in/ min
2. Sheared at minimum 2 inch horizontal displacement.
3. The test specimens were flooded during testing.
4. Tests were performed in general accordance with ASTM D5321-93 Method A using Brainard- Kilman LG-112 Direct Shear machine with effective area of 12 in x 12 in.

TEST CONFIGURATION



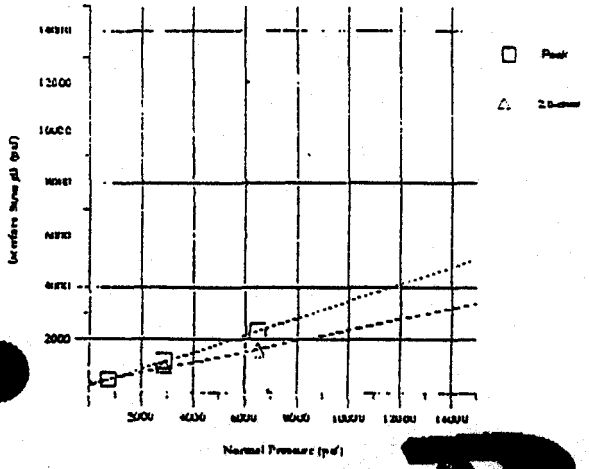
SAMPLE IDENTIFICATION:
PGL C# 38198, GCL Roll # 5320

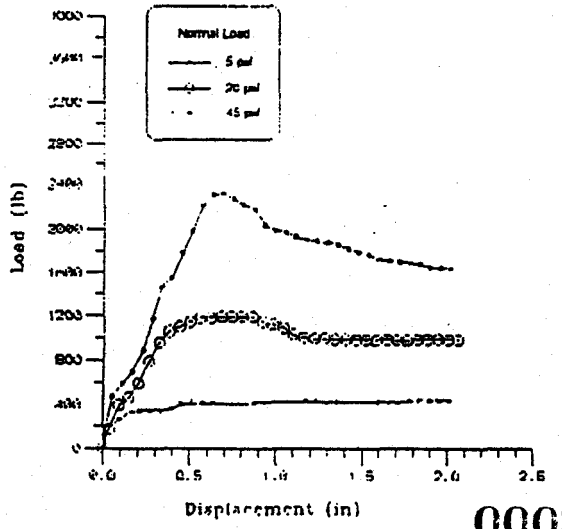
TEST RESULTS:

SAMPLE ID	NORMAL STRESS (psi)	NORMAL STRESS (psf)	Moisture Content (%)	PEAK STRENGTH SHEAR STRESS (psf)	PEAK STRENGTH PEAK SECANT ANGLE	2" DISPLACEMENT STRENGTH SHEAR STRESS (psf)	2" DISPLACEMENT STRENGTH 2" DISPLACEMENT SECANT ANGLE
C# 38198	5	720	122.08	444	32	444	32
	20	2880	75.24	1192	22	976	19
	45	6480	60.39	2311	20	1632	14
	COHESION:			231		333	

OBSERVATIONS:

Stitches of specimens sheared at 45 psi normal stressas was completely separated from woven side at 2" displacement. For 5 normal load, less than 10% of stitches were separated. For 20 psi, about 40% of stitches were separated.





Precision Geosynthetic Laboratories

TABLE 7
MATERIAL PROPERTIES
FERNALD OSDF

2739

FOR: GSE LINING TECHNOLOGY
(Reference: PGL Job No. 990501)

July 1, 1999

INTERNAL SHEAR TEST RESULT (ASTM D5321)

TEST CONDITIONS:

RECORD

SAMPLE PREPARATION

1. Specimens were cut to 20" x 20"

HYDRATION:

1. Hydrated for 7 days at 3 psi using deed weights

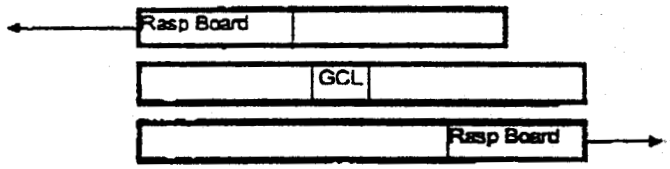
CONSOLIDATION:

1. Each set of specimen was consolidated for 48 hrs at 5, 20, & 45 psi.
2. Loads were applied by pneumatic pressure.

SHEAR TEST:

1. Shear test was conducted at 0.004 in/ min
2. Sheared at minimum 2 inch horizontal displacement.
3. The test specimens were flooded during testing.
4. Tests were performed in general accordance with ASTM D5321-93 Method A using Brainard- Kilman LG-112 Direct Shear machine with effective area of 12 in x 12 in.

TEST CONFIGURATION



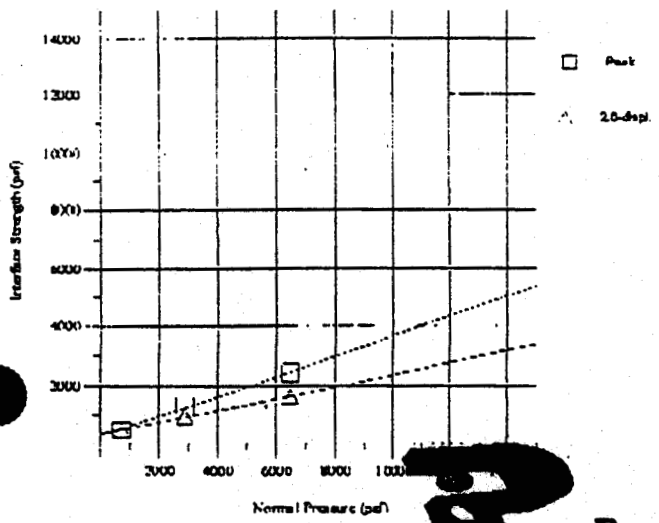
SAMPLE IDENTIFICATION:
PGL C# 38197, GCL Roll # 5276

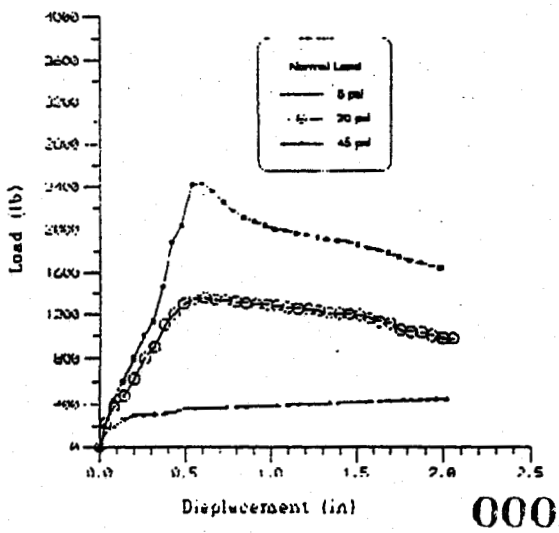
TEST RESULTS:

SAMPLE ID	NORMAL STRESS (psi)	NORMAL STRESS (psf)	Moisture Content (%)	PEAK STRENGTH SHEAR STRESS (psf)	PEAK STRENGTH PEAK SECANT ANGLE	2" DISPLACEMENT STRENGTH SHEAR STRESS (psf)	2" DISPLACEMENT STRENGTH 2" DISPLACEMENT SECANT ANGLE
C# 38197	5	720	131.12	448	32	448	32
	20	2880	77.42	1358	25	968	19
	45	6480	57.35	2420	20	1630	14
	COHESION:			274		333	

OBSERVATIONS:

Stitches of specimens sheared at 45 psi normal stresses was completely separated from woven side at 2" displacement. For 5 normal load, less than 10% of stitches were separated. For 20 psi, about 40% of stitches were separated.





000204

Precision Geosynthetic Laboratories

TABLE 8.
MATERIAL PROPERTIES
FERNALD OSDF

2739

FOR: GSE LINING TECHNOLOGY
(Reference: PGL Job No. 990501)

July 1, 1999

INTERNAL SHEAR TEST RESULT (ASTM D5321)

TEST CONDITIONS:

RECORD

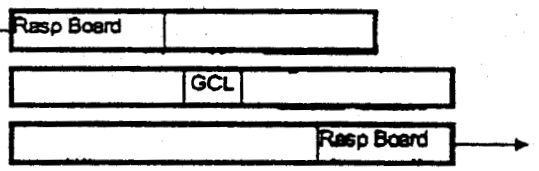
SAMPLE PREPARATION
1. Specimens were cut to 20" x 20"

HYDRATION:
1. Hydrated for 7 days at 3 psi using dead weights

CONSOLIDATION:
1. Each set of specimen was consolidated for 48 hrs at 5, 20, & 45 psi.
2. Loads were applied by pneumatic pressure.

SHEAR TEST:
1. Shear test was conducted at 0.004 in/ min
2. Sheared at minimum 2 inch horizontal displacement.
3. The test specimens were flooded during testing.
4. Tests were performed in general accordance with ASTM D5321-93 Method A using Brainard- Kilman LG-112 Direct Shear machine with effective area of 12 in x 12 in.

TEST CONFIGURATION

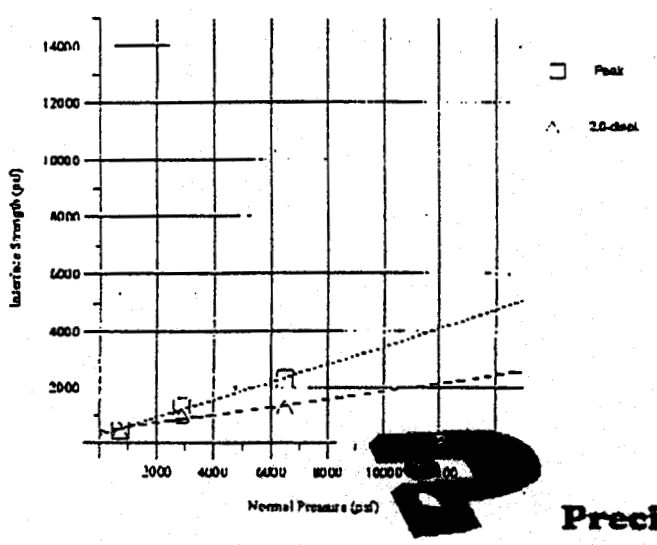


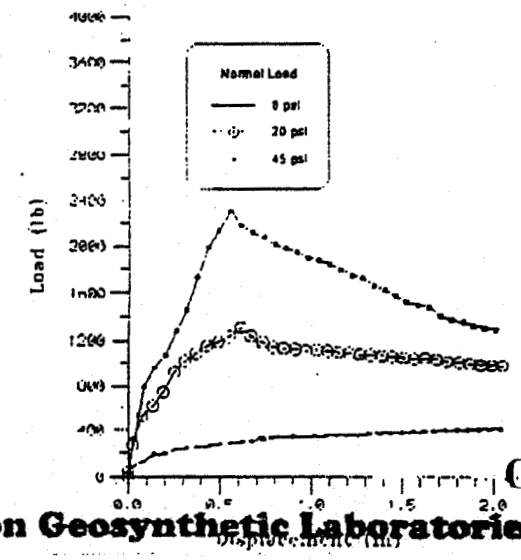
SAMPLE IDENTIFICATION:
PGL C# 38200, GCL Roll # 5188

TEST RESULTS:

SAMPLE ID	NORMAL STRESS (psi)	NORMAL STRESS (psf)	Moisture Content (%)	PEAK STRENGTH SHEAR STRESS (psf)	PEAK STRENGTH PEAK SECANT ANGLE	2" DISPLACEMENT STRENGTH SHEAR STRESS (psf)	2" DISPLACEMENT STRENGTH 2" DISPLACEMENT SECANT ANGLE
C# 38200	5	720	129.87	414	30	414	30
	20	2880	73.67	1311	24	984	19
	45	6480	60.34	2304	20	1295	11
COHESION:				258		407	

OBSERVATIONS:
Stitches of specimens sheared at 45 psi normal stresses was completely separated from woven side at 2" displacement. For 5 normal load, less than 10% of stitches were separated. For 20 psi, about 30% of stitches were separated.





Precision Geosynthetic Laboratories

-- 2739

TABLE 9
MATERIAL PROPERTIES
FERNALD OSDF

FOR: GSE LINING TECHNOLOGY
(Reference: PGL Job No. 990501)

July 1, 1999

INTERNAL SHEAR TEST RESULT (ASTM D5321)

TEST CONDITIONS:

RECORD

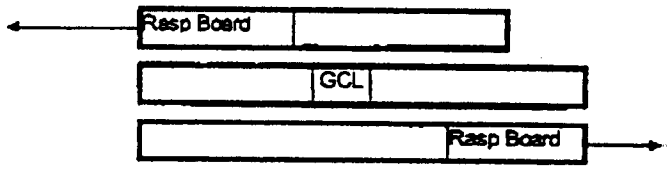
SAMPLE PREPARATION
1. Specimens were cut to 20" x 20"

HYDRATION:
1 Hydrated for 7 days at 3 psi using deed weights

CONSOLIDATION:
1. Each set of specimen was consolidated for 48 hrs at 5, 20, & 45 psi.
2. Loads were applied by pneumatic pressure.

SHEAR TEST:
1. Shear test was conducted at 0.004 in/ min
2. Sheared at minimum 2 inch horizontal displacement.
3. The test specimens were flooded during testing.
4. Tests were performed in general accordance with ASTM D5321-93 Method A using Brainard- Kilman LG-112 Direct Shear machine with effective area of 12 in x 12 in.

TEST CONFIGURATION



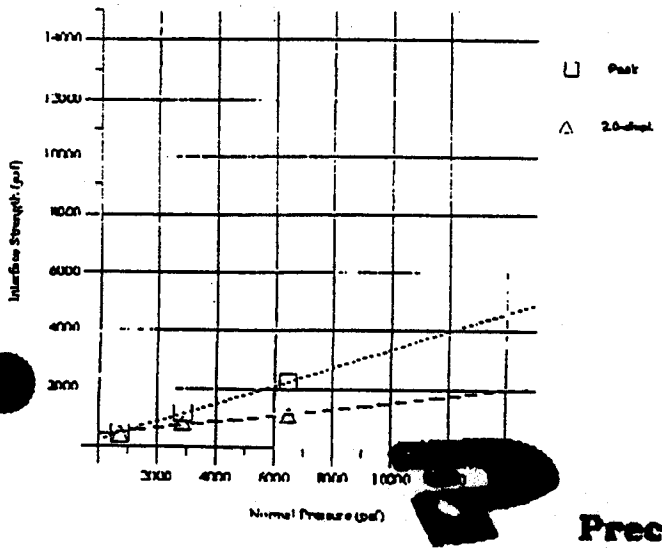
SAMPLE IDENTIFICATION:
PGL C# 38199, GCL Roll # 5144

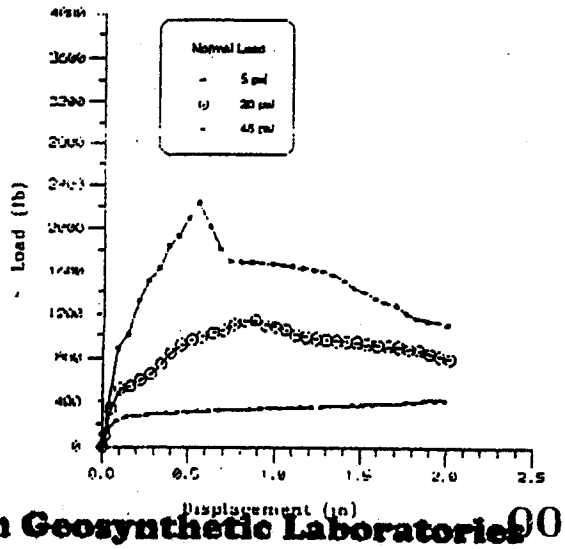
TEST RESULTS:

SAMPLE ID	NORMAL STRESS (psi)	NORMAL STRESS (psf)	Moisture Content (%)	PEAK STRENGTH: SHEAR STRESS (psf)	PEAK STRENGTH: PEAK SECANT ANGLE	2" DISPLACEMENT STRENGTH: SHEAR STRESS (psf)	2" DISPLACEMENT STRENGTH: 2" DISPLACEMENT SECANT ANGLE
C# 38199	5	720	134.45	428	31	428	31
	20	2880	78.23	1145	22	799	16
	45	6480	55.76	2234	19	1101	10
COHESION:				219		395	

OBSERVATIONS:

Stitches of specimens sheared at 45 psi normal stresses was completely separated from woven side of the GCL at 2" displacement. For 5 normal load, less than 10% of stitches were separated. For 20 psi, about 50% of stitches were separated.





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(530) 272-2448 Fax (530) 272-8553

LARGE SCALE DIRECT SHEAR REPORT

Test Method D-6243-B

RECORD

-2739

Client Name: PRECISION LABORATORIES Project Name: FERNALD SUPERFUND SITE Project No: 943022.37

Superstrate: ⇦ Board Spacers

Material 1: ⇦ CETCO Bentomat ST Lot#19992020 Roll#5072 LSN: BDV Rasp Board

Material 2: ⇨ 80 mil GSE HDPE Textured/Textured Roll#114101743 LSN: BEF Clamped

Substrate: ⇨ Concrete Board with Sand Layer

PEAK STRENGTH

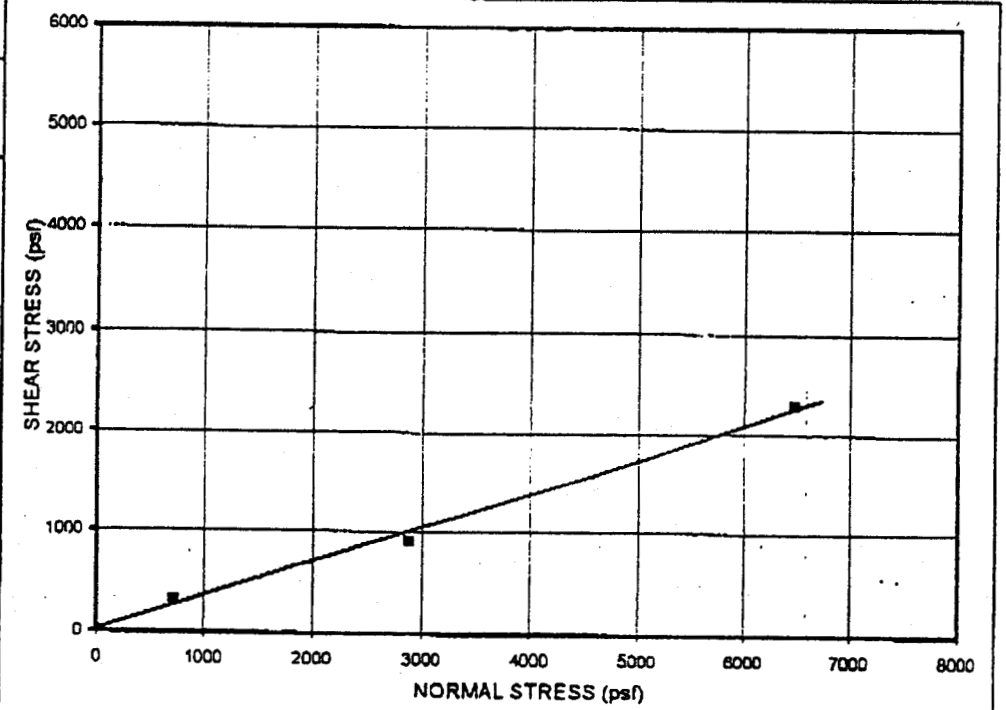
Test Point	Normal Stress psi	Normal Stress psf	Shear Stress psf	Secant Friction Angle
1.	5.0	720	330	25
2.	20.0	2880	910	18
3.	45.0	6480	2290	19

Adhesion: 20 psf

Friction Angle: 19 degrees

Coefficient of Friction: 0.34

NOTE: GRAPH NOT TO SCALE



STRENGTH ENVELOPE

(at 2.5 in. displacement)

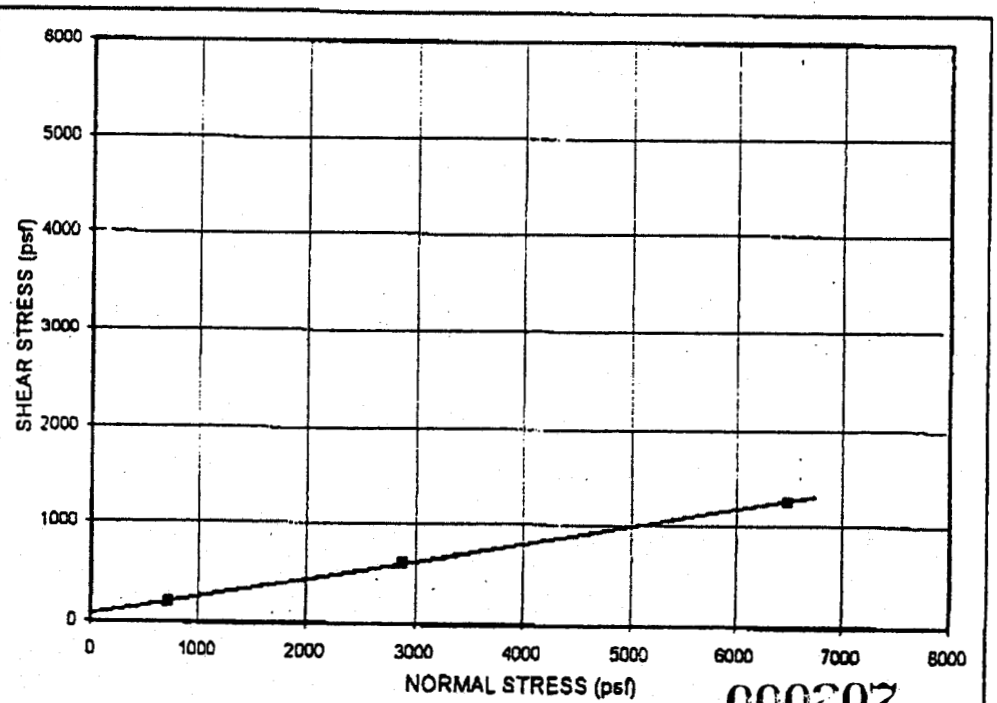
Test Point	Normal Stress psi	Normal Stress psf	Shear Stress psf	Secant Friction Angle
1.	5.0	720	200	16
2.	20.0	2880	610	12
3.	45.0	6480	1260	11

Adhesion: 70 psf

Friction Angle: 10 degrees

Coefficient of Friction: 0.18

NOTE: GRAPH NOT TO SCALE



000207

NOTE: The Friction Angle and Adhesion (or Cohesion) results given here are based on a mathematically determined best fit line. Further interpretation should be conducted by a qualified professional experienced in geosynthetic and geotechnical engineering.

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Report Date: 6/8/99 (rev. 6/15 krc) Entered By: RWM Reviewed By: NU Lab Log: 121B

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LARGE SCALE DIRECT SHEAR REPORT

Test Method D-6243-B

-- 2739

Client Name: PRECISION LABORATORIES Project Name: FERNALD SUPERFUND SITE Project No: 943022.37

Superstrate: ⇦ Board Spacers

Material 1: ⇦ CETCO Bentomat ST Lot#19992020 Roll#5072 LSN: BDV Rasp Board

Material 2: ⇨ 80 mil GSE HDPE Textured/Textured Roll#114101743 LSN: BEF Clamped

Substrate: ⇨ Concrete Board with Sand Layer

DISPLACEMENT vs. SHEAR STRESS

Test Point	Normal Stress psi	Normal Stress psf
1.	5.0	720
2.	20.0	2880
3.	45.0	6480

MOISTURE DATA:

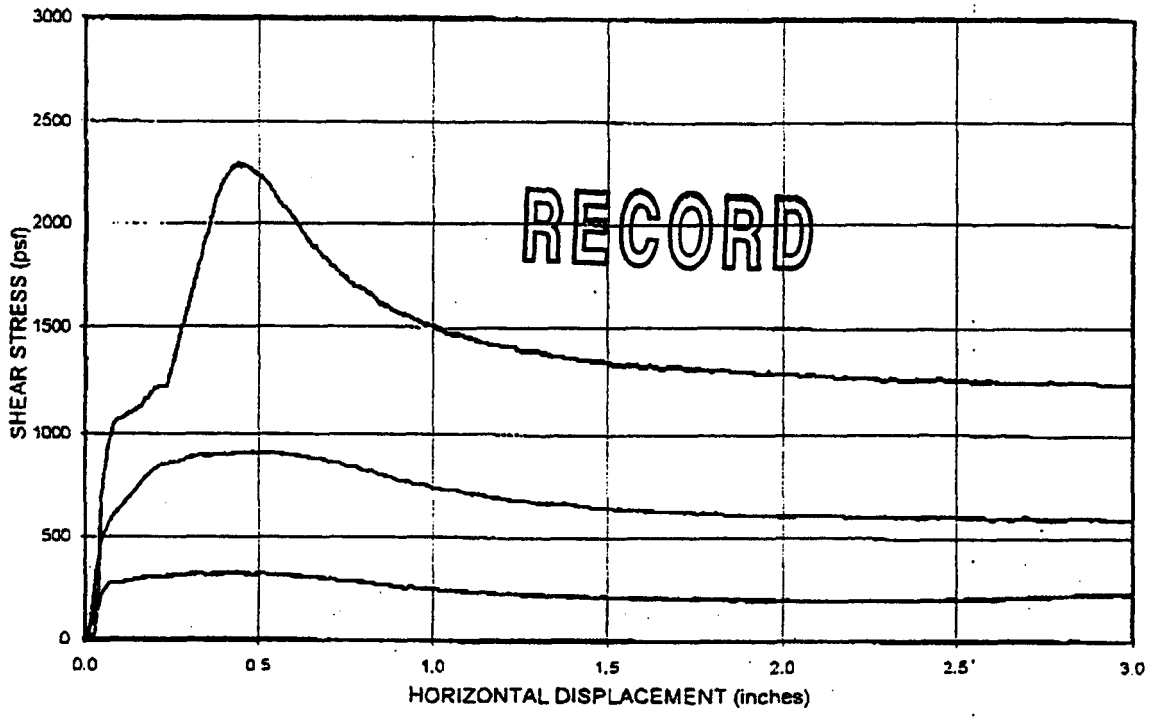
(GCL)

Initial Water Content: 22%

Initial Dry Density: N/A pcf

Final Water Content:(%)

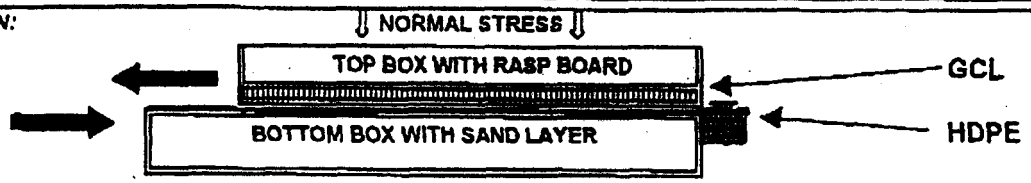
1.	2.	3.
102.4	94.0	71.1



STANDARD CONDITIONS: **SHEAR DISPLACEMENT RATE: 0.004 in/min**

1. The "gap" between shear boxes was set at 80 mil (2.0 mm)
2. The test specimens were flooded during testing unless otherwise noted.
3. High Normal Stresses, >5psi (35 kPa) was applied using air pressure.
4. Low Normal Stresses, <5psi (35 kPa) was applied using dead weights.
5. The tests were terminated after 3.0"(75 mm) of displacement unless otherwise noted.
6. Tests were performed in general accordance with ASTM procedure D-6243 using a Brainerd-Killman LG-112 direct shear machine with an effective area of 12" x 12" (300 x300 mm).

TEST ORIENTATION:



SPECIAL TEST NOTES:

1. Each specimen of HDPE was cut to 14" x 20" and clamped to the lower box
2. The textile portions of the GCL were wrapped around a 12"x12" rasp board in the upper box.
3. The GCL specimens were hydrated for 7 days at 3 psi, in contact with the textured HDPE.
4. After hydration each GCL / HDPE soil specimen was consolidated at the specified normal stress for 48 hrs., then sheared.
5. The woven textile side of the GCL was tested against the HDPE
6. Shearing occurred at the interface between the textured HDPE and GCL specimens.
7. Stretching or deformation of the GCL or HDPE was not observed.

000208

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Report Date: 6/8/99 (rev. 6/15 krc) Entered By: RWM Reviewed By: [illegible] Lab Log: 121B

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LARGE SCALE DIRECT SHEAR REPORT

Test Method D-6243-B

2739

Client Name: PRECISION LABORATORIES Project Name: FERNALD SUPERFUND SITE Project No: 943022.37

Superstrate: ⇦ Board Spacers

Material 1: ⇦ Cetco Bentomat ST; Lot #19992020; Roll #5115 LSN: BDW Rasp Board

Material 2: ⇨ GSE 80 mil HDPE Textured/Textured; Roll #114101753 LSN: BEG Clamped

Substrate: ⇨ Concrete Board with Sand Layer

PEAK STRENGTH

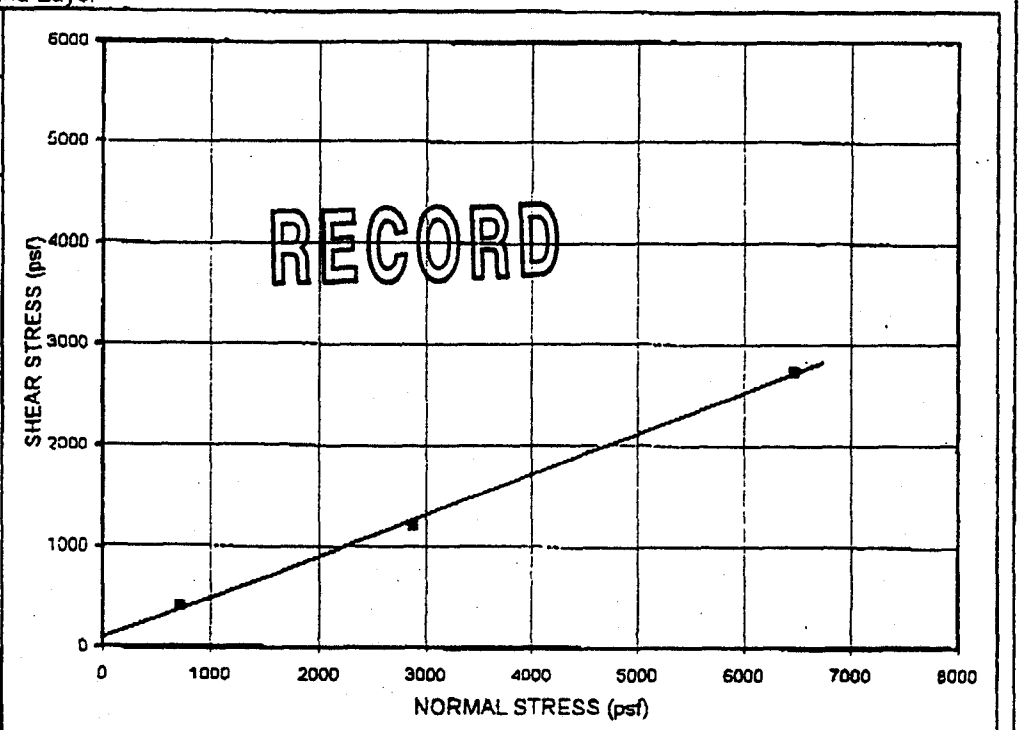
Test Point	Normal Stress psi	Normal Stress psf	Shear Stress psf	Secant Friction Angle
1.	5.0	720	420	30
2.	20.0	2880	1210	23
3.	45.0	6480	2740	23

Adhesion: 100 psf

Friction Angle: 22 degrees

Coefficient of Friction: 0.4

NOTE: GRAPH NOT TO SCALE



STRENGTH ENVELOPE

(at 2.5 in. displacement)

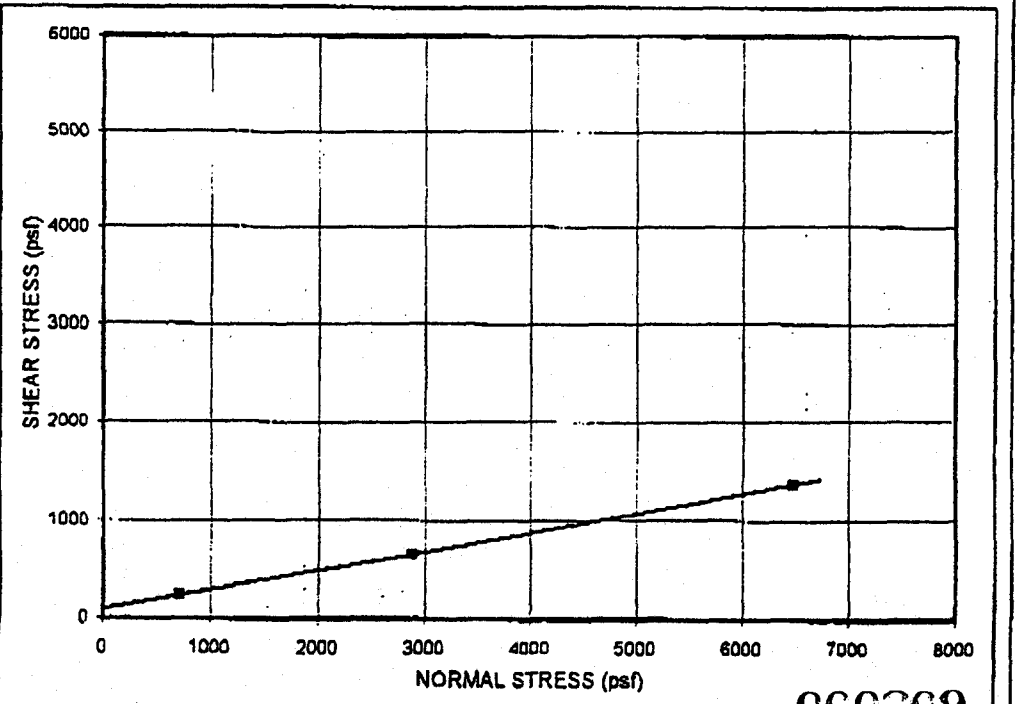
Test Point	Normal Stress psi	Normal Stress psf	Shear Stress psf	Secant Friction Angle
1.	5.0	720	230	18
2.	20.0	2880	660	13
3.	45.0	6480	1370	12

Adhesion: 90 psf

Friction Angle: 11 degrees

Coefficient of Friction: 0.2

NOTE: GRAPH NOT TO SCALE



000209

NOTE: The Friction Angle and Adhesion (or Cohesion) results given here are based on a mathematically determined best fit line. Further interpretation should be conducted by a qualified professional experienced in geosynthetic and geotechnical engineering.

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Report Date: 06/14/99 Entered By: NCL Reviewed By: ML Lab Log: 121 C

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LARGE SCALE DIRECT SHEAR REPORT

Test Method D-6243-B

2739

Client Name: PRECISION LABORATORIES Project Name: FERNALD SUPERFUND SITE Project No: 943022.37

Superstrate: ⇦ Board Spacers.

Material 1: ⇦ Cetco Bentomat ST; Lot #19992020; Roll #5115 LSN: BDW Rasp Board

Material 2: ⇨ GSE 60 mil HDPE Textured/Textured; Roll #114101753 LSN: BEG Clamped

Substrate: ⇨ Concrete Board with Sand Layer

DISPLACEMENT vs. SHEAR STRESS

Test Point	Normal Stress psi	Normal Stress psf
1.	5.0	720
2.	20.0	2880
3.	45.0	6480

MOISTURE DATA:

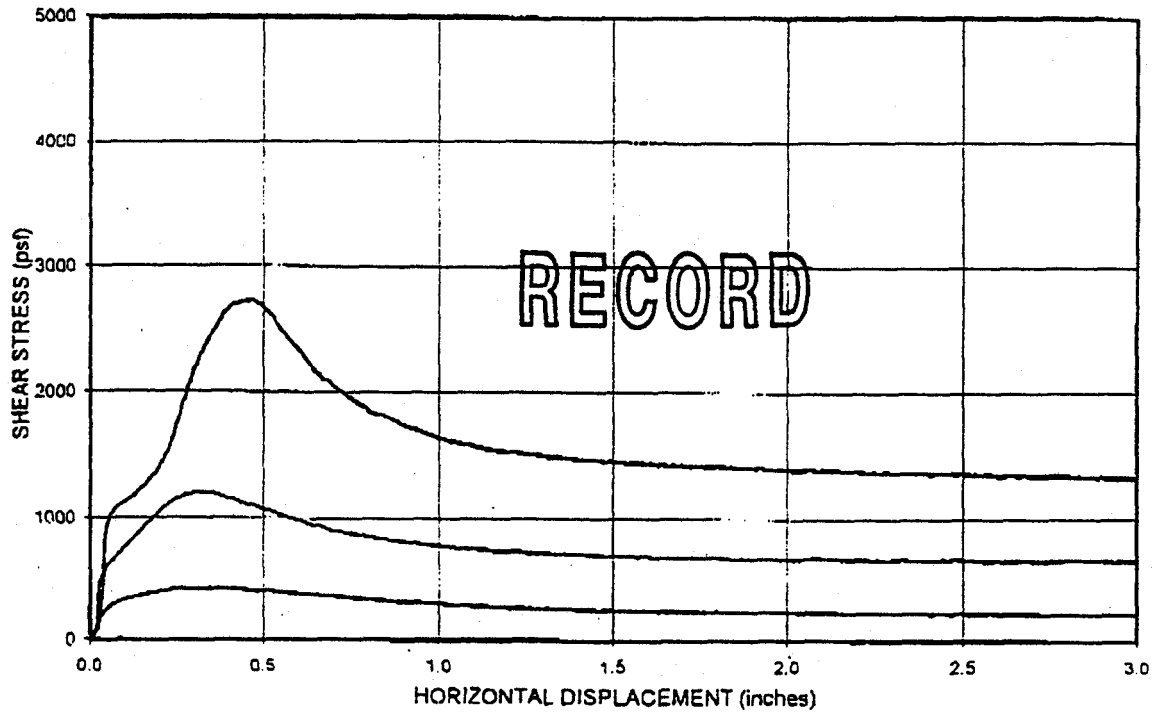
(GCL)

Initial Water Content: 23.4%

Initial Dry Density: NA pcf

Final Water Content:(%)

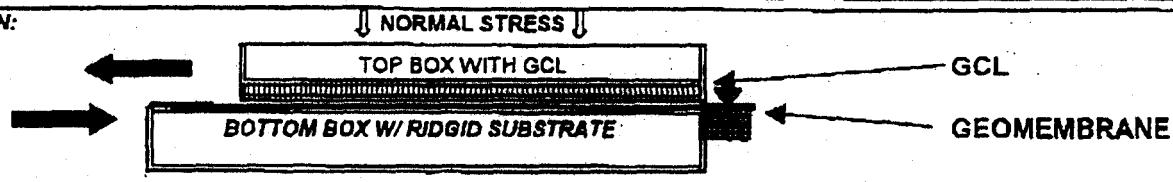
1.	2.	3.
118.5	89.7	69.5



STANDARD CONDITIONS: **SHEAR DISPLACEMENT RATE: 0.004 in/min**

1. The "gap" between shear boxes was set at 60 mil (2.0 mm)
2. The test specimens were flooded during testing unless otherwise noted.
3. High Normal Stresses, >5psi (35 kPa) was applied using air pressure.
4. Low Normal Stresses, <5psi (35 kPa) was applied using dead weights.
5. The tests were terminated after 3.0"(75 mm) of displacement unless otherwise noted.
6. Tests were performed in general accordance with ASTM procedure D-6243 using a Brainard-Killman LG-112 direct shear machine with an effective area of 12" x 12" (300 x300 mm).

TEST ORIENTATION:



SPECIAL TEST NOTES:

1. Each specimen of HDPE was cut to 14" x 20" and clamped to the lower box.
2. The textile portions of the GCL were wrapped around a 12"x12" rasp board in the upper box.
3. Each GCL specimen was hydrated for 7 days at 3 psi, in contact with the textured HDPE.
4. After hydration, each GCL / HDPE specimen was consolidated at the specified normal stress for 48 hrs. then sheared.
5. The woven textile side of the GCL was tested against the HDPE
6. Shearing occurred at the interface between the textured HDPE and GCL specimen.
7. Minor stretching of the GCL fabric occurred in point 3.

000210

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Report Date: 06/14/99 Entered By: NCL Reviewed By: NW Lab Log: 424 C

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LARGE SCALE DIRECT SHEAR REPORT

Test Method D-6243-B

2739

Client Name: PRECISION LABORATORIES Project Name: FERNALD SUPERFUND SITE Project No: 943022.37

Superstrate: ⇦ Board Spacers

Material 1: ⇦ CETCO Bentomat ST Lot#199922020 Roll # 5359 LSN: BEO Resp Board

Material 2: ⇨ 80 mil GSE HDPE Textured/Textured Roll # 114101774 LSN: BEI Clamped

Substrate ⇨ Concrete Board with Sand Layer

PEAK STRENGTH

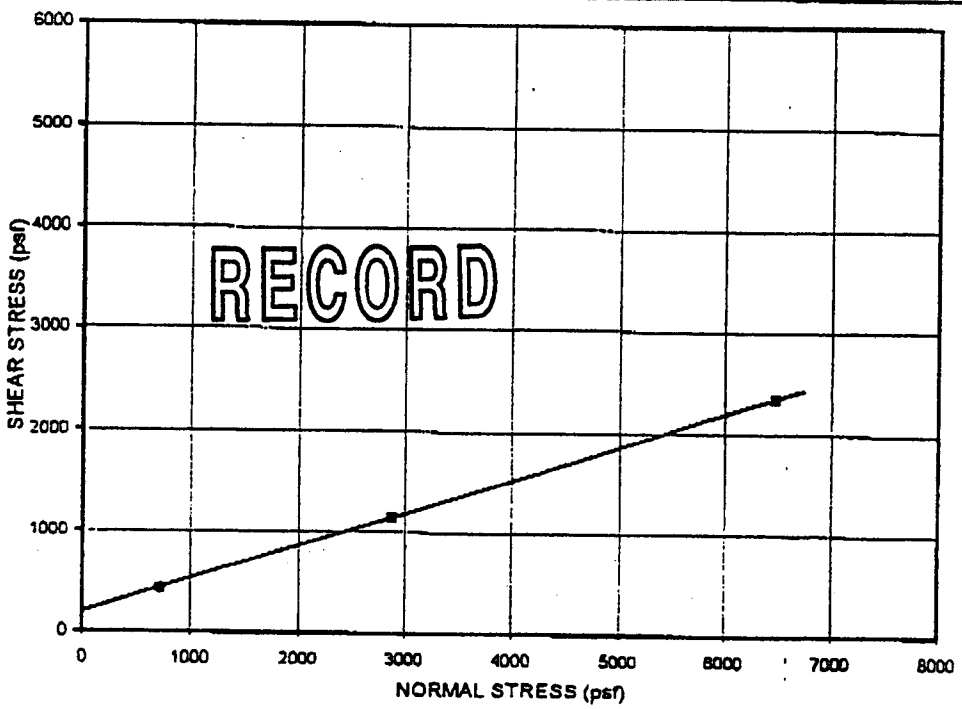
Test Point	Normal Stress psi	Normal Stress psf	Shear Stress psf	Secant Friction Angle
1.	5.0	720	430	31
2.	20.0	2880	1160	22
3.	45.0	6480	2350	20

Adhesion: 190 psf

Friction Angle: 18 degrees

Coefficient of Friction: 0.33

NOTE: GRAPH NOT TO SCALE



STRENGTH ENVELOPE

(at 2.5 in. displacement)

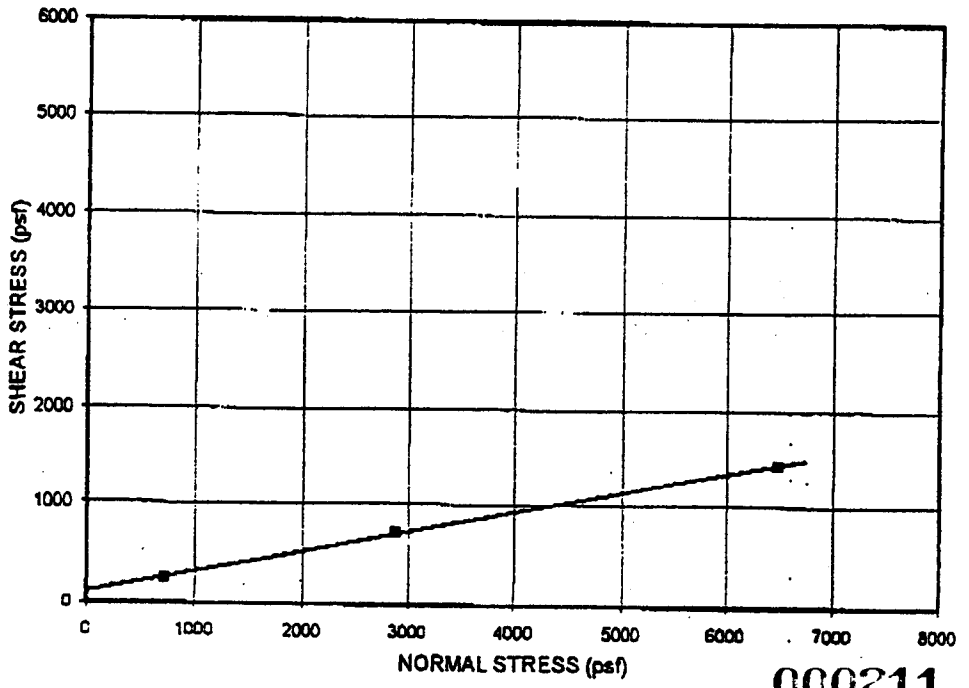
Test Point	Normal Stress psi	Normal Stress psf	Shear Stress psf	Secant Friction Angle
1.	5.0	720	250	19
2.	20.0	2880	720	14
3.	45.0	6480	1430	12

Adhesion: 110 psf

Friction Angle: 12 degrees

Coefficient of Friction: 0.2

NOTE: GRAPH NOT TO SCALE



000211

NOTE: The Friction Angle and Adhesion (or Cohesion) results given here are based on a mathematically determined best fit line. Further interpretation should be conducted by a qualified professional experienced in geosynthetic and geotechnical engineering.

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Entered By: RWM Reviewed By: NL Report Date: 06/14/99 Lab Log: 1211

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LARGE SCALE DIRECT SHEAR REPORT

Test Method D-6243-B 2739

Client Name: PRECISION LABORATORIES Project Name: FERNALD SUPERFUND SITE Project No: 943022.37

Superstrate ⇦ Board Spacers

Material 1: ⇦ CETCO Bentomat ST Lot#199922020 Roll # 5359 LSN: BEO Rasp Board

Material 2: ⇨ 80 mil GSE HDPE Textured/Textured Roll # 114101774 LSN: BEI Clamped

Substrate: ⇨ Concrete Board with Sand Layer

DISPLACEMENT vs. SHEAR STRESS

Test Point	Normal Stress psi	Normal Stress psf
1.	5.0	720
2.	20.0	2880
3.	45.0	6480

MOISTURE DATA:

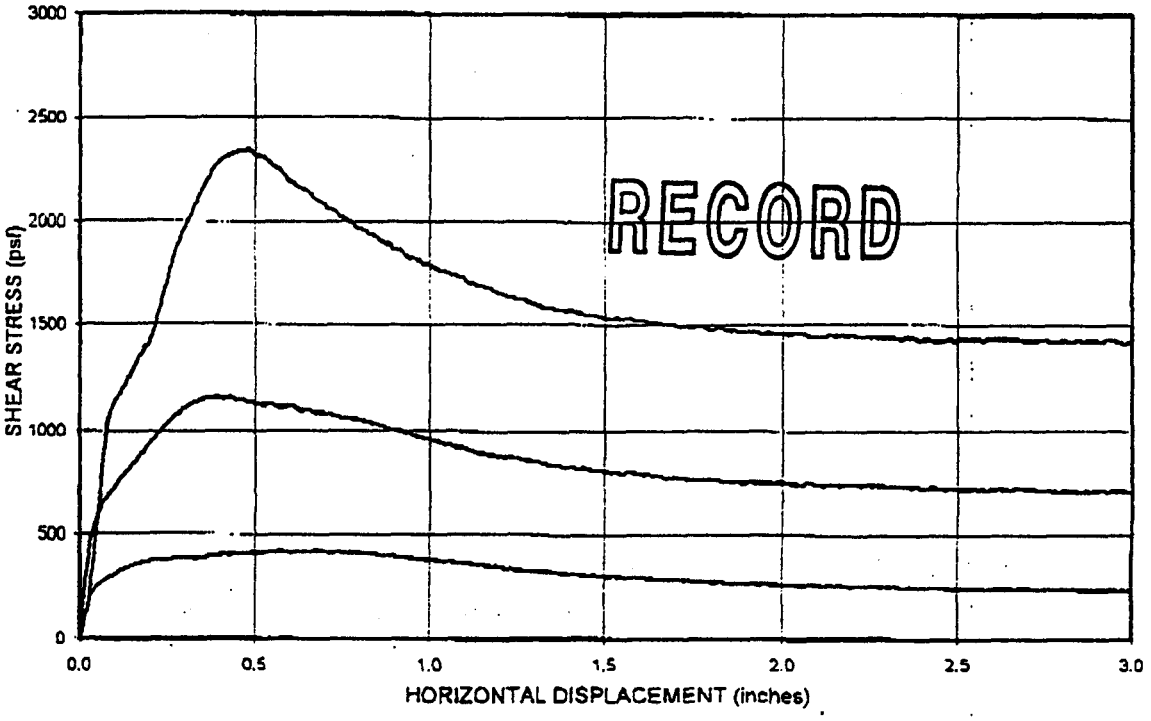
(GCL)

Initial Water Content: 20.2%

Initial Dry Density: N/A pcf

Final Water Content:(%)

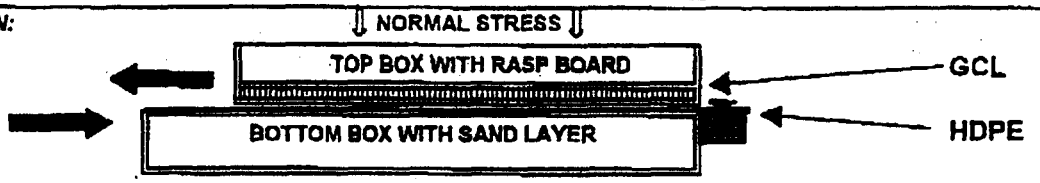
1.	2.	3.
108.6	97.3	80.9



STANDARD CONDITIONS: **SHEAR DISPLACEMENT RATE: 0.004 in/min**

1. The "gap" between shear boxes was set at 80 mil (2.0 mm)
2. The test specimens were flooded during testing unless otherwise noted.
3. High Normal Stresses, >5psi (35 kPa) was applied using air pressure.
4. Low Normal Stresses, <5psi (35 kPa) was applied using dead weights.
5. The tests were terminated after 3.0"(75 mm) of displacement unless otherwise noted.
6. Tests were performed in general accordance with ASTM procedure D-6243 using a Brainard-Killman LG-112 direct shear machine with an effective area of 12" x 12" (300 x300 mm).

TEST ORIENTATION:



SPECIAL TEST NOTES:

1. Each specimen of HDPE was cut to 14" x 20" and clamped to the lower box
2. The textile portions of the GCL were wrapped around a 12"x12" rasp board in the upper box.
3. The GCL specimens were hydrated for 7 days at 3 psi, in contact with the textured HDPE.
4. After hydration each GCL / HDPE soil specimen was consolidated at the specified normal stress for 48 hrs., then sheared.
5. The woven textile side of the GCL was tested against the HDPE
6. Shearing occurred at the interface between the textured HDPE and GCL specimens.
7. Minor stretching of the GCL occurred on the normal stress points 1 and 2.

000212

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Entered By:	Reviewed By:	Report Date:	Lab Log:
RWM	NL	06/14/99	4241

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LARGE SCALE DIRECT SHEAR REPORT

Test Method D-6243-B

2739

Client Name: PRECISION LABORATORIES Project Name: FERNALD SUPERFUND SITE Project No: 943022.37

Superstrate: ⟸ Board Spacers

Material 1: ⟸ CETCO Bentomat ST Lot # 199922020 Roll # 5335 LSN BED Rasp Board

Material 2: ⟹ 80 mil GSE HDPE Textured / Textured Roll # 114101783 LSN: BEJ Clamped

Substrate: ⟹ Concrete Board with Sand Layer

PEAK STRENGTH

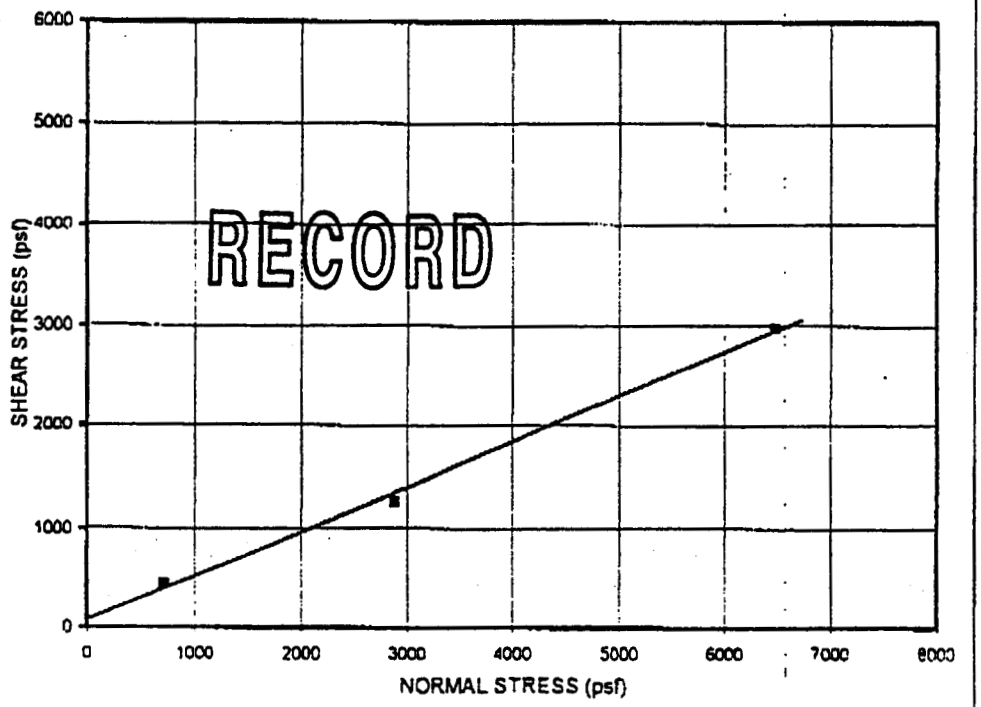
Test Point	Normal Stress psi	Normal Stress psf	Shear Stress psf	Secant Friction Angle
1.	5.0	720	450	32
2.	20.0	2880	1260	24
3.	45.0	6480	2980	25

Adhesion: 70 psf

Friction Angle: 24 degrees

Coefficient of Friction: 0.44

NOTE: GRAPH NOT TO SCALE



STRENGTH ENVELOPE
(at 2.5 in. displacement)

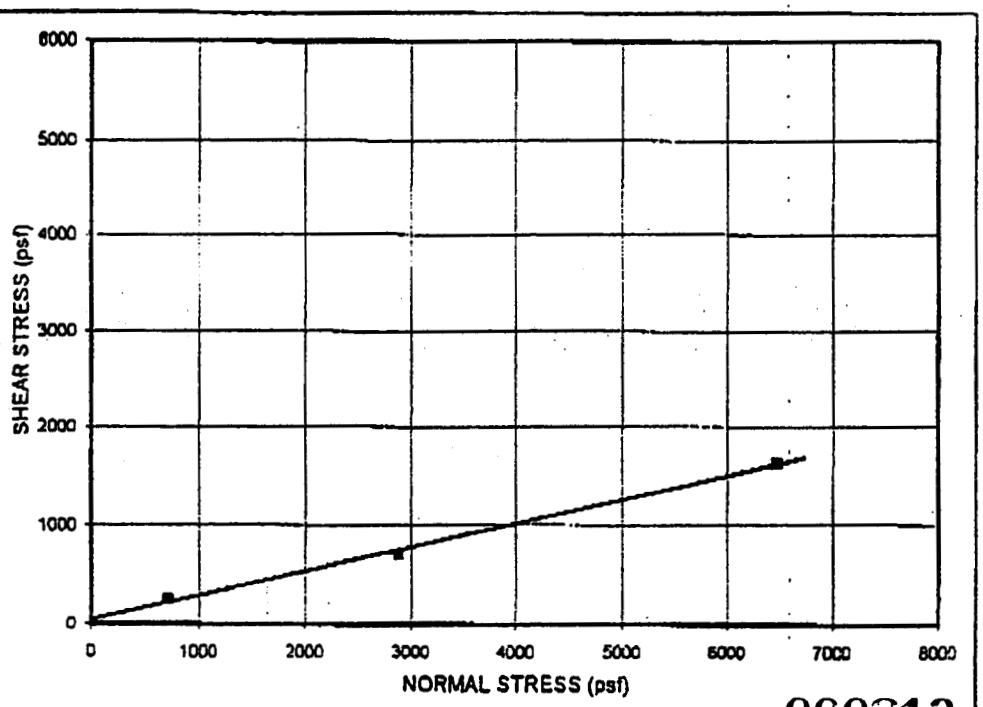
Test Point	Normal Stress psi	Normal Stress psf	Shear Stress psf	Secant Friction Angle
1.	5.0	720	250	19
2.	20.0	2880	700	14
3.	45.0	6480	1640	14

Adhesion: 40 psf

Friction Angle: 14 degrees

Coefficient of Friction: 0.24

NOTE. GRAPH NOT TO SCALE



000213

NOTE: The Friction Angle and Adhesion (or Cohesion) results given here are based on a mathematically determined best fit line. Further interpretation should be conducted by a qualified professional experienced in geosynthetic and geotechnical engineering.

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Entered By:	Reviewed By:	Report Date:	Lab Log:
RWM		06/15/99	121H

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LARGE SCALE DIRECT SHEAR REPORT

Test Method D-6243-B

2739

Client Name: PRECISION LABORATORIES Project Name: FERNALD SUPERFUND SITE Project No: 943022.37

Superstrate: ⇦ Board Spacers

Material 1: ⇦ CETCO Bentomat ST Lot # 199922020 Roll # 5335 LSN: BED Rasp Board

Material 2: ⇨ 80 mil GSE HDPE Textured / Textured Roll # 114101783 LSN: BEJ Clamped

Substrate: ⇨ Concrete Board with Sand Layer

DISPLACEMENT vs. SHEAR STRESS

Test Point	Normal Stress psi	Normal Stress psf
1.	5.0	720
2.	20.0	2880
3.	45.0	6480

MOISTURE DATA:

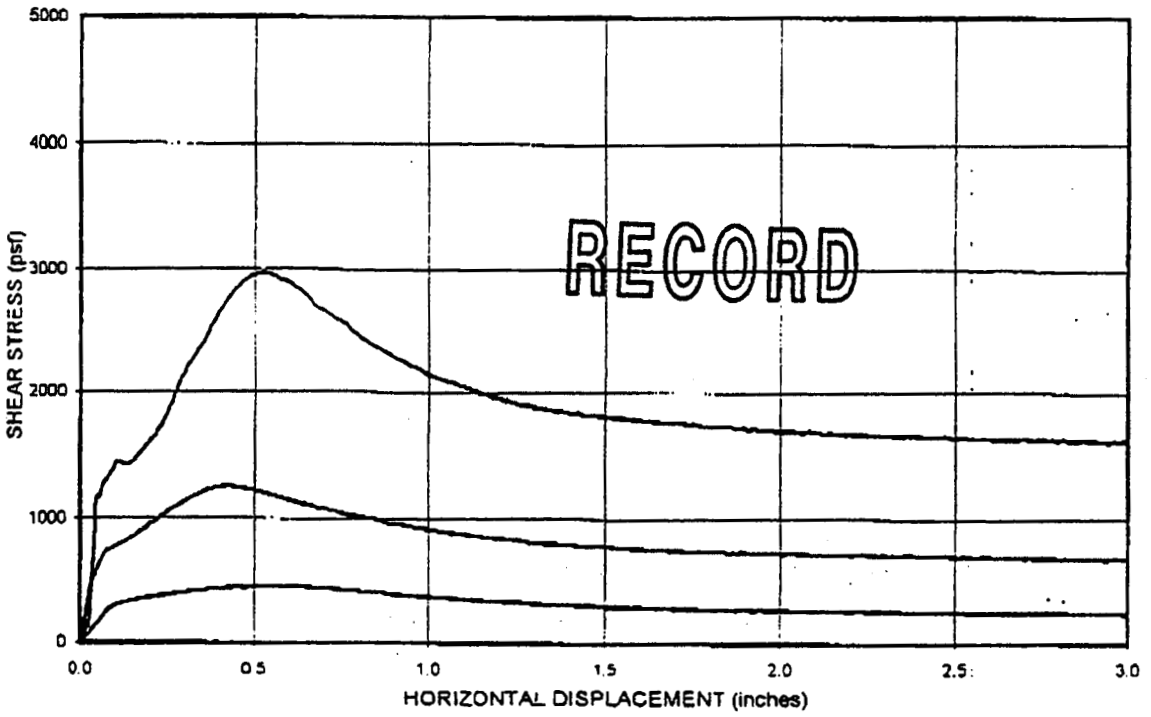
(GCL)

Initial Water Content: 15.8%

Initial Dry Density: N/A pcf

Final Water Content:(%)

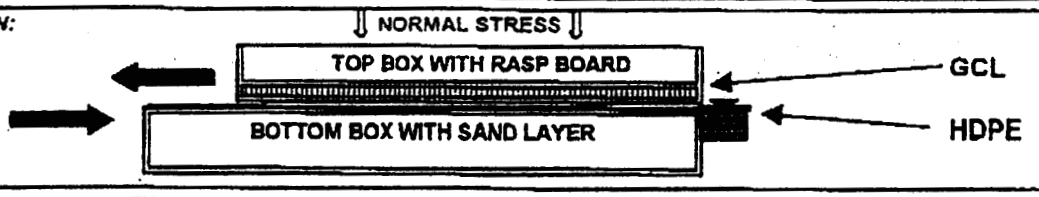
1.	2.	3.
107.4	72.9	65.0



STANDARD CONDITIONS: **SHEAR DISPLACEMENT RATE: 0.004 in/min**

1. The "gap" between shear boxes was set at 80 mil (2.0 mm)
2. The test specimens were flooded during testing unless otherwise noted.
3. High Normal Stresses, >5psi (35 kPa) was applied using air pressure.
4. Low Normal Stresses, <5psi (35 kPa) was applied using dead weights.
5. The tests were terminated after 3.0"(75 mm) of displacement unless otherwise noted.
6. Tests were performed in general accordance with ASTM procedure D-6243 using a Brainard-Killman LG-112 direct shear machine with an effective area of 12" x 12" (300 x300 mm).

TEST ORIENTATION:



SPECIAL TEST NOTES:

1. Each specimen of HDPE was cut to 14" x 20" and clamped to the lower box.
2. The textile portions of the GCL were wrapped around a 12"x12" rasp board in the upper box.
3. The GCL specimens were hydrated for 7 days at 3 psi, in contact with the textured HDPE.
4. After hydration each GCL / HDPE soil specimen was consolidated at the specified normal stress for 48 hrs., then sheared.
5. The woven textile side of the GCL was tested against the HDPE.
6. Shearing occurred at the interface between the textured HDPE and GCL specimens.
7. Minor stretching of the GCL occurred on points 2 and 3.

000214

By accepting the data and result represented on this page, Client agrees to limit the liability of Vector Engineering, Inc. from client and all other parties for claims arising out of use of this data to the cost for the respective test(s) represented hereon, and Client agrees to indemnify and hold harmless Vector from and against all liability in excess of the aforementioned limit.

Entered By:	Reviewed By:	Report Date:	Lab Log:
RWM	NLL	06/15/99	434U

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LARGE SCALE DIRECT SHEAR REPORT

Test Method D-6243-B

— 2739

Client Name: PRECISION LABORATORIES Project Name: FERNALD SUPERFUND SITE Project No: 943022.37

Superstrate: ⇦ Board Spacers

Material 1: ⇦ CETCO Bentomat ST Lot # 199922020 Roll # 5291 LSN: BEC Rasp Board

Material 2: ⇨ 80 mil GSE HDPE Textured / Textured Roll # 114101794 LSN: BEK Clamped

Substrate: ⇨ Concrete Board with Sand Layer

PEAK STRENGTH

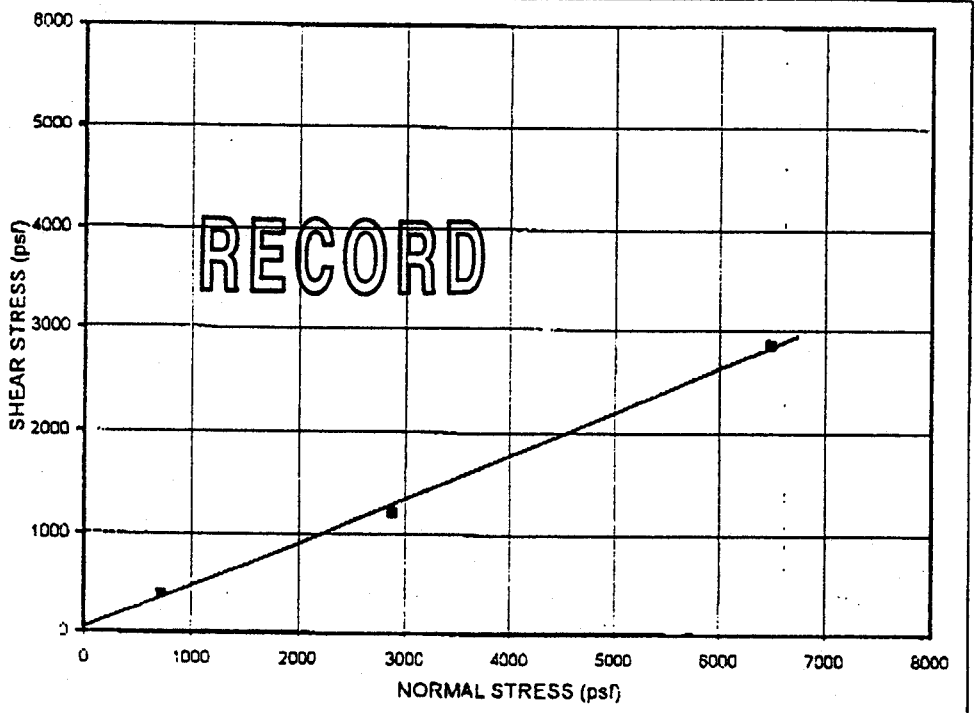
Test Point	Normal Stress psi	Normal Stress psf	Shear Stress psf	Secant Friction Angle
1.	5.0	720	400	29
2.	20.0	2880	1210	23
3.	45.0	6480	2860	24

Adhesion: 50 psf

Friction Angle: 23 degrees

Coefficient of Friction: 0.43

NOTE: GRAPH NOT TO SCALE



STRENGTH ENVELOPE

(at 2.5 in. displacement)

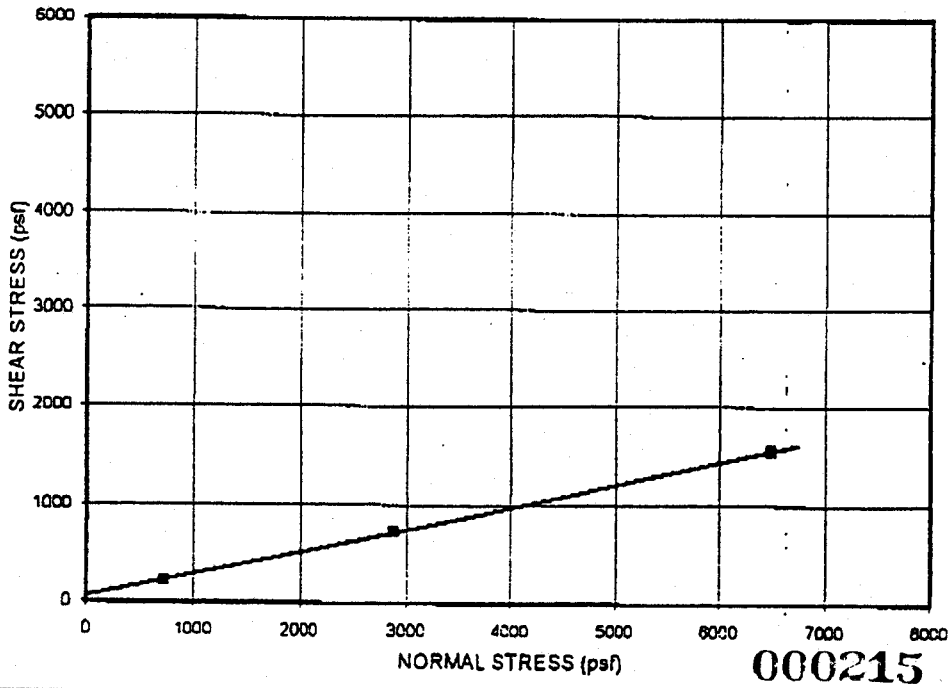
Test Point	Normal Stress psi	Normal Stress psf	Shear Stress psf	Secant Friction Angle
1.	5.0	720	230	18
2.	20.0	2880	730	14
3.	45.0	6480	1550	13

Adhesion: 60 psf

Friction Angle: 13 degrees

Coefficient of Friction: 0.23

NOTE: GRAPH NOT TO SCALE



000215

NOTE: The Friction Angle and Adhesion (or Cohesion) results given here are based on a mathematically determined best fit line. Further interpretation should be conducted by a qualified professional experienced in geosynthetic and geotechnical engineering.

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Entered By: RWM Reviewed By: Report Date: 06/17/99 Lab Log: 121G

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LARGE SCALE DIRECT SHEAR REPORT

Test Method D-6243-B 2739

Client Name: PRECISION LABORATORIES Project Name: FERNALD SUPERFUND SITE Project No: 943022.37

Superstrate: ⟸ Board Spacers

Material 1: ⟸ CETCO Bentomat ST Lot # 199922020 Roll # 5291 LSN: BEC Rasp Board

Material 2: ⟹ 80 mil GSE HDPE Textured / Textured Roll # 114101794 LSN: BEK Clamped

Substrate: ⟹ Concrete Board with Sand Layer

DISPLACEMENT vs. SHEAR STRESS

Test Point	Normal Stress psi	Normal Stress psf
1.	5.0	720
2.	20.0	2880
3.	45.0	6480

MOISTURE DATA:

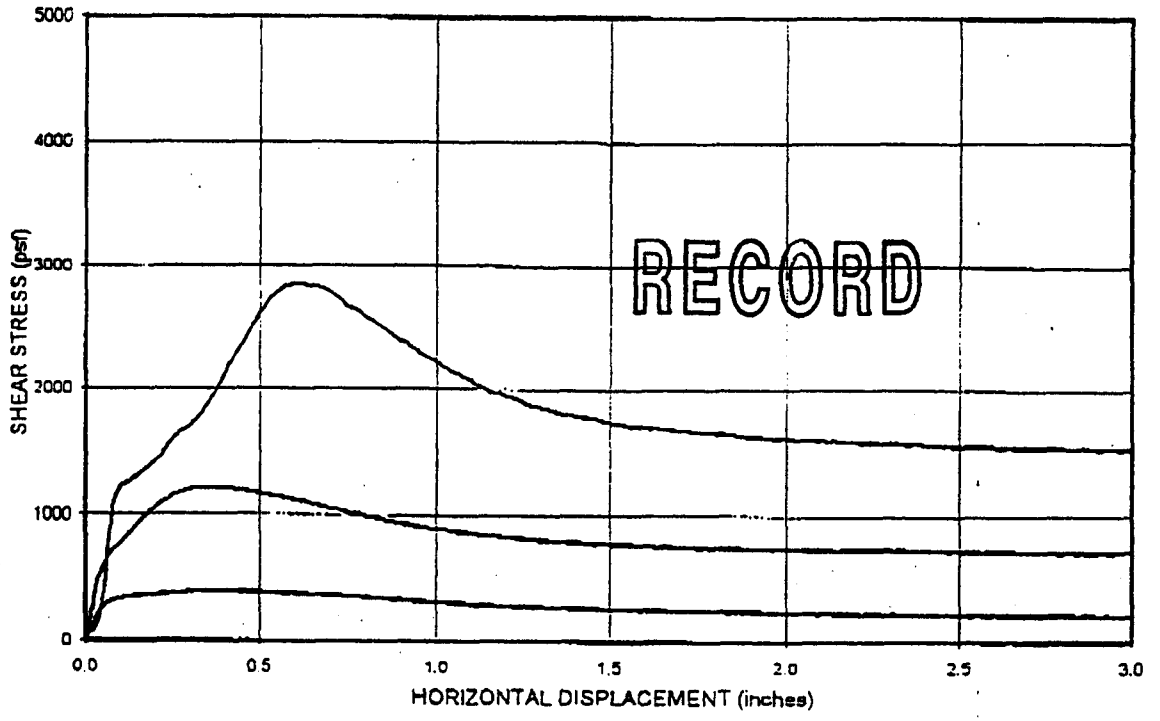
(GCL)

Initial Water Content: 20.6%

Initial Dry Density: N/A pcf

Final Water Content (%)

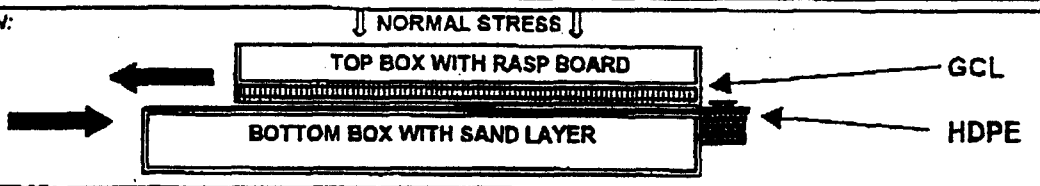
1.	2.	3.
111.1	82.4	73.0



STANDARD CONDITIONS: **SHEAR DISPLACEMENT RATE: 0.004 in/min**

1. The "gap" between shear boxes was set at 80 mil (2.0 mm)
2. The test specimens were flooded during testing unless otherwise noted.
3. High Normal Stresses, >5psi (35 kPa) was applied using air pressure.
4. Low Normal Stresses, <5psi (35 kPa) was applied using dead weights.
5. The tests were terminated after 3.0" (75 mm) of displacement unless otherwise noted.
6. Tests were performed in general accordance with ASTM procedure D-6243 using a Brainard-Killman LG-112 direct shear machine with an effective area of 12" x 12" (300 x300 mm).

TEST ORIENTATION:



SPECIAL TEST NOTES:

1. The GCL was wrapped around a 12"x12" rasp board in the upper box.
2. Each specimen of HDPE was cut to 14" x 20" and clamped to the lower box.
3. The HDPE was bolted to the lower shear box with "channel clamps".
4. The GCL specimens were hydrated for 7 days at 3 psi, in contact with the textured HDPE.
5. After hydration each GCL / HDPE soil specimen was consolidated at the specified normal stress for 48 hrs., then sheared.
6. The woven textile side of the GCL was tested against the HDPE.
7. Shearing occurred at the interface between the textured HDPE and GCL specimens.
8. Minor stretching of the GCL occurred at points 2 and 3.

000216

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Entered By: RWM Reviewed By: KA Report Date: 06/17/99 Lab Log: 121G

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LARGE SCALE DIRECT SHEAR REPORT

Test Method D-6243-B

2739

Client Name: PRECISION LABORATORIES Project Name: FERNALD SUPERFUND SITE Project No: 943022.37

Superstrate: ⟸ Board Spacers

Material 1: ⟸ CETCO Bentomat ST; Lot # 19992020 Roll # 5247 LSN: BEB Rasp Board

Material 2: ⟹ GSE 80 mil HDPE Textured/Textured; Roll # 114101806 LSN: BEL Clamped

Substrate ⟹ Concrete Board with Sand Layer

PEAK STRENGTH

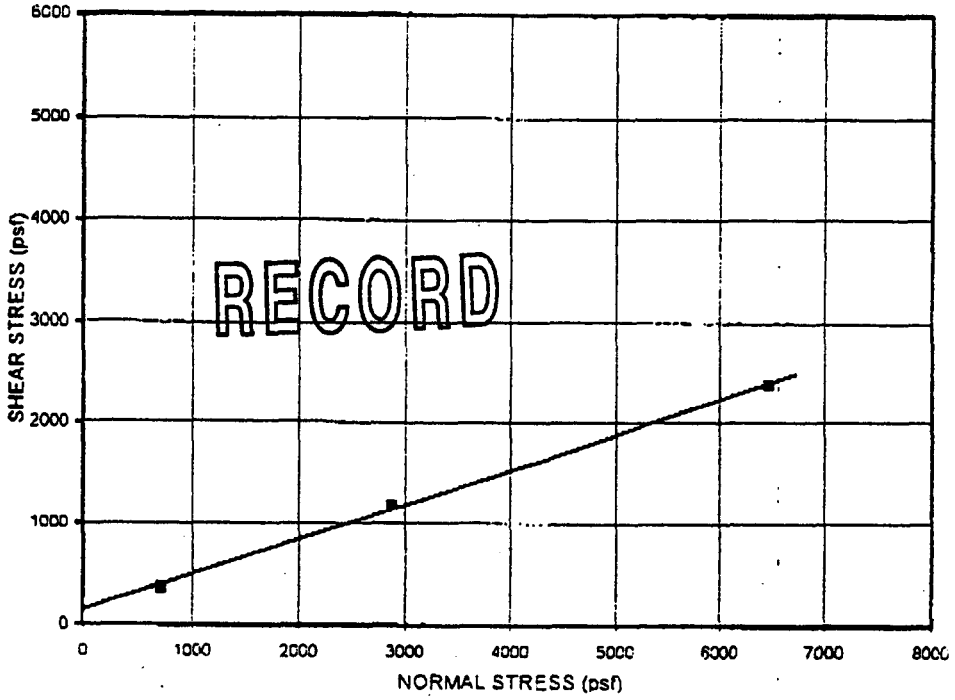
Test Point	Normal Stress psi	Normal Stress psf	Shear Stress psf	Secant Friction Angle
1.	5.0	720	360	27
2.	20.0	2880	1200	23
3.	45.0	6480	2380	20

Adhesion: 140 psf

Friction Angle: 19 degrees

Coefficient of Friction: 0.35

NOTE GRAPH NOT TO SCALE



STRENGTH ENVELOPE

(at 2.5 in. displacement)

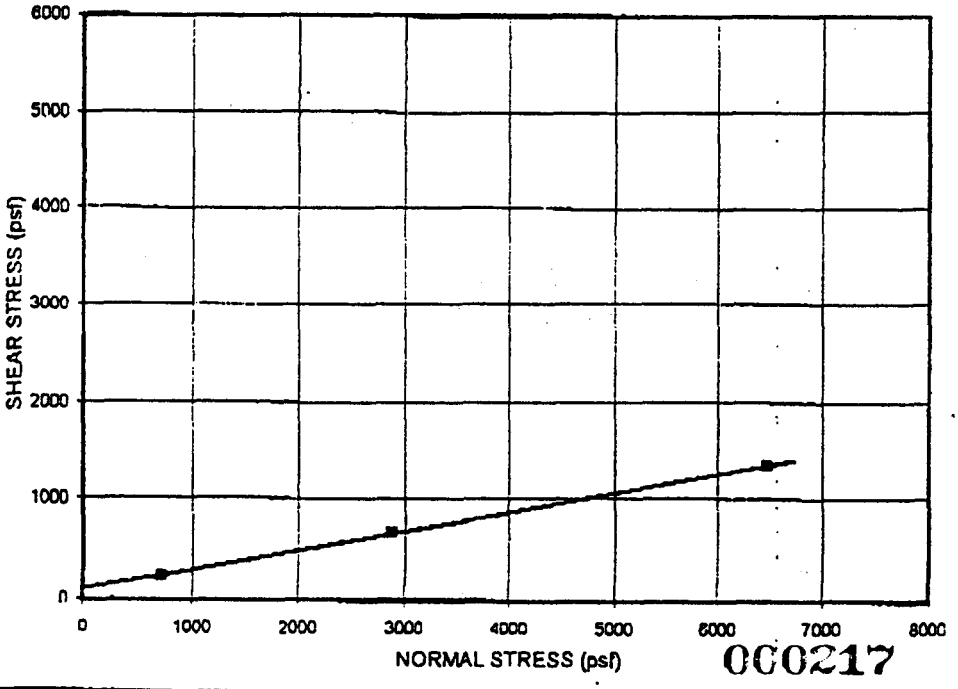
Test Point	Normal Stress psi	Normal Stress psf	Shear Stress psf	Secant Friction Angle
1.	5.0	720	230	18
2.	20.0	2880	680	13
3.	45.0	6480	1340	12

Adhesion: 110 psf

Friction Angle: 11 degrees

Coefficient of Friction: 0.19

NOTE: GRAPH NOT TO SCALE



NOTE: The Friction Angle and Adhesion (or Cohesion) results given here are based on a mathematically determined best fit line. Further interpretation should be conducted by a qualified professional experienced in geosynthetic and geotechnical engineering.

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Report Date: 06/21/99 Entered By: NCL Reviewed By: NVL Lab Log: 121-F

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LARGE SCALE DIRECT SHEAR REPORT

Test Method D-6243-B

2739

Client Name: PRECISION LABORATORIES Project Name: FERNALD SUPERFUND SITE Project No: 943022.37

Superstrate: ⇦ Board Spacers

Material 1. ⇦ CETCO Bentomat ST; Lot # 19992020 Roll # 5247 LSN: BEB Rasp Board

Material 2. ⇨ GSE 80 mil HDPE Textured/Textured; Roll # 114101806 LSN: BEL Clamped

Substrate ⇨ Concrete Board with Sand Layer

DISPLACEMENT vs. SHEAR STRESS

Test Point	Normal Stress psi	Normal Stress psf
1.	5.0	720
2.	20.0	2880
3.	45.0	6480

MOISTURE DATA:

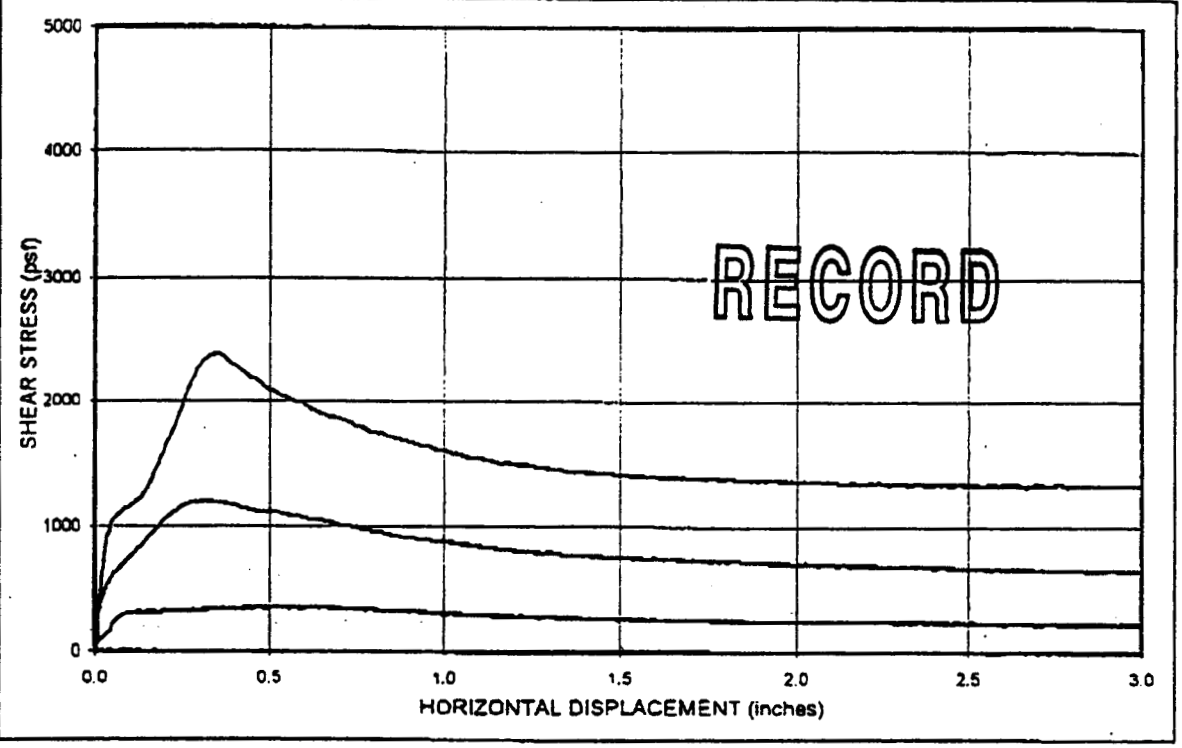
(GCL)

Initial Water Content: 20.8%

Initial Dry Density: NA pcf

Final Water Content:(%)

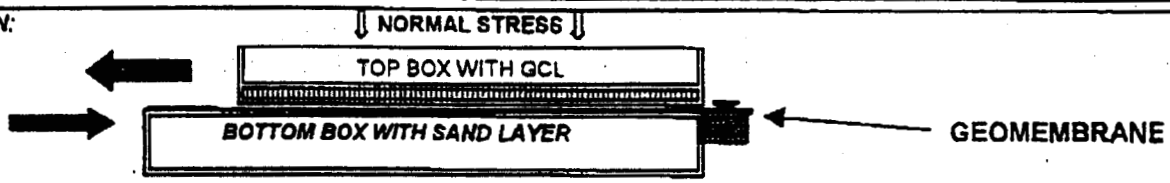
1.	2.	3.
131.6	96.3	78.9



STANDARD CONDITIONS: **SHEAR DISPLACEMENT RATE: 0.004 in/min**

1. The "gap" between shear boxes was set at 80 mil (2.0 mm)
2. The test specimens were flooded during testing unless otherwise noted.
3. High Normal Stresses, >5psi (35 kPa) was applied using air pressure.
4. Low Normal Stresses, <5psi (35 kPa) was applied using dead weights.
5. The tests were terminated after 3.0"(75 mm) of displacement unless otherwise noted.
6. Tests were performed in general accordance with ASTM procedure D-6243 using a Brainard-Killman LG-112 direct shear machine with an effective area of 12" x 12" (300 x300 mm)

TEST ORIENTATION:



SPECIAL TEST NOTES:

1. Each specimen of HDPE was cut to 14" x 20" and clamped to the lower box.
2. The GCL was wrapped around a 12"x12" rasp board in the upper box.
3. Each GCL specimen was hydrated for 7 days at 3 psi, in contact with the textured HDPE.
4. After hydration each GCL / HDPE specimen was consolidated at the specified consolidation stress for 48 hrs. then sheared.
5. The woven textile side of the GCL was tested against the HDPE.
6. Shearing occurred at the interface between the textured HDPE and GCL specimen.
7. Minor stretching of the non-woven fabric occurred in points 2 & 3.

000218

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Report Date: 06/21/99 Entered By: NCL Reviewed By: Nll Lab Log:

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LARGE SCALE DIRECT SHEAR REPORT

Test Method D-6243-B

2739

Client Name: PRECISION LABORATORIES Project Name: FERNALD SUPERFUND SITE Project No: 943022.37

Superstrate: ⇦ Board Spacers

Material 1: ⇦ CETCO Bentomat ST Lot # 199922020 Roll # 5203 LSN: BEA Rasp Board

Material 2: ⇨ GSE 80 mil HDPE Textured/Textured; Roll # 114101816 LSN: BEM Clamped

Substrate: ⇨ Concrete Board with Sand Layer

PEAK STRENGTH

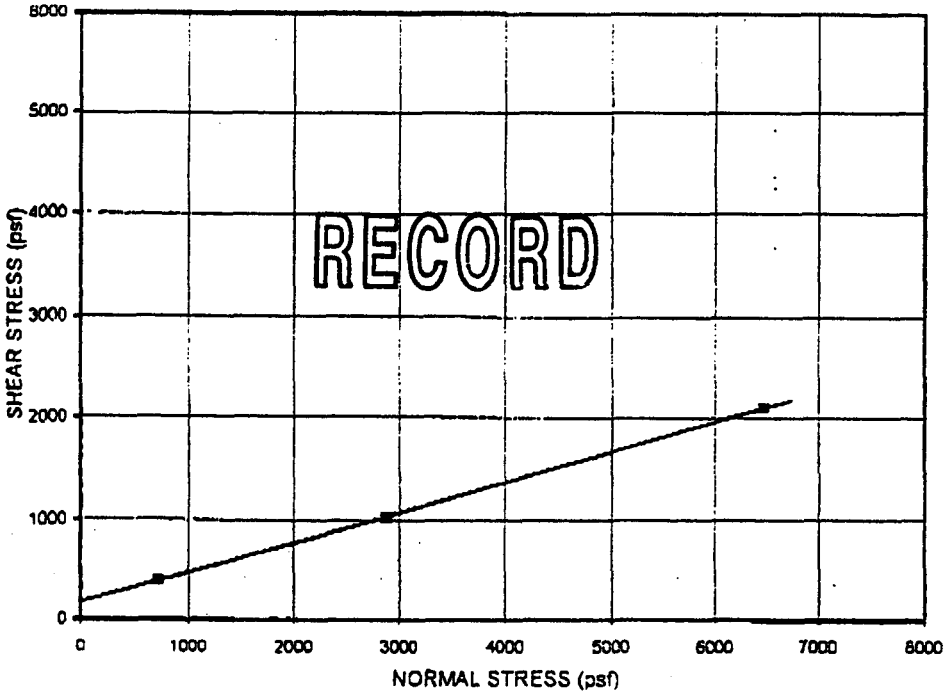
Test Point	Normal Stress psi	Normal Stress psf	Shear Stress psf	Secant Friction Angle
1.	5.0	720	400	29
2.	20.0	2880	1020	20
3.	45.0	6480	2100	18

Adhesion: 180 psf

Friction Angle: 17 degrees

Coefficient of Friction: 0.3

NOTE: GRAPH NOT TO SCALE



STRENGTH ENVELOPE
(at 2.5 in. displacement)

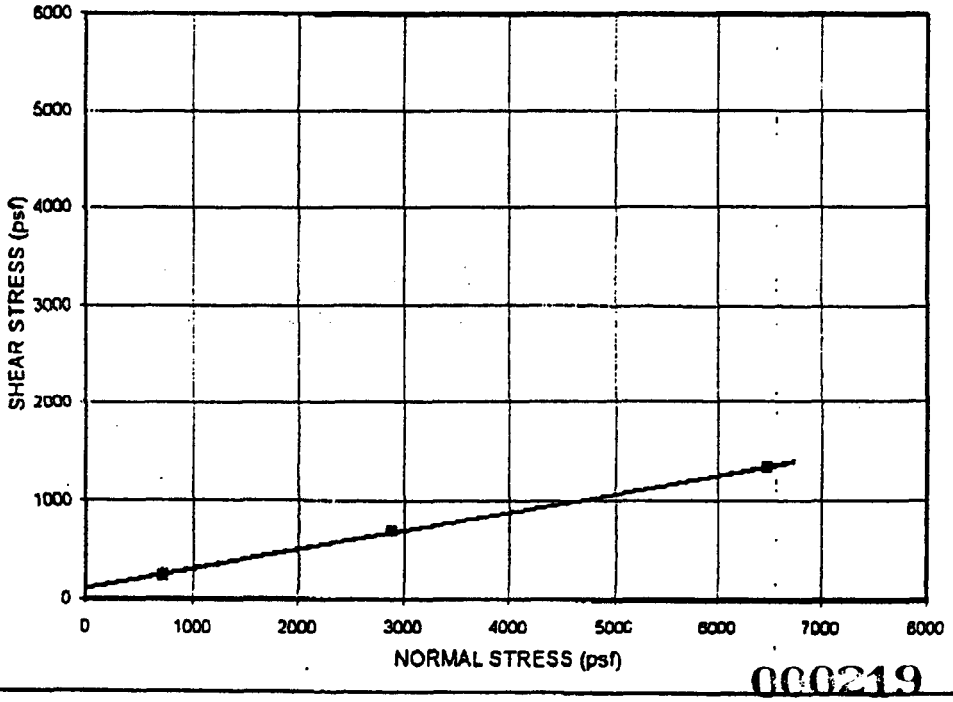
Test Point	Normal Stress psi	Normal Stress psf	Shear Stress psf	Secant Friction Angle
1.	5.0	720	230	18
2.	20.0	2880	670	13
3.	45.0	6480	1350	12

Adhesion: 100 psf

Friction Angle: 11 degrees

Coefficient of Friction: 0.18

NOTE: GRAPH NOT TO SCALE



000219

NOTE: The Friction Angle and Adhesion (or Cohesion) results given here are based on a mathematically determined best fit line. Further interpretation should be conducted by a qualified professional experienced in geosynthetic and geotechnical engineering.

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Entered By: RWM Reviewed By: MU Report Date: 06/21/99 Lab Log: 121E

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LARGE SCALE DIRECT SHEAR REPORT

Test Method D-6243-B

Client Name: PRECISION LABORATORIES Project Name: FERNALD SUPERFUND SITE Project No: 2739 943022.37

Superstrate: ⇦ Board Spacers

Material 1: ⇦ CETCO Bentomat ST Lot # 199922020 Roll # 5203 LSN: BEA Rasp Board

Material 2: ⇨ GSE 80 mil HDPE Textured/Textured; Roll # 114101816 LSN: BEM Clamped

Substrate: ⇨ Concrete Board with Sand Layer

DISPLACEMENT vs. SHEAR STRESS

Test Point	Normal Stress psi	Normal Stress psf
1.	5.0	720
2.	20.0	2880
3.	45.0	6480

MOISTURE DATA:

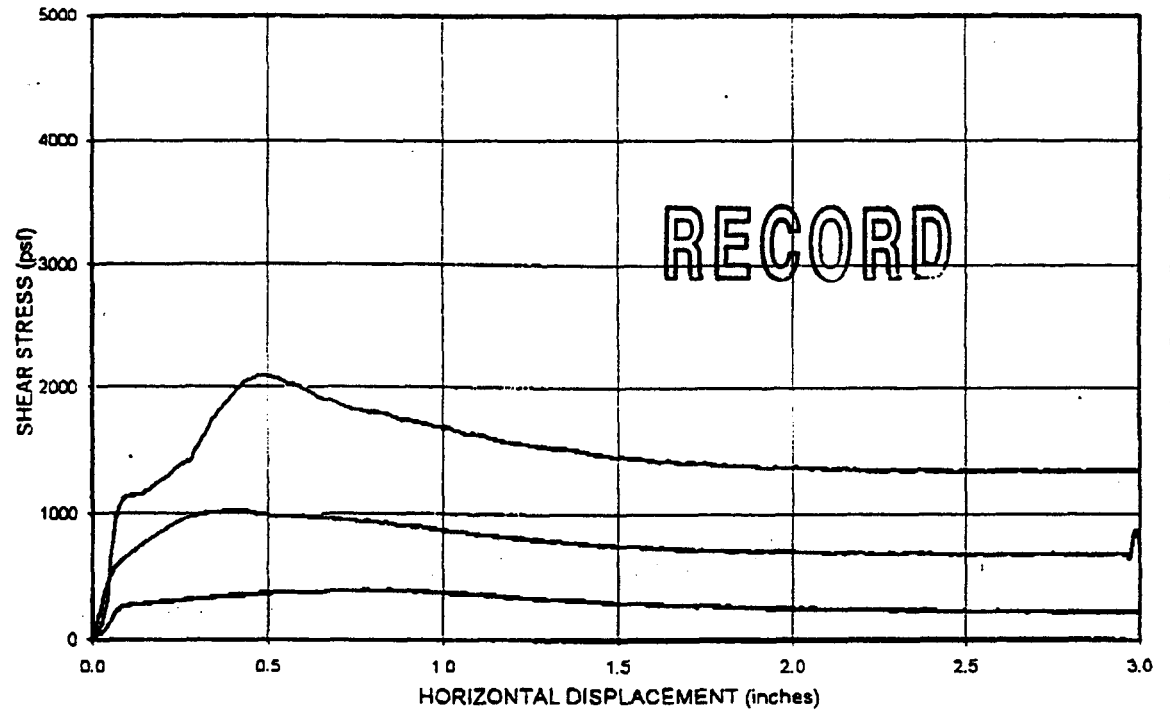
(GCL)

Initial Water Content: 20.1%

Initial Dry Density: N/A pcf

Final Water Content:(%)

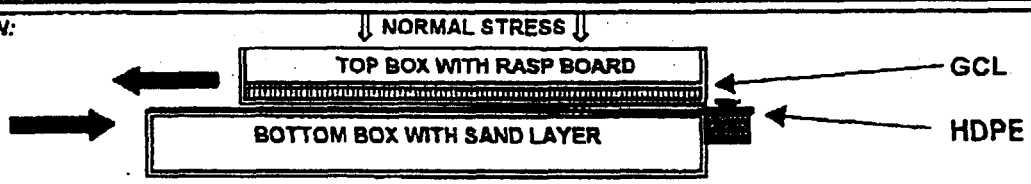
1.	2.	3.
135.5	109.4	70.5



STANDARD CONDITIONS: **SHEAR DISPLACEMENT RATE: 0.004 in/min**

1. The "gap" between shear boxes was set at 80 mil (2.0 mm)
2. The test specimens were flooded during testing unless otherwise noted.
3. High Normal Stresses, >5psi (35 kPa) was applied using air pressure.
4. Low Normal Stresses, <5psi (35 kPa) was applied using dead weights.
5. The tests were terminated after 3.0"(75 mm) of displacement unless otherwise noted.
6. Tests were performed in general accordance with ASTM procedure D-6243 using a Brainard-Killman LG-112 direct shear machine with an effective area of 12" x 12" (300 x300 mm).

TEST ORIENTATION:



SPECIAL TEST NOTES:

1. Each specimen of HDPE was cut to 14" x 20" and clamped to the lower box.
2. The textile portions of the GCL were wrapped around a 12"x12" rasp board in the upper box.
3. The GCL specimens were hydrated for 7 days at 3 psi, in contact with the textured HDPE.
4. After hydration each GCL / HDPE specimen was consolidated at the specified normal stress for 48 hrs., then sheared.
5. The woven textile side of the GCL was tested against the HDPE.
6. Shearing occurred at the interface between the textured HDPE and GCL specimens.
7. Minor stretching of the GCL occurred at points 2 and 3.

000220

By accepting the data and result represented on this page, Client agrees to limit the liability of Vector Engineering, Inc. from client and all other parties for claims arising out of use of this data to the cost for the respective test(s) represented hereon, and Client agrees to indemnify and hold harmless Vector from and against all liability in excess of the aforementioned limit.

Entered By: RWM Reviewed By: NL Report Date: 06/21/99 Lab Log: 1215

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LARGE SCALE DIRECT SHEAR REPORT

Test Method D-6243-B

2739

Client Name: PRECISION LABORATORIES Project Name: FERNALD SUPERFUND SITE Project No: 943022.37

Superstrate: ⇦ Board Spacers

Material 1: ⇦ CETCO Bentomat ST Lot # 19992020 Roll # 5159 LSN: BDX Resp Board

Material 2: ⇨ 80 mil GSE HDPE Textured/Textured Roll # 114101734 LSN: BEE Clamped

Substrate: ⇨ Concrete Board with Sand Layer

PEAK STRENGTH

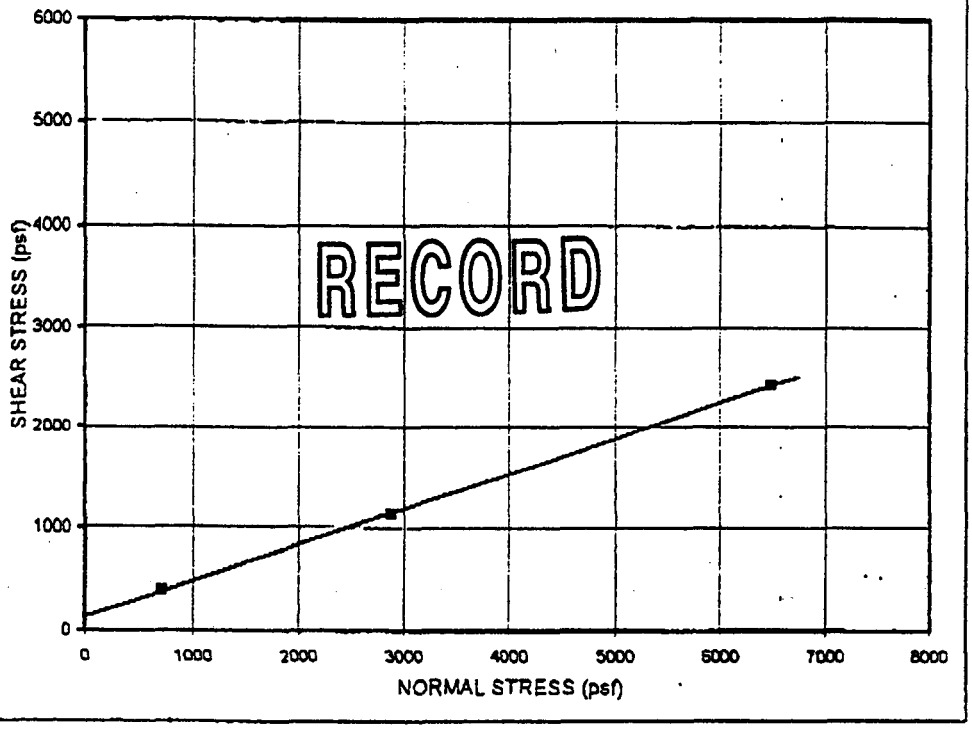
Test Point	Normal Stress psi	Normal Stress psf	Shear Stress psf	Secant Friction Angle
1.	5.0	720	400	29
2.	20.0	2880	1140	22
3.	45.0	6480	2420	20

Adhesion: 140 psf

Friction Angle: 19 degrees

Coefficient of Friction: 0.35

NOTE: GRAPH NOT TO SCALE



STRENGTH ENVELOPE

(at 2.5 in. displacement)

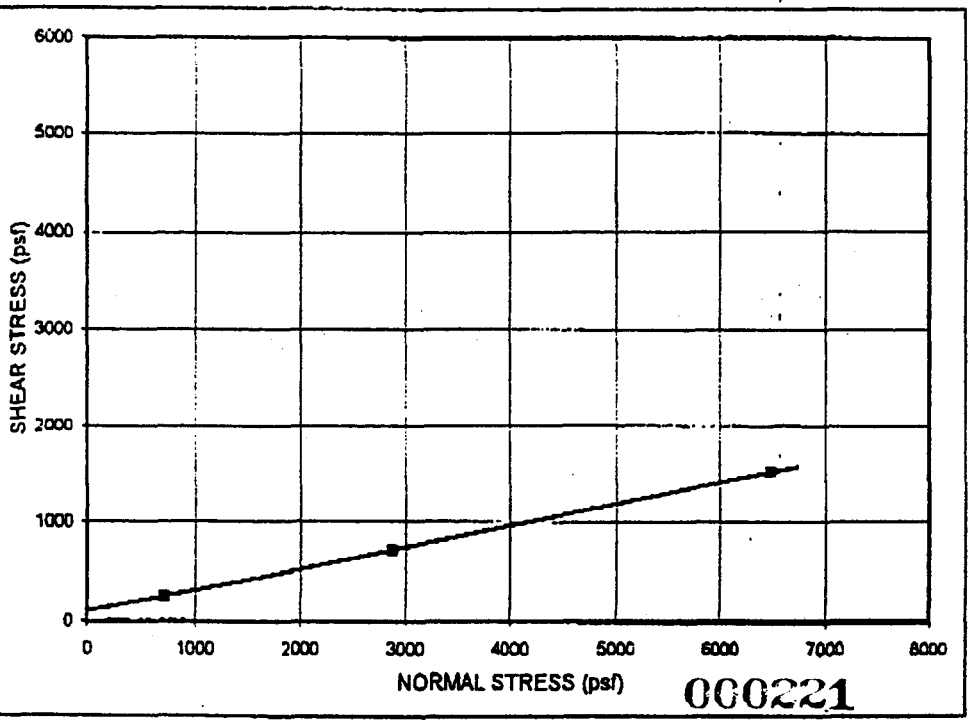
Test Point	Normal Stress psi	Normal Stress psf	Shear Stress psf	Secant Friction Angle
1.	5.0	720	250	19
2.	20.0	2880	730	14
3.	45.0	6480	1500	13

Adhesion: 100 psf

Friction Angle: 12 degrees

Coefficient of Friction: 0.22

NOTE: GRAPH NOT TO SCALE



000221

NOTE: The Friction Angle and Adhesion (or Cohesion) results given here are based on a mathematically determined best fit line. Further interpretation should be conducted by a qualified professional experienced in geosynthetic and geotechnical engineering.

By accepting the data and result represented on this page, Client agrees to limit the liability of Vector Engineering, Inc. from client and all other parties for claims arising out of use of this data to the cost for the respective test(s) represented hereon, and Client agrees to indemnify and hold harmless Vector from and against all liability in excess of the aforementioned limit

Entered By:	Reviewed By:	Report Date:	Lab Log:
RWM	NVL	06/23/99	121D

Vector Engineering Inc.
Laboratory Services
12438 Loma Rica Drive., Suite C, Grass Valley, CA 95945
(530) 272-2448 Fax (530) 272-8553

LARGE SCALE DIRECT SHEAR REPORT

Test Method D-6243-B

-- 2739

Client Name: PRECISION LABORATORIES Project Name: FERNALD SUPERFUND SITE Project No: 943022.37

Superstrate: ⇦ Board Spacers
Material 1: ⇦ CETCO Bentomat ST Lot # 19992020 Roll # 5159 LSN: BDX Rasp Board
Material 2: ⇨ 80 mil GSE HDPE Textured/Textured Roll # 114101734 LSN: BEE Clamped
Substrate: ⇨ Concrete Board with Sand Layer

DISPLACEMENT vs. SHEAR STRESS

Test Point	Normal Stress psi	Normal Stress psf
1.	5.0	720
2.	20.0	2880
3.	45.0	6480

MOISTURE DATA:

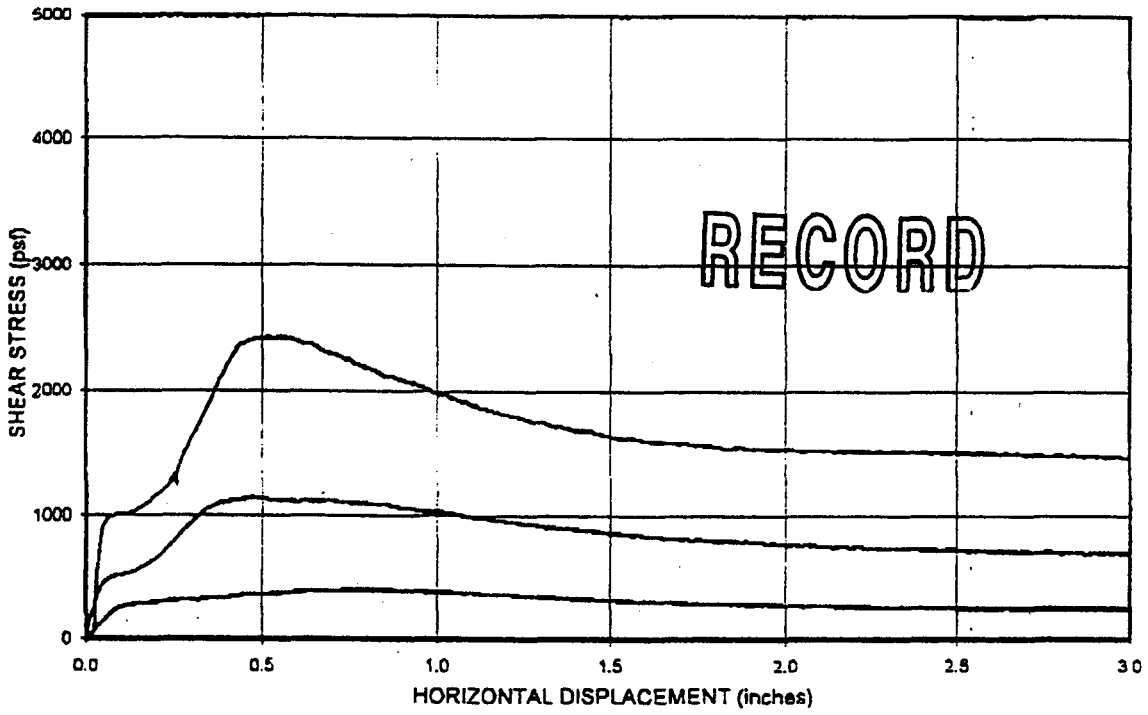
(GCL)

Initial Water Content 12.9%

Initial Dry Density: N/A pcf

Final Water Content:(%)

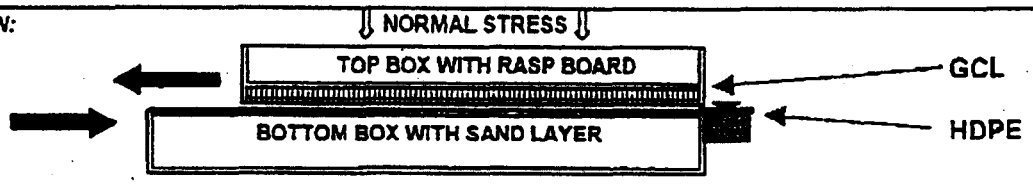
1.	2.	3.
137.3	126.7	77.5



STANDARD CONDITIONS: **SHEAR DISPLACEMENT RATE: 0.004 in/min**

1. The "gap" between shear boxes was set at 80 mil (2.0 mm)
2. The test specimens were flooded during testing unless otherwise noted.
3. High Normal Stresses, >5psi (35 kPa) was applied using air pressure.
4. Low Normal Stresses, <5psi (35 kPa) was applied using dead weights.
5. The tests were terminated after 3.0"(75 mm) of displacement unless otherwise noted.
6. Tests were performed in general accordance with ASTM procedure D-6243 using a Brainard-Killman LG-112 direct shear machine with an effective area of 12" x 12" (300 x300 mm).

TEST ORIENTATION:



SPECIAL TEST NOTES:

1. Each specimen of HDPE was cut to 14" x 20" and clamped to the lower box.
2. The textile portions of the GCL were wrapped around a 12"x12" rasp board in the upper box.
3. The GCL specimens were hydrated for 7 days at 3 psi, in contact with the textured HDPE.
4. After hydration each GCL / HDPE specimen was consolidated at the specified normal stress for 48 hrs., then sheared.
5. The woven textile side of the GCL was tested against the HDPE.
6. Shearing occurred at the interface between the textured HDPE and GCL specimens.
7. Minor stretching of the GCL specimens at point #2 and #3 was observed.

000222

By accepting the data and result represented on this page, Client agrees to limit the liability of Vector Engineering, Inc. from client and all other parties for claims arising out of use of this data to the cost for the respective test(s) represented hereon, and Client agrees to indemnify and hold harmless Vector from and against all liability in excess of the aforementioned limit.

Entered By:	Reviewed By:	Report Date:	Lab Log:
RWM	NCL	06/23/99	121D

SUPPLIER DOCUMENT SUBMITTAL

FDF PROJECT NO.: (1) 20102	CONTRACT NO: (2) 1440	SUBMITTAL NO.:(3) 006	REV.:(4) 4	DATE:(5) 7/6/99	Page 1 of 30 (6)

FROM: GSE Lining Technologies (7)

RECORD

SIGNATURE: _____

TO: FDF ENGINEERING/CONSTRUCTION
DOCUMENT CONTROL (ECDC), MS 52-7 (8)

RECEIVED BY: _____ DATE: _____

			DOCUMENT FAMILY									SUBMITTAL TYPE				SUBMITTAL ACTION		
QTY	DOCUMENT NUMBER	REV	PRO	H&S	MED	TRG	CON	ENG	QAC	OPER	TITLE/DESCRIPTION	DRFT	CFC	INF	ASSOCIATED SPECIFICATION	A	B	C
(9)	(10)	(11)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(13)	(14)	(14)	(14)	(15)	(16)	(16)	(16)
8	1440-006A	1						X			GCL Internal and Interface Shear Strength Test Results		X		02772P.1.04.B		X	

REVIEW DISTRIBUTION

NAME	MS	NAME	MS	NAME	MS
(17)	(18)	(17)	(18)	(17)	(18)
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Kwasi Badu-Tweneboah, GeoSyntec, Eng.	38				
Kathy Fisher, FDF, Procurement	64				
Gregg Johnson, FDF, Health and Safety	64				
Jim Turner, FDF, QA	64				
Chuck Van Arsdale, FDF, Eng.	64				

NO COMMENTS: _____ COMMENTS: (PLEASE USE SPACE BELOW FOR COMMENTS OR INDICATE IF ATTACHMENTS) (19)

Interface shear tests performed by Vector used ASTM D 6321 test procedures. Part 2-DIG, Section 02772P requires tests to be performed using ASTM D 5321 test standards.

27639

RECEIVED BY: [signature] (20) DATE: 7/7/99

(SIGN/DATE AND RETURN A COPY TO ECDC, MS 52-7)

SUBMITTAL TYPE: (BY SUPPLIER)
CFC - CERTIFIED FOR CONSTRUCTION
INF - INFORMATION/RECORD
DRFT - DRAFT/PRELIMINARY

SUBMITTAL ACTION CODE: (BY FDF)
A - Conforms to the Subcontract Requirements
B - Minor Comments - Incorporate and Resubmit
C - Revise and Resubmit (SEE COMMENTS)

FS-F-4955
Rev. 4: 04/??/1999

000223

-- 2739

PRECISION GEOSYNTHETIC LABORATORIES
1742 West Katella Suite #4, Orange, CA 92867

FAX RECORD

Date: 7/3/99
Number of pages including cover sheet: 29

To: Jim Turner
ERIC Reed

re: Final Report
FERNALD.

Phone: 281-230-8663
Fax phone: 513-648-5767
CC:

From: Cora Guy

Phone: 714-744-4599
Fax phone: 714-744-0357

REMARKS: ☐ Urgent ☐ For your review ☐ Reply ASAP ☐ Please comment

ERIC,
You should receive 3 orig copies of the report Thursday via Fedex.

Jim,
Sorry for the delay. I tried to contact you last Friday to get your FedEX address. However I FedX 3 orig copies to ERIC. If you need more let me know.
Many Thanks. Cora.

2739

Precision Geosynthetic Laboratories

July 1, 1999

RECORD

Mr. Eric Reed
GSE LINING TECHNOLOGY, INC.
19103 Gundle Road
Houston, Texas 77073

Dear Mr. Reed

RE: Fernald Superfund Site

Thank you for consulting Precision Geosynthetic Laboratories for your material testing needs.

Enclosed is the laboratory report for the testing of seventeen (17) Bentomat ST GCL and nine (9) 80 mil textured HDPE samples received May 28 and June 1, 1999.

It should be noted that the test specimen and test sample used for this report was believed to be representative of the material produced under the designation herein stated. However, these results are indicative of only the specimens that were actually tested. The testing herein is based upon accepted industry practice as well as the test method listed. Precision Geosynthetic Laboratories neither accepts responsibility for nor makes claims to the final use and purpose of the material.

By accepting the data and results represented on this report, Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims arising out of the use of this data to the cost for the respective test(s) represented in this report, and Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liability in excess of the aforementioned limit.

The test data and all associated project information shall be held in confidence and disclosed to other parties only with the authorization of Client or Precision Geosynthetic Laboratories.

If you have any questions or if we Maybe of further service, please do not hesitate to call at 800-522-4599.

Sincerely,

PRECISION GEOSYNTHETIC LABORATORIES

Cora B. Queja
Quality Assurance

Ronald E. Belanger
Technical Director

Enclosure: (Job No. 990501)

1742 West Katella Ave., Suite #4, Orange, CA 92867 TEL : (714) 744-4599 FAX : (714) 744-0357

2739

RECORD

July 1, 1999

VERIFICATION OF MATERIAL PROPERTIES
Geosynthetic Samples
FERNALD SUPERFUND SITE

FOR: GSE LINING TECHNOLOGY, INC.
(Reference: PGL Job No. 990501)

MATERIAL DESCRIPTION: 17- Bentomat ST GCL and 9- 80 mil textured HDPE geomembrane

No. of MATERIALS: (26)

MANUFACTURER: CETCO / Lovell, WY, GSE, Houston, TX

DATE RECEIVED: May 28 and June 1, 1999

SHIPPER: Federal Express.

SAMPLE IDENTIFICATIONS:

SAMPLE ID	PRECISION CONTROL NUMBER
Bentomat ST GCL Samples Received By Precision Geosynthetic Laboratories:	
Roll #5012 Lot #199922020	C #38093
Roll #5056 Lot #199922020	C #38094
Roll #5100 Lot #199922020	C #38095
Roll #5232 Lot #199922020	C #38196
Roll #5276 Lot #199922020	C #38197
Roll #5320 Lot #199922020	C #38198
Roll #5144 Lot #199922020	C #38199
Roll #5188 Lot #199922020	C #38200
Roll #5358 Lot #199922020	C #38201
Bentomat ST GCL Samples Received By Vector Engineering, Inc.:	
Roll #5072 Lot #199922020	
Roll #5115 Lot #199922020	
Roll #5359 Lot #199922020	
Roll #5335 Lot #199922020	
Roll #5291 Lot #199922020	
Roll #5247 Lot #199922020	
Roll #5203 Lot #199922020	
Roll #5159 Lot #199922020	
80 mil Textured HDPE Geomembrane Samples Received By Vector Engineering, Inc.:	
Roll #114101743	
Roll #114101753	
Roll #114101774	
Roll #114101783	
Roll #114101794	
Roll #114101806	
Roll #114101807	
Roll #114102816	
R[illegible]734	

Precision Geosynthetic Laboratories

-- 2739

Precision Geosynthetic Laboratories

Page 2.
FOR: GSE LINING TECHNOLOGY, INC.
Reference: PGL Job No. 990501
Date: July 1,1999

RECORD

TEST REQUIRED:

DESCRIPTION	TEST METHOD
Internal Shear	ASTM D5321
Interface Shear	ASTM D5321

TEST CONDITIONS: The samples were conditioned for a minimum one hour in the laboratory at 22 ± 2°C (71.6 ± 3.6°F) and at 60 ± 10% relative humidity prior to test.

TEST RESULTS:

The test results are summarized in Tables 1 through 9. The units in which the data are reported are included on the tables.

PRECISION GEOSYNTHETIC LABORATORIES

Cora B. Queja
Quality Assurance

Ronald E. Belanger
Technical Director

1742 West Katella Ave., Suite #4, Orange, CA 92867 TEL : (714) 744-4599 FAX : (714) 744-0357

- 2739

TABLE 1.
MATERIAL PROPERTIES
FERNALD OSDF

FOR: GSE LINING TECHNOLOGY
(Reference: PGL Job No. 990501)

June 8, 1999

INTERNAL SHEAR TEST RESULT (ASTM D6243)

TEST CONDITIONS:

RECORD

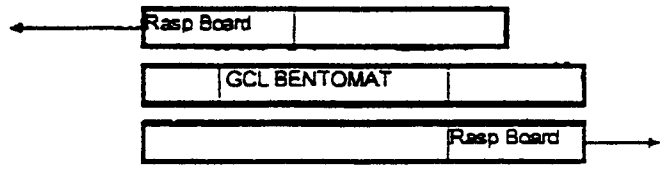
SAMPLE PREPARATION
1. Specimens were cut to 20" x 20"

HYDRATION:
1. Hydrated for 7 days at 3 psi using dead weights

CONSOLIDATION:
1. Each set of specimen was consolidated for 48 hrs at 5, 20, & 45 psi.
2. Loads were applied by pneumatic pressure.

SHEAR TEST:
1. Shear test was conducted at 0.004 in/ min
2. Sheared at minimum 2 inch horizontal displacement.
3. The test specimens were flooded during testing.
4. Tests were performed in general accordance with ASTM D5321-93 Method A using Brainard- Kilman LG-112 Direct Shear machine with effective area of 12 in x 12 in.

TEST CONFIGURATION



SAMPLE IDENTIFICATION:
PGL C# 38093. GCL Roll # 5012

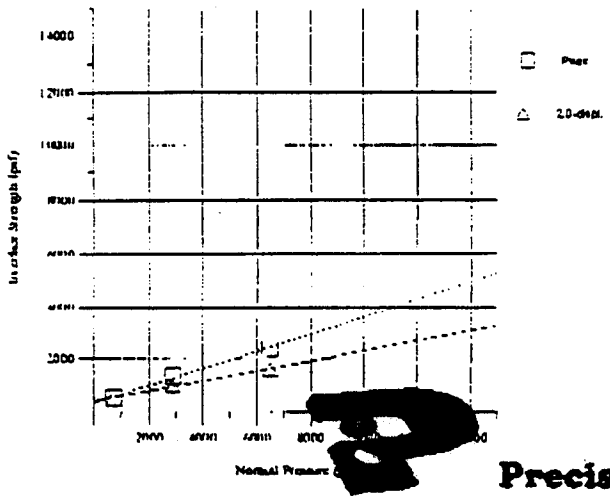
TEST RESULTS:

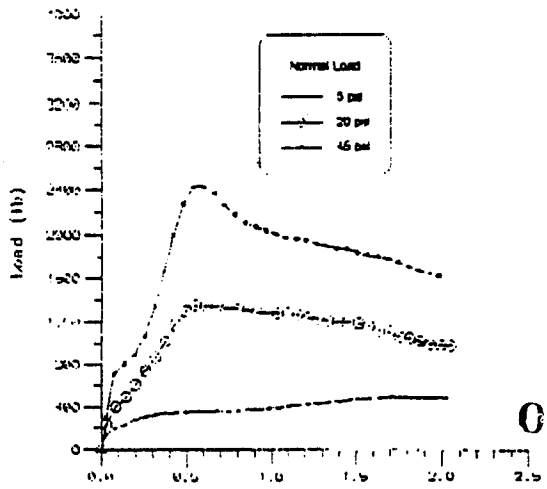
STRENGTH

SAMPLE ID	NORMAL STRESS (psi)	NORMAL STRESS (psf)	Moisture Content (%)	PEAK STRENGTH SHEAR STRESS (psf)	PEAK STRENGTH PEAK SECANT ANGLE	2" DISPLACEMENT SHEAR STRESS (psf)	2" DISPLACEMENT 2" DISPLACEMENT SECANT ANGLE
C# 38093	5	720	148.78	502	35	492	34
	20	2880	110.49	1353	25	986	19
	45	6480	69.87	2430	21	1623	14
	COHESION:			316		381	

OBSERVATIONS:

Stitches of specimens sheared at 20 and 45 psi normal stresses were completely separated from woven side at 2" displacement. For 5 psi normal load, less than 10% of stitches were separated.





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Precision Geosynthetic Laboratories

TABLE 2.
MATERIAL PROPERTIES
FERNALD OSDF

- 2739

FOR: GSE LINING TECHNOLOGY
(Reference: PGL Job No. 990501)

June 10, 1999

INTERNAL SHEAR TEST RESULT (ASTM D5321)

TEST CONDITIONS:

RECORD

SAMPLE PREPARATION

1. Specimens were cut to 20" x 20"

HYDRATION:

1. Hydrated for 7 days at 3 psi using dead weights

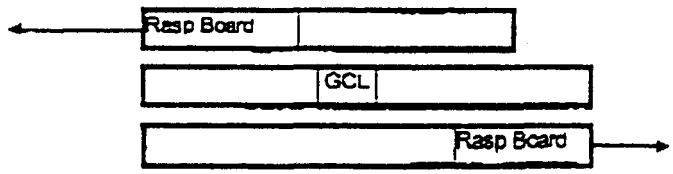
CONSOLIDATION:

1. Each set of specimen was consolidated for 48 hrs at 5, 20, & 45 psi.
2. Loads were applied by pneumatic pressure.

SHEAR TEST:

1. Shear test was conducted at 0.004 in/ min
2. Sheared at minimum 2 inch horizontal displacement.
3. The test specimens were flooded during testing.
4. Tests were performed in general accordance with ASTM D5321-93 Method A using Brainard- Kilman LG-112 Direct Shear machine with effective area of 12 in x 12 in.

TEST CONFIGURATION



SAMPLE IDENTIFICATION:

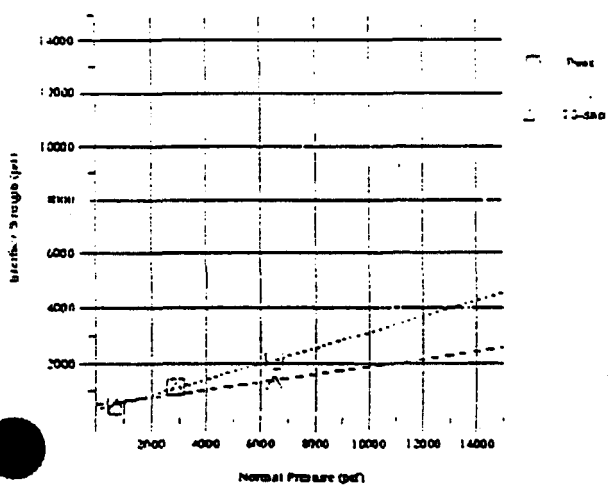
PGL C# 38094 GCL Roll # 5056

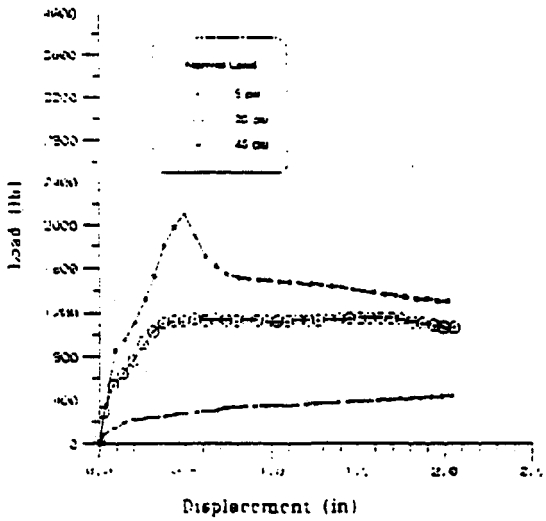
TEST RESULTS:

SAMPLE ID	NORMAL STRESS (psi)	NORMAL STRESS (psf)	Moisture Content (%)	PEAK STRENGTH: SHEAR STRESS (psf)	PEAK STRENGTH: PEAK SECANT ANGLE	2" DISPLACEMENT STRENGTH: SHEAR STRESS (psf)	2" DISPLACEMENT STRENGTH: 2" DISPLACEMENT SECANT ANGLE
C# 38094	5	720	141.02	441	31	441	31
	20	2880	109.21	1153	22	1069	20
	45	6480	75.22	2109	18	1308	11
COHESION:				357		462	

OBSERVATIONS:

Stitiches of specimens sheared at 45 psi normal stresses was completely separated from woven side at 2" displacement. For 5 psi normal load, less than 10% of stitches were separated and for 20 psi, about 50%.





Precision Geosynthetic Laboratories

TABLE 3
MATERIAL PROPERTIES
FERNALD OSDF

-- 2739

FOR: GSE LINING TECHNOLOGY
(Reference: PGL Job No. 990501)

June 13, 1999

INTERNAL SHEAR TEST RESULT (ASTM D5321)

TEST CONDITIONS:

RECORD

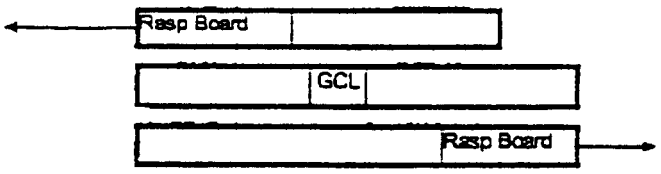
SAMPLE PREPARATION
1. Specimens were cut to 20" x 20"

HYDRATION:
1. Hydrated for 7 days at 3 psi using dead weights

CONSOLIDATION:
1. Each set of specimen was consolidated for 48 hrs at 5, 20, & 45 psi.
2. Loads were applied by pneumatic pressure.

SHEAR TEST:
1. Shear test was conducted at 0.004 in/ min
2. Sheared at minimum 2 inch horizontal displacement.
3. The test specimens were flooded during testing.
4. Tests were performed in general accordance with ASTM D5321-93 Method A using Brainard- Kilman LG-112 Direct Shear machine with effective area of 12 in x 12 in.

TEST CONFIGURATION



SAMPLE IDENTIFICATION:
PGL C# 38095. GCL Roll # 5100

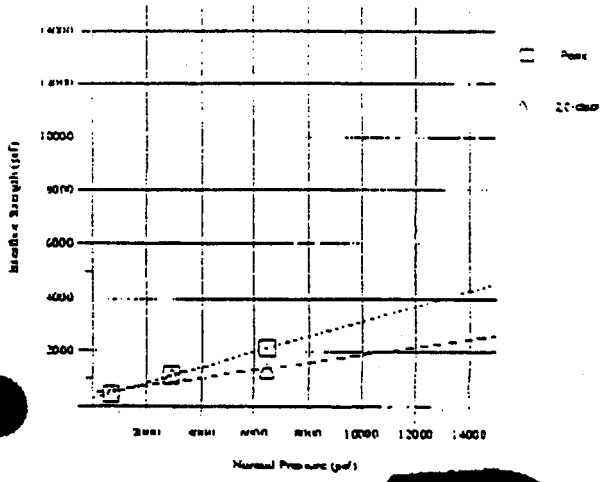
TEST RESULTS:

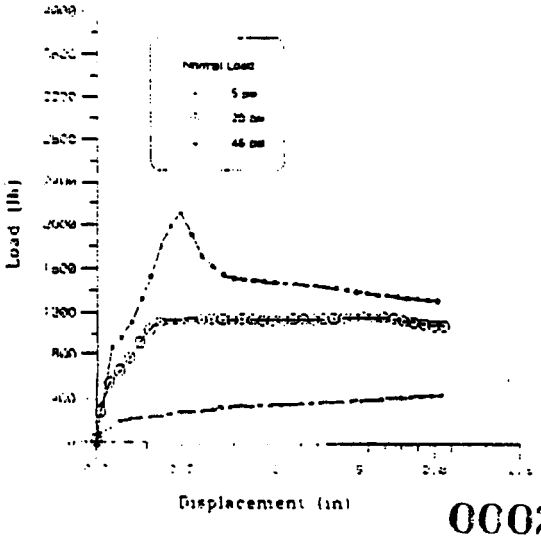
STRENGTH

SAMPLE ID	NORMAL STRESS (psi)	NORMAL STRESS (psf)	Moisture Content (%)	PEAK STRENGTH SHEAR STRESS (psf)	PEAK STRENGTH PEAK SECANT ANGLE	2" DISPLACEMENT SHEAR STRESS (psf)	2" DISPLACEMENT 2" DISPLACEMENT SECANT ANGLE
C# 38095	5	720	132.20	426	31	426	31
	20	2880	98.34	968	19	779	15
	45	6480	59.11	2221	19	1092	10
COHESION:				357		462	

OBSERVATIONS:

Stitches of specimens sheared at 45 psi normal stresses was completely separated from woven side at 2" displacement. Specimens for 5 psi normal load, less than 10% of stitches were separated and for 20 psi, about 50%.





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Precision Geosynthetic Laboratories

TABLE 4.
MATERIAL PROPERTIES
FERNALD OSDF

2739

FOR: GSE LINING TECHNOLOGY
(Reference: PGL Job No. 990501)

June 25, 1999

INTERNAL SHEAR TEST RESULT (ASTM D5321)

TEST CONDITIONS:

RECORD

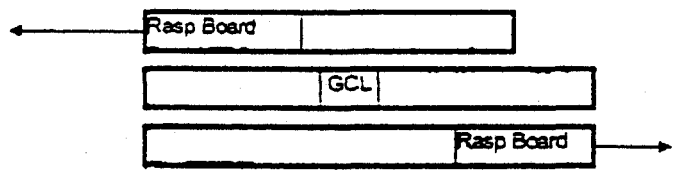
SAMPLE PREPARATION
1. Specimens were cut to 20" x 20"

HYDRATION:
1. Hydrated for 7 days at 3 psi using dead weights

CONSOLIDATION:
1. Each set of specimen was consolidated for 48 hrs at 5, 20, & 45 psi.
2. Loads were applied by pneumatic pressure.

SHEAR TEST:
1. Shear test was conducted at 0.004 in/ min
2. Sheared at minimum 2 inch horizontal displacement.
3. The test specimens were flooded during testing.
4. Tests were performed in general accordance with ASTM D5321-93 Method A using Brainard- Kilman LG-112 Direct Shear machine with effective area of 12 in x 12 in.

TEST CONFIGURATION



SAMPLE IDENTIFICATION:
PGL C# 38096, GCL Roll # 5232

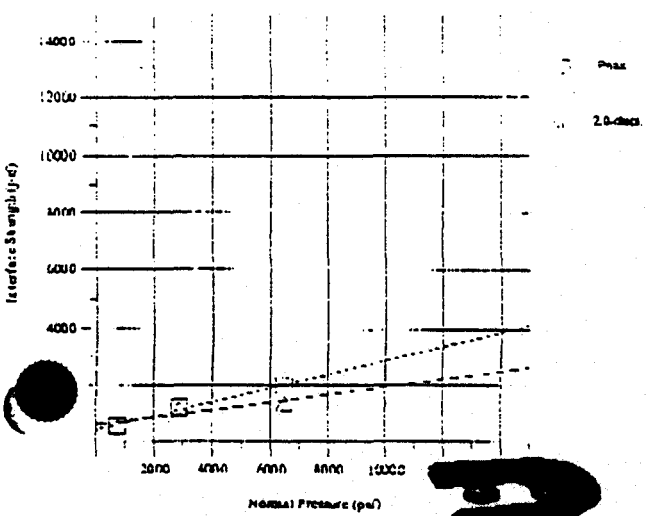
TEST RESULTS:

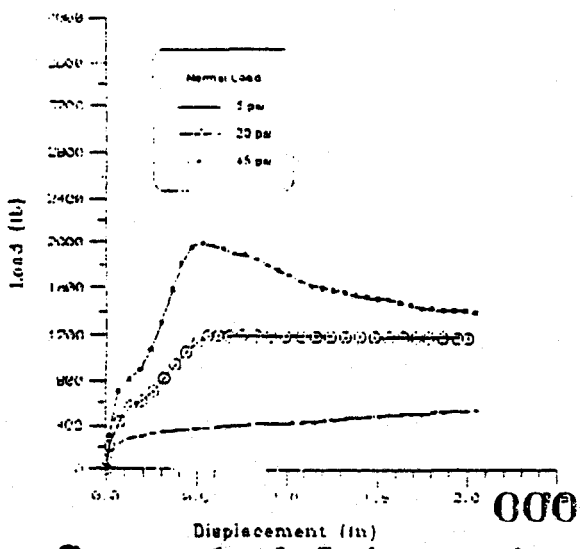
STRENGTH

SAMPLE ID	NORMAL STRESS (psi)	NORMAL STRESS (psf)	Moisture Content (%)	SHEAR STRESS (psf) PEAK STRENGTH	PEAK SECANT ANGLE	SHEAR STRESS (psf) 2" DISPLACEMENT	2" DISPLACEMENT SECANT ANGLE
C# 38196	5	720	122.20	540	37	540	37
	20	2880	91.34	1204	23	1174	22
	45	6480	56.11	1996	17	1395	12
COHESION:				409		567	

OBSERVATIONS:

Stitches of specimen sheared at 45 psi normal stresses was completely separated from woven side at 2" displacement. Specimens for 5 and 20 psi normal loads, less than 10% of stitches were separated.





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Precision Geosynthetic Laboratories

TABLE 5.
MATERIAL PROPERTIES
FERNALD OSDF

2739

FOR: GSE LINING TECHNOLOGY
(Reference: PGL Job No. 990501)

June 25, 1999

INTERNAL SHEAR TEST RESULT (ASTM D5321)

TEST CONDITIONS:

RECORD

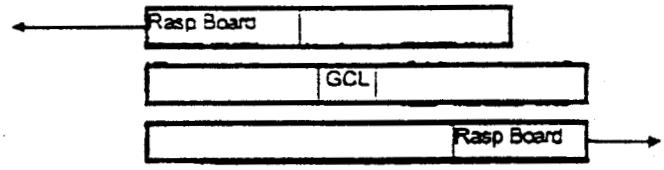
SAMPLE PREPARATION
1 Specimens were cut to 20" x 20"

HYDRATION:
1. Hydrated for 7 days at 3 psi using dead weights

CONSOLIDATION:
1. Each set of specimen was consolidated for 48 hrs at 5, 20, & 45 psi.
2. Loads were applied by pneumatic pressure.

SHEAR TEST:
1. Shear test was conducted at 0.004 in/ min
2. Sheared at minimum 2 inch horizontal displacement.
3. The test specimens were flooded during testing.
4. Tests were performed in general accordance with ASTM D5321-93 Method A using Brainard- Kilman LG-112 Direct Shear machine with effective area of 12 in x 12 in.

TEST CONFIGURATION



SAMPLE IDENTIFICATION:
PGL C# 38201, GCL Roll # 5358

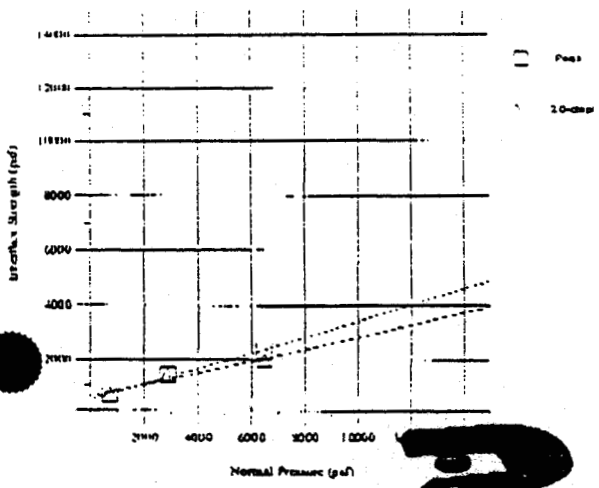
TEST RESULTS:

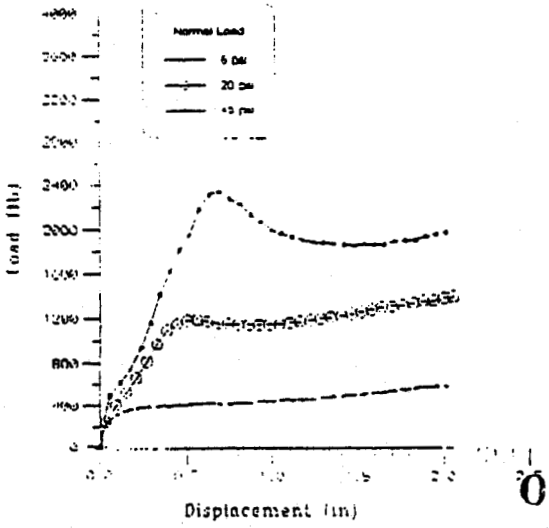
STRENGTH

SAMPLE ID	NORMAL STRESS (psi)	NORMAL STRESS (psf)	Moisture Content (%)	PEAK STRENGTH SHEAR STRESS (psf)	PEAK STRENGTH PEAK SECANT ANGLE	2" DISPLACEMENT SHEAR STRESS (psf)	2" DISPLACEMENT 2" DISPLACEMENT SECANT ANGLE
C# 38201	5	720	135.11	595	40	595	40
	20	2880	88.22	1397	26	1397	26
	45	6480	61.72	2340	20	1958	17
COHESION:				440		549	

OBSERVATIONS:

Stitches of specimens sheared at 45 psi normal stresses was completely separated from woven side at 2 " displacement . Specimens for 5 and 20 psi normal loads, less than 10% of stitches were separated .





000232

Precision Geosynthetic Laboratories

-- 2739

TABLE 6
MATERIAL PROPERTIES
FERNALD OSDF

FOR: GSE LINING TECHNOLOGY
(Reference: PGL Job No. 990501)

July 1, 1999

INTERNAL SHEAR TEST RESULT (ASTM D5321)

TEST CONDITIONS:

RECORD

SAMPLE PREPARATION

1. Specimens were cut to 20" x 20"

HYDRATION:

1. Hydrated for 7 days at 3 psi using dead weights

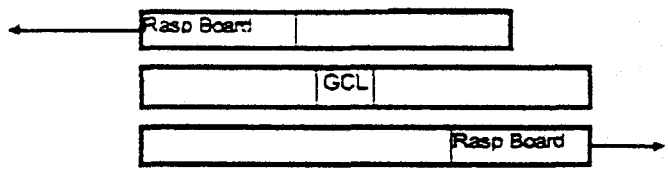
CONSOLIDATION:

1. Each set of specimen was consolidated for 48 hrs at 5, 20, & 45 psi.
2. Loads were applied by pneumatic pressure.

SHEAR TEST:

1. Shear test was conducted at 0.004 in/ min
2. Sheared at minimum 2 inch horizontal displacement.
3. The test specimens were flooded during testing.
4. Tests were performed in general accordance with ASTM D5321-93 Method A using Brainard- Kilman LG-112 Direct Shear machine with effective area of 12 in x 12 in.

TEST CONFIGURATION



SAMPLE IDENTIFICATION:

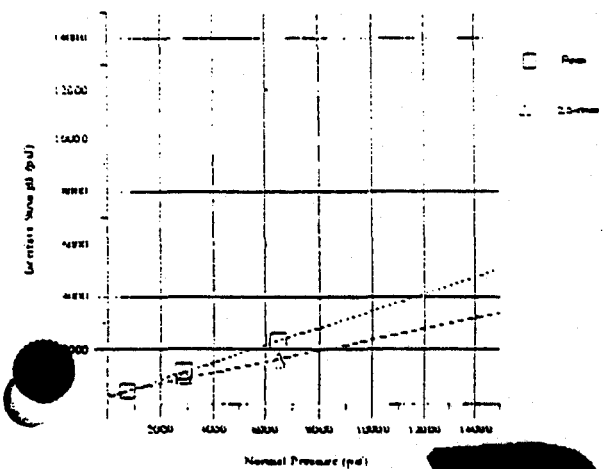
PGL C# 38198, GCL Roll # 5320

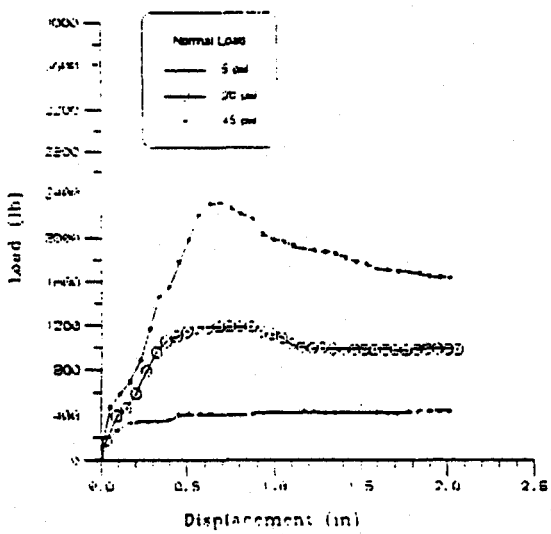
TEST RESULTS:

SAMPLE ID	NORMAL STRESS (psi)	NORMAL STRESS (psf)	Moisture Content (%)	PEAK STRENGTH SHEAR STRESS (psf)	PEAK STRENGTH PEAK SECANT ANGLE	2" DISPLACEMENT STRENGTH SHEAR STRESS (psf)	2" DISPLACEMENT STRENGTH 2" DISPLACEMENT SECANT ANGLE
C# 38198	5	720	122.08	444	32	444	32
	20	2880	75.24	1192	22	976	19
	45	6480	60.39	2311	20	1632	14
	COHESION:			231		333	

OBSERVATIONS:

Stitches of specimens sheared at 45 psi normal stresses was completely separated from woven side at 2 " displacement . For 5 normal load, less than 10% of stitches were separated . For 20 psi, about 40% of stitches were separated.





000233

Precision Geosynthetic Laboratories

2739

TABLE 7
MATERIAL PROPERTIES
FERNALD OSDF

FOR: GSE LINING TECHNOLOGY
(Reference: PGL Job No. 990501)

July 1, 1999

INTERNAL SHEAR TEST RESULT (ASTM D5321)

TEST CONDITIONS:

RECORD

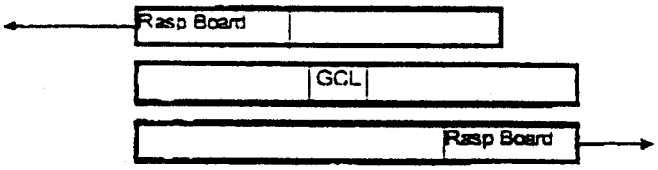
SAMPLE PREPARATION
1. Specimens were cut to 20" x 20"

HYDRATION:
1. Hydrated for 7 days at 3 psi using deed weights

CONSOLIDATION:
1. Each set of specimen was consolidated for 48 hrs at 5, 20, & 45 psi.
2. Loads were applied by pneumatic pressure.

SHEAR TEST:
1. Shear test was conducted at 0.004 in/ min
2. Sheared at minimum 2 inch horizontal displacement.
3. The test specimens were flooded during testing.
4. Tests were performed in general accordance with ASTM D5321-93 Method A using Brainard- Kilman LG-112 Direct Shear machine with effective area of 12 in x 12 in.

TEST CONFIGURATION



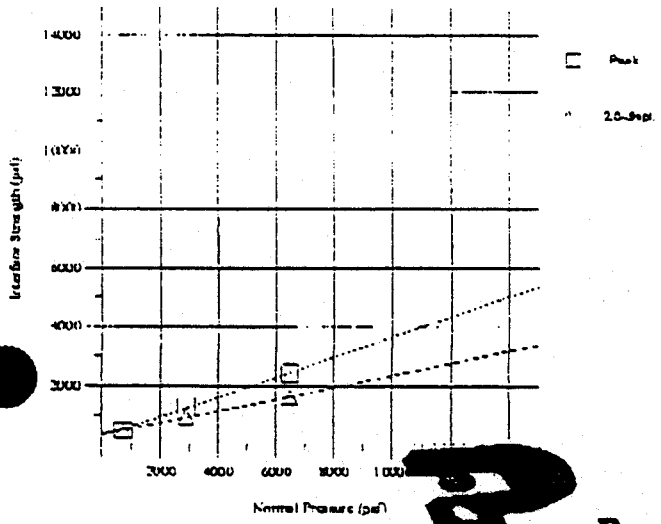
SAMPLE IDENTIFICATION:
PGL C# 38197, GCL Roll # 5276

TEST RESULTS:

SAMPLE ID	NORMAL STRESS (psi)	NORMAL STRESS (psf)	Moisture Content (%)	PEAK STRENGTH: SHEAR STRESS (psf)	PEAK STRENGTH: PEAK SECANT ANGLE	2" DISPLACEMENT STRENGTH: SHEAR STRESS (psf)	2" DISPLACEMENT STRENGTH: 2" DISPLACEMENT SECANT ANGLE
C# 38197	5	720	131.12	448	32	448	32
	20	2880	77.42	1356	25	968	19
	45	6480	57.35	2420	20	1630	14
	COHESION:			274		333	

OBSERVATIONS:

Stitches of specimens sheared at 45 psi normal stresses was completely separated from woven side at 2" displacement. For 5 normal load, less than 10% of stitches were separated. For 20 psi, about 40% of stitches were separated.



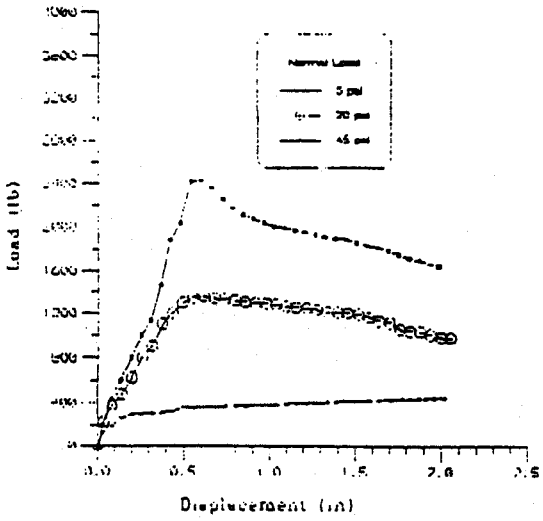


TABLE 8.
MATERIAL PROPERTIES
FERNALD OSDF

2739

FOR: GSE LINING TECHNOLOGY
(Reference: PGL Job No. 990501)

July 1, 1999

INTERNAL SHEAR TEST RESULT (ASTM D5321)

TEST CONDITIONS:

RECORD

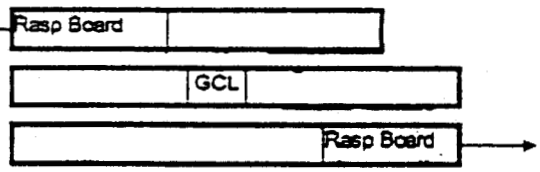
SAMPLE PREPARATION
1. Specimens were cut to 20" x 20"

HYDRATION:
1. Hydrated for 7 days at 3 psi using dead weights

CONSOLIDATION:
1. Each set of specimen was consolidated for 48 hrs at 5, 20, & 45 psi.
2. Loads were applied by pneumatic pressure.

SHEAR TEST:
1. Shear test was conducted at 0.004 in/ min
2. Sheared at minimum 2 inch horizontal displacement.
3. The test specimens were flooded during testing.
4. Tests were performed in general accordance with ASTM D5321-93 Method A using Brainard- Kilman LG-112 Direct Shear machine with effective area of 12 in x 12 in.

TEST CONFIGURATION



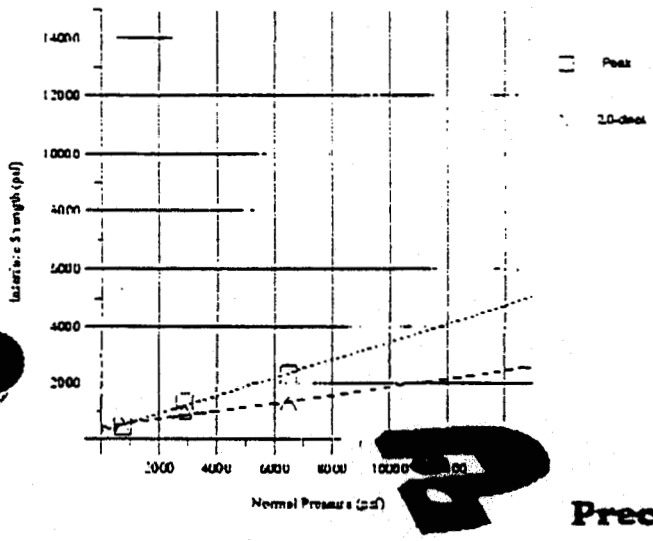
SAMPLE IDENTIFICATION:
PGL C# 38200, GCL Roll # 5188

TEST RESULTS:

SAMPLE ID	NORMAL STRESS (psi)	NORMAL STRESS (psf)	Moisture Content (%)	PEAK STRENGTH SHEAR STRESS (psf)	PEAK STRENGTH PEAK SECANT ANGLE	2" DISPLACEMENT STRENGTH SHEAR STRESS (psf)	2" DISPLACEMENT STRENGTH 2" DISPLACEMENT SECANT ANGLE
C# 38200	5	720	129.87	414	30	414	30
	20	2880	73.67	1311	24	984	19
	45	6480	60.34	2304	20	1295	11
COHESION:				258		407	

OBSERVATIONS:

Stitches of specimens sheared at 45 psi normal stresses was completely separated from woven side at 2" displacement. For 5 normal load, less than 10% of stitches were separated. For 20 psi, about 30% of stitches were separated.



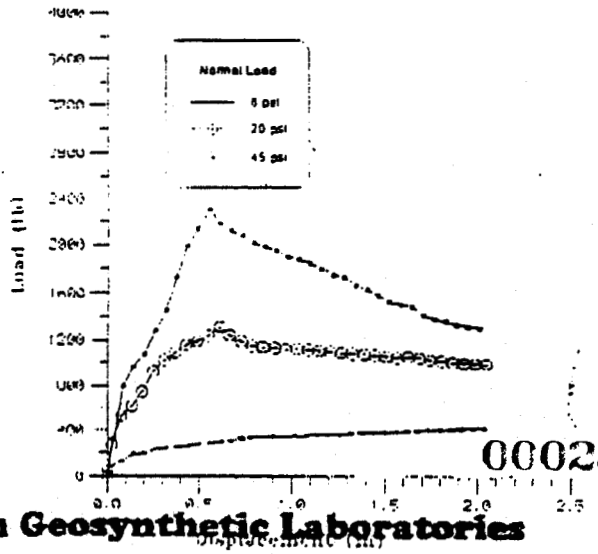


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TABLE 9
MATERIAL PROPERTIES
FERNALD OSDF

2739

FOR: GSE LINING TECHNOLOGY
(Reference: PGL Job No. 990501)

July 1, 1999

INTERNAL SHEAR TEST RESULT (ASTM D5321)

TEST CONDITIONS:

RECORD

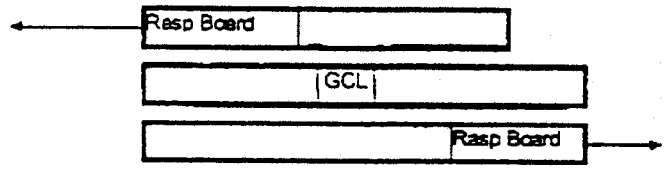
SAMPLE PREPARATION
1. Specimens were cut to 20" x 20"

HYDRATION:
1 Hydrated for 7 days at 3 psi using dead weights

CONSOLIDATION:
1. Each set of specimen was consolidated for 48 hrs at 5, 20, & 45 psi.
2. Loads were applied by pneumatic pressure.

SHEAR TEST:
1. Shear test was conducted at 0.004 in/ min
2. Sheared at minimum 2 inch horizontal displacement.
3. The test specimens were flooded during testing.
4. Tests were performed in general accordance with ASTM D5321-93 Method A using Brainard- Kilman LG-112 Direct Shear machine with effective area of 12 in x 12 in.

TEST CONFIGURATION



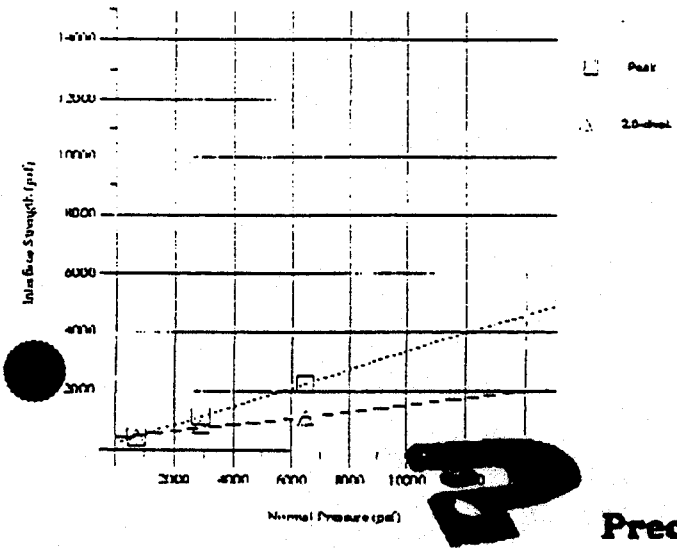
SAMPLE IDENTIFICATION:
PGL C# 38199, GCL Roll # 5144

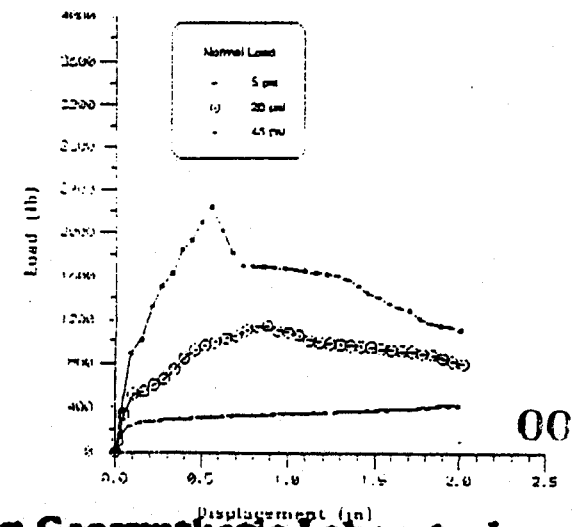
TEST RESULTS:

SAMPLE ID	NORMAL STRESS (psi)	NORMAL STRESS (psf)	Moisture Content (%)	PEAK STRENGTH SHEAR STRESS (psf)	PEAK STRENGTH PEAK SECANT ANGLE	2" DISPLACEMENT STRENGTH SHEAR STRESS (psf)	2" DISPLACEMENT STRENGTH 2" DISPLACEMENT SECANT ANGLE
C# 38199	5	720	134.45	428	31	428	31
	20	2880	78.23	1145	22	799	16 15.5
	45	6480	55.76	2234	19	1101	10
COHESION:				219		395	

OBSERVATIONS:

Stitches of specimens sheared at 45 psi normal stresses was completely separated from woven side of the GCL at 2" displacement. For 5 normal load, less than 10% of stitches were separated. For 20 psi, about 50% of stitches were separated.





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Precision Geosynthetic Laboratories

Vector Engineering Inc.

Laboratory Services
Loma Rice Drive., Suite C, Grass Valley, CA 95945
(530) 272-2448 Fax (530) 272-8553

LARGE SCALE DIRECT SHEAR REPORT

Test Method D-6243-B

RECORD 2739

Client Name: PRECISION LABORATORIES Project Name: FERNALD SUPERFUND SITE Project No: 943022.37

Superstrate: ⟸ Board Spacers

Material 1: ⟸ CETCO Bentomat ST Lot#19992020 Roll#5072 LSN: BDV Rasp Board

Material 2: ⟹ 80 mil GSE HDPE Textured/Textured Roll#114101743 LSN: BEF Clamped

Substrate: ⟹ Concrete Board with Sand Layer

PEAK STRENGTH

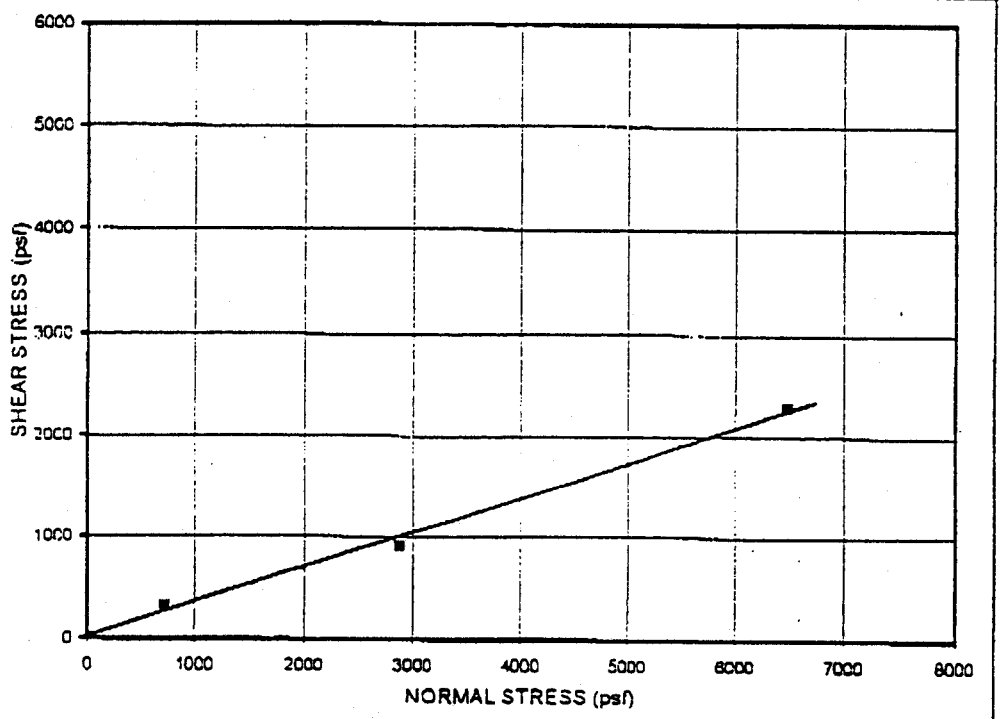
Test Point	Normal Stress psi	Normal Stress psf	Shear Stress psf	Secant Friction Angle
1.	5.0	720	330	25
2.	20.0	2880	910	18
3.	45.0	6480	2290	19

Adhesion: 20 psf

Friction Angle 19 degrees

Coefficient of Friction 0.34

NOTE GRAPH NOT TO SCALE



STRENGTH ENVELOPE

(at 2.5 in displacement)

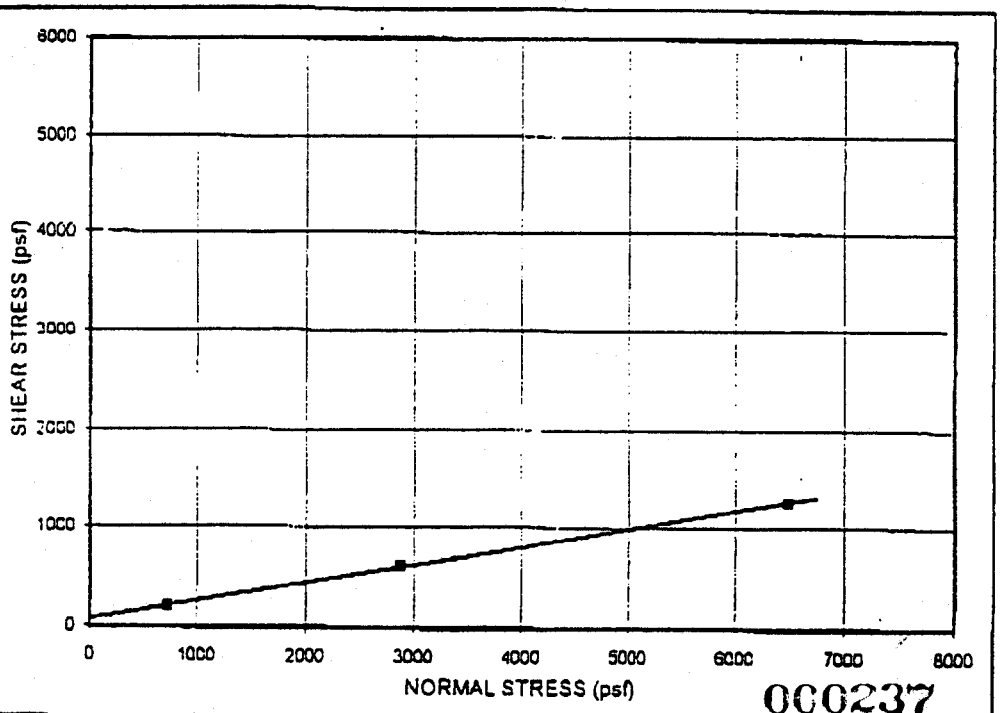
Test Point	Normal Stress psi	Normal Stress psf	Shear Stress psf	Secant Friction Angle
1.	5.0	720	200	16
2.	20.0	2880	610	12
3.	45.0	6480	1260	11

Adhesion: 70 psf

Friction Angle: 10 degrees

Coefficient of Friction: 0.19

NOTE. GRAPH NOT TO SCALE



000237

NOTE: The Friction Angle and Adhesion (or Cohesion) results given here are based on a mathematically determined best fit line. Further interpretation should be conducted by a qualified professional experienced in geosynthetic and geotechnical engineering.

By accepting the data and result represented on this page, Client agrees to limit the liability of Vector Engineering, Inc. from client and all other parties for claims arising out of use of this data to the cost for the respective test(s) represented hereon, and Client agrees to indemnify and hold harmless Vector from and against all liability in excess of the aforementioned limit.

Report Date: 6/8/99 (rev. 6/15 krc) Entered By: RWM Reviewed By: NCL Lab Log: 121B

Vector Engineering Inc.

Laboratory Services

2438 Loma Rica Drive, Suite C, Grass Valley, CA 95945
(530) 272-2448 Fax (530) 272-8553

LARGE SCALE DIRECT SHEAR REPORT

Test Method D-6243-B 2739

Client Name: PRECISION LABORATORIES Project Name: FERNALD SUPERFUND SITE Project No: 943022.37

Superstrate: ⟸ Board Spacers

Material 1: ⟸ CETCO Bentomat ST Lot#19992020 Roll#5072 LSN: BDV Rasp Board

Material 2: ⟹ 80 mil GSE HDPE Textured/Textured Roll#114101743 LSN: BEF Clamped

Substrate ⟹ Concrete Board with Sand Layer

DISPLACEMENT vs. SHEAR STRESS

Test Point	Normal Stress psi	Normal Stress psf
1.	5.0	720
2.	20.0	2880
3.	45.0	6480

MOISTURE DATA:

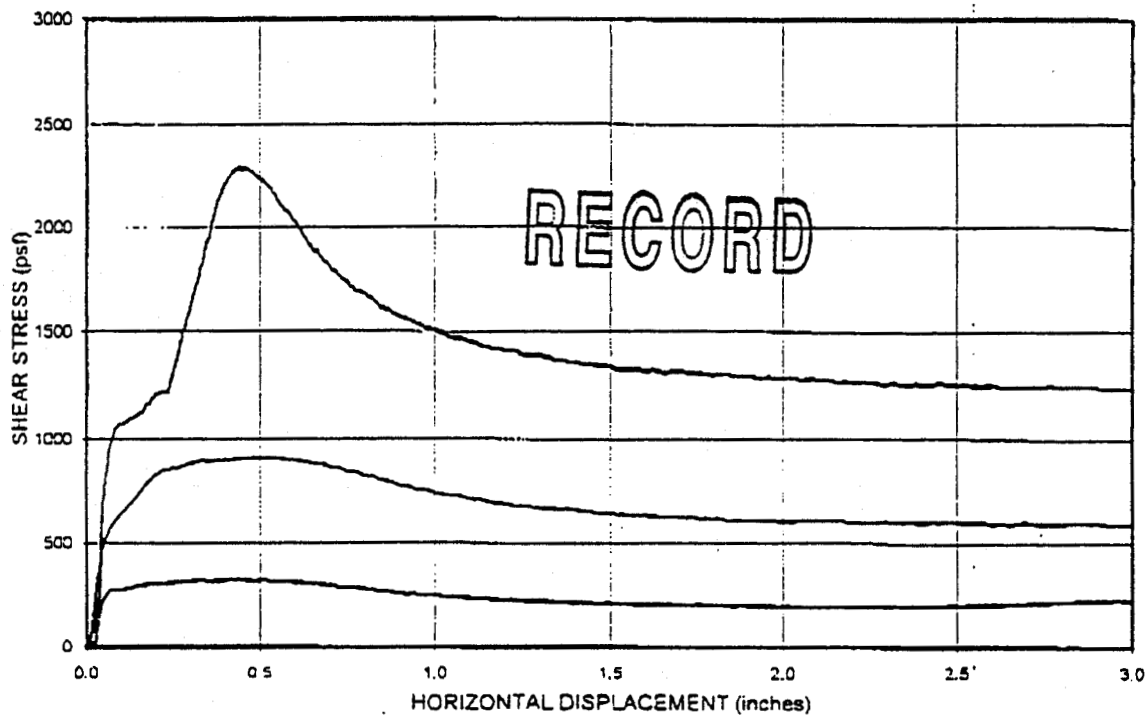
(GCL)

Initial Water Content: 22%

Initial Dry Density: N/A pcf

Final Water Content: (%)

1.	2.	3.
102.4	94.0	71.1

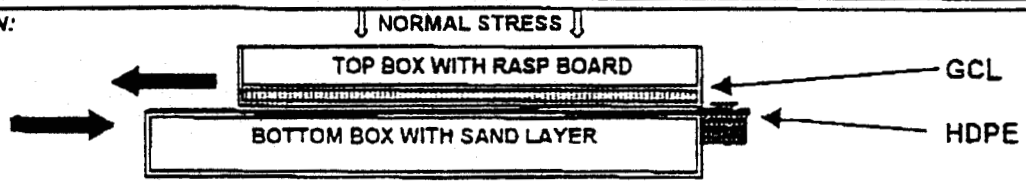


STANDARD CONDITIONS: **SHEAR DISPLACEMENT RATE: 0.004 in/min**

1. The "gap" between shear boxes was set at 80 mil (2.0 mm)
2. The test specimens were flooded during testing unless otherwise noted.
3. High Normal Stresses, >5psi (35 kPa) was applied using air pressure.
4. Low Normal Stresses, <5psi (35 kPa) was applied using dead weights.
5. The tests were terminated after 3.0"(75 mm) of displacement unless otherwise noted.
6. Tests were performed in general accordance with ASTM procedure D-6243 using a Brainard-Killman LG-112 direct shear machine with an effective area of 12" x 12" (300 x300 mm).

Spec call for D5321

TEST ORIENTATION:



SPECIAL TEST NOTES:

1. Each specimen of HDPE was cut to 14" x 20" and clamped to the lower box
2. The textile portions of the GCL were wrapped around a 12"x12" rasp board in the upper box.
3. The GCL specimens were hydrated for 7 days at 3 psi, in contact with the textured HDPE.
4. After hydration each GCL / HDPE soil specimen was consolidated at the specified normal stress for 48 hrs., then sheared.
5. The woven textile side of the GCL was tested against the HDPE
6. Shearing occurred at the interface between the textured HDPE and GCL specimens.
7. Stretching or deformation of the GCL or HDPE was not observed.

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By accepting the data and result represented on this page, Client agrees to limit the liability of Vector Engineering, Inc. from client and all other parties for claims arising out of use of this data to the cost for the respective test(s) represented hereon, and Client agrees to indemnify and hold harmless Vector from and against all liability in excess of the aforementioned limit.

Report Date: 6/8/99 Entered By: Reviewed By: Lab Log:

Vector Engineering Inc.

Laboratory Services

Loma Rica Drive, Suite C, Grass Valley, CA 95945
(530) 272-2448 Fax (530) 272-8553

LARGE SCALE DIRECT SHEAR REPORT

Test Method D-6243-B

2739

Client Name: PRECISION LABORATORIES Project Name: FERNALD SUPERFUND SITE Project No: 943022.37

Superstrate: Board Spacers

Material 1: Cetco Bentomat ST; Lot #10992020; Roll #5115 LSN: BDW Resp Board

Material 2: GSE 80 mil HDPE Textured/Textured; Roll #114101753 LSN: BEG Clamped

Substrate: Concrete Board with Sand Layer

PEAK STRENGTH

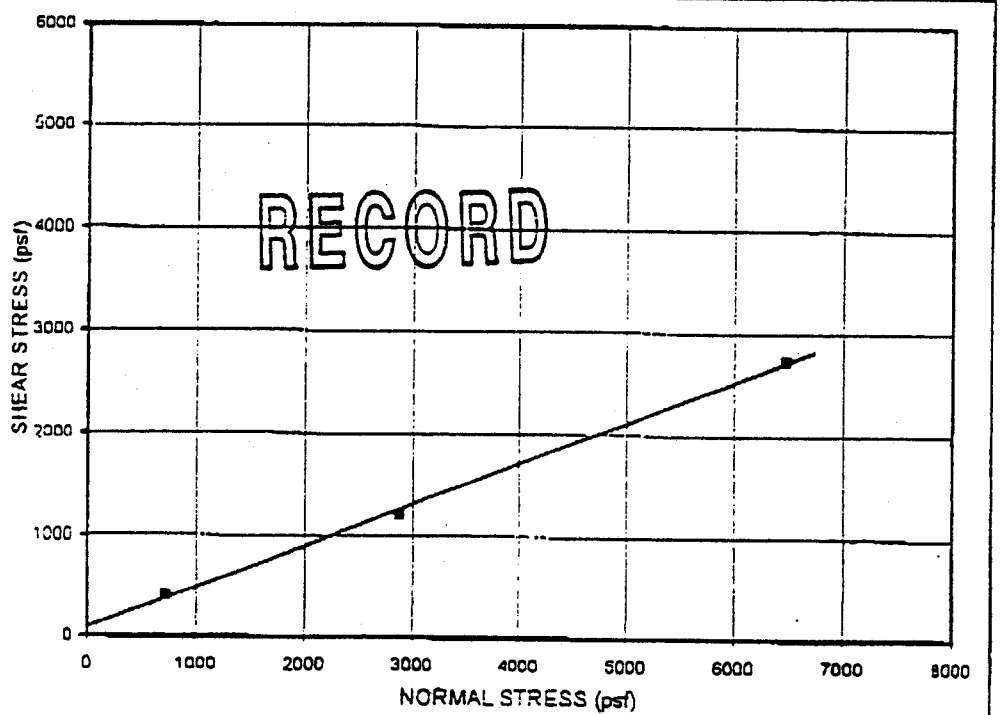
Test Point	Normal Stress psi	Normal Stress psf	Shear Stress psf	Secant Friction Angle
1.	5.0	720	420	30
2.	20.0	2880	1210	23
3.	45.0	6480	2740	23

Adhesion: 100 psf

Friction Angle 22 degrees

Coefficient of Friction 0.4

NOTE: GRAPH NOT TO SCALE



STRENGTH ENVELOPE

(at 2.5 in. displacement)

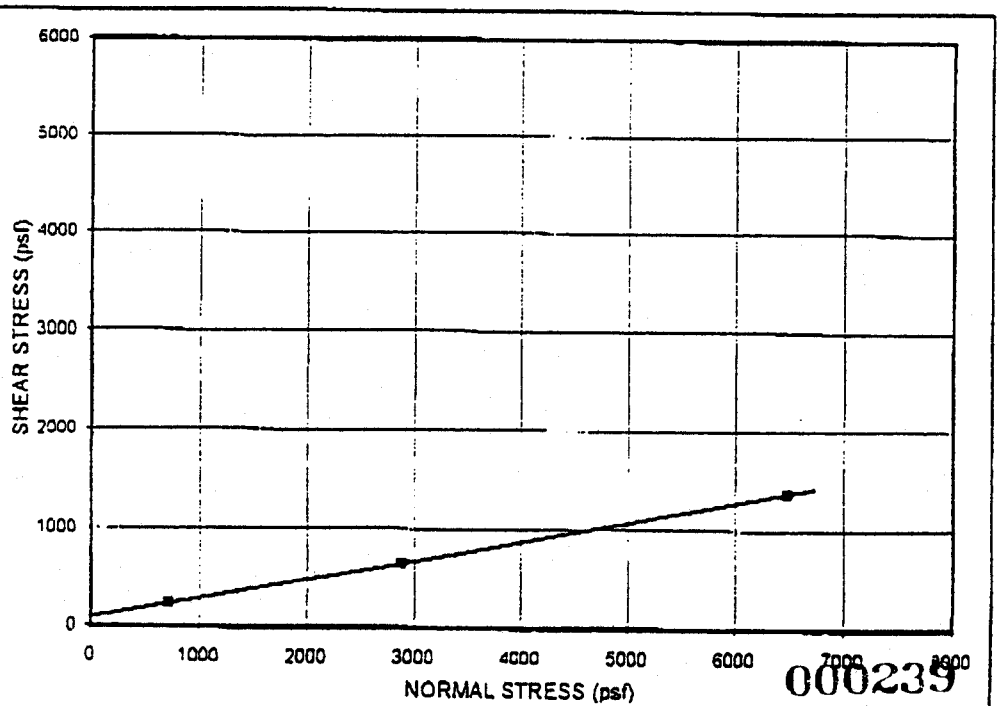
Test Point	Normal Stress psi	Normal Stress psf	Shear Stress psf	Secant Friction Angle
1.	5.0	720	230	18
2.	20.0	2880	660	13
3.	45.0	6480	1370	12

Adhesion: 90 psf

Friction Angle 11 degrees

Coefficient of Friction: 0.2

NOTE: GRAPH NOT TO SCALE



000239

NOTE: The Friction Angle and Adhesion (or Cohesion) results given here are based on a mathematically determined best fit line. Further interpretation should be conducted by a qualified professional experienced in geosynthetic and geotechnical engineering.

By accepting the data and result represented on this page, Client agrees to limit the liability of Vector Engineering, Inc. from client and all other parties for claims arising out of use of this data to the cost for the respective test(s) represented hereon. and Client agrees to indemnify and hold harmless Vector from and against all liability in excess of the aforementioned limit.

Report Date: 06/14/99 Entered By: NCL Reviewed By: ML Lab Log: 121 C

Vector Engineering Inc.
Laboratory Services
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LARGE SCALE DIRECT SHEAR REPORT

Test Method D-6243-B

2739

Client Name: PRECISION LABORATORIES Project Name: FERNALD SUPERFUND SITE Project No: 943022.37

Superstrate: ⟸ Board Spacers

Material 1: ⟸ Cetco Bentomat ST; Lot #19992020; Roll #5115 LSN: BDW Rasp Board

Material 2: ⟹ GSE 80 mil HDPE Textured/Textured; Roll #114101753 LSN: BEG Clamped

Substrate: ⟹ Concrete Board with Sand Layer

DISPLACEMENT vs. SHEAR STRESS

Test Point	Normal Stress psi	Normal Stress psf
1.	5.0	720
2.	20.0	2880
3.	45.0	6480

MOISTURE DATA:

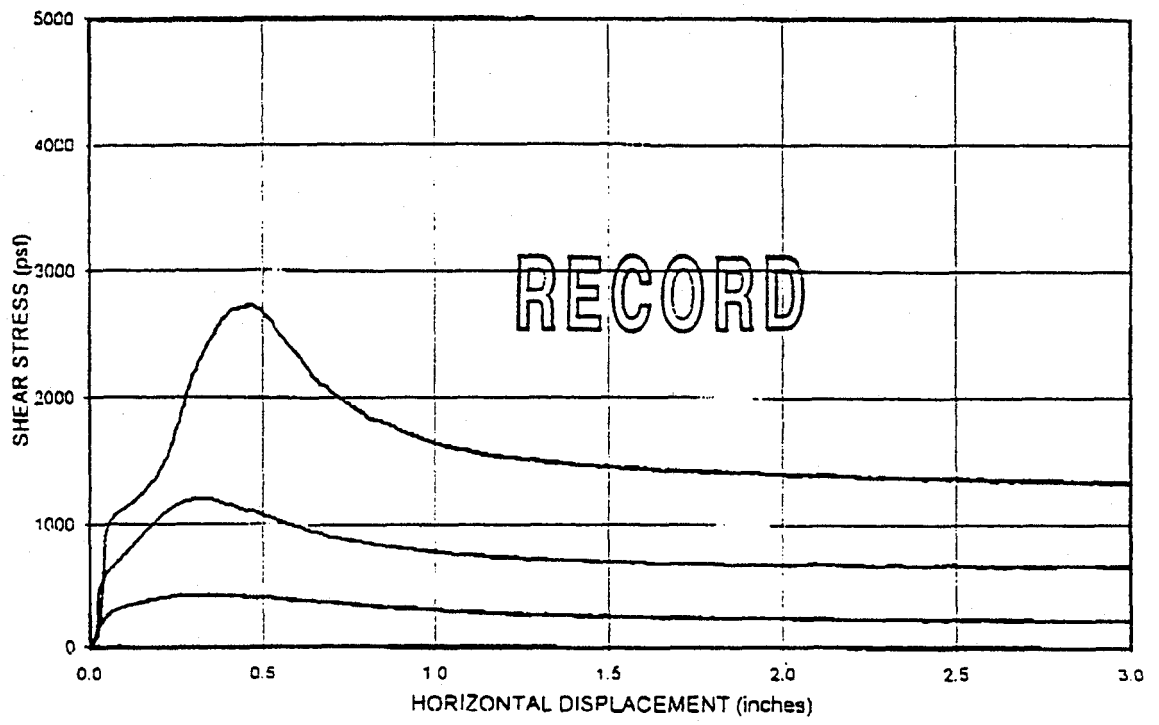
(GCL)

Initial Water Content: 23.4%

Initial Dry Density: NA pcf

Final Water Content:(%)

1.	2.	3.
118.5	89.7	69.5

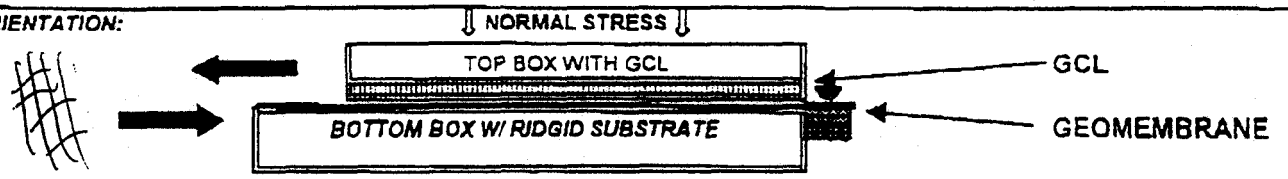


STANDARD CONDITIONS: **SHEAR DISPLACEMENT RATE: 0.004 in/min**

1. The "gap" between shear boxes was set at 60 mil (2.0 mm)
2. The test specimens were flooded during testing unless otherwise noted.
3. High Normal Stresses, >5psi (35 kPa) was applied using air pressure.
4. Low Normal Stresses, <5psi (35 kPa) was applied using dead weights.
5. The tests were terminated after 3.0"(75 mm) of displacement unless otherwise noted.
6. Tests were performed in general accordance with ASTM procedure D-6243 using a Brainard-Killman LG-112 direct shear machine with an effective area of 12" x 12" (300 x300 mm).

Should be D5321

TEST ORIENTATION:



SPECIAL TEST NOTES:

1. Each specimen of HDPE was cut to 14" x 20" and clamped to the lower box
2. The textile portions of the GCL were wrapped around a 12"x12" rasp board in the upper box.
3. Each GCL specimen was hydrated for 7 days at 3 psi, in contact with the textured HDPE.
4. After hydration, each GCL / HDPE specimen was consolidated at the specified normal stress for 48 hrs. then sheared.
5. The woven textile side of the GCL was tested against the HDPE
6. Shearing occurred at the interface between the textured HDPE and GCL specimen.
7. Minor stretching of the GCL fabric occurred in point 3.

000240

By accepting the data and result represented on this page, Client agrees to limit the liability of Vector Engineering, Inc. from client and all other parties for claims arising out of use of this data to the cost for the respective test(s) represented hereon, and Client agrees to indemnify and hold harmless Vector from and against all liability in excess of the aforementioned limit.

Report Date: 06/14/99 Entered By: NC Reviewed By: NL Lab Log:

Vector Engineering Inc.

Laboratory Services

[illegible]8 Loma Rica Drive., Suite C, Grass Valley, CA 95945
(530) 272-2448 Fax (530) 272-8563

LARGE SCALE DIRECT SHEAR REPORT

Test Method D-6243-B

2739

Client Name: PRECISION LABORATORIES Project Name: FERNALD SUPERFUND SITE Project No.: 943022.37

Superstrate ⇦ Board Spacers

Material 1: ⇦ CETCO Bentomat ST Lot#199922020 Roll # 5359 LSN: BEO Resp Board

Material 2: ⇨ 80 mil GSE HDPE Textured/Textured Roll # 114101774 LSN: BEI Clamped

Substrate ⇨ Concrete Board with Sand Layer

PEAK STRENGTH

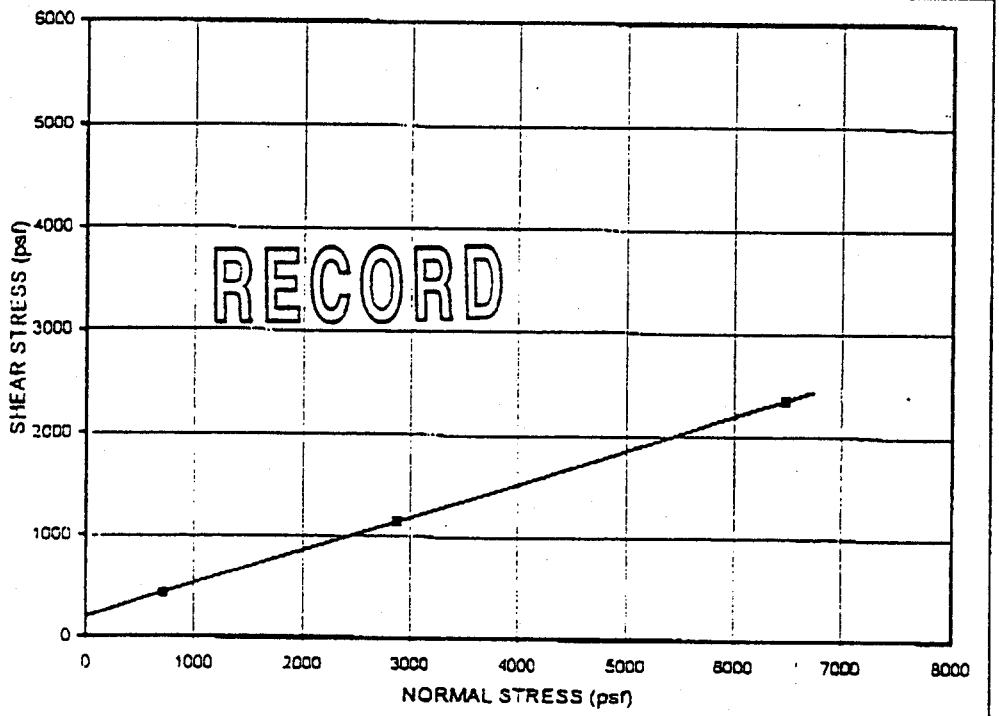
Test Point	Normal Stress psi	Normal Stress psf	Shear Stress psf	Secant Friction Angle
1.	5.0	720	430	31
2.	20.0	2860	1160	22
3.	45.0	6480	2350	20

Adhesion: 190 psf

Friction Angle: 18 degrees

Coefficient of Fr[illegible] 0.33

NOTE GRAPH NOT TO SCALE



STRENGTH ENVELOPE

(at 2.5 in. displacement)

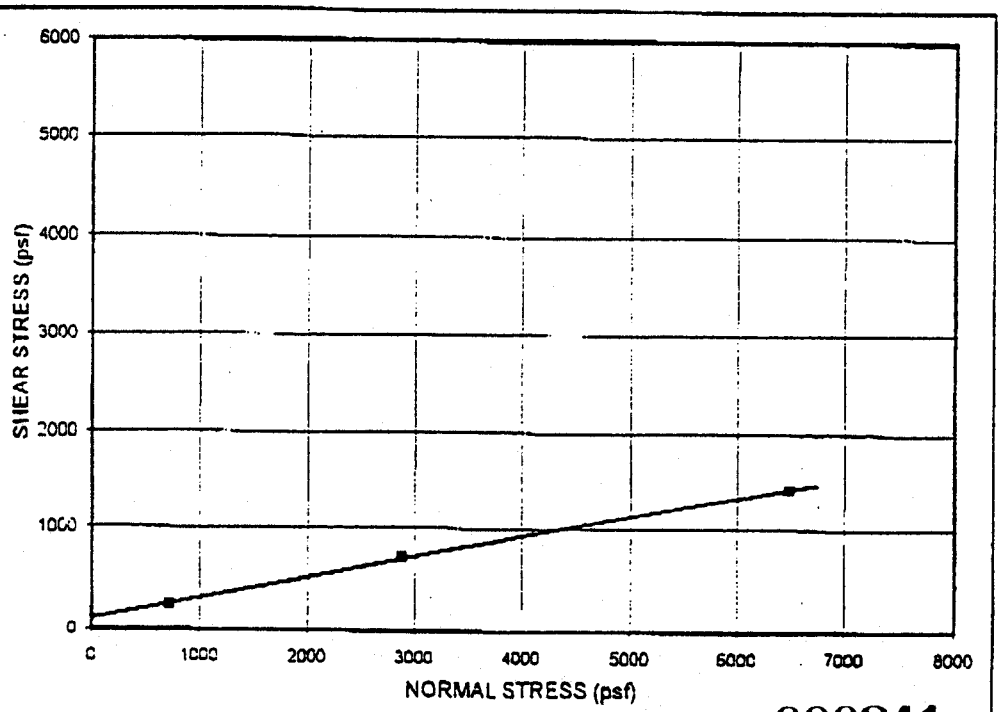
Test Point	Normal Stress psi	Normal Stress psf	Shear Stress psf	Secant Friction Angle
1.	5.0	720	250	19
2.	20.0	2880	720	14
3.	45.0	6480	1430	12

Adhesion: 110 psf

Friction Angle: 12 degrees

Coefficient of Friction: 0.2

NOTE GRAPH NOT TO SCALE



060241

NOTE: The Friction Angle and Adhesion (or Cohesion) results given here are based on a mathematically determined best fit line. Further interpretation should be conducted by a qualified professional experienced in geosynthetic and geotechnical engineering.

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Entered By: RWM Reviewed By: [illegible] Report Date: 06/14/99 Lab Log: 1211

Vector Engineering Inc.

Laboratory Services

12438 Loma Rica Drive., Suite C, Grass Valley, CA 95945
(530) 272-2448 Fax (530) 272-8553

LARGE SCALE DIRECT SHEAR REPORT

Test Method D-6243-B

-- 2739

Client Name: PRECISION LABORATORIES Project Name: FERNALD SUPERFUND SITE Project No: 943022.37

Superstrate: Board Spacers

Material 1: CETCO Bentomat ST Lot#199922020 Roll # 5359 LSN: BEO Rasp Board

Material 2: 80 mil GSE HDPE Textured/Textured Roll # 114101774 LSN: BEI Clamped

Substrate: Concrete Board with Sand Layer

DISPLACEMENT vs. SHEAR STRESS

Test Point	Normal Stress psi	Normal Stress psf
1.	5.0	720
2.	20.0	2880
3.	45.0	6480

MOISTURE DATA:

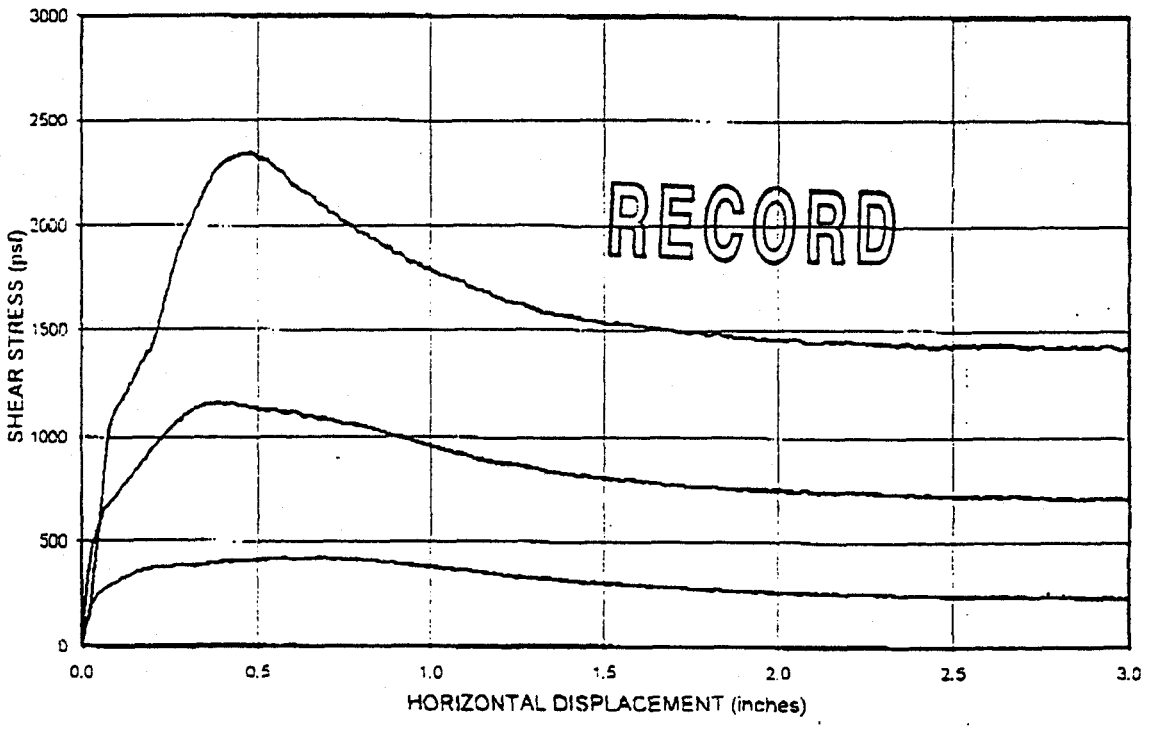
(GCL)

Initial Water Content: 20.2%

Initial Dry Density: N/A pcf

Final Water Content:(%)

1.	2.	3.
108.6	97.3	80.9

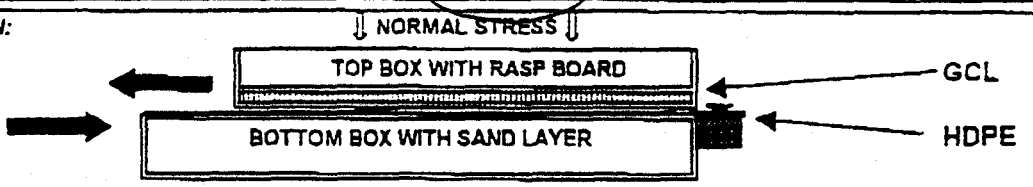


STANDARD CONDITIONS: **SHEAR DISPLACEMENT RATE: 0.004 in/min**

1. The "gap" between shear boxes was set at 80 mil (2.0 mm)
2. The test specimens were flooded during testing unless otherwise noted.
3. High Normal Stresses, >5psi (35 kPa) was applied using air pressure.
4. Low Normal Stresses, <5psi (35 kPa) was applied using dead weights.
5. The tests were terminated after 3.0"(75 mm) of displacement unless otherwise noted.
6. Tests were performed in general accordance with ASTM procedure D-6243 using a Brainard-Killman LG-112 direct shear machine with an effective area of 12" x 12" (300 x300 mm).

Should be D 5321

TEST ORIENTATION:



SPECIAL TEST NOTES:

1. Each specimen of HDPE was cut to 14" x 20" and clamped to the lower box
2. The textile portions of the GCL were wrapped around a 12"x12" rasp board in the upper box.
3. The GCL specimens were hydrated for 7 days at 3 psi, in contact with the textured HDPE.
4. After hydration each GCL / HDPE soil specimen was consolidated at the specified normal stress for 48 hrs., then sheared.
5. The woven textile side of the GCL was tested against the HDPE
6. Shearing occurred at the interface between the textured HDPE and GCL specimens.
7. Minor stretching of the GCL occurred on the normal stress points 1 and 2.

000242

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Entered By: Reviewed By: Report Date: Lab Log:

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Laboratory Services
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LARGE SCALE DIRECT SHEAR REPORT

Test Method D-6243-B

-- 2739

Client Name: PRECISION LABORATORIES Project Name: FERNALD SUPERFUND SITE Project No: 943022.37

Superstrate: ⟸ Board Spacers

Material 1: ⟸ CETCO Bentomat ST Lot # 199922020 Roll # 5335 LSN BED Rasp Board

Material 2: ⟹ 80 mil GSE HDPE Textured / Textured Roll # 114101783 LSN: BEJ Clamped

Substrate: ⟹ Concrete Board with Sand Layer

PEAK STRENGTH

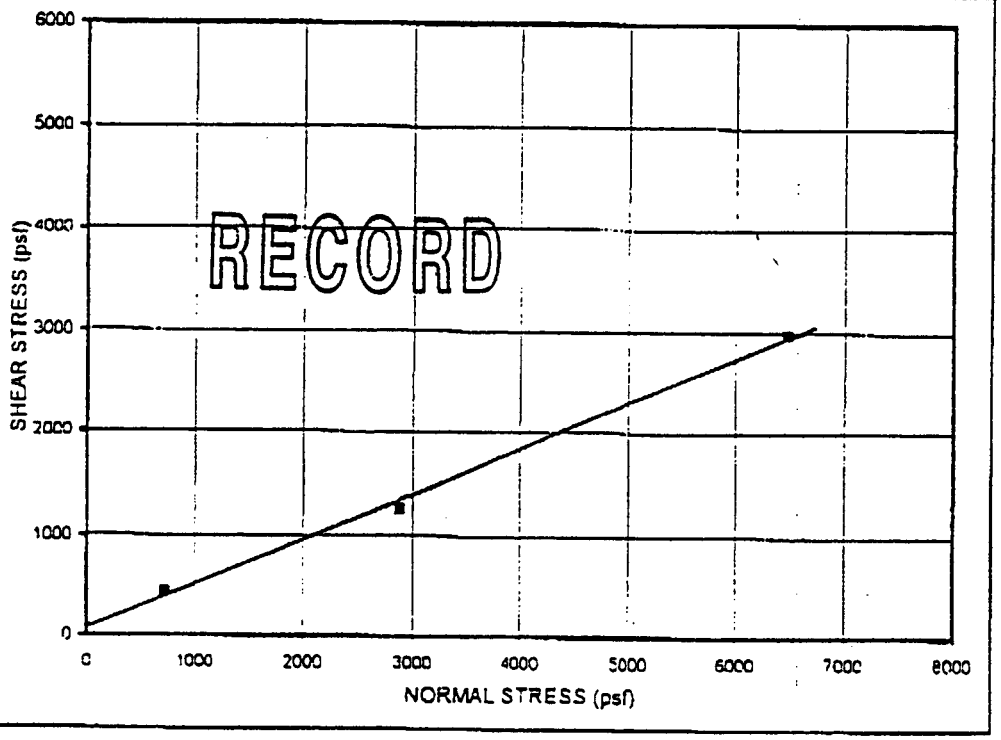
Test Point	Normal Stress psi	Normal Stress psf	Shear Stress psf	Secant Friction Angle
1.	5.0	720	450	32
2.	20.0	2880	1260	24
3.	45.0	6480	2980	25

Adhesion: 70 psf

Friction Angle: 24 degrees

Coefficient of Friction: 0.44

NOTE: GRAPH NOT TO SCALE



STRENGTH ENVELOPE

(at 2.5 in. displacement)

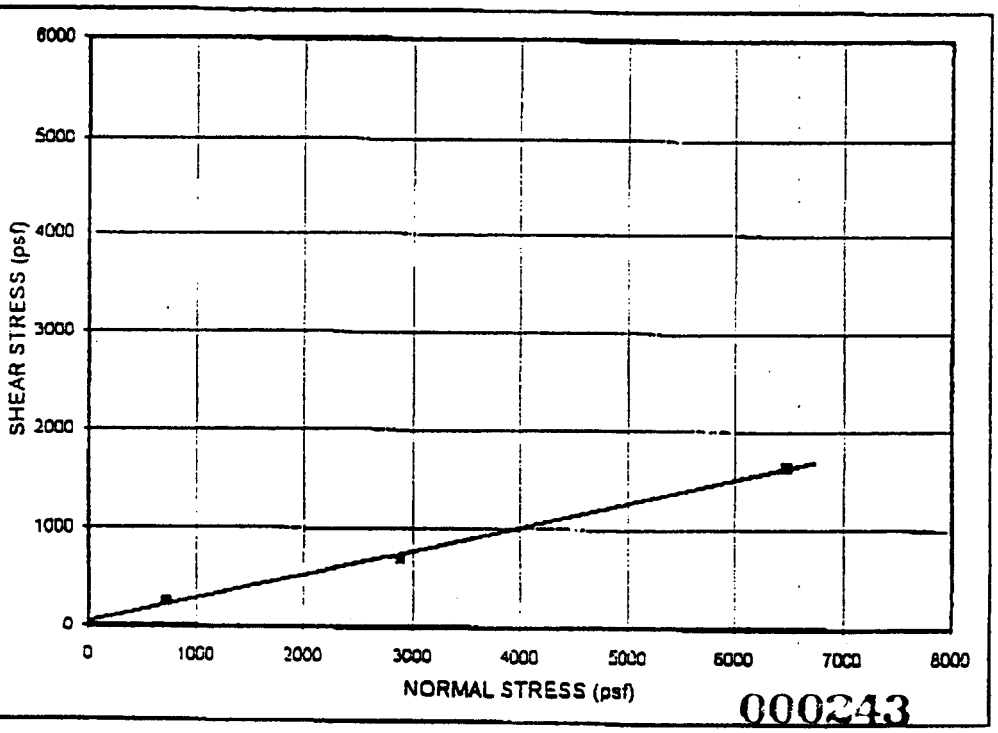
Test Point	Normal Stress psi	Normal Stress psf	Shear Stress psf	Secant Friction Angle
1.	5.0	720	250	19
2.	20.0	2880	700	14
3.	45.0	6480	1640	14

Adhesion: 40 psf

Friction Angle: 14 degrees

Coefficient of Friction: 0.24

NOTE: GRAPH NOT TO SCALE



000243

NOTE: The Friction Angle and Adhesion (or Cohesion) results given here are based on a mathematically determined best fit line. Further interpretation should be conducted by a qualified professional experienced in geosynthetic and geotechnical engineering.

By accepting the data and result represented on this page, Client agrees to limit the liability of Vector Engineering, Inc. from client and all other parties for claims arising out of use of this data to the most for the respective test(s) represented hereon, and Client agrees to indemnify and hold harmless Vector from and against all liability in excess of the aforementioned limit.

Entered By: RWM Reviewed By: Report Date: 06/15/99 Lab Log: 121H

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Laboratory Services
12458 Loma Rica Drive., Suite C, Grass Valley, CA 95945
(530) 272-2448 Fax (530) 272-8553

LARGE SCALE DIRECT SHEAR REPORT

Test Method D-6243-B

-- 2739

Client Name: PRECISION LABORATORIES Project Name: FERNALD SUPERFUND SITE Project No: 943022.37

Superstrate: ⇦ Board Spacers

Material 1: ⇦ CETCO Bentomat ST Lot # 199922020 Roll #.5335 LSN: BED Resp Board

Material 2: ⇨ 80 mil GSE HDPE Textured / Textured Roll # 114101783 LSN: BEJ Clamped

Substrate: ⇨ Concrete Board with Sand Layer

DISPLACEMENT vs. SHEAR STRESS

Test Point	Normal Stress psi	Normal Stress psf
1.	5.0	720
2.	20.0	2880
3.	45.0	6480

MOISTURE DATA:

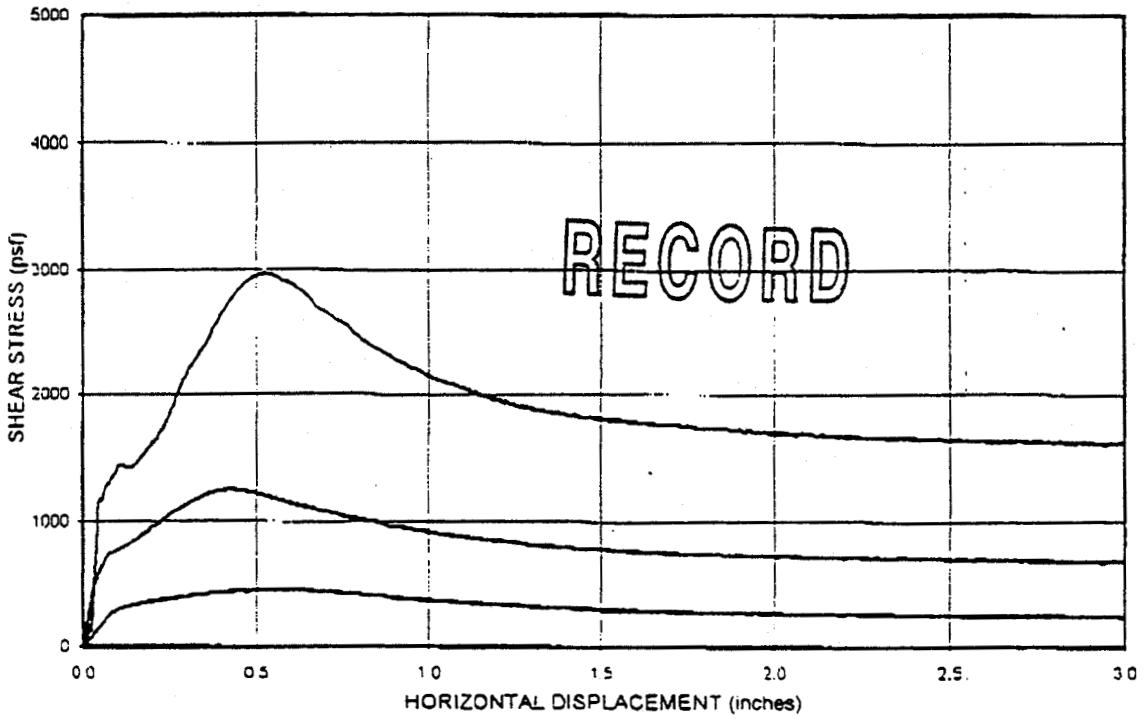
(GCL)

Initial Water Content: 15.8%

Initial Dry Density: N/A pcf

Final Water Content: (%)

1.	2.	3.
107.4	72.9	65.0

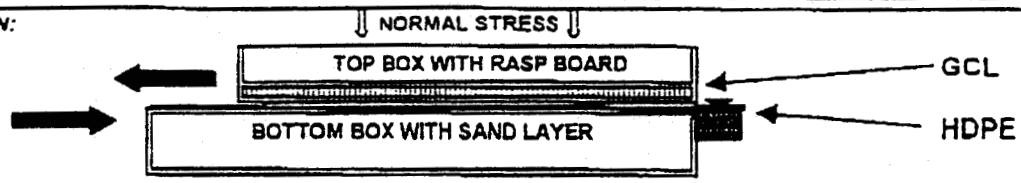


STANDARD CONDITIONS: **SHEAR DISPLACEMENT RATE: 0.004 in/min**

1. The "gap" between shear boxes was set at 80 mil (2.0 mm)
2. The test specimens were flooded during testing unless otherwise noted.
3. High Normal Stresses, >5psi (35 kPa) was applied using air pressure.
4. Low Normal Stresses, <5psi (35 kPa) was applied using dead weights.
5. The tests were terminated after 3.0"(75 mm) of displacement unless otherwise noted.
6. Tests were performed in general accordance with ASTM procedure D-6243 using a Brainard-Killman LG-112 direct shear machine with an effective area of 12" x 12" (300 x300 mm).

Should be D5321

TEST ORIENTATION:



SPECIAL TEST NOTES:

1. Each specimen of HDPE was cut to 14" x 20" and clamped to the lower box.
2. The textile portions of the GCL were wrapped around a 12"x12" rasp board in the upper box.
3. The GCL specimens were hydrated for 7 days at 3 psi, in contact with the textured HDPE.
4. After hydration each GCL / HDPE soil specimen was consolidated at the specified normal stress for 48 hrs., then sheared.
5. The woven textile side of the GCL was tested against the HDPE.
6. Shearing occurred at the interface between the textured HDPE and GCL specimens.
7. Minor stretching of the GCL occurred on points 2 and 3.

000244

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Entered By: RWM Reviewed By: NU Report Date: Lab Log:

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(530) 272-2448 Fax(530) 272-8553

LARGE SCALE DIRECT SHEAR REPORT

Test Method D-6243-B

2739

Client Name: PRECISION LABORATORIES Project Name: FERNALD SUPERFUND SITE Project No: 943022.37

Superstrate: Board Spacers

Material 1: CETCO Bentomat ST Lot # 199922020 Roll # 5291 LSN: BEC Rasp Board

Material 2: 80 mil GSE HDPE Textured / Textured Roll # 114101794 LSN: BEK Clamped

Substrate: Concrete Board with Sand Layer

PEAK STRENGTH

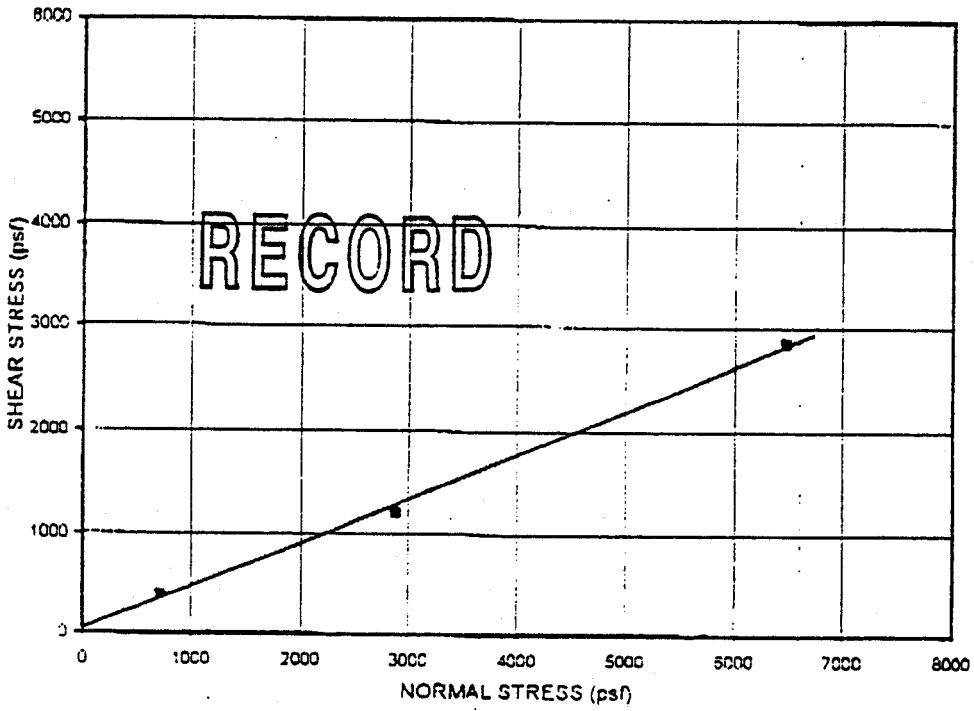
Test Point	Normal Stress psi	Normal Stress psf	Shear Stress psf	Secant Friction Angle
1.	5.0	720	400	29
2.	20.0	2880	1210	23
3.	45.0	6480	2860	24

Adhesion: 50 psf

Friction Angle: 23 degrees

Coefficient of Friction: 0.43

NOTE GRAPH NOT TO SCALE



STRENGTH ENVELOPE

(at 2.5 in. displacement)

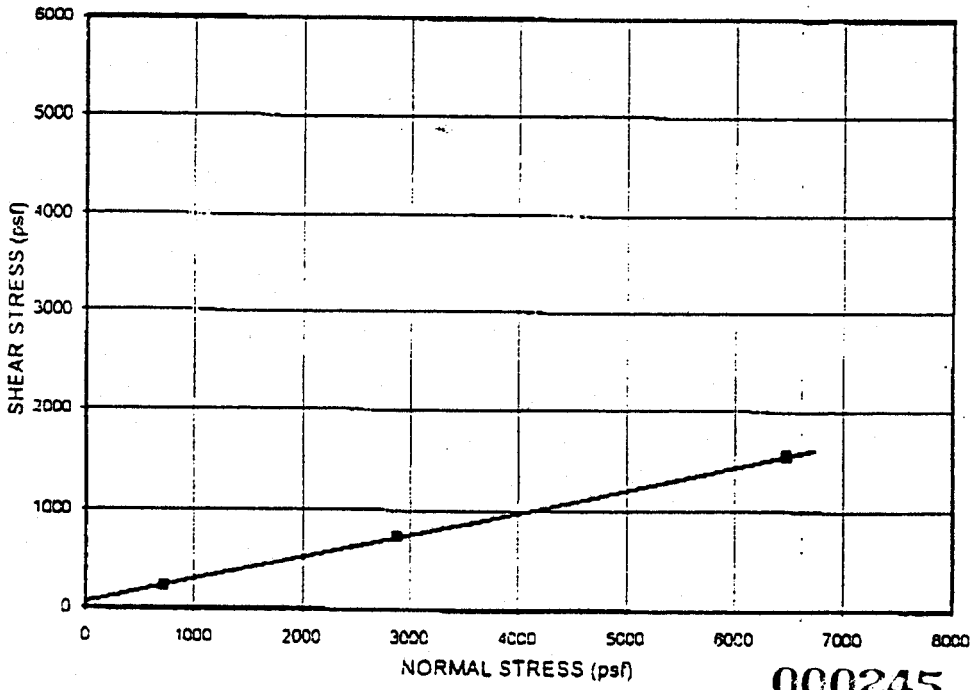
Test Point	Normal Stress psi	Normal Stress psf	Shear Stress psf	Secant Friction Angle
1.	5.0	720	230	18
2.	20.0	2880	730	14
3.	45.0	6480	1550	13

Adhesion: 60 psf

Friction Angle: 13 degrees

Coefficient of Friction: 0.23

NOTE: GRAPH NOT TO SCALE



000245

NOTE: The Friction Angle and Adhesion (or Cohesion) results given here are based on a mathematically determined best fit line. Further interpretation should be conducted by a qualified professional experienced in geosynthetic and geotechnical engineering.

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Entered By: RWM Reviewed By: Report Date: 06/17/99 Lab Log: 121G

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(530) 272-2448 Fax (530) 272-8553

LARGE SCALE DIRECT SHEAR REPORT

Test Method D-6243-B

-- 2739

Client Name: PRECISION LABORATORIES Project Name: FERNALD SUPERFUND SITE Project No: 943022.37

Superstrate: ⇦ Board Spacers

Material 1: ⇦ CETCO Bentomat ST Lot # 199922020 Roll # 5291 LSN: BEC Rasp Board

Material 2: ⇨ 80 mil GSE HDPE Textured / Textured Roll # 114101794 LSN: BEK Clamped

Substrate: ⇨ Concrete Board with Sand Layer

DISPLACEMENT vs. SHEAR STRESS

Test Point	Normal Stress psi	Normal Stress psf
1.	5.0	720
2.	20.0	2880
3.	45.0	6480

MOISTURE DATA:

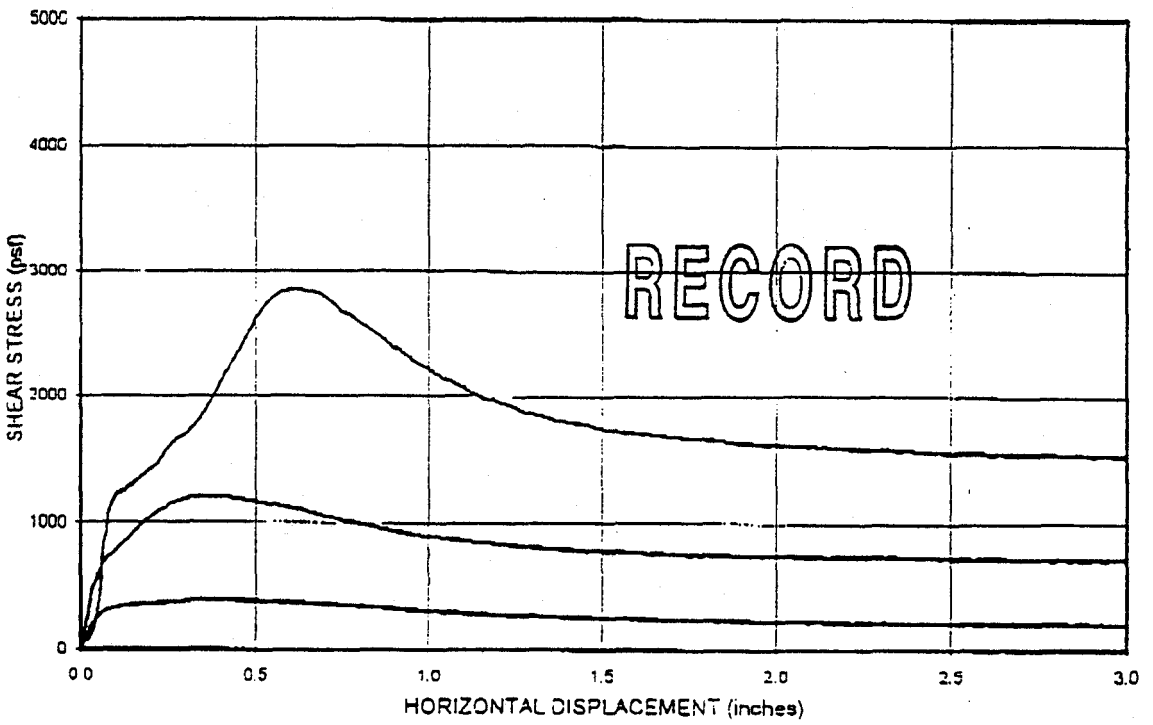
(GCL)

Initial Water Content: 20.6%

Initial Dry Density: N/A pcf

Final Water Content (%)

1.	2.	3.
111.1	82.4	73.0

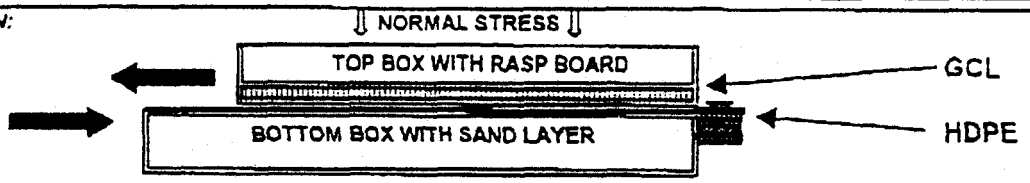


STANDARD CONDITIONS: **SHEAR DISPLACEMENT RATE: 0.004 in/min**

1. The "gap" between shear boxes was set at 80 mil (2.0 mm).
2. The test specimens were flooded during testing unless otherwise noted.
3. High Normal Stresses, >5psi (35 kPa) was applied using air pressure.
4. Low Normal Stresses, <5psi (35 kPa) was applied using dead weights.
5. The tests were terminated after 3.0" (75 mm) of displacement unless otherwise noted.
6. Tests were performed in general accordance with ASTM procedure D-6243 using a Brainard-Killman LG-112 direct shear machine with an effective area of 12" x 12" (300 x300 mm).

should be D5321

TEST ORIENTATION:



SPECIAL TEST NOTES:

1. The GCL was wrapped around a 12"x12" rasp board in the upper box.
2. Each specimen of HDPE was cut to 14" x 20" and clamped to the lower box.
3. The HDPE was bolted to the lower shear box with "channel clamps".
4. The GCL specimens were hydrated for 7 days at 3 psi, in contact with the textured HDPE.
5. After hydration each GCL / HDPE soil specimen was consolidated at the specified normal stress for 48 hrs., then sheared.
6. The woven textile side of the GCL was tested against the HDPE.
7. Shearing occurred at the interface between the textured HDPE and GCL specimens.
8. Minor stretching of the GCL occurred at points 2 and 3.

000246

By accepting the data and result represented on this page, Client agrees to limit the liability of Vector Engineering, Inc. from client and all other parties for claims arising out of use of this data to the cost for the respective test(s) represented hereon, and Client agrees to indemnify and hold harmless Vector from and against all liability in excess of the aforementioned limit.

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Laboratory Services
Loma Rica Drive., Suite C, Grass Valley, CA 95945
(530) 272-2448 Fax(530) 272-8553

LARGE SCALE DIRECT SHEAR REPORT

Test Method D-6243-B

-- 2739

Client Name: PRECISION LABORATORIES Project Name: FERNALD SUPERFUND SITE Project No: 943022.37

Superstrate: Board Spacers

Material 1: CETCO Bentomat ST; Lot # 19992020 Roll # 5247 LSN: BEB Rasp Board

Material 2: GSE 80 mil HDPE Textured/Textured; Roll # 114101806 LSN: BEL Clamped

Substrate: Concrete Board with Sand Layer

PEAK STRENGTH

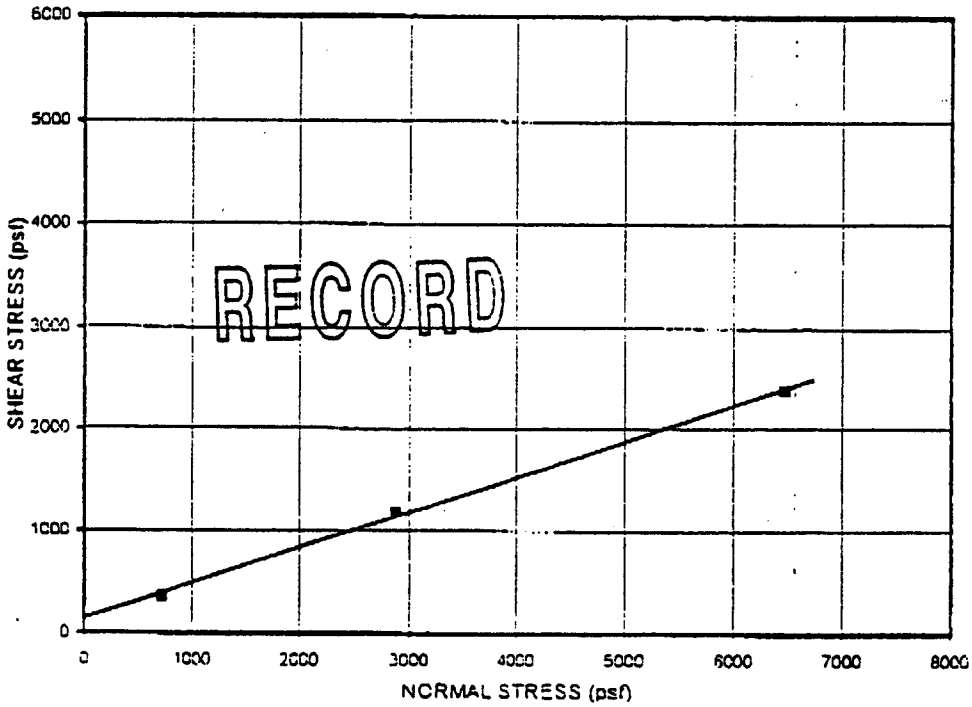
Test Point	Normal Stress psi	Normal Stress psf	Shear Stress psf	Secant Friction Angle
1.	5.0	720	360	27
2.	20.0	2880	1200	23
3.	45.0	6480	2380	20

Adhesion: 140 psf

Friction Angle: 19 degrees

Coefficient of Fr[illegible] 0.35

NOTE GRAPH NOT TO SCALE



STRENGTH ENVELOPE

(at 2.5 in. displacement)

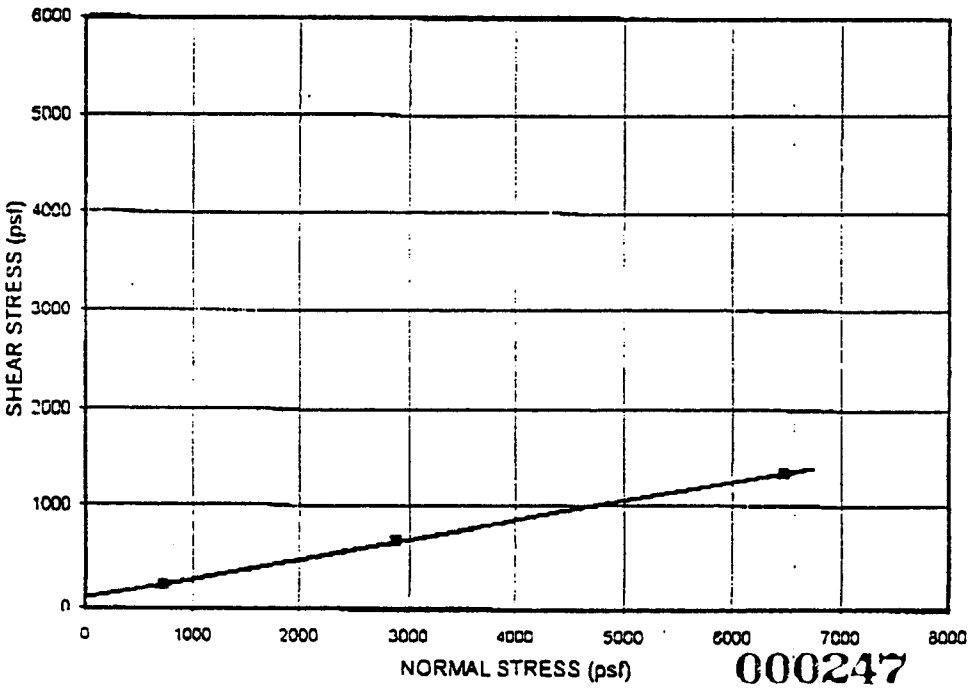
Test Point	Normal Stress psi	Normal Stress psf	Shear Stress psf	Secant Friction Angle
1.	5.0	720	230	18
2.	20.0	2880	680	13
3.	45.0	6480	1340	12

Adhesion: 110 psf

Friction Angle: 11 degrees

Coefficient of Friction: 0.19

NOTE GRAPH NOT TO SCALE



000247

NOTE: The Friction Angle and Adhesion (or Cohesion) results given here are based on a mathematically determined best fit line. Further interpretation should be conducted by a qualified professional experienced in geosynthetic and geotechnical engineering.

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Report Date: 06/21/99 Entered By: NCL Reviewed By: NCL Lab Log: 121-F

Vector Engineering Inc.

Laboratory Services

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(530) 272-2448 Fax:(530) 272-8553

LARGE SCALE DIRECT SHEAR REPORT

Test Method D-6243-B

-- 2739

Client Name: PRECISION LABORATORIES Project Name: FERNALD SUPERFUND SITE Project No: 943022.37

Superstrate: ⇦ Board Spacers

Material 1 ⇦ CETCO Bentomat ST; Lot # 19992020 Roll # 5247 LSN: BEB Rasp Board

Material 2. ⇨ GSE 80 mil HDPE Textured/Textured; Roll # 114101806 LSN: BEL Clamped

Substrate: ⇨ Concrete Board with Sand Layer

DISPLACEMENT vs. SHEAR STRESS

Test Point	Normal Stress psi	Normal Stress psf
1.	5.0	720
2.	20.0	2880
3.	45.0	6480

MOISTURE DATA:

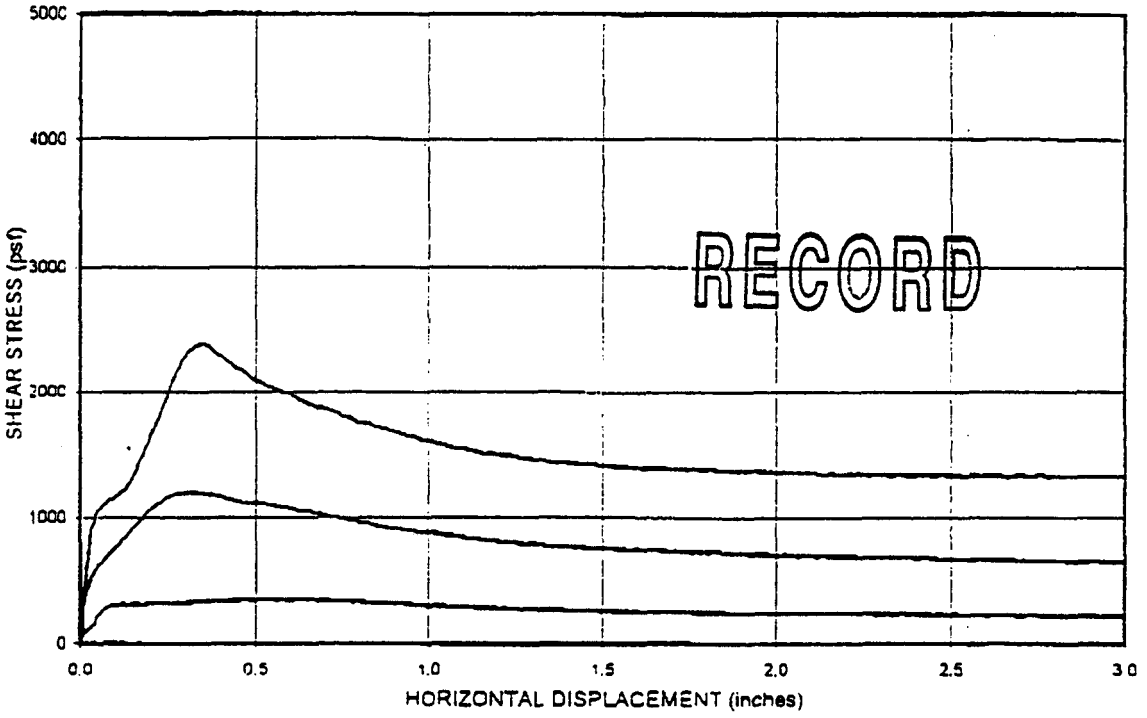
(GCL)

Initial Water Content 20.8%

Initial Dry Density: NA pcf

Final Water Content:(%)

1.	2.	3.
131.6	96.3	78.9

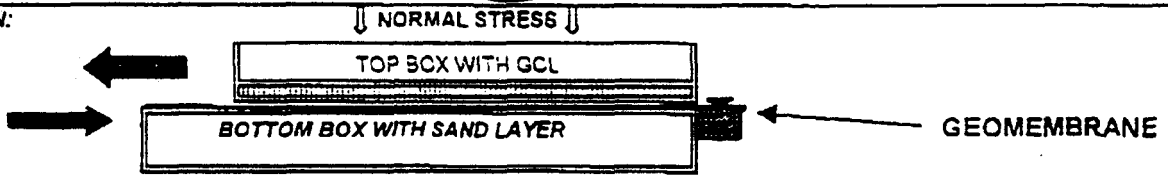


STANDARD CONDITIONS: SHEAR DISPLACEMENT RATE: 0.004 in/min

1. The "gap" between shear boxes was set at 80 mil (2.0 mm)
2. The test specimens were flooded during testing unless otherwise noted.
3. High Normal Stresses, >5psi (35 kPa) was applied using air pressure.
4. Low Normal Stresses, <5psi (35 kPa) was applied using dead weights.
5. The tests were terminated after 3.0"(75 mm) of displacement unless otherwise noted.
6. Tests were performed in general accordance with ASTM procedure D-6243 using a Brainard-Killman LG-112 direct shear machine with an effective area of 12" x 12" (300 x300 mm)

Should be D5321

TEST ORIENTATION:



SPECIAL TEST NOTES:

1. Each specimen of HDPE was cut to 14" x 20" and clamped to the lower box.
2. The GCL was wrapped around a 12"x12" rasp board in the upper box.
3. Each GCL specimen was hydrated for 7 days at 3 psi, in contact with the textured HDPE.
4. After hydration each GCL / HDPE specimen was consolidated at the specified consolidation stress for 48 hrs. then sheared.
5. The woven textile side of the GCL was tested against the HDPE.
6. Shearing occurred at the interface between the textured HDPE and GCL specimen.
7. Minor stretching of the non-woven fabric occurred in points 2 & 3.

000248

By accepting the data and result represented on this page, Client agrees to limit the liability of Vector Engineering, Inc. from client and all other parties for claims arising out of use of this data to the cost for the respective test(s) represented hereon, and Client agrees to indemnify and hold harmless Vector from and against all liability in excess of the aforementioned limit.

Report Date: Entered By: Reviewed By: Lab Log:

Vector Engineering Inc.

Laboratory Services
Loma Rica Drive, Suite C, Grass Valley, CA 95945
(530) 272-2446 Fax (530) 272-8553

LARGE SCALE DIRECT SHEAR REPORT

Test Method D-6243-B

2739

Client Name: PRECISION LABORATORIES Project Name: FERNALD SUPERFUND SITE Project No: 943022.37

Superstrate: ⇦ Board Spacers

Material 1: ⇦ CETCO Bentomat ST Lot # 199922020 Roll # 5203 LSN: BEA Rasp Board

Material 2: ⇨ GSE 80 mil HDPE Textured/Textured; Roll # 114101816 ? LSN: BEM Clamped

Substrate ⇨ Concrete Board with Sand Layer

PEAK STRENGTH

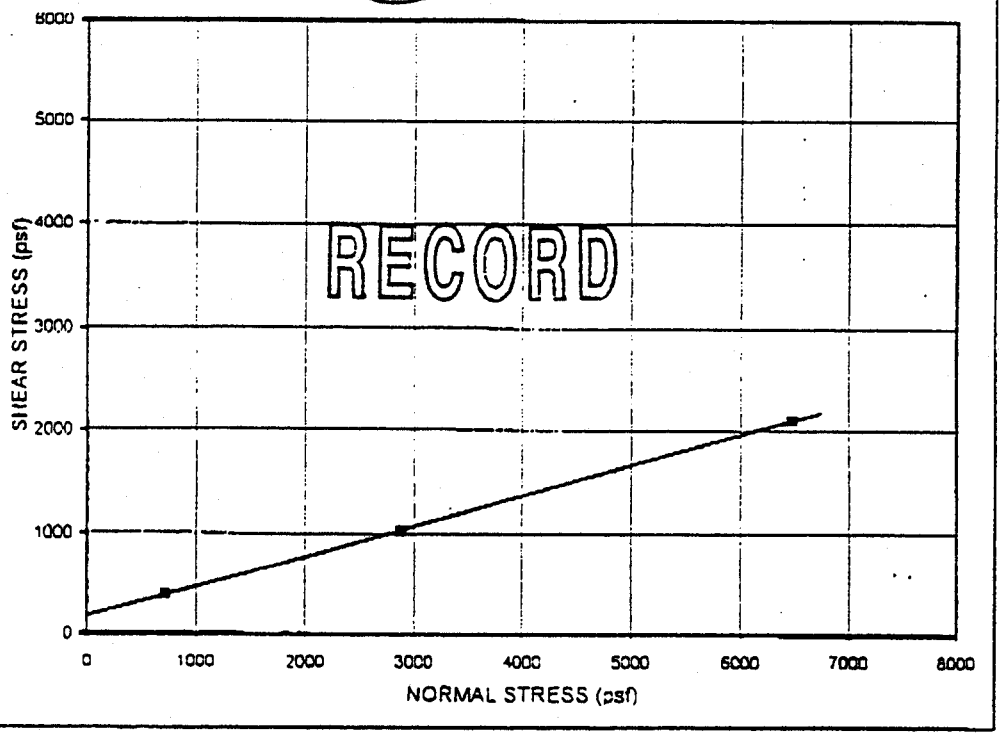
Test Point	Normal Stress psi	Normal Stress psf	Shear Stress psf	Secant Friction Angle
1.	5.0	720	400	29
2.	20.0	2880	1020	20
3.	45.0	6480	2100	18

Adhesion: 180 psf

Friction Angle: 17 degrees

Coefficient of Friction: 0.3

NOTE GRAPH NOT TO SCALE



STRENGTH ENVELOPE

(at 2.5 in. displacement)

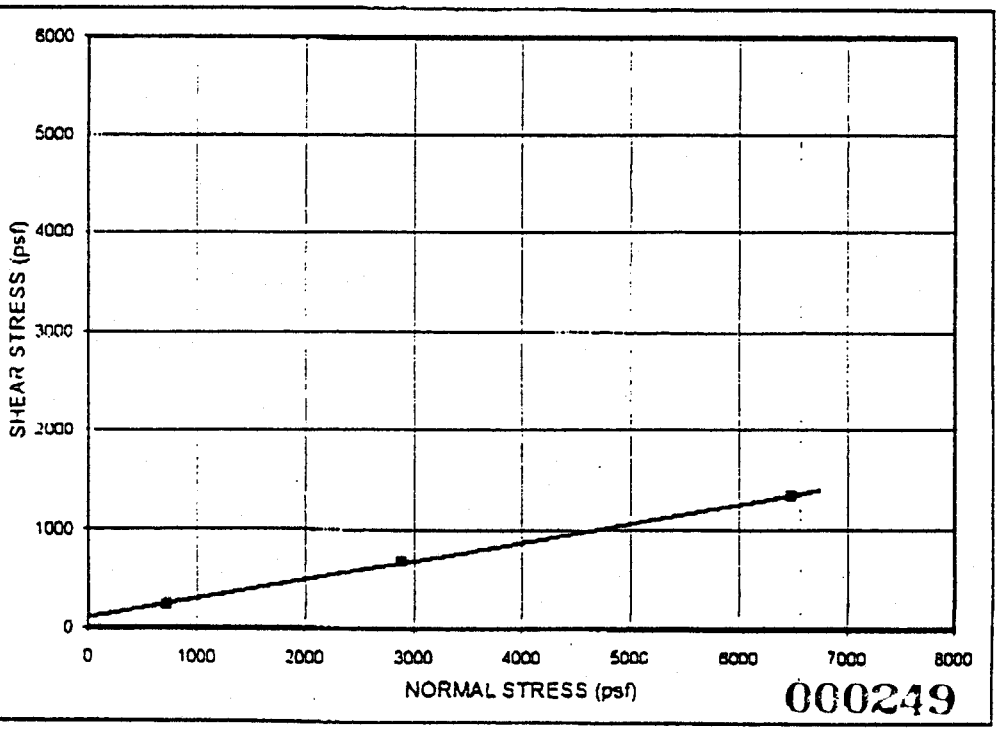
Test Point	Normal Stress psi	Normal Stress psf	Shear Stress psf	Secant Friction Angle
1.	5.0	720	230	18
2.	20.0	2880	670	13
3.	45.0	6480	1350	12

Adhesion: 100 psf

Friction Angle: 11 degrees

Coefficient of Friction: 0.19

NOTE GRAPH NOT TO SCALE



000249

NOTE: The Friction Angle and Adhesion (or Cohesion) results given here are based on a mathematically determined best fit line. Further interpretation should be conducted by a qualified professional experienced in geosynthetic and geotechnical engineering.

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Entered By: RWM Reviewed By: NU Report Date: 06/21/99 Lab Log: 121F

Vector Engineering Inc.
Laboratory Services
12438 Loma Rica Drive, Suite C, Grass Valley, CA 95945
(530) 272-2448 Fax:(530) 272-8553

LARGE SCALE DIRECT SHEAR REPORT

Test Method D-6243-B

-- 2739

Client Name: PRECISION LABORATORIES Project Name: FERNALD SUPERFUND SITE Project No: 943022.37

Superstrate: ⇦ Board Spacers

Material 1: ⇦ CETCO Bentomat ST Lot # 199922020 Roll # 5203 LSN: BEA Rasp Board

Material 2: ⇨ GSE 80 mil HDPE Textured/Textured Roll # 114101816 LSN: BEM Clamped

Substrate: ⇨ Concrete Board with Sand Layer

DISPLACEMENT vs. SHEAR STRESS

Test Point	Normal Stress psi	Normal Stress psf
1.	5.0	720
2.	20.0	2880
3.	45.0	6480

MOISTURE DATA:

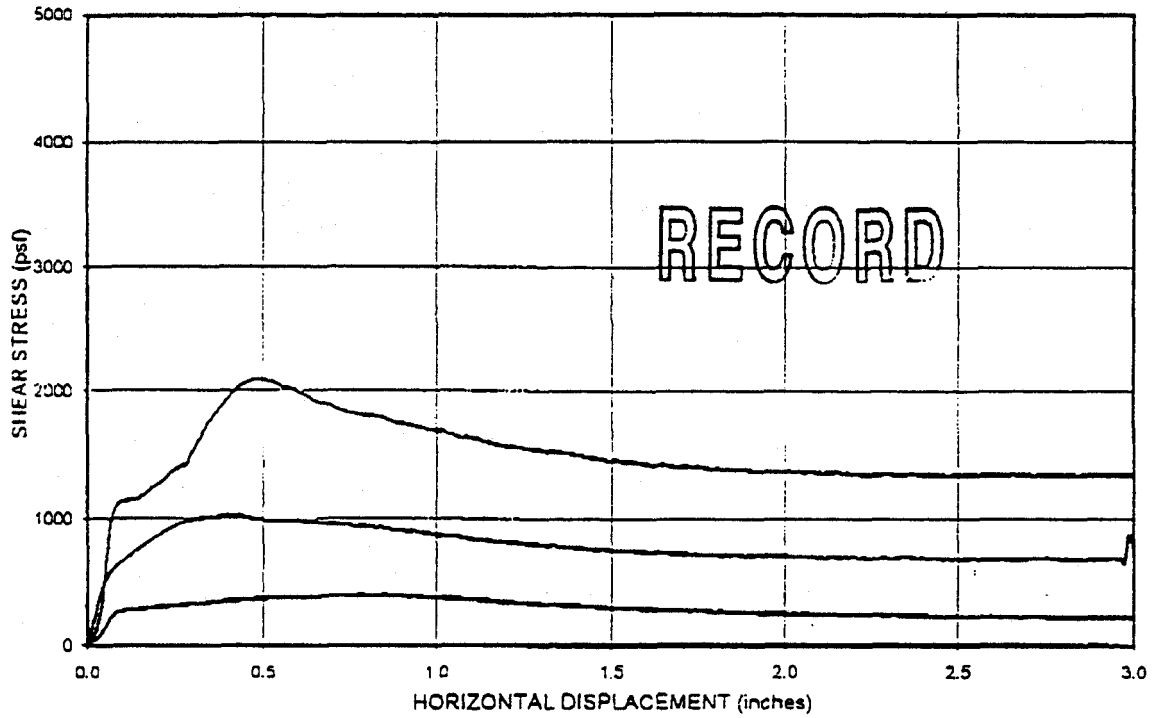
(GCL)

Initial Water Content: 20.1%

Initial Dry Density: N/A pcf

Final Water Content: (%)

1.	2.	3.
135.5	109.4	70.5

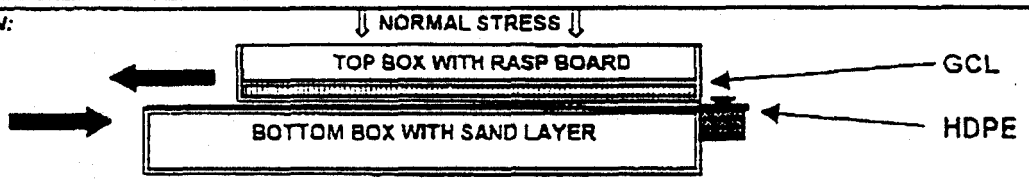


STANDARD CONDITIONS: **SHEAR DISPLACEMENT RATE: 0.004 in/min**

1. The "gap" between shear boxes was set at 80 mil (2.0 mm)
2. The test specimens were flooded during testing unless otherwise noted.
3. High Normal Stresses, >5psi (35 kPa) was applied using air pressure.
4. Low Normal Stresses, <5psi (35 kPa) was applied using dead weights.
5. The tests were terminated after 3.0"(75 mm) of displacement unless otherwise noted.
6. Tests were performed in general accordance with ASTM procedure D-6243 using a Brainard-Killman LG-112 direct shear machine with an effective area of 12" x 12" (300 x300 mm).

Should be D5321

TEST ORIENTATION:



SPECIAL TEST NOTES:

1. Each specimen of HDPE was cut to 14" x 20" and clamped to the lower box.
2. The textile portions of the GCL were wrapped around a 12"x12" rasp board in the upper box.
3. The GCL specimens were hydrated for 7 days at 3 psi, in contact with the textured HDPE.
4. After hydration each GCL / HDPE specimen was consolidated at the specified normal stress for 48 hrs., then sheared.
5. The woven textile side of the GCL was tested against the HDPE.
6. Shearing occurred at the interface between the textured HDPE and GCL specimens.
7. Minor stretching of the GCL occurred at points 2 and 3

000250

By accepting the data and result represented on this page, Client agrees to limit the liability of Vector Engineering, Inc. from client and all other parties for claims arising out of use of this data to the cost for the respective test(s) represented thereon, and Client agrees to indemnify and hold harmless Vector from and against all liability in excess of the aforementioned limit.

Entered By: Reviewed By: Report Date: Lab Log:

Vector Engineering Inc.
Laboratory Services
Loma Rica Drive, Suite C, Grass Valley, CA 95945
(530) 272-2448 Fax (530) 272-8553

LARGE SCALE DIRECT SHEAR REPORT

Test Method D-6243-B 2739

Client Name: PRECISION LABORATORIES Project Name: FERNALD SUPERFUND SITE Project No: 943022.37

Substrate: ⇦ Board Spacers

Material 1: ⇦ CETCO Bentomat ST Lot # 19992020 Roll # 5159 LSN: BDX Resp Board

Material 2: ⇨ 80 mil GSE HDPE Textured/Textured Roll # 114101734 LSN: BEE Clamped

Substrate: ⇨ Concrete Board with Sand Layer

PEAK STRENGTH

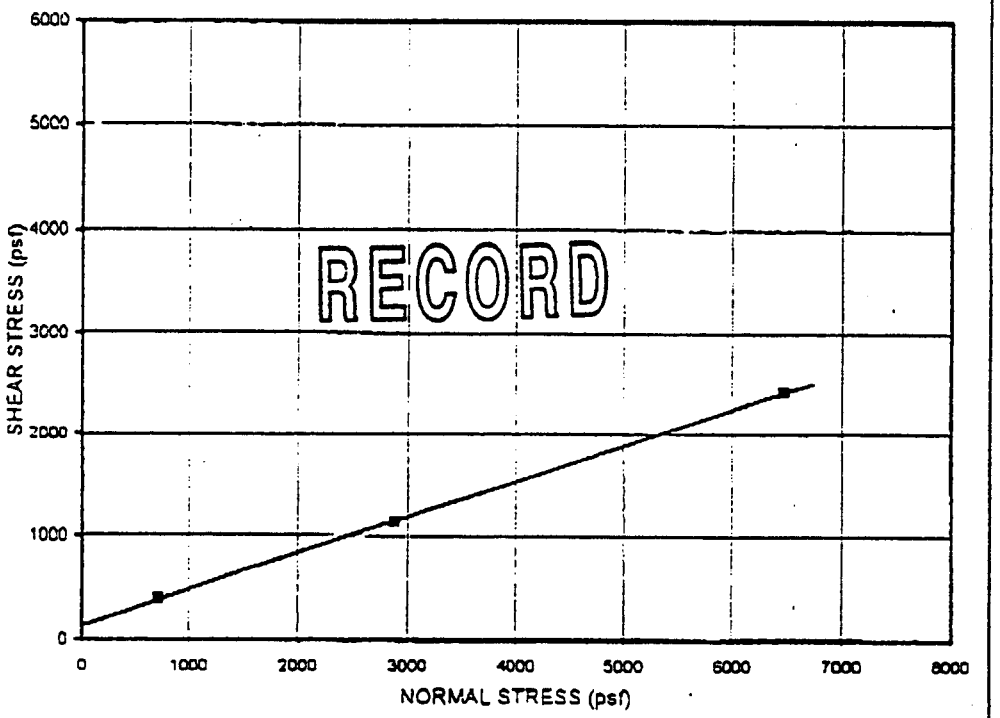
Test Point	Normal Stress psi	Normal Stress psf	Shear Stress psf	Secant Friction Angle
1.	5.0	720	400	29
2.	20.0	2880	1140	22
3.	45.0	6480	2420	20

Adhesion: 140 psf

Friction Angle: 19 degrees

Coefficient of Friction: 0.35

NOTE: GRAPH NOT TO SCALE



STRENGTH ENVELOPE

(at 2.5 in. displacement)

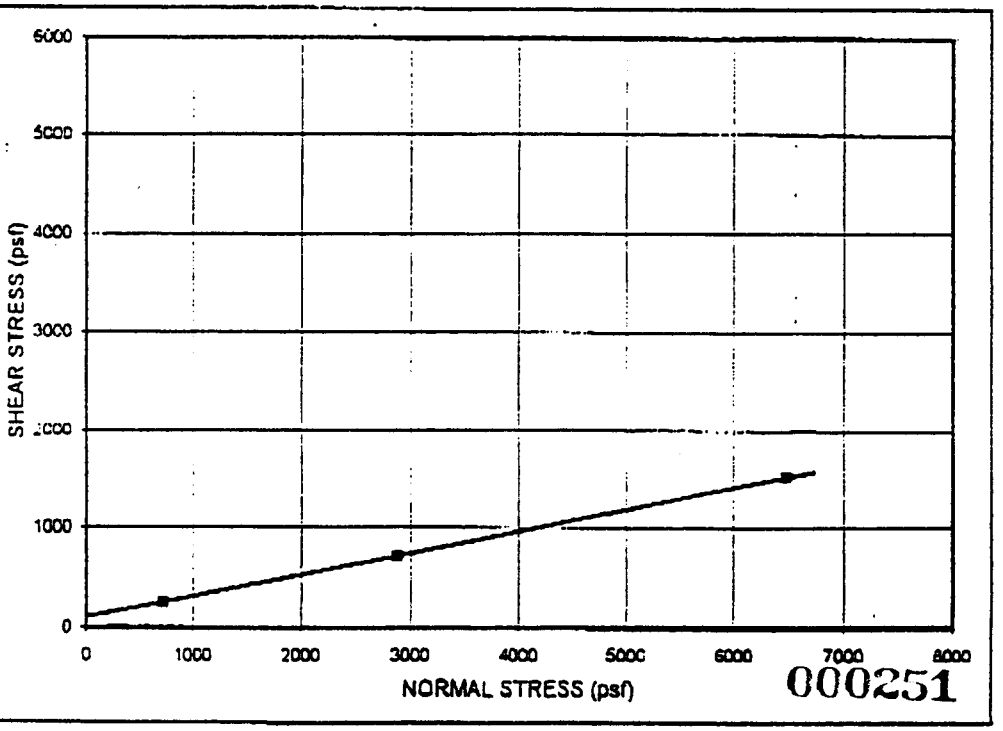
Test Point	Normal Stress psi	Normal Stress psf	Shear Stress psf	Secant Friction Angle
1.	5.0	720	250	19
2.	20.0	2880	730	14
3.	45.0	6480	1500	13

Adhesion: 100 psf

Friction Angle: 12 degrees

Coefficient of Friction: 0.22

NOTE: GRAPH NOT TO SCALE



000251

NOTE: The Friction Angle and Adhesion (or Cohesion) results given here are based on a mathematically determined best fit line. Further interpretation should be conducted by a qualified professional experienced in geosynthetic and geotechnical engineering.

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Entered By:	Reviewed By:	Report Date:	Lab Log:
RWM	NCL	06/23/99	1210

Vector Engineering Inc.
Laboratory Services
12438 Loma Rica Drive, Suite C, Grass Valley, CA 95945
(530) 272-2448 Fax (530) 272-8553

LARGE SCALE DIRECT SHEAR REPORT

Test Method D-6243-B

— 2739

Client Name: PRECISION LABORATORIES Project Name: FERNALD SUPERFUND SITE Project No: 943022.37

Superstrate: ⇦ Board Spacers

Material 1: ⇦ CETCO Bentomat ST Lot # 19992020 Roll # 5159 LSN: BDX Rasp Board

Material 2: ⇨ 80 mil GSE HDPE Textured/Textured Roll # 114101734 LSN: BEE Clamped

Substrate: ⇨ Concrete Board with Sand Layer

DISPLACEMENT vs. SHEAR STRESS

Test Point	Normal Stress psi	Normal Stress psf
1.	5.0	720
2.	20.0	2880
3.	45.0	6480

MOISTURE DATA:

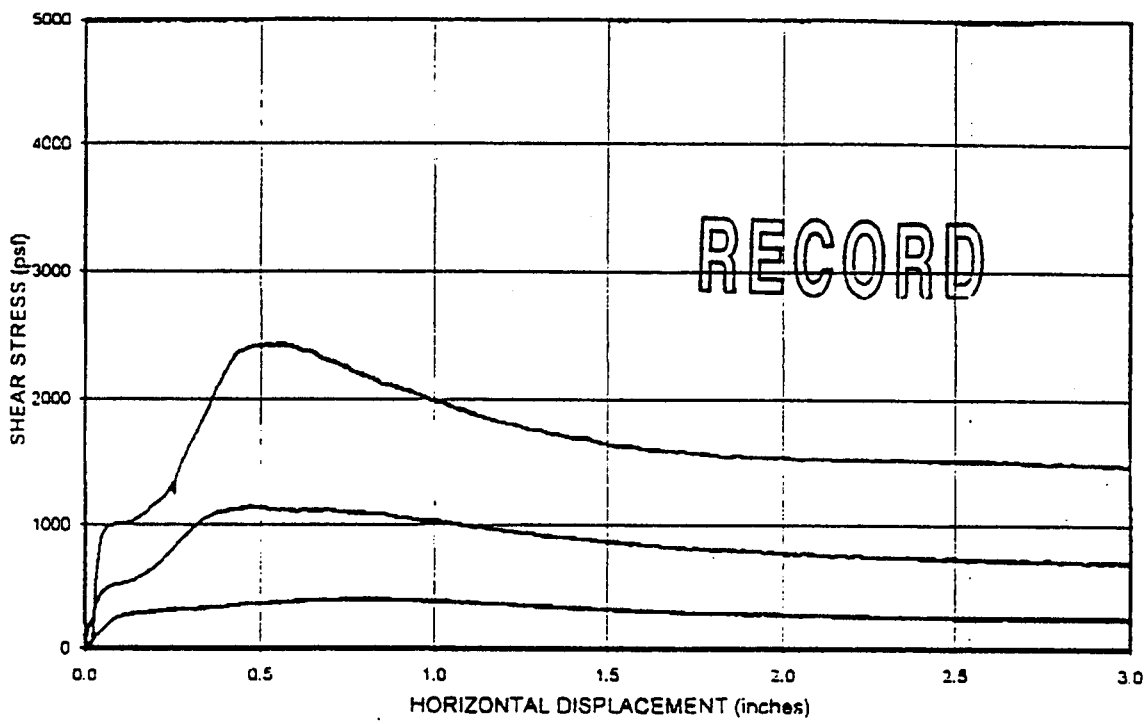
(GCL)

Initial Water Content 12.9%

Initial Dry Density: N/A pcf

Final Water Content:(%)

1.	2.	3.
137.3	126.7	77.5



STANDARD CONDITIONS: **SHEAR DISPLACEMENT RATE: 0.004 in/min**

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2. The test specimens were flooded during testing unless otherwise noted.
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4. Low Normal Stresses, <5psi (35 kPa) was applied using dead weights.
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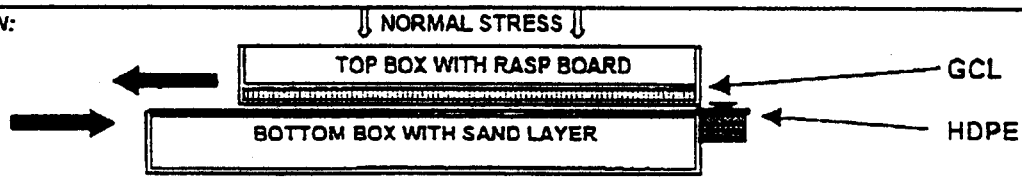
6. Tests were performed in general accordance with ASTM procedure D-6243 using a Brainard-Killman LG-112 direct shear machine with an effective area of 12" x 12" (300 x300 mm).

should be D 5321

TEST ORIENTATION:



SPECIAL TEST NOTES:

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2. The textile portions of the GCL were wrapped around a 12"x12" rasp board in the upper box.
3. The GCL specimens were hydrated for 7 days at 3 psi, in contact with the textured HDPE.
4. After hydration each GCL / HDPE specimen was consolidated at the specified normal stress for 48 hrs., then sheared.
5. The woven textile side of the GCL was tested against the HDPE.
6. Shearing occurred at the interface between the textured HDPE and GCL specimens.
7. Minor stretching of the GCL specimens at point #2 and #3 was observed.

000252

By accepting the data and result represented on this page, Client agrees to limit the liability of Vector Engineering, Inc. from client and all other parties for claims arising out of use of this data to the cost for the respective test(s) represented hereon, and Client agrees to indemnify and hold harmless Vector from and against all liability in excess of the aforementioned limit.

Entered By: Reviewed By: Report Date: Lab Log:

SUPPLIER DOC[illegible]T SUBMITTAL

PROJECT NO.: (1) 20102	CONTRACT NO: (2) 1440	SUBMITTAL NO.:(3) 006	REV.:(4) 5	DATE:(5) 7/8/99	Page 1 of 4 (6)

FROM: GSE Lining Technologies (7)

RECORD

TO: FDF ENGINEERING/CONSTRUCTION
DOCUMENT CONTROL (ECDC), MS 52-7 (8)

SIGNATURE: _____

RECEIVED BY: _____ DATE: _____

QTY	DOCUMENT NUMBER	REV	DOCUMENT FAMILY: PRO	H&S	MED	TRG	CON	ENG	QAC	OPER	TITLE/DESCRIPTION	SUBMITTAL TYPE: DRFT	CFC	INF	ASSOCIATED SPECIFICATION	SUBMITTAL ACTION: A	B	C
(9)	(10)	(11)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(13)	(14)	(14)	(14)	(15)	(16)	(16)	(16)
8	1440-006B	2							X		Quality Control Certificates		X		02772P.1.04.B	KBT ~~X~~	X	

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RECEIVED
JUL 09 1999
KBT @ 07.58 AM.

000253

NO COMMENTS: _____ COMMENTS: (PLEASE USE SPACE BELOW FOR COMMENTS OR INDICATE IF ATTACHMENTS) (19)

(1) Test results are only good for Rolls 5003-5106. Were tests performed by CETCO or STS consultants? If so, we need copies of raw data (test results) with QC signatures.

2739

RECEIVED BY: [signature] DATE: 7/9/99

(SIGN/DATE AND RETURN A COPY TO ECDC, MS 52-7)

SUBMITTAL TYPE: (BY SUPPLIER)
CFC - CERTIFIED FOR CONSTRUCTION
INF - INFORMATION/RECORD
DRFT - DRAFT/PRELIMINARY

SUBMITTAL ACTION CODE: (BY FDF)
A - Conforms to the Subcontract Requirements
B - Minor Comments - Incorporate and Resubmit
C - Revise and Resubmit (SEE COMMENTS)

FS-F-4955
Rev. 4: 04/??/1999

1440-006 Rev. 5
8 July 1999 p. 2 of 4
Doc# 1440-006B, Rev. 0

GSE

GSE Lining Technology, Inc.

RECORD

19103 Gundle Road
Houston, Texas 77073
800-435-2008
281-443-8564
Fax 281-230-8684

--2739

Facsimile

To:	Jim Turner	From:	Eric Reed
Fax:	513/648-5767	Pages:	3
Phone:	513/648-4941	Date:	07/08/99
Re:	Wide Width Test Results for GCL	CC:	

☐ Urgent ☐ For Review ☐ Please Comment ☐ Please Reply ☐ Please Recycle

- Comments: Here are the outstanding test results. Let me know if there is anything else.

1440-006 Rev. 5
July 1999 p. 3 of 4

CETCO
COLLOID ENVIRONMENTAL TECHNOLOGIES COMPANY
1350 West Shure Drive • Arlington Heights, IL 60004-1440 • USA
(847) 392-5800 • Fax (847) 506-6150
http://www.cetco.com

Doc # 1440-006B Rev. C

RECORD

2739

FAX MEMO

June 28, 1999 Pages: 2, including cover

To: Eric Reed
GSE
fax (281) 230-5891

From: Jim Olsta

cc:

Subject: Fluor Daniel Fernald MQC Test Data

Dear Eric:

CETCO has completed the Bentomat ST MQC wide width tensile testing for the Fluor Daniel Fernald project for lot 199922020 rolls 5003-5106. The other GCL MQC test results for these rolls were sent previously.

Sincerely,

Jim Olsta
Technical Manager
Lining Technology Group

CETCO

COLLOID ENVIRONMENTAL TECHNOLOGIES COMPANY

Standard Test Method for Tensile Properties
of Geotextiles by the Wide-Width Strip Method

ASTM D4595

Project: Fluor Daniel Fernald

Proj. No.: 99-072

Sample ID: Lot # 199922020
Roll# 5003-5106

Date: 6/28/99

Requested by: Jim Olsta

RECORD

Specimen Number	Load/Width at Max.Load (lbs./in) Roll 5003	Roll 5018	Roll 5034	Roll 5041	Roll 5058	Roll 5074	Roll 5090	Roll 5106
1	59.8	66.8	76.3	31.7	47.9	69.1	70.4	39.0
2	65.5	68.3	75.3	44.1	54.7	74.8	76.1	41.4
3	65.6	68.5	73.6	44.6	46.0	69.9	72.5	45.8
4	64.8	66.0	69.0	39.3	48.2	73.5	78.7	41.2
5	58.2	67.5	72.8	41.2	50.5	68.8	73.7	37.9
6	61.6	71.5	58.9	59.6	58.9	67.6	81.2	44.1
Average	62.6	68.1	71.0	43.4	51.0	70.6	75.4	41.6

Need MQC Manager signature.

KBT
7-9-99

2739

1440-006 Rev.5
8 July 1999 p. 4 of 4
Doc. # 1440-006 Rev.2

TOTAL P.03

000256

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DF PROJECT NO.: (1) 20102	CONTRACT NO: (2) 1440	SUBMITTAL NO.:(3) 006	REV.:(4) 6	DATE:(5) 7/15/99	Page 1 of 3 (6)

ROM: GSE Lining Technologies (7)

TO: FDF ENGINEERING/CONSTRUCTION
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8	1440-006B	3							X		Quality Control Certificates		X		02772P.1.04.B	X		

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Jim Turner, FDF, QA	64				

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B - Minor Comments - Incorporate and Resubmit
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FS-F-4955
Rev. 4: 04/??/1999

- 2739

CETCO
COLLOID ENVIRONMENTAL TECHNOLOGIES COMPANY
1350 West Shure Drive • Arlington Heights, IL 60004-1440 • USA
(847) 392-5800 • Fax (847) 506-6150
http://www.cetco.com

1440-006 Rev. 6
7-15-99
p. 2 of 3
1440-006B
Rev. 3

FAX MEMO

July 14, 1999

To: Jim Turner
Fernald
fax (513) 648-5767

From: Jim Olsta

Document #

RECORD

cc: Eric Reed, GSE
Noe Garcia, Lovell

Pages: 2, including cover

Subject: Fluor Daniel Fernald Project

Dear Mr. Turner:

Per your e-mail of July 8th regarding extra GCL MQC data, CETCO has completed the bentonite mass per unit area, moisture content and peel strength testing on rolls 5003 and 5319 (see attached spreadsheets).

The testing on roll 5205 is still in progress.

If you have any questions, please feel free to contact me.

Sincerely,

Jim Olsta
Technical Manager
Lining Technologies Group

000258

7/13/99

COLLOID ENVIRONMENTAL TECHNOLOGIES COMPANY
GCL QUALITY DATA

CETCO
LOVELL, WY

RECORD

SHIP TO: FLUOR DANIEL FERNALD
7400 WILLEY RD
HARRISON, OH 45030

MATERIAL	LOT NO	ROLL NO	PEEL STRENGTH lbs.	BENTONITE MASS/AREA lbs./sq ft	MOISTURE CONTENT %
BENTOMAT ST	199922020	5003	44.3	1.06	15.3
BENTOMAT ST	199922020	5319	49.0	1.17	10.8
			ASTM D4632	ASTM D5261	ASTM D4643

2739

1440-006 Rev. 6
7-15-99 p. 3 of 3
Document # 1440-006 Rev. 3

000259

SUPPLIER DOCUM[illegible]BMITTAL

F PROJECT NO.: (1) 20102	CONTRACT NO: (2) 1440	SUBMITTAL NO.:(3) 006	REV.:(4) 7	DATE:(5) 7/15/99	Page 1 of 5 (6)

OM: GSE Lining Technologies (7)

TO: FDF ENGINEERING/CONSTRUCTION
DOCUMENT CONTROL (ECDC), MS 52-7 (8)

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			DOCUMENT FAMILY									SUBMITTAL TYPE				SUBMITTAL ACTION		
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8	1440-006B	4							X		Quality Control Certificates		X		02772P.1.04.B	X		

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Kwasi Badu-Tweneboah, GeoSyntec, Eng.	38				
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Tony Klimek, FDF, Eng.	64				
Jim Turner, FDF, QA	64				

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) COMMENTS: X COMMENTS: (PLEASE USE SPACE BELOW FOR COMMENTS OR INDICATE IF ATTACHMENTS) (19)

000260

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DRFT - DRAFT/PRELIMINARY

SUBMITTAL ACTION CODE: (BY FDF)
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B - Minor Comments - Incorporate and Resubmit
C - Revise and Resubmit (SEE COMMENTS)

FS-F-4955
Rev. 4: 04/??/1999

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(847) 392-5800 • Fax (847) 506-6150
http://www.cetco.com

1440-006 Rev. 7

FAX MEMO	July 15, 1999	7-15-99 p. 2 of 5 Doc. # 1440-006B
To: Jim Turner Fernald fax (513) 648-5767	From: Jim Olsta	
cc: Eric Reed, GSE Noe Garcia, Lovell	Pages: 4, including cover	
Subject: Fluor Daniel Fernald Project	RECORD	

Dear Mr. Turner:

Per your e-mail of July 8th regarding extra GCL MQC data, CETCO has completed the hydraulic conductivity, free swell, fluid loss and wide width strength testing on roll 5205 (see attached spreadsheets).

If you have any questions, please feel free to contact me.

Sincerely,

Jim Olsta
Technical Manager
Lining Technologies Group

000261

STS Consultants, Ltd.

HYDRAULIC CONDUCTIVITY DETERMINATION
GRI-GCL-2
RISING TAILWATER LEVEL

— 2739

1440-006 Rev. 7
7-15-99
p. 3 of 5
Doc. # 1440-006 B

RECORD

STS PROJECT NO.:	29139-A
PROJECT:	Cetco
DATE:	7/14/99

SUMMARY OF TEST RESULTS

SAMPLE NO.	Roll # 5205
LOCATION	
CLASSIFICATION	Bentomat ST

	INITIAL	FINAL
DRY UNIT WEIGHT (pcf)	58.6	53.9
WATER CONTENT (%)	11.2	88.6
DIAMETER (cm)	10.160	10.160
LENGTH (cm)	0.492	0.534

HYDRAULIC GRADIENT (MAXIMUM)	334.6
PERCENT SATURATION	113.8
HYDRAULIC CONDUCTIVITY k (cm/sec)	3.47E-09

(Percent saturation calculation is based on final measurements and an estimated specific gravity.)

PERM5205.xls

—2739
1440-006 Rev. 7
7-15-99
p. 4 of 5
Doc # 1440-006B

CETCO
COLLOID ENVIRONMENTAL TECHNOLOGIES COMPANY

1350 WEST SHURE DRIVE
ARLINGTON HEIGHTS, ILLINOIS 60004

PHONE: (847) 392-5800
FAX: (847) 506-6150

Standard Test Method For Swell Index and Fluid Loss of Clay Component of Geosynthetic Clay Liners

ASTM D 5890 - 95 & ASTM D 5891 - 95

Project: Fluor Daniel Fernald

Proj. No.: 99-072

Sample ID: Lot# 199922020
Roll# 5205
Requested By: Jim Olsta

RECORD

Date: 6/8/99

Test Results:

ROLL#	Free Swell	Fluid Loss
5205	28	15.18

File Name: 99-072

Analyst: NP

STS CONSULTANTS, LTD LABORATORY SERVICES
STS PROJECT NUMBER 29139-A
FLOUR DANIEL FERNALD PROJECT — 2739

1440-006 Rev. 7
7-15-99
p. 5 of 5
Doc. # 1440-006B

ASTM D 4595 WIDE WIDTH TENSILE STRENGTH

Test type: WIDE WIDTH TEST OF BENTOMAT ST

Operator name: LO

Sample Identification: GET5205
Interface Type: 1011 Series
Machine Parameters of test:
Sample Rate (pts/sec): 20.000
Crosshead Speed (in/min): .4000

Instron Corporation
Series IX Automated Materials Testing System 1.09
Test Date: 12 Jul 1999

Sample Type: GCL

Humidity (%): 52
Temperature (deg. F): 71

ROLL NUMBER 5205
DIRECTION TESTED: MACHINE
CONDITION TESTED: DRY

RECORD

RECORD

Dimensions:

	Sample
Width (in)	8.0000
Thickness (in)	.24500
Spec gauge length (in)	4.0000
Grip distance (in)	4.0000

Out of 7 specimens, 1 excluded.

Specimen Number	Load at Max.Load (lbs)	Displacement at Max.Load (in)	% Strain at Max.Load (%)	Load/Width at Max.Load (lbs/in)
1	293.000	.4500	11.2500	36.6200
Excluded	3.375	.0000	.0000	.4219
3	312.400	.4400	11.0000	39.0500
4	274.100	.4200	10.5000	34.2600
5	317.200	.4100	10.2500	39.6600
6	334.800	.4200	10.5000	41.8500
7	285.400	.3800	9.5000	35.6700
Mean:	302.800	.4200	10.5000	37.8500
Standard Deviation:	22.590	.0245	.6126	2.8240

TOTAL P.04

SUPPLIER DOCUMENT SUBMITTAL

FDF PROJECT NO.: (1) 20102	CONTRACT NO: (2) 1440	SUBMITTAL NO.:(3) 006	REV.:(4) 8	DATE:(5) 8/17/99	Page 1 of 4 (6)

FROM: GSE Lining Technologies

(7) RECORD

SIGNATURE: _____

TO: FDF ENGINEERING/CONSTRUCTION
DOCUMENT CONTROL (ECDC), MS 52-7
(8)

RECEIVED BY: _____ DATE: _____

QTY	DOCUMENT NUMBER	REV	DOCUMENT FAMILY PRO	H&S	MED	HRG	CON	ENG	QAC	OPER	TITLE/DESCRIPTION	SUBMITTAL TYPE DRFT	CFC	INF	ASSOCIATED SPECIFICATION	SUBMITTAL ACTION A	B	C
(9)	(10)	(11)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(13)	(14)	(14)	(14)	(15)	(16)	(16)	(16)
8	1440-006A	2						X			GCL Internal and Interface Shear Strength Test Results		X		02772P.1.04.B		X	

REVIEW DISTRIBUTION

NAME	MS	NAME	MS	NAME	MS
(17)	(18)	(17)	(18)	(17)	(18)
Kwasi Badu-Tweneboah, GeoSyntec, Eng.	38				
Kathy Fisher, FDF, Procurement	64				
Gregg Johnson, FDF, Health and Safety	64				
Tony Klimek, FDF, Eng., Approver	64				
Jim Turner, FDF, QA	64				
Chuck Van Arsdale, FDF, Eng.	64				

RECEIVED AUG 17 1999 KBT @ 1:20 pm

NO COMMENTS: _____ COMMENTS: (PLEASE USE SPACE BELOW FOR COMMENTS OR INDICATE IF ATTACHMENTS) (19)

- ASTM D 6243 used instead of ASTM D5321 per specifications.
- Test results not signed by LAB QC Manager

RECEIVED BY: (20) DATE: 8/17/99

(SIGN/DATE AND RETURN A COPY TO ECDC, MS 52-7)

SUBMITTAL TYPE: (BY SUPPLIER)
CFC - CERTIFIED FOR CONSTRUCTION
INF - INFORMATION/RECORD
DRFT - DRAFT/PRELIMINARY

SUBMITTAL ACTION CODE: (BY FDF)
A - Conforms to the Subcontract Requirements
B - Minor Comments - Incorporate and Resubmit
C - Revise and Resubmit (SEE COMMENTS)

000265

27139

FS-F-4955
Rev. 4: 04/??/1999

Submittal 20102-1440-006 Rev.8
8-17-99 p. 2 of 4 Doc# 1440-006A Rev. 2

Precision Geosynthetic Laboratories 1742 West Katella Ave., Suite 4, Orange, CA 92867

FAX RECORD

RECEIVED AUG 17 1999

Date: 8/16 -- 2739

Number of pages including cover sheet: 3

To: Jim Turner
ERIC Reed
last roll of GCL

RE:

c/o

Phone:

Fax phone: 281-230-8663

CC: 513-648-5767

From: Cora B. Queja

Phone: 714-744-4599

Fax phone: 714-744-0357

CompuServe: 102402.3642

Internet: precisionlab.earthlink.net

REMARKS: ☐ Urgent ☒ For your review ☐ Reply ASAP ☐ Please comment

Here's the result of the last roll of GCL

NOTICE: This message is intended only for use of the individual or entify to which it is addressed and may represent an attorney-client communications or otherwise contain information that is privileged, confidential and exempt from disclosure under applicable law. It the reader of this message is NOT the intended recipient, or the employee or agent responsible for delivering this messge to the intended recipient, you are hereby notified that any dissemination, distribution or copying or other use of this communication is strictly prohibited. If you receive the communication in error, please notify us immediately by telephone, and return the message to us at the above address. Thank you.

w:/fax4

Submittal 20102-1440-006 Rev-8 8-17-99 p. 3 of 4 Doc # 1440-006 A Rev 2

Vector Engineering Inc.

Laboratory Services

12438 Loma Rica Drive, Suite C, Grass Valley, CA 95945
(530) 272-2448 Fax:(530) 272-8553

LARGE SCALE DIRECT SHEAR REPORT

Test Method D-6243-B

RECEIVED AUG 17 1999

2739

Client Name: PRECISION LABORATORIES Project Name: FERNALD SUPERFUND SITE Project No: 943022.37

Superstrate: Board Spacers

Material 1: CETCO Bentomat ST Lot # 199922020 Roll # 5033 LSN: BGS Rasp Board

Material 2: GSE 80 mil HDPE Textured/Textured: Roll # 114101816 LSN: BEM Clamped

Substrate: Concrete Board with Sand Layer

DISPLACEMENT vs. SHEAR STRESS

Test Point	Normal Stress psi	Normal Stress psf
1.	5.0	720
2.	20.0	2880
3.	45.0	6480

MOISTURE DATA:

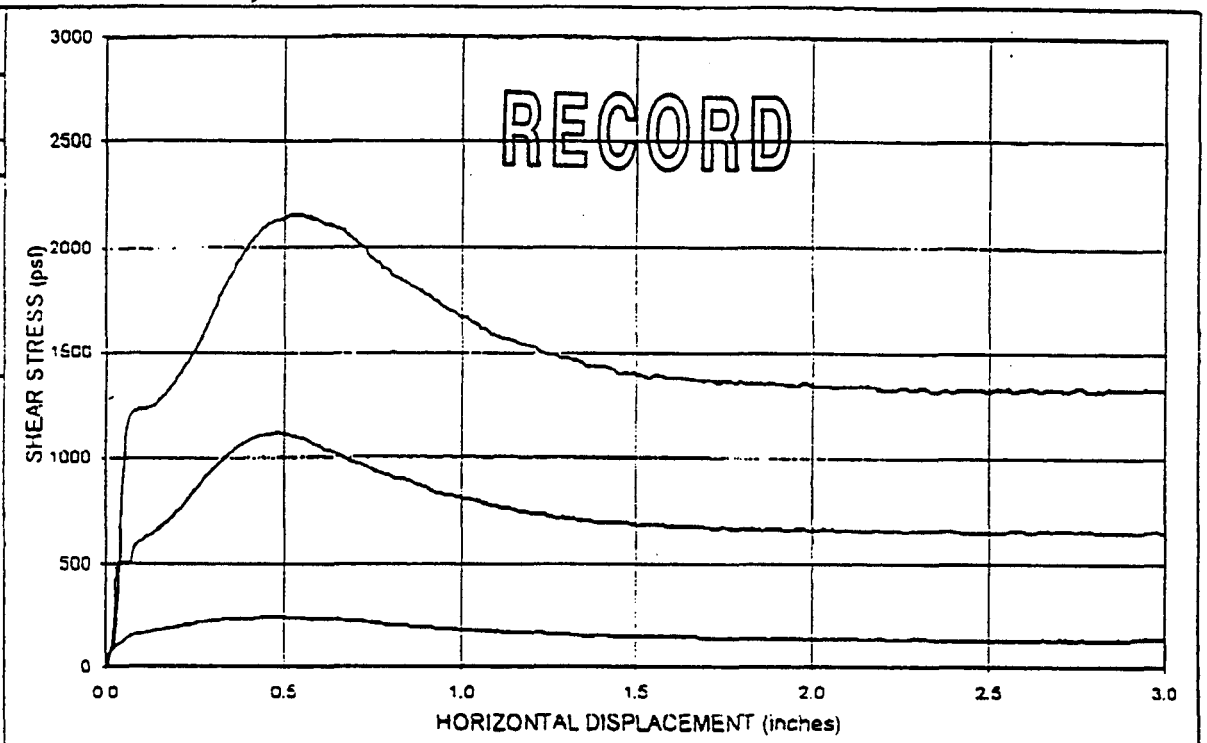
(GCL)

Initial Water Content: 22.5%

Initial Dry Density: N/A pcf

Final Water Content(%)

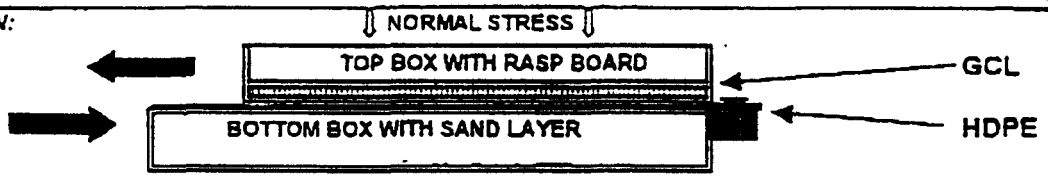
1.	2.	3.
119.4	79.4	61.8



STANDARD CONDITIONS: **SHEAR DISPLACEMENT RATE: 0.004 in/min**

1. The "gap" between shear boxes was set at 80 mil (2.0 mm)
2. The test specimens were flooded during testing unless otherwise noted.
3. High Normal Stresses, >5psi (35 kPa) was applied using air pressure.
4. Low Normal Stresses, <5psi (35 kPa) was applied using dead weights.
5. The tests were terminated after 3.0"(75 mm) of displacement unless otherwise noted.
6. Tests were performed in general accordance with ASTM procedure D-6243 using a Brainard-Killman LG-112 direct shear machine with an effective area of 12" x 12" (300 x300 mm).

TEST ORIENTATION:



SPECIAL TEST NOTES:

1. Each specimen of HDPE wast cut to 14" x 20" and clamped to the lower box.
2. The textile portions of the GCL were wrapped around a 12" x 12" rasp board in the upper box.
3. The GCL specimens were hydrated for 7 days at 3 psi, in contact with the textured HDPE.
4. After hydration, each GCL/HDPE specimen was consolidated at the specified normal stress for 48 hours, then sheared.
5. The woven textile side of the GCL was tested against the HDPE.
6. Shearing occurred at the interface between the textured HDPE and GCL specimens.
7. Minor stretching of the GCL occurred on points 2 and 3.

000267

By accepting the data and result represented on this page, Client agrees to limit the liability of Vector Engineering, Inc. from client and all other parties for claims arising out of use of this data to the cost for the respective test(s) represented hereon, and Client agrees to indemnify and hold harmless Vector from and against all liability in excess of the aforementioned limit.

Report Date: 08/13/99 Entered By: JMR Reviewed By: Lab Log:

Submittal 20102-1440-006 Rev.8
8-17-99 p.4 of 4 Doc.# 1440-006 A Rev.2

Vector Engineering Inc.

Laboratory Services
18 Loma Rica Drive., Suite C, Grass Valley, CA 95945
(530) 272-2448 Fax (530) 272-8553

LARGE SCALE DIRECT SHEAR REPORT

Test Method D-6243-B

RECEIVED AUG 17 1999

2739

Client Name: PRECISION LABORATORIES Project Name: FERNALD SUPERFUND SITE Project No: 943022.37

Superstrate ⟸ Board Spacers

Material 1 ⟸ CETCO Bentomat ST Lot # 199922020 Roll # 5033 LSN: BGS Rasp Board

Material 2 ⟹ GSE 80 mil HDPE Textured/Textured: Roll # 114101816 LSN: BEM Clamped

Substrate ⟹ Concrete Board with Sand Layer

PEAK STRENGTH

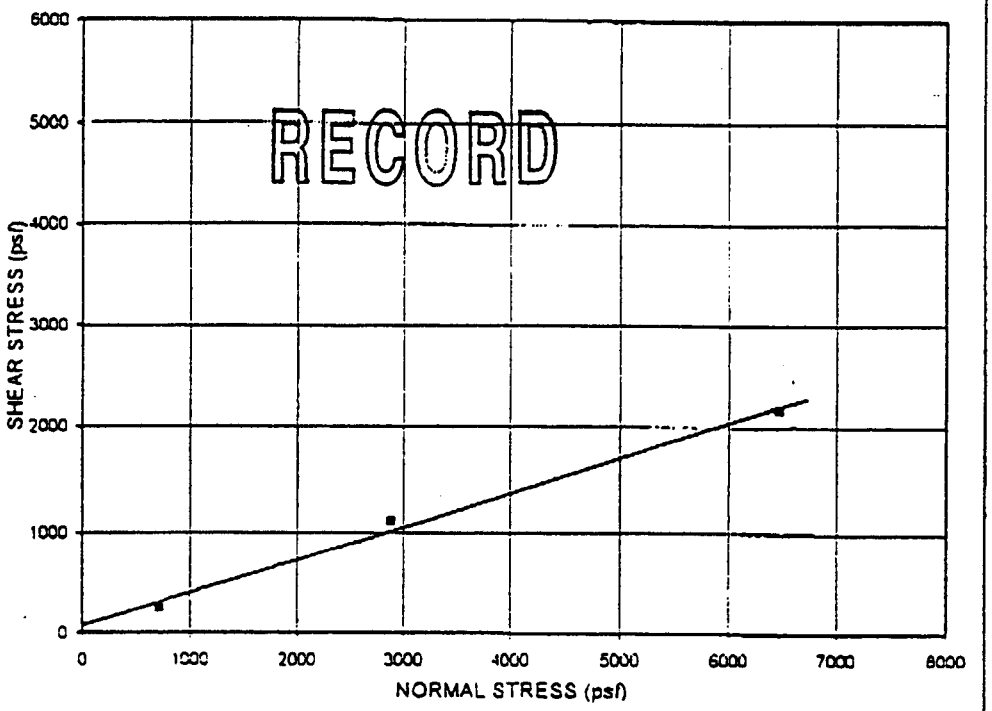
Test Point	Normal Stress psi	Normal Stress psf	Shear Stress psf	Secant Friction Angle
1.	5.0	720	250	19 ✓
2.	20.0	2880	1120	21 ✓
3.	45.0	6480	2160	18 ✓

Adhesion: 70 psf

Friction Angle 18 degrees

Coefficient of Friction: 0.33

NOTE: GRAPH NOT TO SCALE



STRENGTH ENVELOPE

(at 2.5 in. displacement)

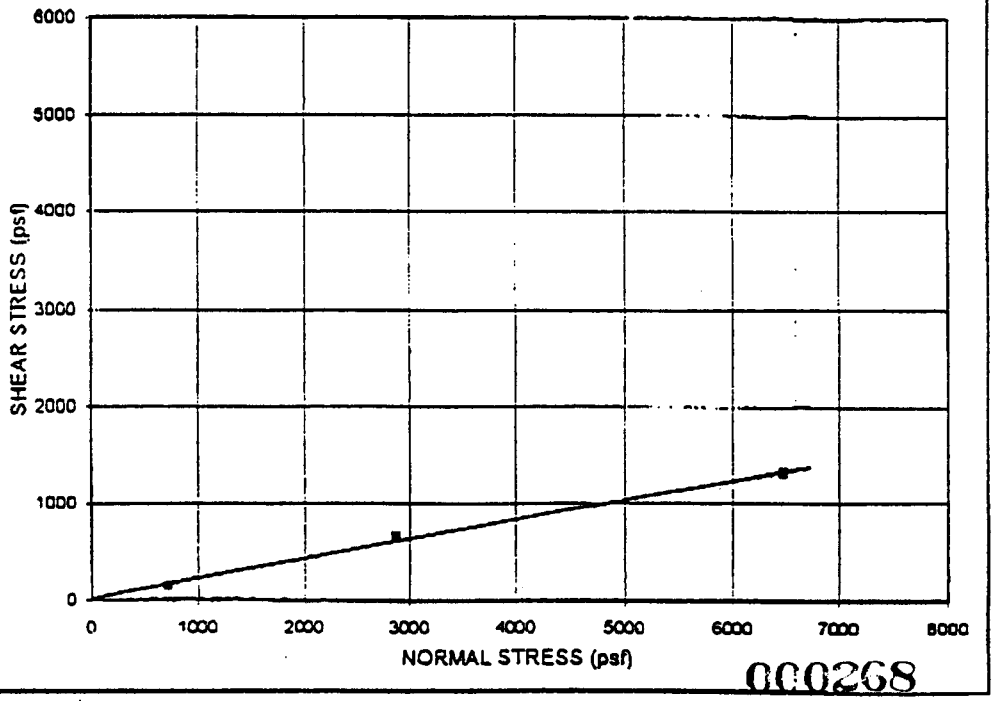
Test Point	Normal Stress psi	Normal Stress psf	Shear Stress psf	Secant Friction Angle
1.	5.0	720	140	11 ✓
2.	20.0	2880	650	13 ✓
3.	45.0	6480	1320	12 ✓

Adhesion: 20 psf

Friction Angle 11 degrees

Coefficient of Friction: 0.2

NOTE: GRAPH NOT TO SCALE



000268

NOTE: The Friction Angle and Adhesion (or Cohesion) results given here are based on a mathematically determined best fit line. Further interpretation should be conducted by a qualified professional experienced in geosynthetic and geotechnical engineering.

By accepting the data and result represented on this page, Client agrees to limit the liability of Vector Engineering, Inc. from client and all other parties for claims arising out of use of this data to the cost for the respective test(s) represented hereon, and Client agrees to indemnify and hold harmless Vector from and against all liability in excess of the aforementioned limit.

Report Date: 08/13/99 Entered By: JMR Reviewed By: Lab Log: 183A

GEOMEMBRANE

SUPPLIER DOCUMENT SUBMITTAL

FDFPROJECT NO: 2010/2	CONTRACT NO: 1440	SUBMITTAL NO: 001/005	REV: 0	DATE: April 16, 1999	PAGE 1 OF 3

FROM: GSE Lining Technologies

SIGNATURE: APK 8/11/99

TO: FDF ENGINEERING/CONSTRUCTION DOCUMENT CONTROL, MS 52-7

RECEIVED BY: (8)

REVISED APK 8/11/99

QTY. (9)	DOCUMENT NUMBER (10)	REV (11)	DOCUMENT FAMILY (12) PRO	H&S	MED	TRG	CON	ENG	QAC	RESUBMITTAL (13) YES	NO	TITLE DESCRIPTION (14)	SUBMITTAL TYPE (15) CFC	INF	ASSOCIATED SPECIFICATION (16)	SUBMITTAL ACTION (17) A	B	C
8	1440-001A	0					X				X	Submittal Register		X	ACR001		X	
8	1440-001B	0		X							X	Material Safety Data Sheets		X	Contract 99SC001440, Sect. C	X		
8	1440-001C	0	X								X	Warranty for GCL		X	Contract (above), Sect. I, General Provisions	X		
8	1440-02770P-1 001D	0						X			X	Manufacturing Capabilities		X	02770P, Rev. 3, Sect. 1.05.A1	X		
8	1440-02770P-2 001E	0						X			X	List of 10 Completed Facilities	X		02770P, Rev. 3. Sect. 1.05.A.2	X		
8	1440-02770P-3 001F	0						X			X	Origin and Identification of Resin	X		02770P, Rev. 3. Sect. 1.05.A.3	X		

DISTRIBUTION

REVIEW DISTRIBUTION: DISTRIBUTION (18)	MS (19)	DISTRIBUTION (18)	MS (19)	CFC DISTRIBUTION: DISTRIBUTION (18)	MS (19)	DISTRIBUTION (18)	MS (19)
Jim Jenkins, FDF, Eng. (Approver)	64						
Jim Burnett, GeoSyntec	38						
Rick Holbrook, FDF, Procurement	64						
Gregg Johnson, FDF, Safety & Health	64						
Jim Turner, FDF, QA	64						
Bill Zebick, FDF, Construction	64						

RECEIVED AUG 18 1999

RECEIVED BY: (20) James C. Jenkins 8/11/99 DATE: 5/12/99 NO COMMENTS: ____ (21) COMMENTS ATTACHED ✓

(SIGN/DATE AND RETURN A COPY TO ECDC, MS52-7)

Comments: (22)

SUBMITTAL ACTION CODE: (BY SUPPLIER)
CFC - CERTIFIED FOR CONSTRUCTION
INF - INFORMATION/RECORD
"X" APPROPRIATE SUBMITTAL ACTION ABOVE

SUPPLIER ACTION CODE: (ECDC) SUPPLIER ACTION ABOVE
A - ACCEPTED DOCUMENT: CONFORMS WITH REQUIREMENTS
B - MINOR COMMENTS: REVISE AND RESUBMIT AS CFC OR INF
C - REVISE AND RESUBMIT

RECORD

000270

2739

FS-F-4955
Rev. 2: 01/18/98

SUPPLIER DOCUMENT SUBMITTAL

FDFPROJECT NO: 20100	CONTRACT NO: 1440	SUBMITTAL NO: 001/005	REV: 0	DATE: April 16, 1999	PAGE 2 OF 3

FROM: GSE Lining Technologies

SIGNATURE: APK 8/11/95

TO: FDF ENGINEERING/CONSTRUCTION DOCUMENT CONTROL, MS 52-7

RECEIVED BY: (8)

Revised APK 8/11/99

QTY. (9)	DOCUMENT NUMBER (10)	REV (11)	DOCUMENT FAMILY (12) PRO	H&S	MED	TRG	CON	ENG	QAC	RESUBMITTAL (13) YES	NO	TITLE DESCRIPTION (14)	SUBMITTAL TYPE (15) CFC	INF	ASSOCIATED SPECIFICATION (16)	SUBMITTAL ACTION (17) A	B	C
8	1440-~~02770P-4~~ 001G	0							X		X	Certification of Welding Rod	X		02770P, Rev. 3, Sect. 1.05.A.4	X		
8	1440-~~02770P-5~~ 001H	0						X			X	Certification of MARV		X	02770P, Rev. 3, Sect. 1.05.A.5	X		
8	1440-~~02770P-6~~ 001I	0					X				X	Recommended Long-Term Storage		X	02770P, Rev. 3, Sect. 1.05.A.6	X		
8	1440-~~02770P-7~~ 001J	0					X				X	Recommended Installation Req'mts		X	02770P, Rev. 3, Sect. 1.05.A.7	X		
8	1440-~~02770P-8~~ 001K	0	X								X	Warranty		X	02770P, Rev. 3, Sect. 1.05.A.8	X		
8	1440-~~02770P-9~~ 001L	0						X			X	Completed Forms GML80T/80S/60T/60S/30S	X		02770P, Rev. 3, Sect. 1.05.A.9	X		
8	1440-~~02772P-1~~ 005A	0						X			X	Product Name	X		02772P, Rev. 2, Sect. 1.04.A.1	X		
8	1440-~~02772P-2~~ 005B	0						X			X	Manufacturer's Daily Production Cap		X	02772P, Rev. 2, Sect. 1.04.A.2	~~X~~	~~X~~	

APK 8/11/99

DISTRIBUTION

REVIEW DISTRIBUTION: DISTRIBUTION (18)	MS (19)	DISTRIBUTION (18)	MS (19)	CFC DISTRIBUTION: DISTRIBUTION (18)	MS (19)	DISTRIBUTION (18)	MS (19)
Jim Jenkins, FDF, Eng. (Approver)	64						
Jim Burnett, GeoSyntec	38						
Rick Holbrook, FDF, Procurement	64						
Gregg Johnson, FDF, Safety & Health	64						
Jim Turner, FDF, QA	64						
Bill Zebick, FDF, Construction	64						

RECEIVED BY: (20) James C. Jenkins (SIGN/DATE AND RETURN A COPY TO ECDC, MS52-7) [signature] 8/11/99 DATE: 5/12/99 NO COMMENTS: ____ (21) COMMENTS ATTACHED ✓

Comments: (22)

SUBMITTAL ACTION CODE: (BY SUPPLIER)
CFC - CERTIFIED FOR CONSTRUCTION
INF - INFORMATION/RECORD
"X" APPROPRIATE SUBMITTAL ACTION ABOVE

SUPPLIER ACTION CODE: (ECDC) SUPPLIER ACTION ABOVE
A - ACCEPTED DOCUMENT: CONFORMS WITH REQUIREMENTS
B - MINOR COMMENTS: REVISE AND RESUBMIT AS CFC OR INF
C - REVISE AND RESUBMIT

000271

RECORD

FS-F-4955
Rev. 2: 01/18/98

2739

SUPPLIER DOCU[illegible]T SUBMITTAL

FDFPROJECT NO: 20100	CONTRACT NO: 1440	SUBMITTAL NO: 001/005	REV: 0	DATE: April 16, 1999	PAGE 3 OF 3

FROM: GSE Lining Technologies

SIGNATURE:

APK 8/11/99

TO: FDF ENGINEERING/CONSTRUCTION DOCUMENT CONTROL, MS 52-7

RECEIVED BY: (8)

Revises APK 8/11/99

QTY. (9)	DOCUMENT NUMBER (10)	REV (11)	DOCUMENT FAMILY (12) PRO	H&S	MED	TRG	CON	ENG	QAC	RESUBMITTAL (13) YES	NO	TITLE DESCRIPTION (14)	SUBMITTAL TYPE (15) CFC	INF	ASSOCIATED SPECIFICATION (16)	SUBMITTAL ACTION (17) A	B	C
8	1440-~~02772P-3~~ 005C	0							X		X	Manufacturer's Quality Control Proc.	X		02772P, Rev. 2, Sect. 1.04.A.3	X		
8	1440-~~02772P-4~~ 005D	0						X			X	Mfgr's Geotextile Requirements	X		02772P, Rev. 2, Sect. 1.04.A.4	X		
8	1440-~~02772P-5~~ 005E	0							X		X	Geotextile Component Certification	X		02772P, Rev. 2, Sect. 1.04.A.5		X	
8	1440-~~02772P-6~~ 005F	0							X		X	Certification of Minimum Average Roll Values	X		02772P, Rev. 2, Sect. 1.04.A.7			X
8	1440-~~02772P-7~~ 005G	0					X				X	Recommended Installation Procedure		X	02772P, Rev. 2, Sect. 1.04.A.8	X		
8	1440-~~02772P-8~~ 005H	0					X				X	Recommended Long-Term Storage Requirements		X	02772P, Rev. 2, Sect. 1.04.A.9	X		
8	1440-~~02772P-9~~ 005I	0					X				X	Projected Delivery Dates	X		02772P, Rev. 2, Sect. 1.04.A.10	X	E	APK 8/11/99
8	1440-~~02772P-10~~ 005J	0						X			X	Completed Form GCL-1	X		02772P, Rev. 2, Sect. 1.04.A.11	X		

DISTRIBUTION

REVIEW DISTRIBUTION: DISTRIBUTION (18)	MS (19)	DISTRIBUTION (18)	MS (19)	CFC DISTRIBUTION: DISTRIBUTION (18)	MS (19)	DISTRIBUTION (18)	MS (19)
Jim Jenkins, FDF, Eng. (Approver)	64						
Jim Burnett, GeoSyntec	38						
Rick Holbrook, FDF, Procurement	64						
Gregg Johnson, FDF, Safety & Health	64						
Jim Turner, FDF, QA	64						
Bill Zebick, FDF, Construction	64						

RECEIVED BY: (20) James C. Jenkins (SIGN/DATE AND RETURN A COPY TO ECDC, MS52-7) Arthur P. Kline 8/11/99 DATE: 5/12/99 NO COMMENTS: ____ (21) COMMENTS ATTACHED ✓

Comments: (22)

SUBMITTAL ACTION CODE: (BY SUPPLIER)
CFC - CERTIFIED FOR CONSTRUCTION
INF - INFORMATION/RECORD
"X" APPROPRIATE SUBMITTAL ACTION ABOVE

SUPPLIER ACTION CODE: (ECDC) SUPPLIER ACTION ABOVE
A - ACCEPTED DOCUMENT: CONFORMS WITH REQUIREMENTS
B - MINOR COMMENTS: REVISE AND RESUBMIT AS CFC OR INF
C - REVISE AND RESUBMIT

2739

000272

RECORD

FS-F-4955
Rev. 2: 01/18/98

REVIEW COMMENT SHEET

DOCUMENT OWNER: Eric Reed	REVIEWING DIVISION: O&PI/QA(SWP), OSDF Project	DATE: April 26, 1999
DOCUMENT NUMBER AND TITLE: 20100-1440-001 Rev. 0		COMMENTS DUE BY: April 29, 1999

ITEM NO.	REVIEWER NAME	PAGE NO. /SECTION	COMMENT	SRC ✓	COMMENT RESOLUTION
1.	J. T. TURNER	1440-02770P-1	Submittal Register should be amended as highlighted on the attached copy of the Submittal Register.		FDF to correct Submittal Register and submit to GSE.
2.	J. T. TURNER	1440-02772P-2	In lieu of actual capacity information, CETCO merely states it will meet (non-specific) production requirements.		
3.	J. T. TURNER	1440-02772P-5	Contrary to specification requirements, only sample certifications of geotextile component conformance to manufacturer's requirements are submitted.		
4.	J. T. TURNER	1440-02772P-6	Table GCL-1 does not indicate that specified requirements that CETCO commits to are minimum average roll values, as specified by Table 02772P-1, Note 1.	✓	
5.	J. T. TURNER	1440-02772P-9	Projected Delivery Dates not supplied to FDF.		FDF to supply updated requirements to GSE.

SIGNIFICANT REVIEW COMMENT RESOLUTION APPROVAL SIGNATURE: DATE:

FS-F-4563 (REV. 03/04/96)

2739

000273

--2739

Supplier Submittal Number: ~~1~~ See following page for accurate numbers. JTY 6-23-99

Document Number: ~~1440-001~~

Specification Requirement 1440-001A AOU 8/11/99

Reference:ACR001

Document Desciption: Submittal Register

RECEIVED AUG 18 1999

INFORMATION ONLY

[ ]A - Conforms to the Subcontract Requirements
[X]B - Minor Comment - Incorporate and Resubmit
[ ]C - Revise and Resubmit
Sig: J. C. Jenkins Date: 5/12/99

Supplier Submittal Number:	1440-001
Document Number:	1440-001A
Specification Requirement Reference:	ACR-001
Document Description:	Submittal Register

TABLE 1
GEOSYNTHETIC MATERIALS
CONTRACT 99SC001440 (GSE)
SUBMITTAL REGISTER
BASE BID

upplier ubmittal umber	Rev No.	Document Number	Rev No.	Specification Requirement Reference	Document Description	Document Type	Document Family	Due Date
140-001	0	1440-001A		ACR001	Submittal Register	INF	Const	a
140-001	0	1440-001B		Contract Section C	Material Safety Data Sheets	INF	H&S	a&d
140-001	0	1440-001C		Section I, General Provisions	Warranty for GCL	INF	Proc	a
140-001	0	1440-001D		02770P.1.05.A.1	Manufacturing Capabilities	INF	Engr	a
140-001	0	1440-001E		02770P.1.05.A.2	List of 10 Completed Facilities	CFC	Engr	a
140-001	0	1440-001F		02770P.1.05.A.3	Origin and Identification of Resin	CFC	Engr	a
140-001	0	1440-001G		02770P.1.05.A.4	Certification of Welding Rod	CFC	QA	a
140-001	0	1440-001H		02770P.1.05.A.5	Certification of Minimum Average Roll Values	CFC	Engr	a&c
140-001	0	1440-001I		02770P.1.05.A.6	Recommended Long-Term Storage Requirements	INF	Const	a
140-001	0	1440-001J		02770P.1.05.A.7	Recommended Installation Requirement	INF	Const	a
140-001	0	1440-001K		02270P.1.04,1.05.A.8	Warranty	INF	Proc	a
140-001	0	1440-001L		02770P.1.05.A.9	Completed Forms GML 80-S, GML 80-T, GML 60S, GML 60-T, GML 30-T	CFC	Engr	a
140-002	0	1440-002A		02770P.1.05.B.1	Quality Control Certificates for Resin	CFC	QA	c
140-002	0	1440-002B		02770P.1.05.B.2	Test Reports of Resin	CFC	Engr	c
440-002	0	1440-002C		02770P.1.05.B.3	Certification of Resin Polymer	CFC	QA	c

000276

2739

1440-001 Rev. 2 6-24-99 P. 2 of 3

TAB
GEOSYNTHETIC MATERIALS
CONTRACT 99SC001440 (GSE)
SUBMITTAL REGISTER
BASE BID

upplier ubmittal umber	Rev No.	Document Number	Rev No.	Specification Requirement Reference	Document Description	Document Type	Document Family	Due Date
440-003	0	1440-003A		02770P.1.05.C	Manufacturing Certificates per shift production of Geomembrane	CFC	QA	c
440-003	0	1440-003B			Roll List	CFC	QA	c
440-004	0	1440-004		02770P.2.03.A.1, 2.03.B.5&B.7, 2.03.C.1	Quality control sampling and testing plan	INF	QA	b
440-005	0	1440-005A		02772P.1.04.A.1	Product Name	CFC	Engr	a
440-005	0	1440-005B		02772P.1.04.A.2	Daily Production Capacity	INF	Engr	a
440-005	0	1440-005C		02772P.1.04.A.3	Manufacturer's Quality Control Procedures	CFC	QA	a
440-005	0	1440-005D		02772P.1.04.A.4	Requirements for Geotextile Component	CFC	Engr	a
440-005	0	1440-005E		02772P.1.04.A.5	Certification of Geotextile Component	CFC	QA	a
440-005	0	1440-005F		02772P.1.04.A.7	Certification of Minimum Average Roll Values	CFC	QA	a
440-005	0	1440-005G		02772P.1.04.A.8	Recommended Installation Procedures	INF	Cosnt	a
440-005	0	1440-005H		02772P.1.04.A.9	Recommended Long-Term Storage Requirements	INF	Const	a
440-005	0	1440-005I		02772P.1.04.A.10	Projected Delivery Dates	CFC	Const	a
440-005	0	1440-005J		02772P.1.04.A.11	Completed Form GCL-1	CFC	Engr	a
440-006	0	1440-006A		02772P.1.04.B	GCL Internal and Interface Shear Strength Test Results	CFC	Engr	c
440-006	0	1440-006B		02772P.1.04.B	Quality Control Certificates	CRC	QA	c
440-007	0	1440-007		02772P.2.01.C, 2.02.A	Quality control sampling and testing plan	INF	QA	b

a. April 9, 1999
b. April 19, 1999
c. 21 days prior to shipment
d. With shipment

1440-001
Rev. 2
6-24-99
p. 3 of 3

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ie supplier shall provide submittals in accordance with Administrative Contractor Requirements ACR-001, attached.

F:\WPW61\CRU2\PROCURMT\99sbmtls\SR0602.wpd Jun 22, 99 (03:44p)

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Supplier Submittal Number: ~~2~~

See following page for accurate numbers JTT 6-23-99

Document Number: ~~1440-002~~

Specification Requirement Reference: Contract Section C 1440-001B MK 5/11/99

Document Description: Material Safety Data Sheet

INFORMATION ONLY

[X] A - Conforms to the Subcontract Requirements
[ ] B - Minor Comment - Incorporate and Resubmit
[ ] C - Revise and Resubmit
Sig: C Jenkins Date: 5/12/99

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AUG 18 1999

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Supplier Submittal Number:	1440-001
Document Number:	1440-001B
Specification Requirement Reference:	Contract Section C
Document Description:	Material Safety Data Sheets

MATERIAL INFORMATION SHEET

GSE Lining Technology, Inc.
19103 Gundle Road
Houston, Texas 77073
(800) 435-2008

Issued By: Robb Matthews
Corporate Safety Director

Date: 8/29/95

NFPA 704:

Health: 0
Flammability: 1
Reactivity: 0

Ratings use five divisions from 0 to 4
0 = no special hazard 4 = severe hazard

Division: Industry Products

I. Product Information

A. Product Names:

HyperFrictionFlex Polyethylene 80 mil, Black

B. Description and Ingredient

2-3% Carbon Black.
Approximately .5% antioxidants & heat stabilizers.

These products do not contain asbestos.

II. Miscellaneous Information

Each of these products is classified as an "article" according to Title 29 of the Code of Federal Regulations, OSHA Part 1916.1200(c). They are formed to a specific shape or design during manufacture, have end use functions dependent upon their shape or design, and do not release any hazardous chemical under normal conditions of use.

*This Material Information Sheet is provided in lieu of a Material Safety Data Sheet. An MSDS is required only for chemicals for products that are hazardous as defined by the OSHA Standard 1910.1200.

MATERIAL INFORMATION SHEET

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Date: 8/29/95

NFPA 704:

Health: 0
Flammability: 1
Reactivity: 0

Ratings use five divisions from 0 to 4
0 = no special hazard 4 = severe hazard

Division: Industry Products

I. Product Information

A. Product Names:

HyperFlex Polyethylene 80 mil, Black

B. Description and Ingredient

2-3% Carbon Black.
Approximately .5% antioxidants & heat stabilizers.

These products do not contain asbestos.

II. Miscellaneous Information

Each of these products is classified as an "article" according to Title 29 of the Code of Federal Regulations, OSHA Part 1916.1200(c). They are formed to a specific shape or design during manufacture, have end use functions dependent upon their shape or design, and do not release any hazardous chemical under normal conditions of use.

*This Material Information Sheet is provided in lieu of a Material Safety Data Sheet. An MSDS is required only for chemicals for products that are hazardous as defined by the OSHA Standard 1910.1200.

MATERIAL INFORMATION SHEET

GSE Lining Technology, Inc.
19103 Gundle Road
Houston, Texas 77073
(800) 435-2008

Issued By: Robb Matthews
Corporate Safety Director

Date: 8/29/95

NFPA 704:

Health: 0
Flammability: 1
Reactivity: 0

Ratings use five divisions from 0 to 4
0 = no special hazard 4 = severe hazard

Division: Industry Products

I. Product Information

A. Product Names:

High Density Polyethylene 30 mil material

B. Description and Ingredient

2-3% Carbon Black.
Approximately .5% antioxidants & heat stabilizers.

These products do not contain asbestos.

II. Miscellaneous Information

Each of these products is classified as an "article" according to Title 29 of the Code of Federal Regulations, OSHA Part 1916.1200(c). They are formed to a specific shape or design during manufacture, have end use functions dependent upon their shape or design, and do not release any hazardous chemical under normal conditions of use.

*This Material Information Sheet is provided in lieu of a Material Safety Data Sheet. An MSDS is required only for chemicals for products that are hazardous as defined by the OSHA Standard 1910.1200.

MATERIAL SAFETY DATA SHEET

SECTION 1 CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product: Polypropylene Nonwoven Fabrics — Emergency Tel. No: 706-965-6300

Manufacturer: Performance Nonwovens Division of Synthetic Industries — For Information: 706-965-6300

Address: Rt. 1 Box 610 Rollins Industrial Blvd. — Date Prepared: November 11, 1996

Ringgold GA 30736 — Prepared By: Kent Snyder & Craig Cochran

SECTION 2 COMPOSITION AND INGREDIENTS INFORMATION

COMPOSITION	CAS NUMBER	OSHA PEL	ACGIH TLV	PERCENT
Polypropylene Fabric	9003-07-0	N/A	N/A	>98
Minor Additives	Mixture	N/A	N/A	<2

Based upon data available to Synthetic Industries, Inc., this product is not hazardous under OHSA Hazard Communication (29 CFR 1910.1200).

SECTION 3 HAZARDOUS IDENTIFICATION

Health -0 Fire - 1 Reactivity - 0

(HMIS/NFPA Hazard Rating: Least - 0, Slight - 1, Moderate - 2, High - 3, Extreme - 4)

Health Hazards: Acute - Not applicable Chronic - Not applicable

SECTION 4 FIRST AID MEASURES

Eye Contact: Flush eyes with water if irritation occurs.
Skin Contact: Not ordinarily required.
Inhalation: Not ordinarily required.
Ingestion: Not ordinarily required.

SECTION 5 FIRE FIGHTING MEASURES

Flash Point: Greater than 315 Deg C (600 Deg F).
Auto Ignition Temperature: Greater than 550 Deg C (1022 Deg F).
Fire and Explosion Hazard: Material will not burn unless preheated. Overheated or molten material may burn slowly with dense smoke. Avoid inhalation of vapors.
Extinguishing Media: Dry Chemical. C02. Foam. Water Fog

SECTION 6 EXPOSURE CONTROLS AND CHEMICAL PROTECTION

Eye Protection: Not normally required unless physical contact with eyes is likely, or if exposed to molten product.
Hand Protection: Not required unless exposed to heated or molten product.
Protective Clothing: None specified for normal use. Avoid contact with burning or molten product.
Engineering Controls: Not required for normal use.
Work & Hygiene Practices: None required for normal use.

SECTION 7 PHYSICAL AND CHEMICAL PROPERTIES

Physical Form	Fabric/Solid
Color	Natural, White, Grey, or Black
Odor	Essentially Odorless
PH	N/A
Melting Point	328F (164C)
Solubility in Water	Insoluble
Specific Gravity	.905
Vapor Density	N/A
Boiling Point	N/A
Water Retention	N/A

SECTION 8 ACCIDENTIAL RELEASE MEASURES

Containment Techniques	Practice reasonable care and caution when handling product.
Clean up Procedures	Practice reasonable care and caution during clean up and dispose of material in accordance with local regulations.
Other Emergency Advice	Avoid inhalation of vapors if material is burning. Store away from oxidizing materials.

SECTION 9 HANDLING AND STORAGE

Storage	Store away from oxidizing materials in a cool, dry place with adequate ventilation.
Handling	No special handling required when product is at room temperature. If product is molten avoid contact with eyes or skin.

SECTION 10 STABILITY AND REACTIVITY

Stability	Stable
Conditions to avoid	N/A
Incompatibility (Materials to Avoid):	Strong oxidizing agents.
Hazardous Decomposition Products (from burning, heating, or reaction to other materials):	Carbon Dioxide, Carbon Monoxide.
Hazardous Polarization	Will not occur.
Conditions to avoid	N/A

PRODUCT NAME: BENTOMAT - ST

Section II HAZARDOUS INGREDIENTS/IDENTITY INFORMATION CONT.

PRODUCT IDENTIFICATION:

Chemical Name: Clay Silicate Compound / Geotextile Composite.
NFPA/HMIS: Health - 2, Fire - 0, Reactivity - 0, Specific Hazard - See Section VI
DOT Class: Not Regulated (49 CFR, IMDG, ICAO, IATA)

Section III PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point:	Not Applicable	Specific Gravity (H_2O = 1):	2.5
Vapor Pressure (mm Hg.):	Not Applicable	Melting Point:	Not Applicable
Vapor Density (AIR = 1):	Not Applicable	Evaporation Rate (Butyl Acetate = 1):	Not Applicable
Solubility in Water:	Negligible		
Appearance and Odor:	Pale gray to buff powder or granules in a geotextile material, odorless.		

Section IV FIRE AND EXPLOSION HAZARD DATA

Flash Point (Method Used):	Not Available	
Flammable Limits:	Not Available	LEL - NA UEL - NA
Extinguishing Media:	Not Applicable	
Special Fire Fighting Procedures:	Not Applicable	
Unusual Fire/Explosion Hazards:	Not Applicable	

Section V REACTIVITY DATA

Stability Unstable -
Stable - X

Conditions to Avoid - None Known

Incompatibility (Materials to Avoid): Powerful oxidizing agents such as fluorine, chlorine trifluoride, manganese trioxide, etc.

Hazardous Decomposition or By-products: Silica will dissolve in hydrofluoric acid producing a corrosive gas, silicon tetrafluoride.

Hazardous Polymerization May Occur -
Will Not Occur - X

Conditions to Avoid - None Known

PRODUCT NAME: BENTOMAT - ST

Section VI HEALTH HAZARD DATA

Route(s) of Entry: **Inhalation?** Yes **Skin?** No **Ingestion?** No

Health Hazards (Acute and Chronic):

Inhalation: Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may have the following serious chronic health effects:

Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness and reduced pulmonary function. Smoking exacerbates this disease. Individuals with silicosis are predisposed to develop tuberculosis.

Cancer Status: The International Agency for Research on Cancer has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (Group 1 - carcinogenic to humans). Refer to IARC Monograph 68, Silica, Some Silicates and Organic Fibers (published in June 1997) in conjunction with the use of these materials. The National Toxicology Program classifies respirable crystalline silica as "reasonably anticipated to be a carcinogen". For further information See: "Adverse effects of Crystalline Silica Exposure" published by the American Thoracic Society Medical Section of the American Lung Association, American Journal of Respiratory and Critical Care Medicine, Volume 155, page 761-765, 1997.

Data with Possible Relevance to Human Health:

The small quantities of crystalline silica (quartz) found in this product are, under normal conditions, naturally coated with an unremovable layer of amorphous silica and/or bentonite clay. IARC (Vol. 68, 1997, pp. 191-192) has stated that crystalline silica (quartz) can differ in toxicity depending on the minerals with which it is combined, citing studies in IARC (Vol. 42, 1987 pg. 86) which stated that the toxic effect of crystalline silica (quartz) is reduced by the "protective effect....due mainly to clay minerals...".

Carcinogenicity: NTP? No IARC Monographs? Yes OSHA Regulated? No

Signs and Symptoms of Exposure:

Excessive inhalation of generated dust may result in shortness of breath and reduced pulmonary function.

Medical Conditions Generally Aggravated by Exposure:

Individuals with respiratory disease, including but not limited to, asthma and bronchitis, or subject to eye irritation should not be exposed to respirable crystalline silica (quartz) dust.

Emergency and First Aid Procedures:

Eyes & Skin: Flush with water.
Gross Inhalation of Dust: Remove to fresh air; give oxygen or artificial respiration if necessary; seek medical attention.
Ingestion: If large amounts are swallowed, get immediate medical attention.

Section VII PRECAUTIONS FOR SAFE HANDLING AND USE

Steps to be Taken in Case Material is Released or Spilled: Vacuum if possible to avoid generating airborne dust. Avoid breathing Wear an approved respirator. Avoid adding water; product will become slippery when wet.
Waste Disposal Method: Bury in an approved sanitary landfill, in accordance with federal, state and local regulations.
Precautions to Be Taken in Handling and Storing: Avoid breathing dust, use NIOSH/MSHA approved respirator where TLV limits for Crystalline Silica may be exceeded.
Other Precautions: Slippery when wet.

PRODUCT NAME: BENTOMAT - ST

Section VIII CONTROL MEASURES

Respiratory Protection: Use appropriate respiratory protection for respirable particulate based on consideration of airborne workplace concentration and duration of exposure arising from intended end use. Refer to the most recent standards of ANSI (z88.2) OSHA (29 CFR 1910.134), MSHA (30 CFR Parts 56 and 57) and NIOSH Respirator Decision Logic.

Ventilation: Use local exhaust as required to maintain exposures below applicable occupational exposure limits (See Section II). See also ACGIH "Industrial Ventilation – A Manual for Recommend Practice", (current edition).

Protective Gloves - Not Required
Eye Protection - Recommended

Other Protective Clothing or Equipment - None
Work/Hygienic Practices - Use good housekeeping practices.

Section IX REGULATORY INFORMATION

SARA 311/312: Hazard Categories for SARA Section 311/312 Reporting: Chronic Health
SARA 313: This product contains the following chemicals subject to annual release reporting requirements under the SARA section 313 (40 CFR 372): None

CERCLA section 103 Reportable Quantity: None

California Proposition 65: *This product contains the following substances known to the state of California to cause cancer and/or reproductive harm: This product contains crystalline silica (respirable); however, the user should note that the small quantities of crystalline silica (quartz) found in this product are, under normal conditions, naturally coated with an unremovable layer of amorphous silica and/or bentonite clay. IARC (Vol. 68, 1997, pg. 191-192) has stated that crystalline silica (quartz) can differ in toxicity depending on the minerals with which it is combined. Citing studies in IARC (Vol. 42, 1987, p. 86) which stated that the toxic effect of crystalline silica (quartz) is reduced by the "protective effect....due mainly to clay minerals...".*

Toxic Substances Control Act: All of the components of this product are listed on the EPA TSCA Inventory or are exempt from notification requirements.

European Inventory of Commercial Chemical Substances: All the components of this product are listed on the EINECS Inventory or exempt from notification requirements. (The EINECS number for Quartz: 231-545-5)

Canadian Environmental Protection Act: All the components of this product are listed on the Canadian Domestic Substances List or exempt from notification requirements.

Japan MITI: All the components of this product are existing chemical substances as defined in the Chemical Substance Control Law.

Australian Inventory of Chemical Substances: All the components of this product are listed on the AICS Inventory or exempt from notification requirements.

Canadian WHMIS Classification: Class D, Division 2, Subdivision A (Very Toxic Material causing other Toxic Effects)

European Community Labeling Classification: Harmful (Xn)

European Community Risk and Safety Phrases: R40, R48, S22

NF-+PA Hazard Rating:	Health: 1	Fire: 0	Reactivity: 0
HMIS Hazard Rating:	Health: *	Fire: 0	Reactivity: 0

*Warning - Chronic health effect possible - inhalation of silica dust may cause lung injury/disease (silicosis). Take appropriate measures to avoid breathing dust. See Section II.

PRODUCT NAME: BENTOMAT - ST

Section IX REGULATORY INFORMATION CONT.

References:
Registry for Toxic Effects of Chemical Substances (RTECS), 1995
Patty's Industrial Hygiene and Toxicology
NTP Seventh Annual Report on Carcinogens, 1994
IARC Monograph Volume 68, Silica, Some Silicates and Organic Fibers, 1997

The information herein has been compiled from sources believed to be reliable and is accurate to the best of our knowledge. However, CETCO cannot give any guarantees regarding information from other sources, and expressly does not make any warranties, nor assumes any liability, for its use.

Supplier Submittal Number: ~~3~~ See following page for accurate numbers

Document Number: ~~1440-003~~ JTT 6-23-99
1440-001C
NOK 8/11/99

Specification Requirement Reference: Section I, General Provisions

Document Description: Warranty for GCL

INFORMATION ONLY

[X] A - Conforms to the Subcontract Requirements
[ ] B - Minor Comment - Incorporate and Resubmit
[ ] C - Revise and Resubmit
Sig: J.C. Jenkins Date: 5/12/99

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WARRANTY MUST MEET OR EXCEED GENERAL PROVISION WARRANTY REQUIREMENTS

Supplier Submittal Number:	1440-001
Document Number:	1440-001C
Specification Requirement Reference:	Section 1, General Provisions
Document Description:	Warranty for GCL

CETCO
BENTOMAT ST and CLAYMAX 200R ®
5 YEAR WARRANTY

Colloid Environmental Technologies Company ("CETCO") warrants to the original owner ("Owner") of the above landfill project that all bentonite-coated fiber mat ("the Product") supplied for the project will be free from manufacturing defects in material and workmanship under normal conditions of use for a period of five (5) years from the effective date. This warranty is subject to the conditions that neither the installing contractor nor any third party have used, misused, modified or damaged the Product prior to delivery to the project and that the back fill used in conjunction with the Product contains no calcium, magnesium or other divalent cations, and is properly compacted.

THE FOREGOING WARRANTY IS IN LIEU OF AND EXCLUDES ALL OTHER WARRANTIES NOT EXPRESSLY SET FORTH HEREIN, WHETHER EXPRESSED OR IMPLIED BY OPERATIONS OF LAW OR OTHERWISE, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, SUITABILITY FOR THE SPECIFIC APPLICATION, AND/OR PATENT AND TRADEMARK NON-INFRINGEMENT.

CETCO shall not be liable for incidental or consequential losses, damages or expenses, directly or indirectly arising from the sale, handling or use of the Product, or from any other cause relating thereto. CETCO's liability hereunder in any case is expressly limited, at CETCO's election, to payment of the installation, removal or reinstallation cost, replacement of defective Product, repair of Product, or the repayment of an amount equal to the purchase price of such Product, whether such claims are for breach of warranty or contract, negligence, tort or otherwise.

Owner agrees to inspect the Products promptly on delivery and notify CETCO in writing within fifteen (15) days of any alleged defects. Any claim by Owner with reference to the Product sold hereunder for any cause shall be deemed waived by Owner unless submitted to CETCO in writing within thirty (30) days from the date Owner discovered, or should have discovered, any claimed breach.

Note: Warranties with respect to workmanship regarding installation of the Product, if any, are provided by the installing contractor only.

Colloid Environmental Technologies Company

EFFECTIVE DATE:_____

Supplier Submittal Number: 1440-001

Document Number: 1440-001D

Specification Requirement Reference: 02770P.1.05.A.1

Document Description: Manufacturing Capabilities

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[X] A - Conforms to the Subcontract Requirements
[ ] B - Minor Comment - Incorporate and Resubmit
[ ] C - Revise and Resubmit
Sign: J.C. Jenkins Date: 6/24/99

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GSE Lining Technology, Inc.

24 February 1999

Fluor Daniel Fernald
7400 Willey Road
Fernald, OH 4503

Attn: Kathy Fisher

RE: Confirmation of Material
GSE Project Number 502302

This letter is to inform you that GSE will commit 100,000 sf of production per day to the Fluor Daniel Fernald project. However, GSE cannot be responsible for circumstances beyond our control, which may lead to less than 100,000 sf of material being committed.

Should you need more information or require further assistance, please contact me at your convenience. GSE looks forward to another successful project with you.

Regards,

Robert T. Nantz

Robert Nantz
Vice President of Domestic Sales

CORPORATE PROFILE

INTRODUCTION

Gundle/SLT Environmental, Inc., the parent company of GSE*, is a corporation formed in July, 1995 by the merger of Gundle Environmental Systems, Inc. and SLT Environmental, Inc. It is listed on the New York Stock Exchange under the symbol "GSE". The company's headquarters and two separate manufacturing facilities are located in Houston, Texas. GSE's GundSeal GCL clay lining manufacturing plant is located in Spearfish, South Dakota, USA. Other manufacturing facilities are located in Germany, the United Kingdom and Egypt.

The founding companies, SLT and Gundle, have long histories in the geomembrane industry. SLT pioneered High Density Polyethylene (HDPE) lining systems and has been provided worldwide service since the early 1970's. Gundle started operations in 1981 and grew to be the world's largest manufacturer and installer of geomembranes.

Combined, GSE Lining Technology, Inc. ("GSE"), is the leading worldwide supplier and installer of flexible geomembrane lining systems used in containment systems and for the prevention of groundwater contamination and environmental damage.

GSE manufactures and installs flexible, geomembrane lining systems and associated materials principally for the containment of wastes, liquids (potable, sanitary or hazardous) and industrial products in cells, ponds, pits and lagoons. GSE's lining systems meet the highest design criteria in the industry. The principal component of these lining systems is a geosynthetic membrane ranging from 20 to 240 mils (0.5 mm to 6.0 mm) in thickness. More complex liner systems may consist of several membrane liners interlaid with geosynthetic clay liners, geotextiles, reinforcing geogrids and drainage materials. The flexible geomembrane lining panels are generally welded together on the customer's jobsite using either an extrusion or a fusion (hot wedge) process. The welded seams are tested both on site and in GSE's laboratory, on request, as part of its Installation Quality Assurance Program.

PRODUCTS

GSE provides the widest range of products that are used in association with geomembrane lining systems. These include geomembranes, geonets, geocomposites, geotextiles, geogrids, vertical barrier systems, concrete protection systems, geosynthetic clay liners, concrete attachments and other prefabricated products.

GEOMEMBRANES

Geomembranes are manufactured in seamless widths from approximately 16 to 34.5 feet (5 to 10.5 meters) and thicknesses ranging from 20 to 240 mils (0.5 to 6.0 mm).

GSE processes various types of resins, including, for example, HDPE and other polyethylene configurations such as very flexible polyethylene (VFPE). All of these resins can be used to manufacture geomembrane with a smooth surface or with texture on one or both sides to improve friction characteristics. These products can also include a white or other color surface as well as other special characteristics such as spark-testable conductive side for non-destructive testing of the entire surface of the sheet after installation.

*Certain trademarks of GSE Lining Technology, Inc. are registered in the United States and certain foreign countries. GSE is a registered trademark of GSE Lining Technology, Inc.

SMOOTH GEOMEMBRANES

GSE HyperFlex* and GSE HD* are produced from premium grade virgin polyethylene resins and exhibit outstanding chemical resistance, UV resistance, mechanical properties, environmental stress crack resistance, dimensional stability and thermal aging characteristics. They are especially suitable for applications requiring superior chemical resistance.

GSE UltraFlex* is a premium grade very flexible polyethylene geomembrane liner with outstanding elongation and flexibility. Its high uniaxial and multiaxial elongation characteristics make it particularly suitable for applications where differential settlement may occur.

TEXTURED GEOMEMBRANES

GSE HyperFrictionFlex*, GSE UltraFrictionFlex*, GSE HD Textured* and GSE UltraFlex Textured are textured liners produced using two different manufacturing techniques. GSE HD Textured incorporates the texturing process with the extrusion of the sheet. FrictionFlex* is a patented secondary texturing process which creates a geomembrane that has the maximum physical properties available for textured geomembrane. Each method can produce sheet with one or both sides textured.

SPECIALTY GEOMEMBRANES

GSE Conductive* is a patented spark-testable liner used in applications where field testing of the entire liner surface subsequent to installation is required. GSE Conductive's one thin electrically conductive surface allows electrical spark testing over 100% of the surface after installation using standard holiday spark test equipment.

GSE White* geomembranes (patented) have a UV stabilized light reflective surface on one side. This reduces liner temperature by reflecting solar energy thus reducing wrinkling caused by expansion and contraction. The white surface used in GSE White also facilitates visual inspection for installation damage. Both GSE White and GSE Conductive take advantage of GSE's three layer coextrusion manufacturing technology.

GSE HyperFlex FR* is a flame retardant geomembrane for use in applications where restrictions of flammable materials apply. GSE StudLiner* sheets are manufactured in a variety of material compositions such as HDPE and VFPE for use in concrete protection systems.

GEOSYNTHETIC CLAY LINER (GCL)

GSE manufactures a unique geosynthetic clay liner called GSE GundSeal*. GundSeal consists of a layer of premium bentonite clay adhered to a GSE geomembrane. GundSeal is the only true clay/geomembrane liner available in the world for environmental applications. The bentonite swells to several times its original volume when hydrated and seals any potential leaks at the point of origin. GundSeal is manufactured in rolls 17.5 feet (5.3 meters) wide and up to 200 feet (61 meters) long.

GEONETS

GSE manufactures HDPE geonet, GSE HyperNet*, for use in drainage systems, leak detection systems or leachate collective systems. GSE FabriNet* is manufactured with geotextile bonded to one or both sides to create a geocomposite net for use where soil is placed directly on top of the drainage layer. Additionally, GSE distributes GundFlow*, a patented tri-planar geonet or geocomposite.

MISCELLANEOUS

GSE also manufactures other products for use in geotechnical applications including GSE CurtainWall* and GSE GundWall* vertical subsurface barriers, GSE PolyLock* concrete embedment strips, and many fabricated products. GSE is also a distributor for the Sensor* leak detection system.

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GEOMEMBRANE MANUFACTURING CAPABILITIES

GSE operates six manufacturing facilities which include flat cast extrusion lines and round die lines with coextrusion capabilities. Combined production capacity for geomembranes is as much as a billion square feet annually (depends upon mil thickness). GSE's ability to manufacture sheet in many different variations and colors has allowed it to satisfy some very unique customer requests.

Quality control is critical during manufacturing. GSE geomembrane is monitored during and after the manufacturing process by trained, experience Quality Assurance Inspectors. Statistical Process Control/ Statistical Quality Control and extensive testing in combination are an integral part of GSE's manufacturing process that ensures the highest quality geomembrane available.

GSE also has a large facility for prefabrication of piping, panels, and other specialty items associated with geotechnical and industrial lining applications.

QUALITY ASSURANCE

GSE's Quality Control/Quality Assurance Program begins with careful specification of resins and other raw materials and extends through field installation. GSE tests all raw materials upon delivery to ensure they meet the strict requirements for its geosynthetic products prior to acceptance.

As the liner is manufactured, our quality control team constantly monitors the sheet. All GSE sheet is spark tested for pinholes during the manufacturing process. Samples are tested against stringent physical property requirements in GSE's state-of-the-art equipped laboratories. Certification is provided for each roll of geosynthetic product delivered to demonstrate that it meets the contract specifications.

The Installation Quality Assurance Technicians are independent of, but work closely with the Installation Site Managers to ensure that the goal of quality is foremost. As the liner is installed, GSE QA Technicians undertake a four step quality control procedure. First, welding is performed by experienced Welding Technicians extensively trained in the use of seaming equipment, and equipment and welding technicians are prequalified daily. Second, all weld seams are visually inspected. Third, GSE nondestructively tests 100% of all weld seams to verify there are no defects. Finally, GSE technicians take random coupon samples of completed welds, and test each weld for peel and shear strength to ensure the weld complies with the specified seam properties.

INSTALLATION CAPABILITIES

GSE has the most comprehensive turn-key installation capabilities of all geomembrane lining companies worldwide. GSE provides its customers with installation services using GSE worldwide installation teams and a global network of dealer installers.

The GSE construction staff is comprised of experienced, trained Site managers, Welding Technicians and Quality Assurance Technicians. All GSE installations are under the supervision of a GSE Site Manager. GSE Site Managers average more than 30 million square feet (3 million square meters) of installation experience. Their responsibility and training assure each installation will be in accordance with the contract specifications. GSE crews have available to them the most comprehensive combination of seam welding and nondestructive testing equipment and systems applicable to the wide variety of geomembrane applications and installations.

From raw material specification to manufacturing, quality assurance and installation, the goal of the GSE team is to provide the customer with the highest quality geomembrane liner system available. That is why we at GSE are proud to say *"For environmental lining solutions...the world comes to GSE*."* 000296

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- 2739

Supplier Submittal Number: ~~02770P-2~~ See following page for accurate numbers JTT 6-23-99
~~(M1.05.A.2)~~

Document Number: ~~1440-02770P-2~~
1440-001E NOK 8/11/99

Specification Requirement Reference: 02770P.1.05.A.2

Document Description: List of 10 Completed Facilties

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[X] A - Conforms to the Subcontract Requirements
[ ] B - Minor Comment - Incorporate and Resubmit
[ ] C - Revise and Resubmit
Sig: J. C. Jenkins Date: 5/12/99

Supplier Submittal Number:	1440-001
Document Number:	1440-001E
Specification Requirement Reference:	02770P.1.05.A.2
Document Description:	List of 10 Completed Facilities

REFERENCE LIST

Job Name:	Acmar Landfill Cell 2	E1122
Location:	Birmingham, AL	
Owner:	Acmar Landfill	
Engineer:	CQA Services	
Installation:	60 mil HDPE	421,000 sq. ft.
	Geotextile	231,000 sq. ft.
	60 mil HDPE Textured	66,000 sq. ft.
Completed:	February 1997	

Job Name:	Riverwood International	H1196
Location:	West Monroe, LA	
Owner:	Riverwood International	
Engineer:	Maxim	
GC:	Heber Costello	
Installation:	60 mil HDPE	2,090,000 sq. ft.
Completed:	January 1997	

Job Name:	BFI Gulf West	O1042
Location:	Annawack, TX	
Owner:	BFI	
Engineer:	Golder	
GC:	Addicks	
Installation:	60 mil HDPE	154,000 sq. ft.
	60 mil HDPE Textured	88,000 sq. ft.
Completed:	December 1996	

Job Name:	BFI Benson Valley	O1054
Location:	Frankfort, KY	
Owner:	BFI	
Engineer:	Kevirons	
Installation:	Geocomposite	511,000 sq. ft.
	40 mil LDPE Textured	481,000 sq. ft.
Completed:	November 1996	

Job Name:	BFI Sinton	H1203
Location:	Sinton, TX	
Owner:	BFI	
Engineer:	Golder	
GC:	Addicks	
Installation:	60 mil HDPE	262,000 sq. ft.
Completed:	November 1996	

Job Name:	San Luis Canal	L1248
Location:	Los Banos, CA	
Owner:	San Luis Water District	
Installation:	40 mil HDPE Textured	1,763,000 sq. ft.
Completed:	November 1996	

Job Name:	Prince George	C1113
Location:	Upper Marlboro, MD	
Engineer:	EA Engineering	
GC:	Cherry Hill	
Installation:	Geotextile	1,500,000 sq. ft.
	60 mil HDPE	783,000 sq. ft.
	GeoNet	130,000 sq. ft.
Completed:	November 1996	

Job Name:	BFI North Shelby	D1108
Location:	Millington, TN	
Owner:	BFI	
Engineer:	STS	
Installation:	60 mil HDPE	172,000 sq. ft.
	60 mil HDPE Textured	172,000 sq. ft.
Completed:	November 1996	

Job Name:	BFI Middlepoint	O1026
Location:	Murfreesboro, TN	
Owner:	BFI	
Installation:	60 mil HDPE Textured	746,000 sq. ft.
	60 mil HDPE	59,000 sq. ft.
	Geocomposite	24,000 sq. ft.
Completed:	November 1996	

Job Name:	Cresson Phase II	K1131
Location:	Victor, CO	
GC:	Ames Construction	
Installation:	80 mil LDPE Textured	3,260,000 sq. ft.
	100 mil LDPE	640,000 sq. ft.
	100 mil LDPE Textured	640,000 sq. ft.
Completed:	November 1996	

Job Name:	Kennecott Pond	K1196
Location:	Salt Lake City, UT	
Owner:	Kennecott	
GC:	W.W. Clyde	
Installation:	80 mil HDPE White	5,000 sq. ft.
Completed:	November 1996	

Job Name:	Kennecott Repository	K1163
Location:	Salt Lake City, UT	
Owner:	Kennecott	
Installation:	Geonet	1,455,000 sq. ft.
	80 mil HDPE Conductive	1,369,000 sq. ft.
	60 mil HDPE Conductive	1,290,000 sq. ft.
	Geotextile	144,000 sq. ft.
	60 mil HDPE	79,000 sq. ft.
	GundFlow	73,000 sq. ft.
	60 mil HDPE Textured	50,000 sq. ft.
	80 mil HDPE Textured	50,000 sq. ft.
	Geocomposite	46,000 sq. ft.
	GCL	14,000 sq. ft.
	80 mil HDPE	8,700 sq. ft.
Completed:	November 1996	

Job Name:	McCain Foods	J1054
Location:	Othello, WA	
Owner:	McCain Foods	
Engineer:	JUB	
Installation:	60 mil HDPE	3,250,000 sq. ft.
Completed:	November 1996	

Job Name:	Cowlitz Co	J1149
Location:	Kelso, WA	
GC:	DelHur Industries	
Installation:	60 mil HDPE White	371,000 sq. ft.
	60 mil HDPE White Textured	61,000 sq. ft.
	60 mil HDPE	13,000 sq. ft.
Completed:	November 1996	

Job Name:	Round Mountain	L1211
Location:	Round Mountain, NV	
Engineer:	ICF Kaiser	
GC:	Ames Construction	
Installation:	60 mil HDPE	11,700,000 sq. ft.
	60 mil HDPE Textured	1,500,000 sq. ft.
	Geotextile	91,000 sq. ft.
Completed:	October 1996	

Job Name:	TS Ranch Dam & Channel	L1252
Location:	Carlin, NV	
Owner:	Barrick Goldstrike	
Installation:	60 mil HDPE	1,500,000 sq. ft.
	Geotextile	246,000 sq. ft.
Completed:	October 1996	

000302

Job Name:	Umetco Minerals	K1180
Location:	Casper, WY	
Owner:	Umetco Minerals	
GC:	Umetco Minerals	
Installation:	60 mil HDPE	1,650,000 sq. ft.
	Geonet	821,000 sq. ft.
	Geotextile	19,000 sq. ft.
Completed:	October 1996	

Job Name:	BFI Golden Triangle	O1036
Location:	Bellmont, TX	
Owner:	BFI	
Engineer:	Golder	
GC:	Addicks	
Installation:	60 mil HDPE	420,000 sq. ft.
	60 mil HDPE Textured	32,000 sq. ft.
Completed:	October 1996	

Job Name:	Cortez Pipeline	L1209
Location:	Cressent Valley, NV	
GC:	Ames Construction	
Installation:	60 mil HDPE Textured	5,800,000 sq. ft.
	60 mil HDPE	4,000,000 sq. ft.
	Geotextile	329,000 sq. ft.
Completed:	October 1996	

Job Name:	Jefferson County LF	E418
Location:	Jefferson, AL	
GC:	BEC/Allwaste	
Installation:	60 mil HDPE	1,512,000 sq. ft.
Completed:	October 1996	

000303

Job Name:	Port Washington	A339
Location:	Port Washington, NY	
GC:	Breco	
Installation:	60 mil HDPE textured	1,100,000 sq. ft.
	60 mil HDPE	682,000 sq. ft.
Completed:	October 1996	

Job Name:	Dallas McCommas Landfill	H1174
Location:	Dallas, TX	
GC:	Association Remediation Services	
Installation:	Geotextile	1,000,000 sq. ft.
	60 mil HDPE	750,000 sq. ft.
	60 mil HDPE Textured	265,000 sq. ft.
Completed:	October 1996	

Job Name:	BFI Blue Ridge	H1205
Location:	Houston, TX	
Owner:	BFI	
Engineer:	Golder	
GC:	Addicks	
Installation:	60 mil HDPE	600,000 sq. ft.
	60 mil HDPE Textured	116,000 sq. ft.
Completed:	October 1996	

Job Name:	GE	41093
Location:	Burtville, AL	
Owner:	GE	
Installation:	100 mil HDPE Conductive	38,000 sq. ft.
	Geonet	38,000 sq. ft.
Completed:	September 1996	

Job Name:	Sunshine Canyon	L1193
Location:	Sylmar, CA	
Owner:	BFI	
Installation:	Geotextile	46,000 sq. ft.
	60 mil HDPE Texture	25,000 sq. ft.
	GCL	25,000 sq. ft.
	Geonet	25,000 sq. ft.
	60 mil HDPE Double Textured	22,000 sq. ft.
	30 mil HDPE	13,000 sq. ft.
Completed:	September 1996	

Job Name:	Barney's Cnyn. BC5	K1116
Location:	Bingham Canyon, UT	
GC:	W.W. Clyde Construction	
Installation:	60 mil HDPE	1,730,000 sq. ft.
Completed:	September 1996	

Job Name:	BFI-Chateau Fresno	O1035
Location:	Fresno, CA	
Owner:	BFI	
Engineer:	Vector	
Installation:	40 mil HDPE	2,000,000 sq. ft.
	40 mil HDPE Textured	1,500,000 sq. ft.
Completed:	September 1996	

Job Name:	BFI Kerrville	H1202
Location:	Kerville, TX	
Owner:	BFI	
Engineer:	Golder	
GC:	Addicks	
Installation:	60 mil HDPE Textured	368,000 sq. ft.
	Geocomposite	361,000 sq. ft.
	60 mil HDPE	23,000 sq. ft.
Completed:	September 1996	

Job Name:	Coeur Rochester Pad	L1142
Location:	Love Lock, NV	
GC:	AMI Construction	
Installation:	80 mil HDPE Textured	2,377,000 sq. ft.
Completed:	September 1996	

Job Name:	Empire Landfill, Pad 9	B1098
Location:	Scranton, PA	
Owner:	Empire Landfill	
Installation:	100 mil HDPE Textured	1,300,000 sq. ft.
Completed:	September 1996	

Job Name:	Lyondell Brine Pit	61276
Location:	Mt. Bellevieu, TX	
Owner:	Lyondell	
Installation:	40 mil HDPE	22,000 sq. ft.
	Geotextile	18,000 sq. ft.
	60 mil HDPE	15,000 sq. ft.
	Geonet	15,000 sq. ft.
Completed:	August 1996	

Job Name:	Reserve Environmental	C1081
Location:	Ashtabula, OH	
Owner:	Reserve Environmental	
Installation:	Geotextile	610,000 sq. ft.
	60 mil HDPE Textured	156,000 sq. ft.
	Geonet	156,000 sq. ft.
	60 mil HDPE	149,000 sq. ft.
Completed:	August 1996	

Job Name:	Sanifill/Citizen's Disposal	F1126
Location:	Grand Block, MI	
Owner:	Sanifill	
Engineer:	NTH	
Installation:	60 mil HDPE	615,000 sq. ft.
	Geotextile	612,000 sq. ft.
	Geonet	605,000 sq. ft.
	Geocomposite	15,000 sq. ft.
	60 mil HDPE	15,000 sq. ft.
Completed:	August 1996	

Job Name:	Webster Parish Landfill	H1173
Location:	Minden, LA	
GC:	Plaquemine Contractors	
Installation:	Geocomposite	400,000 sq. ft.
	60 mil HDPE	220,000 sq. ft.
	60 mil HDPE Textured	140,000 sq. ft.
Completed:	August 1996	

Job Name:	Al Turi	A1096
Location:	Goshen, NY	
Owner:	Al Turi	
Engineer:	Emcon	
Installation:	60 mil HDPE Textured	261,000 sq. ft.
	Geocomposite	261,000 sq. ft.
Completed:	August 1996	

Job Name:	BFI Sunset Farms	H1204
Location:	Travis County, TX	
Owner:	BFI	
Engineer:	Golder	
GC:	Addicks	
Installation:	60 mil HDPE	575,000 sq. ft.
	60 mil HDPE Textured	79,000 sq. ft.
Completed:	August 1996	

Job Name:	LaRoche	21192
Location:	Belvidere, NJ	
Owner:	LaRoche	
Installation:	80 mil HDPE Conductive Textured	44,000 sq. ft.
Completed:	August 1996	

Job Name:	Groose Creek	J1130
Location:	Stanley, ID	
GC:	Ledcon Industries Construction	
Installation:	60 mil LLD	1,250,000 sq. ft.
	Geotextile	291,000 sq. ft.
	Bentomat	80,000 sq. ft.
Completed:	July 1996	

Job Name:	Fort Howard Paper	F1097
Location:	Green Bar, WI	
Owner:	Fort Howard Paper Company	
Installation:	40 mil LDPE	807,000 sq. ft.
	40 mil LDPE Textured	60,000 sq. ft.
Completed:	July 1996	

Job Name:	Franklin Expansion Phase II	A1057
Location:	Tilton, NH	
Owner:	Town of Franklin	
GC:	Pike Industries	
Installation:	80 mil HDPE Textured	183,000 sq. ft.
	80 mil HDPE	57,000 sq. ft.
Completed:	July 1996	

Job Name:	Cortez Gold Acres	L1213
Location:	Cresscent Vale, NV	
GC:	Copeland Construction	
Installation:	60 mil HDPE	717,000 sq. ft.
	80 mil HDPE	41,000 sq. ft.
Completed:	July 1996	

Job Name:	Chesapeake Paper Company	C1117
Location:	Roanoke, VA	
Owner:	Black & Veatch	
GC:	Massie Contracting, Inc.	
Installation:	Geotextile	1,167,000 sq. ft.
	60 mil HDPE	268,000 sq. ft.
	60 mil HDPE Textured	122,000 sq. ft.
Completed:	July 1996	

Job Name:	Pit Area Closure	A1117
Location:	Brattleboro, VT	
Owner:	Windham Solid Waste	
Engineer:	Windham Solid Waste	
GC:	H.E. Sargent	
Installation:	40 mil LDPE	458,000 sq. ft.
	Geocomposite	411,000 sq. ft.
Completed:	June 1996	

Job Name:	Hoechst Celanese	61271
Location:	Bishop, TX	
Owner:	Hoechst Celanese	
Installation:	80 mil HDPE Textured	2,500 sq. ft.
	Geonet	750 sq. ft.
Completed:	June 1996	

Job Name:	Cyprus Bagdad	K1153
Location:	Bagdad, AZ	
GC:	Ames Construction	
Installation:	80 mil HDPE Textured	375,000 sq. ft.
	60 mil HDPE	57,000 sq. ft.
Completed:	May 1996	

Job Name:	Botetourt County Lanfill Cell2	C1146
Location:	Troutville, VA	
Owner:	Botetourt County	
GC:	Counts & Dobyns	
Installation:	Geotextile	189,000 sq. ft.
	60 mil HDPE Textured	189,000 sq. ft.
Completed:	May 1996	

Job Name:	Salt River Landfill	K1148
Location:	Scottsdale, AZ	
Owner:	Rich Allen	
Installation:	60 mil HDPE	250,000 sq. ft.
	60 mil HDPE Textured	250,000 sq. ft.
	Geocomposite	240,000 sq. ft.
Completed:	April 1996	

Job Name:	Huntsman Chemical	21158
Location:	Belpre, OH	
Owner:	Huntsman Chemcal	
Installation:	60 mil HDPE	64,000 sq. ft.
Completed:	April 1996	

Job Name:	Palm City Landfill	P7681
Location:	Palm City, FL	
Owner:	Martin County	
Engineer:	Hazen & Sawyer	
GC:	Hewitt Contracting	
Installation:	60 mil HDPE	969,000 sq. ft.
	HyperNet	450,000 sq. ft.
	GCL	28,000 sq. ft.
Completed:	March 1996	

Job Name:	Mira Mar	L1177
Location:	San Diego, CA	
Owner:	City of San Diego	
GC:	Rasmussen	
Installation:	80 mil HDPE Textured	110,000 sq. ft.
	Geotextile	30,000 sq. ft.
Completed:	March 1996	

Job Name:	City of Harlingen	H1176
Location:	Harlingen, TX	
Owner:	City of Harlingen	
Installation:	Geocomposite	180,000 sq. ft.
	60 mil HDPE	143,000 sq. ft.
	60 mil HDPE Textured	24,000 sq. ft.
Completed:	March 1996	

Job Name:	Upper SW Arkansas Landfill	H1152
Location:	Nashville, AR	
Owner:	Upper SW Arkansas Landfill	
Installation:	60 mil HDPE	14,000 sq. ft.
Completed:	February 1996	

Job Name:	North Star Steel	71058
Location:	Kingman, AZ	
Engineer:	Pat McMarrara	
Installation:	60 mil HDPE	163,000 sq. ft.
Completed:	January 1996	

Job Name:	Channelview Brine Pit	H1162
Location:	Mt. Bellevieu, TX	
Owner:	Lyondell Petrochemical	
Installation:	40 mil HDPE	89,000 sq. ft.
	60 mil HDPE	89,000 sq. ft.
	Geonet	89,000 sq. ft.
Completed:	December 1995	

Job Name:	Golden Sunlight	J1083
Location:	Jefferson, MT	
Owner:	Golden Sunlight Mine	
Installation:	60 mil HDPE	1,292,000 sq. ft.
	60 mil HDPE Textured	9,000 sq. ft.
Completed:	December 1995	

--2739

Supplier Submittal Number: ~~02770P-3~~ ~~(M1.05.A.3)~~ See following page for accurate numbers. 6-23-99 JTT

Document Number: ~~1440-02770P-3~~ 1490-001F NOK 8/11/99

Specification Requirement Reference: 02770P.1.05.A.3

Document Description: Origin and Identification of Resin

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Sig: J. C. Jenkins Date: 5/12/99

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Supplier Submittal Number:	1440-001
Document Number:	1440-001F
Specification Requirement Reference:	02770P.1.05.A.3
Document Description:	Origin and Identification of Resin

STAR... Safety Through Accountability and Recognition

Mobil Polyethylene
Certificate of Analysis

"QUALITY PEOPLE MAKING QUALITY PRODUCTS"

Bill Walling
GSE
19103 Gundle Road
Houston, TX 77073

January 28, 1997

Mobil Chemical, a major supplier of quality polyethylene, has shipped a lot of Material to your facility. The lot identification and analysis are listed below. This data has been supplied by our Quality Control Laboratory located here in Beaumont. If you should need further information or another copy of this report please call your sales office in Irving, TX 214-580-1040.

Resin Identification		Resin Analysis Test	Lot Data
Product Type	HDA-601	Melt Index (gms/10 min) I2	0.55
Lot Number	W-46090	Density (gms/cc)	0.935
Hopper Car Number	ACFX-57288		
Quantity Shipped	174,850		
Date of Manufacture	26-Dec-96		
P.O. Number			
Location Shipped to Aldine, TX		LTB Test ASTM D746 <-90°C	

Thank you for your business. If you need additional assistance, please do not hesitate to contact our Sales Representative in your area.

Sincerely,

C. A. Winney
Quality Assurance Specialist

cc: MP-DALLAS

FAX to 713 [illegible] N. Ivy
FAX to 713 [illegible] R. Schaefer

=-2739

PHILLIPS CHEMICAL COMPANY
A DIVISION OF PHILLIPS PETROLEUM COMPANY
BOX 792 • PHONE: 713 475-3666
PASADENA, TEXAS 77501-0792

PHILLIPS PLASTICS RESINS
Houston Chemical Complex

June 17, 1996

JHV# 11945-96

FAX: 713-230-8640

GSE Lining Technology, Inc.
19103 Gundle Road
Houston, TX 77073

ATTN: Rick Schaefer

This letter will certify that the Marlex* resin shown below, as supplied by Phillips Chemical Company, conforms to our manufacturing specification.

Type:	HHM TR-400GS
Lot Number:	7160820
P.O. Number:	VERBAL
Date Shipped:	06/14/96
Package:	PSPX 2571
Quantity:	172800 LBS.
Melt Index, ASTM D1238:	.110 G/10 MIN
HLMI Flow Rate,ASTM D1238:	11.6 G/10 MIN
Density, ASTM D1505:	.938 G/CC
HLMI/MI Ratio:	105. GM/10 MIN
Production Date:	06/11/96
ESCR, F/50, Cond. B:	1500 HOURS **

J. H. Vaden
Quality Assurance Manager

For COA questions call Sharon Robinette, 713-475-3625

* Reg. U.S. Pat. Off.
** Nominal Value (not tested on each lot)

cc: QA-File-RC

2739

Supplier Submittal Number:	1440-001
Document Number:	1440-001G
Specification Requirement Reference:	02770P.1.05.A.4
Document Description:	Certification of Welding Rod

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Sig: J C Jackson Date: 6/24/99

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GSE Lining Technology, Inc.
Technical Support

February 12, 1999

Kathy Fisher
Fluor Daniel Fernald
7400 Willey Road
Fernald, OH 45030

Subject: Certification for Welding Rod
Project Location: Fernald, OH
GSE Project No. 502302

Certification

The undersigned, being qualified and authorized to do so, hereby certifies that the extrudate is the same resin types and has the same properties as the HD®, HyperFlex and HyperFrictionFlex® geomembrane to be supplied to the above project.

Regards,

Eric Reed
Technical Support Supervisor

For environmental lining solutions . . . the world comes to GSE™
A Gundle/SLT Environmental, Inc. Company

Supplier Submittal Number:	1440-001
Document Number:	1440-001H
Specification Requirement Reference:	02770P.1.05.A.5
Document Description:	Certification of Minimum Average Roll Values

GSE Lining Technology, Inc.

2739

March 3, 1999

Fluor Daniel Fernald
7400 Willey Road
Fernald, OH 45030

Attn: Rick Holbrook

RE: Roll Dimension Clarification
GSE Project No. 502302

GSE inadvertently stated GSE's standard roll dimensions in the Pricing Schedules (Base Contract –Cell 3 Liner, Option 1-Cell 1 Cover System, and Option 2-Cell 4 Liner System) during the Bid Phase. GSE's bid is based on providing roll sizes for this project that comply with the roll dimensions in Table GML-80T, Table GML-80S, Table GML-60T and Table GML-60S. This was a mistake on GSE's part and again GSE will meet the specified roll sizes.

I look forward to working with you again and to another successful project. Should you need anything else, please contact Roger Krabel or myself.

Regards,

Eric Reed

Eric Reed
Technical Support Supervisor

Cc: Roger Krabel- GSE Sales Manager

GSE Lining Technology, Inc.

2739

February 12, 1999

Fluor Daniel Fernald
7400 Willey Road
Fernald, OH 45030

Attn: Kathy Fisher

RE: Certification of 30 mil HD®, 60, 80 mil HyperFrictionFlex®, and 60, 80 mil HyperFlex® Properties
GSE Project No. 502302

Certification

The undersigned, being qualified and authorized to do so, hereby certifies the 30 mil HD®, 60, 80 mil HyperFrictionFlex®, and 60, 80 mil HyperFlex® will meet the following properties:

1. MARV - GSE's' HyperFrictionFlex physical and mechanical properties will meet the properties as listed in Table 02770P-1 with a 95% confidence level.
2. Reclaim - GSE hereby certifies that no reclaimed polymer will be used in the production of materials for the above referenced project. Recycled material reworked from GSE's manufacturing process may be added, but will not exceed 2% by weight.

Eric Reed
Technical Support Supervisor

000321

2739

Supplier Submittal Number:	1440-001
Document Number:	1440-001I
Specification Requirement Reference:	02770P.1.05.A.6
Document Description:	Recommended Long Term Storage Requirements

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Sig. J. C. Jenkins Date 6/24/99

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GSE Lining Technology, Inc.

RECOMMENDED HANDLING AND STORAGE PROCEDURES

HANDLING

1. Material manufactured by GSE Lining Technology, Inc. is provided on flat, wound rolls in three approximate sizes:
   22.5 ft (6.75 m) wide and 2 ft (600 mm) in diameter, 2800 lbs (1275 kg)
   24.0 ft (7.32 m) wide and 2 ft (600 mm) in diameter, 3500 lbs (1610 kg)
   34.5 ft (10.5 m) wide and 2 ft (600 mm) in diameter, 4400 lbs (2025 kg)
   Actual roll dimensions are provided when material is shipped.

2. To assist in handling, two (2) lifting straps are supplied with each roll. For effective handling, a lifting bar (not supplied) 8.2 ft (2.5 m) long must be used to lift the rolls for loading and unloading.

3. Extreme care must be used in crane handling so that damage to the edges of the rolls does not occur during handling.

4. If other handling equipment is used which could come into direct contact with the material, care should be exercised to assure the material is not damaged or punctured.

STORAGE

1. The material is manufactured to be suitable for outdoor installation; therefore, covered storage is not required. **Caution:** If high winds, hail or other adverse environmental conditions are expected, covered storage may be considered to assure the material is not damaged. Also, where local conditions warrant protection from theft or vandalism, consideration should be given to storage in a secured area.

2. The ground surface on which the material is stored should be similar in character to the area to be lined. It should be free of all debris, rocks and other protrusions which could damage the liner material.

3. Rolls can be stored by stacking one on top of the other. The recommended maximum number of rolls which can be stacked on top of one another is five (5) rolls, *i.e*, two high.

4. Boxes of welding rod should not be left outside but stored in a secure, dry, covered area.

- 2739

Supplier Submittal Number: ~~02770P-7~~ ~~(M1.05.A.7)~~ See following page for accurate numbers JTT 6-23-99

Document Number: ~~1440-02770P-7~~ 1440-001J AOK 8/11/99

Specification Requirement Reference: 02770P.1.05.A.7

Document Description: Recommended Installation Requirement

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Supplier Submittal Number:	1440-001
Document Number:	1440-001J
Specification Requirement Reference:	02770P.1.05.A.7
Document Description:	Recommended Installation Requirements

GSE Lining Technology, Inc.

Field Installation

Quality Assurance Plan

This manual contains proprietary information belonging to GSE Lining Technology, Inc. Any information contained herein is not to be discussed with others outside the involved organizations, except with the express prior written consent of GSE's management. This document represents activities commonly undertaken by GSE for installation projects. No part of this document shall be construed as an official contractual document unless attributed to a specific job.

This manual replaces in its entirety and supersedes all earlier versions issued by SLT North America, Inc. and Gundle Lining Systems, Inc. We suggest you maintain contact with your GSE representative to confirm the validity of this version at future dates.

GSE Lining Technology, Inc. reserves the right to change, modify, or discontinue the use of the policies and procedures described herein without notice or prior consent except as contractually obligated to do so otherwise.

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96-068, R8/8/96

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GSE MISSION STATEMENT

To be the world leader in providing geosynthetic lining solutions, products and services to satisfy our customers' needs for protecting the environment.

1.0 INTRODUCTION

1.1 Overview of Construction Quality Assurance Plan

The GSE Installation Quality Assurance Plan was developed based on the company's long-term policy and tradition of quality being the single most significant determining factor. Some projects have specifications which may require project specific modifications to this manual. Such documents, when required, will become an appendix to the construction contract or this manual.

Commonly used geosynthetic components of a lining system are discussed in this manual. This includes polyethylene geomembranes, geotextiles, geonets and geocomposites. This manual can be a useful guide in delineating the quality assurance procedures and minimum requirements for the installation of all the above geosynthetic products.

This manual does not address design guidelines, installation specifications, or selection of geomembranes, bentonite blankets, and other geosynthetics.

1.2 Project Duties and Qualifications of the Geosynthetic Installer Personnel

1.2.1 Project Manager

The GSE Project Manager is charged, at a minimum, with the following responsibilities.

- Primary customer contact for all aspects of the project
- Coordinate projects with clients with regard to submittals, documentation, material delivery, crew mobilization, job progress, invoicing and project close-out
- Develop and implement staffing, equipment and operational plans prior to job start
- Continuously monitor job progress and make necessary adjustments to ensure successful completion; maintain revised schedules and schedule coordination with other project activities to reflect current status subsequent to any significant change
- Attend pre-construction meetings
- Available for site visits and meetings as job progresses to ensure client satisfaction

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1.2.2 Site Supervisor

The Site Supervisor shall have installed a minimum of 5,000,000 square feet of geomembrane. The GSE Site Supervisor is charged, at a minimum, with the following responsibilities:

- Accept surface conditions as satisfactory for deployment or advise customers and project manager if not satisfactory
- The deployment, seaming, testing, repair and detailing of the geosynthetic components installation for which GSE is contracted to install
- The Welding Technicians and other field staff
- Repair and maintenance of all equipment and vehicles used on the jobsite
- Communication with the customer on all matters of scheduling and the installer's role in the project
- Develop time and scope estimates for any applicable change orders with assistance from project manager
- Act as the primary on-site contact for the customer and Independent construction quality assurance (CQA) personnel
- Supervise the completion of all lining installation work including clean up of the jobsite

1.2.3 Quality Assurance Technician

The Quality Assurance (QA) Technician is charged, at a minimum, with the following responsibilities:

- Removal of all conformance and destructive samples from the liner materials
- Monitor all trial welds
- Performance of all non-destructive and destructive testing
- Maintain records of testing performed
- Measurement of deployed materials
- Inspections (walkdown) of completed areas of installation
- Other tasks as required

1.2.4 Welding Technician

The Welding Technician is charged, at a minimum, with the following responsibilities:

- Perform deployment, seaming, and repairs as required for the project
- Equipment maintenance as required
- Perform trial welds
- Perform other functions for the scope of work as directed by the Site Supervisor
- Assist QA Technician as required by the Site Manager

The Master Seamer shall be a welding technician with a minimum of 1,000,000 square feet of geomembrane seaming work and can also be the Site Supervisor or QA Technician.

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1.3 Construction Meetings

1.3.1 Pre-Construction Meeting

Following the award of contract, a Pre-Construction Meeting should be held. This meeting should include all involved parties.

The purpose of this meeting is to begin planning coordination of tasks, addressing problems which might cause difficulties and delays in construction, and present the relevant quality assurance guidelines to all the parties involved. It is very important that the specifications regarding testing, repair, etc., be known and accepted by all.

This meeting should include, but not limited to, the following activities:

- Communicate to all parties any relevant documents
- Review critical design details of the project
- Review the relevant quality assurance guidelines and specifications and agree on any appropriate modifications
- Make appropriate site specific modifications to the design criteria, plans and specifications through the implementation of a documented, site specific addendum
- Reach an agreement on quality control procedures, especially on methods of determining acceptability of the lining system
- Establish lines of authority and communication
- Review safety plans and procedures
- Prepare a time schedule for all operations and any other site specific items pertinent to the lining installation

The meeting should be documented and minutes transmitted to all parties within one week of the meeting.

1.3.2 Progress Meetings

It is recommended an informal daily installation Progress Meeting be held among appropriate parties to discuss current progress.

2.0 GEOMEMBRANE INSTALLATION

2.1 Earthwork

2.1.1 Surface Preparation

The Earthwork Contractor shall be responsible for preparing the subgrade according to the project specifications.

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The Site Supervisor shall verify that:

a) The surface to be lined has been prepared so as to be free of irregularities, protrusions, vegetation, excessive water, loose soil or abrupt changes in grade

b) The supporting surface does not contain stones or other matter of such composition, shape or size which may be damaging to the geomembrane and

c) There are no excessively soft surface areas

Under no circumstances shall the installer deploy any geomembrane in areas not acceptable within these guidelines. A completed surface acceptance form shall be provided to the customer specifically indicating the areas accepted for geomembrane installation during each day's activities. This form shall be provided after installation activities within that area. If at any time during the installation of the geosynthetic lining system the prepared subgrade deteriorates, becomes damaged, or in any way is determined unacceptable by the Site Supervisor, all liner installation work shall stop in those areas and the condition of those areas brought to the attention of the appropriate party.

2.1.2 Anchor Trench

The anchor trenches shall be constructed by the Earthwork Contractor (unless otherwise specified in the contract) to the lines, widths and depths as shown on the drawings and specifications. This task should be performed prior to the geomembrane deployment.

The edges where the geosynthetics enter the trench should be free of irregularities, protrusions, etc. to avoid potential damage to the material. Backfilling of the anchor trench shall be the responsibility of the Earthwork Contractor in accordance with specifications. Backfilling should occur when the geosynthetic material is at its most contracted state to avoid potential bridging problems. Care must be taken to avoid damaging the geosynthetics during backfilling.

2.2 Geomembrane Deployment

The site supervisor, in conjunction with the customer shall agree upon the following issues. If any adverse situation or disagreement exists, the site supervisor shall cease deployment until issues are resolved.

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2.2.1 Installation

The Site Supervisor shall proceed with deployment provided that:

- Deployment equipment does not damage the subgrade
- Personnel who are in contact with the liner do not smoke, wear damaging shoes or engage in other activities which risk damage to the liner
- Use of a low ground pressure, rubber-tired all terrain vehicle (i.e. ATV) is allowed on the geosynthetic surface, provided proper care is taken to avoid damage and excessive traffic

Field panel placement installation sequence should take into account site drainage, wind direction, subgrade surface, access to the site, and production schedule of the project. Geomembrane panel deployment shall not proceed when adverse weather conditions exist which may jeopardize the integrity of the liner installation. Field panels should be seamed as soon as possible after deployment and all deployed material shall be marked with appropriate identification.

2.2.2 Visual Inspection

The Site Supervisor and/or the QA Technician and the designated Independent Inspector shall visually inspect each panel, as soon as possible after deployment, for damage or areas needing repair. Areas shall be marked for repair.

2.3 Field Seaming

Field seaming involves the bonding of adjacent panels using thermal methods.

2.3.1 Seam Layout

In general, seams shall be oriented parallel to the direction of maximum slope, i.e. oriented along, not across, the slope. In corners and odd-shaped geometric locations, the number of seams should be minimized. No horizontal seams should occur on a panel less than five lineal feet from the toe of the slope. On slopes of less than 10% (6L:1H), this rule shall not apply. A cross slope seam may be utilized provided the panel ends are cut at an angle of approximately 45°.

A seam is considered a separate entity if it is the principal attachment that joins two or more panels. Repairs are not considered seams in this context.

A numbering system using adjacent panel numbers shall identify each seam.

2.3.2 Seaming Equipment and Products

Approved processes for field seaming and repairing are extrusion welding and fusion welding. All welding equipment shall have accurate temperature monitoring devices to insure proper measurement of the welder temperatures.

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a) Fusion Process

This process shall be used for seaming panels together and is not generally used for patching or detail work. The apparatus shall be of a hot wedge type and is commonly equipped with a "split wedge" to allow air pressure seam testing.

Fusion welding equipment shall be self propelled devices and shall be equipped with functioning wedge temperature and seaming speed controllers to assure proper control by the Welding Technician.

b) Extrusion Process

This process shall be used primarily for repairs, patching, and special detail fabrication. This method is also useful to connect new panels to previously installed liner that does not have an exposed edge capable of being fusion welded.

The extrusion welding apparatus (handwelder) shall be equipped with temperature monitoring devices.

2.3.3 Seam Preparation

The Welding Technician shall verify that prior to seaming, the seam area is free of moisture, dust, dirt, sand, or debris of any nature; the seam is properly overlapped for welding; the seam is properly heat tacked and abraded when extrusion welding; and seams are performed to minimize "fishmouths".

2.3.4 Trial Seams (Trial Welds)

Prior to production seaming, trial seams shall be made and accepted using project specified criteria. Trial seams shall be made on appropriate sized pieces of identical or equivalent geomembrane material to verify that seaming conditions and procedures are adequate. Each trial seam sample shall be assigned a number and the test results recorded in the appropriate log.

- Trial seams shall be performed for each welder to be used and by each operator of extrusion welders, and by the primary operator of each fusion welder.
- A passing trial seam shall be made prior to the beginning of each seaming period. Typically this is at the start of the day and after lunch break.
- Fusion welded trial seam samples shall be approximately six feet long by one foot wide with the seam centered lengthwise. For extrusion welding, the trial seam sample size shall be approximately three feet long, by one foot wide with the seam centered lengthwise.
- Four specimens, each one inch wide and six inches long shall be cut from the trial seam using a coupon cutter. Two of the specimens shall be tested in shear and two specimens tested for peel on a field tensiometer. When testing a fusion welded seam, both inside and outside seams shall be tested. All shear and peel test specimens shall meet or exceed the project requirements.

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2.3.5 Panel Seams (Production Seaming)

Upon acceptance of the trial seams, work may begin on deployed panels. All seams shall be non-destructively and destructively tested. Each completed seam shall be labeled with pertinent information.

2.3.6 Non-Destructive Seam Testing

GSE shall non-destructively test field seams for their full length using an air pressure test or a vacuum test. The purpose of non-destructive tests is to demonstrate the leak resistance of the seam.

On seams that cannot be non-destructively tested by vacuum or air-pressure methods due to physical constraints, i.e. a boot detail, the seam shall be tested using other approved methods.

The Site Supervisor shall schedule all non-destructive testing operations in order to ensure prompt demonstration of weld quality and the orderly progress of the project.

The QA Technician shall instruct the testing personnel regarding marking of repairs needed, leaks and sign-off marks on seam and repairs.

a) Vacuum Testing

Vacuum testing is routinely performed on extrusion welds and can be performed on fusion welds. The equipment shall consist of a vacuum box assembly with a vacuum gauge, a pumping device, and a soap solution.

The following procedure shall be followed:

- Wet a section of the seam with the soap solution. The seam section must be longer than the vacuum box.
- Place the vacuum box over the wetted area and apply body weight to form a seal between the gasket and the liner.
- Evacuate air to create a negative pressure of approximately 5 psig.
- Observe the seam through the viewing window for presence of soap bubbles emitting from the seam.
- If no bubbles are observed, reposition the box on the next wetted area for testing with a slight overlap.
- If bubbles are detected, which indicates a leak in the seam, mark the area of the leak for repair and retest.

b) Air Pressure Testing

Air pressure testing is performed on seams made by a double-seam fusion welding apparatus.

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The equipment shall be comprised of the following:

- An air pump, or air tank, capable of producing a minimum air pressure of 25 psig in the seam channel
- A sharp hollow needle to insert air into the air channel of the seam
- A hot air gun or other heating device to seal the ends of the air channel

The following procedures shall be followed:

- Seal both ends of the air channel of the seam to be tested.
- Insert the needle into the air chamber at either end of the seam to be tested.
- Pressurize the air channel to a minimum of 25 psig. Allow the pressure to stabilize, and if necessary, re-pressurize to 25 psig and note the pressure.
- With a minimum pressure of 25 psig stabilized in the air channel, the time of day shall be noted.
- After approximately 5 minutes, the air pressure should be read again.
- If the difference between the two readings is more than 4 psig, the seam needs to be retested.
- Upon completion of the test and recording all information required, open the opposite end of the seam from the needle. Escaping air will confirm that the entire length of the seam was pressurized and therefore tested. If air does not escape, the channel is blocked. The blockage must be located and the test redone from that point on.
- Upon completion of the air pressure test, the seam shall be marked and points requiring repair identified.

c) Procedures for Air Pressure Test Failure

Should the seam fail the air pressure test, the following procedure shall be followed:

- Reposition the apparatus and retest the same section
- While the seam air-channel is under pressure, traverse the length of the seam and listen for the leak
- While the seam air-channel is under pressure, apply a soapy solution to the seam edge (do not trim excess material from edge of seam) and observe for bubbles formed by escaping air
- Re-test the seam in progressively smaller increments, until the area of leakage is identified
- Repair the identified leak area by extrusion welding the excess material at the edge of the seam and then vacuum test
- In areas where the air channel is closed and the integrity of the weld is not suspect, vacuum testing is acceptable

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2.3.7 Destructive Seam Testing

Destructive seam tests shall be performed at selected locations. The purpose of these tests is to evaluate bonded seam strength. Seam strength testing shall be performed as work progresses.

a) Location and Frequency

The frequency of sample removal is commonly no more than one sample per 500 lineal feet of seam.

b) Size of Samples

A sample segment twelve inches by twelve inches shall be cut with the seam centered lengthwise. Additional segments may be cut for independent lab testing, archival retain or other uses.

c) Sample Identification

The segment shall be marked with the appropriate destructive sample (D/S) number.

d) Field Testing

Sample shall be tested in peel and in shear using the following procedure:

- Ten specimens of one inch width shall be cut with a coupon cutter from the segment with a machine press and die.
- Five specimens shall be tested for peel. Fusion welds shall be tested from both sides.
- Five specimens shall be tested for shear.
- If specified, a field tensiometer will be supplied. Testing will occur at a rate of two inches per minute.

e) Pass/Fail Criteria

Seams shall exhibit a film tear bond (FTB). For projects which utilize a tensiometer, the following table provides minimum acceptable values.

		Seam Strength ASTM D 4437			
		Shear		Peel	
Product Name	Thickness ASTM D 5199 mm (mils)	Extrusion kN/m (lb/in)	Fusion kN/m (lb/in)	Extrusion kN/m (lb/in)	Fusion kN/m (lb/in)
GSE HyperFlex®	1.0 (40)	14.1 (81)	14.1 (81)	9.1 (52)	11.4 (65)
GSE HyperFlex®	1.5 (60)	21.2 (121)	21.2 (121)	13.7 (78)	17.2 (98)
GSE HyperFlex®	2.0 (80)	28.4 (162)	28.4 (162)	18.2 (104)	22.8 (130)
GSE UltraFlex®	1.0 (40)	9.8 (56)	9.8 (56)	8.4 (48)	8.4 (48)
GSE UltraFlex®	1.5 (60)	14.7 (84)	14.7 (84)	12.6 (72)	12.6 (72)
GSE UltraFlex®	2.0 (80)	19.6 (112)	19.6 (112)	16.8 (96)	16.8 (96)

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		Seam Strength ASTM D 4437			
		Shear		Peel	
Product Name	Thickness ASTM D 5199 mm (mils)	Extrusion kN/m (lb/in)	Fusion kN/m (lb/in)	Extrusion kN/m (lb/in)	Fusion kN/m (lb/in)
GSE HyperFrictionFlex®	1.0 (40)	14.1 (81)	14.1 (81)	9.1 (52)	11.4 (65)
GSE HyperFrictionFlex®	1.5 (60)	21.2 (121)	21.2 (121)	13.7 (78)	17.2 (98)
GSE HyperFrictionFlex®	2.0 (80)	28.4 (162)	28.4 (162)	18.2 (104)	22.8 (130)
GSE UltraFrictionFlex®	1.0 (40)	9.8 (56)	9.8 (56)	8.4 (48)	8.4 (48)
GSE UltraFrictionFlex®	1.5 (60)	14.7 (84)	14.7 (84)	12.6 (72)	12.6 (72)
GSE UltraFrictionFlex®	2.0 (80)	19.6 (112)	19.6 (112)	16.8 (96)	16.8 (96)

In addition to these values, the sample shall not fail within the seam area. Four out of five specimens meeting the above criteria will constitute a passing test.

If the seam fails the test, the following procedure shall be followed. Additional sample segments of the same size shall be removed approximately 10 lineal feet in each direction from the failed seam. Both of these sample segments shall be tested in accordance with the criteria listed above and each segment must pass. This procedure is repeated until a passing result is obtained. In lieu of taking an excessive number of samples, the entire seam may be repaired as outlined in Section 2.3.8.a.

2.3.8 Defects and Repairs

All seams and non-seam areas of the polyethylene lining system shall be examined for identification of defects. Identification of the defect or repair may be made by marking on the sheet/seam with an appropriate marking device.

a) Repair Procedures

Any portion of the polyethylene lining system exhibiting a defect which has been marked for repair shall be repaired with any one or combination of the following methods:

- Patching: used to repair holes, tears
- Grind and reweld: used to repair small sections of extruded seams
- Spot welding: used to repair small minor, localized flaws
- Flap welding: used to extrusion weld the flap of a fusion weld in lieu of a full cap
- Capping: used to repair failed seams
- Topping: application of extrudate bead directly to existing seams.

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The suspected defect shall be demonstratable as out of specification and detrimental to the performance of the liner.

The following conditions shall apply to all the above methods:

- Surfaces of the polyethylene which are to be repaired shall be lightly abraded to assure cleanliness
- All surfaces intended to receive extrudate must be clean and dry at the time of the repair
- All patches and caps shall extend at least four inches beyond the edge of the defect, and all patches shall have rounded corners.

b) Verification of Repairs
Repairs shall be non-destructively tested according to the criteria established in Section 2.3.6.e.

Repairs which pass the non-destructive test will be taken as an indication of an adequate repair. Failed tests indicate that the repair must be re-done and re-tested until a passing test result is obtained.

2.4 Lining System Acceptance

After work is complete, the Site Supervisor and/or QA Technician shall conduct a final inspection (walk-down) of the area for confirmation that all repairs have been appropriately performed, all test results are acceptable and the area has all scrap, trash and debris removed. Only after careful evaluation by the Site Supervisor and acceptance by the Customer shall any material be placed upon the lining system.

The geosynthetic lining system will be accepted by the customer when:

- Installation of materials is complete
- Verification of the adequacy of all seams and repairs, including associated testing and documentation is complete

Acceptance will be indicated by all parties involved by signing a Certificate of Acceptance (see Section 4). Partial areas of the installation may be accepted in order to allow further construction of the project.

3.0 ANCILLARY GEOSYNTHETICS INSTALLATION (Geonets, Geocomposites, GCL's, Geotextiles, and Geogrids)

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3.1 Handling

GSE shall handle all geotextile, geonets, geogrids and geocomposites, in such a manner as to ensure they are not damaged.

- On slopes, the geosynthetics shall be securely anchored in the anchor trench and then rolled down the slope in such a manner as to keep the material in tension.
- Sandbags shall be used to secure the edges of the material when the potential for wind damage is significant.
- Cutting of the material shall be done in such a manner as to prevent damage to any underlying or adjacent geomembrane.
- Care should be taken when deploying geosynthetic materials that stones, debris or other material is not trapped by the geonet, geocomposites, geotextile, geogrids, or GCL and which might damage the geosynthetic or geomembrane.

3.2 Deployment

3.2.1 Geonet (GSE HyperNet®)

Geonets shall be overlapped approximately four inches and fastened together with plastic cable ties.

3.2.2 Geotextile/Geonet Geocomposite (GSE FabriNet®)

The geonet component shall be overlapped approximately four inches and fastened together with plastic cable ties. The unbonded edges of the geotextile component shall remain overlapped. Bonded edges of the geocomposite shall be overlapped approximately four inches and fastened with plastic cable ties.

3.2.3 Geotextile

Geotextiles may be installed by overlapping, by heat bonding (spot or continual basis) or by sewing as specifications dictate.

3.2.4 Geogrid

Geogrids should be installed per manufacturer's recommendations and/or project specifications.

3.2.5 Geosynthetic Clay Liner (GCL)

Seaming of GCLs is achieved by overlapping the GCL panels approximately six inches. When installing GSE GundSeal® GCL with the geomembrane backing up and the bentonite side down, it is necessary to place tape over the seam to prevent intrusion of overlying cover soils into the overlap during soil placement. Alternately, the geomembrane backing may be welded in accordance with GSE GundSeal installation specifications.

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3.3 Geosynthetic Repairs

Repairs shall be made on geosynthetic products as necessary.

3.3.1 Geonet

Any tears larger than twelve inches shall be repaired. Patches shall extend at least six inches from all sides of the tear and shall be fastened with plastic cable ties.

3.3.2 Geotextile/Geonet Geocomposite

Holes or tears in the geocomposite material shall be repaired with a patch of identical or similar material extending at least 6" from all sides of the hole or tear and fastened with plastic cable ties.

3.3.3 Geotextile

Holes in geotextile material shall be repaired using a patch of identical or similar material extending approximately six inches on all sides from the hole and heat bonded to the parent material

3.3.4 Geogrid

Repair of geogrid shall only be made according to the geogrid manufacturer's instructions.

3.3.5 Geosynthetic Clay Liner (GCL)

The area to be repaired (patched) must be free of contamination by foreign matter. Patches should have approximately twelve inches overlaps around the damaged area. For fabric-encased GCLs, the patch is to be tucked into place with excess bentonite poured over the overlap. Simple overlapping of the patch is sufficient for geomembrane backed GCLs. However, temporary attachment of patches is required to ensure that the patch is not dislodged by covering with geomembrane or soil.

4.0 DOCUMENTATION (see attached)

Various aspects of the liner system installation shall be recorded and approved. Attached are GSE's standard Field Installation forms.

4.1 Subgrade Surface Acceptance

4.2 Daily Progress Report / Field QA

4.3 Certificate of Acceptance

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Subgrade Surface Acceptance

Project Name: _____ Customer: _____

Project Number: _____ Date: _____

Location: _____ Partial: _____ Final: _____

This document only applies to the acceptability of surface conditions for installation of geosynthetic products. GSE does not accept responsibility for compaction, elevation or moisture content, nor for the surface condition maintenance during deployment. Structural integrity of the subgrade and maintenance of these conditions are the responsibility of the Owner or Earthwork Contractor.

_____

_____

_____

_____

_____

For GSE Lining Technology, Inc.: _____ For Contractor/Owner: _____

_____ _____

_____ _____

Acceptance Number: _____ Area Accepted: _____/SF Total Area accepted to date: _____

GSE REPRESENTATIVE

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GSE

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Daily Progress Report Master

1-800-435-2008

Project_____ Location_____ Job#_____ Date_____

GSE Representative _____ Owner/Contractor _____ Inspector _____

	NUMBER		TOTAL HOURS
SUPERVISOR			
TECHNICIAN			
TOTAL		TOTAL	
LABOR			
OPERATOR			
OTHER			
TOTAL		TOTAL	

	DAILY	CUMULATIVE
TYPE AND MIL OF MATERIAL	SQUARE FEET	SQUARE FEET

PROGRESS-DELAYS-COMMENTS-ACCIDENTS ON SITE

# OF WELD SAMPLES SHIPPED	FED X #	FIELD WELD TEST DATA CIRCLE Y/N FAXED/CALLED
RAIN / SNOW / WIND		TEMPERATURE °F

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Daily Progress Report Master

Page 2

Project_____ Location_____ Job#_____ Date_____

DEPLOYMENT				WELDING				NON DESTRUCTIVE TESTING						
TYPE	PANEL#	ROLL#	LENGTH	MACH#	TECH	SEAM#	LENGTH	TEST TYPE	SEAM#	LENGTH	START	STOP	REPAIR LOCATION	TECH

PRE-WELD QUALIFICATION						DESTRUCTIVE SAMPLES						
MACH #	OPERATOR	TEMP 1	TEMP 2	TIME	RESULTS	SAMPLE #	SEAM #	DATE WELDED	MACH #	WELDED BY	FIELD P/F	EXACT LOCATION

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GSE™

GSE Lining Technology, Inc.

19103 Gundle Road
Houston, Texas 77073-3598
800-435-2008
713-443-8564
Fax: 713-875-6010

CERTIFICATE OF ACCEPTANCE

JOB NAME:
CLIENT:
BILL TO: -- 2739

JOB DESCR:
% COMPLETE OF TOTAL JOB:

MATERIAL	ESTIMATED SQ. FEET	FINAL QUANTITY / DESCRIPTION

I, the undersigned, duly authorized representative of: _____
do hereby take over and accept the work described above from the date hereof and confirm that to the best of my knowledge the work has been completed in accordance with specifications and the terms and conditions of the contract.

Name	Signature	Title	Date

Work accepted by GSE Lining Technology, Inc. Representative.

	Signature	Title	Date

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GSE FIELD INSTALLATION QUALITY ASSURANCE MANUAL

R 08/08/96

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Supplier Submittal Number:	1440-001
Document Number:	1440-001K
Specification Requirement Reference:	02770P.1.04; 02770P.1.05.A.8
Document Description:	Warranty

[X] A - Conforms to the Subcontract Requirements
[ ] B - Minor Comment - Incorporate and Resubmit
[ ] C - Revise and Resubmit
Sig: [signature] Date: 6/24/99

INFORMATION ONLY

WARRANTY MUST MEET OR EXCEED GENERAL PROVISION WARRANTY REQUIREMENTS

RECEIVED
AUG 18 1999
[signature]

PRO-RATA LIMITED WARRANTY
FOR GSE LINING TECHNOLOGY, INC.
(GEOSYNTHETIC MANUFACTURED MATERIALS)
(U.S.A.)

- 2739

te: _____ Warranty No. SAMPLE

rchaser Name: _____ Project No.: _____

.dress: _____ Effective Date: _____

y, State: _____ Project Name: _____

oduct Type/Description: GSE LINER PRODUCTS Project Address: _____

SE Lining Technology, Inc. ("GSE") warrants each GSE product described above to be free from material manufacturing defects (as scribed by the contract's material specifications) and to be able to withstand normal weathering for a period of twenty (20) years from e above effective date for "normal use" in approved applications. This limited warranty does not include damages or defects in the SE product resulting from acts of God, casualty or catastrophe, including but not limited to: earthquakes, floods, piercing hail, nadoes or force majeure. The term "normal use" does not include, among other things, the exposure of GSE's product to harmful emicals, abuse by machinery, equipment or people; improper site preparation or placement of cover materials; excessive pressures or esses from any source. This warranty is intended for commercial use only and is not in effect for the consumer as defined in the agnuson-Moss Warranty Act.

ould defects or premature loss of use within the scope of this warranty occur, GSE will, at its option, repair or replace the GSE oduct on a pro-rata basis at the current price in such manner as to charge the Purchaser only for that portion of the warranted life hich has elapsed since the purchase of the product. GSE shall have the right to inspect and determine the cause of the alleged defect in e product and to take appropriate steps to repair or replace the product if a defect exists that is covered under this warranty. This mited warranty only extends to the geosynthetic portion of this product manufactured by GSE and does not apply to any third-party ured materials attached to GSE's product. The third-party portion of the product will carry the original manufacturer's y that will be passed through to the Purchaser.

Any claim for any alleged breach of this warranty must be made in writing, by certified mail or courier, to the President of GSE, within n (10) days of Purchaser becoming aware of the alleged defect. Should the required notice not be given, the defect and all warranties re waived by the Purchaser, and Purchaser shall not have rights under this warranty. GSE shall not be obligated to perform any spection or obligated to perform any repair or replacement under this warranty until the area is made available free from all bstructions, water, dirt, sludge, residuals and liquids of any kind. If after inspection it is determined that there is no claim under this arranty, Purchaser shall reimburse GSE for its costs associated with the site inspection.

n the event the exclusive remedy provided herein fails in its essential purpose, and in that event only, the Purchaser shall be entitled to return of the purchase price for so much of the product as GSE determines to have violated the warranty provided herein. GSE shall ot be liable for direct, indirect, special, consequential or incidental damages resulting from a breach of this warranty including, but not imited to: damages for loss of production, lost profits, personal injury or property damage. GSE shall not be obligated to reimburse Purchaser for any repairs, replacement, modifications or alterations made by Purchaser to GSE's product, unless GSE specifically authorized, in writing, said repairs, replacements, modifications or alterations in advance. GSE liability under this warranty shall in no event exceed the replacement cost of the product sold to the Purchaser for the particular installation in which it failed.

GSE neither assumes nor authorizes any person other than an officer of GSE to assume for it any other or additional liability in connection with the GSE product made on the basis of the Limited Warranty. GSE MAKES NO WARRANTY OF ANY KIND OTHER THAN THAT GIVEN HEREIN AND HEREBY DISCLAIMS ALL WARRANTIES, INCLUDING BOTH EXPRESS OR IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, AND BY ACCEPTING DELIVERY OF THE PRODUCT, PURCHASER WAIVES ALL OTHER POSSIBLE WARRANTIES. GSE's WARRANTY BECOMES AN OBLIGATION OF GSE TO PERFORM UNDER THE WARRANTY ONLY UPON RECEIPT OF FINAL PAYMENT

arranty is extended to the Purchaser and is non-transferable and non-assignable, i.e. there are no third-party beneficiaries to this arranty.

000348

Supplier Submittal Number: 1440-001

Document Number: 1440-001L

Specification Requirement Reference: 02770P.1.05.A.9

Document Description: Completed Forms GML 80-S, GML 80-T, GML 60-S, GML 60-T, GML 30-T

[X] A - Conforms to the Subcontract Requirements
[ ] B - Minor Comment - Incorporate and Resubmit
[ ] C - Revise and Resubmit
Date 6/24/99

INFORMATION ONLY

RECEIVED
AUG 18 1999

GML-80T TECHNICAL INFORMATION 80 MIL TI 'RED GEOMEMBRANE LINER

TATION # F99P301726

REFER TO SPECIFICATION SECTION 02770P

=-2739

F THE FOLLOWING INFORMATION WITH THE PROPOSAL

QUIREMENTS	SPECIFIED ASTM METHOD	SPECIFIED REQUIREMENT	CONFORMS TO SPECS YES / NO	REMARKS DOCUMENTATION OF THESE ROUIREMENTS TO BE SUBMITTED WITH BID
CAL PROPERTIES				
NESS MINIMUM	D5994	76 mils	yes	
NESS AVERAGE	D5994	80 mils	yes	
FIC GRAVITY	D792 - A OR D1505	0.94 min	yes	
ON BLACK	D1603	2 - 3 %	yes	
ON BLACK DISPERSION	D5596	CAT 1 OR 2	yes	
ITY HEIGHT	GRI-GM12	7 mils min	yes	
ANICAL PROPERTIES				
IGTH AT YIELD	D638	168 PPI	yes	
IGTH AT BREAK	D638	120 PPI	yes	
GATION AT YIELD	D638	12% MIN	yes	
GATION AT BREAK	D638	100% MIN	yes	
TEMP BRITTLENESS	D746-B	-60 C MAX	yes	
SIONAL STABILITY	D1204	+/-2% MAX	yes	
HED CONSTANT TENSILE LOAD	D5397	500 HRS MIN	yes	
RESISTANCE	D1004	56 LB	yes	
SIZE		20 ft wide, min 390 ft length, min	yes	3/23/99 SA
PROPERTIES				
ENT VIRGIN RESIN		98% MIN	yes	
TY	D792 A OR D1505	0.935	yes	
FLOW INDEX	D 1238 E	1.0g/10 minute max	yes	
SIZE		100,000 SF	yes	
ITIVES/FILLERS		1%	yes	
ING ROD RESIN SHALL BE COMPATIBLE WITH IFIED REQUIREMENTS ON THIS SHEET			yes	
RMATION REQUIRED TO BE PROVIDED WITH PROPOSAL				
AND PHONE # OF CONTACT PERSON			yes	
LY PRODUCTION CAPACITY			yes	
C PROCEDURES			yes	
T OF MATERIAL PROPERTIES			yes	
ST OF 10 FACILITIES			yes	
ESIN INFORMATION			yes	
ERTIFICATION OF MARV			yes	
ONG TERM STORAGE REQUIREMENTS			yes	
STALLATION PROCEDURES			yes	
AMPLE WARRANTY			yes	
ERIAL SAFETY DATA SHEETS			yes	
TING INTERVAL	MAX			
GR.	1/40,000 SF		yes	
KNESS	1/40,000 SF		yes	
ERITY	1/40,000 SF		yes	
SILE PROPERTIES	1/40,000 SF		yes	
BON BLACK PROPERTIES	1/40,000 SF		yes	
IRO STRESS CRACK	1/400,000 SF		yes	
/ TEMP BRITTLENESS	1/400,000 SF		yes	
ENSIONAL STABILITY	1/400,000 SF		yes	
		DATE		
		2/12/99		
OF OFFEROR:				

REVISED: 01/21/99

ML-80S TECHNICAL INFORMATION 80 MIL SMOOTH GEOMEMBRANE LINER

TION # F99P301726

REFER TO SPECIFICATION SECTION 02770P

THE FOLLOWING INFORMATION WITH THE PROPOSAL

ED REQUIREMENTS	SPECIFIED ASTM METHOD	SPECIFIED REQUIREMENT	CONFORMS TO SPECS YES / NO	REMARKS DOCUMENTATION OF THESE RQUIREMENTS TO BE SUBMITTED WITH BID
L PROPERTIES				
ESS MINIMUM	D5994	76 MILS	yes	
ESS AVERAGE	D5994	80 MILS	yes	
C GRAVITY	D792 - A OR D1505	0.94 MIN	yes	
BLACK	D1603	2 - 3 %	yes	
BLACK DISPERSION	D5596	CAT 1 OR 2	yes	
NICAL PROPERTIES				
TH AT YIELD	D638	168 PPI	yes	
TH AT BREAK	D638	120 PPI	yes	
TION AT YIELD	D638	12% MIN	yes	
TION AT BREAK	D638	100% MIN	yes	
MP BRITTLENESS	D746-B	-60 C MAX	yes	
IONAL STABILITY	D1204	+/-2% MAX	yes	
ED CONSTANT TENSILE LOAD	D5397	500 HRS MIN	yes	
ESISTANCE	D1004	56 LB	yes	
IZE		20 ft wide, min 200 ft length, min	yes	
PROPERTIES				
NT VIRGIN RESIN		98% MIN	yes	
Y	D792 A OR 1505	0.935	yes	
LOW INDEX	D 1238 E	1.0g/10 minute, max	yes	
JM SIZE		100,000 SF	yes	
IVES/FILLERS		1%	yes	
RESIN SHALL BE COMPATIBLE WITH SPECIFIED REMENTS ON THIS SHEET			yes	
MATION REQUIRED TO BE PROVIDED WITH PROPOSAL				
AND PHONE # OF CONTACT PERSON			yes	
Y PRODUCTION CAPACITY			yes	
C PROCEDURES			yes	
T OF MATERIAL PROPERTIES			yes	
T OF 10 FACILITIES			yes	
SIN INFORMATION			yes	
RTIFICATION OF MARV			yes	
NG TERM STORAGE REQUIREMENTS			yes	
STALLATION PROCEDURES			yes	
AMPLE WARRANTY			yes	
ERIAL SAFETY DATA SHEETS			yes	
ING INTERVAL	MAX			
R.	1/40,000 SF		yes	
KNESS	1/40,000 SF		yes	
RITY	1/40,000 SF		yes	
SILE PROPERTIES	1/40,000 SF		yes	
BON BLACK PROPERTIES	1/40,000 SF		yes	
IRO STRESS CRACK	1/400,000 SF		yes	
/ TEMP BRITTLENESS	1/400,000 SF		yes	
ENSIONAL STABILITY	1/400,000 SF		yes	
				80-MILSMOOTH HDPE SHALL BE SAME MATERIAL AS TEXTURED WITHOUT TEXTURING. IT SHALL MEET ALL REQUIREMENTS OF SPECIFICATION 02770P EXCEPT ASPERITY HEIGHT.
NATURE				DATE: 2/2/99
IE OF OFFEROR:				

REVISED: 01/21/99

3ML-60T TECHNICAL INFORMATION 60 MIL T JRED GEOMEMBRANE LINER

ATION # F99P301726

REFER TO SPECIFICATION SECTION 02770P

THE FOLLOWING INFORMATION WITH THE PROPOSAL				
QUIREMENTS	SPECIFIED	SPECIFIED	CONFORMS	REMARKS
	ASTM	REQUIREMENT	TO SPECS	DOCUMENTATION OF THESE ROUIREMENTS
	METHOD		YES / NO	TO BE SUBMITTED WITH BID
AL PROPERTIES				
IESS MINIMUM	D5994	58 MILS	yes	
IESS AVERAGE	D5994	60 MILS	yes	
IC GRAVITY	D792 - A OR D1505	0.94 MIN	yes	
N BLACK	D1603	2 - 3 %	yes	
N BLACK DISPERSION	D5596	CAT 1 OR 2	yes	
ITY HEIGHT	GRI-GM12	7 MILS MIN	yes	
NICAL PROPERTIES				
GTH AT YIELD	D638	126 PPI	yes	
GTH AT BREAK	D638	90 PPI	yes	
ATION AT YIELD	D638	12% MIN	yes	
ATION AT BREAK	D638	100% MIN	yes	
EMP BRITTLENESS	D746-B	-60 C MAX	yes	
SIONAL STABILITY	D1204	+/-2% MAX	yes	
IED CONSTANT TENSILE LOAD	D5397	500 HRS MIN	yes	
RESISTANCE	D1004	42 LB	yes	
SIZE		20 ft wide, min 390 ft length, min	yes	
PROPERTIES				
ENT VIRGIN RESIN		98% MIN	yes	
TY	D792 A OR D1505	0.935	yes	
FLOW INDEX	D 1238 E	1.0g/10 minute, max	yes	
SIZE		100,000 SF	yes	
DITIVES/FILLERS		1%	yes	
OD RESIN SHALL BE COMPATIBLE WITH IED REQUIREMENTS ON THIS SHEET			yes	
MATION REQUIRED TO BE PROVIDED WITH PROPOSAL				
AND PHONE # OF CONTACT PERSON			yes	
LY PRODUCTION CAPACITY			yes	
C PROCEDURES			yes	
T OF MATERIAL PROPERTIES			yes	
ST OF 10 FACILITIES			yes	
ESIN INFORMATION			yes	
ERTIFICATION OF MARV			yes	
ONG TERM STORAGE REQUIREMENTS			yes	
STALLATION PROCEDURES			yes	
AMPLE WARRANTY			yes	
ING INTERVAL	MAX			
GR.	1/40,000 SF		yes	
KNESS	1/40,000 SF		yes	
ERITY	1/40,000 SF		yes	
SILE PROPERTIES	1/40,000 SF		yes	
BON BLACK PROPERTIES	1/40,000 SF		yes	
IRO STRESS CRACK	1/400,000 SF		yes	
/ TEMP BRITTLENESS	1/400,000 SF		yes	
ENSIONAL STABILITY	1/400,000 SF		yes	
URE				
OF OFFEROR:				DATE: 2/12/99

REVISED: 01/20/99

: C[redacted]S TECHNICAL INFORMATION 60 MIL SMOOTH GEOMEMBRANE LINER
[redacted]#F99P301726

REFER TO SPECIFICATION SECTION 02770P

IT THE FOLLOWING INFORMATION WITH THE PROPOSAL

FIED REQUIREMENTS	SPECIFIED ASTM METHOD	SPECIFIED REQUIREMENT	CONFORMS TO SPECS YES / NO	REMARKS DOCUMENTATION OF THESE ROUIREMENTS TO BE SUBMITTED WITH BID
ICAL PROPERTIES				
NESS MINIMUM	D5994	58 MILS	yes	
NESS AVERAGE	D5994	60 MILS	yes	
IFIC GRAVITY	D792 - A OR D1505	0.94 MIN	yes	
ON BLACK	D1603	2 - 3 %	yes	
ON BLACK DISPERSION	D5596	CAT 1 OR 2	yes	
ANICAL PROPERTIES				
NGTH AT YIELD	D638	120 PPI	yes	
NGTH AT BREAK	D638	90 PPI	yes	
GATION AT YIELD	D638	12% MIN	yes	
GATION AT BREAK	D638	100% MIN	yes	
TEMP BRITTLENESS	D746-B	-60 C MAX	yes	
NSIONAL STABILITY	D1204	+/-2% MAX	yes	
HED CONSTANT TENSILE LOAD	D5397	500 HRS MIN	yes	
RESISTANCE	D1004	42 LB	yes	
SIZE		20 ft wide, min 200 ft length, min	yes	
N PROPERTIES				
ENT VIRGIN RESIN		98% MIN	yes	
ITY	D792 A OR 1505	0.935	yes	
FLOW INDEX	D 1238 E	1.0g/10 minute, max	yes	
MUM LOT SIZE		100,000 SF	yes	
MV[redacted]OTIVES/FILLERS		1%	yes	
[redacted]D RESIN SHALL BE COMPATIBLE WITH [redacted]EQUIREMENTS ON THIS SHEET			yes	
MATION REQUIRED TO BE PROVIDED WITH PROPOSAL				
E AND PHONE # OF CONTACT PERSON			yes	
ILY PRODUCTION CAPACITY			yes	
QC PROCEDURES			yes	
ST OF MATERIAL PROPERTIES			yes	
IST OF 10 FACILITIES			yes	
RESIN INFORMATION			yes	
ERTIFICATION OF MARV			yes	
LONG TERM STORAGE REQUIREMENTS			yes	
NSTALLATION PROCEDURES			yes	
XAMPLE WARRANTY			yes	
TING INTERVAL	MAX			
GR.	1/40,000 SF		yes	
CKNESS	1/40,000 SF		yes	
PERITY	1/40,000 SF			
NSILE PROPERTIES	1/40,000 SF		yes	
RBON BLACK PROPERTIES	1/40,000 SF		yes	
VIRO STRESS CRACK	1/400,000 SF		yes	
W TEMP BRITTLENESS	1/400,000 SF		yes	
MENSIONAL STABILITY	1/400,000 SF		yes	
				60-MIL SMOOTH HDPE SHALL BE SAME MATERIAL AS TEXTURED WITHOU TEXTURING. IT SHALL MEET REQUIREMENTS OF SPECIFICATION 02770P EXCEPT ASPERITY HEIGHT.
Eric Reed GNATURE				DATE: 2/12/99
ME OF OFFEROR:				

REVISED: 01/20/99

LE GML-30-S TECHNICAL INFORMATION 30 MIL SMOOTH GEOMEMBRANE LINER

JCITATION # F99P301726

:MIT THE FOLLOWING INFORMATION WITH THE PROPOSAL

CIFIED REQUIREMENTS	SPECIFIED ASTM METHOD	SPECIFIED REQUIREMENT	CONFORMS TO SPECS YES / NO	REMARKS
SICAL PROPERTIES				
CKNESS MINIMUM	D5994	27 MILS	yes	
CKNESS AVERAGE	D5994	30 MILS	yes	
CIFIC GRAVITY	D792 - A OR D1505	0.94 MIN	yes	
BON BLACK	D1603	2 - 3 %	yes	
BON BLACK DISPERSION	D5596	CAT 1 OR 2	yes	
CHANICAL PROPERTIES				
ENGTH AT YIELD	D638	65 PPI	yes	
EN[illegible] AT BREAK	D638	120 PPI	yes	
[illegible]ON AT YIELD	D638	12% MIN	yes	
IGATION AT BREAK	D638	100% MIN	yes	
TEMP BRITTLENESS	D746-B	-60 C MAX	yes	
ENSIONAL STABILITY	D1204	+/-2% MAX	yes	
R RESISTANCE	D1004	20 LB	yes	
L SIZE		22 ft wide, min 410 ft length, min	yes	
SIN PROPERTIES				
RCENT VIRGIN RESIN		98% MIN	yes	
NSITY	D792 A OR D1505	0.935	yes	
LT FLOW INDEX	D 1238 E	1.0g/10 minute, max	yes	
XIMUM ADDITIVES/FILLERS		1%	yes	
ELDING ROD RESIN SHALL BE COMPATIBLE WITH ECIFIED REQUIREMENTS ON THIS SHEET			yes	
Eric Reed GNATURE				
ME OF OFFEROR:				DATE: 2/12/99

REVISED: 01/20/99

SUPPLIER DOCU[illegible] SUBMITTAL

FDF PROJECT NO.: (1) 20102	CONTRACT NO: (2) 1440	SUBMITTAL NO.:(3) 002	REV.:(4) 0	DATE:(5) 6/1/99	Page _1_ of _1_(6)

FROM: **GSE Lining Technologies**

(7)

SIGNATURE: _____

TO: **FDF ENGINEERING/CONSTRUCTION DOCUMENT CONTROL (ECDC), MS 52-7**

(8)

RECEIVED BY: _____ DATE: _____

QTY	DOCUMENT NUMBER	REV	DOCUMENT FAMILY: PRO	H&S	MED	TRG	CON	ENG	QAC	OPER	TITLE/DESCRIPTION	SUBMITTAL TYPE: DRFT	CFC	INF	ASSOCIATED SPECIFICATION	SUBMITTAL ACTION: A	B	C	
(9)	(10)	(11)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(13)	(14)	(14)	(14)	(15)	(16)	(16)	(16)	
8	1440-002A	0							X		Quality Control Certificates/Resin		X		02770P.1.05.B.1	X			
8	1440-002B	0						X			Test Reports of Resin		X		02770P.1.05.B.2		X		(1)
8	1440-002C	0							X		Certification of Resin Polymer		X		02770P.1.05.B.3			X	(2)

REVIEW DISTRIBUTION

NAME	MS	NAME	MS	NAME	MS
(17)	(18)	(17)	(18)	(17)	(18)
Jim Jenkins, FDF, Eng., Approver	64				
Kwasi Badu-Tweneboah, GeoSyntec, Eng.	38				
Kathy Fisher, FDF, Procurement	64				
Gregg Johnson, FDF, Health & Safety	64				
Jim Turner, FDF, QA	64				
Chuck Van Arsdale, FDF, Eng.	64				

RECEIVED JUN 28 1999 KBT

000355

NO COMMENTS: _____ COMMENTS: (PLEASE USE SPACE BELOW FOR COMMENTS OR INDICATE IF ATTACHMENTS) (19)

(1) No test method provided.
(2) Certification of no reclaimed polymer missing.

-2739

RECEIVED BY: K Badu (20) DATE: 6/28/99

(SIGN/DATE AND RETURN A COPY TO ECDC, MS 52-7)

SUBMITTAL TYPE: (BY SUPPLIER)
CFC - CERTIFIED FOR CONSTRUCTION
INF - INFORMATION/RECORD
DRFT - DRAFT/PRELIMINARY

SUBMITTAL ACTION CODE: (BY FDF)
A - Conforms to the Subcontract Requirements
B - Minor Comments - Incorporate and Resubmit
C - Revise and Resubmit (SEE COMMENTS)

FS-F-4955
Rev. 4: 04/??/1999

MOBIL CHEMICAL
CERTIFICATE OF ANALYSIS
QUALITY PEOPLE MAKING QUALITY PRODUCTS

-- 2739

FAXED

05/07/1999

DENISE ADAMS
GSE LINING TECHNOLOGY INC
19103 GUNDLE ROAD
HOUSTON, TX 77073

Mobil Chemical, a major supplier of quality polyethylene, has shipped a lot of material to your facility. The lot identification and analyses are listed below. This data has been supplied by our Quality Control Laboratory located here in Beaumont. If you should need further information or another copy of this report, please call your sales office in EDISON, NJ Phone: (908)321-6000.

Resin Identification		Resin Analysis Test	Lot Data
Product Type	EDA601	Density (gms/cc)	0.935
Lot Number	A-60651	Melt Index (gm/10 min) I2	0.59
Hopper Car Number	RUSX-009018		
Quantity Shipped	191,750 LB		
Date Manufactured	04/26/1999		
Delivery Note	0080058943		
Location Shipped To ALDINE, TX			

Test Methods not specified.

KBT
6-28-99

Thank you for your business. If you need additional assistance, please do not hesitate to contact our Sales Representative in your area.

CC: MP-EDISON

Fax To: (281) 230-2510 DENISE ADAMS
JD
DON BOHAC

000356

MOBIL CHEMICAL
CERTIFICATE OF ANALYSIS
QUALITY PEOPLE MAKING QUALITY PRODUCTS

- 2739

DENISE ADAMS
GSE LINING TECHNOLOGY INC
19103 GUNDLE ROAD
HOUSTON, TX 77073

05/04/1999

Mobil Chemical, a major supplier of quality polyethylene, has shipped a lot of material to your facility. The lot identification and analyses are listed below. This data has been supplied by our Quality Control Laboratory located here in Beaumont. If you should need further information or another copy of this report, please call your sales office in EDISON, NJ Phone: (908)321-6000.

Resin Identification		Resin Analysis Test	Lot Data
Product Type	HDA601	Density (gms/cc)	0.935
Lot Number	A-60647	Melt Index (gm/10 min) I2	0.60
Hopper Car Number	MBLX-053738		
Quantity Shipped	191,900 LB		
Date Manufactured	04/26/1999		
Delivery Note	0080058563		
		Test method not specified. KBT 6-28-99	
Location Shipped To ALDINE, TX			

Thank you for your business. If you need additional assistance, please do not hesitate to contact our Sales Representative in your area.

CC: MP-EDISON

Fax To: (281) 230-2510 DENISE ADAMS
JD
DON BOHAC

MOBIL CHEMICAL
CERTIFICATE OF ANALYSIS
QUALITY PEOPLE MAKING QUALITY PRODUCTS

-2739

DENISE ADAMS
GSE LINING TECHNOLOGY INC
19103 GUNDLE ROAD
HOUSTON, TX 77073

05/04/1999

Mobil Chemical, a major supplier of quality polyethylene, has shipped a lot of material to your facility. The lot identification and analyses are listed below. This data has been supplied by our Quality Control Laboratory located here in Beaumont. If you should need further information or another copy of this report, please call your sales office in EDISON, NJ Phone: (908)321-6000.

Resin Identification		Resin Analysis Test	Lot Data
Product Type	HDA601	Density (gms/cc)	0.935
Lot Number	A-60646	Melt Index (gm/10 min) I2	0.59
Hopper Car Number	MBLX-053370		
Quantity Shipped	196,150 LB		
Date Manufactured	04/26/1999		
Delivery Note	0080058562		
Location Shipped To ALDINE, TX			

Test methods not specified
KBT
6-28-99

Thank you for your business. If you need additional assistance, please do not hesitate to contact our Sales Representative in your area.

CC: MP-EDISON

Fax To: (281) 230-2510 DENISE ADAMS
JD
DON BOHAC

SUPPLIER DOC[illegible]T SUBMITTAL

FDF PROJECT NO.: (1) 20102	CONTRACT NO: (2) 1440	SUBMITTAL NO.:(3) 002	REV.:(4) 1	DATE:(5) 6/28/99	Page 1 of 2 (6)

FROM: **GSE Lining Technologies**

(7)

RECORD

SIGNATURE: _____

TO: **FDF ENGINEERING/CONSTRUCTION DOCUMENT CONTROL (ECDC), MS 52-7**

(8)

RECEIVED BY: _____ DATE: _____

QTY	DOCUMENT NUMBER	REV	DOCUMENT FAMILY: PRO	H&S	MED	TRG	CON	ENG	QAC	OPER	TITLE/DESCRIPTION	SUBMITTAL TYPE: DRFT	CFC	INF	ASSOCIATED SPECIFICATION	SUBMITTAL ACTION: A	B	C
(9)	(10)	(11)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(13)	(14)	(14)	(14)	(15)	(16)	(16)	(16)
8	1440-002C	0							X		Certification of Resin Polymer		X		02770P.1.05.B.3	X		

REVIEW DISTRIBUTION

NAME	MS	NAME	MS	NAME	MS
(17)	(18)	(17)	(18)	(17)	(18)
Jim Jenkins, FDF, Eng., Approver	64				
Kwasi Badu-Tweneboah, GeoSyntec, Eng.	38				
Kathy Fisher, FDF, Procurement	64				
Gregg Johnson, FDF, Health & Safety	64				
Jim Turner, FDF, QA	64				
Chuck Van Arsdale, FDF, Eng.	64				

RECEIVED AUG 18 1999

NO COMMENTS: _____ COMMENTS: (PLEASE USE SPACE BELOW FOR COMMENTS OR INDICATE IF ATTACHMENTS) (19)

000359

2739

RECEIVED BY: James C. Jenkins (20) DATE: 6/30/99

(SIGN/DATE AND RETURN A COPY TO ECDC, MS 52-7)

SUBMITTAL TYPE: (BY SUPPLIER)
CFC - CERTIFIED FOR CONSTRUCTION
INF - INFORMATION/RECORD
DRFT - DRAFT/PRELIMINARY

SUBMITTAL ACTION CODE: (BY FDF)
ENTERED
A - Conforms to the Subcontract Requirements
B - Minor Comments - Incorporate and Resubmit
C - Revise and Resubmit (SEE COMMENTS)

FS-F-4955
Rev. 4: 04/??/1999

GSE

GSE Lining Technology, Inc.

--2739

1440-002 Rev. 0
6-30-99
p. 2 of 2
Document 1440-002C

[X] A - Conforms to the Subcontract Requirements
[ ] B - Minor Comment - Incorporate and Resubmit
[ ] C - Revise and Resubmit
Sig: J. C. Jenkins Date: 6/30/99

RECORD

[X] A - Conforms to the Subcontract Requirements
[ ] B - Minor Comment - Incorporate and Resubmit
[ ] C - Revise and Resubmit
Sig: J. C. Jenkins Date: 6/30/99

February 12, 1999

Fluor Daniel Fernald
7400 Willey Road
Fernald, OH 45030

Attn: Kathy Fisher

RE: Certification of 30 mil HD®, 60, 80 mil HyperFrictionFlex®, and 60, 80 mil HyperFlex® Properties
GSE Project No. 502302

Certification

The undersigned, being qualified and authorized to do so, hereby certifies the 30 mil HD®, 60, 80 mil HyperFrictionFlex®, and 60, 80 mil HyperFlex® will meet the following properties:

1. MARV - GSE's' HyperFrictionFlex physical and mechanical properties will meet the properties as listed in Table 02770P-1 with a 95% confidence level.
2. Reclaim - GSE hereby certifies that no reclaimed polymer will be used in the production of materials for the above referenced project. Recycled material reworked from GSE's manufacturing process may be added, but will not exceed 2% by weight.

Eric Reed

Eric Reed
Technical Support Supervisor

000360

SUPPLIER DOCUMENT SUBMITTAL

FDF PROJECT NO.: (1) 20102

CONTRACT NO: (2) 1440

SUBMITTAL NO.:(3) 003

REV.:(4) 0

DATE:(5) 6/2/99

Page 1 of 1 (6)

FROM: GSE Lining Technologies

(7)

SIGNATURE: _____

TO: FDF ENGINEERING/CONSTRUCTION
DOCUMENT CONTROL (ECDC), MS 52-7
(8)

RECEIVED BY: _____ DATE: _____

QTY	DOCUMENT NUMBER	REV	DOCUMENT FAMILY: PRO	H&S	MED	TRG	CON	ENG	QAC	OPER	TITLE/DESCRIPTION	SUBMITTAL TYPE: DRFT	CFC	INF	ASSOCIATED SPECIFICATION	SUBMITTAL ACTION: A	B	C
(9)	(10)	(11)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(13)	(14)	(14)	(14)	(15)	(16)	(16)	(16)
8	1440-003A	0							X		Manufacturing Certificates per shift production		X		02770P.1.05.C			X
8	1440-003B	0							X		Production Roll List			X				

REVIEW DISTRIBUTION

NAME	MS	NAME	MS	NAME	MS
(17)	(18)	(17)	(18)	(17)	(18)
Jim Jenkins, FDF, Eng., Approver	64				
Kwasi Badu-Tweneboah, GeoSyntec, Eng.	38				
Kathy Fisher, FDF, Procurement	64				
Gregg Johnson, FDF, Health and Safety	64				
Jim Turner, FDF, QA	64				
Chuck Van Arsdale, FDF, Eng.	64				

RECEIVED
JUN 07 1999
KBT

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000361

NO COMMENTS: _____ COMMENTS: (PLEASE USE SPACE BELOW FOR COMMENTS OR INDICATE IF ATTACHMENTS) (19) See Below plus attached

- No test results on asphalt height per GRI-GM12 (1 per 40,000 ft²)
- No test results on Notched constant load per ASTM D 5397 (1 per 400,000 ft²)
- No test results on low-temperature brittleness (ASTM D746, 1 per 400,000 ft²)

See attached summary which evolved from 22 June 1999 meeting with FDF.

RECEIVED BY: Kwasi Badu-Tweneboah DATE: 6-20-99

(SIGN/DATE AND RETURN A COPY TO ECDC, MS 52-7)

SUBMITTAL TYPE: (BY SUPPLIER)
CFC - CERTIFIED FOR CONSTRUCTION
INF - INFORMATION/RECORD
DRFT - DRAFT/PRELIMINARY

SUBMITTAL ACTION CODE: (BY FDF)
A - Conforms to the Subcontract Requirements
B - Minor Comments - Incorporate and Resubmit
C - Revise and Resubmit (SEE COMMENTS)

FS-F-4955
Rev. 4: 04/27/1999

GSE

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1440-003 Rev. 1
7-1-99 p. 4 of 4
Doc # 1440-003A

RECORD

Quality Assurance Laboratory Test Results

Job Name: Fluor Daniel Fernald
Sales Order: 6181
Test: NCTL-Single Point
GRI GM5(b) 30% of Yield @ 50°C

Roll Number	Lot Number	Requirement	Result
114101748	A-60646	>500 hrs	Pass
114101761	A-60647	>500 hrs	Pass
114101818	A-60651	>500 hrs	Pass

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1440-003 Rev. 1
7-1-99 p. 3 of 4
Doc # 1440-003A

RECORD

Quality Assurance Laboratory Test Results

Job Name:	Fluor Daniel Fernald
Sales Order:	6181
Test:	Brittleness Temperature of Plastics and Elastomers by Impact ASTM D 746
Criteria:	-60° C

Roll Number	Lot Number	Test Status
114101748	A-60646	Pass
114101761	A-60647	Pass
114101818	A-60651	Pass

000363

SUPPLIER DOCUMENT SUBMITTAL

FDF PROJECT NO.: (1) 20102	CONTRACT NO: (2) 1440	SUBMITTAL NO.:(3) 003	REV.:(4) 1	DATE:(5) 7/1/99	Page 1 of 4 (6)

FROM: GSE Lining Technologies (7)

RECORD

SIGNATURE: _____

TO: FDF ENGINEERING/CONSTRUCTION
DOCUMENT CONTROL (ECDC), MS 52-7 (8)

RECEIVED BY: _____ DATE: _____

			DOCUMENT FAMILY									SUBMITTAL TYPE				SUBMITTAL ACTION		
QTY	DOCUMENT NUMBER	REV	PRO	H&S	MED	TRG	CON	ENG	QAC	OPER	TITLE/DESCRIPTION	DRFT	CFC	INF	ASSOCIATED SPECIFICATION	A	B	C
(9)	(10)	(11)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(13)	(14)	(14)	(14)	(15)	(16)	(16)	(16)
8	1440-003A	0							X		Manufacturing Certificates per shift production		X		02770P.1.05.C		X	

REVIEW DISTRIBUTION

NAME	MS	NAME	MS	NAME	MS
(17)	(18)	(17)	(18)	(17)	(18)
Jim Jenkins, FDF, Eng., Approver	64				
Kwasi Badu-Tweneboah, GeoSyntec, Eng.	38				
Kathy Fisher, FDF, Procurement	64				
Gregg Johnson, FDF, Health and Safety	64				
Jim Turner, FDF, QA	64				
Chuck Van Arsdale, FDF, Eng.	64				

RECEIVED JUL 01 1999

1-2139

000364

NO COMMENTS: _____ COMMENTS: (PLEASE USE SPACE BELOW FOR COMMENTS OR INDICATE IF ATTACHMENTS) (19)

Test Results are not signed by production manager or quality control personnel and dated

RECEIVED BY: [signature] DATE: 7/1/99

(SIGN/DATE AND RETURN A COPY TO ECDC, MS 52-7)

SUBMITTAL TYPE: (BY SUPPLIER)
CFC - CERTIFIED FOR CONSTRUCTION
INF - INFORMATION/RECORD
DRFT - DRAFT/PRELIMINARY

SUBMITTAL ACTION CODE: (BY FDF)
A - Conforms to the Subcontract Requirements
B - Minor Comments - Incorporate and Resubmit
C - Revise and Resubmit (SEE COMMENTS)

FS-F-4955
Rev. 4: 04/22/1999

GSE

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1440-003 Rev. 1
7-1-99 p. 2 of 4
Doc # 1440-003A

Quality Assurance Laboratory Test Results

RECORD

Job Name: Fluor Daniel Fernald
Sales Order: 6181
Test: Asperity measurement of Textured Geomembranes Using a Depth Gage
GRI GM12

Roll #	Minimum Requirement (mils)	Test Results	Status
114101734	7	19	Pass
114101738	7	17	Pass
114101742	7	16	Pass
114101746	7	18	Pass
114101750	7	15	Pass
114101754	7	16	Pass
114101758	7	14	Pass
114101762	7	18	Pass
114101766	7	17	Pass
114101770	7	16	Pass
114101774	7	15	Pass
114101778	7	16	Pass
114101782	7	15	Pass
114101786	7	21	Pass
114101790	7	17	Pass
114101794	7	20	Pass
114101798	7	22	Pass
114101802	7	17	Pass
114101806	7	16	Pass
114101810	7	20	Pass
114101814	7	22	Pass
114101818	7	23	Pass

JUL 01 99 10:22a Dealer Sales 281-230-8663 p.6

Business Unit	Product Number	Roll Number	Lot Grd	Status Code	Location	Sales Order Number	Quantity On Hand	Quantity Hard Committed	On Hand Minus Commit	Actual Weight	Comments
1501	HME080A004	115102793	106				16,826		16,826	6,734	
1501	HME080A004	115102794	106				16,826		16,826	6,734	
1501	HME080A004	115102795	106				16,826		16,826	6,753	
1501	HME080A004	115102796	106				16,826		16,826	6,771	NEW Lot #
1501	HME080A004	115102797	106				16,826		16,826	6,744	
1501	HME080A004	115102798	106				16,826		16,826	6,778	
1501	HME080A004	115102799	106				16,826		16,826	6,760	
1501	HME080A004	115102800	106				16,826		16,826	6,750	
1501	HME080A004	115102801	106				16,826		16,826	6,760	
1501	HME080A004	115102802	106				16,826		16,826	6,762	
1501	HME080A004	115102806	106			00006181	188		188	7,420	
1501	HME080A004	115102807	101		A66646		5,805		5,805	2,362	
1501	HME080A004	115102808	106			00006181	9,352		9,352	7,403	
1501	HME080A004	115102817	106			00006181	16,659		16,659	7,635	
1501	HME080A004	115102819	106			00006181	16,659		16,659	7,658	
1501	HME080A004	115102829	106			00006181	9,494		9,494	7,492	
1501	HME080A004	115102830	106			00006181	328		328	7,492	
1501	HME080A004	115102831	106			00006181	328		328	7,495	
1501	HME080A004	115102836	106			00006181	16,659		16,659	7,505	
1501	HME080A004	115102838	106			00006181	329		329	7,512	
1501	HME080A004	115102839	106			00006181	9,493		9,493	7,525	QC APPROVED
1501	HME080A004	115102843	106			00006181	328		328	7,518	
1501	HME080A004	115102846	106			00006181	141		141	[illegible]	MR No:
1501	HME080A004	115102847	106			00006181	16,659		16,659	7,802	
1501	HME080A004	115102848	106			00006181	16,659		16,659	7,865	Product Code: HME080A
1501	HME080A004	115102849	106			00006181	16,659		16,659	7,481	Date: 5/21/99
1501	HME080A004	115102850	106			00006181	141		141	7,486	
1501	HME080A004	115102851	100				6,460	6,450	10	3,437	Qty Approved: 1 Roll
1501	HME080A004	115102852	100				6,460		6,460	3,411	
1501	HME080A004	115102853	100				6,460		6,460	3,377	
1501	HME080A004	115102854	106			00006870	6,460		6,460	3,580	Approved By:
1501	HME080A004	115102856	100			00006870	6,460		6,460	3,684	
1501	HME080A004	115102857	106			00006870	6,460		6,460	3,589	
1501	HME080A004	115102858	106			00006870	6,460		6,460	3,590	
1501	HME080A004	115102859	106			00006870	6,460		6,460	3,193	
1501	HME080A004	115102860	106				7,802		7,802	3,516	
1501	HME080A004	115102861	106			00006870	6,460		6,460	3,696	
1501	HME080A004	115102862	106			00006870	6,460		6,460	3,589	
1501	HME080A004	115102863	106				6,813		6,813	3,443	
1501	HME080A004	115102864	206				6,460		6,460	3,429	
1501	HME080A004	115102865	206				6,460		6,460	3,441	
1501	HME080A004	115102866	100				6,460	6,450	10	3,428	
1501	HME080A004	115102867	100				6,460	6,450	10	3,449	
1501	HME080A004	115102868	301				6,460		6,460	3,434	
1501	HME080A004	115102869	100				6,460	6,450	10	3,462	
1501	HME080A004	115102870	100				6,460	6,450	10	3,438	
1501	HME080A004	115102871	100				6,460	6,450	10		

2739

281+847+1725 P.01
...THE WORLD COMES TO GSE
MAY-21-1999 16:34 000367

Business Unit	Product Number	Roll Number	Lot Grd	Status Code	Location	Sales Order Number	Quantity On Hand	Quantity Hard Committed	On Hand Minus Commit	Actual Weight	Comments
1501	HMT080A004	~~AK[illegible]FF~~	~~100~~		62381		7,379		7,379		
1501	HMT080A004	AK4274FF	100		62144		8,460		8,460	3,530	
1501	HMT080A004	AK4769FF	948		62534		8,343		8,343	3,452	
1501	HMT080A004	AK5291FF	100		62121		8,484		8,484	3,497	
1501	HMT080A004	AK5313FF	306		62152		8,460		8,460	3,499	
1501	HMT080A004	AK5985FF	100		62121		8,343		8,343	3,540	
1501	HMT080A004	AK6685FF	306		62122		8,343		8,343	3,542	
1501	HMT080A004	AK6686FF	306		62123		8,343		8,343	3,491	
1501	HMT080A004	AK6719FF	100		62131		8,343		8,343	3,507	
1501	HMT080A004	114100321	200		62151	00001680	8,319		8,319	3,486	
1501	HMT080A004	114100322	209		62152	00001680	8,319		8,319	3,515	
1501	HMT080A004	114100323	209		62131	00001680	8,319		8,319	3,601	
1501	HMT080A004	114100324	209		62122	00001680	8,319		8,319	3,581	
1501	HMT080A004	114100349	304	H	62153	00001680	8,319		8,319	3,463	
1501	HMT080A004	114100350	304	H	62122	00001680	8,319		8,319	3,525	
1501	HMT080A004	114100354	306		62122	00001680	8,319		8,319	3,594	
1501	HMT080A004	114100381	100		62132		8,319		8,319	3,476	
1501	HMT080A004	114100596	100		62133		9,636		9,636		
1501	HMT080A004	114100721	101		62014	00001680	8,225		8,225	3,474	
1501	HMT080A004	114100739	101		62014	00001680	7,990		7,990	3,372	
1501	HMT080A004	114101424	100		62152		8,319		8,319	3,530	
1501	HMT080A004	114101425	100		62153	6190	8,319		8,319	3,656	
1501	HMT080A004	114101426	100		62121	6190	8,319		8,319	3,651	
1501	HMT080A004	114101427	100		62122		8,319		8,319	3,534	
1501	HMT080A004	114101428	100		62155		8,319		8,319	3,[illegible]	
1501	HMT080A004	114101429	100		62151		8,319		8,319	3,631	
1501	HMT080A004	114101432	100		62153	6190	8,319		8,319	3,533	
1501	HMT080A004	114101433	102		62153		7,050		7,050	2,998	
1501	HMT080A004	114101434	100		62131	6190	8,319		8,319	3,[illegible]	
1501	HMT080A004	114101435	100		62131	6190	8,319		8,319	3,525	
1501	HMT080A004	114101436	100		62121		8,319		8,319	3,567	
1501	HMT080A004	114101439	100		62131	6190	8,319		8,319	3,[illegible]	
1501	HMT080A004	114101440	100		62131		8,319		8,319	3,537	
1501	HMT080A004	114101442	100		62123	6190	8,319		8,319	3,51[illegible]	
1501	HMT080A004	114101443	100		62121		8,319		8,319	3,647	
1501	HMT080A004	114101446	208		62132	6190	8,319		8,319	3,52[illegible]	
1501	HMT080A004	114101447	208		62131		11,139		11,139	3,484	
1501	HMT080A004	114101448	208		62132		8,319		8,319	3,525	
1501	HMT080A004	114101449	208		62154	6190	8,319		8,319	3,517	
1501	HMT080A004	114101450	208		62153	6190	8,319		8,319	3,530	
1501	HMT080A004	114101451	100		62154	6190	8,319		8,319	3,630	
1501	HMT080A004	114101454	100		62131	6190	8,319		8,319	3,527	
1501	HMT080A004	114101455	100		62131	6190	8,319		8,319	3,508	
1501	HMT080A004	~~114101461~~	100	A60645	62131		11,925		11,925	3,844	
1501	HMT080A004	~~[illegible]~~	100			00008181	8,319		8,319	3,613	
1501	HMT080A004	~~114101731~~	100			00008181	8,319		8,319	3,755	
1501	HMT080A004	114101734	100	A60646		00008181	9,165		9,165	3,923	

NEED LOT #

QC APPROVED
MR No: 6181
Product Code: HMT080A004
Date: 5/21/99
Qty Approved: [illegible]
Approved By: [illegible]

-2739

On Hand Roll Balance by Product Number

Business Unit	Product Number	Roll Number	Lot Grd	Status Code	Location	Sales Order Number	Quantity On Hand	Quantity Hard Committed	On Hand Minus Commit	Actual Weight	Comments
1501	HMT080A004	114101782	100		A60617	00006181	9,165		9,165	3,905	
1501	HMT080A004	114101783	100			00006181	9,165		9,165	3,990	
1501	HMT080A004	114101784	100			00006181	9,165		9,165	3,924	
1501	HMT080A004	114101785	100			00006181	9,165		9,165	3,889	
1501	HMT080A004	114101786	100			00006181	9,165		9,165	3,922	
1501	HMT080A004	114101787	100			00006181	9,165		9,165	3,897	
1501	HMT080A004	114101788	100			00006181	9,165		9,165	3,897	
1501	HMT080A004	114101789	100			00006181	9,165		9,165	3,969	
1501	HMT080A004	114101790	100			00006181	9,165		9,165	3,900	
1501	HMT080A004	114101791	100			00006181	9,165		9,165	3,970	
1501	HMT080A004	114101792	209			00006181	9,165		9,165	3,953	
1501	HMT080A004	114101793	100			00006181	9,165		9,165	4,055	
1501	HMT080A004	114101794	100			00006181	9,165		9,165	3,915	
1501	HMT080A004	114101795	100			00006181	9,165		9,165	3,985	
1501	HMT080A004	114101796	100			00006181	9,165		9,165	3,947	
1501	HMT080A004	114101797	100		15 @ 90 A60616	00006181	9,165		9,165	3,959	
1501	HMT080A004	114101798	100			00006181	18,330		18,330	3,893	
1501	HMT080A004	114101799	100			00006181	9,165		9,165	3,918	
1501	HMT080A004	114101800	100		A60617	00006181	9,165		9,165	3,907	
1501	HMT080A004	114101801	100			00006181	9,165		9,165	3,977	
1501	HMT080A004	114101802	100			00006181	9,165		9,165	3,948	
1501	HMT080A004	114101803	100			00006181	9,165		9,165	3,947	
1501	HMT080A004	114101804	100	Q		00006181	9,165		9,165	3,902	
1501	HMT080A004	~~144101805~~	101	Q		00006181	9,071		9,071	3,975	
1501	HMT080A004	114101806	100	Q		00006181	9,165		9,165	3,910	
1501	HMT080A004	114101807	100	Q		00006181	9,165		9,165	3,970	
1501	HMT080A004	114101808	100	Q	A60646	00006181	9,165		9,165	3,888	
1501	HMT080A004	114101809	100	Q		00006181	9,165		9,165	3,965	
1501	HMT080A004	114101810	100	Q	A60617	00006181	9,165		9,165	3,940	
1501	HMT080A004	114101811	100	Q		00006181	9,165		9,165	3,985	
1501	HMT080A004	114101812	100	Q		00006181	9,330		9,330	3,941	
1501	HMT080A004	114101813	102	Q		00006181	9,259		9,259	3,965	
1501	HMT080A004	114101814	100	Q		00006181	9,259		9,259	3,925	
1501	HMT080A004	114101815	100	Q	A60651	00006181	9,259		9,259	3,950	
1501	HMT080A004	114101816	100	Q		00006181	9,259		9,259	3,934	
1501	HMT080A004	~~114101817~~	100	Q	1917 ok	00006181	9,259		9,259	3,945	
1501	HMT080A004	114101818	100	Q		00006181	9,259		9,259	3,948	
1501	HMT080A004	114101819	100	Q		00006181	9,259		9,259	3,970	
1501	HMT080A004	114101820	100	Q	1931 ok	00006181	9,259		9,259		
1501	HMT080A004	~~114101821~~	100	Q							
	Plant Total:	134	Rolls				1,204,887		1,204,887	601,076	

Good Rolls
81

QC APPROVED
MR No: 6181
Product Code: HMT080A004
Date: 5/21/99
Qty Approved: 38 Rolls
Approved By:

MAY-21-1999 16:35 ...THE WORLD COMES TO GSE 281+847+1725 P.03
TOTAL P.03
000368
-2739

Business Unit	Product Number	Roll Number	Lot Grd	Status Code	Location	Sales Order Number	Quantity On Hand	Quantity Hard Committed	On Hand Minus Commit	Actual Weight	Comments
1501	HMT080A004	114101735	100	A-60646		00006181	9,165		9,165	3,850	
1501	HMT080A004	114101736	100			00006181	9,165		9,165	3,883	
1501	HMT080A004	114101737	100			00006181	9,165		9,165	3,914	
1501	HMT080A004	114101738	100			00006181	9,165		9,165	3,897	
1501	HMT080A004	114101739	100			00006181	9,165	386	9,165	3,877	
1501	HMT080A004	114101740	100			00006181	9,165		9,165	3,898	
1501	HMT080A004	114101741	101			00006181	9,071	387	9,071	3,828	
1501	HMT080A004	114101742	101			00006181	9,095		9,095	3,870	
1501	HMT080A004	114101743	100			00006181	9,165		9,165	3,904	
1501	HMT080A004	114101744	102			00006181	9,259		9,259	3,901	
1501	HMT080A004	114101745	102			00006181	9,259		9,259	3,910	
1501	HMT080A004	114101746	200	A-60647		00006181	9,165		9,165	3,875	
1501	HMT080A004	114101747	102			00006181	9,283		9,283	3,940	
1501	HMT080A004	114101748	100	A-60646		00006181	9,165		9,165	3,870	
1501	HMT080A004	114101749	100			00006181	9,165		9,165	3,880	
1501	HMT080A004	114101750	100			00006181	9,165		9,165	3,977	
1501	HMT080A004	114101751	100	A-60647		00006181	9,165	389	9,165	3,926	
1501	HMT080A004	114101752	100			00006181	9,165		9,165	3,912	
1501	HMT080A004	114101753	101			00006181	9,142		9,142	3,957	
1501	HMT080A004	114101754	100			00006181	9,165		9,165	3,817	
1501	HMT080A004	114101755	100			00006181	9,165		9,165	3,980	
1501	HMT080A004	114101756	100			00006181	9,165		9,165	3,929	
1501	HMT080A004	114101757	100			00006181	9,165		9,165	[illegible]	
1501	HMT080A004	114101758	100			00006181	9,165		9,165	4,033	
1501	HMT080A004	114101759	100			00006181	9,283		9,283	3,970	
1501	HMT080A004	114101760	100			00006181	9,165		9,165	3,990	
1501	HMT080A004	114101761	100			00006181	9,259		9,259	[illegible]	
1501	HMT080A004	114101762	100	Scrapped		00006181	9,165		9,165	3,950	
1501	HMT080A004	[illegible]	100			00006181	9,048		9,048	3,922	
1501	HMT080A004	114101764	100			00006181	9,165		9,165	[illegible]	
1501	HMT080A004	~~114101765~~	100			00006181	8,766		8,766	3,728	
1501	HMT080A004	114101766	100			00006181	9,165		9,165	3,928	
1501	HMT080A004	114101767	100			00006181	9,165		9,165	3,968	
1501	HMT080A004	114101768	100			00006181	9,165		9,165	[illegible]	
1501	HMT080A004	114101769	100			00006181	9,165		9,165	3,985	
1501	HMT080A004	114101770	100			00006181	9,165		9,165	3,929	
1501	HMT080A004	114101771	100			00006181	9,165		9,165	3,969	
1501	HMT080A004	114101772	100			00006181	9,165		9,165	4,004	
1501	HMT080A004	114101773	100			00006181	9,212		9,212	4,005	
1501	HMT080A004	114101774	100			00006181	9,165		9,165	3,880	
1501	HMT080A004	114101775	102			00006181	9,165		9,165	3,985	
1501	HMT080A004	114101776	100			00006181	9,165		9,165	3,925	
1501	HMT080A004	114101777	102			00006181	9,330		9,330	3,972	
1501	HMT080A004	~~114101778~~	200				~~9,165~~		9,165	3,972	
1501	HMT080A004	114101779	100			00006181	9,165		9,165	3,980	
1501	HMT080A004	114101780	100			00006181	9,165		9,165	3,930	
1501	HMT080A004	114101781	100			00006181	9,165		9,165	3,967	

QC APPROVED
MR No: 6181
Product Code: HMT080A004
Date: 5/21/99
Qty Approved: 46 Rolls
Approved By:

-2739

Reviewed 6/[illegible]/99 9 am

EBT

RECEIVED
JUN 22 1999
EBT

Material	Discrepancy	Corrective Action	Responsible	Action[1]
GML	No Asperity Height data	Test Results for GRI-GM12 per	Eric Reed, GSE	C
GML	No data on Environmental Stress Crack testing Notched Constant Tensile Load	Test Results for ASTM D 5397, 1/lot or 1/400kft^2	Eric Reed, GSE	C
GML	No low-temperature brittleness testing information	Test Results for ASTM D 746 Procedure B, 1/lot or 1/400kft^2	Eric Reed, GSE	C
GML	Lot A60651 has only 37,036 ft^2 ; a minimum of 100,000 square feet per lot is required by specification, unless FDF approves otherwise.	Letter of exception to GSE	Rick Holbrook, FDF	A
GML	Short Rolls: #114101741 – 386 feet; #114101742 – 387 feet; #114101753 – 389 feet; #114101763, 385 feet; and #115102807 – 247 feet. (Minimum roll length is specified as 390 feet).	Letter of exception to GSE	Rick Holbrook, FDF	A
GML	Total square feet 749325	Account for missing 20,675 square feet.	Eric Reed, GSE	C
GML	Specification requires NSF 54 Annex A in conjunction with ASTM D 638.	Clarify distinctions between ASTM D638 NSF 54 Annex A	Jim Turner, FDF	?
GML	Specification requires Die C puncture use with ASTM D 1004.	Clarify distinctions used in using Die C.	Jim Turner, FDF	?
GML	Is Roll 2807 smooth or textured?	Clarify	Jim Turner, FDF	A
GML	ASTM D 5596 Carbon Black Dispersion – results unclear.	Clarify	Jim Turner, FDF	A
GML	ASTM D 1204 specified for 15 minutes; test reported at 1 hour.	Confirm longer test is more conservative	Jim Turner, FDF	A

[1] A-Conforms to Contract Requirements; B-Minor Comments; Correct & Resubmit; C-Revise and Resubmit; NCR-Nonconformance Report to be written.

Material	Discrepancy	Corrective Action	Responsible	Action[1]
GML	No Roll Test Data Sheet on Roll 114101737	Acquire Roll Test Data Sheet for Roll # 114101737	Jim Turner, FDF	A
GCL	No Hydraulic Conductivity Data (ASTM D 5887)	Acquire Hydraulic Conductivity Data	Jim Turner, FDF	C
GCL	First CETCO sample (for roll number 5033) covers 72,000 square feet as manufactured; specification requires maximum interval of 40,000 square feet as manufactured.	Write Nonconformance Report. Request additional test data to cover range	Jim Turner, FDF	NCR
GCL	CETCO samples taken for Rolls 5073 and 5089 fail moisture content at 25.5% and 25.8% moisture content, respectively. Specification requires maximum 25% moisture content.	Write Nonconformance Report	Jim Turner, FDF	NCR
GCL	Thirty-five (35) nonwoven geotextile rolls have no accompanying MQC data. These rolls represent two-hundred eighty (280) rolls of manufactured GCL, approximately 81% of our order.	Clarify with CETCO	Jim Turner, FDF	C
GCL	Bentonite Free Swell and Bentonite Fluid Loss data from bentonite raw material.	Determine adequacy of raw bentonite data ~~vice~~ vrs data on bentonite in GCL rolls	Kwasi Badu-Tweneboah, GeoSyntec	? C ?
GCL	Specification calls for ASTM D 5261 to test for bentonite mass per unit area.	Design Change Notice (DCN) to change to ASTM D 5993.	Kwasi Badu-Tweneboah, GeoSyntec	N/A

Gundle/SLT Environmental, Inc.

On Hand Roll Balance by Product Number

MAY-21-1999 16:34 281+847+1725 P.01
...THE WORLD COMES TO GSE
2203000

Business Unit	Product Number	Roll Number	Lot Grd	Status Code	Location	Sales Order Number	Quantity On Hand	Quantity Hard Committed	On Hand Minus Commit	Actual Weight	Comments
1501	HMT080A004	~~AK[illegible]78FF~~	~~498~~		62381		7,379		7,379		
1501	HMT080A004	AK4274FF	100		62144		8,460		8,460	3,530	
1501	HMT080A004	AK4769FF	948		62534		8,343		8,343	3,452	
1501	HMT080A004	AK5291FF	100		62121		8,484		8,484	3,497	
1501	HMT080A004	AK5313FF	306		62152		8,460		8,460	3,499	
1501	HMT080A004	AK5985FF	100		62121		8,343		8,343	3,540	
1501	HMT080A004	AK6685FF	306		62122		8,343		8,343	3,542	
1501	HMT080A004	AK6686FF	306		62123		8,343		8,343	3,491	
1501	HMT080A004	AK9719FF	100		62131		8,343		8,343	3,507	
1501	HMT080A004	114100321	209		62151	00001880	8,319		8,319	3,486	
1501	HMT080A004	114100322	209		62152	00001880	8,319		8,319	3,515	
1501	HMT080A004	114100323	209		62131	00001880	8,319		8,319	3,501	
1501	HMT080A004	114100324	209		62122	00001880	8,319		8,319	3,561	
1501	HMT080A004	114100349	304	H	62153	00001880	8,319		8,319	3,463	
1501	HMT080A004	114100350	304	H	62122	00001880	8,319		8,319	3,525	
1501	HMT080A004	114100354	306		62122	00001880	8,319		8,319	3,594	
1501	HMT080A004	114100381	100		62132		8,319		8,319	3,476	
1501	HMT080A004	114100598	100		62133		9,636		9,636		
1501	HMT080A004	114100721	101		62014	00001880	8,225		8,225	3,474	
1501	HMT080A004	114100739	101		62014	00001880	7,990		7,990	3,372	
1501	HMT080A004	114101424	100		62152		8,319		8,319	3,530	
1501	HMT080A004	114101425	100		62153	6190	8,319		8,319	3,558	
1501	HMT080A004	114101426	100		62121	6190	8,319		8,319	3,551	
1501	HMT080A004	114101427	100		62122		8,319		8,319	3,534	
1501	HMT080A004	114101428	100		62155		8,319		8,319	[illegible]	
1501	HMT080A004	114101429	100		62151		8,319		8,319	3,531	
1501	HMT080A004	114101432	100		62153	6190	8,319		8,319	3,533	
1501	HMT080A004	114101433	102		62153		7,050		7,050	2,998	
1501	HMT080A004	114101434	100		62131	6190	8,319		8,319	3,522	
1501	HMT080A004	114101435	100		62131	6190	8,319		8,319	3,525	
1501	HMT080A004	114101436	100		62121		8,319		8,319	3,567	
1501	HMT080A004	114101439	100		62131	6190	8,319		8,319	[illegible]	
1501	HMT080A004	114101440	100		62131		8,319		8,319	3,537	
1501	HMT080A004	114101442	100		62123	6190	8,319		8,319	3,51[illegible]	
1501	HMT080A004	114101443	100		62121		8,319		8,319	3,54[illegible]	
1501	HMT080A004	114101446	208		62132	6190	8,319		8,319	3,52[illegible]	
1501	HMT080A004	114101447	208		62131		11,139		11,139	3,484	
1501	HMT080A004	114101448	208		62132		8,319		8,319	3,525	
1501	HMT080A004	114101449	208		62154	6190	8,319		8,319	3,517	
1501	HMT080A004	114101450	208		62153	6190	8,319		8,319	3,530	
1501	HMT080A004	114101451	100		62154	6190	8,319		8,319	3,530	
1501	HMT080A004	114101454	100		62131	6190	8,319		8,319	3,527	
1501	HMT080A004	114101455	100		62131	6190	8,319		8,319	3,508	
1501	HMT080A004	~~114101[illegible]~~	100		62131		11,925		11,925	3,844	
1501	HMT080A004	~~[illegible]~~	100	A60645		00008181	8,319		8,319	3,613	
1501	HMT080A004	~~114101731~~	100			00008181	8,319		8,319	3,755	
1501	HMT080A004	114101734	100	A60646		00008181	9,165		9,165	3,923	

NEED LOT #

QC APPROVED
MR No: 6181
Product Code: HMT080A004
Date: 5/21/99
Qty Approved: 2 Rolls
Approved By:

2739

Report R55PTROLL
Version JPT0001

Gundle/SLT Environmental, Inc.

On Hand Roll Balance by Product Number

5/21/99 10:17:31
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Business Unit	Product Number	Roll Number	Lot Grd	Status Code	Location	Sales Order Number	Quantity On Hand	Quantity Hard Committed	On Hand Minus Commit	Actual Weight	Comments
1501	HMT080A004	114101735	100	A-60646		00006181	9,165		9,165	3,850	
1501	HMT080A004	114101736	100			00006181	9,165		9,165	3,883	
1501	HMT080A004	114101737	100			00006181	9,165		9,165	3,914	
1501	HMT080A004	114101738	100			00006181	9,165		9,165	3,897	
1501	HMT080A004	114101739	100			00006181	9,165	386	9,165	3,877	
1501	HMT080A004	114101740	100			00006181	9,165	387	9,165	3,898	
1501	HMT080A004	114101741	101			00006181	9,071		9,071	3,828	
1501	HMT080A004	114101742	101			00006181	9,095		9,095	3,870	
1501	HMT080A004	114101743	100			00006181	9,165		9,165	3,904	
1501	HMT080A004	114101744	102			00006181	9,259		9,259	3,901	
1501	HMT080A004	114101745	102			00006181	9,259		9,259	3,910	
1501	HMT080A004	114101746	208	A-60647		00006181	9,165		9,165	3,875	
1501	HMT080A004	114101747	102			00006181	9,283		9,283	3,940	
1501	HMT080A004	114101748	100	A-60646		00006181	9,165		9,165	3,870	
1501	HMT080A004	114101749	100			00006181	9,165		9,165	3,880	
1501	HMT080A004	114101750	100			00006181	9,165		9,165	3,977	
1501	HMT080A004	114101751	100	A-60647		00006181	9,165	389	9,165	3,928	
1501	HMT080A004	114101752	100			00006181	9,165		9,165	3,912	
1501	HMT080A004	114101753	101			00006181	9,142		9,142	3,957	
1501	HMT080A004	114101754	100			00006181	9,165		9,165	3,917	
1501	HMT080A004	114101755	100			00006181	9,165		9,165	3,980	
1501	HMT080A004	114101756	100			00006181	9,165		9,165	3,929	
1501	HMT080A004	114101757	100			00006181	9,165		9,165	4,033	
1501	HMT080A004	114101758	100			00006181	9,165		9,165	3,970	
1501	HMT080A004	114101759	100			00006181	9,283		9,283	3,990	
1501	HMT080A004	114101760	100			00006181	9,165		9,165	3,979	
1501	HMT080A004	114101761	100			00006181	9,259		9,259	3,950	
1501	HMT080A004	114101762	100	Scrapped		00006181	9,165		9,165	3,922	
1501	HMT080A004	[illegible]	100			00006181	9,048		9,048	3,902	
1501	HMT080A004	114101764	100			00006181	9,165		9,165	3,728	
1501	HMT080A004	~~114101765~~	100			00006181	8,766		8,766	3,928	
1501	HMT080A004	114101766	100			00006181	9,165		9,165	3,968	
1501	HMT080A004	114101767	100			00006181	9,165		9,165	3,994	
1501	HMT080A004	114101768	100			00006181	9,165		9,165	3,985	
1501	HMT080A004	114101769	100			00006181	9,165		9,165	3,929	
1501	HMT080A004	114101770	100			00006181	9,165		9,165	3,969	
1501	HMT080A004	114101771	100			00006181	9,165		9,165	4,004	
1501	HMT080A004	114101772	100			00006181	9,212		9,212	4,005	
1501	HMT080A004	114101773	100			00006181	9,165		9,165	3,980	
1501	HMT080A004	114101774	100			00006181	9,165		9,165	3,985	
1501	HMT080A004	114101775	102			00006181	9,165		9,165	3,925	
1501	HMT080A004	114101776	100			00006181	9,330		9,330	3,972	
1501	HMT080A004	114101777	102				~~9,165~~		9,165	3,972	
1501	HMT080A004	~~114101778~~	208			00006181	9,165		9,165	3,980	
1501	HMT080A004	114101779	100			00006181	9,165		9,165	3,930	
1501	HMT080A004	114101780	100			00006181	9,165		9,165	3,987	
1501	HMT080A004	114101781	100								

QC APPROVED
MR No: 6181
Product Code: HMT080A004
Date: 5/21/99
Qty Approved: 46 Rolls
Approved By:

-2739

ort R55PTROLL

tion: JPT0001

Gundle/SLT Environmental, Inc.

On Hand Roll Balance by Product Number

5/21/99 10:17:31

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Business Unit	Product Number	Roll Number	Lot Grd	Status Code	Location	Sales Order Number	Quantity On Hand	Quantity Hard Committed	On Hand Minus Commit	Actual Weight	Comments
1501	HMT080A004	114101782	100		A60647	00006181	9,165		9,165	3,905	
1501	HMT080A004	114101783	100			00006181	9,165		9,165	3,990	
1501	HMT080A004	114101784	100			00006181	9,165		9,165	3,924	
1501	HMT080A004	114101785	100			00006181	9,165		9,165	3,889	
1501	HMT080A004	114101786	100			00006181	9,165		9,165	3,922	
1501	HMT080A004	114101787	100			00006181	9,165		9,165	3,897	
1501	HMT080A004	114101788	100			00006181	9,165		9,165	3,897	
1501	HMT080A004	114101789	100			00006181	9,165		9,165	3,969	
1501	HMT080A004	114101790	100			00006181	9,165		9,165	3,900	
1501	HMT080A004	114101791	100			00006181	9,165		9,165	3,970	
1501	HMT080A004	114101792	209			00006181	~~9,165~~		9,165	3,953	
1501	HMT080A004	114101793	100			00006181	9,165		9,165	4,055	
1501	HMT080A004	114101794	100			00006181	9,165		9,165	3,915	
1501	HMT080A004	114101795	100			00006181	9,165		9,165	3,985	
1501	HMT080A004	114101796	100			00006181	9,165		9,165	3,947	
1501	HMT080A004	114101797	100		150 90 A60646	00006181	9,165		9,165	3,959	
1501	HMT080A004	114101798	100			00006181	18,330		18,330	3,893	
1501	HMT080A004	114101799	100			00006181	9,165		9,165	3,912	
1501	HMT080A004	114101800	100		A60647	00006181	9,165		9,165	3,807	
1501	HMT080A004	114101801	100			00006181	9,165		9,165	3,997	
1501	HMT080A004	114101802	100			00006181	9,165		9,165	3,948	
1501	HMT080A004	114101803	100			00006181	9,165		9,165	3,947	
1501	HMT080A004	114101804	100	Q		00006181	9,165		9,165	3,902	
1501	HMT080A004	~~114101805~~	101	Q		00006181	9,071		9,071	3,975	
1501	HMT080A004	114101806	100	Q		00006181	9,165		9,165	3,919	
1501	HMT080A004	114101807	100	Q		00006181	9,165		9,165	3,970	
1501	HMT080A004	114101808	100	Q	A60646	00006181	9,165		9,165	3,888	
1501	HMT080A004	114101809	100	Q		00006181	9,165		9,165	3,985	
1501	HMT080A004	114101810	100	Q	A60647	00006181	9,165		9,165	3,940	
1501	HMT080A004	114101811	100	Q		00006181	9,165		9,165	3,985	
1501	HMT080A004	114101812	100	Q		00006181	9,330		9,330	3,941	
1501	HMT080A004	114101813	102	Q		00006181	9,259		9,259	3,965	
1501	HMT080A004	114101814	100	Q		00006181	9,259		9,259	3,925	
1501	HMT080A004	114101815	100	Q	A60051	00006181	9,259		9,259	3,950	
1501	HMT080A004	114101816	100	Q	1917 OK	00006181	9,259		9,259	3,934	
1501	HMT080A004	~~114101817~~	100	Q		00006181	9,259		9,259	3,945	
1501	HMT080A004	114101818	100	Q		00006181	9,259		9,259	3,948	
1501	HMT080A004	114101819	100	Q		00006181	9,259		9,259	3,970	
1501	HMT080A004	114101820	100	Q	1931 OK	00006181	9,259		9,259	501,075	
1501	HMT080A004	~~114101821~~	100	Q			1,204,887		1,204,887		
	Plant Total:	134	Rolls								

Good Rolls 87

QC APPROVED

MR No: 6181

Product Code: HMT080A004

Date: 5/21/99

Qty Approved: 36 Rolls

Approved By:

TOTAL P.03

2739

Business Unit	Product Number	Roll Number	Lot Grd	Status Code	Location	Sales Order Number	Quantity On Hand	Quantity Hard Committed	On Hand Minus Commit	Actual Weight	Comments
1501	HME080A004	115102793	106				16,826		16,826	6,734	
1501	HME080A004	115102794	106				16,826		16,826	6,734	
1501	HME080A004	115102795	106				16,826		16,826	6,753	
1501	HME080A004	115102796	106				16,826		16,826	6,771	NEW Lot #
1501	HME080A004	115102797	106				16,826		16,826	6,744	
1501	HME080A004	115102798	106				16,826		16,826	6,778	
1501	HME080A004	115102799	106				16,826		16,826	6,760	
1501	HME080A004	115102800	106				16,826		16,826	6,750	
1501	HME080A004	115102801	106				16,826		16,826	6,760	
1501	HME080A004	115102802	106				16,826		16,826	6,762	
1501	HME080A004	115102806	106			00006181	166		166	7,420	
1501	HME080A004	115102807	101		A66646		5,605		5,605	2,382	
1501	HME080A004	115102808	106			00006181	9,352		9,352	7,403	
1501	HME080A004	115102817	106			00006181	16,659		16,659	7,635	
1501	HME080A004	115102819	106			00006181	16,659		16,659	7,668	
1501	HME080A004	115102829	106			00006181	9,494		9,494	7,492	
1501	HME080A004	115102830	106			00006181	328		328	7,492	
1501	HME080A004	115102831	106			00006181	328		328	7,495	
1501	HME080A004	115102836	106			00006181	16,659		16,659	7,505	
1501	HME080A004	115102838	106			00006181	329		329	7,512	
1501	HME080A004	115102839	106			00006181	9,493		9,493	7,525	OC APPROVED
1501	HME080A004	115102843	106			00006181	328		328	7,519	
1501	HME080A004	115102846	106			00006181	141		141	7,502	MR No:
1501	HME080A004	115102847	106			00006181	16,659		16,659	7,505	Product Code: HME080A
1501	HME080A004	115102848	106			00006181	16,659		16,659	7,481	Date: 5/21/99
1501	HME080A004	115102849	106			00006181	16,659		16,659	7,466	Qty Approved: 1 Roll
1501	HME080A004	115102850	106			00006181	141		141	3,437	
1501	HME080A004	115102851	100				8,460	8,450	10	3,411	
1501	HME080A004	115102852	100				8,460		8,460	3,577	Approved By:
1501	HME080A004	115102853	100				8,460		8,460	3,580	
1501	HME080A004	115102854	106			00006870	8,460		8,460	3,664	
1501	HME080A004	115102856	100			00006870	8,460		8,460	3,589	
1501	HME080A004	115102857	106			00006870	8,460		8,460	3,590	
1501	HME080A004	115102858	106			00006870	8,460		8,460	3,193	
1501	HME080A004	115102859	106			00006870	8,460		8,460	3,516	
1501	HME080A004	115102860	106			00006870	8,460		8,460	3,698	
1501	HME080A004	115102861	106			00006870	8,460		8,460	3,589	
1501	HME080A004	115102862	106				8,813		8,813	3,443	
1501	HME080A004	115102863	106				8,460		8,460	3,429	
1501	HME080A004	115102864	206				8,460		8,460	3,441	
1501	HME080A004	115102865	206				8,460	8,450	10	3,428	
1501	HME080A004	115102866	100				8,460	8,450	10	3,449	
1501	HME080A004	115102867	100				8,460		8,460	3,434	
1501	HME080A004	115102868	301				8,460	8,450	10	3,462	
1501	HME080A004	115102869	100				8,460	8,450	10	3,438	
1501	HME080A004	115102870	100				8,460	8,450	10		
1501	HME080A004	115102871	100								

TOTAL P.01

000375

2739

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101734

ROLL IDENTIFICATION

Roll Number	114101734
Product Name	HMT080A004
Production Date	5/15/99

Length ≈(+/- 1%)	390 119	feet meters
Width (Nominal)	23.5 7.2	feet meters
Sheet Area	9,165 851	sq. feet sq. meters
Weight	3,923 1,779	pounds kilograms

RESIN INFORMATION

Lot Number	A60646 2739
Type	HDA601
Supplier	Mobil

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.59

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	76	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	216	(379)
- MD		every roll	173	(303)	221	(386)
Break Strength, ppi - TD		every roll	324	(567)	414	(724)
- MD		every roll	324	(567)	429	(751)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		21	
- MD		every roll	13		21	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		695	
- MD		every roll	560		699	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	71	(314)
- MD		every roll	60	(267)	71	(318)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	119	(531)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.3	
- MD		every roll	-2.0		-0.2	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.942	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.6	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

APPROVED g.y. 5/17/99 QA

000376

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101735

ROLL IDENTIFICATION

Roll Number	114101735
Product Name	HMT080A004
Production Date	5/15/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	3,850	pounds
	1,746	kilograms

RESIN INFORMATION

Lot Number	A60646
Type	HDA601
Supplier	Mobil

F-2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.59

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	76	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	204	(356)
- MD		every roll	173	(303)	210	(368)
Break Strength, ppi - TD		every roll	324	(567)	377	(660)
- MD		every roll	324	(567)	407	(712)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		19	
- MD		every roll	13		21	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		649	
- MD		every roll	560		778	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	70	(310)
- MD		every roll	60	(267)	68	(305)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	125	(557)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.3	
- MD		every roll	-2.0		-0.2	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.942	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.6	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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5/17/99
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GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101736

ROLL IDENTIFICATION

Number	114101736
Product Name	HMT080A004
Production Date	5/15/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	3,883	pounds
	1,761	kilograms

RESIN INFORMATION

Lot Number	A60646
Type	HDA601
Supplier	Mobil

2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.59

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	224	(391)
- MD		every roll	173	(303)	233	(407)
Break Strength, ppi - TD		every roll	324	(567)	417	(729)
- MD		every roll	324	(567)	411	(720)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		21	
- MD		every roll	13		20	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		695	
- MD		every roll	560		688	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	68	(303)
- MD		every roll	60	(267)	68	(302)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	129	(574)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.2	
- MD		every roll	-2.0		-0.2	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.942	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.6	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Customer No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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5/17/99
QA

000378

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101738

ROLL IDENTIFICATION

Roll Number	114101738
Product Name	HMT080A004
Production Date	5/15/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	3,897	pounds
	1,768	kilograms

RESIN INFORMATION

Lot Number	A60646
Type	HDA601
Supplier	Mobil

2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.59

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	201	(352)
- MD		every roll	173	(303)	221	(387)
Break Strength, ppi - TD		every roll	324	(567)	398	(696)
- MD		every roll	324	(567)	450	(788)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		20	
- MD		every roll	13		21	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		669	
- MD		every roll	560		722	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	68	(305)
- MD		every roll	60	(267)	72	(322)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	129	(573)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.2	
- MD		every roll	-2.0		-0.1	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.942	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.6	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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000379

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101739

ROLL IDENTIFICATION

Roll Number	114101739
Product Name	HMT080A004
Production Date	5/15/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	3,877	pounds
	1,759	kilograms

RESIN INFORMATION

Lot Number	A60646
Type	HDA601
Supplier	Mobil

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GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.59

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	211	(370)
- MD		every roll	173	(303)	216	(378)
Break Strength, ppi - TD		every roll	324	(567)	374	(654)
- MD		every roll	324	(567)	472	(825)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		22	
- MD		every roll	13		22	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		613	
- MD		every roll	560		759	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	70	(311)
- MD		every roll	60	(267)	72	(320)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	127	(565)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.2	
- MD		every roll	-2.0		-0.1	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.942	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.6	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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5/17/99
QA

000280

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101740

ROLL IDENTIFICATION

Roll Number	114101740
Product Name	HMT080A004
Production Date	5/15/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	3,898	pounds
	1,768	kilograms

RESIN INFORMATION

Lot Number	A60646
Type	HDA601
Supplier	Mobil

2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.59

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	76	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	205	(359)
- MD		every roll	173	(303)	211	(369)
Break Strength, ppi - TD		every roll	324	(567)	438	(767)
- MD		every roll	324	(567)	446	(780)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		24	
- MD		every roll	13		22	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		725	
- MD		every roll	560		721	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	70	(313)
- MD		every roll	60	(267)	72	(321)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	129	(576)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.0	
- MD		every roll	-2.0		0.0	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.4	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

APPROVED
J.Y.
5/17/99
QA

000381

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101741

ROLL IDENTIFICATION

Roll Number	114101741
Product Name	HMT080A004
Production Date	5/15/99

Length ≈(+/- 1%)	386 118	feet meters
Width (Nominal)	23.5 7.2	feet meters
Sheet Area	9,071 843	sq. feet sq. meters
Weight	3,828 1,736	pounds kilograms

RESIN INFORMATION

Lot Number	A60646
Type	HDA601
Supplier	Mobil

2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.59

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	76	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	206	(361)
- MD		every roll	173	(303)	214	(375)
Break Strength, ppi - TD		every roll	324	(567)	426	(746)
- MD		every roll	324	(567)	412	(720)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		22	
- MD		every roll	13		21	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		713	
- MD		every roll	560		649	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	67	(298)
- MD		every roll	60	(267)	70	(313)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	126	(561)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.0	
- MD		every roll	-2.0		0.0	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.4	
ESCR status	ASTM D1693 Cond. B Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

APPROVED
JY
5/17/99
QA

000082

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101742

ROLL IDENTIFICATION

Roll Number	114101742
Product Name	HMT080A004
Production Date	5/15/99

Length ≈(+/- 1%)	387	feet
	118	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,095	sq. feet
	845	sq. meters
Weight	3,870	pounds
	1,755	kilograms

RESIN INFORMATION

Lot Number	A60646
Type	HDA601
Supplier	Mobil

F-2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.59

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	76	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	206	(361)
- MD		every roll	173	(303)	215	(375)
Break Strength, ppi - TD		every roll	324	(567)	392	(686)
- MD		every roll	324	(567)	392	(685)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		23	
- MD		every roll	13		22	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		650	
- MD		every roll	560		622	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	69	(308)
- MD		every roll	60	(267)	69	(305)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	132	(585)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.0	
- MD		every roll	-2.0		-0.1	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.4	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

000383

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GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101743

ROLL IDENTIFICATION

Roll Number	114101743
Product Name	HMT080A004
Production Date	5/15/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	3,904	pounds
	1,771	kilograms

RESIN INFORMATION

Lot Number	A60646
Type	HDA601 — 2739
Supplier	Mobil

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.59

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	76	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	204	(356)
- MD		every roll	173	(303)	211	(369)
Break Strength, ppi - TD		every roll	324	(567)	448	(785)
- MD		every roll	324	(567)	450	(788)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		23	
- MD		every roll	13		22	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		745	
- MD		every roll	560		705	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	72	(319)
- MD		every roll	60	(267)	71	(316)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	131	(585)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.0	
- MD		every roll	-2.0		-0.1	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.4	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101744

ROLL IDENTIFICATION

Roll Number	114101744
Product Name	HMT080A004
Production Date	5/16/99

Length ≈(+/- 1%)	394	feet
	120	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,259	sq. feet
	860	sq. meters
Weight	3,901	pounds
	1,769	kilograms

RESIN INFORMATION

Lot Number	A60646
Type	HDA601
Supplier	Mobil

2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.59

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	76	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	203	(355)
- MD		every roll	173	(303)	211	(369)
Break Strength, ppi - TD		every roll	324	(567)	380	(666)
- MD		every roll	324	(567)	405	(709)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		20	
- MD		every roll	13		21	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		676	
- MD		every roll	560		776	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	70	(312)
- MD		every roll	60	(267)	68	(305)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	127	(566)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		-0.1	
- MD		every roll	-2.0		-0.1	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.6	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101745

ROLL IDENTIFICATION

Roll Number	114101745
Product Name	HMT080A004
Production Date	5/16/99

Length ≈(+/- 1%)	394 120	feet meters
Width (Nominal)	23.5 7.2	feet meters
Sheet Area	9,259 860	sq. feet sq. meters
Weight	3,910 1,774	pounds kilograms

RESIN INFORMATION

Lot Number	A60646
Type	HDA601
Supplier	Mobil

—2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.59

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	76	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	226	(395)
- MD		every roll	173	(303)	234	(409)
Break Strength, ppi - TD		every roll	324	(567)	420	(734)
- MD		every roll	324	(567)	413	(722)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		22	
- MD		every roll	13		21	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		716	
- MD		every roll	560		690	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	68	(302)
- MD		every roll	60	(267)	68	(303)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	129	(572)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		-0.1	
- MD		every roll	-2.0		-0.1	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.6	
ESCR status	ASTM D1693 Cond. B Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101746

ROLL IDENTIFICATION

Roll Number	114101746
Product Name	HMT080A004
Production Date	5/16/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	3,875	pounds
	1,758	kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil

F-2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	81	(2.0)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	219	(383)
- MD		every roll	173	(303)	219	(383)
Break Strength, ppi - TD		every roll	324	(567)	443	(776)
- MD		every roll	324	(567)	423	(740)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		21	
- MD		every roll	13		22	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		731	
- MD		every roll	560		687	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	70	(312)
- MD		every roll	60	(267)	69	(309)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	131	(582)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.1	
- MD		every roll	-2.0		-0.2	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.6	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101747

ROLL IDENTIFICATION

Roll Number	114101747
Product Name	HMT080A004
Production Date	5/16/99

Length ≈(+/- 1%)	395 120	feet meters
Width (Nominal)	23.5 7.2	feet meters
Sheet Area	9,283 862	sq. feet sq. meters
Weight	3,940 1,787	pounds kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil

2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	81	(2.0)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	205	(358)
- MD		every roll	173	(303)	220	(384)
Break Strength, ppi - TD		every roll	324	(567)	400	(701)
- MD		every roll	324	(567)	448	(784)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		20	
- MD		every roll	13		21	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		685	
- MD		every roll	560		726	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	69	(308)
- MD		every roll	60	(267)	71	(315)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	129	(576)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.1	
- MD		every roll	-2.0		-0.2	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.6	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101748

ROLL IDENTIFICATION

Roll Number	114101748
Product Name	HMT080A004
Production Date	5/16/99

Length ≈(+/- 1%)	390 119	feet meters
Width (Nominal)	23.5 7.2	feet meters
Sheet Area	9,165 851	sq. feet sq. meters
Weight	3,870 1,755	pounds kilograms

RESIN INFORMATION

Lot Number	A60646
Type	HDA601
Supplier	Mobil

2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.59

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	76	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	211	(369)
- MD		every roll	173	(303)	216	(379)
Break Strength, ppi - TD		every roll	324	(567)	374	(654)
- MD		every roll	324	(567)	468	(818)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		22	
- MD		every roll	13		21	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		660	
- MD		every roll	560		738	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	71	(316)
- MD		every roll	60	(267)	72	(321)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	129	(575)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.0	
- MD		every roll	-2.0		-0.1	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.6	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101749

ROLL IDENTIFICATION

Roll Number	114101749
Product Name	HMT080A004
Production Date	5/16/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	3,880	pounds
	1,760	kilograms

RESIN INFORMATION

Lot Number	A60646
Type	HDA601
Supplier	Mobil

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GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.59

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	76	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	224	(391)
- MD		every roll	173	(303)	215	(376)
Break Strength, ppi - TD		every roll	324	(567)	399	(699)
- MD		every roll	324	(567)	463	(810)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		22	
- MD		every roll	13		23	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		656	
- MD		every roll	560		745	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	69	(309)
- MD		every roll	60	(267)	73	(324)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	134	(596)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.0	
- MD		every roll	-2.0		-0.1	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.6	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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Roll Test Data Report

GSE Lining Technology, Inc.

Roll No. 114101750

ROLL IDENTIFICATION

Roll Number	114101750
Product Name	HMT080A004
Production Date	5/16/99

Length ≈(+/- 1%)	390 119	feet meters
Width (Nominal)	23.5 7.2	feet meters
Sheet Area	9,165 851	sq. feet sq. meters
Weight	3,977 1,804	pounds kilograms

RESIN INFORMATION

Lot Number	A60646
Type	HDA601
Supplier	Mobil

2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.59

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	212	(371)
- MD		every roll	173	(303)	204	(357)
Break Strength, ppi - TD		every roll	324	(567)	421	(736)
- MD		every roll	324	(567)	395	(691)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		22	
- MD		every roll	13		22	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		693	
- MD		every roll	560		653	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	68	(302)
- MD		every roll	60	(267)	70	(313)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	134	(598)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.2	
- MD		every roll	-2.0		-0.1	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.942	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.6	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101751

ROLL IDENTIFICATION

Roll Number	114101751
Product Name	HMT080A004
Production Date	5/16/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	3,926	pounds
	1,781	kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil

2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	81	(2.1)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	202	(353)
- MD		every roll	173	(303)	207	(362)
Break Strength, ppi - TD		every roll	324	(567)	392	(687)
- MD		every roll	324	(567)	418	(731)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		22	
- MD		every roll	13		22	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		664	
- MD		every roll	560		690	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	66	(294)
- MD		every roll	60	(267)	67	(300)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	132	(587)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.1	
- MD		every roll	-2.0		-0.2	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.6	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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000392

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101752

ROLL IDENTIFICATION

Roll Number	114101752
Product Name	HMT080A004
Production Date	5/16/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	3,912*	pounds
	1,774	kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil

2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	78	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	213	(372)
- MD		every roll	173	(303)	217	(380)
Break Strength, ppi - TD		every roll	324	(567)	443	(775)
- MD		every roll	324	(567)	445	(778)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		23	
- MD		every roll	13		22	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		709	
- MD		every roll	560		713	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	70	(310)
- MD		every roll	60	(267)	71	(315)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	135	(603)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.2	
- MD		every roll	-2.0		-0.1	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.6	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101753

ROLL IDENTIFICATION

Roll Number	114101753
Product Name	HMT080A004
Production Date	5/16/99

Length ≈(+/- 1%)	389	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,142	sq. feet
	849	sq. meters
Weight	3,957	pounds
	1,795	kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601 -- 2739
Supplier	Mobil

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	78	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	206	(361)
- MD		every roll	173	(303)	208	(364)
Break Strength, ppi - TD		every roll	324	(567)	423	(741)
- MD		every roll	324	(567)	428	(750)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		22	
- MD		every roll	13		22	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		706	
- MD		every roll	560		704	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	66	(295)
- MD		every roll	60	(267)	68	(304)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	132	(589)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.2	
- MD		every roll	-2.0		-0.1	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.6	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

000394

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g.y.
5/17/99
QA

Roll Test Data Report

GSE Lining Technology, Inc.

Roll No. 114101754

ROLL IDENTIFICATION

Roll Number	114101754
Product Name	HMT080A004
Production Date	5/16/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	3,917	pounds
	1,777	kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601 — 2739
Supplier	Mobil

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	197	(345)
- MD		every roll	173	(303)	205	(359)
Break Strength, ppi - TD		every roll	324	(567)	399	(698)
- MD		every roll	324	(567)	385	(674)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		23	
- MD		every roll	13		23	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		681	
- MD		every roll	560		635	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	68	(304)
- MD		every roll	60	(267)	69	(308)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	129	(575)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.2	
- MD		every roll	-2.0		-0.1	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.7	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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000395

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101755

ROLL IDENTIFICATION

Roll Number	114101755
Product Name	HMT080A004
Production Date	5/16/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	3,980	pounds
	1,805	kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil

2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	202	(353)
- MD		every roll	173	(303)	203	(355)
Break Strength, ppi - TD		every roll	324	(567)	450	(787)
- MD		every roll	324	(567)	468	(819)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		23	
- MD		every roll	13		23	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		751	
- MD		every roll	560		782	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	65	(290)
- MD		every roll	60	(267)	68	(302)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	127	(564)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.2	
- MD		every roll	-2.0		-0.1	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.7	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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000396

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101756

ROLL IDENTIFICATION

Roll Number	114101756
Product Name	HMT080A004
Production Date	5/16/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	3,929	pounds
	1,782	kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil

2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	81	(2.0)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	211	(370)
- MD		every roll	173	(303)	210	(367)
Break Strength, ppi - TD		every roll	324	(567)	406	(711)
- MD		every roll	324	(567)	427	(747)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		23	
- MD		every roll	13		21	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		668	
- MD		every roll	560		699	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	73	(326)
- MD		every roll	60	(267)	79	(350)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	130	(578)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.3	
- MD		every roll	-2.0		-0.4	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.7	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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000397

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101757

ROLL IDENTIFICATION

Roll Number	114101757
Product Name	HMT080A004
Production Date	5/16/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	3,957	pounds
	1,795	kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil

2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	81	(2.0)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	211	(370)
- MD		every roll	173	(303)	214	(375)
Break Strength, ppi - TD		every roll	324	(567)	383	(670)
- MD		every roll	324	(567)	452	(792)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		21	
- MD		every roll	13		23	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		635	
- MD		every roll	560		736	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	77	(341)
- MD		every roll	60	(267)	77	(341)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	130	(579)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.3	
- MD		every roll	-2.0		-0.4	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.7	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

000398

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5/17/99
QA

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101758

ROLL IDENTIFICATION

Roll Number	114101758
Product Name	HMT080A004
Production Date	5/17/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	4,033	pounds
	1,829	kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil

— 2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	209	(366)
- MD		every roll	173	(303)	210	(368)
Break Strength, ppi - TD		every roll	324	(567)	446	(780)
- MD		every roll	324	(567)	435	(762)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		21	
- MD		every roll	13		22	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		765	
- MD		every roll	560		709	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	75	(333)
- MD		every roll	60	(267)	76	(337)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	131	(583)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.3	
- MD		every roll	-2.0		-0.4	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.7	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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5/17/99
QA

000399

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101759

ROLL IDENTIFICATION

Roll Number	114101759
Product Name	HMT080A004
Production Date	5/17/99

Length ≈(+/- 1%)	395	feet
	120	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,283	sq. feet
	862	sq. meters
Weight	3,970	pounds
	1,801	kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601 — 2739
Supplier	Mobil

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	210	(368)
- MD		every roll	173	(303)	218	(381)
Break Strength, ppi - TD		every roll	324	(567)	418	(732)
- MD		every roll	324	(567)	452	(790)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		21	
- MD		every roll	13		22	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		680	
- MD		every roll	560		734	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	71	(316)
- MD		every roll	60	(267)	72	(318)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	135	(603)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.3	
- MD		every roll	-2.0		-0.4	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.7	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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000400

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101760

ROLL IDENTIFICATION

Roll Number	114101760
Product Name	HMT080A004
Production Date	5/17/99

Length ≈(+/- 1%)	390 119	feet meters
Width (Nominal)	23.5 7.2	feet meters
Sheet Area	9,165 851	sq. feet sq. meters
Weight	3,990 1,810	pounds kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil

2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	212	(370)
- MD		every roll	173	(303)	221	(387)
Break Strength, ppi - TD		every roll	324	(567)	437	(764)
- MD		every roll	324	(567)	459	(803)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		22	
- MD		every roll	13		22	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		734	
- MD		every roll	560		717	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	74	(331)
- MD		every roll	60	(267)	77	(344)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	128	(570)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.3	
- MD		every roll	-2.0		-0.5	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.942	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.7	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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5/17/99
QA

000401

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101761

ROLL IDENTIFICATION

Roll Number	114101761
Product Name	HMT080A004
Production Date	5/17/99

Length ≈(+/- 1%)	394	feet
	120	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,259	sq. feet
	860	sq. meters
Weight	3,975	pounds
	1,803	kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil

2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	222	(388)
- MD		every roll	173	(303)	219	(384)
Break Strength, ppi - TD		every roll	324	(567)	469	(821)
- MD		every roll	324	(567)	428	(749)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		20	
- MD		every roll	13		21	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		760	
- MD		every roll	560		678	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	78	(346)
- MD		every roll	60	(267)	79	(351)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	132	(587)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.3	
- MD		every roll	-2.0		-0.5	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.942	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.7	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

000402

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GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101763

ROLL IDENTIFICATION

Roll Number	114101763
Product Name	HMT080A004
Production Date	5/17/99

Length ≈(+/- 1%)	385 117	feet meters
Width (Nominal)	23.5 7.2	feet meters
Sheet Area	9,048 841	sq. feet sq. meters
Weight	3,922 1,779	pounds kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil

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GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	213	(373)
- MD		every roll	173	(303)	217	(380)
Break Strength, ppi - TD		every roll	324	(567)	437	(764)
- MD		every roll	324	(567)	442	(773)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		21	
- MD		every roll	13		20.	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		731	
- MD		every roll	560		715	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	67	(300)
- MD		every roll	60	(267)	69	(308)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	130	(578)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.2	
- MD		every roll	-2.0		-0.2	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.6	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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000403

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101764

ROLL IDENTIFICATION

Roll Number	114101764
Product Name	HMT080A004
Production Date	5/17/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	3,932	pounds
	1,784	kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil

F-2739

GSE RESIN TEST DATA

Property	*Test Method*	*Results*
Density, g/cc	*ASTM D 1505*	0.935
Melt index, g/10 min.	*ASTM D 1238 (2.16 kg/190 °C)*	0.60

Physical Property	*Test Method*	*Test Frequency*	*Customer Minimum* English	Metric	*Test Results* English	Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	81	(2.0)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	213	(372)
- MD		every roll	173	(303)	214	(375)
Break Strength, ppi - TD		every roll	324	(567)	392	(686)
- MD		every roll	324	(567)	440	(771)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		22	
- MD		every roll	13		21	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		654	
- MD		every roll	560		724	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	68	(303)
- MD		every roll	60	(267)	69	(306)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	128	(568)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.2	
- MD		every roll	-2.0		-0.1	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.7	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101766

ROLL IDENTIFICATION

Roll Number	114101766
Product Name	HMT080A004
Production Date	5/17/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	3,928	pounds
	1,782	kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil

2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	213	(373)
- MD		every roll	173	(303)	210	(368)
Break Strength, ppi - TD		every roll	324	(567)	412	(720)
- MD		every roll	324	(567)	428	(749)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		21	
- MD		every roll	13		21	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		686	
- MD		every roll	560		700	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	67	(298)
- MD		every roll	60	(267)	69	(305)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	127	(563)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.3	
- MD		every roll	-2.0		-0.2	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.942	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.7	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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000405

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101767

ROLL IDENTIFICATION

Roll Number	114101767
Product Name	HMT080A004
Production Date	5/17/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	3,966	pounds
	1,799	kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil

2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	210	(368)
- MD		every roll	173	(303)	212	(371)
Break Strength, ppi - TD		every roll	324	(567)	424	(742)
- MD		every roll	324	(567)	417	(730)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		22	
- MD		every roll	13		22	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		702	
- MD		every roll	560		680	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	66	(295)
- MD		every roll	60	(267)	70	(309)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	131	(581)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.3	
- MD		every roll	-2.0		-0.2	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.942	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.7	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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000406

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101768

ROLL IDENTIFICATION

Roll Number	114101768
Product Name	HMT080A004
Production Date	5/17/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	3,934	pounds
	1,784	kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil

F-2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	76	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	215	(375)
- MD		every roll	173	(303)	225	(393)
Break Strength, ppi - TD		every roll	324	(567)	441	(772)
- MD		every roll	324	(567)	453	(793)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		22	
- MD		every roll	13		20	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		724	
- MD		every roll	560		742	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	68	(303)
- MD		every roll	60	(267)	70	(311)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	128	(570)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.3	
- MD		every roll	-2.0		-0.3	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.942	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.7	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101769

ROLL IDENTIFICATION

Roll Number	114101769
Product Name	HMT080A004
Production Date	5/17/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	3,985	pounds
	1,808	kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil

2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	76	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	212	(371)
- MD		every roll	173	(303)	211	(369)
Break Strength, ppi - TD		every roll	324	(567)	447	(783)
- MD		every roll	324	(567)	453	(792)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		21	
- MD		every roll	13		21	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		744	
- MD		every roll	560		748	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	68	(303)
- MD		every roll	60	(267)	68	(304)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	133	(590)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.3	
- MD		every roll	-2.0		-0.3	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.942	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.7	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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Roll Test Data Report

GSE Lining Technology, Inc.

Roll No. 114101770

ROLL IDENTIFICATION

Roll Number	114101770
Product Name	HMT080A004
Production Date	5/17/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	3,929	pounds
	1,782	kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil

2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	224	(391)
- MD		every roll	173	(303)	218	(381)
Break Strength, ppi - TD		every roll	324	(567)	461	(807)
- MD		every roll	324	(567)	449	(785)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		22	
- MD		every roll	13		21	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		750	
- MD		every roll	560		719	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	69	(306)
- MD		every roll	60	(267)	70	(312)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	130	(580)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.3	
- MD		every roll	-2.0		-0.5	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.942	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.7	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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000409

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101771

ROLL IDENTIFICATION

Roll Number	114101771
Product Name	HMT080A004
Production Date	5/17/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	3,969	pounds
	1,800	kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil

2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	208	(364)
- MD		every roll	173	(303)	217	(380)
Break Strength, ppi - TD		every roll	324	(567)	454	(795)
- MD		every roll	324	(567)	482	(844)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		23	
- MD		every roll	13		22	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		744	
- MD		every roll	560		803	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	76	(336)
- MD		every roll	60	(267)	78	(347)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	130	(579)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.3	
- MD		every roll	-2.0		-0.5	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.942	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.7	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101772

ROLL IDENTIFICATION

Roll Number	114101772
Product Name	HMT080A004
Production Date	5/17/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	4,004	pounds
	1,816	kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil

2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	225	(393)
- MD		every roll	173	(303)	235	(410)
Break Strength, ppi - TD		every roll	324	(567)	446	(781)
- MD		every roll	324	(567)	457	(799)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		19	
- MD		every roll	13		22	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		734	
- MD		every roll	560		688	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	80	(355)
- MD		every roll	60	(267)	80	(354)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	133	(591)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.3	
- MD		every roll	-2.0		-0.2	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.942	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.7	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

APPROVED N.T. 5/19/99 QA

000411

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101773

ROLL IDENTIFICATION

Roll Number	114101773
Product Name	HMT080A004
Production Date	5/18/99

Length ≈(+/- 1%)	392	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,212	sq. feet
	856	sq. meters
Weight	4,005	pounds
	1,817	kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil

2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	227	(397)
- MD		every roll	173	(303)	224	(391)
Break Strength, ppi - TD		every roll	324	(567)	458	(802)
- MD		every roll	324	(567)	459	(804)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		20	
- MD		every roll	13		20	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		755	
- MD		every roll	560		706	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	80	(355)
- MD		every roll	60	(267)	80	(358)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	136	(607)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.3	
- MD		every roll	-2.0		-0.2	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.942	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.7	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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5/19/99
QA

000412

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101774

ROLL IDENTIFICATION

Roll Number	114101774
Product Name	HMT080A004
Production Date	5/18/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	3,880	pounds
	1,760	kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil

GSE RESIN TEST DATA 2739

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	81	(2.0)
Minimum		every roll	76	(1.9)	78	(2.0)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	225	(394)
- MD		every roll	173	(303)	233	(408)
Break Strength, ppi - TD		every roll	324	(567)	455	(796)
- MD		every roll	324	(567)	399	(698)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		19	
- MD		every roll	13		22	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		760	
- MD		every roll	560		621	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	78	(347)
- MD		every roll	60	(267)	79	(350)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	133	(591)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.3	
- MD		every roll	-2.0		-0.2	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.8	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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000413

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101775

ROLL IDENTIFICATION

Roll Number	114101775
Product Name	HMT080A004
Production Date	5/18/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	3,985	pounds
	1,808	kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil

2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	81	(2.0)
Minimum		every roll	76	(1.9)	78	(2.0)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	224	(392)
- MD		every roll	173	(303)	227	(397)
Break Strength, ppi - TD		every roll	324	(567)	460	(805)
- MD		every roll	324	(567)	447	(782)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		22	
- MD		every roll	13		22	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		750	
- MD		every roll	560		703	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	72	(323)
- MD		every roll	60	(267)	73	(325)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	135	(599)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.3	
- MD		every roll	-2.0		-0.2	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.8	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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000414

Roll Test Data Report

GSE Lining Technology, Inc.

Roll No. 114101776

ROLL IDENTIFICATION

Roll Number	114101776
Product Name	HMT080A004
Production Date	5/18/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	3,925	pounds
	1,780	kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil

2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	81	(2.0)
Minimum		every roll	76	(1.9)	79	(2.0)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	220	(386)
- MD		every roll	173	(303)	228	(400)
Break Strength, ppi - TD		every roll	324	(567)	464	(813)
- MD		every roll	324	(567)	471	(825)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		21	
- MD		every roll	13		22	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		754	
- MD		every roll	560		750	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	71	(316)
- MD		every roll	60	(267)	74	(329)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	135	(599)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.3	
- MD		every roll	-2.0		-0.2	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.8	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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000415

Roll Test Data Report

GSE Lining Technology, Inc.

Roll No. 114101777

ROLL IDENTIFICATION

Roll Number	114101777
Product Name	HMT080A004
Production Date	5/18/99

Length ≈(+/- 1%)	397 121	feet meters
Width (Nominal)	23.5 7.2	feet meters
Sheet Area	9,330 867	sq. feet sq. meters
Weight	3,972 1,802	pounds kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil

-- 2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	81	(2.0)
Minimum		every roll	76	(1.9)	79	(2.0)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	227	(398)
- MD		every roll	173	(303)	232	(407)
Break Strength, ppi - TD		every roll	324	(567)	441	(772)
- MD		every roll	324	(567)	456	(799)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		22	
- MD		every roll	13		21	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		721	
- MD		every roll	560		718	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	77	(342)
- MD		every roll	60	(267)	78	(348)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	129	(574)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.3	
- MD		every roll	-2.0		-0.2	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.8	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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000416

Roll Test Data Report

GSE Lining Technology, Inc.

Roll No. 114101779

ROLL IDENTIFICATION

Roll Number	114101779
Product Name	HMT080A004
Production Date	5/18/99

Length ≈(+/- 1%)	390 119	feet meters
Width (Nominal)	23.5 7.2	feet meters
Sheet Area	9,165 851	sq. feet sq. meters
Weight	3,980 1,805	pounds kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA681 — 2739
Supplier	Mobil

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	76	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	216	(379)
- MD		every roll	173	(303)	220	(385)
Break Strength, ppi - TD		every roll	324	(567)	428	(748)
- MD		every roll	324	(567)	436	(762)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		20	
- MD		every roll	13		20	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		709	
- MD		every roll	560		708	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	69	(306)
- MD		every roll	60	(267)	70	(313)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	133	(590)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.2	
- MD		every roll	-2.0		-0.1	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.7	
ESCR status	ASTM D1693 Cond. B Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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QA

000417

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101780

ROLL IDENTIFICATION

Roll Number	114101780
Product Name	HMT080A004
Production Date	5/18/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	3,930	pounds
	1,783	kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil

2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	220	(384)
- MD		every roll	173	(303)	222	(388)
Break Strength, ppi - TD		every roll	324	(567)	446	(781)
- MD		every roll	324	(567)	462	(809)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		22	
- MD		every roll	13		22	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		725	
- MD		every roll	560		730	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	70	(312)
- MD		every roll	60	(267)	70	(312)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	133	(594)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.3	
- MD		every roll	-2.0		-0.3	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.942	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.7	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

000418

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GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101781

ROLL IDENTIFICATION

Roll Number	114101781
Product Name	HMT080A004
Production Date	5/18/99

Length ≈(+/- 1%)	390 119	feet meters
Width (Nominal)	23.5 7.2	feet meters
Sheet Area	9,165 851	sq. feet sq. meters
Weight	3,987 1,809	pounds kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil

2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	218	(381)
- MD		every roll	173	(303)	220	(384)
Break Strength, ppi - TD		every roll	324	(567)	451	(789)
- MD		every roll	324	(567)	431	(755)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		22	
- MD		every roll	13		21	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		731	
- MD		every roll	560		686	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	69	(308)
- MD		every roll	60	(267)	71	(316)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	130	(577)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.3	
- MD		every roll	-2.0		-0.3	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.942	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.7	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

000419

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5/19/99
QA

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101782

ROLL IDENTIFICATION

Roll Number	114101782
Product Name	HMT080A004
Production Date	5/18/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	3,905	pounds
	1,771	kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil

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GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	81	(2.0)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	211	(369)
- MD		every roll	173	(303)	206	(361)
Break Strength, ppi - TD		every roll	324	(567)	416	(727)
- MD		every roll	324	(567)	430	(753)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		22	
- MD		every roll	13		21	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		699	
- MD		every roll	560		718	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	67	(300)
- MD		every roll	60	(267)	69	(308)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	127	(564)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.2	
- MD		every roll	-2.0		-0.1	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.6	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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000420

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101783

ROLL IDENTIFICATION

Roll Number	114101783
Product Name	HMT080A004
Production Date	5/18/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	3,990	pounds
	1,810	kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil — 2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	81	(2.0)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	204	(357)
- MD		every roll	173	(303)	210	(368)
Break Strength, ppi - TD		every roll	324	(567)	436	(762)
- MD		every roll	324	(567)	430	(752)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		23	
- MD		every roll	13		22	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		723	
- MD		every roll	560		685	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	69	(309)
- MD		every roll	60	(267)	70	(310)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	126	(560)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.2	
- MD		every roll	-2.0		-0.1	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.6	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

000421

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Roll Test Data Report

GSE Lining Technology, Inc.

Roll No. 114101784

ROLL IDENTIFICATION

Roll Number	114101784
Product Name	HMT080A004
Production Date	5/18/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	3,924	pounds
	1,780	kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601 — 2739
Supplier	Mobil

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	213	(373)
- MD		every roll	173	(303)	213	(372)
Break Strength, ppi - TD		every roll	324	(567)	417	(729)
- MD		every roll	324	(567)	454	(795)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		23	
- MD		every roll	13		21	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		664	
- MD		every roll	560		714	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	68	(302)
- MD		every roll	60	(267)	70	(313)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	134	(595)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.3	
- MD		every roll	-2.0		-0.5	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.942	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.7	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

000422

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Roll Test Data Report

GSE Lining Technology, Inc.

Roll No. 114101785

ROLL IDENTIFICATION

Roll Number	114101785
Product Name	HMT080A004
Production Date	5/19/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	3,689	pounds
	1,673	kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil

2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	206	(360)
- MD		every roll	173	(303)	215	(376)
Break Strength, ppi - TD		every roll	324	(567)	463	(811)
- MD		every roll	324	(567)	455	(797)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		22	
- MD		every roll	13		22	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		751	
- MD		every roll	560		716	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	66	(293)
- MD		every roll	60	(267)	69	(307)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	129	(574)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.3	
- MD		every roll	-2.0		-0.5	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.942	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.7	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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000423

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101786

ROLL IDENTIFICATION

Roll Number	114101786
Product Name	HMT080A004
Production Date	5/19/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	3,922	pounds
	1,779	kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil

2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	81	(2.1)
Minimum		every roll	76	(1.9)	78	(2.0)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	209	(365)
- MD		every roll	173	(303)	214	(374)
Break Strength, ppi - TD		every roll	324	(567)	426	(746)
- MD		every roll	324	(567)	435	(761)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		22	
- MD		every roll	13		24	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		700	
- MD		every roll	560		688	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	68	(302)
- MD		every roll	60	(267)	69	(307)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	134	(597)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.2	
- MD		every roll	-2.0		-0.1	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.7	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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000424

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101787

ROLL IDENTIFICATION

Roll Number	114101787
Product Name	HMT080A004
Production Date	5/19/99

Length ≈(+/- 1%)	390 119	feet meters
Width (Nominal)	23.5 7.2	feet meters
Sheet Area	9,165 851	sq. feet sq. meters
Weight	3,997 1,813	pounds kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil

- 2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	81	(2.1)
Minimum		every roll	76	(1.9)	78	(2.0)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	227	(398)
- MD		every roll	173	(303)	222	(388)
Break Strength, ppi - TD		every roll	324	(567)	440	(771)
- MD		every roll	324	(567)	438	(767)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		23	
- MD		every roll	13		22	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		716	
- MD		every roll	560		756	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	67	(300)
- MD		every roll	60	(267)	68	(303)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	128	(567)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.2	
- MD		every roll	-2.0		-0.1	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.7	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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000425

Roll Test Data Report

GSE Lining Technology, Inc.

Roll No. 114101788

ROLL IDENTIFICATION

Roll Number	114101788
Product Name	HMT080A004
Production Date	5/19/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	3,897	pounds
	1,768	kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil

E-2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	78	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	214	(374)
- MD		every roll	173	(303)	218	(381)
Break Strength, ppi - TD		every roll	324	(567)	430	(753)
- MD		every roll	324	(567)	472	(825)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		20	
- MD		every roll	13		22	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		673	
- MD		every roll	560		766	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	69	(307)
- MD		every roll	60	(267)	70	(311)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	126	(562)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.2	
- MD		every roll	-2.0		-0.1	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.7	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

APPROVED
5/19/99
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000426

Roll Test Data Report

GSE Lining Technology, Inc.

Roll No. 114101789

ROLL IDENTIFICATION

Roll Number	114101789
Product Name	HMT080A004
Production Date	5/19/99

Length ≈(+/- 1%)	390 119	feet meters
Width (Nominal)	23.5 7.2	feet meters
Sheet Area	9,165 851	sq. feet sq. meters
Weight	3,969 1,800	pounds kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil

2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	78	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	213	(372)
- MD		every roll	173	(303)	217	(379)
Break Strength, ppi - TD		every roll	324	(567)	475	(832)
- MD		every roll	324	(567)	462	(809)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		21	
- MD		every roll	13		22	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		765	
- MD		every roll	560		734	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	67	(296)
- MD		every roll	60	(267)	65	(290)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	131	(582)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.2	
- MD		every roll	-2.0		-0.1	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.7	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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000427

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101790

ROLL IDENTIFICATION

Roll Number	114101790
Product Name	HMT080A004
Production Date	5/19/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	3,900	pounds
	1,769	kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil

2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	78	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	204	(356)
- MD		every roll	173	(303)	209	(365)
Break Strength, ppi - TD		every roll	324	(567)	426	(746)
- MD		every roll	324	(567)	459	(804)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		21	
- MD		every roll	13		23	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		717	
- MD		every roll	560		740	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	67	(300)
- MD		every roll	60	(267)	69	(309)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	130	(577)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.1	
- MD		every roll	-2.0		-0.1	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.7	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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000428

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101791

ROLL IDENTIFICATION

Roll Number	114101791
Product Name	HMT080A004
Production Date	5/19/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	3,970	pounds
	1,801	kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil

2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	78	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	209	(365)
- MD		every roll	173	(303)	213	(373)
Break Strength, ppi - TD		every roll	324	(567)	396	(693)
- MD		every roll	324	(567)	407	(712)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		20	
- MD		every roll	13		23	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		663	
- MD		every roll	560		650	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	69	(308)
- MD		every roll	60	(267)	69	(307)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	129	(573)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.1	
- MD		every roll	-2.0		-0.1	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.7	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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5/20/99
QA

000429

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101792

ROLL IDENTIFICATION

Roll Number	114101792
Product Name	HMT080A004
Production Date	5/19/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	3,953	pounds
	1,793	kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil

2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	81	(2.1)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	209	(365)
- MD		every roll	173	(303)	222	(388)
Break Strength, ppi - TD		every roll	324	(567)	426	(746)
- MD		every roll	324	(567)	418	(731)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		23	
- MD		every roll	13		22	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		720	
- MD		every roll	560		668	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	70	(311)
- MD		every roll	60	(267)	72	(320)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	131	(583)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.2	
- MD		every roll	-2.0		-0.1	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.6	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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Roll Test Data Report

GSE Lining Technology, Inc.

Roll No. 114101793

ROLL IDENTIFICATION

Roll Number	114101793
Product Name	HMT080A004
Production Date	5/19/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	4,055	pounds
	1,839	kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601 — 2739
Supplier	Mobil

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	81	(2.1)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	219	(383)
- MD		every roll	173	(303)	220	(385)
Break Strength, ppi - TD		every roll	324	(567)	475	(832)
- MD		every roll	324	(567)	489	(856)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		20	
- MD		every roll	13		22	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		778	
- MD		every roll	560		805	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	71	(315)
- MD		every roll	60	(267)	70	(313)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	133	(591)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.2	
- MD		every roll	-2.0		-0.1	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.6	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101794

ROLL IDENTIFICATION

Roll Number	114101794
Product Name	HMT080A004
Production Date	5/19/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	3,915	pounds
	1,776	kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil

2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	218	(382)
- MD		every roll	173	(303)	226	(396)
Break Strength, ppi - TD		every roll	324	(567)	429	(751)
- MD		every roll	324	(567)	445	(778)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		21	
- MD		every roll	13		20	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		694	
- MD		every roll	560		704	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	70	(313)
- MD		every roll	60	(267)	72	(322)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	133	(591)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.3	
- MD		every roll	-2.0		-0.2	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.942	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.7	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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000432

Roll Test Data Report

GSE Lining Technology, Inc.

Roll No. 114101795

ROLL IDENTIFICATION

Roll Number	114101795
Product Name	HMT080A004
Production Date	5/19/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	3,965	pounds
	1,799	kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil

2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	197	(345)
- MD		every roll	173	(303)	210	(367)
Break Strength, ppi - TD		every roll	324	(567)	369	(646)
- MD		every roll	324	(567)	405	(709)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		23	
- MD		every roll	13		20	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		620	
- MD		every roll	560		665	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	69	(305)
- MD		every roll	60	(267)	70	(310)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	126	(562)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.3	
- MD		every roll	-2.0		-0.2	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.942	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.7	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101796

ROLL IDENTIFICATION

Roll Number	114101796
Product Name	HMT080A004
Production Date	5/20/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	3,947	pounds
	1,790	kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil

2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	81	(2.0)
Minimum		every roll	76	(1.9)	76	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	224	(393)
- MD		every roll	173	(303)	226	(395)
Break Strength, ppi - TD		every roll	324	(567)	462	(809)
- MD		every roll	324	(567)	471	(825)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		23	
- MD		every roll	13		23	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		726	
- MD		every roll	560		767	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	70	(309)
- MD		every roll	60	(267)	72	(323)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	134	(595)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.0	
- MD		every roll	-2.0		-0.1	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.6	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101797

ROLL IDENTIFICATION

Roll Number	114101797
Product Name	HMT080A004
Production Date	5/20/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	3,959	pounds
	1,796	kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil

2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	228	(399)
- MD		every roll	173	(303)	230	(403)
Break Strength, ppi - TD		every roll	324	(567)	442	(774)
- MD		every roll	324	(567)	464	(811)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		22	
- MD		every roll	13		22	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		705	
- MD		every roll	560		718	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	72	(321)
- MD		every roll	60	(267)	75	(334)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	134	(595)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.1	
- MD		every roll	-2.0		-0.2	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.942	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.7	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101798

ROLL IDENTIFICATION

Roll Number	114101798
Product Name	HMT080A004
Production Date	5/20/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	3,893	pounds
	1,766	kilograms

RESIN INFORMATION

Lot Number	A60646
Type	HDA601
Supplier	Mobil

2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.59

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	219	(383)
- MD		every roll	173	(303)	225	(394)
Break Strength, ppi - TD		every roll	324	(567)	440	(770)
- MD		every roll	324	(567)	475	(831)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		21	
- MD		every roll	13		21	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		682	
- MD		every roll	560		751	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	72	(320)
- MD		every roll	60	(267)	72	(322)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	135	(601)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.1	
- MD		every roll	-2.0		0.0	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.4	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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Roll Test Data Report

Lining Technology, Inc.

Roll No. 114101799

ROLL IDENTIFICATION

Roll Number	114101799
Product Name	HMT080A004
Production Date	5/20/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	3,912	pounds
	1,774	kilograms

RESIN INFORMATION

Lot Number	A60646
Type	HDA601
Supplier	Mobil

2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.59

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	210	(368)
- MD		every roll	173	(303)	216	(377)
Break Strength, ppi - TD		every roll	324	(567)	438	(767)
- MD		every roll	324	(567)	457	(800)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		21	
- MD		every roll	13		22	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		696	
- MD		every roll	560		734	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	72	(321)
- MD		every roll	60	(267)	69	(308)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	139	(618)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.1	
- MD		every roll	-2.0		0.0	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.4	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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000437

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101800

ROLL IDENTIFICATION

Roll Number	114101800
Product Name	HMT080A004
Production Date	5/20/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	3,907	pounds
	1,772	kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil

2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	226	(395)
- MD		every roll	173	(303)	217	(380)
Break Strength, ppi - TD		every roll	324	(567)	441	(772)
- MD		every roll	324	(567)	460	(806)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		21	
- MD		every roll	13		22	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		684	
- MD		every roll	560		730	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	68	(303)
- MD		every roll	60	(267)	65	(287)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	135	(599)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.1	
- MD		every roll	-2.0		-0.2	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.942	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.7	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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000438

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101801

ROLL IDENTIFICATION

Roll Number	114101801
Product Name	HMT080A004
Production Date	5/20/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	3,992	pounds
	1,811	kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil

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GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	225	(395)
- MD		every roll	173	(303)	227	(397)
Break Strength, ppi - TD		every roll	324	(567)	438	(767)
- MD		every roll	324	(567)	469	(820)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		22	
- MD		every roll	13		21	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		706	
- MD		every roll	560		753	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	75	(335)
- MD		every roll	60	(267)	74	(328)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	128	(570)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.1	
- MD		every roll	-2.0		-0.2	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.942	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.7	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101802

ROLL IDENTIFICATION

Roll Number	114101802
Product Name	HMT080A004
Production Date	5/20/99

Length ≈(+/- 1%)	390 119	feet meters
Width (Nominal)	23.5 7.2	feet meters
Sheet Area	9,165 851	sq. feet sq. meters
Weight	3,948 1,791	pounds kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil

2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	222	(389)
- MD		every roll	173	(303)	224	(392)
Break Strength, ppi - TD		every roll	324	(567)	452	(790)
- MD		every roll	324	(567)	477	(835)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		22	
- MD		every roll	13		21	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		721	
- MD		every roll	560		768	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	73	(326)
- MD		every roll	60	(267)	73	(325)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	132	(586)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.1	
- MD		every roll	-2.0		-0.2	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.7	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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000440

Roll Test Data Report

GSE Lining Technology, Inc.

Roll No. 114101803

ROLL IDENTIFICATION

Roll Number	114101803
Product Name	HMT080A004
Production Date	5/20/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	3,940	pounds
	1,787	kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil

2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	212	(371)
- MD		every roll	173	(303)	218	(382)
Break Strength, ppi - TD		every roll	324	(567)	409	(716)
- MD		every roll	324	(567)	408	(713)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		21	
- MD		every roll	13		21	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		668	
- MD		every roll	560		652	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	69	(307)
- MD		every roll	60	(267)	71	(317)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	130	(578)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.1	
- MD		every roll	-2.0		-0.2	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.7	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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000441

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101804

ROLL IDENTIFICATION

Roll Number	114101804
Product Name	HMT080A004
Production Date	5/20/99

Length ≈(+/- 1%)	390 119	feet meters
Width (Nominal)	23.5 7.2	feet meters
Sheet Area	9,165 851	sq. feet sq. meters
Weight	3,947 1,790	pounds kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil

2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	81	(2.0)
Minimum		every roll	76	(1.9)	76	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	212	(371)
- MD		every roll	173	(303)	225	(394)
Break Strength, ppi - TD		every roll	324	(567)	412	(720)
- MD		every roll	324	(567)	458	(802)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		22	
- MD		every roll	13		21	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		670	
- MD		every roll	560		723	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	64	(285)
- MD		every roll	60	(267)	72	(319)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	134	(595)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.0	
- MD		every roll	-2.0		-0.1	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.6	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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000442

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101806

ROLL IDENTIFICATION

Roll Number	114101806
Product Name	HMT080A004
Production Date	5/20/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	3,975	pounds
	1,803	kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil

2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	81	(2.1)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	207	(362)
- MD		every roll	173	(303)	212	(371)
Break Strength, ppi - TD		every roll	324	(567)	423	(740)
- MD		every roll	324	(567)	465	(813)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		21	
- MD		every roll	13		22	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		697	
- MD		every roll	560		761	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	68	(304)
- MD		every roll	60	(267)	70	(313)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	129	(576)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.2	
- MD		every roll	-2.0		-0.2	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.6	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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000443

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101807

ROLL IDENTIFICATION

Roll Number	114101807
Product Name	HMT080A004
Production Date	5/20/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	3,919	pounds
	1,778	kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601 — 2739
Supplier	Mobil

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	81	(2.1)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	209	(366)
- MD		every roll	173	(303)	211	(370)
Break Strength, ppi - TD		every roll	324	(567)	409	(716)
- MD		every roll	324	(567)	418	(732)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		23	
- MD		every roll	13		22	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		680	
- MD		every roll	560		669	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	67	(300)
- MD		every roll	60	(267)	68	(301)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	130	(576)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.2	
- MD		every roll	-2.0		-0.2	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.6	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

000444

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GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101808

ROLL IDENTIFICATION

Roll Number	114101808
Product Name	HMT080A004
Production Date	5/20/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	3,970	pounds
	1,801	kilograms

RESIN INFORMATION

Lot Number	A60646
Type	HDA601
Supplier	Mobil

— 2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.59

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	204	(357)
- MD		every roll	173	(303)	208	(365)
Break Strength, ppi - TD		every roll	324	(567)	437	(764)
- MD		every roll	324	(567)	424	(743)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		23	
- MD		every roll	13		23	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		734	
- MD		every roll	560		680	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	68	(303)
- MD		every roll	60	(267)	69	(309)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	129	(572)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.0	
- MD		every roll	-2.0		-0.1	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.4	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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Quality Assurance Laboratory Test Results

RECEIVED JUL 2 8 [illegible]

Job Name: Fluor Daniel Fernald
Sales Order: 6181
Test: Asperity measurement of Textured Geomembranes Using a Depth Gage GRI GM12

Roll #	Minimum Requirement (mils)	Test Results	Status
114101734	7	19	Pass
114101738	7	17	Pass
114101742	7	16	Pass
114101746	7	18	Pass
114101750	7	15	Pass
114101754	7	16	Pass
114101758	7	14	Pass
114101762	7	18	Pass
114101766	7	17	Pass
114101770	7	16	Pass
114101774	7	15	Pass
114101777	7	14	Pass
114101782	7	15	Pass
114101786	7	21	Pass
114101790	7	17	Pass
114101794	7	20	Pass
114101798	7	22	Pass
114101802	7	17	Pass
114101806	7	16	Pass
114101810	7	20	Pass
114101814	7	22	Pass
114101818	7	23	Pass

OK
KBT
8-10-99

APPROVED #22 [illegible] QA

GSE Lining Technology, Inc.

Roll Test Data Report

-- 2739

Roll No. 114101817

ROLL IDENTIFICATION

Roll Number	114101817
Product Name	HMT080A004
Production Date	5/21/99

Length ≈(+/- 1%)	394	feet
	120	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,259	sq. feet
	860	sq. meters
Weight	3,950	pounds
	1,792	kilograms

RESIN INFORMATION

Lot Number	A60651
Type	HDA601
Supplier	Mobil

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (190/2.16)	0.59

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D 1593/D 751/D 5994					
Average		every roll	80	(2.0)	81	(2.1)
Minimum		every roll	76	(1.9)	79	(2.0)
Tensile Properties:	ASTM D 638, Type IV					
Yield Strength, ppi (N/cm) - TD		every roll	173	(303)	214	(374)
- MD		every roll	173	(303)	218	(382)
Break Strength, ppi (N/cm) - TD		every roll	324	(567)	450	(788)
- MD		every roll	324	(567)	482	(843)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		22	
- MD	(33 mm)	every roll	13		20	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		728	
- MD	(64 mm)	every roll	560		768	
Tear Resistance, lb. (N)	ASTM D 1004					
- TD		every roll	60	(267)	71	(316)
- MD		every roll	60	(267)	72	(318)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	136	(606)
Dimensional Stability, %	ASTM D 1204 (100C, 1hr)					
- TD		every roll	-2.0		0.2	
- MD		every roll	-2.0		-0.3	
Density, g/cc	ASTM D 1505					
		every 4th	0.940		0.944	
Carbon Black Content, %	ASTM D 1603					
		every 4th	2.0		2.7	
ESCR, (hr)	ASTM D 1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D 5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101809

ROLL IDENTIFICATION

Roll Number	114101809
Product Name	HMT080A004
Production Date	5/20/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	3,886	pounds
	1,763	kilograms

RESIN INFORMATION

Lot Number	A60646
Type	HDA601
Supplier	Mobil

2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.59

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	213	(373)
- MD		every roll	173	(303)	210	(368)
Break Strength, ppi - TD		every roll	324	(567)	426	(746)
- MD		every roll	324	(567)	423	(741)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		22	
- MD		every roll	13		22	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		754	
- MD		every roll	560		680	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	68	(303)
- MD		every roll	60	(267)	68	(302)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	130	(580)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.0	
- MD		every roll	-2.0		-0.1	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.4	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101810

ROLL IDENTIFICATION

Roll Number	114101810
Product Name	HMT080A004
Production Date	5/20/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	3,925	pounds
	1,780	kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601 – 2739
Supplier	Mobil

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	221	(387)
- MD		every roll	173	(303)	217	(379)
Break Strength, ppi - TD		every roll	324	(567)	418	(731)
- MD		every roll	324	(567)	405	(708)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		21	
- MD		every roll	13		20	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		694	
- MD		every roll	560		672	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	71	(317)
- MD		every roll	60	(267)	73	(323)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	135	(599)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.3	
- MD		every roll	-2.0		-0.2	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.8	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101811

ROLL IDENTIFICATION

Roll Number	114101811
Product Name	HMT080A004
Production Date	5/20/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	3,985	pounds
	1,808	kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil

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GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	223	(390)
- MD		every roll	173	(303)	224	(392)
Break Strength, ppi - TD		every roll	324	(567)	412	(720)
- MD		every roll	324	(567)	405	(708)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		20	
- MD		every roll	13		22	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		700	
- MD		every roll	560		642	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	72	(321)
- MD		every roll	60	(267)	72	(319)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	128	(570)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.3	
- MD		every roll	-2.0		-0.2	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.8	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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Roll Test Data Report

GSE Lining Technology, Inc.

Roll No. 114101812

ROLL IDENTIFICATION

Roll Number	114101812
Product Name	HMT080A004
Production Date	5/20/99

Length ≈(+/- 1%)	390	feet
	119	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,165	sq. feet
	851	sq. meters
Weight	3,940	pounds
	1,787	kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil

2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	81	(2.0)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	210	(368)
- MD		every roll	173	(303)	210	(367)
Break Strength, ppi - TD		every roll	324	(567)	429	(751)
- MD		every roll	324	(567)	426	(745)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		23	
- MD		every roll	13		21	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		715	
- MD		every roll	560		686	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	67	(300)
- MD		every roll	60	(267)	72	(319)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	130	(580)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.3	
- MD		every roll	-2.0		-0.2	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.8	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101813

ROLL IDENTIFICATION

Roll Number	114101813
Product Name	HMT080A004
Production Date	5/20/99

Length ≈(+/- 1%)	397	feet
	121	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,330	sq. feet
	867	sq. meters
Weight	3,985	pounds
	1,808	kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil

2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	81	(2.0)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	207	(362)
- MD		every roll	173	(303)	208	(364)
Break Strength, ppi - TD		every roll	324	(567)	347	(607)
- MD		every roll	324	(567)	467	(818)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		20	
- MD		every roll	13		23	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		588	
- MD		every roll	560		763	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	68	(304)
- MD		every roll	60	(267)	70	(313)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	133	(590)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.3	
- MD		every roll	-2.0		-0.2	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.8	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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000452

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101814

ROLL IDENTIFICATION

Roll Number	114101814
Product Name	HMT080A004
Production Date	5/20/99

Length ≈(+/- 1%)	394	feet
	120	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,259	sq. feet
	860	sq. meters
Weight	3,941	pounds
	1,788	kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil

2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	211	(370)
- MD		every roll	173	(303)	213	(372)
Break Strength, ppi - TD		every roll	324	(567)	463	(811)
- MD		every roll	324	(567)	451	(790)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		22	
- MD		every roll	13		21	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		764	
- MD		every roll	560		717	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	70	(312)
- MD		every roll	60	(267)	71	(317)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	133	(591)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.2	
- MD		every roll	-2.0		-0.1	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.8	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101815

ROLL IDENTIFICATION

Roll Number	114101815
Product Name	HMT080A004
Production Date	5/21/99

Length ≈(+/- 1%)	394 120	feet meters
Width (Nominal)	23.5 7.2	feet meters
Sheet Area	9,259 860	sq. feet sq. meters
Weight	3,955 1,794	pounds kilograms

RESIN INFORMATION

Lot Number	A60647
Type	HDA601
Supplier	Mobil

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GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.60

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	213	(373)
- MD		every roll	173	(303)	209	(366)
Break Strength, ppi - TD		every roll	324	(567)	416	(727)
- MD		every roll	324	(567)	436	(762)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		24	
- MD		every roll	13		21	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		679	
- MD		every roll	560		704	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	69	(309)
- MD		every roll	60	(267)	72	(319)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	131	(582)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.2	
- MD		every roll	-2.0		-0.1	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.8	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101816

ROLL IDENTIFICATION

Roll Number	114101816
Product Name	HMT080A004
Production Date	5/21/99

Length ≈(+/- 1%)	394	feet
	120	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,259	sq. feet
	860	sq. meters
Weight	3,925	pounds
	1,780	kilograms

RESIN INFORMATION

Lot Number	A60651
Type	HDA601
Supplier	Mobil

2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.59

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	81	(2.1)
Minimum		every roll	76	(1.9)	79	(2.0)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	216	(378)
- MD		every roll	173	(303)	214	(375)
Break Strength, ppi - TD		every roll	324	(567)	455	(796)
- MD		every roll	324	(567)	436	(764)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		21	
- MD		every roll	13		21	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		744	
- MD		every roll	560		697	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	69	(308)
- MD		every roll	60	(267)	71	(317)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	137	(609)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.2	
- MD		every roll	-2.0		-0.3	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.944	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.7	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101818

ROLL IDENTIFICATION

Roll Number	114101818
Product Name	HMT080A004
Production Date	5/21/99

Length ≈(+/- 1%)	394	feet
	120	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,259	sq. feet
	860	sq. meters
Weight	3,934	pounds
	1,784	kilograms

RESIN INFORMATION

Lot Number	A60651
Type	HDA601
Supplier	Mobil

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GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.59

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	81	(2.0)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	219	(383)
- MD		every roll	173	(303)	221	(386)
Break Strength, ppi - TD		every roll	324	(567)	482	(844)
- MD		every roll	324	(567)	447	(783)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		21	
- MD		every roll	13		20	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		777	
- MD		every roll	560		704	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	72	(318)
- MD		every roll	60	(267)	73	(327)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	135	(602)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.3	
- MD		every roll	-2.0		-0.3	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.944	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.7	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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000456

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101819

ROLL IDENTIFICATION

Roll Number	114101819
Product Name	HMT080A004
Production Date	5/21/99

Length ≈(+/- 1%)	394	feet
	120	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,259	sq. feet
	860	sq. meters
Weight	3,945	pounds
	1,789	kilograms

RESIN INFORMATION

Lot Number	A60651
Type	HDA601 — 2739
Supplier	Mobil

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.59

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	81	(2.0)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	220	(386)
- MD		every roll	173	(303)	222	(389)
Break Strength, ppi - TD		every roll	324	(567)	385	(674)
- MD		every roll	324	(567)	452	(790)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		21	
- MD		every roll	13		20	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		621	
- MD		every roll	560		711	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	72	(321)
- MD		every roll	60	(267)	73	(323)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	135	(600)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.3	
- MD		every roll	-2.0		-0.3	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.944	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.7	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

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000457

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114101820

ROLL IDENTIFICATION

Roll Number	114101820
Product Name	HMT080A004
Production Date	5/21/99

Length ≈(+/- 1%)	394	feet
	120	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,259	sq. feet
	860	sq. meters
Weight	3,948	pounds
	1,791	kilograms

RESIN INFORMATION

Lot Number	A60651
Type	HDA601
Supplier	Mobil

2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.59

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5994					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	219	(382)
- MD		every roll	173	(303)	229	(400)
Break Strength, ppi - TD		every roll	324	(567)	370	(648)
- MD		every roll	324	(567)	446	(781)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		20	
- MD		every roll	13		22	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		607	
- MD		every roll	560		684	
Tear Resistance, lb. (N)	ASTM D1004					
- TD		every roll	60	(267)	73	(323)
- MD		every roll	60	(267)	74	(329)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	137	(611)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.3	
- MD		every roll	-2.0		-0.3	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.944	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.7	
ESCR status	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

000458

APPROVED
J.Y.
5/21/99
QA

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 115102807

ROLL IDENTIFICATION

Roll Number	115102807
Product Name	HME080A004
Production Date	5/15/99

Length ≈(+/- 1%)	247	feet
	75	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	5,805	sq. feet
	539	sq. meters
Weight	2,382	pounds
	1,080	kilograms

RESIN INFORMATION

Lot Number	A60646
Type	HDA601
Supplier	Mobil — 2739

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (2.16 kg/190 °C)	0.59

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D1593/D751/D5199					
Average		every roll	80	(2.0)	80	(2.0)
Minimum		every roll	76	(1.9)	77	(1.9)
Tensile Properties:	ASTM D638, Type IV					
Yield Strength, ppi - TD		every roll	173	(303)	206	(360)
- MD		every roll	173	(303)	202	(353)
Break Strength, ppi - TD		every roll	324	(567)	481	(842)
- MD		every roll	324	(567)	476	(832)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		21	
- MD		every roll	13		21	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		819	
- MD		every roll	560		815	
Tear Resistance, lb. (N)	ASTM D1004 Die C					
- TD		every roll	60	(267)	69	(309)
- MD		every roll	60	(267)	69	(307)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	133	(592)
Dimensional Stability, %	ASTM D1204 (100C, 1hr)					
- TD		every roll	-2.0		0.1	
- MD		every roll	-2.0		0.0	
Density, g/cc	ASTM D1505					
		every 4th	0.940		0.943	
Carbon Black Content, %	ASTM D1603					
		every 4th	2.0		2.4	
ESCR (hr)	ASTM D1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

000459

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JY.
5/21/99
QA

SUPPLIER DOCUMENT SUBMITTAL

FDF PROJECT NO.: (1) 20102	CONTRACT NO: (2) 1440	SUBMITTAL NO.:(3) 003	REV.:(4) 2	DATE:(5) 8/10/99	Page 1 of 5 (6)

FROM: **GSE Lining Technologies** (7)

SIGNATURE: _____

TO: **FDF ENGINEERING/CONSTRUCTION**
DOCUMENT CONTROL (ECDC), MS 52-7 (8)

RECEIVED BY: _____ DATE: _____

			DOCUMENT FAMILY									SUBMITTAL TYPE				SUBMITTAL ACTION		
QTY	DOCUMENT NUMBER	REV	PRO	H&S	MED	TRG	CON	ENG	QAC	OPER	TITLE/DESCRIPTION	DRFT	CFC	INF	ASSOCIATED SPECIFICATION	A	B	C
(9)	(10)	(11)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(13)	(14)	(14)	(14)	(15)	(16)	(16)	(16)
8	1440-003A	1							X		Manufacturing Certificates per shift production		X		02770P.1.05.C	X		

REVIEW DISTRIBUTION

NAME	MS	NAME	MS	NAME	MS
(17)	(18)	(17)	(18)	(17)	(18)
Jim Jenkins, FDF, Eng., Approver	64	Chuck Van Arsdale, FDF, Eng.	64		
Kwasi Badu-Tweneboah, GeoSyntec, Eng.	38				
Kathy Fisher, FDF, Procurement	64				
Gregg Johnson, FDF, Health and Safety	64				
Tony Klimek, FDF, Eng.	64				
Jim Turner, FDF, QA	64				

RECEIVED AUG 10 1999 KBT 1 PM.

NO COMMENTS: X COMMENTS: (PLEASE USE SPACE BELOW FOR COMMENTS OR INDICATE IF ATTACHMENTS) (19)

RECEIVED BY: [signature] DATE: 8/10/99

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SUBMITTAL TYPE: (BY SUPPLIER)
CFC - CERTIFIED FOR CONSTRUCTION
INF - INFORMATION/RECORD
DRFT - DRAFT/PRELIMINARY

SUBMITTAL ACTION CODE: (BY FDF)
A - Conforms to the Subcontract Requirements
B - Minor Comments - Incorporate and Resubmit
C - Revise and Resubmit (SEE COMMENTS)

000460

F-27339

FS-F-4955
Rev. 4: 04/??/1999

GSE®

2739

Quality Assurance Laboratory Test Results

RECEIVED JUL 2 8

Job Name: Fluor Daniel Fernald
Sales Order: 6181
Test: Asperity measurement of Textured Geomembranes Using a Depth Gage GRI GM12

Roll #	Minimum Requirement (mils)	Test Results	Status
114101734	7	19	Pass
114101738	7	17	Pass
114101742	7	16	Pass
114101746	7	18	Pass
114101750	7	15	Pass
114101754	7	16	Pass
114101758	7	14	Pass
114101762	7	18	Pass
114101766	7	17	Pass
114101770	7	16	Pass
114101774	7	15	Pass
114101777	7	14	Pass
114101782	7	15	Pass
114101786	7	21	Pass
114101790	7	17	Pass
114101794	7	20	Pass
114101798	7	22	Pass
114101802	7	17	Pass
114101806	7	16	Pass
114101810	7	20	Pass
114101814	7	22	Pass
114101818	7	23	Pass

OK
KBT
8-10-99

APPROVED
#22

GSE Lining Technology, Inc.

Roll Test Data Report

-- 2739

Roll No. 114101817

ROLL IDENTIFICATION

Roll Number	114101817
Product Name	HMT080A004
Production Date	5/21/99

Length ≈(+/- 1%)	394	feet
	120	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	9,259	sq. feet
	860	sq. meters
Weight	3,950	pounds
	1,792	kilograms

RESIN INFORMATION

Lot Number	A60651
Type	HDA601
Supplier	Mobil

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (190/2.16)	0.59

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D 1593/D 751/D 5994					
Average		every roll	80	(2.0)	81	(2.1)
Minimum		every roll	76	(1.9)	79	(2.0)
Tensile Properties:	ASTM D 638, Type IV					
Yield Strength, ppi (N/cm) - TD		every roll	173	(303)	214	(374)
- MD		every roll	173	(303)	218	(382)
Break Strength, ppi (N/cm) - TD		every roll	324	(567)	450	(788)
- MD		every roll	324	(567)	482	(843)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	13		22	
- MD	(33 mm)	every roll	13		20	
Break Elongation, % - TD	gauge length = 2.5"	every roll	560		728	
- MD	(64 mm)	every roll	560		768	
Tear Resistance, lb. (N)	ASTM D 1004					
- TD		every roll	60	(267)	71	(316)
- MD		every roll	60	(267)	72	(318)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every roll	105	(467)	136	(606)
Dimensional Stability, %	ASTM D 1204 (100C, 1hr)					
- TD		every roll	-2.0		0.2	
- MD		every roll	-2.0		-0.3	
Density, g/cc	ASTM D 1505					
		every 4th	0.940		0.944	
Carbon Black Content, %	ASTM D 1603					
		every 4th	2.0		2.7	
ESCR, (hr)	ASTM D 1693 Cond. B					
	Start Date = 5/21/99	every roll	1500		Pending	
Carbon Black Dispersion	ASTM D 5596					
Views in Cat1 - Cat2		every 4th	10		10	

Order No.	6181
Customer Name	FLUOR DANIEL FERNALD
Location	HARRISON, OH

000462

APPROVED
JY
5/21/99
QA

CROSTEXTILE

SUPPLIER DOCUMENT SUBMITTAL

FDF PROJECT NO.: (1) 20102	CONTRACT NO: (2) 1441	SUBMITTAL NO.:(3) 001	REV.:(4) 1	DATE:(5) 07/22/99	Page 1 of 7 (6)

FROM: TNS Advanced Technologies, Inc.
405 Hood Road
Lilburn, Georgia 30047

SIGNATURE: RECORD

TO: FDF ENGINEERING/CONSTRUCTION DOCUMENT CONTROL (ECDC), MS 52-7

(8)

RECEIVED BY: DATE:

QTY	DOCUMENT NUMBER	REV	DOCUMENT FAMILY PRO	H&S	MED	TRG	CON	ENG	QAC	OPER	TITLE/DESCRIPTION	SUBMITTAL TYPE DRFT	CFC	INF	ASSOCIATED SPECIFICATION	SUBMITTAL ACTION A	B	C
(9)	(10)	(11)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(13)	(14)	(14)	(14)	(15)	(16)	(16)	(16)
8	1441-001A	0					X				Submittal Register			X	ACR001			
8	1441-001F	1							X		Certification of MARV			X	02714P.1.04.A.3		X	
8	1441-001H	0						X			Long Term Storage Requirements		X		02714P.1.04.A.5	X		

REVIEW DISTRIBUTION

NAME	MS	NAME	MS	NAME	MS
(17)	(18)	(17)	(18)	(17)	(18)
Jim Jenkins, FDF, Eng., Approval	64	Chuck Van Arsdale, FDF, Eng.	64		
Kwasi Badu-Tweneboah, GeoSyntec, Eng. ✓	38			RECEIVED	
Kathy Fisher, FDF, Purchasing	64			JUL 22 1999	
Gregg Johnson, FDF, Health and Safety	64				
Tony Klimek, FDF, Eng.	64				
Jim Turner, FDF, QA	64				

NO COMMENTS: _____ COMMENTS: (PLEASE USE SPACE BELOW FOR COMMENTS OR INDICATE IF ATTACHMENTS) (19)

000464

2739

RECEIVED BY: [signature] DATE: 07/22/99
(SIGN/DATE AND RETURN A COPY TO ECDC, MS 52-7)

SUBMITTAL TYPE: (BY SUPPLIER)
CFC - CERTIFIED FOR CONSTRUCTION
INF - INFORMATION/RECORD
DRFT - DRAFT/PRELIMINARY

SUBMITTAL ACTION CODE: (BY FDF)
A - Conforms to the Subcontract Requirements
B - Minor Comments - Incorporate and Resubmit
C - Revise and Resubmit (SEE COMMENTS)

FS-F-4955
Rev. 4: 04/??/1999

1441-00[illegible]

TABLE 1
GEOSYNTHETIC MATERIALS
CONTRACT 99SC001441 (TNS)
SUBMITTAL REGISTER
BASE BID

Supplier Submittal Number	Rev No.	Document Number	Rev No.	Specification Requirement Reference	Document Description	Document Type	Document Family	Due Date
1441-001	0	1441-001A		ACR001	Submittal Register	INF	Const	a
1441-001	0	1441-001B		Contract Section C	Material Safety Data Sheets	INF	H&S	a&d
1441-001	0	1441-001C		I, General Provisions	Warranty for Geotextile	INF	Proc	a
1441-001	0	1441-001D		02714P.1.04.A.1	Product Name	INF	Engr	a
1441-001	0	1441-001E		02714P.1.04.A.2	Geotextile Manufacturing Capabilities	INF	Engr	a
1441-001	0	1441-001F		02714P.1.04.A.3	Certification of Minimum Average Roll Values	INF	QA	a
1441-001	0	1441-001G		02714P.1.04.A.4	Projected Delivery Dates	INF	Const	a
1441-001	0	1441-001H		02714P.1.04.A.5	Recommended Long-Term Storage Requirements	CFC	Engr	a
1441-001	0	1441-001I		02714P.1.04.A.6	Completed Forms GT-7, GT-10 and GT-16	CFC	Engr	a
1441-002	0	1441-002		02714P.1.05.B	Quality control Certificates	CFC	QA	c
1441-003	0	1441-003		02714P.2.02	Quality control sampling and testing plan	INF	QA	b

a. April 9, 1999
b. April 19, 1999
c. 21 days prior to shipment
d. With shipment

The supplier shall provide submittals in accordance with Administrative Contractor Requirements ACR-001, attached.

Submittal 1441-001 Rev. 1
7-22-99 p. 2 of 7
Doc. # 1441-001A
RECORD -- 2739

FDF to comment
[signature] 07/22/99

000465

F:\WPW61\CRU2\PROCURMT\99sbmtls\SR0602.wpd Jun 30, 99 (01:44p)

TNS ADVANCED TECHNOLOGIES, INC.
405 Hood Road
Lilburn, GA 30047
Phone: 770/564-1857 Fax:770/564-1818

F-2739

Submittal 1441-001 Rev. 1
7-22-99 p. 3 of 7
Doc. # 1441-001F

February 25, 1999

RECORD

Fluor Daniel Fernald

Dear Sir/Madam:

This is to certify that TNS E070 is a superior quality, nonwoven geotextile produced by needlepunching together 100% polypropylene staple fibers in a random network to form a high strength dimensionally stable fabric. The polypropylene fibers are specially formulated to resist ultraviolet light deterioration, and are inert to commonly encountered soil chemicals. The fabric will not rot or mildew, is non-biodegradable, and is resistant to damage from insects and rodents. Polypropylene is stable within a ph range of 2 to 13. TNS E070 conforms to the physical property values listed below:

FABRIC PROPERTY	TEST METHOD	UNITS	M.A.R.V. Roll Value
Weight	ASTM D5261	mils	7.0
Grab Tensile ?	ASTM D4632	lbs	200
Grab Elongation	ASTM D4632	%	50
Trap Tear ?	ASTM D4533	lbs	75
Puncture	ASTM D4833	lbs	115
Permittivity	ASTM D4491	1/sec	1.41
Permeability	ASTM D4491	cm/sec	.32
Water Flow	ASTM D4491	gpm/ft^2	110
Mullen Burst	ASTM D3786	psi	400
AOS	ASTM D4751	US Sieve	80
UV Resistance, after 500 hrs	ASTM D4355	% Strength retained	70

Sincerely,

Marshall Gaddy
QA/QC Manager
TNS Advanced Technologies

Comments:
1. weight units should be oz/yd^2.
2. Grab Tensile and Tear should have results in both machine and cross-machine directions.
3. AOS units should be in millimeters.

07/22/99

TNS ADVANCED TECHNOLOGIES, IN
405 Hood Road
Lilburn, GA 30047
Phone: 770/564-1857 Fax:770/564-1818

2739

February 25, 1999

RECORD

Su
7-
Doc.

Fluor Daniel Fernald

Dear Sir/Madam:

This is to certify that TNS E100 is a superior quality, nonwoven geotextile proc needlepunching together 100% polypropylene staple fibers in a random networl strength dimensionally stable fabric. The polypropylene fibers are specially fon ultraviolet light deterioration, and are inert to commonly encountered soil chemi will not rot or mildew, is non-biodegradable, and is resistant to damage from ins Polypropylene is stable within a ph range of 2 to 13. TNS E100 conforms to the property values listed below:

FABRIC PROPERTY	TEST METHOD	UNITS	M Ro
Weight	ASTM D5261	mils	
Grab Tensile ?	ASTM D4632	lbs	
Grab Elongation	ASTM D4632	%	
Trap Tear ?	ASTM D4533	lbs	1
Puncture	ASTM D4833	lbs	16
Permittivity	ASTM D4491	1/sec	.94
Permeability	ASTM D4491	cm/sec	.30
Water Flow	ASTM D4491	gpm/ft^2	75
Mullen Burst	ASTM D3786	psi	560
AOS	ASTM D4751	US Sieve	100
UV Resistance, after 500 hrs	ASTM D4355	% Strength retained	70

Sincerely,

Marshall Gaddy
QA/QC Manager
TNS Advanced Technologies

See comments on TNS E070
MARV.
07/22/99

TNS ADVANCED TECHNOLOGIES, INC.
405 Hood Road
Lilburn, GA 30047
Phone: 770/564-1857 Fax:770/564-1818

-- 2739

February 25, 1999

RECORD

Submittal 1441-001 Rev. 1
7-22-99 p. 5 of 7
Doc. #1441-001F

Fluor Daniel Fernald

Dear Sir/Madam:

This is to certify that TNS E160 is a superior quality, nonwoven geotextile produced by needlepunching together 100% polypropylene staple fibers in a random network to form a high strength dimensionally stable fabric. The polypropylene fibers are specially formulated to resist ultraviolet light deterioration, and are inert to commonly encountered soil chemicals. The fabric will not rot or mildew, is non-biodegradable, and is resistant to damage from insects and rodents. Polypropylene is stable within a ph range of 2 to 13. TNS E160 conforms to the physical property values listed below:

FABRIC PROPERTY	TEST METHOD	UNITS	M.A.R.V. Roll Value
Weight	ASTM D5261	mils	16.0
Grab Tensile ?	ASTM D4632	lbs	425
Grab Elongation	ASTM D4632	%	50
Trap Tear ?	ASTM D4533	lbs	150
Puncture	ASTM D4833	lbs	240
Permittivity	ASTM D4491	1/sec	.57
Permeability	ASTM D4491	cm/sec	.25
Water Flow	ASTM D4491	gpm/ft^2	45
Mullen Burst	ASTM D3786	psi	800
AOS	ASTM D4751	US Sieve	100
UV Resistance, after 500 hrs	ASTM D4355	% Strength retained	70

Sincerely,

Marshall Gaddy
QA/QC Manager
TNS Advanced Technologies

See comments on TNS E070 MARV.
07/22/99

1441-001. Rev. 21 7-22-99 p. ~~2 of 3~~ Doc. # 1441-001H 6 of 7

RECORD

Standard Guide for Identification, Storage, and Handling of Geotextiles[1]

—2739

This standard is issued under the fixed designation D 4873; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This standard provides guidelines for the identification and packaging of geotextiles by the manufacturer and for the handling, storage, and placement of geotextiles by the end user. This guide is not to be considered as all-encompassing since each project involving geotextiles presents its own challenges and special conditions.

1.2 This guide is intended to aid manufacturers, suppliers, purchasers and users of geotextiles in the identification, handling, and storage of the geotextiles.

1.3 *This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

D 123 Terminology Relating to Textiles[2]

D 4439 Terminology for Geosynthetics[3]

3. Terminology

3.1 *Definitions:*

3.1.1 *geotextile, n*—any permeable textile used with foundation soil, rock, earth, or any other geotechnical related material as an integral part of a man-made product, structure, or system.

3.1.2 For definitions of other geotextile terms, refer to Terminology D 4439.

3.1.3 For definitions of textile terms, refer to Terminology D 123.

3.2 *Descriptions of Terms Specific to This Standard:*

3.2.1 *core, n*—a mandrel of cardboard, foam or other material on which geotextiles are rolled during manufacture to facilitate handling.

3.2.2 *supplier, n*—the person or organization from whom a geotextile is purchased or otherwise obtained.

3.2.2.1 *Discussion*—The supplier is frequently the manufacturer of the geotextile, but need not be. A supplier who is not the manufacturer is expected to ensure that the responsibilities of the manufacturer are fully met.

4. Significance and Use

4.1 For a geotextile to be properly used it must be adequately identified and packaged. It must be handled, stored, and installed in such a way that its physical property values are not degraded. Failure to follow good practice may result in the unnecessary failure of the geotextile in a properly designed application.

5. Procedure

5.1 *Packaging and Identification:*

5.1.1 When cores are required, use those that have a crushing strength sufficient to avoid collapse or other damage in normal use.

5.1.2 Cover each roll with a wrapping material that will protect the geotextile from damage due to shipment, water, sunlight, or contaminants.

5.1.3 When the fabric is rolled on core, identify each roll with a durable gummed label, or the equivalent, clearly readable on the inside of the core and on the outside of the wrapping for the roll. Show the manufacturer or supplier, the style number, and the roll number. On the outside of the wrapping, the style number should be at least 1.3 cm (0.5 in.) high, and the roll number should be at least 0.2 cm (1/16 in.) high. On the inside of the core, lettering should be at least 0.2 cm (1/16 in.) high.

5.2 *Receiving and Storing on the Job Site:*

5.2.1 While unloading or transferring the geotextile from one location to another, prevent damage to the wrapping or to the geotextile itself. If practicable, use fork lift trucks fitted with poles that can be inserted into the cores of rolls. Be sure that the poles are at least two thirds the length of the rolls to avoid breaking the cores and possibly damaging the geotextile. Do not drag the rolls as damage may result.

5.2.2 Store the geotextile elevated off the ground and ensure that it is adequately covered to protect the geotextile from:

5.2.2.1 Precipitation,

5.2.2.2 Ultraviolet radiation, including sunlight,

5.2.2.3 Chemicals that are strong acids or strong bases,

5.2.2.4 Flames, including welding sparks,

5.2.2.5 Temperatures in excess of 71°C (160°F), and

5.2.2.6 Any other environmental condition that may damage the physical property values of the geotextile.

5.3 *On-Site Handling:*

5.3.1 While transferring geotextiles from one location to another, prevent damage to the wrapping or to the geotextile itself. Follow the cautions specified in 5.2.1.

5.3.2 Prepare the surface on which the geotextile is to be placed so that no damage to the geotextile will occur.

5.3.3 Do not permit unnecessary machinery to operate on the surface of the geotextile.

[1] This guide is under the jurisdiction of ASTM Committee D-35 on Geosynthetics and is the direct responsibility of Subcommittee D35.02 on Durability Properties.

Current edition approved Nov. 25, 1988. Published January 1989.

[2] *Annual Book of ASTM Standards*, Vols 07.01 and 07.02.

[3] *Annual Book of ASTM Standards*, Vol 04.08.

000469

RECORD

Submittal 1441-001 Rev 2
7-22-99 p. ~~3 of 3~~ 7 of 7
JTT 7-22-99

5.3.4 Before unrolling a roll of geotextile at the job site, verify its identification. While unrolling the geotextile, inspect for damage or defects.

5.3.5 Inspect all seams for breaks or unseamed lengths.

5.3.6 If the geotextile is installed without seams but with overlapping, inspect the overlaps to ensure they conform with the specifications for the job.

5.3.7 If folding is required at turns in the fabric, do not trap soil or aggregate in the fold. If soil is trapped, remove it and refold.

5.3.8 Pull out all wrinkles, where possible, during placement unless specified in specification.

5.3.9 Correct any damage that occurs during storage or installation as directed by the engineer in charge of installation.

Doc. # 1441-001H

The American Society for Testing and Materials takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

-- 2739

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 1916 Race St., Philadelphia, PA 19103.

000470

SUPPLIER DOCUMENT SUBMITTAL

FDF PROJECT NO.: (1) 20102

CONTRACT NO: (2) 1441

SUBMITTAL NO.:(3) 001 | REV.:(4) 2 | DATE:(5) 08/02/1999 | Page 1 of 7 (6)

FROM: TNS Advanced Technologies, Inc.
405 Hood Road
Lilburn, Georgia 30047

RECORD

TO: FDF ENGINEERING/CONSTRUCTION DOCUMENT CONTROL (ECDC), MS 52-7

(8)

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8	1441-001F	2							X		Certification of MARV			X	02714P.1.04.A.3	X		

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Gregg Johnson, FDF, Health and Safety	64				
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Jim Turner, FDF, QA	64				

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A - Conforms to the Subcontract Requirements
B - Minor Comments - Incorporate and Resubmit
C - Revise and Resubmit (SEE COMMENTS)

FS-F-4955
Rev. 4: 04/??/1999

Engineered Synthetic Products, Inc.

Representing

TNS Advanced Technologies & SKAPS Industries
405 Hood Road
Lilburn, GA 30047
770-564-1857 Phone
770-564-1818 Fax

2739

RECEIVED JUL 27 1999

RECORD

Date: 7-27-99

Please deliver the following facsimile transmission to:

NAME: Jim Turner

LOCATION: Fluor Daniel Fernald
513-648-5767

FROM: Randy Beckham Kathy Licata Rick Franklin Stormy Shirley

No. Of Pages (Including cover sheets): 4

If you do not receive all of the pages or if the transmission is illegible, call (770) 564-1857 as soon as possible.

Comments: Jim,
Corrected data sheet per your request.
Regards,
Rick

TNS ADVANCED TECHNOLOGIES, INC.
405 Hood Road
Lilburn, GA 30047
Phone: 770/564-1857 Fax:770/564-1818

-- 2739

February 25, 1999

RECORD

Fluor Daniel Fernald

RECEIVED JUL 2 7 1999

Dear Sir/Madam:

This is to certify that TNS E070 is a superior quality, nonwoven geotextile produced by needlepunching together 100% polypropylene staple fibers in a random network to form a high strength dimensionally stable fabric. The polypropylene fibers are specially formulated to resist ultraviolet light deterioration, and are inert to commonly encountered soil chemicals. The fabric will not rot or mildew, is non-biodegradable, and is resistant to damage from insects and rodents. Polypropylene is stable within a ph range of 2 to 13. TNS E070 conforms to the physical property values listed below:

FABRIC PROPERTY	TEST METHOD	UNITS	M.A.R.V. Roll Value
Weight	ASTM D5261	oz/yd^2	7.0
Grab Tensile	ASTM D4632	lbs	200
Grab Elongation	ASTM D4632	%	50
Trap Tear	ASTM D4533	lbs	75
Puncture	ASTM D4833	lbs	115
Permittivity	ASTM D4491	1/sec	1.41
Permeability	ASTM D4491	cm/sec	.32
Water Flow	ASTM D4491	gpm/ft^2	110
Mullen Burst	ASTM D3786	psi	400
AOS	ASTM D4751	US Sieve	80
UV Resistance, after 500 hrs	ASTM D4355	% Strength retained	70

Sincerely,

Marshall Gaddy
QA/QC Manager
TNS Advanced Technologies

TNS ADVANCED TECHNOLOGIES, INC.

405 Hood Road
Lilburn, GA 30047
Phone: 770/564-1857 Fax:770/564-1818

-- 2739

February 25, 1999

RECORD

Fluor Daniel Fernald

RECEIVED JUL 2 7 1999

Dear Sir/Madam:

This is to certify that TNS E100 is a superior quality, nonwoven geotextile produced by needlepunching together 100% polypropylene staple fibers in a random network to form a high strength dimensionally stable fabric. The polypropylene fibers are specially formulated to resist ultraviolet light deterioration, and are inert to commonly encountered soil chemicals. The fabric will not rot or mildew, is non-biodegradable, and is resistant to damage from insects and rodents. Polypropylene is stable within a ph range of 2 to 13. TNS E100 conforms to the physical property values listed below:

FABRIC PROPERTY	TEST METHOD	UNITS	M.A.R.V. Roll Value
Weight	ASTM D5261	oz/yd^2	10.0
Grab Tensile	ASTM D4632	lbs	270
Grab Elongation	ASTM D4632	%	50
Trap Tear	ASTM D4533	lbs	100
Puncture	ASTM D4833	lbs	165
Permittivity	ASTM D4491	1/sec	.94
Permeability	ASTM D4491	cm/sec	.30
Water Flow	ASTM D4491	gpm/ft^2	75
Mullen Burst	ASTM D3786	psi	560
AOS	ASTM D4751	US Sieve	100
UV Resistance, after 500 hrs	ASTM D4355	% Strength retained	70

Sincerely,

Marshall Gaddy
QA/QC Manager
TNS Advanced Technologies

TNS ADVANCED TECHNOLOGIES, INC.

405 Hood Road
Lilburn, GA 30047
Phone: 770/564-1857 Fax:770/564-1818

-- 2739

February 25, 1999

RECORD

Fluor Daniel Fernald

RECEIVED JUL 2 7 1999

Dear Sir/Madam:

This is to certify that TNS E160 is a superior quality, nonwoven geotextile produced by needlepunching together 100% polypropylene staple fibers in a random network to form a high strength dimensionally stable fabric. The polypropylene fibers are specially formulated to resist ultraviolet light deterioration, and are inert to commonly encountered soil chemicals. The fabric will not rot or mildew, is non-biodegradable, and is resistant to damage from insects and rodents. Polypropylene is stable within a ph range of 2 to 13. TNS E160 conforms to the physical property values listed below:

FABRIC PROPERTY	TEST METHOD	UNITS	M.A.R.V. Roll Value
Weight	ASTM D5261	oz/yd^2	16.0
Grab Tensile	ASTM D4632	lbs	425
Grab Elongation	ASTM D4632	%	50
Trap Tear	ASTM D4533	lbs	150
Puncture	ASTM D4833	lbs	240
Permittivity	ASTM D4491	1/sec	.57
Permeability	ASTM D4491	cm/sec	.25
Water Flow	ASTM D4491	gpm/ft^2	45
Mullen Burst	ASTM D3786	psi	800
AOS	ASTM D4751	US Sieve	100
UV Resistance, after 500 hrs	ASTM D4355	% Strength retained	70

Sincerely,

Marshall Gaddy
QA/QC Manager
TNS Advanced Technologies

SUPPLIER DOCUMENT SUBMITTAL

PROJECT NO.: (1) 20102

CONTRACT NO: (2) 1441

SUBMITTAL NO.:(3) 002

REV.:(4) 1

DATE:(5) July 22, 1

FROM: Engineered Synthetic Products, Inc.
405 Hood Road
Lilburn, Georgia 30047

TO: FDF ENGINEERING/CONSTRUCTION DOCUMENT CONTROL (ECDC), MS 52-7

(8)

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si Badu-Tweneboah, GeoSyntec, Eng. ✓	38				
y Fisher, FDF, Procurement	64				
g Johnson, FDF, Health and Safety	64				
y Klimek, FDF, Eng.	64				
Turner, FDF, QA	64				

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B - Minor Comments - Incorporate and Resubmit
C - Revise and Resubmit (SEE COMMENTS)

FS-F-4955
Rev. 4: 04/??/1999

Submittal # 1441-002 Rev. 1
7-22-99 p. 2 of 7

TNS Advanced Technologies
681 DeYoung Road
Greer, South Carolina 29651
(864)968-0592
fax (864)879-4639

Doc. # 1441-002

-- 2739

FAX

RECORD

To: Jim Turner

From: Marshall Gaddy

Subject: Fluor Daniel Fernald

Date: July 22, 1999

# of pages including cover sheet - 5

Jim,

Attached are updated Certifications with the corrected weight ASTM Test Method. Also attached is UV Resistance Testing.

The roll sizes on the TNS E070, E100, and E160 are 180" wide and 450' long.

Please let me know if you have any questions or additional information is needed.

Thank you.

Marshall

FDF should not for UV Resistance Test results on E070, E100 and E160 geotextiles being ordered for Cell 3.
07/22/99

TNS ADVANCED TECHNOLOGIES, INC.
405 Hood Road
Lilburn, GA 30047
Phone: 770/564-1857 Fax:770/564-1818

—2739

February 25, 1999

RECORD

Submittal #1441-002 Rev. 1
7-22-99 p. 3 of 7
Doc. #1441-002

Fluor Daniel Fernald

Dear Sir/Madam:

This is to certify that TNS E070 is a superior quality, nonwoven geotextile produced by needlepunching together 100% polypropylene staple fibers in a random network to form a high strength dimensionally stable fabric. The polypropylene fibers are specially formulated to resist ultraviolet light deterioration, and are inert to commonly encountered soil chemicals. The fabric will not rot or mildew, is non-biodegradable, and is resistant to damage from insects and rodents. Polypropylene is stable within a ph range of 2 to 13. TNS E070 conforms to the physical property values listed below:

FABRIC PROPERTY	TEST METHOD	UNITS	M.A.R.V. Roll Value
Weight	ASTM D5261	mils	7.0
Grab Tensile 1	ASTM D4632	lbs	200
Grab Elongation	ASTM D4632	%	50
Trap Tear 2	ASTM D4533	lbs	75
Puncture	ASTM D4833	lbs	115
Permittivity	ASTM D4491	1/sec	1.41
Permeability	ASTM D4491	cm/sec	.32
Water Flow	ASTM D4491	gpm/ft^2	110
Mullen Burst	ASTM D3786	psi	400
AOS	ASTM D4751	US Sieve	80
UV Resistance, after 500 hrs	ASTM D4355	% Strength retained	70

Sincerely,

Marshall Gaddy
QA/QC Manager
TNS Advanced Technologies

Comments
1. weight units should be oz/yd^2.
2. Grab Tensile and Tear should have results in both machine and cross-machine directions.
3. AOS units should be in millimeters. However, the attached page showing conversion of sieve size to millimeters is adequate

07/22/99

000478

TNS ADVANCED TECHNOLOGIES, INC.
405 Hood Road
Lilburn, GA 30047
Phone: 770/564-1857 Fax:770/564-1818

2739

Submittal #1441-002 Rev. 1
7-22-99 p. 4 of 7
Doc # 1441-002

February 25, 1999

Fluor Daniel Fernald

Dear Sir/Madam:

This is to certify that TNS E100 is a superior quality, nonwoven geotextile produced by needlepunching together 100% polypropylene staple fibers in a random network to form a high strength dimensionally stable fabric. The polypropylene fibers are specially formulated to resist ultraviolet light deterioration, and are inert to commonly encountered soil chemicals. The fabric will not rot or mildew, is non-biodegradable, and is resistant to damage from insects and rodents. Polypropylene is stable within a ph range of 2 to 13. TNS E100 conforms to the physical property values listed below:

FABRIC PROPERTY	TEST METHOD	UNITS	M.A.R.V. Roll Value
Weight	ASTM D5261	mils	10.0
Grab Tensile ?	ASTM D4632	lbs	270
Grab Elongation	ASTM D4632	%	50
Trap Tear ?	ASTM D4533	lbs	100
Puncture	ASTM D4833	lbs	165
Permittivity	ASTM D4491	1/sec	.94
Permeability	ASTM D4491	cm/sec	.30
Water Flow	ASTM D4491	gpm/ft^2	75
Mullen Burst	ASTM D3786	psi	560
AOS	ASTM D4751	US Sieve	100
UV Resistance, after 500 hrs	ASTM D4355	% Strength retained	70

Sincerely,

See Comments on TNS E070 MARV.

Marshall Gaddy
QA/QC Manager
TNS Advanced Technologies

07/22/99

TNS ADVANCED TECHNOLOGIES, INC.
405 Hood Road
Lilburn, GA 30047
Phone: 770/564-1857 Fax:770/564-1818

2739

Submittal #1441-002 Rev. 1
7-22-99 p. 5 of 7
Doc. #1441-002

February 25, 1999

Fluor Daniel Fernald

Dear Sir/Madam:

This is to certify that TNS E160 is a superior quality, nonwoven geotextile produced by needlepunching together 100% polypropylene staple fibers in a random network to form a high strength dimensionally stable fabric. The polypropylene fibers are specially formulated to resist ultraviolet light deterioration, and are inert to commonly encountered soil chemicals. The fabric will not rot or mildew, is non-biodegradable, and is resistant to damage from insects and rodents. Polypropylene is stable within a ph range of 2 to 13. TNS E160 conforms to the physical property values listed below:

FABRIC PROPERTY	TEST METHOD	UNITS	M.A.R.V. Roll Value
Weight	ASTM D5261	mils	16.0
Grab Tensile ?	ASTM D4632	lbs	425
Grab Elongation	ASTM D4632	%	50
Trap Tear ?	ASTM D4533	lbs	150
Puncture	ASTM D4833	lbs	240
Permittivity	ASTM D4491	1/sec	.57
Permeability	ASTM D4491	cm/sec	.25
Water Flow	ASTM D4491	gpm/ft^2	45
Mullen Burst	ASTM D3786	psi	800
AOS	ASTM D4751	US Sieve	100
UV Resistance, after 500 hrs	ASTM D4355	% Strength retained	70

Sincerely,

Marshall Gaddy
QA/QC Manager
TNS Advanced Technologies

See Comments on TNS E070 MARV.

000480

TRI/ENVIRONMENTAL, INC.
A Texas Research International Company

2739

Submittal # 1441-002
Rev. 1
7-22-99 p. 6 of 7
Doc. # 1441-002

GEOTEXTILE TEST RESULTS
TNS Advanced Technologies
UV Resistance Testing

Material: Polypropylene Nonwoven Geotextile
TRI Log #: E2109-10-02

~~SRA~~ LD 7-28-99
Quality Review/Date

PARAMETER	TEST REPLICATE NUMBER 1	2	3	4	5	MEAN	STD	% CHANGE
U.V. Resistance (ASTM D 4355)								
Exposure Time: 500 hours								
Tensile Properties (ASTM D 5035)								
Sample Identification: TNS R040								
MD Tensile Strength (lbs) - BASELINE	89	79	71	65	80	77	8	
MD Tensile Strength (lbs) - EXPOSED	92	77	72	72	76	78	7	101
TD Tensile Strength (lbs) - BASELINE	85	101	112	87	104	98	10	
TD Tensile Strength (lbs) - EXPOSED	106	91	85	119	84	97	14	99
MD Elong. @ Max Load (%) - BASELINE	37	42	49	35	32	39	6	
MD Elong. @ Max Load (%) - EXPOSED	33	33	36	39	37	36	2	91
TD Elong. @ Max Load (%) - BASELINE	74	63	53	87	59	67	12	
TD Elong. @ Max Load (%) - EXPOSED	79	82	59	57	55	66	12	99
Sample Identification: TNS E060								
MD Tensile Strength (lbs) - BASELINE	223	227	111	112	111	157	56	
MD Tensile Strength (lbs) - EXPOSED	183	220	121	143	92	152	45	97
TD Tensile Strength (lbs) - BASELINE	156	238	164	187	157	180	31	
TD Tensile Strength (lbs) - EXPOSED	161	259	157	166	153	179	40	99
MD Elong. @ Max Load (%) - BASELINE	45	47	44	37	41	43	3	
MD Elong. @ Max Load (%) - EXPOSED	46	43	37	43	41	42	3	98
TD Elong. @ Max Load (%) - BASELINE	91	79	59	61	63	71	12	
TD Elong. @ Max Load (%) - EXPOSED	41	79	77	61	58	63	14	90

MD Machine Direction
TD Transverse Direction

The testing herein is based upon accepted industry practice as well as the test method listed.
TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material.

FDF should ask for UV Resistance Test Results on the E070, E100 and E060 geotextiles being ordered for Cell 3.

000481

07/22/99

Submittal #1441-002 Rev. 1
7-22-99
p. 7 of 7

2739

TABLE 1 Nominal Dimensions, Permissible Variations for Wire Cloth of Standard Test Sieves (U.S.A.) Standard Series

Sieve Designation		Nominal Sieve Opening, in.[B]	Permissible Variation of Average Opening from the Standard Sieve Designation	Opening Dimension Exceeded By Not More Than 5 % of the Openings	Maximum Individual Opening	Nominal Wire Diameter, mm
Standard[A]	Alternative					
(1)	(2)	(3)	(4)	(5)	(6)	(7)
125 mm	5 in.	5	±3.70 mm	130.0 mm	130.9 mm	8.00
106 mm	4.24 in.	4.24	±3.20 mm	110.2 mm	111.1 mm	6.30
100 mm[D]	4 in.[D]	4	±3.00 mm	104.0 mm	104.8 mm	6.30
90 mm	3½ in.	3.5	±2.70 mm	93.6 mm	94.4 mm	6.30
75 mm	3 in.	3	±2.20 mm	78.1 mm	78.7 mm	6.30
63 mm	2½ in.	2.5	±1.90 mm	65.6 mm	66.2 mm	5.60
53 mm	2.12 in.	2.12	±1.60 mm	55.2 mm	55.7 mm	5.00
50 mm[D]	2 in.[D]	2	±1.50 mm	52.1 mm	52.6 mm	5.00
45 mm	1¾ in.	1.75	±1.40 mm	46.9 mm	47.4 mm	4.50
37.5 mm	1½ in.	1.5	±1.10 mm	39.1 mm	39.5 mm	4.50
31.5 mm	1¼ in.	1.25	±1.00 mm	32.9 mm	33.2 mm	4.00
26.5 mm	1.06 in.	1.06	±.800 mm	27.7 mm	28.0 mm	3.55
25.0 mm[D]	1.00 in.[D]	1	±.800 mm	26.1 mm	26.4 mm	3.55
22.4 mm	⅞ in.	0.875	±.700 mm	23.4 mm	23.7 mm	3.55
19.0 mm	¾ in.	0.750	±.600 mm	19.9 mm	20.1 mm	3.15
16.0 mm	⅝ in.	0.625	±.500 mm	16.7 mm	17.0 mm	3.15
13.2 mm	0.530 in.	0.530	±.410 mm	13.83 mm	14.05 mm	2.80
12.5 mm[D]	½ in.[D]	0.500	±.390 mm	13.10 mm	13.31 mm	2.50
11.2 mm	7/16 in.	0.438	±.350 mm	11.75 mm	11.94 mm	2.50
9.5 mm	⅜ in.	0.375	±.300 mm	9.97 mm	10.16 mm	2.24
8.0 mm	5/16 in.	0.312	±.250 mm	8.41 mm	8.58 mm	2.00
6.7 mm	0.265 in.	0.265	±.210 mm	7.05 mm	7.20 mm	1.80
6.3 mm[D]	¼ in.[D]	0.250	±.200 mm	6.64 mm	6.78 mm	1.80
5.6 mm	No. 3½[E]	0.223	±.180 mm	5.90 mm	6.04 mm	1.60
4.75 mm	No. 4	0.187	±.150 mm	5.02 mm	5.14 mm	1.60
4.00 mm	No. 5	0.157	±.130 mm	4.23 mm	4.35 mm	1.40
3.35 mm	No. 6	0.132	±.110 mm	3.55 mm	3.66 mm	1.25
2.80 mm	No. 7	0.110	±.095 mm	2.975 mm	3.070 mm	1.12
2.36 mm	No. 8	0.0937	±.080 mm	2.515 mm	2.600 mm	1.00
2.00 mm	No. 10	0.0787	±.070 mm	2.135 mm	2.215 mm	0.900
1.7 mm	No. 12	0.0661	±.060 mm	1.820 mm	1.890 mm	0.800
1.4 mm	No. 14	0.0555	±.050 mm	1.505 mm	1.565 mm	0.710
1.18 mm	No. 16	0.0469	±.045 mm	1.270 mm	1.330 mm	0.630
1.00 mm	No. 18	0.0394	±.040 mm	1.080 mm	1.135 mm	0.560
850 µm[F]	No. 20	0.0331	±35 µm	925 µm	970 µm	0.500
710 µm	No. 25	0.0278	±30 µm	775 µm	815 µm	0.450
600 µm	No. 30	0.0234	±25 µm	660 µm	695 µm	0.400
500 µm	No. 35	0.0197	±20 µm	550 µm	585 µm	0.315
425 µm	No. 40	0.0165	±19 µm	471 µm	502 µm	0.280
355 µm	No. 45	0.0139	±16 µm	396 µm	426 µm	0.224
300 µm	No. 50	0.0117	±14 µm	337 µm	363 µm	0.200
250 µm	No. 60	0.0098	±12 µm	283 µm	306 µm	0.160
212 µm	No. 70	0.0083	±10 µm	242 µm	263 µm	0.140
180 µm	No. 80	0.0070	±9 µm	207 µm	227 µm	0.125
150 µm	No. 100	0.0059	±8 µm	174 µm	192 µm	0.100
125 µm	No. 120	0.0049	±7 µm	147 µm	163 µm	0.090
106 µm	No. 140	0.0041	±6 µm	126 µm	141 µm	0.071
90 µm	No. 170	0.0035	±5 µm	106 µm	122 µm	0.063
75 µm	No. 200	0.0029	±5 µm	91 µm	103 µm	0.050
63 µm	No. 230	0.0025	±4 µm	77 µm	89 µm	0.045
53 µm	No. 270	0.0021	±4 µm	66 µm	76 µm	0.036
45 µm	No. 325	0.0017	±3 µm	57 µm	66 µm	0.032
38 µm	No. 400	0.0015	±3 µm	48 µm	57 µm	0.030
32 µm	No. 450	0.0012	±3 µm	42 µm	50 µm	0.028
25 µm[D]	No. 500	0.0010	±3 µm	34 µm	41 µm	0.025
20 µm[D]	No. 635	0.0008	±3 µm	29 µm	35 µm	0.020

Doc. # 1441-002

2730

[A] These standard designations correspond to the values for test sieve openings recommended by the International Standards Organization, Geneva, Switzerland, except where noted.

[B] Only approximately equivalent to the metric values in Column 1.

[C] The average diameter of the wires in the x and y direction, measured separately, of any wire cloth shall not deviate from the nominal values by more than ±15 %.

[D] These sieves are not in the standard series but they have been included because they are in common usage.

[E] These numbers (3½ to 635) are the approximate number of openings per linear in. but it is preferred that the sieve be identified by the standard designation in millimetres or micrometres.

[F] 1000 µm—1 mm.

shall be made along the midpoints of the opening as shown in Fig. 1.

4.4 Sieve cloth shall conform to the dimensional requirements of Table 1. The average opening (distance between parallel wires measured at the center of the opening), in the *x* (horizontal) and *y* (vertical) directions measured separately, shall conform to the values in Column 1, within the permissible variation in average opening size shown in Column 4. Not more than 5 % of the openings shall exceed the value shown in Column 5. The maximum individual

000482

SUPPLIER DOCUMENT SUBMITTAL

FDF PROJECT NO.: (1) 20102	CONTRACT NO: (2) 1441	SUBMITTAL NO.:(3) 002	REV.:(4) 0	DATE:(5) July 19, 1	Page _1_ of _12_(6)

FROM: Engineered Synthetic Products, Inc.
405 Hood Road
Lilburn, Georgia 30047

RECORD

SIGNATURE: _____

TO: FDF ENGINEERING/CONSTRUCTION DOCUMENT CONTROL (ECDC), MS 52-7

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RECEIVED BY: _____ DATE: _____

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8	1441-002	0							X		Quality Control Certificates		X		02714P.1.05.B.	X		

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Kwasi Badu-Tweneboah, GeoSyntec, Eng.	38				
Kathy Fisher, FDF, Procurement	64				
Gregg Johnson, FDF, Health and Safety	64				
Tony Klimek, FDF, Eng.	64				
Jim Turner, FDF, QA	64				

RECEIVED JUL 19 1999

2739

NO COMMENTS: _____ COMMENTS: (PLEASE USE SPACE BELOW FOR COMMENTS OR INDICATE IF ATTACHMENTS) (19)

- ~~Quality Control Certificates, etc.~~ (JB)
- Actual test results tabulation etc.
- Same comments on MARV data sheets as on Submittal 1441-001 Rev. 0 dated 04/29/99.

000483

RECEIVED BY: _____ DATE: 07/22/99

(SIGN/DATE AND RETURN A COPY TO ECDC, MS 52-7)

SUBMITTAL TYPE: (BY SUPPLIER)
CFC - CERTIFIED FOR CONSTRUCTION
INF - INFORMATION/RECORD
DRFT - DRAFT/PRELIMINARY

SUBMITTAL ACTION CODE: (BY FDF)
A - Conforms to the Subcontract Requirements
B - Minor Comments - Incorporate and Resubmit
C - Revise and Resubmit (SEE COMMENTS)

FS-F-4955
Rev. 4: 04/??/1999

Submittal 1441-002 1
19 July 199
p. 2 of 1
Doc # 1

RECORD 2739

Engineered Synthetic Products, Inc.

Representing

TNS Advanced Technologies & SKAPS Industries
405 Hood Road
Lilburn, GA 30047
770-564-1857 Phone
770-564-1818 Fax

Date: 7-15-99

Please deliver the following facsimile transmission to:

NAME: Jim Turner

LOCATION: Fluor Daniel Fernald

FROM: Randy Beckham Kathy Licata Rick Franklin Stormy Sh y

No. Of Pages (Including cover sheets): _____

If you do not receive all of the pages or if the transmissior illegible, call (770) 564-1857 as soon as possible.

Comments: Jim,

Roll data for geotexty shipping to the site.

Regards,

Rick

TNS ADVANCED TECHNOLOGIES, INC.

405 Hood Road
Lilburn, GA 30047
Phone: 770/564-1857 Fax:770/564-1818

7-19-99

Submittal 1441-002 Rev. 0

19 July 1999

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Doc. # 1441-002

February 25, 1999

RECORD E-2739

Fluor Daniel Fernald

Dear Sir/Madam:

This is to certify that TNS E160 is a superior quality, nonwoven geotextile produced by needlepunching together 100% polypropylene staple fibers in a random network to form a high strength dimensionally stable fabric. The polypropylene fibers are specially formulated to resist ultraviolet light deterioration, and are inert to commonly encountered soil chemicals. The fabric will not rot or mildew, is non-biodegradable, and is resistant to damage from insects and rodents. Polypropylene is stable within a ph range of 2 to 13. TNS E160 conforms to the physical property values listed below:

FABRIC PROPERTY	TEST METHOD	UNITS	M.A.R.V. Roll Value
Weight	ASTM D3776	mils	16.0
Grab Tensile ?	ASTM D4632	lbs	425
Grab Elongation	ASTM D4632	%	50
Trap Tear ?	ASTM D4533	lbs	150
Puncture	ASTM D4833	lbs	240
Permittivity	ASTM D4491	1/sec	.57
Permeability	ASTM D4491	cm/sec	.25
Water Flow	ASTM D4491	gpm/ft^2	45
Mullen Burst	ASTM D3786	psi	800
AOS	ASTM D4751	US Sieve	100
UV Resistance, after 500 hrs	ASTM D4355	% Strength retained	70

Sincerely,

Marshall Gaddy
QA/QC Manager
TNS Advanced Technologies

Comments:

1. For weight, spec calls for ASTM D5261 test procedure; and units should be oz./yd^2.
2. Grab Tensile and Tear should have results in both machine and cross machine directions.
3. AOS should have units in millimeters.

07/22/99

000485

TNS ADVANCED TECHNOLOGIES, INC.

405 Hood Road
Lilburn, GA 30047
Phone: 770/564-1857 Fax:770/564-1818

SCT 7-19-99

February 25, 1999

Submittal 1441-002 Rev. 0
19 July 1999

RECORD

Fluor Daniel Fernald

-2739 p. 4 of 12
Doc. # 1441-002

Dear Sir/Madam:

This is to certify that TNS E070 is a superior quality, nonwoven geotextile produced by needlepunching together 100% polypropylene staple fibers in a random network to form a high strength dimensionally stable fabric. The polypropylene fibers are specially formulated to resist ultraviolet light deterioration, and are inert to commonly encountered soil chemicals. The fabric will not rot or mildew, is non-biodegradable, and is resistant to damage from insects and rodents. Polypropylene is stable within a ph range of 2 to 13. TNS E070 conforms to the physical property values listed below:

FABRIC PROPERTY	TEST METHOD	UNITS	M.A.R.V. Roll Value
Weight	ASTM D3776	mils	7.0
Grab Tensile ?	ASTM D4632	lbs	200
Grab Elongation	ASTM D4632	%	50
Trap Tear ?	ASTM D4533	lbs	75
Puncture	ASTM D4833	lbs	115
Permittivity	ASTM D4491	1/sec	1.41
Permeability	ASTM D4491	cm/sec	.32
Water Flow	ASTM D4491	gpm/ft^2	110
Mullen Burst	ASTM D3786	psi	400
AOS	ASTM D4751	US Sieve	80
UV Resistance, after 500 hrs	ASTM D4355	% Strength retained	70

Sincerely,

Marshall Gaddy
QA/QC Manager
TNS Advanced Technologies

See comments on TNS E160 MARV.

07/22/99

TNS ADVANCED TECHNOLOGIES, INC.

405 Hood Road
Lilburn, GA 30047
Phone: 770/564-1857 Fax:770/564-1818

JTY

February 25, 1999

Submittal 1441-002 Rev 19 July 1999

Fluor Daniel Fernald

RECORD E-2739 p. 5 of 12

Doc. # 1441-002

Dear Sir/Madam:

This is to certify that TNS E100 is a superior quality, nonwoven geotextile produced by needlepunching together 100% polypropylene staple fibers in a random network to form a high strength dimensionally stable fabric. The polypropylene fibers are specially formulated to resist ultraviolet light deterioration, and are inert to commonly encountered soil chemicals. The fabric will not rot or mildew, is non-biodegradable, and is resistant to damage from insects and rodents. Polypropylene is stable within a ph range of 2 to 13. TNS E100 conforms to the physical property values listed below:

FABRIC PROPERTY	TEST METHOD	UNITS	M.A.R.V. Roll Value
Weight	ASTM D3776	mils	10.0
Grab Tensile ?	ASTM D4632	lbs	270
Grab Elongation	ASTM D4632	%	50
Trap Tear ?	ASTM D4533	lbs	100
Puncture	ASTM D4833	lbs	165
Permittivity	ASTM D4491	1/sec	.94
Permeability	ASTM D4491	cm/sec	.30
Water Flow	ASTM D4491	gpm/ft^2	75
Mullen Burst	ASTM D3786	psi	560
AOS	ASTM D4751	US Sieve	100
UV Resistance, after 500 hrs	ASTM D4355	% Strength retained	70

Sincerely,

Marshall Gaddy
QA/QC Manager
TNS Advanced Technologies

See comments on TNS E160 MAK

07/22/99

RECORD

July 15,1999

TNS Advanced Technologies
Nonwoven Quality Data

ROLL #	STYLE	WEIGHT	THICKNESS	GRAB-MD	GRAB-XMD	ELONG-MD	ELONG-XMD	TRAP-MD	TRAP-XMD	PUNCTURE	BURST	FLOW	PERMITIVITY	AOS
300005230	E100	11.1	170	301	323	75	80	110	146	183	578	113	1.77	100
300005231	E100	11.1	170	301	323	75	80	110	146	183	578	113	1.77	100
300005232	E100	11.1	170	301	323	75	80	110	146	183	578	113	1.77	100
300005233	E100	11.1	170	301	323	75	80	110	146	183	578	113	1.77	100
300005234	E100	11.1	170	301	323	75	80	110	146	183	578	113	1.77	100
300005235	E100	11.1	170	301	323	75	80	110	146	183	578	113	1.77	100
300005236	E100	11.1	170	301	323	75	80	110	146	183	578	113	1.77	100
300005237	E100	10.9	164	289	300	69	79	112	139	173	564	87	1.4	100
300005238	E100	10.9	164	289	300	69	79	112	139	173	564	87	1.4	100
300005239	E100	10.9	164	289	300	69	79	112	139	173	564	87	1.4	100
300005240	E100	10.9	164	289	300	69	79	112	139	173	564	87	1.4	100
300005241	E100	10.9	164	289	300	69	79	112	139	173	564	87	1.4	100
300005242	E100	10.9	164	289	300	69	79	112	139	173	564	87	1.4	100
300005243	E100	10.9	164	286	294	69	88	105	119	195	593	87	1.4	100
[illegible]	E080	10.3	148	247	276	56	68	99	112	178	582	87	1.4	100
[illegible]	E080	10.5	152	250	273	57	69	102	112	178	582	87	1.4	100
[illegible]	E080	10.5	152	250	273	57	69	102	112	178	582	87	1.4	100
[illegible]	E080	10.1	150	243	273	55	69	102	112	178	582	87	1.4	100
[illegible]	E080	10.1	150	243	273	55	69	102	112	178	582	87	1.4	100
300005249	E100	11.9	165	285	308	54	66	106	128	204	689	87	1.4	100
300005250	E100	11.9	165	285	308	54	66	106	128	204	689	87	1.4	100
300005251	E100	12.3	170	295	318	57	66	118	128	216	711	87	1.4	100
300005252	E100	12.3	170	295	318	57	66	118	128	216	711	87	1.4	100
300005253	E100	12.3	170	295	318	57	66	118	128	216	711	87	1.4	100
300005254	E100	12.3	170	295	318	57	66	118	128	216	711	87	1.4	100
300005255	E100	12.3	170	295	318	57	66	118	128	216	711	87	1.4	100
300005256	E100	12.3	170	295	318	57	66	118	128	216	711	87	1.4	100
300005257	E100	12.3	170	295	318	57	66	118	128	216	711	87	1.4	100
300005258	E100	11	158	271	304	59	69	107	145	203	655	87	1.4	100
300005259	E100	11	158	271	304	59	69	107	145	203	655	87	1.4	100
300005260	E100	11	158	271	304	59	69	107	145	203	655	87	1.4	100
300005261	E100	11	158	271	304	59	69	107	145	203	655	87	1.4	100
300005262	E100	11	158	271	304	59	69	107	145	203	655	87	1.4	100
300005263	E100	11	158	271	304	59	69	107	145	203	655	87	1.4	100
300005264	E100	11	158	271	304	59	69	107	145	203	655	87	1.4	100
300005265	E100	11.4	165	318	337	63	71	108	139	208	610	87	1.4	120

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19 July 1999
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000488

RECORD

ROLL #	STYLE	WEIGHT	THICKNESS	GRAB-MD	GRAB-XMD	ELONG-MD	ELONG-XMD	TRAP-MD	TRAP-XMD	PUNCTURE	BURST	FLOW	PERMITIVITY	AOS
300005266	E100	11.4	165	318	337	63	71	108	139	208	610	87	1.4	120
300005267	E100	11.4	165	318	337	63	71	108	139	208	610	87	1.4	120
300005268	E100	11.4	165	318	337	63	71	108	139	208	610	87	1.4	120
300005269	E100	11.4	165	318	337	63	71	108	139	208	610	87	1.4	120
300005270	E100	11.4	165	318	337	63	71	108	139	208	610	87	1.4	120
300005271	E100	11.4	165	318	337	63	71	108	139	208	610	87	1.4	120
300005272	E100	10.7	155	305	331	63	74	115	147	201	614	87	1.4	120
300005273	E100	10.7	155	305	331	63	74	115	147	201	614	87	1.4	120
300005274	E100	10.7	155	305	331	63	74	115	147	201	614	87	1.4	120
300005275	E100	10.7	155	305	331	63	74	115	147	201	614	87	1.4	120
300005276	E100	10.7	155	305	331	63	74	115	147	201	614	87	1.4	120
300005277	E100	10.7	155	305	331	63	74	115	147	201	614	87	1.4	120
300005278	E100	10.7	155	305	331	63	74	115	147	201	614	87	1.4	120
300005279	E100	11.4	163	327	336	64	70	113	151	221	643	87	1.4	120
300005280	E100	11.4	163	327	336	64	70	113	151	221	643	87	1.4	120
300005281	E100	11.4	163	327	336	64	70	113	151	221	643	87	1.4	120
300005282	E100	11.4	163	327	336	64	70	113	151	221	643	87	1.4	120
300005283	E100	11.4	163	327	336	64	70	113	151	221	643	87	1.4	120
300005353	E100	13.3	192	359	431	75	83	151	234	235	738	87	1.4	120
300005354	E100	13.3	192	359	431	75	83	151	234	235	738	87	1.4	120
300005355	E100	13.3	192	359	431	75	83	151	234	235	738	87	1.4	120
300005356	E100	13.3	192	359	431	75	83	151	234	235	738	87	1.4	120
300005357	E100	13.3	192	359	431	75	83	151	234	235	738	87	1.4	120
300005358	E100	13.3	192	359	431	75	83	151	234	235	738	87	1.4	120
300005359	E100	13.3	192	359	431	75	83	151	234	235	738	87	1.4	120
300005360	E100	11.1	168	291	360	74	83	151	234	235	738	87	1.4	120
300005361	E100	11.1	168	291	360	74	83	151	234	235	738	87	1.4	120
300005362	E100	11.1	168	291	360	74	83	151	234	235	738	87	1.4	120
300005363	E100	11.1	168	291	360	74	83	151	234	235	738	87	1.4	120
300005364	E100	11.1	168	291	360	74	83	151	234	235	738	87	1.4	120
300005365	E100	11.1	168	291	360	74	83	151	234	235	738	87	1.4	120
300005366	E100	11.1	168	291	360	74	83	151	234	235	738	87	1.4	120
300005367	E100	11.4	169	321	357	67	71	129	166	189	633	108	1.69	100
300005368	E100	11.4	169	321	357	67	71	129	166	189	633	108	1.69	100
300005369	E100	11.4	169	321	357	67	71	129	166	189	633	108	1.69	100
300005370	E100	11.4	169	321	357	67	71	129	166	189	633	108	1.69	100

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ESP

7-16-99; 8:26AM;TNS

000489

RECORD

ROLL #	STYLE	WEIGHT	THICKNESS	GRAB-MD	GRAB-XMD	ELONG-MD	ELONG-XMD	TRAP-MD	TRAP-XMD	PUNCTURE	BURST	FLOW	PERMITIVITY	AOS
300005371	E100	11.4	169	321	357	67	71	129	166	189	633	108	1.69	100
300005372	E100	11.4	169	321	357	67	71	129	166	189	633	108	1.69	100
300005373	E100	11.4	169	321	357	67	71	129	166	189	633	108	1.69	100
300005374	E100	11.1	170	319	337	70	71	118	179	188	632	108	1.69	100
300005375	E100	11.1	170	319	337	70	71	118	179	188	632	108	1.69	100
300005376	E100	11.1	170	319	337	70	71	118	179	188	632	108	1.69	100
300005377	E100	11.1	170	319	337	70	71	118	179	188	632	108	1.69	100
300005378	E100	11.1	170	319	337	70	71	118	179	188	632	108	1.69	100
300005379	E100	11.1	170	319	337	70	71	118	179	188	632	108	1.69	100
300005380	E100	11.1	170	319	337	70	71	118	179	188	632	108	1.69	100
300005381	E100	11.3	170	306	338	66	71	123	191	167	621	108	1.69	100
300005382	E100	11.3	170	306	338	66	71	123	191	167	621	108	1.69	100
300005383	E100	11.3	170	306	338	66	71	123	191	167	621	108	1.69	100
300005384	E100	11.3	170	306	338	66	71	123	191	167	621	108	1.69	100
300005385	E100	11.3	170	306	338	66	71	123	191	167	621	108	1.69	100
300005386	E100	11.3	170	306	338	66	71	123	191	167	621	108	1.69	100
300005387	E100	11.3	170	306	338	66	71	123	191	167	621	108	1.69	100
300005388	E100	11	162	310	331	74	77	111	162	198	607	108	1.69	100
300005389	E100	11	162	310	331	74	77	111	162	198	607	108	1.69	100
300005390	E100	11	162	310	331	74	77	111	162	198	607	108	1.69	100
300005391	E100	11	162	310	331	74	77	111	162	198	607	108	1.69	100
300005392	E100	11	162	310	331	74	77	111	162	198	607	108	1.69	100
300005393	E100	11	162	310	331	74	77	111	162	198	607	108	1.69	100
300005394	E100	11	162	310	331	74	77	111	162	198	607	108	1.69	100
300005395	E100	10.7	172	300	326	69	74	119	161	176	618	108	1.69	100
300005396	E100	10.7	172	300	326	69	74	119	161	176	618	108	1.69	100
300005397	E100	10.7	172	300	326	69	74	119	161	176	618	108	1.69	100
300005398	E100	10.7	172	300	326	69	74	119	161	176	618	108	1.69	100
300005399	E100	10.7	172	300	326	69	74	119	161	176	618	108	1.69	100
300005400	E100	10.7	172	300	326	69	74	119	161	176	618	108	1.69	100
300005401	E100	10.7	172	300	326	69	74	119	161	176	618	108	1.69	100
300005402	E100	11	174	289	342	70	72	132	179	204	616	108	1.69	100
300005403	E100	11	174	289	342	70	72	132	179	204	616	108	1.69	100
300005404	E100	11	174	289	342	70	72	132	179	204	616	108	1.69	100
300005405	E100	11	174	289	342	70	72	132	179	204	616	108	1.69	100
300005406	E100	11	174	289	342	70	72	132	179	204	616	108	1.69	100
300005407	E100	11	174	289	342	70	72	132	179	204	616	108	1.69	100
300005408	E100	11	174	289	342	70	72	132	179	204	616	108	1.69	100
300005409	E100	10.9	173	314	328	71	75	125	187	184	596	103	1.62	100
300005410	E100	10.9	173	314	328	71	75	125	187	184	596	103	1.62	100
300005411	E100	10.9	173	314	328	71	75	125	187	184	596	103	1.62	100

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000490

RECORD

ROLL #	STYLE	WEIGHT	THICKNESS	GRAB-MD	GRAB-XMD	ELONG-MD	ELONG-XMD	TRAP-MD	TRAP-XMD	PUNCTURE	BURST	FLOW	PERMITIVITY	AOS
300005412	E100	10.9	173	314	328	71	75	125	187	184	598	103	1.62	100
300005413	E100	10.9	173	314	328	71	75	125	187	184	598	103	1.62	100
300005414	E100	10.9	173	314	328	71	75	125	187	184	598	103	1.62	100
300005415	E100	10.9	173	314	328	71	75	125	187	184	598	103	1.62	100
300005416	E100	10.9	173	314	328	71	75	125	187	184	598	103	1.62	100
300005417	E100	10.9	173	314	328	71	75	125	187	184	598	103	1.62	100
300005418	E100	10.5	164	287	329	76	78	126	191	182	557	103	1.62	100
300005419	E100	10.5	164	287	329	76	78	126	191	182	557	103	1.62	100
300005420	E100	10.5	164	287	329	76	78	126	191	182	557	103	1.62	100
300005421	E100	10.5	164	287	329	76	78	126	191	182	557	103	1.62	100
300005422	E100	10.5	164	287	329	76	78	126	191	182	557	103	1.62	100
300005423	E100	10.7	153	308	326	77	82	128	188	181	573	103	1.62	100
300005424	E100	10.7	153	308	326	77	82	128	188	181	573	103	1.62	100
300005425	E100	10.7	153	308	326	77	82	128	188	181	573	103	1.62	100
300005426	E100	10.7	153	308	326	77	82	128	188	181	573	103	1.62	100
300005427	E100	10.7	153	308	326	77	82	128	188	181	573	103	1.62	100
300005428	E070	7.5	137	216	223	71	72	92	124	123	420	167	2.62	100
300005429	E070	7.5	137	216	223	71	72	92	124	123	420	167	2.62	100
300005430	E070	7.5	137	216	223	71	72	92	124	123	420	167	2.62	100
300005431	E070	7.5	137	216	223	71	72	92	124	123	420	167	2.62	100
300005432	E070	7.5	137	216	223	71	72	92	124	123	420	167	2.62	100
300005433	E070	7.5	137	216	223	71	72	92	124	123	420	167	2.62	100
300005434	E070	7.5	137	216	223	71	72	92	124	123	420	167	2.62	100
300005435	E070	7.3	135	202	224	70	76	83	124	123	411	174	2.7	100
300005436	E070	7.3	135	202	224	70	76	83	124	123	411	174	2.7	100
300005437	E070	7.3	135	202	224	70	76	83	124	123	411	174	2.7	100
300005438	E070	7.4	139	201	224	73	75	89	134	117	413	174	2.7	100
300005439	E070	7.4	139	201	224	73	75	89	134	117	413	174	2.7	100
300005440	E070	7.4	139	201	224	73	75	89	134	117	413	181	2.8	100
300005441	E070	7.4	139	201	224	73	75	89	134	117	413	181	2.8	100
300005442	E070	7.4	139	201	224	73	75	89	134	117	413	181	2.8	100
300005443	E070	7.4	139	201	224	73	75	89	134	117	413	181	2.8	100
300005444	E070	7.7	143	201	227	76	69	98	132	123	457	181	2.8	100
300005445	E070	7.7	143	201	227	76	69	98	132	123	457	181	2.8	100
300005446	E070	7.7	143	201	227	76	69	98	132	123	457	181	2.8	100
300005447	E070	7.7	143	201	227	76	69	98	132	123	457	181	2.8	100
300005448	E070	7.7	143	201	227	76	69	98	132	123	457	181	2.8	100
300005449	E070	7.7	143	201	227	76	69	98	132	123	457	181	2.8	100
300005450	E070	7.7	143	201	227	76	69	98	132	123	457	181	2.8	100
~~300005451~~	E069	7.6	136	196	227	74	69	89	132	123	457	167	2.62	100
~~300005452~~	E060	7.6	136	196	227	74	69	89	132	123	457	167	2.62	100

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ROLL #	STYLE	WEIGHT	THICKNESS	GRAB-MD	GRAB-XMD	ELONG-MD	ELONG-XMD	TRAP-MD	TRAP-XMD	PUNCTURE	BURST	FLOW	PERMITIVITY	AOS
~~300005453~~	E060	7.4	130	182	227	71	69	89	132	123	457	167	2.62	100
~~300005454~~	E060	7.8	137	189	227	66	69	89	132	123	457	167	2.62	100
300005455	E070	8	142	202	227	68	69	112	127	132	533	159	2.5	100
300005456	E070	8	142	202	227	68	69	112	127	132	533	159	2.5	100
300005457	E070	8	142	202	227	68	69	112	127	132	533	159	2.5	100
300005458	E070	8	142	202	227	68	69	112	127	132	533	159	2.5	100
300005459	E070	8	142	202	227	68	69	112	127	132	533	159	2.5	100
300005460	E070	8	142	202	227	68	69	112	127	132	533	159	2.5	100
300005461	E070	8	142	202	227	68	69	112	127	132	533	159	2.5	100
300005462	E070	8.1	139	211	239	67	70	88	109	125	456	159	2.5	100
300005463	E070	8.1	139	211	239	67	70	88	109	125	456	159	2.5	100
300005464	E070	8.1	139	211	239	67	70	88	109	125	456	159	2.5	100
300005465	E070	8.1	139	211	239	67	70	88	109	125	456	159	2.5	100
300005466	E070	8.1	139	211	239	67	70	88	109	125	456	159	2.5	100
300005467	E070	8.1	139	211	239	67	70	88	109	125	456	159	2.5	100
300005468	E070	8.1	139	211	239	67	70	88	109	125	456	159	2.5	100
300005469	E070	7.7	134	202	219	63	70	80	102	117	465	212	3.33	120
300005470	E070	7.7	134	202	219	63	70	80	102	117	465	212	3.33	120
300005471	E070	7.7	134	202	219	63	70	80	102	117	465	212	3.33	120
300005472	E070	7.7	134	202	219	63	70	80	102	117	465	212	3.33	120
300005473	E070	7.7	134	202	219	63	70	80	102	117	465	212	3.33	120
300005474	E070	7.7	134	202	219	63	70	80	102	117	465	212	3.33	120
300005475	E070	7.7	134	202	219	63	70	80	102	117	465	212	3.33	120
300005476	E070	8	142	223	217	57	70	88	96	126	447	212	3.33	120
300005477	E070	8	142	223	217	57	70	88	96	126	447	212	3.33	120
300005478	E070	8	142	223	217	57	70	88	96	126	447	212	3.33	120
300005479	E070	8	142	223	217	57	70	88	96	126	447	212	3.33	120
300005480	E070	8	142	223	217	57	70	88	96	126	447	212	3.33	120
300005481	E070	8	142	223	217	57	70	88	96	126	447	212	3.33	120
300005482	E070	8	142	223	217	57	70	88	96	126	447	212	3.33	120
300005483	E070	7.6	132	210	206	61	65	86	116	124	474	169	2.66	120
300005484	E070	7.6	132	210	206	61	65	86	116	124	474	169	2.66	120
300005485	E070	7.6	132	210	206	61	65	86	116	124	474	169	2.66	120
300005486	E070	7.6	132	210	206	61	65	86	116	124	474	169	2.66	120
300005487	E070	7.6	132	210	206	61	65	86	116	124	474	169	2.66	120
300005488	E070	7.6	132	210	206	61	65	86	116	124	474	169	2.66	120
300005489	E070	7.6	132	210	206	61	65	86	116	124	474	169	2.66	120
300005490	E070	8.1	133	214	218	63	76	79	100	134	500	169	2.66	120
300005491	E070	8.1	133	214	218	63	76	79	100	134	500	169	2.66	120
300005492	E070	8.1	133	214	218	63	76	79	100	134	500	169	2.66	120
300005493	E070	8.1	133	214	218	63	76	79	100	134	500	169	2.66	120

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ROLL #	STYLE	WEIGHT	THICKNESS	GRAB-MD	GRAB-XMD	ELONG-MD	ELONG-XMD	TRAP-MD	TRAP-XMD	PUNCTURE	BURST	FLOW	PERMITIVITY	AOS
300005494	E070	8.1	133	214	218	63	76	79	100	134	500	169	2.66	120
300005495	E070	8.1	133	214	218	63	76	79	100	134	500	169	2.66	120
300005496	E070	8.1	133	214	218	63	76	79	100	134	500	169	2.66	120
300005497	E070	8	135	223	219	59	70	80	98	123	456	156	2.44	120
300005498	E070	8	135	223	219	59	70	80	98	123	456	156	2.44	120
300005499	E070	8	135	223	219	59	70	80	98	123	456	156	2.44	120
300005500	E070	8	135	223	219	59	70	80	98	123	456	156	2.44	120
300005501	E070	8	135	223	219	59	70	80	98	123	456	156	2.44	120
300005513	E160	17.8	217	445	539	69	76	154	247	265	800	83	1.31	120
300005514	E160	17.8	217	445	539	69	76	154	247	265	800	83	1.31	120
300005515	E160	17.8	217	445	539	69	76	154	247	265	800	83	1.31	120
300005516	E160	17.8	217	445	539	69	76	154	247	265	800	83	1.31	120
300005517	E160	17.8	217	445	539	69	76	154	247	265	800	83	1.31	120
300005518	E160	17.4	222	462	532	75	81	167	261	307	800	83	1.31	120
300005519	E160	17.4	222	462	532	75	81	167	261	307	800	83	1.31	120
300005520	E160	17.4	222	462	532	75	81	167	261	307	800	83	1.31	120
300005521	E160	17.4	222	462	532	75	81	167	261	307	800	83	1.31	120
300005522	E160	17.4	222	462	532	75	81	167	261	307	800	83	1.31	120
300005523	E160	17.4	222	462	532	75	81	167	261	307	800	83	1.31	120
300005524	E160	17.4	222	462	532	75	81	167	261	307	800	83	1.31	120

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TNS ADVANCED TECHNOLOGIES, INC.
405 Hood Rd.
Lilburn, GA 30047
Phone: 770/564-1857 Fax: 770/564-1818

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July 11, 1999

Fluor Daniel Fernald
Fernald, OH

The following checks on our nonwoven fabric are routine during manufacturing:

1. Visual inspection - Nonwoven line inspector inspects fabric for good selvages, across the width weight verification, correct take-up, and needle streaks.
2. Computer monitoring - Constant monitoring for correct weight across the width of the fabric is conducted by a NDC weight profile scanner.
3. Metal detection - Five metal detectors are positioned on the production line to detect needles or other contaminants. If needles are detected, the line automatically shuts down and needles are located and removed.

Certifications are required on all fiber purchases to control raw material properties. SPC data is required for each shipment.

In addition, SPC data on manufacturing supplies is required on all shipments to guarantee our stringent quality control.

In our SPC system of quality reporting a request for corrective action is issued resulting from any property failing to meet specification for three sequential occurrences.

This system has been implemented to correct all non-conforming material. It is TNS policy to ship only fabric meeting or exceeding specification. A quality report is issued daily summarizing manufacturing production.

Sincerely,

Marshall Gaddy
QA/QC Manager
TNS Advanced Technologies

Review of Geotextile Test Data - TNS Advanced Technologies Manufacturer QC

7/22/99

Lot No.	Roll No.	Roll Sq. Ft.	Test Cum S	Cum. Sq. Ft	Test	STD	Measure	Test	STD	Measured	Test	STD	Measured	Test	STD	Measured	Test	STD	Measured	Test	STD
	300005230	6750	6750	6750	D5261	10	11.1	D4632-MD	225	301	D4632-XMD	225	323	D 4533-MD	90	110	D 4533-XMD	90	146	D4833	120
	300005231	6750	13500	13500	D5261	10	11.1	D4632-MD	225	301	D4632-XMD	225	323	D 4533-MD	90	110	D 4533-XMD	90	146	D4833	120
	300005232	6750	20250	20250	D5261	10	11.1	D4632-MD	225	301	D4632-XMD	225	323	D 4533-MD	90	110	D 4533-XMD	90	146	D4833	120
	300005233	6750	27000	27000	D5261	10	11.1	D4632-MD	225	301	D4632-XMD	225	323	D 4533-MD	90	110	D 4533-XMD	90	146	D4833	120
	300005234	6750	33750	33750	D5261	10	11.1	D4632-MD	225	301	D4632-XMD	225	323	D 4533-MD	90	110	D 4533-XMD	90	146	D4833	120
	300005235	6750	40500	40500	D5261	10	11.1	D4632-MD	225	301	D4632-XMD	225	323	D 4533-MD	90	110	D 4533-XMD	90	146	D4833	120
	300005236	6750	47250	47250	D5261	10	11.1	D4632-MD	225	301	D4632-XMD	225	323	D 4533-MD	90	110	D 4533-XMD	90	146	D4833	120
	300005237	6750	6750	54000	D5261	10	10.9	D4632-MD	225	289	D4632-XMD	225	300	D 4533-MD	90	112	D 4533-XMD	90	139	D4833	120
	300005238	6750	13500	60750	D5261	10	10.9	D4632-MD	225	289	D4632-XMD	225	300	D 4533-MD	90	112	D 4533-XMD	90	139	D4833	120
	300005239	6750	20250	67500	D5261	10	10.9	D4632-MD	225	289	D4632-XMD	225	300	D 4533-MD	90	112	D 4533-XMD	90	139	D4833	120
	300005240	6750	27000	74250	D5261	10	10.9	D4632-MD	225	289	D4632-XMD	225	300	D 4533-MD	90	112	D 4533-XMD	90	139	D4833	120
	300005241	6750	33750	81000	D5261	10	10.9	D4632-MD	225	289	D4632-XMD	225	300	D 4533-MD	90	112	D 4533-XMD	90	139	D4833	120
	300005242	6750	40500	87750	D5261	10	10.9	D4632-MD	225	289	D4632-XMD	225	300	D 4533-MD	90	112	D 4533-XMD	90	139	D4833	120
	300005243	6750	47250	94500	D5261	10	10.9	D4632-MD	225	289	D4632-XMD	225	300	D 4533-MD	90	112	D 4533-XMD	90	139	D4833	120
	300005249	6750	6750	101250	D5261	10	11.9	D4632-MD	225	285	D4632-XMD	225	308	D 4533-MD	90	106	D 4533-XMD	90	128	D4833	120
	300005250	6750	13500	108000	D5261	10	11.9	D4632-MD	225	285	D4632-XMD	225	308	D 4533-MD	90	106	D 4533-XMD	90	128	D4833	120
	300005251	6750	6750	114750	D5261	10	12.3	D4632-MD	225	295	D4632-XMD	225	318	D 4533-MD	90	118	D 4533-XMD	90	128	D4833	120
	300005252	6750	13500	121500	D5261	10	12.3	D4632-MD	225	295	D4632-XMD	225	318	D 4533-MD	90	118	D 4533-XMD	90	128	D4833	120
	300005253	6750	20250	128250	D5261	10	12.3	D4632-MD	225	295	D4632-XMD	225	318	D 4533-MD	90	118	D 4533-XMD	90	128	D4833	120
	300005254	6750	27000	135000	D5261	10	12.3	D4632-MD	225	295	D4632-XMD	225	318	D 4533-MD	90	118	D 4533-XMD	90	128	D4833	120
	300005255	6750	33750	141750	D5261	10	12.3	D4632-MD	225	295	D4632-XMD	225	318	D 4533-MD	90	118	D 4533-XMD	90	128	D4833	120
	300005256	6750	40500	148500	D5261	10	12.3	D4632-MD	225	295	D4632-XMD	225	318	D 4533-MD	90	118	D 4533-XMD	90	128	D4833	120
	300005257	6750	47250	155250	D5261	10	12.3	D4632-MD	225	295	D4632-XMD	225	318	D 4533-MD	90	118	D 4533-XMD	90	128	D4833	120
	300005258	6750	6750	162000	D5261	10	11	D4632-MD	225	271	D4632-XMD	225	304	D 4533-MD	90	107	D 4533-XMD	90	145	D4833	120
	300005259	6750	13500	168750	D5261	10	11	D4632-MD	225	271	D4632-XMD	225	304	D 4533-MD	90	107	D 4533-XMD	90	145	D4833	120
	300005260	6750	20250	175500	D5261	10	11	D4632-MD	225	271	D4632-XMD	225	304	D 4533-MD	90	107	D 4533-XMD	90	145	D4833	120
	300005261	6750	27000	182250	D5261	10	11	D4632-MD	225	271	D4632-XMD	225	304	D 4533-MD	90	107	D 4533-XMD	90	145	D4833	120
	300005262	6750	33750	189000	D5261	10	11	D4632-MD	225	271	D4632-XMD	225	304	D 4533-MD	90	107	D 4533-XMD	90	145	D4833	120
	300005263	6750	40500	195750	D5261	10	11	D4632-MD	225	271	D4632-XMD	225	304	D 4533-MD	90	107	D 4533-XMD	90	145	D4833	120
	300005264	6750	40500	195750	D5261	10	11	D4632-MD	225	271	D4632-XMD	225	304	D 4533-MD	90	107	D 4533-XMD	90	145	D4833	120
	300005265	6750	6750	202500	D5261	10	11.4	D4632-MD	225	318	D4632-XMD	225	337	D 4533-MD	90	108	D 4533-XMD	90	139	D4833	120
	300005266	6750	13500	209250	D5261	10	11.4	D4632-MD	225	318	D4632-XMD	225	337	D 4533-MD	90	108	D 4533-XMD	90	139	D4833	120
	300005267	6750	20250	216000	D5261	10	11.4	D4632-MD	225	318	D4632-XMD	225	337	D 4533-MD	90	108	D 4533-XMD	90	139	D4833	120
	300005268	6750	27000	222750	D5261	10	11.4	D4632-MD	225	318	D4632-XMD	225	337	D 4533-MD	90	108	D 4533-XMD	90	139	D4833	120
	300005269	6750	33750	229500	D5261	10	11.4	D4632-MD	225	318	D4632-XMD	225	337	D 4533-MD	90	108	D 4533-XMD	90	139	D4833	120
	300005270	6750	40500	236250	D5261	10	11.4	D4632-MD	225	318	D4632-XMD	225	337	D 4533-MD	90	108	D 4533-XMD	90	139	D4833	120
	300005271	6750	47250	243000	D5261	10	11.4	D4632-MD	225	318	D4632-XMD	225	337	D 4533-MD	90	108	D 4533-XMD	90	139	D4833	120
	300005272	6750	6750	249750	D5261	10	10.7	D4632-MD	225	305	D4632-XMD	225	331	D 4533-MD	90	115	D 4533-XMD	90	147	D4833	120
	300005273	6750	13500	256500	D5261	10	10.7	D4632-MD	225	305	D4632-XMD	225	331	D 4533-MD	90	115	D 4533-XMD	90	147	D4833	120
	300005274	6750	20250	263250	D5261	10	10.7	D4632-MD	225	305	D4632-XMD	225	331	D 4533-MD	90	115	D 4533-XMD	90	147	D4833	120
	300005275	6750	27000	270000	D5261	10	10.7	D4632-MD	225	305	D4632-XMD	225	331	D 4533-MD	90	115	D 4533-XMD	90	147	D4833	120
	300005276	6750	33750	276750	D5261	10	10.7	D4632-MD	225	305	D4632-XMD	225	331	D 4533-MD	90	115	D 4533-XMD	90	147	D4833	120
	300005277	6750	40500	283500	D5261	10	10.7	D4632-MD	225	305	D4632-XMD	225	331	D 4533-MD	90	115	D 4533-XMD	90	147	D4833	120
	300005278	6750	47250	290250	D5261	10	10.7	D4632-MD	225	305	D4632-XMD	225	331	D 4533-MD	90	115	D 4533-XMD	90	147	D4833	120
	300005279	6750	6750	297000	D5261	10	11.4	D4632-MD	225	327	D4632-XMD	225	336	D 4533-MD	90	113	D 4533-XMD	90	151	D4833	120
	300005280	6750	13500	303750	D5261	10	11.4	D4632-MD	225	327	D4632-XMD	225	336	D 4533-MD	90	113	D 4533-XMD	90	151	D4833	120

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10 Oz_Geotextile

Lot No.	Roll No.	Roll Sq. Ft.	Test Cum S	Cum. Sq. Ft	Test	STD	Measure	Test	STD	Measured	Test	STD	Measured	Test	STD	Measured	Test	STD	Measured	Test	STD
	300005281	6750	20250	310500	D5261	10	11.4	D4632-MD	225	327	D4632-XMD	225	336	D 4533-MD	90	113	D 4533-XMD	90	151	D4833	120
	300005282	6750	27000	317250	D5261	10	11.4	D4632-MD	225	327	D4632-XMD	225	336	D 4533-MD	90	113	D 4533-XMD	90	151	D4833	120
	300005283	6750	33750	324000	D5261	10	11.4	D4632-MD	225	327	D4632-XMD	225	336	D 4533-MD	90	113	D 4533-XMD	90	151	D4833	120
	300005353	6750	6750	330750	D5261	10	13.3	D4632-MD	225	359	D4632-XMD	225	431	D 4533-MD	90	151	D 4533-XMD	90	234	D4833	120
	300005354	6750	13500	337500	D5261	10	13.3	D4632-MD	225	359	D4632-XMD	225	431	D 4533-MD	90	151	D 4533-XMD	90	234	D4833	120
	300005355	6750	20250	344250	D5261	10	13.3	D4632-MD	225	359	D4632-XMD	225	431	D 4533-MD	90	151	D 4533-XMD	90	234	D4833	120
	300005356	6750	27000	351000	D5261	10	13.3	D4632-MD	225	359	D4632-XMD	225	431	D 4533-MD	90	151	D 4533-XMD	90	234	D4833	120
	300005357	6750	33750	357750	D5261	10	13.3	D4632-MD	225	359	D4632-XMD	225	431	D 4533-MD	90	151	D 4533-XMD	90	234	D4833	120
	300005358	6750	40500	364500	D5261	10	13.3	D4632-MD	225	359	D4632-XMD	225	431	D 4533-MD	90	151	D 4533-XMD	90	234	D4833	120
	300005359	6750	47250	371250	D5261	10	13.3	D4632-MD	225	359	D4632-XMD	225	431	D 4533-MD	90	151	D 4533-XMD	90	234	D4833	120
	300005360	6750	6750	378000	D5261	10	11.1	D4632-MD	225	291	D4632-XMD	225	360	D 4533-MD	90	151	D 4533-XMD	90	234	D4833	120
	300005361	6750	13500	384750	D5261	10	11.1	D4632-MD	225	291	D4632-XMD	225	360	D 4533-MD	90	151	D 4533-XMD	90	234	D4833	120
	300005362	6750	20250	391500	D5261	10	11.1	D4632-MD	225	291	D4632-XMD	225	360	D 4533-MD	90	151	D 4533-XMD	90	234	D4833	120
	300005363	6750	27000	398250	D5261	10	11.1	D4632-MD	225	291	D4632-XMD	225	360	D 4533-MD	90	151	D 4533-XMD	90	234	D4833	120
	300005364	6750	33750	405000	D5261	10	11.1	D4632-MD	225	291	D4632-XMD	225	360	D 4533-MD	90	151	D 4533-XMD	90	234	D4833	120
	300005365	6750	40500	411750	D5261	10	11.1	D4632-MD	225	291	D4632-XMD	225	360	D 4533-MD	90	151	D 4533-XMD	90	234	D4833	120
	300005366	6750	47250	418500	D5261	10	11.1	D4632-MD	225	291	D4632-XMD	225	360	D 4533-MD	90	151	D 4533-XMD	90	234	D4833	120
	300005367	6750	6750	425250	D5261	10	11.4	D4632-MD	225	321	D4632-XMD	225	357	D 4533-MD	90	129	D 4533-XMD	90	166	D4833	120
	300005368	6750	13500	432000	D5261	10	11.4	D4632-MD	225	321	D4632-XMD	225	357	D 4533-MD	90	129	D 4533-XMD	90	166	D4833	120
	300005369	6750	20250	438750	D5261	10	11.4	D4632-MD	225	321	D4632-XMD	225	357	D 4533-MD	90	129	D 4533-XMD	90	166	D4833	120
	300005370	6750	27000	445500	D5261	10	11.4	D4632-MD	225	321	D4632-XMD	225	357	D 4533-MD	90	129	D 4533-XMD	90	166	D4833	120
	300005371	6750	33750	452250	D5261	10	11.4	D4632-MD	225	321	D4632-XMD	225	357	D 4533-MD	90	129	D 4533-XMD	90	166	D4833	120
	300005372	6750	40500	459000	D5261	10	11.4	D4632-MD	225	321	D4632-XMD	225	357	D 4533-MD	90	129	D 4533-XMD	90	166	D4833	120
	300005373	6750	47250	465750	D5261	10	11.4	D4632-MD	225	321	D4632-XMD	225	357	D 4533-MD	90	129	D 4533-XMD	90	166	D4833	120
	300005374	6750	6750	472500	D5261	10	11.1	D4632-MD	225	319	D4632-XMD	225	337	D 4533-MD	90	118	D 4533-XMD	90	179	D4833	120
	300005375	6750	13500	479250	D5261	10	11.1	D4632-MD	225	319	D4632-XMD	225	337	D 4533-MD	90	118	D 4533-XMD	90	179	D4833	120
	300005376	6750	20250	486000	D5261	10	11.1	D4632-MD	225	319	D4632-XMD	225	337	D 4533-MD	90	118	D 4533-XMD	90	179	D4833	120
	300005377	6750	27000	492750	D5261	10	11.1	D4632-MD	225	319	D4632-XMD	225	337	D 4533-MD	90	118	D 4533-XMD	90	179	D4833	120
	300005378	6750	33750	499500	D5261	10	11.1	D4632-MD	225	319	D4632-XMD	225	337	D 4533-MD	90	118	D 4533-XMD	90	179	D4833	120
	300005379	6750	40500	506250	D5261	10	11.1	D4632-MD	225	319	D4632-XMD	225	337	D 4533-MD	90	118	D 4533-XMD	90	179	D4833	120
	300005380	6750	47250	513000	D5261	10	11.1	D4632-MD	225	319	D4632-XMD	225	337	D 4533-MD	90	118	D 4533-XMD	90	179	D4833	120
	300005381	6750	6750	519750	D5261	10	11.3	D4632-MD	225	306	D4632-XMD	225	338	D 4533-MD	90	123	D 4533-XMD	90	191	D4833	120
	300005382	6750	13500	526500	D5261	10	11.3	D4632-MD	225	306	D4632-XMD	225	338	D 4533-MD	90	123	D 4533-XMD	90	191	D4833	120
	300005383	6750	20250	533250	D5261	10	11.3	D4632-MD	225	306	D4632-XMD	225	338	D 4533-MD	90	123	D 4533-XMD	90	191	D4833	120
	300005384	6750	27000	540000	D5261	10	11.3	D4632-MD	225	306	D4632-XMD	225	338	D 4533-MD	90	123	D 4533-XMD	90	191	D4833	120
	300005385	6750	33750	546750	D5261	10	11.3	D4632-MD	225	306	D4632-XMD	225	338	D 4533-MD	90	123	D 4533-XMD	90	191	D4833	120
	300005386	6750	40500	553500	D5261	10	11.3	D4632-MD	225	306	D4632-XMD	225	338	D 4533-MD	90	123	D 4533-XMD	90	191	D4833	120
	300005387	6750	47250	560250	D5261	10	11.3	D4632-MD	225	306	D4632-XMD	225	338	D 4533-MD	90	123	D 4533-XMD	90	191	D4833	120
	300005388	6750	6750	567000	D5261	10	11	D4632-MD	225	310	D4632-XMD	225	331	D 4533-MD	90	111	D 4533-XMD	90	162	D4833	120
	300005389	6750	13500	573750	D5261	10	11	D4632-MD	225	310	D4632-XMD	225	331	D 4533-MD	90	111	D 4533-XMD	90	162	D4833	120
	300005390	6750	20250	580500	D5261	10	11	D4632-MD	225	310	D4632-XMD	225	331	D 4533-MD	90	111	D 4533-XMD	90	162	D4833	120
	300005391	6750	27000	587250	D5261	10	11	D4632-MD	225	310	D4632-XMD	225	331	D 4533-MD	90	111	D 4533-XMD	90	162	D4833	120
	300005392	6750	33750	594000	D5261	10	11	D4632-MD	225	310	D4632-XMD	225	331	D 4533-MD	90	111	D 4533-XMD	90	162	D4833	120
	300005393	6750	40500	600750	D5261	10	11	D4632-MD	225	310	D4632-XMD	225	331	D 4533-MD	90	111	D 4533-XMD	90	162	D4833	120
	300005394	6750	47250	607500	D5261	10	11	D4632-MD	225	310	D4632-XMD	225	331	D 4533-MD	90	111	D 4533-XMD	90	162	D4833	120
	300005395	6750	6750	614250	D5261	10	10.7	D4632-MD	225	300	D4632-XMD	225	326	D 4533-MD	90	119	D 4533-XMD	90	161	D4833	120

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Lot No.	Roll No.	Roll Sq. Ft.	Test Cum S	Cum. Sq. Ft	Test	STD	Measure	Test	STD	Measured	Test	STD	Measured	Test	STD	Measured	Test	STD	Measured	Test	STD
	300005396	6750	13500	621000	D5261	10	10.7	D4632-MD	225	300	D4632-XMD	225	326	D 4533-MD	90	119	D 4533-XMD	90	161	D4833	120
	300005397	6750	20250	627750	D5261	10	10.7	D4632-MD	225	300	D4632-XMD	225	326	D 4533-MD	90	119	D 4533-XMD	90	161	D4833	120
	300005398	6750	27000	634500	D5261	10	10.7	D4632-MD	225	300	D4632-XMD	225	326	D 4533-MD	90	119	D 4533-XMD	90	161	D4833	120
	300005399	6750	33750	641250	D5261	10	10.7	D4632-MD	225	300	D4632-XMD	225	326	D 4533-MD	90	119	D 4533-XMD	90	161	D4833	120
	300005400	6750	40500	648000	D5261	10	10.7	D4632-MD	225	300	D4632-XMD	225	326	D 4533-MD	90	119	D 4533-XMD	90	161	D4833	120
	300005401	6750	47250	654750	D5261	10	10.7	D4632-MD	225	300	D4632-XMD	225	326	D 4533-MD	90	119	D 4533-XMD	90	161	D4833	120
	300005402	6750	6750	661500	D5261	10	11	D4632-MD	225	289	D4632-XMD	225	342	D 4533-MD	90	132	D 4533-XMD	90	179	D4833	120
	300005403	6750	13500	668250	D5261	10	11	D4632-MD	225	289	D4632-XMD	225	342	D 4533-MD	90	132	D 4533-XMD	90	179	D4833	120
	300005404	6750	20250	675000	D5261	10	11	D4632-MD	225	289	D4632-XMD	225	342	D 4533-MD	90	132	D 4533-XMD	90	179	D4833	120
	300005405	6750	27000	681750	D5261	10	11	D4632-MD	225	289	D4632-XMD	225	342	D 4533-MD	90	132	D 4533-XMD	90	179	D4833	120
	300005406	6750	33750	688500	D5261	10	11	D4632-MD	225	289	D4632-XMD	225	342	D 4533-MD	90	132	D 4533-XMD	90	179	D4833	120
	300005407	6750	40500	695250	D5261	10	11	D4632-MD	225	289	D4632-XMD	225	342	D 4533-MD	90	132	D 4533-XMD	90	179	D4833	120
	300005408	6750	47250	702000	D5261	10	11	D4632-MD	225	289	D4632-XMD	225	342	D 4533-MD	90	132	D 4533-XMD	90	179	D4833	120
	300005409	6750	6750	708750	D5261	10	10.9	D4632-MD	225	314	D4632-XMD	225	328	D 4533-MD	90	125	D 4533-XMD	90	187	D4833	120
	300005410	6750	13500	715500	D5261	10	10.9	D4632-MD	225	314	D4632-XMD	225	328	D 4533-MD	90	125	D 4533-XMD	90	187	D4833	120
	300005411	6750	20250	722250	D5261	10	10.9	D4632-MD	225	314	D4632-XMD	225	328	D 4533-MD	90	125	D 4533-XMD	90	187	D4833	120
	300005412	6750	27000	729000	D5261	10	10.9	D4632-MD	225	314	D4632-XMD	225	328	D 4533-MD	90	125	D 4533-XMD	90	187	D4833	120
	300005413	6750	33750	735750	D5261	10	10.9	D4632-MD	225	314	D4632-XMD	225	328	D 4533-MD	90	125	D 4533-XMD	90	187	D4833	120
	300005414	6750	40500	742500	D5261	10	10.9	D4632-MD	225	314	D4632-XMD	225	328	D 4533-MD	90	125	D 4533-XMD	90	187	D4833	120
	300005415	6750	47250	749250	D5261	10	10.9	D4632-MD	225	314	D4632-XMD	225	328	D 4533-MD	90	125	D 4533-XMD	90	187	D4833	120
	300005416	6750	54000	756000	D5261	10	10.9	D4632-MD	225	314	D4632-XMD	225	328	D 4533-MD	90	125	D 4533-XMD	90	187	D4833	120
	300005417	6750	60750	762750	D5261	10	10.9	D4632-MD	225	314	D4632-XMD	225	328	D 4533-MD	90	125	D 4533-XMD	90	187	D4833	120
	300005418	6750	6750	769500	D5261	10	10.5	D4632-MD	225	287	D4632-XMD	225	329	D 4533-MD	90	126	D 4533-XMD	90	191	D4833	120
	300005419	6750	13500	776250	D5261	10	10.5	D4632-MD	225	287	D4632-XMD	225	329	D 4533-MD	90	126	D 4533-XMD	90	191	D4833	120
	300005420	6750	20250	783000	D5261	10	10.5	D4632-MD	225	287	D4632-XMD	225	329	D 4533-MD	90	126	D 4533-XMD	90	191	D4833	120
	300005421	6750	27000	789750	D5261	10	10.5	D4632-MD	225	287	D4632-XMD	225	329	D 4533-MD	90	126	D 4533-XMD	90	191	D4833	120
	300005422	6750	33750	796500	D5261	10	10.5	D4632-MD	225	287	D4632-XMD	225	329	D 4533-MD	90	126	D 4533-XMD	90	191	D4833	120
	300005423	6750	6750	803250	D5261	10	10.7	D4632-MD	225	308	D4632-XMD	225	326	D 4533-MD	90	128	D 4533-XMD	90	188	D4833	120
	300005424	6750	13500	810000	D5261	10	10.7	D4632-MD	225	308	D4632-XMD	225	326	D 4533-MD	90	128	D 4533-XMD	90	188	D4833	120
	300005425	6750	20250	816750	D5261	10	10.7	D4632-MD	225	308	D4632-XMD	225	326	D 4533-MD	90	128	D 4533-XMD	90	188	D4833	120
	300005426	6750	27000	823500	D5261	10	10.7	D4632-MD	225	308	D4632-XMD	225	326	D 4533-MD	90	128	D 4533-XMD	90	188	D4833	120
	300005427	6750	33750	830250	D5261	10	10.7	D4632-MD	225	308	D4632-XMD	225	326	D 4533-MD	90	128	D 4533-XMD	90	188	D4833	120
	Maximum	6750					13.3						431			151			234		
	Minimum	6750		105.09%	square feet		10.5						300			106			128		
	Mean	6750.0		40,250	[over/(short)]		11.23						336.0			121.8			169.7		
	Std. Devn.	0.00		0.00	rolls short (mea		0.639						27.56			12.77			30.10		
	MARV						9.955						280.90			96.24			109.47		
	Mode	6750		0.00	rolls short (mode)																

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Lot No.	Roll No.	Measured	Test	STD	Measured	Test	STD	Measured
	300005230	183	D3786	450	578	D4355	70	0
	300005231	183	D3786	450	578	D4355	70	0
	300005232	183	D3786	450	578	D4355	70	0
	300005233	183	D3786	450	578	D4355	70	0
	300005234	183	D3786	450	578	D4355	70	0
	300005235	183	D3786	450	578	D4355	70	0
	300005236	183	D3786	450	578	D4355	70	0
	300005237	173	D3786	450	564	D4355	70	0
	300005238	173	D3786	450	564	D4355	70	0
	300005239	173	D3786	450	564	D4355	70	0
	300005240	173	D3786	450	564	D4355	70	0
	300005241	173	D3786	450	564	D4355	70	0
	300005242	173	D3786	450	564	D4355	70	0
	300005243	173	D3786	450	564	D4355	70	0
	300005249	204	D3786	450	689	D4355	70	0
	300005250	204	D3786	450	689	D4355	70	0
	300005251	216	D3786	450	711	D4355	70	0
	300005252	216	D3786	450	711	D4355	70	0
	300005253	216	D3786	450	711	D4355	70	0
	300005254	216	D3786	450	711	D4355	70	0
	300005255	216	D3786	450	711	D4355	70	0
	300005256	216	D3786	450	711	D4355	70	0
	300005257	216	D3786	450	711	D4355	70	0
	300005258	203	D3786	450	655	D4355	70	0
	300005259	203	D3786	450	655	D4355	70	0
	300005260	203	D3786	450	655	D4355	70	0
	300005261	203	D3786	450	655	D4355	70	0
	300005262	203	D3786	450	655	D4355	70	0
	300005263	203	D3786	450	655	D4355	70	0
	300005264	203	D3786	450	655	D4355	70	0
	300005265	208	D3786	450	610	D4355	70	0
	300005266	208	D3786	450	610	D4355	70	0
	300005267	208	D3786	450	610	D4355	70	0
	300005268	208	D3786	450	610	D4355	70	0
	300005269	208	D3786	450	610	D4355	70	0
	300005270	208	D3786	450	610	D4355	70	0
	300005271	208	D3786	450	610	D4355	70	0
	300005272	201	D3786	450	614	D4355	70	0
	300005273	201	D3786	450	614	D4355	70	0
	300005274	201	D3786	450	614	D4355	70	0
	300005275	201	D3786	450	614	D4355	70	0
	300005276	201	D3786	450	614	D4355	70	0
	300005277	201	D3786	450	614	D4355	70	0
	300005278	201	D3786	450	614	D4355	70	0
	300005279	221	D3786	450	643	D4355	70	0
	300005280	221	D3786	450	643	D4355	70	0

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Lot No.	Roll No.	Measured	Test	STD	Measured	Test	STD	Measured
	300005281	221	D3786	450	643	D4355	70	Q
	300005282	221	D3786	450	643	D4355	70	Q
	300005283	221	D3786	450	643	D4355	70	Q
	300005353	235	D3786	450	738	D4355	70	Q
	300005354	235	D3786	450	738	D4355	70	Q
	300005355	235	D3786	450	738	D4355	70	Q
	300005356	235	D3786	450	738	D4355	70	Q
	300005357	235	D3786	450	738	D4355	70	Q
	300005358	235	D3786	450	738	D4355	70	Q
	300005359	235	D3786	450	738	D4355	70	Q
	300005360	235	D3786	450	738	D4355	70	Q
	300005361	235	D3786	450	738	D4355	70	Q
	300005362	235	D3786	450	738	D4355	70	Q
	300005363	235	D3786	450	738	D4355	70	Q
	300005364	235	D3786	450	738	D4355	70	Q
	300005365	235	D3786	450	738	D4355	70	Q
	300005366	235	D3786	450	738	D4355	70	Q
	300005367	189	D3786	450	633	D4355	70	Q
	300005368	189	D3786	450	633	D4355	70	Q
	300005369	189	D3786	450	633	D4355	70	Q
	300005370	189	D3786	450	633	D4355	70	Q
	300005371	189	D3786	450	633	D4355	70	Q
	300005372	189	D3786	450	633	D4355	70	Q
	300005373	189	D3786	450	633	D4355	70	Q
	300005374	188	D3786	450	632	D4355	70	Q
	300005375	188	D3786	450	632	D4355	70	Q
	300005376	188	D3786	450	632	D4355	70	Q
	300005377	188	D3786	450	632	D4355	70	Q
	300005378	188	D3786	450	632	D4355	70	Q
	300005379	188	D3786	450	632	D4355	70	Q
	300005380	188	D3786	450	632	D4355	70	Q
	300005381	167	D3786	450	621	D4355	70	Q
	300005382	167	D3786	450	621	D4355	70	Q
	300005383	167	D3786	450	621	D4355	70	Q
	300005384	167	D3786	450	621	D4355	70	Q
	300005385	167	D3786	450	621	D4355	70	Q
	300005386	167	D3786	450	621	D4355	70	Q
	300005387	167	D3786	450	621	D4355	70	Q
	300005388	198	D3786	450	607	D4355	70	Q
	300005389	198	D3786	450	607	D4355	70	Q
	300005390	198	D3786	450	607	D4355	70	Q
	300005391	198	D3786	450	607	D4355	70	Q
	300005392	198	D3786	450	607	D4355	70	Q
	300005393	198	D3786	450	607	D4355	70	Q
	300005394	198	D3786	450	607	D4355	70	Q
	300005395	176	D3786	450	618	D4355	70	Q

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Lot No.	Roll No.	Measured	Test	STD	Measured	Test	STD	Measured
	300005396	176	D3786	450	618	D4355	70	0
	300005397	176	D3786	450	618	D4355	70	0
	300005398	176	D3786	450	618	D4355	70	0
	300005399	176	D3786	450	618	D4355	70	0
	300005400	176	D3786	450	618	D4355	70	0
	300005401	176	D3786	450	618	D4355	70	0
	300005402	204	D3786	450	616	D4355	70	0
	300005403	204	D3786	450	616	D4355	70	0
	300005404	204	D3786	450	616	D4355	70	0
	300005405	204	D3786	450	616	D4355	70	0
	300005406	204	D3786	450	616	D4355	70	0
	300005407	204	D3786	450	616	D4355	70	0
	300005408	204	D3786	450	616	D4355	70	0
	[illegible]	184	D3786	450	598	D4355	70	0
	300005410	184	D3786	450	598	D4355	70	0
	[illegible]	184	D3786	450	598	D4355	70	0
	[illegible]	184	D3786	450	598	D4355	70	0
	[illegible]	184	D3786	450	598	D4355	70	0
	[illegible]	184	D3786	450	598	D4355	70	0
	[illegible]	184	D3786	450	598	D4355	70	0
	[illegible]	184	D3786	450	598	D4355	70	0
	[illegible]	184	D3786	450	598	D4355	70	0
	300005418	182	D3786	450	557	D4355	70	0
	300005419	182	D3786	450	557	D4355	70	0
	300005420	182	D3786	450	557	D4355	70	0
	300005421	182	D3786	450	557	D4355	70	0
	300005422	182	D3786	450	557	D4355	70	0
	300005423	181	D3786	450	573	D4355	70	0
	300005424	181	D3786	450	573	D4355	70	0
	300005425	181	D3786	450	573	D4355	70	0
	300005426	181	D3786	450	573	D4355	70	0
	300005427	181	D3786	450	573	D4355	70	0
	Maximum	235			738			0
	Minimum	167			557			0
	Mean	196.9			630.4			0.0
	Std. Devn.	19.47			51.92			0.00
	MARV	157.96			526.57			0.00
	Mode							

006500

-- 2739

10 Oz_Geotextile

Review of Geotextile Test Data - TNS Advanced Technologies Manufacturer QC

7/22/99

Lot No.	Roll No.	STD	Measured	Test	STD	Measured	Test	STD	Measured	Test	STD	Measured	Test	STD	Measured
	300005513	120	154	D 4533-XMD	120	247	D4833	180	265	D3786	700	800	D4355	70	21
	300005514	120	154	D 4533-XMD	120	247	D4833	180	265	D3786	700	800	D4355	70	21
	300005515	120	154	D 4533-XMD	120	247	D4833	180	265	D3786	700	800	D4355	70	20
	300005516	120	154	D 4533-XMD	120	247	D4833	180	265	D3786	700	800	D4355	70	20
	300005517	120	154	D 4533-XMD	120	247	D4833	180	265	D3786	700	800	D4355	70	21
	300005518	120	167	D 4533-XMD	120	261	D4833	180	307	D3786	700	800	D4355	70	22
	300005519	120	167	D 4533-XMD	120	261	D4833	180	307	D3786	700	800	D4355	70	22
	300005520	120	167	D 4533-XMD	120	261	D4833	180	307	D3786	700	800	D4355	70	21
	300005521	120	167	D 4533-XMD	120	261	D4833	180	307	D3786	700	800	D4355	70	22
	300005522	120	167	D 4533-XMD	120	261	D4833	180	307	D3786	700	800	D4355	70	22
	300005523	120	167	D 4533-XMD	120	261	D4833	180	307	D3786	700	800	D4355	70	21
	300005524	120	167	D 4533-XMD	120	261	D4833	180	307	D3786	700	800	D4355	70	21
	Maximum		167			261			307			800			22
	Minimum		154			247			265			800			20
	Mean		161.6			255.2			289.5			800.0			21.2
	Std. Devn.		6.41			6.90			20.71			0.00			0.69
	MARV		148.77			241.36			248.09			800.00			19.79
	Mode														

-2739

000501

16 Oz_Geotextile

Review of Geotextile Test Data - TNS Advanced Technologies Manufacturer QC 7/22/99

Lot No.	Roll No.	Roll Sq. Ft.	Test Cum S	Cum. Sq. Ft	Test	STD	Measure	Test	STD	Measured	Test	STD	Measured	Test
	300005513	6750	6750	6750	D5261	16	17.8	D4632-MD	350	445	D4632-XMD	350	539	D 4533-MD
	300005514	6750	13500	13500	D5261	16	17.8	D4632-MD	350	445	D4632-XMD	350	539	D 4533-MD
	300005515	6750	20250	20250	D5261	16	17.8	D4632-MD	350	445	D4632-XMD	350	539	D 4533-MD
	300005516	6750	27000	27000	D5261	16	17.8	D4632-MD	350	445	D4632-XMD	350	539	D 4533-MD
	300005517	6750	33750	33750	D5261	16	17.8	D4632-MD	350	445	D4632-XMD	350	539	D 4533-MD
	300005518	6750	6750	40500	D5261	16	17.4	D4632-MD	350	462	D4632-XMD	350	532	D 4533-MD
	300005519	6750	13500	47250	D5261	16	17.4	D4632-MD	350	462	D4632-XMD	350	532	D 4533-MD
	300005520	6750	20250	54000	D5261	16	17.4	D4632-MD	350	462	D4632-XMD	350	532	D 4533-MD
	300005521	6750	27000	60750	D5261	16	17.4	D4632-MD	350	462	D4632-XMD	350	532	D 4533-MD
	300005522	6750	33750	67500	D5261	16	17.4	D4632-MD	350	462	D4632-XMD	350	532	D 4533-MD
	300005523	6750	40500	74250	D5261	16	17.4	D4632-MD	350	462	D4632-XMD	350	532	D 4533-MD
	300005524	6750	47250	81000	D5261	16	17.4	D4632-MD	350	462	D4632-XMD	350	532	D 4533-MD
	Maximum	6750					17.8			462			539	
	Minimum	6750		108.72%	square feet		17.4			445			532	
	Mean	6750.0		6,500	[over/(short)]		17.57			454.9			534.9	
	Std. Devn.	0.00		0.00	rolls short (m		0.197			8.38			3.45	
	MARV						17.172			438.15			528.01	
	Mode	6750		0.00	rolls short (mode)									

000502

- 2739

RECEIVED
JUL 22 1999

16 Oz_Geotextile

GEOTEXTILE

SUPPLIER DOCUMENT SUBMITTAL

27 JM 7-15-99

FDFPROJECT NO: [redacted]00	CONTRACT NO: 1441	SUBMITTAL NO: 001	RE[redacted]	DATE: 4-29-99	PAGE (6) 1 OF [redacted]

FROM: TNS ADVANCED TECHNOLOGIES

SIGNATURE: Richard J. Franklin

TO: FDF ENGINEERING/CONSTRUCTION DOCUMENT CONTROL, MS 52-7

RECEIVED BY: (8)

RECORD

QTY. (9)	DOCUMENT NUMBER (10)	REV (11)	DOCUMENT FAMILY (12) PRO	H&S	MED	TRG	CON	ENG	QAC	RESUBMITTAL (13) YES	NO	TITLE DESCRIPTION (14)	SUBMITTAL CFC	INF	ASSOCIATED SPECIFICATION (16)	SUBMITTAL ACTION (17) A	B	C
8	1441-001	0					X				X	SUBMITTAL REGISTER		X	ACR001			
8	1441-002	0	X	X							X	WARRANTY-MATERIAL		X				
8	1441-003	0							X		X	MATERIAL CERTS		X			X	
8	1441-004	0							X		X	QC MANUAL		X			X	
~~8~~	~~1441-005~~	~~0~~										~~DELIVERY SCHEDULE~~						
8	1441-027141-1	0						X			X	Product Name		X			X	
~~8~~	~~1441-027141-2~~	~~0~~										~~Certification of MARV~~					~~X~~	EBT
8	1441-027141-5	0						X				Completed Forms GT-7/14/16	X			X		

DISTRIBUTION

REVIEW DISTRIBUTION

DISTRIBUTION (18)	MS (19)	DISTRIBUTION (18)	MS (19)
Jim Jenkins, FDF, Eng, Approver	64	Chuck Von Arsdale, FDF Eng.	64
Kevin Barlo-Turenchalk, GeoSyntec, Eng.	38		
Kathy Fisher, FDF, Procurement	64		
Gregg Johnson, FDF, Health & Safety	64		
Tony Klimek, FDF, Eng.	64		
Jim Turner, FDF, QA	64		

CFC DISTRIBUTION

DISTRIBUTION (18)	MS (19)	DISTRIBUTION (18)	MS (19)
RECEIVED JUL 15 1999 EBT @ 4:2			

RECEIVED BY: (20) [signature] (SIGN/DATE AND RETURN A COPY TO ECDC, MS52-7)

DATE: 7/15/99 NO COMMENTS: ____ (21) COMMENTS ATTACHED X

Comments: (22) THIS WAS REVIEWED AND SUBMITTED ON 5/12/99.

SUBMITTAL ACTION CODE: (BY SUPPLIER)
CFC - CERTIFIED FOR CONSTRUCTION
INF - INFORMATION/RECORD
"X" APPROPRIATE SUBMITTAL ACTION ABOVE

SUPPLIER ACTION CODE: (ECDC) SUPPLIER ACTION ABOVE
A - ACCEPTED DOCUMENT: CONFORMS WITH REQUIREMENTS
B - MINOR COMMENTS: REVISE AND RESUBMIT AS CFC OR INF
C - REVISE AND RESUBMIT

000504

-2739

FS-F-4955
Rev. 2: 01/18/98

-- 2739

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4-29-99
p. 2 of ~~20~~ 24
JM 7-15-99
Doc #1441-001

Supplier Submittal Number: 001

Document Number: 1441-001

Specification Requirement Reference: ACR001

Document Description: Submittal Register

RECORD

FDF To Review
K Bartlewski
7/15/99

TABLE 1
GEOSYNTHETIC MATERIALS
CONTRACT 99SC001441 (TNS)
SUBMITTAL REGISTER
BASE BID

RECORD

upplier ubmittal umber	Rev No.	Document Number	Rev No.	Specification Requirement Reference	Document Description	Document Type	Document Family	Due Date
)1	0	1441-001		ACR001	Submittal Register	INF	Const	a
)2	0	1441-002		Contract Section C	Material Safety Data Sheets	INF	H&S	a&d
)3	0	1441-003-7 1441-003-10 1441-003-16		I, General Provisions	Warranty for Geotextile	INF	Proc	a
2714P-1	0	1441-02714P-1		02714P.1.04.A.1	Product Name	INF	Engr	a
2714P-2	0	1441-02714P-2		02714P.1.04.A.2	Certification of Minimum Average Roll Values	INF	QA	a
2714P-3	0	1441-02714P-3		02714P.1.04.A.3	Projected Delivery Dates	INF	Const	a
2714P-4	0	1441-02714P-4		02714P.1.04.A.4	Recommended Long-Term Storage Requirements	REC	Engr	a
2714P-5	0	1441-02714P-5		02714P.1.04.A.5	Completed Forms GT-7, GT-10 and GT-16	REC	Engr	a
2714P-6	0	1441-02714P-6		02714P.1.05.B	Quality control Certificates	CFC	QA	c
2714P-7	0	1441-02714P-7		02714P.2.02	Quality control sampling and testing plan	INF	QA	b

000506

a. April 9, 1999
b. April 19, 1999
c. 21 days prior to shipment
d. With shipment

he supplier shall provide submittals in accordance with Administrative Contractor Requirements ACR-001, attached.

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Doc # 1441-001
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Doc #1441-002

Supplier Submittal Number: 002

Document Number: 1441-002

2739

Specification Requirement Reference: Contract Section C

Document Description: Material Safety Data Sheet

RECORD

FDF To Review
[illegible]
7/15/99

TNS Advanced Technologies, Inc.

1441-001 Rev. Ø
4-29-99
p. 5 of ~~20~~ 24 JTT 7-15-99
Doc #1441-ØØ2

Material Safety Data Sheet

-- 2739

Section 1—Product Identification

Manufacturer's Name:

TNS Advanced Technologies, Inc.
681 Deyoung Road
Greer, South Carolina 29651

Emergency Phone Number. (800) 867-5181 [(864) 968-0592]

RECORD

Date Prepared: May 29, 1997

Section 2—Hazardous Ingredients

No hazardous components in geotextile fabrics at or above threshold limit values.

Section 3—Physical/Chemical Characteristics

Boiling Point.	Not Applicable
Vapor Pressure:	Not Applicable
Specific Gravity:	0.90 - 0.905
Melting Point:	120 - 170 degrees (C)
Vapor Density:	Not Applicable
Evaporation Rate:	Not Applicable
Solubility in Water:	Not Applicable
Appearance and Odor:	Essentially Odorless

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Doc # 1441-002
F-2739

Section 4—Fire and Explosion Hazard Data

Flash Point:	>600 degrees (F)
Extinguishing Media:	Dry Chemical, CO^2, Foam, Water, Halon
Special Fire Fighting Procedures:	Avoid inhalation of vapors, use self contained breathing apparatus when fire fighting in confined areas.
Unusual Fire and Explosion Hazards:	Treat as a solid that can burn. Generally burns slowly with low smoke density and flaming drips. Burns with high smoke density under certain conditions.

Section 5—Reactivity Data

Material is stable.

Hazardous Polymerization will not occur.

RECORD

Section 6—Health Hazard Data

Primary Routes of Entry:	Inhalation-Negligible Skin Contact-Negligible Indigestion-Not Applicable
Carcinogen:	Not a carcinogen
Emergency and First Aid Procedure:	Eye Contact: flush with water. Skin Contact: treat as thermal burn if contact with molten

Section 7—Precautions for Handling and Use

Practice reasonable care and caution in handling.

Waste Disposal:	Place in appropriate disposal facility in compliance with local regulations.
Storage:	In cool, dry location away from oxidizing materials.

Section—8 Control Measures

Use NIOSH respirators when hot/molten product.

Protective Gloves:	Required when handling molten product.

Practice general hygiene by washing hands and clothes after handling.

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Supplier Submittal Number: 4

Document Number: 1441-003-7
1441-003-10
1441-003-16

Doc # 1441-~~003~~ 002 7-15-99

-- 2739

Specification Requirement Reference: Section I, General Provisions

Document Description: Warranty for Geotextiles

RECORD

FDF TO REVIEW
KBarnhardt

~~# 1441-000~~
1441-001 Rev. 0
4-29-99
p. 8 of ~~20~~ 24
JTT 7-15-99
Doc # 1441-~~00~~ 3
002 JTT 7-15-99

TNS Advanced Technologies
405 Hood Rd.
Lilburn, GA 30047
Phone: 770/564-1857 Fax: 770/564-1818

2739

March 30, 1999

Twenty Year Material Warranty Only
Project:Fernald On Site Disposal Facility - Cell #3
MATERIAL: TNS E070, E100, E160

RECORD

T.N.S. Advanced Technologies hereby warrants that, at the time of installation completion, all T.N.S. Advanced Technologies manufactured materials will conform to the respective T.N.S. Advanced Technologies published material specifications for such materials. Excluded from the warranty given herein shall be any damage to or failure of the material caused by, but not limited to: acts of God; casualty; catastrophe or severe weather conditions, such as earthquakes, tornadoes, hurricanes, floods, high winds, piercing hail, lightening and fire; the exposure of the material to sharp objects, chemicals acids, gases or vapors, either known or unknown, or combinations, or specified by the manufacturer as being harmful thereto; physical abuse to the material caused by vandalism, sabotage, machinery, equipment, people and animals; damage to the material during the transportation, unloading, handling, storage or installation thereof by parties other than T.N.S. Advanced Technologies; excessive pressure or stress from any source, both above and below the material; after installation; subsidence or subgrade settlement; improper site preparation and engineering, and any use of the material which the manufacturer never intended. As used throughout this warranty, the term "sale" shall mean the date on which the material is shipped from T.N.S. Advanced Technologies' manufacturing facility.

Should any significant deterioration or premature loss in use of the material occur during the term hereof which is believed to be covered by this warranty, then T.N.S. Advanced Technologies shall be given prompt written notice of the alleged claim within 30 days after such facts are first observed. Said notice shall be sent by registered or certified mail, return receipt requested, and addressed to T.N.S. Advanced Technologies, 681 DeYoung Road, Greer, South Carolina, 29651, Attention: Contracts Administrator.

The warranty described above is strictly limited to sales of the material for commercial or industrial uses only in accordance with T.N.S. Advanced Technologies published material specifications. Said warranty also is the sole and exclusive warranty given for such material and all other warranties; either express or implied, including but not limited to any warranty of merchantability or fitness for a particular purpose, are hereby disclaimed. In no event shall T.N.S. Advanced Technologies be liable for any direct, indirect, incidental, specific or consequential damages of any kind or any loss or profits resulting from failure of the material or the breach of this warranty; it being further understood that should said warranty fail in its essential purpose, and in that event only, T.N.S. Advanced Technologies' liability hereunder shall in no event exceed the sales price of the material actually received from T.N.S. by the Original Purchaser thereof.

Sincerely,

Monte Thomas-Vice President
TNS Advanced Technologies

--2739 1441-001 Rev.0

p. 9 of ~~20~~ 24 JH 4-29-99 7-15-99

Doc.# 1441-02714P-1

Supplier Submittal Number: 02714P-1 (TX1.04.A.1)

Document Number: 1441-02714P-1

Specification Requirement Reference: 02714P.1.04.A.1

Document Description: Product Name

RECORD

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Doc #1441-027140-1

-- 2739

1.) Product Names	3a – TNS E100 3a – TNS E070
2a) Daily Production capacity available for these products	3a – 28,000 pounds per day of production (2 days of continuous run 252,000 ft² 16 oz./yd² 3c – 28,000 pounds per day of production (approximately 20 hours of continuous run) 252,000 ft² 16 oz/yd²
2b) Manufacturing Quality Control Procedures	As per attached documents
4.) Projected Geotextile delivery dates	As per attachment
5.) Recommended Long Term storage requirements	As per attachment
6.) Completed forms GT-7 ; GT-10 ; GT-16	As per attachment

RECORD

Specifications call for three (3) types of geotextiles. Only two (2) products are listed above.

[illegible]
7/15/99

2739

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4-29-99
p. 11 of ~~2Ø~~ 24 STT 7-15-99
Doc # 1441-Ø2714P-2
(or 1441-ØØ3)

Supplier Submittal Number: 02714P-2 (TX1.04.A.2)

Document Number: 1441-02714P-2

Specification Requirement Reference: 02714P.1.04.A.2

Document Description: Certification of Minimum Average Roll Values

RECORD

#1441-003

TNS ADVANCED TECHNOLOGIES, INC.

405 Hood Road
Lilburn, GA 30047
Phone: 770/564-1857 Fax:770/564-1818

1441-001 Rev 0
4-29-99

2739

p.12 of 2024 7-15-99
Doc #1441-02714P-2
(or 1441-003)

February 25, 1999

Fluor Daniel Fernald

RECORD -- 2739

Dear Sir/Madam:

This is to certify that TNS E070 is a superior quality, nonwoven geotextile produced by needlepunching together 100% polypropylene staple fibers in a random network to form a high strength dimensionally stable fabric. The polypropylene fibers are specially formulated to resist ultraviolet light deterioration, and are inert to commonly encountered soil chemicals. The fabric will not rot or mildew, is non-biodegradable, and is resistant to damage from insects and rodents. Polypropylene is stable within a ph range of 2 to 13. TNS E070 conforms to the physical property values listed below:

FABRIC PROPERTY	TEST METHOD	UNITS	M.A.R.V. Roll Value
Weight	ASTM D3776	mils	7.0
Grab Tensile ?	ASTM D4632	lbs	200
Grab Elongation	ASTM D4632	%	50
Trap Tear ?	ASTM D4533	lbs	75
Puncture	ASTM D4833	lbs	115
Permittivity	ASTM D4491	1/sec	1.41
Permeability	ASTM D4491	cm/sec	.32
Water Flow	ASTM D4491	gpm/ft^2	110
Mullen Burst	ASTM D3786	psi	400
AOS	ASTM D4751	US Sieve	80
UV Resistance, after 500 hrs	ASTM D4355	% Strength retained	70

Sincerely,

Marshall Gaddy
QA/QC Manager
TNS Advanced Technologies

(1) Weight should be mass per unit area per ASTM D5261 with units of oz/yd^2.
(2) Grab Tensile and tear should have results in both machine and cross-machine directions.
(3) AOS should have units in mm.

EBT
7/15/99

#1441-003

TNS ADVANCED TECHNOLOGIES, INC.

405 Hood Road
Lilburn, GA 30047
Phone: 770/564-1857 Fax:770/564-1818

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4-29-99

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Doc # 1441-02714P-2
(or 1441-003)

February 25, 1999

Fluor Daniel Fernald

RECORD -- 2739

Dear Sir/Madam:

This is to certify that TNS E100 is a superior quality, nonwoven geotextile produced by needlepunching together 100% polypropylene staple fibers in a random network to form a high strength dimensionally stable fabric. The polypropylene fibers are specially formulated to resist ultraviolet light deterioration, and are inert to commonly encountered soil chemicals. The fabric will not rot or mildew, is non-biodegradable, and is resistant to damage from insects and rodents. Polypropylene is stable within a ph range of 2 to 13. TNS E100 conforms to the physical property values listed below:

FABRIC PROPERTY	TEST METHOD	UNITS	M.A.R.V. Roll Value
Weight	ASTM D3776	mils	10.0
Grab Tensile ?	ASTM D4632	lbs	270
Grab Elongation	ASTM D4632	%	50
Trap Tear ?	ASTM D4533	lbs	100
Puncture	ASTM D4833	lbs	165
Permittivity	ASTM D4491	1/sec	.94
Permeability	ASTM D4491	cm/sec	.30
Water Flow	ASTM D4491	gpm/ft^2	75
Mullen Burst	ASTM D3786	psi	560
AOS	ASTM D4751	US Sieve	100
UV Resistance, after 500 hrs	ASTM D4355	% Strength retained	70

Sincerely,

Marshall Gaddy
QA/QC Manager
TNS Advanced Technologies

Same comments as before
7/15/99

TNS ADVANCED TECHNOLOGIES, INC.

405 Hood Road
Lilburn, GA 30047
Phone: 770/564-1857 Fax:770/564-1818

#1441-003

1441-001 Rev. 0
4-29-99

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Doc # 1441-02714P-2
(or 1441-003)

February 25, 1999

-- 2739

RECORD

Fluor Daniel Fernald

Dear Sir/Madam:

This is to certify that TNS E160 is a superior quality, nonwoven geotextile produced by needlepunching together 100% polypropylene staple fibers in a random network to form a high strength dimensionally stable fabric. The polypropylene fibers are specially formulated to resist ultraviolet light deterioration, and are inert to commonly encountered soil chemicals. The fabric will not rot or mildew, is non-biodegradable, and is resistant to damage from insects and rodents. Polypropylene is stable within a ph range of 2 to 13. TNS E160 conforms to the physical property values listed below:

FABRIC PROPERTY	TEST METHOD	UNITS	M.A.R.V. Roll Value
Weight	ASTM D3776	mils	16.0
Grab Tensile ?	ASTM D4632	lbs	425
Grab Elongation	ASTM D4632	%	50
Trap Tear ?	ASTM D4533	lbs	150
Puncture	ASTM D4833	lbs	240
Permittivity	ASTM D4491	1/sec	.57
Permeability	ASTM D4491	cm/sec	.25
Water Flow	ASTM D4491	gpm/ft^2	45
Mullen Burst	ASTM D3786	psi	800
AOS	ASTM D4751	US Sieve	100
UV Resistance, after 500 hrs	ASTM D4355	% Strength retained	70

Sincerely,

Marshall Gaddy
QA/QC Manager
TNS Advanced Technologies

Same comments as before
7/15/99

1441-001 Rev. 0
4-29-99
p. 15 of ~~20~~ 24 JM
Doc # 1441-02714P-7
(or 1441-004)

Supplier Submittal Number: 02714P-7 (TX2.02)

Document Number: 1441-02714P-7

2739

Specification Requirement Reference: 02714P.2.02

Document Description: Quality Control Sampling and Testing Plan

RECORD

Test methods and units inconsistent with Specs.

KBoden
7/15/99

#1441-004

--2739

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4-29-99
p. 16 of ~~20~~ 24 7-15-99
Doc# 1441-027147-7
(or 1441-004)

TNS
ADVANCED TECHNOLOGIES

Quality Control

RECORD

Program Outline

1441-001 Rev. 0
4-29-99
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Doc # 1441-027141-7
(or 1441-004)

TNS Advanced Technologies 2739
Quality Control
Program Outline

Raw Material Quality Control

All raw materials used in the manufacture of TNS Advanced Technologies' products are certified by the supplier to meet the most stringent production standards in the industry. Each truck load of fiber received is certified by the supplier's quality control manager to meet specifications set by TNS. Upon delivery and unloading to TNS, each bale is entered into the plant computer tracking system. Upon release to production, each bale is updated as to which lot of finished goods: All fiber releases can be tracked by each supplier and each bale number up to one year after the fiber is processed.

Definition of Lot:

A planned production quantity satisfying all of the following:

RECORD

- Manufactured under the same material specification
- Identified as the same style (fabric designation)
- When tested, having physical characteristics consistent with published values.

Quality Control Sampling of Each Lot:

As a minimum, a number of production units shall be selected at random from each lot in accordance with Table 1.

TABLE 1 Number of Units to be Selected as Lot Sample
Specification Conformance

Number of Units in Lot			Number of Units Selected
1	to	2	1
3	to	8	2
9	to	27	3
28	to	64	4
65	to	125	5
126	to	216	6
217	to	343	7
344	to	512	8
513	to	729	9
730	to	1000	10
1001	to	more	11

Note: A production unit is considered to be a shipment roll.

Typically, the first shipment roll from each line will be sampled. It will be necessary to consider the minimum planned production quantity to determine if more frequent sampling and testing is required.

Quality Control Testing of Each Sample:

Each quality control sample shall be sent to the quality control lab before the end of the shift during which the sample was taken. Full identification of the sampled roll will be provided with the sample.

The following tests shall be run on every sample received in the Q.C. lab.

RECORD

Test Property	Test Method
Weight	ASTM D 3776
Thickness	ASTM D 1777
Grab Tensile	ASTM D 4632
Grab Elongation	ASTM D 4632
Trapezoid Tear Strength	ASTM D 4533
Puncture Resistance	ASTM D 4833
Mullen Burst Strength	ASTM D 3786
Water Flow Rate	ASTM D 4491
Permeability	ASTM D 4491
Permittivity	ASTM D 4491
U.V. Resistance	ASTM D 4355
Apparent Opening Size (A.O.S.)	ASTM D 4751

Quality Control Test Results:

All quality control test results shall be maintained by the Quality Control manager with the corresponding shipment roll identification.

The Quality Control manager will make lot testing summaries available, upon request, detailing the individual test results and aggregate mean, minimum and standard deviations of each test property for the shipment rolls under consideration.

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4-29-99 JTT 7-15-99
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TNS Advanced Technologies Quality Control Plan

The Quality Control Department tests the E-Series fabrics at the following frequencies. The tests for these properties are routine with test results reported representing each roll of fabric produced.

Doc #1441-027141P-7 (or 1441-004)

RECORD

Test Frequency in Square Yards

Property	Units	Test Method	150"	180"
Weight	oz./yd	ASTM D-3776	1,000	1,200
Thickness	mils	ASTM D-1777	5,000	6,000
Grab Tensile	lbs.	ASTM D-4632	5,000	6,000
Grab Elongation	%	ASTM D-4632	5,000	6,000
Mullen Burst	lbs. / in.	ASTM D-3786	12,500	15,000
Puncture	lbs.	ASTM D-4833	12,500	15,000
Trapezoid Tear	lbs.	ASTM D-4533	12,500	15,000
Apparent Opening Size	U.S Standard Sieve	ASTM D-4751	12,500	15,000
Water Permeability	cm./sec.	ASTM D-4491	12,500	15,000
Water Permitivity		ASTM D-4491	12,500	15,000
Flow Rate	gal./ft min.	ASTM D-4491	12,500	15,000

Additional testing is conducted on non-routing properties in the TNS Advanced Technologies Quality Control Lab or at the reputable independent test lab. Examples of non routine test include:

Property	Units	Test Method
Abrasion-sliding block	percent strength retained	ASTM D-4886
Abrasion-rotary platform	lbs.	ASTM D-3884
U.V. Resistance-Fluorescent type	percent strength retention	ASTM G-53
U.V. Resistance-Xenon Type	percent strength retention	ASTM D-4355
Wide Width	lbs. / inch	ASTM D-4595

TNS Advanced Technologies conforms and adheres to the following additional ASTM test methods relating to fabric identification, sampling, and specification conformance.

ASTM D-4873	Identification, storage and handling of Geotextiles
ASTM D-4354	Sampling of Geosynthetics for testing
ASTM D-4759	Determining Specification Conformance of Geosynthetics

TNS Advanced Technologies
TNS E-SERIES NONWOVENS
QUALITY CONTROL
SAMPLING FREQUENCY (FT)

RECORD

Product Type	Roll Length	Weight	Thickness	Grab Tensile	Trap Tear	Puncture	Burst	Water Flow	Permittivity	Permeability
E040	1350	18,000	180,000	90,000	90,000	90,000	90,000	180,000	180,000	180,000
E060	900	13,500	135,000	67,500	67,500	67,500	67,500	135,000	135,000	135,000
E070	780	9,000	90,000	45,000	45,000	45,000	45,000	90,000	90,000	135,000
E080	690	9,000	90,000	45,000	45,000	45,000	45,000	90,000	90,000	90,000
E100	570	9,000	90,000	45,000	45,000	45,000	45,000	90,000	90,000	90,000
E120	480	6,750	67,500	33,750	33,750	33,750	33,750	67,500	67,500	67,500
E140	390	4,500	45,000	22,500	22,500	22,500	22,500	45,000	45,000	45,000
E160	360	4,000	40,000	20,000	20,000	20,000	20,000	40,000	40,000	40,000

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Doc. # 1441-02714P-7
(or 1441-004)

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4-29-99
p. 21 of 24

Supplier Submittal Number: 02714P-5
(TX1.04.A.5)

Document Number: 1441-02714P-5

Specification Requirement Reference: 02714P.1.04.A.5

JTT 7-15-99

Document Description: Completed ~~Froms~~ Forms GT-7, GT-10, and GT-16

RECORD

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KBT
7/15/99

JT 1
7-15-99

~~T1TH 003~~

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4-29-99
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LE GT-10 TECHNICAL INFORMATION FOR 10.0 OZ. GEOTEXTILE

ICATION # F99P301726

REFER TO SPECIFICATION SECTION 02714P

Doc. # 1441-02714P-- 0

MIT THE FOLLOWING INFORMATION WITH THE PROPOSAL

CIFIED REQUIREMENTS	SPECIFIED ASTM METHOD	SPECIFIED REQUIREMENT	CONFORMS TO SPEC YES/NO	REMARKS DOCUMENTATION OF THESE REQUIREMENTS TO BE SUBMITTED WITH BID
SICAL PROPERTIES				
WOVEN NEEDLEPUNCHED			YES	
MER COMPOSITION		95% Polypropylene or polyester by wgt. min.	YES	
S PER UNIT AREA	D 5261	10 oz/sy, min.	YES	
SIZE		15 ft wide, min.	YES	PREFERRED LENGTH 450 FEET
AIMED POLYMER		<20%	YES	
SIZE		>100,000 SF	YES	
HANICAL PROPERTIES				RECORD
STRENGTH	D 4632	225 lb. min.	YES	
STRENGTH	D 4533	90 lb. min.	YES	
TURE STRENGTH	D 4833	120 lb. min.	YES	
T STRENGTH	D 3786	450 psi, min.	YES	
BILITY				
AV T RESISTANCE	D 4355	70 %, min.	YES	
RMATION REQUIRED TO BE PROVIDED WITH PROPOSAL				
UCT NAME				TNS E100
AND PHONE # OF CONTACT PERSON	RICK FRANKLIN 770-564-1867			
IFICATION OF MARV AND			YES	
RESPONDING TEST PROCEDURES			YES	
TERM STORAGE REQUIREMENTS			YES	
RIAL SAFETY DATA SHEETS			YES	
NG INTERVAL	MAX			
PER UNIT AREA	1/50,000 SF		YES	
STRENGTH	1/50,000 SF		YES	
STRENGTH	1/50,000 SF		YES	
TURE STRENGTH	1/50,000 SF		YES	
T STRENGTH	1/50,000 SF		YES	
J Franklin TURE:				
OF OFFEROR: HARD J. FRANKLIN				DATE: 2-12-99

REVISED: 01/20/99

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7-15-99 ~~F1441-003~~

2739

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4-29-99
p. 22 of 24
Doc. # 1441-02714P-5-7

E GT-7 TECHNICAL INFORMATION FOR 7.0 OZ. GEOTEXTILE

:ITA[redacted]N # F99P301726

REFER TO SPECIFICATION SECTION 02714P

IT THE FOLLOWING INFORMATION WITH THE PROPOSAL

IFIED REQUIREMENTS	SPECIFIED ASTM METHOD	SPECIFIED REQUIREMENT	CONFORMS TO SPEC YES/NO	REMARKS DOCUMENTATION OF THESE REQUIREMENTS TO BE SUBMITTED WITH BID
CAL PROPERTIES				
'OVEN NEEDLEPUNCHED			YES	
MER COMPOSITION		95% Polypropylene or	YES	
		polyester by wgt, min.	YES	
PER UNIT AREA	D 5261	7 oz/sy, min.	YES	
ENT OPENING SIZE	D 4751	0.212 mm, max.	YES	
TIVITY	D 4491	0.5 sec-1, min.	YES	
SIZE		15 FT wide, min.	YES	PREFERRED ROLL LENGTH 450 FEET
UMED POLYMER		<20%	YES	
ZE		>100,000 SF	YES	
NICAL PROPERTIES				
STRENGTH	D 4632	180 lb. min.	YES	
STRENGTH	D 4533	75 lb. min.	YES	
URE STRENGTH	D 4833	75 lb. min.	YES	
STRENGTH	D 3786	350 psi, min.	YES	
ILITY				
AC[redacted]ESISTANCE	D 4355	70 %, min.	YES	
MATION REQUIRED TO BE PROVIDED WITH PROPOSAL				
CT NAME				TDS 8070
ND PHONE # OF CONTACT PERSON	RICK FRANKLIN 770-564-1857			
ICATION OF MARV AND			YES	
ESPONDING TEST PROCEDURES			YES	
ERM STORAGE REQUIREMENTS			YES	
IAL SAFETY DATA SHEETS			YES	
G INTERVAL	MAX			
ER UNIT AREA	1/50,000 SF		YES	
TRENGTH	1/50,000 SF		YES	
TRENGTH	1/50,000 SF		YES	
URE STRENGTH	1/50,000 SF		YES	
STRENGTH	1/50,000 SF		YES	
ENT OPENING SIZE	1/100,000 SF		YES	
TIVITY	1/100,000 SF		YES	
D Franklin				
URE:				
F OFFEROR:				2-18-99
HARD J FRANKLIN				

REVISED: 01/20/99

RECORD

7-15-99 ~~E1771-003~~

- 2739

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4-29-99
p. 24 of 24
Doc # 1441-02714P-5-16

:LE GT-16 TECHNICAL INFORMATION FOR 16.0 OZ. GEOTEXTILE
JCITATION # F99P301726

REFER TO SPECIFICATION SECTION 02714P

:MIT THE FOLLOWING INFORMATION WITH THE PROPOSAL

:CIFIED REQUIREMENTS	SPECIFIED ASTM METHOD	SPECIFIED REQUIREMENT	CONFORMS TO SPEC YES/NO	REMARKS DOCUMENTATION OF THESE REQUIREMENTS TO BE SUBMITTED WITH BID
SICAL PROPERTIES				
WOVEN NEEDLEPUNCHED				
YMER COMPOSITION		95% Polypropylene or	YES	
		polyester by wgt, min.	YES	
S PER UNIT AREA	D 5261	16 oz/sy, min.	YES	
L SIZE		15 ft wide, min.	YES	PREFERRED LENGTH 450 FEET
LAIMED POLYMER		<20%	YES	
SIZE		>100,000 SF	YES	
HANICAL PROPERTIES				
B STRENGTH	D 4632	350 lb, min.	YES	
R STRENGTH	D 4533	120 lb, min.	YES	RECORD
CTURE STRENGTH	D 4833	180 lb. min.	YES	
ST STRENGTH	D 3786	700 psi, min.	YES	
ABILITY				
RAV T RESISTANCE	D 4355	70 %, min.	YES	
RMATION REQUIRED TO BE PROVIDED WITH PROPOSAL				
DUCT NAME				TNS 8,160
E AND PHONE # OF CONTACT PERSON		Rick Franklin 770-564-1857		
TIFICATION OF MARV AND			YES	
RESPONDING TEST PROCEDURES			YES	
S TERM STORAGE REQUIREMENTS			YES	
ERIAL SAFETY DATA SHEETS			YES	
ING INTERVAL	MAX			
S PER UNIT AREA	1/50,000 SF		YES	
B STRENGTH	1/50,000 SF		YES	
STRENGTH	1/50,000 SF		YES	
CTURE STRENGTH	1/50,000 SF		YES	
T STRENGTH	1/50,000 SF		YES	
R Franklin STURE:				
OF OFFEROR: HARD J. FRANKLIN				DATE: 2-12-99

REVISED: 01/20/99

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CONTRACTOR/INSTALLER SUBMITTALS

--2739

GEOSYNTHETICS

000529

SUPPLIER DOCUMENT SUBMITTAL

FDF PROJECT NO.	20102	X	CONTRACT NUMBER.: FSC-614A	SUBMITTAL NO.: 02770-4	REV.: 0	DATE: August 2, 1999	PAGE 1 OF 1
	20402						

FROM: PETRO ENVIRONMENTAL TECHNOLOGIES, INC.
7400 WILLEY ROAD, MAILSTOP 52-7; TRAILER NO. 504
HAMILTON, OHIO 45013-9402

SIGNATURE: J. Richard Schairbaum

TO: FDF ENGINEERING/CONSTRUCTION DOCUMENT CONTROL, MS 52-7

RECEIVED BY: Teresa Schwab DATE: 8-3-99

QTY	DOCUMENT NUMBER	REV	DOCUMENT FAMILY: PRO	H&S	MED	TRG	CON	ENG	QAC	RESUBMITTAL: YES	NO	TITLE/DESCRIPTION	SUBMITTAL TYPE: CFC	INF	ASSOCIATED SPECIFICATION	SUBMITTAL ACTION: A	B	C
5	20102-OPTA-DWG-007	0						X			X	Installation Layout Drawings (Option A. Work)	X		02770-1.04.B.1	X		

RECEIVED
AUG 05 1999
R Grisman

DISTRIBUTION

REVIEW DISTRIBUTION

Distribution	MS	Distribution	MS
Jim Jenkins (Approver)	64	Vern Taylor	52-0
Bruce Schweitzer	64		
Jim Burnett	38		
ECDC	52-7		

CFC DISTRIBUTION

Distribution	MS	Distribution	MS
Jim Jenkins	64	OSDF Station	64
Bruce Schweitzer	64	ECDC	52-7
Mike Godber	64	Vern Taylor	52-0
Jim Burnett	38		

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RECEIVED BY: K Bradshaw (signature)
(SIGN/DATE AND RETURN A COPY TO ECDC, MS 52-7)

DATE: 8/9/99 NO COMMENTS ____ COMMENTS ATTACHED X

SEE COMMENTS ON DRAWING

RESUBMIT ENTIRE DOCUMENT NUMBER AS: _____ (REV. #) OR RESUBMIT CHANGED DOCUMENT PAGES AS: DOC. NO.: _____ (REV. #) PCN: _____ (PCN. #)

COMMENTS

ORIGINAL

SUBMITTAL ACTION CODE: (BY SUPPLIER)
CFC - CERTIFIED FOR CONSTRUCTION
INF - INFORMATION/RECORD
"X" APPROPRIATE SUBMITTAL ACTION ABOVE

SUPPLIER ACTION CODE: (ECDC) SUPPLIER ACTION ABOVE
A - ACCEPTED DOCUMENT - CONFORMS WITH REQUIREMENTS
B - MINOR COMMENTS - REVISE & RESUBMIT AS CFC OR INF
C - REVISE & RESUBMIT

PETRO
environmental
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FLUOR DANIEL FERNALD

SOUTHERN WASTE UNITS (SWUs) EXCAVATION/
ON-SITE DISPOSAL FACILITY (OSDF) (PHASE II) PROJECT
Project Nos. 20102/20402; Contract No. FSC-614

SUPPLIER SUBMITTAL No.: 20102/402-614A-02770-4 (Rev. 0)

INSTALLATION LAYOUT DRAWINGS FOR OPTION A. WORK

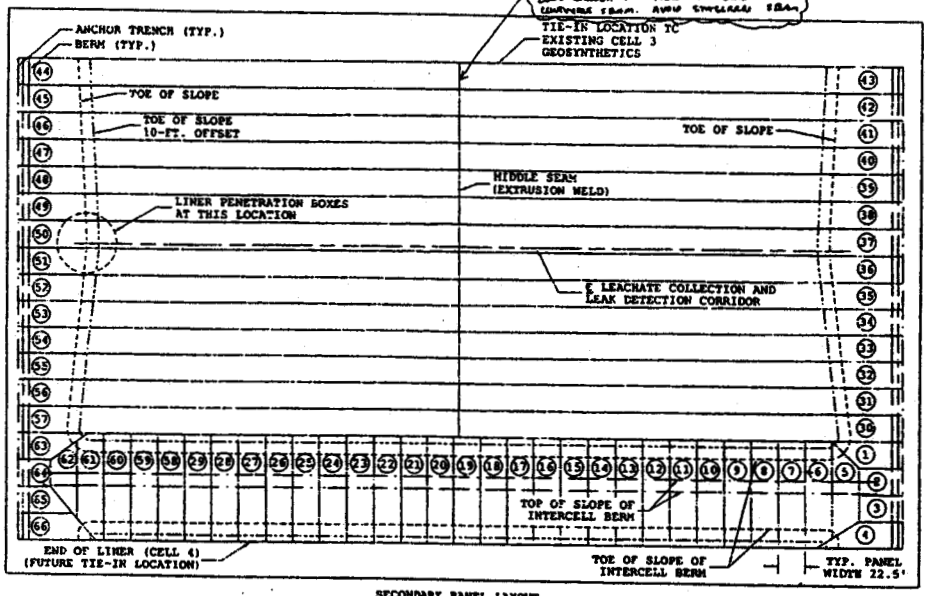
Section 02770-1.04.B.1

Document No. 20102-OPTA-DWG-007 (Rev. 0)

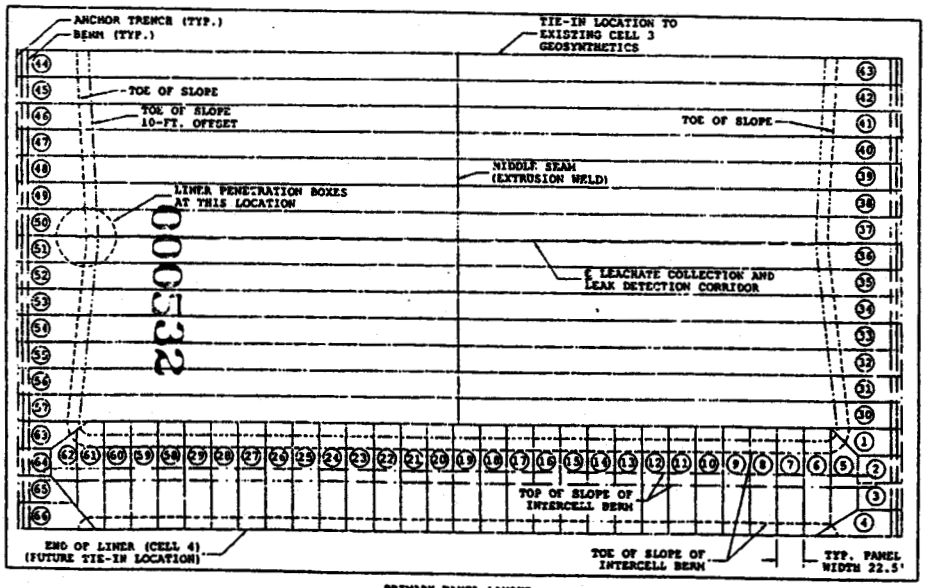
August 2, 1999

000531

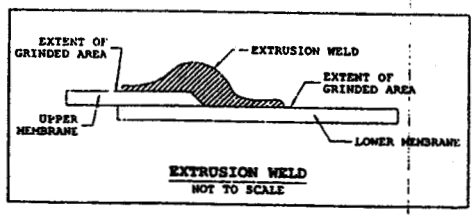
Fernald Site Office: P.O. Box 249 • Ross, Ohio 45061-0249 • 513.648.3402 • Fax 648.3407
7851 Palace Drive • Cincinnati, Ohio 45249 • 513.489.6789 • Fax 489.7208
8200 Seville Road • Lodi, Ohio 44254 • 330.948.1494 • Fax 948.1933



SECONDARY PANEL LAYOUT
SCALE: 1" = 50'



PRIMARY PANEL LAYOUT
SCALE: 1" = 50'



EXTRUSION WELD
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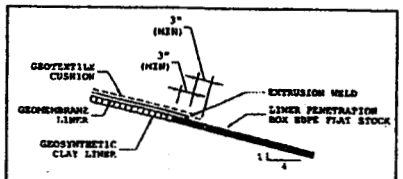
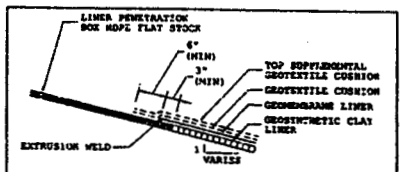
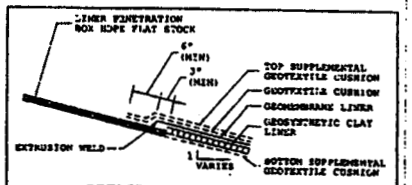


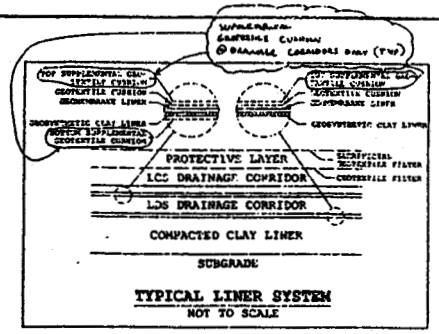
DETAIL
LINER SYSTEM GEOSYNTHETICS TERMINATION TYPE I AT LINER PENETRATION
(NOT TO SCALE)



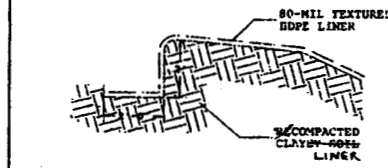
DETAIL
LINER SYSTEM GEOSYNTHETICS TERMINATION TYPE II AT LINER PENETRATION
(NOT TO SCALE)



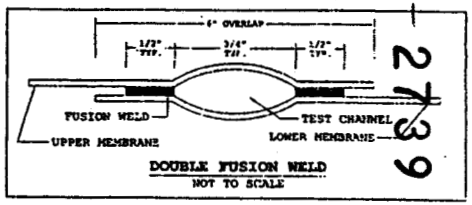
DETAIL
LINER SYSTEM GEOSYNTHETICS TERMINATION TYPE III AT LINER PENETRATION
(NOT TO SCALE)



TYPICAL LINER SYSTEM
NOT TO SCALE



ANCHOR TRENCH DETAIL
NOT TO SCALE



DOUBLE FUSION WELD
NOT TO SCALE

NOTES:
1. ACTUAL PANEL LAYOUT AND SEAMS MAY VARY IN ORDER TO ACCOMODATE FIELD CONDITIONS.
2. THE PANELS SHOWN ARE 22.5 FEET WIDE (TYPICAL).
3. HORIZONTAL SEAMS ARE TO BE A MINIMUM OF 10 FEET FROM TOE OF SLOPE AND POTENTIAL STRESS CONCENTRATIONS.
4. ALL MATERIAL IS 80-MIL TEXTURED HDPE.
5. THE PRIMARY LAYER WILL BE SLIGHTLY DIFFERENT DUE TO INCREASE ELEVATION.
6. THE BASE MAP IS DRAWN FROM "ON-SITE DISPOSAL FACILITY -PHASE II, COMPACTED CLAY LINER GRADING PLAN", SHEET G-6A BY GEOSYNTEC CONSULTANTS, NOV. 8, 1997.
7. SINGLE PANELS TO SHED WATER.

X A - Conform to the Submittal Requirements
B - Minor Comment - Incorporate and Resubmit
C - Revise and Resubmit
Sig: [illegible] Date: 8/16/99

RECEIVED AUG 18 1999

ECOC CONTROLLED COPY NO. C011

NOTE:
THIS PROPOSED PANEL LAYOUT IS BEING SUBMITTED FOR INFORMATION PURPOSES ONLY. MODIFICATIONS TO THIS INTENDED PLAN MAY BE NECESSITATED BY SITE SPECIFICS.

N
W E
S
The Istre Company

GEOMEMBRANE PANEL LAYOUT DRAWING FOR OSDF CELL 3 - FERNALD FACILITY

DRAWN BY: JRS	APPROVED BY: JI	PROJECT NO.: TIC 99080	SCALE: AS SHOWN
VERIFIED BY: JRS	DATE: 08-03-99	CAD FILE: TRANSLD-CELL3.DWG	DRAWING NO.: 1 OF 1

DESCRIPTION:
DOE/OSDF (PHASE II) EXCAVATION PROJECT
DOE, OH.: DE[illegible]-0[illegible]-[illegible]-[illegible], REV. 0

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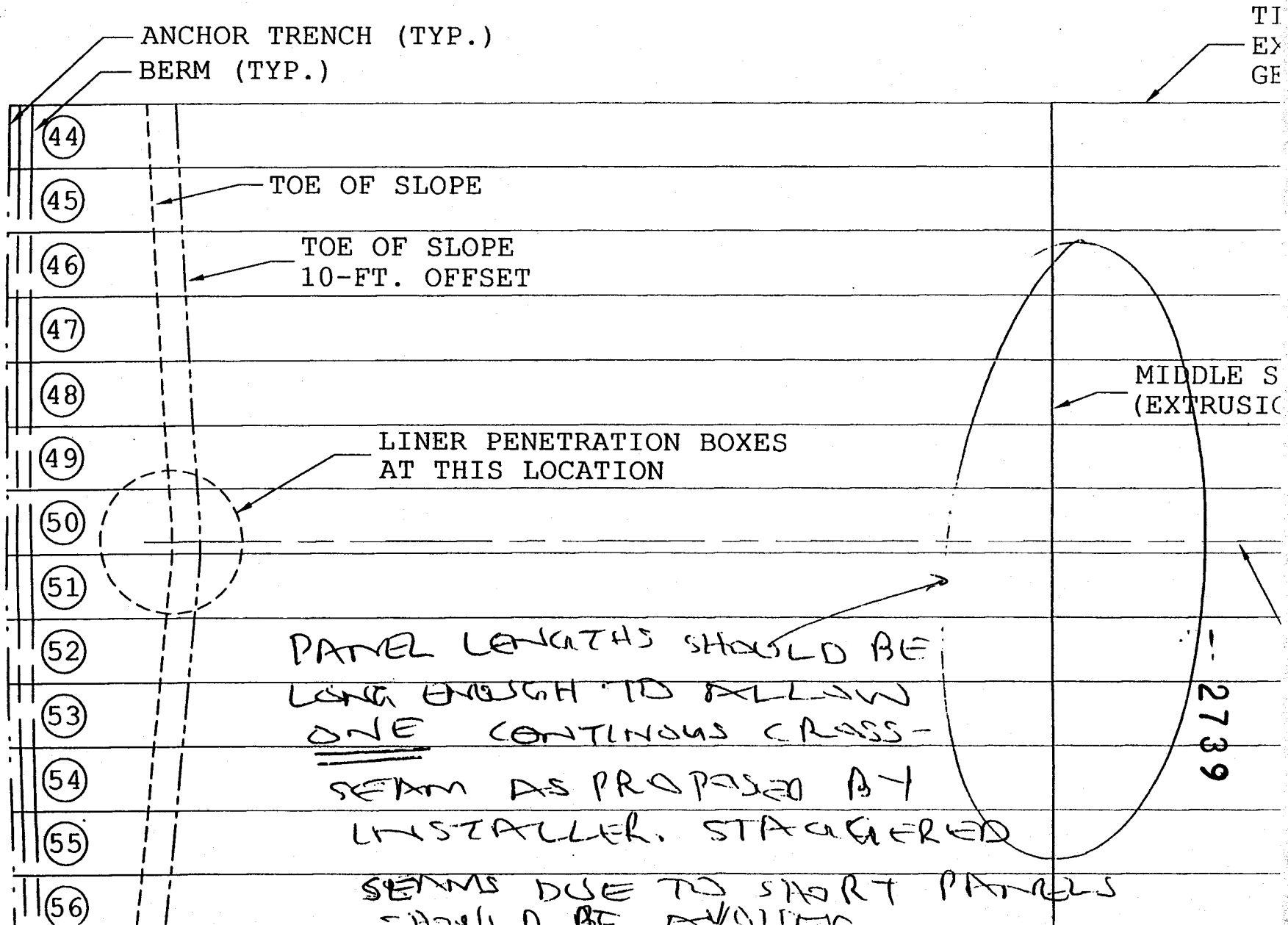

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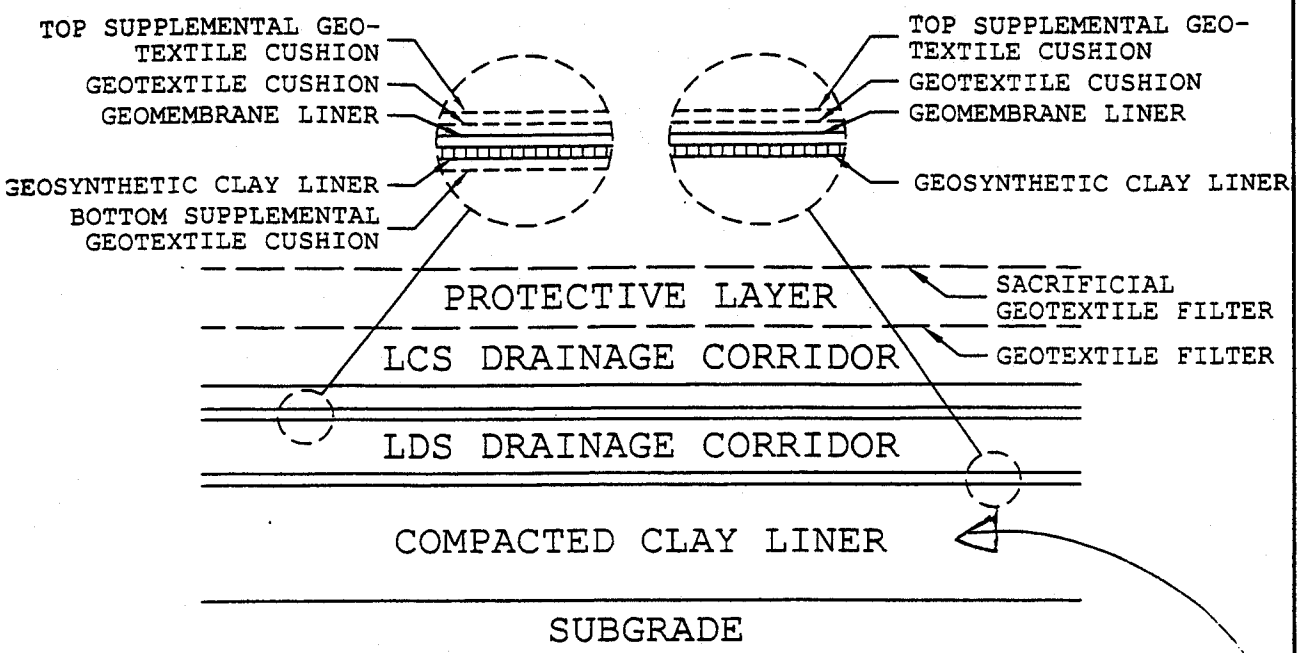
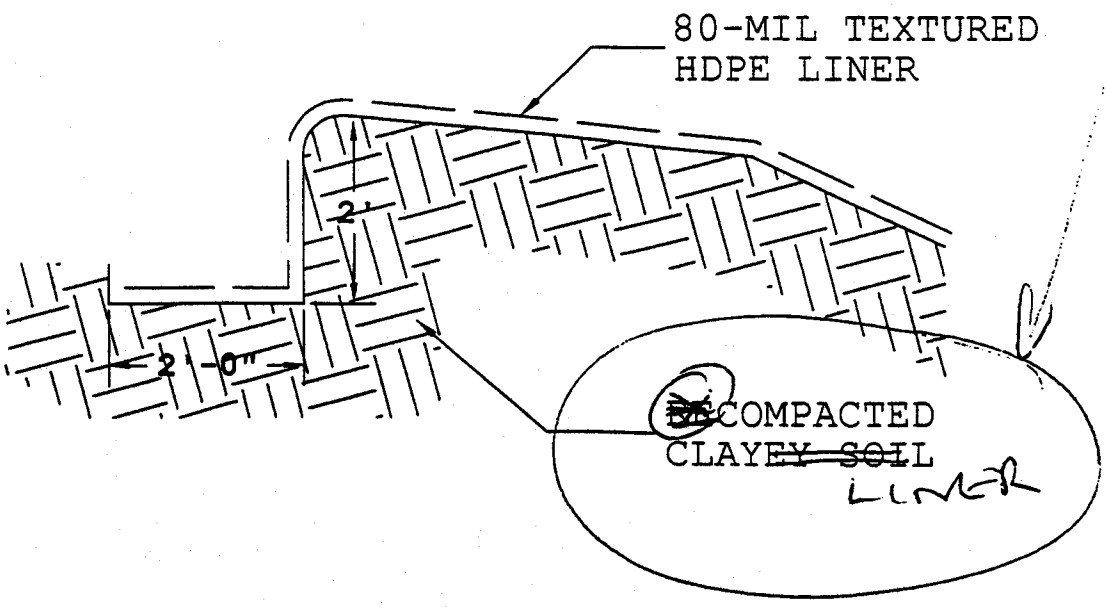
27739



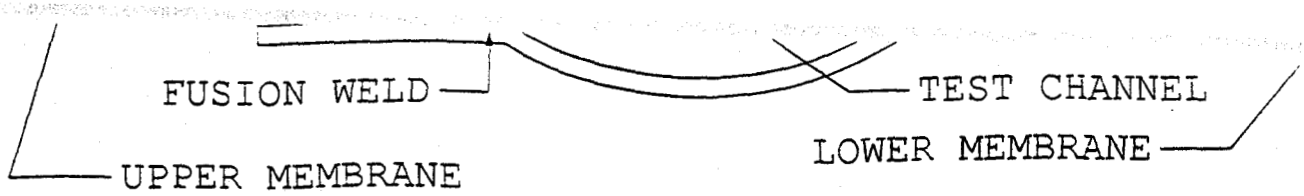
TYPICAL LINER SYSTEM

NOT TO SCALE



ANCHOR TRENCH DETAIL

NOT TO SCALE



DOUBLE FUSION WELD

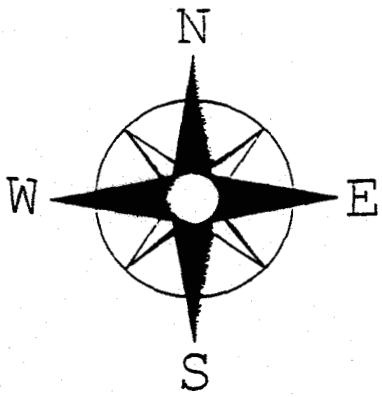
NOT TO SCALE

2739

NOTES:

1. ACTUAL PANEL LAYOUT AND SEAMS MAY VARY IN ORDER T ACCOMODATE FIELD CONDITIONS.
2. THE PANELS SHOWN ARE 22.5 FEET WIDE (TYPICAL).
3. HORIZONTAL SEAMS ARE TO BE A MINIMUM OF 10 FEET F OF SLOPE AND POTENTIAL STRESS CONCENTRATIONS.
4. ALL MATERIAL IS 80-MIL TEXTURED HDPE.
5. THE PRIMARY LAYER WILL BE SLIGHTLY DIFFERENT DUE INCREASE ELEVATION.
6. THE BASE MAP IS DRAFTED FROM "ON-SITE DISPOSAL FA -PHASE II, COMPACT CLAY LINER GRADING PLAN", SHEE BY GEOSYNTEC CONSULTANTS, NOV. 8, 1997.

Reviewed
KB
8/2/99



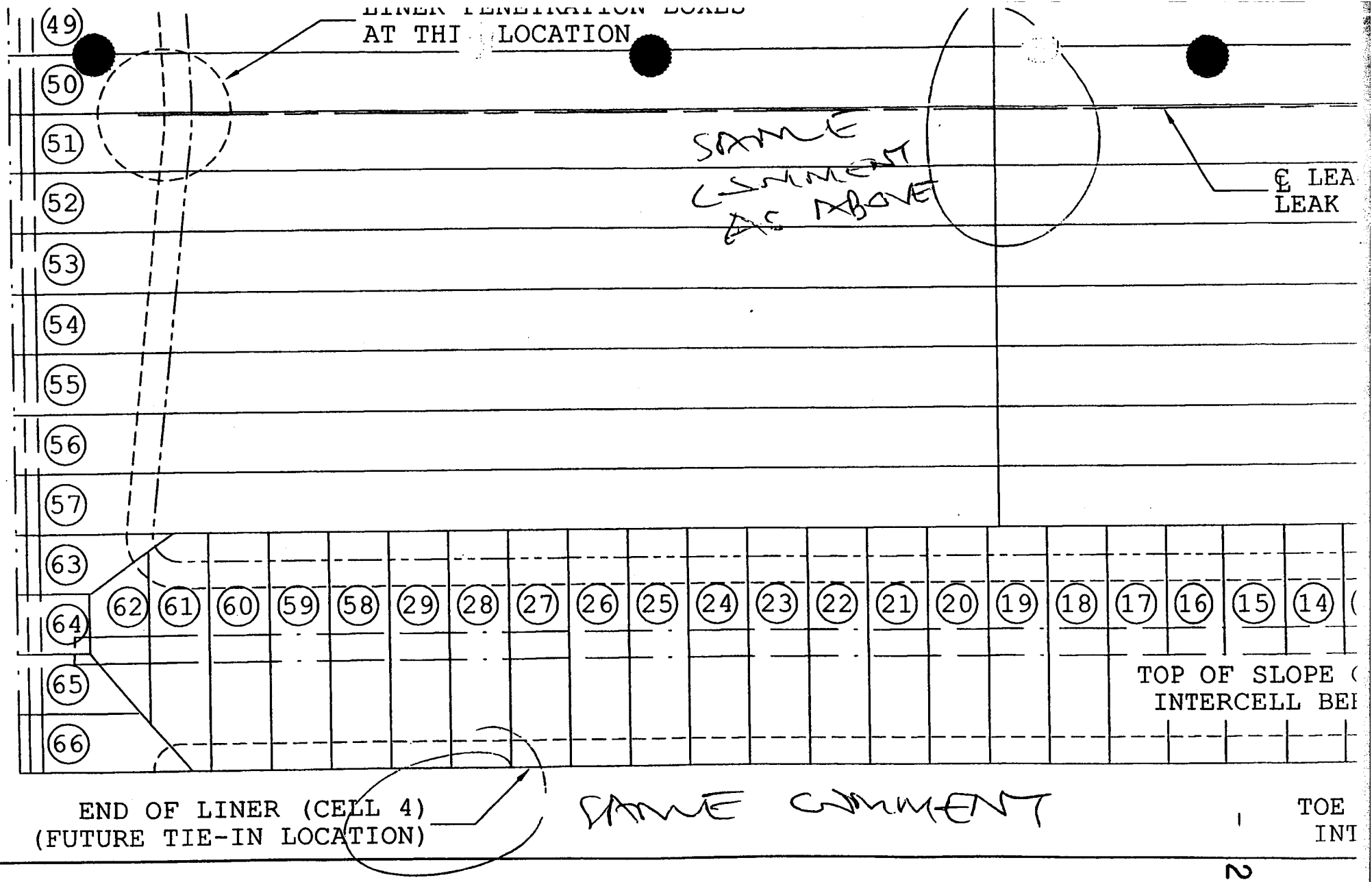
The Istre Company

GEOMEMBRANE PANEL LAYOU
FOR OSDF CELL 3 - FE
FACILITY

DRAWN BY:	APPROVED BY:	PROJECT NO
JRS	JI	TIC 99080
VERIFIED BY:	DATE:	CAD FILE:
JRS	08-02-99	FERNALD-CELL3.DWG

DESCRIPTION:

SWU/OSDF (PHASE II) EXCAVATIO
DOC. NO.: 20102-OPTA-DWG-007, R



PRIMARY PANEL LAYOUT

SCALE: 1" = 50'

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SUPPLIER DOC[illegible]T SUBMITTAL

FDF PROJECT NOs.:	20102	X	CONTRACT NUMBER.: FSC-614A	SUBMITTAL NO.: 02772-1	REV.: 0	DATE: September 29, 1999	PAGE 1 OF 1
	20402						

FROM: PETRO ENVIRONMENTAL TECHNOLOGIES, INC.
7400 WILLEY ROAD, MAILSTOP 52-7; TRAILER NO. 504
HAMILTON, OHIO 45013-9402

SIGNATURE: J. Richard Schaurbaum

TO: FDF ENGINEERING/CONSTRUCTION DOCUMENT CONTROL, MS 52-7

RECEIVED BY: Melissa Creews DATE: Oct. 1, 1999

QTY	DOCUMENT NUMBER	REV	DOCUMENT FAMILY: PRO	H&S	MED	TRG	CON	ENG	QAC	RESUBMITTAL: YES	NO	TITLE/DESCRIPTION	SUBMITTAL TYPE: CFC	INF	ASSOCIATED SPECIFICATION	SUBMITTAL ACTION: A	B	C
7	614-OPTA-059	0					X				X	Letter of Acceptance for GCL for Option A. Work	X		02772-2.03.A	X		

RECEIVED
OCT 04 1999
J. Burnett

DISTRIBUTION

REVIEW DISTRIBUTION: Distribution	MS	Distribution	MS	CFC DISTRIBUTION: Distribution	MS	Distribution	MS
Lou Wehlitz (Approver)	64	Jim Burnett	38	Jim Jenkins	64	Jim Burnett	38
Bruce Schweitzer	64	ECDC	52-7	Bruce Schweitzer	64	OSDF Station	64
Jim Jenkins	64	Vern Taylor	52-0	Mike Godber	64	ECDC	52-7
Bill Zebick	64			Vern Taylor	52-0		

RECEIVED BY: J. Burnett K. Bodenwerk DATE: 10/11/99 NO COMMENTS X COMMENTS ATTACHED ____
(SIGN/DATE AND RETURN A COPY TO ECDC, MS 52-7)

RESUBMIT ENTIRE DOCUMENT NUMBER AS: _____ (REV. #) OR RESUBMIT CHANGED DOCUMENT PAGES AS: DOC. NO.: _____ (REV. #) PCN: _____ (PCN. #)

000537

2739

COMMENTS

ORIGINAL

SUBMITTAL ACTION CODE: (BY SUPPLIER)
CFC - CERTIFIED FOR CONSTRUCTION
INF - INFORMATION/RECORD
"X" APPROPRIATE SUBMITTAL ACTION ABOVE

SUPPLIER ACTION CODE: (ECDC) SUPPLIER ACTION ABOVE
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B - MINOR COMMENTS - REVISE & RESUBMIT AS CFC OR INF
C - REVISE & RESUBMIT

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FLUOR DANIEL FERNALD

SOUTHERN WASTE UNITS (SWUs) EXCAVATION/
ON-SITE DISPOSAL FACILITY (OSDF) (PHASE II) PROJECT
Project Nos. 20102/20402; Contract No. FSC-614

SUPPLIER SUBMITTAL No.: 20102-614A-02772-1 (Rev. 0)

LETTER OF ACCEPTANCE FOR GEOSYNTHETIC CLAY LINER MATERIAL
Section 02772-2.03.A

Document No. 614-OPTA-059 (Rev. 0)

September 29, 1999

Fernald Site Office: P.O. Box 249 • Ross, Ohio 45061-0249 • 513.648.3402 • Fax 648.3407
7851 Palace Drive • Cincinnati, Ohio 45249 • 513.489.6789 • Fax 489.7208
8200 Seville Road • Lodi, Ohio 44254 • 330.948.1494 • Fax 948.1933

September 29, 1999

2739

Mr. Rick Holbrook
Fluor Daniel Fernald
P. O. Box 538704, Mail Stop 64
Cincinnati, Ohio 45253-8704

RE: Acceptance of Geosynthetic Clay Liner (GCL)
Period Beginning July 13, 1999 and Ending August 31, 1999
SWU/OSDF Phase II, Option A. Work
Subcontract No. FSC 614

Dear Rick:

This letter is intended to fulfill the submittal requirement listed in paragraph 2.03A of Technical Specification Section 02772. Specifically, by copy of this letter Petro Environmental Technologies, Inc. conditionally accepts the referenced GCL material for installation. Conditional acceptance is based solely on visual inspection of the shipped material unloaded and stored by Petro Environmental. As Petro Environmental has no contractual responsibility for material testing or Quality Assurance, no opinion on the material's suitability with regard to specification required properties is made. An acceptance status summary for GCL received to date is as follows:

	Date	Quantity Accepted	Quantity Rejected
Material Previously Accepted/Rejected	NONE	NONE	NONE
Accepted/Rejected by this Letter	7/13/99	103,500 SF	NONE
	7/15/99	99,000 SF	NONE
	7/16/99	38,250 SF	NONE
	7/22/99	76,500 SF	NONE
	7/26/99	153,000 SF	NONE
	8/02/99	76,500 SF	NONE
	8/03/99	38,250 SF	NONE
	8/09/99	76,500 SF	NONE
	8/12/99	38,250 SF	NONE
	8/30/99	36,000 SF	NONE
	8/31/99	36,000 SF	NONE
TOTAL TO DATE		771,750 SF	NONE

Sincerely,
PETRO ENVIRONMENTAL TECHNOLOGIES, INC.

J. Richard Schairbaum

J. Richard Schairbaum
Quality Assurance Manager

000539

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SUPPLIER DOC[illegible]NT SUBMITTAL

FDF PROJECT NOs.:	20102 / 20402	X	CONTRACT NUMBER.: FSC-614A	SUBMITTAL NO.: 02770-8	REV.: 0	DATE: September 29, 1999	PAGE 1 OF 1

FROM: PETRO ENVIRONMENTAL TECHNOLOGIES, INC.
7400 WILLEY ROAD, MAILSTOP 52-7; TRAILER NO. 504
HAMILTON, OHIO 45013-9402

SIGNATURE: J. Richard Schairbaum

TO: FDF ENGINEERING/CONSTRUCTION DOCUMENT CONTROL, MS 52-7

RECEIVED BY: Melissa Crews DATE: 10-1-99

QTY	DOCUMENT NUMBER	REV	DOCUMENT FAMILY: PRO	H&S	MED	TRG	CON	ENG	QAC	RESUBMITTAL: YES	NO	TITLE/DESCRIPTION	SUBMITTAL TYPE: CFC	INF	ASSOCIATED SPECIFICATION	SUBMITTAL ACTION: A	B	C
7	614-OPTA-068J	0					X				X	Letter of Acceptance for GML for Option A. Work	X		02770-2.05.A	X		

RECEIVED
OCT 04 1999
J Burnett

DISTRIBUTION

REVIEW DISTRIBUTION: Distribution	MS	Distribution	MS	CFC DISTRIBUTION: Distribution	MS	Distribution	MS
Lou Wehlitz (Approver)	64	Jim Burnett	38	Jim Jenkins	64	Jim Burnett	38
Bruce Schweitzer	64	ECDC	52-7	Bruce Schweitzer	64	OSDF Station	64
Jim Jenkins	64	Vern Taylor	52-0	Mike Godber	64	ECDC	52-7
Bill Zebick	64			Vern Taylor	52-0		

000540

RECEIVED BY: J Burnett K Bodenwendel DATE: 10/11/99 NO COMMENTS X COMMENTS ATTACHED ____
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RESUBMIT ENTIRE DOCUMENT NUMBER AS: _____ (REV. #) OR RESUBMIT CHANGED DOCUMENT PAGES AS: DOC. NO.: _____ (REV. #) PCN: _____ (PCN. #)

COMMENTS

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SUBMITTAL ACTION CODE: (BY SUPPLIER)
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INF - INFORMATION/RECORD
"X" APPROPRIATE SUBMITTAL ACTION ABOVE

SUPPLIER ACTION CODE: (ECDC) SUPPLIER ACTION ABOVE
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C - REVISE & RESUBMIT

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FLUOR DANIEL FERNALD

SOUTHERN WASTE UNITS (SWUs) EXCAVATION/
ON-SITE DISPOSAL FACILITY (OSDF) (PHASE II) PROJECT
Project Nos. 20102/20402; Contract No. FSC-614

SUPPLIER SUBMITTAL No.: 20102-614A-02770-8 (Rev. 0)

LETTER OF ACCEPTANCE FOR GEOMEMBRANE LINER MATERIAL FOR OPTION A. WORK

Section 02770-2.05.A

Document No. 614-OPTA-068J (Rev. 0)

September 29, 1999

Fernald Site Office: P.O. Box 249 • Ross, Ohio 45061-0249 • 513.648.3402 • Fax 648.3407
7851 Palace Drive • Cincinnati, Ohio 45249 • 513.489.6789 • Fax 489.7208
8200 Seville Road • Lodi, Ohio 44254 • 330.948.1494 • Fax 948.1933

September 29, 1999

- 2739

Mr. Rick Holbrook
Fluor Daniel Fernald
P. O. Box 538704, Mail Stop 64
Cincinnati, Ohio 45253-8704

RE: Acceptance of Geomembrane Liner (GML)
Period Beginning July 6, 1999 and Ending July 8, 1999
SWU/OSDF Phase II, Option A. Work
Subcontract No. FSC 614

Dear Rick:

This letter is intended to fulfill the submittal requirement listed in paragraph 2.05.A of Technical Specification Section 02770. Specifically, by copy of this letter Petro Environmental Technologies, Inc. conditionally accepts the referenced geomembrane liner (GML) material for installation. Conditional acceptance is based solely on visual inspection of the shipped material unloaded and stored by Petro Environmental. As Petro Environmental has no contractual responsibility for material testing or Quality Assurance, no opinion of the material's suitability with regard to specification-required properties is made. An acceptance status summary for GML received to date is as follows:

	Date	Quantity Accepted	Quantity Rejected
Material Previously Accepted/Rejected	N.A.	NONE	NONE
Accepted/Rejected by this Letter	7/6/99	431,227 SF	NONE
	7/7/99	220,713 SF	NONE
	7/8/99	110,215 SF	NONE
	7/8/99	5,805 SF	NONE (80-mil Smooth Roll)
TOTAL TO DATE		767,960 SF	NONE

Sincerely,
PETRO ENVIRONMENTAL TECHNOLOGIES, INC.

J. Richard Schairbaum

J. Richard Schairbaum
Quality Assurance Manager

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000542

SUPPLIER DO[illegible]NT SUBMITTAL

FDF PROJECT NOs.:	20102	X	CONTRACT NUMBER.: FSC-614A	SUBMITTAL NO.: 02770-7	REV.: 1	DATE: September 29, 1999	PAGE 1 OF 1
	20402						

FROM: PETRO ENVIRONMENTAL TECHNOLOGIES, INC.
7400 WILLEY ROAD, MAILSTOP 52-7; TRAILER NO. 504
HAMILTON, OHIO 45013-9402

SIGNATURE: J. Richard Schaubaum

TO: FDF ENGINEERING/CONSTRUCTION DOCUMENT CONTROL, MS 52-7

RECEIVED BY: Melissa Crews DATE: 10-1-99

QTY	DOCUMENT NUMBER	REV	DOCUMENT FAMILY: PRO	H&S	MED	TRG	CON	ENG	QAC	RESUBMITTAL: YES	NO	TITLE/DESCRIPTION	SUBMITTAL TYPE: CFC	INF	ASSOCIATED SPECIFICATION	SUBMITTAL ACTION: A	B	C
7	614-OPTA-068I.2	0					X				X	Subgrade Certification (Primary Layer) for Option A. Work	X		02770-1.04.E	X		

RECEIVED
OCT 04 1999
J. Burnett

DISTRIBUTION

REVIEW DISTRIBUTION: Distribution	MS	Distribution	MS	CFC DISTRIBUTION: Distribution	MS	Distribution	MS
Lou Wehlitz (Approver)	64	Jim Burnett	38	Jim Jenkins	64	Jim Burnett	38
Bruce Schweitzer	64	ECDC	52-7	Bruce Schweitzer	64	OSDF Station	64
Jim Jenkins	64	Vern Taylor	52-0	Mike Godber	64	ECDC	52-7
Bill Zebiek	64			Vern Taylor	52-0		

RECEIVED BY: J. Burnett E. Bonnewell DATE: 10/11/99 NO COMMENTS X COMMENTS ATTACHED ____
(SIGN/DATE AND RETURN A COPY TO ECDC, MS 52-7)

RESUBMIT ENTIRE DOCUMENT NUMBER AS: _____ (REV. #) OR RESUBMIT CHANGED DOCUMENT PAGES AS: DOC. NO.: _____ (REV. #) PCN: _____ (PCN. #)

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COMMENTS

ORIGINAL

SUBMITTAL ACTION CODE: (BY SUPPLIER)
CFC - CERTIFIED FOR CONSTRUCTION
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"X" APPROPRIATE SUBMITTAL ACTION ABOVE

SUPPLIER ACTION CODE: (ECDC) SUPPLIER ACTION ABOVE
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B - MINOR COMMENTS - REVISE & RESUBMIT AS CFC OR INF
C - REVISE & RESUBMIT

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FLUOR DANIEL FERNALD

SOUTHERN WASTE UNITS (SWUs) EXCAVATION/
ON-SITE DISPOSAL FACILITY (OSDF) (PHASE II) PROJECT
Project Nos. 20102/20402; Contract No. FSC-614

SUPPLIER SUBMITTAL No.: 20102-614A-02770-7 (Rev. 1)

SUBGRADE ACCEPTANCE CERTIFICATE (PRIMARY LAYER) FOR OPTION A. WORK

Section 02770-1.04.E

Document No. 614-PET-068I.2 (Rev. 0)

September 29, 1999

Fernald Site Office: P.O. Box 249 • Ross, Ohio 45061-0249 • 513.648.3402 • Fax 648.3407
7851 Palace Drive • Cincinnati, Ohio 45249 • 513.489.6789 • Fax 489.7208
8200 Seville Road • Lodi, Ohio 44254 • 330.948.1494 • Fax 948.1933

CERTIFICATE OF ACCEPTANCE SUBGRADE SURFACE

INSTALLER	PROJECT
NAME: ISTRE Co.	NAME: OSDF PHASE II - CELL #3
ADDRESS:	LOCATION: FERNALD, OHIO
INSTALLER AUTHORIZED REPRESENTATIVE: JERRY ISTRE	OWNER: FLUOR DANIEL / DOE

I, the undersigned, duly authorized representative of the Installer, _____, 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.)

PRIMARY: ■ SECONDARY: ☐ OTHER: ☐ _____

DATE	PANEL NOS.	SIGNATURES		
		INSTALLER	GEOSYNTEC	FDF
09 SEPTEMBER 1999	P-1 THRU P-9		Bryan York	
10 SEPTEMBER 1999	P-10 THRU P-20		Bryan York	
11 SEPTEMBER 1999	P-21 THRU P-22		Bryan York	
14 SEPTEMBER 1999	P-23 THRU P-27		Bryan York	
15 SEPTEMBER 1999	P-28 THRU P-33		Bryan York	
22 SEPTEMBER 1999	P-34 THRU P-37		Bryan York	
23 SEPTEMBER 1999	P-38 THRU P-49		Bryan York	
24 SEPTEMBER 1999	P-50 THRU P-55		Bryan York	
25 SEPTEMBER 1999	P-56 THRU P-63		Bryan York	

GeoSyntec Consultants REVIEWED BY: _____ SHEET NO. 1 OF 1

SUPPLIER DOCUMENT SUBMITTAL

FDF PROJECT	20102 / 20402	X	CONTRACT NUMBER.: FSC-614A	SUBMITTAL NO.: 02714-1	REV.: 0	DATE: October 5, 1999	PAGE 1 OF 1

FROM: PETRO ENVIRONMENTAL TECHNOLOGIES, INC.
7400 WILLEY ROAD, MAILSTOP 52-7; TRAILER NO. 504
HAMILTON, OHIO 45013-9402

SIGNATURE: J. Richard Schairbaum

TO: FDF ENGINEERING/CONSTRUCTION DOCUMENT CONTROL, MS 52-7

RECEIVED BY: Erika Jarrett DATE: 10/6/99

QTY	DOCUMENT NUMBER	REV	DOCUMENT FAMILY: PRO	H&S	MED	TRG	CON	ENG	QAC	RESUBMITTAL: YES	NO	TITLE/DESCRIPTION	SUBMITTAL TYPE: CFC	INF	ASSOCIATED SPECIFICATION	SUBMITTAL ACTION: A	B	C
7	614-OPTA-062	0					X				X	Letter of Acceptance for Geotextile for Option A. Work	X		02714-2.03.A	X		

RECEIVED
OCT 07 1999
R Grisman

DISTRIBUTION

REVIEW DISTRIBUTION: Distribution	MS	Distribution	MS	CFC DISTRIBUTION: Distribution	MS	Distribution	MS
Lou Wehlitz (Approver)	64	Jim Burnett	38	Jim Jenkins	64	Jim Burnett	38
Bruce Schweitzer	64	ECDC	52-7	Bruce Schweitzer	64	OSDF Station	64
Jim Jenkins	64	Vern Taylor	52-0	Mike Godber	64	ECDC	52-7
Bill Zebick	64			Vern Taylor	52-0		

RECEIVED BY: [signature] DATE: 10/12/99 NO COMMENTS X COMMENTS ATTACHED ____
(SIGN/DATE AND RETURN A COPY TO ECDC, MS 52-7)

RESUBMIT ENTIRE DOCUMENT NUMBER AS: _____ (REV. #) OR RESUBMIT CHANGED DOCUMENT PAGES AS: DOC. NO.: _____ (REV. #) PCN: _____ (PCN. #)

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COMMENTS

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CFC - CERTIFIED FOR CONSTRUCTION
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SUPPLIER ACTION CODE: (ECDC) SUPPLIER ACTION ABOVE
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FLUOR DANIEL FERNALD

SOUTHERN WASTE UNITS (SWUs) EXCAVATION/
ON-SITE DISPOSAL FACILITY (OSDF) (PHASE II) PROJECT
Project Nos. 20102/20402; Contract No. FSC-614

SUPPLIER SUBMITTAL No.: 20102-614A-02714-1 (Rev. 0)

LETTER OF ACCEPTANCE FOR GEOTEXTILE MATERIALS FOR OPTION A. WORK

Section 02714-2.03.A

Document No. 614-OPTA-062 (Rev. 0)

October 5, 1999

Fernald Site Office: P.O. Box 249 • Ross, Ohio 45061-0249 • 513.648.3402 • Fax 648.3407
7851 Palace Drive • Cincinnati, Ohio 45249 • 513.489.6789 • Fax 489.7208
8200 Seville Road • Lodi, Ohio 44254 • 330.948.1494 • Fax 948.1933

October 5, 1999

Mr. Rick Holbrook
Fluor Daniel Fernald
P. O. Box 538704, Mail Stop 64
Cincinnati, Ohio 45253-8704

RE: Acceptance of Geotextile Materials
Period Beginning August 3, 1999 and Ending September 15, 1999
SWU/OSDF Phase II for Option A. Work
Subcontract No. FSC 614

Dear Rick:

This letter is intended to fulfill the submittal requirement listed in paragraph 2.03.A of Technical Specification Section 02714. Specifically, by copy of this letter Petro Environmental Technologies, Inc. conditionally accepts the referenced geotextile materials for installation. Conditional acceptance is based solely on visual inspection of the shipped material unloaded and stored by Petro Environmental. As Petro Environmental has no contractual responsibility for material testing or Quality Assurance, no opinion of the material's suitability with regard to specification-required properties is made. An acceptance status summary for the various geotextiles received to date are as follows:

7-oz. Geotextile Filter in Liner System

	Date	Quantity Accepted	Quantity Rejected
Material Previously Accepted/Rejected	N.A.	NONE	NONE
Accepted/Rejected by this Letter	08/05/99	405,000 SF	NONE
	08/06/99	27,000 SF	NONE
	09/15/99	27,000 SF	NONE
TOTAL TO DATE		459,000 SF	NONE

10-oz. Geotextile Cushion in Liner System

	Date	Quantity Accepted	Quantity Rejected
Material Previously Accepted/Rejected	N.A.	NONE	NONE
Accepted/Rejected by this Letter	08/03/99	162,000 SF	NONE
	08/04/99	162,000 SF	NONE
	08/05/99	344,250 SF	NONE
	08/06/99	141,750 SF	NONE
TOTAL TO DATE		810,000 SF	NONE

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16-oz. Supplemental Geotextile Cushion in Liner System

	Date	Quantity Accepted	Quantity Rejected
Material Previously Accepted/Rejected	N.A.	NONE	NONE
Accepted/Rejected by this Letter	08/05/99	67,500 SF	NONE
	09/15/99	6,750 SF	NONE
TOTAL TO DATE		74,250 SF	NONE

Sincerely,
PETRO ENVIRONMENTAL TECHNOLOGIES, INC.

J. Richard Schairbaum

J. Richard Schairbaum
Quality Assurance Manager

PETRO environmental technologies

2739

GRANULAR DRAINAGE MATERIAL

Option A Work

SUPPLIER DOCUMENT SUBMITTAL

FDF PROJECT NO.	20102 / 20402	X	CONTRACT NUMBER.: FSC-614A	SUBMITTAL NO.: 02710-1	REV.: 2	DATE: September 3, 1999	PAGE 1 OF 1

FROM: PETRO ENVIRONMENTAL TECHNOLOGIES, INC.
7400 WILLEY ROAD, MAILSTOP 52-7; TRAILER NO. 504
HAMILTON, OHIO 45013-9402

SIGNATURE: J. Richard Schairbaum

TO: FDF ENGINEERING/CONSTRUCTION DOCUMENT CONTROL, MS 52-7

RECEIVED BY: Melissa Crews DATE: 9-3-99

QTY	DOCUMENT NUMBER	REV	DOCUMENT FAMILY: PRO	H&S	MED	TRG	CON	ENG	QAC	RESUBMITTAL: YES	NO	TITLE/DESCRIPTION	SUBMITTAL TYPE: CFC	INF	ASSOCIATED SPECIFICATION	SUBMITTAL ACTION: A	B	C
5	614-OPTA-031A.3	0						X			X	Source of Granular Drain. Material (#57s) for Option A. Work (Source: Watson's)		X	02710-1.04.A.1	X		
5	614-OPTA-031B.3	0						X			X	Test Results of Gran. Drain. Mtl. for Option A. Work (#57s; Source: Watson's)	X		02710-1.04.A.1		X	
1	614-OPTA-031C.3	0						X			X	50-lb. Representative Sample for Option A. Work (#57s; Source: Watson's)	X		02710-1.04.A.2	X		

RECEIVED
SEP 09 1999
R Grusman

DISTRIBUTION

REVIEW DISTRIBUTION: Distribution	MS	Distribution	MS	CFC DISTRIBUTION: Distribution	MS	Distribution	MS
Tony Klimek (Approver)	64	Vern Taylor	52-0	Tony Klimek	64	OSDF Station	64
Bruce Schweitzer	64			Bruce Schweitzer	64	ECDC	52-7
Jim Burnett	38			Mike Godber	64	Vern Taylor	52-0
ECDC	52-7			Jim Burnett	38		

000551

RECEIVED BY: [signature] DATE: 9/10/99 NO COMMENTS ____ COMMENTS ATTACHED X

(SIGN/DATE AND RETURN A COPY TO ECDC, MS 52-7)

RESUBMIT ENTIRE DOCUMENT NUMBER AS: _____ (REV. #) OR RESUBMIT CHANGED DOCUMENT PAGES AS: DOC. NO.: _____ (REV. #) PCN: _____ (PCN. #)

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"X" APPROPRIATE SUBMITTAL ACTION ABOVE

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C - REVISE & RESUBMIT

ENTERED

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FLUOR DANIEL FERNALD

SOUTHERN WASTE UNITS (SWUs) EXCAVATION/
ON-SITE DISPOSAL FACILITY (OSDF) (PHASE II) PROJECT
Project Nos. 20102/20402; Contract No. FSC-614

SUPPLIER SUBMITTAL No.: 20102-614A-02710-1 (Rev. 2)

SOURCE OF GRANULAR DRAINAGE MATERIAL, 50-LB. SAMPLE, AND TEST RESULTS FOR OPTION A. WORK (#57S – WATSON GRAVEL, INC.)

Sections 02710-1.04.A.1 & -A.2

Document No. 614-PET-031A.3 (Rev. 0)
Document No. 614-PET-031B.3 (Rev. 0)
Document No. 614-PET-031C.3 (Rev. 0)

September 3, 1999

Fernald Site Office: P.O. Box 249 • Ross, Ohio 45061-0249 • 513.648.3402 • Fax 648.3407
7851 Palace Drive • Cincinnati, Ohio 45249 • 513.489.6789 • Fax 489.7208
8200 Seville Road • Lodi, Ohio 44254 • 330.948.1494 • Fax 948.1933

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SOURCE OF GRANULAR DRAINAGE MATERIAL

(#57s – WATSON GRAVEL, INC.)

Document No. 614-PET-031A.3 (Rev. 0)
Section 02710-1.04.A.1

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Petro Environmental Technologies, Inc. has selected Watson Gravel, Inc. to provide #57 gravel for OSDF Phase II (Option A). The company's mailing address is P.O. Box 277 Ross, OH. The contact is Paul Boggs and he can be reached at 863-0070. The source of the material is the Watson Gravel, Inc. mine in Ross Twp., Butler County. The quarry is located along the Great Miami River, on State Route 128, approximately 3.5 miles northeast of the intersection of U.S. Route 27 and State Route 128.

OK
KBT
9/24/99

PETRO environmental technologies

TEST RESULTS OF GRANULAR DRAINAGE MATERIAL

(#57s – WATSON GRAVEL, INC.)

Document No. 614-PET-031B.3 (Rev. 0)
Section 02710-1.04.A.1

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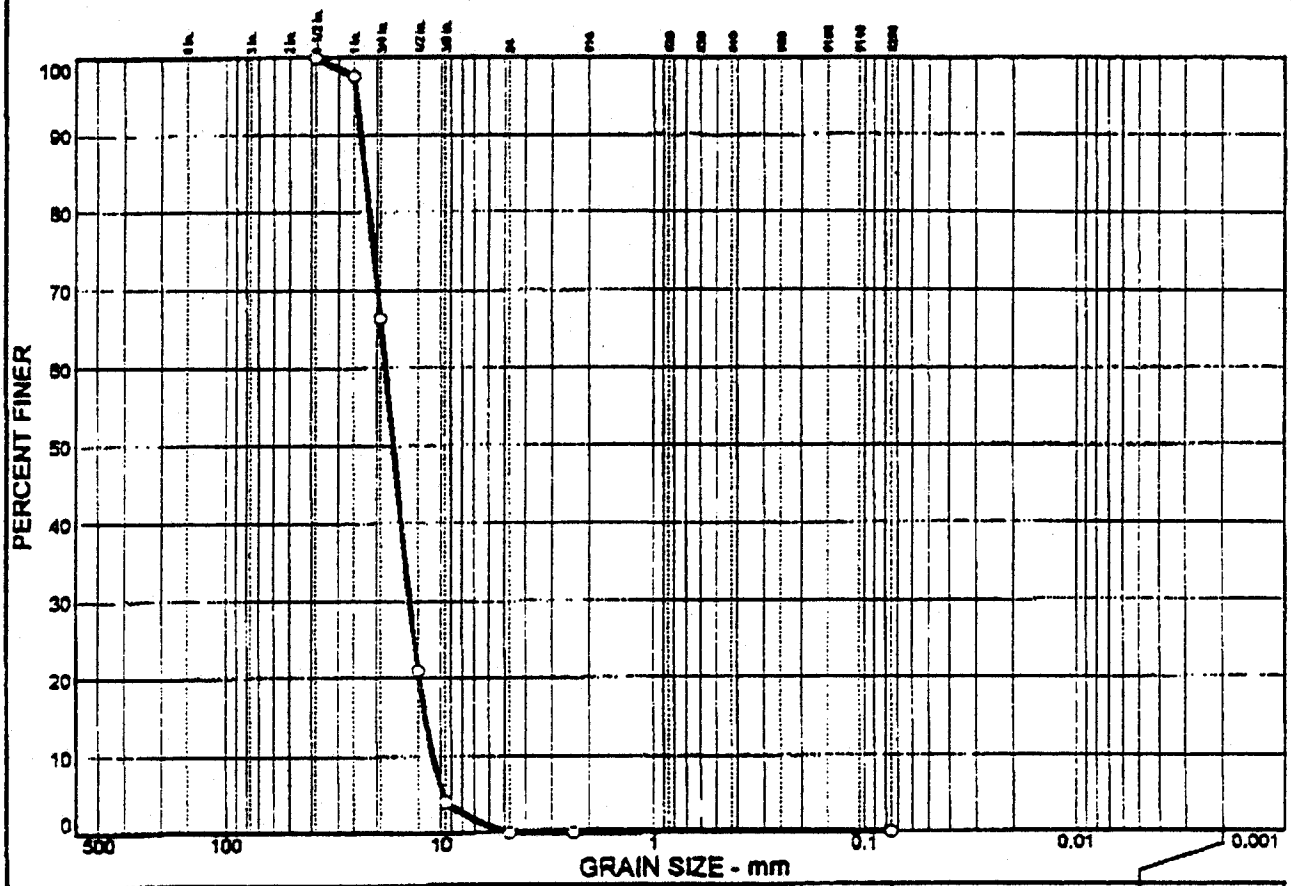
Grain Size Distribution Test Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	100.0	0.0		

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0	100	yes
1 in.	97.6	95-100	yes
.75 in.	66.2	—	—
.5 in.	20.9	25-60	no ?
.375 in.	4.0	—	—
#4	0.0	0-10	yes
#8	0.0	0-5	yes
#200	0.0	0-2	yes

* (no specification provided)

Soil Description

NO. 57 GRAVEL (Poorly graded gravel)

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 22.6 D_{60}= 18.1 D_{50}= 16.6
D_{30}= 14.0 D_{15}= 11.8 D_{10}= 10.9
C_u= 1.66 C_c= 0.99

Classification

USCS= GP AASHTO=

Remarks

LAB NO. 6661

Sample No.: BUCKET **Source of Sample:** L-6661 **Date:** 9/1/99
Location: SOURCE:WATSON SAND & GRAVEL **Elev./Depth:**

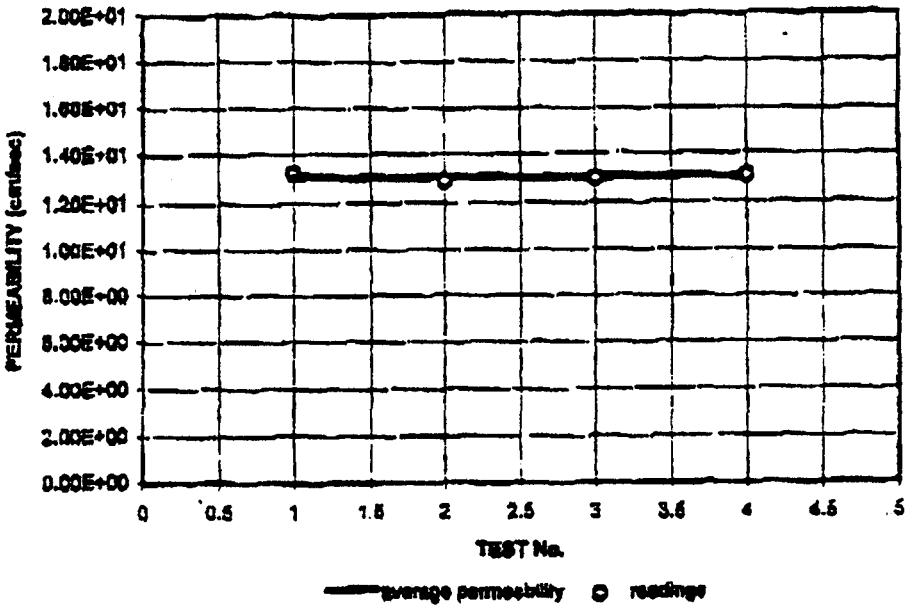
H. C. NUTTING COMPANY

Client: Petro Environmental
Project: Fernald OSDS, Cell 3
Project No: 13962.009

000556
Plate

--2739

CONSTANT HEAD PERMEABILITY TEST



Test Specification: ASTM D 2434

Test No.	Manometers H1 (cm)	Manometers H2 (cm)	Water Levels L1 (cm)	Water Levels L2 (cm)	Water Head (cm)	Flow Volume (cm^3)	Elapsed Time (s)	Calculated Permeability (cm/s)
1		7.62	50.8	25.4	7.62	16286.582	7.69	1.32E+01
2		7.62	50.8	25.4	7.62	16286.582	7.86	1.28E+01
3		7.62	50.8	25.4	7.62	16286.582	7.82	1.30E+01
4		7.62	50.8	25.4	7.62	16286.582	7.77	1.31E+01
Average								1.30E+01

13 cm per Sec

Specimen Conditions			
Diameter D (in)	11.3	Weight of Specimen (gms)	30735.0
Length of Specimen (in)	12.0	Density of Specimen (pcf)	98.2
Length of Flow (in)	12.0	Approximate Porosity	0.4

Material Description	Remarks
Carbonate Content (%) Loss w/pH of 4 = 0.31%	
USCS What Test method?	

Project No FERNALD OSDS-CELL # 3	Tested by FCE Review. by TGG
Client ID PETRO HCN W.O.# 13952.009	CONSTANT HEAD PERMEABILITY TEST
Sample Number S-5661	
Sample Location SOURCE: Watson Gravel	H. C. NUTTING COMPANY
Date 1-Sep-99 Lab No. 5661	

000557

9/1/99

Permeability and carbonate content test results okay. Gradation not okay but classification is okay
[illegible]

SUPPLIER DOCUMENT SUBMITTAL

FDF PROJECT	20102 X / 20402	CONTRACT NUMBER.: FSC-614A	SUBMITTAL NO.: 02710-2	REV.: 0	DATE: June 18, 1999	PAGE 1 OF 1

FROM: PETRO ENVIRONMENTAL TECHNOLOGIES, INC.
7400 WILLEY ROAD, MAILSTOP 52-7; TRAILER NO. 504
HAMILTON, OHIO 45013-9402

SIGNATURE: J. Richard Schaubaum

TO: FDF ENGINEERING/CONSTRUCTION DOCUMENT CONTROL, MS 52-7

RECEIVED BY: Sheka Varrett DATE: 6/21/99

QTY	DOCUMENT NUMBER	REV	DOCUMENT FAMILY: PRO	H&S	MED	TRG	CON	ENG	QAC	RESUBMITTAL: YES	NO	TITLE/DESCRIPTION	SUBMITTAL TYPE: CFC	INF	ASSOCIATED SPECIFICATION	SUBMITTAL ACTION: A	B	C
6	614-OPTA-031D	0							X		X	Cert. of Material Req. for Option A. Work (#78s)	X		02710-1.04.A.1	X		

RECEIVED JUN 23 1999 KBT

DISTRIBUTION

REVIEW DISTRIBUTION: Distribution	MS	Distribution	MS
Mike Godber (Approver)	64	ECDC	52-7
Bruce Schweitzer	64	Vern Taylor	52-0
Jim Jenkins	64		
Jim Burnett	38		

CFC DISTRIBUTION: Distribution	MS	Distribution	MS
Jim Jenkins	64	OSDF Station	64
Bruce Schweitzer	64	ECDC	52-7
Mike Godber	64	Vern Taylor	52-0
Jim Burnett	38		

RECEIVED BY: [signature] DATE: 7/2/99 NO COMMENTS X COMMENTS ATTACHED ____
(SIGN/DATE AND RETURN A COPY TO ECDC, MS 52-7)

RESUBMIT ENTIRE DOCUMENT NUMBER AS: _____ (REV. #) OR RESUBMIT CHANGED DOCUMENT PAGES AS: DOC. NO.: _____ (REV. #) PCN: _____ (PCN. #)

000558

2739

COMMENTS

ORIGINAL

SUBMITTAL ACTION CODE: (BY SUPPLIER)
CFC - CERTIFIED FOR CONSTRUCTION
INF - INFORMATION/RECORD
"X" APPROPRIATE SUBMITTAL ACTION ABOVE

SUPPLIER ACTION CODE: (ECDC) SUPPLIER ACTION ABOVE
A - ACCEPTED DOCUMENT - CONFORMS WITH REQUIREMENTS
B - MINOR COMMENTS - REVISE & RESUBMIT AS CFC OR INF
C - REVISE & RESUBMIT

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FLUOR DANIEL FERNALD

SOUTHERN WASTE UNITS (SWUs) EXCAVATION/
ON-SITE DISPOSAL FACILITY (OSDF) (PHASE II) PROJECT
Project Nos. 20102/20402; Contract No. FSC-614

SUPPLIER SUBMITTAL No.: 20102-614A-02710-2 (Rev. 0)

CERTIFICATION OF MATERIAL REQUIREMENTS (#78s) FOR OPTION A. WORK

Section 02710-1.04.A.1

Document No. 614-OPTA-031D (Rev. 0)

June 18, 1999

Fernald Site Office: P.O. Box 249 • Ross, Ohio 45061-0249 • 513.648.3402 • Fax 648.3407
7851 Palace Drive • Cincinnati, Ohio 45249 • 513.489.6789 • Fax 489.7208
8200 Seville Road • Lodi, Ohio 44254 • 330.948.1494 • Fax 948.1933

DAVON

June 14, 1999 -- 2739

Mr. J. Richard Schairbaum
Quality Control Manager
Petro Environmental Technologies
7851 Palace Drive
Cincinnati, Ohio 45249

Re: Purchase Order F-0310
Fluor Daniel Fernald
Job #WC9-021
OSDF Phase II

Dear Rick:

During the month of June, 1999, Highland Stone Division will be supplying by truck, the following materials to the above referenced project:

Approximately 34,000 tons of #78 crushed and washed limestone for the LDS and LCS Drainage layers for cell drainage.

Highland Stone hereby certifies that this LDS and LCS drainage aggregate meets the requirements of the Specification Section 02710 and the American Society for Testing and Materials (ASTM) Standards included there in.

If you have any questions on this let me know.

Robert R. Backer
Submitted by: Robert R. Backer
Sales Manager

Robert Newby
Signature of Officer of the Company
Title: Chief Operating Officer

4281 Roush Road · Hillsboro, OH 43133-9179 · 937/364-2311 · FAX 937/364-2509

- 2739

LINER PENETRATION BOXES

Option A Work

SUPPLIER DOCUMENT SUBMITTAL

FDF PROJECT NO.	20102 / 20402	X	CONTRACT NUMBER.: FSC-614A	SUBMITTAL NO.: 13005-1	REV.: 1	DATE: May 24, 1999	PAGE 1 OF 1

FROM: PETRO ENVIRONMENTAL TECHNOLOGIES, INC.
7400 WILLEY ROAD, MAILSTOP 52-7; TRAILER NO. 504
HAMILTON, OHIO 45013-9402

SIGNATURE: J. Richard Schairbaum

TO: FDF ENGINEERING/CONSTRUCTION DOCUMENT CONTROL, MS 52-7

RECEIVED BY: Erika Jarrett DATE: 5/24/99

QTY	DOCUMENT NUMBER	REV	DOCUMENT FAMILY: PRO	H&S	MED	TRG	CON	ENG	QAC	RESUBMITTAL: YES	NO	TITLE/DESCRIPTION	SUBMITTAL TYPE: CFC	INF	ASSOCIATED SPECIFICATION	SUBMITTAL ACTION: A	B	C
5	20102 ~~614~~-OPTA-DWG-002A	1						X		X		Shop Dwg. - L. Penetr. Box Type I (Option A.)	X		13005-1.04.A.3			
5	20102 ~~614~~-OPTA-DWG-002B	1						X		X		Shop Dwg. - L. Penetr. Box Type II (Option A.)	X		13005-1.04.A.3			
5	20102 ~~614~~-OPTA-DWG-002C	1						X		X		Shop Dwg. - L. Penetr. Box Type III (Option A.)	X		13005-1.04.A.3			
5	20102 ~~614~~-OPTA-DWG-002D	1						X		X		Shop Dwg. - L. Penetr. Box Type IV (Option A.)	X		13005-1.04.A.3			

RECEIVED
MAY 27 1999
[signature]

DISTRIBUTION

REVIEW DISTRIBUTION: Distribution	MS	Distribution	MS	CFC DISTRIBUTION: Distribution	MS	Distribution	MS
Jim Jenkins (Approver)	64	Vern Taylor	52-0	Jim Jenkins	64	OSDF Station	64
Bruce Schweitzer	64			Bruce Schweitzer	64	ECDC	52-7
Jim Burnett	38			Mike Godber	64	Vern Taylor	52-0
ECDC	52-7			Jim Burnett	38		

RECEIVED BY: Jim Burnett DATE: 2 June 1999 NO COMMENTS ____ Minor COMMENTS ATTACHED ✓
(SIGN/DATE AND RETURN A COPY TO ECDC, MS 52-7)

RESUBMIT ENTIRE DOCUMENT NUMBER AS: _____ (REV. #) OR RESUBMIT CHANGED DOCUMENT PAGES AS: DOC. NO.: _____ (REV. #) PCN: _____ (PCN. #)

000562

2739

COMMENTS

ORIGINAL

SUBMITTAL ACTION CODE: (BY SUPPLIER)	SUPPLIER ACTION CODE: (ECDC) SUPPLIER ACTION ABOVE
CFC - CERTIFIED FOR CONSTRUCTION	A - ACCEPTED DOCUMENT - CONFORMS WITH REQUIREMENTS
INF - INFORMATION/RECORD	B - MINOR COMMENTS - REVISE & RESUBMIT AS CFC OR INF
"X" APPROPRIATE SUBMITTAL ACTION ABOVE	C - REVISE & RESUBMIT

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FLUOR DANIEL FERNALD

SOUTHERN WASTE UNITS (SWUs) EXCAVATION/
ON-SITE DISPOSAL FACILITY (OSDF) (PHASE II) PROJECT
Project Nos. 20102/20402; Contract No. FSC-614

SUPPLIER SUBMITTAL No.: 20102-614A-13005-1 (Rev. 1)

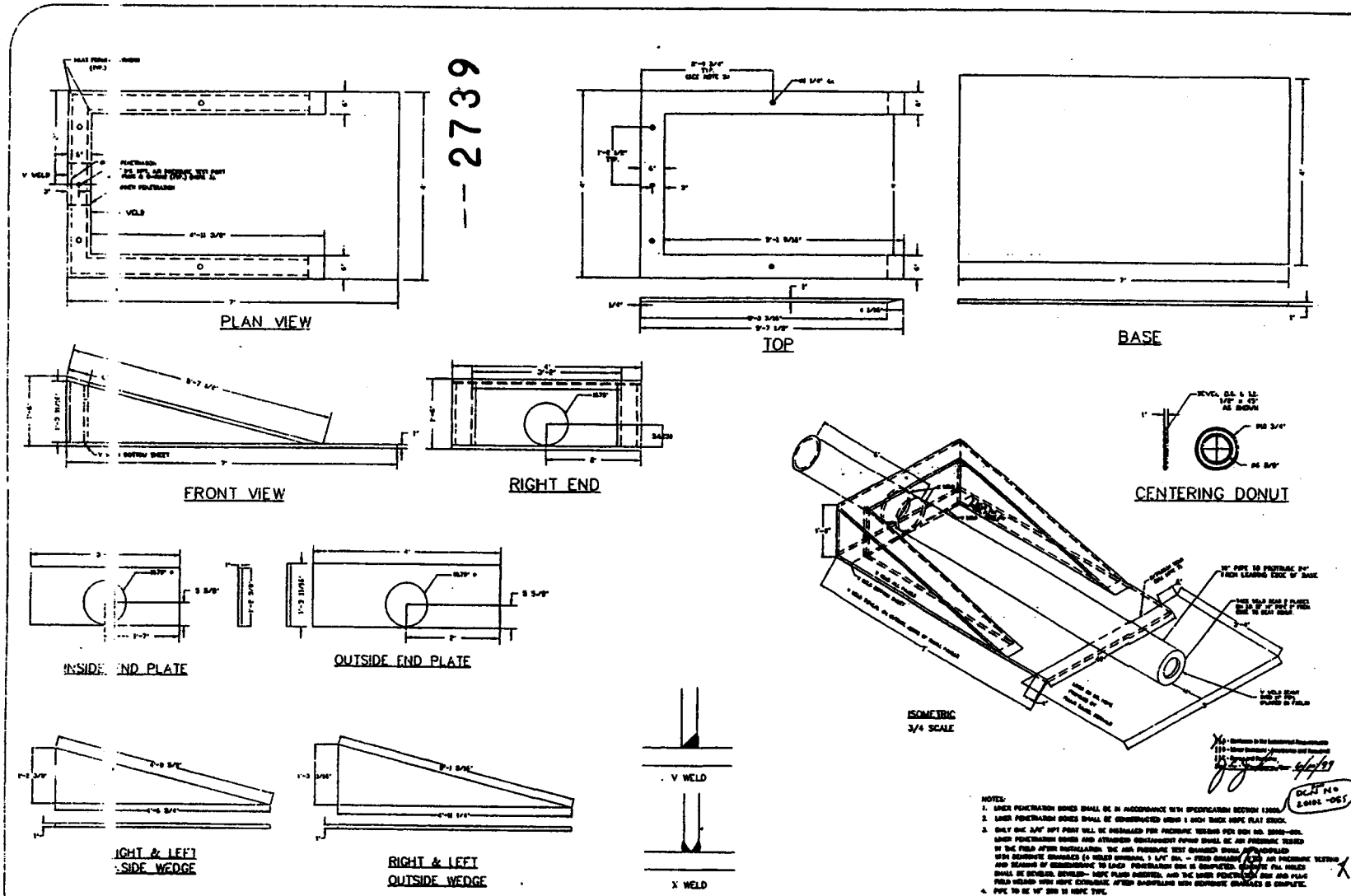
SHOP DRAWINGS FOR LINER PENETATION BOXES -
TYPES I, II, III, & IV
FOR OPTION A. WORK
Section 13005-1.04.A.3

Document No. 20102-OPTA-DWG-002A (Rev. 1)
Document No. 20102-OPTA-DWG-002B (Rev. 1)
Document No. 20102-OPTA-DWG-002C (Rev. 1)
Document No. 20102-OPTA-DWG-002D (Rev. 1)

May 24, 1999

000563

Fernald Site Office: P.O. Box 249 • Ross, Ohio 45061-0249 • 513.648.3402 • Fax 648.3407
7851 Palace Drive • Cincinnati, Ohio 45249 • 513.489.6789 • Fax 489.7208
8200 Seville Road • Lodi, Ohio 44254 • 330.948.1494 • Fax 948.1933



NOTES:

1. LINER PENETRATION BOXES SHALL BE IN ACCORDANCE WITH SPECIFICATION SECTION 13000.
2. LINER PENETRATION BOXES SHALL BE CONSTRUCTED USING 1 INCH THICK HDPE FLAT STOCK.
3. ONLY ONE 3/4" NPT PORT WILL BE INSTALLED FOR PRESSURE TESTING PER DCN NO. 20102-001. LINER PENETRATION BOXES AND ATTACHED CONTAINMENT PIPING SHALL BE AIR PRESSURE TESTED IN THE FIELD AFTER INSTALLATION. THE AIR PRESSURE TEST CHAMBER SHALL BE FABRICATED WITH DEPRESSIVE GRANULES (4 HOLES DIAGONAL, 1 1/4" DIA. - FIELD GRANULES) FOR AIR PRESSURE TESTING AND SEAMING OF GEOMEMBRANE TO LINER PENETRATION BOX IS COMPLETED. DEPRESSIVE FIA HOLES SHALL BE DEVELOP, DEVELOP- HDPE FLUID INSERTED, AND THE LINER PENETRATION BOX AND FLUID FIELD WELDED WITH HDPE EXTRUDER. AFTER DASHFILLING WITH DEPRESSIVE GRANULES IS COMPLETE.
4. PIPE TO BE 10" SDR 11 HDPE TYPE.
5. MATERIAL THICKNESS TOLERANCES TO BE ± 10% DIMENSIONAL TOLERANCES ± 1/16".
6. HDPE 80 MIL TEXTURED LINER MATERIAL AS PROVIDED BY PLASTEK WERKS, FEMALE.
7. EXTENSION WELDED LINER TO BOX TO BE SPARK TESTED BY PLASTEK WERKS PER HACE SP 0100-90 STANDARDS.
8. PERMANENT TEST BACK COMPLETED LINER PENETRATION BOX FROM IS SHIPPING IN ACCORDANCE WITH SPECIFICATION SECTION 13000.

DCN No 20102-065

SUBMIT TEST FARM TO CM FOR REVIEW AND ACCEPTANCE

PLASTEK WERKS, INC.
PLASTICS FABRICATOR

PLASTEK WERKS, INC.
2401 FRANKLIN BLVD.
P.O. BOX 5906
GAINESVILLE, GA. 30504
PHONE (770) 287-8286
FAX (770) 287-3284

CLIENT
PETRO ENVIRONMENTAL TECHNOLOGIES
7400 WILLEY RD.
CINCINNATI, OHIO 45030

ECDC CONTROLLED COPY NO 011

DATE	05/13/99
DRAWN BY:	DOUG GRIFFITH
SCALE:	1"=1'-0"
PROJECT NO.	20102
DRAWING No.	20102-OPTA-DWG-002A
SHEET	1 of 4

FILENAME: PBox1 Rev.01

000564

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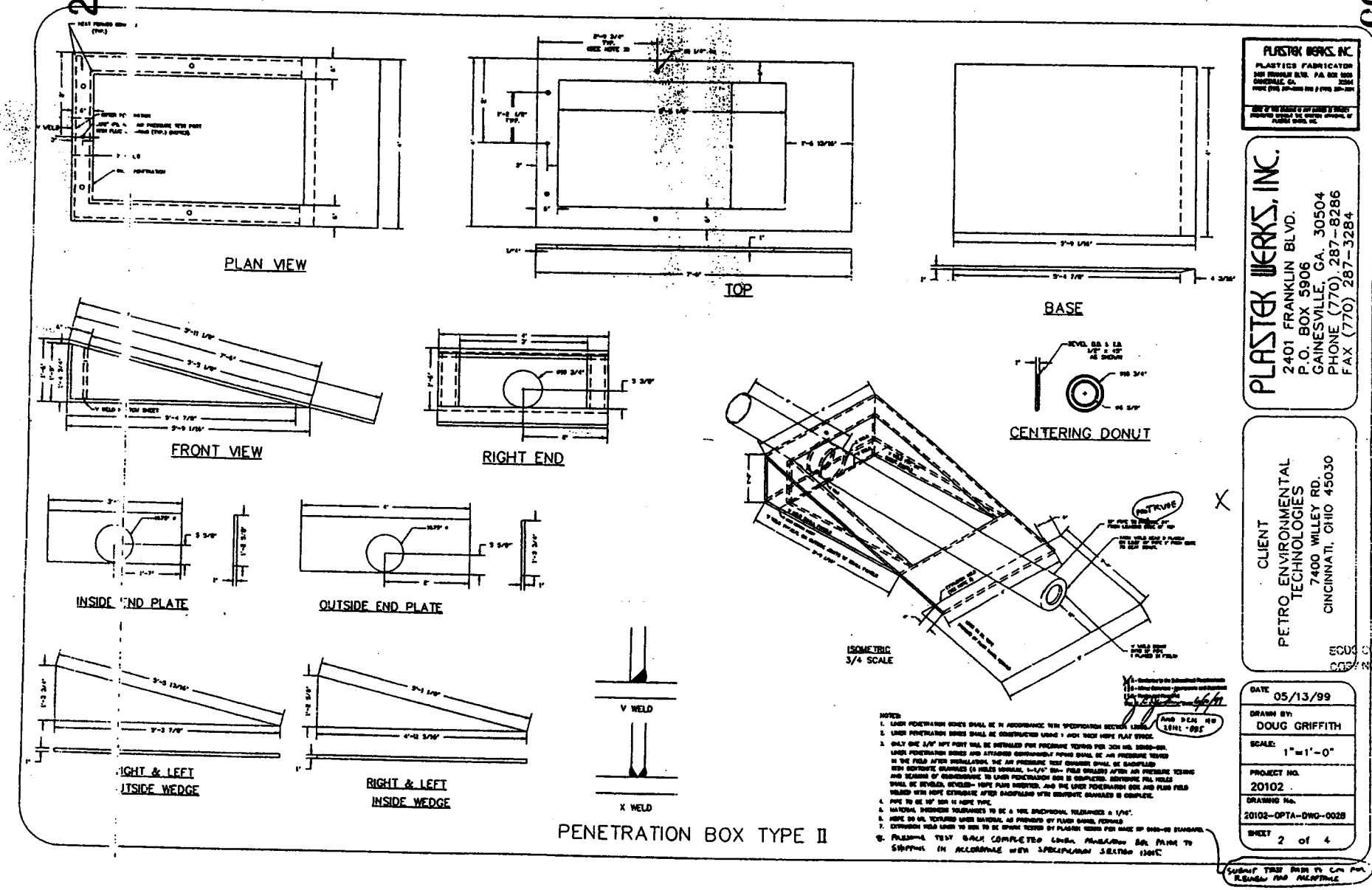
2739

000565



ECOS CONTROLLED COPY NO. 011

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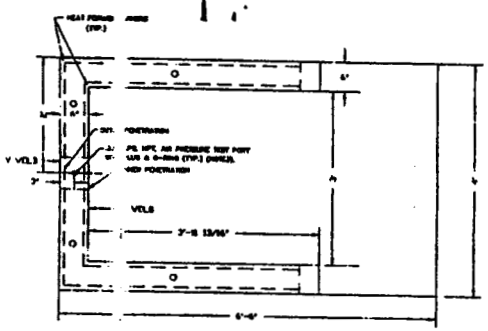
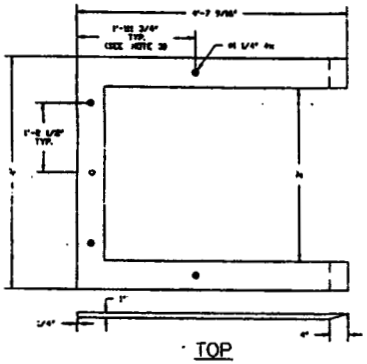
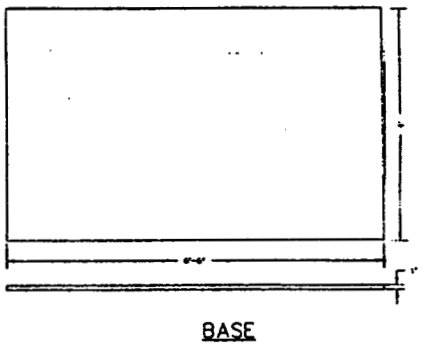
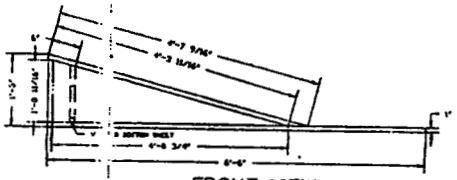
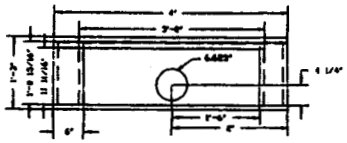
000566

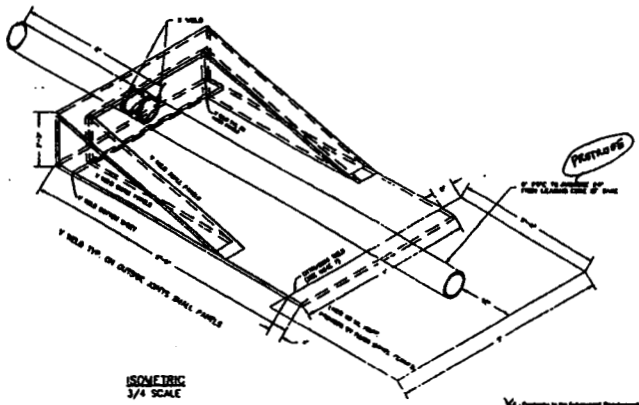


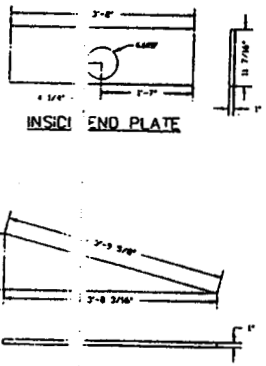


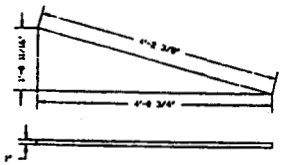


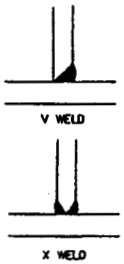












NOTES:

1. LINER PENETRATION BOXES SHALL BE IN ACCORDANCE WITH SPECIFICATION SECTION 13080 PER DCN NO. 2002-095
2. LINER PENETRATION BOXES SHALL BE CONSTRUCTED USING 1 INCH THICK HDPE FLAT STOCK.
3. ONLY ONE 3/8" NPT PORT WILL BE INSTALLED FOR PRESSURE TESTING PER BOX NO. 20102-001. LINER PENETRATION BOXES AND ATTACHED CONTAINMENT PIPING SHALL BE AIR PRESSURE TESTED IN THE FIELD AFTER INSTALLATION. THE AIR PRESSURE TEST CHAMBER SHALL BE MANIFOLDED WITH SEPTICHYE GRAMMER (6 HOLES MINIMUM, 1 1/4" DIA.—HOLE DRILLED) AND THE AIR PRESSURE TESTING AND SEAMING OF REINFORCING TO LINER PENETRATION BOX IS COMPLETED. PRESSURE TAP HOLES SHALL BE DRILLED, REWELDED HDPE FLUID INSERTED, AND THE LINER PENETRATION BOX AND PIPE (TBD) WELDED WITH HDPE EXTRUDER AFTER MANIFOLDING WITH SEPTICHYE GRAMMER IS COMPLETE.
4. HDPE TO BE 0" SDR 11 HDPE TYPE.
5. MATERIAL THICKNESS TOLERANCES TO BE ± 10% DIMENSIONAL TOLERANCES ± 1/16".
6. HDPE SO ML TEXTURED LINER MATERIAL AS PROVIDED BY PLASTEK WORKS FORMULA
7. EXTRUSION WELD LINER TO BOX TO BE SPARK TESTED BY PLASTEK WORKS PER NACE RP 0188-90 STANDARD.
8. PRESSURE TEST EACH COMPLETED LINER PENETRATION BOX PRIOR TO SHIPPING IN ACCORDANCE WITH SPECIFICATION SECTION 13080

SUBMIT TEST DATA TO CM FOR REVIEW AND ACCEPTANCE

PENETRATION BOX TYPE III

PLASTEK WORKS, INC.
PLASTICS FABRICATOR

PLASTEK WORKS, INC.
2401 FRANKLIN BLVD.
P.O. BOX 5906
GAINESVILLE, GA. 30504
PHONE (770) 287-8286
FAX (770) 287-3284

CLIENT
PETRO ENVIRONMENTAL TECHNOLOGIES
7400 WILLEY RD.
CINCINNATI, OHIO 45030

DATE	05/13/99
DRAWN BY:	DOUG GRIFFITH
SCALE:	1"=1'-0"
PROJECT NO.	20102
DRAWING No.	20102-CPTA-DWG-002C
SHEET	3 of 4

FILENAME: PBox3 Rev.01

RECEIVED JUN 15 1999

2739

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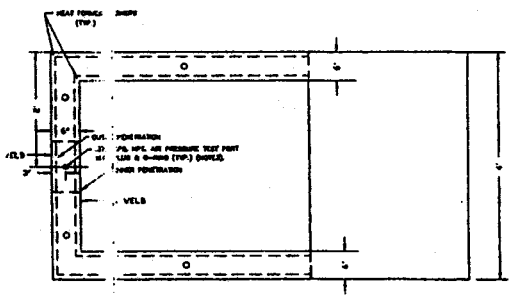
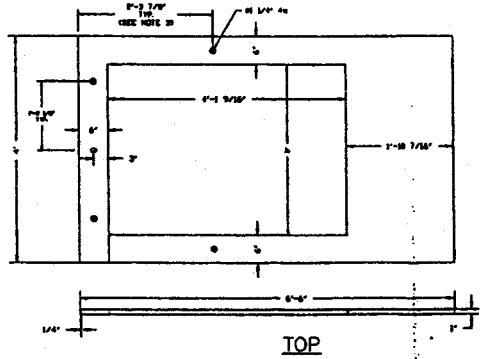


PLAN VIEW



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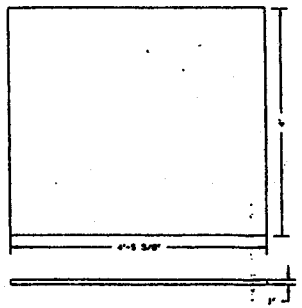

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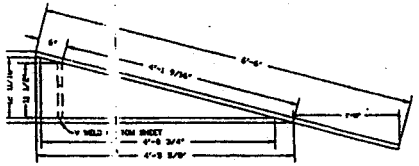
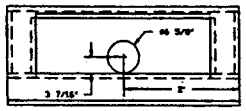
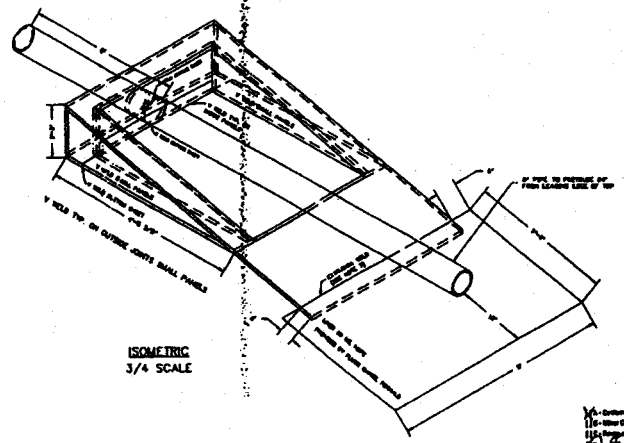


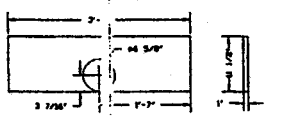
FRONT VIEW



RIGHT END



ISOMETRIC
3/4 SCALE



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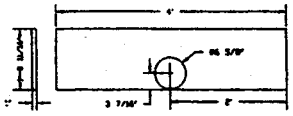

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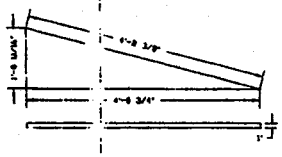
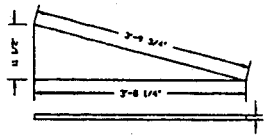
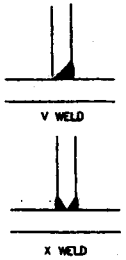


RIGHT & LEFT
OUTSIDE WEDGE



RIGHT & LEFT
INSIDE WEDGE



PENETRATION BOX TYPE IV

NOTES:

1. LINER PENETRATION BOXES SHALL BE IN ACCORDANCE WITH SPECIFICATION SECTION 13085 (REF DLAI No. 20102-003)
2. LINER PENETRATION BOXES SHALL BE CONSTRUCTED USING 1 INCH THICK HDPE FLAT STOCK.
3. ONLY ONE 3/8" NPT PORT WILL BE INSTALLED FOR PRESSURE TESTING PER DWG NO. 20102-003.
   LINER PENETRATION BOXES AND ATTACHED CONTAINMENT PIPING SHALL BE AIR PRESSURE TESTED IN THE FIELD AFTER INSTALLATION. THE AIR PRESSURE TEST CHAMBER SHALL BE MADE WITH SENTRYSTIC GRAMMELS (4 HOLES MINIMUM, 1 1/4" DIA. - HOLES DRILLED INTO AIR PRESSURE TUBING AND SEAMING OF GEOMEMBRANE TO LINER PENETRATION BOX IS COMPLETED. BOX IS THE FIRST AREA SHALL BE DEVELOPED, DEVELOP- HDPE PLUG INSERTED, AND THE LINER PENETRATION BOX AND PLUG FIELD WELDED WITH HDPE EXTRUDATE AFTER BACKFILLING WITH SENTRYSTIC GRAMMELS IS COMPLETE. X
4. PIPE TO BE 6" SDR 11 HDPE TYPE.
5. MATERIAL THICKNESS TOLERANCES TO BE ± 10% DIMENSIONAL TOLERANCES ± 1/16. X
6. HDPE SD MIL TOTAL LINER MATERIAL AS PROVIDED TUNDR DWNG. FORMAT
7. LINER EXTRUSION WELD TO BOX TO BE SPARK TESTED BY PLASTEK WORKS FOR PACE OF DWG-003 STANDARD. X
8. PRESSURE TEST BOLT CONNECTED UNDER CONTAINMENT MIX PRIOR TO SPARKING IN ACCORDANCE WITH SPECIFICATION SECTION 13085

PLASTEK WERKS, INC.
PLASTICS FABRICATOR
2401 FRANKLIN BLVD. P.O. BOX 5906
GAINESVILLE, GA. 30504
PHONE (770) 287-8286
FAX (770) 287-3284

CLIENT
PETRO ENVIRONMENTAL TECHNOLOGIES
7400 WILLEY RD.
CINCINNATI, OHIO 45030

ECDC CONTROLLED COPY NO 011

DATE	05/13/99
DRAWN BY:	DOUG GRIFFITH
SCALE:	1"=1'-0"
PROJECT NO.	20102
DRAWING No.	20102-OPTA-DWG-002D
SHEET	4 of 4

FILENAME: PBox4 Rev.01

HDPE PIPE

SUPPLIER DOCUMENT SUBMITTAL

FDF PROJECT	20102 / 20402	X	CONTRACT NUMBER.: FSC-614A	SUBMITTAL NO.: 02605-1	REV.: 0	DATE: July 30, 1999	PAGE 1 OF 1

FROM: PETRO ENVIRONMENTAL TECHNOLOGIES, INC.
7400 WILLEY ROAD, MAILSTOP 52-7; TRAILER NO. 504
HAMILTON, OHIO 45013-9402

TO: FDF ENGINEERING/CONSTRUCTION DOCUMENT CONTROL, MS 52-7

SIGNATURE: J. Richard Schaubhum

RECEIVED BY: Erika Jarrett DATE: 8/2/99

QTY	DOCUMENT NUMBER	REV	DOCUMENT FAMILY: PRO	H&S	MED	TRG	CON	ENG	QAC	RESUBMITTAL: YES	NO	TITLE/DESCRIPTION	SUBMITTAL TYPE: CFC	INF	ASSOCIATED SPECIFICATION	SUBMITTAL ACTION: A	B	C
6	614-OPTA-044	0							X		X	Resin Supplier's QC Certificates, Mfg.'s Resin	X		02605-1.04.B.1, 02605-1.04.B.2, &	X		
												Test Results, & Certification of Compliance			02605-1.04.C	X		
												for Option A. Work						

RECEIVED
AUG 05 1999
R. Thomas

DISTRIBUTION

REVIEW DISTRIBUTION

Distribution	MS	Distribution	MS
Mike Godber (Approver)	64	ECDC	52-7
Bruce Schweitzer	64	Vern Taylor	52-0
Jim Jenkins	64		
Jim Burnett	38		

CFC DISTRIBUTION

Distribution	MS	Distribution	MS
Jim Jenkins	64	OSDF Station	64
Bruce Schweitzer	64	ECDC	52-7
Mike Godber	64	Vern Taylor	52-0
Jim Burnett	38		

RECEIVED BY: [signature] DATE: 8/7/99 NO COMMENTS ____ COMMENTS ATTACHED X

(SIGN/DATE AND RETURN A COPY TO ECDC, MS 52-7)

RESUBMIT ENTIRE DOCUMENT NUMBER AS: _____ (REV. #) OR RESUBMIT CHANGED DOCUMENT PAGES AS: DOC. NO.: _____ (REV. #) PCN: _____ (PCN. #)

000536

2739

COMMENTS

ORIGINAL

SUBMITTAL ACTION CODE: (BY SUPPLIER)

CFC - CERTIFIED FOR CONSTRUCTION

INF - INFORMATION/RECORD

"X" APPROPRIATE SUBMITTAL ACTION ABOVE

SUPPLIER ACTION CODE: (ECDC) SUPPLIER ACTION ABOVE

A - ACCEPTED DOCUMENT - CONFORMS WITH REQUIREMENTS

B - MINOR COMMENTS - REVISE & RESUBMIT AS CFC OR INF

C - REVISE & RESUBMIT

PETRO
environmental
technologies

2739

FLUOR DANIEL FERNALD

SOUTHERN WASTE UNITS (SWUs) EXCAVATION/
ON-SITE DISPOSAL FACILITY (OSDF) (PHASE II) PROJECT
Project Nos. 20102/20402; Contract No. FSC-614

SUPPLIER SUBMITTAL No.: 20102-614A-02605-1 (Rev. 0)

RESIN SUPPLIER'S QUALITY CONTROL CERTIFICATES, MANUFACTURER'S RESIN TEST RESULTS, & CERTIFICATION OF COMPLIANCE FOR OPTION A. WORK

Sections 02605-1.04.B.1, -1.04.B.2, & -1.04.C

Document No. 614-OPTA-044 (Rev. 0)

July 30, 1999

Fernald Site Office: P.O. Box 249 • Ross, Ohio 45061-0249 • 513.648.3402 • Fax 648.3407
7851 Palace Drive • Cincinnati, Ohio 45249 • 513.489.6789 • Fax 489.7208
8200 Seville Road • Lodi, Ohio 44254 • 330.948.1494 • Fax 948.1933

JUL 15 1999

DRISCOPIPE

2739

PHILLIPS DRISCOPIPE
A DIVISION OF PHILLIPS PETROLEUM COMPANY
11711 Hopewell Road
Hagerstown, Maryland 21740

July 12, 1999

DRISCOPIPE 1000 PRODUCT QUALITY CERTIFICATION

CUSTOMER: Lee Supply Company Incorporate
1st & Lincoln Avenue
Charleroi, PA 15022

ATTENTION: Jerry Biagini

CUSTOMER ORDER NO:	2076
PHILLIPS ORDER NO:	2479316
SHIPPING DATE:	07/07/99
QUANTITY:	5,720 ft
EXTRUSION DATE(S):	07/1999

PRODUCT: 6" DR 11 1000

This letter is being written at your request concerning Driscopipe 1000 series pipe. Driscopipe 1000 series pipe is manufactured from Phillips Marlex TR-480 feedstock resin. The resin has a cell class of PE 345444C according to ASTM D3350. This is a high density, high molecular weight polyethylene resin which meets the criteria for a Type III, Class C, Category 5, Grade PE34 piping material in accordance with ASTM D3350. Driscopipe 1000 pipe, has a Plastic Pipe Institute recommended hydrostatic basis of 1600 psi at 23° C and 800 psi at 60°C based on TR/3 as derived from ASTM D2837 test methodology.

The polyethylene material designation code is PE 3408 CDC.

The dimensional characteristics and pressure capabilities of Driscopipe 1000 are established in accordance with the guidelines set forth in ASTM F714 for sizes 3" IPS and larger, and D3035 for sizes smaller than 3" IPS. These standards are referenced in the print line, and repeated every two feet along the entire length of pipe.

Exceeds specs equivalent of 3

Sincerely,

Sheri Eckles

Sheri Eckles
Services Supervisor Assistant

OK
KBT
8/9/99

PHILLIPS DRISCOPIPE IS ISO 9001 CERTIFIED

Customer order #2076

PHILLIPS DRISCOPIPE, INC.

PLANT HG

Product Description. 10P 06.00" SDR 11.00 0040' JT

PRINT OUT DATE: 07/12/1999

PRODUCTION ORDER NUMBER 100055840

Start Date 07/04/1999

End Date 7/6/99

Minimum Wall (IN):	0.615	Minimum Toe-In (%):	0.302
Maximum Wall (IN):	0.665	Maximum Toe-In (%):	0.423
Minimum OD (IN):	6.623	Minimum Hoop Stress (PSI):	3143.644
Maximum OD (IN):	6.628	Maximum Hoop Stress (PSI):	3198.720
Minimum ID (IN):	5.335	Minimum Ring Tensile (PSI):	
Maximum ID (IN):	5.385	Maximum Ring Tensile (PSI):	
Minimum Eccentricity (%):	1.085	Minimum Carbon Black (%):	2.580
Maximum Eccentricity (%):	6.015	Maximum Carbon Black (%):	2.580
Minimum Melt Index:	0.120	Maximum Carbon Black (%):	2.580
Maximum Out of Round (IN):		Maximum Melt Index:	0.120
Minimum Ovality (%):		Resin	TR-480Z
Maximum Ovality (%):		Lot	71-9-0838 71-9-0853
Number of Samples:	5		

JUL 1

—2739

000572

PHILLIPS CHEMICAL COMPANY
A DIVISION OF PHILLIPS PETROLEUM COMPANY
BOX 792 • PHONE: 713 475-3666
PASADENA, TEXAS 77501-0792

PHILLIPS PLASTICS RESINS
Houston Chemical Complex

=-2739

June 14, 1999

KSL# 17024-99

FAX: 301-582-6670

Phillips Driscopipe
11711 Hopewell Road
Hagerstown, MD 21741

Quality Control

This letter will certify that the Marlex* resin shown below, as supplied by Phillips Chemical Company, conforms to our manufacturing specification.

Type:	HHM TR-480Z
Lot Number:	7190853
P.O. Number:	REL 59
Date Shipped:	06/14/99
Package:	PSPX 2465
Quantity:	186600 LBS.
Melt Index, ASTM D1238:	.12 G/10 MIN
Density, ASTM D1505:	.944 G/CC
ESCR, F/20:	>192 HOURS **

ok 1st
8-9-99

Karen S. Lively
Quality Assurance Manager

For COA questions call Linda Murray, 713-475-3625

* Reg. U.S. Pat. Off.
** Nominal Value (not tested on each lot)

cc: QA-File-RC

TOTAL P.01

PHILLIPS CHEMICAL COMPANY
A DIVISION OF PHILLIPS PETROLEUM COMPANY
BOX 792 • PHONE: 713 475-3868
PASADENA, TEXAS 77501-0792

PHILLIPS PLASTICS RESINS
Houston Chemical Complex

2739

June 04, 1999

KSL# 16070-99

FAX: 301-582-6670

Phillips Driscopipe
11711 Hopewell Road
Hagerstown, MD 21741

Quality Control

This letter will certify that the Marlex* resin shown below, as supplied by Phillips Chemical Company, conforms to our manufacturing specification.

Type:	HHM TR-480Z
Lot Number:	7190838
P.O. Number:	REL 55
Date Shipped:	06/04/99
Package:	PSPX 5908
Quantity:	184800 LBS.
Melt Index, ASTM D1238:	.09 G/10 MIN
Density, ASTM D1505:	.944 G/CC
ESCR, F/20:	>192 HOURS **

OK
EKT
8-9-99

Karen S. Lively
Quality Assurance Manager

For COA questions call Linda Murray, 713-475-3625

* Reg. U.S. Pat. Off.
** Nominal Value (not tested on each lot)

cc: QA-File-RC

TOTAL P.03

2 000 880

72 of 195

513.648-3407

LEE SUPPLY CO. INC.
• DIVERSIFIED PIPE & PUMP SYSTEMS
• INDUSTRIAL • MINING • ENVIRONMENTAL PRODUCTS

Mailing Address: Box 35, Charleroi, PA 15022 *Shipping Address:* 1st & Lincoln Avenue, Charleroi, PA 15022
• *Phone:* (724) 483-3543 • 1-800-353-3747 • *Fax:* (724) 483-0577

--2739

Fax Transmission Sheet

TO: Petro

ATTENTION: Rick

FROM: Kim Wichterman

DATE: 7-14

NUMBER OF SHEETS (Including Cover): 3

REMARKS: Resin Certifications for PO# f-0517

Fax 111798

RECORD
RECORD

PHILLIPS CHEMICAL COMPANY
A DIVISION OF PHILLIPS PETROLEUM COMPANY
BOX 792 • PHONE: 713 475-3656
PASADENA, TEXAS 77501-0792

PHILLIPS PLASTICS RESINS
Houston Chemical Complex

2739

June 14, 1999

KSL# 17024-99

FAX: 301-582-6670

Phillips Driscopipe
11711 Hopewell Road
Hagerstown, MD 21741

Quality Control

This letter will certify that the Marlex* resin shown below, as supplied by Phillips Chemical Company, conforms to our manufacturing specification.

Type:	HHM TR-480Z
Lot Number:	7190853
P.O. Number:	REL 59
Date Shipped:	06/14/99
Package:	PSPX 2465
Quantity:	186600 LBS.
Melt Index, ASTM D1238:	.12 G/10 MIN
Density, ASTM D1505:	.944 G/CC
ESCR, F/20:	>192 HOURS **

Karen S. Lively
Quality Assurance Manager

For COA questions call Linda Murray, 713-475-3625

* Reg. U.S. Pat. Off.
** Nominal Value (not tested on each lot)

cc: QA-File-RC

TOTAL P.01

RECORD

44 of 795

2000 880

-2739

PHILLIPS CHEMICAL COMPANY
A DIVISION OF PHILLIPS PETROLEUM COMPANY
BOX 792 • PHONE: 713 475-3666
PASADENA, TEXAS 77501-0792

PHILLIPS PLASTICS RESINS
Houston Chemical Complex

June 04, 1999

KSL# 16070-99

FAX: 301-582-6670

Phillips Driscopipe
11711 Hopewell Road
Hagerstown, MD 21741

Quality Control

This letter will certify that the Marlex* resin shown below, as supplied by Phillips Chemical Company, conforms to our manufacturing specification.

Type:	HHM TR-480Z
Lot Number:	7190838
P.O. Number:	REL 55
Date Shipped:	06/04/99
Package:	PSPX 5908
Quantity:	184800 LBS.
Melt Index, ASTM D1238:	.09 G/10 MIN
Density, ASTM D1505:	.944 G/CC
ESCR, F/20:	>192 HOURS **

Karen S. Lively
Quality Assurance Manager

For COA questions call Linda Murray, 713-475-3625

* Reg. U.S. Pat. Off.
** Nominal Value (not tested on each lot)

cc: QA-File-RC

RECORD TOTAL P.03

2 880 880

45 of 795

LEE SUPPLY CO. INC.
• DIVERSIFIED PIPE & PUMP SYSTEMS - 513-648-3407
• INDUSTRIAL • MINING • ENVIRONMENTAL PRODUCTS

Mailing Address: Box 35, Charleroi, PA 15022 *Shipping Address:* 1st & Lincoln Avenue, Charleroi, PA 15022
• *Phone:* (724) 483-3543 • 1-800-353-3747 • *Fax:* (724) 483-0577

--2739

Fax Transmission Sheet

TO: Petro Env.

ATTENTION: Rick

FROM: Kim

DATE: 7/28/99

NUMBER OF SHEETS (Including Cover): 3

REMARKS:

RECORD

Fax 11/98

2000 880 46 of 795

JUL 15 1999

DRISCOPIPE

PHILLIPS DRISCOPIPE
A DIVISION OF PHILLIPS PETROLEUM COMPANY
11711 Hopewell Road
Hagerstown, Maryland 21740

-- 2739

July 12, 1999

DRISCOPIPE 1000 PRODUCT QUALITY CERTIFICATION

CUSTOMER: Lee Supply Company Incorporate
1st & Lincoln Avenue
Charleroi, PA 15022

ATTENTION: Jerry Eiagini

CUSTOMER ORDER NO:	2076
PHILLIPS ORDER NO:	2479316
SHIPPING DATE:	07/07/99
QUANTITY:	5,720 ft
EXTRUSION DATE(S):	07/1999

PRODUCT: 6" DR 11 1000

BETTER CELL CLASS THAN 345444C

This letter is being written at your request concerning Driscopipe 1000 series pipe. Driscopipe 1000 series pipe is manufactured from Phillips Marlex TR-480 feedstock resin. The resin has a cell class of PE 345444C according to ASTM D3350. This is a high density, high molecular weight polyethylene resin which meets the criteria for a Type III, Class C, Category 5, Grade PE34 piping material in accordance with ASTM D3350. Driscopipe 1000 pipe, has a Plastic Pipe Institute recommended hydrostatic basis of 1600 psi at 23° C and 800 psi at 60°C based on TR/3 as derived from ASTM D2837 test methodology.

The polyethylene material designation code is PE 3408 CDC.

The dimensional characteristics and pressure capabilities of Driscopipe 1000 are established in accordance with the guidelines set forth in ASTM F714 for sizes 3" IPS and larger, and D3035 for sizes smaller than 3" IPS. These standards are referenced in the print line, and repeated every two feet along the entire length of pipe.

Sincerely,

Sheri Eckles

Sheri Eckles
Services Supervisor Assistant

RECORD

PHILLIPS DRISCOPIPE IS ISO 9001 CERTIFIED

Customer order #2076

PHILLIPS DRISCOPIPE, INC.

PAGE 1

PLANT HG

Product Description: 10P 06.00" SDR 11.00 0040' JT

PRINT OUT DATE: 07/12/1999

PRODUCTION ORDER NUMBER 100055840

Start Date 07/04/1999

End Date 7/6/99

Minimum Wall (IN):	0.615	Minimum Toe-In (%):	0.302
Maximum Wall (IN):	0.665	Maximum Toe-In (%):	0.423
Minimum OD (IN):	6.623	Minimum Hoop Stress (PSI):	3143.644
Maximum OD (IN):	6.628	Maximum Hoop Stress (PSI):	3198.720
Minimum ID (IN):	5.335	Minimum Ring Tensile (PSI):	
Maximum ID (IN):	5.385	Maximum Ring Tensile (PSI):	
Minimum Eccentricity (%):	1.085	Minimum Carbon Black (%):	2.580
Maximum Eccentricity (%):	6.015	Maximum Carbon Black (%):	2.580
Minimum Melt Index:	0.120	Maximum Carbon Black (%):	2.580
Maximum Out of Round (IN):		Maximum Melt Index:	0.120
Minimum Ovality (%):		Resin	TR-480Z
Maximum Ovality (%):		Lot	71-9-0838 71-9-0853
Number of Samples:	5		

RECORD

2000 880

JUL 1

47 of 795

-2739

000580

2000 880
513-648-3407
48 of 195

LEE SUPPLY CO. INC.
• DIVERSIFIED PIPE & PUMP SYSTEMS
• INDUSTRIAL • MINING • ENVIRONMENTAL PRODUCTS

Mailing Address: Box 35, Charleroi, PA 15022 *Shipping Address:* 1st & Lincoln Avenue, Charleroi, PA 15022
• *Phone:* (724) 483-3543 • 1-800-353-3747 • *Fax:* (724) 483-0577

2739

Fax Transmission Sheet

TO: Petro

ATTENTION: Chris Tucker

FROM: Kim

DATE: 8/9/99

NUMBER OF SHEETS (Including Cover): 13

REMARKS: * Pipe certs & resin certs that you have requested.

Thank you!

Fax 111790

RECORD

2000880 49 of 195

DRISCOPIPE

-- 2739

PHILLIPS DRISCOPIPE
A DIVISION OF PHILLIPS PETROLEUM COMPANY
11711 Hopewell Road
Hagerstown, Maryland 21740

July 30, 1999

DRISCOPIPE 1000 PRODUCT QUALITY CERTIFICATION

CUSTOMER: Lee Supply Company Incorporate
1st & Lincoln Avenue
Charleroi, PA 15022

ATTENTION: Jerry Biagini

EXTRUSION DATE(S): 01/99

PRODUCT: 10" dr 11 1000

This letter is being written at your request concerning Driscopipe 1000 series pipe. Driscopipe 1000 series pipe is manufactured from Phillips Marlex TR-480 feedstock resin. The resin has a cell class of PE 345444C according to ASTM D3350. This is a high density, high molecular weight polyethylene resin which meets the criteria for a Type III, Class C, Category 5, Grade PE34 piping material in accordance with ASTM D3350. Driscopipe 1000 pipe, has a Plastic Pipe Institute recommended hydrostatic basis of 1600 psi at 23° C and 800 psi at 60°C based on TR/3 as derived from ASTM D2837 test methodology.

The polyethylene material designation code is PE 3408 CDC.

The dimensional characteristics and pressure capabilities of Driscopipe 1000 are established in accordance with the guidelines set forth in ASTM F714 for sizes 3" IPS and larger, and D3035 for sizes smaller than 3" IPS. These standards are referenced in the print line, and repeated every two feet along the entire length of pipe.

Sincerely,

Sheri Eckles
Services Supervisor Assistant

PHILLIPS DRISCOPIPE IS ISO 9001 CERTIFIED

RECORD

PHILLIPS ORISCOPIPE INC. PAGE 1

PLANT HG Product Description: 10P 10.00" SDR 11.00 0040' JT PRINT OUT DATE: 07/30/1999

PRODUCTION ORDER NUMBER 100044123 Start Date 01/18/1999 End Date 1/19/99

Minimum Wall (IN):	1.003	Minimum Toe-In (%):	0.743
Maximum Wall (IN):	1.030	Maximum Toe-In (%):	0.799
Minimum OD (IN):	10.760	Minimum Hoop Stress (PSI):	3371.034
Maximum OD (IN):	10.767	Maximum Hoop Stress (PSI):	3371.034
Minimum ID (IN):	8.723	Minimum Ring Tensile (PSI):	
Maximum ID (IN):	8.728	Maximum Ring Tensile (PSI):	
Minimum Eccentricity (%):	1.650	Minimum Carbon Black (%):	
Maximum Eccentricity (%):	2.621	Maximum Carbon Black (%):	
Minimum Out of Round (IN):		Minimum Melt Index:	
Maximum Out of Round (IN):		Maximum Melt Index:	
Minimum Ovality (%):		Resin	TR-480Z
Maximum Ovality (%):		Lot	7181617
Number of Samples:	3		

RECORD

2880 880

50 of 795

-2739

000583

2880 880 51 8795
-- 2739

PHILLIPS CHEMICAL COMPANY
A DIVISION OF PHILLIPS PETROLEUM COMPANY
BOX 792 • PHONE: 713 475-3666
PASADENA, TEXAS 77501-0792

PHILLIPS PLASTICS RESINS
Houston Chemical Complex

December 07, 1998

JHV# 27502-98

FAX: 301-582-6670

Phillips Driscopipe
11711 Hopewell Road
Hagerstown, MD 21741

Quality Control

This letter will certify that the Marlex* resin shown below, as supplied by Phillips Chemical Company, conforms to our manufacturing specification.

Type:	HHM TR-480Z
Lot Number:	7181617
P.O. Number:	REL 134
Date Shipped:	12/04/98
Package:	PSPX 2427
Quantity:	189650 LBS.
Melt Index, ASTM D1238:	.10 G/10 MIN
Density, ASTM D1505:	.943 G/CC
ESCR, F/20:	>192 HOURS **

J. H. Vaden
Quality Assurance Manager

For CCA questions call Linda Murray, 713-475-3625

* Reg. U.S. Pat. Off.
** Nominal Value (not tested on each lot)

cc: QA-File-RC

RECORD

2080 880 52 of 795

DRISCOPIPE

-- 2739

PHILLIPS DRISCOPIPE
A DIVISION OF PHILLIPS PETROLEUM COMPANY
11711 Hopewell Road
Hagerstown, Maryland 21740

July 30, 1999

DRISCOPIPE 1000 PRODUCT QUALITY CERTIFICATION

CUSTOMER: Lee Supply Company Incorporate
1st & Lincoln Avenue
Charleroi, PA 15022

ATTENTION: Jerry Biagini

EXTRUSION DATE(S): 12/97

PRODUCT: 6" dr 11 1000

This letter is being written at your request concerning Driscopipe 1000 series pipe. Driscopipe 1000 series pipe is manufactured from Phillips Marlex TR-480 feedstock resin. The resin has a cell class of PE 345444C according to ASTM D3350. This is a high density, high molecular weight polyethylene resin which meets the criteria for a Type III, Class C, Category 5, Grade PE34 piping material in accordance with ASTM D3350. Driscopipe 1000 pipe, has a Plastic Pipe Institute recommended hydrostatic basis of 1600 psi at 23° C and 800 psi at 60°C based on TR/3 as derived from ASTM D2837 test methodology.

The polyethylene material designation code is PE 3408 CDC.

The dimensional characteristics and pressure capabilities of Driscopipe 1000 are established in accordance with the guidelines set forth in ASTM F714 for sizes 3" IPS and larger, and D3035 for sizes smaller than 3" IPS. These standards are referenced in the print line, and repeated every two feet along the entire length of pipe.

Sincerely,

Sheri Eckles

Sheri Eckles
Services Supervisor Assistant

PHILLIPS DRISCOPIPE IS ISO 9001 CERTIFIED

RECORD

PHILLIPS DRISCOPIPE, INC.

PAGE 1

PLANNT HG Product Description. 10P 6" DR11 40' JT

PRINT OUT DATE: 07/30/1999

PRODUCTION ORDER NUMBER 14131

Start Date 12/13/1997

End Date 12/14/97

Minimum Wall (IN):	0.607	Minimum Toe-In (%):	0.160
Maximum Wall (IN):	0.654	Maximum Toe-In (%):	0.270
Minimum OD (IN):	6.620	Minimum Hoop Stress (PSI):	3395.000
Maximum OD (IN):	6.627	Maximum Hoop Stress (PSI):	3446.000
Minimum ID (IN):	5.342	Minimum Ring Tensile (PSI):	
Maximum ID (IN):	5.384	Maximum Ring Tensile (PSI):	
Minimum Eccentricity (%):	3.300	Minimum Carbon Black (%):	
Maximum Eccentricity (%):	5.400	Maximum Carbon Black (%):	
Minimum Melt Index:	0.120	Maximum Carbon Black (%):	
Maximum Out of Round (IN):	116.000	Maximum Melt Index:	0.120
Minimum Ovality (%):	0.860	Resin	TR-480-2
Maximum Ovality (%):	0.870	Lot	71-7-1288
Number of Samples:	10		

2 880 880

53 of 795

=-2739

RECORD

000586

54 of 195

2000880

PHILLIPS CHEMICAL COMPANY
A DIVISION OF PHILLIPS PETROLEUM COMPANY
BOX 792 • PHONE 713 475-3666
PASADENA TEXAS 77501-0792

PHILLIPS PLASTICS RESINS
Houston Chemical Complex

November 07, 1997 2739

JHV# 22921-97

FAX: 301-582-6670

Phillips Driscopipe
11711 Hopewell Road
Hagerstown, MD 21741

Quality Control

This letter will certify that the Marlex* resin shown below, as supplied by Phillips Chemical Company, conforms to our manufacturing specification.

Type:	HHM TR-480Z
Lot Number:	7171288
P.O. Number:	REL 36
Date Shipped:	11/06/97
Package:	PSPX 5862
Quantity:	191350 LBS.
Melt Index, ASTM D1238:	.13 G/10 MIN
Density, ASTM D1505:	.943 G/CC
ESCR, F/20:	>192 HOURS **

J. H. Vaden
Quality Assurance Manager

For COA questions call Sharon Robinette, 713-475-3625

* Reg. U.S. Pat. Off.
** Nominal Value (not tested on each lot)

cc: QA-File-RC

TOTAL P.01

RECORD

2 000 880 35 8795

DRISCOPIPE

PHILLIPS DRISCOPIPE --2739
A DIVISION OF PHILLIPS PETROLEUM COMPANY
Phillips Driscopipe
Startex Plant
2950 Nazareth Road
Wellford, S.C. 29385

August 6, 1999

DRISCOPIPE 1000 PRODUCT QUALITY CERTIFICATION

CUSTOMER: Lee Supply Co.
1st & Lincoln Avenue
Charleroi PA. 15022

ATTENTION: Jennifer

CUSTOMER ORDER NO:N/A
PHILLIPS ORDER NO: N/A
SHIPPING DATE: N/A
QUANTITY: N/A
EXTRUSION DATE(S): 3/99

PRODUCT: 3" DR 11

This letter is being written at your request concerning Driscopipe 1000 series pipe. Driscopipe 1000 series pipe is manufactured from Phillips Marlex TR-480 feedstock resin. The resin has a cell class of PE 345444C according to ASTM D3350. This is a high density, high molecular weight polyethylene resin which meets the criteria for a Type III, Class C, Category 5, Grade PE34 piping material in accordance with ASTM D3350. Driscopipe 1000 pipe, has a Plastic Pipe Institute recommended hydrostatic basis of 1600 psi at 23° C and 800 psi at 60°C based on TR/3 as derived from ASTM D2837 test methodology.

The polyethylene material designation code is PE 3408 CDC.

The dimensional characteristics and pressure capabilities of Driscopipe 1000 are established in accordance with the guidelines set forth in ASTM F714 for sizes 3" IPS and larger, and D3035 for sizes smaller than 3" IPS. These standards are referenced in the print line, and repeated every two feet along the entire length of pipe.

Sincerely,

Carolyn Rogers
Services Specialist

PHILLIPS DRISCOPIPE IS ISO 9001 CERTIFIED

RECORD

000588

PHILLIPS DRISCOPIPE, INC.

PAGE 1

PLANT ST Product Description: 10P 03.00" SDR 11.00 0040' JT

PRINT OUT DATE: 08/06/1999

PRODUCTION ORDER NUMBER 100045839 Start Date 03/20/1999 End Date 3/23/99

Minimum Wall (IN):	0.321	Minimum Toe-In (%):	0.200
Maximum Wall (IN):	0.363	Maximum Toe-In (%):	0.343
Minimum OD (IN):	3.492	Minimum Hoop Stress (PSI):	3221.856
Maximum OD (IN):	3.502	Maximum Hoop Stress (PSI):	3297.188
Minimum ID (IN):	2.796	Minimum Ring Tensile (PSI):	
Maximum ID (IN):	2.837	Maximum Ring Tensile (PSI):	
Minimum Eccentricity (%):	2.059	Minimum Carbon Black (%):	2.401
Maximum Eccentricity (%):	6.887	Maximum Carbon Black (%):	2.520
Minimum Out of Round (IN):	0.046	Minimum Melt Index:	0.080
Maximum Out of Round (IN):	0.060	Maximum Melt Index:	0.100
Minimum Ovality (%):	1.315	Resin	TR-480Z
Maximum Ovality (%):	1.715	Lot	71-9-0233
Number of Samples:	27		

RECORD

000589

2000880

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=-2739

2880880 57 of 795

PHILLIPS CHEMICAL COMPANY
A DIVISION OF PHILLIPS PETROLEUM COMPANY
BOX 792 • PHONE: 713 475-3656
PASADENA, TEXAS 77501-0792

PHILLIPS PLASTICS RESINS
Houston Chemical Complex

2739

February 17, 1999

JHV# 4219-99

FAX: 864-439-7918

Phillips Driscopipe
Startex Plant
2950 Nazareth Road
Wellford, SC 29385

Quality Control

This letter will certify that the Marlex* resin shown below, as supplied by Phillips Chemical Company, conforms to our manufacturing specification.

Type:	HHM TR-480Z
Lot Number:	7190233
P.O. Number:	REL 15
Date Shipped:	02/17/99
Package:	PSPX 9089
Quantity:	181000 LBS.
Melt Index, ASTM D1238:	.09 G/10 MIN
Density, ASTM D1505:	.944 G/CC
ESCR, F/20:	>192 HOURS **

J. H. Vaden
Quality Assurance Manager

For COA questions call Linda Murray, 713-475-3625

* Reg. U.S. Pat. Off.
** Nominal Value (not tested on each lot)

cc: QA-File-RC

Mr. D. F. Mangan
Phillips Driscopipe, Inc.
P.O. Box 83-3866
Richardson, TX 75083

500811376
00199272
00782532

RECORD

TOTAL P.04

2000 880 58 of 795

DRISCOPIPE

PHILLIPS DRISCOPIPE
A DIVISION OF PHILLIPS PETROLEUM COMPANY
11711 Hopewell Road
Hagerstown, Maryland 21740

-- 2739

July 30, 1999

DRISCOPIPE 1000 PRODUCT QUALITY CERTIFICATION

CUSTOMER: Lee Supply Company Incorporate
1st & Lincoln Avenue
Charleroi, PA 15022

ATTENTION: Jerry Biagini

EXTRUSION DATE(S): 03/99

PRODUCT: 8'' dr 11 1000

This letter is being written at your request concerning Driscopipe 1000 series pipe. Driscopipe 1000 series pipe is manufactured from Phillips Marlex TR-480 feedstock resin. The resin has a cell class of PE 345444C according to ASTM D3350. This is a high density, high molecular weight polyethylene resin which meets the criteria for a Type III, Class C, Category 5, Grade PE34 piping material in accordance with ASTM D3350. Driscopipe 1000 pipe, has a Plastic Pipe Institute recommended hydrostatic basis of 1600 psi at 23° C and 800 psi at 60°C based on TR/3 as derived from ASTM D2837 test methodology.

The polyethylene material designation code is PE 3408 CDC.

The dimensional characteristics and pressure capabilities of Driscopipe 1000 are established in accordance with the guidelines set forth in ASTM F714 for sizes 3" IPS and larger, and D3035 for sizes smaller than 3" IPS. These standards are referenced in the print line, and repeated every two feet along the entire length of pipe.

Sincerely,

Sheri Eckles

Sheri Eckles
Services Supervisor Assistant

PHILLIPS DRISCOPIPE IS ISO 9001 CERTIFIED

RECORD

2000 880 59 of 795

PHILLIPS CHEMICAL COMPANY
A DIVISION OF PHILLIPS PETROLEUM COMPANY
BOX 792 • PHONE: 713 475-3686
PASADENA, TEXAS 77501-0792

PHILLIPS PLASTICS RESINS
Houston Chemical Complex

2739

February 06, 1999

JHV# 2940-99

FAX: 301-582-6670

Phillips Driscopipe
11711 Hopewell Road
Hagerstown, MD 21741

Quality Control

This letter will certify that the Marlex* resin shown below, as supplied by Phillips Chemical Company, conforms to our manufacturing specification.

Type:	HHM TR-480Z
Lot Number:	6290110
P.O. Number:	REL 15
Date Shipped:	02/05/99
Package:	PSPX 6275
Quantity:	193300 LBS.
Melt Index, ASTM D1238:	.11 G/10 MIN
Density, ASTM D1505:	.944 G/CC
ESCR, F/20:	>192 HOURS **

J. H. Vaden
Quality Assurance Manager

For COA questions call Linda Murray, 713-475-3625

* Reg. U.S. Pat. Off.
** Nominal Value (not tested on each lot)

cc: QA-File-RC

RECORD

PHILLIPS DRISCOPIPE, INC.

PAGE 1

PL Product Description: 10P 08 00" SDR 11 00 0040' JT

PRINT OUT DATE: 07/30/1999

PR ION ORDER NUMBER 100049215

Start Date 03/20/1999

End Date 3/21/99

Minimum Wall (IN):	0.813	Minimum Toe-In (%):	0.847
Maximum Wall (IN):	0.837	Maximum Toe-In (%):	0.847
Minimum OD (IN):	8.617	Minimum Hoop Stress (PSI):	3364.684
Maximum OD (IN):	8.630	Maximum Hoop Stress (PSI):	3371.034
Minimum ID (IN):	6.986	Minimum Ring Tensile (PSI):	
Maximum ID (IN):	6.989	Maximum Ring Tensile (PSI):	
Minimum Eccentricity (%):	1.812	Minimum Carbon Black (%):	2.510
Maximum Eccentricity (%):	2.748	Maximum Carbon Black (%):	2.570
Minimum Out of Round (IN):		Minimum Melt Index:	0.100
Maximum Out of Round (IN):		Maximum Melt Index:	0.100
Minimum Ovality (%):		Resin	TR-480Z
Maximum Ovality (%):		Lot	62-9-0110
Number of Samples:	4		

2000880

60 of 795

-- 2739

RECORD

000593

TEST EQUIPMENT CALIBRATION

SUPPLIER DOCUMENT SUBMITTAL

FDF PROJECT N	20102	X	CONTRACT NUMBER.: FSC-614A	ITTAL NO.: 02605-2	REV.: 0	DATE: June 11, 1999	PAGE 1 OF 1
	20402						

FROM: PETRO ENVIRONMENTAL TECHNOLOGIES, INC.
7400 WILLEY ROAD, MAILSTOP 52-7; TRAILER NO. 504
HAMILTON, OHIO 45013-9402

SIGNATURE: J. Richard Schaubaum

TO: FDF ENGINEERING/CONSTRUCTION DOCUMENT CONTROL, MS 52-7

RECEIVED BY: Melissa Clews DATE: 6-14-99

QTY	DOCUMENT NUMBER	REV	DOCUMENT FAMILY: PRO	H&S	MED	TRG	CON	ENG	QAC	RESUBMITTAL: YES	NO	TITLE/DESCRIPTION	SUBMITTAL TYPE: CFC	INF	ASSOCIATED SPECIFICATION	SUBMITTAL ACTION: A	B	C
6	614-OPTA-051	0							X		X	Test Gauge Calibration Data for Option A. Work	X		02605-3.05.B.7	X		

RECEIVED
JUN 14 1999
R. Chisman

DISTRIBUTION

REVIEW DISTRIBUTION

Distribution	MS	Distribution	MS
Mike Godber (Approver)	64	ECDC	52-7
Bruce Schweitzer	64	Vern Taylor	52-0
Jim Jenkins	64		
Jim Burnett	38		

CFC DISTRIBUTION

Distribution	MS	Distribution	MS
Jim Jenkins	64	OSDF Station	64
Bruce Schweitzer	64	ECDC	52-7
Mike Godber	64	Vern Taylor	52-0
Jim Burnett	38		

000595

RECEIVED BY: [signature] DATE: 7/6/99 NO COMMENTS X COMMENTS ATTACHED ____
(SIGN/DATE AND RETURN A COPY TO ECDC, MS 52-7)

RESUBMIT ENTIRE DOCUMENT NUMBER AS: _____ (REV. #) OR RESUBMIT CHANGED DOCUMENT PAGES AS: DOC. NO.: _____ (REV. #) PCN: _____ (PCN. #)

2739

COMMENTS

ORIGINAL

SUBMITTAL ACTION CODE: (BY SUPPLIER)
CFC - CERTIFIED FOR CONSTRUCTION
INF - INFORMATION/RECORD
"X" APPROPRIATE SUBMITTAL ACTION ABOVE

SUPPLIER ACTION CODE: (ECDC) SUPPLIER ACTION ABOVE
A - ACCEPTED DOCUMENT - CONFORMS WITH REQUIREMENTS
B - MINOR COMMENTS - REVISE & RESUBMIT AS CFC OR INF
C - REVISE & RESUBMIT

ENTERED

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FLUOR DANIEL FERNALD

SOUTHERN WASTE UNITS (SWUs) EXCAVATION/
ON-SITE DISPOSAL FACILITY (OSDF) (PHASE II) PROJECT
Project Nos. 20102/20402; Contract No. FSC-614

SUPPLIER SUBMITTAL No.: 20102-614A-02605-2 (Rev. 0)

TEST GAUGE CALIBRATION DOCUMENTATION FOR OPTION A. WORK

Section 02605-3.05.B.7

Document No. 614-OPTA-051 (Rev. 0)

June 11, 1999

000596

Fernald Site Office: P.O. Box 249 • Ross, Ohio 45061-0249 • 513.648.3402 • Fax 648.3407
7851 Palace Drive • Cincinnati, Ohio 45249 • 513.489.6789 • Fax 489.7208
8200 Seville Road • Lodi, Ohio 44254 • 330.948.1494 • Fax 948.1933

The Jay Industrial Technologies Group

-- 2739

CERTIFICATE OF ACCURACY

CUSTOMER:
PETRO ENVIROMENTAL TECHNOLOGIES INC.
7851 PALACE DRIVE
CINCINNATI OHIO 45247

SALES ORDER NO. J 109193

	STANDARDS TRACEABLE TO N.I.S.T.			INSTRUMENT CERTIFIED
DESCRIPTION	DWT			PRESSURE GAUGE
MANUFACTURER	ASHCROFT			ASHCROFT
MODEL NO.	1305-B			45 1279 AS L
RANGE	10000 PSI			0 - 200 PSI
ACCURACY	.05%			.5 % FULL SCALE
SERIAL NUMBER	31828			N/A
DATE CERTIFIED	NOVEMBER 3, 1998			JUNE 7, 1999
N.I.S.T. NO.	821/257176-96			99-5004

MINOR DIV.	2 PSI
AMBIENT TEMP.	75 F.
BAROMETRIC PRESS.	30.13 IN. HG.
RELATIVE HUMIDITY	45 %

VALUED APPLIED PSI	INDICATED PSIG	DEVIATION
0	0	NO READABLE ERROR
20	20	NO READABLE ERROR
40	40	NO READABLE ERROR
60	60	NO READABLE ERROR
80	80	NO READABLE ERROR
100	100	NO READABLE ERROR
120	120	NO READABLE ERROR
140	140	NO READABLE ERROR
160	160	NO READABLE ERROR
180	180	NO READABLE ERROR
200	200	NO READABLE ERROR

THIS INSTRUMENT IS CERTIFIED USING STANDARDS TRACEABLE TO THE N.I.S.T..

[X] SPAN [ ] READING

WE FURTHER CERTIFY THAT OUR CALIBRATION SYSTEM COMPLIES WITH MIL. STD. 45662 - A

CERTIFIED BY Jim Dooley TECHNICIAN DATE JUNE 7, 1999

000597

The Jay Industrial Technologies Group

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CERTIFICATE OF ACCURACY

CUSTOMER:
PETRO ENIROMENTAL TECHNOLOGIES INC.
7851 PALACE DRIVE
CINCINNATI OHIO 45247

SALES ORDER NO. J 109287

		STANDARDS TRACEABLE TO N.I.S.T.		INSTRUMENT CERTIFIED
DESCRIPTION	A. T. E.			PRESSURE GAUGE
MANUFACTURER	ASHCROFT			ASHCROFT
MODEL NO.	AQS-2			45 1279 AS 04 L.
RANGE	0-100 PSIG			0 - 30 PSI
ACCURACY	0.05 %			.5 % FULL SCALE
SERIAL NUMBER	AQS-12455			N/A
DATE CERTIFIED	01-25-99			JUNE 8, 1999
N.I.S.T. NO.	12455 - 36186			99-5007

MINOR DIV.	.2 PSI
AMBIENT TEMP.	74 F.
BAROMETRIC PRESS.	30.05 IN. HG.
RELATIVE HUMIDITY	45 %

VALUED APPLIED PSI	INDICATED PSIG	DEVIATION
0	0	NO READABLE ERROR
3	3	NO READABLE ERROR
6	6	NO READABLE ERROR
9	9	NO READABLE ERROR
12	12	NO READABLE ERROR
15	15	NO READABLE ERROR
18	18	NO READABLE ERROR
21	21	NO READABLE ERROR
24	24	NO READABLE ERROR
27	27	NO READABLE ERROR
30	30	NO READABLE ERROR

THIS INSTRUMENT IS CERTIFIED USING STANDARDS TRACEABLE TO THE N.I.S.T..

[X] SPAN [ ] READING

WE FUTHER CERTIFY THAT OUR CALIBRATION SYSTEM COMPLIES WITH MIL STD. 45662-A.

CERTIFIED BY Jim Dooley TECHNICIAN DATE JUNE 8, 1999

000598

SUPPLIER DOCUMENT SUBMITTAL

FDF PROJECT:	20102 X 20402	CONTRACT NUMBER.: FSC-614A	SUBMITTAL NO.: 02770-5	REV.: 0	DATE: August 6, 1999	PAGE 1 OF 1

FROM: PETRO ENVIRONMENTAL TECHNOLOGIES, INC.
7400 WILLEY ROAD, MAILSTOP 52-7; TRAILER NO. 504
HAMILTON, OHIO 45013-9402

TO: FDF ENGINEERING/CONSTRUCTION DOCUMENT CONTROL, MS 52-7

SIGNATURE: J. Richard Schaubman

RECEIVED BY: Melissa Lewis DATE: 8-6-99

QTY	DOCUMENT NUMBER	REV	DOCUMENT FAMILY: PRO	H&S	MED	TRG	CON	ENG	QAC	RESUBMITTAL: YES	NO	TITLE/DESCRIPTION	SUBMITTAL TYPE: CFC	INF	ASSOCIATED SPECIFICATION	SUBMITTAL ACTION: A	B	C
5	614-OPTA-068G	0						X			X	Certificates of Tensiometer Calibration for Option A. work	X		02770-1.04.C	X		

DISTRIBUTION

REVIEW DISTRIBUTION: Distribution	MS	Distribution	MS
Tony Klimek (Approver)	64	Vern Taylor	52-0
Bruce Schweitzer	64		
Jim Burnett	38		
ECDC	52-7		

CFC DISTRIBUTION: Distribution	MS	Distribution	MS
Tony Klimek	64	OSDF Station	64
Bruce Schweitzer	64	ECDC	52-7
Mike Godber	64	Vern Taylor	52-0
Jim Burnett	38		

RECEIVED BY: [signature] DATE: 8/16/99 NO COMMENTS ✓ COMMENTS ATTACHED ___
(SIGN/DATE AND RETURN A COPY TO ECDC, MS 52-7)

RESUBMIT ENTIRE DOCUMENT NUMBER AS: _____ (REV. #) OR RESUBMIT CHANGED DOCUMENT PAGES AS: DOC. NO.: _____ (REV. #) PCN: _____ (PCN. #)

COMMENTS
~~CERTIFICATE SHOULD BE SIGNED.~~

ORIGINAL

SUBMITTAL ACTION CODE: (BY SUPPLIER)
CFC - CERTIFIED FOR CONSTRUCTION
INF - INFORMATION/RECORD
"X" APPROPRIATE SUBMITTAL ACTION ABOVE

SUPPLIER ACTION CODE: (ECDC) SUPPLIER ACTION ABOVE
A - ACCEPTED DOCUMENT - CONFORMS WITH REQUIREMENTS
B - MINOR COMMENTS - REVISE & RESUBMIT AS CFC OR INF
C - REVISE & RESUBMIT

000539

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INFORMATION ONLY

FLUOR DANIEL FERNALD

SOUTHERN WASTE UNITS (SWUs) EXCAVATION/
ON-SITE DISPOSAL FACILITY (OSDF) (PHASE II) PROJECT
Project Nos. 20102/20402; Contract No. FSC-614

SUPPLIER SUBMITTAL No.: 20102-614A-02770-5 (Rev. 0)

CERTIFICATE OF TENSIOMETER CALIBRATION
FOR OPTION A. WORK
Section 02770-1.04.C

Document No. 614-OPTA-068G (Rev. 0)

August 6, 1999

[X] A - Conforms to the Subcontract Requirements
[ ] B - Minor Comment - Incorporate and Resubmit
[ ] C - Revise and Resubmit
Sig: Date: 8/16/99

Fernald Site Office: P.O. Box 249 • Ross, Ohio 45061-0249 • 513.648.3402 • Fax 648.3407
7851 Palace Drive • Cincinnati, Ohio 45249 • 513.489.6789 • Fax 489.7208
8200 Seville Road • Lodi, Ohio 44254 • 330.948.1494 • Fax 948.1933

Attn JERRY —

COLUMBINE
INTERNATIONAL, Ltd.
Plastic Welding Equipment Specialists

- 2739

CALIBRATION CERTIFICATE

Customer Name: THE ISTRE COMP.
Tensiometer Serial Number: NAL-0896

110 Volt [X]
220 Volt [ ]
LBS

Device Calibrated: S-Type load cell
Range: 0-500 lbs. Tension
Model No: M2300-500
Serial No: 126721

Calibration Apparatus:
Dead Weight system w/
Fluke Model 8840A Multimeter

W1	2	R1	835
W2	152	R2	2712
W3	302	R3	4590

Readout Model No: 2840AG-24123
Readout Serial No: 10553035-149
Channel No: N/A

Indicator reading with no load: 0

Applied Force lbs.	Output (mv):	Display reading:	Deviation Error:
2	2.482	2	0.00
52	4.358	52	0.00
102	6.233	102	0.00
152	8.108	152	0.00
202	9.986	202	0.00
252	11.867	252	0.00
302	13.768	302	0.00

Total Deviation Error (%): 0.00%

Temperature at time of calibration: 73 degrees F
Exitation Voltage: 10 V DC

Scale Factor (1):	0.0799	Offset (1):	-65
Scale Factor (2):	0.0799	Offset (2):	-64
Break point:	2712	Calibration Check #	

Traceable to NIST Standards

*NOTE: **Readout and load cell above have been systems calibrated and are considered a matched pair. In general, calibrated readouts and load cells are not interchangeable.**

This calibration conforms to the standards set by ASTM E4.

Calibration performed by: BILL AULTZ

Signature: Bill Aultz Date: 8/3/99

Merchant Circle
...cerville, CA 95667
800-635-6693

Ph: (530) 622-2791
Fax: (530) 622-2704
www.columbineint.com

SUPPLIER DOCUMENT SUBMITTAL

FDF PROJECT NO.	20102	X	CONTRACT NUMBER.: FSC-614A	SUBMITTAL NO.: 02605-2	REV.: 1	DATE: September 3, 1999	PAGE 1 OF 1
	20402						

FROM: PETRO ENVIRONMENTAL TECHNOLOGIES, INC.
7400 WILLEY ROAD, MAILSTOP 52-7; TRAILER NO. 504
HAMILTON, OHIO 45013-9402

TO: FDF ENGINEERING/CONSTRUCTION DOCUMENT CONTROL, MS 52-7

SIGNATURE: J. Richard Schairbaum

RECEIVED BY: Melissa Clews DATE: 9.3.99

QTY	DOCUMENT NUMBER	REV	DOCUMENT FAMILY: PRO	H&S	MED	TRG	CON	ENG	QAC	RESUBMITTAL: YES	NO	TITLE/DESCRIPTION	SUBMITTAL TYPE: CFC	INF	ASSOCIATED SPECIFICATION	SUBMITTAL ACTION: A	B	C
6	614-OPTA-051	1							X	X		Test Gauge Calibration Data for Option A. Work	X		02605-3.05.B.7	X		

RECEIVED SEP 09 1999

DISTRIBUTION

REVIEW DISTRIBUTION

Distribution	MS	Distribution	MS
Mike Godber (Approver)	64	ECDC	52-7
Bruce Schweitzer	64	Vern Taylor	52-0
Jim Jenkins	64		
Jim Burnett	38		

CFC DISTRIBUTION

Distribution	MS	Distribution	MS
Jim Jenkins	64	OSDF Station	64
Bruce Schweitzer	64	ECDC	52-7
Mike Godber	64	Vern Taylor	52-0
Jim Burnett	38		

RECEIVED BY: _____ DATE: 9/10/99 NO COMMENTS X COMMENTS ATTACHED ____
(SIGN/DATE AND RETURN A COPY TO ECDC, MS 52-7)

RESUBMIT ENTIRE DOCUMENT NUMBER AS: _____ (REV. #) OR RESUBMIT CHANGED DOCUMENT PAGES AS: DOC. NO.: _____ (REV. #) PCN: _____ (PCN. #)

COMMENTS

Resubmittal of one gauge due to damage requiring repair and recalibration.

ORIGINAL

SUBMITTAL ACTION CODE: (BY SUPPLIER)

CFC - CERTIFIED FOR CONSTRUCTION

INF - INFORMATION/RECORD

"X" APPROPRIATE SUBMITTAL ACTION ABOVE

SUPPLIER ACTION CODE: (ECDC) SUPPLIER ACTION ABOVE

A - ACCEPTED DOCUMENT - CONFORMS WITH REQUIREMENTS

B - MINOR COMMENTS - REVISE & RESUBMIT AS CFC OR INF

C - REVISE & RESUBMIT

000602

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FLUOR DANIEL FERNALD

SOUTHERN WASTE UNITS (SWUs) EXCAVATION/
ON-SITE DISPOSAL FACILITY (OSDF) (PHASE II) PROJECT
Project Nos. 20102/20402; Contract No. FSC-614

SUPPLIER SUBMITTAL No.: 20102-614A-02605-2 (Rev. 1)

TEST GAUGE CALIBRATION DOCUMENTATION FOR OPTION A. WORK
Section 02605-3.05.B.7

Document No. 614-OPTA-051 (Rev. 1)

September 3, 1999

000603

Fernald Site Office: P.O. Box 249 • Ross, Ohio 45061-0249 • 513.648.3402 • Fax 648.3407
7851 Palace Drive • Cincinnati, Ohio 45249 • 513.489.6789 • Fax 489.7208
8200 Seville Road • Lodi, Ohio 44254 • 330.948.1494 • Fax 948.1933

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The Jay Industrial Technologies Group, Inc.

CERTIFICATE OF ACCURACY

CUSTOMER:
PETRO ENIROMENTAL TECHNOLOGIES INC.
7851 PLACE DRIVE
CINCINNATI OHIO 45247

SALES ORDER NO. J 118133

		STANDARDS TRACEABLE TO N.I.S.T.		INSTRUMENT CERTIFIED	
DESCRIPTION	A. T. E.			PRESSURE GAUGE	
MANUFACTURER	ASHCROFT			ASHCROFT	
MODEL NO.	AQS – 1 (CA)			45 1279 AS 04 L	
RANGE	0–5 IN. H20D			0 – 30 PSI	
ACCURACY	0.06 %			.5 % FULL SCALE	
SERIAL NUMBER	AQS–1525			N/A	
DATE CERTIFIED	02–11–99			AUG 30, 1999	✓
N.I.S.T. NO.	1525–36200			99–5212	✓

MINOR DIV.	.2 PSI
AMBIENT TEMP.	72 F.
BAROMETRIC PRESS.	30.21 IN. HG.
RELATIVE HUMIDITY	36 %

VALUED APPLIED PSI	INDICATED PSIG	DEVIATION
0	0	NO READABLE ERROR
3	3	NO READABLE ERROR
6	6	NO READABLE ERROR
9	9	NO READABLE ERROR
12	12	NO READABLE ERROR
15	15	NO READABLE ERROR
18	18	NO READABLE ERROR
21	21	NO READABLE ERROR
24	24	NO READABLE ERROR
27	27	NO READABLE ERROR
30	30	NO READABLE ERROR

THIS INSTRUMENT IS CERTIFIED USING STANDARDS TRACEABLE TO THE N.I.S.T..

[X] SPAN [ ] READING

FURTHER CERTIFY THAT OUR CALIBRATION SYSTEM COMPLIES WITH MIL. STD. 45662–A.

CERTIFIED BY Jim Dooley TECHNICIAN

DATE AUG 30, 1999

000604

Option A Work

SUPPLIER DOCUMENT SUBMITTAL

FDF PROJECT N.	20102 / 20402	X	CONTRACT NUMBER.: FSC-614A	SUBMITTAL NO.: 02770-6	REV.: 0	DATE: August 24, 1999	PAGE 1 OF 1

FROM: PETRO ENVIRONMENTAL TECHNOLOGIES, INC.
7400 WILLEY ROAD, MAILSTOP 52-7; TRAILER NO. 504
HAMILTON, OHIO 45013-9402

SIGNATURE: J. Richard Schairbaum

TO: FDF ENGINEERING/CONSTRUCTION DOCUMENT CONTROL, MS 52-7

RECEIVED BY: Penny Drago DATE: 8-25-99

QTY	DOCUMENT NUMBER	REV	DOCUMENT FAMILY: PRO	H&S	MED	TRG	CON	ENG	QAC	RESUBMITTAL: YES	NO	TITLE/DESCRIPTION	SUBMITTAL TYPE: CFC	INF	ASSOCIATED SPECIFICATION	SUBMITTAL ACTION: A	B	C
6	614-OPTA-068H.1	0							X		X	Certs. of Calibration for Vacuum Testing Gauges for Option A. Work.	X		02770-1.04.D	X		
6	614-OPTA-068H.2	0							X		X	Certs. of Calibration for Air Testing Gauges for Option A. Work.	X		02770-1.04.D	X		

RECEIVED SEP 09 1999 Kehrman

ORIGINAL

DISTRIBUTION

REVIEW DISTRIBUTION: Distribution	MS	Distribution	MS	CFC DISTRIBUTION: Distribution	MS	Distribution	MS
Mike Godber (Approver)	64	ECDC	52-7	Jim Jenkins	64	OSDF Station	64
Bruce Schweitzer	64	Vern Taylor	52-0	Bruce Schweitzer	64	ECDC	52-7
~~Jim Jenkins~~ Tony Klimek	64	~~Dan Bodine~~ KBT	38	Mike Godber	64	Vern Taylor	52-0
Jim Burnett	38	K Wasi Badu-Tweneboah		Jim Burnett	38		

RECEIVED BY: K Badu-Tweneboah DATE: 9/10/99 NO COMMENTS X COMMENTS ATTACHED

(SIGN/DATE AND RETURN A COPY TO ECDC, MS 52-7)

RESUBMIT ENTIRE DOCUMENT NUMBER AS: _____ (REV. #) OR RESUBMIT CHANGED DOCUMENT PAGES AS: DOC. NO.: _____ (REV. #) PCN: _____ (PCN. #)

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ENTERED

000605

COMMENTS	SUBMITTAL ACTION CODE: (BY SUPPLIER)	SUPPLIER ACTION CODE: (ECDC) SUPPLIER ACTION ABOVE
	CFC - CERTIFIED FOR CONSTRUCTION	A - ACCEPTED DOCUMENT - CONFORMS WITH REQUIREMENTS
	INF - INFORMATION/RECORD	B - MINOR COMMENTS - REVISE & RESUBMIT AS CFC OR INF
	"X" APPROPRIATE SUBMITTAL ACTION ABOVE	C - REVISE & RESUBMIT

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FLUOR DANIEL FERNALD

SOUTHERN WASTE UNITS (SWUs) EXCAVATION/
ON-SITE DISPOSAL FACILITY (OSDF) (PHASE II) PROJECT
Project Nos. 20102/20402; Contract No. FSC-614

SUPPLIER SUBMITTAL No.: 20102-614A-02770-6 (Rev. 0)

CERTIFICATES OF CALIBRATION FOR VACUUM BOX/AIR TESTING GAUGES FOR OPTION A. WORK

Section 02770-1.04.D

Document No. 614-OPTA-068H.1 (Rev. 0)
Document No. 614-OPTA-068H.2 (Rev. 0)

August 24, 1999

Fernald Site Office: P.O. Box 249 • Ross, Ohio 45061-0249 • 513.648.3402 • Fax 648.3407
7851 Palace Drive • Cincinnati, Ohio 45249 • 513.489.6789 • Fax 489.7208
8200 Seville Road • Lodi, Ohio 44254 • 330.948.1494 • Fax 948.1933

000606

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CERTIFICATE OF CALIBRATION FOR

VACUUM BOX TESTING GAUGES

Document No. 614-OPTA-068H.1 (Rev. 0)
Section 02770-1.04.D

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The Jay Industrial Technologies Group, Inc.

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CERTIFICATE OF ACCURACY

CUSTOMER:
ISTRE
13811 EAST POPLAR
GLENNPOOL, OK. 74033

SALES ORDER NO. J 116764

		STANDARDS TRACEABLE TO N.I.S.T.		INSTRUMENT CERTIFIED
DESCRIPTION	A. T. E.	A. T. E.		COMPOUND GAUGE
MANUFACTURER	ASHCROFT	ASHCROFT		ASHCROFT
MODEL NO.	AQS-2	AQS-2		20 1005 A 02 L.
RANGE	0-100 PSI	0-30 IN. HG. VAC.		15#/100KPA -30"/-100KPA
ACCURACY	0.05 %	0.05 %		1 % FULL SCALE
SERIAL NUMBER	AQS-12455	AQS-4229		N/A
DATE CERTIFIED	01-28-99	02-11-99		08-17-99
N.I.S.T. NO.	12455-36186	4229-36200		99-5176

MINOR DIV.	.5#/5KPA -1"/5KPA
AMBIENT TEMP.	76 F.
BAROMETRIC PRESS.	30.09 IN. HG.
RELATIVE HUMIDITY	37 %

VALUED APPLIED		INDICATED		DEVIATION	
PSI	VAC.	PSI	VAC.	PSI	VAC.
0	0	0	0	NO READABLE ERROR	
1	5	1	5	NO READABLE ERROR	
3	10	3	10	NO READABLE ERROR	
5	15	5	15	NO READABLE ERROR	
7	20	7	21	0	+1
9	25	9	26	0	+1
11		11		0	
13		12.5		-.5	
15		14.5		-.5	

THIS INSTRUMENT IS CERTIFIED USING STANDARDS TRACEABLE TO THE N. I. S. T..

[X] SPAN [ ] READING

WE FUTHER CERTIFY THAT OUR CALIBRATION SYSTEM COMPLIES WITH MIL. STD. 45662-A.

CERTIFIED BY [signature] TECHNICIAN

DATE AUGUST 17, 1999

000608

CERTIFICATE OF CALIBRATION FOR

AIR TESTING GAUGES

Document No. 614-OPTA-068H.2 (Rev. 0)
Section 02770-1.04.D

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The Jay Industrial Technologies Group, Inc.

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CERTIFICATE OF ACCURACY

CUSTOMER:
ISTRE
13811 EAST POPLAR
GLENNPOOL, OK. 74033

SALES ORDER NO. J 116764

		STANDARDS TRACEABLE TO N.I.S.T.		INSTRUMENT CERTIFIED
DESCRIPTION	A. T. E.	A. T. E.		PRESSURE GAUGE
MANUFACTURER	ASHCROFT	ASHCROFT		ASHCROFT
MODEL NO.	AQS-2	AQS-2		20 1005 A 01 L.
RANGE	0-100 PSI	0-30 IN. HG. VAC.		0 - 60 PSI
ACCURACY	0.05 %	0.05 %		1 % FULL SCALE
SERIAL NUMBER	AQS-12455 ✓	AQS-4229		N/A
DATE CERTIFIED	01-28-99	02-11-99 ✓		08-17-99 ✓
N.I.S.T. NO.	12455-36186 ✓	4229-36200 ✓		99-5177 ✓

MINOR DIV.	1 PSI
AMBIENT TEMP.	76 F.
BAROMETRIC PRESS.	30.09 IN. HG.
RELATIVE HUMIDITY	37 %

VALUED APPLIED PSI	INDICATED PSI	DEVIATION
0	0	NO READABLE ERROR
5	5	NO READABLE ERROR
10	10	NO READABLE ERROR
15	15	NO READABLE ERROR
20	20	NO READABLE ERROR
25	25	NO READABLE ERROR
30	30	NO READABLE ERROR
35	35	NO READABLE ERROR
40	40	NO READABLE ERROR
45	45	NO READABLE ERROR
50	50	NO READABLE ERROR
55	55	NO READABLE ERROR
60	60	NO READABLE ERROR

THIS INSTRUMENT IS CERTIFIED USING STANDARDS TRACEABLE TO THE N. I. S. T..

[X] SPAN [ ] READING

WE FUTHER CERTIFY THAT OUR CALIBRATION SYSTEM COMPLIES WITH MIL. STD. 45662-A.

CERTIFIED BY R. T. TECHNICIAN DATE AUGUST 17, 1999

000610

The Jay Industrial Technologies Group, Inc.

=-2739

CERTIFICATE OF ACCURACY

CUSTOMER:
ISTRE
13811 EAST POPLAR
GLENNPOOL, OK. 74033

SALES ORDER NO. J 116764

		STANDARDS TRACEABLE TO N.I.S.T.		INSTRUMENT CERTIFIED
DESCRIPTION	A. T. E.	A. T. E.		PRESSURE GAUGE
MANUFACTURER	ASHCROFT	ASHCROFT		ASHCROFT
MODEL NO.	AQS-2	AQS-2		20 1005 A 01 L.
RANGE	0-100 PSI	0-30 IN. HG. VAC.		0 - 60 PSI
ACCURACY	0.05 %	0.05 %		1 % FULL SCALE
SERIAL NUMBER	AQS-12455	AQS-4229		N/A
DATE CERTIFIED	01-28-99	02-11-99		08-17-99
N.I.S.T. NO.	12455-36186	4229-36200		99-5178

MINOR DIV.	1 PSI
AMBIENT TEMP.	76 F.
BAROMETRIC PRESS.	30.09 IN. HG.
RELATIVE HUMIDITY	37 %

VALUED APPLIED PSI	INDICATED PSI	DEVIATION
0	0	NO READABLE ERROR
5	5	NO READABLE ERROR
10	10	NO READABLE ERROR
15	15	NO READABLE ERROR
20	20	NO READABLE ERROR
25	25	NO READABLE ERROR
30	30	NO READABLE ERROR
35	35	NO READABLE ERROR
40	40	NO READABLE ERROR
45	45	NO READABLE ERROR
50	50	NO READABLE ERROR
55	55	NO READABLE ERROR
60	60	NO READABLE ERROR

THIS INSTRUMENT IS CERTIFIED USING STANDARDS TRACEABLE TO THE N. I. S. T..

[X] SPAN [ ] READING

WE FUTHER CERTIFY THAT OUR CALIBRATION SYSTEM COMPLIES WITH MIL. STD. 45662-A.

CERTIFIED BY [signature] TECHNICIAN

DATE AUGUST 17, 1999

000011

The Jay Industrial Technologies Group, Inc.

=-2739

CERTIFICATE OF ACCURACY

CUSTOMER:
ISTRE
13811 EAST POPLAR
GLENNPOOL, OK. 74033

SALES ORDER NO. J 116764

		STANDARDS TRACEABLE TO N.I.S.T.		INSTRUMENT CERTIFIED
DESCRIPTION	A. T. E.	A. T. E.		PRESSURE GAUGE
MANUFACTURER	ASHCROFT	ASHCROFT		ASHCROFT
MODEL NO.	AQS-2	AQS-2		20 1005 A 01 L.
RANGE	0-100 PSI	0-30 IN. HG. VAC.		0 - 60 PSI
ACCURACY	0.05 %	0.05 %		1 % FULL SCALE
SERIAL NUMBER	AQS-12455	AQS-4229		N/A
DATE CERTIFIED	01-28-99	02-11-99		08-17-99
N.I.S.T. NO.	12455-36186	4229-36200		99-5179

MINOR DIV.	1 PSI
AMBIENT TEMP.	76 F.
BAROMETRIC PRESS.	30.09 IN. HG.
RELATIVE HUMIDITY	37 %

VALUED APPLIED PSI	INDICATED PSI	DEVIATION
0	0	NO READABLE ERROR
5	5	NO READABLE ERROR
10	10	NO READABLE ERROR
15	15	NO READABLE ERROR
20	20	NO READABLE ERROR
25	25	NO READABLE ERROR
30	30	NO READABLE ERROR
35	35	NO READABLE ERROR
40	40	NO READABLE ERROR
45	45	NO READABLE ERROR
50	50	NO READABLE ERROR
55	55	NO READABLE ERROR
60	60	NO READABLE ERROR

THIS INSTRUMENT IS CERTIFIED USING STANDARDS TRACEABLE TO THE N. I. S. T..

[X] SPAN [ ] READING

WE FUTHER CERTIFY THAT OUR CALIBRATION SYSTEM COMPLIES WITH MIL. STD. 45662-A.

CERTIFIED BY _____ TECHNICIAN DATE AUGUST 17, 1999

000612

INSTALLER'S QUALIFICATIONS AND RESUMES

SUPPLIER DOCUMENT SUBMITTAL

FDF PROJECT	20102	X	CONTRACT NUMBER.: FSC-614A	SUBMITTAL NO.: 02605-4	REV.: 0	DATE: July 30, 1999	PAGE 1 OF 1
	20402						

FROM: PETRO ENVIRONMENTAL TECHNOLOGIES, INC.
7400 WILLEY ROAD, MAILSTOP 52-7; TRAILER NO. 504
HAMILTON, OHIO 45013-9402

SIGNATURE: J. Richard Schaubaum

TO: FDF ENGINEERING/CONSTRUCTION DOCUMENT CONTROL, MS 52-7

RECEIVED BY: Erika Sarrett DATE: 8/2/99

QTY	DOCUMENT NUMBER	REV	DOCUMENT FAMILY: PRO	H&S	MED	TRG	CON	ENG	QAC	RESUBMITTAL: YES	NO	TITLE/DESCRIPTION	SUBMITTAL TYPE: CFC	INF	ASSOCIATED SPECIFICATION	SUBMITTAL ACTION: A	B	C
6	614-OPTA-064A.1	0							X		X	Documentation of Training/Certification for Option A. Work	X		02605-1.04.C	X		
6	614-OPTA-064A.2	0							X		X	Documentation of Training/Certification for Option A. Work	X		02605-1.04.C	X		
6	614-OPTA-064A.3	0							X		X	Documentation of Training/Certification for Option A. Work	X		02605-1.04.C	X		

RECEIVED
AUG 19 1999
Kerisman

DISTRIBUTION

REVIEW DISTRIBUTION

Distribution	MS	Distribution	MS
Mike Godber (Approver)	64	ECDC	52-7
Bruce Schweitzer	64	Vern Taylor	52-0
Jim Jenkins	64		
Jim Burnett	38		

CFC DISTRIBUTION

Distribution	MS	Distribution	MS
Jim Jenkins	64	OSDF Station	64
Bruce Schweitzer	64	ECDC	52-7
Mike Godber	64	Vern Taylor	52-0
Jim Burnett	38		

RECEIVED BY: Michael W. Godber DATE: 8/12/99 NO COMMENTS ____ COMMENTS ATTACHED ____
(SIGN/DATE AND RETURN A COPY TO ECDC, MS 52-7)

RESUBMIT ENTIRE DOCUMENT NUMBER AS: _____ (REV. #) OR RESUBMIT CHANGED DOCUMENT PAGES AS: DOC. NO.: _____ (REV. #) PCN: _____ (PCN. #)

000614

2739

COMMENTS

ORIGINAL

SUBMITTAL ACTION CODE: (BY SUPPLIER)
CFC - CERTIFIED FOR CONSTRUCTION
INF - INFORMATION/RECORD
"X" APPROPRIATE SUBMITTAL ACTION ABOVE

SUPPLIER ACTION CODE: (ECDC) SUPPLIER ACTION ABOVE
A - ACCEPTED DOCUMENT - CONFORMS WITH REQUIREMENTS
B - MINOR COMMENTS - REVISE & RESUBMIT AS CFC OR INF
C - REVISE & RESUBMIT

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FLUOR DANIEL FERNALD

SOUTHERN WASTE UNITS (SWUs) EXCAVATION/
ON-SITE DISPOSAL FACILITY (OSDF) (PHASE II) PROJECT
Project Nos. 20102/20402; Contract No. FSC-614

SUPPLIER SUBMITTAL No.: 20102-614A-02605-4 (Rev. 0)

DOCUMENTATION OF TRAINING/
CERTIFICATION FOR OPTION A. WORK
Sections 02605-1.04.C

Document No. 614-OPTA-064A.1 (Rev. 0)
Document No. 614-OPTA-064A.2 (Rev. 0)
Document No. 614-OPTA-064A.3 (Rev. 0)

July 30, 1999

000615

Fernald Site Office: P.O. Box 249 • Ross, Ohio 45061-0249 • 513.648.3402 • Fax 648.3407
7851 Palace Drive • Cincinnati, Ohio 45249 • 513.489.6789 • Fax 489.7208
8200 Seville Road • Lodi, Ohio 44254 • 330.948.1494 • Fax 948.1933

2739

INFORMATION ONLY

DOCUMENTATION OF TRAINING/

CERTIFICATION FOR BARRY BRINKMAN

Document No. 614-OPTA-064A.1 (Rev. 0)

[X] A - Conforms to the Subcontract Requirements
[ ] B - Minor Comment - Incorporate and Resubmit
[ ] C - Revise and Resubmit
Sig: Date: 8/12/99

000616

PETRO environmental technologies

ISCO

2739

November 3, 1997

To Whom it May Concern:

This is to certify that David Brinkman, Doug Blair, Gary Strange, Mark Chasteen, Barry Brinkman, Jason Cummons, Rick Strauss and Tom Sucher employees of The Fred B. DeBra Company are qualified to operate the 24" McElroy Butt Fusion Equipment.

Sincerely,

Jim Fletcher

James J. Fletcher
Training Supervisor

JJF\tp

ISCO INDUSTRIES, Inc.
926 Baxter Avenue
Box 4545
Louisville, Ky 40204
P 502.583.6591
F 502.584.9713
HTTP://www.isco-pipe.com

POLYETHYLENE PIPE AND FITTING
HDPE FABRICATION
CULVERT LINERS
GOLF COURSE IRRIGATION SUPPLIES

ISCO

--2739

July 29, 1999

The Fred DeBra Company
4914 Ridge Ave.
Cincinnati, OH 45209

To Whom It May Concern:

This is to confirm that Barry Brinkman, Jason Cummins and Mark Chasteen with The Fred DeBra Company have been trained on the use of the Friatec Electrofusion equipment.

Sincerely,
ISCO Industries, LLC

Jim Fletcher

James J. Fletcher
Production Control

Chris Gilmore
Regional Sales Manager

JJF\rp

ISCO INDUSTRIES, LLC
926 Leader Avenue
Box 4545
Louisville, KY 40204

P 502.585.6891
F 502.584.9712
HTTP://www.isco-pipe.com

POLYETHYLENE PIPE AND FITTING

HDPE FABRICATION

CULVERT LINERS

GOLF COURSE IRRIGATION SUPPLIES

--2739

INFORMATION ONLY

DOCUMENTATION OF TRAINING/

CERTIFICATION FOR TERRY HALLORAN

Document No. 614-OPTA-064A.2 (Rev. 0)

[X] A - Conforms to the Subcontract Requirements
[ ] B - Minor Comment - Incorporate and Resubmit
[ ] C - Revise and Resubmit
Sign: Date: 8/12/98

000619

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ISCO

—2739

REDACTED

May 8, 1997

To Whom It May Concern:

This letter is to certify that Terry Halloran, Social Security # Pipefitter has been trained and is certified to operate McElroy Fusion equipment to fusion weld pipe up to 18 inches in diameter and operate a Central Electrofusion Processor to perform electrofusion coupling fusion.

ISCO Idustries, Inc.

Jimmy Kirchdorfer.
General Manager

INFORMATION ONLY

[X] A - For CFC submittals only - Conforms w/Requts.
[ ] B - Minor Comment - Resubmit as-CFC/INP/REC
[ ] C - Revise and Resubmit
[ ] D - Accepted for INP/REC - Conforms w/Requts.

SIGN-DATE J. C. Jenkins 5/15/97

ISCO INDUSTRIES, Inc.
926 Baxter Avenue
Box 4545
Louisville, KY 40204
P 502.583.4591
F 502.584.9713
HTTP //www.isco-pipe.com

POLYETHYLENE PIPE AND FITTING

HDPE FABRICATION

CULVERT LINERS

GOLF COURSE IRRIGATION SUPPLIES

VBS-TRC-007

000620

Plumbers, Pipe Fitters & Mechanical Equipment Service

Local Union No. 392 — 2739

OF THE

UNITED ASSOCIATION OF JOURNEYMEN AND APPRENTICES OF THE PLUMBING AND PIPE FITTING INDUSTRY OF THE UNITED STATES AND CANADA A.F.L.-C.I.O.

I VERIFY THAT Jerry Halbrew OF LOCAL 392 WHO IS BEING REFERRED TO A SUB CONTRACTOR AT THE FERNALD ENVIRONMENTAL MANAGEMENT PROJECT HAS BEEN CERTIFIED IN THE FUSION WELDING PROCESS FOR HDPE PIPING.

THE ABOVE NAMED INDIVIDUAL HAS ALSO BEEN CERTIFIED ON THE FEMP SITE WITH THE FOLLOWI NG SUB CONTRACTORS.

VBS.

William Koester — 513-241-1760

UNION REPRESENTATIVE (PRINT) — TELEPHONE #

William Koester — 7/29/99

UNION REPRESENTATIVE (SIGN) — DATE

1228 CENTRAL PARKWAY — CINCINNATI, OHIO 45210-2298 — PHONE: (513) 241-1760 — FAX: (513) 241-7565

--2739

INFORMATION ONLY

DOCUMENTATION OF TRAINING/

CERTIFICATION FOR JEROME VESPER

Document No. 614-OPTA-064A.2 (Rev. 0)

[ ] A - Conforms to the Subcontract Requirements
[ ] B - Minor Comment - Incorporate and Resubmit
[ ] C - Revise and Resubmit
Sig: Date: 8/12/93

000622

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LEE SUPPLY CO. INC.

• DIVERSIFIED PIPE & PUMP SYSTEMS
• INDUSTRIAL • MINING • ENVIRONMENTAL PRODUCTS

REDACTED

2739

Certificate of Training

REDACTED

PE Plastic Fusion Joining

Technician: JEROME H. VESPER JR. SS: _____

Address: PO BOX 538704

City: CINCINNATI State: OH Zip: 45253

Material Fused: Small Dia. 4" PE 3408
Large Dia. 6" PE 3408

Equipment: **McElroy Butt Fusion**

Lee Supply Co., Inc., verifies that the above has successfully completed training and qualification in Butt Fusion Procedures as outlined by the Plastic Pipe Institute and Title 49 of the Code of Federal Regulations 192.285.

Date Issued: 04-27-99 Expires: 04-27-00

WILLIAM SEZAWICH
Qualifying Technician

Shawn Lee
Shawn Lee
Manager, Fusion Services

000623

Option A Work

SUPPLIER DOCUMENT SUBMITTAL

FDF PROJECT NO.	20102 / 20402	X	CONTRACT NUMBER.: FSC-614A	SUBMITTAL NO.: 13005-2	REV.: 0	DATE: September 3, 1999	PAGE 1 OF 1

FROM: PETRO ENVIRONMENTAL TECHNOLOGIES, INC.
7400 WILLEY ROAD, MAILSTOP 52-7; TRAILER NO. 504
HAMILTON, OHIO 45013-9402

TO: FDF ENGINEERING/CONSTRUCTION DOCUMENT CONTROL, MS 52-7

SIGNATURE: J. Richard Schaubaum

RECEIVED BY: Melissa Cruus DATE: 9.3.99

QTY	DOCUMENT NUMBER	REV	DOCUMENT FAMILY: PRO	H&S	MED	TRG	CON	ENG	QAC	RESUBMITTAL: YES	NO	TITLE/DESCRIPTION	SUBMITTAL TYPE: CFC	INF	ASSOCIATED SPECIFICATION	SUBMITTAL ACTION: A	B	C
7	614-OPTA-043A.4	0					X				X	Fabricator's Welder's Qualifications and Assoc. Repair Procedures for Option A. Work.	X		13005-1.04.A.1.d	X		

RECEIVED SEP 09 1999 Erusman

DISTRIBUTION

REVIEW DISTRIBUTION

Distribution	MS	Distribution	MS
Lou Wehlitz (Approver)	64	Jim Burnett	38
Bruce Schweitzer	64	ECDC	52-7
Jim Jenkins	64	Vern Taylor	52-0
Bill Zebiek	64		

CFC DISTRIBUTION

Distribution	MS	Distribution	MS
Jim Jenkins	64	Jim Burnett	38
Bruce Schweitzer	64	OSDF Station	64
Mike Godber	64	ECDC	52-7
Vern Taylor	52-0		

RECEIVED BY: [signature] DATE: 9/10/99 NO COMMENTS ____ COMMENTS ATTACHED X

(SIGN/DATE AND RETURN A COPY TO ECDC, MS 52-7)

RESUBMIT ENTIRE DOCUMENT NUMBER AS: _____ (REV. #) OR RESUBMIT CHANGED DOCUMENT PAGES AS: DOC. NO.: _____ (REV. #) PCN: _____ (PCN. #)

000624

2739

COMMENTS

Submitted for repair work to be completed on one of the liner penetration boxes.

ORIGINAL

SUBMITTAL ACTION CODE: (BY SUPPLIER)

CFC - CERTIFIED FOR CONSTRUCTION

INF - INFORMATION/RECORD

"X" APPROPRIATE SUBMITTAL ACTION ABOVE

EFFORTED

SUPPLIER ACTION CODE: (ECDC) SUPPLIER ACTION ABOVE

A - ACCEPTED DOCUMENT - CONFORMS WITH REQUIREMENTS

B - MINOR COMMENTS - REVISE & RESUBMIT AS CFC OR INF

C - REVISE & RESUBMIT

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FLUOR DANIEL FERNALD

SOUTHERN WASTE UNITS (SWUs) EXCAVATION/
ON-SITE DISPOSAL FACILITY (OSDF) (PHASE II) PROJECT
Project Nos. 20102/20402; Contract No. FSC-614

SUPPLIER SUBMITTAL No.: 20102-614A-13005-2 (Rev. 0)

FABRICATOR'S WELDER'S QUALIFICATIONS AND REPAIR PROCEDURES FOR OPTION A. WORK

Sections 13005-1.04.A.1.d

Document No. 614-OPTA-043A.4 (Rev. 0)

September 3, 1999

Fernald Site Office: P.O. Box 249 • Ross, Ohio 45061-0249 • 513.648.3402 • Fax 648.3407
7851 Palace Drive • Cincinnati, Ohio 45249 • 513.489.6789 • Fax 489.7208
8200 Seville Road • Lodi, Ohio 44254 • 330.948.1494 • Fax 948.1933

62 OF 164
--2739

Ameron

Concrete & Steel Pipe Group
Gravity Pipe Products
Protective Lining Products

April 25, 1995

TOO OLD!!
KBT
9-12-99

990622

ORIGINAL

Mark Kirves
Plastek Werks, Inc.
2401 Franklin Blvd.
Gainesville, GA 30504

Dear Mr. Kirves:

This is to certify that the weld samples submitted on March 16, 1995, by the following welder(s) have been inspected, tested and approved. This certification applies only to material supplied by Ameron Protective Linings Division.

The samples were tested in the Quality Control Laboratory of Ameron Protective Linings Division, Brea, California. Test results are as follows:

Welder	Average Tensile Strength of Sample
Mark Kirves	2190 PSI
Jerry Florence	2235 PSI

Best regards,

J. A. Pico, Jr.

J. A. Pico, Jr.
Field Representative

JAP/mbg

STATE OF CALIFORNIA, COUNTY OF ORANGE
Witnessed on 25 day of April, 1995.

Mary Beth Gring

BEKAPLAST® APPLICATOR

FIELD WELDING CERTIFICATE

AWARDED TO
JERRY FLORENCE
Plastek Werks

For successfully meeting welding requirements

for

HDPE (Hand & Extr.--Vert. & Horiz.)
PPC (Hand--Horiz., Extr.--Vert. & Horiz.), PVC (Hand--Horiz.)

This *31st* day of *October* 19 *95*

000627

J.K. KBT

Expires May 1, 1996

atlas
Atlas Minerals & Chemicals, Inc.

990622

Plastek Werks, Inc.

2739

770-287-3284

G10F169

Apr 05 99 04:14p Plastek Werks, Inc. 770-287-3284

990622

-2739

60 OF 164

ORIGINAL

BFGoodrich
TempRite® Engineered Thermoplastics Division

CORZAN™
INDUSTRIAL SYSTEMS

Corzan Industrial Systems

Certificate of Fabrication

Be it known that

Jerry Florence
Plastek Werks

has successfully completed the requirements in welding fabrication to be qualified as a

Corzan Hot-Air Welder

J. Matthew Urbanek
Corzan Representative

1/22/96
Date

SK-KB7

000628

--2739

OK
KBT
9/6/99

REPAIR PROCEDURE
LINER PENETRATION BOX
BLACK HMW-HDPE PIPE GRADE
1" THICK SHEET MATERIAL

1. Inspect all seam areas for cracks and voids.

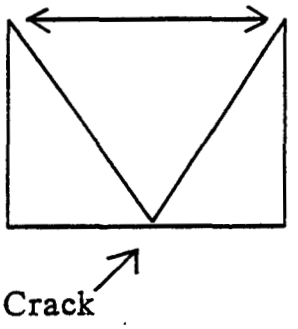
2. Identify areas to be repaired.

3. Any cracks that extend into an area of solid flat sheet must be drilled at the end of the crack as so that the crack cannot continue through the sheet.

4. Grind out existing welds in crack area and grind all crack areas to a V bevel.

5. Clean area to be welded. There must be no foreign material including dirt, dust, grease, oil, water. You may clean with acetone or MEK.

Approximately 1 1/4" wide x 1" deep



6. Scrape area with scraper to remove any oxidation.

7. Set up extrusion welding gun. Set air temperature at 250° C. Set material temperature at 240° C. Check air and material temperature at the end of the Teflon die. Adjust to the above temperatures at the of the die. Purge extrusion welder of existing material right before welding. Purge extrusion welder for approximately 20 to 60 seconds to remove oxidized and over heated material from the barrel.

8. Use a thin width die on extrusion welder for 1st pass. Allow to cool.

REPAIR PROCEDURE

9. Inspect weld for cracks or air voids, if any. Grind out and scrape area again.

10. Use a medium width die on extrusion welder for 2nd pass. Allow to cool. See step #9.

11. Use a wide width die on extrusion welder for a 3rd and 4th pass, if needed. Refer to step #9 in between weld passes. Always allow welds to cool in between weld passes and always scrape area to be welded.

12. Visually inspect all weld areas for cracks, air voids, poor adhesion, stress marks, or improperly filled joint seams.

SUPPLIER DOCUMENT SUBMITTAL

FDF PROJECT NO.	20102	X	CONTRACT NUMBER.: FSC-614A	SUBMITTAL NO.: 02770-1	REV.: 2	DATE: August 26, 1999	PAGE 1 OF 1
	20402						

FROM: PETRO ENVIRONMENTAL TECHNOLOGIES, INC.
7400 WILLEY ROAD, MAILSTOP 52-7; TRAILER NO. 504
HAMILTON, OHIO 45013-9402

SIGNATURE: J. Richard Schaubaum

TO: FDF ENGINEERING/CONSTRUCTION DOCUMENT CONTROL, MS 52-7

RECEIVED BY: Erika Jarrett DATE: 8/26/99

			DOCUMENT FAMILY							RESUBMITTAL			SUBMITTAL TYPE			SUBMITTAL ACTION		
QTY	DOCUMENT NUMBER	REV	PRO	H&S	MED	TRG	CON	ENG	QAC	YES	NO	TITLE/DESCRIPTION	CFC	INF	ASSOCIATED SPECIFICATION	A	B	C
5	614-OPTA-068A.3	1						X		X		Installation Capabilities - Q.C. Procedures		X	02770-1.04.B.3.c	X		
5	614-OPTA-068B.1	1						X		X		Resume of Superintendent		X	02770-1.04.B.5	X		
5	614-OPTA-068B.2	1						X			X	Resume of Quality Control Chief		X	02770-1.04.B.5	X		
5	614-OPTA-068B.3	1						X			X	Resume of Master Seamer		X	02770-1.04.B.5	X		
5	614-OPTA-068C	1						X		X		Cold/Hot Weather Seaming Procedures	X		02770-1.04.B.8	X		

RECEIVED
SEP 09 1999
R Schuman

DISTRIBUTION

REVIEW DISTRIBUTION

Distribution	MS	Distribution	MS
Tony Klimek (Approver)	64	Vern Taylor	52-0
Bruce Schweitzer	64		
Jim Burnett	38		
ECDC	52-7		

CFC DISTRIBUTION

Distribution	MS	Distribution	MS
Tony Klimek	64	OSDF Station	64
Bruce Schweitzer	64	ECDC	52-7
Mike Godber	64	Vern Taylor	52-0
Jim Burnett	38		

0006631

RECEIVED BY: [signature] DATE: 9/10/99 NO COMMENTS ___ COMMENTS ATTACHED X
(SIGN/DATE AND RETURN A COPY TO ECDC, MS 52-7)

RESUBMIT ENTIRE DOCUMENT NUMBER AS: _____ (REV. #) OR RESUBMIT CHANGED DOCUMENT PAGES AS: DOC. NO.: _____ (REV. #) PCN: _____ (PCN. #)

2739

COMMENTS

ORIGINAL

SUBMITTAL ACTION CODE: (BY SUPPLIER)
CFC - CERTIFIED FOR CONSTRUCTION
INF - INFORMATION/RECORD
"X" APPROPRIATE SUBMITTAL ACTION ABOVE

SUPPLIER ACTION CODE: (ECDC) SUPPLIER ACTION ABOVE
A - ACCEPTED DOCUMENT - CONFORMS WITH REQUIREMENTS
B - MINOR COMMENTS - REVISE & RESUBMIT AS CFC OR INF
C - REVISE & RESUBMIT

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technologies

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FLUOR DANIEL FERNALD

SOUTHERN WASTE UNITS (SWUs) EXCAVATION/
ON-SITE DISPOSAL FACILITY (OSDF) (PHASE II) PROJECT
Project Nos. 20102/20402; Contract No. FSC-614

SUPPLIER SUBMITTAL No.: 20102-614A-02770-1 (Rev. 2)

INSTALLATION CAPABILITIES – Q.C. PROCEDURES, RESUMES OF SUPERINTDENDENT, Q.C. CHIEF, & MASTER SEAMER, & COLD/HOT WEATHER SEAMING PROCEDURES FOR OPTION A. WORK

Sections 02770-1.04.B.3, -.B.5, & -.B.8

Document No. 614-OPTA-068A.3 (Rev. 1)
Document No. 614-OPTA-068B.1 (Rev. 1)
Document No. 614-OPTA-068B.2 (Rev. 1)
Document No. 614-OPTA-068B.3 (Rev. 1)
Document No. 614-OPTA-068C (Rev. 1)

August 24, 1999

Fernald Site Office: P.O. Box 249 • Ross, Ohio 45061-0249 • 513.648.3402 • Fax 648.3407
7851 Palace Drive • Cincinnati, Ohio 45249 • 513.489.6789 • Fax 489.7208
8200 Seville Road • Lodi, Ohio 44254 • 330.948.1494 • Fax 948.1933

INSTALLATION CAPABILITIES –
QUALITY CONTROL PROCEDURES

Document No. 614-OPTA-068A.3 (Rev. 1)
Section 02770-1.04.B.3.c

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The Istre Company

Quality Control Manual

NOTE:

The attached Quality Control Manual is superseded by existing Project Contract technical specifications, existing Project-related Quality Control documents, and any manufacturer's specific product-related requirements.

QC
KBT
9-10-99

13811 S. Poplar Pl.
Glenpool, OK 74033
Tele. & Fax (918) 291-2318

QUALITY CONTROL MANUAL

1.0 INTRODUCTION

1.1 This manual defines the Quality Control Program developed and utilized by The Istre Company (T.I.C.) to ensure the quality of workmanship and the installation integrity of geomembranes and other geosynthetic products.

1.2 T.I.C. has recognized that careful and specific documentation of installation quality is required to substantiate this Quality Control Program.

2.0 GEOMEMBRANE INSTALLATION

2.1 Subgrades

2.1.1 The General and/or Earthworks Contractor shall be responsible for preparing and maintaining the subgrade in a condition suitable for installation of the geomembrane unless specifically agreed otherwise.

2.1.2 If requested, T.I.C. will provide their client with written acceptance of the subgrade surfaces. Two possible formats are offered: (a) daily certification of the area covered defined by panel numbers and/or construction stations, (b) certification at the end of liner deployment accepting all areas lined. Subsurface acceptance by T.I.C. will only certify that the surfaces lined were visually inspected and appeared to be suitable for geomembrane deployment.

2.2 Geomembrane Deployment

2.2.1 Prior to commencement of geomembrane deployment, layout drawings shall be produced to indicate the intended panel configuration and seam location and direction. At the direction of the client, these drawings will be formally submitted for pre-approval prior to the start of work.

2.2.2 Each panel shall be assigned a numeric identifier at the time of deployment. The panel identification shall be related to the manufacturer's production roll number. Panel identification will also be shown on As-Built drawings provided upon completion of the project. At the request or direction of the client, these drawings will be formally submitted for approval.

2.2.3 If geomembrane panels are installed in a different arrangement than that shown on the layout drawings, the difference will be reflected in the As-Built drawings.

2.2.4 The methods and equipment used to deploy the geomembrane panel shall not damage the geomembrane or the subgrade.

2.2.5 No personnel working on the geomembrane shall smoke, wear shoes that can damage the geomembrane, or engage in actions that could result in damage to the geomembrane.

2.2.6 Adequate temporary ballast (sand bags) which will not damage the geomembrane shall be used to prevent uplift or movement by wind.

2.2.7 All damage to geomembrane will be repaired in accordance with the following applicable sections. Any areas of the geomembrane significantly damaged will be marked, cut out, and removed from the work area, with resulting repairs performed in accordance with the paragraphs below.

2.2.8 In general, seams shall be oriented parallel to the slope (i.e. - oriented along not across the slope). Whenever possible, horizontal seams should be located not less than 10 feet from the toe of all slopes. Each field seam shall be numbered in a manner that will be recorded on the As-Built drawings and appropriate quality control documents.

2.2.9 All personnel performing seaming operation shall be trained in the operation of the specific seaming equipment being used and will qualify by performing a test weld as described in the following paragraphs. The Project Master Seamer will provide direct supervision over all seaming personnel to verify that proper welding procedures are being followed.

2.2.10 Sufficient slack shall be installed in the geomembrane to compensate for contraction of the material during the low temperature portion of the service life.

In most applications, slack will be installed based on the discretion of the T.I.C. Superintendent. In cases where fixed points exist in the membrane system (i.e. - between structures and attachments), the following equation shall be used to calculate the minimum amount of slack required between these fixed points:

$$S = C \times (T - T_1) \times D$$

Where:

S: the minimum amount of slack required between the fixed points.
C: the coefficient of linear thermal expansion (or contraction) for the geomembrane material.
T: the surface temperature of the geomembrane when the slack is measured.
T_1: the lowest temperature anticipated during the service life of the geomembrane.
D: is the distance between the fixed points under consideration.

2.3 Welding

2.3.1 *Fusion Welding* - Fusion welding consists of placing a heated wedge, mounted on a self-propelled vehicular unit, between two overlapped sheets such that the surface of each sheet is heated above the polyethylene melting point. Immediately after being heated, the overlap region is passed between pressure wheels that compress the molten areas together so that a continuous homogeneous weld is formed. The wedge welder is equipped with a temperature readout that continually monitors the temperature of the wedge.

The wedge welder also has adjustable controls that allow the temperature, pressure and speed to be adjusted to meet specific site conditions.

2.3.2 *Extrusion Welding* - Extrusion fillet welding consists of introducing a bead of molten polyethylene along the edge of the seam overlap. The molten polyethylene bonds to each sheet resulting n a homogeneous bond between the bead and the surfaces of the sheets to be welded. The extrusion welder has temperature readouts which continually monitor the temperature of the extrudate. The extrusion welder also has controls that allow the temperature of the extrudate and the pre-heat air to be adjusted to meet specific site conditions.

2.3.3 T.I.C. relies on the experience of the Project Superintendent and results of test seams to determine seaming restrictions caused by weather. Many factors such as ambient temperature, humidity, wind, sunlight, etc. can affect the integrity of field seams and must be considered when deciding whether or not seaming should proceed. Test seams as described below are required prior to start of daily production seaming to determine whether or not weather conditions will affect T.I.C.'s ability to produce quality seams. Additional non-destructive and destructive testing of production seams substantiate the decision made by the Project Superintendent to continue seaming on any given day.

2.4 Seam Preparation

2.4.1 Seam Preparation for Fusion Welding;

(a) Overlap geomembrane panels approximately 6 inches
(b) Clean seam area thoroughly. Seam area must be free of moisture, dust, sand, or any debris. No grinding is required for fusion welding.
(c) Adjust the panels to minimize any differential wrinkles.

2.4.2 Seam Preparation for Extrusion Welding

(a) Overlap panels a minimum of 6 inches.
(b) Temporarily bond the panels with heat leister. Exercise caution not to damage the adjacent areas.
(c) Clean seam area prior to seaming to assure the area is free from moisture, dust, sand or debris of any kind.
(d) Grind the seam area which will be covered by the extrudate bead. Care should be taken not to grind areas that will remain exposed. Grinding disks should be clean and relatively fresh.
(d) Welding rod shall be kept clean and dry at all times.

2.4.3 General Seaming Procedures

(a) Seaming shall extend as far into the anchor trenches as is feasible when the seam is welded. In any case, seams must extend at least three feet into the anchor trench, or as otherwise specified by the client.

(b) Overlap and seam cleanliness shall be monitored continuously during fusion welding by the Master Seamer and/or Superintendent.

(c) Operating temperature and speed settings shall be monitored during all seaming by the Master Seamer and/or Superintendent.

(d) All cross-seam wrinkles (compensation) shall be aligned to facilitate welding through the wrinkles.

(e) Fishmouths or cross-seam wrinkles that cannot be welded through shall be cut along the ridge to achieve a flat overlap. The cut shall be seamed. Any portion of the cut which has insufficient overlap for extrusion welding shall be covered with a round or oval patch.

2.5 Seam Testing

2.5.1 Trial or test seams shall be performed prior to the start of seaming each day and at least once every five hours of seaming for each seamer and seaming apparatus in use. Test seams shall be made utilizing the scraps of geomembrane in use and shall be seamed under the same conditions as the production seams.

Test seams shall be at least 5 feet in length and should be made from two pieces of geomembrane approximately 12 inches in width.

2.5.2 Testing

(a) Visually inspect the seam for squeeze-out, deformation and general appearance.

(b) Four specimens, each 1 inch wide, shall be cut from the trial seam sample. Test two of the specimens in the shear mode and two in the peel mode using a field tensiometer. If any of the samples exhibit more than 10% peel separation in the weld, the test will be rejected and a new test weld will be performed. If none of the tests indicate peel mode failure, the average peel strengths will be recorded. The specimen tested in the shear mode may only fail outside of the weld.

(c) If the second test weld also fails, the seaming apparatus shall not be used until the deficiencies are corrected and a passing test weld is achieved.

(d) After successful completion of the test weld, the remaining portions of the test weld can be discarded. Documentation will be maintained recording the following: date, technician, machine, ambient temperature, machine settings (temperature and speed), and the test results (see attached TIC Form 1).

3.0 *NON-DESTRUCTIVE SEAM TESTING*

3.1 Concept

T.I.C. will non-destructively test all field seams over their full length using air pressure testing, vacuum testing or other approved methods to verify the continuity and integrity of the seams.

3.2 Air Pressure Testing

Most fusion-welded seams are composed of two distinct welded tracks separated by an un-welded channel (the air channel). Air pressure testing involves pressurizing the air channel and monitoring its ability to hold the air pressure for a period of five minutes.

3.2.1 Procedure for Air Testing

(a) Seal both ends of the air channel in the seam to be tested.

(b) Insert needle or other approved pressure feed device into the sealed air channel.

(c) Pressurize the air channel to above the minimum pressure specified below. Record the initial pressure after a two-minute relaxation period and monitor the pressure for a period of five minutes. Pressure shall remain within the limits specified below, otherwise the faulty area must be located and repaired as described in Section 3.2.2.

Material Thickness Mm (mil)	Minimum Initial Pressure KPa (psi)	Max Permissible Pressure Differential kPa (psi)
1.0 (40)	172 (25)	28 (4)
1.5 (60)	186 (27)	21 (3)
2.0 (80)	207 (30)	21 (3)
2.5 (100)	207 (30)	21 (3)

(d) Release pressure by puncturing the air channel on the end opposite the pressure feed device. Remove needle or pressure feed device and repair any resultant holes.

(e) Record final results on TIC Form 2 (see attached).

3.2.2 Procedure for Non-Complying Air Tests

In the event of a non-complying air pressure test, the following procedure shall be followed until acceptable test results can be obtained:

(a) Verify the integrity of the seals at each end of the air channel, the penetration of the pressure feed and all of the attached equipment.

(b) Carefully visually inspect the seam looking for any possible leak locations. If a flaw is located in the air channel, the seam will be cut at that location and two separate air tests will be recorded on either side of the flaw location. Any necessary repairs will be performed as outlined in Section 3.2.2.c.

(c) If it is impossible to achieve successful air test results over any reasonable length (the maximum length of two liner panels) of seams the T.I.C. Superintendent will choose from the following alternatives:

Alternative 1.

The entire defective seam shall be removed and a 3 foot strip of geomembrane shall be installed with two new fusion welds. The new welds will then be pressure-tested as previously described in Section 3.2.1.

Alternative 2.

A 3 foot cap strip shall be extrusion-welded over the length of the seam. The resulting weld shall be vacuum-tested as described in Section 3.3.

3.3 Vacuum Testing

3.3.1 Equipment

The equipment used for vacuum testing consists of a vacuum box and a vacuum pump. A vacuum box is essentially a rigid housing with a transparent inspection window. The lower portion of the vacuum box is equipped with a thick, soft neoprene sponge. The vacuum box is also equipped with a vacuum guage and a release valve assembly.

3.3.2 Procedure

The vacuum box is placed over the area to be tested and sufficient downward pressure is applied to "seat" the neoprene sponge against the liner.

The vacuum pump is engaged to cause a vacuum in the interior of the vacuum box to approximately 5 psi, ensuring that the vacuum box is "seated" well enough that leakage around the neoprene seal is minimal.

For a period of not less than thirty (30) seconds the seam is observed through the inspection window. A non-complying test is indicated by soap bubbles caused by air flowing from under the seam into the vacuum. If no soap bubbles are observed during the thirty (30) second inspection period, the vacuum is released and the vacuum box is moved to the next test location. When seams longer than the vacuum box are tested, test locations shall be overlapped 4 inches to ensure that 100% of the seam is tested.

3.3.3 Procedure for Non-Complying Tests

All areas where flaws are indicated by vacuum testing shall be marked and repaired as described in Section 3.2.2. All repairs shall be vacuum tested in accordance with Section 3.3.

4.0 *DESTRUCTIVE TESTING*

4.1 Concept

Destructive testing is utilized to evaluate seam strength and quality. Since destructive testing involves physically removing samples from the geomembrane and subsequent repairs, its use should be minimized. The location of destructive samples will be identified in the field by the third-party independent quality assurance consultant.

4.2 Frequency

Destructive test samples shall be marked and removed randomly with an average frequency of one sample per 500 feet of seaming (1 sample for every 250 feet during cold weather seaming conditions).

Extra destructive samples should be taken in potential problem areas i.e. areas of contamination, offset welds or visible defects. It is the responsibility of the T.I.C. Superintendent and the quality control technicians to ensure that all problem areas are located by either destructive or non-destructive testing.

FORM 1

TEST SEAM RECORDS

INTENDENT _____ PROJECT _____

DATE	TRIAL NO.	TIME	AMBIENT TEMP.	MACHINE NO.	MACHINE TEMP	PRE-HEAT TEMP	TECHNICIAN	SHEAR STRENGTH	PEEL STRENGTH	Q.C. TECH-NICIAN	PASS/ FAIL	COMMENTS

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FORM 2

SEAM TESTING

PERINTENDENT ______________________ PROJECT ______________________

SEAM NO.	SEAM DATE	TEST DATE AND TIME	AMBI-ENT TEMP	MACHINE NO.	TECH-NICIAN	AIR PRESSURE MAX	AIR PRESSURE AFTER 5 MIN.	PASS/FAIL	LEAK LOCATION	COMMENTS	Q.C. TECH-NICIAN	REPAIR DATE	MACHINE NO.	ECH-CIAN	TEST OR REPAIR DATE
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FORM 3

DESTRUCTIVE TESTING

UPERINTENDENT _____ PROJECT _____

DATE	MACHINE NO.	TECHNICIAN	SEAM NO.	SAMPLE NO.	FIELD PEEL	FIELD SHEAR	LAB PEEL	LAB SHEAR	LOCATION	COMMENTS	Q.C. TECH-NICIAN

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FORM 4

REPAIR REPORT

'PERINTENDENT _____

PROJECT _____

SEAM NO.	PANEL NO.	REPAIR DATE	MACHINE NO.	TECHNICIAN	AMBIENT TEMP	PATCH NO.	LOCATION OF REPAIRS	REPAIR VACUUM TEST DATE	VACUUM TECH-NICIAN

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Who is the Superintendent?
Jerry Istre?

The Istre Company

2739 KBT 9-12-99

Company's Resume (Subcontract Work):

Terrafix: 425 Attwell Dr., Rexdale, Ontario, Canada M9W5C4
Contact: John Mooney
Phone: (416) 674-1159
Equipment: Columbine dual-wedge fusion welder
Jerry Istre's Responsibility: Owner/Superintendent

- City of Warren, Maine – GSE 60-mil, 200,00 s.f.; Landfill Cap; March, 1996
- E.B. Eddy Paper Mill – Espenola, Ontario, Canada – GSE 80-mil, 400,000 s.f.; Acid Ponds; June, 1996
- City of Rangley, Maine – GSE 60-mil, 250,000 s.f.; Sewage Lagoons; July, 1996
- City of Yarmouth, Maine – GSE 40-mil, 500,000 s.f.; Landfill Cap; August, 1996
- City of Brunswick, Maine – GSE 40-mil, 275,000 s.f.; Landfill Cap; September, 1996

Comanco: Tampa, Florida
Contact: Mark Topp
Phone: Unknown
Equipment: Columbine dual-wedge fusion welder
Jerry Istre's Responsibility: Owner/Superintendent

- IMC – Bartow, Florida – GSE 40-mil, 1,500,000 s.f.; Mine Cap; June 1997

Additional Istre Co. Work:

Fernald (OSDF): Subcontracted with Environmental Design & Construction, Inc. (EDCI)
Contact: Diane Harris
Phone: (256) 551-0372
Equipment: Columbine dual-wedge fusion welder
Jerry Istre's Responsibility: Master Seamer

- Fernald OSDF Cell 1 – Ross, Ohio – National Seal 80-mil, 400,000 s.f.; Oct./Dec., 1997

Subcontracted with Petro Environmental Technologies, Inc.
Contact: J. Richard Schairbaum
Phone: (513) 648-3406
Equipment: Columbine dual-wedge fusion welder (as needed)
Jerry Istre's Responsibility: Quality Control Inspector

- Fernald OSDF Cell 2 – Ross, Ohio – GSE 80-mil, 750,000 s.f.; Aug./Oct., 1998

Jerry Istre's Personal Resume

Project Name & Location	*Material*	*Square Footage*	*Superintendent (S)/ Master Seamer (MS)*
City of Dayton–Dayton, WY	12-mil	50,000	S / MS
BFI–Atlantic City, NJ	40-mil	1,000,000	S
Ft. Howard Paper-Savannah, GA.	40 & 60-mil	3,000,000	S
Kaiser Aluminum- New Orleans, LA.	40 Mil	1,000,000	S
Inspiration Copper- Claypool, AZ.	40 & 80 Mil	100,000	S / MS
Hycroft Mine-Winnamucca, NY	40 Mil	1,000,000	S
Perry Eng.-Leesburg, VA	30 Mil	1,000,000	S / MS
US Corps. Of Eng.-Fayetteville, NC	12 Mil	150,000	S
Summitville Min-Summitville, CO	60 Mil	1,000,000	S
Gilt Edge Brohm Mining-Deadwood, SD	60 Mil	1,370,000	S
Rollins Envir. Service-Baton Rouge, LA	80 Mil	1,000,000	S / MS
Wolverine Tube-Decator, AI	40 Mil	100,000	S / MS
American Cyanamid-Laplace, LA	20 Mil	290,000	S / MS
Builders Transport-Dallas, TX	XR-5	10,000	S / MS
Manada Constr.-Newburg, PA	40 Mil	211,000	S / MS
Cheveron-St. James, LA	100 Mil	40,000	S
Ethal Corp.-Baton Rouge, LA	30 Mil	500,000	S
Manada Const-Harrisburg, PA	60 Mil	3,000,000	S
Suntimes-Aurora, IL	20 Mil	200,000	S / MS
Peters Construction-Granite City, IL	60 Mil	1,200,000	S
Viet Construction-Grove, MN	40 Mil	250,000	S / MS
IL State-West Chicago, IL	30 Mil	70,000	S / MS
Wayne Disposal–Belleville, MI	80 Mil	550,000	S
N.B. Power–Milbank, New Brunswick	60 Mil	500,000	S
Sydney Steel–Sydney, Nova Scotia	60 Mil	50,000	S
Bruin Lagoon–Bruin, PA	60 Mil	200,000	S
USA Steel-Pueblo, CO	30 Mil	1,300,000	S
Hudson Electric–Newburgh, NY	60 Mil	1,300,000	S
BFI-New Orleans, LA	SDR-11	12 Miles	S
Muni. of Coboconk-Coboconk, Ontario	60 Mil	800,000	S
Muni. of Tamagami–Tamagami, Ontario	60 Mil	250,000	S / MS
Novia Scotia Power–North Sydney	60 Mil	1,300,000	S
Muni. of Glecien-Glecien, Alberta	60 Mil	500,000	S
Muni. of Tamagami-Tamagami, Ontario	80 Mil	250,000	S / MS
Uniroyal-Elmira, Ontario	60 Mil	170,000	S
Gyr Construction–Clyde River, NWT	60 Mil	70,000	S / MS
FBD–Coral Harbour, NWT	60 Mil	70,000	S / MS
Muni. of Ottawa, Ontario	30 Mil	3,000,000	S

Jerry Istre's Personal Resume

Project Name & Location	*Material*	*Square Footage*	*Superintendent (S)/ Master Seamer (MS)*
Gyr Construction Igloolic, NWT	60 Mil	80,000	S / MS
Casseilo Construction–Bethlaham, NH	60 Mil	400,000	S
Terrafix–Lacdubonnie, Manitoba	60 Mil	400,000	S
Nortruck Construction-Arviet, NWT	60 Mil	70,000	S / MS
Hovat Construction-Coral Harbour, NWT	60 Mil	50,000	S / MS
E.B. Eddy-Espenola, ONT	80 Mil	500,000	S
Muni-Rangely, ME	60 Mil	300,000	S
Muni.-Yarmouth, MA	40 Mil	500,000	S
C.F. Industries-Bartow, FL	40 Mil	1,600,000	S
Cargil-Bartow, FL	80 Mil	50,000	S
C.F. Industries-Plant City, FL	60 Mil	20,000	S
Labbe & Sons-Brunswick, ME	40 Mil	375,000	S
City of Warren, ME	40 Mil	150,000	S
Petro Environmental	80 Mil	400,000	S

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RESUME OF QUALITY CONTROL CHIEF –

RON J. SCOTT

Document No. 614-OPTA-068B.2 (Rev. 0)
Section 02770-1.04.B.5

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The Istre Company

Name: Ron Scott

Title: ~~Master Seamer~~ Quality Control Chief

Resume:

1. **Fernald – Ross, OH:**
   Cell No. 2 – September, 1998; 80-mil textured geomembrane - 700,000 s.f.

2. **WMI Growe Landfill – Morrisville, PA:**
   June, 1991; 60-mil textured geomembrane liner - 1,000,000 s.f.

3. **WMI Pasco County Landfill – Dade City, FL:**
   March, 1998; 60-mil geomembrane - 400,000 s.f.

4. **WMI Turnkey Landfill – East St. Louis, IL:**
   August, 1986; 60-mil geomembrane – 2,702,000 s.f.

Mr. Ron Scott will be the Q.C. Chief for this project. Mr. Scott has 14 years of field installation and Quality Control experience with HDPE lining systems.

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RESUME OF MASTER SEAMER –

LOUIS LUNA

Document No. 614-OPTA-068B.3 (Rev. 0)
Section 02770-1.04.B.5

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REDACTED

Name: Louis Luke Luna

S. S. No.:

OK.

GEOSYNTHETIC INSTALLATION EXPERIENCE

1996	Temporary Cover Nashua (NY) L.K. Ladd	RAVEN 0.5 mm / 20 mil 73391 sm / 790000 sf
1996	MSW Landfill Cap North Adams (MA) ABScope Environmental	HDPE 1.5 mm / 60 mil 4,599 sm / 49,500 sf
1996	MSW Landfill Cap Seekonk (MA) Littleton Environmental	HDPE 1.0 mm / 40 mil 28613 sm / 308800 sf
1996	MSW Landfill Cap Pepperell (MA) Littleton Environmental	HDPE 1.0 mm/40 mil 38182 sm / 411000 sf
1996	Industrial Landfill Cap Auburn (NY) Kilby Brothers, Inc.	LLDPE 1.5 mm / 60 mil 28,836 sm / 310,400 sf
1997	MSW Landfill Closure Amenia (NY) Roy T. Budnick	LLDPE 1,0 mm/40 mil 59,921 sm / 644,684 sf
1997	Landfill Closure Millis (MA) Littleton Environmental	HDPE 1.0 mm/40 mil 44,592 sm / 480,000 sf
1997	C & D Landfill Closure Nashua (NH) IEM SEALAND	HDPE 1.0 mm / 40 mil 5,760 sm / 62,000 sf
1997	Hazardous Landfill Closure Hatfield (MA) Mackin Construction	HDPE 1.0 mm / 40 mil 20,905 sm / 224,915 sf

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1998	Industrial Landfill Closure Rochester (NY) SLC Constructors	LLDPE 1.0 mm / 40 mil 224,028 sm / 735,000 sf
1998	MSW Landfill Cell Watertown (WI) USA Waste	HDPE 1.5 mm / 60 mil 54,939 sm / 180,246 sf
1998	MSW Landfill Closure Bethlehem (PA) J.D. Morrisey	LLDPE 1.0 mm / 40 mil 96,926 sm / 318,000 sf
1998	MSW Landfill Closure Bennington (VT) Sevenson Environmental	LLDPE 1.0 mm / 40 mil 268,455 sm / 880,760 sf
1998	MSW Landfill Closure New Haven (CT) R. Bates & Sons	HDPE 1.0 mm / 40 mil 579,120 sm / 1,900,000 sf
1998	Hazardous Waste Landfill Cell Fernald (OH) Petro Environmental	HDPE 2.0 mm / 80 mil 59,363 sm / 639,000 sf
1999	MSW Landfill Closure Coatesville (PA) Earth Tech	LLDPE 1.0 mm / 40 mil 392,158 sm / 1,286,606 sf
1999	MSW Landfill Closure Limestone (ME) Bechtel Environmental	LLDPE 1.5 mm / 60 mil 405,031 sm / 1,328,842

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COLD/HOT WEATHER SEAMING PROCEDURES

Document No. 614-OPTA-068C (Rev. 1)
Section 02770-1.04.B.8

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Cold/Hot Weather Seaming Procedures

The following procedures should be used as a supplement to (not replace) the procedures outlined in the project specifications whenever liner welding occurs in ambient temperatures below 40° F or above 104° F.

1. Ambient temperatures should be measured 0 to 6-inches above the surface of the liner and readings logged every hour.

2. Trial welds, for both fusion and extrusion welds, should be run on strips 15-ft. long. Coupons will be taken every 2-ft. for a total of 6 specimens (4 peels and 2 shears).

3. Trial welds will be run under conditions as closely resembling field conditions as possible. For example, the material will be exposed to the same elements as will be encountered during seaming. Run trial welds on the same subgrade conditions. Do not pre-heat trial welds unless you intend on pre-heating during field welding.

4. All available information will be logged for both trial welds and field seaming. This information will include, but not be limited to, the following: Machine temperatures and pyrometer temperatures, speed setting and measured speed, ambient and liner temperature, and peel and sheer values calibrated to pounds per inch (PPI).

5. Additional trial welds will be performed whenever the ambient temperature changes by more than 10° F since the last trial weld.

6. Coupons will be cut and peel tested from the end of every seam.

7. If experiencing weld failure due to lack of heat, slow the machine speed down and retest the machine. Continue to lower speed until passing tests are received.

8. Special care should be taken to prevent any precipitation from entering the weld area.

9. Deployment and seaming operations will be terminated during periods of precipitation and high winds.

10. In the event the ambient temperature should rise to 104° F or greater, all seaming activities will be suspended.

OK.

LOST/9-4-9

SUPPLIER DOCUMENT SUBMITTAL

FDF PROJECT NOs.:	20102 X / 20402	CONTRACT NUMBER.: FSC-614A	SUBMITTAL NO.: 02770-1	REV.: 1	DATE: August 6, 1999	PAGE 1 OF 1

FROM: PETRO ENVIRONMENTAL TECHNOLOGIES, INC.
7400 WILLEY ROAD, MAILSTOP 52-7; TRAILER NO. 504
HAMILTON, OHIO 45013-9402

TO: FDF ENGINEERING/CONSTRUCTION DOCUMENT CONTROL, MS 52-7

SIGNATURE: J. Richard Schaubaum

RECEIVED BY: Melissa Lewis DATE: 8.6.99

QTY	DOCUMENT NUMBER	REV	DOCUMENT FAMILY: PRO	H&S	MED	TRG	CON	ENG	QAC	RESUBMITTAL: YES	NO	TITLE/DESCRIPTION	SUBMITTAL TYPE: CFC	INF	ASSOCIATED SPECIFICATION	SUBMITTAL ACTION: A	B	C
5	614-OPTA-068B.4	0						X			X	Resumes of Seaming Personnel/Install. Crew		X	02770-1.04.B.6 & -1.04.B.7	X		

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Bruce Schweitzer	64		
Jim Burnett	38		
ECDC	52-7		

CFC DISTRIBUTION: Distribution	MS	Distribution	MS
Tony Klimek	64	OSDF Station	64
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Mike Godber	64	Vern Taylor	52-0
Jim Burnett	38		

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COMMENTS ~~NEED MORE DETAIL~~:
1. ~~DATES AND DURATION~~?
2. ~~WHAT WAS ROLE ON PROJECT~~?
3. ~~RESUME OF QUALITY CONTROL CHIEF.~~

APR 8/18/99

ORIGINAL

SUBMITTAL ACTION CODE: (BY SUPPLIER)	SUPPLIER ACTION CODE: (ECDC) SUPPLIER ACTION ABOVE
CFC - CERTIFIED FOR CONSTRUCTION	A - ACCEPTED DOCUMENT - CONFORMS WITH REQUIREMENTS
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FLUOR DANIEL FERNALD

SOUTHERN WASTE UNITS (SWUs) EXCAVATION/
ON-SITE DISPOSAL FACILITY (OSDF) (PHASE II) PROJECT
Project Nos. 20102/20402; Contract No. FSC-614

SUPPLIER SUBMITTAL No.: 20102/402-614A-02770-1 (Rev. 1)

RESUMES OF SEAMING/
INSTALLATION PERSONNEL
Sections 02770-1.04.B.6, & -.B.7

[redacted]

Document No. 614-OPTA-068B.4 (Rev. 0)

AS PER DISCUSSION W/ R. SCHAULBAUM
PROPOSED WELDING TECHNICIANS EXPERIENCE CONSISTS OF WELDING TECH PROJECTS
APK 8/11/99

August 6, 1999

X A - Conforms to the Subcontract Requirements
[ ] B - Minor Comment - Incorporate and Resubmit
[ ] C - Revise and Resubmit
Sig: [signature] Date: 8/18/99

INFORMATION ONLY

Fernald Site Office: P.O. Box 249 • Ross, Ohio 45061-0249 • 513.648.3402 • Fax 648.3407
7851 Palace Drive • Cincinnati, Ohio 45249 • 513.489.6789 • Fax 489.7208
8200 Seville Road • Lodi, Ohio 44254 • 330.948.1494 • Fax 948.1933

--2739

WILLIAM ANDERSON

WELDING TECHNICIAN

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000658

THE ISTRE CO., INC.
13811 S. Poplar Pl.
Glenpool, Ok. 74033

--2739

RESUME

William Anderson

1. Cape Canaveral, Fl.- U. S. Corps of Engineers- 60mil HDPE-3,612,500 Sq. ft.
Geotextile- 3,612,500 Sq. ft

April-97

TELE & FAX: (918) 291-2318

2739

MARCO MURILLO

WELDING TECHNICIAN

000660

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THE ISTRE CO., INC.
13611 S. Poplar Pl.
Glenpool, Ok. 74033

2739

RESUME

Marco Murillo

1. Fernald-Ross, Oh-80mil. HDPE-400,000 Sq. Ft

Dec. 97

TELE & FAX: (918) 291-2318

—2739

LOUIS LUNA

WELDING TECHNICIAN

PETRO
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technologies

000662

THE ISTRE CO., INC.
13811 S. Poplar Pl.
Glenpool, Ok. 74033

-2739

RESUME

Louis Luna

1. Fernald-Ross, Oh 80 mil HDPE- 700,000 Sq. ft.

Nov 98

TELE & FAX: (918) 291-2318

--2739

DANIEL TROUT

WELDING TECHNICIAN

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000664

THE ISTRE CO., INC.
13811 S. Poplar Pl.
Glenpool, Ok. 74033

2739

RESUME

Daniel C. Trout

1. Caper Canaveral, Fl-U.S. Corps of Engineers-60mil. HDPE-3,612,500 Sq. Ft,
- Geotextile- 3,612,500 Sq. ft.

April 97

TELE & FAX: (918) 291-2918

Resume

Efren Mendez

Welding Technician

1. City of Charlette, North Carolina----------40, Mil. HDPE-------
300,000 7/10/99
2. City of Arkedelphia, Arkansas----------40 Mil. HDPE---------
60,000 6/1/99

Resume

Joe Beebout

Welding Technician

1. Wright Patterson AFB, Ohio----------60 Mil. HDPE-----
350,000 - 2/17/96-Reliable Mechanical Inc.

2. Grand Forks, NE.----------60 Mil. HDPE----------
360,000 - 8/1/96-R.E.M. Consulting

3. Leominster, Ma.----------40 Mil. HDPE----------
450,000 10/1/96-R. Bates Inc.

4. Gary, In.----------60 Mil. HDPE----------
758,000 - 4/2/97-U.S. Steel C. J. Lagenfelder

SUPPLIER DOCUMENT SUBMITTAL

FDF PROJECT	20102 / 20402	X	CONTRACT NUMBER.: FSC-614A	SUBMITTAL NO.: 02770-1	REV.: 0	DATE: May 7, 1999	PAGE 1 OF 1

FROM: PETRO ENVIRONMENTAL TECHNOLOGIES, INC.
7400 WILLEY ROAD, MAILSTOP 52-7; TRAILER NO. 504
HAMILTON, OHIO 45013-9402

SIGNATURE: J. Richard Schairbaum

TO: FDF ENGINEERING/CONSTRUCTION DOCUMENT CONTROL, MS 52-7

RECEIVED BY: Erika Jarrett DATE: 5/7/99

QTY	DOCUMENT NUMBER	REV	DOCUMENT FAMILY: PRO	H&S	MED	TRG	CON	ENG	QAC	RESUBMITTAL: YES	NO	TITLE/DESCRIPTION	SUBMITTAL TYPE: CFC	INF	ASSOCIATED SPECIFICATION	SUBMITTAL ACTION: A	B	C
5	614-OPTA-068A.1	0						X			X	Installation Capabilities - Proposed Equipment		X	02770-1.04.B.3.a See Comments	X		
5	614-OPTA-068A.2	0						X			X	Installation Capabilities - Avg. Daily Production		X	02770-1.04.B.3.b KBT	X	X	
5	614-OPTA-068A.3	0						X			X	Installation Capabilities - Q.C. Procedures		X	02770-1.04.B.3.c	X		
5	614-OPTA-068B.1	0						X			X	Resume of Superintendent		X	02770-1.04.B.5		X	
5	614-OPTA-068B.2	0						X			X	Resume of Quality Control Chief		X	02770-1.04.B.5		X	
5	614-OPTA-068B.3	0						X			X	Resumes of Seaming Personnel/Install. Crew		X	02770-1.04.B.6 & -1.04.B.7		X	
5	614-OPTA-068C	0						X			X	Cold Weather Seaming Procedures	X		02770-1.04.B.8	X		

RECEIVED MAY 10 1999 KBT

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REVIEW DISTRIBUTION: Distribution	MS	Distribution	MS	CFC DISTRIBUTION: Distribution	MS	Distribution	MS
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Bruce Schweitzer	64			Bruce Schweitzer	64	ECDC	52-7
Jim Burnett	38			Mike Godber	64	Vern Taylor	52-0
ECDC	52-7			Jim Burnett	38		

RECEIVED BY: K Bartholomew DATE: 7/6/99 NO COMMENTS ____ COMMENTS ATTACHED X

(SIGN/DATE AND RETURN A COPY TO ECDC, MS 52-7)

RESUBMIT ENTIRE DOCUMENT NUMBER AS: _____ (REV. #) OR RESUBMIT CHANGED DOCUMENT PAGES AS: DOC. NO.: _____ (REV. #) PCN: _____ (PCN. #)

000668

2739

ORIGINAL

COMMENTS

SUBMITTAL ACTION CODE: (BY SUPPLIER)
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FLUOR DANIEL FERNALD

SOUTHERN WASTE UNITS (SWUs) EXCAVATION/
ON-SITE DISPOSAL FACILITY (OSDF) (PHASE II) PROJECT
Project Nos. 20102/20402; Contract No. FSC-614

SUPPLIER SUBMITTAL No.: 20102/402-614A-02770-1 (Rev. 0)

INSTALLATION CAPABILITIES, RESUMES OF SUPERINTDENDENT, Q.C. CHIEF, & SEAMING/INSTALLATION PERSONNEL, AND COLD WEATHER SEAMING PROCEDURES

Sections 02770-1.04.B.3, -.B.5, -.B.6, -.B.7, & -.B.8

Document No. 614-OPTA-068A.1 (Rev. 0)
Document No. 614-OPTA-068A.2 (Rev. 0)
Document No. 614-OPTA-068A.3 (Rev. 0)
Document No. 614-OPTA-068B.1 (Rev. 0)
Document No. 614-OPTA-068B.2 (Rev. 0)
Document No. 614-OPTA-068B.3 (Rev. 0)
Document No. 614-OPTA-068C (Rev. 0)

May 7, 1999

Fernald Site Office: P.O. Box 249 • Ross, Ohio 45061-0249 • 513.648.3402 • Fax 648.3407
7851 Palace Drive • Cincinnati, Ohio 45249 • 513.489.6789 • Fax 489.7208
8200 Seville Road • Lodi, Ohio 44254 • 330.948.1494 • Fax 948.1933

INSTALLATION CAPABILITIES –
PROPOSED EQUIPMENT

Document No. 614-OPTA-068A.1 (Rev. 0)

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Installation Capabilities

Information on equipment proposed for this project:

1. 3 Columbine Wedge Welders
2. 3 Columbine Extruder Kits — Does this include guns, leisters, etc.
3. 4 Generators - 3 Hondas &1 Grainger
4. 1 Colunbine Coupon Cutter
5. 1 Columbine Tensiometer
6. 1 Columbine vacuum box what size?
7. 1 Set of pressure testing monometers
8. 4 Sewing machines - 3 Newlong & 1 Union Special
9. 1 Spreader Bar

Layout Equipment

1. 4 Posi-Tracks
2. 2 Lulls
3. 1 Excavator

what about sandbags?

KBT
9-6-99

13811 S. Poplar Pl.
Glenpool, Ok. 74033
Tele. & Fax (918) 291-2318

INSTALLATION CAPABILITIES –
AVERAGE DAILY PRODUCTION

Document No. 614-OPTA-068A.2 (Rev. 0)

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Average daily production anticapated for project

Manpower:

1 Superintendent
1 Master-Seamer
2 Quality-Control
8 Technicians
8 Laborers
4 Operators

How many welders?

1.Installed GCL- 43,000 Square Feet per day
2.Installed GML- 43,000 Square Feet per day
3.Installed Geo-textile 44,000 Square Feet per day
4.Installed Geo-filter 45,000 Square Feet per day

Too optimistic!

Note that all GCLs have to be covered this same day with geomembrane. Deployed geomembrane panels have to be seamed the same day.

LOBT
7-6-94

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INSTALLATION CAPABILITIES –
QUALITY CONTROL PROCEDURES

Document No. 614-OPTA-068A.3 (Rev. 0)

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Quality Control Manual

Note:

The attached quality control manual is superseeded by the project contract construction quality control document.

Specs Section 02770 OK
02772 KBT
02774 7-6-99

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Glenpool, Ok. 74033
Tele. & Fax (918) 291-2318

QUALITY CONTROL MANUAL

1.0 Introduction

1.1 This manual defines the Quality Control Program developed and utilized by The Istre Company (T.I.C.) to ensure the quality of workmanship and the installation integrity of geomembranes and other geosynthetic products.

1.2 T.I.C. has recognized that careful and specific documentation of installation quality is required to substantiate this Quality Control Program.

2.0 Geomembrane Installation

2.1 Subgrades

2.1.1 The General and/or Earthworks Contractor shall be responsible for preparing and maintaining the subgrade in a condition suitable for installation of the geomembrane unless specifically agreed otherwise.

2.1.2 If requested, T.I.C. will provide their client with written acceptance of the subgrade surfaces. Two possible formats are offered: (a) daily certification of the area covered defined by panel numbers and/or construction stations, (b) certification at the end of liner deployment accepting all areas lined. Subsurface acceptance by T.I.C. will only certify that the surfaces lined were visually inspected and appeared to be suitable for geomembrane deployment.

2.2 Geomembrane Deployment

2.2.1 Prior to commencement of geomembrane deployment, layout drawings shall be produced to indicate the intended panel configuration and seam location and direction.

2.2.2 Each panel shall be assigned a numeric identifier at the time of deployment. The panel identification shall be related to the manufacturer's production roll number. Panel identification will also be shown on as-built drawings provided after the completion of the project.

2.2.3 If geomembrane panels are installed in a different arrangement than that shown on the layout drawings the difference will be reflected in the as-built drawings.

2.2.4 The methods and equipment used to deploy the geomembrane panel shall not damage the geomembrane or the subgrade.

2.2.5 No personnel working on the geomembrane shall smoke, wear shoes that can damage the geomembrane, or engage in actions that could result in damage to the geomembrane.

2.2.6 Adequate temporary ballast (sand bags) which will not damage the geomembrane, shall be used to prevent uplift or movement by wind.

2.2.7 All damage to geomembrane will be repaired in accordance with the following paragraphs. Any areas of the geomembrane seriously damaged will be marked, cut out and removed from the

work area with the resulting repairs performed in accordance with the paragraphs below.

2.2.8 In general, seams shall be oriented parallel to the slope, i.e., oriented along not across the slope. Whenever possible, horizontal seams should be located not less than 10 feet from the toe of all slopes. Each field seam shall be numbered in a manner that will be recorded on the as-built drawings and on the appropriate quality control documents.

2.2.9 All personnel performing seaming operation shall be trained in the operation of the specific seaming equipment being used and will qualify by performing a test weld as described in the paragraphs below. The project Master Seamer will provide direct supervision of all personnel seaming to verify proper welding procedures are followed.

2.2.1 Sufficient slack shall be installed in the geomembrane to compensate for the contraction of the material during the low temperature portion of the service life.

In most applications, slack will be installed based on the discretion of the T.I.C. supervisor. In cases where fixed points exist in the membrane system i.e. between structures and attachments, the following equation shall be used to calculate the minimum amount of slack required between the fixed points.

$$S = C \times (T - T_1) \times D$$

Where:

S is the minimum amount of slack required between the fixed points.
C is the coefficient of linear thermal expansion (or contraction) for the geomembrane material.
T is the surface temperature of the geomembrane when the slack is measured.
T_1 is the lowest temperature anticipated during the service life of the geomembrane.
D is the distance between the fixed points under consideration.

2.3 Welding

2.3.1 Fusion Welding. Fusion welding consists of placing a heated wedge, mounted on a self-propelled vehicular unit, between two overlapped sheets such that the surface of each sheet is heated above the polyethylene melting point. Immediately after being heated, the overlap region is passed between pressure wheels that compress the molten areas together so that a continuous homogeneous weld is formed. The wedge welder is equipped with a temperature readout that continually monitors the temperature of the wedge. The wedge welder also has adjustable controls that allow the temperature, pressure and speed to be adjusted to meet specific site conditions.

2.3.2 Extrusion Welding. Extrusion fillet welding consists of introducing a bead of molten polyethylene along the edge of the seam overlap. The molten polyethylene bonds to each sheet resulting n a homogeneous bond between the

bead and the surfaces of the sheets to be welded. The extrusion welder has temperature readouts which continually monitor the temperature of the extradite. The extrusion welder also has controls that allow the temperature of the extradite and the pre-heat air to be adjusted to meet specific site conditions.

2.3.3 T.I.C. relies on the experience of the Project Superintendent and results of test seams to determine seaming restrictions caused by weather. Many factors such as ambient temperature, humidity, wind, sunlight, etc. can affect the integrity of field seams and must be considered when deciding whether or not seaming should proceed. Test seams as described below are required prior to start of daily production seaming to determine whether or not weather conditions will affect T.I.C.'s ability to produce quality seams. Additional non-destructive and destructive testing of production seams substantiate the decision made by the Project Superintendent to continue seaming on any given day.

2.4.1 Seam Preparation for Fusion Welding;

(a) Overlap geomembrane panels approximately 6 inches
(b) Clean seam area thoroughly. Seam area must be free of moisture, dust, sand, or any debris. No grinding is required for fusion welding.
(c) Adjust the panels to minimize any differential wrinkles.

2.4.2 Seam Preparation for Extrusion Welding

(a) Overlap panels a minimum of 6 inches.
(b) Temporarily bond the panels with heat leister. Exercise caution not to damage the adjacent areas.
(c) Clean seam area prior to seaming to assure the area is free from moisture, dust, sand or debris of any kind.
(d) Grind the seam area which will be covered by the extradite bead. Care should be taken not to grind areas that will remain exposed. Grinding disks should be clean and relatively fresh.
(e) Welding rod shall be kept clean and dry at all times.

2.5.1 Test Seams

Test seams shall be performed prior to the start of seaming each day and at least once every five hours of seaming for each seaming apparatus in use. Test seams shall be made utilizing the scraps of geomembrane in use and shall be seamed under the same conditions as the production seams.

Test seam shall be at least 5 feet in length and should be made from two pieces of geomembrane approximately 12 inches in width.

2.5.2 Testing

(a) Visually inspect the seam for squeeze-out, deformation and general appearance.

(b) Four random samples, 1" in width, shall be cut from the test seam. Test each of the samples in peel using a field tensiometer. In the case of split wedge fusion welds, both tracks of each sample. If any of the samples exhibit more than 10% peel separation in the weld, the test will be rejected and a new test weld will be performed. If none of the tests indicate peel failure, the average peel strengths will be recorded. An additional three samples shall be cut from the test weld and tested in shear. The sample tested in shear shall fail outside of the weld.

(c) If the second test weld also fails, the seaming apparatus shall not be used until the deficiencies are corrected and a passing test weld is achieved.

(d) After successful completion of the test weld, the remaining portions of the test weld can be discarded. Documentation will be maintained recording: date, technician, machine, ambient temperature, machine settings (temperature and speed) and the test results. Please see attached form TIC-1.

2.6.1 General Seaming Procedures

(a) Seaming shall extend as far into the anchor trenches as is feasible when the seam is welded. In any case, seams must extend at least three feet into the anchor trench.

(b) Overlap and seam cleanliness shall be monitored continuously during fusion welding.

(c) Operating temperature and speed settings shall be monitored during all seaming.

(d) All cross-seam wrinkles (compensation) shall be aligned to facilitate welding through the wrinkles.

(e) Fishmouths or cross-seam wrinkles that cannot be welded through shall be cut along the ridge to achieve a flat overlap. The cut shall be seamed. Any portion of the cut which has insufficient overlap for extrusion welding shall be covered with a round or oval patch.

3.0 Non-Destructive Seam Testing

3.1 Concept

T.I.C. will non-destructively test all field seams over their full length using air pressure testing, vacuum testing or other approved methods to verify the continuity and integrity of the seams.

3.2 Air Pressure Testing

Most fusion-welded seams are composed of two distinct welded tracks separated by an un-welded channel (the air channel). Air pressure testing involves pressurizing the air channel and monitoring its ability to hold the air pressure for a period of five minutes.

3.1.1 Procedure for Air Testing

(a) Seal both ends of the air channel in the seam to be tested.

(b) Insert needle or other approved pressure feed device into the sealed air channel.

(c) Pressurize air channel to above the minimum pressure specified below. Record initial pressure after a two-minute relaxation period and monitor the pressure for a period of five minutes. Pressure shall remain within the limits specified below, otherwise the faulty area must be located and repaired as described elsewhere in this document.

Material Thickness Mm (mil)	Minimum Initial Pressure KPa (psi)	Max Permissible Pressure Differential kPa (psi)
1.0 (40)	172 (25)	28 (4)
1.5 (60)	186 (27)	21 (3)
2.0 (80)	207 (30)	21 (3)
2.5 (100)	207 (30)	21 (3)

(d) Release pressure by puncturing the air channel on the end opposite the pressure feed device. Remove needle or pressure feed device and repair any resultant holes.

(e) Record final results on form TIC 2 (as attached).

3.2.2 Procedure for Non-Complying Air Tests

In the event of a non-complying air pressure test, the following procedure shall be followed until acceptable test results can be obtained;

(a) Verify the integrity of the seals at each end of the air channel, the penetration of the pressure feed and all of the attached equipment.

(b) Carefully visually inspect the seam looking for any possible leak locations. If a flaw is located in the air channel, the seam will be cut at that location and two separate air tests will be recorded on either side of the flaw location. Any necessary repairs will be as discussed elsewhere in this document.

(c) If it is impossible to achieve successful air test results over any reasonable length of seams the T.I.C. supervisor will choose from the following alternatives;

Alternative 1.

The entire defective seam shall be removed and a 3' strip of geomembrane shall be installed with two new fusion welds. The new welds will then be pressure-tested as per the above.

Alternative 2.

A 3' cap stripe shall be extrusion-welded over the length of the seam. The resulting weld shall be vacuum-tested as describe below.

3.3 Vacuum Testing

3.3.1 Equipment

The equipment used for vacuum testing consists of a vacuum box and a vacuum pump. A vacuum box is essentially a rigid housing with a transparent inspection window. The lower portion of the vacuum box is equipped with a thick, soft neoprene sponge. The vacuum box is also equipped with a vacuum guage and a release valve assembly.

3.3.2 Procedure

The vacuum box is placed over the area to be tested and sufficient downward pressure is applied to "seat" the neoprene sponge against the liner.

The vacuum pump is engaged to cause a vacuum in the interior of the vacuum box to approximately 5 psi, ensuring that the vacuum box is "seated" well enough that leakage around the neoprene seal is minimal.

For a period of not less than thirty (30) seconds the seam is observed through the inspection window. A non-complying test is indicated by soap bubbles caused by air flowing from under the seam into the vacuum. If no soap bubbles are observed during the thirty (30) second inspection period, the vacuum is released and the vacuum box is moved to the next test location. When seams longer than the vacuum box are tested, test locations shall be overlapped 4" to ensure that 100% of the seam is tested.

3.3.3 Procedure for Non-Complying Tests

All areas where flaws are indicated by vacuum testing shall be marked and repaired as describe elsewhere in this document. All repairs shall be vacuum tested as per the above.

4.0 Destructive Testing

4.1 Concept

Destructive testing is utilized to evaluate seam strength and quality. Since destructive testing involves physically removing samples from the geomembrane and subsequent repairs, its use should be minimized. Location of destructive samples should be strategically placed.

4.2 Frequency

Destructive test samples shall be marked and removed randomly with an average frequency of one sample per 500 feet of seaming.

Extra destructive samples should be taken in potential problem areas i.e. areas of contamination, offset welds or visible defects. It is the responsibility of the T.I.C. supervisor and the quality control technicians to ensure that all problem areas are located by either destructive or non-destructive testing.

--2739

RESUME OF SUPERINTENDENT

Document No. 614-OPTA-068B.1 (Rev. 0)

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The Istre Company

Dates and Duration of Employment.

Resume of Jerry Istre
Superintendent

1. Fort Howard Paper Co. Savannah Ga. 40 & 60 Mil. HDPE Paper Lagoons 3,000,000 Sq. Ft. Duration 9 Mths Jan. to Sept 85

2. Manada Const. Hershey Pa. 60 Mil. HDPE Lagoons 3,000,000 Sq. Ft. Duration 6 Mths April to Sept. 87

3. Kaiser Alum. Inc New Orleans, La. 40 Mil. HDPE 1,000,000 Sq. Ft. Duration 6 Weeks July 86

4. City of Ottawa Ottawa, Ont. Canada 30 Mil. VLDPE 3,000,000 Sq. Ft. Duration 5 Mths May to Sept. 89

10 mil ft^2
> 5 mil
sq-ft
per specs.

These are too old (10 yrs or more). What about recent ~~[illegible]~~ experience at Fernald, etc.

KBT
7-6-99

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Glenpool, Ok. 74033
Tele. & Fax (918) 291-2318

RESUME OF QUALITY CONTROL CHIEF

Document No. 614-OPTA-068B.2 (Rev. 0)

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The Istre Company -- 2739

Quality Control Technician

Resume

Dates and Duration of Employment?

Kurt Peterson

List of Projects

1. Cape Canaveral, Fla. U.S. Government 60-Mil. 500.000 ft^2
2. Bartow, Fla. C.F. Industries 40-Mil. 1,500,000 ft^2
3. Bartow, Fla. Cargil 80-Mil. 50,000 Dates?
4. Ross, Ohio Fernald 80-Mil. 400,000

Previous work history was in the area of Quality Control, overseeing earthworks for ten years. Alaska, and Florida are the two main areas of employment.

KPT
7-6-99

13811 S. Poplar Pl.
Glenpool, Ok. 74033
Tele. & Fax (918) 291-2318

RESUMES OF SEAMING PERSONNEL/
INSTALLATION CREW

Document No. 614-OPTA-068B.3 (Rev. 0)

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RON SCOTT

MASTER SEAMER

000688

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Dates and duration of employment.

Name: Ron Scott

Title: Master Seamer

Resume

1. Fernald - Ross, Ohio - Cell#2 - Sept. 98 - 80 Mil. - 700,000 Sq.Ft.

2. WMI Growe Landfill - Morrisville, Pa. - 60 Mil. - Date? 1,000,000 Sq.Ft.

3. WMI Pasco County Landfill - Dade City, Fla. - 60 Mil. Date? 400,000 Sq.Ft.

4. WM Turnkey Landfill - East St. Louis IL. - 60 MIL. - Date? 2,702,000

Mr. Ron Scott will be the Master Seamer for the project. He has fourteen years of field installation of H.D.P.E Lining Systems.

KBT
7-6-99

PO Box 1451 Crowley, La. 70527-1451
Tele & Fax (318) 785-8220

F-2739

GARY CARSON, JR.

WELDING TECHNICIAN

000690

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The Istre Company

2739

Dates and duration of employment

Name: GARY CARSON JR.

Title: Weld Tech

Resume

1. Fernald - Ross, Ohio - Cell#2 - Sept. 98 - 80 Mil. 700,000 Sq.Ft.

2. Uniontown, Pa. Landfill - 80 Mil. 900,000 Sq.Ft. Date?

3. Brockway, Pa. Landfill -60 Mil. - 915,000 Sq.Ft. Date?

PO Box 1451 Crowley, La. 70527-1451
Tele & Fax (318) 785-8220

JUSTIN McELHONE

WELDING TECHNICIAN

PETRO
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Date and duration of employment?

Name: Justin McElhone

Title: Weld Tech

Resume

1. Fernald - Ross, Ohio - Cell#2 - Sept. 98 - 80 Mil. 700,000 Sq.Ft.

2. New Hampshire Landfill - 593,000 Sq.Ft. Date?

COLD WEATHER SEAMING PROCEDURES

Document No. 614-OPTA-068C (Rev. 0)

What about hot (>104°F) weather conditions?
May be not likely at this site, but with current heat wave, it may be possible.

EBT
7-6-99

PETRO environmental technologies

The Istre Company F-2739

Cold Weather Seaming Procedures

The following procedures should be used as a supplement to (not replace) the procedures outlined in the project specifications when ever welding takes place in ambient temperatures below 40 degrees F.

Specs say 0 to 6 inches.

1. Ambient temperatures should be measured two feet above the surface of the liner and readings logged every hour.
2. Trial welds, for both fusion and extrusion welds, should be run on strips 15 feet long. Coupons will be taken every 2 feet for a total of 6 specimens (4 peels and 2 shears).
3. Trial welds will be run under conditions as closely resembling field conditions as possible. For example, the material will be exposed to the same elements as will be encountered during seaming. Run trial welds on the same subgrade conditions. Do not pre-heat trial welds unless you intend on pre-heating during field welding.
4. All available information will be logged for both trial welds and field seaming. This information will include but not be limited to the following: Machine temperatures and pyrometer temperatures, speed setting and measured speed, ambient and liner temperature, peel and shear values calibrated to pounds per inch (PPI).
5. Additional trial welds will be performed whenever the ambient temperature changes by more than 10 degrees F. since the last trial weld.
6. Coupons will be cut and peel tested from the end of every seam.
7. If experiencing weld failure due to lack of heat, slow the machine speed down and retest machine. Continue to lower speed, until passing test are achieved.
8. Special care should be taken to prevent any precipitation from entering the weld area.
9. Deployment and seaming operations will be terminated during periods of precipitation, and high winds.

OK
KBT
7-6-94

13811 S. Poplar Pl.
Glenpool, Ok. 74033
Tele. & Fax (918) 291-2318

SUPPLIER DOCUMENT SUBMITTAL

FDF PROJECT	20102	X	CONTRACT NUMBER.: FSC-614A	SUBMITTAL NO.: 02770-2	REV.: 1	DATE: August 24, 1999	PAGE 1 OF 1
	20402						

FROM: PETRO ENVIRONMENTAL TECHNOLOGIES, INC.
7400 WILLEY ROAD, MAILSTOP 52-7; TRAILER NO. 504
HAMILTON, OHIO 45013-9402

TO: FDF ENGINEERING/CONSTRUCTION DOCUMENT CONTROL, MS 52-7

SIGNATURE: J. Richard Schairbaum

RECEIVED BY: Penny Rogers DATE: 8-25-99

QTY	DOCUMENT NUMBER	REV	DOCUMENT FAMILY PRO	H&S	MED	TRG	CON	ENG	QAC	RESUBMITTAL YES	NO	TITLE/DESCRIPTION	SUBMITTAL TYPE CFC	INF	ASSOCIATED SPECIFICATION	SUBMITTAL ACTION A	B	C
5	614-OPTA-068D	1						X		X		Installation Schedule for Option A. Work	X		02770-1.04.B.2	X		
5	614-OPTA-068E	1						X		X		List of 10 Completed Facil. for Option A. Work		X	02770-1.04.B.4	X		

RECEIVED SEP 09 1999 Richardson

ORIGINAL

DISTRIBUTION

REVIEW DISTRIBUTION

Distribution	MS	Distribution	MS
Tony Klimek (Approver)	64	Vern Taylor	52-0
Bruce Schweitzer	64	~~Ann Bodine~~ EBT	38
Jim Burnett	38	Kuvasi Pradhan-Tuberchuck	
ECDC	52-7		

CFC DISTRIBUTION

Distribution	MS	Distribution	MS
Tony Klimek	64	OSDF Station	64
Bruce Schweitzer	64	ECDC	52-7
Mike Godber	64	Vern Taylor	52-0
Jim Burnett	38		

RECEIVED BY: [signature] DATE: 9/10/99 NO COMMENTS X COMMENTS ATTACHED

(SIGN/DATE AND RETURN A COPY TO ECDC, MS 52-7)

RESUBMIT ENTIRE DOCUMENT NUMBER AS: _____ (REV. #) OR RESUBMIT CHANGED DOCUMENT PAGES AS: DOC. NO.: _____ (REV. #) PCN: _____ (PCN. #)

COMMENTS

SUBMITTAL ACTION CODE: (BY SUPPLIER)
CFC - CERTIFIED FOR CONSTRUCTION
INF - INFORMATION/RECORD
"X" APPROPRIATE SUBMITTAL ACTION ABOVE

SUPPLIER ACTION CODE: (ECDC) SUPPLIER ACTION ABOVE
A - ACCEPTED DOCUMENT - CONFORMS WITH REQUIREMENTS
B - MINOR COMMENTS - REVISE & RESUBMIT AS CFC OR INF
C - REVISE & RESUBMIT

ENTERED

2739

006696

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FLUOR DANIEL FERNALD

SOUTHERN WASTE UNITS (SWUs) EXCAVATION/
ON-SITE DISPOSAL FACILITY (OSDF) (PHASE II) PROJECT
Project Nos. 20102/20402; Contract No. FSC-614

SUPPLIER SUBMITTAL No.: 20102/402-614A-02770-2 (Rev. 1)

INSTALLATION SCHEDULE & LISTING OF 10 COMPLETED FACILITIES FOR OPTION A. WORK

Sections 02770-1.04.B.2, -.B.4

Document No. 614-OPTA-068D (Rev. 1)
Document No. 614-OPTA-068E (Rev. 1)

August 24, 1999

Fernald Site Office: P.O. Box 249 • Ross, Ohio 45061-0249 • 513.648.3402 • Fax 648.3407
7851 Palace Drive • Cincinnati, Ohio 45249 • 513.489.6789 • Fax 489.7208
8200 Seville Road • Lodi, Ohio 44254 • 330.948.1494 • Fax 948.1933

INSTALLATION SCHEDULE FOR

GEOSYNTHETICS

Document No. 614-OPTA-068D (Rev. 1)
Section 02770-1.04.B.2

The Istre Company

Geosynthetics Installation Schedule for OSDF Cell #3

August 11, 1999	Check in men and equipment, training for personnel
August 17, 1999	Start installation of GCL, FML, Geotextile for Secondary Layer
September 4, 1999	Complete installation of Secondary Layer geosynthetics
September 13, 1999	Begin installation of GCL, FML, Geotextile for Primary Layer
October 1, 1999	Complete installation of Primary Layer geosynthetics
October 8, 1999	Start installation of geotextile cushion
October 11, 1999	Complete installation of geotextile cushion
October 12, 1999	Start installation of sacrificial geotextile
October 13, 1999	Complete installation of sacrificial geotextile

13811 S. Poplar Pl.
Glenpool, OK 74033
Tele. & Fax (918) 291-2318

LISTING OF 10 COMPLETED

FACILITIES BY INSTALLER

Document No. 614-OPTA-068E (Rev. 0)
Section 02770-1.04.B.4

The Jerry Istre Co. is a new company that has yet to have completed geomembrane liner installation projects totalling 10,000,000 square feet. Per paragraph 1.04.B.4 of Technical Specification Section 02770, alternate qualifications may be evaluated by the Construction Manager on a case by case basis. Attached is a listing of the completed facilities that the Istre Co. has completed geosynthetic liner installation work, which totals 3,125,000 square feet. In addition to The Istre Co.'s attached listing of completed facilities, also attached is a listing of all projects Mr. Jerry Istre has completed during his 25+ years of experience in the geosynthetic installation industry.

Petro Environmental also believes that is important to note that Mr. Istre has been involved in the installation of geosynthetics for both OSDF Cells 1 and 2, both as a Master Seamer (Cell 1) and as Petro Environmental's Quality Control Inspector (Cell 2). Mr. Istre is acutely aware of the Fernald-specific site requirements with regard to safety, as well as the nature of the work and the quality of workmanship demanded on this jobsite and for the OSDF Project. During the construction of Cell 3 geosynthetics, Mr. Istre will be on-site on a full-time basis functioning as the Superintendent for this aspect of the project.

The Istre Company

Company's Resume (Subcontract Work):

Terrafix: 425 Attwell Dr., Rexdale, Ontario, Canada M9W5C4
Contact: John Mooney
Phone: (416) 674-1159
Equipment: Columbine dual-wedge fusion welder
Jerry Istre's Responsibility: Owner/Superintendent

- City of Warren, Maine – GSE 60-mil, 200,00 s.f.; Landfill Cap; March, 1996
- E.B. Eddy Paper Mill – Espenola, Ontario, Canada – GSE 80-mil, 400,000 s.f.; Acid Ponds; June, 1996
- City of Rangley, Maine – GSE 60-mil, 250,000 s.f.; Sewage Lagoons; July, 1996
- City of Yarmouth, Maine – GSE 40-mil, 500,000 s.f.; Landfill Cap; August, 1996
- City of Brunswick, Maine – GSE 40-mil, 275,000 s.f.; Landfill Cap; September, 1996

Comanco: Tampa, Florida
Contact: Mark Topp
Phone: Unknown
Equipment: Columbine dual-wedge fusion welder
Jerry Istre's Responsibility: Owner/Superintendent

- IMC – Bartow, Florida – GSE 40-mil, 1,500,000 s.f.; Mine Cap; June 1997

Additional Istre Co. Work:

Fernald (OSDF): Subcontracted with Environmental Design & Construction, Inc. (EDCI)
Contact: Diane Harris
Phone: (256) 551-0372
Equipment: Columbine dual-wedge fusion welder
Jerry Istre's Responsibility: Master Seamer

- Fernald OSDF Cell 1 – Ross, Ohio – National Seal 80-mil, 400,000 s.f.; Oct./Dec., 1997

Subcontracted with Petro Environmental Technologies, Inc.
Contact: J. Richard Schairbaum
Phone: (513) 648-3406
Equipment: Columbine dual-wedge fusion welder (as needed)
Jerry Istre's Responsibility: Quality Control Inspector

- Fernald OSDF Cell 2 – Ross, Ohio – GSE 80-mil, 750,000 s.f.; Aug./Oct., 1998

Jerry Istre's Personal Resume

Project Name & Location	*Material*	*Square Footage*	*Superintendent (S)/ Master Seamer (MS)*
City of Dayton–Dayton, WY	12-mil	50,000	S / MS
BFI–Atlantic City, NJ	40-mil	1,000,000	S
Ft. Howard Paper-Savannah, GA.	40 & 60-mil	3,000,000	S
Kaiser Aluminum- New Orleans, LA.	40 Mil	1,000,000	S
Inspiration Copper- Claypool, AZ.	40 & 80 Mil	100,000	S / MS
Hycroft Mine-Winnamucca, NY	40 Mil	1,000,000	S
Perry Eng.-Leesburg, VA	30 Mil	1,000,000	S / MS
US Corps. Of Eng.-Fayetteville, NC	12 Mil	150,000	S
Summitville Min-Summitville, CO	60 Mil	1,000,000	S
Gilt Edge Brohm Mining-Deadwood, SD	60 Mil	1,370,000	S
Rollins Envir. Service-Baton Rouge, LA	80 Mil	1,000,000	S / MS
Wolverine Tube-Decator, AI	40 Mil	100,000	S / MS
American Cyanamid-Laplace, LA	20 Mil	290,000	S / MS
Builders Transport-Dallas, TX	XR-5	10,000	S / MS
Manada Constr.-Newburg, PA	40 Mil	211,000	S / MS
Cheveron-St. James, LA	100 Mil	40,000	S
Ethal Corp.-Baton Rouge, LA	30 Mil	500,000	S
Manada Const-Harrisburg, PA	60 Mil	3,000,000	S
Suntimes-Aurora, IL	20 Mil	200,000	S / MS
Peters Construction-Granite City, IL	60 Mil	1,200,000	S
Viet Construction-Grove, MN	40 Mil	250,000	S / MS
IL State-West Chicago, IL	30 Mil	70,000	S / MS
Wayne Disposal–Belleville, MI	80 Mil	550,000	S
N.B. Power–Milbank, New Brunswick	60 Mil	500,000	S
Sydney Steel–Sydney, Nova Scotia	60 Mil	50,000	S
Bruin Lagoon–Bruin, PA	60 Mil	200,000	S
USA Steel-Pueblo, CO	30 Mil	1,300,000	S
Hudson Electric–Newburgh, NY	60 Mil	1,300,000	S
BFI-New Orleans, LA	SDR-11	12 Miles	S
Muni. of Coboconk-Coboconk, Ontario	60 Mil	800,000	S
Muni. of Tamagami–Tamagami, Ontario	60 Mil	250,000	S / MS
Novia Scotia Power–North Sydney	60 Mil	1,300,000	S
Muni. of Glecien-Glecien, Alberta	60 Mil	500,000	S
Muni. of Tamagami-Tamagami, Ontario	80 Mil	250,000	S / MS
Uniroyal-Elmira, Ontario	60 Mil	170,000	S
Gyr Construction–Clyde River, NWT	60 Mil	70,000	S / MS
FBD–Coral Harbour, NWT	60 Mil	70,000	S / MS
Muni. of Ottawa, Ontario	30 Mil	3,000,000	S

Jerry Istre's Personal Resume

Project Name & Location	*Material*	*Square Footage*	*Superintendent (S)/ Master Seamer (MS)*
Gyr Construction Igloolic, NWT	60 Mil	80,000	S / MS
Casseilo Construction–Bethlaham, NH	60 Mil	400,000	S
Terrafix–Lacdubonnie, Manitoba	60 Mil	400,000	S
Nortruck Construction-Arviet, NWT	60 Mil	70,000	S / MS
Hovat Construction-Coral Harbour, NWT	60 Mil	50,000	S / MS
E.B. Eddy-Espenola, ONT	80 Mil	500,000	S
Muni-Rangely, ME	60 Mil	300,000	S
Muni.-Yarmouth, MA	40 Mil	500,000	S
C.F. Industries-Bartow, FL	40 Mil	1,600,000	S
Cargil-Bartow, FL	80 Mil	50,000	S
C.F. Industries-Plant City, FL	60 Mil	20,000	S
Labbe & Sons-Brunswick, ME	40 Mil	375,000	S
City of Warren, ME	40 Mil	150,000	S
Petro Environmental	80 Mil	400,000	S

13811 S. Poplar Pl.
Glenpool, OK 74033
Tele. & Fax (918) 291-2318

MEMORANDUM

TO: Bill Zebick, Construction Manager
Fluor Daniel Fernald

FROM: Kwasi Badu-Tweneboah KBT
GeoSyntec Consultants

DATE: July 8, 1999

SUBJECT: Qualifications of Proposed Geomembrane Installer
OSDF Phase II, Option A Project – Cell 3
Fernald Environmental Management Project
Fernald, Ohio

Part 1.04B.4 (page 02770-2) of Technical Specification Section 02770: Geomembrane Liner and Cap requires the geomembrane Installer to have completed at least 10 facilities totaling 10,000,000 square feet (minimum) of polyethylene geomembrane. It also states that: "... Alternate qualifications may be evaluated by the Construction Manager on a case by case basis..."

The proposed Installer for the Cell 3 liner work is The Istre Company, which has completed a total of 4,275,000 square feet of polyethylene geomembrane installation work. However, Mr. Istre (the owner of the company) has over 10,000,000 square feet of polyethylene geomembrane installation experience. In addition, Mr. Istre has been involved with the liner installation work for both Cells 1 and 2 of the OSDF project. As such, GeoSyntec CQC and FDF QA personnel are familiar with Mr. Istre's work as a master seamer and quality control inspector of polyethylene geomembrane installation. Also, GeoSyntec has contacted some of Mr. Istre's references and he was given positive recommendations on his workmanship and dedication in getting the job done.

Part 1.04A (page 02770-2) of Section 02770 of the Technical Specifications requires for the submittal of a copy of Installer's letter of approval or license by the geomembrane Manufacturer. An approval or license from the geomembrane Manufacturer would attest to the qualifications of the Installer (i.e., The Istre Company). The geomembrane Manufacturer would also be available to provide technical support to The Istre Company, if needed, during installation.

GeoSyntec therefore suggests that in accordance with the specifications, the Construction Manager may waive the 10,000,000 square footage requirements provided that Mr. Istre is directly involved in the installation of the polyethylene geomembrane for the Cell 3 project. It is also suggested that FDF consider requesting from The Istre Company, through Petro Environmental Technologies, Inc. (Petro), a warranty on geomembrane installation (workmanship) as well as a bond to address any liability associated with completion of the Cell 3 liner installation.

Should you have any questions or require additional information, please do not hesitate to contact me.

* * * * *

Copies to: Jim Jenkins (FDF Engineering)
Mike Godber (FDF QA)
Jim Burnett (GeoSyntec)
GeoSyntec Project File

RCI/DCN FORM

REQUEST FOR CLARIFICATION OF INFORMATION / DESIGN CHANGE NOTICE

WP / WO NO.:	(2) S/C NO.:	(5) Pg 1 OF 1	(6) DATE
20102	614		3/2/99

S/C TITLE:	(11) RCI NO.:
n Waste Unit Excavation / On Site Disposal Facility Phase II Project — 2739	RCI-20102-045R

RESPONSIBLE DISCIPLINE:	(4A) RCI/DCN/TITLE:	(11) DCN NO.:
☐ M ☐ C ☒ OTHER ☐	Waiver of Liner Installer Approval Letter	

(7) DOCUMENTS AFFECTED	(7) DOCUMENT NOS.	(7) REV.	(8) OTHER
chnical Specifications	20102-TS-0001	0	02770-1.04.A

☒ RCI - INQUIRY ☐ USQD SCREENING BY PROJECT ENGINEER (9) ☐ DCN-JUSTIFICATION, EXISTING CONDITION & REQUESTED/PROPOSED CHANGE

ragraph 1.04.A of Technical Specification Section 02770 states that the Contractor is to submit a copy of the Installer's letter of proval or license by the geomembrane manufacturer. Due to the way the contract is structured, FDF selects the manufacturer to ovide geosynthetics for this project, while the Contractor is free to select the Installer of its' choice. The Installer selected by the ntractor may or may not be previously approved by FDF's selected geosynthetics manufacturer, thus such approval would have be garnered in order to meet the requirements of this contractual submittal requirement. Additionally, the manufacturer of the geo-nthetics provides a warranty for that material while the Installer (or Petro Environmental) provides the warranty to cover geosynthetics stallation. In this fashion, both warranties are independent of each other, therefore, the requirement to have the Installer approved by manufacturer to install their products is not a necessity. Therefore, Petro Environmental is requesting that this submittal requirement waived.

J. Richard Schairbaum

) REQUESTER:	COMPANY:	DATE:	(12) FCE / PE	DATE:
Richard Schairbaum	Petro Environmental Technologies, Inc.	3/2/99	J.C. JENKINS J.C. Jenkins	5/11/99

) RESPONSE FOR RCI, IS A DCN REQ'D ☐ NO ☐ YES (14) FOR DCN: ☐ APPROVED ☐ APPROVED AS NOTED ☐ DISAPPROVED

GEOSYNTEC RCI - DCN ACCEPTANCE

) DESIGN ORGANIZATION APPROVAL:	DATE:	(20) CHARGE NO. FOR CAD SERVICES TO INCORPORATE
☐ FIT ☐ FORM ☐ FUNCTION		

) F... E ACCEPTANCE & VERIFICATION THAT ALL REQUIRED REVIEW ARE COMPLETE: (DCN ONLY) DATE:

000707

RFORMANCE GRADE: (17) _____

) CONSTRUCTION CONCURRENCE:	DATE:	(21) WORK COMPLETED: (SIGNOFF BY CE OR PE)	DATE:
RCHASE REQUISITION REQUIRED: ☐ YES ☐ NO (19)			

Response to RCI-20102-045R
Dated 3/2/99
(Page 2 of 2)

The purpose of the approval and/or license of the Installer by the geomembrane Manufacturer is to enable the Installer obtain technical support from the Manufacturer to address problems that may be encountered during installation. For example, in the event repetitive destructive seam test failures are encountered, the geomembrane Manufacturer technical support team may be able assist the Installer to troubleshoot the welding (or seaming) problems. Different geomembrane manufacturers (e.g., GSE, NSC, Serrot, etc.) use resins from different sources (e.g., Mobil, Chevron, etc.) to produce geomembrane rolls and welding rods. The geomembrane Manufacturer may be helpful to confirm compatibility of welding equipment with the resin used to produce geomembrane rolls and welding rods.

Many geomembrane manufacturers would void their material warranty if an approved Installer did not install them. This may become an issue in the event of problems with the material after installation.

Therefore, approval or license of the Installer by the geomembrane Manufacturer is necessary to ensure smooth installation of the geomembrane liner for the Cell 3 project. It is suggested that FDF assist Petro in obtaining the approval or license for the Installer (The Istre Company) from GSE (the geomembrane Manufacturer).

SUPPLIER DOCUMENT SUBMITTAL

FDF PROJECT NO.	20102 / 20402	X	CONTRACT NUMBER.: FSC-614A	SUBMITTAL NO.: 02770-3	REV.: 0	DATE: July 23, 1999	PAGE 1 OF 1

FROM: PETRO ENVIRONMENTAL TECHNOLOGIES, INC.
7400 WILLEY ROAD, MAILSTOP 52-7; TRAILER NO. 504
HAMILTON, OHIO 45013-9402

SIGNATURE: J. Richard Schaubaum

TO: FDF ENGINEERING/CONSTRUCTION DOCUMENT CONTROL, MS 52-7

RECEIVED BY: Teresa Schwab DATE: 7/23/99

QTY	DOCUMENT NUMBER	REV	DOCUMENT FAMILY: PRO	H&S	MED	TRG	CON	ENG	QAC	RESUBMITTAL: YES	NO	TITLE/DESCRIPTION	SUBMITTAL TYPE: CFC	INF	ASSOCIATED SPECIFICATION	SUBMITTAL ACTION: A	B	C
5	614-OPTA-068F	0						X			X	Installer's Letter of Approval for Option A. Work	X		02770-1.04.A	X		

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AUG 02 1999
KBT @ 9:30 AM.

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Jim Jenkins (Approver)	64	Vern Taylor	52-0
Bruce Schweitzer	64		
Jim Burnett	38		
ECDC	52-7		

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Distribution	MS	Distribution	MS
Jim Jenkins	64	OSDF Station	64
Bruce Schweitzer	64	ECDC	52-7
Mike Godber	64	Vern Taylor	52-0
Jim Burnett	38		

000709

RECEIVED BY: K Bordin Weinbrock DATE: 8/4/99 NO COMMENTS X COMMENTS ATTACHED ____
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"X" APPROPRIATE SUBMITTAL ACTION ABOVE

SUPPLIER ACTION CODE: (ECDC) SUPPLIER ACTION ABOVE
A - ACCEPTED DOCUMENT - CONFORMS WITH REQUIREMENTS
B - MINOR COMMENTS - REVISE & RESUBMIT AS CFC OR INF
C - REVISE & RESUBMIT

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FLUOR DANIEL FERNALD

SOUTHERN WASTE UNITS (SWUs) EXCAVATION/
ON-SITE DISPOSAL FACILITY (OSDF) (PHASE II) PROJECT
Project Nos. 20102/20402; Contract No. FSC-614

SUPPLIER SUBMITTAL No.: 20102/402-614A-02770-3 (Rev. 0)

INSTALLER'S LETTER OF APPROVAL
FOR OPTION A. WORK
Sections 02770-1.04.A

Document No. 614-OPTA-068F (Rev. 0)

July 23, 1999

000710

Fernald Site Office: P.O. Box 249 • Ross, Ohio 45061-0249 • 513.648.3402 • Fax 648.3407
7851 Palace Drive • Cincinnati, Ohio 45249 • 513.489.6789 • Fax 489.7208
8200 Seville Road • Lodi, Ohio 44254 • 330.948.1494 • Fax 948.1933

2739

GSE Lining Technology, Inc.

19103 Gundle Road
Houston, Texas 77073
800-435-2008
713-443-8564
Fax 713-875-6010

July 16, 1999

The Istre Company
13811 S. Poplar Pl.
Glenpool, OK 74033

Attn: Jerry Istre

RE: Installer Approval
GSE Project No. 502302

To whom it may concern:

The undersigned, being qualified and authorized to do so, hereby acknowledges The Istre Company and its employees as an approved installer of GSE's geosynthetic products for the OSDF Cell #3.

Regards,

David Leggett
Manager - Dealer Sales

SUPPLIER DOCUMENT SUBMITTAL

FDF PROJECT NO.	20102	X	CONTRACT NUMBER.: FSC-614A	SUBMITTAL NO.: 02770-2	REV.: 0	DATE: July 1, 1999	PAGE 1 OF 1
	20402						

FROM: PETRO ENVIRONMENTAL TECHNOLOGIES, INC.
7400 WILLEY ROAD, MAILSTOP 52-7; TRAILER NO. 504
HAMILTON, OHIO 45013-9402

SIGNATURE: J. Richard Schaubaum

TO: FDF ENGINEERING/CONSTRUCTION DOCUMENT CONTROL, MS 52-7

RECEIVED BY: Melissa Crews DATE: 7.2.99

QTY	DOCUMENT NUMBER	REV	DOCUMENT FAMILY: PRO	H&S	MED	TRG	CON	ENG	QAC	RESUBMITTAL: YES	NO	TITLE/DESCRIPTION	SUBMITTAL TYPE: CFC	INF	ASSOCIATED SPECIFICATION	SUBMITTAL ACTION: A	B	C
5	614-OPTA-068D	0						X			X	Installation Schedule for Option A. Work	X		02770-1.04.B.2		X	
5	614-OPTA-068E	0						X			X	List of 10 Completed Facil. for Option A. Work		X	02770-1.04.B.4		X	

RECEIVED
AUG 09 1999
K Grisman

ANTHONY R KYMEK

DISTRIBUTION

REVIEW DISTRIBUTION

Distribution	MS	Distribution	MS
~~Jim Jenkins~~ (Approver) JUL 06 1999		Vern Taylor	52-0
Bruce Schweitzer	64		
Jim Burnett	38		
ECDC	52-7		

CFC DISTRIBUTION

Distribution	MS	Distribution	MS
Jim Jenkins	64	OSDF Station	64
Bruce Schweitzer	64	ECDC	52-7
Mike Godber	64	Vern Taylor	52-0
Jim Burnett	38		

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INF - INFORMATION/RECORD
"X" APPROPRIATE SUBMITTAL ACTION ABOVE

SUPPLIER ACTION CODE: (ECDC) SUPPLIER ACTION ABOVE
A - ACCEPTED DOCUMENT - CONFORMS WITH REQUIREMENTS
B - MINOR COMMENTS - REVISE & RESUBMIT AS CFC OR INF
C - REVISE & RESUBMIT

ENTERED

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FLUOR DANIEL FERNALD

SOUTHERN WASTE UNITS (SWUs) EXCAVATION/
ON-SITE DISPOSAL FACILITY (OSDF) (PHASE II) PROJECT
Project Nos. 20102/20402; Contract No. FSC-614

SUPPLIER SUBMITTAL No.: 20102/402-614A-02770-2 (Rev. 0)

INSTALLATION SCHEDULE & LISTING OF 10 COMPLETED FACILITIES FOR OPTION A. WORK

Sections 02770-1.04.B.2, -.B.4

Document No. 614-OPTA-068D (Rev. 0)
Document No. 614-OPTA-068E (Rev. 0)

July 1, 1999

000713

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7851 Palace Drive • Cincinnati, Ohio 45249 • 513.489.6789 • Fax 489.7208
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=-2739

INSTALLATION SCHEDULE FOR

GEOSYNTHETICS

Document No. 614-OPTA-068D (Rev. 0)

[ ] A - Conforms to the Subcontract Requirements
[X] B - Minor Comment - Incorporate and Resubmit
[ ] C - Revise and Resubmit
Sig: Date: 8/5/99

ECDC CONTROLLED
COPY NO.
C011

000714

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The Istre Company

--2739

N W E S

Schedule

Fernald Cell #3

1. August 11, 1999 Check In Men and Equipment

2. August 18, 1999 Start Installation GCL, FML, Geotextile, Secondary

3. September 6, 1999 Complete Secondary ~~LABOR DAY~~

4. September 13, 1999 Start Installation GCL, FML, Geotextile, Primary

5. October 29, 1999 Complete Primary

6. October 8, 1999 Start Geotextile Cushion

7. October 11, 1999 Complete Geotextile Cushion

8. October 12, 1999 Start Sacrifical Geotextile

9. Oct0ber 13, 1999 Complete Sacrifical Geotextile

September?

13811 S. Poplar Pl.
Glenpool, Ok. 74033
Tele. & Fax (918) 291-2318

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LISTING OF 10 COMPLETED

FACILITIES BY INSTALLER

Document No. 614-OPTA-068E (Rev. 0)

[ ] A - Conforms to the Subcontract Requirements
[X] B - Minor Comment - Incorporate and Resubmit
[ ] C - Revise and Resubmit
Sig: [signature] Date: 8/5/99

ECDC CONTROLLED
COPY NO.
C011

000716

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The Jerry Istre Co. is a new company that has yet to have completed geomembrane liner installation projects totalling 10,000,000 square feet. Per paragraph 1.04.B.4 of Technical Specification Section 02770, alternate qualifications may be evaluated by the Construction Manager on a case by case basis. Attached is a listing of the completed facilities that the Istre Co. has completed geosynthetic liner installation work, which totals 4,275,000 square feet. In addition to The Istre Co.'s attached listing of completed facilities, also attached is a listing of all projects Mr. Jerry Istre has completed during his 25+ years of experience in the geosynthetic installation industry.

Petro Environmental also believes that is important to note that Mr. Istre has been involved in the installation of geosynthetics for both OSDF Cells 1 and 2, both as a Master Seamer (Cell 1) and as Petro Environmental's Quality Control Inspector (Cell 2). Mr. Istre is acutely aware of the Fernald-specific site requirements with regard to safety, as well as the nature of the work and the quality of workmanship demanded on this jobsite and for the OSDF Project. During the construction of Cell 3 geosynthetics, Mr. Istre will be on-site on a full-time basis functioning as the Superintendent for this aspect of the project.

AS QA?
MASTER SEAMER?

The Istre Company

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WHO DID THIS WORK? EXPLAIN WHO/ HOW THIS WAS DONE.

Resume

Sub-Contract Work

Terrafix - 425 Attwell Dr. Rexdale Ont. Canada M9W5C4 Phone # 416-674-1159 John Mooney

1. City of Rangley, Maine - GSE 60 Mil. - 250,000 - Sewage Lagoons July 96

2. City of Warren, Maine - GSE 60 Mil. - 200,000 - Landfill Cap March 96.

3. City of Yarmouth, Ma. - GSE 40 Mil. - 500,000 - Landfill Cap August 96

4. E. B. Eddy Paper Mill - Espenola, Ont. Canada - GSE 80 Mil. - 400,000 Acid Ponds June 96

5. City of Brunswick, Maine - GSE 40 Mil. - 275,000 - Landfill Cap Sept. 96

Comanco Tampa, Fla. Mark Topp

1. IMC - Bartow Fla. - GSE 40 Mil. - 1,500,000 - Mine Cap June 97

EDCI Huntsville, Alabama - Diane Harris - Phone # 256-551-0372

1. Fernald - Ross, Ohio - Master Seamer - NSC 80 Mil. - 400,000 - Cell # 1 Oct. 97

Petro Environmental - Fernald - Ross, Ohio - Mark Mather Phone # 513-648-3402

1. Fernald - Ross, Ohio - Quality Control - GSE 80 Mil. 750,000 - Cell #2 - Aug 98

13811 S. Poplar Pl.
Glenpool, Ok. 74033
Tele. & Fax (918) 291-2318

See Spec 02770-3 1.04 B.4.

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WHO/How WAS THIS work Done? Istee Co?

Istee himself as master seamer?

PROJECT NAME & LOCATION	MATERIAL	SQ. FEET
City of Dayton-Dayton, Wy.	12 Mil	50,000
BFI- Atlantic City, NJ	40 Mil	1,000,000
Ft. Howard Paper-Savannah, Ga.	40 & 60 Mil	3,000,000
Kaiser Aluminum- New Orleans, La.	40 Mil	1,000,000
Inspiration Copper- Claypool, Az.	40 & 80 Mil	100,000
Hycroft Mine-Winnamucca, Nv.	40 Mil	1,000,000
Perry Eng.-Leesburg, Va.	30 Mil	1,000,000
US Corps. of Eng.-Fayetteville, Nc.	12 Mil	150,000
Summitville Mine-Summitville, Co.	60 Mil	1,000,000
Gilt Edge Brohm Mining-Deadwood, SD	60 Mil	1,370,000
Rollins Envir. Service-Baton Rouge, LA	80 Mil	1,000,000
Wolverine Tube-Decator, Al	40 Mil	100,000
American Cyanamid-Laplace, La	20 Mil	290,000
Builders Transport-Dallas, Tx	XR-5	10,000
Manada Const-Newburg, Pa	40 Mil	211,000
Cheveron-St. James, LA	100 Mil	40,000
Ethal Corp.-Baton Rouge, La	30 Mil	500,000
Manada Const-Harrisburg, Pa	60 Mil	3,000,000
Suntimes- Aurora, IL	20 Mil	200,000
Peters Construction-Granite City, IL	60 Mil	1,200,000
Viet Construction-Grove, Mn	40 Mil	250,000
IL state- West Chicago, IL	30 Mil	70,000
Wayne Disposal - Belleville, Mi (2)	80 Mil	550,000
N. B. Power - Milbank, New Brunswick	60 Mil	500,000
Sydney Steel - Sydney, Nova Scotia	60 Mil	50,000
Bruin Lagoon - Bruin, Pa	60 Mil	200,000
USA Steel - Pueblo, Co	30 Mil	1,300,000
Hudson Electric - Newburgh, NY	60 Mil	1,300,000
BFI - New Orleans, La (METHANE SYSTEM)	SDR-11	12 Miles
Muni. Of Coboconk - Coboconk, Ontario	60 Mil	800,000
Muni. of Tamagami - Tamagami, Ontario	60 Mil	250,000
Novia Scotia Power - North Sydney, Novia Scotia	60 Mil	1,300,000
Muni. Of Glecien - Glecien, Alberta	60 Mil	500,000
Muni. of Tamagami - Tamagami, Ontario	80 Mil	250,000
Uniroyal - Elmira, Ontario	60 Mil	170,000
Gyr Construction - Clyde River, N W T	60 Mil	70,000
F B D - Coral Harbour, N W T	60 Mil	70,000
Muni Of Ottawa - Ottawa, Ontario	30 Mil	3,000,000
Gyr Construction Igloolic, NWT	60 Mil	80,000
Cassello Construction - Bethlaham, NH	60 Mil	400,000

Terrafix - Lacdubonnie, Manitoba	60 Mil	400,000
Nortuck Construction- Arviet, NWT	60 Mil	70,000
Hovat Construction- Coral Harbour, NWT	60 Mil	50,000
E. B. Eddy - Espenola, ONT	80 Mil	500,000
Muni - Rangely, ME	60 Mil	300,000
Muni - Yarmouth, MA	40 Mil	500,000
C. F. Industries - Bartow, FL	40 Mil	1,600,000
Cargil - Bartow, FL	80 Mil	50,000
C. F. Industries - Plant City, FL	60 Mil	20,000
Labbe & Sons - Brunswick, Me	40 Mil	375,000
City of Warren, Me	40 Mil	150,000
Petro-Environmental	80 Mil	400,000

FLUOR DANIEL FERNALD

P.O. Box 538704 Cincinnati, Ohio 45253-8704 (513) 648-3000

--2739

August 3, 1999

Fernald Environmental Management Project

Letter No. C: SWP(OSDF):99-0025

Petro Environmental Technologies
7851 Palace
Cincinnati, OH 45251

Dear Mr. Mather:

SUBCONTRACT NO. FSC-614, PETRO ENVIRONMENTAL TECHNOLOGIES, INC., SWU/OSDF ALTERNATIVE SPECIFICATION REQUIREMENTS

In accordance with the OSDF Phase II Contract, Specification Section 2770, Para. 1.04 B; the Contractor is to submit information on the geosynthetic installation company which shall show the company performed work on at least (10) facilities and has installed a minimum of 10,000,000 SF of material. The specification also states alternate qualifications may be evaluated by the Construction Manager on a case by case basis.

Petro Environmental Technologies, Inc. (Petro) has submitted "The Istre Company" as their installer for geosynthetics. This company's resume shows they have installed 3,000,000 SF of Geomembrane material and have worked on six facilities. The company's resume clearly does not meet the requirements of the specifications. However, when further reviewing the resume of Jerry Istre, he was found to have installed and or supervised the installation of 31 million square feet of Geomembrane material. Also, this individual has worked on Cells 1 and 2 of the OSDF Project and his workmanship as a Seamer and Quality Control Representative was found to be highly satisfactory. The Istre Company is also an authorized installer for GSE liner products which further indicates the company and owner is qualified to install and seam Geomembrane material supplied by Flour Daniel Fernald (FDF). Installation warranty in accordance with the warranty provisions of current contract shall apply. The remaining requirements of Specification Section 2770 Part 1.04 shall apply.

Sincerely,

William A. Zebick
OSDF Construction Manager

Concurrence:

FDF Quality Assurance — Date 30 July 99

GeoSyntec Consultants, Inc. — Date 30 July 99

MEMORANDUM

TO: Bill Zebick, Construction Manager
Fluor Daniel Fernald

FROM: Kwasi Badu-Tweneboah KBT
GeoSyntec Consultants

DATE: July 8, 1999

SUBJECT: Qualifications of Proposed Geomembrane Installer
OSDF Phase II, Option A Project – Cell 3
Fernald Environmental Management Project
Fernald, Ohio

Part 1.04B.4 (page 02770-2) of Technical Specification Section 02770: Geomembrane Liner and Cap requires the geomembrane Installer to have completed at least 10 facilities totaling 10,000,000 square feet (minimum) of polyethylene geomembrane. It also states that: "... Alternate qualifications may be evaluated by the Construction Manager on a case by case basis..."

The proposed Installer for the Cell 3 liner work is The Istre Company, which has completed a total of 4,275,000 square feet of polyethylene geomembrane installation work. However, Mr. Istre (the owner of the company) has over 10,000,000 square feet of polyethylene geomembrane installation experience. In addition, Mr. Istre has been involved with the liner installation work for both Cells 1 and 2 of the OSDF project. As such, GeoSyntec CQC and FDF QA personnel are familiar with Mr. Istre's work as a master seamer and quality control inspector of polyethylene geomembrane installation. Also, GeoSyntec has contacted some of Mr. Istre's references and he was given positive recommendations on his workmanship and dedication in getting the job done.

GQ0409-03.1/1999/FDFMEM7.DOC

Part 1.04A (page 02770-2) of Section 02770 of the Technical Specifications requires for the submittal of a copy of Installer's letter of approval or license by the geomembrane Manufacturer. An approval or license from the geomembrane Manufacturer would attest to the qualifications of the Installer (i.e., The Istre Company). The geomembrane Manufacturer would also be available to provide technical support to The Istre Company, if needed, during installation.

GeoSyntec therefore suggests that in accordance with the specifications, the Construction Manager may waive the 10,000,000 square footage requirements provided that Mr. Istre is directly involved in the installation of the polyethylene geomembrane for the Cell 3 project. It is also suggested that FDF consider requesting from The Istre Company, through Petro Environmental Technologies, Inc. (Petro), a warranty on geomembrane installation (workmanship) as well as a bond to address any liability associated with completion of the Cell 3 liner installation.

Should you have any questions or require additional information, please do not hesitate to contact me.

* * * * *

Copies to: Jim Jenkins (FDF Engineering)
Mike Godber (FDF QA)
Jim Burnett (GeoSyntec)
GeoSyntec Project File

GQ0409-03.1/1999/FDFMEM7.DOC

DOCUMENT ROUTING SHEET
ON-SITE DISPOSAL FACILITY
PROJECT NO. 20102

-- 2739

Date: 7/6/99

Project/Contract/P.O. Name OSDF Phase II Project/Contract/P.O. No. FSC 614A

Do[illegible] Title

Review the attached Document/Submittal/DCN and return to: Jenkins DUE DATE July 13

Submittal/DCN No. 02770-2 Rev. 0 Date: 7/1/99 Submittal/DCN Title Installation Sched for Option A List of 10 Completed Facilities

Routing Sequence	Reviewing Discipline	Review To Be Completed By	Review Completed By	Document/DCN Approved	Document/DCN Disapproved	Sumittal Status "A"	"B"	"C"	"10"	Remarks
(1) Reviewer:	Engineering Klimek	Van Arsdale					X	~~X~~	APK	NEED MORE
Reviewer:	Construction									DOCUMENTATION ON
Reviewer:	Safety									Experience. K Wrek
(2) Reviewer:	Quality Godber					X				CONCUR WITH GM ACCEPTANCE 7/7/99
Reviewer:	Procurement									
Reviewer:	Project Controls									
Reviewer:	Envir. Compliance									
Reviewer:	Proj. Manager									
Reviewer:	Estimating									
Rev[illegible]	Title III A-E									
Reviewer:										
Reviewer:										

Special Instruction/Additional Comments:

Document Originator/DCN Requester: Petro

Sent to ECDC: Date:

Submittal/DCN Sent to Contractor: Date:

Status	Defination
A	Reviewed
B	Reviewed , proceed with work incorporating comments. Change submittal as noted and resubmit
C	Change submittal as noted and resubmitt
[illegible]	Information only

:Ud[illegible]card

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SUPPLIER DOC[illegible]NT SUBMITTAL

FDF PROJECT NOs.:	20102	X	CONTRACT NUMBER.: FSC-614A	SUBMITTAL NO.: 02605-4	REV.: 1	DATE: October 6, 1999	PAGE 1 OF 1
	20402						

FROM: PETRO ENVIRONMENTAL TECHNOLOGIES, INC.
7400 WILLEY ROAD, MAILSTOP 52-7; TRAILER NO. 504
HAMILTON, OHIO 45013-9402

SIGNATURE J. Richard Schaubaum

TO: FDF ENGINEERING/CONSTRUCTION DOCUMENT CONTROL, MS 52-7

RECEIVED BY: Melissa Lewis DATE: 10-6-99

QTY	DOCUMENT NUMBER	REV	DOCUMENT FAMILY: PRO	H&S	MED	TRG	CON	ENG	QAC	RESUBMITTAL: YES	NO	TITLE/DESCRIPTION	SUBMITTAL TYPE: CFC	INF	ASSOCIATED SPECIFICATION	SUBMITTAL ACTION: A	B	C
6	614-OPTA-064A.2	1							X	X		Documentation of Training/Certification for Option A. Work	X		02605-1.04.C	X		

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RECEIVED
OCT 07 1999
R Eusman

DISTRIBUTION

REVIEW DISTRIBUTION: Distribution	MS	Distribution	MS	CFC DISTRIBUTION: Distribution	MS	Distribution	MS
Mike Godber (Approver)	64	ECDC	52-7	Jim Jenkins	64	OSDF Station	64
Bruce Schweitzer	64	Vern Taylor	52-0	Bruce Schweitzer	64	ECDC	52-7
Jim Jenkins	64			Mike Godber	64	Vern Taylor	52-0
Jim Burnett	38			Jim Burnett	38		

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RECEIVED BY: K Bartholomew DATE: 10/12/99 NO COMMENTS X COMMENTS ATTACHED ____
(SIGN/DATE AND RETURN A COPY TO ECDC, MS 52-7)

RESUBMIT ENTIRE DOCUMENT NUMBER AS: _____ (REV. #) OR RESUBMIT CHANGED DOCUMENT PAGES AS: DOC. NO.: _____ (REV. #) PCN: _____ (PCN. #)

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COMMENTS

ORIGINAL

SUBMITTAL ACTION CODE: (BY SUPPLIER)
CFC - CERTIFIED FOR CONSTRUCTION
INF - INFORMATION/RECORD
"X" APPROPRIATE SUBMITTAL ACTION ABOVE

SUPPLIER ACTION CODE: (ECDC) SUPPLIER ACTION ABOVE
A - ACCEPTED DOCUMENT - CONFORMS WITH REQUIREMENTS
B - MINOR COMMENTS - REVISE & RESUBMIT AS CFC OR INF
C - REVISE & RESUBMIT

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FLUOR DANIEL FERNALD

SOUTHERN WASTE UNITS (SWUs) EXCAVATION/
ON-SITE DISPOSAL FACILITY (OSDF) (PHASE II) PROJECT
Project Nos. 20102/20402; Contract No. FSC-614

SUPPLIER SUBMITTAL No.: 20102-614A-02605-4 (Rev. 1)

DOCUMENTATION OF TRAINING/ CERTIFICATION FOR OPTION A. WORK
Sections 02605-1.04.C

Document No. 614-OPTA-064A.2 (Rev. 1)

October 6, 1999

Fernald Site Office: P.O. Box 249 • Ross, Ohio 45061-0249 • 513.648.3402 • Fax 648.3407
7851 Palace Drive • Cincinnati, Ohio 45249 • 513.489.6789 • Fax 489.7208
8200 Seville Road • Lodi, Ohio 44254 • 330.948.1494 • Fax 948.1933

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DOCUMENTATION OF TRAINING/

CERTIFICATION FOR JEROME VESPER

Document No. 614-OPTA-064A.2 (Rev. 1)

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F-2739

REDACTED

Chris Tucker
Petro Environmental
@ Fernald
Fax 513 648 3407

Dear Mr. Tucker

This letter is to confirm that on October 6, 1999, at your location at the Fernald plant an Electrofusion training session was held. Jerry Vesper [illegible] ith Pereo Environmental was trained in the Electrofusion process.

If any additional clarification is needed on the training session please let me know.

Sincerely Yours,

Richard J. Hart
ISCO Industries, Inc.
Regional Sales Manager

ISCO INDUSTRIES, Inc.
926 Baxter Avenue
Box 4545
Louisville, KY 40204

P 502.583.6591
F 502.584.9713
HTTP //www.isco-pipe.com

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