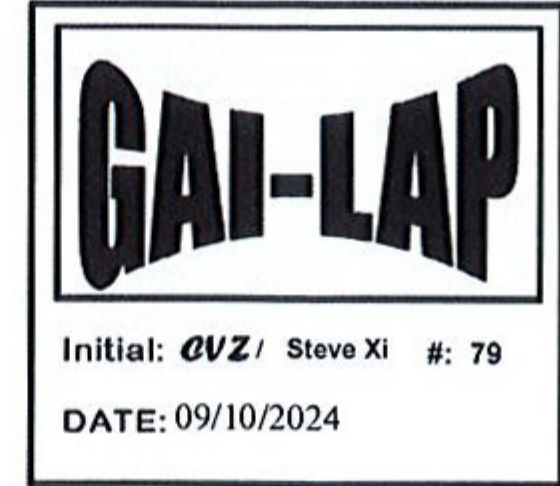




TESTING, RESEARCH, CONSULTING AND FIELD SERVICES
Austin, TX - USA | Anaheim, CA - USA | Anderson, SC - USA | Gold Coast - Australia | Suzhou - China

Sep 10th, 2024

Echo Liu
Haoyang Environmental Co., Ltd
1567 Culture Street, Yucheng National
High-Tech Industrial Development
Zone, Dezhou City, Shandong province, China



Re: FINAL LABORATORY TEST REPORT 最终实验室检测报告

Ms. Liu:

Thank you for consulting TRI Suzhou for your material testing needs.

感谢选用 TRI 苏州实验室为您检测材料

Enclosed is the **final** laboratory report for the **Conformance** testing of two (2) Smooth HDPE Geomembrane samples.

附上一份 2 个光面土工膜品的最终符合性实验室检测报告

PROJECT NAME 项目名称: HDPE Geomembrane Testing

DATE REPORTED 报告日期: Sep 10th, 2024

REFERENCE TRI JOB NO. 涉及工作编号: SCH20169

DATE RECEIVED 接收日期: Jul 20th, 2024

SAMPLE(S) SENT BY 送样人: Haoyang Environmental Co., Ltd

SAMPLE IDENTIFICATIONS 样品信息:

SAMPLE ID 样品 ID

1.0 mm Smooth HDPE Geomembrane

2.0 mm Smooth HDPE Geomembrane

TRI CONTROL NUMBER 受控编号

02390

02391

TESTS REQUIRED / PERFORMED 检测需求/检毕:

TEST METHOD 检测方法

1. ASTM D5199

2. ASTM D1505

3. ASTM D6693

4. ASTM D1004

5. ASTM D4833

6. ASTM D4218

7. ASTM D5596

8. ASTM D5397

DESCRIPTION 描述

Thickness 厚度

Density 密度

Tensile Property 拉伸强度

Tear Resistance 直角撕裂

Puncture Resistance 穿刺强度

Carbon Black Content 炭黑含量

Carbon Black Dispersion 炭黑分散度

Notched Constant Tensile Load 耐环境应力开裂

TEST RESULTS 检测结果: The test results are summarized in the attached Table(s) 1-2. 检测结果参见附表 1-2.

Respectfully, 此致

TRI Geosynthetic Testing and Services (Suzhou) Co., Ltd.

Steve Xi
Quality Assurance

Chad Blackwell
General Manager

Signatures are on file

It shall be noted that the sample/s tested is/are believed to be true representatives of the material produced under the designation herein stated. In addition, the attached laboratory tests results are considered indicative only of the quality of samples/specimens that were actually tested. The appropriate test methods hereby employed are based on the current and accepted industry practices. TRI neither accepts responsibility for nor makes claims to the intended final use and purpose of the material. The test data and all associated project information shall be held confidential and not to be reproduced and/or disclosed to other parties except in full and with prior written approval from the client or any pertinent entity duly authorized by the respective client. It is our policy to keep physical records of each job for five (5) years commencing from the date of receipt of the samples and keep its corresponding electronic file for seven (7) years. **Retained conformance samples are disposed of after one (1) month.** On the other hand, should you need us to keep them at a longer period, please advise us in writing.



TESTING, RESEARCH, CONSULTING AND FIELD SERVICES
Austin, TX - USA | Anaheim, CA - USA | Anderson, SC - USA | Gold Coast - Australia | Suzhou - China

需说明的是，所送检样品会被认为是根据设计所生产材料的真实代表。另外，所附实验室检测结果仅表明所检测样品质量。此次合适的检测方法的采用是根据目前通用行业实际情况。TRI 既不对样品接受负责也不对材料的最终使用目的及用途发表声明。检测数据及相关项目信息为商业秘密，不得复制，非经客户书面同意或授权同意不得外泄给其他机构。我司自接收样品日起保存纸质记录 5 年，保存相应电子记录 7 年。样品留存 1 个月 after 废弃。如需保存更长时间，请以书面方式提前通知

6 Pages Total (including this sheet)



TABLE 1.

MATERIAL PROPERTIES

材料属性

CLIENT 客户: Haoyang Environmental Co., Ltd
PROJECT 项目: HDPE Geomembrane Testing

Date Received 接收日期: 2024.07.20

Date Reported 报告日期: 2024.09.10

Client Sample ID 样品编号: 1.0mm Smooth HDPE Geomembrane

Material Description 材料描述: 1.0mm Smooth HDPE Geomembrane

QC'd By 质量担当: *State*

TRI Job No. 工作编号: SCH20169

TRI Control No. 受控编号: 02390

SPECIMENS 样品

METHOD	DESCRIPTION	1	2	3	4	5	6	7	8	9	10	Avg. 平均值	Std. Dev. 标准偏差	Min 最小值	Max 最大值	Proj. Specs. 项目指标 (See Note 1)
ASTM D5199	Thickness 厚度 (mm) Apparatus: Dead weight dial micrometer with 6.35mm (0.250in) dia. pressure foot and a pressure of 43.10 kPa (6.25psi) 仪器: 测微计带 6.35mm 直径的压脚, 并由 65.8g-509g 重的压脚提供 43.10kPa 压力 provided by a 65.8gm - 658gm weight. Loading time: 5 sec. Specimen Size: 4" x 4" 加载时间: 5 秒 样品尺寸: 101.6mm x 101.6mm	1.17	1.00	1.08	1.08	1.14	1.17	1.18	1.10	1.07	1.14	1.12	0.06	1.00	1.18	1.00
ASTM D1505	Density 密度 (grams/cm ³) 0.9465 0.9462 0.9462											0.9463	0.0002	0.9462	0.9465	0.94
ASTM D6693 Type IV IV型	Tensile Properties 拉伸性能: Test Specimens: Type IV, Width of narrow section: 0.25"(6.4mm), Length of narrow section: 1.3"(33mm), Width Overall: 0.75"(19.1mm). 检测样品: IV型, 狭长部分宽度: 0.25"(6.4mm), 狭长部分长度: 1.3"(33mm), 总体宽度: 0.75"(19.1mm) Length Overall: 4.5"(114mm) Conditioning: Conducted test in standard laboratory atmosphere of 21 ± 2 °C (70 ± 3.6 °F), and 总体长度: 4.5"(114mm) 条件: 测试条件在标准实验室大气环境 21 ± 2 °C 相对湿度: 60 ± 10% 下进行. 60 ± 10% relative humidity. CRE Type Tensile Testing Machine (YT010P) is set for rate of Separation: 2"/min (HDPE) 设定 CRE 拉伸仪 (YT010P) 分离速率: 2"/min (HDPE) 夹具初始距离: 2.5"(63mm); 传感器量程: 100lbs(500 N) Initial gauge length: 2.5" (63mm). Load full scale: 100lbs(500 N)															
沿机方向	Tensile Strength at Yield 屈服拉伸强度 (kN/m)	MD 18	20	20	19	18						19	1	18	20	15
非沿机方向		TD 21	20	19	18	19						20	1	18	21	
沿机方向	Elongation at Yield 屈服延伸率 (percent 百分率)	MD 16	19	18	20	19						18	2	16	20	12
非沿机方向		TD 18	16	17	18	16						17	1	16	18	
沿机方向	Tensile Strength at Break 断裂强度 (kN/m)	MD 34	39	37	39	33						36	3	33	39	27
非沿机方向		TD 40	41	40	34	34						38	4	34	41	
沿机方向	Elongation at Break 断裂延伸率 (percent 百分率)	MD 769	792	757	855	727						780	48	727	855	700
非沿机方向		TD 805	848	887	769	744						810	58	744	887	

Gauge Length 标长 = 2.0 in. (GRI-GM13 Mod)

(Continued on next page)

(Sheet 1 of 2)



TESTING, RESEARCH, CONSULTING AND FIELD SERVICES
Austin, TX - USA | Anaheim, CA - USA | Anderson, SC - USA | Gold Coast - Australia | Suzhou - China

TABLE 1.

MATERIAL PROPERTIES

材料属性

CLIENT 客户: Haoyang Environmental Co., Ltd

PROJECT 项目: HDPE Geomembrane Testing

Date Received 接收日期: 2024.07.20

Date Reported 报告日期: 2024.09.10

Client Sample ID 样品编号: 1.0mm Smooth HDPE Geomembrane

Material Description 材料描述: 1.0mm Smooth HDPE Geomembrane

QC'd By 质量担当: *Steve*

TRI Job No. 工作编号: SCH20169

TRI Control No. 受控编号: 02390

SPECIMENS 样品

METHOD	DESCRIPTION	1	2	3	4	5	6	7	8	9	10	Avg.	Std. Dev.	Min	Max	Proj. Specs.
ASTM D1004	Tear Resistance 撕裂强度 (N)															
Die C	Set GRE Type tensile testing machine (YT010 P) constant rate of separation 2" (50mm)/min, initial gauge length: 1" (25.4mm). 设定拉伸仪 (YT010 P) 速率为 2" (50mm)/min, 夹具初始距离: 1" (25.4mm). 传感器为 100lbs (500 N). 样本由蝶形模具裁取.															
模具C	Load full scale: 100lbs (500 N). Specimen was cut by butterfly die.															
沿机方向	MD	150	151	156	154	157	159	153	152	156	151	154	3	150	159	125
非沿机方向	TD	151	156	134	134	144	149	147	152	151	147	146	7	134	156	
ASTM D4833	Puncture Resistance 穿刺强度 (N)															
	Specimens were treated as directed in Test Method D4833. They were clamped without tension between circular plates of a ring clamp attachment secured in the tensile machine. Test specimens extended to or beyond the outer edges of the clamping plates. 样品按检测方法 D4833 的指导进行检测, 在用圆环夹具夹在样品时不要有任何的张力. 夹具牢固的固定在拉伸仪上, 待检样品需超过玻璃出圆环夹具的边缘.															
ASTM D4218	Carbon Content/碳含量	522	532	495	507	536	531	521	514	482	463	494	32	434	536	320
	Apparatus 仪器: Muffle Furnace 马弗炉															
	2.42 2.44															
ASTM D5596	Carbon Black Dispersion 炭黑分散度 (category rating per reference chart PCN: 12-455960-38等级范围参照图PCN)	1	1	1	1	1	1	1	1	1	1	2.43	0.01	2.42	2.44	2-3
ASTM D5397**	Notched Constant Tensile Load /抗应力裂纹 (hours/小时)	1	1	1	1	1	1	1	1	1	1	1	N/A	N/A	N/A	Cat.1/Cat.2
Single Point	Yield Stress at Room Temperature per ASTM D6693: 2984 psi															
单点	屈服压力在室温下参照 ASTM D6693															
	30% of the Yield Stress obtained was used in the NCTL test: 895 psi															
	30% 的获得屈服压力被用来进行 NCTL 检测															
	>500 >500 >500 >500 >500 >500											>500	N/A	N/A	N/A	500

** - Tested at TRI Texas
End of Table 1

(Sheet 2 of 2)

Note 1 : The Project Specification values reflected herein were provided by the Client. 项目指标由客户提供

By accepting the data and results presented on this report, the Client agrees to limit the liability of TRI SUZHOU from Client and all other related parties for any claims on issues, due to the use of this data, to the cost respective of the tests presented in this report; and the Client agrees to indemnify and hold harmless TRI SUZHOU from and against all liabilities in excess of the aforementioned limits.
通过接受了这篇报告中数据和结果, 客户同意限定TRI 苏州来自客户和其他相关方的责任. 所有因使用这些数据索赔问题, 报告中提出的各项检测的成本, 客户同意赔偿并承担后果, TRI 苏州不承担超过上述限额的所有责任。



TESTING, RESEARCH, CONSULTING AND FIELD SERVICES
Austin, TX - USA | Anaheim, CA - USA | Anderson, SC - USA | Gold Coast - Australia | Suzhou - China

TABLE 2.
MATERIAL PROPERTIES
材料属性
CLIENT 客户: Haoyang Environmental Co., Ltd
PROJECT 项目: HDPE Geomembrane Testing

Date Received 接收日期: 2024.07.20
Date Reported 报告日期: 2024.09.10
Client Sample ID 样品编号: 2.0mm Smooth HDPE Geomembrane
Material Description 材料描述: 2.0mm Smooth HDPE Geomembrane

QC'd By 质量担当: *Sam*
TRI Job No. 工作编号: SCH20169
TRI Control No. 受控编号: 02391

SPECIMENS 样品												Proj. Specs. 项目指标 (See Note1)						
		1	2	3	4	5	6	7	8	9	10	Avg. 平均值	Std. Dev. 标准偏差	Min 最小值	Max 最大值			
METHOD	DESCRIPTION																	
ASTM D5199	Thickness 厚度 (mm)	Apparatus: Dead weight dial micrometer with 6.35mm (0.250in) dia presser foot and a pressure of 43.10 kPa (6.25psi) 仪器: 测微计带 6.35mm 直径的压脚, 并由 65.8g-509g 重的压脚提供 43.10kPa 压力 provided by a 65.8gm - 658gm weight. Loading time: 5 sec Specimen Size: 4" x 4" 加载时间: 5 秒 样品尺寸: 101.6mmx101.6mm																
		2.12	2.15	2.16	2.13	2.15	2.06	2.14	2.05	2.00	2.07							
ASTM D1505	Density 密度 (grams/ cm. ³)	0.9460	0.9457	0.9455											2.10	0.05	2.00	2.00
ASTM D6693	Tensile Properties 拉伸性能:																	
Type IV		Test Specimens: Type IV, Width of narrow section: 0.25"(6.4mm), Length of narrow section: 1.3"(33 mm), Width Overall: 0.75"(19.1 mm), 拉伸样品: IV 型, 狭长部分宽度: 0.25"(6.4mm), 狭长部分长度: 1.3"(33mm), 总体宽度: 0.75" (19.1mm) Length Overall: 4.5"(114mm) Conditioning: Conducted test in standard laboratory atmosphere of 21 +/-2 °C (70 +/-3.6° F), and 总体长度: 4.5" (114mm) 条件: 测试条件在标准实验室大气压环境温度 21 ± 2 °C 相对湿度: 60 +/-10% 下进行. 60 +/-10 % relative humidity. CRE Type Tensile Testing Machine (YT010P) is set for rate of Separation: 2"/min (HDPE) 设定 CRE 拉伸仪 (YT010P) 分离速率: 2"/min (HDPE) 夹具初始距离: 2.5"(63 mm); 传感器量程: 100lbs(500 N) Initial gauge length: 2.5" (63mm). Load full scale: 100lbs(500 N)																
	Tensile Strength at Yield 屈服拉伸强度 (kN/m)	MD 38	37	39	37	37	37	37	37	37	37	38	1	37	39	29		
沿机方向		TD 39	37	37	38	40	40	40	40	40	40	38	1	37	40			
非沿机方向	Elongation at Yield 屈服延伸率 (percent 百分率)	MD 21	20	19	20	19	20	19	19	19	19	20	1	19	21	12		
沿机方向		TD 19	18	18	19	16	16	16	16	16	16	18	1	16	19			
非沿机方向	Tensile Strength at Break 断裂强度 (kN/m)	MD 68	71	71	68	70	70	70	70	70	70	70	2	68	71	53		
沿机方向		TD 64	68	65	68	70	70	70	70	70	70	67	2	64	70			
非沿机方向	Elongation at Break 断裂延伸率 (百分比 percent)	MD 857	926	885	896	888	888	888	888	888	888	891	25	857	926	700		
沿机方向		TD 846	923	888	928	915	915	915	915	915	915	900	34	846	928			
非沿机方向		Gauge Length 标长 = 2.0 in. (GRI-GM13 Mod)																

(Continued on next page) (Sheet 1 of 2)



TESTING, RESEARCH, CONSULTING AND FIELD SERVICES
Austin, TX - USA | Anaheim, CA - USA | Anderson, SC - USA | Gold Coast - Australia | Suzhou - China

TABLE 2.
MATERIAL PROPERTIES
材料属性

CLIENT 客户: Haoyang Environmental Co., Ltd
PROJECT 项目: HDPE Geomembrane Testing

Date Received 接收日期: 2024.07.20
Date Reported 报告日期: 2024.09.10
Client Sample ID 样品编号: 2.0mm Smooth HDPE Geomembrane
Material Description 材料描述: 2.0mm Smooth HDPE Geomembrane

QC'd By 质量担当: *State*
TRI Job No. 工作编号: SCH20169
TRI Control No. 受控编号: 02391

SPECIMENS样品												Proj. Specs. 项目指标 (See Note1)			
METHOD	DESCRIPTION	1	2	3	4	5	6	7	8	9	10	Avg. 平均值	Std. Dev. 标准偏差	Min 最小值	Max 最大值
ASTM D1004 Die C 模具C	Tear Resistance 撕裂强度 (N) Set CRE Type tensile testing machine(YT010 P) constant rate of separation 2" (50mm)/min, initial gauge length: 1 " (25.4mm). 设定拉伸仪 (YT010 P) 速率为 2" (50mm)/min, 夹具初始距离: 1"(25.4mm). 传感器为 100lbs(500 N). 样本由蝶形模具截取. Load full scale: 100lbs(500 N). Specimen was cut by butterfly die.														
沿机方向	MD	316	308	325	323	317	314	317	314	317	321	317	5	308	325
非沿机方向	TD	312	317	316	317	311	310	304	312	317	316	313	4	304	317
ASTM D4833	Puncture Resistance 穿刺强度 (N) Specimens were treated as directed in Test Method D4833. They were clamped without tension between circular plates of a ring clamp attachment secured in the tensile machine. Test specimens extended to or beyond the outer edges of the clamping plates. 样品按检测方法 D4833 的指导进行检测, 在用圆盘环形夹具夹住样品时不要有任何的张力。 夹具牢固的固定在拉伸仪上, 待检样品需超过或露出圆盘夹具的边缘。														
ASTM D4218	Carbon Content/碳含量 Apparatus 仪器: Muffle Furnace 马弗炉	793	774	801	801	785	795	800	768	773	771	786	13	768	802
		768	790	781	802	794									
ASTM D5596	Carbon Black Dispersion 炭黑分散度 (category rating per reference chart PCN: 12-455960-38等级范围参照图PCN)	2.05	2.08									2.06	0.02	2.05	2.08
ASTM D5397** Single Point 单点	Notched Constant Tensile Load /抗应力裂纹 (hours小时) Yield Stress at Room Temperature per ASTM D6693: 2507 psi 屈服压力在室温下参照 ASTM D6693 30% of the Yield Stress obtained was used in the NCTL test: 752 psi 30% 的获得屈服压力被用来进行 NCTL 检测	1	1	1	1	1	1	1	1	1	1	1	N/A	N/A	N/A
		>500	>500	>500	>500	>500	>500	>500	>500	>500	>500	>500	N/A	N/A	N/A

** - Tested at TRI Texas
End of Table 2

(Sheet 2 of 2)

Note 1: The Project Specification values reflected herein were provided by the Client. 项目指标由客户提供

By accepting the data and results presented on this report, the Client agrees to limit the liability of TRI SUZHOU from Client and all other related parties for any claims on issues, due to the use of this data, to the cost respective of the tests presented in this report; and the Client agrees to indemnify and hold harmless TRI SUZHOU from and against all liabilities in excess of the aforementioned limits.
通过接受了这篇报告中数据和结果, 客户同意限定 TRI 苏州来自客户和其他相关方的责任, 所有其因使用这些数据索赔问题, 报告中提出的各项检测的成本, 客户同意赔偿并承担后果, TRI 苏州不承担任何超过上述限额的所有责任。