

SGI TESTING SERVICES

A GEORGIA LIMITED LIABILITY COMPANY

27 June 2010

Mr. Jose Urrutia
Closure Turf, LLC
3005 Breckinridge Blvd., Suite 240
Duluth, Georgia 3096

Subject: Laboratory Test Results Transmittal
Interface Direct Shear Testing
Closure Turf Cover System

Dear Mr. Urrutia,

SGI Testing Services, LLC (SGI) is pleased to present the attached test results for the above-mentioned project. The note section below addresses sample preparation, sample disposal and a disclosure statement.

SGI appreciates the opportunity to provide laboratory testing services to Closure Turf, LLC. Should you have any questions regarding the attached document(s), or if you require additional information, please do not hesitate to contact the undersigned.

Sincerely,

Zehong Yuan, Ph.D., P.E.
Laboratory Manager

Attachments

NOTES:

- (1) Unless otherwise noted in the test results the sample(s)/specimen(s) were prepared in accordance with the applicable test standards or generally accepted sampling procedures.
- (2) Contaminated/chemical samples and all related laboratory generated waste (i.e., test liquids, PPE, absorbents, etc.) will be returned to the client or designated representative(s), at the client's cost, within 60 days following the completion of the testing program, unless special arrangements for proper disposal are made with SGI.
- (3) Materials that are not contaminated will be discarded after test specimens and archived specimens are obtained. Archived specimens will be discarded 30 days after the completion of the testing program, unless long-term storage arrangements are specifically made with SGI.
- (4) The reported results apply only to the materials and test conditions used in the laboratory testing program. The results do not necessarily apply to other materials or test conditions. The test results should not be used in engineering analysis unless the test conditions model the anticipated field conditions. The testing was performed in accordance with general engineering testing standards and requirements. The reported results are submitted for the exclusive use of the client to whom they are addressed.

SGI10007.REPORT.2010.06

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LILBURN, GA 30048-2427

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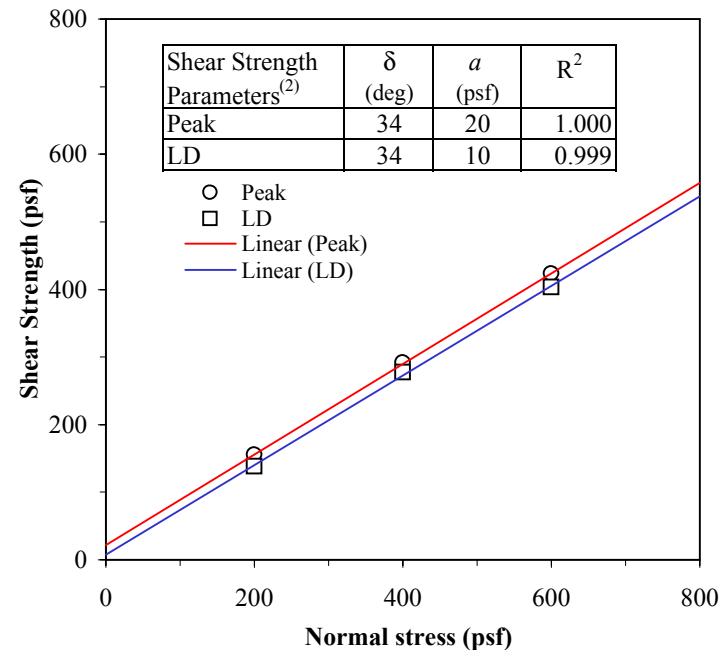
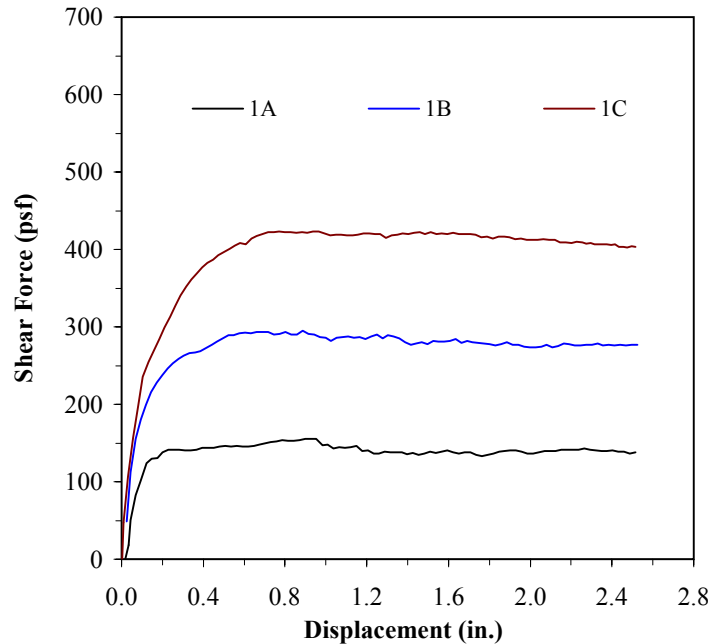
PHONE: 770.931.8222 FAX: 770.931.8240

ATTACHMENT A

TEST RESULTS

**CLOSURE TURF LLC -LANDFILL COVER SYSTEM
INTERFACE DIRECT SHEAR TESTING (ASTM D 5321)**

Upper Shear Box: Concrete sand nominally compacted/
Artificial grass with grass side (green yarns) side up
Lower Shear Box: Concrete sand



Test No.	Shear Box Size (in. x in.)	Normal Stress (psf)	Shear Rate (in./min)	Soaking		Consolidation		Concrete Sand			Upper Soil			GCL		Shear Strengths		Failure Mode	
				Stress (psf)	Time (hour)	Stress (psf)	Time (hour)	γ_d (pcf)	ω_i (%)	ω_f (%)	γ_d (pcf)	ω_i (%)	ω_f (%)	ω_i (%)	ω_f (%)	τ_p (psf)	τ_{LD} (psf)		
1A	12 x 12	200	0.04	200	24	-	-	-	-	-	-	-	-	-	-	-	155	138	(1)
1B	12 x 12	400	0.04	400	24	-	-	-	-	-	-	-	-	-	-	-	292	277	(1)
1C	12 x 12	600	0.04	600	24	-	-	-	-	-	-	-	-	-	-	-	423	403	(1)

NOTES:

- (1) Sliding (i.e., shear failure) occurred at the interface between the upper concrete sand and grass side of the artificial grass.
- (2) The reported total-stress parameters of friction angle and adhesion were determined from a best-fit line drawn through the test data. Caution should be exercised in using these strength parameters for applications involving normal stresses outside the range of the stresses covered by the test series. The large-displacement (LD) shear strength was calculated using the shear force measured at the end of the test.

DATE OF TEST: 4/27/2010

FIGURE NO. C-1

PROJECT NO. SGI10007

DOCUMENT NO.

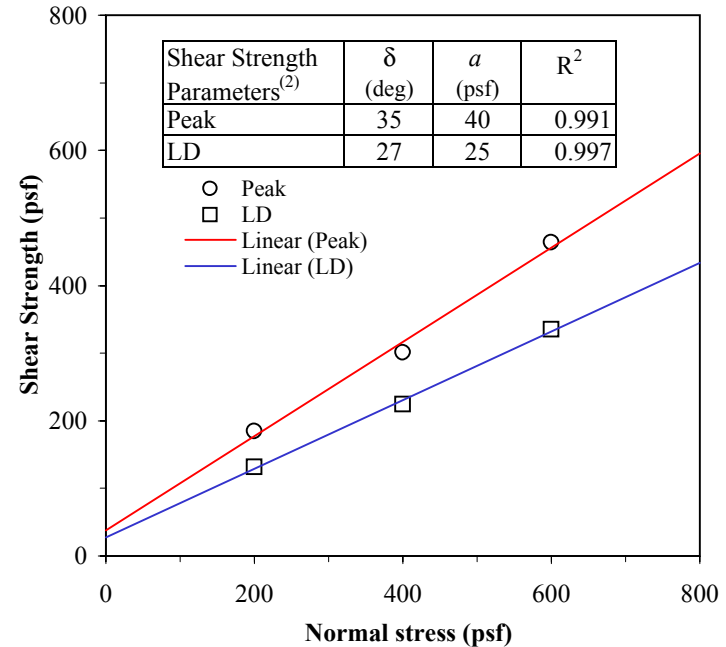
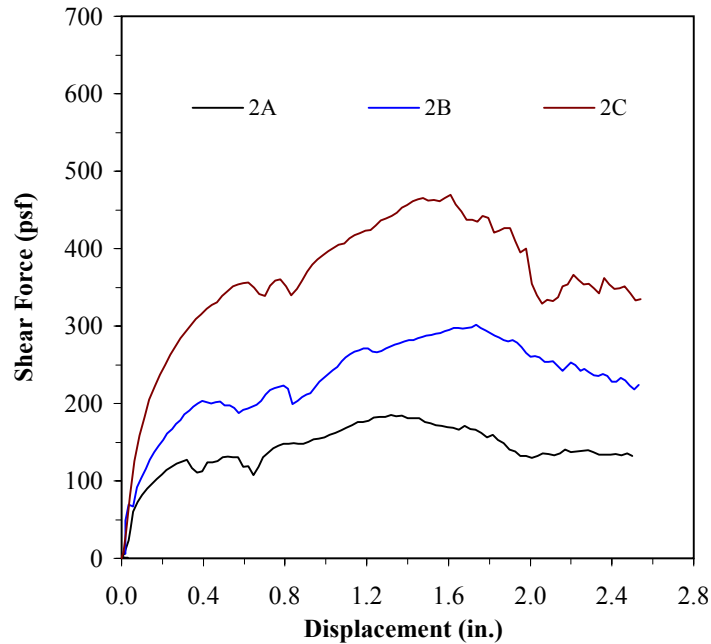
FILE NO.



SGI TESTING SERVICES, LLC

**CLOSURE TURF LLC -LANDFILL COVER SYSTEM
INTERFACE DIRECT SHEAR TESTING (ASTM D 5321)**

Upper Shear Box: Concrete sand nominally compacted
Artificial grass with grass side (green yarns) up/
Agru 50 mil LLDPE Super Gripnet geomembrane with studs side up/
Lower Shear Box: Concrete sand



Test No.	Shear Box Size (in. x in.)	Normal Stress (psf)	Shear Rate (in./min)	Soaking		Consolidation		Concrete Sand			Upper Soil			GCL		Shear Strengths		Failure Mode
				Stress (psf)	Time (hour)	Stress (psf)	Time (hour)	γ_d (pcf)	ω_i (%)	ω_f (%)	γ_d (pcf)	ω_i (%)	ω_f (%)	ω_i (%)	ω_f (%)	τ_p (psf)	τ_{LD} (psf)	
2A	12 x 12	200	0.04	200	24	-	-	-	-	-	-	-	-	-	-	185	132	(1)
2B	12 x 12	400	0.04	400	24	-	-	-	-	-	-	-	-	-	-	302	224	(1)
2C	12 x 12	600	0.04	600	24	-	-	-	-	-	-	-	-	-	-	464	335	(1)

NOTES:

- (1) Sliding (i.e., shear failure) occurred at the interface between the geotextile of the artificial grass and studs side of the geomembrane.
- (2) The reported total-stress parameters of friction angle and adhesion were determined from a best-fit line drawn through the test data. Caution should be exercised in using these strength parameters for applications involving normal stresses outside the range of the stresses covered by the test series. The large-displacement (LD) shear strength was calculated using the shear force measured at the end of the test.

DATE OF TEST: 4/27/2010

FIGURE NO. C-2

PROJECT NO. SGI10007

DOCUMENT NO.

FILE NO.



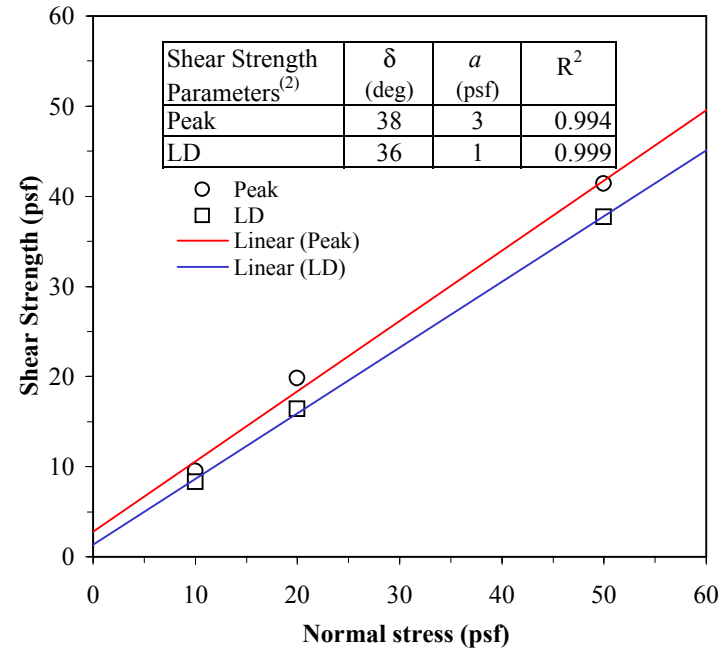
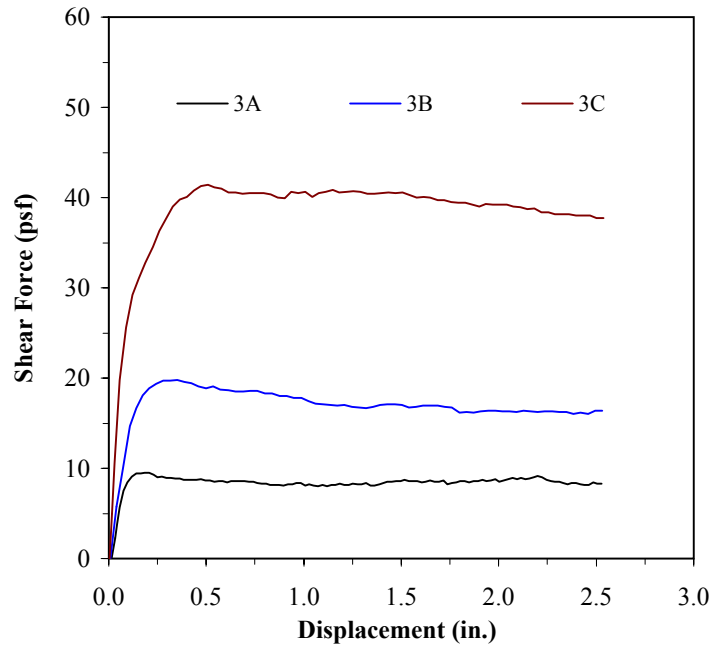
SGI TESTING SERVICES, LLC

ATTACHMENT B

TEST RESULTS (LOW NORMAL STRESS)

**CLOSURETURF LLC -LANDFILL COVER SYSTEM
INTERFACE DIRECT SHEAR TESTING (ASTM D 5321)**

Upper Shear Box: Concrete sand nominally compacted/
Artificial grass with grass side (green yarns) side up
Lower Shear Box: Concrete sand



Test No.	Shear Box Size (in. x in.)	Normal Stress (psf)	Shear Rate (in./min)	Soaking		Consolidation		Lower Soil			Upper Soil			GCL		Shear Strengths		Failure Mode	
				Stress (psf)	Time (hour)	Stress (psf)	Time (hour)	γ_d (pcf)	ω_i (%)	ω_f (%)	γ_d (pcf)	ω_i (%)	ω_f (%)	ω_i (%)	ω_f (%)	τ_p (psf)	τ_{LD} (psf)		
3A	12 x 12	10	0.04	10	24	-	-	-	-	-	-	-	-	-	-	-	10	8	(1)
3B	12 x 12	20	0.04	20	24	-	-	-	-	-	-	-	-	-	-	-	20	16	(1)
3C	12 x 12	50	0.04	50	24	-	-	-	-	-	-	-	-	-	-	-	41	38	(1)

NOTES:

- (1) Sliding (i.e., shear failure) occurred at the interface between the upper concrete sand and grass side of the artificial grass.
- (2) The reported total-stress parameters of friction angle and adhesion were determined from a best-fit line drawn through the test data. Caution should be exercised in using these strength parameters for applications involving normal stresses outside the range of the stresses covered by the test series. The large-displacement (LD) shear strength was calculated using the shear force measured at the end of the test.

DATE OF TEST: 5/15/2010

FIGURE NO. C-3

PROJECT NO. SGI10007

DOCUMENT NO.

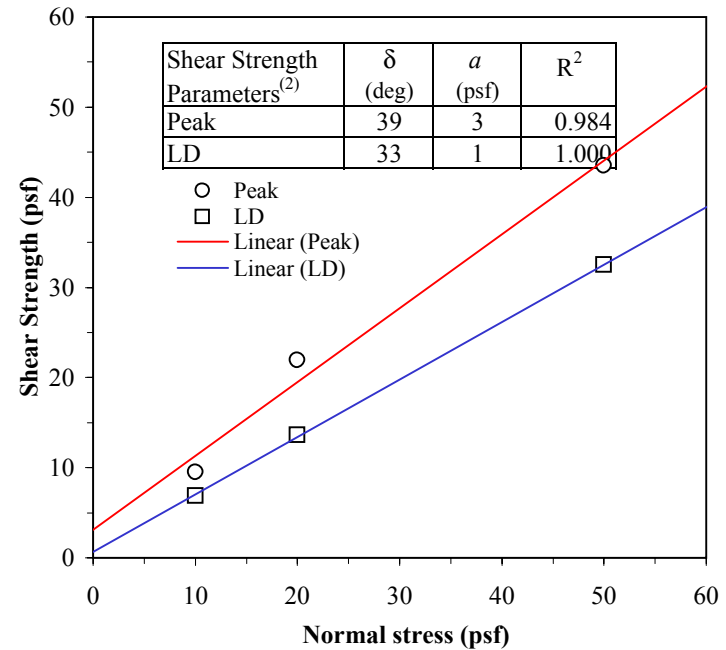
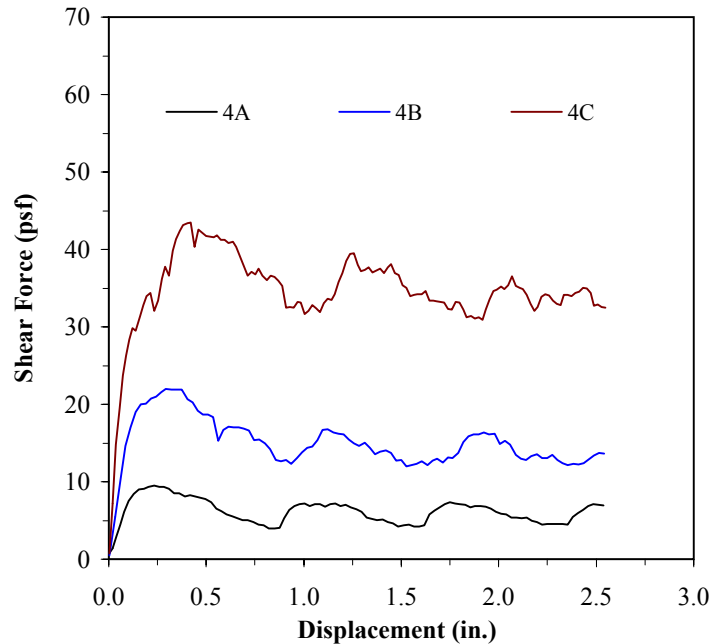
FILE NO.



SGI TESTING SERVICES, LLC

**CLOSURETURF LLC -LANDFILL COVER SYSTEM
INTERFACE DIRECT SHEAR TESTING (ASTM D 5321)**

Upper Shear Box: Concrete sand nominally compacted
Artificial grass with grass side (green yarns) up/
Agru 50 mil LLDPE Super Gripnet geomembrane with studs side up/
Lower Shear Box: Concrete sand



Test No.	Shear Box Size (in. x in.)	Normal Stress (psf)	Shear Rate (in./min)	Soaking		Consolidation		Lower Soil			Upper Soil			GCL		Shear Strengths		Failure Mode	
				Stress (psf)	Time (hour)	Stress (psf)	Time (hour)	γ_d (pcf)	ω_i (%)	ω_f (%)	γ_d (pcf)	ω_i (%)	ω_f (%)	ω_i (%)	ω_f (%)	τ_p (psf)	τ_{LD} (psf)		
4A	12 x 12	10	0.04	10	24	-	-	-	-	-	-	-	-	-	-	-	10	7	(1)
4B	12 x 12	20	0.04	20	24	-	-	-	-	-	-	-	-	-	-	-	22	14	(1)
4C	12 x 12	50	0.04	50	24	-	-	-	-	-	-	-	-	-	-	-	44	33	(1)

NOTES:

- (1) Sliding (i.e., shear failure) occurred at the interface between the geotextile of the artificial grass and studs side of the geomembrane.
- (2) The reported total-stress parameters of friction angle and adhesion were determined from a best-fit line drawn through the test data. Caution should be exercised in using these strength parameters for applications involving normal stresses outside the range of the stresses covered by the test series. The large-displacement (LD) shear strength was calculated using the shear force measured at the end of the test.

DATE OF TEST: 5/15/2010

FIGURE NO. C-4

PROJECT NO. SGI10007

DOCUMENT NO.

FILE NO.



SGI TESTING SERVICES, LLC

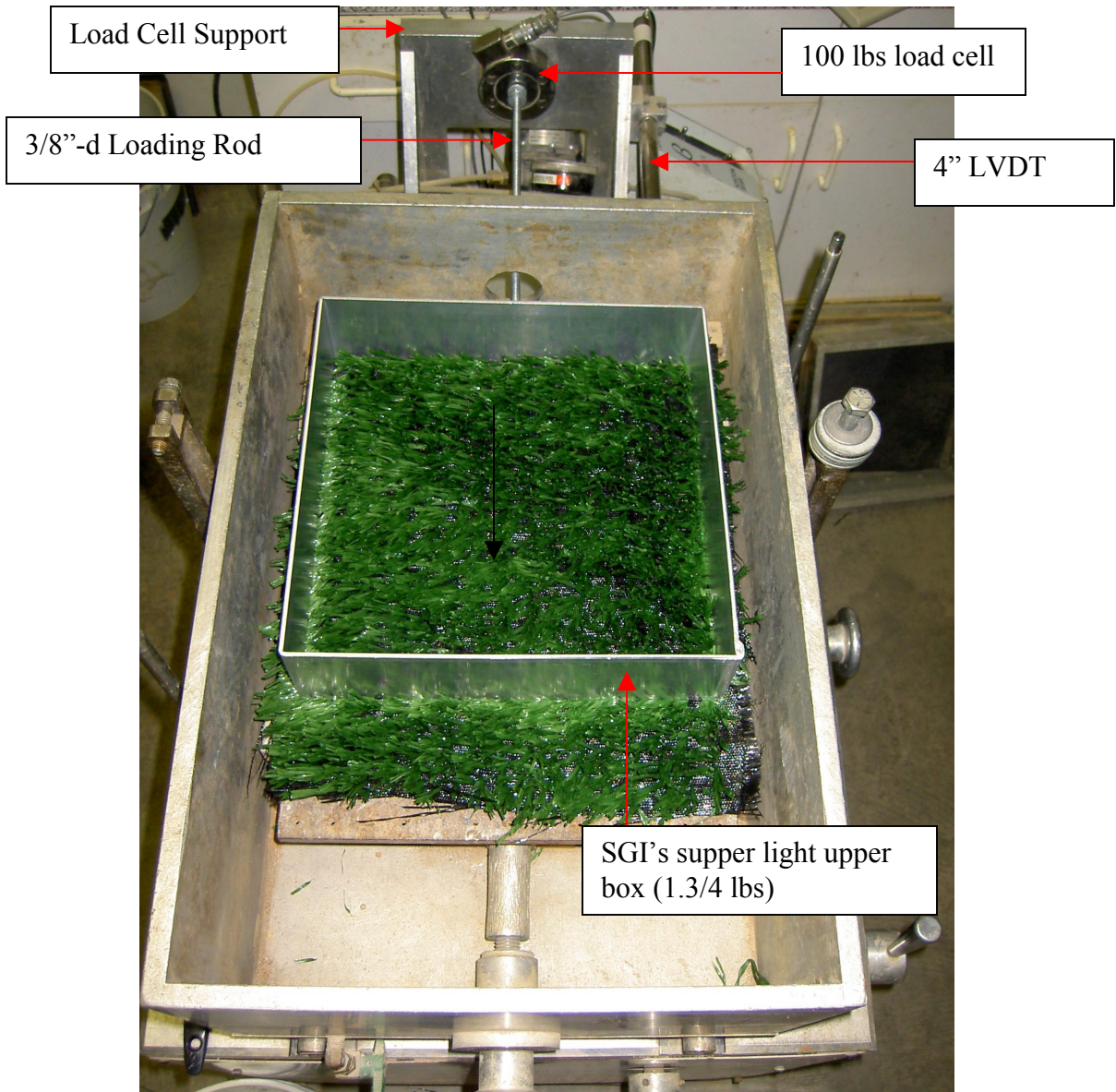


Figure 1. SGI's low pressure interface direct shear test setup.



Figure 2. Sand/grass interface test at a normal stress of 20 psf.