



SGI TESTING SERVICES

A GEORGIA LIMITED LIABILITY COMPANY

30 July 2019

Mr. Mike Orton
SRW Products, Inc.
P.O. Box 70
Princeton, MN 55371

Subject: Laboratory Test Results Transmittal
Connection Strength Testing
SRW Geogrids Connected Mid-Size Precast Blocks

Dear Mr. Orton,

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

SGI appreciates the opportunity to provide laboratory testing services to SRW Products. 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.

SGI19029.2019.03

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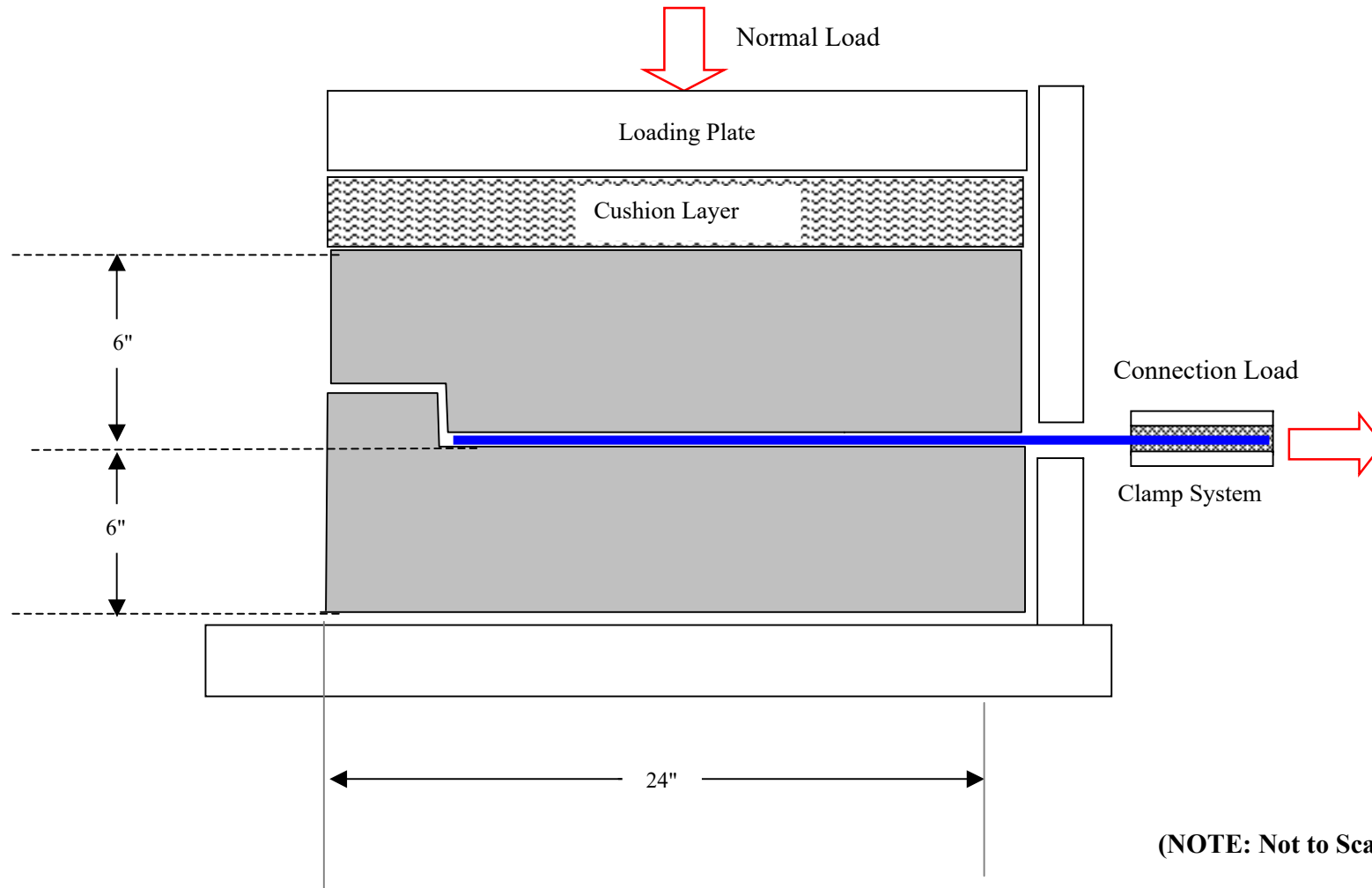
FACILITY LOCATION
4405 INTERNATIONAL BLVD., SUITE B-117
NORCROSS, GA 30093

PHONE: 770.931.8222 FAX: 770.931.8240

ATTACHMENT A

SCHEMATIC DIAGRAM AND TEST PHOTOS

**SCHEMATIC DIAGRAM OF CONNECTION TEST CROSS-SECTION
MID-SIZE PRECAST BLOCK**



DATE: 6/22/2019

FIGURE NO. A-1

PROJECT NO. SGI19029

DOCUMENT NO.

FILE NO.



SGI TESTING SERVICES, LLC



Figure A-2. Side view of top and bottom Mid-size blocks.



Figure A-3. Front view of the connection test setup.



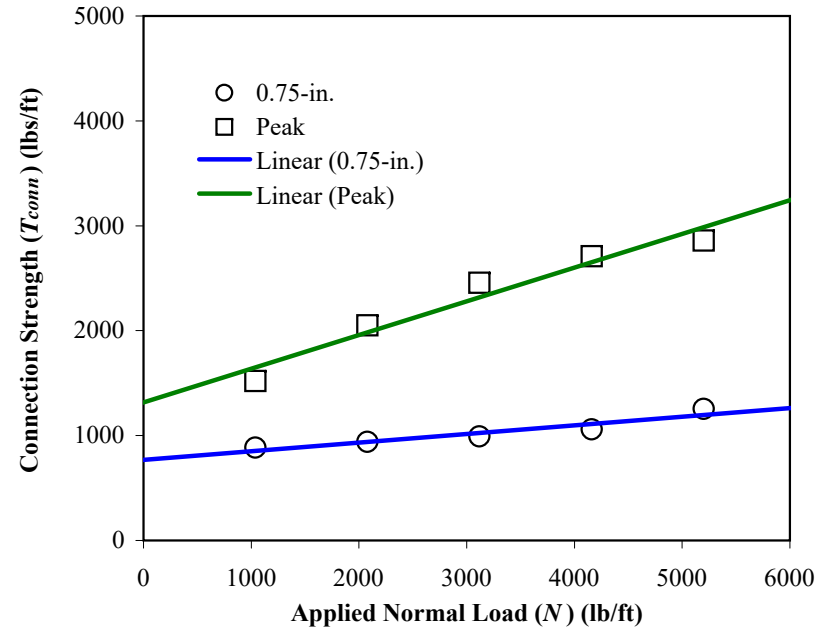
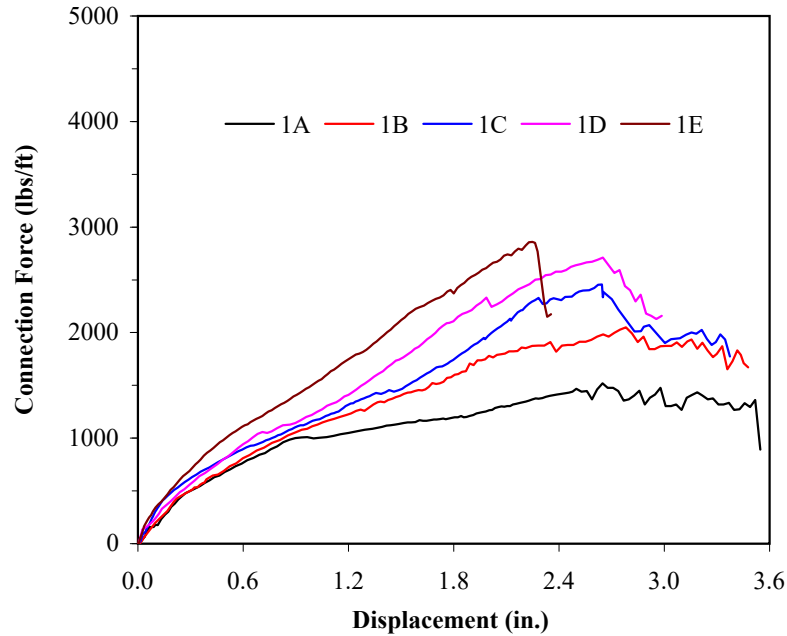
Figure A-4. Abrasion and rupture of geogrid at the completion of a test. The arrow points to direction of connection load.

ATTACHMENT B

CONNECTION TEST RESULTS

SRW PRODUCTS
CONNECTION STRENGTH TESTING (ASTM D 6638)

TEST SERIES NO. 1: SRW-7 geogrid in machine direction between two courses of Mid-Size blocks
 without AASHTO #57 stone



Test No.	Geogrid Specimen Width W (in.)	Test Normal Stress σ_n (psi)	Equivalent Normal Load N (lb/ft)	Approximate No. of Blocks n (-)	Approximate Wall Height h (ft)	0.75-in. Strength $I_{0.75-in}$ (lb/ft)	Peak Strength I_{peak} (lb/ft)	Connection Strength Equations (Strength assumed to be linearly related to N)
1A	23.0	3.6	1040			886	1518	$T_{0.75-in.} = 770 + (N) \tan (5^\circ)$ $T_{peak} = 1315 + (N) \tan (18^\circ)$
1B	23.0	7.2	2080			939	2050	
1C	23.0	10.8	3120			991	2455	
1D	23.0	14.4	4160			1057	2710	
1E	23.0	18.1	5200			1255	2859	

NOTES:

Dimensions of Block: 24" wide by 24" long and 6" high.
 Weight of Full-Size Block: .
 Approximate Unit Weight of Facing (Block):
 Failure Mode: Abrasion and/or rupture of geogrid ribs in each test.

DATE REPORTED: 6/28/2019

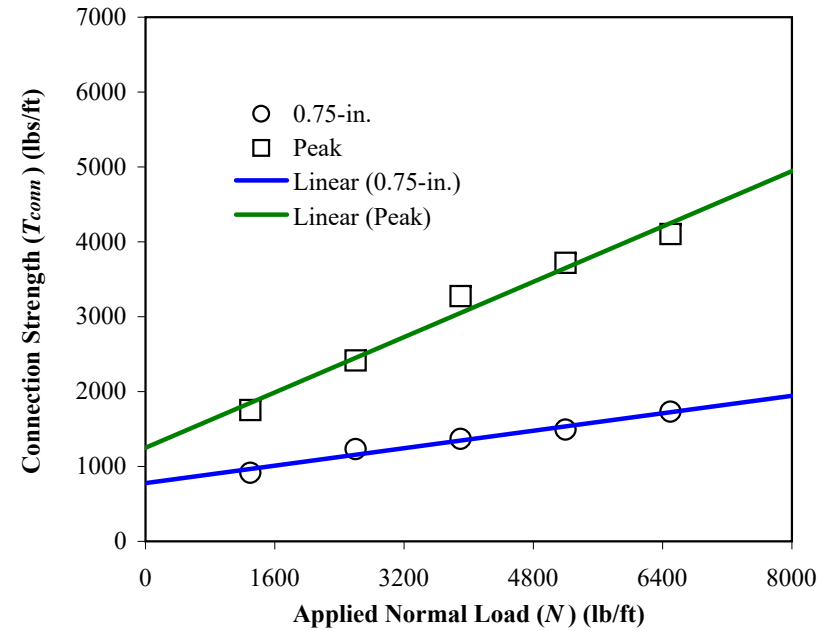
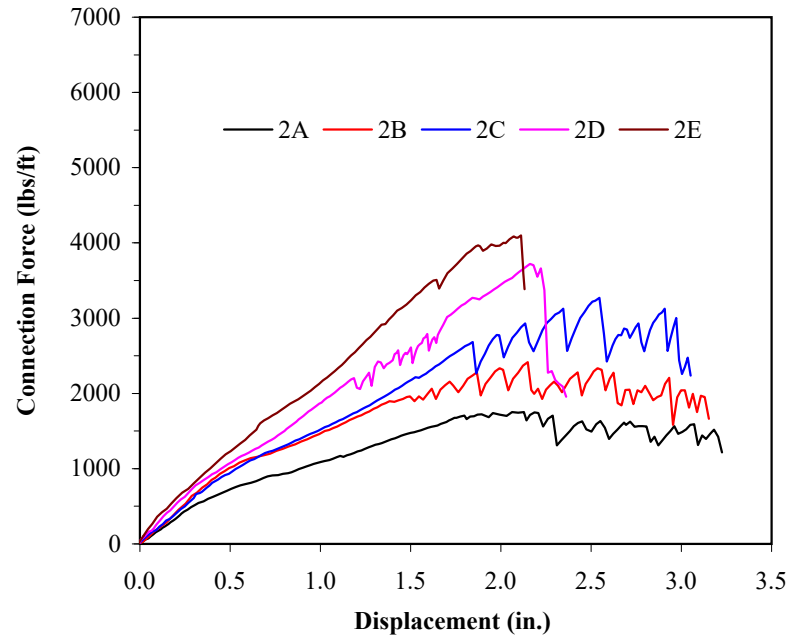
FIGURE NO. B-1
 PROJECT NO. SGI19029
 DOCUMENT NO.
 FILE NO.



SGI TESTING SERVICES, LLC

SRW PRODUCTS CONNECTION STRENGTH TESTING (ASTM D 6638)

TEST SERIES NO. 2: SRW-9 geogrid in machine direction between two courses of Mid-Size blocks
without AASHTO #57 stone



Test No.	Geogrid Specimen Width W (in.)	Test Normal Stress σ_n (psi)	Equivalent Normal Load N (lb/ft)	Approximate No. of Blocks n (-)	Approximate Wall Height h (ft)	0.75-in. Strength $T_{0.75-in}$ (lb/ft)	Peak Strength T_{peak} (lb/ft)	Connection Strength Equations (Strength assumed to be linearly related to N)
2A	23.0	4.5	1300			914	1753	$T_{0.75-in.} = 780 + (N) \tan (8 ^\circ)$ $T_{peak} = 1250 + (N) \tan (25 ^\circ)$
2B	23.0	9.0	2600			1229	2414	
2C	23.0	13.5	3900			1369	3272	
2D	23.0	18.1	5200			1492	3719	
2E	23.0	22.6	6500			1729	4101	

NOTES:

Dimensions of Block: 24" wide by 24" long and 6" high.

Weight of Full-Size Block: .

Approximate Unit Weight of Facing (Block):

Failure Mode: Abrasion and/or rupture of geogrid ribs in each test.

DATE REPORTED: 6/28/2019

FIGURE NO. B-2

PROJECT NO. SGI19029

DOCUMENT NO.

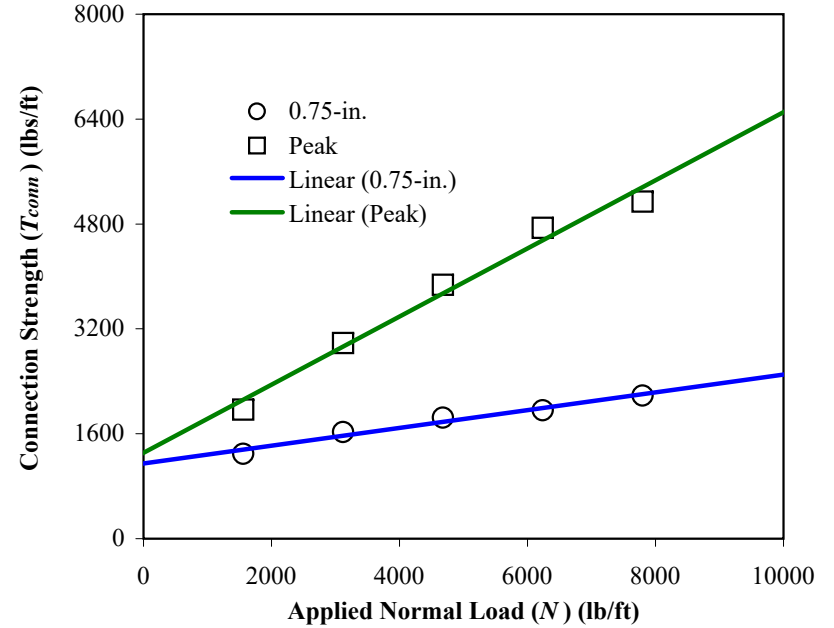
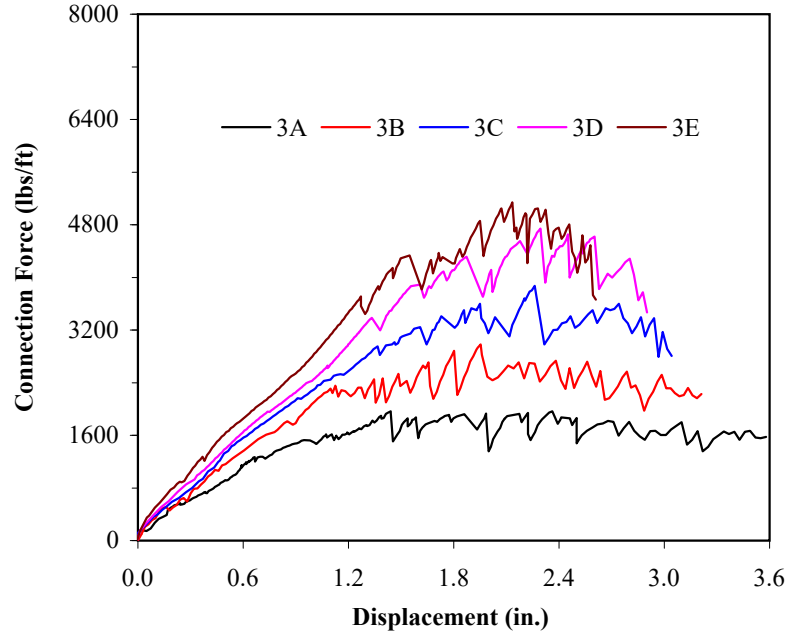
FILE NO.



SGI TESTING SERVICES, LLC

SRW PRODUCTS
CONNECTION STRENGTH TESTING (ASTM D 6638)

TEST SERIES NO. 3: SRW-11 geogrid in machine direction between two courses of Mid-Size blocks
 without AASHTO #57 stone



Test No.	Geogrid Specimen Width W (in.)	Test Normal Stress σ_n (psi)	Equivalent Normal Load N (lb/ft)	Approximate No. of Blocks n (-)	Approximate Wall Height h (ft)	0.75-in. Strength $T_{0.75-in}$ (lb/ft)	Peak Strength T_{peak} (lb/ft)	Connection Strength Equations (Strength assumed to be linearly related to N)
3A	23.0	5.4	1560			1291	1967	$T_{0.75-in.} = 1145 + (N) \tan (8^\circ)$ $T_{peak} = 1310 + (N) \tan (27^\circ)$
3B	23.0	10.8	3120			1626	2982	
3C	23.0	16.3	4680			1844	3871	
3D	23.0	21.7	6240			1956	4740	
3E	23.0	27.1	7800			2183	5139	

NOTES:

Dimensions of Block: 24" wide by 24" long and 6" high.

Weight of Full-Size Block: .

Approximate Unit Weight of Facing (Block):

Failure Mode: Abrasion and/or rupture of geogrid ribs in each test.

DATE REPORTED: 6/28/2019

FIGURE NO. B-3

PROJECT NO. SGI19029

DOCUMENT NO.

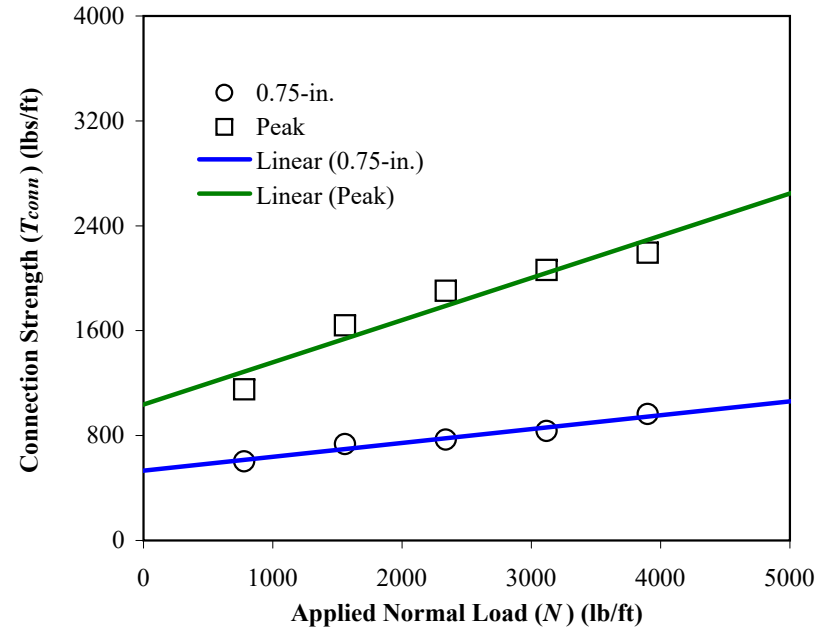
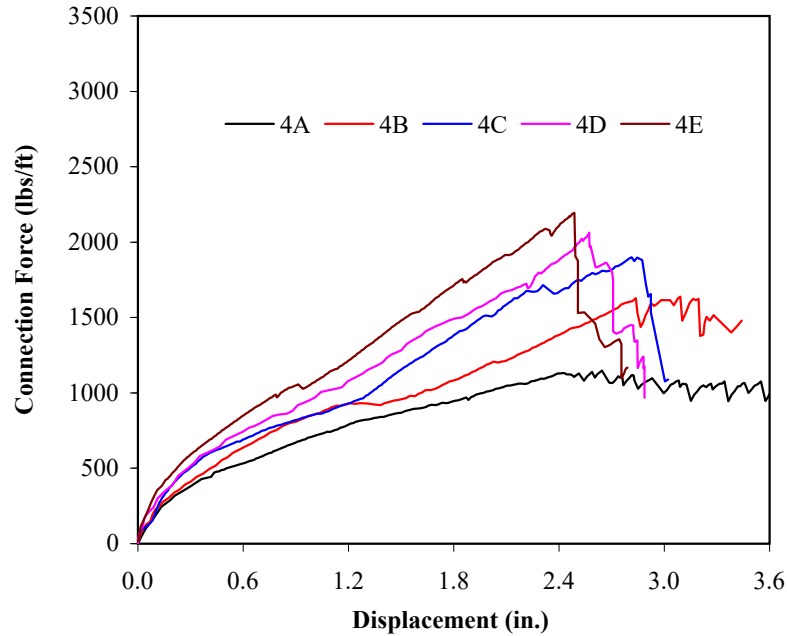
FILE NO.



SGI TESTING SERVICES, LLC

SRW PRODUCTS
CONNECTION STRENGTH TESTING (ASTM D 6638)

TEST SERIES NO. 1: SRW-5 geogrid in machine direction between two courses of Mid-Size blocks
 without AASHTO #57 stone



Test No.	Geogrid Specimen Width W (in.)	Test Normal Stress σ_n (psi)	Equivalent Normal Load N (lb/ft)	Approximate No. of Blocks n (-)	Approximate Wall Height h (ft)	0.75-in. Strength $I_{0.75-in}$ (lb/ft)	Peak Strength I_{peak} (lb/ft)	Connection Strength Equations (Strength assumed to be linearly related to N)
4A	23.0	2.7	780			602	1151	$T_{0.75-in.} = 535 + (N) \tan (6^\circ)$ $T_{peak} = 1035 + (N) \tan (18^\circ)$
4B	23.0	5.4	1560			733	1639	
4C	23.0	8.1	2340			768	1902	
4D	23.0	10.8	3120			835	2063	
4E	23.0	13.5	3900			963	2195	

NOTES:

Dimensions of Block: 24" wide by 24" long and 6" high.
 Weight of Full-Size Block: .
 Approximate Unit Weight of Facing (Block):
 Failure Mode: Abrasion and/or rupture of geogrid ribs in each test.

DATE REPORTED: 7/28/2019

FIGURE NO. B-4
 PROJECT NO. SGI19029
 DOCUMENT NO.
 FILE NO.



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