



4/21/2010
cdm

SHEAR STRENGTH EVALUATION

Laboratory: UTAH STATE UNIVERSITY
LOGAN, UTAH

Compac Unit - Unit Shear Strength

	Peak Strength	Serviceability
Intercept (plf)	769	769
Slope	26.9	26.9
Maximum (plf)	2595	2595

Compac Unit - Unit Shear Strength with Geogrid

	Peak Strength	Serviceability
Intercept (plf)	769	769
Slope	26.9	26.9
Maximum (plf)	2595	2595

Notes:

Shear testing was performed with 3/4" as a failure criteria so these results reflect both peak and serviceability.

Insertion of geogrid material between Compac units did not result in any reduction in shear strength so values are identical.

Laboratory Test Data:

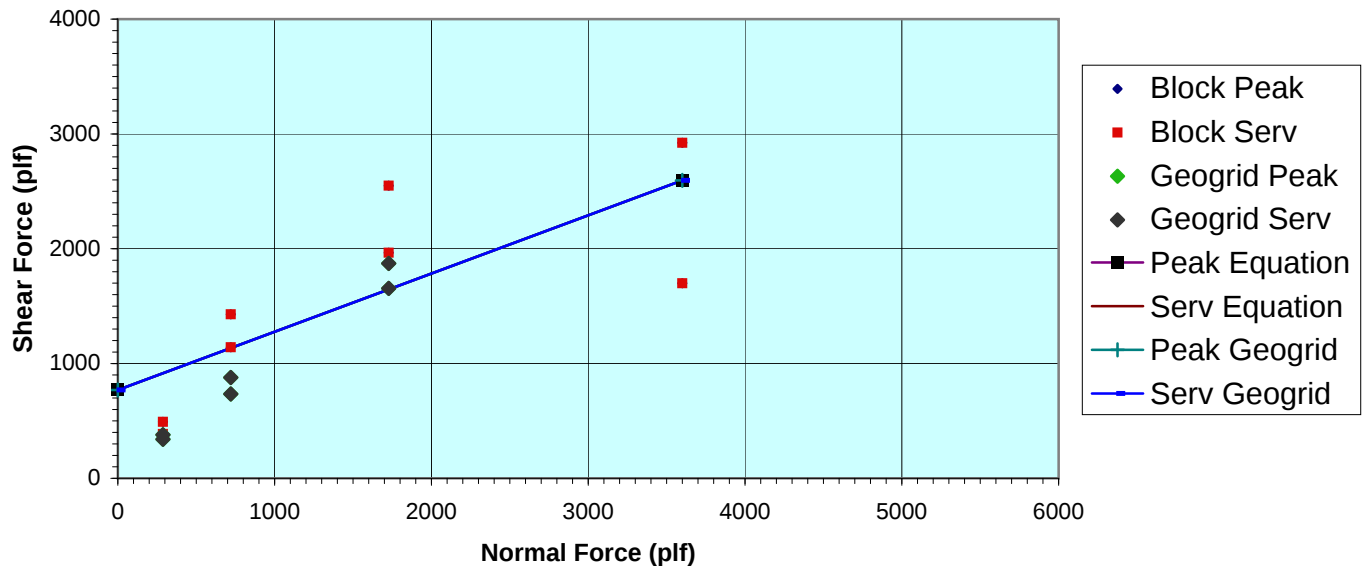
Block to Block Shear

Normal Load (plf)	Shear Strength (plf)	Serviceability (plf)
288	492	492
288	386	386
720	1428	1428
720	1142	1142
1728	1966	1966
1728	2549	2549
3600	2923	2923
3600	1699	1699

Block to Block with Geogrid Inclusion

Normal Load (plf)	Shear Strength (plf)	Serviceability (plf)
288	340	340
288	379	379
720	734	734
720	878	878
1728	1655	1655
1728	1872	1872
3600		
3600		

Inter Unit Shear Strength





1/5/2012
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SHEAR STRENGTH EVALUATION

Laboratory: BCGT
Kingstone, ONT 3/20/2009

Compac II Unit - Unit Shear Strength

	Peak Strength	Serviceability
Intercept (plf)	1475	1475
Slope	29.0	29.0
Maximum (plf)	3337	3337

Compac II Unit - Unit Shear Strength with Geogrid

	Peak Strength	Serviceability
Intercept (plf)	1250	1250
Slope	29.0	29.0
Maximum (plf)	3129	3129

Notes:

NCMA serviceability criteria is neglected in Keystone design

Laboratory Test Data:

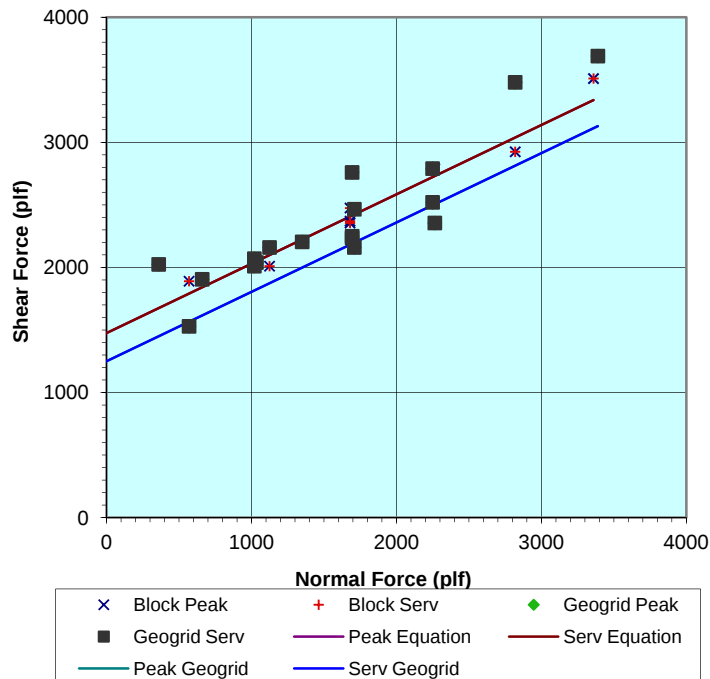
Block to Block Shear

Normal Load (plf)	Shear Strength (plf)	Serviceability (plf)
569	1890	1890
1124	2010	2010
1679	2370	2370
1679	2355	2355
1679	2475	2475
2264	2790	2790
2819	2925	2925
3359	3510	3510

Block to Block with Geogrid Inclusion

Normal Load (plf)	Shear Strength (plf)	Serviceability (plf)
359	2025	2025
569	1530	1530
659	1905	1905
1019	2010	2010
1019	2070	2070
1034	2040	2040
1124	2160	2160
1349	2205	2205
1694	2760	2760
1694	2235	2235
1694	2250	2250
1709	2465	2465
1709	2160	2160
2249	2790	2790
2249	2520	2520
2264	2355	2355
2819	3480	3480
3389	3690	3690

Inter Unit Shear Strength



SHEAR STRENGTH EVALUATION

Laboratory: BCGT
Kingstone, ONT
11/9/2009
11/12/2009

Compac III Unit - Unit Shear Strength

	Peak Strength	Serviceability
Intercept (plf)	1393	1393
Slope	34.0	34.0
Maximum (plf)	3245	3245

Compac III Unit - Unit Shear Strength with Geogrid

	Peak Strength	Serviceability
Intercept (plf)	900	900
Slope	34.0	34.0
Maximum (plf)	2762	2762

Notes:

NCMA serviceability criteria is neglected in Keystone design

Laboratory Test Data:

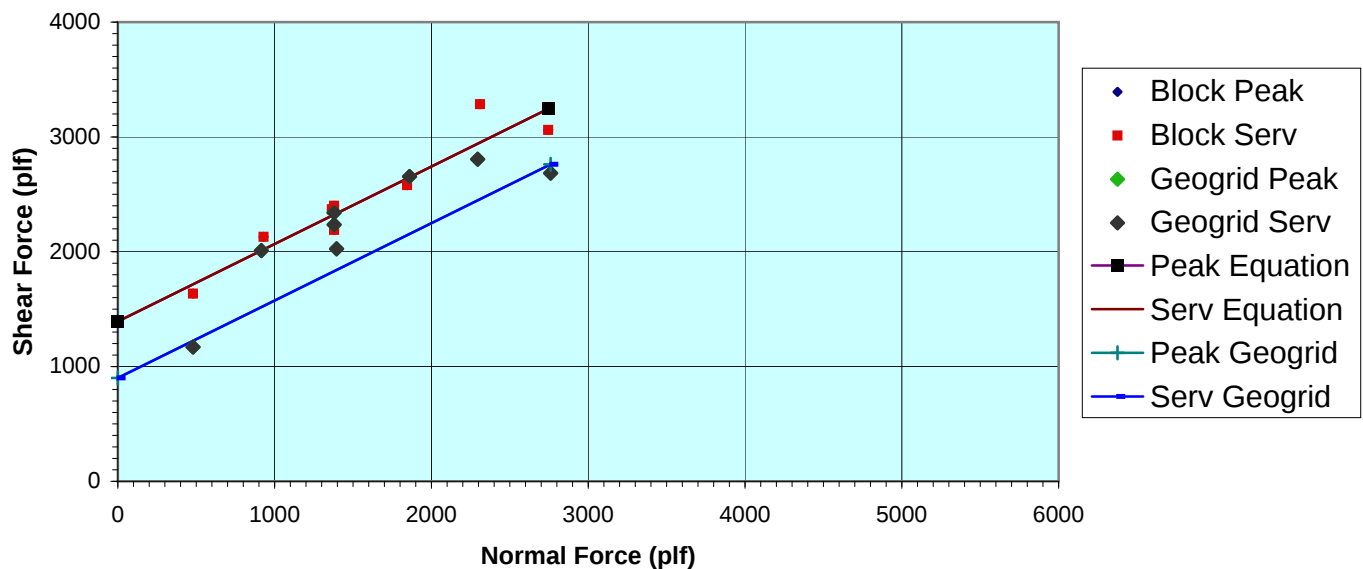
Block to Block Shear

Normal Load (plf)	Shear Strength (plf)	Serviceability (plf)
480	1635	1635
930	2130	2130
1365	2370	2370
1380	2400	2400
1380	2190	2190
1845	2580	2580
2310	3285	3285
2745	3060	3060

Block to Block with Geogrid Inclusion

Normal Load (plf)	Shear Strength (plf)	Serviceability (plf)
480	1170	1170
915	2010	2010
1380	2235	2235
1380	2340	2340
1395	2025	2025
1860	2655	2655
2295	2805	2805
2760	2685	2685

Inter Unit Shear Strength





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SHEAR STRENGTH EVALUATION

Laboratory: UTAH STATE UNIVERSITY
LOGAN, UTAH

Standard Unit - Unit Shear Strength

	Peak Strength	Serviceability
Intercept (plf)	2427	2427
Slope	17.4	17.4
Maximum (plf)	5586	5586

Standard Unit - Unit Shear Strength with Geogrid

	Peak Strength	Serviceability
Intercept (plf)	1550	1550
Slope	17.4	17.4
Maximum (plf)	4709	4709

Notes:

Shear testing was performed with 3/4" as a failure criteria so these results reflect both peak and serviceability.

Laboratory Test Data:

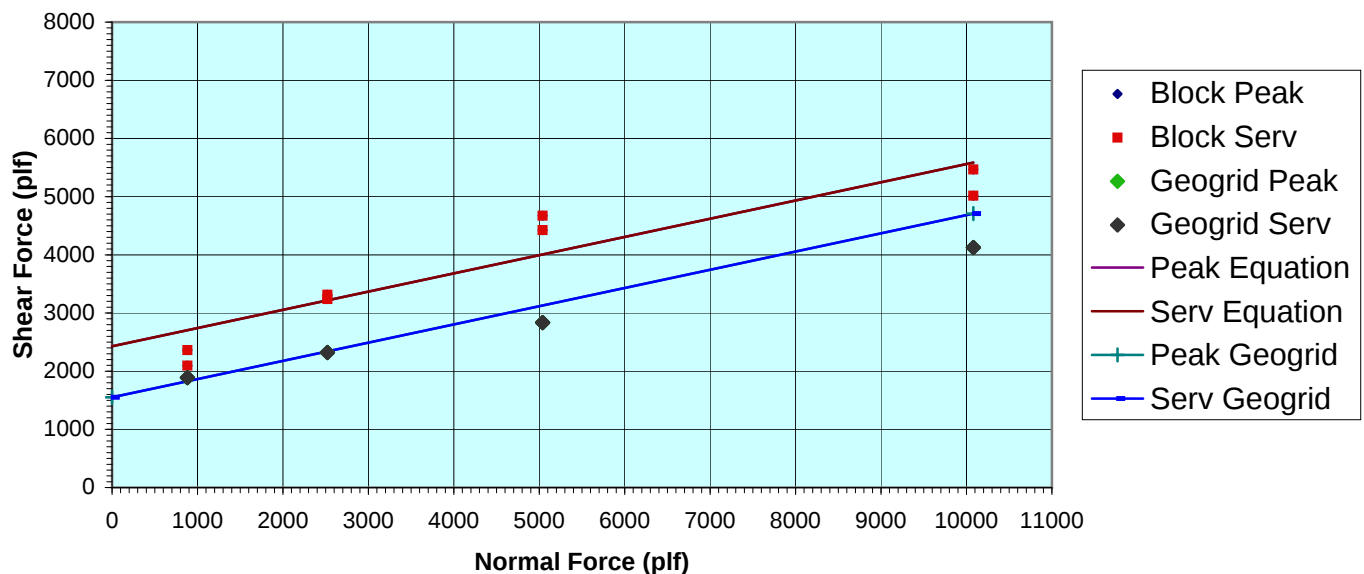
Block to Block Shear

Normal Load (plf)	Shear Strength (plf)	Serviceability (plf)
882	2096	2096
882	2361	2361
2520	3313	3313
2520	3240	3240
5040	4425	4425
5040	4672	4672
10080	5015	5015
10080	5468	5468

Block to Block with Geogrid Inclusion

Normal Load (plf)	Shear Strength (plf)	Serviceability (plf)
882	1890	1890
882	1890	1890
2520	2320	2320
2520	2320	2320
5040	2835	2835
5040	2835	2835
10080	4124	4124
10080	4124	4124

Inter Unit Shear Strength





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SHEAR STRENGTH EVALUATION

Laboratory: BCGT
Kingston ONT

Standard II Unit - Unit Shear Strength

	Peak Strength	Serviceability
Intercept (plf)	1375	1375
Slope	35.0	35.0
Maximum (plf)	4370	4370

Standard II Unit - Unit Shear Strength with Geogrid

	Peak Strength	Serviceability
Intercept (plf)	1556	1556
Slope	19.0	19.0
Maximum (plf)	3014	3014

Notes:

NCMA serviceability criteria is neglected in Keystone design

Laboratory Test Data:

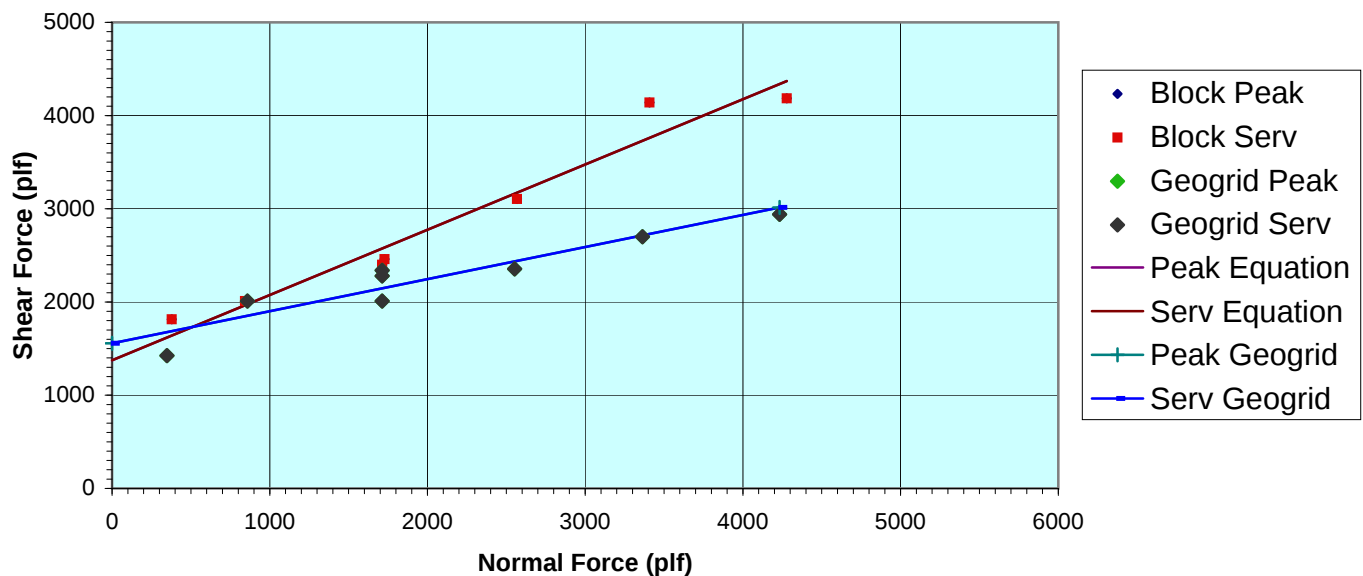
Block to Block Shear

Normal Load (plf)	Shear Strength (plf)	Serviceability (plf)
378	1815	1815
843	2010	2010
1713	2370	2370
1713	2400	2400
1728	2460	2460
2568	3105	3105
3408	4140	4140
4278	4185	4185

Block to Block with Geogrid Inclusion

Normal Load (plf)	Shear Strength (plf)	Serviceability (plf)
348	1425	1425
858	2010	2010
1713	2340	2340
1713	2010	2010
1713	2280	2280
2553	2355	2355
3363	2700	2700
4233	2940	2940

Inter Unit Shear Strength



SHEAR STRENGTH EVALUATION

Laboratory: BCGT
Kingstone, ONT 1/3/2012

Standard III Unit - Unit Shear Strength

	Peak Strength	Serviceability
Intercept (plf)	1719	1719
Slope	37.0	37.0
Maximum (plf)	4522	4522

Standard III Unit - Unit Shear Strength with Geogrid

	Peak Strength	Serviceability
Intercept (plf)	1500	1500
Slope	32.0	32.0
Maximum (plf)	3984	3984

Notes:

NCMA serviceability criteria is neglected in Keystone design

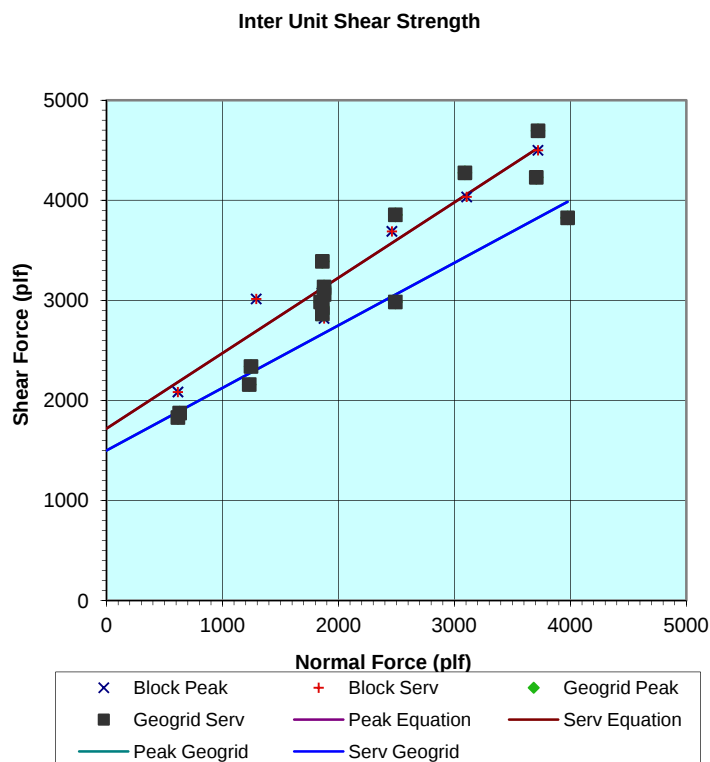
Laboratory Test Data:

Block to Block Shear

Normal Load (plf)	Shear Strength (plf)	Serviceability (plf)
615	2085	2085
1290	3015	3015
1860	3075	3075
1860	3075	3075
1875	2820	2820
2460	3690	3690
3105	4034	4034
3720	4500	4500

Block to Block with Geogrid Inclusion

Normal Load (plf)	Shear Strength (plf)	Serviceability (plf)
615	1830	1830
630	1875	1875
1230	2160	2160
1245	2340	2340
1845	2985	2985
1860	2940	2940
1860	2865	2865
1860	3390	3390
1875	3060	3060
1875	3135	3135
2490	2985	2985
2490	3855	3855
3090	4275	4275
3705	4230	4230
3720	4695	4695
3975	3825	3825





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SHEAR STRENGTH EVALUATION

Laboratory: BCGT
Kingston, ONT

Country Manor Unit - Unit Shear Strength

	Peak Strength	Serviceability
Intercept (plf)	707	707
Slope	20.0	20.0
Maximum (plf)	1226	1226

Country Manor Unit - Unit Shear Strength with Geogrid

	Peak Strength	Serviceability
Intercept (plf)	0	0
Slope		
Maximum (plf)	0	0

Notes:

Country Manor test data showed considerable variance.
One set of data was chosen as representative and used.

Laboratory Test Data:

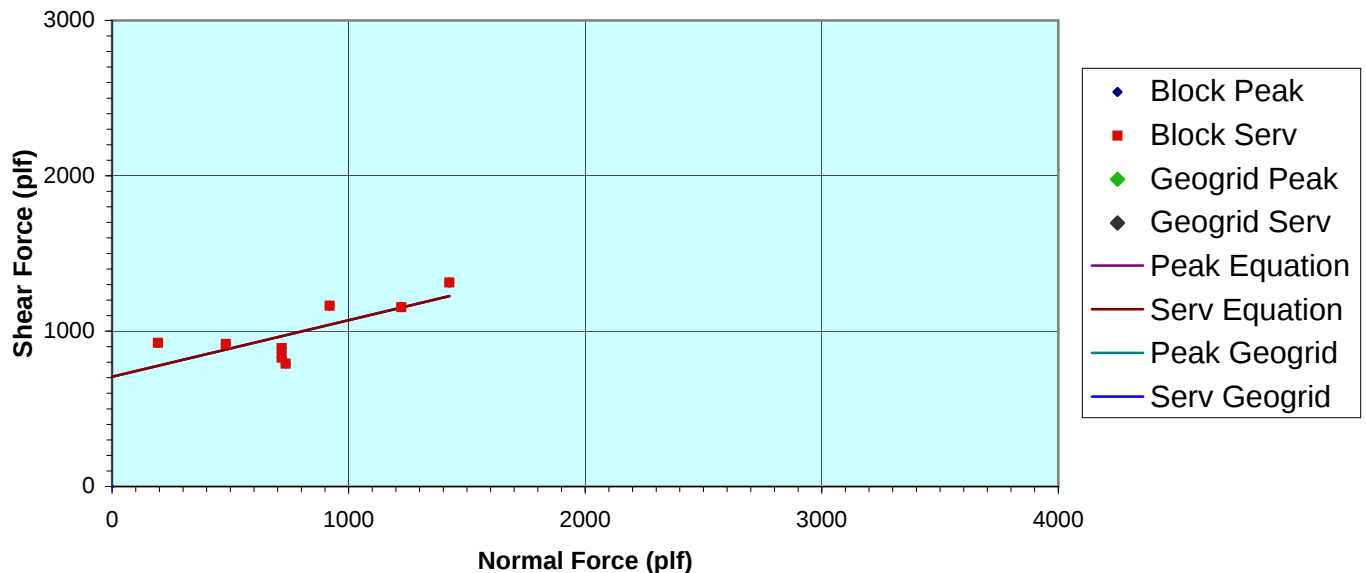
Block to Block Shear

Normal Load (plf)	Shear Strength (plf)	Serviceability (plf)
194	925	925
481	918	918
717	891	891
717	829	829
734	791	791
920	1164	1164
1223	1154	1154
1426	1313	1313

Block to Block with Geogrid Inclusion

Normal Load (plf)	Shear Strength (plf)	Serviceability (plf)

Inter Unit Shear Strength





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SHEAR STRENGTH EVALUATION

Laboratory: BCGT 7/24/2001
Kingston, ONT

Century Unit - Unit Shear Strength

	Peak Strength	Serviceability
Intercept (plf)	900	900
Slope	30.0	30.0
Maximum (plf)	1860	1860

Century Unit - Unit Shear Strength with Geogrid

	Peak Strength	Serviceability
Intercept (plf)	900	900
Slope	30.0	30.0
Maximum (plf)	1864	1864

Notes:

NCMA serviceability criteria is neglected in Keystone design

Laboratory Test Data:

Block to Block Shear

Normal Load (plf)	Shear Strength (plf)	Serviceability (plf)
267	1055	1055
507	1345	1345
740	1623	1623
747	1364	1364
753	1440	1440
999	1737	1737
1245	1566	1566
1258	1737	1737
1662	1800	1800

Block to Block with Geogrid Inclusion

Normal Load (plf)	Shear Strength (plf)	Serviceability (plf)
267	878	878
513	1276	1276
747	1402	1402
759	1427	1427
759	1352	1352
1005	1667	1667
1245	1806	1806
1669	1895	1895

Inter Unit Shear Strength

