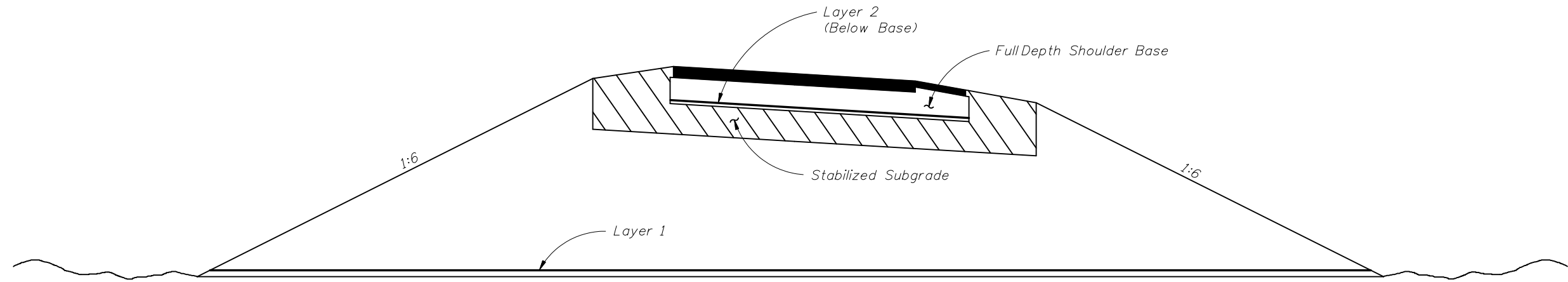


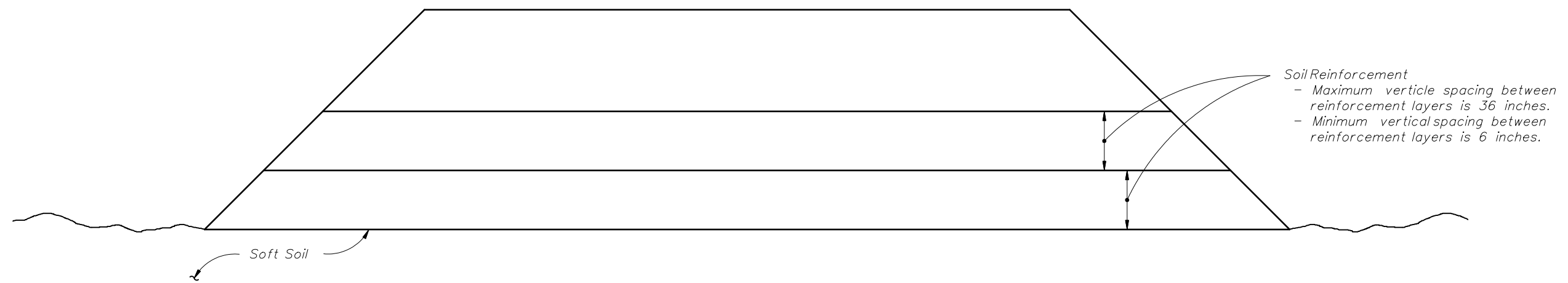
**GEOSYNTHETIC REINFORCED SOIL SLOPES**

**GENERAL NOTES**

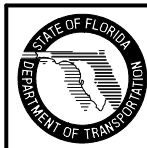
1. All Designs shall meet the requirements shown on this sheet and the contract documents.
2.  $T_a = \frac{T_{ult}}{RF_c RF_d RF_j CRF}$
3. Intermediate reinforcement shall be rolled out parallel to slope face.



REINFORCED EMBANKMENT



GEOSYNTHETIC REINFORCED FOUNDATIONS CONSTRUCTED ON SOFT SOILS



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TABLE OF WOVEN GEOTEXTILE VALUES

PROPERTY		REQUIRED TEST METHOD	MIRAFI GEOLON HP 370	MIRAFI GEOLON HP 570	MIRAFI GEOLON HP 665	MIRAFI GEOLON HP 770	MIRAFI GEOLON HS 400	MIRAFI GEOLON HS 600	MIRAFI GEOLON HS 800	MIRAFI GEOLON HS 1150	MIRAFI MIRAMESH GR	
Permittivity (0.05 sec <sup>-1</sup> Min.)		ASTM D 4491	0.52	0.40	0.26	0.23	0.1	0.32	0.20	0.32	—	
UV Stability (Min. Retained Strength @ 500 hr.)		ASTM D 4355	70%	70%	70%	70%	50%	50%	50%	50%	90%	
Burst Strength (psi)		GRI : GS1	800	1,200	1,200	1,200	—	—	—	—	—	
Grab Strength (lb.)		ASTM D 4632	400 x 250	475 x 440	600 X 700	550 x 450	—	—	—	—	—	
A.D.S. (in.)		ASTM D 4751	0.0236	0.0236	0.0167	0.0236	0.0167	0.0335	0.0335	0.0236	0.120 x 0.120	
Tensile Strength (lb./ft.)		ASTM D 4595										
Machine Direction	Ultimate		3,240	4,800	4,800	7,200	4,800	7,200	9,600	13,800	1,440	
	2% Strain		540	960	—	780	—	—	—	—	—	
	5% Strain		1,356	2,400	1,200	3,600	1,080	2,400	3,600	4,800	—	
Cross Direction	Ultimate		2,700	4,800	6,600	4,800	4,800	3,600	3,600	3,600	1,733	
	2% Strain		540	1,320	—	1,320	—	—	—	—	—	
	5% Strain		1,560	2,604	4,200	3,600	2,400	—	—	—	—	
Strain @ Ultimate Tensile Strength			ASTM D 4595	14%	10%	12%	12%	15%	15%	10%	12%	6%
Secant Modulus @ (lb./ft.)	2% Strain			27,000	48,000	—	39,000	—	—	—	—	—
	5% Strain	27,120		48,000	24,000	72,000	21,600	48,000	72,000	96,000	—	
	10% Strain	24,000		48,000	30,000	66,000	33,600	57,600	96,000	120,000	—	
Seam Breaking Strength (lb./ft.)		ASTM D 4884	1,688	3,000	3,600	3,000	2,400	2,400	2,400	2,400	—	
Puncture Resistance (lb.)		ASTM D 4833	180	195	280	160	—	—	—	—	—	
Tear Strength (lb.)	Machine Direction	ASTM D 4833	170	180	180	250	—	—	—	—	—	
	Cross Direction	ASTM D 4833	110	180	275	300	—	—	—	—	—	
Soil- Geosynthetic Friction		GRI : GG5, GT7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	
Creep Resistance-T <sub>creep</sub> (lb./ft.)		ASTM D 5262	—	—	—	—	2,880	4,320	5,760	8,280	471 x 566	
Creep Reduction Factor (T <sub>ult</sub> /T <sub>creep</sub> )		GRI : GG3 & GT5	3.5	3.5	3.5	3.5	1.67	1.67	1.67	1.67	3.0	
Installation Damage (RF <sub>c</sub> )	Sand	GRI : GG4 & GT7	1.10	1.10	1.10	1.10	1.15	1.15	1.10	1.10	1.05	
	Limestone		1.25	1.25	1.25	1.25	1.25	1.25	1.20	1.20	1.10	
Durability (RF <sub>d</sub> )	Chemical	ASTM D 5322	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.10	
	Biological	ASTM D1987, D3083, G21 & G22	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
Joint Strength (RF <sub>j</sub> )	Mechanical	ASTM D 4595, GRI : GG4 & GT7	—	—	—	—	—	—	—	—	—	
	Overlap *	GRI : GG5 & GT6	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
Approved Application Usage			3, 4	3, 4	3, 4	3, 4	3, 4	3, 4	3, 4	3, 4	1, 4	

Approved Application Usage: 1 = Steepened Slopes  
 2 = Reinforcement of Foundations over Soft Soils  
 3 = Both Steepened Slopes & Reinforcement of Foundations over Soft Soils  
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 5 = Construction Expedient  
 \* Minimum 3' Overlap

APPROVED GEOSYNTHETIC PRODUCTS  
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TABLE OF WOVEN GEOTEXTILE VALUES

PROPERTY		REQUIRED TEST METHOD	MIRAFI BXG11	MIRAFI BXG12	MIRAFI GEOLON HS 2400	MIRAFI GEOLON HS 3000	MIRAFI GEOLON HS 3600	AMDCO 2006	AMDCO 2016	AMDCO 2044	COMTRAC 70/70	
Permittivity (0.05 sec <sup>-1</sup> Min.)		ASTM D 4491	—	—	0.02	0.02	0.02	0.05	0.70	0.15	0.20	
UV Stability (Min. Retained Strength @ 500 hr.)		ASTM D 4355	70%	70%	70%	70%	70%	70%	70%	70%	70%	
Burst Strength (psi)		GRI : GS1	—	—	—	—	—	1,000	1,100	1,500	—	
Grab Strength (lb.)		ASTM D 4632	—	—	—	—	—	315	315	600/500	—	
A.D.S. (in.)		ASTM D 4751	1.0 x 1.0	1.0 x 1.0	0.0118	0.0118	0.0118	0.0167	0.0167	0.0236	0.0335	
Tensile Strength (lb./ft.)		ASTM D 4595										
Machine Direction	Ultimate		2,000	2,000	28,800	36,000	43,200	2,100	2,400	4,800	16,800	
	2% Strain		500	500	—	—	—	156	276	456	—	
	5% Strain		920	920	14,400	18,000	21,600	564	744	1,452	6,000	
Cross Direction	Ultimate		2,000	4,000	3,600	3,600	3,600	2,100	2,400	4,800	3,600	
	2% Strain		500	750	—	—	—	576	660	1,380	—	
	5% Strain		920	1,350	—	—	—	1,104	1,404	2,604	—	
Strain @ Ultimate Tensile Strength				12%	12%	10%	10%	10%	8%	8%	8%	14%
Secant Modulus @ (lb./ft.)	2% Strain		ASTM D 4595	25,000	25,000	—	—	—	7,800	13,800	22,800	—
	5% Strain	18,400		18,400	288,000	360,000	432,000	11,280	14,880	29,040	120,000	
	10% Strain	—		—	288,000	360,000	432,000	10,440	12,480	31,200	120,000	
Seam Breaking Strength (lb./ft.)		ASTM D 4884	—	—	3,600	3,600	3,600	—	—	—	2,400	
Puncture Resistance (lb.)		ASTM D 4833	—	—	—	—	—	120	120	170	—	
Tear Strength (lb.)	Machine Direction	ASTM D 4833	—	—	—	—	—	120	120	250	—	
	Cross Direction	ASTM D 4833	—	—	—	—	—	120	120	250	—	
Soil- Geosynthetic Friction		GRI : GG5, GT7	0.8	0.8	0.8	0.8	0.8	0.65	0.65	0.65	0.9	
Creep Resistance-T <sub>creep</sub> (lb./ft.)		ASTM D 5262	—	—	17,280	21,600	21,600	600	685	1,371	—	
Creep Reduction Factor (T <sub>ult</sub> /T <sub>creep</sub> )		GRI : GG3 & GT5	1.6	1.6	1.67	1.67	1.67	3.5	3.5	3.5	1.67	
Installation Damage (RF <sub>C</sub> )	Sand	GRI : GG4 & GT7	1.05	1.05	1.1	1.1	1.1	1.10	1.05	1.05	1.15	
	Limestone		1.10	1.10	1.20	1.20	1.20	1.20	1.20	1.10	1.5	
Durability (RF <sub>D</sub> )	Chemical	ASTM D 5322	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	
	Biological	ASTM D1987, D3083, G21 & G22	1.0	1.0	1.0	1.0	1.0				1.0	1.0
Joint Strength (RF <sub>J</sub> )	Mechanical	ASTM D 4595, GRI : GG4 & GT7	—	—	—	—	—	—	—	—	—	
	Overlap *	GRI : GG5 & GT6	1.0	1.0	1.0	1.0	1.0	1.2	1.2	1.2	1.0	
Approved Application Usage			3, 4	3, 4	3, 4	3, 4	3, 4	3	3	3	3	

Approved Application Usage: 1 = Steepened Slopes  
 2 = Reinforcement of Foundations over Soft Soils  
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 \* Minimum 3' Overlap

APPROVED GEOSYNTHETIC PRODUCTS  
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TABLE OF WOVEN GEOGRID VALUES

PROPERTY		REQUIRED TEST METHOD	MARAFI MG 2XT	MARAFI MG 3XT	MARAFI MG 5XT (Matrex 30)	MARAFI MG 7XT	MARAFI MG 8XT	MARAFI MG 10XT (Matrex 60)	MARAFI MG 18XT (Matrex 90)	MARAFI MG 20XT (Matrex 120)	MARAFI MG 22XT (Matrex 180)	MARAFI MG 24XT (Matrex 240)	
UV Stability (Min. Retained Strength @ 500 hr.)		ASTM D 4355	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	
Tensile Strength (lb./ft.)		ASTM D 6637											
Machine Direction	Ultimate		2,000	3,150	4,300	5,700	7,000	9,500	9,360	12,420	17,760	25,380	
	2% Strain		—	—	—	—	—	—	—	—	—	—	
	5% Strain		1,000	1,056	1,740	2,160	2,520	3,120	3,250	5,340	6,700	7,000	
Cross Direction	Ultimate		2,000	—	—	—	—	—	—	—	—	—	—
	2% Strain		—	—	—	—	—	—	—	—	—	—	—
	5% Strain	—	—	—	—	—	—	—	—	—	—	—	
Strain @ Ultimate Tensile Strength		ASTM D 6637	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	
Secant Modulus @ (lb./ft.)	2% Strain		—	—	—	—	—	—	—	—	—	—	
	5% Strain		20,000	21,120	34,800	43,200	50,400	62,400	65,000	106,800	134,000	140,000	
	10% Strain		—	—	—	—	—	—	—	—	—	—	
Junction Strength (lb./ft.)		GRI : GG2	—	—	—	—	—	—	—	—	—	—	
Soil- Geosynthetic Friction		GRI : GG5, GT7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	
Creep Resistance- $T_{creep}$ (lb./ft.)		ASTM D 5262	1,250	1,969	2,688	3,563	4,375	5,938	5,850	7,221	10,326	14,756	
Creep Reduction Factor ( $T_{ult}/T_{creep}$ )		GRI : GG3 & GT5	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.72	1.72	1.72	
Installation Damage (RF <sub>c</sub> )	Sand	GRI : GG4 & GT7	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	
	Limestone		1.5	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	
Durability (RF <sub>d</sub> )	Chemical	ASTM D 5322	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	
	Biological	ASTM D1987, D3083, G21 & G22	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
Joint Strength (RF <sub>j</sub> )	Mechanical	ASTM D 6637, GRI : GG4 & GT7	—	—	—	—	—	—	—	—	—	—	
	Overlap *	GRI : GG5 & GT6	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	
Approved Application Usage			3	3	3	3	3	3	3	3	3	3	

Approved Application Usage:

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TABLE OF WOVEN GEOGRID VALUES

PROPERTY		REQUIRED TEST METHOD	SYNTEEN SF 11	SYNTEEN SF 12	SYNTEEN SF 20	SYNTEEN SF 35	SYNTEEN SF 40	SYNTEEN SF 50	SYNTEEN SF 55	SYNTEEN SF 80	SYNTEEN SF 110
UV Stability (Min. Retained Strength @ 500 hr.)		ASTM D 4355	70%	70%	70%	70%	70%	70%	70%	70%	70%
Tensile Strength (lb./ft.)		ASTM D 6637									
Machine Direction	Ultimate		2,388	2,388	1,672	2,627	3,050	3,731	3,774	5,583	7,462
	2% Strain		526	526	370	462	488	791	736	1,016	1,186
	5% Strain		990	1,042	670	725	970	922	1,159	1,273	1,684
Cross Direction	Ultimate		3,870	5,268	1,630	2,556	3,050	3,933	2,499	2,206	2,179
	2% Strain		578	797	370	399	430	630	604	882	1,274
	5% Strain	792	1,129	670	583	765	815	796	1,563	1,581	
Strain @ Ultimate Tensile Strength		ASTM D 6637	12.6%	13.0%	9.4%	14.1%	9.9%	14.2%	11.5%	13.9%	18.8%
Secant Modulus (lb./ft.)	2% Strain		26,300	26,300	18,494	23,114	24,408	39,551	36,799	50,807	59,298
	5% Strain		15,840	20,840	13,397	14,499	19,404	18,432	23,174	25,459	33,712
	10% Strain		—	—	15,206	15,234	22,089	18,432	27,137	37,910	27,380
Junction Strength (lb./ft.)		GRI : GG2	354	320	—	—	—	—	—	—	—
Soil- Geosynthetic Friction		GRI : GG5, GT7	1.0	1.0	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Creep Resistance- $T_{creep}$ (lb./ft.)		ASTM D 5262	—	—	1,005	1,523	1,525	2,201	2,265	3,182	4,029
Creep Reduction Factor ( $T_{ult}/T_{creep}$ )		GRI : GG3 & GT5	—	—	1.66	1.73	2.00	1.70	1.67	1.75	2.02
Installation Damage (RF <sub>C</sub> )	Sand	GRI : GG4 & GT7	1.18	1.06	1.05	1.15	1.15	1.08	1.08	1.08	1.08
	Limestone		1.31	1.20	1.75	1.70	1.60	1.55	1.55	1.55	1.35
Durability (RF <sub>d</sub> )	Chemical	ASTM D 5322	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
	Biological	ASTM D1987, D3083, G21 & G22	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Joint Strength (RF <sub>j</sub> )	Mechanical	ASTM D 6637, GRI : GG4 & GT7	—	—	—	—	—	—	—	—	—
	Overlap *	GRI : GG5 & GT6	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Approved Application Usage			3, 4, 5	3, 4, 5	3	3	3	3	3	3	3

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APPROVED GEOSYNTHETIC PRODUCTS  
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TABLE OF WOVEN GEOGRID VALUES							
PROPERTY		REQUIRED TEST METHOD	RAUGRID 3/3	RAUGRID 4/2	RAUGRID 6/3	RAUGRID 8/3	RAUGRID 10/3
UV Stability (Min. Retained Strength @ 500 hr.)		ASTM D 4355	95%	95%	95%	95%	95%
Tensile Strength (lb./ft.)		ASTM D 6637					
Machine Direction	Ultimate		2,233	2,843	4,350	5,288	6,590
	2% Strain		—	—	—	—	—
	5% Strain		712	767	1,144	1,165	1,582
Cross Direction	Ultimate		2,213	1,459	1,959	2,089	2,192
	2% Strain		—	—	—	—	—
	5% Strain	541	356	452	507	521	
Strain @ Ultimate Tensile Strength		ASTM D 6637	10.8%	11.8%	13.1%	12.2%	11.5%
Secant Modulus @ (lb./ft.)	2% Strain		—	—	—	—	—
	5% Strain		—	—	—	—	—
	10% Strain	—	—	—	—	—	
Junction Strength (lb./ft.)		GRI : GG2	N/A	100%	100%	100%	100%
Soil- Geosynthetic Friction		GRI : GG5, GT7	0.8	0.8	0.8	0.8	0.8
Creep Resistance- $T_{creep}$ (lb./ft.)		ASTM D 5262	1,466	1,870	2,862	3,479	4,335
Creep Reduction Factor ( $T_{ult}/T_{creep}$ )		GRI : GG3 & GT5	1.52	1.52	1.52	1.52	1.52
Installation Damage (RFC)	Sand	GRI : GG4 & GT7	1.10	1.10	1.10	1.10	1.10
	Limestone		1.17	1.17	1.17	1.17	1.17
Durability (RF <sub>d</sub> )	Chemical	ASTM D 5322	1.15	1.15	1.15	1.15	1.15
	Biological	ASTM D1987, D3083, G21 & G22	1.15	1.15	1.15	1.15	1.15
Joint Strength (RF <sub>j</sub> )	Mechanical	ASTM D 6637, GRI : GG4 & GT7	—	—	—	—	—
	Overlap *	GRI : GG5 & GT6	—	—	—	—	—
Approved Application Usage			2, 5	2, 5	2, 5	2, 5	2, 5

Approved Application Usage:  
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APPROVED GEOSYNTHETIC PRODUCTS  
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TABLE OF EXTRUDED GEOGRID VALUES

PROPERTY		REQUIRED TEST METHOD	TENSAR BX 4100	TENSAR BX 4200	TENSAR BX 1100	TENSAR BX 1120	TENSAR BX 1200	TENSAR BX 1220	TENSAR BX 1500
UV Stability (Min. Retained Strength @ 500 hr.)		ASTM D 4355	90%	90%	90%	100%	90%	100%	90%
Tensile Strength (lb./ft.)		ASTM D 6637							
Machine Direction	Ultimate		860	1,270	850	850	1,315	1,315	1,790
	2% Strain		240	370	280	280	410	410	580
	5% Strain		480	705	580	580	810	810	1,200
Cross Direction	Ultimate		875	1,370	1,300	1,300	1,975	1,975	2,055
	2% Strain		300	500	450	450	670	670	685
	5% Strain	635	960	920	920	1,360	1,360	1,370	
Strain @ Ultimate Tensile Strength		ASTM D 6637	10%	10%	10%	10%	10%	10%	10%
Secant Modulus @ (lb./ft.)	2% Strain		11,995	18,506	14,000	14,000	20,500	20,500	29,000
	5% Strain		9,596	14,092	11,600	11,600	16,200	16,200	27,400
	10% Strain		—	—	—	—	—	—	—
Junction Strength (lb./ft.)		GRI : GG2	90%	90%	93%	93%	93%	93%	93%
Soil- Geosynthetic Friction		GRI : GG5, GT7	—	0.95	0.90	0.90	0.90	0.90	0.90
Creep Resistance- $T_{creep}$ (lb./ft.)		ASTM D 5262	250	420	180/280	180/280	255/555	255/555	470/575
Creep Reduction Factor ( $T_{ult}/T_{creep}$ )		GRI : GG3 & GT5	3.5	3.27	2.07	2.07	1.61	1.61	2.09
Installation Damage (RF <sub>C</sub> )	Sand	GRI : GG4 & GT7	1.10	1.10	1.10	1.10	1.10	1.10	1.10
	Limestone		1.43	1.35	1.35	1.35	1.35	1.35	1.35
Durability (RF <sub>D</sub> )	Chemical	ASTM D 5322	1.1	1.1	1.1	1.1	1.1	1.1	1.1
	Biological	ASTM D1987, D3083, G21 & G22	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Joint Strength (RF <sub>J</sub> )	Mechanical	ASTM D 6637, GRI : GG4 & GT7	—	—	—	—	—	—	—
	Overlap *	GRI : GG5 & GT6	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Approved Application Usage			3, 4, 5	3, 4, 5	3, 4, 5	3, 4, 5	3, 4, 5	3, 4, 5	3, 4, 5

Approved Application Usage:

- 1 = Steepened Slopes
- 2 = Reinforcement of Foundations over Soft Soils
- 3 = Both Steepened Slopes & Reinforcement of Foundations over Soft Soils
- 4 = Reinforced Embankment
- 5 = Construction Expedient
- \* Minimum 3' Overlap

APPROVED GEOSYNTHETIC PRODUCTS  
(EXTRUDED GEOGRID)  
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TABLE OF EXTRUDED GEOGRID VALUES								
PROPERTY		REQUIRED TEST METHOD	TENSAR UX 1400 HS UX 1400 MSE UX MESA 3	TENSAR UX 1500 HS UX 1500 MSE UX MESA 4	TENSAR UX 1600 HS UX 1600 MSE UX MESA 5	TENSAR UX 1700 HS UX 1700 MSE UX MESA 6	TENAX MS 220	TENAX MS 330
UV Stability (Min. Retained Strength @ 500 hr.)		ASTM D 4355	90%	90%	90%	90%	85%	85%
Tensile Strength (lb./ft.)		ASTM D 6637						
Machine Direction	Ultimate		4,790	7810	9,860	11,980	925	1,370
	2% Strain		1,100	1,850	2,330	2,740	300	418
	5% Strain		2,130	3,560	3,980	5,140	615	925
Cross Direction	Ultimate		—	—	—	—	1,400	2,100
	2% Strain		—	—	—	—	445	616
	5% Strain	—	—	—	—	890	1,340	
Strain @ Ultimate Tensile Strength		ASTM D 6637	10%	10%	10%	10%	12%	12%
Secant Modulus (lb./ft.)	2% Strain		55,000	92,500	116,500	137,000	15,000	20,900
	5% Strain		42,600	71,200	79,600	102,800	12,330	18,500
	10% Strain	—	—	—	—	—	—	
Junction Strength (lb./ft.)		GRI : GG2	90%	90%	90%	90%	835	1,230
Soil- Geosynthetic Friction		GRI : GG5, GT7	0.462	0.462	0.462	0.462	—	—
Creep Resistance- $T_{creep}$ (lb./ft.)		ASTM D 5262	1,970	3,000	3,960	4,975	—	—
Creep Reduction Factor ( $T_{ult}/T_{creep}$ )		GRI : GG3 & GT5	2.43	2.60	2.49	2.41	5.0	5.0
Installation Damage (RF <sub>c</sub> )	Sand	GRI : GG4 & GT7	1.10	1.10	1.10	1.10	3.0	3.0
	Limestone		1.20	1.20	1.20	1.20	3.0	3.0
Durability (RF <sub>d</sub> )	Chemical	ASTM D 5322	1.1	1.1	1.1	1.1	2.0	2.0
	Biological	ASTM D1987, D3083, G21 & G22	1.0	1.0	1.0	1.0	2.0	2.0
Joint Strength (RF <sub>j</sub> )	Mechanical	ASTM D 6637, GRI : GG4 & GT7	1.0	1.0	1.0	1.0	—	—
	Overlap *	GRI : GG5 & GT6	1.0	1.0	1.0	1.0	—	—
Approved Application Usage			3	3	3	3	2	2

Approved Application Usage:

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