

GENERAL NOTES

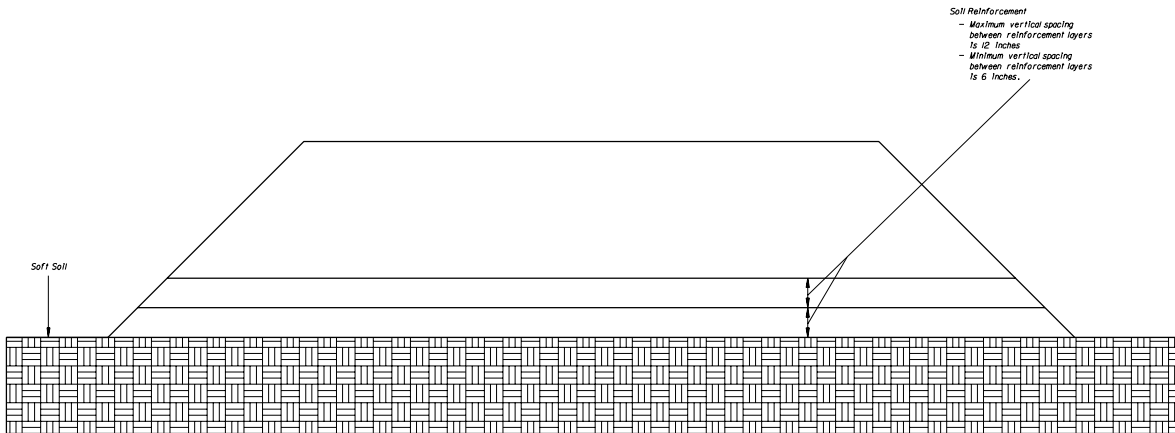
1. All Designs shall meet the requirements shown on this sheet and the contract documents.
2. $T_{(all)} = T_{(ult)}/RF$ but, not to exceed 19% of $T_{(ult)}$.
3. Intermediate reinforcement shall be rolled out parallel to slope face.

GEOSYNTHETIC REINFORCED SOIL SLOPES

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION
ROAD DESIGN

GEOSYNTHETIC REINFORCED SOILS

Designed By	Name	Date	Approved By	Name	Date
ADP	ADP	07/99	[Signature]	[Signature]	07/99
Drawn By	SM	07/99	Checked By	PKL	06/99
Checked By	PKL	06/99	Scale	1 of 8	501



Soil Reinforcement
 - Maximum vertical spacing between reinforcement layers is 12 inches
 - Minimum vertical spacing between reinforcement layers is 6 inches.

Soft Soil

GEOSYNTHETIC REINFORCED FOUNDATIONS CONSTRUCTED ON SOFT SOILS

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION ROAD DESIGN			
GEOSYNTHETIC REINFORCED SOILS			
Designed By	RDG	Date	07/99
Drawn By	SM	Checked By	SM
Checked By	RDG	Date	08/99
Approved By	<i>[Signature]</i> STATE PROFESSIONAL ENGINEER		
Sheet No.	2 of 8	Project No.	501

TABLE OF WOVEN GEOTEXTILE VALUES

PROPERTY	REQUIRED TEST METHOD	MIRAFI HP 370	MIRAFI HP 470	MIRAFI HP 570	MIRAFI HP 670	MIRAFI HP 770	MIRAFI HS 400	MIRAFI HS 600	MIRAFI HS 800	MIRAFI HS 1150	
Permeability (0.05 sec ⁻¹ Min.)	ASTM D 449	0.52	0.20	0.40	0.50	0.23	0.026	0.32	0.20	0.32	
UV Stability (Retained 50% Strength Min. @ 500 hr.)	ASTM D 4355	70%	70%	70%	70%	70%	70%	70%	70%	70%	
Burst Strength (psi)	GRI: G51	800	1,200	1,200	1,200	1,200	—	—	—	—	
Grab Strength (lb)	ASTM D 4632	400 x 250	380 x 350	475 x 440	650 x 450	600 x 550	—	—	—	—	
A.D.S. (in)	ASTM D 4751	0.0236	0.0335	0.0236	0.0335	0.0236	0.018	0.0335	0.0335	0.0236	
Machine Direction	ASTM D 4595	Ultimate	3,240	3,600	4,800	6,420	7,200	4,800	7,200	9,600	13,800
		2% Ultimate	540	900	960	1,080	1,080	—	—	—	—
		5% Ultimate	1,356	1,800	2,400	3,000	3,000	2,040	3,600	4,800	—
Cross Direction	ASTM D 4595	Ultimate	2,700	3,600	4,800	4,800	4,800	4,800	3,600	3,600	3,600
		2% Ultimate	540	1,200	1,320	1,200	1,320	—	—	—	—
		5% Ultimate	1,356	1,800	2,400	2,700	2,400	2,400	—	—	—
Strain @ Ultimate Tensile Strength (lb/ft)	ASTM D 4595	14%	10%	10%	14%	12%	15%	15%	10%	12%	
Sagant Modulus @	ASTM D 4595	2% strain	27,000	45,000	48,000	54,000	54,000	—	—	—	—
		5% strain	27,120	36,000	48,000	54,000	60,000	21,600	40,800	72,000	96,000
		10% strain	24,000	36,000	48,000	54,000	66,000	33,600	57,600	96,000	120,000
Seam Breaking Strength (lb/ft)	ASTM D 4894	1,440	1,800	3,000	3,600	1,200	2,400	2,400	2,400	2,400	
Puncture Resistance (lb)	ASTM D 4833	180	170	190	200	220	—	—	—	—	
Tear Strength (lb)	Machine Direction	ASTM D 4833	180	130	180	250	250	—	—	—	—
	Cross Direction	ASTM D 4833	110	200	180	200	400	—	—	—	—
Soil-Geosynthetic Friction	GRI: G65, G77	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	
Creep Resistance - T _{Creep} (lb/ft)	ASTM D 5262	—	—	—	—	—	2,880	4,320	5,760	8,280	
Creep Reduction Factor (T _{ult} /T _{Creep})	GRI: G63 & G75	5.0	5.0	5.0	5.0	5.0	1.67	1.67	1.67	1.67	
Installation Damage (RF _i)	Sand	GRI: G64 & G77	1.25	1.25	1.15	1.15	1.15	1.3	1.25	1.2	1.15
	Limestone		1.5	1.5	1.35	1.35	1.35	5	3.5	1.85	1.7
Durability (RF _d)	Chemical	ASTM D 5322	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	
Joint Strength (RF _j)	Mechanical	ASTM D 4595, GRI: G64 & G77	—	—	—	—	—	—	—	—	
	Overlap	GRI: G65 & G76	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
Approved Application Usage		3	3	3	3	3	3	3	3	3	

Approved Application Usage: 1 = Steepened Slopes
 2 = Reinforcement of Foundations over Soft Soils
 3 = Both Steepened Slopes & Reinforcement of Foundations over Soft Soils

APPROVED GEOSYNTHETIC PRODUCTS
 (WOVEN GEOTEXTILES)
 APPLICATION AND PROPERTIES

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION
 ROAD DESIGN

GEOSYNTHETIC REINFORCED
 SOILS

Designed By	POP	Date	07/99	Approved By	<i>[Signature]</i>
Drawn By	POP	Revision	06/99	Scale	1" = 10'
Checked By	PWL	Date	06/99	Sheet No.	3 of 8
				Project No.	501

TABLE OF WOVEN GEOTEXTILE VALUES

PROPERTY	REQUIRED TEST METHOD	MIRIFI HS 1400	MIRIFI HS 1715	MIRIFI HS 2400	MIRIFI HS 3000	MIRIFI HS 3600	AMOCO 2006	AMOCO 2016	AMOCO 2044	CONTRAC 70/70	
Permittivity (0.25 sec ⁻¹ Min.)	ASTM D 4491	0.20	0.32	0.02	0.02	0.02	0.05	0.70	0.15	0.20	
UV Stability (Retained 50% Strength Min. @ 500 hr.)	ASTM D 4355	70%	70%	70%	70%	70%	70%	70%	70%	70%	
Burst Strength (psi)	GR1, G51	—	—	—	—	—	1,000	1,100	1,500	—	
Grab Strength (lb)	ASTM D 4632	—	—	—	—	—	315	315	600/500	—	
A.D.S. (ft)	ASTM D 4751	0.0335	0.0335	0.018	0.018	0.018	0.0167	0.0167	0.0236	0.0335	
Tensile Strength (lb/ft)	Machine Direction ASTM D 4595	Ultimate	16,800	20,580	28,800	36,000	43,200	2,100	2,400	4,800	16,800
		2X Ultimate	—	—	—	—	—	156	276	456	—
		5X Ultimate	6,000	8,400	14,400	18,000	21,600	564	744	1,452	6,000
		Ultimate	3,600	3,600	3,600	3,600	3,600	2,100	2,400	4,800	3,600
		2X Ultimate	—	—	—	—	—	576	660	1,380	—
		5X Ultimate	—	—	—	—	—	1,104	1,404	2,604	—
Strain @ Ultimate Tensile Strength	ASTM D 4595	14%	14%	10%	10%	10%	8%	8%	8%	14%	
		—	—	—	—	—	7,800	13,800	22,800	—	
Seam Breaking Strength (lb/ft)	ASTM D 4884	2,400	2,400	3,600	3,600	3,600	—	—	—	2,400	
		—	—	—	—	—	120	120	170	—	
		—	—	—	—	—	—	—	—	—	
Puncture Resistance (lb)	ASTM D 4833	—	—	—	—	—	120	120	250	—	
		—	—	—	—	—	120	120	250	—	
Stiffness (lb)	Machine Direction	—	—	—	—	—	120	120	250	—	
	Cross Direction	—	—	—	—	—	120	120	250	—	
Soil-Geosynthetic Friction	GR1, G05, G77	0.9	0.9	0.9	0.9	0.9	0.65	0.65	0.65	0.9	
Creep Resistance - T _{creep} (lb/ft)	ASTM D 5262	10,080	12,348	17,280	21,600	21,600	600	685	1,371	—	
Creep Reduction Factor (T _{ult} /T _{creep})	GR1, G03 & G75	1.67	1.67	1.67	1.67	1.67	3.5	3.5	3.5	1.67	
Durability (RF _d)	ASTM D 5322	Sand	1.5	1.5	1.1	1.1	1.1	1.0	1.05	1.05	1.5
		Limestone	1.5	1.35	1.25	1.25	1.25	1.20	1.20	1.0	1.5
		Chemical	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
		Biological	1.0	1.0	1.0	1.0	1.0	—	—	—	1.0
Joint Strength (RF _j)	ASTM D 4595, GR1, G04 & G77	Mechanical	—	—	—	—	—	—	—	—	
		Overlap	1.0	1.0	1.0	1.0	1.0	1.2	1.2	1.2	1.0
Approved Application Usage		3	3	3	3	3	3	3	3	3	

Approved Application Usage: 1 = Steepened Slopes
 2 = Reinforcement of Foundations over Soft Soils
 3 = Both Steepened Slopes & Reinforcement of Foundations over Soft Soils

APPROVED GEOSYNTHETIC PRODUCTS
 (WOVEN GEOTEXTILES)
 APPLICATION AND PROPERTIES

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION
 ROAD DESIGN

GEOSYNTHETIC REINFORCED
 SOILS

Designed By	POP	Date	07/99	Approved By	<i>[Signature]</i>
Drawn By	POP	Date	08/99	State Geotechnical Engineer	
Checked By	FWL	Date	08/99	Scale	4 of 8
				Page No.	501

TABLE OF WOVEN GEOGRID VALUES

PROPERTY	REQUIRED TEST METHOD	MIRIFI MG 2XT	MIRIFI MG 3XT	MIRIFI MG 5XT (Matrex 30)	MIRIFI MG 7XT	MIRIFI MG 8XT	MIRIFI MG 10XT (Matrex 60)	MIRIFI MG 18XT (Matrex 90)	MIRIFI MG 20XT (Matrex 120)	MIRIFI MG 22XT (Matrex 180)	MIRIFI MG 24XT (Matrex 240)
UV Stability (Retained 50% Strength Min. @ 500 hr.)	ASTM D 4355	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%
Machine Direction Tensile Strength (lb/ft)	Ultimate	2,000	2,800	3,590	4,350	6,230	8,300	9,360	12,420	17,760	25,380
	2% Ultimate	—	—	—	—	—	—	—	—	—	—
	5% Ultimate	1,200	1,656	1,740	2,460	2,520	3,120	4,400	5,340	7,140	10,020
	Ultimate	2,000	—	—	—	—	—	—	—	—	—
	2% Ultimate	—	—	—	—	—	—	—	—	—	—
	5% Ultimate	—	—	—	—	—	—	—	—	—	—
	Strain @ Ultimate Tensile Strength	ASTM D 4595	10%	10%	10%	10%	10%	10%	10%	10%	10%
Seam Welds @ (lb/ft)	2% strain	—	—	—	—	—	—	—	—	—	—
	5% strain	—	21,120	34,800	43,200	50,400	62,400	88,800	106,800	142,800	200,400
	10% strain	—	—	—	—	—	—	—	—	—	—
	Ultimate	—	—	—	—	—	—	—	—	—	—
Junction Strength (lb/ft)	GRI: GG2	—	—	—	—	—	—	—	—	—	—
Soil-Geosynthetic Friction	GRI: GG5, GT7	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
Creep Resistance T_{creep} (lb/ft)	ASTM D 5262	1,200	1,680	2,154	2,610	3,738	4,980	5,616	7,221	10,326	14,756
Creep Reduction Factor (T_{ult}/T_{creep})	GRI: GG3 & GT5	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67
Installation Damage (RF _d)	Sand	GRI: GG4 & GT7	1.25	1.20	1.15	1.15	1.15	1.1	1.1	1.1	1.1
	Limestone	Not Recommended	1.75	1.3	1.3	1.3	1.25	1.25	1.25	1.25	1.25
	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	1.0	1.0
Joint Strength (RF _j)	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	3	3	3	3	3	3	3	3	

Approved Application Usage: 1 = Steepened Slopes
 2 = Reinforcement of Foundations over Soft Soils
 3 = Both Steepened Slopes & Reinforcement of Foundations over Soft Soils

APPROVED GEOSYNTHETIC PRODUCTS
 (WOVEN GEOGRIDS)
 APPLICATION AND PROPERTIES

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION ROAD DESIGN					
GEOSYNTHETIC REINFORCED SOILS					
Designed By	PCP	Date	07/99	Approved By	<i>[Signature]</i>
Drawn By	PCP	Check No.	26/99	State Geotechnical Engineer	
Checked By	FWL	Date	08/99	Scale	5 of 8
					501

TABLE OF WOVEN GEOGRID VALUES

PROPERTY	REQUIRED TEST METHOD	SYNTEEN SF 20	SYNTEEN SF 35	SYNTEEN SF 40	SYNTEEN SF 50	SYNTEEN SF 55	SYNTEEN SF 80	SYNTEEN SF 110			
UV Stability (Retained 50% Strength Min. @ 500 hr.)	ASTM D 4355	70%	70%	70%	70%	70%	70%	70%			
Tensile Strength (lb/ft)	ASTM D 4595	Ultimate	1,809	2,627	3,051	3,731	3,774	5,583	8,126		
		Machine Direction	370	462	488	791	736	1,016	1,186		
2% Ultimate		670	725	970	922	1,159	1,273	1,684			
5% Ultimate		1,809	2,556	3,051	3,933	2,499	2,206	2,176			
Cross Direction		370	399	488	791	604	882	1,274			
5% Ultimate		670	583	970	922	796	1,563	1,581			
Strain @ Ultimate Tensile Strength		9.4%	14.1%	9.9%	14.2%	11.5%	14.2%	18.8%			
Seam Strength (lb/ft)	ASTM D 4595	2% strain	18,494	23,114	24,408	39,551	36,799	50,807	59,298		
		5% strain	13,397	14,499	19,404	18,432	23,174	25,459	33,676		
		10% strain	15,206	15,234	22,089	18,432	27,137	37,910	27,380		
Junction Strength (lb/ft)	GRI: G62	—	—	—	—	—	—	—			
Soil-Geosynthetic Friction	GRI: G65, G77	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	4,026			
Creep Reduction Factor (T_{ult}/T_{creep})	GRI: G63 & G75	1.80	1.72	2.00	1.70	1.67	1.75	2.02			
Inactivation Damage (R_{G})	Sand	1.05	1.15	1.15	1.08	1.08	1.08	1.08			
	Limestone	GRI: G64 & G77	1.75	1.70	1.80	1.55	1.55	1.55	1.35		
Durability (R_{G})	Chemical	ASTM D 5322	1.0	1.0	1.0	1.0	1.0	1.0	1.0		
	Biological	ASTM D1987, D3083, G21 & G22	1.0	1.0	1.0	1.0	1.0	1.0	1.0		
Joint Strength (R_{G})	Mechanical	ASTM D 4595, GRI: G64 & G77	—	—	—	—	—	—	—		
	Overlap	GRI: G65 & G76	1.0	1.0	1.0	1.0	1.0	1.0	1.0		
Approved Application Usage		3	3	3	3	3	3	3			

Approved Application Usage: 1 = Steepened Slopes
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 3 = Both Steepened Slopes & Reinforcement of Foundations over Soft Soils

APPROVED GEOSYNTHETIC PRODUCTS
 (WOVEN GEOGRID)
 APPLICATION AND PROPERTIES

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION ROAD DESIGN			
GEOSYNTHETIC REINFORCED SOILS			
Designed By	NAME	DATE	APPROVED BY
Drawn By	NAME	DATE	STATE GEOLOGICAL ENGINEER
Checked By	NAME	DATE	REVISION
			6 of 8
			501

TABLE OF EXTRUDED GEOGRID VALUES

PROPERTY	REQUIRED TEST METHOD	TENSAR BX 400	TENSAR BX 420	TENSAR BX 4200	TENSAR BX 4220	TENSAR UX 900 HS	TENSAR UX 1100 HS	TENSAR UX 1400 HS	TENSAR UX 1500 HS	TENSAR UX 1600 HS	TENSAR UX 1700 HS		
UV Stability (Retained 50% Strength Min. @ 500 hr.)	ASTM D 4355	—	90%	90%	90%	90%	90%	90%	90%	90%	90%		
Tensile Strength (lb/ft)	ASTM D 4595	Ultimate	860	860	1,270	1,270	3,700	3,700	4,400	6,900	9,000	10,800	
		2% Ultimate	240	240	370	370	840	840	1,000	1,800	2,330	2,740	
		5% Ultimate	480	480	705	705	1,440	1,440	2,000	3,700	4,450	5,400	
		Machine Direction	Ultimate	875	875	1,370	1,370	—	—	—	—	—	—
		Cross Direction	2% Ultimate	300	300	500	500	—	—	—	—	—	—
		5% Ultimate	635	635	960	960	—	—	—	—	—	—	—
Strain @ Ultimate Tensile Strength	ASTM D 4595	—	—	—	—	10%	10%	10%	10%	10%	10%		
Seam Strength (lb/ft)	2% strain	11,995	11,995	18,506	18,506	42,015	42,015	50,000	89,993	116,518	137,012		
	5% strain	9,596	9,596	14,092	14,092	28,800	28,800	40,000	73,996	89,006	108,005		
	10% strain	—	—	—	—	—	—	—	—	—	—		
	—	—	—	—	—	—	—	—	—	—	—		
Junction Strength (lb/ft)	GRI: G02	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%		
Soil-Geosynthetic Friction	GRI: G05, G77	—	0.90	0.95	0.95	0.462	0.462	0.462	0.462	0.462	0.462		
Creep Resistance- T_{creep} (lb/ft)	ASTM D 5262	250	250	420	420	900	1,350	1,850	2,800	3,700	4,650		
Creep Reduction Factor (T_{ult}/T_{creep})	GRI: G03 & G75	3.5	3.5	3.27	3.27	4.12	3.65	2.38	2.46	2.43	2.33		
Insulation Damage (R _F)	Sand	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		
	Limestone	GRI: G04 & G77	1.43	1.43	1.35	1.35	1.25	1.25	1.20	1.20	1.20		
Durability (R _F)	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	1.0	1.0		
Joint Strength (lb/ft)	Mechanical	ASTM D 4595, GRI: G04 & G77	—	—	—	—	1.0	1.0	1.0	1.0	1.0		
	Overlap	GRI: G05 & G76	1.0	1.0	1.0	1.0	—	1.0	1.0	1.0	1.0		
Approved Application Usage		3	3	3	3	3	3	3	3	3	3		

Approved Application Usage: 1 = Steepened Slopes
 2 = Reinforcement of Foundations over Soft Soils
 3 = Both Steepened Slopes & Reinforcement of Foundations over Soft Soils

APPROVED GEOSYNTHETIC PRODUCTS
 (EXTRUDED GEOGRID)
 APPLICATION AND PROPERTIES

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION ROAD DESIGN			
GEOSYNTHETIC REINFORCED SOILS			
Designed By	NAME	DATE	APPROVED BY
Drawn By	PPF	07/99	STATE GEOLOGICAL ENGINEER
Checked By	PPF	08/99	SECTION
	PKL	08/99	CD
			7 of 8
			501

TABLE OF EXTRUDED GEOGRID VALUES

PROPERTY		REQUIRED TEST METHOD	TENAX MS 220	TENAX MS 330							
UV Stability (Retained 50% Strength Min. @ 500 hr.)		ASTM D 4355	85%	85%							
Tensile Strength (lb/ft)											
Machine Direction	Ultimate	ASTM D 4595	925	1,370							
	2% Ultimate		300	418							
	5% Ultimate		65	925							
	Ultimate		1,400	2,100							
	2% Ultimate		445	616							
	5% Ultimate		890	1,340							
Cross Direction	Ultimate	ASTM D 4595	925	1,370							
	2% Ultimate		300	418							
	5% Ultimate		65	925							
	Ultimate		1,400	2,100							
Strain @ Ultimate Tensile Strength											
Staple Strength (lb/ft)	2% strain	ASTM D 4595	15,000	20,900							
	5% strain		12,330	18,500							
	10% strain		—	—							
	Ultimate		—	—							
Junction Strength (lb/ft)		GRI: G02	835	1,230							
Soil - Geosynthetic Friction		GRI: G05, G77	—	—							
Creep Resistance - T_{creep} (lb/ft)		ASTM D 5262	—	—							
Creep Reduction Factor (T_{ult} / T_{creep})		GRI: G03 & G75	5.0	5.0							
Inactivation Damage (RF_c)	Sand	GRI: G04 & G77	3.0	3.0							
	Limestone		3.0	3.0							
Durability (RF_d)	Chemical	ASTM D 5322	2.0	2.0							
	Biological	ASTM D1987, D3083, G21 & G22	—	—							
Joint Strength (RF_j)	Mechanical	ASTM D 4595, GRI: G04 & G77	—	—							
	Overlap	GRI: G05 & G76	—	—							
Approved Application Usage			2	2							

Approved Application Usage: 1 = Steepened Slopes
 2 = Reinforcement of Foundations over Soft Soils
 3 = Both Steepened Slopes & Reinforcement of Foundations over Soft Soils

APPROVED GEOSYNTHETIC PRODUCTS
 (EXTRUDED GEOGRID)
 APPLICATION AND PROPERTIES

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION ROAD DESIGN			
GEOSYNTHETIC REINFORCED SOILS			
Designed By	PPM	Date	07/99
Drawn By	PPM	Date	08/99
Checked By	PHL	Date	08/99
Approved By	<i>[Signature]</i>		
Revision		Sheet No.	
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