TA 73

DEPARTMENT OF ENERGY
National Nuclear Security Administration
Los Alamos Site Office
Los Alamos, New Mexico 87544

AUG 15 2006

Mr. James Bearzi, Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505-6303

Dear Mr. Bearzi:

Subject: Response to July 14, 2006 Request for Additional Information Remedy Design Work Plan for the Los Alamos Site Office TA-73 Airport Landfill, Revision 2 Los Alamos National Laboratory, EPA ID #NM0890010515 HWB-LANL-05-015

Enclosed is a matrix table that contains our responses to each of the requests in your letter of July 14, 2006. We've enclosed two hard copies and one electronic copy (i.e., CD) of the matrix table and the three requested final designs (i.e., MatCon cover, retaining walls, and hangar pads). The designs have been stamped "Final" by the Engineer of Record, Berg Keshian. Per your inquiry about test pad results, we will forward the results of the MatCon and infiltration layer test pads when our contractor has completed this work in the August-September timeframe.

Sincerely

David R. Gregory
Federal Project Director

ES: 6BE-007

cc w/out enclosure:
B. Enz, ES, LASO
D. Gregory, ES, LASO

Darlene Goering,
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505-6303
cc: Continued on page 2

L. King, 6PD-N
Environmental protection Agency
Region 6
1445 Ross Avenue, Suite 1200
Dallas, TX, 75202-2733
S. Yanicak, NMED-DOE OB, LANL, MS J993
N. Quintana, LANL E/ER, MS M992
A. Phelps, LANL ADEP, MS J591
Records Center

Document Title: REQUEST FOR ADDITIONAL INFORMATION, REMEDY DESIGN WORK PLAN FOR THE LOS ALAMOS SITE OFFICE, TA-73 AIRPORT LANDFILL, REVISION 2, (NMED 07/14/06)

Item No.	Review Comment	Resolution
1	"...the DOE and the Los Alamos National Security, LLC (collectively, the Permittees) must submit these documents as final within 30 days of receipt of this letter. • The final design for the MatCon cover. • The final design for the retaining walls. • The final design for the hangar pads..."	Comment incorporated, the requested final documents are provided with this submittal.
2	a)...Drawing 2005 Section G shows that a 40 mil smooth very flexible polyethylene (VFPE) liner has been added to the design of the sloping interface between the taxiway and the Matcon. Although the general specifications for the VFPE liner are provided in Section 06005 of the Construction Specifications, no specific installation procedures of this feature are provided in any of the documents. It is unclear how the non-woven geotextile and the VFPE liners will be anchored or constructed at the point of interface between the rip rap covered grade and the Matcon, or how far they extend onto the Matcon. b) As shown on Section G, the rip rap is directly placed on the geotextile which is underlain by the VFPE liner. No provisions for protecting the liners or preventing water from getting under the liner are discussed. It appears the non-woven geotextile is provided as a protection for the VFPE liner, but it is not discussed whether that would be sufficient, especially during construction. c) Management of run-off water along this interface will be managed and any interconnection between this interface and the storm sewer features shown on Drawing 2003 are also not discussed or shown on the drawings. Since this feature spans a great distance (i.e., the interface area east of Section C on Drawing 2005 to the east slopes), more detailed design and construction specifications should be provided. The Permittees must provide this information within 30 days of receipt of this letter."	Comments noted and/or incorporated. a) This section view will be shown in more detail on a revised Drawing 2005. Installation procedures for the non-woven geotextile and the VFPE in this area will be added as a note to Drawing 2005. b) 16 oz non-woven geotextile placed above and below the VFPE will adequately protect the liner, based on the engineer's judgement. A note similar to that on Drawing 2022 re: not dropping stone onto the VFPE to prevent damage will be added to Dwg 2005. The geotextile-geomembrane-geotextile layers will be folded over at the top of the section in an anchoring trench, under the taxiway elevation as shown in Drawing 2005 Section G, which will inhibit water flow under the geosynthetics. c) Based on the elevations along the south edge of the cover shown on Drawing 2002, any water that runs onto the capped area from the taxiway will either enter one of the stormwater inlets, or will flow across the pavement to drainage bench #1 and be conveyed north or south to the downchutes. No interconnection other than the inlets exists and no more detail is needed for the drawings or specifications.

RDWP = Remedy Design Work Plan
CQCP = Construction Quality Control Plan
CP = Construction Plan
PCMP = Post-Closure Care and Monitoring Plan

Item No.	Review Comment	Resolution
3	The settlement evaluation text and tables reference figures that are not provided in the Work Plan. In addition, references are made to Sites C and D. These sites are not described in the Work Plan. The Permittees must clarify these references in the final settlement calculations to be provided following construction contract award.	Comment noted. The figures and sites cited are from the article referenced on p. 4 (Edil et al., "Settlement of Municipal Refuse", from Geotechnics of Waste and Fills, ASTM STP 1070), and provided as Appendix A.
4	Section 2.2 (Design Basis) of the Work Plan indicates that the new cover design for the eastern and northern slopes will produce a more stable slope. However, it does not appear that slope stability calculations are provided for the proposed new cover design for the northern and eastern slopes. The Permittees must provide slope stability calculations for the armored portions of the landfill cover. The Permittees must provide this information within 30 days of receipt of this letter.	Comment noted. The reference in Section 2.2 to increased stability is in comparison to a slope containing a flexible membrane liner (FML) in the profile. FMLs typically have friction angles less than those of the overlying and underlying soil. Therefore a slope without an FML will typically have more shear strength than a slope with an FML. No additional stability calculations are required.

RDWP = Remedy Design Work Plan
CQCP = Construction Quality Control Plan
CP = Construction Plan
PCMP = Post-Closure Care and Monitoring Plan

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION, RDWP FOR THE LASO TA-73 AIRPORT LANDFILL, REVISION 2 (NMED 07/14/06)

08/10/06

CONTENTS

1. Job Mix Formula for MatCon Asphalt for the LANL Airport Landfill (final design)
2. Design Calculations for LANL Airport Landfill (Tensar Earth Technologies-mechanically stabilized earth retaining walls-final design)
3. Construction Drawings for the LANL Airport Landfill (Tensar Earth Technologies-mechanically stabilized earth retaining walls-final design)
4. Final approved-for-construction drawings:
    a. Drawing 2005B-Capping System Details
    b. Drawing 3000A-Structural Wall 1 Plan and Elevations
    c. Drawing 3001A-Structural Wall 1 Sections
    d. Drawing 3002A-Structural Wall 1 Details
    e. Drawing 3003A-Hangar Foundation

Job Mix Formula for Impermeable MatCon® Modified Asphalt Cap
Los Alamos National Laboratory Airport Landfill

Prepared For

Wilder Construction Company
1525 East Marine Drive
Everett, WA 98201-1927

Attn: Mr. Jerry Thayer
MatCon® Program Manager

Prepared By

Gaylon L. Baumgardner
Executive Vice President
Paragon Technical Services, Inc.
gaylon.baumgardner@ptsilab.com
Phone 601-933-3217

5 June 2006

paragon
technical services, inc.

Job Mix Formula for Impermeable MatCon® Modified Asphalt Cap
Los Alamos National Laboratory Airport Landfill
5 June 2006

Mix Design Parameters for MatCon® Impermeable Asphalt

Table 1

Mineral Aggregate - Combination / Blend Ratio	
Aggregate Type	**Wt % in Blend**
-1/2" Crushed Intermediate Agg - Waldo Pit	30
Crushed Fine Aggregate - Waldo Pit	48.5
Natural Fine Aggregate - Waldo Pit	20
Hydrated Lime - Type N - Chem Lime	1.5

Table 2

Job Mix Formula, Aggregate Blend Gradation Comparison			
	MATCON® Guide Specification Range	JMF as per Table 1 Wt % Passing	
Sieve Size, mm (No.)	Wt % Passing	Target	Project Limits
12.5 mm (1/2")	100	100	100
9.5 mm (3/8")	85-100	97	92 - 100
4.75 mm (No. 4)	60-80	67	63 - 71
2.36 mm (No. 8)	40-60	47	43 - 51
1.18 mm (No. 16)	25-40	33	29 - 37
0.600 mm (No. 30)	15-25	24	20 - 28
0.300 mm (No. 50)	11-20	16	13 - 19
0.150 mm (No.100)	7-15	10	7 - 13
0.075 mm (No.200)	5-10	7	5 - 9

MatCon® is a Register Trademark of Wilder Construction Company

Paragon Technical Services, Inc. 390 Carrier Blvd. Richland, MS 39218
Phone 601.932.8365 Toll Free 866.636.2176 Fax 601.932.8466
e-mail info@ptsilab.com www.ptsilab.com 2.1.2005

paragon
technical services, inc.

Job Mix Formula for Impermeable MatCon® Modified Asphalt Cap
Los Alamos National Laboratory Airport Landfill
5 June 2006

Table 3

Asphalt Content	
Type	**Wt %,** by weight of total Mixture
MATCON® Proprietary Binder	8.2%
JMF Aggregate Blend, Dry	91.8%
Anti-strip	Not Required

Table 4

Performance Properties of Specimens Prepared using Asphalt Institute Marshall Method (50 Blow), Mix Design @ 8.0% MATCON® Binder		
Test Property	**MATCON® Requirements**	**Results**
Binder Content, %	6% to 9%	8.2%
Hydraulic Conductivity (k, cm/sec, ASTM 5084)	<1.0 x 10-8	Pass
Tensile Strength Ratio ((TSR), %, AASHTO T-283))	>80	85%
Volumetric Analysis in Accordance with Asphalt Institute Manual Series No. 2 (MS-2)		
Maximum Specific Gravity, Gmm	-	2.327
Bulk Specific Gravity, Gsb	-	2.280
Air Voids, %	3% max	2.0%
Voids in Mineral Aggregate, VMA, %	-	17.0
Voids Filled with Asphalt, VFA, %	-	89.0

MatCon® is a Register Trademark of Wilder Construction Company

Paragon Technical Services, Inc. 390 Carrier Blvd. Richland, MS 39218
Phone 601.932.8365 Toll Free 866.636.2176 Fax 601.932.8466
e-mail info@ptsilab.com www.ptsilab.com 2.1.2005

Job Mix Formula for Impermeable MatCon® Modified Asphalt Cap
Los Alamos National Laboratory Airport Landfill
5 June 2006

Table 5

Aggregate Properties						
	ASTM		Results			
Property	**Test Method**	**MATCON® Property**	-1/2" Crushed Intermediate	Crushed Fine Aggregate	Natural Fine Aggregate	Hydrated Lime
Type			Granite	Granite	Nat Sand	
Quarry			Waldo	Waldo	Waldo	Chem Lime
Unit Weight, lbs/ft³	C29	Loose	77.7	97.9	na	na
		Rodded	90.3	110.0	na	na
Soundness, Sodium Sulfate	C88	<9%	3.8	3.8	na	na
Hardness, LA Abraision	C131	<40%	15	na	na	na
Fractured Faces	D5821		100	100	na	na
Sand Equivalency	D2419		na	62	59	na
Bulk Specific Gravity	C127/128		2.599	2.495	2.519	2.309
Absorption, %			1.7	2.2	1.74	na
Sieve Analysis, % Passing						
Sieve Size, mm (No.)						
12.5 mm (1/2")	C136	Not Applicable for Stockpile Aggregates	100	100	100	100
9.5 mm (3/8")			90.8	99.9	100	100
4.75 mm (No. 4)			11.4	90.3	90.7	100
2.36 mm (No. 8)			1.6	63.8	79.4	100
1.18 mm (No. 16)			0.9	43.6	68.1	100
0.600 mm (No. 30)			0.8	30.1	53.3	100
0.300 mm (No. 50)			0.8	19.7	28.0	99.9
0.150 mm (No.100)			0.7	12.2	10.3	99.5
0.075 mm (No.200)			0.5	7.5	6.0	99.4

MatCon® is a Register Trademark of Wilder Construction Company

Paragon Technical Services, Inc. 390 Carrier Blvd. Richland, MS 39218
Phone 601.932.8365 Toll Free 866.636.2176 Fax 601.932.8466
e-mail info@ptsilab.com www.ptsilab.com 2.1.2005

paragon
technical services, inc.

Job Mix Formula for Impermeable MatCon® Modified Asphalt Cap
Los Alamos National Laboratory Airport Landfill
5 June 2006

Table 6

Hydraulic Conductivity vs Density @ Optimum AC Content		
Gmm, %	**Air Voids, %**	Hydraulic Conductivity (k, cm/sec, ASTM 5084)
91.5	8.5	1.24×10^{-4}
95.5	4.5	6.42×10^{-4}
97.0	3.0	6.40×10^{-10}
97.4	2.6	8.04×10^{-10}

MatCon® is a Register Trademark of Wilder Construction Company

Paragon Technical Services, Inc. 390 Carrier Blvd. Richland, MS 39218
Phone 601.932.8365 Toll Free 866.636.2176 Fax 601.932.8466
e-mail info@ptsilab.com www.ptsilab.com

TENSAR Earth Technologies, Inc.

5883 Glenridge Drive
Suite 200
Atlanta, Georgia 30328
Tel: 404-250-1290
Fax: 404-250-9185

DESIGN CALCULATIONS

Prepared for

Los Alamos Site Office TA-73 Airport Landfills

W.O. NO. 13104.002.001.7000

Los Alamos County, New Mexico

PHILIP D. EGAN
NEW MEXICO
9532
REGISTERED PROFESSIONAL ENGINEER

TET#D06602

May 24, 2006

TABLE OF CONTENTS	PAGE

CALCULATED BY: CANDANCE CAMPBELL
CHECKED BY: WESLIE ROSS WR 5/25/06

DESIGN ASSUMPTIONS

Project Name:	LASO TA-73 Airport Landfills Los Alamos County, NM	**Date:**	5/24/06
Project Number	D06602	**Engineer:**	CLC

THE FOLLOWING ASSUMPTIONS HAVE BEEN ADOPTED BY TET FOR THE PURPOSE OF DEVELOPING A FINAL DESIGN. ALL ASSUMPTIONS MUST BE VERIFIED BY OTHERS PRIOR TO CONSTRUCTION.

1. Design Methodology

In general accordance with AASHTO Standard Specifications for Highway Bridges 2002

2. Soil Properties

Soils	***Unit Weight γ, PCF***	***Friction Angle ϕ', degrees***	***Cohesion PSF***
Reinforced Soil	130	32	0
Retained Soil	100	35.5	0
Foundation Soil	130	32	4000

NOTE: ALL SOIL PROPERTIES MUST BE VERIFIED BY A GEOTECHNICAL ENGINEER PRIOR TO CONSTRUCTION.

3. Geometry

- General Information
  - Three Mechanically Stabilized Earth (MSE) walls with the following geometry:

Walls	*Length, ft*	*Maximum Design Height, ft*	*Top & Toe slope*
Wall 2	347.0	26.5	4:1 Top Slope Level Toe slope
Wall 3	56.5	6.0	4:1 Top Slope Level Toe slope
Wall 4	50.0	7.0	4:1 Top Slope Level Toe slope

- MSE Walls are superimposed at the following stations:

  - Wall 2 and Wall 4:
    - Wall 2 from Sta. 1+00.0 to Sta. 1+35.7 and Wall 4 from Sta. 1+00.0 to 1+50.0

  - Wall 2 and Wall 3:
    - Wall 2 from Sta. 4+00.7 to Sta. 4+47.0 Wall 3 from Sta. 1+00.0 to Sta. 1+34

4. Facing

SierraScape galvanized baskets with stone facing and a setback of 1.5" to achieve 1H:12V face batter.

5. Loading

Traffic Loading	= 250 psf
Design Seismic Acceleration	= 0.262 g

6. Geogrid Reinforcement

Type	*Creep Limited Strength, Lbs/ft*	*Reduction Factor RF_{ID}/RF_D*	*Working Strength, Lbs/ft*
UX1400MSE	2170	1.10/1.0	1973
UX1500MSE	3255	1.10/1.0	2959
UX160MSE	4308	1.10/1.0	3917

Soil-geogrid interaction coefficient	= 0.8
Percent coverage of geogrid	= 94 %
Design life	= 75 years

7. Stability Analysis

	<u>**Static**</u>	<u>**Static**</u>
Internal Stability		
Minimum factor of safety for geogrid pullout	= 1.5	= 1.1
Minimum factor of safety for geogrid strength	= 1.5	= 1.1
Minimum factor of safety for direct sliding at geogrid	= 1.5	= 1.1
Minimum factor of safety for connection	= 1.5	= 1.1
External Stability	<u>**Static**</u>	
Minimum factor of safety for direct sliding at base	= 1.5	= 1.1
Maximum eccentricity, e/L	= 1/6	= 1/3

NOTE: Global stability is beyond the scope of this design.

8. **Maximum Applied Bearing Pressure** = 3915 psf (Static)

= 6056 psf (Seismic)

9. **Hydraulic Conditions**

Groundwater/phreatic surfaces were not considered in this design. Water surfaces assumed to be sufficiently below the base of the MSE walls as not influence the internal and external stability of the MSE walls.

10. **Notes**

A. The design presented herein is based on the information provided to Tensar Earth Technologies, Inc. Tensar Earth Technologies, Inc. accepts no liability for the information or verification of information.

B. The owner or owner's representative is responsible to review and verify the design parameters prior to construction.

C. Tensar Earth Technologies, Inc. assumes no liability for interpretation of subsurface conditions, suitability of soil design parameters, and subsurface groundwater conditions.

D. Evaluation of foundation bearing capacity and global stability are the responsibility of the owner or owner's representative. Tensar Earth Technologies, Inc., accepts no responsibility or liability for the evaluation of global stability and foundation bearing capacity.

E. Total and differential settlement and their effects on this system are the responsibility of the owner or owner's representative. Tensar Earth Technologies, Inc. accepts no responsibility or liability for the evaluation of settlements.

F. Flood conditions and rapid drawdown have not been considered in the design.

11. **References**

For references see Section 9.0 on sheet 2 of 11, Construction Requirements, of the construction drawings.

SIERRASCAPE®
RETAINING WALL SYSTEMS

AASHTO DESIGN METHOD
LASO TA-73 Airport Landfills

PROJECT IDENTIFICATION

Title:	LASO TA-73 Airport Landfills
Project Number:	D06602
Client:	Slaton Bros SW
Designer:	CLC
Station Number:	1+35.7-4+00.7

Description:

Wall 2_DH=26.5'_EXTERNAL

Company's information:

Name: Tensar Earth Technologies, Inc.
Street: 5883 Glenridge Drive
Suite 200
Atlanta, GA 30328
Telephone #: (404) 250-1290
Fax #: (404) 250-9185
E-Mail: ccampbell@tensarcorp.com

Original file path and name: k:_d\D06602\Final\Design\Design without Wall 1\Wall1an..... .....ndWall2_26.5'_EX.BEN
Original date and time of creating this file: May 22, 2006

PROGRAM MODE: ANALYSIS of a SIMPLE STRUCTURE using GEOGRID as reinforcing material.

SOIL DATA

REINFORCED SOIL

Unit weight, γ	130.0 lb/ft ^{3}
Design value of internal angle of friction, ϕ	32.0 °

RETAINED SOIL

Unit weight, γ	100.0 lb/ft ^{3}
Design value of internal angle of friction, ϕ	35.5 °

FOUNDATION SOIL (Considered as an equivalent uniform soil)

Equivalent unit weight, $\gamma_{equiv.}$	130.0 lb/ft ^{3}
Equivalent internal angle of friction, $\phi_{equiv.}$	32.0 °
Equivalent cohesion, $c_{equiv.}$	4000.0 lb/ft ^{2}

Water table does not affect bearing capacity

LATERAL EARTH PRESSURE COEFFICIENTS

Ka (internal stability) = 0.3073 (if batter is less than 10°, Ka is calculated from eq. 15. Otherwise, eq. 38 is utilized)
Inclination of internal slip plane, ψ = 61.00° (see Fig. 28 in DEMO 82).
Ka (external stability) = 0.2866 (if batter is less than 10°, Ka is calculated from eq. 16. Otherwise, eq. 17 is utilized)

BEARING CAPACITY

Bearing capacity coefficients (calculated by MSEW): Nc = 35.49 N γ = 30.21

SEISMICITY

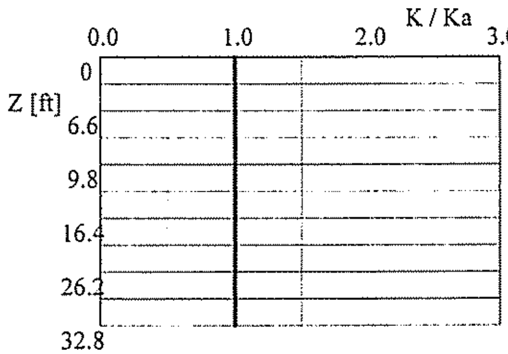
Maximum ground acceleration coefficient, α_o = 0.131
Kae (α_o > 0) = 0.4015 Kae (α_o = 0) = 0.2486 Δ Kae = 0.1529 (see eq. 37 in DEMO 82)
Seismic soil-geogrid friction coefficient, F* is 80.0% of its specified static value.

INPUT DATA: Geogrids (Analysis)

D A T A	Geogrid type #1	Geogrid type #2	Geogrid type #3	Geogrid type #4	Geogrid type #5
Tult [lb/ft]	3974.1	4796.3	7811.2	9866.7	11990.8
Durability reduction factor, RFd	1.00	1.00	1.00	1.00	1.00
Installation-damage reduction factor, RFid	1.10	1.10	1.10	1.10	1.10
Creep reduction factor, RFc	2.34	2.21	2.40	2.29	2.22
Fs-overall for strength	N/A	N/A	N/A	N/A	N/A
Coverage ratio, Rc	0.940	0.940	0.940	0.940	0.940
Friction angle along geogrid-soil interface, ρ	26.56	26.56	26.56	26.56	26.56
Pullout resistance factor, F*	0.80·tanϕ	0.80·tanϕ	0.80·tanϕ	0.80·tanϕ	0.80·tanϕ
Scale-effect correction factor, α	1.0	1.0	1.0	1.0	1.0

Variation of Lateral Earth Pressure Coefficient With Depth

Z	K / Ka
0 ft	1.00
3.3 ft	1.00
6.6 ft	1.00
9.8 ft	1.00
13.1 ft	1.00
16.4 ft	1.00
19.7 ft	1.00



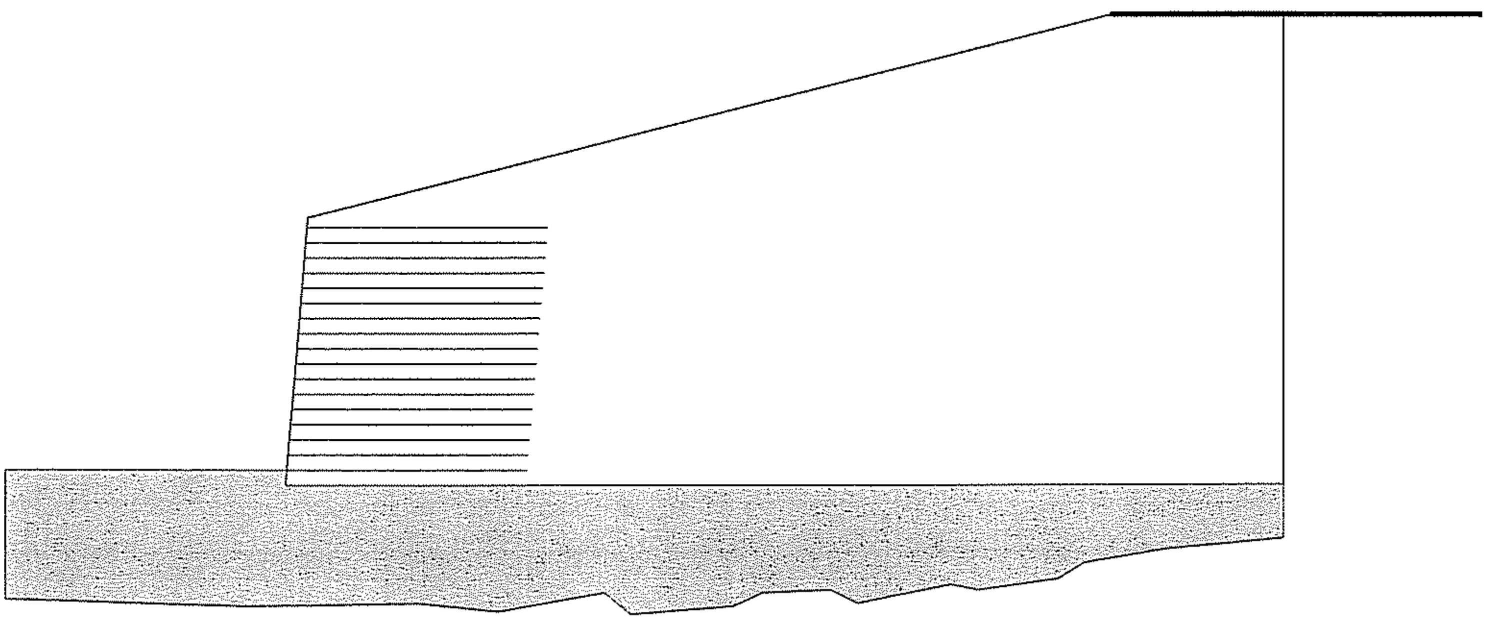
INPUT DATA: Geometry and Surcharge loads (of a SIMPLE STRUCTURE)

Design height, Hd	26.50	[ft]	{ Embedded depth is E = 1.50 ft, and height above top of finished bottom grade is H = 25.00 ft }
Batter, ω	4.8	[deg]	
Backslope, β	14.0	[deg]	
Backslope rise	20.0	[ft]	Broken back equivalent angle, I = 14.04° (see Fig. 25 in DEMO 82)

UNIFORM SURCHARGE
Uniformly distributed dead load is 0.0 [lb/ft ²]

OTHER EXTERNAL LOAD(S)
[S1] Strip Load, Qv-d = 0.0 and Qv-l = 250.0 [lb/ft ²].
Footing width, b=150.0 [ft]. Distance of center of footing from wall face, d = 155.0 [ft] @ depth of 0.0 [ft] below soil surface.

ANALYZED REINFORCEMENT LAYOUT:



SCALE:

0 2 4 6 8 10[ft]

ANALYSIS: CALCULATED FACTORS (Static conditions)

N/A

Bearing capacity, Fs = ~~48.65~~, Meyerhof stress = 3860 lb/ft².

Foundation Interface: Direct sliding, Fs = 3.969, Eccentricity, e/L = 0.0135, Fs-overturning = 7.96

GEOGRID				CONNECTION						
#	Elevation [ft]	Length [ft]	Type #	Fs-overall [connection strength]	Fs-overall [geogrid strength]	Geogrid strength Fs	Pullout resistance Fs	Direct sliding Fs	Eccentricity e/L	Product name
1	0.00	24.00	4	4.77	4.32	4.321	95.511	3.223	0.0135	UX1600MSE-SS
2	1.50	24.00	4	2.48	2.25	2.249	47.088	3.364	0.0086	UX1600MSE-SS
3	3.00	24.00	4	2.62	2.38	2.380	46.569	3.519	0.0038	UX1600MSE-SS
4	4.50	24.00	3	1.62	1.91	1.909	45.510	3.687	-0.0008	UX1500MSE-SS
5	6.00	24.00	3	1.72	2.03	2.034	44.310	3.871	-0.0053	UX1500MSE-SS
6	7.50	24.00	3	1.85	2.18	2.177	43.149	4.074	-0.0096	UX1500MSE-SS
7	9.00	24.00	3	1.97	2.34	2.342	42.013	4.299	-0.0139	UX1500MSE-SS
8	10.50	24.00	3	2.03	2.53	2.534	40.886	4.548	-0.0182	UX1500MSE-SS
9	12.00	24.00	3	2.09	2.76	2.760	39.818	4.826	-0.0225	UX1500MSE-SS
10	13.50	24.00	3	2.17	3.03	3.030	38.799	5.138	-0.0270	UX1500MSE-SS
11	15.00	24.00	3	2.27	3.36	3.359	37.824	5.490	-0.0318	UX1500MSE-SS
12	16.50	24.00	3	2.39	3.77	3.768	36.959	5.889	-0.0371	UX1500MSE-SS
13	18.00	24.00	3	2.55	4.29	4.290	36.221	6.342	-0.0431	UX1500MSE-SS
14	19.50	24.00	3	2.75	4.98	4.981	35.646	6.859	-0.0504	UX1500MSE-SS
15	21.00	24.00	3	3.04	5.94	5.936	35.389	7.446	-0.0597	UX1500MSE-SS
16	22.50	24.00	3	3.45	7.35	7.346	35.636	8.102	-0.0726	UX1500MSE-SS
17	24.00	24.00	3	4.13	9.63	9.632	36.831	8.799	-0.0920	UX1500MSE-SS
18	25.50	24.00	3	4.83	12.46	12.456	35.937	9.422	-0.1257	UX1500MSE-SS

ANALYSIS: CALCULATED FACTORS (Seismic conditions)

N/A

Bearing capacity, Fs = ~~38.56~~, Meyerhof stress = 4673 lb/ft².

Foundation Interface: Direct sliding, Fs = 2.180, Eccentricity, e/L = 0.0928, Fs-overturning = 3.72

GEOGRID				CONNECTION						
#	Elevation [ft]	Length [ft]	Type #	Fs-overall [connection strength]	Fs-overall [geogrid strength]	Geogrid strength Fs	Pullout resistance Fs	Direct sliding Fs	Eccentricity e/L	Product name
1	0.00	24.00	4	3.49	3.72	3.724	55.886	1.770	0.0928	UX1600MSE-SS
2	1.50	24.00	4	2.09	2.08	2.081	31.774	1.866	0.0789	UX1600MSE-SS
3	3.00	24.00	4	2.20	2.20	2.197	31.297	1.972	0.0658	UX1600MSE-SS
4	4.50	24.00	3	1.51	1.76	1.765	30.446	2.091	0.0534	UX1500MSE-SS
5	6.00	24.00	3	1.61	1.88	1.876	29.493	2.225	0.0416	UX1500MSE-SS
6	7.50	24.00	3	1.72	2.00	2.003	28.554	2.376	0.0305	UX1500MSE-SS
7	9.00	24.00	3	1.83	2.15	2.148	27.618	2.549	0.0199	UX1500MSE-SS
8	10.50	24.00	3	1.88	2.32	2.316	26.672	2.748	0.0099	UX1500MSE-SS
9	12.00	24.00	3	1.95	2.51	2.511	25.743	2.980	0.0004	UX1500MSE-SS
10	13.50	24.00	3	2.02	2.74	2.744	24.819	3.253	-0.0087	UX1500MSE-SS
11	15.00	24.00	3	2.11	3.02	3.023	23.889	3.577	-0.0176	UX1500MSE-SS
12	16.50	24.00	3	2.22	3.37	3.366	22.980	3.970	-0.0265	UX1500MSE-SS
13	18.00	24.00	3	2.37	3.80	3.797	22.082	4.451	-0.0355	UX1500MSE-SS
14	19.50	24.00	3	2.55	4.35	4.353	21.187	5.050	-0.0453	UX1500MSE-SS
15	21.00	24.00	3	2.80	5.10	5.102	20.329	5.807	-0.0567	UX1500MSE-SS
16	22.50	24.00	3	3.17	6.16	6.161	19.507	6.769	-0.0710	UX1500MSE-SS
17	24.00	24.00	3	3.75	7.77	7.775	18.728	7.956	-0.0915	UX1500MSE-SS
18	25.50	24.00	3	4.34	9.64	9.643	16.911	9.193	-0.1257	UX1500MSE-SS

N/A*

* see internal stability analysis

SIERRASCAPE®
RETAINING WALL SYSTEMS

AASHTO DESIGN METHOD
LASO TA-73 Airport Landfills

PROJECT IDENTIFICATION

Title:	LASO TA-73 Airport Landfills
Project Number:	D06602
Client:	Slaton Bros SW
Designer:	CLC
Station Number:	1+35.7-4+00.7

Description:

Wall 2_DH=26.5'_INTERNAL

Company's information:

Name: Tensar Earth Technologies, Inc.
Street: 5883 Glenridge Drive
Suite 200
Atlanta, GA 30328
Telephone #: (404) 250-1290
Fax #: (404) 250-9185
E-Mail: ccampbell@tensarcorp.com

Original file path and name: k:_d\D06602\Final\Design\Design without Wall 1\Wall1an.....
.....ndWall2_26.5'_IN.BEN
Original date and time of creating this file: May 22, 2006

PROGRAM MODE: ANALYSIS
of a SIMPLE STRUCTURE
using GEOGRID as reinforcing material.

SOIL DATA

REINFORCED SOIL

Unit weight, γ 130.0 lb/ft ^{3}
Design value of internal angle of friction, ϕ 32.0 °

RETAINED SOIL

Unit weight, γ 100.0 lb/ft ^{3}
Design value of internal angle of friction, ϕ 35.5 °

FOUNDATION SOIL (Considered as an equivalent uniform soil)

Equivalent unit weight, $\gamma_{equiv.}$ 130.0 lb/ft ^{3}
Equivalent internal angle of friction, $\phi_{equiv.}$ 32.0 °
Equivalent cohesion, $c_{equiv.}$ 4000.0 lb/ft ^{2}

Water table does not affect bearing capacity

LATERAL EARTH PRESSURE COEFFICIENTS

Ka (internal stability) = 0.3073 (if batter is less than 10°, Ka is calculated from eq. 15. Otherwise, eq. 38 is utilized)
Inclination of internal slip plane, ψ = 61.00° (see Fig. 28 in DEMO 82).
Ka (external stability) = 0.2866 (if batter is less than 10°, Ka is calculated from eq. 16. Otherwise, eq. 17 is utilized)

BEARING CAPACITY

Bearing capacity coefficients (calculated by MSEW): Nc = 35.49 N γ = 30.21

SEISMICITY

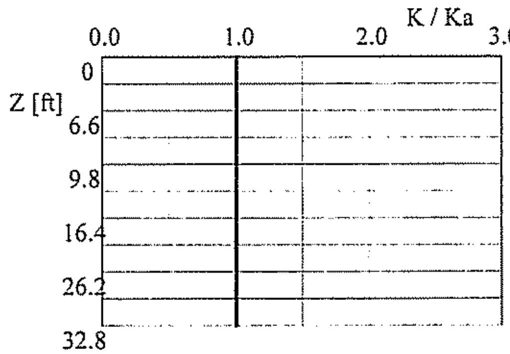
Maximum ground acceleration coefficient, α_o = 0.262
Kae (α_o > 0) = 0.6339 Kae (α_o = 0) = 0.2486 Δ Kae = 0.3853 (see eq. 37 in DEMO 82)
Seismic soil-geogrid friction coefficient, F* is 80.0% of its specified static value.

INPUT DATA: Geogrids
(Analysis)

D A T A	Geogrid type #1	Geogrid type #2	Geogrid type #3	Geogrid type #4	Geogrid type #5
Tult [lb/ft]	3974.1	4796.3	7811.2	9866.7	11990.8
Durability reduction factor, RFd	1.00	1.00	1.00	1.00	1.00
Installation-damage reduction factor, RFid	1.10	1.10	1.10	1.10	1.10
Creep reduction factor, RFc	2.34	2.21	2.40	2.29	2.22
Fs-overall for strength	N/A	N/A	N/A	N/A	N/A
Coverage ratio, Rc	0.940	0.940	0.940	0.940	0.940
Friction angle along geogrid-soil interface, ρ	26.56	26.56	26.56	26.56	26.56
Pullout resistance factor, F*	0.80·tanφ	0.80·tanφ	0.80·tanφ	0.80·tanφ	0.80·tanφ
Scale-effect correction factor, α	1.0	1.0	1.0	1.0	1.0

Variation of Lateral Earth Pressure Coefficient With Depth

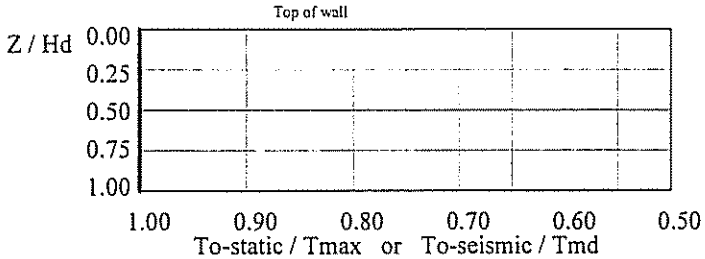
Z	K / Ka
0 ft	1.00
3.3 ft	1.00
6.6 ft	1.00
9.8 ft	1.00
13.1 ft	1.00
16.4 ft	1.00
19.7 ft	1.00



INPUT DATA: Facia and Connection (according to revised Demo 82)
(Analysis)

FACIA type: Facing enabling frictional connection of reinforcement (e.g., modular concrete blocks, gabions)
Depth/height of block is 1.48/1.48 ft. Horizontal distance to Center of Gravity of block is 0.74 ft.
Average unit weight of block is $\gamma_f = 114.58$ lb/ft³

Z / Hd	To-static / Tmax or To-seismic / Tmd
0.00	1.00
0.25	1.00
0.50	1.00
0.75	1.00
1.00	1.00



Geogrid Type #1 σ [(1)]	CRult [(2)]	Geogrid Type #2 σ	CRult	Geogrid Type #3 σ	CRult	Geogrid Type #4 σ	CRult	Geogrid Type #5 σ	CRult
0.0	1.00	0.0	1.00	0.0	1.00	0.0	0.38	0.0	0.38
						1200.9	0.44	1200.9	0.44
						2999.0	0.53	3600.5	0.56
						6000.1	0.68	7198.9	0.74

Geogrid Type #1[3)] σ	CRcr	Geogrid Type #2 σ	CRcr	Geogrid Type #3 σ	CRcr	Geogrid Type #4 σ	CRcr	Geogrid Type #5 σ	CRcr
0.0	0.15	0.0	0.15	0.0	0.15	0.0	0.38	0.0	0.38
480.3	0.20	480.3	0.20	599.4	0.21	1200.9	0.44	1200.9	0.44
1200.9	0.27	1200.9	0.27	1800.3	0.33	2999.0	0.53	3600.5	0.56
2399.6	0.39	2399.6	0.39	3600.5	0.51	6000.1	0.68	7198.9	0.74

(1) σ = Confining stress in between stacked blocks [lb/ft ²]
(2) CRult = Tc-ult / Tult
(3) CRcr = Tcre / Tult

In seismic analysis, long term strength is reduced to 100% of its static value.

D A T A (for connection only)	Type #1	Type #2	Type #3	Type #4	Type #5
Product Name	UX1100MSE..	UX1400MSE..	UX1500MSE..	UX1600MSE..	UX1700MSE..
Connection strength reduction factor, RFd	1.10	1.10	1.10	1.10	1.10
Creep reduction factor, RFc	N/A	N/A	N/A	N/A	N/A

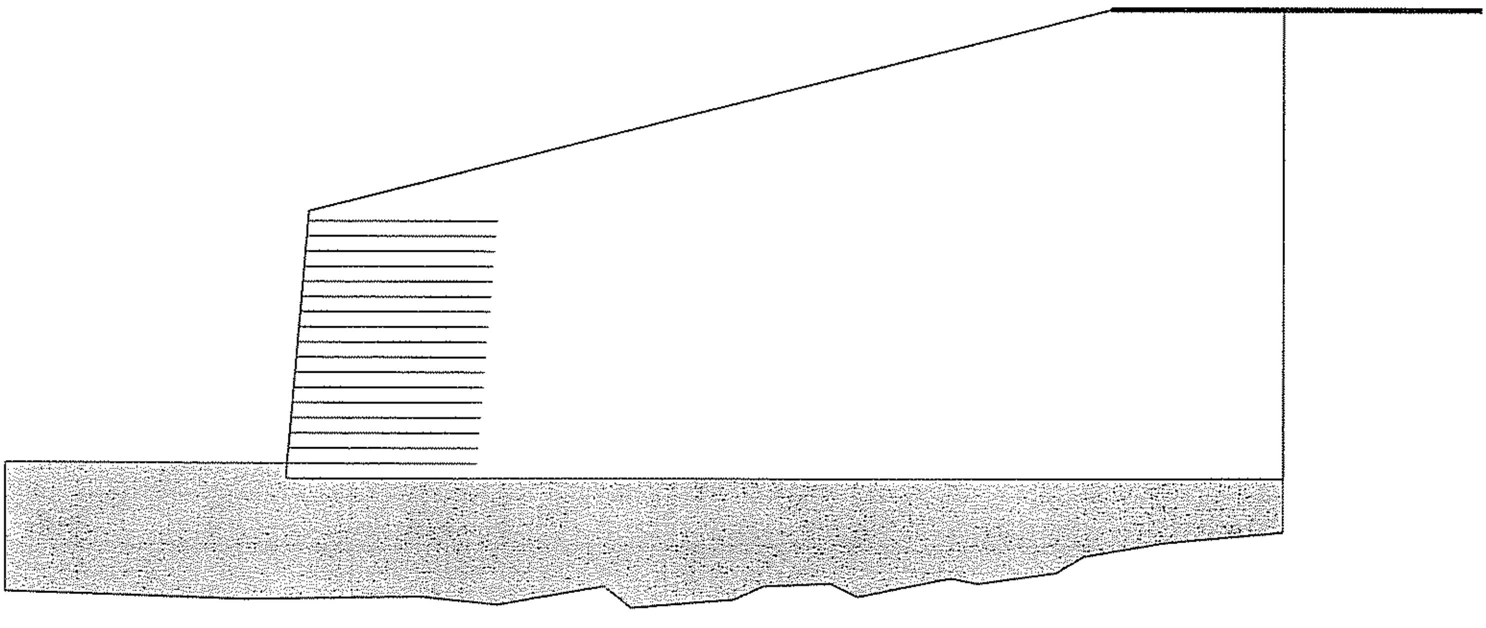
INPUT DATA: Geometry and Surcharge loads (of a SIMPLE STRUCTURE)

Design height, Hd	26.50	[ft]	{ Embedded depth is E = 1.50 ft, and height above top of finished bottom grade is H = 25.00 ft }
Batter, ω	4.8	[deg]	
Backslope, β	14.0	[deg]	
Backslope rise	20.0	[ft]	Broken back equivalent angle, I = 14.04° (see Fig. 25 in DEMO 82)

UNIFORM SURCHARGE
Uniformly distributed dead load is 0.0 [lb/ft ^{2}]

OTHER EXTERNAL LOAD(S)
[S1] Strip Load, Qv-d = 0.0 and Qv-l = 250.0 [lb/ft ^{2}].
Footing width, b=150.0 [ft]. Distance of center of footing from wall face, d = 155.0 [ft] @ depth of 0.0 [ft] below soil surface.

ANALYZED REINFORCEMENT LAYOUT:



SCALE:

0 2 4 6 8 10[ft]

License number MSEW-301064

ANALYSIS: CALCULATED FACTORS (Static conditions)

N/A
Bearing capacity, Fs = 44.42, Meyerhof stress = 3970 lb/ft².

Foundation Interface: Direct sliding, Fs = 3.315, Eccentricity, e/L = 0.0392, Fs-overturning = 5.54

GEOGRID #	Elevation [ft]	Length [ft]	Type #	CONNECTION Fs-overall [connection strength]	Fs-overall [geogrid strength]	Geogrid strength Fs	Pullout resistance Fs	Direct sliding Fs	Eccentricity e/L	Product name
1	0.00	19.00	4	4.77	4.32	4.321	73.047	2.692	0.0392	UX1600MSE-SS
2	1.50	19.00	4	2.48	2.25	2.249	35.960	2.818	0.0317	UX1600MSE-SS
3	3.00	19.00	4	2.62	2.38	2.380	35.356	2.957	0.0246	UX1600MSE-SS
4	4.50	19.00	3	1.62	1.91	1.909	34.220	3.110	0.0179	UX1500MSE-SS
5	6.00	19.00	3	1.72	2.03	2.034	32.954	3.278	0.0115	UX1500MSE-SS
6	7.50	19.00	3	1.85	2.18	2.177	31.677	3.466	0.0054	UX1500MSE-SS
7	9.00	19.00	3	1.97	2.34	2.342	30.428	3.675	-0.0005	UX1500MSE-SS
8	10.50	19.00	3	2.03	2.53	2.534	29.190	3.909	-0.0061	UX1500MSE-SS
9	12.00	19.00	3	2.09	2.76	2.760	27.948	4.174	-0.0116	UX1500MSE-SS
10	13.50	19.00	3	2.17	3.03	3.030	26.745	4.476	-0.0170	UX1500MSE-SS
11	15.00	19.00	3	2.27	3.36	3.359	25.566	4.821	-0.0225	UX1500MSE-SS
12	16.50	19.00	3	2.39	3.77	3.768	24.402	5.221	-0.0282	UX1500MSE-SS
13	18.00	19.00	3	2.55	4.29	4.290	23.307	5.687	-0.0344	UX1500MSE-SS
14	19.50	19.00	3	2.75	4.98	4.981	22.284	6.233	-0.0416	UX1500MSE-SS
15	21.00	19.00	3	3.04	5.94	5.936	21.353	6.878	-0.0507	UX1500MSE-SS
16	22.50	19.00	3	3.45	7.35	7.346	20.639	7.634	-0.0631	UX1500MSE-SS
17	24.00	19.00	3	4.13	9.63	9.632	20.302	8.492	-0.0824	UX1500MSE-SS
18	25.50	19.00	3	4.83	12.46	12.456	18.548	9.330	-0.1181	UX1500MSE-SS

ANALYSIS: CALCULATED FACTORS (Seismic conditions)

N/A N/A N/A* N/A*
Bearing capacity, Fs = 16.99, Meyerhof stress = 9252 lb/ft².

Foundation Interface: Direct sliding, Fs = 1.214, Eccentricity, e/L = 0.2934, Fs-overturning = 1.57 N/A

GEOGRID #	Elevation [ft]	Length [ft]	Type #	CONNECTION Fs-overall [connection strength]	Fs-overall [geogrid strength]	Geogrid strength Fs	Pullout resistance Fs	Direct sliding Fs	Eccentricity e/L	Product name
1	0.00	19.00	4	2.76	3.28	3.282	33.873	0.986	0.2934	UX1600MSE-SS
2	1.50	19.00	4	1.82	1.94	1.941	21.099	1.042	0.2579	UX1600MSE-SS
3	3.00	19.00	4	1.92	2.05	2.049	20.649	1.106	0.2244	UX1600MSE-SS
4	4.50	19.00	3	1.43	1.65	1.650	19.884	1.178	0.1928	UX1500MSE-SS
5	6.00	19.00	3	1.52	1.75	1.753	19.038	1.261	0.1632	UX1500MSE-SS
6	7.50	19.00	3	1.62	1.87	1.870	18.181	1.355	0.1355	UX1500MSE-SS
7	9.00	19.00	3	1.73	2.00	2.004	17.334	1.465	0.1098	UX1500MSE-SS
8	10.50	19.00	3	1.78	2.16	2.159	16.486	1.594	0.0859	UX1500MSE-SS
9	12.00	19.00	3	1.84	2.34	2.340	15.627	1.748	0.0637	UX1500MSE-SS
10	13.50	19.00	3	1.92	2.55	2.554	14.777	1.934	0.0434	UX1500MSE-SS
11	15.00	19.00	3	2.01	2.81	2.810	13.925	2.163	0.0246	UX1500MSE-SS
12	16.50	19.00	3	2.12	3.12	3.124	13.060	2.452	0.0072	UX1500MSE-SS
13	18.00	19.00	3	2.25	3.52	3.517	12.203	2.827	-0.0090	UX1500MSE-SS
14	19.50	19.00	3	2.43	4.02	4.023	11.343	3.328	-0.0246	UX1500MSE-SS
15	21.00	19.00	3	2.68	4.70	4.699	10.465	4.027	-0.0402	UX1500MSE-SS
16	22.50	19.00	3	3.03	5.65	5.647	9.590	5.045	-0.0577	UX1500MSE-SS
17	24.00	19.00	3	3.58	7.08	7.076	8.700	6.577	-0.0803	UX1500MSE-SS
18	25.50	19.00	3	4.15	8.75	8.746	7.353	8.689	-0.1178	UX1500MSE-SS

N/A*

*see external stability analysis

SIERRASCAPE®
RETAINING WALL SYSTEMS

AASHTO DESIGN METHOD
LASO TA-73 Airport Landfills

PROJECT IDENTIFICATION

Title:	LASO TA-73 Airport Landfills
Project Number:	D06602
Client:	Slaton Bros SW
Designer:	CLC
Station Number:	Wall 2_4+00.7-4+21.3/ Wall 3_1+00.0-1+09.7

Description:

Tiered wall...Wall 2_DH=22.0' and Wall 3_DH=6', 10' offset_EXTERNAL

Company's information:

Name: Tensar Earth Technologies, Inc.
Street: 5883 Glenridge Drive
Suite 200
Atlanta, GA 30328
Telephone #: (404) 250-1290
Fax #: (404) 250-9185
E-Mail: ccampbell@tensarcorp.com

Original file path and name: k:_d\D06602\Final\Design\Design without Wall 1\Wall2an.....
.....ndWall3_22-6'_EX.BEN
Original date and time of creating this file: May 22, 2006

PROGRAM MODE: ANALYSIS
of SUPERIMPOSED WALL
using GEOGRID as reinforcing material.

SOIL DATA

REINFORCED SOIL

Unit weight, γ 130.0 lb/ft ^{3}
Design value of internal angle of friction, ϕ 32.0 °

RETAINED SOIL

Unit weight, γ 100.0 lb/ft ^{3}
Design value of internal angle of friction, ϕ 35.5 °

FOUNDATION SOIL (Considered as an equivalent uniform soil)

Equivalent unit weight, $\gamma_{equiv.}$ 130.0 lb/ft ^{3}
Equivalent internal angle of friction, $\phi_{equiv.}$ 32.0 °
Equivalent cohesion, $c_{equiv.}$ 4000.0 lb/ft ^{2}

Water table does not affect bearing capacity

LATERAL EARTH PRESSURE COEFFICIENTS

Ka (internal stability) = 0.3073 (if batter is less than 10°, Ka is calculated from eq. 15. Otherwise, eq. 38 is utilized)
Inclination of internal slip plane, ψ = 61.00° (see Fig. 28 in DEMO 82).
Ka (external stability) = 0.2866 (if batter is less than 10°, Ka is calculated from eq. 16. Otherwise, eq. 17 is utilized)

BEARING CAPACITY

Bearing capacity coefficients (calculated by MSEW): Nc = 35.49 N γ = 30.21

SEISMICITY

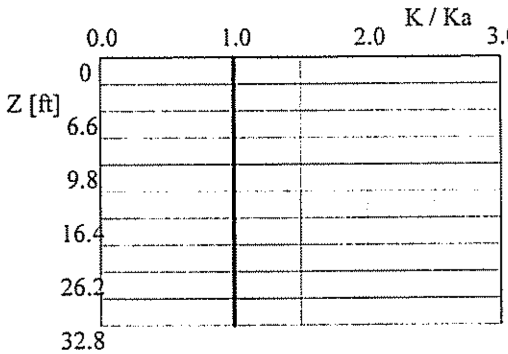
Maximum ground acceleration coefficient, α_o = 0.131
Kae (α_o > 0) = 0.4492 Kae (α_o = 0) = 0.2866 Δ Kae = 0.1625 (see eq. 37 in DEMO 82)
Seismic soil-geogrid friction coefficient, F* is 80.0% of its specified static value.

INPUT DATA: Geogrids
(Analysis)

D A T A	Geogrid type #1	Geogrid type #2	Geogrid type #3	Geogrid type #4	Geogrid type #5
Tult [lb/ft]	3974.1	4796.3	7811.2	9866.7	11990.8
Durability reduction factor, RFd	1.00	1.00	1.00	1.00	1.00
Installation-damage reduction factor, RFid	1.10	1.10	1.10	1.10	1.10
Creep reduction factor, RFc	2.34	2.21	2.40	2.29	2.22
Fs-overall for strength	N/A	N/A	N/A	N/A	N/A
Coverage ratio, Rc	0.940	0.940	0.940	0.940	0.940
Friction angle along geogrid-soil interface, ρ	26.56	26.56	26.56	26.56	26.56
Pullout resistance factor, F*	$0.80 \cdot \tan\phi$	$0.80 \cdot \tan\phi$	$0.80 \cdot \tan\phi$	$0.80 \cdot \tan\phi$	$0.80 \cdot \tan\phi$
Scale-effect correction factor, α	1.0	1.0	1.0	1.0	1.0

Variation of Lateral Earth Pressure Coefficient With Depth

Z	K / Ka
0 ft	1.00
3.3 ft	1.00
6.6 ft	1.00
9.8 ft	1.00
13.1 ft	1.00
16.4 ft	1.00
19.7 ft	1.00



INPUT DATA: Geometry and Surcharge loads (of SUPERIMPOSED wall)

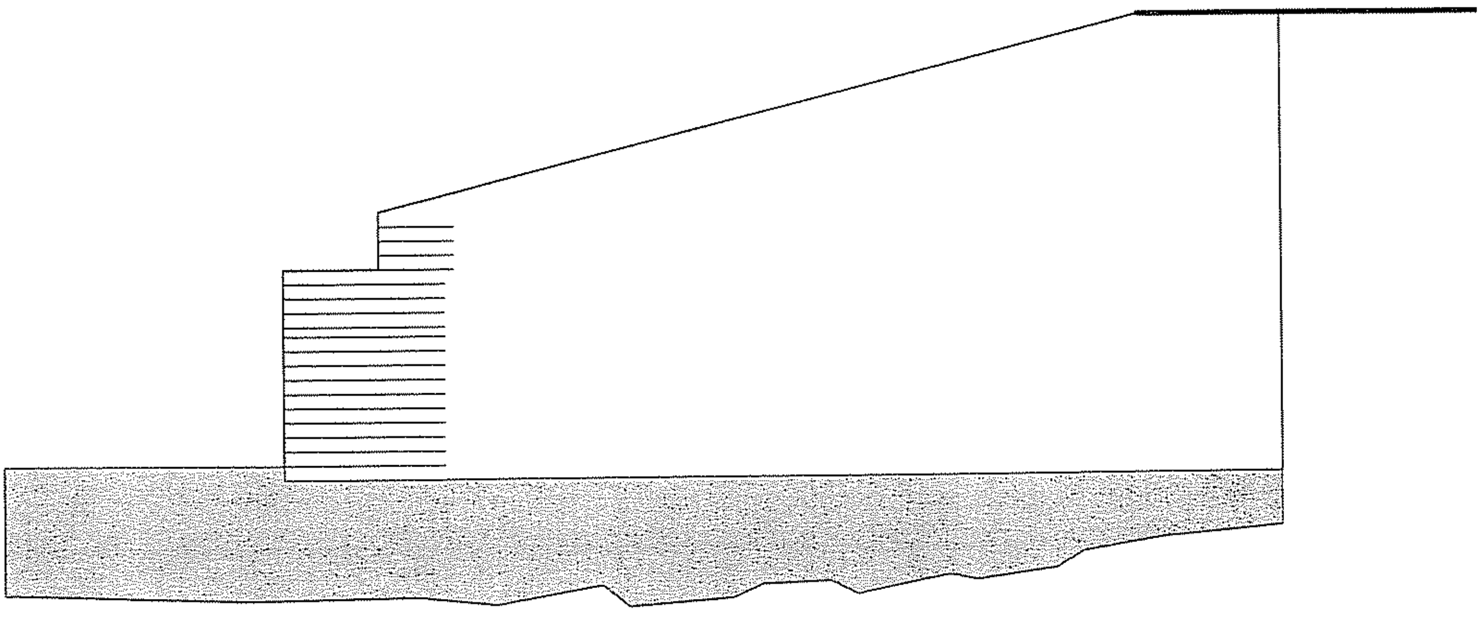
Design height, Hd	28.00	[ft]	{ Embedded depth is E = 1.50 ft, and height above top of finished bottom grade is H = 26.50 ft, where H1 = 6.00 and H2 = 20.50 }
Batter, ω	0.0	[deg]	
Backslope, β	14.0	[deg]	
Backslope rise	20.0	[ft]	Broken back equivalent angle, I = 14.04° (see Fig. 25 in DEMO 82)

Offset of upper segment from lower one, Offset = 10.0 ft, Blackslope2 = 0.0 deg. and Backslope rise, S2 = 0.0 ft.

UNIFORM SURCHARGE
Uniformly distributed dead load is 0.0 [lb/ft ^{2}]

OTHER EXTERNAL LOAD(S)
[S1] Strip Load, Qv-d = 0.0 and Qv-l = 250.0 [lb/ft ^{2}].
Footing width, b=150.0 [ft]. Distance of center of footing from wall face, d = 155.0 [ft] @ depth of 0.0 [ft] below soil surface.

ANALYZED REINFORCEMENT LAYOUT:



SCALE:

0 2 4 6 8 10[ft]

ANALYSIS: CALCULATED FACTORS (Static conditions)

N/A

Bearing capacity, Fs = 43.69, Meyerhof stress = 3915 lb/ft².

Foundation Interface: Direct sliding, Fs = 2.943, Eccentricity, e/L = 0.0646, Fs-overturning = 4.51

#	GEOGRID Elevation [ft]	Length [ft]	Type #	CONNECTION Fs-overall [connection strength]	Fs-overall [geogrid strength]	Geogrid strength Fs	Pullout resistance Fs	Direct sliding Fs	Eccentricity e/L	Product name
1	0.00	17.00	4	4.74	4.09	4.086	65.346	2.389	0.0646	UX1600MSE-SS
2	1.50	17.00	4	2.42	2.12	2.123	30.596	2.485	0.0527	UX1600MSE-SS
3	3.00	17.00	4	2.51	2.24	2.239	28.923	2.587	0.0410	UX1600MSE-SS
4	4.50	17.00	3	1.50	1.79	1.789	27.253	2.699	0.0294	UX1500MSE-SS
5	6.00	17.00	3	1.52	1.90	1.898	25.586	2.819	0.0178	UX1500MSE-SS
6	7.50	17.00	3	1.53	2.02	2.023	23.923	2.950	0.0062	UX1500MSE-SS
7	9.00	17.00	3	1.55	2.16	2.164	22.264	3.092	-0.0057	UX1500MSE-SS
8	10.50	17.00	3	1.57	2.33	2.327	20.611	3.246	-0.0180	UX1500MSE-SS
9	12.00	17.00	3	1.60	2.52	2.516	18.964	3.411	-0.0312	UX1500MSE-SS
10	13.50	17.00	3	1.63	2.74	2.739	17.326	3.587	-0.0456	UX1500MSE-SS
11	15.00	17.00	3	1.98	3.58	3.576	18.688	3.771	-0.0622	UX1500MSE-SS
12	16.00	17.00	3	2.04	3.89	3.888	17.707	3.894	-0.0751	UX1500MSE-SS
13	17.50	17.00	3	1.73	3.58	3.584	13.029	4.066	-0.0989	UX1500MSE-SS
14	19.00	17.00	3	1.79	4.05	4.054	11.448	4.196	-0.1322	UX1500MSE-SS
15	20.50	17.00	4	3.81	4.28	4.278	6.836	4.209	-0.1852	UX1600MSE-SS
16	22.00	8.00	2	3.73	7.67	7.666	17.577	4.278	0.0016	UX1400MSE-SS
17	23.50	8.00	2	2.00	4.45	4.453	6.561	5.067	-0.0149	UX1400MSE-SS
18	25.00	8.00	2	2.33	5.68	5.679	4.645	6.198	-0.0340	UX1400MSE-SS
19	26.50	8.00	2	2.14	5.77	5.771	1.886	7.871	-0.0643	UX1400MSE-SS

ANALYSIS: CALCULATED FACTORS (Seismic conditions)

N/A

Bearing capacity, Fs = 26.59, Meyerhof stress = 6056 lb/ft².

Foundation Interface: Direct sliding, Fs = 1.561, Eccentricity, e/L = 0.2135, Fs-overturning = 2.03

#	GEOGRID Elevation [ft]	Length [ft]	Type #	CONNECTION Fs-overall [connection strength]	Fs-overall [geogrid strength]	Geogrid strength Fs	Pullout resistance Fs	Direct sliding Fs	Eccentricity e/L	Product name
1	0.00	17.00	4	3.47	3.52	3.523	38.257	1.268	0.2135	UX1600MSE-SS
2	1.50	17.00	4	2.05	1.97	1.967	20.725	1.336	0.1828	UX1600MSE-SS
3	3.00	17.00	4	2.12	2.07	2.075	19.591	1.413	0.1533	UX1600MSE-SS
4	4.50	17.00	3	1.41	1.66	1.663	18.458	1.501	0.1249	UX1500MSE-SS
5	6.00	17.00	3	1.43	1.77	1.765	17.328	1.601	0.0976	UX1500MSE-SS
6	7.50	17.00	3	1.45	1.88	1.880	16.200	1.718	0.0713	UX1500MSE-SS
7	9.00	17.00	3	1.47	2.01	2.012	15.075	2.175	0.0222	UX1500MSE-SS
8	10.50	17.00	3	1.50	2.16	2.163	13.954	2.345	0.0036	UX1500MSE-SS
9	12.00	17.00	3	1.52	2.34	2.339	12.838	2.542	-0.0150	UX1500MSE-SS
10	13.50	17.00	3	1.56	2.55	2.545	11.727	2.770	-0.0341	UX1500MSE-SS
11	15.00	17.00	3	1.88	3.28	3.280	12.286	3.033	-0.0546	UX1500MSE-SS
12	16.00	17.00	3	1.95	3.56	3.561	11.604	3.229	-0.0696	UX1500MSE-SS
13	17.50	17.00	3	1.67	3.33	3.331	8.813	3.549	-0.0960	UX1500MSE-SS
14	19.00	17.00	3	1.74	3.77	3.767	7.741	3.870	-0.1310	UX1500MSE-SS
15	20.50	17.00	4	3.38	4.05	4.053	4.852	4.092	-0.1849	UX1600MSE-SS
16	22.00	8.00	2	3.38	6.33	6.331	9.592	2.439	0.0410	UX1400MSE-SS
17	23.50	8.00	2	1.91	4.03	4.030	4.261	3.082	0.0070	UX1400MSE-SS
18	25.00	8.00	2	2.23	5.11	5.109	2.982	4.173	-0.0245	UX1400MSE-SS
19	26.50	8.00	2	2.07	5.29	5.292	1.257	6.305	-0.0620	UX1400MSE-SS

N/A*

* See internal stability analysis

SIERRASCAPE®
RETAINING WALL SYSTEMS

AASHTO DESIGN METHOD
LASO TA-73 Airport Landfills

PROJECT IDENTIFICATION

Title:	LASO TA-73 Airport Landfills
Project Number:	D06602
Client:	Slaton Bros SW
Designer:	CLC
Station Number:	Wall 2_4+00.7-4+21.3/ Wall 3_1+00.0-1+09.7

Description:

Tiered wall...Wall 2_DH=22.0' and Wall 3_DH=6', 10' offset_INTERNAL

Company's information:

Name: Tensar Earth Technologies, Inc.
Street: 5883 Glenridge Drive
Suite 200
Atlanta, GA 30328
Telephone #: (404) 250-1290
Fax #: (404) 250-9185
E-Mail: ccampbell@tensarcorp.com

Original file path and name: k:_d\D06602\Final\Design\Design without Wall 1\Wall2an.....
.....ndWall3_22-6'_IN.BEN

Original date and time of creating this file: May 22, 2006

PROGRAM MODE: ANALYSIS
of SUPERIMPOSED WALL
using GEOGRID as reinforcing material.

SOIL DATA

REINFORCED SOIL

Unit weight, γ	130.0 lb/ft ^{3}
Design value of internal angle of friction, ϕ	32.0 °

RETAINED SOIL

Unit weight, γ	100.0 lb/ft ^{3}
Design value of internal angle of friction, ϕ	35.5 °

FOUNDATION SOIL (Considered as an equivalent uniform soil)

Equivalent unit weight, $\gamma_{equiv.}$	130.0 lb/ft ^{3}
Equivalent internal angle of friction, $\phi_{equiv.}$	32.0 °
Equivalent cohesion, $c_{equiv.}$	4000.0 lb/ft ^{2}

Water table does not affect bearing capacity

LATERAL EARTH PRESSURE COEFFICIENTS

Ka (internal stability) = 0.3073 (if batter is less than 10°, Ka is calculated from eq. 15. Otherwise, eq. 38 is utilized)
Inclination of internal slip plane, ψ = 61.00° (see Fig. 28 in DEMO 82).
Ka (external stability) = 0.2866 (if batter is less than 10°, Ka is calculated from eq. 16. Otherwise, eq. 17 is utilized)

BEARING CAPACITY

Bearing capacity coefficients (calculated by MSEW): Nc = 35.49 N γ = 30.21

SEISMICITY

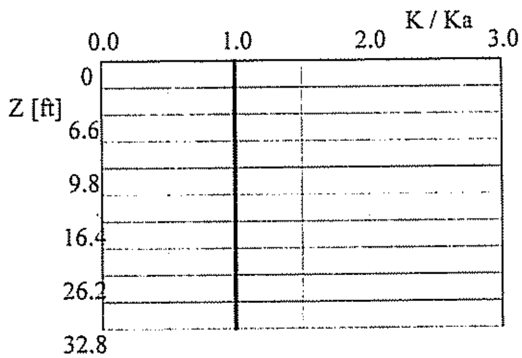
Maximum ground acceleration coefficient, α_o = 0.262
Kae (α_o > 0) = 0.6986 Kae (α_o = 0) = 0.2866 Δ Kae = 0.4120 (see eq. 37 in DEMO 82)
Seismic soil-geogrid friction coefficient, F* is 80.0% of its specified static value.

INPUT DATA: Geogrids
(Analysis)

D A T A	Geogrid type #1	Geogrid type #2	Geogrid type #3	Geogrid type #4	Geogrid type #5
Tult [lb/ft]	3974.1	4796.3	7811.2	9866.7	11990.8
Durability reduction factor, RFd	1.00	1.00	1.00	1.00	1.00
Installation-damage reduction factor, RFid	1.10	1.10	1.10	1.10	1.10
Creep reduction factor, RFc	2.34	2.21	2.40	2.29	2.22
Fs-overall for strength	N/A	N/A	N/A	N/A	N/A
Coverage ratio, Rc	0.940	0.940	0.940	0.940	0.940
Friction angle along geogrid-soil interface, ρ	26.56	26.56	26.56	26.56	26.56
Pullout resistance factor, F*	$0.80 \cdot \tan\phi$	$0.80 \cdot \tan\phi$	$0.80 \cdot \tan\phi$	$0.80 \cdot \tan\phi$	$0.80 \cdot \tan\phi$
Scale-effect correction factor, α	1.0	1.0	1.0	1.0	1.0

Variation of Lateral Earth Pressure Coefficient With Depth

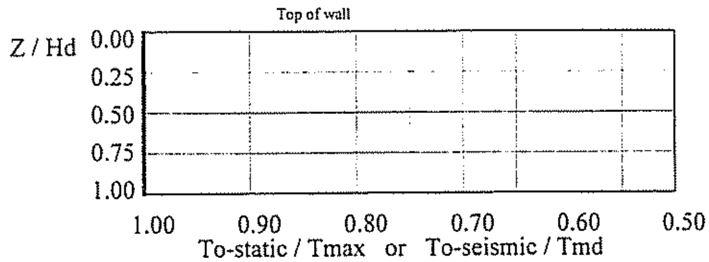
Z	K / Ka
0 ft	1.00
3.3 ft	1.00
6.6 ft	1.00
9.8 ft	1.00
13.1 ft	1.00
16.4 ft	1.00
19.7 ft	1.00



INPUT DATA: Facia and Connection (according to revised Demo 82) (Analysis)

FACIA type: Facing enabling frictional connection of reinforcement (e.g., modular concrete blocks, gabions)
Depth/height of block is 1.48/1.48 ft. Horizontal distance to Center of Gravity of block is 0.74 ft.
Average unit weight of block is γ_f = 114.58 lb/ft^3

Z / Hd	To-static / Tmax or To-seismic / Tmd
0.00	1.00
0.25	1.00
0.50	1.00
0.75	1.00
1.00	1.00



Geogrid Type #1 σ [(1)]	CRult [(2)]	Geogrid Type #2 σ	CRult	Geogrid Type #3 σ	CRult	Geogrid Type #4 σ	CRult	Geogrid Type #5 σ	CRult
0.0	1.00	0.0	1.00	0.0	1.00	0.0	0.38	0.0	0.38
						1200.9	0.44	1200.9	0.44
						2999.0	0.53	3600.5	0.56
						6000.1	0.68	7198.9	0.74

Geogrid Type #1[3)] σ	CRcr	Geogrid Type #2 σ	CRcr	Geogrid Type #3 σ	CRcr	Geogrid Type #4 σ	CRcr	Geogrid Type #5 σ	CRcr
0.0	0.15	0.0	0.15	0.0	0.15	0.0	0.38	0.0	0.38
480.3	0.20	480.3	0.20	599.4	0.21	1200.9	0.44	1200.9	0.44
1200.9	0.27	1200.9	0.27	1800.3	0.33	2999.0	0.53	3600.5	0.56
2399.6	0.39	2399.6	0.39	3600.5	0.51	6000.1	0.68	7198.9	0.74

(1) σ = Confining stress in between stacked blocks [lb/ft^2]
(2) CRult = Tc-ult / Tult
(3) CRcr = Tcre / Tult

In seismic analysis, long term strength is reduced to 100% of its static value.

D A T A (for connection only)	Type #1	Type #2	Type #3	Type #4	Type #5
Product Name	UX1100MSE..	UX1400MSE..	UX1500MSE..	UX1600MSE..	UX1700MSE..
Connection strength reduction factor, RFd	1.10	1.10	1.10	1.10	1.10
Creep reduction factor, RFc	N/A	N/A	N/A	N/A	N/A

INPUT DATA: Geometry and Surcharge loads (of SUPERIMPOSED wall)

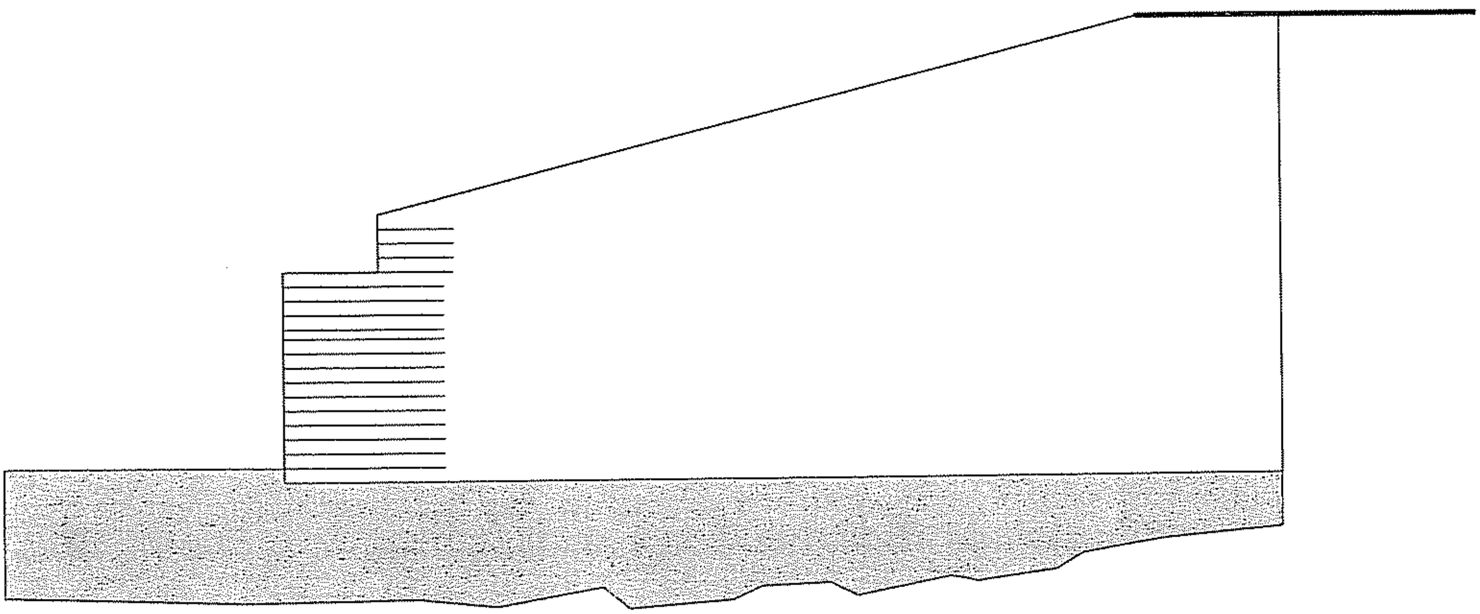
Design height, Hd	28.00	[ft]	{ Embedded depth is E = 1.50 ft, and height above top of finished bottom grade is H = 26.50 ft, where H1 = 6.00 and H2 = 20.50 }
Batter, ω	0.0	[deg]	
Backslope, β	14.0	[deg]	
Backslope rise	20.0	[ft]	Broken back equivalent angle, I = 14.04° (see Fig. 25 in DEMO 82)

Offset of upper segment from lower one, Offset = 10.0 ft, Blackslope2 = 0.0 deg. and Backslope rise, S2 = 0.0 ft.

UNIFORM SURCHARGE
Uniformly distributed dead load is 0.0 [lb/ft ^{2}]

OTHER EXTERNAL LOAD(S)
[S1] Strip Load, Qv-d = 0.0 and Qv-l = 250.0 [lb/ft ^{2}].
Footing width, b=150.0 [ft]. Distance of center of footing from wall face, d = 155.0 [ft] @ depth of 0.0 [ft] below soil surface.

ANALYZED REINFORCEMENT LAYOUT:



SCALE:

0 2 4 6 8 10[ft]

N/A

ANALYSIS: CALCULATED FACTORS (Static conditions)

Bearing capacity, Fs = 43.69, Meyerhof stress = 3915 lb/ft².

Foundation Interface: Direct sliding, Fs = 2.943, Eccentricity, e/L = 0.0646, Fs-overturning = 4.51

#	Elevation [ft]	Length [ft]	Type #	CONNECTION Fs-overall [connection strength]	Fs-overall [geogrid strength]	Geogrid strength Fs	Pullout resistance Fs	Direct sliding Fs	Eccentricity e/L	Product name
1	0.00	17.00	4	4.74	4.09	4.086	65.346	2.389	0.0646	UX1600MSE-SS
2	1.50	17.00	4	2.42	2.12	2.123	30.596	2.485	0.0527	UX1600MSE-SS
3	3.00	17.00	4	2.51	2.24	2.239	28.923	2.587	0.0410	UX1600MSE-SS
4	4.50	17.00	3	1.50	1.79	1.789	27.253	2.699	0.0294	UX1500MSE-SS
5	6.00	17.00	3	1.52	1.90	1.898	25.586	2.819	0.0178	UX1500MSE-SS
6	7.50	17.00	3	1.53	2.02	2.023	23.923	2.950	0.0062	UX1500MSE-SS
7	9.00	17.00	3	1.55	2.16	2.164	22.264	3.092	-0.0057	UX1500MSE-SS
8	10.50	17.00	3	1.57	2.33	2.327	20.611	3.246	-0.0180	UX1500MSE-SS
9	12.00	17.00	3	1.60	2.52	2.516	18.964	3.411	-0.0312	UX1500MSE-SS
10	13.50	17.00	3	1.63	2.74	2.739	17.326	3.587	-0.0456	UX1500MSE-SS
11	15.00	17.00	3	1.98	3.58	3.576	18.688	3.771	-0.0622	UX1500MSE-SS
12	16.00	17.00	3	2.04	3.89	3.888	17.707	3.894	-0.0751	UX1500MSE-SS
13	17.50	17.00	3	1.73	3.58	3.584	13.029	4.066	-0.0989	UX1500MSE-SS
14	19.00	17.00	3	1.79	4.05	4.054	11.448	4.196	-0.1322	UX1500MSE-SS
15	20.50	17.00	4	3.81	4.28	4.278	6.836	4.209	-0.1852	UX1600MSE-SS
16	22.00	8.00	2	3.73	7.67	7.666	17.577	4.278	0.0016	UX1400MSE-SS
17	23.50	8.00	2	2.00	4.45	4.453	6.561	5.067	-0.0149	UX1400MSE-SS
18	25.00	8.00	2	2.33	5.68	5.679	4.645	6.198	-0.0340	UX1400MSE-SS
19	26.50	8.00	2	2.14	5.77	5.771	1.886	7.871	-0.0643	UX1400MSE-SS

ANALYSIS: CALCULATED FACTORS (Seismic conditions)

N/A* N/A

Bearing capacity, Fs = 11.33, Meyerhof stress = 13309 lb/ft².

Foundation Interface: Direct sliding, Fs = 1.073, Eccentricity, e/L = 0.3648, Fs-overturning = 1.31 N/A*

#	Elevation [ft]	Length [ft]	Type #	CONNECTION Fs-overall [connection strength]	Fs-overall [geogrid strength]	Geogrid strength Fs	Pullout resistance Fs	Direct sliding Fs	Eccentricity e/L	Product name
1	0.00	17.00	4	2.85	3.17	3.172	31.490	0.871	0.3648	UX1600MSE-SS
2	1.50	17.00	4	1.82	1.86	1.858	18.458	0.921	0.3163	UX1600MSE-SS
3	3.00	17.00	4	1.89	1.96	1.959	17.447	0.978	0.2698	UX1600MSE-SS
4	4.50	17.00	3	1.35	1.57	1.575	16.438	1.044	0.2254	UX1500MSE-SS
5	6.00	17.00	3	1.37	1.67	1.671	15.430	1.120	0.1830	UX1500MSE-SS
6	7.50	17.00	3	1.39	1.78	1.780	14.425	1.211	0.1425	UX1500MSE-SS
7	9.00	17.00	3	1.41	1.90	1.905	13.423	1.688	0.0502	UX1500MSE-SS
8	10.50	17.00	3	1.44	2.05	2.048	12.424	1.846	0.0254	UX1500MSE-SS
9	12.00	17.00	3	1.47	2.21	2.214	11.429	2.036	0.0014	UX1500MSE-SS
10	13.50	17.00	3	1.50	2.41	2.409	10.439	2.265	-0.0224	UX1500MSE-SS
11	15.00	17.00	3	1.81	3.08	3.076	10.750	2.545	-0.0467	UX1500MSE-SS
12	16.00	17.00	3	1.88	3.34	3.336	10.135	2.766	-0.0638	UX1500MSE-SS
13	17.50	17.00	3	1.63	3.15	3.152	7.842	3.154	-0.0928	UX1500MSE-SS
14	19.00	17.00	3	1.69	3.56	3.564	6.887	3.594	-0.1296	UX1500MSE-SS
15	20.50	17.00	4	3.10	3.89	3.889	4.449	3.983	-0.1846	UX1600MSE-SS
16	22.00	8.00	2	3.15	5.56	5.555	7.645	1.717	0.0815	UX1400MSE-SS
17	23.50	8.00	2	1.85	3.75	3.745	3.702	2.224	0.0299	UX1400MSE-SS
18	25.00	8.00	2	2.15	4.73	4.729	2.574	3.153	-0.0143	UX1400MSE-SS
19	26.50	8.00	2	2.02	4.96	4.962	1.109	5.263	-0.0595	UX1400MSE-SS

N/A*

* See external external stability analysis

SIERRASCAPE®
RETAINING WALL SYSTEMS

AASHTO DESIGN METHOD
LASO TA-73 Airport Landfills

PROJECT IDENTIFICATION

Title:	LASO TA-73 Airport Landfills
Project Number:	D06602
Client:	Slaton Bros SW
Designer:	CLC
Station Number:	Wall 2_4+21.3-4+47.0/ Wall 3_1+09.7-1+39.8

Description:

Tiered wall...Wall 2_DH=16.0' and Wall 3_DH=6', 10' offset_EXTERNAL

Company's information:

Name: Tensar Earth Technologies, Inc.
Street: 5883 Glenridge Drive
Suite 200
Atlanta, GA 30328
Telephone #: (404) 250-1290
Fax #: (404) 250-9185
E-Mail: ccampbell@tensarcorp.com

Original file path and name: k:_d\D06602\Final\Design\Design without Wall 1\Wall2an.....
.....ndWall3_16-6'_EX.BEN
Original date and time of creating this file: May 22, 2006

PROGRAM MODE: ANALYSIS
of SUPERIMPOSED WALL
using GEOGRID as reinforcing material.

SOIL DATA

REINFORCED SOIL

Unit weight, γ	130.0 lb/ft ^{3}
Design value of internal angle of friction, ϕ	32.0 °

RETAINED SOIL

Unit weight, γ	100.0 lb/ft ^{3}
Design value of internal angle of friction, ϕ	35.5 °

FOUNDATION SOIL (Considered as an equivalent uniform soil)

Equivalent unit weight, $\gamma_{equiv.}$	130.0 lb/ft ^{3}
Equivalent internal angle of friction, $\phi_{equiv.}$	32.0 °
Equivalent cohesion, $c_{equiv.}$	4000.0 lb/ft ^{2}

Water table does not affect bearing capacity

LATERAL EARTH PRESSURE COEFFICIENTS

Ka (internal stability) = 0.3073 (if batter is less than 10°, Ka is calculated from eq. 15. Otherwise, eq. 38 is utilized)
Inclination of internal slip plane, ψ = 61.00° (see Fig. 28 in DEMO 82).
Ka (external stability) = 0.2866 (if batter is less than 10°, Ka is calculated from eq. 16. Otherwise, eq. 17 is utilized)

BEARING CAPACITY

Bearing capacity coefficients (calculated by MSEW): Nc = 35.49 N γ = 30.21

SEISMICITY

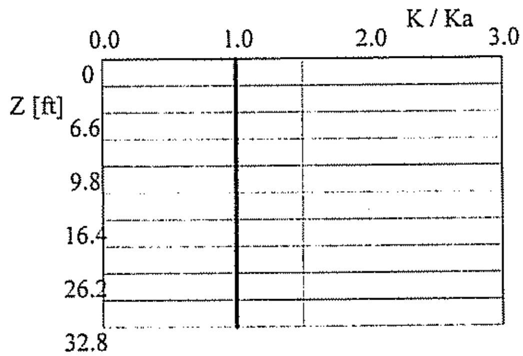
Maximum ground acceleration coefficient, α_o = 0.131
Kae (α_o > 0) = 0.4492 Kae (α_o = 0) = 0.2866 Δ Kae = 0.1625 (see eq. 37 in DEMO 82)
Seismic soil-geogrid friction coefficient, F* is 80.0% of its specified static value.

INPUT DATA: Geogrids
(Analysis)

DATA		Geogrid type #1	Geogrid type #2	Geogrid type #3	Geogrid type #4	Geogrid type #5
Tult [lb/ft]		3974.1	4796.3	7811.2	9866.7	11990.8
Durability reduction factor, RFd		1.00	1.00	1.00	1.00	1.00
Installation-damage reduction factor, RFid		1.10	1.10	1.10	1.10	1.10
Creep reduction factor, RFc		2.34	2.21	2.40	2.29	2.22
Fs-overall for strength		N/A	N/A	N/A	N/A	N/A
Coverage ratio, Rc		0.940	0.940	0.940	0.940	0.940
Friction angle along geogrid-soil interface,	ρ	26.56	26.56	26.56	26.56	26.56
Pullout resistance factor, F*		$0.80 \cdot \tan\phi$	$0.80 \cdot \tan\phi$	$0.80 \cdot \tan\phi$	$0.80 \cdot \tan\phi$	$0.80 \cdot \tan\phi$
Scale-effect correction factor,	α	1.0	1.0	1.0	1.0	1.0

Variation of Lateral Earth Pressure Coefficient With Depth

Z	K / Ka
0 ft	1.00
3.3 ft	1.00
6.6 ft	1.00
9.8 ft	1.00
13.1 ft	1.00
16.4 ft	1.00
19.7 ft	1.00



License number MSEW-301064

INPUT DATA: Geometry and Surcharge loads (of SUPERIMPOSED wall)

Design height, Hd 22.00 [ft] { Embedded depth is E = 1.50 ft, and height above top of finished bottom grade is H = 20.50 ft, where H1 = 6.00 and H2 = 14.50 }

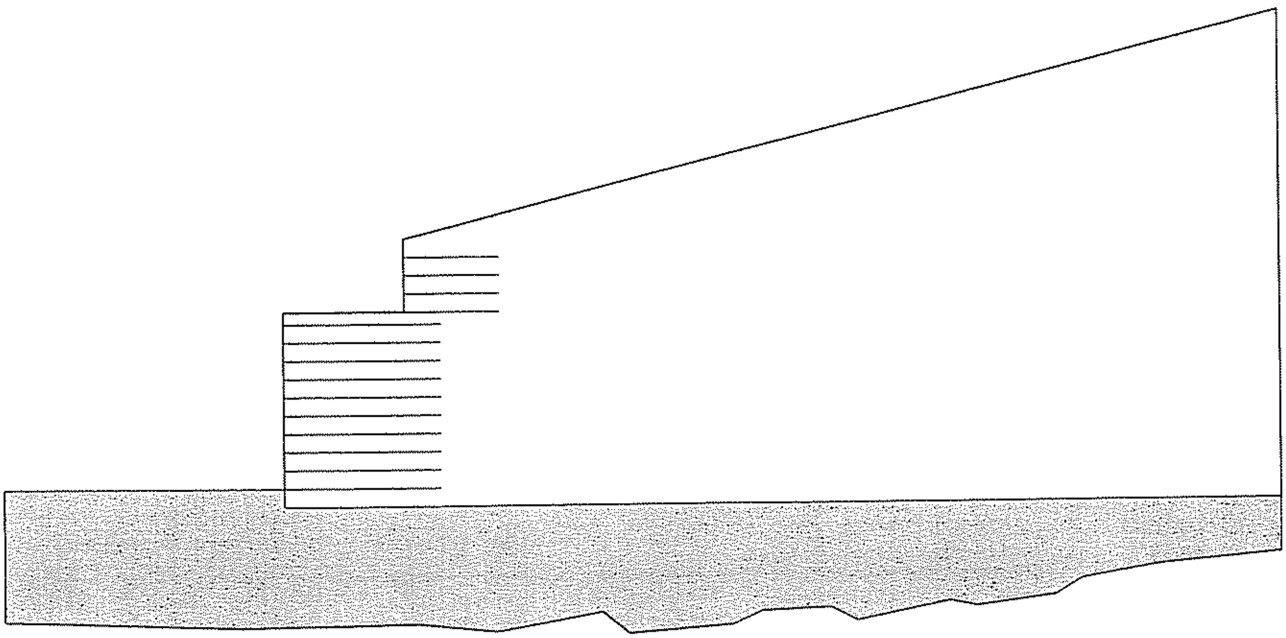
Batter, ω 0.0 [deg]
Backslope, β 14.0 [deg]
Backslope rise 20.0 [ft] Broken back equivalent angle, I = 14.04° (see Fig. 25 in DEMO 82)

Offset of upper segment from lower one, Offset = 10.0 ft, Blackslope2 = 0.0 deg. and Backslope rise, S2 = 0.0 ft.

UNIFORM SURCHARGE
Uniformly distributed dead load is 0.0 [lb/ft ^{2}]

OTHER EXTERNAL LOAD(S)
[S1] Strip Load, Qv-d = 0.0 and Qv-l = 250.0 [lb/ft ^{2}].
Footing width, b=150.0 [ft]. Distance of center of footing from wall face, d = 155.0 [ft] @ depth of 0.0 [ft] below soil surface.

ANALYZED REINFORCEMENT LAYOUT:



SCALE:

0 2 4 6 8 10[ft]

ANALYSIS: CALCULATED FACTORS (Static conditions)

N/A

Bearing capacity, Fs = 57.80, Meyerhof stress = 2832 lb/ft².

Foundation Interface: Direct sliding, Fs = 2.720, Eccentricity, e/L = 0.0746, Fs-overturning = 4.17

GEOGRID #	Elevation [ft]	Length [ft]	Type #	CONNECTION Fs-overall [connection strength]	Fs-overall [geogrid strength]	Geogrid strength Fs	Pullout resistance Fs	Direct sliding Fs	Eccentricity e/L	Product name
1	0.00	13.00	3	3.35	4.19	4.186	52.770	2.209	0.0746	UX1500MSE-SS
2	1.50	13.00	3	1.67	2.20	2.205	24.255	2.308	0.0586	UX1500MSE-SS
3	3.00	13.00	3	1.70	2.37	2.374	22.580	2.415	0.0429	UX1500MSE-SS
4	4.50	13.00	3	1.74	2.57	2.571	20.891	2.529	0.0271	UX1500MSE-SS
5	6.00	13.00	3	1.78	2.80	2.804	19.203	2.648	0.0111	UX1500MSE-SS
6	7.50	13.00	3	1.83	3.08	3.084	17.517	2.771	-0.0058	UX1500MSE-SS
7	9.00	13.00	3	1.89	3.42	3.425	15.833	2.890	-0.0243	UX1500MSE-SS
8	10.50	13.00	3	1.97	3.85	3.851	14.153	2.992	-0.0461	UX1500MSE-SS
9	12.00	13.00	3	2.07	4.40	4.398	12.477	3.047	-0.0746	UX1500MSE-SS
10	13.50	13.00	3	2.20	5.13	5.127	10.808	2.989	-0.1182	UX1500MSE-SS
11	15.00	13.00	3	1.90	4.90	4.903	7.301	2.664	-0.2053	UX1500MSE-SS
12	16.00	8.00	2	3.99	8.20	8.199	25.911	4.278	0.0016	UX1400MSE-SS
13	17.50	8.00	2	2.17	4.82	4.817	10.230	5.067	-0.0149	UX1400MSE-SS
14	19.00	8.00	2	2.58	6.28	6.284	7.864	6.198	-0.0340	UX1400MSE-SS
15	20.50	8.00	2	2.51	6.76	6.765	3.676	7.871	-0.0643	UX1400MSE-SS

ANALYSIS: CALCULATED FACTORS (Seismic conditions)

N/A.

Bearing capacity, Fs = 36.17, Meyerhof stress = 4324 lb/ft².

Foundation Interface: Direct sliding, Fs = 1.493, Eccentricity, e/L = 0.2160, Fs-overturning = 2.01

GEOGRID #	Elevation [ft]	Length [ft]	Type #	CONNECTION Fs-overall [connection strength]	Fs-overall [geogrid strength]	Geogrid strength Fs	Pullout resistance Fs	Direct sliding Fs	Eccentricity e/L	Product name
1	0.00	13.00	3	3.05	3.74	3.736	32.759	1.212	0.2160	UX1500MSE-SS
2	1.50	13.00	3	1.60	2.08	2.081	16.987	1.297	0.1745	UX1500MSE-SS
3	3.00	13.00	3	1.63	2.24	2.241	15.807	1.650	0.0931	UX1500MSE-SS
4	4.50	13.00	3	1.67	2.43	2.426	14.618	1.774	0.0663	UX1500MSE-SS
5	6.00	13.00	3	1.72	2.65	2.646	13.430	1.916	0.0406	UX1500MSE-SS
6	7.50	13.00	3	1.77	2.91	2.908	12.243	2.078	0.0154	UX1500MSE-SS
7	9.00	13.00	3	1.83	3.23	3.229	11.057	2.260	-0.0101	UX1500MSE-SS
8	10.50	13.00	3	1.91	3.63	3.629	9.874	2.458	-0.0375	UX1500MSE-SS
9	12.00	13.00	3	2.01	4.14	4.143	8.694	2.651	-0.0701	UX1500MSE-SS
10	13.50	13.00	3	2.14	4.83	4.825	7.518	2.771	-0.1165	UX1500MSE-SS
11	15.00	13.00	3	1.86	4.67	4.666	5.206	2.617	-0.2051	UX1500MSE-SS
12	16.00	8.00	2	3.58	6.63	6.633	13.621	2.439	0.0410	UX1400MSE-SS
13	17.50	8.00	2	2.05	4.28	4.285	6.420	3.082	0.0070	UX1400MSE-SS
14	19.00	8.00	2	2.44	5.50	5.496	4.778	4.173	-0.0245	UX1400MSE-SS
15	20.50	8.00	2	2.39	5.96	5.965	2.269	6.305	-0.0620	UX1400MSE-SS

N/A*

* see internal stability analysis

SIERRASCAPE®
RETAINING WALL SYSTEMS

AASHTO DESIGN METHOD
LASO TA-73 Airport Landfills

PROJECT IDENTIFICATION

Title:	LASO TA-73 Airport Landfills
Project Number:	D06602
Client:	Slaton Bros SW
Designer:	CLC
Station Number:	Wall 2_4+21.3-4+47.0/ Wall 3_1+09.7-1+39.8

Description:

Tiered wall...Wall 2_DH=16.0' and Wall 3_DH=6', 10' offset_INTERNAL

Company's information:

Name: Tensar Earth Technologies, Inc.
Street: 5883 Glenridge Drive
Suite 200
Atlanta, GA 30328
Telephone #: (404) 250-1290
Fax #: (404) 250-9185
E-Mail: ccampbell@tensarcorp.com

Original file path and name: k:_d\D06602\Final\Design\Design without Wall 1\Wall2an.....
.....ndWall3_16-6'_IN.BEN

Original date and time of creating this file: May 22, 2006

PROGRAM MODE: ANALYSIS
of SUPERIMPOSED WALL
using GEOGRID as reinforcing material.

SOIL DATA

REINFORCED SOIL

Unit weight, γ	130.0 lb/ft ^{3}
Design value of internal angle of friction, ϕ	32.0 °

RETAINED SOIL

Unit weight, γ	100.0 lb/ft ^{3}
Design value of internal angle of friction, ϕ	35.5 °

FOUNDATION SOIL (Considered as an equivalent uniform soil)

Equivalent unit weight, $\gamma_{equiv.}$	130.0 lb/ft ^{3}
Equivalent internal angle of friction, $\phi_{equiv.}$	32.0 °
Equivalent cohesion, $c_{equiv.}$	4000.0 lb/ft ^{2}

Water table does not affect bearing capacity

LATERAL EARTH PRESSURE COEFFICIENTS

Ka (internal stability) = 0.3073 (if batter is less than 10°, Ka is calculated from eq. 15. Otherwise, eq. 38 is utilized)
Inclination of internal slip plane, ψ= 61.00° (see Fig. 28 in DEMO 82).
Ka (external stability) = 0.2866 (if batter is less than 10°, Ka is calculated from eq. 16. Otherwise, eq. 17 is utilized)

BEARING CAPACITY

Bearing capacity coefficients (calculated by MSEW): Nc = 35.49 N γ= 30.21

SEISMICITY

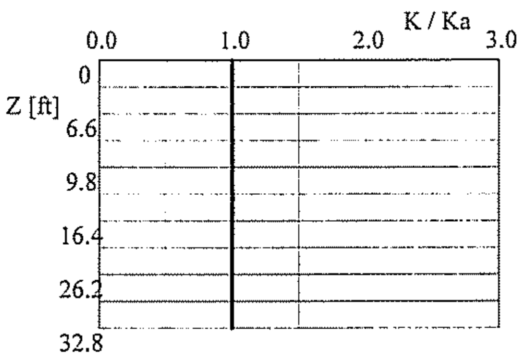
Maximum ground acceleration coefficient, α_o = 0.262
Kae (α_o> 0) = 0.6986 Kae (α_o= 0) = 0.2866 Δ Kae = 0.4120 (see eq. 37 in DEMO 82)
Seismic soil-geogrid friction coefficient, F* is 80.0% of its specified static value.

INPUT DATA: Geogrids (Analysis)

D A T A	Geogrid type #1	Geogrid type #2	Geogrid type #3	Geogrid type #4	Geogrid type #5
Tult [lb/ft]	3974.1	4796.3	7811.2	9866.7	11990.8
Durability reduction factor, RFd	1.00	1.00	1.00	1.00	1.00
Installation-damage reduction factor, RFid	1.10	1.10	1.10	1.10	1.10
Creep reduction factor, RFc	2.34	2.21	2.40	2.29	2.22
Fs-overall for strength	N/A	N/A	N/A	N/A	N/A
Coverage ratio, Rc	0.940	0.940	0.940	0.940	0.940
Friction angle along geogrid-soil interface, ρ	26.56	26.56	26.56	26.56	26.56
Pullout resistance factor, F*	0.80·tanϕ	0.80·tanϕ	0.80·tanϕ	0.80·tanϕ	0.80·tanϕ
Scale-effect correction factor, α	1.0	1.0	1.0	1.0	1.0

Variation of Lateral Earth Pressure Coefficient With Depth

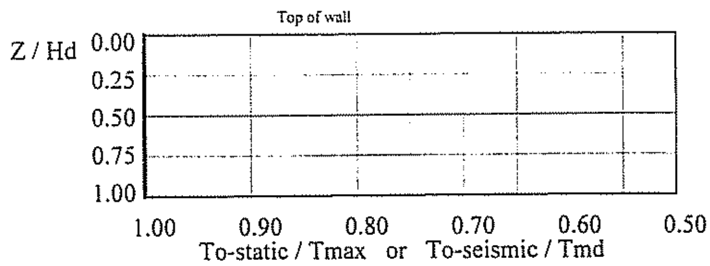
Z	K / Ka
0 ft	1.00
3.3 ft	1.00
6.6 ft	1.00
9.8 ft	1.00
13.1 ft	1.00
16.4 ft	1.00
19.7 ft	1.00



INPUT DATA: Facia and Connection (according to revised Demo 82)
(Analysis)

FACIA type: Facing enabling frictional connection of reinforcement (e.g., modular concrete blocks, gabions)
Depth/height of block is 1.48/1.48 ft. Horizontal distance to Center of Gravity of block is 0.74 ft.
Average unit weight of block is $\gamma_f = 114.58$ lb/ft^3

Z / Hd	To-static / Tmax or To-seismic / Tmd
0.00	1.00
0.25	1.00
0.50	1.00
0.75	1.00
1.00	1.00



Geogrid Type #1 σ [1]	CRult [2]	Geogrid Type #2 σ	CRult	Geogrid Type #3 σ	CRult	Geogrid Type #4 σ	CRult	Geogrid Type #5 σ	CRult
0.0	1.00	0.0	1.00	0.0	1.00	0.0	0.38	0.0	0.38
						1200.9	0.44	1200.9	0.44
						2999.0	0.53	3600.5	0.56
						6000.1	0.68	7198.9	0.74

Geogrid Type #1[3] σ	CRcr	Geogrid Type #2 σ	CRcr	Geogrid Type #3 σ	CRcr	Geogrid Type #4 σ	CRcr	Geogrid Type #5 σ	CRcr
0.0	0.15	0.0	0.15	0.0	0.15	0.0	0.38	0.0	0.38
480.3	0.20	480.3	0.20	599.4	0.21	1200.9	0.44	1200.9	0.44
1200.9	0.27	1200.9	0.27	1800.3	0.33	2999.0	0.53	3600.5	0.56
2399.6	0.39	2399.6	0.39	3600.5	0.51	6000.1	0.68	7198.9	0.74

(1) σ = Confining stress in between stacked blocks [lb/ft^2]
(2) CRult = Tc-ult / Tult
(3) CRcr = Tcre / Tult

In seismic analysis, long term strength is reduced to 100% of its static value.

D A T A (for connection only)	Type #1	Type #2	Type #3	Type #4	Type #5
Product Name	UX1100MSE..	UX1400MSE..	UX1500MSE..	UX1600MSE..	UX1700MSE..
Connection strength reduction factor, RFd	1.10	1.10	1.10	1.10	1.10
Creep reduction factor, RFc	N/A	N/A	N/A	N/A	N/A

INPUT DATA: Geometry and Surcharge loads (of SUPERIMPOSED wall)

Design height, Hd 22.00 [ft] { Embedded depth is E = 1.50 ft, and height above top of finished bottom grade is H = 20.50 ft, where H1 = 6.00 and H2 = 14.50 }

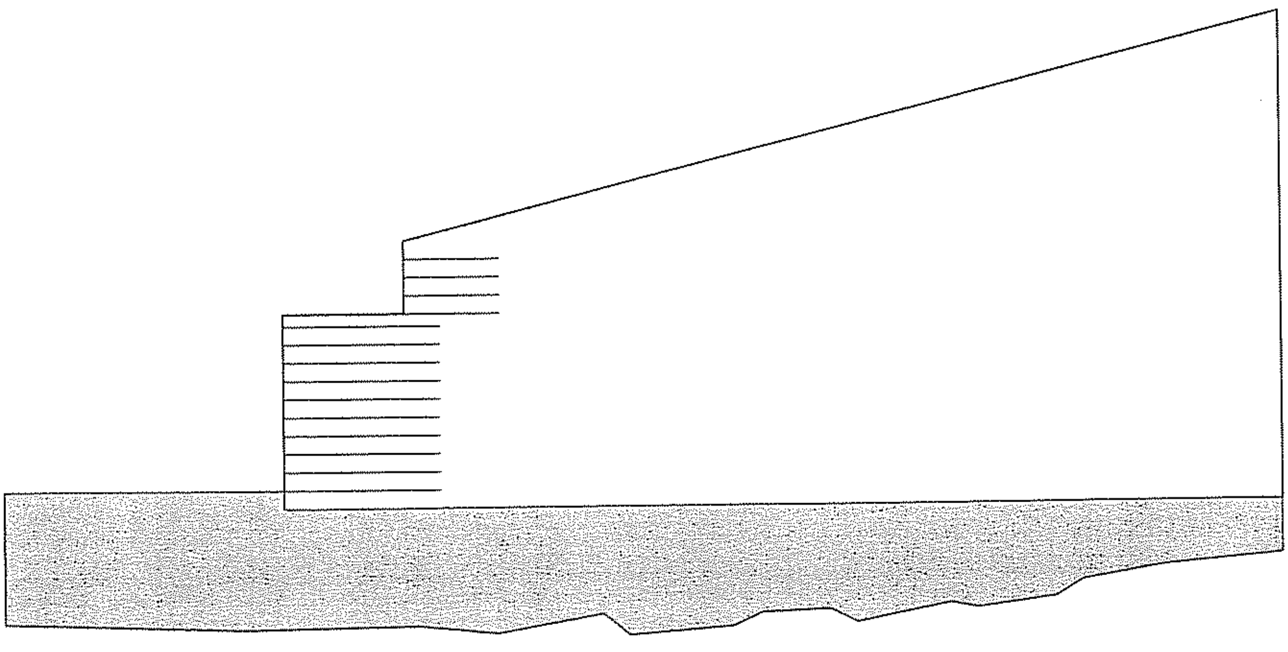
Batter, ω 0.0 [deg]
Backslope, β 14.0 [deg]
Backslope rise 20.0 [ft] Broken back equivalent angle, I = 14.04° (see Fig. 25 in DEMO 82)

Offset of upper segment from lower one, Offset = 10.0 ft, Blackslope2 = 0.0 deg. and Backslope rise, S2 = 0.0 ft.

UNIFORM SURCHARGE
Uniformly distributed dead load is 0.0 [lb/ft ²]

OTHER EXTERNAL LOAD(S)
[S1] Strip Load, Qv-d = 0.0 and Qv-l = 250.0 [lb/ft ²].
Footing width, b=150.0 [ft]. Distance of center of footing from wall face, d = 155.0 [ft] @ depth of 0.0 [ft] below soil surface.

ANALYZED REINFORCEMENT LAYOUT:



SCALE:

0 2 4 6 8 10[ft]

ANALYSIS: CALCULATED FACTORS (Static conditions)

Bearing capacity, Fs = 57.80, Meyerhof stress = 2832 lb/ft².

Foundation Interface: Direct sliding, Fs = 2.720, Eccentricity, e/L = 0.0746, Fs-overturning = 4.17

N/A*

#	Elevation [ft]	Length [ft]	Type #	Fs-overall [connection strength]	Fs-overall [geogrid strength]	Geogrid strength Fs	Pullout resistance Fs	Direct sliding Fs	Eccentricity e/L	Product name
1	0.00	13.00	3	3.35	4.19	4.186	52.770	2.209	0.0746	UX1500MSE-SS
2	1.50	13.00	3	1.67	2.20	2.205	24.255	2.308	0.0586	UX1500MSE-SS
3	3.00	13.00	3	1.70	2.37	2.374	22.580	2.415	0.0429	UX1500MSE-SS
4	4.50	13.00	3	1.74	2.57	2.571	20.891	2.529	0.0271	UX1500MSE-SS
5	6.00	13.00	3	1.78	2.80	2.804	19.203	2.648	0.0111	UX1500MSE-SS
6	7.50	13.00	3	1.83	3.08	3.084	17.517	2.771	-0.0058	UX1500MSE-SS
7	9.00	13.00	3	1.89	3.42	3.425	15.833	2.890	-0.0243	UX1500MSE-SS
8	10.50	13.00	3	1.97	3.85	3.851	14.153	2.992	-0.0461	UX1500MSE-SS
9	12.00	13.00	3	2.07	4.40	4.398	12.477	3.047	-0.0746	UX1500MSE-SS
10	13.50	13.00	3	2.20	5.13	5.127	10.808	2.989	-0.1182	UX1500MSE-SS
11	15.00	13.00	3	1.90	4.90	4.903	7.301	2.664	-0.2053	UX1500MSE-SS
12	16.00	8.00	2	3.99	8.20	8.199	25.911	4.278	0.0016	UX1400MSE-SS
13	17.50	8.00	2	2.17	4.82	4.817	10.230	5.067	-0.0149	UX1400MSE-SS
14	19.00	8.00	2	2.58	6.28	6.284	7.864	6.198	-0.0340	UX1400MSE-SS
15	20.50	8.00	2	2.51	6.76	6.765	3.676	7.871	-0.0643	UX1400MSE-SS

N/A

ANALYSIS: CALCULATED FACTORS (Seismic conditions)

N/A*

Bearing capacity, Fs = 15.85, Meyerhof stress = 9387 lb/ft².

Foundation Interface: Direct sliding, Fs = 1.035, Eccentricity, e/L = 0.3640, Fs-overturning = 1.31

N/A*

#	Elevation [ft]	Length [ft]	Type #	Fs-overall [connection strength]	Fs-overall [geogrid strength]	Geogrid strength Fs	Pullout resistance Fs	Direct sliding Fs	Eccentricity e/L	Product name
1	0.00	13.00	3	2.85	3.44	3.440	27.774	0.841	0.3640	UX1500MSE-SS
2	1.50	13.00	3	1.55	1.99	1.992	15.445	0.905	0.2985	UX1500MSE-SS
3	3.00	13.00	3	1.58	2.14	2.144	14.368	1.264	0.1423	UX1500MSE-SS
4	4.50	13.00	3	1.62	2.32	2.321	13.284	1.377	0.1050	UX1500MSE-SS
5	6.00	13.00	3	1.67	2.53	2.531	12.200	1.511	0.0699	UX1500MSE-SS
6	7.50	13.00	3	1.72	2.78	2.782	11.117	1.671	0.0367	UX1500MSE-SS
7	9.00	13.00	3	1.78	3.09	3.088	10.036	1.864	0.0044	UX1500MSE-SS
8	10.50	13.00	3	1.86	3.47	3.469	8.956	2.093	-0.0285	UX1500MSE-SS
9	12.00	13.00	3	1.96	3.96	3.958	7.879	2.352	-0.0654	UX1500MSE-SS
10	13.50	13.00	3	2.10	4.61	4.608	6.807	2.585	-0.1147	UX1500MSE-SS
11	15.00	13.00	3	1.84	4.49	4.492	4.789	2.573	-0.2048	UX1500MSE-SS
12	16.00	8.00	2	3.30	5.75	5.752	10.685	1.717	0.0815	UX1400MSE-SS
13	17.50	8.00	2	1.97	3.94	3.936	5.475	2.224	0.0299	UX1400MSE-SS
14	19.00	8.00	2	2.33	4.99	4.995	4.005	3.153	-0.0143	UX1400MSE-SS
15	20.50	8.00	2	2.30	5.45	5.449	1.918	5.263	-0.0595	UX1400MSE-SS

N/A*

* See external stability analysis

SIERRASCAPE®
RETAINING WALL SYSTEMS

AASHTO DESIGN METHOD
LASO TA-73 Airport Landfills

PROJECT IDENTIFICATION

Title: LASO TA-73 Airport Landfills
Project Number: D06602
Client: Slaton Bros SW
Designer: CLC
Station Number: 1+39.8-1+56.5

Description:

Wall 3_DH=6'_EXTERNAL

Company's information:

Name: Tensar Earth Technologies, Inc.
Street: 5883 Glenridge Drive
Suite 200
Atlanta, GA 30328
Telephone #: (404) 250-1290
Fax #: (404) 250-9185
E-Mail: ccampbell@tensarcorp.com

Original file path and name: k:_d\D06602\Final\Design\Design without Wall 1\Wall3_6.....
.....ll 1\Wall3_6'_EX.BEN
Original date and time of creating this file: May 22, 2006

PROGRAM MODE: ANALYSIS
of a SIMPLE STRUCTURE
using GEOGRID as reinforcing material.

SOIL DATA

REINFORCED SOIL

Unit weight, γ 130.0 lb/ft³

Design value of internal angle of friction, ϕ 32.0 °

RETAINED SOIL

Unit weight, γ 100.0 lb/ft³

Design value of internal angle of friction, ϕ 35.5 °

FOUNDATION SOIL (Considered as an equivalent uniform soil)

Equivalent unit weight, $\gamma_{equiv.}$ 130.0 lb/ft³

Equivalent internal angle of friction, $\phi_{equiv.}$ 32.0 °

Equivalent cohesion, $c_{equiv.}$ 4000.0 lb/ft²

Water table does not affect bearing capacity

LATERAL EARTH PRESSURE COEFFICIENTS

Ka (internal stability) = 0.3073 (if batter is less than 10°, Ka is calculated from eq. 15. Otherwise, eq. 38 is utilized)
Inclination of internal slip plane, ψ= 61.00° (see Fig. 28 in DEMO 82).
Ka (external stability) = 0.2866 (if batter is less than 10°, Ka is calculated from eq. 16. Otherwise, eq. 17 is utilized)

BEARING CAPACITY

Bearing capacity coefficients (calculated by MSEW): Nc = 35.49 N γ= 30.21

SEISMICITY

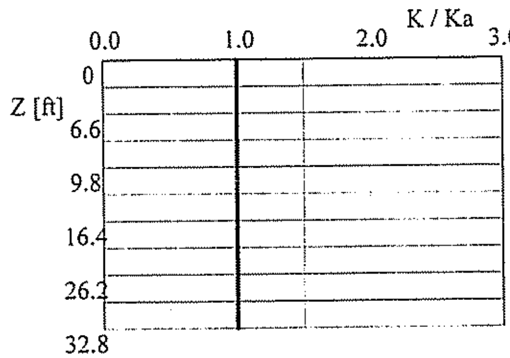
Maximum ground acceleration coefficient, α_o = 0.131
Kae (α_o> 0) = 0.4015 Kae (α_o= 0) = 0.2486 Δ Kae = 0.1529 (see eq. 37 in DEMO 82)
Seismic soil-geogrid friction coefficient, F* is 80.0% of its specified static value.

INPUT DATA: Geogrids
(Analysis)

D A T A	Geogrid type #1	Geogrid type #2	Geogrid type #3	Geogrid type #4	Geogrid type #5
Tult [lb/ft]	3974.1	4796.3	7811.2	9866.7	11990.8
Durability reduction factor, RFd	1.00	1.00	1.00	1.00	1.00
Installation-damage reduction factor, RFid	1.10	1.10	1.10	1.10	1.10
Creep reduction factor, RFc	2.34	2.21	2.40	2.29	2.22
Fs-overall for strength	N/A	N/A	N/A	N/A	N/A
Coverage ratio, Rc	0.940	0.940	0.940	0.940	0.940
Friction angle along geogrid-soil interface, ρ	26.56	26.56	26.56	26.56	26.56
Pullout resistance factor, F*	$0.80 \cdot \tan\phi$	$0.80 \cdot \tan\phi$	$0.80 \cdot \tan\phi$	$0.80 \cdot \tan\phi$	$0.80 \cdot \tan\phi$
Scale-effect correction factor, α	1.0	1.0	1.0	1.0	1.0

Variation of Lateral Earth Pressure Coefficient With Depth

Z	K / Ka
0 ft	1.00
3.3 ft	1.00
6.6 ft	1.00
9.8 ft	1.00
13.1 ft	1.00
16.4 ft	1.00
19.7 ft	1.00



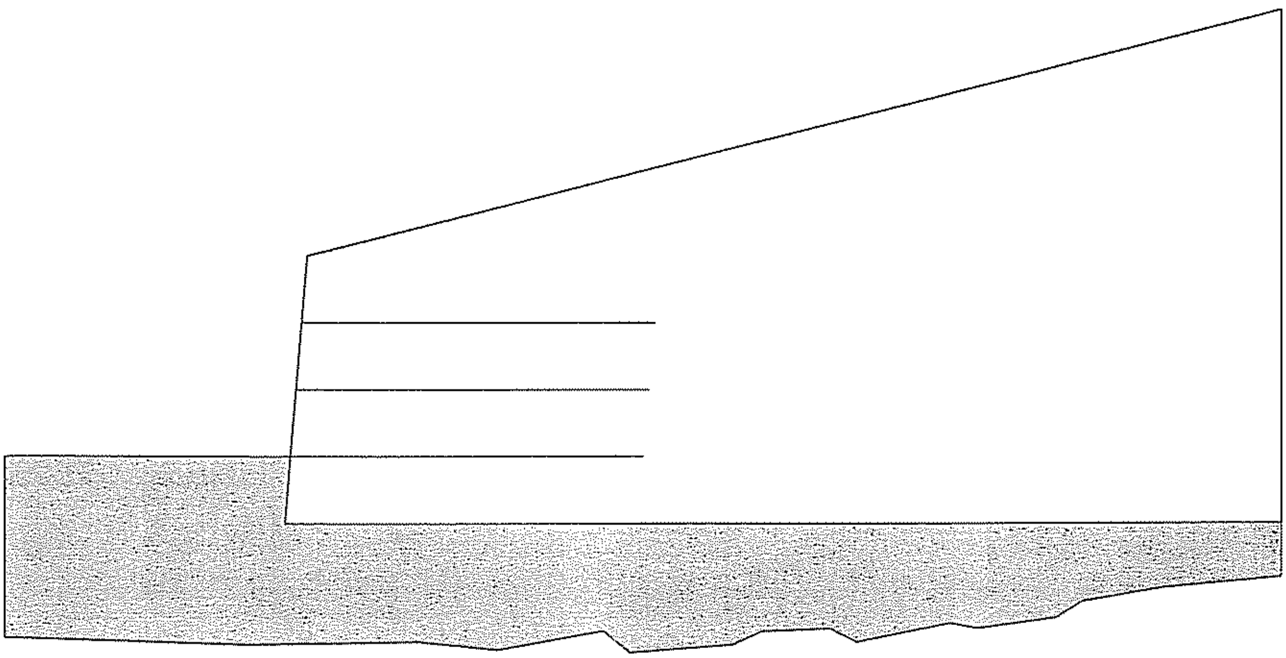
INPUT DATA: Geometry and Surcharge loads (of a SIMPLE STRUCTURE)

Design height, Hd	6.00	[ft]	{ Embedded depth is E = 1.50 ft, and height above top of finished bottom grade is H = 4.50 ft }
Batter, ω	4.8	[deg]	
Backslope, β	14.0	[deg]	
Backslope rise	20.0	[ft]	Broken back equivalent angle, I = 14.04° (see Fig. 25 in DEMO 82)

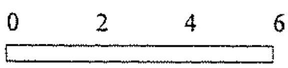
UNIFORM SURCHARGE
Uniformly distributed dead load is 0.0 [lb/ft ²]

OTHER EXTERNAL LOAD(S)
[S1] Strip Load, Qv-d = 0.0 and Qv-l = 250.0 [lb/ft ²].
Footing width, b=150.0 [ft]. Distance of center of footing from wall face, d = 155.0 [ft] @ depth of 0.0 [ft] below soil surface.

ANALYZED REINFORCEMENT LAYOUT:



SCALE:



ANALYSIS: CALCULATED FACTORS (Static conditions)

N/A
Bearing capacity, Fs = 170.98, Meyerhof stress = 920 lb/ft².

Foundation Interface: Direct sliding, Fs = 5.199, Eccentricity, e/L = -0.0125, Fs-overturning = 13.99

GEOGRID #	Elevation [ft]	Length [ft]	Type #	CONNECTION Fs-overall [connection strength]	Fs-overall [geogrid strength]	Geogrid strength Fs	Pullout resistance Fs	Direct sliding Fs	Eccentricity e/L	Product name
1	0.00	8.00	2	4.90	10.07	10.066	35.495	4.222	-0.0125	UX1400MSE-SS
2	1.50	8.00	2	2.77	6.16	6.160	16.258	5.030	-0.0255	UX1400MSE-SS
3	3.00	8.00	2	3.61	8.78	8.781	15.677	6.184	-0.0410	UX1400MSE-SS
4	4.50	8.00	2	4.64	12.51	12.505	13.244	7.876	-0.0678	UX1400MSE-SS

ANALYSIS: CALCULATED FACTORS (Seismic conditions)

N/A.
Bearing capacity, Fs = 165.23, Meyerhof stress = 950 lb/ft².

Foundation Interface: Direct sliding, Fs = 3.065, Eccentricity, e/L = 0.0234, Fs-overturning = 7.39

GEOGRID #	Elevation [ft]	Length [ft]	Type #	CONNECTION Fs-overall [connection strength]	Fs-overall [geogrid strength]	Geogrid strength Fs	Pullout resistance Fs	Direct sliding Fs	Eccentricity e/L	Product name
1	0.00	8.00	2	4.56	8.73	8.729	21.213	2.489	0.0234	UX1400MSE-SS
2	1.50	8.00	2	2.67	5.67	5.675	10.940	3.157	-0.0057	UX1400MSE-SS
3	3.00	8.00	2	3.45	7.91	7.910	10.088	4.279	-0.0325	UX1400MSE-SS
4	4.50	8.00	2	4.41	10.97	10.970	8.093	6.423	-0.0658	UX1400MSE-SS

N/A*

* see internal stability analysis

SIERRASCAPE®
RETAINING WALL SYSTEMS

AASHTO DESIGN METHOD
LASO TA-73 Airport Landfills

PROJECT IDENTIFICATION

Title:	LASO TA-73 Airport Landfills
Project Number:	D06602
Client:	Slaton Bros SW
Designer:	CLC
Station Number:	1+39.8-1+56.5

Description:

Wall 3_DH=6'_INTERNAL

Company's information:

Name: Tensar Earth Technologies, Inc.
Street: 5883 Glenridge Drive
Suite 200
Atlanta, GA 30328
Telephone #: (404) 250-1290
Fax #: (404) 250-9185
E-Mail: ccampbell@tensarcorp.com

Original file path and name: k:_d\D06602\Final\Design\Design without Wall 1\Wall3_6.....
.....ll 1\Wall3_6'_IN.BEN
Original date and time of creating this file: May 22, 2006

PROGRAM MODE: ANALYSIS
of a SIMPLE STRUCTURE
using GEOGRID as reinforcing material.

SOIL DATA

REINFORCED SOIL

Unit weight, γ 130.0 lb/ft^3

Design value of internal angle of friction, ϕ 32.0 °

RETAINED SOIL

Unit weight, γ 100.0 lb/ft^3

Design value of internal angle of friction, ϕ 35.5 °

FOUNDATION SOIL (Considered as an equivalent uniform soil)

Equivalent unit weight, $\gamma_{equiv.}$ 130.0 lb/ft^3

Equivalent internal angle of friction, $\phi_{equiv.}$ 32.0 °

Equivalent cohesion, $c_{equiv.}$ 4000.0 lb/ft^2

Water table does not affect bearing capacity

LATERAL EARTH PRESSURE COEFFICIENTS

Ka (internal stability) = 0.3073 (if batter is less than 10°, Ka is calculated from eq. 15. Otherwise, eq. 38 is utilized)

Inclination of internal slip plane, ψ= 61.00° (see Fig. 28 in DEMO 82).

Ka (external stability) = 0.2866 (if batter is less than 10°, Ka is calculated from eq. 16. Otherwise, eq. 17 is utilized)

BEARING CAPACITY

Bearing capacity coefficients (calculated by MSEW): Nc = 35.49 N γ= 30.21

SEISMICITY

Maximum ground acceleration coefficient, α_o = 0.262

Kae (α_o> 0) = 0.6339 Kae (α_o= 0) = 0.2486 Δ Kae = 0.3853 (see eq. 37 in DEMO 82)

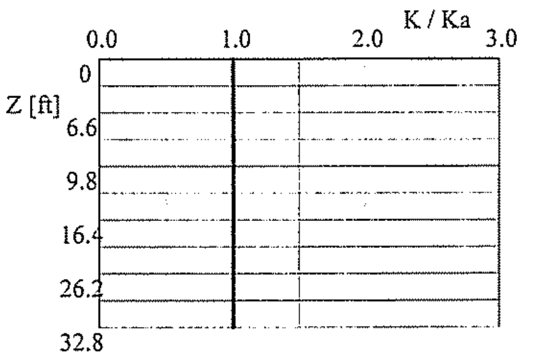
Seismic soil-geogrid friction coefficient, F* is 80.0% of its specified static value.

INPUT DATA: Geogrids
(Analysis)

D A T A	Geogrid type #1	Geogrid type #2	Geogrid type #3	Geogrid type #4	Geogrid type #5
Tult [lb/ft]	3974.1	4796.3	7811.2	9866.7	11990.8
Durability reduction factor, RFd	1.00	1.00	1.00	1.00	1.00
Installation-damage reduction factor, RFid	1.10	1.10	1.10	1.10	1.10
Creep reduction factor, RFc	2.34	2.21	2.40	2.29	2.22
Fs-overall for strength	N/A	N/A	N/A	N/A	N/A
Coverage ratio, Rc	0.940	0.940	0.940	0.940	0.940
Friction angle along geogrid-soil interface, ρ	26.56	26.56	26.56	26.56	26.56
Pullout resistance factor, F*	0.80·tanϕ	0.80·tanϕ	0.80·tanϕ	0.80·tanϕ	0.80·tanϕ
Scale-effect correction factor, α	1.0	1.0	1.0	1.0	1.0

Variation of Lateral Earth Pressure Coefficient With Depth

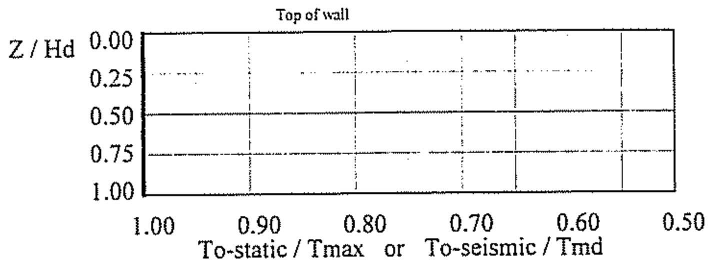
Z	K / Ka
0 ft	1.00
3.3 ft	1.00
6.6 ft	1.00
9.8 ft	1.00
13.1 ft	1.00
16.4 ft	1.00
19.7 ft	1.00



INPUT DATA: Facia and Connection (according to revised Demo 82)
(Analysis)

FACIA type: Facing enabling frictional connection of reinforcement (e.g., modular concrete blocks, gabions)
Depth/height of block is 1.48/1.48 ft. Horizontal distance to Center of Gravity of block is 0.74 ft.
Average unit weight of block is γ_f = 114.58 lb/ft³

Z / Hd	To-static / Tmax or To-seismic / Tmd
0.00	1.00
0.25	1.00
0.50	1.00
0.75	1.00
1.00	1.00



Geogrid Type #1 σ [1]	CRult [2]	Geogrid Type #2 σ	CRult	Geogrid Type #3 σ	CRult	Geogrid Type #4 σ	CRult	Geogrid Type #5 σ	CRult
0.0	1.00	0.0	1.00	0.0	1.00	0.0	0.38	0.0	0.38
						1200.9	0.44	1200.9	0.44
						2999.0	0.53	3600.5	0.56
						6000.1	0.68	7198.9	0.74

Geogrid Type #1[3] σ	CRcr	Geogrid Type #2 σ	CRcr	Geogrid Type #3 σ	CRcr	Geogrid Type #4 σ	CRcr	Geogrid Type #5 σ	CRcr
0.0	0.15	0.0	0.15	0.0	0.15	0.0	0.38	0.0	0.38
480.3	0.20	480.3	0.20	599.4	0.21	1200.9	0.44	1200.9	0.44
1200.9	0.27	1200.9	0.27	1800.3	0.33	2999.0	0.53	3600.5	0.56
2399.6	0.39	2399.6	0.39	3600.5	0.51	6000.1	0.68	7198.9	0.74

(1) σ = Confining stress in between stacked blocks [lb/ft ²]
(2) CRult = Tc-ult / Tult
(3) CRcr = Tcre / Tult

In seismic analysis, long term strength is reduced to 100% of its static value.

D A T A (for connection only)	Type #1	Type #2	Type #3	Type #4	Type #5
Product Name	UX1100MSE..	UX1400MSE..	UX1500MSE..	UX1600MSE..	UX1700MSE..
Connection strength reduction factor, RFd	1.10	1.10	1.10	1.10	1.10
Creep reduction factor, RFc	N/A	N/A	N/A	N/A	N/A

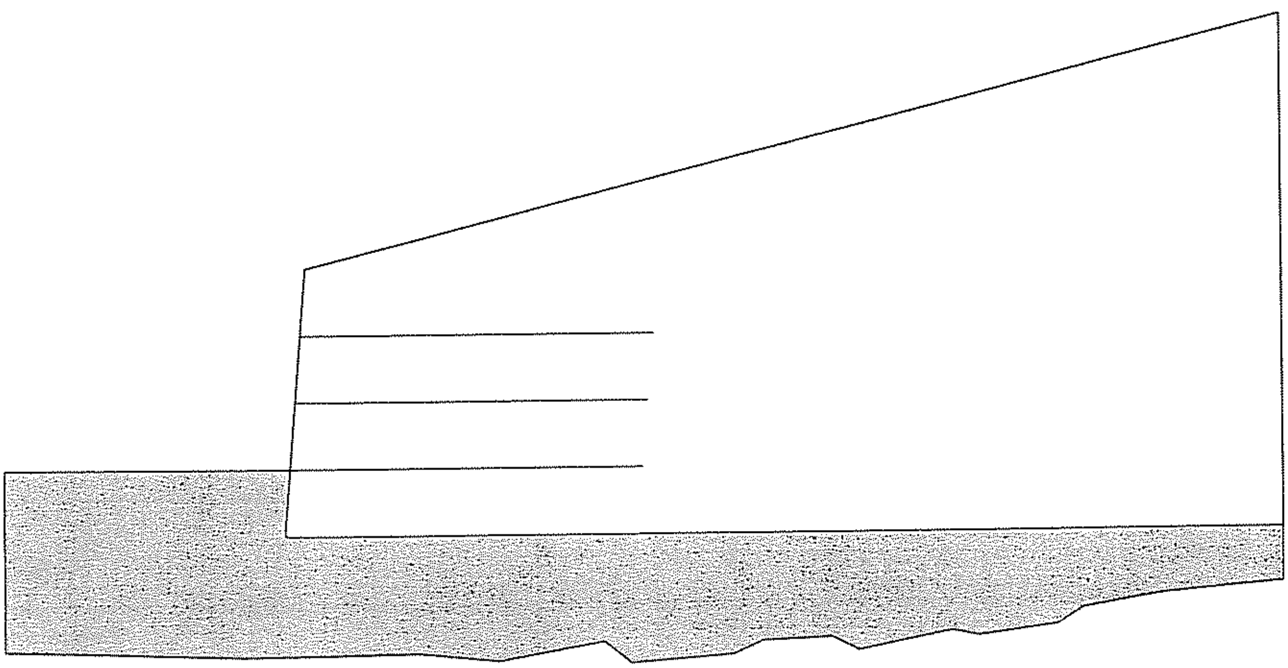
INPUT DATA: Geometry and Surcharge loads (of a SIMPLE STRUCTURE)

Design height, Hd	6.00	[ft]	{ Embedded depth is E = 1.50 ft, and height above top of finished bottom grade is H = 4.50 ft }
Batter, ω	4.8	[deg]	
Backslope, β	14.0	[deg]	
Backslope rise	20.0	[ft]	Broken back equivalent angle, I = 14.04° (see Fig. 25 in DEMO 82)

U N I F O R M   S U R C H A R G E
Uniformly distributed dead load is 0.0 [lb/ft ^{2}]

OTHER EXTERNAL LOAD(S)
[S1] Strip Load, Qv-d = 0.0 and Qv-l = 250.0 [lb/ft ^{2}].
Footing width, b=150.0 [ft]. Distance of center of footing from wall face, d = 155.0 [ft] @ depth of 0.0 [ft] below soil surface.

ANALYZED REINFORCEMENT LAYOUT:



SCALE:

0 2 4 6 [ft]

ANALYSIS: CALCULATED FACTORS (Static conditions)

Bearing capacity, Fs = 170.98, Meyerhof stress = 920 lb/ft². N/A*

Foundation Interface: Direct sliding, Fs = 5.199, Eccentricity, e/L = -0.0125, Fs-overturning = 13.99

#	GEOGRID Elevation [ft]	Length [ft]	Type #	CONNECTION Fs-overall [connection strength]	Fs-overall [geogrid strength]	Geogrid strength Fs	Pullout resistance Fs	Direct sliding Fs	Eccentricity e/L	Product name
1	0.00	8.00	2	4.90	10.07	10.066	35.495	4.222	-0.0125	UX1400MSE-SS
2	1.50	8.00	2	2.77	6.16	6.160	16.258	5.030	-0.0255	UX1400MSE-SS
3	3.00	8.00	2	3.61	8.78	8.781	15.677	6.184	-0.0410	UX1400MSE-SS
4	4.50	8.00	2	4.64	12.51	12.505	13.244	7.876	-0.0678	UX1400MSE-SS

ANALYSIS: CALCULATED FACTORS (Seismic conditions)

N/A* Bearing capacity, Fs = 149.07, Meyerhof stress = 1044 lb/ft².

Foundation Interface: Direct sliding, Fs = 2.188, Eccentricity, e/L = 0.0602, Fs-overturning = 4.981 N/A*

#	GEOGRID Elevation [ft]	Length [ft]	Type #	CONNECTION Fs-overall [connection strength]	Fs-overall [geogrid strength]	Geogrid strength Fs	Pullout resistance Fs	Direct sliding Fs	Eccentricity e/L	Product name
1	0.00	8.00	2	4.32	7.89	7.889	17.637	1.776	0.0602	UX1400MSE-SS
2	1.50	8.00	2	2.59	5.34	5.338	9.704	2.311	0.0150	UX1400MSE-SS
3	3.00	8.00	2	3.33	7.33	7.328	8.721	3.280	-0.0233	UX1400MSE-SS
4	4.50	8.00	2	4.24	9.99	9.988	6.805	5.429	-0.0635	UX1400MSE-SS

N/A*

* see external stability analysis

SIERRASCAPE®
RETAINING WALL SYSTEMS

AASHTO DESIGN METHOD
LASO TA-73 Airport Landfills

PROJECT IDENTIFICATION

Title:	LASO TA-73 Airport Landfills
Project Number:	D06602
Client:	Slaton Bros SW
Designer:	CLC
Station Number:	Wall 2_1+00.0-1+35.7/ Wall 4_1+00.0-1+50.0

Description:

Tiered wall...Wall 2_DH=16.0' and Wall 4 _DH=7', 10' offset_EXTERNAL

Company's information:

Name: Tensar Earth Technologies, Inc.
Street: 5883 Glenridge Drive
Suite 200
Atlanta, GA 30328
Telephone #: (404) 250-1290
Fax #: (404) 250-9185
E-Mail: ccampbell@tensarcorp.com

Original file path and name: k:_d\D06602\Final\Design\Design without Wall 1\Wall2an.....
.....andWall 4_16'_EX.BEN
Original date and time of creating this file: May 22, 2006

PROGRAM MODE: ANALYSIS
of SUPERIMPOSED WALL
using GEOGRID as reinforcing material.

SOIL DATA

REINFORCED SOIL

Unit weight, γ 130.0 lb/ft ^{3}
Design value of internal angle of friction, ϕ 32.0 °

RETAINED SOIL

Unit weight, γ 100.0 lb/ft ^{3}
Design value of internal angle of friction, ϕ 35.5 °

FOUNDATION SOIL (Considered as an equivalent uniform soil)

Equivalent unit weight, $\gamma_{equiv.}$ 130.0 lb/ft ^{3}
Equivalent internal angle of friction, $\phi_{equiv.}$ 32.0 °
Equivalent cohesion, $c_{equiv.}$ 4000.0 lb/ft ^{2}

Water table does not affect bearing capacity

LATERAL EARTH PRESSURE COEFFICIENTS

Ka (internal stability) = 0.3073 (if batter is less than 10°, Ka is calculated from eq. 15. Otherwise, eq. 38 is utilized)
Inclination of internal slip plane, ψ = 61.00° (see Fig. 28 in DEMO 82).
Ka (external stability) = 0.2866 (if batter is less than 10°, Ka is calculated from eq. 16. Otherwise, eq. 17 is utilized)

BEARING CAPACITY

Bearing capacity coefficients (calculated by MSEW): Nc = 35.49 N γ = 30.21

SEISMICITY

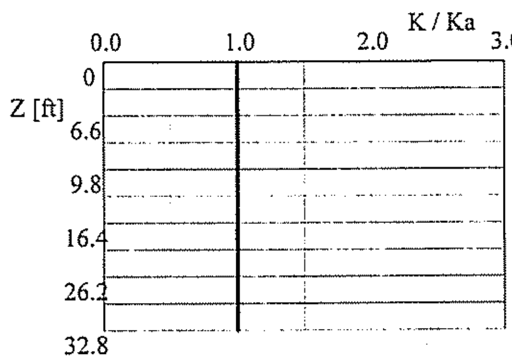
Maximum ground acceleration coefficient, α_o = 0.131
Kae (α_o> 0) = 0.4492 Kae (α_o= 0) = 0.2866 Δ Kae = 0.1625 (see eq. 37 in DEMO 82)
Seismic soil-geogrid friction coefficient, F* is 80.0% of its specified static value.

INPUT DATA: Geogrids
(Analysis)

D A T A	Geogrid type #1	Geogrid type #2	Geogrid type #3	Geogrid type #4	Geogrid type #5
Tult [lb/ft]	3974.1	4796.3	7811.2	9866.7	11990.8
Durability reduction factor, RFd	1.00	1.00	1.00	1.00	1.00
Installation-damage reduction factor, RFid	1.10	1.10	1.10	1.10	1.10
Creep reduction factor, RFc	2.34	2.21	2.40	2.29	2.22
Fs-overall for strength	N/A	N/A	N/A	N/A	N/A
Coverage ratio, Rc	0.940	0.940	0.940	0.940	0.940
Friction angle along geogrid-soil interface, ρ	26.56	26.56	26.56	26.56	26.56
Pullout resistance factor, F*	0.80·tanϕ	0.80·tanϕ	0.80·tanϕ	0.80·tanϕ	0.80·tanϕ
Scale-effect correction factor, α	1.0	1.0	1.0	1.0	1.0

Variation of Lateral Earth Pressure Coefficient With Depth

Z	K / Ka
0 ft	1.00
3.3 ft	1.00
6.6 ft	1.00
9.8 ft	1.00
13.1 ft	1.00
16.4 ft	1.00
19.7 ft	1.00



INPUT DATA: Geometry and Surcharge loads (of SUPERIMPOSED wall)

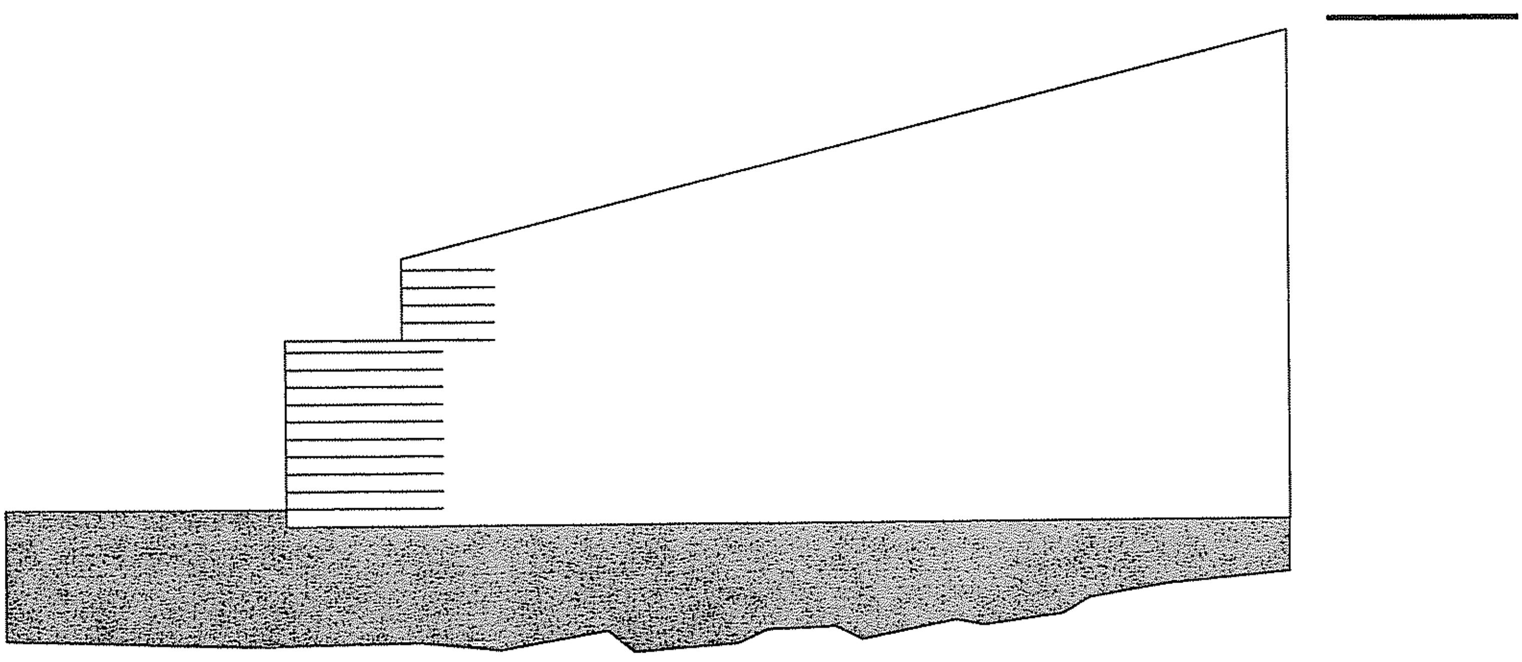
Design height, Hd	23.00	[ft]	{ Embedded depth is E = 1.50 ft, and height above top of finished bottom grade is H = 21.50 ft, where H1 = 7.00 and H2 = 14.50 }
Batter, ω	0.0	[deg]	
Backslope, β	14.0	[deg]	
Backslope rise	20.0	[ft]	Broken back equivalent angle, I = 14.04° (see Fig. 25 in DEMO 82)

Offset of upper segment from lower one, Offset = 10.0 ft, Blackslope2 = 0.0 deg. and Backslope rise, S2 = 0.0 ft.

UNIFORM SURCHARGE
Uniformly distributed dead load is 0.0 [lb/ft ^{2}]

OTHER EXTERNAL LOAD(S)
[S1] Strip Load, Qv-d = 0.0 and Qv-l = 250.0 [lb/ft ^{2}].
Footing width, b=150.0 [ft]. Distance of center of footing from wall face, d = 155.0 [ft] @ depth of 0.0 [ft] below soil surface.

ANALYZED REINFORCEMENT LAYOUT:



SCALE:

0 2 4 6 8 10[ft]

ANALYSIS: CALCULATED FACTORS (Static conditions)

N/A

Bearing capacity, Fs = ~~56.84~~, Meyerhof stress = 2897 lb/ft².

Foundation Interface: Direct sliding, Fs = 2.637, Eccentricity, e/L = 0.0723, Fs-overturning = 4.06

#	Elevation [ft]	Length [ft]	Type #	Fs-overall [connection strength]	Fs-overall [geogrid strength]	Geogrid strength Fs	Pullout resistance Fs	Direct sliding Fs	Eccentricity e/L	Product name
1	0.00	13.50	3	3.22	4.02	4.023	55.132	2.141	0.0723	UX1500MSE-SS
2	1.50	13.50	3	1.60	2.11	2.114	25.433	2.228	0.0560	UX1500MSE-SS
3	3.00	13.50	3	1.63	2.27	2.270	23.741	2.321	0.0398	UX1500MSE-SS
4	4.50	13.50	3	1.66	2.45	2.449	22.066	2.418	0.0234	UX1500MSE-SS
5	6.00	13.50	3	1.69	2.66	2.660	20.378	2.518	0.0065	UX1500MSE-SS
6	7.50	13.50	3	1.73	2.91	2.910	18.692	2.618	-0.0115	UX1500MSE-SS
7	9.00	13.50	3	1.77	3.21	3.212	17.024	2.711	-0.0314	UX1500MSE-SS
8	10.50	13.50	3	1.83	3.58	3.584	15.345	2.786	-0.0550	UX1500MSE-SS
9	12.00	13.50	3	1.91	4.05	4.053	13.672	2.819	-0.0856	UX1500MSE-SS
10	13.50	13.50	3	2.00	4.66	4.664	12.022	2.762	-0.1308	UX1500MSE-SS
11	15.00	13.50	3	1.69	4.37	4.368	8.249	2.508	-0.2141	UX1500MSE-SS
12	16.00	8.00	2	3.66	7.17	7.167	26.437	3.875	0.0126	UX1400MSE-SS
13	17.50	8.00	2	1.95	4.12	4.120	10.697	4.512	-0.0038	UX1400MSE-SS
14	19.00	8.00	2	2.25	5.15	5.148	8.589	5.397	-0.0208	UX1400MSE-SS
15	20.50	8.00	2	2.73	6.86	6.859	6.211	6.685	-0.0420	UX1400MSE-SS
16	22.00	8.00	2	3.29	9.19	9.187	2.827	8.559	-0.0821	UX1400MSE-SS

ANALYSIS: CALCULATED FACTORS (Seismic conditions)

N/A

Bearing capacity, Fs = ~~35.17,~~ Meyerhof stress = 4462 lb/ft².

Foundation Interface: Direct sliding, Fs = 1.457, Eccentricity, e/L = 0.2169, Fs-overturning = 1.98

#	Elevation [ft]	Length [ft]	Type #	Fs-overall [connection strength]	Fs-overall [geogrid strength]	Geogrid strength Fs	Pullout resistance Fs	Direct sliding Fs	Eccentricity e/L	Product name
1	0.00	13.50	3	2.94	3.60	3.603	34.475	1.183	0.2169	UX1500MSE-SS
2	1.50	13.50	3	1.54	2.00	2.000	17.882	1.261	0.1755	UX1500MSE-SS
3	3.00	13.50	3	1.56	2.15	2.146	16.687	1.351	0.1358	UX1500MSE-SS
4	4.50	13.50	3	1.59	2.32	2.315	15.504	1.756	0.0583	UX1500MSE-SS
5	6.00	13.50	3	1.63	2.51	2.514	14.311	1.885	0.0327	UX1500MSE-SS
6	7.50	13.50	3	1.67	2.75	2.750	13.119	2.030	0.0072	UX1500MSE-SS
7	9.00	13.50	3	1.72	3.03	3.034	11.941	2.190	-0.0190	UX1500MSE-SS
8	10.50	13.50	3	1.78	3.38	3.384	10.754	2.357	-0.0476	UX1500MSE-SS
9	12.00	13.50	3	1.85	3.83	3.825	9.571	2.512	-0.0818	UX1500MSE-SS
10	13.50	13.50	3	1.95	4.40	4.399	8.405	2.599	-0.1294	UX1500MSE-SS
11	15.00	13.50	3	1.66	4.17	4.166	5.910	2.474	-0.2139	UX1500MSE-SS
12	16.00	8.00	2	3.32	5.97	5.972	14.664	2.142	0.0665	UX1400MSE-SS
13	17.50	8.00	2	1.86	3.73	3.735	6.970	2.621	0.0292	UX1400MSE-SS
14	19.00	8.00	2	2.14	4.62	4.622	5.490	3.378	-0.0036	UX1400MSE-SS
15	20.50	8.00	2	2.59	6.06	6.060	3.848	4.720	-0.0355	UX1400MSE-SS
16	22.00	8.00	2	3.12	7.99	7.989	1.699	7.441	-0.0812	UX1400MSE-SS

N/A

* See Internal Stability Analysis

SIERRASCAPE®
RETAINING WALL SYSTEMS

AASHTO DESIGN METHOD
LASO TA-73 Airport Landfills

PROJECT IDENTIFICATION

Title:	LASO TA-73 Airport Landfills
Project Number:	D06602
Client:	Slaton Bros SW
Designer:	CLC
Station Number:	Wall 2_1+00.0-1+35.7/ Wall 4_1+00.0-1+50.0

Description:

Tiered wall...Wall 2_DH=16.0' and Wall 4 _DH=7', 10' offset_INTERNAL

Company's information:

Name: Tensar Earth Technologies, Inc.
Street: 5883 Glenridge Drive
Suite 200
Atlanta, GA 30328
Telephone #: (404) 250-1290
Fax #: (404) 250-9185
E-Mail: ccampbell@tensarcorp.com

Original file path and name: k:_d\D06602\Final\Design\Design without Wall 1\Wall2an..... .....2andWall4_16'_IN.BEN
Original date and time of creating this file: May 22, 2006

PROGRAM MODE: ANALYSIS
of SUPERIMPOSED WALL
using GEOGRID as reinforcing material.

SOIL DATA

REINFORCED SOIL

Unit weight, γ 130.0 lb/ft ³

Design value of internal angle of friction, ϕ 32.0 °

RETAINED SOIL

Unit weight, γ 100.0 lb/ft ³

Design value of internal angle of friction, ϕ 35.5 °

FOUNDATION SOIL (Considered as an equivalent uniform soil)

Equivalent unit weight, $\gamma_{equiv.}$ 130.0 lb/ft ³

Equivalent internal angle of friction, $\phi_{equiv.}$ 32.0 °

Equivalent cohesion, $c_{equiv.}$ 4000.0 lb/ft ²

Water table does not affect bearing capacity

LATERAL EARTH PRESSURE COEFFICIENTS

Ka (internal stability) = 0.3073 (if batter is less than 10°, Ka is calculated from eq. 15. Otherwise, eq. 38 is utilized)
Inclination of internal slip plane, ψ = 61.00° (see Fig. 28 in DEMO 82).
Ka (external stability) = 0.2866 (if batter is less than 10°, Ka is calculated from eq. 16. Otherwise, eq. 17 is utilized)

BEARING CAPACITY

Bearing capacity coefficients (calculated by MSEW): Nc = 35.49 N γ = 30.21

SEISMICITY

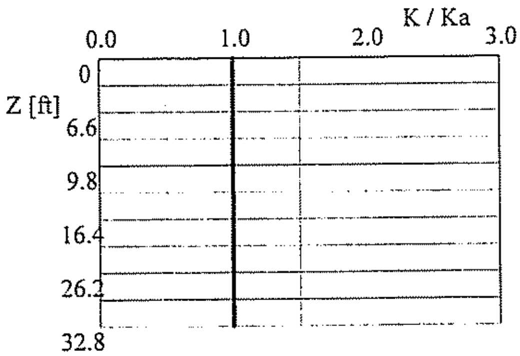
Maximum ground acceleration coefficient, α_o = 0.262
Kae (α_o > 0) = 0.6986 Kae (α_o = 0) = 0.2866 Δ Kae = 0.4120 (see eq. 37 in DEMO 82)
Seismic soil-geogrid friction coefficient, F* is 80.0% of its specified static value.

INPUT DATA: Geogrids
(Analysis)

D A T A	Geogrid type #1	Geogrid type #2	Geogrid type #3	Geogrid type #4	Geogrid type #5
Tult [lb/ft]	3974.1	4796.3	7811.2	9866.7	11990.8
Durability reduction factor, RFd	1.00	1.00	1.00	1.00	1.00
Installation-damage reduction factor, RFid	1.10	1.10	1.10	1.10	1.10
Creep reduction factor, RFc	2.34	2.21	2.40	2.29	2.22
Fs-overall for strength	N/A	N/A	N/A	N/A	N/A
Coverage ratio, Rc	0.940	0.940	0.940	0.940	0.940
Friction angle along geogrid-soil interface, ρ	26.56	26.56	26.56	26.56	26.56
Pullout resistance factor, F*	0.80·tanϕ	0.80·tanϕ	0.80·tanϕ	0.80·tanϕ	0.80·tanϕ
Scale-effect correction factor, α	1.0	1.0	1.0	1.0	1.0

Variation of Lateral Earth Pressure Coefficient With Depth

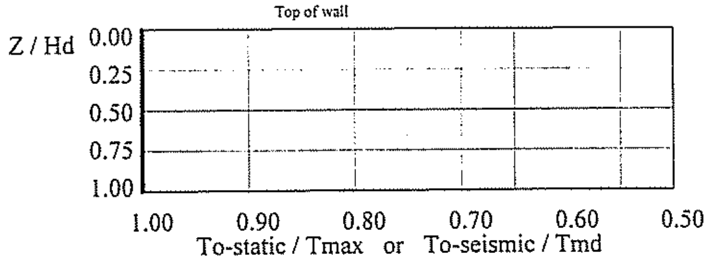
Z	K / Ka
0 ft	1.00
3.3 ft	1.00
6.6 ft	1.00
9.8 ft	1.00
13.1 ft	1.00
16.4 ft	1.00
19.7 ft	1.00



INPUT DATA: Facia and Connection (according to revised Demo 82)
(Analysis)

FACIA type: Facing enabling frictional connection of reinforcement (e.g., modular concrete blocks, gabions)
Depth/height of block is 1.48/1.48 ft. Horizontal distance to Center of Gravity of block is 0.74 ft.
Average unit weight of block is γ_f = 114.58 lb/ft ^{3}

Z / Hd	To-static / Tmax or To-seismic / Tmd
0.00	1.00
0.25	1.00
0.50	1.00
0.75	1.00
1.00	1.00



Geogrid Type #1 σ [(1)]	CRult [(2)]	Geogrid Type #2 σ	CRult	Geogrid Type #3 σ	CRult	Geogrid Type #4 σ	CRult	Geogrid Type #5 σ	CRult
0.0	1.00	0.0	1.00	0.0	1.00	0.0	0.38	0.0	0.38
						1200.9	0.44	1200.9	0.44
						2999.0	0.53	3600.5	0.56
						6000.1	0.68	7198.9	0.74

Geogrid Type #1[(3)] σ	CRcr	Geogrid Type #2 σ	CRcr	Geogrid Type #3 σ	CRcr	Geogrid Type #4 σ	CRcr	Geogrid Type #5 σ	CRcr
0.0	0.15	0.0	0.15	0.0	0.15	0.0	0.38	0.0	0.38
480.3	0.20	480.3	0.20	599.4	0.21	1200.9	0.44	1200.9	0.44
1200.9	0.27	1200.9	0.27	1800.3	0.33	2999.0	0.53	3600.5	0.56
2399.6	0.39	2399.6	0.39	3600.5	0.51	6000.1	0.68	7198.9	0.74

(1) σ = Confining stress in between stacked blocks [lb/ft ^{2}]
(2) CRult = Tc-ult / Tult
(3) CRcr = Tcrc / Tult

In seismic analysis, long term strength is reduced to 100% of its static value.

D A T A (for connection only)	Type #1	Type #2	Type #3	Type #4	Type #5
Product Name	UX1100MSE..	UX1400MSE..	UX1500MSE..	UX1600MSE..	UX1700MSE..
Connection strength reduction factor, RFd	1.10	1.10	1.10	1.10	1.10
Creep reduction factor, RFc	N/A	N/A	N/A	N/A	N/A

INPUT DATA: Geometry and Surcharge loads (of SUPERIMPOSED wall)

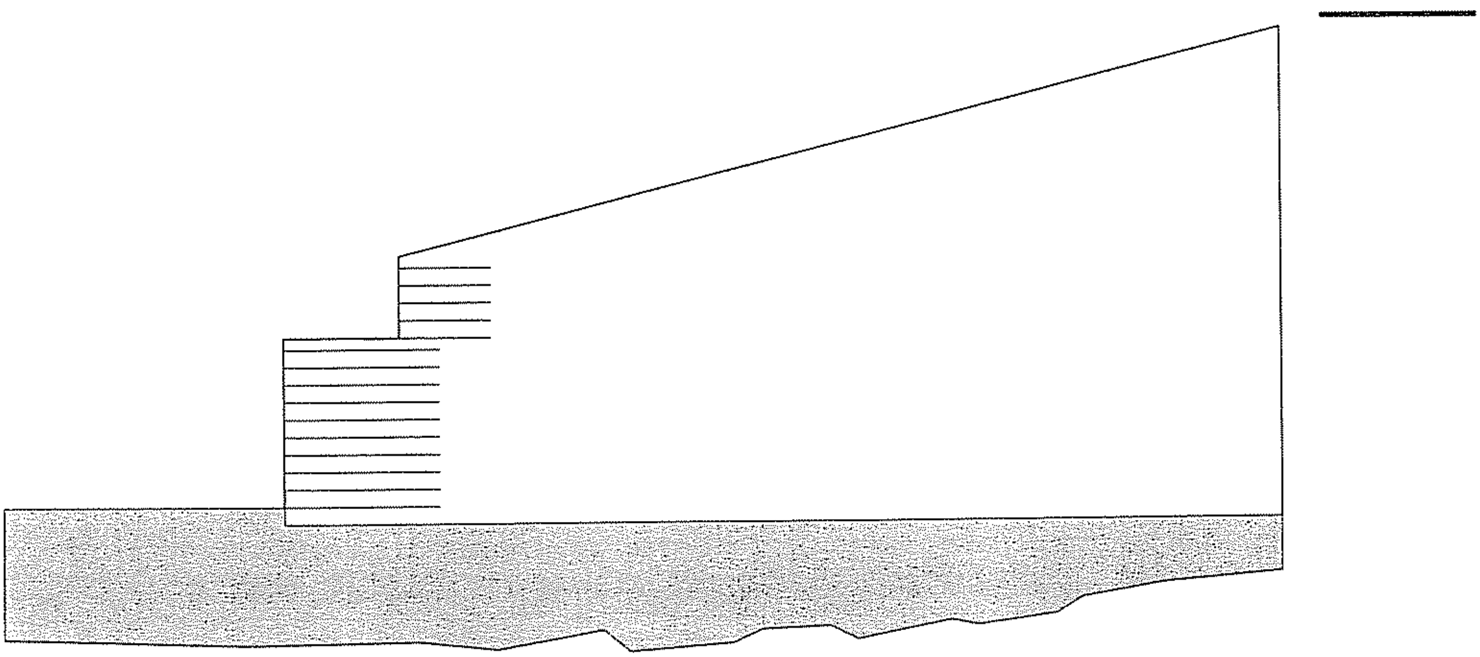
Design height, Hd	23.00	[ft]	{ Embedded depth is E = 1.50 ft, and height above top of finished bottom grade is H = 21.50 ft, where H1 = 7.00 and H2 = 14.50 }
Batter, ω	0.0	[deg]	
Backslope, β	14.0	[deg]	
Backslope rise	20.0	[ft]	Broken back equivalent angle, I = 14.04° (see Fig. 25 in DEMO 82)

Offset of upper segment from lower one, Offset = 10.0 ft, Blackslope2 = 0.0 deg. and Backslope rise, S2 = 0.0 ft.

UNIFORM SURCHARGE
Uniformly distributed dead load is 0.0 [lb/ft ^{2}]

OTHER EXTERNAL LOAD(S)
[S1] Strip Load, Qv-d = 0.0 and Qv-l = 250.0 [lb/ft ^{2}].
Footing width, b=150.0 [ft]. Distance of center of footing from wall face, d = 155.0 [ft] @ depth of 0.0 [ft] below soil surface.

ANALYZED REINFORCEMENT LAYOUT:



SCALE:

0 2 4 6 8 10[ft]

ANALYSIS: CALCULATED FACTORS (Static conditions)

N/A*

Bearing capacity, Fs = 56.84, Meyerhof stress = 2897 lb/ft².

Foundation Interface: Direct sliding, Fs = 2.637, Eccentricity, e/L = 0.0723, Fs-overturning = 4.06

GEOGRID #	Elevation [ft]	Length [ft]	Type #	CONNECTION Fs-overall [connection strength]	Fs-overall [geogrid strength]	Geogrid strength Fs	Pullout resistance Fs	Direct sliding Fs	Eccentricity e/L	Product name
1	0.00	13.50	3	3.22	4.02	4.023	55.132	2.141	0.0723	UX1500MSE-SS
2	1.50	13.50	3	1.60	2.11	2.114	25.433	2.228	0.0560	UX1500MSE-SS
3	3.00	13.50	3	1.63	2.27	2.270	23.741	2.321	0.0398	UX1500MSE-SS
4	4.50	13.50	3	1.66	2.45	2.449	22.066	2.418	0.0234	UX1500MSE-SS
5	6.00	13.50	3	1.69	2.66	2.660	20.378	2.518	0.0065	UX1500MSE-SS
6	7.50	13.50	3	1.73	2.91	2.910	18.692	2.618	-0.0115	UX1500MSE-SS
7	9.00	13.50	3	1.77	3.21	3.212	17.024	2.711	-0.0314	UX1500MSE-SS
8	10.50	13.50	3	1.83	3.58	3.584	15.345	2.786	-0.0550	UX1500MSE-SS
9	12.00	13.50	3	1.91	4.05	4.053	13.672	2.819	-0.0856	UX1500MSE-SS
10	13.50	13.50	3	2.00	4.66	4.664	12.022	2.762	-0.1308	UX1500MSE-SS
11	15.00	13.50	3	1.69	4.37	4.368	8.249	2.508	-0.2141	UX1500MSE-SS
12	16.00	8.00	2	3.66	7.17	7.167	26.437	3.875	0.0126	UX1400MSE-SS
13	17.50	8.00	2	1.95	4.12	4.120	10.697	4.512	-0.0038	UX1400MSE-SS
14	19.00	8.00	2	2.25	5.15	5.148	8.589	5.397	-0.0208	UX1400MSE-SS
15	20.50	8.00	2	2.73	6.86	6.859	6.211	6.685	-0.0420	UX1400MSE-SS
16	22.00	8.00	2	3.29	9.19	9.187	2.827	8.559	-0.0821	UX1400MSE-SS

ANALYSIS: CALCULATED FACTORS (Seismic conditions)

N/A*

Bearing capacity, Fs = 14.83, Meyerhof stress = 10032 lb/ft².

Foundation Interface: Direct sliding, Fs = 1.012, Eccentricity, e/L = 0.3690, Fs-overturning = 1.29

GEOGRID #	Elevation [ft]	Length [ft]	Type #	CONNECTION Fs-overall [connection strength]	Fs-overall [geogrid strength]	Geogrid strength Fs	Pullout resistance Fs	Direct sliding Fs	Eccentricity e/L	Product name
1	0.00	13.50	3	2.76	3.33	3.326	29.341	0.822	0.3690	UX1500MSE-SS
2	1.50	13.50	3	1.49	1.92	1.916	16.300	0.881	0.3040	UX1500MSE-SS
3	3.00	13.50	3	1.52	2.06	2.056	15.208	0.951	0.2420	UX1500MSE-SS
4	4.50	13.50	3	1.55	2.22	2.218	14.125	1.387	0.0928	UX1500MSE-SS
5	6.00	13.50	3	1.58	2.41	2.408	13.035	1.515	0.0587	UX1500MSE-SS
6	7.50	13.50	3	1.63	2.63	2.633	11.945	1.666	0.0259	UX1500MSE-SS
7	9.00	13.50	3	1.68	2.91	2.905	10.867	1.844	-0.0064	UX1500MSE-SS
8	10.50	13.50	3	1.74	3.24	3.239	9.782	2.049	-0.0398	UX1500MSE-SS
9	12.00	13.50	3	1.81	3.66	3.661	8.700	2.270	-0.0778	UX1500MSE-SS
10	13.50	13.50	3	1.91	4.21	4.208	7.633	2.457	-0.1279	UX1500MSE-SS
11	15.00	13.50	3	1.64	4.02	4.017	5.454	2.442	-0.2137	UX1500MSE-SS
12	16.00	8.00	2	3.09	5.27	5.268	11.772	1.492	0.1212	UX1400MSE-SS
13	17.50	8.00	2	1.80	3.47	3.475	6.068	1.858	0.0633	UX1400MSE-SS
14	19.00	8.00	2	2.06	4.27	4.272	4.728	2.467	0.0146	UX1400MSE-SS
15	20.50	8.00	2	2.49	5.54	5.543	3.259	3.654	-0.0284	UX1400MSE-SS
16	22.00	8.00	2	3.00	7.23	7.234	1.417	6.583	-0.0800	UX1400MSE-SS

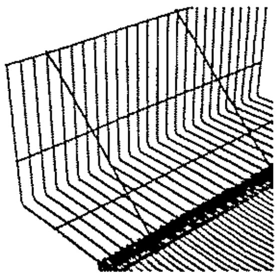
N/A*

*See external stability analysis

SIERRASCAPE®

RETAINING WALL SYSTEM

INSTALLATION GUIDE



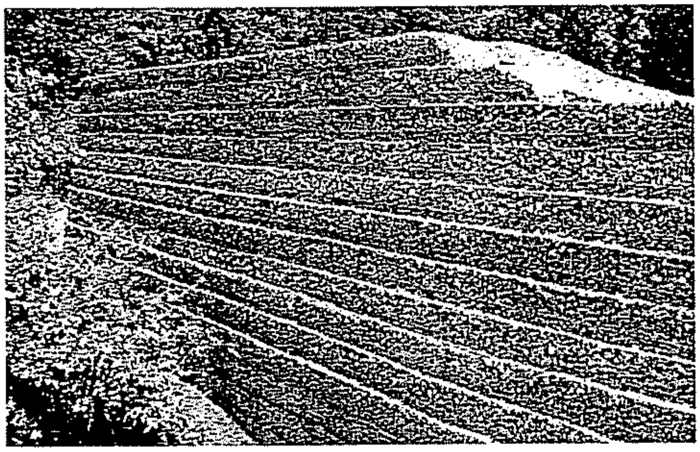
This manual for the SierraScape® Retaining Wall System from Tensar Earth Technologies (TET) is provided as a guideline for construction and quality control of the installation. This manual shall be provided to the Owner's Engineer, the construction quality assurance inspector, and the Contractor.

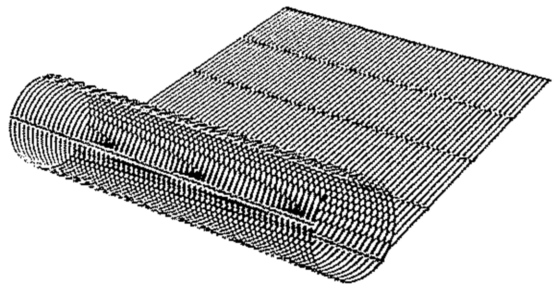
1. Responsibilities for Construction Compliance

The Contractor must provide for construction of the wall in accordance with the contract documents, plans, and specifications. The Contractor is also responsible for the verification of line, grade, and other physical features.

The TET technical representative may assist the Contractor and the inspection staff with the procedures within this manual and the contract plans, documents, and specifications. The representative may be on site at the start of construction and thereafter only as requested or necessary.

The TET technical representative is not authorized to countermand any details or instructions herein or on the approved construction drawings without the express written agreement of the Engineer.





Tensar Uniaxial (UX) Geogrid.

2. Materials and Handling

MATERIALS SUPPLIED

Tensar® Uniaxial (UX) and Biaxial (BX) Reinforcement Geogrids

Non-woven needle punched geotextile or Turf Reinforcement Mat (TRM) from TET (depending on facing option)

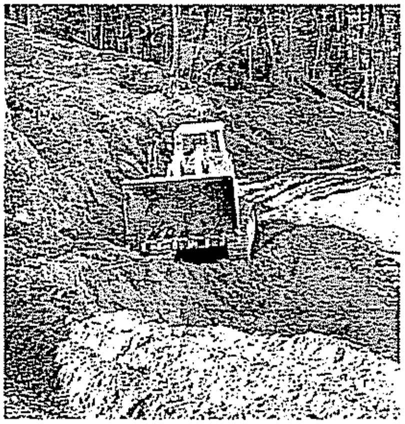
SierraScape Facing Elements

Support Struts

SierraScape Connection Rods

HANDLING WALL MATERIALS

Tensar Geogrids are shipped in roll form. The Contractor is responsible for off-loading the rolls. Standard roll sizes of the UX Geogrids are 4.36 feet wide x 200 or 250 feet long and weigh between 75 and 180 pounds. The rolls should be color coded by the Contractor on their edges, according to type, prior to the removal of the labels. The standard roll size for BX1100 Geogrid is 10 and 13 feet wide x 246 feet long, while the standard roll size for BX1200 is 10 and 13 feet wide x 165 feet long.



Preparing the subgrade.

The SierraScape facing units are typically packaged 50 to a bundle. The support struts and SierraScape connection rods are boxed loose. All materials are to be off-loaded by the Contractor.

It is the Contractor's responsibility to verify the quantities shipped and the condition of the materials.

Geotextile and TRM are shipped in roll form and are to be off-loaded by the Contractor. The standard roll sizes are 15 feet wide by 300 feet long and 6.7 feet wide by 150 feet long, respectively.

If certifications are required by the contract documents, they will be supplied along with the material that is shipped. It is the Contractor's responsibility to ensure that the Engineer is provided this information.

The Contractor is allowed one hour to off-load the facing units, geogrid, and accessories.

CONTRACTOR SUPPLIED MATERIALS

Reinforced, select, or plantable fill

Cable ties or tie wire

Utility saw

Alignment system materials (laser, stringline, etc.)

Side cut shears

4-foot level

All labor, equipment, and supervision necessary to perform the total wall construction.

3. Preparatory Work for Wall Construction

Verify the condition, approval, and receipt of the SierraScape facing units, connection rods, support struts, Tensar Geogrid, and fill materials. Materials should arrive in good condition. TET will not replace materials that have been accepted by the Contractor.

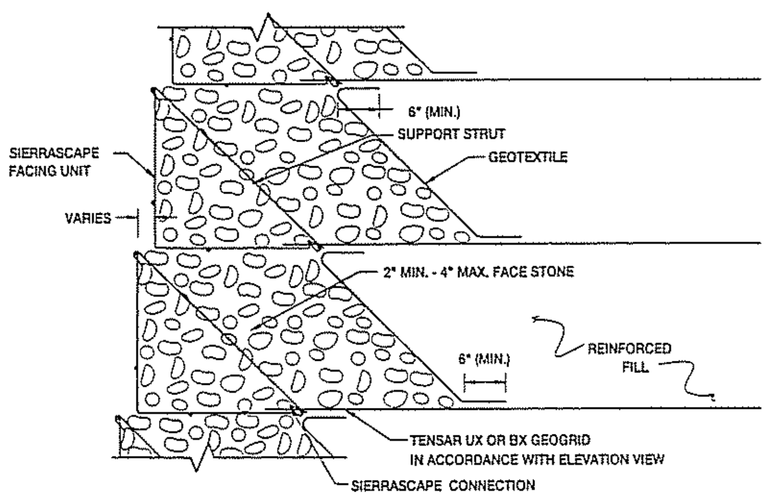
Prepare subgrade by excavating to the plan elevation and horizontally to the design geogrid lengths. It is the Contractor's responsibility to verify that insitu conditions are as shown on the design plans prior to beginning construction. If site conditions vary from the plans, the wall may require redesign. In this case, the Engineer must be notified by the Contractor prior to proceeding with the SierraScape Wall construction.

The subgrade shall be approved before proceeding with the wall construction. Any soils found unsuitable by the Engineer shall be treated in a manner approved by the Engineer.

Grade and proof roll subgrade.

Checking setback and wall alignment.

Placing the geogrid over the connection loops of the facing element.



SierraScape Facing Detail (stone-filled face).

4. Wall Construction

Install offset stringline, story pole, or other control for the purpose of checking wall alignment.

Pre-cut the geogrid and geotextile to the lengths stated on the Plans.

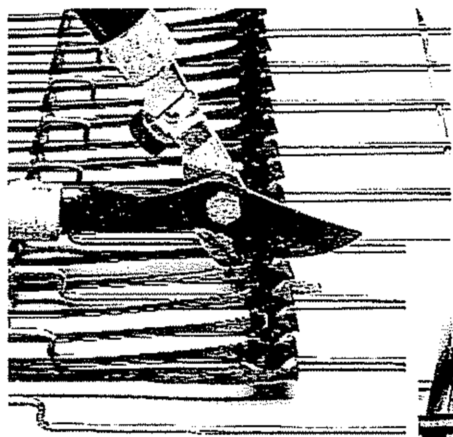
Install the facing elements on level grade. Butt facing elements end-to-end with the extended horizontal wires on one unit overlapping the adjacent unit. *Note: the elements may move forward during backfill placement and compaction. Set the first few courses 1 to 2 inches behind the face control line. Adjust setback of upper courses based on observed movements.*

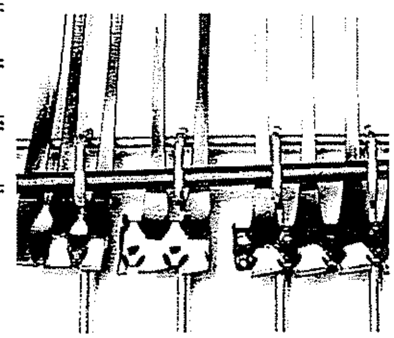
Attach the end vertical wires of adjacent elements with cable ties or tie wires to maintain alignment and contain fill.

Two strips of Tensar UX Geogrid shall be attached to each facing element. The geogrid shall not overlap adjacent facing elements. The two outer ribs of the left geogrid shall be placed between the outer two wires on the left side of the facing element. The outer ribs of the other geogrid shall be positioned between outer wires on the right side of the facing element. Two geogrid ribs shall be positioned between each pair of wires. As shown in the photo (to the right), the transverse bar of the UX Geogrid will have to be cut in places to position pairs of ribs between pairs of wires. Cuts shall be made only at apertures between wire pairs. *Note: The transverse bar may need to be cut in a few more places to allow contact between the geogrid and the connection loops.*

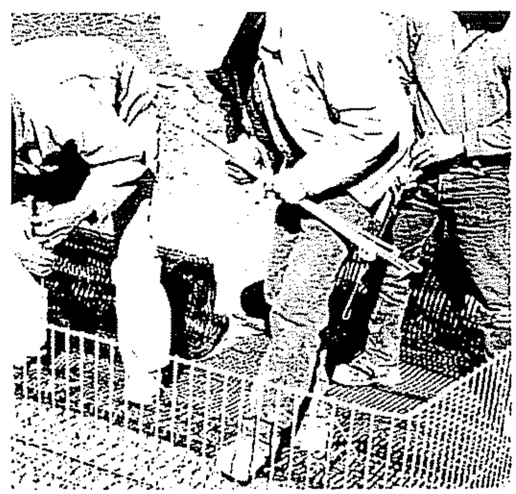
Thread the connection rod through the connection loop over the ribs of the Tensar UX Geogrid.

Inserting the SierraScape connection rod.





When geogrid apertures do not perfectly align with the SierraScape "loops", cut the geogrid at the transverse bar that does not bear on a connection loop.



Installing support struts at both ends of the SierraScape facing unit.

Wall Construction Continued...

Place face backing as specified where face fill is finer than 2- to 4-inch stone. Where 1- to 2-inch stone face fill is specified, use BX1100 or BX1120 Geogrid to retain the stone. Where finer grained fill is specified, use a TRM or geotextile. The face backing will be 2 feet wide to cover the face and extend 6 inches under the fill. It may be connected to the top with clips, ties, or the diagonal struts discussed below.

Connect the top and back horizontal wires of the facing elements with diagonal stiffening struts spaced at approximately 16-inch spacing. One strut should be positioned between the two end wires to support the joint between facing units.

In preparation for fill placement, pull the UX Geogrid toward the reinforced backfill zone so that it is tight against the connection. Maintain alignment of the facing elements by standing on them. Place the first 9-inch lift of backfill on top of the geogrid, while maintaining an open zone at the facing element for the stone facing. The fill should be placed near the face of the wall first and then proceed toward the tails of the geogrid. This will promote further tensioning of the geogrid.

After the backfill is placed on the geogrid, roll the pre-cut geotextile along the front edge of the backfill (if required). A tab of at least 6 inches of geotextile is required to extend under the stone facing.

Facing fill material should be installed in 9-inch loose lifts unless the plans require smaller lifts. To provide a level surface for the next facing element, it is optional to use a thin layer of well-graded aggregate at the top of the basket.

A vibratory plate tamper is recommended for compacting facing and reinforced fill materials within 3 feet of the wall face or as the plans require. *Note: Good compaction at the wall face will minimize "pillowing" of the lower facing units as the wall construction proceeds.*

Conventional rolled compaction equipment may be used to compact reinforced fill beyond the 3-foot face zone to 95% of AASHTO-T99 maximum dry density or as otherwise specified. The thickness of compacted lift shall be no more than 9 inches.

Alignment adjustments will be required as the type of fill, the moisture content, equipment, and wall height will effect the amount of movement of an individual facing element. *Note: The facing elements may not move uniformly. Subsequent rows of facing elements can be set with a relative setback based upon observed movements. The Contractor should check facing alignment as every course of elements is placed. To correct alignment, a 2-inch maximum overhang is permitted.*

At the end of each day, the Contractor must ensure that the reinforced backfill is graded to drain away from the face of the wall. Berms and/or ditches must also be in place and functioning to prevent the entrance of runoff into the wall construction site.

Placing backfill over the geotextile separator.

Compacting the reinforced backfill.

5. Definitions

Contract Document:
The Agreement between the Owner and the Contractor including conditions of the contract drawings, specifications, and the provisions of the Agreement between the Contractor and the Supplier of the SierraScape System. These documents shall also include addenda and other modifications issued prior to the execution of the Contract.

Geotextile:
A non-woven, needle punched fabric used for separation and filtration.

Inspector:
The Authorized Representative assigned to see that the workmanship and materials are in accordance with the terms of the Contract.

Plans:
The part of the Contract documents consisting of the approved plans, profiles, typical cross sections, working drawings and supplemental drawings, or exact reproduction thereof, which shows the location, character, details, and dimensions of the Work to be performed.

Reinforced Fill:
The fill material that interacts with the geogrid reinforcement to create a mechanically stabilized earth mass. Its limits extend from the back of the facing elements to the tails of the soil reinforcement or as stated on the Plans.

Setback (Batter):
The rearward offset from the vertical plane between two vertically adjacent courses.

SierraScape Connection Rods:
Mechanical connection devices made of high-density polyethylene with fiberglass inclusions to positively connect the geogrid to the SierraScape facing elements.

SierraScape Facing Elements:
Wire-formed baskets that provide facial stability during placement and compaction of the fill material; the internally braced elements simplify facing alignment.

Support Struts:
Wire-formed braces designed to stiffen the SierraScape facing elements and maintain facing alignment.

Specification:
A description of the quality and quantity of the materials and workmanship that will be required of the Contractor in the execution of the Work under the Contract between the Owner and the Contractor.

Tensar Geogrids:
Polymeric grids formed by a regular network of integrally connected tensile elements with apertures of sufficient size to allow interlocking with surrounding soil, rock, or earth and functioning primarily as reinforcement.

Tensar Earth Technologies is your single-source for the SierraScape System. To find out how we can help you simplify your next wall construction project, call 800-TENSAR-1, e-mail info@tensarcorp.com, or visit www.tensarcorp.com.

Tensar®

Tensar Earth Technologies, Inc.
5883 Glenridge Drive, Suite 200
Atlanta, GA 30328
www.tensarcorp.com

Tensar

Tensar Earth Technologies, Inc.
5883 Glenridge Drive, Suite 200
Atlanta, Georgia 30328-5363
Phone: (800) 836-7271
www.tensarcorp.com

Product Specification
Tensar Structural Geogrid

- UX1000HS Structural Geogrid
- UX1100HS Structural Geogrid
- UX1400HS Structural Geogrid
- UX1500HS Structural Geogrid
- UX1600HS Structural Geogrid
- UX1700HS Structural Geogrid
- UX1800HS Structural Geogrid

Tensar Earth Technologies, Inc. warrants that at the time of delivery the geogrid furnished hereunder shall be of the quality and specification stated herein. If the geogrid does not meet the specifications on this page and Tensar is notified prior to installation, Tensar will replace the geogrid at no cost to the customer.

This product specification supersedes all prior specifications for the product described above and is not applicable to any products shipped prior to August 1, 2005

Tensar

Tensar Earth Technologies, Inc.
5883 Glenridge Drive, Suite 200
Atlanta, Georgia 30328-5363
Phone: (800) 836-7271
www.tensarcorp.com

Product Specification - Structural Geogrid UX1400HS

Tensar Earth Technologies, Inc. reserves the right to change its product specifications at any time. It is the responsibility of the specifier and purchaser to ensure that product specifications used for design and procurement purposes are current and consistent with the products used in each instance. Please contact Tensar Earth Technologies, Inc. at 800-836-7271 for assistance

Product Type:	**Integrally Formed Structural Geogrid**
Polymer:	**High Density Polyethylene**
Load Transfer Mechanism:	**Positive Mechanical Interlock**
Recommended Applications:	**Sierra System (Reinforced Slopes), Prism System (Embankments), Temporary Walls**

Product Properties

Index Properties	Units	MD Values[1]
▪ Tensile Strength @ 5% Strain[2]	kN/m (lb/ft)	31 (2,130)
▪ Ultimate Tensile Strength[2]	kN/m (lb/ft)	70 (4,800)
▪ Junction Strength[3]	kN/m (lb/ft)	66 (4,520)
▪ Flexural Stiffness[4]	mg-cm	730,000
Durability		
▪ Resistance to Long Term Degradation[5]	%	100
▪ Resistance to UV Degradation[6]	%	95
Load Capacity		
▪ Maximum Allowable (Design) Strength[7]	kN/m (lb/ft)	30.2 (2,070)
Recommended Allowable Strength Reduction Factors[7]		
▪ Minimum Reduction Factor for Installation Damage (RF_{ID})[8]		1.05
▪ Minimum Reduction Factor for Creep (RF_{CR})		2.21
▪ Minimum Reduction Factor for Durability (RF_D)		1.00

Dimensions and Delivery

The structural geogrid shall be delivered to the jobsite in roll form with each roll individually identified and nominally measuring 1.33 meters (4.36 feet) in width and 76.2 meters (250.0 feet) in length. A typical truckload quantity is 432 rolls.

Notes:

1. Unless indicated otherwise, values shown are minimum average roll values determined in accordance with ASTM D4759. Brief descriptions of test procedures are given in the following notes. Complete descriptions of test procedures are available on request from Tensar Earth Technologies, Inc.
2. True resistance to elongation when initially subjected to a load measured via ASTM D6637 without deforming test materials under load before measuring such resistance or employing "secant" or "offset" tangent methods of measurement so as to overstate tensile properties.
3. Load transfer capability determined in accordance with GRI-GG2-87.
4. Resistance to bending force determined in accordance with ASTM D5732-95, using specimen dimensions of 864 millimeters in length by one aperture in width.
5. Resistance to loss of load capacity or structural integrity when subjected to chemically aggressive environments in accordance with EPA 9090 immersion testing.
6. Resistance to loss of load capacity or structural integrity when subjected to 500 hours of ultraviolet light and aggressive weathering in accordance with ASTM D4355.
7. Reduction factors are used to calculate the geogrid strength available for resisting force in long-term load bearing applications. Allowable Strength (T_{allow}) is determined by reducing the ultimate tensile strength (T_{ult}) by reduction factors for installation damage (RF_{ID}), creep (RF_{CR}) and chemical/biological durability ($RF_D = RF_{CD} \cdot RF_{BD}$) per GRI-GG4 [$T_{allow} = T_{ult}/(RF_{ID} \cdot RF_{CR} \cdot RF_D)$]. Recommended minimum reduction factors are based on product-specific testing. Project specifications, standard public agency specifications and/or design code requirements may require higher reduction factors. **It is the responsibility of the designer to ensure that appropriate reduction factors are applied.** Contact Tensar Earth Technologies, Inc. for further recommendations.
8. Minimum value is based on Installation Damage Testing in Sand, Silt, and Clay soils. Coarser soils require increased RF_{ID} values.

Tensar Earth Technologies, Inc. warrants that at the time of delivery the geogrid furnished hereunder shall be of the quality and specification stated herein. If the geogrid does not meet the specifications on this page and Tensar is notified prior to installation, Tensar will replace the geogrid at no cost to the customer.

This product specification supersedes all prior specifications for the product described above and is not applicable to any products shipped prior to August 1, 2005

Tensar

Tensar Earth Technologies, Inc.
5883 Glenridge Drive, Suite 200
Atlanta, Georgia 30328-5363
Phone: (800) 836-7271
www.tensarcorp.com

Product Specification - Structural Geogrid UX1500HS

Tensar Earth Technologies, Inc. reserves the right to change its product specifications at any time. It is the responsibility of the specifier and purchaser to ensure that product specifications used for design and procurement purposes are current and consistent with the products used in each instance. Please contact Tensar Earth Technologies, Inc. at 800-836-7271 for assistance

Product Type:	**Integrally Formed Structural Geogrid**
Polymer:	**High Density Polyethylene**
Load Transfer Mechanism:	**Positive Mechanical Interlock**
Recommended Applications:	**Sierra System (Reinforced Slopes), Prism System (Embankments), Temporary Walls**

Product Properties

Index Properties	**Units**	**MD Values[1]**
▪ Tensile Strength @ 5% Strain[2]	kN/m (lb/ft)	52 (3,560)
▪ Ultimate Tensile Strength[2]	kN/m (lb/ft)	114 (7,810)
▪ Junction Strength[3]	kN/m (lb/ft)	105 (7,200)
▪ Flexural Stiffness[4]	mg-cm	5,100,000
Durability		
▪ Resistance to Long Term Degradation[5]	%	100
▪ Resistance to UV Degradation[6]	%	95
Load Capacity		
▪ Maximum Allowable (Design) Strength[7]	kN/m (lb/ft)	45.2 (3,100)
Recommended Allowable Strength Reduction Factors[7]		
▪ Minimum Reduction Factor for Installation Damage (RF_{ID})[8]		1.05
▪ Minimum Reduction Factor for Creep (RF_{CR})		2.40
▪ Minimum Reduction Factor for Durability (RF_D)		1.00

Dimensions and Delivery

The structural geogrid shall be delivered to the jobsite in roll form with each roll individually identified and nominally measuring 1.33 meters (4.36 feet) in width and 61.0 meters (200.0 feet) in length. A typical truckload quantity is 324 rolls.

Notes:

1. Unless indicated otherwise, values shown are minimum average roll values determined in accordance with ASTM D4759. Brief descriptions of test procedures are given in the following notes. Complete descriptions of test procedures are available on request from Tensar Earth Technologies, Inc.
2. True resistance to elongation when initially subjected to a load measured via ASTM D6637 without deforming test materials under load before measuring such resistance or employing "secant" or "offset" tangent methods of measurement so as to overstate tensile properties.
3. Load transfer capability determined in accordance with GRI-GG2-87.
4. Resistance to bending force determined in accordance with ASTM D5732-95, using specimen dimensions of 864 millimeters in length by one aperture in width.
5. Resistance to loss of load capacity or structural integrity when subjected to chemically aggressive environments in accordance with EPA 9090 immersion testing.
6. Resistance to loss of load capacity or structural integrity when subjected to 500 hours of ultraviolet light and aggressive weathering in accordance with ASTM D4355.
7. Reduction factors are used to calculate the geogrid strength available for resisting force in long-term load bearing applications. Allowable Strength (T_{allow}) is determined by reducing the ultimate tensile strength (T_{ult}) by reduction factors for installation damage (RF_{ID}), creep (RF_{CR}) and chemical/biological durability ($RF_D = RF_{CD} \cdot RF_{BD}$) per GRI-GG4 [$T_{allow} = T_{ult}/(RF_{ID} \cdot RF_{CR} \cdot RF_D)$]. Recommended minimum reduction factors are based on product-specific testing. Project specifications, standard public agency specifications and/or design code requirements may require higher reduction factors. **It is the responsibility of the designer to ensure that appropriate reduction factors are applied.** Contact Tensar Earth Technologies, Inc. for further recommendations.
8. Minimum value is based on Installation Damage Testing in Sand, Silt, and Clay soils. Coarser soils require increased RF_{ID} values.

Tensar Earth Technologies, Inc. warrants that at the time of delivery the geogrid furnished hereunder shall be of the quality and specification stated herein. If the geogrid does not meet the specifications on this page and Tensar is notified prior to installation, Tensar will replace the geogrid at no cost to the customer.

This product specification supersedes all prior specifications for the product described above and is not applicable to any products shipped prior to August 1, 2005

Tensar

Tensar Earth Technologies, Inc.
5883 Glenridge Drive, Suite 200
Atlanta, Georgia 30328-5363
Phone: (800) 836-7271
www.tensarcorp.com

Product Specification - Structural Geogrid UX1600HS

Tensar Earth Technologies, Inc. reserves the right to change its product specifications at any time. It is the responsibility of the specifier and purchaser to ensure that product specifications used for design and procurement purposes are current and consistent with the products used in each instance. Please contact Tensar Earth Technologies, Inc. at 800-836-7271 for assistance

Product Type: Integrally Formed Structural Geogrid
Polymer: High Density Polyethylene
Load Transfer Mechanism: Positive Mechanical Interlock
Recommended Applications: Sierra System (Reinforced Slopes), Prism System (Embankments), Temporary Walls

Product Properties

Index Properties	Units	MD Values[1]
• Tensile Strength @ 5% Strain[2]	kN/m (lb/ft)	58 (3,980)
• Ultimate Tensile Strength[2]	kN/m (lb/ft)	144 (9,870)
• Junction Strength[3]	kN/m (lb/ft)	135 (9,250)
• Flexural Stiffness[4]	mg-cm	6,000,000
Durability		
• Resistance to Long Term Degradation[5]	%	100
• Resistance to UV Degradation[6]	%	95
Load Capacity		
• Maximum Allowable (Design) Strength[7]	kN/m (lb/ft)	59.9 (4,110)
Recommended Allowable Strength Reduction Factors[7]		
• Minimum Reduction Factor for Installation Damage (RF_{ID})[8]		1.05
• Minimum Reduction Factor for Creep (RF_{CR})		2.29
• Minimum Reduction Factor for Durability (RF_D)		1.00

Dimensions and Delivery

The structural geogrid shall be delivered to the jobsite in roll form with each roll individually identified and nominally measuring 1.33 meters (4.36 feet) in width and 61.0 meters (200.0 feet) in length. A typical truckload quantity is 216 rolls.

Notes:

1. Unless indicated otherwise, values shown are minimum average roll values determined in accordance with ASTM D4759. Brief descriptions of test procedures are given in the following notes. Complete descriptions of test procedures are available on request from Tensar Earth Technologies, Inc.
2. True resistance to elongation when initially subjected to a load measured via ASTM D6637 without deforming test materials under load before measuring such resistance or employing "secant" or "offset" tangent methods of measurement so as to overstate tensile properties.
3. Load transfer capability determined in accordance with GRI-GG2-87.
4. Resistance to bending force determined in accordance with ASTM D5732-95, using specimen dimensions of 864 millimeters in length by one aperture in width.
5. Resistance to loss of load capacity or structural integrity when subjected to chemically aggressive environments in accordance with EPA 9090 immersion testing.
6. Resistance to loss of load capacity or structural integrity when subjected to 500 hours of ultraviolet light and aggressive weathering in accordance with ASTM D4355.
7. Reduction factors are used to calculate the geogrid strength available for resisting force in long-term load bearing applications. Allowable Strength (T_{allow}) is determined by reducing the ultimate tensile strength (T_{ult}) by reduction factors for installation damage (RF_{ID}), creep (RF_{CR}) and chemical/biological durability ($RF_D = RF_{CD} \cdot RF_{BD}$) per GRI-GG4 [$T_{allow} = T_{ult}/(RF_{ID} \cdot RF_{CR} \cdot RF_D)$]. Recommended minimum reduction factors are based on product-specific testing. Project specifications, standard public agency specifications and/or design code requirements may require higher reduction factors. **It is the responsibility of the designer to ensure that appropriate reduction factors are applied.** Contact Tensar Earth Technologies, Inc. for further recommendations.
8. Minimum value is based on Installation Damage Testing in Sand, Silt, and Clay soils. Coarser soils require increased RF_{ID} values.

Tensar Earth Technologies, Inc. warrants that at the time of delivery the geogrid furnished hereunder shall be of the quality and specification stated herein. If the geogrid does not meet the specifications on this page and Tensar is notified prior to installation, Tensar will replace the geogrid at no cost to the customer.

This product specification supersedes all prior specifications for the product described above and is not applicable to any products shipped prior to August 1, 2005

Tensar

CONSTRUCTION DRAWINGS
Prepared For

SIERRASCAPE®
RETAINING WALL SYSTEMS

LASO TA-73 AIRPORT LANDFILLS

W.O. NO. 13104.002.001.7000

LOS ALAMOS COUNTY, NEW MEXICO

INDEX

SHEET	DESCRIPTION
1.	Title Sheet
2.	Construction Requirements
3.	Plan View
4.	Elevation View – Wall 2
5.	Elevation View – Wall 2 (Cont.)
6.	Elevation View – Wall 3
7.	Elevation View – Wall 4
8.	Typical Cross–Section
9.	Typical Cross–Section
10.	Typical Details
11.	Typical Details

PHILIP D. EGAN
NEW MEXICO
9732
REGISTERED PROFESSIONAL ENGINEER

SIERRASCAPE®
RETAINING WALL SYSTEMS

Tensar
Tensar Earth Technologies, Inc.
5883 Glenridge Drive, Suite 200
Atlanta, Georgia 30328
(404) 250-1290

REVISIONS \ ISSUE

0	5/24/06	ISSUED FOR REVIEW	

Project Number: D06602
File Name: D0660201.DWG
Date Drawn: 5/24/06
Scale: AS SHOWN
Designed by: CLC
Drawn by: KJK
Checked by:

LASO TA-73 AIRPORT LANDFILLS
W.O. NO. 13104.002.001.7000
LOS ALAMOS COUNTY, NEW MEXICO

TITLE SHEET

CONSTRUCTION REQUIREMENTS FOR PLACEMENT OF TENSAR GEOGRIDS AND BACKFILL SOILS FOR TENSAR SIERRASCAPE REINFORCED RETAINING WALLS

1.0 MATERIAL

1.1 BACKFILL SOILS

1.1.1 REINFORCED BACKFILL MATERIAL SPECIFIED BELOW SHALL BE ON-SITE SOILS OR SELECT FREE DRAINING BACKFILL. REINFORCED BACKFILL MATERIALS SHALL BE APPROVED BY OWNER OR OWNER'S REPRESENTATIVE AND SHALL MEET THE STRENGTH REQUIREMENTS AS DEFINED IN SECTION 7.0. THE REINFORCED BACKFILL MATERIAL SHALL MEET THE FOLLOWING GRADATION:

SIEVE SIZE	PERCENT PASSING
2"	100
No. 4	100-20
No. 40	0 – 60
No. 200	0 - 15

THE PORTION OF THE REINFORCED BACKFILL MATERIAL PASSING THE No. 40 SIEVE SHALL HAVE A LIQUID LIMIT LESS THAN 40 AND A PLASTICITY INDEX LESS THAN 6. REINFORCED BACKFILL MATERIAL SHALL BE CLASSIFIED PER THE UNIFIED SOIL CLASSIFICATION SYSTEM AS LOW PLASTICITY OR NON-PLASTIC SOILS.

1.1.2 REINFORCED BACKFILL AND RETAINED SOIL/FILL MATERIALS SHALL BE FREE OF EXCESS MOISTURE, ROOTS, MUCK, SOD, SNOW, FROZEN LUMPS, ORGANIC MATTER OR OTHER DELETERIOUS MATERIALS. ALL ROCK PARTICLES AND HARD EARTH CLODS SHALL BE LESS THAN THREE INCHES IN THE LONGEST DIMENSION. REINFORCED BACKFILL MATERIALS WHICH DO NOT MEET THIS CRITERIA SHALL BE CONSIDERED UNSUITABLE AND SHALL BE REMOVED.

1.2 GEOGRID REINFORCEMENT SHALL BE TENSAR UNIAXIAL GEOGRIDS MANUFACTURED BY THE TENSAR CORPORATION, MORROW, GEORGIA.

1.3 GEOTEXTILE FABRIC SHALL BE AASHTO M288 CLASS 3 GEOTEXTILE.

1.4 THE WALL FACING SHALL BE GALVANIZED 1.80"X12.67" (0.192"ϕ x 0.243"ϕ) WELDED WIRE FORMS. WIRE FORM GEOMETRY SHALL BE AS DETAILED IN THE CONSTRUCTION DRAWINGS.

2.0 TECHNICAL REQUIREMENTS

2.1 THE OWNER OR OWNER'S REPRESENTATIVE SHALL VERIFY THAT REINFORCED BACKFILL MATERIAL MEETS THE GRADATION AND OTHER REQUIREMENTS OF SECTION 1.1 PRIOR TO PROCEEDING WITH CONSTRUCTION.

2.2 PRIOR TO CONSTRUCTION OF THE TENSAR REINFORCED WALL, THE CONTRACTOR SHALL CLEAR AND GRUB THE REINFORCED BACKFILL ZONE AREA, REMOVING TOPSOIL, BRUSH, SOD OR OTHER ORGANIC OR DELETERIOUS MATERIAL. ANY UNSUITABLE SOILS SHALL BE OVER-EXCAVATED, REPLACED AND COMPACTED WITH BACKFILL MATERIAL TO PROJECT SPECIFICATIONS OR AS OTHERWISE DIRECTED BY THE OWNER OR OWNER'S REPRESENTATIVE.

2.3 FOUNDATION SHALL BE PREPARED AS PER PROJECT SPECIFICATIONS. THE OWNER OR OWNER'S REPRESENTATIVE SHALL CONFIRM THAT THE SITE HAS BEEN PROPERLY PREPARED AND THE DESIGN PARAMETERS IN SECTION 7.0 ARE APPROPRIATE PRIOR TO FILL PLACEMENT.

2.4 FILL SHALL BE PLACED IN HORIZONTAL LAYERS NOT EXCEEDING 10 INCHES IN UNCOMPACTED THICKNESS FOR HEAVY COMPACTION EQUIPMENT. FOR ZONES WHERE COMPACTION IS ACCOMPLISHED WITH HAND-OPERATED EQUIPMENT, FILL SHALL BE PLACED IN HORIZONTAL LAYERS NOT EXCEEDING 8 INCHES IN UNCOMPACTED THICKNESS. ONLY HAND-OPERATED EQUIPMENT SHALL BE ALLOWED WITHIN THREE FEET OF THE BACK FACE OF WALL.

2.5 FILL MATERIALS SHALL BE PLACED FROM THE BACK OF THE WELDED WIRE FORMS TOWARDS THE ENDS OF THE GEOGRID TO ENSURE FURTHER TENSIONING.

2.6 FILL SHALL BE COMPACTED AS SPECIFIED BY PROJECT SPECIFICATIONS OR TO A MINIMUM OF 95% OF THE MAXIMUM DRY DENSITY AS DETERMINED IN ACCORDANCE WITH AASHTO T-99 (STANDARD PROCTOR), AT A MOISTURE CONTENT NO GREATER THAN 2 PERCENTAGE POINTS WET AND NO LESS THAN 1 PERCENTAGE POINT DRY OF OPTIMUM.

2.7 TESTING METHODS AND FREQUENCY, AND VERIFICATION OF MATERIAL SPECIFICATIONS SHALL BE THE RESPONSIBILITY OF THE OWNER OR OWNER'S REPRESENTATIVE.

2.8 WELDED WIRE FACING SHALL BE ERECTED AND MAINTAINED DURING CONSTRUCTION TO THE BATTER AS SHOWN ON THE DRAWINGS. INDIVIDUAL WIRE FORM DEFORMATIONS SHALL BE LIMITED TO 2.5 INCHES AT THE TOP AND A BULGE OF 2 INCHES, MEASURED FROM THE BASE OF THE WIRE FORM. THE CONTRACTOR SHALL PROVIDE ALIGNMENT CONTROL FOR EACH COURSE OF WELDED WIRE FORMS AND MAKE ALIGNMENT CORRECTIONS AS NECESSARY.

2.9 IF EXCESSIVE DEFORMATION OCCURS AS DEFINED BY SECTION 2.8 COMPACTION PROCEDURES SHOULD BE MODIFIED TO PROVIDE MAXIMUM ALLOWABLE COMPACTION AT THE WALL FACE. ALSO, ADDITIONAL STRUTS MAY BE REQUIRED TO STIFFEN THE WIRE FACE.

2.10 WELDED WIRE FORMS SHALL BE INSTALLED USING THE CORRECT ANGLE SHOWN ON THE DRAWINGS. THE ENDS OF THE WIRE FORMS SHALL BE OVERLAPPED 2.4 INCHES AND THE WIRE FORM JOINTS SHALL BE STAGGERED VERTICALLY. ANY PROTRUDING WIRES SHALL BE BENT OR CUT OFF.

2.11 A COMPLETE SET OF APPROVED CONSTRUCTION DRAWINGS AND CONTRACT SPECIFICATIONS SHALL BE ON-SITE AT ALL TIMES DURING CONSTRUCTION OF THE TENSAR REINFORCED RETAINING WALL.

3.0 TENSAR GEOGRID PLACEMENT

3.1 TENSAR GEOGRID SHALL BE PLACED AT THE LOCATIONS AND ELEVATIONS SHOWN ON THE DRAWINGS.

3.2 TENSAR GEOGRID LENGTHS SHALL BE AS SHOWN ON THE CONSTRUCTION DRAWINGS. TENSAR GEOGRID LENGTHS ARE MEASURED FROM THE CONNECTION LOOP, EXTENDING TO THE TAIL OF THE GEOGRIDS. REINFORCED FILL ZONE LENGTH (BASE WIDTH) IS MEASURED FROM THE FRONT FACE OF THE WALL, EXTENDING TO THE TAIL OF THE GEOGRIDS.

3.2.1 TENSAR GEOGRID REINFORCEMENT SHALL BE CONTINUOUS THROUGHOUT THEIR EMBEDMENT LENGTH(S).

3.3 TRACKED CONSTRUCTION EQUIPMENT SHALL NOT BE OPERATED DIRECTLY ON THE GEOGRID. A MINIMUM BACKFILL THICKNESS OF 6 INCHES IS REQUIRED FOR OPERATION OF TRACKED VEHICLES OVER THE GEOGRID. TURNING OF TRACKED VEHICLES SHOULD KEPT TO A MINIMUM TO PREVENT TRACKS FROM DISPLACING THE FILL AND/OR THE GEOGRID.

3.4 RUBBER-TIRED VEHICLES MAY PASS OVER THE GEOGRID REINFORCEMENT AT SLOW SPEEDS, LESS THAN 10 MPH. SUDDEN BRAKING AND SHARP TURNING SHALL BE AVOIDED.

3.5 TENSAR UNIAXIAL GEOGRIDS SHALL BE CUT NEXT TO THE CROSS-MACHINE DIRECTION BAR. THE GEOGRID SHALL BE PLACED SUCH THAT THE CONNECTION LOOPS PASS THROUGH THE LONG AXIS OF THE APERTURES (MACHINE DIRECTION) WITH THE CONNECTION ROD THREADED THROUGH THE CONNECTION LOOPS AND OVER THE LONG AXIS OF THE APERTURES. TENSAR UNIAXIAL GEOGRID SHALL BE ROLLED OUT WITH THE MACHINE DIRECTION PERPENDICULAR TO THE WALL FACE.

3.6 A MINIMUM OF 3 INCHES OF FILL MATERIAL SHALL BE REQUIRED BETWEEN LAYERS OF UNIAXIAL GEOGRIDS, UNLESS OTHERWISE SHOWN.

4.0 CHANGES TO GEOGRID LAYOUT OR PLACEMENT

4.1 NO CHANGES TO THE TENSAR GEOGRID LAYOUT, INCLUDING, BUT NOT LIMITED TO, LENGTH, GEOGRID TYPE, OR ELEVATION, SHALL BE MADE WITHOUT THE EXPRESS, WRITTEN CONSENT OF TENSAR EARTH TECHNOLOGIES, INC.

5.0 DRAINAGE

5.1 AT THE END OF EACH WORKDAY, BACKFILL SURFACE SHALL BE GRADED AWAY FROM THE WALL FACE A MINIMUM OF 2 PERCENT SLOPE AND A TEMPORARY SOIL BERM SHALL BE CONSTRUCTED NEAR THE WALL CREST TO PREVENT SURFACE WATER RUNOFF FROM OVERTOPPING THE WALL.

5.2 AT THE END OF EACH WORKDAY, BACKFILL SURFACE SHALL BE COMPACTED WITH A SMOOTH WHEEL ROLLER TO MINIMIZE PONDING OF WATER AND SATURATION OF THE BACKFILL.

5.3 THE ENGINEERING, DESIGN, ANALYSIS, DETAILING, AND MITIGATION OF BOTH SURFACE DRAINAGE AND SEEPAGE OF GROUNDWATER SHALL BE THE RESPONSIBILITY OF THE OWNER OR OWNER'S REPRESENTATIVE.

5.4 PERMANENT SURFACE WATER DIVERSION SHALL BE REQUIRED AND PROVIDED BY THE OWNER OR OWNER'S REPRESENTATIVE.

5.5 THE TENSAR REINFORCED WALL HAS BEEN DESIGNED ON THE ASSUMPTION THAT THE REINFORCED BACKFILL MATERIAL SHALL BE FREE OF SUBSURFACE DRAINAGE OF WATER (SEEPAGE). PERMANENT SUBSURFACE WATER (SEEPAGE) COLLECTION AND DIVERSION SHALL BE THE RESPONSIBILITY OF THE OWNER OR OWNER'S REPRESENTATIVE.

5.6 CARE SHALL BE TAKEN NOT TO CONTAMINATE THE GEOTEXTILE FABRIC WITH FINE-GRAINED SOILS OR OTHER DELETERIOUS MATERIALS.

6.0 METHOD OF PAYMENT

SEE CONTRACT DOCUMENTS

7.0 DESIGN PARAMETERS

7.1 DESIGN OF THE REINFORCED SOIL STRUCTURE IS BASED ON THE FOLLOWING PARAMETERS:

-	EFFECTIVE FRICTION ANGLE	EFFECTIVE COHESION	MOIST UNIT WEIGHT
REINFORCED BACKFILL	32°	0 psf	130 pcf
RETAINED SOIL	35.5°	0 psf	100 pcf
FOUNDATION SOIL	32°	4000 psf	130 pcf

7.2 FACTORS OF SAFETY:

7.2.1 INTERNAL STABILITY

-	STATIC	SEISMIC
MINIMUM FACTOR OF SAFETY FOR GEOGRID STRENGTH	= 1.5	= 1.1
MINIMUM FACTOR OF SAFETY FOR GEOGRID PULLOUT	= 1.5	= 1.1
MINIMUM FACTOR OF SAFETY FOR CONNECTION	= 1.5	= 1.1
SOIL-GEOGRID INTERACTION COEFFICIENT	= 0.8	
PERCENT COVERAGE OF GEOGRID	= 94 %	
DESIGN LIFE	= 75 YEARS	

7.2.2 EXTERNAL STABILITY

MINIMUM FACTOR OF SAFETY FOR SLIDING AT BASE	= 1.5	= 1.1
MAXIMUM FACTOR OF SAFETY FOR ECCENTRICITY, e/L	= 1/6	= 1/3

7.2.3 GLOBAL STABILITY:
GLOBAL STABILITY AND FOUNDATION BEARING CAPACITY ARE THE RESPONSIBILITY OF THE OWNER OR OWNER'S REPRESENTATIVE. TENSAR EARTH TECHNOLOGIES, INC. ACCEPTS NO LIABILITY OR RESPONSIBILITY FOR GLOBAL STABILITY OR FOUNDATION BEARING CAPACITY.

7.3 LOADINGS:
7.3.1 TRAFFIC SURCHARGE = 250 psf
7.3.2 SEISMIC ACCELERATION COEFFICIENT = 0.262 g

7.4 HYDROSTATIC DESIGN:
GROUNDWATER/PHREATIC ARE SURFACES NOT CONSIDERED IN THE WALL DESIGN. WATER SURFACE IS ASSUMED TO BE SUFFICIENTLY BELOW BOTTOM OF WALL AS NOT TO INFLUENCE INTERNAL AND EXTERNAL STABILITY.

7.5 MAXIMUM APPLIED BEARING PRESSURE (STATIC) = 3915 psf

8.0 SPECIAL PROVISIONS

8.1 THE DESIGN PRESENTED HEREIN IS BASED ON SOIL PARAMETERS, FOUNDATION CONDITIONS, GROUNDWATER CONDITIONS, AND LOADINGS STATED IN SECTION 7.0.

8.2 WALL ELEVATION VIEWS AND LOCATIONS, AND GEOMETRY OF EXISTING STRUCTURES MUST BE VERIFIED BY THE OWNER OR OWNER'S REPRESENTATIVE PRIOR TO CONSTRUCTION.

8.3 TENSAR EARTH TECHNOLOGIES, INC. ASSUMES NO LIABILITY FOR INTERPRETATION OR VERIFICATION OF SUBSURFACE CONDITIONS, FOR SUITABILITY OF SOIL DESIGN PARAMETERS OR FOR INTERPRETATION OF SUBSURFACE GROUNDWATER CONDITIONS.

8.4 THE OWNER OR OWNER'S REPRESENTATIVE IS RESPONSIBLE FOR REVIEWING AND VERIFYING THAT THE ACTUAL SITE CONDITIONS AND PARAMETERS ARE AS DESCRIBED HEREIN PRIOR TO AND DURING CONSTRUCTION. THE OWNER OR OWNER'S REPRESENTATIVE SHALL BE ON-SITE TO ASSURE CONSTRUCTION IS IN ACCORDANCE WITH THESE NOTES AND DRAWINGS AND THE CONTRACT PLANS AND SPECIFICATIONS. THE CONTRACTOR SHALL FOLLOW THE INSTRUCTIONS PROVIDED IN THE WELDED WIRE FORM ERECTION GUIDE PROVIDED BY TENSAR EARTH TECHNOLOGIES, INC.

8.5 THE SOIL DESIGN PARAMETERS STATED IN SECTION 7.0 SHALL BE VERIFIED BY THE OWNER OR OWNER'S REPRESENTATIVE. IF ACTUAL CONDITIONS ARE FOUND TO BE OTHER THAN AS SET FORTH IN THESE PARAMETERS, THEN CONSTRUCTION SHALL NOT PROCEED AND THE RELEVANT DATA SHALL BE PROVIDED TO TENSAR EARTH TECHNOLOGIES, INC. FOR PURPOSES OF MODIFYING THE DESIGN.

8.6 PROCEEDING WITH CONSTRUCTION WITHOUT FIRST VERIFYING CONDITIONS AND PARAMETERS DISCUSSED IN SECTIONS 1.1 AND 7.0 SHALL ABSOLVE TENSAR EARTH TECHNOLOGIES, INC. FROM ALL LIABILITY FOR THE DESIGN AND CONSTRUCTION OF THIS STRUCTURE AND THE CONTRACTOR SHALL INDEMNIFY AND HOLD HARMLESS TENSAR EARTH TECHNOLOGIES, INC. FROM ALL RESULTING CLAIMS, DAMAGES, LOSSES AND EXPENSES.

8.7 IF ANY ROCK FORMATIONS AND/OR GROUNDWATER ARE ENCOUNTERED DURING CONSTRUCTION, IMMEDIATELY CONTACT TENSAR EARTH TECHNOLOGIES, INC. AT 404-250-1290 AND THE OWNER'S REPRESENTATIVE.

8.8 ANY REVISIONS TO DESIGN PARAMETERS STATED IN SECTION 7.0 OR STRUCTURE GEOMETRY SHALL REQUIRE DESIGN MODIFICATIONS PRIOR TO PROCEEDING WITH CONSTRUCTION.

8.9 THIS DESIGN IS ONLY VALID FOR THE PROPOSED TENSAR RETAINING WALL(S) AS SHOWN HEREIN.

8.10 TOTAL SETTLEMENT AND DIFFERENTIAL SETTLEMENT IN EXCESS OF 1/100 SHALL BE THE RESPONSIBILITY OF THE OWNER OR OWNER'S REPRESENTATIVE. TENSAR EARTH TECHNOLOGIES ACCEPTS NO LIABILITY OR RESPONSIBILITY FOR THE EVALUATION OF SETTLEMENTS.

8.11 ON-SITE SITE ASSISTANCE WILL BE PROVIDED BY TENSAR EARTH TECHNOLOGIES, INC. AT THE REQUEST OF THE CONTRACTOR OR AS PROVIDED IN THE CONTRACT SPECIFICATIONS. TENSAR EARTH TECHNOLOGIES IS NOT RESPONSIBLE FOR HAVING PERSONNEL ON-SITE UNLESS SPECIFICALLY PROVIDED FOR IN A WRITTEN CONTRACT SIGNED BY TENSAR EARTH TECHNOLOGIES, INC. THE TENSAR REPRESENTATIVE WILL NOT HAVE THE AUTHORITY TO STOP OR START CONSTRUCTION OF THE RETAINING WALL.

9.0 REFERENCE DOCUMENTS:

THE DESIGN CALCULATIONS AND CONSTRUCTION DRAWINGS PREPARED BY TENSAR EARTH TECHNOLOGIES, INC. ARE BASED UPON THE FOLLOWING DOCUMENTS:

9.1 CONSTRUCTION PLAN PREPARED BY NORTH WIND, INC. FOR "THE LOS ALAMOS SITE OFFICE TA-73 AIRPORT LANDFILL," REVISION 2, PAGES 9 AND 10, DATED JUNE 2005.

9.2 CONTRACT PLANS FOR U.S. DEPARTMENT OF ENERGY FOR "LOS ALAMOS SITE OFFICE TA-73 AIRPORT LANDFILLS FINAL CLOSURE DESIGN, REV. 1," W.O. NO. 13104.002.001.7000, PREPARED BY NORTH WIND AND WESTON SOLUTIONS TEAM, LAST DATED 6/22/05.

9.3 CONSTRUCTION SPECIFICATION FOR "LASO TA-73 AIRPORT LANDFILL," SECTION 02273, MECHANICALLY STABILIZED EARTH RETAINING WALL, DATED JUNE 2005.

PHILIP D. EGAN
NEW MEXICO
9532
REGISTERED PROFESSIONAL ENGINEER

SIERRASCAPE®
RETAINING WALL SYSTEMS

Tensar
Tensar Earth Technologies, Inc.
5883 Glenridge Drive, Suite 200
Atlanta, Georgia 30328
(404) 250–1290

REVISIONS \ ISSUE

0	5/24/06	ISSUED FOR REVIEW	[signature]

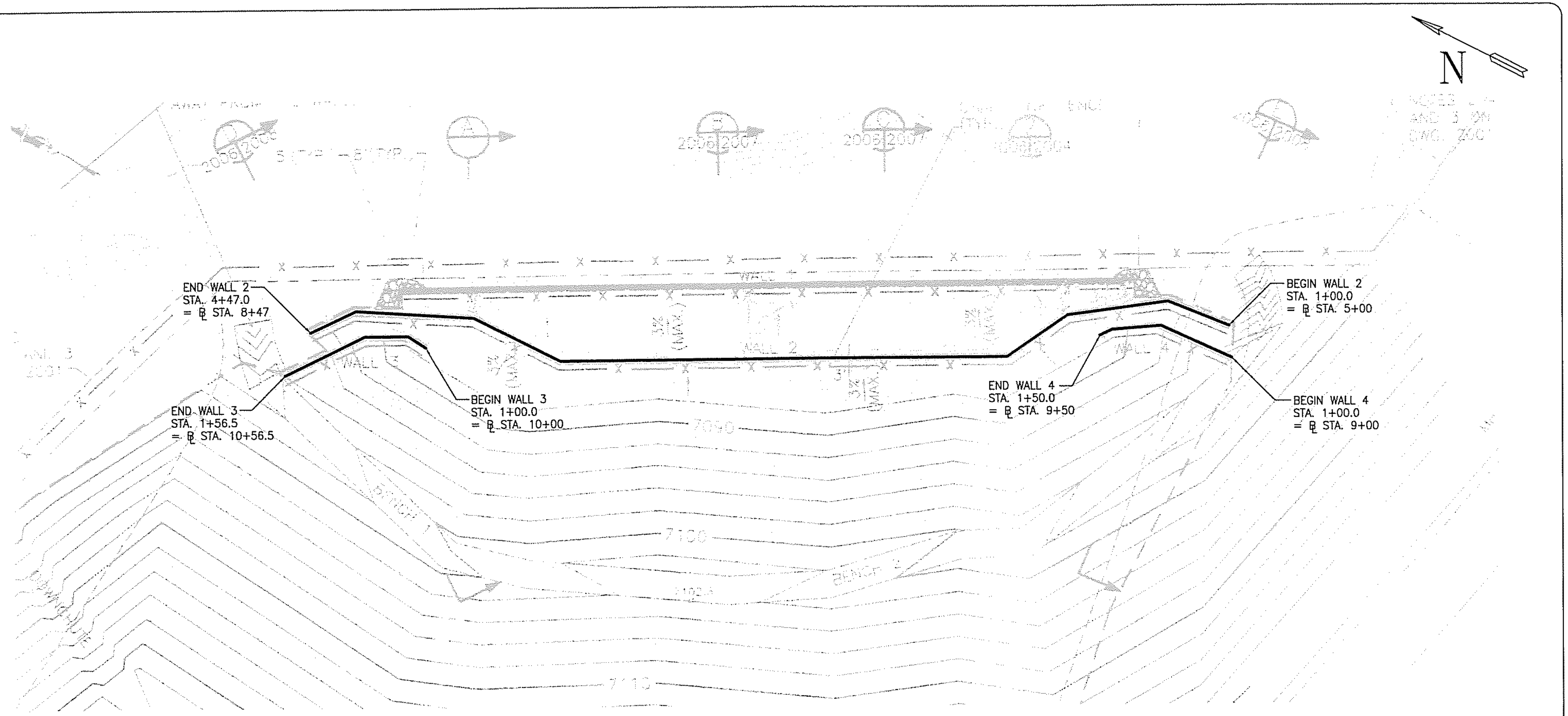
Project Number: D06602
File Name: D0660202.DWG
Date Drawn: 5/24/06
Scale: AS SHOWN
Designed by: CLC
Drawn by: KJK
Checked by: [signature]

LASO TA-73 AIRPORT LANDFILLS

LOS ALAMOS COUNTY, NEW MEXICO

CONSTRUCTION REQUIREMENTS

Sheet Number



PLAN VIEW
NOT TO SCALE

NOTE:
1. PLAN VIEW SHOWN FOR ILLUSTRATIVE PURPOSE ONLY.
2. PLAN VIEW ADOPTED FROM CONTRACT PLANS FOR "LOS ALAMOS SITE OFFICE TA-73 AIRPORT LANDFILLS," W.O. No. 13104.002.001.7000, WALL PLAN AND WALL SECTIONS, SHEET 1 OF 3, DRAWING NO. 2006, LAST DATED 6/30/06.

PHILIP D. EGAN
NEW MEXICO
9682
REGISTERED PROFESSIONAL ENGINEER

SIERRASCAPE®
RETAINING WALL SYSTEMS

Tensar
Tensar Earth Technologies, Inc.
5883 Glenridge Drive, Suite 200
Atlanta, Georgia 30328
(404) 250-1290

REVISIONS \ ISSUE

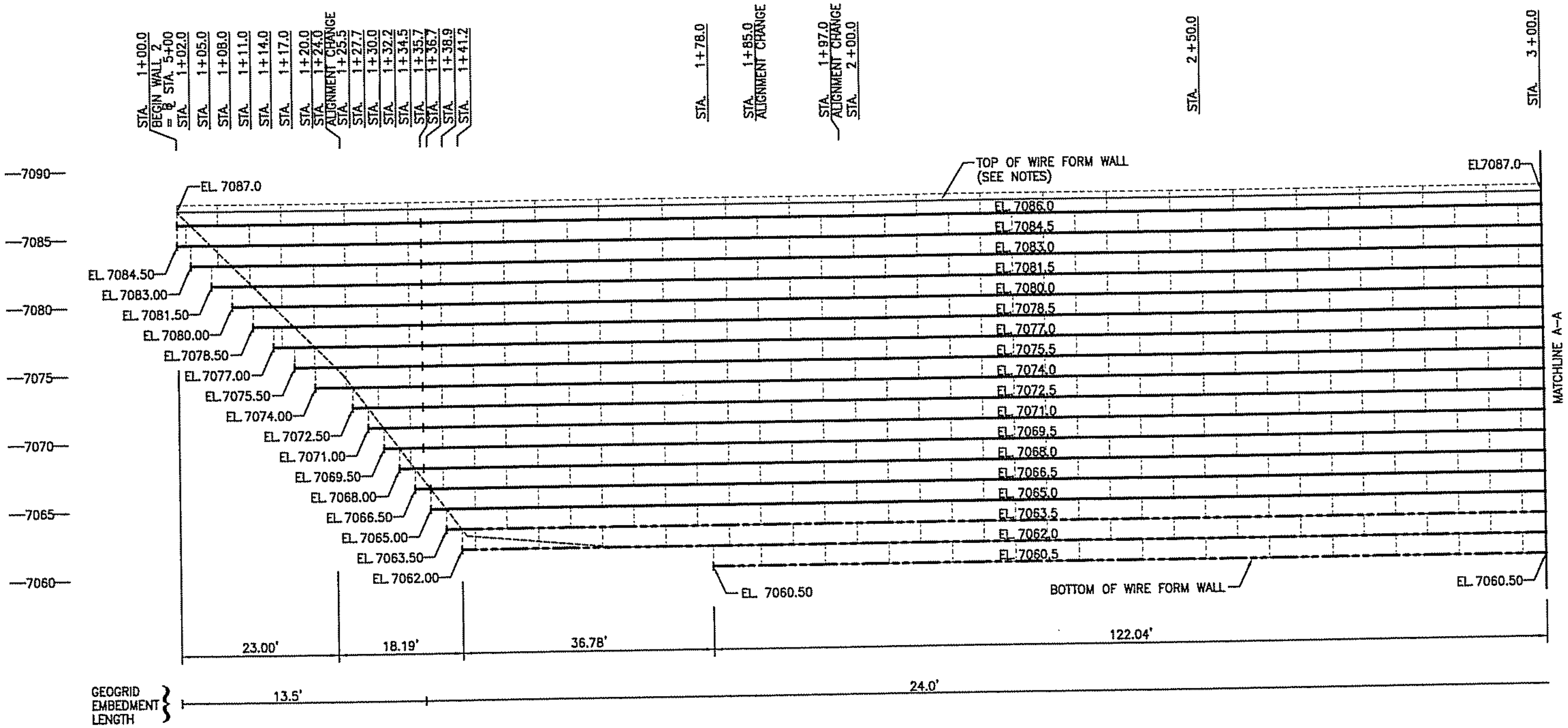
0	5/24/06	ISSUED FOR REVIEW	

Project Number: D06602
File Name: D0660203.DWG
Date Drawn: 5/24/06
Scale: AS SHOWN
Designed by: CLC
Drawn by: KJK
Checked by:

LASO TA-73 AIRPORT LANDFILLS
W.O. NO. 13104.002.001.7000
LOS ALAMOS COUNTY, NEW MEXICO

PLAN VIEW

Sheet Number
3 OF 11



FRONT FACE ELEVATION VIEW - WALL 2

NOTES:
1. SEE NESTED BASKET DETAIL ON SHEET 10 OF 11 OR TOP OF SIERRASCAPE WALL, FINISHING DETAIL ON SHEET 11 OF 11.
2. FINISHED TOP OF WALL SHALL BE CONTRACTOR'S OPTION.

LEGEND

- SIERRASCAPE WIRE FORM (TYP.) (SEE CONSTRUCTION REQUIREMENTS FOR SPECIFICATIONS)
- PROPOSED GRADE
- CHANGE IN EMBEDMENT LENGTH OR GEOGRID TERMINATION
- TENSAR UX1500MSE GEOGRID
- TENSAR UX1600MSE GEOGRID
- EL. XXX.X — APPROX. GEOGRID ELEVATION

VERTICAL SCALE FEET 5 0 5 10

HORIZONTAL SCALE FEET 10 5 0 10 20

PHILIP D. EGAN NEW MEXICO 9532 REGISTERED PROFESSIONAL ENGINEER

THIS DESIGN IS BASED UPON SPECIFIC PROPERTIES OF TENSAR PRODUCTS (GEOGRIDS, DRAINAGE COMPOSITES AND EROSION MEDIA), WHICH ARE PROPRIETARY TO THE TENSAR CORPORATION 1210 CITIZENS PARKWAY, MORROW, GA, 30260. ANY SUBSTITUTION OF THE SPECIFIED PRODUCTS WILL INVALIDATE THIS DESIGN. THIS DRAWING IS BEING FURNISHED FOR USE ON THIS SPECIFIC PROJECT ONLY. ANY PARTY ACCEPTING THIS DOCUMENT DOES SO IN CONFIDENCE AND AGREES THAT IT SHALL NOT BE DUPLICATED WHOLE OR IN PART, NOR DISCLOSED TO OTHERS, WITHOUT THE CONSENT OF TENSAR EARTH TECHNOLOGIES, INC.

SIERRASCAPE RETAINING WALL SYSTEMS

Tensar
Tensar Earth Technologies, Inc.
5883 Glenridge Drive, Suite 200
Atlanta, Georgia 30328
(404) 250-1290

REVISIONS \ ISSUE

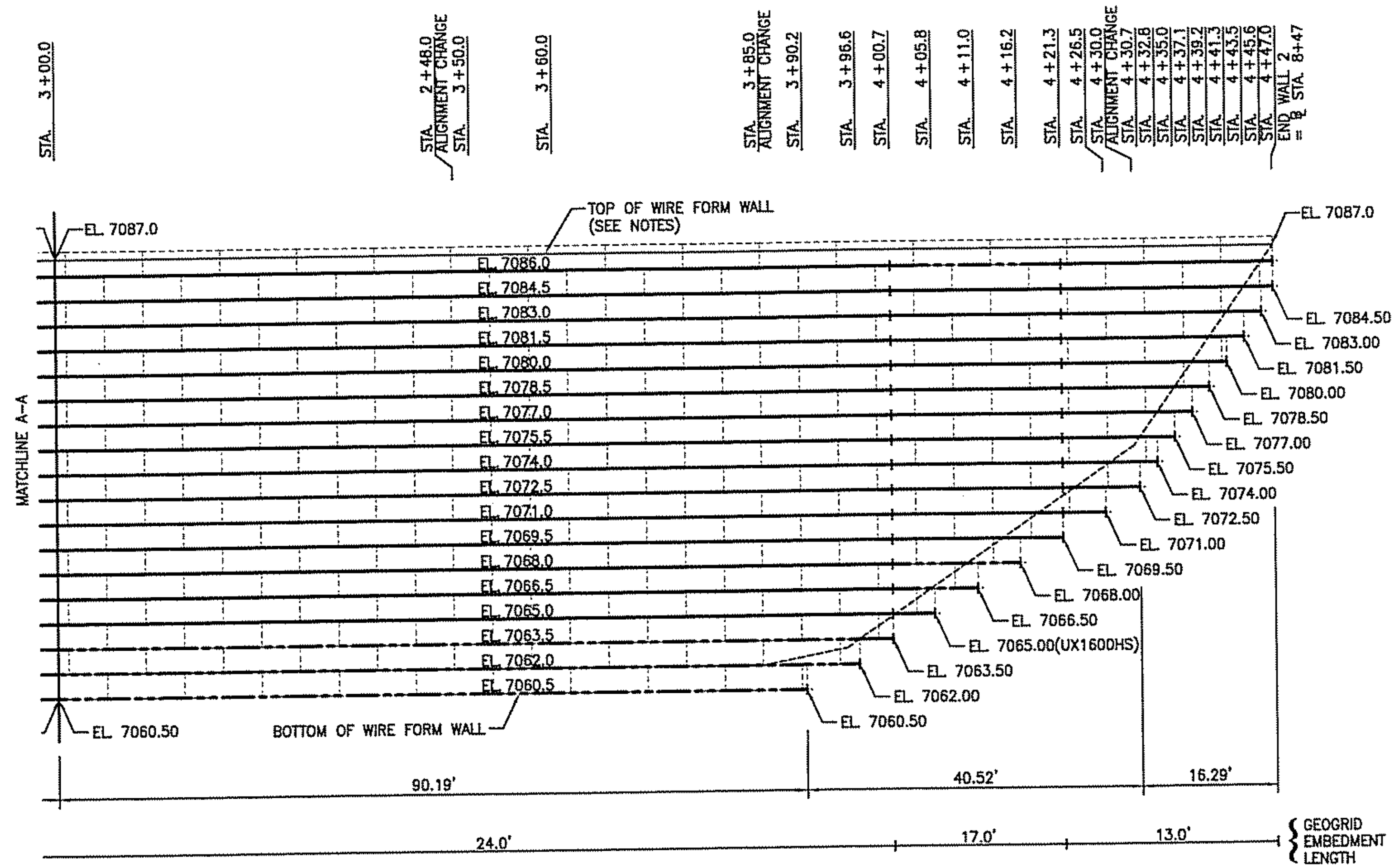
0	5/24/06	ISSUED FOR REVIEW	

Project Number: D06602
File Name: D0660204.DWG
Date Drawn: 5/24/06
Scale: AS SHOWN
Designed by: CLC
Drawn by: KJK
Checked by:

LASO TA-73 AIRPORT LANDFILLS
W.O. NO. 13104.002.001.7000
LOS ALAMOS COUNTY, NEW MEXICO

ELEVATION VIEW
WALL 2

Sheet Number
4 OF 11



FRONT FACE ELEVATION VIEW – WALL 2 (CONT.)

NOTES:
1. SEE NESTED BASKET DETAIL ON SHEET 10 OF 11 OR TOP OF SIERRASCAPE WALL, FINISHING DETAIL ON SHEET 11 OF 11.
2. FINISHED TOP OF WALL SHALL BE CONTRACTOR'S OPTION.

LEGEND

- SIERRASCAPE WIRE FORM (TYP.) (SEE CONSTRUCTION REQUIREMENTS FOR SPECIFICATIONS)
- PROPOSED GRADE
- CHANGE IN EMBEDMENT LENGTH OR GEOGRID TERMINATION
- TENSAR UX1500MSE GEOGRID
- TENSAR UX1600MSE GEOGRID
- EL. XXX.X — APPROX. GEOGRID ELEVATION

VERTICAL SCALE FEET: 5 0 5 10
HORIZONTAL SCALE FEET: 10 5 0 10 20

PHILIP D. EGAN — NEW MEXICO — 9032 — REGISTERED PROFESSIONAL ENGINEER

SIERRASCAPE RETAINING WALL SYSTEMS

Tensar Earth Technologies, Inc.
5883 Glenridge Drive, Suite 200
Atlanta, Georgia 30328
(404) 250-1290

REVISIONS \ ISSUE

0	5/24/06	ISSUED FOR REVIEW	

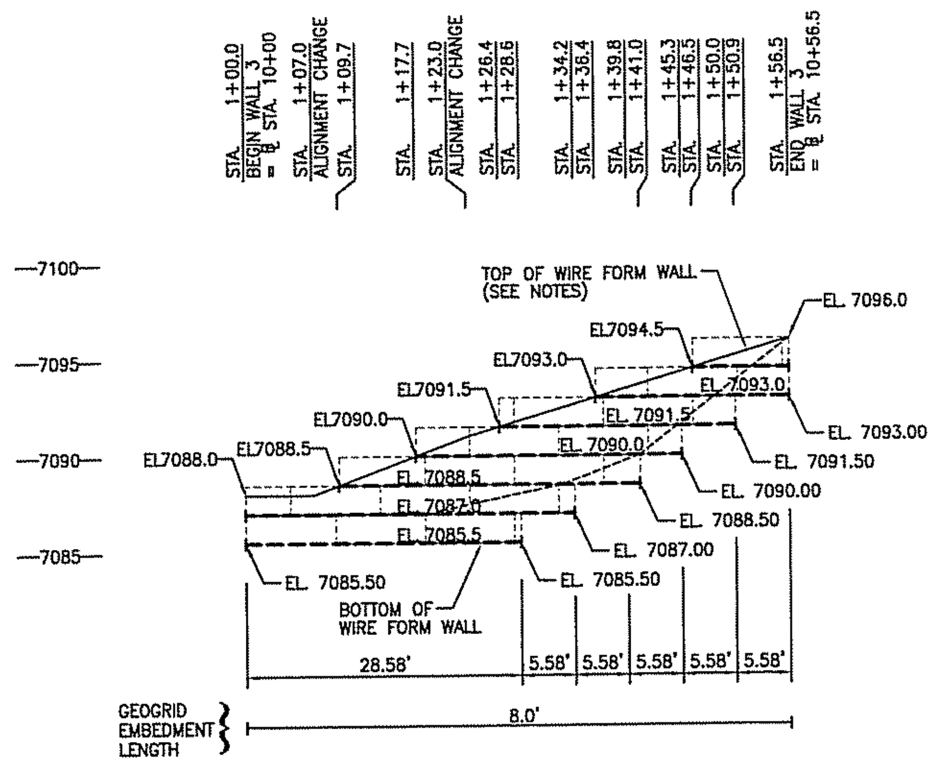
Project Number: D06602
File Name: D0660204.DWG
Date Drawn: 5/24/06
Scale: AS SHOWN
Designed by: CLC
Drawn by: KJK
Checked by:

LASO TA-73 AIRPORT LANDFILLS
W.O. NO. 13104.002.001.7000

LOS ALAMOS COUNTY, NEW MEXICO

ELEVATION VIEW
WALL 2 (CONT.)

Sheet Number
5 OF 11



FRONT FACE ELEVATION VIEW – WALL 3

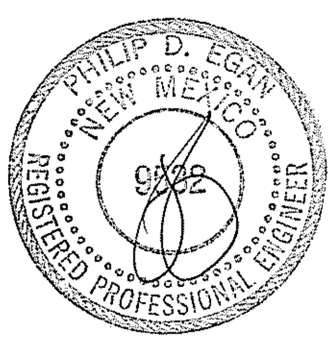
NOTES:
1. SEE NESTED BASKET DETAIL ON SHEET 10 OF 11 OR TOP OF SIERRASCAPE WALL, FINISHING DETAIL ON SHEET 11 OF 11.
2. FINISHED TOP OF WALL SHALL BE CONTRACTOR'S OPTION.

LEGEND

[dashed box]	SIERRASCAPE WIRE FORM (TYP.) (SEE CONSTRUCTION REQUIREMENTS FOR SPECIFICATIONS)
———	PROPOSED GRADE
–·–+–·–	CHANGE IN EMBEDMENT LENGTH OR GEOGRID TERMINATION
– – – –	TENSAR UX1400MSE GEOGRID
EL. XXX.X	APPROX. GEOGRID ELEVATION

VERTICAL SCALE FEET 5 0 5 10

HORIZONTAL SCALE FEET 10 5 0 10 20



THIS DESIGN IS BASED UPON SPECIFIC PROPERTIES OF TENSAR PRODUCTS (GEOGRIDS, DRAINAGE COMPOSITES AND EROSION MEDIA), WHICH ARE PROPRIETARY TO THE TENSAR CORPORATION 1210 CITIZENS PARKWAY, MORROW, GA. 30260. ANY SUBSTITUTION OF THE SPECIFIED PRODUCTS WILL INVALIDATE THIS DESIGN. THIS DRAWING IS BEING FURNISHED FOR USE ON THIS SPECIFIC PROJECT ONLY. ANY PARTY ACCEPTING THIS DOCUMENT DOES SO IN CONFIDENCE AND AGREES THAT IT SHALL NOT BE DUPLICATED WHOLE OR IN PART, NOR DISCLOSED TO OTHERS, WITHOUT THE CONSENT OF TENSAR EARTH TECHNOLOGIES, INC.

SIERRASCAPE® RETAINING WALL SYSTEMS

Tensar Earth Technologies, Inc.
5883 Glenridge Drive, Suite 200
Atlanta, Georgia 30328
(404) 250-1290

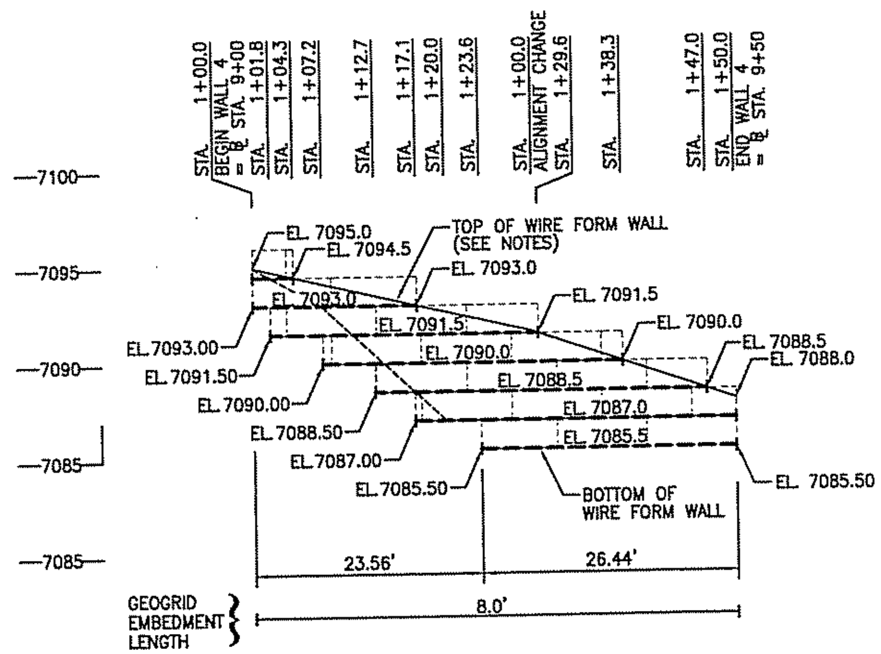
REVISIONS \ ISSUE

0	5/24/06	ISSUED FOR REVIEW	

Project Number: D06602
File Name: D0660206.DWG
Date Drawn: 5/24/06
Scale: AS SHOWN
Designed by: CLC
Drawn by: KJK
Checked by:

LASO TA-73 AIRPORT LANDFILLS
W.O. NO. 13104.002.001.7000
LOS ALAMOS COUNTY, NEW MEXICO

ELEVATION VIEW
WALL 3



FRONT FACE ELEVATION VIEW – WALL 4

NOTES:

1. SEE NESTED BASKET DETAIL ON SHEET 10 OF 11 OR TOP OF SIERRASCAPE WALL, FINISHING DETAIL ON SHEET 11 OF 11.
2. FINISHED TOP OF WALL SHALL BE CONTRACTOR'S OPTION.

LEGEND

- SIERRASCAPE WIRE FORM (TYP.) (SEE CONSTRUCTION REQUIREMENTS FOR SPECIFICATIONS)
- PROPOSED GRADE
- CHANGE IN EMBEDMENT LENGTH OR GEOGRID TERMINATION
- TENSAR UX1400MSE GEOGRID
- EL. XXX.X APPROX. GEOGRID ELEVATION

VERTICAL SCALE FEET 10 5 0 5

HORIZONTAL SCALE FEET 10 5 0 10 20

PHILIP D. EGAN
NEW MEXICO
9532
REGISTERED PROFESSIONAL ENGINEER

THIS DESIGN IS BASED UPON SPECIFIC PROPERTIES OF TENSAR PRODUCTS (GEOGRIDS, DRAINAGE COMPOSITES AND EROSION MEDIA), WHICH ARE PROPRIETARY TO THE TENSAR CORPORATION 1210 CITIZENS PARKWAY, MORROW, GA, 30260. ANY SUBSTITUTION OF THE SPECIFIED PRODUCTS WILL INVALIDATE THIS DESIGN. THIS DRAWING IS BEING FURNISHED FOR USE ON THIS SPECIFIC PROJECT ONLY. ANY PARTY ACCEPTING THIS DOCUMENT DOES SO IN CONFIDENCE AND AGREES THAT IT SHALL NOT BE DUPLICATED WHOLE OR IN PART, NOR DISCLOSED TO OTHERS, WITHOUT THE CONSENT OF TENSAR EARTH TECHNOLOGIES, INC.

SIERRASCAPE®
RETAINING WALL SYSTEMS

Tensar
Tensar Earth Technologies, Inc.
5883 Glenridge Drive, Suite 200
Atlanta, Georgia 30328
(404) 250-1290

REVISIONS \ ISSUE

0	5/24/06	ISSUED FOR REVIEW	

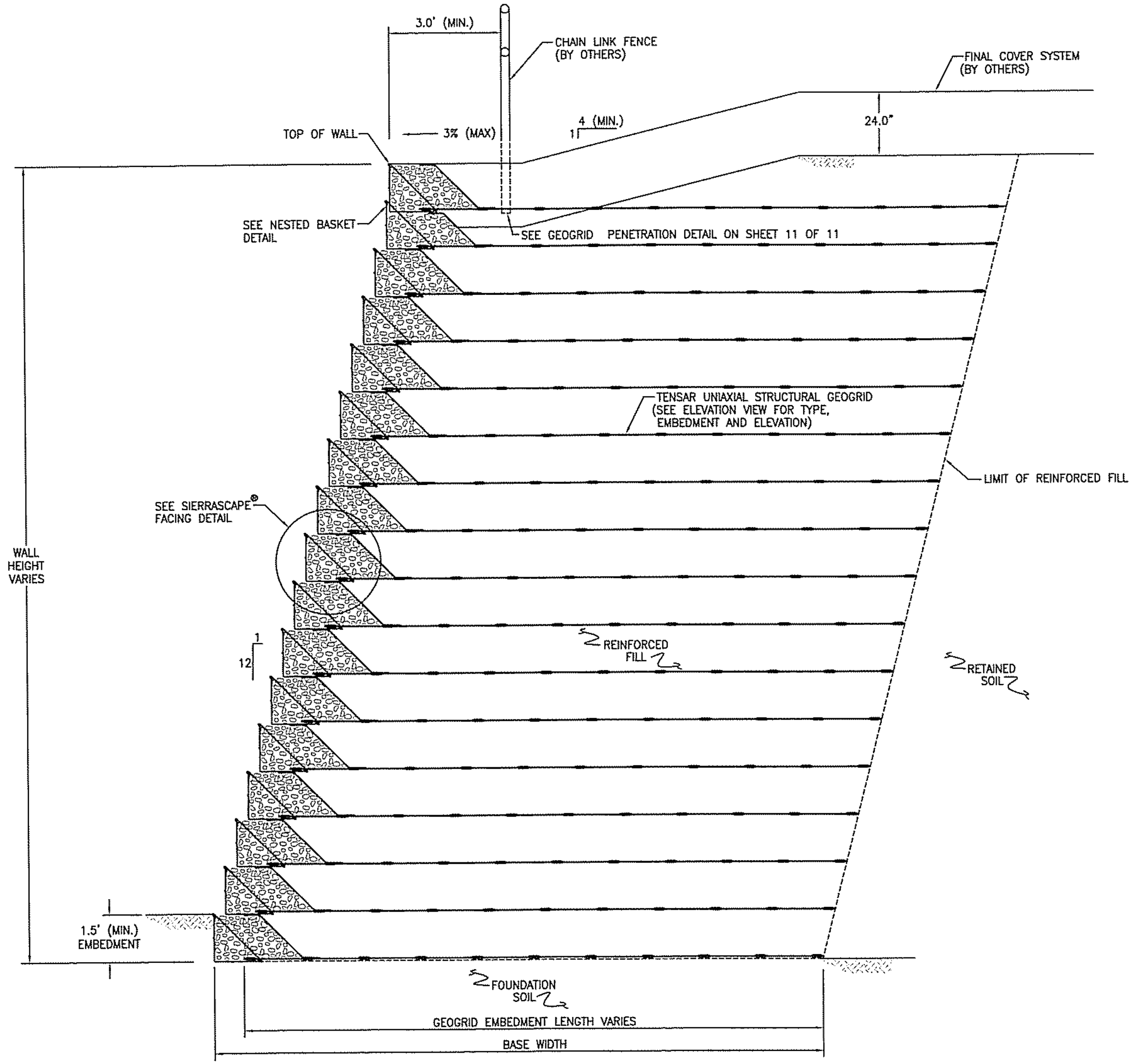
Project Number D06602
File Name D0660207.DWG
Date Drawn 5/24/06
Scale AS SHOWN
Designed by CLC
Drawn by KJK
Checked by

LASO TA-73 AIRPORT LANDFILLS

LOS ALAMOS COUNTY, NEW MEXICO

ELEVATION VIEW
WALL 4

Sheet Number
7 OF 11



TYPICAL CROSS-SECTION

NOTE:
THIS TYPICAL CROSS-SECTION IS APPLICABLE TO WALL 2 FROM STA. 1+35.7 TO STA. 4+00.7 AND WALL 3 FROM STA. 1+39.8 TO STA. 1+56.5.

SCALE
2 1 0 2 4 FEET

PHILIP D. EGAN
NEW MEXICO
9582
REGISTERED PROFESSIONAL ENGINEER

THIS DESIGN IS BASED UPON SPECIFIC PROPERTIES OF TENSAR PRODUCTS (GEOGRIDS, DRAINAGE COMPOSITES AND EROSION MEDIA), WHICH ARE PROPRIETARY TO THE TENSAR CORPORATION 1210 CITIZENS PARKWAY, MORROW, GA 30260. ANY SUBSTITUTION OF THE SPECIFIED PRODUCTS WILL INVALIDATE THIS DESIGN. THIS DRAWING IS BEING FURNISHED FOR USE ON THIS SPECIFIC PROJECT ONLY. ANY PARTY ACCEPTING THIS DOCUMENT DOES SO IN CONFIDENCE AND AGREES THAT IT SHALL NOT BE DUPLICATED WHOLE OR IN PART, NOR DISCLOSED TO OTHERS, WITHOUT THE CONSENT OF TENSAR EARTH TECHNOLOGIES, INC.

SIERRASCAPE®
RETAINING WALL SYSTEMS

Tensar Earth Technologies, Inc.
5883 Glenridge Drive, Suite 200
Atlanta, Georgia 30328
(404) 250-1290

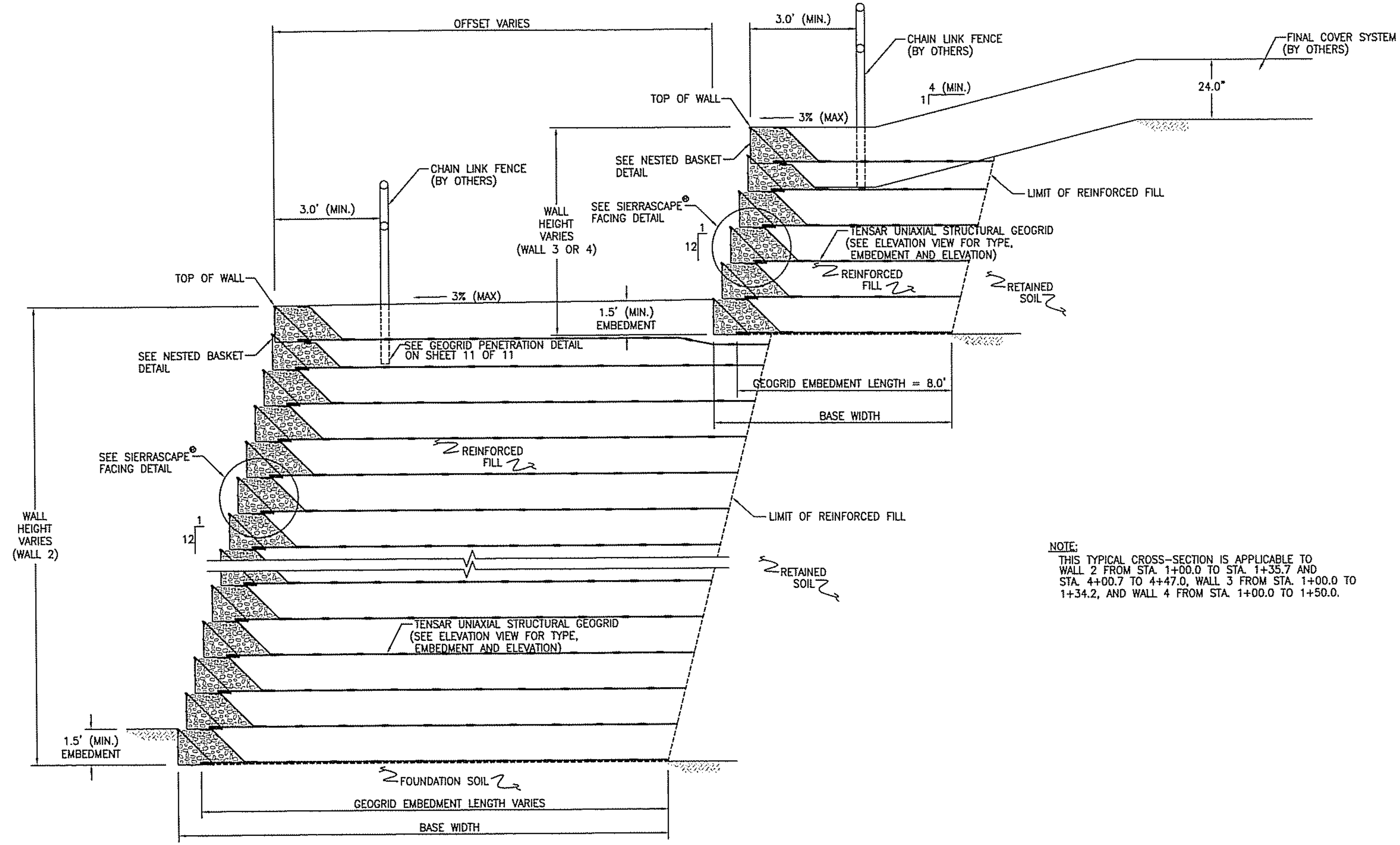
REVISIONS \ ISSUE			
0	5/24/06	ISSUED FOR REVIEW	

Project Number: D06602
File Name: D0660208.DWG
Date Drawn: 5/24/06
Scale: AS SHOWN
Designed by: CLC
Drawn by: KJK
Checked by:

LASO TA-73 AIRPORT LANDFILLS
W.O. NO. 13104.002.001.7000
LOS ALAMOS COUNTY, NEW MEXICO

TYPICAL CROSS-SECTION

Sheet Number
8 OF 11



TYPICAL CROSS-SECTION

NOTE:
THIS TYPICAL CROSS-SECTION IS APPLICABLE TO WALL 2 FROM STA. 1+00.0 TO STA. 1+35.7 AND STA. 4+00.7 TO 4+47.0, WALL 3 FROM STA. 1+00.0 TO 1+34.2, AND WALL 4 FROM STA. 1+00.0 TO 1+50.0.

SCALE
2 1 0 2 4 FEET

PHILIP D. EGAN
NEW MEXICO
9802
REGISTERED PROFESSIONAL ENGINEER

THIS DESIGN IS BASED UPON SPECIFIC PROPERTIES OF TENSAR PRODUCTS (GEOGRIDS, DRAINAGE COMPOSITES AND EROSION MEDIA), WHICH ARE PROPRIETARY TO THE TENSAR CORPORATION 1210 CITIZENS PARKWAY, MORROW, GA, 30260. ANY SUBSTITUTION OF THE SPECIFIED PRODUCTS WILL INVALIDATE THIS DESIGN. THIS DRAWING IS BEING FURNISHED FOR USE ON THIS SPECIFIC PROJECT ONLY. ANY PARTY ACCEPTING THIS DOCUMENT DOES SO IN CONFIDENCE AND AGREES THAT IT SHALL NOT BE DUPLICATED WHOLE OR IN PART, NOR DISCLOSED TO OTHERS, WITHOUT THE CONSENT OF TENSAR EARTH TECHNOLOGIES, INC.

SIERRASCAPE®
RETAINING WALL SYSTEMS

Tensar
Tensar Earth Technologies, Inc.
5883 Glenridge Drive, Suite 200
Atlanta, Georgia 30328
(404) 250-1290

REVISIONS \ ISSUE

0	5/24/06	ISSUED FOR REVIEW	

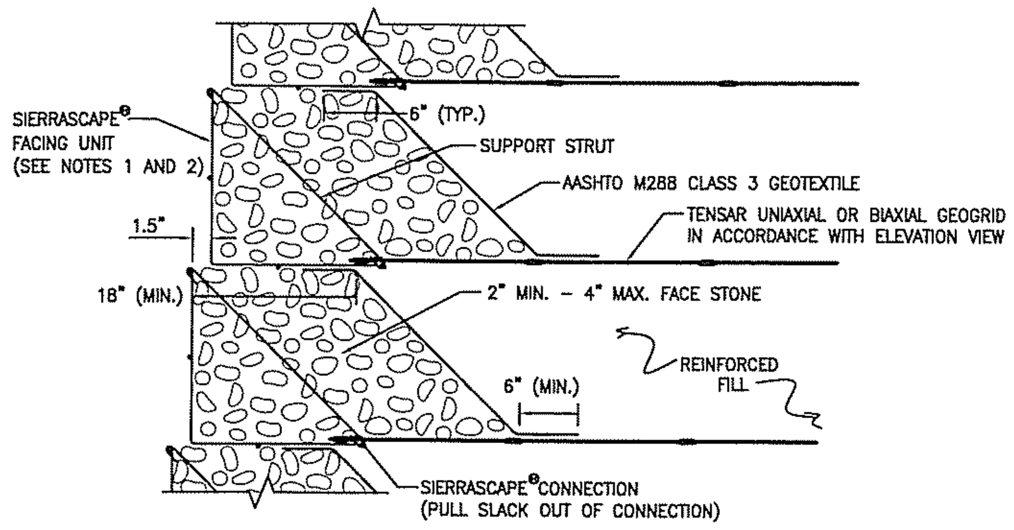
Project Number: D06602
File Name: D0660209.DWG
Date Drawn: 5/24/06
Scale: AS SHOWN
Designed by: CLC
Drawn by: KJK
Checked by:

LASO TA-73 AIRPORT LANDFILLS
W.O. NO. 13104.002.001.7000

LOS ALAMOS COUNTY, NEW MEXICO

TYPICAL CROSS-SECTION

Sheet Number
9 OF 11

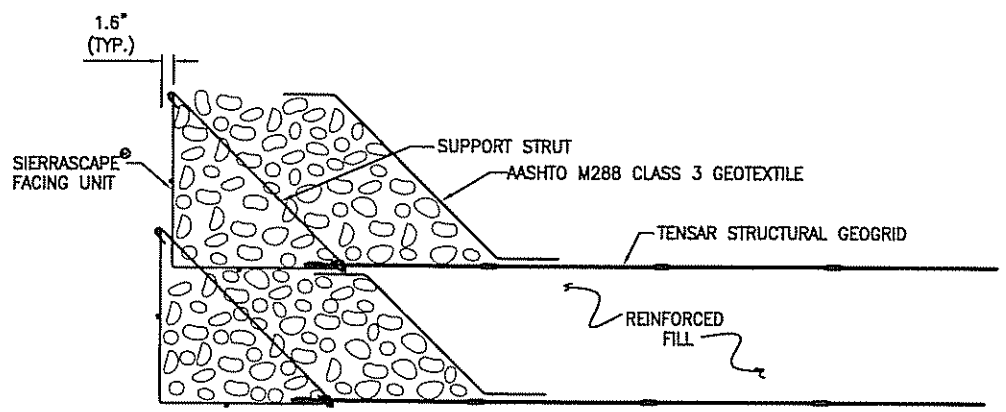


NOTES:

1. SEE SIERRASCAPE® FACING UNIT DETAIL FOR FACING MATERIAL AND DIMENSIONS.
2. ALL FACING UNITS SHALL BE GALVANIZED PER ASTM A123 AFTER FABRICATION.
3. OPTIONAL – A THIN LAYER (2" MIN.) OF FINER STONE (1/4"-1") MAY BE PLACED AT THE TOP OF EACH UNIT TO PROVIDE A LEVEL SURFACE FOR THE UNIT ABOVE.

SIERRASCAPE® FACING DETAIL

NOT TO SCALE

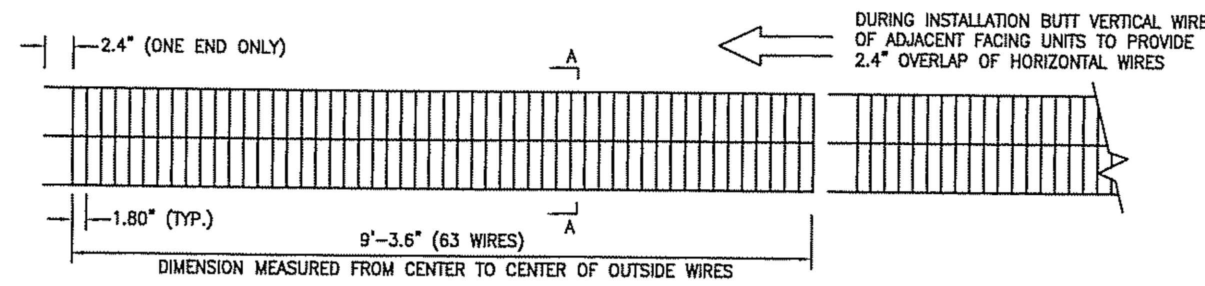


NOTES:

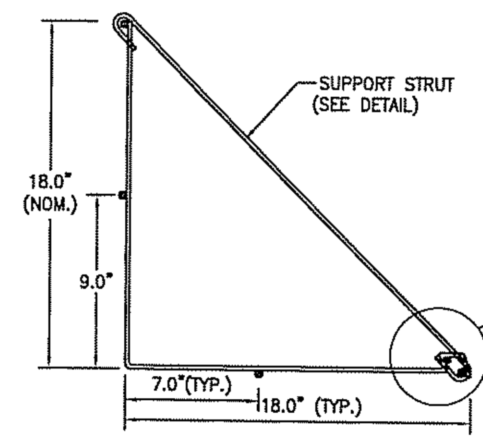
1. SET TOPMOST SIERRASCAPE FACING UNIT INSIDE FACING UNIT BELOW TO FOLLOW GRADE.
2. HORIZONTAL WIRES OF TOPMOST FACING UNIT MAY BE CUT TO ALLOW INSTALLATION OF STRUTS ON FACING UNIT BELOW.

NESTED BASKET DETAIL

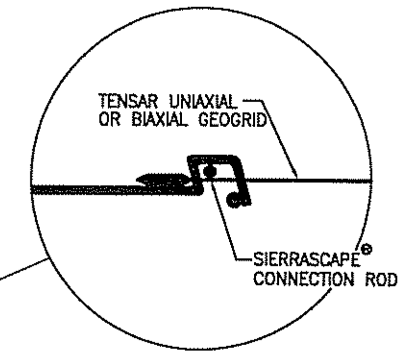
NOT TO SCALE



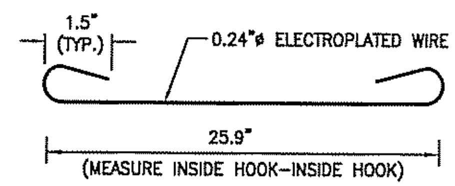
ELEVATION VIEW



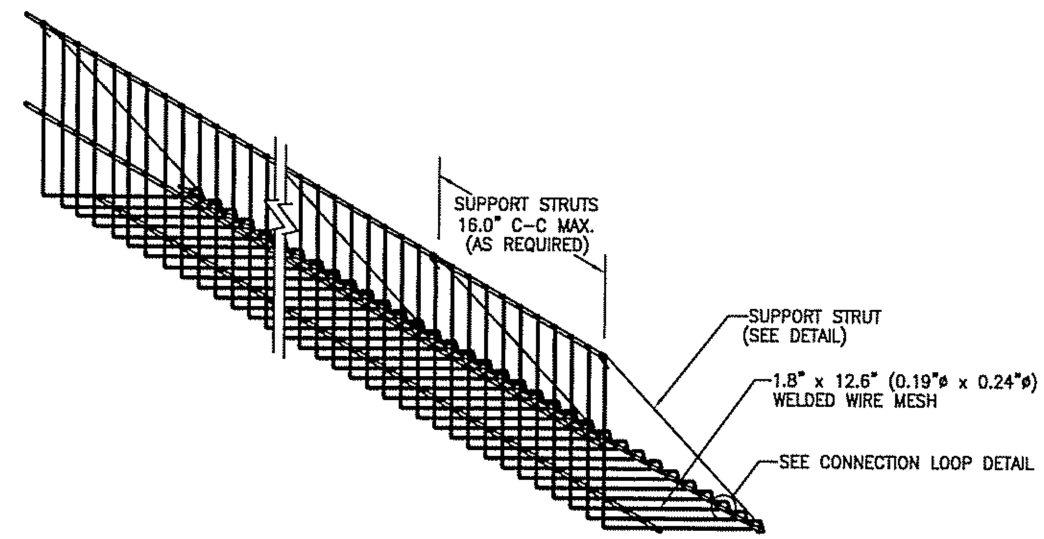
SECTION A-A



CONNECTION LOOP DETAIL



SUPPORT STRUT DETAIL



NOTE:

UNLESS OTHERWISE SPECIFIED IN THE SIERRASCAPE® FACING DETAIL ALL FACING UNITS SHALL BE GALVANIZED PER ASTM A123 AFTER BENDING.

SIERRASCAPE® FACING UNIT

NOT TO SCALE

SIERRASCAPE® RETAINING WALL SYSTEMS

Tensar

Tensar Earth Technologies, Inc.
5883 Glenridge Drive, Suite 200
Atlanta, Georgia 30328
(404) 250-1290

REVISIONS \ ISSUE

0	5/24/06	ISSUED FOR REVIEW	[initials]

Project Number: D06602
File Name: D0660210.DWG
Date Drawn: 5/24/06
Scale: AS SHOWN
Designed by: CLC
Drawn by: KJK
Checked by: [initials]

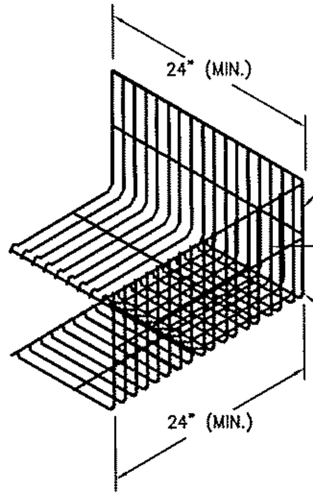
LASO TA-73 AIRPORT LANDFILLS

W.O. NO. 13104.002.001.7000

LOS ALAMOS COUNTY, NEW MEXICO

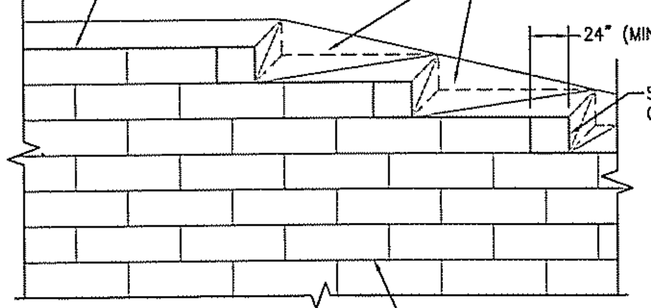
TYPICAL DETAILS

Sheet Number 10 OF 11



SIERRASCAPE® OUTSIDE CORNER UNIT

NOT TO SCALE

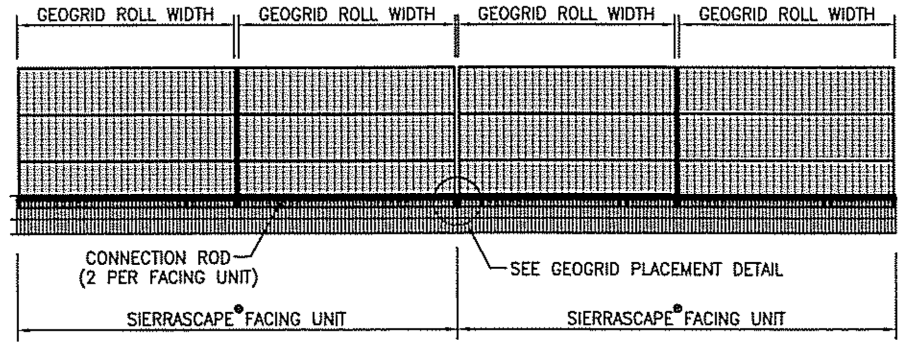


NOTES:

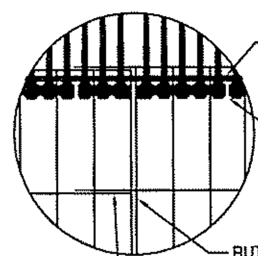
1. SEE SIERRASCAPE® FACING UNIT DETAIL FOR FACING MATERIALS AND DIMENSIONS.
2. USE SIERRASCAPE® FACING UNIT TO FABRICATE CONTINUOUS CORNER. PROVIDE 24" (MIN.) OF SIERRASCAPE® FACING UNIT IN BOTH DIRECTIONS AS MEASURED FROM THE CORNER BEND.
3. INSTALL ADJACENT SIERRASCAPE® FACING UNITS TO PROVIDE 4" OVERLAP OF HORIZONTAL WIRES.

TOP OF SIERRASCAPE® WALL, FINISHING DETAIL

NOT TO SCALE



PLAN VIEW

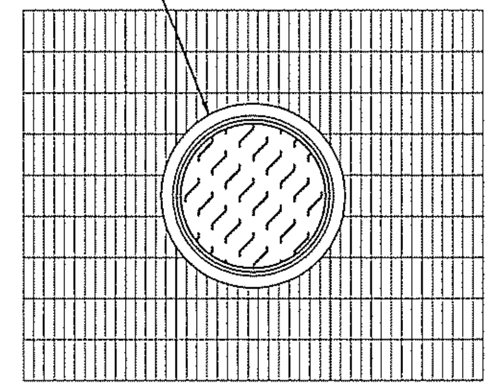


NOTES:

1. SEE SIERRASCAPE FACING UNIT DETAIL FOR FACING MATERIALS AND DIMENSIONS.
2. TWO ROLLS OF UNIAXIAL GEOGRID SHALL BE PLACED ON EACH SIERRASCAPE FACING UNIT WITH TWO GEOGRID RIBS BETWEEN EACH PAIR OF WIRE CONNECTION LOOPS.
3. DURING INSTALLATION BUTT VERTICAL WIRE OF ADJACENT FACING UNITS TO PROVIDE 2.4" OVERLAP OF HORIZONTAL WIRES.

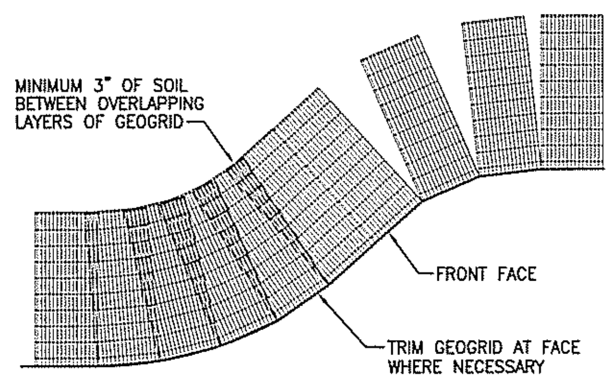
TYPICAL SIERRASCAPE® GEOGRID COVERAGE

NOT TO SCALE



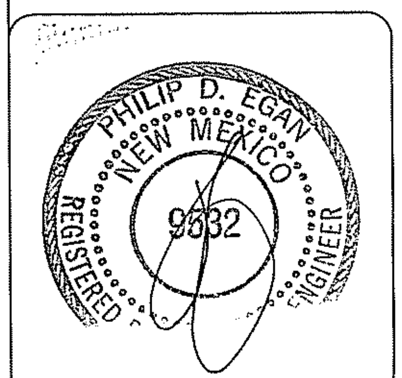
GEOGRID PENETRATION

NOT TO SCALE



GEOGRID PLACEMENT ON CURVES

NOT TO SCALE



THIS DESIGN IS BASED UPON SPECIFIC PROPERTIES OF TENSAR PRODUCTS (GEOGRIDS, DRAINAGE COMPOSITES AND EROSION MEDIA), WHICH ARE PROPRIETARY TO THE TENSAR CORPORATION 1210 CITIZENS PARKWAY, MORROW, GA 30260. ANY SUBSTITUTION OF THE SPECIFIED PRODUCTS WILL INVALIDATE THIS DESIGN. THIS DRAWING IS BEING FURNISHED FOR USE ON THIS SPECIFIC PROJECT ONLY. ANY PARTY ACCEPTING THIS DOCUMENT DOES SO IN CONFIDENCE AND AGREES THAT IT SHALL NOT BE DUPLICATED WHOLE OR IN PART, NOR DISCLOSED TO OTHERS, WITHOUT THE CONSENT OF TENSAR EARTH TECHNOLOGIES, INC.

SIERRASCAPE® RETAINING WALL SYSTEMS

Tensar Earth Technologies, Inc.
5883 Glenridge Drive, Suite 200
Atlanta, Georgia 30328
(404) 250-1290

Tensar

REVISIONS \ ISSUE

0	5/24/06	ISSUED FOR REVIEW	WL

Project Number: D06602
File Name: D0660211.DWG
Date Drawn: 5/24/06
Scale: AS SHOWN
Designed by: CLC
Drawn by: KJK
Checked by: WAL

LASO TA-73 AIRPORT LANDFILLS

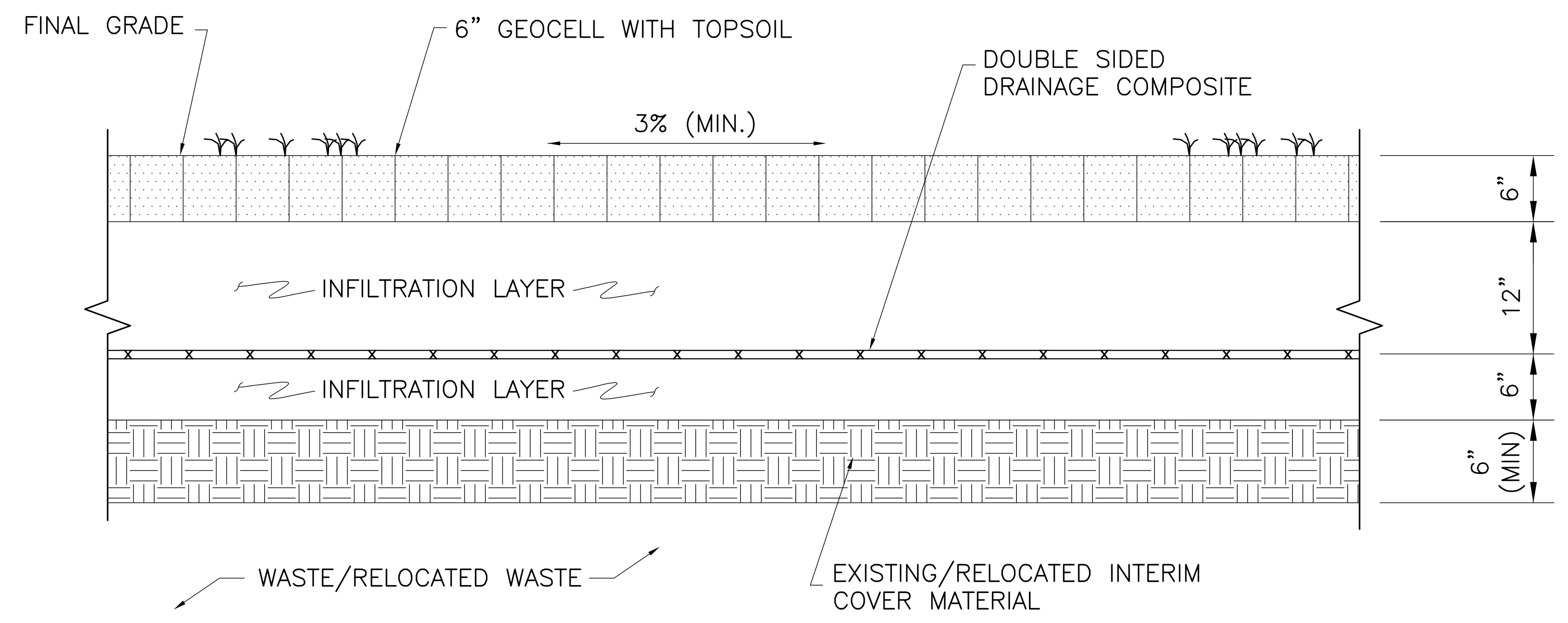
W.O. NO. 13104.002.001.7000

LOS ALAMOS COUNTY, NEW MEXICO

TYPICAL DETAILS

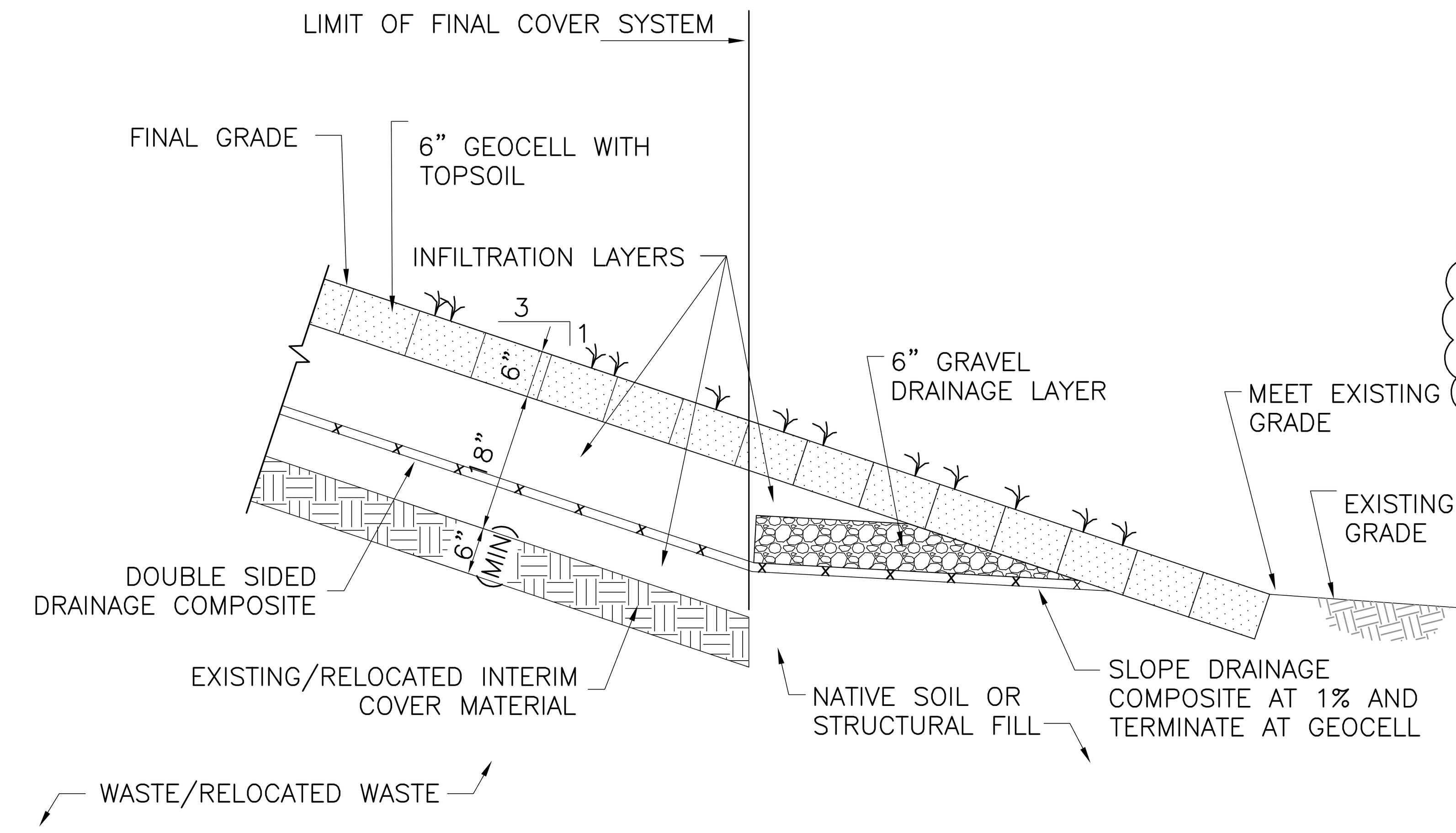
Sheet Number

11 OF 11



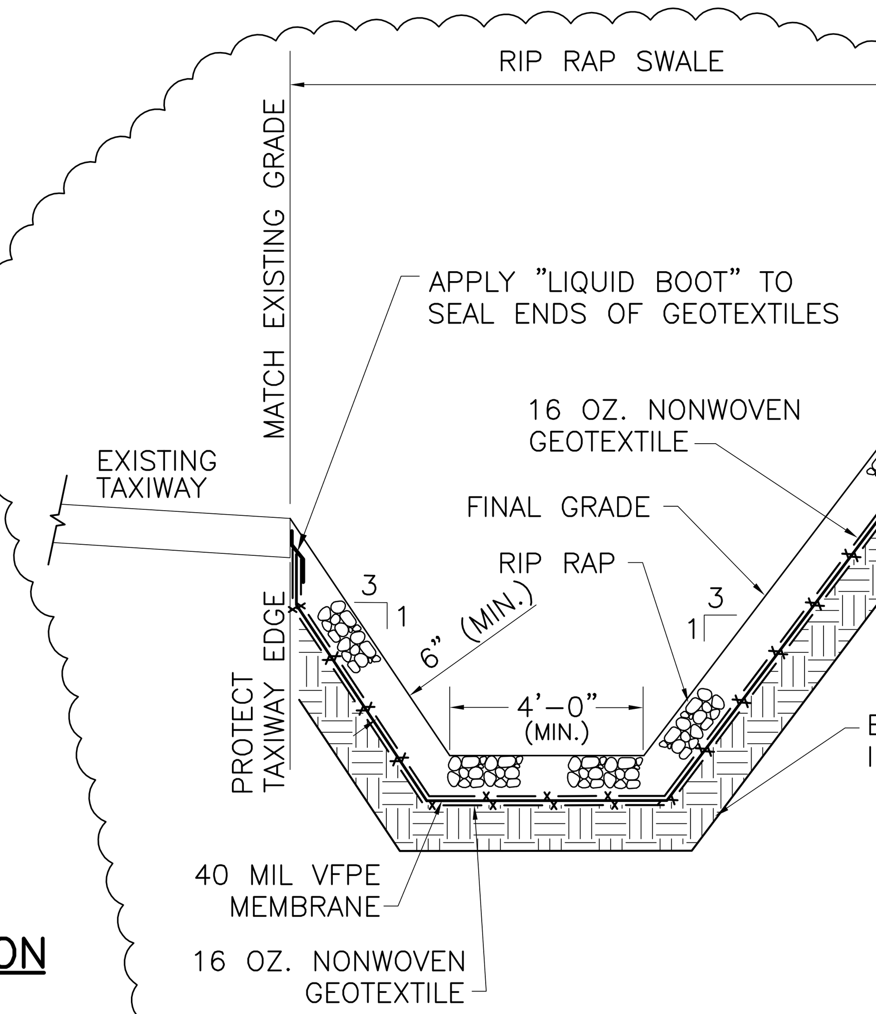
TYPICAL ARMORED LANDFILL FINAL COVER SYSTEM

DETAIL 1
N.T.S. 2002 2005



TYPICAL NORTH FACE TOE OF SLOPE – CROSS SECTION

SECTION A
N.T.S. 2002 2005

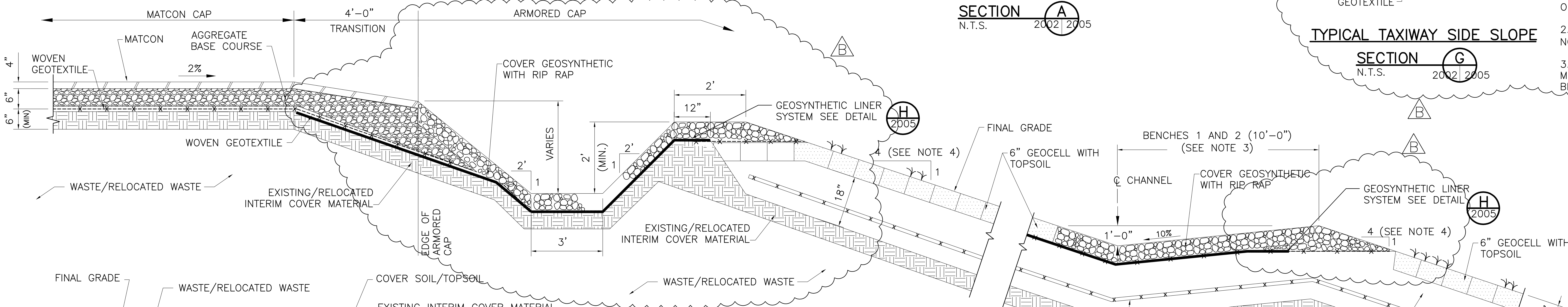


TYPICAL TAXIWAY SIDE SLOPE

SECTION G
N.T.S. 2002 2005

SIDE SLOPE NOTES:

1. PLACE GEOSYNTHETIC COMPONENTS AT LEAST 2'–0" BEYOND THE LIMIT OF THE MATCON.
2. LIMIT DROP HEIGHT OF RIP RAP TO NO MORE THAN 24".
3. DO NOT MOVE RIP RAP WITH MECHANICAL EQUIPMENT AFTER IT HAS BEEN PLACED.

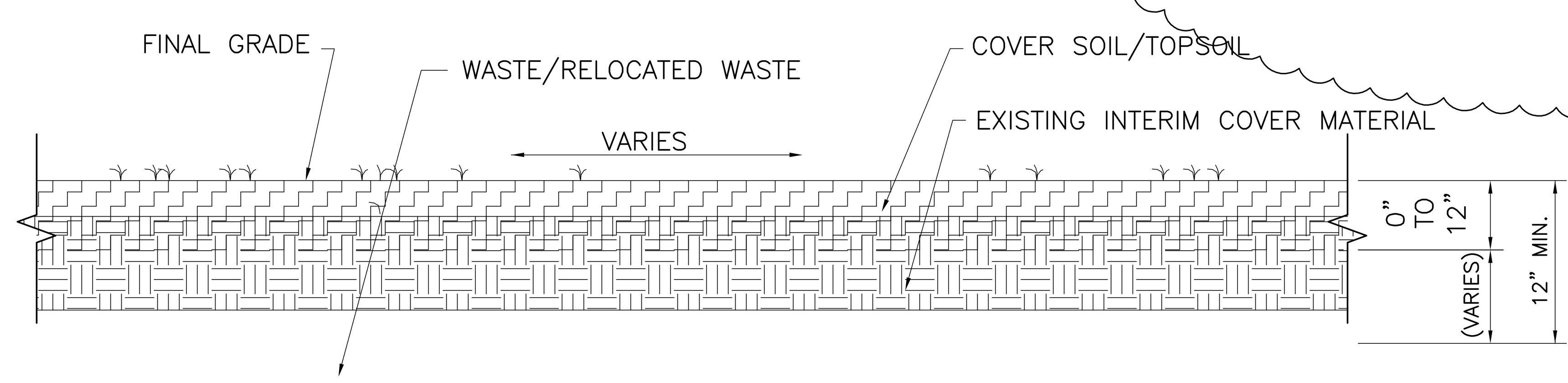


TYPICAL SIDE SLOPE – CROSS SECTION

DETAIL 2
N.T.S. 2002 2005

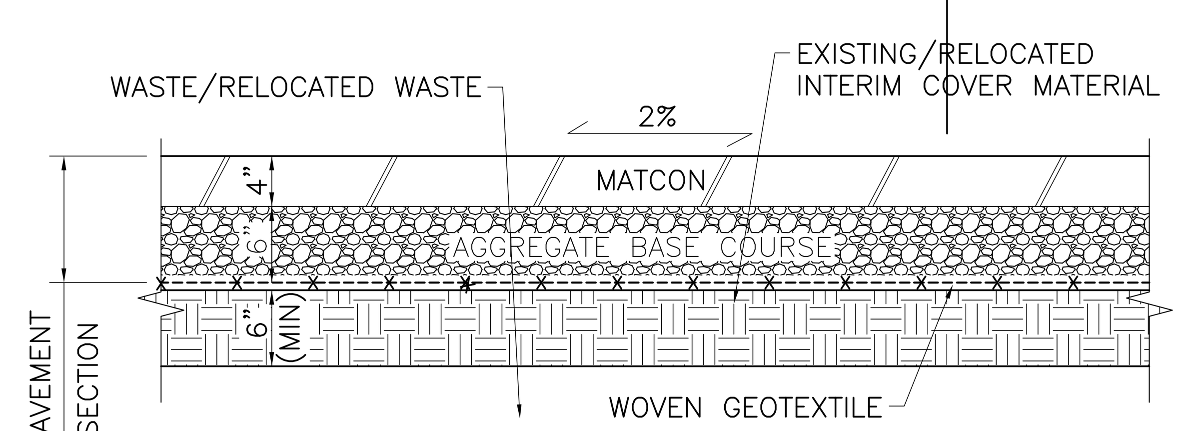
GENERAL NOTES:

1. FINAL GRADE DETAILS ARE SHOWN AT 4H:1V SLOPE FOR INFORMATIONAL PURPOSES ONLY. ACTUAL GRADES SHALL BE AS INDICATED ON DRAWING 2002 AND 2015.
2. REFER TO DRAWING 2021 FOR STORMWATER CONTROL DETAILS PERTAINING TO THE SWALE DETAILS.
3. PLACE CONCRETE INFILL ON BENCHES 1 AND 2. ALL OTHER SIDESLOPES SHALL RECEIVE 6" GEOCELL WITH TOPSOIL.
4. NORTH SLOPE IS A 3H:1V SLOPE.
5. ALL WASTE ENCOUNTERED OUTSIDE OF FINAL COVER SYSTEM LIMITS DURING CONSTRUCTION SHALL BE RELOCATED SUCH THAT THE LIMIT OF WASTE SHALL BE OFF–SET INSIDE THE LIMIT OF THE FINAL COVER SYSTEM A MINIMUM DISTANCE OF 1–FOOT.



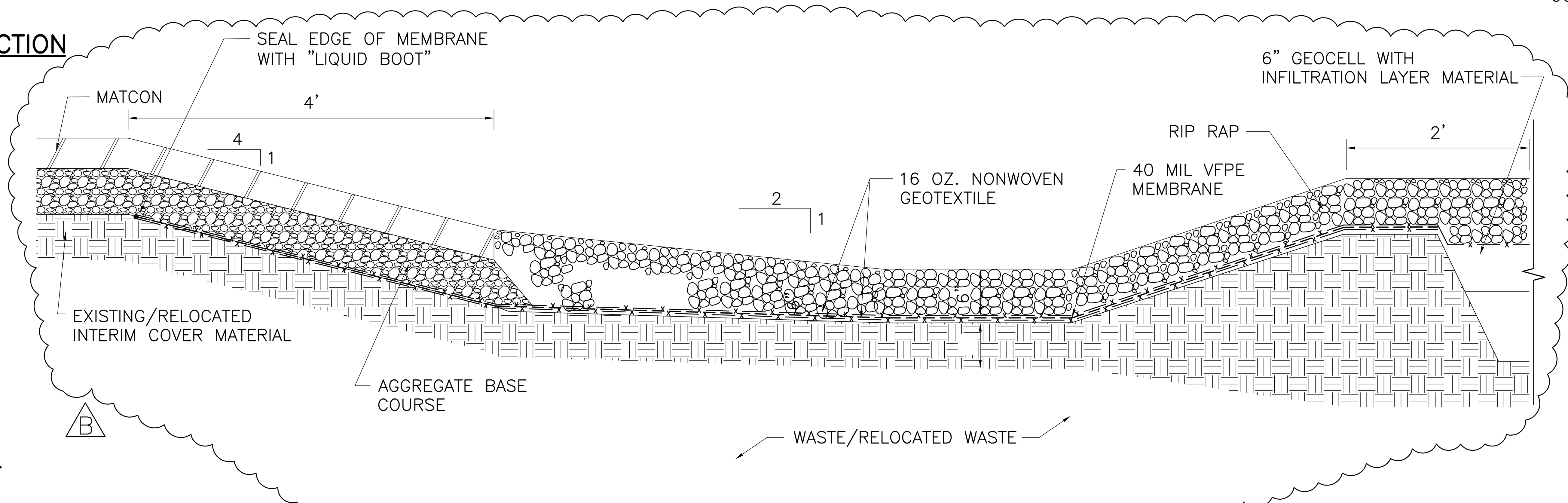
TYPICAL DDA FINAL COVER SYSTEM – CROSS SECTION

DETAIL 4
N.T.S. 2015 2005



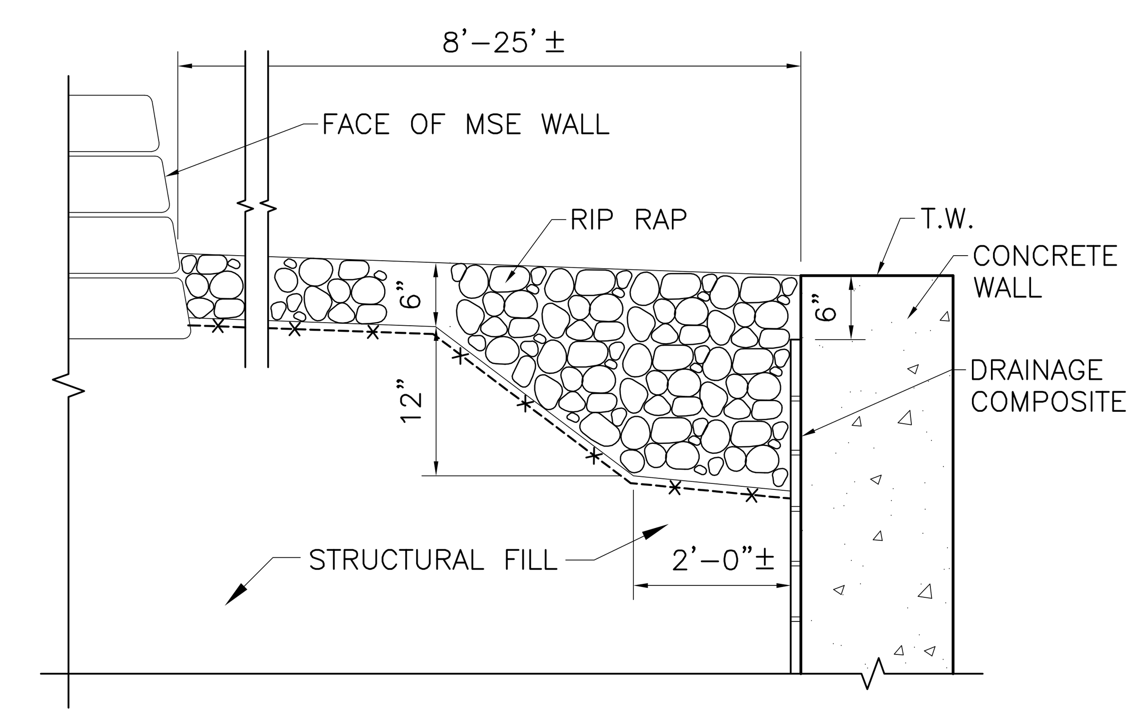
TYPICAL LANDFILL MATCON FINAL COVER SYSTEM CROSS SECTION

DETAIL 3
N.T.S. 2002 2005



TYPICAL GEOSYNTHETIC LINER SYSTEM – CROSS SECTION

DETAIL H
N.T.S. 2005



TYPICAL – ARMORED CAP AT CONCRETE WALL CROSS SECTION

DETAIL 5
N.T.S. 2006 2005 2007

NO.	DATE	APPR.	REVISION
B	8/08/06	BK	REVISED SLOPE DETAILS
A	3/20/06	BK	ISSUED FOR CONSTRUCTION
2	2/22/06	BK	REVISED PER NMED COMMENTS
1	6/30/05	BK	FINAL ISSUED TO NMED FOR PERMIT REVIEW
0	6/2/05	AH	90% ISSUED TO DOE FOR REVIEW

LOS ALAMOS SITE OFFICE
TA–73 AIRPORT LANDFILLS
LOS ALAMOS NEW MEXICO

North Wind WESTON SOLUTIONS TEAM

		DATE
CHECKED	RWM	6/22/05
DES. ENG.	AH	6/22/05
PROJ. ENG.	AH	6/22/05
PROJ. MGR.	BK	6/22/05
APPROVED	BK	6/22/05
APPROVED		

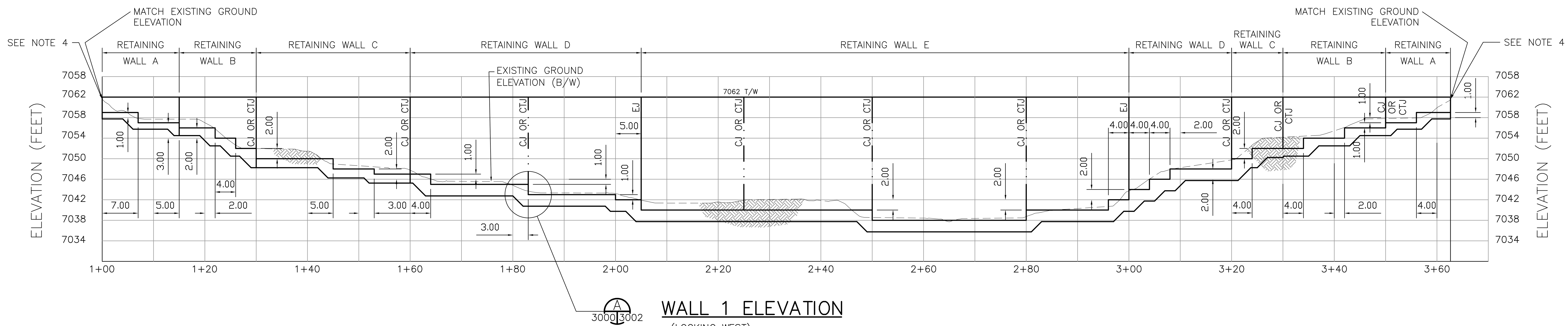
CLIENT APPROVALS DATE

BERG KESHIAN JR. NEW MEXICO 15690 PROFESSIONAL ENGINEER

CAPPING SYSTEM DETAILS
SHEET 1 OF 2

DRAWN EAD | DATE 02/06/04 | DWG. NO. 2005 | REV. NO. B
SCALE N.T.S. | W.O. NO. 13104.002.001 | SHT. OF

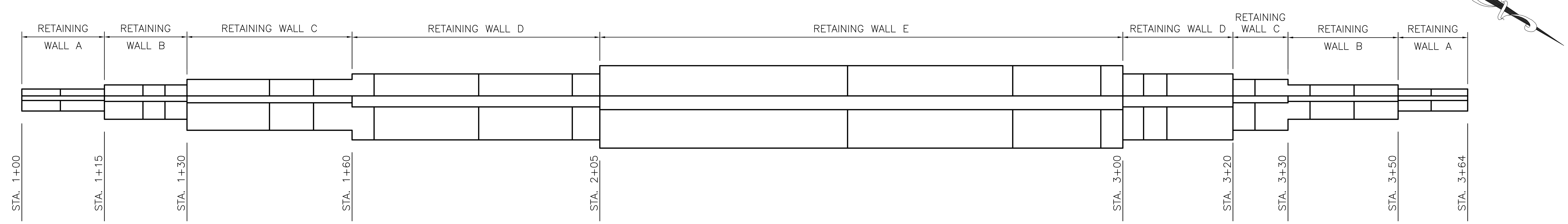
G:\ACADPROJ\13104.002.001LANL\FINAL\2005-25RevB.DWG



WALL 1 ELEVATION

(LOOKING WEST)

SCALE: 1"=10'



WALL 1 PLAN

SCALE: 1"=10'

NOTE:
FOR DETAILS OF RETAINING WALLS SEE DWG. 3001 & 3002

NOTES:

1. SEE DRAWING 2002 FOR SITE GRADES.
2. SEE DRAWING 2007 AND 2008 FOR GENERAL WALL ELEVATIONS AND SECTIONS.
3. SEE DRAWING 3002 FOR JOINT SYMBOLS AND DETAILS.
4. ADJUST WALL HEIGHT AND KEY INTO NATIVE GROUND/BEDROCK.
5. THE BOTTOM OF FOUNDATIONS SHALL BE CARRIED A MINIMUM OF 2 FEET INTO COMPETENT BEDROCK. IF OVER–EXCAVATION IS REQUIRED TO ACHIEVE 2 FEET EMBEDMENT INTO COMPETENT BEDROCK A LEAN CONCRETE MIX MAY BE PLACED BELOW THE DESIGN FOUNDATION BEARING LEVEL. REINFORCING BARS SHALL BE INSTALLED TO TIE THE LEAN MIX TO THE FOUNDATION AS DIRECTED BY THE ENGINEER.

   ALTERNATIVELY, IF OVER–EXCAVATION IS REQUIRED TO ACHIEVE 2 FEET EMBEDMENT INTO COMPETENT BEDROCK THE WALL HEIGHT MAY BE INCREASED AND THE APPROPRIATE WALL SECTION CONSTRUCTED AT THAT LOCATION. THE MAXIMUM WALL HEIGHT SHALL NOT EXCEED 24"–0".

10 0 10 20

HORIZ. SCALE: 1"=10'

NO.	DATE	APPR.	REVISION
A	3/20/06	BK	ISSUED FOR CONSTRUCTION
1	6/30/05	BK	FINAL ISSUED TO NMED FOR PERMIT REVIEW
0	6/7/05	AH	90% ISSUED TO DOE FOR REVIEW

LOS ALAMOS SITE OFFICE
TA–73 AIRPORT LANDFILLS
LOS ALAMOS NEW MEXICO

North Wind WESTON SOLUTIONS TEAM

		DATE
CHECKED	JJF	6/22/05
DES. ENG.	JJF	6/22/05
PROJ. ENG.	AH	6/22/05
PROJ. MGR.	BK	6/22/05
APPROVED	BK	6/22/05
APPROVED		

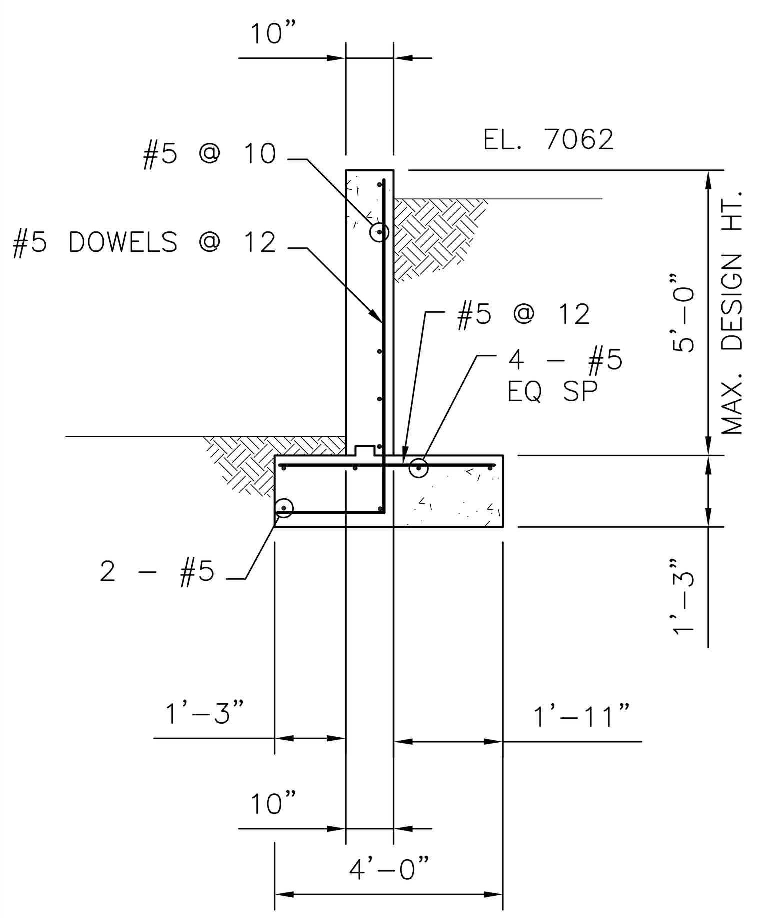
CLIENT APPROVALS DATE

BERG KEHIAIAN JR. 8590 LICENSED PROFESSIONAL ENGINEER 3/20/06

STRUCTURAL WALL 1 PLAN AND ELEVATIONS

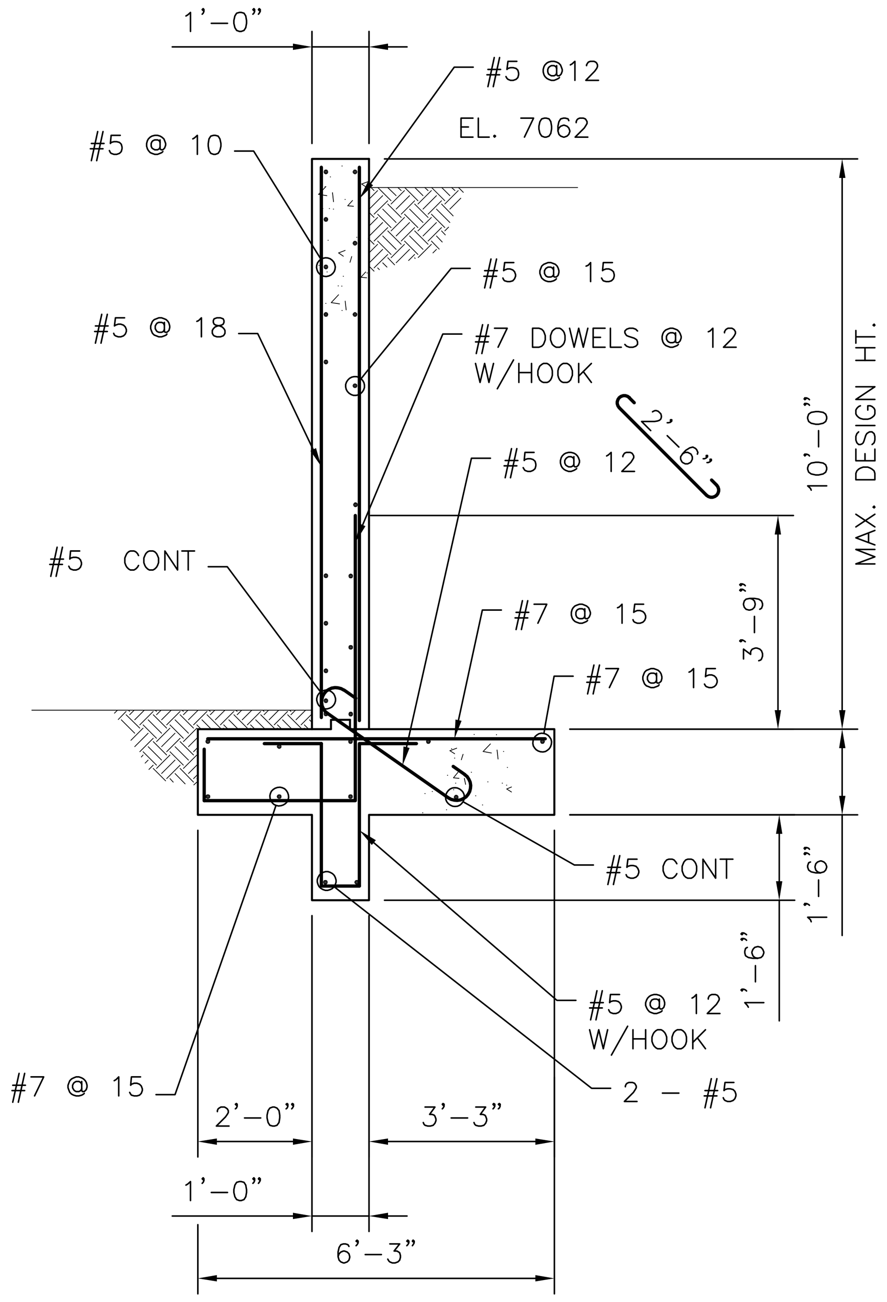
DRAWN: JAS | DATE: 02/06/04 | DWG. NO.: 3000 | REV. NO.: A
SCALE: AS NOTED | W.O. NO.: 13104.002.001 | SHT. ___ OF ___

G:\ACADPROJ\13104.002.001LANL\FINAL\3000.DWG



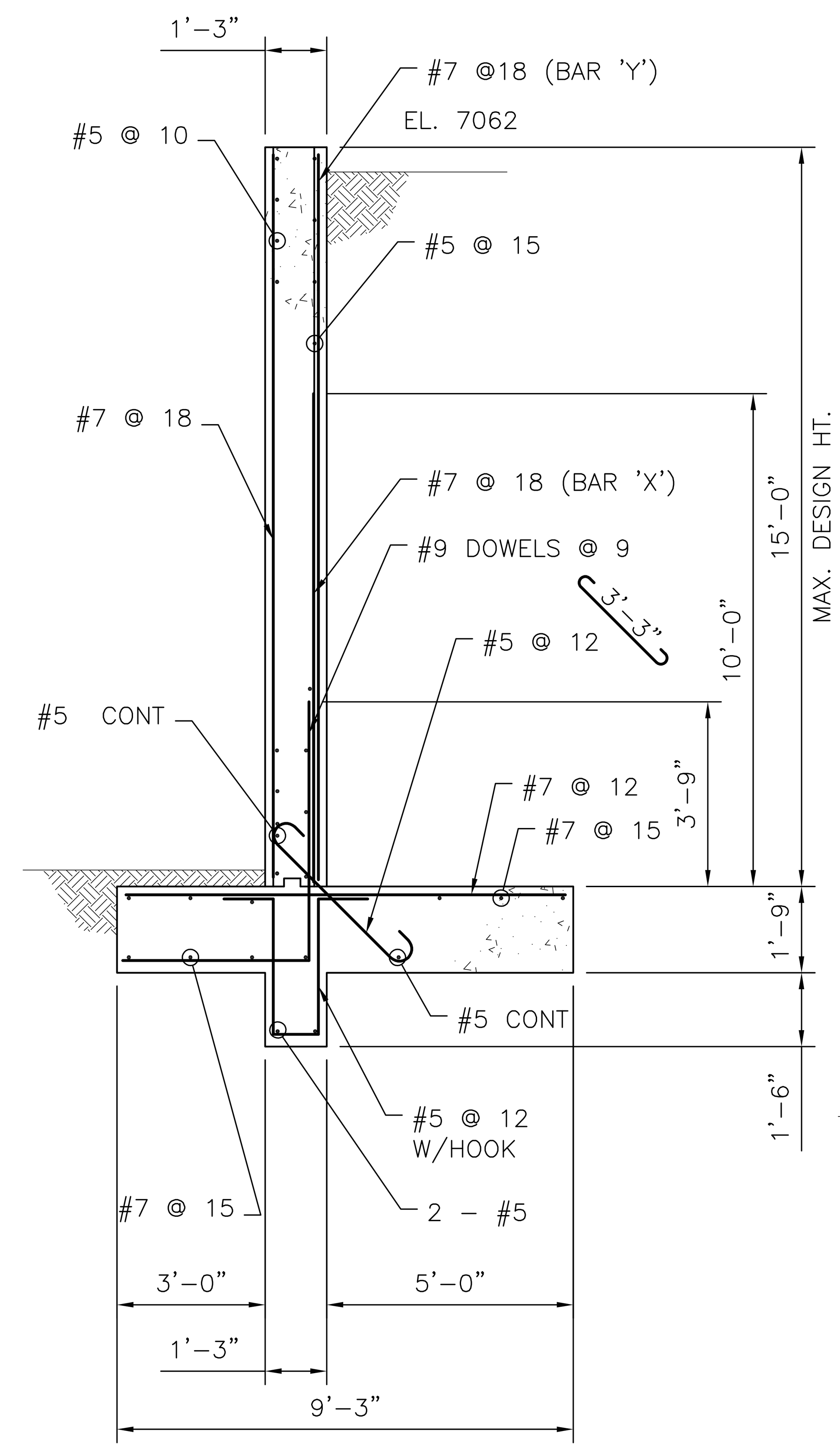
RETAINING WALL A

SCALE: 3/8"=1'-0"
SEE DWG. 3002 FOR KEY AND JOINT DETAILS



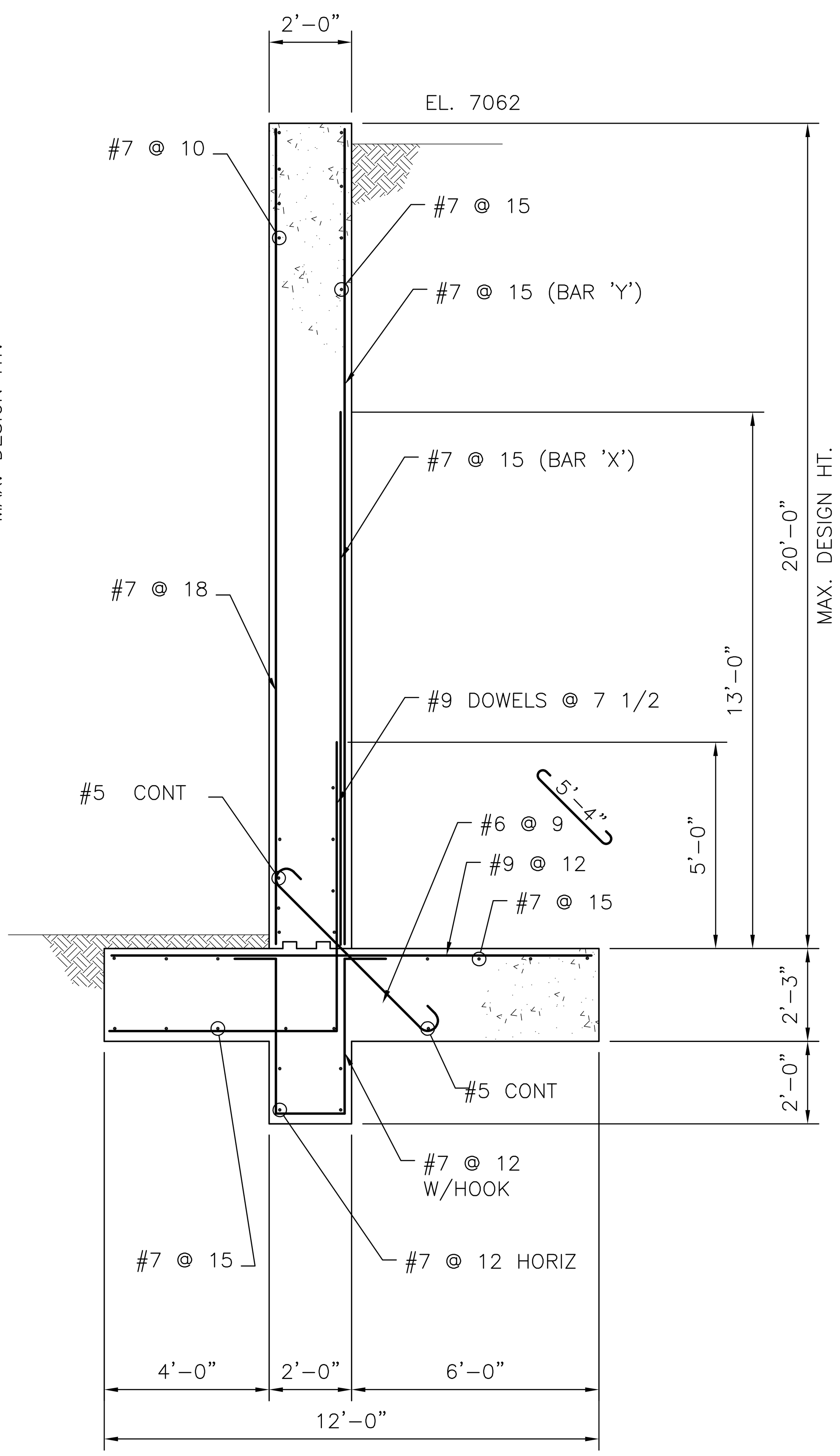
RETAINING WALL B

SCALE: 3/8"=1'-0"
SEE DWG. 3002 FOR KEY AND JOINT DETAILS



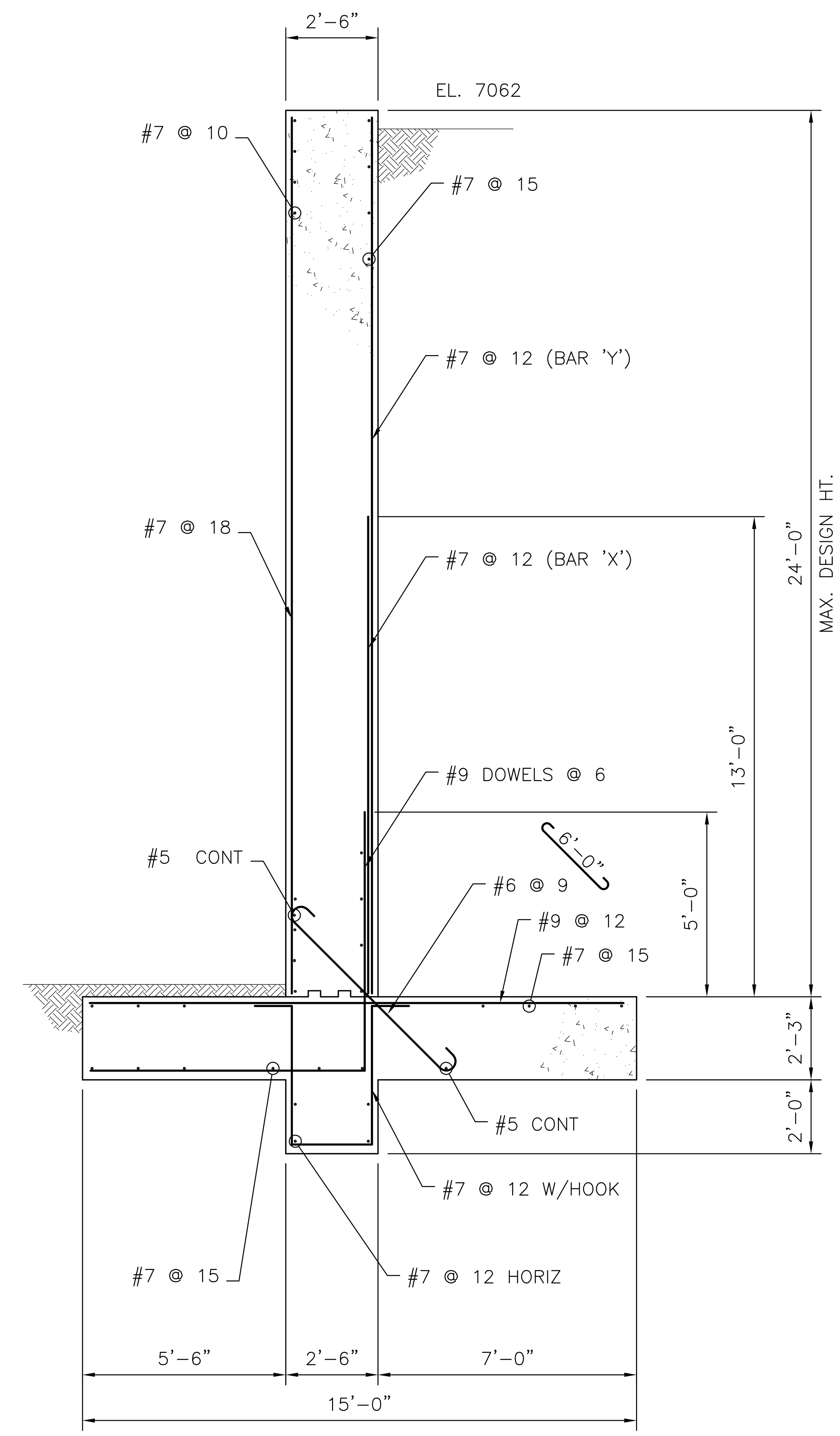
RETAINING WALL C

SCALE: 3/8"=1'-0"
SEE DWG. 3002 FOR KEY AND JOINT DETAILS



RETAINING WALL D

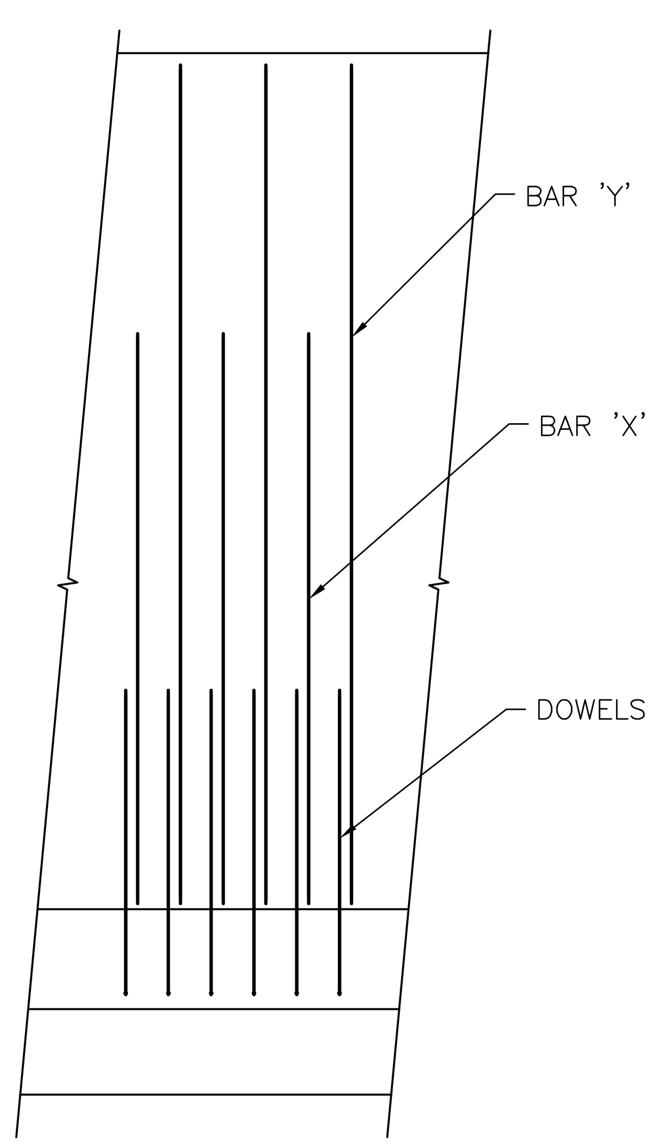
SCALE: 3/8"=1'-0"
SEE DWG. 3002 FOR KEY AND JOINT DETAILS



RETAINING WALL E

SCALE: 3/8"=1'-0"
SEE DWG. 3002 FOR KEY AND JOINT DETAILS

NOTE:
FOR ADDITIONAL RETAINING WALL DETAILS, SEE TYPICAL RETAINING WALL DETAIL, DWG. 3002.



ELEVATION BACK FACE RETAINING WALL
VERTICAL REBAR ARRANGEMENT

SCALE: NONE

1'-0" 3'-0"
0 2'-0" 4'-0"
3/8"=1'-0"

G:\ACADPROJ\13104.002.001LANL\FINAL\3001.DWG

NO.	DATE	APPR.	REVISION
A	3/20/06	BK	ISSUED FOR CONSTRUCTION
1	6/30/05	BK	FINAL ISSUED TO NMED FOR PERMIT REVIEW
0	6/2/05	AH	90% ISSUED TO DOE FOR REVIEW

LOS ALAMOS SITE OFFICE
TA-73 AIRPORT LANDFILLS
LOS ALAMOS NEW MEXICO

North Wind WESTON SOLUTIONS TEAM

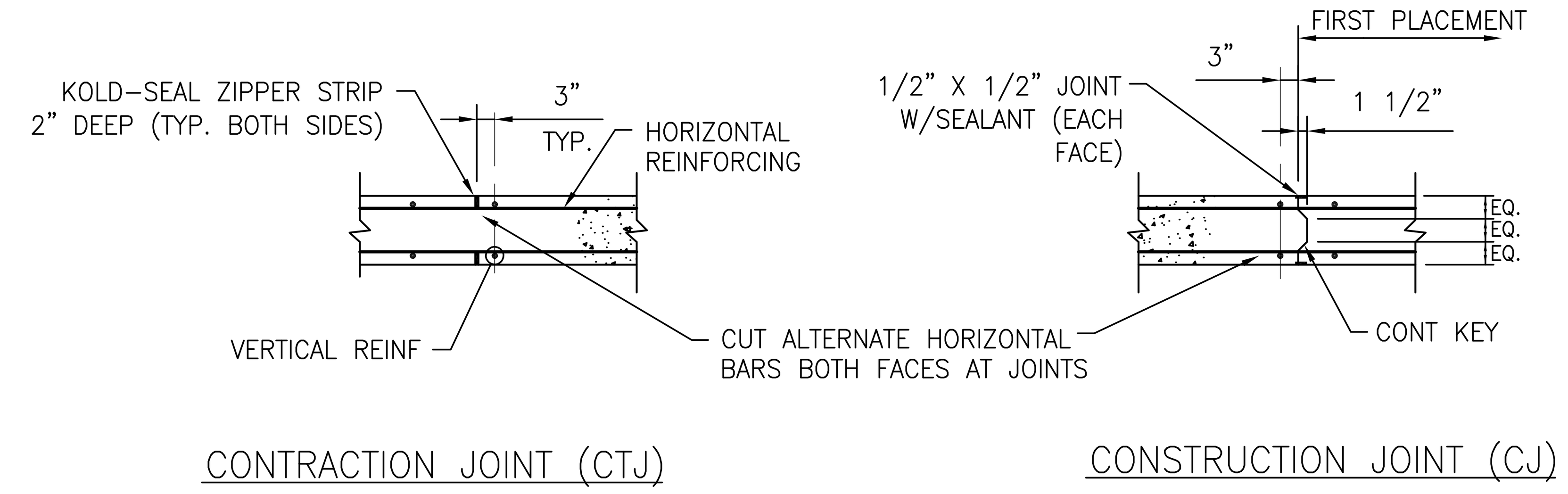
		DATE
CHECKED	JJF	6/22/05
DES. ENG.	JJF	6/22/05
PROJ. ENG.	AH	6/22/05
PROJ. MGR.	BK	6/22/05
APPROVED	BK	6/22/05
APPROVED		

CLIENT APPROVALS DATE

BERG KESHIAN JR. 8590 LICENSED PROFESSIONAL ENGINEER 3/20/06

STRUCTURAL WALL 1
SECTIONS

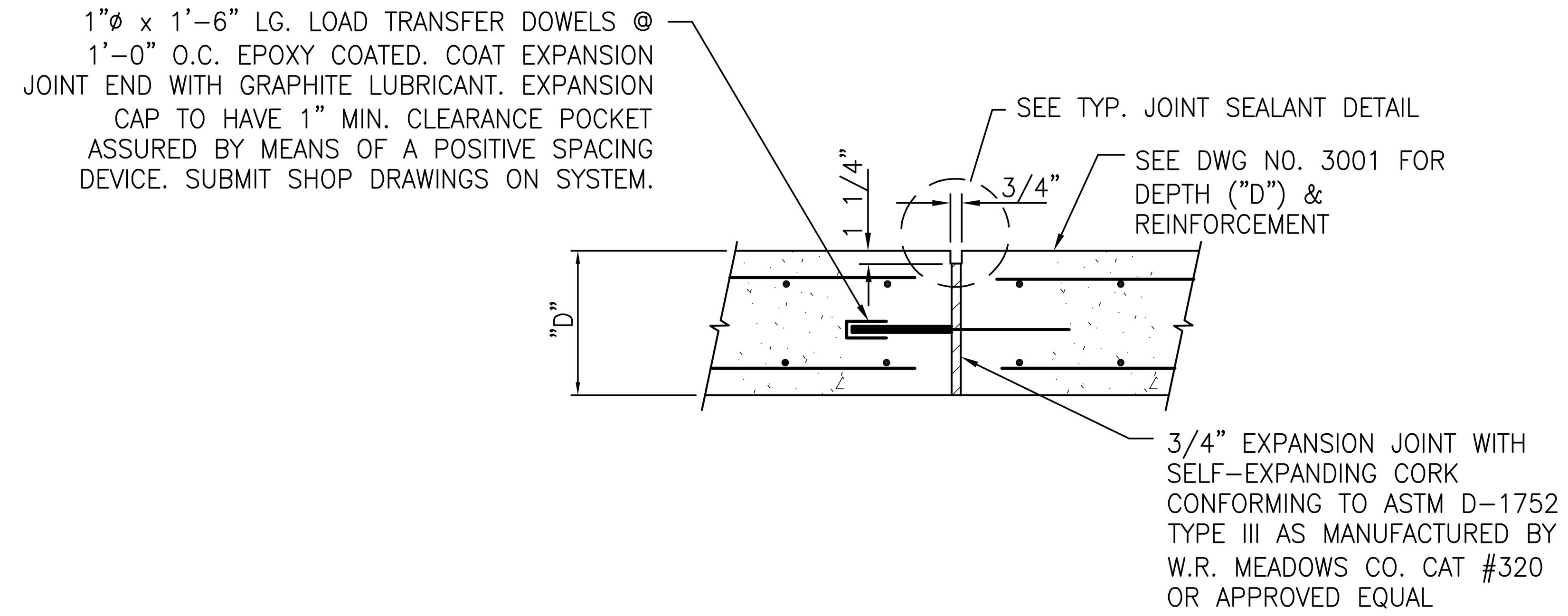
DRAWN	DATE	DWG. NO.	REV. NO.
JAS	02/06/04	3001	A
SCALE: AS NOTED	W.O. NO. 13104.002.001	SHT. ___ OF ___	



VERTICAL JOINT DETAIL – CONCRETE WALL

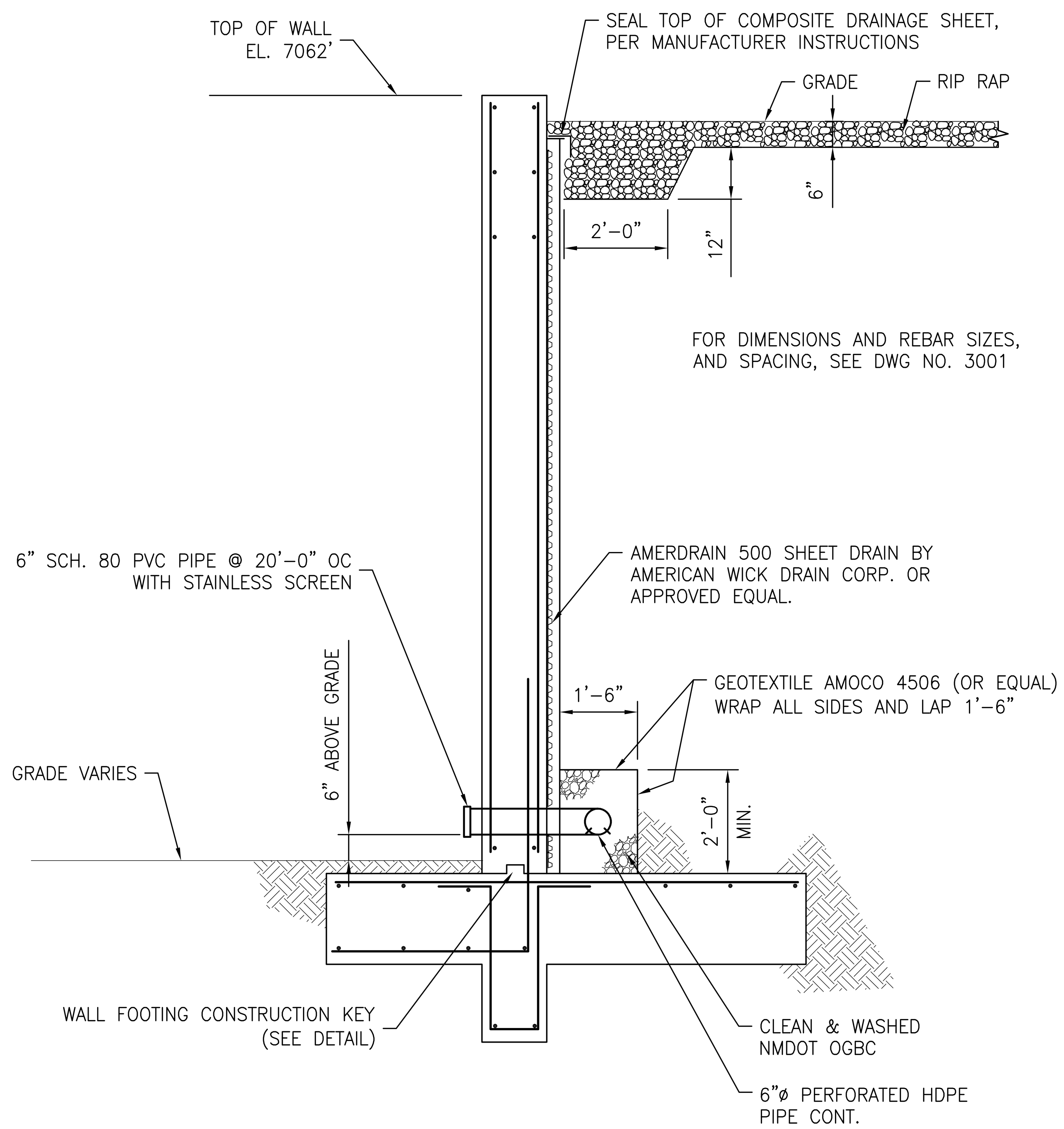
SCALE: NONE

NOTES:
1. PRIOR TO SECOND PLACEMENT OF WALL AT CONSTRUCTION JOINTS, ABRASIVE BLAST OR CHIP FIRST PLACEMENT FACE JOINT TO REMOVE LAITANCE, HONEY COMBING, ETC. CLEAN WITH WATER AND STIFF BRUSH WITH "WELD CRETE" OR EPOXY BONDING AGENT.



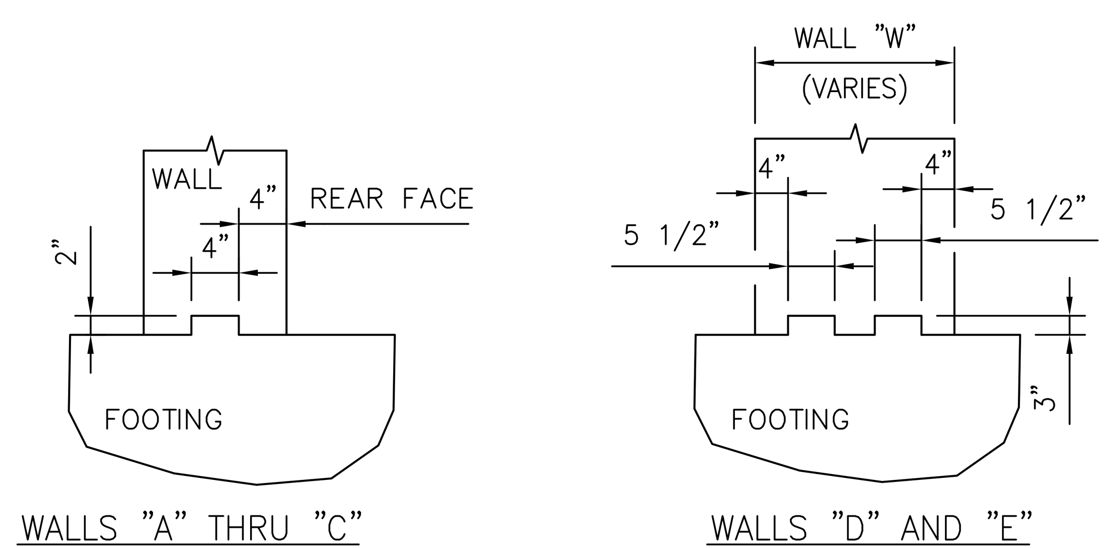
WALL CONTROL EXPANSION JOINT DETAIL (EJ)

SCALE: NONE



TYPICAL RETAINING WALL DETAIL

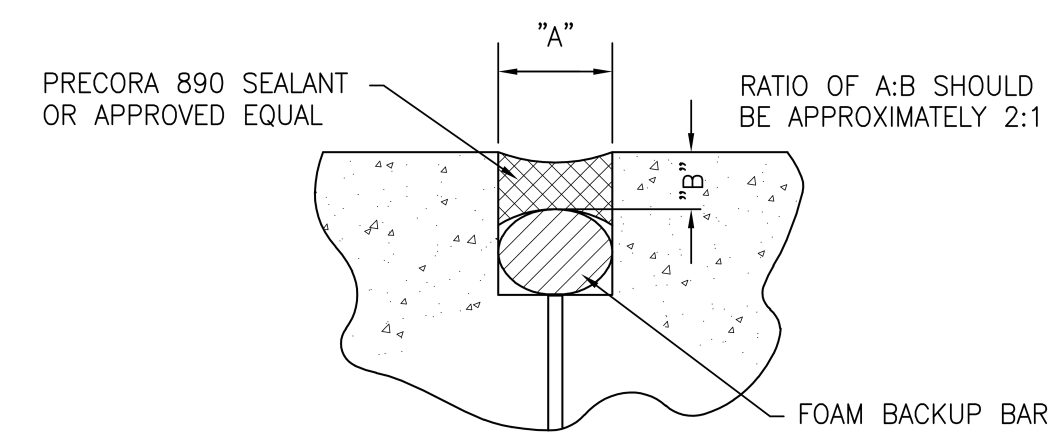
SCALE: NONE



TYPICAL WALL – FOOTING CONSTRUCTION KEYS

SCALE: NONE

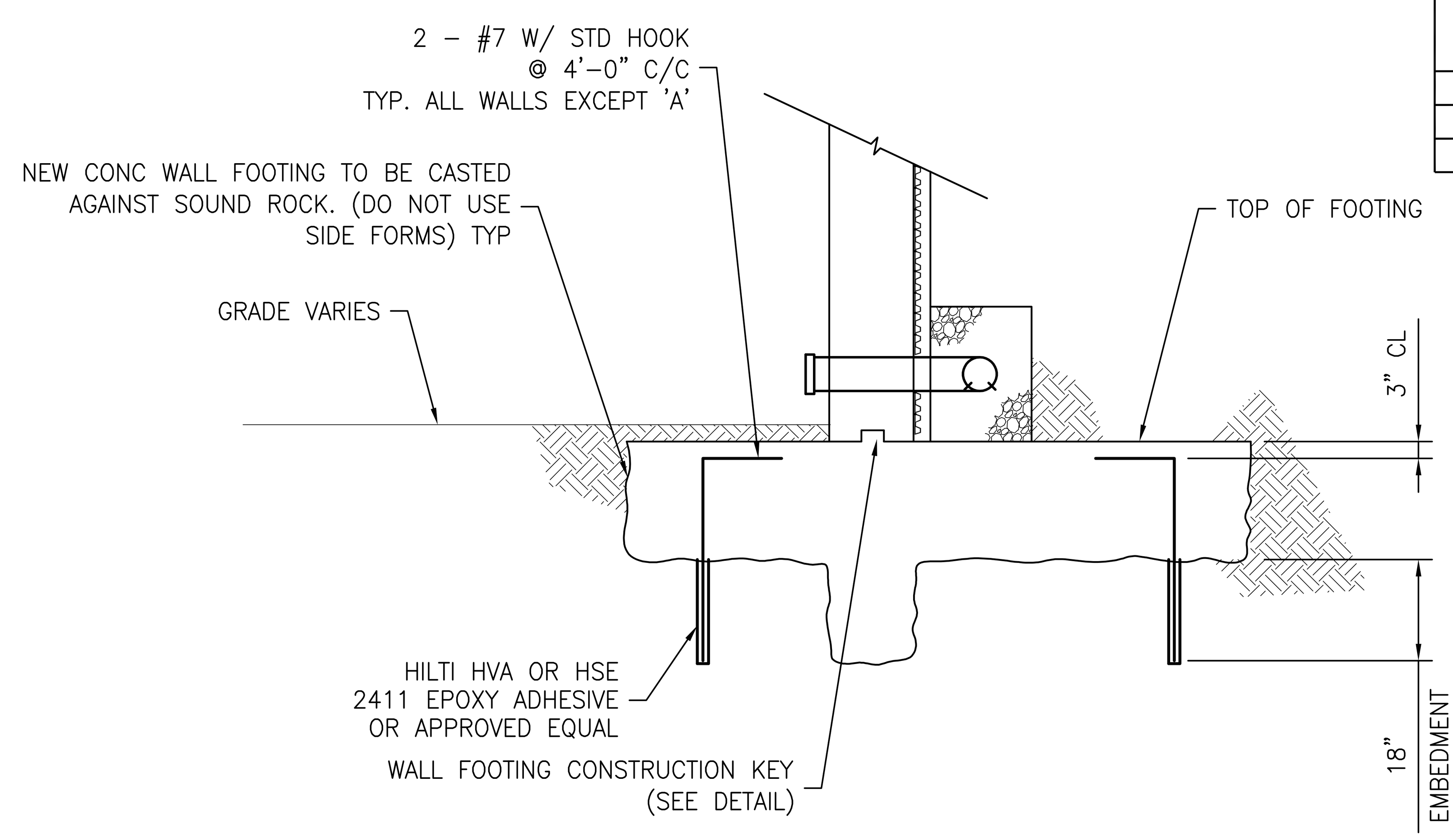
NOTES:
1. PRIOR TO SECOND PLACEMENT OF WALL AT CONSTRUCTION JOINTS, ABRASIVE BLAST OR CHIP FIRST PLACEMENT FACE JOINT TO REMOVE LAITANCE, HONEY COMBING, ETC. CLEAN WITH WATER AND STIFF BRUSH WITH "WELD CRETE" OR EPOXY BONDING AGENT.



JOINT SEALANT DETAIL

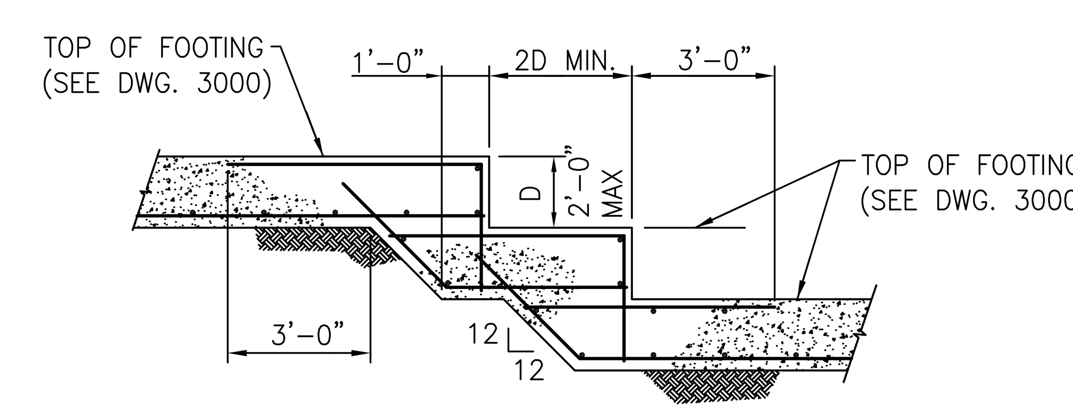
SCALE: NONE

REBAR LAP LENGTHS		
BAR SIZE	LAP LENGTH (HORIZONTAL)	LAP LENGTH (VERTICAL)
#5	3'-3"	3'-0"
#7	4'-3"	3'-9"
#9	5'-6"	4'-9"



TYPICAL FOOTING ROCK EMBEDMENT AND ANCHOR DETAIL

SCALE: NONE



A
3000 3002

VERTICAL JOINT DETAIL CONCRETE WALL

SCALE: NONE

NOTES:

DESIGN CRITERIA:

1.0 THE RETAINING WALL WAS DESIGN IN ACCORDANCE WITH IBC 2003, ASCE 7-02, AND ACI 318-02.

2.0 SECISMIC DESIGN CRITERIA:

2.1 SEISMIC USE GROUP: I
2.2 SEISMIC DESIGN CATEGORY: C
2.3 SDS = 0.40 (SHORT PERIOD)
2.4 SD1 = 0.12 (1 SEC. PERIOD)
2.5 SOIL SITE CLASS: B

CONCRETE NOTES:

1.0 CONCRETE & REINFORCEMENT STEEL

1.1 CONSTRUCTION SHALL CONFORM TO AMERICAN CONCRETE INSTITUTE (ACI) CODE 318-02.
1.2 CONCRETE STRENGTH SHALL BE A MINIMUM OF 3,000 P.S.I. (28 DAY COMPRESSIVE STRENGTH).
1.2.1 MAXIMUM WATER CEMENT RATIO 0.46 (lbs/lbs)
1.2.2 CEMENT FACTOR (BAGS/C.Y.) MIN. 7.00
1.2.3 SLUMP RANGE (INCHES) 1-3
1.2.4 ALL CONCRETE SHALL BE AIR ENTRAINED, AND SHALL HAVE AN AIR CONTENT OF 6% +/- 1%.
1.3 ALL EXPOSED CONCRETE SHALL HAVE AN "EARTH TONE" COLOR. SUBMIT SAMPLES FOR APPROVAL.

2.0 REINFORCEMENT SHALL BE NEW DEFORMED STEEL BARS HAVING A MINIMUM YIELD STRESS OF 60,000 P.S.I., IN ACCORDANCE WITH LATEST ASTM SPECIFICATION A615, GRADE 60, AND SUPPLEMENT S-1.

3.0 CONCRETE PROTECTION (COVER) FOR REINFORCEMENT SHALL BE AS FOLLOWS:

3.1.1 CAST AGAINST EARTH : 3 INCHES
3.1.2 FORMED SURFACE TO BE EXPOSED TO FLUID OR IN CONTACT WITH EARTH: 2 INCHES

4.0 AT SPLICES, BARS ARE TO BE LAPPED IN ACCORDANCE WITH ACI 318-02 AND THE TABLE SHOWN ON THIS DRAWING.

5.0 CONCRETE SHALL BE WET CURED FOR A MINIMUM OF SEVEN (7) DAYS. (THE USE OF AN APPROVED LIQUID MEMBANE-FORMING CURING COMPOUND IS PERMITTED).

6.0 THE PROTECTION OF CONCRETE DURING PLACEMENT IN EITHER COOL AND COLD WEATHER, OR HOT WEATHER SHALL MEET THE MINIMUM REQUIREMENTS OF ACI 318-02.

7.0 DO NOT BACKFILL UNTIL CONCRETE HAS CURED A MINIMUM OF SEVEN (7) DAYS. CONFIRM CONCRETE STRENGTH BY BREAK TEST.

GEOTECHNICAL NOTES:

1.0 ALL EXCAVATIONS SHALL BE COMPLETED IN COMPLIANCE WITH OSHA REQUIREMENTS FOR EXCAVATION (29 CFR PART 1926 SUBPART B).

2.0 THE BOTTOM OF FOUNDATIONS SHALL BE CARRIED A MINIMUM OF 2'-0" INTO COMPETENT ROCK.

3.0 BACKFILL SHALL BE PLACED AND COMPACTED IN ACCORDANCE WITH THE REQUIREMENTS OF SPECIFICATION SECTION 02200.

TOPOGRAPHICAL NOTES:

1.0 ALL DIMENSIONS AND GRADES SHOWN ON THE DRAWINGS SHALL BE FIELD VERIFIED PRIOR TO START OF CONSTRUCTION.

NO.	DATE	APPR.	REVISION
A	3/20/06	BK	ISSUED FOR CONSTRUCTION
2	2/22/06	BK	REVISED PER NMED COMMENTS
1	6/30/05	BK	FINAL ISSUED TO NMED FOR PERMIT REVIEW
0	6/2/05	AH	90% ISSUED TO DOE FOR REVIEW

LOS ALAMOS SITE OFFICE
TA-73 AIRPORT LANDFILLS
LOS ALAMOS NEW MEXICO

North Wind WESTON SOLUTIONS TEAM

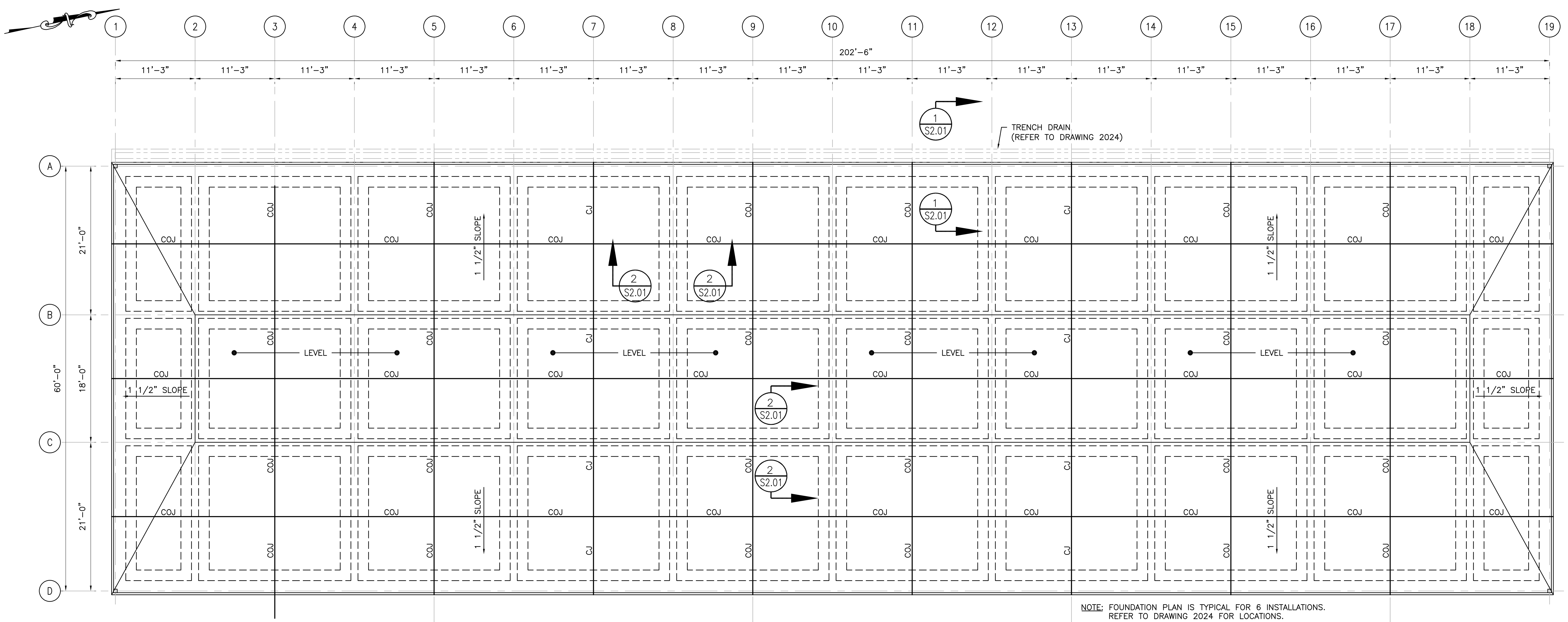
		DATE
CHECKED	JJF	6/22/05
DES. ENG.	JJF	6/22/05
PROJ. ENG.	AH	6/22/05
PROJ. MGR.	BK	6/22/05
APPROVED	BK	6/22/05
APPROVED		

CLIENT APPROVALS | DATE

STRUCTURAL WALL I DETAILS

DRAWN: JAS | DATE: 02/06/04 | DWG. NO. 3002 | REV. NO. A
SCALE: AS NOTED | W.O. NO. 13104.002.001 | SHT. ___ OF ___

G:\ACADPROJ\13104.002.001LANL\FINAL\3002.DWG



NOTE: FOUNDATION PLAN IS TYPICAL FOR 6 INSTALLATIONS. REFER TO DRAWING 2024 FOR LOCATIONS.

FOUNDATION PLAN

SCALE: 1/8" = 1'-0"

GENERAL NOTES:

1. CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS AND ELEVATIONS PRIOR TO COMMENCING WORK. CONTRACTOR SHALL NOTIFY ENGINEER IMMEDIATELY OF ANY DISCREPANCIES.

2. CONTRACTOR SHALL COMPLY WITH ALL FEDERAL, STATE AND LOCAL RULES AND REGULATIONS GOVERNING PERFORMANCE OF WORK.

3. DIMENSIONS ARE BASED UPON PRELIMINARY METAL BUILDING VENDOR PRINTS. CONTRACTOR TO COORDINATE WITH METAL BUILDING VENDOR TO OBTAIN FINAL CERTIFIED VENDOR PRINTS. NOTIFY ENGINEER OF ANY CHANGES FROM DESIGN DRAWING.

CONCRETE

1. ALL CONCRETE WORK SHALL BE IN ACCORDANCE WITH ACI 301 AND 318 LATEST EDITION.

2. ALL CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 4000 PSI AT 28 DAYS.

3. ALL CONCRETE TO CONTAIN 3% ENTRAINED AIR.

4. CONCRETE TO BE PLACED WITH MAXIMUM SLUMP OF 4 INCHES.

5. ALL REINFORCING BARS SHALL MEET THE REQUIREMENTS OF ASTM A-615, GRADE 60. DETAILING SHALL CONFORM TO ACI 315, LATEST EDITION.

6. ALL REINFORCING SPLICES SHALL BE IN ACCORDANCE WITH ACI 318. PLACE BARS AT CONSTRUCTION JOINTS AS DETAILED OR SPECIFICALLY APPROVED BY ENGINEER.

7. ALL EXPOSED CONCRETE PAD SURFACES SHALL BE CURED USING A "NON-RESIDUAL" LIQUID MEMBRANE CURING COMPOUND (L&M CURE MANUFACTURED BY L&M CONSTRUCTION CHEMICALS OR APPROVED EQUAL). AFTER CURING, APPLY CHEMICAL SEALER/HARDENER (SEALHARD MANUFACTURED BY L&M CONSTRUCTION CHEMICALS OR APPROVED EQUAL) TO PAD SURFACE. DO NOT APPLY TO AREAS WHICH RECEIVE COLUMN BASE PLATES.

8. PROVIDE 3/4" INCH CHAMFER ON ALL EXPOSED EDGES.

9. CONTRACTOR SHALL SUBMIT REINFORCING STEEL SHOP DRAWINGS FOR REVIEW AT LEAST 10 WORKING DAYS PRIOR TO FABRICATION.

10. BAR CHAIRS, HIGH CHAIRS, SUPPORT BARS AND ALL OTHER ACCESSORIES SHALL BE PROVIDED IN ACCORDANCE WITH ACI AND CRSI STANDARDS.

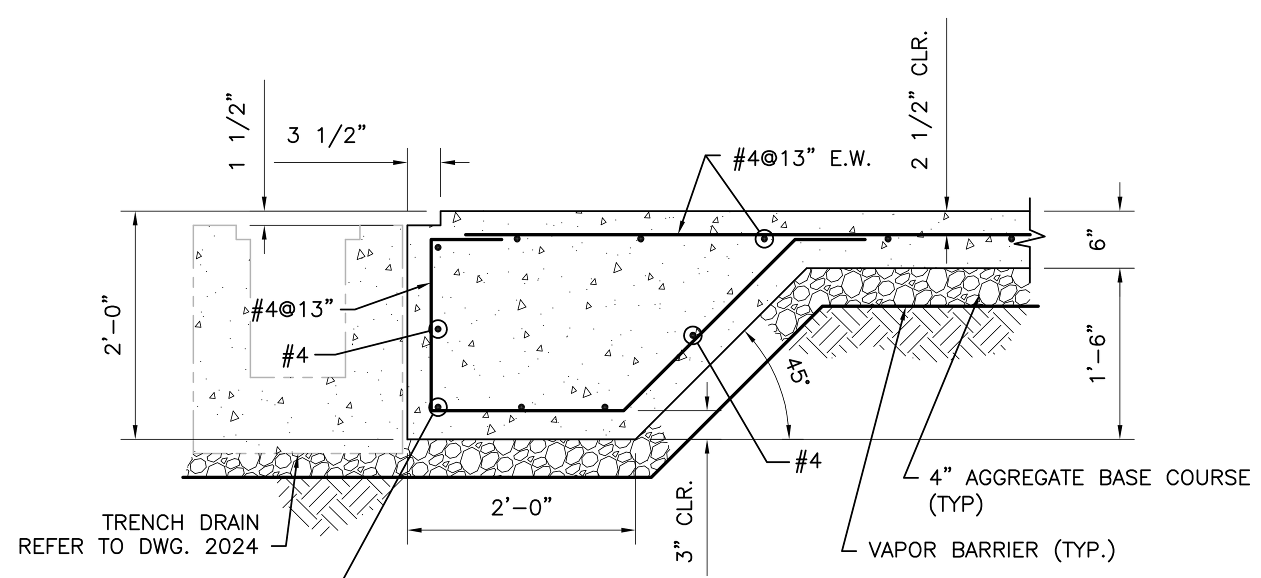
11. ALL CONCRETE SHALL RECEIVE A STEEL TROWEL FINISH.

12. ANCHOR BOLTS SHALL BE IN ACCORDANCE WITH ASTM A-307.

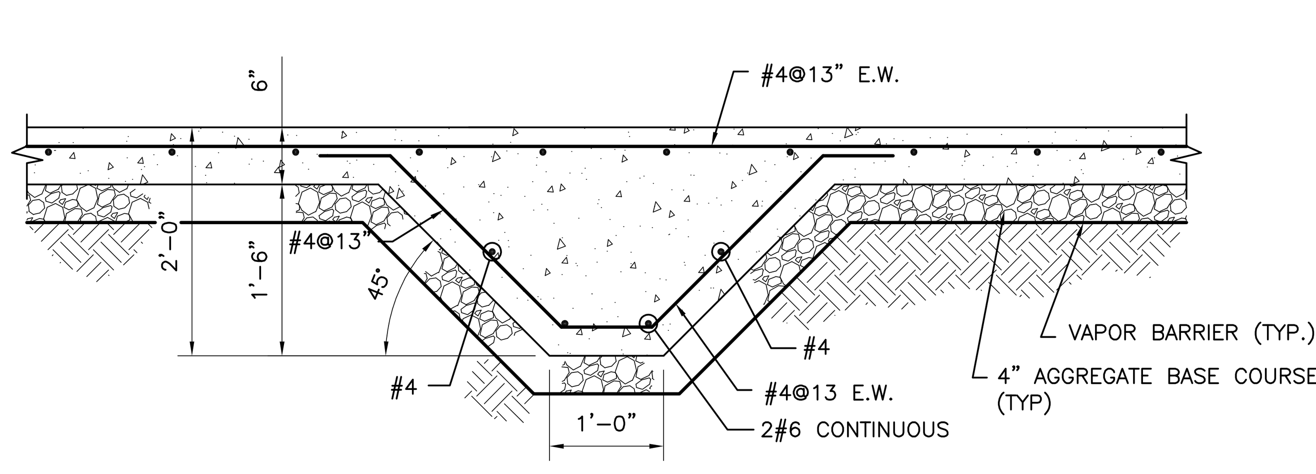
13. NONSHRINK GROUT SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 7000 PSI.

14. AGGREGATE BASE COURSE SHALL CONFORM TO NMDOT SPECIFICATIONS SECTION 304.21 FOR CLASS I BASE COURSE.

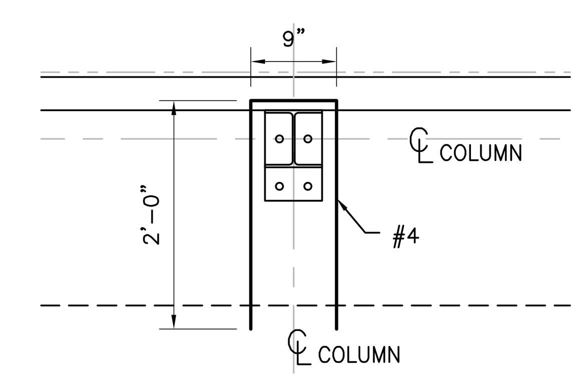
15. VAPOR BARRIER SHALL BE 6 MIL POLYETHYLENE SHEET COVERED WITH 10 OZ. (MIN.) NONWOVEN GEOTEXTILE. EXTEND VAPOR BARRIER 2 FEET (MIN.) BEYOND EDGE OF CONCRETE.



1 SECTION S-1 SCALE: 3/4"=1'-0"



2 SECTION S-1 SCALE: 3/4"=1'-0"



TYPICAL ENLARGED PLAN AT EXTERIOR COLUMN

SCALE: 3/4" = 1'-0"

ERECT-A-TUBE 8 UNIT N60-45 HANGAR

COLUMN REACTIONS

COLUMN	Vdown	Vup	±Hx	±Hy	DESCRIPTION
B.1, B.19, C.1, C.19	4.28	1.84	2.64	1.00	ENDWALL COLUMNS
B.2, B.18, C.2, C.18	12.83	6.32	4.37	3.05	FIRST INTERIOR COLUMNS
B.4, B.6, B.8, B.10, B.12, B.14, B.16 C.4, C.6, C.8, C.10, C.12, C.14, C.16	17.11	7.49	4.37	3.05	INTERIOR COLUMNS
A.1, D.19	5.76	1.94	1.42	1.52	CORNER COLUMNS
A.3, D.17	13.79	3.48	1.00	3.05	SINGLE DOOR COLUMNS
A.7, A.11, A.15, D.5, D.9, D.13	20.68	5.06	1.00	3.05	DOUBLE DOOR COLUMNS
A.19, D.1	10.68	2.98	1.42	1.52	CORNER/DOOR COLUMNS
FS	N/A	N/A	N/A	3.05	FLOOR SOCKETS

NOTES:

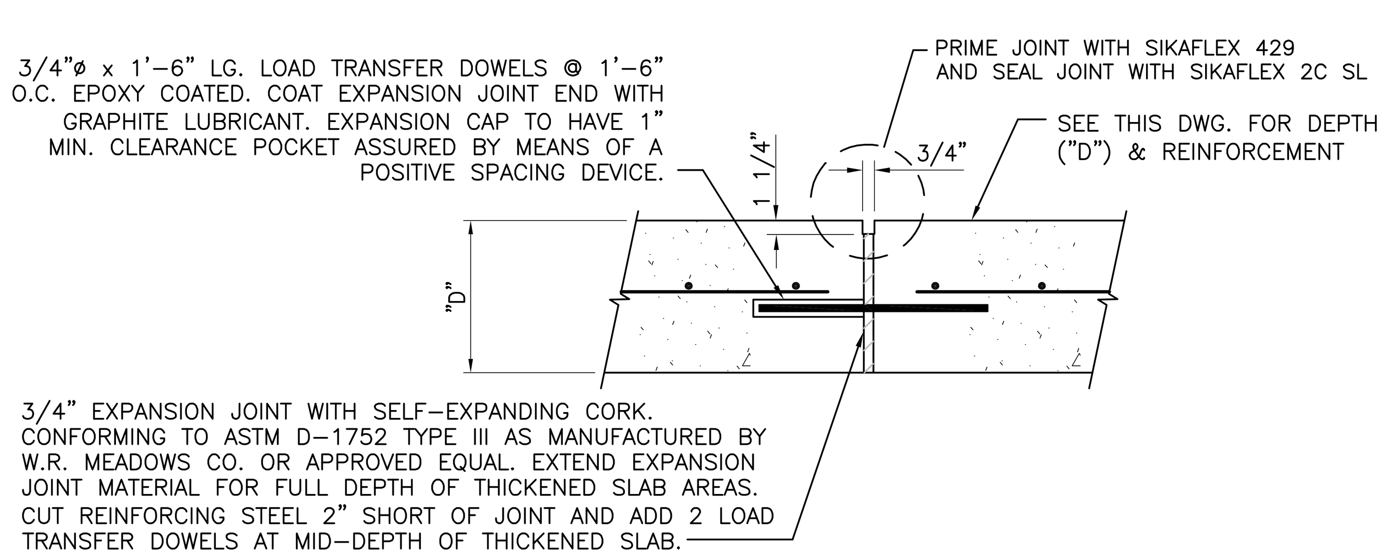
1. THE FOUNDATION HAS BEEN DESIGNED USING THE COLUMN REACTIONS INDICATED. IF THE FINAL COLUMN REACTIONS ARE DIFFERENT, THE ENGINEER SHALL BE NOTIFIED.

2. ALL REACTIONS ARE IN KIPS.

3. Vup, Hx AND Hy ARE DUE TO WIND LOAD.

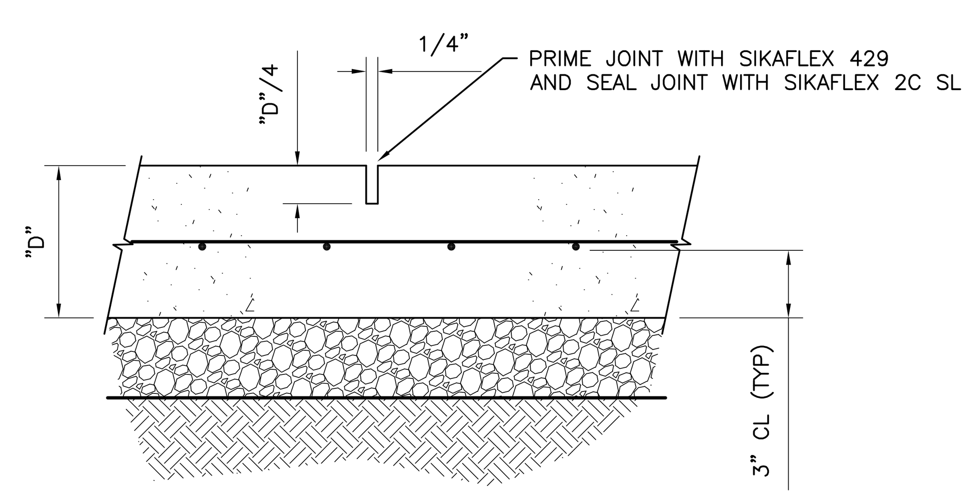
4. ALL HORIZONTAL REACTIONS CAN ACT IN POSITIVE OR NEGATIVE DIRECTION.

5. ALL COLUMN BASE PLATES ARE DESIGNED FOR FOUR 3/4" DIA. ANCHOR BOLTS, TO COMPLY WITH THE OSHA REGULATIONS OF MARCH 2003 FOR STEEL ERECTION.



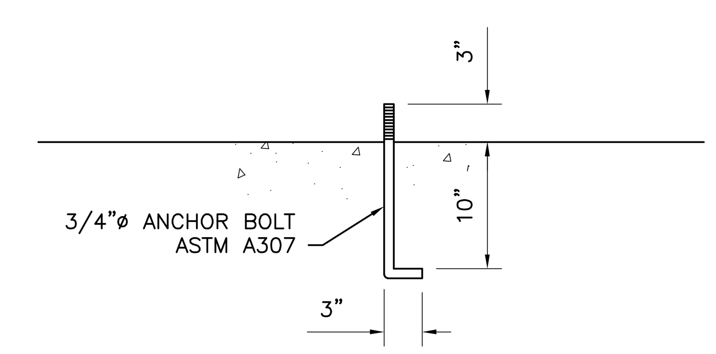
SLAB CONSTRUCTION/EXPANSION JOINT DETAIL (CJ)

SCALE: NONE



SLAB CONTROL JOINT DETAIL (COJ)

SCALE: NONE



NOTE: SEE METAL BUILDING VENDOR DRAWING FOR LOCATIONS.

ANCHOR BOLT DETAIL

SCALE: 1" = 1'-0"

NO.	DATE	APPR.	REVISION
A	04/20/06	BK	ISSUED FOR CONSTRUCTION, MODIFIED DWG. 2024, ADDED DWG. 3003

LOS ALAMOS SITE OFFICE

TA-73 AIRPORT LANDFILLS

LOS ALAMOS NEW MEXICO

North Wind WESTON SOLUTIONS TEAM

		DATE
CHECKED	FWS	4/19/06
DES. ENG.	TB	4/19/06
PROJ. ENG.	AH	4/19/06
PROJ. MGR.	BK	4/19/06
APPROVED	BK	4/19/06
APPROVED		

CLIENT APPROVALS DATE

BERG KESHIAN, JR. NEW MEXICO 8590 LICENSED PROFESSIONAL ENGINEER 4/20/06

HANGAR FOUNDATION

DRAWN A. SPANIER | DATE 4/11/06 | DWG. NO. 3003 | REV. NO. A

SCALE AS SHOWN | W.O. NO. 13104.002.001 | SHT. 1 OF 1

G:\ACADPROJ\13104.002.001LANL\FINAL\3003.DWG