VERDURA® RETAINING WALL STANDARD PLANS

NOTES

PART 1: GENERAL

1.01 DESCRIPTION

A. WORK SHALL CONSIST OF FURNISHING AND CONSTRUCTING A VERDURA SEGMENTAL RETAINING WALL SYSTEM IN ACCORDANCE WITH THESE SPECIFICATIONS AND IN CONFORMITY WITH THE LINES, GRADES, DESIGN AND DIMENSIONS SHOWN ON THESE PLANS.

B. WORK INCLUDES PREPARING FOUNDATION SOIL, FURNISHING AND INSTALLING LEVELING PAD. PLANTABLE SOIL UNIT FILL, AND BACKFILL TO THE LINES AND GRADES SHOWN ON THE CONSTRUCTION DRAWINGS.

C. WORK INCLUDES FURNISHING AND INSTALLING GEOSYNTHETIC SOIL REINFORCEMENT OF THE TYPE, SIZE, LOCATION, STRENGTH AND LENGTHS DESIGNATED ON THE CONSTRUCTION DRAWINGS.

D. WORK INCLUDES FURNISHING AND INSTALLING FOUNDATION DRAIN, SUBDRAIN AND OTHER WALL–RELATED DRAINAGE SYSTEMS THAT MAY BE SHOWN ON THE CONSTRUCTION DRAWINGS.

1.02 REFERENCED DOCUMENTS AND TEST METHODS

A. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

1) ASTM C–1372 SPECIFICATION FOR SEGMENTAL RETAINING WALL UNITS
2) ASTM D–6913 PARTICLE–SIZE DISTRIBUTION (GRADATION) OF SOILS
3) ASTM D–3080 DIRECT SHEAR TEST OF SOILS UNDER CONSOLIDATED DRAINED CONDITIONS
4) ASTM D–1557 LABORATORY COMPACTION CHARACTERISTICS OF SOIL MODIFIED PROCTOR
5) ASTM D–4318 LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX OF SOILS
6) ASTM D–4595 TENSILE PROPERTIES OF GEOTEXTILES – WIDE WIDTH STRIP
7) ASTM D–5262 UNCONFINED TENSION CREEP BEHAVIOR OF GEOSYNTHETICS
8) ASTM D–3034 POLYVINYL CHLORIDE PIPE (PVC)
9) ASTM D–4829 EXPANSION INDEX OF SOILS
10) ASTM C–140 STD. SPEC. FOR SAMPLING AND TESTING CONCRETE MASONRY UNITS
11) ASTM C–90 STD. SPEC. FOR SOLID LOAD BEARING CONCRETE MASONRY UNITS
12) ASTM D–4632 GRAB BREAKING LOAD AND ELONGATION OF GEOTEXTILES
14) ASTM D–4833 INDEX PUNCTURE RESISTANCE OF GEOTEXTILES
15) ASTM D–4491 WATER PERMEABILITY OF GEOTEXTILES BY PERMATIVITY
16) ASTM D–3786 HYDRAULIC BURSTING STRENGTH OF TEXTILE FABRICS

B. GEOSYNTHETIC RESEARCH INSTITUTE (GRI)

1) GRI–GG4–DETERMINATION OF LONG TERM DESIGN STRENGTH OF GEOGRIDS
2) GRI–GG5–DETERMINATION OF GEOGRID (SOIL) PULLOUT

C. U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION

1) AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, FIFTH EDITION (2010)
2. CALIFORNIA AMENDMENTS TO THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS (FOURTH EDITION), DATED SEPTEMBER 2010

1.03 SUBMITTALS/CERTIFICATION

A. REFER TO PROJECT REQUIREMENTS IN THE CONTRACT DOCUMENTS.

PART 2: PRODUCTS

2.01 MODULAR CONCRETE RETAINING WALL UNITS

A. MODULAR CONCRETE UNITS SHALL BE VERDURA, AS INDICATED IN TABLE 2.

B. MODULAR CONCRETE MATERIALS SHALL CONFORM TO THE REQUIREMENTS OF ASTM C1372 – STANDARD SPECIFICATIONS FOR SRW UNITS.

C. MODULAR CONCRETE UNITS SHALL CONFORM TO THE FOLLOWING STRUCTURAL AND GEOMETRIC REQUIREMENTS MEASURED IN ACCORDANCE WITH SECTION 1.03 AND OTHER APPROPRIATE REFERENCES:
* COMPRESSIBLE STRENGTH = 4000 PSI (27,000 KPA) MINIMUM AT 28 DAYS;
* MOISTURE ABSORPTION = 6% MAXIMUM FOR STANDARD WEIGHT AGGREGATES;
* BATTER = AS INDICATED IN TABLE 2.
* DIMENSIONAL TOLERANCES = ±1/8" (3mm) FROM NOMINAL UNIT DIMENSIONS (NOT INCLUDING EXPOSED AGGREGATE FACE TEXTURE), ±1/8" (3mm) UNIT HEIGHT – TOP AND BOTTOM PLANES.

2.02 GEOSYNTHETIC–CONCRETE BLOCK CONNECTORS

A. CONNECTORS SHALL BE 1 INCH (25.4 mm) DIAMETER OR GREATER SCHEDULE 80 PIPE OR EQUIVALENT AND MUST BE CAPABLE OF PROVIDING POSITIVE MECHANICAL INTERLOCK BETWEEN GEOSYNTHETIC SOIL REINFORCEMENT MATERIAL (GEOGRID) AND BLOCK.

B. CONNECTORS SHALL BE CAPABLE OF HOLDING THE GEOSYNTHETIC SOIL REINFORCEMENT IN THE PROPER DESIGN POSITION DURING GEOSYNTHETIC PRE–TENSIONING AND BACKFILLING PROCEDURES

2.03 BASE LEVELING PAD MATERIAL

A. REFER TO PROJECT REQUIREMENTS IN THE CONTRACT DOCUMENTS.

2.04 UNIT FILL

A. UNIT FILL SHALL CONSIST OF SOILS USED FOR WALL BACKFILL OR AS SPECIFIED WITHIN THE CONTRACT DOCUMENTS. UNIT FILL MATERIALS ARE DEFINED AS THOSE THAT ARE WITHIN THE BLOCK FACIA UNITS.

2.05 SOIL BACKFILL

A. REFER TO PROJECT REQUIREMENTS IN THE CONTRACT DOCUMENTS.

2.06 GEOGRID SOIL REINFORCEMENT

A. GEOSYNTHETIC REINFORCEMENT SHALL BE OF THE TYPE SHOWN ON THESE DESIGN PLANS. THE CONTRACTOR, OR THE SUPPLIER AS HIS AGENT, SHALL FURNISH THE GEOTECHNICAL ENGINEER OF RECORD WITH A CERTIFICATE OF COMPLIANCE CERTIFYING THAT THE GEOSYNTHETIC REINFORCEMENT COMPLIES WITH THIS SECTION OF THE SPECIFICATIONS, THE DRAWINGS AND THE DESIGN CALCULATIONS.

2.07 DRAINAGE PIPE

A. REFER TO PROJECT REQUIREMENTS IN THE CONTRACT DOCUMENTS.

2.08 FILTER FABRIC

A. REFER TO PROJECT REQUIREMENTS IN THE CONTRACT DOCUMENTS.

2.09 FILTER MATERIAL

A. REFER TO PROJECT REQUIREMENTS IN THE CONTRACT DOCUMENTS.

PART 3: EXECUTION

3.01 SURFACE CONDITIONS

A. REFER TO PROJECT REQUIREMENTS IN THE CONTRACT DOCUMENTS.

3.02 LAYOUT

A. REFER TO PROJECT REQUIREMENTS IN THE CONTRACT DOCUMENTS.

3.03 SUBSURFACE DRAINAGE SYSTEM INSTALLATION

A. REFER TO PROJECT REQUIREMENTS IN THE CONTRACT DOCUMENTS.

3.04 EXCAVATION

A. REFER TO PROJECT REQUIREMENTS IN THE CONTRACT DOCUMENTS.

3.05 BASE LEVELING PAD

A. REFER TO PROJECT REQUIREMENTS IN THE CONTRACT DOCUMENTS.

3.06 MODULAR UNIT INSTALLATION

A. FIRST COURSE OF UNITS SHALL BE PLACED ON THE LEVELING PAD AT THE APPROPRIATE LINES AND GRADES. MOLDED SURFACE OF MODULAR UNITS SHALL BE USED FOR ALIGNMENT. ALIGNMENT AND LEVEL SHALL BE CHECKED IN ALL DIRECTIONS AND ENSURE THAT ALL UNITS ARE IN FULL CONTACT WITH THE LEVELING PAD AND PROPERLY SEATED.

B. UNITS SHALL BE PLACED ON THE LEVELING PAD WITH A MAXIMUM DISTANCE OF 9 INCHES (228 mm) BETWEEN ADJACENT UNITS. THE SPACING BETWEEN UNITS INSTALLED IN CURVED REGIONS (CONCAVE OR CONVEX) MUST BE ADJUSTED ACCORDINGLY AND SUCH THAT THE RUNNING BOND LAYOUT IS MAINTAINED. THE RUNNING BOND LAYOUT IS ENSURING THAT THE STAGGERED BLOCKS SHALL BE CENTERED ON UNITS ABOVE AND BELOW. ALL BLOCK LAYOUT AND PLACEMENT SHALL BE IN ACCORDANCE WITH THESE PLANS AND PROJECT REQUIREMENTS IN THE CONTRACT DOCUMENTS.

C. MODULAR UNITS MAY BE INSTALLED HORIZONTALLY WITH RESPECT TO THE PROFILE WALL ALIGNMENT OR MAY BE MADE TO FOLLOW THE BOTTOM OF WALL CONTOURS ("RUN WITH THE GRADE"). WHERE BOTTOM OF WALL CONTOURS ARE USED TO SET THE FIRST ROW OF MODULAR BLOCKS, GRADES MAY NOT SLOPE MORE THAN 15% WITH RESPECT TO THE HORIZONTAL PLANE. REFER TO PROJECT REQUIREMENTS IN THE CONTRACT DOCUMENTS FOR ALIGNMENT.

D. PLACE UNIT FILL WITHIN AND BETWEEN WALL UNITS. OVERFILL AND COMPACT UNIT FILL WITH NON–MECHANICAL METHODS (IE. FOOT STOMPING, ETC.). UNIT FILL SHOULD BE FIRM. NO MINIMUM RELATIVE COMPACTION REQUIRED FOR THE UNIT FILL.

E. EXCESS UNIT FILL MUST BE SCREEDED (ROD–BOARDED) OFF TO DEVELOP A FLAT BASE UPON WHICH SUBSEQUENT UNITS CAN BE POSITIONED. SCREEDED SURFACE SHALL PARTIALLY EXPOSE RAIL OF BLOCK. IF UNIT FILL HAS SIGNIFICANT VOID SPACES FILL AND LEVEL AS REQUIRED.

F. IF GEOGRID IS REQUIRED AT THIS BLOCK COURSE, CLEAR UNIT FILL MATERIAL FROM NOTCH IN THE BLOCK AND INSTALL GEOGRID AS PER DETAILS AND SECTION 3.07 D OF THESE PLANS.

G. PLACE AND ALIGN NEXT BLOCK COURSE. MAXIMUM STACKED VERTICAL HEIGHT OF WALL UNITS PRIOR TO UNIT FILL AND REINFORCED SOIL PLACEMENT AND COMPACTION SHALL NOT EXCEED ONE COURSE. FOLLOW WALL ERECTION AND UNIT FILL CLOSELY WITH STRUCTURE BACKFILL.

3.07 GEOSYNTHETIC SOIL REINFORCEMENT INSTALLATION

A. GEOSYNTHETIC SOIL REINFORCEMENT SHALL BE ORIENTED WITH THE HIGHEST STRENGTH AXIS PERPENDICULAR TO THE WALL ALIGNMENT.

B. GEOSYNTHETIC SOIL REINFORCEMENT SHALL BE PLACED AT THE STRENGTHS, LENGTHS, AND ELEVATIONS SHOWN ON THESE DRAWINGS. WHERE GEOSYNTHETIC PLACEMENT ELEVATIONS VARY FROM FACING UNIT INCREMENTS, GEOSYNTHETIC ELEVATIONS MAY BE ADJUSTED UP OR DOWN BY 4 INCHES (101 mm).

C. WITHIN THE REINFORCED SOIL ZONE, THE GEOSYNTHETIC SOIL REINFORCEMENT SHALL BE LAID HORIZONTALLY ON COMPACTED FILL. THE GEOSYNTHETIC SOIL REINFORCEMENT SHALL BE LAID FLAT PRIOR TO ADDITIONAL FILL PLACEMENT.

D. ATTACH GEOSYNTHETIC REINFORCEMENT TO THE MODULAR BLOCK WALL UNITS IN ACCORDANCE WITH THE DETAILS OF THESE PLANS AND SPECIFICATIONS. PLACE GEOSYNTHETIC REINFORCEMENT OVERLAP SO THAT IT OVERHANGS THE FACE OF THE WALL. INSERT SOLID 1" DIA. SCHEDULE 80 PVC CONNECTOR PIPE INTO THE NOTCH IN THE BLOCK BELOW. OVERLAP THE GEOSYNTHETIC REINFORCEMENT ONTO THE PIPE AND STEP INTO PLACE TO SECURE THE OVERLAPPING GEOSYNTHETIC CONNECTION. PULL THE GEOSYNTHETIC OVERLAP TIGHT AND INSTALL NEXT BLOCK COURSE ON TOP TO HOLD GEOSYNTHETIC CONNECTION IN PLACE.

E. GEOSYNTHETIC SOIL REINFORCEMENT SHALL BE CONTINUOUS THROUGHOUT THE EMBEDDED LENGTH. SPLICED CONNECTIONS BETWEEN SHORTER PIECES OF GEOSYNTHETIC REINFORCEMENT TO MAKE LONGER PIECES WILL NOT BE PERMITTED.

3.08 REINFORCED BACKFILL PLACEMENT

A. REFER TO PROJECT REQUIREMENTS IN THE CONTRACT DOCUMENTS.

3.09 EROSION CONTROL

A. REFER TO PROJECT REQUIREMENTS IN THE CONTRACT DOCUMENTS.

3.10 AS–BUILT CONSTRUCTION TOLERANCES

A. VERTICAL ALIGNMENT: ±1.5 INCHES (37 mm) OVER ANY DISTANCE.

B. WALL BATTER: WITHIN 2 DEGREES OF DESIGN BATTER.

C. HORIZONTAL ALIGNMENT: ±1.5 INCHES (37 mm) OVER ANY 10 FT (3 M) DISTANCE.

D. CORNERS, BENDS, CURVES: ±1 FT (0.3 M) TO DESIGN LOCATIONS.

E. MAXIMUM HORIZONTAL GAP BETWEEN ERECTED UNITS SHALL BE 9 INCHES (228 mm).

F. FIELD INSPECTION AND TESTING SHALL BE PERFORMED PER PROJECT REQUIREMENTS IN THE CONTRACT DOCUMENTS.

3.11 FIELD QUALITY CONTROL

A. REFER TO PROJECT REQUIREMENTS IN THE CONTRACT DOCUMENTS.

TABLE 1 – REFERENCE DOCUMENTATION:

1.) VERDURA RETAINING WALL DESIGN PER LRFD, PROPRIETARY SRW RETAINING WALL SYSTEM SUBMITTAL FOR PRE–APPROVAL WITH CAL–TRANS PREPARED BY SOIL RETENTION DESIGNS INC. DATED: OCTOBER 22, 2010

TABLE 2 – VERDURA BLOCK PROPERTIES

Unit Type, Verdura	V40	V60
Unit Size, Rail Height, in. (mm)	7.75(197)	7.75(197)
Unit Size, Crown Height, in. (mm)	10.75(273)	10.75(273)
Unit Size, Width, in. (mm)	18(457)	18(457)
Unit Size, Depth, in. (mm)	12(305)	18(457)
Weight, (type.), lbs. (N)	82(365)	132(271)
Batter = (degrees from vertical)	14	14

TABLE 3 – SOIL STRENGTH REQUIREMENTS

MATERIAL	SHEAR STRENGTH	
	Friction Angle (°)	Cohesion(kPa)
*Reinforced Soil	34 MIN.	0
Retained Soil	30 MIN.	0
Foundation Soil	30 MIN.	0

* REINFORCED / INFILL SOIL SHALL SATISFY MINIMUM GRADATION AND PLASTICITY REQUIREMENTS OF THE CALTRANS SPECIAL PROVISIONS (AS NOTED BELOW)

SAND EQUILIVANT ≥ 30
PLASTICITY INDEX ≤ 6
SOIL ph FROM 4.5 TO 9

SIEVE	PARTICLE SIZE	PERCENT PASSING
2 INCH	50 mm	100
#4	4–75 mm	50–100
#40	425 um	0–30
#200	75 um	0–15

TABLE 4 – GEOSYNTHETIC REINFORCEMENT PROPERTIES

TEST METHOD	UNIT	MIRAGRID 8xT	MIRAGRID 20XT
Tensile Strength (at ultimate)	ASTM D6637 lbs/ft (kN/m)	7400 (108)	13705 (200)
Long Term Allowable Design Load	GRI GC–4 lbs/ft (kN/m)	3871 (56.5)	7169 (104.6)

DATE

CALL BEFORE YOU DIG USA 800-227-2600

SOIL RETENTION DESIGNS INC.
2501 STATE ST. CARLSBAD CA. 92008
PH: 800–346–7995 FAX: 760–960–6099

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	WALL #
XX	XXX	XX	XXX/XXX	XX

REGISTERED CIVIL ENGINEER — x/x/x DATE

x–x–x
PLANS APPROVAL DATE

The State of California or its officers or agents shall not be responsible for the accuracy or

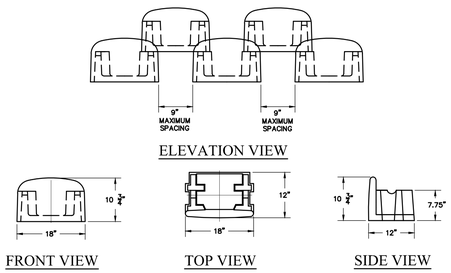
REGISTERED PROFESSIONAL ENGINEER — DANIEL A. OSBORNE — No. 64108 — EXP. 12/31/14 — CIVIL — STATE OF CALIFORNIA

CALTRANS STANDARD DETAILS

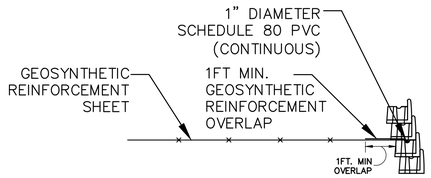
GENERAL NOTES

VERDURA® RETAINING WALL PLANS

1 OF 7 SHTS.

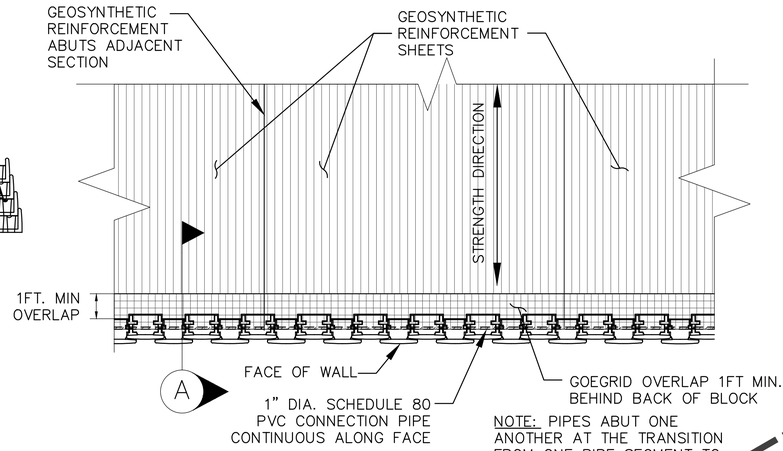


VERDURA 40 BLOCK DETAILS



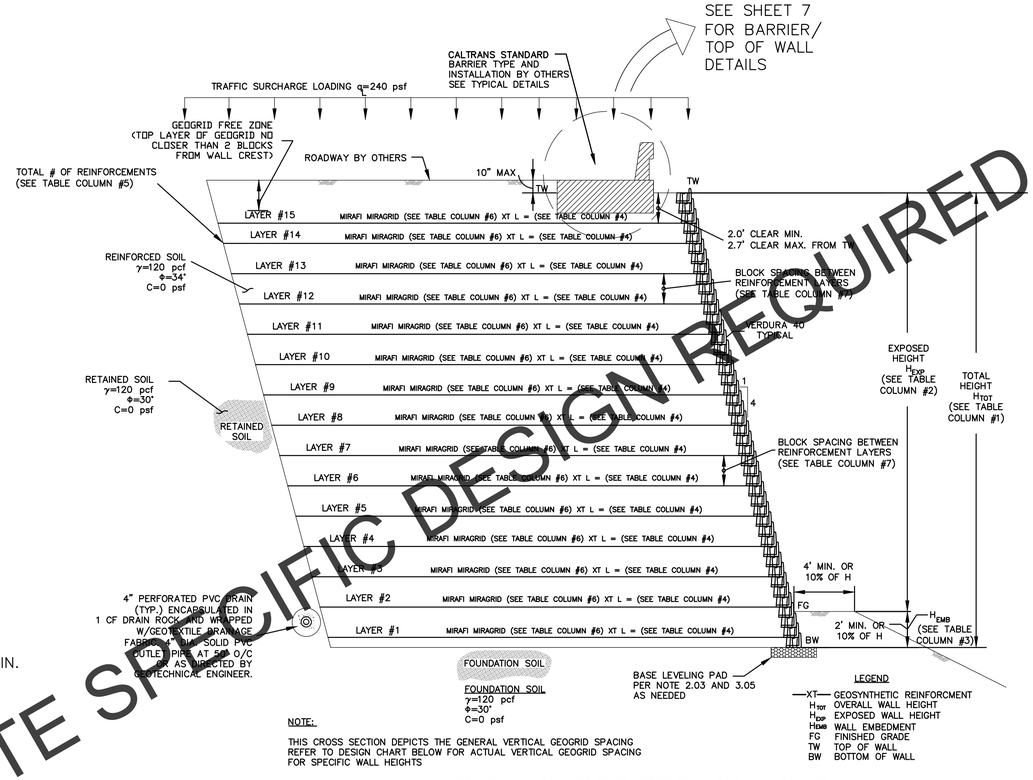
SECTION A

NOTE:
GEOSYNTHETIC REINFORCEMENT OVERLAP SHALL BE ON TOP.



NOTE: PIPES ABUT ONE ANOTHER AT THE TRANSITION FROM ONE PIPE SEGMENT TO THE NEXT PIPE SEGMENT.

PLAN VIEW



NOTE:
THIS CROSS SECTION DEPICTS THE GENERAL VERTICAL GEOGRID SPACING REFER TO DESIGN CHART BELOW FOR ACTUAL VERTICAL GEOGRID SPACING FOR SPECIFIC WALL HEIGHTS

TYPICAL CROSS SECTION - CASE I

VERDURA GEOGRID CONNECTION DETAIL

CASE 1 DESIGN CHART– VERDURA®40 RETAINING WALL– LEVEL TOP WITH TRAFFIC SURCHARGE AND BARRIER										
COLUMN #1	COLUMN #2	COLUMN #3	COLUMN #4	COLUMN #5	COLUMN #6 GEOGRID REINFORCEMENT TYPE		COLUMN #7 BLOCK SPACING BETWEEN REINFORCEMENT LAYER NUMBER			
TOTAL HEIGHT H TOT (FT)	EXPOSED HEIGHT H' (FT)	EMBEDED DEPTH H EMB (FT)	REINFORCEMENT LENGTH L (FT)	NUMBER OF REINFORCEMENT LAYERS	MIRAGRID 8XT GEOGRID PER LAYER NUMBER	MIRAGRID 20XT GEOGRID PER LAYER NUMBER	1 BLOCK SPACING	2 BLOCK SPACING	3 BLOCK SPACING	FROM THE CREST
< 6	4 OR LESS	2	8	(MINIMUM 2)	ALL LAYERS	N/A	LAYER #1	N/A	LAYER #2	MAXIMUM 4 COURSES
8	6	2	8	4	ALL LAYERS	N/A	LAYER #1	LAYER #4	LAYERS #2 THROUGH #3	MAXIMUM 4 COURSES
10	8	2	8	5	ALL LAYERS	N/A	LAYER #1	LAYER #5	LAYERS #2 THROUGH #4	MAXIMUM 4 COURSES
12	10	2	9	6	ALL LAYERS	N/A	LAYER #1	LAYER #6	LAYERS #2 THROUGH #5	MAXIMUM 4 COURSES
14	12	2	9.8	7	ALL LAYERS	N/A	LAYER #1	LAYER #7	LAYERS #2 THROUGH #6	MAXIMUM 4 COURSES
16	14	2	11.2	8	ALL LAYERS	N/A	LAYER #1	LAYER #8	LAYERS #2 THROUGH #7	MAXIMUM 4 COURSES
18	16	2	12.6	9	ALL LAYERS	N/A	LAYER #1	LAYER #9	LAYERS #2 THROUGH #8	MAXIMUM 4 COURSES
20	18	2	14	10	ALL LAYERS	N/A	LAYER #1	LAYER #10	LAYERS #2 THROUGH #9	MAXIMUM 4 COURSES
22	19.8	2.2	15.4	11	ALL LAYERS	N/A	LAYER #1	LAYER #11	LAYERS #2 THROUGH #10	MAXIMUM 4 COURSES
24	21.6	2.4	16.8	12	LAYERS #3 THROUGH #12	LAYERS #1 & #2	LAYER #1	LAYER #12	LAYERS #2 THROUGH #11	MAXIMUM 4 COURSES
26	23.4	2.6	18.2	13	LAYERS #4 THROUGH #13	LAYERS #1 THROUGH #3	LAYER #1	LAYER #13	LAYERS #2 THROUGH #12	MAXIMUM 4 COURSES
28	25.2	2.8	19.6	14	LAYERS #5 THROUGH #14	LAYERS #1 THROUGH #4	LAYER #1	LAYER #14	LAYERS #2 THROUGH #13	MAXIMUM 4 COURSES
30	27	3.0	21	15	LAYERS #6 THROUGH #15	LAYERS #1 THROUGH #5	LAYER #1	LAYER #15	LAYERS #2 THROUGH #14	MAXIMUM 4 COURSES

NOTE: FOR WALLS GREATER THAN 30' SEE MAXIMUM 30'–40' TOTAL HEIGHT DESIGN

NOTES:

1) GEOGRID LENGTHS ARE MEASURED FROM THE POINT OF CONNECTION
2) ALL IRRIGATION LINES ARE TO BE INSTALLED ALONG THE FACE OF THE WALL. REFER TO PROJECTS REQUIREMENTS WITHIN THE CONSTRUCTION DOCUMENTS FOR IRRIGATION DETAILS

DESIGN NOTES:

1) FOR DESIGN WALL HEIGHTS NOT DEPICTED IN THE TABLE USE LARGER WALL HEIGHT DESIGN CASE FROM THE TABLE. EXAMPLE: FOR A 12.1 FT WALL USE THE 14 FT DESIGN CASE.
2) WHERE THE MINIMUM NUMBER OF REQUIRED GEOGRIDS FOR THE LARGER WALL HEIGHT DESIGN DOES NOT FIT WITHIN THE DESIGN WALL HEIGHT, USE A CLOSER GEOGRID SPACING AS NECESSARY TO FIT ALL REQUIRED GEOGRIDS WITHIN THE DESIGN HEIGHT.
3) TOTAL HEIGHT DESIGN IN COLUMN #1 ACCOMMODATES BARRIER AND SURCHARGE LOADING. ROAD GRADE ELEVATION EQUALS TW ELEVATION+10" MAX.

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DATE

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SOIL RETENTION DESIGNS INC.
2501 STATE ST. CARLSBAD CA. 92008
PH: 800–346–7995 FAX: 760–960–6099

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	WALL #
XX	XXX	XX	XXX/XXX	XX

REGISTERED CIVIL ENGINEER — x/x/x DATE

X–X–X
PLANS APPROVAL DATE

The State of California or its officers or agents shall not be responsible for the accuracy or

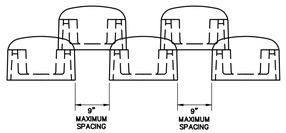
REGISTERED PROFESSIONAL ENGINEER DARIEN A. OSBORNE No. 64108 EXP.12/31/14 CIVIL STATE OF CALIFORNIA

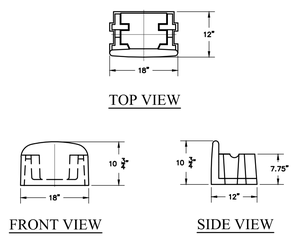
CALTRANS STANDARD DETAILS

CASE I DESIGN MAXIMUM 30' TOTAL HEIGHT

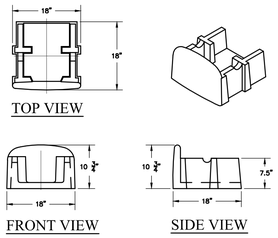
VERDURA® RETAINING WALL PLANS

2 OF 7 SHTS.

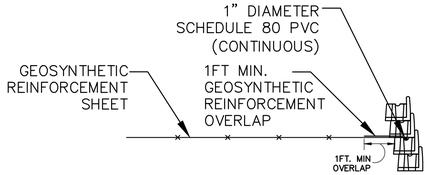




VERDURA 40 BLOCK DETAILS

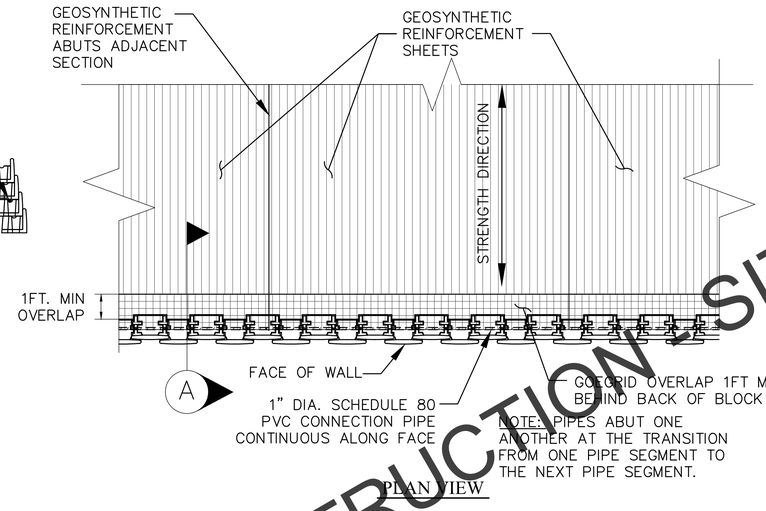


VERDURA 60 BLOCK DETAILS



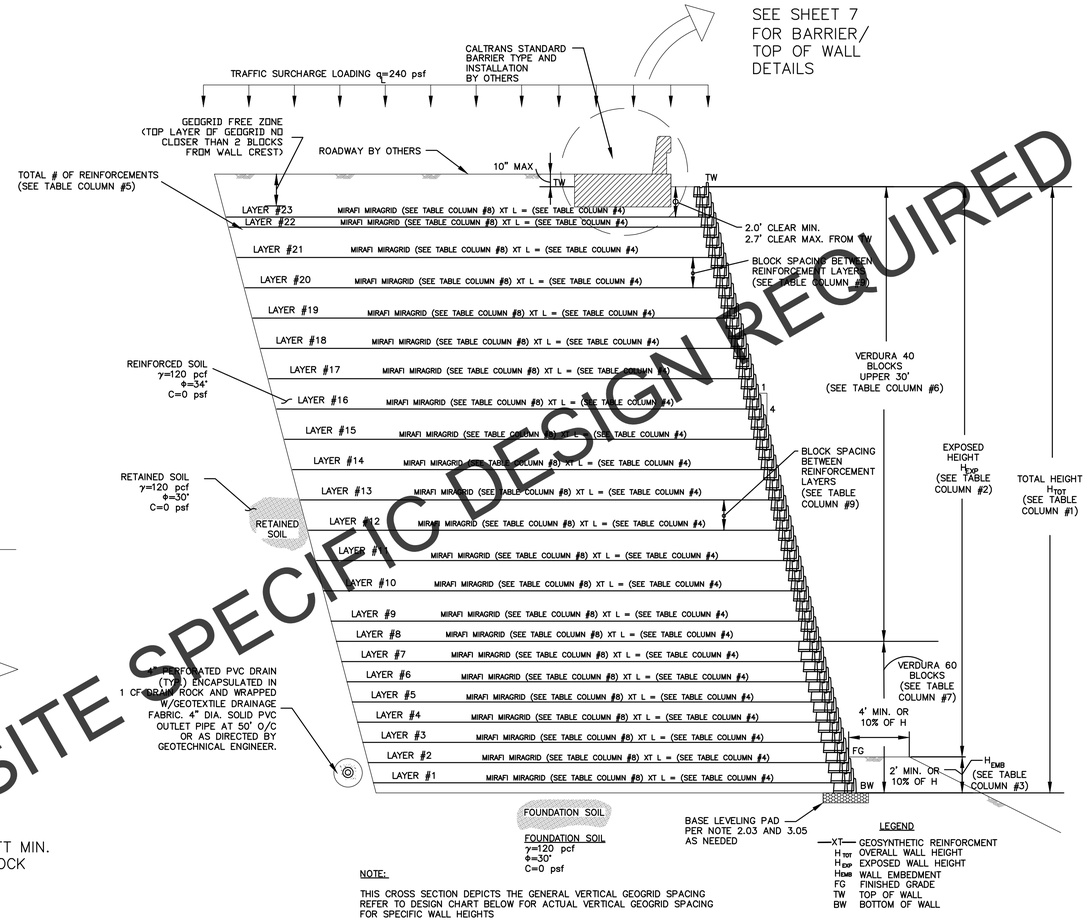
SECTION A

NOTE:
GEOSYNTHETIC REINFORCEMENT OVERLAP SHALL BE ON TOP.



PLAN VIEW

VERDURA GEOGRID CONNECTION DETAIL



NOTE:
THIS CROSS SECTION DEPICTS THE GENERAL VERTICAL GEOGRID SPACING
REFER TO DESIGN CHART BELOW FOR ACTUAL VERTICAL GEOGRID SPACING
FOR SPECIFIC WALL HEIGHTS

TYPICAL CROSS SECTION - CASE I

CASE 1 DESIGN CHART® VERDURA 40/60 RETAINING WALL– LEVEL TOP WITH TRAFFIC SURCHARGE AND BARRIER

COLUMN #1	COLUMN #2	COLUMN #3	COLUMN #4	COLUMN #5	COLUMN #6	COLUMN #7	COLUMN #8 GEOGRID REINFORCEMENT TYPE			COLUMN #9 BLOCK SPACING BETWEEN REINFORCEMENT LAYER NUMBER			
TOTAL HEIGHT Htot (FT)	EXPOSED HEIGHT H' (FT)	EMBEDED DEPTH H EMB (FT)	REINFORCEMENT LENGTH (FT)	NUMBER OF REINFORCEMENT LAYERS	HEIGHT OF VERDURA 40 BLOCKS (FT)	HEIGHT OF VERDURA 60 BLOCKS (FT)	MIRAGRID 8XT GEOGRID PER LAYER (#) W/ V40 BLOCK	MIRAGRID 20XT GEOGRID PER LAYER (#) W/ V40 BLOCK	MIRAGRID 20XT GEOGRID PER LAYER (#) W/ V60 BLOCK	1 BLOCK SPACING	2 BLOCK SPACING	3 BLOCK SPACING	FROM THE CREST
32	28.8	3.2	22.4	17	30	2	LAYERS #8 THROUGH #17	LAYERS #3 THROUGH #7	LAYERS #1 & #2	LAYERS #1 & #17	LAYERS #2 & #3	LAYERS #4 THROUGH #16	MAXIMUM 4 COURSES
34	30.6	3.4	23.8	18	30	4	LAYERS #9 THROUGH #18	LAYERS #4 THROUGH #8	LAYERS #1 THROUGH #3	LAYER #1	LAYERS #2 THROUGH #4 & #18	LAYERS #5 THROUGH #17	MAXIMUM 4 COURSES
36	32.4	3.6	25.2	20	30	6	LAYERS #11 THROUGH #20	LAYERS #6 THROUGH #10	LAYERS #1 THROUGH #5	LAYERS #1 & #20	LAYERS #2 THROUGH #6	LAYERS #7 THROUGH #19	MAXIMUM 4 COURSES
38	34.2	3.8	26.6	21	30	8	LAYERS #12 THROUGH #21	LAYERS #7 THROUGH #11	LAYERS #1 THROUGH #6	LAYER #1	LAYERS #2 THROUGH #8 & #21	LAYERS #9 THROUGH #20	MAXIMUM 4 COURSES
40	36	4.0	28	23	30	10	LAYERS #14 THROUGH #23	LAYERS #9 THROUGH #13	LAYERS #1 THROUGH #8	LAYERS #1 & #23	LAYERS #2 THROUGH #9	LAYERS #10 THROUGH #22	MAXIMUM 4 COURSES

NOTE: FOR WALLS LESS THAN 30.1' SEE MAXIMUM 30' TOTAL HEIGHT DESIGN

NOTES:

1) GEOGRID LENGTHS ARE MEASURED FROM THE POINT OF CONNECTION
2) ALL IRRIGATION LINES ARE TO BE INSTALLED ALONG THE FACE OF THE WALL. REFER TO PROJECTS REQUIREMENTS WITHIN THE CONSTRUCTION DOCUMENTS FOR IRRIGATION DETAILS

DESIGN NOTES:

1) FOR DESIGN WALL HEIGHTS NOT DEPICTED IN THE TABLE USE LARGER WALL HEIGHT DESIGN CASE FROM THE TABLE. EXAMPLE: FOR A 12.1 FT WALL USE THE 14 FT DESIGN CASE.
2) WHERE THE MINIMUM NUMBER OF REQUIRED GEOGRIDS FOR THE LARGER WALL HEIGHT DESIGN DOES NOT FIT WITHIN THE DESIGN WALL HEIGHT, USE A CLOSER GEOGRID SPACING AS NECESSARY TO FIT ALL REQUIRED GEOGRIDS WITHIN THE DESIGN HEIGHT.
3) TOTAL HEIGHT DESIGN IN COLUMN #1 ACCOMMODATES BARRIER AND SURCHARGE LOADING. ROAD GRADE ELEVATION EQUALS TW ELEVATION+10" MAX.

DATE

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SOIL RETENTION
DESIGNS INC.
2501 STATE ST. CARLSBAD CA. 92008
PH: 800-346-7995 FAX: 760-960-6099

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	WALL #
XX	XXX	XX	XXX/XXX	XX

REGISTERED CIVIL ENGINEER — x/x/x DATE

X-X-X
PLANS APPROVAL DATE

The State of California or its officers or agents shall not be responsible for the accuracy or

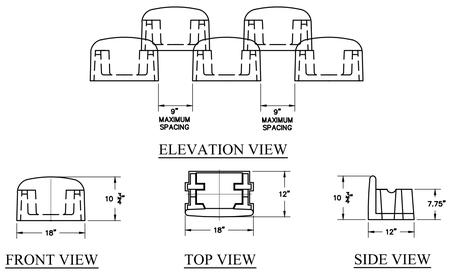
REGISTERED PROFESSIONAL ENGINEER
DARIEN A. OSBORNE
No. 64108
EXP.12/31/14
CIVIL
STATE OF CALIFORNIA

CALTRANS STANDARD DETAILS

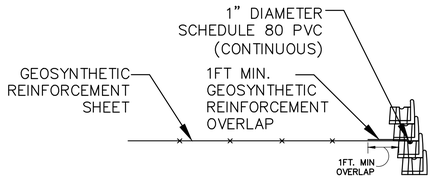
CASE I DESIGN
30' TO 40' TOTAL HEIGHT

VERDURA® RETAINING WALL PLANS

3 OF 7 SHTS.

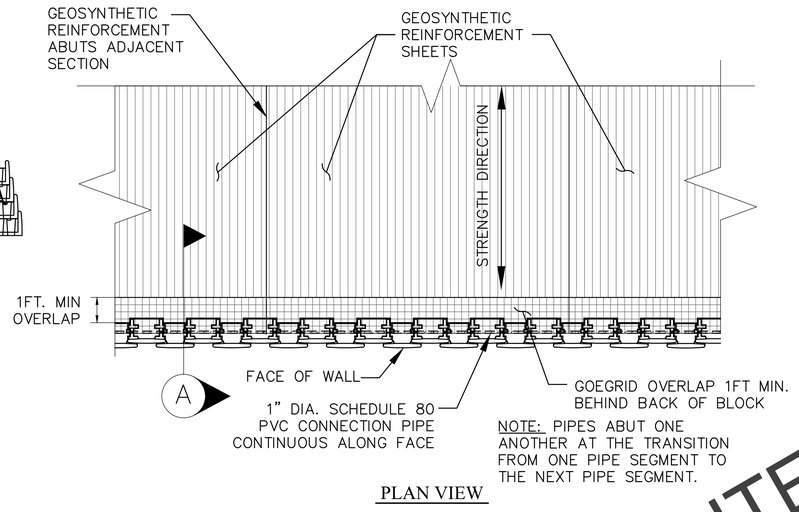


VERDURA 40 BLOCK DETAILS



SECTION A

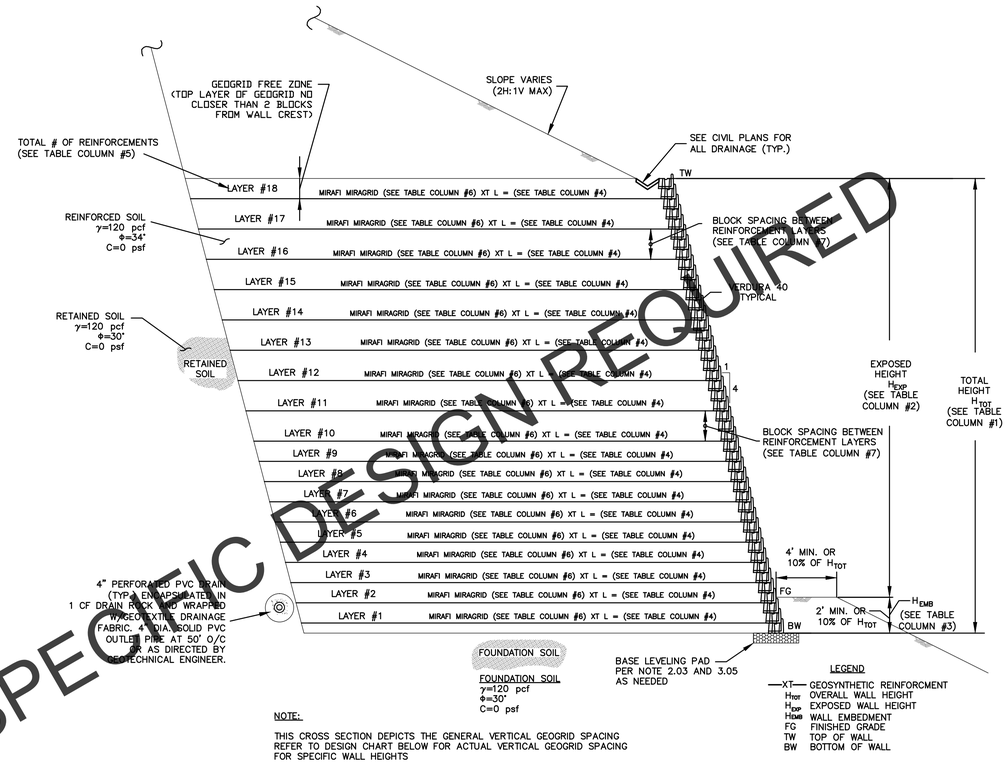
NOTE:
GEOSYNTHETIC REINFORCEMENT OVERLAP SHALL BE ON TOP.



NOTE: PIPES ABUT ONE ANOTHER AT THE TRANSITION FROM ONE PIPE SEGMENT TO THE NEXT PIPE SEGMENT.

PLAN VIEW

VERDURA CONNECTION DETAIL



NOTE:
THIS CROSS SECTION DEPICTS THE GENERAL VERTICAL GEOGRID SPACING REFER TO DESIGN CHART BELOW FOR ACTUAL VERTICAL GEOGRID SPACING FOR SPECIFIC WALL HEIGHTS

TYPICAL CROSS SECTION - CASE II

CASE 2 DESIGN CHART– VERDURA 40® RETAINING WALL– 2:1 ASCENDING SLOPE

COLUMN #1	COLUMN #2	COLUMN #3	COLUMN #4	COLUMN #5	COLUMN #6 GEOGRID REINFORCEMENT TYPE		COLUMN #7 BLOCK SPACING BETWEEN REINFORCEMENT LAYER NUMBER			
TOTAL HEIGHT H TOT (FT)	EXPOSED HEIGHT H' (FT)	EMBEDED HEIGHT H EMB (FT)	REINFORCEMENT LENGTH L (FT)	NUMBER OF REINFORCEMENT LAYERS	MIRAGRID 8XT GEOGRID PER LAYER (#)	MIRAGRID 20XT GEOGRID PER LAYER (#)	1 BLOCK SPACING	2 BLOCK SPACING	3 BLOCK SPACING	FROM THE CREST
< 6	4 OR LESS	2	8	3 (MINIMUM 2)	ALL LAYERS	N/A	LAYER #1	N/A	LAYERS #2 & #3	MAXIMUM 2 COURSES
8	6	2	8	4	ALL LAYERS	N/A	LAYER #1	N/A	LAYERS #2 THROUGH #4	MAXIMUM 2 COURSES
10	8	2	10	5	ALL LAYERS	N/A	LAYER #1	N/A	LAYERS #2 THROUGH #5	MAXIMUM 2 COURSES
12	10	2	10	6	ALL LAYERS	N/A	LAYER #1	N/A	LAYERS #2 THROUGH #6	MAXIMUM 2 COURSES
14	12	2	12	7	ALL LAYERS	N/A	LAYER #1	N/A	LAYERS #2 THROUGH #7	MAXIMUM 2 COURSES
16	14	2	13.5	8	ALL LAYERS	N/A	LAYER #1	N/A	LAYERS #2 THROUGH #8	MAXIMUM 2 COURSES
18	16	2	15	9	LAYERS #3 THROUGH #9	LAYERS #1 & #2	LAYER #1	N/A	LAYERS #2 THROUGH #9	MAXIMUM 2 COURSES
20	18	2	17	10	LAYERS #4 THROUGH #10	LAYERS #1 THROUGH #3	LAYER #1	N/A	LAYERS #2 THROUGH #10	MAXIMUM 2 COURSES
22	19.8	2.2	18.5	11	LAYERS #6 THROUGH #11	LAYERS #1 THROUGH #5	LAYER #1	N/A	LAYERS #2 THROUGH #11	MAXIMUM 2 COURSES
24	21.6	2.4	20.5	13	LAYERS #8 THROUGH #13	LAYERS #1 THROUGH #7	LAYER #1	LAYERS #2 THROUGH #4	LAYERS #5 THROUGH #13	MAXIMUM 2 COURSES
26	23.4	2.6	22	15	LAYERS #11 THROUGH #15	LAYERS #1 THROUGH #10	LAYER #1	LAYERS #2 THROUGH #7	LAYERS #8 THROUGH #15	MAXIMUM 2 COURSES
28	25.2	2.8	24	16	LAYERS #12 THROUGH #16	LAYERS #1 THROUGH #11	LAYER #1	LAYERS #2 THROUGH #7	LAYERS #8 THROUGH #16	MAXIMUM 2 COURSES
30	27	3.0	25.5	19	LAYERS #15 THROUGH #19	LAYERS #1 THROUGH #14	LAYERS #1 & #2	LAYERS #3 THROUGH #12	LAYERS #13 THROUGH #19	MAXIMUM 2 COURSES

NOTE: FOR WALLS GREATER THAN 30' SEE MAXIMUM 30'–40' TOTAL HEIGHT DESIGN

NOTES:

1) GEOGRID LENGTHS ARE MEASURED FROM THE POINT OF CONNECTION
2) ALL IRRIGATION LINES ARE TO BE INSTALLED ALONG THE FACE OF THE WALL. REFER TO PROJECTS REQUIREMENTS WITHIN THE CONSTRUCTION DOCUMENTS FOR IRRIGATION DETAILS

DESIGN NOTES:

1) FOR DESIGN WALL HEIGHTS NOT DEPICTED IN THE TABLE USE LARGER WALL HEIGHT DESIGN CASE FROM THE TABLE. EXAMPLE: FOR A 12.1 FT WALL USE THE 14 FT DESIGN CASE.
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DATE

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PH: 800–346–7995 FAX: 760–960–6099

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	WALL #
XX	XXX	XX	XXX/XXX	XX

REGISTERED CIVIL ENGINEER — x/x/x DATE

X–X–X
PLANS APPROVAL DATE

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REGISTERED PROFESSIONAL ENGINEER
DARIEN A. OSBORNE
No. 64108
EXP.12/31/14
CIVIL
STATE OF CALIFORNIA

CALTRANS STANDARD DETAILS

CASE II DESIGN
MAXIMUM 30' TOTAL HEIGHT

VERDURA® RETAINING WALL PLANS

4

OF 7 SHTS.

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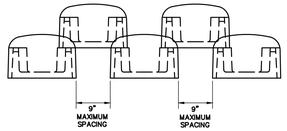
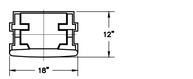
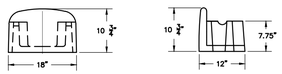


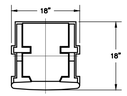


TOP VIEW

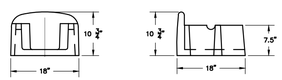


FRONT VIEW SIDE VIEW

VERDURA 40 BLOCK DETAILS

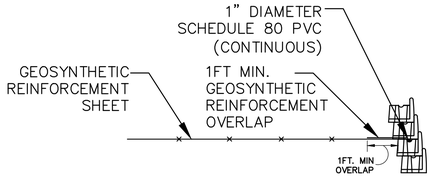


TOP VIEW



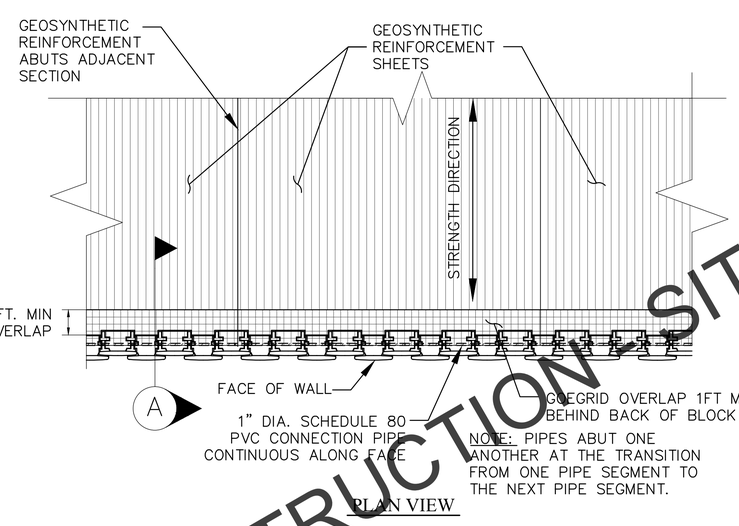
FRONT VIEW SIDE VIEW

VERDURA 60 BLOCK DETAILS

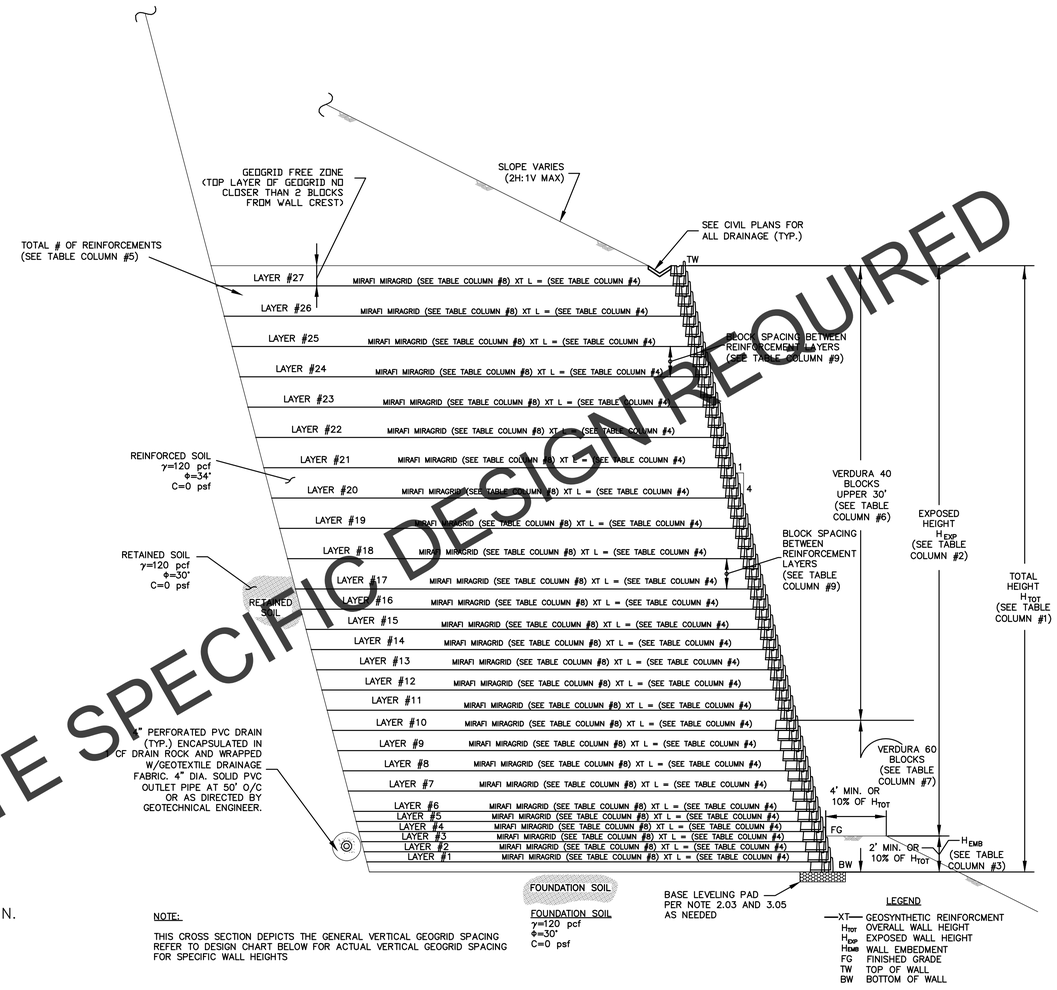


SECTION A

NOTE:
GEOSYNTHETIC REINFORCEMENT OVERLAP SHALL BE ON TOP.



PLAN VIEW



NOTE:
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TYPICAL CROSS SECTION - CASE II

VERDURA CONNECTION DETAIL

CASE 2 DESIGN CHART– VERDURA® 40/60 RETAINING WALL– 2:1 ASCENDING SLOPE

COLUMN #1	COLUMN #2	COLUMN #3	COLUMN #4	COLUMN #5	COLUMN #6	COLUMN #7	COLUMN #8 GEOGRID REINFORCEMENT TYPE			COLUMN #9 BLOCK SPACING BETWEEN REINFORCEMENT LAYER NUMBER			
TOTAL HEIGHT Htot (FT)	EXPOSED HEIGHT H' (FT)	EMBEDED DEPTH H EMB (FT)	REINFORCEMENT LENGTH (FT)	NUMBER OF REINFORCEMENT LAYERS	HEIGHT OF VERDURA 40 BLOCKS (FT)	HEIGHT OF VERDURA 60 BLOCKS (FT)	MIRAGRID 8XT GEOGRID PER LAYER (#) W/ V40 BLOCK	MIRAGRID 20XT GEOGRID PER LAYER (#) W/ V40 BLOCK	MIRAGRID 20XT GEOGRID PER LAYER (#) W/ V60 BLOCK	1 BLOCK SPACING	2 BLOCK SPACING	3 BLOCK SPACING	FROM THE CREST
32	28.8	3.2	28	21	30	2	LAYERS #18 THROUGH #21	LAYERS #4 THROUGH #17	LAYERS #1 THROUGH #3	LAYERS #1 THROUGH #4	LAYERS #5 THROUGH #13	LAYERS #14 THROUGH #21	MAXIMUM 2 COURSES
34	30.6	3.4	29	25	30	4	LAYERS #23 THROUGH #25	LAYERS #7 THROUGH #22	LAYERS #1 THROUGH #6	LAYERS #1 THROUGH #8	LAYERS #9 THROUGH #18	LAYERS #19 THROUGH #25	MAXIMUM 2 COURSES
36	32.4	3.6	30.5	28	30	6	N/A	LAYERS #10 THROUGH #28	LAYERS #1 THROUGH #9	LAYERS #1 THROUGH #10	LAYERS #11 THROUGH #22	LAYERS #23 THROUGH #28	MAXIMUM 2 COURSES
38	34.2	3.8	32.5	31	30	8	N/A	LAYERS #13 THROUGH #31	LAYERS #1 THROUGH #12	LAYERS #1 THROUGH #14	LAYERS #15 THROUGH #24	LAYERS #25 THROUGH #31	MAXIMUM 2 COURSES
40	36	4.0	34	35	30	10	N/A	LAYERS #16 THROUGH #35	LAYERS #1 THROUGH #15	LAYERS #1 THROUGH #18	LAYERS #19 THROUGH #29	LAYERS #30 THROUGH #35	MAXIMUM 2 COURSES

NOTE: FOR WALLS LESS THAN 30.1' SEE MAXIMUM 30' TOTAL HEIGHT DESIGN

NOTES:

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DATE

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SOIL RETENTION
DESIGNS INC.
2501 STATE ST. CARLSBAD CA. 92008
PH: 800-346-7995 FAX: 760-960-6099

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	WALL #
XX	XXX	XX	XXX/XXX	XX

REGISTERED CIVIL ENGINEER x/x/x DATE

X-X-X
PLANS APPROVAL DATE

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REGISTERED PROFESSIONAL ENGINEER
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No. 64108
EXP.12/31/14
CIVIL
STATE OF CALIFORNIA

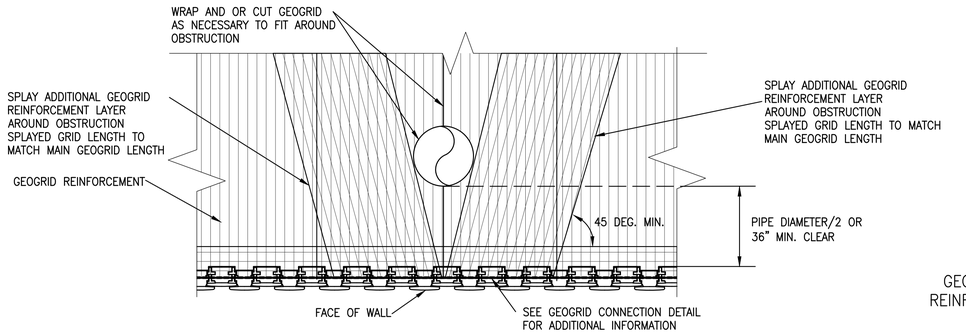
CALTRANS STANDARD DETAILS

CASE II DESIGN
30' TO 40' TOTAL HEIGHT

VERDURA® RETAINING WALL PLANS

5

OF 7 SHTS.



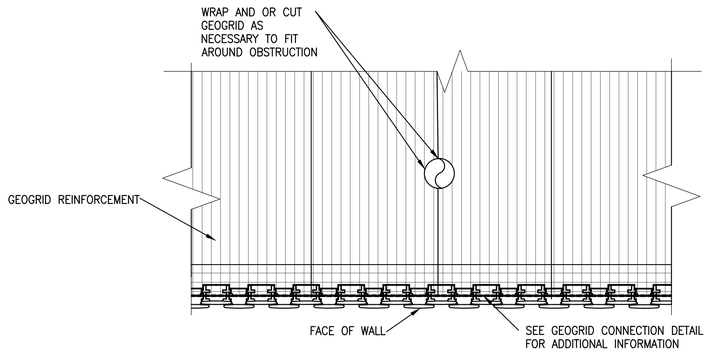
PLAN VIEW

NOTE:

1. SPLAYED GRID LAYER IS TO BE PLACED 1 BLOCK COURSE ABOVE / BELOW MAIN GEOGRID REINFORCING LAYER

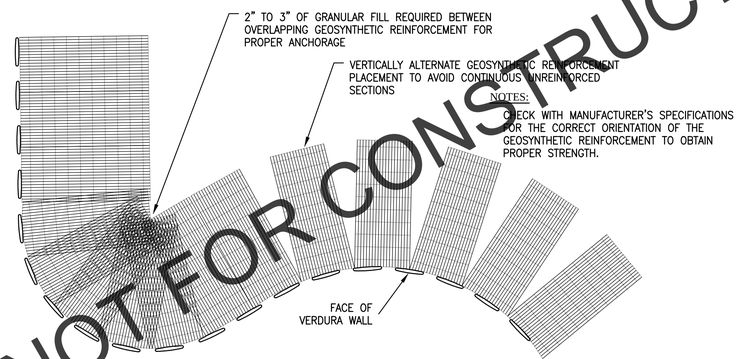
2. PIPE PROTRUSION SHALL BE PLACED A MINIMUM DISTANCE AWAY FROM THE BACK OF BLOCK EQUAL TO THE PIPE DIAMETER/2 OR 36" WHICHEVER IS GREATER.

GEOGRID OBSTRUCTION DETAIL FOR PROTRUSIONS ≥36"

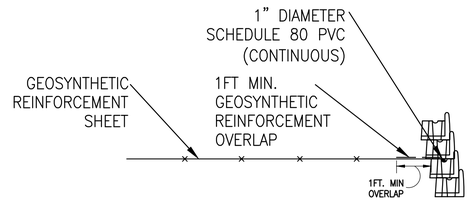


PLAN VIEW

GEOGRID OBSTRUCTION DETAIL FOR PROTRUSIONS <36"

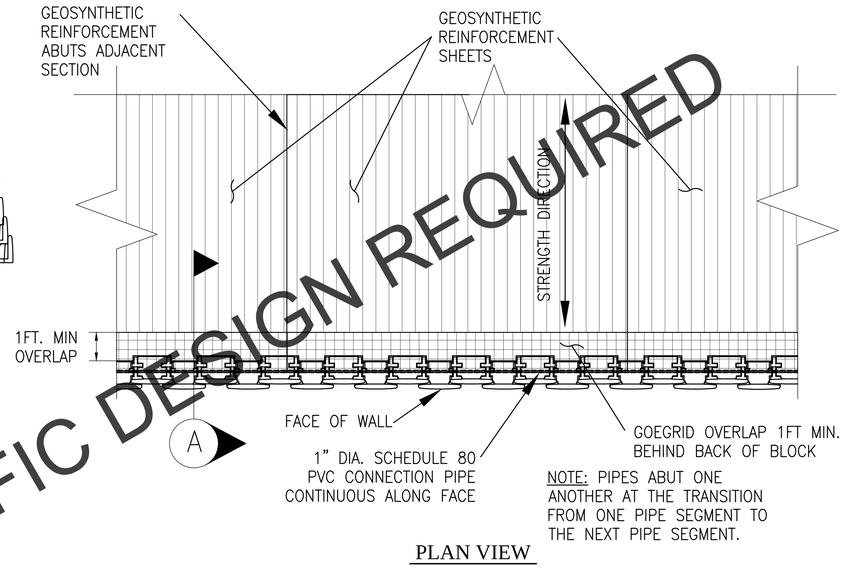


GEOGRID PLACEMENT ON CURVES



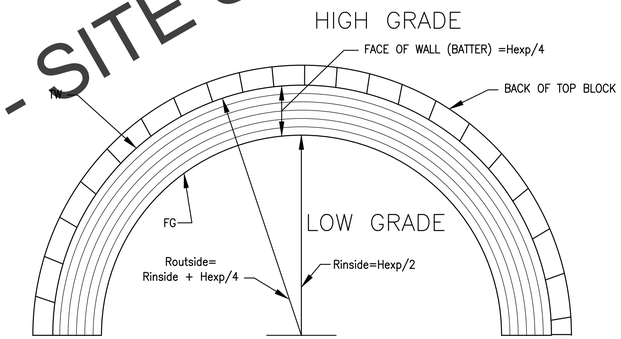
SECTION A

NOTE:
GEOSYNTHETIC REINFORCEMENT OVERLAP SHALL BE ON TOP.



PLAN VIEW

GEOGRID CONNECTION DETAIL



PLAN VIEW

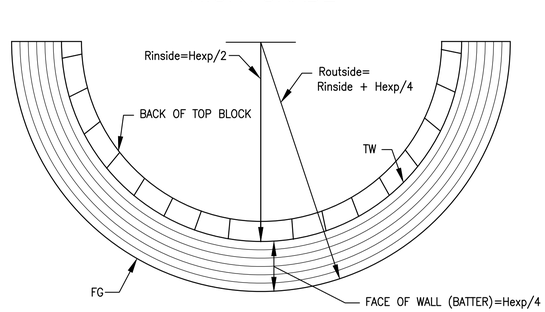
LEGEND:
Hexp = EXPOSED HEIGHT
Rinside = INSIDE RADIUS
Routside = OUTSIDE RADIUS

NOTES:

1. TIGHTER RADIUS CURVES CAN BE ACHIEVED BY VARYING THE SPACING BETWEEN THE BLOCKS. THE MAXIMUM SPACING OF THE BLOCKS SHALL BE 9" AND THE MINIMUM SPACING OF THE BLOCK SHALL NOT BE LESS THAN 4".

2. THE MINIMUM INSIDE RADIUS SHALL NOT BE LESS THAN THE EXPOSED HEIGHT DIVIDED BY 2, HEXP/2, OR 5 FT.

TYPICAL CONCAVE CURVE DETAIL



PLAN VIEW

LEGEND:
Hexp = EXPOSED HEIGHT
Rinside = INSIDE RADIUS
Routside = OUTSIDE RADIUS

TYPICAL CONVEX CURVE DETAIL

DATE

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SOIL RETENTION DESIGNS INC.
2501 STATE ST. CARLSBAD CA. 92008
PH: 800-346-7995 FAX: 760-960-6099

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	WALL #
XX	XXX	XX	XXX/XXX	XX

REGISTERED CIVIL ENGINEER — DATE x/x/x

PLANS APPROVAL DATE x-x-x

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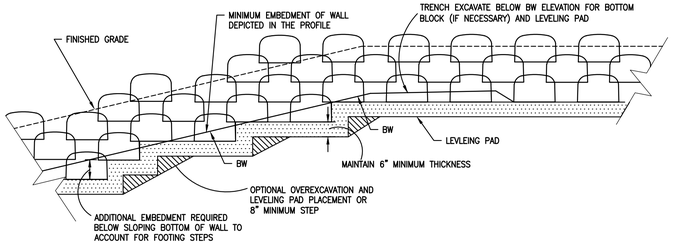
REGISTERED PROFESSIONAL ENGINEER DARIEN A. OSBORNE No. 64108 EXP.12/31/14 CIVIL STATE OF CALIFORNIA

CALTRANS STANDARD DETAILS

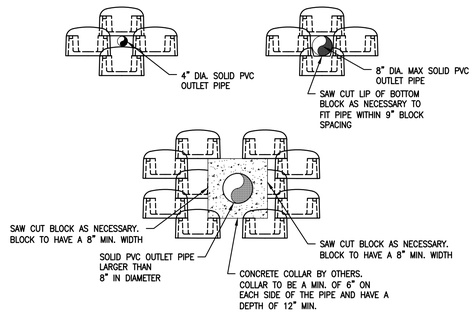
TYPICAL DETAILS

6

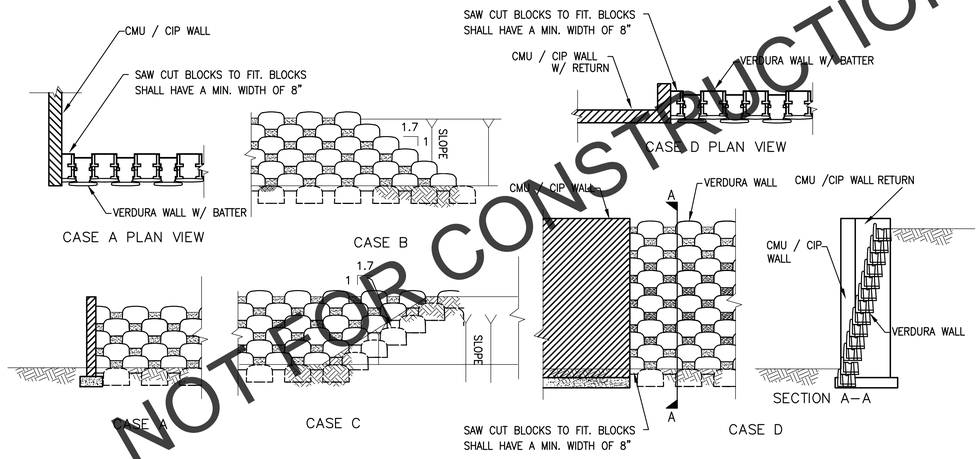
VERDURA® RETAINING WALL PLANS OF 7 SHTS.



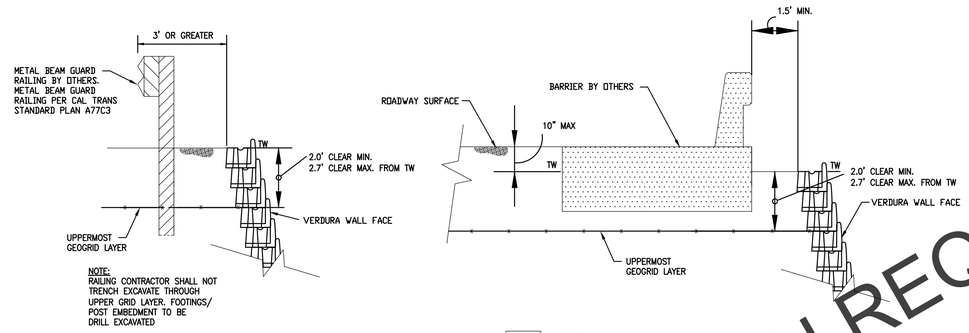
STEPPED BOTTOM OF WALL DETAIL



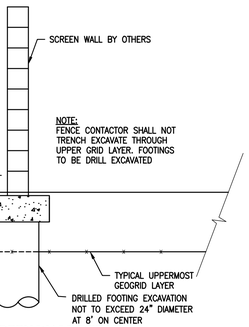
FACE PENETRATION DETAILS



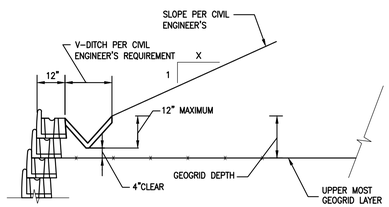
END OF WALL TRANSITION DETAILS



BARRIER DETAILS

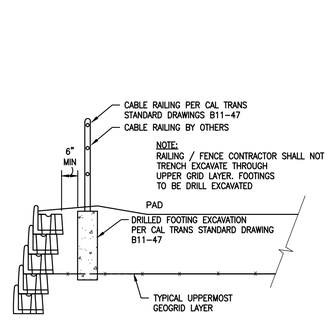


TYPICAL SCREEN WALL DETAIL

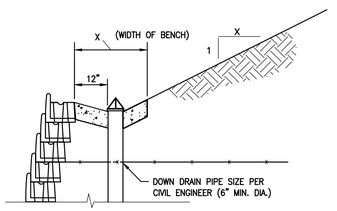


TYPICAL V DITCH DETAIL

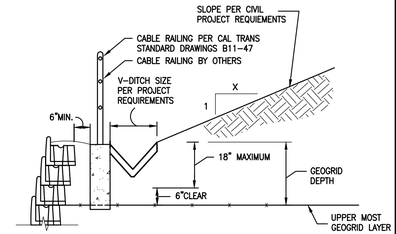
NOTE:
CABLE RAILING PER PROJECT REQUIREMENTS



TYPICAL CABLE RAILING DETAIL



TYPICAL DOWNDRAIN DETAIL



TYPICAL V DITCH / CABLE RAILING DETAIL

TOP OF WALL DETAILS

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DATE

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DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	WALL #
XX	XXX	XX	XXX/XXX	XX

REGISTERED CIVIL ENGINEER — x/x/x DATE

X-X-X
PLANS APPROVAL DATE

The State of California or its officers or agents shall not be responsible for the accuracy or

REGISTERED PROFESSIONAL ENGINEER — DARIENA OSBORNE — No. 64108 — EXP.12/31/14 — CIVIL — STATE OF CALIFORNIA

CALTRANS STANDARD DETAILS

TYPICAL DETAILS 7

VERDURA® RETAINING WALL PLANS OF 7 SHTS.