

FIRESTONE

GAINESVILLE, GA

KEYSTONE COMPAC REAR LIP RETAINING WALL SYSTEM

04/03/2020

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1.0 REINFORCED ZONE

THE REINFORCED BACKFILL SOIL SHALL BE COMPACTED GRANULAR FILL FREE OF DEBRIS AND MEETING THE FOLLOWING GRADATION AS DETERMINED IN ACCORDANCE WITH ASTM D422.

SIEVE SIZE	PERCENT PASSING
1 INCH	100 - 75
NO. 4	100 - 20
NO. 40	0 - 60
NO. 200	0 - 35

THE MAXIMUM SIEVE SIZE SHOULD BE LIMITED TO 1 INCH. REINFORCED BACKFILL SOIL SHALL CONSIST OF MATERIAL MEETING USCS CRITERIA FOR GW, GP, SW, SP, SC OR SM & THE MATERIAL TO HAVE A PH RANGE OF 3 - 9. THE PORTION PASSING THE NO. 40 SIEVE SHALL HAVE A PLASTICITY INDEX LESS THAN 20. THE MATERIAL SHALL BE SUBSTANTIALLY FREE OF SHALE OR OTHER SOFT, POOR DURABILITY PARTICLES. THE MATERIAL SHALL HAVE A MAGNESIUM SULFATE SOUNDNESS LOSS OF LESS THAN 30 PERCENT AFTER FOUR CYCLES (OR A SODIUM SULFATE VALUE LESS THAN 15 PERCENT AFTER FIVE CYCLES). TESTING SHALL BE IN ACCORDANCE WITH AASHTO T-104.

2.0 TECHNICAL REQUIREMENTS

FILL SHALL BE COMPACTED AS SPECIFIED BY THE PROJECT SPECIFICATIONS OR TO A MINIMUM 95% OF THE MAXIMUM DENSITY, AND WITHIN +3/-3 PERCENT OF OPTIMUM MOISTURE CONTENT AS DETERMINED IN ACCORDANCE WITH ASTM D-698 (STANDARD PROCTOR DENSITY), WHICHEVER IS GREATER.

FILL SHALL BE PLACED IN HORIZONTAL LAYERS NOT EXCEEDING 8 INCHES IN COMPACTED THICKNESS FOR HEAVY COMPACTION EQUIPMENT. FOR ZONES WHERE COMPACTION IS ACCOMPLISHED WITH HAND EQUIPMENT, FILL SHALL BE PLACED IN HORIZONTAL LAYERS NOT EXCEEDING 6 INCHES IN UNCOMPACTED THICKNESS. ONLY HAND OPERATED EQUIPMENT SHALL BE ALLOWED WITHIN 3 FEET OF THE WALL FACE.

IN THE ABSENCE OF OWNER'S DIRECTION TO EMPLOY MORE STRINGENT COMPACTION SPECIFICATIONS, THE COMPACTED DENSITY OF THE FILL SHALL BE TESTED EVERY 2,000 SQUARE FEET PER 8 INCH LIFT OR EVERY 200 LINEAR FEET OF A SINGLE COURSE OF BLOCKS, WHICHEVER IS LESS. (THESE TESTS MUST INCLUDE THE BACKFILL ZONE IMMEDIATELY BEHIND THE WALL WHERE HEAVY COMPACTION EQUIPMENT MAY NOT OPERATE.)

THE GAP UNIT SHALL BE GLUED TO THE TOP MOST STANDARD UNIT.

TESTING METHODS, FREQUENCY AND VERIFICATION OF MATERIAL SPECIFICATIONS AND COMPACTION SHALL BE THE RESPONSIBILITY OF THE OWNER AND/OR CONSTRUCTION VERIFICATION ENGINEER.

HEAVY AND/OR CONSTRUCTION EQUIPMENT NOT INVOLVED WITH THE WALL CONSTRUCTION SHALL NOT OPERATE WITHIN 10.0' OF THE WALL FACE UNTIL FINAL PAVEMENT AND CURBING IS IN PLACE BEHIND THE WALL AS APPLICABLE.

3.0 GEOGRID PLACEMENT

GEOGRID SHALL BE PLACED AT THE LOCATIONS, ELEVATIONS AND WITH THE PROPER EMBEDMENT LENGTH AS SHOWN ON THE CONSTRUCTION DRAWINGS. EMBEDMENT LENGTH IS MEASURED FROM THE FRONT FACE OF THE WALL UNIT. THE EDGE OF THE GEOGRID SHOULD BE VISIBLE AT THE WALL FACE FOR CONSTRUCTION VERIFICATION PURPOSES.

GEOGRIDS SHALL BE CONNECTED TO THE WALL UNIT PER THE MANUFACTURER'S INSTRUCTIONS.

NO MORE THAN TWO COURSES OF BLOCK SHOULD BE STACKED PRIOR TO INFILLING WITH #57 STONE. COURSES BELOW GEOGRID LAYER MUST BE INFILLED WITH #57 STONE PRIOR TO PLACING GEOGRID REINFORCEMENT.

PRIOR TO PLACING FILL MATERIALS IN THE REINFORCED ZONE, THE GEOGRIDS SHALL BE ANCHORED TO THE WALL UNITS, PULLED TIGHT TO REMOVE ANY SLACK, AND LAID FLAT AND HORIZONTAL. NO PORTION OF THE GEOGRID PLACEMENT SHALL BE STEEPER THAN 10% GRADE FROM THE HORIZONTAL OR ALLOWED TO DROOP DOWN DIRECTLY BEHIND THE BLOCK.

TRACKED CONSTRUCTION EQUIPMENT SHALL NOT BE OPERATED DIRECTLY ON THE GEOGRID MATERIALS. A MINIMUM FILL THICKNESS OF 6 INCHES IS REQUIRED FOR OPERATION OF TRACKED VEHICLES OVER THE GEOGRID. THE TURNING OF TRACKED VEHICLES SHALL BE KEPT TO A MINIMUM TO PREVENT DISPLACEMENT OF GEOGRIDS.

4.0 DRAINAGE

BACKFILL SHALL BE GRADED AWAY FROM THE WALL FACE AND COMPACTED TO 95% STANDARD PROCTOR AT THE END OF EACH WORK DAY TO PREVENT WATER FROM BEING DIRECTED TOWARDS THE REINFORCED SOIL MASS.

PERMANENT DRAINAGE AND SITE GRADING SHALL BE PERFORMED TO PREVENT RUNOFF FROM BEING DIRECTED OVER THE WALL FACE OR ALLOWED TO POND ABOVE THE REINFORCED MASS.

SURFACE WATER FLOW EITHER TEMPORARY OR PERMANENT SHOULD NOT BE ALLOWED TO RUN ALONG TOE OF EARTH STRUCTURE AT ANY TIME. CONCENTRATED WATER FLOW ALONG THE WALL TOE CAN UNDERMINE & DAMAGE THE EARTH STRUCTURE FOUNDATION. CIVIL SITE DESIGNER IS RESPONSIBLE FOR ADDRESSING ALL POSSIBLE EROSION CONCERNS TO PROTECT WALL FOUNDATION.

5.0 DESIGN PARAMETERS

DESIGN OF THE REINFORCED SOIL STRUCTURES IS BASED ON THE FOLLOWING PARAMETERS:

REINFORCED ZONE	$\phi' = 28^\circ$	$C' = 0$ PSF	$\gamma = 120$ PCF
RETAINED ZONE	$\phi' = 28^\circ$	$C' = 0$ PSF	$\gamma = 120$ PCF
FOUNDATION ZONE	$\phi' = 28^\circ$	$C' = 0$ PSF	$\gamma = 120$ PCF

INTERNAL STABILITY:

MIN. F.S. AGAINST GEOGRID PULLOUT	= 1.5
SOIL-GEOGRID INTERACTION COEFFICIENT	= 0.8
PERCENT COVERAGE OF GEOGRID	= 100%
MINIMUM F.S. FOR UNCERTAINTIES	= 1.5

EXTERNAL STABILITY:

MINIMUM F.S. AGAINST BASE SLIDING	= 2.0
MINIMUM F.S. AGAINST OVERTURNING	= 2.0
MINIMUM F.S. FOR GLOBAL STABILITY	= 1.3
MINIMUM F.S. FOR RAPID DRAWDOWN	= N/A

UNIFORM SURCHARGE	= 250 PSF
HYDROSTATIC LOADING	= NONE
REQUIRED BEARING CAPACITY	= VARIES (SEE ELEVATION VIEW)

6.0 SPECIAL PROVISIONS

ACCEPTABLE GEOGRID REINFORCEMENTS ARE:	TYPE 1	TYPE 2	TYPE 3
	STRATAGRID 200	STRATAGRID 350	STRATAGRID 550
	MIRAFI 3XT	MIRAFI 5XT	MIRAFI 8XT

OTHER GRID SYSTEMS MUST BE SUBMITTED FOR APPROVAL BY EES PRIOR TO CONSTRUCTION.

ENGINEERED EARTH SOLUTIONS, LLC (EES) ASSUMES NO LIABILITY FOR INTERPRETATIONS OF SUBSURFACE CONDITIONS, STABILITY OF SOIL PARAMETERS, AND SUBSURFACE GROUNDWATER CONDITIONS. THE WALL CONTRACTOR AND/OR CONSTRUCTION VERIFICATION ENGINEER IS RESPONSIBLE FOR REVIEWING AND VERIFYING THAT CONDITIONS DESCRIBED ABOVE ARE ACCURATE PRIOR TO AND DURING CONSTRUCTION.

ALL WALLS OVER 25.0' IN HEIGHT REQUIRE DEEP BORINGS AT THE WALL LOCATION EVERY 50.0' O.C. ALONG THE WALL LENGTH. THE BORINGS SHALL EXTEND TO 1.5 TIMES THE WALL HEIGHT. FOR EXAMPLE, A 40.0' WALL WOULD REQUIRE DEEP BORINGS TO 60.0'. THE BORING RESULTS SHOULD BE SUBMITTED TO THE CONSTRUCTION VERIFICATION ENGINEER TO VERIFY FOUNDATION DESIGN PARAMETERS PRIOR TO CONSTRUCTION.

THE WALL CONTRACTOR AND/OR OWNER IS RESPONSIBLE FOR HAVING SUPERVISION OF ALL PHASES OF CONSTRUCTION BY A QUALIFIED GEOTECHNICAL ENGINEER (CONSTRUCTION VERIFICATION ENGINEER).

SETTLEMENT AND ITS EFFECT ON THE RETAINING WALL SYSTEM HAS NOT BEEN EVALUATED BY EES. FOR THE EVALUATION OF SETTLEMENT, ADDITIONAL TESTING OF THE SUBGRADE AND ADDITIONAL ENGINEERING IS REQUIRED WHICH IS OUTSIDE THE SCOPE OF PRODUCING THESE SHOP DRAWINGS. EES CAN PROVIDE A PROPOSAL TO PERFORM THE ADDITIONAL TESTING AND CALCULATIONS UPON REQUEST.

A COPY OF THESE DRAWINGS SHALL BE PROVIDED TO FUTURE OWNERS OF THE DEVELOPED PROPERTY TO PROVIDE THEM WITH A RECORD OF THE LOCATION OF THE REINFORCED ZONE AND RECOMMENDATIONS REGARDING PERMISSIBLE CONSTRUCTION ACTIVITIES AROUND THE MECHANICALLY STABILIZED EARTH STRUCTURE.

GENERAL NOTES:

1. SOIL INSTALLED IN SLOPES BOTH ABOVE AND BELOW THE REINFORCED STRUCTURE SHALL BE COMPACTED TO WITHIN 95% OF ITS MAXIMUM DRY DENSITY AS DETERMINED BY THE STANDARD PROCTOR TEST (ASTM D-698). FILL SOILS INSTALLED ABOVE AND BELOW THE REINFORCED ZONE MUST MEET THE REINFORCED ZONE PARAMETERS NOTED IN NOTE 5.0 DESIGN PARAMETERS.

2. CONSTRUCTION VERIFICATION OF THE WALL INSTALLATION BY AN ENGINEER IS REQUIRED AND MUST BE PROVIDED BY A KNOWLEDGEABLE GEOTECHNICAL ENGINEER FAMILIAR WITH MECHANICALLY STABILIZED STRUCTURES. EES CAN PERFORM THIS VERIFICATION AS REQUESTED BUT MUST INCLUDE DAILY SITE VISITS.

3. IDENTIFICATION OF ALL UTILITIES SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR PRIOR TO CONSTRUCTION. ANY CONFLICTS SHALL BE REPORTED TO THE ENGINEER OF RECORD PRIOR TO CONSTRUCTION.

4. EXCAVATION THROUGH THE GEOSYNTHETIC REINFORCEMENT FOR THE PURPOSE OF PLANTING TREES OR INSTALLATION OF UTILITIES SHOULD NOT OCCUR WITHOUT APPROVAL BY THE ENGINEER OF RECORD.

5. WATERLINES INCLUDING IRRIGATION SYSTEMS MUST BE WATER TIGHT WITHIN 100 FEET OF THE REINFORCED ZONE. LEAKAGE BEHIND A RETAINING WALL WILL INCREASE THE HORIZONTAL PRESSURE AGAINST THE WALL LEADING TO WALL FAILURE. FOR THIS REASON, SUBSURFACE WATERLINES AND IRRIGATION SYSTEMS SHOULD NOT BE INSTALLED ABOVE THE REINFORCED ZONES OF THE RETAINING WALL, OR WITHIN 5 FEET BEHIND THE REINFORCED ZONES.

6. THE RETAINING WALLS DESIGNED HEREIN ARE IN ACCORDANCE WITH THE STANDARD OF PRACTICE AS OUTLINED BY THE NATIONAL CONCRETE MASONRY ASSOCIATION (NCMA) DESIGN MANUAL FOR SEGMENTAL RETAINING WALLS, SECOND EDITION.

7. ALL CONSTRUCTION ACTIVITY SHALL CONFORM TO THE MINIMUM REQUIREMENTS PER O.S.H.A. STANDARDS.

8. THIS DESIGN IS BASED UPON SPECIFIC PROPERTIES OF MATERIALS WHICH ARE PROPRIETARY. ANY SUBSTITUTION OF THE SPECIFIED PRODUCTS OR CHANGE IN STRUCTURE GEOMETRY 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, IN WHOLE OR IN PART, NOR DISCLOSED TO OTHERS WITHOUT THE CONSENT OF ENGINEERED EARTH SOLUTIONS, LLC. THIS DRAWING, DESIGN NOTES, AND ASSOCIATED CALCULATIONS HAVE BEEN PREPARED BY ENGINEERED EARTH SOLUTIONS, LLC. FROM INFORMATION PROVIDED BY OTHERS. FINAL DETERMINATION OF THE SUITABILITY OF ANY INFORMATION CONTAINED HEREIN IS THE RESPONSIBILITY OF THE USER.

9. DISCOVERY OF SUBSURFACE GROUNDWATER SHALL BE REPORTED IMMEDIATELY TO THE PROJECT GEOTECHNICAL ENGINEER. CONSTRUCTION VERIFICATION ENGINEER AND EES FOR ADDITIONAL DRAINAGE CONSIDERATION.

10. STORM DRAIN SYSTEMS ARE PRONE TO LEAKING. THEREFORE, IF A JOINT IN A STORM WATER PIPE IS LOCATED WITHIN 100 FEET OF THE RETAINING WALL, THE STORM WATER PIPE MUST BE WATER TIGHT. NEOPRENE O-RINGS MUST BE INSTALLED AT ALL STORM PIPE JOINTS AS A MINIMUM.

11. CONSTRUCTION ACTIVITIES, WHICH OCCUR ON THE SITE AFTER COMPLETION OF THE RETAINING WALL, SHOULD BE MONITORED BY THE OWNER'S REPRESENTATIVE TO INSURE THAT THEY DO NOT RESULT IN EXCAVATION THROUGH GEOSYNTHETIC REINFORCEMENT OR IN THE VICINITY OF THE WALL FOUNDATION. HEAVY CONSTRUCTION EQUIPMENT SHOULD NOT BE PERMITTED TO OPERATE WITHIN 10.0 FEET BEHIND A WALL FACE.

12. EARTH STRUCTURE LOCATION IN RELATION TO PROPERTY LINES, WATERSHED EASEMENTS, UTILITY EASEMENTS OR ANY OTHER TYPE OF EASEMENT OR BUFFER ARE THE RESPONSIBILITY OF THE OWNER OR THE SITE CIVIL ENGINEER. EES ASSUMES NO LIABILITY FOR THE LOCATION OF THE EARTH STRUCTURE. SURVEY CONTROL MUST BE PERFORMED USING THE CIVIL SITE DESIGNER'S LOCATION INFORMATION AND ACCOUNT FOR ALL STRUCTURE FACE BATTER. DEVIATION FROM THE CIVIL SITE DESIGN LAYOUT MUST BE REPORTED TO AND APPROVED BY THE CIVIL SITE DESIGNER PRIOR TO THE CONSTRUCTION OF THE EARTH STRUCTURE / RETAINING WALL.

13. GEOTECHNICAL REPORT BY ECS SOUTHEAST DATED 03/18/2020 WAS PROVIDED FOR USE. BORINGS WERE INCLUDED WHICH INDICATE GENERAL SOIL TYPES. THE OWNER OR OWNER'S REPRESENTATIVE HAS PROVIDED SPECIFIC SOIL PARAMETERS FOR THE PROPOSED EARTH STRUCTURE. IN PREPARATION OF THE DESIGN, THESE SOIL PARAMETERS WERE USED. CONSTRUCTION VERIFICATION OF THE ABOVE SOIL CONDITIONS IS IMPERATIVE PRIOR TO AND DURING CONSTRUCTION. FAILURE TO VALIDATE THESE SOIL PARAMETERS CAN RESULT IN STRUCTURE FAILURE.

14. ALL ROOF DRAINS AND ROOF DRAIN OUTLETS MUST BE PIPED TO STORM DRAIN SYSTEM. ROOF DRAINS SHALL NOT BE EMPTIED INTO DRY WELLS OR POP UP DISSIPATORS WITHIN 20.0' OF THE REINFORCED ZONE.

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NOTE: THE CIVIL SITE DESIGNER SHALL APPROVE PRIOR TO CONSTRUCTION THE DETAILED LAYOUT FOR THE RETAINING WALL(S) AS SHOWN IN THESE SHOP DRAWINGS. DESIGN AND COORDINATION OF SURFACE DRAINAGE, STORM STRUCTURES, UTILITIES, FENCES, CURBS, GUARDRAILS AND OTHER NEW AND EXISTING IMPROVEMENTS IN THE RETAINING WALL AREA REMAINS THE SOLE RESPONSIBILITY OF THE CIVIL SITE DESIGNER.

THE WALL INSTALLER IS RESPONSIBLE FOR PROVIDING DRAINAGE AS SHOWN ON THE CONSTRUCTION DRAWINGS. FAILURE TO FOLLOW THESE DRAWINGS IN THEIR ENTIRETY WILL INVALIDATE THE DESIGN.

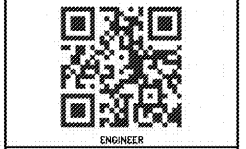


NO.	DATE	REVISION / ISSUE
1	04/03/20	ISSUE FOR CONSTRUCTION

DRAWN BY:	GRC
DESIGNED BY:	CWL
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