

Steven V. Stenger  
County Executive

Saint Louis  
**COUNTY**  
TRANSPORTATION  
PUBLIC WORKS

Nichalos D. Gardner, Ph.D., P.E.  
Director

Stephanie Leon Streeter, P.E.  
Deputy Director

June 17, 2016

Tom Zeisler  
c/o Midwest Block and Brick  
12901 St. Charles Rock Rd.  
Bridgeton, MO 63044

RE: Application 16BLD-01460 (master plan retaining wall designs for Brutus block product)

Mr. Zeisler:

I am pleased to announce that the Brutus block retaining walls designs you submitted are approved for use within this jurisdiction as master plans. The assigned master plan numbers are:

Single tier wall up to 6' high w/ level soil backfill and 100 psf surcharge 725-16-8  
Single tier wall up to 6' high w/ sloping soil backfill (max 1 vert:4 horiz) 725-16-9  
Two tier wall with each tier up to 4' high level with a level soil backfill 725-16-10

Anyone applying for a building permit for a retaining wall in our jurisdiction based on these plans must provide:

1. a completed permit application form that includes the appropriate master plan number listed above.
2. municipal zoning approval (if the wall is located within the city limits of a contracting municipality).
3. four (4) copies of the site plan showing the location and length of the wall, drawn to scale. Top and bottom of wall elevations, the direction of drainage, the retained side of the wall, and distances to any structures, parking lots, and property lines must be indicated on the site plan.
4. four (4) copies of the front elevation view of the wall with dimensions.
5. four (4) copies of construction details of the specific wall design to be built. These details (e.g. geogrid type, length, locations, leveling pad size, backfill material, etc.) must match those in the approved master plan (i.e. the 10 pages of plans and specifications that you submitted and I approved).

If you have any questions, you may contact me at (314) 615-3726.

Sincerely,



Chris Falk, P.E.  
Building Plan Reviewer

# BRUTUS RETAINING WALL SYSTEM ST. LOUIS COUNTY MASTERPLAN

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SHEET 10	STANDARD DESIGN - TIERED WALLS

MIDCOAST & ASSOCIATES, LLC  
636-978-7770  
O'FALLON, MO  
MO COA #E-2013015539

BRUTUS  
RETAINING WALL SYSTEM

MIDWEST BLOCK & BRICK  
12901 ST. CHARLES ROCK RD  
BRIDGETON, MO 63044  
314-291-3200  
314-291-0265 FAX

COVER SHEET

SHEET 1 OF 10

DATE: MAY 2016

APPLICATION:

THE BRUTUS RETAINING WALL SYSTEM IS A REINFORCED SOIL STRUCTURE COMBINING AN ARCHITECTURALLY ATTRACTIVE CONCRETE FACING BLOCK WITH GEOGRID REINFORCEMENT. THE GEOGRID REINFORCEMENT INTERLOCKS WITH THE BRUTUS BLOCK UNITS AND FILL SOIL TO CREATE A STABLE GRAVITY RETAINING WALL. DESIGN OF THESE REINFORCED SOIL STRUCTURES USES WELL ESTABLISHED GUIDELINES THAT ARE READILY AVAILABLE. THE FOLLOWING SPECIFICATIONS AND DETAILS PROVIDE A DESIGN TO INCORPORATE GEOGRID REINFORCEMENT INTO THE SOIL FOR THE PURPOSES OF CONSTRUCTING RETAINING WALLS. CONSULT MIDWEST BLOCK AND BRICK FOR ADDITIONAL DETAILS REGARDING DESIGN, APPEARANCE AND AESTHETIC CONSIDERATIONS.

STANDARD DESIGN PROCEDURE:

THE FOLLOWING DESIGN TABLES ESTABLISHED FOR THE CONSTRUCTION OF SOIL REINFORCED WALLS ARE BASED UPON GENERALLY ACCEPTED SOIL PARAMETERS IN THE ST LOUIS COUNTY, MISSOURI AREA. ALL SOIL PARAMETERS ASSUMED IN THE DESIGN ARE WELL DRAINED, LONG TERM STRENGTH CONDITIONS. HIGH PLASTIC SILTS AND CLAYS SHOULD BE AVOIDED WITHOUT SPECIFIC DESIGN RECOMMENDATIONS FROM LOCAL GEOTECHNICAL ENGINEERS. FROST HEAVE AND SETTLEMENT NEED TO BE ADDRESSED IF WARRANTED BY CONDITIONS. ALSO, SPECIFIC PRECAUTIONS ARE NECESSARY FOR WALLS CONSTANTLY IN CONTACT WITH WATER, I.E. NEAR OR AT RIVERS, LAKES AND PONDS.

THREE TYPICAL GEOMETRIC CASES WERE SELECTED FOR THESE TABLES. THE FIRST CASE IS A TYPICAL RETAINING WALL WITH HORIZONTAL BACKFILL AND 100 PSF SURCHARGE, THE SECOND CASE IS A 3:1 SLOPING BACKFILL AND THE THIRD CASE IS A TIERED WALL. THE FOLLOWING IS A SUMMARY OF THE DESIGN PARAMETERS USED AND THE MINIMUM FACTORS OF SAFETY WHICH THE TABLES ARE BASED ON.

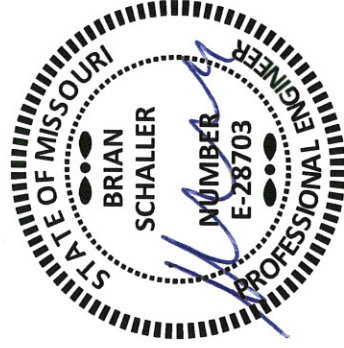
SOIL PROPERTIES:

	FRICTION ANGLE (DEGREES)	UNIT WEIGHT (LBS/CF)	COHESION (LBS/SF)
WALL FILL	28	120	0
RETAINED BACKFILL	28	120	0
FOUNDATION SOIL	28	120	0

FRICTION ANGLE - DEGREES  
UNIT WEIGHT - LBS PER CUBIC FOOT  
COHESION - LBS PER SQUARE FOOT

MINIMUM FACTORS OF SAFETY CALCULATED:

REINFORCEMENT PULLOUT = 1.5  
REINFORCEMENT RUPTURE = 1.5  
EXTERNAL SLIDING = 1.5  
INTERNAL SLIDING = 1.5  
OVERTURNING = 2.0  
BEARING CAPACITY = 1,500 PSF



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APPLICATIONS

SHEET 2 OF 10

DATE: MAY 2016

SPECIFICATIONS - ST LOUIS COUNTY MASTERPLAN:

MATERIALS:

RETAINING WALL UNITS SHALL BE BRUTUS UNITS AS MANUFACTURED BY MIDWEST BLOCK AND BRICK. THE UNITS ARE 8" TALL x 18" WIDE x 12" DEEP. CONCRETE WALL UNITS SHALL MEET THE REQUIREMENTS OF ASTM C1372-01 WITH THE MAXIMUM WATER ABSORPTION LIMITED TO 8.0 PERCENT. THE CONCRETE SHALL HAVE ADEQUATE FREEZE THAW RESISTANCE IN ACCORDANCE WITH ASTM C1372-11.

REINFORCED WALL BACKFILL MATERIAL SHALL BE COMPACTED SOIL FROM ON-SITE. THE SOIL SHALL BE FREE OF CLUMPS, FREE OF ROCKS LARGER THAN 4" AND FREE OF ORGANIC MATERIALS. DO NOT USE HIGH PLASTIC SOILS THAT HAVE PI>20 OR LL>40.

GEOGRIDS SHALL BE MIRAGRID 2XT OR 3XT AS MANUFACTURED BY TENCATE GEOSYNTHETICS; STRATA SG150 OR SG200 AS MANUFACTURED BY STRATA SYSTEMS, INC; OR SYNTEEN SF20 OR SF35 AS MANUFACTURED BY SYNTEEN TECHNICAL FABRICS, INC. ALL OF THESE GEOGRIDS MEET THE STRENGTH REQUIREMENTS OF THE DESIGN CALCULATIONS.

GEOTEXTILE FILTER FABRIC SHALL BE A NONWOVEN FABRIC WITH A MINIMUM WEIGHT OF 3.5 OZ/SY.

LEVELING PAD SHALL BE CONSTRUCTED OF WELL GRADED CRUSHED LIMESTONE SIMILAR TO 1" MINUS.

DRAINAGE ROCK SHALL BE FREE DRAINING ROCK SUCH AS 3/4" CLEAN CRUSHED LIMESTONE.

PERFORATED PIPE SHALL BE HDPE COIL PIPE.

WALL FOUNDATION:

FOUNDATION SOIL SHALL BE EXCAVATED AS REQUIRED FOR THE LEVELING PAD AND THE REINFORCED FILL ZONE TO THE DEPTHS AND LOCATIONS SHOWN ON THE PLAN SHEET. THE EXPOSED FOUNDATION SOIL SHALL BE OBSERVED PRIOR TO CONSTRUCTION TO VERIFY THAT THE EXPOSED MATERIAL IS SUITABLE FOR A NET DESIGN BEARING PRESSURE OF 1,500 PSF AND THAT THE BASE OF THE EXCAVATION IS FREE OF LOOSE SOIL, UNCOMPACTED FILL, WATER OR FROZEN MATERIAL. UNDERCUT ANY UNSUITABLE SOIL. UNDERCUT AREAS SHALL BE FILLED WITH CRUSHED LIMESTONE AND COMPACTED TO AT LEAST 95% OF THE MATERIAL'S STANDARD PROCTOR MAXIMUM DRY DENSITY.

CONSTRUCT THE CRUSHED ROCK LEVELING PAD TO LINES AND GRADE SHOWN ON THE PLANS.

CONSTRUCT THE HORIZONTAL DRAINAGE LAYER AT THE LINES AND GRADES SHOWN ON THE PLANS. THE 12" OF DRAINAGE ROCK SHALL BE SEPARATED FROM THE REINFORCED WALL BACKFILL WITH A FILTER FABRIC. PLACE THE PERFORATED PIPE BEHIND THE BASE UNIT AND IN THE DRAINAGE LAYER. SLOPE THE PIPE TO THE LOW POINT IN THE WALL AND DAYLIGHT THE PIPE THROUGH THE WALL FACE.

WALL CONSTRUCTION:

INSTALL THE FIRST COURSE OF UNITS WITH THE REAR LIPS REMOVED ON THE LEVELING PAD. INSTALL THE NEXT COURSE IN A RUNNING BOND CONFIGURATION. PULL UNIT FORWARD. UNITS MAY NEED TO BE CUT TO MAINTAIN THE RUNNING BOND AROUND CURVED SECTIONS. A MINIMUM OF 4" OF THE UNIT SHALL OVERLAP THE UNIT BELOW IT. BACKFILL UNITS AND CONTINUE CONSTRUCTION. CAP UNITS SHALL BE GLUED IN PLACE AT THE TOP OF THE WALL.

DRAINAGE ROCK SHALL BE DIRECTLY BEHIND THE WALL UNITS A MINIMUM OF 12" THICK.

GEOGRID REINFORCING:

THE GEOGRID SHALL BE CUT TO DESIGN LENGTHS AND PLACED BETWEEN THE BLOCKS AT THE ELEVATIONS SHOWN ON THE PLANS. THE GEOGRID'S PRIMARY STRENGTH DIRECTION WILL BE DIRECTED PERPENDICULAR TO THE WALL FACE (INTO THE FILL). THE GEOGRIDS PLACED OUTSIDE A PLUS OR MINUS 4" ZONE OF THE GEOGRID DESIGN ELEVATION WILL NOT BE ACCEPTED. THE GEOGRID SHALL BE PLACED HORIZONTALLY AND LAY FLAT ON THE REINFORCED FILL SOIL. THE GEOGRID SHALL BE PLACED SO A MINIMUM OF 8" OF GRID IS BETWEEN BLOCK LAYERS. SLACK IN THE GEOGRID SHALL BE REMOVED PRIOR TO PLACING ADDITIONAL BACKFILL. REFER TO GEOGRID MANUFACTURER'S INSTALLATION RECOMMENDATIONS.

THE UPPER BLOCK AT ALL GEOGRID LOCATIONS SHALL HAVE THE REAR LIP REMOVED.

WALL BACKFILL:

WALL BACKFILL MATERIAL SHALL BE PLACED IN 8" MAXIMUM LOOSE LIFTS AND COMPACTED TO AT LEAST 95% OF THE MATERIAL'S MAXIMUM DRY DENSITY AS DETERMINED BY THE STANDARD PROCTOR METHOD. BACKFILL SHALL BE PLACED, SPREAD AND COMPACTED IN SUCH A MANNER THAT MINIMIZES WRINKLES AND MOVEMENT OF THE GEOGRID.

PLACE 12" OF DRAINAGE ROCK BEHIND UNITS. SEPARATE DRAINAGE ROCK AND SOIL WITH THE FILTER FABRIC.

DURING BACKFILL PLACEMENT THE 3 FOOT ZONE DIRECTLY BEHIND THE WALL SHALL BE LIMITED TO THE USE OF HAND OPERATED COMPACTION EQUIPMENT ONLY.

CONSTRUCTION EQUIPMENT SHALL NOT BE OPERATED DIRECTLY ON THE GEOGRID.

PROTECTION OF WORK:

THE SURFACE OF THE WALL BACKFILL SHALL BE GRADED AT THE END OF EACH DAY OF WORK TO PROVIDE POSITIVE SURFACE DRAINAGE AWAY FROM THE WALL. GRADING SHALL INCLUDE PROPER CONTOURING OF FILLS IN ADJACENT AREAS TO PREVENT THE FLOW OF SURFACE WATER INTO THE REINFORCED EARTH ZONE.

THE DESIGN OF THE WALL IS BASED ON CONDITIONS AND LOADS IMPOSED ON THE WALL AT COMPLETION OF THE PROJECT. PRIOR TO PROJECT COMPLETION, THE WALL IS VULNERABLE TO DAMAGES CAUSED BY CONSTRUCTION ACTIVITY ADJACENT TO THE WALL. OF PARTICULAR CONCERN IS GRADING AND PAVEMENT CONSTRUCTION EQUIPMENT ON THE RETAINED BACKFILL AT THE TOP OF THE WALL. ONLY EQUIPMENT WITH A WEIGHT NOT EXCEEDING ONE TON CAN BE USED IN THE 3 FOOT ZONE DIRECTLY BEHIND THE BACK OF THE WALL FACE.

THE SOIL IN FRONT OF THE WALL SHALL BE PROTECTED FROM FUTURE EROSION.



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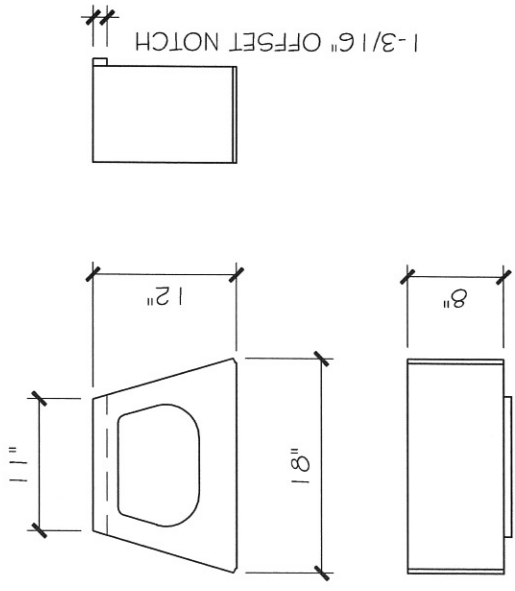
**BRUTUS  
RETAINING WALL SYSTEM**

MIDWEST BLOCK # BRICK  
12901 ST. CHARLES ROCK RD  
BRIDGETON, MO 63044  
314-291-3200  
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**SPECIFICATIONS**

SHEET 3 OF 10

DATE: MAY 2016



### STRAIGHT FACE BLOCK DETAIL

NOT TO SCALE

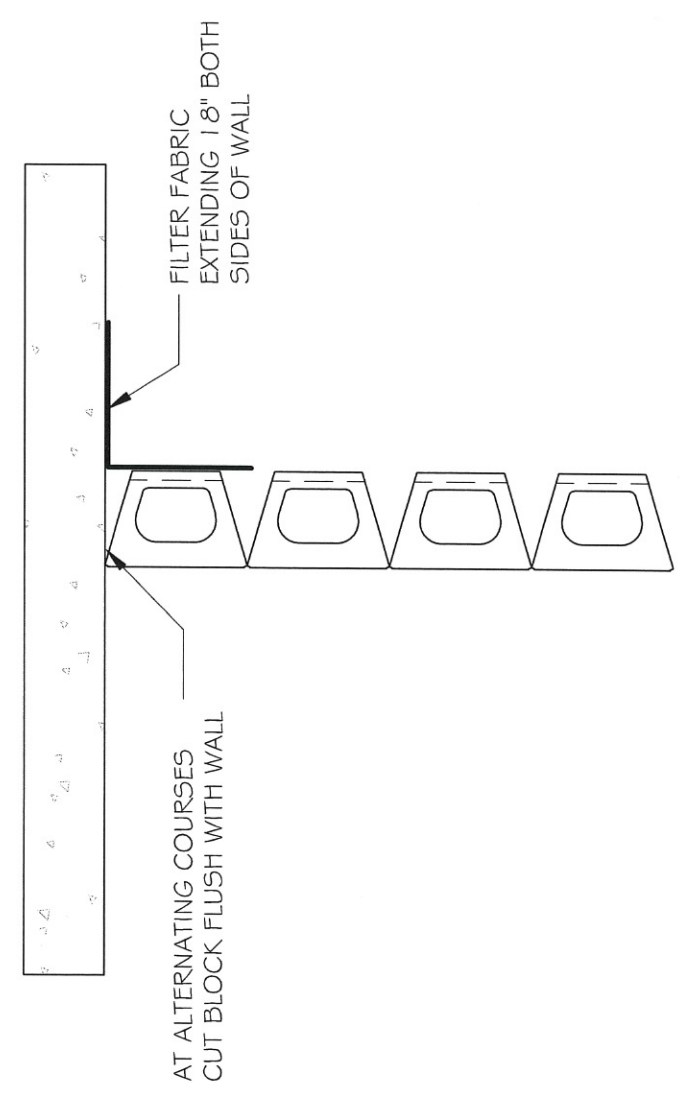
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### DETAILS

SHEET 4 OF 10  
 DATE: MAY 2016



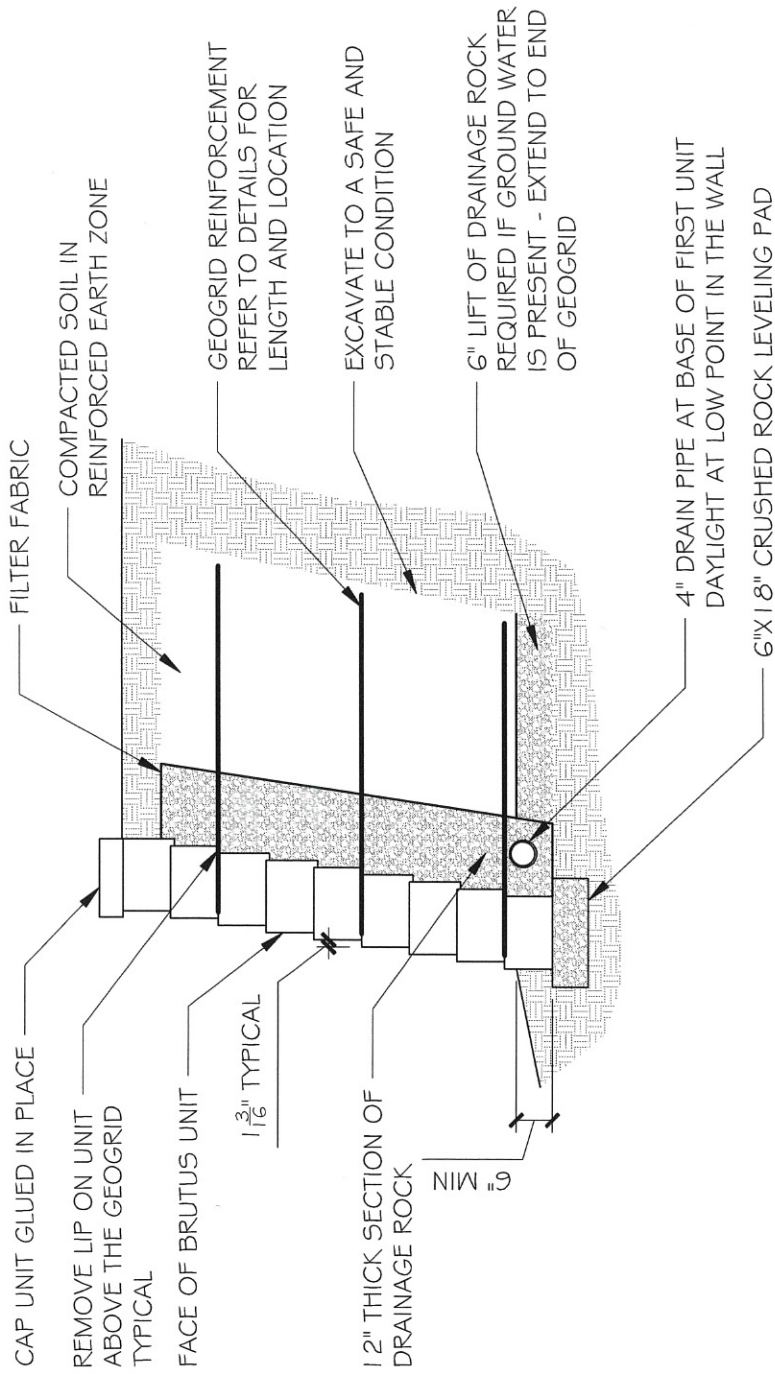
AT ALTERNATING COURSES  
 CUT BLOCK FLUSH WITH WALL

FILTER FABRIC  
 EXTENDING 18" BOTH  
 SIDES OF WALL

### ABUTMENT DETAIL

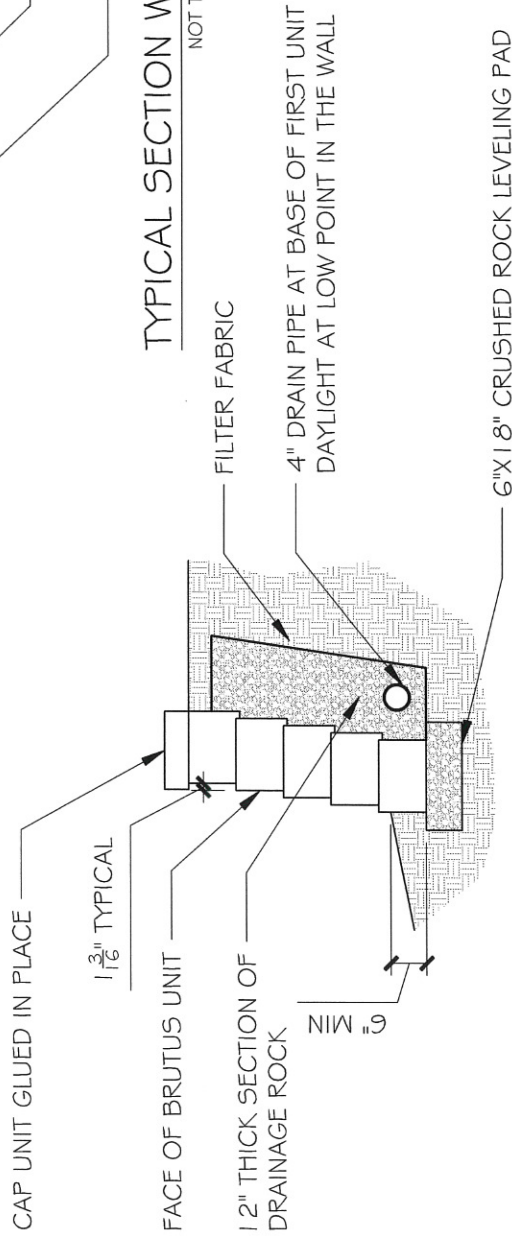
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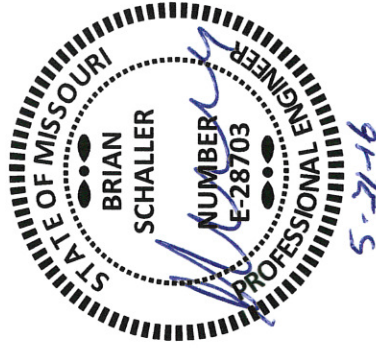
TYPICAL SECTION WITH REINFORCEMENT

NOT TO SCALE



TYPICAL SECTION WITHOUT REINFORCEMENT

NOT TO SCALE



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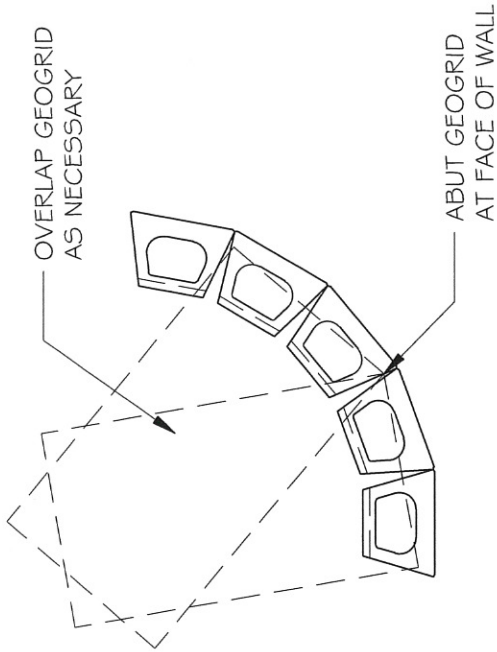
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TYPICAL SECTIONS

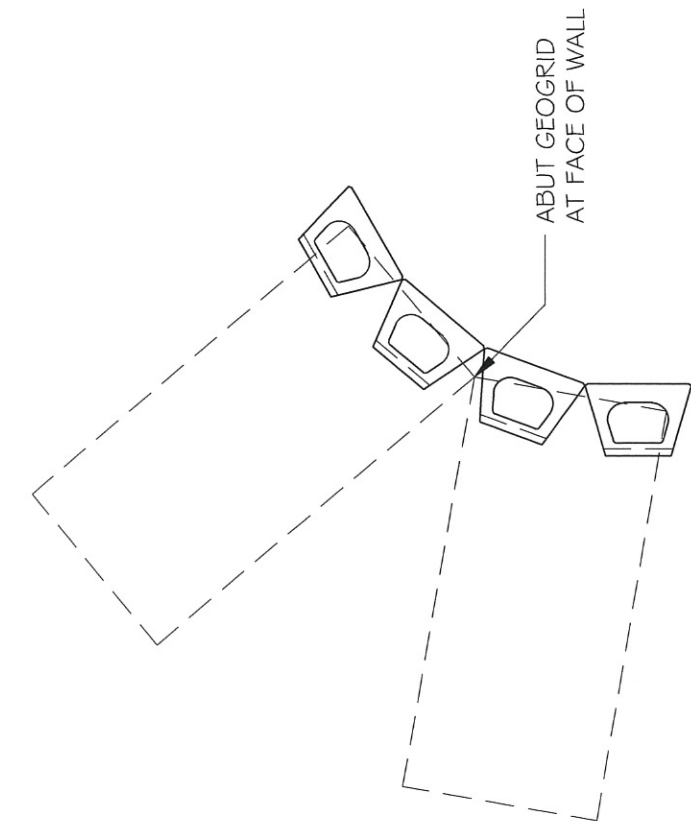
SHEET 5 OF 10

DATE: MAY 2016



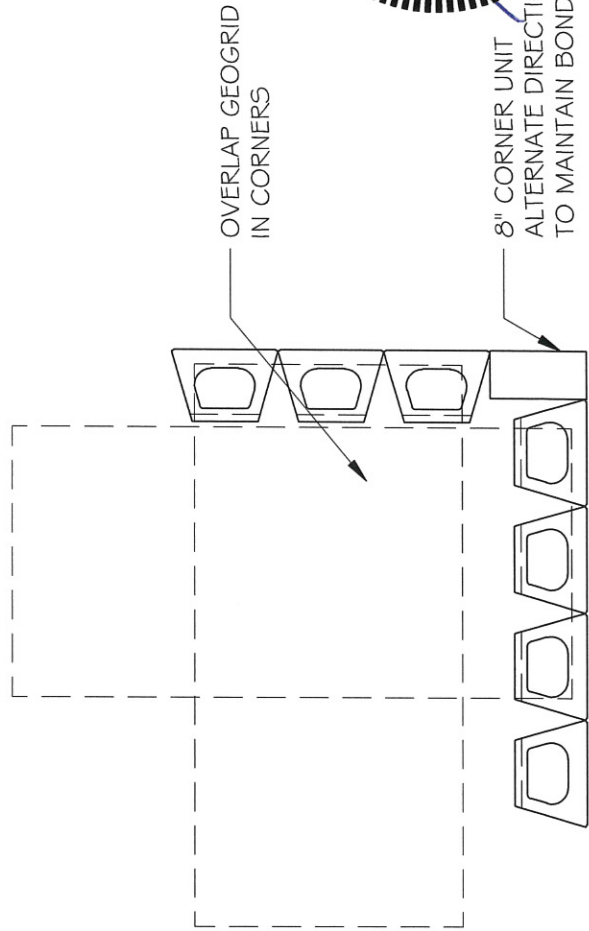
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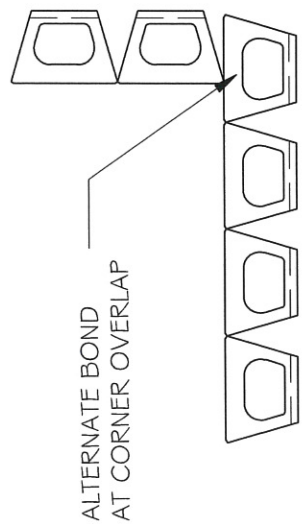
INSIDE RADIUS DETAIL

NOT TO SCALE



OUTSIDE CORNER DETAIL

NOT TO SCALE



INSIDE CORNER DETAIL

NOT TO SCALE



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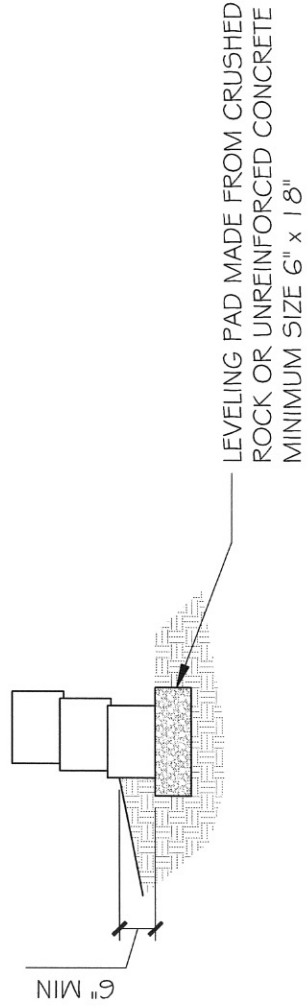
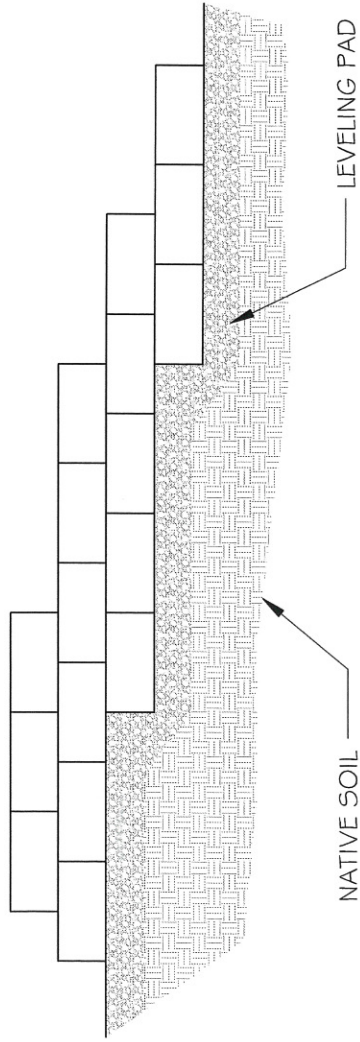
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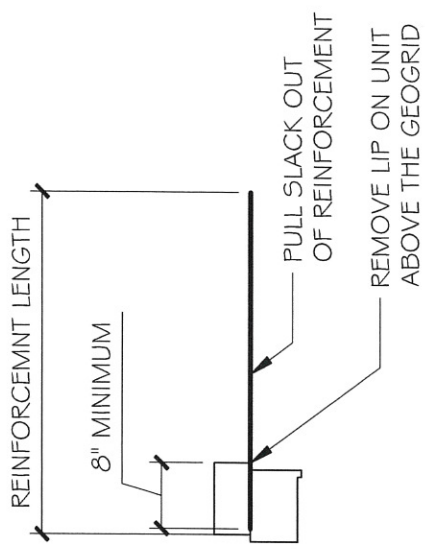
SHEET 6 OF 10

DATE: MAY 2016



LEVELING PAD DETAIL

NOT TO SCALE



CONNECTION DETAIL

NOT TO SCALE



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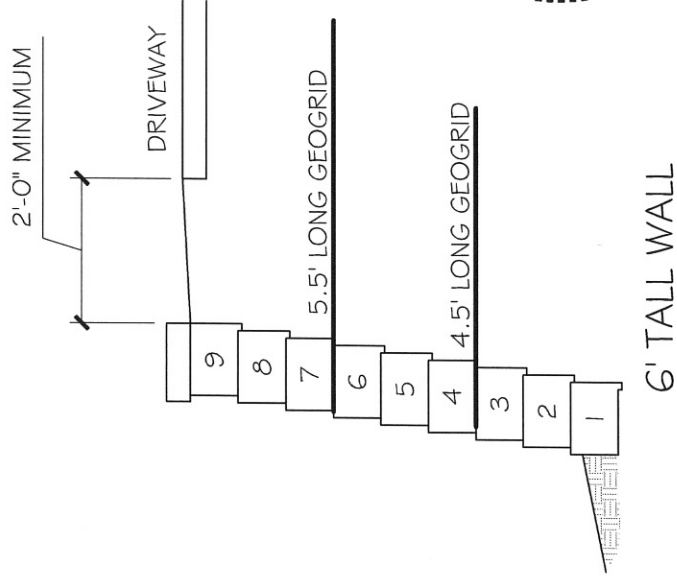
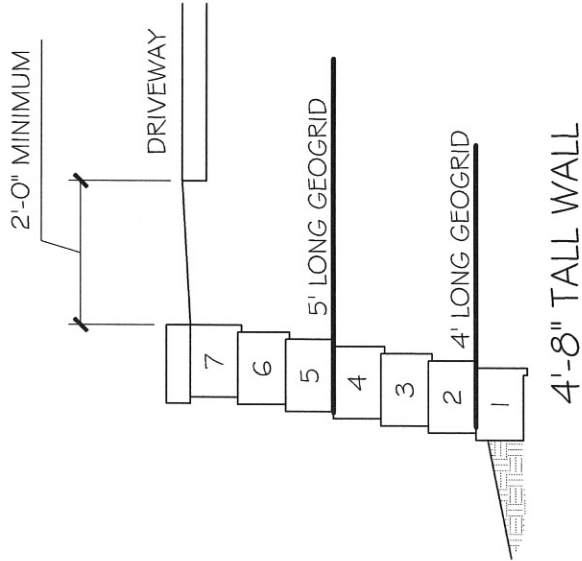
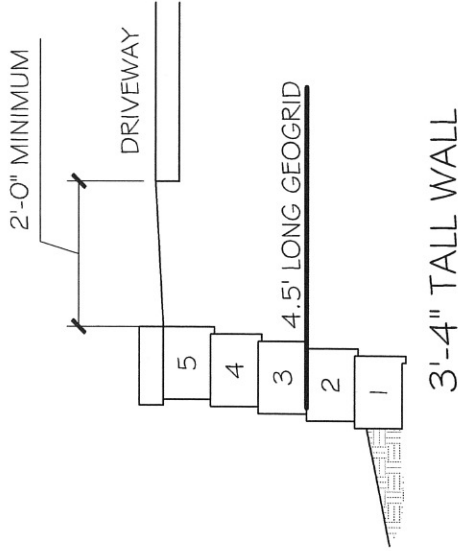
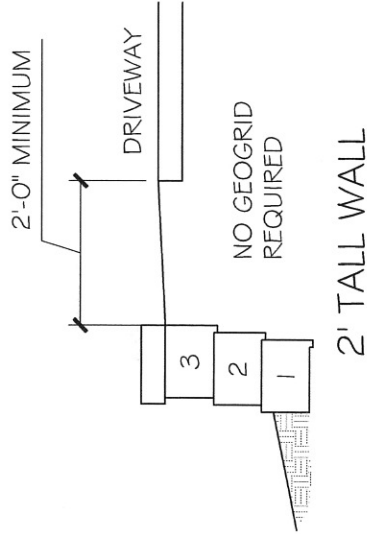
SHEET 7 OF 10

DATE: MAY 2016



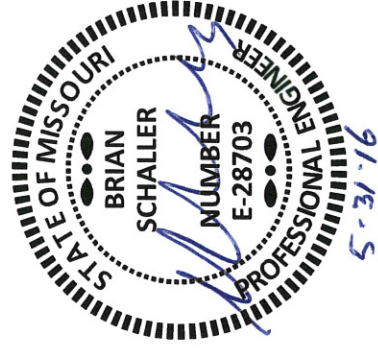
**NOTES:**

1. GEOGRID LENGTH MEASURED FROM FACE OF WALL.
2. GEOGRID SHALL BE MIRAGRID 2XT OR 3XT, STRATAGRID SG 150 OR SG200 OR SYNTEEN SF20 OR SF35.
3. BLOCKS DIRECTLY ABOVE GEOGRID SHALL HAVE THE REAR LIPS REMOVED.
4. WALL HEIGHT MEASURED FROM TOP OF LEVELING PAD TO TOP OF WALL.
5. SEE TYPICAL DETAIL FOR BACKFILL REQUIREMENTS AND CONSTRUCTION NOTES.
6. GRADE AT BASE OF WALL IS TO SLOPE AWAY FROM WALL TO PREVENT PONDING.



**TYPICAL SECTION - 100 PSF SURCHARGE**

NOT TO SCALE



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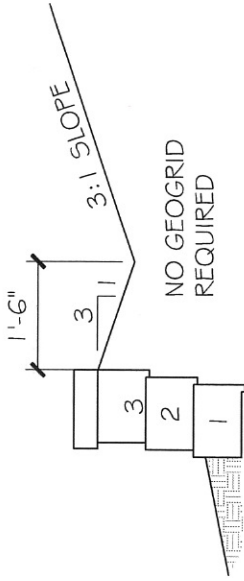
FLAT BACKFILL

SHEET 8 OF 10

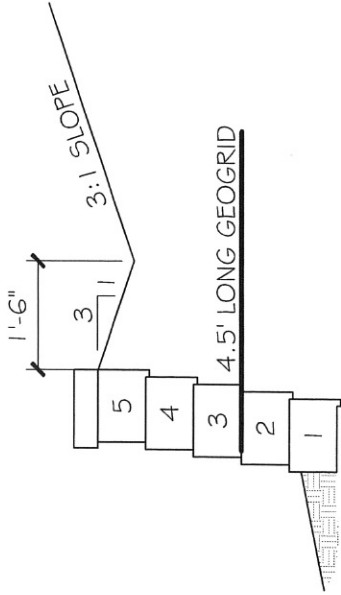
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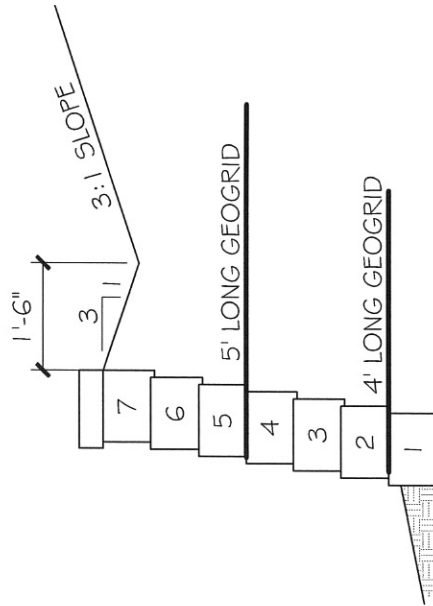
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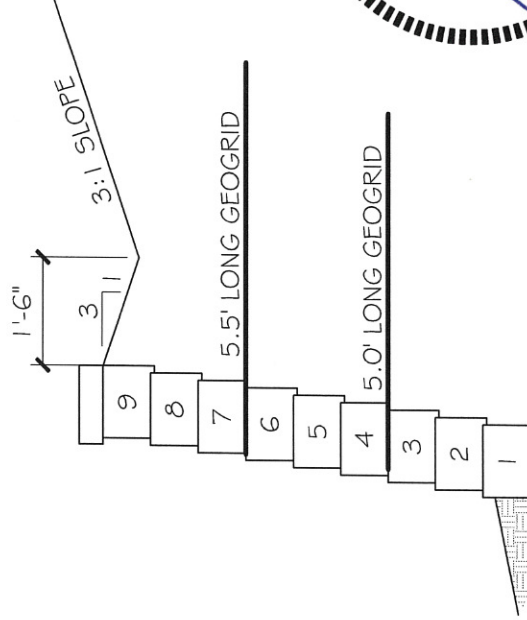
2' TALL WALL



3'-4" TALL WALL



4'-8" TALL WALL



6' TALL WALL

TYPICAL SECTION - 3:1 SLOPING BACKFILL

NOT TO SCALE



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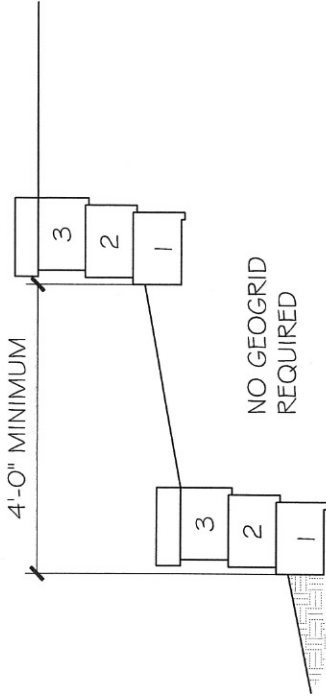
SLOPING BACKFILL

SHEET 9 OF 10

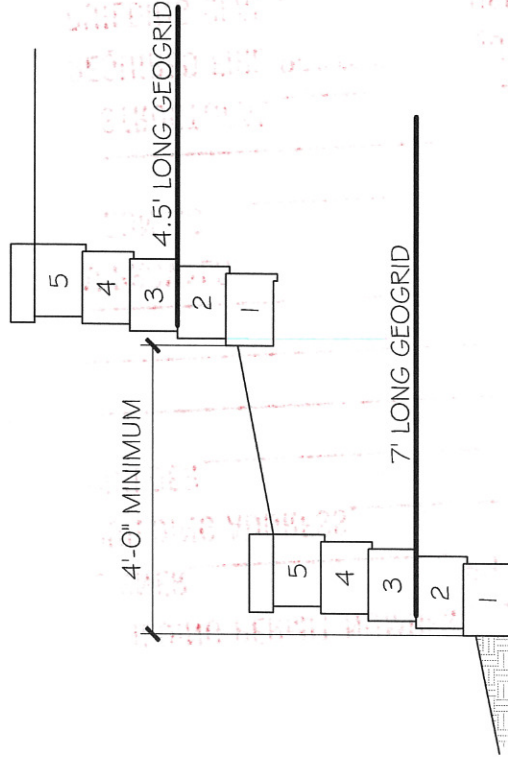
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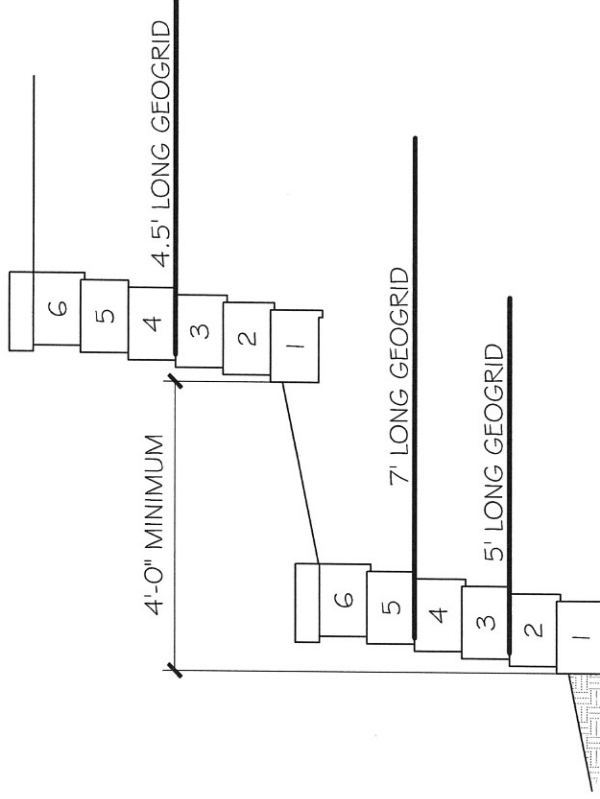
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6. GRADE AT BASE OF WALL IS TO SLOPE AWAY FROM WALL TO PREVENT PONDING.



2' TIERED WALLS



3'-4" TIERED WALLS



4'-0" TIERED WALLS

TYPICAL SECTION - TIERED WALLS

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TIERED WALLS

SHEET 10 OF 10

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