

# CARDINAL LANDING

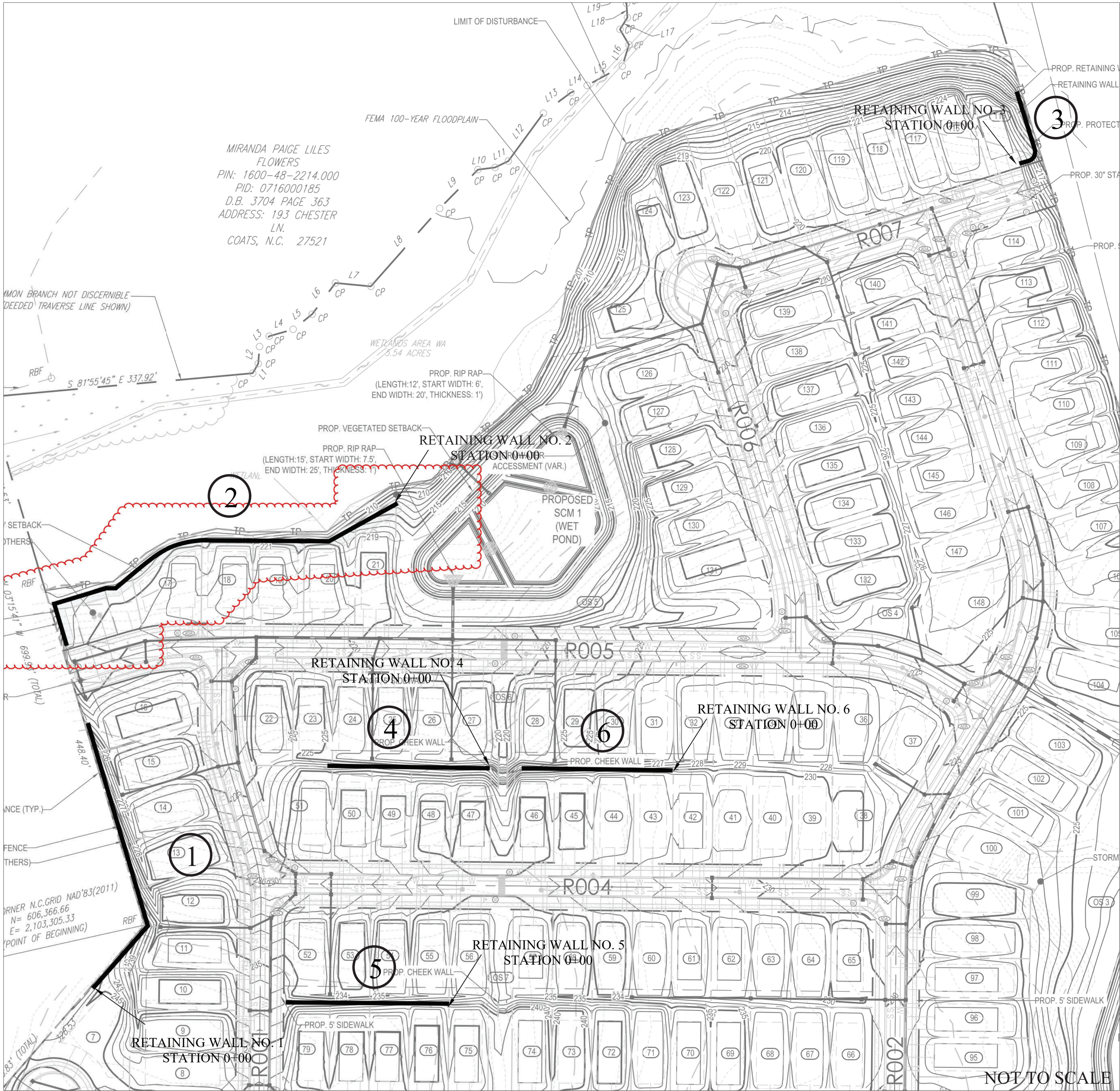
NC HIGHWAY 27 E  
COATS, NORTH CAROLINA

## SHEET INDEX

RW-1.0	TITLE SHEET
RW-2.0	SITE LAYOUT
RW-3.0	RETAINING WALL NO. 1 PROFILE
RW-3.1	RETAINING WALL NO. 1 PROFILE
RW-4.0	RETAINING WALL NO. 2 PROFILE
RW-4.1	RETAINING WALL NO. 2 PROFILE CONT.
RW-4.2	RETAINING WALL NO. 2 PROFILE CONT.
RW-5.0	RETAINING WALL NO. 3 PROFILE
RW-6.0	RETAINING WALL NO. 4 PROFILE
RW-7.0	RETAINING WALL NO. 5 PROFILE
RW-8.0	RETAINING WALL NO. 6 PROFILE
RW-9.0	RIDGEROCK PLUS UNIT DETAILS
RW-9.1	RIDGEROCK MAXIM UNIT DETAILS
RW-9.2	GENERAL SEGMENTAL WALL DETAILS
RW-10.0	RETAINING WALL SPECIFICATIONS

TITLE SHEET					<div>CARDINAL LANDING</div> <div>NC HIGHWAY 27 E COATS, NORTH CAROLINA MARVEL PROJECT NO. 24-17810</div>		<div>SEAL</div> <div></div> <div>Date: 2025/03/09 17:02:40-05'00"</div>		<div></div> <div>PO BOX 1955 GARNER, NORTH CAROLINA 27529 (919) 812-1375 • LICENSE NO. P-1332</div>		<div>SHEET</div> <div>RW-1.0</div>	
REV	DATE	DESCRIPTION	<div>ISSUED FOR CONSTRUCTION 9-27-2024</div> <div>DRAWN BY: BDH DESIGNED BY: BDH REVIEWED BY:</div>									
R-1	3-5-25	REVISED WALL 2 / ADD WALL 4, 5,&6										
			1 OF 15									





Note: The site plan used in the development of these plans was prepared by Underfoot Engineering on 6-5-2023. The site plan above has been modified to show a general location and orientation of the retaining wall(s) on the site. This modified site plan is not intended to be used for locating or staking of the retaining wall(s) and should not be relied on by other parties. Please refer to the original site plan (Revision dated 1-31-2025) prepared by Underfoot Engineering for the location and layout of the retaining wall(s).

## Construction Notes

### Prior to Construction:

1. A pre-construction meeting should be scheduled by the owner/owners' representative and/or general contractor prior to the start of construction and include all pertinent parties involved in the construction and testing of the retaining wall. This should also include any contractors that will be installing utilities in the reinforced zone of the retaining wall.
2. Confirmation of the location of property lines, limits of disturbances, watersheds, wetlands, easements, buffers, curb and gutter, and/or buildings to the proposed retaining wall should be performed by the general contractor to verify that the distances shown on the provided site plan are available.
3. Confirmation of existing utility line locations (Stormwater, Sewer, Water, Electrical, and Gas) and the locations of future utility lines that are in close proximity of the planned retaining wall(s) shall be performed by the general contractor to verify that proper clearances are available.
4. Confirmation of the in-situ and proposed grades shall be performed to verify that site grades shown on the provided site plan are accurate. The Retaining Wall Design Engineer shall be notified if the actual grades differ than those on the provided site plan.

### During Construction:

5. Structures located in close proximity to the excavation area of the retaining wall shall be properly supported so as not to undermine or cause damage to the structure. If existing structures do not allow the proper installation of the retaining wall design specified, the Retaining Wall Design Engineer shall be notified to review the impact to the retaining wall design.
6. Utility structures and underground utility lines located within the reinforced zone of the retaining wall(s) shall be installed prior to or during construction of the retaining wall(s) to prevent damage to the reinforcement layers. If the presence of utility structures interfere with the integrity of the reinforcement, the Retaining Wall Design Engineer shall be notified during construction to review the impact to the retaining wall design.

### Post Construction

7. Construction activities in the vicinity of the retaining walls should be monitored by the general contractor to verify that it does not result in damage to the retaining wall. Heavy equipment should not be allowed operate within 3 feet of the retaining wall(s) to prevent from impacting the structural integrity of the retaining wall(s). The Retaining Wall Design Engineer shall be notified if any damage to the retaining wall or wall units occurs during post construction activities.
8. Construction activities in the vicinity of the reinforced zone of the retaining wall(s) should be monitored by the general contractor to verify that it does not result in damage to the retaining wall geogrid. Installation of light poles, signs, handrails, guardrails, shrubs, or trees (etc) in the reinforced zone of the retaining wall(s) shall not damage the upper layers of reinforcement. The Retaining Wall Design Engineer shall be notified if any damage to the reinforcement occurs during post construction activities.
9. Placement of low permeable soil at the top and in front of the retaining wall(s) should be performed by the site contractor immediately after final construction activities. Proper erosion control at the top and bottom portions of the retaining wall(s) is critical to wall performance. Any portion of the retaining wall(s) where geogrid or wall units are exposed due to excessive erosion shall be removed and reconstructed in accordance with the retaining wall plans.
10. Excessive surface water flowing towards the top of the retaining wall(s) should be properly managed or diverted by permanent diversion ditches to prevent overtopping the front face of the retaining wall. Excessive surface water that flows over the top of retaining walls can lead to undermining of the foundation system over time. Catch inlets can be installed as needed in low areas of the retaining wall to help collect and channel surface water from the retaining wall.
11. Since segmental retaining walls are flexible reinforced soil masses, differential movement and strain of the reinforced and retained soil matrix could result in minor cracking of the ground surface. This cracking can lead to reflective cracks in pavement sections and/or separation of concrete curbs and aprons that are located in the vicinity of the retaining wall. In addition, cracking and gapping of the segmental wall units, especially in cut corners and curves may also occur during post construction activities. High quality backfill with low fine contents, proper backfill compaction, and firm foundations can limit the amount of post construction movement of retaining walls. Any cracks that develop in soil or pavement areas should be sealed as soon as possible to prevent the infiltration of surface water. Cracking or gapping observed in wall units should be sealed with grout as soon as possible to prevent the loss of drainage aggregate from behind the wall(s).

### SITE LAYOUT

REV	DATE	DESCRIPTION
R-1	3-5-25	REVISED WALL 2 / ADD WALL 4, 5,&6

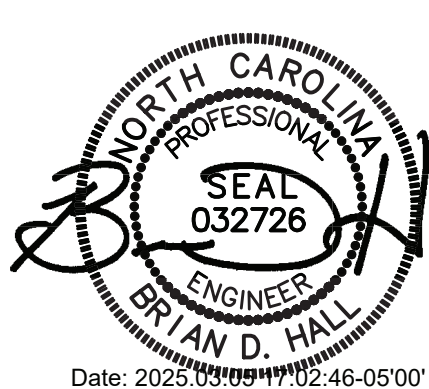
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DESIGNED BY: BDH  
REVIEWED BY:

## CARDINAL LANDING

NC HIGHWAY 27 E  
COATS, NORTH CAROLINA  
MARVEL PROJECT NO. 24-17810

### SEAL



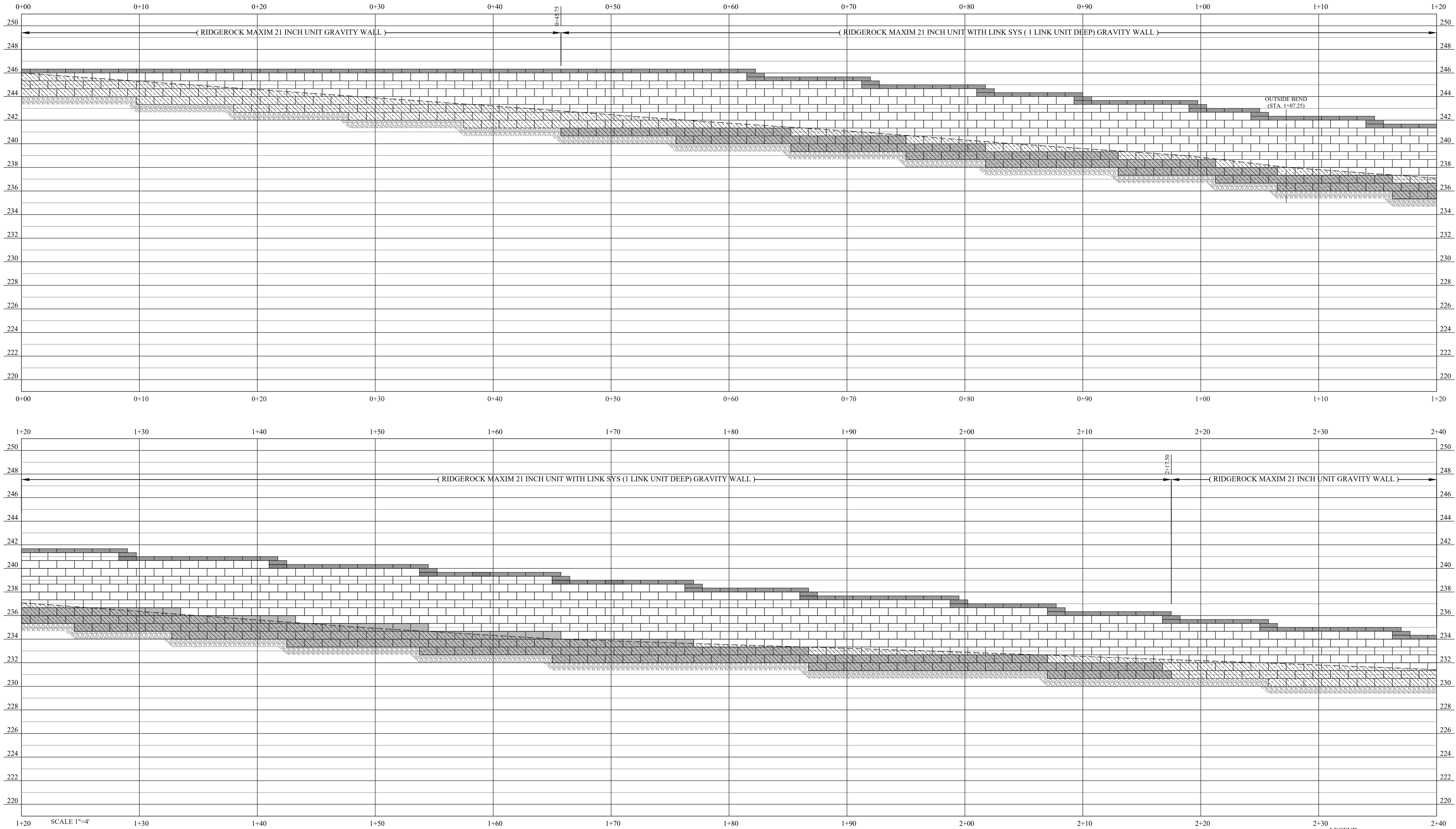
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### SHEET

RW-2.0

2 OF 15





RETAINING WALL 1

- LEGEND:
- 1). GRIDLOK GL 370 GEOGRID
  - 2). EMBEDDED BLOCK
  - 3). LEVELING PAD

RETAINING WALL NO. 1 PROFILE		
REV	DATE	DESCRIPTION
R-1	3-5-25	REVISED WALL 2 / ADD WALL 4, 5,&6

ISSUED FOR CONSTRUCTION	
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REVIEWED BY:	

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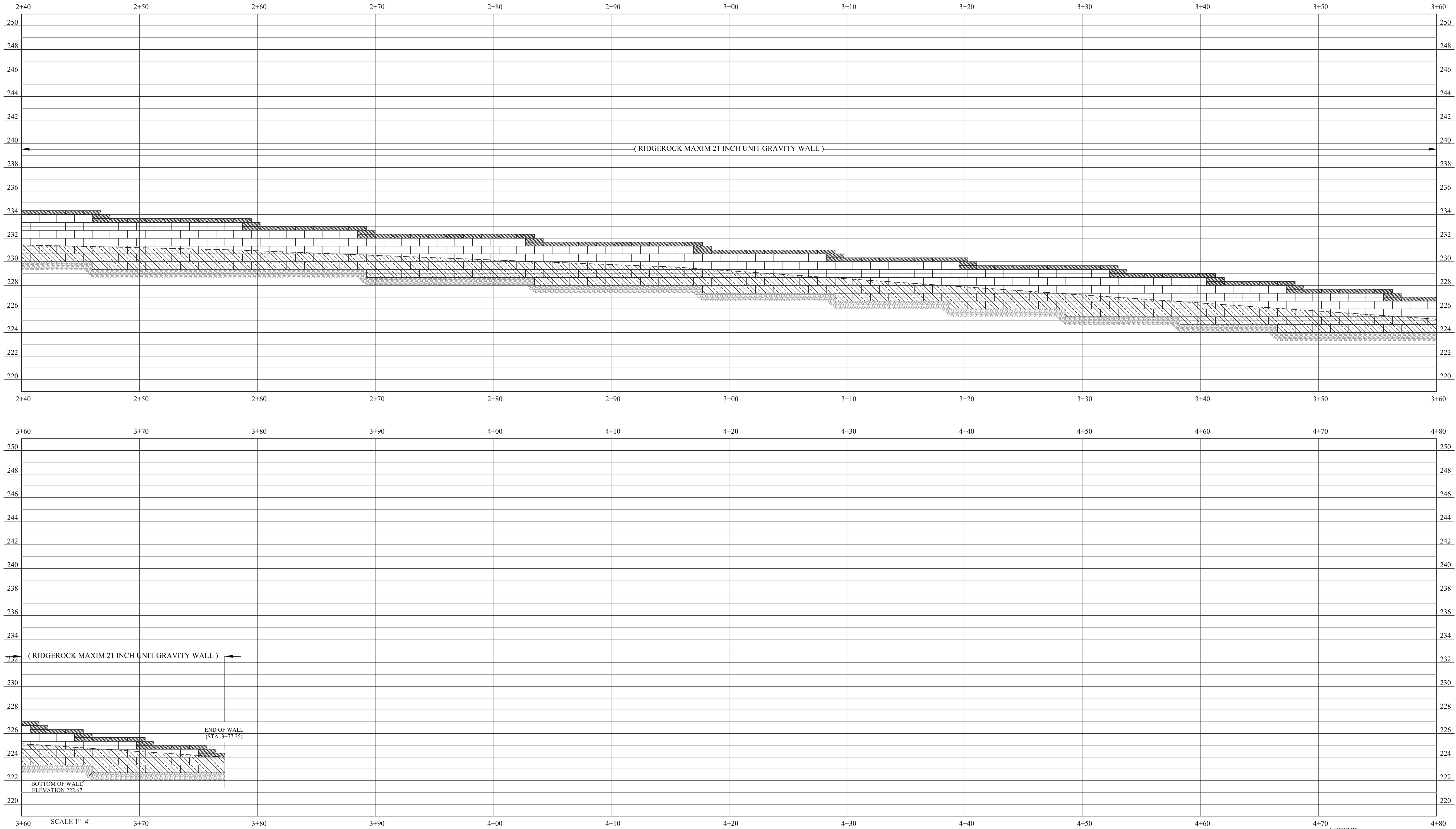
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SHEET

RW-3.0

3 OF 15



RETAINING WALL 1

- LEGEND:
- 1). GRIDLOK GL 370 GEOGRID
  - 2). EMBEDDED BLOCK
  - 3). LEVELING PAD

RETAINING WALL NO. 1 PROFILE CONT.		
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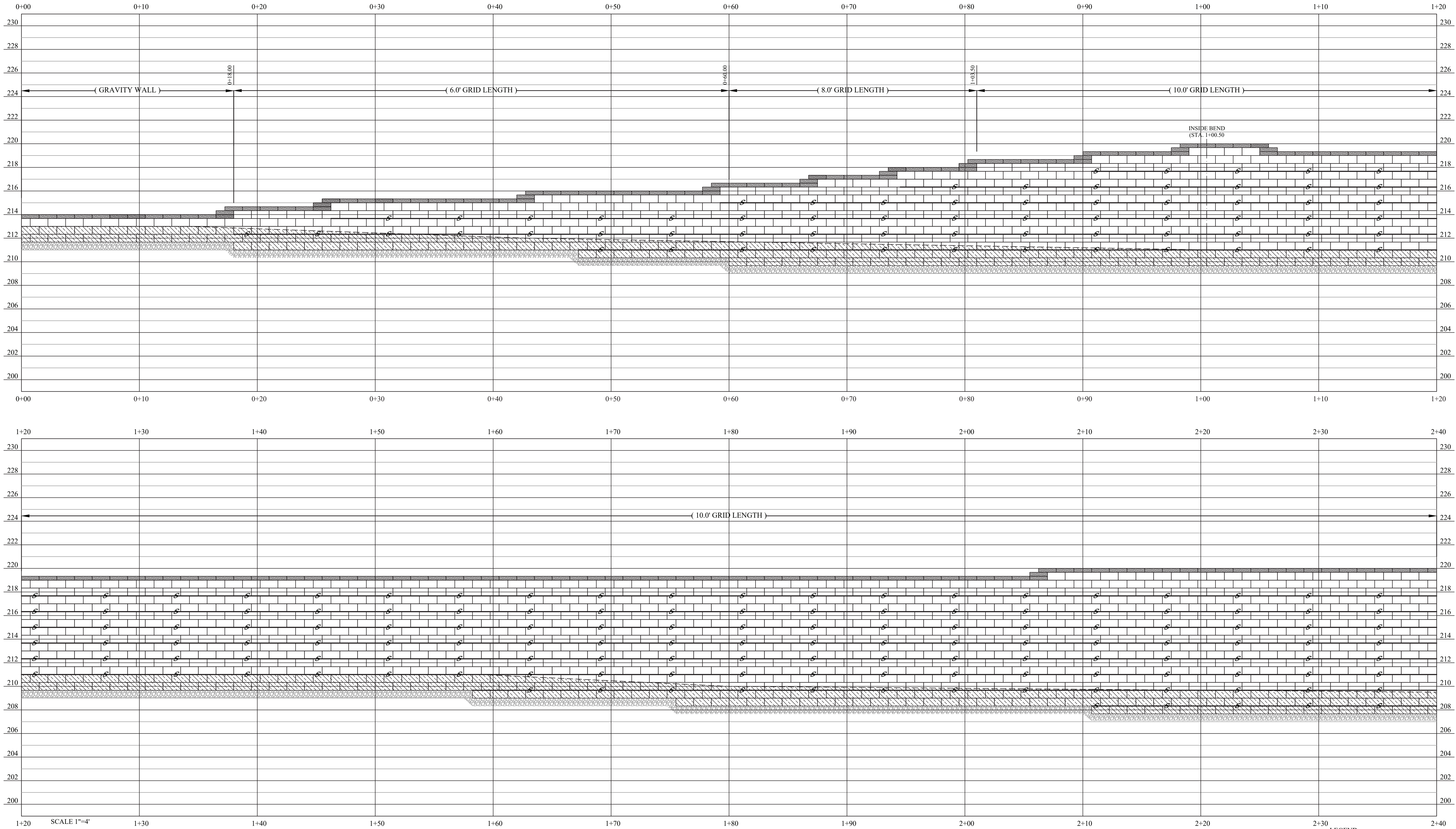
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RW-3.1

4 OF 15





RETAINING WALL 2

- LEGEND:
- 1). GRIDLOK GL 370 GEOGRID
  - 2). EMBEDDED BLOCK
  - 3). LEVELING PAD

RETAINING WALL NO. 2 PROFILE

REV	DATE	DESCRIPTION
R-1	3-5-25	REVISED WALL 2 / ADD WALL 4, 5,&6

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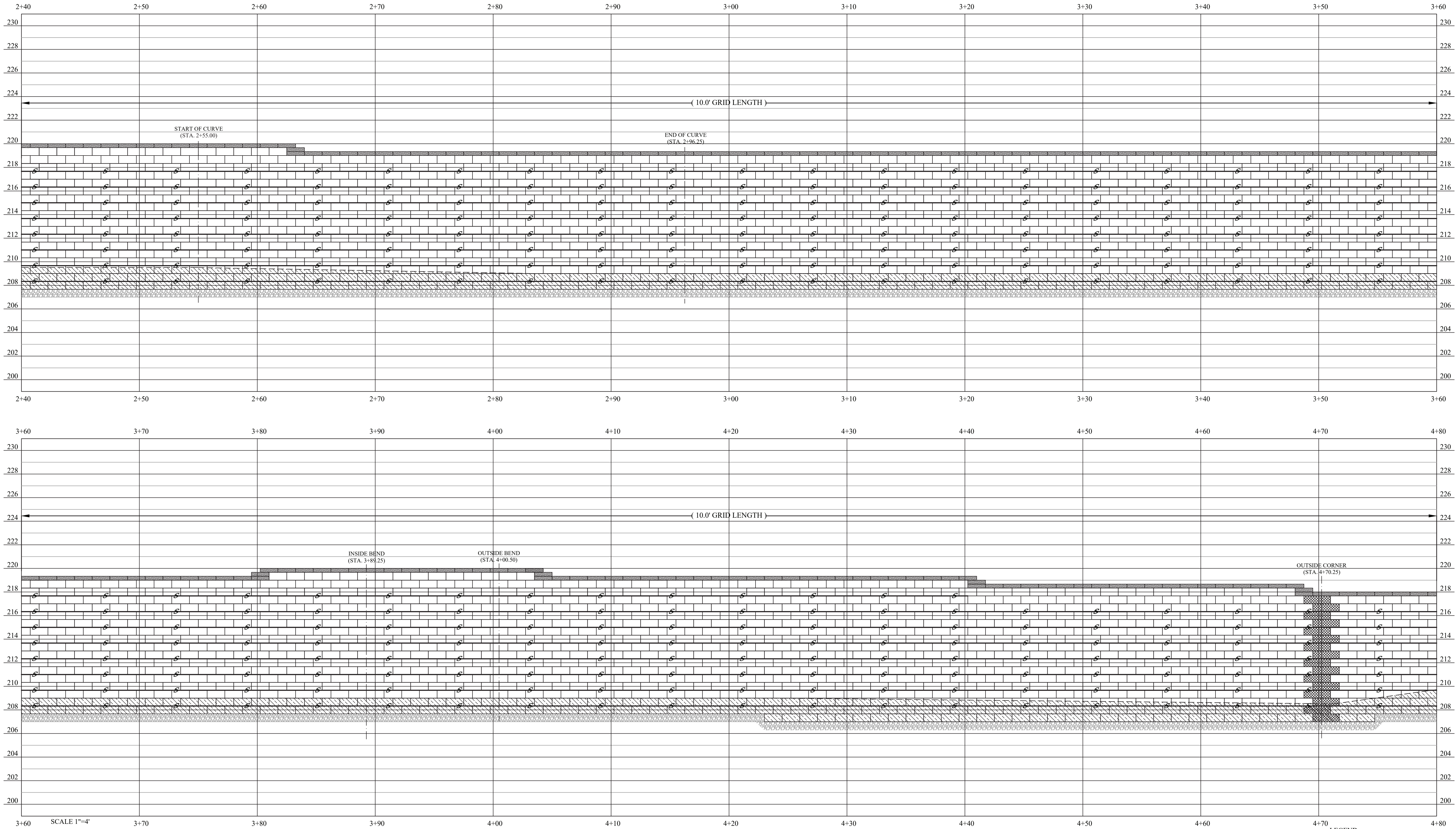


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RW-4.0

5 OF 15



RETAINING WALL 2

- LEGEND:
- 1). GRIDLOK GL 370 GEOGRID
  - 2). EMBEDDED BLOCK
  - 3). LEVELING PAD

RETAINING WALL NO. 2 PROFILE CONT.

REV	DATE	DESCRIPTION
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RW-4.1

6 OF 15





RETAINING WALL 2

- LEGEND:
- 1) GRIDLOK GL 370 GEOGRID
  - 2) EMBEDDED BLOCK
  - 3) LEVELING PAD

RETAINING WALL NO. 2 PROFILE CONT.

REV	DATE	DESCRIPTION
R-1	3-5-25	REVISED WALL 2 / ADD WALL 4, 5,&6

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CARDINAL  
LANDING

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COATS, NORTH CAROLINA  
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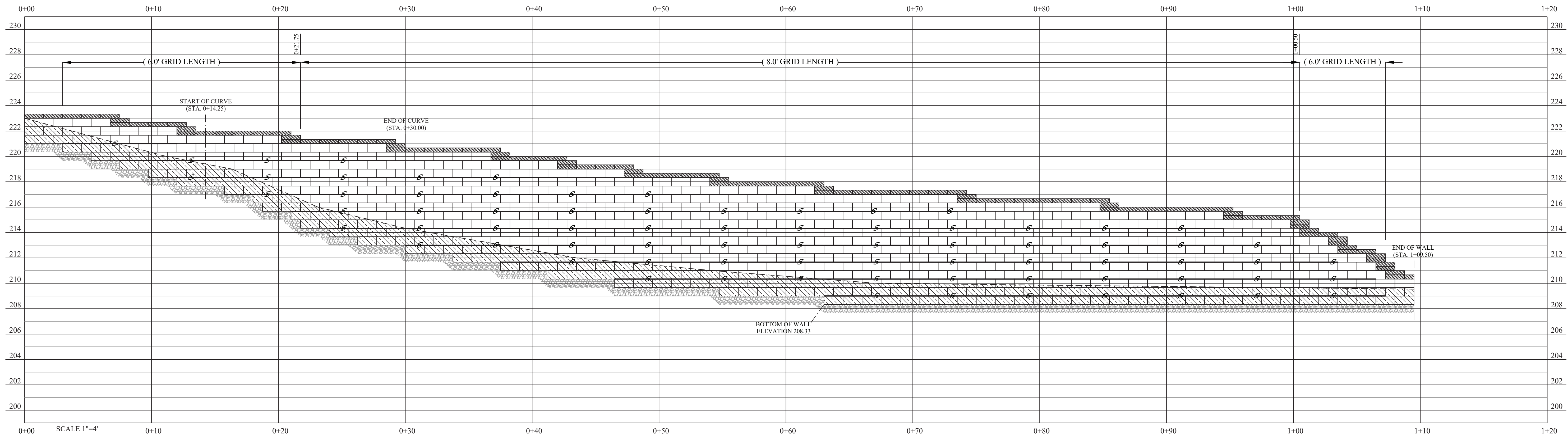
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RW-4.2

7 OF 15



RETAINING WALL 3

- LEGEND:
- 1. GRIDLOK GL 370 GEOGRID
  - 2. EMBEDDED BLOCK
  - 3. LEVELING PAD

RETAINING WALL NO. 3 PROFILE

REV	DATE	DESCRIPTION
R-1	3-5-25	REVISED WALL 2 / ADD WALL 4, 5,&6

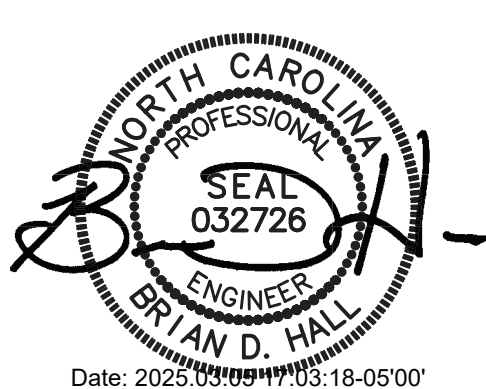
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LANDING

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RW-5.0

8 OF 15





## RETAINING WALL NO. 4 PROFILE

<p align="center"><b>ISSUED FOR CONSTRUCTION 9-27-2024</b></p>	
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MARVEL PROJECT NO. 24-17810

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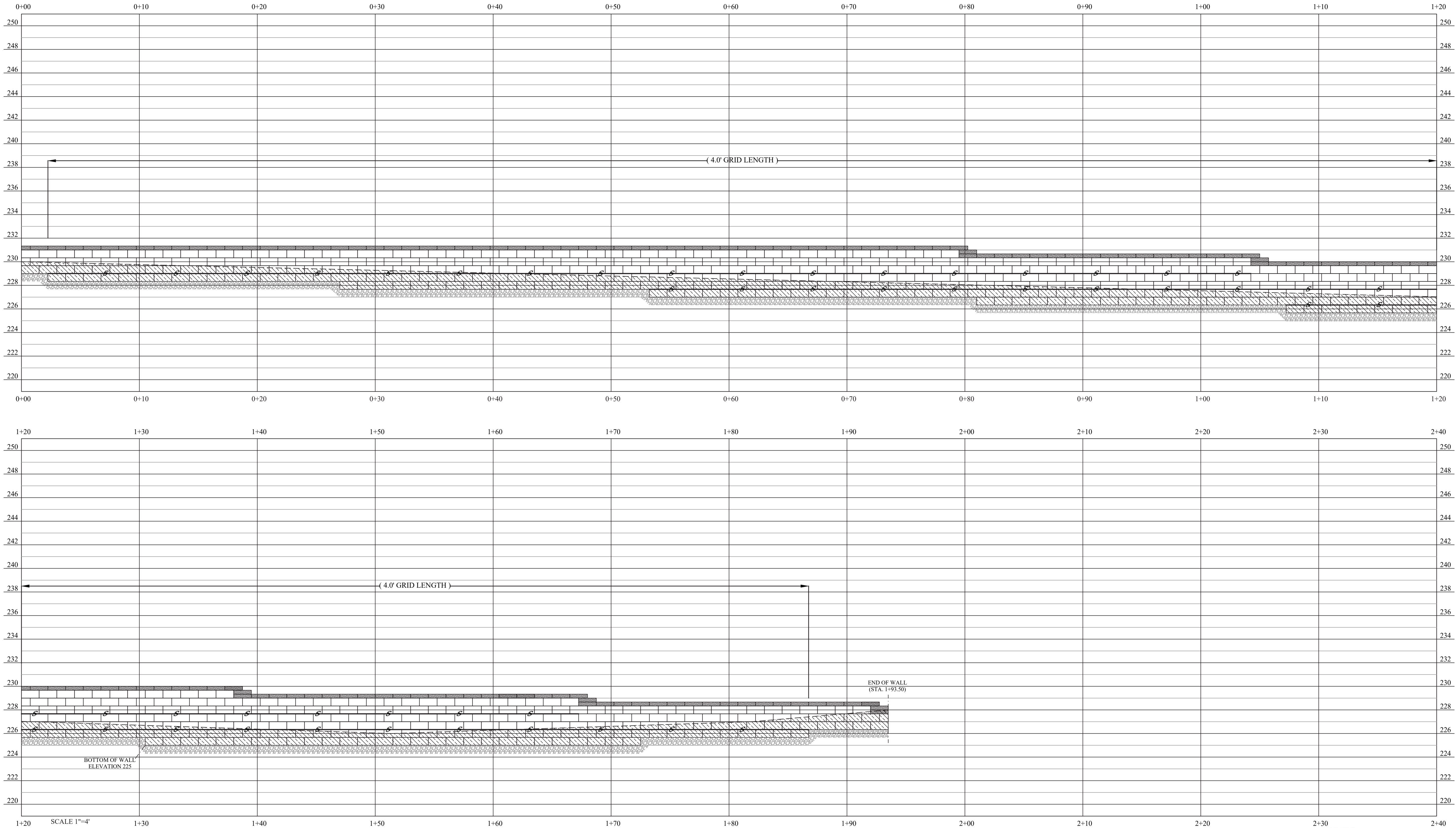
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SHEET

RW-6.0

9 OF 15





RETAINING WALL 5

- LEGEND:
- 1). GRIDLOK GL 370 GEOGRID
  - 2). EMBEDDED BLOCK
  - 3). LEVELING PAD

RETAINING WALL NO. 5 PROFILE

REV	DATE	DESCRIPTION
R-1	3-5-25	REVISED WALL 2 / ADD WALL 4, 5,&6

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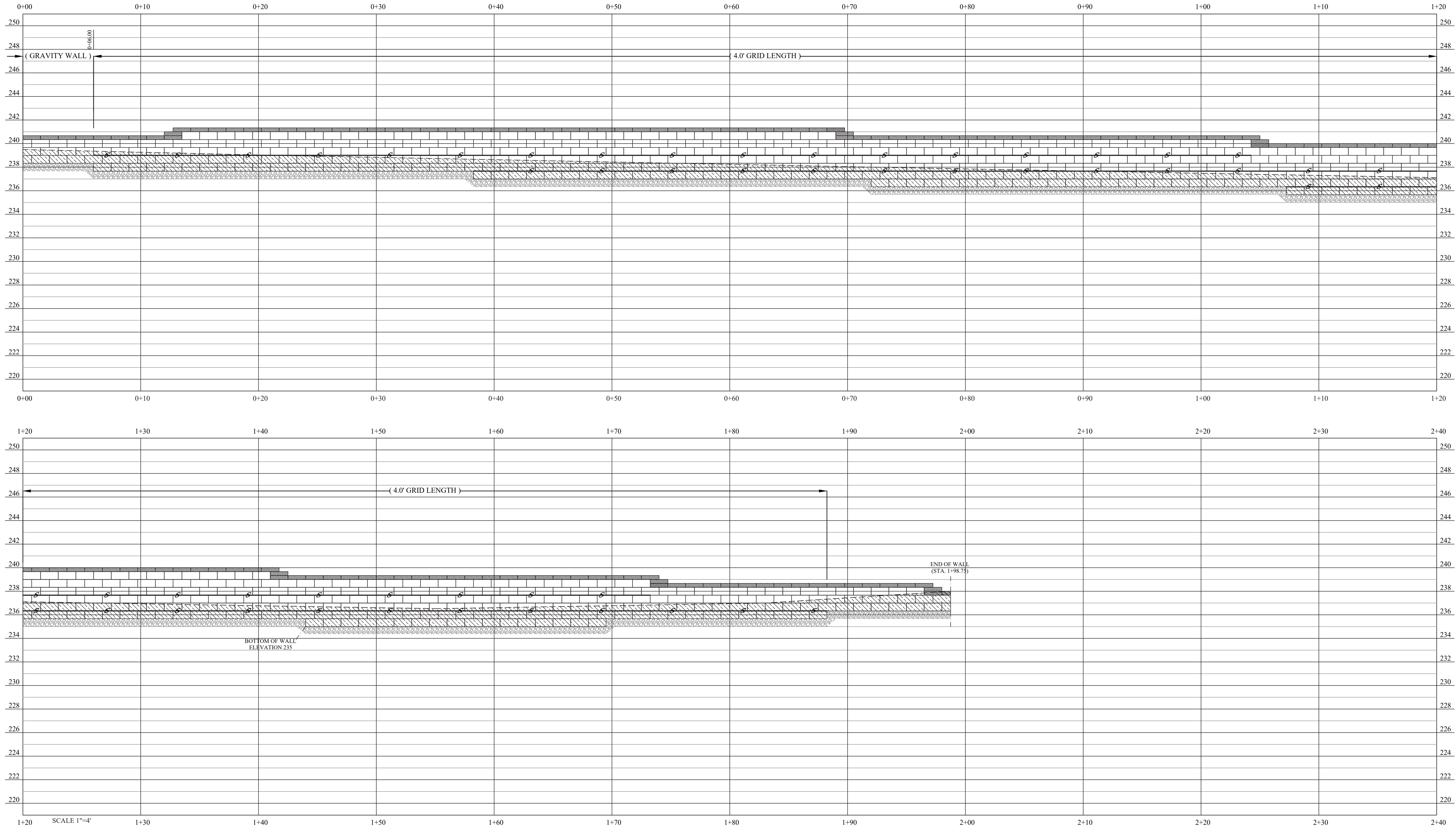
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SHEET

RW-7.0

10 OF 15





RETAINING WALL 6

- LEGEND:
- 1). GRIDLOK GL 370 GEOGRID
  - 2). EMBEDDED BLOCK
  - 3). LEVELING PAD

RETAINING WALL NO. 6 PROFILE		
REV	DATE	DESCRIPTION
R-1	3-5-25	REVISED WALL 2 / ADD WALL 4, 5,&6

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LANDING

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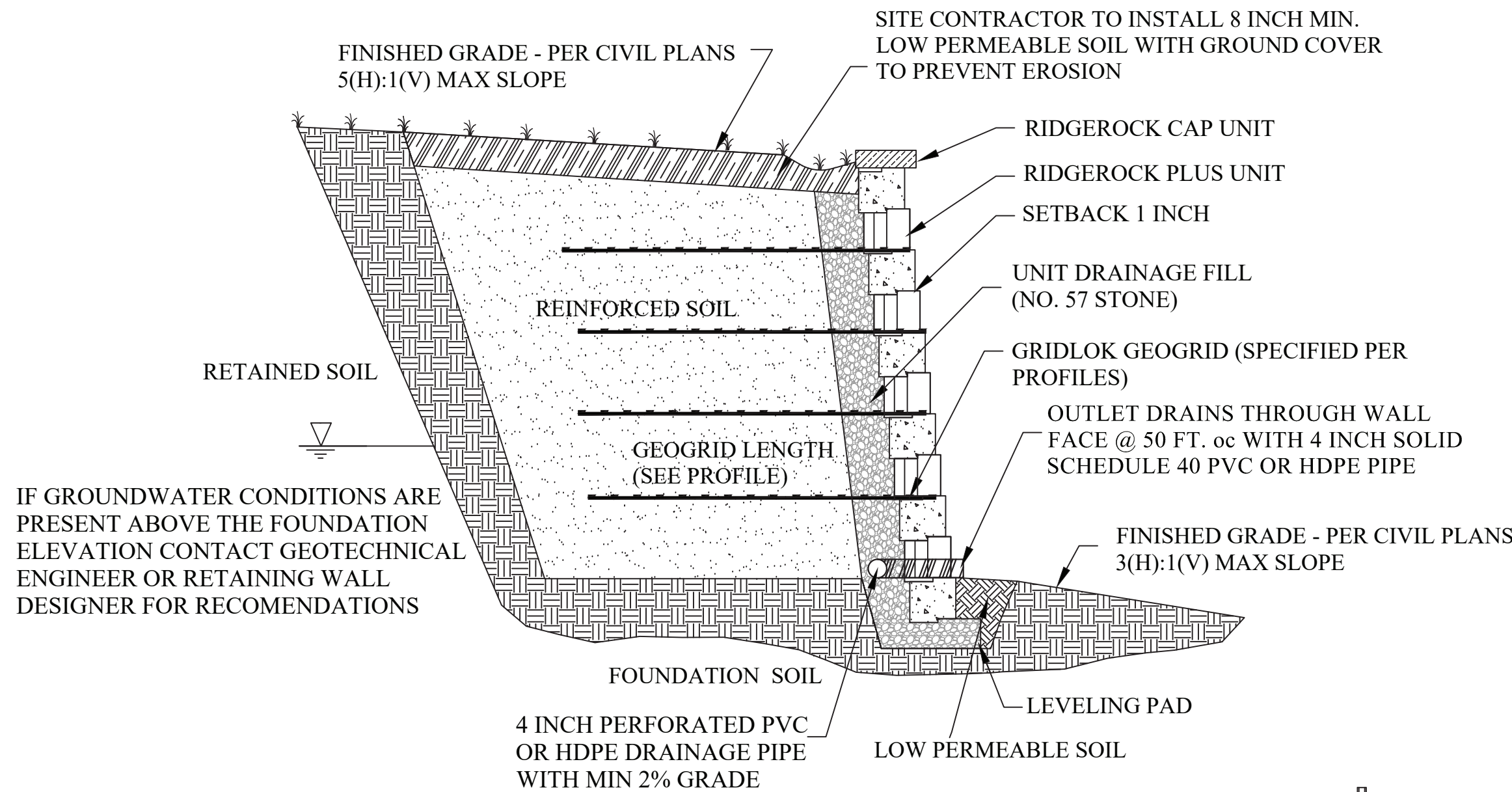
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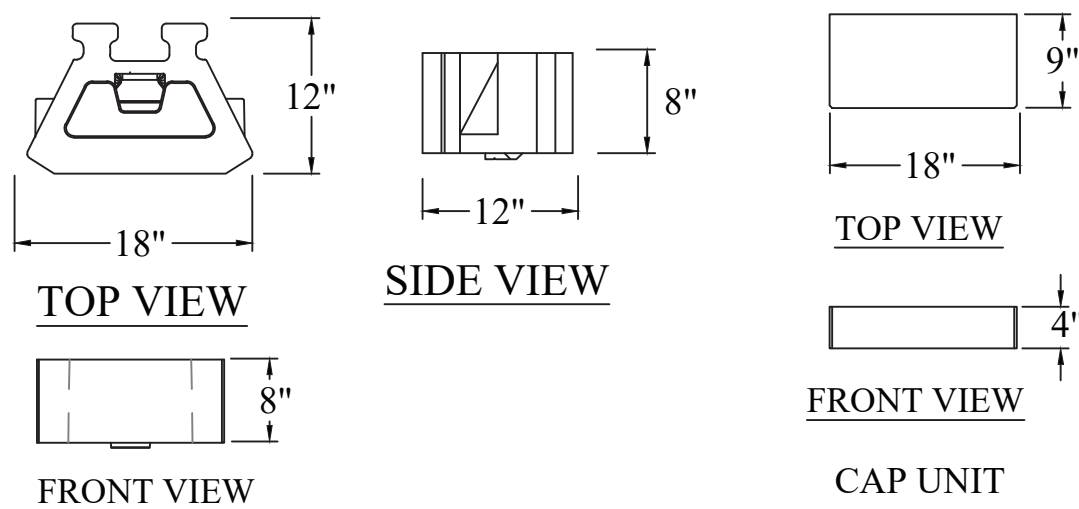
11 OF 15





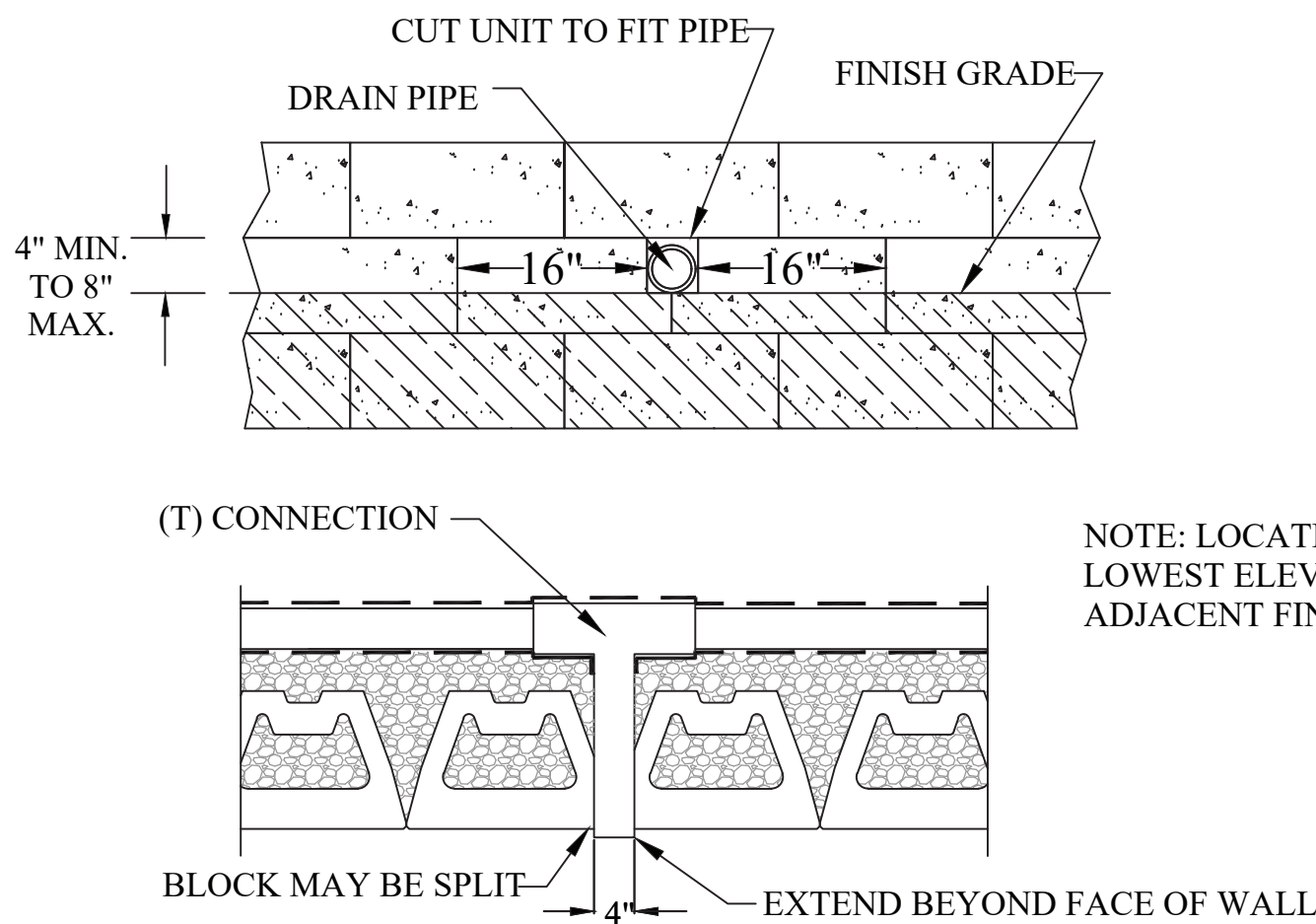
RIDGEROCK RETAINING WALL DETAIL

SCALE: NONE



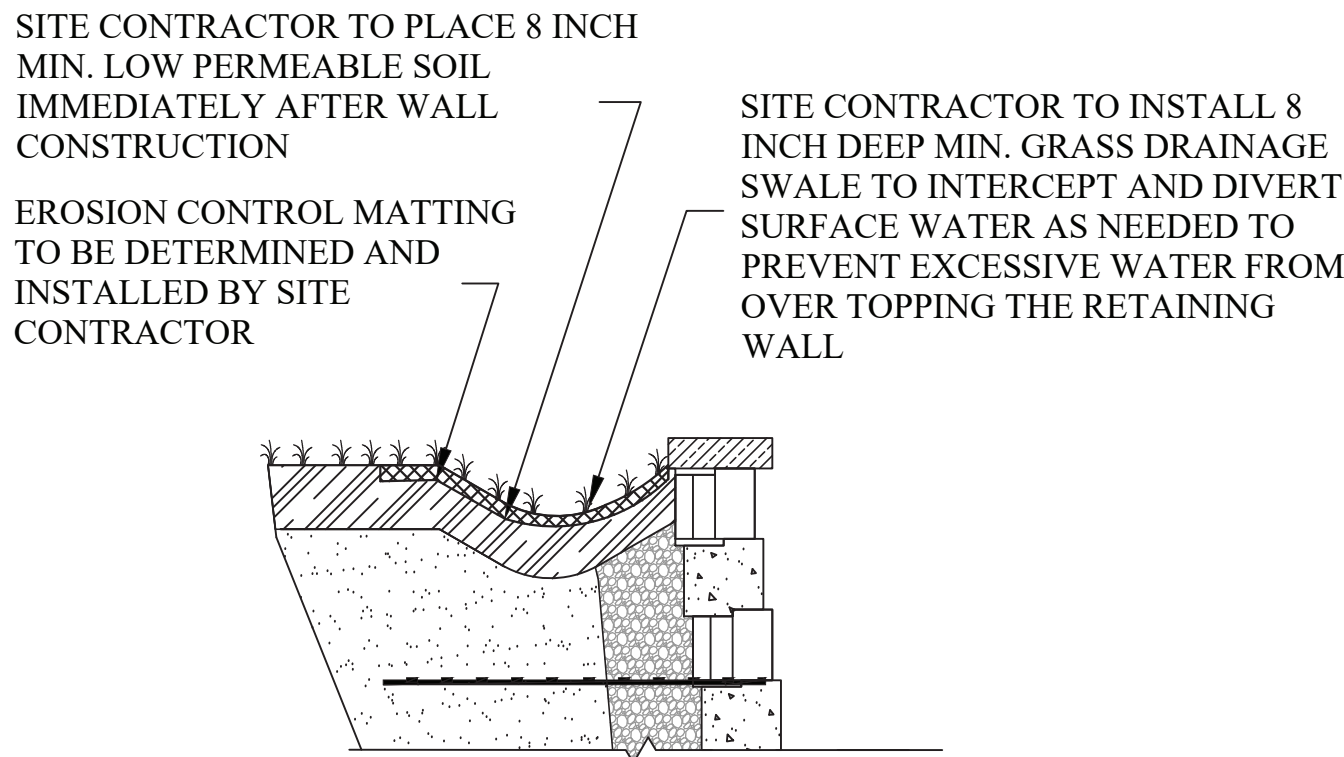
RIDGEROCK PLUS BLOCK DETAILS

SCALE: NONE



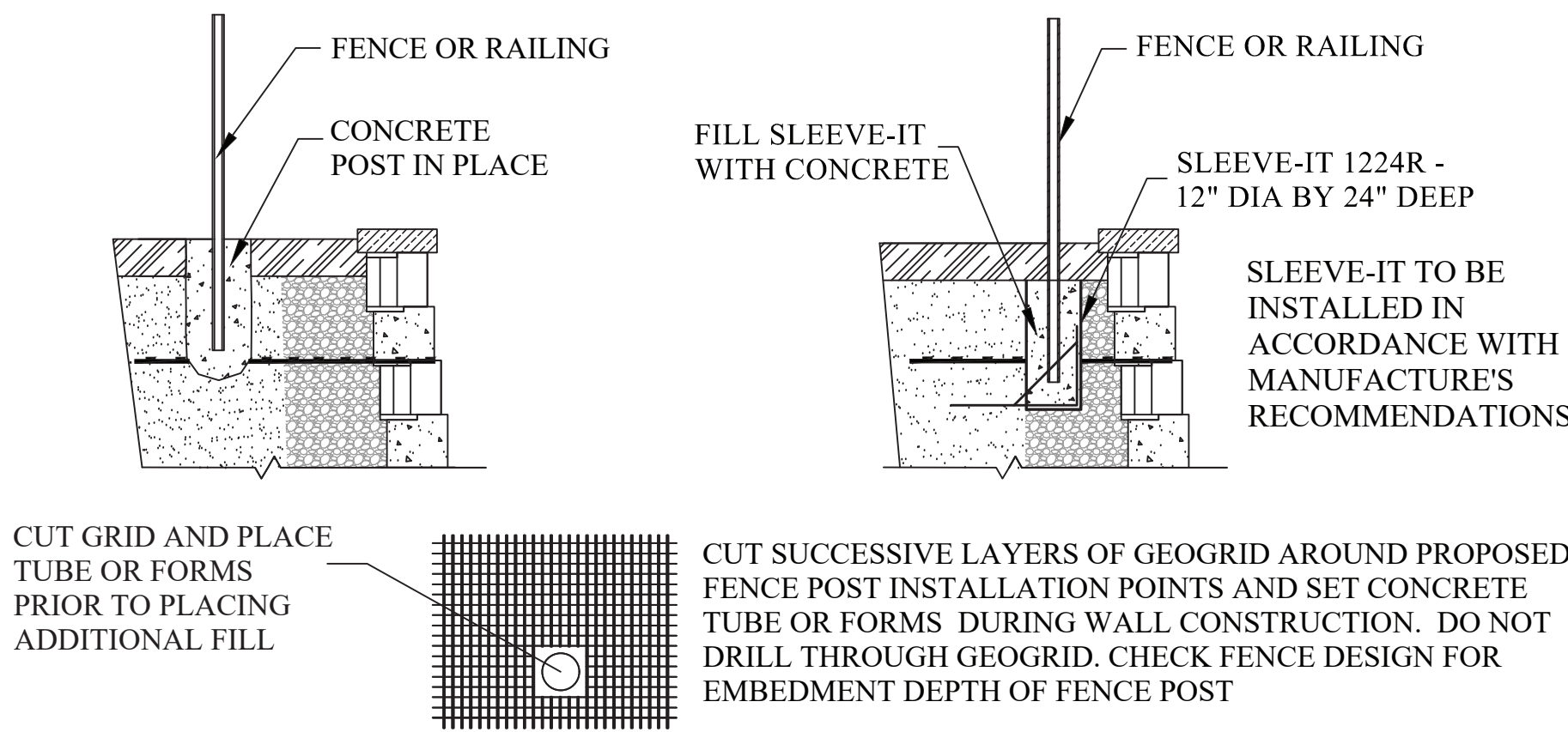
FACE OUTLET DRAIN DETAIL

SCALE: NONE



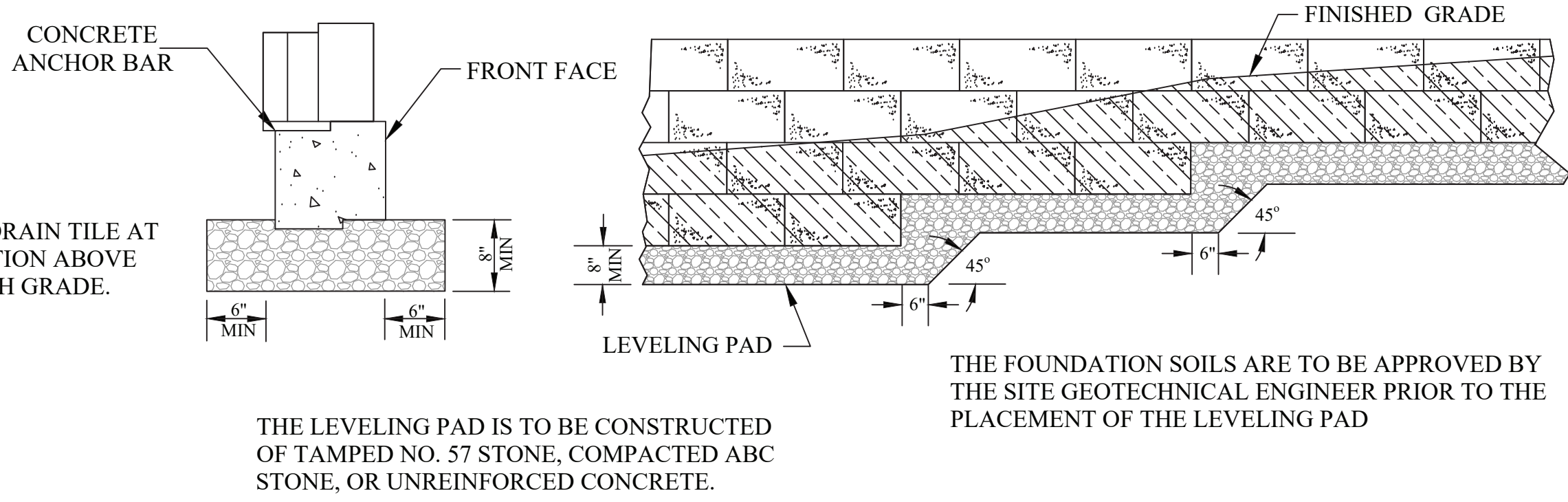
DRAINAGE SWALE DETAIL (AS NEEDED)

SCALE: NONE



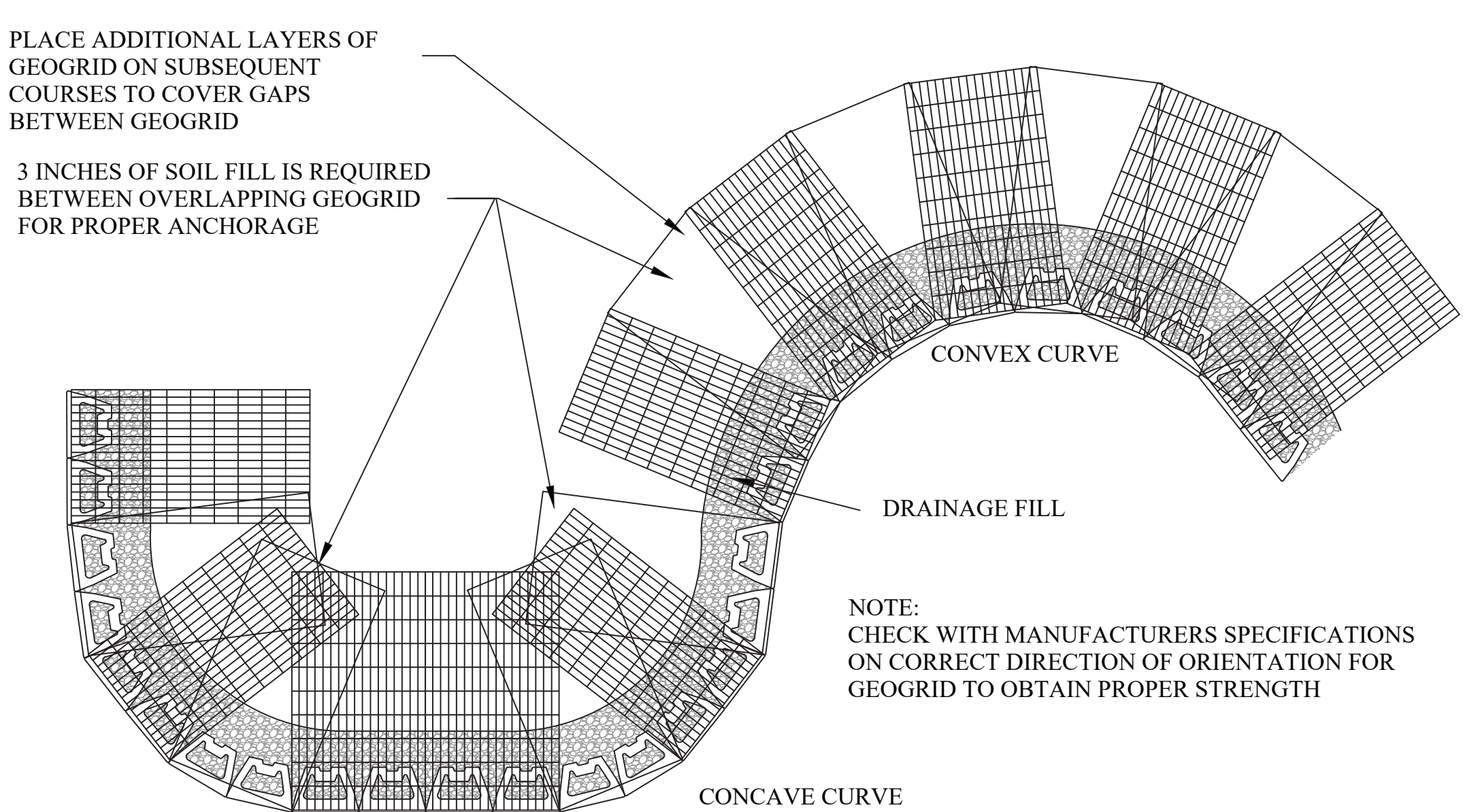
TYPICAL HAND RAILING DETAIL

SCALE: NONE



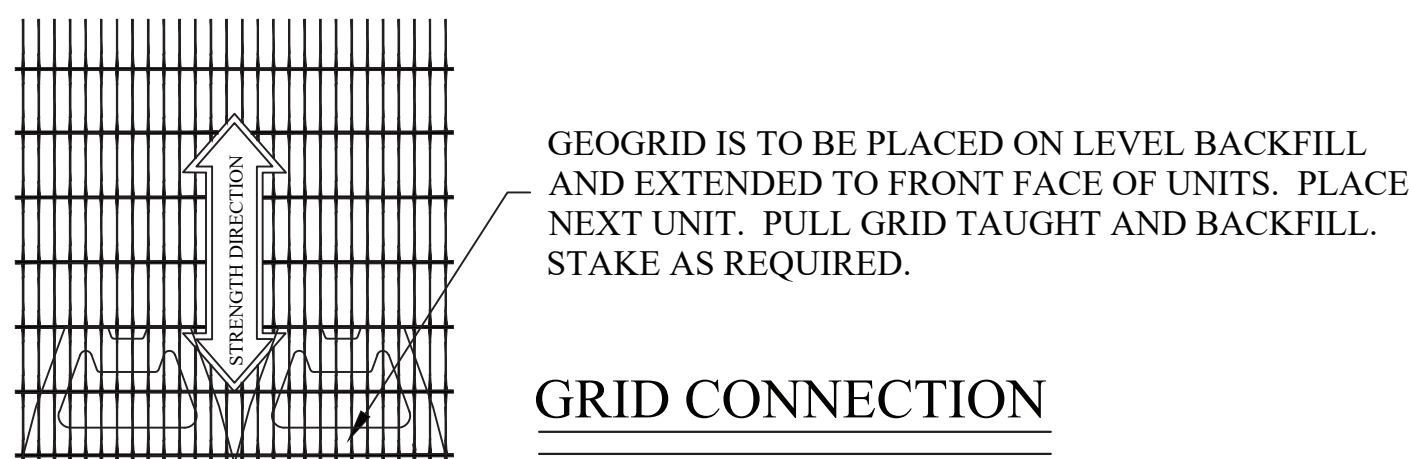
LEVELING PAD DETAILS

SCALE: NONE



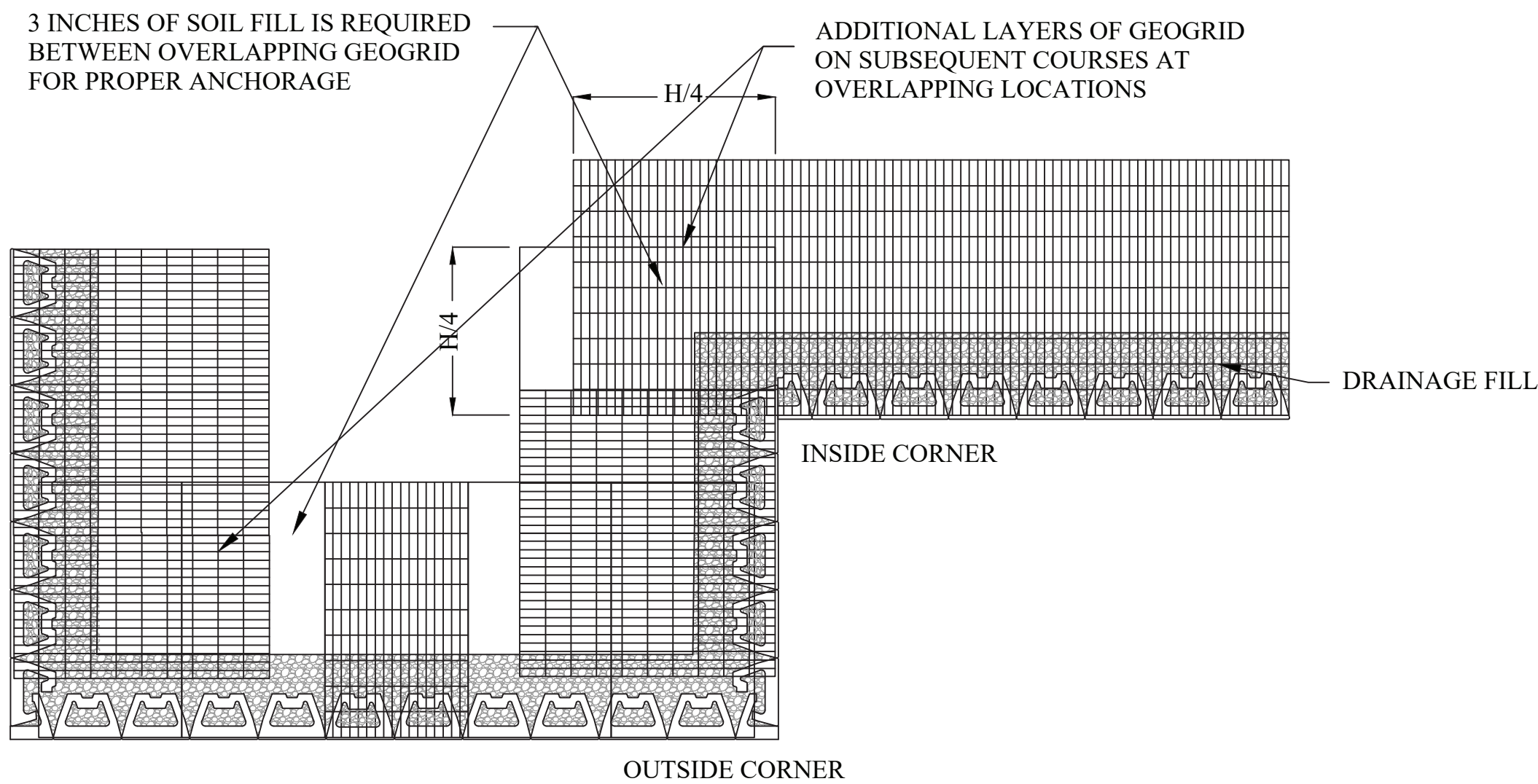
GEOGRID INSTALLATION AT CURVES

SCALE: NONE



GRID CONNECTION

SCALE: NONE



GEOGRID INSTALLATION AT CORNERS

SCALE: NONE

RIDGEROCK PLUS UNIT DETAILS

REV	DATE	DESCRIPTION
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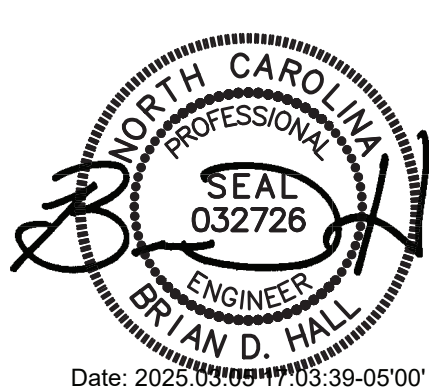
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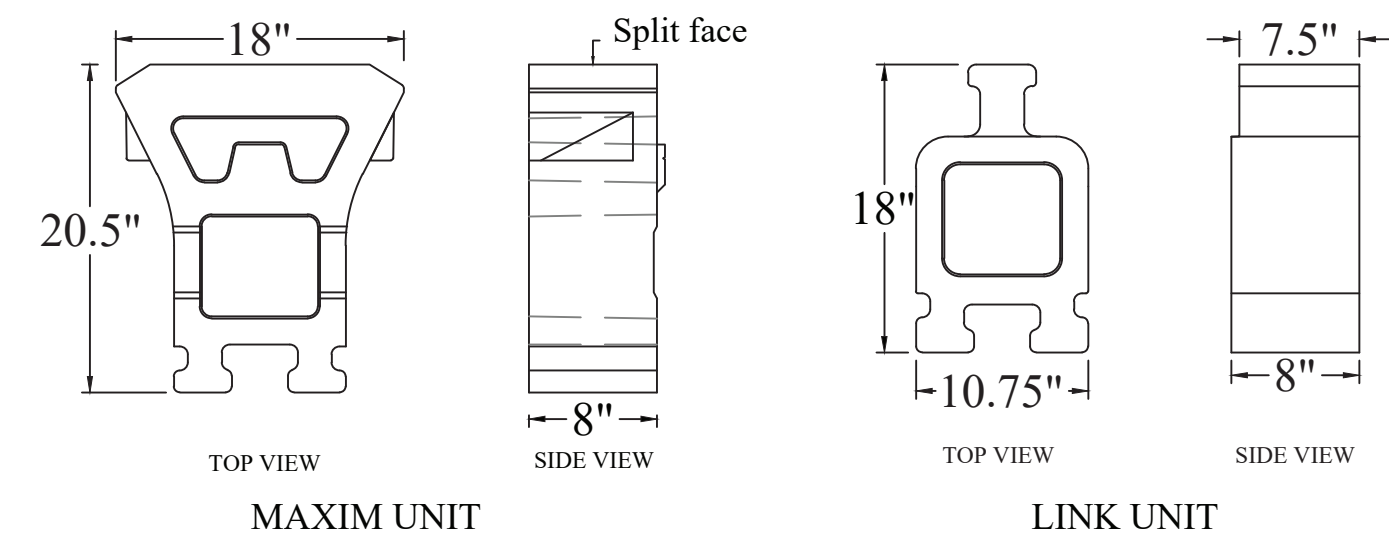
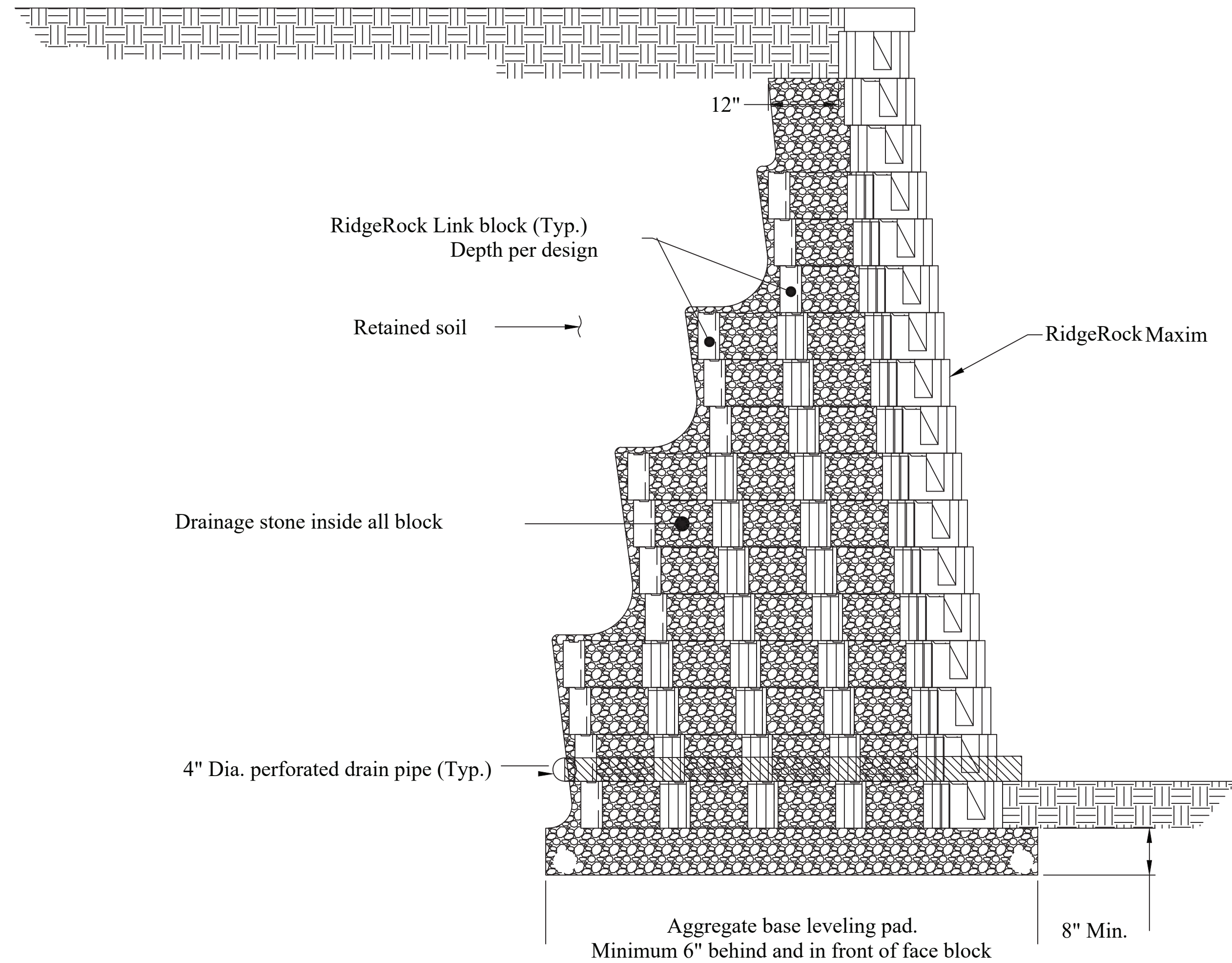
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RW-9.0

12 OF 15



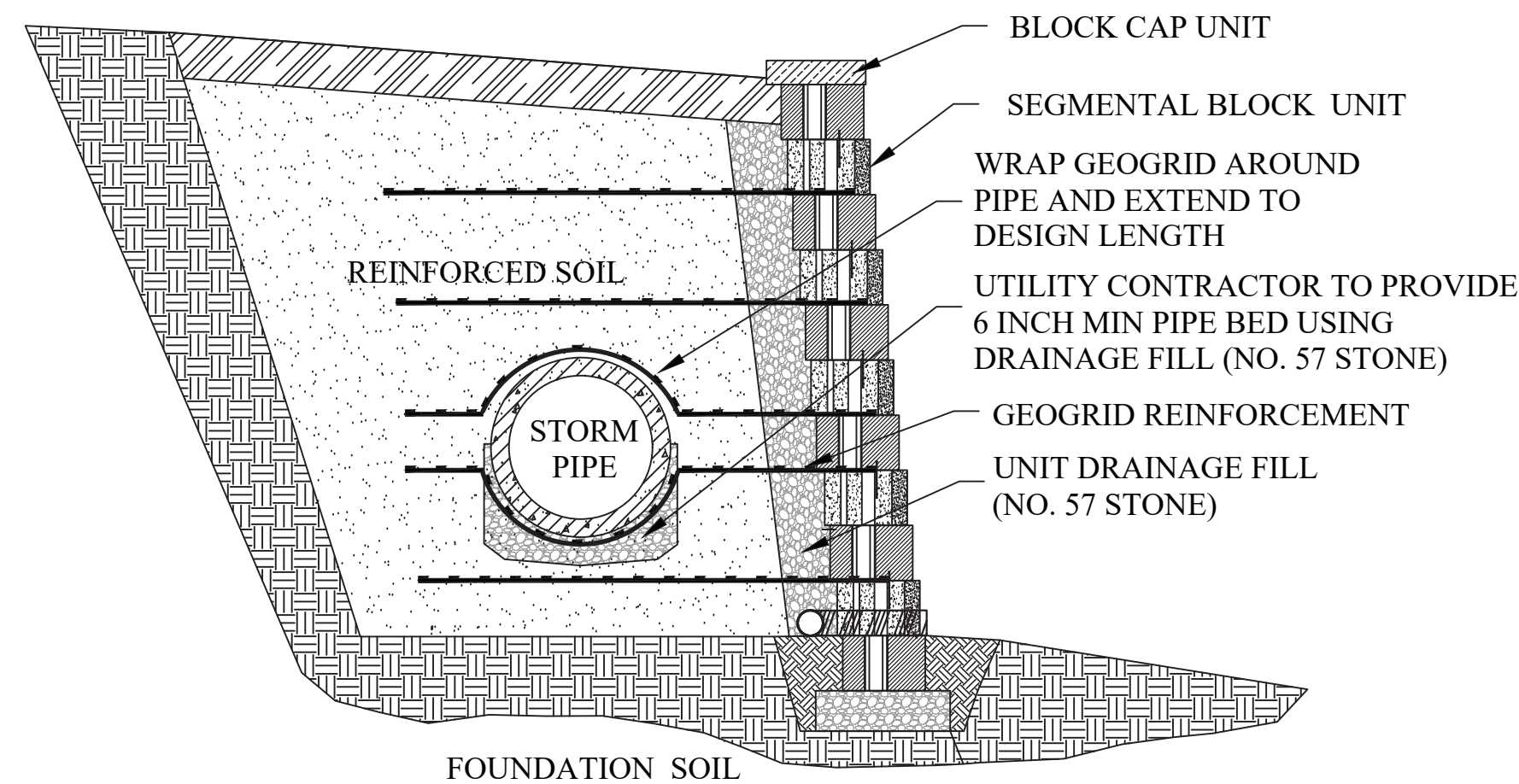


**RIDGEROCK BLOCK DETAILS**

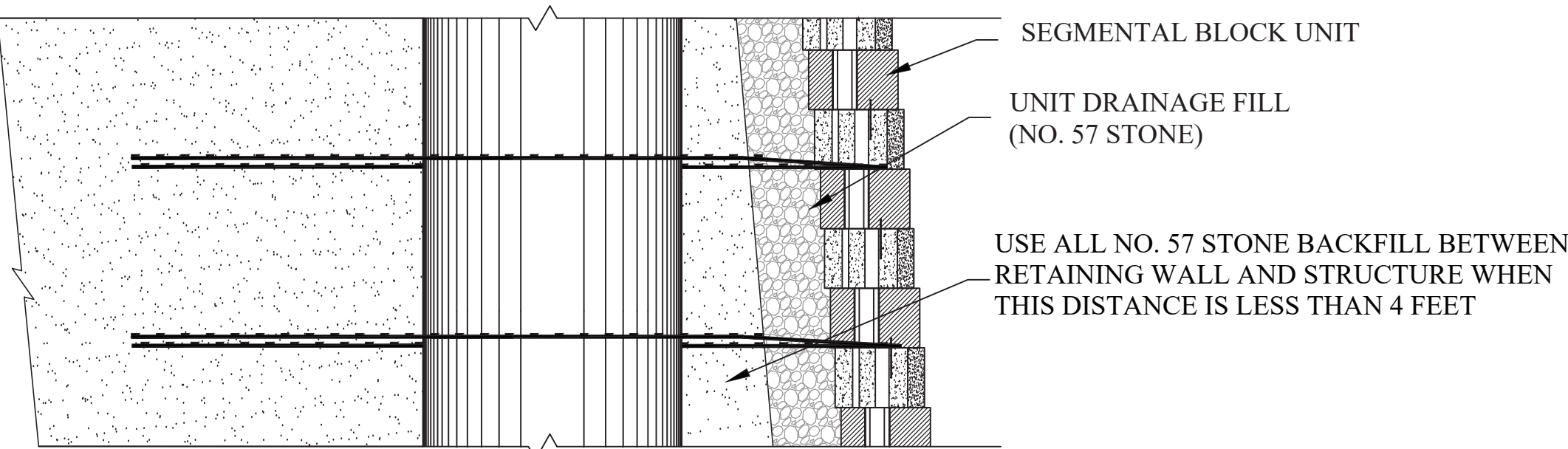
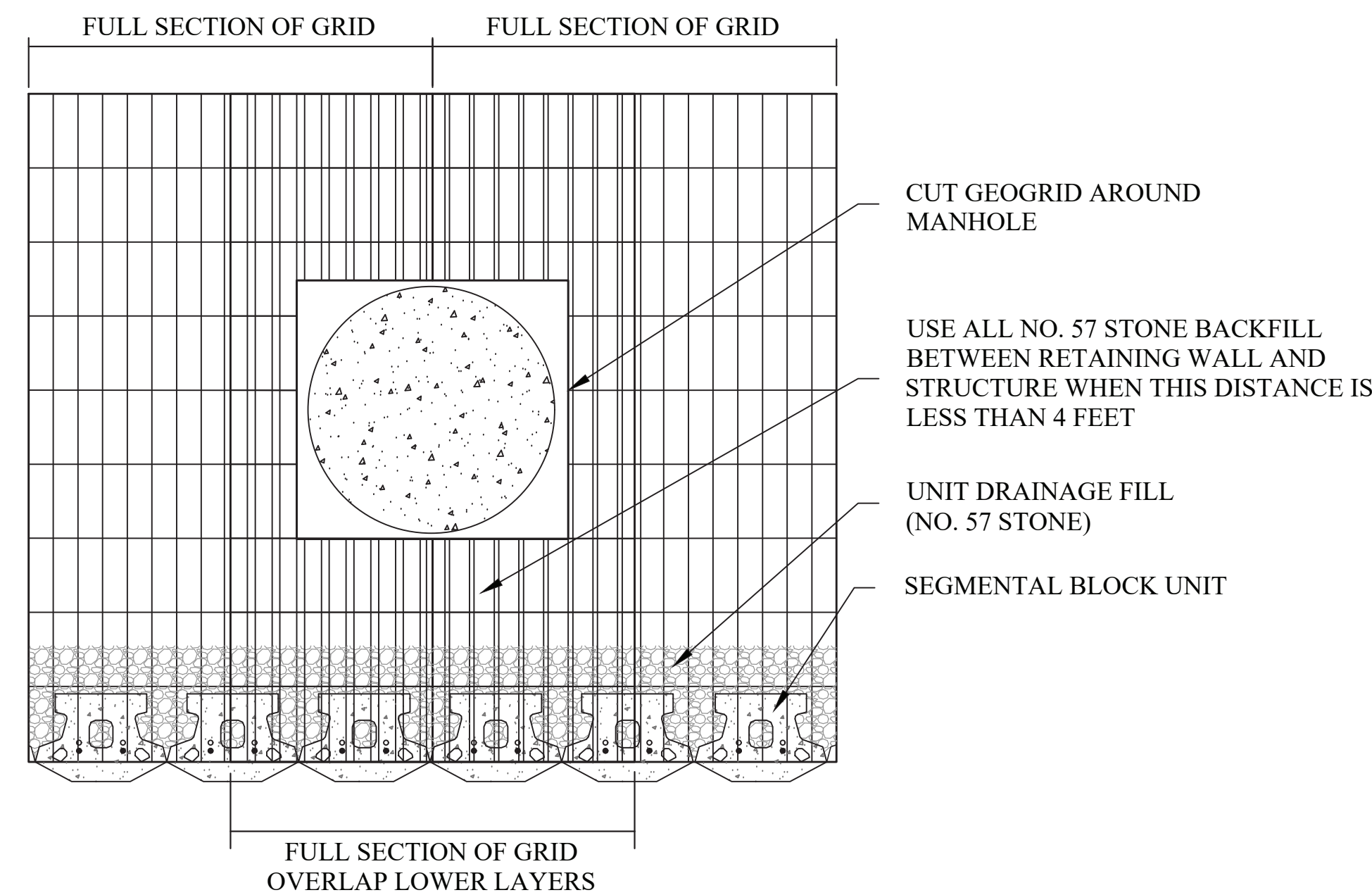
SCALE: NONE

RIDGEROCK MAXIM UNIT DETAILS			CARDINAL LANDING  NC HIGHWAY 27 E COATS, NORTH CAROLINA MARVEL PROJECT NO. 24-17810		<div>SEAL</div> <div></div>		<div><b>MARVEL</b> ENGINEERING &amp; CONSULTING PO BOX 1955 GARNER, NORTH CAROLINA 27529 (919) 812-1375 • LICENSE NO. P-1332</div>		SHEET	
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									13 OF 15	





SEGMENTAL WALL WITH PIPE IN REINFORCED ZONE  
SCALE: NONE



SEGMENTAL WALL AT PIER / MANHOLE  
SCALE: NONE

<b>GENERAL SEGMENTAL WALL DETAILS</b>			<div style="font-size: 24px; font-weight: bold; margin-bottom: 10px;">CARDINAL LANDING</div> <div style="font-size: 12px; margin-bottom: 10px;">NC HIGHWAY 27 E COATS, NORTH CAROLINA MARVEL PROJECT NO. 24-17810</div>	<div style="font-size: 10px; margin-bottom: 5px;">SEAL</div>	<div style="font-size: 10px; margin-top: 5px;">PO BOX 1955 GARNER, NORTH CAROLINA 27529 (919) 812-1375 • LICENSE NO. P-1332</div>	SHEET	
REV	DATE	DESCRIPTION				<b>ISSUED FOR CONSTRUCTION</b> 9-27-2024	RW-9.2
R-1	3-5-25	REVISED WALL 2 / ADD WALL 4, 5,&6				DRAWN BY: BDH DESIGNED BY: BDH REVIEWED BY:	14 OF 15



1.0 GENERAL

REINFORCED SOIL SEGMENTAL RETAINING WALLS (SRW'S) ARE GRAVITY WALLS WITH AN EXPANDED WIDTH CREATED BY A GEOSYNTHETIC REINFORCED SOIL MASS LOCATED BEHIND A COLUMN OF DRY STACKED SRW CONCRETE UNITS. THE DRY-STACKED COLUMN OF SRW UNITS AND GEOSYNTHETIC REINFORCED SOIL ZONE ACT TOGETHER TO RESIST THE DESTABILIZING FORCES GENERATED BY THE RETAINED SOIL AND SURCHARGE LOADS.

1.1 DESIGN

THE DESIGN FOR THE RETAINING WALL(S) PRESENTED IN THESE PLANS WAS PRIMARILY DEVELOPED USING THE METHODS OUTLINED IN THE *DESIGN MANUAL FOR SEGMENTAL RETAINING WALLS - 3RD EDITION* FROM THE NATIONAL CONCRETE MASONRY ASSOCIATION (NCMA). THE NCMA METHOD USES COULOMB'S GENERAL EQUATION FOR THE ACTIVE EARTH PRESSURE COEFFICIENT (Ka) WITH SPECIFIC INTERPRETATIONS TO ANALYZE THE EXTERNAL, INTERNAL, AND FACING STABILITY OF SEGMENTAL RETAINING WALLS. IN CERTAIN CIRCUMSTANCES, WE HAVE UTILIZED THE METHODS OUTLINED IN THE *MECHANICALLY STABILIZED EARTH WALLS AND REINFORCED SOIL SLOPES DESIGN & CONSTRUCTION GUIDELINES (PUBLICATION NO. FHWA-NHI-00-043)* FROM THE U.S. DEPARTMENT OF TRANSPORTATION - FEDERAL HIGHWAY ADMINISTRATION. THE FHWA METHOD USES RANKINE'S GENERAL EQUATION FOR THE ACTIVE EARTH PRESSURE COEFFICIENT (Ka) WITH SPECIFIC INTERPRETATIONS TO ANALYZE THE EXTERNAL, INTERNAL, AND FACING STABILITY OF SEGMENTAL RETAINING WALLS.

1.2 SOIL ASSUMPTIONS

THE SOIL PARAMETERS USED IN THE DESIGN OF THE RETAINING WALL(S) ARE ASSUMED VALUES BASED ON OUR EXPERIENCE WITH THE PROPERTIES OF LOCAL MATERIALS AND LOCALLY AVAILABLE FILL MATERIALS. ADEQUATE LABORATORY TESTING, AS DETERMINED BY THE PROJECT GEOTECHNICAL ENGINEER, SHOULD BE PERFORMED ON THE EXISTING SOILS IN THE AREA OF THE PROPOSED RETAINING WALL(S) AND OF THE PROPOSED BACKFILL MATERIAL TO DETERMINE IF THE ASSUMED SOIL PARAMETERS REPRESENT THE ACTUAL ONSITE CONDITIONS. THE RESULTS OF THE SOIL TESTING SHALL BE PROVIDED TO THE RETAINING WALL DESIGN ENGINEER FOR REVIEW PRIOR TO CONSTRUCTION OF THE RETAINING WALL. THE TESTED SOILS SHALL, AT A MINIMUM, HAVE THE FOLLOWING PROPERTIES:

- 1) REINFORCED SOILS       $\phi$  = 30 DEGREES; COHESION = 0 PSF; WET UNIT WEIGHT = 120 LBS/CU.FT
- 2) RETAINED SOILS       $\phi$  = 28 DEGREES; COHESION = 50 PSF; WET UNIT WEIGHT = 115 LBS/CU.FT
- 3) FOUNDATION SOILS       $\phi$  = 28 DEGREES; COHESION = 50 PSF; WET UNIT WEIGHT = 115 LBS/CU.FT

IF THE SOIL MATERIALS DO NOT MEET THESE MINIMUM VALUES, THE RETAINING WALL DESIGN ENGINEER SHALL BE NOTIFIED IMMEDIATELY FOR REVIEW WITH REGARDS TO THE FINAL RETAINING WALL DESIGN.

1.3 GROUNDWATER CONDITIONS

THIS RETAINING WALL DESIGN ASSUMES THAT GROUNDWATER IS PRESENT AT A DEPTH THAT WILL NOT AFFECT THE SUPPORT CHARACTERISTICS OF THE RETAINING WALL(S). DUE TO THE POTENTIAL FOR ADVERSE EFFECTS OF HYDROSTATIC PRESSURE ON THE RETAINING WALL SYSTEM, THE RETAINING WALL DESIGN ENGINEER SHALL BE NOTIFIED IMMEDIATELY IF GROUNDWATER IS ENCOUNTERED ABOVE THE FOUNDATION LEVEL OF THE RETAINING WALL, WATER OR WETNESS IS OBSERVED DURING CONSTRUCTION FROM OR IN A CUT SOIL BANK, OR IF LOCAL SPRINGS ARE ENCOUNTERED BELOW OR BEHIND THE RETAINING WALL(S).

1.4 LOADING CONDITIONS

THIS RETAINING WALL DESIGN TAKES INTO ACCOUNT THE ASSUMED LOADING CONDITIONS THAT ARE LOCATED WITHIN THE PLANE OF INFLUENCE OF THE RETAINING WALL(S). FOR THIS DESIGN, WE HAVE INCLUDED NO LIVE LOAD SURCHARGE CONDITIONS, NO DEAD LOAD SURCHARGE CONDITIONS, AND NO LATERAL LOAD SURCHARGE CONDITIONS. ALTERATIONS TO THE PROVIDED SITE DESIGN, AND/OR STRUCTURES SUCH AS LIGHT POLES, GUARDRAILS, HANDRAILS, UTILITY STRUCTURES, AND LANDSCAPING INSTALLED IN CLOSE PROXIMITY TO THE RETAINING WALL CAN SIGNIFICANTLY ALTER THE ASSUMED LOADING CONDITIONS. THE PROJECT STRUCTURAL ENGINEER SHALL REVIEW THE ASSUMED LOADING CONDITIONS, AND NOTIFY THE RETAINING WALL DESIGN ENGINEER REGARDING LOADING CONDITIONS CONCERNS WITH THE FINAL RETAINING WALL DESIGN. ADDITIONALLY, IF FUTURE CONDITIONS ARISE THAT MAY ALTER THE ASSUMED LOADING CONDITIONS, THE RETAINING WALL ENGINEER SHALL BE NOTIFIED FOR REVIEW.

1.5 RETAINING WALL SETBACK

THE SETBACK ASSUMED FOR THE RETAINING WALL(S) IS 1 INCH PER BLOCK. THE SITE CIVIL ENGINEER SHALL DETERMINE THE FINAL RETAINING WALL LOCATION BASED ON THE TOTAL HORIZONTAL DISTANCE BETWEEN THE TOP AND BOTTOM UNITS OF THE RETAINING WALL.

1.6 FOUNDATION REQUIREMENTS

BASED ON THE CALCULATIONS PERFORMED FOR THE RETAINING WALL(S) PROVIDED IN THESE PLANS, THE MAXIMUM BEARING PRESSURE EXERTED BY THE RETAINING WALL(S) ON THE FOUNDATION SOIL IS 2,000 POUNDS PER SQUARE FOOT (PSF). THE ALLOWABLE SOIL BEARING CAPACITY SHOULD BE DETERMINED BY THE PROJECT GEOTECHNICAL ENGINEER USING THE ULTIMATE BEARING CAPACITY OF THE FOUNDATION SOILS DIVIDED BY A MINIMUM FACTOR OF SAFETY OF 2.0. THE BEARING CAPACITY, SETTLEMENT, AND OVERALL GLOBAL STABILITY SHOULD BE ADDRESSED BY A QUALIFIED GEOTECHNICAL ENGINEER.

2.0 MATERIALS

2.1 CONCRETE MASONRY WALL UNITS

THE CONCRETE WALL UNITS SHALL BE SEGMENTAL UNITS MANUFACTURED IN ACCORDANCE WITH ASTM C-1372 AND ASTM C-140. THE UNITS SHALL HAVE A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 3,000 PSI. THE UNITS SHALL BE INTERLOCKED IN ACCORDANCE WITH THE MANUFACTURERS SPECIFICATIONS. THE UNITS SHALL BE USED AND KEPT FREE OF DEFECTS THAT WOULD INTERFERE WITH THE PLACING OR POSITIONING OF THE UNIT OR IMPAIR ITS STRENGTH. THE CONTRACTOR SHALL PREVENT EXCESS MUD, WET CEMENT, EPOXY, AND THE LIKE MATERIALS FROM COMING IN CONTACT WITH AND AFFIXING TO THE UNITS. MINOR CRACKS INCIDENTAL TO THE USUAL METHOD MANUFACTURING OR MINOR CHIPPING RESULTING FROM SHIPMENT AND DELIVERY ARE NOT GROUNDS FOR REJECTION.

2.2 GEOGRID REINFORCEMENT

GEOGRID REINFORCEMENT SHALL CONSIST OF HIGH TENACITY GEOGRID MANUFACTURED FOR THE SOIL REINFORCEMENT APPLICATIONS. THE TYPE, LENGTH, AND PLACEMENT OF THE REINFORCING GEOSYNTHETIC SHALL BE AS SHOWN ON THE RETAINING WALL PROFILE. GEOGRID SHALL BE REJECTED IF 20% OR MORE OF A STRUCTURAL RIB HAS BEEN CUT OR DAMAGED. THE CONTRACTOR SHALL INSPECT ALL GEOGRID DELIVERED TO THE JOBSITE AND REJECT MATERIALS THAT MEET THIS CRITERIA. THE CONTRACTOR SHALL PREVENT EXCESS MUD, WET CEMENT, EPOXY, AND THE LIKE MATERIALS FROM COMING IN CONTACT WITH AND AFFIXING TO THE GEOGRID MATERIAL. IF THE GEOGRID IS DAMAGED ONSITE OR DURING PLACEMENT, IT SHALL BE REPLACED.

2.3 DRAINAGE PIPE

THE DRAINAGE COLLECTION PIPE SHALL BE A MINIMUM OF 4 INCH DIAMETER PERFORATED OR SLOTTED, PVC OR CORRUGATED HDPE PIPE. THE PIPE MAY BE COVERED WITH A KNITTED OR NON-WOVEN GEOTEXTILE SOCK TO FUNCTION AS A FILTER. DRAINAGE PIPE SHALL BE MANUFACTURED IN ACCORDANCE WITH ASTM D-3034 OR AASHTO M 252.

2.4 GEOTEXTILE FILTER FABRIC / GEOCOMPOSITE DRAIN (IF REQUIRED)

GEOTEXTILE FILTER FABRIC SHALL CONSIST OF NEEDLE PUNCHED NON-WOVEN POLYPROPYLENE MATERIAL WHICH MEETS THE AASHTO M288-2006 CLASS 3 STRENGTH CRITERIA. IT SHALL HAVE A MAXIMUM AVERAGE ROLL VALUE OF 0.30 MM FOR ITS APPARENT OPENING SIZE AND PERMITTIVITY OF AT LEAST 0.2/SEC. PRE-APPROVED NON-WOVEN GEOTEXTILES INCLUDE AMOCO 4546, CARTHAGE MILLS FX-40HS, HANES GEO TERRATEX N04, AND TENCATE MIRAFI 140N. GEOCOMPOSITE DRAINS SHALL CONSIST OF A FORMED POLYSTYRENE CORE COVERED ON ONE SIDE WITH A NON-WOVEN NEEDLE-PUNCHED POLYPROPYLENE FILTER FABRIC. PRE-APPROVED GEOCOMPOSITE DRAINS INCLUDE TENCATE MIRAFI G200N, HAYNES GEO TERRADRAIN 101, AND STRATA SYSTEMS STRATADRAIN.

2.5 STRUCTURAL FILL SOILS IN THE REINFORCED ZONE

THE STRUCTURAL FILL USED IN THE REINFORCED ZONE OF THE RETAINING WALL(S) SHALL HAVE A USCS CLASSIFICATION OF GW, GP, GM, SW, SP, SP-SM, SP-SC, OR SM. SILTS AND CLAYS (ML, MH, CL OR CH) ARE NOT ACCEPTABLE. IF AGGREGATE BASE COURSE (ABC) OR NO. 57 STONE IS SPECIFIED, IT SHALL MEET THE CLASSIFICATION AND GRADATION REQUIREMENTS OF THE NCDOT. STRUCTURAL FILL MATERIALS SHALL HAVE A MAXIMUM PARTICLE SIZE NOT EXCEEDING 1.5 INCH, AND AN ORGANIC CONTENT LESS THAN 0.5 PERCENT. AT A MINIMUM, THESE MATERIALS SHALL HAVE NO MORE THAN 35 PERCENT FINES PASSING THE NO. 200 SIEVE, AND SHALL NOT HAVE A LIQUID LIMIT GREATER THAN 40 AND A PLASTICITY INDEX GREATER THAN 15, UNLESS APPROVED BY THE DESIGN ENGINEER. SELECT GRANULAR FILL SHALL BE USED FOR ALL RETAINING WALLS IF SPECIFIED, WALLS EXCEEDING 20 FEET IN HEIGHT, AND/OR WALLS SUPPORTING STRUCTURES. SELECT GRANULAR FILL SHALL HAVE NO MORE THAN 15 PERCENT FINES PASSING THE NO. 200 SIEVE AND SHALL HAVE A PLASTICITY INDEX OF LESS THAN 6 UNLESS WRITTEN CONSENT IS OBTAINED FROM THE RETAINING WALL DESIGN ENGINEER PRIOR TO PLACEMENT. THE MINIMUM INTERNAL ANGLE OF FRICTION, COHESION, AND WET UNIT WEIGHT SHALL BE EQUAL TO OR GREATER THAN THE DESIGN VALUES PROVIDED IN SECTION 1.2, AS DETERMINED BY THE ONSITE GEOTECHNICAL ENGINEER. SOILS CONTAINING ROOTS, BRUSH, SOD, OR OTHER ORGANIC MATERIAL OR FROZEN SOILS, SNOW, ICE, HEAVY CLAYS, OR WET SOILS SHALL ALSO NOT BE PERMITTED AS STRUCTURAL FILL. ONSITE MATERIALS MAY BE UTILIZED PROVIDED IT COMPLIES WITH THESE SPECIFICATIONS AS DETERMINED BY THE ONSITE GEOTECHNICAL ENGINEER.

3.0 INSTALLATION NOTES

3.1 LEVELING PAD

THE LEVELING PAD SHALL CONSIST OF COMPACTED AGGREGATE BASE COURSE (ABC) STONE, TAMPED NO. 57 STONE, OR UNREINFORCED CONCRETE. THE PAD SHALL BE A MINIMUM OF 8 INCHES THICK (UNO). THE ABC STONE SHALL BE COMPACTED TO 95 % OF THE STANDARD PROCTOR (ASTM D-698) MAXIMUM DRY DENSITY. AGGREGATE MATERIAL SHALL RECEIVE A MINIMUM OF ONE PASS OF THE COMPACTION EQUIPMENT. THE TOP OF THE LEVELING PAD FOR THE WALL SECTIONS SHALL BE MAINTAINED AT A MINIMUM DEPTH OF 10% OF THE TOTAL WALL HEIGHT, UNLESS OTHERWISE SHOWN ON THE PROFILE SHEETS. THE RETAINING WALL ENGINEER SHALL BE NOTIFIED IMMEDIATELY IF THE LEVELING PAD DEPTH OF THE RETAINING WALL IS FOUND TO BE 6 INCHES OR LESS BELOW THE PLANNED FINAL SUBGRADE ELEVATION.

3.2 FIRST BLOCK COURSE

THE FIRST COURSE OF BLOCK SHALL BE PLACED ON TOP OF AND IN FULL CONTACT WITH THE LEVELING PAD. THE UNITS SHALL MAINTAIN A MINIMUM DISTANCE OF 6 INCHES FROM THE FRONT AND BACK OF THE LEVELING PAD. PROPER ALIGNMENT MAY BE ACHIEVED WITH THE AID OF A STRING LINE. PROCEED TO THE NEXT COURSE OF BLOCK. EACH UNIT SHALL BE IN CONTACT WITH THE UNITS ON BOTH SIDES AS WELL AS ABOVE AND BELOW. SOME ADJUSTMENTS MAY BE REQUIRED FOR WALLS WITH CURVES AND A BATTER.

3.3 UNIT FILL

THE VOID WITHIN EACH UNIT AND BETWEEN THE UNITS SHALL BE COMPLETELY FILLED WITH COURSE AGGREGATE MEETING THE GRADATION REQUIREMENTS FOR NO. 57 OR NO. 67 STONE IN ACCORDANCE WITH ASTM C-33. A MINIMUM THICKNESS OF 12 INCHES OF NO. 57 STONE SHALL BE PLACED AT THE BACK OF EACH BLOCK AS INDICATED ON THE DETAILS. EACH COURSE SHALL BE COMPLETELY FILLED AND EXCESS MATERIAL SWEEP CLEAN FROM THE TOP BLOCK BEFORE INSTALLING THE SUBSEQUENT GEOGRID LAYER.

3.4 GEOGRID INSTALLATION

THE GEOGRID REINFORCEMENT SHALL BE LAID HORIZONTALLY ON NATIVE MATERIAL OR COMPACTED BACK FILL AND CONNECTED TO THE CONCRETE WALL UNITS IN ACCORDANCE WITH THE MANUFACTURERS SPECIFICATIONS. GEOGRID SHALL BE ROLLED OUT WITH THE MACHINE DIRECTION (MD) DESIGN STRENGTH PERPENDICULAR TO THE WALL FACE. GEOGRID SHALL BE PULLED TAUT REMOVING ALL SLACK FROM THE MATERIAL AND ANCHORED BEFORE ADDING FILL. GEOGRID SHALL BE INSTALLED AT THE ELEVATIONS AND LENGTHS REQUIRED AS SHOWN ON THE WALL PROFILE(S). THE SOIL SURFACE SHALL BE SMOOTH AND LEVEL AND HAVE BEEN COMPACTED BEFORE INSTALLING THE GEOGRID.

3.5 STRUCTURAL FILL PLACEMENT

STRUCTURAL FILL MATERIAL SHALL BE PLACED IN LIFTS NOT EXCEEDING 8 INCHES IN COMPACTED THICKNESS. THE REINFORCED STRUCTURAL FILL SHALL BE COMPACTED TO **95% OF THE STANDARD PROCTOR (ASTM D-698)** MAXIMUM DRY DENSITY AT A MOISTURE CONTENT OF +/- **3% OF THE OPTIMUM MOISTURE CONTENT**. ONLY HAND OPERATED EQUIPMENT SHALL BE ALLOWED WITHIN 3 FEET OF THE SEGMENTAL UNITS. STRUCTURAL FILL SHALL BE PLACED FROM THE WALL UNITS REARWARD TO INSURE TAUTNESS OF THE GEOGRID. CONSTRUCTION EQUIPMENT SHALL NOT BE OPERATED DIRECTLY ON THE GEOGRID.

3.6 RETAINING WALL CAPS

APPLY A CONSTRUCTION ADHESIVE TO THE RETAINING WALL UNITS AND CAPS TO PREVENT THEIR REMOVAL.

4.0 QUALITY ASSURANCE

IN ACCORDANCE WITH SECTION 1704 OF THE NORTH CAROLINA BUILDING CODE, THE OWNER SHALL CONTRACT WITH A QUALIFIED CONSTRUCTION MATERIALS TESTING AGENCY CAPABLE OF PROVIDING THE REQUIRED SPECIAL INSPECTIONS DURING CONSTRUCTION OF THE RETAINING WALL(S). THE TESTING AGENCY SHALL PROVIDE QUALIFIED PERSONNEL TO PERFORM CONTINUOUS MONITORING AS NECESSARY TO ENSURE COMPLIANCE WITH THE RETAINING WALL PLANS. THE SPECIAL INSPECTION TESTING AGENCY SHALL COMPLY WITH SECTION 1807.2.5 OF THE NORTH CAROLINA BUILDING CODE AND AT A MINIMUM PROVIDE THE FOLLOWING:

- SOIL BEARING CAPACITY TESTING OF THE FOUNDATION AREA, INCLUDING THE AREA IN THE REINFORCING ZONE, TO VERIFY THAT THE FOUNDATION SOILS ARE ACCEPTABLE FOR THE SPECIFIED SOIL BEARING PRESSURE IN SECTION 1.6 PRIOR TO PLACEMENT OF THE LEVELING BASE COURSE. IF THE SOIL BEARING CAPACITY IS NOT ADEQUATE, THE TESTING AGENCY SHALL PROVIDE RECOMMENDATIONS TO REMEDIATE THE SUBGRADE SOILS TO ACHIEVE THE REQUIRED BEARING CAPACITY..
- COMPACTION TESTING SHALL BE PERFORMED IN ACCORDANCE WITH THE PROVISIONS OF THE NORTH CAROLINA BUILDING CODE AND AS DETERMINED BY THE SPECIAL INSPECTION TESTING AGENCY. AT A MINIMUM , TESTING SHALL BE PERFORMED AT EACH SPECIFIED GRID LAYER ELEVATION, AND NO MORE THAN 100 FEET INTERVALS ALONG THE LENGTH OF THE RETAINING WALL(S). COMPACTION TESTS THAT DO NOT MEET THE MINIMUM REQUIREMENTS ABOVE, SHALL BE REMEDIATED IN ACCORDANCE WITH THE SPECIAL INSPECTION TESTING AGENCY'S RECOMMENDATIONS.
- MONITORING DURING THE INSTALLATION OF THE GEOGRID REINFORCEMENT FOR TYPE, LENGTH, AND ELEVATION TO VERIFY COMPLIANCE WITH THE RETAINING WALL PROFILES.
- MONITORING DURING THE INSTALLATION OF THE DRAINAGE PIPE / LAYER OR BACKDRAIN TO VERIFY PROPER INSTALLATION WITH THE PROJECT PLANS.
- THE RETAINING WALL DESIGN ENGINEER SHALL BE NOTIFIED IMMEDIATELY PRIOR TO MODIFYING WALL CONSTRUCTION IF THE EXISTING SITE CONDITIONS DEVIATE FROM THE CONDITIONS OR ASSUMPTIONS PROVIDED FOR IN THE RETAINING WALL PLANS.

AS REQUIRED BY SECTION 1704.1.2 OF THE NORTH CAROLINA BUILDING CODE, THE RESULTS OF THE SPECIAL INSPECTION TESTING SHOULD BE PROVIDED TO THE LOCAL BUILDING OFFICIAL AND THE RETAINING WALL DESIGN ENGINEER AFTER CONSTRUCTION OF THE RETAINING WALL(S) IS COMPLETE FOR A FINAL REVIEW. THE RETAINING WALL DESIGN ENGINEER SHALL NOT SIGN ANY DOCUMENT, NO MATTER BY WHOM REQUESTED, IN WHICH HE IS REQUIRED TO CERTIFY, GUARANTEE, OR WARRANT CONDITIONS OF WHICH THAT HE HAS NOT OR CANNOT ASCERTAIN.

5.0 ADDITIONAL CONSIDERATIONS

- A BUILDING PERMIT MAY BE REQUIRED PRIOR TO CONSTRUCTION OF THE RETAINING WALL(S). THE OWNER / CONTRACTOR SHALL OBTAIN ALL REQUIRED PERMITS PRIOR TO BEGINNING CONSTRUCTION OF THE RETAINING WALL(S) IN ACCORDANCE WITH THE NORTH CAROLINA BUILDING CODE.
- STABILITY OF ANY EXCAVATIONS OR TEMPORARY SLOPES REQUIRED BY THE INSTALLATION OF RETAINING WALL(S) SHALL BE ADDRESSED BY A QUALIFIED GEOTECHNICAL ENGINEER. RESPONSIBILITY OF THESE TEMPORARY MEASURES RESTS WITH THE OWNER AND/OR THE GENERAL CONTRACTOR. ALL SLOPES AND EXCAVATIONS SHALL MEET CURRENT OSHA STANDARDS.
- HANDRAILS/GUARDRAILS SHALL BE INSTALLED AS REQUIRED BY SECTION 1013 OF THE NORTH CAROLINA BUILDING CODE. THE TYPE AND LOCATION OF THE HANDRAIL/GUARDRAIL SHALL BE DETERMINED BY THE OWNER AND/OR GENERAL CONTRACTOR AND INSTALLED IN ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS.
- THE RETAINING WALL HAS BEEN DESIGNED WITH THE ASSUMPTION THAT THE REINFORCED STRUCTURAL FILL MATERIAL SHALL BE FREE OF SUBSURFACE DRAINAGE OR WATER SEEPAGE. TEMPORARY OR LONG TERM SURFACE DRAINAGE, SITE GRADING, AND/OR SURFACE OR SUBSURFACE WATER COLLECTION OR DIVERSION SYSTEMS SHALL BE DETERMINED AND INSTALLED BY THE OWNER AND/OR GENERAL CONTRACTOR.
- THIS RETAINING WALL DESIGN IS BASED UPON THE PROPERTIES OF THE MATERIALS SPECIFICALLY SPECIFIED IN THESE RETAINING WALL PLANS. THE RETAINING WALL DESIGN ENGINEER SHALL BE NOTIFIED IMMEDIATELY OF ANY CHANGES TO THE SPECIFIED MATERIALS FOR REVIEW WITH THE FINAL RETAINING WALL DESIGN.

RETAINING WALL SPECIFICATIONS

REV	DATE	DESCRIPTION
R-1	3-5-25	REVISED WALL 2 / ADD WALL 4, 5,&6

ISSUED FOR CONSTRUCTION

9-27-2024

DRAWN BY: BDH

DESIGNED BY: BDH

REVIEWED BY:

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15 OF 15

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