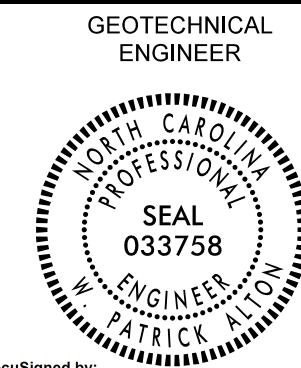


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# RETAINING WALL NO. 1

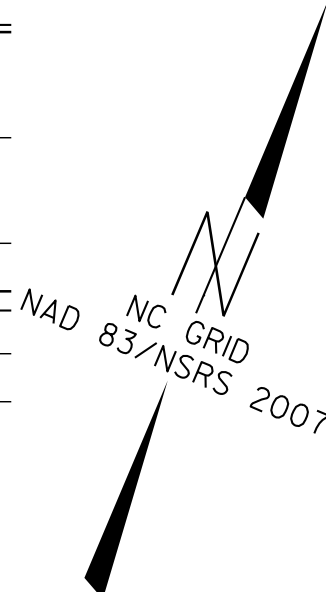
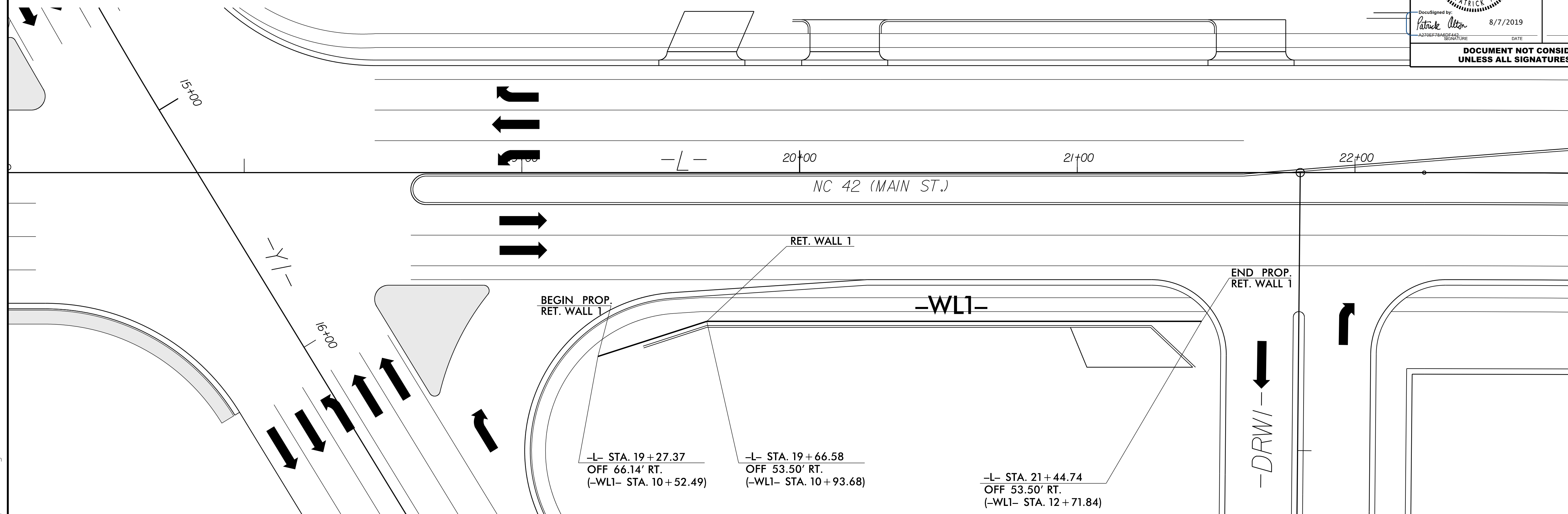


ENGINEER

DocuSigned by:  
Patrick A. O'Neil  
8/7/2019

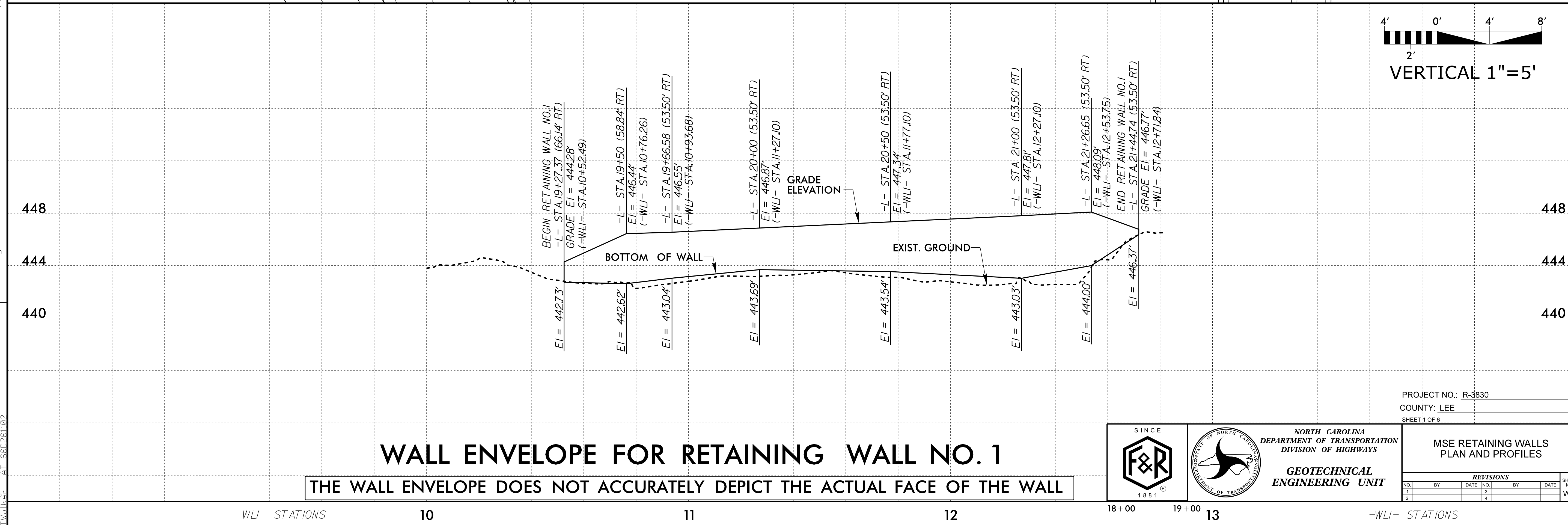
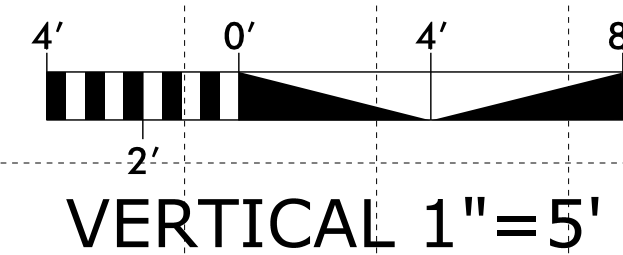
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8/17/99



REVISIONS

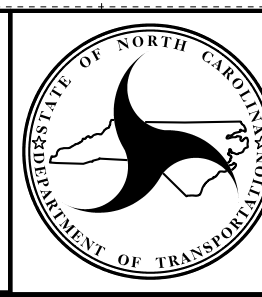
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## WALL ENVELOPE FOR RETAINING WALL NO. 1

THE WALL ENVELOPE DOES NOT ACCURATELY DEPICT THE ACTUAL FACE OF THE WALL

PROJECT NO.: R-3830  
COUNTY: LEE  
SHEET 1 OF 6



NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
DIVISION OF HIGHWAYS  
**GEOTECHNICAL  
ENGINEERING UNIT**

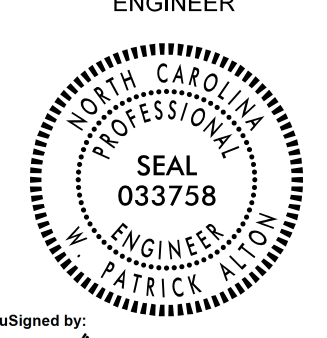
MSE RETAINING WALLS  
PLAN AND PROFILES

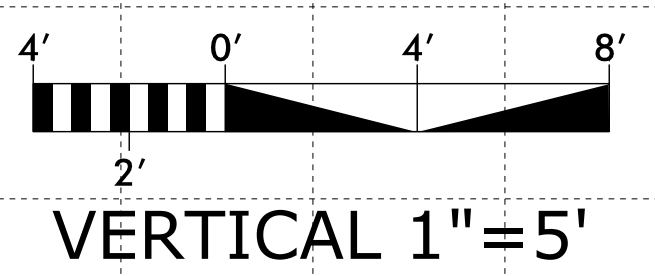
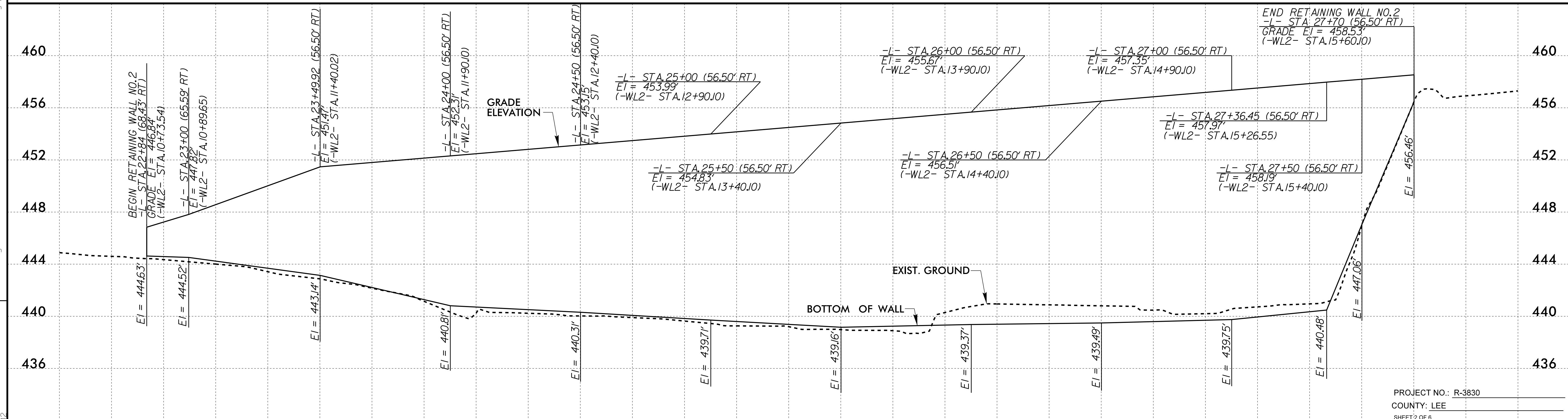
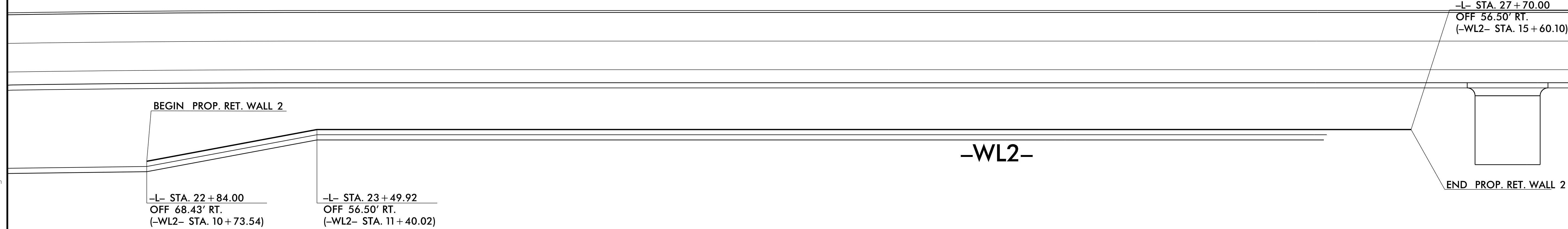
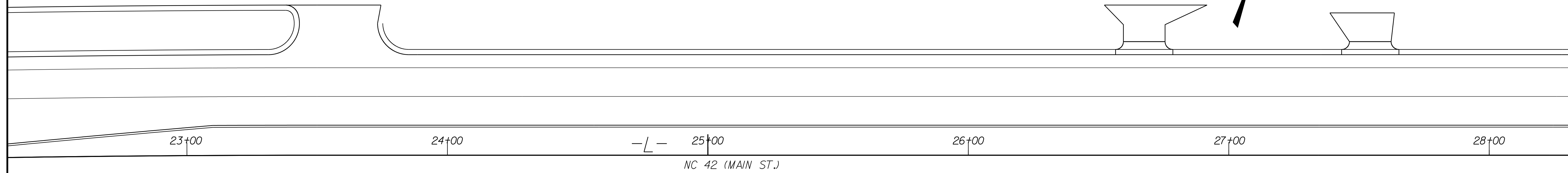
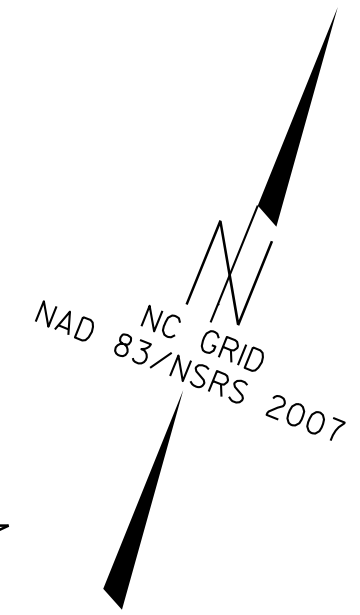
REVISIONS					
NO.	BY	DATE	NO.	BY	DATE
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2			4		

SHEET NO. 1  
W-1

-WL1- STATIONS      10      11      12      18+00      19+00      13      -WL1- STATIONS


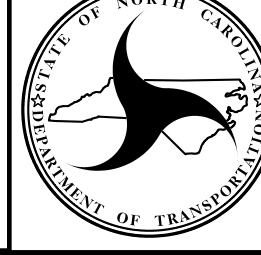
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GEOTECHNICAL ENGINEER  
 ENGINEER  
  
 Documented by: Patrick Altier  
 DATE: 8/7/2019  
 SIGNATURE: \_\_\_\_\_  
 DATE: \_\_\_\_\_  
**DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED**



**WALL ENVELOPE FOR RETAINING WALL NO. 2**  
 THE WALL ENVELOPE DOES NOT ACCURATELY DEPICT THE ACTUAL FACE OF THE WALL

PROJECT NO.: R-3830  
 COUNTY: LEE  
 SHEET 2 OF 6

SINCE 1881  
  
 NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS  
  
 GEOTECHNICAL ENGINEERING UNIT

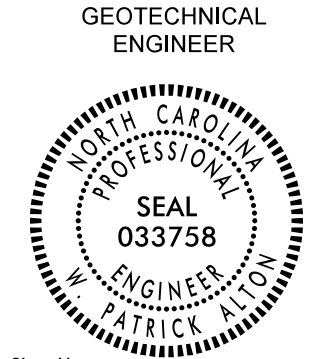
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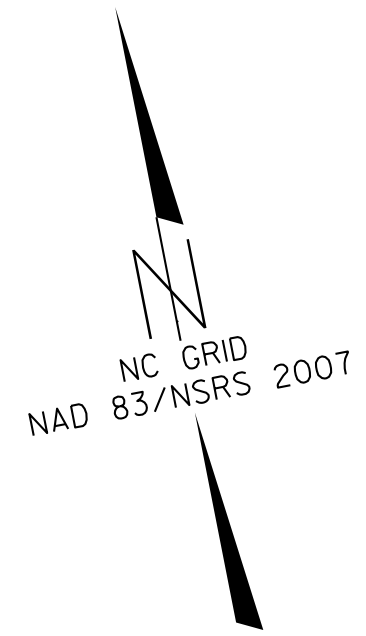
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NO.	BY	DATE	NO.	BY	DATE
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2			4		

SHEET NO. WV-2

8/17/99  
 REVISIONS  
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# RETAINING WALL NO. 3

GEOTECHNICAL ENGINEER  
 ENGINEER  
  
 Documented by: *Patrick Altier* 8/7/2019  
 DATE SIGNATURE DATE  
**DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED**

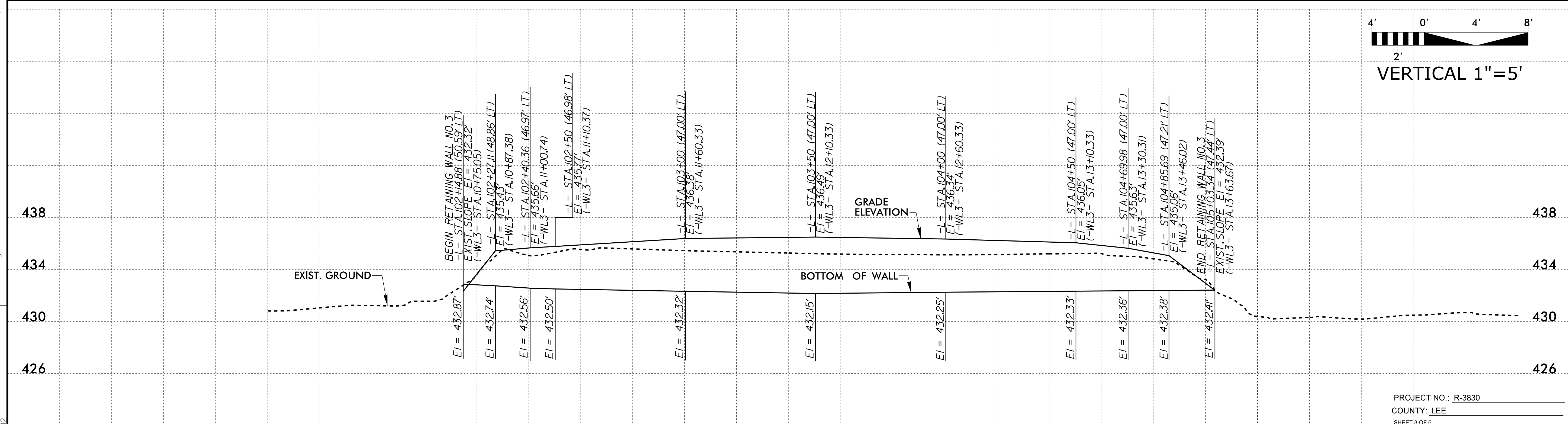
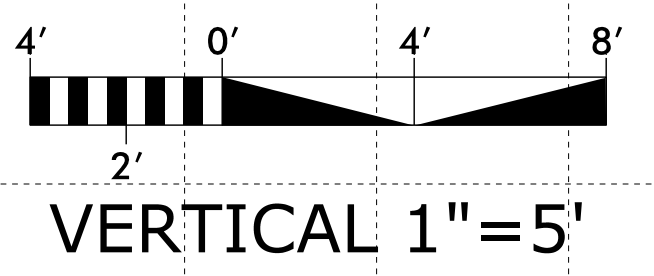
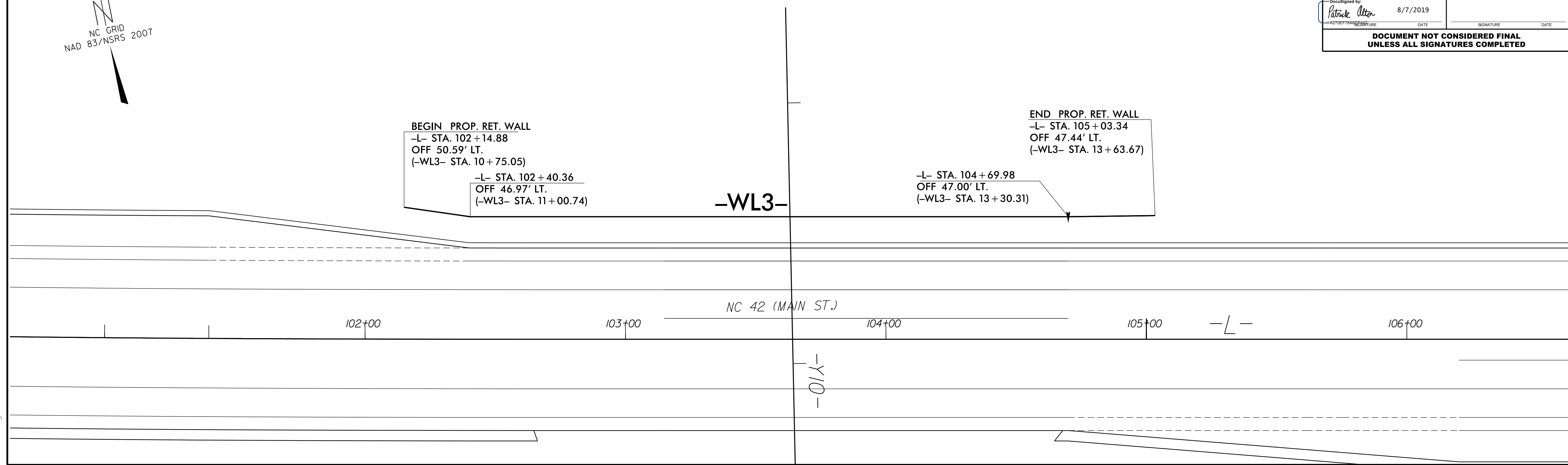


**BEGIN PROP. RET. WALL**  
 -L- STA. 102+14.88  
 OFF 50.59' LT.  
 (-WL3- STA. 10+75.05)  
 -L- STA. 102+40.36  
 OFF 46.97' LT.  
 (-WL3- STA. 11+00.74)

**END PROP. RET. WALL**  
 -L- STA. 105+03.34  
 OFF 47.44' LT.  
 (-WL3- STA. 13+63.67)  
 -L- STA. 104+69.98  
 OFF 47.00' LT.  
 (-WL3- STA. 13+30.31)

-WL3-


REVISIONS



## WALL ENVELOPE FOR RETAINING WALL NO. 3

THE WALL ENVELOPE DOES NOT ACCURATELY DEPICT THE ACTUAL FACE OF THE WALL

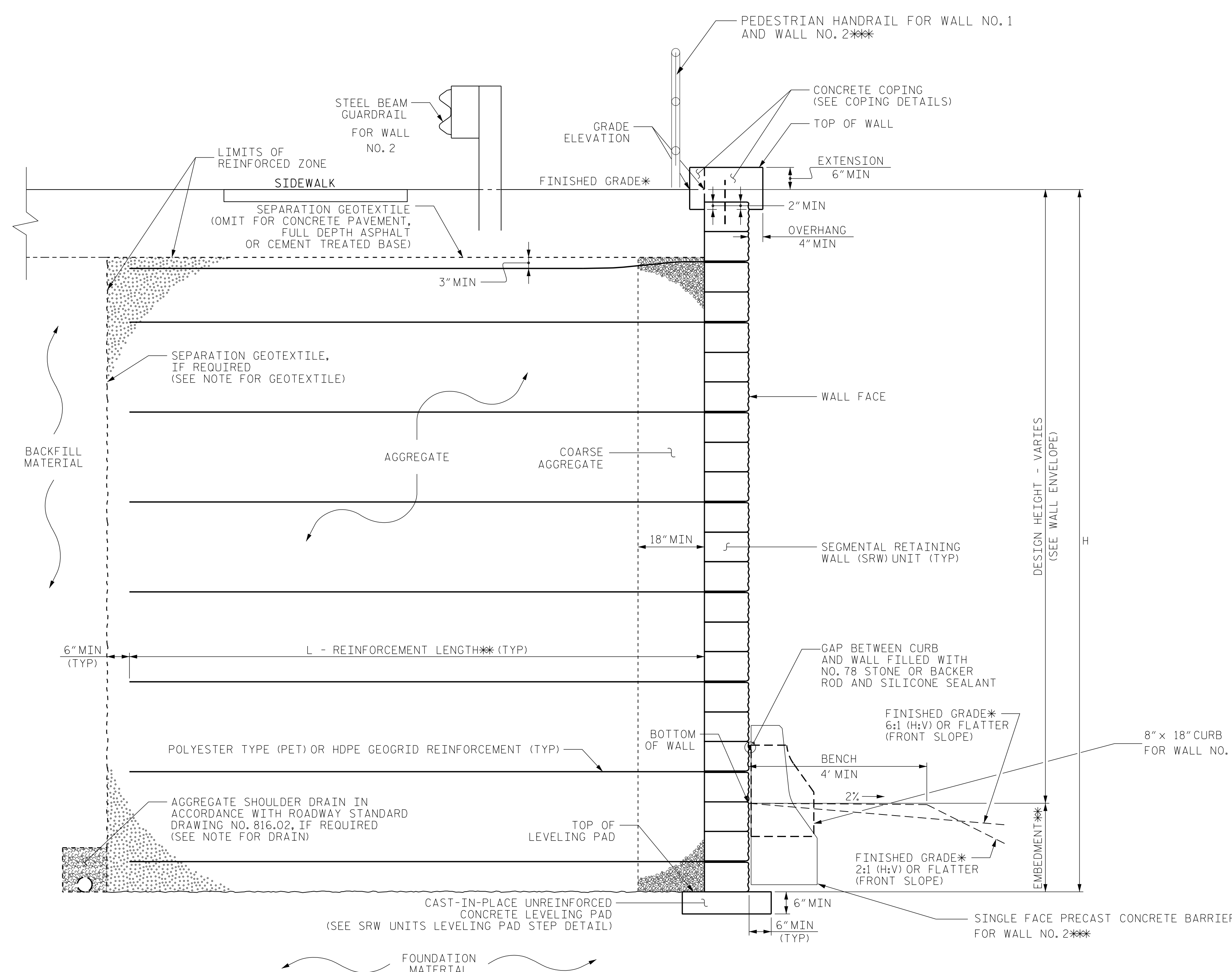
PROJECT NO.: R-3830  
 COUNTY: LEE  
 SHEET 3 OF 6

SINCE 1881  
  
 NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS  
 GEOTECHNICAL ENGINEERING UNIT  
 MSE RETAINING WALLS PLAN AND PROFILES  

REVISIONS					
NO.	BY	DATE	NO.	BY	DATE
1			3		
2			4		

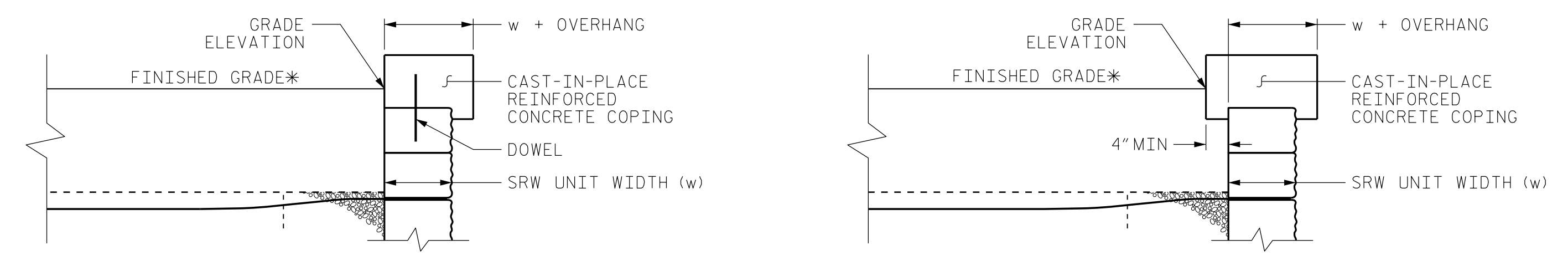
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-WL3- STATIONS      10      11      12      13      18+00      19+00      14      -WL3- STATIONS



**MSE WALL WITH SRW UNITS - TYPICAL SECTION**

\* SEE ROADWAY PLANS FOR FINISHED GRADE DETAILS.  
 \*\* SEE MSE RETAINING WALLS PROVISION AND IF APPLICABLE, MSE WALL NOTES FOR EMBEDMENT AND REINFORCEMENT LENGTH REQUIREMENTS.  
 \*\*\* SEE ROADWAY PLANS FOR DETAILS  
 \*\*\*\* SEE ROADWAY PLANS FOR DETAILS FOR HANDRAIL DETAILS



**COPING DETAILS**

AT THE CONTRACTOR'S OPTION, CONNECT COPING TO SRW UNITS WITH DOWELS OR EXTEND COPING DOWN BACK OF SRW UNITS.  
 \*SEE ROADWAY PLANS FOR FINISHED GRADE DETAILS.

GEOTECHNICAL ENGINEER  W. Patrick Allen 6/13/2019	ENGINEER   
<b>DOCUMENT NOT CONSIDERED FINAL          UNLESS ALL SIGNATURES COMPLETED</b>	

PROJECT NO.: R-3830  
 COUNTY: LEE  
 SHEET 4 OF 6

SINCE  1881	 <b>NORTH CAROLINA          DEPARTMENT OF TRANSPORTATION          DIVISION OF HIGHWAYS</b>  <b>GEOTECHNICAL          ENGINEERING UNIT</b>	<b>MSE RETAINING WALLS          TYPICAL SECTION          (SRW UNITS)</b>	SHEET NO. <b>W-4</b> DATE: 02/02/2018
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**NOTES:**

FOR MECHANICALLY STABILIZED EARTH (MSE) RETAINING WALLS, SEE MECHANICALLY STABILIZED EARTH RETAINING WALLS PROVISION.  
 FOR STEEL BEAM GUARDRAIL, SEE ROADWAY PLANS AND SECTION 862 OF THE STANDARD SPECIFICATIONS.  
 FOR PEDESTRIAN HANDRAIL AND CURB DETAILS, SEE STRUCTURE PLAN  
 FOR SINGLE FACED PRECAST CONCRETE BARRIER, SEE ROADWAY PLANS AND SECTION 857 OF THE STANDARD SPECIFICATIONS.  
 USE AN MSE WALL SYSTEM WITH SEGMENTAL RETAINING WALL UNITS (SRW) UNITS THAT MEET ARTICLE 1040-4 OF THE STANDARD SPECIFICATIONS FOR RETAINING WALL NO.1 & NO.2.  
 WHEN USING AN MSE WALL SYSTEM WITH SRW UNITS FOR RETAINING WALL NO.1 & NO.2, FREEZE-THAW DURABLE SRW UNITS THAT MEET ARTICLE 1040-4 OF THE STANDARD SPECIFICATIONS ARE REQUIRED.  
 CAST-IN-PLACE REINFORCED CONCRETE COPING FOR THE VERTICAL EDGES IS REQUIRED WHERE HANDRAIL AND CURB REQUIRED FOR RETAINING WALL NO 1 & NO.2.  
 A SEPARATION GEOTEXTILE IS REQUIRED AT THE BACK OF THE REINFORCED ZONE FOR RETAINING WALL NO.1 & NO.2.  
 A DRAIN IS REQUIRED FOR RETAINING WALL NO.1 & NO.2.  
 BEFORE BEGINNING MSE WALL DESIGN FOR RETAINING WALL NO.1 AND NO.2, SURVEY WALL LOCATION AND SUBMIT A REVISED WALL PROFILE VIEW (WALL ENVELOPE) FOR REVIEW. DO NOT START WALL DESIGN OR CONSTRUCTION UNTIL THE REVISED WALL ENVELOPE IS ACCEPTED.

DESIGN RETAINING WALL NO.1 FOR THE FOLLOWING:  
 1) H = DESIGN HEIGHT + EMBEDMENT  
 2) DESIGN LIFE = 100 YEARS  
 3) MAXIMUM FACTORED VERTICAL PRESSURE ON FOUNDATION MATERIAL = 1,275 LB/SF.  
 4) MINIMUM REINFORCEMENT LENGTH (L) = 1.0 H OR 6 FT, WHICHEVER IS LONGER  
 5) MINIMUM EMBEDMENT DEPTH = 1 FT  
 6) REINFORCED ZONE AGGREGATE PARAMETERS:

AGGREGATE TYPE*	UNIT WEIGHT ( $\gamma$ ) LB/CF	FRICTION ANGLE ( $\phi$ ) DEGREES	COHESION (c) LB/SF
COARSE	110	38	0
FINE	115	34	0

\* SEE MSE RETAINING WALLS PROVISION FOR COARSE AND FINE AGGREGATE MATERIAL REQUIREMENTS.

7) IN-SITU ASSUMED MATERIAL PARAMETERS:

MATERIAL TYPE	UNIT WEIGHT ( $\gamma$ ) LB/CF	FRICTION ANGLE ( $\phi$ ) DEGREES	COHESION (c) LB/SF
BACKFILL	120	30	0
FOUNDATION	120	30	0

DESIGN RETAINING WALL NO.2 FOR THE FOLLOWING:  
 1) H = DESIGN HEIGHT + EMBEDMENT  
 2) DESIGN LIFE = 100 YEARS  
 3) MAXIMUM FACTORED VERTICAL PRESSURE ON FOUNDATION MATERIAL = 4,425 LB/SF.  
 4) MINIMUM REINFORCEMENT LENGTH (L) = 0.7 H OR 6 FT, WHICHEVER IS LONGER  
 5) MINIMUM EMBEDMENT DEPTH = 2 FT  
 6) REINFORCED ZONE AGGREGATE PARAMETERS:


AGGREGATE TYPE*	UNIT WEIGHT ( $\gamma$ ) LB/CF	FRICTION ANGLE ( $\phi$ ) DEGREES	COHESION (c) LB/SF
COARSE	110	38	0
FINE	115	34	0

\* SEE MSE RETAINING WALLS PROVISION FOR COARSE AND FINE AGGREGATE MATERIAL REQUIREMENTS.

7) IN-SITU ASSUMED MATERIAL PARAMETERS:

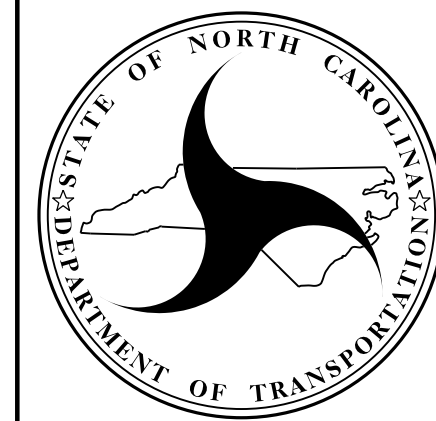
MATERIAL TYPE	UNIT WEIGHT ( $\gamma$ ) LB/CF	FRICTION ANGLE ( $\phi$ ) DEGREES	COHESION (c) LB/SF
BACKFILL	120	30	0
FOUNDATION	120	30	0

DESIGN RETAINING WALL NO.1 AND NO.2 FOR A LIVE LOAD (TRAFFIC) SURCHARGE.  
 EXISTING OR FUTURE OBSTRUCTIONS SUCH AS FOUNDATIONS, GUARDRAIL, FENCE OR HANDRAIL POSTS, PAVEMENTS, PIPES, INLETS OR UTILITIES MAY INTERFERE WITH REINFORCEMENT FOR RETAINING WALL NO.1 & NO.2.  
 DO NOT PLACE LEVELING PAD CONCRETE, AGGREGATE OR REINFORCEMENT FOR RETAINING WALL NO.1 AND NO.2 UNTIL EXCAVATION DIMENSIONS AND FOUNDATION MATERIAL ARE APPROVED.  
 "TEMPORARY SHORING" MAY BE REQUIRED FOR RETAINING WALL NO.1 & NO.2 IN ACCORDANCE WITH THE TEMPORARY SHORING PROVISION. SEE ROADWAY, STRUCTURE or TRAFFIC CONTROL PLANS.  
 AT THE CONTRACTOR'S OPTION, "TEMPORARY SHORING FOR WALL CONSTRUCTION" MAY BE USED TO CONSTRUCT RETAINING WALL NO.1 & NO.2. SEE MSE RETAINING WALLS PROVISION FOR TEMPORARY SHORING FOR WALL CONSTRUCTION.  
 DESIGN RETAINING WALL NO.1 AND WALL NO.2 FOR ADDITIONAL 50 LB PER LF OF PEDESTRIAN LIVE LOAD ON PEDESTRIAN HANDRAIL

GEOTECHNICAL ENGINEER  SEAL 033758 ENGINEER PATRICK ALLEN	ENGINEER
DocuSigned by: W. Patrick Allen 6/13/2019	DATE SIGNATURE DATE
<b>DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED</b>	

ESTIMATED MSE WALL QUANTITIES (SQUARE FEET)	
MSE RETAINING WALL NO.1	1,120 SF
MSE RETAINING WALL NO.2	7,550 SF

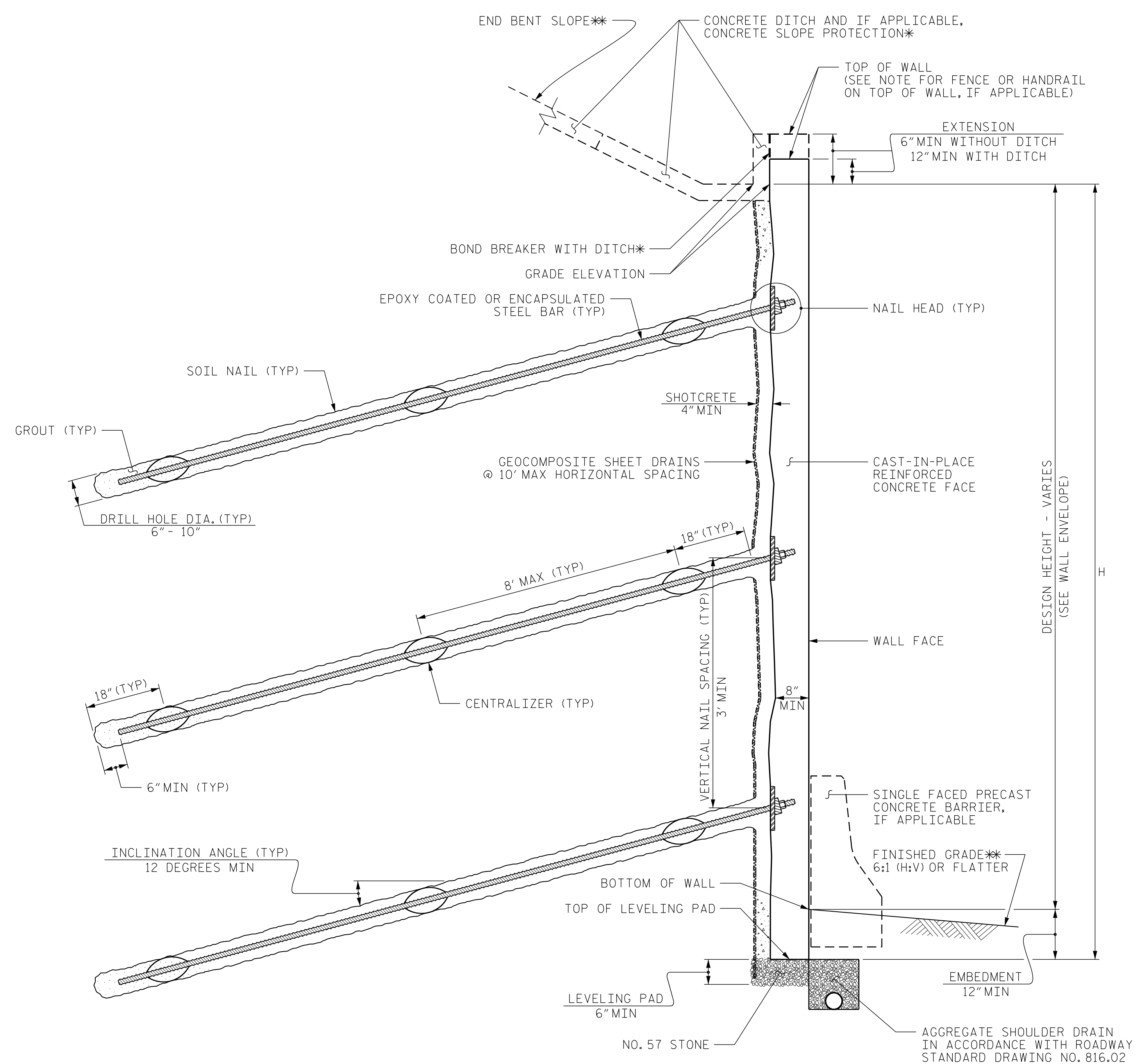
PROJECT NO.: R-3830  
 COUNTY: LEE  
 SHEET 5 OF 6



**NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
DIVISION OF HIGHWAYS**  
  
**GEOTECHNICAL  
ENGINEERING UNIT**

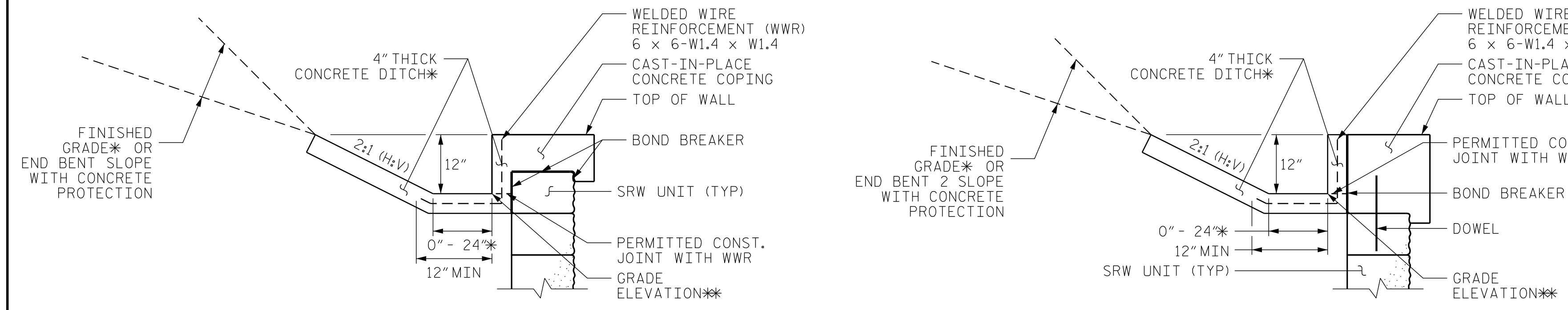
MSE RETAINING WALLS  
NOTES

DATE: 02/02/2018  
 SHEET NO. W-5



**SOIL NAIL WALL - TYPICAL SECTION**

\* SEE CONCRETE DITCH BEHIND WALL DETAILS.  
\*\* SEE PLANS FOR END BENT SLOPE DETAILS.



**CONCRETE DITCH BEHIND WALL WITH BACK SLOPE**

\* SEE ROADWAY PLANS FOR CONCRETE DITCH AND FINISHED GRADE DETAILS.  
\*\* SEE WALL ENVELOPE FOR GRADE ELEVATIONS.

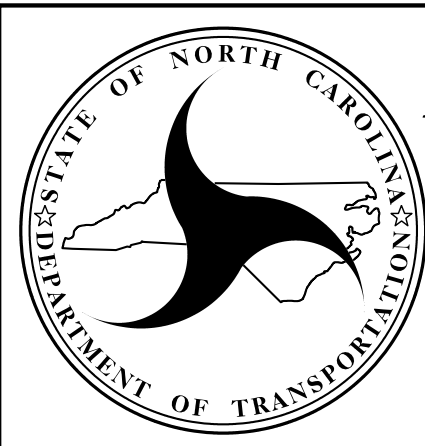
**NOTES:**

- FOR SOIL NAIL RETAINING WALLS, SEE SOIL NAIL RETAINING WALLS PROVISION.
- FOR SINGLE FACED PRECAST CONCRETE BARRIER, SEE ROADWAY PLANS AND SECTION 857 OF THE STANDARD SPECIFICATIONS.
- BEFORE BEGINNING SOIL NAIL WALL DESIGN FOR RETAINING WALL NO. 3, SURVEY WALL LOCATION AND SUBMIT A REVISED WALL PROFILE VIEW (WALL ENVELOPE) FOR REVIEW. DO NOT START WALL DESIGN OR CONSTRUCTION UNTIL THE REVISED WALL ENVELOPE IS ACCEPTED.
- DESIGN RETAINING WALL NO. 3 FOR THE FOLLOWING:
  - 1) H = DESIGN HEIGHT + EMBEDMENT
  - 2) DESIGN LIFE = 100 YEARS
  - 3) MINIMUM EMBEDMENT DEPTH = 1 FT
  - 4) IN-SITU ASSUMED MATERIAL PARAMETERS ABOVE BOTTOM OF WALL:
    - UNIT WEIGHT,  $\gamma = 120$  LB/CF
    - FRICTION ANGLE,  $\phi = 30$  DEGREES
    - COHESION,  $c = 0$  LB/SF
  - 5) IN-SITU ASSUMED MATERIAL PARAMETERS BELOW BOTTOM OF WALL:
    - UNIT WEIGHT,  $\gamma = 120$  LB/CF
    - FRICTION ANGLE,  $\phi = 30$  DEGREES
    - COHESION,  $c = 0$  LB/SF
- EXISTING OR FUTURE OBSTRUCTIONS SUCH AS FOUNDATIONS, GUARDRAIL, FENCE OR HANDRAIL POSTS, PAVEMENTS, PIPES, INLETS OR UTILITIES MAY INTERFERE WITH SOIL NAILS FOR RETAINING WALL NO. 3.
- FOUNDATIONS FOR THE EXISTING END BENTS MAY INTERFERE WITH SOIL NAILS FOR RETAINING WALL NO. 3.

**ESTIMATED SOIL NAIL WALL QUANTITIES**

RETAINING WALL NO.	SOIL NAIL RETAINING WALLS (SQUARE FEET)	SOIL NAIL VERIFICATION TESTS	SOIL NAIL PROOF TESTS
3	1,455	2	1

PROJECT NO.: R-3830  
COUNTY: LEE  
SHEET 6 OF 6



**NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
DIVISION OF HIGHWAYS**

**GEOTECHNICAL  
ENGINEERING UNIT**

**SOIL NAIL WALL  
WITH BACK SLOPE-  
TYPICAL & NOTES**