

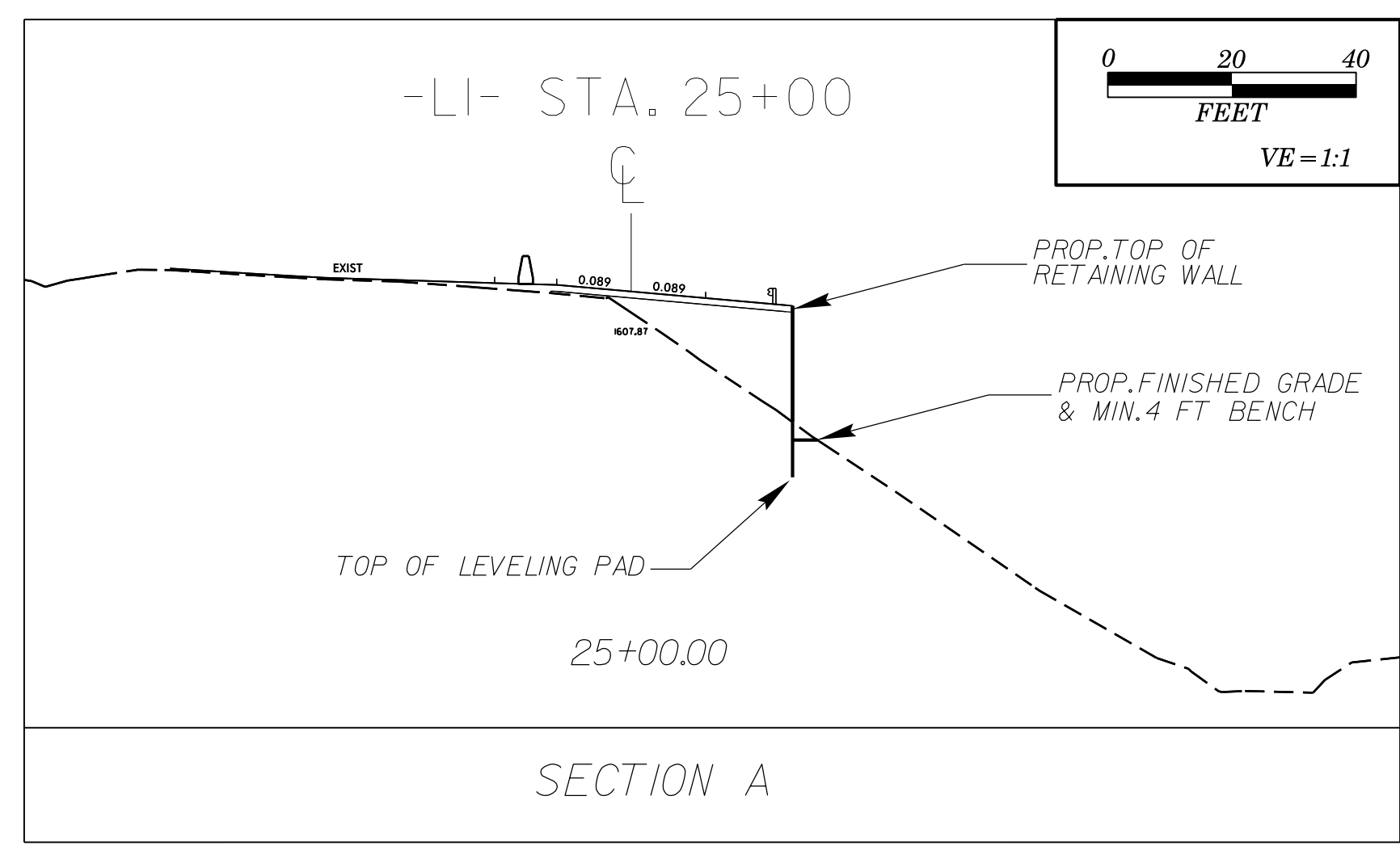
GEOTECHNICAL ENGINEER

ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 039550 3-2-17

SIGNATURE DATE SIGNATURE DATE

SMSE RETAINING WALL INFORMATION									
-L1- STA	OFFSET FROM C (RIGHT)	ELEV @ TOP OF WALL	* PROPOSED FINISHED GRADE	TOP OF LEVELING PAD	ESTIMATED SMSE WALL EMBEDMENT BELOW BENCH	**DESIGN SMSE WALL HEIGHT "H"	SOIL OF SOIL NAIL WALL	SOIL NAIL WALL HEIGHT	WALL REINFORCEMENT LENGTH "L"
19+70.00	26.00	1643.34	1642.84	1640.84	2.00	2.00	1643.34	0.00	0.5XH
20+00.00	26.00	1644.61	1636.98	1634.98	2.00	9.63	1641.51	6.53	0.5XH
20+50.00	26.00	1641.21	1631.63	1629.13	2.50	12.08	1637.42	8.29	0.5XH
21+00.00	26.00	1637.83	1625.68	1622.18	3.50	15.65	1633.38	11.20	0.5XH
21+50.00	26.00	1634.38	1618.72	1613.22	5.50	21.16	1630.19	16.97	0.5XH
22+00.00	26.00	1630.84	1614.01	1608.01	6.00	22.83	1624.76	16.75	0.5XH
22+50.00	26.00	1627.31	1608.80	1602.30	6.50	25.01	1620.94	18.64	0.5XH
23+00.00	26.00	1623.77	1604.88	1599.88	5.00	23.89	1619.32	19.44	0.7XH
23+50.00	26.00	1620.11	1602.26	1597.76	4.50	22.35	1614.07	16.31	0.7XH
24+00.00	26.00	1616.37	1597.65	1592.65	5.00	23.72	1610.86	18.21	0.7XH
24+50.00	26.00	1612.68	1591.66	1586.16	5.50	26.52	1603.86	17.70	0.5XH
25+00.00	26.00	1608.97	1587.32	1581.82	5.50	27.15	1599.93	18.11	0.5XH
25+50.00	26.00	1605.30	1585.45	1580.45	5.00	24.85	1598.54	18.09	0.7XH
26+00.00	26.00	1601.91	1584.18	1579.68	4.50	22.23	1595.19	15.51	0.7XH
26+40.00	26.00	1587.43	1586.93	1584.93	2.00	2.00	1587.43	0.00	0.5XH



TOTAL STRUCTURE QUANTITIES	
SHORED MSE RETAINING WALLS	13,530 SQ. FT.

NOTE: SMSE WALL QUANTITY INCLUDES EMBEDMENT FROM FINISHED GRADE TO TOP OF LEVELING PAD.

ESTIMATED QUANTITIES	
PERMANENT SOIL NAIL SHORING	9,910 SQ. FT.
MINIMUM NAIL LENGTH RATIO: $L_{SN} = H_{SN} / 0.60$	

* ELEVATION @ PROPOSED FINISHED GRADE / 4 FT BENCH DOES NOT INCLUDE EMBEDMENT DEPTH
 ** FOR DESIGN WALL HEIGHT "H" AND ADDITIONAL CONSTRUCTION DETAILS, SEE SHEET 2 OF 4

PROJECT NO.: W-5521
 WILKES COUNTY
 STATION: -L1- 19+70 TO 26+40, 26' RT
 SHEET 1 OF 4

PREPARED BY: M. BREWER DATE: 3/2/17
 REVIEWED BY: M. PLOTKIN DATE: 3/2/17

Prepared in the Office of:

ECS

ECS SOUTHEAST, LLP
 1812 CENTER PARK DRIVE, SUITE D
 CHARLOTTE, NC 28217
 (704) 525-5152 [PHONE]
 (704) 357-0023 [FAX]
 NC REGISTERED ENGINEERING FIRM # F-1078


GEOTECHNICAL ENGINEERING UNIT

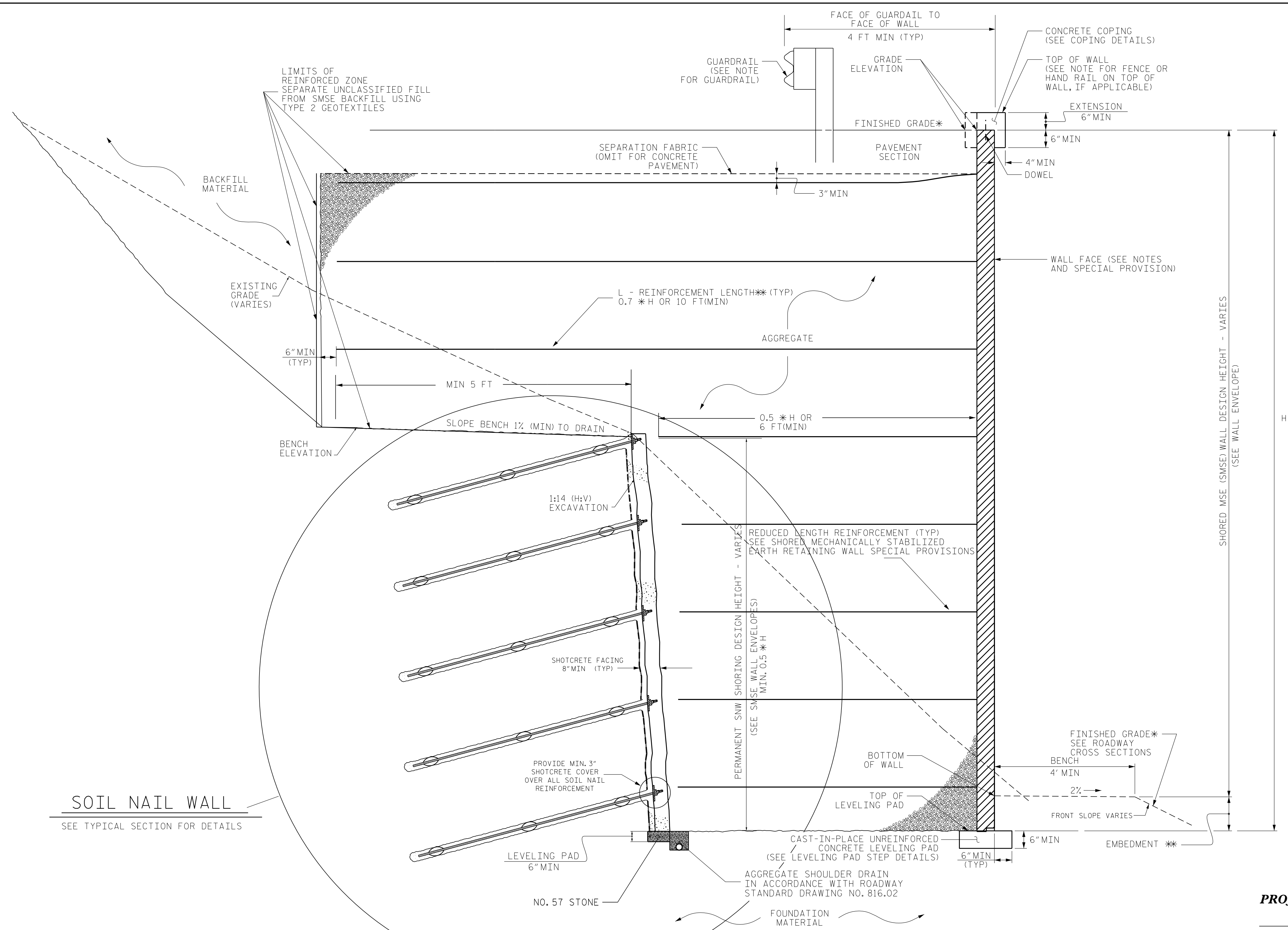
EASTERN REGIONAL OFFICE
 WESTERN REGIONAL OFFICE
 CONTRACT OFFICE

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

SHORED MECHANICALLY STABILIZED EARTH (SMSE) RETAINING WALL

REVISIONS						SHEET NO. W-1
NO.	BY	DATE	NO.	BY	DATE	
1	DMB	2/27/17	3			TOTAL SHEETS 4
2			4			

GEOTECHNICAL ENGINEER  SEAL 039550 3-2-17 ENGINEER MARGE PLOTKIN		ENGINEER SIGNATURE _____ DATE _____ SIGNATURE _____ DATE _____	
---	--	--	--



SOIL NAIL WALL
SEE TYPICAL SECTION FOR DETAILS

SMSE WALL TYPICAL SECTION

*SEE ROADWAY PLANS FOR FINISHED GRADE DETAILS.
**SEE SMSE RETAINING WALLS PROVISION FOR EMBEDMENT AND REINFORCEMENT LENGTH REQUIREMENTS.

PROJECT NO.: W-5521
WILKES COUNTY
STATION: -L1- 19+70 TO 26+40, 26' RT
 SHEET 2 OF 4

PREPARED BY: M. BREWER	DATE: 3/2/17
REVIEWED BY: M. PLOTKIN	DATE: 3/2/17

Prepared in the Office of:

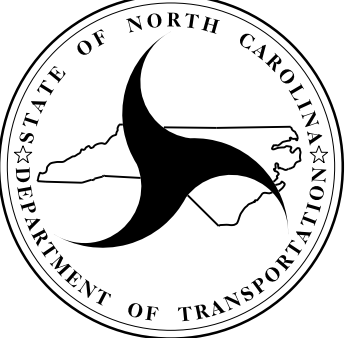


ECS SOUTHEAST, LLP
 1812 CENTER PARK DRIVE, SUITE D
 CHARLOTTE, NC 28217
 (704) 525-5152 [PHONE]
 (704) 357-0023 [FAX]
 NC REGISTERED ENGINEERING FIRM # F-1078

GEOTECHNICAL ENGINEERING UNIT

EASTERN REGIONAL OFFICE
 WESTERN REGIONAL OFFICE
 CONTRACT OFFICE

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH



REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	W-2
1	DMB	2/27/17	3			TOTAL SHEETS
2			4			4

SMSE NOTES

FOR SHORED MECHANICALLY STABILIZED EARTH (SMSE) RETAINING WALLS, SEE SHORED MECHANICALLY STABILIZED EARTH RETAINING WALLS SPECIAL PROVISION.

FOR LOCATIONS WHERE A SHORED MECHANICALLY STABILIZED EARTH (SMSE) RETAINING WALL IS NOT USED, USE FULL LENGTH REINFORCEMENT AS SHOWN IN SMSE TYPICAL SECTION.

FOR STEEL BEAM GUARDRAIL, SEE ROADWAY PLANS AND SECTION 862 OF THE STANDARD SPECIFICATIONS.

DO NOT USE STANDARD SIZE NO. 2S OR 2MS AS SELECT MATERIAL FOR THE RETAINING WALL.

USE AN SMSE WALL SYSTEM WITH PRECAST PANELS OR CAST-IN-PLACE FACING FOR THIS RETAINING WALL. DO NOT USE SEGMENTAL RETAINING WALL (SRW) UNITS.

A SMOOTH ARCHITECTURAL FINISH IS REQUIRED FOR PRECAST CONCRETE PANELS OR CAST-IN-PLACE FACING FOR THE RETAINING WALL.

CAST-IN-PLACE REINFORCED CONCRETE COPING IS REQUIRED FOR THE RETAINING WALL.

A DRAIN IS REQUIRED FOR THE RETAINING WALL.

BEFORE BEGINNING SMSE WALL DESIGN FOR THE RETAINING WALL, SURVEY EXISTING GROUND ELEVATIONS SHOWN ON THE WALL PROFILE VIEW (WALL ENVELOPE) AND SUBMIT A REVISED WALL ENVELOPE FOR REVIEW. DO NOT START WALL DESIGN OR CONSTRUCTION UNTIL THIS ENVELOPE IS ACCEPTED.

DESIGN THE RETAINING WALL FOR WALL HEIGHTS EQUAL TO THE DESIGN HEIGHT (DIFFERENCE BETWEEN GRADE ELEVATION AND BOTTOM OF WALL ELEVATION) PLUS EMBEDMENT (DIFFERENCE BETWEEN BOTTOM OF WALL ELEVATION AND TOP OF LEVELING PAD ELEVATION).
 DESIGN THE RETAINING WALL FOR THE FOLLOWING:
 1) H = DESIGN HEIGHT + EMBEDMENT
 2) DESIGN LIFE = 100 YEARS
 3) MAXIMUM FACTORED VERTICAL STRESS ON FOUNDATION MATERIAL = 8,600 LB/SF
 4) MINIMUM REINFORCEMENT LENGTH (L) = 0.7 * H, OR 10 FT, WHICHEVER IS GREATER. (VARIES, SEE PROVISION)
 5) MINIMUM SOIL NAIL REINFORCEMENT LENGTH (L_{SN}) = H_{SN} / 0.60 OR 10 FT, WHICHEVER IS GREATER. (VARIES, SEE PROVISION)
 6) MINIMUM EMBEDMENT ELEVATION = VARIES, SEE TABLE
 7) AGGREGATE PARAMETERS:

AGGREGATE TYPE*	UNIT WEIGHT (g) LB/CF	FRICTION ANGLE (f) DEGREES	COHESION (c) LB/SF
COARSE	110	38	0
FINE	125	34	0

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

8) IN-SITU ASSUMED MATERIAL PARAMETERS:

MATERIAL TYPE	UNIT WEIGHT (g) LB/CF	FRICTION ANGLE (f) DEGREES	COHESION (c) LB/SF
BACKFILL	120	32	25
FOUNDATION	120	30	25

DESIGN THE RETAINING WALL FOR A LIVE LOAD (TRAFFIC) SURCHARGE.

IF PRESENT, DESIGN THE RETAINING WALL FOR DRAINAGE PIPES THAT EXTEND THROUGH OR UNDER THE WALL, WHERE APPLICABLE.

EXISTING OR FUTURE OBSTRUCTIONS SUCH AS FOUNDATIONS, 8 FT GUARDRAIL POSTS, PAVEMENTS, PIPES, INLETS OR UTILITIES MAY INTERFERE WITH REINFORCEMENT FOR THE RETAINING WALL.

DO NOT PLACE LEVELING PAD CONCRETE, SELECT MATERIAL OR REINFORCEMENT FOR THE RETAINING WALL UNTIL OBTAINING APPROVAL OF THE EXCAVATION DEPTH AND FOUNDATION MATERIAL.

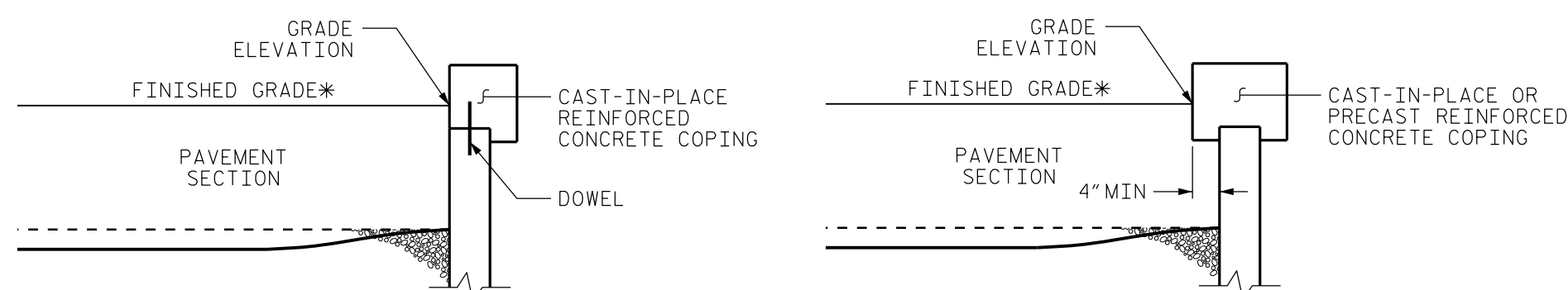
THE SMSE WALL DESIGNER SHALL CONSULT WITH THE SOIL NAIL WALL DESIGNER TO VERIFY LOCATIONS WHERE "TEMPORARY SHORING" MAY BE REQUIRED FOR THE RETAINING WALL IN ACCORDANCE WITH THE TEMPORARY SHORING PROVISION. SEE TRAFFIC CONTROL PLANS. IN LOCATIONS WHERE "PERMANENT SOIL NAIL WALL" IS USED, PAYMENT WILL NOT BE MADE FOR "TEMPORARY SHORING" FOR TRAFFIC CONTROL.

FOR FENCES OR HANDRAILS ON THE TOP OF THE RETAINING WALL, SEE ROADWAY PLANS FOR FENCE OR HANDRAIL ATTACHMENT DETAILS.

THE PERMANENT SOIL NAIL WALL HEIGHT IS AN ESTIMATE ONLY, THAT IS BASED ON THE ANTICIPATED EXCAVATION PLUS THE MINIMUM EMBEDMENT LISTED.

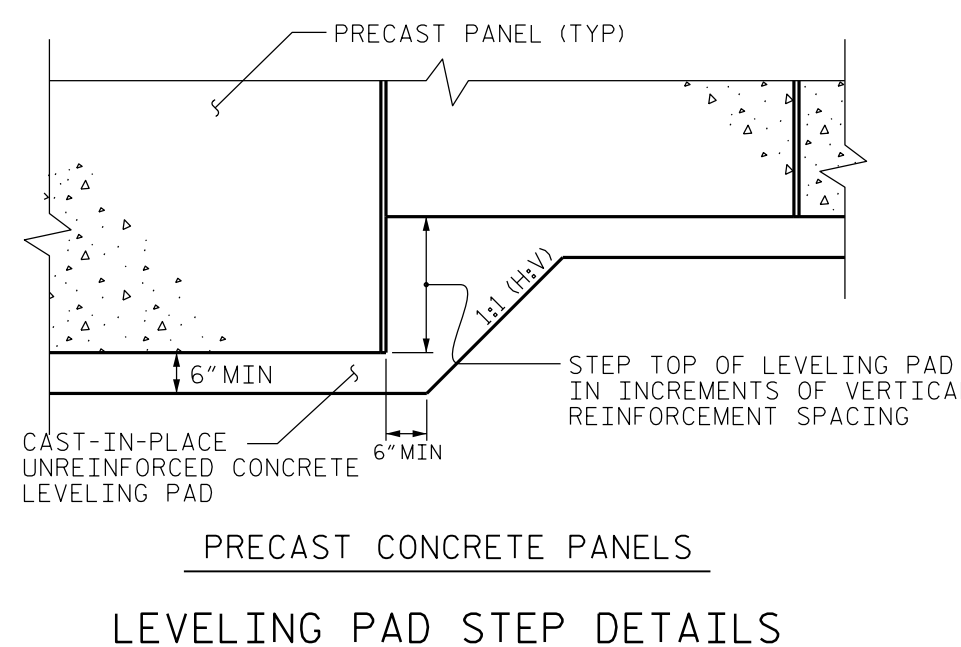
THE SOIL NAIL WALL DESIGNER IS RESPONSIBLE FOR DETERMINING GLOBAL STABILITY BASED ON THE FINISHED SMSE WALL. A MINIMUM FACTOR OF SAFETY OF 1.35 IS REQUIRED FOR GLOBAL STABILITY. SUBMIT THESE RESULTS WITH THE WALL DESIGN PACKAGE. VERIFY PIPE LOCATIONS AND ELEVATIONS BEFORE BEGINNING MSE WALL DESIGN OR CONSTRUCTION.

CONTRACTOR SHALL DAYLIGHT AGGREGATE SHOULDER DRAINS OUTSIDE OF THE LIMITS OF THE WALL.

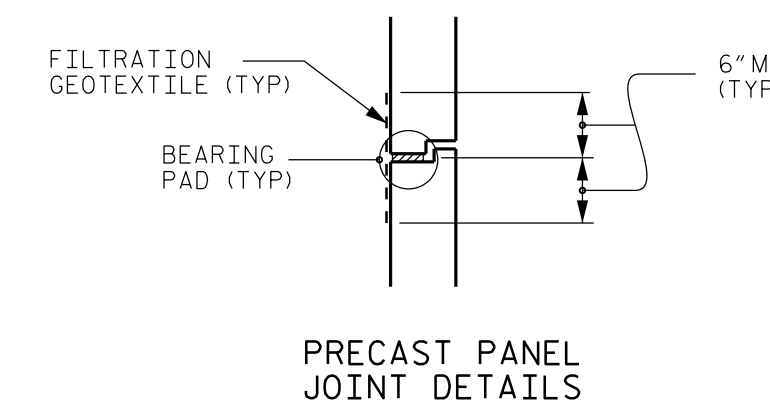


COPING DETAILS

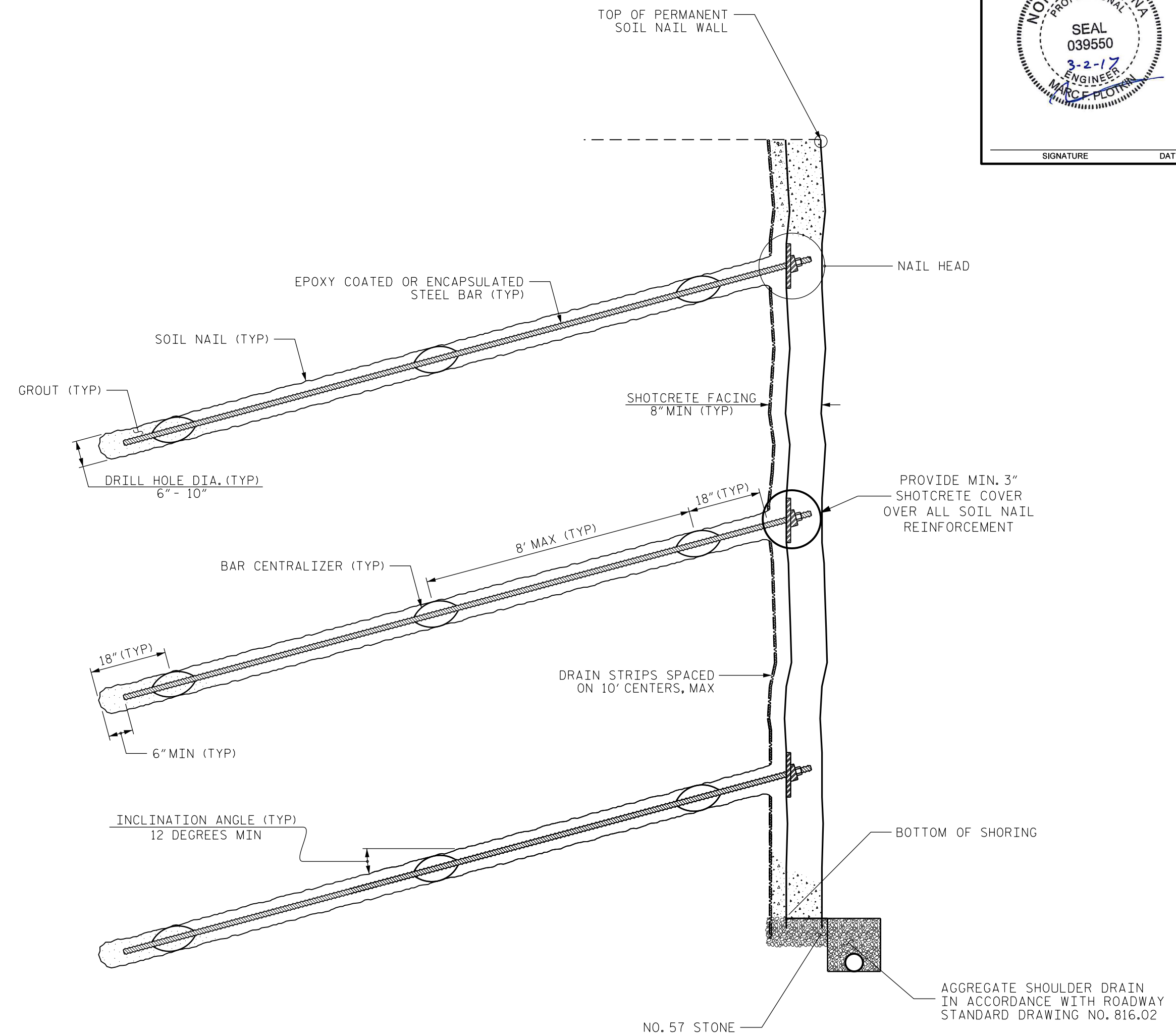
AT THE CONTRACTOR'S OPTION, CONNECT COPING TO PANELS WITH DOWELS OR EXTEND COPING DOWN BACK OF PANELS. *SEE ROADWAY PLANS FOR FINISHED GRADE DETAILS.



LEVELING PAD STEP DETAILS



PRECAST PANEL JOINT DETAILS



PERMANENT SOIL NAIL WALL TYPICAL SECTION

DESIGN SOIL NAIL WALL FOR HEIGHTS EQUAL TO THE DESIGN HEIGHT (DIFFERENCE BETWEEN GRADE ELEVATION AND THE TOP OF LEVELING PAD).

DESIGN SOIL NAIL WALL FOR A LIVE LOAD (TRAFFIC) SURCHARGE.

WHERE APPLICABLE, DESIGN SOIL NAIL WALL FOR A PIPE EXTENDING THROUGH OR UNDER THE WALL AS SHOWN. VERIFY PIPE LOCATION AND ELEVATION BEFORE BEGINNING SOIL NAIL WALL DESIGN OR CONSTRUCTION.

"TOP OF SOIL NAIL WALL" AS SHOWN IN WALL ENVELOPES REPRESENTS THE APPROXIMATE GRADE ELEVATION A DISTANCE OF 0.5 OR 0.7 TIMES PROPOSED WALL HEIGHT (H) AT THAT STATION.

THE ESTIMATED SOIL NAIL WALL QUANTITY IS BASED ON THE 0.5 OR 0.7 TIMES H OFFSET PLUS THE MINIMUM EMBEDMENT LISTED IN THE DESIGN TABLE. THESE VALUES ARE PROVIDED AS AN ESTIMATE ONLY AND MAY VARY DUE TO SITE CONDITIONS.

GEOTECHNICAL ENGINEER SEAL 039550 3-2-17 M. PLOTKIN	ENGINEER SIGNATURE _____ DATE _____ SIGNATURE _____ DATE _____
--	--

PROJECT NO.: W-5521
WILKES COUNTY
STATION: -L1- 19+70 TO 26+40 26' RT
SHEET 3 OF 4

SHORED MECHANICALLY STABILIZED EARTH (SMSE) RETAINING WALL

REVISIONS

NO.	BY	DATE	NO.	BY	DATE	SHEET NO.
1	DMB	2/27/17	3			W-3
2			4			TOTAL SHEETS 4

PREPARED BY: M. BREWER	DATE: 3/2/17
REVIEWED BY: M. PLOTKIN	DATE: 3/2/17

Prepared in the Office of:

ECS SOUTHEAST, LLP
 1812 CENTER PARK DRIVE, SUITE D
 CHARLOTTE, NC 28217
 (704) 525-5152 [PHONE]
 (704) 357-0023 [FAX]
 NC REGISTERED ENGINEERING FIRM # F-1078

GEOTECHNICAL ENGINEERING UNIT

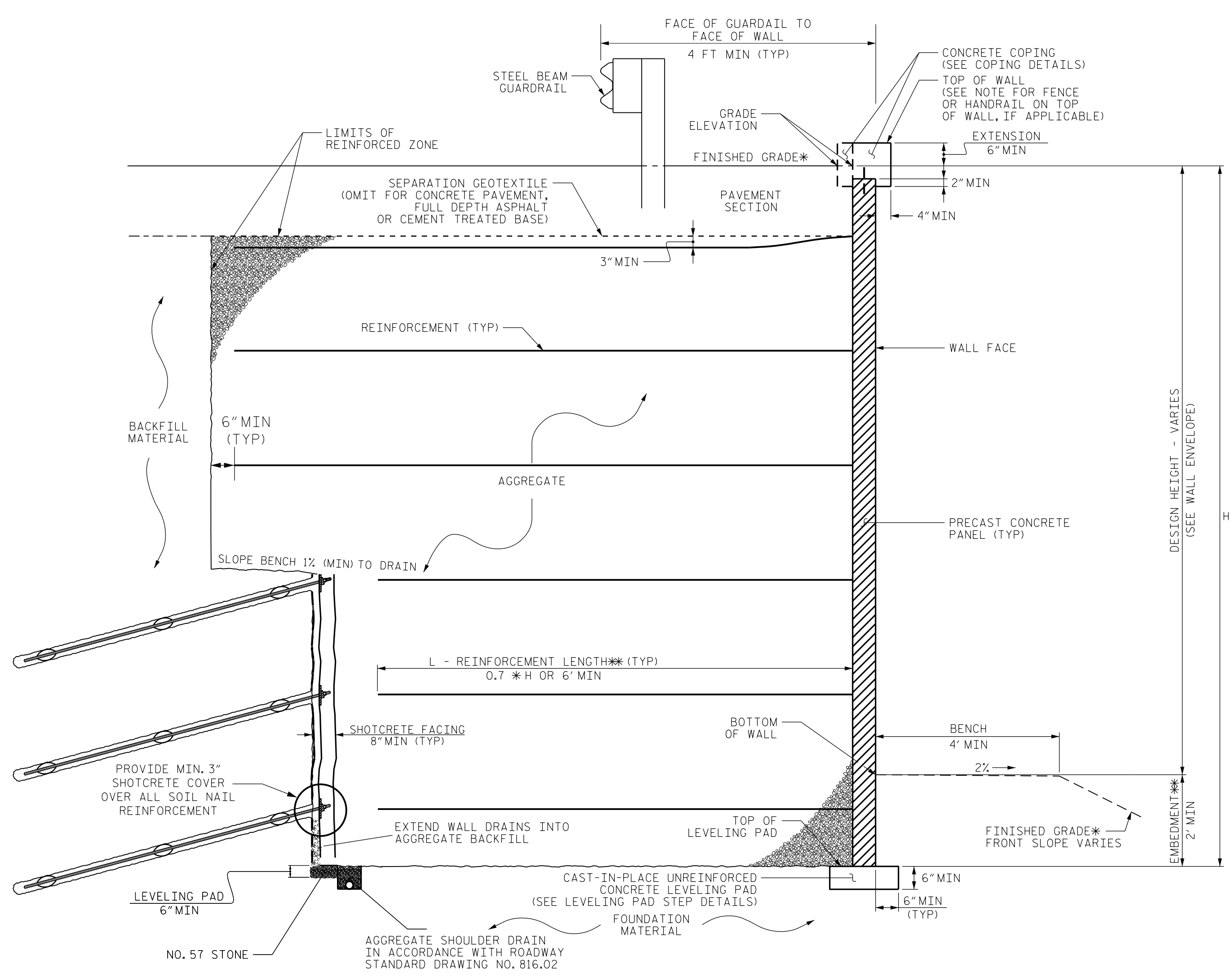
EASTERN REGIONAL OFFICE
 WESTERN REGIONAL OFFICE
 CONTRACT OFFICE

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH

SHORED MECHANICALLY STABILIZED EARTH (SMSE) RETAINING WALL

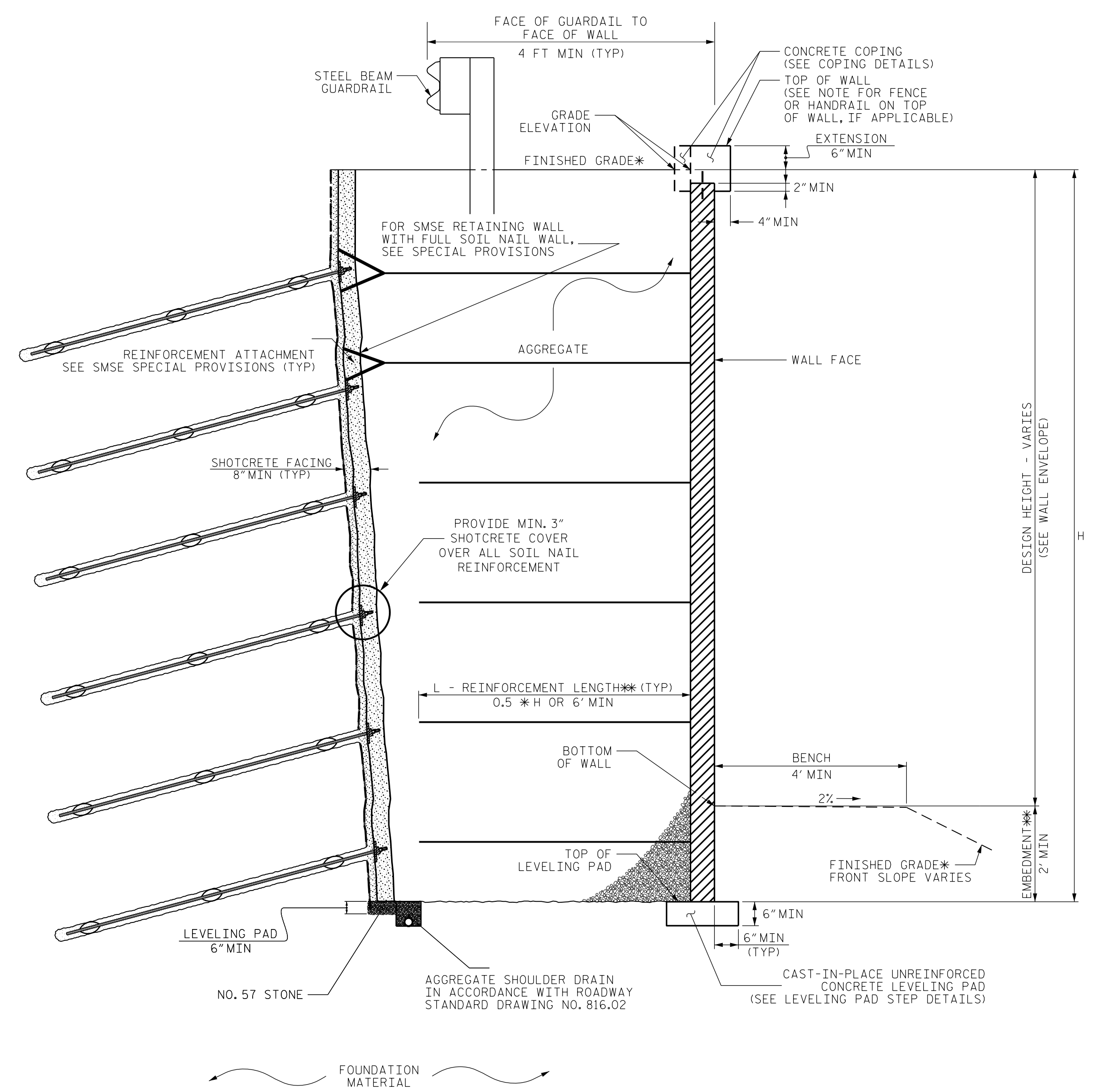
REVISIONS

NO.	BY	DATE	NO.	BY	DATE	SHEET NO.
1	DMB	2/27/17	3			W-3
2			4			TOTAL SHEETS 4



SMSE WALL WITH SOIL NAIL WALL < 2/3 H

*SEE ROADWAY PLANS FOR FINISHED GRADE DETAILS.
 **SEE SMSE RETAINING WALLS PROVISION FOR EMBEDMENT AND REINFORCEMENT LENGTH REQUIREMENTS.



SMSE WALL WITH FULL HEIGHT SOIL NAIL WALL

*SEE ROADWAY PLANS FOR FINISHED GRADE DETAILS.
 **SEE SMSE RETAINING WALLS PROVISION FOR EMBEDMENT AND REINFORCEMENT LENGTH REQUIREMENTS.

PROJECT NO.: W-5521
 WILKES COUNTY
 STATION: -L1- 19+70 TO 26+40, 26' RT
 SHEET 4 OF 4

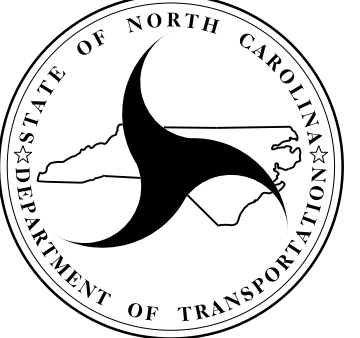
PREPARED BY: M. BREWER DATE: 3/2/17
 REVIEWED BY: M. PLOTKIN DATE: 3/2/17

Prepared in the Office of:



ECS SOUTHEAST, LLP
 1812 CENTER PARK DRIVE, SUITE D
 CHARLOTTE, NC 28217
 (704) 525-5152 [PHONE]
 (704) 357-0023 [FAX]
 NC REGISTERED ENGINEERING FIRM # F-1078

GEOTECHNICAL ENGINEERING UNIT
 EASTERN REGIONAL OFFICE
 WESTERN REGIONAL OFFICE
 CONTRACT OFFICE
 STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH



SHORED MECHANICALLY STABILIZED EARTH (SMSE) RETAINING WALL						SHEET NO. W-4
REVISIONS						
NO.	BY	DATE	NO.	BY	DATE	TOTAL SHEETS
1	DMB	2/27/17	3			4
2			4			4