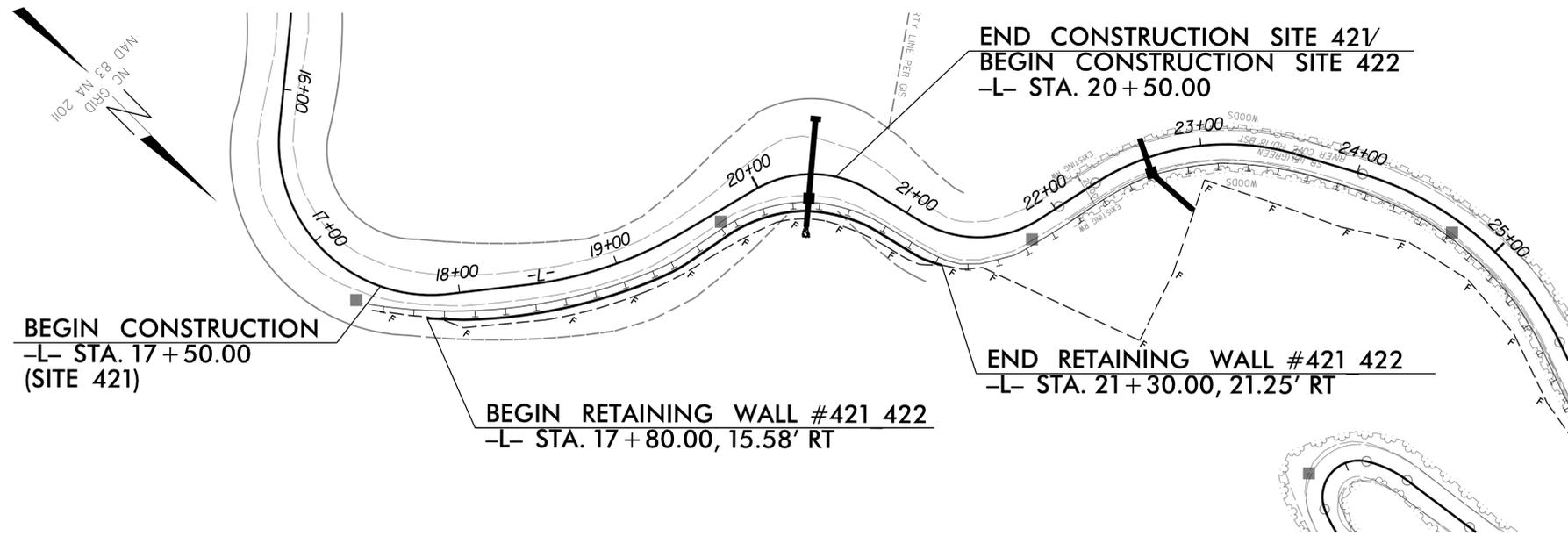
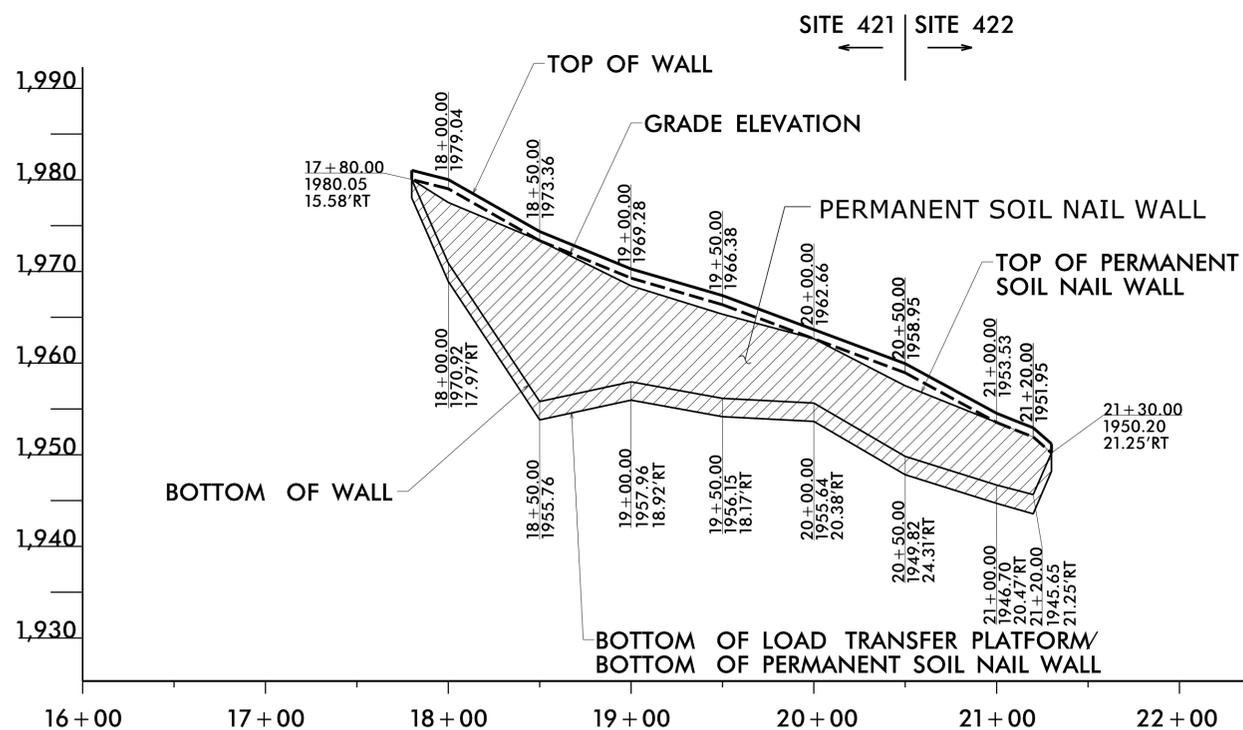


# RETAINING WALL #421\_422:



## RETAINING WALL #421\_422 - PLAN

NOT TO SCALE



## RETAINING WALL #421\_422 - ENVELOPE

NOT TO SCALE  
(LOOKING AT FACE OF WALL)

THE WALL ENVELOPE DOES NOT ACCURATELY DEPICT THE ACTUAL WALL FACE OF WALL #421\_422 AT THE FOLLOWING LOCATION:  
-L- STA. 17+80 +/- TO 21+30 +/- RT

PREPARED BY: KND DATE: 12/25  
REVIEWED BY: REK DATE: 12/25

RETAINING WALL ENVELOPE AND WALL LAYOUT PROVIDED TGS ENGINEERS, INC. OCTOBER 9, 2025.

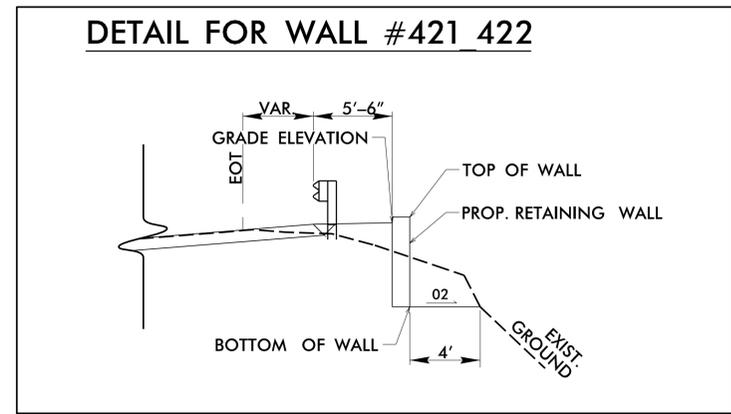
GEOTECHNICAL ENGINEER

Signed by: Robert E. Kral  
1/5/2026

ENGINEER

\_\_\_\_\_  
SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED



RETAINING WALL #421_422								
STA. -L-	GRADE ELEVATION (FT)	BOTTOM OF WALL ELEVATION (FT)	WALL DESIGN HEIGHT "H" (FT)	BOTTOM OF SOIL NAIL WALL ELEVATION (FT)	TOP OF SOIL NAIL WALL ELEVATION (FT)	APPROX. HEIGHT OF SOIL NAIL WALL (FT)	WALL REINFORCEMENT LENGTH (FT)	
							UPPER	LOWER
17+80.00	1980.05	1980.05	1.00	1978.05	1980.05	2.00	0.7xH OR 10 FT (MIN)	0.5xH OR 6 FT (MIN)
18+00.00	1979.04	1970.92	9.12	1968.92	1975.71	6.79	0.7xH OR 10 FT (MIN)	0.5xH OR 6 FT (MIN)
18+50.00	1973.36	1955.76	18.60	1953.76	1973.55	19.79	0.7xH OR 10 FT (MIN)	0.5xH OR 6 FT (MIN)
19+00.00	1969.28	1957.96	12.32	1955.96	1968.16	12.20	0.7xH OR 10 FT (MIN)	0.5xH OR 6 FT (MIN)
19+50.00	1966.38	1956.15	11.23	1954.15	1964.69	10.54	0.7xH OR 10 FT (MIN)	0.5xH OR 6 FT (MIN)
20+00.00	1962.66	1955.64	8.02	1953.64	1961.21	7.57	0.7xH OR 10 FT (MIN)	0.5xH OR 6 FT (MIN)
20+50.00	1958.95	1949.82	9.13	1947.82	1956.45	8.63	0.7xH OR 10 FT (MIN)	0.5xH OR 6 FT (MIN)
21+00.00	1953.53	1946.70	7.83	1944.70	1951.64	6.94	0.7xH OR 10 FT (MIN)	0.5xH OR 6 FT (MIN)
21+20.00	1951.95	1945.65	7.30	1943.65	1951.95	8.30	0.7xH OR 10 FT (MIN)	0.5xH OR 6 FT (MIN)
21+30.00	1950.20	1950.20	1.00	1948.20	1950.20	2.00	0.7xH OR 10 FT (MIN)	0.5xH OR 6 FT (MIN)

PAY ITEM QUANTITIES - SITE 421	
SHORED MSE RETAINING WALL	3,090 SF
LOAD TRANSFER PLATFORM	270 LF

PAY ITEM QUANTITIES - SITE 422	
SHORED MSE RETAINING WALL	650 SF
LOAD TRANSFER PLATFORM	80 LF

ESTIMATED QUANTITIES - SITE 421 (NOT FOR BIDDING)	
SOIL NAIL RETAINING WALL	3,180 SF
SOIL NAIL VERIFICATION TESTS	2 EA
SOIL NAIL PROOF TESTS	5 EA

ESTIMATED QUANTITIES - SITE 422 (NOT FOR BIDDING)	
SOIL NAIL RETAINING WALL	700 SF
SOIL NAIL VERIFICATION TESTS	1 EA
SOIL NAIL PROOF TESTS	2 EA

PROJECT NO.: W03291  
POLK COUNTY  
RETAINING WALL #421\_422: -L- STA. 17+80.00 TO 21+30.00, RT  
SHEET 1 OF 5

Prepared in the Office of:

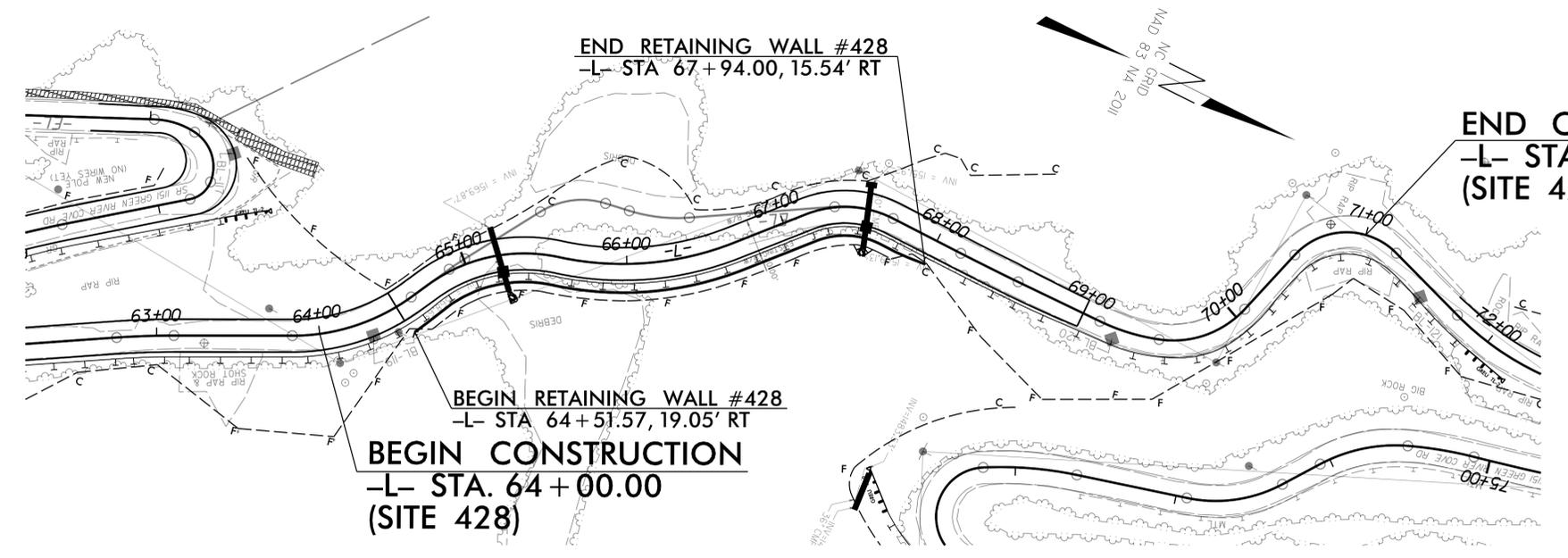
**CAROLINAS GEOTECHNICAL GROUP**  
1805 SARDIS ROAD NORTH  
SUITE 100  
CHARLOTTE, NC 28270  
(980) 339-8684

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

SHEET NO. W-1

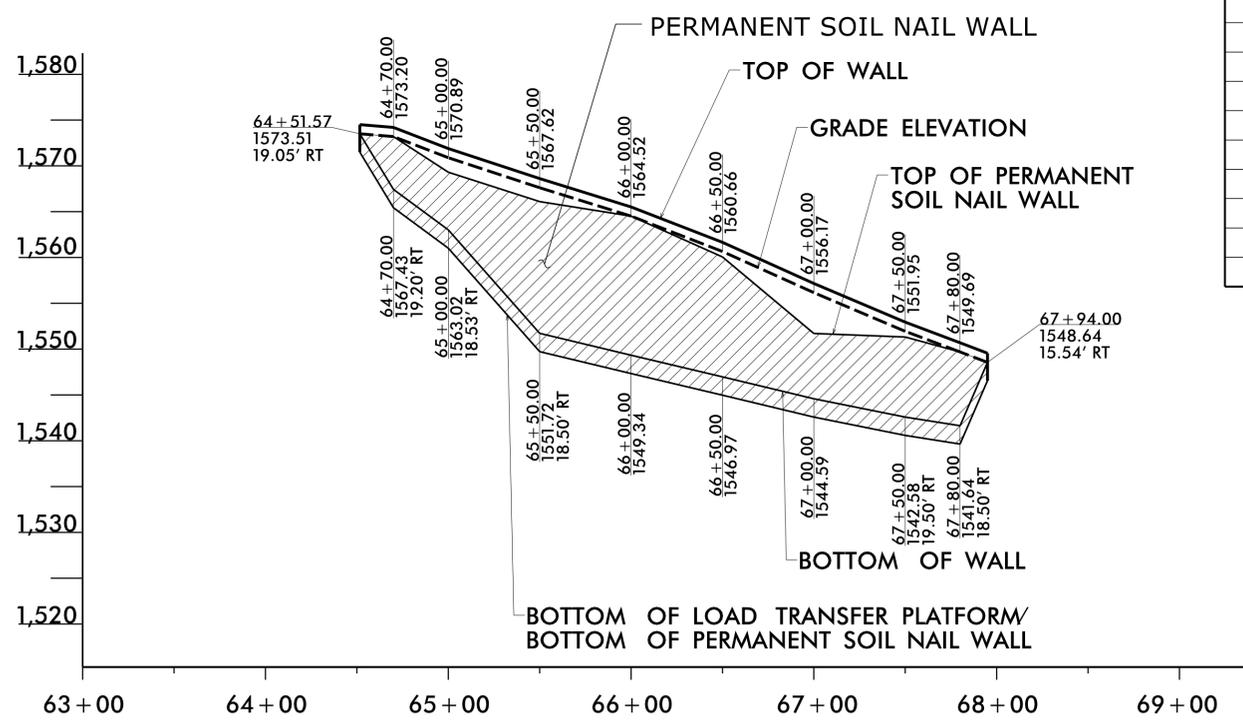
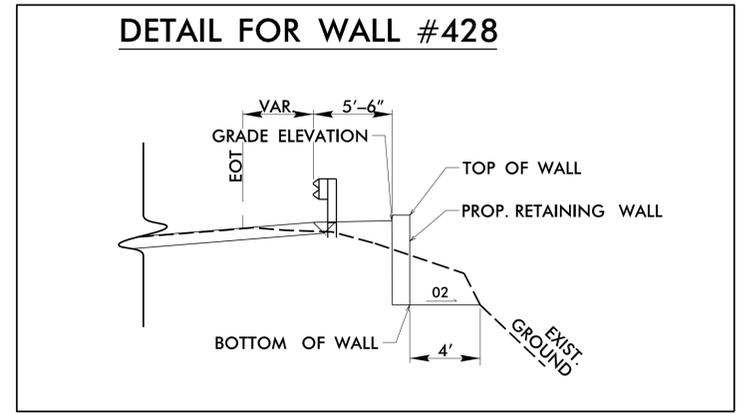
# RETAINING WALL #428:

GEOTECHNICAL ENGINEER  Signed by: Robert E. Kral 1/5/2026 DATE	ENGINEER SIGNATURE DATE
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	



**RETAINING WALL #428 - PLAN**

NOT TO SCALE



**RETAINING WALL #428 - ENVELOPE**

NOT TO SCALE  
(LOOKING AT FACE OF WALL)

RETAINING WALL #428								
STA. -L-	GRADE ELEVATION (FT)	BOTTOM OF WALL ELEVATION (FT)	WALL DESIGN HEIGHT "H" (FT)	BOTTOM OF SOIL NAIL WALL ELEVATION (FT)	TOP OF SOIL NAIL WALL ELEVATION (FT)	APPROX. HEIGHT OF SOIL NAIL WALL (FT)	WALL REINFORCEMENT LENGTH (FT)	
							UPPER	LOWER
64+51.57	1573.51	1573.51	1.00	1571.51	1573.51	2.00	0.7xH OR 10 FT (MIN)	0.5xH OR 6 FT (MIN)
64+70.00	1573.20	1567.43	6.77	1565.43	1573.20	7.77	0.7xH OR 10 FT (MIN)	0.5xH OR 6 FT (MIN)
65+00.00	1570.89	1563.02	8.87	1561.02	1569.31	8.29	0.7xH OR 10 FT (MIN)	0.5xH OR 6 FT (MIN)
65+50.00	1567.62	1551.72	16.90	1549.72	1566.10	16.38	0.7xH OR 10 FT (MIN)	0.5xH OR 6 FT (MIN)
66+00.00	1564.52	1549.34	16.18	1547.34	1564.52	17.18	0.7xH OR 10 FT (MIN)	0.5xH OR 6 FT (MIN)
66+50.00	1560.66	1546.97	14.69	1544.97	1560.06	15.09	0.7xH OR 10 FT (MIN)	0.5xH OR 6 FT (MIN)
67+00.00	1556.17	1544.59	12.58	1542.59	1551.71	9.12	0.7xH OR 10 FT (MIN)	0.5xH OR 6 FT (MIN)
67+50.00	1551.95	1542.58	10.37	1540.58	1551.32	10.74	0.7xH OR 10 FT (MIN)	0.5xH OR 6 FT (MIN)
67+80.00	1549.69	1541.64	9.05	1539.64	1549.69	10.05	0.7xH OR 10 FT (MIN)	0.5xH OR 6 FT (MIN)
67+94.00	1548.64	1548.64	1.00	1546.64	1548.64	2.00	0.7xH OR 10 FT (MIN)	0.5xH OR 6 FT (MIN)

**PAY ITEM QUANTITIES - SITE 428**

SHORED MSE RETAINING WALL	4,180 SF
LOAD TRANSFER PLATFORM	350 LF

**ESTIMATED QUANTITIES - SITE 428 (NOT FOR BIDDING)**

SOIL NAIL RETAINING WALL	4,100 SF
SOIL NAIL VERIFICATION TESTS	2 EA
SOIL NAIL PROOF TESTS	5 EA

PROJECT NO.: W03291

POLK COUNTY

RETAINING WALL #428: -L- STA. 64+51.57 TO 67+94.00, RT

SHEET 2 OF 5

THE WALL ENVELOPE DOES NOT ACCURATELY DEPICT THE ACTUAL WALL FACE OF WALL #428 AT THE FOLLOWING LOCATION:  
-L- STA. 64+52 +/- TO 67+94 +/- RT

PREPARED BY: KND	DATE: 12/25
REVIEWED BY: REK	DATE: 12/25

RETAINING WALL ENVELOPE AND WALL LAYOUT PROVIDED TGS ENGINEERS, INC. OCTOBER 9, 2025.

Prepared in the Office of:

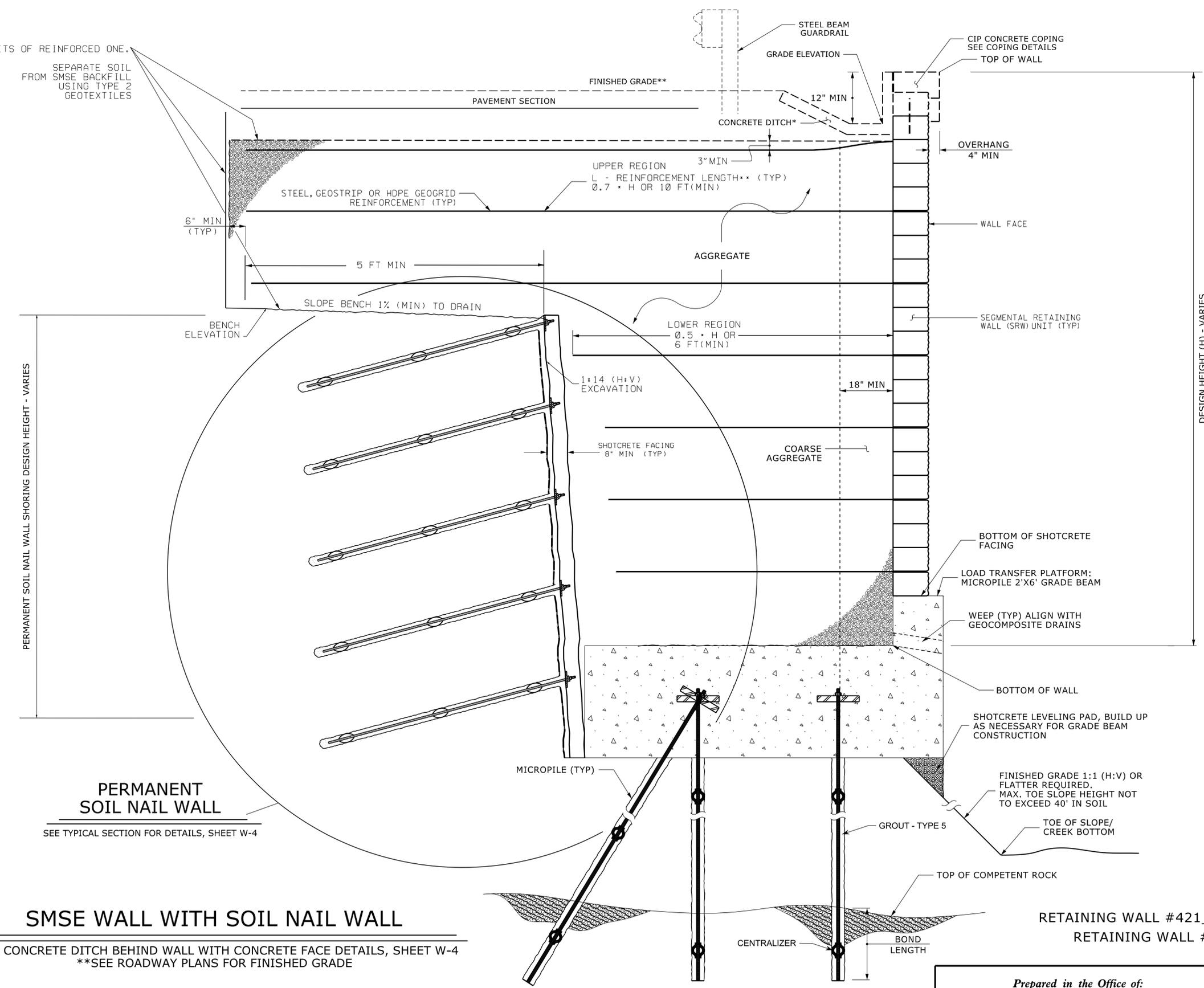


**CAROLINAS GEOTECHNICAL GROUP**  
1805 SARDIS ROAD NORTH  
SUITE 100  
CHARLOTTE, NC 28270  
(980) 339-8684

**RETAINING WALL #428 SHORED MECHANICALLY STABILIZED EARTH (SMSE) WALL**

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1			3			W-2
2			4			

LIMITS OF REINFORCED ONE.  
SEPARATE SOIL FROM SMSE BACKFILL USING TYPE 2 GEOTEXTILES



**PERMANENT SOIL NAIL WALL**  
SEE TYPICAL SECTION FOR DETAILS, SHEET W-4

**SMSE WALL WITH SOIL NAIL WALL**

\*SEE CONCRETE DITCH BEHIND WALL WITH CONCRETE FACE DETAILS, SHEET W-4  
\*\*SEE ROADWAY PLANS FOR FINISHED GRADE

GEOTECHNICAL ENGINEER  Signed by: Robert E. Kral DATE: 1/5/2026	ENGINEER SIGNATURE: _____ DATE: _____
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	

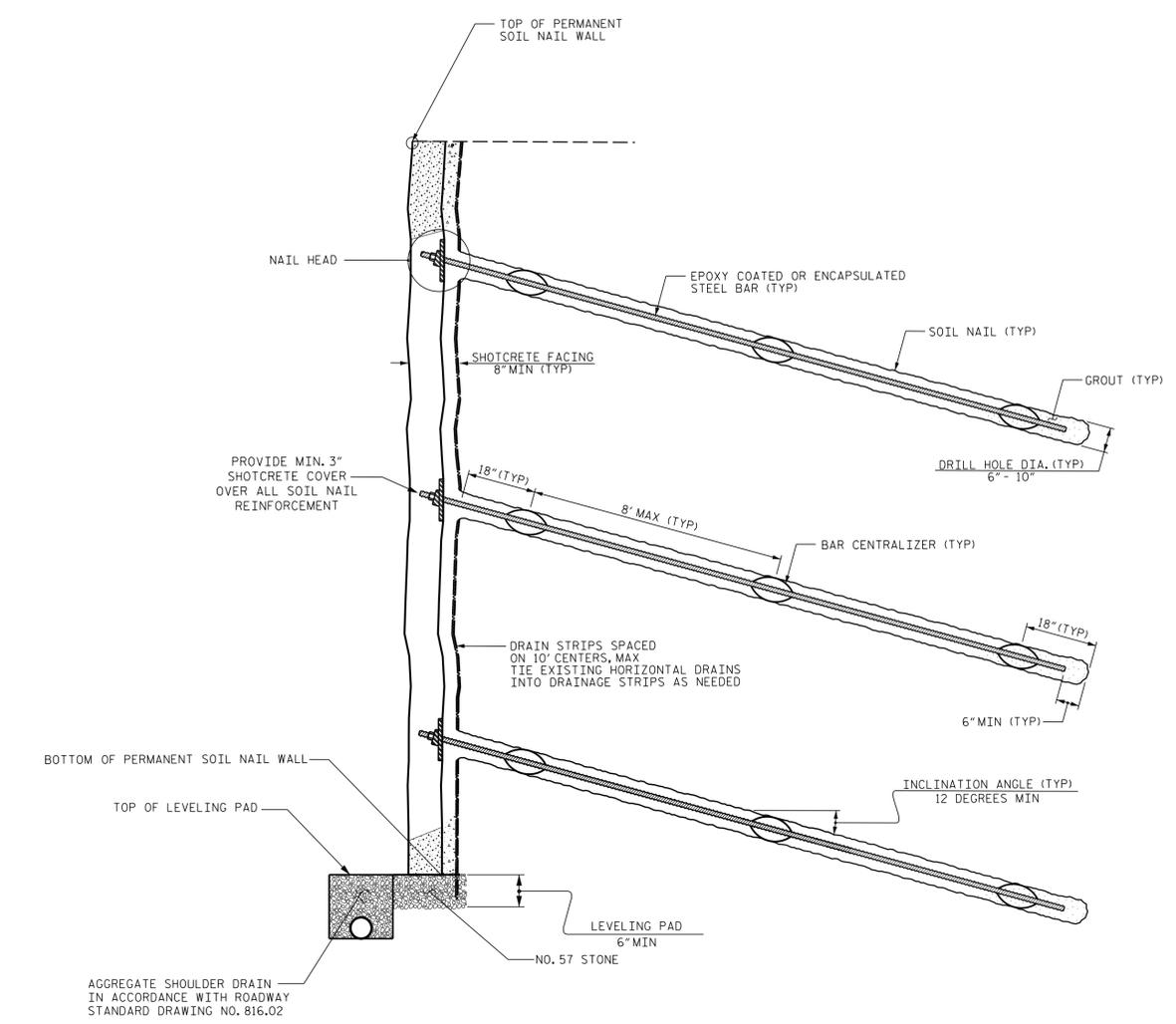
PROJECT NO.: W03291  
 POLK COUNTY  
 RETAINING WALL #421\_422: -L- STA. 17+80.00 TO 21+30.00, RT  
 RETAINING WALL #428: -L- STA. 64+51.57 TO 67+94.00, RT  
 SHEET 3 OF 5

PREPARED BY: KND	DATE: 12/25
REVIEWED BY: REK	DATE: 12/25

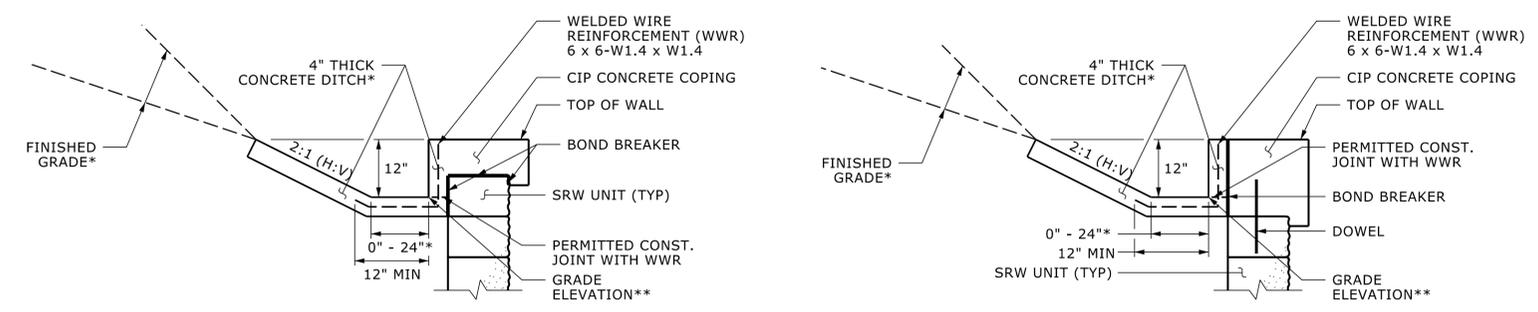
Prepared in the Office of:  

**CAROLINUS GEOTECHNICAL GROUP**  
 1805 SARDIS ROAD NORTH  
 SUITE 100  
 CHARLOTTE, NC 28270  
 (980) 339-8684

REVISIONS						SHEET NO. W-3
NO.	BY	DATE	NO.	BY	DATE	
1			3			
2			4			



**PERMANENT SOIL NAIL WALL - TYPICAL SECTION**  
NOT TO SCALE



**CONCRETE DITCH BEHIND WALL WITH CONCRETE COPING**

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

FOR CONCRETE DITCHES, SEE SECTION 850 OF THE STANDARD SPECIFICATIONS.

**NOTES:**

- FOR SHORED MECHANICALLY STABILIZED EARTH (SMSE) WALL RETAINING WALLS, SEE SHORED MECHANICALLY STABILIZED EARTH WALLS SPECIAL PROVISION.
- USE AN SMSE WALL SYSTEM WITH SEGMENTAL RETAININGWALL (SRW) UNITS FOR RETAINING WALLS #421\_422 AND #428.
- FOR LOAD TRANSFER PLATFORM, SEE MICROPILE GRADE BEAM SPECIAL PROVISION.
- FOR MICROPILES, SEE MICROPILE GRADE BEAM SPECIAL PROVISION.
- DESIGN LOAD TRANSFER PLATFORM FOR A MINIMUM OF 5 FEET OF GROUND LOSS BELOW GRADE BEAM.
- MICROPILE CASING MAY BE REQUIRED.
- LOAD TRANSFER PLATFORM WIDTH IS EQUAL FOR 0.5H OR 6FT, WHICHEVER IS GREATER. PAY PER LINEAR FOOT.
- MICROPILES SHOULD BE PAID PER FOOT AND EXTENDED A MINIMUM OF 10 FEET INTO ROCK.
- DRILL RIG ACCESS TO THE LOAD TRANSFER BENCH MAY BE LIMITED. MICROPILES MAY NEED TO BE DRILLED FROM ABOVE.
- A SEPARATION GEOTEXTILE IS REQUIRED AT THE BACK OF THE REINFORCED ZONE FOR RETAINING WALLS #421\_422 AND #428.
- EXTEND THE TOP TWO LAYERS OF GEOTEXTILE TO CENTERLINE OF ROAD.
- FOR STEEL BEAM GUARDRAIL, SEE ROADWAY PLANS AND SECTION 862 OF THE STANDARD SPECIFICATIONS.
- BEFORE BEGINNING SMSE WALL DESIGN FOR RETAINING WALLS #421\_422 AND #428, 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 WALLS #421\_422 AND #428 FOR THE FOLLOWING:
- 1) DESIGN HEIGHT (H) = GRADE ELEVATION - BOTTOM OF WALL ELEVATION
  - 2) DESIGN LIFE = 75 YEARS
  - 3) MAXIMUM FACTORED VERTICAL PRESSURE ON BOTTOM OF PERMANENT SOIL NAIL WALL AND LOAD TRANSFER PLATFORM = 3,200 PSF
  - 4) MINIMUM MSE REINFORCEMENT LENGTH (L) = VARIES, SEE TABLE ON SHEETS W-1 AND W-2.
  - 5) MINIMUM SOIL NAIL REINFORCEMENT LENGTHS ARE BASED ON SNAIL.
  - 6) REINFORCED ZONE AGGREGATE PARAMETERS:

AGGREGATE TYPE*	UNIT WEIGHT (γ) PCF	FRICTION ANGLE (φ) DEGREES	COHESION (c) PSF
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: ASSUMED BORROW MATERIAL PARAMETERS, SEE SECTION 1018 OF THE STANDARD SPECIFICATIONS  
 UNIT WEIGHT, γ = 120 PCF  
 FRICTION ANGLE, φ = 30 DEGREES  
 COHESION, c = 0 PSF  
 IN-SITU ASSUMED MATERIAL PARAMETERS RESIDUAL SOIL:  
 UNIT WEIGHT, γ = 120 PCF  
 FRICTION ANGLE, φ = 30 DEGREES  
 COHESION, c = 0 PSF  
 IN-SITU ASSUMED MATERIAL PARAMETERS WEATHERED ROCK:  
 UNIT WEIGHT, γ = 130 PCF  
 FRICTION ANGLE, φ = 32 DEGREES  
 COHESION, c = 400 PSF  
 IN-SITU ASSUMED MATERIAL PARAMETERS CRYSTALLINE ROCK:  
 UNIT WEIGHT, γ = 170 PCF  
 FRICTION ANGLE, φ = 34 DEGREES  
 COHESION, c = 1,000 PSF

EXISTING OR FUTURE OBSTRUCTIONS SUCH AS FOUNDATIONS, FENCE OR HANDRAIL POSTS, PAVEMENTS, PIPES, INLETS OR UTILITIES MAY INTERFERE WITH MICROPILES FOR RETAINING WALLS #421\_422 AND #428.

GEOTECHNICAL ENGINEER  Signed by: <i>Robert E. Kral</i> 1/5/2026 AASPE OFFICIAL SIGNATURE DATE	ENGINEER SIGNATURE DATE
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	

PROJECT NO.: W03291  
 POLK COUNTY  
 RETAINING WALL #421\_422:-L- STA. 17+80.00 TO 21+30.00, RT  
 RETAINING WALL #428:-L- STA. 64+51.57 TO 67+94.00, RT  
 SHEET 4 OF 5

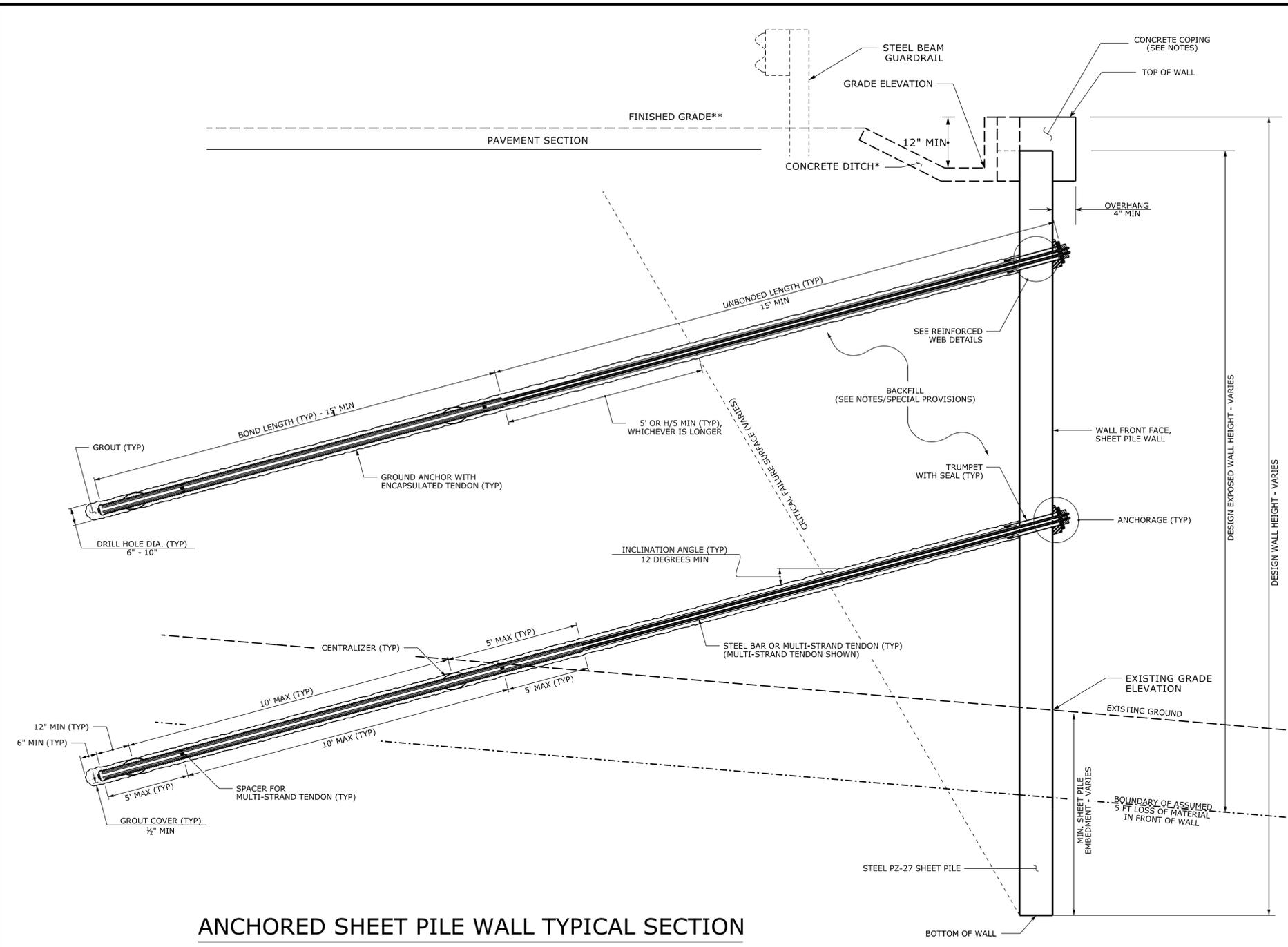
Prepared in the Office of:

**CAROLINAS GEOTECHNICAL GROUP**  
 1805 SARDIS ROAD NORTH  
 SUITE 100  
 CHARLOTTE, NC 28270  
 (980) 339-8684

REVISIONS						SHEET NO. W-4
NO.	BY	DATE	NO.	BY	DATE	
1			3			
2			4			

PREPARED BY: KND	DATE: 12/25
REVIEWED BY: REK	DATE: 12/25

GEOTECHNICAL ENGINEER  SEAL 042642 ROBERT E. KRAL	ENGINEER  SIGNATURE _____ DATE _____
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	



**ANCHORED SHEET PILE WALL TYPICAL SECTION**  
 \*SEE CONCRETE DITCH BEHIND WALL WITH CONCRETE FACE DETAILS, SHEET W-4  
 \*\*SEE ROADWAY PLANS FOR FINISHED GRADE

**NOTES:**

- AT THE CONTRACTORS OPTION, AN ANCHORED SHEET PILE RETAINING WALL MAY BE CONSIDERED FOR RETAINING WALL #428.
- FOR ANCHORED SHEET PILE RETAINING WALL, REFER TO ANCHORED SHEET PILE RETAINING WALLS SPECIAL PROVISION.
- DESIGN ANCHORED RETAINING WALLS FOR WALL HEIGHTS EQUAL TO THE WALL DESIGN HEIGHT "H" (SUM OF DESIGN EXPOSED WALL HEIGHT AND MINIMUM SHEET PILE EMBEDMENT).
- SHEET PILE TIP ELEVATIONS SHALL EXTEND THROUGH COLLUVIAL MATERIAL AND MINIMUM OF 3 FEET INTO RESIDUAL OR TO REFUSAL IN WEATHERED ROCK OR ON ROCK.
- DESIGN ANCHORED SHEET PILE RETAINING WALL FOR UP TO 5 FEET OF COLLUVIAL MATERIAL LOSS IN FRONT OF SHEETS.
- ANCHORS ARE SHOWN IN GENERAL LOCATIONS AND MAY BE RELOCATED BASED ON THE SUBMITTED DESIGN. DESIGN AND LOCATIONS OF WALLERS SHOULD BE SUBMITTED WITH THE DESIGN SUBMITTAL.
- GRouted ANCHORS ARE SHOWN, HOWEVER, ALTERNATIVE ANCHORED SYSTEMS INCLUDING DEADMAN OR APPROVED ALTERNATE MAY BE CONSIDERED. ALL COMPONENTS ARE REQUIRED TO PROVIDE THAT STATED DESIGN LIFE.
- FOR STEEL BEAM GUARDRAIL, SEE ROADWAY PLANS AND SECTION 862 OF THE STANDARD SPECIFICATIONS.
- BEFORE BEGINNING ANCHORED SHEET PILE WALL DESIGN FOR RETAINING WALLS #428, 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 ANCHORED SHEET PILE RETAINING WALL #428 FOR THE FOLLOWING:
  - 1) DESIGN HEIGHT (H) = GRADE ELEVATION - BOTTOM OF WALL ELEVATION
  - 2) DESIGN LIFE = 75 YEARS
  - 3) ASSUMED BORROW MATERIAL PARAMETERS, SEE SECTION 1018 OF THE STANDARD SPECIFICATIONS  
 UNIT WEIGHT,  $\gamma = 120$  PCF  
 FRICTION ANGLE,  $\phi = 30$  DEGREES  
 COHESION,  $c = 0$  PSF
  - 4) IN-SITU ASSUMED MATERIAL PARAMETERS RESIDUAL SOIL:  
 UNIT WEIGHT,  $\gamma = 120$  PCF  
 FRICTION ANGLE,  $\phi = 30$  DEGREES  
 COHESION,  $c = 0$  PSF
  - 5) IN-SITU ASSUMED MATERIAL PARAMETERS WEATHERED ROCK:  
 UNIT WEIGHT,  $\gamma = 130$  PCF  
 FRICTION ANGLE,  $\phi = 32$  DEGREES  
 COHESION,  $c = 400$  PSF
  - 6) IN-SITU ASSUMED MATERIAL PARAMETERS CRYSTALLINE ROCK:  
 UNIT WEIGHT,  $\gamma = 170$  PCF  
 FRICTION ANGLE,  $\phi = 34$  DEGREES  
 COHESION,  $c = 1,000$  PSF
- EXISTING OR FUTURE OBSTRUCTIONS SUCH AS FOUNDATIONS, FENCE OR HANDRAIL POSTS, PAVEMENTS, PIPES, INLETS OR UTILITIES WILL INTERFERE WITH SOIL NAILS FOR ANCHORED SHEET PILE RETAINING WALL #428.
- ANCHORED SHEET PILE RETAINING WALL #428 CONSTRUCTION WILL REQUIRE GROUND TO BE CREATED TO REACH GRADE ELEVATION AT SOME LOCATIONS ALONG THE WALL ALIGNMENT. CONSTRUCTION OF THE CREATED GROUND SHOULD BE ACCOUNTED FOR IN THE ANCHORED SHEET PILE WALL DESIGN.

**CONTRACTORS OPTION:  
 ANCHORED SHEET PILE RETAINING WALL #428**

STA. -L-	GRADE ELEVATION (FT)	TOP OF WALL ELEVATION (FT)	EXISTING GRADE ELEVATION* (FT)	DESIGN WALL HEIGHT, "H" (FT)
64+51.57	1573.51	1574.51	1573.52	29.51
64+70.00	1573.20	1574.20	1570.43	29.20
65+00.00	1570.89	1571.89	1565.80	26.89
65+50.00	1567.62	1568.62	1554.82	23.62
66+00.00	1564.52	1565.52	1562.06	16.18
66+50.00	1560.66	1561.66	1555.61	14.69
67+00.00	1556.17	1557.17	1546.62	12.58
67+50.00	1551.95	1552.95	1546.21	10.37
67+80.00	1549.69	1550.69	1541.64	10.69
67+94.00	1548.64	1549.64	1548.20	9.64

\*OBTAINED FROM PROVIDED CROSS SECTION AND SURVEY DATA.

<b>CONTRACTOR'S OPTION ESTIMATED QUANTITIES - SITE #428</b>	
ANCHORED SHEET PILE RETAINING WALLS	6,140 SF

PROJECT NO.: W03291  
 POLK COUNTY  
 RETAINING WALL #428: -L- STA. 64+51.57 TO 67+94.00, RT  
 SHEET 5 OF 5

Prepared in the Office of:  
  
**CARLINAS GEOTECHNICAL GROUP**  
 1805 SARDIS ROAD NORTH  
 SUITE 100  
 CHARLOTTE, NC 28270  
 (980) 339-8684

CONTRACTOR'S OPTION: ANCHORED RETAINING WALL RETAINING WALL #428					
REVISIONS					
NO.	BY	DATE	NO.	BY	DATE
1			3		
2			4		

PREPARED BY: KND	DATE: 12/25
REVIEWED BY: REK	DATE: 12/25