

RETAINING WALL #15 DETAIL SHEET

GEOTECHNICAL
ENGINEER

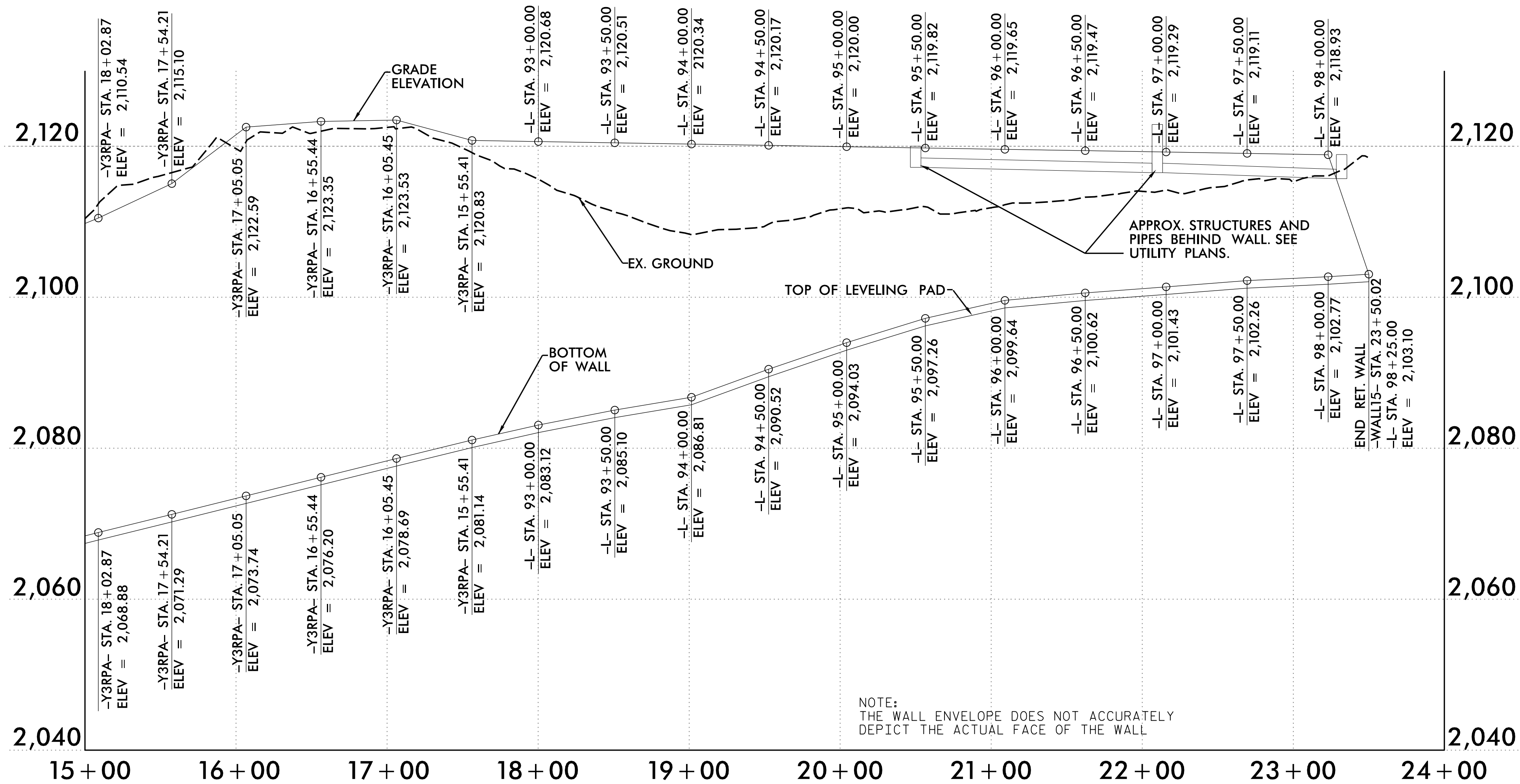
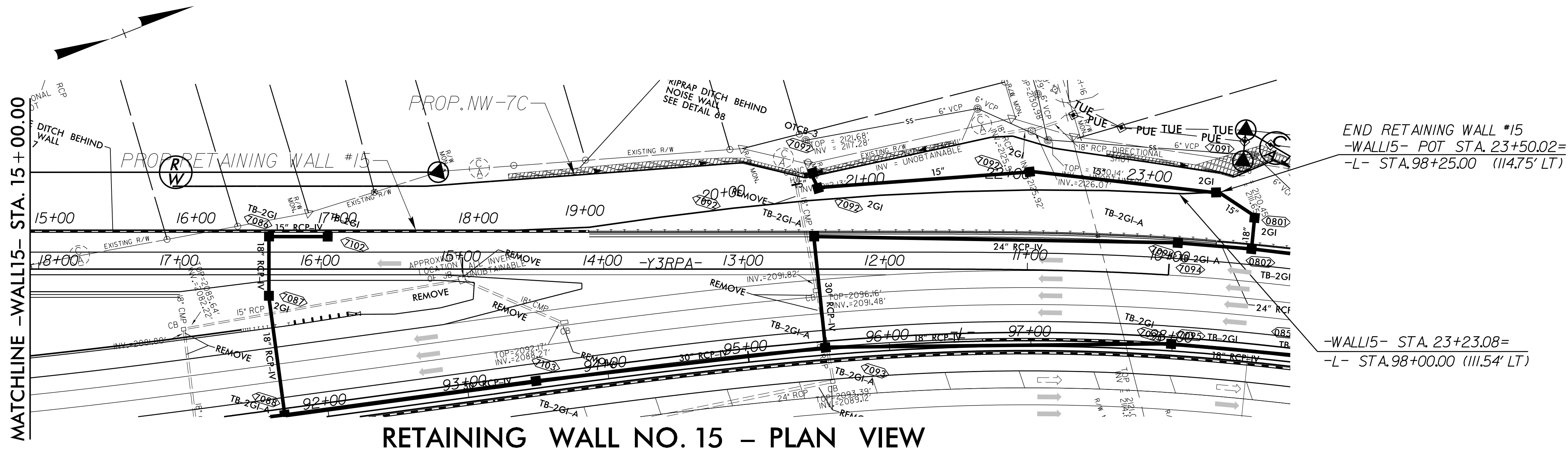


SIGNATURE _____ DATE 7/20/2026

ENGINEER

SIGNATURE _____ DATE _____

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UNLESS ALL SIGNATURES COMPLETED



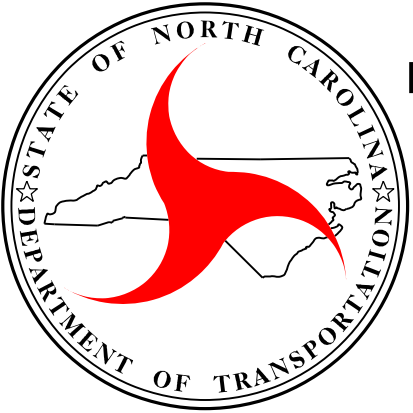
PROJECT NO.: I-2513AC
BUNCOMBE COUNTY
STATION: +/- -Y3RPA- 22+33 TO -L- 98+25
SHEET 2 OF 3 WALL ID RW-15

PREPARED BY: E. A. MCINTOSH, P.E.	DATE: 06/26
REVIEWED BY: M. A. MULLA, P.E.	DATE: 06/26

Prepared in the Office of:



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1812 CENTER PARK DRIVE, SUITE D
CHARLOTTE, NC 28217
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NC REGISTERED
ENGINEERING
FIRM # F-1519



NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

GEOTECHNICAL
ENGINEERING UNIT

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1	-	3	-	-	-	W-41
2	-	-	4	-	-	



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FOR SOIL NAIL RETAINING WALLS, SEE SOIL NAIL RETAINING WALLS PROVISION.

FOR SINGLE FACED PRECAST CONCRETE BARRIER, -Y3RPA- STA. 14+10.39 TO 22+48.19, SEE ROADWAY PLANS AND SECTION 857 OF THE STANDARD SPECIFICATIONS.

A 48" BLACK VINYL COATED CHAIN LINK FENCE IS REQUIRED FOR RETAINING WALL NO. 15. SEE ROADWAY STANDARD 866.06 (ROADWAY DETAIL AND PAY ITEM).

CIP REINFORCED CONCRETE COPING IS REQUIRED FOR RETAINING WALL NO. 15.

AN ARCHITECTURAL CONCRETE SURFACE TREATMENT IS REQUIRED FOR RETAINING WALL NO. 15. SEE "ARCHITECTURAL CONCRETE SURFACE TREATMENT" SPECIAL PROVISION.

BEFORE BEGINNING SOIL NAIL WALL DESIGN FOR RETAINING WALL NO. 15, 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. 15 FOR THE FOLLOWING:

- 1) DESIGN HEIGHT (H) = WALL HEIGHT + WALL EMBEDMENT
- 2) DESIGN LIFE = 100 YEARS
- 3) MINIMUM WALL EMBEDMENT ELEVATION = 1 FT
- 4) IN-SITU ASSUMED MATERIAL PARAMETERS:
 - UNIT WEIGHT, γ = 120 PCF
 - FRICITION ANGLE, ϕ = 33 DEGREES
 - COHESION, c = 0 PSF
- 5) MINIMUM REINFORCEMENT LENGTH (L) = 0.9 H OR 10 FT., WHICHEVER IS LONGER, UNLESS NOTED OTHERWISE (SEE #6 BELOW)
- 6) MINIMUM REINFORCEMENT LENGTH (L) = 0.7 H FOR -WALL15- STA. 10+90.11 TO 17+56.28 FOR RIGHT OF WAY

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. 15. VERIFY PIPE AND STRUCTURE LOCATIONS AND ELEVATIONS WITH UTILITY PLANS BEFORE BEGINNING SOIL NAIL WALL DESIGN OR CONSTRUCTION.

DESIGN RETAINING WALL NO. 15 FOR SOUND WALL BARRIER WALL NO. 7C LOADING. SOUND WALL OFFSET AND PANEL HEIGHTS VARY ALONG WALL NO. 15 ALIGNMENT. SEE NOISE WALL STANDARD DRAWING & SPECIAL PROVISIONS (APPENDIX H) FOR LOADING DETAILS.

FOUNDATIONS FOR SOUND BARRIER WALL NO. 7C WILL INTERFERE WITH SOIL NAILS FOR RETAINING WALL NO. 15. SEE SOUND BARRIER WALL AND ROADWAY PLANS FOR PANEL AND POST LOCATIONS.

SEWERLINE 6 IS ANTICIPATED WITHIN THE REINFORCED ZONE OF WALL NO. 15 FROM APPROX. -WALL15- STA. 10+90.11 TO 12+46.60. DESIGN SOIL NAILS WITH MINIMUM INCLINATION OF 15 DEGREES TO MAINTAIN 3 FEET SEPARATION FROM NAIL TO BOTTOM OF SEWERLINE 6.

DESIGN RETAINING WALL NO. 15 TO INCORPORATE DRAIN DROP INLET STRUCTURES AND PIPES WITHIN REINFORCED ZONE AND ALONG TOE OF WALL 15. INCLUDE DETAILS IN MSE WALL DESIGN SUBMITTAL.

AT THE CONTRACTORS OPTION, "TEMPORARY SHORING" MAY BE REQUIRED TO ACHIEVE THE TOP OF WALL GRADE ELEVATION FOR RETAINING WALL NO. 15 FROM -Y3RPA- STA. 15+55.41 TO -L- STA. 98+25.00 IN ORDER TO BEGIN SOIL NAIL WALL CONSTRUCTION.



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

PROJECT NO.: I-2513AC

BUNCOMBE COUNTY

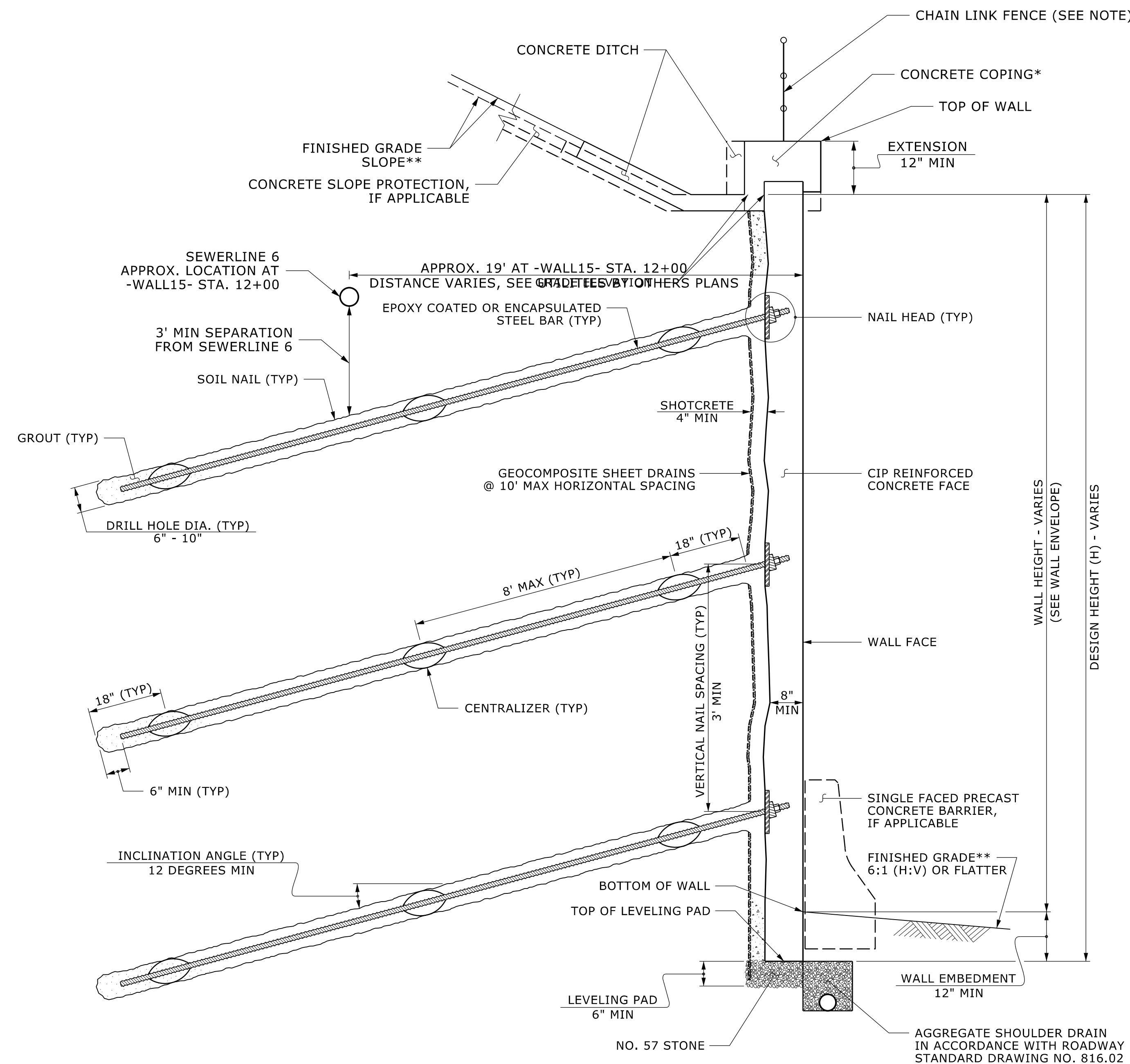
STATION: +/- -Y3RPA- 22+33 TO -L- 98+25

SHEET 3 OF 3 WALL ID RW-15

RETAINING WALL NO. 15
SOIL NAIL WALL
TYPICAL SECTION AND NOTES

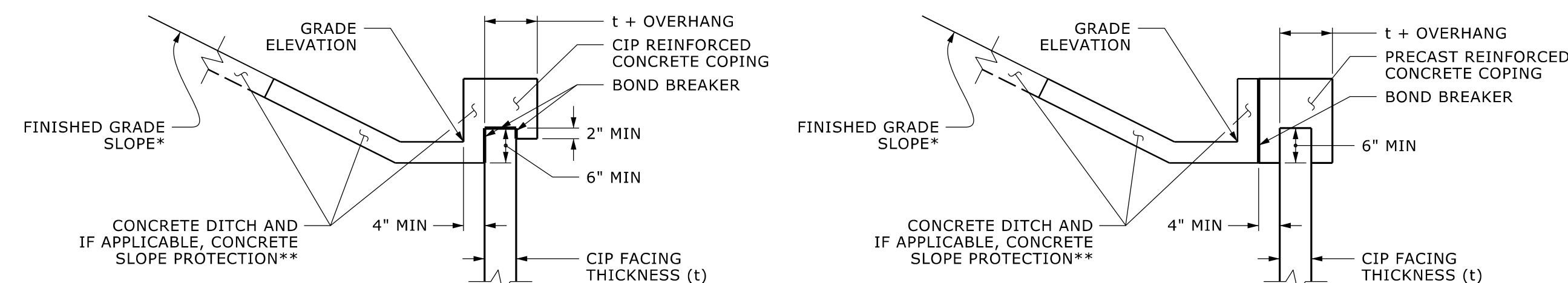
REVISIONS						SHEET NO. W-42
NO.	BY	DATE	NO.	BY	DATE	
1			3			
2			4			

SHEET
NO.
W-42



SOIL NAIL WALL - TYPICAL SECTION

*SEE CONCRETE DITCH BEHIND WALL DETAILS.
**SEE PLANS FOR FINISHED GRADE SLOPE DETAILS.



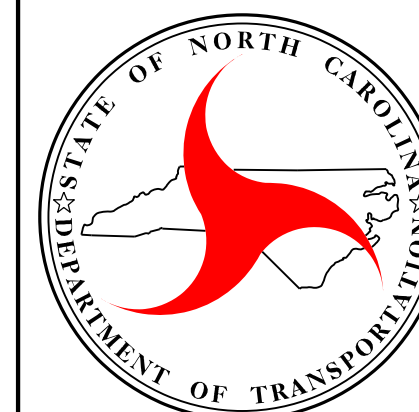
COPING DETAILS

*SEE PLANS FOR FINISHED GRADE SLOPE DETAILS.
**SEE CONCRETE DITCH BEHIND WALL DETAILS.

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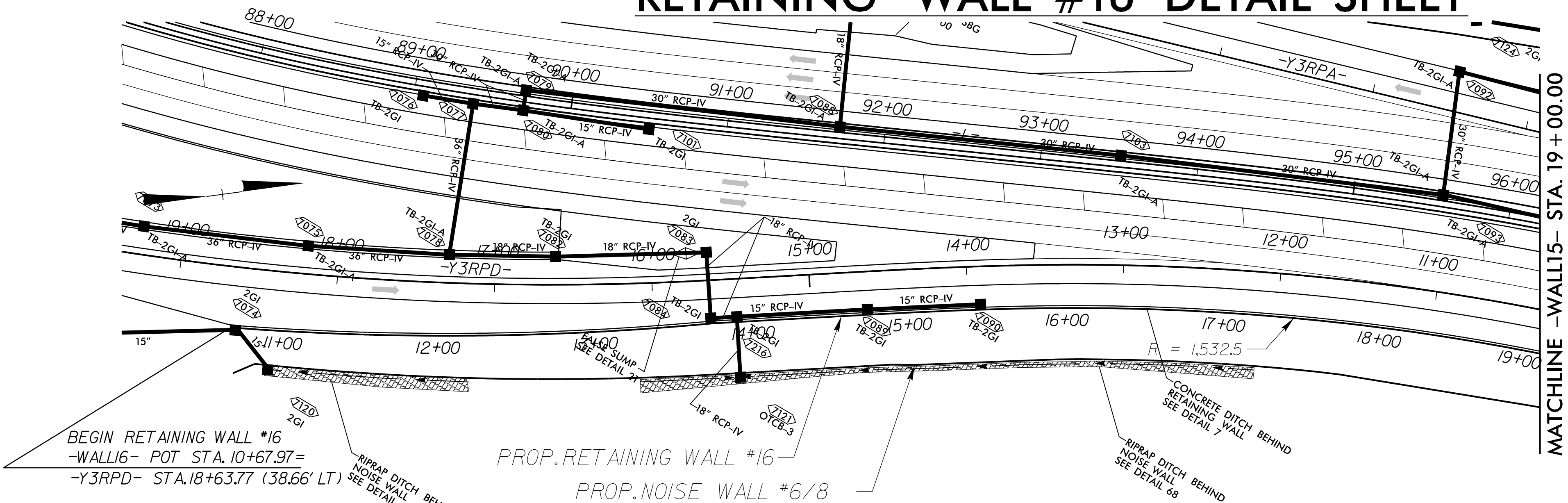
NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

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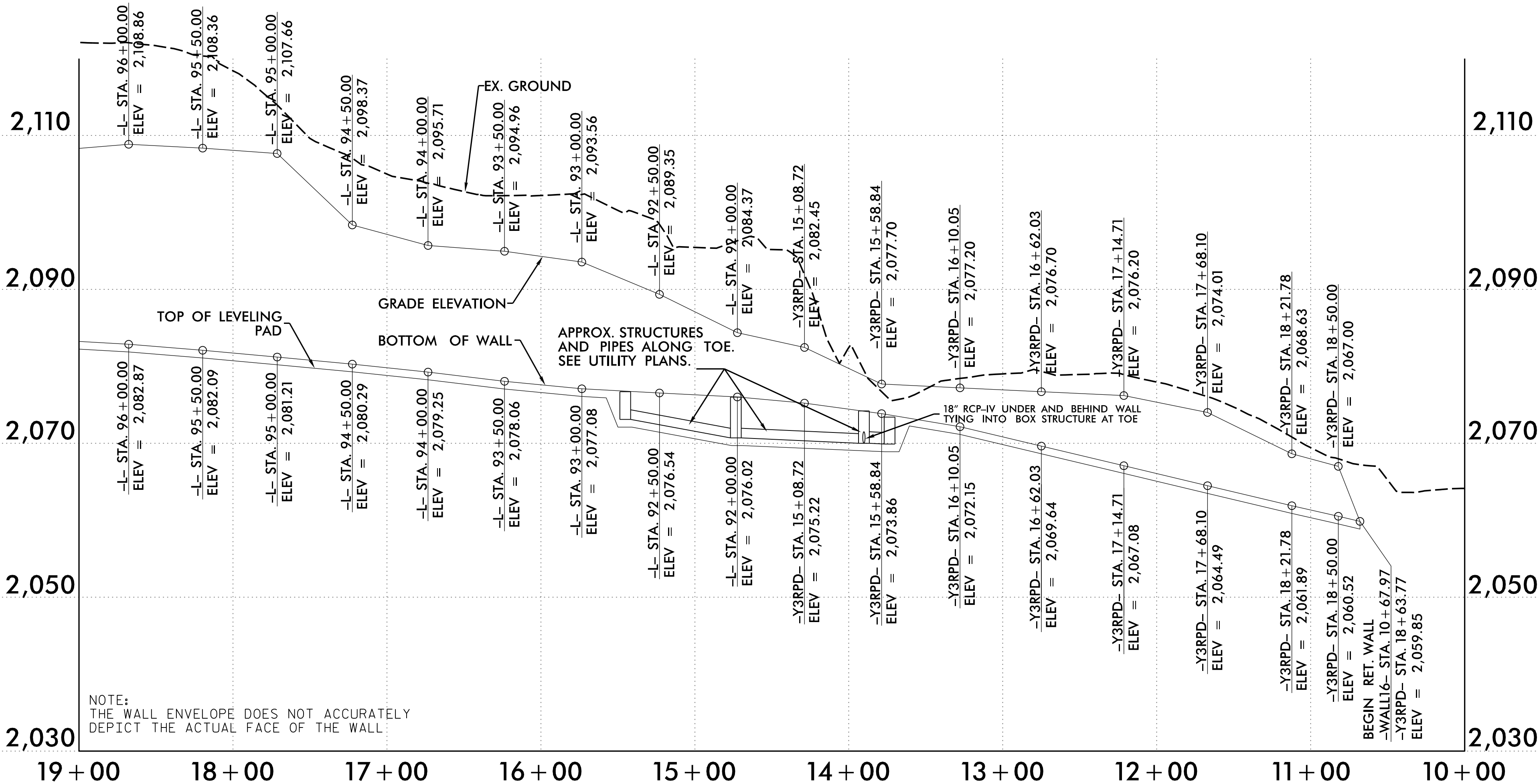
PREPARED BY: E. A. MCINTOSH, P.E.	DATE: 06/26
REVIEWED BY: M. A. MULLA, P.E.	DATE: 06/26

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RETAINING WALL #16 DETAIL SHEET



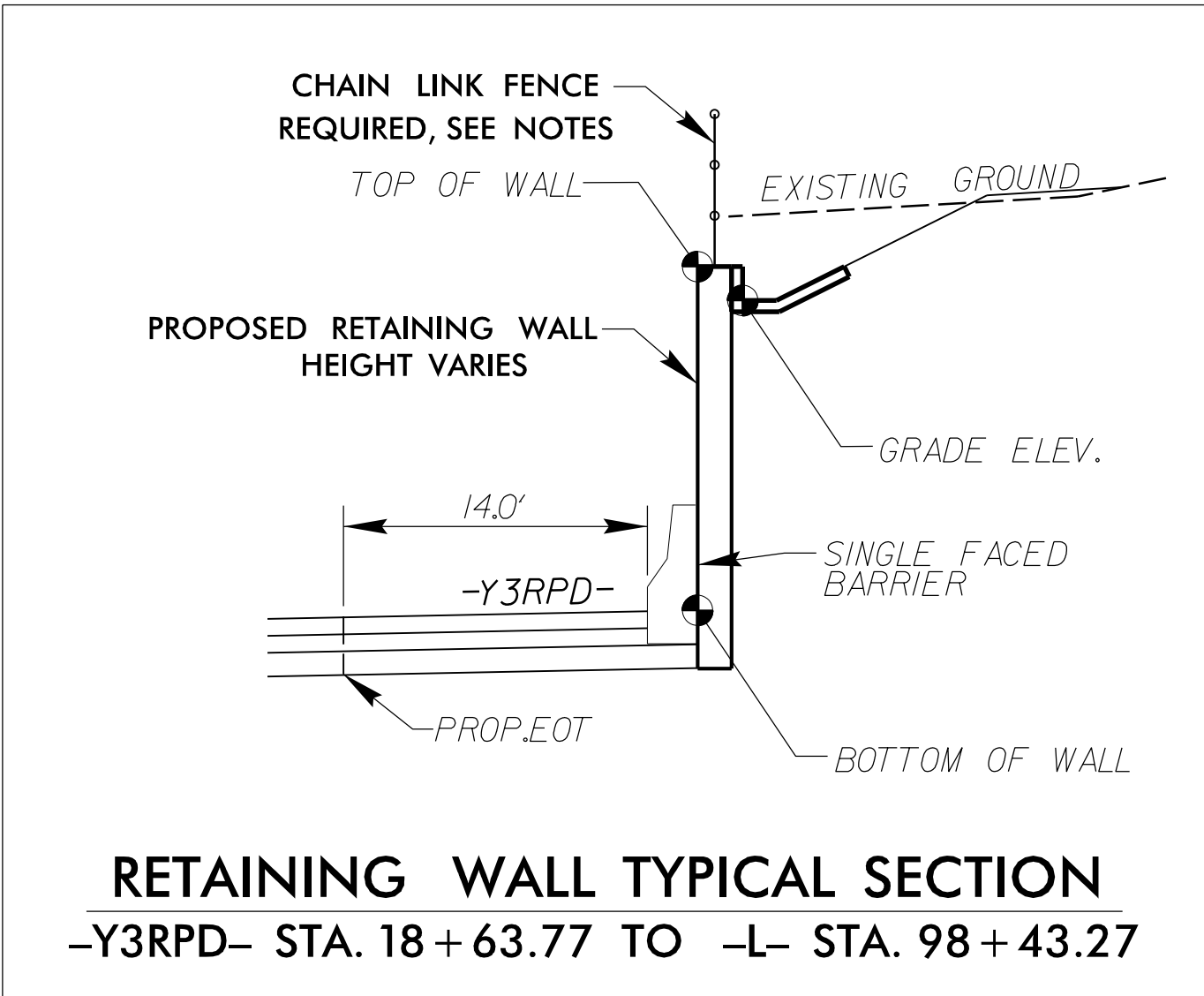
RETAINING WALL NO. 16 – PLAN VIEW



RETAINING WALL NO. 16 – ENVELOPE VIEW

ESTIMATED SOIL NAIL WALL QUANTITIES*			
RETAINING WALL NO.	SOIL NAIL RETAINING WALL (SQUARE FEET)	SOIL NAIL VERIFICATION TESTS	SOIL NAIL PROOF TESTS
WALL NO. 16	16,465	7	33
PAY ITEM			QUANTITY
ARCHITECTURAL CONCRETE SURFACE TREATMENT			16,465 SF

* = ESTIMATED WALL QUANTITIES INCLUDE ESTIMATED WALL EMBEDMENT AREA



PROJECT NO.: I-2513AC
BUNCOMBE COUNTY
STATION: +/- -Y3RPD- 18+63.77 TO -L- 98+54.63
SHEET 1 OF 3 WALL ID RW-16

GEOTECHNICAL ENGINEER

SIGNATURE

ENGINEER

SIGNATURE

7/20/2026

DATE

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PREPARED BY: E. A. MCINTOSH, P.E. DATE: 06/26
REVIEWED BY: M. A. MULLA, P.E. DATE: 06/26

Prepared in the Office of:

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NC REGISTERED ENGINEERING FIRM # F-1519

NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

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ENGINEERING UNIT

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1	-	-	3	-	-	W-43
2	-	-	4	-	-	

RETAINING WALL NO. 16
SOIL NAIL WALL
PLAN AND ENVELOPE

RETAINING WALL #16 DETAIL SHEET

GEOTECHNICAL
ENGINEER



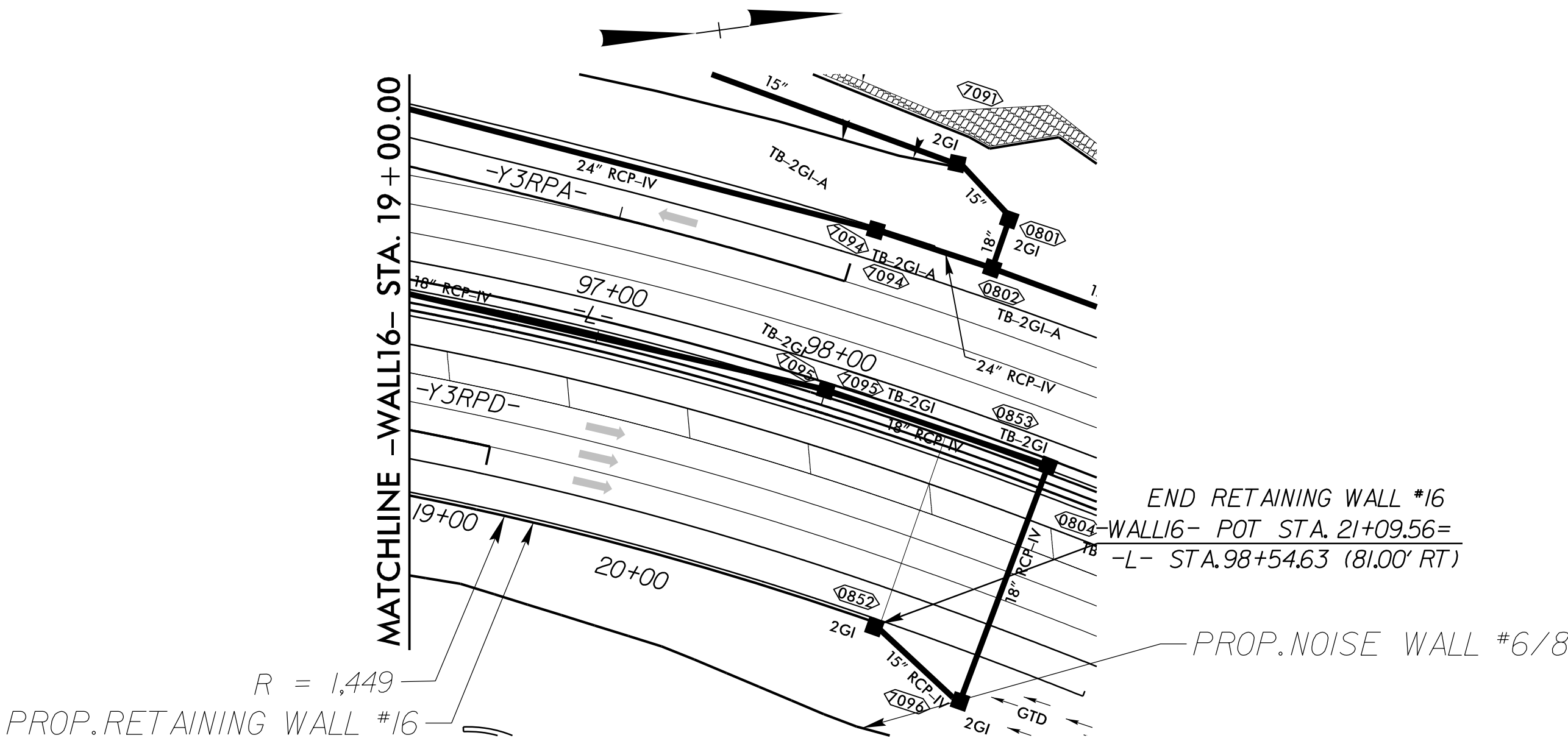
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SIGNATURE DATE

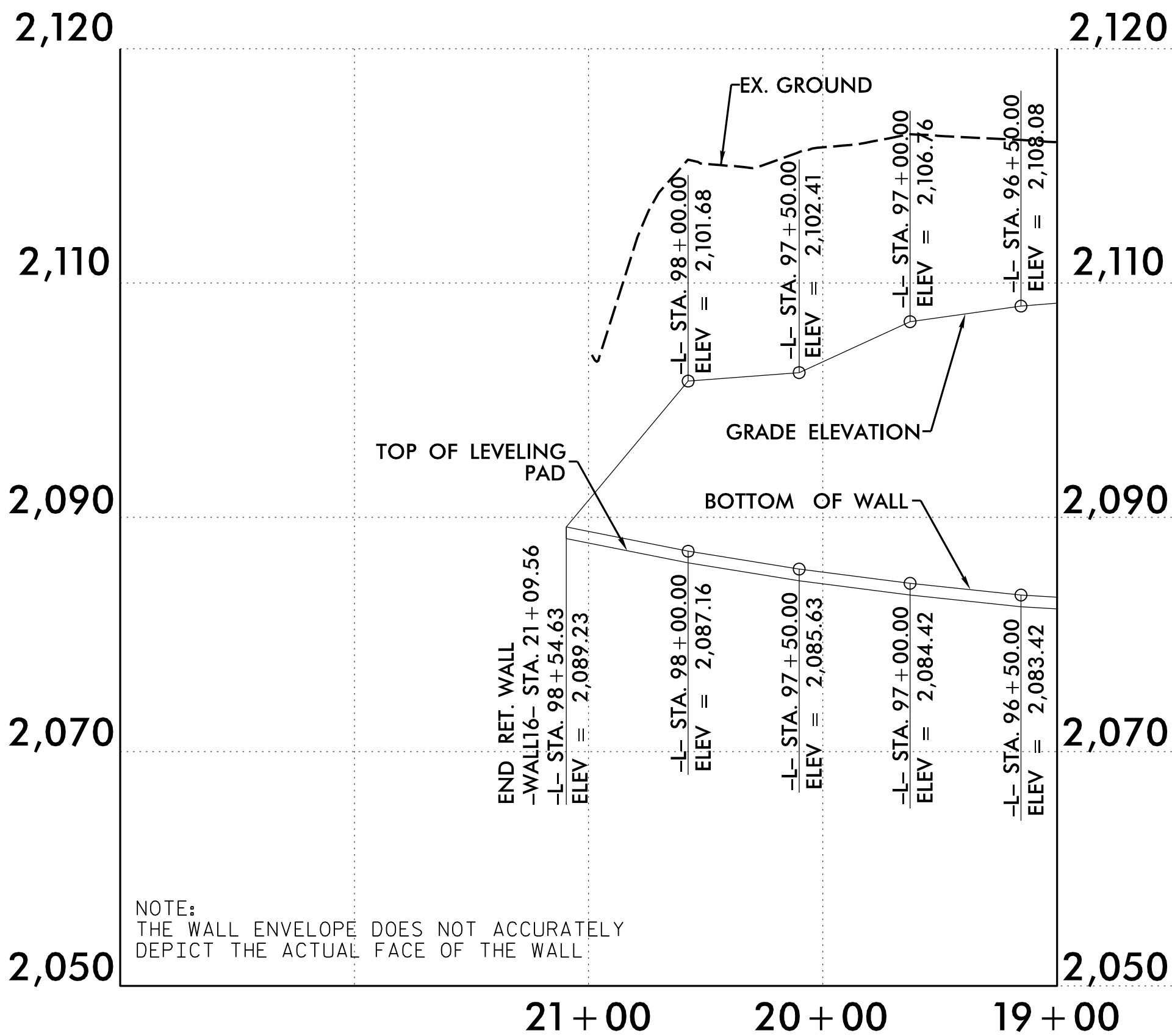
ENGINEER

SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL
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RETAINING WALL NO. 16 – PLAN VIEW



RETAINING WALL NO. 16 – ENVELOPE VIEW

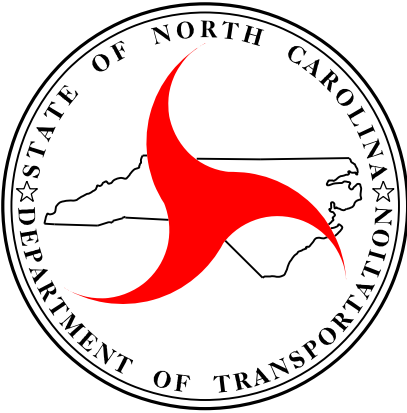
PROJECT NO.: I-2513AC
BUNCOMBE COUNTY
STATION: +/- -Y3RPD- 18+63.77 TO -L- 98+54.63
SHEET 2 OF 3 WALL ID RW-16

PREPARED BY: E. A. MCINTOSH, P.E.	DATE: 06/26
REVIEWED BY: M. A. MULLA, P.E.	DATE: 06/26

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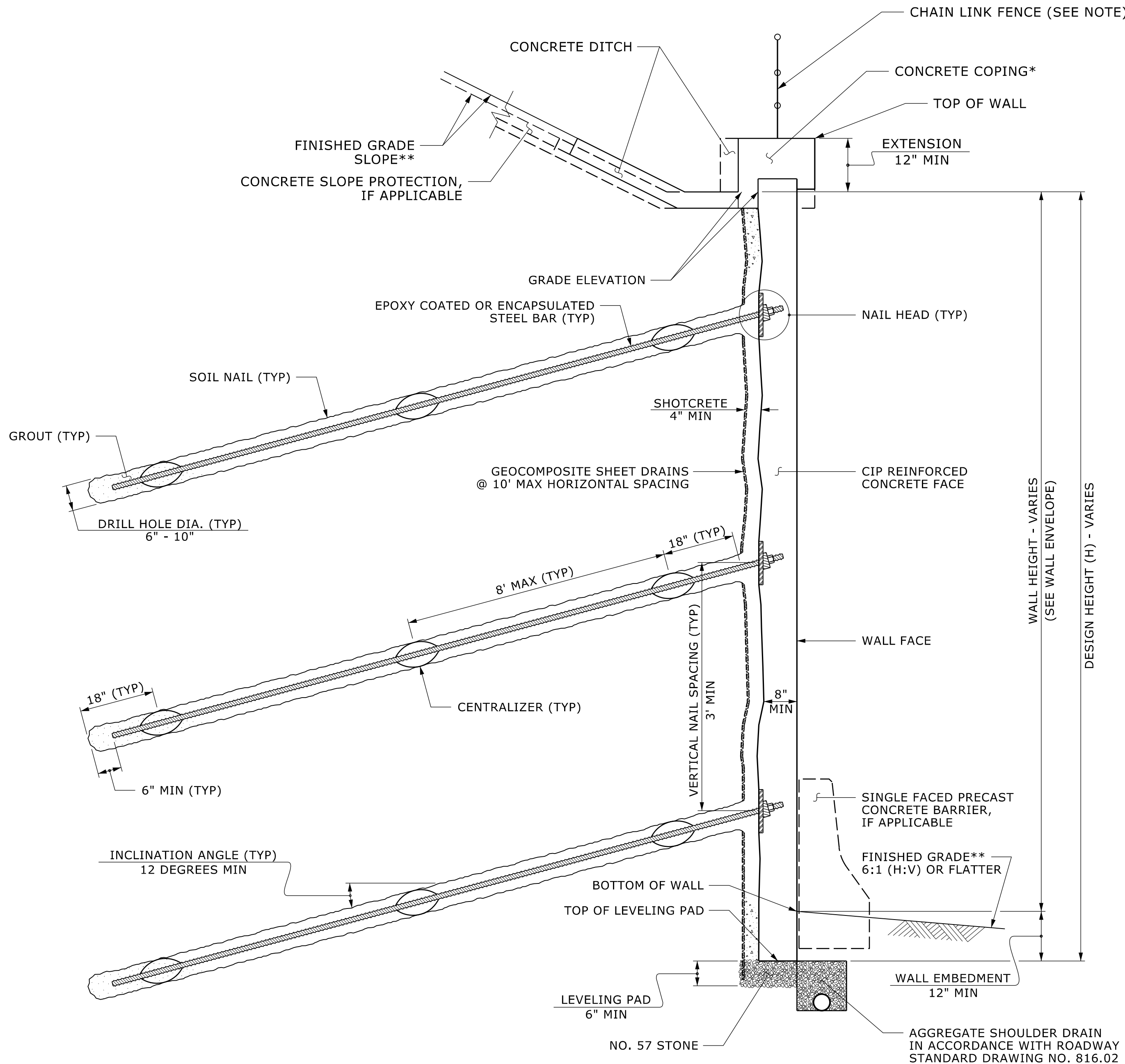


NORTH CAROLINA
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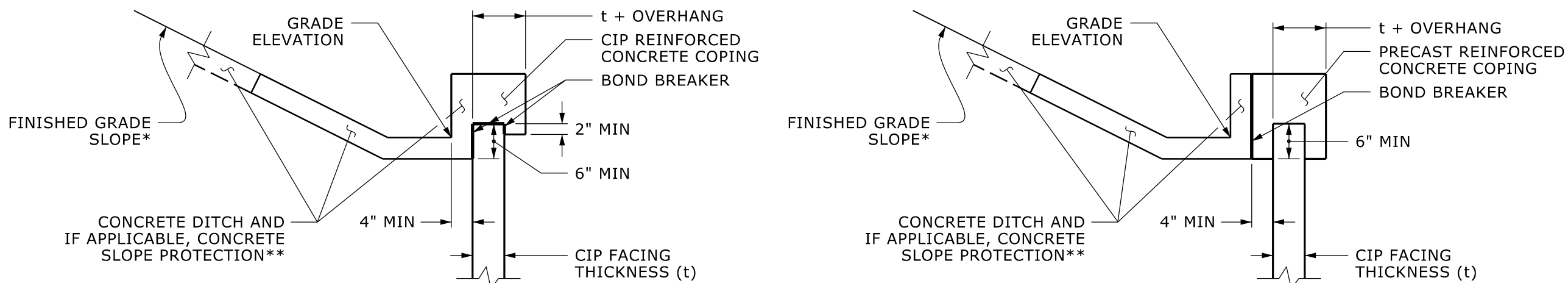
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SOIL NAIL WALL - TYPICAL SECTION

*SEE CONCRETE DITCH BEHIND WALL DETAILS.
**SEE PLANS FOR FINISHED GRADE SLOPE DETAILS.



COPING DETAILS

*SEE PLANS FOR FINISHED GRADE SLOPE DETAILS.
**SEE CONCRETE DITCH BEHIND WALL DETAILS.

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.

A 48" BLACK VINYL COATED CHAIN LINK FENCE IS REQUIRED FOR RETAINING WALL NO. 16. SEE ROADWAY STANDARD 866.06 (ROADWAY DETAIL AND PAY ITEM).

CIP REINFORCED CONCRETE COPING IS REQUIRED FOR RETAINING WALL NO. 16.

AN ARCHITECTURAL CONCRETE SURFACE TREATMENT IS REQUIRED FOR RETAINING WALL NO. 16. SEE "ARCHITECTURAL CONCRETE SURFACE TREATMENT" SPECIAL PROVISION.

BEFORE BEGINNING SOIL NAIL WALL DESIGN FOR RETAINING WALL NO. 16, 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.

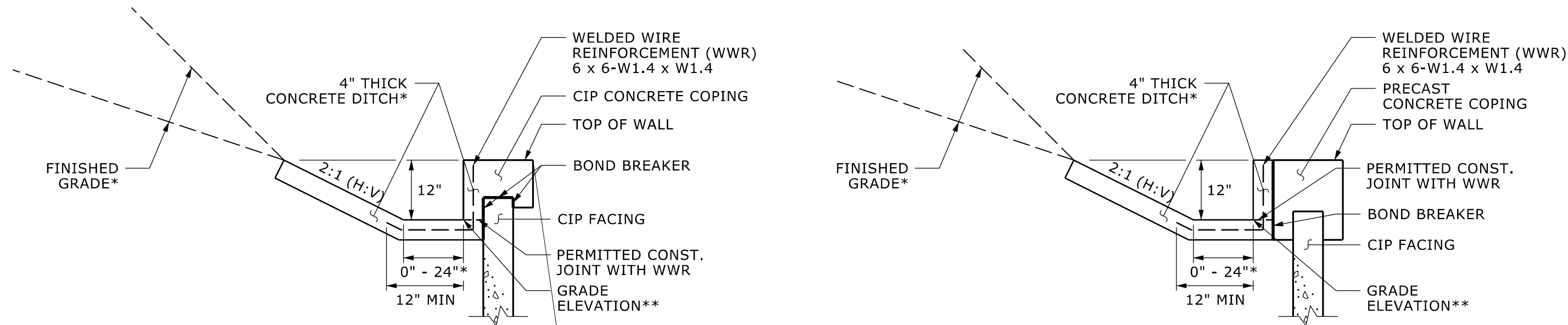
DESIGN RETAINING WALL NO. 16 FOR THE FOLLOWING:

- 1) H = WALL HEIGHT + WALL EMBEDMENT
- 2) DESIGN LIFE = 100 YEARS
- 3) MINIMUM WALL EMBEDMENT DEPTH = 1 FT
- 4) IN-SITU ASSUMED MATERIAL PARAMETERS:
UNIT WEIGHT, γ = 120 PCF
FRICTION ANGLE, ϕ = 32 DEGREES
COHESION, c = 0 PSF

MINIMUM SOIL NAIL LENGTH = 1.0 H OR 10 FT, WHICHEVER IS LONGER.

DESIGN RETAINING WALL NO. 16 TO INCORPORATE DRAIN DROP INLET STRUCTURES LOCATED ALONG THE TOE OF THE WALL LOCATED NEAR -WALL16- STA. 15+44.5, 14+72.4 AND 13+72.9 AND FOR PIPE GOING INTO DRAIN DROP STRUCTURE AT -WALL16- STA. 13+72.9. INCLUDE DETAILS IN SOIL NAIL WALL DESIGN SUBMITTAL.

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. 16.



CONCRETE DITCH BEHIND
WALL WITH CONCRETE COPING

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

PROJECT NO.: I-2513AC

BUNCOMBE COUNTY

STATION: +/- -Y3RPD- 18+63.77 TO -L- 98+54.63

SHEET 3 OF 3 WALL ID RW-16

RETAINING WALL NO. 16
SOIL NAIL WALL
TYPICAL SECTION AND NOTES

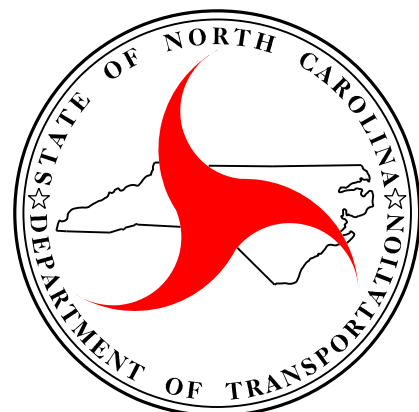
REVISIONS						SHEET NO.
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1			3			
2			4			

W-45

Prepared in the Office of:



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NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

GEOTECHNICAL
ENGINEERING UNIT

RETAINING WALL #18 DETAIL SHEET

RETAINING WALL #17
REMOVED FROM PROJECT

GEOTECHNICAL
ENGINEER



ENGINEER

SIGNATURE

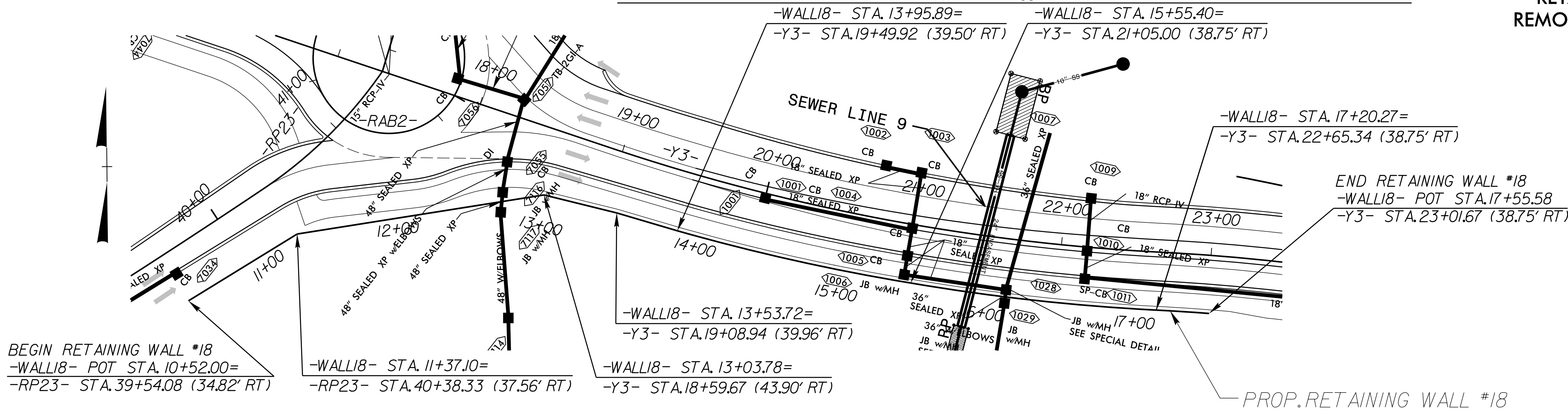
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7/20/2026

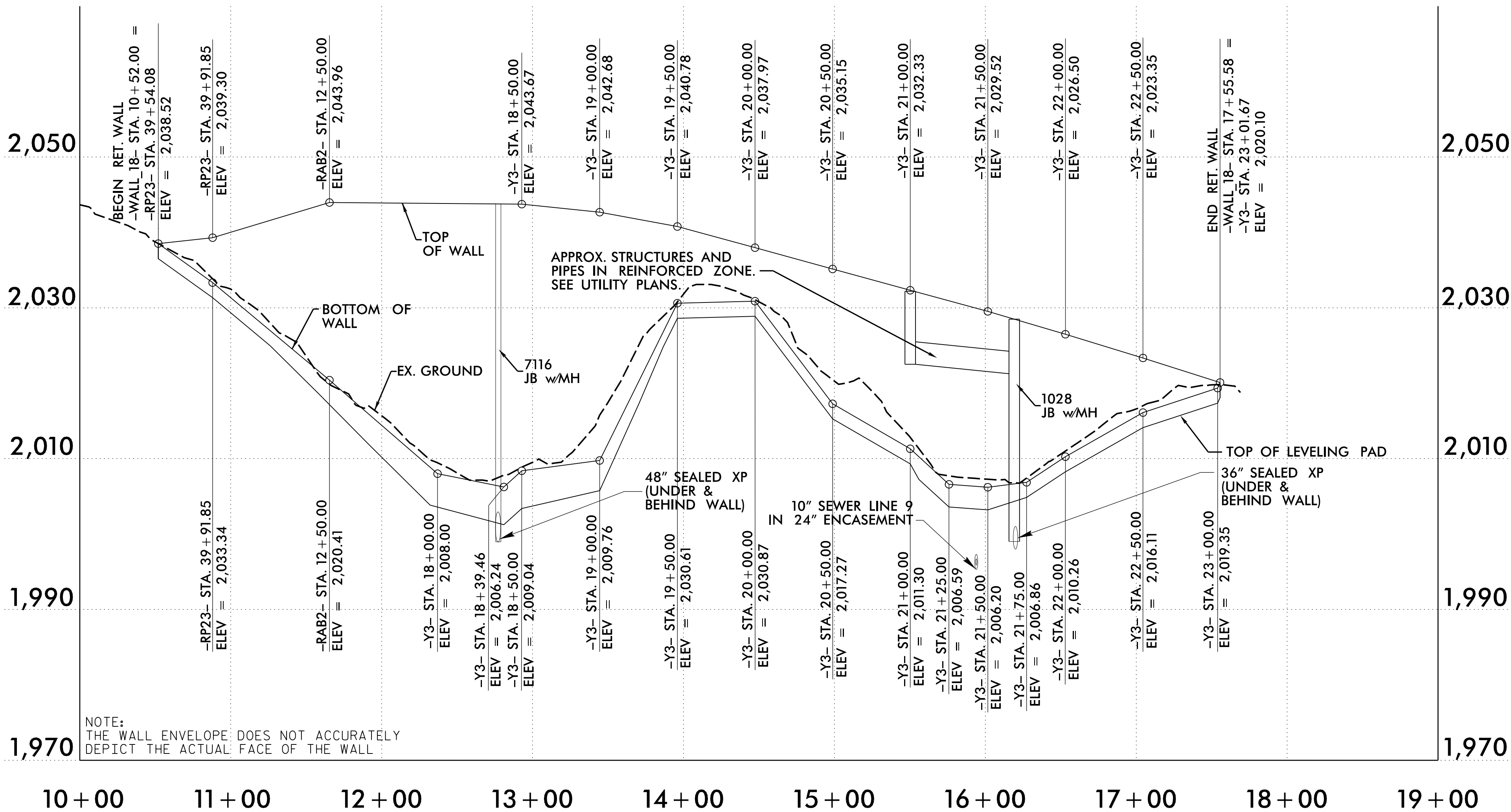
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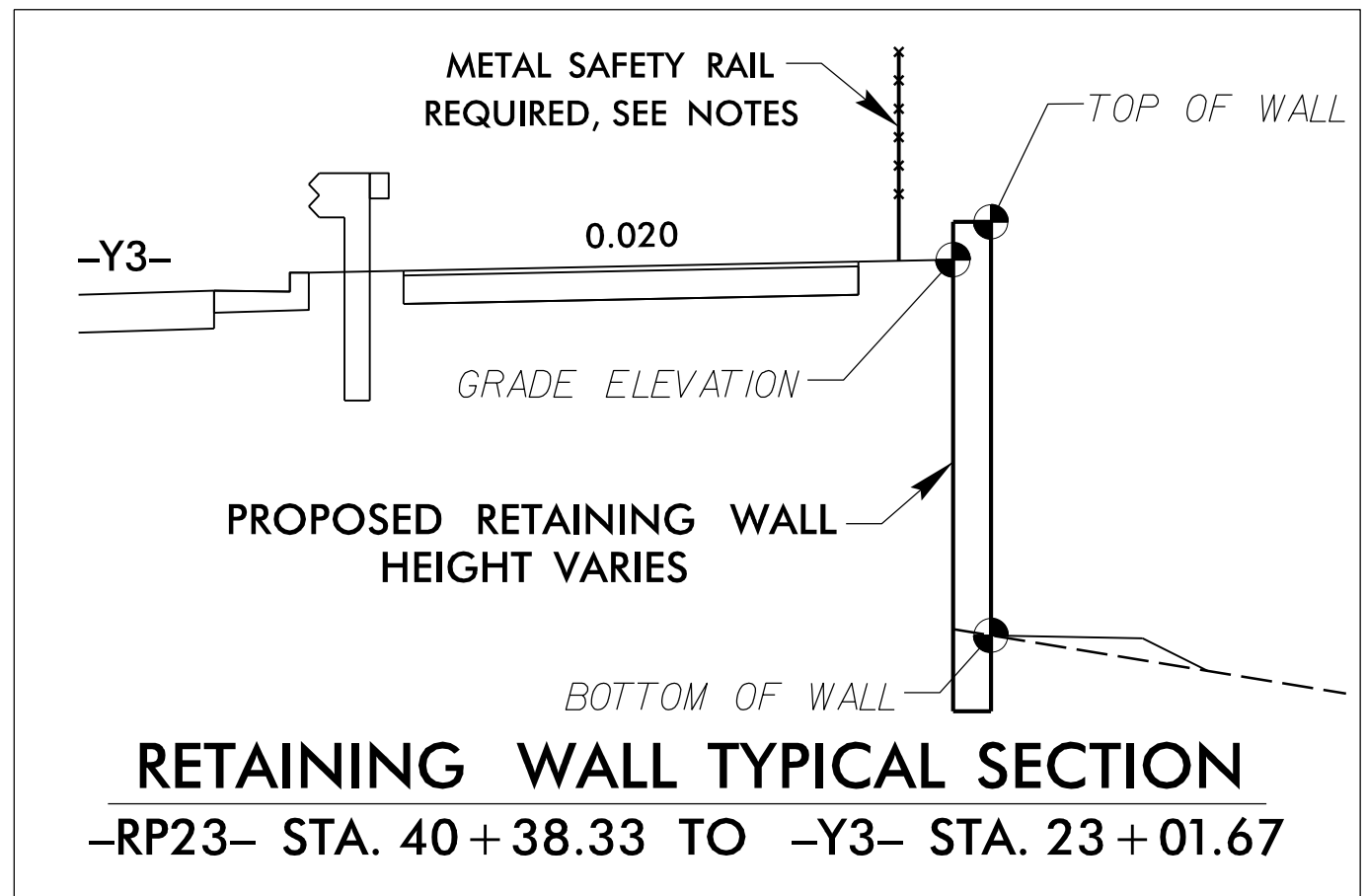
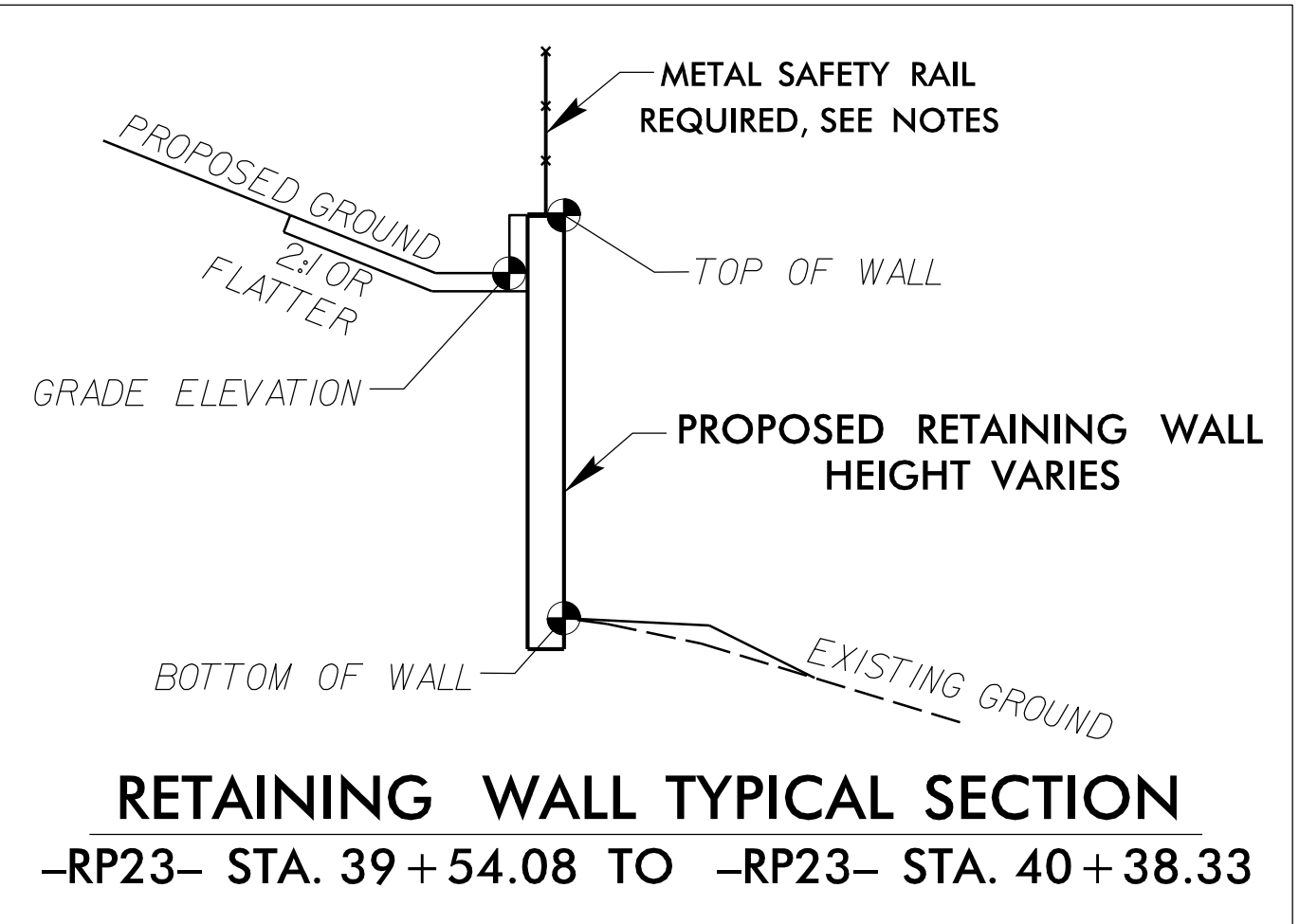
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RETAINING WALL NO. 18 - PLAN VIEW



RETAINING WALL NO. 18 - ENVELOPE VIEW



PROJECT NO.: I-2513AC

BUNCOMBE COUNTY

STATION: +/- -RP23- 39+54.08 TO -Y3- 23+01.67

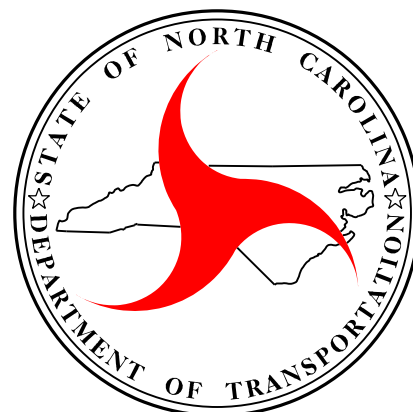
SHEET 1 OF 3 WALL ID RW-18

PREPARED BY: E. A. MCINTOSH, P.E. DATE: 06/26
REVIEWED BY: M. A. MULLA, P.E. DATE: 06/26

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DIVISION OF HIGHWAYS

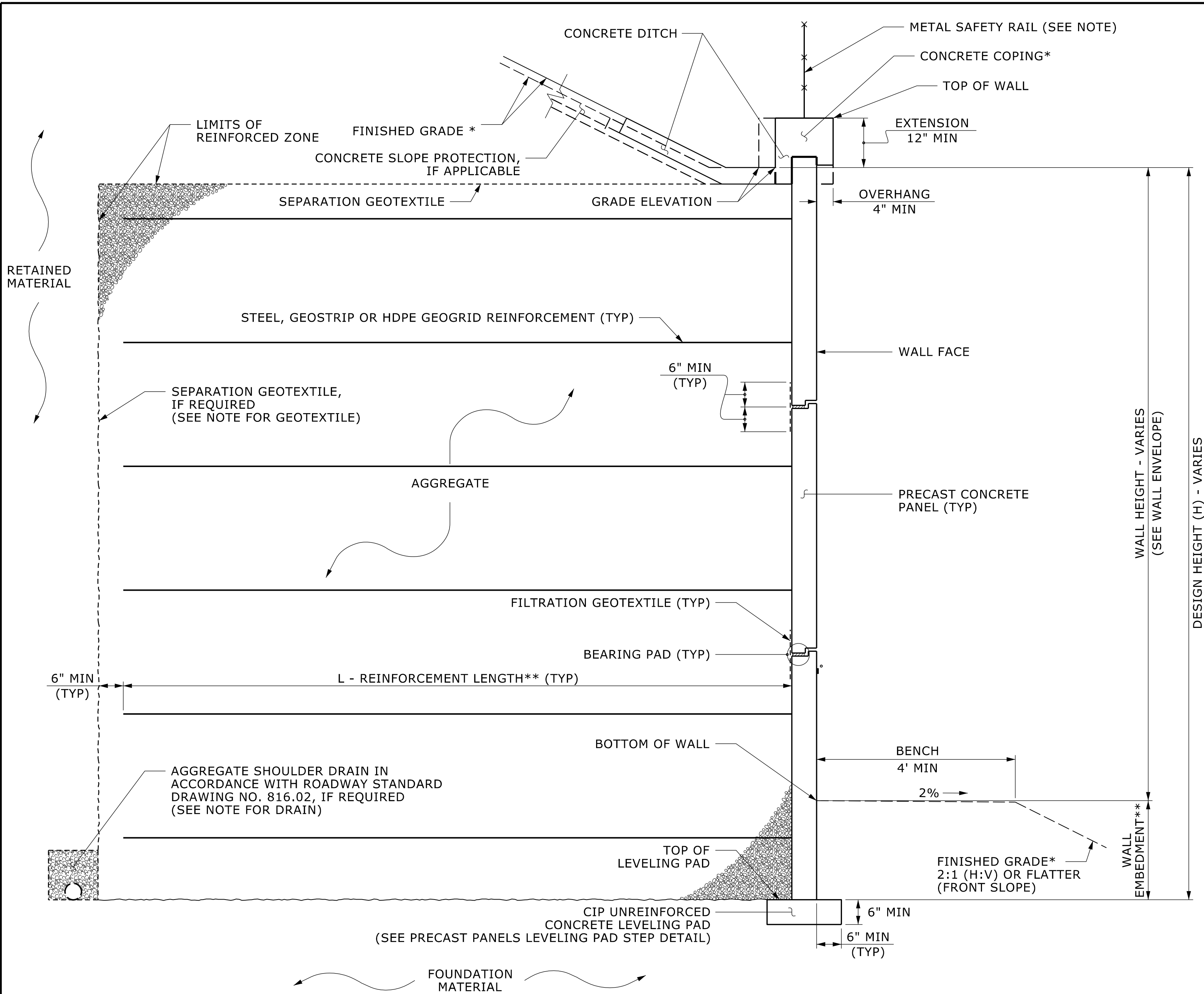
GEOTECHNICAL
ENGINEERING UNIT

RETAINING WALL NO. 18
MSE WALL
PLAN AND ENVELOPE

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1			3			
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W-46

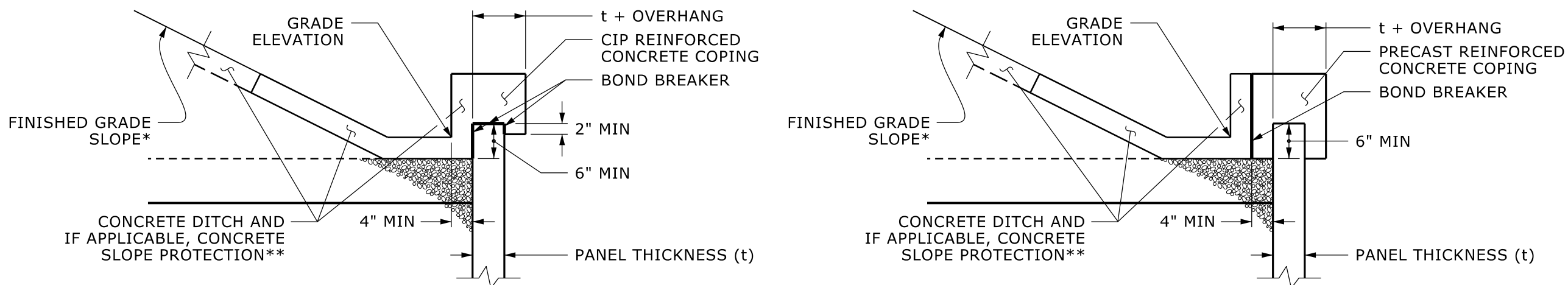
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MSE WALL WITH PRECAST PANELS - TYPICAL SECTION

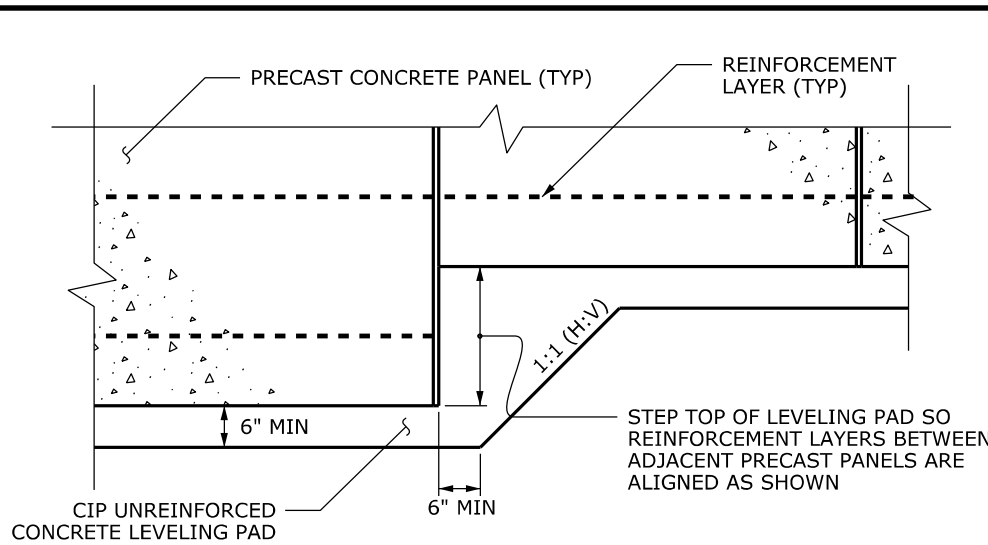
*SEE COPING DETAILS AND PLANS FOR FINISHED GRADE DETAILS.
**SEE MSE RETAINING WALLS PROVISION AND IF APPLICABLE, MSE WALL NOTES FOR WALL EMBEDMENT AND REINFORCEMENT LENGTH REQUIREMENTS.

-RP23- STA. 39+54.00 TO STA. 40+38.33



COPING DETAILS

*SEE PLANS FOR FINISHED GRADE SLOPE DETAILS.
**SEE CONCRETE DITCH BEHIND WALL DETAILS.



PRECAST PANELS LEVELING PAD STEP DETAIL

NOTES:

FOR MECHANICALLY STABILIZED EARTH (MSE) RETAINING WALLS, SEE MECHANICALLY STABILIZED EARTH RETAINING WALLS PROVISION.

A 54" METAL SAFETY RAIL IS REQUIRED FOR RETAINING WALL NO. 18. SEE ROADWAY STANDARD 866.06 (ROADWAY DETAIL AND PAY ITEM).

CIP REINFORCED CONCRETE COPING IS REQUIRED FOR RETAINING WALL NO. 18.

AN ARCHITECTURAL CONCRETE SURFACE TREATMENT IS REQUIRED FOR RETAINING WALL NO. 18. SEE "ARCHITECTURAL CONCRETE SURFACE TREATMENT" SPECIAL PROVISION.

AT THE CONTRACTOR'S OPTION, USE FINE AGGREGATE IN THE REINFORCED ZONE OF RETAINING WALL NO. 18.

A SEPARATION GEOTEXTILE IS REQUIRED AT THE BACK OF THE REINFORCED ZONE FOR RETAINING WALL NO. 18.

A DRAIN IS REQUIRED FOR RETAINING WALL NO. 18.

BEFORE BEGINNING MSE WALL DESIGN FOR RETAINING WALL NO. 18, 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. 18 FOR THE FOLLOWING:

- 1) H = WALL HEIGHT + WALL EMBEDMENT
- 2) DESIGN LIFE = 100 YEARS
- 3) MAXIMUM FACTORED VERTICAL PRESSURE ON FOUNDATION MATERIAL = 9,200 PSF
- 4) MINIMUM REINFORCEMENT LENGTH (L) = 0.7H or 6 FT., WHICHEVER IS LONGER
- 5) 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.

6) IN-SITU ASSUMED MATERIAL PARAMETERS:

MATERIAL TYPE	UNIT WEIGHT (γ) PCF	FRICTION ANGLE (ϕ) DEGREES	COHESION (c) PSF
RETAINED	120	30	0
FOUNDATION	120	30	0

DESIGN RETAINING WALL NO. 18 FOR A LIVE LOAD (TRAFFIC) SURCHARGE.

DESIGN RETAINING WALL NO. 18 FOR A PIPE EXTENDING THROUGH THE WALL AS SHOWN. VERIFY PIPE LOCATION AND ELEVATION BEFORE BEGINNING MSE WALL DESIGN OR CONSTRUCTION.

FOUNDATIONS FOR SIGNS, LIGHTING or SIGNALS WILL BE LOCATED BEHIND RETAINING WALL NO. 18 AND WILL or MAY INTERFERE WITH REINFORCEMENT. BEFORE BEGINNING MSE WALL CONSTRUCTION, SUBMIT PROPOSED CONSTRUCTION METHODS FOR THESE FOUNDATIONS FOR APPROVAL.

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. 18.

DO NOT PLACE LEVELING PAD CONCRETE, AGGREGATE or REINFORCEMENT FOR RETAINING WALL NO. 18 UNTIL EXCAVATION DIMENSIONS AND FOUNDATION MATERIAL ARE APPROVED.

"TEMPORARY SHORING" IS REQUIRED FOR RETAINING WALL NO. 18 IN ACCORDANCE WITH THE TEMPORARY SHORING PROVISION. SEE TRAFFIC CONTROL PLANS.

PROJECT NO.: I-2513AC

BUNCOMBE COUNTY

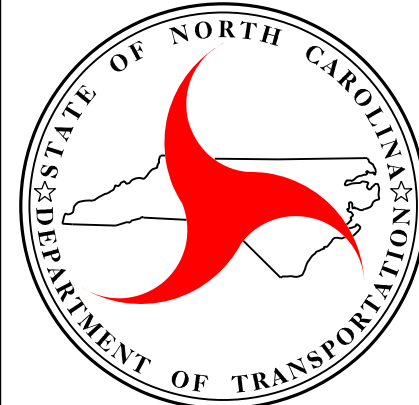
STATION: +/- -RP23- 39+54.08 TO -Y3- 23+01.67

SHEET 2 OF 3 WALL ID RW-18

Prepared in the Office of:



ECS SOUTHEAST, LLC
1812 CENTER PARK DRIVE, SUITE D
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(704) 525-5152 [PHONE]
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NC REGISTERED
ENGINEERING
FIRM # F-1519



NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

GEOTECHNICAL
ENGINEERING UNIT

RETAINING WALL NO. 18
MSE WALL WITH PRECAST PANELS
TYPICAL SECTION AND NOTES

REVISIONS

NO.	BY	DATE	NO.	BY	DATE	SHEET NO.
1			3			W-47
2			4			

PREPARED BY: E. A. MCINTOSH, P.E.	DATE: 06/26
REVIEWED BY: M. A. MULLA, P.E.	DATE: 06/26

SHEET
NO.
W-49

GEOTECHNICAL
ENGINEER

SEAL
018979

ENGINEER

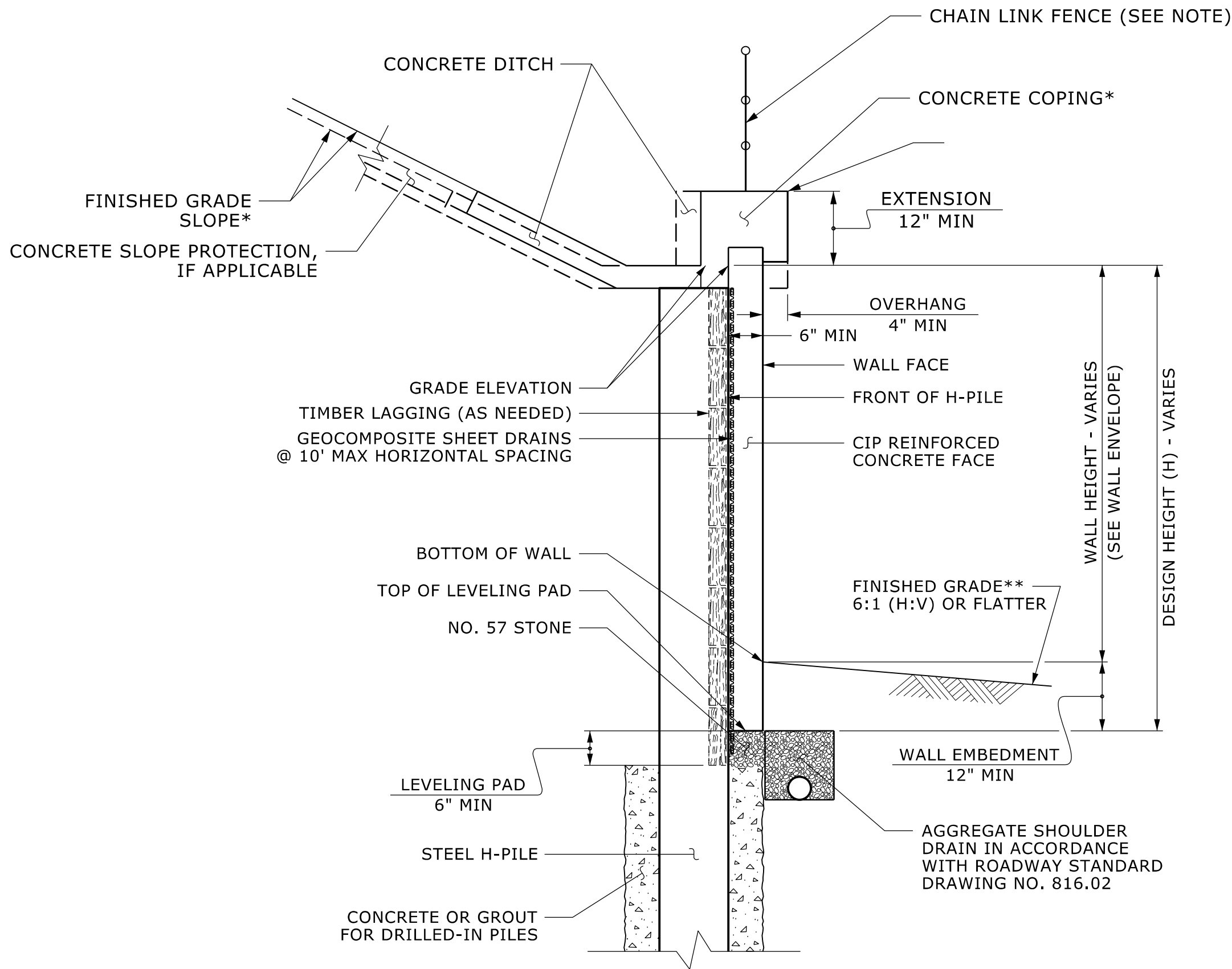
7/20/2026

SIGNATUREDATE

ENGINEER

SIGNATUREDATE

DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED



SOLDIER PILE WALL WITH
CIP FACE - TYPICAL SECTION

*SEE CONCRETE DITCH BEHIND WALL DETAILS.
**SEE PLANS FOR FINISHED GRADE SLOPE DETAILS.

NOTES:

FOR SOLDIER PILE RETAINING WALLS, SEE SOLDIER PILE RETAINING WALLS PROVISION.

DRILLED-IN H-PILES ARE REQUIRED FOR RETAINING WALL NO. 21.

A 48" BLACK VINYL COATED CHAIN LINK FENCE IS REQUIRED FOR RETAINING WALL NO. 21. SEE ROADWAY STANDARD 866.06 (ROADWAY DETAIL AND PAY ITEM).

USE A SOLDIER PILE RETAINING WALL WITH A CIP REINFORCED CONCRETE FACE FOR RETAINING WALL NO. 21.

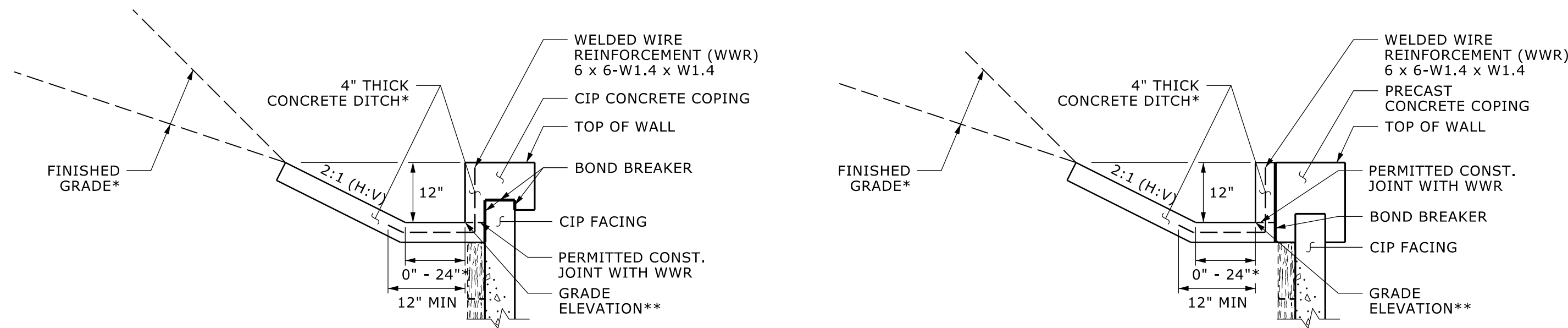
CIP REINFORCED CONCRETE COPING IS REQUIRED FOR RETAINING WALL NO. 21.

AN ARCHITECTURAL CONCRETE SURFACE TREATMENT IS REQUIRED FOR RETAINING WALL NO. 21. SEE "ARCHITECTURAL CONCRETE SURFACE TREATMENT" SPECIAL PROVISION.

BEFORE BEGINNING SOLDIER PILE WALL DESIGN FOR RETAINING WALL NO. 21, 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.

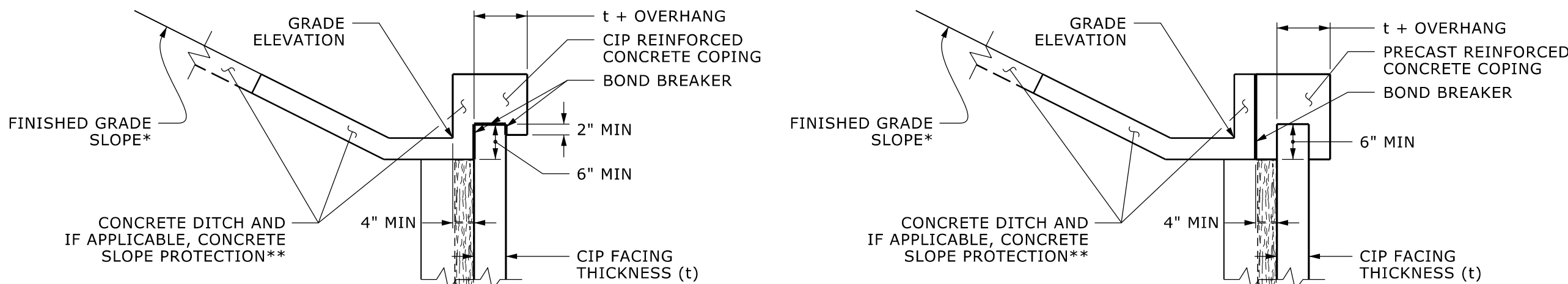
DESIGN RETAINING WALL NO. 21 FOR THE FOLLOWING:

- 1) H = WALL HEIGHT + WALL EMBEDMENT
- 2) DESIGN LIFE = 100 YEARS
- 3) MINIMUM WALL EMBEDMENT DEPTH = 1.5 FT
- 4) IN-SITU ASSUMED MATERIAL PARAMETERS:
UNIT WEIGHT, γ = 120 PCF
FRICTION ANGLE, ϕ = 28 DEGREES
COHESION, c = 0.0 PSF



CONCRETE DITCH BEHIND
WALL WITH CONCRETE COPING

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



COPING DETAILS

*SEE PLANS FOR FINISHED GRADE SLOPE DETAILS.
**SEE CONCRETE DITCH BEHIND WALL DETAILS.

PROJECT NO.: I-2513AC

BUNCOMBE COUNTY

STATION: +/- -Y3- 28+48.16 TO -Y3- 29+54.63

SHEET 2 OF 2 WALL ID RW-21

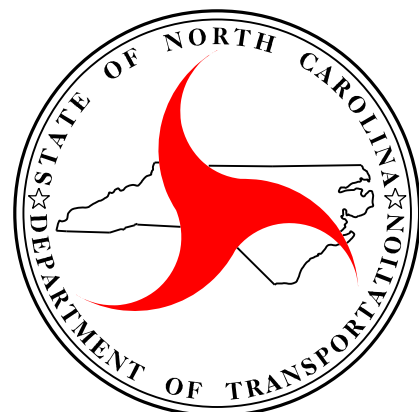
RETAINING WALL NO. 21
SOLDIER PILE WALL
TYPICAL SECTION AND NOTES

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1			3			
2			4			W-50

Prepared in the Office of:



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CHARLOTTE, NC 28217
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(704) 357-0023 [FAX]
NC REGISTERED
ENGINEERING
FIRM # F-1519

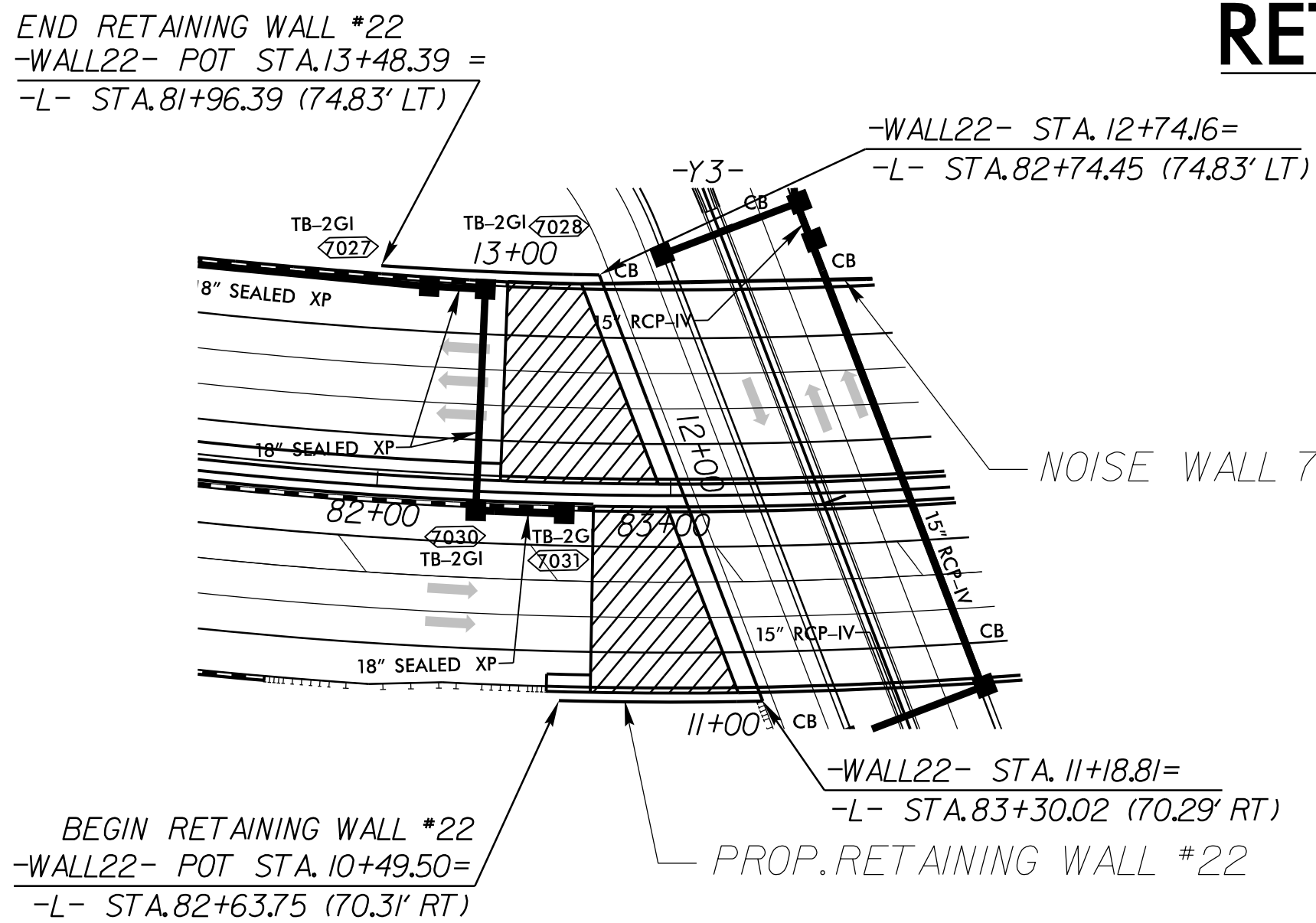


NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

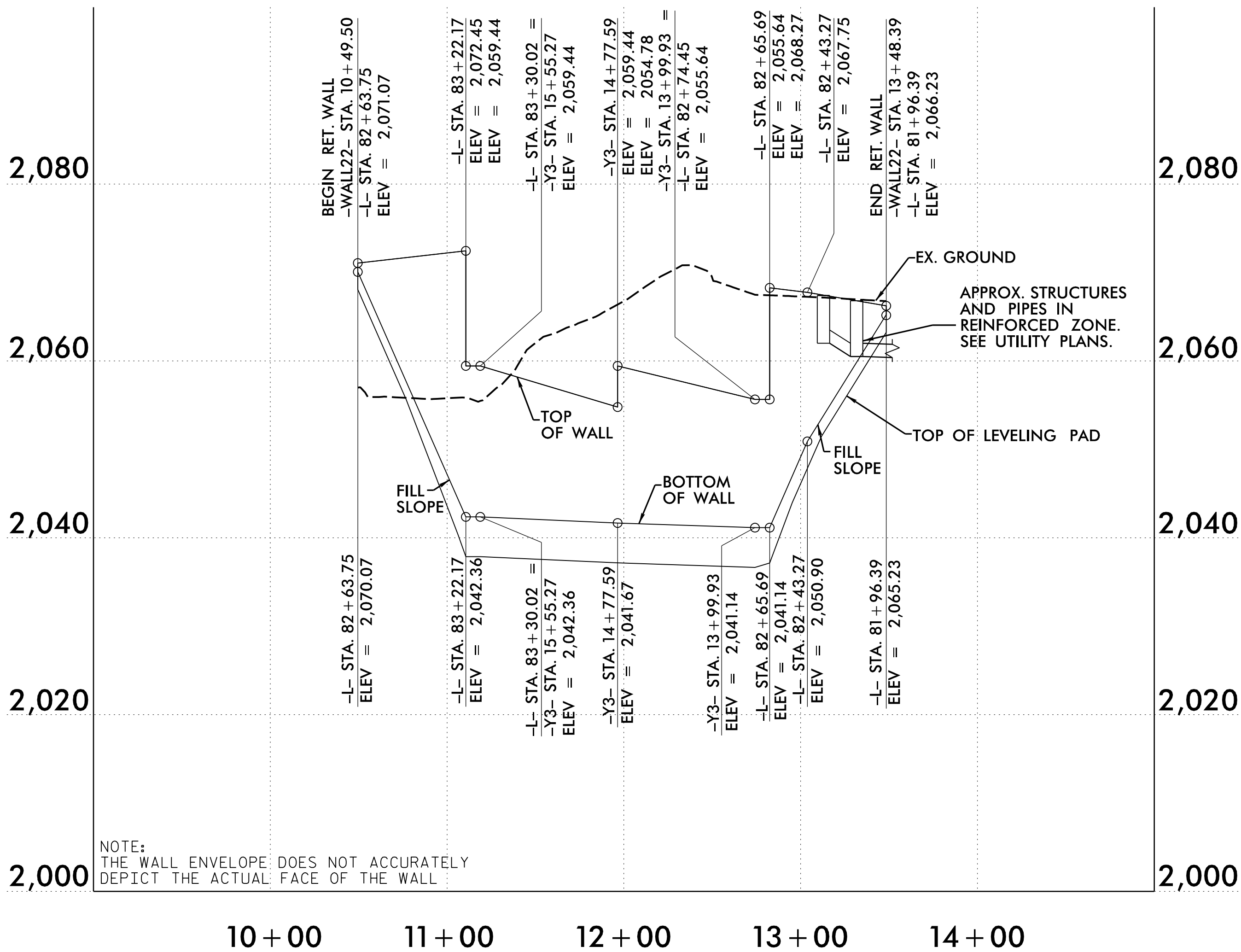
GEOTECHNICAL
ENGINEERING UNIT

PREPARED BY: E. A. MCINTOSH, P.E.	DATE: 06/26
REVIEWED BY: M. A. MULLA, P.E.	DATE: 06/26

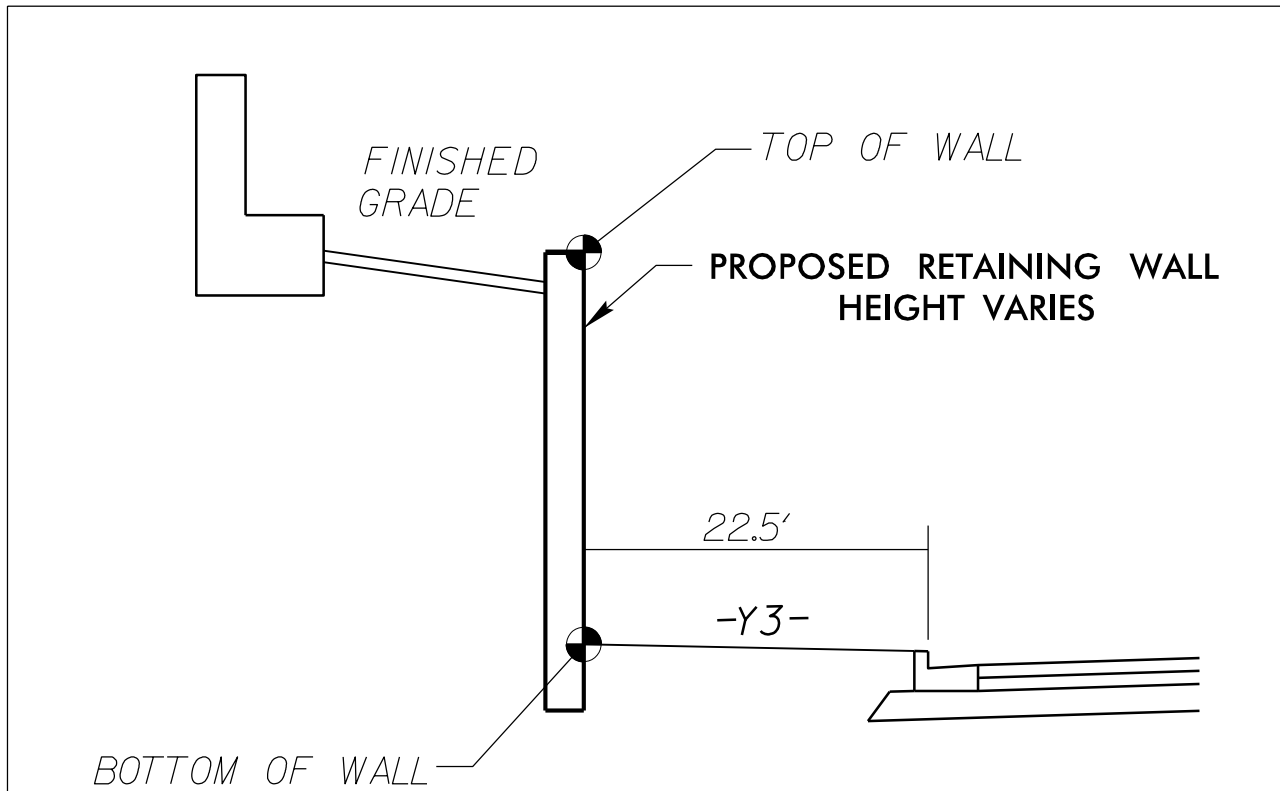
RETAINING WALL #22 DETAIL SHEET



RETAINING WALL NO. 22 – PLAN VIEW

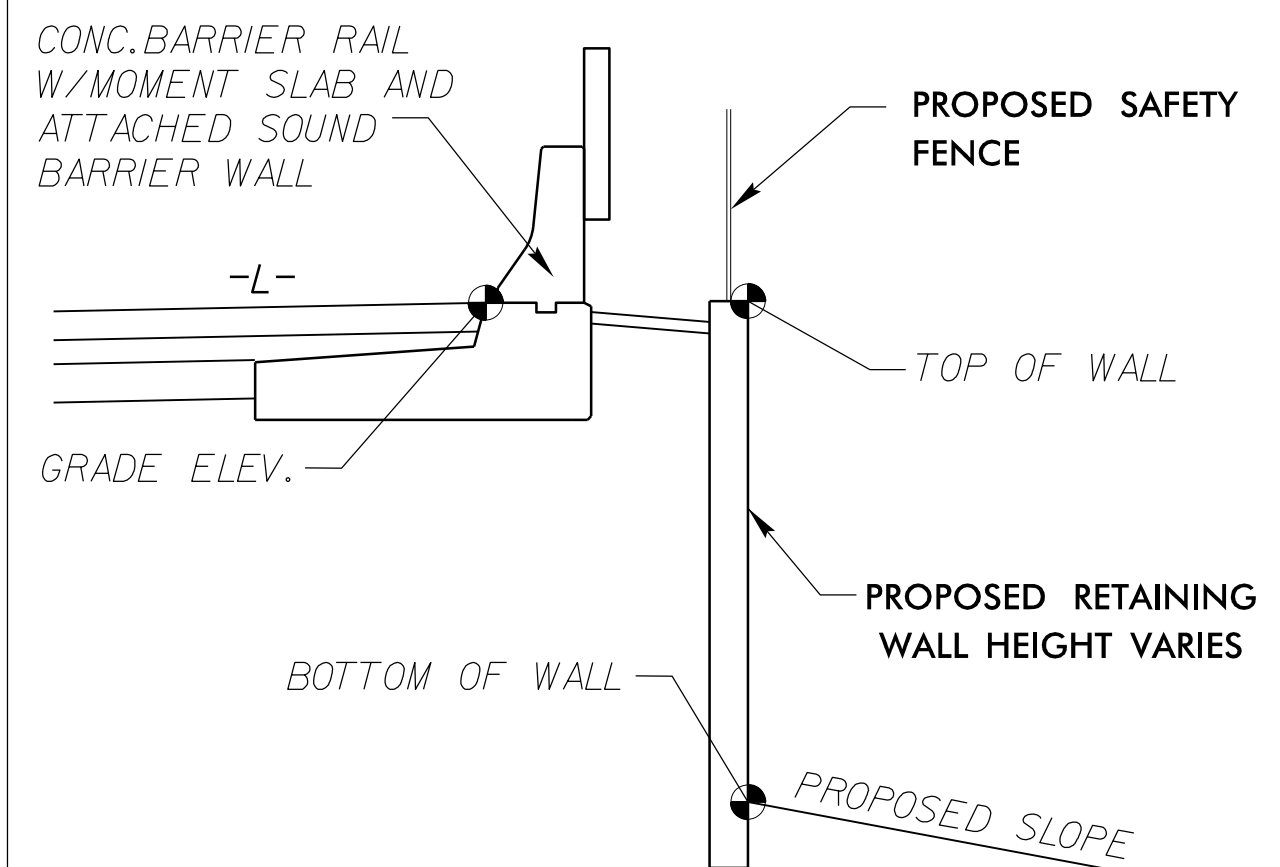


RETAINING WALL NO. 22 – ENVELOPE VIEW



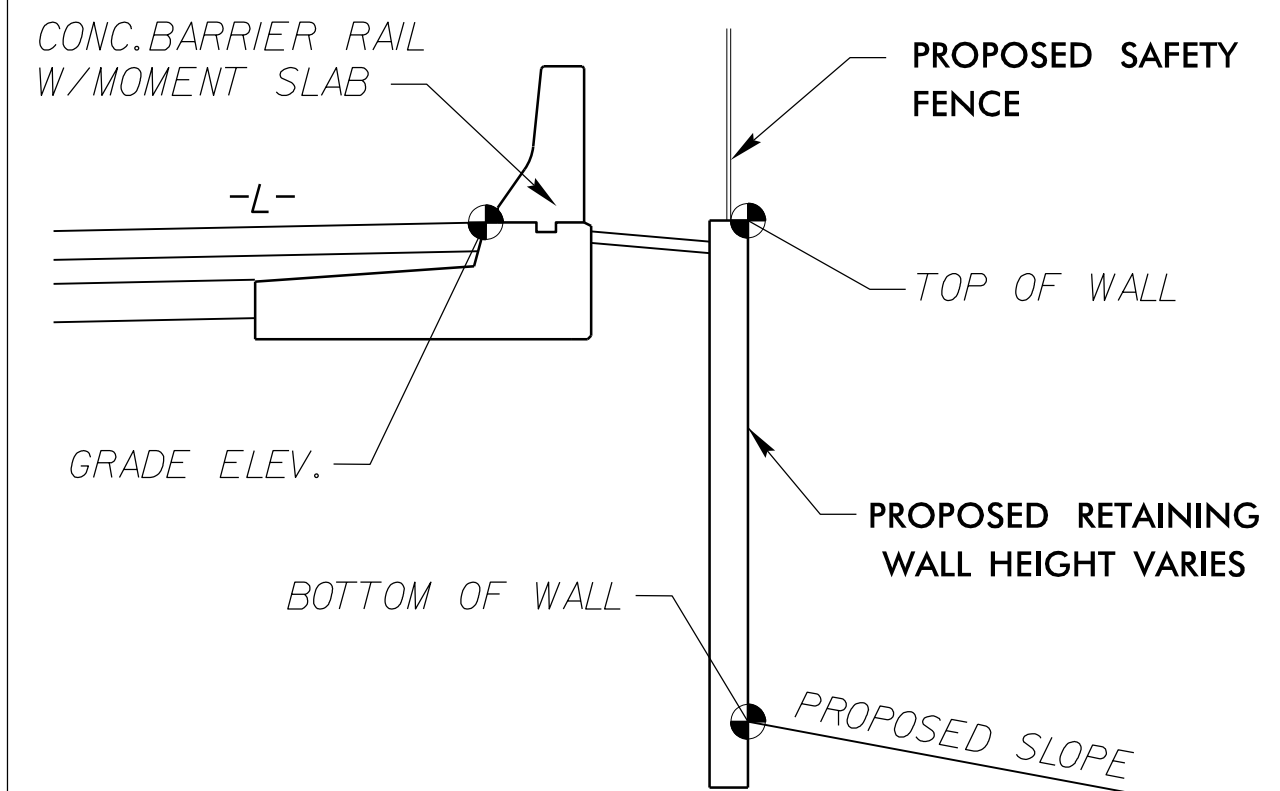
RETAINING WALL TYPICAL SECTION

-WALL22- STA. 11 + 18.81 TO 12 + 74.16



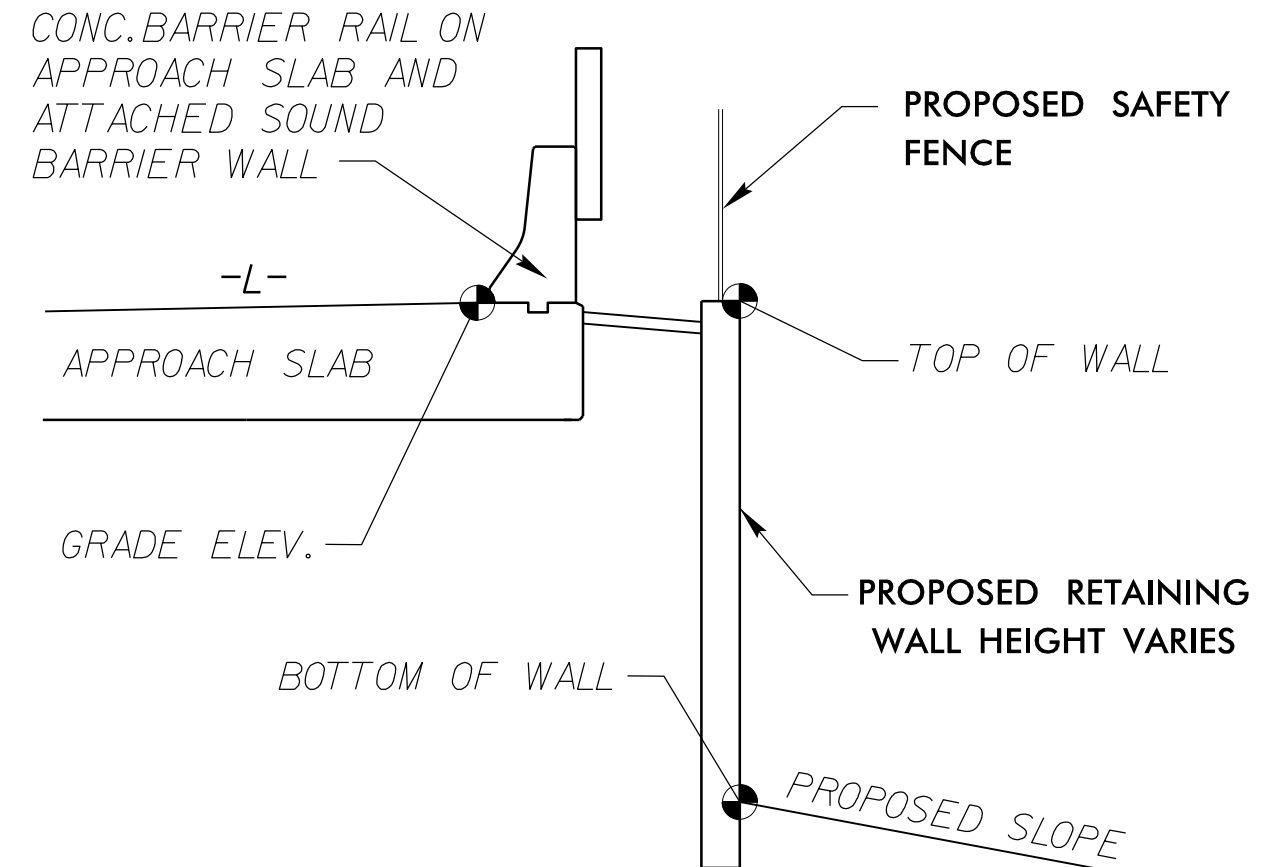
RETAINING WALL TYPICAL SECTION

-WALL22- STA. 13 + 05.10 TO 13 + 48.39



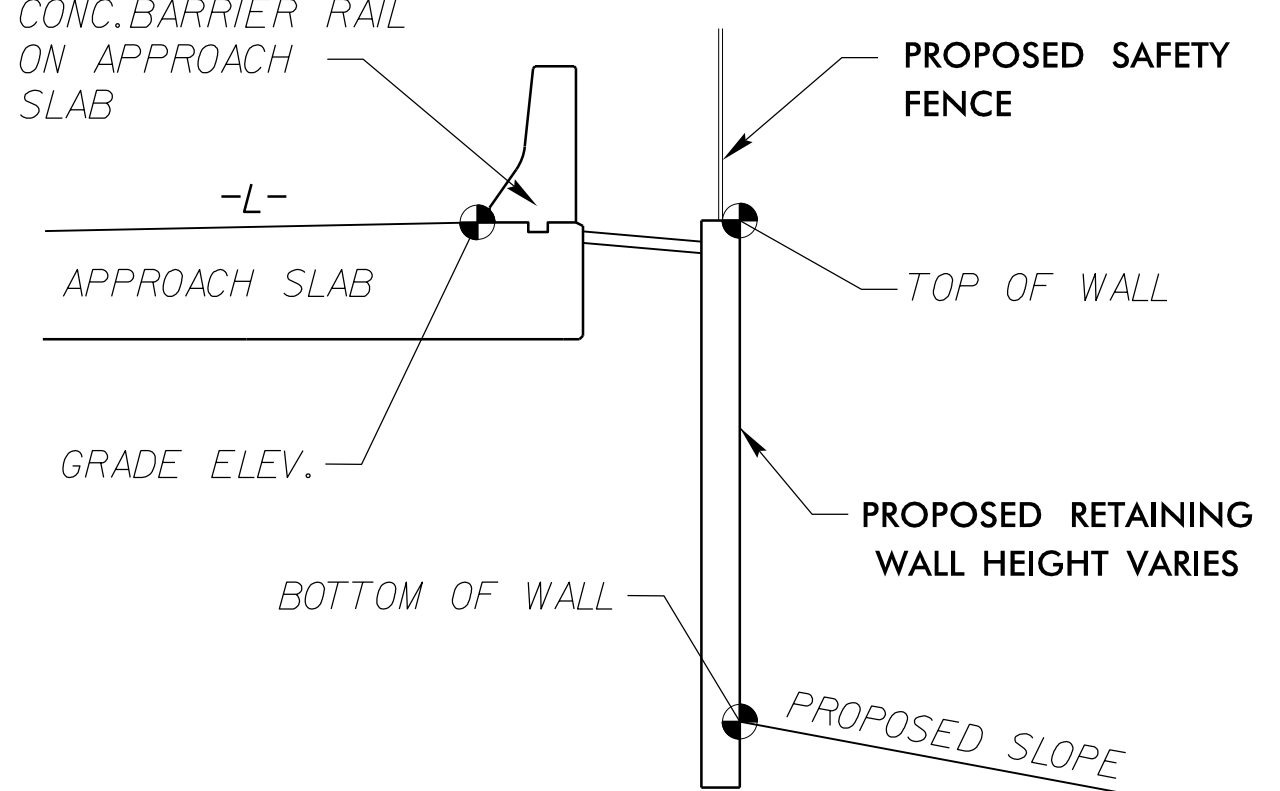
RETAINING WALL TYPICAL SECTION

-WALL22- STA. 10 + 49.50 TO 10 + 60.08



RETAINING WALL TYPICAL SECTION

-WALL22- STA. 12 + 80.15 TO 13 + 05.10



RETAINING WALL TYPICAL SECTION

-WALL22- STA. 10 + 60.08 TO 11 + 10.56

GEOTECHNICAL ENGINEER

ENGINEER

SIGNATURE

DATE

7/20/2026

SIGNATURE

DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ESTIMATED MSE WALL QUANTITIES* (SQUARE FEET)	
MSE RETAINING WALL NO. 22	5,600
ARCHITECTURAL CONCRETE SURFACE TREATMENT	5,600

* = ESTIMATED WALL QUANTITIES INCLUDE ESTIMATED WALL EMBEDMENT AREA

PROJECT NO.: I-2513AC

BUNCOMBE COUNTY

STATION: +/- -L- 82+63.75 TO -L- 81+96.39

SHEET 1 OF 4 WALL ID RW-22

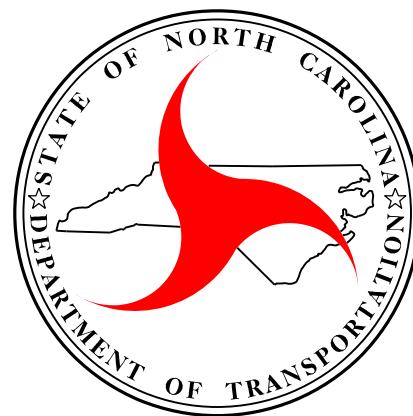
RETAINING WALL NO. 22
MSE WALL
PLAN AND ENVELOPE

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1			3			W-51
2			4			

Prepared in the Office of:



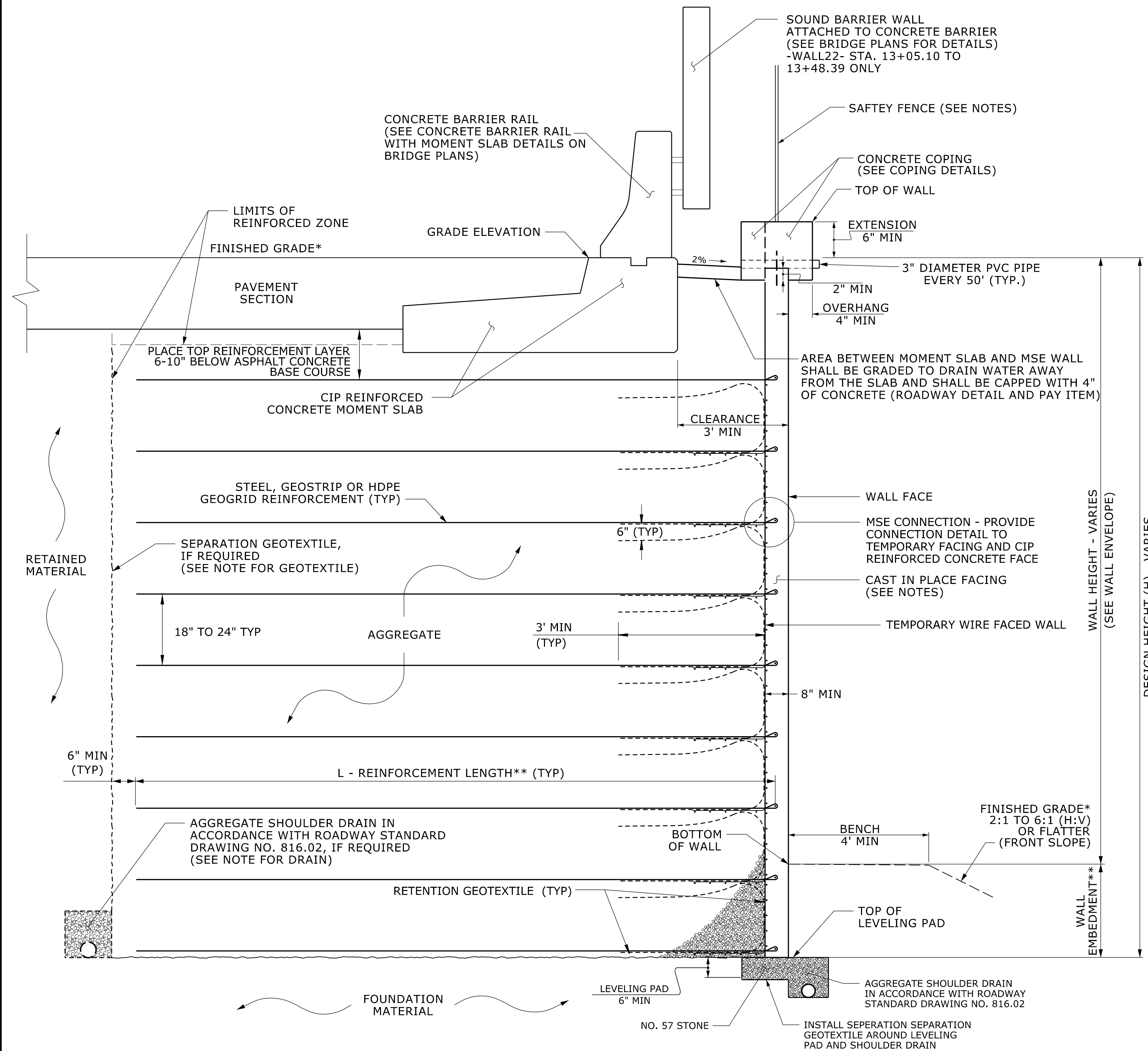
ECS SOUTHEAST, LLC
1812 CENTER PARK DRIVE, SUITE D
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(704) 357-0023 [FAX]
NC REGISTERED ENGINEERING FIRM # F-1519



NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

GEOTECHNICAL
ENGINEERING UNIT

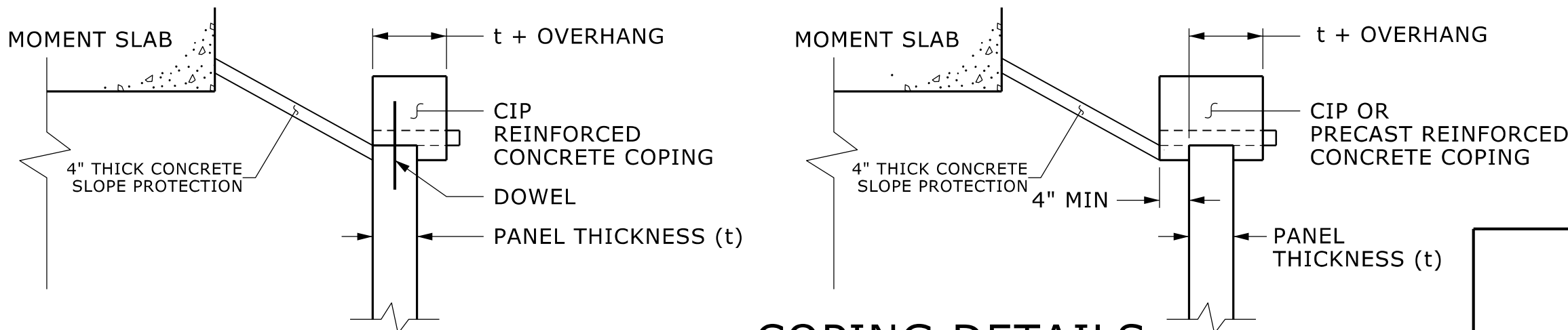
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CIP MSE WALL AND MOMENT SLAB

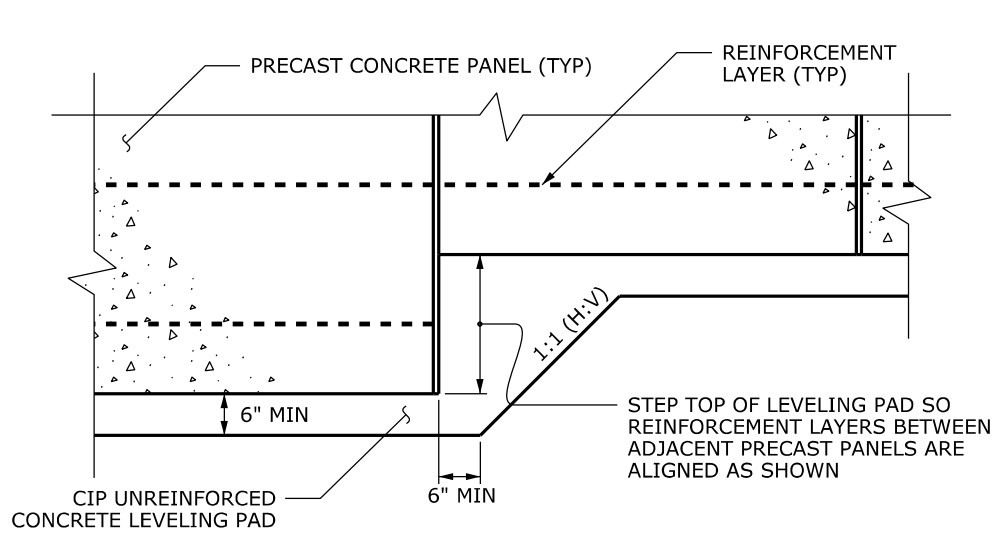
*SEE ROADWAY PLANS FOR FINISHED GRADE DETAILS.
**SEE MSE RETAINING WALLS PROVISION AND IF APPLICABLE, MSE WALL NOTES FOR WALL EMBEDMENT AND REINFORCEMENT LENGTH REQUIREMENTS.

-WALL22- STA. 10+49.50 TO STA. 10+60.08
-WALL22- STA. 13+05.10 TO STA. 13+48.39
W/ ATTACHED SOUND BARRIER WALL TO CONCRETE BARRIER RAIL



COPING DETAILS

AT THE CONTRACTOR'S OPTION, CONNECT COPING TO PANELS WITH DOWELS OR EXTEND COPING DOWN BACK OF PANELS.



PRECAST PANELS LEVELING PAD STEP DETAIL

NOTES:

FOR MECHANICALLY STABILIZED EARTH (MSE) RETAINING WALLS, SEE MSE RETAINING WALLS PROVISION.

FOR SINGLE FACED PRECAST CONCRETE BARRIER, SEE ROADWAY PLANS AND SECTION 857 OF THE STANDARD SPECIFICATIONS.

A SAFETY FENCE IS REQUIRED FROM -WALL22- STA 10+49.50 TO 11+10.56 AND -WALL22- STA 12+80.15 TO 13+48.39. SEE ROADWAY STANDARD 866.06 (ROADWAY DETAIL AND PAY ITEM).

A CONCRETE BARRIER RAIL WITH MOMENT SLAB IS REQUIRED ABOVE RETAINING WALL NO. 22. SEE PLANS FOR CONCRETE BARRIER RAIL WITH MOMENT SLAB DETAILS.

CIP REINFORCED CONCRETE COPING IS REQUIRED FOR RETAINING WALL NO. 22.

A SEPARATION GEOTEXTILE IS REQUIRED AT THE BACK OF THE REINFORCED ZONE FOR RETAINING WALL NO. 22.

A DRAIN IS REQUIRED FOR RETAINING WALL NO. 22.

BEFORE BEGINNING MSE WALL DESIGN FOR RETAINING WALL NO. 22, 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. 22 FOR THE FOLLOWING:

- 1) H = WALL HEIGHT + WALL EMBEDMENT
- 2) DESIGN LIFE = 100 YEARS
- 3) MAXIMUM FACTORED VERTICAL PRESSURE ON FOUNDATION MATERIAL = 10,300 PSF
- 4) MINIMUM REINFORCEMENT LENGTH (L) = 0.7 H OR 6 FT., WHICHEVER IS LONGER UNLESS NOTED OTHERWISE
- 5) MINIMUM REINFORCEMENT LENGTH (L) = 0.9 H FOR -WALL22- STA. 12+50.0 TO 13+48.39
- 6) MINIMUM EMBEDMENT DEPTH = H/7 OR 2 FT., WHICHEVER IS GREATER
- 7) REINFORCED ZONE AGGREGATE PARAMETERS:

AGGREGATE TYPE*	UNIT WEIGHT (γ) PCF	FRICTION ANGLE (ϕ) DEGREES	COHESION (c) PSF
COARSE	110	38	0
*SEE MSE RETAINING WALLS PROVISION FOR COARSE AGGREGATE MATERIAL REQUIREMENTS.			

8) IN-SITU ASSUMED MATERIAL PARAMETERS:

MATERIAL TYPE	UNIT WEIGHT (γ) PCF	FRICTION ANGLE (ϕ) DEGREES	COHESION (c) PSF
RETAINED	120	30	0
FOUNDATION	120	30	0

DESIGN RETAINING WALL NO. 22 FOR A LIVE LOAD (TRAFFIC) SURCHARGE.

DESIGN RETAINING WALL NO. 22 TO ACCOUNT FOR WIND EXPOSURE CATEGORY B (WIND PRESSURE = 27 PSF) WHERE SOUND BARRIER WALL IS ATTACHED TO THE CONCRETE BARRIER RAIL (-WALL22- STA. 12+50.0 TO 13+48.39).

FOUNDATIONS FOR SIGNS, LIGHTING or SIGNALS WILL BE LOCATED BEHIND RETAINING WALL NO. 22 AND MAY INTERFERE WITH REINFORCEMENT. BEFORE BEGINNING MSE WALL CONSTRUCTION, SUBMIT PROPOSED CONSTRUCTION METHODS FOR THESE FOUNDATIONS FOR APPROVAL.

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. 22.

DO NOT PLACE LEVELING PAD CONCRETE, AGGREGATE OR REINFORCEMENT FOR RETAINING WALL NO. 22 UNTIL EXCAVATION DIMENSIONS AND FOUNDATION MATERIAL ARE APPROVED.

DESIGN RETAINING WALLS NO. 22 TO INCORPORATE DRAIN DROP INLET STRUCTURES AND PIPES WITHIN REINFORCED ZONE OF WALL 22. INCLUDE DETAILS IN MSE WALL DESIGN SUBMITTAL.

PROJECT NO.: I-2513AC

BUNCOMBE COUNTY

STATION: +/- -L- 82+64 TO -L- 81+96

SHEET 2 OF 4 WALL ID RW-22

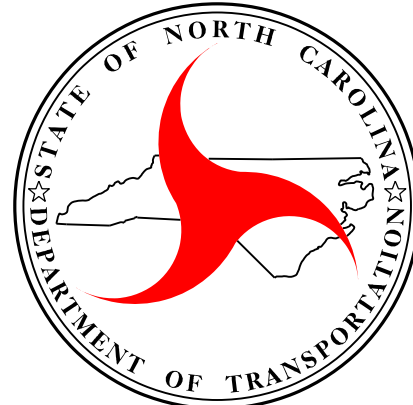
RETAINING WALL NO. 22 MSE WALL WITH PRECAST PANELS WITH MOMENT SLAB TYPICAL SECTION AND NOTES

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1			3			W-52
2			4			

Prepared in the Office of:



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(704) 525-5152 [PHONE]
(704) 357-0023 [FAX]
NC REGISTERED
ENGINEERING
FIRM # F-1519



NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

GEOTECHNICAL
ENGINEERING UNIT



SIGNATURE	DATE
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UNLESS ALL SIGNATURES COMPLETED

NOTES:

FOR TYPE 2 BRIDGE APPROACH FILL, SEE BRIDGE APPROACH FILLS PROVISION AND ROADWAY STANDARD DRAWING NO. 423.03.

DESIGN REINFORCEMENT CONNECTED TO END BENT CAPS FOR FACTORED LOAD AND LENGTH OR REINFORCEMENT IN ACTIVE ZONE (L)
SHOWN. CAST REINFORCEMENT OR CONNECTORS INTO CAP BACKWALL FOR END BENT NO. 1. MAINTAIN A CLEARANCE OF AT LEAST 3 INCHES
BETWEEN REINFORCEMENT OR CONNECTOR AND REINFORCING STEEL IN CAP.

FOUNDATION FOR END BENT NO. 1 WILL INTERFERE WITH REINFORCEMENT FOR RETAINING WALL NO. 22. SEE "FOUNDATION LAYOUT" SHEET FOR FOUNDATION LOCATIONS.

"TEMPORARY SHORING" IS BE REQUIRED FOR RETAINING WALL NO. 22 IN ACCORDANCE WITH THE TEMPORARY SHORING PROVISION.
SEE TRAFFIC CONTROL PLANS.

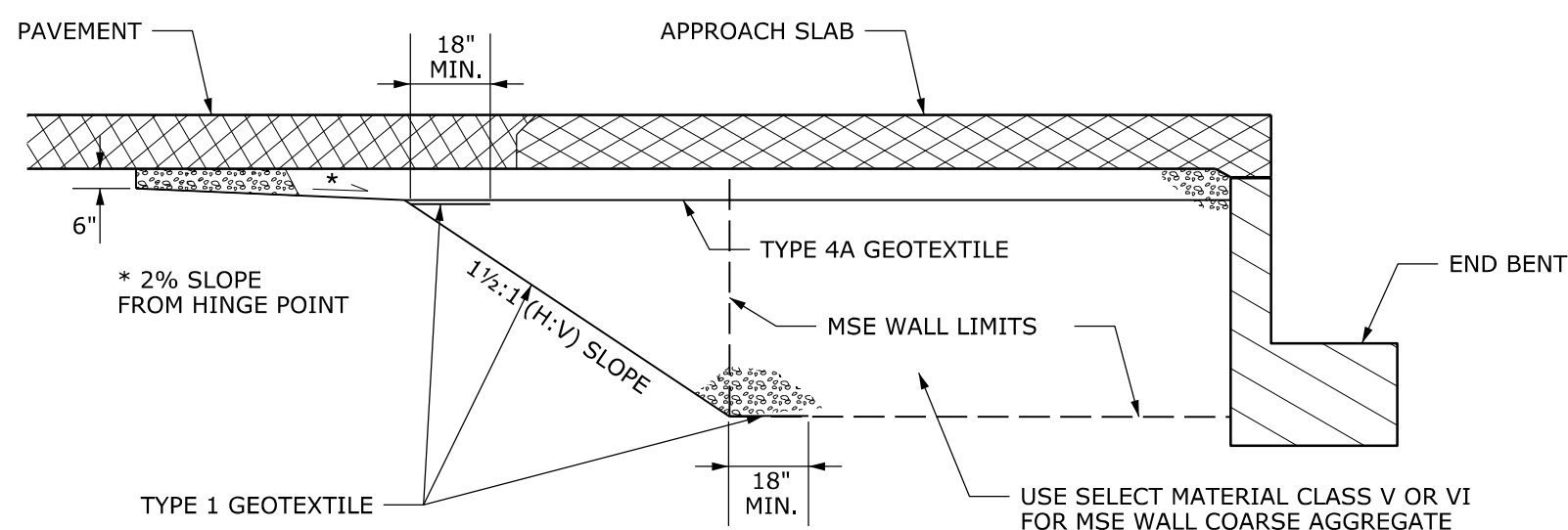
CLOSE COORDINATION WITH STRUCTURE PLANS IS REQUIRED. SEE BRIDGE PLANS FOR ADDITIONAL DETAILS FOR REQUIRED WALL AESTHETICS AND GEOMETRIC TIE-IN BETWEEN MSE WALL AND BRIDGE END BENT CAP. THE CONTRACTOR SHALL SUBMIT DETAILS FOR CONSTRUCTING THE MSE WALL, CAST IN PLACE FACING, AND PRECAST OR CAST IN PLACE COPING THAT ACHIEVE THE DESIRED AESTHETIC RESULT AS DEPICTED IN THE STRUCTURE PLAN DETAILS. THESE DETAILS SHALL BE APPROVED BY THE ENGINEER BEFORE BEGINNING CONSTRUCTION OF THE BRIDGE OR WALLS. THE COST FOR ACHIEVING THE PLAN INDICATED GEOMETRIC AESTHETIC RESULT, INCLUDING CUSTOM COPING, TOOLED JOINT LINES, AND ALL ASSOCIATED LABOR AND MATERIALS, SHALL BE INCIDENTAL TO THE COST OF "MSE RETAINING WALL NO. 22".

CAST IN PLACE FACING AND CORNER COPINGS AT THE BRIDGE END BENT CAPS SHALL NOT BE INSTALLED AFTER A MINIMUM PERIOD OF 30 DAYS SINCE PLACING THE LAST BRIDGE APPROACH FILL OR SETTLEMENT HAS REACHED 90% OF MAXIMUM ANTICIPATED LONG TERM SETTLEMENT.

THE BRIDGE END BENT SHALL BE BUILT IN ITS ENTIRETY BEFORE INSTALLING THE CAST IN PLACE FACING

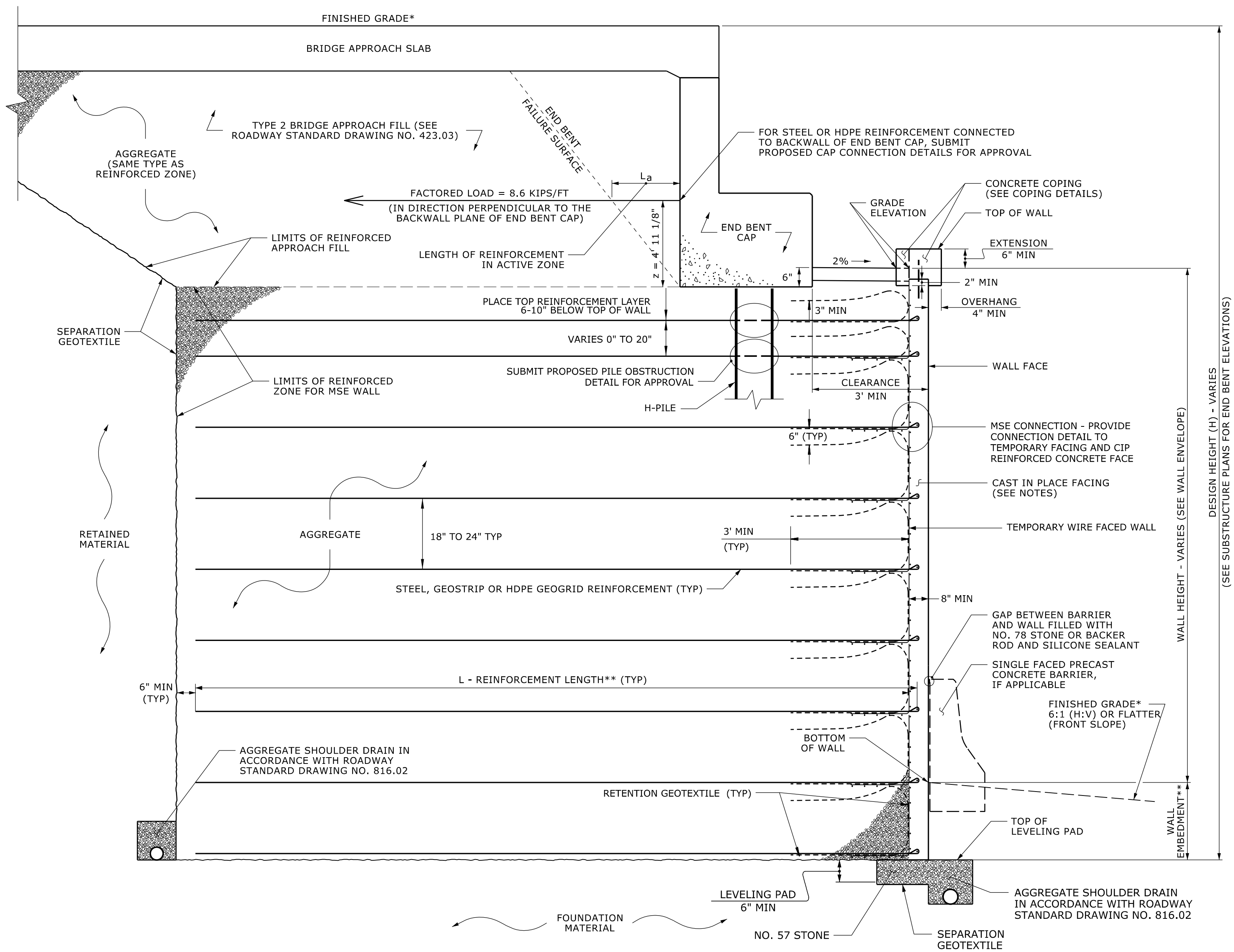
THE CIP FACING SHALL BE INSTALLED CONTINUOUSLY BETWEEN LEFT AND RIGHT LANE BRIDGES WITH NO STAGED CONSTRUCTION JOINT.

THE REINFORCED ZONE OF RETAINING WALL NO. 22 WILL INTERFERE WITH BRIDGE APPROACH FILL FOR BRIDGE NO. 100898 AND 100899. SEE APPROACH FILL WITH ADJACENT MSE WALL DETAIL AND STRUCTURE PLANS.



APPROACH FILL WITH
ADJACENT MSE WALL DETAIL

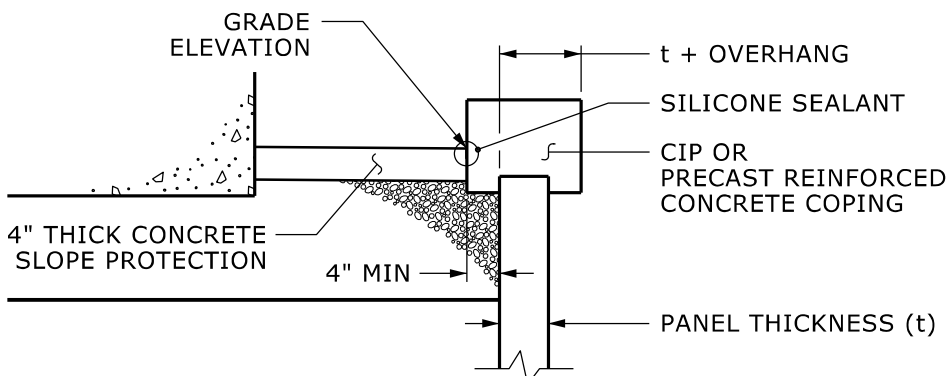
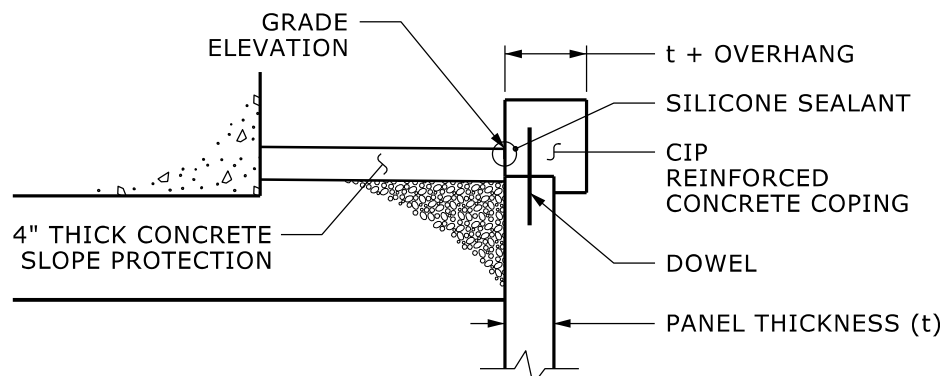
USE WHERE MSE WALL REINFORCED ZONE AND APPROACH FILL
LIMITS OVERLAP. OUTSIDE OF MSE WALL REINFORCED ZONE LIMITS,
SEE ROADWAY STANDARD DRAWING NO. 423.01.



CIP MSE ABUTMENT WALL - TYPICAL SECTION

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

-WALL22- STA. 11+18.81 TO STA. 12+74.16



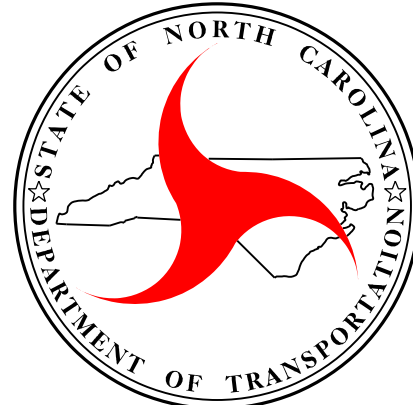
COPING DETAILS FOR MSE ABUTMENT WALL

AT THE CONTRACTOR'S OPTION, CONNECT
COPING TO PANELS WITH DOWELS OR
EXTEND COPING DOWN BACK OF PANELS.

Prepared in the Office of:



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FIRM # F-1519



NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

PROJECT NO.: I-2513AC

BUNCOMBE COUNTY

STATION: +/- -L- 82+64 TO -L- 81+96

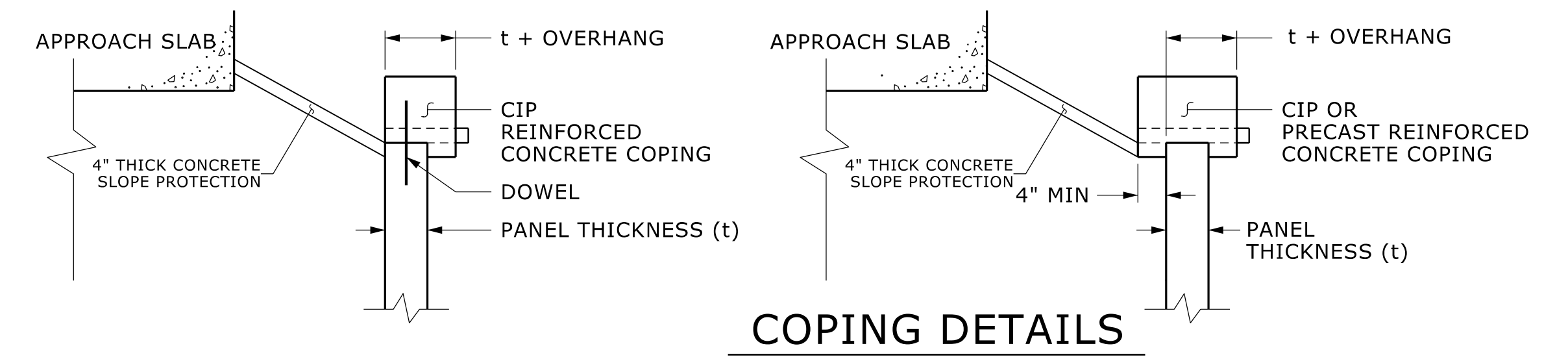
SHEET 3 OF 4 WALL ID RW-22

RETAINING WALL NO. 22
MSE WALL WITH PRECAST PANELS
FOR BRIDGE ABUTMENT
TYPICAL SECTION AND NOTES

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1			3			W-5
2			4			

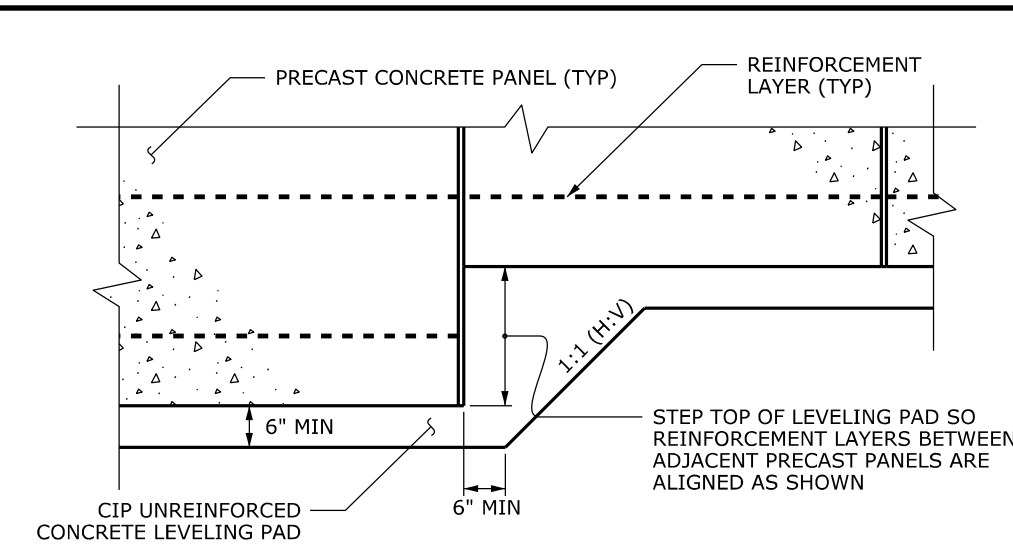
SHEET
NO.
W-52

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McIntosh AT ECS-DFVFF-7YTA



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PREPARED BY: E. A. MCINTOSH, P.E.	DATE: 06/26
REVIEWED BY: M. A. MULLA, P.E.	DATE: 06/26



GEOTECHNICAL
ENGINEER

NORTH CAROLINA
PROFESSIONAL
SEAL
018979
ENGINEER
Mohammed A. Mulla

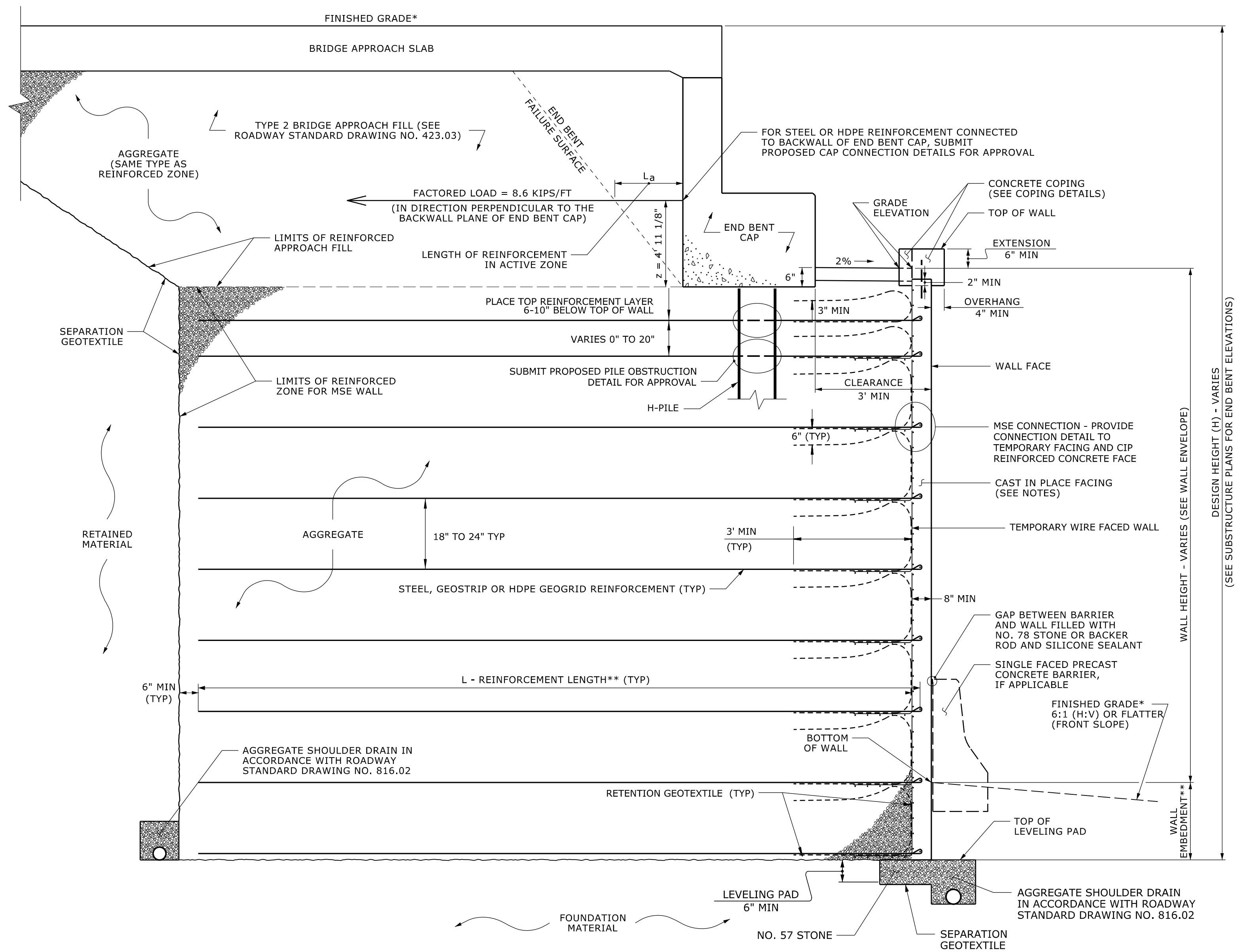
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W-56

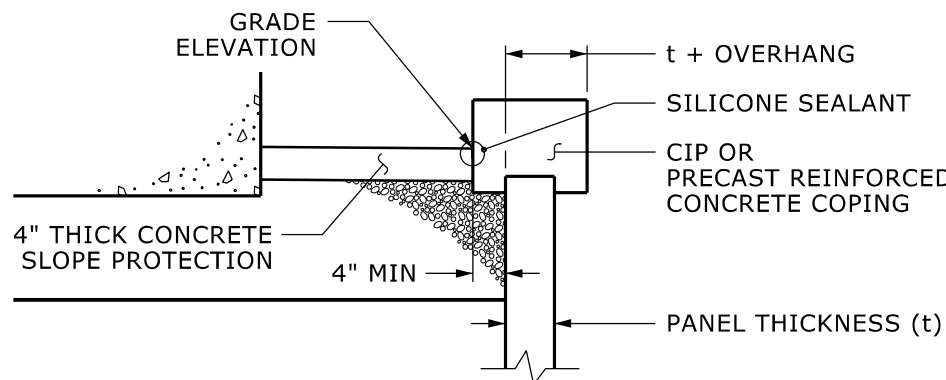
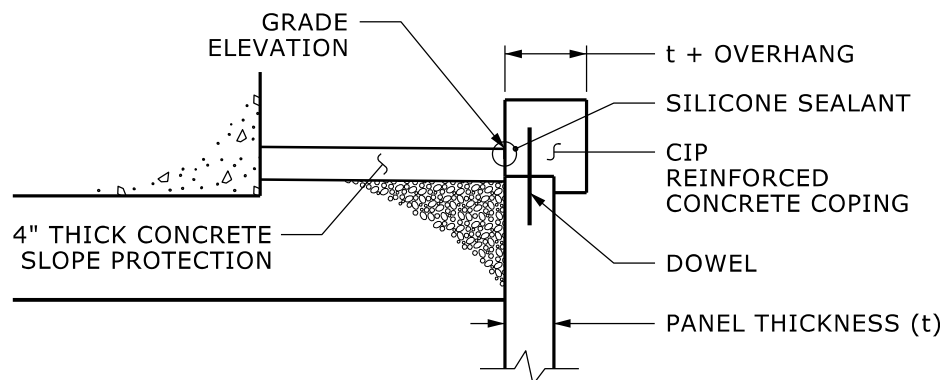
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CIP MSE ABUTMENT WALL - TYPICAL SECTION

*SEE ROADWAY PLANS FOR FINISHED GRADE DETAILS.
**SEE MSE RETAINING WALLS PROVISION AND IF APPLICABLE,
MSE WALL NOTES FOR WALL EMBEDMENT AND REINFORCEMENT LENGTH REQUIREMENTS.
-WALL23- STA. 11+19.71 TO STA. 12+71.57



COPING DETAILS FOR MSE ABUTMENT WALL

AT THE CONTRACTOR'S OPTION, CONNECT
COPING TO PANELS WITH DOWELS OR
EXTEND COPING DOWN BACK OF PANELS.

NOTES:

FOR TYPE 2 BRIDGE APPROACH FILL, SEE BRIDGE APPROACH FILLS PROVISION AND ROADWAY STANDARD DRAWING NO. 423.03.

DESIGN REINFORCEMENT CONNECTED TO END BENT CAPS FOR FACTORED LOAD AND LENGTH OR REINFORCEMENT IN ACTIVE ZONE (L) SHOWN. CAST REINFORCEMENT OR CONNECTORS INTO CAP BACKWALL FOR END BENT NO. 2. MAINTAIN A CLEARANCE OF AT LEAST 3 INCHES BETWEEN REINFORCEMENT OR CONNECTOR AND REINFORCING STEEL IN CAP.

FOUNDATION FOR END BENT NO. 2 WILL INTERFERE WITH REINFORCEMENT FOR RETAINING WALL NO. 23. SEE "FOUNDATION LAYOUT" SHEET FOR FOUNDATION LOCATIONS.

"TEMPORARY SHORING" IS BE REQUIRED FOR RETAINING WALL NO. 23 IN ACCORDANCE WITH THE TEMPORARY SHORING PROVISION. SEE TRAFFIC CONTROL PLANS.

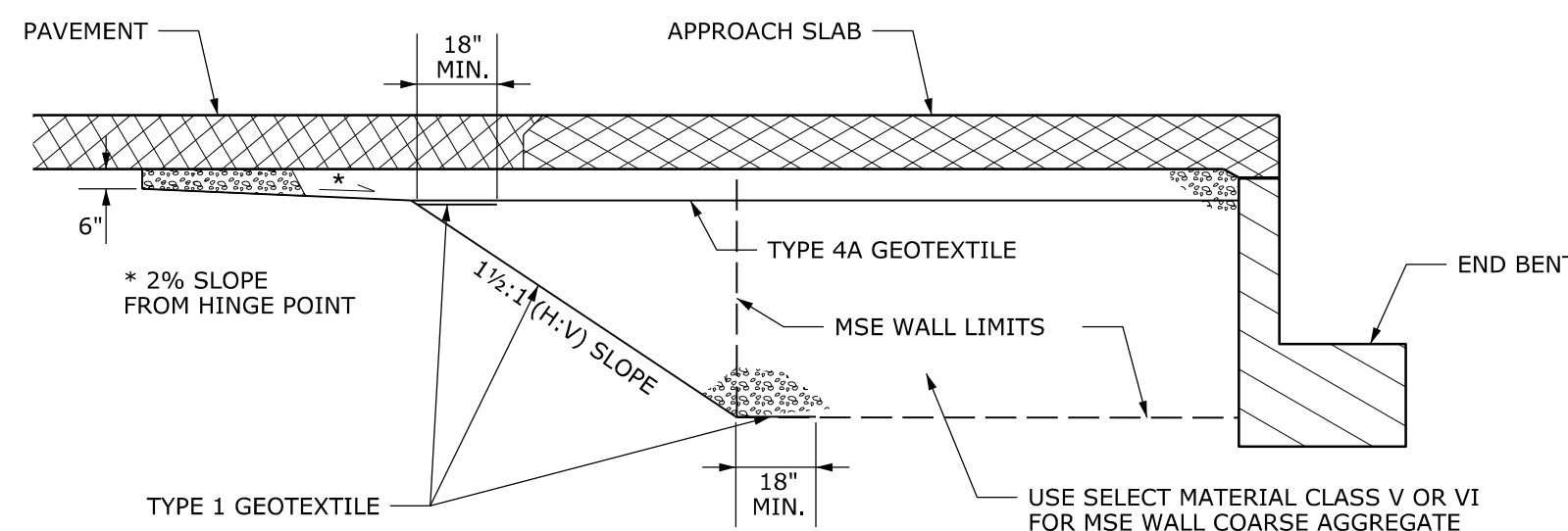
CLOSE COORDINATION WITH STRUCTURE PLANS IS REQUIRED. SEE BRIDGE PLANS FOR ADDITIONAL DETAILS FOR REQUIRED WALL AESTHETICS AND GEOMETRIC TIE-IN BETWEEN MSE WALL AND BRIDGE END BENT CAP. THE CONTRACTOR SHALL SUBMIT DETAILS FOR CONSTRUCTING THE MSE WALL, CAST IN PLACE FACING, AND PRECAST OR CAST IN PLACE COPING THAT ACHIEVE THE DESIRED AESTHETIC RESULT AS DEPICTED IN THE STRUCTURE PLAN DETAILS. THESE DETAILS SHALL BE APPROVED BY THE ENGINEER BEFORE BEGINNING CONSTRUCTION OF THE BRIDGE OR WALLS. THE COST FOR ACHIEVING THE PLAN INDICATED GEOMETRIC AESTHETIC RESULT, INCLUDING CUSTOM COPING, TOOLED JOINT LINES, AND ALL ASSOCIATED LABOR AND MATERIALS, SHALL BE INCIDENTAL TO THE COST OF "MSE RETAINING WALL NO. 23".

CAST IN PLACE FACING AND CORNER COPINGS AT THE BRIDGE END BENT CAPS SHALL NOT BE INSTALLED AFTER A MINIMUM PERIOD OF 30 DAYS SINCE PLACING THE LAST BRIDGE APPROACH FILL OR SETTLEMENT HAS REACHED 90% OF MAXIMUM ANTICIPATED LONG TERM SETTLEMENT.

THE BRIDGE END BENT SHALL BE BUILT IN ITS ENTIRETY BEFORE INSTALLING THE CAST IN PLACE FACING.

THE CIP FACING SHALL BE INSTALLED CONTINUOUSLY BETWEEN LEFT AND RIGHT LANE BRIDGES WITH NO STAGED CONSTRUCTION JOINT.

THE REINFORCED ZONE OF RETAINING WALL NO. 23 WILL INTERFERE WITH BRIDGE APPROACH FILL FOR BRIDGE NO. 100898 AND 100899. SEE APPROACH FILL WITH ADJACENT MSE WALL DETAIL AND STRUCTURE PLANS.



APPROACH FILL WITH
ADJACENT MSE WALL DETAIL

USE WHERE MSE WALL REINFORCED ZONE AND APPROACH FILL
LIMITS OVERLAP, OUTSIDE OF MSE WALL REINFORCED ZONE LIMITS,
SEE ROADWAY STANDARD DRAWING NO. 423.01.

PROJECT NO.: I-2513AC

BUNCOMBE COUNTY

STATION: +/- -L- 84+54 TO -L- 85+50

SHEET 3 OF 4 WALL ID RW-23

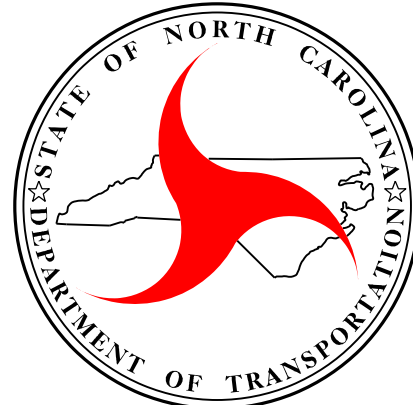
RETAINING WALL NO. 23
MSE WALL WITH PRECAST PANELS
FOR BRIDGE ABUTMENT
TYPICAL SECTION AND NOTES

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1		3				W-57
2			4			

Prepared in the Office of:



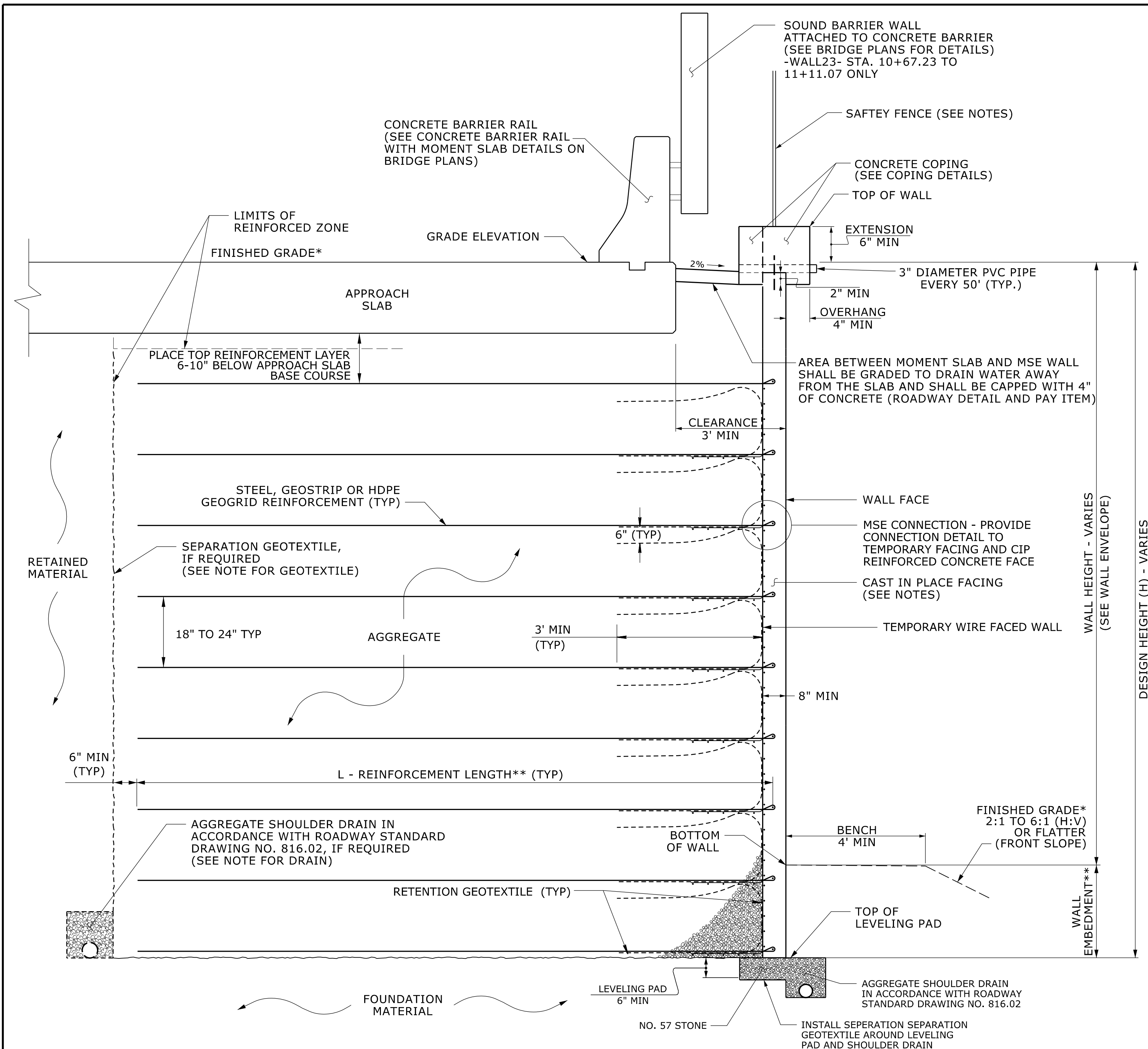
ECS SOUTHEAST, LLC
1812 CENTER PARK DRIVE, SUITE D
CHARLOTTE, NC 28217
(704) 525-5152 [PHONE]
(704) 357-0023 [FAX]
NC REGISTERED
ENGINEERING
FIRM # F-1519



NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

GEOTECHNICAL
ENGINEERING UNIT

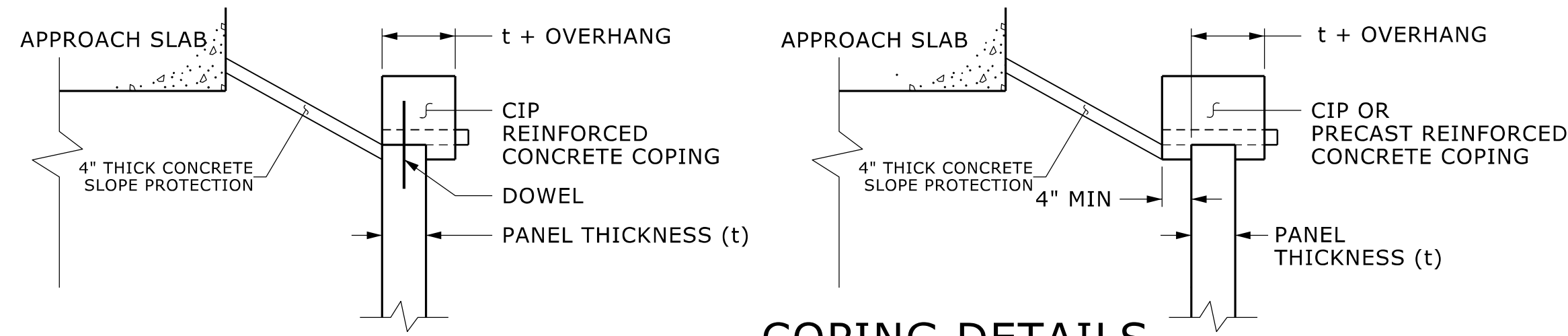
I:\JUN-2026 [7:53 PM] \Users\emcintosh\OneDrive - ECS Corporate Services\31 Asheville - I-2513AC - 31-4489 I-2513AC 1/2 Structures\CADD\GEOTECH\Plan\Prof\I2513AC_Typical_sheets_EM.dgn



CIP MSE WALL AND APPROACH SLAB

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

-WALL23- STA. 12+80.14 TO STA. 13+02.77
-WALL23- STA. 10+67.23 TO STA. 11+11.07
W/ ATTACHED SOUND BARRIER WALL TO CONCRETE BARRIER RAIL



COPING DETAILS

AT THE CONTRACTOR'S OPTION, CONNECT COPING TO PANELS WITH DOWELS OR EXTEND COPING DOWN BACK OF PANELS.

GEOTECHNICAL ENGINEER

7/20/2026

SIGNATURE

DATE

ENGINEER

SIGNATURE

DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT NO.: I-2513AC

BUNCOMBE COUNTY

STATION: +/- -L- 84+54 TO -L- 85+50

SHEET 4 OF 4 WALL ID RW-23

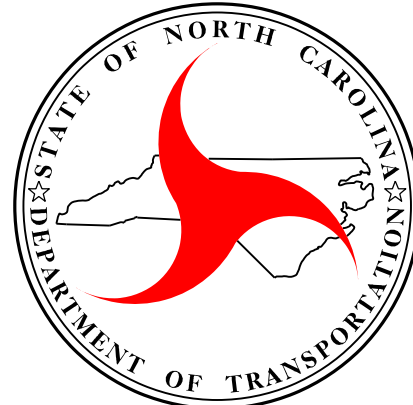
RETAINING WALL NO. 23
MSE WALL WITH PRECAST PANELS
WITH APPROACH SLAB
TYPICAL SECTION

REVISIONS						SHEET NO. W-58
NO.	BY	DATE	NO.	BY	DATE	
1			3			
2			4			

Prepared in the Office of:



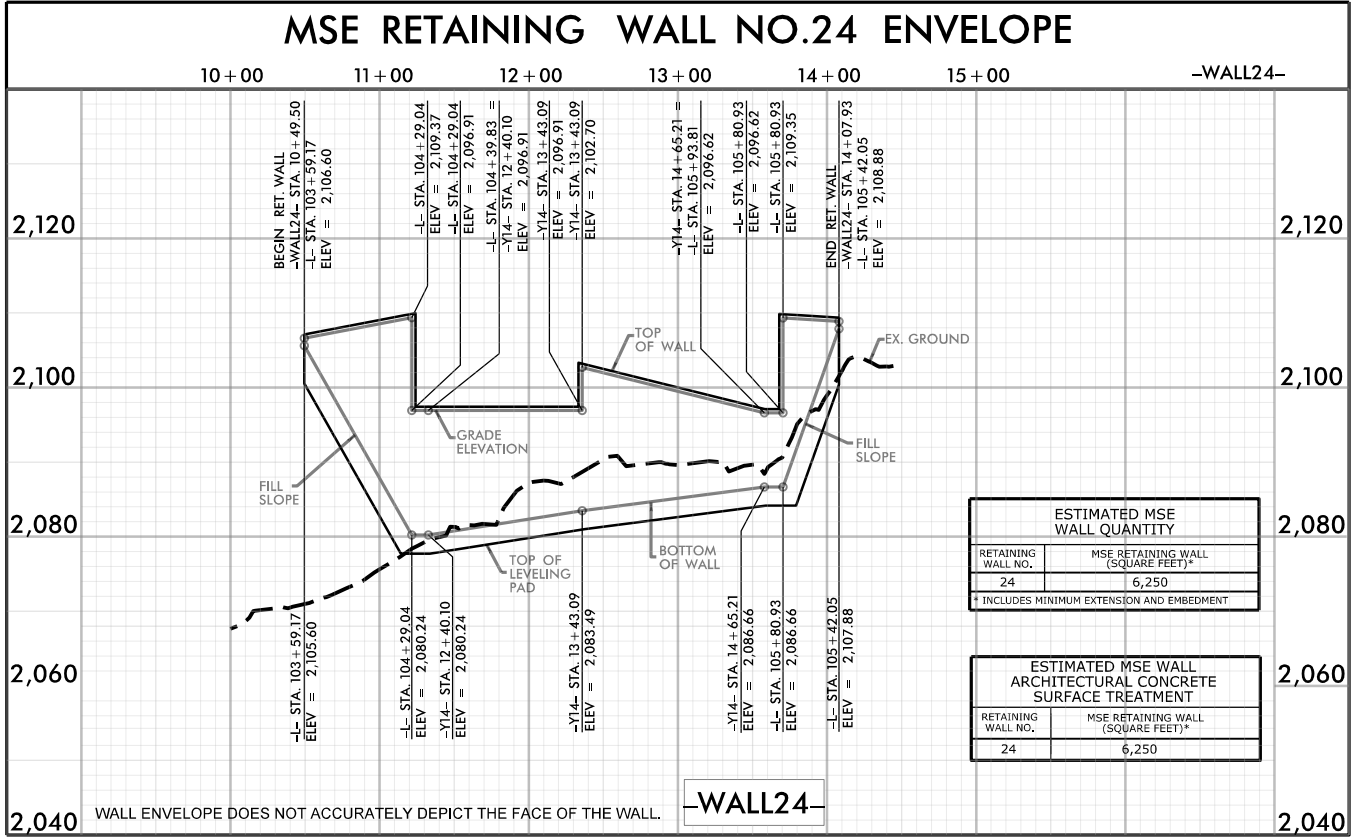
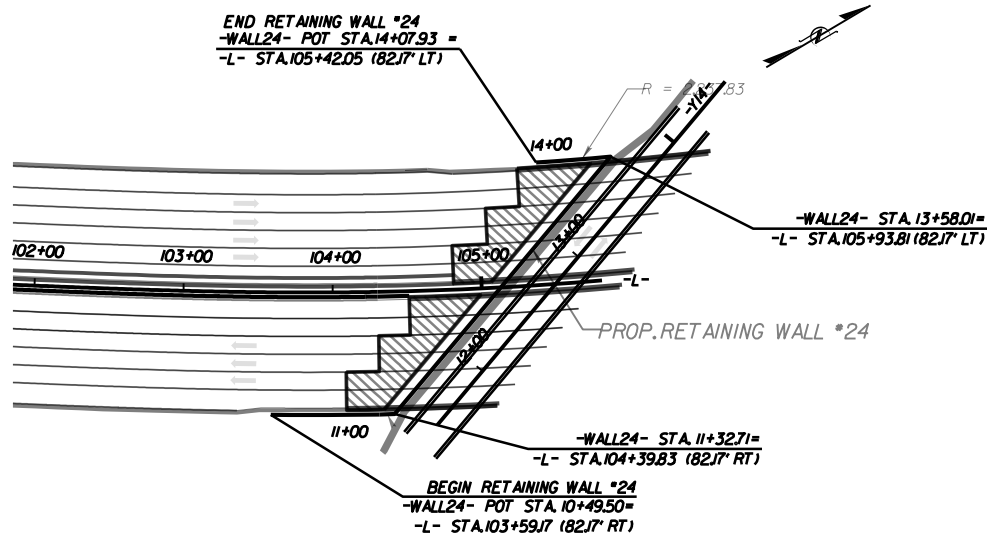
ECS SOUTHEAST, LLC
1812 CENTER PARK DRIVE, SUITE D
CHARLOTTE, NC 28217
(704) 525-5152 [PHONE]
(704) 357-0023 [FAX]
NC REGISTERED
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FIRM # F-1519

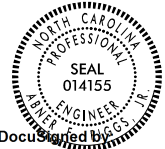


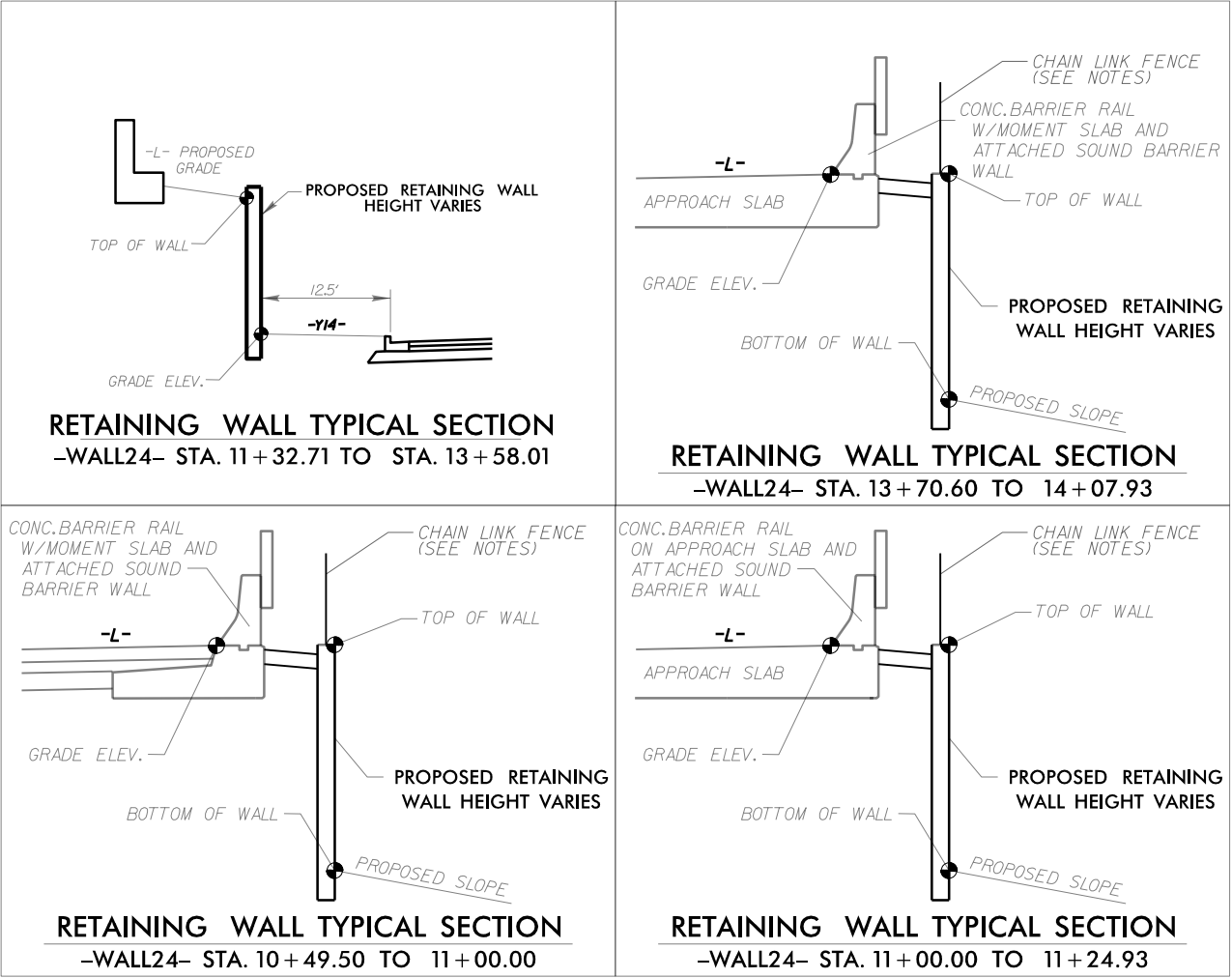
NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

GEOTECHNICAL
ENGINEERING UNIT

MSE RETAINING WALL NO.24 PLAN



PROJECT REFERENCE NO.		SHEET NO.	
I-2513AC		W-59	
GEOTECHNICAL ENGINEER		ENGINEER	
		DATE	
DocuSign Envelope ID: C2E8474B-99AD-074B-1		DATE	
Almer Riggs Jr. 7/22/2026		DATE	
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED			



PROJECT NO.: 34165.1.6 (I-2513AC)
BUNCOMBE COUNTY
STATION: STA. 10+49.50 TO 14+07.93 -WALL24-
SHEET 1 OF 5 WALL ID RW-24



RETAINING WALL NO. 24
MSE WALL WITH PRECAST PANELS
WITH MOMENT SLAB
PLAN AND ENVELOPE

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1	FIELDS, W. D.	5/4/26	3	FIELDS, W. D.	6/8/26	
2	FIELDS, W. D.	5/26/26	4	FIELDS, W. D.	6/15/26	

PREPARED BY: ALMULLA, H.	DATE: 04/14/2026
REVIEWED BY: RIGGS, JR., A. F.	DATE: 04/14/2026



4" THICK CONCRETE SLOPE PROTECTION

MOMENT SLAB

CIP REINFORCED CONCRETE COPING

DOWEL

PANEL THICKNESS (t)

4" THICK CONCRETE SLOPE PROTECTION

MOMENT SLAB

CIP REINFORCED CONCRETE COPING

4" MIN

PANEL THICKNESS (t)

COPING DETAILS

Prepar

AT THE CONTRACTOR'S OPTION, CONNECT COPING TO PANELS
WITH DOWELS OR EXTEND COPING DOWN BACK OF PANELS.



**GEOTECHNICAL
ENGINEERING UNIT**

PROJECT NO.: 34165.1.6 (I-2513AC)
BUNCOMBE COUNTY
 STATION: STA. 10+49.50 TO 14+07.93 -WALL24-
SHEET 2 OF 5 WALL ID RW-24

RETAINING WALL NO. 24
MSE WALL WITH PRECAST PANELS
WITH MOMENT SLAB
TYPICAL SECTION AND NOTES

REVISIONS					
NO.	BY	DATE	NO.	BY	DATE
1	FIELDS, W. D.	5/4/26	4	FIELDS, W. D.	6/8/26
2	FIELDS, W. D.	5/12/26	5	FIELDS, W. D.	5/26/26
3	FIELDS, W. D.	5/26/26	6	FIELDS, W. D.	6/17/26

SHEE
NO.

PREPARED BY: ALMULLA, H.	DATE: 04/14/2026
REVIEWED BY: RIGGS, JR., A. F.	DATE: 04/14/2026

PROJECT REFERENCE NO. I-2513AC SHEET NO. W-61

GEOTECHNICAL
ENGINEER

ENGINEER



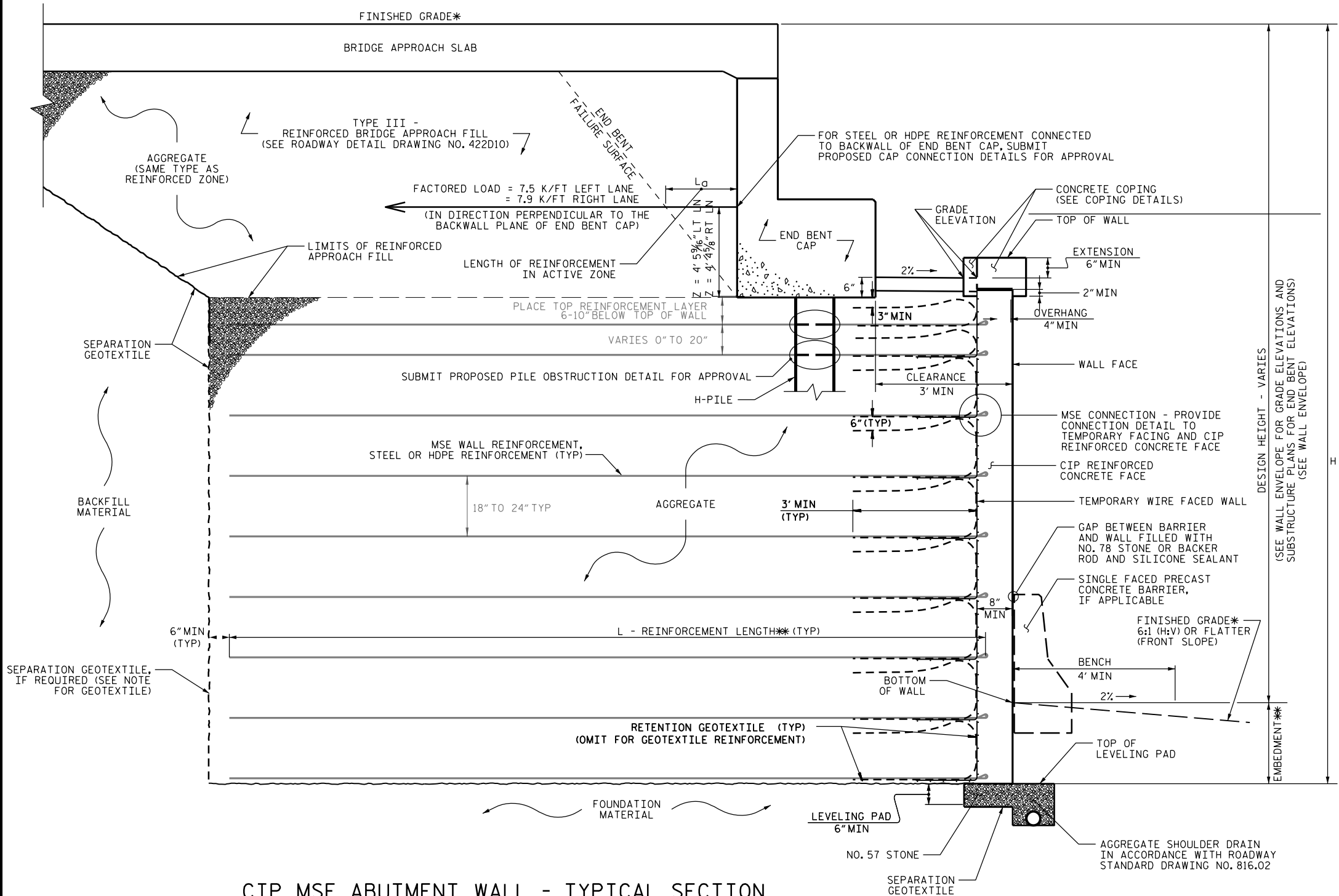
DocuSigned by

Albert Riggs Jr.

7/22/2026

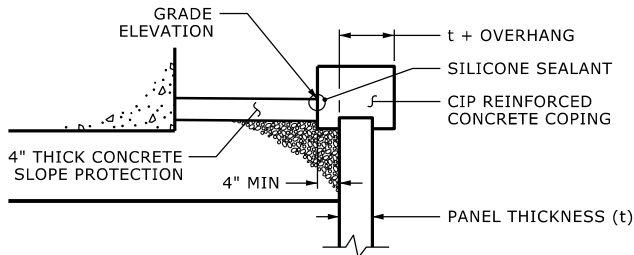
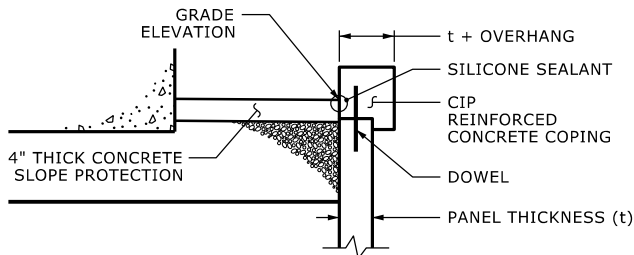
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DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED



CIP MSE ABUTMENT WALL - 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.



COPING DETAILS

AT THE CONTRACTOR'S OPTION, CONNECT
COPING TO PANELSWITH DOWELS OR
EXTEND COPING DOWN BACK OF PANELS.

PROJECT NO.: 34165.1.6 (I-2513AC)
BUNCOMBE COUNTY
STATION: STA. 10+49.50 TO 14+07.93 -WALL24-
SHEET 3 OF 5 WALL ID RW-24

RETAINING WALL NO.24
MSE WALL WITH PRECAST PANELS
FOR BRIDGE ABUTMENT
TYPICAL AND COPING DETAILS

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1	FIELDS, W. D.	5/4/26	4	FIELDS, W. D.	6/8/26	
2	FIELDS, W. D.	5/12/26	5	FIELDS, W. D.	5/26/26	
3	FIELDS, W. D.	5/26/26	6	FIELDS, W. D.	6/17/26	

Prepared in the Office of:



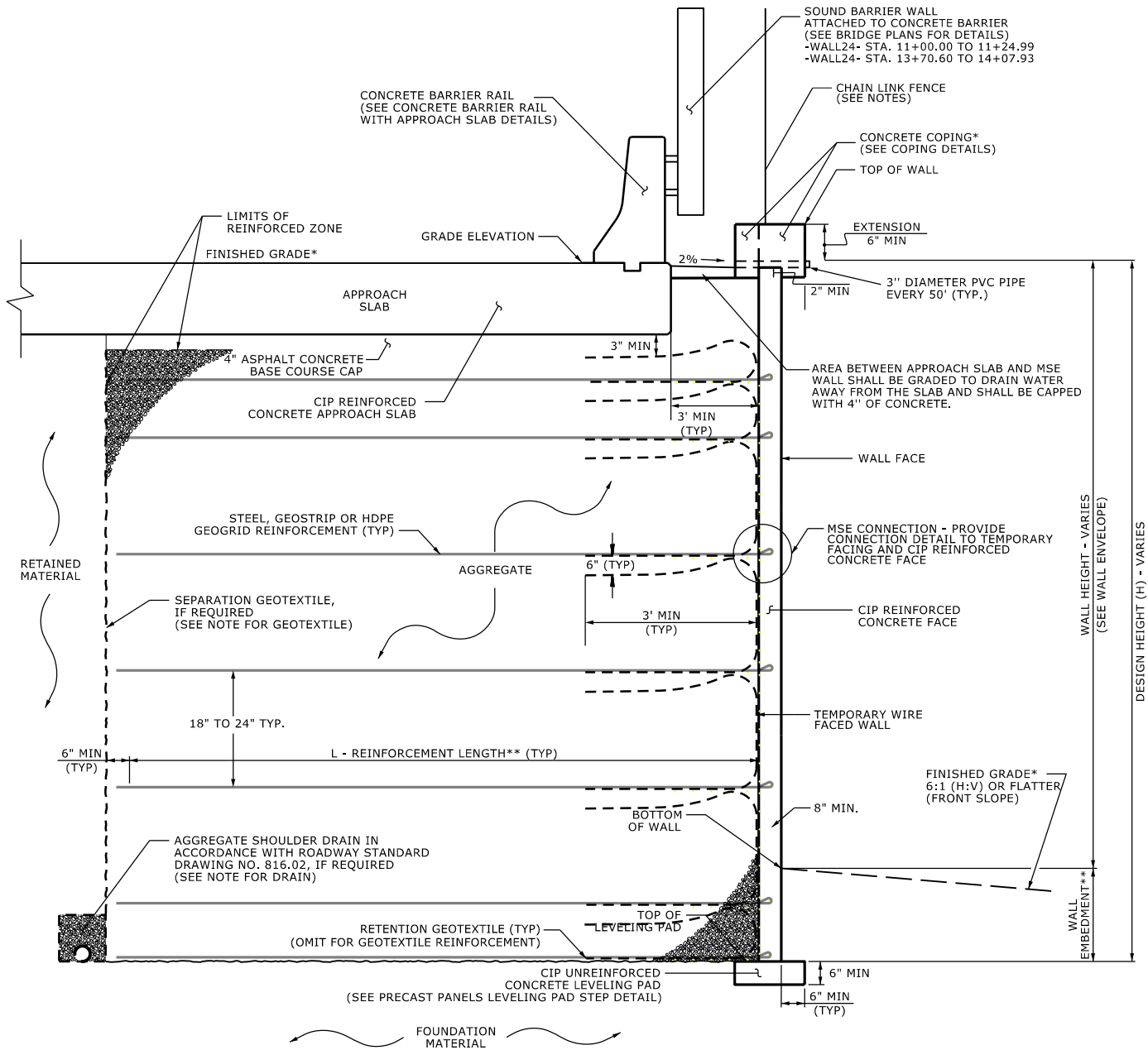
3150 SPRING FOREST ROAD, SUITE 100
RALPH, NORTH CAROLINA 27616
NC REGISTERED ENGINEERING FIRM: F-0869
NC REGISTERED GEOLOGIC FIRM: C-367



NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

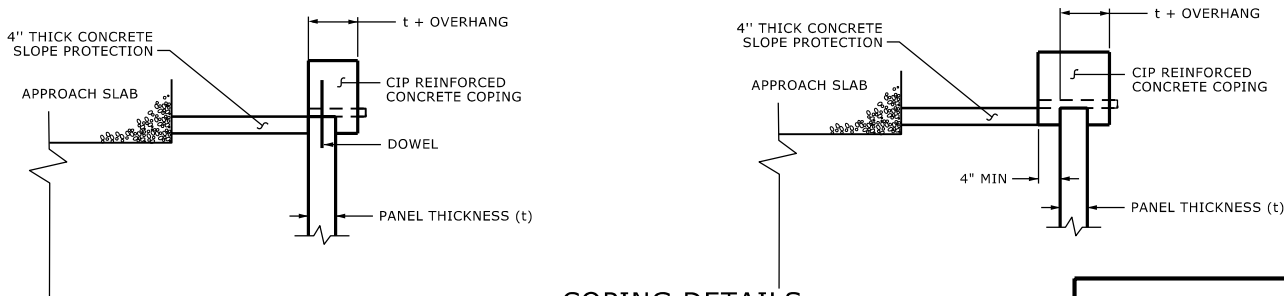
GEOTECHNICAL
ENGINEERING UNIT

PREPARED BY: ALMULLA, H.	DATE: 04/14/2026
REVIEWED BY: RIGGS, Jr., A. F.	DATE: 04/14/2026



CIP MSE WALL - 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.



COPING DETAILS

AT THE CONTRACTOR'S OPTION, CONNECT COPING TO PANELS WITH DOWELS OR EXTEND COPING DOWN BACK OF PANELS.

PROJECT REFERENCE NO.
I-2513AC

SHEET NO.
W-62

ENGINEER

Almer T. Riggs, Jr.
7/22/2026

ENGINEER
DATE: _____
SIGNATURE: _____
DATE: _____

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UNLESS ALL SIGNATURES COMPLETED

PROJECT NO.: 34165.1.6 (I-2513AC)
BUNCOMBE COUNTY
STATION: STA. 10+49.50 TO 14+07.93 -WALL24-
SHEET 4 OF 5 WALL ID RW-24

RETAINING WALL NO. 24
MSE WALL WITH PRECAST PANELS
WITH APPROACH SLAB
TYPICAL SECTION AND NOTES

REVISIONS					
NO.	BY	DATE	NO.	BY	DATE
1	FIELDS, W. D.	5/4/26	5	FIELDS, W. D.	5/26/26
2	FIELDS, W. D.	5/12/26	4	FIELDS, W. D.	6/8/26
3	FIELDS, W. D.	5/26/26	6	FIELDS, W. D.	6/17/26

SHEET NO.

PREPARED BY: ALMULLA, H.	DATE: 04/14/2026
REVIEWED BY: RIGGS, JR., A. F.	DATE: 04/14/2026

Prepared in the Office of:

3150 SPRING FOREST ROAD, SUITE 100
RALEIGH, NORTH CAROLINA 27616
NC REGISTERED ENGINEERING FIRM: F-0869
NC REGISTERED GEOLOGIC FIRM: C-367



NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

GEOTECHNICAL
ENGINEERING UNIT

NOTES:

FOR MECHANICALLY STABILIZED EARTH (MSE) RETAINING WALLS, SEE MECHANICALLY STABILIZED EARTH RETAINING WALLS PROVISION.

FOR TYPE 2 BRIDGE APPROACH FILL, SEE BRIDGE APPROACH FILLS PROVISION AND ROADWAY STANDARD DRAWING NO. 423.03.

FOR SINGLE FACED PRECAST CONCRETE BARRIER, SEE ROADWAY PLANS AND SECTION 857 OF THE STANDARD SPECIFICATIONS.

A CONCRETE BARRIER RAIL WITH MOMENT SLAB IS REQUIRED ABOVE RETAINING WALL NO. 24. SEE PLANS FOR CONCRETE BARRIER RAIL WITH MOMENT SLAB DETAILS.

AT THE CONTRACTOR'S OPTION, USE FINE AGGREGATE IN THE REINFORCED ZONE OF RETAINING WALL NO. 24.

CIP REINFORCED CONCRETE COPING AND FACING IS REQUIRED FOR RETAINING WALL NO 24.

AN ARCHITECTURAL CONCRETE SURFACE TREATMENT IS REQUIRED FOR RETAINING WALL NO. 24. SEE "ARCHITECTURAL CONCRETE SURFACE TREATMENT" SPECIAL PROVISION

CLOSE COORDINATION WITH STRUCTURAL PLANS IS REQUIRED. SEE BRIDGE PLANS FOR ADDITIONAL DETAILS FOR REQUIRED WALL AESTHETICS AND GEOMETRIC TIE-IN BETWEEN MSE WALL, CAST-IN-PLACE FACING, AND CAST-IN-PLACE COPINGS THAT ACHIEVE THE DESIRED AESTHETIC RESULT AS DEPICTED IN THE STRUCTURAL PLAN DETAILS. THESE DETAILS SHALL BE APPROVED BY THE ENGINEER BEFORE BEGINNING CONSTRUCTION OF THE BRIDGE WALLS. THE COST FOR ACHIEVING THE PLAN - INDICATED GEOMETRIC AESTHETIC RESULT, INCLUDING CUSTOM COPING, TOOLED JOINT LINES, AND ALL ASSOCIATED LABOR AND MATERIALS, SHALL BE INCIDENTAL TO THE COST OF "MSE RETAINING WALL NO. 24".

CAST-IN-PLACE FACING AND CORNER COPINGS AT THE BRIDGE END BENT SHALL NOT BE INSTALLED UNTIL AFTER A MINIMUM PERIOD OF 30 DAYS SINCE PLACING THE LAST BRIDGE APPROACH FILL OR SETTLEMENT HAS REACHED 90% OF THE MAXIMUM ANTICIPATED LONG-TERM SETTLEMENT.

THE BRIDGE END BENT SHALL BE BUILT IN ITS ENTIRETY BEFORE INSTALLING THE CIP FACING.

THE CIP FACING SHALL BE INSTALLED CONTINUOUSLY BETWEEN LEFT AND RIGHT LANE BRIDGES WITH NO STAGED CONSTRUCTION JOINT.

A SEPARATION GEOTEXTILE IS REQUIRED AT THE BACK OF THE REINFORCED ZONE FOR RETAINING WALL NO. 24.

A DRAIN IS REQUIRED FOR RETAINING WALL NO. 24.

BEFORE BEGINNING MSE WALL DESIGN FOR RETAINING WALL NO. 24, 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. 24 FOR THE FOLLOWING:
- 1) DESIGN HEIGHT (H) = WALL HEIGHT + WALL EMBEDMENT
 - 2) DESIGN LIFE = 100 YEARS
 - 3) MAXIMUM FACTORED VERTICAL PRESSURE ON FOUNDATION MATERIAL = 4,340PSF
 - 4) MINIMUM REINFORCEMENT LENGTH (L) = 0.7(H) OR 6.0 FT, WHICHEVER IS LONGER
 - 5) MINIMUM EMBEDMENT ELEVATION = 2.5 FT
 - 6) REINFORCED ZONE AGGREGATE PARAMETERS:

AGGREGATE TYPE*	UNIT WEIGHT (γ) PCF	FRICTION ANGLE (φ)	COHESION (c)
COARSE	110	DEGREES	PSF
FINE	115	38	0
*SEE MSE RETAINING WALLS PROVISION FOR COARSE AND FINE AGGREGATE MATERIAL REQUIREMENTS.			

7) IN-SITU ASSUMED MATERIAL PARAMETERS:

MATERIAL TYPE	UNIT WEIGHT (γ) PCF	FRICTION ANGLE (φ)	COHESION (c)
RETAINED	120	DEGREES	PSF
FOUNDATION	115	30	0

THE WALL SITE FOR RETAINING WALL NO. 24 LOCATED AT END BENT NO. 1 IS CLASSIFIED AS AASHTO SITE CLASS D.

DESIGN RETAINING WALL NO. 24 FOR A LIVE LOAD (TRAFFIC) SURCHARGE.

DESIGN RETAINING WALL NO. 24 TO ACCOUNT FOR WIND EXPOSURE CATAGORY B (WIND PRESSURE = 27 PSF) WHERE SOUND BARRIER WALL IS ATTACHED TO THE CONCRETE BARRIER WALL (-WALL24- STA. 10+49.50 TO 11+00.00).

DESIGN REINFORCEMENT CONNECTED TO END BENT CAPS FOR FACTORED LOAD AND LENGTH OF REINFORCEMENT IN ACTIVE ZONE (L) SHOWN. CAST REINFORCEMENT OR CONNECTORS INTO CAP BACKWALL FOR END BENT NO. 1 LOCATED AT STATION 105+03 -L-. MAINTAIN A CLEARANCE OF AT LEAST 3" BETWEEN REINFORCEMENT OR CONNECTORS AND REINFORCING STEEL IN CAP.

FOUNDATIONS FOR SIGNS, LIGHTING or SIGNALS WILL BE LOCATED BEHIND RETAINING WALL NO. 24 AND MAY INTERFERE WITH REINFORCEMENT. BEFORE BEGINNING MSE WALL CONSTRUCTION, SUBMIT PROPOSED CONSTRUCTION METHODS FOR THESE FOUNDATIONS FOR APPROVAL.

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. 24.

FOUNDATIONS FOR END BENT NO. 1 LOCATED AT STATION 105+03 -L- MAY INTERFERE WITH REINFORCEMENT FOR RETAINING WALL NO. 24. SEE "FOUNDATION LAYOUT" SHEET FOR FOUNDATION LOCATIONS.

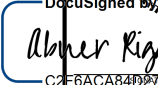
DO NOT PLACE LEVELING PAD CONCRETE, AGGREGATE OR REINFORCEMENT FOR RETAINING WALL NO. 24 UNTIL EXCAVATION DIMENSIONS AND FOUNDATION MATERIAL ARE APPROVED.

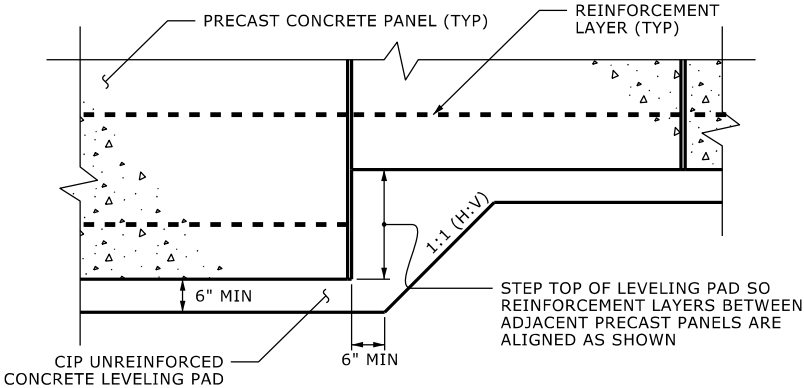
DESIGN RETAINING WALL NO. 24 TO INCORPORATE DRAIN DROP INLET STRUCTURES AND PIPES WITHIN REINFORCED ZONE OF WALL NO. 24 INCLUDE DETAILS IN MSE DESIGN SUBMITTAL.

"TEMPORARY SHORING" IS REQUIRED FOR RETAINING WALL NO. 24 IN ACCORDANCE WITH THE TEMPORARY SHORING PROVISION. SEE ROADWAY, STRUCTURE or TRAFFIC CONTROL PLANS.

48" BLACK VINYL COATED CHAIN LINK FENCE IS REQUIRED FULL LENGTH OF WALL, WHERE NOT UNDER BRIDGE. SEE ROADWAY STANDARD 866.06 (ROADWAY DETAIL AND PAY ITEM).

CONDUIT EMBEDDED IN CIP WALL FACE, SEE LIGHTING PLANS

PROJECT REFERENCE NO.	SHEET NO.
I-2513AC	W-63
GEOTECHNICAL ENGINEER 	ENGINEER
DocuSigned by  7/22/2026 C2F6ACA84D274B1...	DATE SIGNATURE DATE
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	



PRECAST PANELS
LEVELING PAD STEP DETAIL

PROJECT NO.: 34165.1.6 (I-2513AC)

BUNCOMBE COUNTY

STATION: STA. 10+49.50 TO 14+07.93 -WALL24-

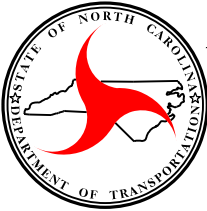
SHEET 5 OF 5 WALL ID RW-24

PREPARED BY: ALMULLA, H.	DATE: 04/14/2026
REVIEWED BY: RIGGS, Jr., A. F.	DATE: 04/14/2026

Prepared in the Office of:



3150 SPRING FOREST ROAD, SUITE 100
RALPH, NORTH CAROLINA 27616
NC REGISTERED ENGINEERING FIRM: F-0869
NC REGISTERED GEOLOGIC FIRM: C-367



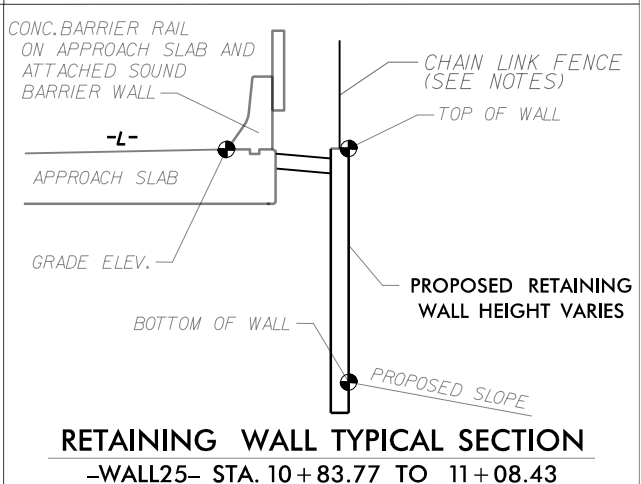
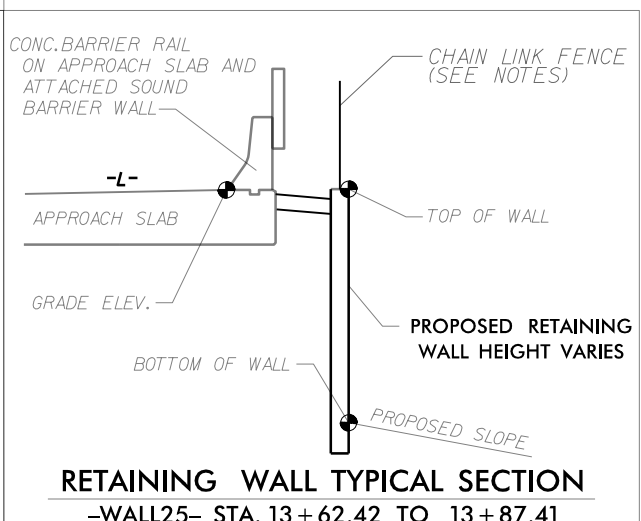
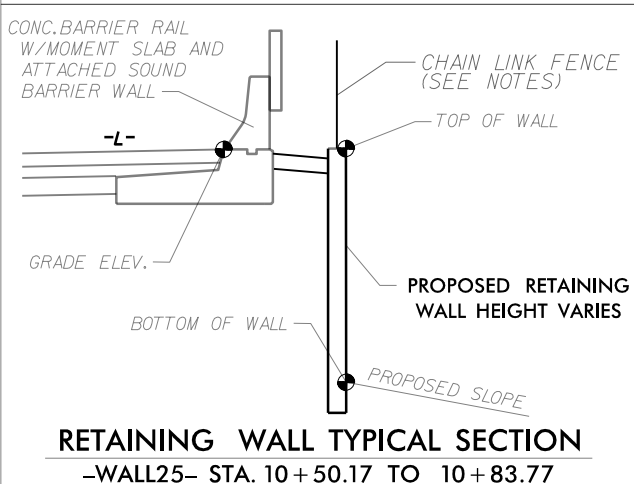
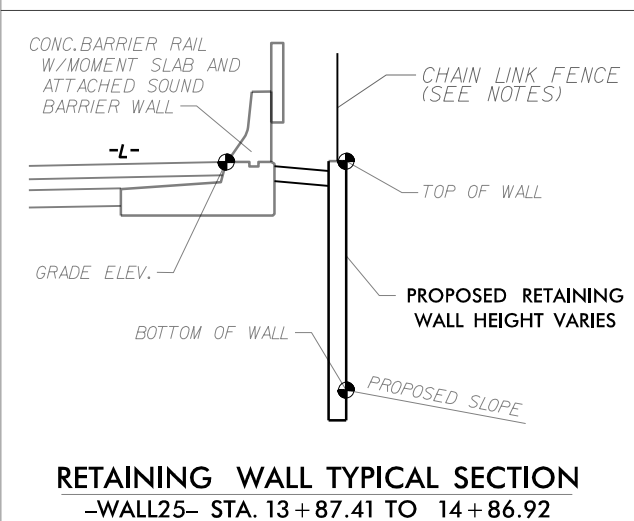
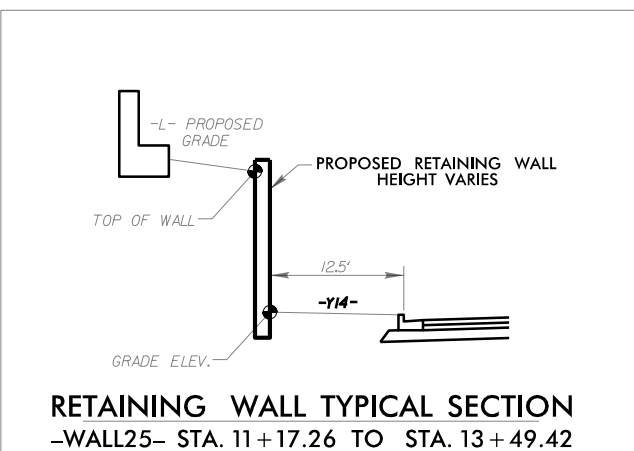
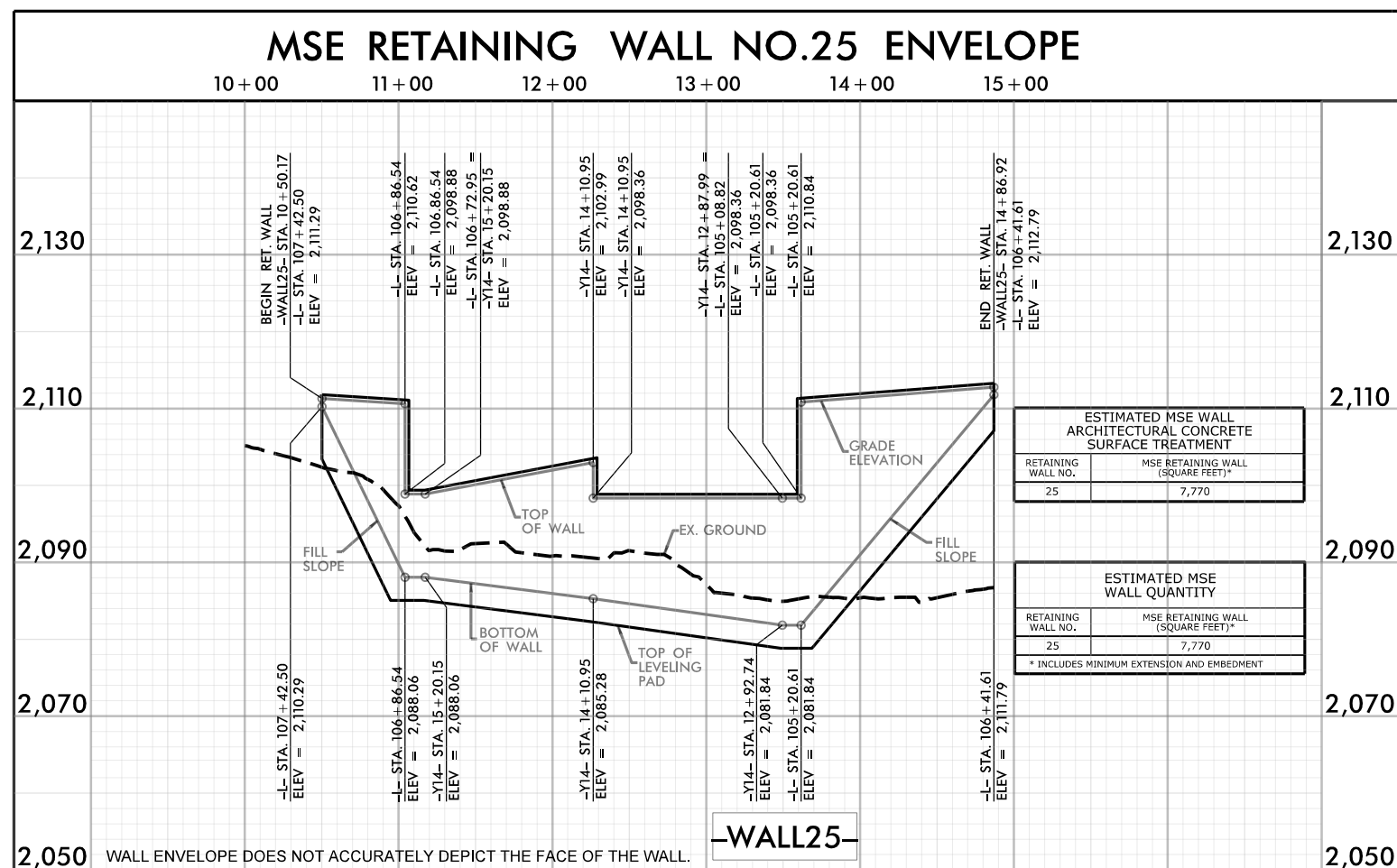
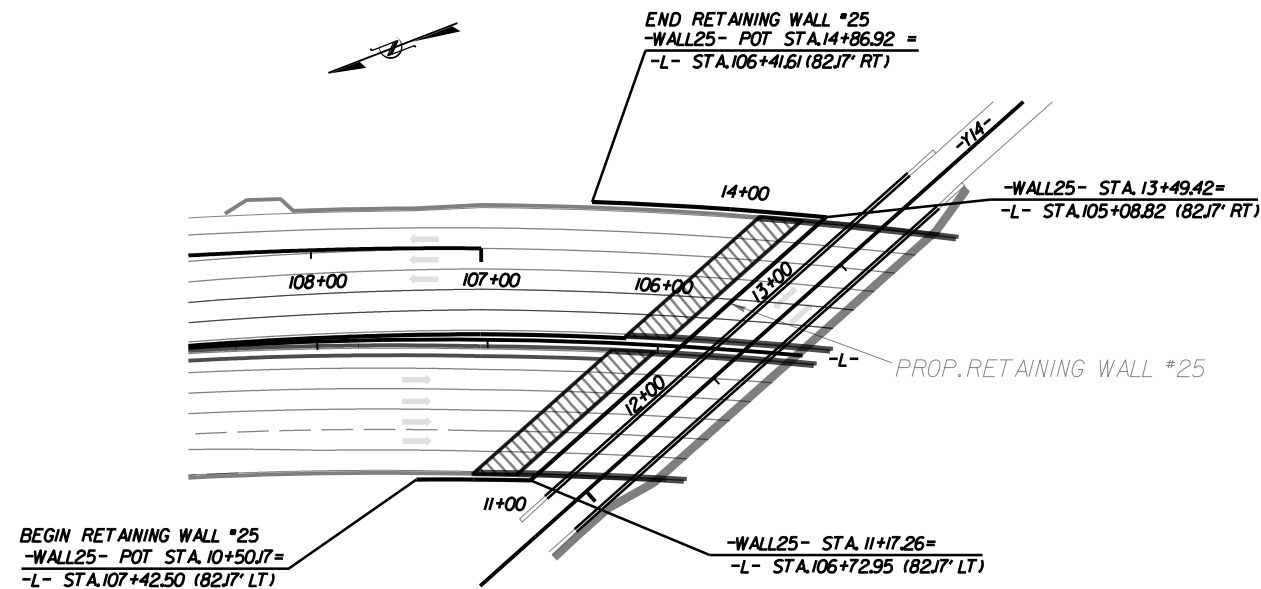
NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

GEOTECHNICAL
ENGINEERING UNIT

RETAINING WALL NO. 24
MSE WALL WITH PRECAST PANELS
WITH MOMENT SLAB
LEVELING PAD STEP DETAIL AND NOTES

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1	FIELDS, W. D.	5/4/26	4	FIELDS, W. D.	6/8/26	
2	FIELDS, W. D.	5/12/26	5	FIELDS, W. D.	5/26/26	
3	FIELDS, W. D.	5/26/26	6	FIELDS, W. D.	6/17/26	

MSE RETAINING WALL NO.25 PLAN



PROJECT NO.: 34165.1.6 (I-2513AC)
BUNCOMBE COUNTY
 STATION: STA. 10+50.17 TO 14+86.92 -WALL25-
 SHEET 1 OF 5 WALL ID RW-25

PREPARED BY: ALMULLA, H.	DATE: 04/14/2026
REVIEWED BY: RIGGS, JR., A. F.	DATE: 04/14/2026

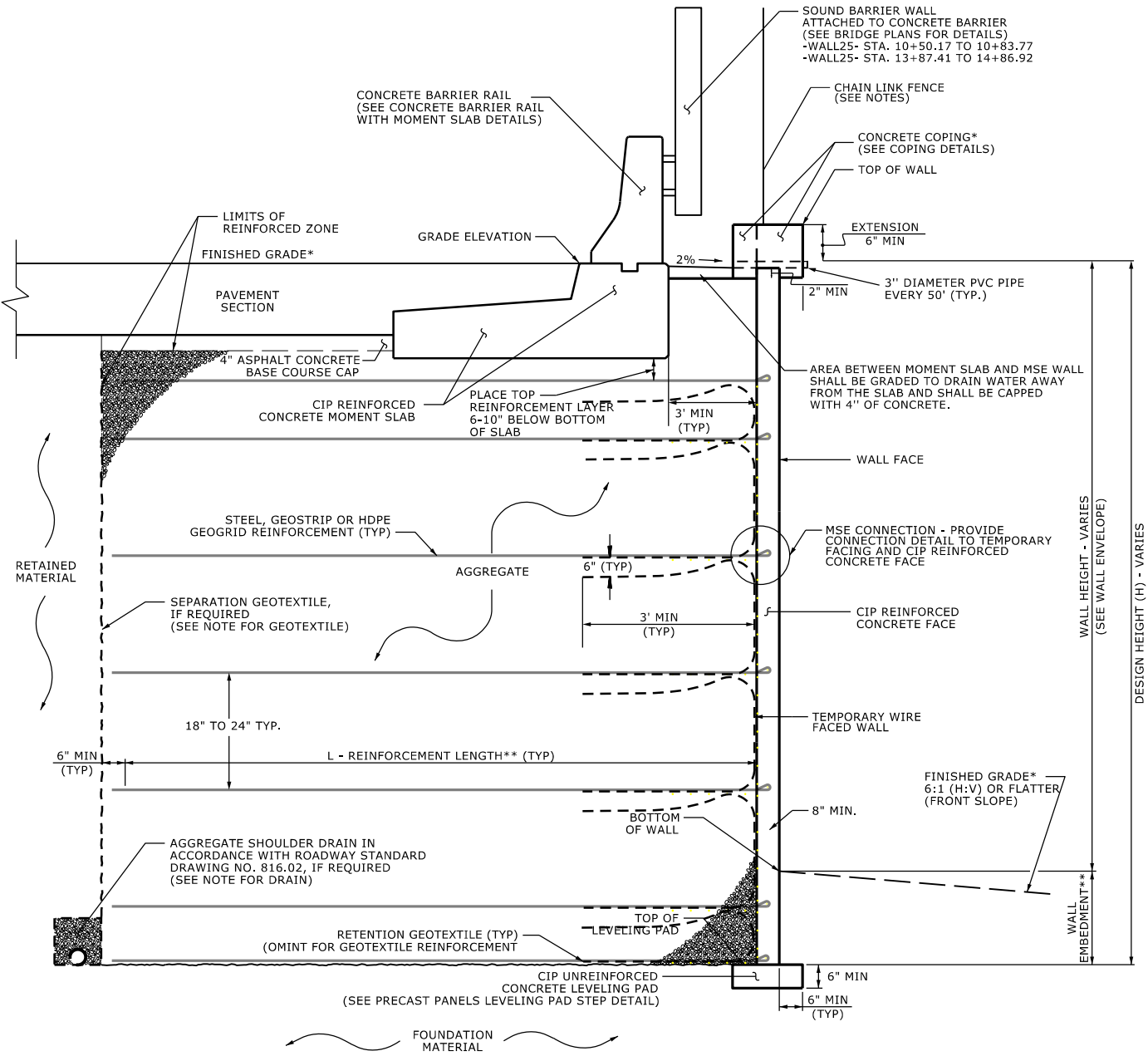
Prepared in the Office of:

 **Terracon**

3150 SPRING FOREST ROAD, SUITE 100
RALPHIGH, NORTH CAROLINA 27616
NC REGISTERED ENGINEERING FIRM: E-9869
NC REGISTERED GEOLOGIC FIRM: C-397

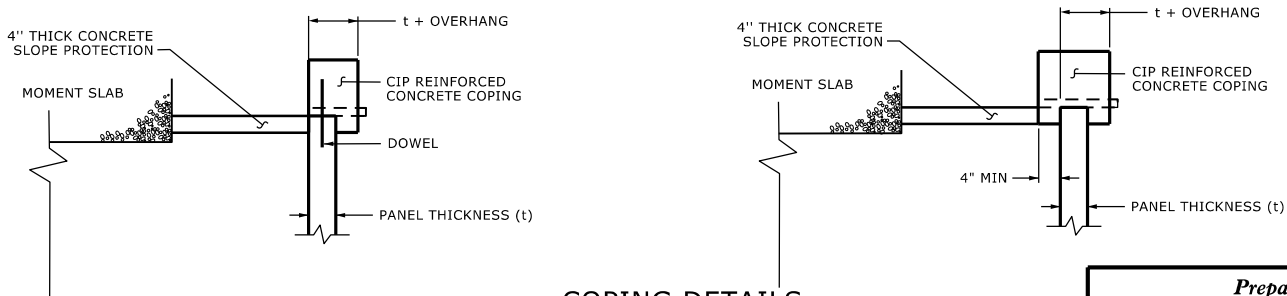
RETAINING WALL NO. 25
MSE WALL WITH PRECAST PANELS
WITH MOMENT SLAB
PLAN AND ENVELOPE

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1	FIELDS, W. D.	6/8/26	3			
2			4			



CIP MSE WALL - 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.



COPING DETAILS

AT THE CONTRACTOR'S OPTION, CONNECT COPING TO PANELS WITH DOWELS OR EXTEND COPING DOWN BACK OF PANELS.

PROJECT REFERENCE NO. I-2513AC		SHEET NO. W-65	
ENGINEER  DocuSigned by <i>Almer Riggs Jr.</i> 7/22/2026 C2E6ACA84027481		ENGINEER	
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED			

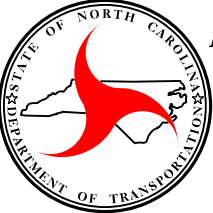
PREPARED BY: ALMULLA, H.	DATE: 04/14/2026
REVIEWED BY: RIGGS, JR., A. F.	DATE: 04/14/2026

Prepared in the Office of:



3150 SPRING FOREST ROAD, SUITE 100
RALEIGH, NORTH CAROLINA 27616
NC REGISTERED ENGINEERING FIRM: F-0869
NC REGISTERED GEOLOGIC FIRM: C-367

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



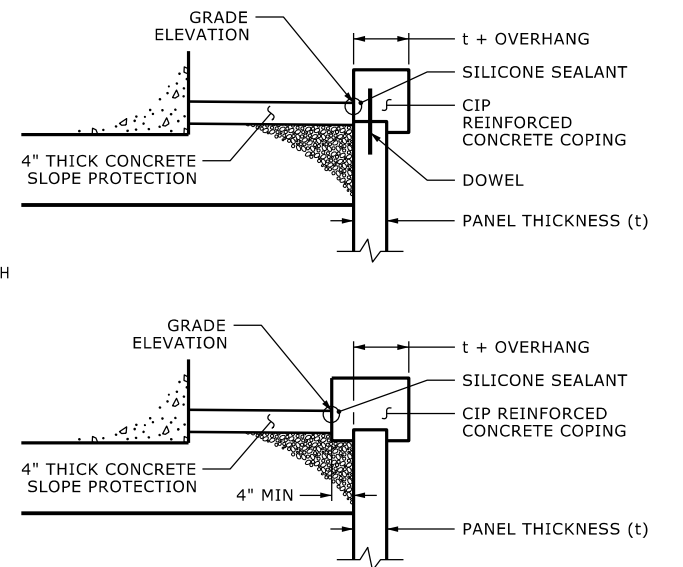
**GEOTECHNICAL
ENGINEERING UNIT**

PROJECT NO.: 34165.1.6 (I-2513AC)
BUNCOMBE COUNTY
STATION: STA. 10+50.17 TO 14+86.92 -WALL25-
SHEET 2 OF 5 WALL ID RW-25

RETAINING WALL NO. 25
MSE WALL WITH PRECAST PANELS
WITH MOMENT SLAB
TYPICAL SECTION AND NOTES

REVISIONS					
NO.	BY	DATE	NO.	BY	DATE
1	FIELDS, W. D.	5/4/26	4	FIELDS, W. D.	6/8/26
2	FIELDS, W. D.	5/12/26	5	FIELDS, W. D.	5/26/26
3	FIELDS, W. D.	5/26/26	6	FIELDS, W. D.	6/17/26

SHEET NO.



AT THE CONTRACTOR'S OPTION, CONNECT
COPING TO PANELSWITH DOWELS OR
EXTEND COPING DOWN BACK OF PANELS.

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

PROJECT NO.: 34165.1.6 (I-2513AC)
BUNCOMBE COUNTY
STATION: STA. 10+50.17 TO 14+86.92 -WALL25-
SHEET 3 OF 5 WALL ID RW-25

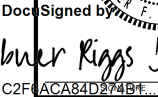


**GEOTECHNICAL
ENGINEERING UNIT**

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1	FIELDS, W. D.	5/4/26	4	FIELDS, W. D.	6/8/26	
2	FIELDS, W. D.	5/12/26	5	FIELDS, W. D.	5/26/26	
3	FIELDS, W. D.	5/26/26	6	FIELDS, W. D.	6/17/26	

N-67

ENGINEER



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**DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED**



AT THE CONTRACTOR'S OPTION, CONNECT COPING TO PANELS
WITH DOWELS OR EXTEND COPING DOWN BACK OF PANELS.



**GEOTECHNICAL
ENGINEERING UNIT**

PROJECT NO.: 34165.1.6 (I-2513AC)
BUNCOMBE COUNTY
 STATION: STA. 10+50.17 TO 14+86.92 -WALL25-
 SHEET 4 OF 5 WALL ID RW-25

RETAINING WALL NO. 25
MSE WALL WITH PRECAST PANELS
WITH APPROACH SLAB
TYPICAL SECTION AND NOTES

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1	FIELDS, W. D.	5/4/26	5	FIELDS, W. D.	5/26/26	
2	FIELDS, W. D.	5/12/26	4	FIELDS, W. D.	6/8/26	
3	FIELDS, W. D.	5/26/26	6	FIELDS, W. D.	6/17/26	

PREPARED BY: ALMULLA, H.	DATE: 04/14/2026
REVIEWED BY: RIGGS, JR., A. F.	DATE: 04/14/2026

NOTES:

FOR MECHANICALLY STABILIZED EARTH (MSE) RETAINING WALLS, SEE MECHANICALLY STABILIZED EARTH RETAINING WALLS PROVISION.

FOR TYPE 2 BRIDGE APPROACH FILL, SEE BRIDGE APPROACH FILLS PROVISION AND ROADWAY STANDARD DRAWING NO. 423.03.

FOR SINGLE FACED PRECAST CONCRETE BARRIER, SEE ROADWAY PLANS AND SECTION 857 OF THE STANDARD SPECIFICATIONS.

A CONCRETE BARRIER RAIL WITH MOMENT SLAB IS REQUIRED ABOVE RETAINING WALL NO. 25. SEE PLANS FOR CONCRETE BARRIER RAIL WITH MOMENT SLAB DETAILS.

AT THE CONTRACTOR'S OPTION, USE FINE AGGREGATE IN THE REINFORCED ZONE OF RETAINING WALL NO. 25.

CIP REINFORCED CONCRETE COPING AND FACING IS REQUIRED FOR RETAINING WALL NO 25.

AN ARCHITECTURAL CONCRETE SURFACE TREATMENT IS REQUIRED FOR RETAINING WALL NO. 25. SEE "ARCHITECTURAL CONCRETE SURFACE TREATMENT" SPECIAL PROVISION

CLOSE COORDINATION WITH STRUCTURAL PLANS IS REQUIRED. SEE BRIDGE PLANS FOR ADDITIONAL DETAILS FOR REQUIRED WALL AESTHETICS AND GEOMETRIC TIE-IN BETWEEN MSE WALL, CAST-IN-PLACE FACING, AND CAST-IN-PLACE COPINGS THAT ACHIEVE THE DESIRED AESTHETIC RESULT AS DEPICTED IN THE STRUCTURAL PLAN DETAILS. THESE DETAILS SHALL BE APPROVED BY THE ENGINEER BEFORE BEGINNING CONSTRUCTION OF THE BRIDGE WALLS. THE COST FOR ACHIEVING THE PLAN - INDICATED GEOMETRIC AESTHETIC RESULT, INCLUDING CUSTOM COPING, TOOLED JOINT LINES, AND ALL ASSOCIATED LABOR AND MATERIALS, SHALL BE INCIDENTAL TO THE COST OF "MSE RETAINING WALL NO. 25".

CAST-IN-PLACE FACING AND CORNER COPINGS AT THE BRIDGE END BENT SHALL NOT BE INSTALLED UNTIL AFTER A MINIMUM PERIOD OF 30 DAYS SINCE PLACING THE LAST BRIDGE APPROACH FILL OR SETTLEMENT HAS REACHED 90% OF THE MAXIMUM ANTICIPATED LONG-TERM SETTLEMENT.

THE BRIDGE END BENT SHALL BE BUILT IN ITS ENTIRETY BEFORE INSTALLING THE CIP FACING.

THE CIP FACING SHALL BE INSTALLED CONTINUOUSLY BETWEEN LEFT AND RIGHT LANE BRIDGES WITH NO STAGED CONSTRUCTION JOINT.

A SEPARATION GEOTEXTILE IS REQUIRED AT THE BACK OF THE REINFORCED ZONE FOR RETAINING WALL NO. 25.

A DRAIN IS REQUIRED FOR RETAINING WALL NO. 25.

BEFORE BEGINNING MSE WALL DESIGN FOR RETAINING WALL NO. 25, 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. 25 FOR THE FOLLOWING:

1) DESIGN HEIGHT (H) = WALL HEIGHT + WALL EMBEDMENT

2) DESIGN LIFE = 100 YEARS

3) MAXIMUM FACTORED VERTICAL PRESSURE ON FOUNDATION MATERIAL = 5,820 PSF

4) MINIMUM REINFORCEMENT LENGTH (L) = 0.7(H) OR 6.0 FT, WHICHEVER IS LONGER

5) MINIMUM EMBEDMENT ELEVATION = 3.0 FT

6) REINFORCED ZONE AGGREGATE PARAMETERS:

AGGREGATE TYPE*	UNIT WEIGHT (γ) PCF	FRICTION ANGLE (φ)	COHESION (c)
COARSE	110	DEGREES	PSF
FINE	115	38	0
*SEE MSE RETAINING WALLS PROVISION FOR COARSE AND FINE AGGREGATE MATERIAL REQUIREMENTS.			

7) IN-SITU ASSUMED MATERIAL PARAMETERS:

MATERIAL TYPE	UNIT WEIGHT (γ) PCF	FRICTION ANGLE (φ)	COHESION (c)
RETAINED	120	DEGREES	PSF
FOUNDATION	115	30	0

THE WALL SITE FOR RETAINING WALL NO. 25 LOCATED AT END BENT NO. 1 IS CLASSIFIED AS AASHTO SITE CLASS D.

DESIGN RETAINING WALL NO. 25 FOR A LIVE LOAD (TRAFFIC) SURCHARGE.

DESIGN RETAINING WALL NO. 25 TO ACCOUNT FOR WIND EXPOSURE CATAGORY B (WIND PRESSURE = 27 PSF) WHERE SOUND BARRIER WALL IS ATTACHED TO THE CONCRETE BARRIER WALL (-WALL25- STA. 10+50.17 TO 110+83.77 AND -WALL25- STA. 13+87.41 TO 14+86.92).

DESIGN REINFORCEMENT CONNECTED TO END BENT CAPS FOR FACTORED LOAD AND LENGTH OF REINFORCEMENT IN ACTIVE ZONE (L) SHOWN. CAST REINFORCEMENT OR CONNECTORS INTO CAP BACKWALL FOR END BENT NO. 1 LOCATED AT STATION 105+97 -L-. MAINTAIN A CLEARANCE OF AT LEAST 3" BETWEEN REINFORCEMENT OR CONNECTORS AND REINFORCING STEEL IN CAP.

FOUNDATIONS FOR SIGNS, LIGHTING or SIGNALS WILL BE LOCATED BEHIND RETAINING WALL NO. 25 AND MAY INTERFERE WITH REINFORCEMENT. BEFORE BEGINNING MSE WALL CONSTRUCTION, SUBMIT PROPOSED CONSTRUCTION METHODS FOR THESE FOUNDATIONS FOR APPROVAL.

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. 25.

FOUNDATIONS FOR END BENT NO. 1 LOCATED AT STATION 105+97 -L- MAY INTERFERE WITH REINFORCEMENT FOR RETAINING WALL NO. 25. SEE "FOUNDATION LAYOUT" SHEET FOR FOUNDATION LOCATIONS.

DO NOT PLACE LEVELING PAD CONCRETE, AGGREGATE OR REINFORCEMENT FOR RETAINING WALL NO. 25 UNTIL EXCAVATION DIMENSIONS AND FOUNDATION MATERIAL ARE APPROVED.

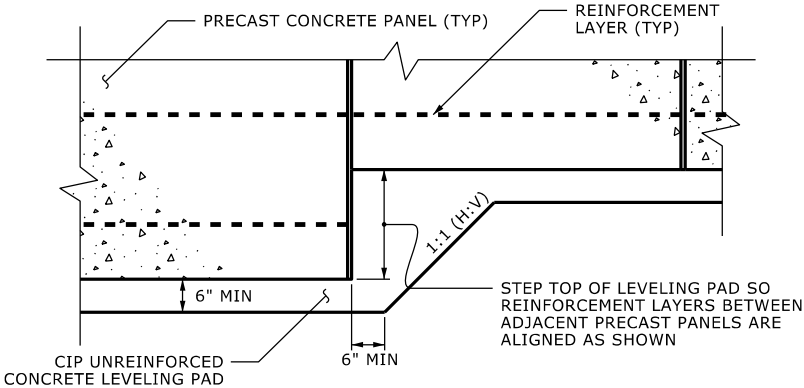
DESIGN RETAINING WALL NO. 25 TO INCORPORATE DRAIN DROP INLET STRUCTURES AND PIPES WITHIN REINFORCED ZONE OF WALL NO. 25 INCLUDE DETAILS IN MSE DESIGN SUBMITTAL.

"TEMPORARY SHORING" IS REQUIRED FOR RETAINING WALL NO. 25 IN ACCORDANCE WITH THE TEMPORARY SHORING PROVISION. SEE ROADWAY, STRUCTURE or TRAFFIC CONTROL PLANS.

48" BLACK VINYL COATED CHAIN LINK FENCE IS REQUIRED FULL LENGTH OF WALL, WHERE NOT UNDER BRIDGE. SEE ROADWAY STANDARD 866.06 (ROADWAY DETAIL AND PAY ITEM).

CONDUIT EMBEDDED IN CIP WALL FACE, SEE LIGHTING PLANS

PROJECT REFERENCE NO.	SHEET NO.
I-2513AC	W-68
GEOTECHNICAL ENGINEER  ENGINEER	ENGINEER
DocuSigned by:  7/22/2026	
C2F6AC84D274B4	SIGNATURE DATE
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	



PRECAST PANELS
LEVELING PAD STEP DETAIL

PROJECT NO.: 34165.1.6 (I-2513AC)

BUNCOMBE COUNTY

STATION: STA. 10+50.17 TO 14+86.92 -WALL25-

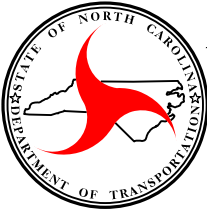
SHEET 5 OF 5 WALL ID RW-25

PREPARED BY: ALMULLA, H.	DATE: 04/14/2026
REVIEWED BY: RIGGS, Jr., A. F.	DATE: 04/14/2026

Prepared in the Office of:



3150 SPRING FOREST ROAD, SUITE 100
RALPH, NORTH CAROLINA 27616
NC REGISTERED ENGINEERING FIRM: F-0869
NC REGISTERED GEOLOGIC FIRM: C-367



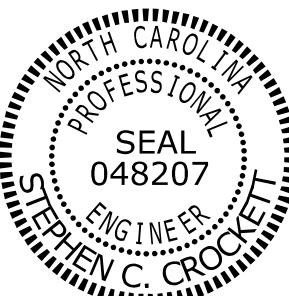
NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

GEOTECHNICAL
ENGINEERING UNIT

RETAINING WALL NO. 25
MSE WALL WITH PRECAST PANELS
WITH MOMENT SLAB
LEVELING PAD STEP DETAIL AND NOTES

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1	FIELDS, W. D.	5/4/26	4	FIELDS, W. D.	6/8/26	
2	FIELDS, W. D.	5/12/26	5	FIELDS, W. D.	5/26/26	
3	FIELDS, W. D.	5/26/26	6	FIELDS, W. D.	6/17/26	

GEOTECHNICAL
ENGINEER

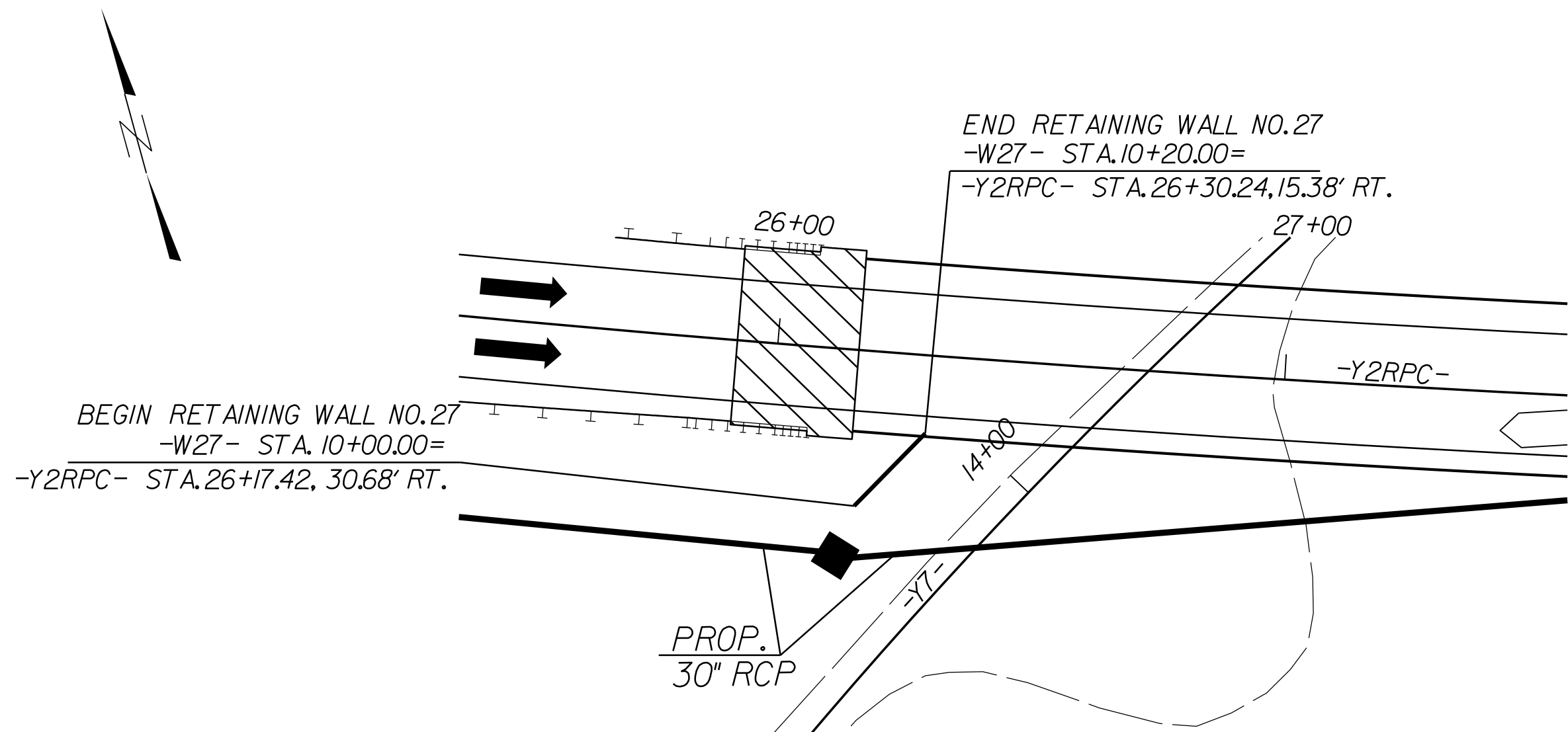


DocuSigned by:
Stephen Crockett 7/22/2026

SIGNATURE DATE

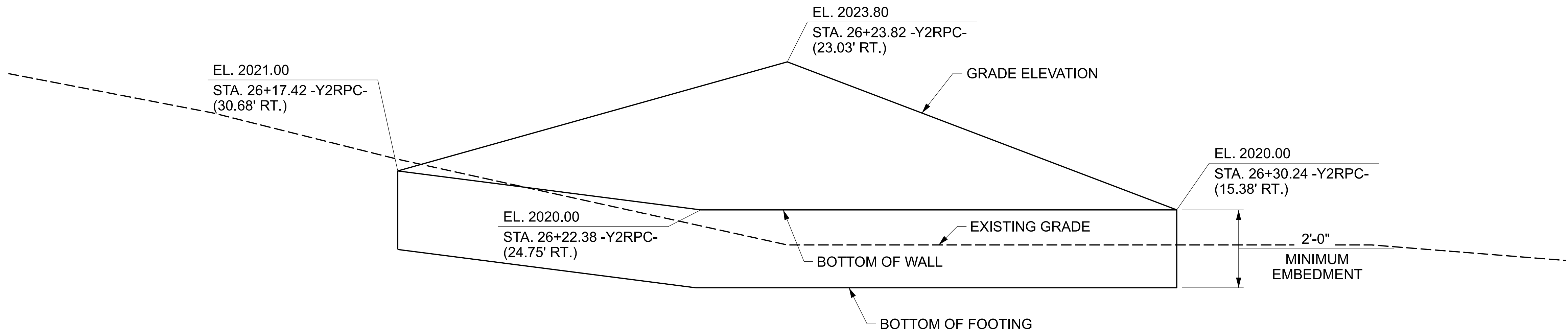
ENGINEER

SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

RETAINING WALL NO. 27 PLAN
NOT TO SCALE

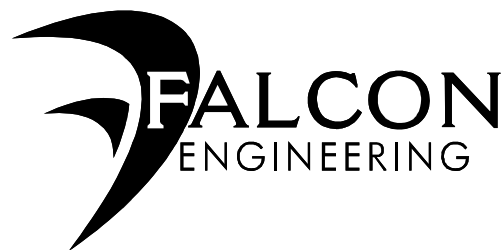
ESTIMATED CIP GRAVITY WALL QUANTITY	
RETAINING WALL NO.	CIP GRAVITY RETAINING WALL (SQUARE FEET)
27	80



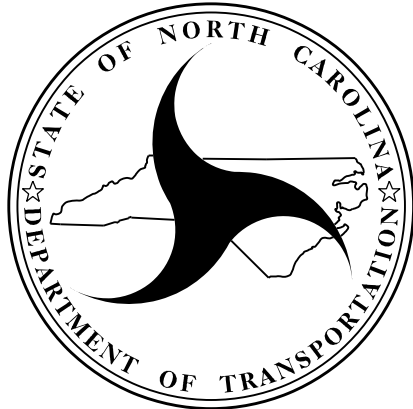
RETAINING WALL NO. 27 ENVELOPE
DIMENSIONS OF WALL TAKEN ALONG FRONT FACE OF MSE WALL
NOT TO SCALE

PROJECT NO.: I-2513AC
BUNCOMBE COUNTY
STATION: -Y2RPC- 26+16.64 TO 26+30.24
SHEET 1 OF 2 WALL ID RW-27

PREPARED BY: S. CROCKETT	DATE: 4/2/26
REVIEWED BY: J. HAMM	DATE: 4/3/26



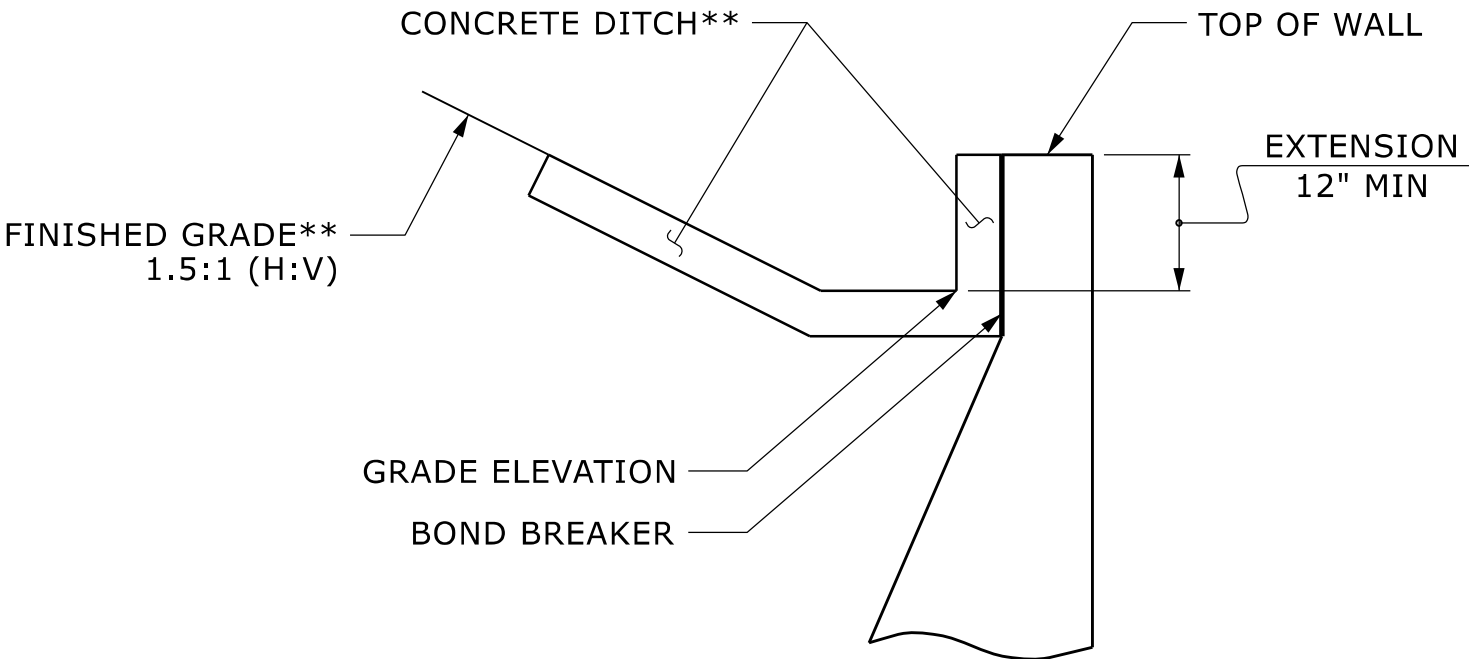
FALCON ENGINEERING, INC.
1210 TRINITY ROAD, SUITE 110
CARY, NC 27513
PHONE: 919.871.0800
www.falconengineers.com



NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL
ENGINEERING UNIT

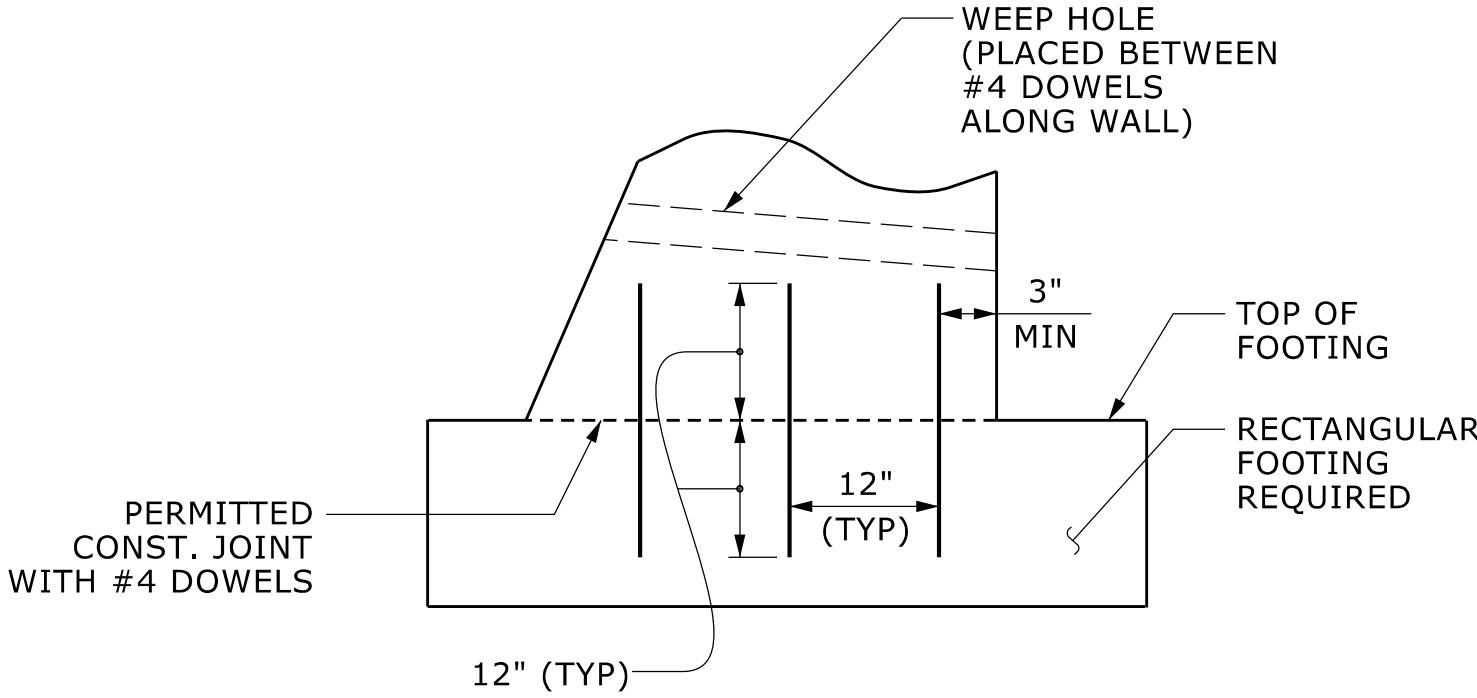
RETAINING WALL NO. 27
WALL PLAN AND ENVELOPE

REVISIONS						SHEET NO. W-69
NO.	BY	DATE	NO.	BY	DATE	
1			3			
2			4			



SLOPE CASE

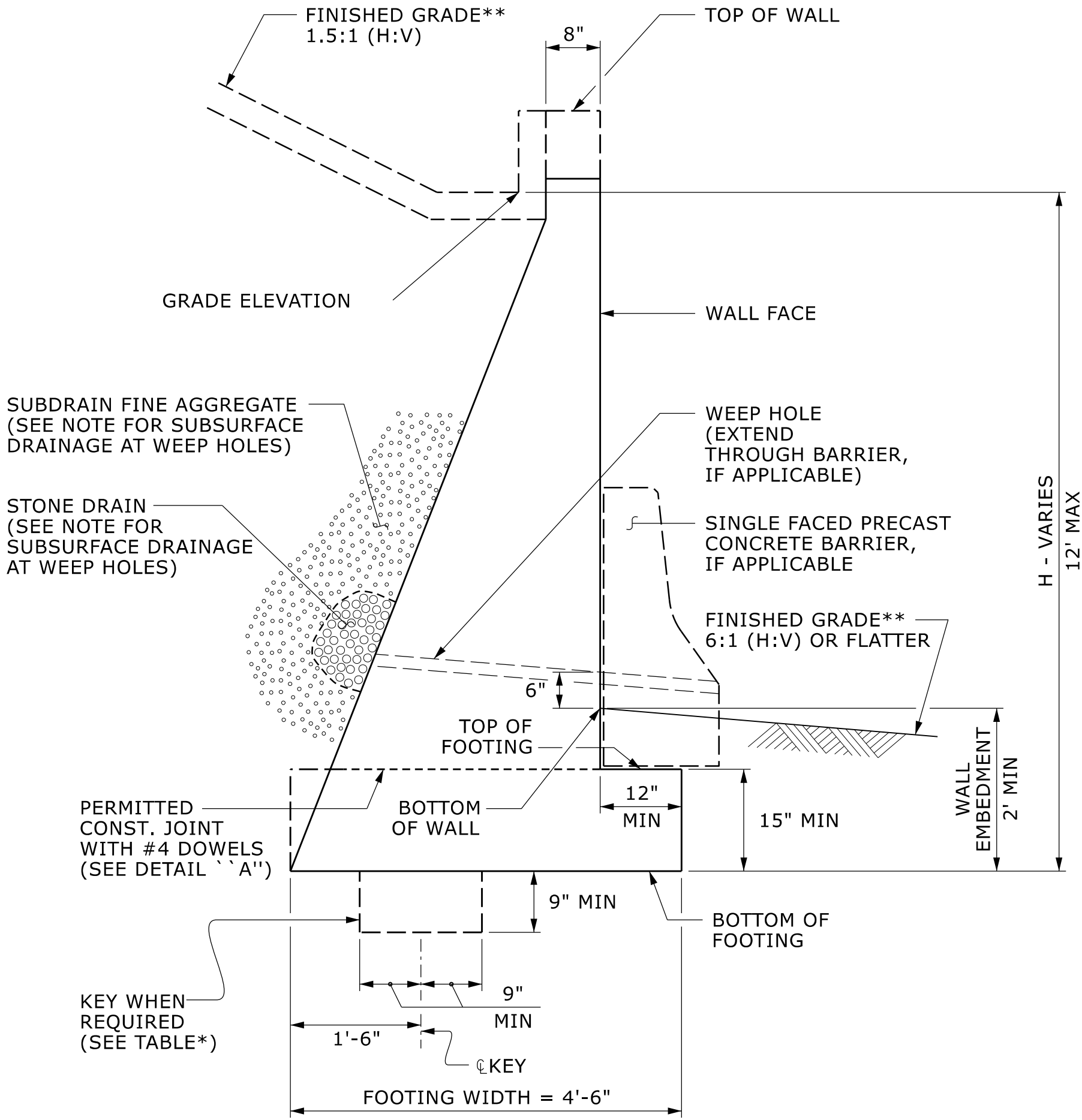
****SEE ROADWAY PLANS FOR CONCRETE DITCH AND FINISHED GRADE DETAILS.**



DETAIL "A"

NOTES:

- FOR CIP GRAVITY RETAINING WALLS, SEE SECTION 453 OF THE STANDARD SPECIFICATIONS.
- FOR SUBSURFACE DRAINAGE AT WEEP HOLES, SEE ARTICLE 414-8 OF THE STANDARD SPECIFICATIONS.
- CIP GRAVITY WALL IS BASED ON THE FOLLOWING IN-SITU ASSUMED SOIL PARAMETERS:
UNIT WEIGHT, $\gamma = 120$ PCF
FRICTION ANGLE, $\phi = 34$ DEGREES
(GROUNDWATER MORE THAN 7' BELOW BOTTOM OF FOOTING)
COHESION, $c = 0$ PSF
- BEFORE BEGINNING CIP GRAVITY WALL CONSTRUCTION, SURVEY WALL LOCATIONS AND SUBMIT WALL PROFILE VIEWS (WALL ENVELOPES) FOR REVIEW. FOR WALL ENVELOPES, INCLUDE BOTTOM OF WALL, EXISTING GROUND AND GRADE ELEVATIONS AND OTHER ELEVATIONS AS NEEDED AT INTERVALS OF 25' OR LESS ALONG WALLS. DO NOT START WALL CONSTRUCTION UNTIL WALL ENVELOPES ARE ACCEPTED.
- DO NOT PLACE CONCRETE FOR FOOTINGS UNTIL EXCAVATION DIMENSIONS AND FOUNDATION MATERIAL ARE APPROVED.
- WHEN CONSTRUCTING CIP GRAVITY WALL WITH A CONSTRUCTION JOINT AS SHOWN IN DETAIL "A", PROVIDE A MINIMUM OF 3 EQUALLY SPACED #4 DOWELS AT INTERVALS OF 1'-6" ALONG WALLS.

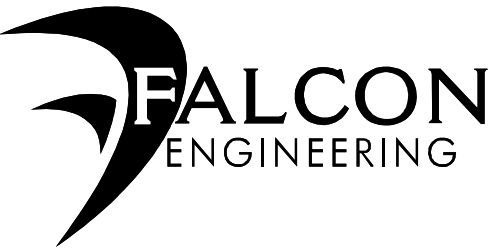


STANDARD CIP GRAVITY WALL

****SEE ROADWAY PLANS FOR FINISHED GRADE DETAILS.**

PROJECT NO.: I-2513AC
BUNCOMBE COUNTY
STATION: -Y2RPC- 26+16.64 TO 26+30.24
SHEET 2 OF 2 WALL ID RW-27

PREPARED BY: S. CROCKETT	DATE: 4/2/26
REVIEWED BY: J. HAMM	DATE: 4/3/26



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1210 TRINITY ROAD, SUITE 110
CARY, NC 27513
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REVISIONS						SHEET NO. W-70
NO.	BY	DATE	NO.	BY	DATE	
1			3			
2			4			

RETAINING WALL NO. 27
CIP GRAVITY WALL DETAILS
AND NOTES

GEOTECHNICAL
ENGINEER



DocuSigned by:
Stephen Crockett
CSCASFEED48C0435
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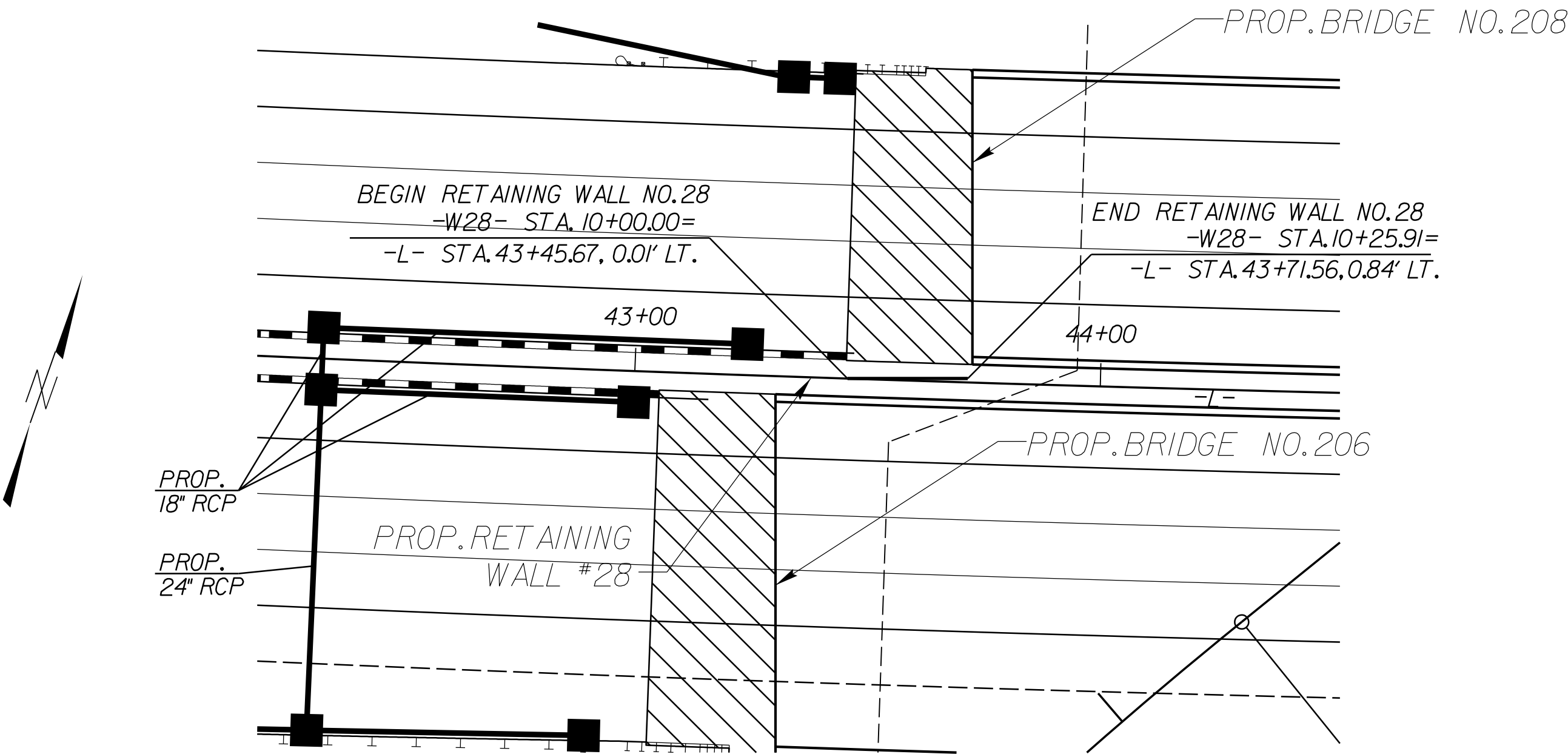
7/17/2026
DATE

ENGINEER

SIGNATURE

DATE

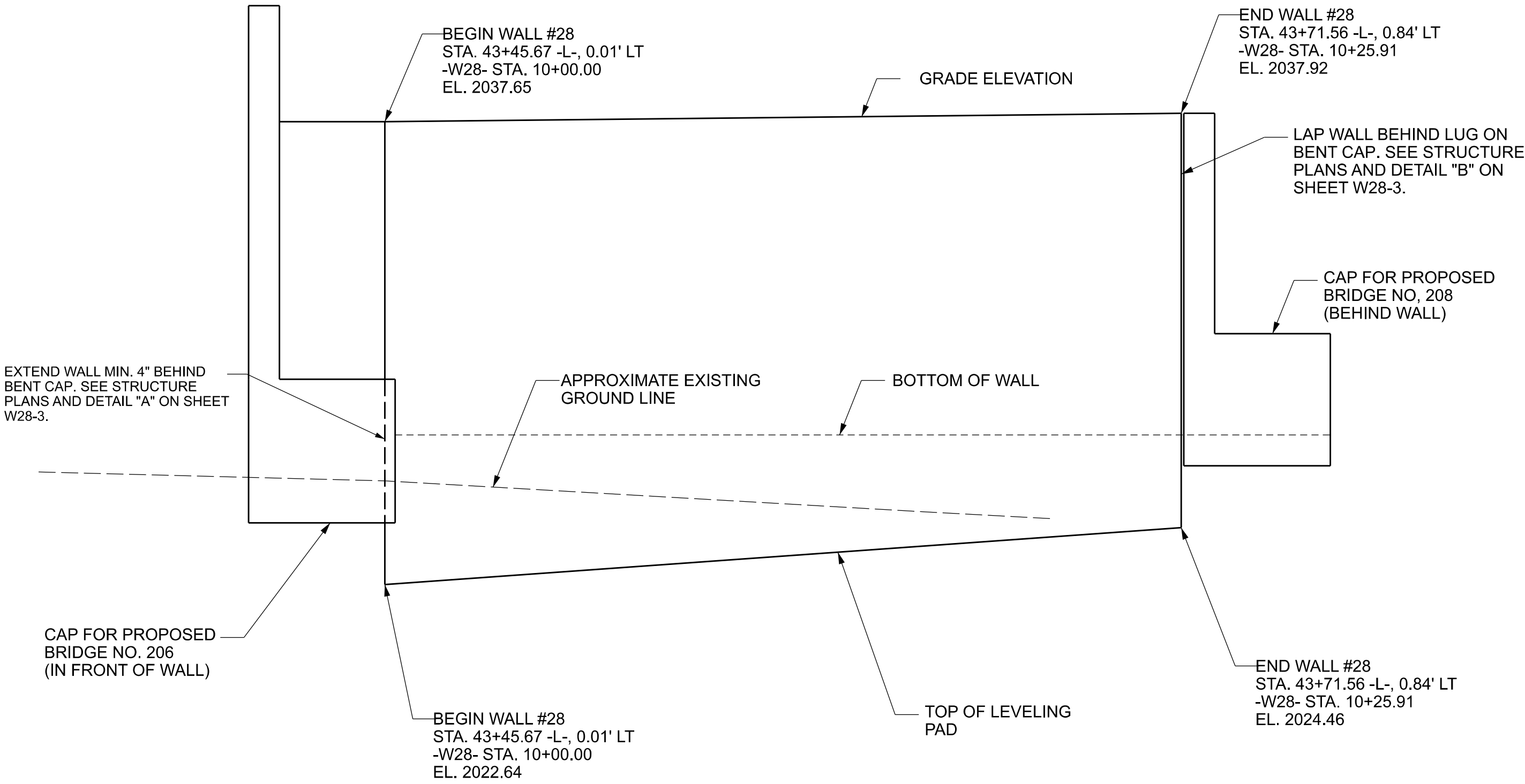
DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED



RETAINING WALL NO. 28 PLAN

NOT TO SCALE

ESTIMATED MSE WALL QUANTITIES (SQUARE FEET)	
PAY ITEM	QUANTITY
MSE RETAINING WALL NO.28	370 SF



RETAINING WALL NO. 28 ENVELOPE

DIMENSIONS OF WALL TAKEN ALONG FRONT FACE OF MSE WALL

NOT TO SCALE

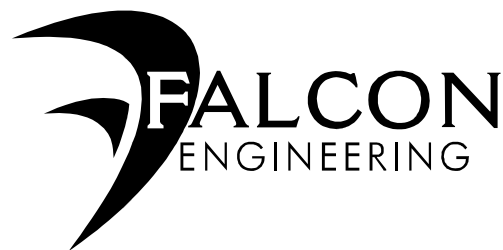
PROJECT NO.: I-2513AC

BUNCOMBE COUNTY

STATION: -L- 43+45.67 TO 43+71.47

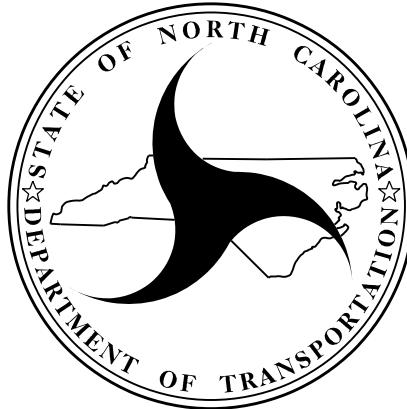
SHEET 1 OF 3 WALL ID WALL28

PREPARED BY: S. CROCKETT	DATE: 4/2/26
REVIEWED BY: J. HAMM	DATE: 4/3/26



FALCON ENGINEERING, INC.
1210 TRINITY ROAD, SUITE 110
CARY, NC 27513

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NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

GEOTECHNICAL
ENGINEERING UNIT

REVISIONS						SHEET NO. W-71
NO.	BY	DATE	NO.	BY	DATE	
1			3			
2			4			

GEOTECHNICAL
ENGINEER



DocuSigned by:
Stephen Crockett
CSCASPE048207048207
SIGNATURE

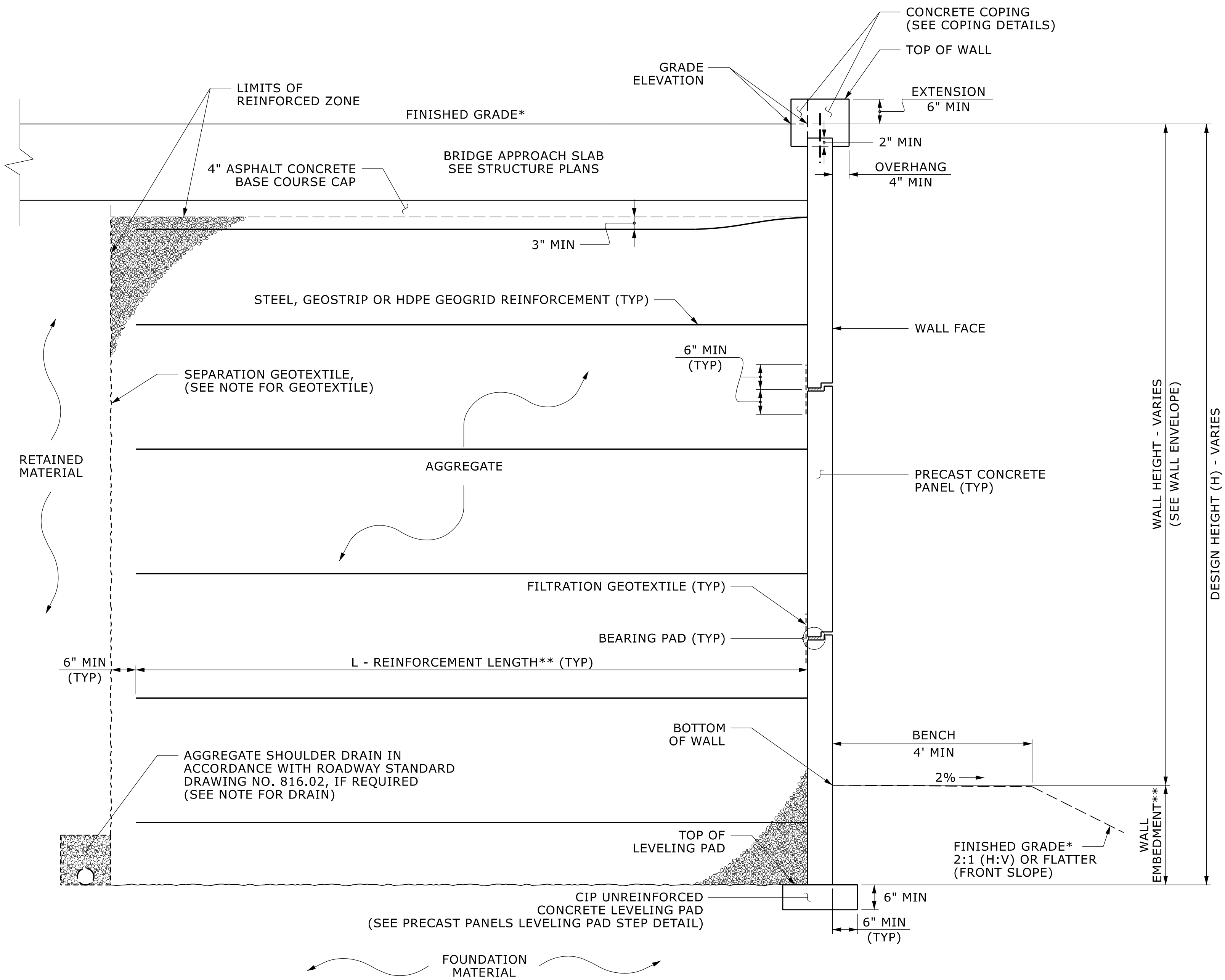
ENGINEER

7/17/2026

SIGNATURE

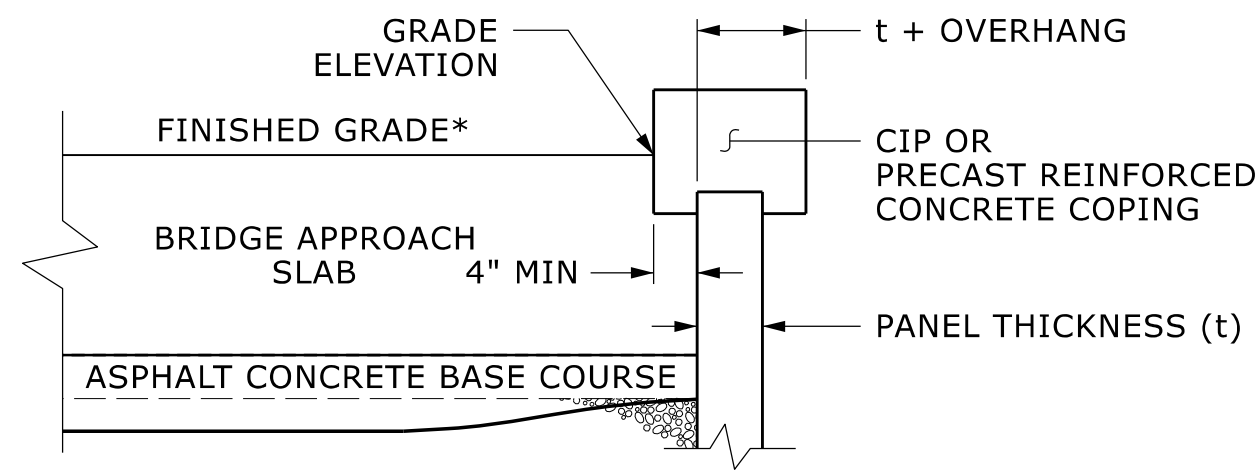
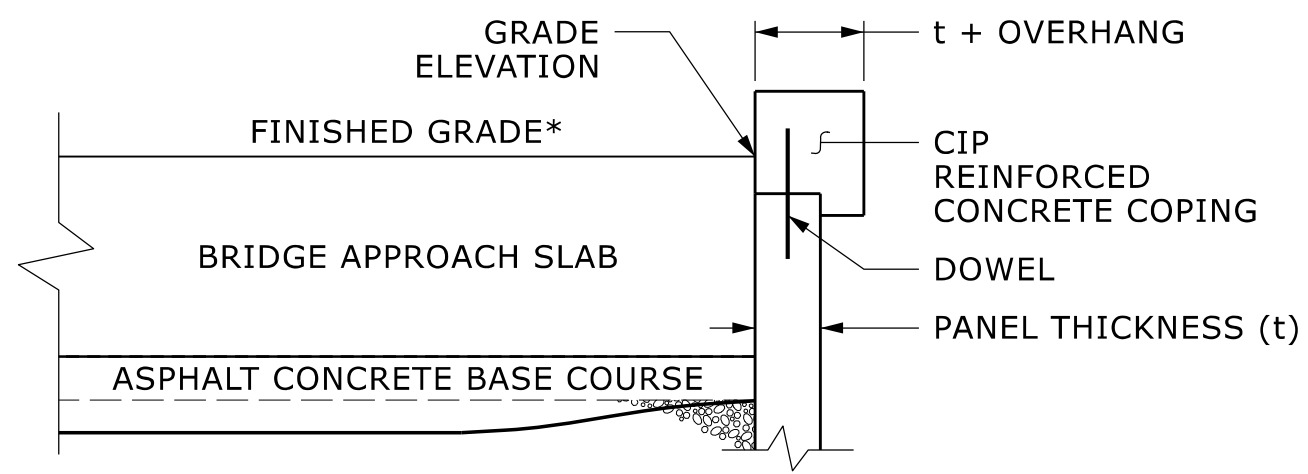
DATE

**DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED**



MSE WALL WITH PRECAST PANELS - TYPICAL SECTION

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

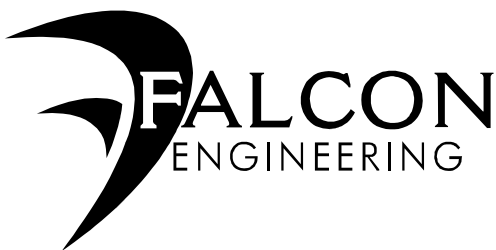


COPING DETAILS

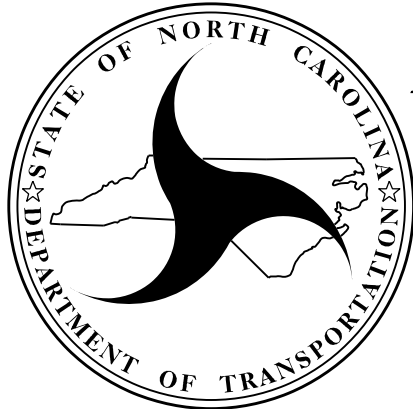
AT THE CONTRACTOR'S OPTION, CONNECT COPING TO PANELS
WITH DOWELS OR EXTEND COPING DOWN BACK OF PANELS.
*SEE ROADWAY PLANS FOR FINISHED GRADE DETAILS.

PROJECT NO.: I-2513AC
BUNCOMBE COUNTY
STATION: -L- 43+45.67 TO 43+71.47
SHEET 2 OF 3 WALL ID WALL28

PREPARED BY: S. CROCKETT	DATE: 4/2/26
REVIEWED BY: J. HAMM	DATE: 4/3/26



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NORTH CAROLINA
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DIVISION OF HIGHWAYS

GEOTECHNICAL
ENGINEERING UNIT

MSE WALL WITH PANELS
TYPICAL AND COPING DETAILS FOR
RETAINING WALL NO. 28

REVISIONS						SHEET NO. W-72
NO.	BY	DATE	NO.	BY	DATE	
1			3			
2			4			

NOTES:

FOR MECHANICALLY STABILIZED EARTH (MSE) RETAINING WALLS, SEE MECHANICALLY STABILIZED EARTH RETAINING WALLS PROVISION.

A SEPARATION GEOTEXTILE IS REQUIRED AT THE BACK OF THE REINFORCED ZONE FOR RETAINING WALL NO. 28.

A DRAIN IS REQUIRED FOR RETAINING WALL NO. 28.

BEFORE BEGINNING MSE WALL DESIGN FOR RETAINING WALL NO. 28, 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. 28 FOR THE FOLLOWING:

- 1) DESIGN HEIGHT (H) = WALL HEIGHT + WALL EMBEDMENT
- 2) DESIGN LIFE = 100 YEARS
- 3) MAXIMUM FACTORED VERTICAL PRESSURE ON FOUNDATION MATERIAL = 3,880 PSF
- 4) MINIMUM REINFORCEMENT LENGTH (L) = 0.7H OR 6 FT, WHICHEVER IS LONGER
- 5) MINIMUM EMBEDMENT DEPTH = 2 FT
- 6) REINFORCED ZONE AGGREGATE PARAMETERS:

AGGREGATE TYPE*	UNIT WEIGHT (γ) PCF	FRICTION ANGLE (ϕ) DEGREES	COHESION (c) PSF
COARSE	110	38	0
*SEE MSE RETAINING WALLS PROVISION FOR COARSE AND FINE AGGREGATE MATERIAL REQUIREMENTS.			

7) IN-SITU ASSUMED MATERIAL PARAMETERS:

MATERIAL TYPE	UNIT WEIGHT (γ) PCF	FRICTION ANGLE (ϕ) DEGREES	COHESION (c) PSF
RETAINED	120	30	0
FOUNDATION	115	28	0

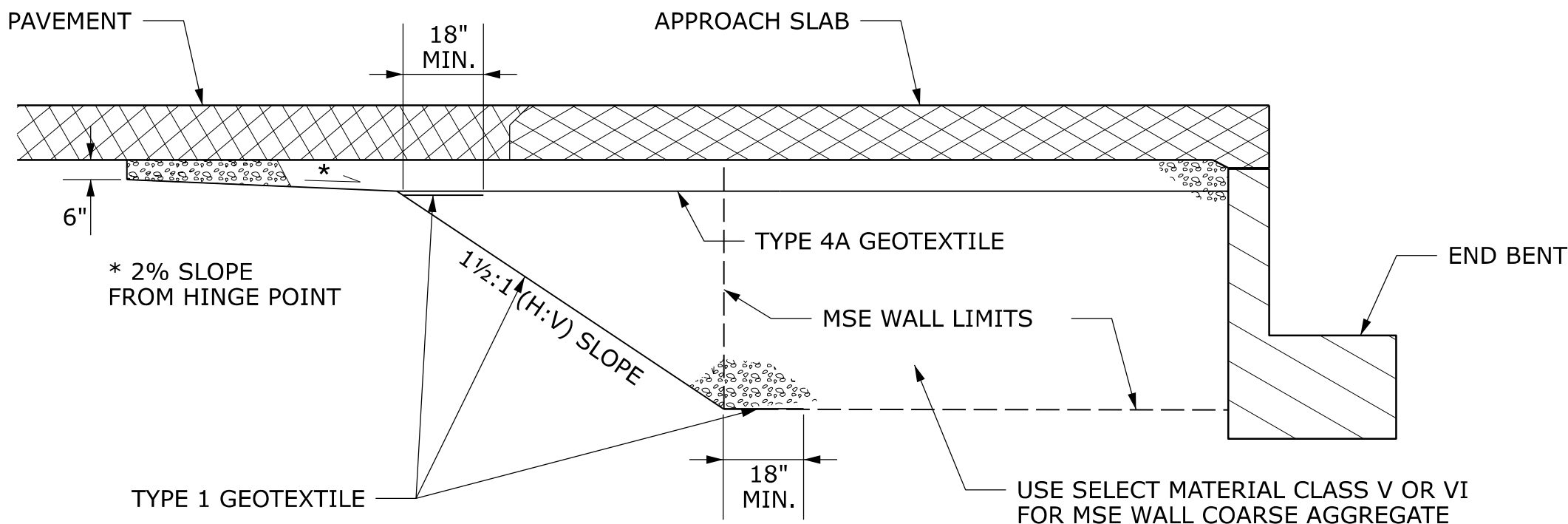
DESIGN RETAINING WALL NO. 28 FOR A LIVE LOAD (TRAFFIC) SURCHARGE.

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. 28.

DO NOT PLACE LEVELING PAD CONCRETE, AGGREGATE OR REINFORCEMENT FOR RETAINING WALL NO. 28 UNTIL EXCAVATION DIMENSIONS AND FOUNDATION MATERIAL ARE APPROVED.

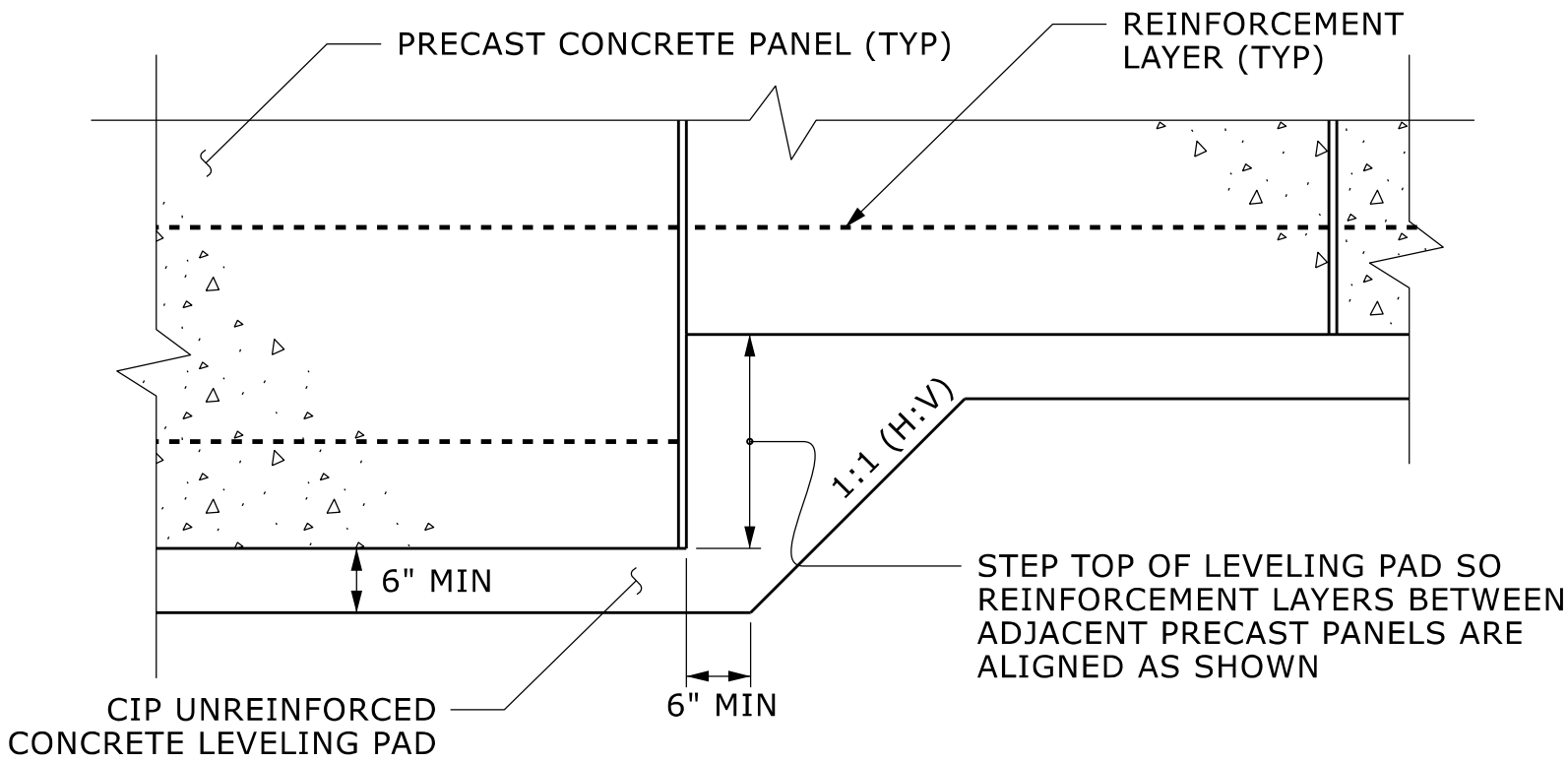
"TEMPORARY SHORING" IS REQUIRED FOR RETAINING WALL NO. 28 IN ACCORDANCE WITH THE TEMPORARY SHORING PROVISION. SEE ROADWAY PLANS.

THE REINFORCED ZONE OF RETAINING WALL NO. 28 WILL INTERFERE WITH THE BRIDGE APPROACH FILL FOR BRIDGE NO. 208. SEE APPROACH FILL WITH ADJACENT MSE WALL DETAIL AND STRUCTURE PLANS.

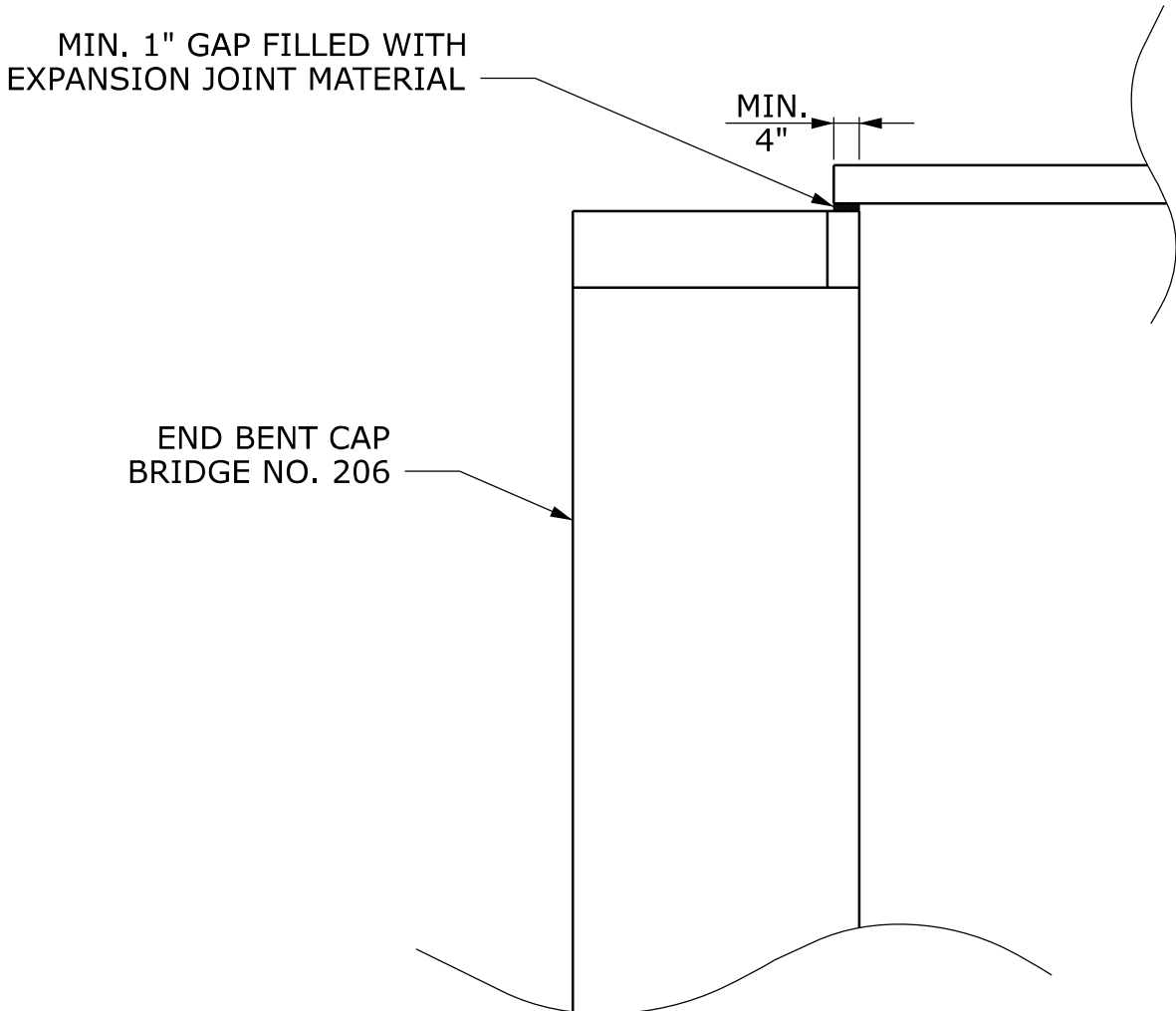


APPROACH FILL WITH
ADJACENT MSE WALL DETAIL

USE WHERE MSE WALL REINFORCED ZONE AND APPROACH FILL LIMITS OVERLAP. OUTSIDE OF MSE WALL REINFORCED ZONE LIMITS, SEE ROADWAY STANDARD DRAWING NO. 423.01.

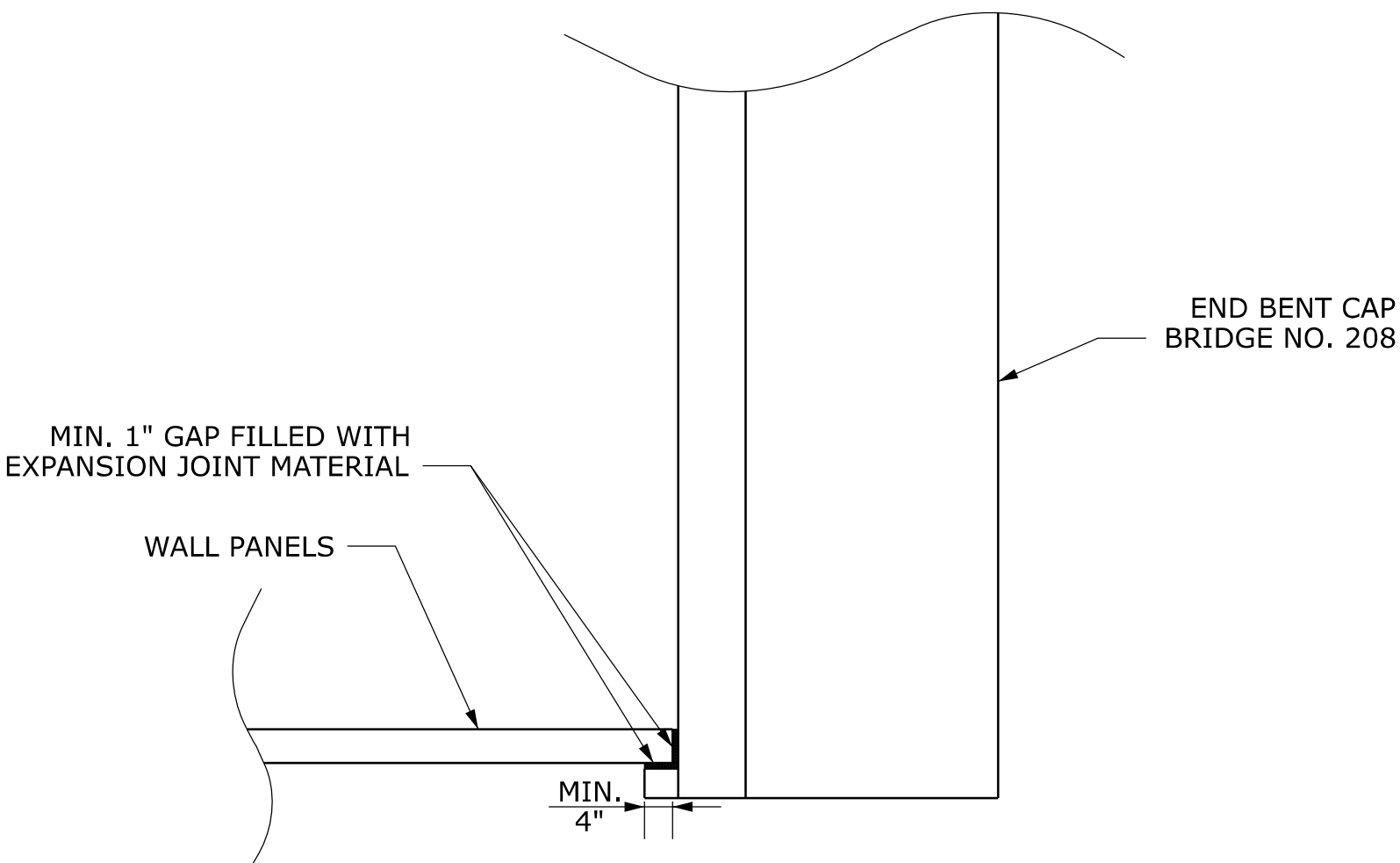


PRECAST PANELS
LEVELING PAD STEP DETAIL



DETAIL "A"

NOT TO SCALE



DETAIL "B"

NOT TO SCALE

PROJECT NO.: I-2513AC

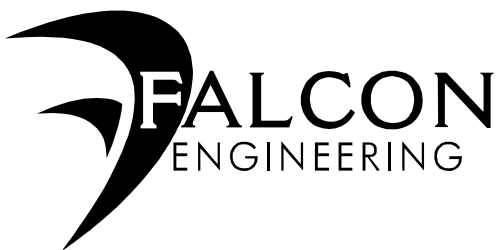
BUNCOMBE COUNTY

STATION: -L- 43+45.67 TO 43+71.47

SHEET 3 OF 3

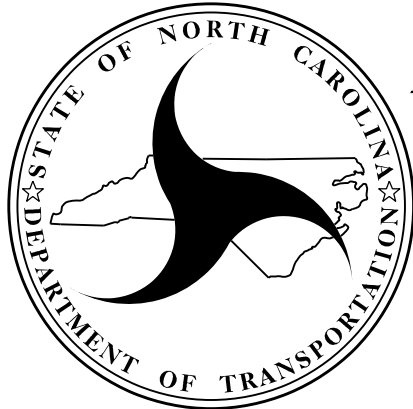
WALL ID WALL28

PREPARED BY: S. CROCKETT	DATE: 4/2/26
REVIEWED BY: J. HAMM	DATE: 4/3/26



FALCON ENGINEERING, INC.
1210 TRINITY ROAD, SUITE 110
CARY, NC 27513

PHONE: 919.871.0800
www.falconengineers.com



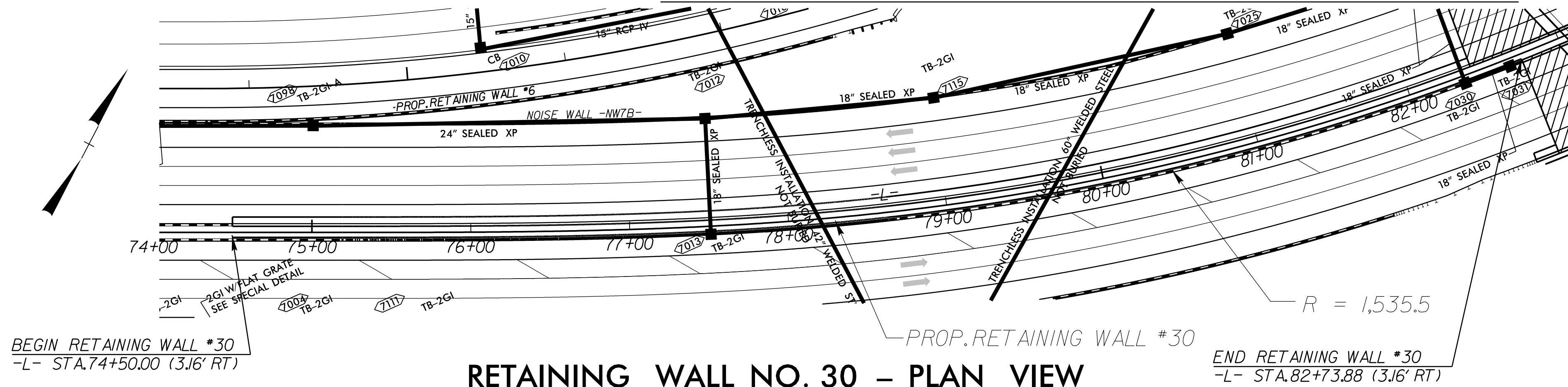
NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

GEOTECHNICAL
ENGINEERING UNIT

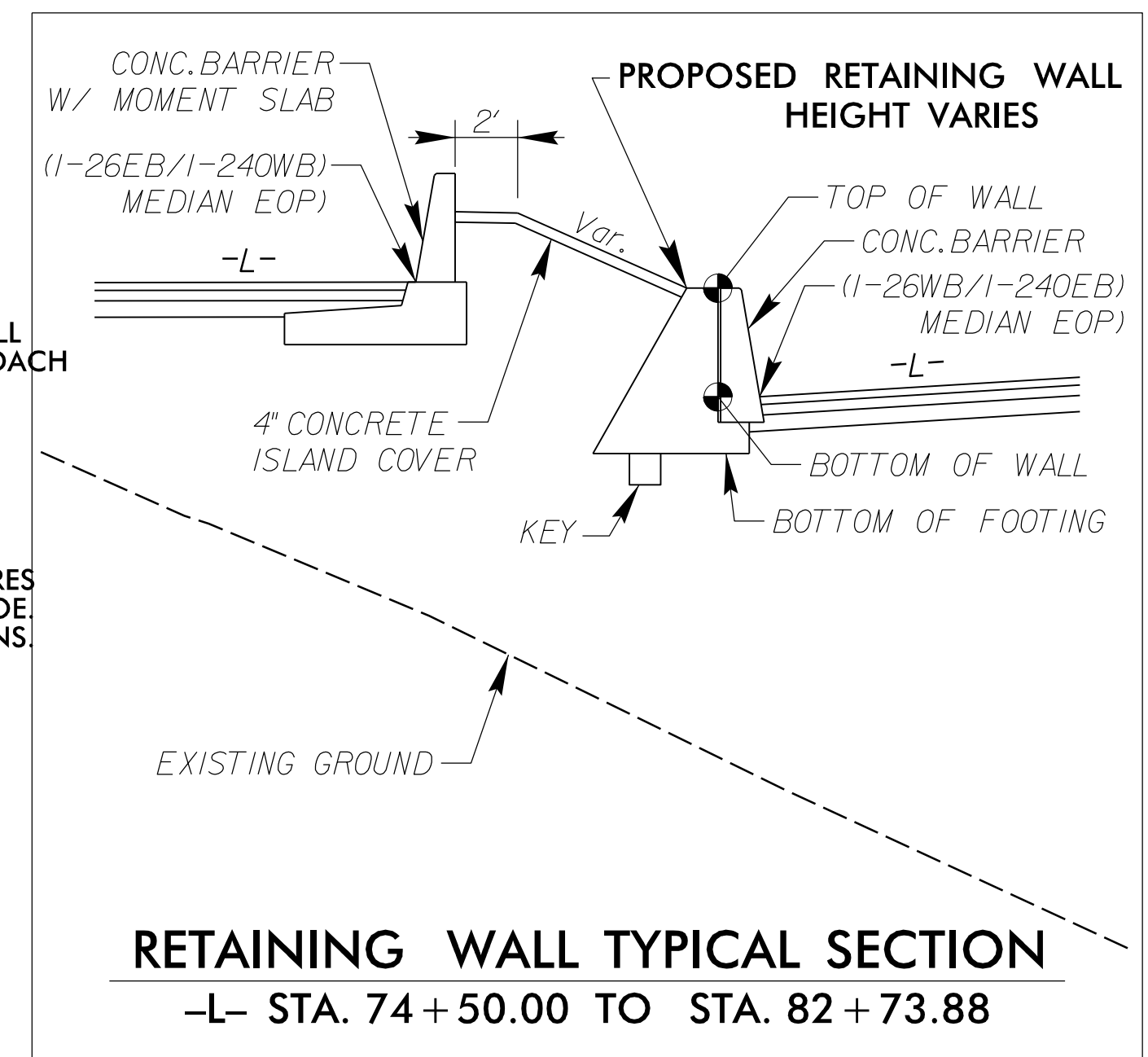
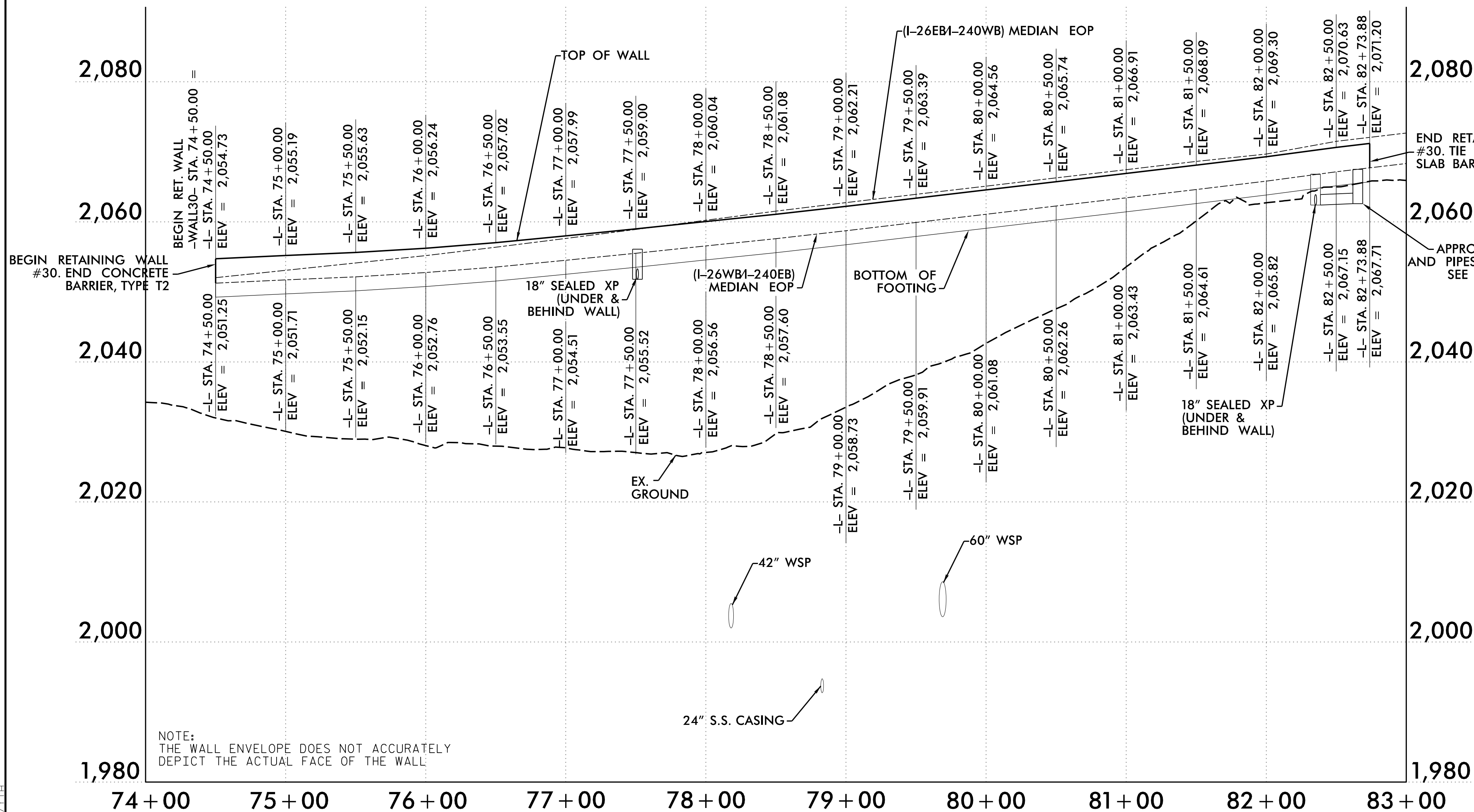
MSE WALL WITH PANELS NOTES
AND WALL DETAILS
FOR RETAINING WALL NO. 28

REVISIONS						SHEET NO. W-73
NO.	BY	DATE	NO.	BY	DATE	
1			3			
2			4			

RETAINING WALL #30 DETAIL SHEET



ESTIMATED CIP GRAVITY WALL QUANTITY	
RETAINING WALL NO.	CIP GRAVITY RETAINING WALL (SQUARE FEET)
30	4,525



PROJECT NO.: I-2513AC
BUNCOMBE COUNTY
STATION: +/- -L- 74+50.00 TO -L- 82+73.88
SHEET 1 OF 6 WALL ID RW-30

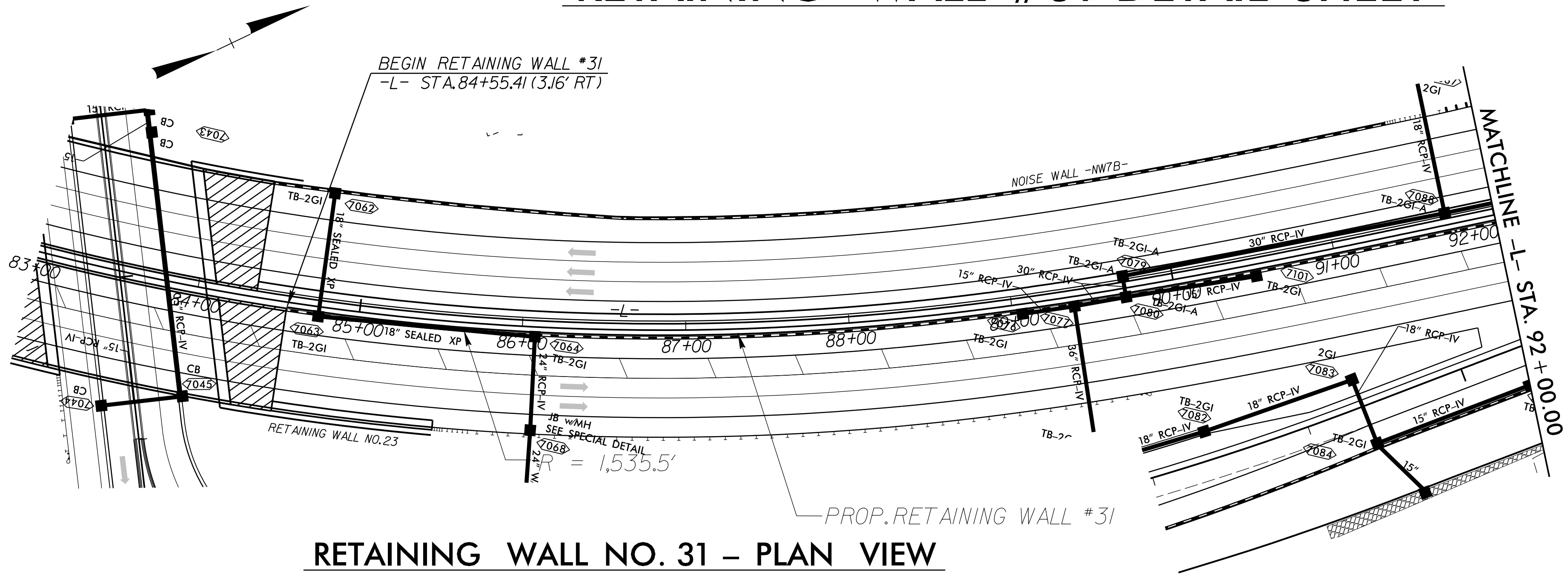
PREPARED BY: E. A. MCINTOSH, P.E. DATE: 06/26
REVIEWED BY: M. A. MULLA, P.E. DATE: 06/26

Prepared in the Office of:
ECS
ECS SOUTHEAST, LLC
1812 CENTER PARK DRIVE, SUITE D
CHARLOTTE, NC 28217
(704) 525-5152 (PHONE)
(704) 357-0023 (FAX)
NC REGISTERED
ENGINEERING
FIRM # F-1519

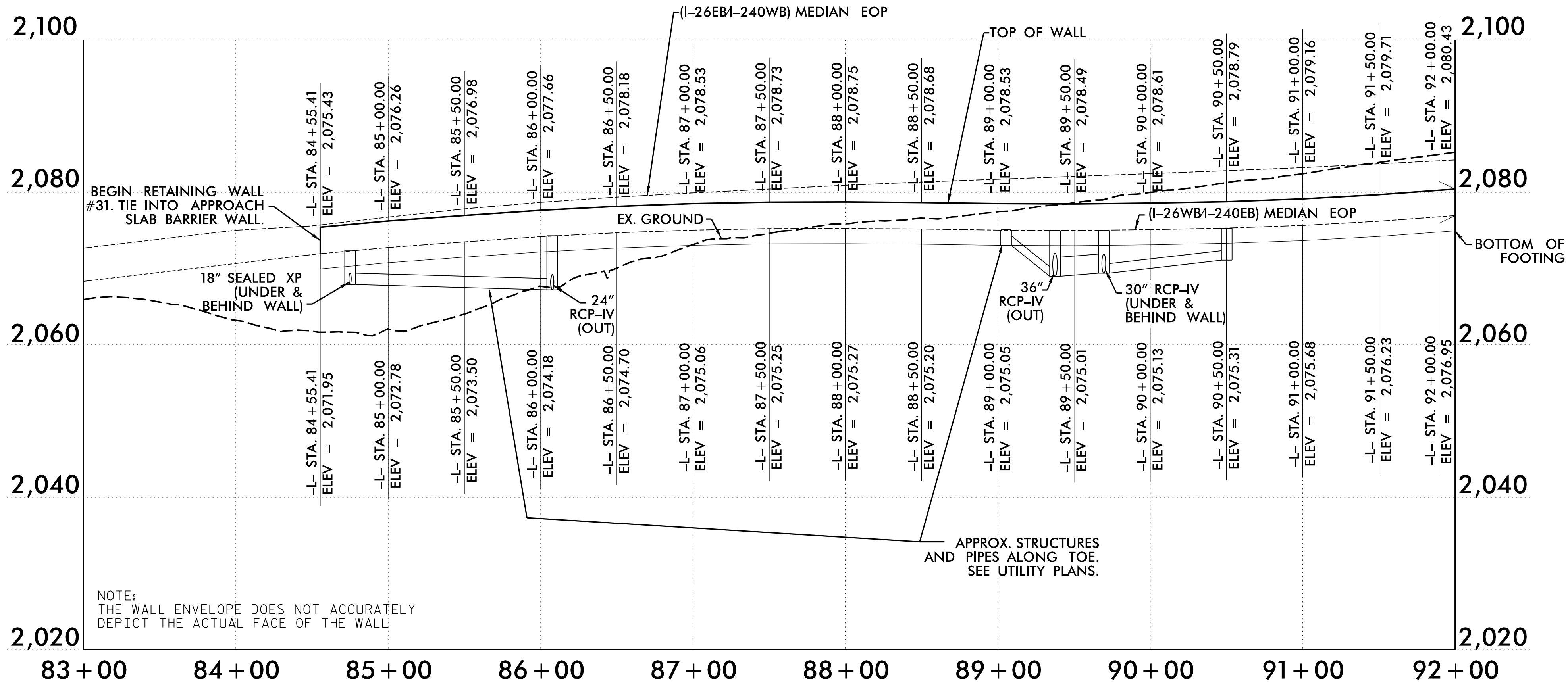
NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
**GEOTECHNICAL
ENGINEERING UNIT**

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1	-	-	3	-	-	W-74
2	-	-	4	-	-	

RETAINING WALL #31 DETAIL SHEET

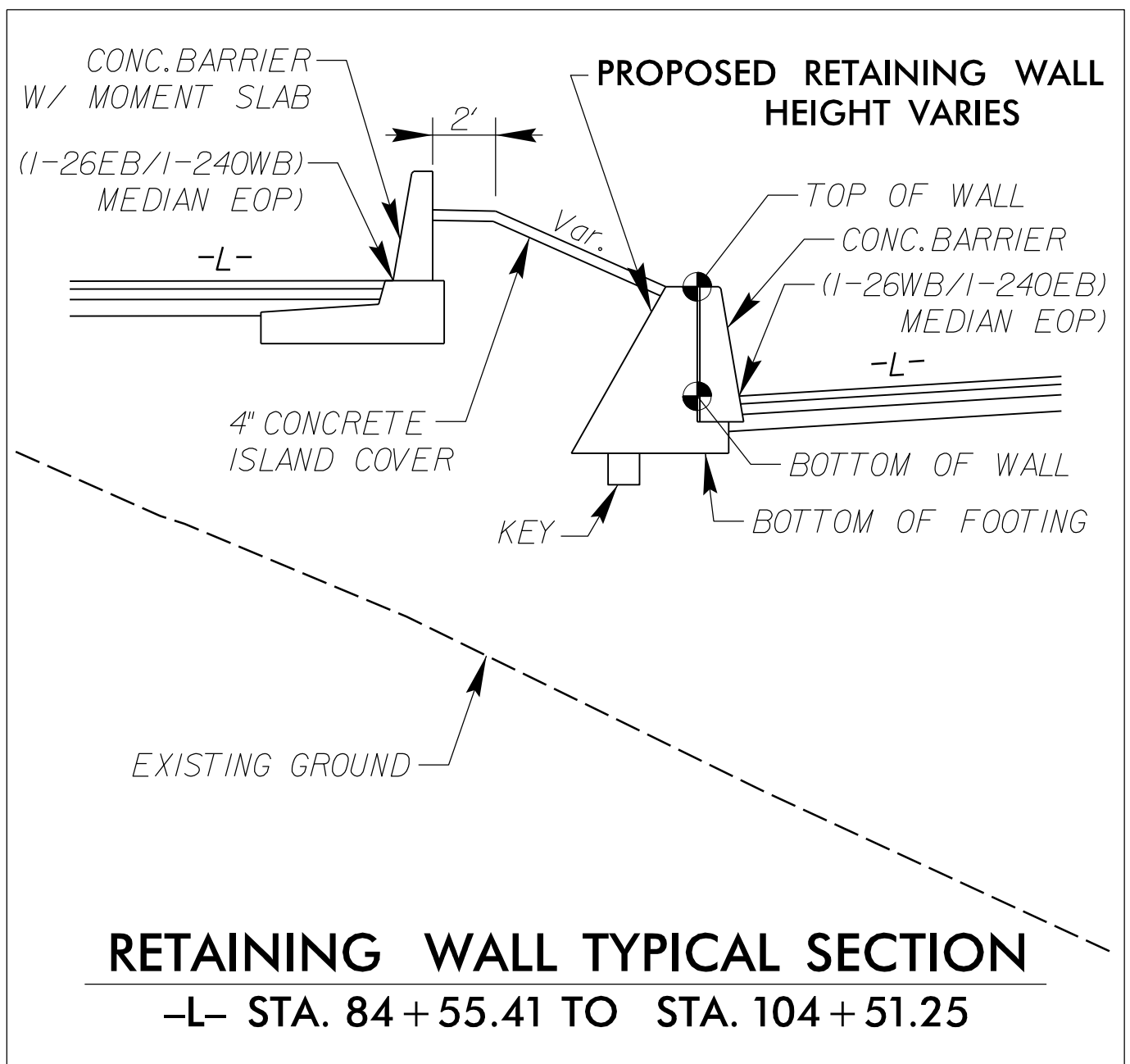


RETAINING WALL NO. 31 – PLAN VIEW



RETAINING WALL NO. 31 – ENVELOPE VIEW

ESTIMATED CIP GRAVITY WALL QUANTITY	
RETAINING WALL NO.	CIP GRAVITY RETAINING WALL (SQUARE FEET).
31	10,960



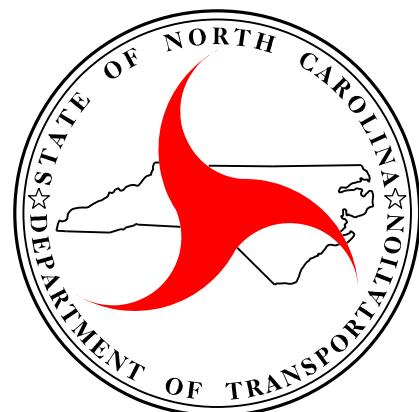
PROJECT NO.: I-2513AC
BUNCOMBE COUNTY
STATION: +/- -L- 84+55.41 TO -L- 104+51.25
SHEET 2 OF 6 WALL ID RW-31

PREPARED BY: E. A. MCINTOSH, P.E. DATE: 06/26
REVIEWED BY: M. A. MULLA, P.E. DATE: 06/26

Prepared in the Office of:



ECS SOUTHEAST, LLC
1812 CENTER PARK DRIVE, SUITE D
CHARLOTTE, NC 28217
(704) 525-5152 (PHONE)
(704) 357-0023 (FAX)
NC REGISTERED
ENGINEERING
FIRM # F-1519



NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

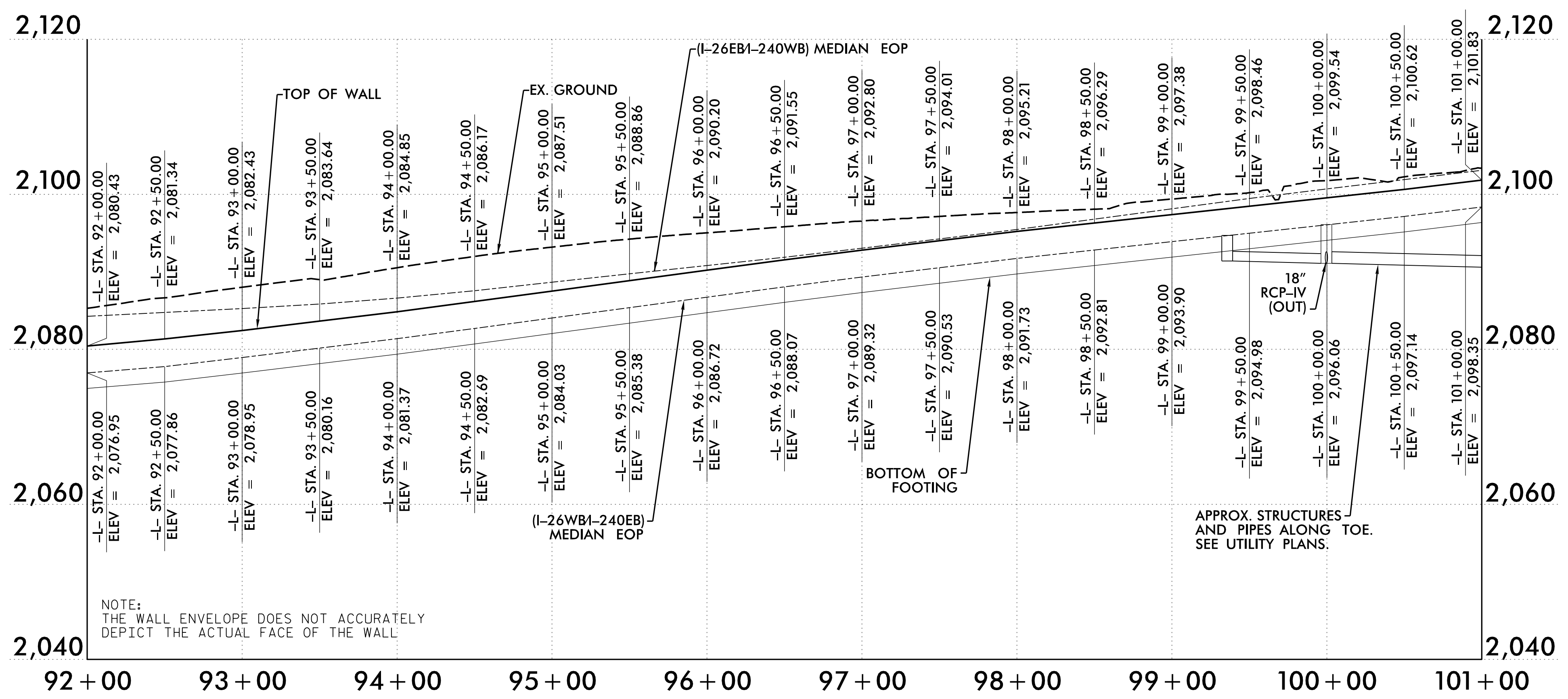
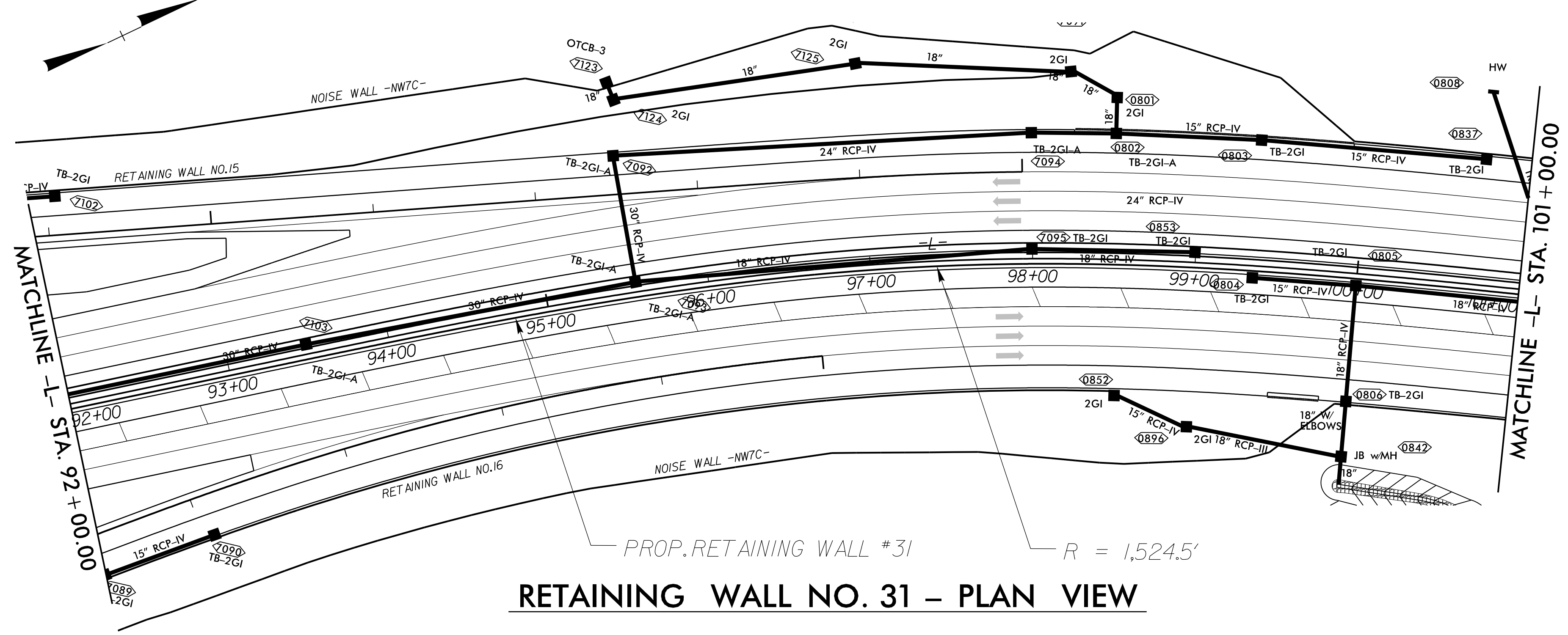
GEOTECHNICAL
ENGINEERING UNIT

RETAINING WALL NO. 31
CAST IN PLACE (CIP)
GRAVITY RETAINING WALL
PLAN AND ENVELOPE

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

SHEET NO.
W-75

RETAINING WALL #31 DETAIL SHEET



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

GEOTECHNICAL
ENGINEER

7/20/2026

SIGNATURE

DATE

ENGINEER

SIGNATURE

DATE

DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

PROJECT NO.: I-2513AC
BUNCOMBE COUNTY
STATION: +/- -L- 84+55.41 TO -L- 104+51.25
SHEET 3 OF 6 WALL ID RW-31

RETAINING WALL NO. 31
CAST IN PLACE (CIP)
GRAVITY RETAINING WALL
PLAN AND ENVELOPE

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1	-	3	-	-	-	
2	-	4	-	-	-	W-76

05 JUN 2026 08:30
C:\Users\mulla\OneDrive - ECS Corporate Services\31 Asheville - I-2513AC - 31-4489 I-2513AC 1/2
Structures\CADD\GEOTECH\Plan\Prof\I2513AC_GEO_RWALL_RET-Wall31-2.DEC.dgn

PREPARED BY: E. A. MCINTOSH, P.E.	DATE: 06/26
REVIEWED BY: M. A. MULLA, P.E.	DATE: 06/26

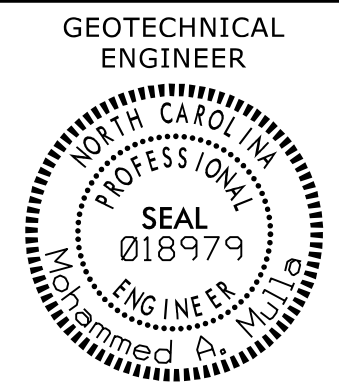
Prepared in the Office of:

ECS SOUTHEAST, LLC
1812 CENTER PARK DRIVE, SUITE D
CHARLOTTE, NC 28217
(704) 525-5152 (PHONE)
(704) 357-0023 (FAX)
NC REGISTERED
ENGINEERING
FIRM # F-1519

NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

GEOTECHNICAL
ENGINEERING UNIT

RETAINING WALL #31 DETAIL SHEET

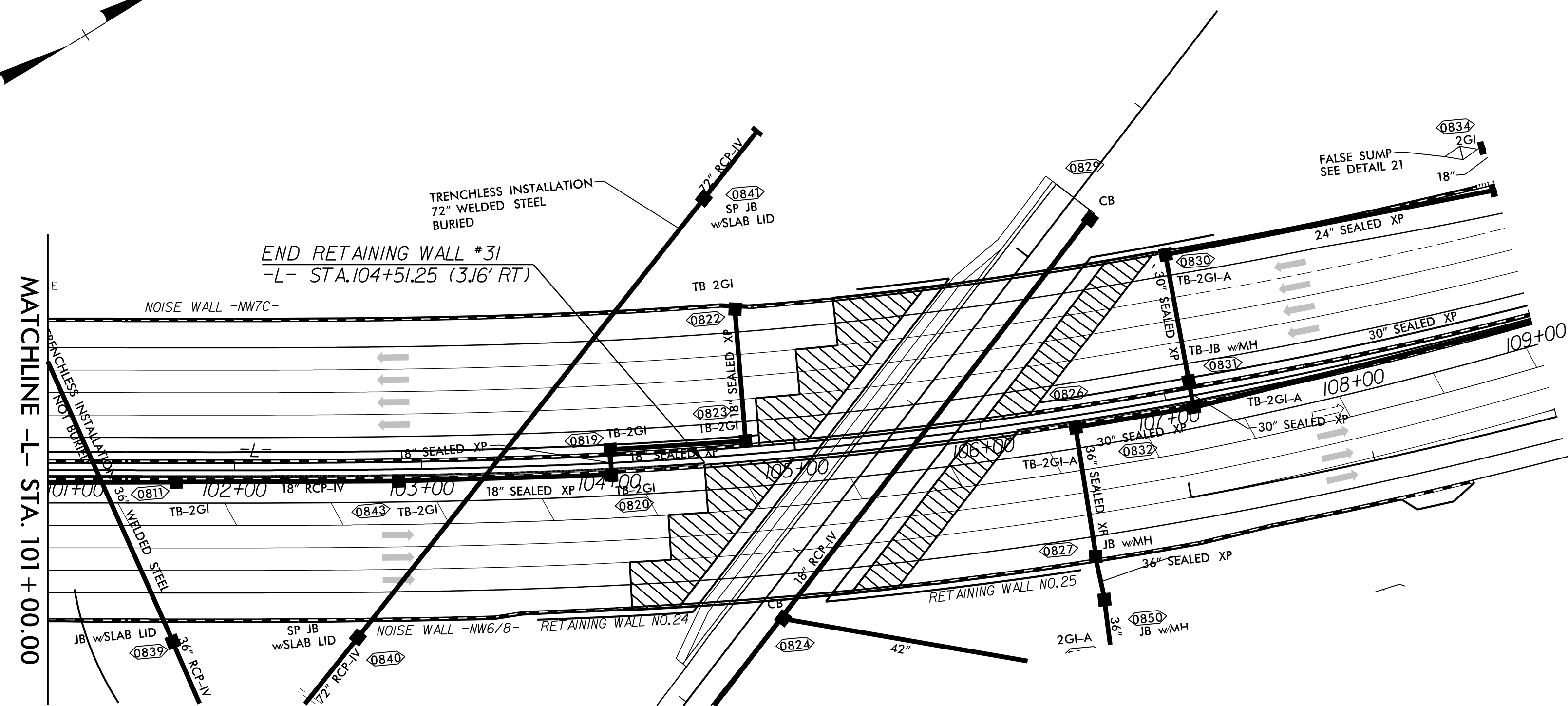


ENGINEER

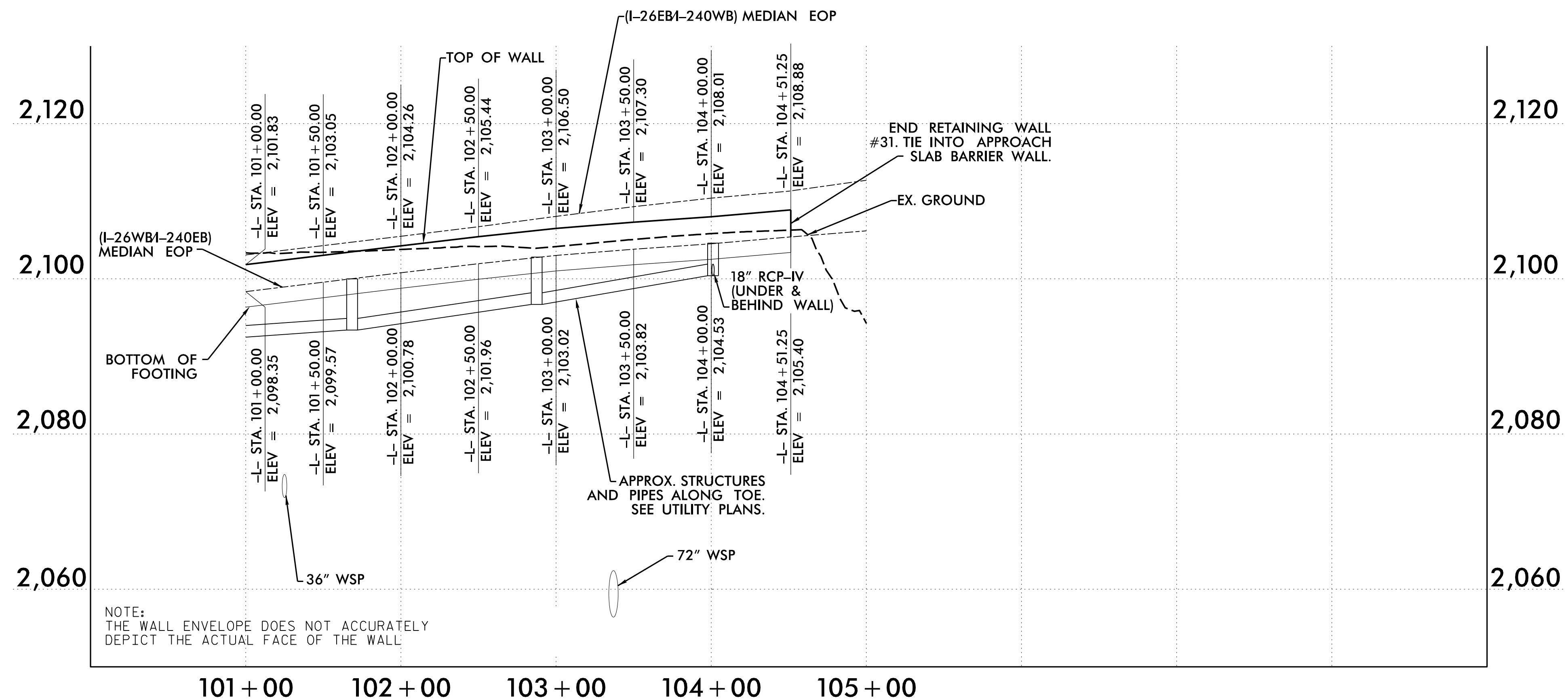
7/20/2026

SIGNATURE DATE SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED



RETAINING WALL NO. 31 – PLAN VIEW



RETAINING WALL NO. 31 – ENVELOPE VIEW

PROJECT NO.: I-2513AC

BUNCOMBE COUNTY

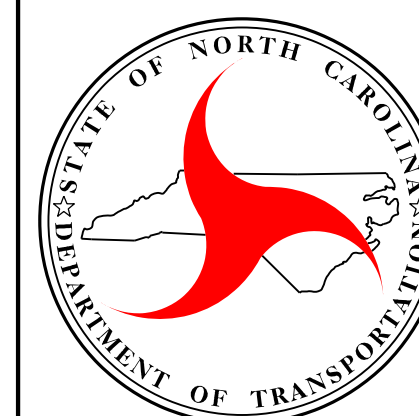
STATION: +/- -L- 84+55.41 TO -L- 104+51.25

SHEET 4 OF 6 WALL ID RW-31

Prepared in the Office of:



ECS SOUTHEAST, LLC
1812 CENTER PARK DRIVE, SUITE D
CHARLOTTE, NC 28217
(704) 525-5152 [PHONE]
(704) 357-0023 [FAX]
NC REGISTERED
ENGINEERING
FIRM # F-1519



NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

GEOTECHNICAL
ENGINEERING UNIT

RETAINING WALL NO. 31
CAST IN PLACE (CIP)
GRAVITY RETAINING WALL
PLAN AND ENVELOPE

REVISIONS

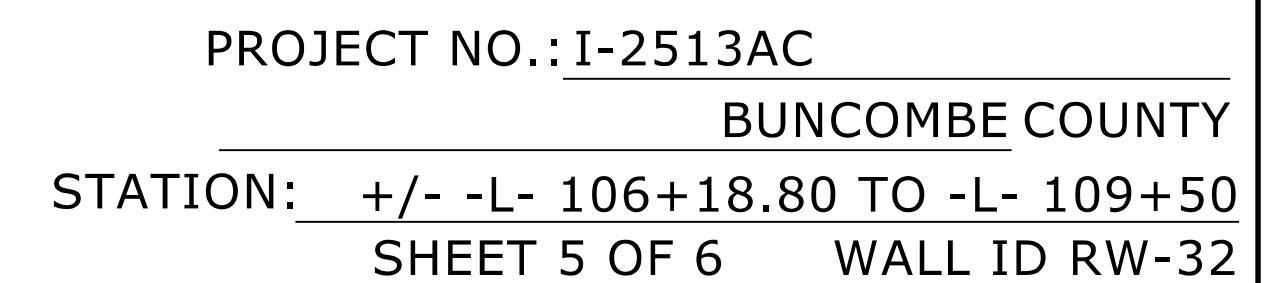
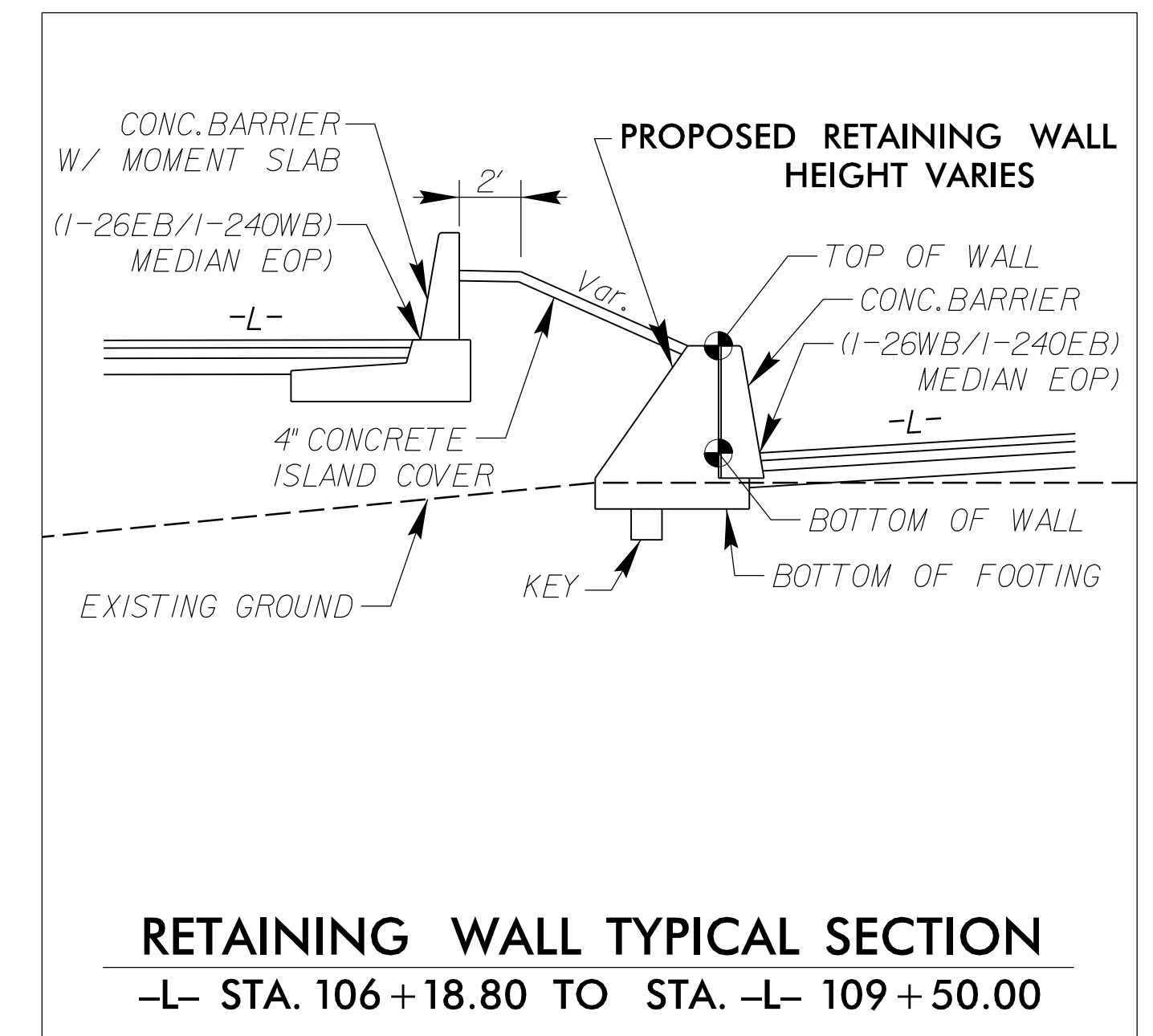
NO.	BY	DATE	NO.	BY	DATE	SHEET NO.
1	-	3	-	-	-	W-77
2	-	4	-	-	-	

PREPARED BY: E. A. MCINTOSH, P.E.	DATE: 06/26
REVIEWED BY: M. A. MULLA, P.E.	DATE: 06/26

GEOTECHNICAL ENGINEER	ENGINEER
7/20/2026 SIGNATURE _____	SIGNATURE _____

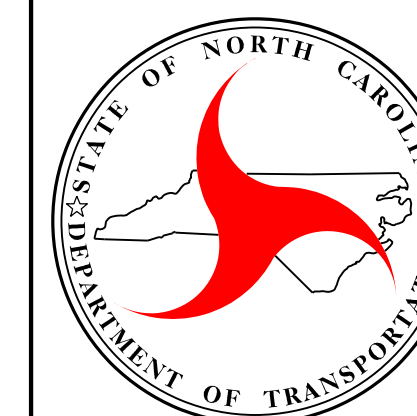
DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

RETAINING WALL NO.	CIP GRAVITY RETAINING WALL (SQUARE FEET).
32	1,820



Prepared in the Office of:

 ECS SOUTHEAST, LLC
1812 CENTER PARK DRIVE, SUITE D
CHARLOTTE, NC 28217
(704) 525-5152 [PHONE]
(704) 357-0023 [FAX]
NC REGISTERED
ENGINEERING
FIRM # F-1519

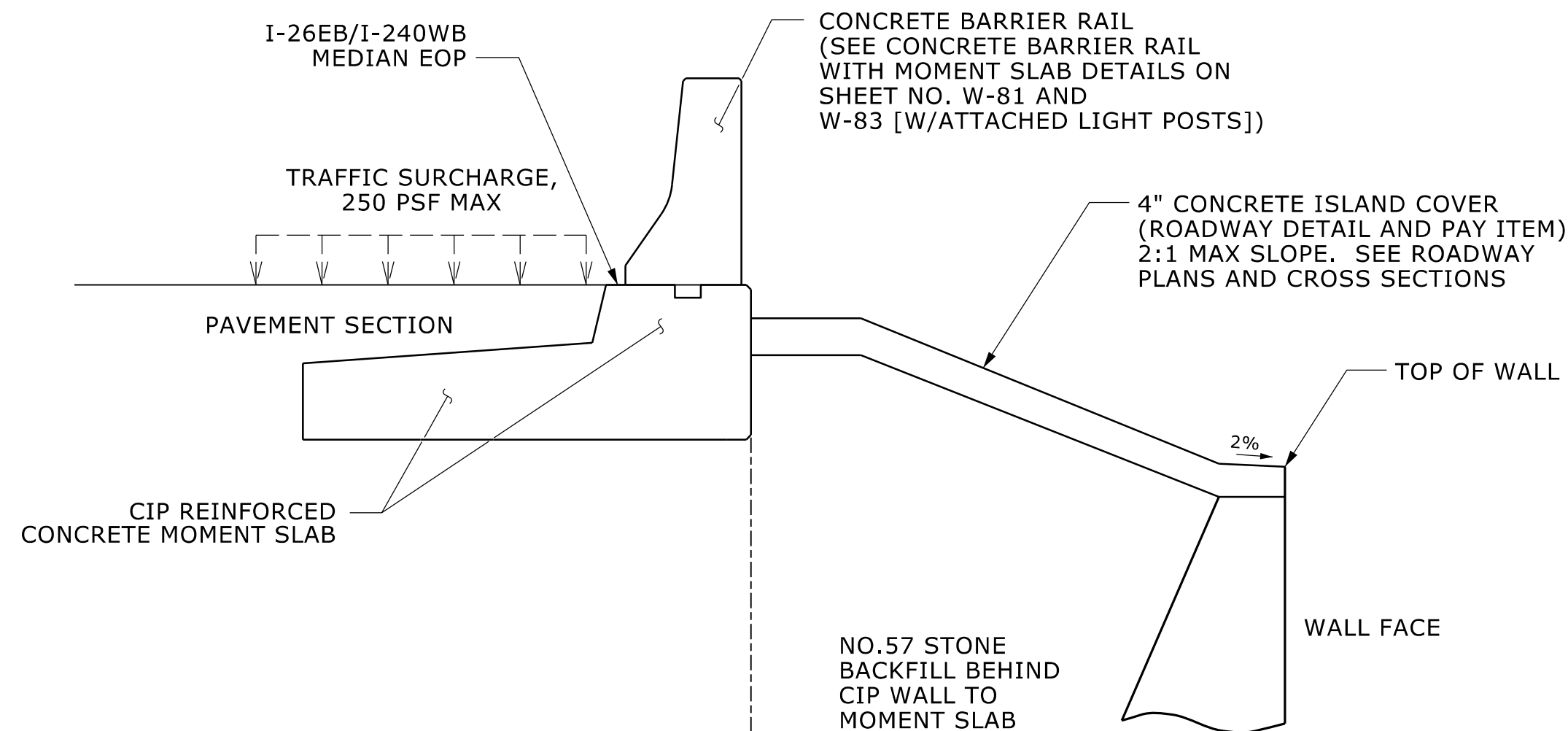


RETAINING WALL NO. 32
CAST IN PLACE (CIP)
GRAVITY RETAINING WALL
PLAN AND ENVELOPE

REVISIONS						SHEET NO. W-78
NO.	BY	DATE	NO.	BY	DATE	
1	-	-	3	-	-	
2			4			

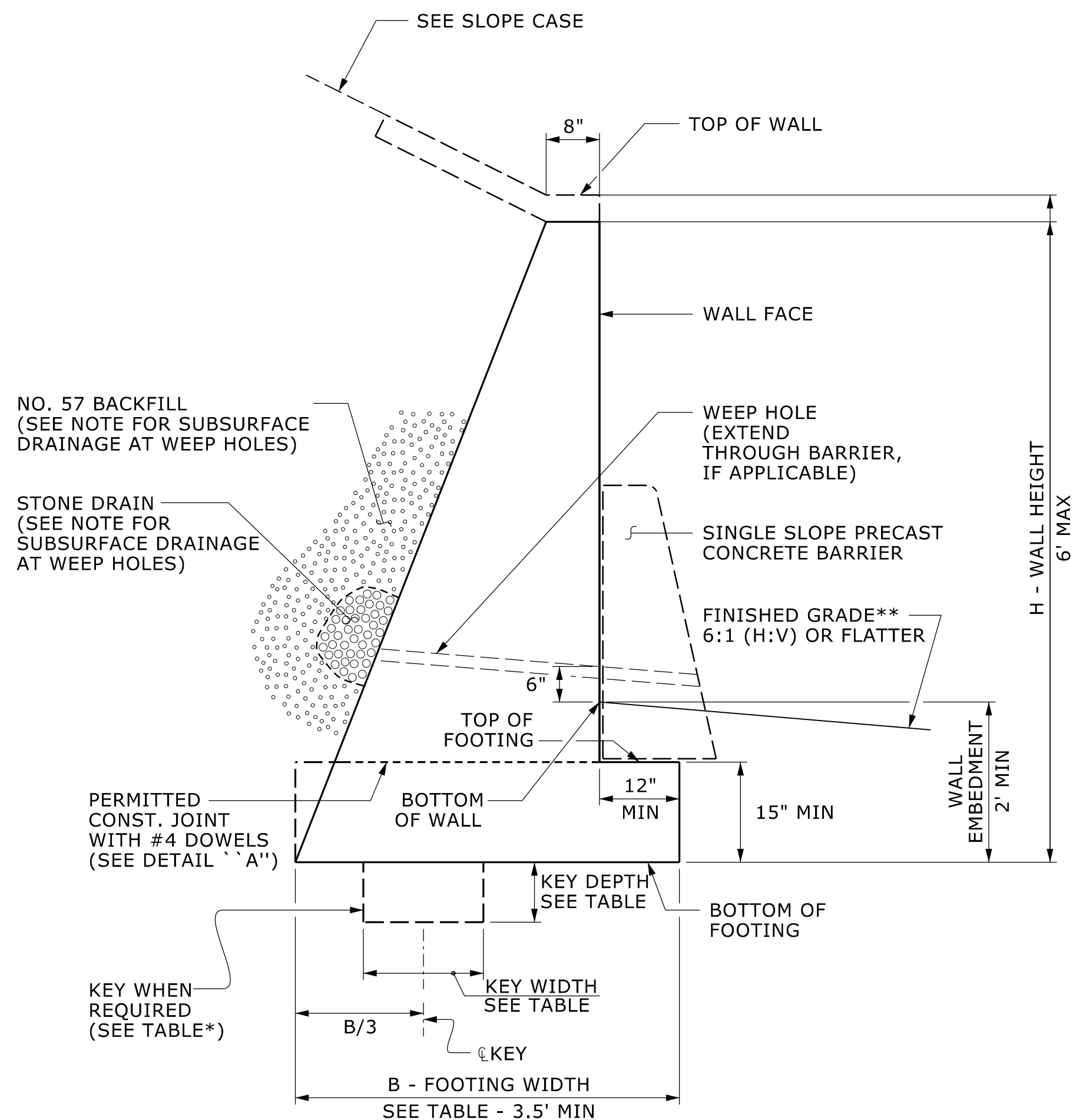
EET
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-78

C:\Users\emantosh\OneDrive - ECS Corporate Services\31 Asheville - 31-4489 [1-25]3AC % Structures\CADD_GEO\TECH\PlanP-of\125]3AC_GEO.RWAL_RET-Wal|32-1.DEC.dgn



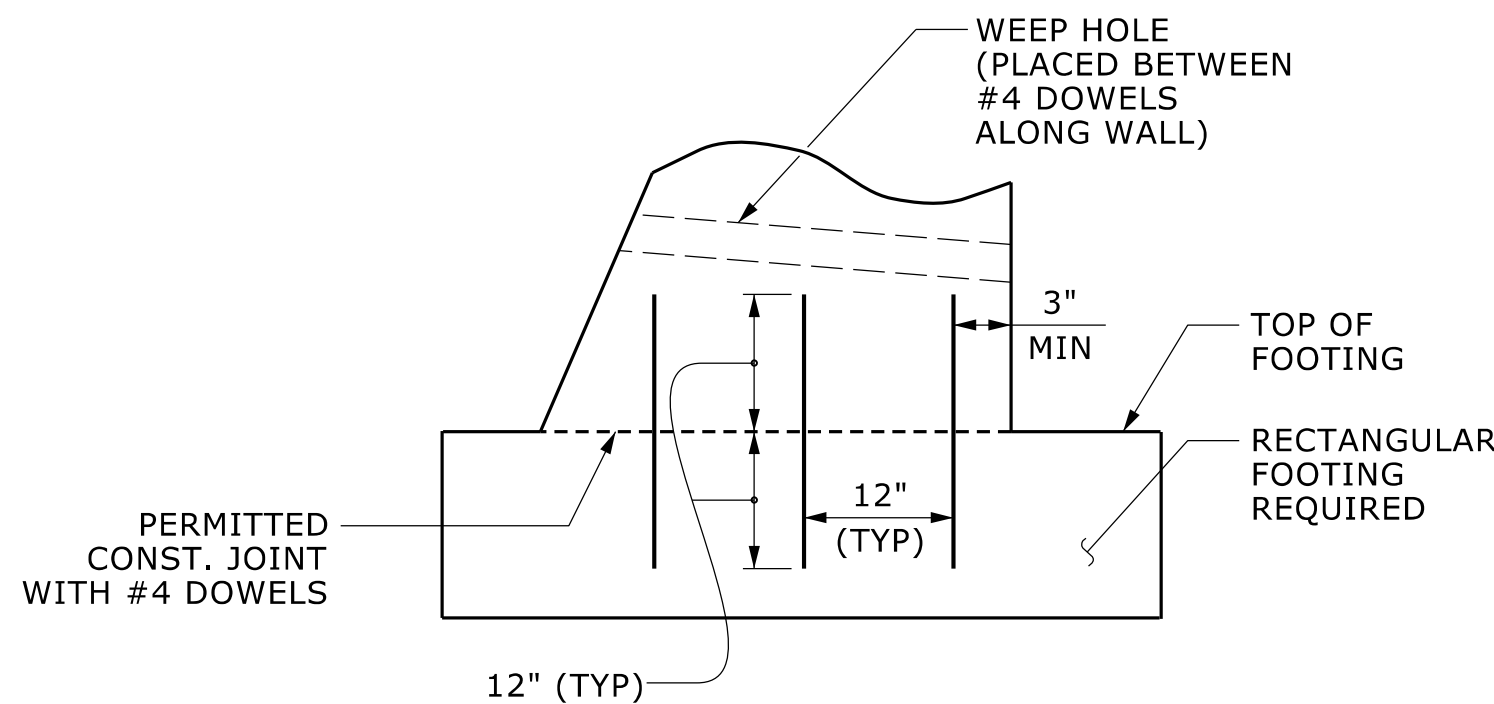
SLOPE CASE

****SEE ROADWAY PLANS FOR
CONCRETE DITCH AND FINISHED GRADE DETAILS.**



CIP GRAVITY WALL

****SEE ROADWAY PLANS FOR FINISHED GRADE DETAILS.**



DETAIL "A"

H (FT)	3' - < 6'
SLOPE CASE - 2:1	.70*
SLOPE CASE - 4:1	.70*
NO SLOPE CASE WITH TRAFFIC SURCHARGE	.60*

B/H RATIO (B = 3.5' MIN)

*KEY IS REQUIRED FOR "SLOPE CASES" AND "NO SLOPE CASE WITH TRAFFIC SURCHARGE"

KEY DIMENSIONS	KEY DEPTH (FEET)	KEY WIDTH (FEET)
SLOPE CASE - 2:1	2.25	2.0
SLOPE CASE - 4:1	1.5	1.5
NO SLOPE CASE WITH TRAFFIC SURCHARGE	0.75	1.5

MINIMUM KEY DIMENSIONS

PROJECT NO.: I-2513AC

BUNCOMBE COUNTY

STATION: +/- -L- 74+50 TO -L- 109+50

SHEET 6 OF 6 WALL IDs RW-30-32

RETAINING WALL NOS. 30-32
CAST IN PLACE (CIP)
GRAVITY RETAINING WALL
TYPICAL SECTION AND NOTES

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1			3			W-7
2			4			

SHEET
NO.
W-79

NOTES:

FOR CIP GRAVITY RETAINING WALLS, SEE SECTION 453 OF THE STANDARD SPECIFICATIONS.

FOR SINGLE FACED PRECAST CONCRETE BARRIER, SEE ROADWAY PLANS
AND SECTION 857 OF THE STANDARD SPECIFICATIONS.

FOR SUBSURFACE DRAINAGE AT WEEP HOLES, SEE ARTICLE 414-8 OF THE STANDARD SPECIFICATIONS.

CIP GRAVITY WALLS ARE BASED ON THE FOLLOWING IN-SITU
ASSUMED SOIL PARAMETERS:
UNIT WEIGHT, $\gamma = 120$ PCF
FRICTION ANGLE, $\phi = 30$ DEGREES
COHESION, $c = 0$ PSF

USE COARSE AGGREGATE (NO. 57 STONE) BEHIND CIP GRAVITY WALL WITH THE FOLLOWING SOIL PARAMETER:
UNIT WEIGHT, $\gamma = 110$ PCF
FRICTION ANGLE, $\phi = 38$ DEGREES
COHESION, $c = 0$ PSF

DO NOT USE CIP GRAVITY WALLS IF ASSUMED SOIL
PARAMETERS ARE NOT APPLICABLE OR GROUNDWATER IS ABOVE BOTTOM
OF FOOTING.

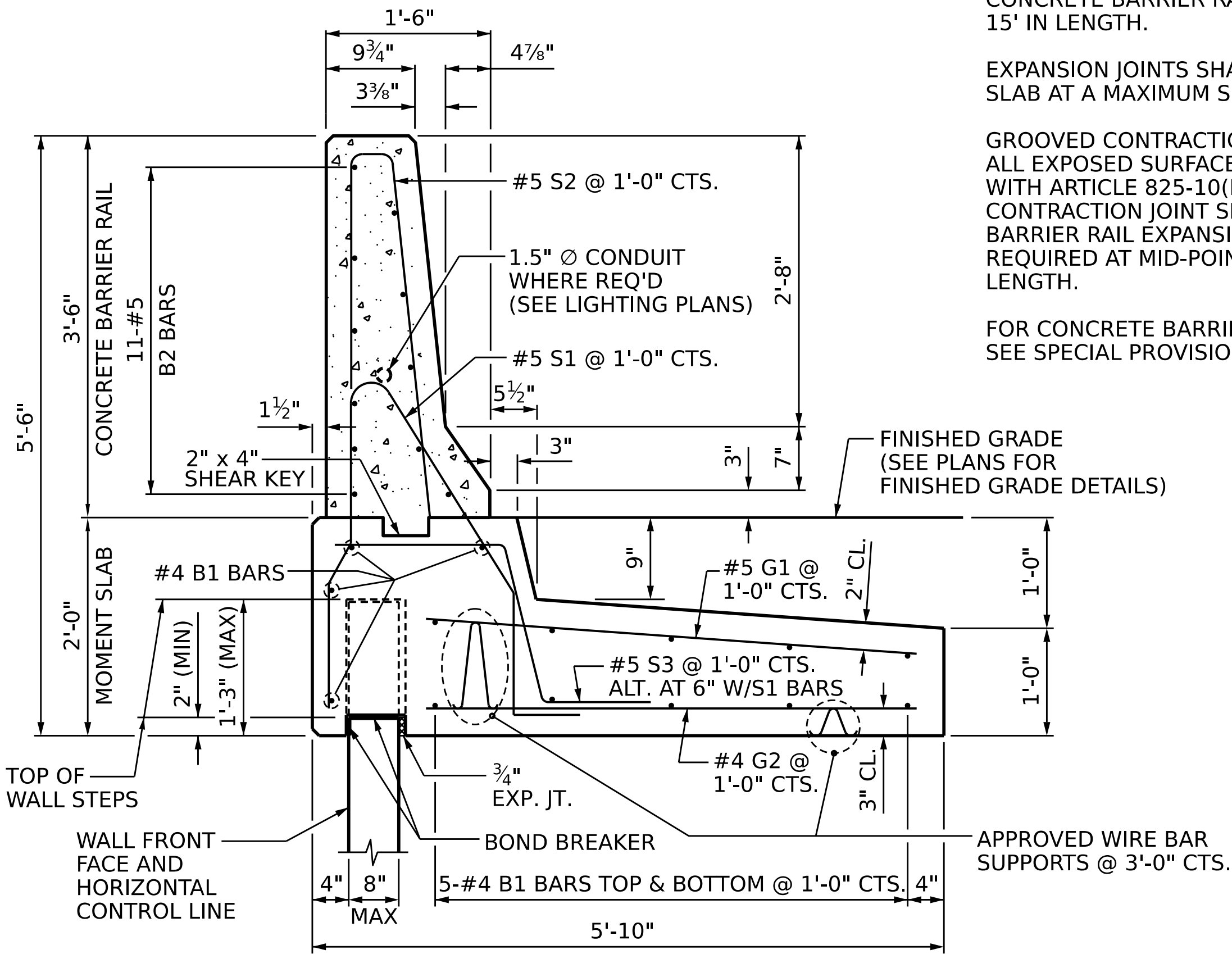
DO NOT USE CIP GRAVITY WALLS WHEN VERY LOOSE OR SOFT SOIL OR MUCK IS BELOW WALLS.

BEFORE BEGINNING CIP GRAVITY WALL CONSTRUCTION, SURVEY WALL LOCATIONS AND SUBMIT WALL PROFILE VIEWS (WALL ENVELOPES) FOR REVIEW. FOR WALL ENVELOPES, INCLUDE BOTTOM OF WALL, EXISTING GROUND AND GRADE ELEVATIONS AND OTHER ELEVATIONS AS NEEDED AT INTERVALS OF 25' OR LESS ALONG WALLS. DO NOT START WALL CONSTRUCTION UNTIL WALL ENVELOPES ARE ACCEPTED.

DO NOT PLACE CONCRETE FOR FOOTINGS UNTIL EXCAVATION
DIMENSIONS AND FOUNDATION MATERIAL ARE APPROVED.

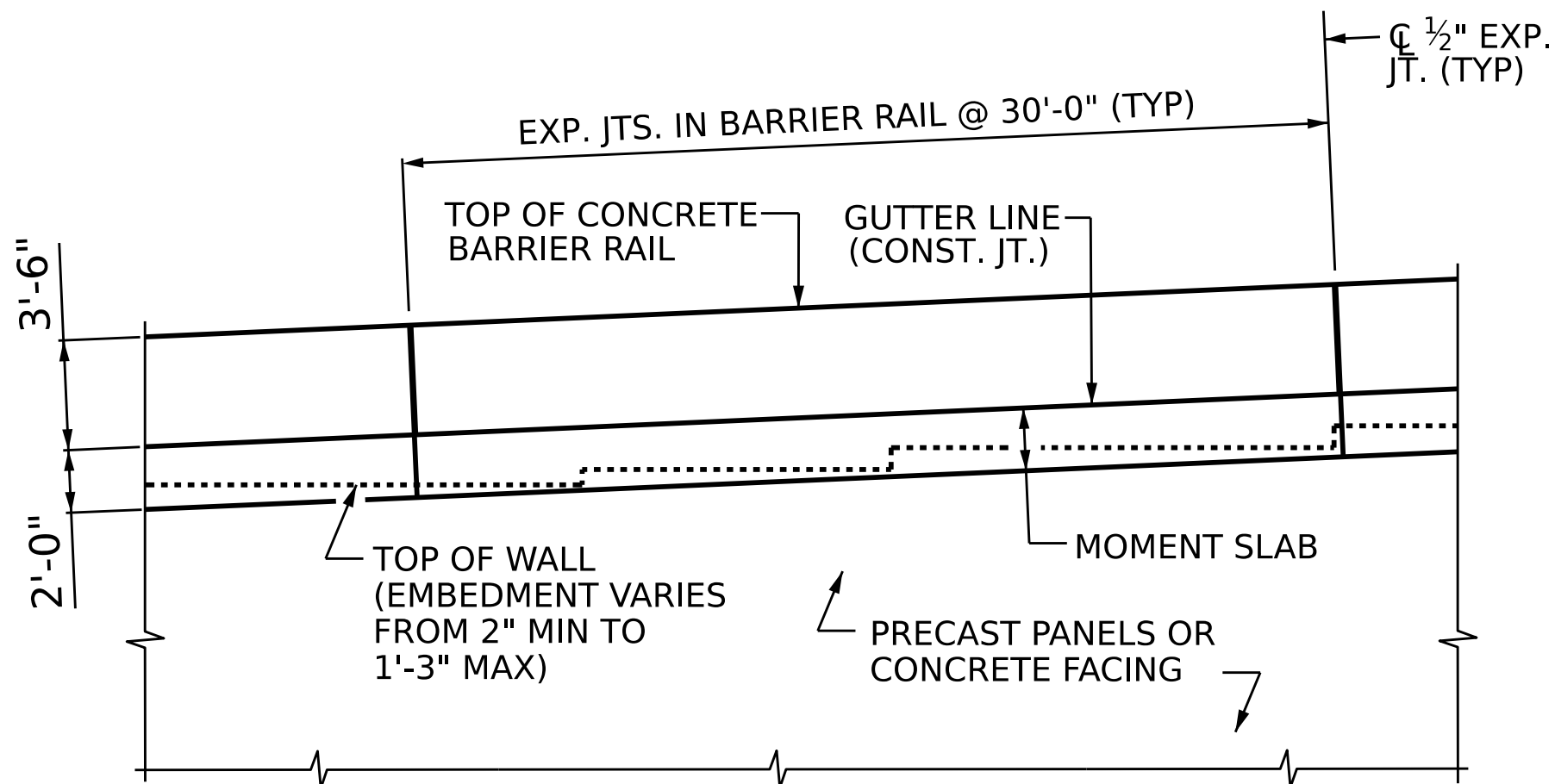
WHEN CONSTRUCTING CIP GRAVITY WALLS WITH A CONSTRUCTION JOINT AS SHOWN IN DETAIL "A", PROVIDE A MINIMUM OF 3 EQUALLY SPACED #4 DOWELS AT INTERVALS OF 1'-6" ALONG WALLS.

DESIGN RETAINING WALLS NOS. 30, 31 AND 32 TO INCORPORATE DRAIN DROP INLET STRUCTURES AND PIPES ALONG THE TOE OF THE WALLS AND FOR PIPES GOING INTO DRAIN DROP STRUCTURES AT -L 77+51.13, 82+35.25, 84+75.00, 89+69.53, 104+01.17, AND 107+11.77. INCLUDE DETAILS IN CIP GRAVITY WALL DESIGN SUBMITTAL.



CONCRETE BARRIER RAIL WITH MOMENT SLAB

USE THIS DETAIL UNLESS NOTED OTHERWISE



CONCRETE BARRIER RAIL WITH MOMENT SLAB - PARTIAL ELEVATION

NOTES:

FOR CONCRETE BARRIER RAIL WITH MOMENT SLAB, SEE SECTION 460 OF THE STANDARD SPECIFICATIONS.

CONCRETE BARRIER RAIL WITH MOMENT SLAB SHALL BE A MINIMUM OF 15' IN LENGTH.

EXPANSION JOINTS SHALL BE PLACED IN THE BARRIER RAIL AND MOMENT SLAB AT A MAXIMUM SPACING OF 30'.

GROOVED CONTRACTION JOINTS, 1/2" IN DEPTH, SHALL BE TOOLED IN ALL EXPOSED SURFACES OF THE BARRIER RAIL AND IN ACCORDANCE WITH ARTICLE 825-10(B) OF THE STANDARD SPECIFICATIONS. A CONTRACTION JOINT SHALL BE LOCATED AT EACH THIRD POINT BETWEEN BARRIER RAIL EXPANSION JOINTS. ONLY ONE CONTRACTION JOINT IS REQUIRED AT MID-POINT OF BARRIER RAIL SEGMENTS LESS THAN 20' IN LENGTH.

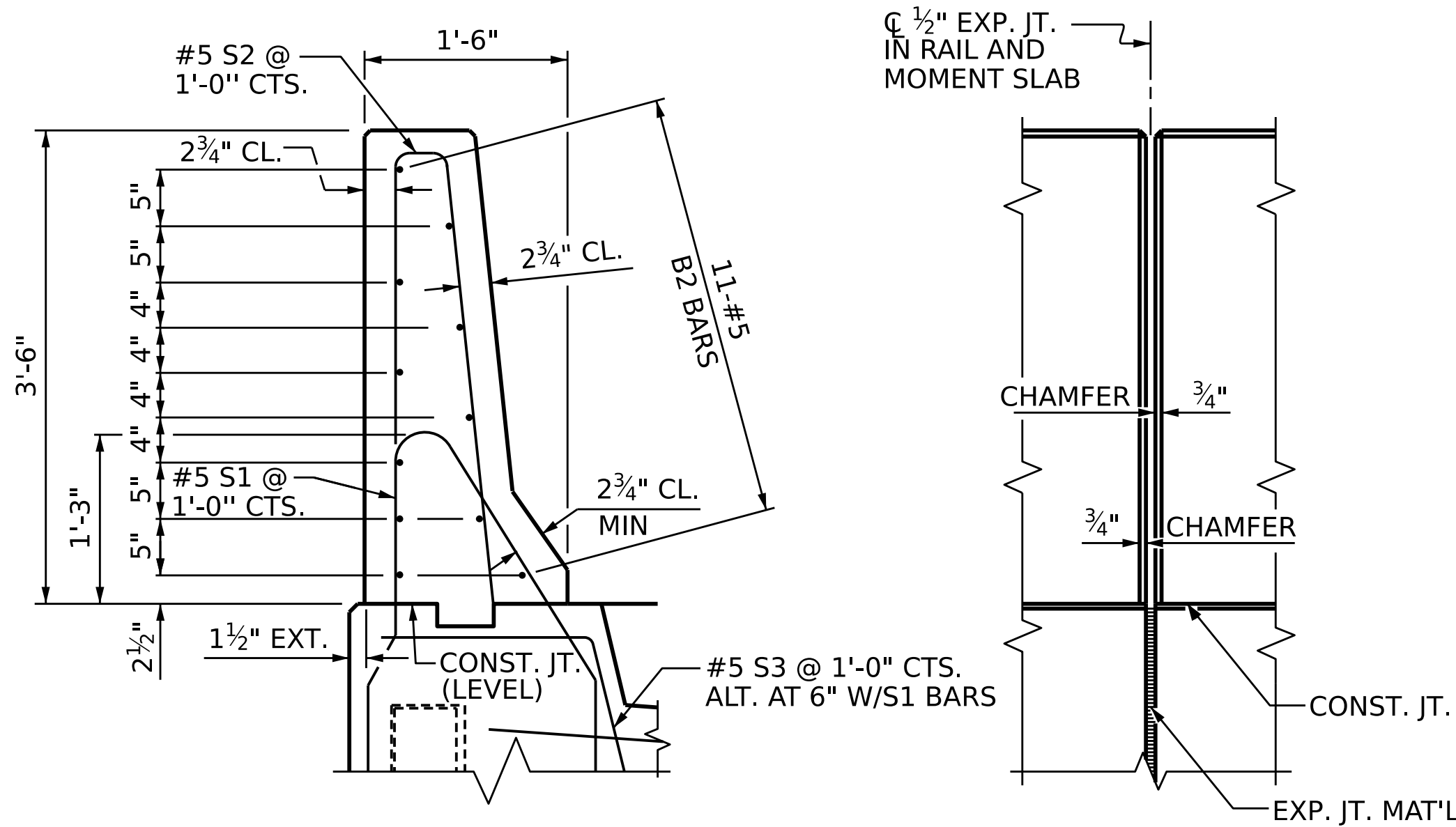
FOR CONCRETE BARRIER RAIL WITH MOMENT SLAB AND LIGHT SUPPORT, SEE SPECIAL PROVISION.

EXPANSION OR CONTRACTION JOINTS IN THE BARRIER RAIL AND MOMENT SLAB SHALL BE ALIGNED WITH JOINTS IN WALL FACING BELOW.

THE BARRIER RAIL SHALL NOT BE CAST UNTIL THE MOMENT SLAB HAS ATTAINED AN AGE OF THREE CURING DAYS OR A MINIMUM COMPRESSIVE STRENGTH OF 2,000 PSI. IN ADDITION, NO FILL MATERIAL, ASPHALT, OR CONSTRUCTION EQUIPMENT IS ALLOWED ON THE MOMENT SLAB PRIOR TO SATISFYING THE MINIMUM CONCRETE CURING AND STRENGTH REQUIREMENTS.

ALL REINFORCING STEEL IN THE BARRIER RAIL SHALL BE EPOXY COATED.

IF EXISTING OR FUTURE OBSTRUCTIONS SUCH AS FOUNDATIONS, BARRIERS, PIPES, INLETS OR UTILITIES WILL INTERFERE WITH CONCRETE BARRIER RAIL WITH MOMENT SLAB OR CONCRETE FACING FOR RETAINING WALL WILL BE THICKER THAN 8", CONCRETE BARRIER RAIL WITH MOMENT SLAB DETAILS SHALL BE REVISED AND SUBMITTED FOR APPROVAL.



SECTION THRU RAIL

ELEV. @ EXP. JOINTS

BARRIER RAIL DETAILS

MOMENT SLAB SUMMARY (WHERE ASSOCIATED WITH A WALL)

WALL	CONCRETE BARRIER RAIL WITH MOMENT SLAB		CONCRETE BARRIER RAIL WITH MOMENT SLAB AND LIGHT SUPPORT		
	STA. RANGE	PAY LENGTH (LF) *	STA.	NO. LOCATIONS	PAY LENGTH (LF)
RW 2	-L- 62+11.02 TO 63+81.00	169.00	N/A	0	0
RW 3 **	-RP23- 18+65.00 TO 37+74.00	1817.54	SEE LIGHTING PLANS	6	93.00
RW 5	-L- 65+90.00 TO 81+67.80	1599.17	N/A	0	0
RW 6	-RP32- 28+45.00 TO 30+45.00	200.00	N/A	0	0
RW 8	-L- 15+90.00 TO 17+00.00	110.00	N/A	0	0
RW 12	-Y2A- 14+38.02 TO 17+25.00	326.72	N/A	0	0
RW 30 **	-L- 74+50.00 TO 82+41.82	760.92	SEE LIGHTING PLANS	2	31.00
RW 31 **	-L- 84+35.93 TO 104+81.32	1952.39	SEE LIGHTING PLANS	6	93.00
RW 32	-L- 106+32.56 TO 109+50.00	317.44	N/A	0	0
TOTALS		7253.18		14	217.00

* WHERE LIGHT SUPPORT IS PRESENT, QUANTITY HAS BEEN DEDUCTED FROM PAY LENGTH

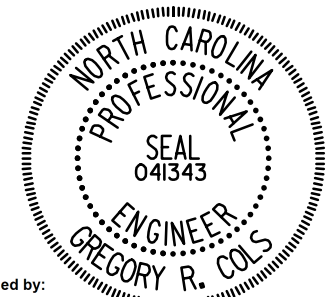
** 1.5" DIA. CONDUIT REQUIRED IN BARRIER RAIL. SEE LIGHTING PLANS FOR CONDUIT DETAILS AND JUNCTION BOX / ACCESS PANEL LOCATIONS.

NOTE: FOR CONCRETE BARRIER RAIL WITH MOMENT SLAB AT NOISE WALL, SEE STRUCTURE 7, 9, AND 10 PLANS.

FOR CONCRETE BARRIER RAIL WITH MOMENT SLAB AT WALL 22 AND 23, SEE STRUCTURE 8 PLANS.

FOR OTHER CONCRETE BARRIER RAIL WITH MOMENT SLAB LOCATIONS, SEE ROADWAY PLANS.

STRUCTURE
ENGINEER



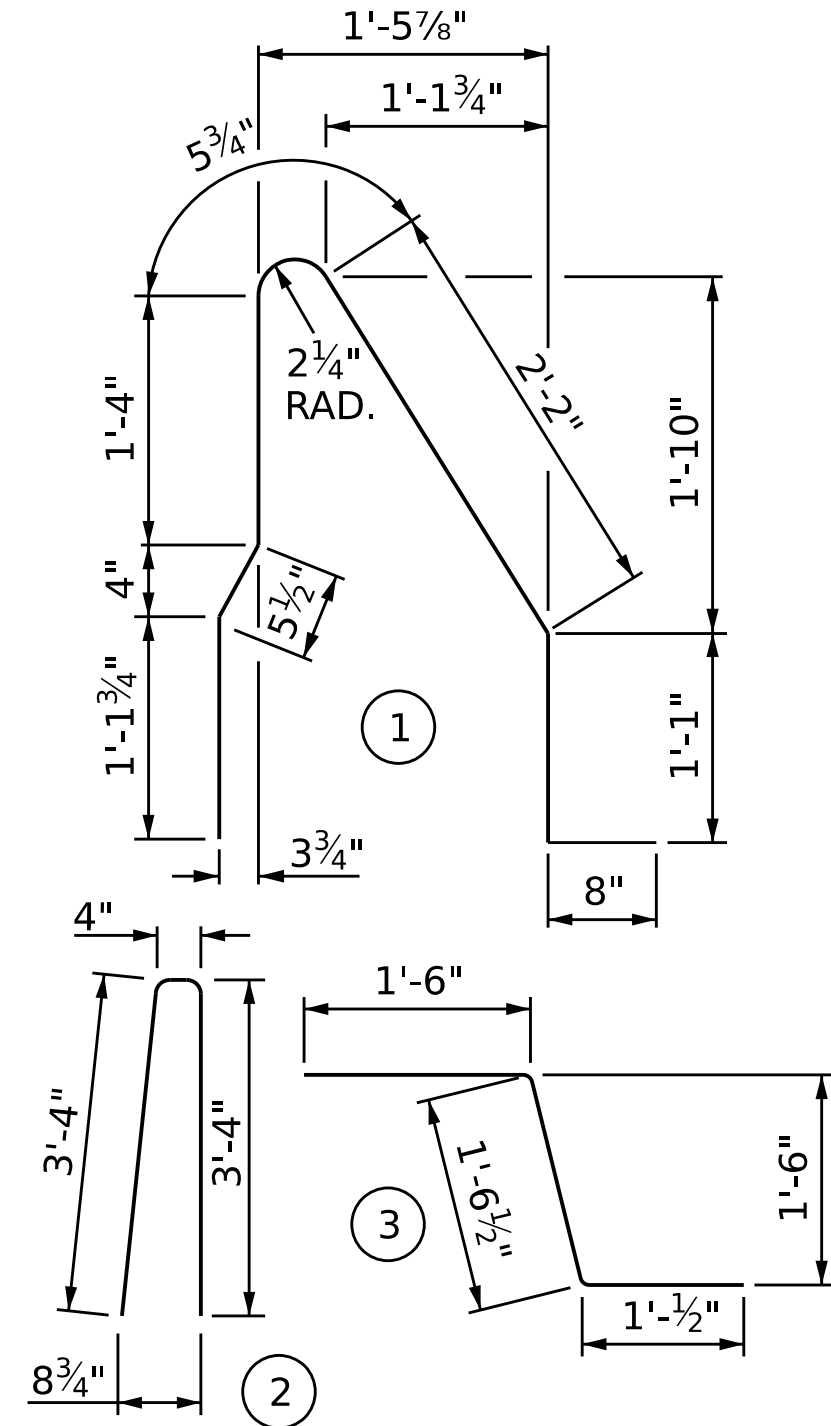
Signed by:

Gregory Cols
180CFCC2CF4949F

7/16/2026
DATE

DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

BAR TYPES



ALL BAR DIMENSIONS ARE OUT TO OUT

BILL OF MATERIAL

FOR ONE 30'-0" SECTION OF CONCRETE BARRIER RAIL WITH MOMENT SLAB

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
B1	14	#4	STR	29'-7"	277
*B2	11	#5	STR	29'-7"	339
G1	31	#5	STR	4'-4"	140
G2	31	#4	STR	4'-4"	90
*S1	31	#5	1	7'-4"	237
*S2	31	#5	2	7'-0"	226
S3	30	#5	3	4'-1"	128

REINFORCING STEEL 635 LB

* EPOXY COATED REINFORCING STEEL 802 LB

CLASS AA CONCRETE BARRIER RAIL 4.1 CY

CLASS A CONCRETE MOMENT SLAB 9.1 CY

CONCRETE BARRIER RAIL WITH MOMENT SLAB 30 LIN FT

PROJECT NO.: I-2513 AC

BUNCOMBE COUNTY

STATION:

SHEET 1 OF 4

CONCRETE BARRIER RAIL WITH MOMENT SLAB FOR PRECAST PANELS AND CONCRETE FACING

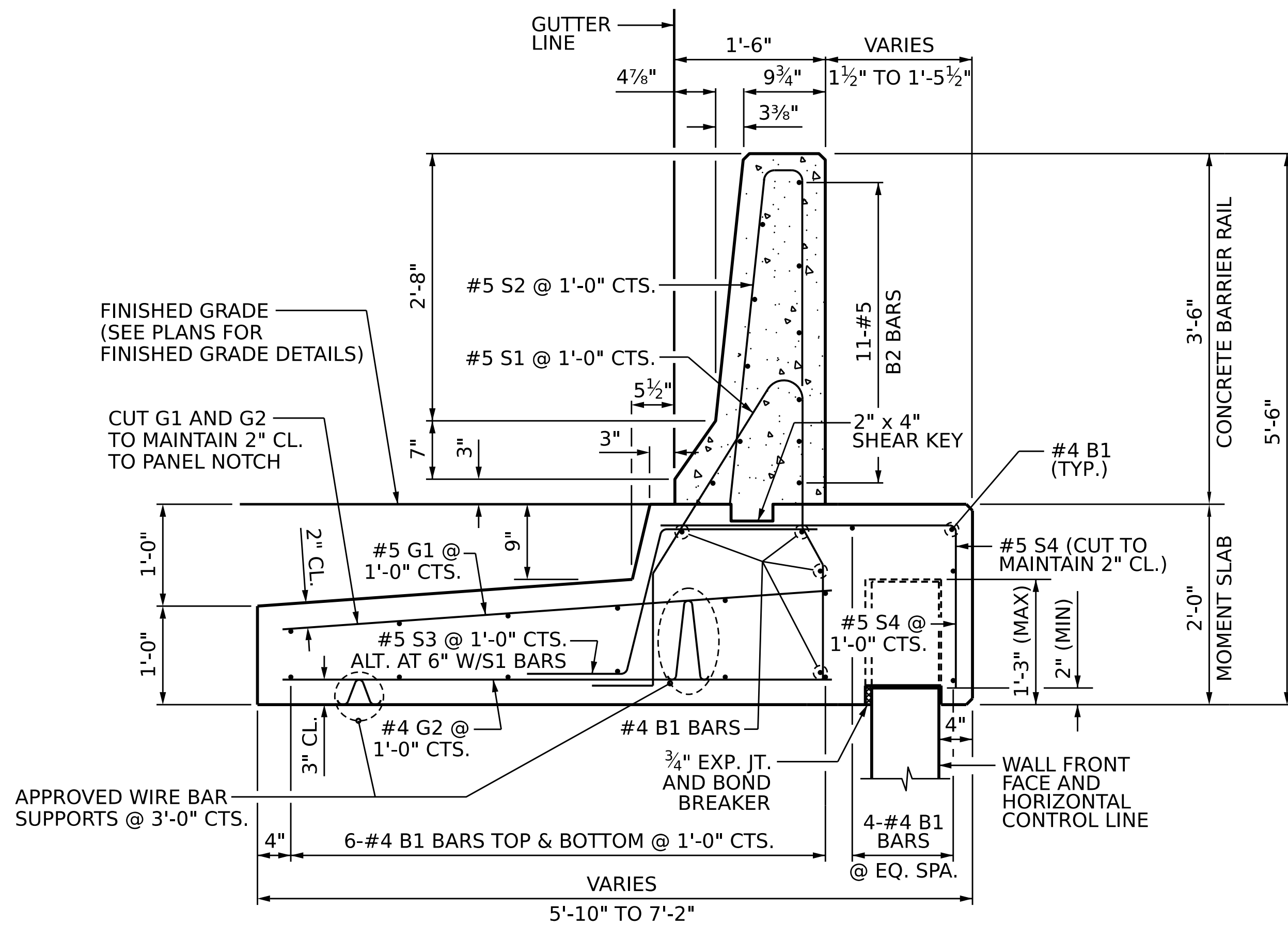
REVISIONS

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

SHEET NO.

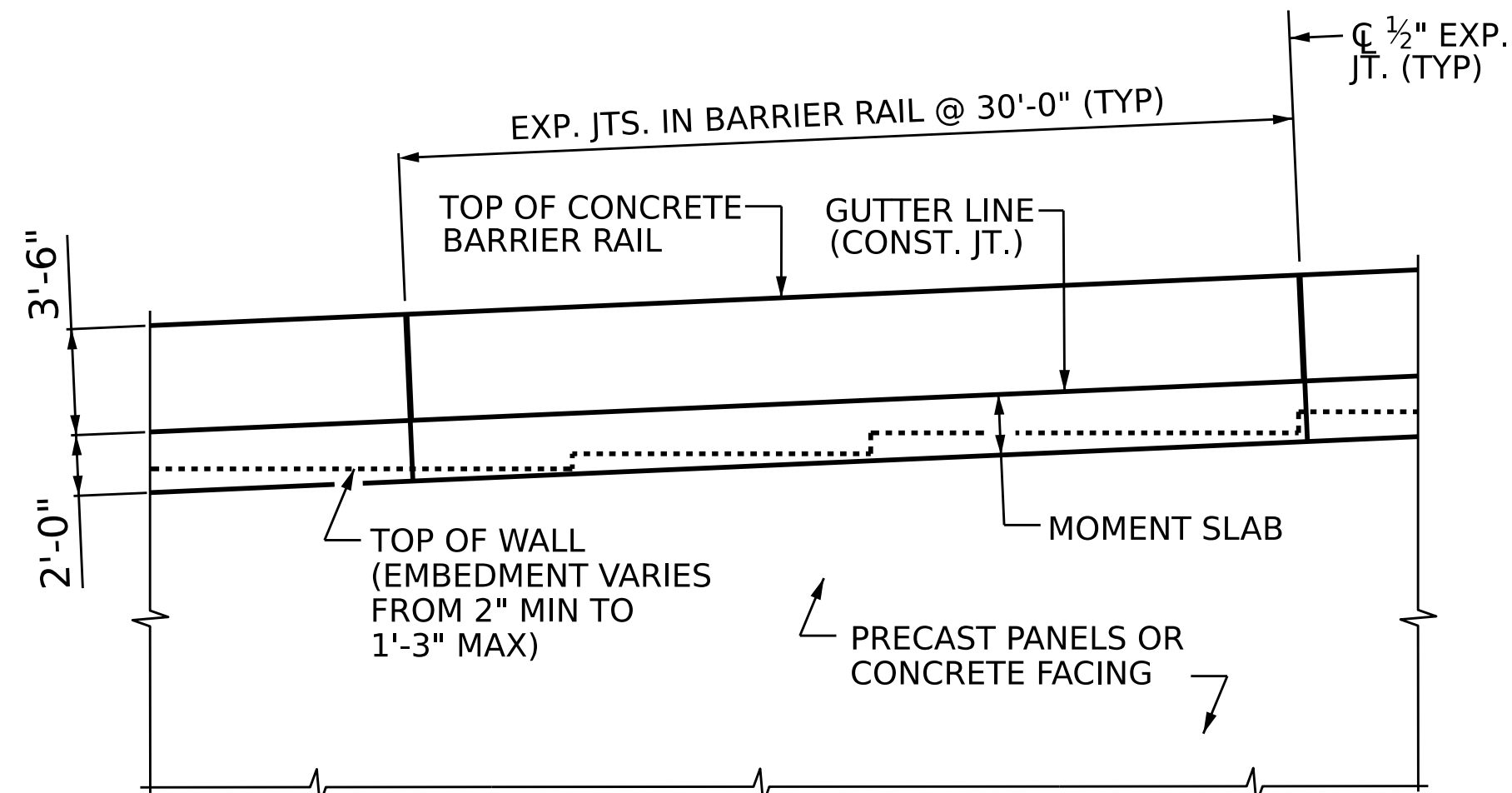
W-80

PREPARED BY: L. LEE	DATE: 07/2024
REVIEWED BY: G. COLS	DATE: 07/2024

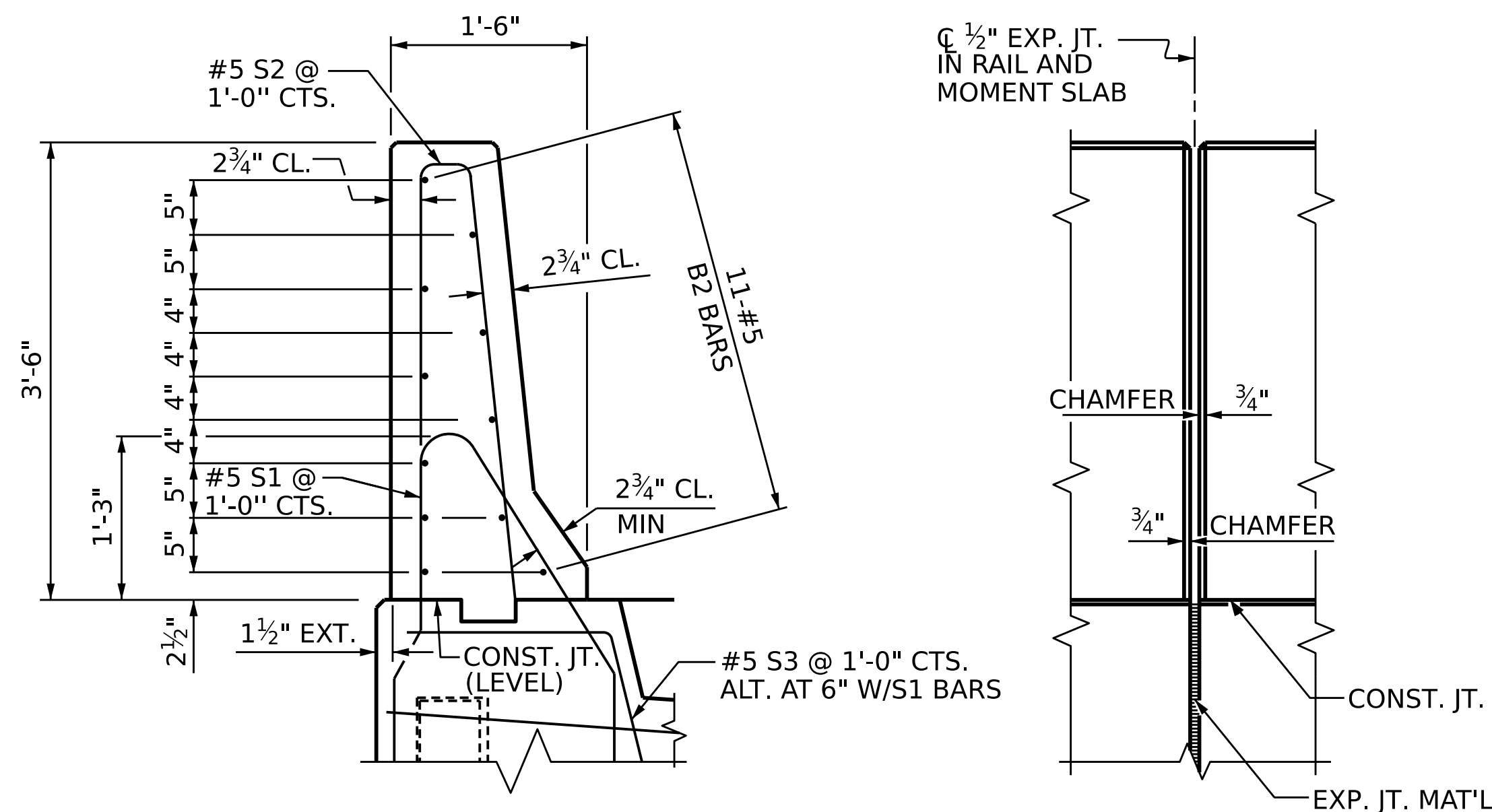


CONCRETE BARRIER RAIL WITH MOMENT SLAB

USE THIS DETAIL AT / BEHIND WALL 2, STATION RANGE -L- 62+90.82 TO 63+81.00
USE THIS DETAIL AT / BEHIND WALL 6, STATION RANGE -RP32- 28+45.00 TO 29+35.00



CONCRETE BARRIER RAIL WITH MOMENT SLAB - PARTIAL ELEVATION



SECTION THRU RAIL

ELEV. @ EXP. JOINTS

BARRIER RAIL DETAILS

NOTES:

FOR CONCRETE BARRIER RAIL WITH MOMENT SLAB, SEE SECTION 460 OF THE STANDARD SPECIFICATIONS.

CONCRETE BARRIER RAIL WITH MOMENT SLAB SHALL BE A MINIMUM OF 15' IN LENGTH.

EXPANSION JOINTS SHALL BE PLACED IN THE BARRIER RAIL AND MOMENT SLAB AT A MAXIMUM SPACING OF 30'.

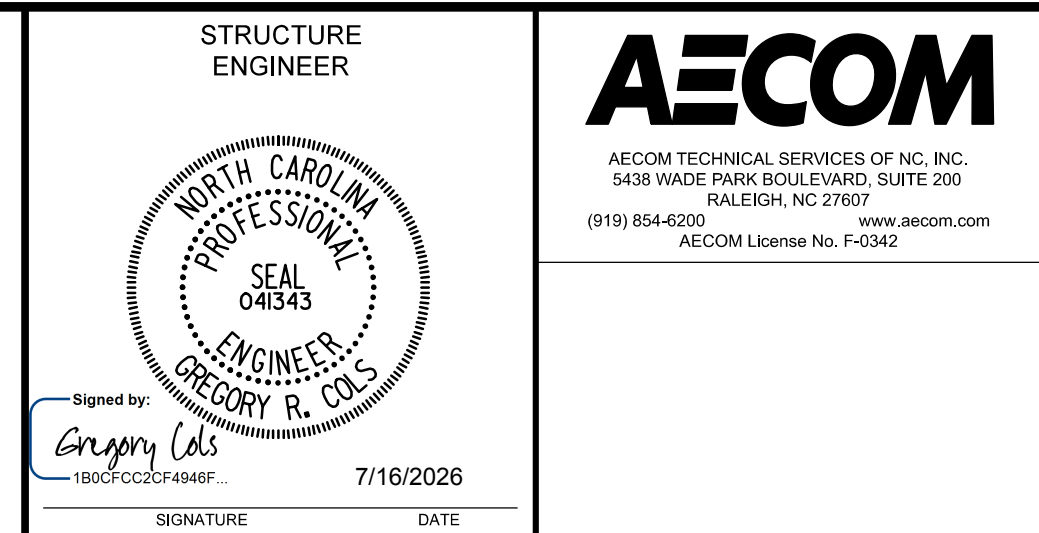
GROOVED CONTRACTION JOINTS, 1/2" IN DEPTH, SHALL BE TOOLED IN ALL EXPOSED SURFACES OF THE BARRIER RAIL AND IN ACCORDANCE WITH ARTICLE 825-10(B) OF THE STANDARD SPECIFICATIONS. A CONTRACTION JOINT SHALL BE LOCATED AT EACH THIRD POINT BETWEEN BARRIER RAIL EXPANSION JOINTS. ONLY ONE CONTRACTION JOINT IS REQUIRED AT MID-POINT OF BARRIER RAIL SEGMENTS LESS THAN 20' IN LENGTH.

EXPANSION OR CONTRACTION JOINTS IN THE BARRIER RAIL AND MOMENT
SLAB SHALL BE ALIGNED WITH JOINTS IN WALL FACING BELOW.

THE BARRIER RAIL SHALL NOT BE CAST UNTIL THE MOMENT SLAB HAS ATTAINED AN AGE OF THREE CURING DAYS OR A MINIMUM COMPRESSIVE STRENGTH OF 2,000 PSI. IN ADDITION, NO FILL MATERIAL, ASPHALT, OR CONSTRUCTION EQUIPMENT IS ALLOWED ON THE MOMENT SLAB PRIOR TO SATISFYING THE MINIMUM CONCRETE CURING AND STRENGTH REQUIREMENTS.

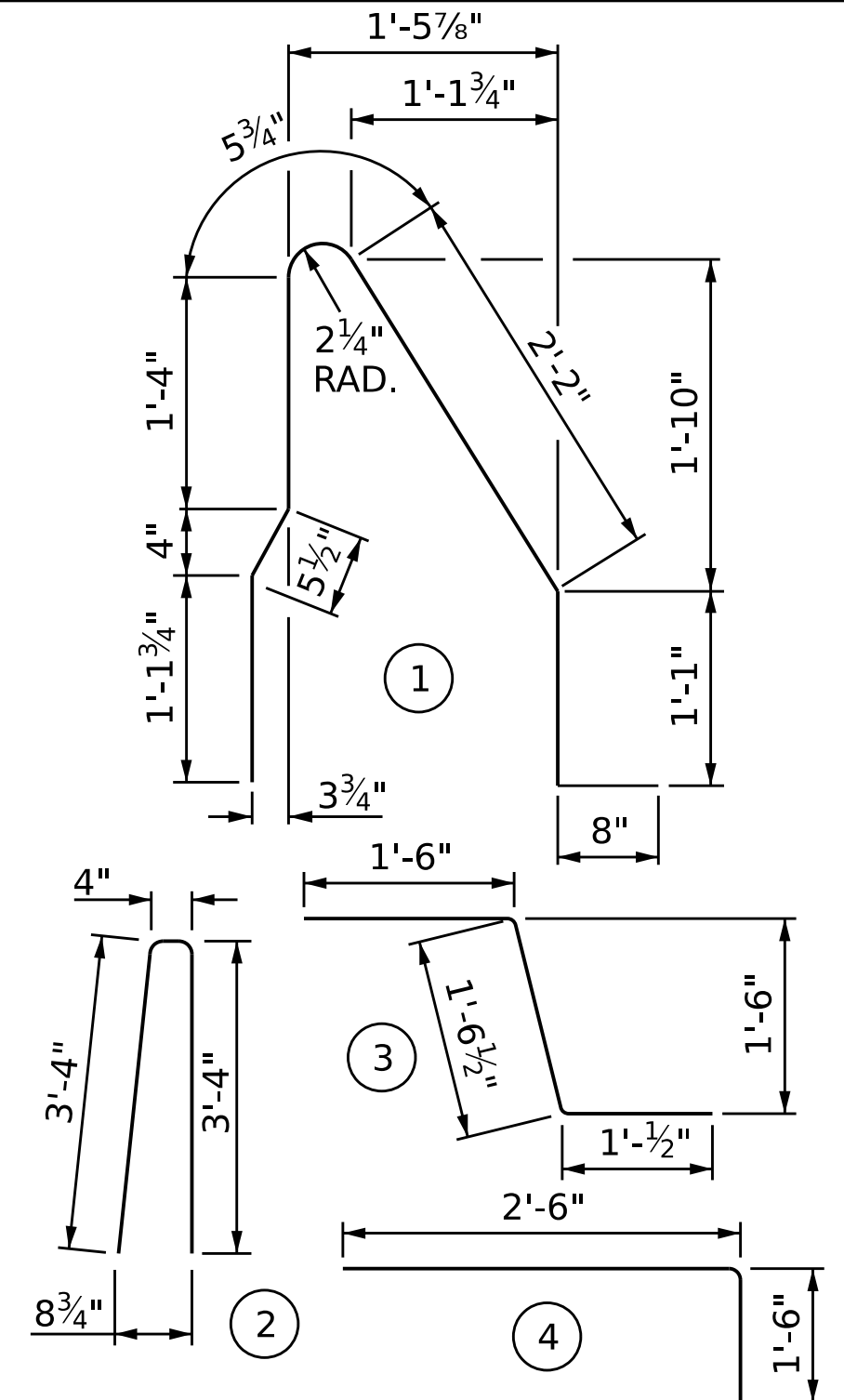
ALL REINFORCING STEEL IN THE BARRIER RAIL SHALL BE EPOXY COATED.

IF EXISTING OR FUTURE OBSTRUCTIONS SUCH AS FOUNDATIONS, BARRIERS, PIPES, INLETS OR UTILITIES WILL INTERFERE WITH CONCRETE BARRIER RAIL WITH MOMENT SLAB OR CONCRETE FACING FOR RETAINING WALL WILL BE THICKER THAN 8", CONCRETE BARRIER RAIL WITH MOMENT SLAB DETAILS SHALL BE REVISED AND SUBMITTED FOR APPROVAL.



**DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED**

BAR TYPES



ALL BAR DIMENSIONS ARE OUT TO OUT

BILL OF MATERIAL

FOR ONE 30'-0" SECTION OF CONCRETE
BARRIER RAIL WITH MOMENT SLAB

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
B1	20	#4	STR	29'-7"	395
*B2	11	#5	STR	29'-7"	339
G1	31	#5	STR	5'-6"	178
G2	31	#4	STR	5'-6"	114
*S1	31	#5	1	7'-4"	237
*S2	31	#5	2	7'-0"	226
S3	30	#5	3	4'-1"	128
S4	30	#5	4	4'-0"	125

REINFORCING STEEL	940 LB
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* EPOXY COATED REINFORCING STEEL 202 LB

REINFORCING STEEL	802 LB
CLASS AA CONCRETE	

CLASS AA CONCRETE	
BARRIER RAIL	4.1 CY

CLASS A CONCRETE

PROJECT NO.: I-2513 AC

BUNCOMBE COUNTY

STATION: 53+86.35 -L-

SHEET 3 OF 4 WALL ID RW-2-

CONCRETE BARRIER RAIL WITH MOMENT SLAB FOR PRECAST PANELS AND CONCRETE FACING

REVISIONS						SHEET NO. W-82
NO.	BY	DATE	NO.	BY	DATE	
1	-	-	3	-	-	
2			4			

SHEET
NO.
W-82



Job	I-2513 AC Wall	Station :	83+50.80	Page	_____	of	_____
Description	Working Days Estimate	Project No	60646756	Sheet	_____	of	_____
		Comp. by :	BC	Date	_____	7/9/26	
		Checked by	GRC	Date	_____	7/14/26	

NCDOT WORKING DAYS ESTIMATE

WALLS

Operation	Est. Days	Element	Con- Current	Production Rate
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MSE Wall #RW1	42	02		200 CY/day for excavation 2 days for initial section
No. Walls	1			2 days to pour the pad
LF walls	4331.0 ft			5 days to cure the pad
SF walls	4845.0 SF			500 SF per day to place panels
Excv	51.0 CY			200 LF per day for coping
Assume Avg	8.0 ft	25.0 ft		
Ht (Ft)				
Length	8.0 ft	25.0 ft		

MSE Wall #RW2	39	02		200 CY/day for excavation 2 days for initial section
No. Walls	1			2 days to pour the pad
LF walls	814.0 ft			5 days to cure the pad
SF walls	11810.0 SF			500 SF per day to place panels
Excv	7.8 CY			200 LF per day for coping
Assume Avg	2.0 ft	5.0 ft	8.0 ft	
Ht (Ft)				
Length	6.0 ft	6.0 ft	9.6 ft	

MSE Wall #RW3	52	02		200 CY/day for excavation 2 days for initial section
No. Walls	1			2 days to pour the pad
LF walls	1335.0 ft			5 days to cure the pad
SF walls	17495.0 SF			500 SF per day to place panels
Excv	4.0 CY			200 LF per day for coping
Assume Avg	7.0 ft			
Ht (Ft)				
Length	8.4 ft			

MSE Wall #RW4	16	02		200 CY/day for excavation 2 days for initial section
No. Walls	1			2 days to pour the pad
LF walls	298.0 ft			5 days to cure the pad
SF walls	2175.0 SF			500 SF per day to place panels
Excv	0.0 CY			200 LF per day for coping

MSE Wall #RW5	107	02		200 CY/day for excavation 2 days for initial section
No. Walls	1			2 days to pour the pad
LF walls	1599.0 ft			5 days to cure the pad
SF walls	44945.0 SF			500 SF per day to place panels
Excv	0.0 CY			200 LF per day for coping

Note: Walls 3 and 5 are constructed together in some areas, with surcharge and waiting periods.
Waiting period and concurrent construction are not considered in this calculation.



Job	I-2513 AC Wall	Station :	83+50.80	Page		of	
Description	Working Days Estimate	Project No	60646756	Sheet		of	
		Comp. by :	BC	Date		7/9/26	
		Checked by	GRC	Date		7/14/26	

NCDOT WORKING DAYS ESTIMATE

WALLS

Operation	Est. Days	Element	Current	Production Rate
MSE Wall #RW6	20	02		200 CY/day for excavation 2 days for initial section
No. Walls	1			2 days to pour the pad
LF walls	422.0 ft			5 days to cure the pad
SF walls	3170.0 SF			500 SF per day to place panels
Excv	34.7 CY			200 LF per day for coping
Assume Avg	18.0 ft	12.0 ft	6.0 ft	
Ht (Ft)				
Length	18.0 ft	12.0 ft	6.0 ft	

MSE Wall #RW7	15	02		200 CY/day for excavation 2 days for initial section
No. Walls	1			2 days to pour the pad
LF walls	270.0 ft			5 days to cure the pad
SF walls	1500.0 SF			500 SF per day to place panels
Excv	2.0 CY			200 LF per day for coping
Assume Avg	5.0 ft			
Ht (Ft)				
Length	6.0 ft			

MSE Wall #RW8	16	02		200 CY/day for excavation 2 days for initial section
No. Walls	1			2 days to pour the pad
LF walls	590.0 ft			5 days to cure the pad
SF walls	1410.0 SF			500 SF per day to place panels
Excv	6.3 CY			200 LF per day for coping
Assume Avg	10.0 ft			
Ht				
Length	7.0 ft			

MSE Wall #RW9	23	02		200 CY/day for excavation 2 days for initial section
No. Walls	1			2 days to pour the pad
LF walls	205.0 ft			5 days to cure the pad
SF walls	5755.0 SF			500 SF per day to place panels
Excv	0.0 CY			200 LF per day for coping

Soil Nail Wall #RW10	20			
No. Walls	1		10	nails per day
LF walls	305.0 ft		3	day per 100 LF
Sf Wall	3885.0 ft		1	day additional when former liners are required
Nails	156			200 LF per day for coping

Soil Nail Wall #RW11	32			
No. Walls	1		10	nails per day
LF walls	580.0 ft		3	day per 100 LF
Sf Wall	6360.0 ft		1	day additional when former liners are required
Nails	255			



Job	I-2513 AC Wall	Station :	83+50.80	Page		of	
Description	Working Days Estimate	Project No	60646756	Sheet		of	
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		Checked by	GRC	Date		7/14/26	

NCDOT WORKING DAYS ESTIMATE

WALLS

Operation	Est. Days	Element	Current	Con-	Production Rate
MSE Wall #RW12	35	02			200 CY/day for excavation 2 days for initial section 2 days to pour the pad 5 days to cure the pad 500 SF per day to place panels 200 LF per day for coping
No. Walls	1				
LF walls	268.0 ft				
SF walls	11180.0 SF				
Excv	59.8 CY				
Assume Avg	25.0 ft	15.0 ft			
Ht					
Length	22.5 ft	13.5 ft			
Soil Nail Wall #RW13	6				
No. Walls	1			10	nails per day
LF walls	130.0 ft			3	day per 100 LF
Sf Wall	965.0 ft			1	day additional when former liners are required
Nails	39				
Soil Nail Wall #RW14	35.5				
No. Walls	1			10	nails per day
LF walls	378.0 ft			3	day per 100 LF
Sf Wall	7875.0 ft			1	day additional when former liners are required
Nails	315				
Soil Nail Wall #RW15	165				
No. Walls	1			10	nails per day
LF walls	1260 ft			3	day per 100 LF
Sf Wall	37950.0 ft			1	day additional when former liners are required
Nails	1518				
Soil Nail Wall #RW16	77				
No. Walls	1			10	nails per day
LF walls	1042 ft			3	day per 100 LF
Sf Wall	16465.0 ft			1	day additional when former liners are required
Nails	659				
MSE Wall #RW18	45	02			200 CY/day for excavation 2 days for initial section 2 days to pour the pad 5 days to cure the pad 500 SF per day to place panels 200 LF per day for coping
No. Walls	1				
LF walls	748 ft				
SF walls	15415.0 SF				
Excv	22.0 CY				
Assume Avg	7.0 ft	14.0 ft	10.0 ft		
Ht					
Length	6.0 ft	9.8 ft	7.0 ft		



Job	I-2513 AC Wall	Station :	83+50.80	Page		of	
Description	Working Days Estimate	Project No	60646756	Sheet		of	
		Comp. by :	BC	Date		7/9/26	
		Checked by	GRC	Date		7/14/26	

NCDOT WORKING DAYS ESTIMATE

WALLS

Operation	Est. Days	Element	Con- Current	Production Rate
Soldier Pile Wall #RW21	13	02		200 CY/day for excavation 2 days for initial section
No. Walls	1			2 days to pour the pad
LF walls	106 ft			5 days to cure the pad
SF walls	735.0 SF			500 SF per day to place panels
Excv	2.2 CY			200 LF per day for coping
Assume Avg	5.5 CY			
Ht				
Length	5.5 ft			

CIP Wall #RW27	15	02		200 CY/day for excavation 2 days for top section
No. Walls	1			2 days to pour the wall
LF walls	20.0 ft			5 days to cure the wall
SF walls	80.0 SF			500 SF per day to place panels
Excv	0.4 CY			200 LF per day for coping
Assume Avg	2.0 ft	1.0 ft		1 Day for drilling, 1 Day to set and pour concrete, 1 day set in place
Ht				
Length	2.0 ft	1.0 ft		

note: Wall 28 included with bridge plans

CIP Wall #RW30	35	02		200 CY/day for excavation 9 days for top section
No. Walls	1			4 days to pour the pad
LF walls	824 ft			7 days to cure the pad
SF walls	4525.0 SF			500 SF per day to place panels
Excv	0.0 CY			200 LF per day for coping

CIP Wall #RW31	70	02		200 CY/day for excavation 20 days for Top section
No. Walls	1			6 days to pour the pad
LF walls	1752 ft			9 days to cure the pad
SF walls	10960.0 SF			500 SF per day to place panels
Excv	2.7 CY			200 LF per day for coping
Assume Avg	6.0 ft			1 Day for drilling, 1 Day to set and pour concrete, 1 day set in place
Ht				
Length	6.0 ft			

CIP Wall #RW32	22	02		200 CY/day for excavation 3 days for Top section
No. Walls	1			3 days to pour the pad
LF walls	331 ft			6 days to cure the pad
SF walls	1820.0 SF			500 SF per day to place panels
Excv	3.6 CY			200 LF per day for coping
Height	7 ft			1 Day for drilling, 1 Day to set and pour concrete, 1 day set in place
Length	7 ft			