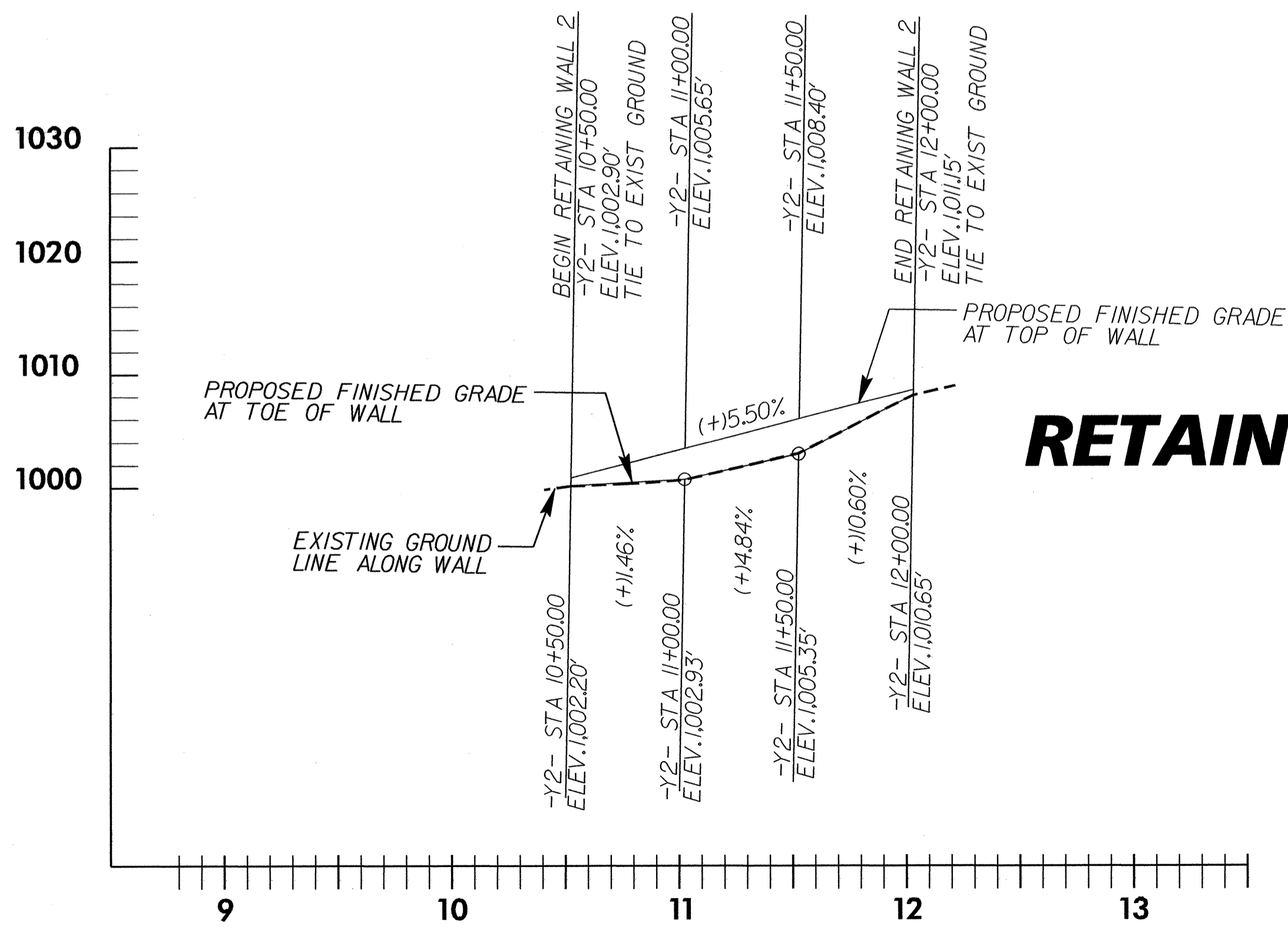


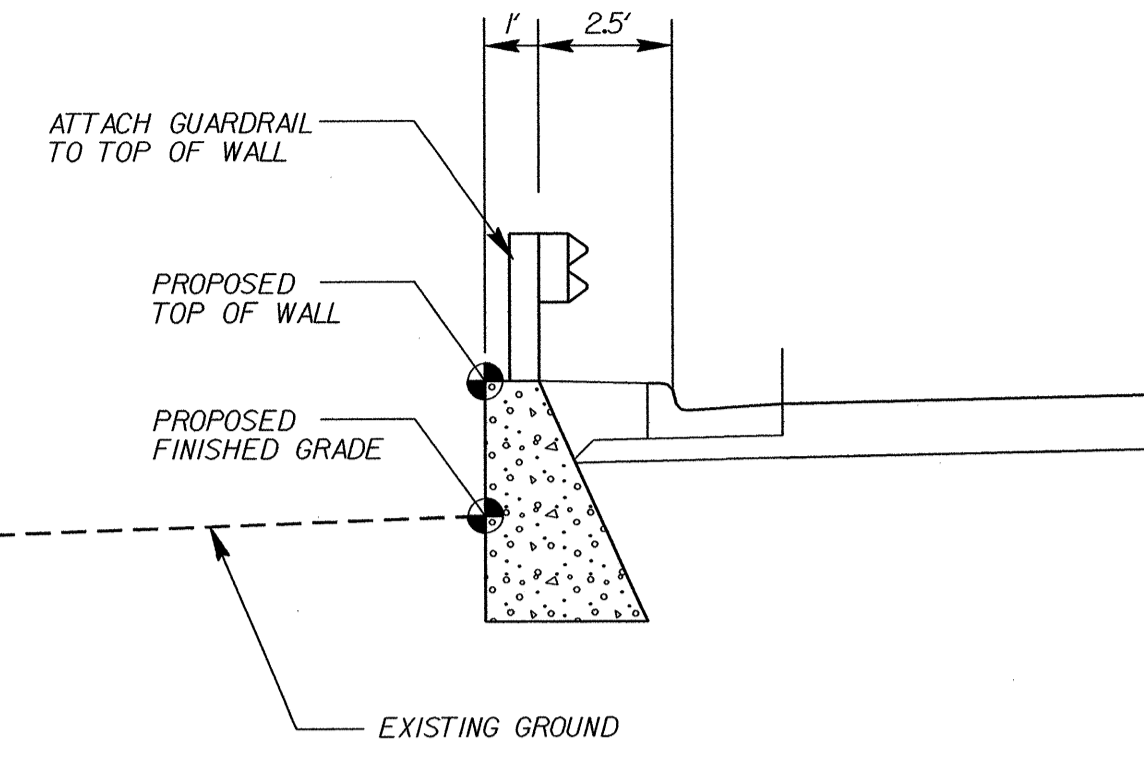
NOTE - ALL STATIONS AND OFFSETS ARE BASED ON -Y2- CENTERLINE AND ARE DIMENSIONED TO THE ROADWAY EDGE OF THE WALL

LOCATION SKETCH



# RETAINING WALL 1

## RETAINING WALL 1



WALL 1 DETAIL  
-Y2- STA 10+50.00 TO STA 12+00.00

### TOTAL STRUCTURE QUANTITIES

GRAVITY RETAINING WALLS	319	SQ. FT.
GUARDRAIL	150	LIN. FT.

### GRAVITY RETAINING WALL ELEVATIONS

-Y2- STA	OFFSET FROM CL (LEFT)	ELEV @ TOP OF WALL	* PROPOSED FINISHED GRADE	* EXPOSED WALL HEIGHT	** DESIGN WALL HEIGHT "H"
10+50.00	16.50	1002.90	1002.20	0.70	0.70
11+00.00	16.50	1005.65	1002.93	2.72	2.72
11+50.00	16.50	1008.40	1005.35	3.05	3.05
12+00.00	16.50	1011.15	1010.65	0.50	0.50

\* ELEVATION @ PROPOSED FINISHED GRADE AND EXPOSED WALL HEIGHT DO NOT INCLUDE EMBEDMENT DEPTH  
\*\* FOR DESIGN WALL HEIGHT "H", SEE CIP GRAVITY WALL DETAILS, SHT 2 OF 3, W-2

PROJECT NO.: U-2826B  
FORSYTH COUNTY  
STATION: -Y2-10+50.00 TO 12+00.00  
SHEET 1 OF 3

**GEOTECHNICAL ENGINEERING UNIT**

EASTERN REGIONAL OFFICE  
 WESTERN REGIONAL OFFICE  
 CONTRACT OFFICE

STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH

**GRAVITY RETAINING WALL #1**

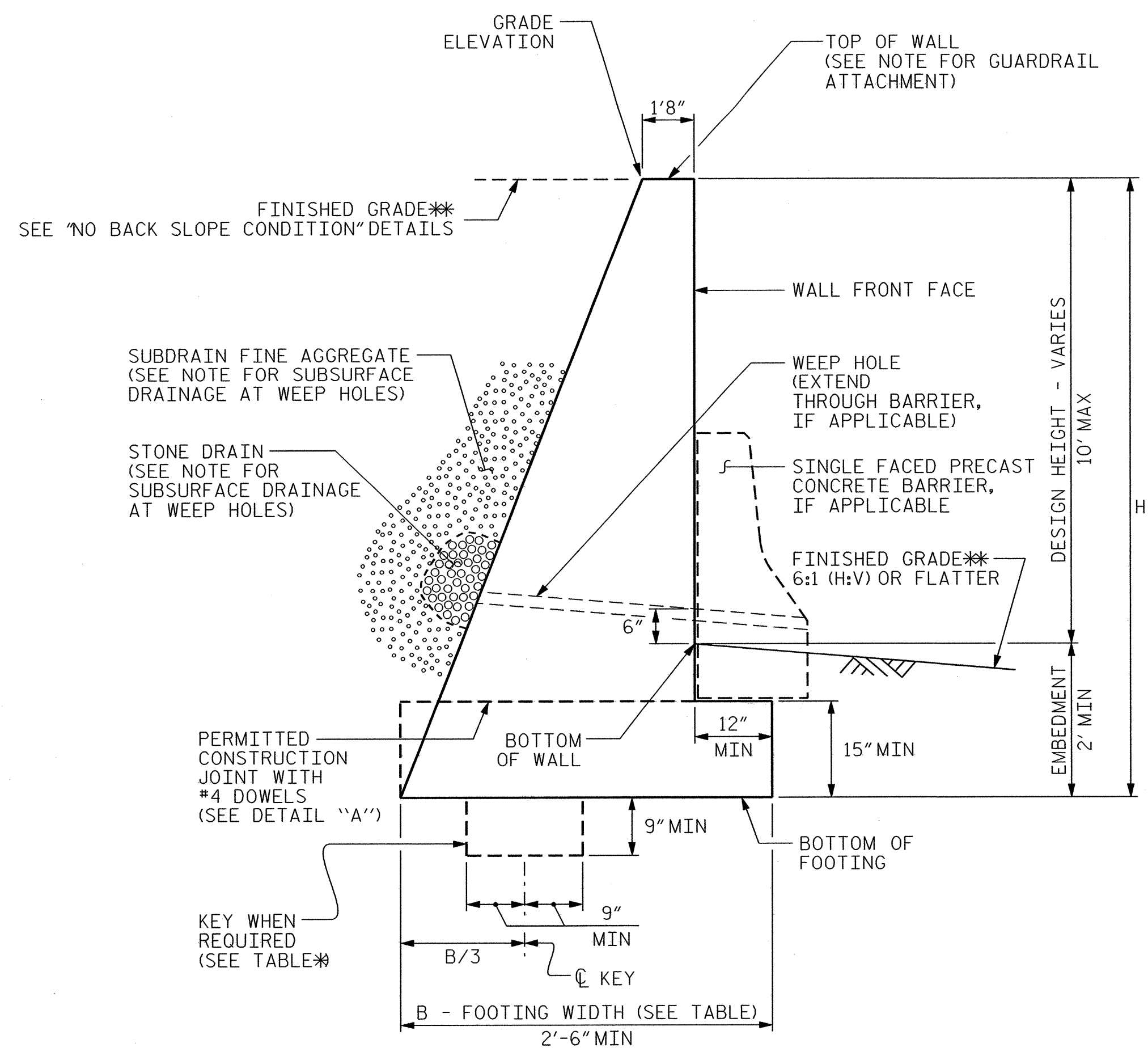
REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	W-1
1			3			TOTAL SHEETS
2			4			

PREPARED BY: J.T. WILLIAMS      DATE: 10/10  
REVIEWED BY: S.C. CLARK      DATE: 1/11

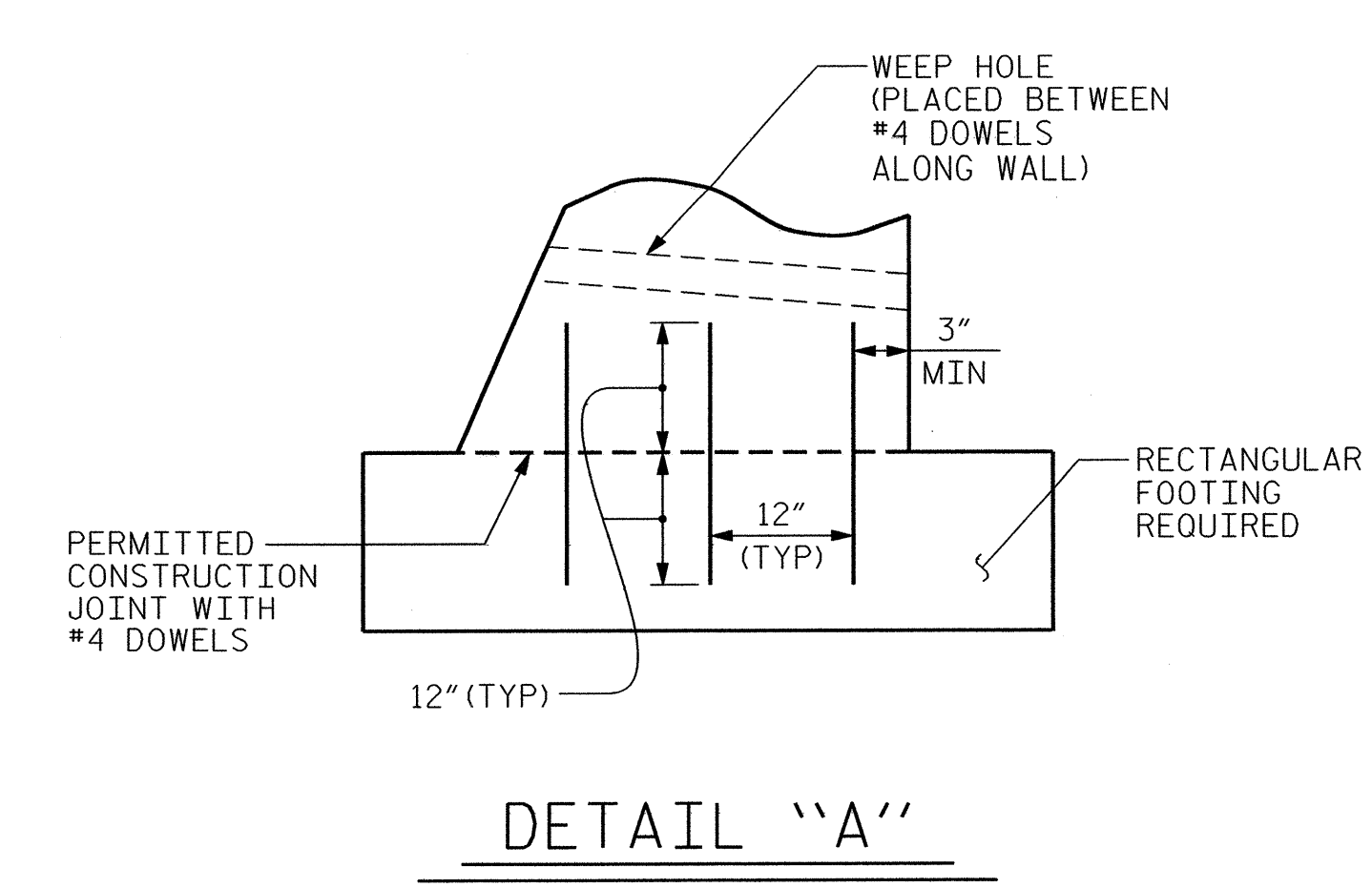
GEOTECHNICAL ENGINEER      ENGINEER

**SEAL 29869**  
ENGINEER  
FRANK C. CLARK

Signature: *Frank C. Clark*      DATE: 1/10/11



**STANDARD CIP GRAVITY WALL**  
\*SEE ROADWAY PLANS FOR FINISHED GRADE AND DITCH DETAILS.

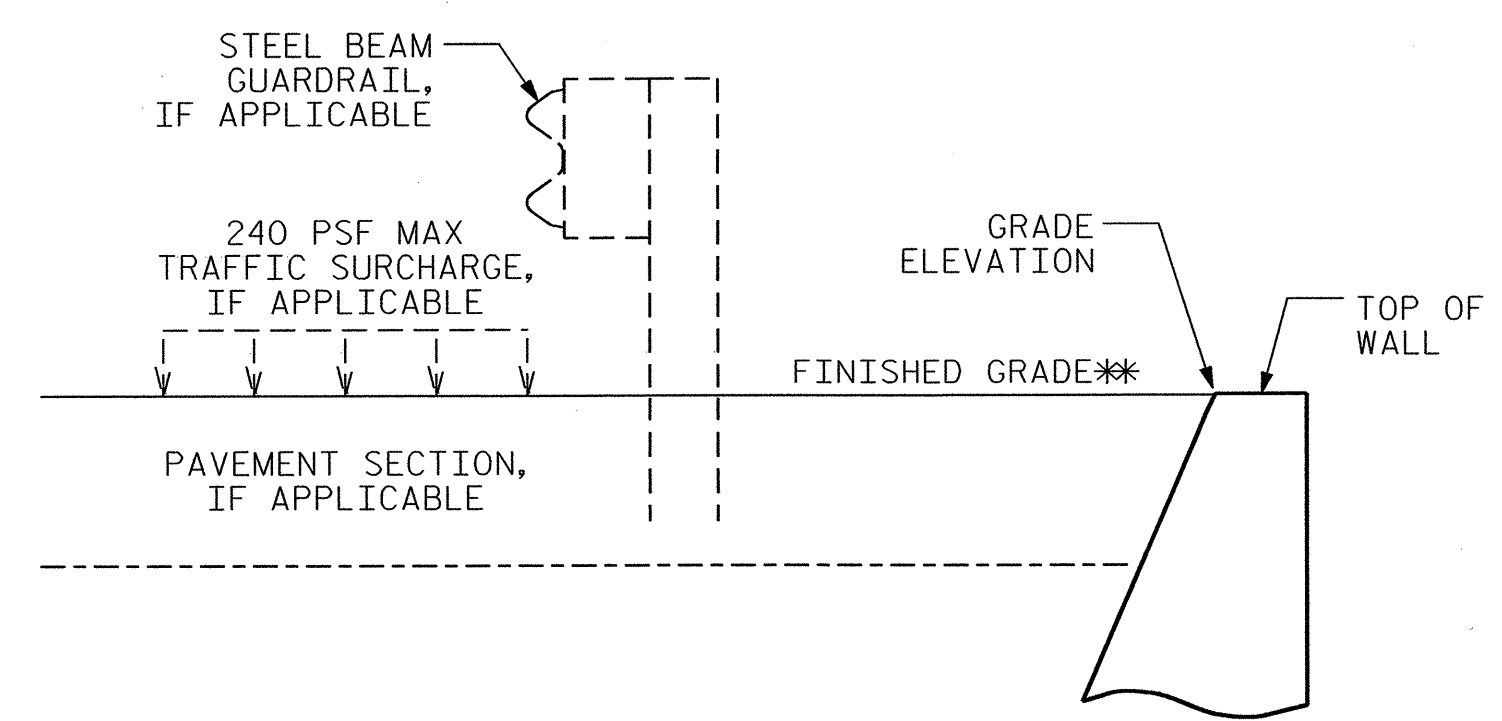


**DETAIL "A"**

H (FT)	3 - < 6	6 - 9	> 9 - 12
BACK SLOPE CONDITION	.66	.70*	.75*
NO BACK SLOPE CONDITION WITH TRAFFIC SURCHARGE	.80	.75*	.70*
NO BACK SLOPE CONDITION WITHOUT TRAFFIC SURCHARGE	.60	.60	.60

**B/H RATIO**  
(B = 2'-6" MIN)

\*KEY IS REQUIRED FOR "BACK SLOPE CONDITION" OR "NO BACK SLOPE CONDITION WITH TRAFFIC SURCHARGE" WHEN H IS 6' OR GREATER.



**NO BACK SLOPE CONDITION**  
\*SEE ROADWAY PLANS FOR FINISHED GRADE DETAILS.

**NOTES:**

- FOR CIP GRAVITY RETAINING WALLS, SEE CAST-IN-PLACE GRAVITY RETAINING WALLS PROVISION.
- FOR STEEL BEAM GUARDRAIL, SEE ROADWAY PLANS AND SECTION 862 OF THE STANDARD SPECIFICATIONS.
- FOR STEEL BEAM ANCHORAGE DETAILS, SEE SECTION 862.03 IN THE NCDOT ROADWAY STANDARD DRAWINGS FOR THE ANCHORAGE FOR GUARDRAIL POST ON BOX CULVERT DETAIL.
- ANCHOR BOLTS FOR GUARDRAIL POST CAN BE CAST INTO THE WALL, AS SHOWN IN THE NCDOT STRUCTURE DESIGN UNITS STANDARD GRA1 SHOWN ON SHEET 3 OF 3, W-3.
- ALTERNATIVELY, THE ANCHORS CAN BE ATTACHED WITH ADHESIVE, IN ACCORDANCE WITH THE SPECIAL PROVISIONS.
- CONTRACTOR'S ATTENTION IS CALLED TO WIDENED TOP OF THE GRAVITY WALL.
- FOR SUBSURFACE DRAINAGE AT WEEP HOLES, SEE ARTICLE 410-9 OF THE STANDARD SPECIFICATIONS.
- CIP GRAVITY WALLS ARE BASED ON THE FOLLOWING IN-SITU ASSUMED SOIL PARAMETERS:  
UNIT WEIGHT,  $\gamma = 120$  PCF  
FRICTION ANGLE,  $\phi = 35$  DEGREES (GROUNDWATER WITHIN 5' OF BOTTOM OF FOOTING)  
FRICTION ANGLE,  $\phi = 30$  DEGREES (GROUNDWATER MORE THAN 5' BELOW BOTTOM OF FOOTING)  
COHESION,  $c = 0$  PSF
- DO NOT USE CIP GRAVITY WALLS IF THE ASSUMED SOIL PARAMETERS ARE NOT APPLICABLE OR GROUNDWATER IS ABOVE THE BOTTOM OF FOOTING.
- DO NOT USE CIP GRAVITY WALLS WHEN VERY LOOSE OR SOFT SOIL OR MUCK IS PRESENT 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 UNTIL OBTAINING APPROVAL OF THE EXCAVATION DEPTH AND FOUNDATION MATERIAL.
- 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.

**PROJECT NO.:** U-2826B  
**FORSYTH COUNTY**  
**STATION:** -Y2-10+50.00 TO 12+00.00  
SHEET 2 OF 3

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

**GEOTECHNICAL ENGINEERING UNIT**

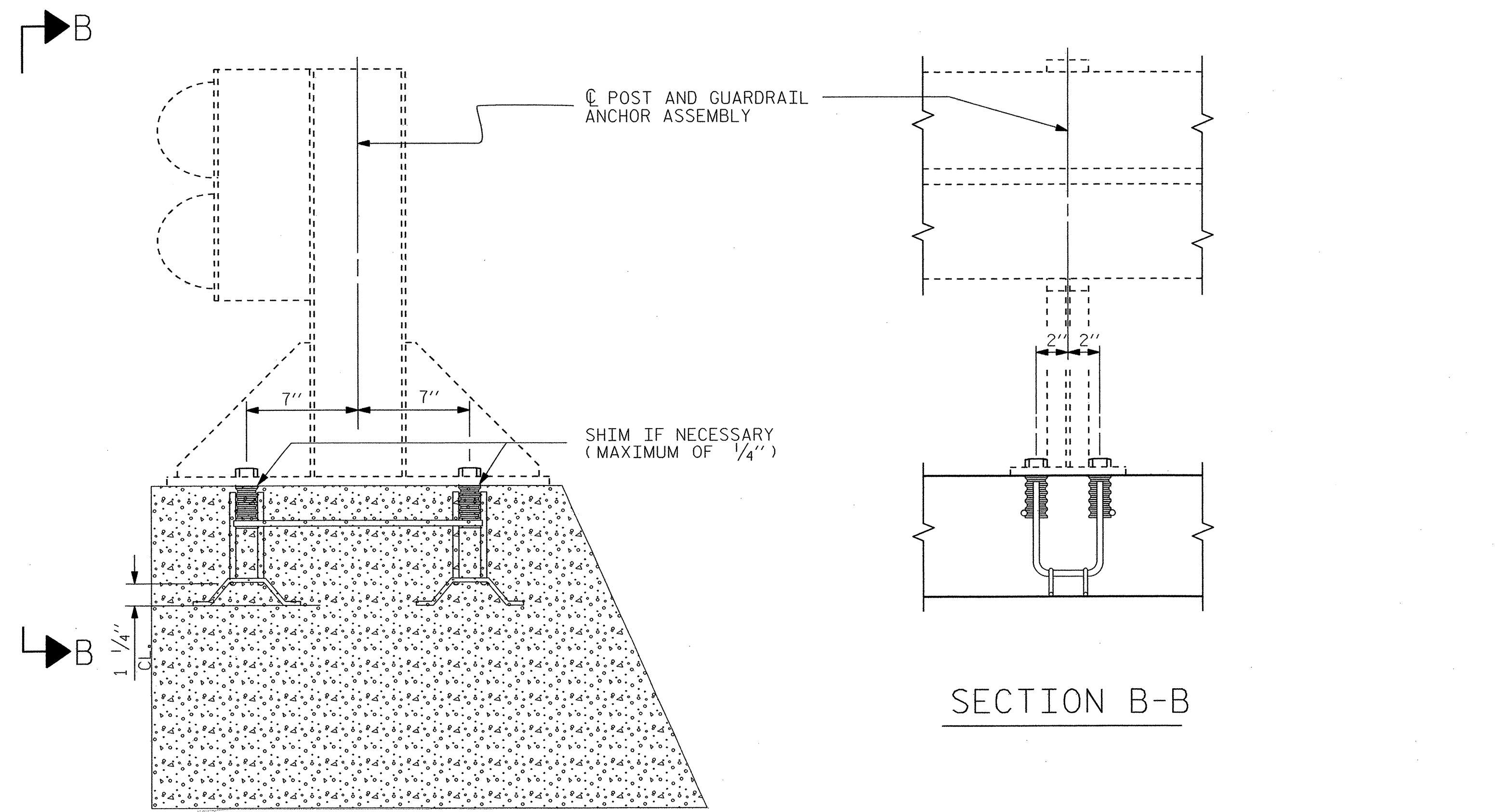
EASTERN REGIONAL OFFICE  
 WESTERN REGIONAL OFFICE  
 CONTRACT OFFICE

STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH

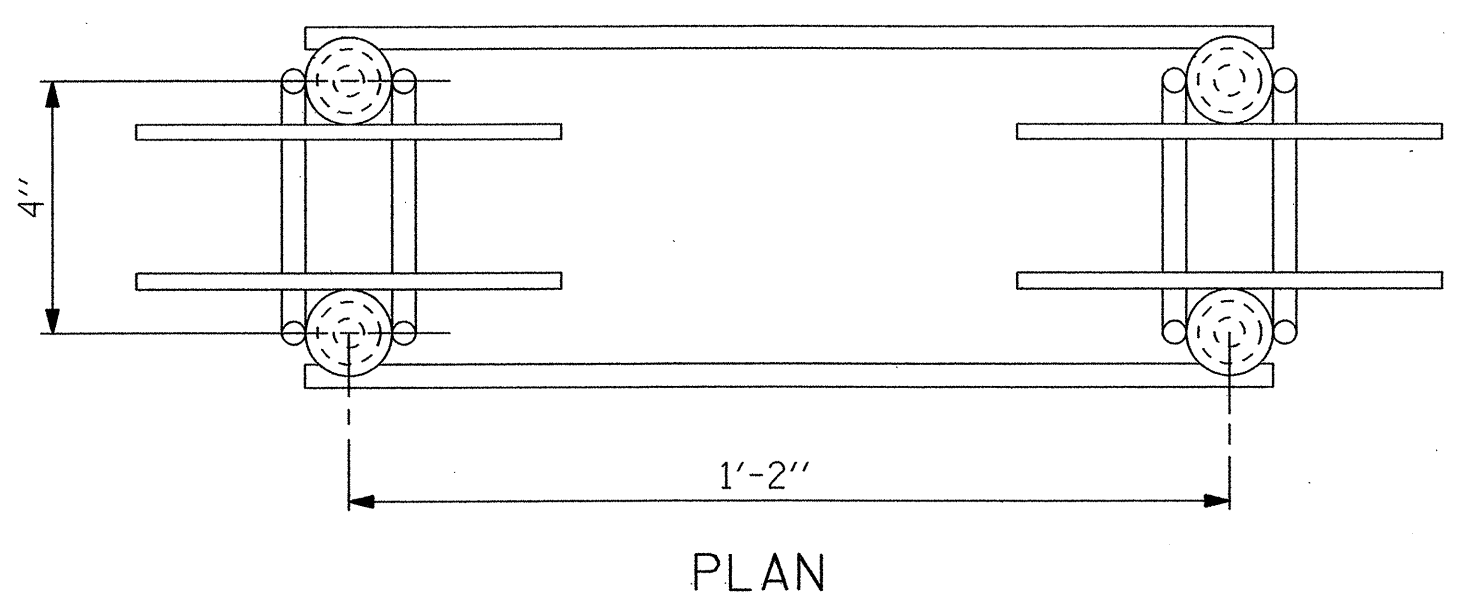
PREPARED BY: J.T. WILLIAMS  
REVIEWED BY: S.C. CLARK

DATE: 10/10  
DATE: 1/11

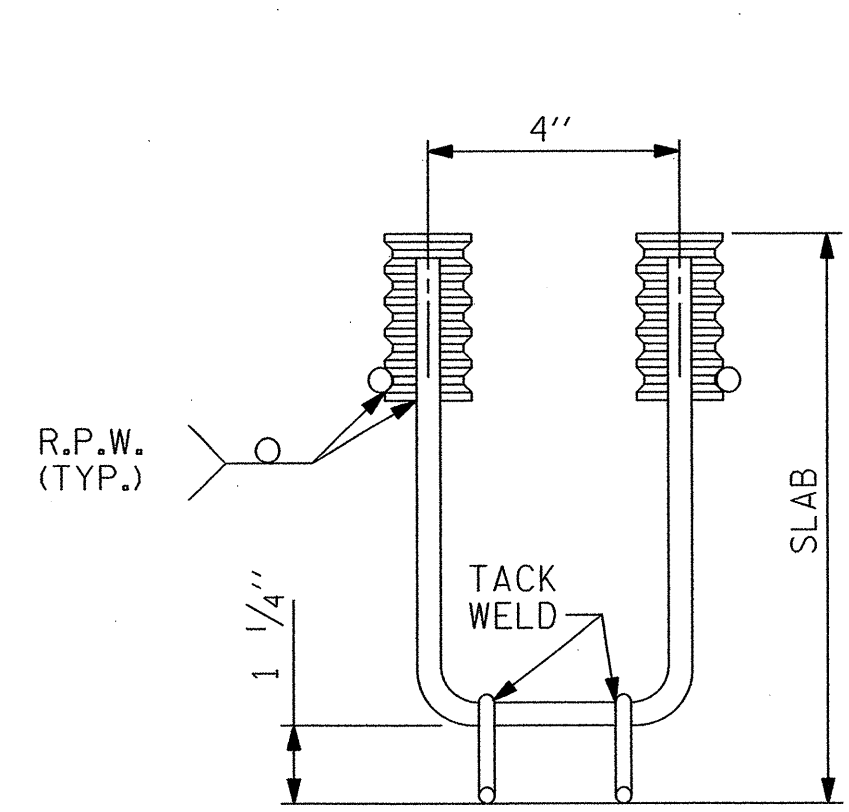
PLAN  
SHOWING : GUARDRAIL ANCHOR ASSEMBLY SPACING.



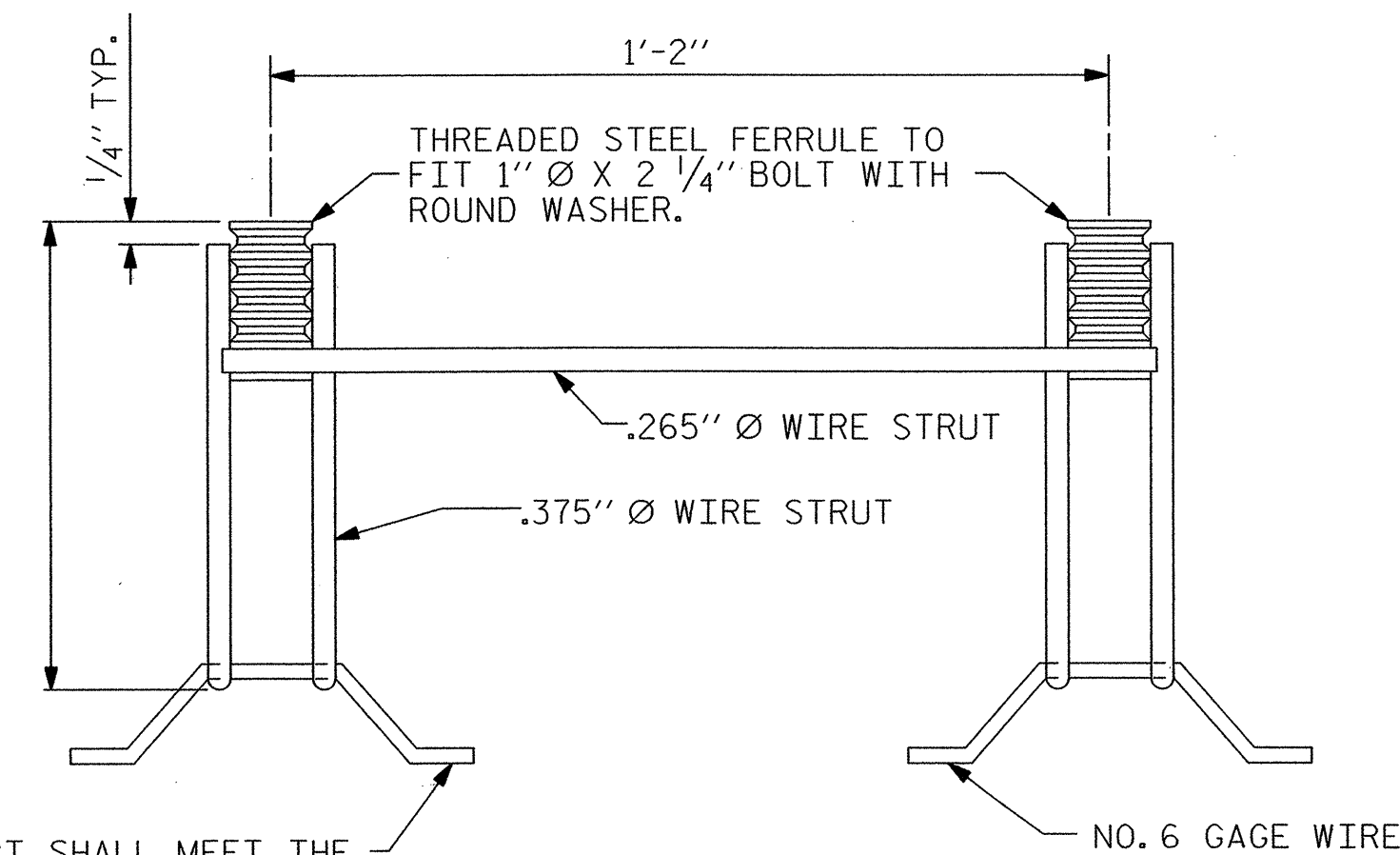
SECTION B-B



PLAN



ELEVATION



SIDE VIEW

THIS SUPPORT SHALL MEET THE REQUIREMENTS AS SPECIFIED FOR SUPPORTS FOR REINFORCING STEEL. SEE SPECIFICATIONS.

GUARDRAIL ANCHOR ASSEMBLY FOR CIP GRAVITY WALL

NOTES

- THE GUARDRAIL ANCHOR ASSEMBLY FOR CAST-IN-PLACE GRAVITY RETAINING WALLS SHALL CONSIST OF THE FOLLOWING COMPONENTS :
- A. FERRULES SHALL BE MADE FROM STEEL MEETING THE REQUIREMENTS OF AASHTO M169, GRADE 12L14 AND SHALL HAVE A MINIMUM LENGTH OF THREADS OF 2 1/2".
  - B. 4 - 1" Ø X 2 1/4" BOLTS WITH WASHERS, BOLTS SHALL CONFORM TO THE REQUIREMENTS OF ASTM A307. BOLTS AND WASHERS SHALL BE GALVANIZED. (AT THE CONTRACTOR'S OPTION, STAINLESS STEEL BOLTS AND WASHERS MAY BE USED AS AN ALTERNATE FOR THE 1" Ø X 2 1/4" GALVANIZED BOLTS AND WASHERS. THEY SHALL CONFORM TO OR EXCEED THE MECHANICAL REQUIREMENTS OF ASTM A307. THE USE OF THIS ALTERNATE SHALL BE APPROVED BY THE ENGINEER.)
  - C. WIRE STRUTS SHOWN IN THE GUARDRAIL ANCHOR ASSEMBLY FOR CULVERTS DETAIL ARE MINIMUM ALLOWABLE SIZE AND SHALL HAVE A MINIMUM TENSILE STRENGTH OF 100,000 P.S.I. AS AN OPTION, A 1/16" Ø WIRE STRUT WITH A MINIMUM TENSILE STRENGTH OF 90,000 PSI IS ACCEPTABLE.
- GUARDRAIL ANCHOR ASSEMBLY WITH BOLTS SHALL BE ASSEMBLED IN THE SHOP. BOLT THREADS MAY BE RECUT AS NECESSARY TO INSURE FIT.
- THE COSTS ASSOCIATED WITH THE GUARDRAIL ANCHOR ASSEMBLY UNITS, INCLUDING MATERIALS, MANUFACTURING, AND INSTALLATION WILL BE CONSIDERED INCIDENTAL TO THE RETAINING WALL. NO ADDITIONAL COMPENSATION WILL BE CONSIDERED.
- FERRULES TO BE PLUGGED DURING POURING OF WALL AS RECOMMENDED BY THE MANUFACTURER.
- AT THE CONTRACTOR'S OPTION, FERRULES WITH OPEN OR CLOSED ENDS MAY BE USED.
- PAYMENT FOR GUARDRAIL, POSTS, AND POST BASE PLATES IS INCLUDED IN ROADWAY PAY ITEMS.
- THE CONTRACTOR MAY USE ADHESIVELY ANCHORED ANCHOR BOLTS IN PLACE OF GUARDRAIL ANCHOR ASSEMBLY. LEVEL TWO FIELD TESTING IS REQUIRED, AND THE YIELD LOAD OF THE 1" Ø BOLT IS 21.8 KIPS. FOR ADHESIVELY ANCHORED ANCHOR BOLTS OR DOWELS, SEE SPECIAL PROVISIONS.

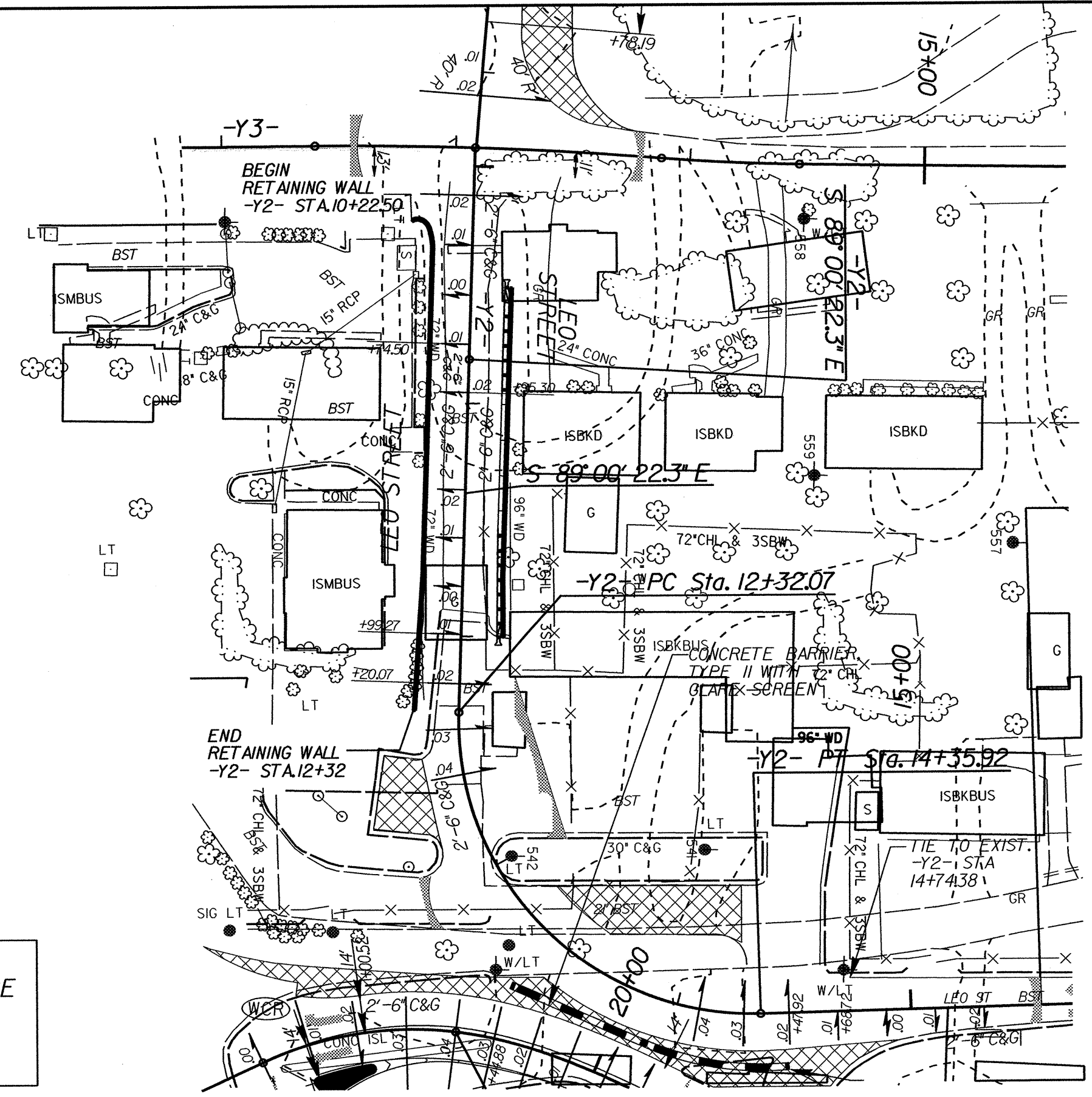
PROJECT NO.: U-2826B  
 FORSYTH COUNTY  
 STATION: -Y2-10+50.00 TO 12+00.00  
 SHEET 3 OF 3

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

**GEOTECHNICAL ENGINEERING UNIT**

EASTERN REGIONAL OFFICE  
 WESTERN REGIONAL OFFICE  
 CONTRACT OFFICE

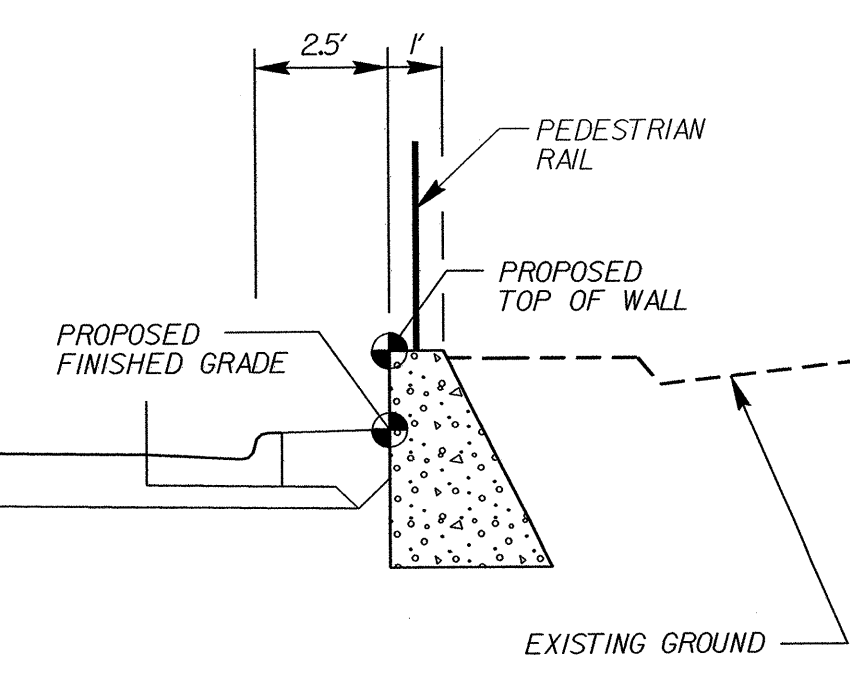
STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH



NOTE - ALL STATIONS AND OFFSETS ARE BASED ON -Y2- CENTERLINE AND ARE DIMENSIONED TO THE ROADWAY EDGE OF THE WALL

LOCATION SKETCH

**RETAINING WALL 2**



WALL 2 DETAIL  
-Y2- STA 10+22.50 TO STA 12+32.00

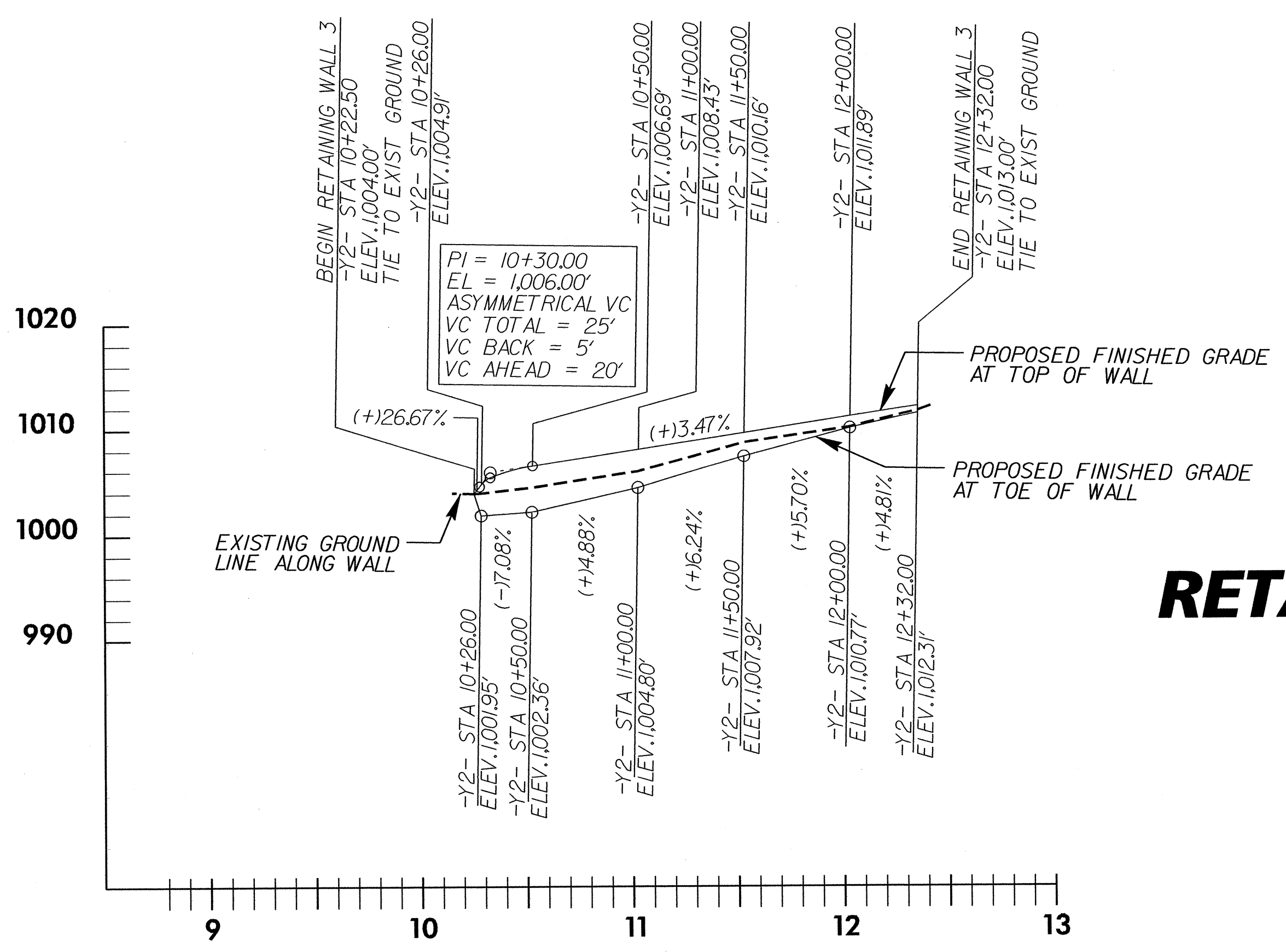
**TOTAL STRUCTURE QUANTITIES**

GRAVITY RETAINING WALLS	555	SQ. FT.
PEDESTRIAN RAIL	216	LIN. FT.

**GRAVITY RETAINING WALL ELEVATIONS**

-Y2- STA	OFFSET FROM C (RIGHT)	ELEV @ TOP OF WALL	* PROPOSED FINISHED GRADE	* EXPOSED WALL HEIGHT	** DESIGN WALL HEIGHT "H"
10+26.00	26.29	1004.91	1001.95	2.96	2.46
10+50.00	16.14	1006.69	1002.36	4.33	3.83
11+00.00	16.53	1008.43	1004.80	3.63	3.13
11+50.00	16.53	1010.16	1007.92	2.24	1.74
12+00.00	17.45	1011.89	1010.77	1.12	0.62
12+32.00	18.58	1013.00	1012.31	0.69	0.19

\* ELEVATION @ PROPOSED FINISHED GRADE AND EXPOSED WALL HEIGHT DO NOT INCLUDE EMBEDMENT DEPTH  
\*\* FOR DESIGN WALL HEIGHT "H", SEE STANDARD DRAWING No. 453.01



**RETAINING WALL 2**

PROJECT NO.: U-2826B  
FORSYTH COUNTY  
STATION: -Y2- 10+22.50 TO 12+32.00  
SHEET 1 OF 3

PREPARED BY: J.T. WILLIAMS  
REVIEWED BY: S.C. CLARK  
DATE: 10/10  
DATE: 1/11

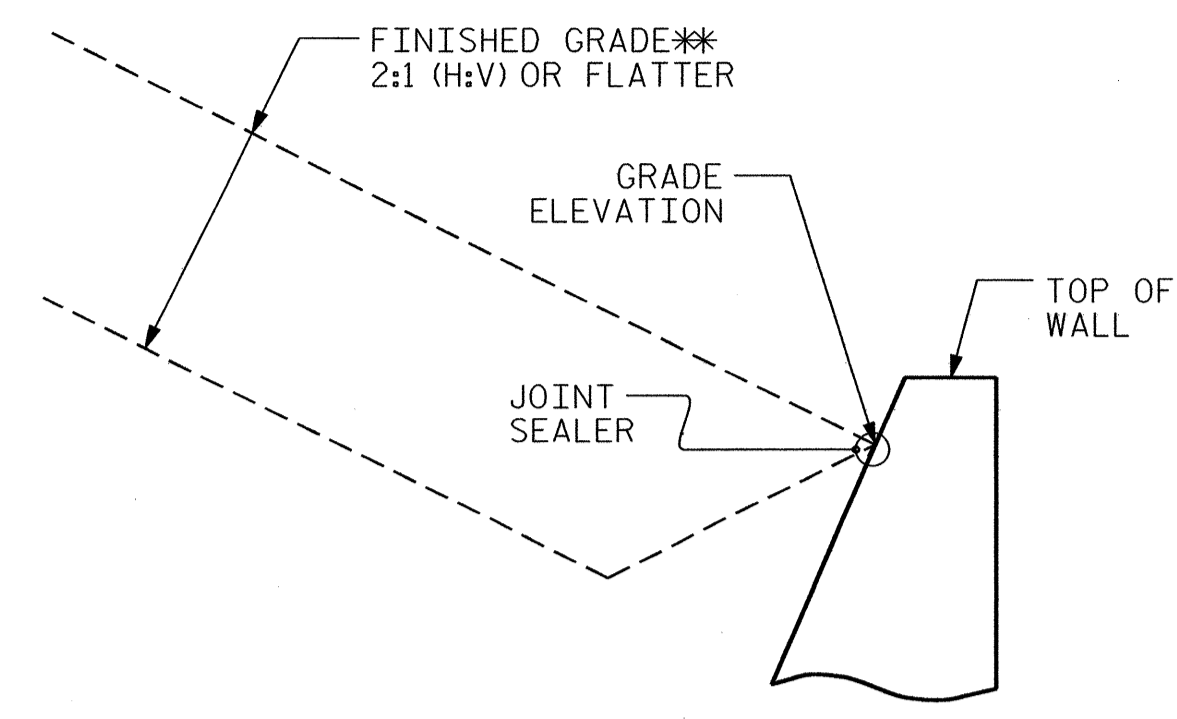
**GEOTECHNICAL ENGINEERING UNIT**

EASTERN REGIONAL OFFICE  
 WESTERN REGIONAL OFFICE  
 CONTRACT OFFICE

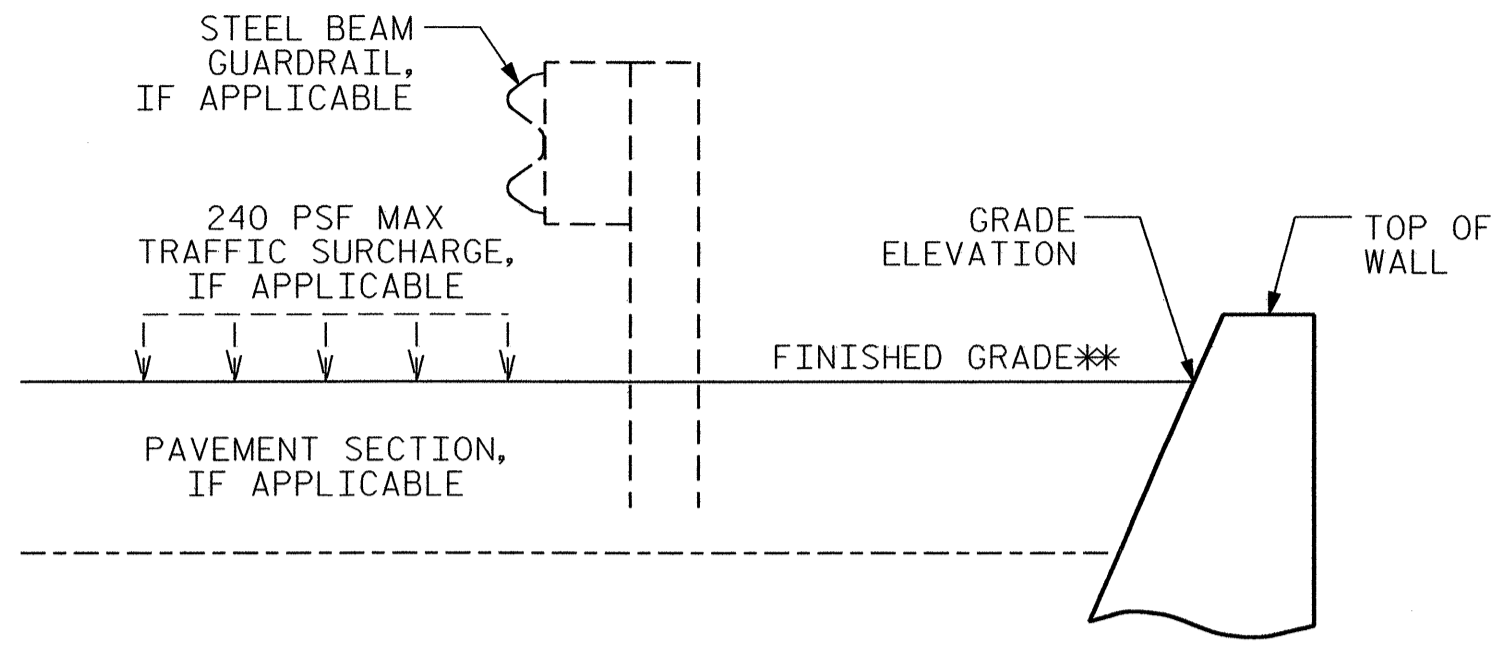
STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH

**GRAVITY RETAINING WALL #2**

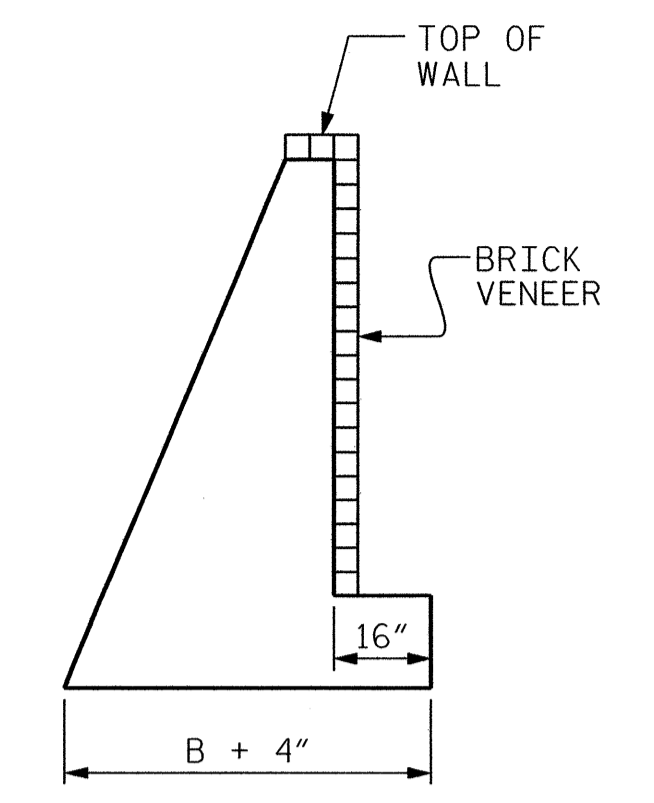
REVISIONS						SHEET NO. W-4 TOTAL SHEETS
NO.	BY	DATE	NO.	BY	DATE	
1			3			TOTAL SHEETS
2			4			



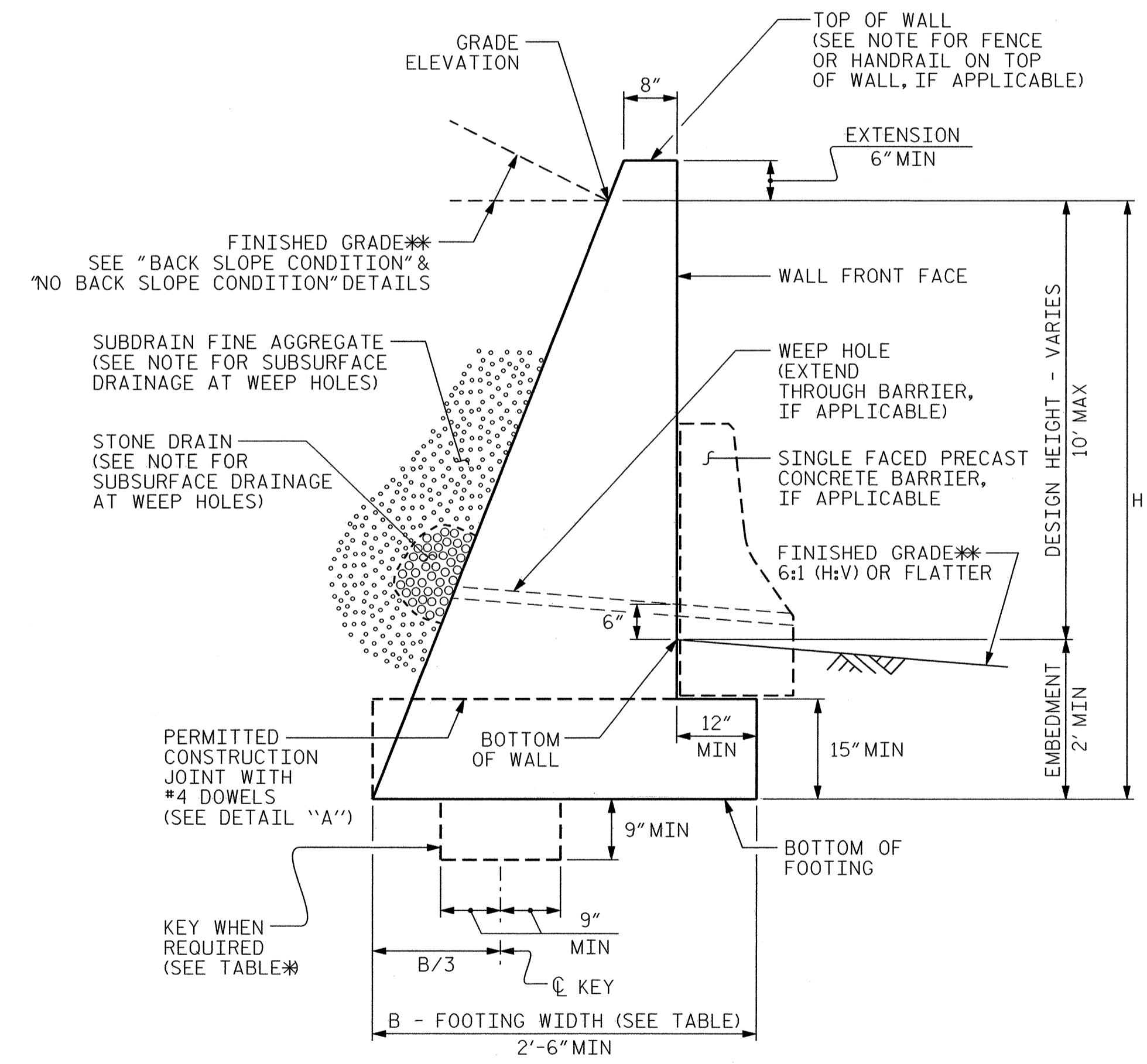
**BACK SLOPE CONDITION**  
 \*\*SEE ROADWAY PLANS FOR FINISHED GRADE AND DITCH DETAILS.



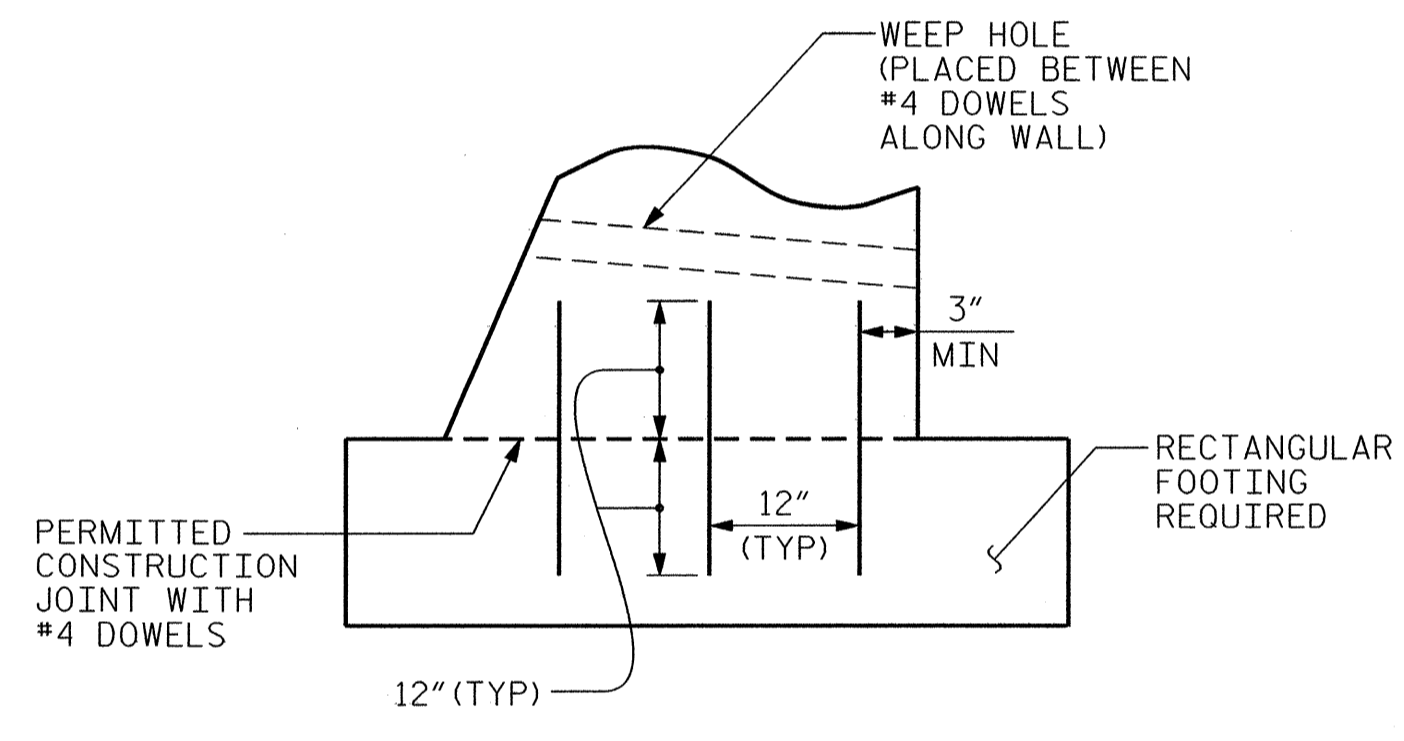
**NO BACK SLOPE CONDITION**  
 \*\*SEE ROADWAY PLANS FOR FINISHED GRADE DETAILS.



**BRICK VENEER DETAIL**  
 (WHEN APPLICABLE)



**STANDARD CIP GRAVITY WALL**  
 \*\*SEE ROADWAY PLANS FOR FINISHED GRADE AND DITCH DETAILS.



**DETAIL "A"**

H (FT)	3 - < 6	6 - 9	> 9 - 12
BACK SLOPE CONDITION	.66	.70*	.75*
NO BACK SLOPE CONDITION WITH TRAFFIC SURCHARGE	.80	.75*	.70*
NO BACK SLOPE CONDITION WITHOUT TRAFFIC SURCHARGE	.60	.60	.60

**B/H RATIO**  
 (B = 2'-6" MIN)

\*KEY IS REQUIRED FOR "BACK SLOPE CONDITION" OR "NO BACK SLOPE CONDITION WITH TRAFFIC SURCHARGE" WHEN H IS 6' OR GREATER.

**NOTES:**

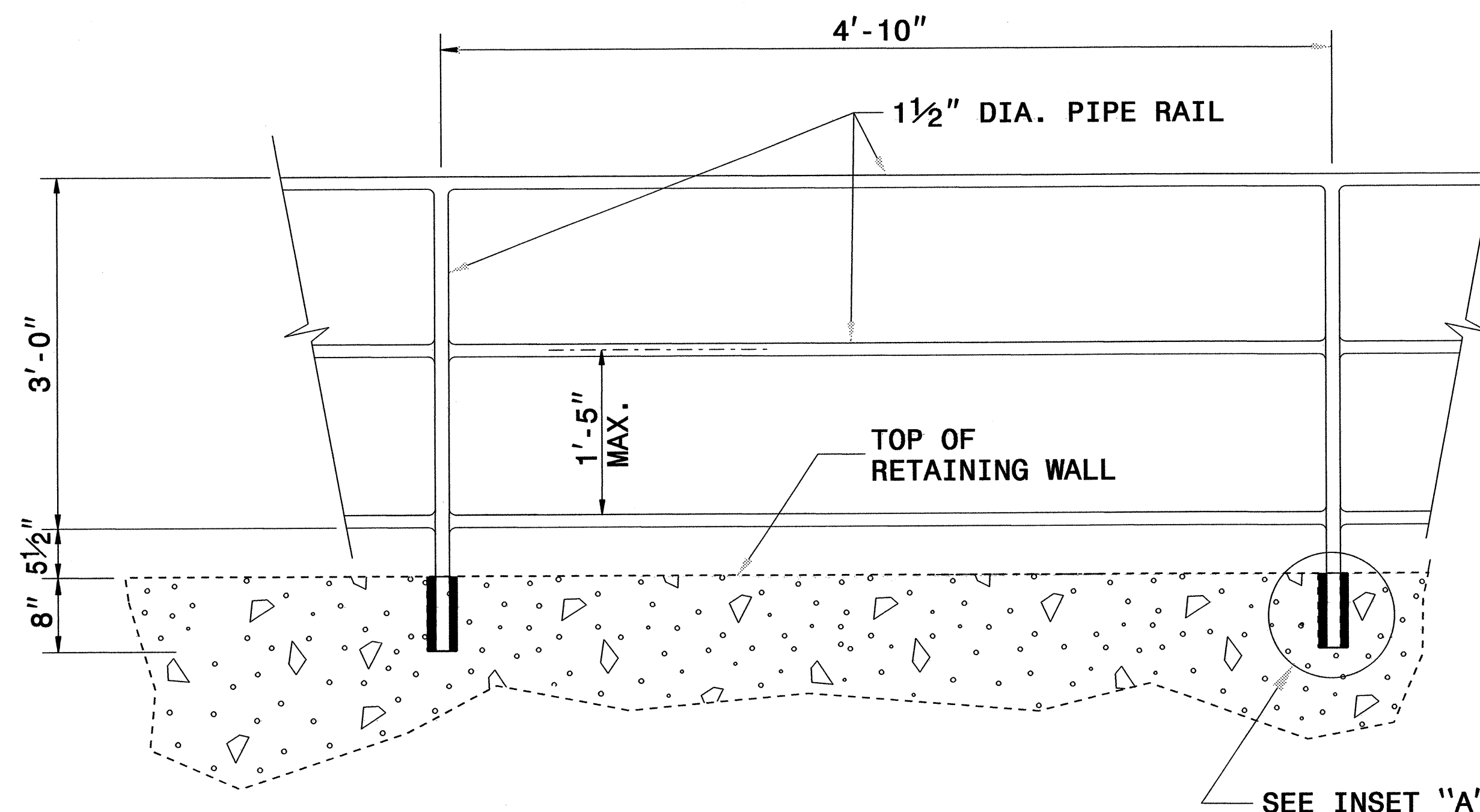
- FOR STANDARD CIP GRAVITY RETAINING WALLS, SEE CAST-IN-PLACE GRAVITY RETAINING WALLS PROVISION.
- FOR STEEL BEAM GUARDRAIL, SEE ROADWAY PLANS AND SECTION 862 OF THE STANDARD SPECIFICATIONS.
- FOR SINGLE FACED PRECAST CONCRETE BARRIER, SEE ROADWAY PLANS AND SECTION 857 OF THE STANDARD SPECIFICATIONS.
- FOR FENCES OR HANDRAILS ON TOP OF WALLS, SEE SHEET W-5 FOR FENCE OR HANDRAIL ATTACHMENT DETAILS.
- FOR SUBSURFACE DRAINAGE AT WEEP HOLES, SEE ARTICLE 410-9 OF THE STANDARD SPECIFICATIONS.
- STANDARD CIP GRAVITY WALLS ARE BASED ON THE FOLLOWING IN-SITU ASSUMED SOIL PARAMETERS:  
 UNIT WEIGHT,  $\gamma = 120$  PCF  
 FRICTION ANGLE,  $\phi = 35$  DEGREES (GROUNDWATER WITHIN 5' OF BOTTOM OF FOOTING)  
 FRICTION ANGLE,  $\phi = 30$  DEGREES (GROUNDWATER MORE THAN 5' BELOW BOTTOM OF FOOTING)  
 COHESION,  $c = 0$  PSF
- DO NOT USE STANDARD CIP GRAVITY WALLS IF THE ASSUMED SOIL PARAMETERS ARE NOT APPLICABLE OR GROUNDWATER IS ABOVE THE BOTTOM OF FOOTING.
- DO NOT USE STANDARD CIP GRAVITY WALLS WHEN VERY LOOSE OR SOFT SOIL OR MUCK IS PRESENT BELOW WALLS.
- BEFORE BEGINNING STANDARD 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 UNTIL OBTAINING APPROVAL OF THE EXCAVATION DEPTH AND FOUNDATION MATERIAL.
- 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.

**PROJECT NO.: U-2826B**  
**FORSYTH COUNTY**  
**STATION: -Y2- 10+22.50 TO 12+32.00**  
 SHEET 2 OF 3

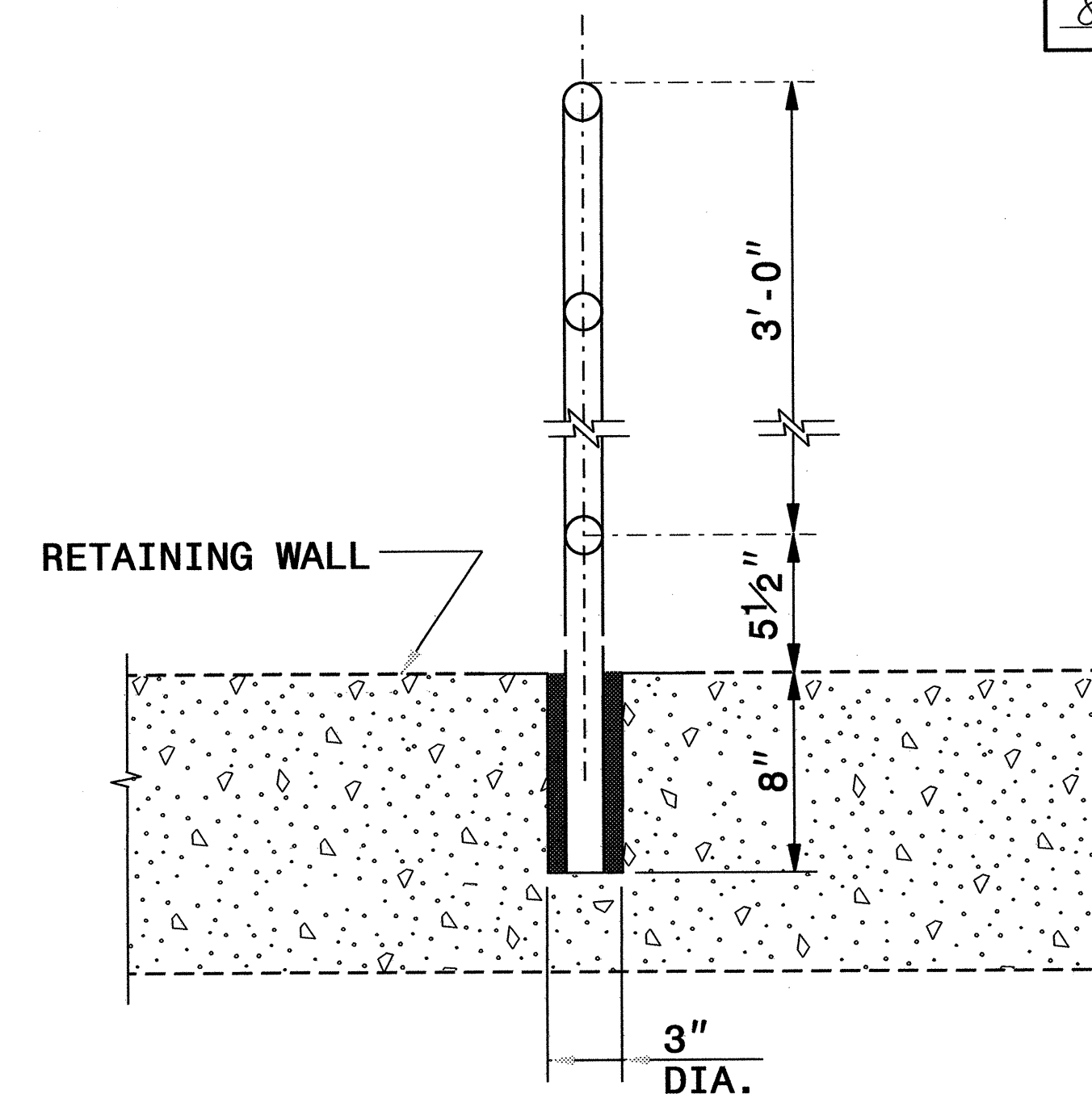


S. C. Clark 1/11/11  
SIGNATURE DATE

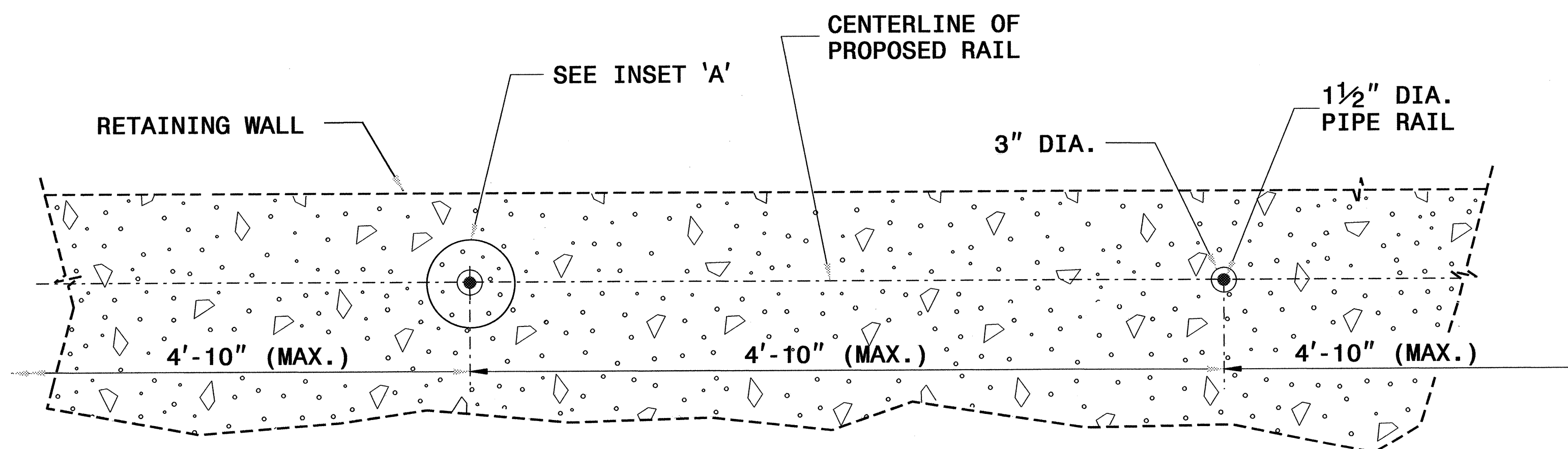
SIGNATURE DATE



**ELEVATION OF PROPOSED PEDESTRIAN HANDRAIL**



**INSET 'A'**



**PLAN VIEW**

**NOTES:**

CONSTRUCT PROPOSED STEEL PIPE RAIL OF 1 1/2" DIAMETER SCHEDULE 40 PLAIN END GALVANIZED STEEL PIPE MEETING THE REQUIREMENTS OF ASTM A53.

REPAIR GALVANIZING IN ACCORDANCE WITH SECTION 1076 OF THE NCDOT STANDARD SPECIFICATIONS.

PAINT, IF REQUIRED BY THE ENGINEER, IN ACCORDANCE WITH SECTION 1080 OF THE STANDARD SPECIFICATIONS.

WELD IN ACCORDANCE WITH ARTICLE 1072-20 OF THE STANDARD SPECIFICATIONS.

**PROJECT NO.:** U-2826B  
**FORSYTH COUNTY**  
**STATION:** -Y2- 10+22.50 TO 12+32.00  
SHEET 3 OF 3

PREPARED BY: J.T. WILLIAMS DATE: 10/10  
REVIEWED BY: S.C. CLARK DATE: 1/11

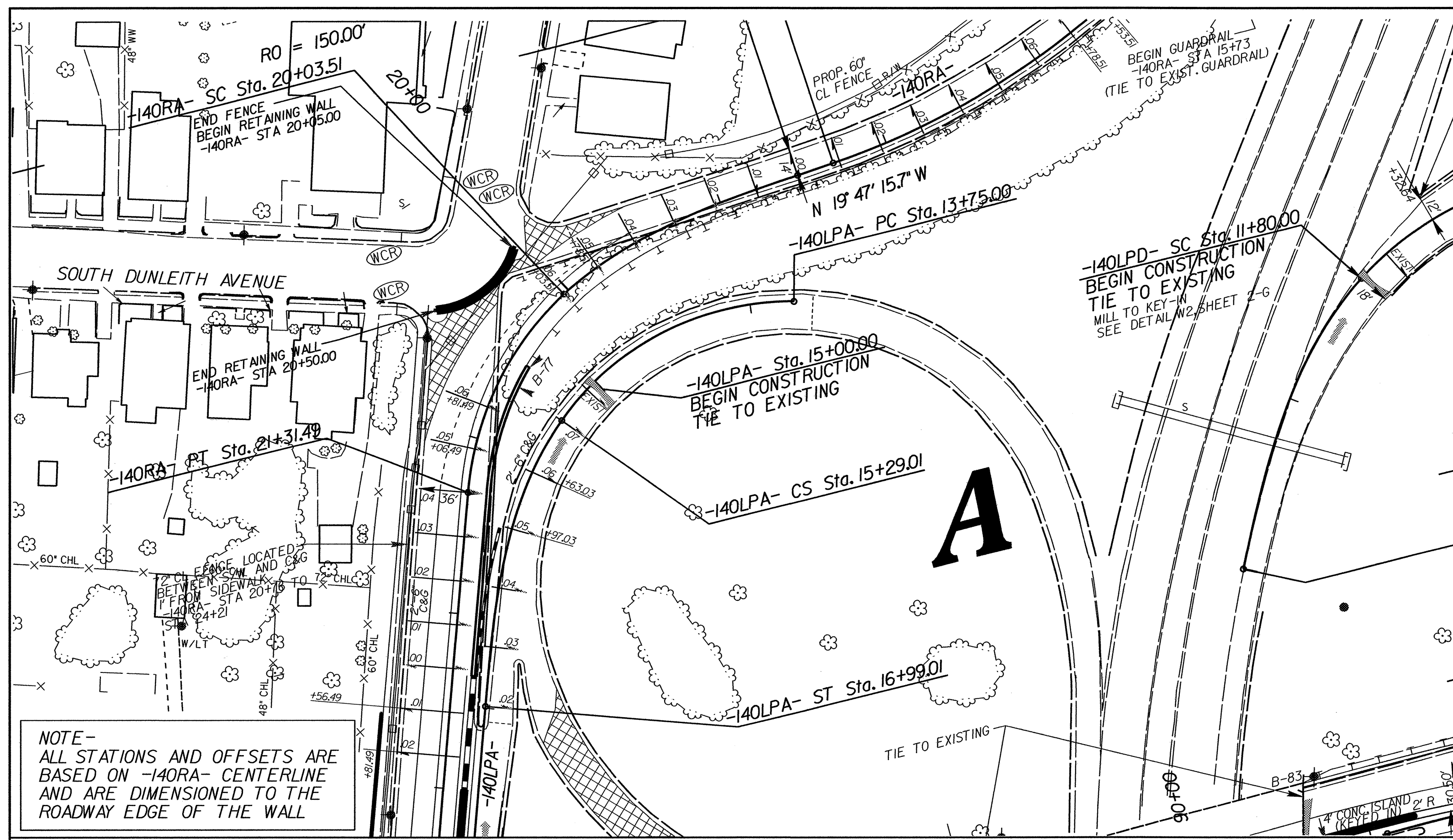
**GEOTECHNICAL ENGINEERING UNIT**

EASTERN REGIONAL OFFICE  
 WESTERN REGIONAL OFFICE  
 CONTRACT OFFICE

STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH

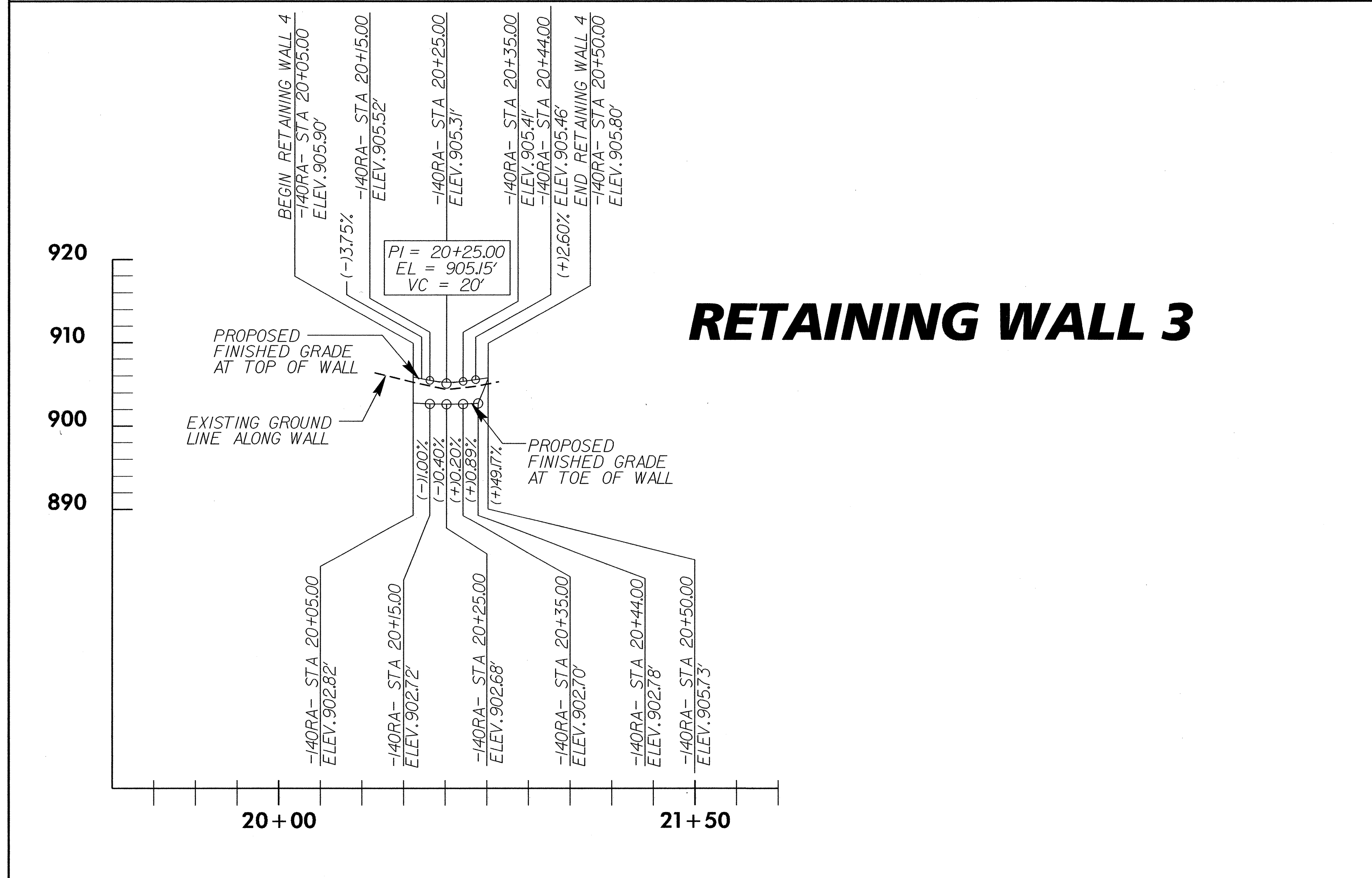
**PROPOSED PEDESTRIAN SAFETY RAIL**

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	W-6
1			3			TOTAL SHEETS
2			4			

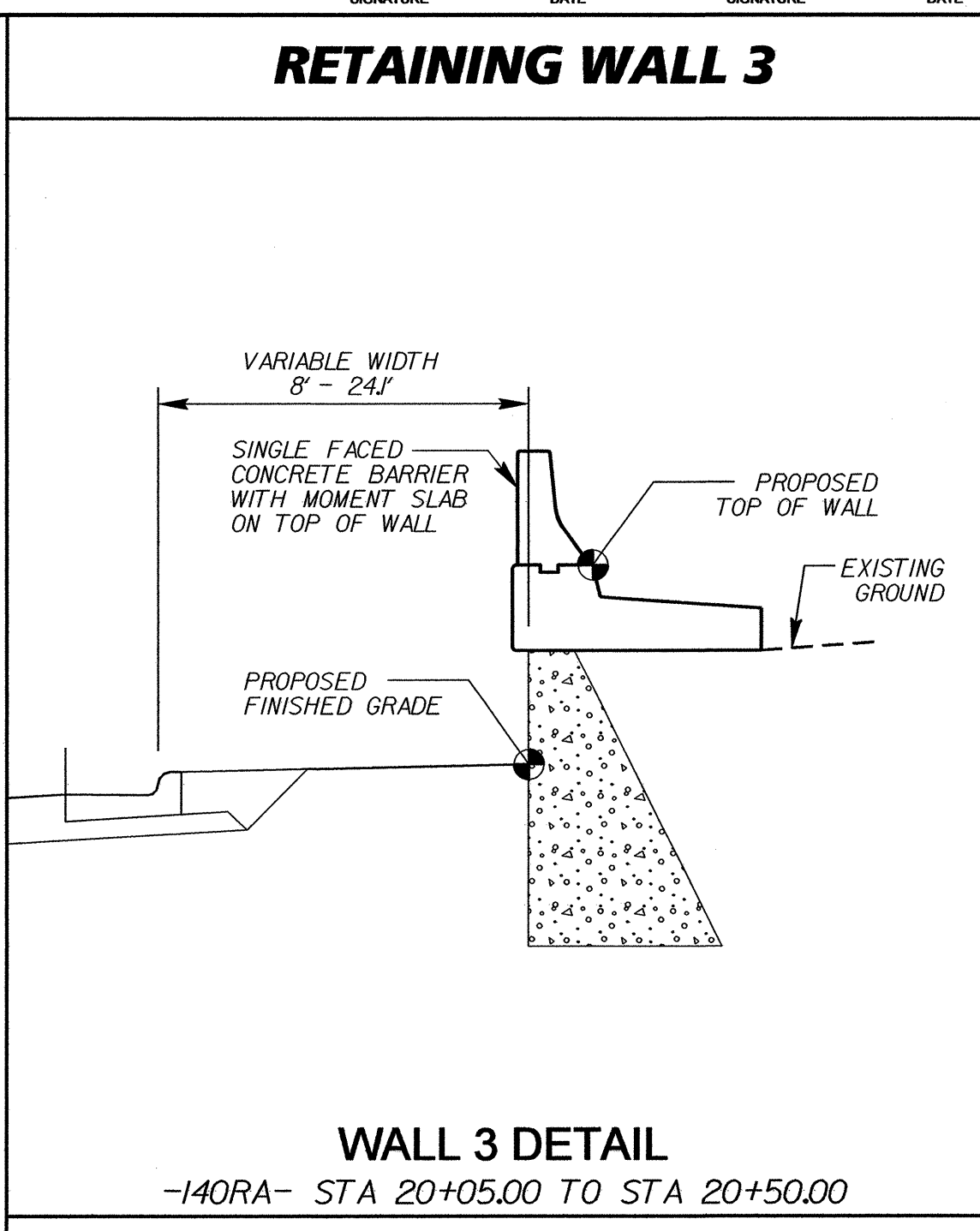


NOTE - ALL STATIONS AND OFFSETS ARE BASED ON -140RA- CENTERLINE AND ARE DIMENSIONED TO THE ROADWAY EDGE OF THE WALL

LOCATION SKETCH



**RETAINING WALL 3**



WALL 3 DETAIL  
-140RA- STA 20+05.00 TO STA 20+50.00

TOTAL STRUCTURE QUANTITIES

GRAVITY RETAINING WALLS	135	SQ. FT.
SINGLE FACED CONCRETE BARRIER WITH MOMENT SLAB	61	LIN. FT.

GRAVITY RETAINING WALL ELEVATIONS

-140RA- STA	OFFSET FROM CL (RIGHT)	ELEV @ TOP OF WALL	* PROPOSED FINISHED GRADE	* EXPOSED WALL HEIGHT	** DESIGN WALL HEIGHT "H"
20+05.00	37.65	905.90	902.82	3.08	2.58
20+15.00	33.74	905.52	902.72	2.80	2.30
20+25.00	32.64	905.31	902.68	2.63	2.13
20+35.00	34.29	905.41	902.70	2.71	2.21
20+44.00	44.58	905.46	902.78	2.68	2.18
20+50.00	50.03	905.80	905.73	0.07	0.00

\* ELEVATION @ PROPOSED FINISHED GRADE AND EXPOSED WALL HEIGHT DO NOT INCLUDE EMBEDMENT DEPTH  
\*\* FOR DESIGN WALL HEIGHT "H", SEE SHEET W-9.

PROJECT NO.: U-2826B  
FORSYTH COUNTY  
STATION: -140RA-20+05.00 TO 20+50.00  
SHEET 1 OF 4

GEOTECHNICAL ENGINEER ENGINEER

*S. C. Clark* 1/11/11  
SIGNATURE DATE

*S. C. Clark* 1/11/11  
SIGNATURE DATE

PROFESSIONAL SEAL 29869 ENGINEER STATE OF NORTH CAROLINA

GEOTECHNICAL ENGINEERING UNIT

EASTERN REGIONAL OFFICE  
 WESTERN REGIONAL OFFICE  
 CONTRACT OFFICE

STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH

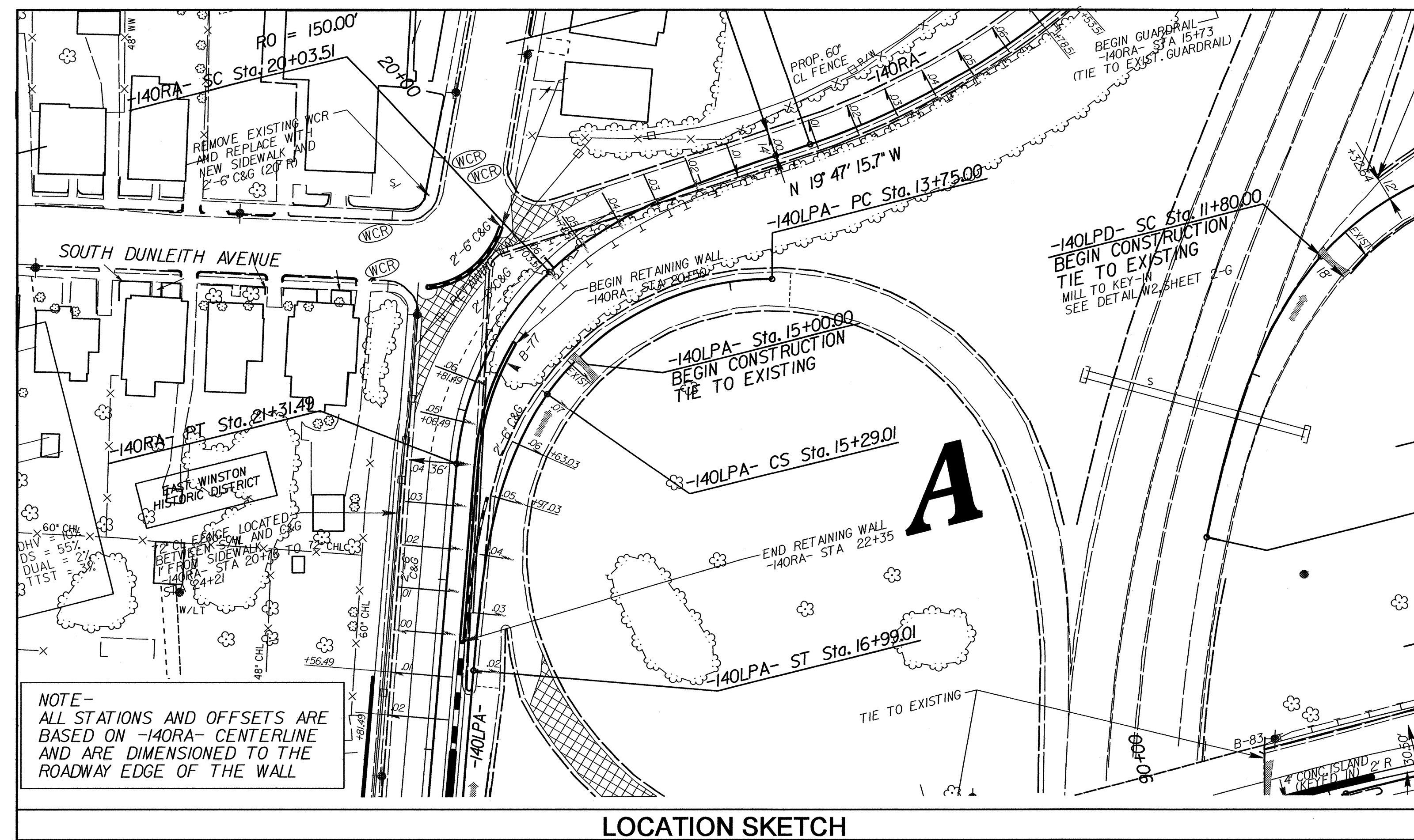
GRAVITY RETAINING WALL #3

REVISIONS

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

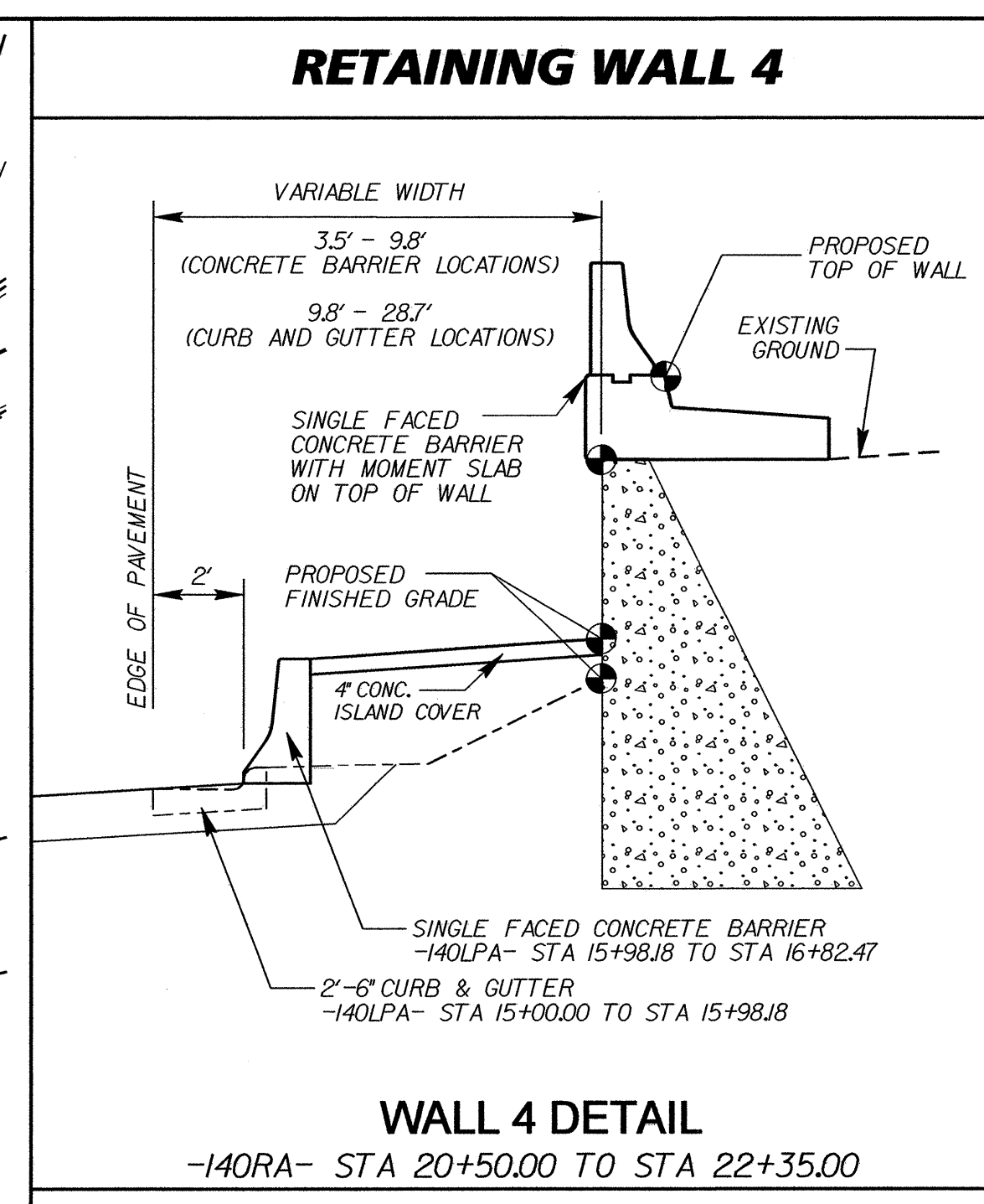
SHEET NO. W-7  
TOTAL SHEETS

PREPARED BY: J.T. WILLIAMS DATE: 10/10  
REVIEWED BY: S.C. CLARK DATE: 1/11



LOCATION SKETCH

NOTE - ALL STATIONS AND OFFSETS ARE BASED ON -140RA- CENTERLINE AND ARE DIMENSIONED TO THE ROADWAY EDGE OF THE WALL



WALL 4 DETAIL  
-140RA- STA 20+50.00 TO STA 22+35.00

GEOTECHNICAL ENGINEER      ENGINEER

SEAL 29869  
ENGINEER  
SHANE C. CLARK

1/10/11

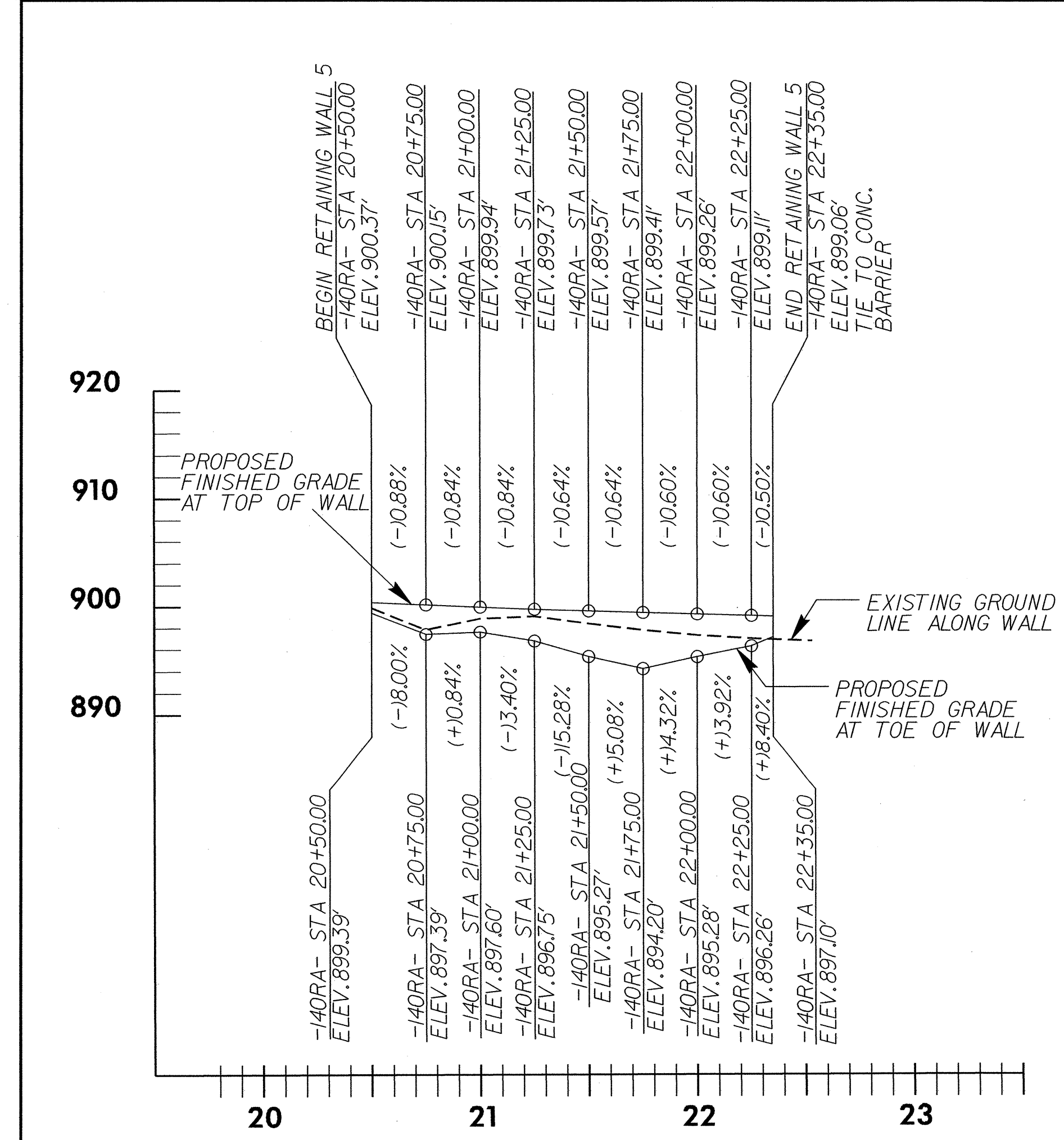
TOTAL STRUCTURE QUANTITIES	
GRAVITY RETAINING WALLS	611 SQ. FT.
SINGLE FACED CONCRETE BARRIER WITH MOMENT SLAB	181 LIN. FT.

GRAVITY RETAINING WALL ELEVATIONS					
-140RA- STA	OFFSET FROM CL (LEFT)	ELEV @ TOP OF WALL	* PROPOSED FINISHED GRADE	* EXPOSED WALL HEIGHT	** DESIGN WALL HEIGHT "H"
20+50.00	31.58	900.37	899.39	0.98	0.48
20+75.00	32.05	900.15	897.39	2.76	2.26
21+00.00	31.04	899.94	897.60	2.34	1.84
21+25.00	30.36	899.73	896.75	2.98	2.48
21+50.00	31.58	899.57	895.27	4.30	3.80
21+75.00	32.05	899.41	894.20	3.24	2.74
22+00.00	31.04	899.26	895.28	3.65	3.15
22+25.00	30.36	899.11	896.26	2.59	2.09
22+35.00	30.36	899.06	897.10	2.59	2.09

\* ELEVATION @ PROPOSED FINISHED GRADE AND EXPOSED WALL HEIGHT DO NOT INCLUDE EMBEDMENT DEPTH  
\*\* FOR DESIGN WALL HEIGHT "H", SEE SHEET W-8.

A THREE RAIL PEDESTRIAN HANDRAIL IS REQUIRED ON TOP OF RETAINING WALL #4. SEE ATTACHMENT DETAILS.

PROJECT NO.: U-2826B  
FOURSYTH COUNTY  
STATION: -140RA-20+50.00 TO 22+35.00  
SHEET 2 OF 4



RETAINING WALL 4

GEOTECHNICAL ENGINEERING UNIT

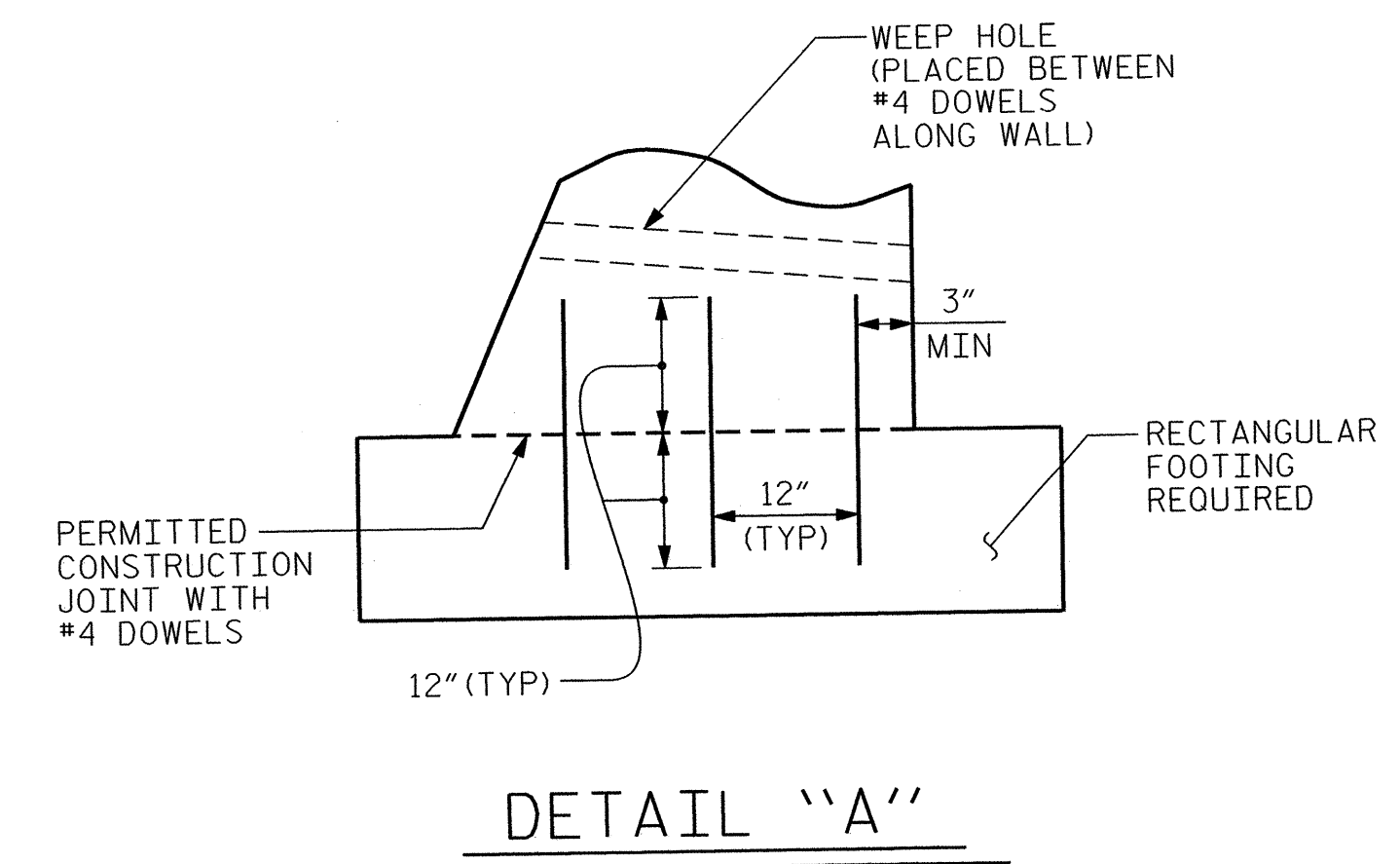
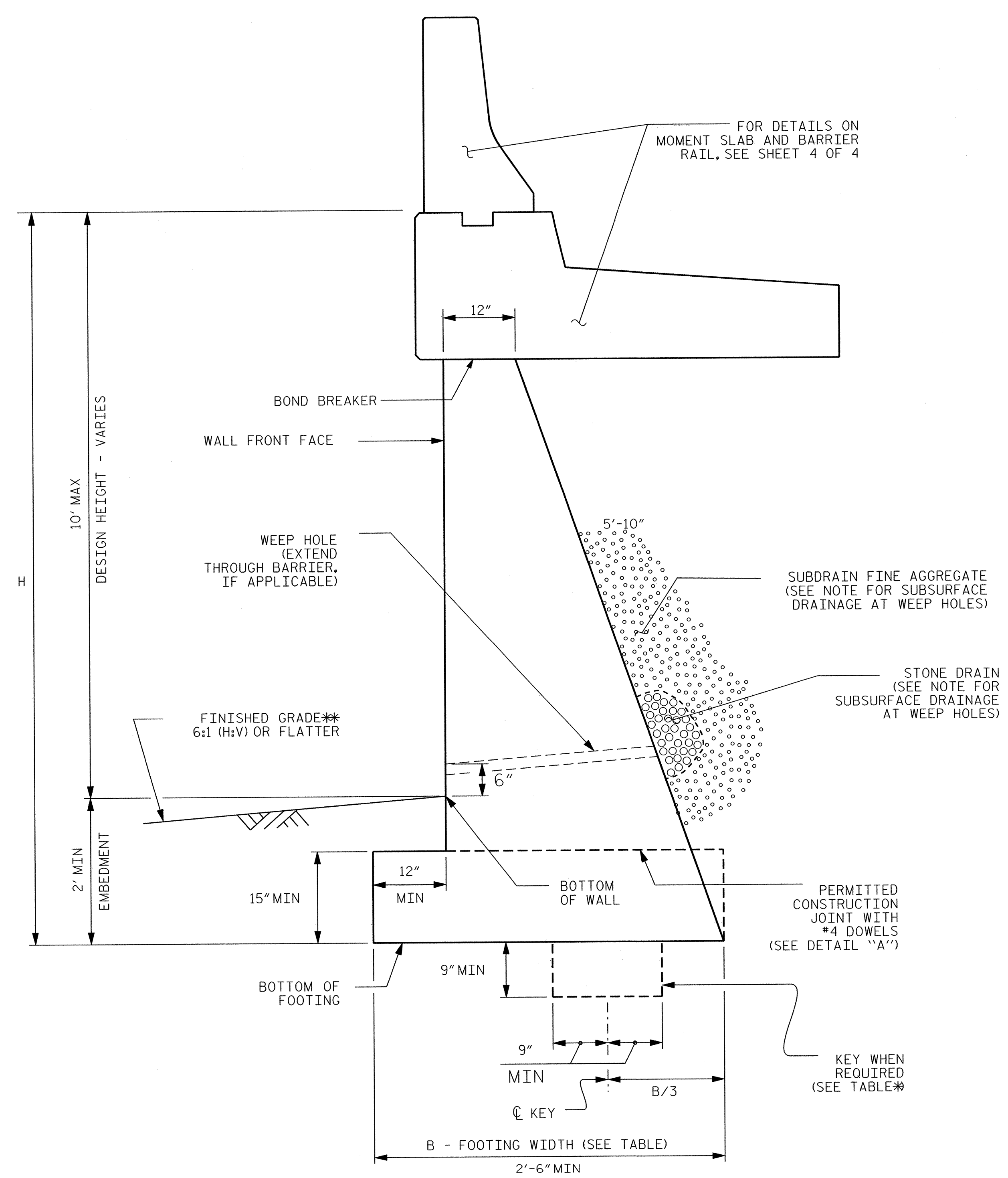
EASTERN REGIONAL OFFICE  
 WESTERN REGIONAL OFFICE  
 CONTRACT OFFICE

STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH

REVISIONS						SHEET NO. W-8 TOTAL SHEETS
NO.	BY	DATE	NO.	BY	DATE	
1			3			
2			4			

PREPARED BY: J.T. WILLIAMS      DATE: 10/10  
REVIEWED BY: S.C. CLARK      DATE: 10/10





H (FT)	3 - < 6	6 - 9	> 9 - 12
BACK SLOPE CONDITION	.66	.70*	.75*
NO BACK SLOPE CONDITION WITH TRAFFIC SURCHARGE	.80	.75*	.70*
NO BACK SLOPE CONDITION WITHOUT TRAFFIC SURCHARGE	.60	.60	.60

**B/H RATIO**  
(B = 2'-6" MIN)

\*KEY IS REQUIRED FOR "BACK SLOPE CONDITION" OR "NO BACK SLOPE CONDITION WITH TRAFFIC SURCHARGE" WHEN H IS 6' OR GREATER.

**NOTES:**

FOR CIP GRAVITY RETAINING WALLS, SEE CAST-IN-PLACE GRAVITY RETAINING WALLS PROVISION.

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

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

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

FOR SUBSURFACE DRAINAGE AT WEEP HOLES, SEE ARTICLE 410-9 OF THE STANDARD SPECIFICATIONS.

CIP GRAVITY WALLS ARE BASED ON THE FOLLOWING IN-SITU ASSUMED SOIL PARAMETERS:  
 UNIT WEIGHT,  $\gamma = 120$  PCF  
 FRICTION ANGLE,  $\phi = 35$  DEGREES (GROUNDWATER WITHIN 5' OF BOTTOM OF FOOTING)  
 FRICTION ANGLE,  $\phi = 30$  DEGREES (GROUNDWATER MORE THAN 5' BELOW BOTTOM OF FOOTING)  
 COHESION,  $c = 0$  PSF

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

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

BEFORE BEGINNING STANDARD 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 UNTIL OBTAINING APPROVAL OF THE EXCAVATION DEPTH AND FOUNDATION MATERIAL.

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.

**CIP GRAVITY WALL WITH CONCRETE BARRIER RAIL WITH MOMENT SLAB**

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

**PROJECT NO.:** U-2826B  
**FORSYTH COUNTY**  
**STATION:** -140RA-20+05.00 TO 20+50.00  
 SHEET 3 OF 4

**GEOTECHNICAL ENGINEERING UNIT**

EASTERN REGIONAL OFFICE  
 WESTERN REGIONAL OFFICE  
 CONTRACT OFFICE

STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH

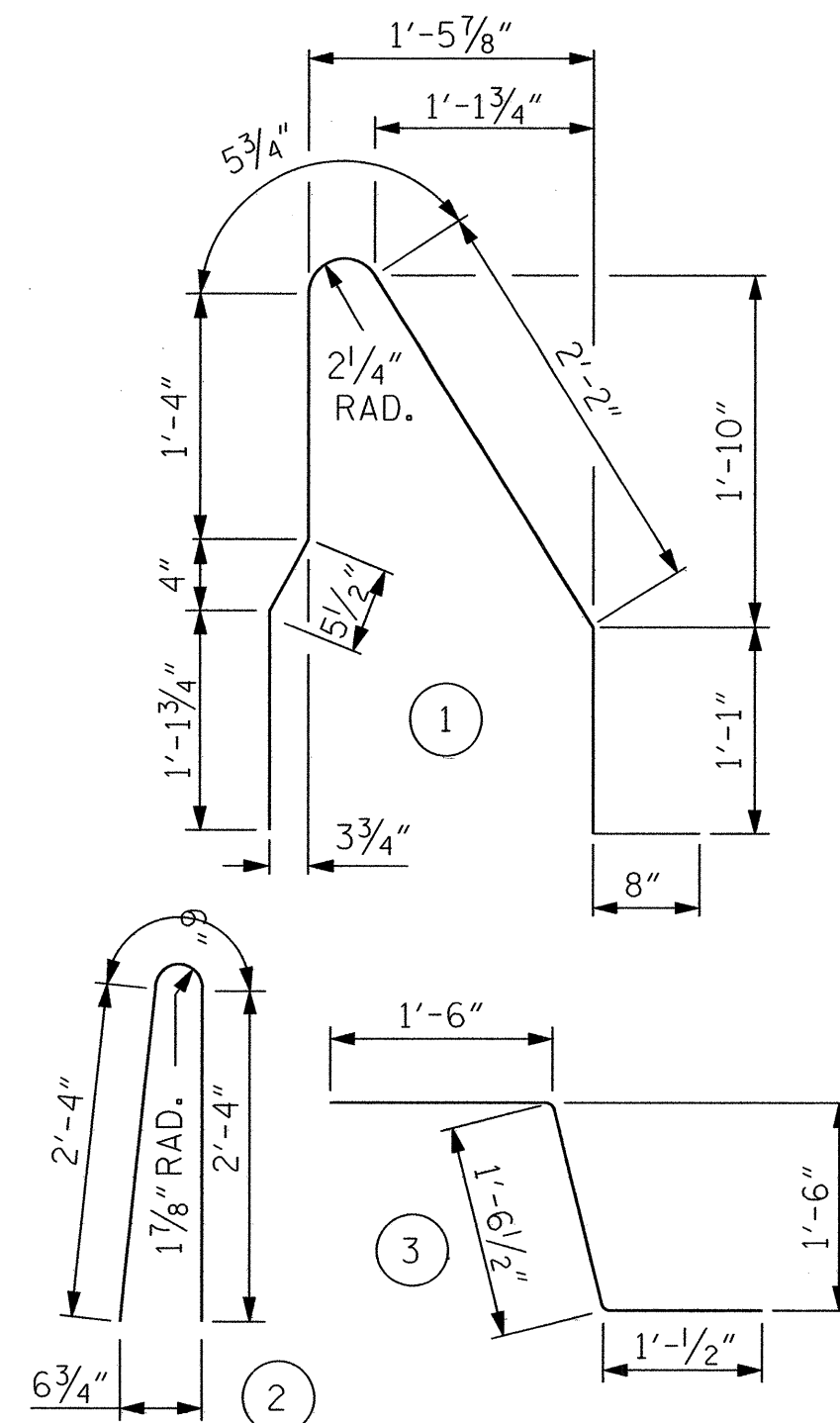
**GRAVITY RETAINING WALL #3 & #4**

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	W-9
1			3			TOTAL SHEETS
2			4			



S.C. Clark      1/16/11  
SIGNATURE      DATE

**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	8	#5	STR	29'-7"	247
G1	31	#5	STR	5'-6"	178
G2	31	#4	STR	5'-6"	114
* S1	31	#5	1	7'-3"	234
* S2	31	#5	2	5'-2"	167
S3	31	#5	3	4'-1"	128
REINFORCING STEEL					697 LBS.
* EPOXY COATED REINFORCING STEEL					648 LBS.
CLASS AA CONCRETE BARRIER RAIL					3.1 CU. YDS.
CLASS A CONCRETE MOMENT SLAB					9.1 CU. YDS.
CONCRETE BARRIER RAIL WITH MOMENT SLAB					30 LIN. FT.

**NOTES:**

FOR CONCRETE BARRIER RAIL WITH MOMENT SLAB, SEE CONCRETE BARRIER RAIL WITH MOMENT SLAB PROVISION.  
CONCRETE BARRIER RAIL WITH MOMENT SLAB SHALL BE A MINIMUM OF 15 FEET IN CONTIGUOUS LENGTH AND CONSTRUCTED WITH ARC SEGMENTS TO MATCH THE CURVATURE OF THE WALL AS SHOWN IN THE PLANS.

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

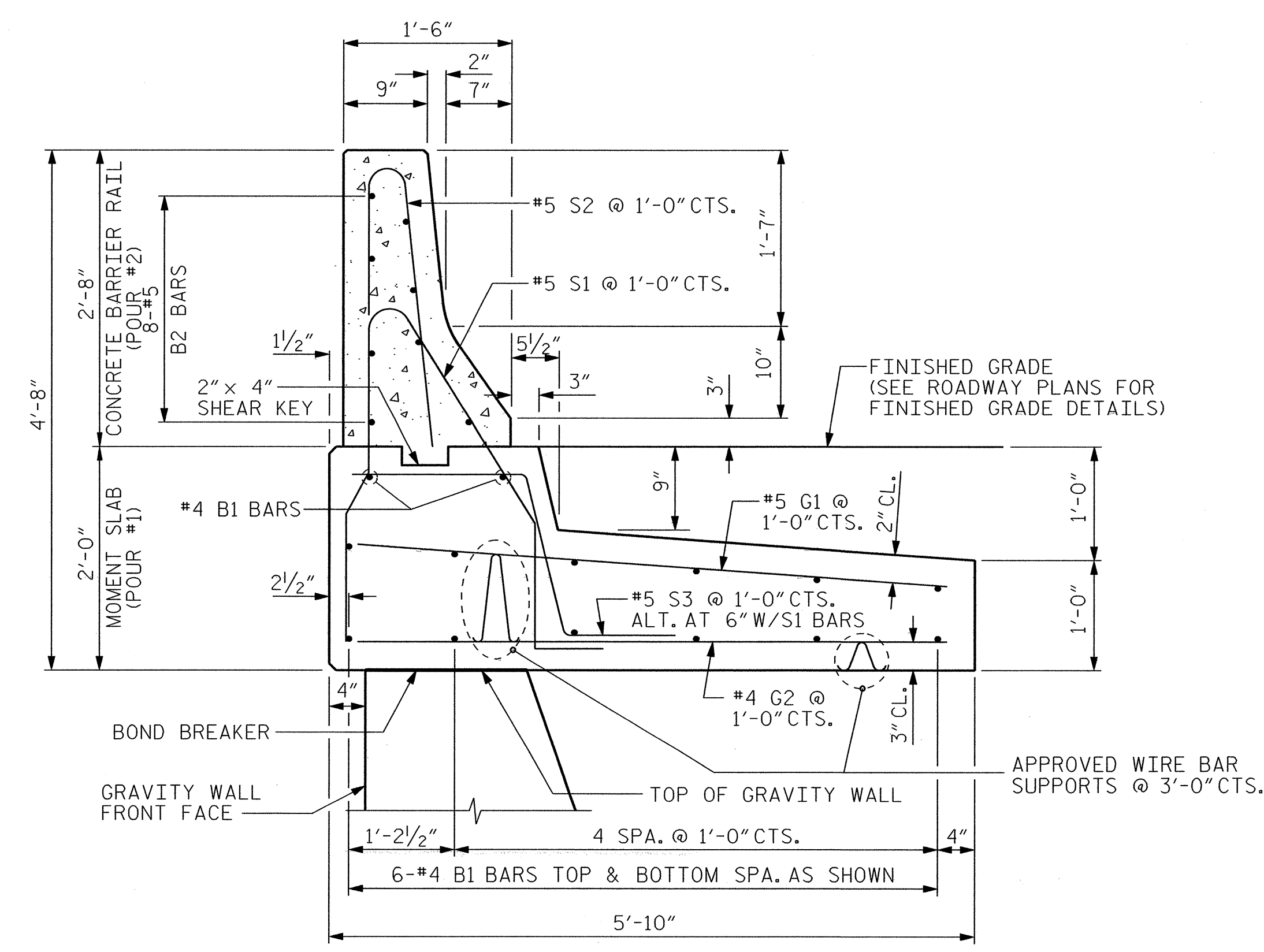
GROOVED CONTRACTION JOINTS, 1/2" IN DEPTH, SHALL BE TOOLED IN ALL EXPOSED SURFACES OF THE BARRIER RAIL AND IN ACCORDANCE WITH ARTICLE 825-10(B) OF THE STANDARD SPECIFICATIONS. A CONTRACTION JOINT SHALL BE LOCATED AT EACH THIRD POINT BETWEEN BARRIER RAIL EXPANSION JOINTS. ONLY ONE CONTRACTION JOINT IS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

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 2000 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.

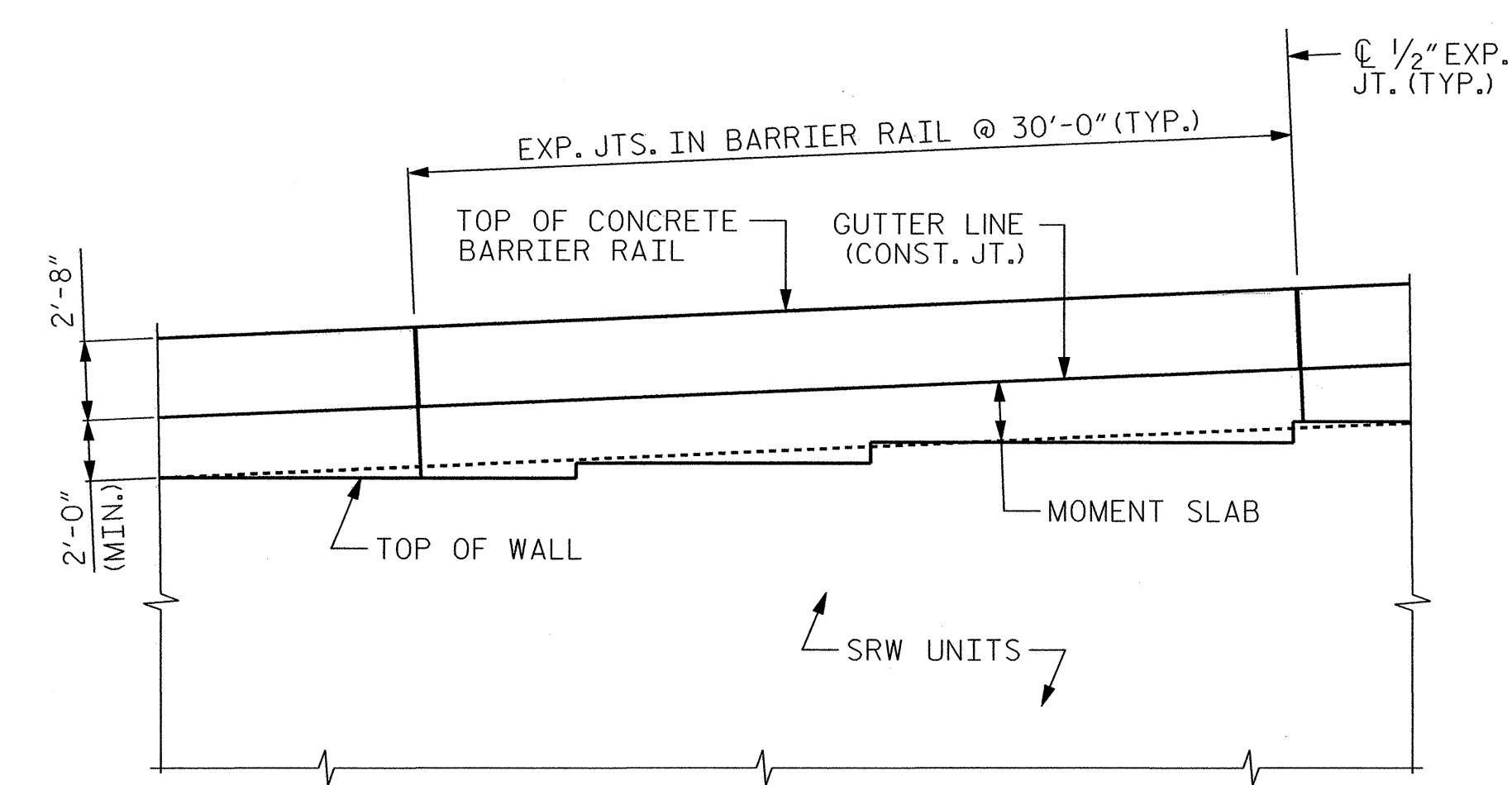
ALL REINFORCING STEEL IN THE BARRIER RAIL SHALL BE EPOXY COATED.

IF STEPS ARE REQUIRED AT TOP OF WALL, DETAILS SHOWING INTERFACE BETWEEN BOTTOM OF MOMENT SLAB AND STEPS SHALL BE SUBMITTED FOR APPROVAL.

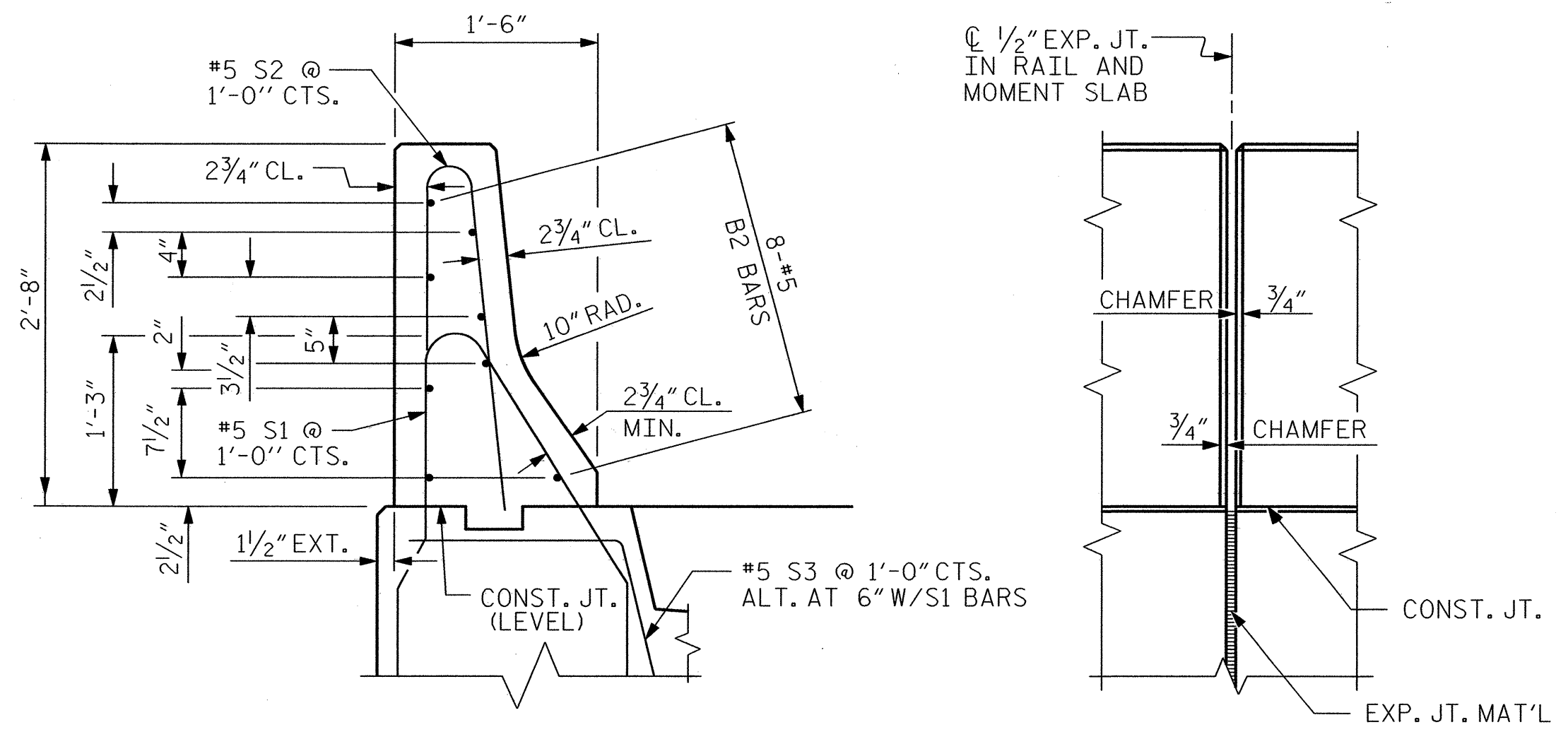
IF EXISTING OR FUTURE OBSTRUCTIONS SUCH AS FOUNDATIONS, BARRIERS, PIPES, INLETS OR UTILITIES WILL INTERFERE WITH CONCRETE BARRIER RAIL WITH MOMENT SLAB, CONCRETE BARRIER RAIL WITH MOMENT SLAB DETAILS SHALL BE REVISED AND SUBMITTED FOR APPROVAL.



**CONCRETE BARRIER RAIL WITH MOMENT SLAB**



**CONCRETE BARRIER RAIL WITH MOMENT SLAB - PARTIAL ELEVATION**



SECTION THRU RAIL

ELEV. @ EXP. JOINTS

**BARRIER RAIL DETAILS**

PREPARED BY: J. SALVO	DATE: 10/10
REVIEWED BY: S.C. CLARK	DATE: 1/11

**GEOTECHNICAL ENGINEERING UNIT**

EASTERN REGIONAL OFFICE  
 WESTERN REGIONAL OFFICE  
 CONTRACT OFFICE

STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH

**PROJECT NO.:** U-2826B  
**FORSYTH COUNTY**  
**STATION:** -140RA-20+05.00 TO 20+50.00  
SHEET 4 OF 4

**CONCRETE BARRIER RAIL WITH MOMENT SLAB RETAINING WALL #3 & #4**

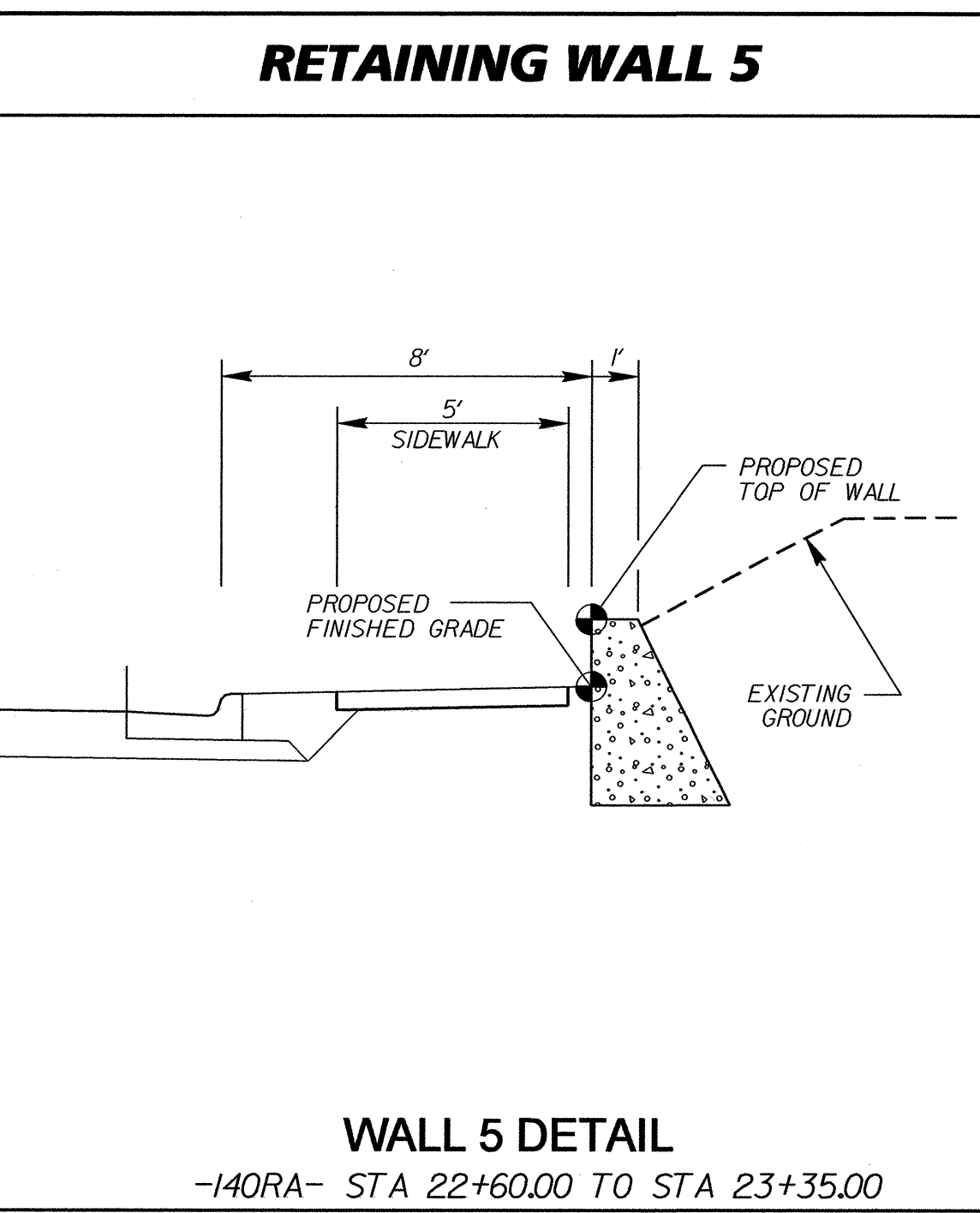
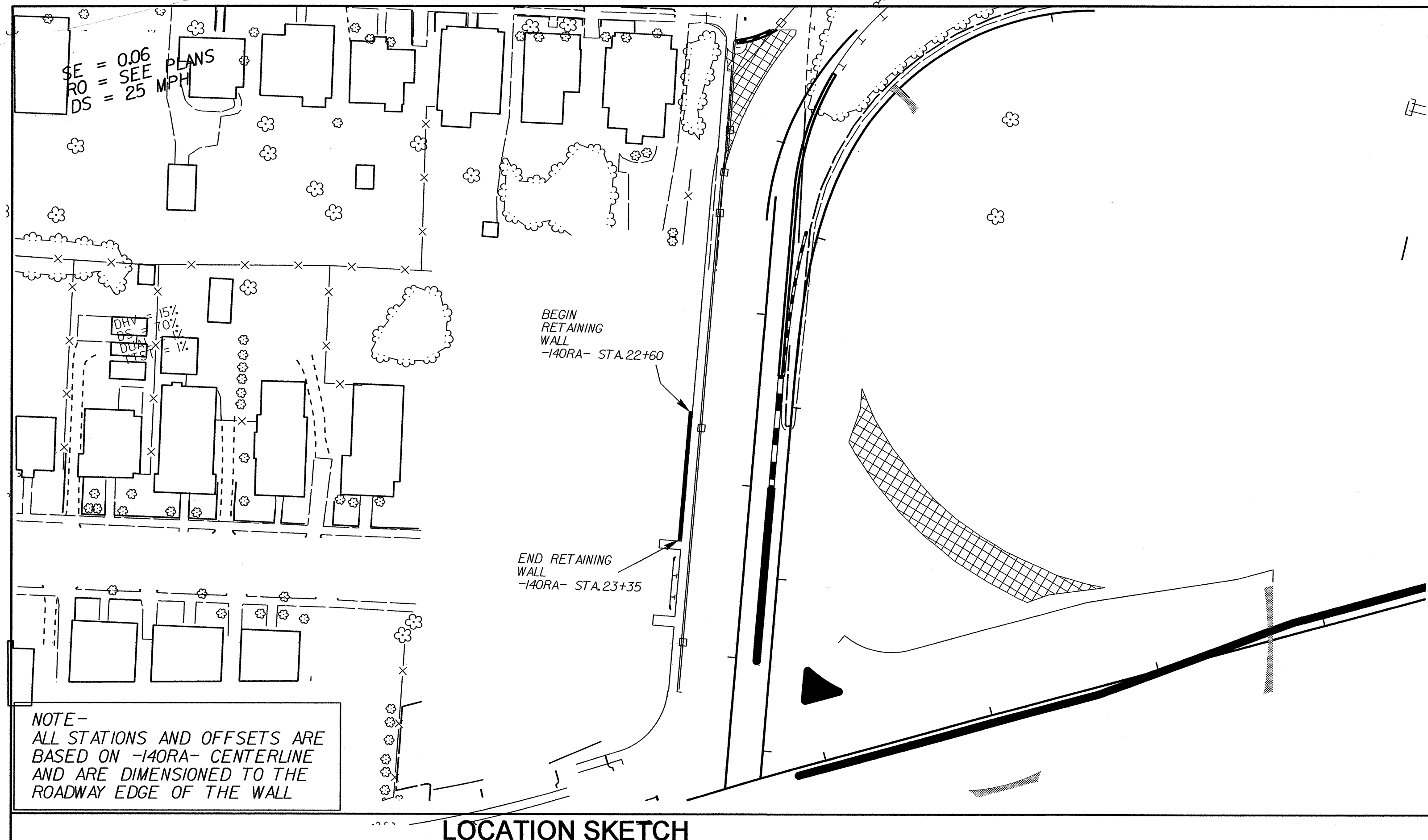
REVISIONS						SHEET NO. W-10
NO.	BY	DATE	NO.	BY	DATE	
1			3			TOTAL SHEETS
2			4			

GEOTECHNICAL ENGINEER

ENGINEER

S.C. Clark 1/10/11

SIGNATURE DATE SIGNATURE DATE



LOCATION SKETCH

**TOTAL STRUCTURE QUANTITIES**

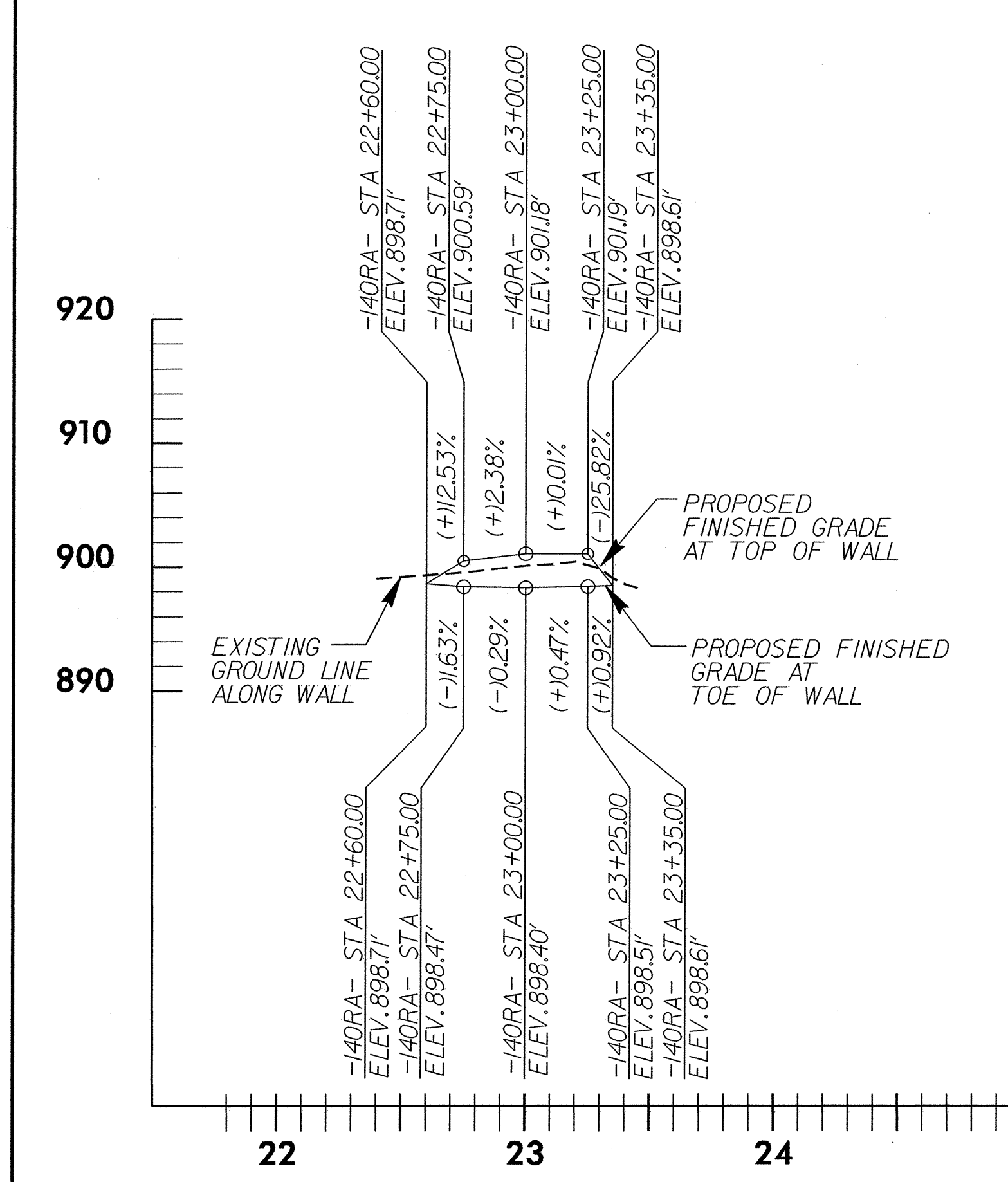
GRAVITY RETAINING WALLS	159	SQ. FT.
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**GRAVITY RETAINING WALL ELEVATIONS**

-140RA- STA	OFFSET FROM CL (RIGHT)	ELEV @ TOP OF WALL	* PROPOSED FINISHED GRADE	* EXPOSED WALL HEIGHT	** DESIGN WALL HEIGHT "H"
22+60.00	39.00	898.71	898.71	0.00	0.00
22+75.00	32.05	900.59	898.47	2.12	1.62
23+00.00	31.04	901.18	898.40	2.78	2.28
23+25.00	30.36	901.19	898.51	2.68	2.18
23+35.00	39+00	898.61	898.61	0.00	0.00

\* ELEVATION @ PROPOSED FINISHED GRADE AND EXPOSED WALL HEIGHT DO NOT INCLUDE EMBEDMENT DEPTH

\*\* FOR DESIGN WALL HEIGHT "H", SEE STANDARD DRAWING No. 453.01, FOUND ON SHEET W-4



**RETAINING WALL 5**

**PROJECT NO.:** U-2826B  
**FORSYTH COUNTY**  
**STATION:** -140RA-22+60.00 TO 23+35.00  
**SHEET** | OF 1

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RALEIGH

**GRAVITY RETAINING WALL #5**

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	W-11
1			3			TOTAL SHEETS
2			4			

PREPARED BY: J.T. WILLIAMS DATE: 10/10  
REVIEWED BY: S.C. CLARK DATE: 10/10