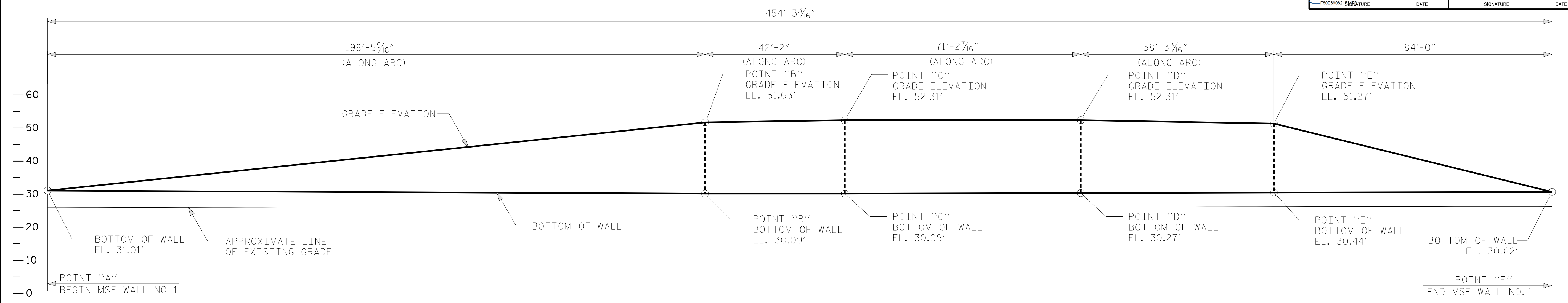


**This electronic collection of documents is provided
for the convenience of the user
and is Not a Certified Document –**

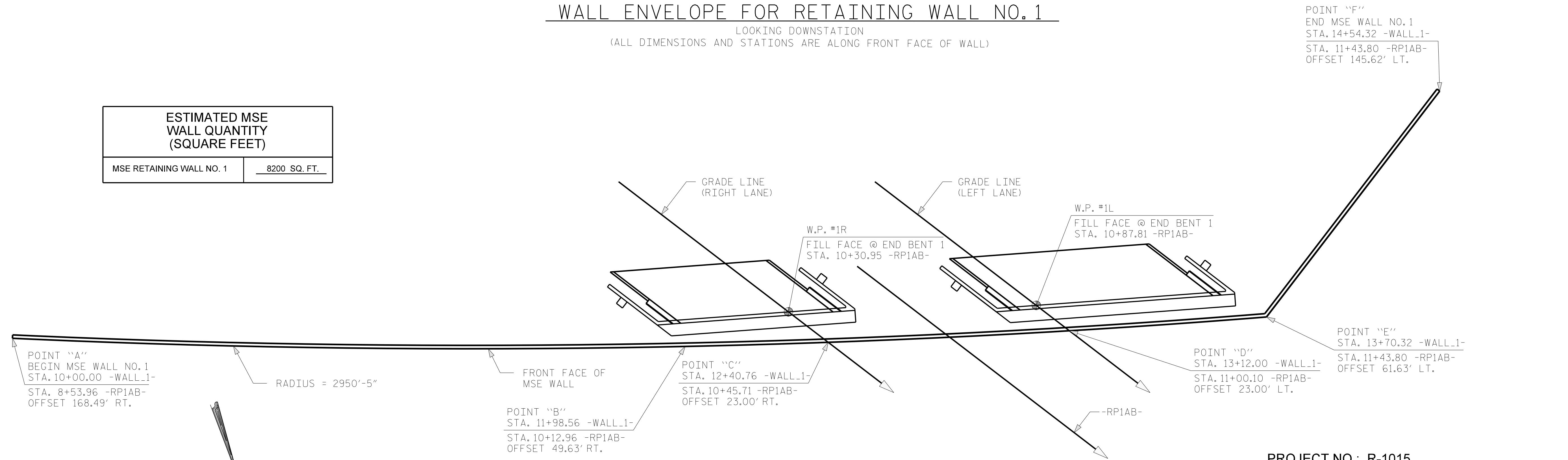
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and sealed by the individuals whose names and license
numbers appear on each page, on the dates appearing
with their signature on that page.**

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WALL ENVELOPE FOR RETAINING WALL NO. 1
LOOKING DOWNSTATION
(ALL DIMENSIONS AND STATIONS ARE ALONG FRONT FACE OF WALL)

ESTIMATED MSE WALL QUANTITY (SQUARE FEET)	
MSE RETAINING WALL NO. 1	8200 SQ. FT.



PLAN VIEW FOR RETAINING WALL NO. 1
(BRIDGE SUPERSTRUCTURE NOT SHOWN FOR CLARITY)

PROJECT NO.: R-1015
CRAVEN COUNTY
STATION: 11+76.30 -RP1AB- = 96+97.07 -L-
SHEET 1 OF 11

PREPARED BY: W.D. SHUECRAFT DATE: 8/18
REVIEWED BY: E.C. HOWEY DATE: 8/18

NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

GEOTECHNICAL
ENGINEERING UNIT

RETAINING WALL NO. 1
PLAN VIEW AND
WALL ENVELOPE

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

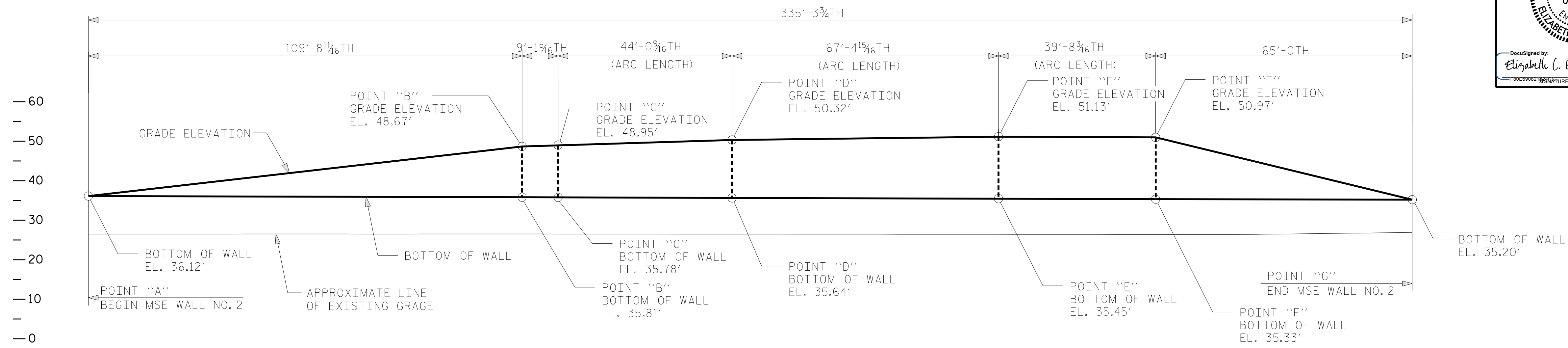
SHEET NO. W-1

GEOTECHNICAL ENGINEER

Elizabeth C. Howey
8/22/2018

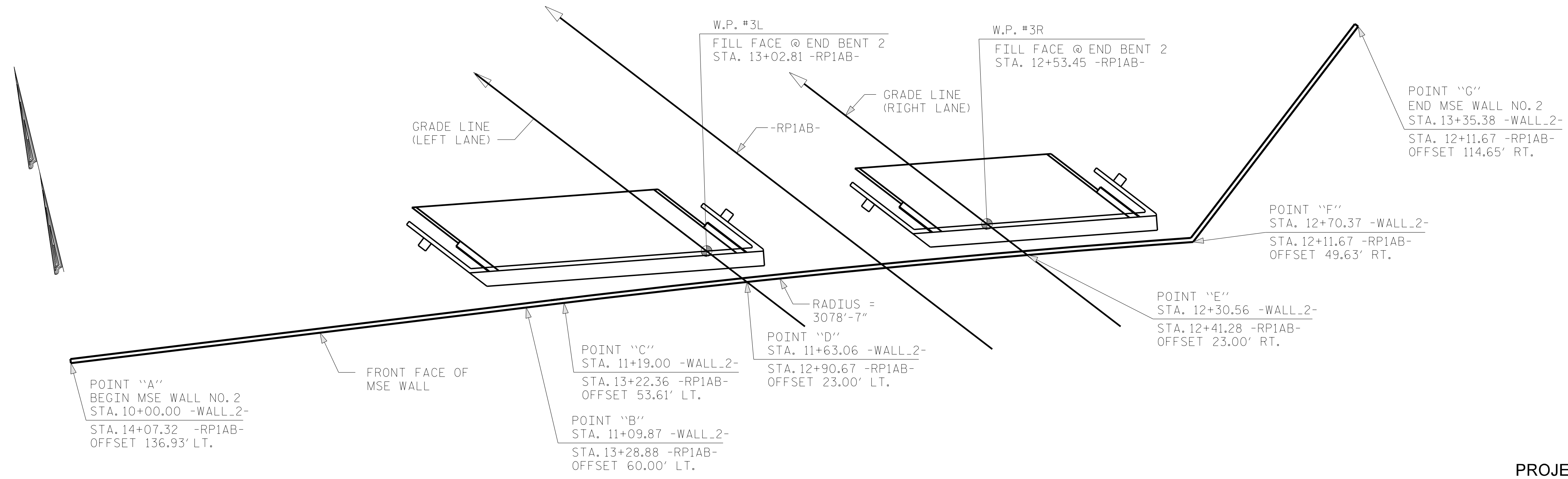
ENGINEER

SIGNATURE DATE



WALL ENVELOPE FOR RETAINING WALL NO. 2
LOOKING UPSTATION
(ALL DIMENSIONS AND STATIONS ARE ALONG FRONT FACE OF WALL)

ESTIMATED MSE WALL QUANTITY (SQUARE FEET)	
MSE RETAINING WALL NO. 2	4600 SQ. FT.



PLAN VIEW FOR RETAINING WALL NO. 2
(BRIDGE SUPERSTRUCTURE NOT SHOWN FOR CLARITY)

PROJECT NO.: R-1015
CRAVEN COUNTY
STATION: 11+76.30 -RP1AB- = 96+97.07 -L-
SHEET 2 OF 11

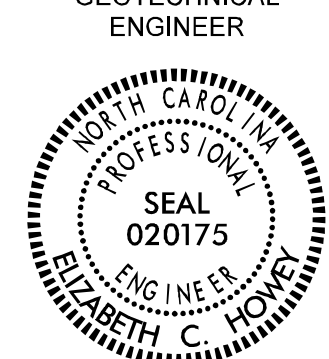
PREPARED BY: W.D. SHUECRAFT DATE: 8/18
REVIEWED BY: E.C. HOWEY DATE: 8/18



NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

**GEOTECHNICAL
ENGINEERING UNIT**

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

GEOTECHNICAL ENGINEER  Elizabeth C. Howey <small>DATE</small> 8/22/2018 <small>SIGNATURE</small>	ENGINEER <small>SIGNATURE</small> <small>DATE</small>
---	--

NOTES FOR WALL NO. 1:

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

FOR TYPE III REINFORCED BRIDGE APPROACH FILL, SEE BRIDGE APPROACH FILLS PROVISION AND ROADWAY DETAIL DRAWING NO. 422D10.

FOR SINGLE FACED PRECAST CONCRETE BARRIER, SEE ROADWAY PLANS AND SECTION 857 OF THE STANDARD SPECIFICATIONS. AT THE CONTRACTOR'S OPTION, USE FINE AGGREGATE IN THE REINFORCED ZONE OF RETAINING WALL NO. 1.

A SEPARATION GEOTEXTILE IS REQUIRED AT THE BACK OF THE REINFORCED ZONE FOR RETAINING WALL NO. 1.

A DRAIN IS REQUIRED FOR RETAINING WALL NO. 1.

PILE SLEEVES ARE REQUIRED AROUND PILES FOR END BENT NO. 1 LL LOCATED AT STATION 10+87.81 -RP1AB- AND END BENT NO. 1 RL LOCATED AT STATION 10+30.95 -RP1AB-.

BEFORE BEGINNING MSE WALL DESIGN FOR RETAINING WALL NO. 1, SURVEY WALL LOCATION AND SUBMIT A REVISED WALL PROFILE VIEW (WALL ENVELOPE) FOR REVIEW. DO NOT START WALL DESIGN OR CONSTRUCTION UNTIL THE REVISED WALL ENVELOPE IS ACCEPTED.

DESIGN RETAINING WALL NO. 1 FOR THE FOLLOWING:

- 1) H = DESIGN HEIGHT + EMBEDMENT
- 2) DESIGN LIFE = 100 YEARS
- 3) MAXIMUM FACTORED VERTICAL STRESS ON FOUNDATION MATERIAL = 6,650 LB/SF
- 4) MINIMUM REINFORCEMENT LENGTH (L) = 0.95H UNDER AND BETWEEN END BENT CAPS. MINIMUM REINFORCEMENT LENGTH = 0.70H OR 6 FEET WHICHEVER IS LONGER OUTSIDE CAP AREA ALONG WALL WINGS.
- 5) REINFORCED ZONE AGGREGATE PARAMETERS:

AGGREGATE TYPE*	UNIT WEIGHT (γ) LB/CF	FRICITION ANGLE (φ) DEGREES	COHESION (c) LB/SF
COARSE	110	38	0
FINE	115	34	0

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

6) IN-SITU ASSUMED MATERIAL PARAMETERS:

MATERIAL TYPE	UNIT WEIGHT (γ) LB/CF	FRICITION ANGLE (φ) DEGREES	COHESION (c) LB/SF
BACKFILL	120	30	0
FOUNDATION	120	30	0

DESIGN RETAINING WALL NO. 1 FOR A LIVE LOAD (TRAFFIC) SURCHARGE.

EXISTING OR FUTURE OBSTRUCTIONS SUCH AS FOUNDATIONS, GUARDRAIL, FENCE OR HANDRAIL POSTS, PAVEMENTS PIPES, INLETS OR UTILITIES MAY INTERFERE WITH REINFORCEMENT FOR RETAINING WALL NO. 1.

DO NOT PLACE LEVELING PAD CONCRETE, AGGREGATE OR REINFORCEMENT FOR RETAINING WALL NO. 1 UNTIL EXCAVATION DIMENSIONS AND FOUNDATION MATERIAL ARE APPROVED.

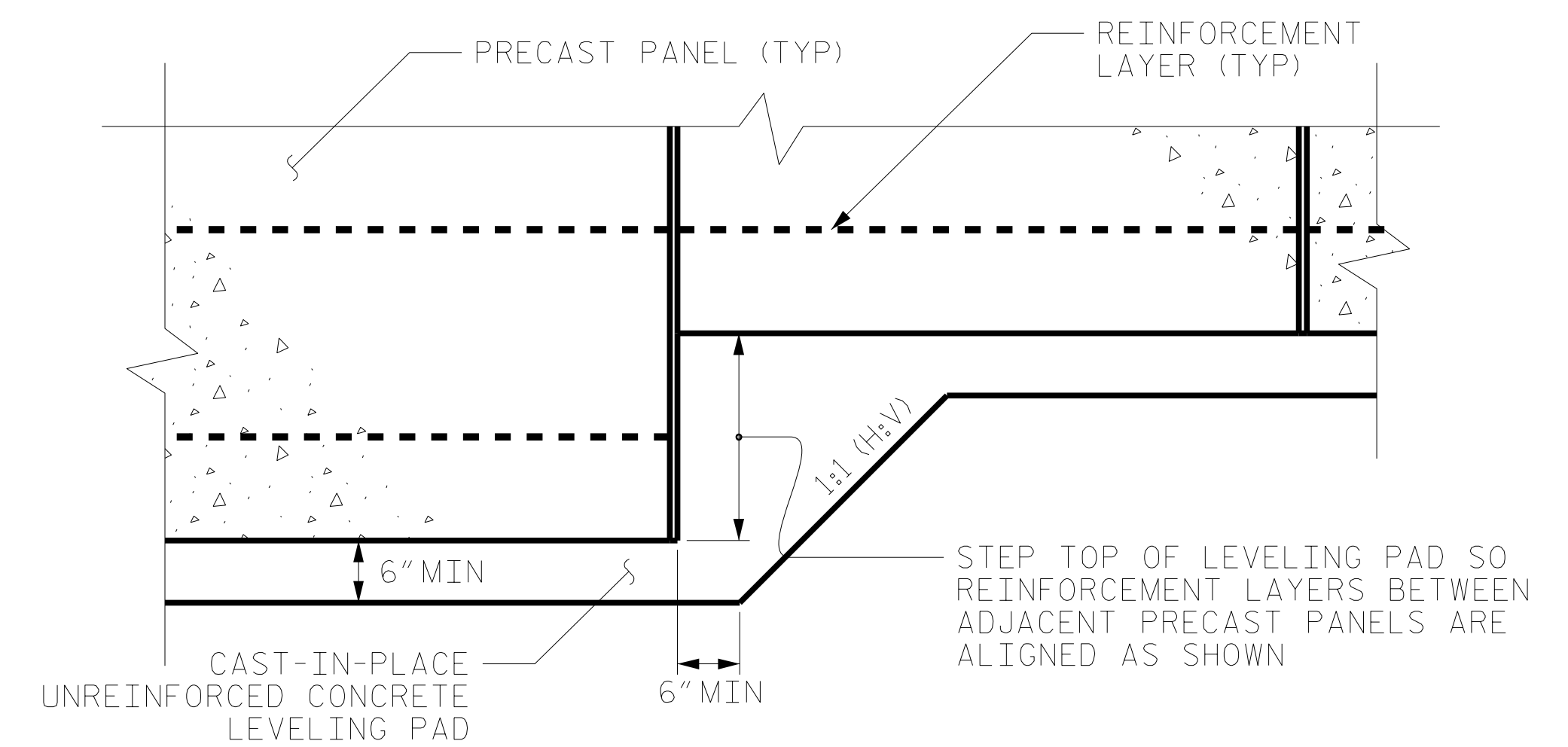
DESIGN REINFORCEMENT CONNECTED TO END BENT CAPS FOR FACTORED LOAD AND LENGTH OF REINFORCEMENT IN ACTIVE ZONE (L) SHOWN. CAST REINFORCEMENT CONNECTORS INTO CAP BACKWALL FOR END BENT NO. 1 LL AT STATION 10+87.81 -RP1AB- AND END BENT NO. 1 RL LOCATED AT STATION 10+30.95 -RP1AB-. MAINTAIN A CLEARANCE OF AT LEAST 3" BETWEEN CONNECTORS AND REINFORCING STEEL IN CAP.

FOUNDATIONS FOR END BENT NO. 1 LL LOCATED AT STATION 10+87.81 -RP1AB- AND END BENT NO. 1 RL LOCATED AT STATION 10+30.95 -RP1AB-, WILL INTERFERE WITH REINFORCEMENT FOR RETAINING WALL NO. 1. SEE "FOUNDATION LAYOUT" SHEET FOR FOUNDATION LOCATIONS.

INSTALL PILE SLEEVES FOR END BENT NO. 1 LL AT STATION 10+87.81 -RP1AB- AND END BENT NO. 1 RL LOCATED AT STATION 10+30.95 -RP1AB- WHILE CONSTRUCTING RETAINING WALL NO. 1. THEN, INSTALL PILES THROUGH THE CORRUGATED STEEL PIPES AND FILL PIPES WITH LOOSE UNCOMPACTED SAND BEFORE CONSTRUCTING END BENT CAPS.

UNDERCUT IS REQUIRED BENEATH A PORTION OF RETAINING WALL NO. 1 PRIOR TO MSE WALL CONSTRUCTION. SEE ROADWAY PLANS FOR LIMITS OF UNDERCUT.

THE BOTTOM OF RETAINING WALL NO. 1 IS LOCATED NEAR THE GROUNDWATER TABLE AND DEWATERING MAY BE REQUIRED.

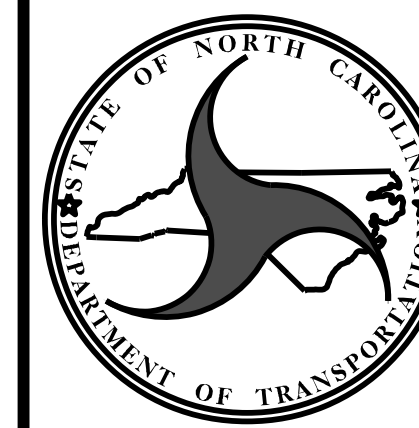


PRECAST CONCRETE PANELS

LEVELING PAD STEP DETAILS

PROJECT NO.: R-1015
 CRAVEN COUNTY
 STATION: 11+76.30 -RP1AB- = 96+97.07 -L-
 SHEET 3 OF 11

PREPARED BY: W.D. SHUECRAFT	DATE: 8/18
REVIEWED BY: E.C. HOWEY	DATE: 8/18

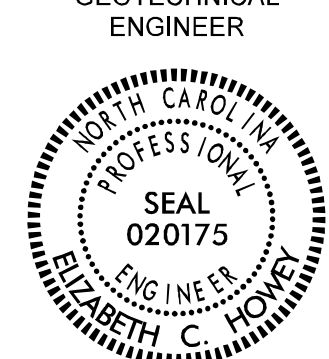


NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

**GEOTECHNICAL
ENGINEERING UNIT**

**RETAINING WALL NO. 1
NOTES AND LEVELING
PAD STEP DETAILS**

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

GEOTECHNICAL ENGINEER  Elizabeth C. Howey <small>DocuSigned by: Elizabeth C. Howey</small>	ENGINEER <small>SIGNATURE</small>
8/22/2018 <small>DATE</small>	 <small>SIGNATURE</small>

NOTES FOR WALL NO. 2:

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

FOR TYPE III REINFORCED BRIDGE APPROACH FILL, SEE BRIDGE APPROACH FILLS PROVISION AND ROADWAY DETAIL DRAWING NO. 422D10.

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

AT THE CONTRACTOR'S OPTION, USE FINE AGGREGATE IN THE REINFORCED ZONE OF RETAINING WALL NO. 2.

A SEPARATION GEOTEXTILE IS REQUIRED AT THE BACK OF THE REINFORCED ZONE FOR RETAINING WALL NO. 2.

A DRAIN IS REQUIRED FOR RETAINING WALL NO. 2.

PILE SLEEVES ARE REQUIRED AROUND PILES FOR END BENT NO. 2 LL LOCATED AT STATION 13+02.81 -RP1AB- AND END BENT NO. 2 RL LOCATED AT STATION 12+53.45 -RP1AB-.

BEFORE BEGINNING MSE WALL DESIGN FOR RETAINING WALL NO. 2, SURVEY WALL LOCATION AND SUBMIT A REVISED WALL PROFILE VIEW (WALL ENVELOPE) FOR REVIEW. DO NOT START WALL DESIGN OR CONSTRUCTION UNTIL THE REVISED WALL ENVELOPE IS ACCEPTED.

DESIGN RETAINING WALL NO. 2 FOR THE FOLLOWING:

- 1) H = DESIGN HEIGHT + EMBEDMENT
- 2) DESIGN LIFE = 100 YEARS
- 3) MAXIMUM FACTORED VERTICAL STRESS ON FOUNDATION MATERIAL = 5,950 LB/SF
- 4) MINIMUM REINFORCEMENT LENGTH (L) = 0.70H OR 6 FT, WHICHEVER IS LONGER
- 5) REINFORCED ZONE AGGREGATE PARAMETERS:

AGGREGATE TYPE*	UNIT WEIGHT (γ) LB/CF	FRICITION ANGLE (ϕ) DEGREES	COHESION (c) LB/SF
COARSE	110	38	0
FINE	115	34	0

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

6) IN-SITU ASSUMED MATERIAL PARAMETERS:

MATERIAL TYPE	UNIT WEIGHT (γ) LB/CF	FRICITION ANGLE (ϕ) DEGREES	COHESION (c) LB/SF
BACKFILL	120	30	0
FOUNDATION	120	30	0

DESIGN RETAINING WALL NO. 2 FOR A LIVE LOAD (TRAFFIC) SURCHARGE.

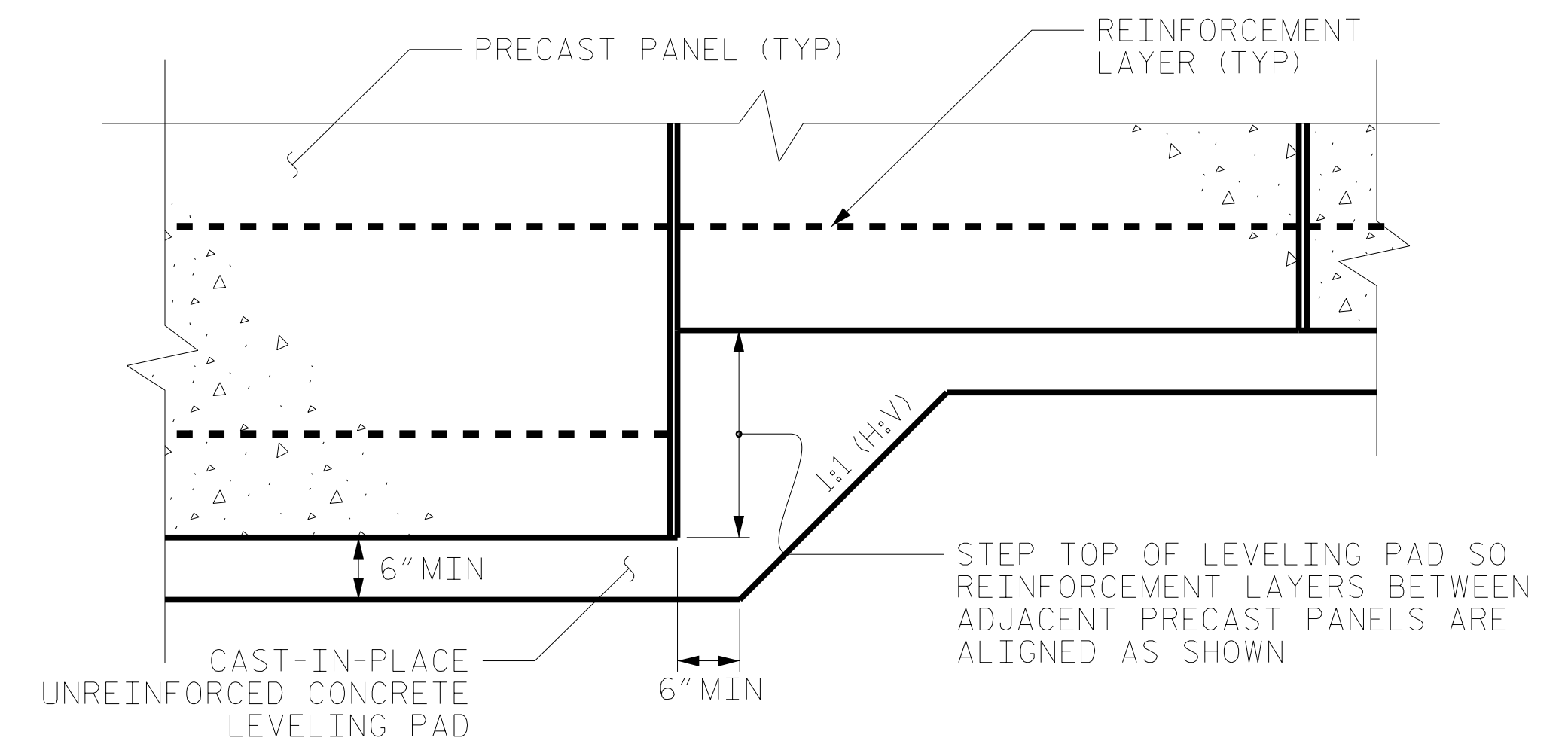
EXISTING OR FUTURE OBSTRUCTIONS SUCH AS FOUNDATIONS, GUARDRAIL, FENCE OR HANDRAIL POSTS, PAVEMENTS PIPES, INLETS OR UTILITIES MAY INTERFERE WITH REINFORCEMENT FOR RETAINING WALL NO. 2.

DO NOT PLACE LEVELING PAD CONCRETE, AGGREGATE OR REINFORCEMENT FOR RETAINING WALL NO. 2 UNTIL EXCAVATION DIMENSIONS AND FOUNDATION MATERIAL ARE APPROVED.

DESIGN REINFORCEMENT CONNECTED TO END BENT CAPS FOR FACTORED LOAD AND LENGTH OF REINFORCEMENT IN ACTIVE ZONE (L) SHOWN. CAST REINFORCEMENT CONNECTORS INTO CAP BACKWALL FOR END BENT NO. 2 LL AT STATION 13+02.81 -RP1AB- AND END BENT NO. 2 RL LOCATED AT STATION 12+53.45 -RP1AB-. MAINTAIN A CLEARANCE OF AT LEAST 3" BETWEEN CONNECTORS AND REINFORCING STEEL IN CAP.

FOUNDATIONS FOR END BENT NO. 2 LL LOCATED AT STATION 13+02.81 -RP1AB- AND END BENT NO. 2 RL LOCATED AT STATION 12+53.45 -RP1AB-, WILL INTERFERE WITH REINFORCEMENT FOR RETAINING WALL NO. 2. SEE "FOUNDATION LAYOUT" SHEET FOR FOUNDATION LOCATIONS.

INSTALL PILE SLEEVES FOR END BENT NO. 2 LL AT STATION 13+02.81 -RP1AB- AND END BENT NO. 2 RL LOCATED AT STATION 12+53.45 -RP1AB- WHILE CONSTRUCTING RETAINING WALL NO. 2. THEN, INSTALL PILES THROUGH THE CORRUGATED STEEL PIPES AND FILL PIPES WITH LOOSE UNCOMPACTED SAND BEFORE CONSTRUCTING END BENT CAPS.

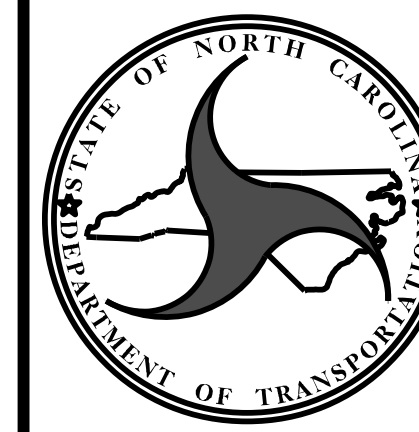


PRECAST CONCRETE PANELS

LEVELING PAD STEP DETAILS

PROJECT NO.: R-1015
 CRAVEN COUNTY
 STATION: 11+76.30 -RP1AB- = 96+97.07 -L-
 SHEET 4 OF 11


PREPARED BY: W.D. SHUECRAFT	DATE: 8/18
REVIEWED BY: E.C. HOWEY	DATE: 8/18

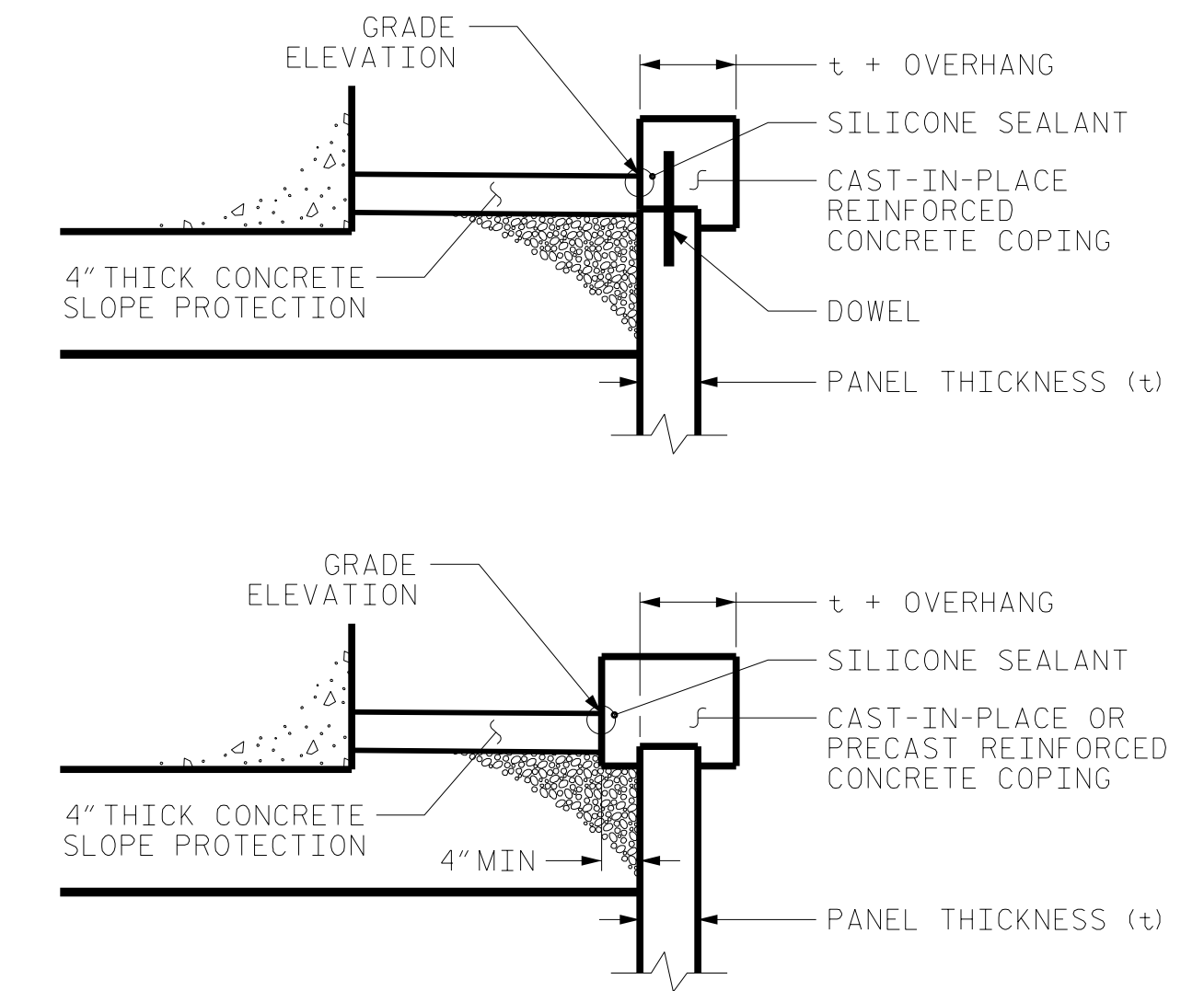
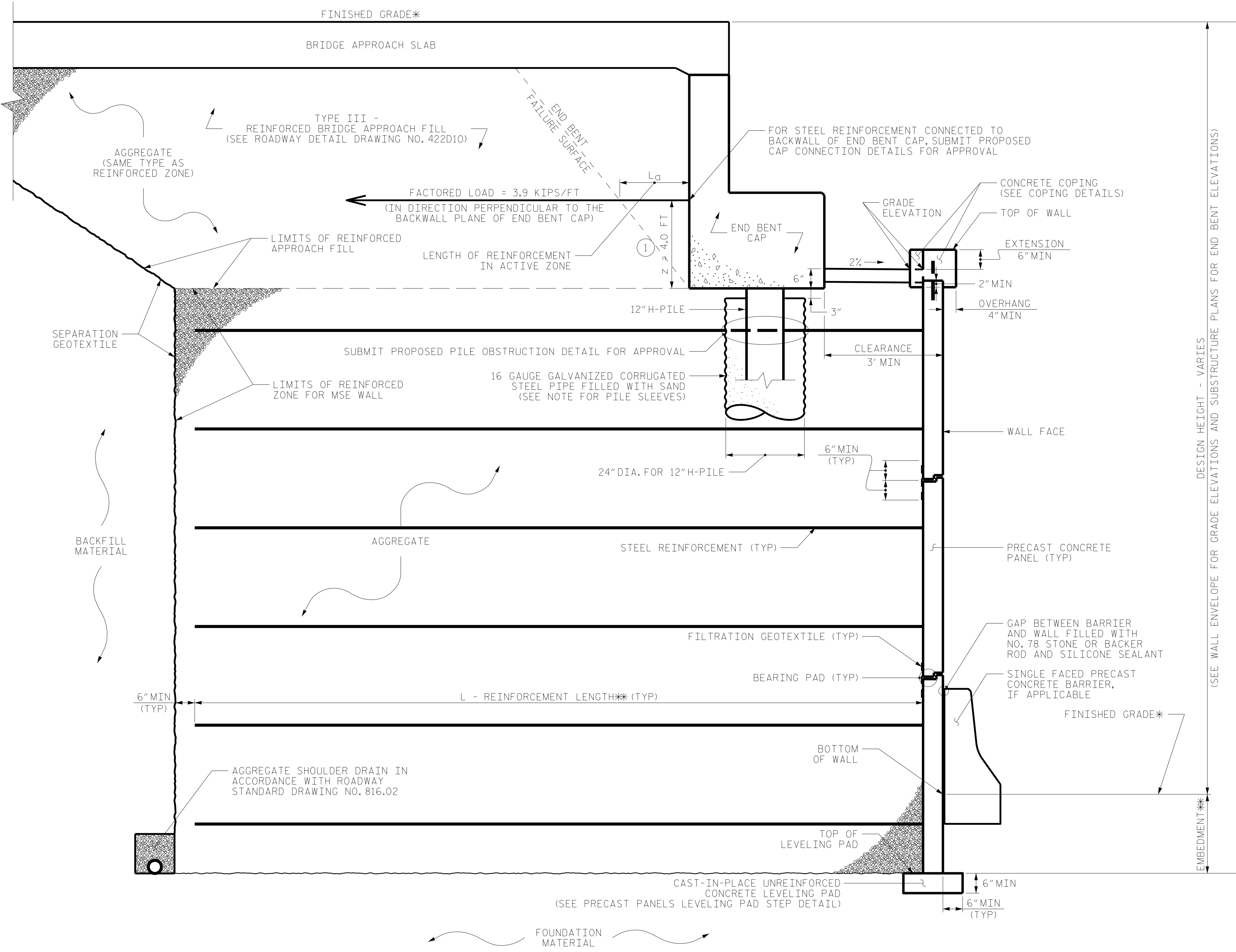


NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 DIVISION OF HIGHWAYS
 GEOTECHNICAL
 ENGINEERING UNIT

RETAINING WALL NO. 2
 NOTES AND LEVELING
 PAD STEP DETAILS

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

GEOTECHNICAL ENGINEER  Elizabeth C. Howey <small>FE006602182453</small>	ENGINEER DATE: 9/13/2018 SIGNATURE: _____ DATE: _____
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COPING DETAILS

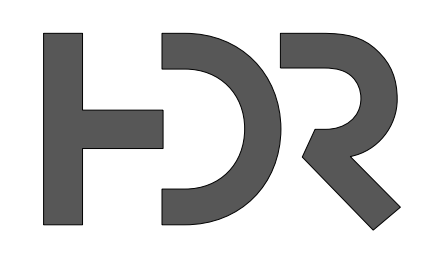
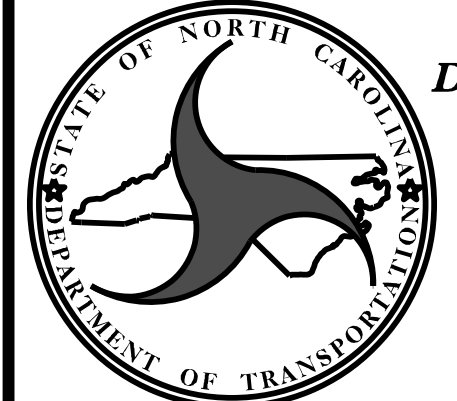
AT THE CONTRACTOR'S OPTION, CONNECT COPING TO PANELS WITH DOWELS OR EXTEND COPING DOWN BACK OF PANELS.

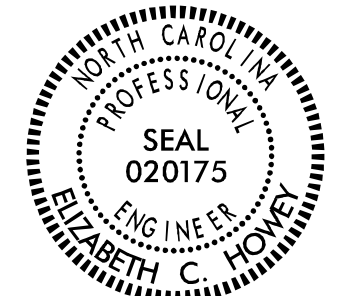
MSE ABUTMENT WALL WITH PRECAST PANELS - TYPICAL SECTION

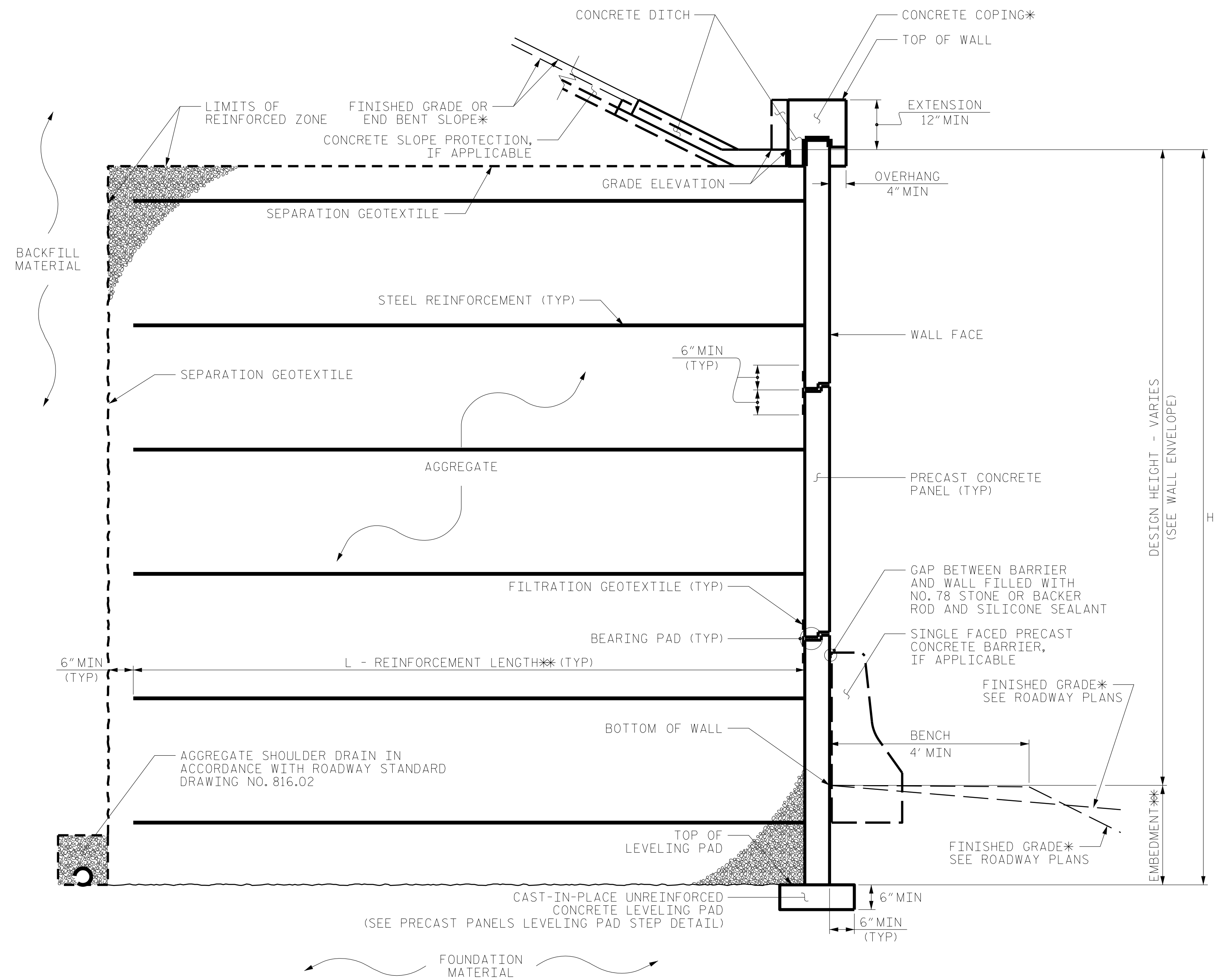
*SEE ROADWAY PLANS FOR FINISHED GRADE DETAILS.
 **SEE MSE RETAINING WALLS PROVISION AND IF APPLICABLE, MSE WALL NOTES FOR EMBEDMENT AND REINFORCEMENT LENGTH REQUIREMENTS.

PROJECT NO.: R-1015
 CRAVEN COUNTY
 STATION: 11+76.30 -RP1AB- = 96+97.07 -L-
 SHEET 5 OF 11

PREPARED BY: W.D. SHUECRAFT DATE: 8/18
 REVIEWED BY: E.C. HOWEY DATE: 8/18

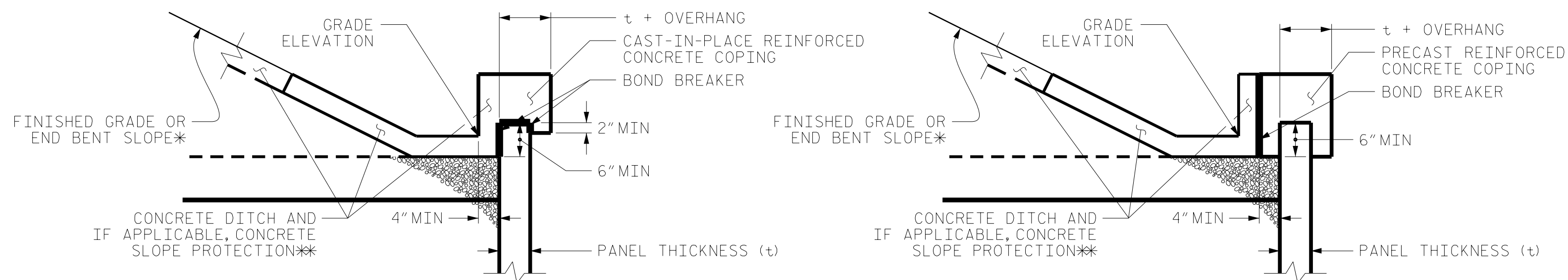
		NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS		RETAINING WALL NO. 1 & 2 TYPICAL & COPING DETAILS																							
		GEOTECHNICAL ENGINEERING UNIT		<table border="1"> <thead> <tr> <th colspan="6">REVISIONS</th> </tr> <tr> <th>NO.</th> <th>BY</th> <th>DATE</th> <th>NO.</th> <th>BY</th> <th>DATE</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>E.C. HOWEY</td> <td>9/18</td> <td>3</td> <td></td> <td></td> </tr> <tr> <td>2</td> <td></td> <td></td> <td>4</td> <td></td> <td></td> </tr> </tbody> </table>		REVISIONS						NO.	BY	DATE	NO.	BY	DATE	1	E.C. HOWEY	9/18	3			2			4
REVISIONS																											
NO.	BY	DATE	NO.	BY	DATE																						
1	E.C. HOWEY	9/18	3																								
2			4																								

GEOTECHNICAL ENGINEER  Elizabeth C. Howey 8/22/2018		ENGINEER 	
SIGNATURE	DATE	SIGNATURE	DATE



MSE WALL WITH PRECAST PANELS - TYPICAL SECTION

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

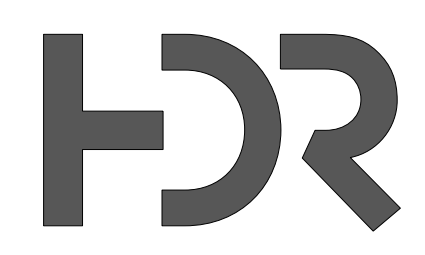
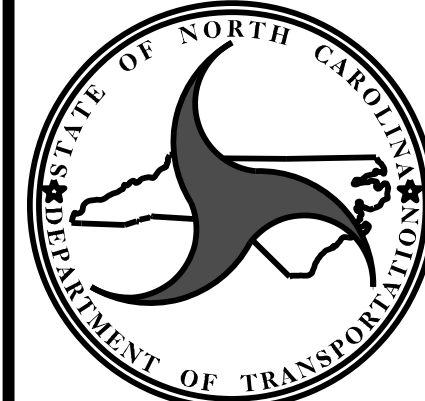


COPING DETAILS

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

PROJECT NO.: R-1015
 CRAVEN COUNTY
 STATION: 11+76.30 -RP1AB- = 96+97.07 -L-
 SHEET 6 OF 11

PREPARED BY: W.D. SHUECRAFT DATE: 8/18
 REVIEWED BY: E.C. HOWEY DATE: 8/18

		NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS		RETAINING WALL NO. 1 & 2 TYPICAL & COPING DETAILS																							
		GEOTECHNICAL ENGINEERING UNIT		<table border="1"> <thead> <tr> <th colspan="6">REVISIONS</th> </tr> <tr> <th>NO.</th> <th>BY</th> <th>DATE</th> <th>NO.</th> <th>BY</th> <th>DATE</th> </tr> </thead> <tbody> <tr> <td>1</td> <td></td> <td></td> <td>3</td> <td></td> <td></td> </tr> <tr> <td>2</td> <td></td> <td></td> <td>4</td> <td></td> <td></td> </tr> </tbody> </table>		REVISIONS						NO.	BY	DATE	NO.	BY	DATE	1			3			2			4
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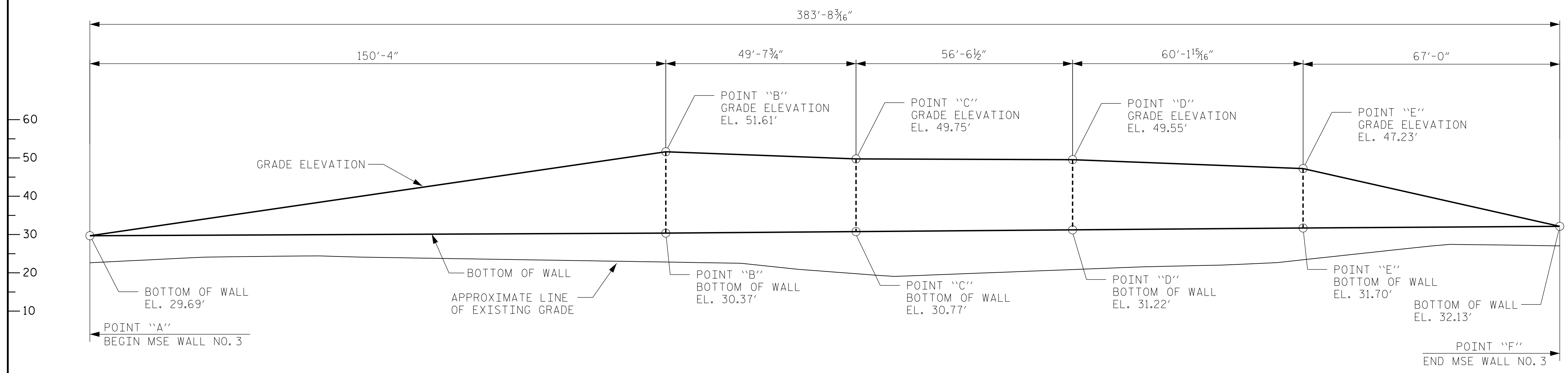
GEOTECHNICAL ENGINEER

ENGINEER

DocuSigned by:
Muhammad Shafiq Rahman 8/28/2018

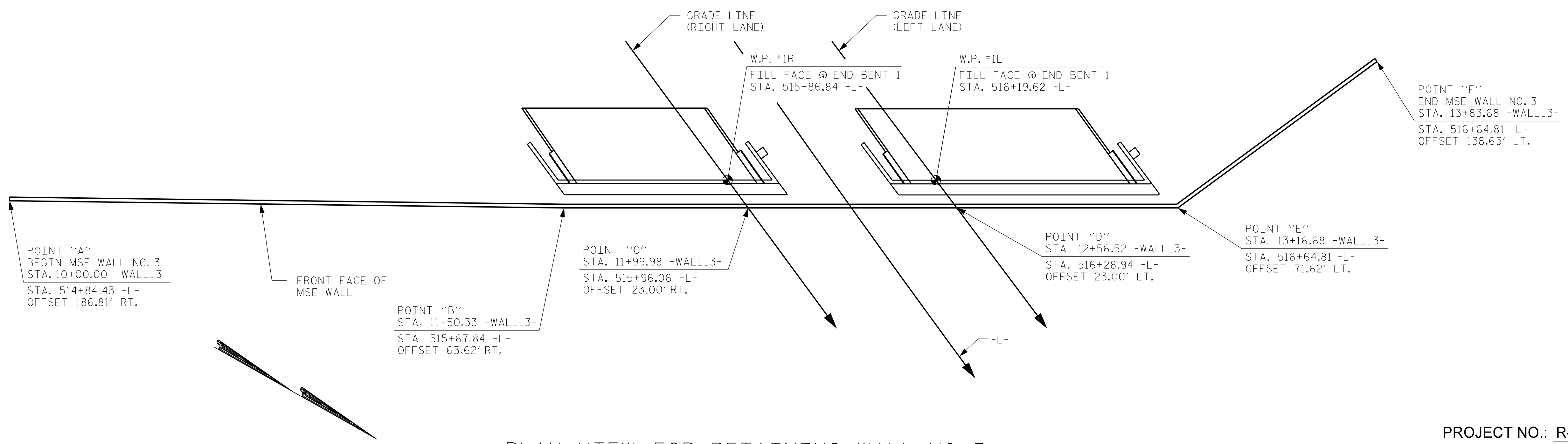
ACCREDITED SIGNATURE DATE SIGNATURE DATE

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



WALL ENVELOPE FOR RETAINING WALL NO. 3
 LOOKING DOWNSTATION
 (ALL DIMENSIONS AND STATIONS ARE ALONG FRONT FACE OF WALL)

ESTIMATED MSE WALL QUANTITY (SQUARE FEET)	
MSE RETAINING WALL NO. 3	6,400 SF



PLAN VIEW FOR RETAINING WALL NO. 3
 (BRIDGE SUPERSTRUCTURE NOT SHOWN FOR CLARITY)

PROJECT NO.: R-1015

CRAVEN COUNTY

STATION: 516+87.37 -L- / 69+02.79 -RP2AC-

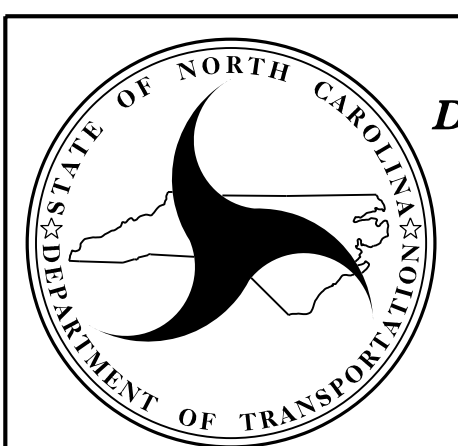
SHEET 7 OF 11

PREPARED BY: C.R. PASTRANA DATE: 8/2018

REVIEWED BY: M.S. RAHMAN DATE: 8/2018

ESP

ESP ASSOCIATES, INC
 7011 ALBERT PICK RD
 SUITE E
 GREENSBORO, NC 27409
 FIRM # C-0587
 WWW.ESPASSOCIATES.COM



NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 DIVISION OF HIGHWAYS

**GEOTECHNICAL
 ENGINEERING UNIT**

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

GEOTECHNICAL ENGINEER

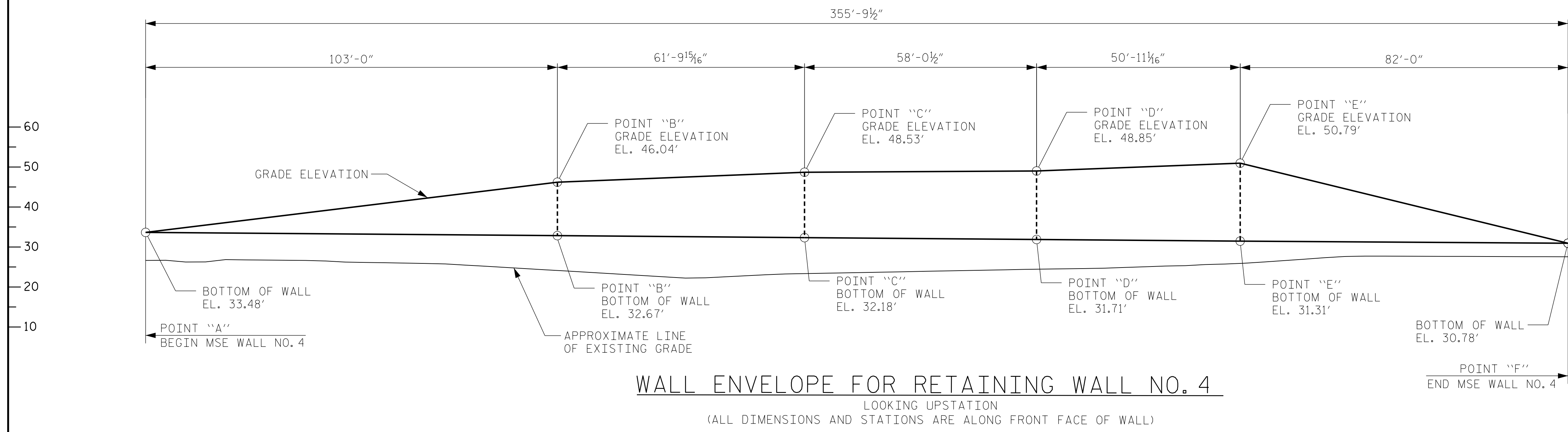
ENGINEER

SEAL 033500

DocuSigned by: Muhammad Shafiq Rahman 8/28/2018

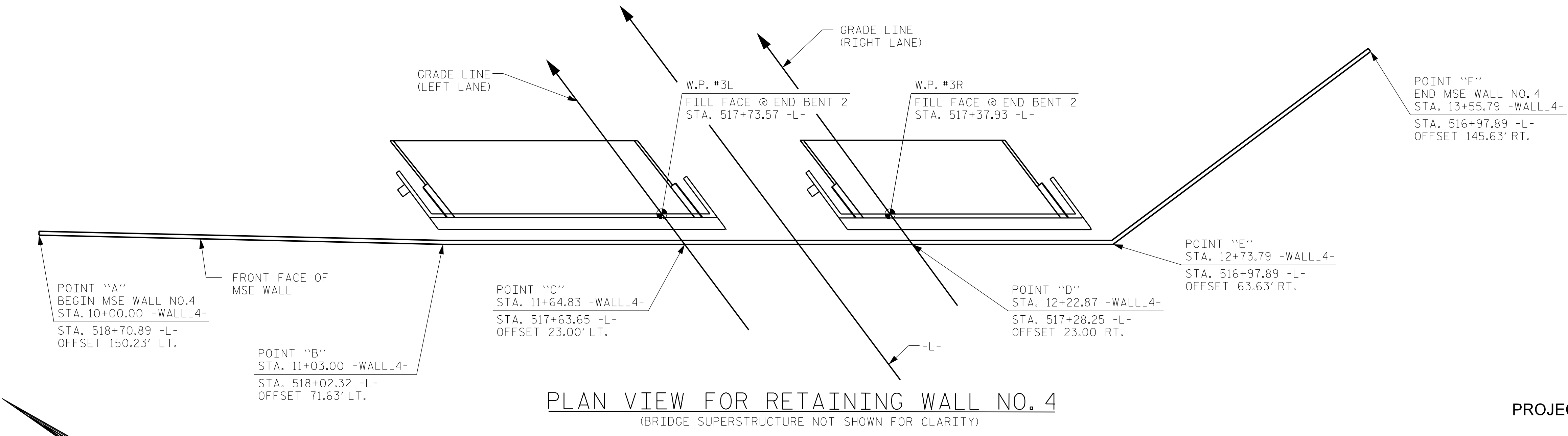
DATE: SIGNATURE: DATE:

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED



ESTIMATED MSE WALL QUANTITY (SQUARE FEET)

MSE RETAINING WALL NO. 4	5,400 SF
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PROJECT NO.: R-1015

CRAVEN COUNTY

STATION: 516+87.37 -L- / 69+02.79 -RP2AC-

SHEET 8 OF 11

PREPARED BY: C.R. PASTRANA DATE: 8/2018

REVIEWED BY: M.S. RAHMAN DATE: 8/2018

ESP

ESP ASSOCIATES, INC
7011 ALBERT PICK RD
SUITE E
GREENSBORO, NC 27409
FIRM # C-0587
WWW.ESPASSOCIATES.COM

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

GEOTECHNICAL ENGINEERING UNIT

RETAINING WALL NO. 4 PLAN VIEW AND WALL ENVELOPE

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

NOTES:

FOR MECHANICALLY STABILIZED EARTH (MSE) RETAINING WALLS, SEE MECHANICALLY STABILIZED EARTH RETAINING WALLS PROVISION.
 FOR TYPE III REINFORCED BRIDGE APPROACH FILL, SEE BRIDGE APPROACH FILLS PROVISION AND ROADWAY DETAIL DRAWING NO. 422D10.
 FOR SINGLE FACED PRECAST CONCRETE BARRIER, SEE ROADWAY PLANS AND SECTION 857 OF THE STANDARD SPECIFICATIONS.
 AT THE CONTRACTOR'S OPTION, USE FINE AGGREGATE IN THE REINFORCED ZONE OF RETAINING WALL NO. 3 AND WALL NO. 4.
 A SEPARATION GEOTEXTILE IS REQUIRED AT THE BACK OF THE REINFORCED ZONE FOR RETAINING WALL NO. 3 AND WALL NO. 4.
 A DRAIN IS REQUIRED FOR RETAINING WALL NO. 3 AND WALL NO. 4.

PILE SLEEVES ARE REQUIRED AROUND PILES FOR END BENT NO. 1 (LL) LOCATED AT STATION 516+19.62 -L- AND END BENT NO. 1 (RL) LOCATED AT STATION 515+86.84 -L-.

PILE SLEEVES ARE REQUIRED AROUND PILES FOR END BENT NO. 2 (LL) LOCATED AT STATION 517+73.57 -L- AND END BENT NO. 2 (RL) LOCATED AT STATION 517+37.93 -L-.

BEFORE BEGINNING MSE WALL DESIGN FOR RETAINING WALL NO. 3 AND WALL NO. 4, SURVEY WALL LOCATION AND SUBMIT A REVISED WALL PROFILE VIEW (WALL ENVELOPE) FOR REVIEW. DO NOT START WALL DESIGN OR CONSTRUCTION UNTIL THE REVISED WALL ENVELOPE IS ACCEPTED.

DESIGN RETAINING WALL NO. 3 AND WALL NO. 4 FOR THE FOLLOWING:

- 1) H = DESIGN HEIGHT + EMBEDMENT
- 2) DESIGN LIFE = 100 YEARS
- 3) MAXIMUM FACTORED VERTICAL PRESSURE ON FOUNDATION MATERIAL = 7.5 KSF (WALL NO. 3) AND 7.0 KSF (WALL NO. 4).
- 4) MINIMUM REINFORCEMENT LENGTH (L) = 0.8H (WALL NO. 3) AND 0.85H (WALL NO. 4) OR 6 FT, WHICHEVER IS LONGER
- 5) MINIMUM EMBEDMENT DEPTH FOR = H/10 OR 2.0 FT, WHICHEVER IS GREATER.
- 6) REINFORCED ZONE AGGREGATE PARAMETERS:

AGGREGATE TYPE*	UNIT WEIGHT (γ) PCF	FRICTION ANGLE (ϕ) DEGREES	COHESION (c) PSF
COARSE	110	38	0
FINE	115	34	0

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

7) IN-SITU ASSUMED MATERIAL PARAMETERS:

MATERIAL TYPE	UNIT WEIGHT (γ) PCF	FRICTION ANGLE (ϕ) DEGREES	COHESION (c) PSF
BACKFILL	120	30	0
FOUNDATION FOR WALL NO. 3	118	29	0
FOUNDATION FOR WALL NO. 4	117	27	0

DESIGN RETAINING WALL NO. 3 AND WALL NO. 4 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. 3 AND WALL NO. 4.

DESIGN REINFORCEMENT CONNECTED TO END BENT CAPS FOR FACTORED LOAD AND LENGTH OF REINFORCEMENT IN ACTIVE ZONE (L_a) SHOWN. CAST REINFORCEMENT OR CONNECTORS INTO CAP BACKWALL FOR END BENT NO. 1 (LL) LOCATED AT STATION 516+19.62 -L-, END BENT NO. 1 (RL) LOCATED AT STATION 515+86.84 -L-, END BENT NO. 2 (LL) LOCATED AT STATION 517+73.57 -L- AND END BENT NO. 2 (RL) LOCATED AT STATION 517+37.93. MAINTAIN A CLEARANCE OF AT LEAST 3" BETWEEN REINFORCEMENT OR CONNECTORS AND REINFORCING STEEL IN CAP.

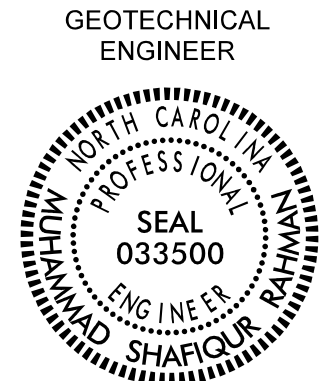
FOUNDATIONS FOR END BENT NO. 1 (LL) LOCATED AT STATION 516+19.62 -L- AND END BENT NO. 1 (RL) LOCATED AT STATION 515+86.84 -L- WILL INTERFERE WITH REINFORCEMENT FOR RETAINING WALL NO. 3. SEE "FOUNDATION LAYOUT" SHEET FOR FOUNDATION LOCATIONS.

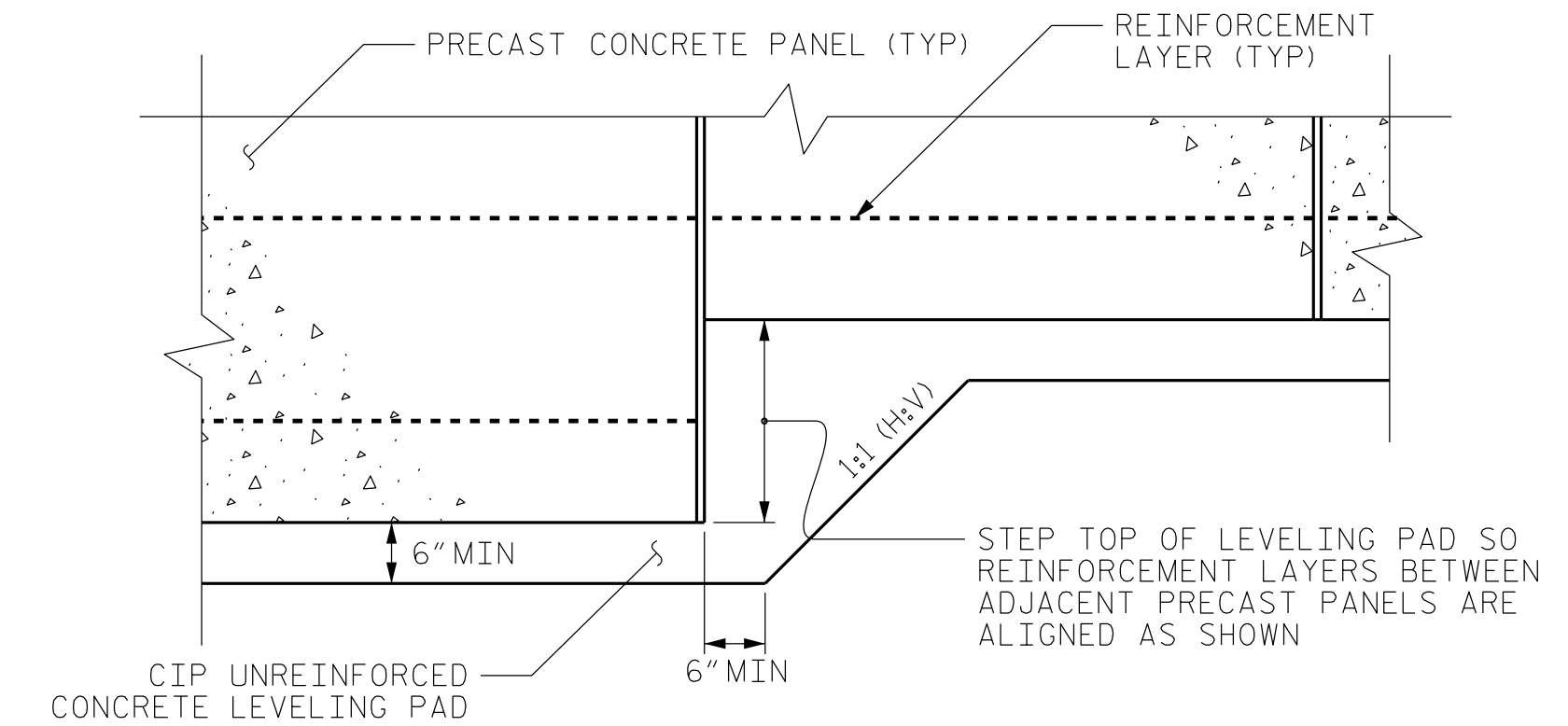
FOUNDATIONS FOR END BENT NO. 2 (LL) LOCATED AT STATION 517+73.57 -L- AND END BENT NO. 2 (RL) LOCATED AT STATION 517+37.93 -L- WILL INTERFERE WITH REINFORCEMENT FOR RETAINING WALL NO. 4. SEE "FOUNDATION LAYOUT" SHEET FOR FOUNDATION LOCATIONS.

INSTALL PILE SLEEVES FOR END BENT NO. 1 (LL) LOCATED AT STATION 516+19.62 -L- AND END BENT NO. 1 (RL) LOCATED AT STATION 515+86.84 -L- WHILE CONSTRUCTING RETAINING WALL NO. 3. OBSERVE A 2 MONTH WAITING PERIOD AFTER CONSTRUCTING THE MSE ABUTMENT WALL TO WITHIN 1 FT OF THE BOTTOM OF CAP ELEVATION. THEN INSTALL PILES THROUGH THE CORRUGATED STEEL PIPES AND FILL PIPES WITH LOOSE UNCOMPACTED SAND BEFORE CONSTRUCTING END BENT CAPS.

INSTALL PILE SLEEVES FOR END BENT NO. 2 (LL) LOCATED AT STATION 517+73.57 -L-, AND END BENT NO. 2 (RL) LOCATED AT STATION 517+37.93 -L- WHILE CONSTRUCTING RETAINING WALL NO. 4. OBSERVE A 2 MONTH WAITING PERIOD AFTER CONSTRUCTING THE MSE ABUTMENT WALL TO WITHIN 1 FT OF THE BOTTOM OF CAP ELEVATION. THEN INSTALL PILES THROUGH THE CORRUGATED STEEL PIPES AND FILL PIPES WITH LOOSE UNCOMPACTED SAND BEFORE CONSTRUCTING END BENT CAPS.

DO NOT PLACE LEVELING PAD CONCRETE, AGGREGATE OR REINFORCEMENT FOR RETAINING WALL NO. 3 AND WALL NO. 4 UNTIL EXCAVATION DIMENSIONS AND FOUNDATION MATERIAL ARE APPROVED.

GEOTECHNICAL ENGINEER  SEAL 033500 ENGINEER MUHAMMAD SHAFIQ REHMAN	ENGINEER
DocuSigned by: Muhammad Shafiq Rehman 8/28/2018 ACC34G703898868URE	SIGNATURE DATE
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**PRECAST PANELS
LEVELING PAD STEP DETAIL**

PROJECT NO.: R-1015
 CRAVEN COUNTY
 STATION: 516+87.37 -L- / 69+02.79 -RP2AC-
 SHEET 9 OF 11

**RETAINING WALL NO. 3 & 4
NOTES & LEVELING PAD
STEP DETAIL**

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

PREPARED BY: C.R. PASTRANA	DATE: 8/2018
REVIEWED BY: M.S. RAHMAN	DATE: 8/2018



ESP ASSOCIATES, INC.
 7011 ALBERT PICK RD
 SUITE E
 GREENSBORO, NC 27409
 FIRM # C-0587
 WWW.ESPASSOCIATES.COM



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

**GEOTECHNICAL
ENGINEERING UNIT**

GEOTECHNICAL ENGINEER

ENGINEER

SEAL 033500

ENGINEER

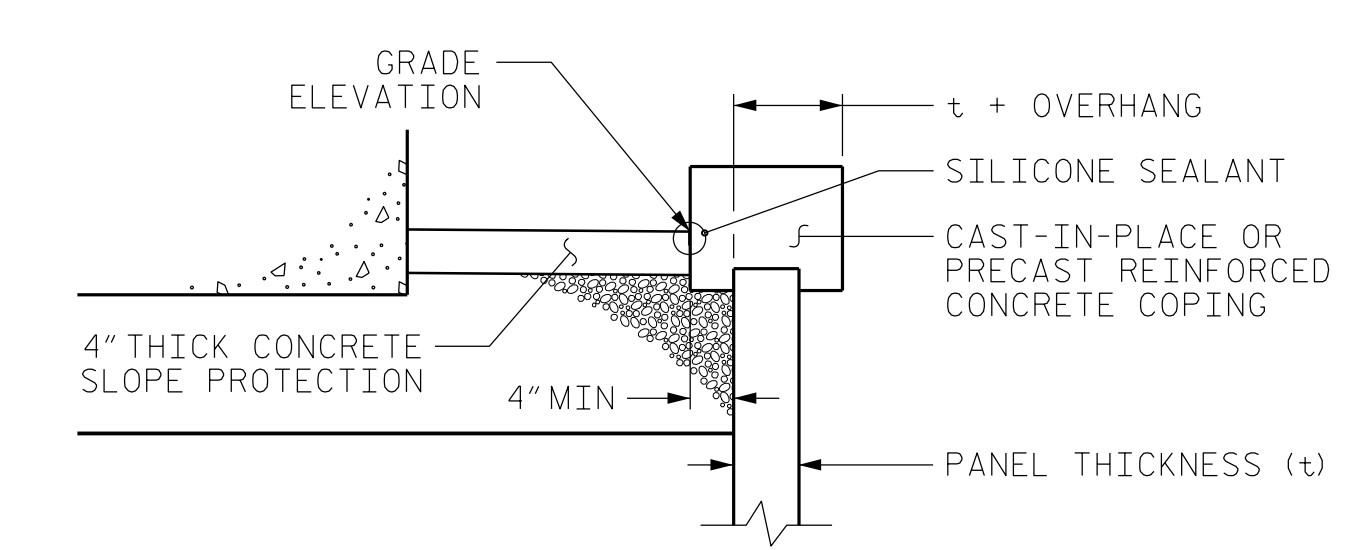
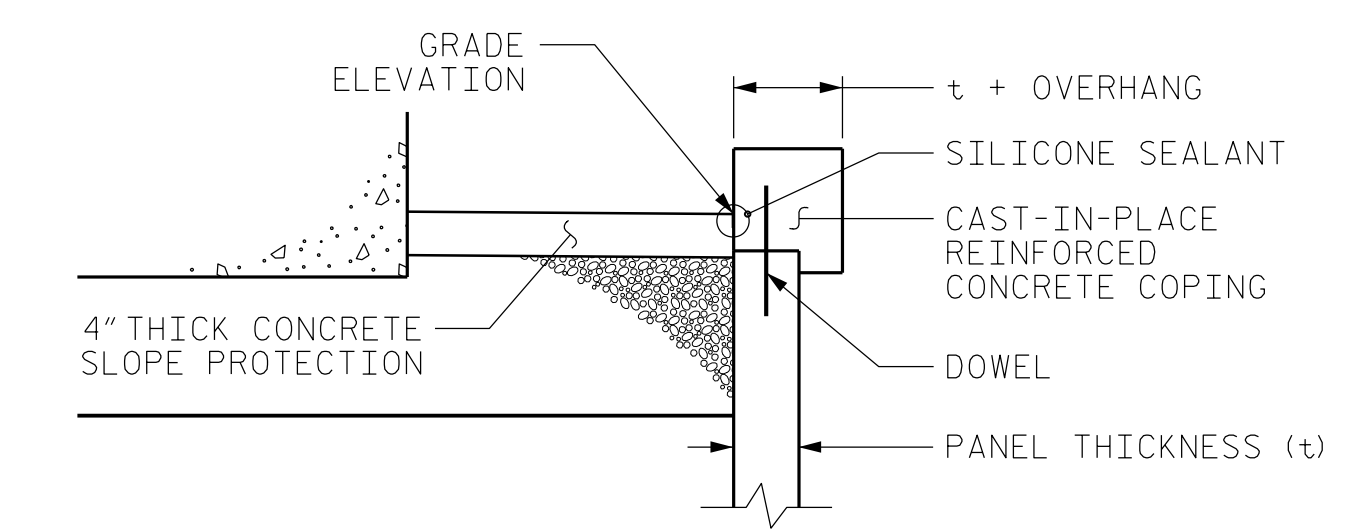
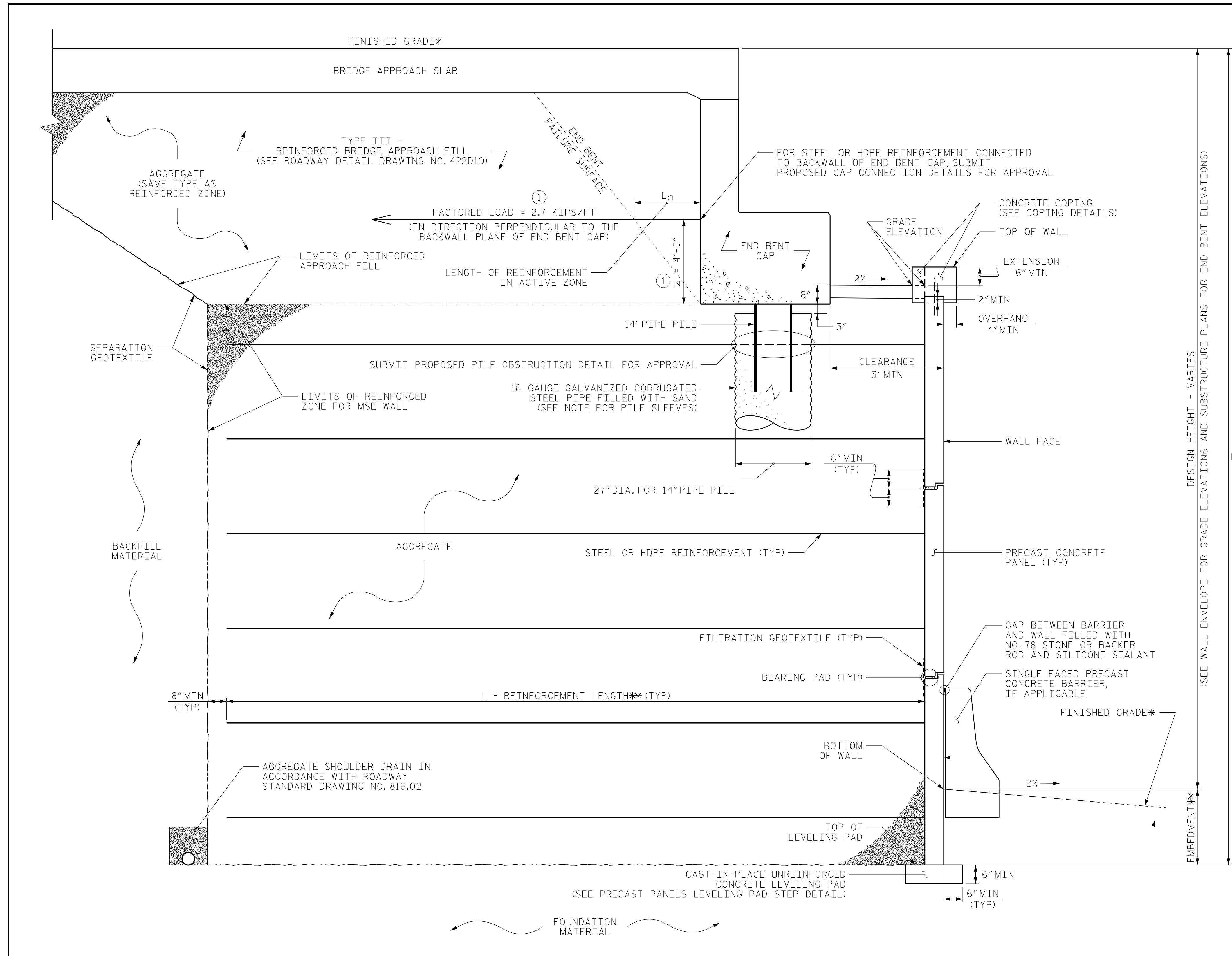
MUHAMMAD SHAFIQUR RAHMAN

DocuSigned by: Muhammad Shafiq Rahman 9/13/2018

DATE: 9/13/2018

SIGNATURE: _____ DATE: _____

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COPING DETAILS

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

MSE ABUTMENT 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 EMBEDMENT AND REINFORCEMENT LENGTH REQUIREMENTS.

PROJECT NO.: R-1015

CRAVEN COUNTY

STATION: 516+87.37 -L- / 69+02.79 -RP2AC-

SHEET 10 OF 11

PREPARED BY: C.R. PASTRANA	DATE: 8/2018
REVIEWED BY: M.S. RAHMAN	DATE: 8/2018

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RETAINING WALL NO. 3 & 4 TYPICAL & COPING DETAILS

REVISIONS					
NO.	BY	DATE	NO.	BY	DATE
1	M.S. RAHMAN	9/2018	3		
2			4		

SHEET NO. W-10

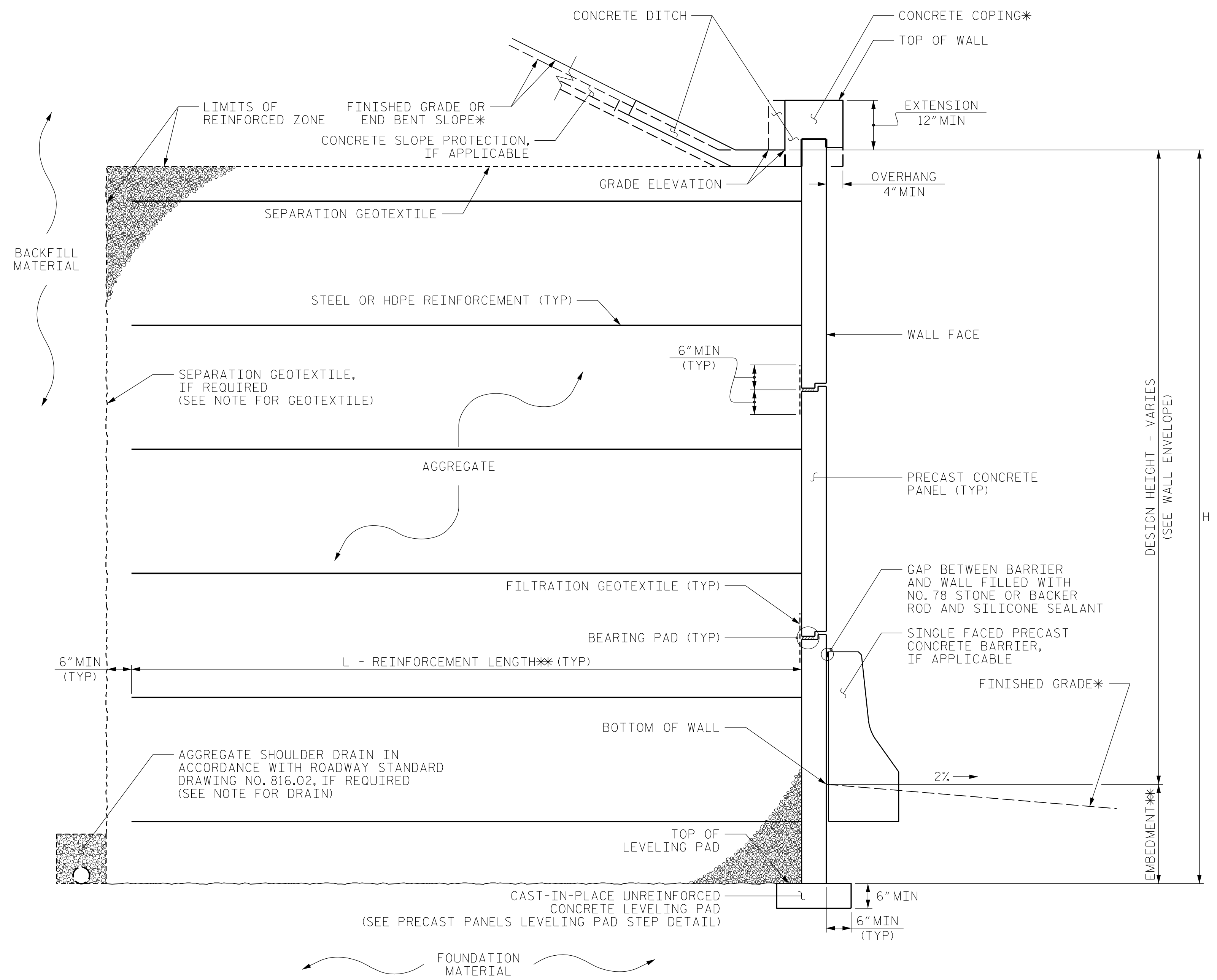
GEOTECHNICAL ENGINEER

ENGINEER

DocuSigned by:
Muhammad Shafiq Rehman / 28/2018

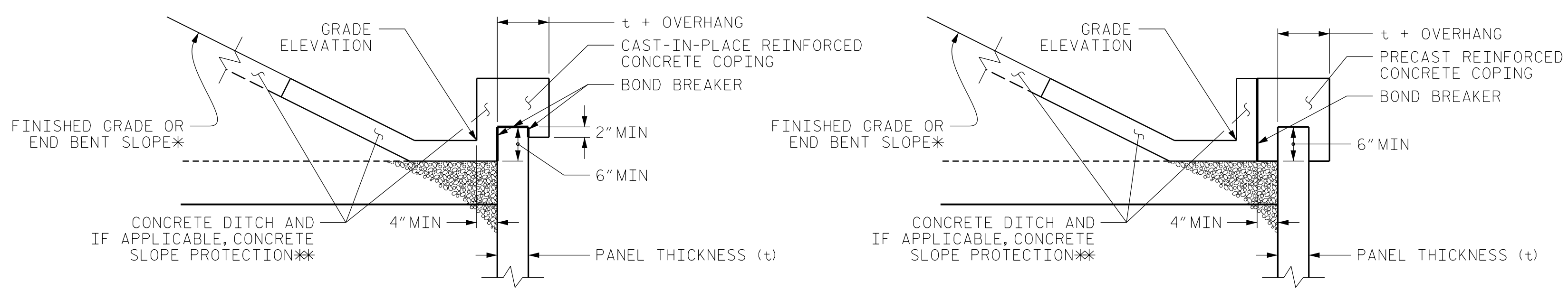
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MSE WALL WITH PRECAST PANELS - TYPICAL SECTION

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



COPING DETAILS

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

PROJECT NO.: R-1015
 CRAVEN COUNTY
 STATION: 516+87.37 -L- / 69+02.79 -RP2AC-
 SHEET 11 OF 11

PREPARED BY: C.R. PASTRANA DATE: 8/2018
 REVIEWED BY: M.S. RAHMAN DATE: 8/2018

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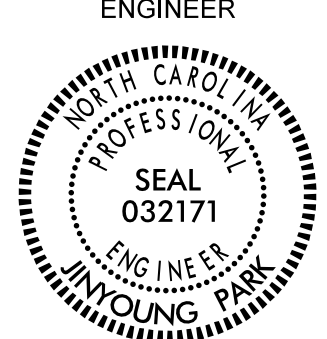
**NORTH CAROLINA
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 DIVISION OF HIGHWAYS**

**GEOTECHNICAL
 ENGINEERING UNIT**

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

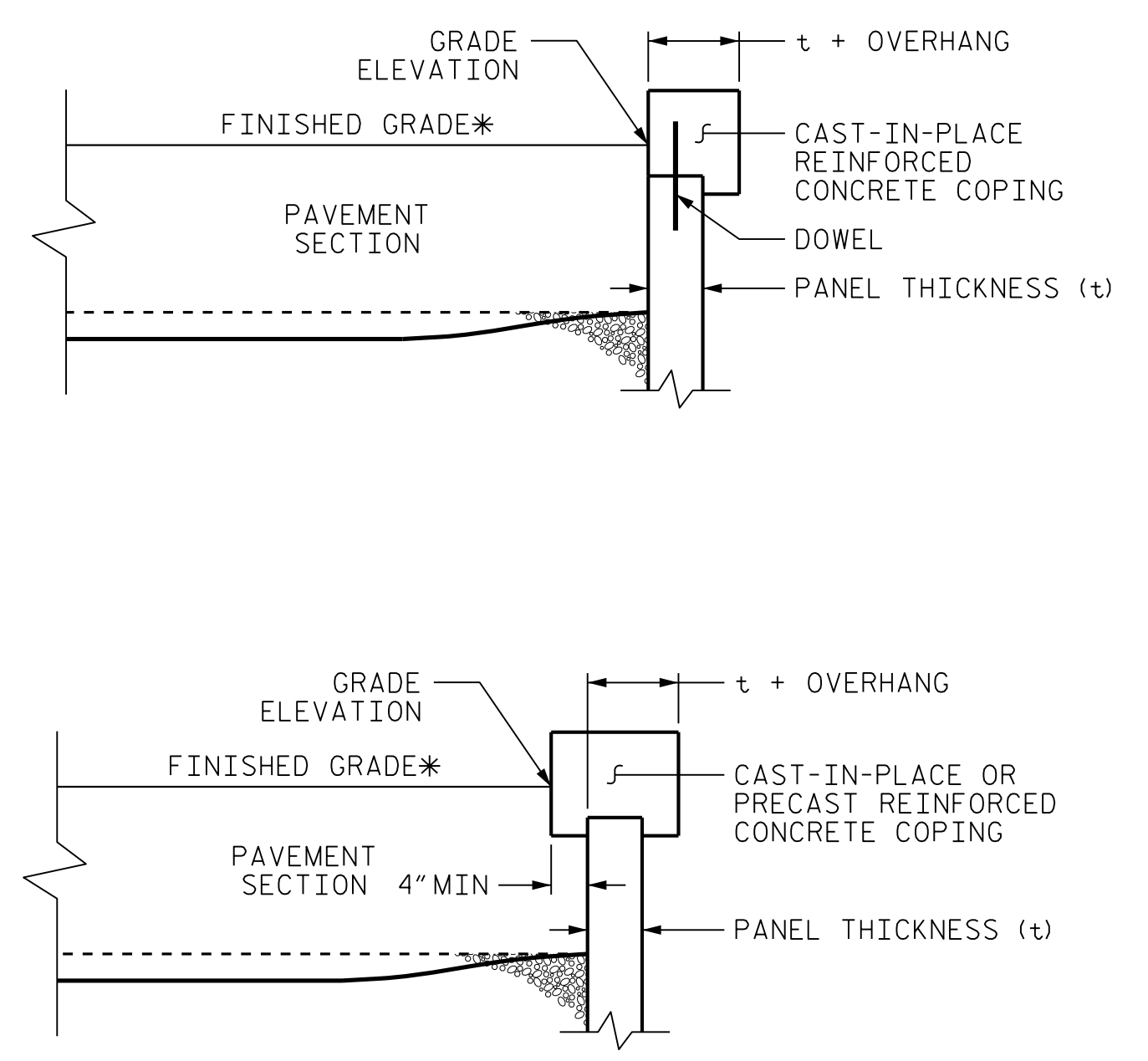
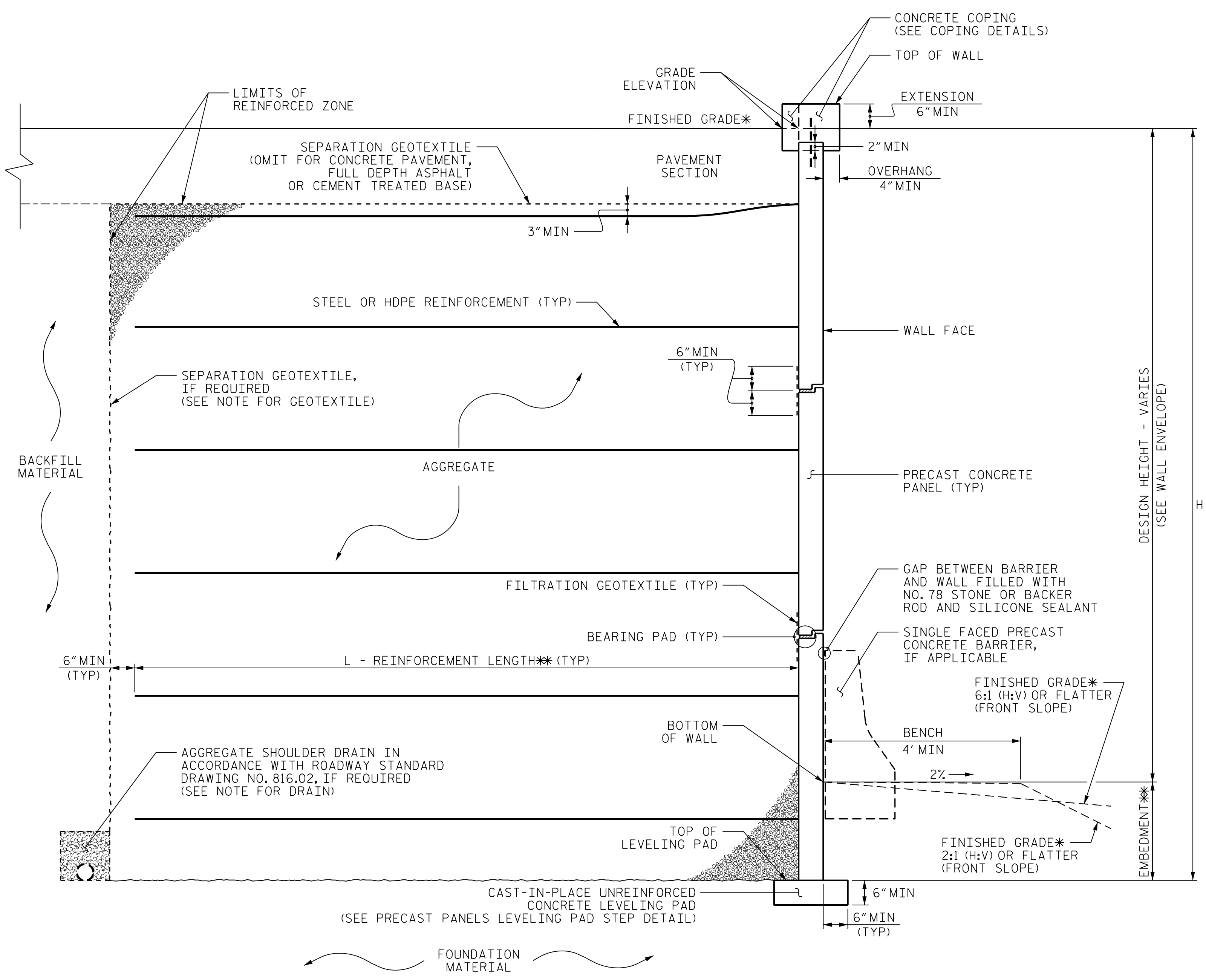
GEOTECHNICAL ENGINEER

ENGINEER



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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.

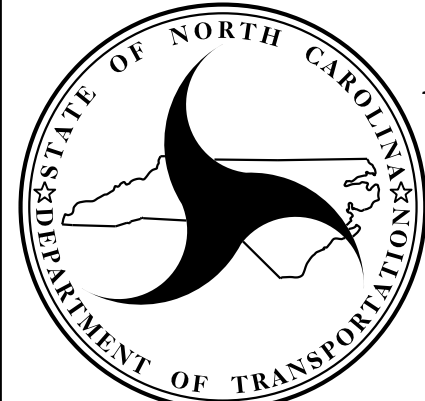
MSE WALL WITH PRECAST PANELS - TYPICAL SECTION

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

FROM -WALL-1- STA. 13+70.32 TO -WALL-1- STA. 14+54.32, FROM -WALL-2- STA. 12+70.37 TO -WALL-2- STA. 13+35.38,
FROM -WALL-3- STA. 13+16.68 TO -WALL-3- STA. 13+83.68 AND FROM -WALL-4- STA. 12+73.79 TO -WALL-4- STA. 13+55.79

PROJECT NO.: R-1015
 CRAVEN COUNTY
 STATION: 96+97.07 -L / 516+87.37 -L-
 SHEET OF

PREPARED BY: J. PARK DATE: 5/21/2019
 REVIEWED BY: J. BATTS DATE: 5/21/2019



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

**GEOTECHNICAL
 ENGINEERING UNIT**

REVISIONS						SHEET NO. W-12
NO.	BY	DATE	NO.	BY	DATE	
1			3			
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GEOTECHNICAL ENGINEER

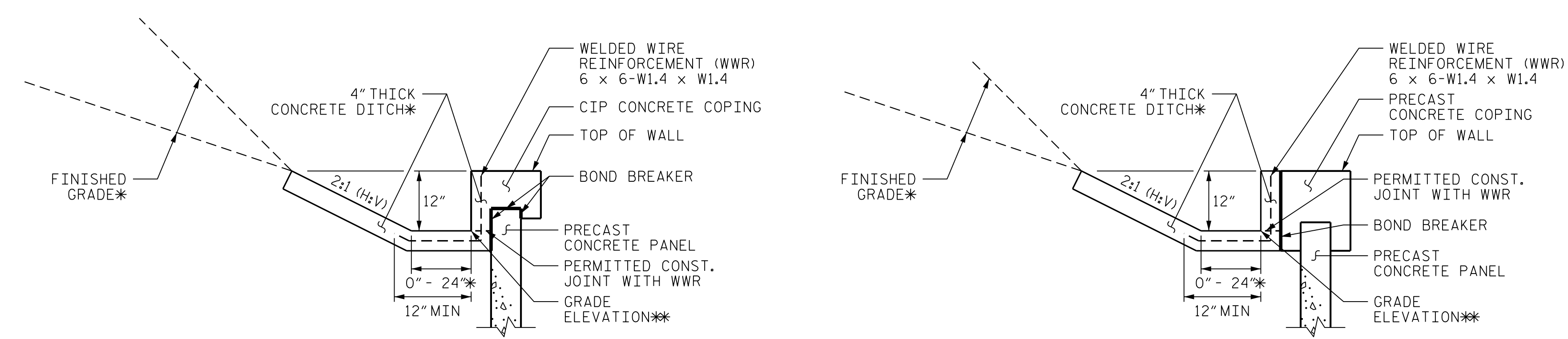
DocSigned by: *J. Young Park* 5/21/2019

DATE

ENGINEER

DATE

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**CONCRETE DITCH BEHIND
WALL WITH CONCRETE COPING**

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

NOTES

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

INSTALL CONCRETE DITCHES FROM -WALL_1- STA. 10+00.00 TO -WALL_1- STA. 11+98.56, FROM -WALL_2- STA. 10+00.00 TO -WALL_2- STA. 11+09.87, FROM -WALL_3- STA. 10+00.00 TO -WALL_3- STA. 11+50.33 AND FROM -WALL_4- STA. 10+00.00 TO -WALL_4- STA. 11+03.00.

PROJECT NO.: R-1015
 CRAVEN COUNTY
 STATION: 96+97.07 -L- / 516+87.37 -L-
 SHEET OF

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

**GEOTECHNICAL
 ENGINEERING UNIT**

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

PREPARED BY: J. PARK	DATE: 5/21/2019
REVIEWED BY: J. BATTS	DATE: 5/21/2019

SHEET NO. W-13