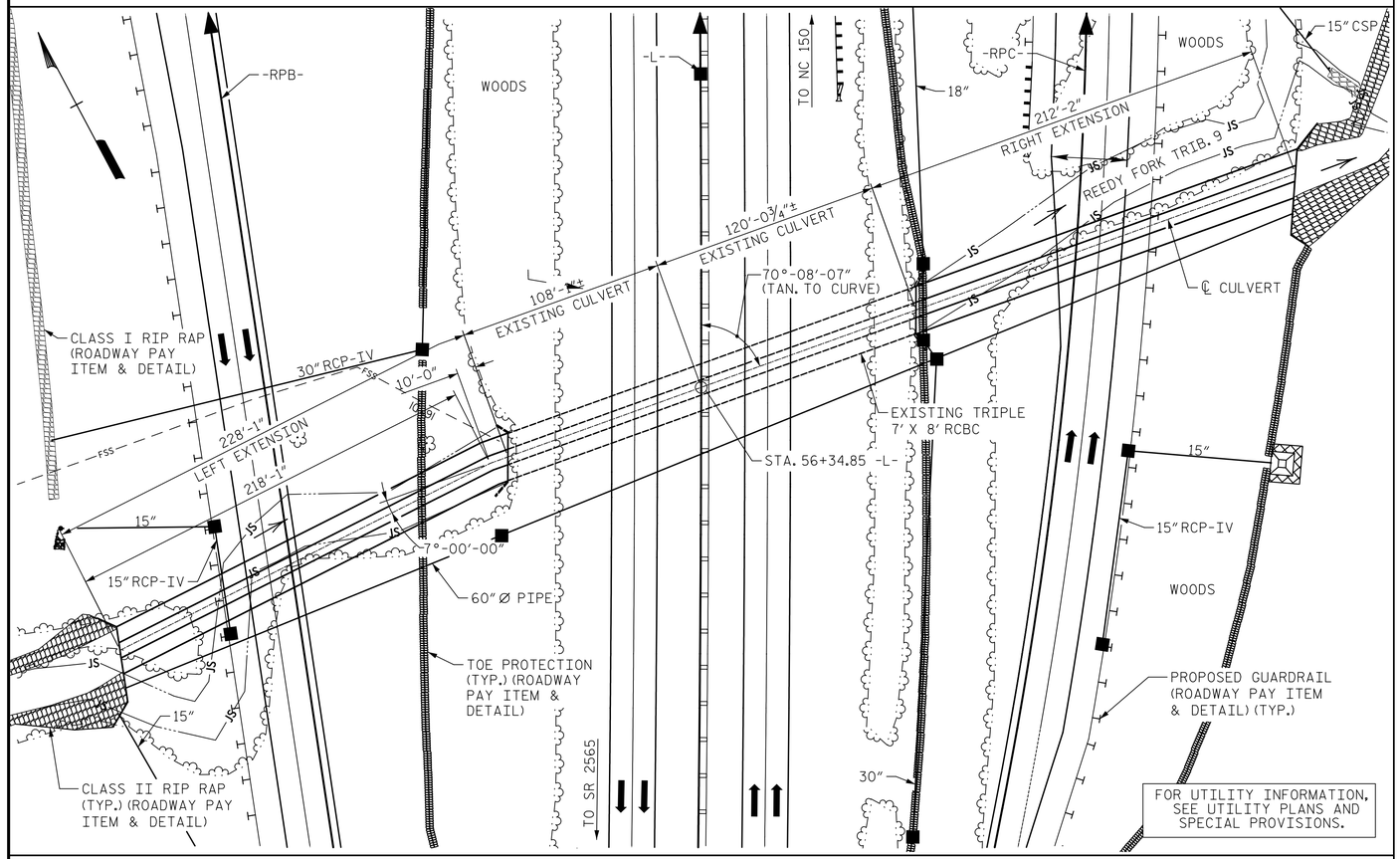
BM #3: R/R SPIKE IN 32"Ø GUM TREE, 162.15' RT OF STA. 48+52.28 -L-, EL. 747.31



LOCATION SKETCH

HYDRAULIC DATA

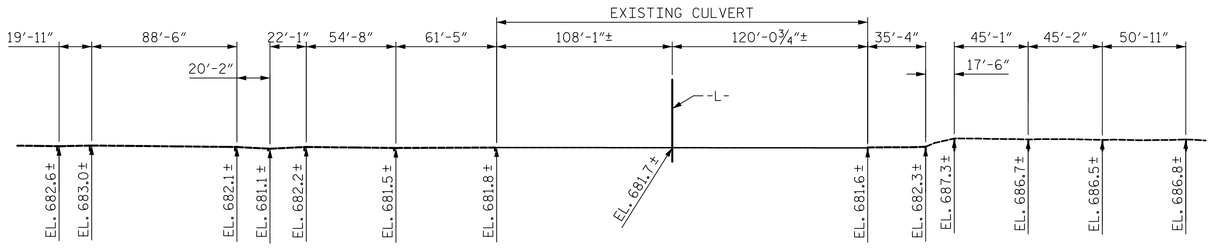
DESIGN DISCHARGE	= 1,700 C.F.S.
FREQUENCY OF DESIGN FLOOD	= 50 YRS.
DESIGN HIGH WATER ELEVATION	= 691.4'
DRAINAGE AREA	= 3.16 SQ. MI.
BASE DISCHARGE (Q100)	= 2,100 C.F.S.
BASE HIGH WATER ELEVATION	= 695.1

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE	= 3,870 C.F.S.
FREQUENCY OF OVERTOPPING FLOOD	= 500+ YRS.
OVERTOPPING FLOOD ELEVATION	= 720.2'

ROADWAY DATA

G.P. ELEV. @ STA. 56+34.85 -L- (-L- SB) = 719.37
BED ELEV. @ STA. 56+34.85 -L- = 681.7
ROADWAY FILL SLOPES= 2:1



PROFILE ALONG ℄ CULVERT

DRAWN BY : J.S. HOBSON DATE : 04/12/19
CHECKED BY : J.A. LEE DATE : 04/24/19
DESIGN ENGINEER OF RECORD : J.S. HOBSON DATE : 04/26/19

NOTES

ASSUMED LIVE LOAD ---------- HL-93 OR ALTERNATE LOADING.

MAX. DESIGN FILL (RIGHT EXTENSION) ------- 36.90 FT.

MAX. DESIGN FILL (LEFT EXTENSION) -------- 30.22 FT.

FOR OTHER DESIGN DATA AND NOTES SEE STANDARD NOTE SHEET.

3"Ø WEEP HOLES INDICATED TO BE IN ACCORDANCE WITH THE SPECIFICATIONS.

CONCRETE IN CULVERT EXTENSIONS TO BE POURED IN THE FOLLOWING ORDER:

PHASE I:

1. WING FOOTINGS AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS.
2. THE REMAINING PORTIONS OF PHASE I WALLS.

PHASE II:

3. FLOOR SLAB INCLUDING 4" OF VERTICAL WALL.
4. THE REMAINING PORTION OF PHASE II WALL FULL HEIGHT FOLLOWED BY ROOF SLAB AND HEADWALL.

CONCRETE IN 60"Ø PIPE WINGS, FOOTINGS, AND HEADWALL SHALL BE POURED IN THE FOLLOWING ORDER:

1. WINGS AND HEADWALL FOOTING UP TO CONSTRUCTION JOINT.
2. REMAINING PORTION OF WINGS AND HEADWALL FULL HEIGHT.

THE RESIDENT ENGINEER SHALL CHECK THE LENGTH OF CULVERT BEFORE STAKING IT OUT TO MAKE CERTAIN THAT IT WILL PROPERLY TAKE CARE OF THE FILL.

DIMENSIONS FOR WING LAYOUT AS WELL AS ADDITIONAL REINFORCING STEEL EMBEDDED IN BARREL ARE SHOWN ON WING SHEET.

DOWELS SHALL BE USED TO CONNECT THE CULVERT EXTENSION TO THE EXISTING CULVERT AS SHOWN. FOR NOTE REGARDING SETTING OF DOWELS, SEE SHEET SN.

IF APPROVED BY THE ENGINEER, THE CONTRACTOR MAY USE THE EXISTING WINGS AS TEMPORARY SHORING FOR THE CONSTRUCTION OF THE CULVERT EXTENSIONS. IN THIS CASE, THE BOTTOM SLAB OF THE EXTENSION SHALL BE POURED AT LEAST 72 HOURS PRIOR TO CUTTING THE WINGS. THE WINGS MAY BE CUT EARLIER PROVIDED THE SLAB CONCRETE STRENGTH HAS REACHED A MINIMUM COMPRESSIVE STRENGTH OF 1500 PSI.

NO PRECAST REINFORCED BOX CULVERT OPTION WILL BE ALLOWED.

FOR CULVERT DIVERSION DETAILS AND PAY ITEMS, SEE EROSION CONTROL PLANS.

FOR EPOXY RESIN INJECTION, SEE SPECIAL PROVISIONS.

FOR SHOTCRETE REPAIRS, SEE SPECIAL PROVISIONS.

FOR CONCRETE REPAIRS, SEE SPECIAL PROVISIONS.

TRANSVERSE CONSTRUCTION JOINTS SHALL BE USED IN THE BARREL, SPACED TO LIMIT THE POURS TO A MAXIMUM OF 70 FT. LOCATION OF JOINTS SHALL BE SUBJECT TO APPROVAL OF THE ENGINEER.

A 3 FOOT STRIP OF FILTER FABRIC SHALL BE ATTACHED TO THE FILL FACE OF THE WING COVERING THE ENTIRE LENGTH OF THE EXPANSION JOINT.

AT THE CONTRACTOR'S OPTION, HE MAY SPLICE THE VERTICAL REINFORCING STEEL IN THE INTERIOR FACE OF EXTERIOR WALLS AND BOTH FACES OF INTERIOR WALLS ABOVE LOWER WALL CONSTRUCTION JOINT. THE SPLICE LENGTH SHALL BE AS PROVIDED IN THE SPLICE LENGTH CHART SHOWN ON THE PLANS. EXTRA WEIGHT OF STEEL DUE TO THE SPLICES SHALL BE PAID FOR BY THE CONTRACTOR.

EXCAVATE A MINIMUM OF 1 FOOT BELOW CULVERT BEARING ELEVATION AND REPLACE WITH FOUNDATION CONDITIONING MATERIAL PER SECTION 414 OF THE STANDARD SPECIFICATIONS.

UNDERCUT ANY SOFT/LOOSE ALLUVIAL SOILS THAT MAY BE ENCOUNTERED BENEATH THE BOTTOM OF THE FOUNDATION CONDITIONING MATERIAL. BACKFILL UNDERCUT AREAS WITH FOUNDATION CONDITIONING MATERIAL (SELECT MATERIAL CLASS VI; NO. 57 STONE). INCLUDE 200 CUBIC YARDS OF UNDERCUT AND 300 TONS OF FOUNDATION CONDITIONING MATERIAL AS CONTINGENCY ITEMS IN THE CONTRACT FOR LEFT CULVERT EXTENSION AND 185 CUBIC YARDS OF UNDERCUT AND 275 TONS OF FOUNDATION CONDITIONING MATERIAL FOR RIGHT CULVERT EXTENSION. THE COST OF THE CONTINGENCY QUANTITY OF FOUNDATION CONDITIONING MATERIAL SHALL BE PAID FOR AT THE CONTRACT UNIT BID PRICE. THE COST OF THE CONTINGENCY UNDERCUT SHALL BE CONSIDERED INCIDENTAL TO THE CULVERT EXCAVATION LUMP SUM.

INSTALL TYPE V GEOTEXTILE AT THE BOTTOM OF EXCAVATION PRIOR TO PLACING FOUNDATION CONDITIONING MATERIAL. THE GEOTEXTILE SHOULD BE PLACED AT THE BOTTOM OF THE EXCAVATION AND WRAPPED UP THE SIDE WALLS OF THE EXCAVATION. INCLUDE 1,200 SQ. YDS. OF TYPE V GEOTEXTILE IN THE CONTRACT FOR LEFT CULVERT EXTENSION AND 1,100 SQ. YDS FOR RIGHT CULVERT EXTENSION. THE COST OF TYPE V GEOTEXTILE SHALL BE CONSIDERED INCIDENTAL TO FOUNDATION CONDITIONING MATERIAL.

FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.

FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.

FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.

FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.

I HEREBY CERTIFY THESE PLANS ARE THE AS-BUILT PLANS

TOTAL STRUCTURE QUANTITIES

CULVERT EXCAVATION	LUMP SUM	
FOUNDATION COND. MAT'L		
LEFT EXTENSION	451	TONS
RIGHT EXTENSION	419	TONS
TOTAL	870	TONS
CLASS A CONCRETE		
LEFT EXTENSION	853.2	C.Y.
RIGHT EXTENSION	877.9	C.Y.
TOTAL	1,731.1	C.Y.
REINFORCING STEEL		
LEFT EXTENSION	102,286	LBS.
RIGHT EXTENSION	96,215	LBS.
TOTAL	198,501	LBS.
CONCRETE REPAIRS	1.2	CU. FT.
SHOTCRETE REPAIRS	11.5	CU. FT.
EPOXY RESIN INJECTION	420.0	LIN. FT.

Mead &Hunt
111 E. Hargett Street
Suite 300
Raleigh, NC 27601
919-714-8670
meadhunt.com
NC License No. F-1235

NORTH CAROLINA PROFESSIONAL SEAL 043177 ENGINEER JOHN S. HOBSON

DocuSigned by: Jack Hobson 5B6E7C2B670044B... 5/07/2021

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PROJECT NO. R-4707
GUILFORD COUNTY
STATION: 56+34.85 -L-

EXTENDS CULVERT NO. 355

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

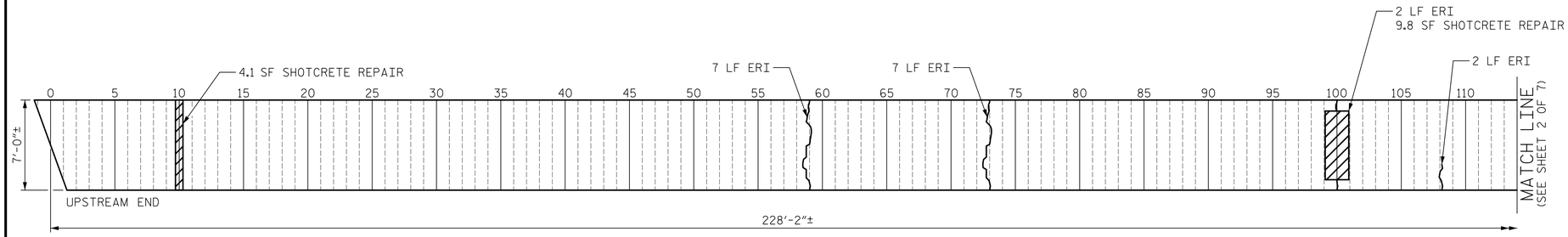
TRIPLE 7 FT. x 8 FT. CONCRETE BOX CULVERT LEFT EXTENSION AND RIGHT EXTENSION WITH 60"Ø PIPE

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C1-01
1			3			TOTAL SHEETS
2			4			24

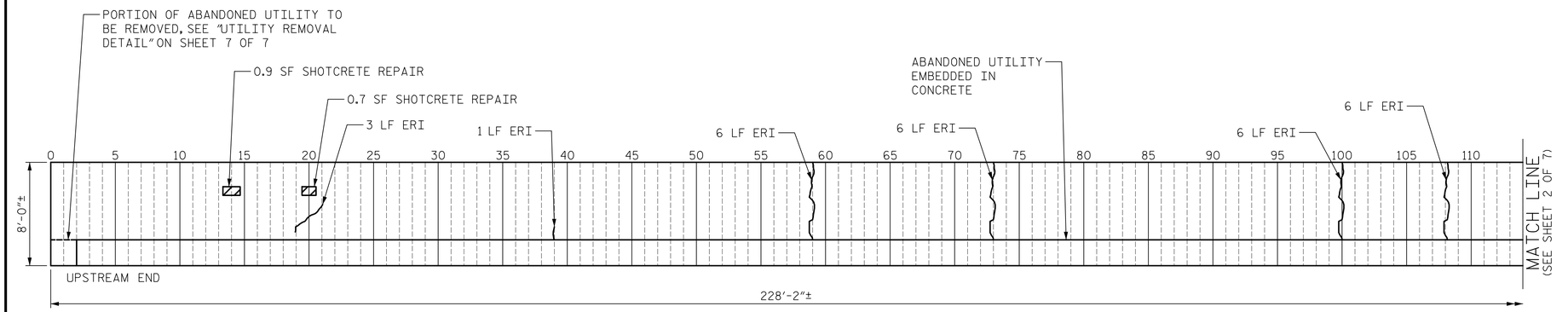
= SHOTCRETE REPAIR AREA

= CONCRETE REPAIR AREA

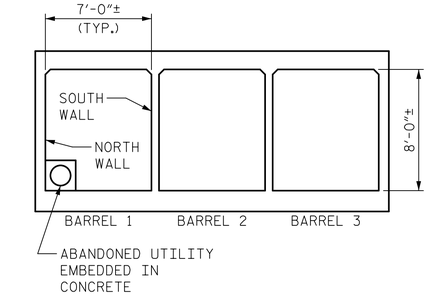
= EPOXY RESIN INJECTION (ERI)



LOOKING UP AT TOP SLAB

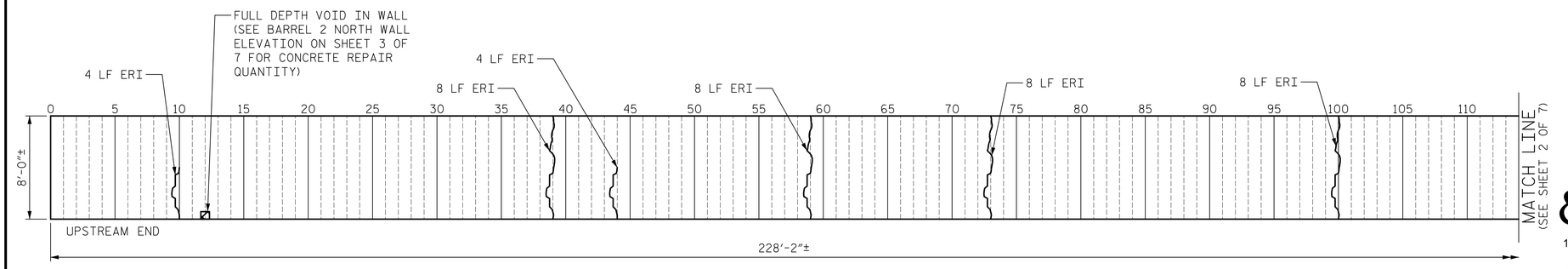


NORTH WALL ELEVATION



EXISTING CULVERT SECTION

(LOOKING DOWNSTREAM)



SOUTH WALL ELEVATION

Mead &Hunt
111 E. Hargett Street
Suite 300
Raleigh, NC 27601
919-714-8670
meadhunt.com
NC License No. F-1235

NORTH CAROLINA PROFESSIONAL SEAL 043177 ENGINEER JOHN S. HOBSON

DocuSigned by: Jack Hobson 5B6E7C2B67004B... 4/16/2020

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PROJECT NO. R-4707

GUILFORD COUNTY

STATION: 56+34.85 -L-

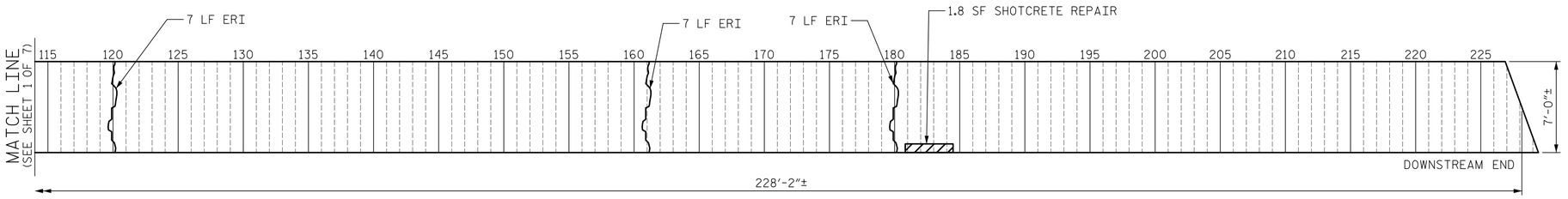
SHEET 1 OF 7

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

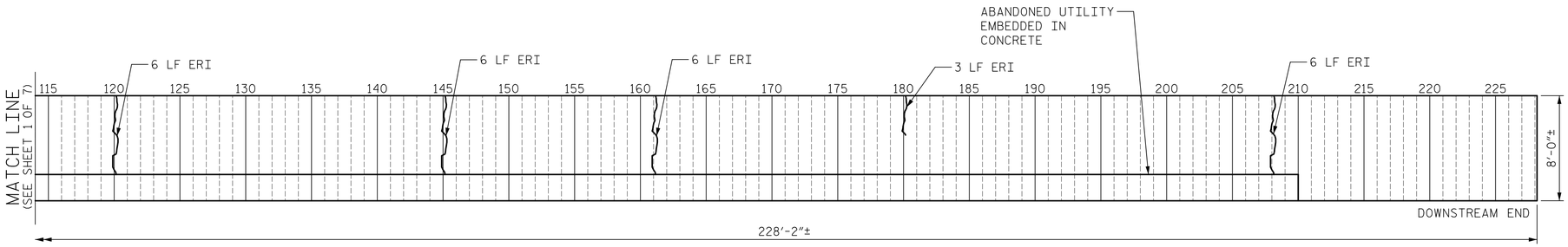
BARREL 1 WALLS AND TOP SLAB REPAIRS

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C1-02
1			3			TOTAL SHEETS
2			4			24

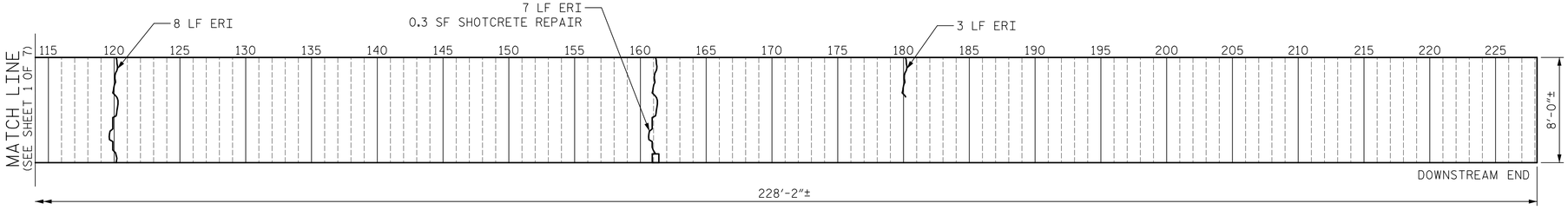
DRAWN BY : A.J. FORFA DATE : 03/06/19
CHECKED BY : J.S. HOBSON DATE : 04/17/19
DESIGN ENGINEER OF RECORD : J.S. HOBSON DATE : 04/26/19



LOOKING UP AT TOP SLAB



NORTH WALL ELEVATION



SOUTH WALL ELEVATION

AS-BUILT REPAIR QUANTITY TABLE

	QUANTITIES			
	ESTIMATE		ACTUAL	
SHOTCRETE REPAIRS	AREA SQ. FT.	VOLUME CU. FT.	AREA SQ. FT.	VOLUME CU. FT.
BARREL 1	17.6	4.1		
CONCRETE REPAIRS	AREA SQ. FT.	VOLUME CU. FT.	AREA SQ. FT.	VOLUME CU. FT.
BARREL 1	5.9	1.0		
EPOXY RESIN INJECTION		LIN. FT.		LIN. FT.
BARREL 1		152.0		

NOTES:

VALUES IN CHART REPRESENT ESTIMATED REPAIR TOTALS AFTER REMOVAL OF UNSOUND CONCRETE, MINIMUM OF 1" BEHIND REBAR AND MINIMUM 2" CLEARANCE TO SAWCUT. FOR REPAIR DETAILS, SEE "CULVERT REPAIR DETAILS" SHEET.

REPAIR LOCATIONS AND ESTIMATE OF QUANTITIES ARE BASED ON THE BEST INFORMATION AVAILABLE. IF ADDITIONAL REPAIRS NOT SHOWN ON THE DRAWINGS ARE DEEMED NECESSARY BY THE ENGINEER, THE ENGINEER WILL NOTE ON THE DRAWINGS THE APPROXIMATE LOCATION AND DESCRIPTION OF THE REPAIRS AND ENTER THE ACTUAL QUANTITIES INTO THE AS-BUILT REPAIR QUANTITY TABLE.

CONCRETE REPAIRS MAY BE SUBSTITUTED IN LIEU OF SHOTCRETE REPAIRS WITH THE APPROVAL OF THE ENGINEER.

= SHOTCRETE REPAIR AREA

= CONCRETE REPAIR AREA

= EPOXY RESIN INJECTION (ERI)

DRAWN BY : A.J. FORFA DATE : 03/06/19
CHECKED BY : J.S. HOBSON DATE : 04/17/19
DESIGN ENGINEER OF RECORD : J.S. HOBSON DATE : 04/26/19

Mead & Hunt
111 E. Hargett Street
Suite 300
Raleigh, NC 27601
919-714-8670
meadhunt.com
NC License No. F-1235

NORTH CAROLINA PROFESSIONAL SEAL 043177 ENGINEER JOHN S. HOBSON

DocuSigned by: Jack Hobson 5B6E7C2B6700448... 4/16/2020

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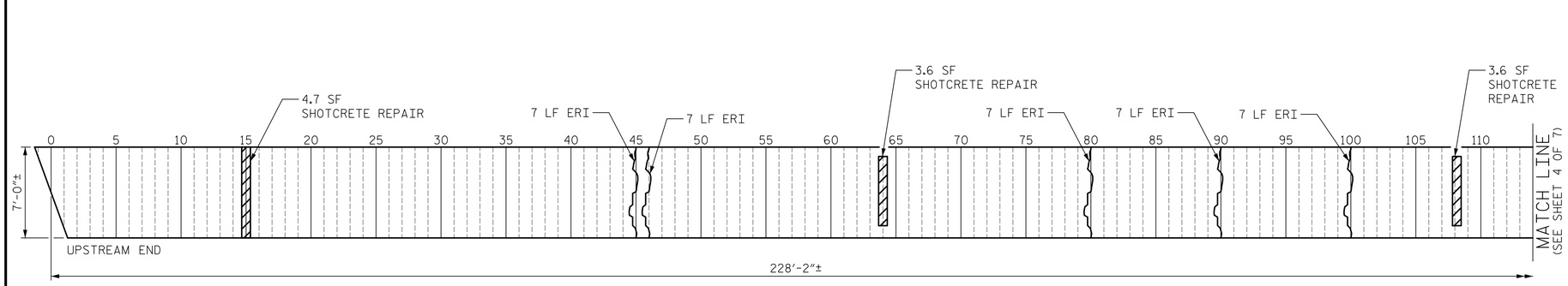
PROJECT NO. R-4707
GUILFORD COUNTY
STATION: 56+34.85 -L-

SHEET 2 OF 7

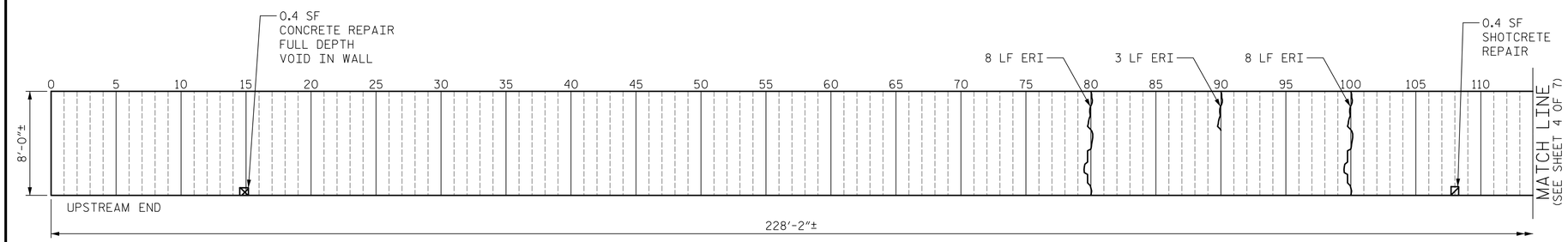
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

BARREL 1 WALLS AND TOP SLAB REPAIRS

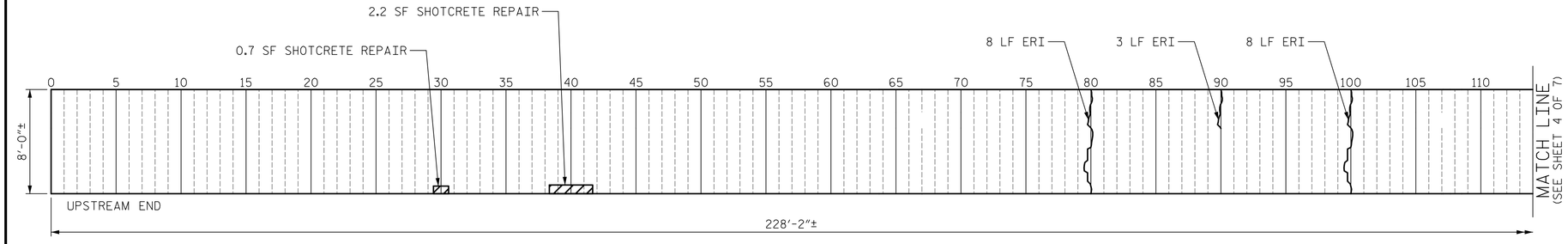
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C1-03
1			3			TOTAL SHEETS
2			4			24



LOOKING UP AT TOP SLAB



NORTH WALL ELEVATION

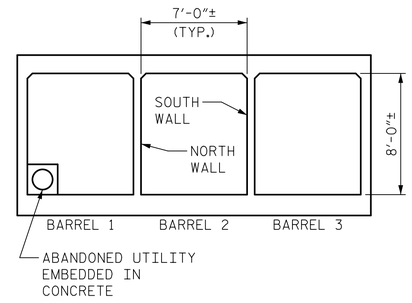


SOUTH WALL ELEVATION

= SHOTCRETE REPAIR AREA

= CONCRETE REPAIR AREA

= EPOXY RESIN INJECTION (ERI)



EXISTING CULVERT SECTION

(LOOKING DOWNSTREAM)

Mead &Hunt
111 E. Hargett Street
Suite 300
Raleigh, NC 27601
919-714-8670
meadhunt.com
NC License No. F-1235

NORTH CAROLINA PROFESSIONAL SEAL 043177 ENGINEER JOHN S. HOBSON

DocuSigned by: Jack Hobson 5B6E7C2B67004B... 4/16/2020

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PROJECT NO. R-4707

GUILFORD COUNTY

STATION: 56+34.85 -L-

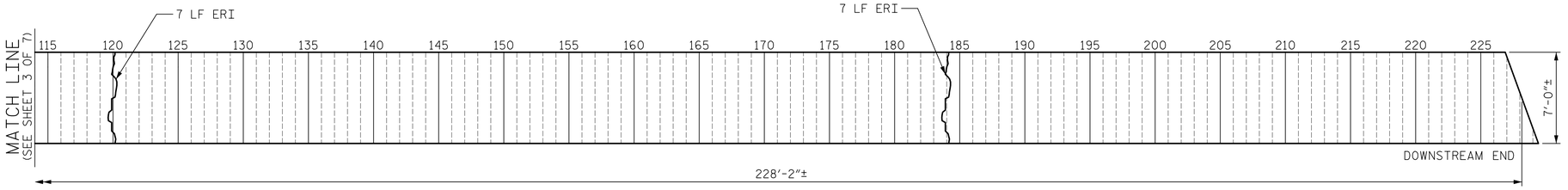
SHEET 3 OF 7

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

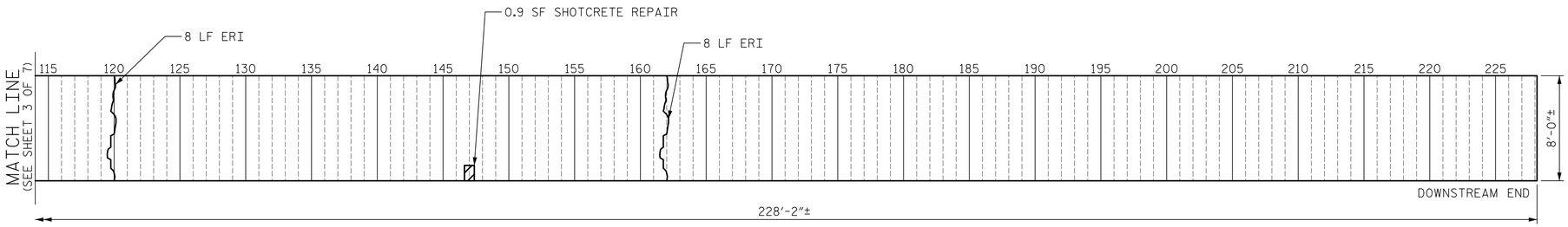
BARREL 2 WALLS AND TOP SLAB REPAIRS

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C1-04
1			3			TOTAL SHEETS
2			4			24

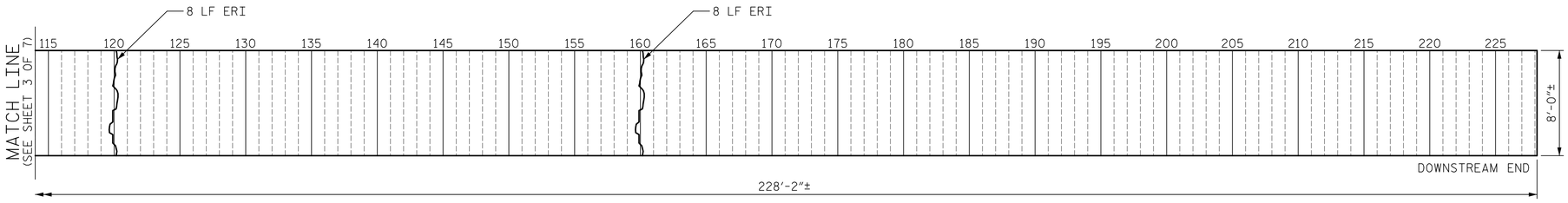
DRAWN BY : A.J. FORFA DATE : 03/05/19
CHECKED BY : J.S. HOBSON DATE : 04/17/19
DESIGN ENGINEER OF RECORD : J.S. HOBSON DATE : 04/26/19



LOOKING UP AT TOP SLAB



NORTH WALL ELEVATION



SOUTH WALL ELEVATION

AS-BUILT REPAIR QUANTITY TABLE

	QUANTITIES			
	ESTIMATE		ACTUAL	
SHOTCRETE REPAIRS	AREA SQ. FT.	VOLUME CU. FT.	AREA SQ. FT.	VOLUME CU. FT.
BARREL 2	15.9	4.1		
CONCRETE REPAIRS	AREA SQ. FT.	VOLUME CU. FT.	AREA SQ. FT.	VOLUME CU. FT.
BARREL 2	0.4	0.2		
EPOXY RESIN INJECTION		LIN. FT.		LIN. FT.
BARREL 2		119.0		

NOTES:

VALUES IN CHART REPRESENT ESTIMATED REPAIR TOTALS AFTER REMOVAL OF UNSOUND CONCRETE, MINIMUM OF 1" BEHIND REBAR AND MINIMUM 2" CLEARANCE TO SAWCUT. FOR REPAIR DETAILS, SEE "CULVERT REPAIR DETAILS" SHEET.

REPAIR LOCATIONS AND ESTIMATE OF QUANTITIES ARE BASED ON THE BEST INFORMATION AVAILABLE. IF ADDITIONAL REPAIRS NOT SHOWN ON THE DRAWINGS ARE DEEMED NECESSARY BY THE ENGINEER, THE ENGINEER WILL NOTE ON THE DRAWINGS THE APPROXIMATE LOCATION AND DESCRIPTION OF THE REPAIRS AND ENTER THE ACTUAL QUANTITIES INTO THE AS-BUILT REPAIR QUANTITY TABLE.

CONCRETE REPAIRS MAY BE SUBSTITUTED IN LIEU OF SHOTCRETE REPAIRS WITH THE APPROVAL OF THE ENGINEER.

= SHOTCRETE REPAIR AREA

= CONCRETE REPAIR AREA

= EPOXY RESIN INJECTION (ERI)

DRAWN BY : A.J. FORFA DATE : 03/06/19
CHECKED BY : J.S. HOBSON DATE : 04/17/19
DESIGN ENGINEER OF RECORD : J.S. HOBSON DATE : 04/26/19

Mead & Hunt
111 E. Hargett Street
Suite 300
Raleigh, NC 27601
919-714-8670
meadhunt.com
NC License No. F-1235

NORTH CAROLINA PROFESSIONAL SEAL 043177 ENGINEER JOHN S. HOBSON

DocuSigned by: Jack Hobson 5B6E7C2B6700448... 4/16/2020

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PROJECT NO. R-4707
GUILFORD COUNTY
STATION: 56+34.85 -L-

SHEET 4 OF 7

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

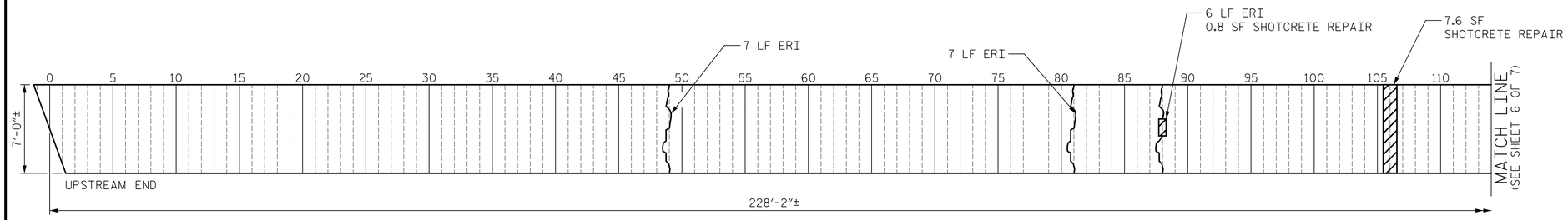
BARREL 2 WALLS AND TOP SLAB REPAIRS

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C1-05
1			3			TOTAL SHEETS
2			4			24

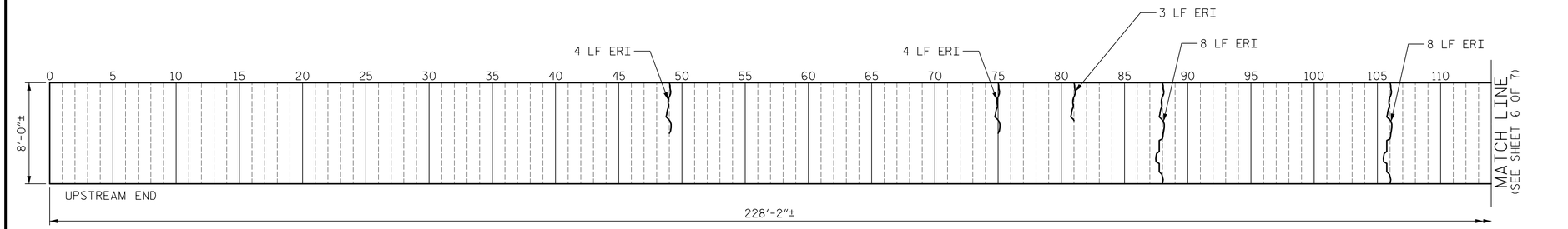
= SHOTCRETE REPAIR AREA

= CONCRETE REPAIR AREA

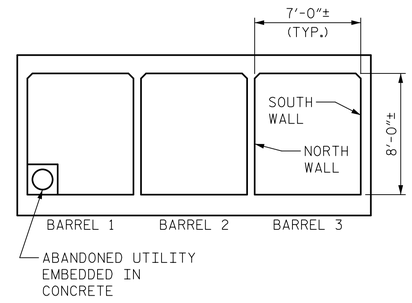
= EPOXY RESIN INJECTION (ERI)



LOOKING UP AT TOP SLAB

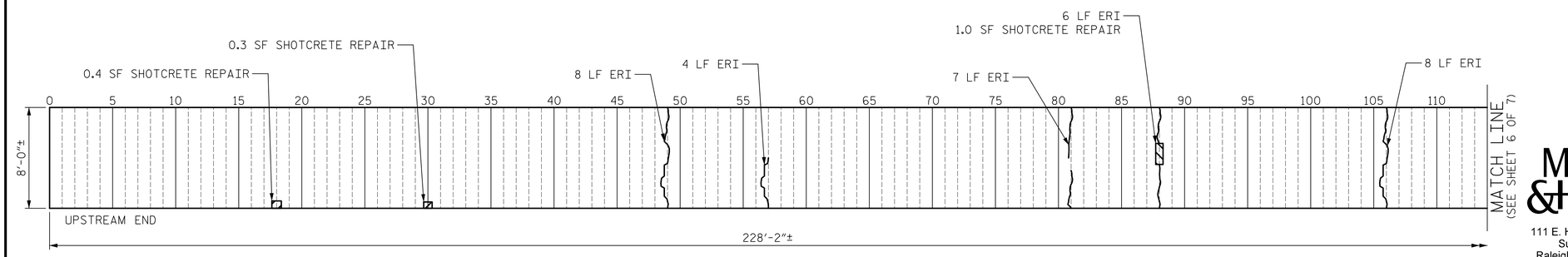


NORTH WALL ELEVATION



EXISTING CULVERT SECTION

(LOOKING DOWNSTREAM)



SOUTH WALL ELEVATION

Mead &Hunt
111 E. Hargett Street
Suite 300
Raleigh, NC 27601
919-714-8670
meadhunt.com
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NORTH CAROLINA PROFESSIONAL SEAL 043177 ENGINEER JOHN S. HOBSON

DocuSigned by: Jack Hobson 5B6E7C2B67004B... 4/16/2020

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PROJECT NO. R-4707

GUILFORD COUNTY

STATION: 56+34.85 -L-

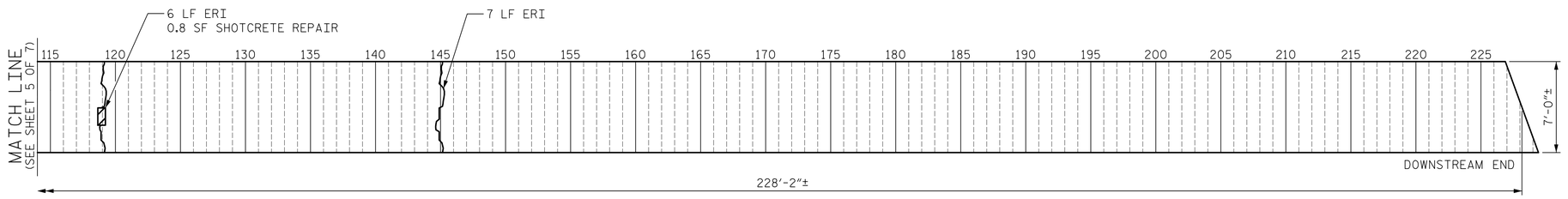
SHEET 5 OF 7

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

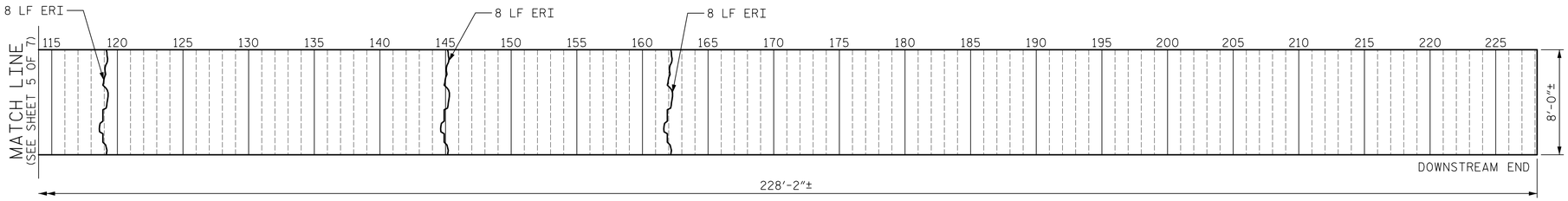
BARREL 3 WALLS AND TOP SLAB REPAIRS

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C1-06
1			3			TOTAL SHEETS
2			4			24

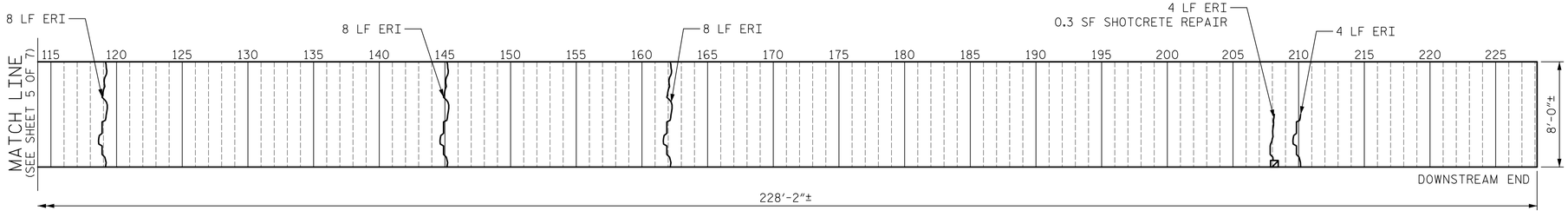
DRAWN BY : A.J. FORFA DATE : 03/04/19
CHECKED BY : J.S. HOBSON DATE : 04/17/19
DESIGN ENGINEER OF RECORD : J.S. HOBSON DATE : 04/26/19



LOOKING UP AT TOP SLAB



NORTH WALL ELEVATION



SOUTH WALL ELEVATION

AS-BUILT REPAIR QUANTITY TABLE

	QUANTITIES			
	ESTIMATE		ACTUAL	
SHOTCRETE REPAIRS	AREA SQ. FT.	VOLUME CU. FT.	AREA SQ. FT.	VOLUME CU. FT.
BARREL 3	11.2	3.3		
CONCRETE REPAIRS	AREA SQ. FT.	VOLUME CU. FT.	AREA SQ. FT.	VOLUME CU. FT.
BARREL 3	0.0	0.0		
EPOXY RESIN INJECTION		LIN. FT.		LIN. FT.
BARREL 3		149.0		

NOTES:

VALUES IN CHART REPRESENT ESTIMATED REPAIR TOTALS AFTER REMOVAL OF UNSOUND CONCRETE, MINIMUM OF 1" BEHIND REBAR AND MINIMUM 2" CLEARANCE TO SAWCUT. FOR REPAIR DETAILS, SEE "CULVERT REPAIR DETAILS" SHEET.

REPAIR LOCATIONS AND ESTIMATE OF QUANTITIES ARE BASED ON THE BEST INFORMATION AVAILABLE. IF ADDITIONAL REPAIRS NOT SHOWN ON THE DRAWINGS ARE DEEMED NECESSARY BY THE ENGINEER, THE ENGINEER WILL NOTE ON THE DRAWINGS THE APPROXIMATE LOCATION AND DESCRIPTION OF THE REPAIRS AND ENTER THE ACTUAL QUANTITIES INTO THE AS-BUILT REPAIR QUANTITY TABLE.

CONCRETE REPAIRS MAY BE SUBSTITUTED IN LIEU OF SHOTCRETE REPAIRS WITH THE APPROVAL OF THE ENGINEER.

= SHOTCRETE REPAIR AREA

= CONCRETE REPAIR AREA

= EPOXY RESIN INJECTION (ERI)

DRAWN BY : A.J. FORFA DATE : 03/05/19
CHECKED BY : J.S. HOBSON DATE : 04/17/19
DESIGN ENGINEER OF RECORD : J.S. HOBSON DATE : 04/26/19

Mead & Hunt
111 E. Hargett Street
Suite 300
Raleigh, NC 27601
919-714-8670
meadhunt.com
NC License No. F-1235

NORTH CAROLINA PROFESSIONAL SEAL 043177 ENGINEER JOHN S. HOBSON

DocuSigned by: Jack Hobson 5B6E7C2B6700448... 4/16/2020

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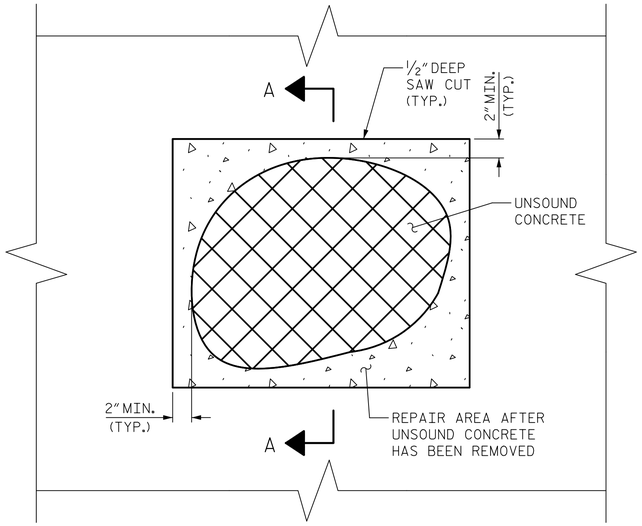
PROJECT NO. R-4707
GUILFORD COUNTY
STATION: 56+34.85 -L-

SHEET 6 OF 7

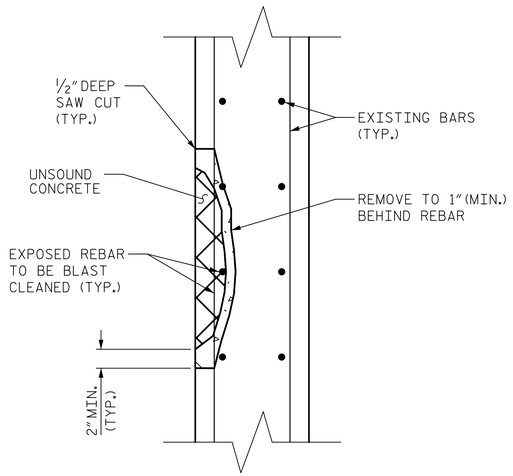
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

BARREL 3 WALLS AND TOP SLAB REPAIRS

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C1-07
1			3			TOTAL SHEETS
2			4			24



FACE REPAIR



SECTION A-A

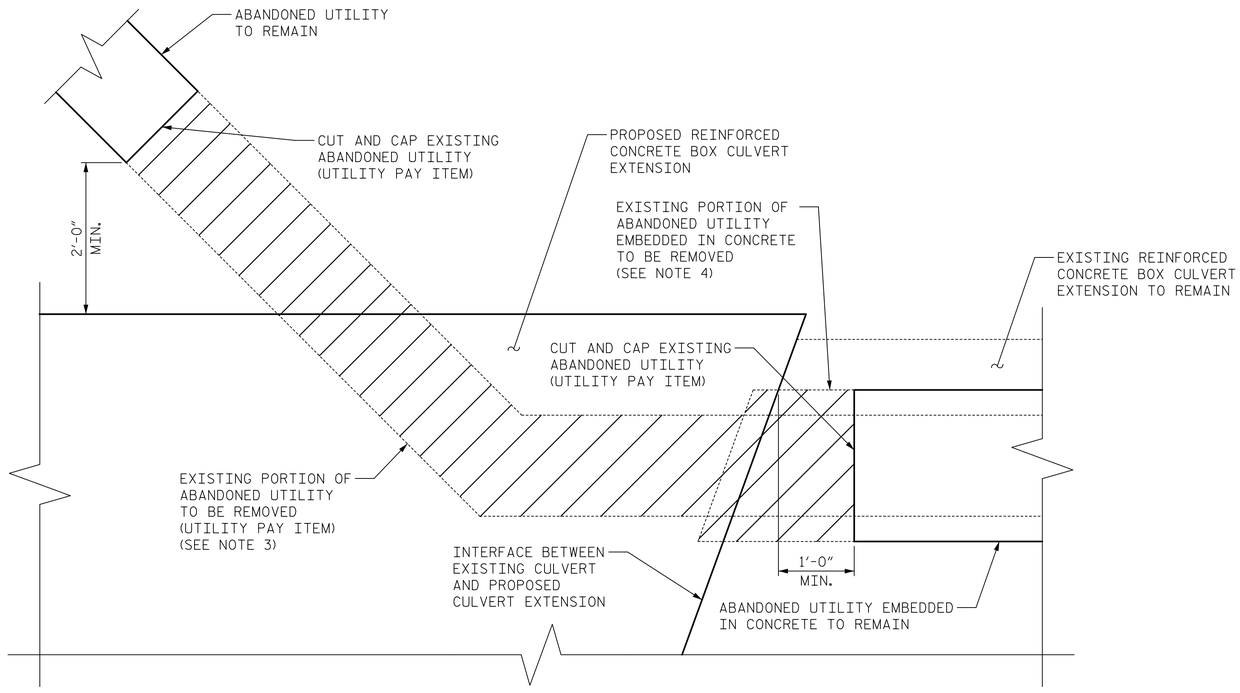
NOTES:

1. FOR SHALLOW REPAIRS THAT DO NOT ENGAGE REINFORCEMENT, ANCHOR PATCH MATERIAL USING 1/4" GALVANIZED BOLTS, EPOXY ANCHORED WITH 2" EMBEDMENT. PLACE IN A 6" GRID. USE A LATEX OR EPOXY PATCH MATERIAL FOR IMPROVED BOND.
2. ANY DAMAGE TO EXISTING REINFORCING STEEL, DURING CONTRACTOR'S OPERATIONS, SHALL BE REPAIRED AS DIRECTED BY THE ENGINEER AND PERFORMED AT NO ADDITIONAL COST.
3. ENSURE NO CONTENTS INSIDE THE ABANDONED UTILITY PIPE EMPTY INTO THE WATERWAY DURING THE REMOVAL PROCESS.
4. PAYMENT FOR REPAIR OF EXISTING CULVERT WALL AND SLAB AT LOCATION OF REMOVAL OF ABANDONED UTILITY EMBEDDED IN CONCRETE SHALL BE MADE UNDER CONCRETE REPAIRS.

REPAIR SEQUENCE:

1. SOUND CONCRETE TO DETERMINE EXTENT OF REPAIR LOCATION.
2. REMOVE SURFACE CONCRETE TO VERIFY SAWCUT DEPTH WILL NOT DAMAGE EXISTING REINFORCING STEEL. SAW CUT AROUND REPAIR AREA TO A NOMINAL DEPTH OF 1/2".
3. REMOVE CONCRETE WITHIN A SAW CUT AREA TO MINIMUM 1/2 "DEPTH.
4. ABRASIVE BLAST ALL EXPOSED EXISTING REINFORCING STEEL IN REPAIR AREAS TO REMOVE LOOSE CONCRETE, RUST SCALE, ETC. FOR BARS WITH MORE THAN 10% SECTION LOSS, SPLICE AND SECURELY TIE SUPPLEMENTAL REINFORCING BARS AS NEEDED.
5. REMOVE ALL LOOSE OR WEAKENED MATERIAL THEN CLEAN THE REPAIR AREA OF DIRT, GREASE, OIL, AND FOREIGN MATTER.
6. PREPARE SURFACE AND PLACE APPROVED REPAIR MATERIAL ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.

CULVERT REPAIR



UTILITY REMOVAL DETAIL

(UPSTREAM END OF BARREL 1)

DRAWN BY : A.J. FORFA DATE : 03/06/19
CHECKED BY : J.S. HOBSON DATE : 04/17/19
DESIGN ENGINEER OF RECORD : J.S. HOBSON DATE : 04/26/19

Mead & Hunt
111 E. Hargett Street
Suite 300
Raleigh, NC 27601
919-714-8670
meadhunt.com
NC License No. F-1235

NORTH CAROLINA PROFESSIONAL SEAL 043177 ENGINEER JOHN S. HOBSON

DocuSigned by: Jack Hobson 4/16/2020
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GUILFORD COUNTY
STATION: 56+34.85 -L-

SHEET 7 OF 7

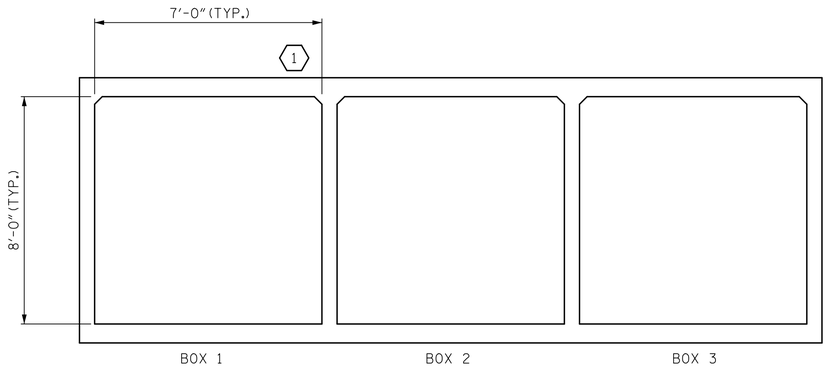
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

CULVERT REPAIR DETAILS

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C1-08
1			3			TOTAL SHEETS
2			4			24

LOAD AND RESISTANCE FACTOR RATING (LRFR) SUMMARY FOR REINFORCED CONCRETE BOX CULVERTS

	CONTROLLING LOAD RATING	MINIMUM RATING FACTOR (RF)	STRENGTH I LIMIT STATE							
			MOMENT				SHEAR			
			RATING FACTOR	BOX NO.	ELEMENT TYPE	DISTANCE FROM LEFT END OF ELEMENT (ft)	RATING FACTOR	BOX NO.	ELEMENT TYPE	DISTANCE FROM LEFT END OF ELEMENT (ft)
PERMANENT LOAD RATING	(1)	1.03	1.09	1	TOP SLAB	3.88	1.03	1	TOP SLAB	2



LRFR SUMMARY

(LOOKING DOWNSTREAM)

LOAD FACTORS:

DESIGN LOAD RATING FACTORS

LOAD TYPE	MAX FACTOR	MIN FACTOR
DC	1.25	0.90
DW	1.50	0.65
EV	1.30	0.90
EH	1.35	0.90
ES	1.35	0.90
LS	1.75	--
WA	1.00	--

NOTES:

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.

THE EFFECTS OF LIVE LOAD ON DESIGN AND LOAD RATING MAY BE NEGLECTED FOR CULVERTS WITH CERTAIN FILL DEPTHS DESCRIBED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.

CULVERTS WITH NEGLIGIBLE LIVE LOAD SHOULD BE LOAD RATED FOR PERMANENT LOADS ONLY IN ACCORDANCE WITH THE AASHTO MANUAL FOR BRIDGE EVALUATION.

ASSEMBLED BY :	J.S. HOBSON	DATE :	03/01/19
CHECKED BY :	J.A. LEE	DATE :	04/15/19
DRAWN BY :	BNB 6/19		
CHECKED BY :	THC 6/19		

Mead &Hunt
111 E. Hargett Street
Suite 300
Raleigh, NC 27601
919-714-8670
meadhunt.com
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DocuSigned by: Jack Hobson 5B6E7C2B67004B... 4/16/2020

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PROJECT NO. R-4707

GUILFORD COUNTY

STATION: 56+34.85 -L-

SHEET 1 OF 16

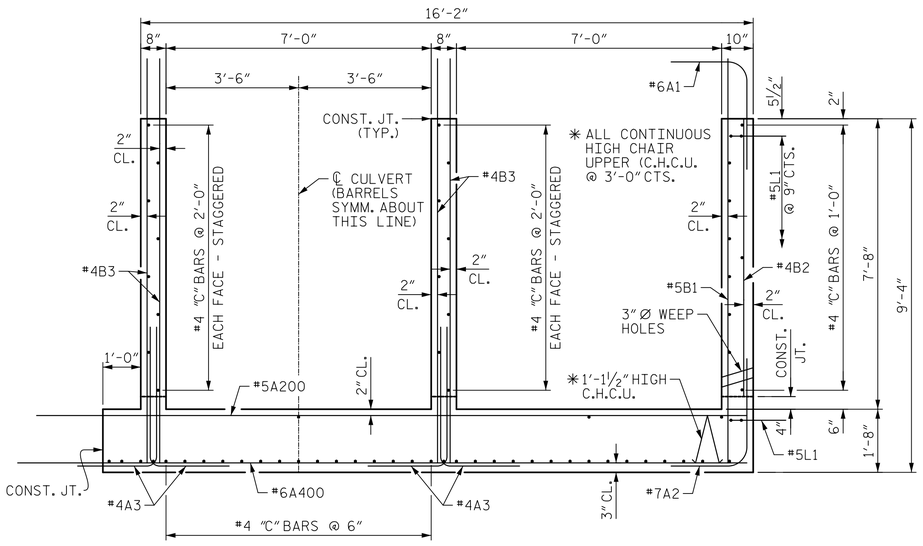
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

STANDARD

LRFR SUMMARY FOR REINFORCED CONCRETE BOX CULVERTS
(DEEP FILLS)
(LEFT AND RIGHT EXTENSION)

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C1-09
1			3			TOTAL SHEETS
2			4			24

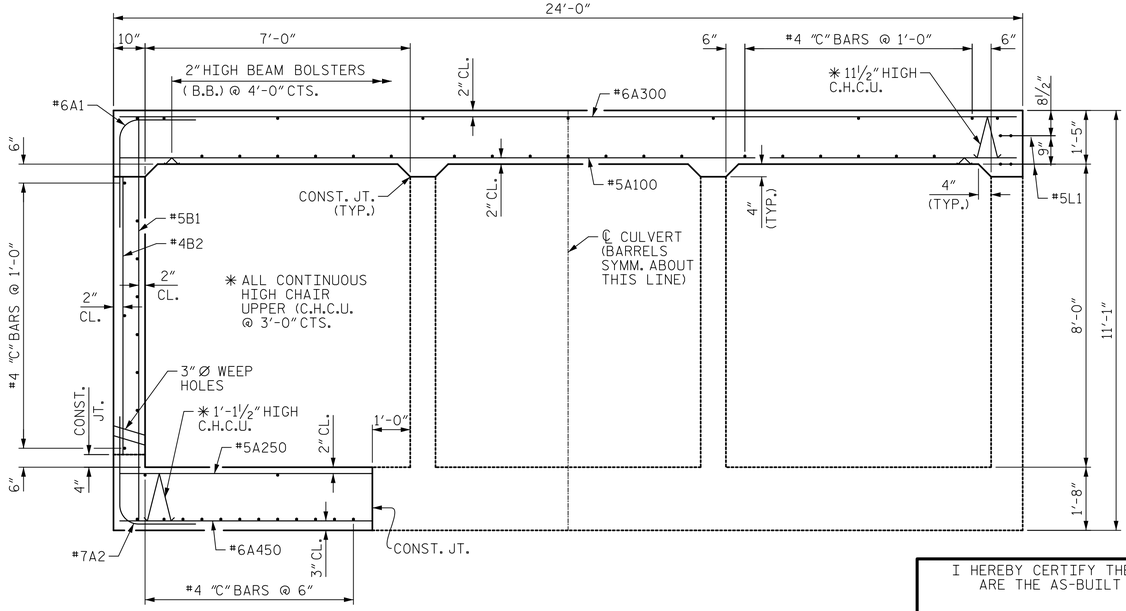
STD. NO. LRFR7



RIGHT ANGLE SECTION OF BARREL

LEFT EXTENSION - PHASE I (LOOKING DOWNSTREAM)

THERE ARE 63 ″C″ BARS IN SECTION OF BARREL

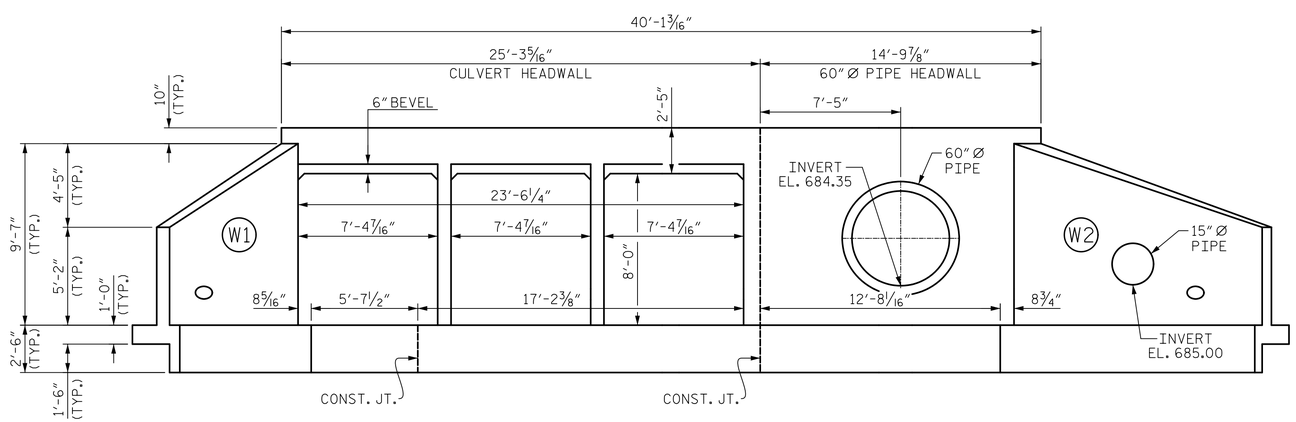


RIGHT ANGLE SECTION OF BARREL

LEFT EXTENSION - PHASE II (LOOKING DOWNSTREAM)

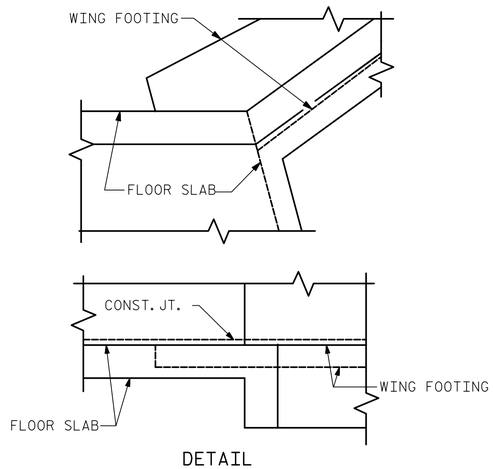
THERE ARE 51 ″C″ BARS IN SECTION OF BARREL

I HEREBY CERTIFY THESE PLANS ARE THE AS-BUILT PLANS



LEFT END ELEVATION NORMAL TO SKEW

(LOOKING DOWNSTREAM)



DETAIL

CONNECTION OF WING FOOTING AND FLOOR SLAB WHEN SLAB IS THICKER THAN FOOTING

Mead &Hunt
111 E. Hargett Street
Suite 300
Raleigh, NC 27601
919-714-8670
meadhunt.com
NC License No. F-1235

NORTH CAROLINA PROFESSIONAL SEAL 043177 ENGINEER JOHN S HOBSON

DocuSigned by: Jack Hobson 5B6E7C2B67004B...

4/16/2020

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PROJECT NO. R-4707

GUILFORD COUNTY

STATION: 56+34.85 -L-

SHEET 2 OF 16

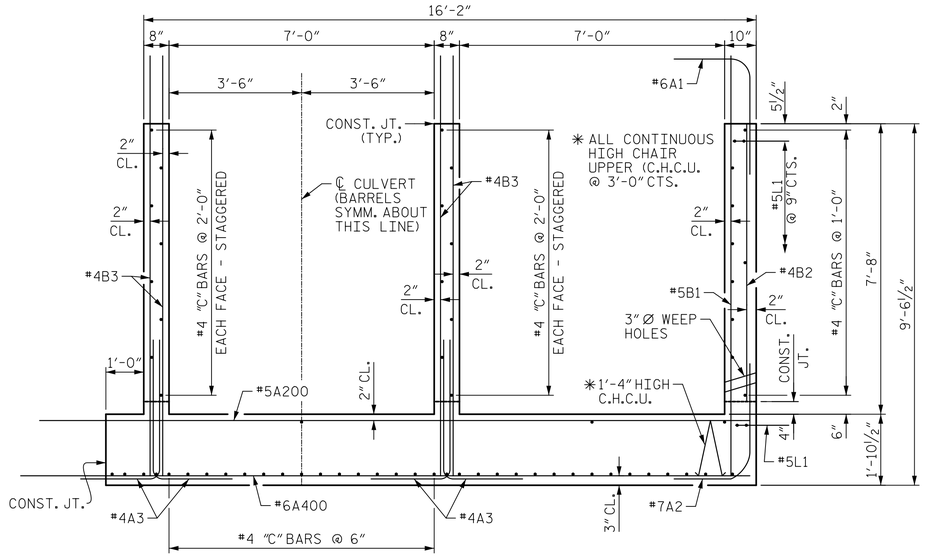
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

TRIPLE 7 FT. × 8 FT. REINFORCED CONCRETE BOX CULVERT

(LEFT EXTENSION)

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C1-10
1			3			TOTAL SHEETS
2			4			24

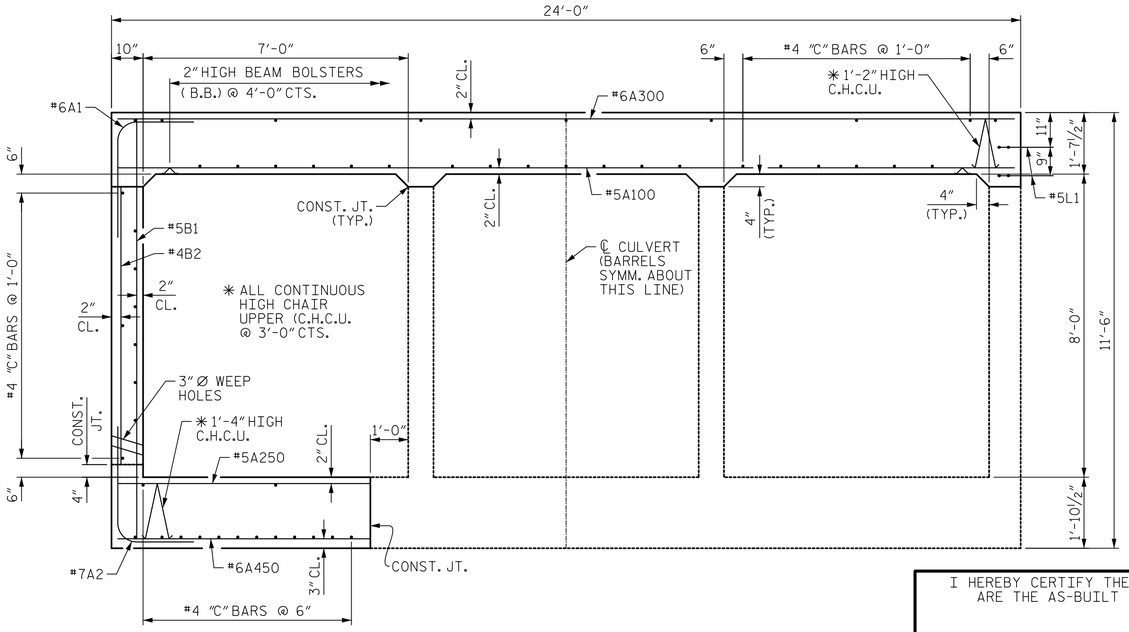
DRAWN BY : J.S. HOBSON DATE : 03/28/19
CHECKED BY : J.A. LEE DATE : 04/15/19
DESIGN ENGINEER OF RECORD : J.S. HOBSON DATE : 04/26/19



RIGHT ANGLE SECTION OF BARREL

RIGHT EXTENSION - PHASE I (LOOKING DOWNSTREAM)

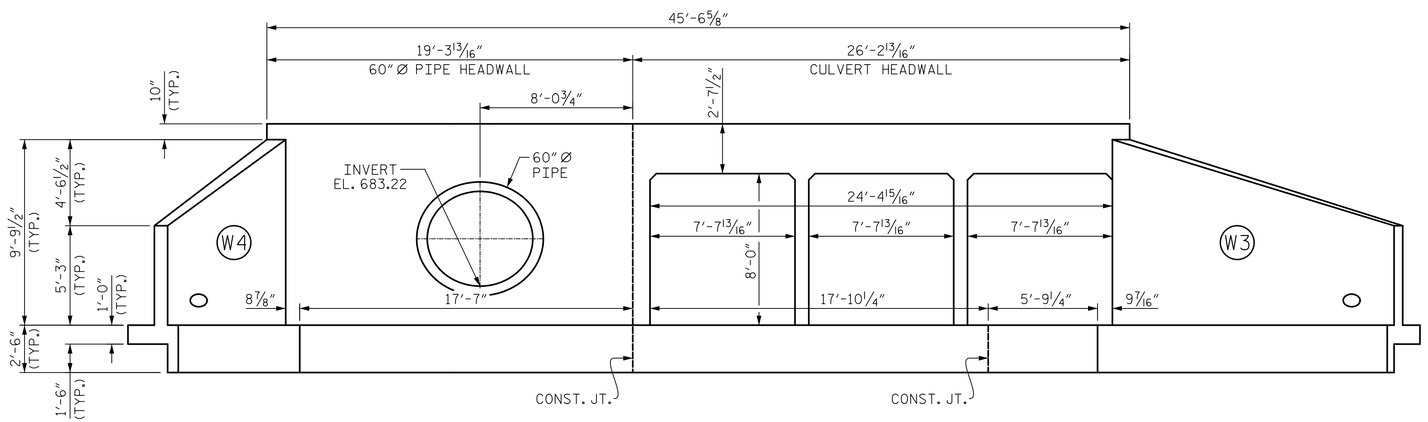
THERE ARE 63 "C" BARS IN SECTION OF BARREL



RIGHT ANGLE SECTION OF BARREL

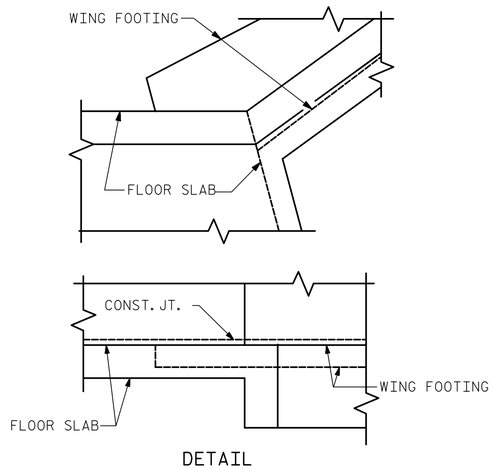
RIGHT EXTENSION - PHASE II (LOOKING DOWNSTREAM)

THERE ARE 51 "C" BARS IN SECTION OF BARREL



RIGHT END ELEVATION NORMAL TO SKEW

(LOOKING UPSTREAM)



DETAIL

CONNECTION OF WING FOOTING AND FLOOR SLAB WHEN SLAB IS THICKER THAN FOOTING

I HEREBY CERTIFY THESE PLANS ARE THE AS-BUILT PLANS

Mead &Hunt
111 E. Hargett Street
Suite 300
Raleigh, NC 27601
919-714-8670
meadhunt.com
NC License No. F-1235

NORTH CAROLINA PROFESSIONAL SEAL 043177 ENGINEER JOHN S HOBSON

DocuSigned by: Jack Hobson 5B6E7C2B670044B...

4/16/2020

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PROJECT NO. R-4707

GUILFORD COUNTY

STATION: 56+34.85 -L-

SHEET 3 OF 16

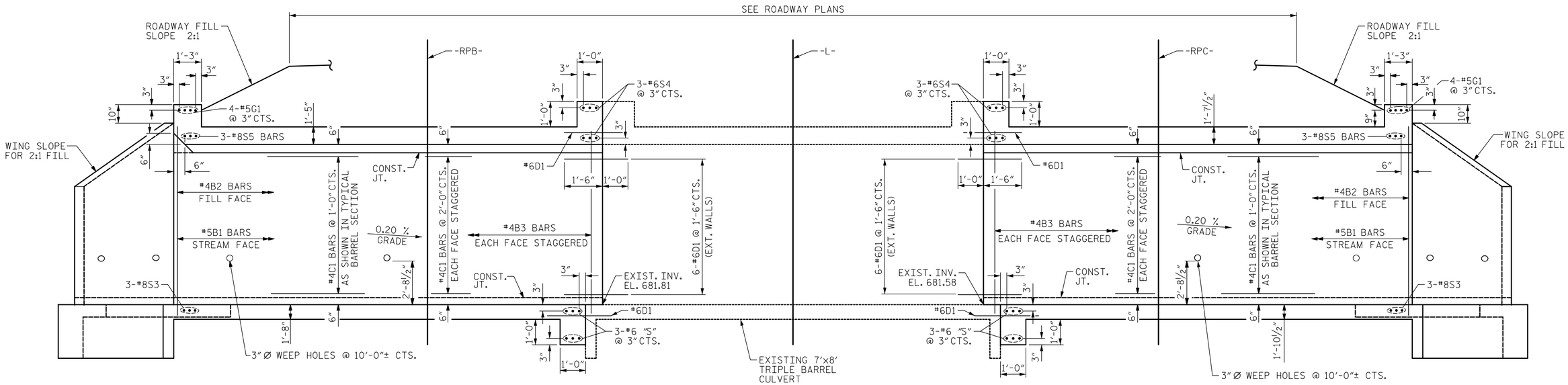
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

TRIPLE 7 FT. x 8 FT. REINFORCED CONCRETE BOX CULVERT

(RIGHT EXTENSION)

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C1-11
1			3			TOTAL SHEETS
2			4			24

DRAWN BY : J.S. HOBSON DATE : 03/28/19
CHECKED BY : J.A. LEE DATE : 04/15/19
DESIGN ENGINEER OF RECORD : J.S. HOBSON DATE : 04/26/19



EXTERIOR WALL — INTERIOR WALL

LEFT EXTENSION - NORMAL TO ROADWAY

INTERIOR WALL — EXTERIOR WALL

RIGHT EXTENSION - NORMAL TO ROADWAY

I HEREBY CERTIFY THESE PLANS ARE THE AS-BUILT PLANS

LEFT EXTENSION QUANTITIES

CULVERT EXCAVATION		LUMP SUM	
FOUNDATION COND. MAT'L	451	TONS	
CLASS A CONCRETE			
PHASE I BARRELS @	1.675 CY/FT	381.0	C.Y.
PHASE II BARREL @	1.967 CY/FT	451.2	C.Y.
60" Ø PIPE HEADWALL		9.4	C.Y.
WING W1, ETC.		4.9	C.Y.
WING W2, ETC.		6.7	C.Y.
TOTAL		853.2	C.Y.
REINFORCING STEEL			
PHASE I BARRELS		53,006	LBS.
PHASE II BARREL		47,683	LBS.
60" Ø PIPE HEADWALL		650	LBS.
WING W1, ETC.		383	LBS.
WING W2, ETC.		564	LBS.
TOTAL		102,286	LBS.

RIGHT EXTENSION QUANTITIES

CULVERT EXCAVATION		LUMP SUM	
FOUNDATION COND. MAT'L	419	TONS	
CLASS A CONCRETE			
PHASE I BARRELS @	1.807 CY/FT	382.6	C.Y.
PHASE II BARREL @	2.205 CY/FT	470.0	C.Y.
60" Ø PIPE HEADWALL		12.6	C.Y.
WING W3, ETC.		8.0	C.Y.
WING W4, ETC.		4.7	C.Y.
TOTAL		877.9	C.Y.
REINFORCING STEEL			
PHASE I BARRELS		49,853	LBS.
PHASE II BARREL		44,530	LBS.
60" Ø PIPE HEADWALL		853	LBS.
WING W3, ETC.		590	LBS.
WING W4, ETC.		389	LBS.
TOTAL		96,215	LBS.

DRAWN BY : J.S. HOBSON DATE : 03/28/19
CHECKED BY : J.A. LEE DATE : 04/15/19
DESIGN ENGINEER OF RECORD : J.S. HOBSON DATE : 04/26/19

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PROJECT NO. R-4707
GUILFORD COUNTY
STATION: 56+34.85 -L-

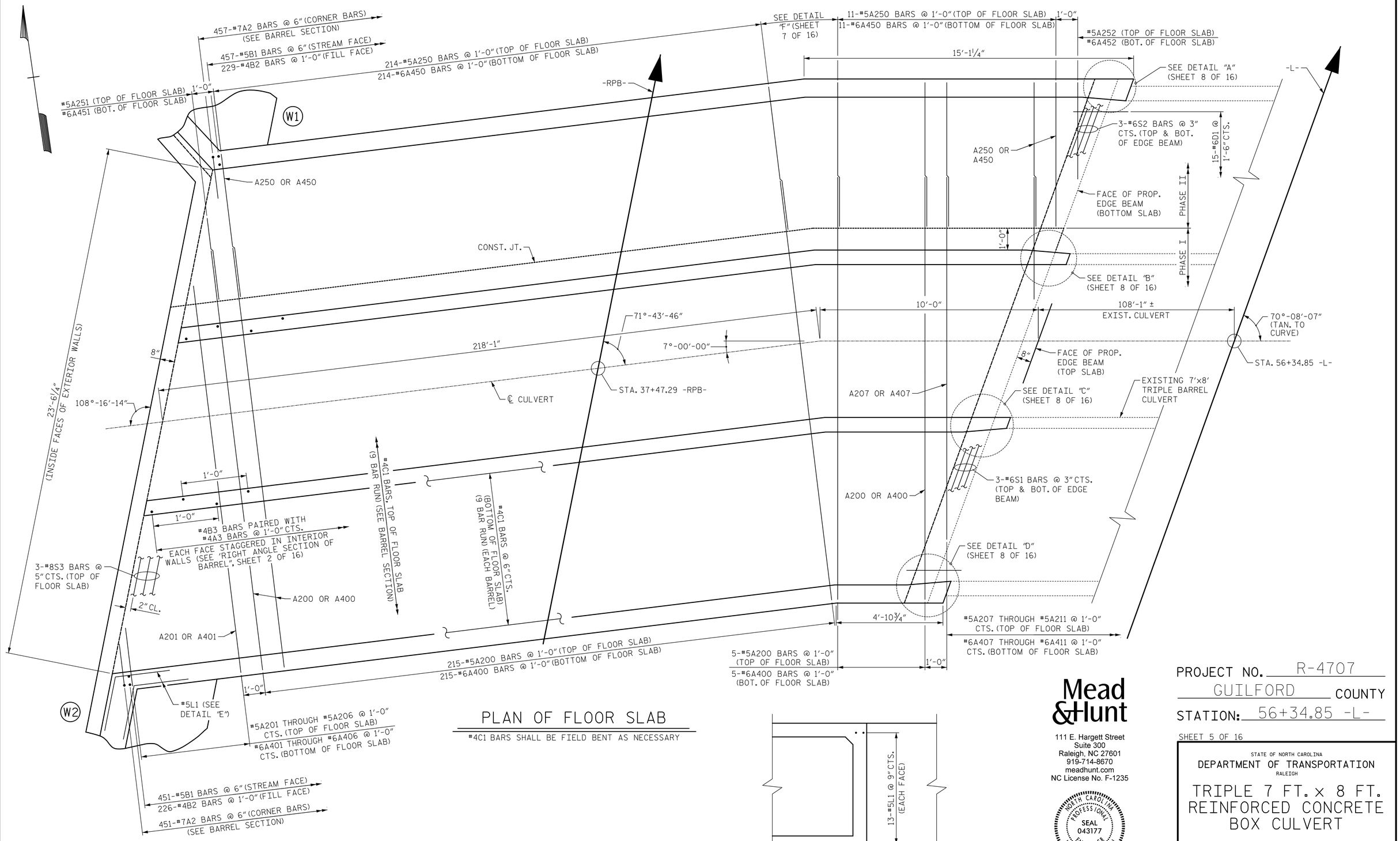
SHEET 4 OF 16

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

TRIPLE 7 FT. x 8 FT. REINFORCED CONCRETE BOX CULVERT

(LEFT & RIGHT EXTENSION)

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C1-12
1			3			TOTAL SHEETS
2			4			24



PLAN OF FLOOR SLAB

#4C1 BARS SHALL BE FIELD BENT AS NECESSARY

DETAIL "E"

DRAWN BY : J.S. HOBSON DATE : 04/08/19
CHECKED BY : J.A. LEE DATE : 04/15/19
DESIGN ENGINEER OF RECORD : J.S. HOBSON DATE : 04/26/19

Mead & Hunt
111 E. Hargett Street
Suite 300
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PROJECT NO. R-4707
GUILFORD COUNTY
STATION: 56+34.85 -L-

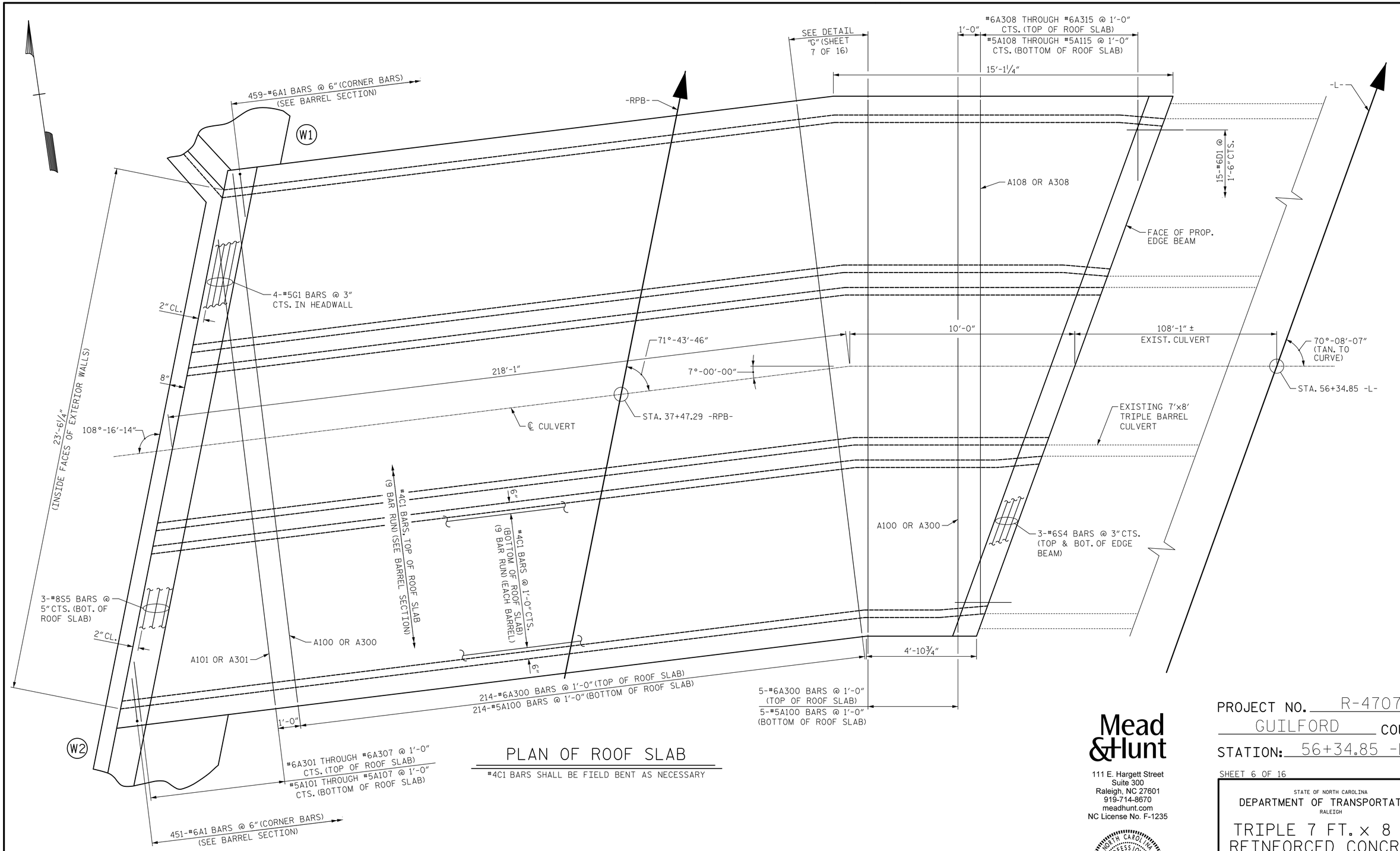
SHEET 5 OF 16

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

TRIPLE 7 FT. x 8 FT. REINFORCED CONCRETE BOX CULVERT

(LEFT EXTENSION)

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C1-13
1			3			TOTAL SHEETS
2			4			24



PLAN OF ROOF SLAB

#4C1 BARS SHALL BE FIELD BENT AS NECESSARY

DRAWN BY : J.S. HOBSON DATE : 04/08/19
CHECKED BY : J.A. LEE DATE : 04/16/19
DESIGN ENGINEER OF RECORD : J.S. HOBSON DATE : 04/26/19

Mead & Hunt
111 E. Hargett Street
Suite 300
Raleigh, NC 27601
919-714-8670
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NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 043177 JOHN S. HOBSON
DocuSigned by: Jack Hobson 5B6E7C2B67004B... 4/16/2020

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PROJECT NO. R-4707
GUILFORD COUNTY
STATION: 56+34.85 -L-

SHEET 6 OF 16

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

TRIPLE 7 FT. x 8 FT. REINFORCED CONCRETE BOX CULVERT

(LEFT EXTENSION)

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C1-14
1			3			TOTAL SHEETS
2			4			24

BILL OF MATERIAL - LEFT EXTENSION

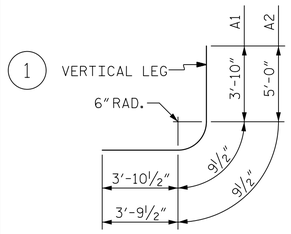
PHASE I

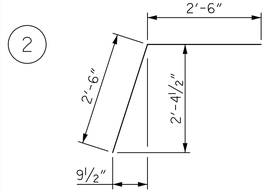
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A200	220	#5	STR	20'-1''	4608
A201	1	#5	STR	17'-10''	19
A202	1	#5	STR	14'-10''	15
A203	1	#5	STR	11'-9''	12
A204	1	#5	STR	8'-9''	9
A205	1	#5	STR	5'-8''	6
A206	1	#5	STR	2'-8''	3
A207	1	#5	STR	17'-4''	18
A208	1	#5	STR	14'-7''	15
A209	1	#5	STR	11'-10''	12
A210	1	#5	STR	9'-1''	9
A211	1	#5	STR	6'-4''	7
A225	2	#5	STR	11'-11''	25
A226	1	#5	STR	17'-5''	18
A400	220	#6	STR	19'-10''	6554
A401	1	#6	STR	17'-10''	27
A402	1	#6	STR	14'-10''	22
A403	1	#6	STR	11'-9''	18
A404	1	#6	STR	8'-9''	13
A405	1	#6	STR	5'-8''	9
A406	1	#6	STR	2'-8''	4
A407	1	#6	STR	17'-1''	26
A408	1	#6	STR	14'-4''	22
A409	1	#6	STR	11'-7''	17
A410	1	#6	STR	8'-10''	13
A411	1	#6	STR	6'-1''	9
A425	2	#6	STR	11'-2''	34
A426	1	#6	STR	16'-8''	25
A1	451	#6	1	8'-6''	5758
A2	451	#7	1	9'-7''	8834
A3	912	#4	3	5'-6''	3351
B1	451	#5	STR	10'-8''	5018
B2	226	#4	STR	7'-4''	1107
B3	912	#4	STR	10'-8''	6498
C1	441	#4	STR	34'-11''	10286
D1	17	#6	STR	2'-6''	64
L1	24	#5	2	5'-0''	125
S1	6	#6	STR	21'-9''	196
S3	3	#8	STR	24'-11''	200
REINFORCING STEEL					53,006 LBS.

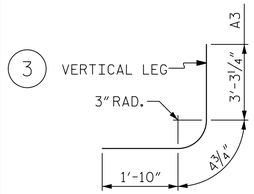
PHASE II

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A100	219	#5	STR	23'-8''	5406
A101	1	#5	STR	20'-10''	22
A102	1	#5	STR	17'-10''	19
A103	1	#5	STR	14'-10''	15
A104	1	#5	STR	11'-9''	12
A105	1	#5	STR	8'-9''	9
A106	1	#5	STR	5'-8''	6
A107	1	#5	STR	2'-8''	3
A108	1	#5	STR	22'-10''	24
A109	1	#5	STR	20'-1''	21
A110	1	#5	STR	17'-4''	18
A111	1	#5	STR	14'-6''	15
A112	1	#5	STR	11'-10''	12
A113	1	#5	STR	9'-1''	9
A114	1	#5	STR	6'-4''	7
A115	1	#5	STR	3'-7''	4
A125	2	#5	STR	15'-0''	31
A126	1	#5	STR	20'-6''	21
A250	228	#5	STR	6'-7''	1566
A251	1	#5	STR	3'-9''	4
A252	1	#5	STR	4'-5''	5
A300	219	#6	STR	23'-8''	7785
A301	1	#6	STR	20'-10''	31
A302	1	#6	STR	17'-10''	27
A303	1	#6	STR	14'-10''	22
A304	1	#6	STR	11'-9''	18
A305	1	#6	STR	8'-9''	13
A306	1	#6	STR	5'-8''	9
A307	1	#6	STR	2'-8''	4
A308	1	#6	STR	22'-10''	34
A309	1	#6	STR	20'-1''	30
A310	1	#6	STR	17'-4''	26
A311	1	#6	STR	14'-6''	22
A312	1	#6	STR	11'-10''	18
A313	1	#6	STR	9'-1''	14
A314	1	#6	STR	6'-4''	10
A315	1	#6	STR	3'-7''	5
A325	2	#6	STR	15'-0''	45
A326	1	#6	STR	20'-6''	31
A450	228	#6	STR	6'-7''	2254
A451	1	#6	STR	3'-9''	6
A452	1	#6	STR	4'-5''	7
A1	459	#6	1	8'-6''	5860
A2	457	#7	1	9'-7''	8952
B1	457	#5	STR	10'-8''	5084
B2	229	#4	STR	7'-4''	1122
C1	357	#4	STR	34'-11''	8327
D1	25	#6	STR	2'-6''	94
G1	4	#5	STR	24'-11''	104
L1	2	#5	2	5'-0''	10
S2	6	#6	STR	7'-0''	63
S4	6	#6	STR	25'-2''	227
S5	3	#8	STR	24'-11''	200
REINFORCING STEEL					47,683 LBS.

BAR TYPES



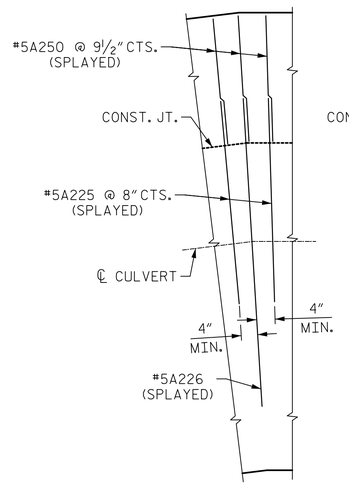




ALL BAR DIMENSIONS ARE OUT TO OUT.

SPLICE LENGTH CHART

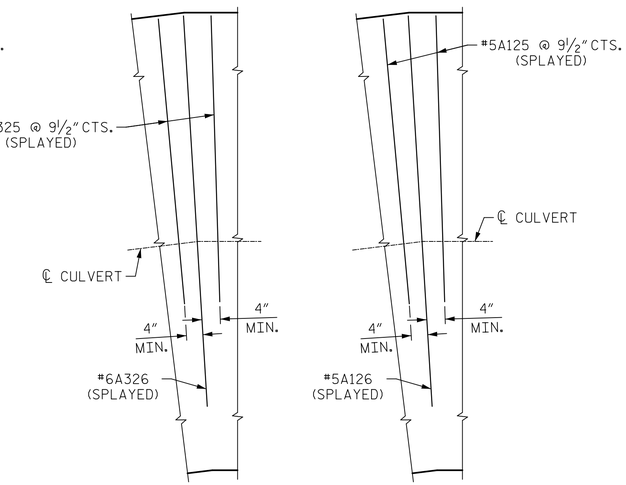
BAR	SIZE	SPLICE
A200 A207-A211 A225-A226	#5	3'-0"
A400 A407-A411 A425-A426	#5	2'-9"
B1	#5	2'-4"
B3	#4	1'-10"
C1	#4	2'-5"
S1	#6	3'-7"



TOP OF FLOOR SLAB

BOTTOM OF FLOOR SLAB

DETAIL "F"



TOP OF ROOF SLAB

BOTTOM OF ROOF SLAB

DETAIL "G"

DRAWN BY : J.S. HOBSON DATE : 04/09/19
CHECKED BY : J.A. LEE DATE : 04/18/19
DESIGN ENGINEER OF RECORD : J.S. HOBSON DATE : 04/26/19

Mead & Hunt
111 E. Hargett Street
Suite 300
Raleigh, NC 27601
919-714-8670
meadhunt.com
NC License No. F-1235

NORTH CAROLINA PROFESSIONAL SEAL 043177 ENGINEER JOHN S. HOBSON

DocuSigned by: Jack Hobson 5B6E7C2B6700448... 4/16/2020

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PROJECT NO. R-4707
GUILFORD COUNTY
STATION: 56+34.85 -L-

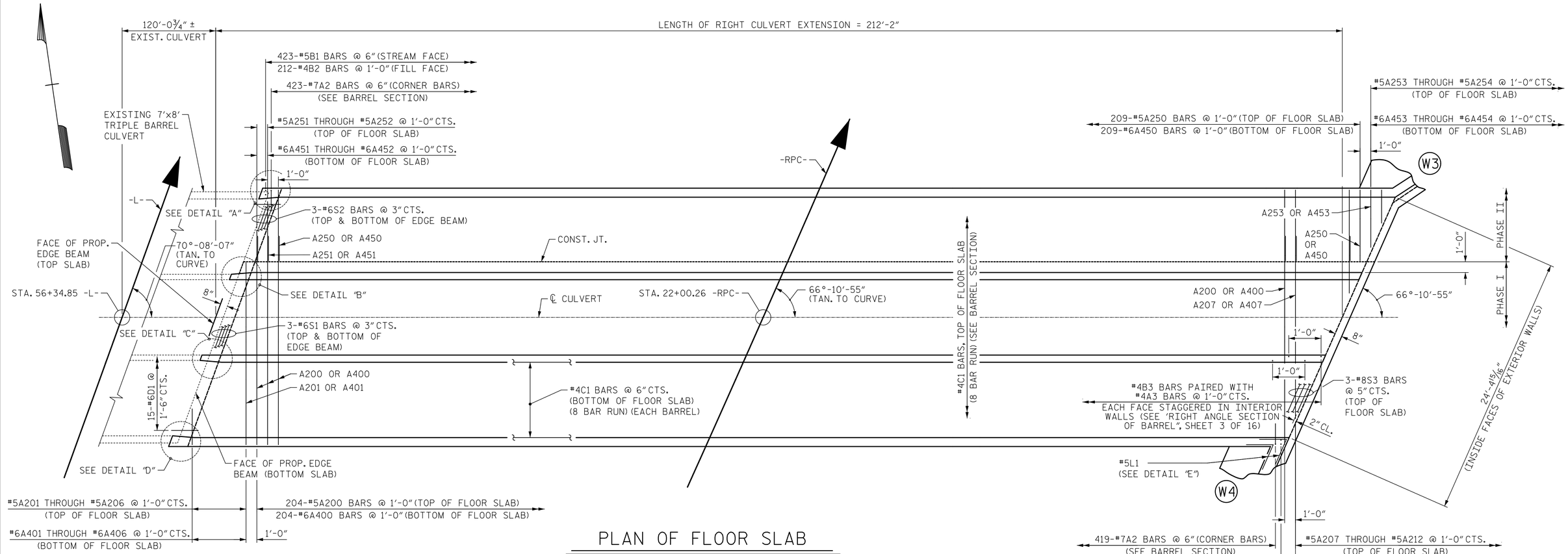
SHEET 7 OF 16

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

TRIPLE 7 FT. x 8 FT. REINFORCED CONCRETE BOX CULVERT

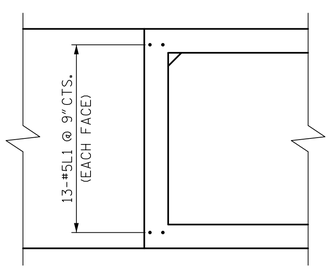
(LEFT EXTENSION)

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C1-15
1			3			TOTAL SHEETS
2			4			24



PLAN OF FLOOR SLAB

#4C1 BARS SHALL BE FIELD BENT AS NECESSARY



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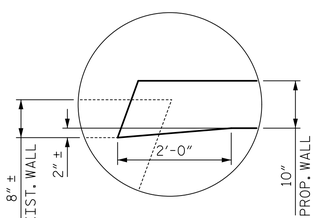
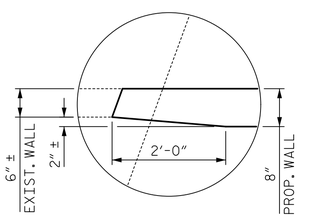


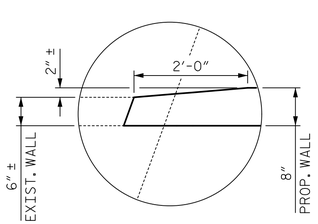
DETAIL "A"

(RIGHT EXT. SHOWN, LEFT EXT. SIMILAR)



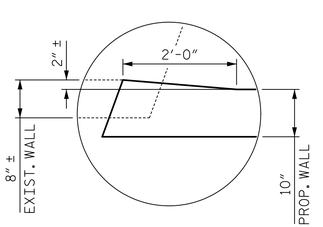
DETAIL "C"

(RIGHT EXT. SHOWN, LEFT EXT. SIMILAR)



DETAIL "B"

(RIGHT EXT. SHOWN, LEFT EXT. SIMILAR)



DETAIL "D"

(RIGHT EXT. SHOWN, LEFT EXT. SIMILAR)

DRAWN BY :	J.S. HOBSON	DATE :	04/01/19
CHECKED BY :	J.A. LEE	DATE :	04/18/19
DESIGN ENGINEER OF RECORD :	J.S. HOBSON	DATE :	04/26/19

Mead &Hunt
111 E. Hargett Street
Suite 300
Raleigh, NC 27601
919-714-8670
meadhunt.com
NC License No. F-1235

NORTH CAROLINA PROFESSIONAL SEAL 043177 ENGINEER JOHN S. HOBSON

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PROJECT NO. R-4707

GUILFORD COUNTY

STATION: 56+34.85 -L-

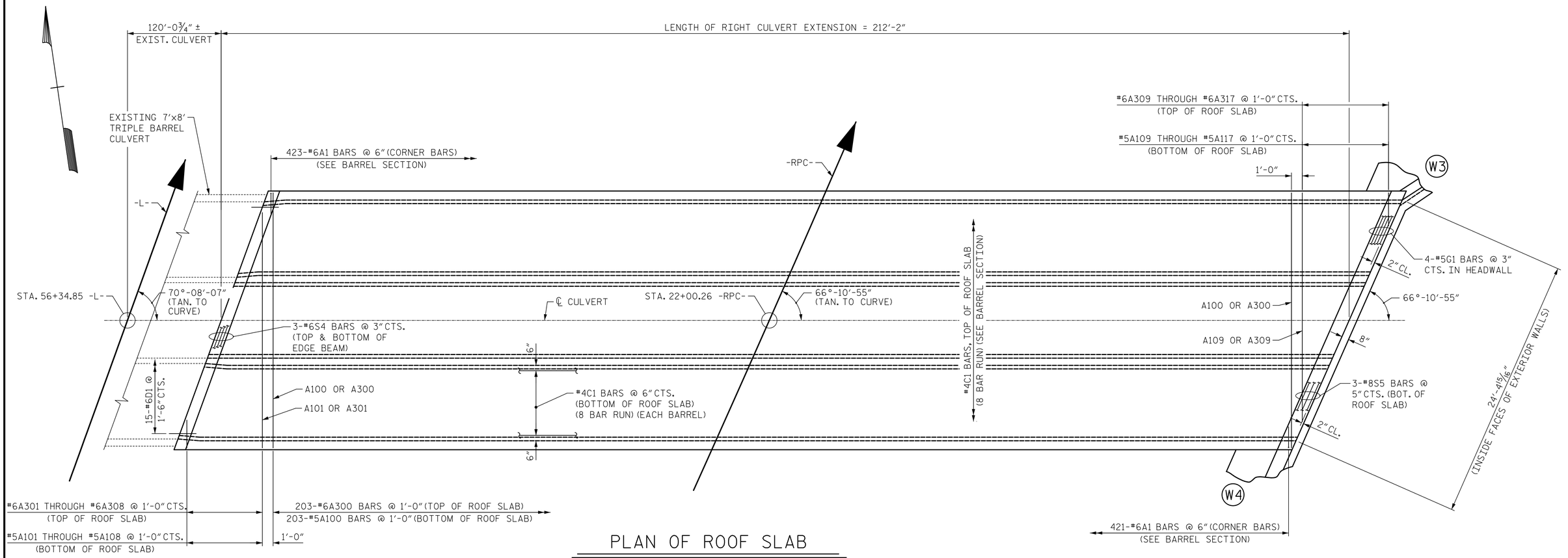
SHEET 8 OF 16

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

TRIPLE 7 FT. × 8 FT. REINFORCED CONCRETE BOX CULVERT

(RIGHT EXTENSION)

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C1-16
1			3			TOTAL SHEETS
2			4			24



PLAN OF ROOF SLAB

#4C1 BARS SHALL BE FIELD BENT AS NECESSARY

DRAWN BY : J.S. HOBSON DATE : 04/01/19
CHECKED BY : J.A. LEE DATE : 04/18/19
DESIGN ENGINEER OF RECORD : J.S. HOBSON DATE : 04/26/19

Mead &Hunt
111 E. Hargett Street
Suite 300
Raleigh, NC 27601
919-714-8670
meadhunt.com
NC License No. F-1235

NORTH CAROLINA PROFESSIONAL SEAL 043177 ENGINEER JOHN S. HOBSON
DocuSigned by: Jack Hobson 5B6E7C2B670044B... 4/16/2020

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PROJECT NO. R-4707
GUILFORD COUNTY
STATION: 56+34.85 -L-

SHEET 9 OF 16

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

TRIPLE 7 FT. x 8 FT. REINFORCED CONCRETE BOX CULVERT

(RIGHT EXTENSION)

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C1-17
1			3			TOTAL SHEETS
2			4			24

BILL OF MATERIAL - RIGHT EXTENSION

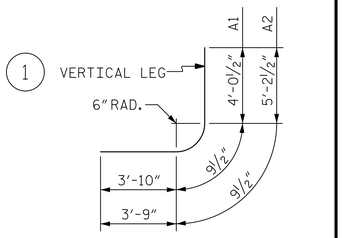
PHASE I

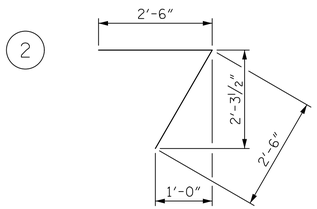
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A200	204	#5	STR	20'-1''	4273
A201	1	#5	STR	16'-11''	18
A202	1	#5	STR	14'-4''	15
A203	1	#5	STR	11'-7''	12
A204	1	#5	STR	8'-10''	9
A205	1	#5	STR	6'-1''	6
A206	1	#5	STR	3'-4''	3
A207	1	#5	STR	17'-8''	18
A208	1	#5	STR	15'-4''	16
A209	1	#5	STR	13'-0''	14
A210	1	#5	STR	10'-8''	11
A211	1	#5	STR	8'-4''	9
A212	1	#5	STR	6'-0''	6
A400	204	#6	STR	19'-10''	6077
A401	1	#6	STR	16'-11''	25
A402	1	#6	STR	14'-4''	22
A403	1	#6	STR	11'-7''	17
A404	1	#6	STR	8'-10''	13
A405	1	#6	STR	6'-1''	9
A406	1	#6	STR	3'-4''	5
A407	1	#6	STR	17'-5''	26
A408	1	#6	STR	15'-1''	23
A409	1	#6	STR	12'-9''	19
A410	1	#6	STR	10'-5''	16
A411	1	#6	STR	8'-1''	12
A412	1	#6	STR	5'-9''	9
A1	421	#6	1	8'-8''	481
A2	419	#7	1	9'-9''	8350
A3	849	#4	3	5'-6"	3119
B1	419	#5	STR	11'-1''	4844
B2	210	#4	STR	7'-4''	1029
B3	849	#4	STR	11'-1''	6286
C1	378	#4	STR	37'-6'	9469
D1	17	#6	STR	2'-6''	64
L1	24	#5	2	5'-0''	125
S1	6	#6	STR	21'-9"	196
S3	3	#8	STR	25'-10''	207
REINFORCING STEEL					49,853 LBS.

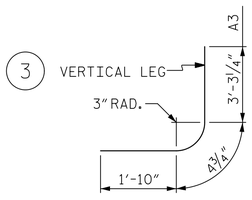
PHASE II

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A100	203	#5	STR	23'-8''	5011
A101	1	#5	STR	21'-10''	23
A102	1	#5	STR	19'-1''	20
A103	1	#5	STR	16'-4''	17
A104	1	#5	STR	13'-7''	14
A105	1	#5	STR	10'-10''	11
A106	1	#5	STR	8'-1''	8
A107	1	#5	STR	5'-4''	6
A108	1	#5	STR	2'-7''	3
A109	1	#5	STR	21'-3''	22
A110	1	#5	STR	18'-11''	20
A111	1	#5	STR	16'-7''	17
A112	1	#5	STR	14'-3''	15
A113	1	#5	STR	11'-11''	12
A114	1	#5	STR	9'-7''	10
A115	1	#5	STR	7'-8''	8
A116	1	#5	STR	5'-4''	6
A117	1	#5	STR	3'-1''	3
A250	209	#5	STR	6'-7''	1435
A251	1	#5	STR	5'-6''	6
A252	1	#5	STR	2'-9''	3
A253	1	#5	STR	5'-4''	6
A254	1	#5	STR	3'-1''	3
A300	203	#6	STR	23'-8''	7216
A301	1	#6	STR	21'-10''	33
A302	1	#6	STR	19'-1''	29
A303	1	#6	STR	16'-4''	25
A304	1	#6	STR	13'-7''	20
A305	1	#6	STR	10'-10''	16
A306	1	#6	STR	8'-1''	12
A307	1	#6	STR	1'-0''	2
A308	1	#6	STR	2'-7''	4
A309	1	#6	STR	21'-3''	32
A310	1	#6	STR	18'-11''	28
A311	1	#6	STR	16'-7''	25
A312	1	#6	STR	14'-3''	21
A313	1	#6	STR	11'-11''	18
A314	1	#6	STR	9'-7''	14
A315	1	#6	STR	7'-8''	12
A316	1	#6	STR	5'-4''	8
A317	1	#6	STR	3'-1''	5
A450	209	#6	STR	6'-7''	2067
A451	1	#6	STR	5'-6''	8
A452	1	#6	STR	2'-9''	4
A453	1	#6	STR	5'-4''	8
A454	1	#6	STR	3'-1''	5
A1	423	#6	1	8'-8''	5507
A2	423	#7	1	9'-9''	8430
B1	423	#5	STR	11'-1''	4890
B2	212	#4	STR	7'-4''	1038
C1	306	#4	STR	37'-6''	7665
D1	25	#6	STR	2'-6''	94
G1	4	#5	STR	25'-10''	108
L1	2	#4	3	5'-0"	10
S2	6	#6	STR	7'-0''	63
S4	6	#6	STR	25'-2''	227
S5	3	#8	STR	25'-10''	207
REINFORCING STEEL					44,530 LBS.

BAR TYPES







ALL BAR DIMENSIONS ARE OUT TO OUT.

SPLICE LENGTH CHART

BAR	SIZE	SPLICE
A200, A207-A212	#5	3'-0"
A400, A407-A412	#5	2'-9"
B1	#5	2'-4"
B3	#4	1'-10"
C1	#4	2'-5"
S1	#6	3'-7"

DRAWN BY : J.S. HOBSON DATE : 04/03/19
CHECKED BY : J.A. LEE DATE : 04/18/19
DESIGN ENGINEER OF RECORD : J.S. HOBSON DATE : 04/26/19

Mead &Hunt
111 E. Hargett Street
Suite 300
Raleigh, NC 27601
919-714-8670
meadhunt.com
NC License No. F-1235

NORTH CAROLINA PROFESSIONAL SEAL 043177 ENGINEER JOHN S. HOBSON
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PROJECT NO. R-4707
GUILFORD COUNTY
STATION: 56+34.85 -L-

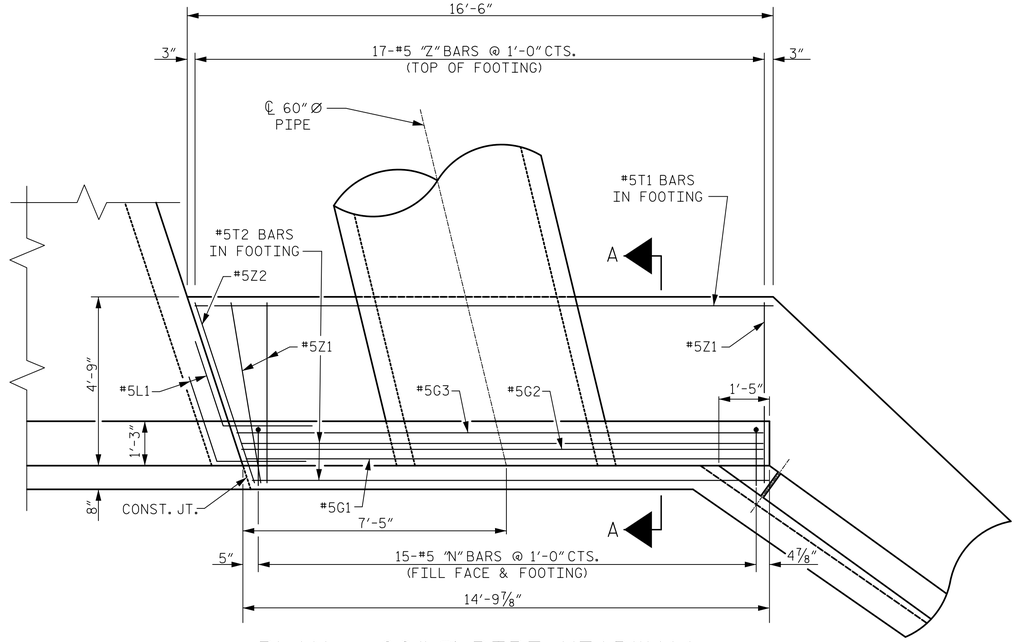
SHEET 10 OF 16

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

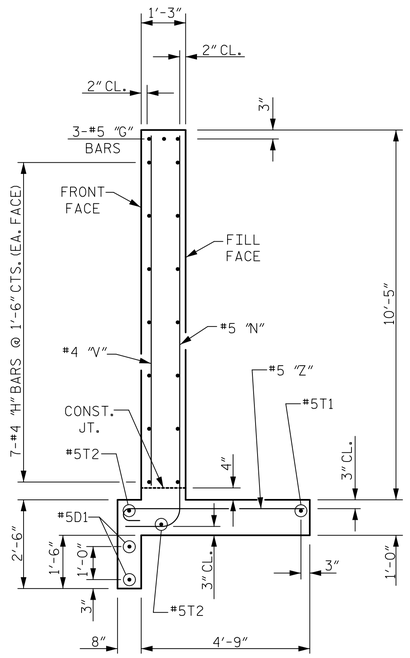
TRIPLE 7 FT. x 8 FT. REINFORCED CONCRETE BOX CULVERT

(RIGHT EXTENSION)

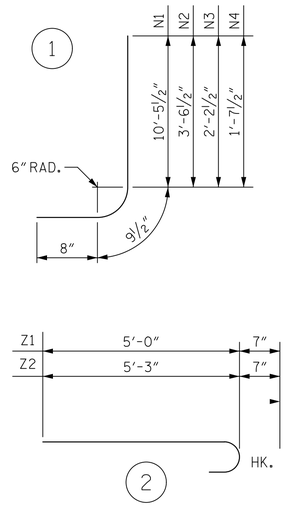
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C1-18
1			3			TOTAL SHEETS
2			4			24



PLAN - 60″Ø PIPE HEADWALL



SECTION A-A



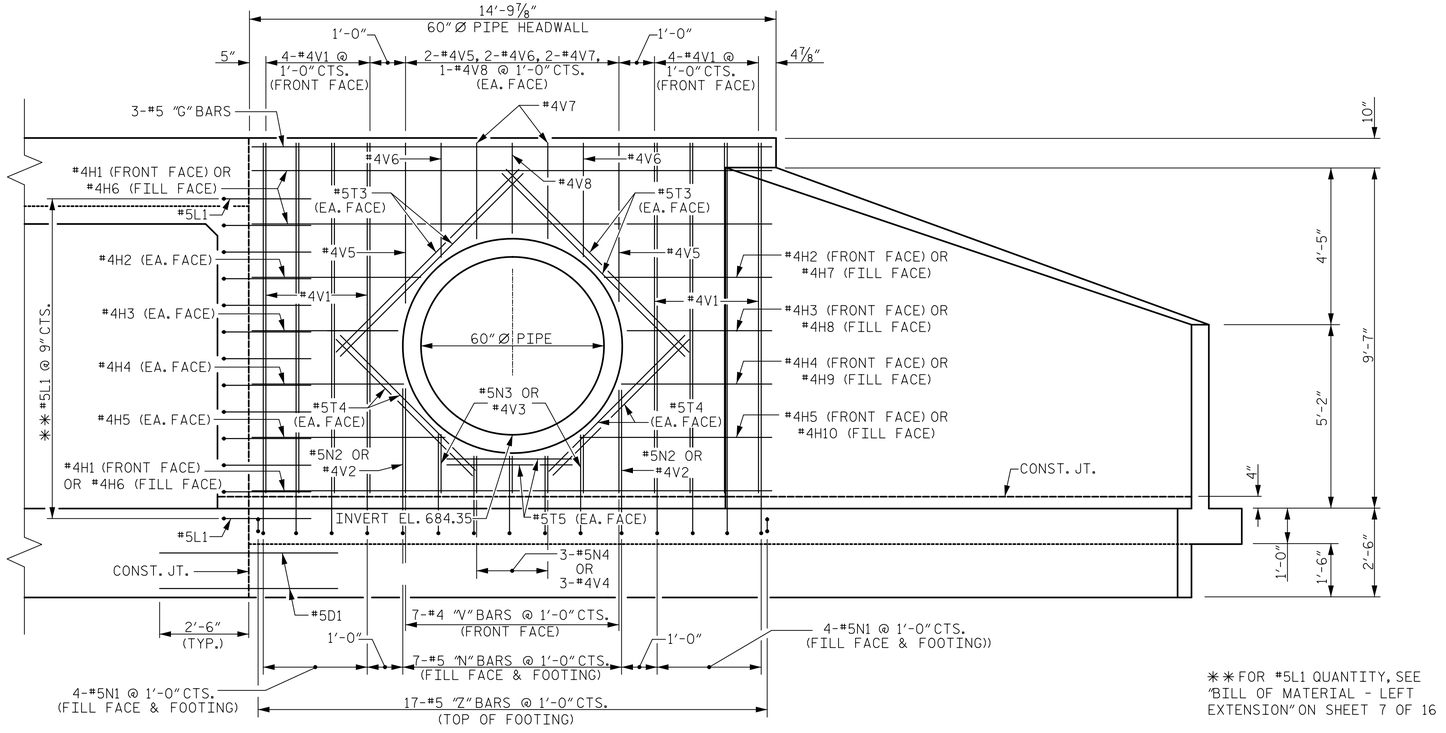
BAR TYPES

ALL BAR DIMENSIONS ARE OUT TO OUT.

BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
D1	2	#5	STR	5′-0″	10
H1	3	#4	STR	14′-6″	29
H2	3	#4	STR	4′-8″	9
H3	3	#4	STR	4′-0″	8
H4	3	#4	STR	4′-3″	9
H5	3	#4	STR	5′-4″	11
H6	3	#4	STR	14′-10″	30
H7	1	#4	STR	4′-10″	3
H8	1	#4	STR	4′-2″	3
H9	1	#4	STR	4′-5″	3
H10	1	#4	STR	5′-6″	4
G1	1	#5	STR	14′-6″	15
G2	1	#5	STR	14′-8″	15
G3	1	#5	STR	14′-10″	15
N1	8	#5	1	11′-11″	99
N2	2	#5	1	5′-0″	10
N3	2	#5	1	3′-8″	8
N4	3	#5	1	3′-1″	10
T1	1	#5	STR	16′-3″	17
T2	2	#5	STR	14′-7″	30
T3	8	#5	STR	7′-4″	61
T4	8	#5	STR	5′-5″	45
T5	4	#5	STR	3′-9″	16
V1	8	#4	STR	9′-11″	53
V2	2	#4	STR	3′-0″	4
V3	2	#4	STR	1′-8″	2
V4	3	#4	STR	1′-1″	2
V5	4	#4	STR	4′-5″	12
V6	4	#4	STR	3′-2″	8
V7	4	#4	STR	2′-8″	7
V8	2	#4	STR	2′-6″	3
Z1	16	#5	2	5′-7″	93
Z2	1	#5	2	5′-10″	6

REINFORCING STEEL (60″Ø PIPE HEADWALL)	650 LBS
CLASS A CONCRETE (60″Ø PIPE HEADWALL)	9.4 CY



ELEVATION - 60″Ø PIPE HEADWALL

∗∗ FOR #5L1 QUANTITY, SEE "BILL OF MATERIAL - LEFT EXTENSION" ON SHEET 7 OF 16

I HEREBY CERTIFY THESE PLANS ARE THE AS-BUILT PLANS

Mead & Hunt
111 E. Hargett Street
Suite 300
Raleigh, NC 27601
919-714-8670
meadhunt.com
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NORTH CAROLINA PROFESSIONAL SEAL 043177 ENGINEER SHAWN S. HOBSON

DocuSigned by: Jack Hobson 5B6E7C2B670044B... 4/16/2020

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PROJECT NO. R-4707

GUILFORD COUNTY

STATION: 56+34.85 -L-

SHEET 11 OF 16

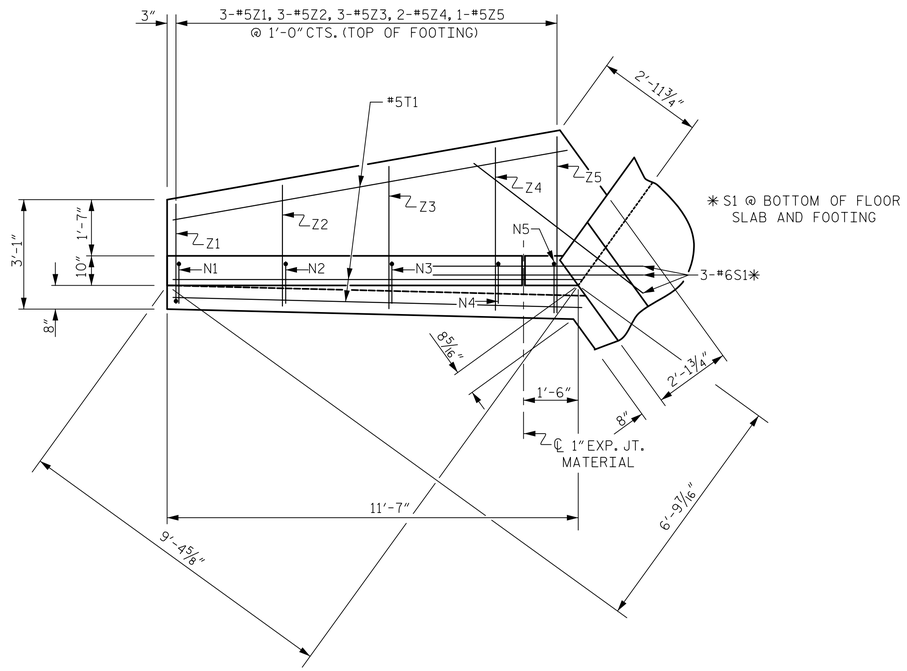
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

60″Ø PIPE HEADWALL

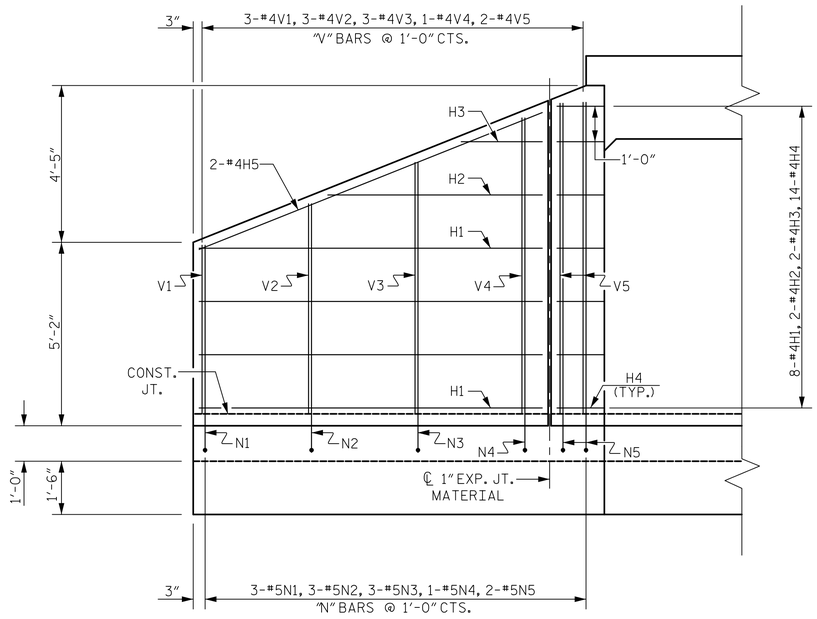
(LEFT EXTENSION)

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C1-19
1			3			TOTAL SHEETS
2			4			24

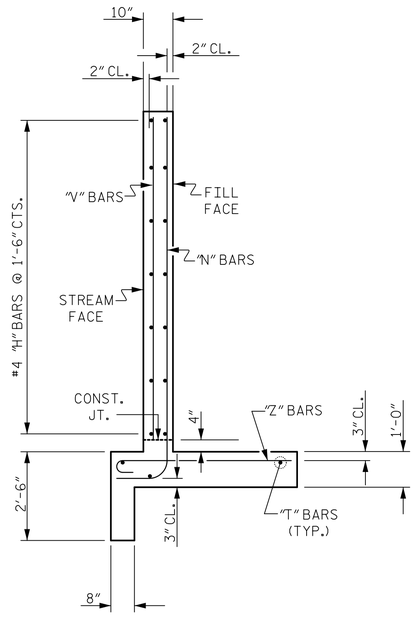
DRAWN BY :	J.A. LEE	DATE :	03/18/19
CHECKED BY :	J.S. HOBSON	DATE :	04/15/19
DESIGN ENGINEER OF RECORD :	J.S. HOBSON	DATE :	04/26/19



PLAN W1

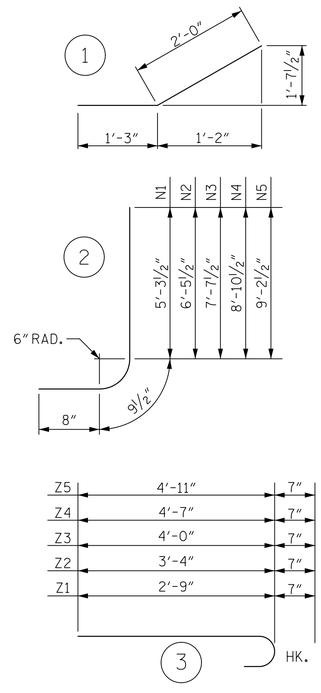


ELEVATION W1



TYPICAL WING SECTION

BAR TYPES



ALL BAR DIMENSIONS ARE OUT TO OUT.

BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	8	#4	STR	9'-8"	52
H2	2	#4	STR	6'-0"	8
H3	2	#4	STR	2'-3"	3
H4	14	#4	1	3'-3"	30
H5	2	#4	STR	10'-4"	14
N1	3	#5	2	6'-9"	21
N2	3	#5	2	7'-11"	25
N3	3	#5	2	9'-1"	28
N4	1	#5	2	10'-4"	11
N5	2	#5	2	10'-8"	22
S1	3	#6	STR	6'-0"	27
T1	3	#5	STR	11'-3"	35
V1	3	#4	STR	4'-9"	10
V2	3	#4	STR	5'-11"	12
V3	3	#4	STR	7'-1"	14
V4	1	#4	STR	8'-4"	6
V5	2	#4	STR	8'-8"	12
Z1	3	#5	3	3'-4"	10
Z2	3	#5	3	3'-11"	12
Z3	3	#5	3	4'-7"	14
Z4	2	#5	3	5'-2"	11
Z5	1	#5	3	5'-6"	6

REINFORCING STEEL
FOR WING W1 383 LBS

CLASS A CONCRETE
WING W1 4.5 CY
CURTAIN WALL 0.4 CY
TOTAL 4.9 CY

DRAWN BY : J.A. LEE DATE : 03/25/19
CHECKED BY : J.S. HOBSON DATE : 04/15/19
DESIGN ENGINEER OF RECORD : J.S. HOBSON DATE : 04/26/19

Mead & Hunt
111 E. Hargett Street
Suite 300
Raleigh, NC 27601
919-714-8670
meadhunt.com
NC License No. F-1235

NORTH CAROLINA PROFESSIONAL SEAL 043177 ENGINEER JOHN S. HOBSON
DocuSigned by: Jack Hobson 5B6E7C2B67004B... 4/16/2020

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT NO. R-4707
GUILFORD COUNTY
STATION: 56+34.85 -L-

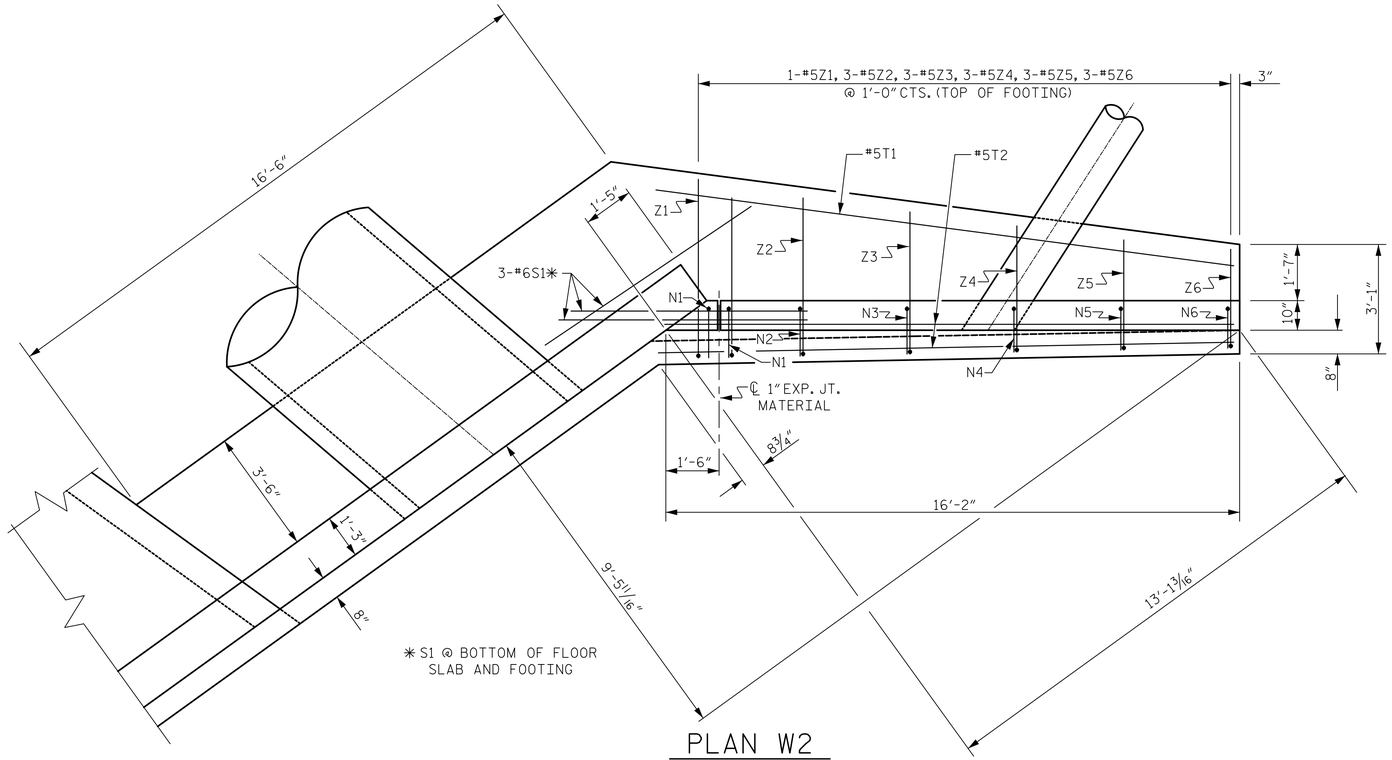
SHEET 12 OF 16

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

WING W1
FOR
CONCRETE BOX CULVERT
(LEFT EXTENSION)

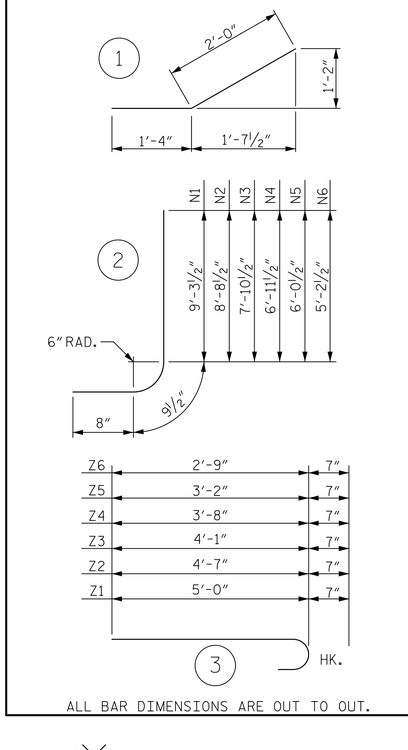
H=8'-0" SLOPE=2:1

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C1-20
1			3			TOTAL SHEETS
2			4			24



PLAN W2

BAR TYPES



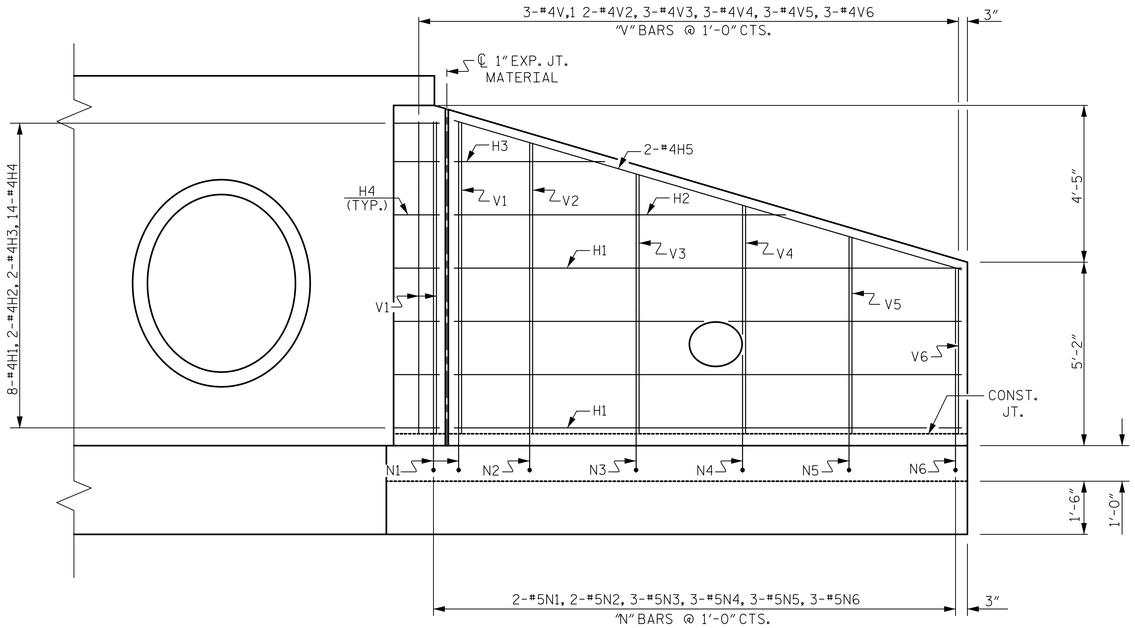
ALL BAR DIMENSIONS ARE OUT TO OUT.

BILL OF MATERIAL

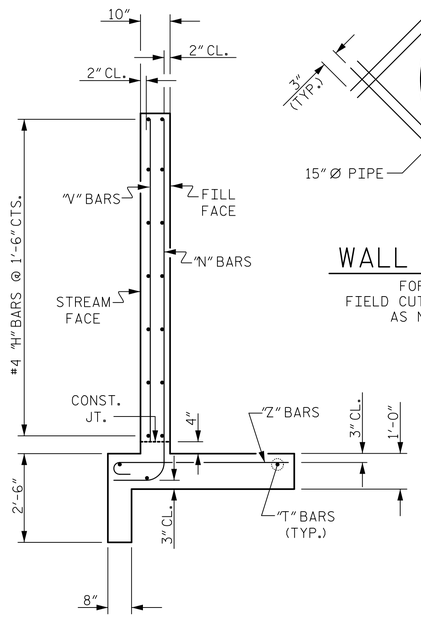
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
E1	16	#5	STR	2'-8"	45
H1	8	#4	STR	14'-3"	76
H2	2	#4	STR	9'-2"	12
H3	2	#4	STR	4'-1"	5
H4	14	#4	1	3'-4"	31
H5	2	#4	STR	14'-10"	20
N1	2	#5	2	10'-9"	22
N2	2	#5	2	10'-2"	21
N3	3	#5	2	9'-4"	29
N4	3	#5	2	8'-5"	26
N5	3	#5	2	7'-6"	23
N6	3	#5	2	6'-8"	21
S1	3	#6	STR	7'-0"	32
T1	1	#5	STR	17'-6"	18
T2	2	#5	STR	16'-1"	34
V1	3	#4	STR	8'-9"	18
V2	2	#4	STR	8'-2"	11
V3	3	#4	STR	7'-4"	15
V4	3	#4	STR	6'-5"	13
V5	3	#4	STR	5'-6"	11
V6	3	#4	STR	4'-8"	9
Z1	1	#5	3	5'-7"	6
Z2	3	#5	3	5'-2"	16
Z3	3	#5	3	4'-8"	15
Z4	3	#5	3	4'-3"	13
Z5	3	#5	3	3'-9	12
Z6	3	#5	3	3'-4"	10

REINFORCING STEEL
FOR WING W2 564 LBS

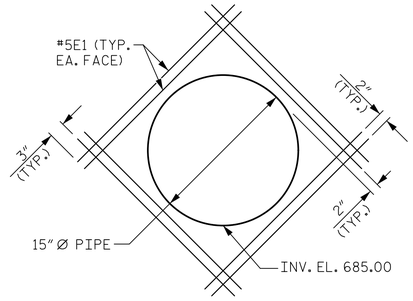
CLASS A CONCRETE
WING W2 6.1 CY
CURTAIN WALL 0.6 CY
TOTAL 6.7 CY



ELEVATION W2



TYPICAL WING SECTION



WALL OPENING DETAIL

FOR PIPE THROUGH W2 WALL.
FIELD CUT, SHIFT, OR BEND "N", "H", AND "V" AS NECESSARY TO CLEAR PIPE.

Mead &Hunt
111 E. Hargett Street
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Raleigh, NC 27601
919-714-8670
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NORTH CAROLINA PROFESSIONAL SEAL 043177 ENGINEER JOHN S. HOBSON
DocuSigned by: Jack Hobson 5B6E7C2B67004AB 4/16/2020

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT NO. R-4707
GUILFORD COUNTY
STATION: 56+34.85 -L-

SHEET 13 OF 16

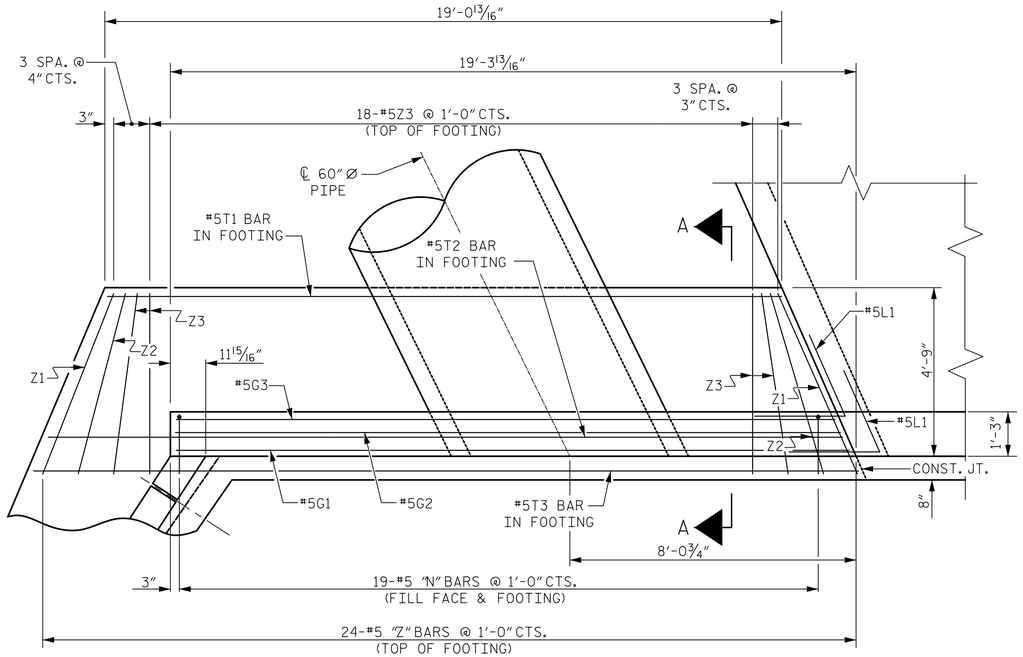
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

WING W2 FOR CONCRETE BOX CULVERT (LEFT EXTENSION)

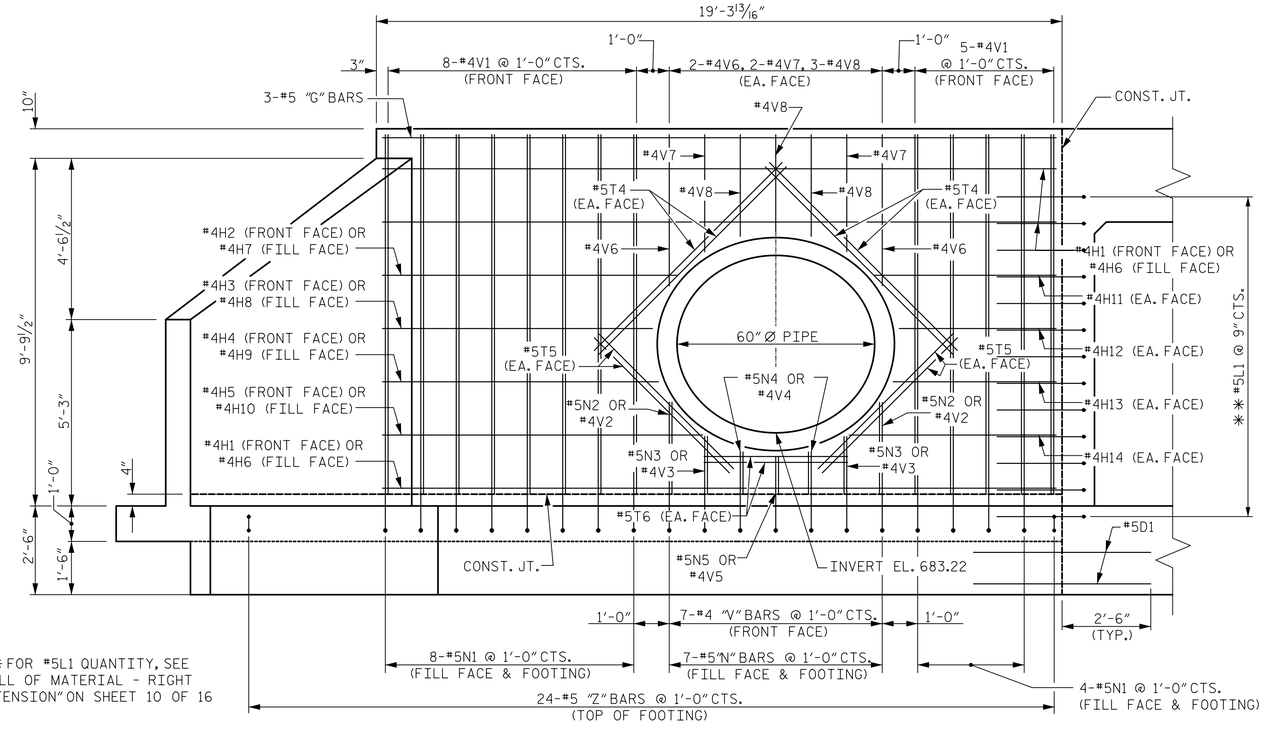
H=8'-0" SLOPE=2:1

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C1-21
1			3			TOTAL SHEETS
2			4			24

DRAWN BY : J.A. LEE DATE : 03/18/19
CHECKED BY : J.S. HOBSON DATE : 04/15/19
DESIGN ENGINEER OF RECORD : J.S. HOBSON DATE : 04/26/19

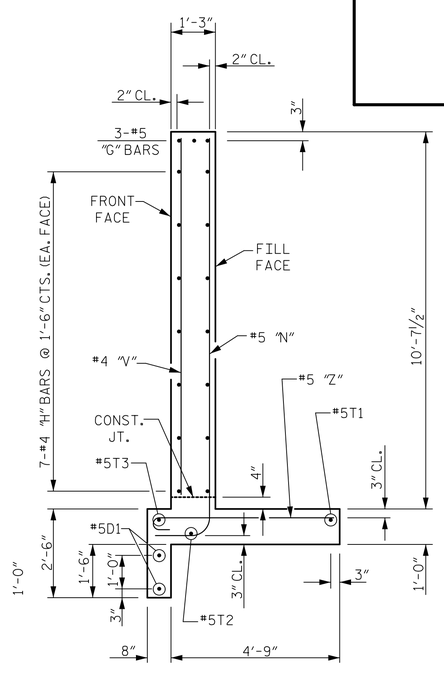


PLAN - 60″Ø PIPE HEADWALL



**FOR #5L1 QUANTITY, SEE "BILL OF MATERIAL - RIGHT EXTENSION" ON SHEET 10 OF 16

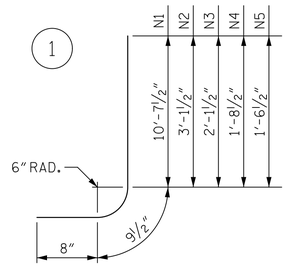
ELEVATION - 60″Ø PIPE HEADWALL

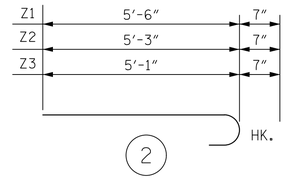


SECTION A-A

BAR TYPES

ALL BAR DIMENSIONS ARE OUT TO OUT.





BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
D1	2	#5	STR	5′-0″	10
H1	3	#4	STR	18′-10″	38
H2	1	#4	STR	8′-3″	6
H3	1	#4	STR	7′-7″	5
H4	1	#4	STR	7′-9″	5
H5	1	#4	STR	9′-0″	6
H6	3	#4	STR	18′-6″	37
H7	1	#4	STR	7′-10″	5
H8	1	#4	STR	7′-2″	5
H9	1	#4	STR	7′-4″	5
H10	1	#4	STR	8′-7″	6
H11	2	#4	STR	5′-0″	7
H12	2	#4	STR	4′-4″	6
H13	2	#4	STR	4′-6″	6
H14	2	#4	STR	5′-9″	8
G1	1	#5	STR	18′-10″	20
G2	1	#5	STR	18′-8″	19
G3	1	#5	STR	18′-6″	19
N1	12	#5	1	12′-1″	151
N2	2	#5	1	4′-7″	10
N3	2	#5	1	3′-7″	7
N4	2	#5	1	3′-2″	7
N5	1	#5	1	3′-0″	3
T1	1	#5	STR	18′-11″	20
T2	1	#5	STR	22′-3″	23
T3	1	#5	STR	23′-2″	24
T4	8	#5	STR	7′-6″	63
T5	8	#5	STR	5′-5″	45
T6	4	#5	STR	4′-1″	17
V1	13	#4	STR	10′-1″	88
V2	2	#4	STR	2′-7″	3
V3	2	#4	STR	1′-7″	2
V4	2	#4	STR	1′-2″	2
V5	1	#4	STR	1′-0″	1
V6	4	#4	STR	4′-2″	11
V7	4	#4	STR	3′-3″	9
V8	6	#4	STR	2′-8″	11
Z1	2	#5	2	6′-1″	13
Z2	2	#5	2	5′-10″	12
Z3	20	#5	2	5′-8″	118

REINFORCING STEEL (60″Ø PIPE HEADWALL)	853 LBS
CLASS A CONCRETE (60″Ø PIPE HEADWALL)	12.6 CY

I HEREBY CERTIFY THESE PLANS ARE THE AS-BUILT PLANS

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Mead & Hunt
111 E. Hargett Street
Suite 300
Raleigh, NC 27601
919-714-8670
meadhunt.com
NC License No. F-1235

NORTH CAROLINA PROFESSIONAL SEAL 043177 ENGINEER JOHN S. HOBSON

DocuSigned by: Jack Hobson 5B6E7C2B67004AB... 4/16/2020

PROJECT NO. R-4707

GUILFORD COUNTY

STATION: 56+34.85 -L-

SHEET 14 OF 16

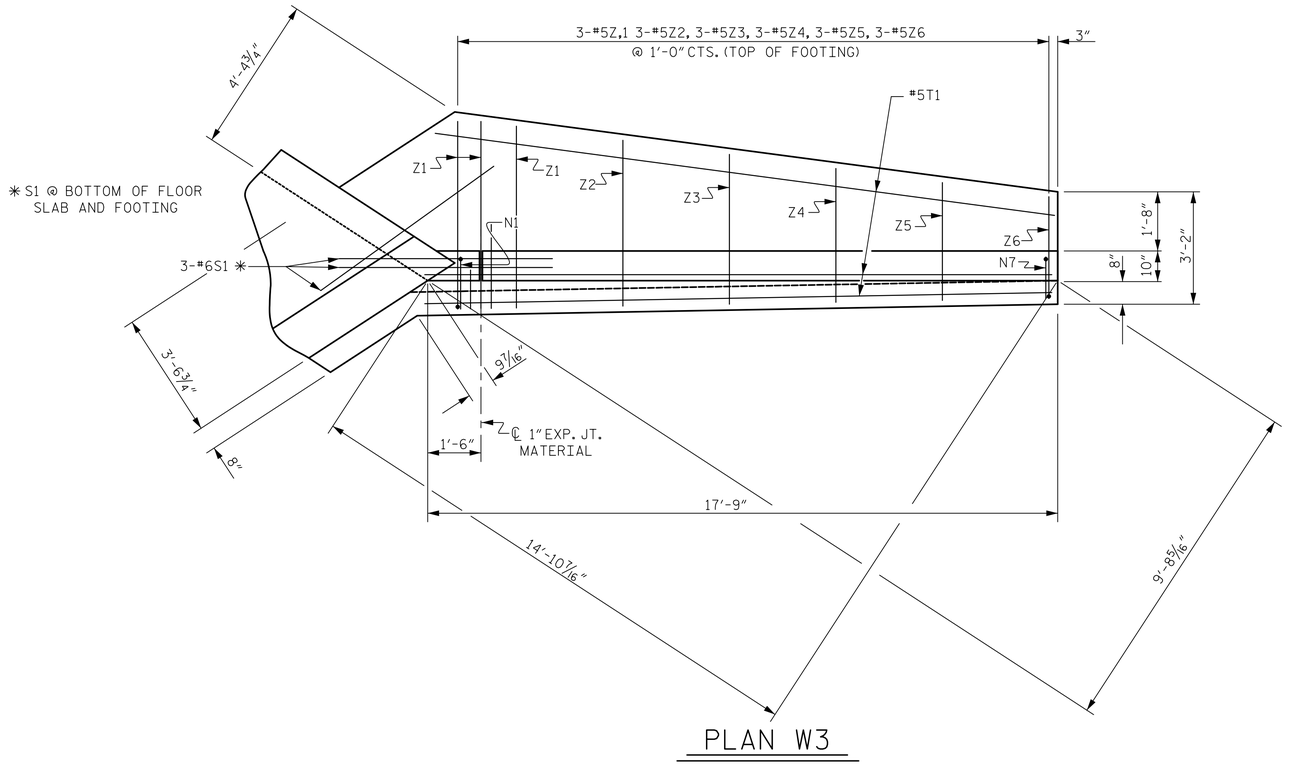
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

60″Ø PIPE HEADWALL

(RIGHT EXTENSION)

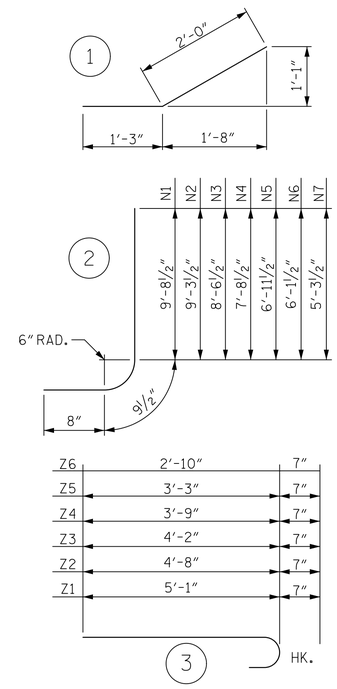
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C1-22
1			3			TOTAL SHEETS
2			4			24

DRAWN BY : J.A. LEE DATE : 03/26/19
CHECKED BY : J.S. HOBSON DATE : 04/15/19
DESIGN ENGINEER OF RECORD : J.S. HOBSON DATE : 04/26/19



PLAN W3

BAR TYPES

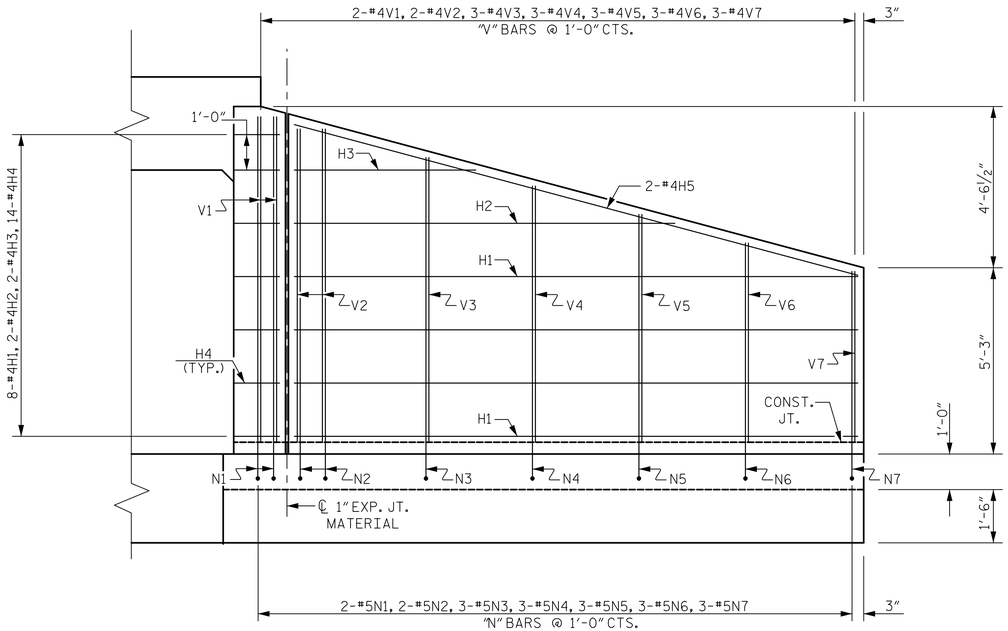


ALL BAR DIMENSIONS ARE OUT TO OUT.

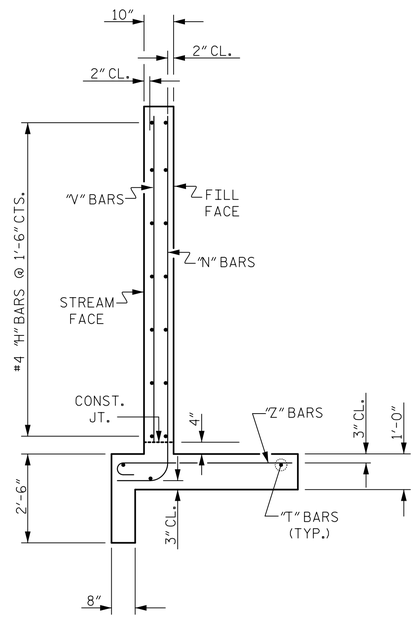
BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	8	#4	STR	15'-10"	85
H2	2	#4	STR	10'-8"	14
H3	2	#4	STR	5'-1"	7
H4	14	#4	1	3'-3"	30
H5	2	#4	STR	16'-5"	22
N1	2	#5	2	11'-2"	23
N2	2	#5	2	10'-9"	22
N3	3	#5	2	10'-0"	31
N4	3	#5	2	9'-2"	29
N5	3	#5	2	8'-5"	26
N6	3	#5	2	7'-7"	24
N7	3	#5	2	6'-9"	21
S1	3	#6	STR	6'-0"	27
T1	3	#5	STR	17'-6"	55
V1	2	#4	STR	9'-2"	12
V2	2	#4	STR	8'-9"	12
V3	3	#4	STR	8'-0"	16
V4	3	#4	STR	7'-2"	14
V5	3	#4	STR	6'-5"	13
V6	3	#4	STR	5'-7"	11
V7	3	#4	STR	4'-9"	10
Z1	3	#5	3	5'-8"	18
Z2	3	#5	3	5'-3"	16
Z3	3	#5	3	4'-9"	15
Z4	3	#5	3	4'-4"	14
Z5	3	#5	3	3'-10"	12
Z6	3	#5	3	3'-5"	11

REINFORCING STEEL FOR WING W3	590	LBS
CLASS A CONCRETE		
WING W3	7.3	CY
CURTAIN WALL	0.7	CY
TOTAL	8.0	CY



ELEVATION W3



TYPICAL WING SECTION

DRAWN BY : J.A. LEE DATE : 03/18/19
CHECKED BY : J.S. HOBSON DATE : 04/15/19
DESIGN ENGINEER OF RECORD : J.S. HOBSON DATE : 04/26/19

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DocuSigned by: Jack Hobson 5B6E7C2B670044B...
4/16/2020

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PROJECT NO. R-4707
GUILFORD COUNTY
STATION: 56+34.85 -L-

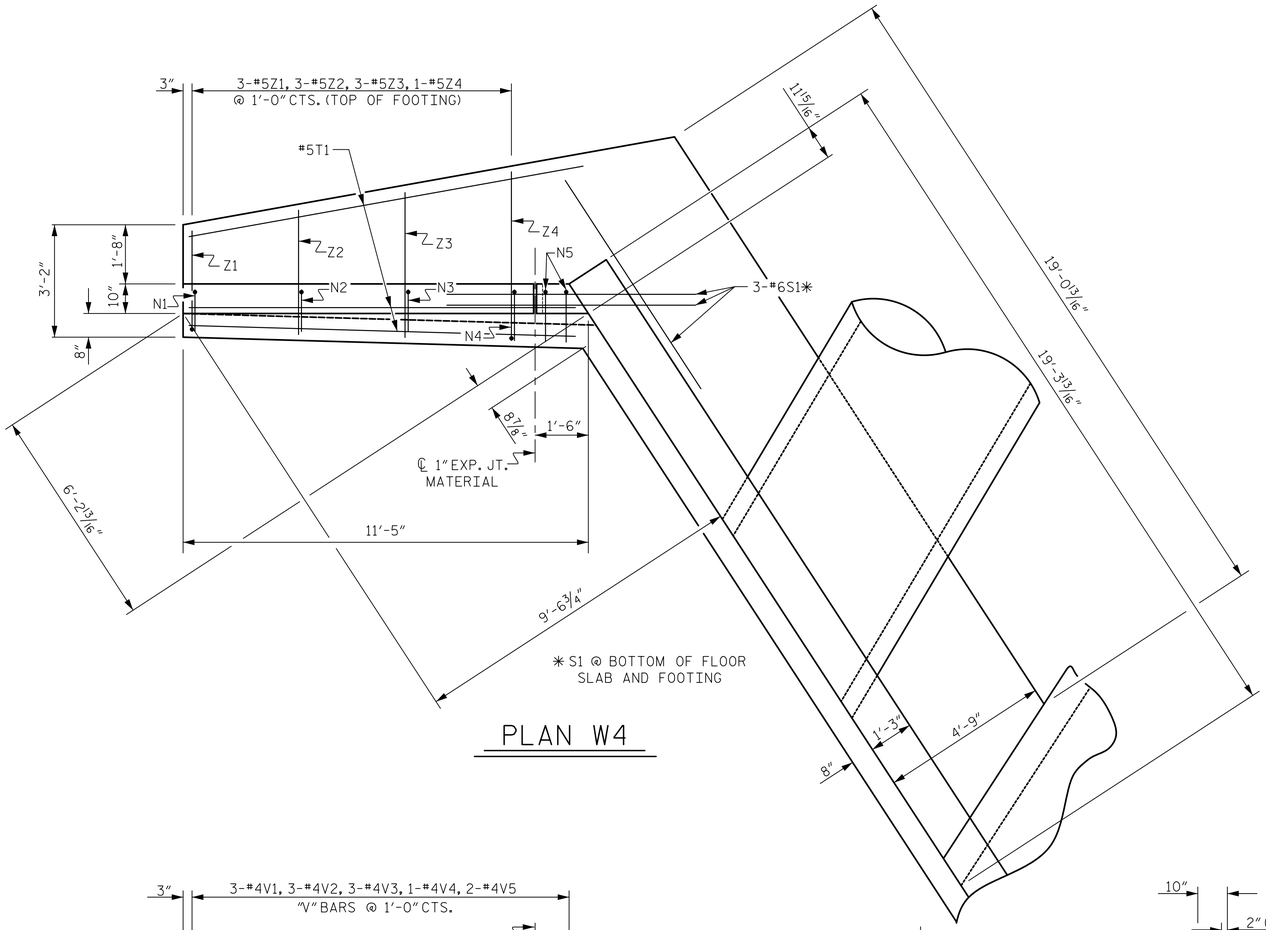
SHEET 15 OF 16

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

WING W3 FOR CONCRETE BOX CULVERT (RIGHT EXTENSION)

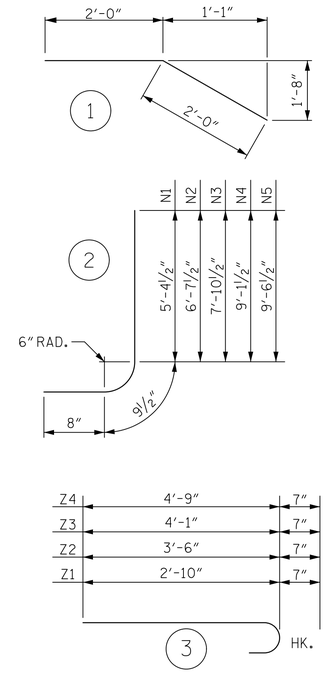
H=8'-0" SLOPE=2:1

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C1-23
1			3			TOTAL SHEETS
2			4			24



PLAN W4

BAR TYPES

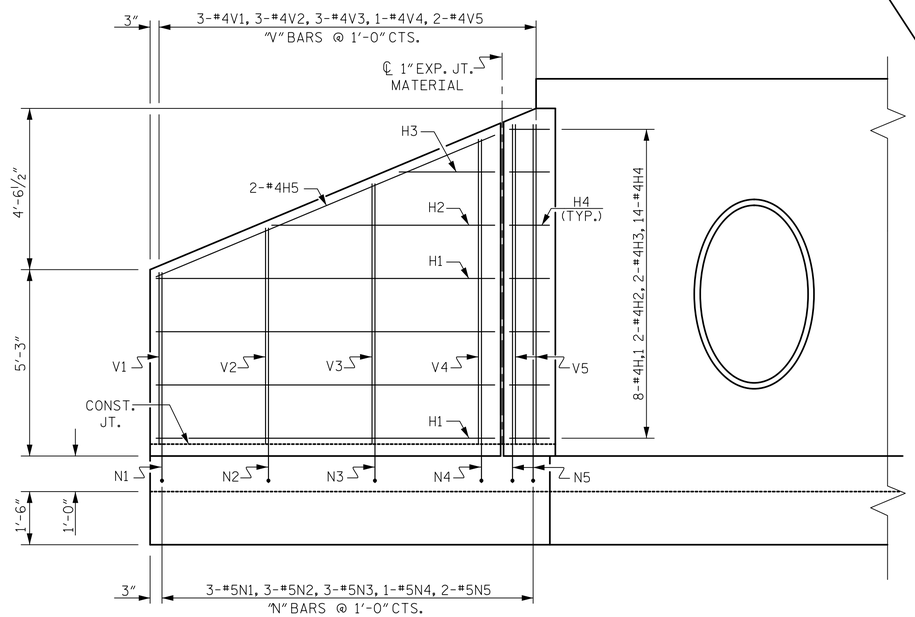


ALL BAR DIMENSIONS ARE OUT TO OUT.

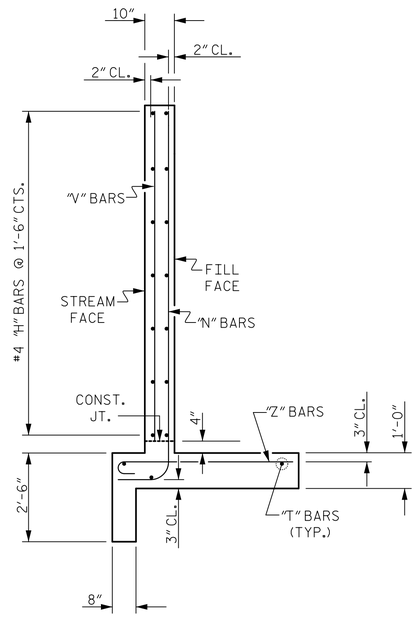
BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	8	#4	STR	9'-6"	51
H2	2	#4	STR	6'-3"	8
H3	2	#4	STR	2'-8"	4
H4	14	#4	1	4'-0"	37
H5	2	#4	STR	10'-4"	14
N1	3	#5	2	6'-10"	21
N2	3	#5	2	8'-1"	25
N3	3	#5	2	9'-4"	29
N4	1	#5	2	10'-7"	11
N5	2	#5	2	11'-0"	23
S1	3	#6	STR	7'-0"	32
T1	3	#5	STR	11'-0"	34
V1	3	#4	STR	4'-10"	10
V2	3	#4	STR	6'-1"	12
V3	3	#4	STR	7'-4"	15
V4	1	#4	STR	8'-7"	6
V5	2	#4	STR	9'-0"	12
Z1	3	#5	3	3'-5"	11
Z2	3	#5	3	4'-1"	13
Z3	3	#5	3	4'-8"	15
Z4	1	#5	3	5'-4"	6

REINFORCING STEEL FOR WING W4	389	LBS
CLASS A CONCRETE		
WING W4	4.3	CY
CURTAIN WALL	0.4	CY
TOTAL	4.7	CY



ELEVATION W4



TYPICAL WING SECTION

Mead &Hunt
111 E. Hargett Street
Suite 300
Raleigh, NC 27601
919-714-8670
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NC License No. F-1235

NORTH CAROLINA PROFESSIONAL SEAL 043177 ENGINEER JOHN S. HOBSON
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PROJECT NO. R-4707
GUILFORD COUNTY
STATION: 56+34.85 -L-

SHEET 16 OF 16

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

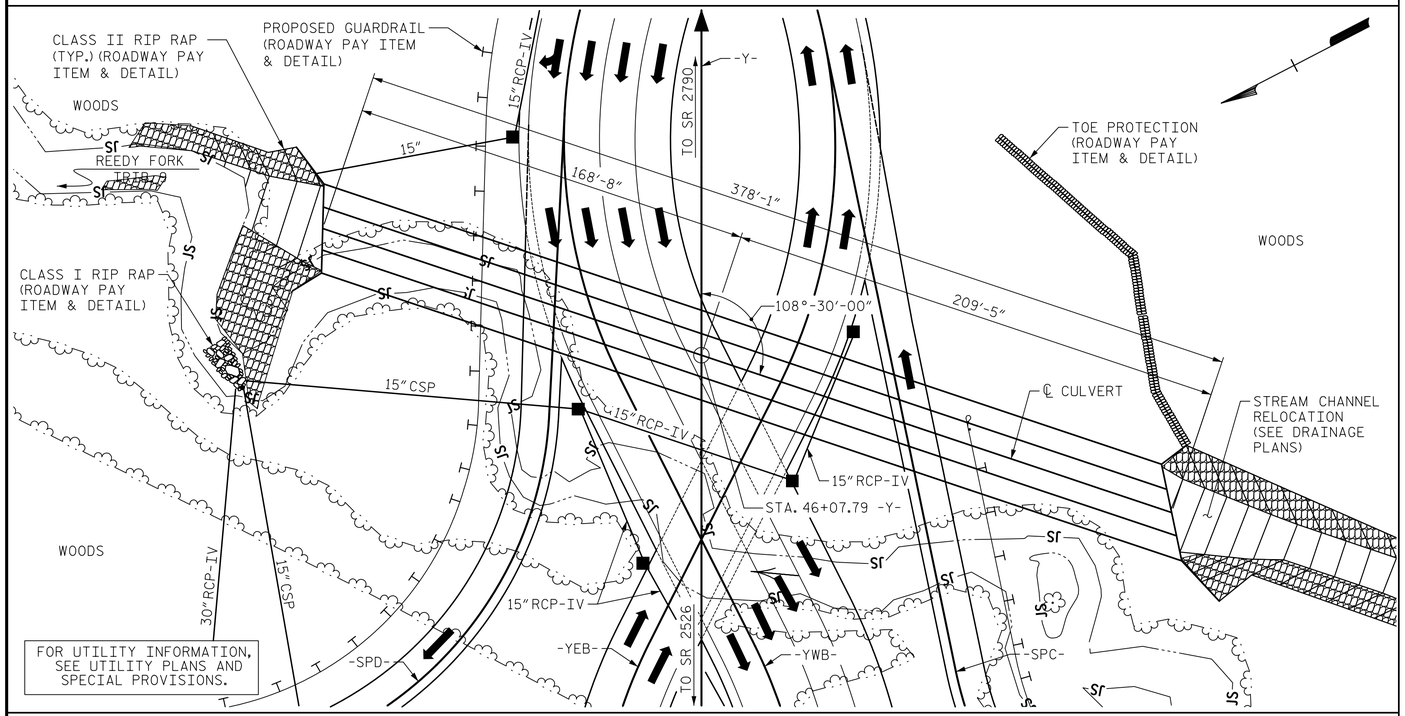
WING W4 FOR CONCRETE BOX CULVERT (RIGHT EXTENSION)

H=8'-0" SLOPE=2:1

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C1-24
1			3			TOTAL SHEETS
2			4			24

DRAWN BY : J.A. LEE DATE : 03/27/19
CHECKED BY : J.S. HOBSON DATE : 04/15/19
DESIGN ENGINEER OF RECORD : J.S. HOBSON DATE : 04/26/19

BM #11: R/R SPIKE IN ROOT OF 24" HICKORY TREE, 166.54' LT OF STA. 55+89.32 -Y-, EL. 733.65



LOCATION SKETCH

HYDRAULIC DATA

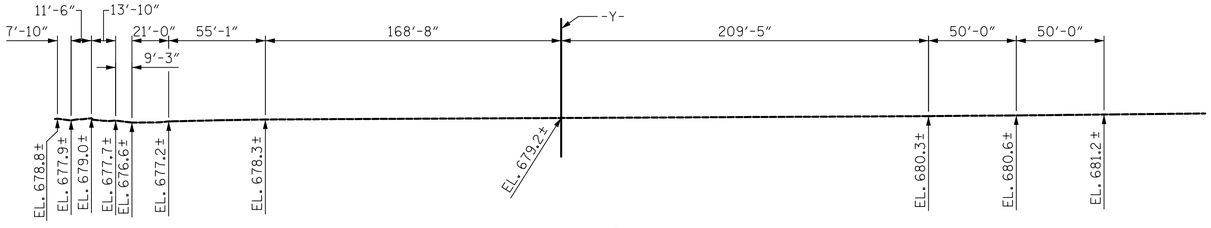
DESIGN DISCHARGE	= 1,700 C.F.S.
FREQUENCY OF DESIGN FLOOD	= 50 YRS.
DESIGN HIGH WATER ELEVATION	= 687.6'
DRAINAGE AREA	= 3.16 SQ. MI.
BASE DISCHARGE (Q100)	= 2,100 C.F.S.
BASE HIGH WATER ELEVATION	= 689.4'

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE	= 8,400 C.F.S.
FREQUENCY OF OVERTOPPING FLOOD	= 500+ YRS.
OVERTOPPING FLOOD ELEVATION	= 719.7'

ROADWAY DATA

GRADE POINT ELEV. @ STA. 46+07.79 -Y- = 726.23
BED ELEV. @ STA. 46+07.79 -Y- = 679.20
ROADWAY FILL SLOPES= 2:1



PROFILE ALONG ℄ CULVERT

NOTES

ASSUMED LIVE LOAD ---------- HL-93 OR ALTERNATE LOADING.

MAX. DESIGN FILL---------- 37.99 FT.

MIN. DESIGN FILL---------- 33.57 FT.

FOR OTHER DESIGN DATA AND NOTES SEE STANDARD NOTE SHEET.

3" Ø WEEP HOLES INDICATED TO BE IN ACCORDANCE WITH THE SPECIFICATIONS.

CONCRETE IN CULVERTS TO BE POURED IN THE FOLLOWING ORDER:

1. WING FOOTINGS AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS.
2. THE REMAINING PORTIONS OF THE WALLS AND WINGS FULL HEIGHT.
3. ROOF SLAB INCLUDING REMAINING PORTION OF WALLS AND HEADWALL.

THE RESIDENT ENGINEER SHALL CHECK THE LENGTH OF CULVERT BEFORE STAKING IT OUT TO MAKE CERTAIN THAT IT WILL PROPERLY TAKE CARE OF THE FILL.

DIMENSIONS FOR WING LAYOUT AS WELL AS ADDITIONAL REINFORCING STEEL EMBEDDED IN BARREL ARE SHOWN ON WING SHEET.

STEEL IN THE BOTTOM SLAB MAY BE SPLICED AT THE PERMITTED CONSTRUCTION JOINT AT THE CONTRACTOR'S OPTION. EXTRA WEIGHT OF STEEL DUE TO SPLICES WILL BE PAID FOR BY THE CONTRACTOR.

TRANSVERSE CONSTRUCTION JOINTS SHALL BE USED IN THE BARREL, SPACED TO LIMIT THE POURS TO A MAXIMUM OF 70 FT. LOCATION OF JOINTS SHALL BE SUBJECT TO APPROVAL OF THE ENGINEER.

A 3 FOOT STRIP OF FILTER FABRIC SHALL BE ATTACHED TO THE FILL FACE OF THE WING COVERING THE ENTIRE LENGTH OF THE EXPANSION JOINT.

AT THE CONTRACTOR'S OPTION, HE MAY SPLICE THE VERTICAL REINFORCING STEEL IN THE INTERIOR FACE OF EXTERIOR WALLS AND BOTH FACES OF INTERIOR WALLS ABOVE LOWER WALL CONSTRUCTION JOINT. THE SPLICE LENGTH SHALL BE AS PROVIDED IN THE SPLICE LENGTH CHART SHOWN ON THE PLANS. EXTRA WEIGHT OF STEEL DUE TO THE SPLICES SHALL BE PAID FOR BY THE CONTRACTOR.

EXCAVATE A MINIMUM OF 1 FOOT BELOW CULVERT BEARING ELEVATION AND REPLACE WITH FOUNDATION CONDITIONING MATERIAL PER SECTION 414 OF THE STANDARD SPECIFICATIONS.

UNDERCUT ANY SOFT/LOOSE ALLUVIAL SOILS THAT MAY BE ENCOUNTERED BENEATH THE BOTTOM OF THE FOUNDATION CONDITIONING MATERIAL. BACKFILL UNDERCUT AREAS WITH FOUNDATION CONDITIONING MATERIAL (SELECT MATERIAL CLASS VI; NO. 57 STONE). INCLUDE 600 CUBIC YARDS OF UNDERCUT AND 875 TONS OF FOUNDATION CONDITIONING MATERIAL AS CONTINGENCY ITEMS IN THE CONTRACT.

NO PRECAST REINFORCED BOX CULVERT OPTION WILL BE ALLOWED.

DETAILED DRAWINGS FOR FALSEWORK AND FORMS FOR THIS BOX CULVERT SHALL BE SUBMITTED. SEE SHEET SN.

FOR CULVERT DIVERSION DETAILS AND PAY ITEMS, SEE EROSION CONTROL PLANS.

FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.

FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.

FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.

FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.

TOTAL STRUCTURE QUANTITIES

CLASS A CONCRETE			
BARREL @	7.109 CY/FT	2,668.2	C.Y.
WING ETC.		46.4	C.Y.
TOTAL		2,714.7	C.Y.
REINFORCING STEEL			
BARREL		334,072	LBS.
WINGS ETC.		3,298	LBS.
TOTAL		337,370	LBS.
CULVERT EXCAVATION ---------- LUMP SUM			
FOUNDATION COND. MAT'L ---------- 1,067 TONS			

I HEREBY CERTIFY THESE PLANS ARE THE AS-BUILT PLANS

DRAWN BY : J.S. HOBSON DATE : 03/07/19
CHECKED BY : J.A. LEE DATE : 04/03/19
DESIGN ENGINEER OF RECORD : J.S. HOBSON DATE : 04/11/19

Mead & Hunt
111 E. Hargett Street
Suite 300
Raleigh, NC 27601
919-714-8670
meadhunt.com
NC License No. F-1235

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 043177 J. S. HOBSON
Docusigned by: Jack Hobson 5B6E7C2B6700448...
4/16/2020

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT NO. R-4707
GUILFORD COUNTY
STATION: 46+07.79 -Y-

SHEET 1 OF 9 CULVERT NO. 1285

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

QUADRUPLE 8 FT. × 10 FT. REINFORCED CONCRETE BOX CULVERT

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C2-01
1			3			TOTAL SHEETS
2			4			9

LOAD AND RESISTANCE FACTOR RATING (LRFR) SUMMARY FOR REINFORCED CONCRETE BOX CULVERTS

LEVEL		VEHICLE	WEIGHT (W) (TONS)	⟨#⟩ CONTROLLING LOAD RATING	MINIMUM RATING FACTORS (RF)	TONS = W × RF	STRENGTH I LIMIT STATE									COMMENT NUMBER
								MOMENT				SHEAR				
							LIVE-LOAD FACTORS (γ_{LL})	RATING FACTOR	BOX NO.	ELEMENT TYPE	DISTANCE FROM LEFT END OF ELEMENT (ft)	RATING FACTOR	BOX NO.	ELEMENT TYPE	DISTANCE FROM LEFT END OF ELEMENT (ft)	
DESIGN LOAD RATING		HL-93 (INVENTORY)	N/A	⟨1⟩	4.21	--	1.75	4.21	1	TOP SLAB	4.17	12.28	1	TOP SLAB	2.31	
		HL-93 (OPERATING)	N/A		5.46	--	1.35	5.46	1	TOP SLAB	4.17	15.91	1	TOP SLAB	2.31	
		HS-20 (INVENTORY)	36.000	⟨2⟩	4.21	151.56	1.75	4.21	1	TOP SLAB	4.17	12.28	1	TOP SLAB	2.31	
		HS-20 (OPERATING)	36.000		5.46	196.56	1.35	5.46	1	TOP SLAB	4.17	15.91	1	TOP SLAB	2.31	
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH	13.500		20.13	271.76	1.40	20.13	1	TOP SLAB	4.17	58.24	1	TOP SLAB	2.31	
		SNGARBS2	20.000		13.61	272.20	1.40	13.61	1	TOP SLAB	4.17	39.38	1	TOP SLAB	2.31	
		SNAGRIS2	22.000		12.38	272.36	1.40	12.38	1	TOP SLAB	4.17	35.82	1	TOP SLAB	2.31	
		SNCOTTS3	27.250		9.97	271.68	1.40	9.97	1	TOP SLAB	4.17	28.86	1	TOP SLAB	2.31	
		SNAGGRS4	34.925		7.80	272.42	1.40	7.80	1	TOP SLAB	4.17	22.60	1	TOP SLAB	2.31	
		SNS5A	35.550		7.65	271.96	1.40	7.65	1	TOP SLAB	4.17	22.19	1	TOP SLAB	2.31	
		SNS6A	39.950		6.83	272.86	1.40	6.83	1	TOP SLAB	4.17	19.94	1	TOP SLAB	2.31	
		SNS7B	42.000		6.49	272.58	1.40	6.49	1	TOP SLAB	4.17	18.91	1	TOP SLAB	2.31	
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33.000		8.26	272.58	1.40	8.26	1	TOP SLAB	4.17	23.97	1	TOP SLAB	2.31	
		TNT4A	33.075		8.23	272.21	1.40	8.23	1	TOP SLAB	4.17	24.02	1	TOP SLAB	2.31	
		TNT6A	41.600		6.58	273.73	1.40	6.58	1	TOP SLAB	4.17	19.29	1	TOP SLAB	2.31	
		TNT7A	42.000		6.67	280.14	1.40	6.67	1	TOP SLAB	4.17	19.51	1	TOP SLAB	2.31	
		TNT7B	42.000		6.67	280.14	1.40	6.67	1	TOP SLAB	4.17	19.84	1	TOP SLAB	2.31	
		TNAGRIT4	43.000		6.33	272.19	1.40	6.33	1	TOP SLAB	4.17	18.49	1	TOP SLAB	2.31	
		TNAGT5A	45.000		6.07	273.15	1.40	6.07	1	TOP SLAB	4.17	17.83	1	TOP SLAB	2.31	
		TNAGT5B	45.000	⟨3⟩	6.06	272.70	1.40	6.06	1	TOP SLAB	4.17	17.59	1	TOP SLAB	2.31	

LOAD FACTORS:

DESIGN LOAD RATING FACTORS

LOAD TYPE	MAX FACTOR	MIN FACTOR
DC	1.25	0.90
DW	1.50	0.65
EV	1.30	0.90
EH	1.35	0.90
ES	1.35	0.90
LS	1.75	--
WA	1.00	--

NOTE:

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.

COMMENTS:

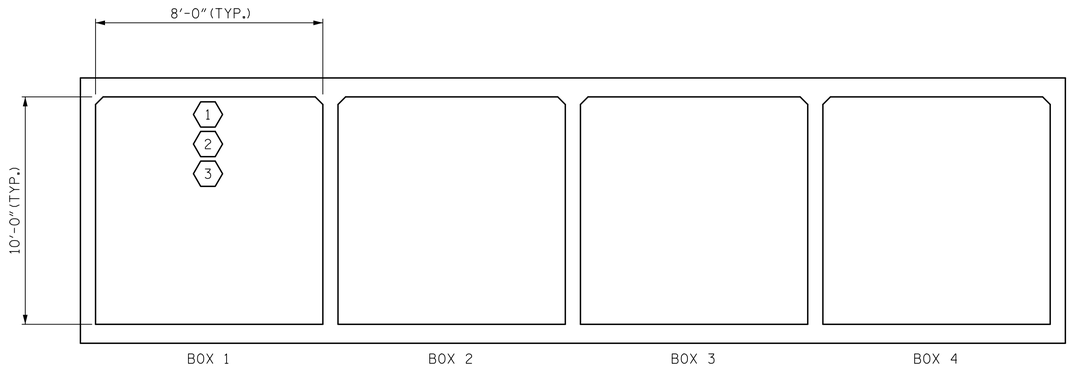
⟨#⟩ CONTROLLING LOAD RATING

⟨1⟩ DESIGN LOAD RATING (HL-93)

⟨2⟩ DESIGN LOAD RATING (HS-20)

⟨3⟩ LEGAL LOAD RATING **

** SEE CHART FOR VEHICLE TYPE



LRFR SUMMARY

(LOOKING DOWNSTREAM)

ASSEMBLED BY : J.S. HOBSON DATE :03/07/19
CHECKED BY : J.A. LEE DATE :04/03/19

DRAWN BY : WMC 7/11
CHECKED BY : GM 7/11

REV. 10/1/11 MAA/GM

Mead & Hunt
111 E. Hargett Street
Suite 300
Raleigh, NC 27601
919-714-8670
meadhunt.com
NC License No. F-1235

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 043177 JOHN S. HOBSON

Docusigned by: Jack Hobson 5B6E7C2B670044B... 3/16/2020

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT NO. R-4707

GUILFORD COUNTY

STATION: 46+07.79 -Y-

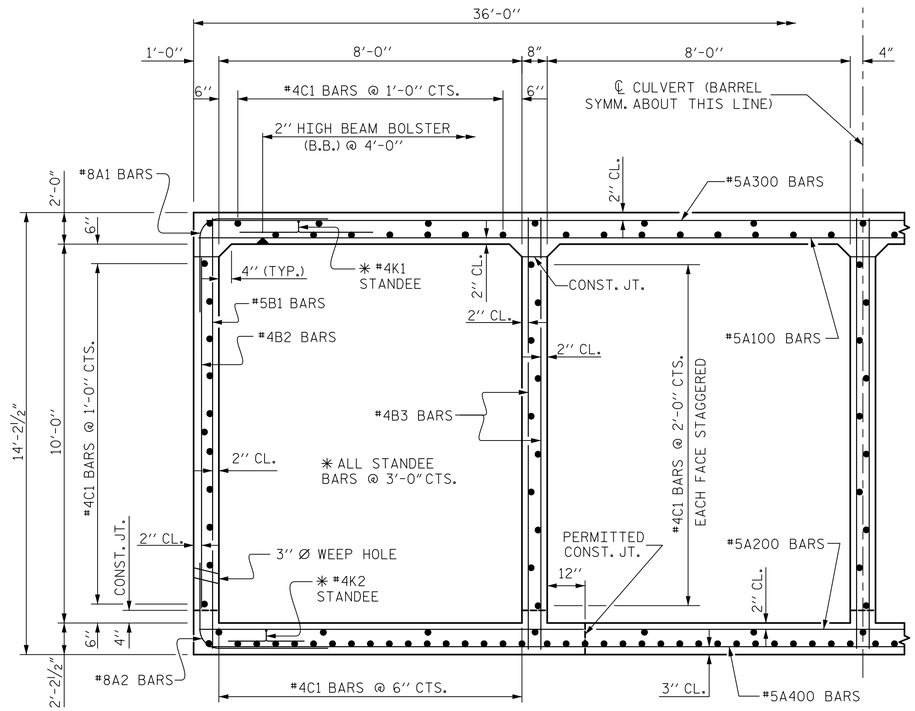
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

STANDARD

LRFR SUMMARY FOR REINFORCED CONCRETE BOX CULVERTS (NON-INTERSTATE TRAFFIC)

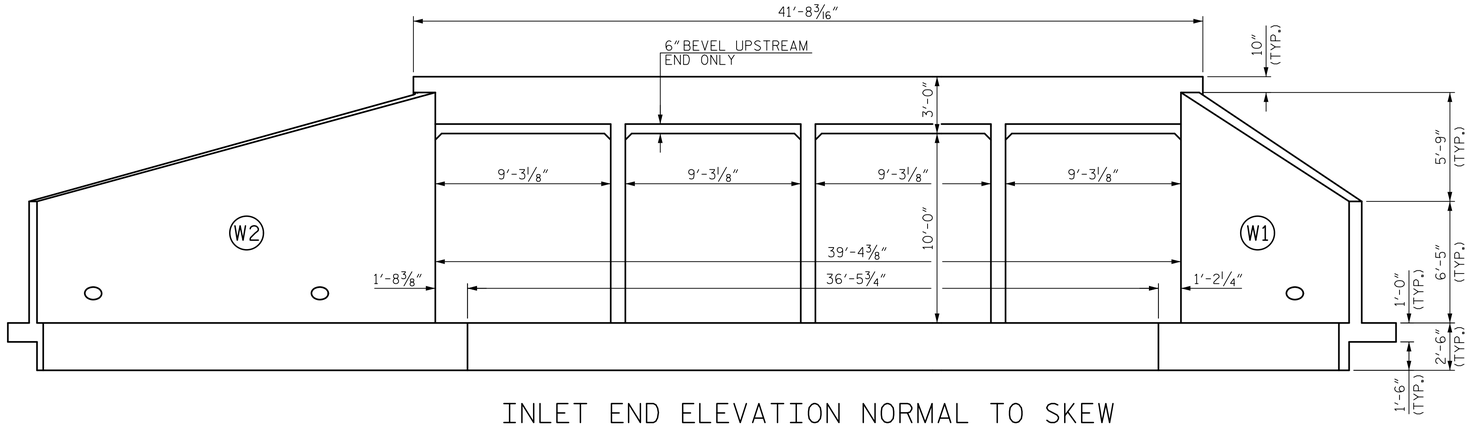
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C2-02
1			3			TOTAL SHEETS
2			4			9

STD. NO. LRFR5

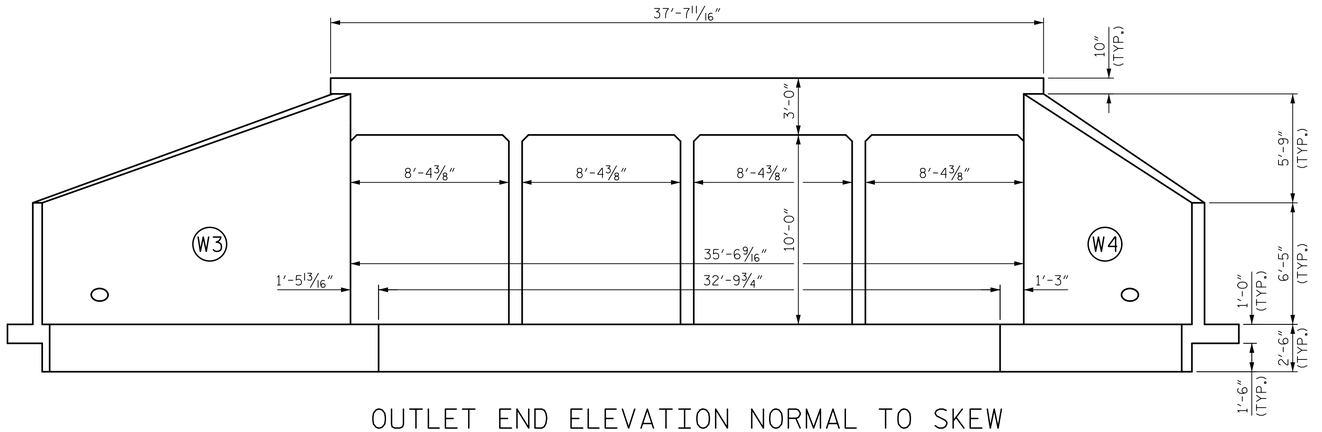


RIGHT ANGLE SECTION OF BARREL

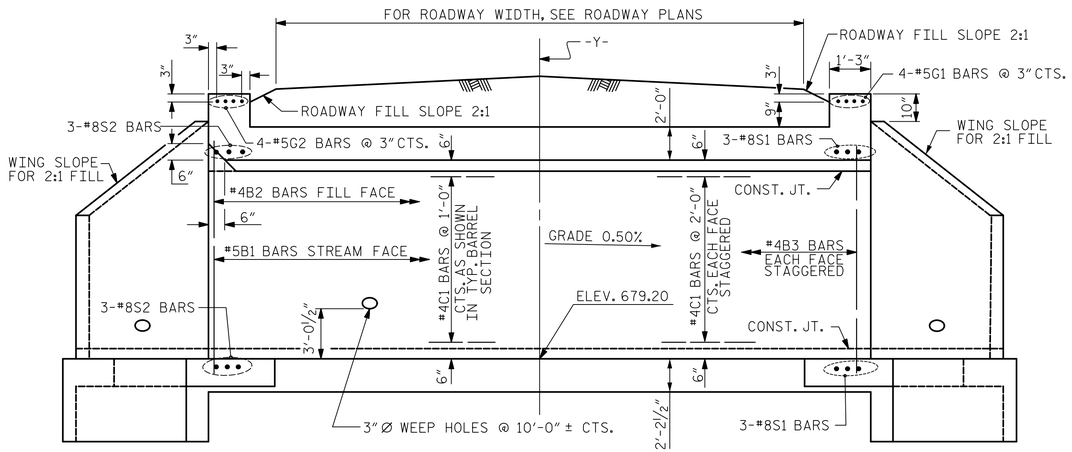
THERE ARE 178 " C " BARS IN SECTION OF BARREL



INLET END ELEVATION NORMAL TO SKEW

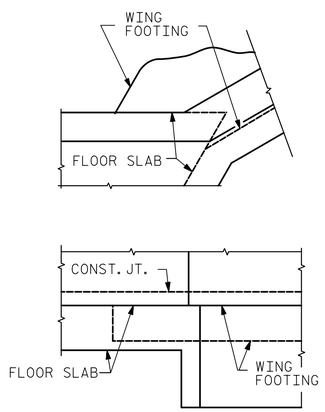


OUTLET END ELEVATION NORMAL TO SKEW



EXTERIOR WALL INTERIOR WALL

CULVERT SECTION NORMAL TO ROADWAY



DETAIL

CONNECTION OF WING FOOTING AND FLOOR SLAB WHEN SLAB IS THICKER THAN FOOTING

I HEREBY CERTIFY THESE PLANS ARE THE AS-BUILT PLANS

Mead &Hunt
111 E. Hargett Street
Suite 300
Raleigh, NC 27601
919-714-8670
meadhunt.com
NC License No. F-1235

NORTH CAROLINA PROFESSIONAL SEAL 043177 ENGINEER JOHN S. HOBSON

Docusigned by: Jack Hobson 5BE7C2B67004488... 3/16/2020

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT NO. R-4707
GUILFORD COUNTY
STATION: 46+07.79 -Y-

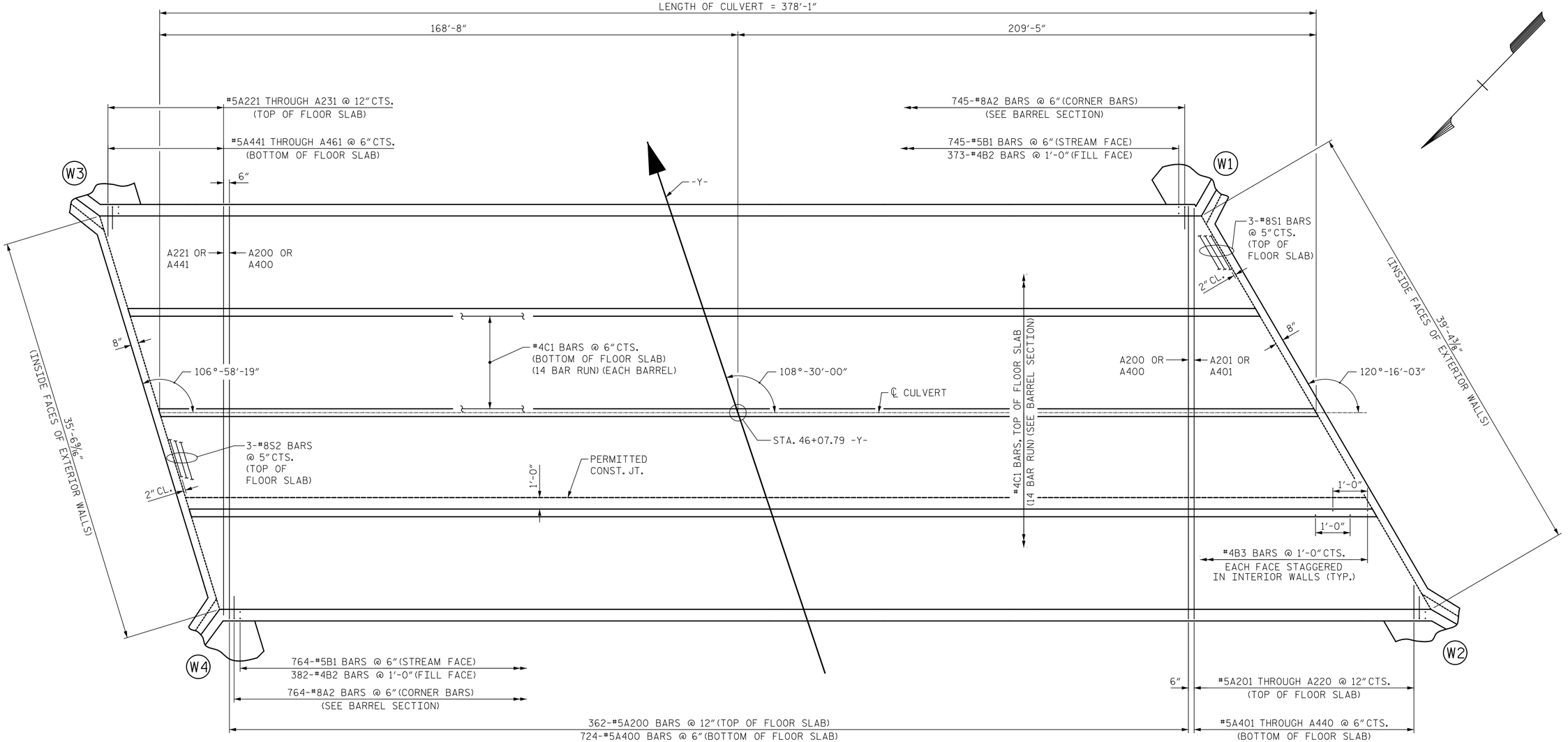
SHEET 3 OF 9

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

QUADRUPLE 8 FT. x 10 FT. REINFORCED CONCRETE BOX CULVERT

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C2-03
1			3			TOTAL SHEETS
2			4			9

DRAWN BY : J.S. HOBSON DATE : 03/07/19
CHECKED BY : J.A. LEE DATE : 04/03/19
DESIGN ENGINEER OF RECORD : J.S. HOBSON DATE : 04/11/19



PLAN OF FLOOR SLAB

Mead &Hunt
111 E. Hargett Street
Suite 300
Raleigh, NC 27601
919-714-8670
meadhunt.com
NC License No. F-1235

NORTH CAROLINA PROFESSIONAL SEAL 043177 ENGINEER JOHN S. HOBSON

Docusigned by: Jack Hobson 4/16/2020
5B6E7C2B6700448...

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT NO. R-4707
GUILFORD COUNTY
STATION: 46+07.79 -Y-

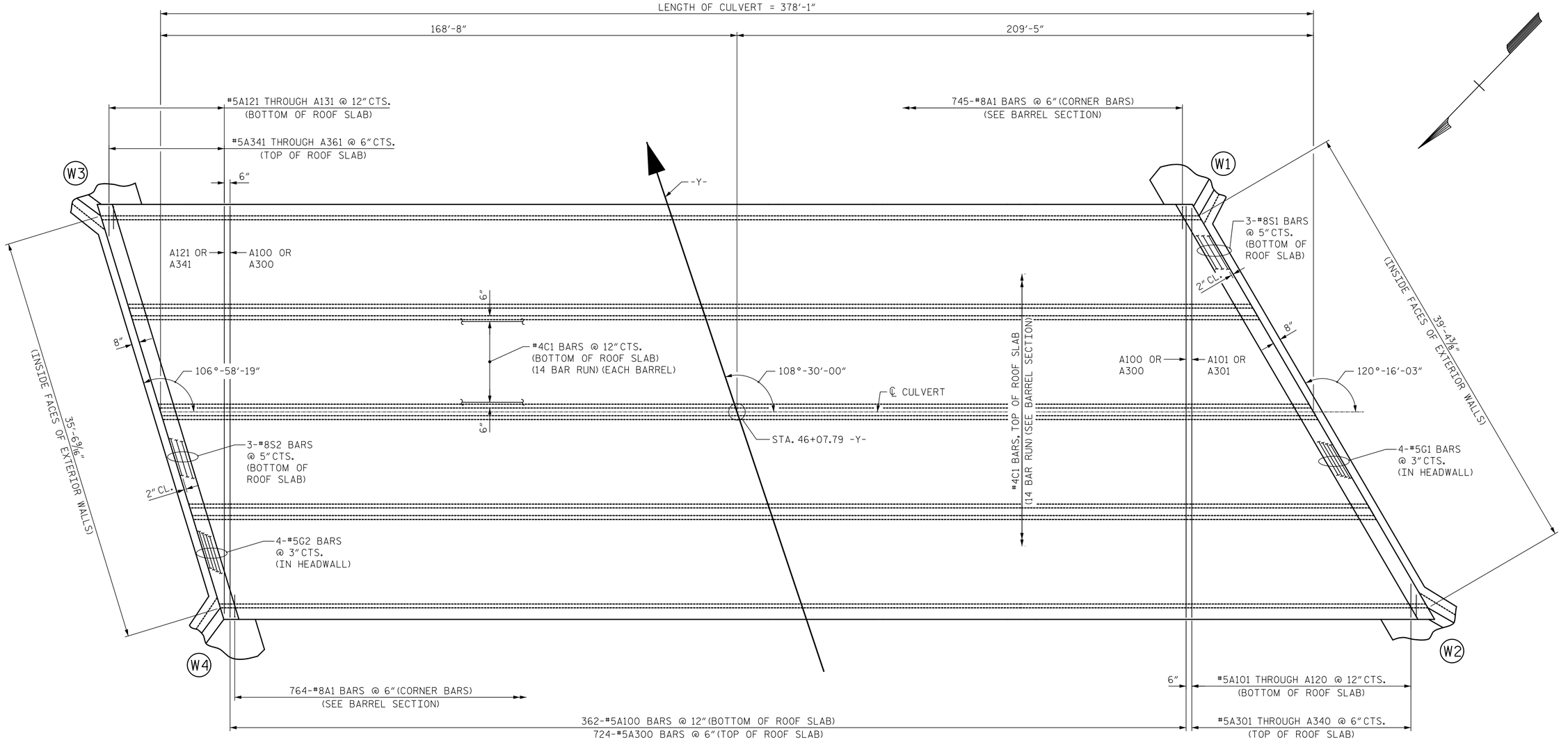
SHEET 4 OF 9

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

QUADRUPLE
8 FT. × 10 FT.
REINFORCED CONCRETE
BOX CULVERT

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C2-04
1			3			TOTAL SHEETS
2			4			9

DRAWN BY : J.S. HOBSON DATE : 03/15/19
CHECKED BY : J.A. LEE DATE : 04/04/19
DESIGN ENGINEER OF RECORD : J.S. HOBSON DATE : 04/11/19



PLAN OF ROOF SLAB

Mead &Hunt
111 E. Hargett Street
Suite 300
Raleigh, NC 27601
919-714-8670
meadhunt.com
NC License No. F-1235

NORTH CAROLINA PROFESSIONAL SEAL 043177 ENGINEER JOHN S. HOBSON
Docusigned by: Jack Hobson 4/16/2020
5B6E7C2B670044B...

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT NO. R-4707
GUILFORD COUNTY
STATION: 46+07.79 -Y-

SHEET 5 OF 9

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

QUADRUPLE
8 FT. × 10 FT.
REINFORCED CONCRETE
BOX CULVERT

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C2-05
1			3			TOTAL SHEETS
2			4			9

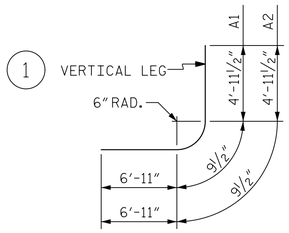
DRAWN BY : J.S. HOBSON DATE : 03/15/19
CHECKED BY : J.A. LEE DATE : 04/04/19
DESIGN ENGINEER OF RECORD : J.S. HOBSON DATE : 04/11/19

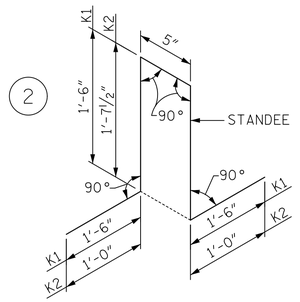
BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A100	362	#5	STR	35'-8"	13467	A300	724	#5	STR	35'-8"	26933	A400	724	#5	STR	35'-8"	26933
A101	1	#5	STR	35'-6"	37	A301	1	#5	STR	35'-6"	37	A401	1	#5	STR	35'-6"	37
A102	1	#5	STR	33'-10"	35	A302	1	#5	STR	34'-8"	36	A402	1	#5	STR	34'-8"	36
A103	1	#5	STR	32'-1"	33	A303	1	#5	STR	33'-10"	35	A403	1	#5	STR	33'-10"	35
A104	1	#5	STR	30'-4"	32	A304	1	#5	STR	33'-0"	34	A404	1	#5	STR	33'-0"	34
A105	1	#5	STR	28'-7"	30	A305	1	#5	STR	32'-1"	33	A405	1	#5	STR	32'-1"	33
A106	1	#5	STR	26'-10"	28	A306	1	#5	STR	31'-2"	33	A406	1	#5	STR	31'-2"	33
A107	1	#5	STR	25'-1"	26	A307	1	#5	STR	30'-4"	32	A407	1	#5	STR	30'-4"	32
A108	1	#5	STR	23'-4"	24	A308	1	#5	STR	29'-6"	31	A408	1	#5	STR	29'-6"	31
A109	1	#5	STR	21'-10"	23	A309	1	#5	STR	28'-7"	30	A409	1	#5	STR	28'-7"	30
A110	1	#5	STR	20'-1"	21	A310	1	#5	STR	27'-10"	29	A410	1	#5	STR	27'-10"	29
A111	1	#5	STR	18'-4"	19	A311	1	#5	STR	26'-10"	28	A411	1	#5	STR	26'-10"	28
A112	1	#5	STR	16'-7"	17	A312	1	#5	STR	26'-2"	27	A412	1	#5	STR	26'-2"	27
A113	1	#5	STR	14'-10"	15	A313	1	#5	STR	25'-1"	26	A413	1	#5	STR	25'-1"	26
A114	1	#5	STR	13'-1"	14	A314	1	#5	STR	24'-3"	25	A414	1	#5	STR	24'-3"	25
A115	1	#5	STR	11'-4"	12	A315	1	#5	STR	23'-4"	24	A415	1	#5	STR	23'-4"	24
A116	1	#5	STR	9'-10"	10	A316	1	#5	STR	22'-7"	24	A416	1	#5	STR	22'-7"	24
A117	1	#5	STR	8'-1"	8	A317	1	#5	STR	21'-10"	23	A417	1	#5	STR	21'-10"	23
A118	1	#5	STR	6'-4"	7	A318	1	#5	STR	20'-11"	22	A418	1	#5	STR	20'-11"	22
A119	1	#5	STR	4'-8"	5	A319	1	#5	STR	20'-1"	21	A419	1	#5	STR	20'-1"	21
A120	1	#5	STR	2'-11"	3	A320	1	#5	STR	19'-3"	20	A420	1	#5	STR	19'-3"	20
A121	1	#5	STR	35'-4"	37	A321	1	#5	STR	18'-4"	19	A421	1	#5	STR	18'-4"	19
A122	1	#5	STR	32'-1"	33	A322	1	#5	STR	17'-7"	18	A422	1	#5	STR	17'-7"	18
A123	1	#5	STR	28'-10"	30	A323	1	#5	STR	16'-7"	17	A423	1	#5	STR	16'-7"	17
A124	1	#5	STR	25'-5"	27	A324	1	#5	STR	15'-8"	16	A424	1	#5	STR	15'-8"	16
A125	1	#5	STR	22'-2"	23	A325	1	#5	STR	14'-10"	15	A425	1	#5	STR	14'-10"	15
A126	1	#5	STR	18'-11"	20	A326	1	#5	STR	14'-0"	15	A426	1	#5	STR	14'-0"	15
A127	1	#5	STR	15'-8"	16	A327	1	#5	STR	13'-1"	14	A427	1	#5	STR	13'-1"	14
A128	1	#5	STR	12'-5"	13	A328	1	#5	STR	12'-4"	13	A428	1	#5	STR	12'-4"	13
A129	1	#5	STR	9'-2"	10	A329	1	#5	STR	11'-4"	12	A429	1	#5	STR	11'-4"	12
A130	1	#5	STR	5'-10"	6	A330	1	#5	STR	10'-8"	11	A430	1	#5	STR	10'-8"	11
A131	1	#5	STR	2'-7"	3	A331	1	#5	STR	9'-10"	10	A431	1	#5	STR	9'-10"	10
						A332	1	#5	STR	9'-0"	9	A432	1	#5	STR	9'-0"	9
A200	362	#5	STR	35'-8"	13467	A333	1	#5	STR	8'-1"	8	A433	1	#5	STR	8'-1"	8
A201	1	#5	STR	35'-6"	37	A334	1	#5	STR	7'-1"	7	A434	1	#5	STR	7'-1"	7
A202	1	#5	STR	33'-10"	35	A335	1	#5	STR	6'-4"	7	A435	1	#5	STR	6'-4"	7
A203	1	#5	STR	32'-1"	33	A336	1	#5	STR	5'-5"	6	A436	1	#5	STR	5'-5"	6
A204	1	#5	STR	30'-4"	32	A337	1	#5	STR	4'-8"	5	A437	1	#5	STR	4'-8"	5
A205	1	#5	STR	28'-7"	30	A338	1	#5	STR	3'-9"	4	A438	1	#5	STR	3'-9"	4
A206	1	#5	STR	26'-10"	28	A339	1	#5	STR	2'-11"	3	A439	1	#5	STR	2'-11"	3
A207	1	#5	STR	25'-1"	26	A340	1	#5	STR	2'-1"	2	A440	1	#5	STR	2'-1"	2
A208	1	#5	STR	23'-4"	24	A341	1	#5	STR	35'-4"	37	A441	1	#5	STR	35'-4"	37
A209	1	#5	STR	21'-10"	23	A342	1	#5	STR	33'-9"	35	A442	1	#5	STR	33'-9"	35
A210	1	#5	STR	20'-1"	21	A343	1	#5	STR	32'-1"	33	A443	1	#5	STR	32'-1"	33
A211	1	#5	STR	18'-4"	19	A344	1	#5	STR	30'-5"	32	A444	1	#5	STR	30'-5"	32
A212	1	#5	STR	16'-7"	17	A345	1	#5	STR	28'-10"	30	A445	1	#5	STR	28'-10"	30
A213	1	#5	STR	14'-10"	15	A346	1	#5	STR	27'-1"	28	A446	1	#5	STR	27'-1"	28
A214	1	#5	STR	13'-1"	14	A347	1	#5	STR	25'-5"	27	A447	1	#5	STR	25'-5"	27
A215	1	#5	STR	11'-4"	12	A348	1	#5	STR	23'-9"	25	A448	1	#5	STR	23'-9"	25
A216	1	#5	STR	9'-10"	10	A349	1	#5	STR	22'-2"	23	A449	1	#5	STR	22'-2"	23
A217	1	#5	STR	8'-1"	8	A350	1	#5	STR	20'-5"	21	A450	1	#5	STR	20'-5"	21
A218	1	#5	STR	6'-4"	7	A351	1	#5	STR	18'-11"	20	A451	1	#5	STR	18'-11"	20
A219	1	#5	STR	4'-8"	5	A352	1	#5	STR	17'-1"	18	A452	1	#5	STR	17'-1"	18
A220	1	#5	STR	2'-11"	3	A353	1	#5	STR	15'-8"	16	A453	1	#5	STR	15'-8"	16
A221	1	#5	STR	35'-4"	37	A354	1	#5	STR	13'-9"	14	A454	1	#5	STR	13'-9"	14
A222	1	#5	STR	32'-1"	33	A355	1	#5	STR	12'-5"	13	A455	1	#5	STR	12'-5"	13
A223	1	#5	STR	28'-10"	30	A356	1	#5	STR	10'-7"	11	A456	1	#5	STR	10'-7"	11
A224	1	#5	STR	25'-5"	27	A357	1	#5	STR	9'-2"	10	A457	1	#5	STR	9'-2"	10
A225	1	#5	STR	22'-2"	23	A358	1	#5	STR	7'-3"	8	A458	1	#5	STR	7'-3"	8
A226	1	#5	STR	18'-11"	20	A359	1	#5	STR	5'-10"	6	A459	1	#5	STR	5'-10"	6
A227	1	#5	STR	15'-8"	16	A360	1	#5	STR	3'-11"	4	A460	1	#5	STR	3'-11"	4
A228	1	#5	STR	12'-5"	13	A361	1	#5	STR	2'-7"	3	A461	1	#5	STR	2'-7"	3
A229	1	#5	STR	9'-2"	10												
A230	1	#5	STR	5'-10"	6												
A231	1	#5	STR	2'-7"	3												

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	1509	#8	1	12'-8"	51034
A2	1509	#8	1	12'-8"	51034
B1	1509	#5	STR	13'-9"	21641
B2	755	#4	STR	9'-3"	4665
B3	2269	#4	STR	13'-9"	20841
C1	1780	#4	STR	40'-0"	47562
G1	4	#5	STR	41'-3"	172
G2	4	#5	STR	37'-3"	155
K1	8299	#4	2	6'-5"	35572
K2	4151	#4	2	5'-8"	15714
S1	6	#8	STR	41'-3"	661
S2	6	#8	STR	37'-3"	597
REINFORCING STEEL					334,072 LBS.

BAR TYPE





ALL BAR DIMENSIONS ARE OUT TO OUT.

SPLICE LENGTH CHART

BAR	SIZE	SPLICE
B1	#5	2'-4"
B3	#4	1'-10"
C1	#4	2'-5"

DRAWN BY : J.S. HOBSON DATE : 03/15/19
CHECKED BY : J.A. LEE DATE : 04/08/19
DESIGN ENGINEER OF RECORD : J.S. HOBSON DATE : 04/11/19

Mead &Hunt
111 E. Hargett Street
Suite 300
Raleigh, NC 27601
919-714-8670
meadhunt.com
NC License No. F-1235

NORTH CAROLINA PROFESSIONAL SEAL 043177 ENGINEER JOSHUA S. HOBSON
DocuSigned by: Jack Hobson 5B6E7C2B67004AB... 4/16/2020

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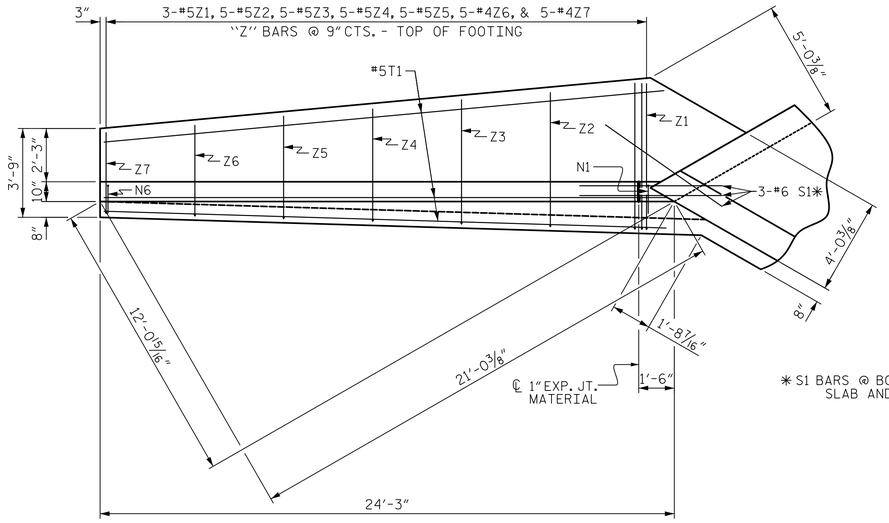
PROJECT NO. R-4707
GUILFORD COUNTY
STATION: 46+07.79 -Y-

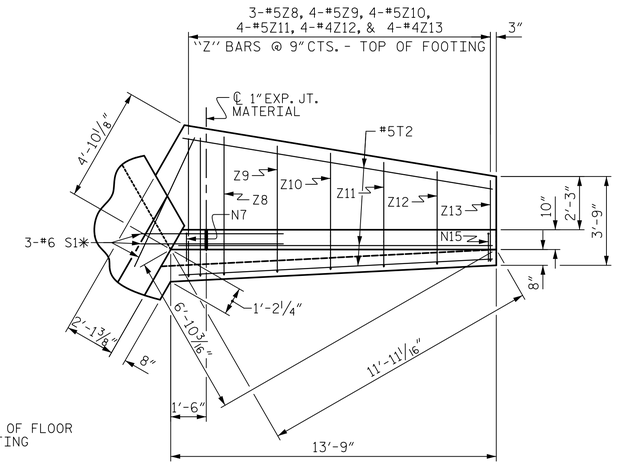
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

QUADRUPLE 8 FT. x 10 FT. REINFORCED CONCRETE BOX CULVERT

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C2-06
1			3			TOTAL SHEETS
2			4			9

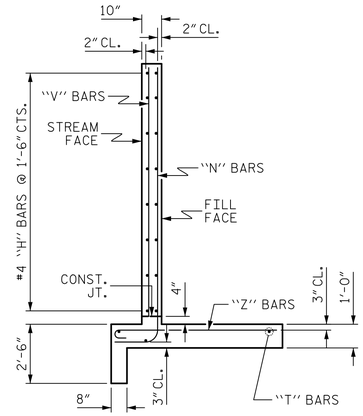


PLAN W2

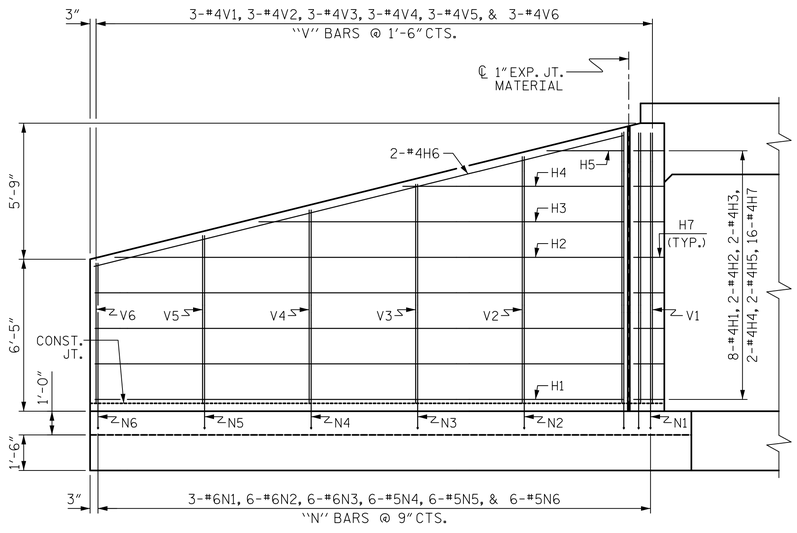


PLAN W1

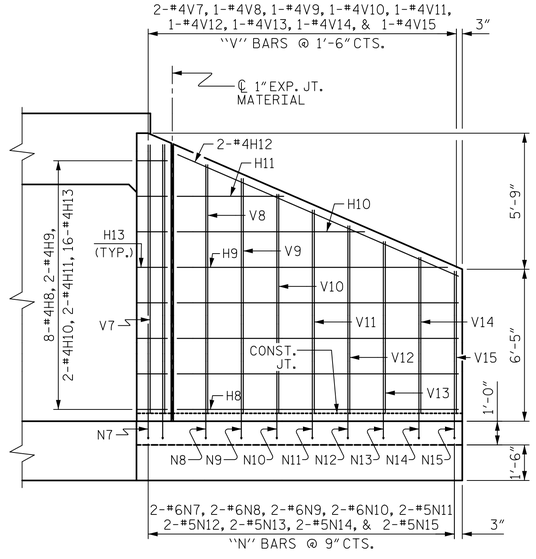
* S1 BARS @ BOTTOM OF FLOOR SLAB AND FOOTING



TYPICAL WING SECTION



ELEVATION W2



ELEVATION W1

Mead &Hunt
111 E. Hargett Street
Suite 300
Raleigh, NC 27601
919-714-8670
meadhunt.com
NC License No. F-1235

NORTH CAROLINA PROFESSIONAL SEAL 043177 ENGINEER J. S. HOBSON

DocuSigned by: Jack Hobson 5B6E7C2B67004AB... 3/16/2020

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PROJECT NO. R-4707

GUILFORD COUNTY

STATION: 46+07.79 -Y-

SHEET 7 OF 9

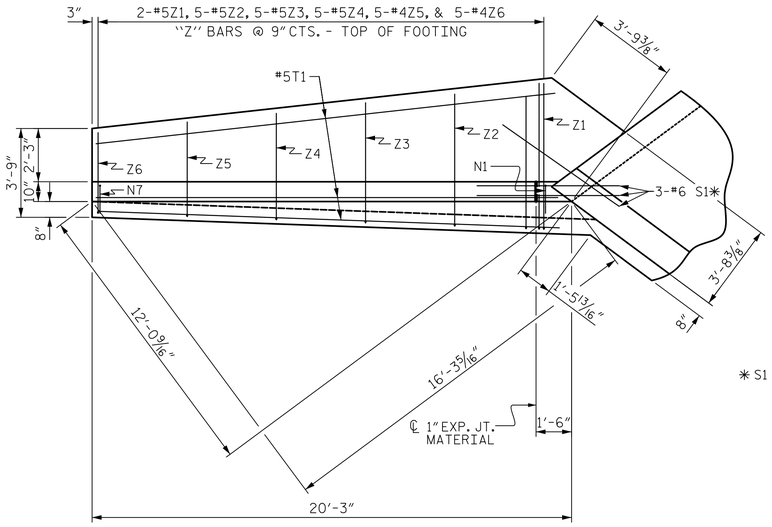
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

RIGHT SIDE WINGS FOR CONCRETE BOX CULVERT

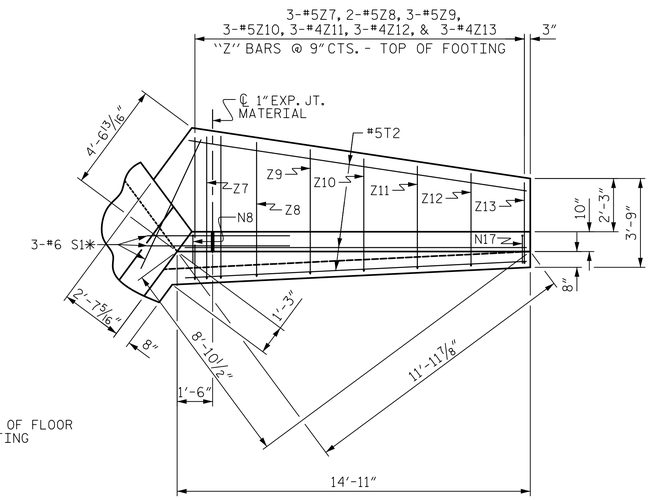
H = 10'-0" SLOPE = 2:1

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C2-07
1			3			TOTAL SHEETS
2			4			9

DRAWN BY : J.S. HOBSON DATE : 03/11/19
CHECKED BY : J.A. LEE DATE : 04/08/19
DESIGN ENGINEER OF RECORD : J.S. HOBSON DATE : 04/11/19

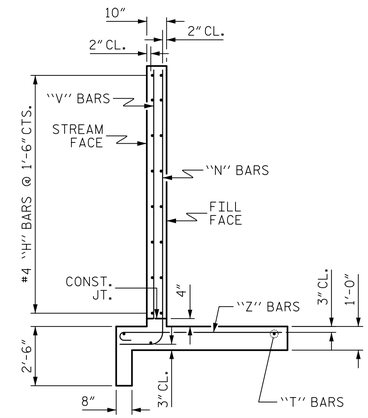


PLAN W3

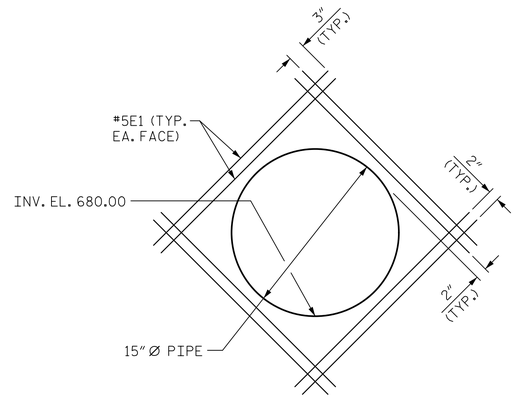


* S1 BARS @ BOTTOM OF FLOOR SLAB AND FOOTING

PLAN W4

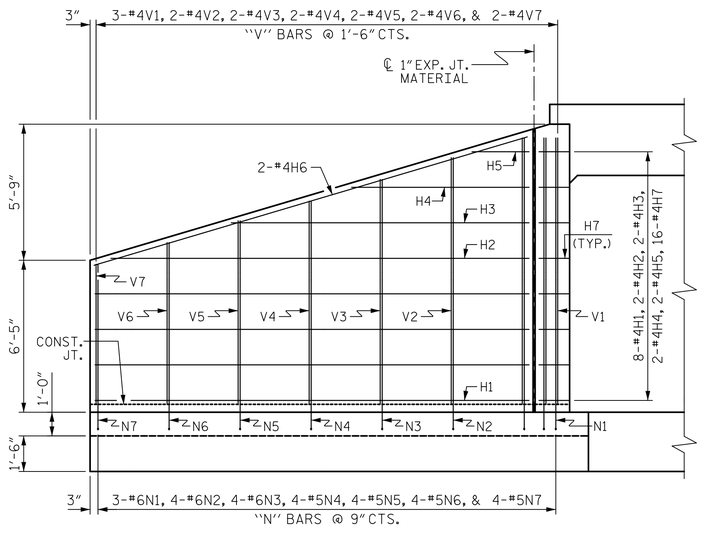


TYPICAL WING SECTION

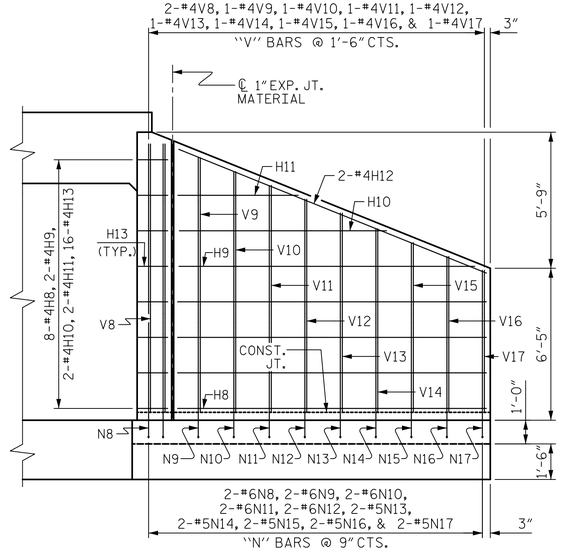


WALL OPENING DETAIL

FOR PIPE THROUGH W3 WALL.
FIELD CUT, SHIFT, OR BEND "N", "H", AND "V"
AS NECESSARY TO CLEAR PIPE.



ELEVATION W3



ELEVATION W4

Mead &Hunt
111 E. Hargett Street
Suite 300
Raleigh, NC 27601
919-714-8670
meadhunt.com
NC License No. F-1235

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 043177 J. S. HOBSON
Docusigned by: Jack Hobson 4/16/2020
5B6E7C2B6700448...

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT NO. R-4707
GUILFORD COUNTY
STATION: 46+07.79 -Y-

SHEET 8 OF 9

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

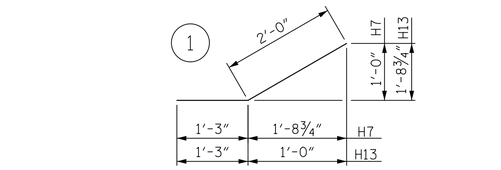
LEFT SIDE WINGS FOR CONCRETE BOX CULVERT

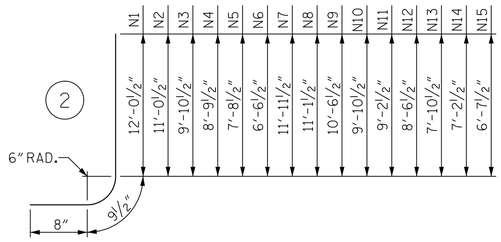
H = 10'-0" SLOPE = 2:1

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C2-08
1			3			TOTAL SHEETS
2			4			9

DRAWN BY : J.S. HOBSON DATE : 03/12/19
CHECKED BY : J.A. LEE DATE : 04/08/19
DESIGN ENGINEER OF RECORD : J.S. HOBSON DATE : 04/11/19

BAR TYPES FOR RIGHT WINGS





Z1	6'-2"	7"
Z2	5'-8"	7"
Z3	5'-3"	7"
Z4	4'-9"	7"
Z5	4'-4"	7"
Z6	3'-10"	6"
Z7	3'-5"	6"
Z8	5'-7"	7"
Z9	5'-4"	7"
Z10	4'-11"	7"
Z11	4'-5"	7"
Z12	3'-11"	6"
Z13	3'-5"	6"

HK.

3

ALL BAR DIMENSIONS ARE OUT TO OUT.

BILL OF MATERIAL FOR RIGHT WINGS

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	8	#4	STR	22'-4"	119
H2	2	#4	STR	21'-6"	29
H3	2	#4	STR	15'-5"	21
H4	2	#4	STR	9'-4"	12
H5	2	#4	STR	3'-3"	4
H6	2	#4	STR	23'-0"	31
H7	16	#4	1	3'-3"	35
H8	8	#4	STR	11'-10"	63
H9	2	#4	STR	11'-5"	15
H10	2	#4	STR	7'-11"	11
H11	2	#4	STR	4'-6"	6
H12	2	#4	STR	12'-11"	17
H13	16	#4	1	3'-3"	35
N1	3	#6	2	13'-6"	61
N2	6	#6	2	12'-6"	113
N3	6	#6	2	11'-4"	102
N4	6	#5	2	10'-3"	64
N5	6	#5	2	9'-2"	57
N6	6	#5	2	8'-0"	50
N7	2	#6	2	13'-5"	40
N8	2	#6	2	12'-7"	38
N9	2	#6	2	12'-0"	36
N10	2	#6	2	11'-4"	34
N11	2	#5	2	10'-8"	22
N12	2	#5	2	10'-0"	21
N13	2	#5	2	9'-4"	19
N14	2	#5	2	8'-8"	18
N15	2	#5	2	8'-1"	17
S1	6	#6	STR	6'-0"	54
T1	3	#5	STR	23'-9"	74
T2	3	#5	STR	13'-3"	41
V1	3	#4	STR	11'-5"	23
V2	3	#4	STR	10'-5"	21
V3	3	#4	STR	9'-3"	19
V4	3	#4	STR	8'-2"	16
V5	3	#4	STR	7'-1"	14
V6	3	#4	STR	5'-11"	12
V7	2	#4	STR	11'-4"	15
V8	1	#4	STR	10'-6"	7
V9	1	#4	STR	9'-11"	7
V10	1	#4	STR	9'-3"	6
V11	1	#4	STR	8'-7"	6
V12	1	#4	STR	7'-11"	5
V13	1	#4	STR	7'-3"	5
V14	1	#4	STR	6'-7"	4
V15	1	#4	STR	6'-0"	4
Z1	3	#5	3	6'-9"	21
Z2	5	#5	3	6'-3"	33
Z3	5	#5	3	5'-10"	30
Z4	5	#5	3	5'-4"	28
Z5	5	#5	3	4'-11"	26
Z6	5	#4	3	4'-4"	14
Z7	5	#4	3	3'-11"	13
Z8	3	#5	3	6'-2"	19
Z9	4	#5	3	5'-11"	25
Z10	4	#5	3	5'-6"	23
Z11	4	#5	3	5'-0"	21
Z12	4	#4	3	4'-5"	12
Z13	4	#4	3	3'-11"	10

REINFORCING STEEL FOR 2 RIGHT WINGS 1,698 LBS

CLASS A CONCRETE

2 WINGS	20.1	CY
1 HEADWALL	1.9	CY
1 END CURTAIN WALL	2.3	CY
TOTAL	24.3	CY

BILL OF MATERIAL FOR LEFT WINGS

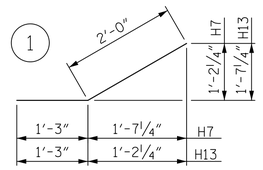
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
E1	16	#5	STR	2'-8"	45
H1	8	#4	STR	18'-4"	98
H2	2	#4	STR	17'-8"	24
H3	2	#4	STR	12'-7"	17
H4	2	#4	STR	7'-6"	10
H5	2	#4	STR	2'-5"	3
H6	2	#4	STR	19'-1"	25
H7	16	#4	1	3'-3"	35
H8	8	#4	STR	13'-0"	69
H9	2	#4	STR	12'-6"	17
H10	2	#4	STR	8'-9"	12
H11	2	#4	STR	5'-1"	7
H12	2	#4	STR	14'-0"	19
H13	16	#4	1	3'-3"	35
N1	3	#6	2	13'-4"	60
N2	4	#6	2	12'-6"	75
N3	4	#6	2	11'-7"	70
N4	4	#5	2	10'-8"	45
N5	4	#5	2	9'-10"	41
N6	4	#5	2	8'-11"	37
N7	4	#5	2	8'-0"	33
N8	2	#6	2	13'-5"	40
N9	2	#6	2	12'-10"	39
N10	2	#6	2	12'-3"	37
N11	2	#6	2	11'-8"	35
N12	2	#6	2	11'-1"	33
N13	2	#5	2	10'-6"	22
N14	2	#5	2	9'-10"	21
N15	2	#5	2	9'-3"	19
N16	2	#5	2	8'-8"	18
N17	2	#5	2	8'-1"	17
S1	6	#6	STR	6'-0"	54
T1	3	#5	STR	19'-6"	61
T2	3	#5	STR	14'-5"	45
V1	3	#4	STR	11'-3"	23
V2	2	#4	STR	10'-5"	14
V3	2	#4	STR	9'-6"	13
V4	2	#4	STR	8'-7"	11
V5	2	#4	STR	7'-9"	10
V6	2	#4	STR	6'-10"	9
V7	2	#4	STR	5'-11"	8
V8	2	#4	STR	11'-4"	15
V9	1	#4	STR	10'-9"	7
V10	1	#4	STR	10'-2"	7
V11	1	#4	STR	9'-7"	6
V12	1	#4	STR	9'-0"	6
V13	1	#4	STR	8'-5"	6
V14	1	#4	STR	9'-9"	7
V15	1	#4	STR	7'-2"	5
V16	1	#4	STR	6'-7"	4
V17	1	#4	STR	6'-0"	4
Z1	2	#5	3	6'-9"	14
Z2	5	#5	3	6'-2"	32
Z3	5	#5	3	5'-8"	30
Z4	5	#5	3	5'-1"	27
Z5	5	#4	3	4'-6"	15
Z6	5	#4	3	3'-11"	13
Z7	3	#5	3	6'-7"	21
Z8	2	#5	3	6'-3"	13
Z9	3	#5	3	5'-10"	18
Z10	3	#5	3	5'-4"	17
Z11	3	#4	3	4'-10"	10
Z12	3	#4	3	4'-5"	9
Z13	3	#4	3	3'-11"	8

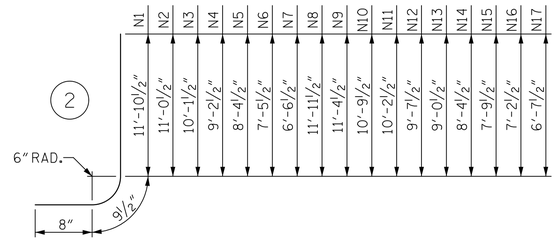
REINFORCING STEEL FOR 2 LEFT WINGS 1,600 LBS

CLASS A CONCRETE

2 WINGS	18.6	CY
1 HEADWALL	1.7	CY
1 END CURTAIN WALL	2.0	CY
TOTAL	22.3	CY

BAR TYPES FOR LEFT WINGS





Z1	6'-2"	7"
Z2	5'-7"	7"
Z3	5'-1"	7"
Z4	4'-6"	7"
Z5	4'-0"	6"
Z6	3'-5"	6"
Z7	6'-0"	7"
Z8	5'-8"	7"
Z9	5'-3"	7"
Z10	4'-9"	7"
Z11	4'-4"	6"
Z12	3'-11"	6"
Z13	3'-5"	6"

HK.

3

ALL BAR DIMENSIONS ARE OUT TO OUT.

Mead &Hunt
111 E. Hargett Street
Suite 300
Raleigh, NC 27601
919-714-8670
meadhunt.com
NC License No. F-1235

NORTH CAROLINA PROFESSIONAL SEAL 043177 ENGINEER JACK S. HOBSON
Docusigned by: Jack Hobson 5B6E7C2B6700448...
4/16/2020

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT NO. R-4707
GUILFORD COUNTY
STATION: 46+07.79 -Y-

SHEET 9 OF 9

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

WINGWALL BILL OF MATERIAL FOR CONCRETE BOX CULVERT

H = 10'-0" SLOPE = 2:1

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C2-09
1			3			TOTAL SHEETS
2			4			9

DRAWN BY : J.S. HOBSON DATE : 03/12/19
CHECKED BY : J.A. LEE DATE : 04/09/19
DESIGN ENGINEER OF RECORD : J.S. HOBSON DATE : 04/11/19

STANDARD NOTES

DESIGN DATA:

SPECIFICATIONS	A.A.S.H.T.O. (CURRENT)
LIVE LOAD	SEE PLANS
IMPACT ALLOWANCE	SEE A.A.S.H.T.O.
STRESS IN EXTREME FIBER OF STRUCTURAL STEEL - AASHTO M270 GRADE 36	20,000 LBS. PER SQ. IN.
- AASHTO M270 GRADE 50W	27,000 LBS. PER SQ. IN.
- AASHTO M270 GRADE 50	27,000 LBS. PER SQ. IN.
REINFORCING STEEL IN TENSION - GRADE 60	24,000 LBS. PER SQ. IN.
CONCRETE IN COMPRESSION	1,200 LBS. PER SQ. IN.
CONCRETE IN SHEAR	SEE A.A.S.H.T.O.
STRUCTURAL TIMBER - TREATED OR UNTREATED EXTREME FIBER STRESS	1,800 LBS. PER SQ. IN.
COMPRESSION PERPENDICULAR TO GRAIN OF TIMBER	375 LBS. PER SQ. IN.
EQUIVALENT FLUID PRESSURE OF EARTH	30 LBS. PER CU. FT. (MINIMUM)

MATERIAL AND WORKMANSHIP:

EXCEPT AS MAY OTHERWISE BE SPECIFIED ON PLANS OR IN THE SPECIAL PROVISIONS, ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE 2018 "STANDARD SPECIFICATIONS FOR ROADS AND STRUCTURES" OF THE N. C. DEPARTMENT OF TRANSPORTATION.

STEEL SHEET PILING FOR PERMANENT OR TEMPORARY APPLICATIONS SHALL BE HOT ROLLED.

CONCRETE:

UNLESS OTHERWISE REQUIRED ON PLANS, CLASS A CONCRETE SHALL BE USED FOR ALL PORTIONS OF ALL STRUCTURES WITH THE EXCEPTION THAT: CLASS AA CONCRETE SHALL BE USED IN BRIDGE SUPERSTRUCTURES, ABUTMENT BACKWALLS, AND APPROACH SLABS; AND CLASS B CONCRETE SHALL BE USED FOR SLOPE PROTECTION AND RIP RAP.

CONCRETE CHAMFERS:

UNLESS OTHERWISE NOTED ON THE PLANS, ALL EXPOSED CORNERS ON STRUCTURES SHALL BE CHAMFERED ¾" WITH THE FOLLOWING EXCEPTIONS: TOP CORNERS OF CURBS MAY BE ROUNDED TO 1½" RADIUS WHICH IS BUILT INTO CURB FORMS; CORNERS OF TRANSVERSE FLOOR EXPANSION JOINTS SHALL BE ROUNDED WITH A ¼" FINISHING TOOL UNLESS OTHERWISE REQUIRED ON PLANS; AND CORNERS OF EXPANSION JOINTS IN THE ROADWAY FACES AND TOPS OF CURBS AND SIDEWALKS SHALL BE ROUNDED TO A ¼" RADIUS WITH A FINISHING STONE OR TOOL UNLESS OTHERWISE REQUIRED ON PLANS.

DOWELS:

DOWELS WHEN INDICATED ON PLANS AS FOR CULVERT EXTENSIONS, SHALL BE EMBEDDED AT LEAST 12" INTO THE OLD CONCRETE AND GROUTED INTO PLACE WITH 1:2 CEMENT MORTAR.

ALLOWANCE FOR DEAD LOAD DEFLECTION, SETTLEMENT, ETC. IN CASTING SUPERSTRUCTURES:

BRIDGES SHALL BE BUILT ON THE GRADE OR VERTICAL CURVE SHOWN ON PLANS. SLABS, CURBS AND PARAPETS SHALL CONFORM TO THE GRADE OR CURVE.

ALL DIMENSIONS WHICH ARE GIVEN IN SECTION AND ARE AFFECTED BY DEAD LOAD DEFLECTIONS ARE DIMENSIONS AT CENTER LINE OF BEARING UNLESS OTHERWISE NOTED ON PLANS. IN SETTING FORMS FOR STEEL BEAM BRIDGES AND PRESTRESSED CONCRETE GIRDER BRIDGES, ADJUSTMENTS SHALL BE MADE DUE TO THE DEAD LOAD DEFLECTIONS FOR THE ELEVATIONS SHOWN. WHERE BLOCKS ARE SHOWN OVER BEAMS FOR BUILDING UP TO THE SLAB, THE VERTICAL DIMENSIONS OF THE BLOCKS SHALL BE ADJUSTED BETWEEN BEARINGS TO COMPENSATE FOR DEAD LOAD DEFLECTIONS, VERTICAL CURVE ORDINATE, AND ACTUAL BEAM CAMBER. WHERE BOTTOM OF SLAB IS IN LINE WITH BOTTOM OF TOP FLANGES, DEPTH OF SLAB BETWEEN BEARINGS SHALL BE ADJUSTED TO COMPENSATE FOR DEAD LOAD DEFLECTION, VERTICAL CURVE ORDINATE, AND ACTUAL BEAM CAMBER.

IN SETTING FALSEWORK AND FORMS FOR REINFORCED CONCRETE SPANS, AN ALLOWANCE SHALL BE MADE FOR DEAD LOAD DEFLECTIONS, SETTLEMENT OF FALSEWORK, AND PERMANENT CAMBER WHICH SHALL BE PROVIDED FOR IN ADDITION TO THE ELEVATIONS SHOWN. AFTER REMOVAL OF THE FALSEWORK, THE FINISHED STRUCTURES SHALL CONFORM TO THE PROFILE AND ELEVATIONS SHOWN ON THE PLANS AND CONSTRUCTION ELEVATIONS FURNISHED BY THE ENGINEER.

DETAILED DRAWINGS FOR FALSEWORK OR FORMS FOR BRIDGE SUPERSTRUCTURE AND ANY STRUCTURE OR PARTS OF A STRUCTURE AS NOTED ON THE PLANS SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL BEFORE CONSTRUCTION OF THE FALSEWORK OR FORMS IS STARTED.

REINFORCING STEEL:

ALL REINFORCING STEEL SHALL BE DEFORMED. DIMENSIONS RELATIVE TO PLACEMENT OF REINFORCING ARE TO CENTERS OF BARS UNLESS OTHERWISE INDICATED IN THE PLANS. DIMENSIONS ON BAR DETAILS ARE TO CENTERS OF BARS OR ARE OUT TO OUT AS INDICATED ON PLANS.

WIRE BAR SUPPORTS SHALL BE PROVIDED FOR REINFORCING STEEL WHERE INDICATED ON THE PLANS. WHEN BAR SUPPORT PIECES ARE PLACED IN CONTINUOUS LINES, THEY SHALL BE SO PLACED THAT THE ENDS OF THE SUPPORTING WIRES SHALL BE LAPPED TO LOCK LEGS ON ADJOINING PIECES.

STRUCTURAL STEEL:

AT THE CONTRACTOR'S OPTION, HE MAY SUBSTITUTE ⅞" Ø SHEAR STUDS FOR THE ¾" Ø STUDS SPECIFIED ON THE PLANS. THIS SUBSTITUTION SHALL BE MADE AT THE RATE OF 3 - ⅞" Ø STUDS FOR 4 - ¾" Ø STUDS, AND STUD SPACING CHANGES SHALL BE MADE AS NECESSARY TO PROVIDE THE SAME EQUIVALENT NUMBER OF ⅞" Ø STUDS ALONG THE BEAM AS SHOWN FOR ¾" Ø STUDS BASED ON THE RATIO OF 3 - ⅞" Ø STUDS FOR 4 - ¾" Ø STUDS. STUDS OF THE LENGTH SPECIFIED ON THE PLANS MUST BE PROVIDED. THE MAXIMUM SPACING SHALL BE 2'-0".

EXCEPT AT THE INTERIOR SUPPORTS OF CONTINUOUS BEAMS WHERE THE COVER PLATE IS IN CONTACT WITH BEARING PLATE, THE CONTRACTOR MAY, AT HIS OPTION, SUBSTITUTE FOR THE COVER PLATES DESIGNATED ON THE PLANS COVER PLATES OF THE EQUIVALENT AREA PROVIDED THESE PLATES ARE AT LEAST 5/16" IN THICKNESS AND DO NOT EXCEED A WIDTH EQUAL TO THE FLANGE WIDTH LESS 2" OR A THICKNESS EQUAL TO 2 TIMES THE FLANGE THICKNESS. THE SIZE OF FILLET WELDS SHALL CONFORM TO THE REQUIREMENTS OF THE CURRENT ANSI/AASHTO/AWS "BRIDGE WELDING CODE". ELECTROSLAG WELDING WILL NOT BE PERMITTED.

WITH THE SOLE EXCEPTION OF EDGES AT SURFACES WHICH BEAR ON OTHER SURFACES, ALL SHARP EDGES AND ENDS OF SHAPES AND PLATES SHALL BE SLIGHTLY ROUNDED BY SUITABLE MEANS TO A RADIUS OF APPROXIMATELY 1/16 INCH OR EQUIVALENT FLAT SURFACE AT A SUITABLE ANGLE PRIOR TO PAINTING, GALVANIZING, OR METALLIZING.

HANDRAILS AND POSTS:

METAL STANDARDS AND FACES OF THE CONCRETE END POSTS FOR THE METAL RAIL SHALL BE SET NORMAL TO THE GRADE OF THE CURB, UNLESS OTHERWISE SHOWN ON PLANS. THE METAL RAIL AND TOPS OF CONCRETE POSTS USED WITH THE ALUMINUM RAIL SHALL BE BUILT PARALLEL TO THE GRADE OF THE CURB.

METAL HANDRAILS SHALL BE IN ACCORDANCE WITH THE PLANS. RAILS SHALL BE AS MANUFACTURED FOR BRIDGE RAILING. CASTINGS SHALL BE OF A UNIFORM APPEARANCE. FINS AND OTHER DEFORMATIONS RESULTING FROM CASTING OR OTHERWISE SHALL BE REMOVED IN A MANNER SO THAT A UNIFORM COLORING OF THE COMPLETED CASTING SHALL BE OBTAINED. CASTINGS WITH DISCOLORATIONS OR OF NON-UNIFORM COLORING WILL NOT BE ACCEPTED. CERTIFIED MILL REPORTS ARE REQUIRED FOR METAL RAILS AND POSTS.

SPECIAL NOTES:

GENERALLY, IN CASE OF DISCREPANCY, THIS STANDARD SHEET OF NOTES SHALL GOVERN OVER THE SPECIFICATIONS, BUT THE REMAINDER OF THE PLANS SHALL GOVERN OVER NOTES HEREON, AND SPECIAL PROVISIONS SHALL GOVERN OVER ALL. SEE SPECIFICATIONS ARTICLE 105-4.

ENGLISH

JANUARY, 1990

STD. NO. SN

REV. 6-16-95	EEM	(/) RGW	REV. 5-7-03	RWW	(/) JTE	REV. 10-1-11	MAA	(/) GM	$$$$$$SYSTIME$$$$$
REV. 8-16-99	RWW	(/) LES	REV. 5-1-06	TLA	(/) GM	REV. 12-17	MAA	(/) THC	$$$$$$$$$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$$$$$$$
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