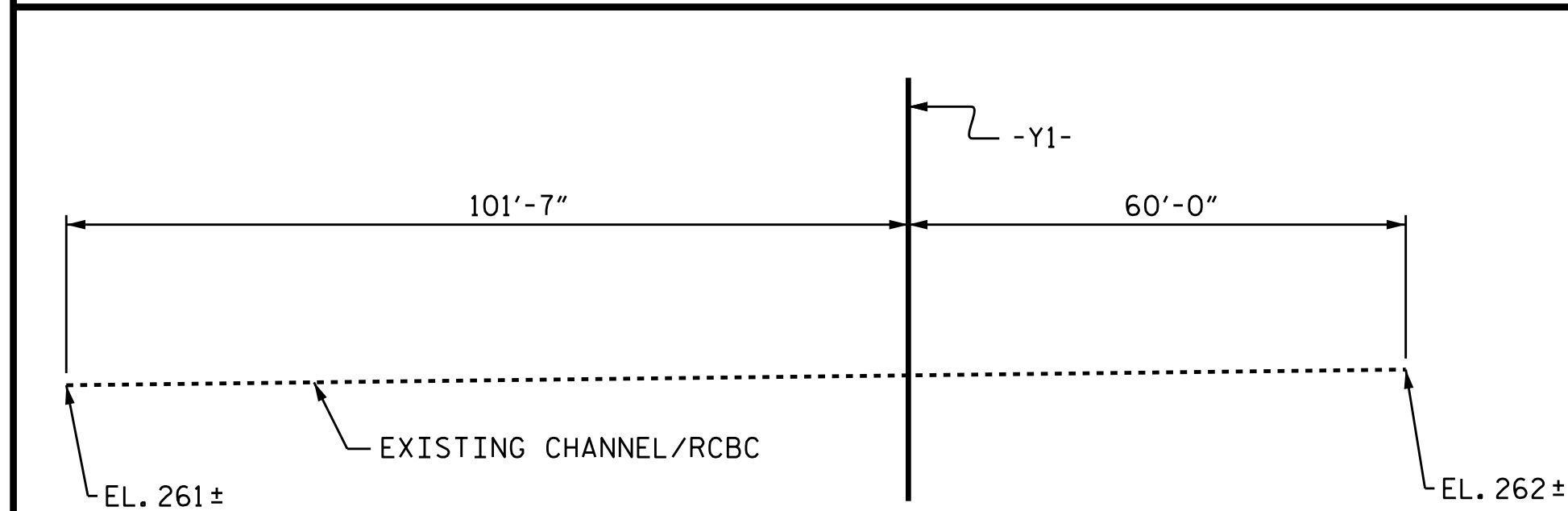


**LOCATION SKETCH**

TEMPORARY SHORING NOT SHOWN FOR CLARITY. SEE TRAFFIC CONTROL PLANS FOR TEMPORARY SHORING LOCATIONS.



**PROFILE ALONG CULVERT**

I HEREBY CERTIFY THESE PLANS ARE THE AS-BUILT PLANS

**GRADE DATA**

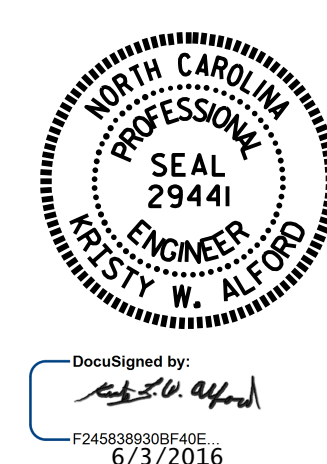
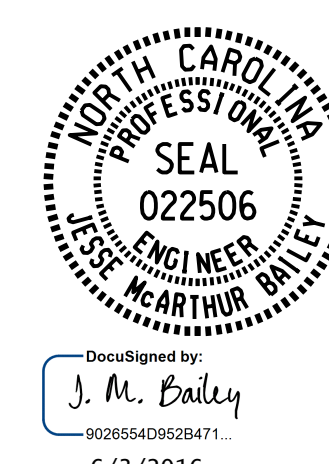
GRADE POINT ELEV. @ STA. 15+13.11 -Y1-	=	272.76
BED ELEV. @ STA. 15+13.11 -Y1-	=	261.56
ROADWAY SLOPE	=	2:1

**HYDRAULIC DATA**

DESIGN DISCHARGE	=	870 CFS
DESIGN FLOOD FREQUENCY	=	50 YEARS
DESIGN HIGH WATER ELEVATION	=	267.7
DRAINAGE AREA	=	0.90 SQ. MI.
BASE DISCHARGE (Q100)	=	900 CFS
BASE ELEVATION (Q100)	=	267.86

**TOTAL STRUCTURE QUANTITIES**

<b>CLASS A CONCRETE</b>	
STAGE I	179.1 C.Y.
STAGE II	152.1 C.Y.
<b>TOTAL</b>	<b>331.2 C.Y.</b>
<b>REINFORCING STEEL</b>	
STAGE I	26998 LBS.
STAGE II	22781 LBS.
<b>TOTAL</b>	<b>49779 LBS.</b>
<b>FOUNDATION CONDITIONING MATERIAL</b>	
STAGE I	153 TONS
STAGE II	105 TONS
<b>TOTAL</b>	<b>258 TONS</b>
CULVERT EXCAVATION	LUMP SUM
REMOVAL OF EXISTING STRUCTURE	LUMP SUM



**NOTES**

- ASSUMED LIVE LOAD -----HL-93 OR ALTERNATE LOADING.
- DESIGN FILL----- 4.49' (MAX. FILL)  
2.91' (MIN. FILL)
- 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. STAGE I OUTLET END APRON AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS.
  2. THE REMAINING PORTIONS OF THE STAGE I WALLS AND OUTLET WALLS FULL HEIGHT FOLLOWED BY ROOF SLAB AND HEADWALLS.
  3. STAGE II FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS.
  4. THE REMAINING PORTIONS OF THE STAGE II WALLS FULL HEIGHT FOLLOWED BY ROOF SLAB.
- 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.
- 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.
- STEEL IN THE BOTTOM SLAB MAY BE SPLICED AT THE PERMITTED CONSTRUCTION JOINT AT THE CONTRACTOR'S OPTION. EXTRA WEIGHT OF STEEL DUE TO THE SPLICES SHALL BE PAID FOR BY THE CONTRACTOR.
- AT THE CONTRACTOR'S OPTION, HE MAY SPLICE THE VERTICAL REINFORCING STEEL IN THE INTERIOR FACE OF EXTERIOR WALL 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.
- DOWELS SHALL BE USED TO CONNECT THE PROPOSED CULVERT TO THE EXISTING CULVERT AND EXISTING LINED CHANNEL AS SHOWN. FOR NOTE REGARDING SETTING OF DOWELS, SEE SHEET SN.
- THE PIPES THROUGH THE WALLS OF THE CULVERT SHALL BE LOCATED BY THE ENGINEER. THE REINFORCING STEEL SHALL BE FIELD BENT AS NECESSARY TO CLEAR PIPE.
- THE CONTRACTOR SHALL PROVIDE INDEPENDENT ASSURANCE SAMPLES OF REINFORCING STEEL AS FOLLOWS: FOR PROJECTS REQUIRING UP TO 400 TONS OF REINFORCING STEEL, ONE 30 INCH SAMPLE OF EACH SIZE BAR USED, AND FOR PROJECTS REQUIRING OVER 400 TONS OF REINFORCING STEEL, TWO 30 INCH SAMPLES OF EACH SIZE BAR USED. THE BARS FROM WHICH THE SAMPLES ARE TAKEN MUST THEN BE SPLICED WITH REPLACEMENT BARS OF THE SIZE AND LENGTH OF THE SAMPLE, PLUS A MINIMUM LAP SPLICE OF THIRTY BAR DIAMETERS. PAYMENT FOR THE SAMPLES OF REINFORCING STEEL SHALL BE CONSIDERED INCIDENTAL TO VARIOUS PAY ITEMS.
- FOR CULVERT DIVERSION DETAILS AND PAY ITEM, SEE EROSION CONTROL PLANS.
- NO PRECAST REINFORCED BOX CULVERT OPTION WILL BE ALLOWED.
- FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.
- FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.
- FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.
- FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.
- FOR LIMITS OF TEMPORARY SHORING FOR MAINTENANCE OF TRAFFIC, SEE TRAFFIC CONTROL PLANS.
- FOR PAY ITEM FOR TEMPORARY SHORING FOR MAINTENANCE OF TRAFFIC, SEE ROADWAY PLANS.
- TRAFFIC SHALL BE MAINTAINED ON SITE. FOR MAINTENANCE OF TRAFFIC, SEE TRAFFIC CONTROL PLANS.
- AFTER SERVING AS A TEMPORARY STRUCTURE, THE EXISTING REINFORCED CONCRETE BOX CULVERT SHALL BE REMOVED AS SHOWN IN THE LOCATION SKETCH.
- CONCRETE REPAIR MAY BE REQUIRED DUE TO REMOVAL OF EXISTING UTILITIES. METHOD OF CONCRETE REPAIR SHALL BE APPROVED BY THE ENGINEER. PAYMENT FOR CONCRETE REPAIR SHALL BE CONSIDERED INCIDENTAL TO VARIOUS PAY ITEMS.

PROJECT NO. B-5121/B-5317  
WAKE COUNTY  
 STATION: 15+13.11 -Y1-

SHEET 1 OF 10

STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH  
**DOUBLE 11 FT. X 7 FT.  
 CONCRETE BOX CULVERT**

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

DRAWN BY : William F. Parker DATE : 08/15  
 CHECKED BY : I.L. AVERETTE DATE : 11/2015  
 DESIGN ENGINEER OF RECORD: I.L. AVERETTE DATE : 12/2015

DOCUMENT NOT CONSIDERED  
 FINAL UNLESS ALL  
 SIGNATURES COMPLETED



**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 x RF	STRENGTH I LIMIT STATE								COMMENT NUMBER		
						MOMENT				SHEAR						
						LIVE-LOAD FACTORS (VLL)	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	1.04	--	1.75	1.33	1	BOTTOM SLAB	10.79	1.04	1	TOP SLAB	10.38		
	HL-93 (OPERATING)	N/A		1.34	--	1.35	1.72	1	BOTTOM SLAB	10.79	1.34	1	TOP SLAB	10.38		
	HS-20 (INVENTORY)	36.000	2	1.05	37.82	1.75	1.33	1	BOTTOM SLAB	10.79	1.05	1	BOTTOM SLAB	10.70		
	HS-20 (OPERATING)	36.000		1.36	49.03	1.35	1.72	1	BOTTOM SLAB	10.79	1.36	1	BOTTOM SLAB	10.70		
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH	13.500		2.34	31.58	1.40	3.64	1	BOTTOM SLAB	10.79	2.34	1	TOP SLAB	10.38	
		SNGARBS2	20.000		2.10	42.03	1.40	2.60	1	BOTTOM SLAB	10.79	2.10	1	BOTTOM SLAB	10.70	
		SNAGRIS2	22.000		1.92	42.14	1.40	2.41	1	BOTTOM SLAB	10.79	1.92	1	BOTTOM SLAB	10.70	
		SNCOTTS3	27.250		1.30	35.35	1.40	1.81	1	BOTTOM SLAB	10.79	1.30	1	TOP SLAB	10.38	
		SNAGGRS4	34.925		1.21	42.19	1.40	1.49	1	BOTTOM SLAB	10.79	1.21	1	BOTTOM SLAB	10.70	
		SNS5A	35.550		1.22	43.25	1.40	1.49	1	BOTTOM SLAB	10.79	1.22	1	BOTTOM SLAB	10.70	
		SNS6A	39.950		1.19	47.60	1.40	1.50	1	BOTTOM SLAB	10.79	1.19	1	BOTTOM SLAB	10.70	
		SNS7B	42.000		1.11	46.82	1.40	1.43	1	BOTTOM SLAB	10.79	1.11	1	BOTTOM SLAB	10.70	
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33.000		1.28	42.38	1.40	1.64	1	BOTTOM SLAB	10.79	1.28	1	BOTTOM SLAB	10.70	
		TNT4A	33.075		1.43	47.19	1.40	1.75	1	BOTTOM SLAB	10.79	1.43	1	BOTTOM SLAB	10.70	
		TNT6A	41.600		1.20	49.91	1.40	1.60	1	BOTTOM SLAB	10.79	1.20	1	BOTTOM SLAB	10.70	
		TNT7A	42.000		1.15	48.38	1.40	1.49	1	BOTTOM SLAB	10.79	1.15	1	BOTTOM SLAB	10.70	
		TNT7B	42.000		1.26	52.76	1.40	1.53	1	BOTTOM SLAB	10.79	1.26	1	BOTTOM SLAB	10.70	
		TNAGRIT4	43.000		1.13	48.56	1.40	1.42	1	BOTTOM SLAB	10.79	1.13	1	BOTTOM SLAB	10.70	
TNAGT5A	45.000		1.10	49.38	1.40	1.38	1	BOTTOM SLAB	10.79	1.10	1	BOTTOM SLAB	10.70			
TNAGT5B	45.000		3	1.00	45.22	1.40	1.28	1	BOTTOM SLAB	10.79	1.00	1	BOTTOM SLAB	10.70		

**LOAD FACTORS:**

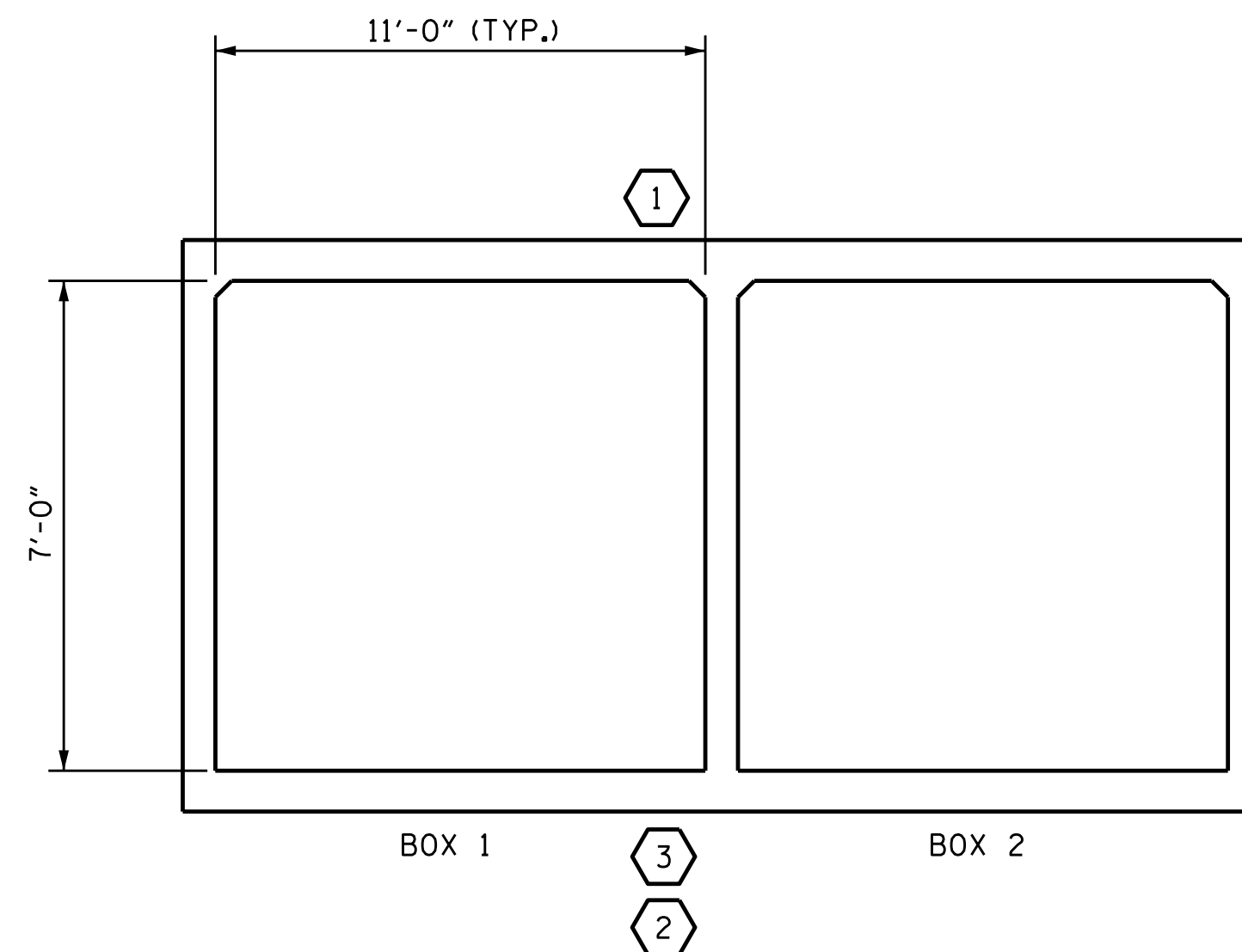
DESIGN LOAD RATING FACTORS

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.

#	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**

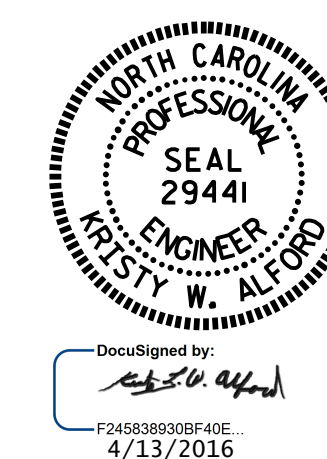
(LOOKING DOWNSTREAM)

PROJECT NO. B-5121/B-5317

WAKE COUNTY

STATION: 15+13.11 -Y1-

SHEET 2 OF 10

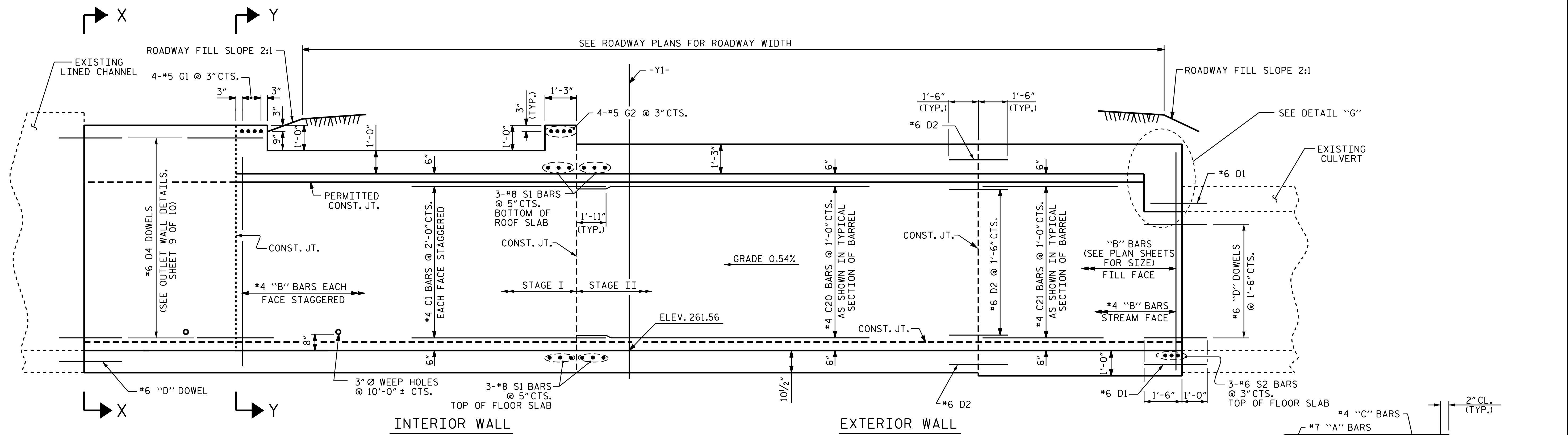


STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH  
STANDARD  
LRFR SUMMARY FOR  
REINFORCED CONCRETE  
BOX CULVERTS  
(NON-INTERSTATE TRAFFIC)

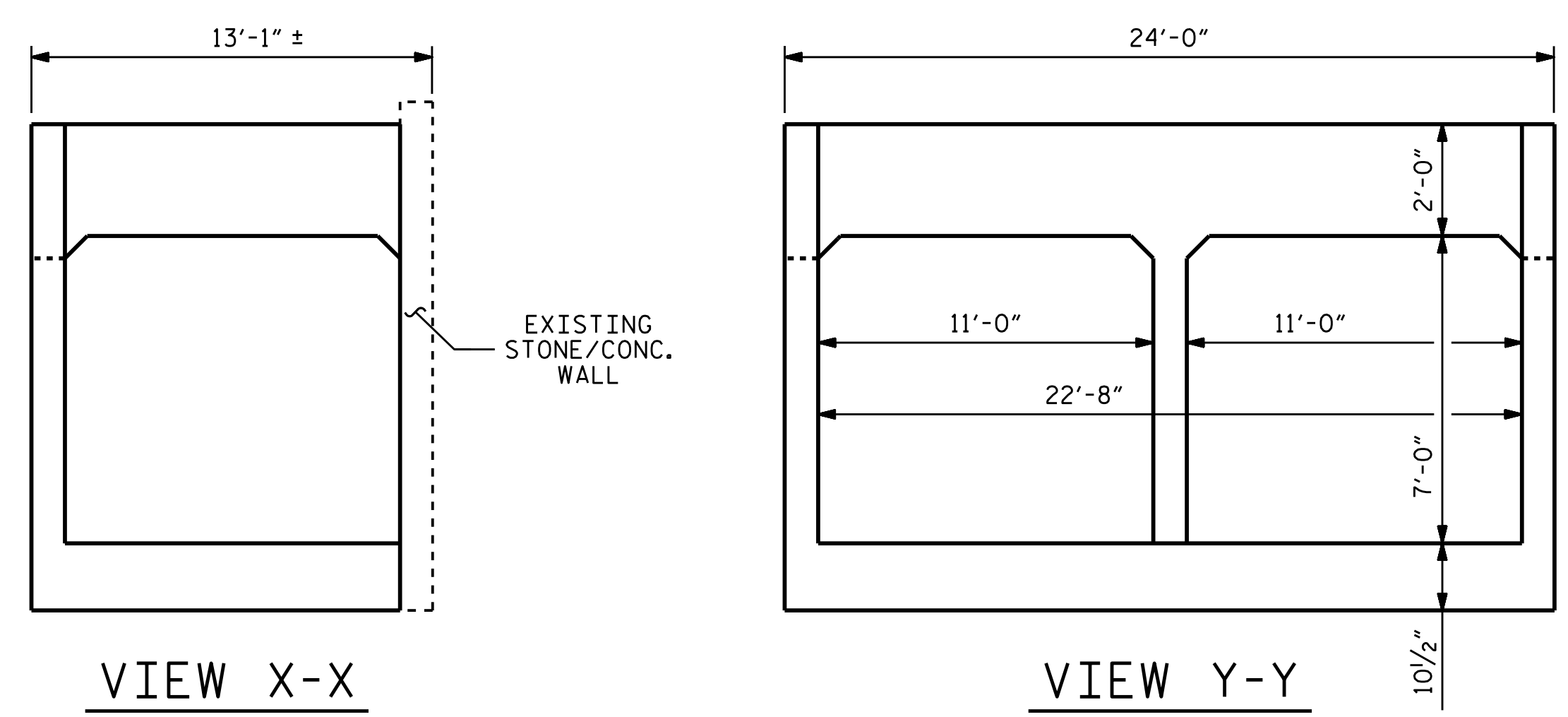
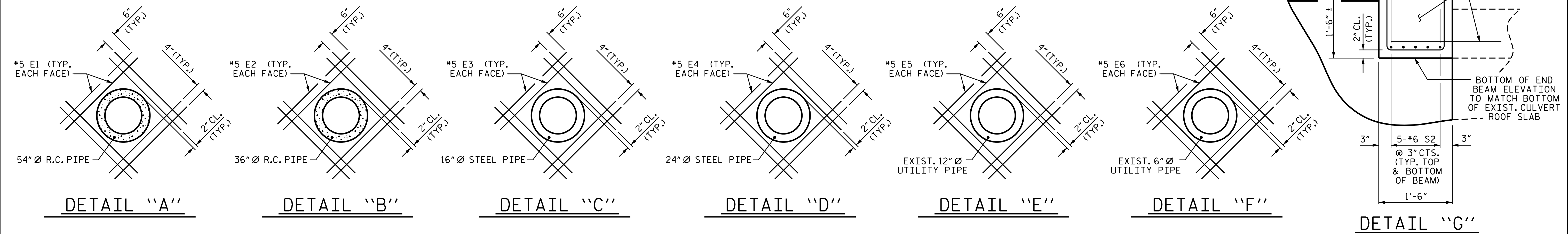
ASSEMBLED BY : T.L. AVERETTE	DATE : 10/15
CHECKED BY : J.P. ADAMS	DATE : 12/15
DRAWN BY : WMC	7/11
CHECKED BY : GM	7/11
REV. 10/1/11	MAA/GM

DOCUMENT NOT CONSIDERED  
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SIGNATURES COMPLETED

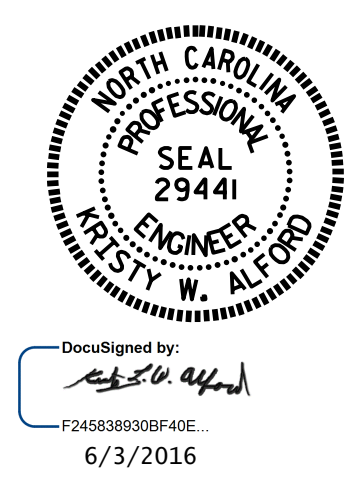
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-2
1			3			TOTAL SHEETS
2			4			10



**CULVERT SECTION NORMAL TO ROADWAY**  
 PIPES THROUGH WALLS OF CULVERT NOT SHOWN FOR CLARITY. SEE SHEETS 5 THROUGH 8 OF 10.



I HEREBY CERTIFY THESE PLANS  
ARE THE AS-BUILT PLANS



PROJECT NO. B-5121/B-5317  
WAKE COUNTY  
 STATION: 15+13.11 -Y1-

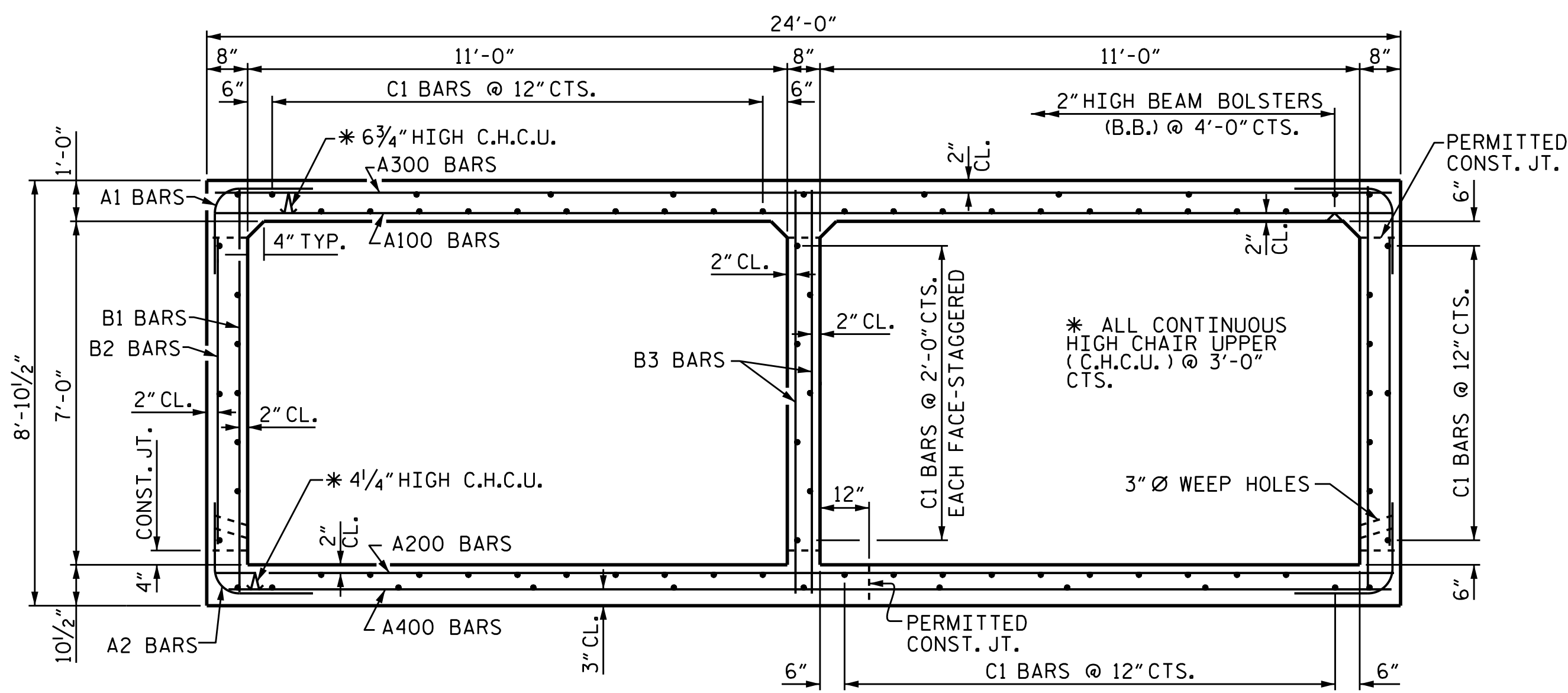
SHEET 3 OF 10  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH  
**DOUBLE 11 FT. X 7 FT.  
 CONCRETE BOX CULVERT**

DRAWN BY: William F. Parker DATE: 08/15  
 CHECKED BY: I.L. AVERETTE DATE: 11/2015  
 DESIGN ENGINEER OF RECORD: I.L. AVERETTE DATE: 12/2015

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-3
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2			4			10

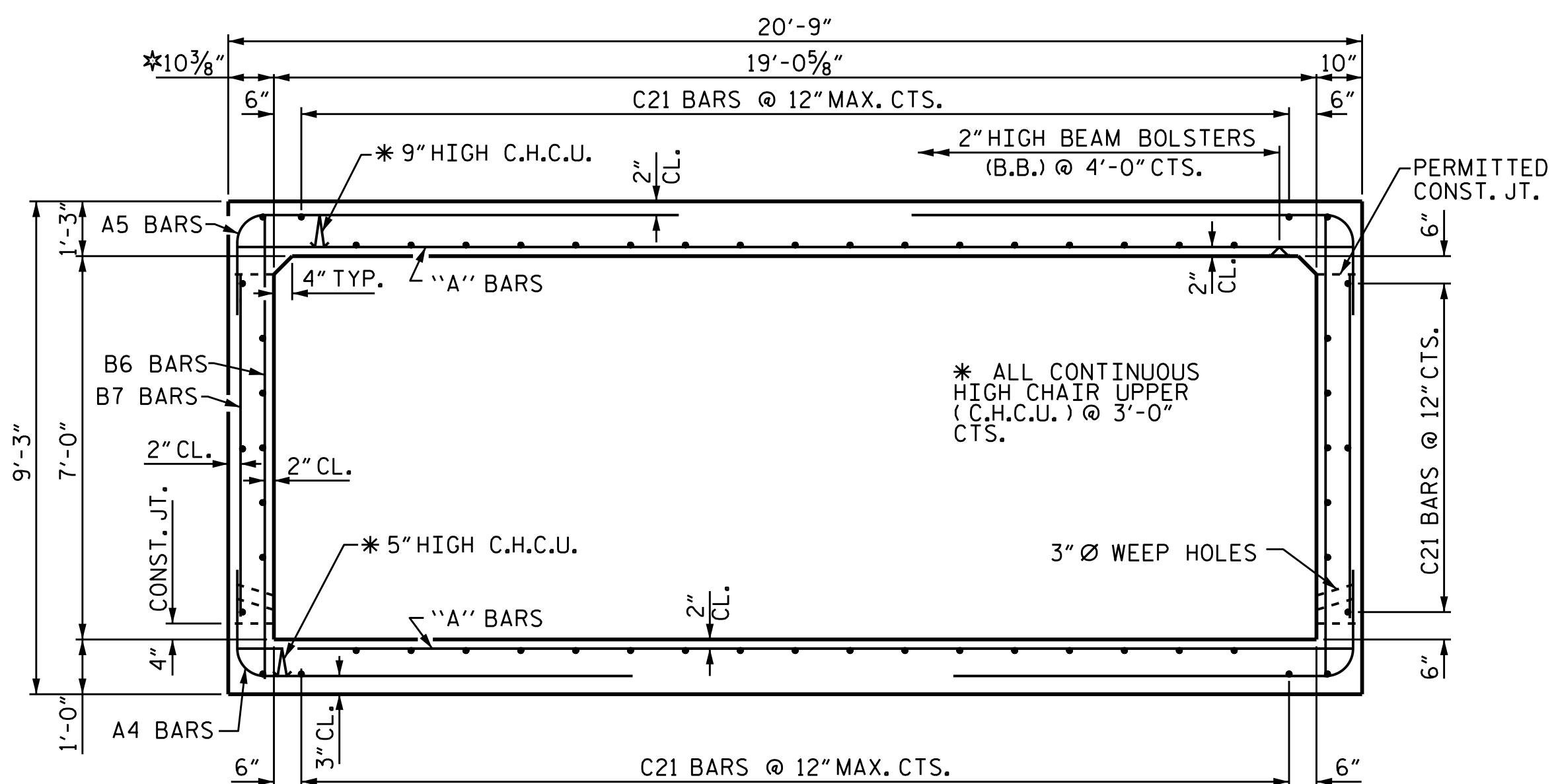
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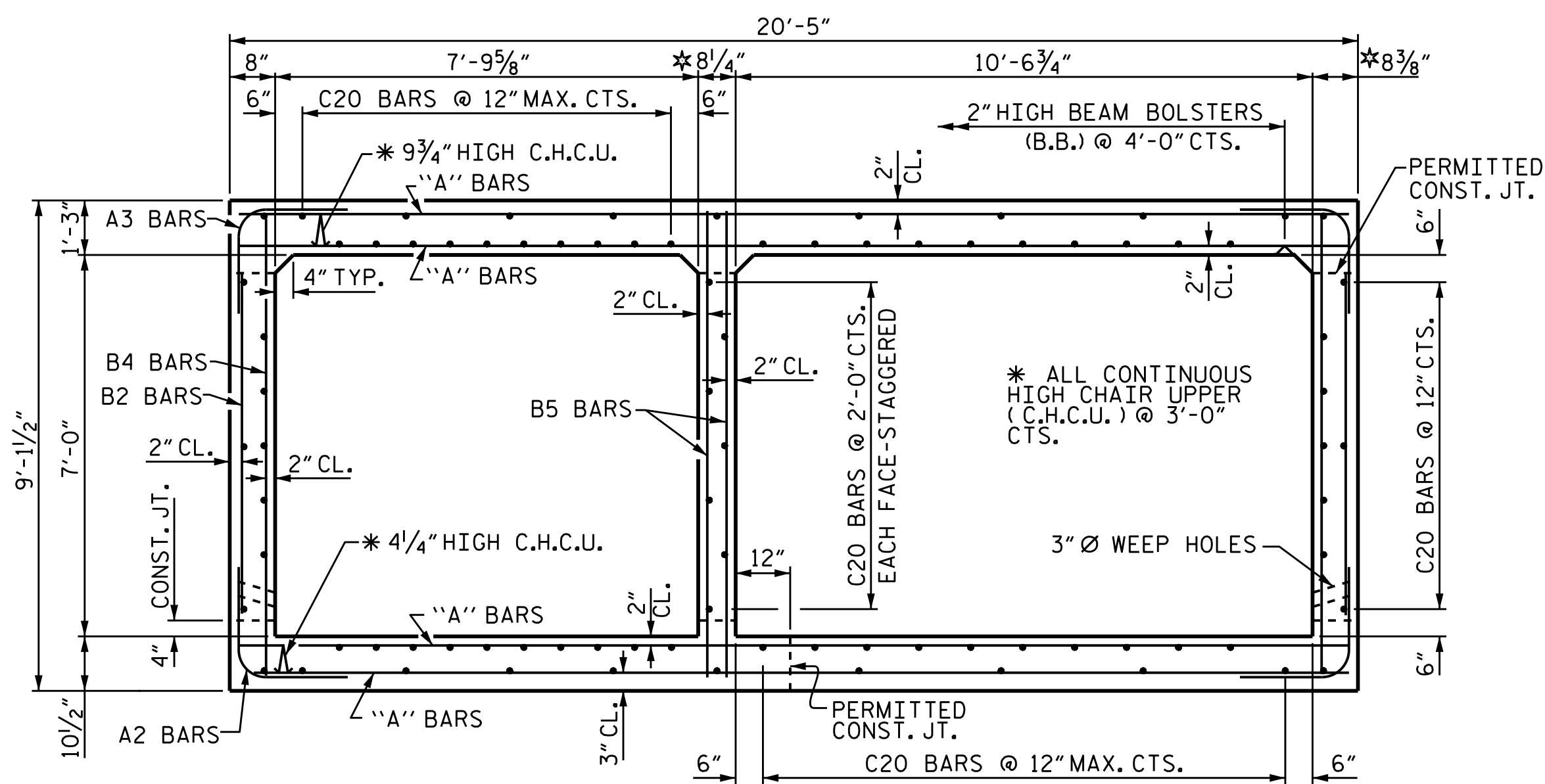
**BARREL SECTION A-A**

THERE ARE 85 "C" BARS IN SECTION OF BARREL.



**BARREL SECTION C-C**

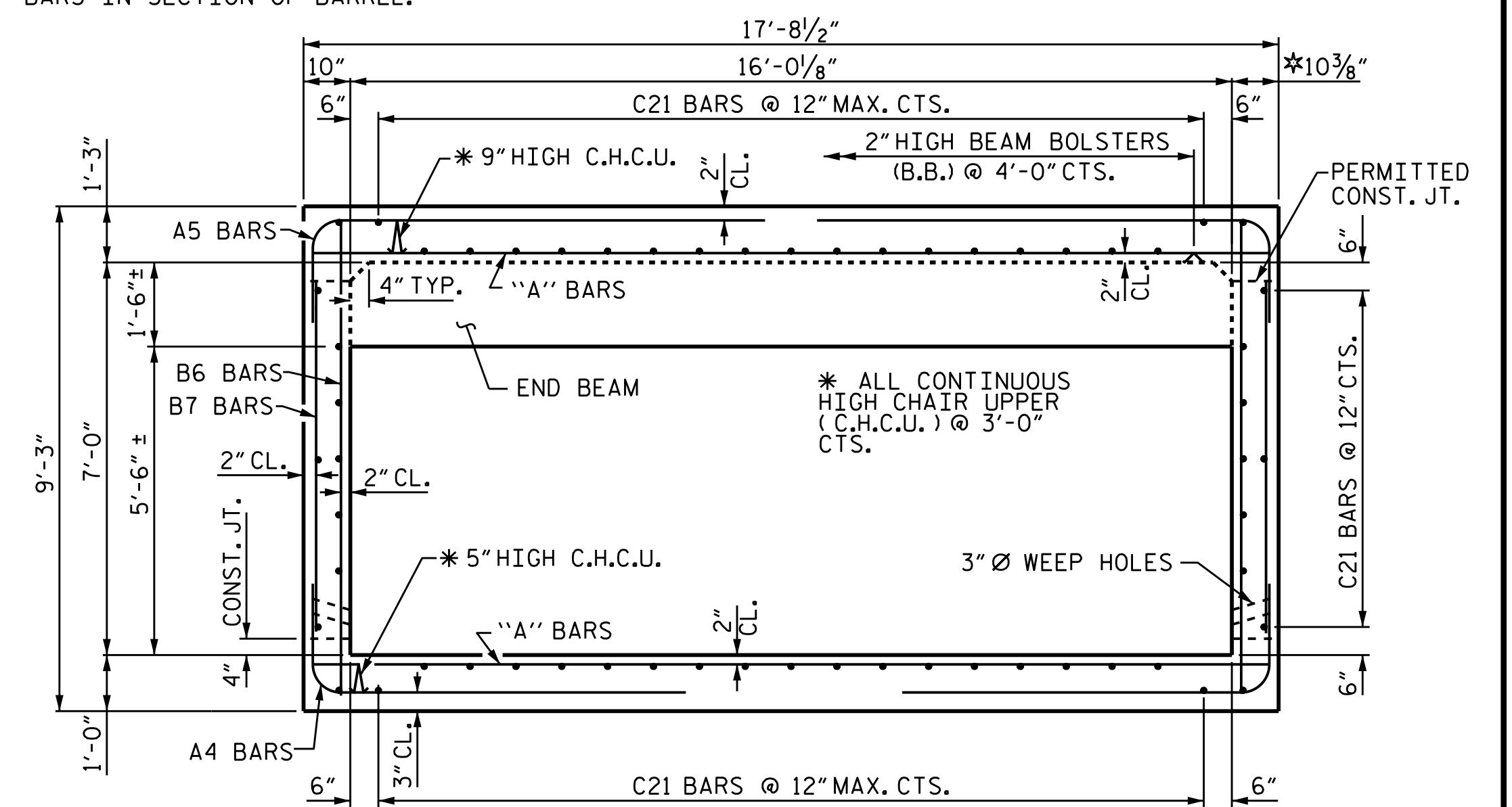
THERE ARE 58 "C" BARS IN SECTION OF BARREL.



**BARREL SECTION B-B**

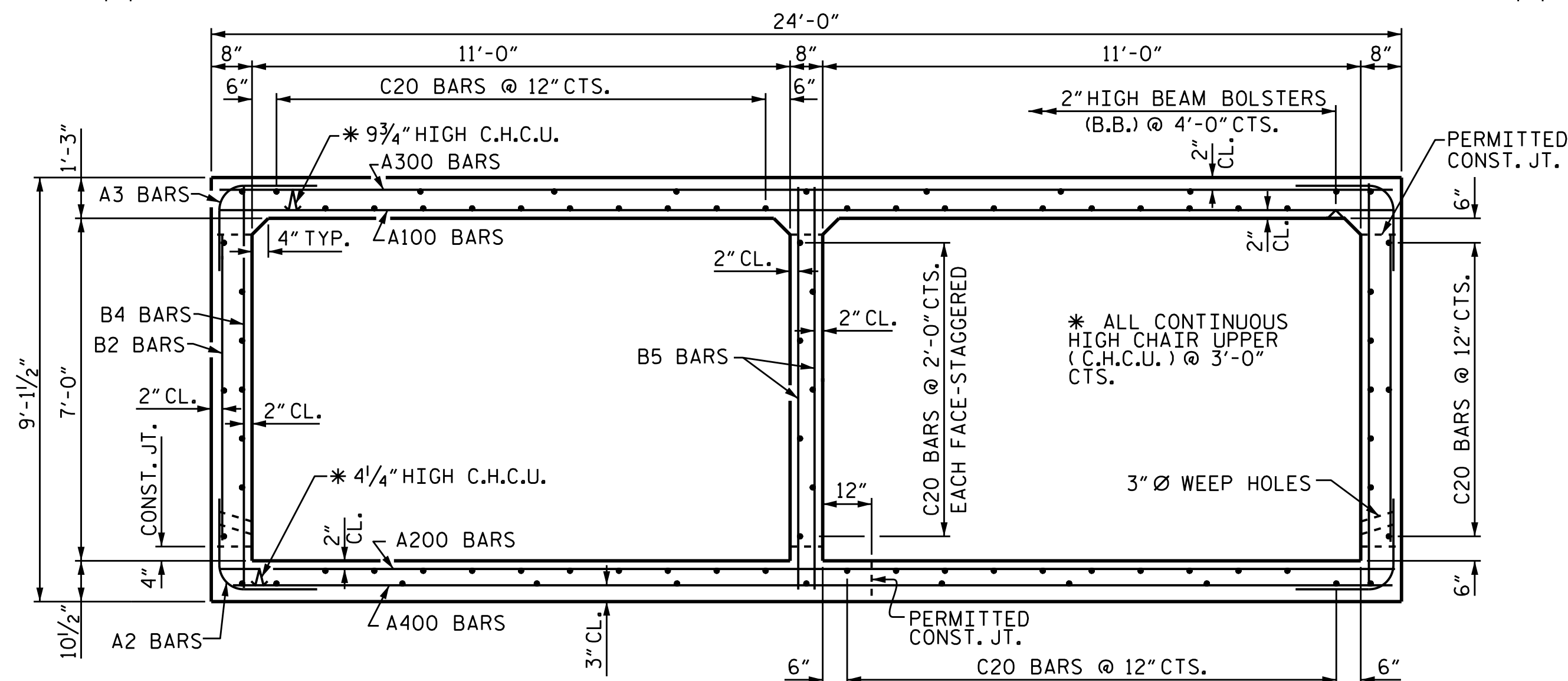
THERE ARE 85 "C" BARS IN SECTION OF BARREL.

\*SKEWED DIMENSION



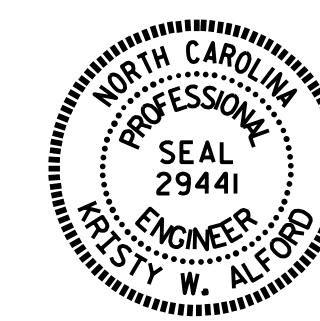
**BARREL SECTION D-D**

THERE ARE 58 "C" BARS IN SECTION OF BARREL.



**BARREL SECTION E-E**

THERE ARE 85 "C" BARS IN SECTION OF BARREL.



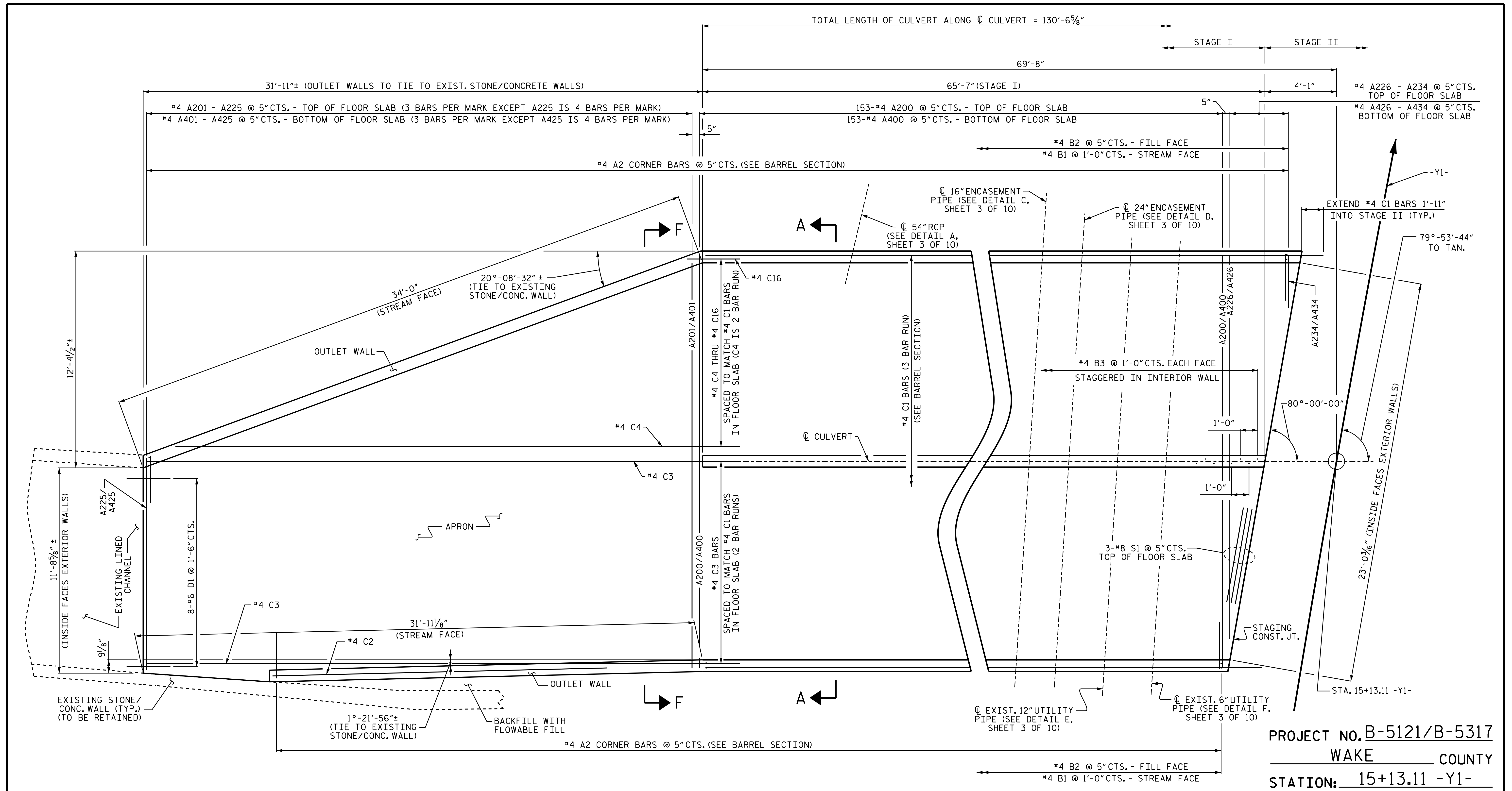
DocuSigned by:  
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4/13/2016

PROJECT NO. B-5121/B-5317  
WAKE COUNTY  
 STATION: 15+13.11 -Y1-  
 SHEET 4 OF 10

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH					
DOUBLE 11 FT. X 7 FT. CONCRETE BOX CULVERT BARREL SECTIONS					
REVISIONS					
NO.	BY:	DATE:	NO.	BY:	DATE:
1			3		
2			4		
SHEET NO.					C-4
TOTAL SHEETS					10

DRAWN BY : I.L. AVERETTE DATE : 11/2015  
 CHECKED BY : J.P. ADAMS DATE : 12/2015  
 DESIGN ENGINEER OF RECORD: I.L. AVERETTE DATE : 12/2015

DOCUMENT NOT CONSIDERED  
 FINAL UNLESS ALL  
 SIGNATURES COMPLETED



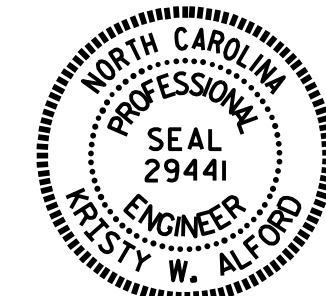
**STAGE I - FLOOR PLAN**  
 FOR SECTION F-F AND ADDITIONAL REINFORCING STEEL IN APRON AND OUTLET WALLS, SEE SHEET 9 OF 10  
 FOR SECTION A-A, SEE SHEET 4 OF 10

**PROJECT NO. B-5121/B-5317**  
**WAKE COUNTY**  
**STATION: 15+13.11 -Y1-**

SHEET 5 OF 10

STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH

**DOUBLE 11 FT. X 7 FT.  
 CONCRETE BOX CULVERT  
 STAGE I  
 FLOOR PLAN**



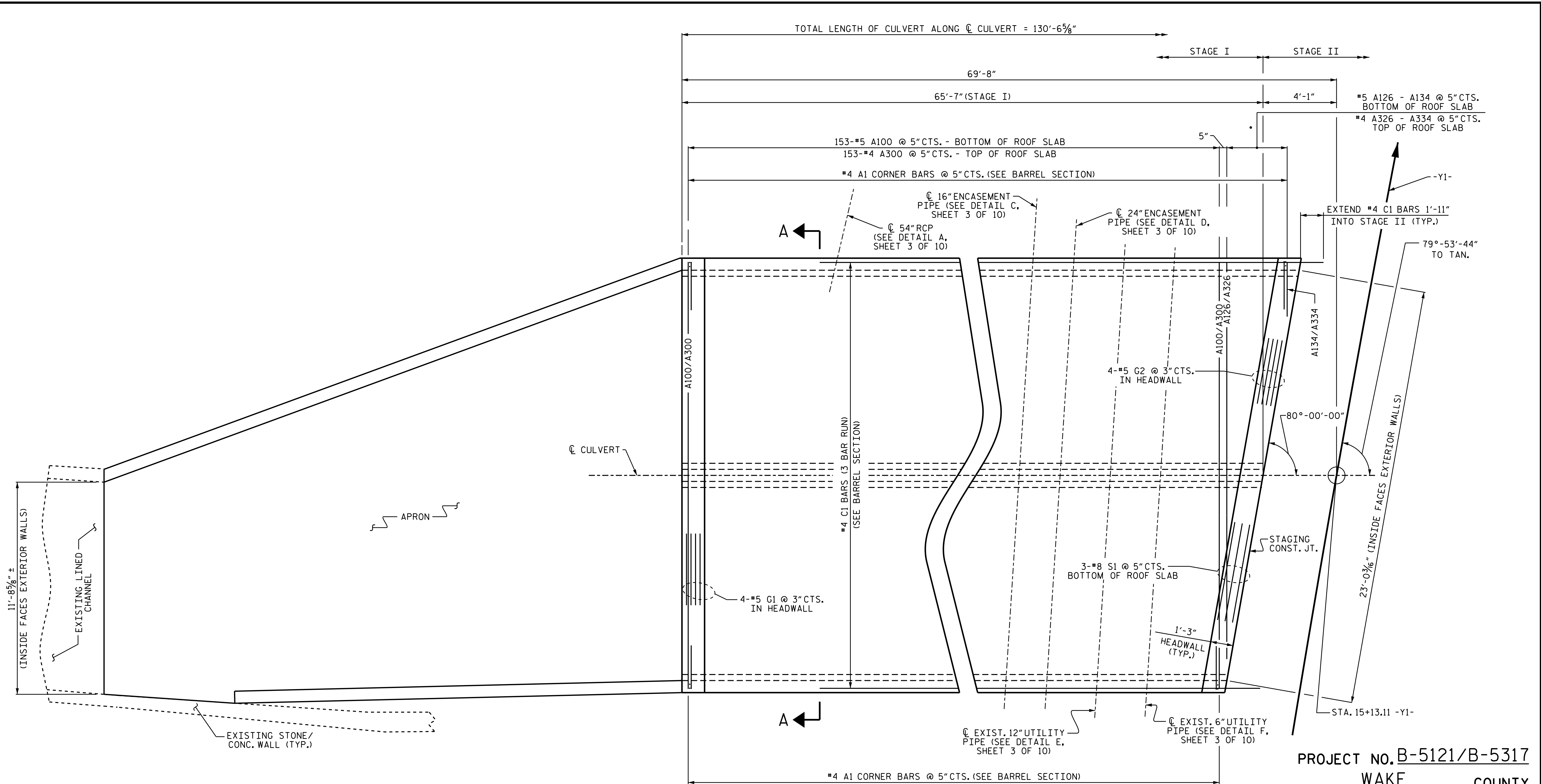
DocuSigned by:  
 Kristy W. Alford  
 6/3/2016

DRAWN BY : T.L. AVERETTE DATE : 11/2015  
 CHECKED BY : J.P. ADAMS DATE : 12/2015  
 DESIGN ENGINEER OF RECORD : T.L. AVERETTE DATE : 12/2015

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REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-5
1			3			TOTAL SHEETS
2			4			10





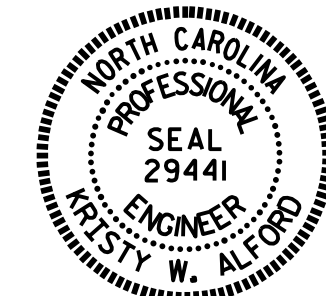
**STAGE I - ROOF PLAN**  
FOR SECTION A-A, SEE SHEET 4 OF 10

**PROJECT NO. B-5121/B-5317**  
**WAKE COUNTY**  
**STATION: 15+13.11 -Y1-**

SHEET 6 OF 10

STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH

**DOUBLE 11 FT. X 7 FT.  
CONCRETE BOX CULVERT  
STAGE I  
ROOF PLAN**

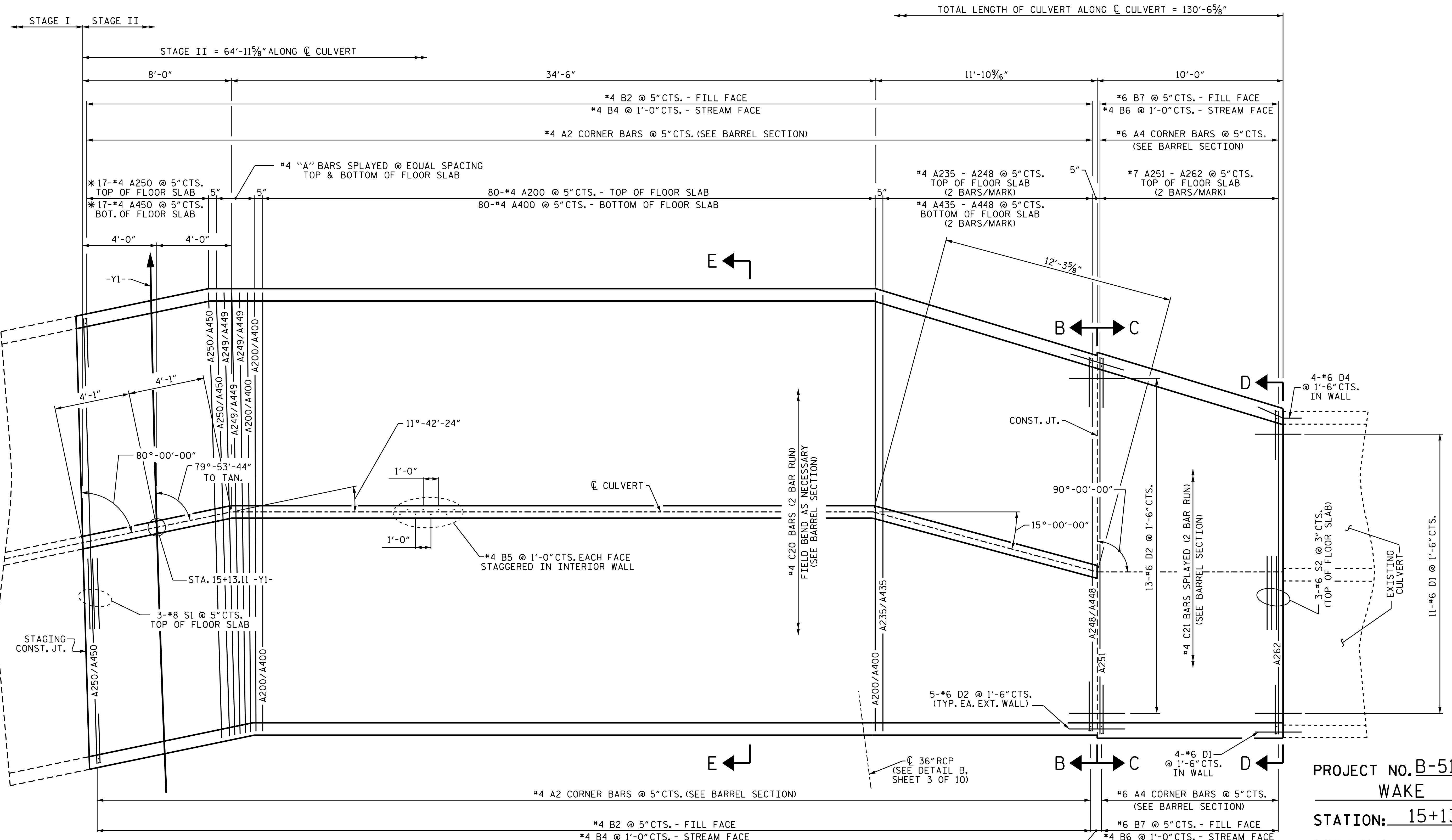


DocuSigned by  
F245838930BF40E...  
6/3/2016

DRAWN BY : William F. Parker DATE : 08/15  
CHECKED BY : I.L. AVERETTE DATE : 11/2015  
DESIGN ENGINEER OF RECORD: I.L. AVERETTE DATE : 12/2015

DOCUMENT NOT CONSIDERED  
FINAL UNLESS ALL  
SIGNATURES COMPLETED

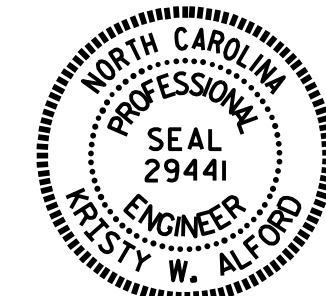
REVISIONS						SHEET NO.	
NO.	BY:	DATE:	NO.	BY:	DATE:	C-6	
1			3			TOTAL SHEETS	
2			4			10	



**STAGE II - FLOOR PLAN**

\* - "A" BARS PLACED PARALLEL TO CONSTRUCTION JOINT FOR SECTION VIEWS, SEE SHEET 4 OF 10

PROJECT NO. **B-5121/B-5317**  
**WAKE** COUNTY  
 STATION: **15+13.11 -Y1-**  
 SHEET 7 OF 10

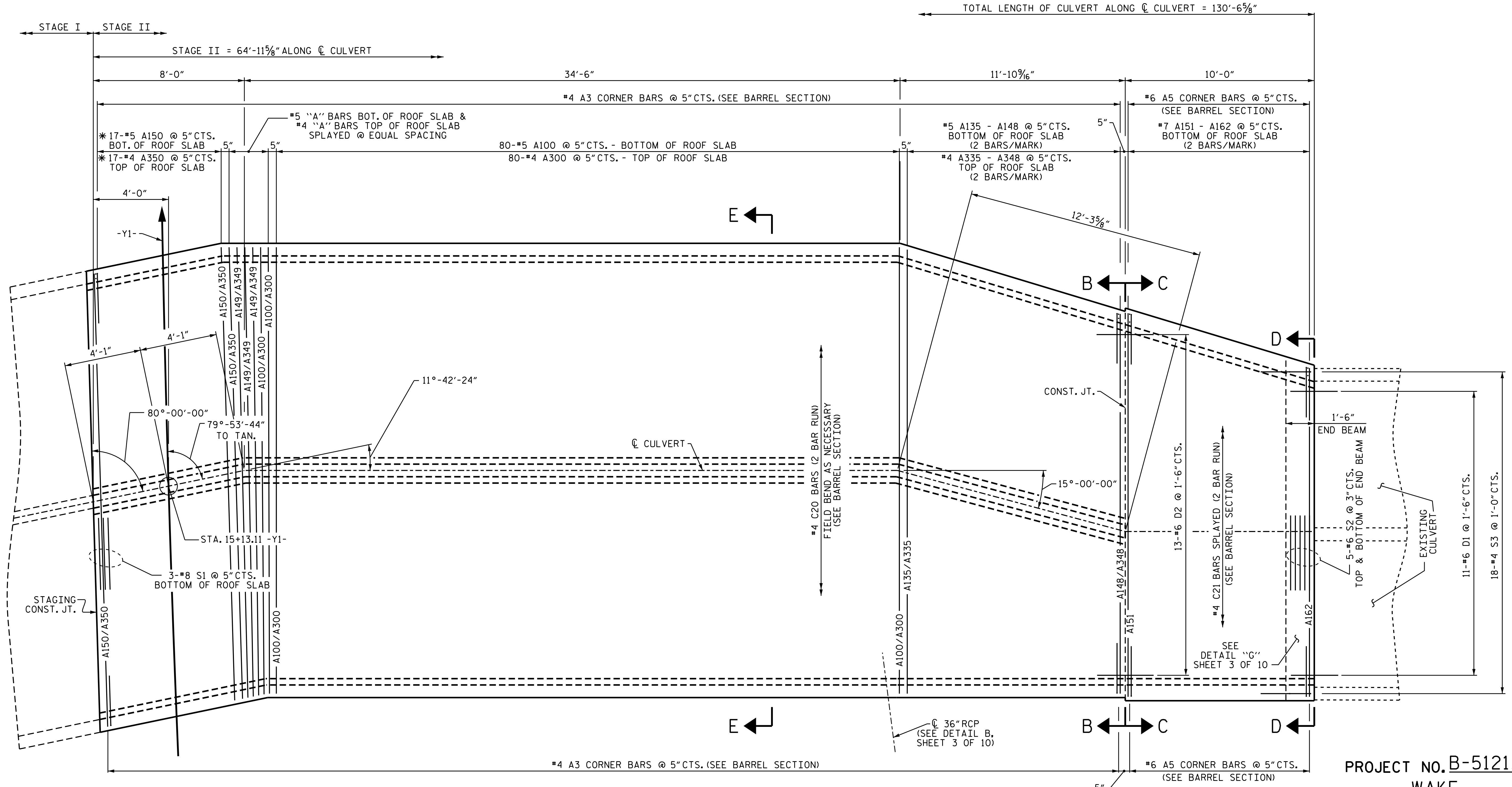


DocuSigned by:  
 Kristy W. Alford  
 F245838930BF0AE...  
 4/13/2016

DRAWN BY : William F. Parker DATE : 08/15  
 CHECKED BY : I.L. AVERETTE DATE : 11/2015  
 DESIGN ENGINEER OF RECORD: I.L. AVERETTE DATE : 12/2015

DOCUMENT NOT CONSIDERED  
 FINAL UNLESS ALL  
 SIGNATURES COMPLETED

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-7
1			3			TOTAL SHEETS
2			4			10



**STAGE II - ROOF PLAN**

\* - "A" BARS PLACED PARALLEL TO CONSTRUCTION JOINT FOR SECTION VIEWS, SEE SHEET 4 OF 10

PROJECT NO. B-5121/B-5317  
WAKE COUNTY  
 STATION: 15+13.11 -Y1-  
 SHEET 8 OF 10



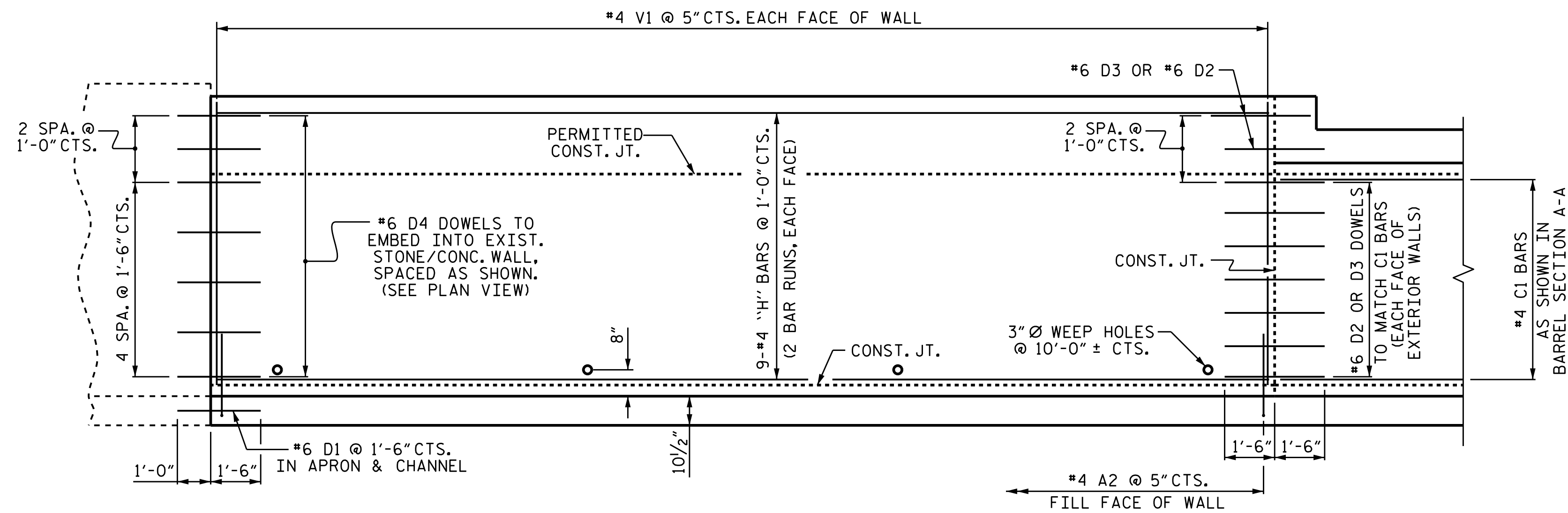
STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH  
**DOUBLE 11 FT. X 7 FT.  
 CONCRETE BOX CULVERT  
 STAGE II  
 ROOF PLAN**

DRAWN BY: William F. Parker DATE: 08/15  
 CHECKED BY: I.L. AVERETTE DATE: 11/2015  
 DESIGN ENGINEER OF RECORD: I.L. AVERETTE DATE: 12/2015

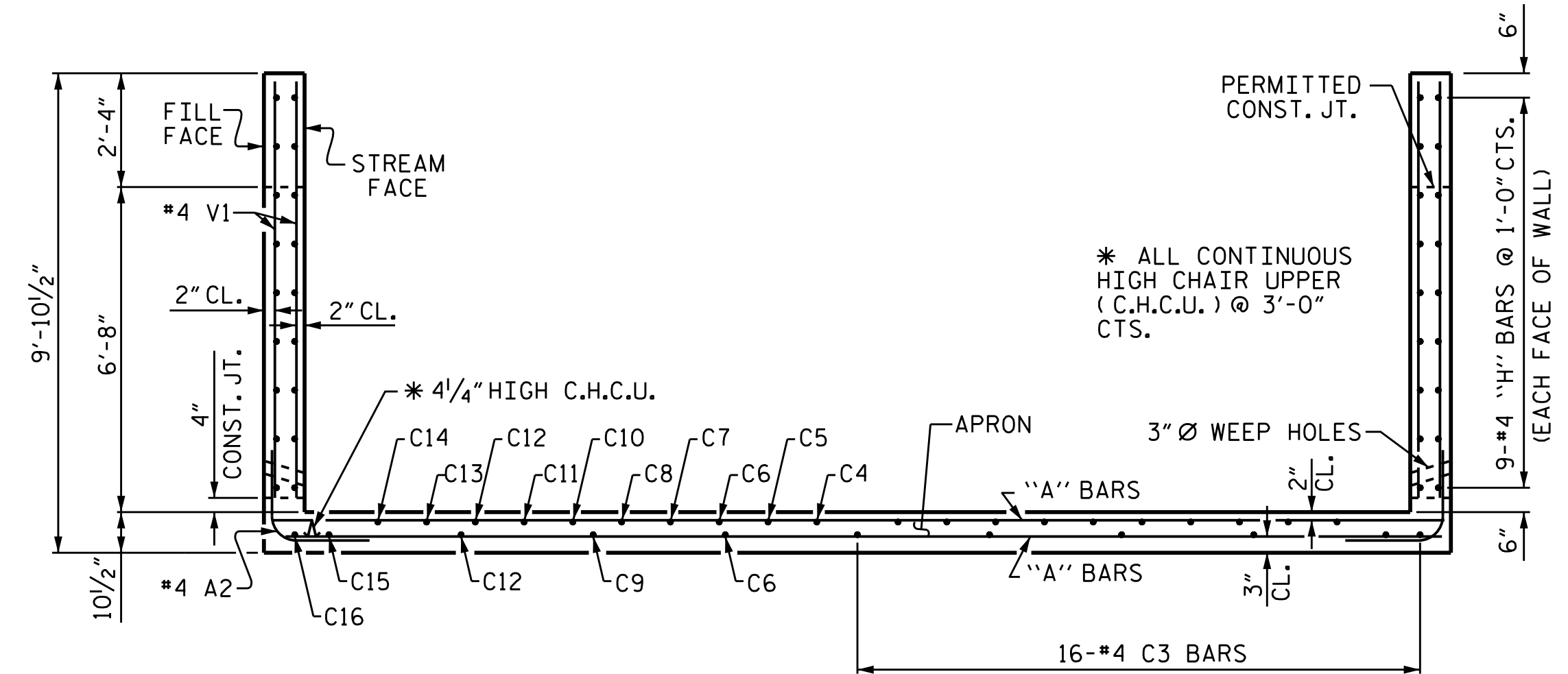
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 SIGNATURES COMPLETED

REVISIONS						SHEET NO.	
NO.	BY:	DATE:	NO.	BY:	DATE:	C-8	
1			3			TOTAL SHEETS	
2			4			10	



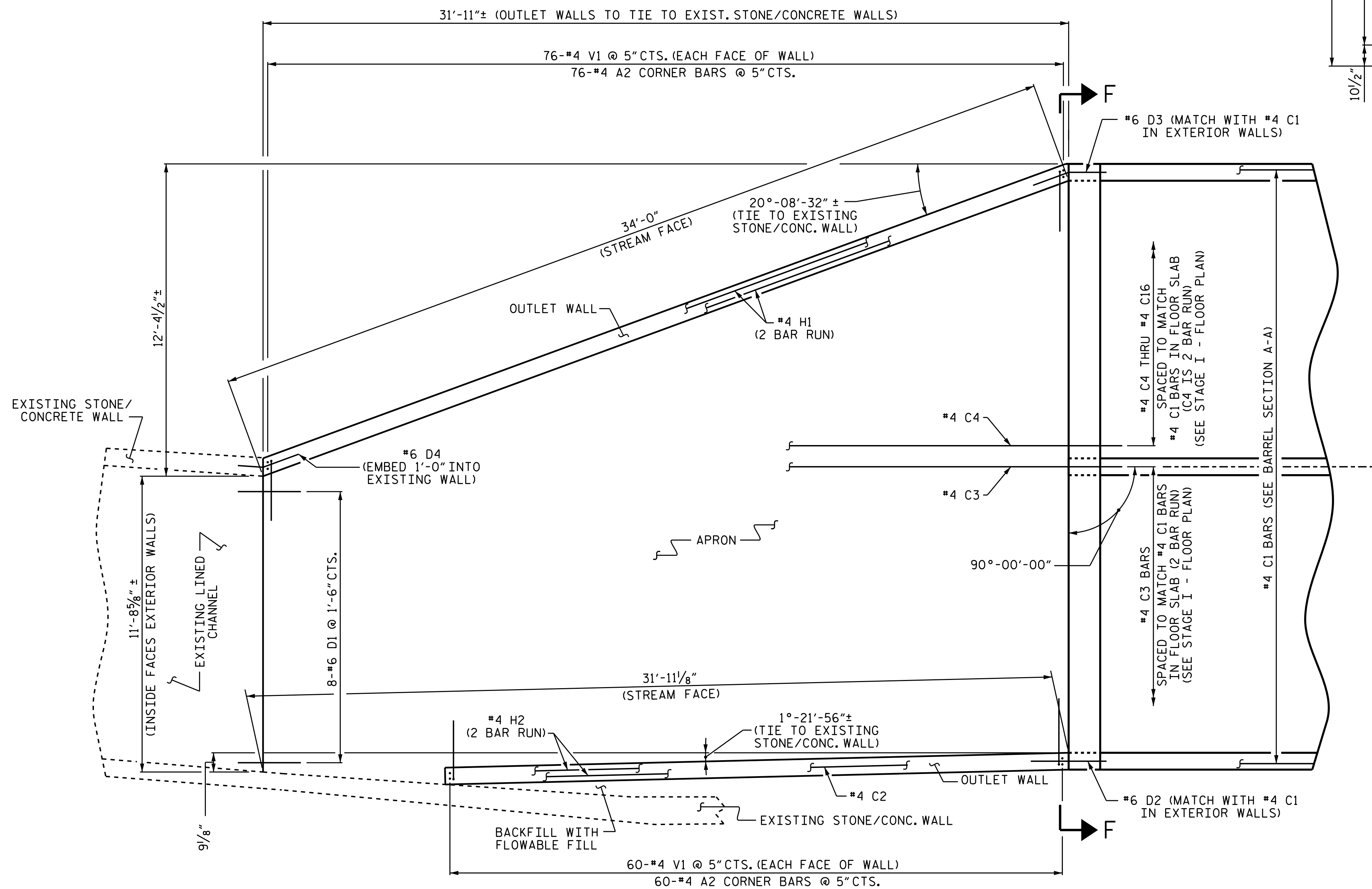


**OUTLET WALL SECTION VIEW**



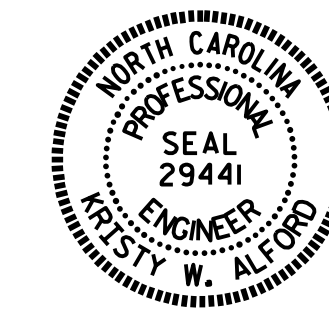
**SECTION F-F**

MATCH #4 "C" BARS IN APRON WITH #4 C1 BARS IN BARREL FLOOR SLAB



**PLAN - OUTLET WALLS**

PROJECT NO. B-5121/B-5317  
 WAKE COUNTY  
 STATION: 15+13.11 -Y1-  
 SHEET 9 OF 10



DocuSigned by:  
 Kristy W. Alford  
 4/13/2016

STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH

**OUTLET WALL DETAILS**

DRAWN BY: I.L. AVERETTE DATE: 11/2015  
 CHECKED BY: J.P. ADAMS DATE: 12/2015  
 DESIGN ENGINEER OF RECORD: I.L. AVERETTE DATE: 12/2015

DOCUMENT NOT CONSIDERED  
 FINAL UNLESS ALL  
 SIGNATURES COMPLETED

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-9
1			3			TOTAL SHEETS
2			4			10

