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09/08/99

CONTRACT: TIP PROJECT: U–2581BA

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

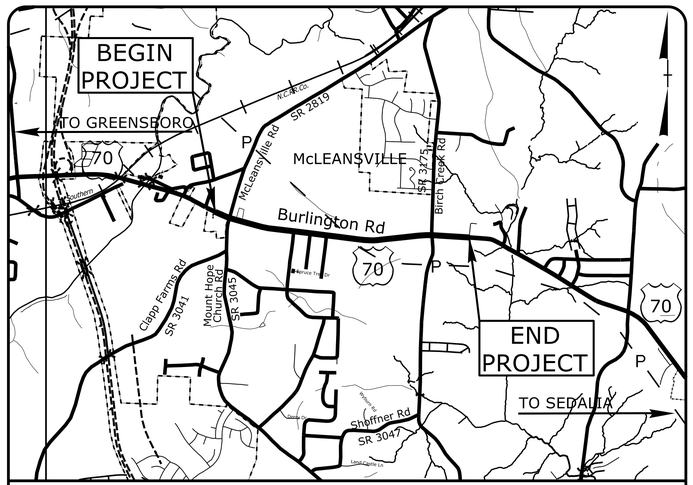
GUILFORD COUNTY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U–2581BA	1	

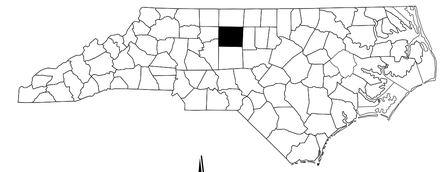
STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION
34840.1.1		PE
34840.2.4		R/W, UTIL.
		CONST.

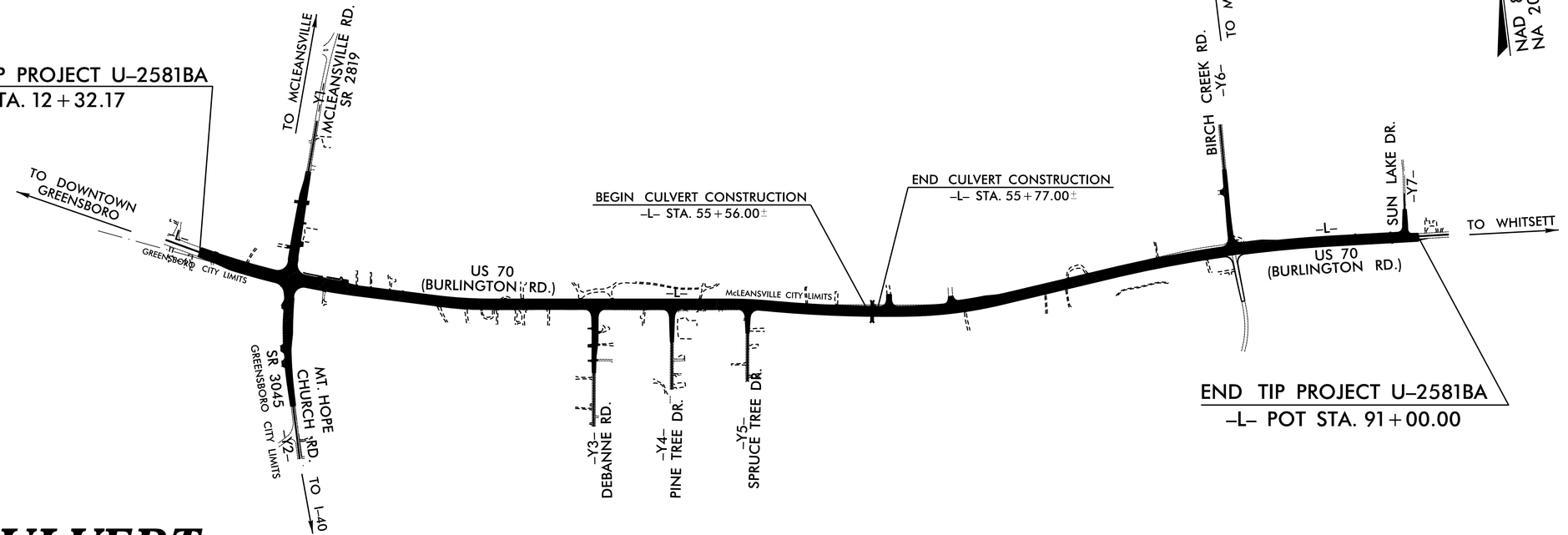
LOCATION: *US 70 (BURLINGTON ROAD) FROM WEST OF SR 3045 (MT. HOPE CHURCH ROAD)/ SR 2819 (MCLEANSVILLE ROAD) TO JUST EAST OF SR 3175 (BIRCH CREEK ROAD)*

TYPE OF WORK: *GRADING, PAVING, DRAINAGE, SIGNALS AND CULVERT*



VICINITY MAP
NOT TO SCALE

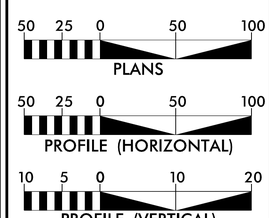




CULVERT

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

GRAPHIC SCALES



DESIGN DATA

ADT 2019 = 15,430
ADT 2039 = 25,890
K = 12 %
D = 60 %
T = 6 % *
V = 50 MPH
* (TTST 1 + DUAL 5)
FUNC CLASS = PRINCIPAL ARTERIAL

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT U–2581BA = 1.490 MI.

TOTAL LENGTH OF TIP PROJECT U–2581BA = 1.490 MI.

Prepared for the North Carolina Department of Transportation
In the Office of:
MI ENGINEERING
1011 SCHAUB DRIVE, SUITE 100
RALEIGH, NC 27606
(919) 851-6606
FIRM PE NUMBER : P-0671

2018 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE: OCTOBER 30, 2018

LETTING DATE: OCTOBER 15, 2019

MORRIS ISRAELNAIM, PE
PROJECT ENGINEER

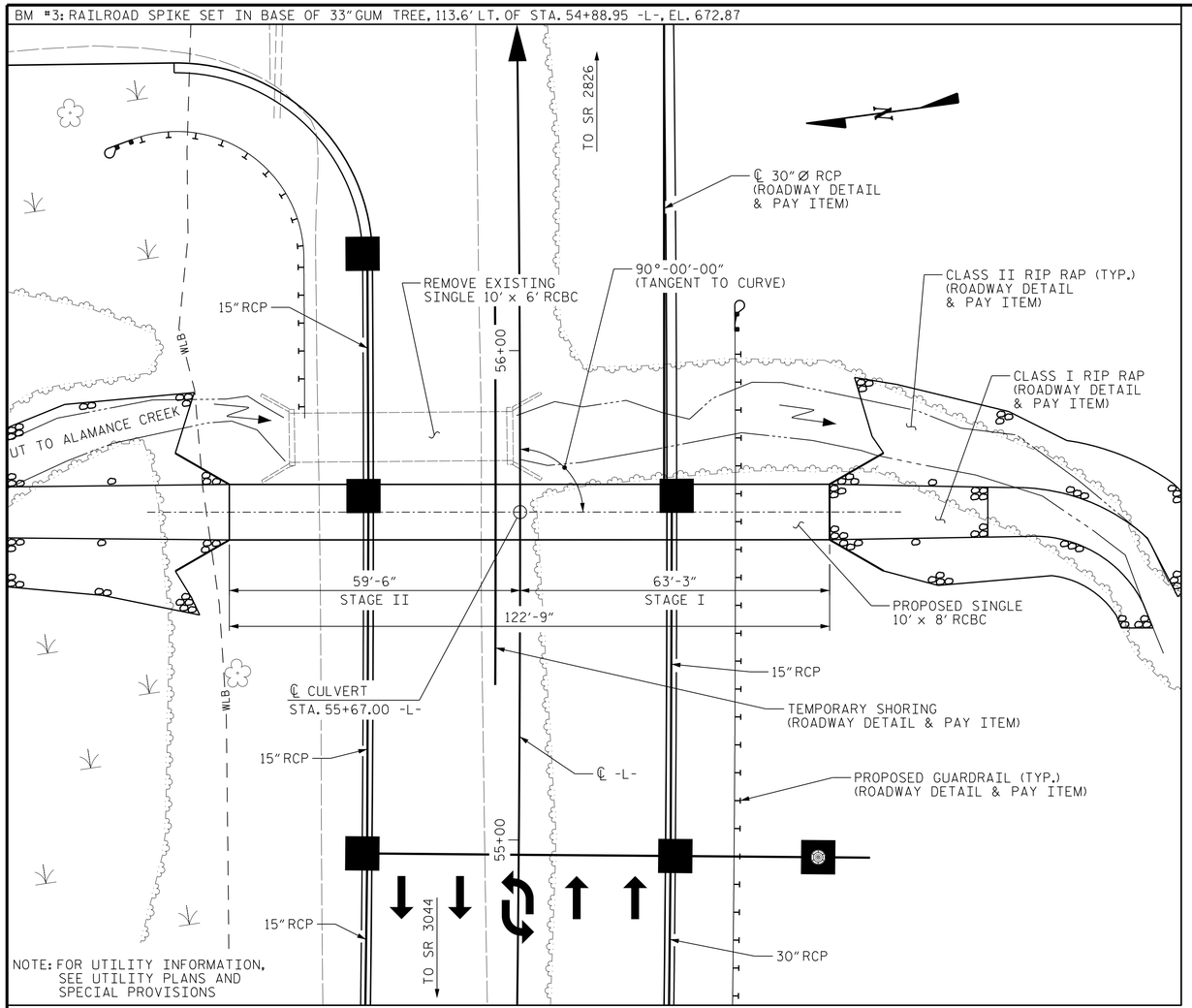
JILLA I. BREWER, PE
PROJECT DESIGN ENGINEER

NCDOT CONTACT LAURA SUTTON, PE

STATE OF NORTH CAROLINA • DEPARTMENT OF TRANSPORTATION •

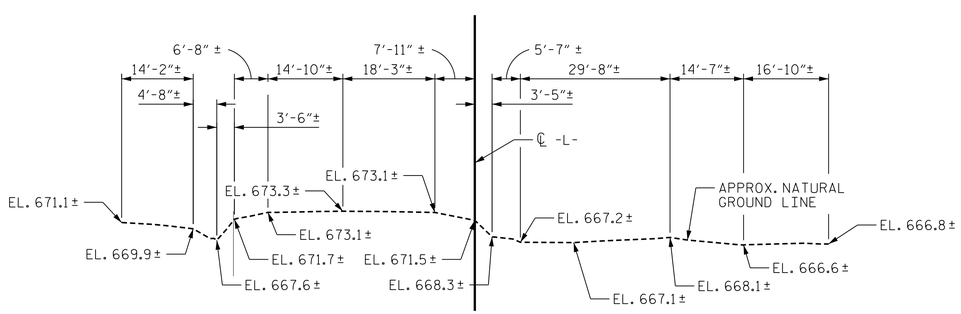
$DATE$
$TIME$
$NAME$
Filenames: $FILE$

BM #3: RAILROAD SPIKE SET IN BASE OF 33" GUM TREE, 113.6' LT. OF STA. 54+88.95 -L-, EL. 672.87



LOCATION SKETCH

GRADE POINT ELEVATION @ 55+67.00 -L- = 678.74
BED ELEVATION @ 55+67.00 -L- = 662.03
ROADWAY SLOPES = 2:1



PROFILE ALONG ℄ CULVERT

NOTES

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

DESIGN FILL----------6.51 FT.

FOR OTHER DESIGN DATA AND NOTES, SEE STANDARD NOTES 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 WING FOOTINGS AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS.
2. THE REMAINING PORTIONS OF STAGE I WALLS AND STAGE I WINGS FULL HEIGHT, FOLLOWED BY ROOF SLAB AND HEADWALL.
3. STAGE II WING FOOTINGS AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS.
4. THE REMAINING PORTIONS OF STAGE II WALLS AND STAGE II WINGS FULL HEIGHT, FOLLOWED BY ROOF SLAB 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.

AT THE CONTRACTOR'S OPTION, HE MAY SPLICE THE VERTICAL REINFORCING STEEL IN THE INTERIOR FACE OF EXTERIOR WALL 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.

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.

STEEL SHEET PILING REQUIRED FOR SHORING SHALL BE HOT ROLLED.

THE EXISTING STRUCTURE CONSISTING OF A SINGLE 10 FT X 6 FT RCBC LOCATED AT THE SITE OF THE PROPOSED STRUCTURE SHALL BE REMOVED.

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.

EXCAVATE AT LEAST 1 FOOT BELOW BOTTOM OF CULVERT AND REPLACE WITH FOUNDATION CONDITIONING MATERIAL IN ACCORDANCE WITH ARTICLE 414-4 OF THE STANDARD SPECIFICATIONS.

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

FOR CONSTRUCTION SEQUENCE, SEE EROSION CONTROL PLANS.

FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.

FOR FALSWORK AND FORMWORK, SEE SPECIAL PROVISIONS.

FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.

FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.

FOR ASBESTOS ASSESSMENT FOR BRIDGE DEMOLITION AND RENOVATION ACTIVITES, SEE SPECIAL PROVISIONS.

HYDRAULIC DATA

DESIGN DISCHARGE .....= 550 CFS
FREQUENCY OF DESIGN FLOOD .....= 50 YRS.
DESIGN HIGH WATER ELEVATION .....= 671.0 FT.
DRAINAGE AREA .....= 0.64 SQ. MI.
BASE DISCHARGE (Q100).....= 600 CFS
BASE HIGH WATER ELEVATION .....= 671.5 FT.

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE .....= 1325 CFS
FREQUENCY OF OVERTOPPING FLOOD .....= 500+ YRS.
OVERTOPPING FLOOD ELEVATION .....= 678.7 FT.*

*OVERTOPS SAG AT STA. 55+70.30 -L-

-L- PROFILE DATA

PVI STA. 56+30.00 -L-
PVI EL. = 672.33
VC = 712.00
g1 = -3.0843%
g2 = +4.3268%

TOTAL STRUCTURE QUANTITIES

CLASS A CONCRETE		
STAGE I	91.8	C.Y.
STAGE II	86.7	C.Y.
TOTAL	178.5	C.Y.
REINFORCING STEEL		
STAGE I	10,839	LBS.
STAGE II	10,122	LBS.
TOTAL	20,961	LBS.
FOUNDATION CONDITIONING MATERIAL		
STAGE I	69	TONS
STAGE II	65	TONS
TOTAL	134	TONS
CULVERT EXCAVATION	LUMP SUM	
REMOVAL OF EXISTING STRUCTURE	LUMP SUM	
ASBESTOS ASSESSMENT	LUMP SUM	

PROJECT NO. U-2581BA
GUILFORD COUNTY
STATION: 55+67.00 -L-

SHEET 1 OF 8

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

SINGLE 10 FT. X 8 FT. CONCRETE BOX CULVERT STAGE I AND II 90° SKEW

Julia L. Brewer
NORTH CAROLINA PROFESSIONAL SEAL 46029 ENGINEER JULIA L. BREWER
8/23/2019

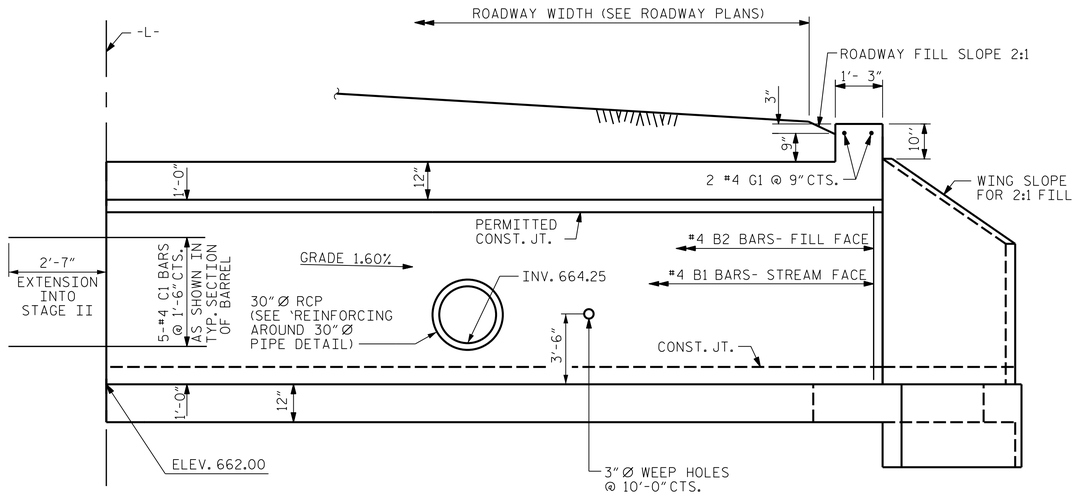
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

MI ENGINEERING
1011 SCHAUB DRIVE, SUITE 100
RALEIGH, NC 27606
(919) 851-6606
FIRM PE NUMBER : P-0671

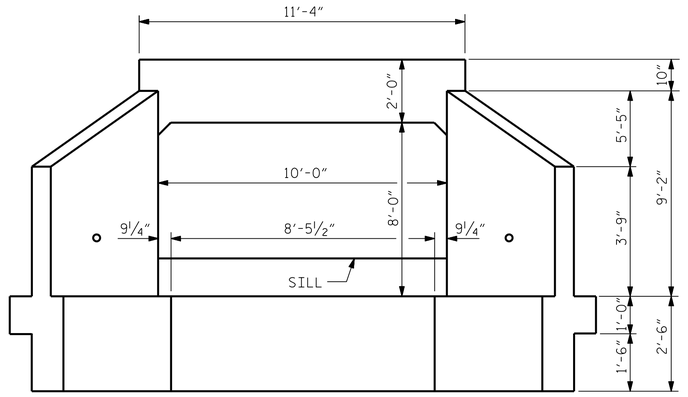
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-1
1			3			TOTAL SHEETS
2			4			8

DRAWN BY : J.I. BREWER DATE : 04/19
CHECKED BY : R. ASENCIO DATE : 05/19
DESIGN ENGINEER OF RECORD : J.I. BREWER DATE : 05/19

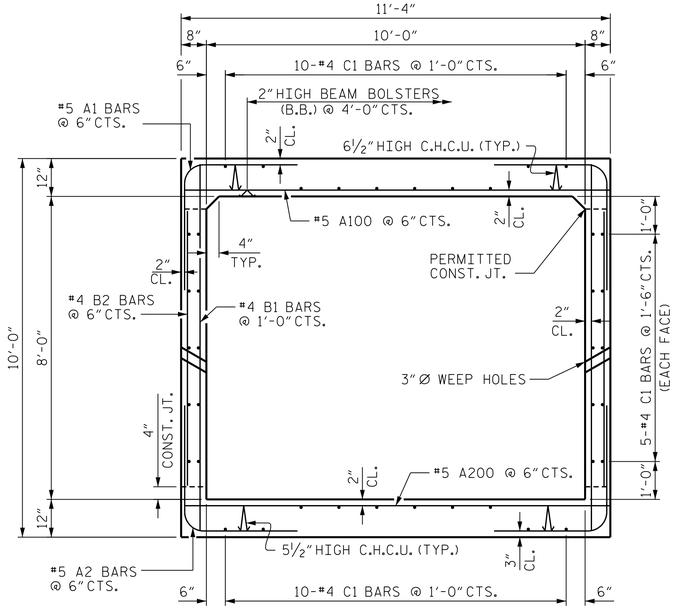
$DATE$
$TIME$
$NAME$
Filename: $FILE$



CULVERT SECTION NORMAL TO ROADWAY

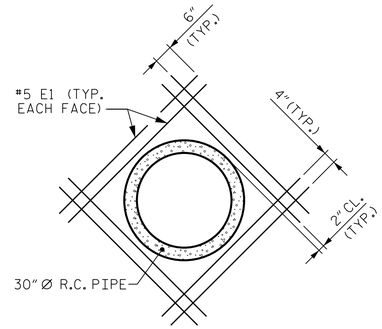


OUTLET ELEVATION NORMAL TO SKEW



RIGHT ANGLE SECTION OF BARREL

THERE ARE 40 "C" BARS IN SECTION OF BARREL



DETAIL OF REINFORCING AROUND 30"Ø PIPE

NOTE: 30"Ø PIPE THROUGH THE SIDEWALL OF THE CULVERT SHALL BE LOCATED BY THE ENGINEER. THE REINFORCING STEEL SHALL BE FIELD BENT AS NECESSARY TO CLEAR PIPE.

TOTAL STAGE I QUANTITIES		
CLASS A CONCRETE		
BARREL @ 1.24 CY/FT	78.4	C.Y.
WINGS, ETC.	12.2	C.Y.
SILLS	1.2	C.Y.
TOTAL	91.8	C.Y.
REINFORCING STEEL		
BARREL	10,118	LBS.
WINGS, ETC.	721	LBS.
TOTAL	10,839	LBS.
FOUNDATION CONDITIONING MATERIAL	69	TONS
CULVERT EXCAVATION	LUMP	SUM

PROJECT NO. U-2581BA

GUILFORD COUNTY

STATION: 55+67.00 -L-

SHEET 2 OF 8

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

SINGLE 10 FT. X 8 FT. CONCRETE BOX CULVERT STAGE I 90° SKEW

NORTH CAROLINA PROFESSIONAL SEAL 46029 ENGINEER JULIA I. BREWER

7/12/2019

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

MI ENGINEERING
1011 SCHAUB DRIVE, SUITE 100
RALEIGH, NC 27606
(919) 851-6606
FIRM PE NUMBER : P-0671

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

SHEET NO. C-2

TOTAL SHEETS 8

DRAWN BY :	W.O. KEITH	DATE :	04/19
CHECKED BY :	R. ASENCIO	DATE :	05/19
DESIGN ENGINEER OF RECORD :	J.I. BREWER	DATE :	05/19

7/12/2019
11:21:32 AM
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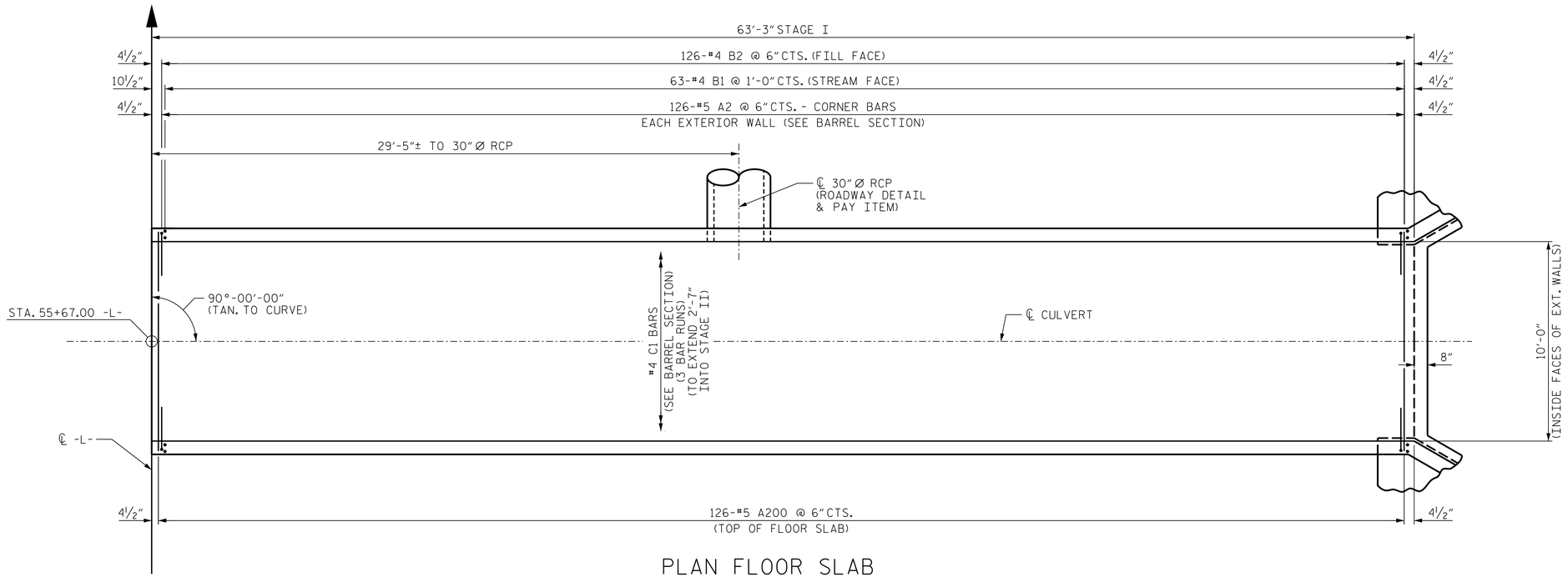
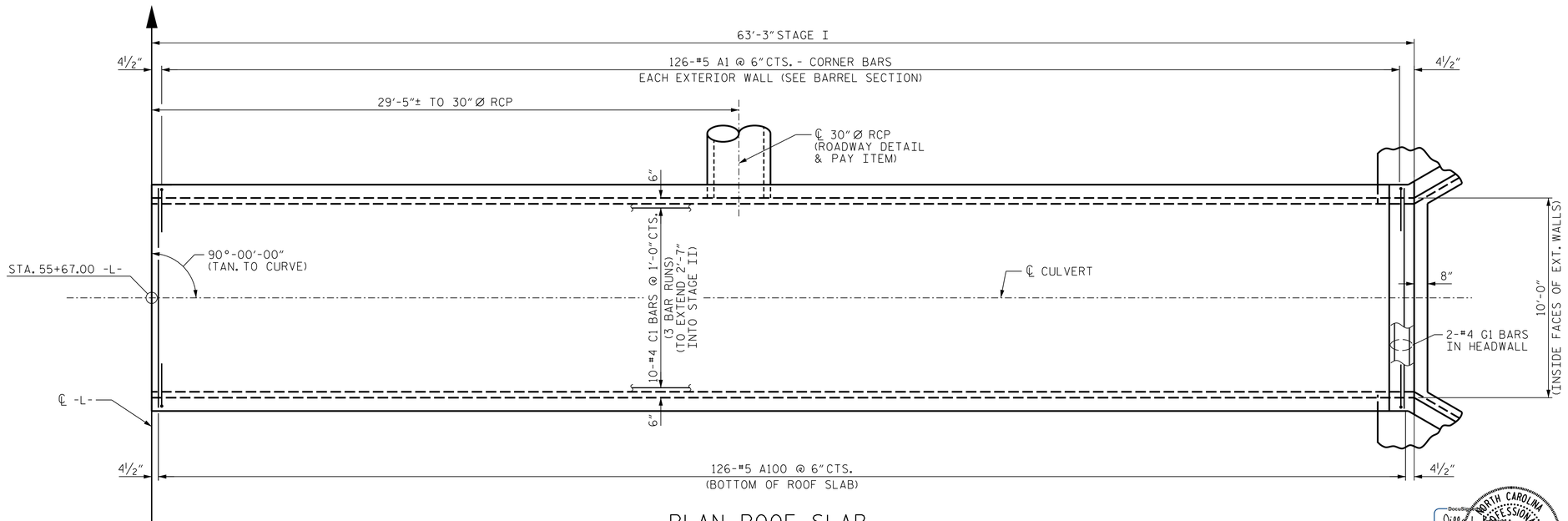


PLAN FLOOR SLAB

SILLS NOT SHOWN. SEE SHEET 7 OF 8 FOR LOCATIONS



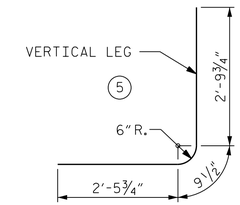
PLAN ROOF SLAB

BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	252	#5	5	6'-1"	1599
A2	252	#5	5	6'-1"	1599
A100	126	#5	STR	11'-0"	1446
A200	126	#5	STR	11'-0"	1446
B1	126	#4	STR	9'-7"	807
B2	252	#4	STR	7'-4"	1234
C1	120	#4	STR	23'-2"	1857
D1	12	#6	STR	1'-7"	29
G1	2	#4	STR	11'-0"	15
E1	16	#5	STR	5'-2"	86
REINFORCING STEEL					10,118 LBS.

BAR TYPES

ALL BAR DIMENSIONS ARE OUT TO OUT.



SPLICE LENGTH CHART

BAR	SIZE	SPLICE LENGTH
B1	#4	1'-9"
C1	#4	1'-11"

PROJECT NO. U-2581BA

GUILFORD COUNTY

STATION: 55+67.00 -L-

SHEET 3 OF 8

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

SINGLE 10 FT. X 8 FT. CONCRETE BOX CULVERT STAGE I 90° SKEW

NORTH CAROLINA PROFESSIONAL SEAL 46029 ENGINEER JILLA I. BREWER

DocuSigned by: Jilla I. Brewer EBGEB3DADB384FC...

8/23/2019

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MI ENGINEERING
1011 SCHAUB DRIVE, SUITE 100
RALEIGH, NC 27606
(919) 851-6606
FIRM PE NUMBER : P-0671

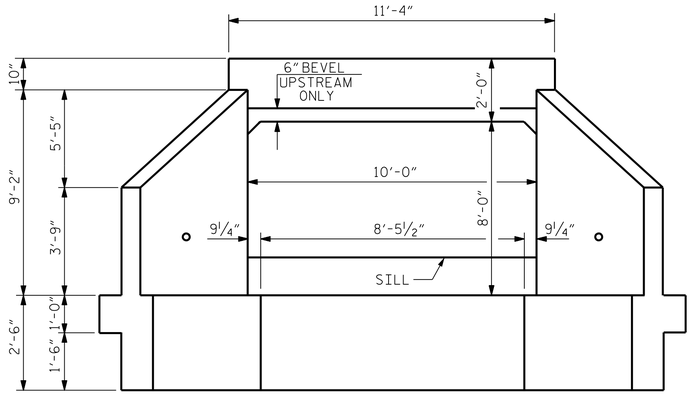
REVISIONS					
NO.	BY:	DATE:	NO.	BY:	DATE:
1			3		
2			4		

SHEET NO. C-3

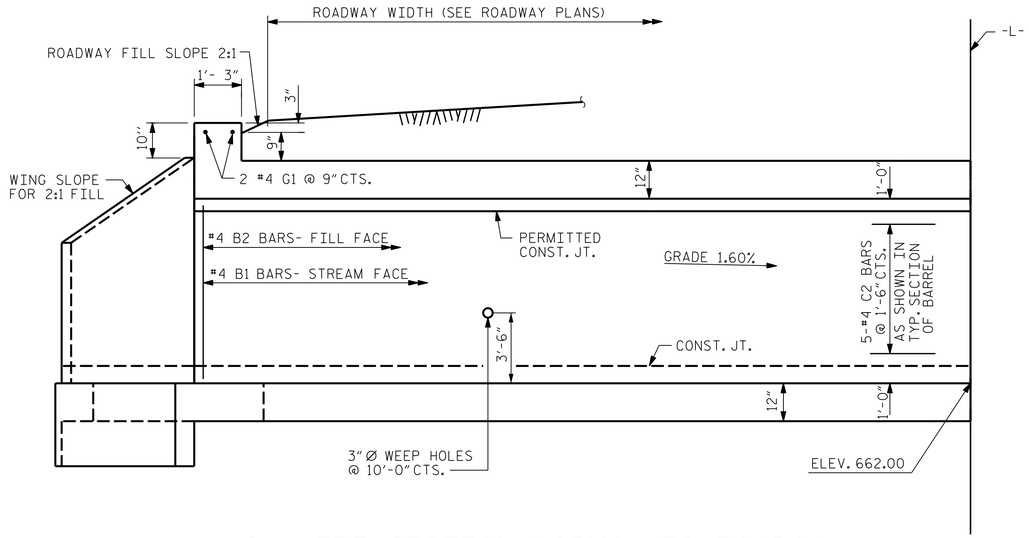
TOTAL SHEETS 8

DRAWN BY : W.O. KEITH DATE : 04/19
CHECKED BY : R. ASENCIO DATE : 05/19
DESIGN ENGINEER OF RECORD : J.I. BREWER DATE : 05/19

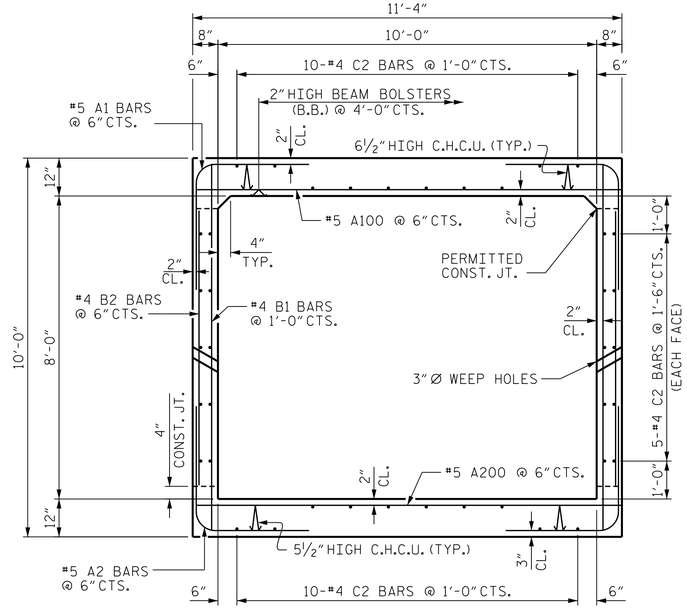
$DATE$
$TIME$
$NAME$
Filename: $FILE$



INLET ELEVATION NORMAL TO SKEW



CULVERT SECTION NORMAL TO ROADWAY



RIGHT ANGLE SECTION OF BARREL

THERE ARE 40 "C" BARS IN SECTION OF BARREL

TOTAL STAGE II QUANTITIES	
CLASS A CONCRETE	
BARREL @ 1.24 CY/FT	73.7 C.Y.
WINGS, ETC.	12.2 C.Y.
SILLS	0.8 C.Y.
TOTAL	86.7 C.Y.
REINFORCING STEEL	
BARREL	9,401 LBS.
WINGS, ETC.	721 LBS.
TOTAL	10,122 LBS.
FOUNDATION CONDITIONING MATERIAL	65 TONS
CULVERT EXCAVATION	LUMP SUM

PROJECT NO. U-2581BA

GUILFORD COUNTY

STATION: 55+67.00 -L-

SHEET 4 OF 8

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

SINGLE 10 FT. X 8 FT. CONCRETE BOX CULVERT STAGE II 90° SKEW

NORTH CAROLINA PROFESSIONAL SEAL 46029 ENGINEER JULIA I. BREWER

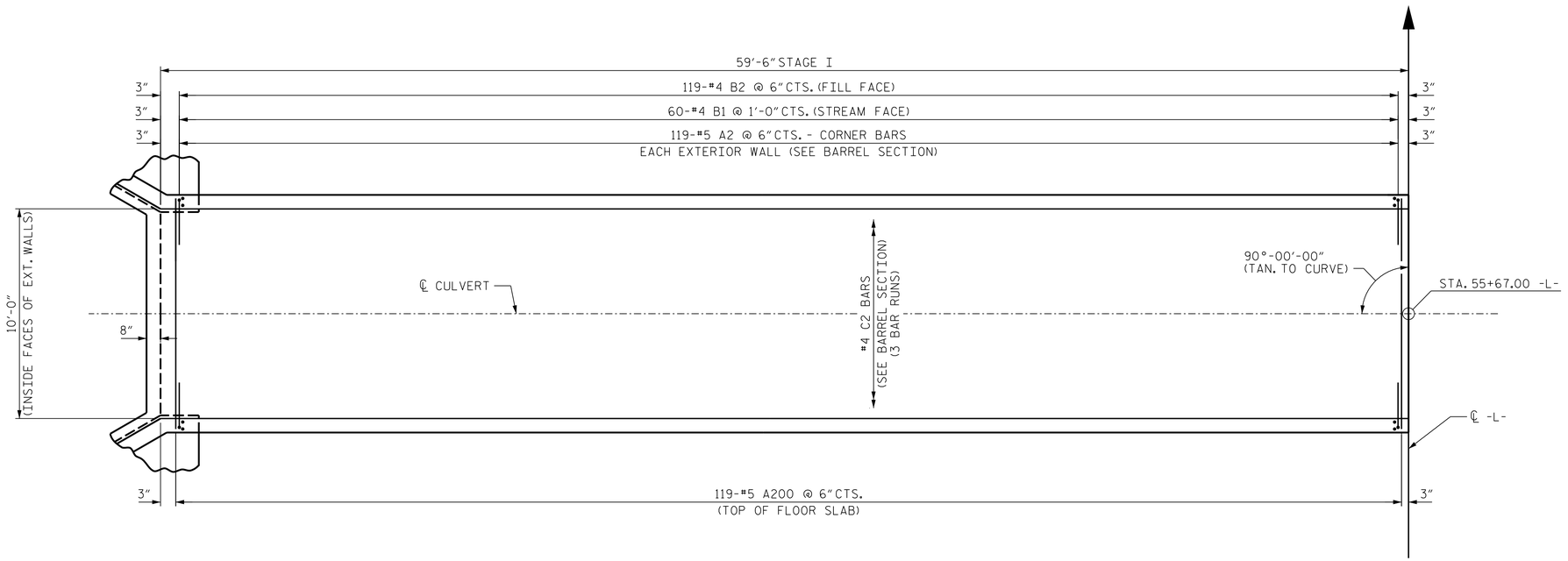
7/12/2019

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

MI ENGINEERING
1011 SCHAUB DRIVE, SUITE 100
RALEIGH, NC 27606
(919) 851-6606
FIRM PE NUMBER : P-0671

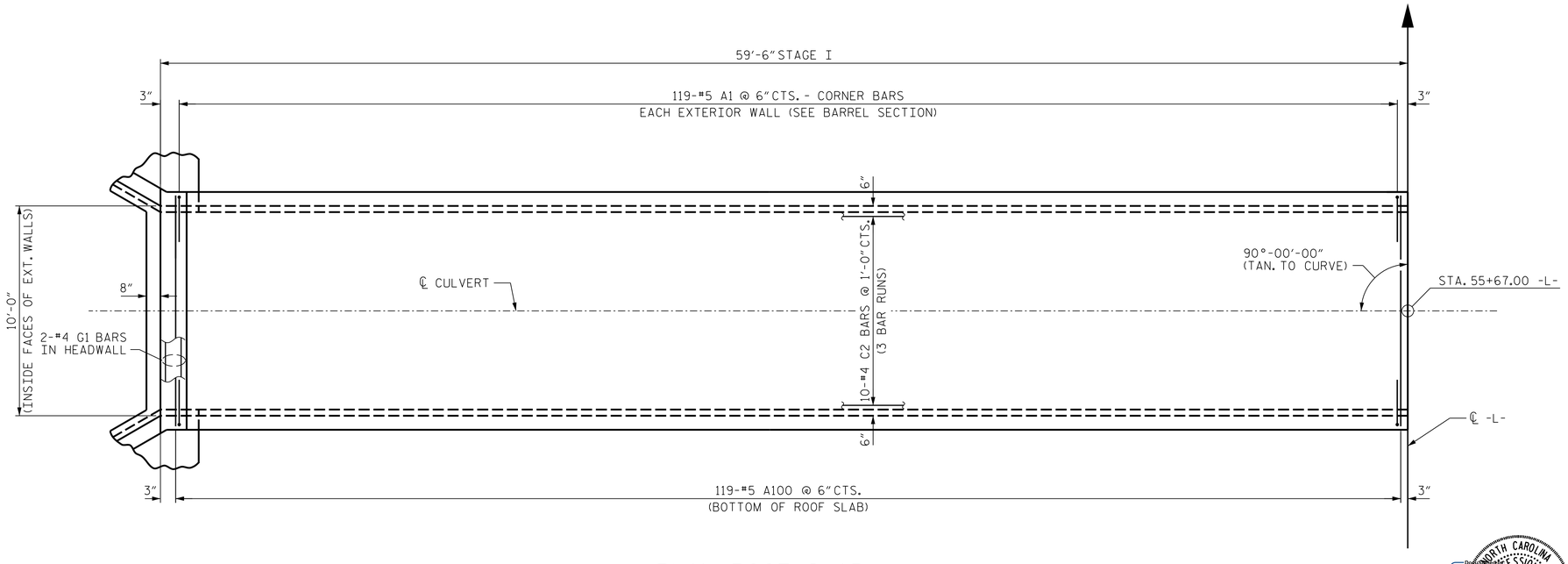
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-4
1			3			TOTAL SHEETS
2			4			8

DRAWN BY :	W.O. KEITH	DATE :	04/19
CHECKED BY :	R. ASENCIO	DATE :	05/19
DESIGN ENGINEER OF RECORD :	J.I. BREWER	DATE :	05/19



PLAN FLOOR SLAB

SILLS NOT SHOWN. SEE SHEET 7 OF 8 FOR LOCATIONS.



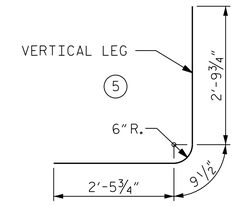
PLAN ROOF SLAB

BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	238	#5	5	6'-1"	1510
A2	238	#5	5	6'-1"	1510
A100	119	#5	STR	11'-0"	1365
A200	119	#5	STR	11'-0"	1365
B1	120	#4	STR	9'-7"	768
B2	238	#4	STR	7'-4"	1166
C2	120	#4	STR	21'-0"	1683
D1	8	#6	STR	1'-7"	19
G1	2	#4	STR	11'-0"	15
REINFORCING STEEL					9,401 LBS.

BAR TYPES

ALL BAR DIMENSIONS ARE OUT TO OUT.



SPLICE LENGTH CHART

BAR	SIZE	SPLICE LENGTH
B1	#4	1'-9"
C1	#4	1'-11"

PROJECT NO. U-2581BA

GUILFORD COUNTY

STATION: 55+67.00 -L-

SHEET 5 OF 8

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

SINGLE 10 FT. X 8 FT. CONCRETE BOX CULVERT STAGE II 90° SKEW

NORTH CAROLINA PROFESSIONAL SEAL 46029 ENGINEER JULIA I. BREWER

Digitally signed by Julia Brewer
DN: cn=Julia Brewer, o=MI Engineering, ou=Engineering, email=jbrewer@miengineering.com, c=US
Date: 2019.07.12 11:23:40 -04'00'

7/12/2019

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

MI ENGINEERING
1011 SCHAUB DRIVE, SUITE 100
RALEIGH, NC 27606
(919) 851-6606
FIRM PE NUMBER : P-0671

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

SHEET NO. C-5

TOTAL SHEETS 8

DRAWN BY :	W.O. KEITH	DATE : 04/19
CHECKED BY :	R. ASENCIO	DATE : 05/19
DESIGN ENGINEER OF RECORD :	J.I. BREWER	DATE : 05/19

7/12/2019
11:23:40 AM
User: jlsroelnalm
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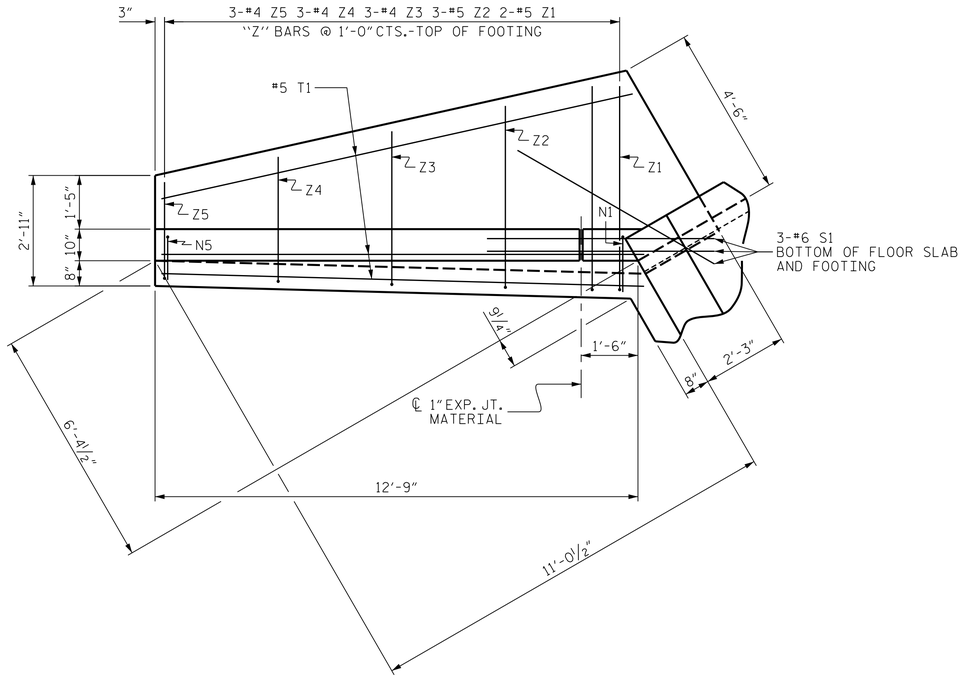
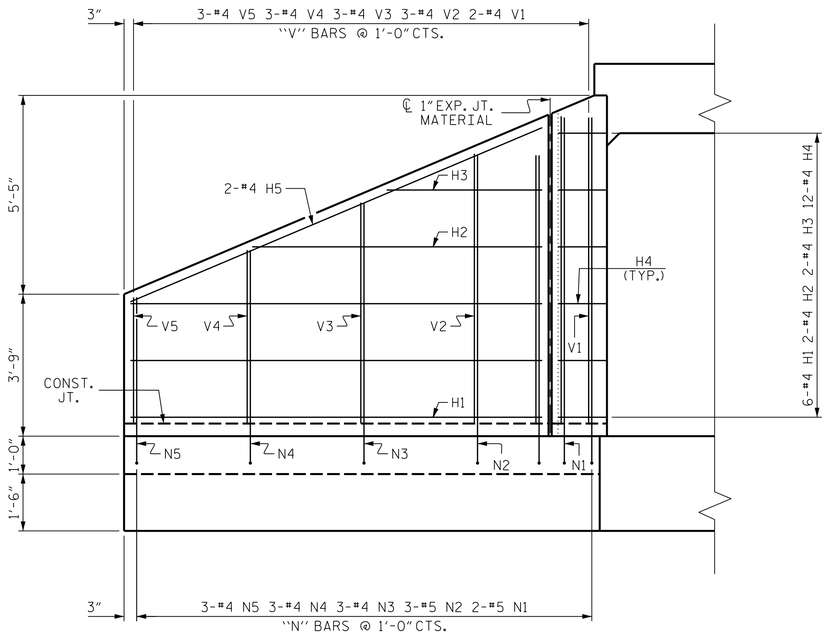


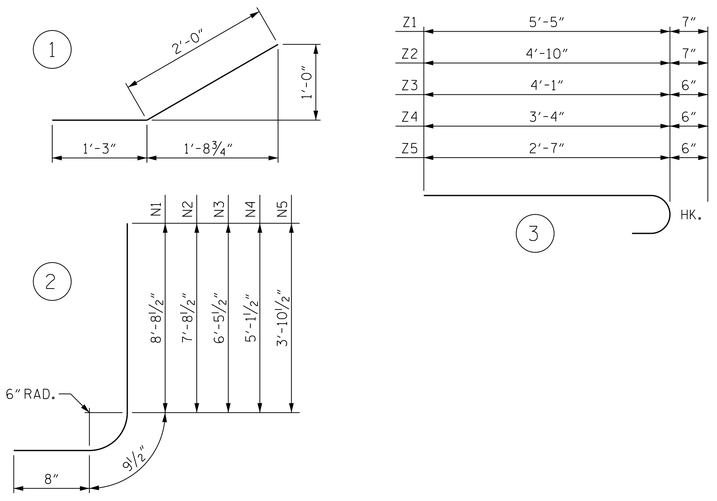
PLAN



ELEVATION

BAR TYPES

ALL BAR DIMENSIONS ARE OUT TO OUT.

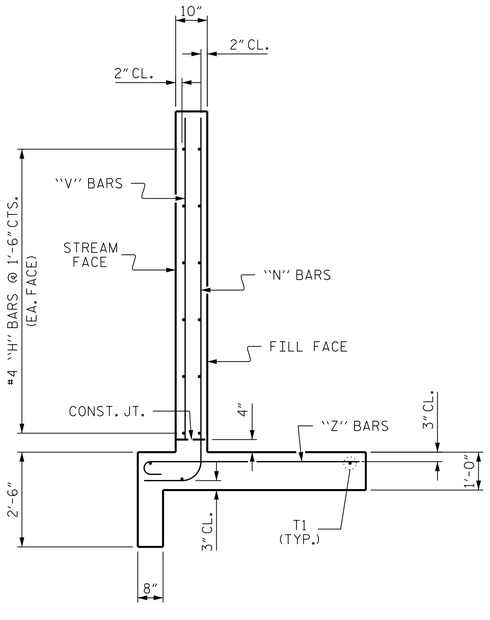


BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	12	#4	STR	10'-10"	87
H2	4	#4	STR	7'-8"	20
H3	4	#4	STR	4'-1"	11
H4	24	#4	1	3'-3"	52
H5	4	#4	STR	11'-9"	31
N1	4	#5	2	10'-2"	42
N2	6	#5	2	9'-2"	57
N3	6	#4	2	7'-11"	32
N4	6	#4	2	6'-7"	26
N5	6	#4	2	5'-4"	21
S1	6	#6	STR	6'-0"	54
T1	6	#5	STR	12'-9"	80
V1	4	#4	STR	8'-1"	22
V2	6	#4	STR	7'-1"	28
V3	6	#4	STR	5'-10"	23
V4	6	#4	STR	4'-7"	18
V5	6	#4	STR	3'-4"	13
Z1	4	#5	3	6'-0"	25
Z2	6	#5	3	5'-5"	34
Z3	6	#4	3	4'-7"	18
Z4	6	#4	3	3'-10"	15
Z5	6	#4	3	3'-1"	12

REINFORCING STEEL
FOR 2 WINGS 721 LBS

CLASS A CONCRETE	STAGE I	STAGE II
2 WINGS	10.7 CY	10.7 CY
1 HEADWALL	0.6 CY	0.6 CY
1 END CURTAIN WALL	0.9 CY	0.9 CY
TOTAL	12.2 CY	12.2 CY



TYPICAL WING SECTION

7/12/2019

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

MI ENGINEERING
1011 SCHAUB DRIVE, SUITE 100
RALEIGH, NC 27606
(919) 851-6606
FIRM PE NUMBER : P-0671

ASSEMBLED BY:	J.I. BREWER	DATE:	05/19
CHECKED BY :	R. ASENCIO	DATE:	05/19
DESIGN ENGINEER OF RECORD:	J.I. BREWER	DATE:	05/19
DRAWN BY :	CCJ 10/99		
CHECKED BY :	RWW 03/00		

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-6
1			3			TOTAL SHEETS
2			4			8

PROJECT NO. U-2581BA
GUILFORD COUNTY
STATION: 55+67.00 -L-

SHEET 6 OF 8

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

STANDARD WINGS FOR CONCRETE BOX CULVERT

H = 8'-0" SLOPE = 2:1
STAGE I OR II
90° SKEW

7/12/2019
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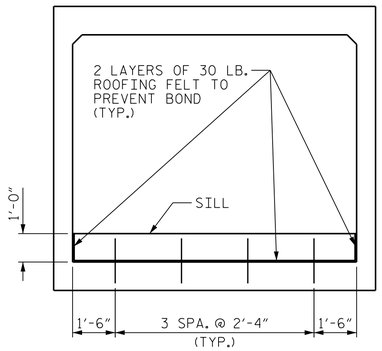
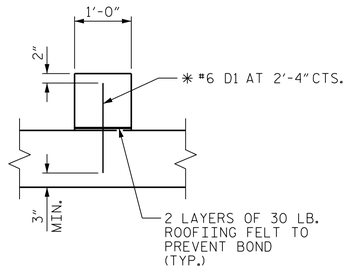


ELEVATION



SECTION THROUGH SILL

* DOWELS MAY BE PUSHED INTO GREEN CONCRETE AFTER SLAB HAS BEEN FLOAT FINISHED.

CULVERT SILL DETAILS

(LOOKING DOWNSTREAM)

NOTES

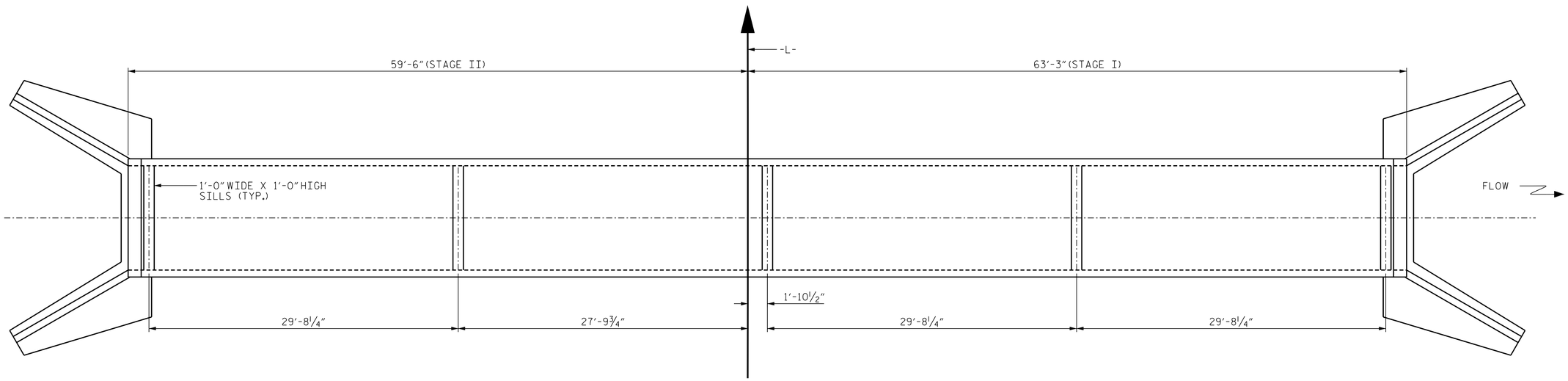
MATERIAL EXCAVATED FROM THE EXISTING BED SHALL BE STOCKPILED FOR USE IN THE PROPOSED CULVERT AND SHALL PROVIDE A CONTINUOUS LOW FLOW CHANNEL AS SHOWN. THE MATERIAL SHALL BE NATURAL STONE WITH A GRADATION SIZE SIMILAR TO THAT OF CLASS B RIP RAP. STONES LARGER THAN 6 INCHES SHALL NOT BE PLACED WITHIN THE LOW FLOW CHANNEL. BED MATERIAL SHALL BE SUBJECT TO APPROVAL BY THE ENGINEER, AND MAY BE SUBJECT TO PERMIT CONDITIONS.

THE STOCKPILED MATERIAL SHALL BE PLACED TO PROVIDE A DEPTH OF 1 FOOT IN LOW FLOW BARREL.

THE TOP OF BED MATERIAL IN THE LOW FLOW BARREL SHOULD MATCH THE STREAM BED ELEVATION.

THE ENTIRE COST OF THE WORK REQUIRED TO PLACE EXCAVATED OR SUPPLEMENTAL MATERIAL AS SHOWN ON THE PLANS SHALL BE INCLUDED IN THE CONTRACT LUMP SUM PRICE BID FOR CULVERT EXCAVATION.

THE ENTIRE COST OF WORK REQUIRED TO CONSTRUCT THE SILLS SHALL BE INCLUDED IN THE VARIOUS PAY ITEMS.



PLAN VIEW SHOWING SILL LOCATIONS

PROJECT NO. U-2581BA

GUILFORD COUNTY

STATION: 55+67.00 -L-

SHEET 7 OF 8

NORTH CAROLINA PROFESSIONAL SEAL 46029 ENGINEER JILLA L. BREWER

Digitally signed by Jilla Brewer

7/12/2019

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MI ENGINEERING
1011 SCHAUB DRIVE, SUITE 100
RALEIGH, NC 27606
(919) 851-6606
FIRM PE NUMBER : P-0671

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

SINGLE 10 FT. X 8 FT. CONCRETE BOX CULVERT STAGE I OR II 90° SKEW

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-7
1			3			TOTAL SHEETS
2			4			8

DRAWN BY : J.I. BREWER DATE : 05/19
CHECKED BY : R. ASENCIO DATE : 05/19
DESIGN ENGINEER OF RECORD : J.I. BREWER DATE : 05/19

7/12/2019
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User: jlsrdelnglm
Filename: N:\NC Bridges\MI8009_VHB_U-2581BA_Culvert\U-2581BA\Structures\410_013_U2581BA_SMU_CUT_007.dgn

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 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	2.10	--	1.75	2.10	1	BOTTOM SLAB	5.67	5.03	1	BOTTOM SLAB	1.00	
		HL-93 (OPERATING)	N/A		2.26	--	1.35	2.26	1	BOTTOM SLAB	5.67	6.52	1	BOTTOM SLAB	1.00	
		HS-20 (INVENTORY)	36.000	2	2.10	75.60	1.75	2.10	1	BOTTOM SLAB	5.67	5.03	1	BOTTOM SLAB	1.00	
		HS-20 (OPERATING)	36.000		2.26	81.36	1.35	2.26	1	BOTTOM SLAB	5.67	6.52	1	BOTTOM SLAB	1.00	
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH	13.500		3.83	51.71	1.40	3.83	1	EXTERIOR WALL	5.00	9.97	1	EXTERIOR WALL	1.00	1
		SNGARBS2	20.000		2.71	54.20	1.40	2.71	1	EXTERIOR WALL	5.00	9.96	1	EXTERIOR WALL	1.00	1
		SNAGRIS2	22.000		2.71	59.62	1.40	2.71	1	EXTERIOR WALL	5.00	9.96	1	EXTERIOR WALL	1.00	1
		SNCOTTS3	27.250	3	2.62	71.40	1.40	2.62	1	BOTTOM SLAB	5.67	6.20	1	BOTTOM SLAB	1.00	
		SNAGGRS4	34.925		2.71	94.65	1.40	2.71	1	EXTERIOR WALL	5.00	6.20	1	BOTTOM SLAB	1.00	1
		SNS5A	35.550		2.71	96.34	1.40	2.71	1	EXTERIOR WALL	5.00	6.20	1	BOTTOM SLAB	1.00	1
		SNS6A	39.950		2.71	108.26	1.40	2.71	1	EXTERIOR WALL	5.00	6.20	1	BOTTOM SLAB	1.00	1
		SNS7B	42.000		2.71	113.82	1.40	2.71	1	EXTERIOR WALL	5.00	6.20	1	BOTTOM SLAB	1.00	1
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33.000		2.71	89.43	1.40	2.71	1	EXTERIOR WALL	5.00	9.82	1	EXTERIOR WALL	1.00	1
		TNT4A	33.075		2.71	89.63	1.40	2.71	1	EXTERIOR WALL	5.00	7.38	1	BOTTOM SLAB	1.00	1
		TNT6A	41.600		2.71	112.74	1.40	2.71	1	EXTERIOR WALL	5.00	6.69	1	BOTTOM SLAB	1.00	1
		TNT7A	42.000		2.71	113.82	1.40	2.71	1	EXTERIOR WALL	5.00	6.69	1	BOTTOM SLAB	1.00	1
		TNT7B	42.000		2.71	113.82	1.40	2.71	1	EXTERIOR WALL	5.00	6.67	1	BOTTOM SLAB	1.00	1
		TNAGRIT4	43.000		2.71	116.53	1.40	2.71	1	EXTERIOR WALL	5.00	6.67	1	BOTTOM SLAB	1.00	1
		TNAGT5A	45.000		2.71	121.95	1.40	2.71	1	EXTERIOR WALL	5.00	6.67	1	BOTTOM SLAB	1.00	1
		TNAGT5B	45.000		2.71	121.95	1.40	2.71	1	EXTERIOR WALL	5.00	6.67	1	BOTTOM SLAB	1.00	1

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.

THE LIVE LOAD RATING FOR VEHICLES ON -L- WERE COMPUTED WITH A DESIGN FILL DEPTH OF 6.51 FT.

COMMENTS:

1. VERTICAL ELEMENTS ARE REFERENCED STARTING AT THE BOTTOM.

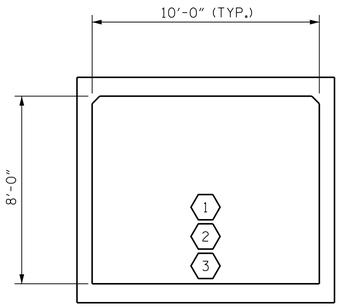
(#) CONTROLLING LOAD RATING

(1) DESIGN LOAD RATING (HL-93)

(2) DESIGN LOAD RATING (HS-20)

(3) LEGAL LOAD RATING **

** SEE CHART FOR VEHICLE TYPE



BOX 1

LRFR SUMMARY
(LOOKING DOWNSTREAM)

PROJECT NO. U-2581BA

GUILFORD COUNTY

STATION: 55+67.00 -L-

SHEET 8 OF 8

NORTH CAROLINA PROFESSIONAL SEAL 46029 ENGINEER JILLA L. BREWER

Digitally signed by Jilla L. Brewer
DN: cn=Jilla L. Brewer, o=MI Engineering, ou=Engineering, email=jbrewer@miengineering.com, c=US
Date: 2019.07.12 08:26:23 -04'00'

7/12/2019

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

MI ENGINEERING
1011 SCHAUB DRIVE, SUITE 100
RALEIGH, NC 27606
(919) 851-6606
FIRM PE NUMBER : P-0671

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:	C-8
1			3			TOTAL SHEETS
2			4			8

ASSEMBLED BY:	J.I. BREWER	DATE: 05/19
CHECKED BY :	R. ASENCIO	DATE: 05/19
DESIGN ENGINEER OF RECORD:	J.I. BREWER	DATE: 05/19
DRAWN BY :	WMC 7/11	REV. 10/1/11 MMA/GM
CHECKED BY :	GM 7/11	

7/12/2019
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User: jlsrdeinglm
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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