

BDL #8 = $(18^\circ)(1.2)(2.8) = 17.28'' \Rightarrow 18''$

Design Ht.:
 683.42
 675.13
 8.29
 via 8'-6" for
 table dimensions

OR

Design Ht.:
 8"
 6'-0"
 8"
 8"
 784'
 via \Rightarrow 8'-6"

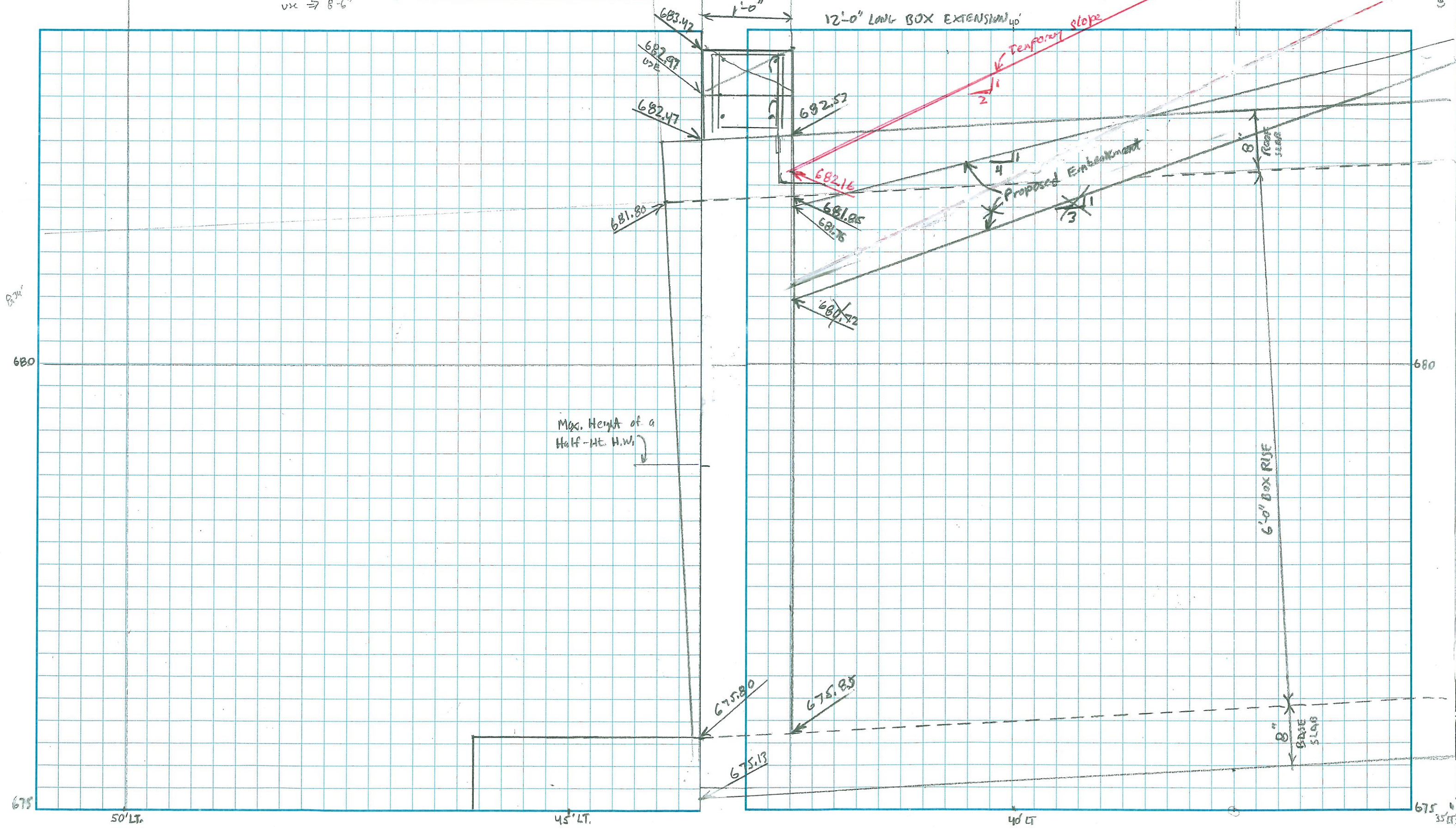
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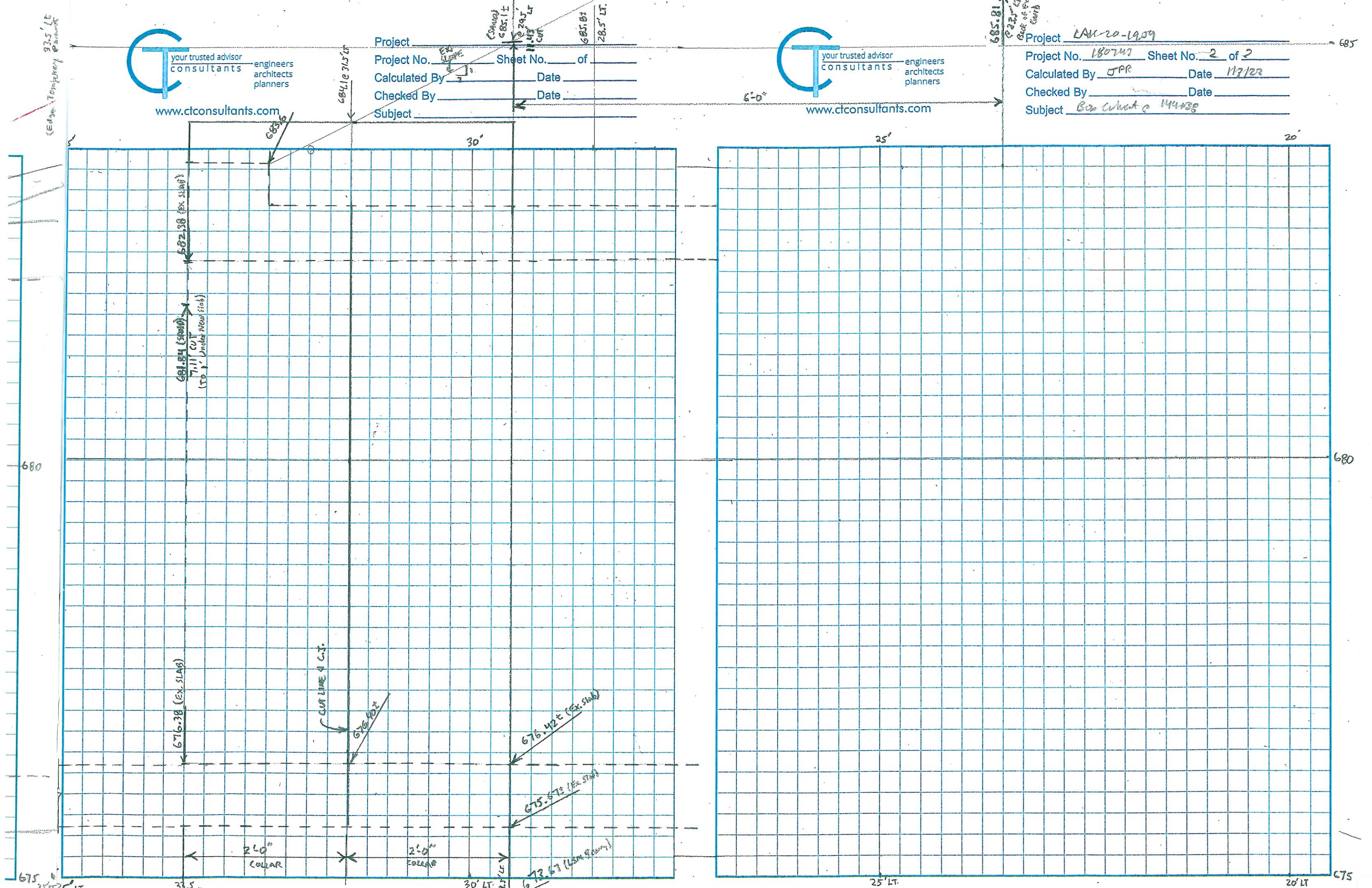


Project _____
 Project No. _____ Sheet No. _____ of _____
 Calculated By _____ Date _____
 Checked By _____ Date _____
 Subject _____

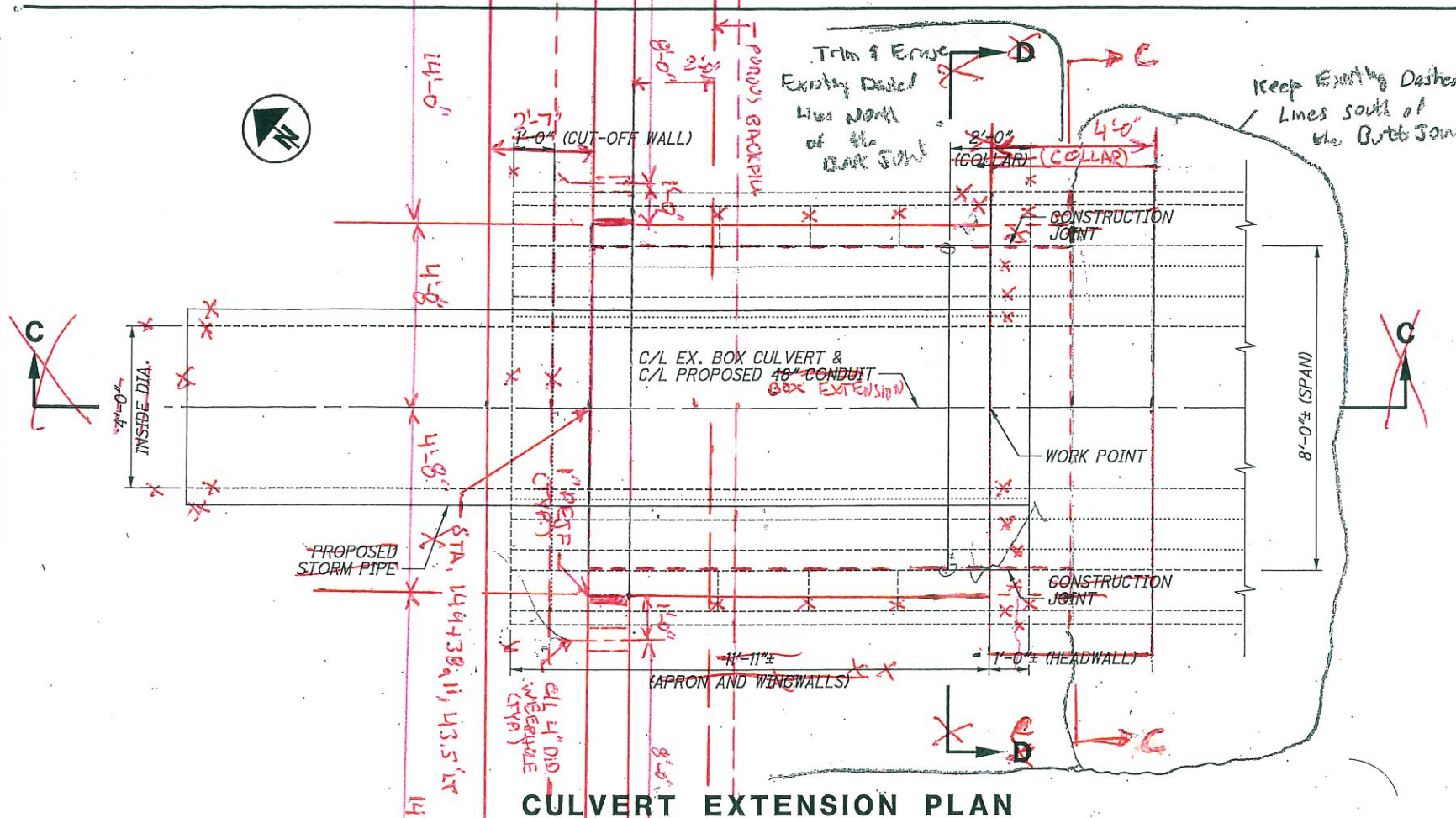


Project LAK-20-1959
 Project No. 180743 Sheet No. 1 of 2
 Calculated By JPR Date 11/3/22
 Checked By _____ Date _____
 Subject Box Culvert STA 144+38





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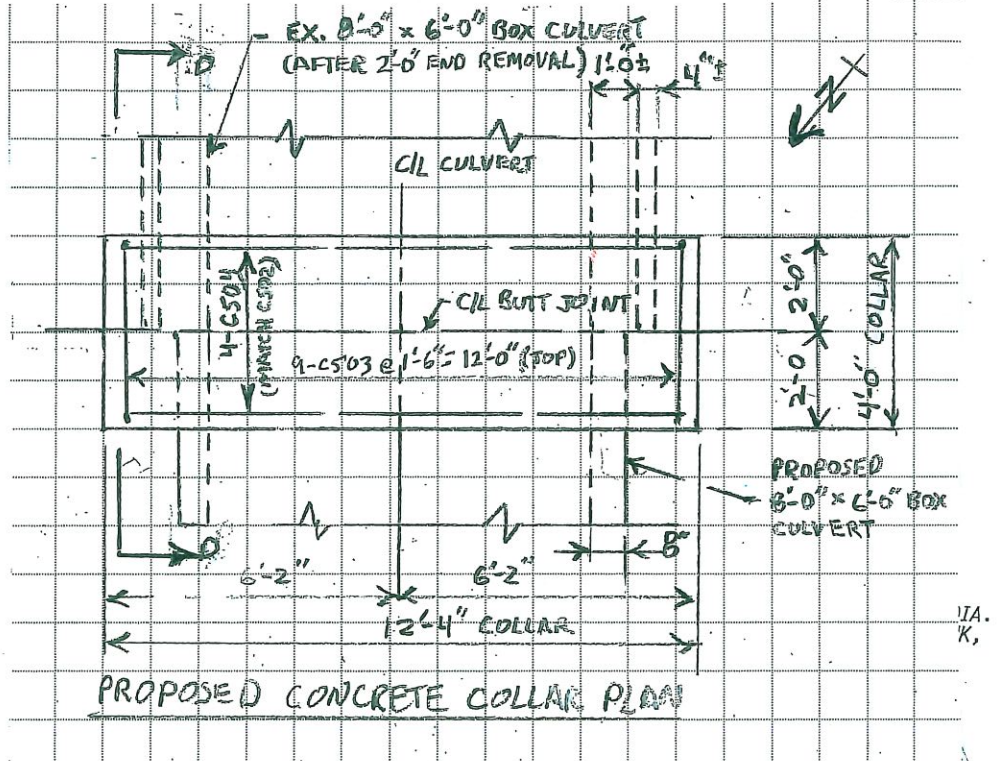


CULVERT EXTENSION PLAN

MARK	NUMBER	TOTAL	LENGTH	WEIGHT	TYPE	DIMENSIONS							
						A	B	C	D	E	R	INC.	
C501	4820	2'-3"	11368	1 STR.	10"	1'-6"	-	-	-	-	-	-	-
C502	4-8	19'-6"	82'48	5 STR.	3'-11"	12'-0"	3'-11"	-	-	-	-	-	-
C503	28-8	3'-8"	107'48	STR.	-	-	-	-	-	-	-	-	-
C504	4-2	9'-0"	112'7"	5 STR.	7'-6"	12'-0"	7'-6"	-	-	-	-	-	-
C505	2	7'-8"	16	STR.	-	-	-	-	-	-	-	-	-
TOTAL = 193' LBS (414)													

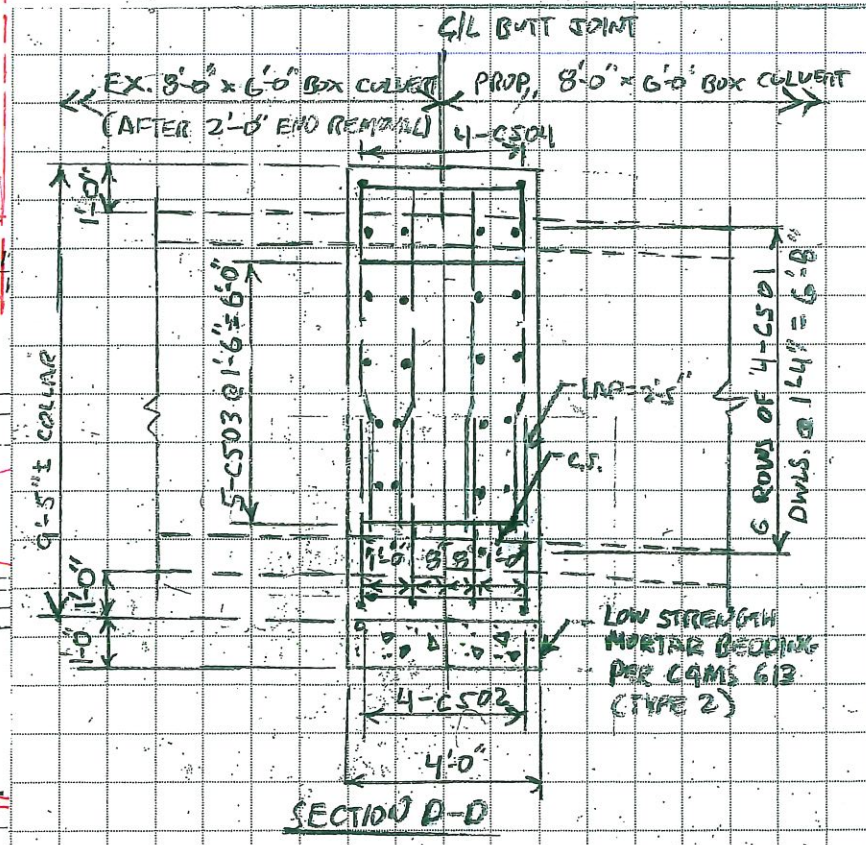
Revised Steel Bar Details

- NOTES:
- ALL REINFORCING BARS SHALL BE EPOXY COATED.
 - THE BAR NUMBER IS SPECIFIED ON THE PLANS IN THE BAR MARK COLUMN. THE FIRST DIGIT INDICATES THE BAR SIZE NUMBER. FOR EXAMPLE, C501 IS A NUMBER 5 BAR. BAR DIMENSIONS SHOWN ARE OUT-TO-OUT, UNLESS OTHERWISE NOTED.

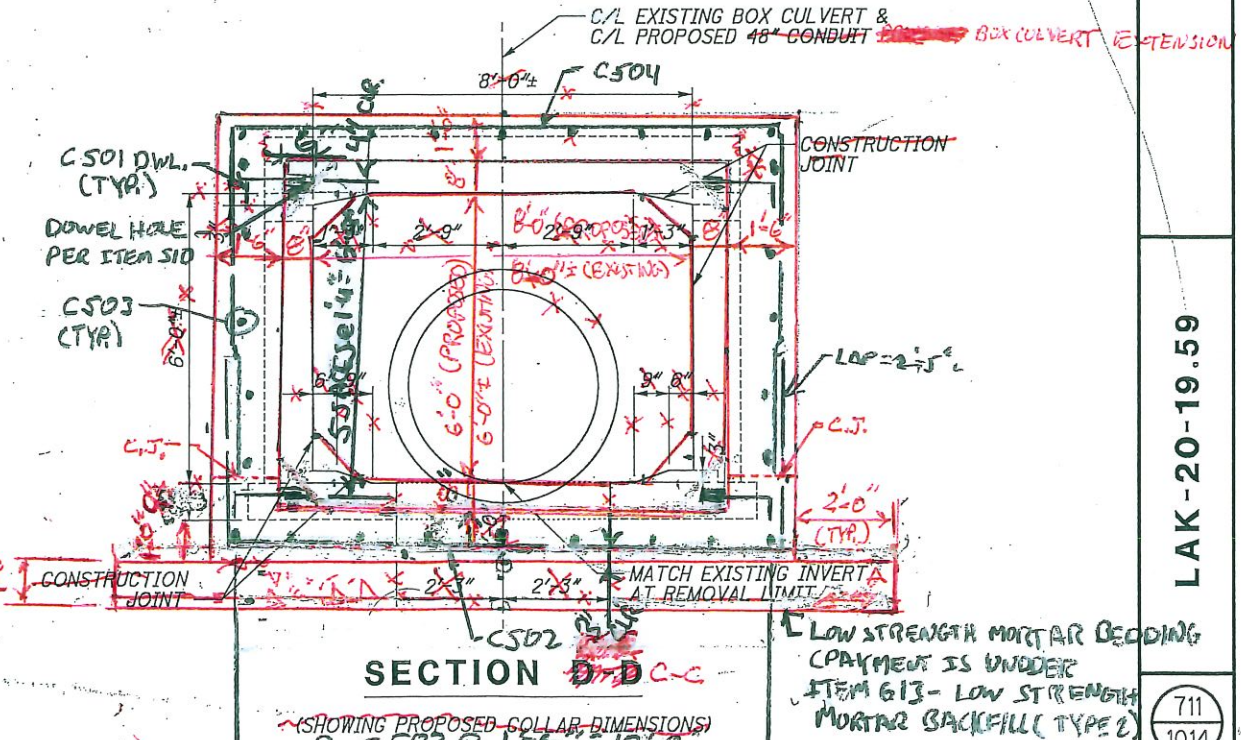


PROPOSED CONCRETE COLLAR PLAN

- SECTION**
- FOR CULVERT PLAN AND PROFILE AT STA. 149+38, SEE SHEET 386
 - FOR CULVERT PARTIAL REMOVAL DETAILS, SEE SHEET 110.
 - ~~ITEM 602 CONCRETE MASONRY, AS PER PLAN~~
- THE FOLLOWING ITEMS USED FOR CONSTRUCTING THE PROPOSED PIPE COLLAR ARE PROVIDED FOR BIDDING PURPOSES ONLY:
- CONCRETE REMOVED
 - REINFORCING STEEL
 - DOWEL HOLES
 - CLASS GCI CONCRETE
 - LOW STRENGTH MORTAR BEDDING
- 2 YD = 4820 LBS EACH
 7 CU YD = 210,000 LBS
 2 CU YD = 60,000 LBS
- PAYMENT FOR ALL LABOR, MATERIALS, EQUIPMENT AND INCIDENTALS IS INCLUDED IN THE CONTRACT UNIT PRICE BID FOR ITEM 602 CONCRETE MASONRY, AS PER PLAN.
- FOR PROPOSED HEADWALL DETAILS SEE THE PLAN INSERT SHEETS FOR CULVERT HEADWALL AT STA. 149+38.



SECTION D-D



SECTION D-D C-C

NOTE:
 PROPOSED HW 2-2 HEADWALL IS NOT SHOWN. SEE THE CULVERT PROFILE AT STA. 149+38.

GENERAL NOTES

DESIGN SPECIFICATIONS: THIS STANDARD DRAWING CONFORMS TO "STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES" ADOPTED BY THE AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS, 2002 AND THE ODOT BRIDGE DESIGN MANUAL.

DESIGN DATA: THE FOLLOWING DESIGN DATA IS ASSUMED:

INTERNAL ANGLE OF FRICTION () = 30 DEGREES
 COEFFICIENT OF FRICTION () = 0.30
 UNIT WEIGHT OF SOIL = 120 PCF
 UNIT WEIGHT OF CONCRETE = 150 PCF
 SLOPE OF BACKFILL = 2:1 (TYPE A & B HEADWALLS)
 HEIGHT OF LIVE LOAD SURCHARGE = 2 FT (TYPE C HEADWALLS)
 MAXIMUM FOUNDATION BEARING PRESSURE = 2000 P.S.F.

CONCRETE - COMPRESSIVE STRENGTH 4000 PSI
 (FOOTING, WINGWALL AND FORESLOPE WALL)

REINFORCING STEEL - ASTM A615, A616, OR A617
 GRADE 60 MINIMUM YIELD STRENGTH
 60,000 PSI (ALL REINFORCING SHALL BE EPOXY COATED)

BACKFILL LIMITATION: WHEN THE DESIGN HEIGHT IS GREATER THAN 10 FT, THE BACKFILL BEHIND THE WINGWALLS SHALL NOT BE PLACED HIGHER THAN THE ELEVATION OF THE SOIL ABOVE THE TOE. WHEN THE SOIL ABOVE THE TOE IS AT ITS FINISHED ELEVATION, THE REMAINDER OF THE BACKFILL MAY BE PLACED.

POROUS BACKFILL WITH FILTER FABRIC 1'-6" THICK SHALL BE PLACED BEHIND THE WINGWALLS ONLY AND SHALL EXTEND TO 12" BELOW THE EMBANKMENT SURFACE. GEOTEXTILE FABRIC SHALL BE PLACED BETWEEN THE POROUS BACKFILL AND REPLACED EXCAVATION ADJACENT TO THE STRUCTURE. IT SHALL TURN UNDER THE BOTTOM OF THE POROUS BACKFILL AND RETURN 6" ABOVE THE TOP ELEVATION OF THE WEEPHOLE.

WEEPHOLES SHALL BE PLACED 6" TO 12" ABOVE THE NORMAL WATER ELEVATION OR GROUND LINE AND SHALL HAVE A MAXIMUM SPACING OF 10'-0". A MINIMUM OF ONE WEEPHOLE SHALL BE PROVIDED PER WINGWALL.

PREFORMED EXPANSION JOINT FILLER: PREFORMED EXPANSION JOINT FILLER (PEJF) CONFORMING TO CMS 705.03, 1 INCH THICK, SHALL BE PLACED ABOVE THE FOOTING BETWEEN THE SIDES OF THE BOX CULVERT AND THE ENDS OF THE WINGWALLS. PAYMENT FOR MATERIALS AND INSTALLATION SHALL BE INCLUDED WITH ITEM 516 - 1" PREFORMED EXPANSION JOINT FILLER.

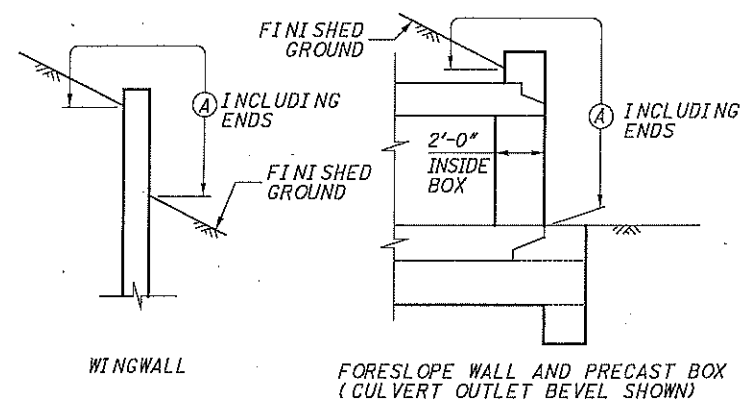
SEALING OF FORESLOPE WALL AND WINGWALLS: ALL EXPOSED FORESLOPE WALL AND WINGWALL CONCRETE SHALL BE SEALED WITH EPOXY-URETHANE SEALER. THE LIMITS SHALL BE AS SHOWN IN THE DIAGRAMS BELOW. PAYMENT FOR THE EPOXY-URETHANE SEALER SHALL BE PER ITEM 512 - SEALING OF CONCRETE SURFACES.

WATERPROOFING: TYPE 2 WATERPROOFING, PER CMS 512.09 AND 711.25, SHALL EXTEND VERTICALLY DOWN THE ENTIRE SIDES OF THE PRECAST CULVERT SECTIONS FOR ALL PORTIONS OF THE CULVERT WHICH SHALL BE IN CONTACT WITH THE BACKFILL. PAYMENT FOR THE MEMBRANE WATERPROOFING SHALL BE AT THE CONTRACT PRICE BID PER SQUARE YARD FOR ITEM 512 - TYPE 2 WATERPROOFING.

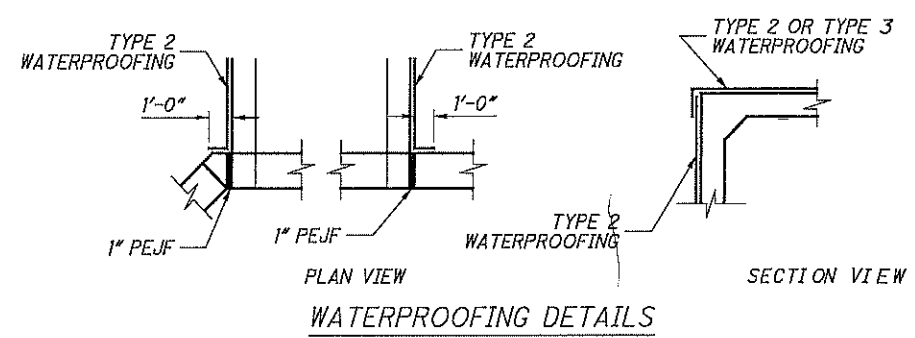
IF PAVEMENT IS NOT PLACED DIRECTLY ON TOP OF THE CULVERT, TYPE 2 WATERPROOFING, PER CMS 512.09 AND 711.25 SHALL BE APPLIED TO THE ENTIRE TOP SURFACE OF THE PRECAST CULVERT SECTIONS AND SHALL EXTEND ONE FOOT VERTICALLY DOWN THE SIDES FOR ALL PORTIONS OF THE CULVERT WHICH SHALL BE IN CONTACT WITH THE BACKFILL. PAYMENT FOR THE MEMBRANE WATERPROOFING SHALL BE AT THE CONTRACT PRICE BID PER SQUARE YARD FOR ITEM 512 - TYPE 2 WATERPROOFING.

IF PAVEMENT IS TO BE USED DIRECTLY ON TOP OF THE CULVERT, TYPE 3 WATERPROOFING, PER CMS 512.10 AND 711.29 SHALL BE APPLIED TO THE ENTIRE TOP SURFACE OF THE PRECAST CULVERT SECTIONS AND SHALL EXTEND ONE FOOT VERTICALLY DOWN THE SIDES FOR ALL PORTIONS OF THE CULVERT WHICH SHALL BE IN CONTACT WITH THE BACKFILL. PAYMENT FOR THE MEMBRANE WATERPROOFING SHALL BE AT THE CONTRACT PRICE BID PER SQUARE YARD FOR ITEM 512 - TYPE 3 WATERPROOFING.

ITEM 611 - 8'x6' CONDUIT, TYPE A, 706.05, AS PER PLAN
 THE REQUIREMENTS OF CMS SECTION 611 SHALL APPLY CONFORMING TO ASTM C1577. DIMENSIONS OF BOX CULVERT SHALL CONFORM TO DETAILS SHOWN ON THE PLAN.



LIMITS OF ITEM 512-SEALING CONCRETE SURFACES
 (A) - SEAL ENTIRE CONCRETE SURFACE AREA



BASIS OF PAYMENT: ALL LABOR, EQUIPMENT AND INCIDENTALS REQUIRED TO CONSTRUCT THE FOOTING, CUTOFF WALL, WINGWALLS AND FORESLOPE WALL SHALL BE INCLUDED WITH ITEM 511 - CLASS C CONCRETE (RET-WALL/WINGWALL- INCLUDING FOOTING). PAYMENT FOR REINFORCING STEEL SHALL BE INCLUDED WITH ITEM 509 - EPOXY COATED REINFORCING STEEL.

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PLAN INSERT SHEET

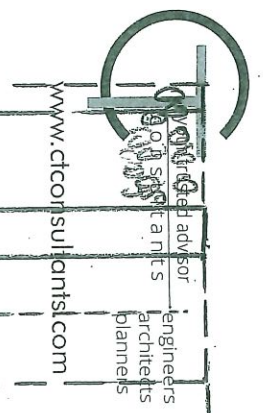
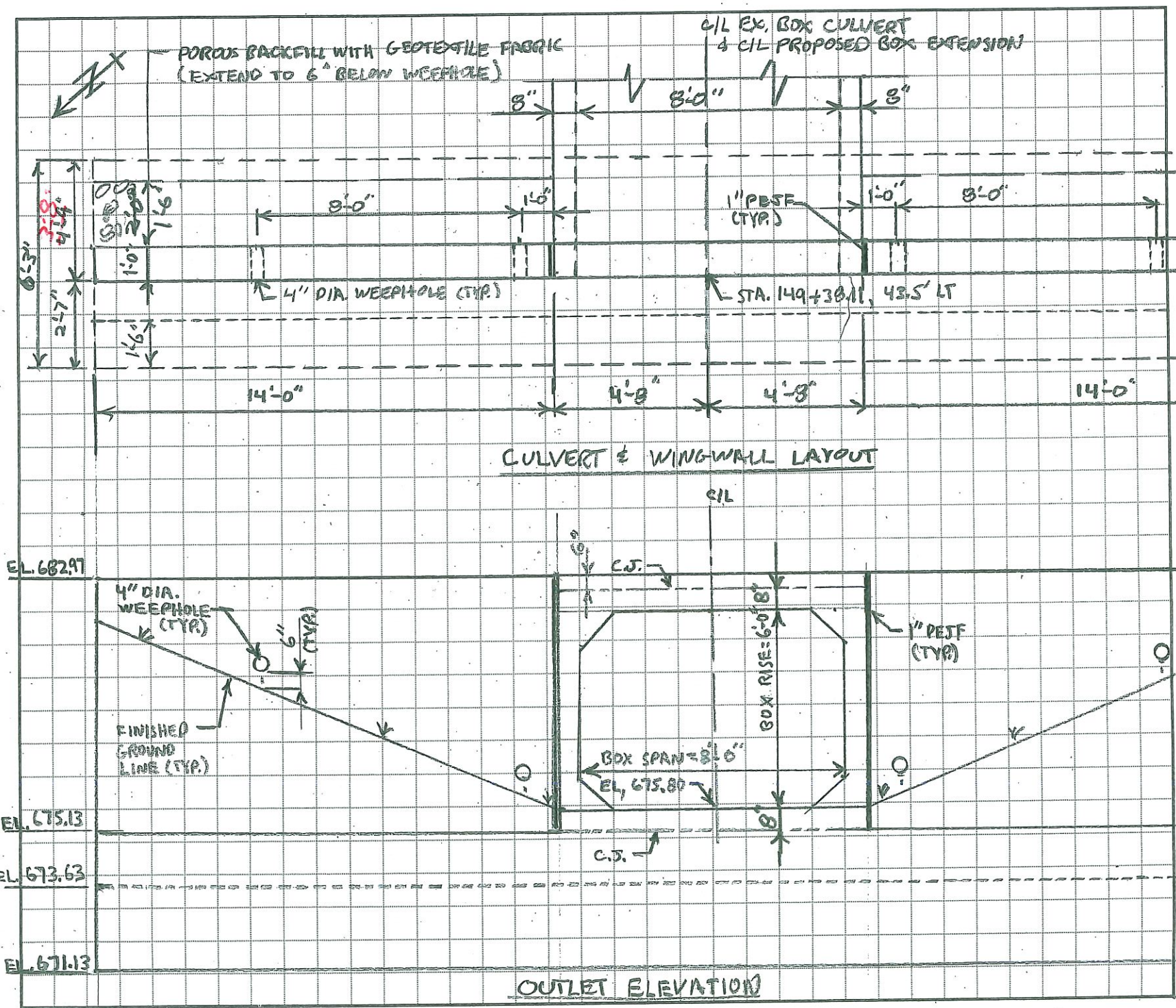
510 10000 48 EACH DOWEL HOLES WITH NON-SHRINK, NON-METALLIC GROUT **A**

ROCK CHANNEL PROTECTION, TYPE B WITH FILTER
 8'x6' CONDUIT, TYPE A AS PER PLAN

ESTIMATED QUANTITIES				
ITEM	ITEM EXT	TOTAL	UNIT	DESCRIPTION
202	1000	11200	LUMP	STRUCTURE REMOVED PORTIONS OF STRUCTURE REMOVED
503	11100		LUMP	COFFERDAMS, GRIBS, AND SHEETING EXCAVATION BRACING A
503	2100	2100	LUMP	UNCLASSIFIED EXCAVATION (WINGWALL FOOTING)
509	10000	xx	LB	EPOXY COATED REINFORCING STEEL
511	46000	25 xx	SG. YD.	CLASS CCI CONCRETE, RETAINING WALL/WINGWALL, NOT INCLUDING FOOTING
511	46510	21 xx	CU. YD.	CLASS CCI CONCRETE, FOOTING
511	46610	0.5 xx	CU. YD.	CLASS CCI CONCRETE, HEADWALL
512	33000	2.8 xx	SG. YD.	TYPE 2 MEMBRANE WATERPROOFING A
516	13600	16 xx	SG. YD.	1" PREFORMED EXPANSION JOINT FILLER
518	21230		LUMP	POROUS BACKFILL WITH FILTER FABRIC - GEOTEXTILE
601	32104	9	SG. YD.	RIPRAP USING 6" REINFORCED CONCRETE SLAB, AS PER PLAN
602	2000	7	CY	AS PER PLAN CONCRETE MASONRY A
611	9491	12 xx	LINE FT.	XX'-0" SPAN X X'-0" RISE CONDUIT, TYPE A, 706.05, AS PER PLAN
613	41300	3	CU. YD.	LOW STRENGTH MORTAR BACKFILL (TYPE 2) A
512	10100	30 xx 31	SG. YD.	SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)

A - TO BE USED FOR CONSTRUCTING A PIPE COLLAR
 NOTE: TOTALS CARRIED TO GENERAL SUMMARY SHEET

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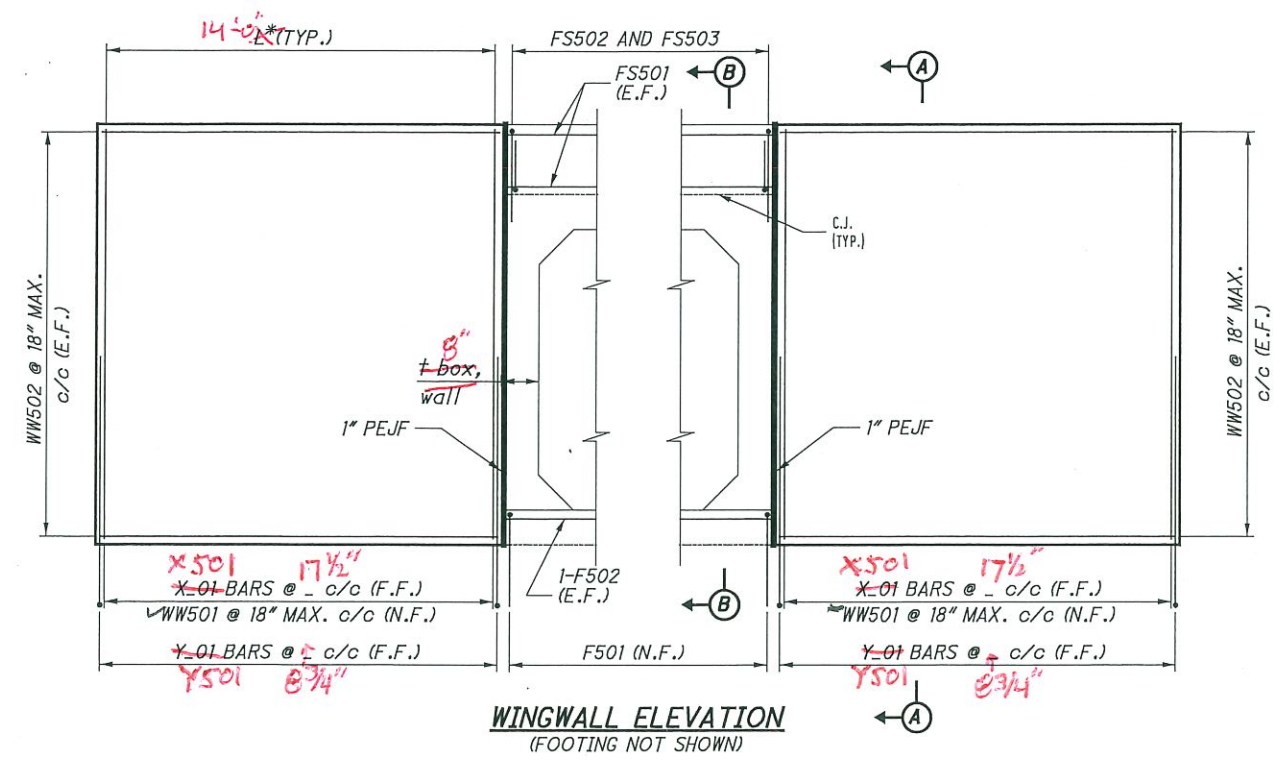
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 Date _____
 Date _____

~~ELEVATION~~

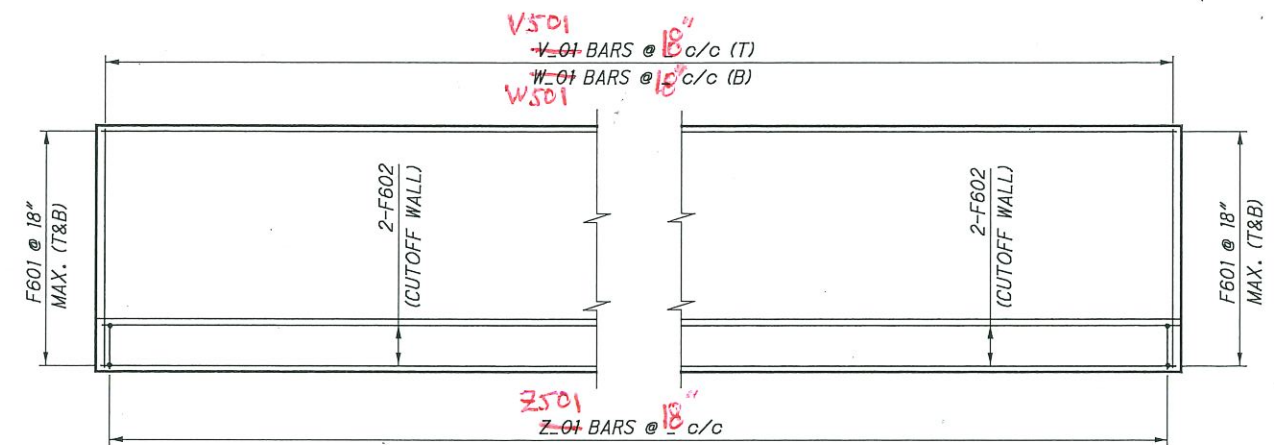
OUTLET ELEVATION

CULVERT & WINGWALL LAYOUT

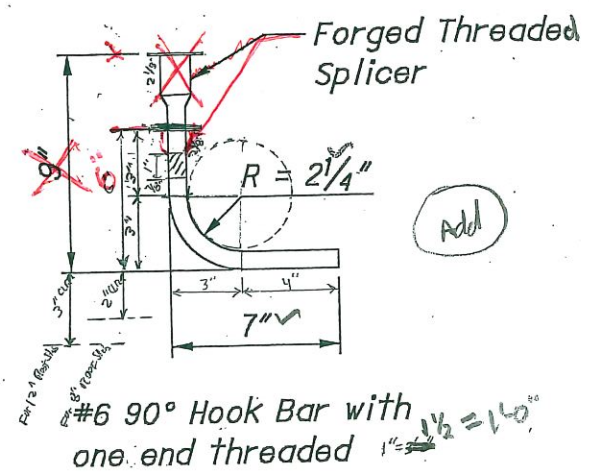
6'-0"
3'-0"
6'-2"
7'-8"



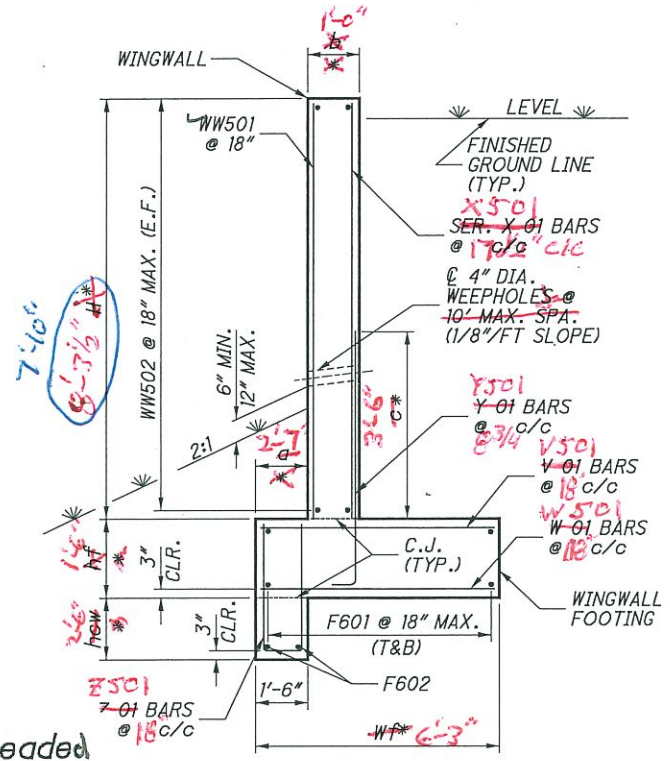
WINGWALL ELEVATION
(FOOTING NOT SHOWN)



FOOTING PLAN

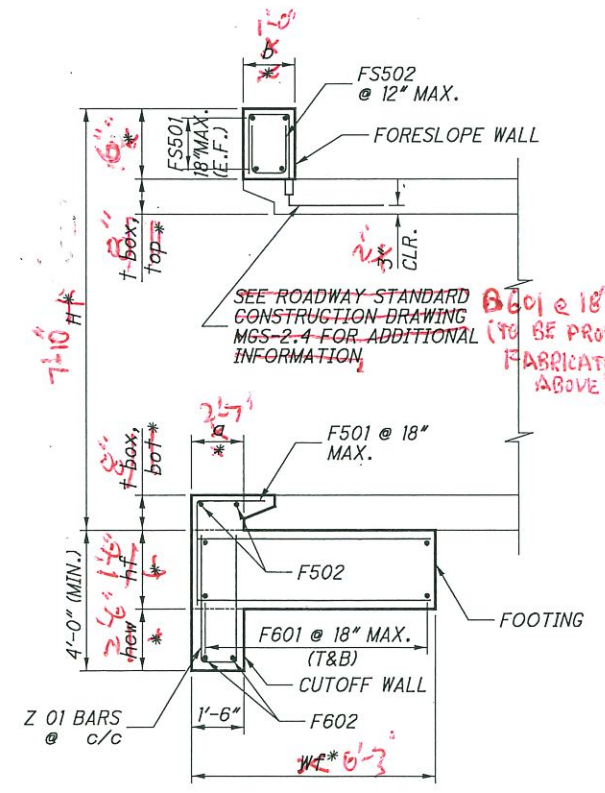


Forged Threaded Splicer



SECTION A-A

(POROUS BACKFILL NOT SHOWN FOR CLARITY)



SECTION B-B

(CULVERT INLET BEVEL SHOWN)

NOTES

1. FOR CULVERT LOCATION PLAN, SEE SHEET ~~xx/xx~~ **293/1014**.
2. FOR PRECAST BOX CULVERT DETAILS, SEE SHEET ~~xx/xx~~ **701/1014**.
3. THE BAR SIZE NUMBER IS SPECIFIED ON THE PLANS IN THE BAR MARK COLUMN. THE FIRST DIGIT INDICATES THE BAR SIZE NUMBER. FOR EXAMPLE, WW501 IS A NO. 5 BAR. BAR DIMENSIONS SHOWN ARE OUT TO OUT. ALL REINFORCING STEEL SHALL BE EPOXY COATED.
4. THE LAP SPLICE LENGTHS USED IN THESE DETAILS ARE AS FOLLOWS: 2'-5" FOR #5 BARS; 2'-11" FOR #6 BARS.

LEGEND:

C.J.	CONSTRUCTION JOINT	N.F.	NEAR FACE
CLR.	CLEAR	SER.	SERIES
DIA.	DIAMETER	STR.	STRAIGHT
E.F.	EACH FACE	(T)	TOP
F.F.	FAR FACE	(B)	BOTTOM
MAX.	MAXIMUM	T&B	TOP AND BOTTOM
MIN.	MINIMUM	TYP.	TYPICAL
PEJF	PREFORMED EXPANSION JOINT FILLER	INC.	INCREMENT

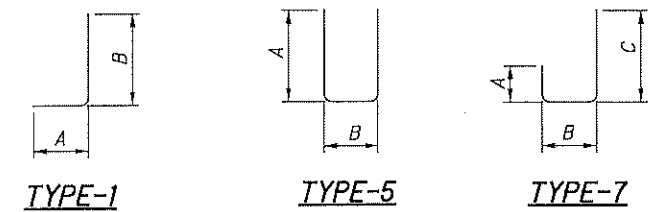
* AN UNDERScore (.) OR AN ASTERISK (*) INDICATES A SPACE TO BE COMPLETED BY DESIGNER USING INFORMATION PICKED FROM THE STANDARD DRAWINGS.

Insert the Bar schedule

Generated from

Design Data Sheet

HWDD - Rebar 01-17-20 MS EXCEL sheet (for bar schedule...) **TYPE C HEADWALL**



TYPE C HEADWALL REINFORCING SCHEDULE							
BAR MARK	NUMBER	LENGTH	WEIGHT (LBS.)	TYPE	BAR TYPE DIMENSIONS		
					A	B	C
WINGWALLS							
X501	20	22	7'- 8"	STR.			923
Y501	40		5'- 6"	STR.	0'- 10"	4'- 9"	
WW501	20	22	7'- 8"	STR.			
WW502	24		13'- 8"	STR.			
FOOTING & CUTOFF WALL							
V501	25	26	5'- 4 1/2" - 11"	STR.			1,308
W501	25	26	5'- 11"	STR.			
Z501	25	26	8'- 2"	STR.	3'- 7"	1'- 2"	
F501	7		4'- 4"	STR.	2'- 7"	1'- 10"	
F502	2		9'- 0"	STR.			
F601	20		19'- 9"	STR.			
F602	4		19'- 9"	STR.			
FORESLOPE WALL							
FS501	4		9'- 0"	STR.			60
FS502	10		0'- 9"	STR.	0'- 2"	0'- 8"	
FS503	10		1'- 4"	STR.	0'- 2"	0'- 8"	0'- 9"
			TOTAL				2,291

X501 $7'-10" - 2" = 5'-10"$

Y501 $(3'-6" + 1'-6") = 5'-0"$

WW501 $7'-10"$

WW502 $14'-0" - (2 \times 1'-0") = 12'-0"$

V501 $6'-3" - (5' \times 2") = 5'-4"$

Z501 $(8' + 4' + 2') = 14'-0"$

F501 $(2'-6" + 5') = 7'-6"$

F502 $9'-0" - (2' \times 2") = 5'-0"$

F601 $14'-0" + 9'-4" + 14'-0" = 37'-4"$

F602 Same as F601

$14'-0" \div 2.25 = 6.22 \text{ spm} \Rightarrow 6 \text{ spm} @ 10 \text{ ft} = 2 \times 10 = 20$

$14'-0" \div 2.25 = 6.22 \text{ spm} \Rightarrow 6 \text{ spm} @ 10 \text{ ft} = 2 \times 10 = 20$

$14'-0" \div 1.50 = 9.33 \text{ spm} \Rightarrow 9 \text{ spm} @ 10 \text{ ft} = 9 \times 10 = 90$

$8'-2" \div 1.50 = 5.47 \text{ spm} \Rightarrow 5 \text{ spm} @ 10 \text{ ft} = 5 \times 10 = 50$

$14'-0" + (8" + 8' + 8") + 14'-0" = 37'-3"$

$37'-3" + 1.5' = 38'-9"$

$(8" + 8' + 8") = 9'-4" + 1.5' = 10'-9"$

$14'-0" + 9'-4" + 14'-0" = 37'-4"$

$2 \times 10 \text{ spm} = 20 \text{ spm} @ 10 \text{ ft} = 2 \times 10 = 20$

$9'-4" \div 1' = 9.4 \text{ spm} \Rightarrow 9 \text{ spm} @ 10 \text{ ft} = 9 \times 10 = 90$

INSERT ODOT BOX
CULVERT REINFORCING
DESIGN HERE
IF SPAN 12'

Not Needed
($\text{spm} = 8'-0" < 12'-0"$)

Type C Headwall: Reinforcing Schedule Calculations

If Override Option is Not Used, Leave Cell Blank *

Reference shall be made to the "Concrete Headwalls for Precast Box Culverts" Standard Drawing for headwall dimensions and reinforcing data.

Precast Box Culvert:

Span = ~~10.00~~ ft **8.00 ft**
 Rise = ~~7.00~~ ft **6.00 ft**
 Default Override *
 $t_{box,wall}$ = ~~10.00~~ in **8.00 in**
 $t_{box,top}$ = ~~10.00~~ in **8.00 in**
 $t_{box,bot}$ = ~~10.00~~ in **8.00 in**

Wingwalls:

H = ~~10.50~~ ft **7.83'**
 h_1 = ~~10.50~~ ft
 h_2 = ~~10.50~~ ft ($h_2=h_1=H$)
 L_1 = ~~18.00~~ ft **14.00 ft**
 L_2 = ~~18.00~~ ft ($L_2=L_1$)
 a = ~~3.67~~ ft **2.58 ft**
 b = ~~1.25~~ ft **1.00 ft**
 c = ~~3.92~~ ft **3.50 ft**

Footing & Cutoff Wall:

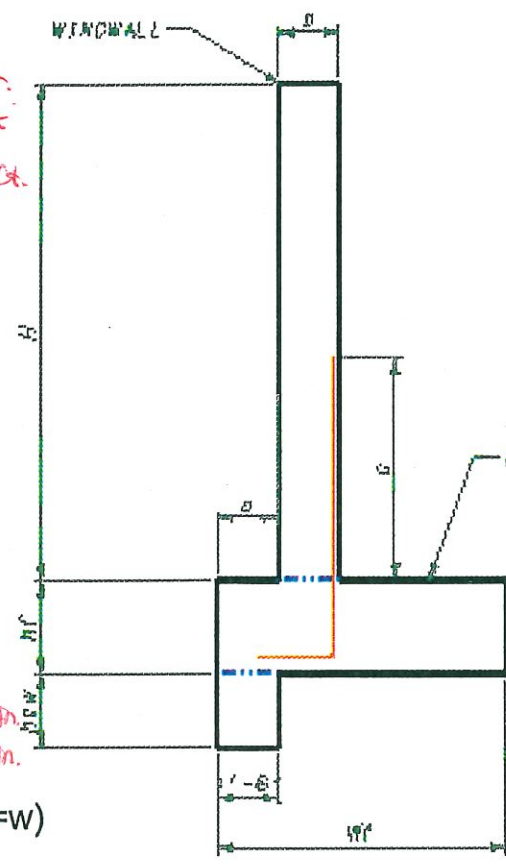
W_f = ~~8.00~~ ft **6.25 ft**
 h_f = ~~2.00~~ ft **1.50 ft**
 h_{cw} = ~~2.00~~ ft **2.50 ft**

Bar Size:

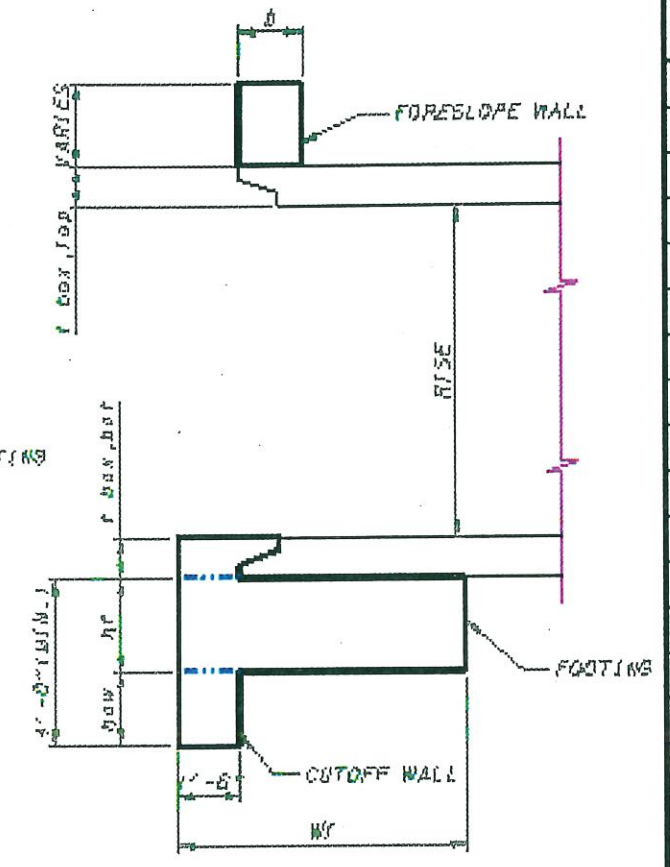
V = #5 ✓
 W = #5 ✓
 X = #5 ✓
 Y = #6-#5
 Z = #5 ✓

Bar Spacing:

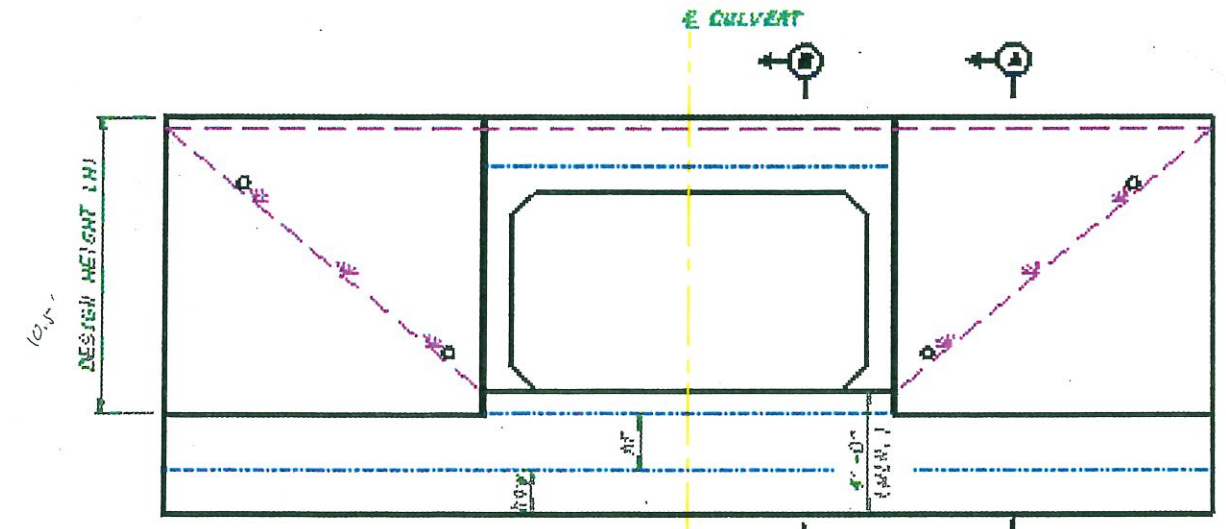
v = 18.00 in ✓
 w = 18.00 in ✓
 x = ~~18.00~~ in **17.50 in**
 y = ~~9.00~~ in **8.75 in**
 z = 18.00 in ($z=w$)



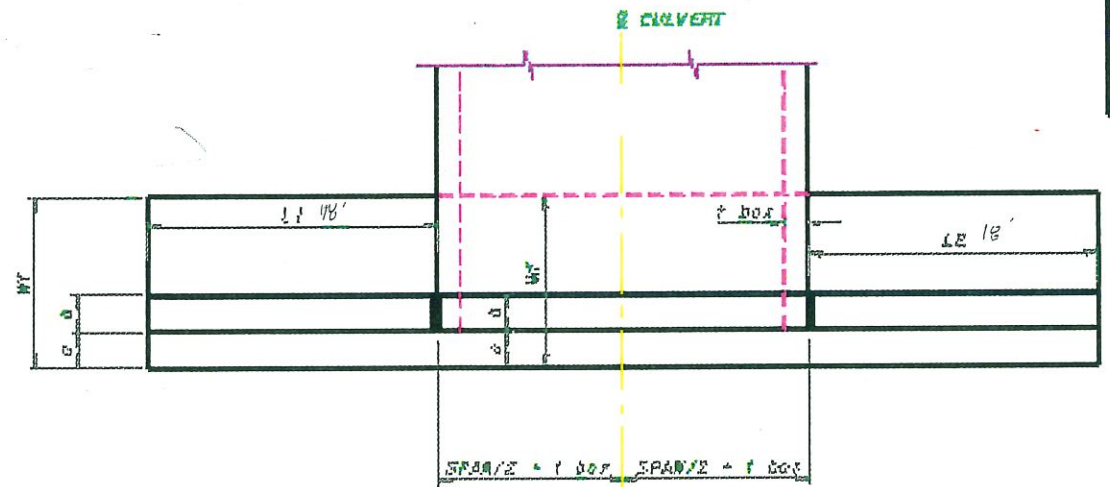
SECTION A-A



SECTION B-B



ELEVATION
 TYPE C HEADWALL



PLAN
 TYPE C HEADWALL

BAR MARK	NUMBE
X501	26
Y601	50
WW501	26
WW502	32
V501	33
W501	33
Z501	33
F501	9
F502	2
F601	28
F602	4
FS501	4
FS502	13
FS503	13

18'-0"
8'-0"
10'-0"
4'-0"
24'-11"
49'-10"
49'-0"
4'-0"
4'-0"
4'-0"

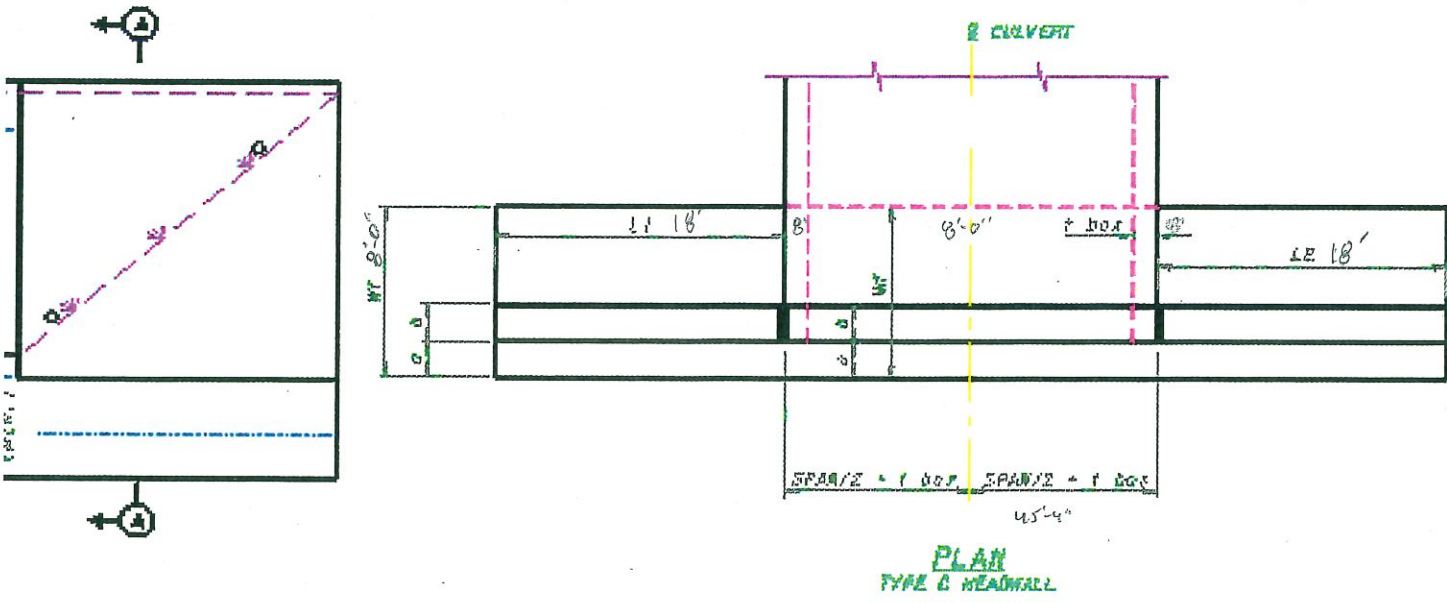
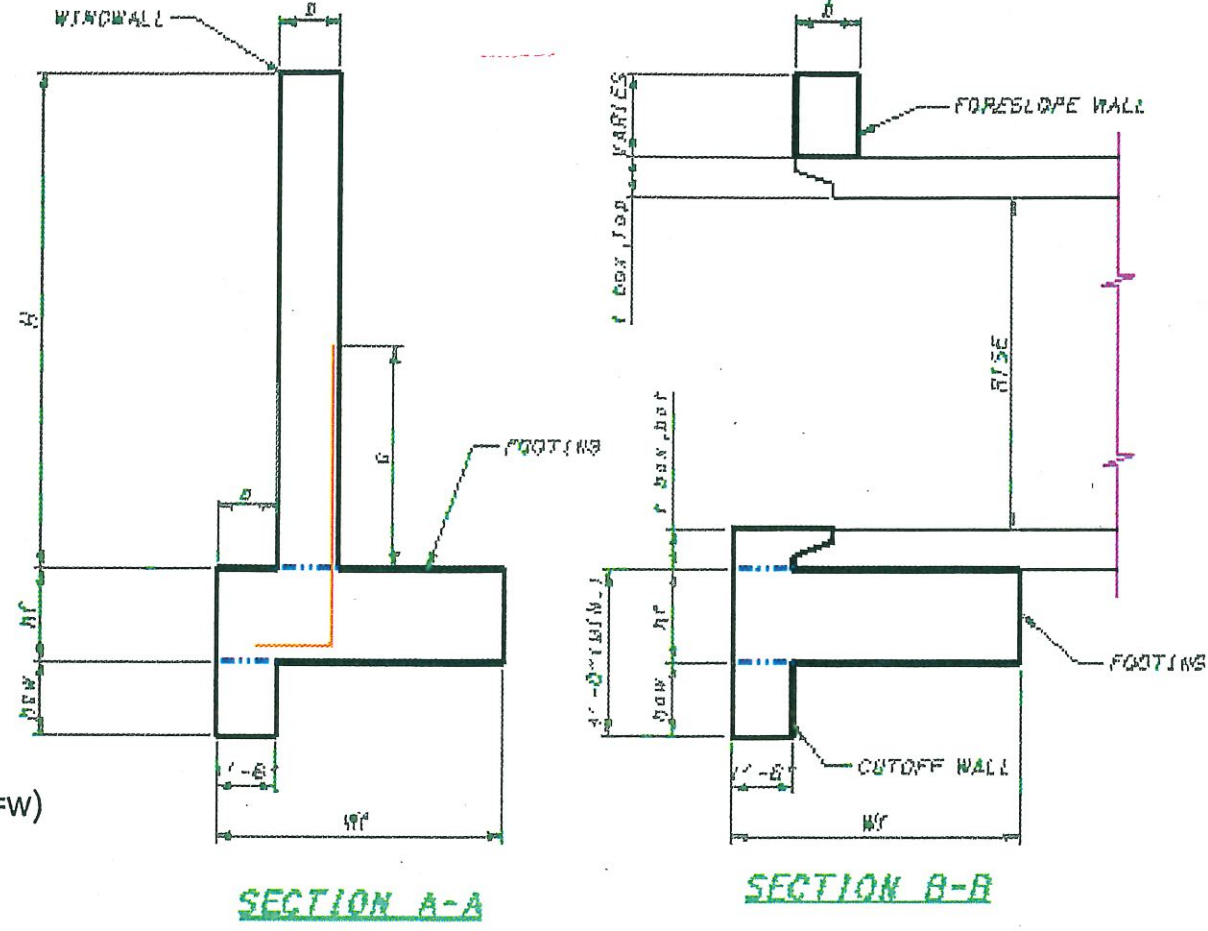
S If Override Option is Not Used, Leave Cell Blank *
Culverts" Standard Drawing for headwall dimensions and reinforcing data.

Cutoff Wall:

- = 8.00 ft
- = 2.00 ft
- = 2.00 ft

- = #5
- = #5
- = #5
- = #6
- = #5

- ing:**
- = 18.00 in
 - = 18.00 in
 - = 18.00 in
 - = 9.00 in
 - = 18.00 in (z=w)



TYPE C HEADWALL REINFORCING SCHEDULE							
BAR MARK	NUMBER	LENGTH	WEIGHT (LBS.)	TYPE	BAR TYPE DIMENSIONS		
					A	B	C
WINGWALLS							
X501	26	10'- 4"	281	STR.			
Y601	50	6'- 6"	489	1	1'- 0"	5'- 8"	
WW501	26	10'- 4"	281	STR.			
WW502	32	17'- 8"	590	STR.			
FOOTING & CUTOFF WALL							
V501	33	7'- 8"	264	STR.			
W501	33	7'- 8"	264	STR.			
Z501	33	8'- 2"	282	5	3'- 7"	1'- 2"	
F501	9	6'- 1"	58	1	3'- 8"	2'- 6"	
F502	2	11'- 4"	24	STR.			
F601	28	24'- 11"	1,048	STR.	45'-4" - (3'45" dia) = 44'-10" $\frac{1}{2} \times 22'-8" = 11'-4"$ $\frac{24'-11"}{2} = 12'-5.5"$		
F602	4	24'- 11"	150	STR.			
FORESLOPE WALL							
FS501	4	11'- 4"	48	STR.			
FS502	13	3'- 8"	50	5	1'- 6"	0'- 11"	
FS503	13	4'- 5"	60	7	1'- 6"	0'- 11"	2'- 3"
TOTAL			3,889				