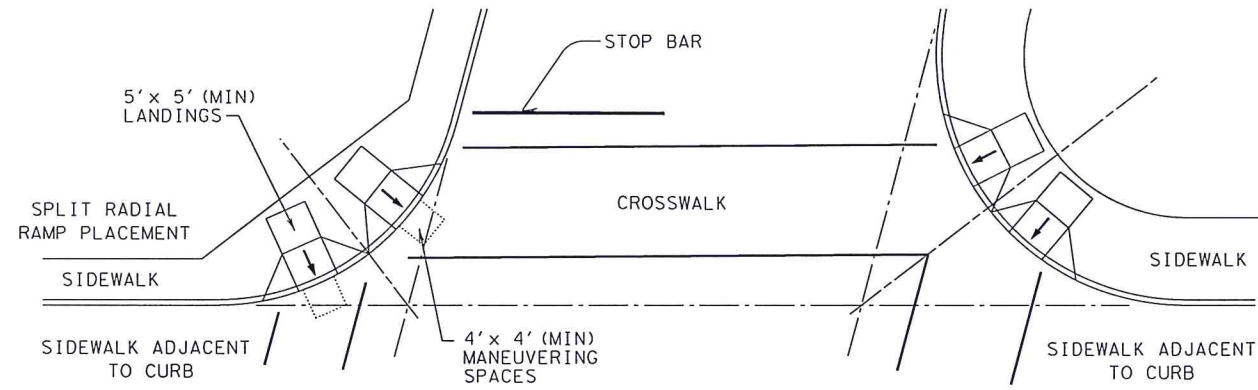
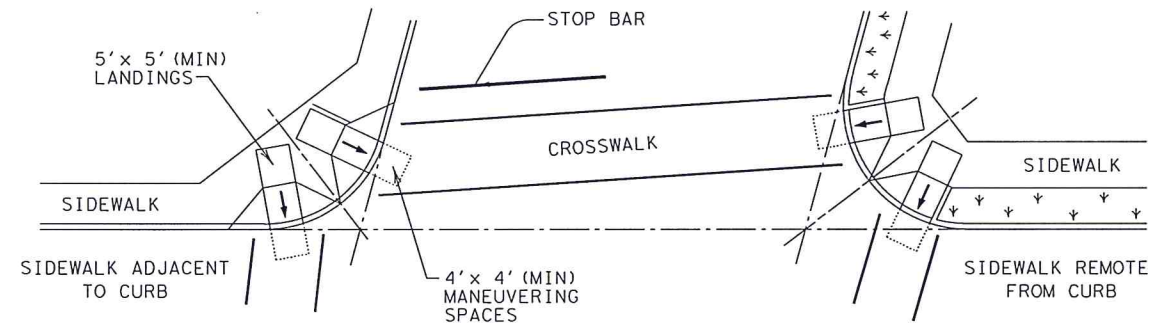


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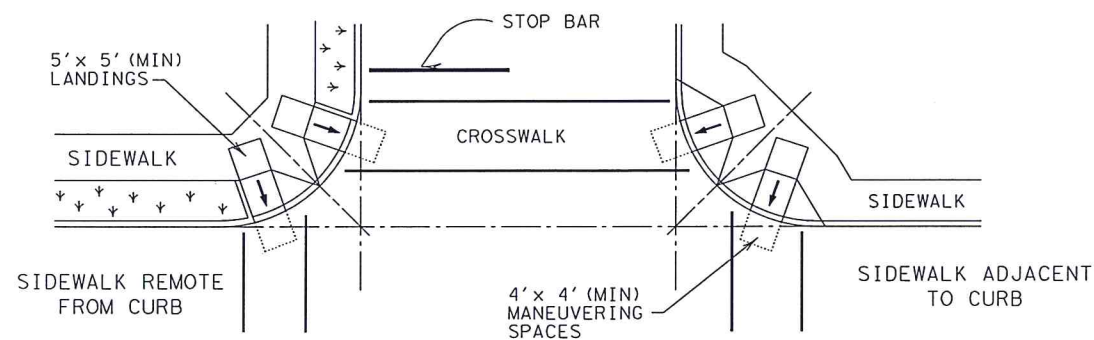
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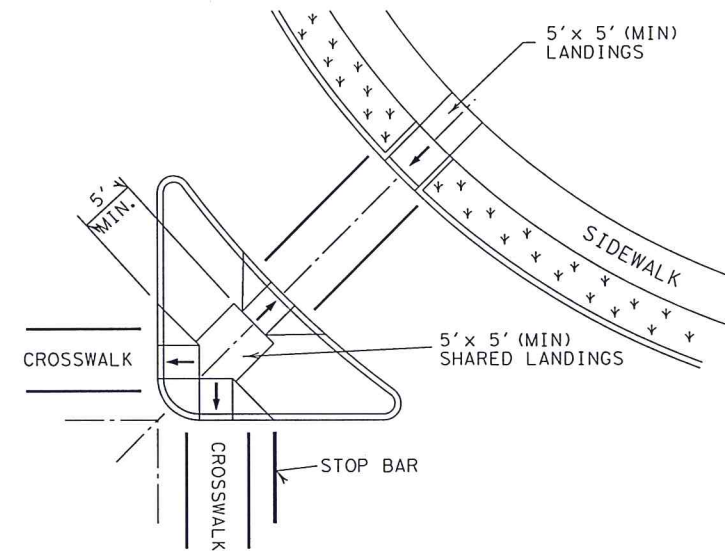
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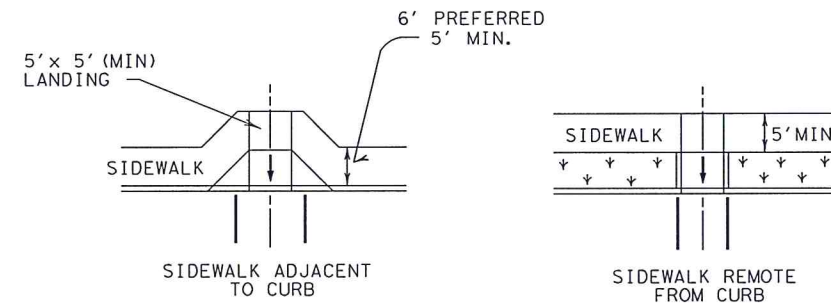
SKewed INTERSECTION WITH "SMALL" RADIUS



NORMAL INTERSECTION WITH "SMALL" RADIUS




AT INTERSECTION  
W/FREE RIGHT TURN & ISLAND



MID-BLOCK PLACEMENT  
PERPENDICULAR RAMPS

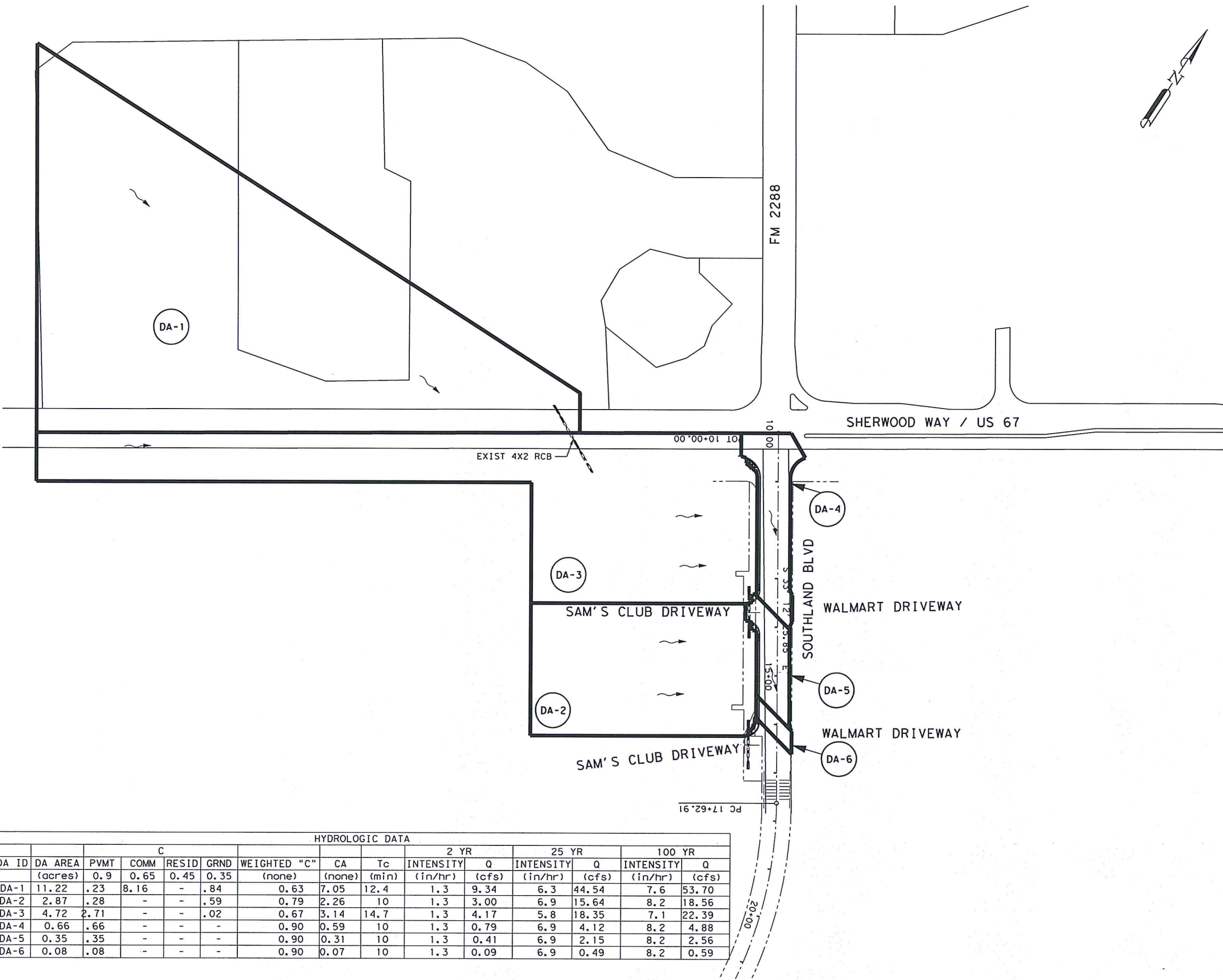
TYPICAL CROSSING LAYOUTS

SHEET 4 OF 4

 Texas Department of Transportation				Design Division Standard	
PEDESTRIAN FACILITIES					
CURB RAMPS					
PED-12A					
FILE: ped12a.dgn		DN: TxDOT	CR: RM	DN: TxDOT	CR: VP
© TxDOT March 2002		CONT	SECT	JOB	HIGHWAY
REVISIONS		SOUTHLAND			
VP June 13, 2012		DIST	COUNTY		SHEET NO.
		TOM GREEN		38	

LEGEND

- DIRECTION OF FLOW
- SUB DRAINAGE BOUNDARY
- DRAINAGE AREA ID



09/23/2016

STATE OF TEXAS

MICHAEL C. COYLE


95634

LICENSED PROFESSIONAL ENGINEER

0' 50' 100' 200'

SCALE: 1"=200'

REV. NO. DATE DESCRIPTION BY

LJA Engineering, Inc. 

FRN - F-1386

THE CITY OF SAN ANGELO

TEXAS

SOUTHLAND BOULEVARD

OVERALL DRAINAGE AREA MAP

SHEET 1 OF 1

39

HYDROLOGIC DATA														
DA ID	DA AREA (acres)	C												
		PVMT	COMM	RESID	GRND	WEIGHTED "C"	CA	Tc	INTENSITY	Q	INTENSITY	Q	INTENSITY	Q
		0.9	0.65	0.45	0.35	(none)	(none)	(min)	(in/hr)	(cfs)	(in/hr)	(cfs)	(in/hr)	(cfs)
DA-1	11.22	.23	8.16	-	.84	0.63	7.05	12.4	1.3	9.34	6.3	44.54	7.6	53.70
DA-2	2.87	.28	-	-	.59	0.79	2.26	10	1.3	3.00	6.9	15.64	8.2	18.56
DA-3	4.72	2.71	-	-	.02	0.67	3.14	14.7	1.3	4.17	5.8	18.35	7.1	22.39
DA-4	0.66	.66	-	-	-	0.90	0.59	10	1.3	0.79	6.9	4.12	8.2	4.88
DA-5	0.35	.35	-	-	-	0.90	0.31	10	1.3	0.41	6.9	2.15	8.2	2.56
DA-6	0.08	.08	-	-	-	0.90	0.07	10	1.3	0.09	6.9	0.49	8.2	0.59

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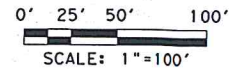
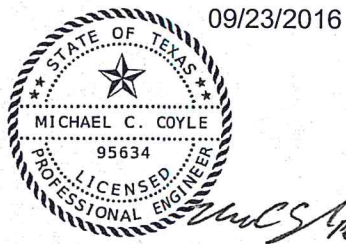
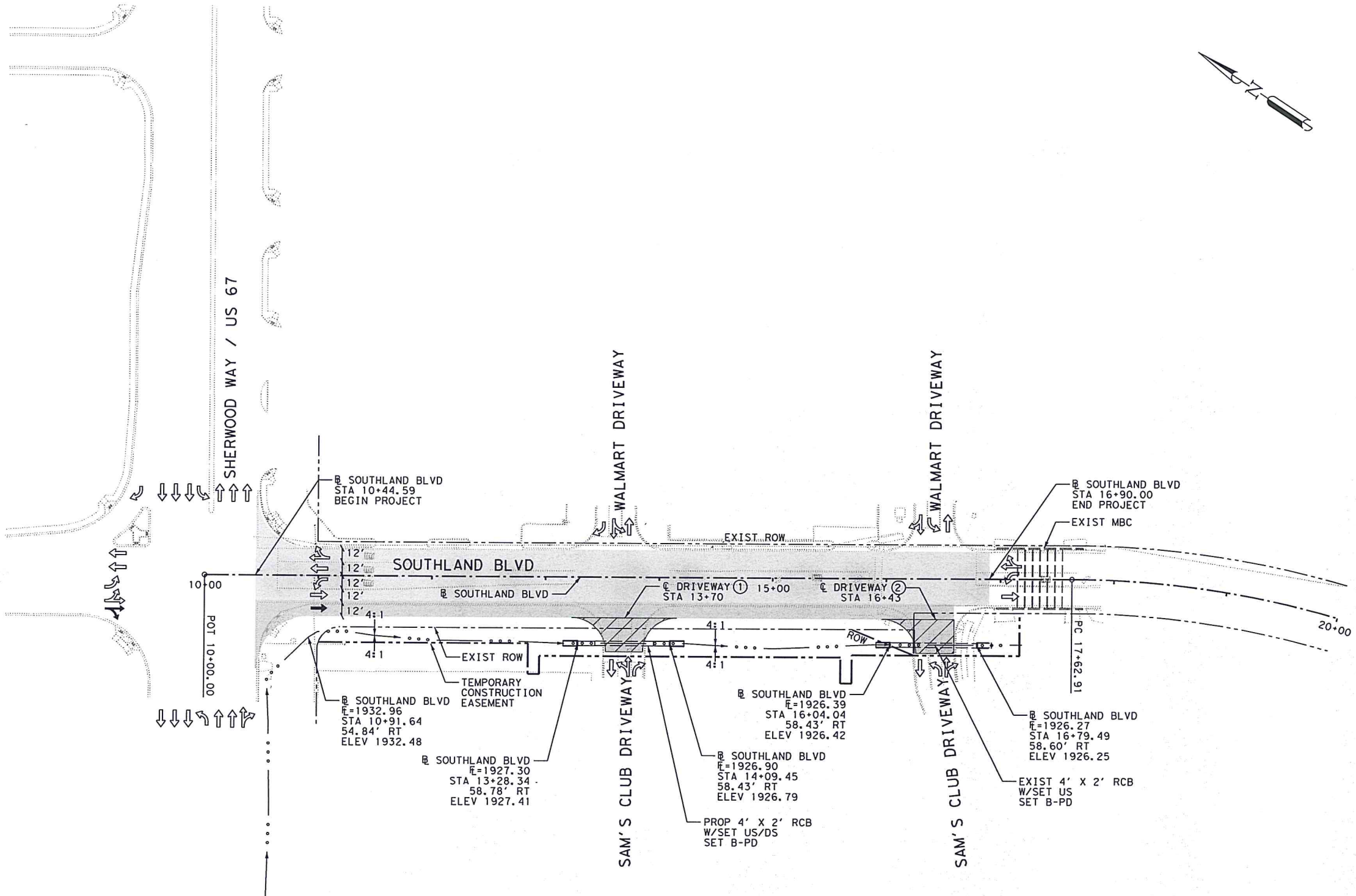


LEGEND

- DIRECTION OF FLOW
- DITCH
- PROP STORM SEWER
- EXIST STORM SEWER

NOTES:

- 1. PIPE LENGTHS SHOWN IN PROFILE ARE CENTER OF STRUCTURES. LENGTHS SHOWN ON SUMMARY OF STORM SEWER QUANTITIES ARE CALCULATED PAY LENGTHS.
- 2. CONTRACTOR TO VERIFY LOCATION OF EXISTING STORM SEWER AND ADJUST PROPOSED TIE-IN LOCATIONS AS DIRECTED BY THE ENGINEER.
- 3. REFER TO DRIVEWAY DETAILS SHEET FOR MORE INFORMATION.



REV. NO.	DATE	DESCRIPTION	BY
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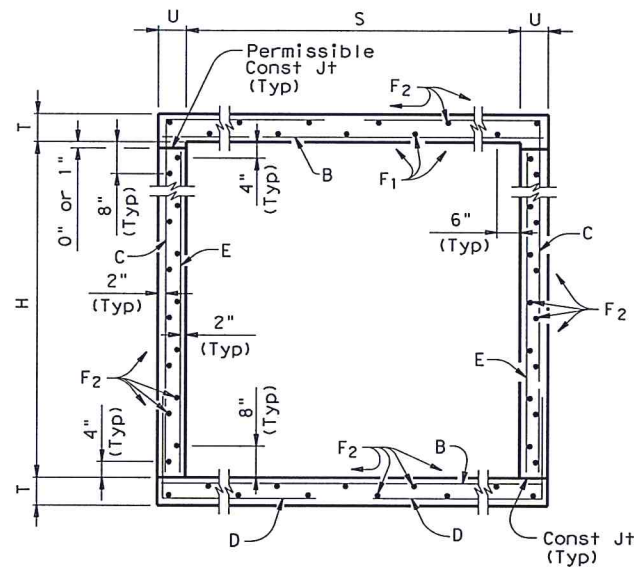
**LJA Engineering, Inc.**  
FRN - F-1386



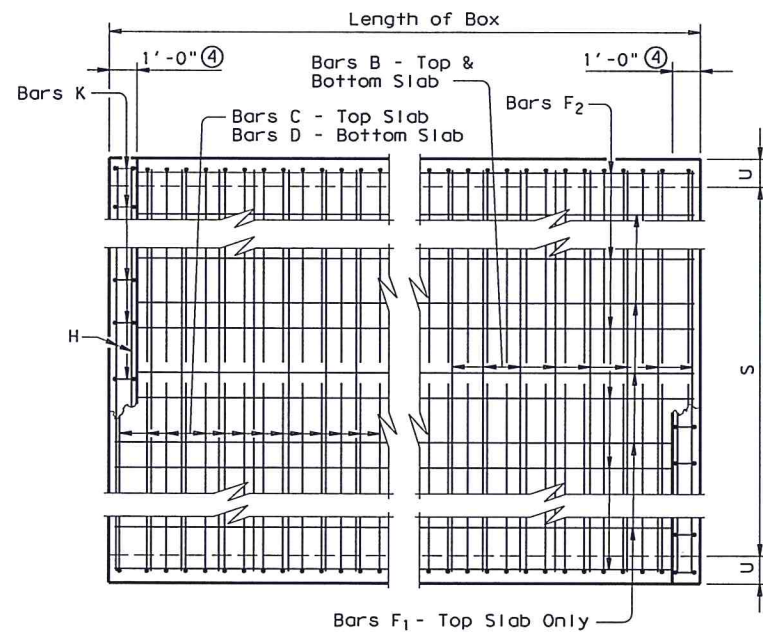
**SOUTHLAND BOULEVARD**  
**DRAINAGE PLAN**

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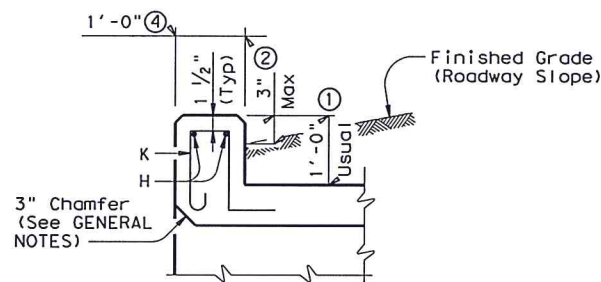
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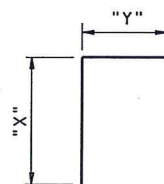
TYPICAL SECTION



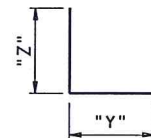
PLAN OF REINF STEEL



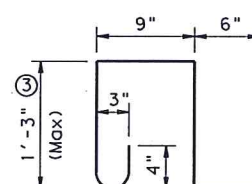
SECTION THRU CURB



BARS C



BARS D



BARS K ~ #4  
(Spa = 1'-0" Max)  
(Length = 4'-3")

- ① 0" min to 5'-0" max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail, bicycle rail or curbs taller than 1'-0", refer to ECD standard. For structures with T6 bridge rail, refer to T6-CM standard. For structures with traffic rail, other than T6, refer to RAC standard.
- ② For vehicle safety, the following requirements must be met:
  - For structures without bridge rail, curbs shall project no more than 3" above finished grade.
  - For structures with bridge rail, curbs shall be flush with finished grade.Curb heights shall be reduced, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
- ③ For curbs less than 1'-0" high, tilt bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, bars K may be omitted.
- ④ 1'-0" typical. 2'-0" when RAC standard is referred to elsewhere in the plans.

Deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064 may be used to replace conventional reinforcement shown at the Contractor's option. The area of required reinforcement may be reduced by the ratio of 60 ksi / 70 ksi. Spacing of WWR is limited to 4" Min and 18" Max. When required, provide lap splices in the WWR of the same length required for the equivalent bar size, rounded up for wire sizes between conventional bar sizes.

Example Conversion: Replacement of No. 6 Gr 60 at 6" Spacing with WWR.  
WWR required = (0.44 sq in/ 0.5') x (60 ksi/70 ksi) = 0.754 sq in/ft.  
If D30.6 wire is used to meet the 0.754 sq in/ft requirement in this example, the required spacing = (0.306 sq in/ 0.754 sq in/ft) x 12 in/ft = 4.87" Max spacing.  
Required lap length for the provided D30.6 wire is 2'-2" (Lap required for uncoated No. 5 bars, as shown in Item 440).

**GENERAL NOTES:**

Designed according to AASHTO LRFD Specifications.  
Designed to the maximum fill height shown.  
All reinforcing steel shall be Grade 60.  
All concrete shall be Class "C" with these exceptions: use Class "S" for top slabs of culverts with overlay, with 1-to-2 course surface treatment, or with the top slab as the final riding surface.  
Class "C" concrete shall have a minimum compressive strength of 3,600 psi. Class "S" concrete shall have a minimum compressive strength of 4,000 psi.  
The use of permanent forms is not allowed.  
The bottom edge of the top slab shall be chamfered 3" at the entrance.  
Reinforcing bars shall be adjusted to provide a minimum of 1 1/4" clear cover.  
Construction joints shown at the flow line may be raised a maximum of 6" at the Contractor's option.  
If this option is used, Bars E may be cut off or raised, and Bars C and D may be reversed.  
See standard SCC-MD for skewed ends, angle sections and lengthening details.

HL93 LOADING

SHEET 1 OF 2

		Bridge Division Standard	
<b>SINGLE BOX CULVERTS CAST-IN-PLACE 0' TO 30' FILL</b>			
<b>SCC-3 &amp; 4</b>			
FILE: sc34ste.dgn	DN: GAF	CK: LHW	DR: BWH/TxDOT
©TxDOT February 2010	CONT	SECT	JOB
REVISIONS		HIGHWAY	
10-12: Added WWR		SOUTHLAND	
DIST		COUNTY	SHEET NO.
TOM GREEN		41	



**DISCLAIMER:**

11:08:36 AM

Deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064 may be used to replace conventional reinforcement shown at the Contractor's option. The area of required reinforcement may be reduced by the ratio of 60 ksi / 70 ksi. Spacing of WWR is limited to 2" Min and 18" Max. When required, provide lap splices in the WWR of the same length required for the equivalent bar size, rounded up for wire sizes between conventional bar sizes.

Example Conversion: Replacement of No. 6 Gr 60 at 6" Spacing with WWR.


WWR required =  $(0.44 \text{ sq in/ } 0.5') \times (60 \text{ ksi}/70 \text{ ksi}) = 0.754 \text{ sq in/ft.}$

If D30.6 wire is used to meet the 0.754 sq in/ft requirement in this example, the required spacing =  $(0.306 \text{ sq in/ } 0.754 \text{ sq in/ft}) \times 12 \text{ in/ft} = 4.87''$

Max spacing.

Required lap length for the provided D30.6 wire is 2'-2" (Lap required for uncoated No. 5 bars, as shown in Item 440).

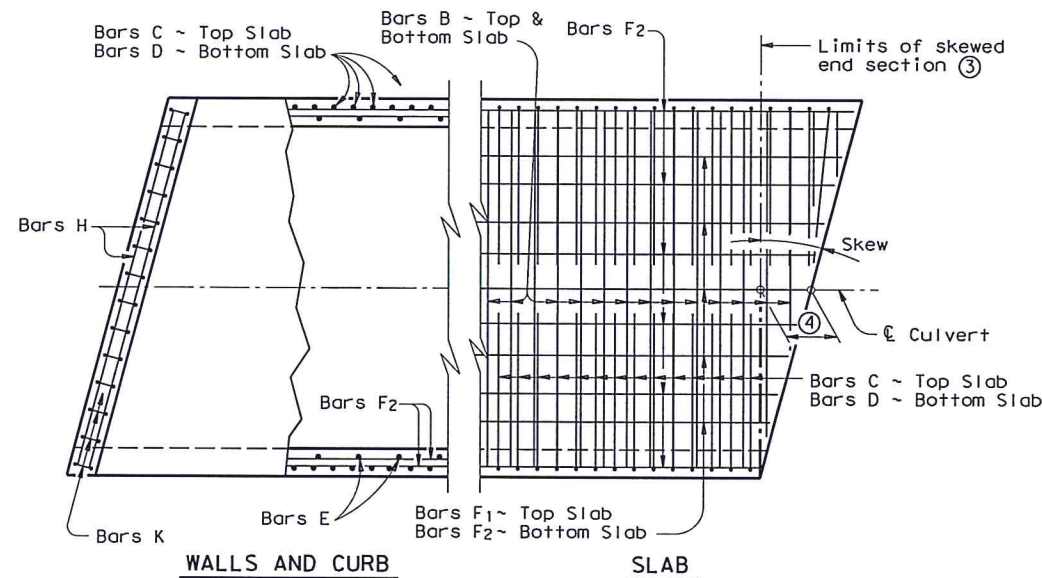
SCC-3 & 4

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 February 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS 10-12: Added VINR				SOUTHLAND
	DIST	COUNTY		SHEET NO.
		TOM GREEN		42



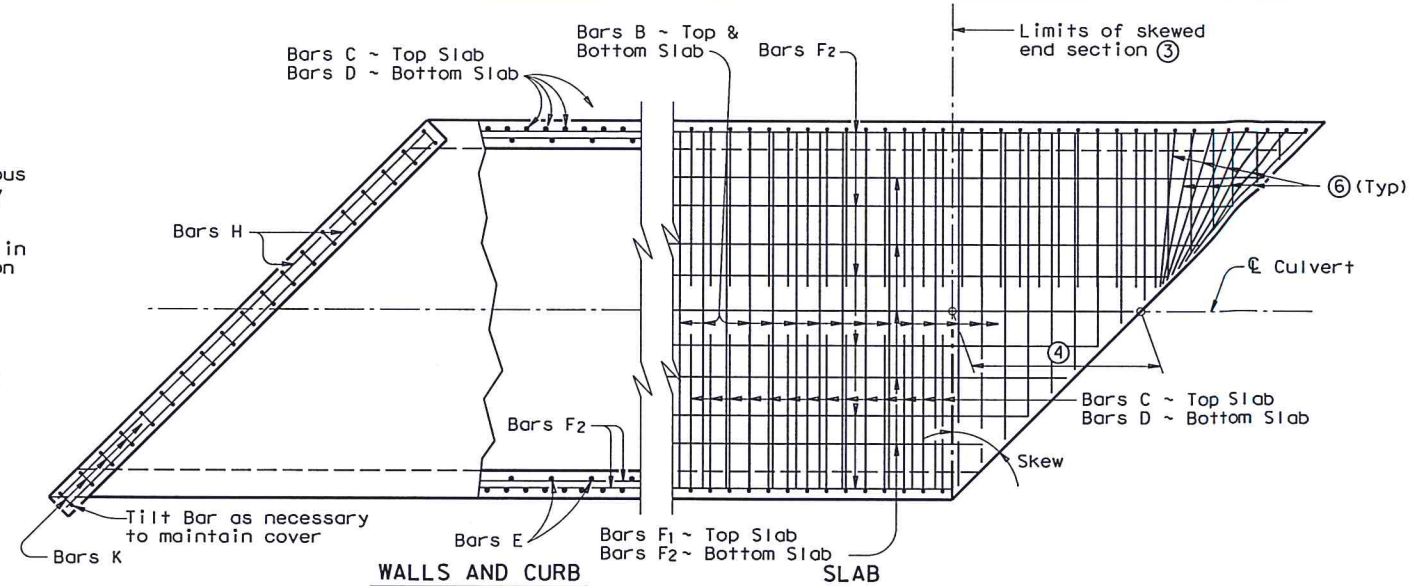
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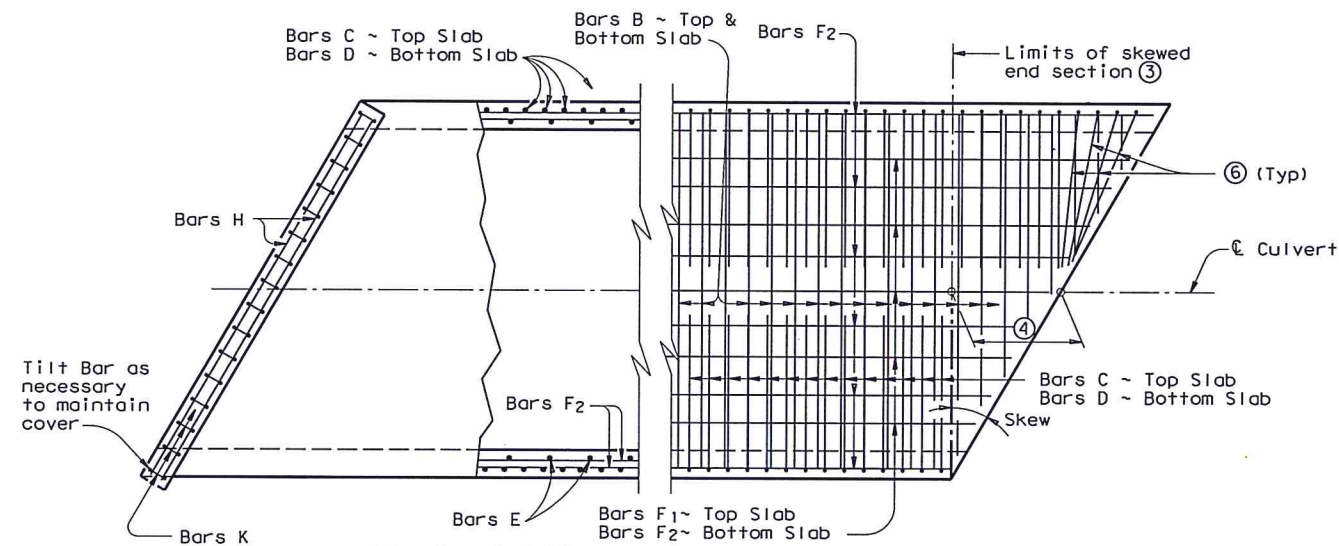


PLAN OF SKEWED ENDS ~ FROM 0° TO 15°

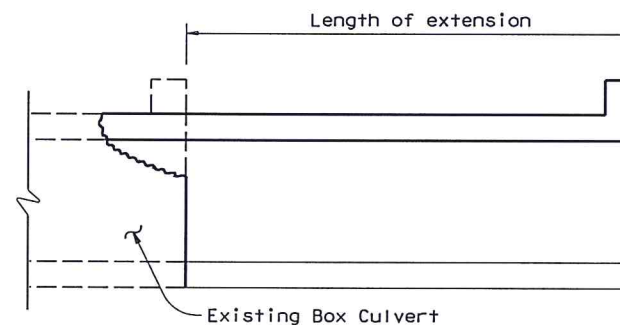
- ② When the spacing between Bars B becomes less than half of the normal spacing, bars shall be cut to avoid fouling
- ③ The length of Bars B and E will vary in the skewed end sections [One half of overall width] x [Tan of the skew angle]
- ④ Bars F1 and F2 shall be continuous through the angle section. They shall be bent to remain parallel to the walls of the Box Culvert.
- ⑤ When necessary to avoid fouling in acute corners, the slab extension leg of Bars C and Bars D may be shortened to a minimum of 1'-6" for skews of 30° and 45°.
- ⑥ For skews of 15° or less, the contractor has the option of placing Bars B, C and D parallel to the skewed end while maintaining spacing along centerline box. Lengths of Bars B shown on the standards shall be increased to accommodate the skew.



PLAN OF SKEWED ENDS ~ OVER 30° TO 45°



PLAN OF SKEWED ENDS ~ OVER 15° TO 30°

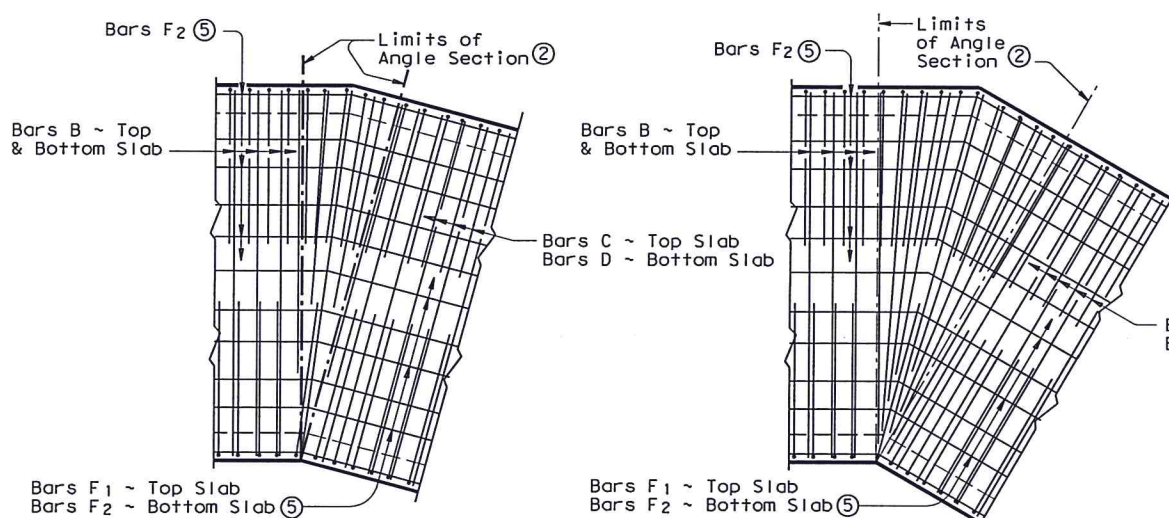


LENGTHENING DETAIL

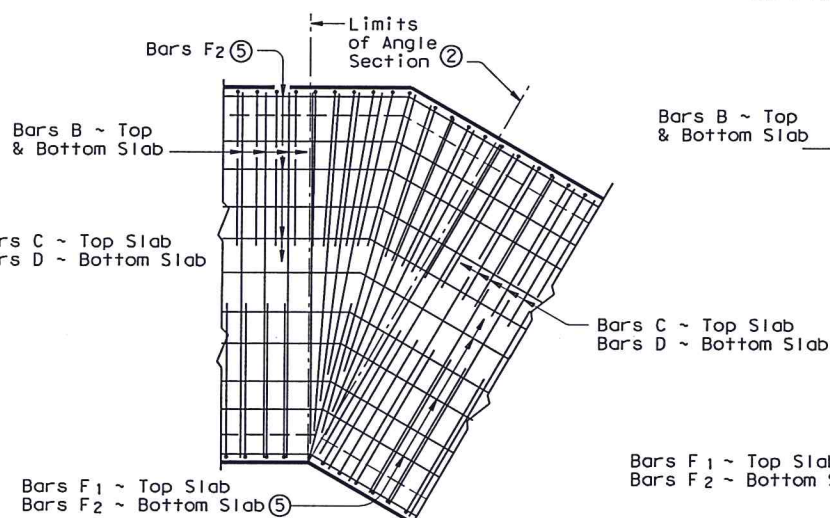
- ① For box culverts with less than 2'-0" of fill, the top slab shall be broken back to provide a minimum 1'-10" lap of the existing longitudinal bars with the longitudinal bars in the extension. If the depth of fill is 2'-0" or greater, the top slab shall be broken back to provide a 1'-0" minimum embedment of existing longitudinal reinforcing into the extension. Alternatively, if the fill height is greater than 2'-0", the existing curb may be left in place and 2'-0" long #6 bars shall be drilled and grouted 1'-0" into the existing top slab at 1'-6" center to center spacing. Wings and apron shall be broken back as necessary to install the extension. Exposed wingwall and apron reinforcing may be removed or cleaned and included in the extension. When lengthening existing box culverts with dimensions different than current standard dimensions, horizontal and vertical transitions shall be formed as directed by the Engineer. Bottom slabs shall match to maintain an uninterrupted flow line. Existing and new reinforcing shall be field bent into transition maintaining specified cover requirements.

#### GENERAL NOTES:

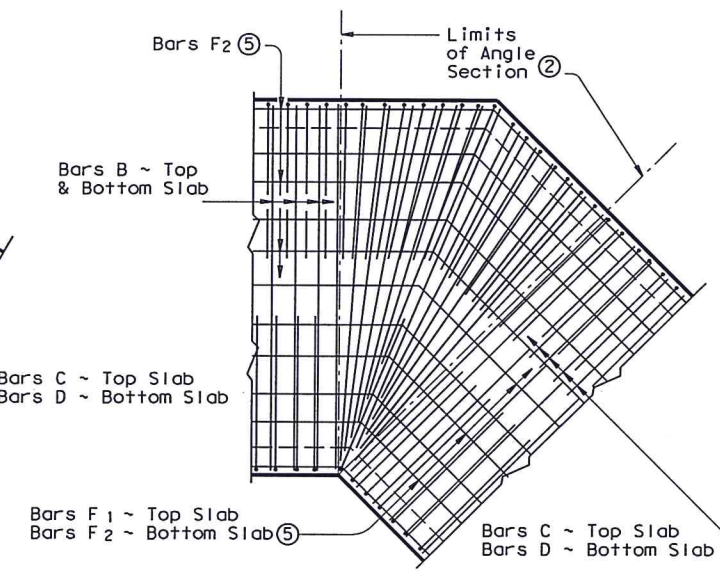
- Designed according to AASHTO LRFD Specifications.
- All reinforcing steel shall be Grade 60.
- All concrete shall be Class "C" with these exceptions: use Class "S" for top slabs of culverts with overlay, with 1-to-2 course surface treatment, or with the top slab as the final riding surface.
- Class "C" concrete shall have a minimum compressive strength of 3,600 psi. Class "S" concrete shall have a minimum compressive strength of 4,000 psi.
- The use of permanent forms is not allowed.
- Refer to Single Box Culverts Cast-in-Place standard for details of straight sections of culvert. For skewed sections and angle sections refer to Single Box Culverts Cast-in-Place standard for slab and wall dimensions, bar sizes, maximum bar spacing, and any other details not shown. For Skewed ends with curbs, adjust length of Bars H, number of Bars K, curb concrete volume and reinforcing steel weight by dividing the values shown on the culvert standards by the cosine of the skew angle.
- Laps for Bars H, when required, shall be 1'-9" for uncoated bars and 2'-7" for epoxy coated.



PLAN OF ANGLE SECTION ~ FROM 0° TO 15°




PLAN OF ANGLE SECTION ~ OVER 15° TO 30°



PLAN OF ANGLE SECTION ~ OVER 30° TO 45°

#### HL93 LOADING



Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS

CAST-IN-PLACE

MISCELLANEOUS DETAILS

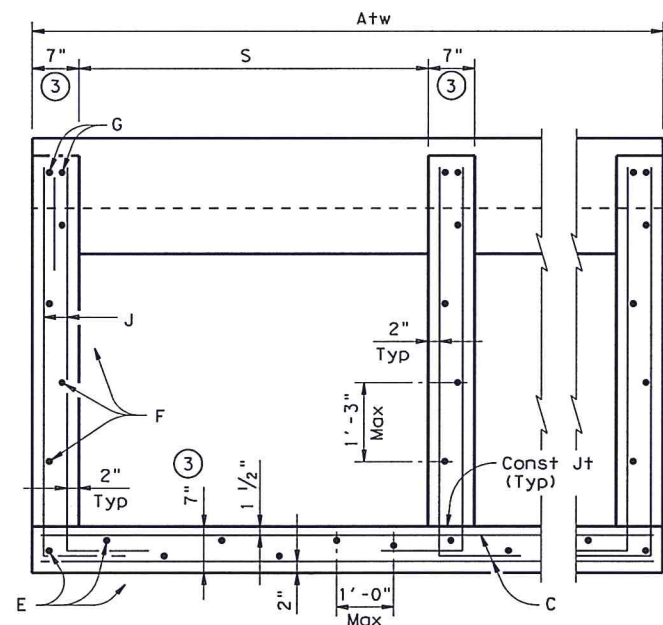
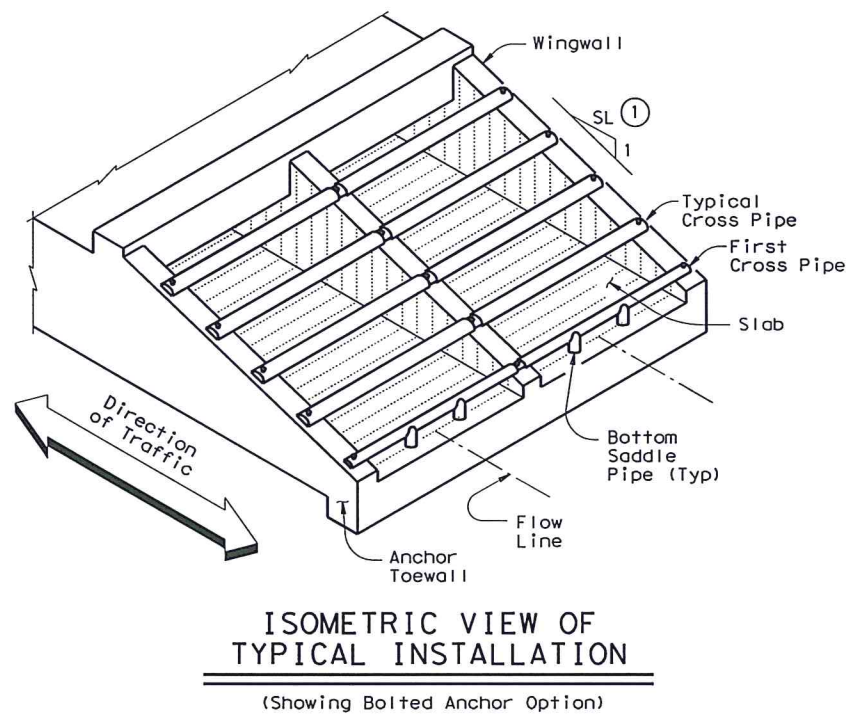
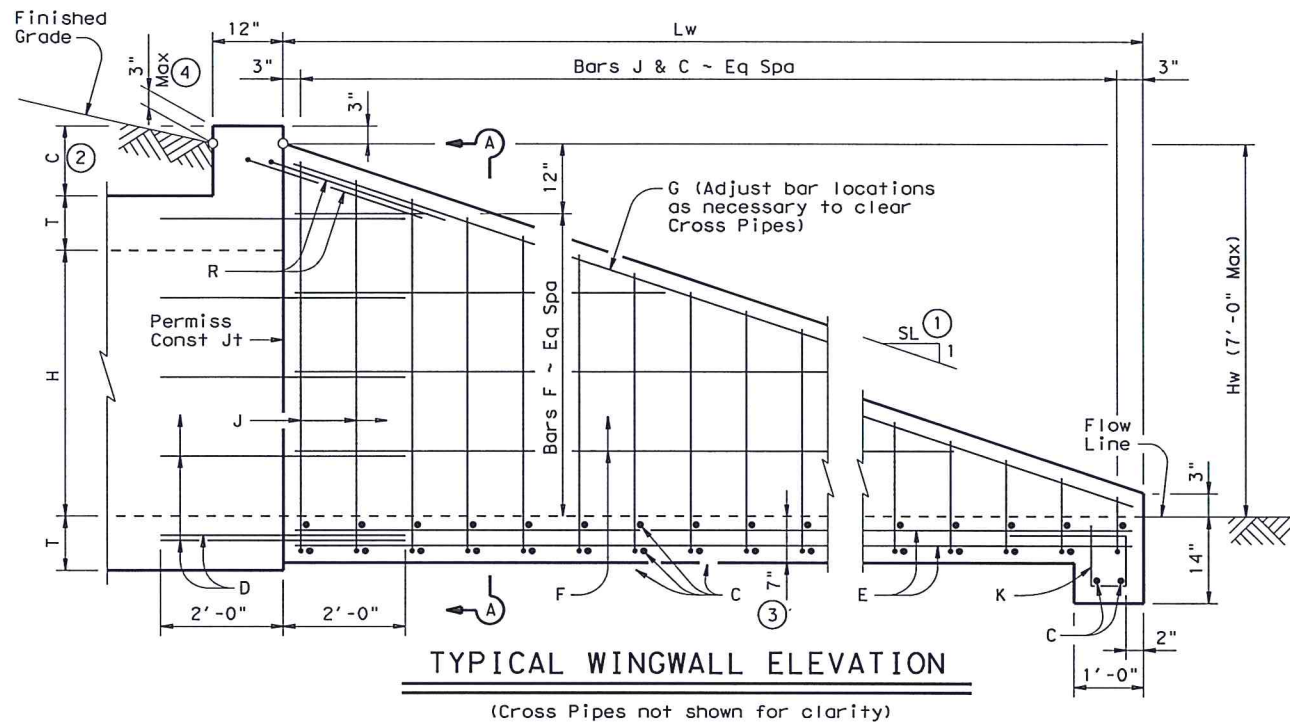
SCC-MD

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REVISIONS				SOUTHLAND
	DIST	COUNTY		SHEET NO.
		TOM GREEN		43

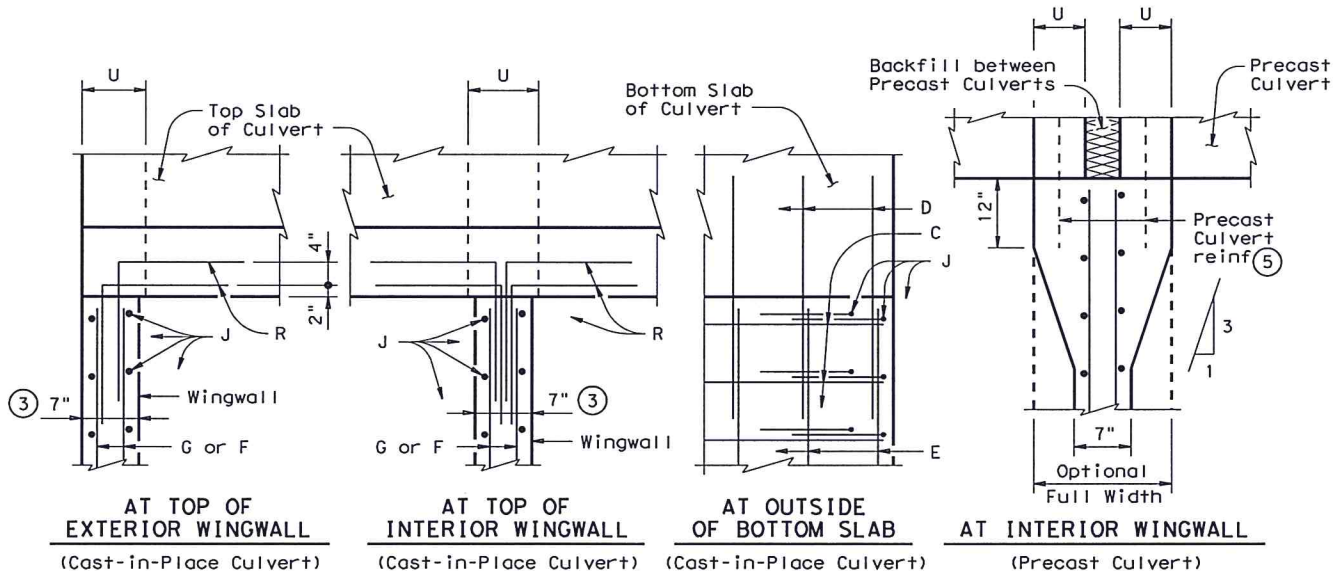
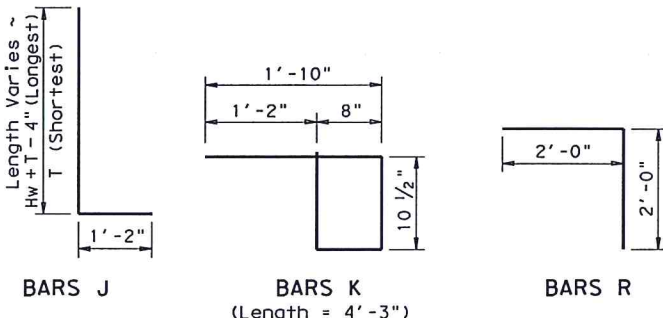


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SECTION A-A  
(Showing typical Wingwall and Wing Slab reinforcing)  
(Pipe Runners not shown for clarity)



PLAN VIEWS OF CORNER DETAILS


TABLE OF REINFORCING BAR SIZES & SPACING		
Bar	Size	Spacing
C	#4	10" Max
D	#4	match F & E
E	#4	1'-0" Max
F	#4	1'-3" Max
G	#6	Shown
J	#4	10" Max
K	#4	1'-0" Max
R	#4	Shown

- Slope will be 6:1 or flatter.
- 0" min to 5'-0" max. Estimated curb heights are shown elsewhere in the plans. For structures without railing and curbs taller than 1'-0", refer to ECD standard.
- Wingwall and slab thicknesses may be the same as the adjacent culvert wall and slab thicknesses (7" Minimum). If thicknesses greater than the minimum (7") are used, no changes will be made in quantities and no additional compensation will be allowed.
- For vehicle safety, curbs shall project no more than 3" above finished grade. Curb heights shall be reduced, if necessary, to meet these requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
- For Culverts with C = 0", the precast culvert reinforcing may extend 1'-0" minimum into Wingwall. Wingwall Bars D and R may be omitted. Otherwise, refer to the "Wingwall Connection Detail" on the SCP-MD standard.

Formulas: (All values are in Feet)  
 $Hw = H + T + C - 0.250'$   
 $Lw = (Hw - 0.250') (SL)$   
For Cast-in-place culverts:  
 $Atw = (N) (S) + (N+1) (U)$   
For Precast culverts:  
 $Atw = (N) (2U+S) + (N-1) (0.500')$   
Total Wingwall Area (S.F.)  
 $= (0.5) (Hw + 0.250') (Lw) (N+1)$   
Total Concrete Volume (C.Y.)  
 $= [(Wingwall Area) (0.583') + (Lw) (Atw) (0.583') + (Atw) (1.000') (1.167' - 0.583')] \div (27)$   
Total Reinforcing (Lbs)  
 $= (1.55) (Lw) (Atw) + (4.43) (Atw) + (K) (Hw) (N+1) (\sqrt{Lw})$

C = Height of Curb above top of Top Slab  
Hw = Height of Wingwall  
K = Constant Value for use in formulas  
Slope SL:1 K  
6:1 ~ 10.41  
Atw = Anchor Toewall Length  
Lw = Length of Wingwall  
N = Number of Culvert Barrels  
S = Clear Span of each Barrel  
SL:1 = Side Slope Ratio (Horizontal : 1 Vertical)  
See applicable box culvert standard for H, S, T, and U values.

**GENERAL NOTES:**  
Designed according to AASHTO LRFD Specifications.  
The Safety End Treatments shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the Cross Pipes.  
Cross Pipes are designed for a traversing load of 10,000 pounds at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.  
All concrete shall be Class "C" and shall have a minimum compressive strength of 3600 psi.  
All reinforcing steel shall be Grade 60. All reinforcing shall be adjusted as necessary to provide a minimum clear cover of 1 1/4".  
The quantities for concrete, reinforcing steel, and Cross Pipes resulting from the formulas given herein are for Contractor's information only.  
Cross Pipes, Sleeve Pipes, and Saddle Pipes shall conform to the requirements of ASTM A53 (Type E or S, Grade B), ASTM A500 (Grade B), or API 5LX52.  
Bolts and nuts shall conform to ASTM A307. All steel components, except the concrete reinforcing, shall be galvanized after fabrication. Galvanizing damaged during transport or construction shall be repaired in accordance with the specifications.  
See BCS standard sheet for additional dimensions and information.  
Alternate design drawings bearing the seal of a professional engineer will be acceptable for precast construction of the Safety End Treatments.



**SAFETY END TREATMENT**  
FOR BOX CULVERTS  
(MAXIMUM Hw = 7'-0")  
TYPE I ~ PARALLEL DRAINAGE

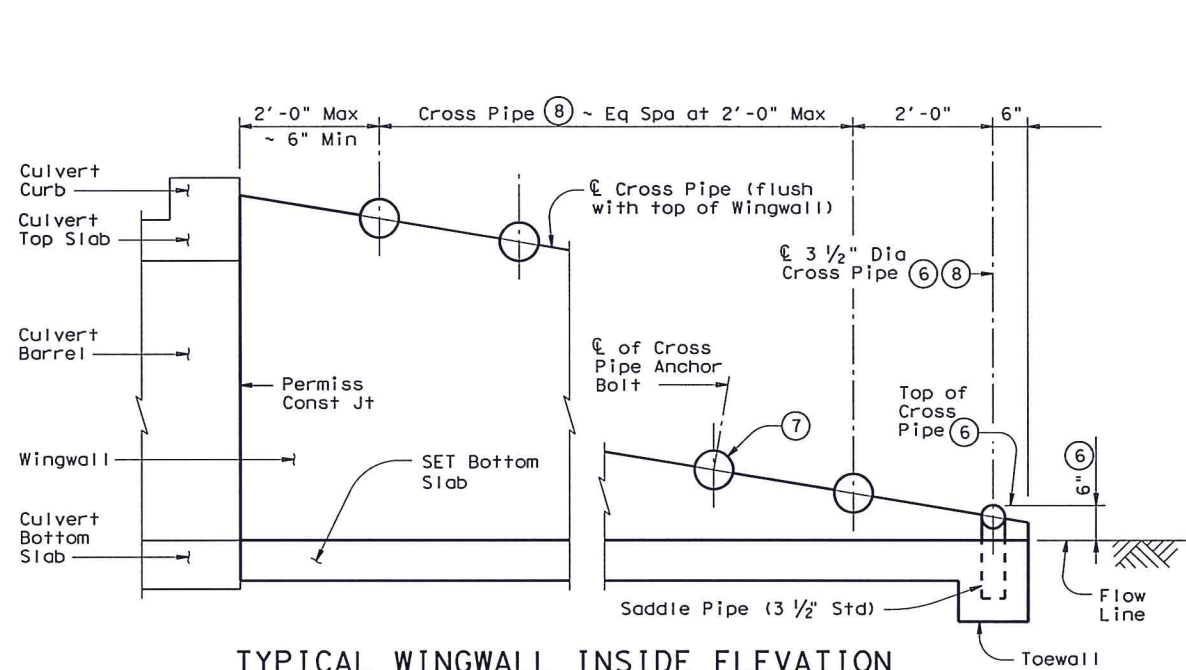
SETB-PD

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REVISIONS				SOUTHLAND
	DIST		COUNTY	SHEET NO.
			TOM GREEN	44

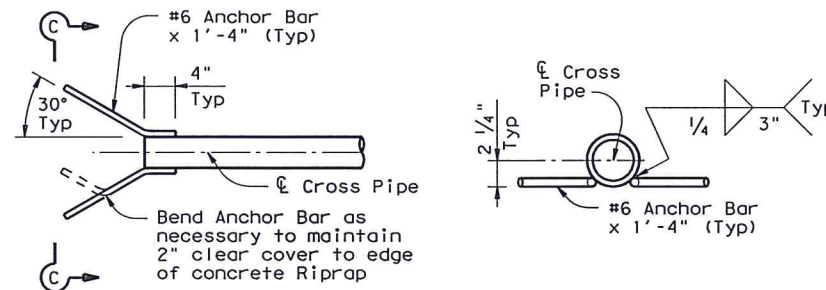


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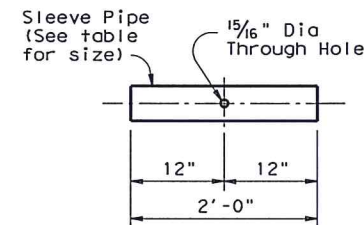
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TYPICAL WINGWALL INSIDE ELEVATION  
(Showing installation of Cross Pipes)



OPTIONAL ANCHOR BAR DETAILS

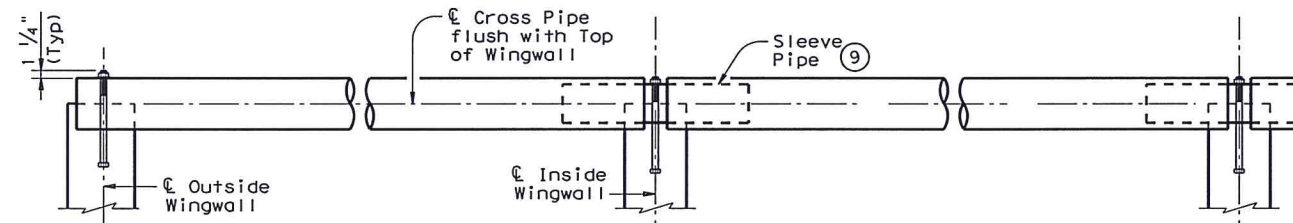
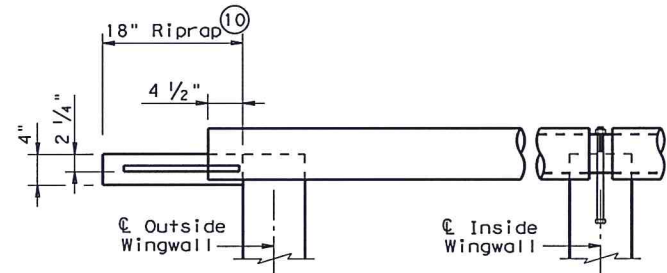


SLEEVE PIPE DETAILS

REQUIRED PIPE SIZES		
Culvert Span Sizes	Cross Pipe Size	Sleeve Pipe Size
First Pipe	3 1/2" STD	2 1/2" STD
30" to 42"	4" STD	3" STD
48" to 72"	5" STD	4" STD
78" to 120"	6" STD	5" STD

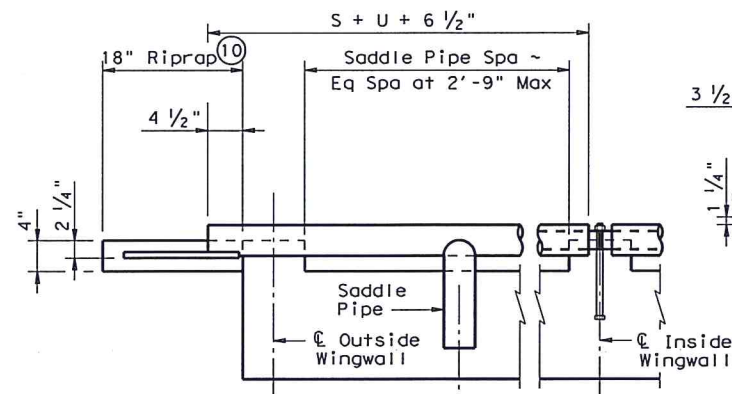
STANDARD PIPE SIZES		
Pipe Size	Pipe O.D.	Pipe I.D.
2 1/2" STD	2.875"	2.469"
3" STD	3.500"	3.068"
3 1/2" STD	4.000"	3.548"
4" STD	4.500"	4.026"
5" STD	5.563"	5.047"
6" STD	6.625"	6.065"

- The proper installation of the first Cross Pipe is critical for vehicle safety. The top of the first Cross Pipe must be placed at no more than 6" above the flow line.
- The third Cross Pipe from the bottom of the Culvert shall always be installed using a bolted connection. Care shall be taken to ensure that concrete does not flow into this Cross Pipe so as to permit disassembly of the bolted connection to allow cleanout access.
- Cross Pipes and Sleeve Pipes (if required) shall be as shown in the REQUIRED PIPE SIZES table. Saddle Pipes for the 3 1/2" first Cross Pipe shall also be 3 1/2".
- At Contractor's option, the Cross Pipe may be continuous across the Inside Wingwalls. If such option is selected, the Sleeve Pipe shall be omitted and a 15/16" diameter through hole made in the Cross Pipe to accept the anchor bolt at the centerline of each Interior Wingwall.
- Riprap will be required when using the optional Anchor Bar details and shall be included in the Price Bid for Safety End Treatment. Such Riprap shall be concrete Riprap in accordance with Item 432, "Riprap".

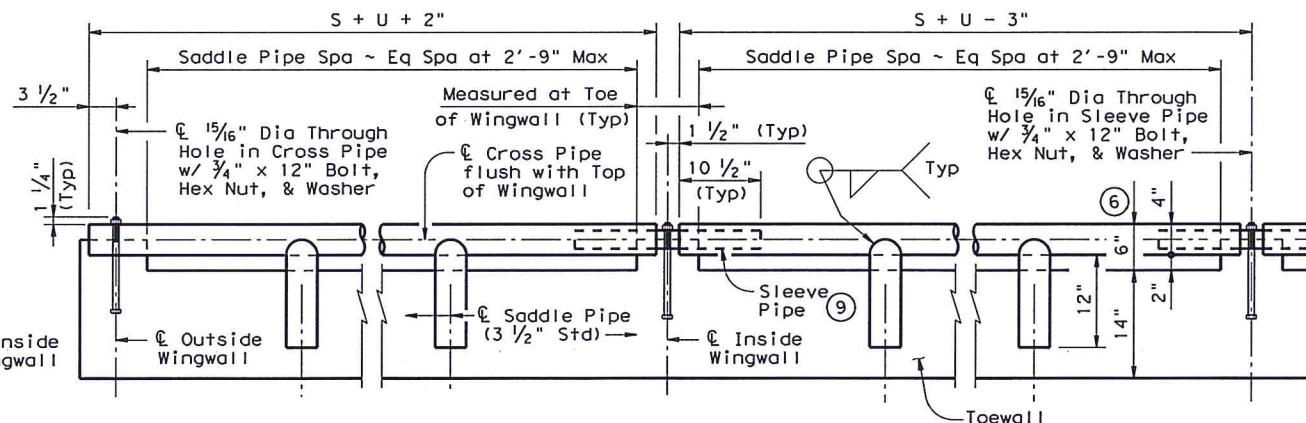


SECTION THROUGH INSTALLATION OF TYPICAL FULL CROSS PIPE

(Anchor details and dimensions are similar to those shown below in SECTION THROUGH INSTALLATION OF 3 1/2" FIRST CROSS PIPE detail.)



OUTSIDE CULVERT BARREL WITH  
OPTIONAL ANCHOR BARS & RIPRAP



SECTION THROUGH INSTALLATION OF 3 1/2" FIRST CROSS PIPE

OUTSIDE CULVERT BARREL  
WITH BOLTED ANCHOR

INSIDE CULVERT BARREL

CROSS PIPE INSTALLATION DETAILS

SHEET 2 OF 2



SAFETY END TREATMENT  
FOR BOX CULVERTS  
(MAXIMUM HW = 7'-0")  
TYPE I ~ PARALLEL DRAINAGE

SETB-PD

FILE: setbpase.dgn	DN: GAF	CK: CAT	DW: JRP	CK: GAF
©TxDOT February 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS				SOUTHLAND
	DIST	COUNTY		SHEET NO.
		TOM GREEN		45



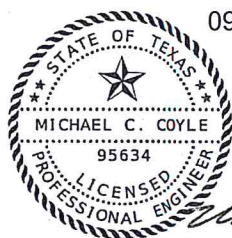
LEGEND

- 6 BURIED 6" WATER LINE PVC
- 8 BURIED 8" WATER LINE PVC
- 12 BURIED 12" WATER LINE PVC
- 16 BURIED 16" WATER LINE AC
- 36 BURIED 36" WATER LINE
- WATER VALVE
- SS BURIED SANITARY SEWER LINE
- W8 BURIED 8" SEWER LINE
- CCCC BURIED COPPER CABLE
- UG FO BURIED FIBER OPTIC CABLE
- OU EXISTING ELECTRIC LINE OVERHEAD
- GRAVITY FLOW DIRECTION
- MANHOLE
- LP LIGHT POLE

NOTES:

1. THE CONTRACTOR SHALL CONTACT TEXAS EXCAVATION SAFETY SYSTEM (800-DIG-TESS: 800-344-8377), CITY OF SAN ANGELO DISTRIBUTION OFFICE AT 325-657-4295, AND RELEVANT UTILITY COMPANIES 48 HOURS PRIOR TO LOCATING EXISTING UTILITIES AND/OR CONSTRUCTION ACTIVITIES.

09/23/2016



0' 25' 50' 100'  
SCALE: 1"=100'

REV. NO.	DATE	DESCRIPTION	BY
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**LJA Engineering, Inc.**  
FRN - F-1386



SOUTHLAND BOULEVARD

EXISTING UTILITY LAYOUT

SHEET 1 OF 1

SHEET NO.  
46

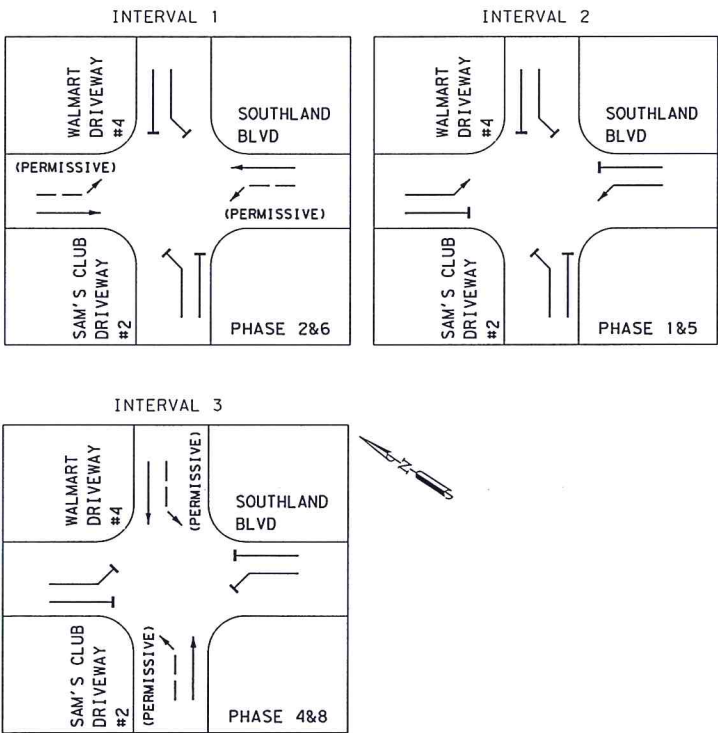
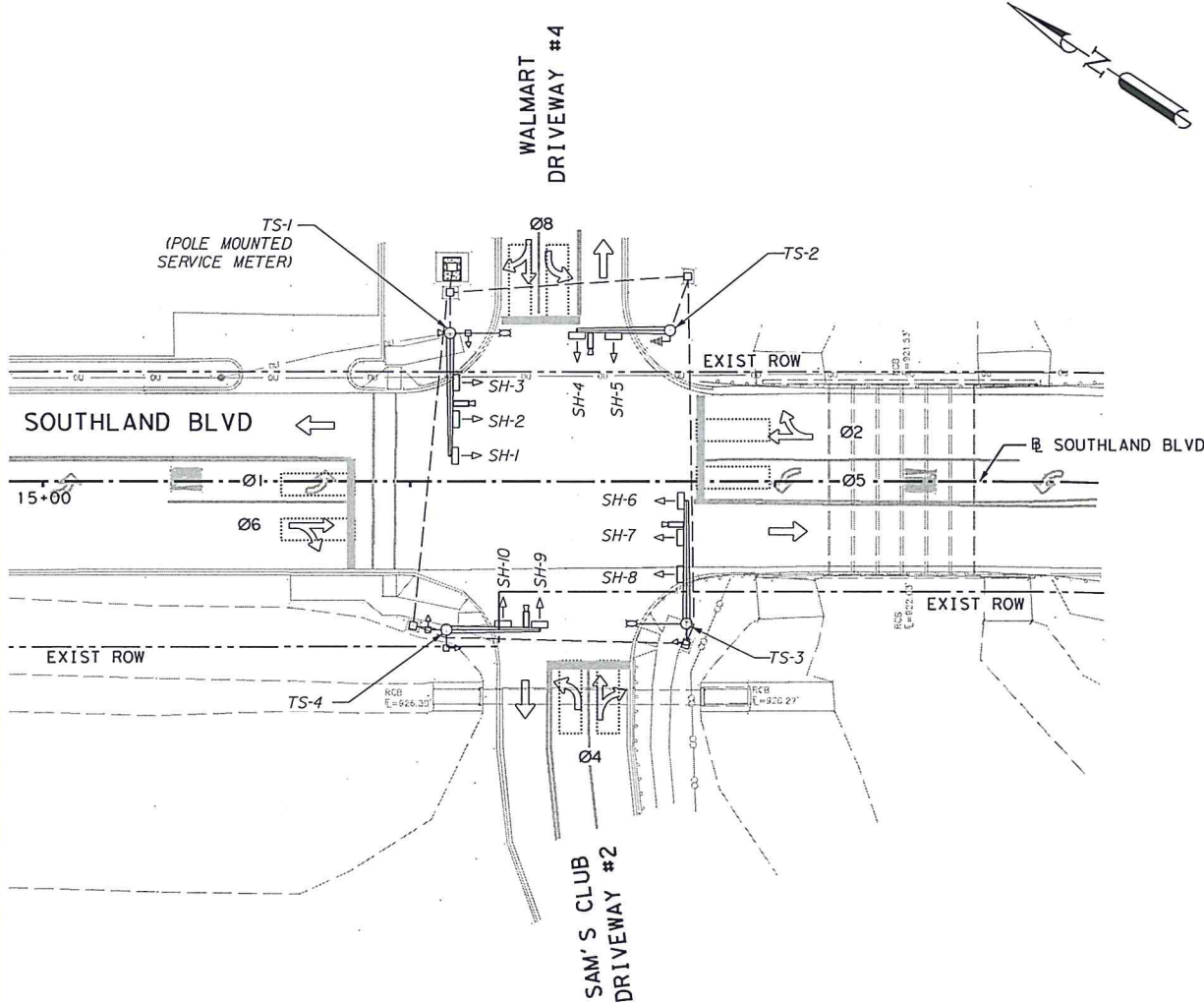


EXISTING SIGNAL HEAD SCHEDULE

<div>RYG</div>	<div>RYYG</div>
SIGNALS	SIGNALS
SH-2	SH-1
SH-3	SH-6
SH-4	
SH-5	
SH-7	
SH-8	
SH-9	
SH-10	

LEGEND

- EXIST SIGNAL POLE
- EXIST MAST ARM
- ⊞ EXIST SIGNAL CONTROLLER
- ▽ EXIST METER AND DISCONNECT
- ⊞ EXIST HORIZONTAL SIGNAL HEAD
- ⊞ EXIST PEDESTRIAN SIGNAL
- ⊞ EXIST LUMINAIRE WITH ARM
- ⊞ EXIST ANTENNA
- EXIST PULL BOX
- ⊞ EXIST VIVDS CAMERA
- EXIST CONDUIT
- ⊞ EXIST VIDEO DETECTION ZONE
- TRAFFIC FLOW



SEQUENCE CHART										
INTERVAL	PHASE 2&6			PHASE 1&5			PHASE 4&8			FLASHING OPERATIONS
SIGNAL FACE	R/W	CLEAR 2&6	CLEAR TO ALL PHASES	R/W	CLEAR 1&5	CLEAR TO ALL PHASES	R/W	CLEAR 4&8	CLEAR TO ALL PHASES	NORMAL AND EMERGENCY
SH-2, SH-3	G	Y	R	R	R	R	R	R	R	R
SH-1	G	Y	R	<G	<Y	R	R	R	R	R
SH-7, SH-8	G	Y	R	R	R	R	R	R	R	R
SH-6	G	Y	R	<G	<Y	R	R	R	R	R
SH-4, SH-5	R	R	R	R	R	R	G	Y	R	R
SH-9, SH-10	R	R	R	R	R	R	G	Y	R	R

Sep. 23, 2016

0' 25' 50'

SCALE: 1"=50'

REV. NO.	DATE	DESCRIPTION	BY

FRN - F-1386

SOUTHLAND BOULEVARD  
EXISTING SIGNAL CONDITIONS  
AT SAM'S/WALMART DRIVEWAY

SHEET 1 OF 2

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