FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6	STP 2021 (719) HES	FM 166
STATE	DISTRICT	COUNTY
TEXAS	BRY	BURLESON
CONTROL	SECTION	JOB / SHEET NO.
0955	01	027 / 1

DESIGN SPEED: N/A

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

SEE SHEET 2
FOR INDEX OF SHEETS
AND SHEET 3 FOR
PROJECT LOCATION MAP

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

FINAL PLANS

CONTRACTOR:

LETTING DATE:

DATE CONTRACTOR BEGAN WORK:

DATE WORK WAS COMPLETED:

DATE WORK WAS ACCEPTED:

FINAL CONTRACT COST: $

PROJECT NUMBER: STP 2021 (719) HES

FM 166
BURLESON COUNTY

TOTAL LENGTH OF PROJECT = 82,078 FT= 15.545 MILES

FOR THE CONSTRUCTION OF SAFETY WORK CONSISTING OF IMPROVE GUARDRAIL TO DESIGN STANDARDS, SAFETY TREAT FIXED OBJECTS

LOCATION NO.	HIGHWAY	CONTROL NO.	LIMITS	2019/2039 ADT	REFERENCE MARKERS		TOTAL LENGTH (FT)	BRIDGE LENGTH (FT)	RDWY LENGTH (FT)
					BEGIN	END			
1	FM 166	0955-01-027	FROM: SH 36 TO: FM 50	1882/2258	RM 600-0.02 MI	RM 614+1.66 MI	82,078	340	81,738

NO EXCEPTIONS
NO EQUATIONS
RAILROAD: DOT# 765-822A

STATE OF TEXAS
DAN THOMA
98622
LICENSED
PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 4/5/2021 DATE

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

TEXAS DEPARTMENT OF TRANSPORTATION®

SUBMITTED FOR LETTING: 4/28/2021
DocuSigned by: Dan A. Combs, P.E.
59B67CE6AA5C4D2... DESIGN MANAGER

RECOMMENDED FOR LETTING: 4/28/2021
DocuSigned by: Doug McTaine, P.E.
DAA3B0E... DIRECTOR OF TRANSPORTATION PLANNING AND DEVELOPMENT

APPROVED FOR LETTING: 4/28/2021
DocuSigned by: Lance W. Simmons
7A1E426988DE4A2... DISTRICT ENGINEER

SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, NOVEMBER 1, 2014, AND SPECIFICATION ITEMS LISTED AS FOLLOWS, SHALL GOVERN ON THIS PROJECT:

REQUIRED CONTRACT PROVISIONS FOR ALL FEDERAL-AID CONSTRUCTION CONTRACTS (FORM FHWA 1273, MAY, 2012)

REV DATE: 2-12-2015
CSJ: 0955-01-027

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Plotted on: 4/6/2021

Design Filename: P:\120\96\01\Design\027 FM 166\Civil\General\1209601_index.dgn

SHEET NO.		DESCRIPTION
		GENERAL
1		TITLE SHEET
2		INDEX OF SHEETS
3		PROJECT LOCATION MAP
4-7		PROJECT LAYOUT
8-8B		GENERAL NOTES
9-9C		ESTIMATE AND QUANTITY SHEET
10-41		SUMMARY OF DRIVEWAYS
42-49		SUMMARY OF CULVERTS
50		SUMMARY OF MBGF
51		SUMMARY OF SW3P
52		SUMMARY OF SMALL SIGNS
		TRAFFIC CONTROL
53		SEQUENCE OF WORK
54-65	*	BC(1)-14 THRU BC(12)-14
66	*	TCP(1-2)-18
67	*	TCP (1-6)-18
68	*	TCP(2-1)-18 THRU TCP(2-8)-18
69-70	*	TCP(2-8)-18
70	*	TCP(S-1)-08A
71	*	TCP(S-2)-08A
72	*	TCP(S-2c)-10
73	*	WZ(RS)-16
		ROADWAY
74-77		MBGF LAYOUT
78		CUT & RESTORE DETAILS
79	*	GF(31)-19
80	*	GF(31)LS-19
81-82	*	GF(31)TRTL3-20
83	*	GF(31)MS-19
84	*	SGT(10S)31-16
85	*	SGT(11S)31-18
86	*	SGT(12S)31-18
87	*	SGT(15)31-20
88	*	BED-14
		TRAFFIC
89-95	*	D&OM(1)-20 THRU D&OM(6)-20, & D&OM(VIA)-20
96	*	PM(1)-20
97	*	SMD(GEN)-08
98	*	SMD(SLIP-1)-08
99	*	SMD(SLIP-2)-08
100	*	SMD(SLIP-3)-08
		DRAINAGE
101-103		DRAINAGE AREA MAP
104		HYDRAULIC DATA
105-130		CULVERT LAYOUTS
131		CONCRETE PIPE COLLAR AND CONNECTION DETAIL
131A		BCS
132-133	*	SCC-5&6
134-135	*	MC-3-23
136-137	*	MC-4-23
138-139	*	MC-6-16
140	*	MC-MD
141	*	PW
142	*	CH-PA-O
143	*	CH-PW-O
144	*	CH-PW-S
145-146	*	SETB-PD
147-148	*	SETP-CD
149	*	SETP-PD
150	*	PSET-SC
151	*	PSET-SP
152	*	PSET-RC
153	*	PSET-RP
154	*	PSET-RR
		ENVIRONMENTAL
155		ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS (EPIC)
156		TxDOT STORM WATER POLLUTION PREVENTION PLAN (SW3P) NARRATIVE
157-158		SW3P DETAILS
159-160	*	EC(1)-16 THRU EC(2)-16

THE STANDARD SHEETS SPECIFICALLY SHOWN WITH PRECEDING (*), HAVE BEEN SELECTED BY ME OR UNDER MY RESPONSIBLE SUPERVISION AS BEING APPLICABLE TO THIS PROJECT.

APPROVAL

STATE OF TEXAS
DAN THOMA
98622
LICENSED
PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 4/6/2021 DATE

PRINT DATE	REVISION DATE
4/6/2021	

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

FM 166

INDEX OF SHEETS

FED. RD. DIV.NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	2

Plotted on: 3/31/2021

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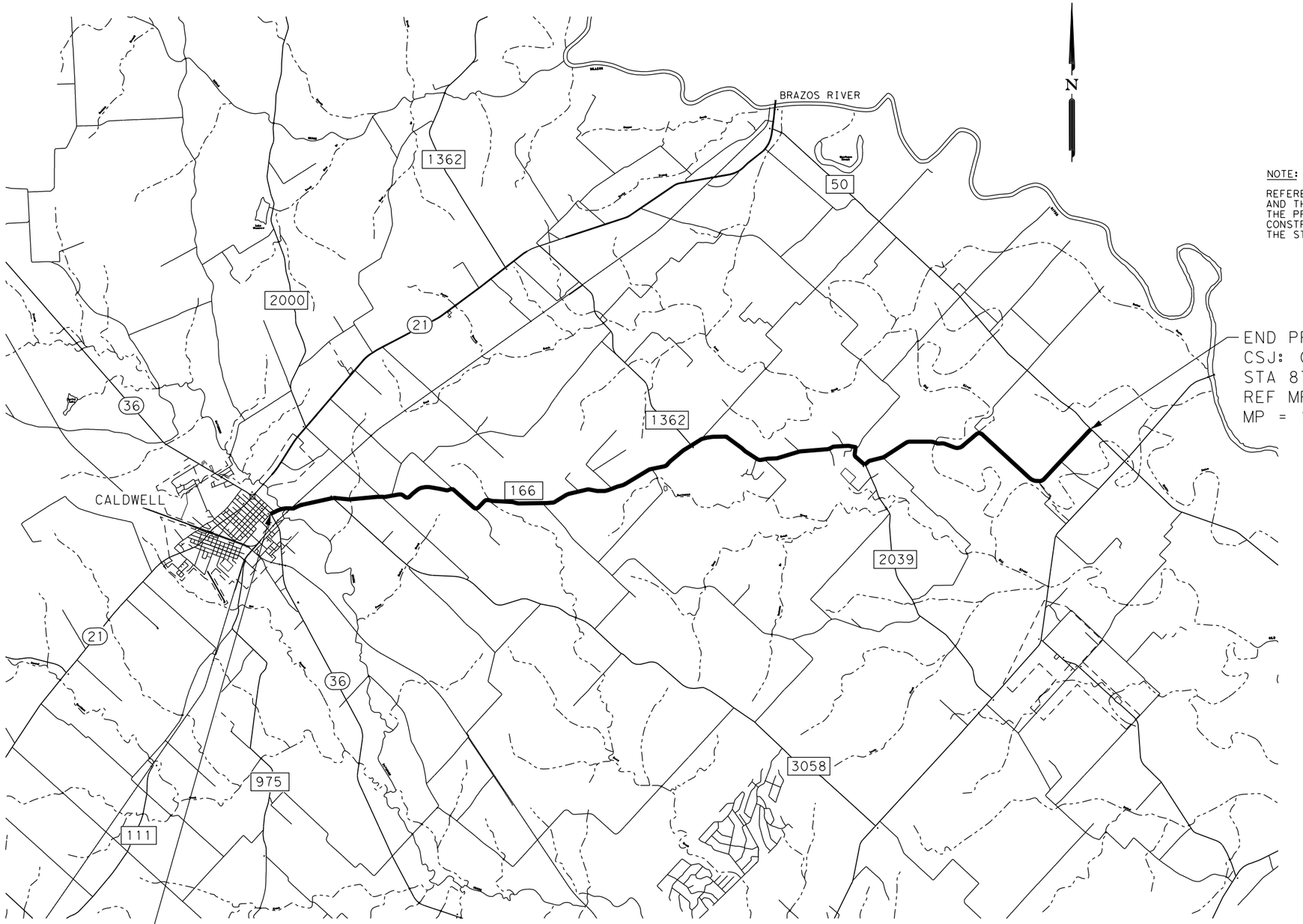


NOTE:

REFERENCE MARKERS AND MILE POINTS SHOWN ON THIS SHEETS AND THE TITLE SHEET ARE FOR REFERENCE PURPOSES ONLY. THE PROJECT LIMIT STATIONS SHOWN REPRESENT THE PROJECT CONSTRUCTION LENGTH. THE PROJECT QUATITIES ARE BASED ON THE STATION, NOT THE REFERENCE MARKERS OR MILE POINTS.

END PROJECT
CSJ: 0955-01-027
STA 872+58
REF MRK = 614+1.66 MI
MP = 15.58 MI

BEGIN PROJECT
CSJ: 0955-01-027
STA 50+00
REF MRK = 600-0.02 MI
MP = 0.00 MI

BURLESON COUNTY

DESIGN

STATE OF TEXAS — HEATHER McNEAL — 114428 — LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS — DAN THOMA — 98622 — LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

0 1 MI 2 MI 3 MI
SCALE: 1"= 2 MI

PRINT DATE	REVISION DATE
3/31/2021	

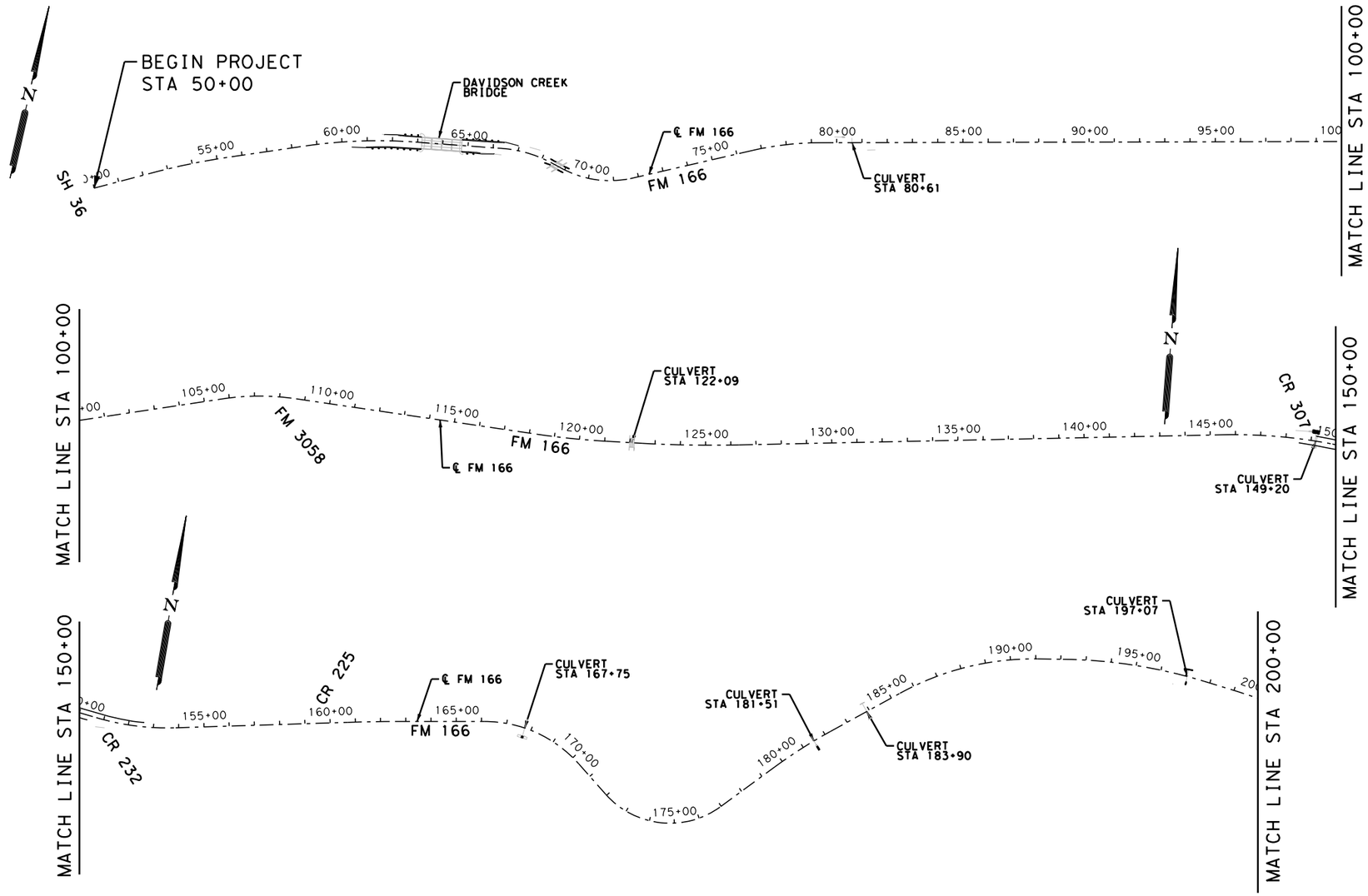
PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

FM 166

PROJECT LOCATION MAP

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	3



DESIGN

STATE OF TEXAS — HEATHER McNEAL — 114428 — LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS — DAN THOMA — 98622 — LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

0 250 500 750

SCALE: 1"= 500'

PRINT DATE	REVISION DATE
3/31/2021	

PAPE-DAWSON ENGINEERS

SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS

2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000

TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

FM 166

PROJECT LAYOUT

SHEET 1 OF 4 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	4

Plotted on: 3/31/2021

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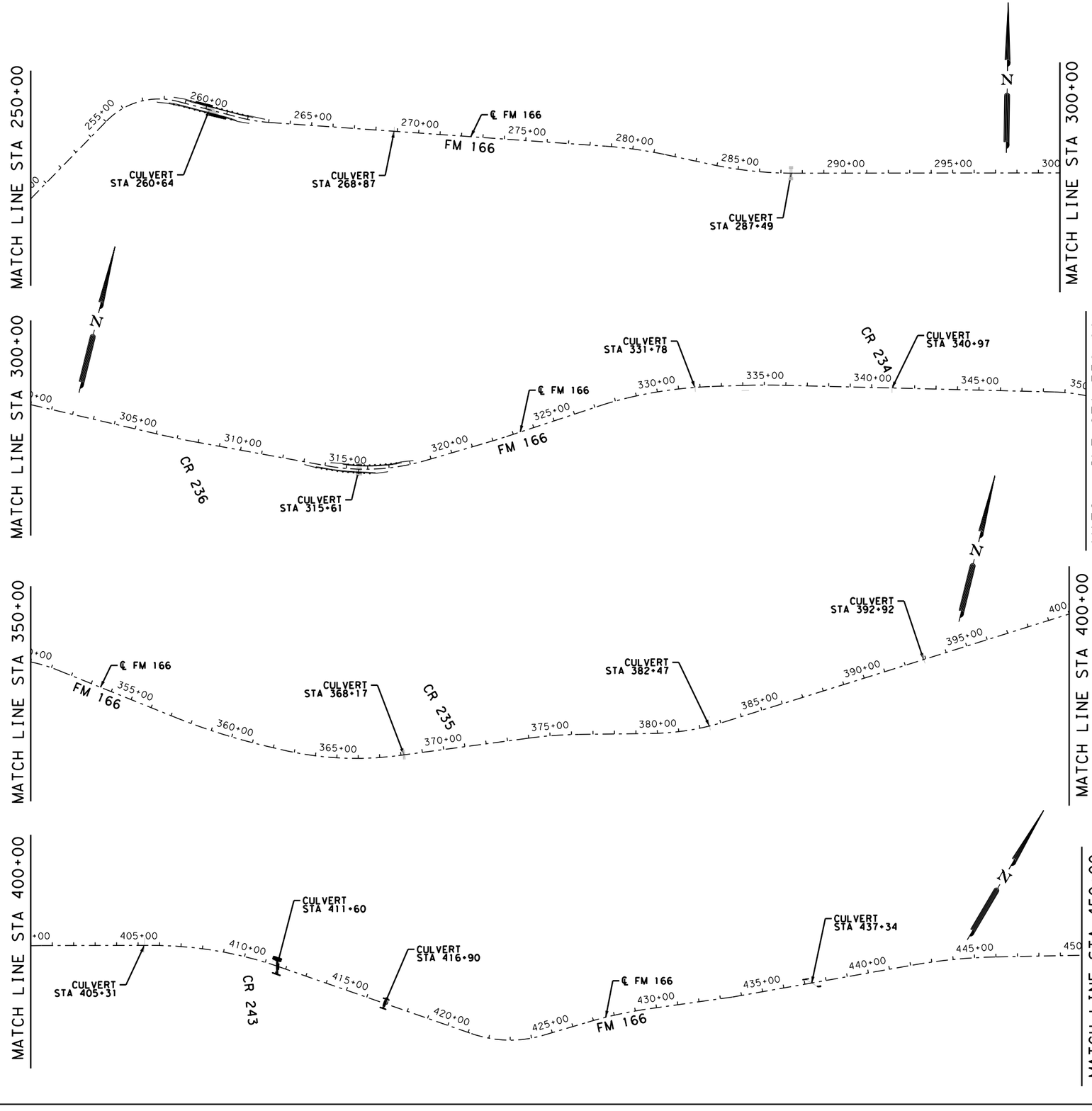

DESIGN

STATE OF TEXAS
HEATHER McNEAL
114428
LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS
DAN THOMA
98622
LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

0 250 500 750
SCALE: 1"= 500'

PRINT DATE	REVISION DATE
3/31/2021	

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

FM 166

PROJECT LAYOUT

SHEET 2 OF 4 SHEETS

FED.RD. DIV.NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	5

Plotted on: 3/31/2021

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Plotted on: 3/31/2021

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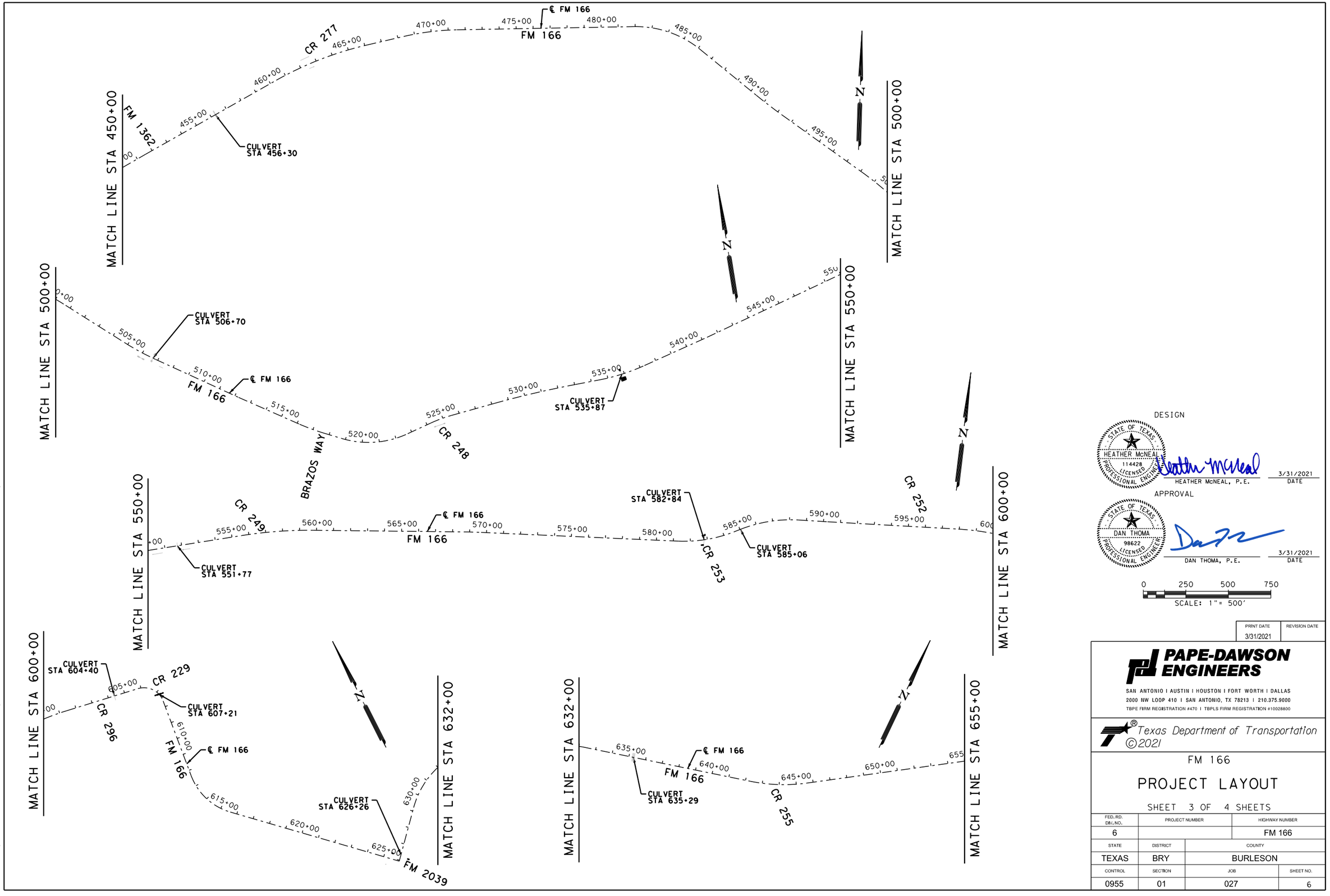


DESIGN

HEATHER McNEAL 114428 LICENSED PROFESSIONAL ENGINEER — STATE OF TEXAS

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

DAN THOMA 98622 LICENSED PROFESSIONAL ENGINEER — STATE OF TEXAS

DAN THOMA, P.E. — 3/31/2021 DATE

0 250 500 750

SCALE: 1"= 500'

PRINT DATE	REVISION DATE
3/31/2021	

PAPE-DAWSON ENGINEERS

SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS

2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000

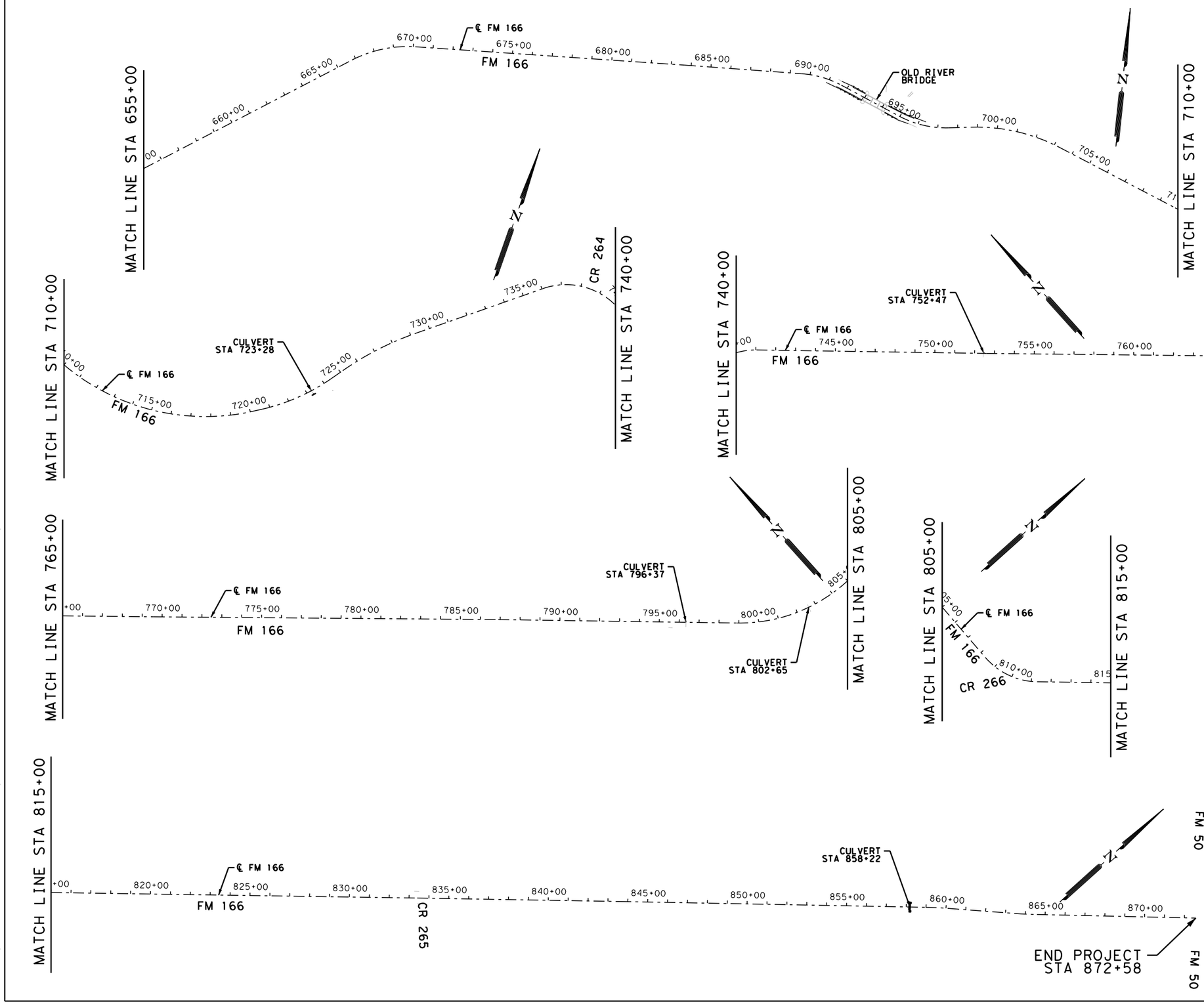
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

FM 166

PROJECT LAYOUT

SHEET 3 OF 4 SHEETS

FED.RD. DIV.NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166
STATE	DISTRICT	COUNTY
TEXAS	BRY	BURLESON
CONTROL	SECTION	JOB / SHEET NO.
0955	01	027 / 6



DESIGN

STATE OF TEXAS — HEATHER McNEAL — 114428 — LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS — DAN THOMA — 98622 — LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

0 250 500 750

SCALE: 1"= 500'

PRINT DATE	REVISION DATE
3/31/2021	

PAPE-DAWSON ENGINEERS

SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS

2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000

TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

FM 166

PROJECT LAYOUT

SHEET 4 OF 4 SHEETS

FED.RD. DIV.NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	7

BASIS OF ESTIMATE					
ITEM	**DESCRIPTION**	**COURSE**	**RATE**	**AMOUNT**	**QUANTITY**
168	Vegetative Watering		20 GAL/SY	8,388 SY	168 MG

BASIS OF ESTIMATE * for contractor's information only					
ITEM	**DESCRIPTION**	**COURSE**	**RATE**	**AMOUNT**	**QUANTITY**
166*	Fertilizer **		60 LB/AC	1.73 AC	0.052 TON

Note: Rates are for estimating purposes only. Actual Rates will be determined in the field.
** Tonnage represents Nitrogen content only.

GENERAL:

Contractor questions on this project are to be addressed to the following individuals:
Eric Bennett, P.E., A.E., Eric.Bennett@txdot.gov
James Kreamer, P.E., A.A.E., James.Kreamer@txdot.gov

Contractor questions will be accepted through email, phone, and in person by the above individuals.

All contractor questions will be reviewed by the Engineer. Once a response is developed, it will be posted to TxDOT's Public FTP at the following address:
https://ftp.dot.state.tx.us/pub/txdot-info/Pre-Letting%20Responses/

All questions submitted that generate a response will be posted through this site. The site is organized by District, Project Type (Construction or Maintenance), Letting Date, CCSJ/Project Name.

ITEM 7 "LEGAL RELATIONS AND RESPONSIBILITIES"

State contract mowers will mow the right of way during the growing season. The Contractor will be notified by the Engineer one week in advance of the anticipated time when mowers will be in the limits of the project. Clean the right of way to such a condition that allows the mowing contractors to safely mow.

Sheet:8

Highway: FM 166 **Control:** 0955-01-027
County: BURLESON

In the event of the declaration of a hurricane watch, warning, other severe weather warning or national or state emergency that requires the roadways in the vicinity be used as evacuation routes, cease all work that requires the Contractor's, sub-contractors' or material suppliers' vehicles to enter the stream of traffic on these primary or secondary evacuation routes. This work includes material hauling and delivery, and mobilization or demobilization of equipment.

The following roadways are recognized evacuation routes in the Bryan District:

Primary Evacuation Routes: IH 45, US 290, SH 6, SH 36.

Secondary Evacuation Routes: US 79, US 84, SH 7, SH 30, SH 21, SH 105.

Other routes may be designated.

No significant traffic generator events identified.

ITEM 8 "PROSECUTION AND PROGRESS"

By noon of each Wednesday, provide the Engineer a written outline of the daily work schedule for the following week. Include in the outline the times and places for proposed traffic control changes, lane and shoulder closures, and moving operations or other operations that affect traffic on the roadway. Unless otherwise authorized by the Engineer, prosecute the work on this project in accordance with the following sequence of work:

1) Set advance signing and barricades.
2) Follow TCP detour plan and sequence of work for culvert replacement.
3) Safety treat cross drainage structures.
4) Replace and install metal beam guard fence.
5) Safety treat driveway pipes.
6) Final cleanup.

Some of these operations may be performed simultaneously.

Prepare Progress Schedule Bar Chart.

The 90-day delayed start allowed after authorization under SP008-003 is for Contractor time for material acquisition.

Equipment and material may be pre-staged at approved locations.

ITEM 132 "EMBANKMENT"

Provide Embankment material for areas within the limits of the Pavement Structure that meet one of the following requirements:

- Sources outside the ROW provide material with a plasticity index between 10 and 25 and with less than 10% silt.
- Sources within the ROW provide material with a plasticity index between 10 and 25 and with less than 10% silt.

Provide Embankment material for areas outside the limits of the Pavement Structure with a plasticity index between 10 and 35.

ITEM 134 "BACKFILLING PAVEMENT EDGES"

Furnish Type A or B material meeting one of the following requirements:
Item 247, Type D Grade 3;
Reclaimed Asphalt Pavement (RAP) with 95% of the RAP passing the 2 inch sieve.

Place emulsified asphalt (SS-1, CSS-1, or as approved by the Engineer) at an application rate of 0.15 gal/SY.

ITEM 160 "TOPSOIL"

All slopes requiring topsoil will be tracked immediately upon final grading to prevent erosion per standard sheet EC(1)-16. Tracking slopes to prevent erosion will not be measured or paid for directly, but will be subsidiary to pertinent Items.

Topsoil may be obtained from the right of way at sites of proposed excavation and embankment.

ITEM 162 "SODDING FOR EROSION CONTROL"

Furnish and place Bermuda block-sod.

ITEM 166 "FERTILIZER"

Fertilize all areas of project that are being seeded and sodded.

Sheet:8A

Highway: FM 166 **Control:** 0955-01-027
County: BURLESON

ITEM 168 "VEGETATIVE WATERING"

Vegetative watering is required for all areas of the project that are being seeded or sodded at a rate of 10 GAL/SY per application for 2 applications.

ITEM 169 "SOIL RETENTION BLANKET"

Soil retention blankets made from Jute material will not be allowed.

ITEM 432 "RIPRAP"

The fifty foot (50') approach taper to the MBGF end treatment will be concrete Mow Strip unless otherwise shown in the plans or otherwise directed by the Engineer.

ITEM 464 "REINFORCED CONCRETE PIPE"

Seal joints using cold applied plastic asphalt sewer compound or cold applied preformed plastic gaskets. When cohesionless material is used for backfill, wrap the joints prior to backfilling with sand proof tape following the manufacturer's recommendations or with an equivalent material and method.

ITEM 467 "SAFETY END TREATMENTS"

All Type II SET's shall have riprap aprons as shown on the plans. Riprap aprons are considered subsidiary to Type II SET's.

ITEM 502 "BARRICADES, SIGNS AND TRAFFIC HANDLING"

Where shown on applicable TCP standards, channelizing devices on the centerline are required at all times; including when a pilot vehicle is used to lead traffic. Mount a G20-4 sign at a conspicuous location on the rear of the vehicle. Traffic delays caused by one-lane, two-way traffic control, will not be allowed to exceed 5 minutes unless approved by the Engineer.

During one-way operations, station flaggers at all county roads and any other locations, such as private businesses, that may have traffic entering the work area.

Removal of ground mounted temporary signs and supports as specified on standard sheet BC(5), shall include the immediate backfilling of support holes with Type B embankment material and the compaction of the backfill material.

The Contractor Force Account "Safety Contingency" that has been established for this project is intended to be utilized for work zone enhancements, to improve the effectiveness of the Traffic Control Plan, that could not be foreseen in the project planning and design stage. These enhancements will be mutually agreed upon by the Engineer and the Contractor's Responsible Person based on weekly or more frequent traffic management reviews on the project. The Engineer may choose to use existing bid items if it does not slow the implementation of enhancement.

ITEM 540 "METAL BEAM GUARD FENCE"

Furnish and Install only one type of timber post.

ITEM 544 "GUARDRAIL END TREATMENTS"

Furnish and install only MASH compliant guardrail end treatments.

ITEM 644 "SMALL ROADSIDE SIGN ASSEMBLIES"

Salvage and deliver all aluminum sign faces to the local TxDOT maintenance office.

ITEM 662 "WORK ZONE PAVEMENT MARKINGS"

Paint and beads may be used for non-removable work zone pavement markings.

All striping limits must be approved by the Engineer before striping operations may begin.

ITEM 666 "REFLECTORIZED PAVEMENT MARKINGS"

Unless authorized by the Engineer, the Contractor will not place the pavement markings on the resurfaced roadway until it has cured for 3 days.

All striping limits must be approved by the Engineer before striping operations may begin.

ITEM 672 "RAISED PAVEMENT MARKERS"

Use flexible bituminous adhesive for applications on all pavement types.

Sheet:8B

Highway: FM 166 **Control:** 0955-01-027
County: BURLESON

ITEM 678 "PAVEMENT SURFACE PREPARATION FOR MARKINGS"

It is not anticipated that pavement surface preparation for markings will be needed. If the Engineer determines that it is needed, payment for work will be determined in accordance with Article 9.7 "Payment for Extra Work and Force Account Method".

ITEM 6001 "PORTABLE CHANGEABLE MESSAGE SIGN"

Furnish, install, and operate up to 2 Portable Changeable Message Signs (PCMS) for this project. The signs can be used both on the project and within a ten (10) mile radius of the project. Locations, messages, and durations of use will be specified by the Engineer. The primary uses will be to inform the public of special events, lane and road closures, and changes in traffic control. Signs will be paid for only when used as directed by the Engineer.

ITEM 6185 "TRUCK MOUNTED ATTENUATOR (TMA) AND TRAILER ATTENUATOR (TA)"

In addition to the shadow vehicles with truck mounted attenuator (TMA) that are specified as being required on the traffic control plan (TCP) for this project,
provide (1) shadow vehicle(s) with TMA for TCP (1-2)-18 as detailed on General Note 5 of this standard sheet.
provide (1) shadow vehicle(s) with TMA for TCP (1-6)-18 as detailed on General Note 8 of this standard sheet.
provide (1) shadow vehicle(s) with TMA for TCP (2-1)-18 as detailed on General Note 4 of this standard sheet.
provide (1) shadow vehicle(s) with TMA for TCP (2-2)-18 as detailed on General Note 6 of this standard sheet.
provide (1) shadow vehicle(s) with TMA for TCP (2-3)-18 as detailed on General Note 7 of this standard sheet.
provide (1) shadow vehicle(s) with TMA for TCP(S-1)-08A as detailed on General Note 4 of this standard sheet.
provide (1) shadow vehicle(s) with TMA for TCP(S-2)-08A as detailed on General Note 11 of this standard sheet.

Therefore, Seven (7) total shadow vehicles with TMA will be required for this type of work. The contractor will be responsible for determining if one or more of these operations will be ongoing at the same time to determine the total number of TMAs needed for the project.

One hundred and eighty (180) TMA days are provided in the project estimate for stationary operations.
Zero (0) TMA days are provided in the project estimate for mobile operations.

QUANTITY SHEET

CONTROLLING PROJECT ID 0955-01-027 **DISTRICT** Bryan **COUNTY** Burleson
HIGHWAY FM 166

		CONTROL SECTION JOB		**0955-01-027**		TOTAL EST.	TOTAL FINAL
		PROJECT ID		**A00126431**			
		COUNTY		**Burleson**			
		HIGHWAY		**FM 166**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	105-6002	REMOVING STAB BASE AND ASPH PAV (2")	SY	16.000		16.000	
	132-6022	EMBANKMENT (VEHICLE)(DENS CONT)(TY C)	CY	284.000		284.000	
	134-6005	BACKFILL TY A	CY	26.000		26.000	
	160-6003	FURNISHING AND PLACING TOPSOIL (4")	SY	5,471.000		5,471.000	
	162-6002	BLOCK SODDING	SY	2,917.000		2,917.000	
	164-6009	BROADCAST SEED (TEMP) (WARM)	SY	2,744.000		2,744.000	
	164-6011	BROADCAST SEED (TEMP) (COOL)	SY	2,744.000		2,744.000	
	164-6023	CELL FBR MLCH SEED(PERM)(RURAL)(CLAY)	SY	5,471.000		5,471.000	
	168-6001	VEGETATIVE WATERING	MG	168.000		168.000	
	169-6003	SOIL RETENTION BLANKETS (CL 1) (TY C)	SY	2,663.000		2,663.000	
	400-6007	CUT & RESTORE CONC PAVING	SY	20.000		20.000	
	400-6008	CUT & RESTORE ASPH PAVING	SY	136.000		136.000	
	400-6012	CUT AND RESTORE PAV (FLEX BASE)	SY	192.000		192.000	
	402-6001	TRENCH EXCAVATION PROTECTION	LF	149.000		149.000	
	403-6001	TEMPORARY SPL SHORING	SF	2,656.000		2,656.000	
	432-6001	RIPRAP (CONC)(4 IN)	CY	29.000		29.000	
	432-6024	RIPRAP (STONE COMMON)(DRY)(12 IN)	CY	24.000		24.000	
	432-6045	RIPRAP (MOW STRIP)(4 IN)	CY	165.000		165.000	
	459-6006	GABION MATTRESSES (GALV)(9 IN)	SY	95.000		95.000	
	460-6003	CMP (GAL STL 24 IN)	LF	118.000		118.000	
	460-6004	CMP (GAL STL 30 IN)	LF	14.000		14.000	
	460-6005	CMP (GAL STL 36 IN)	LF	46.000		46.000	
	460-6007	CMP (GAL STL 48 IN)	LF	74.000		74.000	
	460-6008	CMP (GAL STL 60 IN)	LF	44.000		44.000	
	460-6010	CMP AR (GAL STL DES 3)	LF	2.000		2.000	
	460-6011	CMP AR (GAL STL DES 4)	LF	8.000		8.000	
	460-6012	CMP AR (GAL STL DES 5)	LF	43.000		43.000	
	460-6029	CMP AR (GAL STL DES 8)	LF	10.000		10.000	
	462-6047	CONC BOX CULV (4 FT X 2 FT)(EXTEND)	LF	8.000		8.000	
	462-6057	CONC BOX CULV (6 FT X 6 FT)(EXTEND)	LF	42.000		42.000	
	464-6002	RC PIPE (CL III)(15 IN)	LF	24.000		24.000	
	464-6003	RC PIPE (CL III)(18 IN)	LF	214.000		214.000	
	464-6005	RC PIPE (CL III)(24 IN)	LF	38.000		38.000	
	464-6007	RC PIPE (CL III)(30 IN)	LF	24.000		24.000	
	464-6008	RC PIPE (CL III)(36 IN)	LF	20.000		20.000	
	464-6009	RC PIPE (CL III)(42 IN)	LF	12.000		12.000	
	464-6032	RC PIPE (ARCH)(CL III)(DES 3)	LF	46.000		46.000	

QUANTITY SHEET

CONTROLLING PROJECT ID 0955-01-027 **DISTRICT** Bryan **COUNTY** Burleson
HIGHWAY FM 166

			CONTROL SECTION JOB		**0955-01-027**	TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00126431**		
			COUNTY		**Burleson**		
			HIGHWAY		**FM 166**		
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	466-6097	HEADWALL (CH - PW - 0) (DIA= 24 IN)	EA	1.000		1.000	
	466-6099	HEADWALL (CH - PW - 0) (DIA= 30 IN)	EA	1.000		1.000	
	466-6101	HEADWALL (CH - PW - 0) (DIA= 36 IN)	EA	4.000		4.000	
	466-6102	HEADWALL (CH - PW - 0) (DIA= 42 IN)	EA	1.000		1.000	
	466-6105	HEADWALL (CH - PW - 0) (DIA= 60 IN)	EA	5.000		5.000	
	466-6130	HEADWALL (CH - PW - S) (DIA= 24 IN)	EA	2.000		2.000	
	466-6134	HEADWALL (CH - PW - S) (DIA= 36 IN)	EA	1.000		1.000	
	466-6136	HEADWALL (CH - PW - S) (DIA= 48 IN)	EA	1.000		1.000	
	466-6138	HEADWALL (CH - PW - S) (DIA= 60 IN)	EA	1.000		1.000	
	466-6198	WINGWALL (PW - 2) (HW=9 FT)	EA	2.000		2.000	
	467-6001	SET (PIPE RUNNER ASSEMBLY)	EA	2.000		2.000	
	467-6134	SET (TY I)(S= 4 FT)(HW= 2 FT)(6:1) (P)	EA	4.000		4.000	
	467-6333	SET (TY II) (15 IN) (CMP) (6: 1) (P)	EA	4.000		4.000	
	467-6341	SET (TY II) (15 IN) (RCP) (6: 1) (P)	EA	4.000		4.000	
	467-6348	SET (TY II) (18 IN) (CMP) (6: 1) (P)	EA	129.000		129.000	
	467-6363	SET (TY II) (18 IN) (RCP) (6: 1) (P)	EA	26.000		26.000	
	467-6375	SET (TY II) (24 IN) (CMP) (3: 1) (C)	EA	32.000		32.000	
	467-6377	SET (TY II) (24 IN) (CMP) (4: 1) (C)	EA	3.000		3.000	
	467-6379	SET (TY II) (24 IN) (CMP) (6: 1) (C)	EA	1.000		1.000	
	467-6380	SET (TY II) (24 IN) (CMP) (6: 1) (P)	EA	27.000		27.000	
	467-6388	SET (TY II) (24 IN) (RCP) (3: 1) (C)	EA	4.000		4.000	
	467-6395	SET (TY II) (24 IN) (RCP) (6: 1) (P)	EA	4.000		4.000	
	467-6406	SET (TY II) (30 IN) (CMP) (3: 1) (C)	EA	3.000		3.000	
	467-6408	SET (TY II) (30 IN) (CMP) (4: 1) (C)	EA	4.000		4.000	
	467-6410	SET (TY II) (30 IN) (CMP) (6: 1) (P)	EA	2.000		2.000	
	467-6413	SET (TY II) (30 IN) (HDPE) (6: 1) (P)	EA	2.000		2.000	
	467-6423	SET (TY II) (30 IN) (RCP) (6: 1) (P)	EA	2.000		2.000	
	467-6439	SET (TY II) (36 IN) (CMP) (3: 1) (C)	EA	3.000		3.000	
	467-6444	SET (TY II) (36 IN) (CMP) (6: 1) (P)	EA	4.000		4.000	
	467-6448	SET (TY II) (36 IN) (RCP) (3: 1) (C)	EA	3.000		3.000	
	467-6454	SET (TY II) (36 IN) (RCP) (6: 1) (P)	EA	2.000		2.000	
	467-6532	SET (TY II) (DES 3) (CMP) (3: 1) (C)	EA	2.000		2.000	
	467-6540	SET (TY II) (DES 3) (RCP) (3: 1) (C)	EA	2.000		2.000	
	467-6546	SET (TY II) (DES 4) (CMP) (3: 1) (C)	EA	2.000		2.000	
	467-6556	SET (TY II) (DES 5) (CMP) (3: 1) (C)	EA	6.000		6.000	
	467-6574	SET (TY II) (DES 8) (CMP) (3: 1) (C)	EA	2.000		2.000	
	496-6004	REMOV STR (SET)	EA	13.000		13.000	

QUANTITY SHEET

CONTROLLING PROJECT ID 0955-01-027 **DISTRICT** Bryan **COUNTY** Burleson
HIGHWAY FM 166

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**0955-01-027**			
		PROJECT ID		**A00126431**			
		COUNTY		**Burleson**			
		HIGHWAY		**FM 166**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	496-6005	REMOV STR (WINGWALL)	EA	2.000		2.000	
	496-6006	REMOV STR (HEADWALL)	EA	5.000		5.000	
	496-6007	REMOV STR (PIPE)	LF	1,500.000		1,500.000	
	496-6008	REMOV STR (BOX CULVERT)	LF	48.000		48.000	
	500-6001	MOBILIZATION	LS	100.00%		100.00%	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	8.000		8.000	
	506-6002	ROCK FILTER DAMS (INSTALL) (TY 2)	LF	763.000		763.000	
	506-6011	ROCK FILTER DAMS (REMOVE)	LF	763.000		763.000	
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	815.000		815.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	815.000		815.000	
	540-6001	MTL W-BEAM GD FEN (TIM POST)	LF	1,125.000		1,125.000	
	540-6006	MTL BEAM GD FEN TRANS (THRIE-BEAM)	EA	8.000		8.000	
	540-6033	MTL BM GD FEN (LONG SPAN SYSTEM)	EA	2.000		2.000	
	542-6001	REMOVE METAL BEAM GUARD FENCE	LF	875.000		875.000	
	544-6001	GUARDRAIL END TREATMENT (INSTALL)	EA	16.000		16.000	
	544-6003	GUARDRAIL END TREATMENT (REMOVE)	EA	8.000		8.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	2.000		2.000	
	644-6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	EA	2.000		2.000	
	644-6076	REMOVE SM RD SN SUP&AM	EA	4.000		4.000	
	658-6028	INSTL DEL ASSM (D-SY)SZ (BRF)GF1	EA	79.000		79.000	
	658-6047	INSTL OM ASSM (OM-2Y)(WC)GND	EA	4.000		4.000	
	658-6062	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	EA	79.000		79.000	
	658-6109	INSTL OM ASSM (OM-2Z)(WFLX)SRF(BI)	EA	53.000		53.000	
	666-6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	LF	80.000		80.000	
	666-6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	LF	72.000		72.000	
	672-6009	REFL PAV MRKR TY II-A-A	EA	4.000		4.000	
	6001-6002	PORTABLE CHANGEABLE MESSAGE SIGN	EA	2.000		2.000	
	6185-6002	TMA (STATIONARY)	DAY	180.000		180.000	
	18	EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)	LS	1.000		1.000	
		LAW ENFORCEMENT: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000	
		SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000	
1	401-6001	FLOWABLE BACKFILL	CY	5.000		5.000	
	460-6002	CMP (GAL STL 18 IN)	LF	932.000		932.000	
1A	401-6001	FLOWABLE BACKFILL	CY	23.000		23.000	
	460-6002	CMP (GAL STL 18 IN)	LF	812.000		812.000	

QUANTITY SHEET

CONTROLLING PROJECT ID 0955-01-027 **DISTRICT** Bryan **COUNTY** Burleson
HIGHWAY FM 166

			CONTROL SECTION JOB	**0955-01-027**		TOTAL EST.	TOTAL FINAL
			PROJECT ID	**A00126431**			
			COUNTY	**Burleson**			
			HIGHWAY	**FM 166**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
1A	4122-6004	THERMO PIPE(18")(HDPE)(TY S)(CSB)	LF	120.000		120.000	

Plotted on: 3/31/2021

Design Filename: P:\120\96\01\Design\027 FM 166\Civil\Summaries\1209601_Sum01.dgn

SUMMARY OF DRIVEWAYS AND SIDE ROADS

DRWY NUM	STATION	LOCATION	REMARKS	OFFSET	EXIST DRIVE WAY WIDTH	EXIST DRIVEWAY SURFACE MATERIAL	CULVERT DESCRIPTION		ITEM 132	ITEM 162	ITEM 400			ITEM 462	ITEM 460			ITEM 464					ITEM 467															
							EXISTING	PROPOSED WORK	EMBANK-MENT (VEHICLE) (DENS CONT) (TY C)	BLOCK SODDING	CUT & RESTORE			CONC BOX CULV	CMP (GAL STL)			RC PIPE (CL III)					SET (PIPE RUNNER ASSEMBLY)	SET (TY II) (CMP) (6:1) (P)					SET (TY II) (HDPE) (6:1) (P)	SET (TY I) (6:1) (P)	SET (TY II) (RCP) (6:1) (P)							
											ASPH PAVING	CONC PAVING	PAV (FLEX BASE)	(4FT X 2FT)	(18 IN)	(24 IN)	(36 IN)	(15 IN)	(18 IN)	(24 IN)	(30 IN)	(36 IN)		(15 IN)	(18 IN)	(24 IN)	(30 IN)	(36 IN)	(30 IN)	(4FT X 2FT)	(15 IN)	(18 IN)	(24 IN)	(30 IN)	(36 IN)
					LF				CY	SY	SY	SY	SY	LF	LF	LF	LF	LF	LF	LF	LF	LF	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA
(FM 166) (CSJ: 0955-01-027)																																			
2	50+92	96° 41′ 17.03" W 30° 31′ 58.11" N	DRIVEWAY	RT	24	Gravel	NO CULVERT	NO WORK																												
1	52+51	96° 41′ 15.67" W 30° 31′ 59.28" N	DRIVEWAY	LT	47.5	Concrete	36" X 68′ CMP W/ SETs	INSTALL PIPE RUNNERS EA END															2													
3	53+98	96° 41′ 14.09" W 30° 31′ 59.84" N	S WRIGHT ST	LT	33	Asphalt	2 - 4′ X 2′ X 39 LF MBC	REMOVE 2 - 2′ LT / 2′ RT MBC; REPLACE W/ 2 - 4′ X 2′ X 2 LF LT & 2 LF RT MBC & 2 - SET (TY I) (6:1) (P) EA END						8															4							
4	55+61	96° 41′ 12.10" W 30° 31′ 59.83" N	DRIVEWAY	RT	16.5	Grass/Dirt	NO CULVERT	NO WORK																												
5	67+61	96° 40′ 58.78" W 30° 32′ 02.73" N	DRIVEWAY	LT	21.5	Gravel	36" X 42′ CMP	REMOVE 2′ RT CMP; REPLACE W/ 36" X 2′ RT CMP & SET (TY II) (36IN) (CMP) (6:1) (P) EA END		13							2											2							
8	72+58	96° 40′ 53.24" W 30° 32′ 02.30" N	DRIVEWAY	RT	11	Asphalt	NO CULVERT	NO WORK																												
9	72+78	96° 40′ 53.30" W 30° 32′ 02.91" N	DRIVEWAY	LT	30	Concrete	18" X 48′ CMP	REMOVE 2′ LT / 2′ RT CMP; REPLACE W/18" X 2′ LT & 2′ RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END		22					4										2									
10	73+74	96° 40′ 52.03" W 30° 32′ 02.79" N	DRIVEWAY	RT	12.5	Gravel	NO CULVERT	NO WORK																												
11	75+59	96° 40′ 50.37" W 30° 32′ 04.07" N	DRIVEWAY	LT	24	Concrete	NO CULVERT	NO WORK																												
12	78+45	96° 40′ 47.10" W 30° 32′ 04.53" N	DRIVEWAY	RT	16	Gravel	15" X 25′ CMP	INSTALL SET (TY II) (15IN) (CMP) (6:1) (P) EA END															2													
299	79+07	96° 40′ 46.55" W 30° 32′ 05.18" N	DRIVEWAY	LT	18	Grass/Dirt	NO CULVERT	NO WORK																												
13	79+49	96° 40′ 46.08" W 30° 32′ 05.25" N	DRIVEWAY	LT	18	Grass/Dirt	12" X 32′ CMP	REMOVE 12" CMP; REPLACE W/ 18" X 32′ CMP & SET (TY II) (18 IN) (CMP) (6:1) (P) EA END		22					32										2									
15	80+06	96° 40′ 45.45" W 30° 32′ 05.39" N	DRIVEWAY	LT	20	Gravel	24" X 30′ CMP W/ SETs	NO WORK																												
14 *	81+36	96° 40′ 43.87" W 30° 32′ 05.13" N	DRIVEWAY	RT	22	Asphalt	24" X 31′ CMP	REMOVE 2′ RT CMP; REPLACE W/ 24" X 2′ RT CMP & SET (TY II) (24IN) (CMP) (6:1) (P) EA END		13						2									2									
FM 166 (CSJ: 0955-01-027) SHEET 1 OF 32 SUBTOTAL									0	70	0	0	0	8	36	2	2	0	0	0	0	0	2	2	4	2	0	2	0	4	0	0	0	0	0

NOTES:

1. A FULL TOPOGRAPHIC SURVEY WAS NOT PERFORMED. THE LOCATIONS SHOWN ARE APPROXIMATE AND MUST BE VERIFIED BY THE CONTRACTOR PRIOR TO COMMENCEMENT OF WORK.
2. PROVIDE 12" DEEP TOEWALLS FOR ALL S.E.T.'S
3. SEE SWPPP SUMMARIES FOR SEEDING, VEGETATIVE WATERING, AND SOIL RETENTION BLANKETS QUANTITIES.
4. BLOCK SODDING BASED ON CULVERT DIAMETER ON EACH END:
   - ≤18" PIPE = 11 SY BLOCK SOD
   - 24" PIPE = 13 SY BLOCK SOD
   - 30" PIPE = 15 SY BLOCK SOD
   - ≥36" PIPE = 16 SY BLOCK SOD

* CAST IN PLACE S.E.T.
ALL OTHER S.E.T.'S MAY BE PRECAST OR CIP

DESIGN

STATE OF TEXAS — HEATHER McNEAL — 114428 — LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS — DAN THOMA — 98622 — LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

PRINT DATE	REVISION DATE
3/31/2021	

PAPE-DAWSON ENGINEERS

SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS

2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000

TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

SUMMARY OF DRIVEWAYS

SHEET 1 OF 32 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY
TEXAS	BRY	BURLESON

CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	10

SUMMARY OF DRIVEWAYS AND SIDE ROADS

DRWY NUM	STATION	LOCATION	REMARKS	OFFSET	EXIST DRIVE WAY WIDTH	EXIST DRIVEWAY SURFACE MATERIAL	CULVERT DESCRIPTION		ITEM 496			BID ALTERNATIVES	
												ITEM 401	ITEM 4122
							EXISTING	PROPOSED WORK	REMOV STR (PIPE)	REMOV STR (SET)	REMOV STR (BOX CULVERT)	FLOWABLE BACKFILL	THERMOPLASTIC PIPE (18 IN)
					LF				LF	EA	LF	CY	LF
(FM 166) (CSJ: 0955-01-027)													
2	50+92	96° 41′ 17.03" W 30° 31′ 58.11" N	DRIVEWAY	RT	24	Gravel	NO CULVERT	NO WORK					
1	52+51	96° 41′ 15.67" W 30° 31′ 59.28" N	DRIVEWAY	LT	47.5	Concrete	36" X 68′ CMP W/ SETs	INSTALL PIPE RUNNERS EA END					
3	53+98	96° 41′ 14.09" W 30° 31′ 59.84" N	S WRIGHT ST	LT	33	Asphalt	2 - 4′ X 2′ X 39 LF MBC	REMOVE 2 - 2′ LT / 2′ RT MBC; REPLACE W/ 2 - 4′ X 2′ X 2 LF LT & 2 LF RT MBC & 2 - SET (TY I) (6:1) (P) EA END			8		
4	55+61	96° 41′ 12.10" W 30° 31′ 59.83" N	DRIVEWAY	RT	16.5	Grass/Dirt	NO CULVERT	NO WORK					
5	67+61	96° 40′ 58.78" W 30° 32′ 02.73" N	DRIVEWAY	LT	21.5	Gravel	36" X 42′ CMP	REMOVE 2′ RT CMP; REPLACE W/ 36" X 2′ RT CMP & SET (TY II) (36IN) (CMP) (6:1) (P) EA END	2				
8	72+58	96° 40′ 53.24" W 30° 32′ 02.30" N	DRIVEWAY	RT	11	Asphalt	NO CULVERT	NO WORK					
9	72+78	96° 40′ 53.30" W 30° 32′ 02.91" N	DRIVEWAY	LT	30	Concrete	18" X 48′ CMP	REMOVE 2′ LT / 2′ RT CMP; REPLACE W/18" X 2′ LT & 2′ RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END	4				
10	73+74	96° 40′ 52.03" W 30° 32′ 02.79" N	DRIVEWAY	RT	12.5	Gravel	NO CULVERT	NO WORK					
11	75+59	96° 40′ 50.37" W 30° 32′ 04.07" N	DRIVEWAY	LT	24	Concrete	NO CULVERT	NO WORK					
12	78+45	96° 40′ 47.10" W 30° 32′ 04.53" N	DRIVEWAY	RT	16	Gravel	15" X 25′ CMP	INSTALL SET (TY II) (15IN) (CMP) (6:1) (P) EA END					
299	79+07	96° 40′ 46.55" W 30° 32′ 05.18" N	DRIVEWAY	LT	18	Grass/Dirt	NO CULVERT	NO WORK					
13	79+49	96° 40′ 46.08" W 30° 32′ 05.25" N	DRIVEWAY	LT	18	Grass/Dirt	12" X 32′ CMP	REMOVE 12" CMP; REPLACE W/ 18" X 32′ CMP & SET (TY II) (18 IN) (CMP) (6:1) (P) EA END	32				
15	80+06	96° 40′ 45.45" W 30° 32′ 05.39" N	DRIVEWAY	LT	20	Gravel	24" X 30′ CMP W/ SETs	NO WORK					
14 *	81+36	96° 40′ 43.87" W 30° 32′ 05.13" N	DRIVEWAY	RT	22	Asphalt	24" X 31′ CMP	REMOVE 2′ RT CMP; REPLACE W/ 24" X 2′ RT CMP & SET (TY II) (24IN) (CMP) (6:1) (P) EA END	2				
FM 166 (CSJ: 0955-01-027) SHEET 2 OF 32 SUBTOTAL									40	0	8	0	0

NOTES:

1. A FULL TOPOGRAPHIC SURVEY WAS NOT PERFORMED. THE LOCATIONS SHOWN ARE APPROXIMATE AND MUST BE VERIFIED BY THE CONTRACTOR PRIOR TO COMMENCEMENT OF WORK.
2. PROVIDE 12" DEEP TOEWALLS FOR ALL S.E.T.'S
3. SEE SWPPP SUMMARIES FOR SEEDING, VEGETATIVE WATERING, AND SOIL RETENTION BLANKETS QUANTITIES.
4. BLOCK SODDING BASED ON CULVERT DIAMETER ON EACH END:
   - ≤18" PIPE = 11 SY BLOCK SOD
   - 24" PIPE = 13 SY BLOCK SOD
   - 30" PIPE = 15 SY BLOCK SOD
   - ≥36" PIPE = 16 SY BLOCK SOD

* CAST IN PLACE S.E.T.
ALL OTHER S.E.T.'S MAY BE PRECAST OR CIP

DESIGN

STATE OF TEXAS — HEATHER McNEAL — 114428 — LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS — DAN THOMA — 98622 — LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

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2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

SUMMARY OF DRIVEWAYS

SHEET 2 OF 32 SHEETS

FED. RD. DIV.NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	11

Plotted on: 3/31/2021

Design Filename: P:\120\96\01\Design\027 FM 166\Civil\Summaries\1209601_Sum01.dgn

SUMMARY OF DRIVEWAYS AND SIDE ROADS

DRWY NUM	STATION	LOCATION	REMARKS	OFFSET	EXIST DRIVE WAY WIDTH	EXIST DRIVEWAY SURFACE MATERIAL	CULVERT DESCRIPTION		ITEM 132	ITEM 162	ITEM 400			ITEM 462	ITEM 460			ITEM 464					ITEM 467															
							EXISTING	PROPOSED WORK	EMBANK-MENT (VEHICLE) (DENS CONT) (TY C)	BLOCK SODDING	CUT & RESTORE			CONC BOX CULV	CMP (GAL STL)			RC PIPE (CL III)					SET (PIPE RUNNER ASSEMBLY)	SET (TY II) (CMP) (6:1) (P)					SET (TY II) (HDPE) (6:1) (P)	SET (TY I) (6:1) (P)	SET (TY II) (RCP) (6:1) (P)						
											ASPH PAVING	CONC PAVING	PAV (FLEX BASE)	(4FT X 2FT)	(18 IN)	(24 IN)	(36 IN)	(15 IN)	(18 IN)	(24 IN)	(30 IN)	(36 IN)		(15 IN)	(18 IN)	(24 IN)	(30 IN)	(36 IN)	(30 IN)	(4FT X 2FT)	(15 IN)	(18 IN)	(24 IN)	(30 IN)	(36 IN)
					LF				CY	SY	SY	SY	SY	LF	LF	LF	LF	LF	LF	LF	LF	LF	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA
(FM 166) (CSJ: 0955-01-027)																																			
16 *	82+07	96° 40′ 43.07" W 30° 32′ 05.26" N	DRIVEWAY	RT	27	Gravel	24" X 41′ CMP W/ SETs	REMOVE SETs & INSTALL SET (TY II) (24IN)(CMP) (6:1) (P) EA END																	2											
18	93+86	96° 40′ 29.82" W 30° 32′ 07.39" N	DRIVEWAY	RT	39	Asphalt	18" X 51′ CMP	REMOVE 2′ RT CMP; REPLACE W/ 18" X 2′ RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END		11					2										2										
400 *	100+95	96° 40′ 21.89" W 30° 32′ 08.85" N	DRIVEWAY	RT	22	Grass/Dirt	18" X 47′ CMP	REMOVE 2′ LT CMP; REPLACE W/ 18" X 2′ LT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END		11					2										2										
20	102+08	96° 40′ 20.61" W 30° 32′ 09.04" N	DRIVEWAY	RT	31	Concrete	18" X 33′ CMP W/ SETs	REMOVE SETs ; REPLACE W/18" X 4′ LT & 4′ RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END		22					8										2										
22	102+91	96° 40′ 19.68" W 30° 32′ 09.18" N	DRIVEWAY	RT	30	Concrete	18" X 32′ CMP W/ SETs	REMOVE SETs ; REPLACE W/18" X 4′ LT & 4′ RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END		22					8										2										
304	104+61	96° 40′ 17.79" W 30° 32′ 09.60" N	DRIVEWAY	RT	16	Grass/Dirt	18" X 23′ CMP	REMOVE 18" CMP; REPLACE W/ 18" X 24′ CMP & SET (TY II) (18 IN) (CMP) (6:1) (P) EA END		22					24										2										
24	105+15	96° 40′ 17.18" W 30° 32′ 09.68" N	DRIVEWAY	RT	22	Gravel	12" X 33′ CMP	REMOVE 12" CMP; REPLACE W/ 18" X 34′ CMP & SET (TY II) (18 IN) (CMP) (6:1) (P) EA END	6	22			10		34									2										
17	106+39	96° 40′ 15.90" W 30° 32′ 10.53" N	DRIVEWAY	LT	47	Asphalt	NO CULVERT	NO WORK																												
26	108+11	96° 40′ 13.90" W 30° 32′ 09.68" N	FM 3058	RT	30	Asphalt	NO CULVERT	NO WORK																												
28	109+02	96° 40′ 12.90" W 30° 32′ 09.60" N	DRIVEWAY	RT	16	Grass/Dirt	NO CULVERT	NO WORK																												
19	112+10	96° 40′ 09.31" W 30° 32′ 10.05" N	DRIVEWAY	LT	16	Concrete	24" X 22′ CMP W/ SETs	NO WORK																												
21	122+68	96° 39′ 57.29" W 30° 32′ 09.22" N	DRIVEWAY	LT	15.5	Grass/Dirt	NO CULVERT	NO WORK																												
401	136+60	96° 39′ 41.42" W 30° 32′ 10.06" N	DRIVEWAY	LT	15	Gravel	30" X 26′ HDPE	INSTALL SET (TY II) (30IN) (HDPE) (6:1) (P) EA END		30																		2								
30	138+76	96° 39′ 38.88" W 30° 32′ 09.25" N	DRIVEWAY	RT	62	Asphalt	15" X 72′ CMP W/ SETs	NO WORK																												
FM 166 (CSJ: 0955-01-027) SHEET 3 OF 32 SUBTOTAL									6	140	0	0	10	0	78	0	0	0	0	0	0	0	0	0	12	2	0	0	2	0	0	0	0	0	0

NOTES:

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2. PROVIDE 12" DEEP TOEWALLS FOR ALL S.E.T.'S
3. SEE SWPPP SUMMARIES FOR SEEDING, VEGETATIVE WATERING, AND SOIL RETENTION BLANKETS QUANTITIES.
4. BLOCK SODDING BASED ON CULVERT DIAMETER ON EACH END:
   - ≤18" PIPE = 11 SY BLOCK SOD
   - 24" PIPE = 13 SY BLOCK SOD
   - 30" PIPE = 15 SY BLOCK SOD
   - ≥36" PIPE = 16 SY BLOCK SOD

* CAST IN PLACE S.E.T.
ALL OTHER S.E.T.'S MAY BE PRECAST OR CIP

DESIGN

STATE OF TEXAS · HEATHER McNEAL · 114428 · LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS · DAN THOMA · 98622 · LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

PRINT DATE	REVISION DATE
3/31/2021	

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

SUMMARY OF DRIVEWAYS

SHEET 3 OF 32 SHEETS

FED. RD. DIV.NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166
STATE	DISTRICT	COUNTY
TEXAS	BRY	BURLESON
CONTROL	SECTION	JOB / SHEET NO.
0955	01	027 / 12

Plotted on: 3/31/2021

Design Filename: P:\120\96\01\Design\027 FM 166\Civil\Summaries\1209601_Sum01.dgn

Plotted on: 3/31/2021

SUMMARY OF DRIVEWAYS AND SIDE ROADS

DRWY NUM	STATION	LOCATION	REMARKS	OFFSET	EXIST DRIVE WAY WIDTH	EXIST DRIVEWAY SURFACE MATERIAL	CULVERT DESCRIPTION		ITEM 496			BID ALTERNATIVES	
												ITEM 401	ITEM 4122
							EXISTING	PROPOSED WORK	REMOV STR (PIPE)	REMOV STR (SET)	REMOV STR (BOX CULVERT)	FLOWABLE BACKFILL	THERMOPLASTIC PIPE (18 IN)
					LF				LF	EA	LF	CY	LF
(FM 166) (CSJ: 0955-01-027)													
16 *	82+07	96° 40′ 43.07" W 30° 32′ 05.26" N	DRIVEWAY	RT	27	Gravel	24" X 41′ CMP W/ SETs	REMOVE SETs & INSTALL SET (TY II) (24IN)(CMP) (6:1) (P) EA END		2			
18	93+86	96° 40′ 29.82" W 30° 32′ 07.39" N	DRIVEWAY	RT	39	Asphalt	18" X 51′ CMP	REMOVE 2′ RT CMP; REPLACE W/ 18" X 2′ RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END	2				
400 *	100+95	96° 40′ 21.89" W 30° 32′ 08.85" N	DRIVEWAY	RT	22	Grass/Dirt	18" X 47′ CMP	REMOVE 2′ LT CMP; REPLACE W/ 18" X 2′ LT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END	2				
20	102+08	96° 40′ 20.61" W 30° 32′ 09.04" N	DRIVEWAY	RT	31	Concrete	18" X 33′ CMP W/ SETs	REMOVE SETs ; REPLACE W/18" X 4′ LT & 4′ RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END		2			
22	102+91	96° 40′ 19.68" W 30° 32′ 09.18" N	DRIVEWAY	RT	30	Concrete	18" X 32′ CMP W/ SETs	REMOVE SETs ; REPLACE W/18" X 4′ LT & 4′ RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END		2			
304	104+61	96° 40′ 17.79" W 30° 32′ 09.60" N	DRIVEWAY	RT	16	Grass/Dirt	18" X 23′ CMP	REMOVE 18" CMP; REPLACE W/ 18" X 24′ CMP & SET (TY II) (18 IN) (CMP) (6:1) (P) EA END	23				
24	105+15	96° 40′ 17.18" W 30° 32′ 09.68" N	DRIVEWAY	RT	22	Gravel	12" X 33′ CMP	REMOVE 12" CMP; REPLACE W/ 18" X 34′ CMP & SET (TY II) (18 IN) (CMP) (6:1) (P) EA END	33				
17	106+39	96° 40′ 15.90" W 30° 32′ 10.53" N	DRIVEWAY	LT	47	Asphalt	NO CULVERT	NO WORK					
26	108+11	96° 40′ 13.90" W 30° 32′ 09.68" N	FM 3058	RT	30	Asphalt	NO CULVERT	NO WORK					
28	109+02	96° 40′ 12.90" W 30° 32′ 09.60" N	DRIVEWAY	RT	16	Grass/Dirt	NO CULVERT	NO WORK					
19	112+10	96° 40′ 09.31" W 30° 32′ 10.05" N	DRIVEWAY	LT	16	Concrete	24" X 22′ CMP W/ SETs	NO WORK					
21	122+68	96° 39′ 57.29" W 30° 32′ 09.22" N	DRIVEWAY	LT	15.5	Grass/Dirt	NO CULVERT	NO WORK					
401	136+60	96° 39′ 41.42" W 30° 32′ 10.06" N	DRIVEWAY	LT	15	Gravel	30" X 26′ HDPE	INSTALL SET (TY II) (30IN) (HDPE) (6:1) (P) EA END					
30	138+76	96° 39′ 38.88" W 30° 32′ 09.25" N	DRIVEWAY	RT	62	Asphalt	15" X 72′ CMP W/ SETs	NO WORK					
FM 166 (CSJ: 0955-01-027) SHEET 4 OF 32 SUBTOTAL									60	6	0	0	0

NOTES:

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2. PROVIDE 12" DEEP TOEWALLS FOR ALL S.E.T.'S
3. SEE SWPPP SUMMARIES FOR SEEDING, VEGETATIVE WATERING, AND SOIL RETENTION BLANKETS QUANTITIES.
4. BLOCK SODDING BASED ON CULVERT DIAMETER ON EACH END:
   - ≤18" PIPE = 11 SY BLOCK SOD
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* CAST IN PLACE S.E.T.
ALL OTHER S.E.T.'S MAY BE PRECAST OR CIP

DESIGN

STATE OF TEXAS · HEATHER McNEAL · 114428 · LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS · DAN THOMA · 98622 · LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

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TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

SUMMARY OF DRIVEWAYS

SHEET 4 OF 32 SHEETS

FED. RD. DIV.NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	13

Design Filename: P:\120\96\01\Design\027 FM 166\Civil\Summaries\1209601_Sum01.dgn

SUMMARY OF DRIVEWAYS AND SIDE ROADS

DRWY NUM	STATION	LOCATION	REMARKS	OFFSET	EXIST DRIVE WAY WIDTH	EXIST DRIVEWAY SURFACE MATERIAL	CULVERT DESCRIPTION		ITEM 132	ITEM 162	ITEM 400			ITEM 462	ITEM 460			ITEM 464					ITEM 467														
							EXISTING	PROPOSED WORK	EMBANK-MENT (VEHICLE) (DENS CONT) (TY C)	BLOCK SODDING	CUT & RESTORE			CONC BOX CULV	CMP (GAL STL)			RC PIPE (CL III)					SET (PIPE RUNNER ASSEMBLY)	SET (TY II) (CMP) (6:1) (P)					SET (TY II) (HDPE) (6:1) (P)	SET (TY I) (6:1) (P)	SET (TY II) (RCP) (6:1) (P)						
											ASPH PAVING	CONC PAVING	PAV (FLEX BASE)	(4FT X 2FT)	(18 IN)	(24 IN)	(36 IN)	(15 IN)	(18 IN)	(24 IN)	(30 IN)	(36 IN)		(15 IN)	(18 IN)	(24 IN)	(30 IN)	(36 IN)	(30 IN)	(4FT X 2FT)	(15 IN)	(18 IN)	(24 IN)	(30 IN)	(36 IN)
					LF				CY	SY	SY	SY	SY	LF	LF	LF	LF	LF	LF	LF	LF	LF	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA
(FM 166) (CSJ: 0955-01-027)																																			
405	138+84	96° 39′ 38.86" W 30° 32′ 10.22" N	DRIVEWAY	LT	18	Grass/Dirt	NO CULVERT	NO WORK																											
23	139+74	96° 39′ 37.83" W 30° 32′ 10.28" N	DRIVEWAY	LT	18	Grass/Dirt	24" X 29′ CMP W/ SETs	NO WORK																											
25	148+61	96° 39′ 27.64" W 30° 32′ 10.68" N	CO RD 307	LT	38	Asphalt	30" X 56′ CMP W/ SETs	NO WORK																											
32	150+92	96° 39′ 25.11" W 30° 32′ 09.64" N	CO RD 232	RT	29	Gravel	36" X 37′ CMP	REMOVE 36" CMP; REPLACE W/ 36" X 38′ CMP & SET (TY II) (36 IN) (CMP) (6:1) (P) EA END	12	32			18				38										2								
34	159+58	96° 39′ 15.20" W 30° 32′ 10.62" N	DRIVEWAY	RT	16	Gravel	18" X 25′ CMP	INSTALL SET (TY II) (18IN) (CMP) (6:1) (P) EA END																	2									
27	159+72	96° 39′ 15.18" W 30° 32′ 11.35" N	CO RD 225	LT	25	Asphalt	24" X 40′ CMP W/ SETs	NO WORK																											
29	160+88	96° 39′ 13.86" W 30° 32′ 11.44" N	DRIVEWAY	LT	22	Asphalt	NO CULVERT	NO WORK																											
31	170+03	96° 39′ 03.46" W 30° 32′ 11.18" N	DRIVEWAY	LT	8	Concrete	12" X 12′ RCP	REMOVE 12" RCP; REPLACE W/ 18" X 20′ RCP & SET (TY II) (18 IN) (RCP) (6:1) (P) EA END	2			4							20													2			
36	171+82	96° 39′ 02.35" W 30° 32′ 09.55" N	DRIVEWAY	RT	16	Gravel	18" X 29′ CMP	REMOVE 2′ LT / 2′ RT CMP; REPLACE W/18" X 2′ LT & 2′ RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END		22					4										2									
38	174+53	96° 38′ 59.24" W 30° 32′ 08.51" N	DRIVEWAY	RT	25	Gravel	NO CULVERT	NO WORK																											
40	175+65	96° 38′ 57.88" W 30° 32′ 08.85" N	DRIVEWAY	RT	29	Gravel	NO CULVERT	NO WORK																											
42	176+94	96° 38′ 56.49" W 30° 32′ 09.54" N	DRIVEWAY	RT	29	Gravel	NO CULVERT	NO WORK																											
44	190+37	96° 38′ 44.16" W 30° 32′ 16.78" N	DRIVEWAY	RT	55	Gravel	NO CULVERT	NO WORK																											
46	200+90	96° 38′ 32.39" W 30° 32′ 16.33" N	DRIVEWAY	RT	17	Gravel	NO CULVERT	NO WORK																											
FM 166 (CSJ: 0955-01-027) SHEET 5 OF 32 SUBTOTAL									14	54	0	4	18	0	4	0	38	0	20	0	0	0	0	0	4	0	0	2	0	0	0	2	0	0	0

NOTES:

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2. PROVIDE 12" DEEP TOEWALLS FOR ALL S.E.T.'S
3. SEE SWPPP SUMMARIES FOR SEEDING, VEGETATIVE WATERING, AND SOIL RETENTION BLANKETS QUANTITIES.
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   - ≥36" PIPE = 16 SY BLOCK SOD

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ALL OTHER S.E.T.'S MAY BE PRECAST OR CIP

DESIGN

STATE OF TEXAS · HEATHER McNEAL · 114428 · LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS · DAN THOMA · 98622 · LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

PRINT DATE	REVISION DATE
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TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

SUMMARY OF DRIVEWAYS

SHEET 5 OF 32 SHEETS

FED. RD. DIV.NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166
STATE	DISTRICT	COUNTY
TEXAS	BRY	BURLESON
CONTROL	SECTION	JOB / SHEET NO.
0955	01	027 / 14

Plotted on: 3/31/2021

Design Filename: P:\120\96\01\Design\027 FM 166\Civil\Summaries\1209601_Sum01.dgn

Plotted on: 3/31/2021

Design Filename: P:\120\96\01\Design\027 FM 166\Civil\Summaries\1209601_Sum01.dgn

SUMMARY OF DRIVEWAYS AND SIDE ROADS

DRWY NUM	STATION	LOCATION	REMARKS	OFFSET	EXIST DRIVE WAY WIDTH	EXIST DRIVEWAY SURFACE MATERIAL	CULVERT DESCRIPTION		ITEM 496			BID ALTERNATIVES	
												ITEM 401	ITEM 4122
							EXISTING	PROPOSED WORK	REMOV STR (PIPE)	REMOV STR (SET)	REMOV STR (BOX CULVERT)	FLOWABLE BACKFILL	THERMOPLASTIC PIPE (18 IN)
					LF				LF	EA	LF	CY	LF
(FM 166) (CSJ: 0955-01-027)													
405	138+84	96° 39′ 38.86" W 30° 32′ 10.22" N	DRIVEWAY	LT	18	Grass/Dirt	NO CULVERT	NO WORK					
23	139+74	96° 39′ 37.83" W 30° 32′ 10.28" N	DRIVEWAY	LT	18	Grass/Dirt	24" X 29′ CMP W/ SETs	NO WORK					
25	148+61	96° 39′ 27.64" W 30° 32′ 10.68" N	CO RD 307	LT	38	Asphalt	30" X 56′ CMP W/ SETs	NO WORK					
32	150+92	96° 39′ 25.11" W 30° 32′ 09.64" N	CO RD 232	RT	29	Gravel	36" X 37′ CMP	REMOVE 36" CMP; REPLACE W/ 36" X 38′ CMP & SET (TY II) (36 IN) (CMP) (6:1) (P) EA END	37				
34	159+58	96° 39′ 15.20" W 30° 32′ 10.62" N	DRIVEWAY	RT	16	Gravel	18" X 25′ CMP	INSTALL SET (TY II) (18IN) (CMP) (6:1) (P) EA END					
27	159+72	96° 39′ 15.18" W 30° 32′ 11.35" N	CO RD 225	LT	25	Asphalt	24" X 40′ CMP W/ SETs	NO WORK					
29	160+88	96° 39′ 13.86" W 30° 32′ 11.44" N	DRIVEWAY	LT	22	Asphalt	NO CULVERT	NO WORK					
31	170+03	96° 39′ 03.46" W 30° 32′ 11.18" N	DRIVEWAY	LT	8	Concrete	12" X 12′ RCP	REMOVE 12" RCP; REPLACE W/ 18" X 20′ RCP & SET (TY II) (18 IN) (RCP) (6:1) (P) EA END	12				
36	171+82	96° 39′ 02.35" W 30° 32′ 09.55" N	DRIVEWAY	RT	16	Gravel	18" X 29′ CMP	REMOVE 2′ LT / 2′ RT CMP; REPLACE W/18" X 2′ LT & 2′ RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END	4				
38	174+53	96° 38′ 59.24" W 30° 32′ 08.51" N	DRIVEWAY	RT	25	Gravel	NO CULVERT	NO WORK					
40	175+65	96° 38′ 57.88" W 30° 32′ 08.85" N	DRIVEWAY	RT	29	Gravel	NO CULVERT	NO WORK					
42	176+94	96° 38′ 56.49" W 30° 32′ 09.54" N	DRIVEWAY	RT	29	Gravel	NO CULVERT	NO WORK					
44	190+37	96° 38′ 44.16" W 30° 32′ 16.78" N	DRIVEWAY	RT	55	Gravel	NO CULVERT	NO WORK					
46	200+90	96° 38′ 32.39" W 30° 32′ 16.33" N	DRIVEWAY	RT	17	Gravel	NO CULVERT	NO WORK					
FM 166 (CSJ: 0955-01-027) SHEET 6 OF 32 SUBTOTAL									53	0	0	0	0

NOTES:

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HEATHER McNEAL, P.E. — 3/31/2021 DATE

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SUMMARY OF DRIVEWAYS

SHEET 6 OF 32 SHEETS

FED. RD. DIV.NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	15

Plotted on: 3/31/2021

SUMMARY OF DRIVEWAYS AND SIDE ROADS

DRWY NUM	STATION	LOCATION	REMARKS	OFFSET	EXIST DRIVE WAY WIDTH	EXIST DRIVEWAY SURFACE MATERIAL	CULVERT DESCRIPTION		ITEM 132	ITEM 162	ITEM 400			ITEM 462	ITEM 460			ITEM 464					ITEM 467																
							EXISTING	PROPOSED WORK	EMBANK-MENT (VEHICLE) (DENS CONT) (TY C)	BLOCK SODDING	CUT & RESTORE			CONC BOX CULV	CMP (GAL STL)			RC PIPE (CL III)					SET (PIPE RUNNER ASSEMBLY)	SET (TY II) (CMP) (6:1) (P)					SET (TY II) (HDPE) (6:1) (P)	SET (TY I) (6:1) (P)	SET (TY II) (RCP) (6:1) (P)							
											ASPH PAVING	CONC PAVING	PAV (FLEX BASE)	(4FT X 2FT)	(18 IN)	(24 IN)	(36 IN)	(15 IN)	(18 IN)	(24 IN)	(30 IN)	(36 IN)		(15 IN)	(18 IN)	(24 IN)	(30 IN)	(36 IN)	(30 IN)	(4FT X 2FT)	(15 IN)	(18 IN)	(24 IN)	(30 IN)	(36 IN)
					LF				CY	SY	SY	SY	SY	LF	LF	LF	LF	LF	LF	LF	LF	LF	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA
(FM 166) (CSJ: 0955-01-027)																																				
48	210+08	96° 38' 22.17" W 30° 32' 14.32" N	DRIVEWAY	RT	15	Gravel	NO CULVERT	NO WORK																												
50	211+18	96° 38' 20.95" W 30° 32' 14.04" N	DRIVEWAY	RT	14	Asphalt	NO CULVERT	NO WORK																												
33	217+28	96° 38' 14.01" W 30° 32' 15.56" N	CO RD 258	LT	22	Asphalt	NO CULVERT	NO WORK																												
35	219+00	96° 38' 12.01" W 30° 32' 14.75" N	DRIVEWAY	LT	23	Gravel	18" X 45' CMP	REMOVE 2' LT / 2' RT CMP; REPLACE W/18" X 2' LT & 2' RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END		22					4										2									
52	223+51	96° 38' 08.78" W 30° 32' 11.15" N	DRIVEWAY	RT	25	Grass/Dirt	NO CULVERT	NO WORK																												
54	224+00	96° 38' 08.43" W 30° 32' 10.77" N	DRIVEWAY	RT	13	Gravel	18" X 25' CMP	REMOVE 2' LT / 2' RT CMP; REPLACE W/18" X 2' LT & 2' RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END		22					4										2									
37	224+74	96° 38' 07.19" W 30° 32' 10.82" N	DRIVEWAY	LT	17	Asphalt	18" X 35' CMP W/ SETs	NO WORK																												
56	228+63	96° 38' 04.58" W 30° 32' 07.61" N	DRIVEWAY	RT	15	Gravel	18" X 21' CMP W/ SETs	NO WORK																												
39	233+77	96° 37' 59.82" W 30° 32' 04.57" N	DRIVEWAY	LT	18	Gravel	24" X 18' CMP W/ SETs	NO WORK																												
41	238+57	96° 37' 55.82" W 30° 32' 01.31" N	DRIVEWAY	LT	24	Gravel	18" X 52' CMP	REMOVE 2' LT / 4' RT CMP; REPLACE W/18" X 2' LT & 4' RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END		22					6										2									
58*	239+49	96° 37' 55.67" W 30° 32' 00.13" N	DRIVEWAY	RT	10	Gravel	18" X 25' CMP	INSTALL SET (TY II) (18IN) (CMP) (6:1) (P) EA END																	2											
60	243+87	96° 37' 51.64" W 30° 31' 57.35" N	CO RD 233	RT	20	Asphalt	NO CULVERT	NO WORK																												
62	250+78	96° 37' 44.72" W 30° 32' 00.57" N	DRIVEWAY	RT	19	Gravel	24" X 27' CMP	REMOVE 2' LT / 2' RT CMP; REPLACE W/24" X 2' LT & 2' RT CMP & SET (TY II) (24IN) (CMP) (6:1) (P) EA END		26						4									2									
43	262+53	96° 37' 33.39" W 30° 32' 04.04" N	DRIVEWAY	LT	18	Gravel	18" X 29' CMP	REMOVE 2' LT CMP; REPLACE W/ 18" X 2' LT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END		11					2										2									
FM 166 (CSJ: 0955-01-027) SHEET 7 OF 32 SUBTOTAL									0	103	0	0	0	0	16	4	0	0	0	0	0	0	0	10	2	0	0	0	0	0	0	0	0	0	0

NOTES:

1. A FULL TOPOGRAPHIC SURVEY WAS NOT PERFORMED. THE LOCATIONS SHOWN ARE APPROXIMATE AND MUST BE VERIFIED BY THE CONTRACTOR PRIOR TO COMMENCEMENT OF WORK.
2. PROVIDE 12" DEEP TOEWALLS FOR ALL S.E.T.'S
3. SEE SWPPP SUMMARIES FOR SEEDING, VEGETATIVE WATERING, AND SOIL RETENTION BLANKETS QUANTITIES.
4. BLOCK SODDING BASED ON CULVERT DIAMETER ON EACH END:
   - ≤18" PIPE = 11 SY BLOCK SOD
   - 24" PIPE = 13 SY BLOCK SOD
   - 30" PIPE = 15 SY BLOCK SOD
   - ≥36" PIPE = 16 SY BLOCK SOD

* CAST IN PLACE S.E.T.
ALL OTHER S.E.T.'S MAY BE PRECAST OR CIP

DESIGN

STATE OF TEXAS — HEATHER McNEAL — 114428 — LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS — DAN THOMA — 98622 — LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

PRINT DATE	REVISION DATE
3/31/2021	

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

SUMMARY OF DRIVEWAYS

SHEET 7 OF 32 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY
TEXAS	BRY	BURLESON

CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	16

Design Filename: P:\120\96\01\Design\027 FM 166\Civil\Summaries\1209601_Sum01.dgn

Plotted on: 3/31/2021

Design Filename: P:\120\96\01\Design\027 FM 166\Civil\Summaries\1209601_Sum01.dgn

SUMMARY OF DRIVEWAYS AND SIDE ROADS

DRWY NUM	STATION	LOCATION	REMARKS	OFFSET	EXIST DRIVE WAY WIDTH	EXIST DRIVEWAY SURFACE MATERIAL	CULVERT DESCRIPTION		ITEM 496			BID ALTERNATIVES	
												ITEM 401	ITEM 4122
							EXISTING	PROPOSED WORK	REMOV STR (PIPE)	REMOV STR (SET)	REMOV STR (BOX CULVERT)	FLOWABLE BACKFILL	THERMOPLASTIC PIPE (18 IN)
					LF				LF	EA	LF	CY	LF
(FM 166) (CSJ: 0955-01-027)													
48	210+08	96° 38′ 22.17" W 30° 32′ 14.32" N	DRIVEWAY	RT	15	Gravel	NO CULVERT	NO WORK					
50	211+18	96° 38′ 20.95" W 30° 32′ 14.04" N	DRIVEWAY	RT	14	Asphalt	NO CULVERT	NO WORK					
33	217+28	96° 38′ 14.01" W 30° 32′ 15.56" N	CO RD 258	LT	22	Asphalt	NO CULVERT	NO WORK					
35	219+00	96° 38′ 12.01" W 30° 32′ 14.75" N	DRIVEWAY	LT	23	Gravel	18" X 45′ CMP	REMOVE 2′ LT / 2′ RT CMP; REPLACE W/18" X 2′ LT & 2′ RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END	4				
52	223+51	96° 38′ 08.78" W 30° 32′ 11.15" N	DRIVEWAY	RT	25	Grass/Dirt	NO CULVERT	NO WORK					
54	224+00	96° 38′ 08.43" W 30° 32′ 10.77" N	DRIVEWAY	RT	13	Gravel	18" X 25′ CMP	REMOVE 2′ LT / 2′ RT CMP; REPLACE W/18" X 2′ LT & 2′ RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END	4				
37	224+74	96° 38′ 07.19" W 30° 32′ 10.82" N	DRIVEWAY	LT	17	Asphalt	18" X 35′ CMP W/ SETs	NO WORK					
56	228+63	96° 38′ 04.58" W 30° 32′ 07.61" N	DRIVEWAY	RT	15	Gravel	18" X 21′ CMP W/ SETs	NO WORK					
39	233+77	96° 37′ 59.82" W 30° 32′ 04.57" N	DRIVEWAY	LT	18	Gravel	24" X 18′ CMP W/ SETs	NO WORK					
41	238+57	96° 37′ 55.82" W 30° 32′ 01.31" N	DRIVEWAY	LT	24	Gravel	18" X 52′ CMP	REMOVE 2′ LT / 4′ RT CMP; REPLACE W/18" X 2′ LT & 4′ RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END	6				
58*	239+49	96° 37′ 55.67" W 30° 32′ 00.13" N	DRIVEWAY	RT	10	Gravel	18" X 25′ CMP	INSTALL SET (TY II) (18IN) (CMP) (6:1) (P) EA END					
60	243+87	96° 37′ 51.64" W 30° 31′ 57.35" N	CO RD 233	RT	20	Asphalt	NO CULVERT	NO WORK					
62	250+78	96° 37′ 44.72" W 30° 32′ 00.57" N	DRIVEWAY	RT	19	Gravel	24" X 27′ CMP	REMOVE 2′ LT / 2′ RT CMP; REPLACE W/24" X 2′ LT & 2′ RT CMP & SET (TY II) (24IN) (CMP) (6:1) (P) EA END	4				
43	262+53	96° 37′ 33.39" W 30° 32′ 04.04" N	DRIVEWAY	LT	18	Gravel	18" X 29′ CMP	REMOVE 2′ LT CMP; REPLACE W/ 18" X 2′ LT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END	2				
FM 166 (CSJ: 0955-01-027) SHEET 8 OF 32 SUBTOTAL									20	0	0	0	0

NOTES:

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2. PROVIDE 12" DEEP TOEWALLS FOR ALL S.E.T.'S
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ALL OTHER S.E.T.'S MAY BE PRECAST OR CIP

DESIGN

STATE OF TEXAS · HEATHER McNEAL · 114428 · LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS · DAN THOMA · 98622 · LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

PRINT DATE	REVISION DATE
3/31/2021	

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TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

SUMMARY OF DRIVEWAYS

SHEET 8 OF 32 SHEETS

FED. RD. DIV.NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	17

SUMMARY OF DRIVEWAYS AND SIDE ROADS

DRWY NUM	STATION	LOCATION	REMARKS	OFFSET	EXIST DRIVE WAY WIDTH	EXIST DRIVEWAY SURFACE MATERIAL	CULVERT DESCRIPTION		ITEM 132	ITEM 162	ITEM 400			ITEM 462	ITEM 460			ITEM 464					ITEM 467															
							EXISTING	PROPOSED WORK	EMBANK-MENT (VEHICLE) (DENS CONT) (TY C)	BLOCK SODDING	CUT & RESTORE			CONC BOX CULV	CMP (GAL STL)			RC PIPE (CL III)					SET (PIPE RUNNER ASSEMBLY)	SET (TY II) (CMP) (6:1) (P)					SET (TY II) (HDPE) (6:1) (P)	SET (TY I) (6:1) (P)	SET (TY II) (RCP) (6:1) (P)						
											ASPH PAVING	CONC PAVING	PAV (FLEX BASE)	(4FT X 2FT)	(18 IN)	(24 IN)	(36 IN)	(15 IN)	(18 IN)	(24 IN)	(30 IN)	(36 IN)		(15 IN)	(18 IN)	(24 IN)	(30 IN)	(36 IN)	(30 IN)	(4FT X 2FT)	(15 IN)	(18 IN)	(24 IN)	(30 IN)	(36 IN)
					LF				CY	SY	SY	SY	SY	LF	LF	LF	LF	LF	LF	LF	LF	LF	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA
(FM 166) (CSJ: 0955-01-027)																																			
45	277+45	96° 37' 16.44" W 30° 32' 02.63" N	DRIVEWAY	LT	25	Gravel	24" X 40' CMP	REMOVE 2' LT / 2' RT CMP; REPLACE W/24" X 6' LT & 2' RT CMP & SET (TY II) (24IN) (CMP) (6:1) (P) EA END		26						8									2									
64 *	277+85	96° 37' 16.05" W 30° 32' 01.92" N	DRIVEWAY	RT	16	Gravel	18" X 23' CMP	REMOVE 18" CMP; REPLACE W/ 18" X 24' CMP & SET (TY II) (18 IN) (CMP) (6:1) (P) EA END	4	22			8		24									2									
47	279+19	96° 37' 14.45" W 30° 32' 02.50" N	DRIVEWAY	LT	24	Asphalt	24" X 27' Plastic W/ SETs	NO WORK																											
66	283+98	96° 37' 09.20" W 30° 32' 00.94" N	DRIVEWAY	RT	43	Gravel	18" X 47' CMP	REMOVE 4' LT / 2' RT CMP; REPLACE W/18" X 12' LT & 6' RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END	9	22			1		18									2									
68	285+04	96° 37' 07.98" W 30° 32' 00.76" N	DRIVEWAY	RT	17	Grass/Dirt	NO CULVERT	NO WORK																											
70	296+60	96° 36' 54.74" W 30° 32' 00.37" N	DRIVEWAY	RT	18	Asphalt	18" X 30' CMP W/ SETs	INSTALL SET (TY II) (18IN) (CMP) (6:1) (P) EA END																	2										
72	299+47	96° 36' 51.47" W 30° 32' 00.24" N	DRIVEWAY	RT	18	Grass/Dirt	NO CULVERT	NO WORK																											
49	306+86	96° 36' 43.01" W 30° 32' 00.85" N	DRIVEWAY	LT	23	Gravel	18" X 50' CMP	REMOVE 18" CMP; REPLACE W/ 18" X 50' CMP & SET (TY II) (18 IN) (CMP) (6:1) (P) EA END	9	22			11		50									2									
74	307+23	96° 36' 42.58" W 30° 31' 59.98" N	CO RD 236	RT	29	Asphalt	NO CULVERT	NO WORK																											
76	308+65	96° 36' 40.95" W 30° 32' 00.08" N	DRIVEWAY	RT	15	Gravel	18" X 27' CMP W/ SETs	NO WORK																											
51	309+82	96° 36' 39.64" W 30° 32' 00.79" N	DRIVEWAY	LT	24	Gravel	18" X 30' CMP	REMOVE 18" CMP; REPLACE W/ 18" X 42' CMP & SET (TY II) (18 IN) (CMP) (6:1) (P) EA END	6	22			11		42									2									
78	319+65	96° 36' 28.52" W 30° 32' 01.83" N	DRIVEWAY	RT	20	Asphalt	24" X 37' CMP W/ SETs	NO WORK																											
53	327+10	96° 36' 21.55" W 30° 32' 06.16" N	DRIVEWAY	LT	25	Gravel	18" X 42' CMP	REMOVE 2' LT / 2' RT CMP; REPLACE W/18" X 2' LT & 2' RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END		22					4									2									
55	329+47	96° 36' 19.10" W 30° 32' 07.25" N	DRIVEWAY	LT	18	Asphalt	NO CULVERT	NO WORK																											
FM 166 (CSJ: 0955-01-027) SHEET 9 OF 32 SUBTOTAL									28	136	0	0	31	0	138	8	0	0	0	0	0	0	0	0	12	2	0	0	0	0	0	0	0	0	0

NOTES:

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2. PROVIDE 12" DEEP TOEWALLS FOR ALL S.E.T.'S
3. SEE SWPPP SUMMARIES FOR SEEDING, VEGETATIVE WATERING, AND SOIL RETENTION BLANKETS QUANTITIES.
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   - 30" PIPE = 15 SY BLOCK SOD
   - ≥36" PIPE = 16 SY BLOCK SOD

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ALL OTHER S.E.T.'S MAY BE PRECAST OR CIP

DESIGN

STATE OF TEXAS · HEATHER McNEAL · 114428 · LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS · DAN THOMA · 98622 · LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

PRINT DATE	REVISION DATE
3/31/2021	

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

SUMMARY OF DRIVEWAYS

SHEET 9 OF 32 SHEETS

FED. RD. DIV.NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166
STATE	DISTRICT	COUNTY
TEXAS	BRY	BURLESON
CONTROL	SECTION	JOB / SHEET NO.
0955	01	027 / 18

Plotted on: 3/31/2021

Design Filename: P:\120\96\01\Design\027 FM 166\Civil\Summaries\1209601_Sum01.dgn

SUMMARY OF DRIVEWAYS AND SIDE ROADS

DRWY NUM	STATION	LOCATION	REMARKS	OFFSET	EXIST DRIVE WAY WIDTH	EXIST DRIVEWAY SURFACE MATERIAL	CULVERT DESCRIPTION		ITEM 496			BID ALTERNATIVES	
												ITEM 401	ITEM 4122
							EXISTING	PROPOSED WORK	REMOV STR (PIPE)	REMOV STR (SET)	REMOV STR (BOX CULVERT)	FLOWABLE BACKFILL	THERMOPLASTIC PIPE (18 IN)
					LF				LF	EA	LF	CY	LF
(FM 166) (CSJ: 0955-01-027)													
45	277+45	96° 37' 16.44" W 30° 32' 02.63" N	DRIVEWAY	LT	25	Gravel	24" X 40' CMP	REMOVE 2' LT / 2' RT CMP; REPLACE W/24" X 6' LT & 2' RT CMP & SET (TY II) (24IN) (CMP) (6:1) (P) EA END	4				
64*	277+85	96° 37' 16.05" W 30° 32' 01.92" N	DRIVEWAY	RT	16	Gravel	18" X 23' CMP	REMOVE 18" CMP; REPLACE W/ 18" X 24' CMP & SET (TY II) (18 IN) (CMP) (6:1) (P) EA END	23				
47	279+19	96° 37' 14.45" W 30° 32' 02.50" N	DRIVEWAY	LT	24	Asphalt	24" X 27' Plastic W/ SETs	NO WORK					
66	283+98	96° 37' 09.20" W 30° 32' 00.94" N	DRIVEWAY	RT	43	Gravel	18" X 47' CMP	REMOVE 4' LT / 2' RT CMP; REPLACE W/18" X 12' LT & 6' RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END	6				
68	285+04	96° 37' 07.98" W 30° 32' 00.76" N	DRIVEWAY	RT	17	Grass/Dirt	NO CULVERT	NO WORK					
70	296+60	96° 36' 54.74" W 30° 32' 00.37" N	DRIVEWAY	RT	18	Asphalt	18" X 30' CMP W/ SETs	INSTALL SET (TY II) (18IN) (CMP) (6:1) (P) EA END					
72	299+47	96° 36' 51.47" W 30° 32' 00.24" N	DRIVEWAY	RT	18	Grass/Dirt	NO CULVERT	NO WORK					
49	306+86	96° 36' 43.01" W 30° 32' 00.85" N	DRIVEWAY	LT	23	Gravel	18" X 50' CMP	REMOVE 18" CMP; REPLACE W/ 18" X 50' CMP & SET (TY II) (18 IN) (CMP) (6:1) (P) EA END	50			6	50
74	307+23	96° 36' 42.58" W 30° 31' 59.98" N	CO RD 236	RT	29	Asphalt	NO CULVERT	NO WORK					
76	308+65	96° 36' 40.95" W 30° 32' 00.08" N	DRIVEWAY	RT	15	Gravel	18" X 27' CMP W/ SETs	NO WORK					
51	309+82	96° 36' 39.64" W 30° 32' 00.79" N	DRIVEWAY	LT	24	Gravel	18" X 30' CMP	REMOVE 18" CMP; REPLACE W/ 18" X 42' CMP & SET (TY II) (18 IN) (CMP) (6:1) (P) EA END	30			7	42
78	319+65	96° 36' 28.52" W 30° 32' 01.83" N	DRIVEWAY	RT	20	Asphalt	24" X 37' CMP W/ SETs	NO WORK					
53	327+10	96° 36' 21.55" W 30° 32' 06.16" N	DRIVEWAY	LT	25	Gravel	18" X 42' CMP	REMOVE 2' LT / 2' RT CMP; REPLACE W/18" X 2' LT & 2' RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END	4				
55	329+47	96° 36' 19.10" W 30° 32' 07.25" N	DRIVEWAY	LT	18	Asphalt	NO CULVERT	NO WORK					
FM 166 (CSJ: 0955-01-027) SHEET 10 OF 32 SUBTOTAL									117	0	0	13	92

NOTES:

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DESIGN

STATE OF TEXAS · HEATHER McNEAL · 114428 · LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS · DAN THOMA · 98622 · LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

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SUMMARY OF DRIVEWAYS

SHEET 10 OF 32 SHEETS

FED. RD. DIV.NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	19

Plotted on: 3/31/2021

Design Filename: P:\120\96\01\Design\027 FM 166\Civil\Summaries\1209601_Sum01.dgn

SUMMARY OF DRIVEWAYS AND SIDE ROADS

DRWY NUM	STATION	LOCATION	REMARKS	OFFSET	EXIST DRIVE WAY WIDTH	EXIST DRIVEWAY SURFACE MATERIAL	CULVERT DESCRIPTION		ITEM 132	ITEM 162	ITEM 400			ITEM 462	ITEM 460			ITEM 464					ITEM 467															
							EXISTING	PROPOSED WORK	EMBANK-MENT (VEHICLE) (DENS CONT) (TY C)	BLOCK SODDING	CUT & RESTORE			CONC BOX CULV	CMP (GAL STL)			RC PIPE (CL III)					SET (PIPE RUNNER ASSEMBLY)	SET (TY II) (CMP) (6:1) (P)					SET (TY II) (HDPE) (6:1) (P)	SET (TY I) (6:1) (P)	SET (TY II) (RCP) (6:1) (P)						
											ASPH PAVING	CONC PAVING	PAV (FLEX BASE)	(4FT X 2FT)	(18 IN)	(24 IN)	(36 IN)	(15 IN)	(18 IN)	(24 IN)	(30 IN)	(36 IN)		(15 IN)	(18 IN)	(24 IN)	(30 IN)	(36 IN)	(30 IN)	(4FT X 2FT)	(15 IN)	(18 IN)	(24 IN)	(30 IN)	(36 IN)
					LF				CY	SY	SY	SY	SY	LF	LF	LF	LF	LF	LF	LF	LF	LF	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA
(FM 166) (CSJ: 0955-01-027)																																			
80	331+45	96° 36' 16.66" W 30° 32' 07.22" N	DRIVEWAY	RT	13.5	Grass/Dirt	NO CULVERT	NO WORK																											
404	334+13	96° 36' 13.72" W 30° 32' 07.86" N	DRIVEWAY	RT	16	Gravel	12" X 32' RCP	REMOVE 12" RCP; REPLACE W/ 18" X 32' RCP & SET (TY II) (18 IN) (RCP) (6:1) (P) EA END	5	22			8					32												2				
57	336+72	96° 36' 11.01" W 30° 32' 09.13" N	DRIVEWAY	LT	19	Gravel	18" X 25' CMP	REMOVE 18" CMP; REPLACE W/ 18" X 26' CMP & SET (TY II) (18 IN) (CMP) (6:1) (P) EA END	4	22			9		26										2								
59	340+85	96° 36' 06.36" W 30° 32' 09.90" N	CO RD 234	LT	62	Asphalt	NO CULVERT	NO WORK																											
301	343+21	96° 36' 03.68" W 30° 32' 10.13" N	DRIVEWAY	LT	16	Grass/Dirt	NO CULVERT	NO WORK																											
302	343+26	96° 36' 03.51" W 30° 32' 09.67" N	DRIVEWAY	RT	15	Gravel	24" X 25' CMP	REMOVE 2' LT CMP; REPLACE W/ 24" X 2' LT CMP & SET (TY II) (24IN) (CMP) (6:1) (P) EA END		13						2										2							
84	344+33	96° 36' 02.30" W 30° 32' 09.79" N	DRIVEWAY	RT	29	Gravel	18" X 58' CMP	REMOVE 2' LT / 2' RT CMP; REPLACE W/18" X 2' LT & 2' RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END		22					4										2								
86	358+24	96° 35' 46.72" W 30° 32' 09.43" N	DRIVEWAY	RT	18	Gravel	18" X 29.5' CMP	REMOVE 2' LT / 2' RT CMP; REPLACE W/18" X 6' LT & 2' RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END		22					8										2								
61	370+68	96° 35' 32.93" W 30° 32' 11.60" N	CO RD 235	LT	56	Asphalt	18" X 71' CMP W/ SETs	REMOVE SETs & INSTALL SET (TY II) (18IN)(CMP) (6:1) (P) EA END																	2								
88	379+50	96° 35' 22.98" W 30° 32' 13.23" N	DRIVEWAY	RT	28	Gravel	NO CULVERT	NO WORK																											
90	380+02	96° 35' 22.39" W 30° 32' 13.37" N	DRIVEWAY	RT	14	Gravel	NO CULVERT	NO WORK																											
63	385+20	96° 35' 17.36" W 30° 32' 16.21" N	DRIVEWAY	LT	32	Asphalt	NO CULVERT	NO WORK																											
92	387+69	96° 35' 14.49" W 30° 32' 16.83" N	DRIVEWAY	RT	17	Grass/Dirt	NO CULVERT	NO WORK																											
65	391+01	96° 35' 11.56" W 30° 32' 19.01" N	DRIVEWAY	LT	15	Grass/Dirt	NO CULVERT	NO WORK																											
FM 166 (CSJ: 0955-01-027) SHEET 11 OF 32 SUBTOTAL									9	101	0	0	17	0	38	2	0	0	32	0	0	0	0	0	8	2	0	0	0	0	0	2	0	0	0

NOTES:

1. A FULL TOPOGRAPHIC SURVEY WAS NOT PERFORMED. THE LOCATIONS SHOWN ARE APPROXIMATE AND MUST BE VERIFIED BY THE CONTRACTOR PRIOR TO COMMENCEMENT OF WORK.
2. PROVIDE 12" DEEP TOEWALLS FOR ALL S.E.T.'S
3. SEE SWPPP SUMMARIES FOR SEEDING, VEGETATIVE WATERING, AND SOIL RETENTION BLANKETS QUANTITIES.
4. BLOCK SODDING BASED ON CULVERT DIAMETER ON EACH END:
   ≤18" PIPE = 11 SY BLOCK SOD
   24" PIPE = 13 SY BLOCK SOD
   30" PIPE = 15 SY BLOCK SOD
   ≥36" PIPE = 16 SY BLOCK SOD

* CAST IN PLACE S.E.T.
ALL OTHER S.E.T.'S MAY BE PRECAST OR CIP

DESIGN

STATE OF TEXAS — HEATHER McNEAL — 114428 — LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS — DAN THOMA — 98622 — LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

PRINT DATE	REVISION DATE
3/31/2021	

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

SUMMARY OF DRIVEWAYS

SHEET 11 OF 32 SHEETS

FED. RD. DIV.NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY
TEXAS	BRY	BURLESON

CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	20

Plotted on: 3/31/2021

Design Filename: P:\120\96\01\Design\027 FM 166\Civil\Summaries\1209601_Sum01.dgn

SUMMARY OF DRIVEWAYS AND SIDE ROADS

DRWY NUM	STATION	LOCATION	REMARKS	OFFSET	EXIST DRIVE WAY WIDTH	EXIST DRIVEWAY SURFACE MATERIAL	CULVERT DESCRIPTION		ITEM 496			BID ALTERNATIVES	
												ITEM 401	ITEM 4122
							EXISTING	PROPOSED WORK	REMOV STR (PIPE)	REMOV STR (SET)	REMOV STR (BOX CULVERT)	FLOWABLE BACKFILL	THERMOPLASTIC PIPE (18 IN)
					LF				LF	EA	LF	CY	LF
(FM 166) (CSJ: 0955-01-027)													
80	331+45	96° 36′ 16.66" W 30° 32′ 07.22" N	DRIVEWAY	RT	13.5	Grass/Dirt	NO CULVERT	NO WORK					
404	334+13	96° 36′ 13.72" W 30° 32′ 07.86" N	DRIVEWAY	RT	16	Gravel	12" X 32′ RCP	REMOVE 12" RCP; REPLACE W/ 18" X 32′ RCP & SET (TY II) (18 IN) (RCP) (6:1) (P) EA END	32				
57	336+72	96° 36′ 11.01" W 30° 32′ 09.13" N	DRIVEWAY	LT	19	Gravel	18" X 25′ CMP	REMOVE 18" CMP; REPLACE W/ 18" X 26′ CMP & SET (TY II) (18 IN) (CMP) (6:1) (P) EA END	25				
59	340+85	96° 36′ 06.36" W 30° 32′ 09.90" N	CO RD 234	LT	62	Asphalt	NO CULVERT	NO WORK					
301	343+21	96° 36′ 03.68" W 30° 32′ 10.13" N	DRIVEWAY	LT	16	Grass/Dirt	NO CULVERT	NO WORK					
302	343+26	96° 36′ 03.51" W 30° 32′ 09.67" N	DRIVEWAY	RT	15	Gravel	24" X 25′ CMP	REMOVE 2′ LT CMP; REPLACE W/ 24" X 2′ LT CMP & SET (TY II) (24IN) (CMP) (6:1) (P) EA END	2				
84	344+33	96° 36′ 02.30" W 30° 32′ 09.79" N	DRIVEWAY	RT	29	Gravel	18" X 58′ CMP	REMOVE 2′ LT / 2′ RT CMP; REPLACE W/18" X 2′ LT & 2′ RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END	4				
86	358+24	96° 35′ 46.72" W 30° 32′ 09.43" N	DRIVEWAY	RT	18	Gravel	18" X 29.5′ CMP	REMOVE 2′ LT / 2′ RT CMP; REPLACE W/18" X 6′ LT & 2′ RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END	4				
61	370+68	96° 35′ 32.93" W 30° 32′ 11.60" N	CO RD 235	LT	56	Asphalt	18" X 71′ CMP W/ SETs	REMOVE SETs & INSTALL SET (TY II) (18IN)(CMP) (6:1) (P) EA END		2			
88	379+50	96° 35′ 22.98" W 30° 32′ 13.23" N	DRIVEWAY	RT	28	Gravel	NO CULVERT	NO WORK					
90	380+02	96° 35′ 22.39" W 30° 32′ 13.37" N	DRIVEWAY	RT	14	Gravel	NO CULVERT	NO WORK					
63	385+20	96° 35′ 17.36" W 30° 32′ 16.21" N	DRIVEWAY	LT	32	Asphalt	NO CULVERT	NO WORK					
92	387+69	96° 35′ 14.49" W 30° 32′ 16.83" N	DRIVEWAY	RT	17	Grass/Dirt	NO CULVERT	NO WORK					
65	391+01	96° 35′ 11.56" W 30° 32′ 19.01" N	DRIVEWAY	LT	15	Grass/Dirt	NO CULVERT	NO WORK					
FM 166 (CSJ: 0955-01-027) SHEET 12 OF 32 SUBTOTAL									67	2	0	0	0

NOTES:

1. A FULL TOPOGRAPHIC SURVEY WAS NOT PERFORMED. THE LOCATIONS SHOWN ARE APPROXIMATE AND MUST BE VERIFIED BY THE CONTRACTOR PRIOR TO COMMENCEMENT OF WORK.
2. PROVIDE 12" DEEP TOEWALLS FOR ALL S.E.T.'S
3. SEE SWPPP SUMMARIES FOR SEEDING, VEGETATIVE WATERING, AND SOIL RETENTION BLANKETS QUANTITIES.
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   - 30" PIPE = 15 SY BLOCK SOD
   - ≥36" PIPE = 16 SY BLOCK SOD

* CAST IN PLACE S.E.T.
ALL OTHER S.E.T.'S MAY BE PRECAST OR CIP

DESIGN

STATE OF TEXAS — HEATHER McNEAL — 114428 — LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS — DAN THOMA — 98622 — LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

PRINT DATE	REVISION DATE
3/31/2021	

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2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

SUMMARY OF DRIVEWAYS

SHEET 12 OF 32 SHEETS

FED. RD. DIV.NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	21

Plotted on: 3/31/2021

Design Filename: P:\120\96\01\Design\027 FM 166\Civil\Summaries\1209601_Sum01.dgn

Plotted on: 3/31/2021

Design Filename: P:\120\96\01\Design\027 FM 166\Civil\Summaries\1209601_Sum01.dgn

SUMMARY OF DRIVEWAYS AND SIDE ROADS

DRWY NUM	STATION	LOCATION	REMARKS	OFFSET	EXIST DRIVE WAY WIDTH	EXIST DRIVEWAY SURFACE MATERIAL	CULVERT DESCRIPTION		ITEM 132	ITEM 162	ITEM 400			ITEM 462	ITEM 460			ITEM 464					ITEM 467																	
							EXISTING	PROPOSED WORK	EMBANK-MENT (VEHICLE) (DENS CONT) (TY C)	BLOCK SODDING	CUT & RESTORE			CONC BOX CULV	CMP (GAL STL)			RC PIPE (CL III)					SET (PIPE RUNNER ASSEMBLY)	SET (TY II) (CMP) (6:1) (P)					SET (TY II) (HDPE) (6:1) (P)	SET (TY I) (6:1) (P)	SET (TY II) (RCP) (6:1) (P)								
											ASPH PAVING	CONC PAVING	PAV (FLEX BASE)	(4FT X 2FT)	(18 IN)	(24 IN)	(36 IN)	(15 IN)	(18 IN)	(24 IN)	(30 IN)	(36 IN)		(15 IN)	(18 IN)	(24 IN)	(30 IN)	(36 IN)	(30 IN)	(4FT X 2FT)	(15 IN)	(18 IN)	(24 IN)	(30 IN)	(36 IN)
					LF				CY	SY	SY	SY	SY	LF	LF	LF	LF	LF	LF	LF	LF	LF	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA
(FM 166) (CSJ: 0955-01-027)																																					
67	392+29	96° 35' 10.30" W 30° 32' 19.66" N	DRIVEWAY	LT	16	Grass/Dirt	NO CULVERT	NO WORK																													
94	397+18	96° 35' 04.97" W 30° 32' 21.34" N	DRIVEWAY	RT	42	Gravel	NO CULVERT	NO WORK																													
96	397+90	96° 35' 04.30" W 30° 32' 21.75" N	DRIVEWAY	RT	16	Grass/Dirt	NO CULVERT	NO WORK																													
69	402+85	96° 34' 59.74" W 30° 32' 24.73" N	DRIVEWAY	LT	16	Gravel	24" X 27' CMP	INSTALL SET (TY II) (24IN) (CMP) (6:1) (P) EA END																		2											
71	406+73	96° 34' 55.84" W 30° 32' 26.62" N	DRIVEWAY	LT	23	Gravel	18" X 38' CMP	REMOVE 18" CMP; REPLACE W/ 18" X 38' CMP & SET (TY II) (18 IN) (CMP) (6:1) (P) EA END	7	22			11		38										2											
303	407+94	96° 34' 54.49" W 30° 32' 26.98" N	DRIVEWAY	LT	16	Grass/Dirt	NO CULVERT	NO WORK																													
100	410+24	96° 34' 51.76" W 30° 32' 27.06" N	CO RD 243	RT	39	Asphalt	NO CULVERT	NO WORK																													
102	414+83	96° 34' 46.63" W 30° 32' 27.90" N	DRIVEWAY	RT	16.5	Grass/Dirt	NO CULVERT	NO WORK																													
73	415+36	96° 34' 46.15" W 30° 32' 28.60" N	DRIVEWAY	LT	18	Grass/Dirt	NO CULVERT	NO WORK																													
104	423+48	96° 34' 36.85" W 30° 32' 29.76" N	DRIVEWAY	RT	24	Gravel	NO CULVERT	NO WORK																													
75	426+67	96° 34' 34.83" W 30° 32' 32.56" N	DRIVEWAY	LT	30	Grass/Dirt	18" X 50' CMP	REMOVE 4' LT / 2' RT CMP; REPLACE W/18" X 4' LT & 2' RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END		22					6										2											
77	427+10	96° 34' 34.40" W 30° 32' 32.80" N	DRIVEWAY	LT	14	Gravel	18" X 24' CMP	REMOVE 4' LT / 4' RT CMP; REPLACE W/18" X 4' LT & 4' RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END		22					8										2											
106	437+19	96° 34' 24.74" W 30° 32' 38.39" N	DRIVEWAY	RT	24	Gravel	NO CULVERT	NO WORK																													
79	438+43	96° 34' 24.25" W 30° 32' 39.82" N	DRIVEWAY	LT	16	Gravel	18" X 27' CMP	REMOVE 2' RT CMP; REPLACE W/ 18" X 2' RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END		11					2										2											
FM 166 (CSJ: 0955-01-027) SHEET 13 OF 32 SUBTOTAL									7	77	0	0	11	0	54	0	0	0	0	0	0	0	0	0	8	2	0	0	0	0	0	0	0	0	0	0

NOTES:

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2. PROVIDE 12" DEEP TOEWALLS FOR ALL S.E.T.'S
3. SEE SWPPP SUMMARIES FOR SEEDING, VEGETATIVE WATERING, AND SOIL RETENTION BLANKETS QUANTITIES.
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* CAST IN PLACE S.E.T.
ALL OTHER S.E.T.'S MAY BE PRECAST OR CIP

DESIGN

STATE OF TEXAS · HEATHER McNEAL · 114428 · LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS · DAN THOMA · 98622 · LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

PRINT DATE	REVISION DATE
3/31/2021	

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

SUMMARY OF DRIVEWAYS

SHEET 13 OF 32 SHEETS

FED. RD. DIV.NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY
TEXAS	BRY	BURLESON

CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	22

SUMMARY OF DRIVEWAYS AND SIDE ROADS

DRWY NUM	STATION	LOCATION	REMARKS	OFFSET	EXIST DRIVE WAY WIDTH	EXIST DRIVEWAY SURFACE MATERIAL	CULVERT DESCRIPTION		ITEM 496			BID ALTERNATIVES	
												ITEM 401	ITEM 4122
							EXISTING	PROPOSED WORK	REMOV STR (PIPE)	REMOV STR (SET)	REMOV STR (BOX CULVERT)	FLOWABLE BACKFILL	THERMOPLASTIC PIPE (18 IN)
					LF				LF	EA	LF	CY	LF
(FM 166) (CSJ: 0955-01-027)													
67	392+29	96° 35′ 10.30" W 30° 32′ 19.66" N	DRIVEWAY	LT	16	Grass/Dirt	NO CULVERT	NO WORK					
94	397+18	96° 35′ 04.97" W 30° 32′ 21.34" N	DRIVEWAY	RT	42	Gravel	NO CULVERT	NO WORK					
96	397+90	96° 35′ 04.30" W 30° 32′ 21.75" N	DRIVEWAY	RT	16	Grass/Dirt	NO CULVERT	NO WORK					
69	402+85	96° 34′ 59.74" W 30° 32′ 24.73" N	DRIVEWAY	LT	16	Gravel	24" X 27′ CMP	INSTALL SET (TY II) (24IN) (CMP) (6:1) (P) EA END					
71	406+73	96° 34′ 55.84" W 30° 32′ 26.62" N	DRIVEWAY	LT	23	Gravel	18" X 38′ CMP	REMOVE 18" CMP; REPLACE W/ 18" X 38′ CMP & SET (TY II) (18 IN) (CMP) (6:1) (P) EA END	38				
303	407+94	96° 34′ 54.49" W 30° 32′ 26.98" N	DRIVEWAY	LT	16	Grass/Dirt	NO CULVERT	NO WORK					
100	410+24	96° 34′ 51.76" W 30° 32′ 27.06" N	CO RD 243	RT	39	Asphalt	NO CULVERT	NO WORK					
102	414+83	96° 34′ 46.63" W 30° 32′ 27.90" N	DRIVEWAY	RT	16.5	Grass/Dirt	NO CULVERT	NO WORK					
73	415+36	96° 34′ 46.15" W 30° 32′ 28.60" N	DRIVEWAY	LT	18	Grass/Dirt	NO CULVERT	NO WORK					
104	423+48	96° 34′ 36.85" W 30° 32′ 29.76" N	DRIVEWAY	RT	24	Gravel	NO CULVERT	NO WORK					
75	426+67	96° 34′ 34.83" W 30° 32′ 32.56" N	DRIVEWAY	LT	30	Grass/Dirt	18" X 50′ CMP	REMOVE 4′ LT / 2′ RT CMP; REPLACE W/18" X 4′ LT & 2′ RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END	6				
77	427+10	96° 34′ 34.40" W 30° 32′ 32.80" N	DRIVEWAY	LT	14	Gravel	18" X 24′ CMP	REMOVE 4′ LT / 4′ RT CMP; REPLACE W/18" X 4′ LT & 4′ RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END	8				
106	437+19	96° 34′ 24.74" W 30° 32′ 38.39" N	DRIVEWAY	RT	24	Gravel	NO CULVERT	NO WORK					
79	438+43	96° 34′ 24.25" W 30° 32′ 39.82" N	DRIVEWAY	LT	16	Gravel	18" X 27′ CMP	REMOVE 2′ RT CMP; REPLACE W/ 18" X 2′ RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END	2				
FM 166 (CSJ: 0955-01-027) SHEET 14 OF 32 SUBTOTAL									54	0	0	0	0

NOTES:

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3. SEE SWPPP SUMMARIES FOR SEEDING, VEGETATIVE WATERING, AND SOIL RETENTION BLANKETS QUANTITIES.
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DESIGN

STATE OF TEXAS · HEATHER McNEAL · 114428 · LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

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SUMMARY OF DRIVEWAYS

SHEET 14 OF 32 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	23

Plotted on: 3/31/2021

Design Filename: P:\120\96\01\Design\027 FM 166\Civil\Summaries\1209601_Sum01.dgn

Plotted on: 3/31/2021

Design Filename: P:\120\96\01\Design\027 FM 166\Civil\Summaries\1209601_Sum01.dgn

SUMMARY OF DRIVEWAYS AND SIDE ROADS

DRWY NUM	STATION	LOCATION	REMARKS	OFFSET	EXIST DRIVE WAY WIDTH	EXIST DRIVEWAY SURFACE MATERIAL	CULVERT DESCRIPTION		ITEM 132	ITEM 162	ITEM 400			ITEM 462	ITEM 460			ITEM 464					ITEM 467															
							EXISTING	PROPOSED WORK	EMBANK-MENT (VEHICLE) (DENS CONT) (TY C)	BLOCK SODDING	CUT & RESTORE			CONC BOX CULV	CMP (GAL STL)			RC PIPE (CL III)					SET (PIPE RUNNER ASSEMBLY)	SET (TY II) (CMP) (6:1) (P)					SET (TY II) (HDPE) (6:1) (P)	SET (TY I) (6:1) (P)	SET (TY II) (RCP) (6:1) (P)						
											ASPH PAVING	CONC PAVING	PAV (FLEX BASE)	(4FT X 2FT)	(18 IN)	(24 IN)	(36 IN)	(15 IN)	(18 IN)	(24 IN)	(30 IN)	(36 IN)		(15 IN)	(18 IN)	(24 IN)	(30 IN)	(36 IN)	(30 IN)	(4FT X 2FT)	(15 IN)	(18 IN)	(24 IN)	(30 IN)	(36 IN)
					LF				CY	SY	SY	SY	SY	LF	LF	LF	LF	LF	LF	LF	LF	LF	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA
(FM 166) (CSJ: 0955-01-027)																																			
81	441+61	96° 34' 21.36" W 30° 32' 41.72" N	DRIVEWAY	LT	14	Grass/Dirt	18" X 18' RCP	REMOVE 18" RCP; REPLACE W/ 18" X 26' RCP & SET (TY II) (18 IN) (RCP) (6:1) (P) EA END	3	22									26												2				
108	447+58	96° 34' 15.21" W 30° 32' 44.40" N	DRIVEWAY	RT	15	Gravel	NO CULVERT	NO WORK																											
83	451+82	96° 34' 11.55" W 30° 32' 47.31" N	FM 1362 S	LT	40	Asphalt	30" X 44' RCP	REMOVE 4' LT / 4' RT RCP; REPLACE W/30" X 12' LT & 12' RT RCP (CL III) & SET (TY II) (30IN) (RCP) (6:1) (P) EA END	13	30	4									24											2		
110	452+92	96° 34' 09.92" W 30° 32' 47.04" N	DRIVEWAY	RT	10	Gravel	NO CULVERT	NO WORK																											
112	454+22	96° 34' 08.61" W 30° 32' 47.63" N	DRIVEWAY	RT	31	Gravel	18" X 42' CMP	REMOVE 18" CMP; REPLACE W/ 18" X 42' CMP & SET (TY II) (18 IN) (CMP) (6:1) (P) EA END	8	22			14		42									2									
114	461+02	96° 34' 01.88" W 30° 32' 51.00" N	DRIVEWAY	RT	16	Grass/Dirt	NO CULVERT	NO WORK																											
402	462+17	96° 34' 00.68" W 30° 32' 51.43" N	DRIVEWAY	RT	16	Grass/Dirt	NO CULVERT	NO WORK																											
85	462+52	96° 34' 00.72" W 30° 32' 52.36" N	CO RD 227	LT	40	Gravel	18" X 56' CMP	REMOVE 2' LT / 4' RT CMP; REPLACE W/18" X 2' LT & 4' RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END		22					6									2									
116	462+65	96° 34' 00.20" W 30° 32' 51.63" N	DRIVEWAY	RT	25	Gravel	18" X 29' CMP	REMOVE 18" CMP; REPLACE W/ 18" X 30' CMP & SET (TY II) (18 IN) (CMP) (6:1) (P) EA END	5	22			12		30									2									
87	487+61	96° 33' 32.46" W 30° 32' 52.06" N	DRIVEWAY	LT	34	Gravel	24" X 42' CMP	REMOVE 2' LT / 2' RT CMP; REPLACE W/24" X 2' LT & 2' RT CMP & SET (TY II) (24IN) (CMP) (6:1) (P) EA END		26						4									2									
118	491+06	96° 33' 29.98" W 30° 32' 49.28" N	DRIVEWAY	RT	16	Grass/Dirt	NO CULVERT	NO WORK																											
406	491+34	96° 33' 29.72" W 30° 32' 49.11" N	DRIVEWAY	RT	14	Grass/Dirt	NO CULVERT	NO WORK																											
89	496+60	96° 33' 24.42" W 30° 32' 46.56" N	DRIVEWAY	LT	30	Asphalt	18" X 43' CMP	REMOVE 2' LT / 2' RT CMP; REPLACE W/18" X 2' LT & 2' RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END		22					4									2									
91	498+22	96° 33' 22.90" W 30° 32' 45.64" N	DRIVEWAY	LT	12	Gravel	18" X 22' CMP	REMOVE 2' LT CMP; REPLACE W/ 18" X 2' LT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END		11					2									2									
FM 166 (CSJ: 0955-01-027) SHEET 15 OF 32 SUBTOTAL									29	177	4	0	26	0	84	4	0	0	26	0	24	0	0	0	10	2	0	0	0	0	0	2	0	2	0

NOTES:

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2. PROVIDE 12" DEEP TOEWALLS FOR ALL S.E.T.'S
3. SEE SWPPP SUMMARIES FOR SEEDING, VEGETATIVE WATERING, AND SOIL RETENTION BLANKETS QUANTITIES.
4. BLOCK SODDING BASED ON CULVERT DIAMETER ON EACH END:
   - ≤18" PIPE = 11 SY BLOCK SOD
   - 24" PIPE = 13 SY BLOCK SOD
   - 30" PIPE = 15 SY BLOCK SOD
   - ≥36" PIPE = 16 SY BLOCK SOD

* CAST IN PLACE S.E.T.
ALL OTHER S.E.T.'S MAY BE PRECAST OR CIP

DESIGN

STATE OF TEXAS · HEATHER McNEAL · 114428 · LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS · DAN THOMA · 98622 · LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

PRINT DATE	REVISION DATE
3/31/2021	

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

SUMMARY OF DRIVEWAYS

SHEET 15 OF 32 SHEETS

FED. RD. DIV.NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY
TEXAS	BRY	BURLESON

CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	24

Plotted on: 3/31/2021

Design Filename: P:\120\96\01\Design\027 FM 166\Civil\Summaries\1209601_Sum01.dgn

SUMMARY OF DRIVEWAYS AND SIDE ROADS

DRWY NUM	STATION	LOCATION	REMARKS	OFFSET	EXIST DRIVE WAY WIDTH	EXIST DRIVEWAY SURFACE MATERIAL	CULVERT DESCRIPTION		ITEM 496			BID ALTERNATIVES	
												ITEM 401	ITEM 4122
							EXISTING	PROPOSED WORK	REMOV STR (PIPE)	REMOV STR (SET)	REMOV STR (BOX CULVERT)	FLOWABLE BACKFILL	THERMOPLASTIC PIPE (18 IN)
					LF				LF	EA	LF	CY	LF
(FM 166) (CSJ: 0955-01-027)													
81	441+61	96° 34' 21.36" W 30° 32' 41.72" N	DRIVEWAY	LT	14	Grass/Dirt	18" X 18' RCP	REMOVE 18" RCP; REPLACE W/ 18" X 26' RCP & SET (TY II) (18 IN) (RCP) (6:1) (P) EA END	18				
108	447+58	96° 34' 15.21" W 30° 32' 44.40" N	DRIVEWAY	RT	15	Gravel	NO CULVERT	NO WORK					
83	451+82	96° 34' 11.55" W 30° 32' 47.31" N	FM 1362 S	LT	40	Asphalt	30" X 44' RCP	REMOVE 4' LT / 4' RT RCP; REPLACE W/30" X 12' LT & 12' RT RCP (CL III) & SET (TY II) (30IN) (RCP) (6:1) (P) EA END	8				
110	452+92	96° 34' 09.92" W 30° 32' 47.04" N	DRIVEWAY	RT	10	Gravel	NO CULVERT	NO WORK					
112	454+22	96° 34' 08.61" W 30° 32' 47.63" N	DRIVEWAY	RT	31	Gravel	18" X 42' CMP	REMOVE 18" CMP; REPLACE W/ 18" X 42' CMP & SET (TY II) (18 IN) (CMP) (6:1) (P) EA END	42				
114	461+02	96° 34' 01.88" W 30° 32' 51.00" N	DRIVEWAY	RT	16	Grass/Dirt	NO CULVERT	NO WORK					
402	462+17	96° 34' 00.68" W 30° 32' 51.43" N	DRIVEWAY	RT	16	Grass/Dirt	NO CULVERT	NO WORK					
85	462+52	96° 34' 00.72" W 30° 32' 52.36" N	CO RD 227	LT	40	Gravel	18" X 56' CMP	REMOVE 2' LT / 4' RT CMP; REPLACE W/18" X 2' LT & 4' RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END	6				
116	462+65	96° 34' 00.20" W 30° 32' 51.63" N	DRIVEWAY	RT	25	Gravel	18" X 29' CMP	REMOVE 18" CMP; REPLACE W/ 18" X 30' CMP & SET (TY II) (18 IN) (CMP) (6:1) (P) EA END	29				
87	487+61	96° 33' 32.46" W 30° 32' 52.06" N	DRIVEWAY	LT	34	Gravel	24" X 42' CMP	REMOVE 2' LT / 2' RT CMP; REPLACE W/24" X 2' LT & 2' RT CMP & SET (TY II) (24IN) (CMP) (6:1) (P) EA END	4				
118	491+06	96° 33' 29.98" W 30° 32' 49.28" N	DRIVEWAY	RT	16	Grass/Dirt	NO CULVERT	NO WORK					
406	491+34	96° 33' 29.72" W 30° 32' 49.11" N	DRIVEWAY	RT	14	Grass/Dirt	NO CULVERT	NO WORK					
89	496+60	96° 33' 24.42" W 30° 32' 46.56" N	DRIVEWAY	LT	30	Asphalt	18" X 43' CMP	REMOVE 2' LT / 2' RT CMP; REPLACE W/18" X 2' LT & 2' RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END	4				
91	498+22	96° 33' 22.90" W 30° 32' 45.64" N	DRIVEWAY	LT	12	Gravel	18" X 22' CMP	REMOVE 2' LT CMP; REPLACE W/ 18" X 2' LT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END	2				
FM 166 (CSJ: 0955-01-027) SHEET 16 OF 32 SUBTOTAL									113	0	0	0	0

NOTES:

1. A FULL TOPOGRAPHIC SURVEY WAS NOT PERFORMED. THE LOCATIONS SHOWN ARE APPROXIMATE AND MUST BE VERIFIED BY THE CONTRACTOR PRIOR TO COMMENCEMENT OF WORK.
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* CAST IN PLACE S.E.T.
ALL OTHER S.E.T.'S MAY BE PRECAST OR CIP

DESIGN

STATE OF TEXAS — HEATHER McNEAL — 114428 — LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS — DAN THOMA — 98622 — LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

PRINT DATE	REVISION DATE
3/31/2021	

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2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

SUMMARY OF DRIVEWAYS

SHEET 16 OF 32 SHEETS

FED. RD. DIV.NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	25

SUMMARY OF DRIVEWAYS AND SIDE ROADS

DRWY NUM	STATION	LOCATION	REMARKS	OFFSET	EXIST DRIVE WAY WIDTH	EXIST DRIVEWAY SURFACE MATERIAL	CULVERT DESCRIPTION		ITEM 132	ITEM 162	ITEM 400			ITEM 462	ITEM 460			ITEM 464					ITEM 467														
							EXISTING	PROPOSED WORK	EMBANK-MENT (VEHICLE) (DENS CONT) (TY C)	BLOCK SODDING	CUT & RESTORE			CONC BOX CULV	CMP (GAL STL)			RC PIPE (CL III)					SET (PIPE RUNNER ASSEMBLY)	SET (TY II) (CMP) (6:1) (P)					SET (TY II) (HDPE) (6:1) (P)	SET (TY I) (6:1) (P)	SET (TY II) (RCP) (6:1) (P)						
											ASPH PAVING	CONC PAVING	PAV (FLEX BASE)	(4FT X 2FT)	(18 IN)	(24 IN)	(36 IN)	(15 IN)	(18 IN)	(24 IN)	(30 IN)	(36 IN)		(15 IN)	(18 IN)	(24 IN)	(30 IN)	(36 IN)	(30 IN)	(4FT X 2FT)	(15 IN)	(18 IN)	(24 IN)	(30 IN)	(36 IN)
					LF				CY	SY	SY	SY	SY	LF	LF	LF	LF	LF	LF	LF	LF	LF	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA
(FM 166) (CSJ: 0955-01-027)																																			
120	499+10	96° 33′ 22.65" W 30° 32′ 44.49" N	DRIVEWAY	RT	12	Gravel	12" X 34′ CMP	REMOVE 12" CMP; REPLACE W/ 18" X 34′ CMP & SET (TY II) (18 IN) (CMP) (6:1) (P) EA END	4	22			6		34										2										
122 *	501+69	96° 33′ 20.46" W 30° 32′ 42.81" N	DRIVEWAY	RT	14	Gravel	18" X 17′ CMP	REMOVE 2′ LT / 2′ RT CMP; REPLACE W/18" X 2′ LT & 2′ RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END	3	22			2		4										2										
124	503+27	96° 33′ 19.08" W 30° 32′ 41.80" N	DRIVEWAY	RT	12	Concrete	18" X 27′ CMP	REMOVE 2′ RT CMP; REPLACE W/ 18" X 2′ RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END		11					2										2										
126	504+79	96° 33′ 17.92" W 30° 32′ 40.68" N	DRIVEWAY	RT	20	Gravel	24" X 24′ CMP	REMOVE 2′ LT / 2′ RT CMP; REPLACE W/24" X 2′ LT & 2′ RT CMP & SET (TY II) (24IN) (CMP) (6:1) (P) EA END		26						4										2								
128	506+04	96° 33′ 16.74" W 30° 32′ 39.92" N	DRIVEWAY	RT	10	Gravel	24" X 20′ CMP W/ SETs	NO WORK																											
130	507+36	96° 33′ 15.51" W 30° 32′ 39.13" N	DRIVEWAY	RT	11	Gravel	18" X 25′ RCP	REMOVE 4′ RT RCP; REPLACE W/ 18" X 4′ RT RCP & SET (TY II) (18IN) (RCP) (6:1) (P) EA END		13								4													2			
132	512+14	96° 33′ 11.11" W 30° 32′ 36.32" N	DRIVEWAY	RT	16	Gravel	18" X 25′ CMP	REMOVE 2′ LT / 2′ RT CMP; REPLACE W/18" X 2′ LT & 2′ RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END		22					4										2										
93	512+26	96° 33′ 10.54" W 30° 32′ 36.81" N	DRIVEWAY	LT	13	Gravel	8" X 25′ CMP	REMOVE 8" CMP; REPLACE W/ 18" X 26′ CMP & SET (TY II) (18 IN) (CMP) (6:1) (P) EA END	3	22			6		26										2										
95	515+72	96° 33′ 07.31" W 30° 32′ 34.83" N	DRIVEWAY	LT	20	Gravel	24" X 46′ CMP	REMOVE 2′ LT CMP; REPLACE W/ 24" X 2′ LT CMP & SET (TY II) (24IN) (CMP) (6:1) (P) EA END		13						2										2								
134	517+58	96° 33′ 05.93" W 30° 32′ 33.26" N	BRAZOS WAY	RT	29	Concrete	18" X 37′ CMP	REMOVE SETs ; REPLACE W/18" X 4′ LT & 4′ RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END		22					8										2										
97	521+07	96° 33′ 01.97" W 30° 32′ 32.72" N	DRIVEWAY	LT	16	Grass/Dirt	NO CULVERT	NO WORK																											
136	521+31	96° 33′ 01.73" W 30° 32′ 32.10" N	DRIVEWAY	RT	11	Gravel	18" X 27′ CMP	REMOVE 2′ RT CMP; REPLACE W/ 18" X 2′ RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END		11					2										2										
99	524+13	96° 32′ 58.64" W 30° 32′ 33.18" N	DRIVEWAY	LT	14	Gravel	NO CULVERT	NO WORK																											
138	524+70	96° 32′ 57.86" W 30° 32′ 32.70" N	CO RD 248	RT	19	Asphalt	18" X 30′ CMP W/ SETs	NO WORK																											
FM 166 (CSJ: 0955-01-027) SHEET 17 OF 32 SUBTOTAL									10	184	0	0	14	0	80	6	0	0	4	0	0	0	0	0	14	4	0	0	0	0	0	2	0	0	0

NOTES:

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2. PROVIDE 12" DEEP TOEWALLS FOR ALL S.E.T.'S
3. SEE SWPPP SUMMARIES FOR SEEDING, VEGETATIVE WATERING, AND SOIL RETENTION BLANKETS QUANTITIES.
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   - ≥36" PIPE = 16 SY BLOCK SOD

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ALL OTHER S.E.T.'S MAY BE PRECAST OR CIP

DESIGN

STATE OF TEXAS · HEATHER McNEAL · 114428 · LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS · DAN THOMA · 98622 · LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

PRINT DATE	REVISION DATE
3/31/2021	

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

SUMMARY OF DRIVEWAYS

SHEET 17 OF 32 SHEETS

FED. RD. DIV.NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166
STATE	DISTRICT	COUNTY
TEXAS	BRY	BURLESON
CONTROL	SECTION	JOB / SHEET NO.
0955	01	027 / 26

Plotted on: 3/31/2021

Design Filename: P:\120\96\01\Design\027 FM 166\Civil\Summaries\1209601_Sum01.dgn

SUMMARY OF DRIVEWAYS AND SIDE ROADS

DRWY NUM	STATION	LOCATION	REMARKS	OFFSET	EXIST DRIVE WAY WIDTH	EXIST DRIVEWAY SURFACE MATERIAL	CULVERT DESCRIPTION		ITEM 496			BID ALTERNATIVES	
												ITEM 401	ITEM 4122
							EXISTING	PROPOSED WORK	REMOV STR (PIPE)	REMOV STR (SET)	REMOV STR (BOX CULVERT)	FLOWABLE BACKFILL	THERMOPLASTIC PIPE (18 IN)
					LF				LF	EA	LF	CY	LF
(FM 166) (CSJ: 0955-01-027)													
120	499+10	96° 33′ 22.65" W 30° 32′ 44.49" N	DRIVEWAY	RT	12	Gravel	12" X 34′ CMP	REMOVE 12" CMP; REPLACE W/ 18" X 34′ CMP & SET (TY II) (18 IN) (CMP) (6:1) (P) EA END	34				
* 122	501+69	96° 33′ 20.46" W 30° 32′ 42.81" N	DRIVEWAY	RT	14	Gravel	18" X 17′ CMP	REMOVE 2′ LT / 2′ RT CMP; REPLACE W/18" X 2′ LT & 2′ RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END	4				
124	503+27	96° 33′ 19.08" W 30° 32′ 41.80" N	DRIVEWAY	RT	12	Concrete	18" X 27′ CMP	REMOVE 2′ RT CMP; REPLACE W/ 18" X 2′ RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END	2				
126	504+79	96° 33′ 17.92" W 30° 32′ 40.68" N	DRIVEWAY	RT	20	Gravel	24" X 24′ CMP	REMOVE 2′ LT / 2′ RT CMP; REPLACE W/24" X 2′ LT & 2′ RT CMP & SET (TY II) (24IN) (CMP) (6:1) (P) EA END	4				
128	506+04	96° 33′ 16.74" W 30° 32′ 39.92" N	DRIVEWAY	RT	10	Gravel	24" X 20′ CMP W/ SETs	NO WORK					
130	507+36	96° 33′ 15.51" W 30° 32′ 39.13" N	DRIVEWAY	RT	11	Gravel	18" X 25′ RCP	REMOVE 4′ RT RCP; REPLACE W/ 18" X 4′ RT RCP & SET (TY II) (18IN) (RCP) (6:1) (P) EA END	4				
132	512+14	96° 33′ 11.11" W 30° 32′ 36.32" N	DRIVEWAY	RT	16	Gravel	18" X 25′ CMP	REMOVE 2′ LT / 2′ RT CMP; REPLACE W/18" X 2′ LT & 2′ RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END	4				
93	512+26	96° 33′ 10.54" W 30° 32′ 36.81" N	DRIVEWAY	LT	13	Gravel	8" X 25′ CMP	REMOVE 8" CMP; REPLACE W/ 18" X 26′ CMP & SET (TY II) (18 IN) (CMP) (6:1) (P) EA END	25				
95	515+72	96° 33′ 07.31" W 30° 32′ 34.83" N	DRIVEWAY	LT	20	Gravel	24" X 46′ CMP	REMOVE 2′ LT CMP; REPLACE W/ 24" X 2′ LT CMP & SET (TY II) (24IN) (CMP) (6:1) (P) EA END	2				
134	517+58	96° 33′ 05.93" W 30° 32′ 33.26" N	BRAZOS WAY	RT	29	Concrete	18" X 37′ CMP	REMOVE SETs ; REPLACE W/18" X 4′ LT & 4′ RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END		2			
97	521+07	96° 33′ 01.97" W 30° 32′ 32.72" N	DRIVEWAY	LT	16	Grass/Dirt	NO CULVERT	NO WORK					
136	521+31	96° 33′ 01.73" W 30° 32′ 32.10" N	DRIVEWAY	RT	11	Gravel	18" X 27′ CMP	REMOVE 2′ RT CMP; REPLACE W/ 18" X 2′ RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END	2				
99	524+13	96° 32′ 58.64" W 30° 32′ 33.18" N	DRIVEWAY	LT	14	Gravel	NO CULVERT	NO WORK					
138	524+70	96° 32′ 57.86" W 30° 32′ 32.70" N	CO RD 248	RT	19	Asphalt	18" X 30′ CMP W/ SETs	NO WORK					
FM 166 (CSJ: 0955-01-027) SHEET 18 OF 32 SUBTOTAL									81	2	0	0	0

NOTES:

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ALL OTHER S.E.T.'S MAY BE PRECAST OR CIP

DESIGN

STATE OF TEXAS — HEATHER McNEAL — 114428 — LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS — DAN THOMA — 98622 — LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

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SUMMARY OF DRIVEWAYS

SHEET 18 OF 32 SHEETS

FED. RD. DIV.NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	27

Plotted on: 3/31/2021

Design Filename: P:\120\96\01\Design\027 FM 166\Civil\Summaries\1209601_Sum01.dgn

SUMMARY OF DRIVEWAYS AND SIDE ROADS

DRWY NUM	STATION	LOCATION	REMARKS	OFFSET	EXIST DRIVE WAY WIDTH	EXIST DRIVEWAY SURFACE MATERIAL	CULVERT DESCRIPTION		ITEM 132	ITEM 162	ITEM 400			ITEM 462	ITEM 460			ITEM 464					ITEM 467															
							EXISTING	PROPOSED WORK	EMBANK-MENT (VEHICLE) (DENS CONT) (TY C)	BLOCK SODDING	CUT & RESTORE			CONC BOX CULV	CMP (GAL STL)			RC PIPE (CL III)					SET (PIPE RUNNER ASSEMBLY)	SET (TY II) (CMP) (6:1) (P)					SET (TY II) (HDPE) (6:1) (P)	SET (TY I) (6:1) (P)	SET (TY II) (RCP) (6:1) (P)							
											ASPH PAVING	CONC PAVING	PAV (FLEX BASE)	(4FT X 2FT)	(18 IN)	(24 IN)	(36 IN)	(15 IN)	(18 IN)	(24 IN)	(30 IN)	(36 IN)		(15 IN)	(18 IN)	(24 IN)	(30 IN)	(36 IN)	(30 IN)	(4FT X 2FT)	(15 IN)	(18 IN)	(24 IN)	(30 IN)	(36 IN)
					LF				CY	SY	SY	SY	SY	LF	LF	LF	LF	LF	LF	LF	LF	LF	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA
(FM 166) (CSJ: 0955-01-027)																																				
101	525+06	96° 32′ 57.56" W 30° 32′ 33.33" N	DRIVEWAY	LT	12	Gravel	NO CULVERT	NO WORK																												
103	526+71	96° 32′ 55.67" W 30° 32′ 33.67" N	DRIVEWAY	LT	23	Grass/Dirt	NO CULVERT	NO WORK																												
105	528+64	96° 32′ 53.47" W 30° 32′ 33.71" N	DRIVEWAY	LT	17	Gravel	18" X 27′ CMP	REMOVE 2′ LT / 2′ RT CMP; REPLACE W/18" X 2′ LT & 2′ RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END		22					4									2										
107	533+61	96° 32′ 47.75" W 30° 32′ 33.93" N	DRIVEWAY	LT	22	Gravel	15" X 34′ CMP	INSTALL SET (TY II) (15IN) (CMP) (6:1) (P) EA END																2											
109	537+15	96° 32′ 43.81" W 30° 32′ 34.06" N	DRIVEWAY	LT	17	Gravel	18" X 27′ CMP	INSTALL SET (TY II) (18IN) (CMP) (6:1) (P) EA END																	2										
140	541+28	96° 32′ 39.05" W 30° 32′ 34.37" N	DRIVEWAY	RT	28	Gravel	18" X 44′ CMP W/ SETs	NO WORK																												
111	543+74	96° 32′ 36.49" W 30° 32′ 35.59" N	DRIVEWAY	LT	13	Gravel	18" X 30′ CMP	INSTALL SET (TY II) (18IN) (CMP) (6:1) (P) EA END																	2										
142	543+90	96° 32′ 36.13" W 30° 32′ 34.99" N	DRIVEWAY	RT	12	Gravel	12" X 16′ RCP	REMOVE 12" RCP; REPLACE W/ 18" X 16′ RCP & SET (TY II) (18 IN) (RCP) (6:1) (P) EA END	3	22			6					16													2			
113 *	544+77	96° 32′ 35.36" W 30° 32′ 35.87" N	DRIVEWAY	LT	13	Gravel	18" X 20′ CMP	REMOVE 2′ LT / 2′ RT CMP; REPLACE W/18" X 2′ LT & 2′ RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END		22					4									2										
115	546+17	96° 32′ 33.79" W 30° 32′ 36.14" N	DRIVEWAY	LT	18	Gravel	18" X 25′ CMP W/ SETs	NO WORK																												
117 *	548+17	96° 32′ 31.58" W 30° 32′ 36.63" N	DRIVEWAY	LT	14	Gravel	12" X 19′ CMP	REMOVE 12" CMP; REPLACE W/ 18" X 20′ CMP & SET (TY II) (18 IN) (CMP) (6:1) (P) EA END	3	22			7		20									2										
119 *	548+66	96° 32′ 31.04" W 30° 32′ 36.77" N	DRIVEWAY	LT	16	Gravel	15" X 22′ RCP	REMOVE 15" RCP; REPLACE W/ 18" X 22′ RCP & SET (TY II) (18 IN) (RCP) (6:1) (P) EA END	4	22			8					22													2			
121	549+44	96° 32′ 30.17" W 30° 32′ 36.94" N	DRIVEWAY	LT	10	Gravel	18" X 25′ CMP	REMOVE 2′ LT / 2′ RT CMP; REPLACE W/18" X 2′ LT & 2′ RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END		22					4									2										
305	550+39	96° 32′ 29.11" W 30° 32′ 37.15" N	DRIVEWAY	LT	17	Gravel	NO CULVERT	NO WORK																												
FM 166 (CSJ: 0955-01-027) SHEET 19 OF 32 SUBTOTAL									10	132	0	0	21	0	32	0	0	0	38	0	0	0	0	2	12	0	0	0	0	0	0	4	0	0	0

NOTES:

1. A FULL TOPOGRAPHIC SURVEY WAS NOT PERFORMED. THE LOCATIONS SHOWN ARE APPROXIMATE AND MUST BE VERIFIED BY THE CONTRACTOR PRIOR TO COMMENCEMENT OF WORK.
2. PROVIDE 12" DEEP TOEWALLS FOR ALL S.E.T.'S
3. SEE SWPPP SUMMARIES FOR SEEDING, VEGETATIVE WATERING, AND SOIL RETENTION BLANKETS QUANTITIES.
4. BLOCK SODDING BASED ON CULVERT DIAMETER ON EACH END:
   - ≤18" PIPE = 11 SY BLOCK SOD
   - 24" PIPE = 13 SY BLOCK SOD
   - 30" PIPE = 15 SY BLOCK SOD
   - ≥36" PIPE = 16 SY BLOCK SOD

* CAST IN PLACE S.E.T.
ALL OTHER S.E.T.'S MAY BE PRECAST OR CIP

DESIGN

STATE OF TEXAS · HEATHER McNEAL · 114428 · LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS · DAN THOMA · 98622 · LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

PRINT DATE	REVISION DATE
3/31/2021	

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

SUMMARY OF DRIVEWAYS

SHEET 19 OF 32 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY
TEXAS	BRY	BURLESON

CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	28

Plotted on: 3/31/2021

Design Filename: P:\120\96\01\Design\027 FM 166\Civil\Summaries\1209601_Sum01.dgn

Plotted on: 3/31/2021

Design Filename: P:\120\96\01\Design\027 FM 166\Civil\Summaries\1209601_Sum01.dgn

SUMMARY OF DRIVEWAYS AND SIDE ROADS

DRWY NUM	STATION	LOCATION	REMARKS	OFFSET	EXIST DRIVE WAY WIDTH	EXIST DRIVEWAY SURFACE MATERIAL	CULVERT DESCRIPTION		ITEM 496			BID ALTERNATIVES	
												ITEM 401	ITEM 4122
							EXISTING	PROPOSED WORK	REMOV STR (PIPE)	REMOV STR (SET)	REMOV STR (BOX CULVERT)	FLOWABLE BACKFILL	THERMOPLASTIC PIPE (18 IN)
					LF				LF	EA	LF	CY	LF
(FM 166) (CSJ: 0955-01-027)													
101	525+06	96° 32′ 57.56" W 30° 32′ 33.33" N	DRIVEWAY	LT	12	Gravel	NO CULVERT	NO WORK					
103	526+71	96° 32′ 55.67" W 30° 32′ 33.67" N	DRIVEWAY	LT	23	Grass/Dirt	NO CULVERT	NO WORK					
105	528+64	96° 32′ 53.47" W 30° 32′ 33.71" N	DRIVEWAY	LT	17	Gravel	18" X 27′ CMP	REMOVE 2′ LT / 2′ RT CMP; REPLACE W/18" X 2′ LT & 2′ RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END	4				
107	533+61	96° 32′ 47.75" W 30° 32′ 33.93" N	DRIVEWAY	LT	22	Gravel	15" X 34′ CMP	INSTALL SET (TY II) (15IN) (CMP) (6:1) (P) EA END					
109	537+15	96° 32′ 43.81" W 30° 32′ 34.06" N	DRIVEWAY	LT	17	Gravel	18" X 27′ CMP	INSTALL SET (TY II) (18IN) (CMP) (6:1) (P) EA END					
140	541+28	96° 32′ 39.05" W 30° 32′ 34.37" N	DRIVEWAY	RT	28	Gravel	18" X 44′ CMP W/ SETs	NO WORK					
111	543+74	96° 32′ 36.49" W 30° 32′ 35.59" N	DRIVEWAY	LT	13	Gravel	18" X 30′ CMP	INSTALL SET (TY II) (18IN) (CMP) (6:1) (P) EA END					
142	543+90	96° 32′ 36.13" W 30° 32′ 34.99" N	DRIVEWAY	RT	12	Gravel	12" X 16′ RCP	REMOVE 12" RCP; REPLACE W/ 18" X 16′ RCP & SET (TY II) (18 IN) (RCP) (6:1) (P) EA END	16				
* 113	544+77	96° 32′ 35.36" W 30° 32′ 35.87" N	DRIVEWAY	LT	13	Gravel	18" X 20′ CMP	REMOVE 2′ LT / 2′ RT CMP; REPLACE W/18" X 2′ LT & 2′ RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END	4				
115	546+17	96° 32′ 33.79" W 30° 32′ 36.14" N	DRIVEWAY	LT	18	Gravel	18" X 25′ CMP W/ SETs	NO WORK					
* 117	548+17	96° 32′ 31.58" W 30° 32′ 36.63" N	DRIVEWAY	LT	14	Gravel	12" X 19′ CMP	REMOVE 12" CMP; REPLACE W/ 18" X 20′ CMP & SET (TY II) (18 IN) (CMP) (6:1) (P) EA END	19				
* 119	548+66	96° 32′ 31.04" W 30° 32′ 36.77" N	DRIVEWAY	LT	16	Gravel	15" X 22′ RCP	REMOVE 15" RCP; REPLACE W/ 18" X 22′ RCP & SET (TY II) (18 IN) (RCP) (6:1) (P) EA END	22				
121	549+44	96° 32′ 30.17" W 30° 32′ 36.94" N	DRIVEWAY	LT	10	Gravel	18" X 25′ CMP	REMOVE 2′ LT / 2′ RT CMP; REPLACE W/18" X 2′ LT & 2′ RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END	4				
305	550+39	96° 32′ 29.11" W 30° 32′ 37.15" N	DRIVEWAY	LT	17	Gravel	NO CULVERT	NO WORK					
FM 166 (CSJ: 0955-01-027) SHEET 20 OF 32 SUBTOTAL									69	0	0	0	0

NOTES:

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2. PROVIDE 12" DEEP TOEWALLS FOR ALL S.E.T.'S
3. SEE SWPPP SUMMARIES FOR SEEDING, VEGETATIVE WATERING, AND SOIL RETENTION BLANKETS QUANTITIES.
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   - ≤18" PIPE = 11 SY BLOCK SOD
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   - 30" PIPE = 15 SY BLOCK SOD
   - ≥36" PIPE = 16 SY BLOCK SOD

* CAST IN PLACE S.E.T.
ALL OTHER S.E.T.'S MAY BE PRECAST OR CIP

DESIGN

STATE OF TEXAS — HEATHER McNEAL — 114428 — LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS — DAN THOMA — 98622 — LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

PRINT DATE	REVISION DATE
3/31/2021	

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

SUMMARY OF DRIVEWAYS

SHEET 20 OF 32 SHEETS

FED. RD. DIV.NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY
TEXAS	BRY	BURLESON

CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	29

SUMMARY OF DRIVEWAYS AND SIDE ROADS

DRWY NUM	STATION	LOCATION	REMARKS	OFFSET	EXIST DRIVE WAY WIDTH	EXIST DRIVEWAY SURFACE MATERIAL	CULVERT DESCRIPTION		ITEM 132	ITEM 162	ITEM 400			ITEM 462	ITEM 460			ITEM 464					ITEM 467															
							EXISTING	PROPOSED WORK	EMBANK-MENT (VEHICLE) (DENS CONT) (TY C)	BLOCK SODDING	CUT & RESTORE			CONC BOX CULV	CMP (GAL STL)			RC PIPE (CL III)					SET (PIPE RUNNER ASSEMBLY)	SET (TY II) (CMP) (6:1) (P)					SET (TY II) (HDPE) (6: 1) (P)	SET (TY I) (6:1) (P)	SET(TY II) (RCP) (6:1) (P)						
											ASPH PAVING	CONC PAVING	PAV (FLEX BASE)	(4FT X 2FT)	(18 IN)	(24 IN)	(36 IN)	(15 IN)	(18 IN)	(24 IN)	(30 IN)	(36 IN)		(15 IN)	(18 IN)	(24 IN)	(30 IN)	(36 IN)	(30 IN)	(4FT X 2FT)	(15 IN)	(18 IN)	(24 IN)	(30 IN)	(36 IN)
					LF				CY	SY	SY	SY	SY	LF	LF	LF	LF	LF	LF	LF	LF	LF	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA
(FM 166) (CSJ: 0955-01-027)																																				
144	550+73	96° 32' 28.56" W 30° 32' 36.67" N	DRIVEWAY	RT	46	Grass/Dirt	18" X 56' CMP	REMOVE 18" CMP; REPLACE W/ 18" X 56' CMP & SET (TY II) (18 IN) (CMP) (6:1) (P) EA END		22					56										2										
413	550+99	96° 32' 28.45" W 30° 32' 37.33" N	DRIVEWAY	LT	12	Gravel	NO CULVERT	NO WORK																												
123	551+27	96° 32' 28.14" W 30° 32' 37.41" N	DRIVEWAY	LT	15	Gravel	NO CULVERT	NO WORK																												
125	551+60	96° 32' 27.78" W 30° 32' 37.49" N	DRIVEWAY	LT	16	Gravel	NO CULVERT	NO WORK																												
146	552+38	96° 32' 26.69" W 30° 32' 36.91" N	DRIVEWAY	RT	38	Asphalt	18" X 42' CMP W/ SETs	NO WORK																												
127	553+79	96° 32' 25.36" W 30° 32' 38.03" N	CO RD 251	LT	16	Gravel	15" X 21' RCP	REMOVE 4' LT / 4' RT RCP; REPLACE W/15" X 8' LT & 8' RT RCP (CL III) & SET (TY II) (15IN) (RCP) (6:1) (P) EA END	3	22			2					16												2					
129	556+74	96° 32' 22.09" W 30° 32' 38.84" N	CO RD 249	LT	20	Asphalt	NO CULVERT	NO WORK																												
131	558+99	96° 32' 19.49" W 30° 32' 39.06" N	DRIVEWAY	LT	14	Gravel	18" X 19' CMP W/ SETs	NO WORK																												
133	565+06	96° 32' 12.55" W 30° 32' 39.59" N	DRIVEWAY	LT	20	Grass/Dirt	NO CULVERT	NO WORK																												
307	565+76	96° 32' 11.29" W 30° 32' 39.64" N	DRIVEWAY	LT	10	Grass/Dirt	15" X 12' RCP	REMOVE 15" RCP; REPLACE W/ 18" X 20' RCP & SET (TY II) (18 IN) (RCP) (6:1) (P) EA END	2	22								20												2					
135	567+40	96° 32' 09.89" W 30° 32' 39.77" N	DRIVEWAY	LT	14	Gravel	18" X 28' RCP	REMOVE 4' LT / 4' RT RCP; REPLACE W/18" X 4' LT & 4' RT RCP (CL III) & SET (TY II) (18IN) (RCP) (6:1) (P) EA END		22								8												2					
148	568+74	96° 32' 08.29" W 30° 32' 39.09" N	DRIVEWAY	RT	22	Gravel	18" X 45' CMP	REMOVE 2' RT CMP; REPLACE W/ 18" X 2' RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END		11					2										2										
137	573+31	96° 32' 03.13" W 30° 32' 40.06" N	DRIVEWAY	LT	14	Gravel	18" X 20' RCP	REMOVE 4' LT RCP; REPLACE W/ 18" X 8' LT RCP (CL III) & SET (TY II) (18IN) (RCP) (6:1) (P) EA END	3	11			1					8												2					
139	575+39	96° 32' 00.75" W 30° 32' 40.14" N	DRIVEWAY	LT	20	Gravel	24" X 24' CMP W/ SETs	INSTALL SET (TY II) (24IN) (CMP) (6:1) (P) EA END																												
FM 166 (CSJ: 0955-01-027) SHEET 21 OF 32 SUBTOTAL									8	110	0	0	3	0	58	0	0	16	36	0	0	0	0	0	4	2	0	0	0	0	2	6	0	0	0

NOTES:

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2. PROVIDE 12" DEEP TOEWALLS FOR ALL S.E.T.'S
3. SEE SWPPP SUMMARIES FOR SEEDING, VEGETATIVE WATERING, AND SOIL RETENTION BLANKETS QUANTITIES.
4. BLOCK SODDING BASED ON CULVERT DIAMETER ON EACH END:
   - ≤18" PIPE = 11 SY BLOCK SOD
   - 24" PIPE = 13 SY BLOCK SOD
   - 30" PIPE = 15 SY BLOCK SOD
   - ≥36" PIPE = 16 SY BLOCK SOD

* CAST IN PLACE S.E.T.
ALL OTHER S.E.T.'S MAY BE PRECAST OR CIP

DESIGN

STATE OF TEXAS · HEATHER McNEAL · 114428 · LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS · DAN THOMA · 98622 · LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

PRINT DATE	REVISION DATE
3/31/2021	

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

SUMMARY OF DRIVEWAYS

SHEET 21 OF 32 SHEETS

FED. RD. DIV.NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166
STATE	DISTRICT	COUNTY
TEXAS	BRY	BURLESON
CONTROL	SECTION	JOB / SHEET NO.
0955	01	027 / 30

Plotted on: 3/31/2021

Design Filename: P:\120\96\01\Design\027 FM 166\Civil\Summaries\1209601_Sum01.dgn

Plotted on: 3/31/2021

Design Filename: P:\120\96\01\Design\027 FM 166\Civil\Summaries\1209601_Sum01.dgn

SUMMARY OF DRIVEWAYS AND SIDE ROADS

DRWY NUM	STATION	LOCATION	REMARKS	OFFSET	EXIST DRIVE WAY WIDTH	EXIST DRIVEWAY SURFACE MATERIAL	CULVERT DESCRIPTION		ITEM 496			BID ALTERNATIVES	
												ITEM 401	ITEM 4122
							EXISTING	PROPOSED WORK	REMOV STR (PIPE)	REMOV STR (SET)	REMOV STR (BOX CULVERT)	FLOWABLE BACKFILL	THERMOPLASTIC PIPE (18 IN)
					LF				LF	EA	LF	CY	LF
(FM 166) (CSJ: 0955-01-027)													
144	550+73	96° 32′ 28.56" W 30° 32′ 36.67" N	DRIVEWAY	RT	46	Grass/Dirt	18" X 56′ CMP	REMOVE 18" CMP; REPLACE W/ 18" X 56′ CMP & SET (TY II) (18 IN) (CMP) (6:1) (P) EA END	56				
413	550+99	96° 32′ 28.45" W 30° 32′ 37.33" N	DRIVEWAY	LT	12	Gravel	NO CULVERT	NO WORK					
123	551+27	96° 32′ 28.14" W 30° 32′ 37.41" N	DRIVEWAY	LT	15	Gravel	NO CULVERT	NO WORK					
125	551+60	96° 32′ 27.78" W 30° 32′ 37.49" N	DRIVEWAY	LT	16	Gravel	NO CULVERT	NO WORK					
146	552+38	96° 32′ 26.69" W 30° 32′ 36.91" N	DRIVEWAY	RT	38	Asphalt	18" X 42′ CMP W/ SETs	NO WORK					
127	553+79	96° 32′ 25.36" W 30° 32′ 38.03" N	CO RD 251	LT	16	Gravel	15" X 21′ RCP	REMOVE 4′ LT / 4′ RT RCP; REPLACE W/15" X 8′ LT & 8′ RT RCP (CL III) & SET (TY II) (15IN) (RCP) (6:1) (P) EA END	8				
129	556+74	96° 32′ 22.09" W 30° 32′ 38.84" N	CO RD 249	LT	20	Asphalt	NO CULVERT	NO WORK					
131	558+99	96° 32′ 19.49" W 30° 32′ 39.06" N	DRIVEWAY	LT	14	Gravel	18" X 19′ CMP W/ SETs	NO WORK					
133	565+06	96° 32′ 12.55" W 30° 32′ 39.59" N	DRIVEWAY	LT	20	Grass/Dirt	NO CULVERT	NO WORK					
307	565+76	96° 32′ 11.29" W 30° 32′ 39.64" N	DRIVEWAY	LT	10	Grass/Dirt	15" X 12′ RCP	REMOVE 15" RCP; REPLACE W/ 18" X 20′ RCP & SET (TY II) (18 IN) (RCP) (6:1) (P) EA END	12				
135	567+40	96° 32′ 09.89" W 30° 32′ 39.77" N	DRIVEWAY	LT	14	Gravel	18" X 28′ RCP	REMOVE 4′ LT / 4′ RT RCP; REPLACE W/18" X 4′ LT & 4′ RT RCP (CL III) & SET (TY II) (18IN) (RCP) (6:1) (P) EA END	8				
148	568+74	96° 32′ 08.29" W 30° 32′ 39.09" N	DRIVEWAY	RT	22	Gravel	18" X 45′ CMP	REMOVE 2′ RT CMP; REPLACE W/ 18" X 2′ RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END	2				
137	573+31	96° 32′ 03.13" W 30° 32′ 40.06" N	DRIVEWAY	LT	14	Gravel	18" X 20′ RCP	REMOVE 4′ LT RCP; REPLACE W/ 18" X 8′ LT RCP (CL III) & SET (TY II) (18IN) (RCP) (6:1) (P) EA END	4				
139	575+39	96° 32′ 00.75" W 30° 32′ 40.14" N	DRIVEWAY	LT	20	Gravel	24" X 24′ CMP W/ SETs	INSTALL SET (TY II) (24IN) (CMP) (6:1) (P) EA END					
FM 166 (CSJ: 0955-01-027) SHEET 22 OF 32 SUBTOTAL									90	0	0	0	0

NOTES:

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* CAST IN PLACE S.E.T.
ALL OTHER S.E.T.'S MAY BE PRECAST OR CIP

DESIGN

STATE OF TEXAS — HEATHER McNEAL — 114428 — LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS — DAN THOMA — 98622 — LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

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TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

SUMMARY OF DRIVEWAYS

SHEET 22 OF 32 SHEETS

FED. RD. DIV.NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	31

Plotted on: 3/31/2021

Design Filename: P:\120\96\01\Design\027 FM 166\Civil\Summaries\1209601_Sum01.dgn

SUMMARY OF DRIVEWAYS AND SIDE ROADS

DRWY NUM	STATION	LOCATION	REMARKS	OFFSET	EXIST DRIVE WAY WIDTH	EXIST DRIVEWAY SURFACE MATERIAL	CULVERT DESCRIPTION		ITEM 132	ITEM 162	ITEM 400			ITEM 462	ITEM 460			ITEM 464					ITEM 467															
							EXISTING	PROPOSED WORK	EMBANK-MENT (VEHICLE) (DENS CONT) (TY C)	BLOCK SODDING	CUT & RESTORE			CONC BOX CULV	CMP (GAL STL)			RC PIPE (CL III)					SET (PIPE RUNNER ASSEMBLY)	SET (TY II) (CMP) (6:1) (P)					SET (TY II) (HDPE) (6:1) (P)	SET (TY I) (6:1) (P)	SET (TY II) (RCP) (6:1) (P)						
											ASPH PAVING	CONC PAVING	PAV (FLEX BASE)	(4FT X 2FT)	(18 IN)	(24 IN)	(36 IN)	(15 IN)	(18 IN)	(24 IN)	(30 IN)	(36 IN)		(15 IN)	(18 IN)	(24 IN)	(30 IN)	(36 IN)	(30 IN)	(4FT X 2FT)	(15 IN)	(18 IN)	(24 IN)	(30 IN)	(36 IN)
					LF				CY	SY	SY	SY	SY	LF	LF	LF	LF	LF	LF	LF	LF	LF	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA
(FM 166) (CSJ: 0955-01-027)																																				
308	576+26	96° 31′ 59.72" W 30° 32′ 39.54" N	DRIVEWAY	RT	83	Asphalt	NO CULVERT	NO WORK																													
150	576+95	96° 31′ 58.94" W 30° 32′ 39.56" N	DRIVEWAY	RT	30	Asphalt	NO CULVERT	NO WORK																													
*141	580+50	96° 31′ 54.91" W 30° 32′ 40.41" N	DRIVEWAY	LT	11	Gravel	15" X 15′ RCP	REMOVE 15" RCP; REPLACE W/ 24" X 16′ RCP & SET (TY II) (24 IN) (RCP) (6:1) (P) EA END	3	26			6							16												2					
*143	580+94	96° 31′ 54.42" W 30° 32′ 40.43" N	DRIVEWAY	LT	15	Asphalt	24" X 20′ CMP	REMOVE 2′ LT / 4′ RT CMP; REPLACE W/24" X 2′ LT & 4′ RT CMP & SET (TY II) (24IN) (CMP) (6:1) (P) EA END	4	26	1					6										2											
152	582+91	96° 31′ 52.08" W 30° 32′ 40.02" N	CO RD 253	RT	15	Asphalt	NO CULVERT	NO WORK																													
145	587+50	96° 31′ 47.30" W 30° 32′ 42.14" N	DRIVEWAY	LT	20	Gravel	NO CULVERT	NO WORK																													
147	590+04	96° 31′ 44.35" W 30° 32′ 42.37" N	DRIVEWAY	LT	15	Gravel	NO CULVERT	NO WORK																													
407	590+82	96° 31′ 43.45" W 30° 32′ 42.19" N	DRIVEWAY	LT	15	Grass/Dirt	NO CULVERT	NO WORK																													
*149	591+38	96° 31′ 42.82" W 30° 32′ 42.31" N	DRIVEWAY	LT	10	Gravel	12" X 18′ CMP	REMOVE 12" CMP; REPLACE W/ 18" X 18′ CMP & SET (TY II) (18 IN) (CMP) (6:1) (P) EA END	2	22			5		18										2											
151	592+63	96° 31′ 41.39" W 30° 32′ 42.38" N	DRIVEWAY	LT	12	Gravel	18" X 25′ RCP	REMOVE 8′ LT / 4′ RT RCP; REPLACE W/18" X 8′ LT & 4′ RT RCP (CL III) & SET (TY II) (18IN) (RCP) (6:1) (P) EA END	3	22			1					12												2					
156	594+20	96° 31′ 39.57" W 30° 32′ 41.80" N	DRIVEWAY	RT	13	Asphalt	18" X 21′ CMP W/ SETs	NO WORK																													
153	595+81	96° 31′ 37.76" W 30° 32′ 42.55" N	CO RD 252	LT	25	Asphalt	18" X 43′ CMP	REMOVE 4′ LT / 2′ RT CMP; REPLACE W/18" X 4′ LT & 2′ RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END		22					6										2											
155	597+82	96° 31′ 35.46" W 30° 32′ 42.62" N	DRIVEWAY	LT	10	Gravel	18" X 18′ CMP	REMOVE 2′ LT / 2′ RT CMP; REPLACE W/18" X 2′ LT & 2′ RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END		22					4										2											
158	598+70	96° 31′ 34.45" W 30° 32′ 41.97" N	DRIVEWAY	RT	16	Gravel	18" X 25′ RCP	REMOVE 8′ LT / 4′ RT RCP; REPLACE W/18" X 8′ LT & 4′ RT RCP (CL III) & SET (TY II) (18IN) (RCP) (6:1) (P) EA END	4	22			2					12												2					
FM 166 (CSJ: 0955-01-027) SHEET 23 OF 32 SUBTOTAL									16	162	1	0	14	0	28	6	0	0	24	16	0	0	0	0	6	2	0	0	0	0	0	4	2	0	0

NOTES:

1. A FULL TOPOGRAPHIC SURVEY WAS NOT PERFORMED. THE LOCATIONS SHOWN ARE APPROXIMATE AND MUST BE VERIFIED BY THE CONTRACTOR PRIOR TO COMMENCEMENT OF WORK.
2. PROVIDE 12" DEEP TOEWALLS FOR ALL S.E.T.'S
3. SEE SWPPP SUMMARIES FOR SEEDING, VEGETATIVE WATERING, AND SOIL RETENTION BLANKETS QUANTITIES.
4. BLOCK SODDING BASED ON CULVERT DIAMETER ON EACH END:
   - ≤18" PIPE = 11 SY BLOCK SOD
   - 24" PIPE = 13 SY BLOCK SOD
   - 30" PIPE = 15 SY BLOCK SOD
   - ≥36" PIPE = 16 SY BLOCK SOD

* CAST IN PLACE S.E.T.
ALL OTHER S.E.T.'S MAY BE PRECAST OR CIP

DESIGN

STATE OF TEXAS — HEATHER McNEAL — 114428 — LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS — DAN THOMA — 98622 — LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

PRINT DATE	REVISION DATE
3/31/2021	

PAPE-DAWSON ENGINEERS

SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

SUMMARY OF DRIVEWAYS

SHEET 23 OF 32 SHEETS

FED. RD. DIV.NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY
TEXAS	BRY	BURLESON

CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	32

SUMMARY OF DRIVEWAYS AND SIDE ROADS

DRWY NUM	STATION	LOCATION	REMARKS	OFFSET	EXIST DRIVE WAY WIDTH	EXIST DRIVEWAY SURFACE MATERIAL	CULVERT DESCRIPTION		ITEM 496			BID ALTERNATIVES	
												ITEM 401	ITEM 4122
							EXISTING	PROPOSED WORK	REMOV STR (PIPE)	REMOV STR (SET)	REMOV STR (BOX CULVERT)	FLOWABLE BACKFILL	THERMOPLASTIC PIPE (18 IN)
					LF				LF	EA	LF	CY	LF
(FM 166) (CSJ: 0955-01-027)													
308	576+26	96° 31′ 59.72" W 30° 32′ 39.54" N	DRIVEWAY	RT	83	Asphalt	NO CULVERT	NO WORK					
150	576+95	96° 31′ 58.94" W 30° 32′ 39.56" N	DRIVEWAY	RT	30	Asphalt	NO CULVERT	NO WORK					
* 141	580+50	96° 31′ 54.91" W 30° 32′ 40.41" N	DRIVEWAY	LT	11	Gravel	15" X 15′ RCP	REMOVE 15" RCP; REPLACE W/ 24" X 16′ RCP & SET (TY II) (24 IN) (RCP) (6:1) (P) EA END	15				
* 143	580+94	96° 31′ 54.42" W 30° 32′ 40.43" N	DRIVEWAY	LT	15	Asphalt	24" X 20′ CMP	REMOVE 2′ LT / 4′ RT CMP; REPLACE W/24" X 2′ LT & 4′ RT CMP & SET (TY II) (24IN) (CMP) (6:1) (P) EA END	6				
152	582+91	96° 31′ 52.08" W 30° 32′ 40.02" N	CO RD 253	RT	15	Asphalt	NO CULVERT	NO WORK					
145	587+50	96° 31′ 47.30" W 30° 32′ 42.14" N	DRIVEWAY	LT	20	Gravel	NO CULVERT	NO WORK					
147	590+04	96° 31′ 44.35" W 30° 32′ 42.37" N	DRIVEWAY	LT	15	Gravel	NO CULVERT	NO WORK					
407	590+82	96° 31′ 43.45" W 30° 32′ 42.19" N	DRIVEWAY	LT	15	Grass/Dirt	NO CULVERT	NO WORK					
* 149	591+38	96° 31′ 42.82" W 30° 32′ 42.31" N	DRIVEWAY	LT	10	Gravel	12" X 18′ CMP	REMOVE 12" CMP; REPLACE W/ 18" X 18′ CMP & SET (TY II) (18 IN) (CMP) (6:1) (P) EA END	18				
151	592+63	96° 31′ 41.39" W 30° 32′ 42.38" N	DRIVEWAY	LT	12	Gravel	18" X 25′ RCP	REMOVE 8′ LT / 4′ RT RCP; REPLACE W/18" X 8′ LT & 4′ RT RCP (CL III) & SET (TY II) (18IN) (RCP) (6:1) (P) EA END	12				
156	594+20	96° 31′ 39.57" W 30° 32′ 41.80" N	DRIVEWAY	RT	13	Asphalt	18" X 21′ CMP W/ SETs	NO WORK					
153	595+81	96° 31′ 37.76" W 30° 32′ 42.55" N	CO RD 252	LT	25	Asphalt	18" X 43′ CMP	REMOVE 4′ LT / 2′ RT CMP; REPLACE W/18" X 4′ LT & 2′ RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END	6				
155	597+82	96° 31′ 35.46" W 30° 32′ 42.62" N	DRIVEWAY	LT	10	Gravel	18" X 18′ CMP	REMOVE 2′ LT / 2′ RT CMP; REPLACE W/18" X 2′ LT & 2′ RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END	4				
158	598+70	96° 31′ 34.45" W 30° 32′ 41.97" N	DRIVEWAY	RT	16	Gravel	18" X 25′ RCP	REMOVE 8′ LT / 4′ RT RCP; REPLACE W/18" X 8′ LT & 4′ RT RCP (CL III) & SET (TY II) (18IN) (RCP) (6:1) (P) EA END	12				
FM 166 (CSJ: 0955-01-027) SHEET 24 OF 32 SUBTOTAL									73	0	0	0	0

NOTES:

1. A FULL TOPOGRAPHIC SURVEY WAS NOT PERFORMED. THE LOCATIONS SHOWN ARE APPROXIMATE AND MUST BE VERIFIED BY THE CONTRACTOR PRIOR TO COMMENCEMENT OF WORK.
2. PROVIDE 12" DEEP TOEWALLS FOR ALL S.E.T.'S
3. SEE SWPPP SUMMARIES FOR SEEDING, VEGETATIVE WATERING, AND SOIL RETENTION BLANKETS QUANTITIES.
4. BLOCK SODDING BASED ON CULVERT DIAMETER ON EACH END:
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   - 30" PIPE = 15 SY BLOCK SOD
   - ≥36" PIPE = 16 SY BLOCK SOD

* CAST IN PLACE S.E.T.
ALL OTHER S.E.T.'S MAY BE PRECAST OR CIP

DESIGN

STATE OF TEXAS — HEATHER McNEAL — 114428 — LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS — DAN THOMA — 98622 — LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

PRINT DATE	REVISION DATE
3/31/2021	

PAPE-DAWSON ENGINEERS
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TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

SUMMARY OF DRIVEWAYS

SHEET 24 OF 32 SHEETS

FED. RD. DIV.NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	33

Plotted on: 3/31/2021

Design Filename: P:\120\96\01\Design\027 FM 166\Civil\Summaries\1209601_Sum01.dgn

SUMMARY OF DRIVEWAYS AND SIDE ROADS

DRWY NUM	STATION	LOCATION	REMARKS	OFFSET	EXIST DRIVE WAY WIDTH	EXIST DRIVEWAY SURFACE MATERIAL	CULVERT DESCRIPTION		ITEM 132	ITEM 162	ITEM 400			ITEM 462	ITEM 460			ITEM 464					ITEM 467														
							EXISTING	PROPOSED WORK	EMBANK-MENT (VEHICLE) (DENS CONT) (TY C)	BLOCK SODDING	CUT & RESTORE			CONC BOX CULV	CMP (GAL STL)			RC PIPE (CL III)					SET (PIPE RUNNER ASSEMBLY)	SET (TY II) (CMP) (6:1) (P)					SET (TY II) (HDPE) (6:1) (P)	SET (TY I) (6:1) (P)	SET (TY II) (RCP) (6:1) (P)						
											ASPH PAVING	CONC PAVING	PAV (FLEX BASE)	(4FT X 2FT)	(18 IN)	(24 IN)	(36 IN)	(15 IN)	(18 IN)	(24 IN)	(30 IN)	(36 IN)		(15 IN)	(18 IN)	(24 IN)	(30 IN)	(36 IN)	(30 IN)	(4FT X 2FT)	(15 IN)	(18 IN)	(24 IN)	(30 IN)	(36 IN)
					LF				CY	SY	SY	SY	SY	LF	LF	LF	LF	LF	LF	LF	LF	LF	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA
(FM 166) (CSJ: 0955-01-027)																																			
157	599+46	96° 31′ 33.54" W 30° 32′ 42.62" N	DRIVEWAY	LT	15	Gravel	18" X 28′ CMP	INSTALL SET (TY II) (18IN) (CMP) (6:1) (P) EA END																	2										
403	600+55	96° 31′ 32.29" W 30° 32′ 42.35" N	DRIVEWAY	LT	18	Asphalt	18" X 23′ CMP	REMOVE 2′ LT / 2′ RT CMP; REPLACE W/18" X 2′ LT & 2′ RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END		22					4										2										
411	601+32	96° 31′ 31.39" W 30° 32′ 42.24" N	DRIVEWAY	LT	12	Gravel	NO CULVERT	NO WORK																												
160	601+44	96° 31′ 31.38" W 30° 32′ 41.66" N	DRIVEWAY	RT	47	Concrete	NO CULVERT	NO WORK																												
159	601+56	96° 31′ 31.12" W 30° 32′ 42.20" N	DRIVEWAY	LT	13	Gravel	NO CULVERT	NO WORK																												
161	602+99	96° 31′ 29.51" W 30° 32′ 41.98" N	DRIVEWAY	LT	12	Gravel	NO CULVERT	NO WORK																												
162	603+46	96° 31′ 29.15" W 30° 32′ 41.16" N	CO RD 296	RT	16	Gravel	24" X 26′ CMP	REMOVE 4′ LT / 4′ RT CMP; REPLACE W/24" X 4′ LT & 4′ RT CMP & SET (TY II) (24IN) (CMP) (6:1) (P) EA END		26						8										2									
163	603+79	96° 31′ 28.61" W 30° 32′ 41.79" N	DRIVEWAY	LT	10	Gravel	NO CULVERT	NO WORK																												
165	606+84	96° 31′ 25.03" W 30° 32′ 40.73" N	CO RD 229	LT	24	Asphalt	NO CULVERT	NO WORK																												
164	609+29	96° 31′ 25.87" W 30° 32′ 38.16" N	DRIVEWAY	RT	17	Grass/Dirt	18" X 26′ CMP	REMOVE 2′ LT / 2′ RT CMP; REPLACE W/18" X 2′ LT & 6′ RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END		22					8										2									
166	613+79	96° 31′ 26.39" W 30° 32′ 33.61" N	DRIVEWAY	RT	17	Asphalt	18" X 46′ CMP	REMOVE 4′ LT CMP; REPLACE W/ 18" X 4′ LT CMP(CL III) & SET (TY II) (18IN) (CMP) (6:1) (P) EA END		11					4										2									
167	615+82	96° 31′ 24.44" W 30° 32′ 32.29" N	DRIVEWAY	LT	35	Gravel	18" X 46′ CMP	REMOVE 4′ RT CMP; REPLACE W/ 18" X 8′ RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END		11					8										2									
168	617+35	96° 31′ 23.78" W 30° 32′ 30.72" N	DRIVEWAY	RT	16	Grass/Dirt	18" X 26′ CMP	INSTALL SET (TY II) (18IN) (CMP) (6:1) (P) EA END																	2										
170	622+70	96° 31′ 19.46" W 30° 32′ 26.97" N	DRIVEWAY	RT	14	Gravel	18" X 24′ CMP W/ SETs	NO WORK																												
FM 166 (CSJ: 0955-01-027) SHEET 25 OF 32 SUBTOTAL									0	92	0	0	0	0	24	8	0	0	0	0	0	0	0	12	2	0	0	0	0	0	0	0	0	0	0

NOTES:

1. A FULL TOPOGRAPHIC SURVEY WAS NOT PERFORMED. THE LOCATIONS SHOWN ARE APPROXIMATE AND MUST BE VERIFIED BY THE CONTRACTOR PRIOR TO COMMENCEMENT OF WORK.
2. PROVIDE 12" DEEP TOEWALLS FOR ALL S.E.T.'S
3. SEE SWPPP SUMMARIES FOR SEEDING, VEGETATIVE WATERING, AND SOIL RETENTION BLANKETS QUANTITIES.
4. BLOCK SODDING BASED ON CULVERT DIAMETER ON EACH END:
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   - 30" PIPE = 15 SY BLOCK SOD
   - ≥36" PIPE = 16 SY BLOCK SOD

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DESIGN

STATE OF TEXAS · HEATHER McNEAL · 114428 · LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS · DAN THOMA · 98622 · LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

PRINT DATE	REVISION DATE
3/31/2021	

PAPE-DAWSON ENGINEERS

SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

SUMMARY OF DRIVEWAYS

SHEET 25 OF 32 SHEETS

FED. RD. DIV.NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY
TEXAS	BRY	BURLESON

CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	34

Plotted on: 3/31/2021

Design Filename: P:\120\96\01\Design\027 FM 166\Civil\Summaries\1209601_Sum01.dgn

Plotted on: 3/31/2021

Design Filename: P:\120\96\01\Design\027 FM 166\Civil\Summaries\1209601_Sum01.dgn

SUMMARY OF DRIVEWAYS AND SIDE ROADS

DRWY NUM	STATION	LOCATION	REMARKS	OFFSET	EXIST DRIVE WAY WIDTH	EXIST DRIVEWAY SURFACE MATERIAL	CULVERT DESCRIPTION		ITEM 496			BID ALTERNATIVES	
												ITEM 401	ITEM 4122
							EXISTING	PROPOSED WORK	REMOV STR (PIPE)	REMOV STR (SET)	REMOV STR (BOX CULVERT)	FLOWABLE BACKFILL	THERMOPLASTIC PIPE (18 IN)
					LF				LF	EA	LF	CY	LF
(FM 166) (CSJ: 0955-01-027)													
157	599+46	96° 31′ 33.54" W 30° 32′ 42.62" N	DRIVEWAY	LT	15	Gravel	18" X 28′ CMP	INSTALL SET (TY II) (18IN) (CMP) (6:1) (P) EA END					
403	600+55	96° 31′ 32.29" W 30° 32′ 42.35" N	DRIVEWAY	LT	18	Asphalt	18" X 23′ CMP	REMOVE 2′ LT / 2′ RT CMP; REPLACE W/18" X 2′ LT & 2′ RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END	4				
411	601+32	96° 31′ 31.39" W 30° 32′ 42.24" N	DRIVEWAY	LT	12	Gravel	NO CULVERT	NO WORK					
160	601+44	96° 31′ 31.38" W 30° 32′ 41.66" N	DRIVEWAY	RT	47	Concrete	NO CULVERT	NO WORK					
159	601+56	96° 31′ 31.12" W 30° 32′ 42.20" N	DRIVEWAY	LT	13	Gravel	NO CULVERT	NO WORK					
161	602+99	96° 31′ 29.51" W 30° 32′ 41.98" N	DRIVEWAY	LT	12	Gravel	NO CULVERT	NO WORK					
162	603+46	96° 31′ 29.15" W 30° 32′ 41.16" N	CO RD 296	RT	16	Gravel	24" X 26′ CMP	REMOVE 4′ LT / 4′ RT CMP; REPLACE W/24" X 4′ LT & 4′ RT CMP & SET (TY II) (24IN) (CMP) (6:1) (P) EA END	8				
163	603+79	96° 31′ 28.61" W 30° 32′ 41.79" N	DRIVEWAY	LT	10	Gravel	NO CULVERT	NO WORK					
165	606+84	96° 31′ 25.03" W 30° 32′ 40.73" N	CO RD 229	LT	24	Asphalt	NO CULVERT	NO WORK					
164	609+29	96° 31′ 25.87" W 30° 32′ 38.16" N	DRIVEWAY	RT	17	Grass/Dirt	18" X 26′ CMP	REMOVE 2′ LT / 2′ RT CMP; REPLACE W/18" X 2′ LT & 6′ RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END	4				
166	613+79	96° 31′ 26.39" W 30° 32′ 33.61" N	DRIVEWAY	RT	17	Asphalt	18" X 46′ CMP	REMOVE 4′ LT CMP; REPLACE W/ 18" X 4′ LT CMP(CL III) & SET (TY II) (18IN) (CMP) (6:1) (P) EA END	4				
167	615+82	96° 31′ 24.44" W 30° 32′ 32.29" N	DRIVEWAY	LT	35	Gravel	18" X 46′ CMP	REMOVE 4′ RT CMP; REPLACE W/ 18" X 8′ RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) EA END	4				
168	617+35	96° 31′ 23.78" W 30° 32′ 30.72" N	DRIVEWAY	RT	16	Grass/Dirt	18" X 26′ CMP	INSTALL SET (TY II) (18IN) (CMP) (6:1) (P) EA END					
170	622+70	96° 31′ 19.46" W 30° 32′ 26.97" N	DRIVEWAY	RT	14	Gravel	18" X 24′ CMP W/ SETs	NO WORK					
FM 166 (CSJ: 0955-01-027) SHEET 26 OF 32 SUBTOTAL									24	0	0	0	0

NOTES:

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3. SEE SWPPP SUMMARIES FOR SEEDING, VEGETATIVE WATERING, AND SOIL RETENTION BLANKETS QUANTITIES.
4. BLOCK SODDING BASED ON CULVERT DIAMETER ON EACH END:
   - ≤18" PIPE = 11 SY BLOCK SOD
   - 24" PIPE = 13 SY BLOCK SOD
   - 30" PIPE = 15 SY BLOCK SOD
   - ≥36" PIPE = 16 SY BLOCK SOD

* CAST IN PLACE S.E.T.
ALL OTHER S.E.T.'S MAY BE PRECAST OR CIP

DESIGN

STATE OF TEXAS · HEATHER McNEAL · 114428 · LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS · DAN THOMA · 98622 · LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

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TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

SUMMARY OF DRIVEWAYS

SHEET 26 OF 32 SHEETS

FED. RD. DIV.NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY
TEXAS	BRY	BURLESON

CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	35

SUMMARY OF DRIVEWAYS AND SIDE ROADS

DRWY NUM	STATION	LOCATION	REMARKS	OFFSET	EXIST DRIVE WAY WIDTH	EXIST DRIVEWAY SURFACE MATERIAL	CULVERT DESCRIPTION		ITEM 132	ITEM 162	ITEM 400			ITEM 462	ITEM 460			ITEM 464					ITEM 467														
							EXISTING	PROPOSED WORK	EMBANK-MENT (VEHICLE) (DENS CONT) (TY C)	BLOCK SODDING	CUT & RESTORE			CONC BOX CULV	CMP (GAL STL)			RC PIPE (CL III)					SET (PIPE RUNNER ASSEMBLY)	SET (TY II) (CMP) (6:1) (P)					SET (TY II) (HDPE) (6:1) (P)	SET (TY I) (6:1) (P)	SET (TY II) (RCP) (6:1) (P)						
											ASPH PAVING	CONC PAVING	PAV (FLEX BASE)	(4FT X 2FT)	(18 IN)	(24 IN)	(36 IN)	(15 IN)	(18 IN)	(24 IN)	(30 IN)	(36 IN)		(15 IN)	(18 IN)	(24 IN)	(30 IN)	(36 IN)	(30 IN)	(4FT X 2FT)	(15 IN)	(18 IN)	(24 IN)	(30 IN)	(36 IN)
					LF				CY	SY	SY	SY	SY	LF	LF	LF	LF	LF	LF	LF	LF	LF	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA
(FM 166) (CSJ: 0955-01-027)																																			
409	625+24	96° 31′ 16.79" W 30° 32′ 25.73" N	DRIVEWAY	LT	12	Grass/Dirt	NO CULVERT	NO WORK																											
169	625+96	96° 31′ 16.26" W 30° 32′ 24.67" N	FM 2039	LT	27	Asphalt	NO CULVERT	NO WORK																											
171	636+86	96° 31′ 05.90" W 30° 32′ 29.97" N	DRIVEWAY	LT	14	Gravel	18" X 26′ RCP	REMOVE 4′ LT RCP; REPLACE W/ 18" X 8′ LT RCP (CL III) & SET (TY II) (18IN) (RCP) (6:1) (P) EA END		11								8													2			
172	643+87	96° 30′ 57.86" W 30° 32′ 30.86" N	CO RD 255	RT	31	Asphalt	NO CULVERT	NO WORK																											
174	652+54	96° 30′ 49.30" W 30° 32′ 35.31" N	DRIVEWAY	RT	32	Grass/Dirt	NO CULVERT	NO WORK																											
173	655+60	96° 30′ 46.64" W 30° 32′ 37.35" N	DRIVEWAY	LT	22	Grass/Dirt	18" X 25′ RCP	REMOVE 18" RCP; REPLACE W/ 18" X 26′ RCP & SET (TY II) (18 IN) (RCP) (6:1) (P) EA END	5	22								26												2			
175	673+21	96° 30′ 28.43" W 30° 32′ 44.43" N	DRIVEWAY	LT	24	Gravel	18" X 51′ CMP	REMOVE 18" CMP; REPLACE W/ 18" X 52′ CMP & SET (TY II) (18 IN) (CMP) (6:1) (P) EA END	10	22			11		52										2								
176	673+29	96° 30′ 28.34" W 30° 32′ 43.43" N	DRIVEWAY	RT	34	Concrete	18" X 34′ CMP W/ SETs	REMOVE 18" CMP & SET'S; REPLACE W/ 18" X 38′ CMP & SET (TY II) (18 IN) (CMP) (6:1) (P) EA END	6	22		16			38										2								
178	681+32	96° 30′ 19.16" W 30° 32′ 43.51" N	DRIVEWAY	RT	17	Grass/Dirt	NO CULVERT	NO WORK																											
177	689+98	96° 30′ 09.23" W 30° 32′ 44.14" N	DRIVEWAY	LT	17	Grass/Dirt	NO CULVERT	NO WORK																											
179	690+72	96° 30′ 08.33" W 30° 32′ 44.07" N	DRIVEWAY	LT	15	Grass/Dirt	NO CULVERT	NO WORK																											
181	698+10	96° 30′ 00.49" W 30° 32′ 42.09" N	DRIVEWAY	LT	44	Grass/Dirt	NO CULVERT	NO WORK																											
180	702+19	96° 29′ 55.91" W 30° 32′ 41.14" N	DRIVEWAY	RT	12	Gravel	NO CULVERT	NO WORK																											
182	703+40	96° 29′ 54.66" W 30° 32′ 40.74" N	DRIVEWAY	RT	14	Grass/Dirt	NO CULVERT	NO WORK																											
FM 166 (CSJ: 0955-01-027) SHEET 27 OF 32 SUBTOTAL									21	77	0	16	11	0	90	0	0	0	34	0	0	0	0	0	4	0	0	0	0	0	4	0	0	0	0

NOTES:

1. A FULL TOPOGRAPHIC SURVEY WAS NOT PERFORMED. THE LOCATIONS SHOWN ARE APPROXIMATE AND MUST BE VERIFIED BY THE CONTRACTOR PRIOR TO COMMENCEMENT OF WORK.
2. PROVIDE 12" DEEP TOEWALLS FOR ALL S.E.T.'S
3. SEE SWPPP SUMMARIES FOR SEEDING, VEGETATIVE WATERING, AND SOIL RETENTION BLANKETS QUANTITIES.
4. BLOCK SODDING BASED ON CULVERT DIAMETER ON EACH END:
   - ≤18" PIPE = 11 SY BLOCK SOD
   - 24" PIPE = 13 SY BLOCK SOD
   - 30" PIPE = 15 SY BLOCK SOD
   - ≥36" PIPE = 16 SY BLOCK SOD

* CAST IN PLACE S.E.T.
ALL OTHER S.E.T.'S MAY BE PRECAST OR CIP

DESIGN

STATE OF TEXAS · HEATHER McNEAL · 114428 · LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS · DAN THOMA · 98622 · LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

PRINT DATE	REVISION DATE
3/31/2021	

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

SUMMARY OF DRIVEWAYS

SHEET 27 OF 32 SHEETS

FED. RD. DIV.NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY
TEXAS	BRY	BURLESON

CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	36

Plotted on: 3/31/2021

Design Filename: P:\120\96\01\Design\027 FM 166\Civil\Summaries\1209601_Sum01.dgn

Plotted on: 3/31/2021

Design Filename: P:\120\96\01\Design\027 FM 166\Civil\Summaries\1209601_Sum01.dgn

SUMMARY OF DRIVEWAYS AND SIDE ROADS

DRWY NUM	STATION	LOCATION	REMARKS	OFFSET	EXIST DRIVE WAY WIDTH	EXIST DRIVEWAY SURFACE MATERIAL	CULVERT DESCRIPTION		ITEM 496			BID ALTERNATIVES	
												ITEM 401	ITEM 4122
							EXISTING	PROPOSED WORK	REMOV STR (PIPE)	REMOV STR (SET)	REMOV STR (BOX CULVERT)	FLOWABLE BACKFILL	THERMOPLASTIC PIPE (18 IN)
					LF				LF	EA	LF	CY	LF
(FM 166) (CSJ: 0955-01-027)													
409	625+24	96° 31′ 16.79" W 30° 32′ 25.73" N	DRIVEWAY	LT	12	Grass/Dirt	NO CULVERT	NO WORK					
169	625+96	96° 31′ 16.26" W 30° 32′ 24.67" N	FM 2039	LT	27	Asphalt	NO CULVERT	NO WORK					
171	636+86	96° 31′ 05.90" W 30° 32′ 29.97" N	DRIVEWAY	LT	14	Gravel	18" X 26′ RCP	REMOVE 4′ LT RCP; REPLACE W/ 18" X 8′ LT RCP (CL III) & SET (TY II) (18IN) (RCP) (6:1) (P) EA END	4				
172	643+87	96° 30′ 57.86" W 30° 32′ 30.86" N	CO RD 255	RT	31	Asphalt	NO CULVERT	NO WORK					
174	652+54	96° 30′ 49.30" W 30° 32′ 35.31" N	DRIVEWAY	RT	32	Grass/Dirt	NO CULVERT	NO WORK					
173	655+60	96° 30′ 46.64" W 30° 32′ 37.35" N	DRIVEWAY	LT	22	Grass/Dirt	18" X 25′ RCP	REMOVE 18" RCP; REPLACE W/ 18" X 26′ RCP & SET (TY II) (18 IN) (RCP) (6:1) (P) EA END	25				
175	673+21	96° 30′ 28.43" W 30° 32′ 44.43" N	DRIVEWAY	LT	24	Gravel	18" X 51′ CMP	REMOVE 18" CMP; REPLACE W/ 18" X 52′ CMP & SET (TY II) (18 IN) (CMP) (6:1) (P) EA END	51				
176	673+29	96° 30′ 28.34" W 30° 32′ 43.43" N	DRIVEWAY	RT	34	Concrete	18" X 34′ CMP W/ SETs	REMOVE 18" CMP & SET'S; REPLACE W/ 18" X 38′ CMP & SET (TY II) (18 IN) (CMP) (6:1) (P) EA END	34				
178	681+32	96° 30′ 19.16" W 30° 32′ 43.51" N	DRIVEWAY	RT	17	Grass/Dirt	NO CULVERT	NO WORK					
177	689+98	96° 30′ 09.23" W 30° 32′ 44.14" N	DRIVEWAY	LT	17	Grass/Dirt	NO CULVERT	NO WORK					
179	690+72	96° 30′ 08.33" W 30° 32′ 44.07" N	DRIVEWAY	LT	15	Grass/Dirt	NO CULVERT	NO WORK					
181	698+10	96° 30′ 00.49" W 30° 32′ 42.09" N	DRIVEWAY	LT	44	Grass/Dirt	NO CULVERT	NO WORK					
180	702+19	96° 29′ 55.91" W 30° 32′ 41.14" N	DRIVEWAY	RT	12	Gravel	NO CULVERT	NO WORK					
182	703+40	96° 29′ 54.66" W 30° 32′ 40.74" N	DRIVEWAY	RT	14	Grass/Dirt	NO CULVERT	NO WORK					
FM 166 (CSJ: 0955-01-027) SHEET 28 OF 32 SUBTOTAL									114	0	0	0	0

NOTES:

1. A FULL TOPOGRAPHIC SURVEY WAS NOT PERFORMED. THE LOCATIONS SHOWN ARE APPROXIMATE AND MUST BE VERIFIED BY THE CONTRACTOR PRIOR TO COMMENCEMENT OF WORK.
2. PROVIDE 12" DEEP TOEWALLS FOR ALL S.E.T.'S
3. SEE SWPPP SUMMARIES FOR SEEDING, VEGETATIVE WATERING, AND SOIL RETENTION BLANKETS QUANTITIES.
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   - ≤18" PIPE = 11 SY BLOCK SOD
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   - 30" PIPE = 15 SY BLOCK SOD
   - ≥36" PIPE = 16 SY BLOCK SOD

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DESIGN

STATE OF TEXAS · HEATHER McNEAL · 114428 · LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS · DAN THOMA · 98622 · LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

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TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

SUMMARY OF DRIVEWAYS

SHEET 28 OF 32 SHEETS

FED. RD. DIV.NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY
TEXAS	BRY	BURLESON

CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	37

SUMMARY OF DRIVEWAYS AND SIDE ROADS

DRWY NUM	STATION	LOCATION	REMARKS	OFFSET	EXIST DRIVE WAY WIDTH	EXIST DRIVEWAY SURFACE MATERIAL	CULVERT DESCRIPTION		ITEM 132	ITEM 162	ITEM 400			ITEM 462	ITEM 460			ITEM 464					ITEM 467															
							EXISTING	PROPOSED WORK	EMBANK-MENT (VEHICLE) (DENS CONT) (TY C)	BLOCK SODDING	CUT & RESTORE			CONC BOX CULV	CMP (GAL STL)			RC PIPE (CL III)					SET (PIPE RUNNER ASSEMBLY)	SET (TY II) (CMP) (6:1) (P)					SET (TY II) (HDPE) (6:1) (P)	SET (TY I) (6:1) (P)	SET (TY II) (RCP) (6:1) (P)						
											ASPH PAVING	CONC PAVING	PAV (FLEX BASE)	(4FT X 2FT)	(18 IN)	(24 IN)	(36 IN)	(15 IN)	(18 IN)	(24 IN)	(30 IN)	(36 IN)		(15 IN)	(18 IN)	(24 IN)	(30 IN)	(36 IN)	(30 IN)	(4FT X 2FT)	(15 IN)	(18 IN)	(24 IN)	(30 IN)	(36 IN)
					LF				CY	SY	SY	SY	SY	LF	LF	LF	LF	LF	LF	LF	LF	LF	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA
(FM 166) (CSJ: 0955-01-027)																																			
184	711+77	96° 29′ 45.79" W 30° 32′ 37.46" N	DRIVEWAY	RT	19	Grass/Dirt	NO CULVERT	NO WORK																											
186	720+51	96° 29′ 35.86" W 30° 32′ 38.88" N	DRIVEWAY	RT	14	Gravel	18" X 41′ CMP	REMOVE 18" CMP; REPLACE W/ 18" X 42′ CMP & SET (TY II) (18 IN) (CMP) (6:1) (P) EA END		22			7		42										2										
183	723+91	96° 29′ 33.76" W 30° 32′ 41.82" N	DRIVEWAY	LT	16	Grass/Dirt	NO CULVERT	NO WORK																											
185	738+48	96° 29′ 20.03" W 30° 32′ 50.28" N	CO RD 264	LT	25	Asphalt	NO CULVERT	NO WORK																											
188	757+58	96° 29′ 04.27" W 30° 32′ 37.08" N	DRIVEWAY	RT	22	Grass/Dirt	NO CULVERT	NO WORK																											
190	766+39	96° 28′ 57.01" W 30° 32′ 31.04" N	DRIVEWAY	RT	15	Grass/Dirt	NO CULVERT	NO WORK																											
187	766+96	96° 28′ 56.08" W 30° 32′ 31.06" N	DRIVEWAY	LT	22	Grass/Dirt	18" X 46′ CMP	REMOVE 18" CMP; REPLACE W/ 18" X 46′ CMP & SET (TY II) (18 IN) (CMP) (6:1) (P) EA END		22					46										2										
192	774+63	96° 28′ 50.40" W 30° 32′ 25.23" N	DRIVEWAY	RT	74	Asphalt	18" X 82′ CMP W/ SETs	REMOVE 20′ RT CMP; REPLACE W/ 18" X 20′ RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) RT ONLY	18	11	33				20										1										
194	776+53	96° 28′ 48.75" W 30° 32′ 23.99" N	DRIVEWAY	RT	35	Gravel	24" X 41′ RCP W/ SETs	NO WORK																											
189	782+60	96° 28′ 43.30" W 30° 32′ 20.22" N	DRIVEWAY	LT	16	Grass/Dirt	18" X 24′ CMP	REMOVE 18" CMP; REPLACE W/ 18" X 28′ CMP & SET (TY II) (18 IN) (CMP) (6:1) (P) EA END		22					28										2										
196	795+57	96° 28′ 33.19" W 30° 32′ 10.81" N	DRIVEWAY	RT	13	Gravel	36" X 21′ RCP	REMOVE 4′ LT / 4′ RT RCP; REPLACE W/36" X 4′ LT & 4′ RT RCP (CL III) & SET (TY II) (36IN) (RCP) (6:1) (P) EA END		32												8											2
191	798+45	96° 28′ 30.30" W 30° 32′ 09.29" N	DRIVEWAY	LT	30	Gravel	NO CULVERT	NO WORK																											
193 *	800+16	96° 28′ 28.88" W 30° 32′ 08.21" N	DRIVEWAY	LT	15	Gravel	8" X 36′ STEEL	REMOVE 8" STEEL; REPLACE W/ 18" X 36′ CMP & SET (TY II) (18 IN) (CMP) (6:1) (P) EA END	5	22			7		36										2										
FM 166 (CSJ: 0955-01-027) SHEET 29 OF 32 SUBTOTAL									23	131	33	0	14	0	172	0	0	0	0	0	0	8	0	0	9	0	0	0	0	0	0	0	0	0	2

NOTES:

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2. PROVIDE 12" DEEP TOEWALLS FOR ALL S.E.T.'S
3. SEE SWPPP SUMMARIES FOR SEEDING, VEGETATIVE WATERING, AND SOIL RETENTION BLANKETS QUANTITIES.
4. BLOCK SODDING BASED ON CULVERT DIAMETER ON EACH END:
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DESIGN

STATE OF TEXAS · HEATHER McNEAL · 114428 · LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS · DAN THOMA · 98622 · LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

PRINT DATE	REVISION DATE
3/31/2021	

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

SUMMARY OF DRIVEWAYS

SHEET 29 OF 32 SHEETS

FED. RD. DIV.NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY
TEXAS	BRY	BURLESON

CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	38

Plotted on: 3/31/2021

Design Filename: P:\120\96\01\Design\027 FM 166\Civil\Summaries\1209601_Sum01.dgn

Plotted on: 3/31/2021

Design Filename: P:\120\96\01\Design\027 FM 166\Civil\Summaries\1209601_Sum01.dgn

SUMMARY OF DRIVEWAYS AND SIDE ROADS

DRWY NUM	STATION	LOCATION	REMARKS	OFFSET	EXIST DRIVE WAY WIDTH	EXIST DRIVEWAY SURFACE MATERIAL	CULVERT DESCRIPTION		ITEM 496			BID ALTERNATIVES	
												ITEM 401	ITEM 4122
							EXISTING	PROPOSED WORK	REMOV STR (PIPE)	REMOV STR (SET)	REMOV STR (BOX CULVERT)	FLOWABLE BACKFILL	THERMOPLASTIC PIPE (18 IN)
					LF				LF	EA	LF	CY	LF
(FM 166) (CSJ: 0955-01-027)													
184	711+77	96° 29′ 45.79" W 30° 32′ 37.46" N	DRIVEWAY	RT	19	Grass/Dirt	NO CULVERT	NO WORK					
186	720+51	96° 29′ 35.86" W 30° 32′ 38.88" N	DRIVEWAY	RT	14	Gravel	18" X 41′ CMP	REMOVE 18" CMP; REPLACE W/ 18" X 42′ CMP & SET (TY II) (18 IN) (CMP) (6:1) (P) EA END	41				
183	723+91	96° 29′ 33.76" W 30° 32′ 41.82" N	DRIVEWAY	LT	16	Grass/Dirt	NO CULVERT	NO WORK					
185	738+48	96° 29′ 20.03" W 30° 32′ 50.28" N	CO RD 264	LT	25	Asphalt	NO CULVERT	NO WORK					
188	757+58	96° 29′ 04.27" W 30° 32′ 37.08" N	DRIVEWAY	RT	22	Grass/Dirt	NO CULVERT	NO WORK					
190	766+39	96° 28′ 57.01" W 30° 32′ 31.04" N	DRIVEWAY	RT	15	Grass/Dirt	NO CULVERT	NO WORK					
187	766+96	96° 28′ 56.08" W 30° 32′ 31.06" N	DRIVEWAY	LT	22	Grass/Dirt	18" X 46′ CMP	REMOVE 18" CMP; REPLACE W/ 18" X 46′ CMP & SET (TY II) (18 IN) (CMP) (6:1) (P) EA END	46				
192	774+63	96° 28′ 50.40" W 30° 32′ 25.23" N	DRIVEWAY	RT	74	Asphalt	18" X 82′ CMP W/ SETs	REMOVE 20′ RT CMP; REPLACE W/ 18" X 20′ RT CMP & SET (TY II) (18IN) (CMP) (6:1) (P) RT ONLY	20				
194	776+53	96° 28′ 48.75" W 30° 32′ 23.99" N	DRIVEWAY	RT	35	Gravel	24" X 41′ RCP W/ SETs	NO WORK					
189	782+60	96° 28′ 43.30" W 30° 32′ 20.22" N	DRIVEWAY	LT	16	Grass/Dirt	18" X 24′ CMP	REMOVE 18" CMP; REPLACE W/ 18" X 28′ CMP & SET (TY II) (18 IN) (CMP) (6:1) (P) EA END	24			5	28
196	795+57	96° 28′ 33.19" W 30° 32′ 10.81" N	DRIVEWAY	RT	13	Gravel	36" X 21′ RCP	REMOVE 4′ LT / 4′ RT RCP; REPLACE W/36" X 4′ LT & 4′ RT RCP (CL III) & SET (TY II) (36IN) (RCP) (6:1) (P) EA END	8				
191	798+45	96° 28′ 30.30" W 30° 32′ 09.29" N	DRIVEWAY	LT	30	Gravel	NO CULVERT	NO WORK					
193 *	800+16	96° 28′ 28.88" W 30° 32′ 08.21" N	DRIVEWAY	LT	15	Gravel	8" X 36′ STEEL	REMOVE 8" STEEL; REPLACE W/ 18" X 36′ CMP & SET (TY II) (18 IN) (CMP) (6:1) (P) EA END	36				
FM 166 (CSJ: 0955-01-027) SHEET 30 OF 32 SUBTOTAL									175	0	0	5	28

NOTES:

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DESIGN

STATE OF TEXAS — HEATHER McNEAL — 114428 — LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS — DAN THOMA — 98622 — LICENSED PROFESSIONAL ENGINEER

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TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

SUMMARY OF DRIVEWAYS

SHEET 30 OF 32 SHEETS

FED. RD. DIV.NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	39

SUMMARY OF DRIVEWAYS AND SIDE ROADS

DRWY NUM	STATION	LOCATION	REMARKS	OFFSET	EXIST DRIVE WAY WIDTH	EXIST DRIVEWAY SURFACE MATERIAL	CULVERT DESCRIPTION		ITEM 132	ITEM 162	ITEM 400			ITEM 462	ITEM 460			ITEM 464					ITEM 467																
							EXISTING	PROPOSED WORK	EMBANK-MENT (VEHICLE) (DENS CONT) (TY C)	BLOCK SODDING	CUT & RESTORE			CONC BOX CULV	CMP (GAL STL)			RC PIPE (CL III)					SET (PIPE RUNNER ASSEMBLY)	SET (TY II) (CMP) (6:1) (P)					SET (TY II) (HDPE) (6:1) (P)	SET (TY I) (6:1) (P)	SET (TY II) (RCP) (6:1) (P)								
											ASPH PAVING	CONC PAVING	PAV (FLEX BASE)	(4FT X 2FT)	(18 IN)	(24 IN)	(36 IN)	(15 IN)	(18 IN)	(24 IN)	(30 IN)	(36 IN)		(15 IN)	(18 IN)	(24 IN)	(30 IN)	(36 IN)	(30 IN)	(4FT X 2FT)	(15 IN)	(18 IN)	(24 IN)	(30 IN)	(36 IN)
					LF				CY	SY	SY	SY	SY	LF	LF	LF	LF	LF	LF	LF	LF	LF	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA
(FM 166) (CSJ: 0955-01-027)																																					
198	800+16	96° 28' 29.35" W 30° 32' 07.66" N	DRIVEWAY	RT	16	Gravel	30" X 32' CMP	INSTALL SET (TY II) (30IN) (CMP) (6:1) (P) EA END																		2										
200	804+49	96° 28' 24.60" W 30° 32' 06.01" N	DRIVEWAY	RT	50	Gravel	NO CULVERT	NO WORK																													
202	806+87	96° 28' 21.86" W 30° 32' 05.93" N	DRIVEWAY	RT	32	Gravel	NO CULVERT	NO WORK																													
204	809+17	96° 28' 19.14" W 30° 32' 05.91" N	DRIVEWAY	RT	30	Asphalt	NO CULVERT	NO WORK																													
* 195	833+51	96° 27' 59.50" W 30° 32' 23.08" N	DRIVEWAY	LT	12	Grass/Dirt	24" X 24' RCP	REMOVE 4' LT / 4' RT RCP; REPLACE W/24" X 4' LT & 4' RT RCP & SET (TY II) (24IN) (RCP) (6:1) (P) EA END		26										8												2			
206	833+65	96° 27' 58.84" W 30° 32' 22.71" N	DRIVEWAY	RT	25	Asphalt	24" X 41' CMP	REMOVE 2' LT / 2' RT CMP; REPLACE W/24" X 2' LT & 2' RT CMP & SET (TY II) (24IN) (CMP) (6:1) (P) EA END		22						4											2							
310	840+41	96° 27' 53.40" W 30° 32' 27.46" N	DRIVEWAY	RT	15	Grass/Dirt	NO CULVERT	NO WORK																													
208	847+34	96° 27' 47.75" W 30° 32' 32.27" N	DRIVEWAY	RT	20	Grass/Dirt	NO CULVERT	NO WORK																													
210	853+79	96° 27' 42.58" W 30° 32' 36.82" N	DRIVEWAY	RT	20	Grass/Dirt	NO CULVERT	NO WORK																													
212	860+08	96° 27' 37.55" W 30° 32' 41.26" N	DRIVEWAY	RT	14	Grass/Dirt	15" X 21' RCP	REMOVE 4' LT / 4' RT RCP; REPLACE W/15" X 4' LT & 4' RT RCP (CL III) & SET (TY II) (15IN) (RCP) (6:1) (P) EA END		22			2					8															2			
FM 166 (CSJ: 0955-01-027) SHEET 31 OF 32 SUBTOTAL									0	70	0	0	2	0	0	4	0	8	0	8	0	0	0	0	0	2	2	0	0	0	2	0	2	0	0
FM 166 (CSJ: 0955-01-027) PROJECT TOTAL									**181**	**1,816**	**38**	**20**	**192**	**8**	**932**	**44**	**40**	**24**	**214**	**24**	**24**	**8**	**2**	**4**	**129**	**26**	**2**	**4**	**2**	**4**	**4**	**26**	**4**	**2**	**2**

NOTES:

1. A FULL TOPOGRAPHIC SURVEY WAS NOT PERFORMED. THE LOCATIONS SHOWN ARE APPROXIMATE AND MUST BE VERIFIED BY THE CONTRACTOR PRIOR TO COMMENCEMENT OF WORK.
2. PROVIDE 12" DEEP TOEWALLS FOR ALL S.E.T.'S
3. SEE SWPPP SUMMARIES FOR SEEDING, VEGETATIVE WATERING, AND SOIL RETENTION BLANKETS QUANTITIES.
4. BLOCK SODDING BASED ON CULVERT DIAMETER ON EACH END:
   - ≤18" PIPE = 11 SY BLOCK SOD
   - 24" PIPE = 13 SY BLOCK SOD
   - 30" PIPE = 15 SY BLOCK SOD
   - ≥36" PIPE = 16 SY BLOCK SOD

* CAST IN PLACE S.E.T.
ALL OTHER S.E.T.'S MAY BE PRECAST OR CIP

DESIGN

STATE OF TEXAS — HEATHER McNEAL — 114428 — LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS — DAN THOMA — 98622 — LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

PRINT DATE	REVISION DATE
3/31/2021	

PAPE-DAWSON ENGINEERS

SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

SUMMARY OF DRIVEWAYS

SHEET 31 OF 32 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY
TEXAS	BRY	BURLESON

CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	40

Plotted on: 3/31/2021

Design Filename: P:\120\96\01\Design\027 FM 166\Civil\Summaries\1209601_Sum01.dgn

Plotted on: 3/31/2021

Design Filename: P:\120\96\01\Design\027 FM 166\Civil\Summaries\1209601_Sum01.dgn

SUMMARY OF DRIVEWAYS AND SIDE ROADS

DRWY NUM	STATION	LOCATION	REMARKS	OFFSET	EXIST DRIVE WAY WIDTH	EXIST DRIVEWAY SURFACE MATERIAL	CULVERT DESCRIPTION		ITEM 496			BID ALTERNATIVES	
												ITEM 401	ITEM 4122
							EXISTING	PROPOSED WORK	REMOV STR (PIPE)	REMOV STR (SET)	REMOV STR (BOX CULVERT)	FLOWABLE BACKFILL	THERMOPLASTIC PIPE (18 IN)
					LF				LF	EA	LF	CY	LF
(FM 166) (CSJ: 0955-01-027)													
198	800+16	96° 28' 29.35" W 30° 32' 07.66" N	DRIVEWAY	RT	16	Gravel	30" X 32' CMP	INSTALL SET (TY II) (30IN) (CMP) (6:1) (P) EA END					
200	804+49	96° 28' 24.60" W 30° 32' 06.01" N	DRIVEWAY	RT	50	Gravel	NO CULVERT	NO WORK					
202	806+87	96° 28' 21.86" W 30° 32' 05.93" N	DRIVEWAY	RT	32	Gravel	NO CULVERT	NO WORK					
204	809+17	96° 28' 19.14" W 30° 32' 05.91" N	DRIVEWAY	RT	30	Asphalt	NO CULVERT	NO WORK					
* 195	833+51	96° 27' 59.50" W 30° 32' 23.08" N	DRIVEWAY	LT	12	Grass/Dirt	24" X 24' RCP	REMOVE 4' LT / 4' RT RCP; REPLACE W/24" X 4' LT & 4' RT RCP & SET (TY II) (24IN) (RCP) (6:1) (P) EA END	8				
206	833+65	96° 27' 58.84" W 30° 32' 22.71" N	DRIVEWAY	RT	25	Asphalt	24" X 41' CMP	REMOVE 2' LT / 2' RT CMP; REPLACE W/24" X 2' LT & 2' RT CMP & SET (TY II) (24IN) (CMP) (6:1) (P) EA END	4				
310	840+41	96° 27' 53.40" W 30° 32' 27.46" N	DRIVEWAY	RT	15	Grass/Dirt	NO CULVERT	NO WORK					
208	847+34	96° 27' 47.75" W 30° 32' 32.27" N	DRIVEWAY	RT	20	Grass/Dirt	NO CULVERT	NO WORK					
210	853+79	96° 27' 42.58" W 30° 32' 36.82" N	DRIVEWAY	RT	20	Grass/Dirt	NO CULVERT	NO WORK					
212	860+08	96° 27' 37.55" W 30° 32' 41.26" N	DRIVEWAY	RT	14	Grass/Dirt	15" X 21' RCP	REMOVE 4' LT / 4' RT RCP; REPLACE W/15" X 4' LT & 4' RT RCP (CL III) & SET (TY II) (15IN) (RCP) (6:1) (P) EA END	8				
FM 166 (CSJ: 0955-01-027) SHEET 32 OF 32 SUBTOTAL									20	0	0	0	0
FM 166 (CSJ: 0955-01-027) PROJECT TOTAL									**1,170**	**10**	**8**	**18**	**120**

NOTES:

1. A FULL TOPOGRAPHIC SURVEY WAS NOT PERFORMED. THE LOCATIONS SHOWN ARE APPROXIMATE AND MUST BE VERIFIED BY THE CONTRACTOR PRIOR TO COMMENCEMENT OF WORK.
2. PROVIDE 12" DEEP TOEWALLS FOR ALL S.E.T.'S
3. SEE SWPPP SUMMARIES FOR SEEDING, VEGETATIVE WATERING, AND SOIL RETENTION BLANKETS QUANTITIES.
4. BLOCK SODDING BASED ON CULVERT DIAMETER ON EACH END:
   - ≤18" PIPE = 11 SY BLOCK SOD
   - 24" PIPE = 13 SY BLOCK SOD
   - 30" PIPE = 15 SY BLOCK SOD
   - ≥36" PIPE = 16 SY BLOCK SOD

* CAST IN PLACE S.E.T.
ALL OTHER S.E.T.'S MAY BE PRECAST OR CIP

DESIGN

STATE OF TEXAS — HEATHER McNEAL — 114428 — LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS — DAN THOMA — 98622 — LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

PRINT DATE	REVISION DATE
3/31/2021	

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

SUMMARY OF DRIVEWAYS

SHEET 32 OF 32 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	41

SUMMARY OF CROSS CULVERTS

STATION	CULVERT DESCRIPTION		ITEM 105	ITEM 132	ITEM 134	ITEM 162	ITEM 400	ITEM 401	ITEM 402	ITEM 403	ITEM 432		ITEM 459	ITEM 460											ITEM 462	ITEM 464				ITEM 466	
											RIPRAP			CMP (GAL (STL)					CMP AR (GAL STL)						CONC BOX CULV	RC PIPE (CL III)				HEADWALL	
	EXISTING STRUCTURE	PROPOSED WORK	REMOVING STAB BASE AND ASPH (2")	EMBANKMENT (VEHICLE)(DENS CONT)(TY C)	BACKFILL TY A	BLOCK SODDING	CUT & RESTORING PVMT	FLOWABLE BACKFILL	TRENCH EXCAVATION PROTECTION	TEMPORARY SPL SHORING	(CONC) (4 IN)	(STONE COMMON) (DRY) (12 IN)	GABION MATTRESSES (GALV) (9 IN)	(24 IN)	(30 IN)	(36 IN)	(48 IN)	(60 IN)	(DES 3)	(DES 4)	(DES 5)	(DES 8)	(6 FT X 6 FT) (EXTEND)	(24 IN)	(36 IN)	(42 IN)	(DES 3)	(CH-PW-0) (DIA= 24 IN)	(CH-PW-0) (DIA= 30 IN)
			SY	CY	CY	SY	SY	CY	LF	SF	CY	CY	SY	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	EA	EA
80+61	36"X 40 LF CMP	(U/S) LT: INSTALL HEADWALL (CH-PW-0)(DIA=36 IN)(3:1)-EXTEND 36" X 2' CMP (D/S) RT: EXTEND 36" X 4' CMP, INSTALL SET (TY II)(36")(CMP)(3:1)(C)		3		32										6														
122+09	3-6'X 6'X 36 LF MBC W/ WINGWALLS	(U/S) LT: REMOVE 3-6' X 6' X 2' MBC & WINGWALL & RIPRAP APRON EXTEND 3-6' X 6' X 6' MBC, INSTALL WINGWALL (PW-2)(H=8.5FT)(3:1) (D/S) RT: REMOVE 3-6' X 6' X 2' MBC & WINGWALL & RIPRAP APRON EXTEND 3-6'X 6'X 8' MBC, INSTALL WINGWALL (PW-2)(HW=8.5 FT)(3:1)		19		37				423													42						
149+20	4' X 6' X 40 LF SBC W/ WINGWALLS	(U/S) LT: 12" STONE RIPRAP W/ 12"X36" TOE (D/S) RT: NO WORK REQUIRED										15																	
167+75	42" X 62.5 LF RCP W/ DROP INLET (LT) & HEADWALL (RT)	(U/S) LT: NO WORK REQUIRED (D/S) RT: 12" STONE RIPRAP W/ 12"X36" TOE										4																	
181+51	24" X 41 LF CMP W/ HEADWALL (RT)	(U/S) LT: INSTALL SET (TY II)(24 IN)(CMP)(3:1)(C) (D/S) RT: REMOVE HEADWALL (D/S) RT: EXTEND 24" X 12' CMP, INSTALL HEADWALL (CH-PW-0)(DIA=36 IN)(3:1) W/ 12" STONE RIPRAP W/ 12"X36" TOE		5		13				46		5		12																
183+90	42" X 69 LF RCP W/ HEADWALLS	(U/S) LT: REMOVE HEADWALL (U/S) LT: EXTEND 42" X 6' RCP, INSTALL HEADWALL (CH-PW-0)(DIA=42 IN)(3:1) (D/S) RT: REMOVE HEADWALL (D/S) RT: EXTEND 42" X 6' RCP, INSTALL HEADWALL (CH-PW-0)(DIA=60 IN)(3:1) W/ RIPRAP(CONC)(4IN) 12"X36" TOE		17		32				264	7																12			
197+07	36"X 61 LF CMP	(U/S) LT: REMOVE 36" X 4' CMP (U/S) LT: INSTALL HEADWALL (CH-PW-0)(DIA=36 IN)(3:1) (D/S) RT: REMOVE 36" X 8' CMP (D/S) RT: INSTALL SET (TY II)(36 IN)(CMP)(3:1)(C) W/ GABION MATTRESS (9 IN) (GALV)		1	3	16							17																
207+12	24" X 55 LF CMP	(U/S) LT: REMOVE 24"X 6' CMP (U/S): LT: INSTALL SET (TY II)(24 IN)(CMP)(3:1)(C) (D/S) RT: REMOVE 24" X 8' CMP (D/S) RT: INSTALL SET (TY II)(24 IN)(CMP)(3:1)(C)		1		26																								
214+77	DES8 36 LF CMP	~~(D/S) LT: REMOVE DES8 X 4' CMP~~ (D/S) LT: EXTEND DES 8 X 6' CMP, INSTALL SET (TY II)(DES 8)(CMP)(3:1)(C) (U/S) RT: REMOVE DES 8 X 2' CMP (U/S) RT: EXTEND DES 8 X 4' CMP, INSTALL SET (TY II)(DES 8)(CMP)(3:1)(C)		3		32				243												10								
226+78	24" X 38 LF CMP	(U/S) LT: REMOVE MITERED END (U/S) LT: INSTALL SET (TY II)(24 IN)(CMP)(4:1)(C) (D/S) RT: REMOVE MITERED END (D/S) RT: INSTALL SET (TY II)(24 IN)(CMP)(4:1)(C)		1		26																								
235+35	2-30" X 40 LF CMP	(U/S) LT: INSTALL 2-SET (TY II)(30 IN)(CMP)(4:1)(C) (D/S) RT: INSTALL 2-SET (TY II)(30 IN)(CMP)(4:1)(C)		2		60																								
(CSJ: 0955-01-027) SHEET 1 OF 8 SUBTOTAL			0	52	3	274	0	0	0	976	7	24	17	12	0	6	0	0	0	0	0	10	42	0	0	12	0	0	0

NOTES:

1. BLOCK SODDING BASED ON CULVERT DIAMETER ON EACH END.

PRINT DATE	REVISION DATE
4/5/2021	

PAPE-DAWSON ENGINEERS

SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

FM 166

SUMMARY OF CULVERTS

SHEET 1 OF 8 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	42

Plotted on: 4/5/2021

Design Filename: P:\120\96\01\Design\027 FM 166\Civil\Summaries\1209601_Sum02.dgn

SUMMARY OF CROSS CULVERTS (CONT.)

STATION	CULVERT DESCRIPTION: EXISTING STRUCTURE	CULVERT DESCRIPTION: PROPOSED WORK	ITEM 466 HEADWALL (CH-PW-0) (DIA= 36 IN)	ITEM 466 HEADWALL (CH-PW-0) (DIA= 42 IN)	ITEM 466 HEADWALL (CH-PW-0) (DIA= 60 IN)	ITEM 466 HEADWALL (CH-PW-S) (DIA= 24 IN)	ITEM 466 HEADWALL (CH-PW-S) (DIA= 36 IN)	ITEM 466 HEADWALL (CH-PW-S) (DIA= 48 IN)	ITEM 466 HEADWALL (CH-PW-S) (DIA= 60 IN)	ITEM 466 WINGWALL (PW-2) (HW=8.5 FT)	ITEM 467 SET (TY II) (CMP) (C) (DES 3) (3:1)	(DES 4) (3:1)	(DES 5) (3:1)	(DES 8) (3:1)	(24 IN) (3:1)	(24 IN) (4:1)	(24 IN) (6:1)	(30 IN) (3:1)	(30 IN) (4:1)	(36 IN) (3:1)	ITEM 467 SET (TY II) (CMP) (P) (24 IN) (6:1)	ITEM 467 SET(TY II)(RCP)(C) (24 IN) (3:1)	(36 IN) (3:1)	(DES 3) (3:1)	ITEM 496 REM STR (BOX CULVERT)	REM STR (SET)	REM STR (WINGWALL)	REM STR (HEADWALL)	REM STR (PIPE)	ITEM 658 INSTL OM ASSM (OM-2Z) (WFLX) SRF(BI)
			EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	LF	EA	EA	EA	LF	EA
80+61	36"X 40 LF CMP	(U/S) LT: INSTALL HEADWALL (CH-PW-0) (DIA=36 IN) (3:1) -EXTEND 36" X 2' CMP (D/S) RT: EXTEND 36" X 4' CMP, INSTALL SET (TY II) (36") (CMP) (3:1) (C)	1																1											
122+09	3-6'X 6'X 36 LF MBC W/ WINGWALLS	(U/S) LT: REMOVE 3-6' X 6' X 2' MBC & WINGWALL & RIPRAP APRON EXTEND 3-6' X 6' X 6' MBC, INSTALL WINGWALL (PW-2) (H=8.5FT) (3:1) (D/S) RT: REMOVE 3-6' X 6' X 2' MBC & WINGWALL & RIPRAP APRON EXTEND 3-6'X 6'X 8' MBC, INSTALL WINGWALL (PW-2) (HW=8.5 FT) (3:1)								2															12		2			2
149+20	4' X 6' X 40 LF SBC W/ WINGWALLS	(U/S) LT: 12" STONE RIPRAP W/ 12"X36" TOE (D/S) RT: NO WORK REQUIRED																												
167+75	42" X 62.5 LF RCP W/ DROP INLET (LT) & HEADWALL (RT)	(U/S) LT: NO WORK REQUIRED (D/S) RT: 12" STONE RIPRAP W/ 12"X36" TOE																												
181+51	24" X 41 LF CMP W/ HEADWALL (RT)	(U/S) LT: INSTALL SET (TY II) (24 IN) (CMP) (3:1) (C) (D/S) RT: REMOVE HEADWALL (D/S) RT: EXTEND 24" X 12' CMP, INSTALL HEADWALL (CH-PW-0) (DIA=36 IN) (3:1) W/ 12" STONE RIPRAP W/ 12"X36" TOE	1												1												1		
183+90	42" X 69 LF RCP W/ HEADWALLS	(U/S) LT: REMOVE HEADWALL (U/S) LT: EXTEND 42" X 6' RCP, INSTALL HEADWALL (CH-PW-0) (DIA=42 IN) (3:1) (D/S) RT: REMOVE HEADWALL (D/S) RT: EXTEND 42" X 6' RCP, INSTALL HEADWALL (CH-PW-0) (DIA=60 IN) (3:1) W/ RIPRAP (CONC) (4IN) 12"X36" TOE		1	1																						2		1
197+07	36"X 61 LF CMP	(U/S) LT: REMOVE 36" X 4' CMP (U/S) LT: INSTALL HEADWALL (CH-PW-0) (DIA=36 IN) (3:1) (D/S) RT: REMOVE 36" X 8' CMP (D/S) RT: INSTALL SET (TY II) (36 IN) (CMP) (3:1) (C) W/ GABION MATTRESS (9 IN) (GALV)	1																1									12		
207+12	24" X 55 LF CMP	(U/S) LT: REMOVE 24"X 6' CMP (U/S): LT: INSTALL SET (TY II) (24 IN) (CMP) (3:1) (C) (D/S) RT: REMOVE 24" X 8' CMP (D/S) RT: INSTALL SET (TY II) (24 IN) (CMP) (3:1) (C)													2													14		
214+77	DES8 36 LF CMP	~~(D/S) LT: REMOVE DES8 X 4' CMP~~ (D/S) LT: EXTEND DES 8 X 6' CMP, INSTALL SET (TY II) (DES 8) (CMP) (3:1) (C) (U/S) RT: REMOVE DES 8 X 2' CMP (U/S) RT: EXTEND DES 8 X 4' CMP, INSTALL SET (TY II) (DES 8) (CMP) (3:1) (C)													2													6		
226+78	24" X 38 LF CMP	(U/S) LT: REMOVE MITERED END (U/S) LT: INSTALL SET (TY II) (24 IN) (CMP) (4:1) (C) (D/S) RT: REMOVE MITERED END (D/S) RT: INSTALL SET (TY II) (24 IN) (CMP) (4:1) (C)														2													
235+35	2-30" X 40 LF CMP	(U/S) LT: INSTALL 2-SET (TY II) (30 IN) (CMP) (4:1) (C) (D/S) RT: INSTALL 2-SET (TY II) (30 IN) (CMP) (4:1) (C)																	4											
(CSJ: 0955-01-027) SHEET 2 OF 8 SUBTOTAL			3	1	1	0	0	0	0	2	0	0	0	2	3	2	0	0	4	2	0	0	0	0	12	0	2	3	32	3

NOTES:

1. BLOCK SODDING BASED ON CULVERT DIAMETER ON EACH END.

PRINT DATE	REVISION DATE
4/5/2021	

PAPE-DAWSON ENGINEERS

SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

FM 166

SUMMARY OF CULVERTS

SHEET 2 OF 8 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	43

SUMMARY OF CROSS CULVERTS (CONT.)

STATION	CULVERT DESCRIPTION		ITEM 105	ITEM 132	ITEM 134	ITEM 162	ITEM 400	ITEM 401	ITEM 402	ITEM 403	ITEM 432		ITEM 459	ITEM 460										ITEM 462	ITEM 464				ITEM 466	
											RIPRAP			CMP (GAL (STL)					CMP AR (GAL STL)					CONC BOX CULV	RC PIPE (CL III)				HEADWALL	
	EXISTING STRUCTURE	PROPOSED WORK	REMOVING STAB BASE AND ASPH (2")	EMBANKMENT (VEHICLE)(DENS CONT)(TY C)	BACKFILL TY A	BLOCK SODDING	CUT & RESTORING PVMT	FLOWABLE BACKFILL	TRENCH EXCAVATION PROTECTION	TEMPORARY SPL SHORING	(CONC) (4 IN)	(STONE COMMON) (DRY) (12 IN)	GABION MATTRESSES (GALV) (9 IN)	(24 IN)	(30 IN)	(36 IN)	(48 IN)	(60 IN)	(DES 3)	(DES 4)	(DES 5)	(DES 8)	(6 FT X 6 FT) (EXTEND)	(24 IN)	(36 IN)	(42 IN)	(DES 3)	(CH-PW-O) (DIA= 24 IN)	(CH-PW-O) (DIA= 30 IN)
			SY	CY	CY	SY	SY	CY	LF	SF	CY	CY	SY	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	EA	EA
260+24	5- 3' X 4' X 85 LF MBC W/ WINGWALLS	(U/S) LT: RIPRAP(CONC)(4IN) (D/S) RT: RIPRAP(CONC)(4IN)									14																		
268+87	DES4 X 39 LF CMP	(D/S) LT: REMOVE DES4 X 6 LF CMP (D/S) LT: EXTEND DES4 X 4' CMP, INSTALL SET (TY II)(DES4)(CMP)(3:1)(C) (U/S) RT: REMOVE DES4 X 4 LF CMP (U/S) RT: EXTEND DES4 X 4' CMP, INSTALL SET (TY II)(DES4)(CMP)(3:1)(C)		1		26				127										8									
287+49	3-36" X 44 LF RCP W/ SETS	(U/S) LT: NO WORK REQUIRED (D/S) RT: REMOVE SETs; EXTEND 3-36" X 4' RCP; INSTALL 3-SET (TY II)(36 IN)(RCP)(3:1) (C)		3		48																			12				
315+61	5- 36" X 38 LF RCP W/ SETS	(U/S) LT: RIPARAP(CONC)(4IN) (D/S) RT: RIPARAP(CONC)(4IN)									2																		
331+78	24" X 44 LF CMP	(D/S) LT: INSTALL SET (TY II)(24 IN)(CMP)(3:1)(C) (U/S) RT: INSTALL SET (TY II)(24 IN)(CMP)(3:1)(C)		1		26																							
340+97	24" X 40 LF CMP	PLUG & ABANDON PIPE						5																					
368+17	4- 24" X 45 LF CMP	(U/S) LT: INSTALL 4- SET (TY II)(24 IN)(CMP)(3:1)(C) (D/S) RT: INSTALL 4- SET (TY II)(24 IN)(CMP)(3:1)(C) W/ GABION MATTRESS (9 IN) (GALV)		2	5	52							21																
382+47	30" X 40 LF CMP	(U/S) LT: REMOVE 30" X 4 LF CMP (U/S) LT: EXTEND 30" X 4' CMP, INSTALL SET (TY II)(30 IN)(CMP)(3:1)(C) (D/S) RT: REMOVE 30" X 4 LF CMP (D/S) RT: EXTEND 30" X 6' CMP, INSTALL SET (TY II)(30 IN)(CMP)(3:1)(C)		2		30									10														
392+92	30" X 45 LF CMP	(U/S) LT: REMOVE 30" X 4' CMP (U/S) LT: INSTALL SET (TY II)(30 IN)(CMP)(3:1)(C) (D/S) RT: REMOVE 30" X 2' CMP (D/S) RT: EXTEND 30" X 4' CMP, INSTALL HEADWALL (CH-PW-O)(DIAM-30 IN)(3:1)		1		30									4														1
405+31	60" X 70 LF CMP	(U/S) LT: REMOVE 60" X 12' CMP (U/S) LT: INSTALL HEADWALL (CH-PW-O)(DIA=60 IN)(3:1) (D/S) RT: REMOVE 60" X 12' CMP (D/S) RT: INSTALL HEADWALL (CH-PW-O)(DIA=60 IN)(3:1)		1		32				364																			
411+60	2- 48" X 50 LF CMP	REMOVE 48" X 50' CMP, INSTALL 48" X 62' CMP (U/S) LT: EXTEND 48" X 4' CMP, INSTALL HEADWALL (CH-PW-S)(DIA=60 IN)(2:1) W/ RIPRAP(CONC)(4IN) 12" X 36" TOEDOWN (D/S) RT: EXTEND 48" X 8' CMP, INSTALL HEADWALL (CH-PW-S)(DIA=48 IN)(2:1)		15		21	30		50	373	6							74											
416+90	5' X 5' X 28 LF SBC, 60" X 16' CMP (LT), 60" X 15' CMP (RT)	REMOVE 5' X 5' SBC, 60" CMP INSTALL 60" X 44' CMP (U/S) LT: INSTALL HEADWALL (CH-PW-O)(DIA=60 IN)(2:1) (D/S) RT: INSTALL HEADWALL (CH-PW-O)(DIA=60 IN)(2:1)		2		40	25		44	339								44											
437+34	24" X 60 LF CMP	(U/S) RT: EXTEND 24"X 5.5' CMP, 45° BEND, EXTEND 24"X 4' INSTALL SET (TY II)(24 IN)(CMP)(6:1)(P) (D/S) LT: EXTEND 24"X 2' CMP, INSTALL HEADWALL (CH-PW-45°)(DIA= 24 IN)(3:1)		2		29								12															
(CSJ: 0955-01-027) SHEET 3 OF 8 SUBTOTAL			0	30	5	334	55	5	94	1203	22	0	21	12	14	0	74	44	0	8	0	0	0	0	12	0	0	0	1

NOTES:

1. BLOCK SODDING BASED ON CULVERT DIAMETER ON EACH END.

PRINT DATE	REVISION DATE
4/5/2021	

PAPE-DAWSON ENGINEERS

SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

FM 166

SUMMARY OF CULVERTS

SHEET 3 OF 8 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	44

Plotted on: 4/5/2021

Design Filename: P:\120\96\01\Design\027 FM 166\Civil\Summaries\1209601_Sum02.dgn

SUMMARY OF CROSS CULVERTS (CONT.)

STATION	CULVERT DESCRIPTION		ITEM 466 HEADWALL					ITEM 466 HEADWALL		ITEM 466 WINGWALL	ITEM 467 SET (TY II) (CMP) (C)										ITEM 467 SET (TY II) (CMP) (P)	ITEM 467 SET(TY II)(RCP)(C)			ITEM 496					ITEM 658
	EXISTING STRUCTURE	PROPOSED WORK	(CH-PW-0) (DIA= 36 IN)	(CH-PW-0) (DIA= 42 IN)	(CH-PW-0) (DIA= 60 IN)	(CH-PW-S) (DIA= 24 IN)	(CH-PW-S) (DIA= 36 IN)	(CH-PW-S) (DIA= 48 IN)	(CH-PW-S) (DIA= 60 IN)	(PW-2) (HW=8.5 FT)	(DES 3) (3:1)	(DES 4) (3:1)	(DES 5) (3:1)	(DES 8) (3:1)	(24 IN) (3:1)	(24 IN) (4:1)	(24 IN) (6:1)	(30 IN) (3:1)	(30 IN) (4:1)	(36 IN) (3:1)	(24 IN) (6:1)	(24 IN) (3:1)	(36 IN) (3:1)	(DES 3) (3:1)	REM STR (BOX CULVERT)	REM STR (SET)	REM STR (WINGWALL)	REM STR (HEADWALL)	REM STR (PIPE)	INSTL OM ASSM (OM-2Z) (WFLX) SRF(BI)
			EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	LF	EA	EA	EA	LF	EA
260+24	5- 3' X 4' X 85 LF MBC W/ WINGWALLS	(U/S) LT: RIPRAP(CONC)(4IN) (D/S) RT: RIPRAP(CONC)(4IN)																												
268+87	DES4 X 39 LF CMP	(D/S) LT: REMOVE DES4 X 6 LF CMP (D/S) LT: EXTEND DES4 X 4' CMP, INSTALL SET (TY II)(DES4)(CMP)(3:1)(C) (U/S) RT: REMOVE DES4 X 4 LF CMP (U/S) RT: EXTEND DES4 X 4' CMP, INSTALL SET (TY II)(DES4)(CMP)(3:1)(C)										2																	10	
287+49	3-36" X 44 LF RCP W/ SETS	(U/S) LT: NO WORK REQUIRED (D/S) RT: REMOVE SETs; EXTEND 3-36" X 4' RCP; INSTALL 3-SET (TY II)(36 IN)(RCP)(3:1) (C)																					3							
315+61	5- 36" X 38 LF RCP W/ SETS	(U/S) LT: RIPARAP(CONC)(4IN) (D/S) RT: RIPARAP(CONC)(4IN)																												
331+78	24" X 44 LF CMP	(D/S) LT: INSTALL SET (TY II)(24 IN)(CMP)(3:1)(C) (U/S) RT: INSTALL SET (TY II)(24 IN)(CMP)(3:1)(C)													2															
340+97	24" X 40 LF CMP	PLUG & ABANDON PIPE																												
368+17	4- 24" X 45 LF CMP	(U/S) LT: INSTALL 4- SET (TY II)(24 IN)(CMP)(3:1)(C) (D/S) RT: INSTALL 4- SET (TY II)(24 IN)(CMP)(3:1)(C) W/ GABION MATTRESS (9 IN) (GALV)													8															
382+47	30" X 40 LF CMP	(U/S) LT: REMOVE 30" X 4 LF CMP (U/S) LT: EXTEND 30" X 4' CMP, INSTALL SET (TY II)(30 IN)(CMP)(3:1)(C) (D/S) RT: REMOVE 30" X 4 LF CMP (D/S) RT: EXTEND 30" X 6' CMP, INSTALL SET (TY II)(30 IN)(CMP)(3:1)(C)																2											8	
392+92	30" X 45 LF CMP	(U/S) LT: REMOVE 30" X 4' CMP (U/S) LT: INSTALL SET (TY II)(30 IN)(CMP)(3:1)(C) (D/S) RT: REMOVE 30" X 2' CMP (D/S) RT: EXTEND 30" X 4' CMP, INSTALL HEADWALL (CH-PW-0)(DIAM-30 IN)(3:1)																1											6	
405+31	60" X 70 LF CMP	(U/S) LT: REMOVE 60" X 12' CMP (U/S) LT: INSTALL HEADWALL (CH-PW-0)(DIA=60 IN)(3:1) (D/S) RT: REMOVE 60" X 12' CMP (D/S) RT: INSTALL HEADWALL (CH-PW-0)(DIA=60 IN)(3:1)			2																								24	
411+60	2- 48" X 50 LF CMP	REMOVE 48" X 50' CMP, INSTALL 48" X 62' CMP (U/S) LT: EXTEND 48" X 4' CMP, INSTALL HEADWALL (CH-PW-S)(DIA=60 IN)(2:1) W/ RIPRAP(CONC)(4IN) 12" X 36" TOEDOWN (D/S) RT: EXTEND 48" X 8' CMP, INSTALL HEADWALL (CH-PW-S)(DIA=48 IN)(2:1)						1	1																				50	
416+90	5' X 5' X 28 LF SBC, 60" X 16' CMP (LT), 60" X 15' CMP (RT)	REMOVE 5' X 5' SBC, 60" CMP INSTALL 60" X 44' CMP (U/S) LT: INSTALL HEADWALL (CH-PW-0)(DIA=60 IN)(2:1) (D/S) RT: INSTALL HEADWALL (CH-PW-0)(DIA=60 IN)(2:1)			2																					28			31	1
437+34	24" X 60 LF CMP	(U/S) RT: EXTEND 24"X 5.5' CMP, 45° BEND, EXTEND 24"X 4' INSTALL SET (TY II)(24 IN)(CMP)(6:1)(P) (D/S) LT: EXTEND 24"X 2' CMP, INSTALL HEADWALL (CH-PW-45°)(DIA= 24 IN)(3:1)				1											1													1
(CSJ: 0955-01-027) SHEET 4 OF 8 SUBTOTAL			0	0	4	1	0	1	1	0	0	2	0	0	10	0	1	3	0	0	0	0	3	0	28	3	0	0	129	2

NOTES:

1. BLOCK SODDING BASED ON CULVERT DIAMETER ON EACH END.

PRINT DATE	REVISION DATE
4/5/2021	

PAPE-DAWSON ENGINEERS

SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

FM 166

SUMMARY OF CULVERTS

SHEET 4 OF 8 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	45

Plotted on: 4/5/2021

Design Filename: P:\120\96\01\Design\027 FM 166\Civil\Summaries\1209601_Sum02.dgn

SUMMARY OF CROSS CULVERTS (CONT.)

STATION	CULVERT DESCRIPTION		ITEM 105	ITEM 132	ITEM 134	ITEM 162	ITEM 400	ITEM 401	ITEM 402	ITEM 403	ITEM 432		ITEM 459	ITEM 460										ITEM 462	ITEM 464				ITEM 466	
											RIPRAP			CMP (GAL (STL)					CMP AR (GAL STL)					CONC BOX CULV	RC PIPE (CL III)				HEADWALL	
	EXISTING STRUCTURE	PROPOSED WORK	REMOVING STAB BASE AND ASPH (2")	EMBANKMENT (VEHICLE) (DENS CONT) (TY C)	BACKFILL TY A	BLOCK SODDING	CUT & RESTORING PVMT	FLOWABLE BACKFILL	TRENCH EXCAVATION PROTECTION	TEMPORARY SPL SHORING	(CONC) (4 IN)	(STONE COMMON) (DRY) (12 IN)	GABION MATTRESSES (GALV) (9 IN)	(24 IN)	(30 IN)	(36 IN)	(48 IN)	(60 IN)	(DES 3)	(DES 4)	(DES 5)	(DES 8)	(6 FT X 6 FT) (EXTEND)	(24 IN)	(36 IN)	(42 IN)	(DES 3)	(CH-PW-O) (DIA= 24 IN)	(CH-PW-O) (DIA= 30 IN)
			SY	CY	CY	SY	SY	CY	LF	SF	CY	CY	SY	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	EA	EA
456+30	2- 24" X 51 LF CMP	(U/S) LT: REMOVE 2-24"X 2 LF; EXTEND 2-24"X 2' CMP, INSTALL 2- SET (TY II)(24 IN)(CMP)(3:1) (D/S) RT: INSTALL 2- SET (TY II)(24 IN)(CMP)(3:1)(C)		3		52								4															
506+70	24" X 39 LF RCP W/ HEADWALLS	(U/S) RT: REMOVE HEADWALL & ROCKWALL (U/S) RT: EXTEND 24" X 6' RCP, INSTALL SET (TY II)(24 IN)(RCP)(3:1)(C) (D/S) LT: REMOVE HEADWALL (D/S) LT: EXTEND 24" X 6' RCP, INSTALL HEADWALL (CH-PW-O)(DIA=36 IN)(3:1)		4		26				199														12					
535+87	36" X 48 LF CMP	(U/S) LT: REMOVE 24" X 2' CMP (U/S) LT: INSTALL SET (TY II)(36 IN)(CMP)(3:1)(C) (D/S) RT: REMOVE 24" X 4', INSTALL HEADWALL (CH-PW-15)(DIA=36 IN)(3:1) W/ GABION MATTRESS (9 IN) (GALV)		1	18	11							57															
551+77	24" X 42 LF CMP	(U/S) LT: REMOVE 24" X 2' CMP (U/S) LT: EXTEND 24" X 4' CMP, INSTALL HEADWALL (CH-PW-O)(DIA=24 IN)(3:1) (D/S) RT: REMOVE 24" X 4' CMP (D/S) RT:EXTEND 24" X 4' CMP, INSTALL SET (TY II)(24 IN)(CMP)(3:1)(C)		1		26								8														1	
582+84	24" X 54 LF CMP	(D/S) LT: REMOVE 24" X 2', EXTEND 24"X 2' CMP, INSTALL SET (TY II)(24 IN)(CMP)(4:1)(C) (U/S) RT: REMOVE 24" X 2', INSTALL 24" X 6' CMP W/ 2-38 °BENDS SET (TY II)(24 IN)(CMP)(6:1)(P)		1		16								8															
585+06	24 " X 44 LF CMP	(U/S) LT: REMOVE 24" X 4' CMP (U/S) LT: EXTEND 24" X 2' CMP, INSTALL SET (TY II)(24 IN)(CMP)(3:1)(C) (D/S) RT: REMOVE 24" X 4' CMP (D/S) RT: EXTEND 24" X 4' CMP, INSTALL SET (TY II)(24 IN)(CMP)(3:1)(C)		1		26								6															
604+40	24" X 45 LF RCP	(U/S) RT: REMOVE 24" X 4' RCP (U/S) RT: INSTALL SET (TY II)(24 IN)(RCP)(3:1)(C) (D/S) LT: REMOVE 24" X 4' RCP (D/S) LT: EXTEND 24"X2' RCP, INSTALL SET (TY II)(24 IN)(RCP)(3:1)(C)		1		26																		2					
607+21	24" X 36' CMP LT 18" X 8' RCP RT	REMOVE 36' CMP LT AND 8' RCP RT, INSTALL DES3 X 46 LF RCP (D/S) LT: INSTALL SET (TY II)(DES3)(RCP)(3:1)(C) (U/S) RT: INSTALL SET (TY II)(DES3)(RCP)(3:1) (C)		1		12	21		16	101																	46		
626+26	24" X 52' CMP 24" X 46' RCP	(U/S) LT: REMOVE 24" X 4' CMP, EXTEND 24" X 4' CMP, INSTALL SET (TY II)(24 IN)(CMP)(3:1)(C) (D/S) RT: REMOVE 24" X 6' RCP, INSTALL SET (TY II)(24 IN)(RCP)(3:1)(C)		1		26								4															
635+29	4- 24" X 50 LF CMP	(U/S) RT: REMOVE 4-24" X 2 LF CMP, INSTALL 4- SET (TY II)(24 IN)(CMP)(3:1)(C) REMOVE STAB BASE (D/S) LT: REMOVE 4-24" X 2 LF CMP, INSTALL 4- SET (TY II)(24 IN)(CMP)(3:1)(C) REMOVE STAB BASE	16	2		104																							
723+28	24" X 41 LF CMP	(D/S) LT: REMOVE 24" X 4' CMP (D/S) LT: EXTEND 24" X 10' CMP, INSTALL SET (TY II)(24 IN)(CMP)(3:1)(C) (U/S) RT: REMOVE 24" X 4' CMP (U/S) RT: EXTEND 24" X 4' CMP, INSTALL HEADWALL (CH-PW-15)(DIA=24 IN)(3:1)		1		47				83				14															
(CSJ: 0955-01-027) SHEET 5 OF 8 SUBTOTAL			16	17	18	372	21	0	16	383	0	0	57	44	0	0	0	0	0	0	0	0	0	14	0	0	46	1	0

NOTES:

1. BLOCK SODDING BASED ON CULVERT DIAMETER ON EACH END.

PRINT DATE	REVISION DATE
4/5/2021	

PAPE-DAWSON ENGINEERS

SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

FM 166

SUMMARY OF CULVERTS

SHEET 5 OF 8 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	46

SUMMARY OF CROSS CULVERTS (CONT.)

STATION	CULVERT DESCRIPTION: EXISTING STRUCTURE	CULVERT DESCRIPTION: PROPOSED WORK	ITEM 466 HEADWALL (CH-PW-O) (DIA= 36 IN)	ITEM 466 HEADWALL (CH-PW-O) (DIA= 42 IN)	ITEM 466 HEADWALL (CH-PW-O) (DIA= 60 IN)	ITEM 466 HEADWALL (CH-PW-S) (DIA= 24 IN)	ITEM 466 HEADWALL (CH-PW-S) (DIA= 36 IN)	ITEM 466 HEADWALL (CH-PW-S) (DIA= 48 IN)	ITEM 466 HEADWALL (CH-PW-S) (DIA= 60 IN)	ITEM 466 WINGWALL (PW-2) (HW=8.5 FT)	ITEM 467 SET (TY II) (CMP) (C) (DES 3) (3:1)	(DES 4) (3:1)	(DES 5) (3:1)	(DES 8) (3:1)	(24 IN) (3:1)	(24 IN) (4:1)	(24 IN) (6:1)	(30 IN) (3:1)	(30 IN) (4:1)	(36 IN) (3:1)	SET (TY II) (CMP) (P) (24 IN) (6:1)	SET (TY II) (RCP) (C) (24 IN) (3:1)	(36 IN) (3:1)	(DES 3) (3:1)	ITEM 496 REM STR (BOX CULVERT)	REM STR (SET)	REM STR (WINGWALL)	REM STR (HEADWALL)	REM STR (PIPE)	ITEM 658 INSTL OM ASSM (OM-2Z) (WFLX) SRF(BI)
			EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	LF	EA	EA	EA	LF	EA
456+30	2- 24" X 51 LF CMP	(U/S) LT: REMOVE 2-24"X 2 LF; EXTEND 2-24"X 2' CMP, INSTALL 2- SET (TY II)(24 IN)(CMP)(3:1) (D/S) RT: INSTALL 2- SET (TY II)(24 IN)(CMP)(3:1)(C)													4														4	
506+70	24" X 39 LF RCP W/ HEADWALLS	(U/S) RT: REMOVE HEADWALL & ROCKWALL (U/S) RT: EXTEND 24" X 6' RCP, INSTALL SET (TY II)(24 IN)(RCP)(3:1)(C) (D/S) LT: REMOVE HEADWALL (D/S) LT: EXTEND 24" X 6' RCP, INSTALL HEADWALL (CH-PW-O)(DIA=36 IN)(3:1)	1																			1						2		
535+87	36" X 48 LF CMP	(U/S) LT: REMOVE 24" X 2' CMP (U/S) LT: INSTALL SET (TY II)(36 IN)(CMP)(3:1)(C) (D/S) RT: REMOVE 24" X 4', INSTALL HEADWALL (CH-PW-15)(DIA=36 IN)(3:1) W/ GABION MATTRESS (9 IN) (GALV)					1												1									6	2
551+77	24" X 42 LF CMP	(U/S) LT: REMOVE 24" X 2' CMP (U/S) LT: EXTEND 24" X 4' CMP, INSTALL HEADWALL (CH-PW-O)(DIA=24 IN)(3:1) (D/S) RT: REMOVE 24" X 4' CMP (D/S) RT:EXTEND 24" X 4' CMP, INSTALL SET (TY II)(24 IN)(CMP)(3:1)(C)													1														6	2
582+84	24" X 54 LF CMP	(D/S) LT: REMOVE 24" X 2', EXTEND 24"X 2' CMP, INSTALL SET (TY II)(24 IN)(CMP)(4:1)(C) (U/S) RT: REMOVE 24" X 2', INSTALL 24" X 6' CMP W/ 2-38 °BENDS SET (TY II)(24 IN)(CMP)(6:1)(P)														1						1							4	2
585+06	24 " X 44 LF CMP	(U/S) LT: REMOVE 24" X 4' CMP (U/S) LT: EXTEND 24" X 2' CMP, INSTALL SET (TY II)(24 IN)(CMP)(3:1)(C) (D/S) RT: REMOVE 24" X 4' CMP (D/S) RT: EXTEND 24" X 4' CMP, INSTALL SET (TY II)(24 IN)(CMP)(3:1)(C)													2														8	2
604+40	24" X 45 LF RCP	(U/S) RT: REMOVE 24" X 4' RCP (U/S) RT: INSTALL SET (TY II)(24 IN)(RCP)(3:1)(C) (D/S) LT: REMOVE 24" X 4' RCP (D/S) LT: EXTEND 24"X2' RCP, INSTALL SET (TY II)(24 IN)(RCP)(3:1)(C)																					2						8	2
607+21	24" X 36' CMP LT 18" X 8' RCP RT	REMOVE 36' CMP LT AND 8' RCP RT, INSTALL DES3 X 46 LF RCP (D/S) LT: INSTALL SET (TY II)(DES3)(RCP)(3:1)(C) (U/S) RT: INSTALL SET (TY II)(DES3)(RCP)(3:1) (C)																						2					44	2
626+26	24" X 52' CMP 24" X 46' RCP	(U/S) LT: REMOVE 24" X 4' CMP, EXTEND 24" X 4' CMP, INSTALL SET (TY II)(24 IN)(CMP)(3:1)(C) (D/S) RT: REMOVE 24" X 6' RCP, INSTALL SET (TY II)(24 IN)(RCP)(3:1)(C)													1								1						10	2
635+29	4- 24" X 50 LF CMP	(U/S) RT: REMOVE 4-24" X 2 LF CMP, INSTALL 4- SET (TY II)(24 IN)(CMP)(3:1)(C) REMOVE STAB BASE (D/S) LT: REMOVE 4-24" X 2 LF CMP, INSTALL 4- SET (TY II)(24 IN)(CMP)(3:1)(C) REMOVE STAB BASE													8														16	
723+28	24" X 41 LF CMP	(D/S) LT: REMOVE 24" X 4' CMP (D/S) LT: EXTEND 24" X 10' CMP, INSTALL SET (TY II)(24 IN)(CMP)(3:1)(C) (U/S) RT: REMOVE 24" X 4' CMP (U/S) RT: EXTEND 24" X 4' CMP, INSTALL HEADWALL (CH-PW-15)(DIA=24 IN)(3:1)				1									1														8	2
(CSJ: 0955-01-027) SHEET 6 OF 8 SUBTOTAL			1	0	0	1	1	0	0	0	0	0	0	0	17	1	0	0	0	1	1	4	0	2	0	0	0	2	114	16

NOTES:

1. BLOCK SODDING BASED ON CULVERT DIAMETER ON EACH END.

PRINT DATE: 4/5/2021 | REVISION DATE:

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SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

FM 166

SUMMARY OF CULVERTS

SHEET 6 OF 8 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	47

Plotted on: 4/5/2021

Design Filename: P:\120\96\01\Design\027 FM 166\Civil\Summaries\1209601_Sum02.dgn

SUMMARY OF CROSS CULVERTS (CONT.)

STATION	CULVERT DESCRIPTION		ITEM 105	ITEM 132	ITEM 134	ITEM 162	ITEM 400	ITEM 401	ITEM 402	ITEM 403	ITEM 432		ITEM 459	ITEM 460										ITEM 462	ITEM 464				ITEM 466	
											RIPRAP			CMP (GAL (STL)					CMP AR (GAL STL)					CONC BOX CULV	RC PIPE (CL III)				HEADWALL	
	EXISTING STRUCTURE	PROPOSED WORK	REMOVING STAB BASE AND ASPH (2")	EMBANKMENT (VEHICLE)(DENS CONT)(TY C)	BACKFILL TY A	BLOCK SODDING	CUT & RESTORING PVMT	FLOWABLE BACKFILL	TRENCH EXCAVATION PROTECTION	TEMPORARY SPL SHORING	(CONC) (4 IN)	(STONE COMMON) (DRY) (12 IN)	GABION MATTRESSES (GALV) (9 IN)	(24 IN)	(30 IN)	(36 IN)	(48 IN)	(60 IN)	(DES 3)	(DES 4)	(DES 5)	(DES 8)	(6 FT X 6 FT) (EXTEND)	(24 IN)	(36 IN)	(42 IN)	(DES 3)	(CH-PW-O) (DIA= 24 IN)	(CH-PW-O) (DIA= 30 IN)
			SY	CY	CY	SY	SY	CY	LF	SF	CY	CY	SY	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	EA	EA
752+47	DES5 X 40 LF CMP	(U/S) RT: REMOVE DES5 X 2' CMP (U/S) RT: EXTEND DES5 X 2' CMP, INSTALL SET (TY II)(DES5)(CMP)(3:1)(C) (D/S) LT: REMOVE DES5 X 2' CMP (D/S) LT: EXTEND DES 5 X 2' CMP, INSTALL SET (TY II)(DES 5)(CMP)(3:1)(C)		1		32															4									
796+37	24" X 40 LF CMP	(U/S) LT: REMOVE 24" X 2' CMP (U/S) LT: EXTEND 24" X 2' CMP, INSTALL SET (TY II)(24 IN)(CMP)(3:1)(C) (D/S) RT: REMOVE 24" X 2' CMP (D/S) RT: EXTEND 24" X 4' CMP, INSTALL SET (TY II)(24 IN)(CMP)(3:1)(C)		1		26								6															
802+65	DES3 X 40 LF CMP	(U/S) LT: REMOVE DES 3 X 2' CMP (U/S) LT: EXTEND DES 3 X 2' CMP, INSTALL SET (TYII)(DES 3)(CMP)(3:1)(C) (D/S) RT: REMOVE DES 3 X 2' CMP (D/S) RT: INSTALL SET (TY II)(DES 3)(CMP)(3:1)(C)		1		32														2									
858+22	2- DES5 X 41 LF CMP	(U/S) LT: REMOVE DES5 X 2' CMP (EAST PIPE), INSTALL 2-SET(TY II)(DES5)(3:1)(C) (D/S) RT: REMOVE DES5 41 LF (D/S) RT: INSTALL DES5 39 LF(CMP), INSTALL 2-SET (TY II)(DES5)(CMP)(3:1)(C)		1		31	22		39	94											39									
(CSJ: 0955-01-027) SHEET 7 OF 8 SUBTOTAL			0	4	0	121	22	0	39	94	0	0	0	6	0	0	0	0	2	0	43	0	0	0	0	0	0	0	0
(CSJ: 0955-01-27) TOTAL			**16**	**103**	**26**	**1101**	**98**	**5**	**149**	**2656**	**29**	**24**	**95**	**74**	**14**	**6**	**74**	**44**	**2**	**8**	**43**	**10**	**42**	**14**	**12**	**12**	**46**	**1**	**1**

NOTES:

1. BLOCK SODDING BASED ON CULVERT DIAMETER ON EACH END.

PRINT DATE	REVISION DATE
4/5/2021	

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

FM 166

SUMMARY OF CULVERTS

SHEET 7 OF 8 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	48

Plotted on: 4/5/2021

Design Filename: P:\120\96\01\Design\027 FM 166\Civil\Summaries\1209601_Sum02.dgn

SUMMARY OF CROSS CULVERTS (CONT.)

STATION	CULVERT DESCRIPTION		ITEM 466 HEADWALL					ITEM 466 HEADWALL		ITEM 466 WINGWALL	ITEM 467 SET (TY II) (CMP) (C)										ITEM 496						ITEM 658
	EXISTING STRUCTURE	PROPOSED WORK	(CH-PW-0) (DIA= 36 IN)	(CH-PW-0) (DIA= 42 IN)	(CH-PW-0) (DIA= 60 IN)	(CH-PW-S) (DIA= 24 IN)	(CH-PW-S) (DIA= 36 IN)	(CH-PW-S) (DIA= 48 IN)	(CH-PW-S) (DIA= 60 IN)	(PW-2) (HW=8.5 FT)	(DES 3) (3:1)	(DES 4) (3:1)	(DES 5) (3:1)	(DES 8) (3:1)	(24 IN) (3:1)	(24 IN) (4:1)	(24 IN) (6:1)	(30 IN) (3:1)	(30 IN) (4:1)	(36 IN) (3:1)	SET (TY II) (CMP) (P) (24 IN) (6:1)	SET (TY II) (RCP) (C) (24 IN) (3:1)	(36 IN) (3:1)	(DES 3) (3:1)	REM STR (BOX CULVERT)	REM STR (SET)	REM STR (WINGWALL)	REM STR (HEADWALL)	REM STR (PIPE)	INSTL OM ASSM (OM-2Z) (WFLX) SRF(BI)
			EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	LF	EA	EA	EA	LF	EA
752+47	DES5 X 40 LF CMP	(U/S) RT: REMOVE DES5 X 2' CMP (U/S) RT: EXTEND DES5 X 2' CMP, INSTALL SET (TY II)(DES5)(CMP)(3:1)(C) (D/S) LT: REMOVE DES5 X 2' CMP (D/S) LT: EXTEND DES 5 X 2' CMP, INSTALL SET (TY II)(DES 5)(CMP)(3:1)(C)											2															4	
796+37	24" X 40 LF CMP	(U/S) LT: REMOVE 24" X 2' CMP (U/S) LT: EXTEND 24" X 2' CMP, INSTALL SET (TY II)(24 IN)(CMP)(3:1)(C) (D/S) RT: REMOVE 24" X 2' CMP (D/S) RT: EXTEND 24" X 4' CMP, INSTALL SET (TY II)(24 IN)(CMP)(3:1)(C)													2													4	
802+65	DES3 X 40 LF CMP	(U/S) LT: REMOVE DES 3 X 2' CMP (U/S) LT: EXTEND DES 3 X 2' CMP, INSTALL SET (TYII)(DES 3)(CMP)(3:1)(C) (D/S) RT: REMOVE DES 3 X 2' CMP (D/S) RT: INSTALL SET (TY II)(DES 3)(CMP)(3:1)(C)									2																	4	
858+22	2- DES5 X 41 LF CMP	(U/S) LT: REMOVE DES5 X 2' CMP (EAST PIPE), INSTALL 2-SET(TY II)(DES5)(3:1)(C) (D/S) RT: REMOVE DES5 41 LF (D/S) RT: INSTALL DES5 39 LF(CMP), INSTALL 2-SET (TY II)(DES5)(CMP)(3:1)(C)											4															43	
(CSJ: 0955-01-027) SHEET 8 OF 8 SUBTOTAL			0	0	0	0	0	0	0	0	2	0	6	0	2	0	0	0	0	0	0	0	0	0	0	0	0	55	32
(CSJ: 0955-01-27) TOTAL			**4**	**1**	**5**	**2**	**1**	**1**	**1**	**2**	**2**	**2**	**6**	**2**	**32**	**3**	**1**	**3**	**4**	**3**	**1**	**4**	**3**	**2**	**40**	**3**	**2**	**5**	**330**	**53**

SUMMARY OF PAVEMENT MARKINGS

ITEM	0666-6303	0666-6315	0672-6009
STATION	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	REFL PAV MRKR TY II-A-A
	LF	LF	EA
CULVERT 411+60	32	32	1
CULVERT 416+90	18	18	1
CULVERT 607+21	14	14	1
CULVERT 858+22	16	8	1
(CSJ: 0955-01-027) PROJECT TOTAL	**80**	**72**	**4**

NOTES:

1. BLOCK SODDING BASED ON CULVERT DIAMETER ON EACH END.

PRINT DATE	REVISION DATE
4/5/2021	

PAPE-DAWSON ENGINEERS
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2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

FM 166

SUMMARY OF CULVERTS

SHEET 8 OF 8 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	49

Plotted on: 4/5/2021

Design Filename: P:\120\96\01\Design\027 FM 166\Civil\Summaries\1209601_Sum02.dgn

SUMMARY OF BRIDGES AND METAL BEAM GUARD FENCE

STATION TO STATION	CROSSING NAME	WORK TYPE	ITEM 432	ITEM 542	ITEM 540			ITEM 544		ITEM 644			ITEM 658		
			RIPRAP (MOWSTRIP) (4IN)	REMOVE METAL BEAM GUARD FENCE	MTL W-BEAM GD FEN (TIM POST)	MTL BEAM GD FEN TRANS (THRIE-BEAM)	METAL GUARD FENCE (LONG SPAN SYSTEM)	GUARDRAIL END TREATMENT (INSTALL)	GUARDRAIL END TREATMENT (REMOVE)	REMOVE SM RD SN SUP & AM	IN SM RD SN SUP&AM TY10BWG(1)SA (T)	IN SM RD SN SUP&AM TY10BWG(1)SA (P)	INSTL DEL ASSM (D-SW) SZ 1 (BRF) GF2 (BI)	INSTL OM ASSM (OM-2Y)(WC) GND	INSTL DEL ASSM (D-SY)SZ (BRF)GF1
			CY	LF	LF	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA
(CSJ: 0955-01-027)															
STA 60+67 TO STA 67+50	DAVIDSON CREEK	REPLACE	40	425	275	4		4	4	4	2	2	19	4	19
STA 258+94 TO STA 259+00	BERRY CREEK	INSTALL	40		450			4					24		24
STA 312+68 TO SAT 318+81	CULV 315+61	INSTALL	38		250		2	4					21		21
STA 690+23 TO STA 696+83	OLD RIVER	REPLACE	47	450	150	4		4	4				15	4	15
(CSJ: 0955-01-027) TOTAL			**165**	**875**	**1125**	**8**	**2**	**16**	**8**	**4**	**2**	**2**	**79**	**8**	**79**

NOTES:

1. SEE SWPPP SUMMARIES FOR SEEDING, VEGETATIVE WATERING, AND SOIL RETENTION BLANKETS QUANTITIES.

PRINT DATE	REVISION DATE
3/31/2021	

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
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TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

FM 166

SUMMARY OF MBGF

FED. RD. DIV.NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	50

SUMMARY OF SW3P

ITEM	0160-6003	0164-6009	0164-6011	0164-6023	0169-6003	0506-6002	0506-6011	0506-6038	0506-6039
STATION	FURNISHING AND PLACING TOPSOIL (4")	BROADCAST SEED (TEMP) (WARM)	BROADCAST SEED (TEMP) (COOL)	CELL FBR MLCH SEED(PERM)(RURAL)(CLAY)	SOIL RETENTION BLANKETS (CL 1) (TY C)	ROCK FILTER DAMS (INSTALL) (TY 2)	ROCK FILTER DAMS (REMOVE)	TEMP SEDMT CONT FENCE (INSTALL)	TEMP SEDMT CONT FENCE (REMOVE)
	SY	SY	SY	SY	SY	LF	LF	LF	LF
63+95	1,486	743	743	1,486	1,486	68	68		
80+61	43	22	22	43		15	15	20	20
122+09	138	69	69	138		20	20	20	20
167+75	14	7	7	14					
181+51	82	41	41	82		10	10	20	20
183+90	126	63	63	126		15	15	20	20
197+07	205	103	103	205		15	15	20	20
207+12	50	25	25	50		15	15	20	20
214+77	118	59	59	118		15	15	20	20
226+78	30	15	15	30		10	10	20	20
235+35	50	25	25	50		15	15	15	15
260+24						15	15	30	30
268+87	27	14	14	27		15	15	20	20
287+49	61	31	31	61		25	25	20	20
315+61						35	35	20	20
331+78	33	17	17	33		15	15	20	20
368+17	120	60	60	120		20	20	20	20
382+47	28	14	14	28		15	15	20	20
392+92	22	11	11	22		15	15	25	25
405+31	93	47	47	93		20	20	20	20
411+60	257	129	129	257		25	25	20	20
416+90	106	53	53	106		20	20	30	30
437+34	201	101	101	201		10	10	35	35
456+30	58	29	29	58		20	20	35	35
506+70	47	24	24	47		15	15	20	20
535+87	146	73	73	146		30	30	20	20
551+77	41	21	21	41		15	15	20	20
582+84	135	68	68	135		15	15	20	20
585+06	45	23	23	45		15	15	40	40
604+40	22	11	11	22		15	15	25	25
607+21	28	14	14	28		15	15	20	20
626+26	57	29	29	57		15	15	20	20
635+29	130	65	65	130		25	25	30	30
693+58	1,177	589	589	1,177	1,177	60	60		
723+28	84	42	42	84		15	15	20	20
752+47	27	14	14	27		15	15	30	30
796+37	20	10	10	20		15	15	20	20
802+65	25	13	13	25		25	25	20	20
858+22	139	70	70	139		25	25	20	20
(CSJ: 0955-01-027) PROJECT TOTAL	**5,471**	**2,744**	**2,744**	**5,471**	**2,663**	**763**	**763**	**815**	**815**

PRINT DATE	REVISION DATE
4/6/2021	

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TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

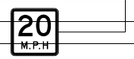
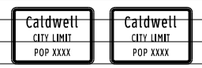
FM 166

SUMMARY OF SW3P

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	51

SUMMARY OF SMALL SIGNS

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX) POST TYPE: FRP = Fiberglass, TWT = Thin-Wall, 10BWG = 10 BWG, S80 = Sch 80	POSTS: 1 or 2	ANCHOR TYPE: UA=Universal Conc, UB=Universal Bolt, SA=Slipbase-Conc, SB=Slipbase-Bolt, WS=Wedge Steel, WP=Wedge Plastic	MOUNTING DESIGNATION: PREFABRICATED: P = "Plain", T = "T", U = "U"	MOUNTING DESIGNATION: 1EXT or 2EXT = # of Ext, BM = Extruded Wind Beam, WC = 1.12 #/ft Wing Channel, EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE: TY N, TY S
74	1-1	R2-1		24" X 30"	X		10 BWG	1	SA	P		
74	1-2	W1-3R		36" X 36"	X		10 BWG	1	SA	T		
74	1-3	13-1P		18" X 18"	X							
74	1-4	I-2A	 BACK TO BACK	24" X 18"	X		10 BWG	1	SA	P		
74	1-5	W5-3		36" X 36"	X		10 BWG	1	SA	T		

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

http://www.txdot.gov/

NOTE:

1. Sign supports shall be located as shown on the plans, except that the Engineer may shift the sign supports, within design guidelines, where necessary to secure a more desirable location or to avoid conflict with utilities. Unless otherwise shown on the plans, the Contractor shall stake and the Engineer will verify all sign support locations.
2. For installation of bridge mount clearance signs, see Bridge Mounted Clearance Sign Assembly (BMCS)Standard Sheet.
3. For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD(GEN).

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

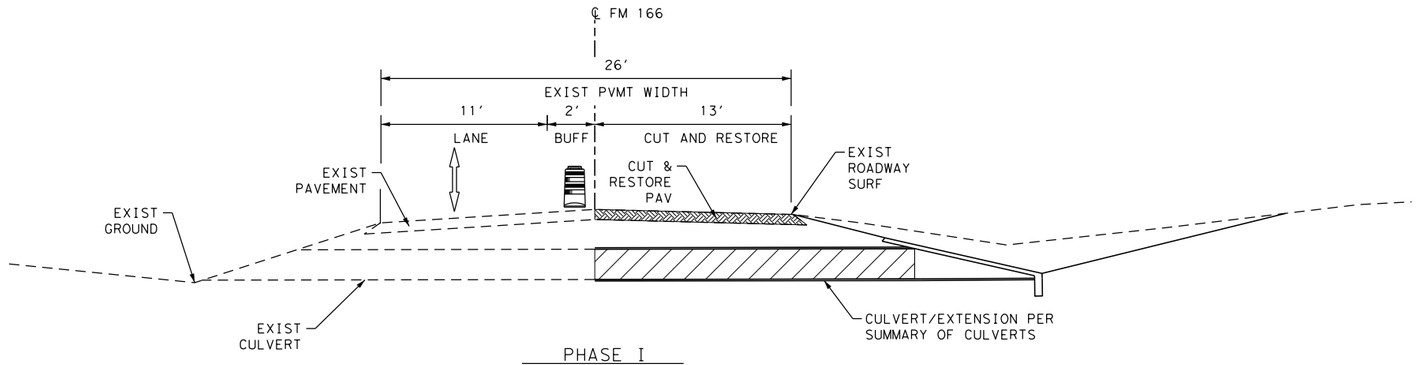
FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	0955	01	027	FM 166
4-16	DIST	COUNTY		SHEET NO.
8-16	BRY	BURLESON		52

18

DATE: 3/31/2021 3:04:37 PM
FILE: P:\120196\01\Design\027 FM 166\Civil\General\1209601_SOSS.dgn

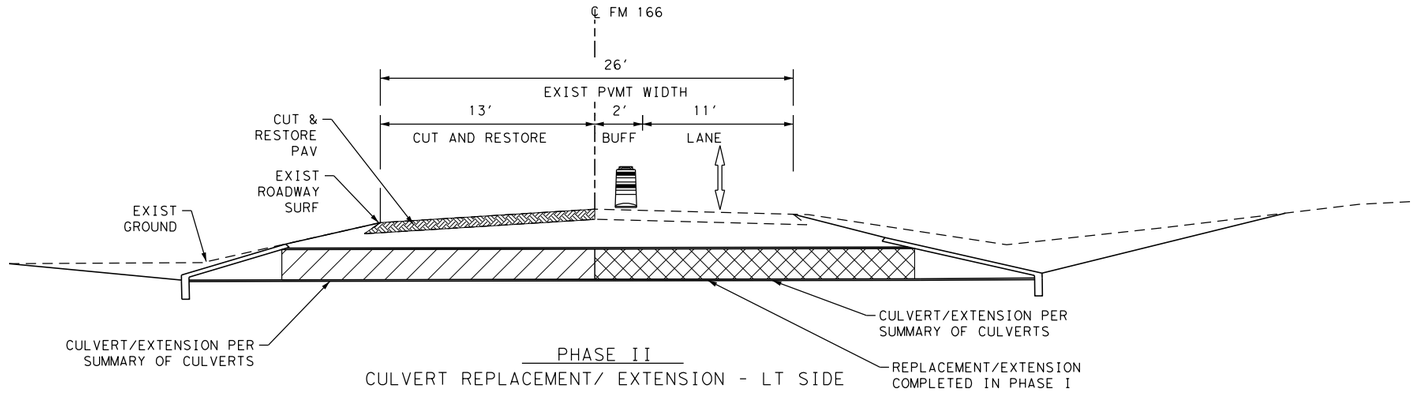
LEGEND

- CUT & RESTORE PAVEMENT
- CURRENT PHASE CONSTRUCTION
- PREVIOUS PHASE CONSTRUCTION



PHASE I

CULVERT REPLACEMENT/ EXTENSION - RT SIDE



PHASE II

CULVERT REPLACEMENT/ EXTENSION - LT SIDE

DESIGN

STATE OF TEXAS · HEATHER McNEAL · 114428 · LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS · DAN THOMA · 98622 · LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

PRINT DATE	REVISION DATE
3/31/2021	

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TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

FM 166

SEQUENCE OF WORK

FED.RD. DIV.NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	53

BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

1. The Barricade and Construction Standard Sheets (BC sheets) are intended to show typical examples for placement of temporary traffic control devices, construction pavement markings, and typical work zone signs. The information contained in these sheets meet or exceed the requirements shown in the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).

2. The development and design of the Traffic Control Plan (TCP)is the responsibility of the Engineer.

3. The Contractor may propose changes to the TCP that are signed and sealed by a licensed professional engineer for approval. The Engineer may develop, sign and seal Contractor proposed changes.

4. The Contractor is responsible for installing and maintaining the traffic control devices as shown in the plans. The Contractor may not move or change the approximate location of any device without the approval of the Engineer.

5. Geometric design of lane shifts and detours should, when possible, meet the applicable design criteria contained in manuals such as the American Association of State Highway and Transportation Officials (AASHTO), "A Policy on Geometric Design of Highways and Streets," the TxDOT "Roadway Design Manual" or engineering judgment.

6. When projects abut, the Engineer(s) may omit the END ROAD WORK, TRAFFIC FINES DOUBLE, and other advance warning signs if the signing would be redundant and the work areas appear continuous to the motorists. If the adjacent project is completed first, the Contractor shall erect the necessary warning signs as shown on these sheets, the TCP sheets or as directed by the Engineer. The BEGIN ROAD WORK NEXT X MILES sign shall be revised to show appropriate work zone distance.

7. The Engineer may require duplicate warning signs on the median side of divided highways where median width will permit and traffic volumes justify the signing.

8. All signs shall be constructed in accordance with the details found in the "Standard Highway Sign Designs for Texas," latest edition. Sign details not shown in this manual shall be shown in the plans or the Engineer shall provide a detail to the Contractor before the sign is manufactured.

9. The temporary traffic control devices shown in the illustrations of the BC sheets are examples. As necessary, the Engineer will determine the most appropriate traffic control devices to be used.

10. As shown on BC(2), the OBEY WARNING SIGNS STATE LAW sign, STAY ALERT TALK OR TEXT LATER (see Sign Detail G20-10T) and the WORK ZONE TRAFFIC FINES DOUBLE sign with plaque shall be erected in advance of the CSJ limits. However, the TRAFFIC FINES DOUBLE sign will not be required on projects consisting solely of mobile operation work, such as striping or milling edgeline rumble strips. The BEGIN ROAD WORK NEXT X MILES, CONTRACTOR and END ROAD WORK signs shall be erected at or near the CSJ limits.

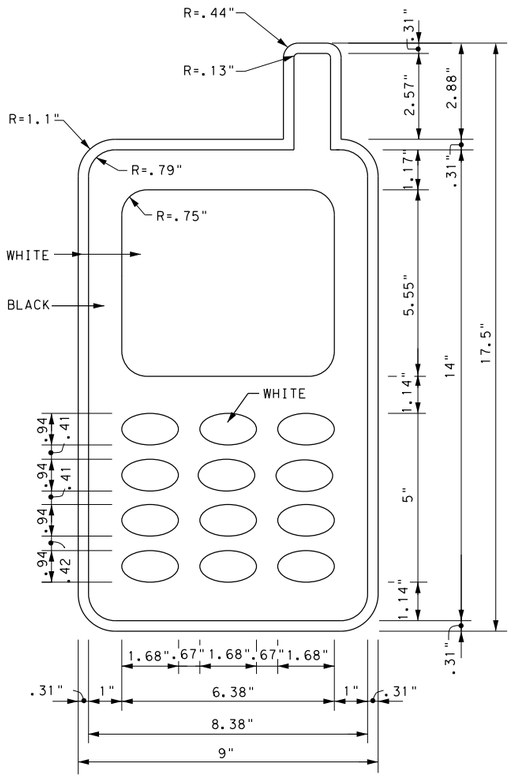
11. Except for devices required by Note 10, traffic control devices should be in place only while work is actually in progress or a definite need exists.

12. The Engineer has the final decision on the location of all traffic control devices.

13. Inactive equipment and work vehicles, including workers' private vehicles must be parked away from travel lanes. They should be as close to the right-of-way line as possible, or located behind a barrier or guardrail, or as approved by the Engineer.

WORKER SAFETY APPAREL NOTES:

1. Workers on foot who are exposed to traffic or to construction equipment within the right-of-way shall wear high-visibility safety apparel meeting the requirements of ISEA "American National Standard for High-Visibility Apparel," or equivalent revisions, and labeled as ANSI 107-2004 standard performance for Class 2 or 3 risk exposure. Class 3 garments should be considered for high traffic volume work areas or night time work.



3.0" Radius, 1.25" Border, 0.75" Indent, Black on Yellow;
[STAY ALERT] Font: D
3.0" Radius, 1.25" Border, 0.75" Indent, Black on Orange;
[TALK OR TEXT LATER] Font: C specified length;

SIGN DETAIL (G20-10T)

Only pre-qualified products shall be used. The "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources and may be found on-line at the web address given below or by contacting:

Texas Department of Transportation
Traffic Operations Division - TE
Phone (512) 416-3118

THE DOCUMENTS BELOW CAN BE FOUND ON-LINE AT http://www.txdot.gov
COMPLIANT WORK ZONE TRAFFIC CONTROL DEVICES LIST (CWZTCD)
DEPARTMENTAL MATERIAL SPECIFICATIONS (DMS)
MATERIAL PRODUCER LIST (MPL)
ROADWAY DESIGN MANUAL - SEE "MANUALS (ONLINE MANUALS)"
STANDARD HIGHWAY SIGN DESIGNS FOR TEXAS (SHSD)
TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD)
TRAFFIC ENGINEERING STANDARD SHEETS

Texas Department of Transportation — Traffic Operations Division Standard

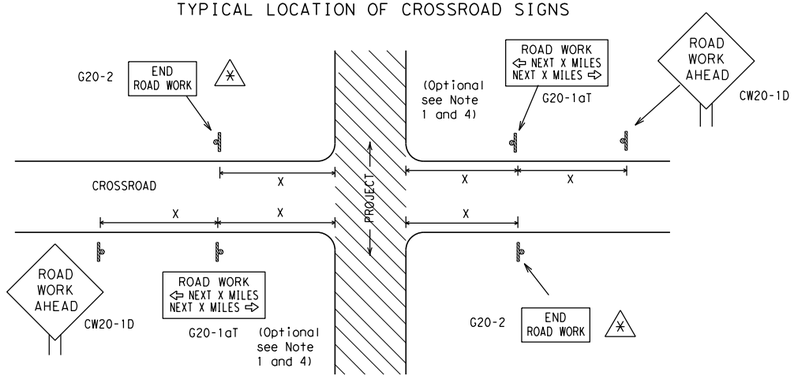
BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0955	01	027	FM 166
4-03 5-10 8-14	DIST	COUNTY		SHEET NO.
9-07 7-13	BRY	BURLESON		54

DATE: 3/31/2021 3:04:44 PM
FILE: P:\120\96\01\Design\027 FM 166\Civil\Standards\TCP\bc-14.dgn

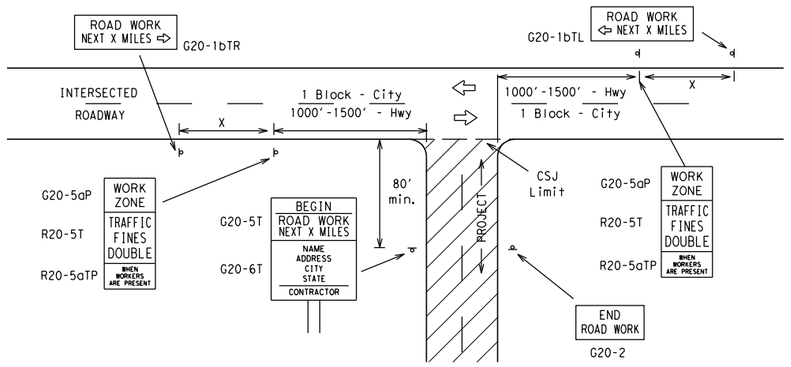
TYPICAL LOCATION OF CROSSROAD SIGNS



✳ May be mounted on back of "ROAD WORK AHEAD"(CW20-1D) sign with approval of Engineer. (See note 2 below)

1. The typical minimum signing on a crossroad approach should be a "ROAD WORK AHEAD" (CW20-1D)sign and a (G20-2) "END ROAD WORK" sign, unless noted otherwise in plans.
2. The Engineer may use the reduced size 36" x 36" ROAD WORK AHEAD (CW20-1D) sign mounted back to back with the reduced size 36" x 18" "END ROAD WORK"(G20-2) sign on low volume crossroads (see Note 4 under "Typical Construction Warning Sign Size and Spacing"). See the "Standard Highway Sign Designs for Texas" manual for sign details. The Engineer may omit the advance warning signs on low volume crossroads. The Engineer will determine whether a road is low volume. This information shall be shown in the plans.
3. Based on existing field conditions, the Engineer/Inspector may require additional signs such as FLAGGER AHEAD, LOOSE GRAVEL, or other appropriate signs. When additional signs are required, these signs will be considered part of the minimum requirements. The Engineer/Inspector will determine the proper location and spacing of any sign not shown on the BC sheets, Traffic Control Plan sheets or the Work Zone Standard Sheets.
4. The "ROAD WORK NEXT X MILES"(G20-1aT)sign shall be required at high volume crossroads to advise motorists of the length of construction in either direction from the intersection. The Engineer will determine whether a roadway is considered high volume.
5. Additional traffic control devices may be shown elsewhere in the plans for higher volume crossroads.
6. When work occurs in the intersection area, appropriate traffic control devices, as shown elsewhere in the plans or as determined by the Engineer/Inspector, shall be in place.

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

1. The Engineer will determine the types and location of any additional traffic control devices, such as a flagger and accompanying signs, or other signs, that should be used when work is being performed at or near an intersection.
2. If construction closes the road at a T-intersection the Contractor shall place the "CONTRACTOR NAME"(G20-6T) sign behind the Type 3 Barricades for the road closure (see BC(10) also). The "ROAD WORK NEXT X MILES" left arrow(G20-1bTL) and "ROAD WORK NEXT X MILES" right arrow (G20-1bTR)" signs shall be replaced by the detour signing called for in the plans.

TYPICAL CONSTRUCTION WARNING SIGN SIZE AND SPACING[1,5,6]

SIZE			SPACING	
Sign Number or Series	Conventional Road	Expressway/ Freeway	Posted Speed	Sign Spacing "X" △
			MPH	Feet (Apprx.)
CW20[4] CW21 CW22 CW23 CW25	48" x 48"	48" x 48"	30	120
			35	160
			40	240
			45	320
CW1, CW2, CW7, CW8, CW9, CW11, CW14	36" x 36"	48" x 48"	50	400
			55	500[2]
			60	600[2]
CW3, CW4, CW5, CW6, CW8-3, CW10, CW12	48" x 48"	48" x 48"	65	700[2]
			70	800[2]
			75	900[2]
			80	1000[2]
			✳	✳ [3]

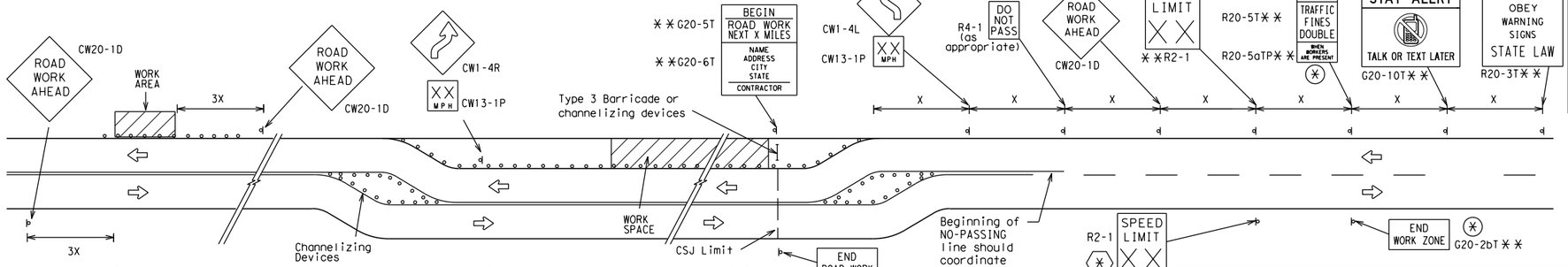
✳ For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

△ Minimum distance from work area to first Advance Warning sign nearest the work area and/or distance between each additional sign.

GENERAL NOTES

1. Special or larger size signs may be used as necessary.
2. Distance between signs should be increased as required to have 1500 feet advance warning.
3. Distance between signs should be increased as required to have 1/2 mile or more advance warning.
4. 36" x 36" "ROAD WORK AHEAD" (CW20-1D)signs may be used on low volume crossroads at the discretion of the Engineer. See Note 2 under "Typical Location of Crossroad Signs".
5. Only diamond shaped warning sign sizes are indicated.
6. See sign size listing in "TMUTCD", Sign Appendix or the "Standard Highway Sign Designs for Texas" manual for complete list of available sign design sizes.

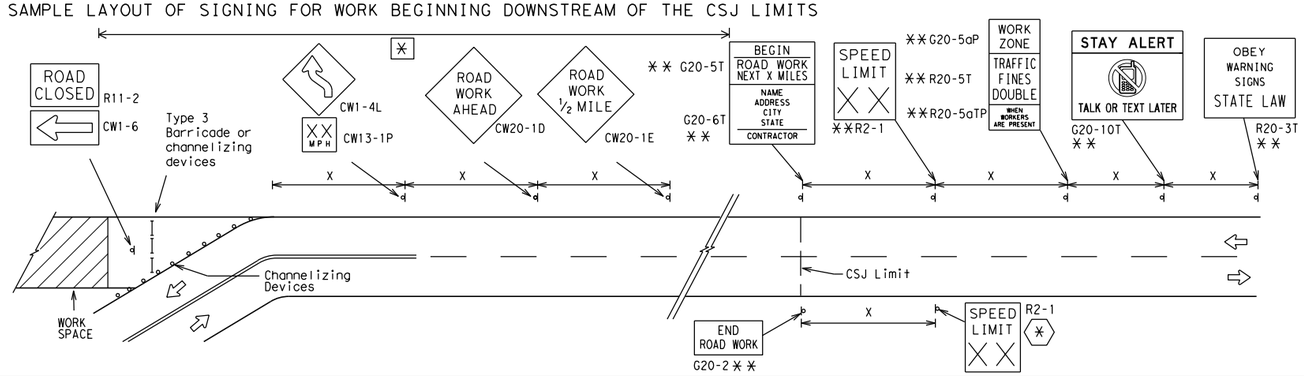
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD"(CW20-1D)signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing of signs and channelizing devices.

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING DOWNSTREAM OF THE CSJ LIMITS



NOTES

The Contractor shall determine the appropriate distance to be placed on the G20-1 series signs and "BEGIN ROAD WORK NEXT X MILES"(G20-5T)sign for each specific project. This distance shall replace the "X" and shall be rounded to the nearest whole mile with the approval of the Engineer. No decimals shall be used.

(✳) The "BEGIN WORK ZONE"(G20-9TP) and "END WORK ZONE" (G20-2bT) shall be used as shown on the sample layout when advance signs are required outside the CSJ Limits. They inform the motorist of entering or leaving a part of the work zone lying outside the CSJ Limits where traffic fines may double if workers are present.

✳✳ Required CSJ Limit signing. See Note 10 on BC(1). TRAFFIC FINES DOUBLE signs will not be required on projects consisting solely of mobile operations work.

✳ Area for placement of "ROAD WORK AHEAD" (CW20-1D)sign and other signs or devices as called for on the Traffic Control Plan.

(✳) Contractor will install a regulatory speed limit sign at the end of the work zone.

LEGEND	
⊢⊣	Type 3 Barricade
○ ○ ○	Channelizing Devices
▬	Sign
X	See Typical Construction Warning Sign Size and Spacing chart or the TMUTCD for sign spacing requirements.

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0955	01	027	FM 166
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13	BRY	BURLESON		55

DATE: 3/31/2021 3:04:44 PM
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DATE: 3/31/2021 3:04:45 PM
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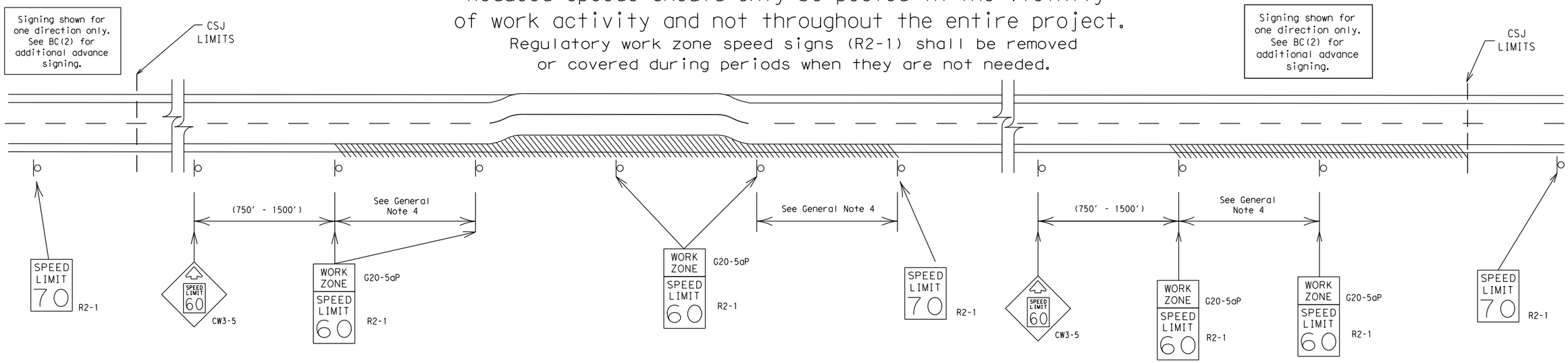
TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

Work zone speed limits shall be regulatory, established in accordance with the "Procedures for Establishing Speed Zones," and approved by the Texas Transportation Commission, or by City Ordinance when within Incorporated City Limits.

Reduced speeds should only be posted in the vicinity of work activity and not throughout the entire project.

Regulatory work zone speed signs (R2-1) shall be removed or covered during periods when they are not needed.



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

This type of work zone speed limit should be included on the design of the traffic control plans when restricted geometrics with a lower design speed are present in the work zone and modification of the geometrics to a higher design speed is not feasible.

Long/Intermediate Term Work Zone Speed Limit signs, when approved as described above, should be posted and visible to the motorist when work activity is present. Work activity may also be defined as a change in the roadway that requires a reduced speed for motorists to safely negotiate the work area, including:

a) rough road or damaged pavement surface
b) substantial alteration of roadway geometrics (diversions)
c) construction detours
d) grade
e) width
f) other conditions readily apparent to the driver

As long as any of these conditions exist, the work zone speed limit signs should remain in place.

SHORT TERM WORK ZONE SPEED LIMITS

This type of work zone speed limit may be included on the design of the traffic control plans when workers or equipment are not behind concrete barrier, when work activity is within 10 feet of the traveled way or actually in the travelled way.

Short Term Work Zone Speed Limit signs should be posted and visible to the motorists only when work activity is present. When work activity is not present, signs shall be removed or covered.
(See Removing or Covering on BC(4)).

GENERAL NOTES

1. Regulatory work zone speed limits should be used only for sections of construction projects where speed control is of major importance.
2. Regulatory work zone speed limit signs shall be placed on supports at a 7 foot minimum mounting height.
3. Speed zone signs are illustrated for one direction of travel and are normally posted for each direction of travel.
4. Frequency of work zone speed limit signs should be:
   40 mph and greater 0.2 to 2 miles
   35 mph and less 0.2 to 1 mile
5. Regulatory speed limit signs shall have black legend and border on a white reflective background (See "Reflective Sheeting" on BC(4)).
6. Fabrication, erection and maintenance of the"ADVANCE SPEED LIMIT"(CW3-5)sign, "WORK ZONE"(G20-5aP) plaque and the "SPEED LIMIT"(R2-1)signs shall not be paid for directly, but shall be considered subsidiary to Item 502.
7. Turning signs from view, laying signs over or down will not be allowed, unless as otherwise noted under "REMOVING OR COVERING" on BC(4).
8. Techniques that may help reduce traffic speeds include but are not limited to:
   A. Law enforcement.
   B. Flagger stationed next to sign.
   C. Portable changeable message sign (PCMS).
   D. Low-power (drone) radar transmitter.
   E. Speed monitor trailers or signs.
9. Speeds shown on details above are for illustration only. Work Zone Speed Limits should only be posted as approved for each project.
10. For more specific guidance concerning the type of work, work zone conditions and factors impacting allowable regulatory construction speed zone reduction see TxDOT form #1204 in the TxDOT e-form system.

Texas Department of Transportation

Traffic Operations Division Standard

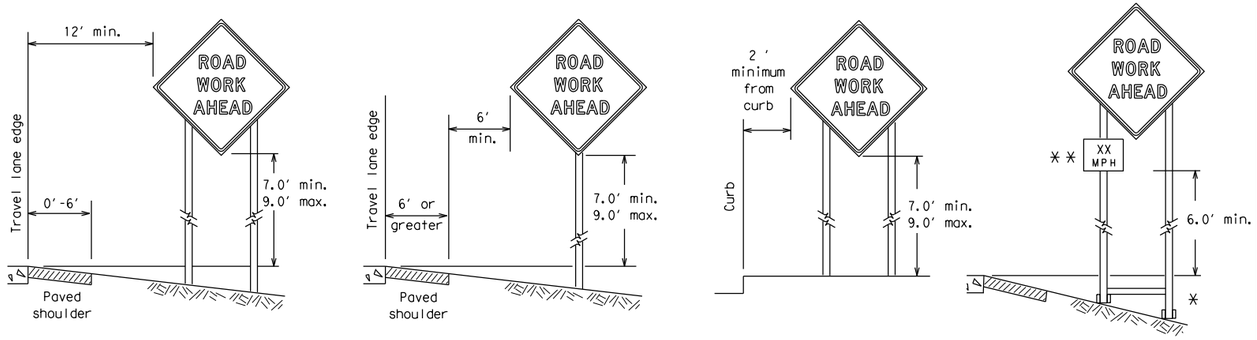
BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0955	01	027	FM 166
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13	BRY	BURLESON		56

97

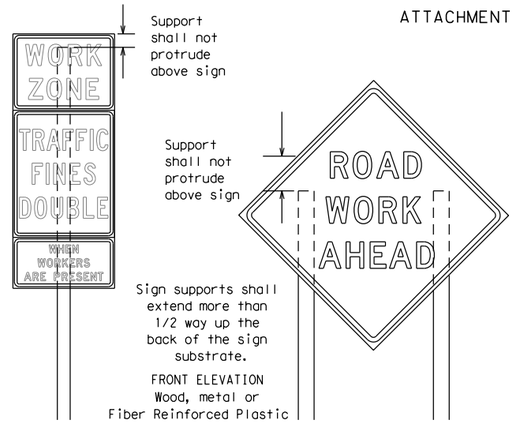
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



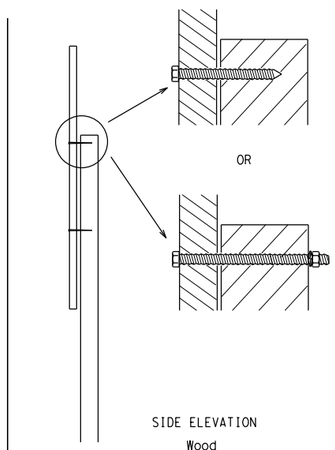
⁎ When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

⁎⁎ When plaques are placed on dual-leg supports, they should be attached to the upright nearest the travel lane. Supplemental plaques (advisory or distance) should not cover the surface of the parent sign.

ATTACHMENT FOR SIGN SUPPORTS



Splicing embedded perforated square metal tubing in order to extend post height will only be allowed when the splice is made using four bolts, two above and two below the spice point. Splice must be located entirely behind the sign substrate, not near the base of the support. Splice insert lengths should be at least 5 times nominal post size, centered on the splice and of at least the same gauge material.

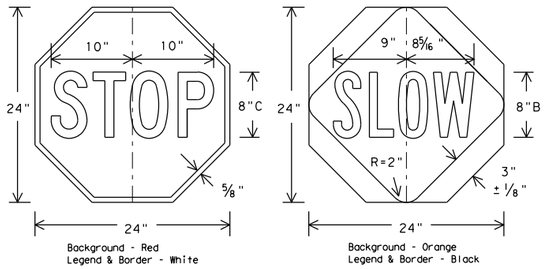


Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

Nails shall NOT be allowed. Each sign shall be attached directly to the sign support. Multiple signs shall not be joined or spliced by any means. Wood supports shall not be extended or repaired by splicing or other means.

STOP/SLOW PADDLES

1. STOP/SLOW paddles are the primary method to control traffic by flaggers. The STOP/SLOW paddle size should be 24" x 24" as detailed below.
2. When used at night, the STOP/SLOW paddle shall be retroreflectorized.
3. STOP/SLOW paddles may be attached to a staff with a minimum length of 6′ to the bottom of the sign.
4. Any lights incorporated into the STOP or SLOW paddle faces shall only be as specifically described in Section 6E.03 Hand Signaling Devices in the TMUTCD.



CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

1. Permanent signs are used to give notice of traffic laws or regulations, call attention to conditions that are potentially hazardous to traffic operations, show route designations, destinations, directions, distances, services, points of interest, and other geographical, recreational, or cultural information. Drivers proceeding through a work zone need the same, if not better route guidance as normally installed on a roadway without construction.
2. When permanent regulatory or warning signs conflict with work zone conditions, remove or cover the permanent signs until the permanent sign message matches the roadway condition.
3. When existing permanent signs are moved and relocated due to construction purposes, they shall be visible to motorists at all times.
4. If existing signs are to be relocated on their original supports, they shall be installed on crashworthy bases as shown on the SMD Standard sheets. The signs shall meet the required mounting heights shown on the BC Sheets or the SMD Standards. This work should be paid for under the appropriate pay item for relocating existing signs.
5. If permanent signs are to be removed and relocated using temporary supports, the Contractor shall use crashworthy supports as shown on the BC sheets or the CWZTCD. The signs shall meet the required mounting heights shown on the BC Sheets or the SMD Standards during construction. This work should be paid for under the appropriate pay item for relocating existing signs.
6. Any sign or traffic control device that is struck or damaged by the Contractor or his/her construction equipment shall be replaced as soon as possible by the Contractor to ensure proper guidance for the motorists. This will be subsidiary to Item 502.

GENERAL NOTES FOR WORK ZONE SIGNS

1. Contractor shall install and maintain signs in a straight and plumb condition and/or as directed by the Engineer.
2. Wooden sign posts shall be painted white.
3. Barricades shall NOT be used as sign supports.
4. All signs shall be installed in accordance with the plans or as directed by the Engineer. Signs shall be used to regulate, warn, and guide the traveling public safely through the work zone.
5. The Contractor may furnish either the sign design shown in the plans or in the "Standard Highway Sign Designs for Texas" (SHSD). The Engineer/Inspector may require the Contractor to furnish other work zone signs that are shown in the TMUTCD but may have been omitted from the plans. Any variation in the plans shall be documented by written agreement between the Engineer and the Contractor's Responsible Person. All changes must be documented in writing before being implemented. This can include documenting the changes in the Inspector's TxDOT diary and having both the Inspector and Contractor initial and date the agreed upon changes.
6. The Contractor shall furnish sign supports listed in the "Compliant Work Zone Traffic Control Device List" (CWZTCD). The Contractor shall install the sign support in accordance with the manufacturer's recommendations. If there is a question regarding installation procedures, the Contractor shall furnish the Engineer a copy of the manufacturer's installation recommendations so the Engineer can verify the correct procedures are being followed.
7. The Contractor is responsible for installing signs on approved supports and replacing signs with damaged or cracked substrates and/or damaged or marred reflective sheeting as directed by the Engineer/Inspector.
8. Identification markings may be shown only on the back of the sign substrate. The maximum height of letters and/or company logos used for identification shall be 1 inch.
9. The Contractor shall replace damaged wood posts. New or damaged wood sign posts shall not be spliced.

DURATION OF WORK (as defined by the "Texas Manual on Uniform Traffic Control Devices" Part 6)

1. The types of sign supports, sign mounting height, the size of signs, and the type of sign substrates can vary based on the type of work being performed. The Engineer is responsible for selecting the appropriate size sign for the type of work being performed. The Contractor is responsible for ensuring the sign support, sign mounting height and substrate meets manufacturer's recommendations in regard to crashworthiness and duration of work requirements.
   a. Long-term stationary - work that occupies a location more than 3 days.
   b. Intermediate-term stationary - work that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than one hour.
   c. Short-term stationary - daytime work that occupies a location for more than 1 hour in a single daylight period.
   d. Short, duration - work that occupies a location up to 1 hour.
   e. Mobile - work that moves continuously or intermittently (stopping for up to approximately 15 minutes.)

SIGN MOUNTING HEIGHT

1. The bottom of Long-term/Intermediate-term signs shall be at least 7 feet, but not more than 9 feet, above the paved surface, except as shown for supplemental plaques mounted below other signs.
2. The bottom of Short-term/Short Duration signs shall be a minimum of 1 foot above the pavement surface but no more than 2 feet above the ground.
3. Long-term/Intermediate-term Signs may be used in lieu of Short-term/Short Duration signing.
4. Short-term/Short Duration signs shall be used only during daylight and shall be removed at the end of the workday or raised to appropriate Long-term/Intermediate sign height.
5. Regulatory signs shall be mounted at least 7 feet, but not more than 9 feet, above the paved surface regardless of work duration.

SIZE OF SIGNS

1. The Contractor shall furnish the sign sizes shown on BC (2) unless otherwise shown in the plans or as directed by the Engineer.

SIGN SUBSTRATES

1. The Contractor shall ensure the sign substrate is installed in accordance with the manufacturer's recommendations for the type of sign support that is being used. The CWZTCD lists each substrate that can be used on the different types and models of sign supports.
2. "Mesh" type materials are NOT an approved sign substrate, regardless of the tightness of the weave.
3. All wooden individual sign panels fabricated from 2 or more pieces shall have one or more plywood cleat, 1/2" thick by 6" wide, fastened to the back of the sign and extending fully across the sign. The cleat shall be attached to the back of the sign using wood screws that do not penetrate the face of the sign panel. The screws shall be placed on both sides of the splice and spaced at 6" centers. The Engineer may approve other methods of splicing the sign face.

REFLECTIVE SHEETING

1. All signs shall be retroreflective and constructed of sheeting meeting the color and retro-reflectivity requirements of DMS-8300 for rigid signs or DMS-8310 for roll-up signs. The web address for DMS specifications is shown on BC(1).
2. White sheeting, meeting the requirements of DMS-8300 Type A, shall be used for signs with a white background.
3. Orange sheeting, meeting the requirements of DMS-8300 Type B_{FL} or Type C_{FL}, shall be used for rigid signs with orange backgrounds.

SIGN LETTERS

1. All sign letters and numbers shall be clear, and open rounded type uppercase alphabet letters as approved by the Federal Highway Administration (FHWA) and as published in the "Standard Highway Sign Design for Texas" manual. Signs, letters and numbers shall be of first class workmanship in accordance with Department Standards and Specifications.

REMOVING OR COVERING

1. When sign messages may be confusing or do not apply, the signs shall be removed or completely covered.
2. Long-term stationary or intermediate stationary signs installed on square metal tubing may be turned away from traffic 90 degrees when the sign message is not applicable. This technique may not be used for signs installed in the median of divided highways or near any intersections where the sign may be seen from approaching traffic.
3. Signs installed on wooden skids shall not be turned at 90 degree angles to the roadway. These signs should be removed or completely covered when not required.
4. When signs are covered, the material used shall be opaque, such as heavy mil black plastic, or other materials which will cover the entire sign face and maintain their opaque properties under automobile headlights at night, without damaging the sign sheeting.
5. Burlap shall NOT be used to cover signs.
6. Duct tape or other adhesive material shall NOT be affixed to a sign face.
7. Signs and anchor stubs shall be removed and holes backfilled upon completion of work.

SIGN SUPPORT WEIGHTS

1. Where sign supports require the use of weights to keep from turning over, the use of sandbags with dry, cohesionless sand should be used.
2. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
3. Rock, concrete, iron, steel or other solid objects shall not be permitted for use as sign support weights.
4. Sandbags should weigh a minimum of 35 lbs and a maximum of 50 lbs.
5. Sandbags shall be made of a durable material that tears upon vehicular impact. Rubber (such as tire inner tubes) shall NOT be used.
6. Rubber ballasts designed for channelizing devices should not be used for ballast on portable sign supports. Sign supports designed and manufactured with rubber bases may be used when shown on the CWZTCD list.
7. Sandbags shall only be placed along or laid over the base supports of the traffic control device and shall not be suspended above ground level or hung with rope, wire, chains or other fasteners. Sandbags shall be placed along the length of the skids to weigh down the sign support.
8. Sandbags shall NOT be placed under the skid and shall not be used to level sign supports placed on slopes.

FLAGS ON SIGNS

1. Flags may be used to draw attention to warning signs. When used the flag shall be 16 inches square or larger and shall be orange or fluorescent red-orange in color. Flags shall not be allowed to cover any portion of the sign face.

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS 9-07 8-14 7-13	0955	01	027	FM 166
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	BRY	BURLESON		57

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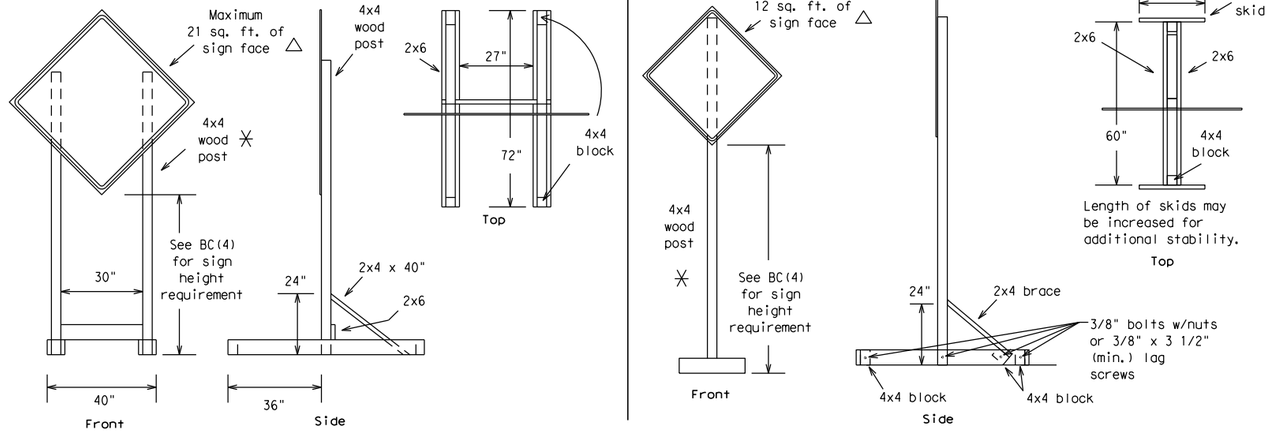
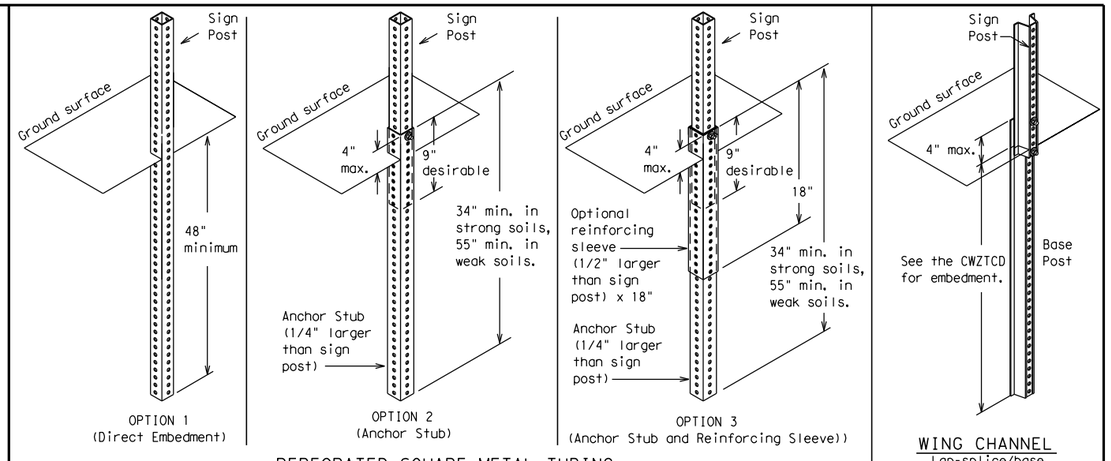


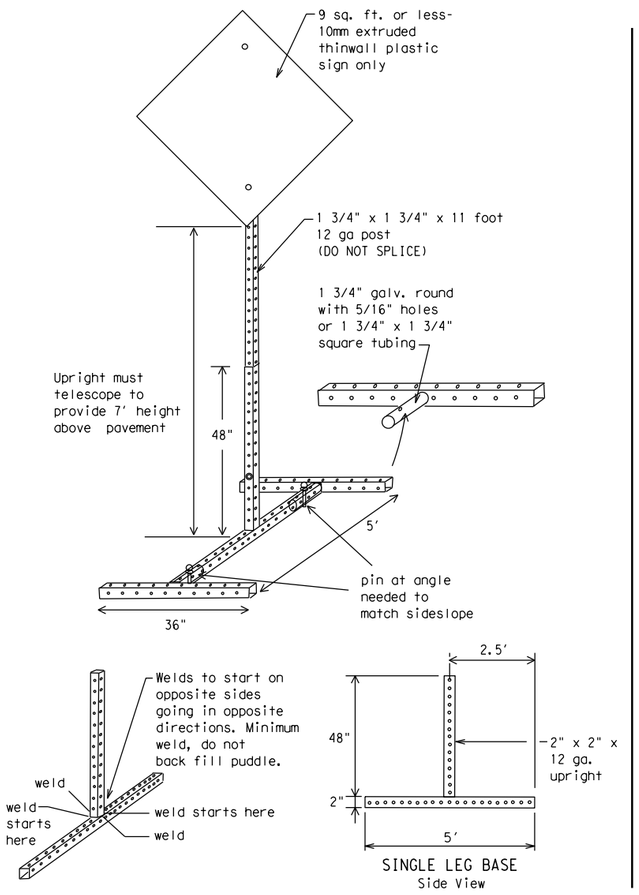
SKID MOUNTED WOOD SIGN SUPPORTS

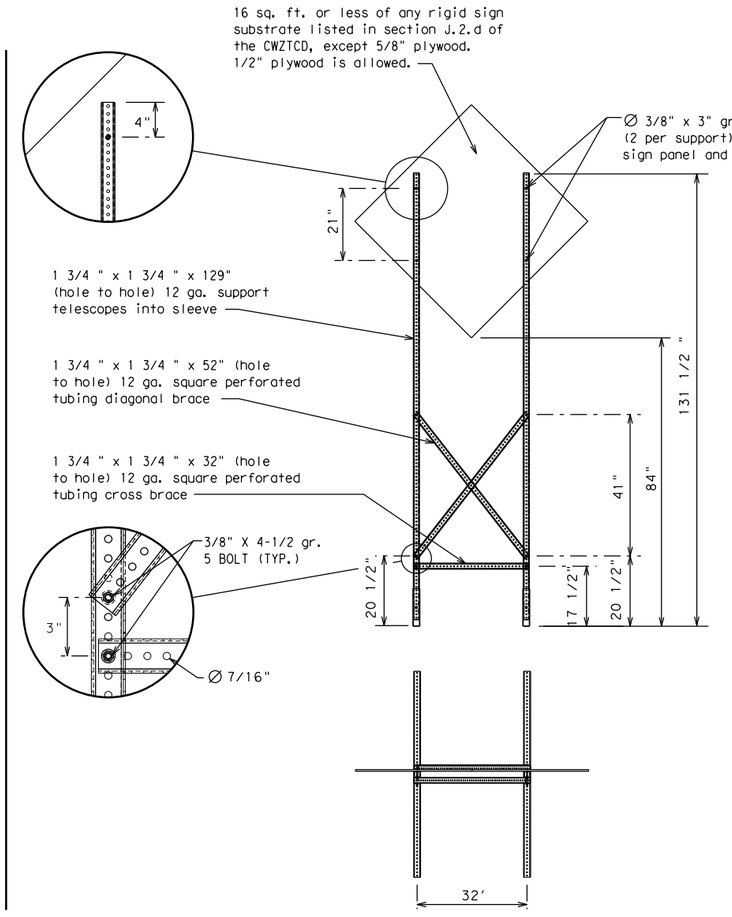
LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS □

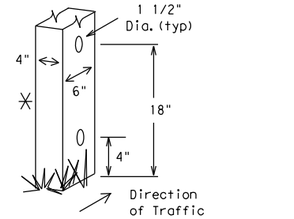


GROUND MOUNTED SIGN SUPPORTS

Refer to the CWZTCD and the manufacturer's installation procedure for each type sign support.
The maximum sign square footage shall adhere to the manufacturer's recommendation.
Two post installations can be used for larger signs.

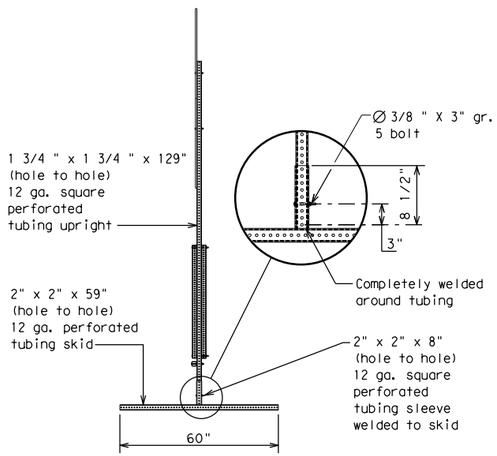






Nominal Post Size	Number of Posts	Maximum Sq. feet of Sign Face	Minimum Soil Embedment	Drilled Hole(s) Required
4 x 4	1	12	36"	NO
4 x 4	2	21	36"	NO
4 x 6	1	21	36"	YES
4 x 6	2	36	36"	YES

WOOD POST SYSTEM FOR GROUND MOUNTED SIGN SUPPORTS



SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

WEDGE ANCHORS

Both steel and plastic Wedge Anchor Systems as shown on the SMD Standard Sheets may be used as temporary sign supports for signs up to 10 square feet of sign face. They may be set in concrete or in sturdy soils if approved by the Engineer. (See web address for "Traffic Engineering Standard Sheets" on BC(1)).

OTHER DESIGNS

MORE DETAILS OF APPROVED LONG/INTERMEDIATE AND SHORT TERM SUPPORTS CAN BE FOUND ON THE CWZTCD LIST. SEE BC(1) FOR WEBSITE LOCATION.

GENERAL NOTES

1. Nails may be used in the assembly of wooden sign supports, but 3/8" bolts with nuts or 3/8" x 3 1/2" lag screws must be used on every joint for final connection.
2. No more than 2 sign posts shall be placed within a 7 ft. circle, except for specific materials noted on the CWZTCD List.
3. When project is completed, all sign supports and foundations shall be removed from the project site. This will be considered subsidiary to Item 502.

□ See BC(4) for definition of "Work Duration."

✳ Wood sign posts MUST be one piece. Splicing will NOT be allowed. Posts shall be painted white.

△ See the CWZTCD for the type of sign substrate that can be used for each approved sign support.

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-14

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WHEN NOT IN USE, REMOVE THE PCMS FROM THE RIGHT-OF-WAY OR PLACE THE PCMS BEHIND BARRIER OR GUARDRAIL WITH SIGN PANEL TURNED PARALLEL TO TRAFFIC

PORTABLE CHANGEABLE MESSAGE SIGNS

1. The Engineer/Inspector shall approve all messages used on portable changeable message signs (PCMS).
2. Messages on PCMS should contain no more than 8 words (about four to eight characters per word), not including simple words such as "TO," "FOR," "AT," etc.
3. Messages should consist of a single phase, or two phases that alternate. Three-phase messages are not allowed. Each phase of the message should convey a single thought, and must be understood by itself.
4. Use the word "EXIT" to refer to an exit ramp on a freeway; i.e., "EXIT CLOSED." Do not use the term "RAMP."
5. Always use the route or interstate designation (IH, US, SH, FM) along with the number when referring to a roadway.
6. When in use the bottom of a stationary PCMS message panel should be a minimum 7 feet above the roadway, where possible.
7. The message term "WEEKEND" should be used only if the work is to start on Saturday morning and end by Sunday evening at midnight. Actual days and hours of work should be displayed on the PCMS if work is to begin on Friday evening and/or continue into Monday morning.
8. The Engineer/Inspector may select one of two options which are available for displaying a two-phase message on a PCMS. Each phase may be displayed for either four seconds each or for three seconds each.
9. Do not "flash" messages or words included in a message. The message should be steady burn or continuous while displayed.
10. Do not present redundant information on a two-phase message; i.e., keeping two lines of the message the same and changing the third line.
11. Do not use the word "Danger" in message.
12. Do not display the message "LANES SHIFT LEFT" or "LANES SHIFT RIGHT" on a PCMS. Drivers do not understand the message.
13. Do not display messages that scroll horizontally or vertically across the face of the sign.
14. The following table lists abbreviated words and two-word phrases that are acceptable for use on a PCMS. Both words in a phrase must be displayed together. Words or phrases not on this list should not be abbreviated, unless shown in the TMUTCD.
15. PCMS character height should be at least 18 inches for trailer mounted units. They should be visible from at least 1/2 (.5) mile and the text should be legible from at least 600 feet at night and 800 feet in daylight. Truck mounted units must have a character height of 10 inches and must be legible from at least 400 feet.
16. Each line of text should be centered on the message board rather than left or right justified.
17. If disabled, the PCMS should default to an illegible display that will not alarm motorists and will only be used to alert workers that the PCMS has malfunctioned. A pattern such as a series of horizontal solid bars is appropriate.

WORD OR PHRASE	ABBREVIATION
Access Road	ACCS RD
Alternate	ALT
Avenue	AVE
Best Route	BEST RTE
Boulevard	BLVD
Bridge	BRDG
Cannot	CANT
Center	CTR
Construction Ahead	CONST AHD
CROSSING	XING
Detour Route	DETOUR RTE
Do Not	DONT
East	E
Eastbound	(route) E
Emergency	EMER
Emergency Vehicle	EMER VEH
Entrance, Enter	ENT
Express Lane	EXP LN
Expressway	EXPWY
XXXX Feet	XXXX FT
Fog Ahead	FOG AHD
Freeway	FRWY, FWY
Freeway Blocked	FWY BLKD
Friday	FRI
Hazardous Driving	HAZ DRIVING
Hazardous Material	HAZMAT
High-Occupancy	HOV
Vehicle Highway	HWY
Hour(s)	HR, HRS
Information	INFO
It Is	ITS
Junction	JCT
Left	LFT
Left Lane	LFT LN
Lane Closed	LN CLOSED
Lower Level	LWR LEVEL
Maintenance	MAINT

WORD OR PHRASE	ABBREVIATION
Major	MAJ
Miles	MI
Miles Per Hour	MPH
Minor	MNR
Monday	MON
Normal	NORM
North	N
Northbound	(route) N
Parking	PKING
Road	RD
Right Lane	RT LN
Saturday	SAT
Service Road	SERV RD
Shoulder	SHLDR
Slippery	SLIP
South	S
Southbound	(route) S
Speed	SPD
Street	ST
Sunday	SUN
Telephone	PHONE
Temporary	TEMP
Thursday	THURS
To Downtown	TO DWNTN
Traffic	TRAF
Travelers	TRVLRS
Tuesday	TUES
Time Minutes	TIME MIN
Upper Level	UPR LEVEL
Vehicles (s)	VEH, VEHS
Warning	WARN
Wednesday	WED
Weight Limit	WT LIMIT
West	W
Westbound	(route) W
Wet Pavement	WET PVMT
Will Not	WONT

Roadway designation # IH-number, US-number, SH-number, FM-number

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

(The Engineer may approve other messages not specifically covered here.)

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

- FREEWAY CLOSED X MILE
- FRONTAGE ROAD CLOSED
- ROAD CLOSED AT SH XXX
- SHOULDER CLOSED XXX FT
- ROAD CLSD AT FM XXXX
- RIGHT LN CLOSED XXX FT
- RIGHT X LANES CLOSED
- RIGHT X LANES OPEN
- CENTER LANE CLOSED
- DAYTIME LANE CLOSURES
- NIGHT LANE CLOSURES
- I-XX SOUTH EXIT CLOSED
- VARIOUS LANES CLOSED
- EXIT XXX CLOSED X MILE
- EXIT CLOSED
- RIGHT LN TO BE CLOSED
- MALL DRIVEWAY CLOSED
- X LANES CLOSED TUE - FRI
- XXXXXXXX BLVD CLOSED

Other Condition List

- ROADWORK XXX FT
- ROAD REPAIRS XXXX FT
- FLAGGER XXXX FT
- LANE NARROWS XXXX FT
- RIGHT LN NARROWS XXXX FT
- TWO-WAY TRAFFIC XX MILE
- MERGING TRAFFIC XXXX FT
- CONST TRAFFIC XXX FT
- LOOSE GRAVEL XXXX FT
- UNEVEN LANES XXXX FT
- DETOUR X MILE
- ROUGH ROAD XXXX FT
- ROADWORK PAST SH XXXX
- ROADWORK NEXT FRI-SUN
- BUMP XXXX FT
- US XXX EXIT X MILES
- TRAFFIC SIGNAL XXXX FT
- LANES SHIFT *

* LANES SHIFT in Phase 1 must be used with STAY IN LANE in Phase 2.

Phase 2: Possible Component Lists

Action to Take/Effect on Travel List

- MERGE RIGHT
- FORM X LINES RIGHT
- DETOUR NEXT X EXITS
- USE XXXXX RD EXIT
- USE EXIT XXX
- USE EXIT I-XX NORTH
- STAY ON US XXX SOUTH
- USE I-XX E TO I-XX N
- TRUCKS USE US XXX N
- WATCH FOR TRUCKS
- WATCH FOR TRUCKS
- EXPECT DELAYS
- EXPECT DELAYS
- PREPARE TO STOP
- REDUCE SPEED XXX FT
- END SHOULDER USE
- USE OTHER ROUTES
- WATCH FOR WORKERS
- STAY IN LANE *

Location List

- AT FM XXXX
- BEFORE RAILROAD CROSSING
- NEXT X MILES
- PAST US XXX EXIT
- XXXXXXX TO XXXXXXX
- US XXX TO FM XXXX

Warning List

- SPEED LIMIT XX MPH
- MAXIMUM SPEED XX MPH
- MINIMUM SPEED XX MPH
- ADVISORY SPEED XX MPH
- RIGHT LANE EXIT
- USE CAUTION
- DRIVE SAFELY
- DRIVE WITH CARE

** Advance Notice List

- TUE-FRI XX AM- X PM
- APR XX-XX X PM-X AM
- BEGINS MONDAY
- BEGINS MAY XX
- MAY X-X XX PM - XX AM
- NEXT FRI-SUN
- XX AM TO XX PM
- NEXT TUE AUG XX
- TONIGHT XX PM- XX AM

* LANES SHIFT in Phase 1 must be used with STAY IN LANE in Phase 2.

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

1. Only 1 or 2 phases are to be used on a PCMS.
2. The 1st phase (or both) should be selected from the "Road/Lane/Ramp Closure List" and the "Other Condition List".
3. A 2nd phase can be selected from the "Action to Take/Effect on Travel, Location, General Warning, or Advance Notice Phase Lists".
4. A Location Phase is necessary only if a distance or location is not included in the first phase selected.
5. If two PCMS are used in sequence, they must be separated by a minimum of 1000 ft. Each PCMS shall be limited to two phases, and should be understandable by themselves.
6. For advance notice, when the current date is within seven days of the actual work date, calendar days should be replaced with days of the week. Advance notification should typically be for no more than one week prior to the work.

WORDING ALTERNATIVES

1. The words RIGHT, LEFT and ALL can be interchanged as appropriate.
2. Roadway designations IH, US, SH, FM and LP can be interchanged as appropriate.
3. EAST, WEST, NORTH and SOUTH (or abbreviations E, W, N and S) can be interchanged as appropriate.
4. Highway names and numbers replaced as appropriate.
5. ROAD, HIGHWAY and FREEWAY can be interchanged as needed.
6. AHEAD may be used instead of distances if necessary.
7. FT and MI, MILE and MILES interchanged as appropriate.
8. AT, BEFORE and PAST interchanged as needed.
9. Distances or AHEAD can be eliminated from the message if a location phase is used.

PCMS SIGNS WITHIN THE R.O.W. SHALL BE BEHIND GUARDRAIL OR CONCRETE BARRIER OR SHALL HAVE A MINIMUM OF FOUR (4) PLASTIC DRUMS PLACED PERPENDICULAR TO TRAFFIC ON THE UPSTREAM SIDE OF THE PCMS, WHEN EXPOSED TO ONE DIRECTION OF TRAFFIC. WHEN EXPOSED TO TWO WAY TRAFFIC, THE FOUR DRUMS SHOULD BE PLACED WITH ONE DRUM AT EACH OF THE FOUR CORNERS OF THE UNIT.

FULL MATRIX PCMS SIGNS

1. When Full Matrix PCMS signs are used, the character height and legibility/visibility requirements shall be maintained as listed in Note 15 under "PORTABLE CHANGEABLE MESSAGE SIGNS" above.
2. When symbol signs, such as the "Flagger Symbol"(CW20-7) are represented graphically on the Full Matrix PCMS sign and, with the approval of the Engineer, it shall maintain the legibility/visibility requirement listed above.
3. When symbol signs are represented graphically on the Full Matrix PCMS, they shall only supplement the use of the static sign represented, and shall not substitute for, or replace that sign.
4. A full matrix PCMS may be used to simulate a flashing arrow board provided it meets the visibility, flash rate and dimming requirements on BC(7), for the same size arrow.

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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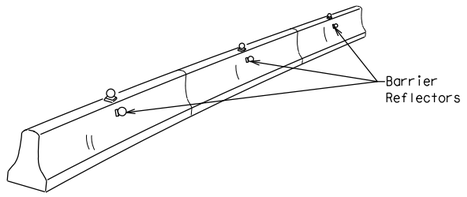
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13	BRY	BURLESON		59

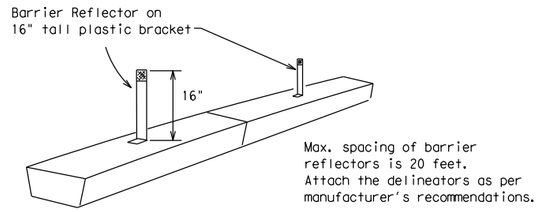
100

1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost of the reflectors shall be considered subsidiary to Item 512.

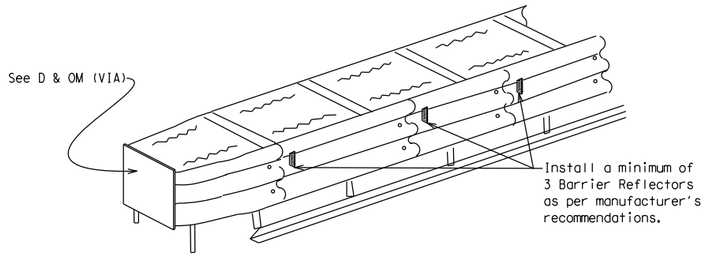


CONCRETE TRAFFIC BARRIER (CTB)

3. Where traffic is on one side of the CTB, two (2) Barrier Reflectors shall be mounted in approximately the midsection of each section of CTB. An alternate mounting location is uniformly spaced at one end of each CTB. This will allow for attachment of a barrier grapple without damaging the reflector. The Barrier Reflector mounted on the side of the CTB shall be located directly below the reflector mounted on top of the barrier, as shown in the detail above.
4. Where CTB separates two-way traffic, three barrier reflectors shall be mounted on each section of CTB. The reflector unit on top shall have two yellow reflective faces (Bi-Directional)while the reflectors on each side of the barrier shall have one yellow reflective face, as shown in the detail above.
5. When CTB separates traffic traveling in the same direction, no barrier reflectors will be required on top of the CTB.
6. Barrier Reflector units shall be yellow or white in color to match the edgeline being supplemented.
7. Maximum spacing of Barrier Reflectors is forty (40) feet.
8. Pavement markers or temporary flexible-reflective roadway marker tabs shall NOT be used as CTB delineation.
9. Attachment of Barrier Reflectors to CTB shall be per manufacturer's recommendations.
10. Missing or damaged Barrier Reflectors shall be replaced as directed by the Engineer.
11. Single slope barriers shall be delineated as shown on the above detail.



LOW PROFILE CONCRETE BARRIER (LPCB)

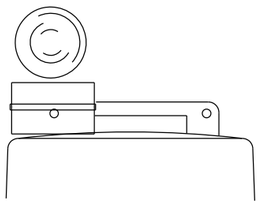


DELINEATION OF END TREATMENTS

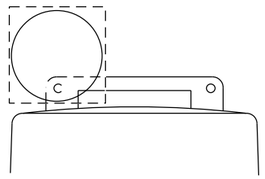
END TREATMENTS FOR
CTB'S USED
IN WORK ZONES

End treatments used on CTB's in work zones shall meet crashworthy standards as defined in the National Cooperative Highway Research Report 350. Refer to the CWZTCD List for approved end treatments and manufacturers.

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



Type C Warning Light or approved substitute mounted on a drum adjacent to the travel way.



Warning reflector may be round or square.Must have a yellow reflective surface area of at least 30 square inches

WARNING LIGHTS

1. Warning lights shall meet the requirements of the TMUTCD.
2. Warning lights shall NOT be installed on barricades.
3. Type A-Low Intensity Flashing Warning Lights are commonly used with drums. They are intended to warn of or mark a potentially hazardous area. Their use shall be as indicated on this sheet and/or other sheets of the plans by the designation "FL". The Type A Warning Lights shall not be used with signs manufactured with Type B_{FL} or C_{FL} Sheeting meeting the requirements of Departmental Material Specification DMS-8300.
4. Type-C and Type D 360 degree Steady Burn Lights are intended to be used in a series for delineation to supplement other traffic control devices. Their use shall be as indicated on this sheet and/or other sheets of the plans by the designation "SB".
5. The Engineer/Inspector or the plans shall specify the location and type of warning lights to be installed on the traffic control devices.
6. When required by the Engineer, the Contractor shall furnish a copy of the warning lights certification. The warning light manufacturer will certify the warning lights meet the requirements of the latest ITE Purchase Specifications for Flashing and Steady-Burn Warning Lights.
7. When used to delineate curves, Type-C and Type D Steady Burn Lights should only be placed on the outside of the curve, not the inside.
8. The location of warning lights and warning reflectors on drums shall be as shown elsewhere in the plans.

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

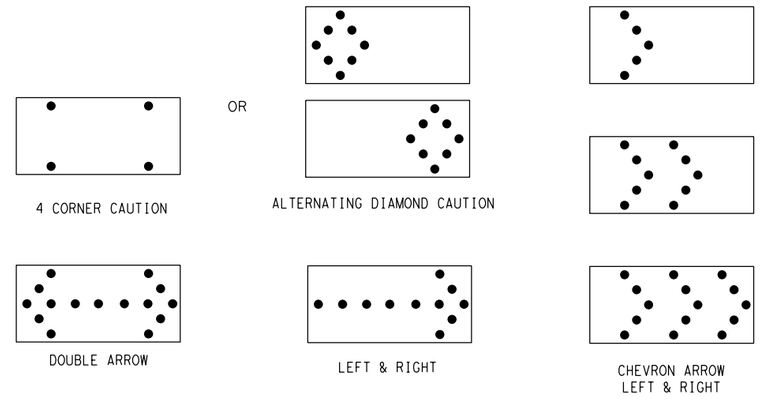
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing devices to form a merging taper may be used for delineation. If used, the successive flashing of the sequential warning lights should occur from the beginning of the taper to the end of the merging taper in order to identify the desired vehicle path. The rate of flashing for each light shall be 65 flashes per minute, plus or minus 10 flashes.
4. Type C and D steady-burn warning lights are intended to be used in a series to delineate the edge of the travel lane on detours, on lane changes, on lane closures, and on other similar conditions.
5. Type A, Type C and Type D warning lights shall be installed at locations as detailed on other sheets in the plans.
6. Warning lights shall not be installed on a drum that has a sign, chevron or vertical panel.
7. The maximum spacing for warning lights on drums should be identical to the channelizing device spacing.

WARNING REFLECTORS MOUNTED ON PLASTIC DRUMS AS A SUBSTITUTE FOR TYPE C (STEADY BURN) WARNING LIGHTS

1. A warning reflector or approved substitute may be mounted on a plastic drum as a substitute for a Type C, steady burn warning light at the discretion of the Contractor unless otherwise noted in the plans.
2. The warning reflector shall be yellow in color and shall be manufactured using a sign substrate approved for use with plastic drums listed on the CWZTCD.
3. The warning reflector shall have a minimum retroreflective surface area (one-side) of 30 square inches.
4. Round reflectors shall be fully reflectorized, including the area where attached to the drum.
5. Square substrates must have a minimum of 30 square inches of reflectorized sheeting. They do not have to be reflectorized where it attaches to the drum.
6. The side of the warning reflector facing approaching traffic shall have sheeting meeting the color and retroreflectivity requirements for DMS 8300-Type B or Type C.
7. When used near two-way traffic, both sides of the warning reflector shall be reflectorized.
8. The warning reflector should be mounted on the side of the handle nearest approaching traffic.
9. The maximum spacing for warning reflectors should be identical to the channelizing device spacing requirements.

Arrow Boards may be located behind channelizing devices in place for a shoulder taper or merging taper, otherwise they shall be delineated with four (4) channelizing devices placed perpendicular to traffic on the upstream side of traffic.

1. The Flashing Arrow Board should be used for all lane closures on multi-lane roadways, or slow moving maintenance or construction activities on the travel lanes.
2. Flashing Arrow Boards should not be used on two-lane, two-way roadways, detours, diversions or work on shoulders unless the "CAUTION" display (see detail below) is used.
3. The Engineer/Inspector shall choose all appropriate signs, barricades and/or other traffic control devices that should be used in conjunction with the Flashing Arrow Board.
4. The Flashing Arrow Board should be able to display the following symbols:



4 CORNER CAUTION

ALTERNATING DIAMOND CAUTION

DOUBLE ARROW

LEFT & RIGHT

CHEVRON ARROW
LEFT & RIGHT

5. The "CAUTION" display consists of four corner lamps flashing simultaneously, or the Alternating Diamond Caution mode as shown.
6. The straight line caution display is NOT ALLOWED.
7. The Flashing Arrow Board shall be capable of minimum 50 percent dimming from rated lamp voltage. The flashing rate of the lamps shall not be less than 25 nor more than 40 flashes per minute.
8. Minimum lamp "on time" shall be approximately 50 percent for the flashing arrow and equal intervals of 25 percent for each sequential phase of the flashing chevron.
9. The sequential arrow display is NOT ALLOWED.
10. The flashing arrow display is the TxDOT standard; however, the sequential Chevron display may be used during daylight operations.
11. The Flashing Arrow Board shall be mounted on a vehicle, trailer or other suitable support.
12. A Flashing Arrow Board SHALL NOT BE USED to laterally shift traffic.
13. A full matrix PCMS may be used to simulate a Flashing Arrow Board provided it meets visibility, flash rate and dimming requirements on this sheet for the same size arrow.
14. Minimum mounting height of trailer mounted Arrow Boards should be 7 feet from roadway to bottom of panel.

REQUIREMENTS			
TYPE	MINIMUM SIZE	MINIMUM NUMBER OF PANEL LAMPS	MINIMUM VISIBILITY DISTANCE
B	30 x 60	13	3/4 mile
C	48 x 96	15	1 mile

ATTENTION
Flashing Arrow Boards shall be equipped with automatic dimming devices.

WHEN NOT IN USE, REMOVE THE ARROW BOARD FROM THE RIGHT-OF-WAY OR PLACE THE ARROW BOARD BEHIND CONCRETE TRAFFIC BARRIER OR GUARDRAIL.

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

1. Truck-mounted attenuators (TMA) used on TxDOT facilities must meet the requirements outlined in the National Cooperative Highway Research Report No. 350 (NCHRP 350) or the Manual for Assessing Safety Hardware (MASH).
2. Refer to the CWZTCD for the requirements of Level 2 or Level 3 TMAs.
3. Refer to the CWZTCD for a list of approved TMAs.
4. TMAs are required on freeways unless otherwise noted in the plans.
5. A TMA should be used anytime that it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the work performance.
6. The only reason a TMA should not be required is when a work area is spread down the roadway and the work crew is an extended distance from the TMA.

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION ARROW PANEL, REFLECTORS, WARNING LIGHTS & ATTENUATOR

BC(7)-14

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GENERAL NOTES

1. For long term stationary work zones on freeways, drums shall be used as the primary channelizing device.
2. For intermediate term stationary work zones on freeways, drums should be used as the primary channelizing device but may be replaced in tangent sections by vertical panels, or 42" two-piece cones. In tangent sections one-piece cones may be used with the approval of the Engineer but only if personnel are present on the project at all times to maintain the cones in proper position and location.
3. For short term stationary work zones on freeways, drums are the preferred channelizing device but may be replaced in tapers, transitions and tangent sections by vertical panels, two-piece cones or one-piece cones as approved by the Engineer.
4. Drums and all related items shall comply with the requirements of the current version of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) and the "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
5. Drums, bases, and related materials shall exhibit good workmanship and shall be free from objectionable marks or defects that would adversely affect their appearance or serviceability.
6. The Contractor shall have a maximum of 24 hours to replace any plastic drums identified for replacement by the Engineer/Inspector. The replacement device must be an approved device.

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

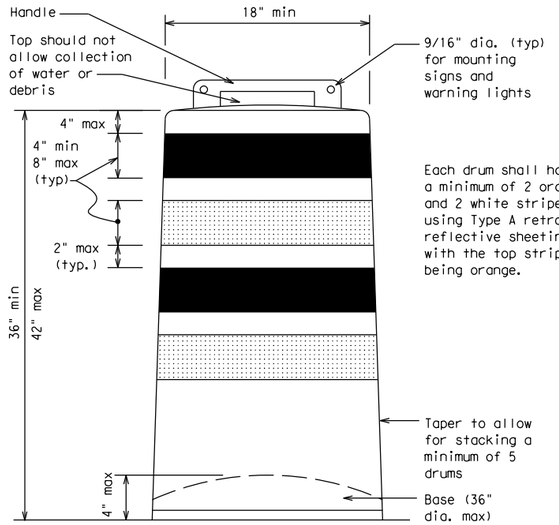
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents accidental separation due to normal handling and/or air turbulence created by passing vehicles.
3. Plastic drums shall be constructed of lightweight flexible, and deformable materials. The Contractor shall NOT use metal drums or single piece plastic drums as channelization devices or sign supports.
4. Drums shall present a profile that is a minimum of 18 inches in width at the 36 inch height when viewed from any direction. The height of drum unit (body installed on base) shall be a minimum of 36 inches and a maximum of 42 inches.
5. The top of the drum shall have a built-in handle for easy pickup and shall be designed to drain water and not collect debris. The handle shall have a minimum of two widely spaced 9/16 inch diameter holes to allow attachment of a warning light, warning reflector unit or approved compliant sign.
6. The exterior of the drum body shall have a minimum of four alternating orange and white retroreflective circumferential stripes not less than 4 inches nor greater than 8 inches in width. Any non-reflectorized space between any two adjacent stripes shall not exceed 2 inches in width.
7. Bases shall have a maximum width of 36 inches, a maximum height of 4 inches, and a minimum of two footholds of sufficient size to allow base to be held down while separating the drum body from the base.
8. Plastic drums shall be constructed of ultra-violet stabilized, orange, high-density polyethylene (HDPE) or other approved material.
9. Drum body shall have a maximum unballasted weight of 11 lbs.
10. Drum and base shall be marked with manufacturer's name and model number.

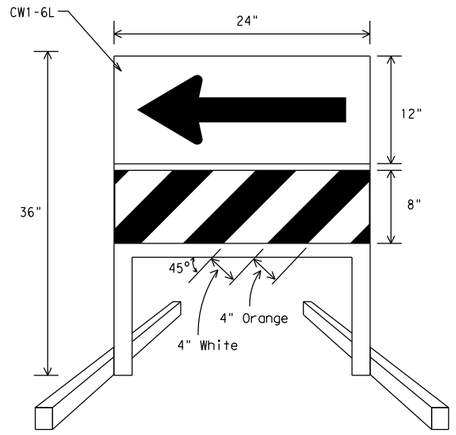
RETROREFLECTIVE SHEETING

1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall be suitable for use on and shall adhere to the drum surface such that, upon vehicular impact, the sheeting shall remain adhered in-place and exhibit no delaminating, cracking, or loss of retroreflectivity other than that loss due to abrasion of the sheeting surface.

BALLAST

1. Unballasted bases shall be large enough to hold up to 50 lbs. of sand. This base, when filled with the ballast material, should weigh between 35 lbs (minimum) and 50 lbs (maximum). The ballast may be sand in one to three sandbags separate from the base, sand in a sand-filled plastic base, or other ballasting devices as approved by the Engineer. Stacking of sandbags will be allowed, however height of sandbags above pavement surface may not exceed 12 inches.
2. Bases with built-in ballast shall weigh between 40 lbs. and 50 lbs. Built-in ballast can be constructed of an integral crumb rubber base or a solid rubber base.
3. Recycled truck tire sidewalls may be used for ballast on drums approved for this type of ballast on the CWZTCD list.
4. The ballast shall not be heavy objects, water, or any material that would become hazardous to motorists, pedestrians, or workers when the drum is struck by a vehicle.
5. When used in regions susceptible to freezing, drums shall have drainage holes in the bottoms so that water will not collect and freeze becoming a hazard when struck by a vehicle.
6. Ballast shall not be placed on top of drums.
7. Adhesives may be used to secure base of drums to pavement.





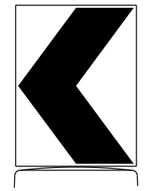
DIRECTION INDICATOR BARRICADE

1. The Direction Indicator Barricade may be used in tapers, transitions, and other areas where specific directional guidance to drivers is necessary.
2. If used, the Direction Indicator Barricade should be used in series to direct the driver through the transition and into the intended travel lane.
3. The Direction Indicator Barricade shall consist of One-Direction Large Arrow (CW1-6) sign in the size shown with a black arrow on a background of Type B_{FL} or Type C_{FL} Orange retroreflective sheeting above a rail with Type A retroreflective sheeting in alternating 4" white and orange stripes sloping downward at an angle of 45 degrees in the direction road users are to pass. Sheeting types shall be as per DMS 8300.
4. Double arrows on the Direction Indicator Barricade will not be allowed.
5. Approved manufacturers are shown on the CWZTCD List. Ballast shall be as approved by the manufacturers instructions.

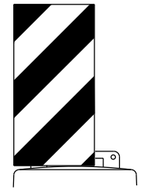
This detail is not intended for fabrication. See note 3 and the CWZTCD list for providers of approved Detectable Pedestrian Barricades

DETECTABLE PEDESTRIAN BARRICADES

1. When existing pedestrian facilities are disrupted, closed, or relocated in a TTC zone, the temporary facilities shall be detectable and include accessibility features consistent with the features present in the existing pedestrian facility.
2. Where pedestrians with visual disabilities normally use the closed sidewalk, a device that is detectable by a person with a visual disability traveling with the aid of a long cane shall be placed across the full width of the closed sidewalk.
3. Detectable pedestrian barricades similar to the one pictured above, longitudinal channelizing devices, some concrete barriers, and wood or chain link fencing with a continuous detectable edging can satisfactorily delineate a pedestrian path.
4. Tape, rope, or plastic chain strung between devices are not detectable, do not comply with the design standards in the "Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)" and should not be used as a control for pedestrian movements.
5. Warning lights shall not be attached to detectable pedestrian barricades.
6. Detectable pedestrian barricades may use 8" nominal barricade rails as shown on BC(10) provided that the top rail provides a smooth continuous rail suitable for hand trailing with no splinters, burrs, or sharp edges.



18" x 24" Sign
(Maximum Sign Dimension)
Chevron CW1-8, Opposing Traffic Lane Divider, Driveway sign D70a, Keep Right R4 series or other signs as approved by Engineer



12" x 24"
Vertical Panel
mount with diagonals sloping down towards travel way

Plywood, Aluminum or Metal sign substrates shall NOT be used on plastic drums

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

1. Signs used on plastic drums shall be manufactured using substrates listed on the CWZTCD.
2. Chevrons and other work zone signs with an orange background shall be manufactured with Type B_{FL} or Type C_{FL} Orange sheeting meeting the color and retroreflectivity requirements of DMS-8300, "Sign Face Material," unless otherwise specified in the plans.
3. Vertical Panels shall be manufactured with orange and white sheeting meeting the requirements of DMS-8300 Type A Diagonal stripes on Vertical Panels shall slope down toward the intended traveled lane.
4. Other sign messages (text or symbolic) may be used as approved by the Engineer. Sign dimensions shall not exceed 18 inches in width or 24 inches in height, except for the R9 series signs discussed in note 8 below.
5. Signs shall be installed using a 1/2 inch bolt (nominal) and nut, two washers, and one locking washer for each connection.
6. Mounting bolts and nuts shall be fully engaged and adequately torqued. Bolts should not extend more than 1/2 inch beyond nuts.
7. Chevrons may be placed on drums on the outside of curves, on merging tapers or on shifting tapers. When used in these locations they may be placed on every drum or spaced not more than on every third drum. A minimum of three (3) should be used at each location called for in the plans.
8. R9-9, R9-10, R9-11 and R9-11a Sidewalk Closed signs which are 24 inches wide may be mounted on plastic drums, with approval of the Engineer.

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-14

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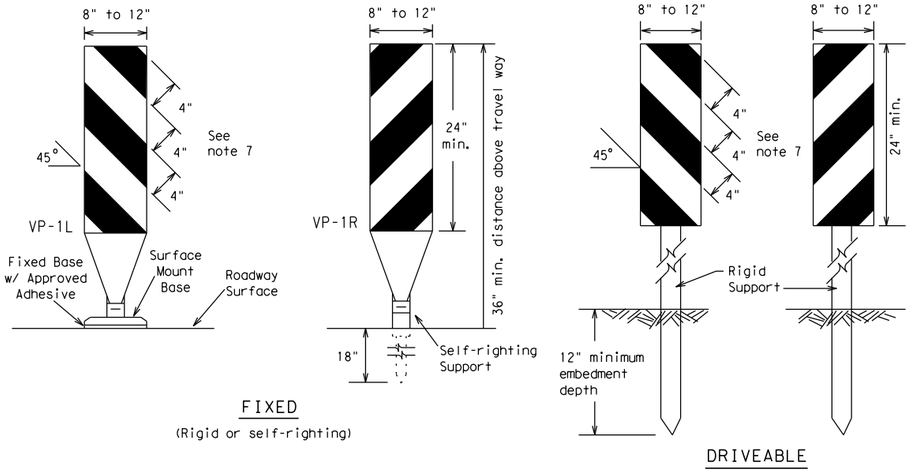
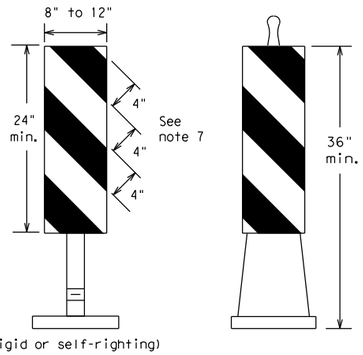
4-03 7-13	DIST	COUNTY		SHEET NO.
9-07 8-14	BRY	BURLESON		61



FIXED

(Rigid or self-righting)

DRIVEABLE

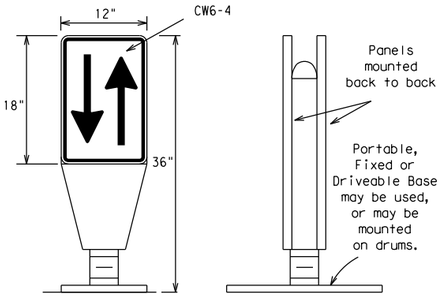


(Rigid or self-righting)

PORTABLE

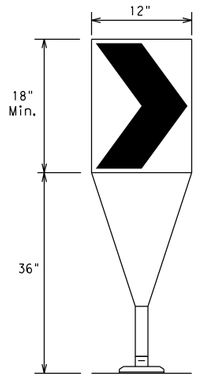
VERTICAL PANELS (VPs)

1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is required. The Engineer/Inspector shall refer to the Roadway Design Manual Appendix B "Treatment of Pavement Drop-offs in Work Zones" for additional guidelines on the use of VP's for drop-offs.
3. VP's should be mounted back to back if used at the edge of cuts adjacent to two-way two lane roadways. Stripes are to be reflective orange and reflective white and should always slope downward toward the travel lane.
4. VP's used on expressways and freeways or other high speed roadways, may have more than 270 square inches of retroreflective area facing traffic.
5. Self-righting supports are available with portable base. See "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
6. Sheeting for the VP's shall be retroreflective Type A conforming to Departmental Material Specification DMS-8300, unless noted otherwise.
7. Where the height of reflective material on the vertical panel is 36 inches or greater, a panel stripe of 6 inches shall be used.



OPPOSING TRAFFIC LANE DIVIDERS (OTLD)

1. Opposing Traffic Lane Dividers (OTLD) are delineation devices designed to convert a normal one-way roadway section to two-way operation. OTLD's are used on temporary centerlines. The upward and downward arrows on the sign's face indicate the direction of traffic on either side of the divider. The base is secured to the pavement with an adhesive or rubber weight to minimize movement caused by a vehicle impact or wind gust.
2. The OTLD may be used in combination with 42" cones or VPs.
3. Spacing between the OTLD shall not exceed 500 feet. 42" cones or VPs placed between the OTLD's should not exceed 100 foot spacing.
4. The OTLD shall be orange with a black non-reflective legend. Sheeting for the OTLD shall be retroreflective Type B_{FL} or Type C_{FL} conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.



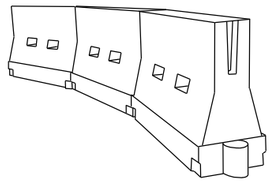
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

1. The chevron shall be a vertical rectangle with a minimum size of 12 by 18 inches.
2. Chevrons are intended to give notice of a sharp change of alignment with the direction of travel and provide additional emphasis and guidance for vehicle operators with regard to changes in horizontal alignment of the roadway.
3. Chevrons, when used, shall be erected on the outside of a sharp curve or turn, or on the far side of an intersection. They shall be in line with and at right angles to approaching traffic. Spacing should be such that the motorist always has three in view, until the change in alignment eliminates its need.
4. To be effective, the chevron should be visible for at least 500 feet.
5. Chevrons shall be orange with a black nonreflective legend. Sheeting for the chevron shall be retroreflective Type B_{FL} or Type C_{FL} conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.
6. For Long Term Stationary use on tapers or transitions on freeways and divided highways self-righting chevrons may be used to supplement plastic drums but not to replace plastic drums.

CHEVRONS

GENERAL NOTES

1. Work Zone channelizing devices illustrated on this sheet may be installed in close proximity to traffic and are suitable for use on high or low speed roadways. The Engineer/Inspector shall ensure that spacing and placement is uniform and in accordance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
2. Channelizing devices shown on this sheet may have a driveable, fixed or portable base. The requirement for self-righting channelizing devices must be specified in the General Notes or other plan sheets.
3. Channelizing devices on self-righting supports should be used in work zone areas where channelizing devices are frequently impacted by errant vehicles or vehicle related wind gusts making alignment of the channelizing devices difficult to maintain. Locations of these devices shall be detailed elsewhere in the plans. These devices shall conform to the TMUTCD and the "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
4. The Contractor shall maintain devices in a clean condition and replace damaged, nonreflective, faded, or broken devices and bases as required by the Engineer/Inspector. The Contractor shall be required to maintain proper device spacing and alignment.
5. Portable bases shall be fabricated from virgin and/or recycled rubber. The portable bases shall weigh a minimum of 30 lbs.
6. Pavement surfaces shall be prepared in a manner that ensures proper bonding between the adhesives, the fixed mount bases and the pavement surface. Adhesives shall be prepared and applied according to the manufacturer's recommendations.
7. The installation and removal of channelizing devices shall not cause detrimental effects to the final pavement surfaces, including pavement surface discoloration or surface integrity. Driveable bases shall not be permitted on final pavement surfaces. The Engineer/Inspector shall approve all application and removal procedures of fixed bases.



LONGITUDINAL CHANNELIZING DEVICES (LCD)

1. LCDs are crashworthy, lightweight, deformable devices that are highly visible, have good target value and can be connected together. They are not designed to contain or redirect a vehicle on impact.
2. LCDs may be used instead of a line of cones or drums.
3. LCDs shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
4. LCDs should not be used to provide positive protection for obstacles, pedestrians or workers.
5. LCDs shall be supplemented with retroreflective delineation as required for temporary barriers on BC(7) when placed roughly parallel to the travel lanes.
6. LCDs used as barricades placed perpendicular to traffic should have at least one row of reflective sheeting meeting the requirements for barricade rails as shown on BC(10) placed near the top of the LCD along the full length of the device.

WATER BALLASTED SYSTEMS USED AS BARRIERS

1. Water ballasted systems used as barriers shall not be used solely to channelize road users, but also to protect the work space per the appropriate NCHRP 350 crashworthiness requirements based on roadway speed and barrier application.
2. Water ballasted systems used to channelize vehicular traffic shall be supplemented with retroreflective delineation or channelizing devices to improve daytime/nighttime visibility. They may also be supplemented with pavement markings.
3. Water ballasted systems used as barriers shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
4. Water ballasted systems used as barriers should not be used for a merging taper except in low speed (less than 45 MPH) urban areas. When used on a taper in a low speed urban area, the taper shall be delineated and the taper length should be designed to optimize road user operations considering the available geometric conditions.
5. When water ballasted systems used as barriers have blunt ends exposed to traffic, they should be attenuated as per manufacturer recommendations or flared to a point outside the clear zone.

If used to channelize pedestrians, longitudinal channelizing devices or water ballasted systems must have a continuous detectable bottom for users of long canes and the top of the unit shall not be less than 32 inches in height.

HOLLOW OR WATER BALLASTED SYSTEMS USED AS LONGITUDINAL CHANNELIZING DEVICES OR BARRIERS

Posted Speed *	Formula	Minimum Desirable Taper Lengths ** 10′ Offset	11′ Offset	12′ Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent
30	$L = \frac{WS^2}{60}$	150′	165′	180′	30′	60′
35		205′	225′	245′	35′	70′
40		265′	295′	320′	40′	80′
45	L = WS	450′	495′	540′	45′	90′
50		500′	550′	600′	50′	100′
55		550′	605′	660′	55′	110′
60		600′	660′	720′	60′	120′
65		650′	715′	780′	65′	130′
70		700′	770′	840′	70′	140′
75		750′	825′	900′	75′	150′
80		800′	880′	960′	80′	160′

** Taper lengths have been rounded off.
L=Length of Taper (FT.) W=Width of Offset (FT.)
S=Posted Speed (MPH)

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

SHEET 9 OF 12

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-14

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	BRY	BURLESON		62

103

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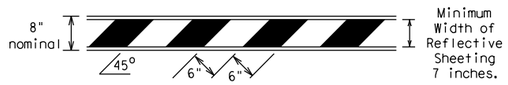
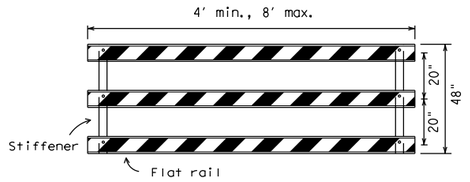
TYPE 3 BARRICADES

1. Refer to the Compliant Work Zone Traffic Control Devices List (CWZTCD) for details of the Type 3 Barricades and a list of all materials used in the construction of Type 3 Barricades.
2. Type 3 Barricades shall be used at each end of construction projects closed to all traffic.
3. Barricades extending across a roadway should have stripes that slope downward in the direction toward which traffic must turn in detouring. When both right and left turns are provided, the chevron striping may slope downward in both directions from the center of the barricade. Where no turns are provided at a closed road striping should slope downward in both directions toward the center of roadway.
4. Striping of rails, for the right side of the roadway, should slope downward to the left. For the left side of the roadway, striping should slope downward to the right.
5. Identification markings may be shown only on the back of the barricade rails. The maximum height of letters and/or company logos used for identification shall be 1".
6. Barricades shall not be placed parallel to traffic unless an adequate clear zone is provided.
7. Warning lights shall NOT be installed on barricades.
8. Where barricades require the use of weights to keep from turning over, the use of sandbags with dry, cohesionless sand is recommended. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight. Sand bags shall not be stacked in a manner that covers any portion of a barricade rails reflective sheeting. Rock, concrete, iron, steel or other solid objects will NOT be permitted. Sandbags should weigh a minimum of 35 lbs and a maximum of 50 lbs. Sandbags shall be made of a durable material that tears upon vehicular impact. Rubber (such as tire inner tubes) shall not be used for sandbags. Sandbags shall only be placed along or upon the base supports of the device and shall not be suspended above ground level or hung with rope, wire, chains or other fasteners.
9. Sheeting for barricades shall be retroreflective Type A conforming to Departmental Material Specification DMS-8300 unless otherwise noted.

Barricades shall NOT be used as a sign support.



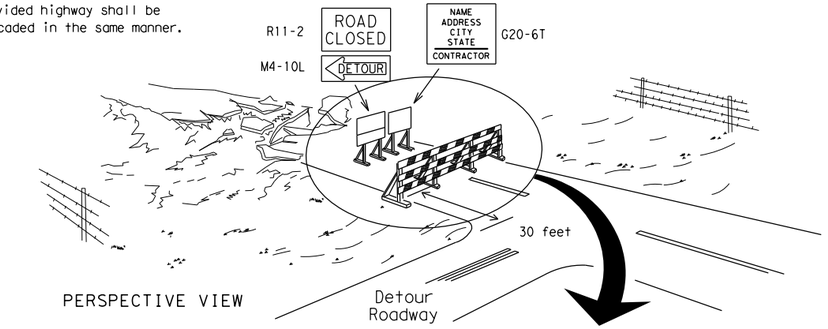
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



Stiffener may be inside or outside of support, but no more than 2 stiffeners shall be allowed on one barricade.

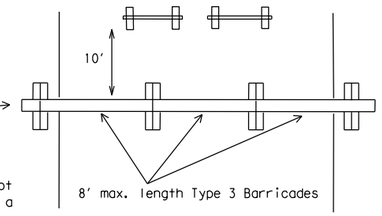
TYPICAL PANEL DETAIL
FOR SKID OR POST TYPE BARRICADES

Each roadway of a divided highway shall be barricaded in the same manner.



PERSPECTIVE VIEW

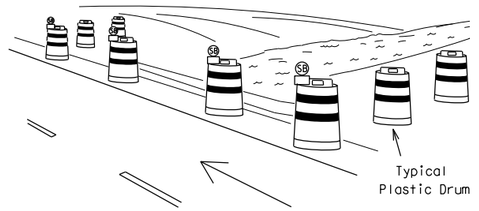
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

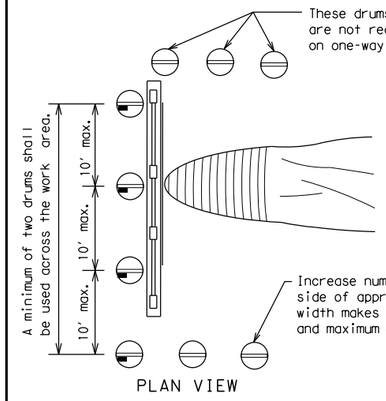
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

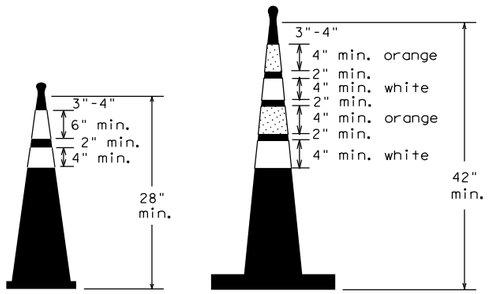
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder width is greater than 12 feet, steady-burn lights may be omitted if drums are used.
5. Drums must extend the length of the culvert widening.



PLAN VIEW

LEGEND	
	Plastic drum
	Plastic drum with steady burn light or yellow warning reflector
SB	Steady burn warning light or yellow warning reflector

CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



Two-Piece cones

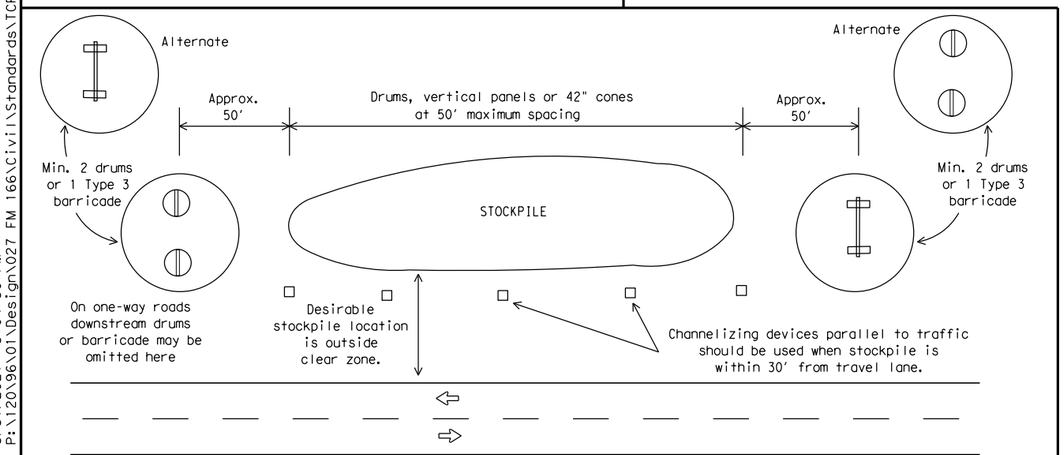
One-Piece cones

Tubular Marker

28" Cones shall have a minimum weight of 9 1/2 lbs.

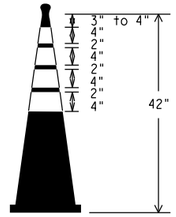
42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

1. Traffic cones and tubular markers shall be predominantly orange, and meet the height and weight requirements shown above.
2. One-piece cones have the body and base of the cone molded in one consolidated unit. Two-piece cones have a cone shaped body and a separate rubber base, or ballast, that is added to keep the device upright and in place.
3. Two-piece cones may have a handle or loop extending up to 8" above the minimum height shown, in order to aid in retrieving the device.
4. Cones or tubular markers used at night shall have white or white and orange reflective bands as shown above. The reflective bands shall have a smooth, sealed outer surface and meet the requirements of Departmental Material Specification DMS-8300 Type A.
5. 28" cones and tubular markers are generally suitable for short duration and short-term stationary work as defined on BC(4). These should not be used for intermediate-term or long-term stationary work unless personnel is on-site to maintain them in their proper upright position.
6. 42" two-piece cones, vertical panels or drums are suitable for all work zone durations.
7. Cones or tubular markers used on each project should be of the same size and shape.



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

THIS DEVICE SHALL NOT BE USED ON PROJECTS LET AFTER MARCH 2014.



EDGELINE CHANNELIZER

1. This device is intended only for use in place of a vertical panel to channelize traffic by indicating the edge of the travel lane. It is not intended to be used in transitions or tapers.
2. This device shall not be used to separate lanes of traffic (opposing or otherwise) or warn of objects.
3. This device is based on a 42 inch, two-piece cone with an alternate striping pattern: four 4 inch retroreflective bands, with an approximate 2 inch gap between bands. The color of the band should correspond to the color of the edgeline (yellow for left edgeline, white for right edgeline) for which the device is substituted or for which it supplements. The reflectorized bands shall be retroreflective Type A conforming to Departmental Material Specification DMS-8300, unless otherwise noted.
4. The base must weigh a minimum of 30 lbs.

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-14

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WORK ZONE PAVEMENT MARKINGS

GENERAL

1. The Contractor shall be responsible for maintaining work zone and existing pavement markings, in accordance with the standard specifications and special provisions, on all roadways open to traffic within the CSJ limits unless otherwise stated in the plans.
2. Color, patterns and dimensions shall be in conformance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
3. Additional supplemental pavement marking details may be found in the plans or specifications.
4. Pavement markings shall be installed in accordance with the TMUTCD and as shown on the plans.
5. When short term markings are required on the plans, short term markings shall conform with the TMUTCD, the plans and details as shown on the Standard Plan Sheet WZ(STPM).
6. When standard pavement markings are not in place and the roadway is opened to traffic, DO NOT PASS signs shall be erected to mark the beginning of the sections where passing is prohibited and PASS WITH CARE signs at the beginning of sections where passing is permitted.
7. All work zone pavement markings shall be installed in accordance with Item 662, "Work Zone Pavement Markings."

RAISED PAVEMENT MARKERS

1. Raised pavement markers are to be placed according to the patterns on BC(12).
2. All raised pavement markers used for work zone markings shall meet the requirements of Item 672, "RAISED PAVEMENT MARKERS" and Departmental Material Specification DMS-4200 or DMS-4300.

PREFABRICATED PAVEMENT MARKINGS

1. Removable prefabricated pavement markings shall meet the requirements of DMS-8241.
2. Non-removable prefabricated pavement markings (foil back) shall meet the requirements of DMS-8240.

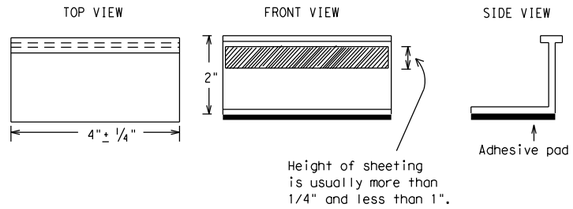
MAINTAINING WORK ZONE PAVEMENT MARKINGS

1. The Contractor will be responsible for maintaining work zone pavement markings within the work limits.
2. Work zone pavement markings shall be inspected in accordance with the frequency and reporting requirements of work zone traffic control device inspections as required by Form 599.
3. The markings should provide a visible reference for a minimum distance of 300 feet during normal daylight hours and 160 feet when illuminated by automobile low-beam headlights at night, unless sight distance is restricted by roadway geometrics.
4. Markings failing to meet this criteria within the first 30 days after placement shall be replaced at the expense of the Contractor as per Specification Item 662.

REMOVAL OF PAVEMENT MARKINGS

1. Pavement markings that are no longer applicable, could create confusion or direct a motorist toward or into the closed portion of the roadway shall be removed or obliterated before the roadway is opened to traffic.
2. The above shall not apply to detours in place for less than three days, where flaggers and/or sufficient channelizing devices are used in lieu of markings to outline the detour route.
3. Pavement markings shall be removed to the fullest extent possible, so as not to leave a discernable marking. This shall be by any method approved by TxDOT Specification Item 677 for "Eliminating Existing Pavement Markings and Markers".
4. The removal of pavement markings may require resurfacing or seal coating portions of the roadway as described in Item 677.
5. Subject to the approval of the Engineer, any method that proves to be successful on a particular type pavement may be used.
6. Blast cleaning may be used but will not be required unless specifically shown in the plans.
7. Over-painting of the markings SHALL NOT BE permitted.
8. Removal of raised pavement markers shall be as directed by the Engineer.
9. Removal of existing pavement markings and markers will be paid for directly in accordance with Item 677, "ELIMINATING EXISTING PAVEMENT MARKINGS AND MARKERS," unless otherwise stated in the plans.
10. Black-out marking tape may be used to cover conflicting existing markings for periods less than two weeks when approved by the Engineer.

Temporary Flexible-Reflective Roadway Marker Tabs



STAPLES OR NAILS SHALL NOT BE USED TO SECURE TEMPORARY FLEXIBLE-REFLECTIVE ROADWAY MARKER TABS TO THE PAVEMENT SURFACE

1. Temporary flexible-reflective roadway marker tabs used as guidemarks shall meet the requirements of DMS-8242.
2. Tabs detailed on this sheet are to be inspected and accepted by the Engineer or designated representative. Sampling and testing is not normally required, however at the option of the Engineer, either "A" or "B" below may be imposed to assure quality before placement on the roadway.
   A. Select five (5) or more tabs at random from each lot or shipment and submit to the Construction Division, Materials and Pavement Section to determine specification compliance.
   B. Select five (5) tabs and perform the following test. Affix five (5) tabs at 24 inch intervals on an asphaltic pavement in a straight line. Using a medium size passenger vehicle or pickup, run over the markers with the front and rear tires at a speed of 35 to 40 miles per hour, four (4) times in each direction. No more than one (1) out of the five (5) reflective surfaces shall be lost or displaced as a result of this test.
3. Small design variances may be noted between tab manufacturers.
4. See Standard Sheet WZ(STPM) for tab placement on new pavements. See Standard Sheet TCP(7-1) for tab placement on seal coat work.

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

1. Raised pavement markers used as guidemarks shall be from the approved product list, and meet the requirements of DMS-4200.
2. All temporary construction raised pavement markers provided on a project shall be of the same manufacturer.
3. Adhesive for guidemarks shall be bituminous material hot applied or butyl rubber pad for all surfaces, or thermoplastic for concrete surfaces.

Guidemarks shall be designated as:
YELLOW - (two amber reflective surfaces with yellow body).
WHITE - (one silver reflective surface with white body).

DEPARTMENTAL MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
TRAFFIC BUTTONS	DMS-4300
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY REMOVABLE, PREFABRICATED PAVEMENT MARKINGS	DMS-8241
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS	DMS-8242

A list of prequalified reflective raised pavement markers, non-reflective traffic buttons, roadway marker tabs and other pavement markings can be found at the Material Producer List web address shown on BC(1).

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	0955	01	027	FM 166
2-98 9-07	DIST	COUNTY		SHEET NO.
1-02 7-13	BRY	BURLESON		64
11-02 8-14				

DATE: 3/31/2021 3:04:51 PM
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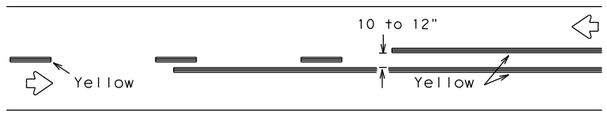
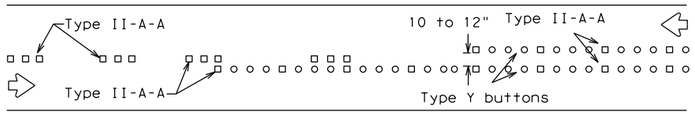
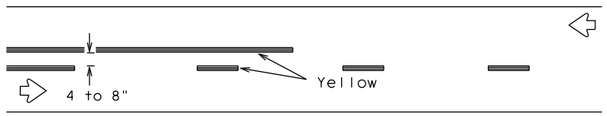
PAVEMENT MARKING PATTERNS



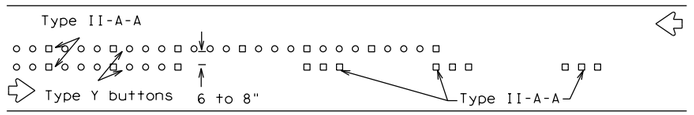
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



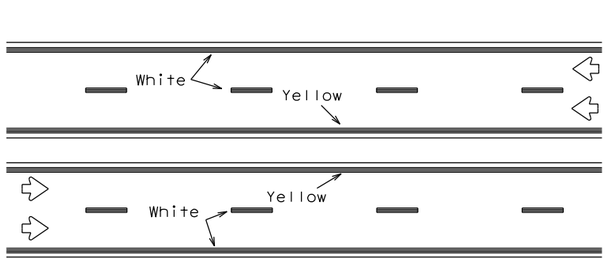
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



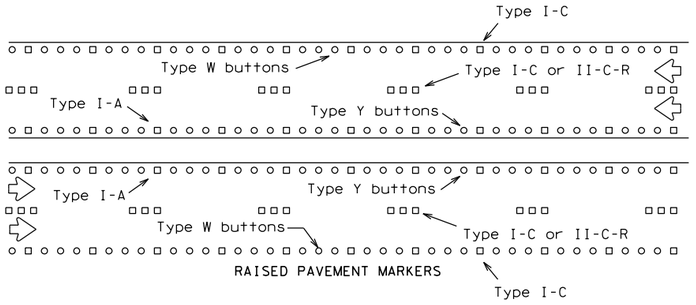
RAISED PAVEMENT MARKERS - PATTERN B

Pattern A is the TXDOT Standard, however Pattern B may be used if approved by the Engineer.
Prefabricated markings may be substituted for reflectorized pavement markings.

CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO-LANE, TWO-WAY HIGHWAYS



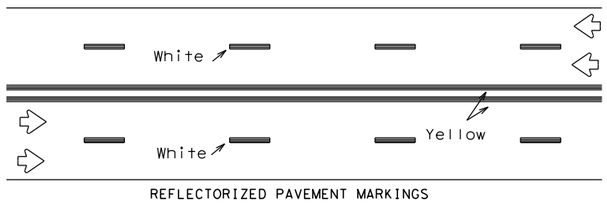
REFLECTORIZED PAVEMENT MARKINGS



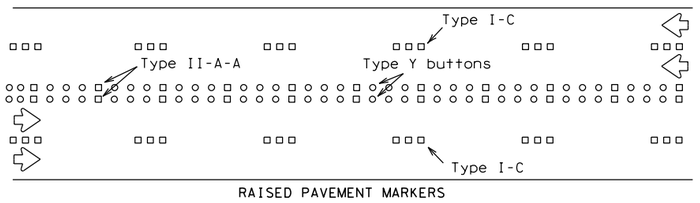
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



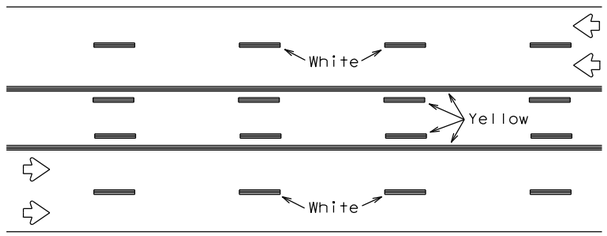
REFLECTORIZED PAVEMENT MARKINGS



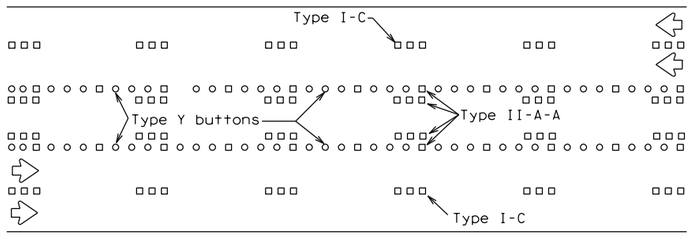
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

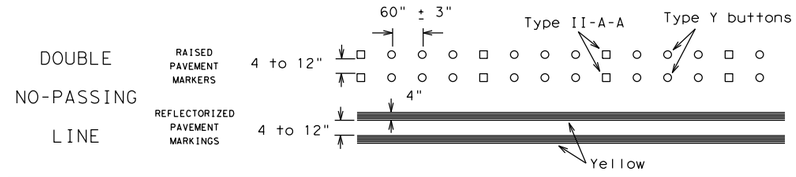
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

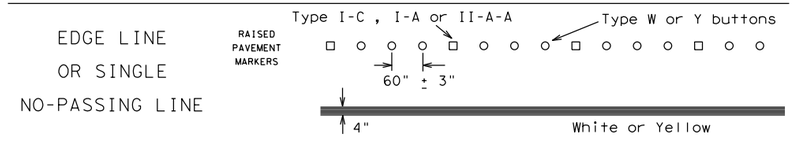
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

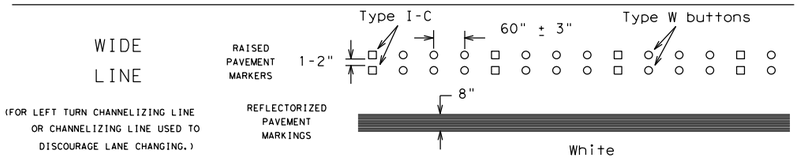


EDGE LINE OR SINGLE NO-PASSING LINE



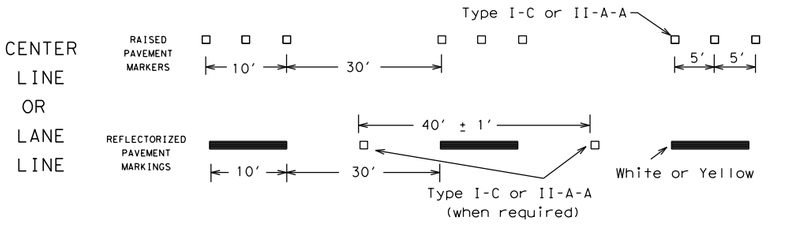
WIDE LINE

(FOR LEFT TURN CHANNELIZING LINE OR CHANNELIZING LINE USED TO DISCOURAGE LANE CHANGING.)

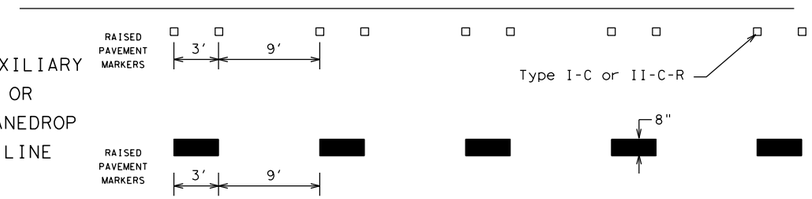


BROKEN LINES

CENTER LINE OR LANE LINE

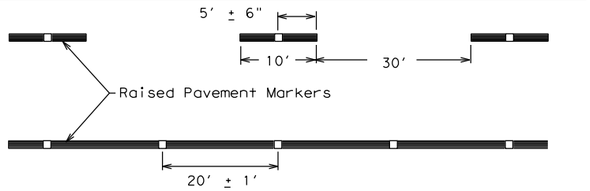


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

If raised pavement markers are used to supplement REMOVABLE markings, the markers shall be applied to the top of the tape at the approximate mid length of tape used for broken lines or at 20 foot spacing for solid lines. This allows an easier removal of raised pavement markers and tape.



Centerline only - not to be used on edge lines

Raised pavement markers used as standard pavement markings shall be from the approved products list and meet the requirements of Item 672 "RAISED PAVEMENT MARKERS."

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
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2-98 7-13	BRY	BURLESON		65
11-02 8-14				

106

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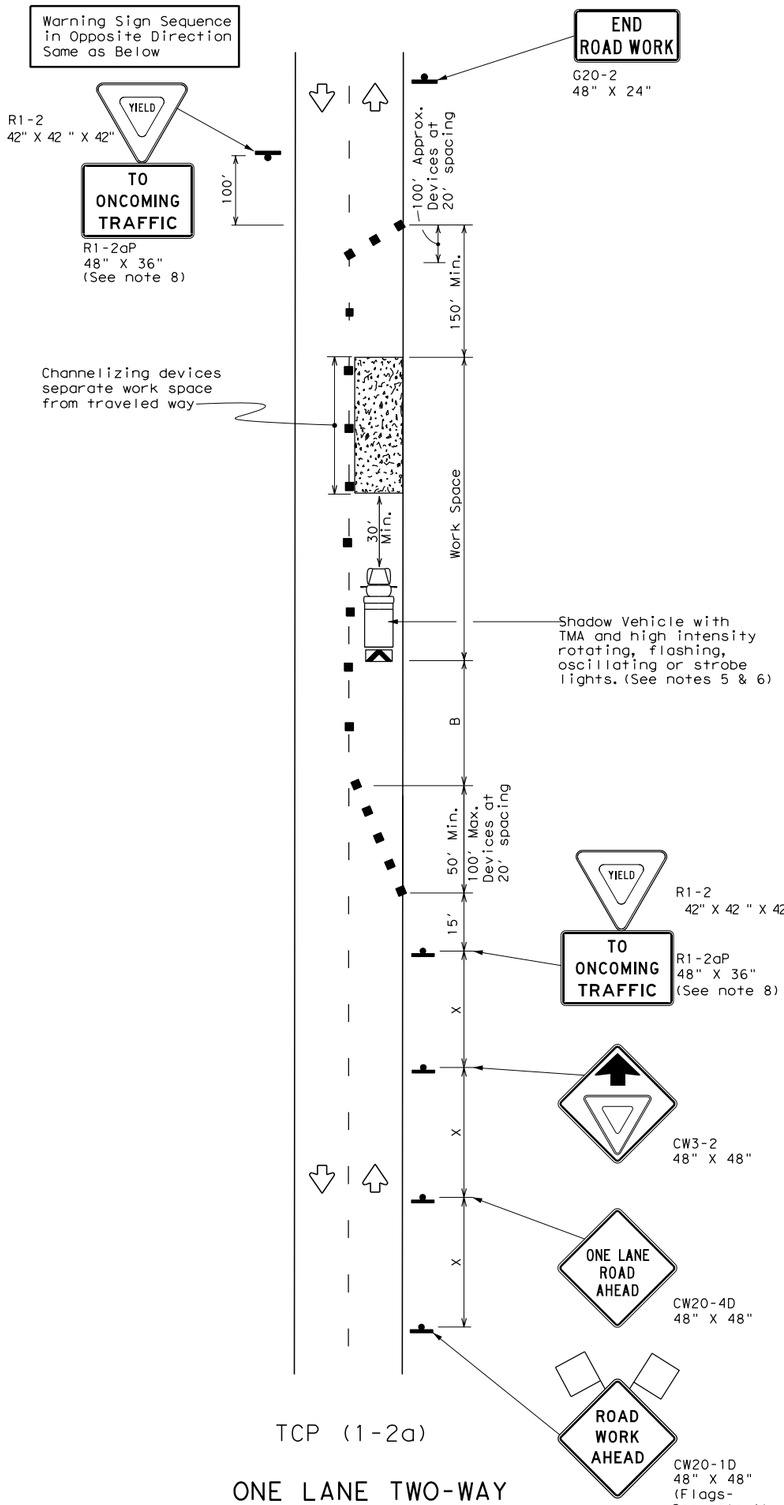
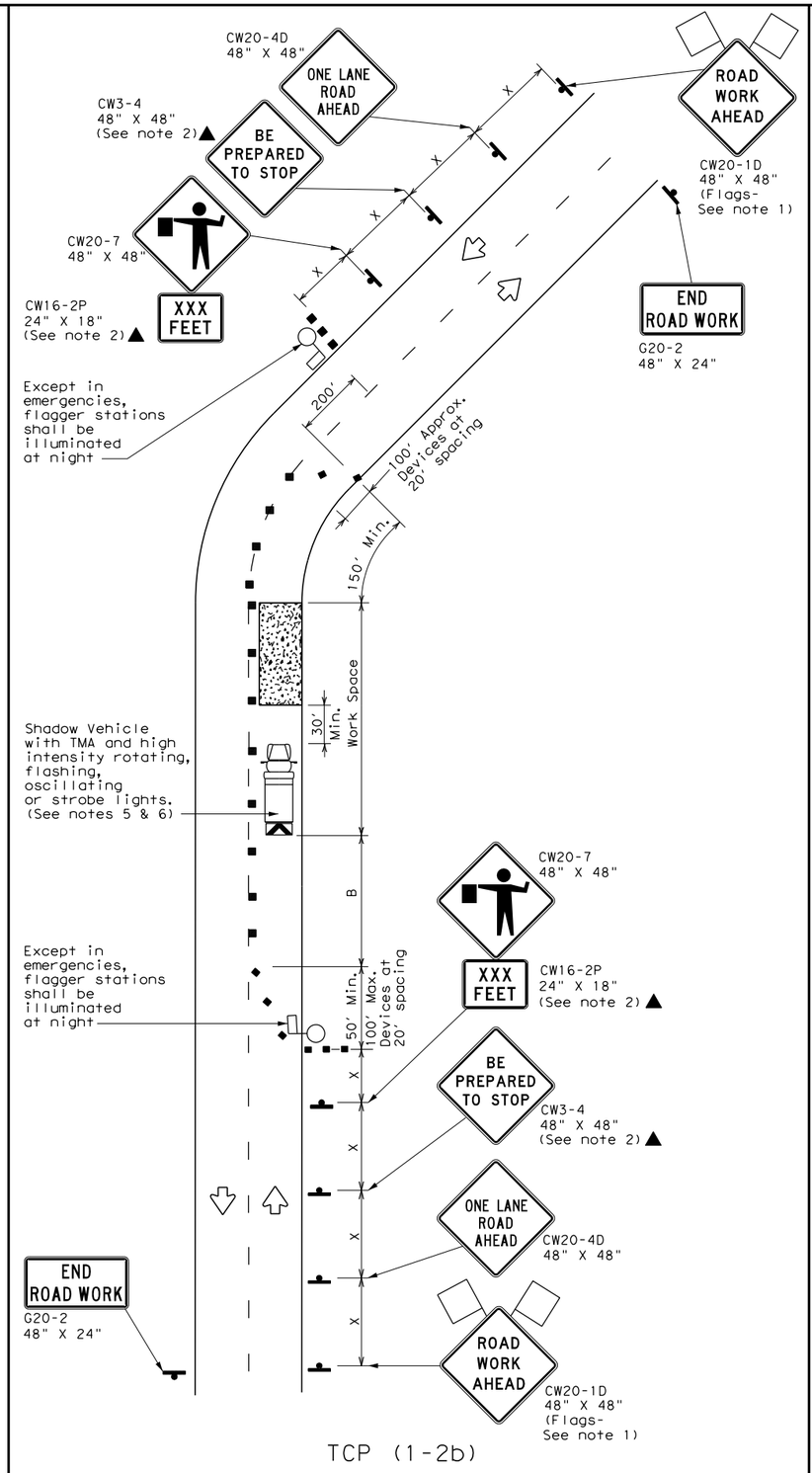


TCP (1-2a)

ONE LANE TWO-WAY
CONTROL WITH YIELD SIGNS
(Less than 2000 ADT - See note 7)



TCP (1-2b)

ONE LANE TWO-WAY
CONTROL WITH FLAGGERS

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board	M	Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent	Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"	Stopping Sight Distance
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'	200'
35		205'	225'	245'	35'	70'	160'	120'	250'
40		265'	295'	320'	40'	80'	240'	155'	305'
45	L = WS	450'	495'	540'	45'	90'	320'	195'	360'
50		500'	550'	600'	50'	100'	400'	240'	425'
55		550'	605'	660'	55'	110'	500'	295'	495'
60		600'	660'	720'	60'	120'	600'	350'	570'
65		650'	715'	780'	65'	130'	700'	410'	645'
70		700'	770'	840'	70'	140'	800'	475'	730'
75		750'	825'	900'	75'	150'	900'	540'	820'

* Conventional Roads Only
** Taper lengths have been rounded off.
L=Length of Taper(FT) W=Width of Offset(FT) S=Posted Speed(MPH)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓		

GENERAL NOTES

1. Flags attached to signs where shown are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. The CW3-4 "BE PREPARED TO STOP" sign may be installed after the CW20-4D "ONE LANE ROAD AHEAD" sign, but proper sign spacing shall be maintained.
4. Sign spacing may be increased or an additional CW20-1D "ROAD WORK AHEAD" sign may be used if advance warning ahead of the flagger or R1-2 "YIELD" sign is less than 1500 feet.
5. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
6. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.

TCP (1-2a)

7. R1-2 "YIELD" sign traffic control may be used on projects with approaches that have adequate sight distance. For projects in urban areas, work spaces should be no longer than one half city block. In rural areas on roadways with less than 2000 ADT, work spaces should be no longer than 400 feet.
8. R1-2 "YIELD" sign with R1-2aP "TO ONCOMING TRAFFIC" plaque shall be placed on a support at a 7 foot minimum mounting height.

TCP (1-2b)

9. Flaggers should use two-way radios or other methods of communication to control traffic.
10. Length of work space should be based on the ability of flaggers to communicate.
11. If the work space is located near a horizontal or vertical curve, the buffer distances should be increased in order to maintain adequate stopping sight distance to the flagger and a queue of stopped vehicles (see table above).
12. Channelizing devices on the center-line may be omitted when a pilot car is leading traffic and approved by the Engineer.
13. Flaggers should use 24" STOP/SLOW paddles to control traffic. Flags should be limited to emergency situations.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
ONE-LANE TWO-WAY
TRAFFIC CONTROL

TCP(1-2)-18

FILE: tcp1-2-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-90 4-98 2-94 2-12 1-97 2-18	0955	01	027	FM 166
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		66

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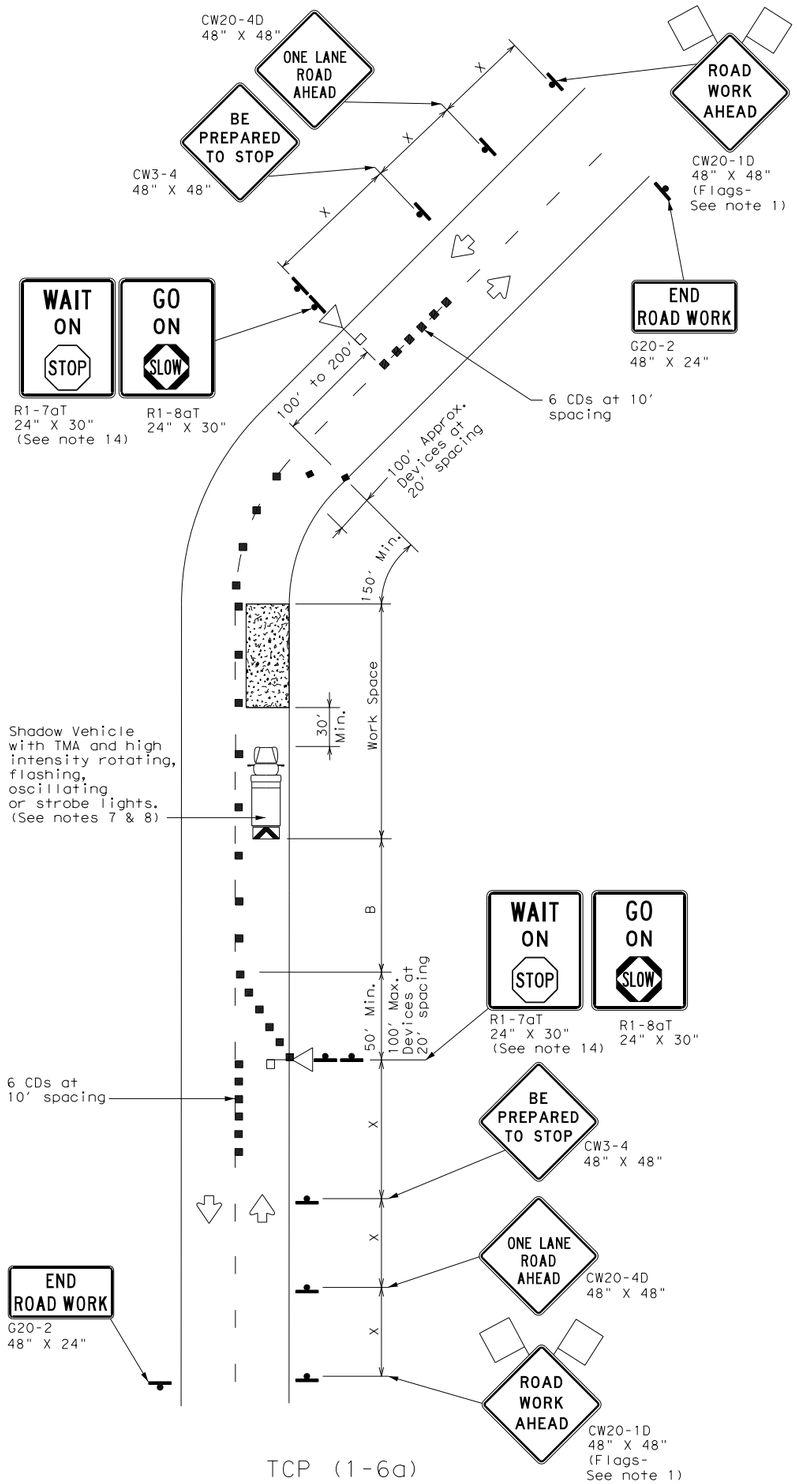
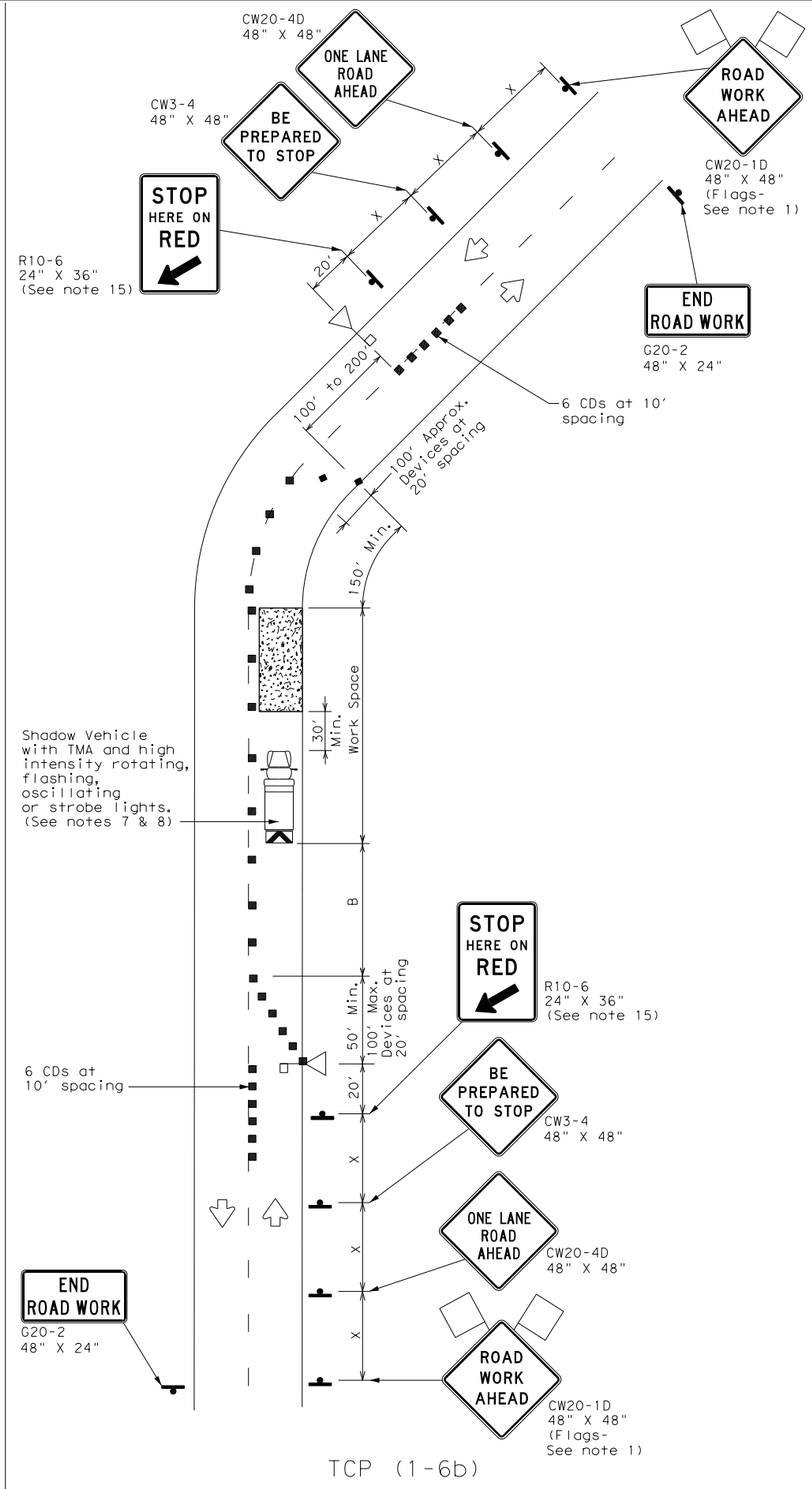


TCP (1-6a)

ONE LANE TWO-WAY
CONTROL WITH STOP/SLOW AFADs



TCP (1-6b)

ONE LANE TWO-WAY CONTROL
WITH RED/YELLOW LENS AFADs

LEGEND			
	Type 3 Barricade		Channelizing Devices (CDs)
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Automated Flagger Assistance Device (AFAD)	M	Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent	Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"	Stopping Sight Distance
30	$L=\frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'	200'
35		205'	225'	245'	35'	70'	160'	120'	250'
40		265'	295'	320'	40'	80'	240'	155'	305'
45	L=WS	450'	495'	540'	45'	90'	320'	195'	360'
50		500'	550'	600'	50'	100'	400'	240'	425'
55		550'	605'	660'	55'	110'	500'	295'	495'
60		600'	660'	720'	60'	120'	600'	350'	570'
65		650'	715'	780'	65'	130'	700'	410'	645'
70		700'	770'	840'	70'	140'	800'	475'	730'
75		750'	825'	900'	75'	150'	900'	540'	820'

* Conventional Roads Only
** Taper lengths have been rounded off.
L=Length of Taper(FT) W=Width of Offset(FT) S=Posted Speed(MPH)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓		

GENERAL NOTES

1. Flags attached to signs where shown are REQUIRED.
2. AFADs shall only be used in situations where there is one lane of approaching traffic in the direction to be controlled.
3. Adequate stopping sight distance must be provided to each AFAD location for approaching traffic. (See table above).
4. Each AFAD shall be operated by a qualified/certified flagger. Flaggers operating AFADs shall not leave them unattended while they are in use.
5. One flagger may operate two AFADs only when the flagger has an unobstructed view of both AFADs and of the approaching traffic in both directions.
6. When pilot cars are used, a flagger controlling traffic shall be located on each approach. AFADs shall not be operated by the pilot car operator.
7. All AFADs shall be equipped with gate arms with an orange or fluorescent red-orange flag attached to the end of the gate arm. The flag shall be a minimum of 16" square.
8. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
9. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.
10. Flaggers should use two-way radios or other methods of communication to control traffic.
11. Length of work space should be based on the ability of flaggers to communicate.
12. If the work space is located near a horizontal or vertical curve, the buffer distances should be increased in order to maintain stopping sight distance to the AFAD.
13. Channelizing devices on the center line may be omitted when a pilot car is leading traffic and approved by the Engineer.
14. The R1-7aT "WAIT ON STOP" sign and the R1-8aT "GO ON SLOW" sign shall be installed at the AFAD location on separate supports or they may be fabricated as one 48" x 30" sign. They shall not obscure the face of the STOP/SLOW AFAD.
15. The R10-6 "STOP HERE ON RED" arrow sign shall be offset so as not to obscure the lenses of the AFAD.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
AUTOMATED FLAGGER ASSISTANCE DEVICES (AFADS)

TCP(1-6)-18

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©TxDOT February 2012	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		67

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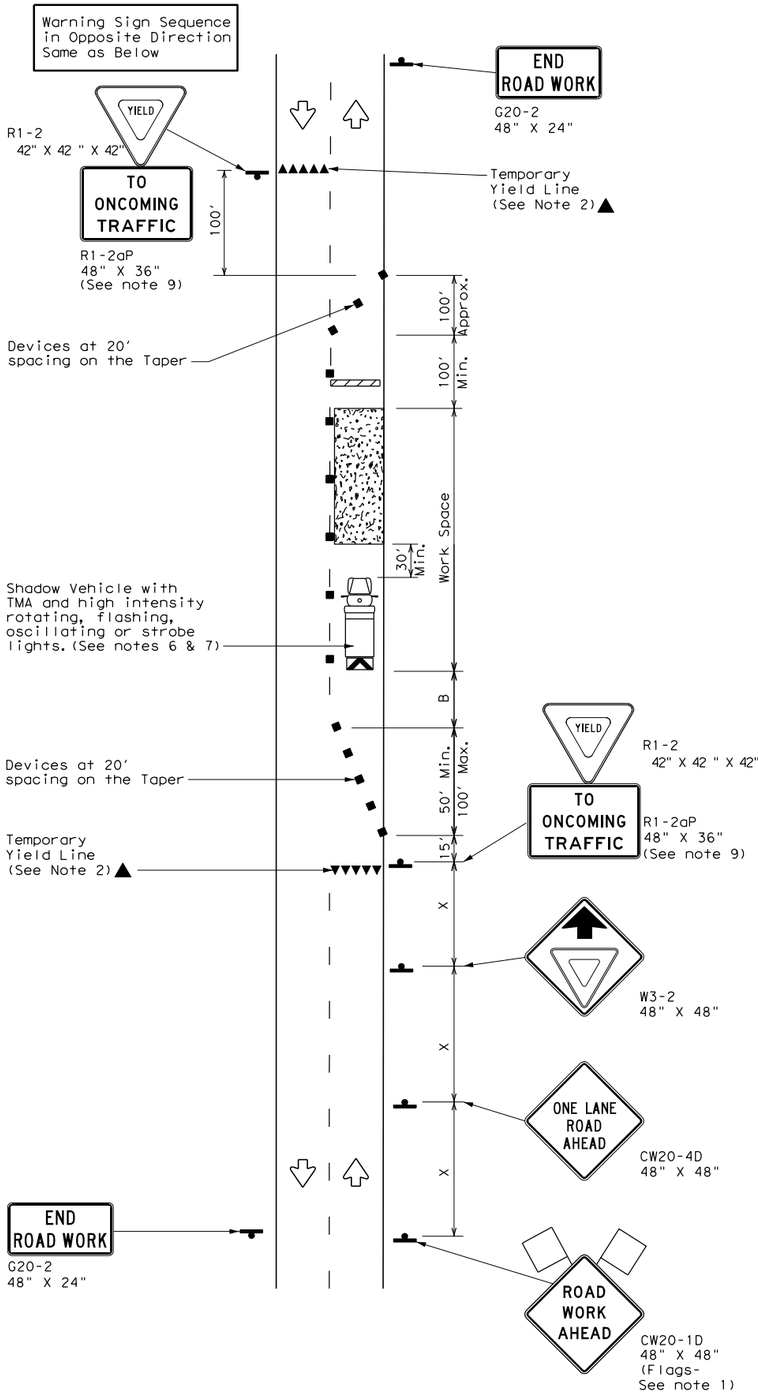
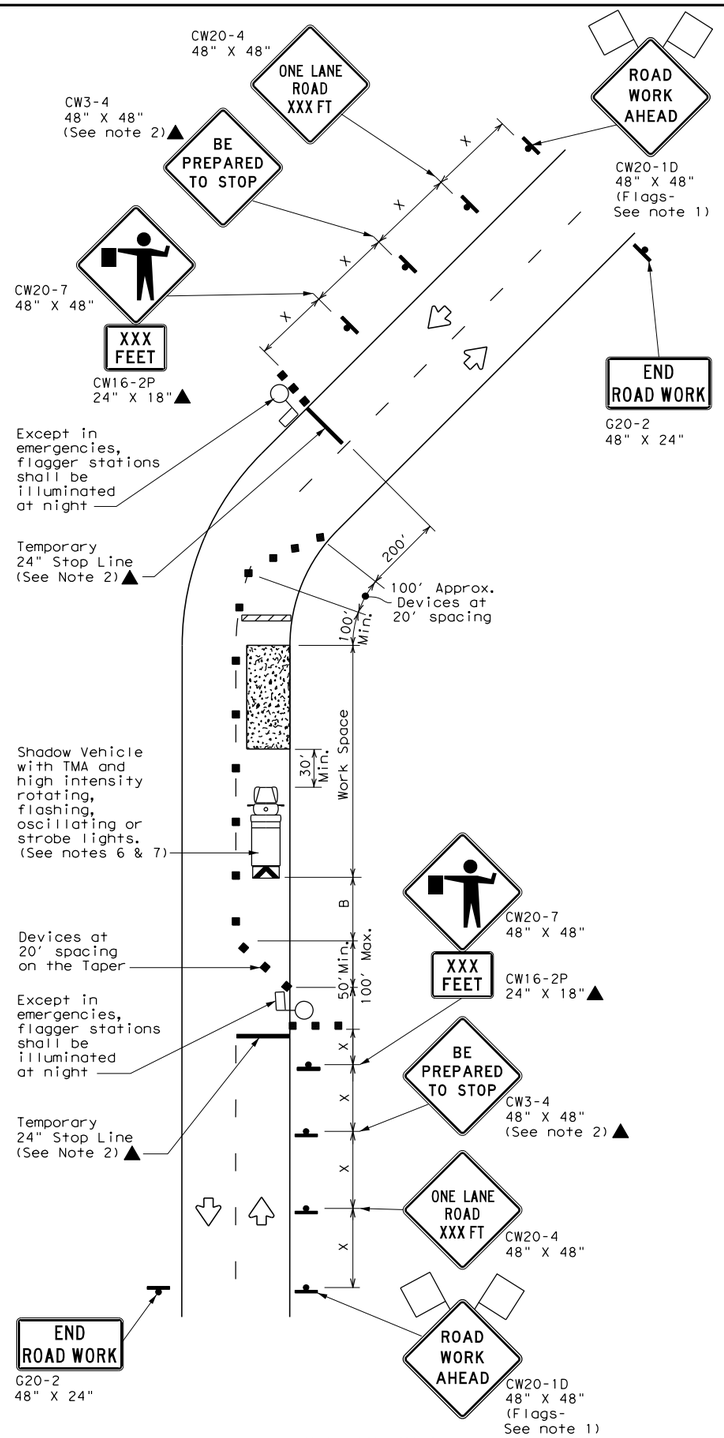


TCP (2-2a)
2-LANE ROADWAY WITHOUT PAVED SHOULDERS
ONE LANE TWO-WAY
CONTROL WITH YIELD SIGNS
(Less than 2000 ADT - See Note 9)



TCP (2-2b)
2-LANE ROADWAY WITHOUT PAVED SHOULDERS
ONE LANE TWO-WAY
CONTROL WITH FLAGGERS

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board	M	Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent	Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"	Stopping Sight Distance
30	$L=\frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'	200'
35		205'	225'	245'	35'	70'	160'	120'	250'
40		265'	295'	320'	40'	80'	240'	155'	305'
45	L=WS	450'	495'	540'	45'	90'	320'	195'	360'
50		500'	550'	600'	50'	100'	400'	240'	425'
55		550'	605'	660'	55'	110'	500'	295'	495'
60		600'	660'	720'	60'	120'	600'	350'	570'
65		650'	715'	780'	65'	130'	700'	410'	645'
70		700'	770'	840'	70'	140'	800'	475'	730'
75		750'	825'	900'	75'	150'	900'	540'	820'

* Conventional Roads Only
** Taper lengths have been rounded off.
L=Length of Taper(FT) W=Width of Offset(FT) S=Posted Speed(MPH)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓	✓	

GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. The CW3-4 "BE PREPARED TO STOP" sign may be installed after the CW20-4 "ONE LANE ROAD XXX FT" sign, but proper sign spacing shall be maintained.
4. Flaggers should use two-way radios or other methods of communication to control traffic.
5. Length of work space should be based on the ability of flaggers to communicate.
6. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
7. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect a wider work space.

TCP (2-2a)

8. The R1-2 "YIELD" sign traffic control may be used on projects with approaches that have adequate sight distance. For projects in urban areas, work space should be no longer than one half city block. In rural areas, roadways with less than 2000 ADT, work space should be no longer than 400 feet.
9. The R1-2aP "YIELD TO ONCOMING TRAFFIC" sign shall be placed on a support at a 7 foot minimum mounting height.

TCP (2-2b)

10. Channelizing devices on the center line may be omitted when a pilot car is leading traffic and approved by the Engineer.
11. If the work space is located near a horizontal or vertical curve, the buffer distances should be increased in order to maintain stopping sight distance to the flagger and a queue of stopped vehicles. (See table above).
12. Flaggers should use 24" STOP/SLOW paddles to control traffic. Flags should be limited to emergency situtations.

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
ONE-LANE TWO-WAY
TRAFFIC CONTROL

TCP(2-2)-18

FILE: tcp2-2-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03 1-97 2-12 4-98 2-18	0955	01	027	FM 166
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		68

DATE: 3/31/2021 3:05:04 PM
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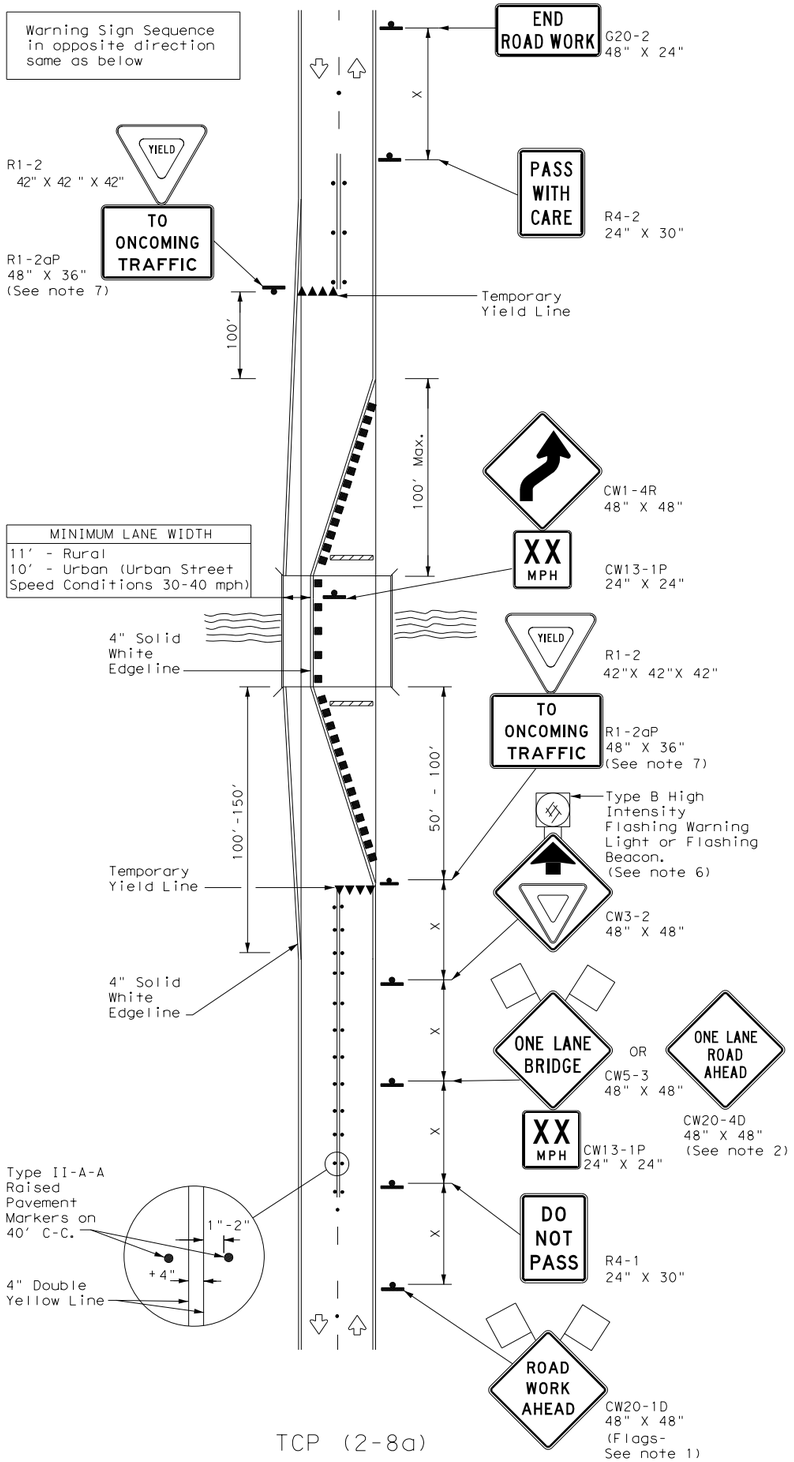
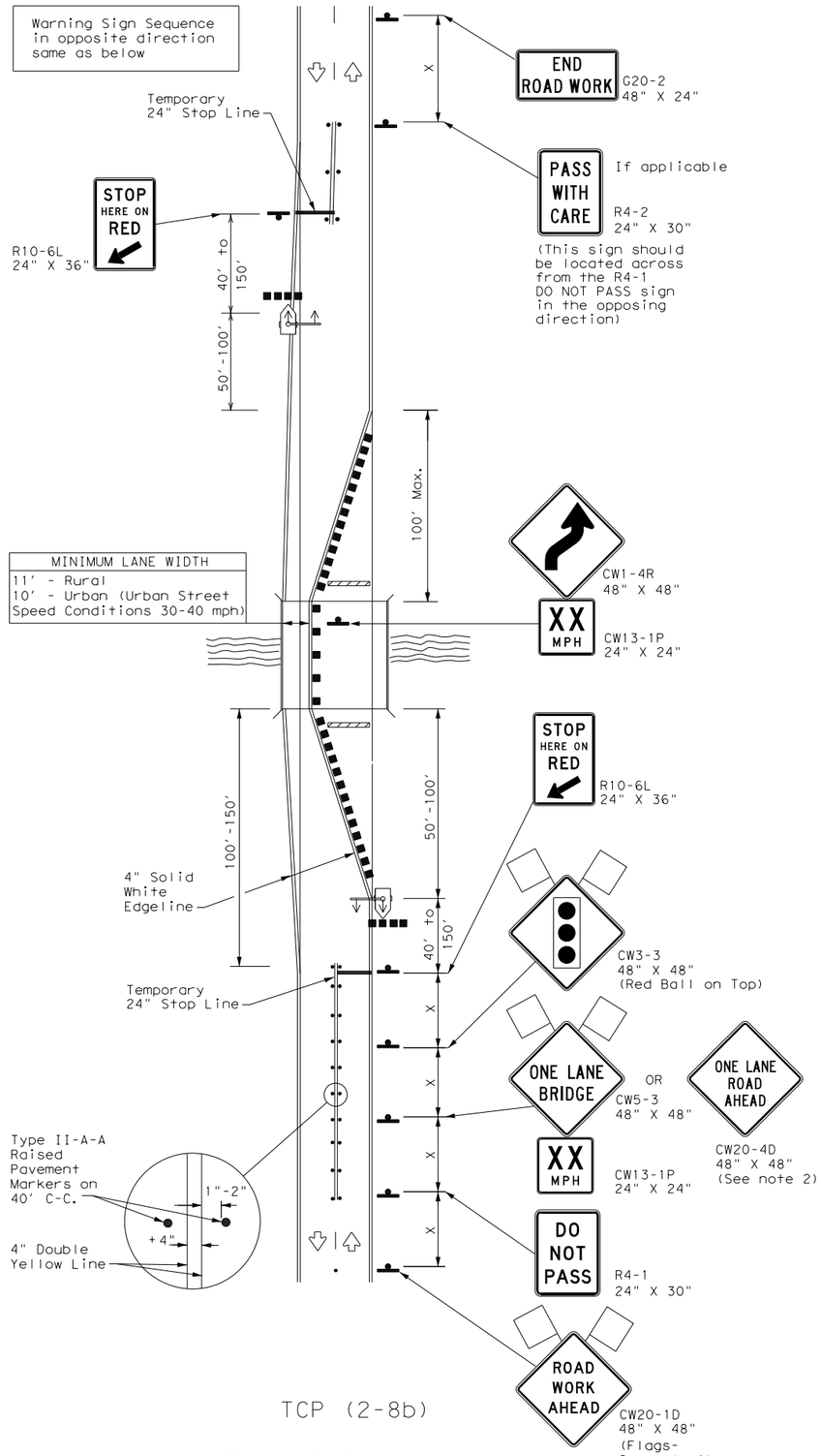


TCP (2-8a)

ONE LANE TWO-WAY
TRAFFIC CONTROL WITH YIELD SIGNS
(Less Than 2000 ADT-See Note 5)



TCP (2-8b)

ONE LANE TWO-WAY
TRAFFIC CONTROL WITH TRAFFIC SIGNAL

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Sign		Traffic Flow
	Flag		Flagger
	Raised Pavement Markers Ty II-AA		Temporary or Portable Traffic Signal

Posted Speed *	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent	Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"	Stopping Sight Distance
30	$L=\frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'	200'
35		205'	225'	245'	35'	70'	160'	120'	250'
40		265'	295'	320'	40'	80'	240'	155'	305'
45	L=WS	450'	495'	540'	45'	90'	320'	195'	360'
50		500'	550'	600'	50'	100'	400'	240'	425'
55		550'	605'	660'	55'	110'	500'	295'	495'
60		600'	660'	720'	60'	120'	600'	350'	570'
65		650'	715'	780'	65'	130'	700'	410'	645'
70		700'	770'	840'	70'	140'	800'	475'	730'
75		750'	825'	900'	75'	150'	900'	540'	820'

* Conventional Roads Only

** Taper lengths have been rounded off.
L=Length of Taper(FT) W=Width of Offset(FT) S=Posted Speed(MPH)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
			✓	✓

GENERAL NOTES

1. Flags attached to signs where shown are REQUIRED.
2. When this TCP is used at a location which does not involve a bridge, a 48" x 48" CW20-4D "ONE LANE ROAD AHEAD" signs should be used in lieu of the CW5-3 "ONE LANE BRIDGE" signs. The CW13-1P Advisory Speed Plaque is required with either warning sign.
3. Raised pavement markers shall be placed 40 feet c-c on centerline between DO NOT PASS signs and stop or yield lines.
4. For intermediate term situations, when it is not feasible to remove and restore pavement markings, the channelization must be made dominant by using a very close spacing. This is especially important in locations of conflicting information, such as where traffic is directed over a double yellow centerline. In such locations a maximum channelizing device spacing of 20 feet is recommended. The 20 foot channelizing device spacing recommendation is intended for the area of conflicting information and not the entire work zone.

TCP (2-8a)

5. Traffic control by CW3-2 "YIELD AHEAD" symbol signs for one lane two-way traffic control operations should be limited to work spaces less than 400 feet long and roadways with less than 2000 ADT. Otherwise, portable traffic signals should be used.
6. If power is available, a flashing beacon should be attached to the CW3-2 "YIELD AHEAD" symbol sign for emphasis.
7. The R1-2 "YIELD" and R1-2aP "TO ONCOMING TRAFFIC" signs and other regulatory signs shall be installed at 7 foot minimum mounting height.

TCP (2-8b)

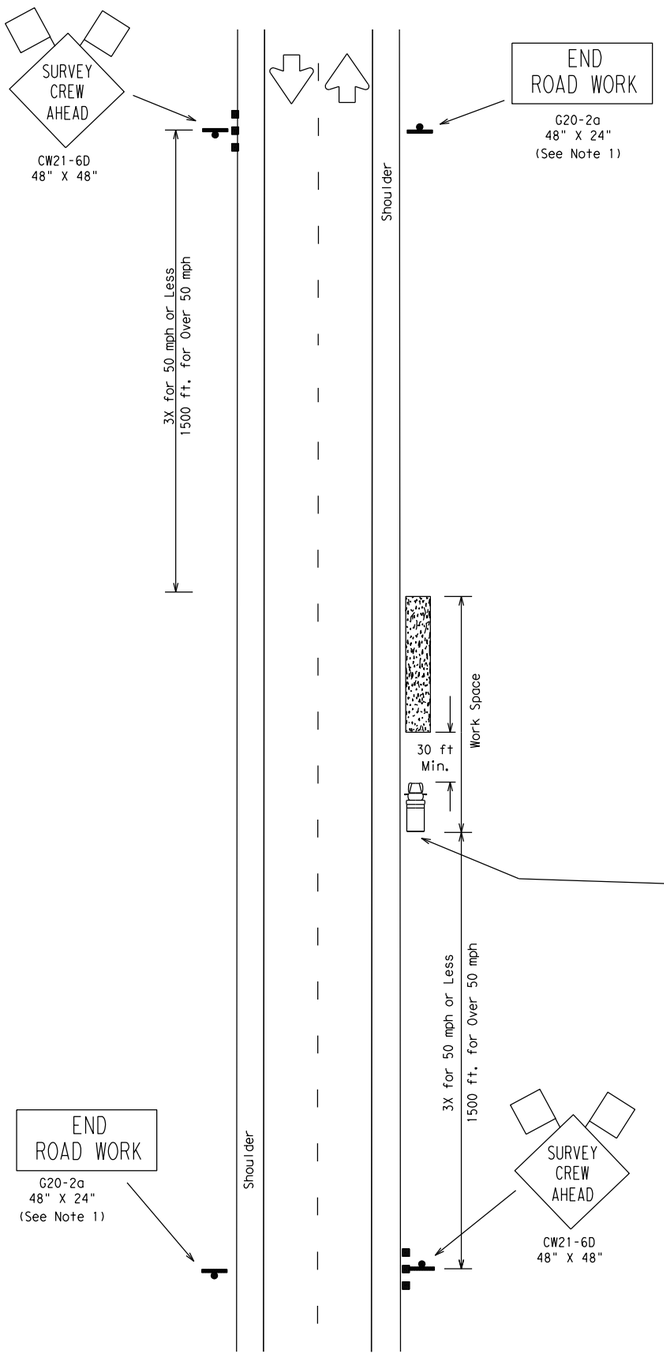
8. A list of approved Portable Traffic Signals can be found in the "Compliant Work Zone Traffic Control Devices" list.
9. Portable traffic signals should be located to provide adequate stopping sight distance for approaching motorist (See table above).

Texas Department of Transportation | Traffic Operations Division Standard

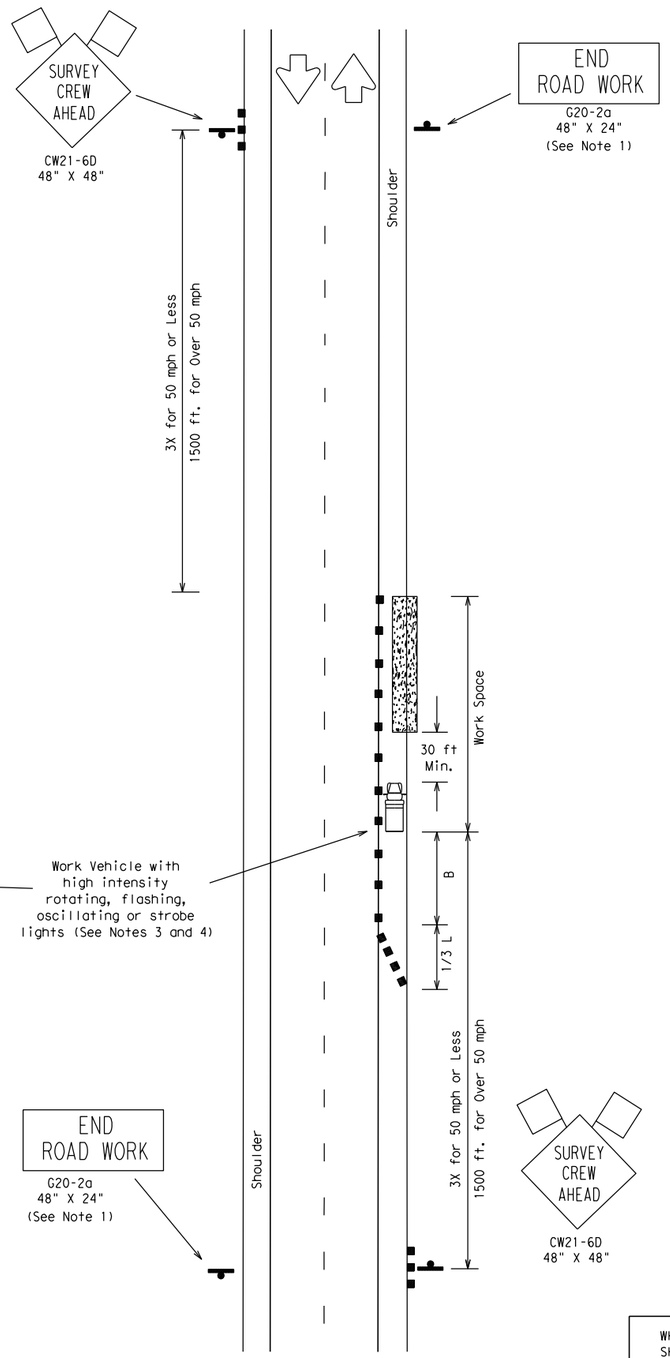
TRAFFIC CONTROL PLAN
LONG TERM ONE-LANE TWO-WAY CONTROL

TCP(2-8)-18

FILE: tcp2-8-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0955	01	027	FM 166
8-95 3-03	DIST	COUNTY		SHEET NO.
1-97 2-12	BRY	BURLESON		69
4-98 2-18				



TCP (S-1a)
WORK OFF SHOULDER OR PAVED SURFACE



TCP (S-1b)
WORK ON SHOULDER

Type III Barricade ■ ■ Channelizing Devices Flag
Heavy Work Vehicle Truck Mounted Attenuator (TMA)
Trailer Mounted Flashing Arrow Panel
Portable Changeable Message Sign (PCMS)

Posted Speed ✳	Formula	Minimum Desirable Taper Lengths ✳✳ 10′ Offset	11′ Offset	12′ Offset	Suggested Maximum Spacing of Device On a Taper	On a Tangent	Min. Sign Spacing "X" Distance	Longitudinal Buffer Space "B"
30	$L=\frac{WS^2}{60}$	150′	165′	180′	30′	60′-75′	120′	90′
35		205′	225′	245′	35′	70′-90′	160′	120′
40		265′	295′	320′	40′	80′-100′	240′	155′
45	L=WS	450′	495′	540′	45′	90′-110′	320′	195′
50		500′	550′	600′	50′	100′-125′	400′	240′
55		550′	605′	660′	55′	110′-140′	500′	295′
60		600′	660′	720′	60′	120′-150′	600′	350′
65		650′	715′	780′	65′	130′-165′	700′	410′
70		700′	770′	840′	70′	140′-175′	800′	475′
75		750′	825′	900′	75′	150′-185′	900′	540′

✳ Conventional Roads Only

✳✳ Taper lengths have been rounded off.
L=Length of Taper (FT.) W=Width of Offset (FT.) S=Posted Speed (MPH)

TYPICAL USAGE:				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓		

DEFINITIONS:
SHORT DURATION - work that occupies a location up to 1 hour.
SHORT TERM STATIONARY - daytime work that occupies a location for more than 1 hour within a single daylight period.

GENERAL NOTES:

1. The G20-2a "END ROAD WORK" sign may be placed on the back of the CW21-6D "SURVEY CREW AHEAD" sign or may be omitted for short duration (less than 1 hour) work.
2. Channelizing devices on the shoulder taper and tangent section may be omitted for short duration (less than 1 hour) work.
3. If line-of-sight requirements for surveying operations will preclude the placement of the Work Vehicle to protect workers, the channelizing devices mentioned in Note 2 are required.
1. 4. A Shadow Vehicle with a Truck Mounted Attenuator and flashing warning lights/arrow panel in caution mode may be used in lieu of the Work Vehicle to protect the work space.
5. The CW20-1D "ROAD WORK AHEAD" sign may be substituted for the CW21-6D "SURVEY CREW AHEAD" sign.
6. This plan may also be used for shoulder work or off shoulder work for multilane undivided roadways.
7. The CW21-6D "SURVEY CREW AHEAD" sign for low volume intersecting side roads is desirable, but is not required when working less than 15 minutes in area of the side road, as determined by the Engineer.

TCP(S-1a)

8. Cones may be placed at edge of pavement adjacent to the work space to enhance safety.

WHENEVER POSSIBLE, SURVEY PARTIES SHOULD AVOID, BY THE USE OF OFFSET LINES, ANY UNNECCESSARY PERIODS OF TIME ON THE ROAD SURFACE.

8-18-08 Revision
1 Corrected misspelling.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC CONTROL PLAN FOR SURVEYING OPERATIONS

TCP(S-1)-08A

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS
8-08

CONT	SECT	JOB	HIGHWAY
0955	01	027	FM 166
DIST	COUNTY		SHEET NO.
BRY	BURLESON		70

DATE: 3/31/2021 3:05:07 PM
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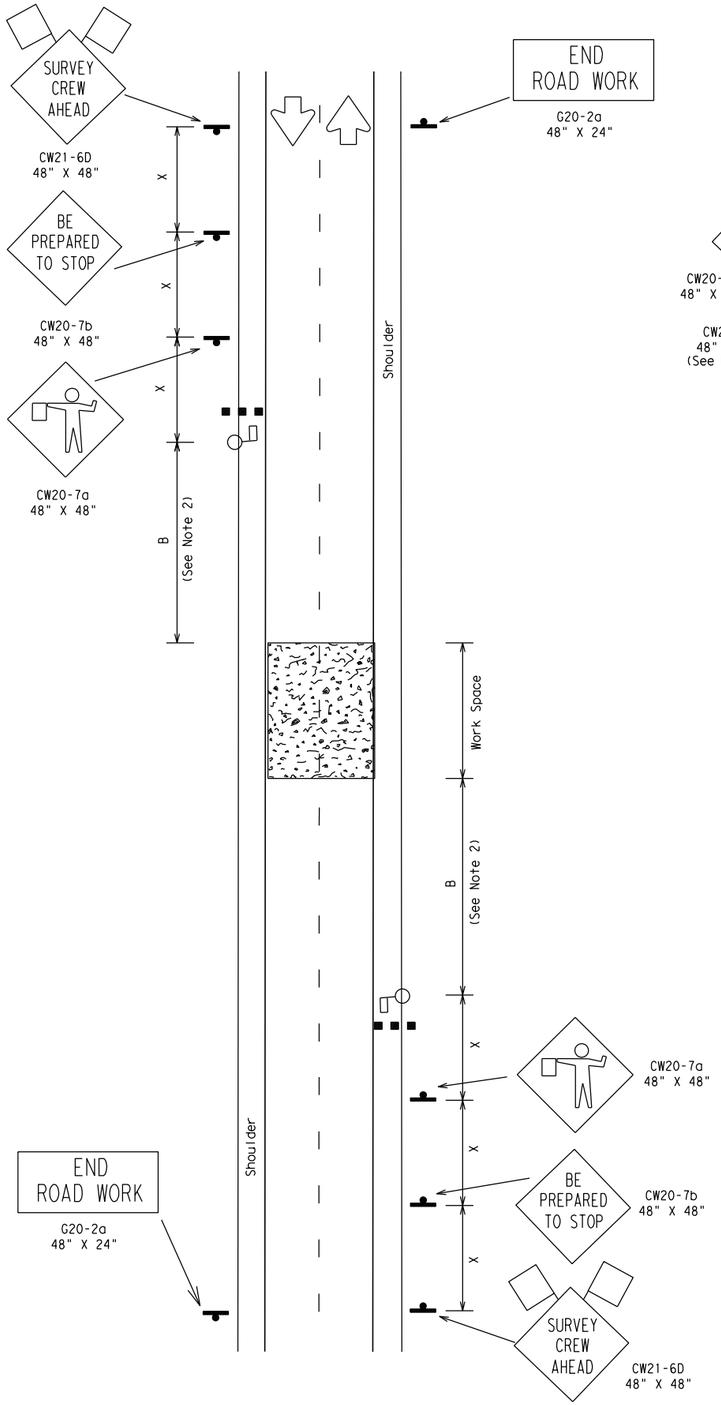
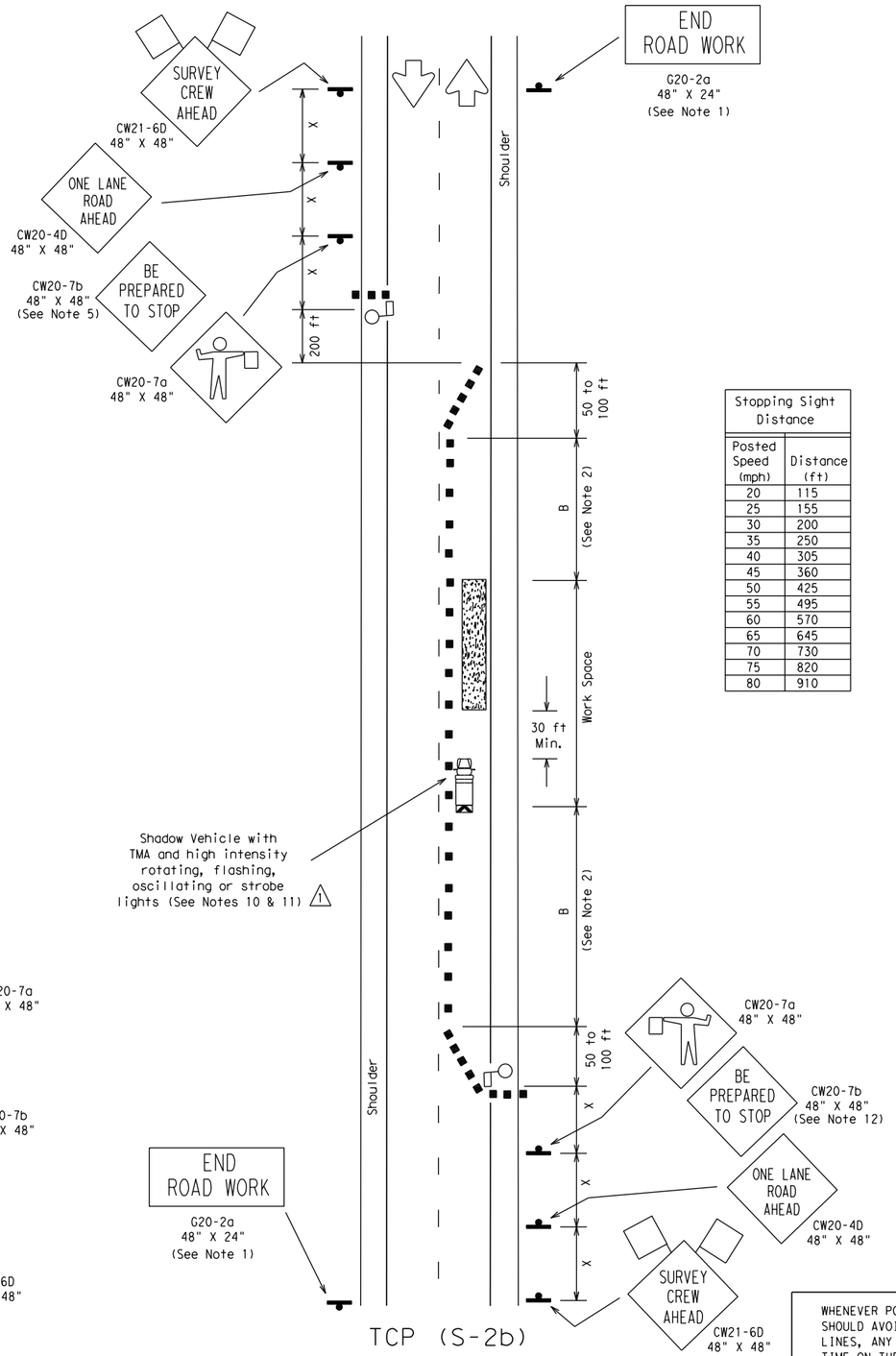


TCP (S-2a)
ROAD CLOSED FOR LESS THAN 20 MINUTES -
OFF PEAK TRAFFIC HOURS
WITH OR WITHOUT SHOULDERS



TCP (S-2b)
WORK IN ROADWAY
OFF PEAK TRAFFIC HOURS
WITH OR WITHOUT SHOULDERS

Stopping Sight Distance	
Posted Speed (mph)	Distance (ft)
20	115
25	155
30	200
35	250
40	305
45	360
50	425
55	495
60	570
65	645
70	730
75	820
80	910

Posted Speed ✳	Formula	Minimum Desirable Taper Lengths ✳✳ 10′ Offset	11′ Offset	12′ Offset	Suggested Maximum Spacing of Device On a Taper	On a Tangent	Min. Sign Spacing "X" Distance	Longitudinal Buffer Space "B"
30	$L=\frac{WS^2}{60}$	150′	165′	180′	30′	60′-75′	120′	90′
35		205′	225′	245′	35′	70′-90′	160′	120′
40		265′	295′	320′	40′	80′-100′	240′	155′
45	L=WS	450′	495′	540′	45′	90′-110′	320′	195′
50		500′	550′	600′	50′	100′-125′	400′	240′
55		550′	605′	660′	55′	110′-140′	500′	295′
60		600′	660′	720′	60′	120′-150′	600′	350′
65		650′	715′	780′	65′	130′-165′	700′	410′
70		700′	770′	840′	70′	140′-175′	800′	475′
75		750′	825′	900′	75′	150′-185′	900′	540′

✳ Conventional Roads Only

✳✳ Taper lengths have been rounded off.
L=Length of Taper (FT.) W=Width of Offset (FT.) S=Posted Speed (MPH)

TYPICAL USAGE:				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓		

DEFINITIONS:
SHORT DURATION - work that occupies a location up to 1 hour.
SHORT TERM STATIONARY - daytime work that occupies a location for more than 1 hour within a single daylight period.

GENERAL NOTES:
1. The G20-2a "END ROAD WORK" sign may be placed on the back of the CW21-6D "SURVEY CREW AHEAD" sign or may be omitted for short duration (less than 1 hour) work.
2. Adequate Stopping Sight Distance (see Stopping Sight Distance table) should be maintained from approaching traffic to the flagger or a queue of stopped vehicles. The Buffer Space "B" should be extended around curves or other obstacles, when necessary, to have adequate Stopping Sight Distance to the flagger station.
3. Flaggers should use two-way radios or other means of communication while flagging.
4. The length of the work space should be based on the ability of the flaggers to communicate.
5. CW20-1D "ROAD WORK AHEAD" signs may be substituted for CW21-6D "SURVEY CREW AHEAD" signs.
6. The CW21-6D "SURVEY CREW AHEAD" sign for low volume intersecting side roads is desirable, but is not required when working less than 15 minutes in area of the side road, as determined by the Engineer.

TCP(S-2a)

7. Road closures shall be less than 20 minutes. Closures less than 5 minutes are desirable.
8. Sign spacing should be increased if traffic repeatedly queues past the CW20-7b "BE PREPARED TO STOP" sign.
9. The surveying instrument should not be located on the paved surface.

TCP (S-2B)

10. For short duration work the Shadow Vehicle with a TMA may be replaced by another Work Vehicle with high intensity rotating, flashing or strobe lights.
11. Shadow Vehicles with a TMA are desirable when workers or equipment are in the work space. When approved by the engineer, Type III barricades or other channelizing devices may be substituted for the Shadow Vehicle.
12. The CW20-7b "BE PREPARED TO STOP" sign is optional. When used, it should be installed after the CW20-4D "ONE LANE ROAD AHEAD" sign.

WHENEVER POSSIBLE, SURVEY PARTIES SHOULD AVOID, BY THE USE OF OFFSET LINES, ANY UNNECCESSARY PERIODS OF TIME ON THE ROAD SURFACE.

8-18-08 Revision
1 Corrected referrence to notes.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC CONTROL PLAN FOR SURVEYING OPERATIONS

TCP(S-2)-08A

REVISIONS	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
8-08	CONT	SECT	JOB	HIGHWAY
	0955	01	027	FM 166
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		71

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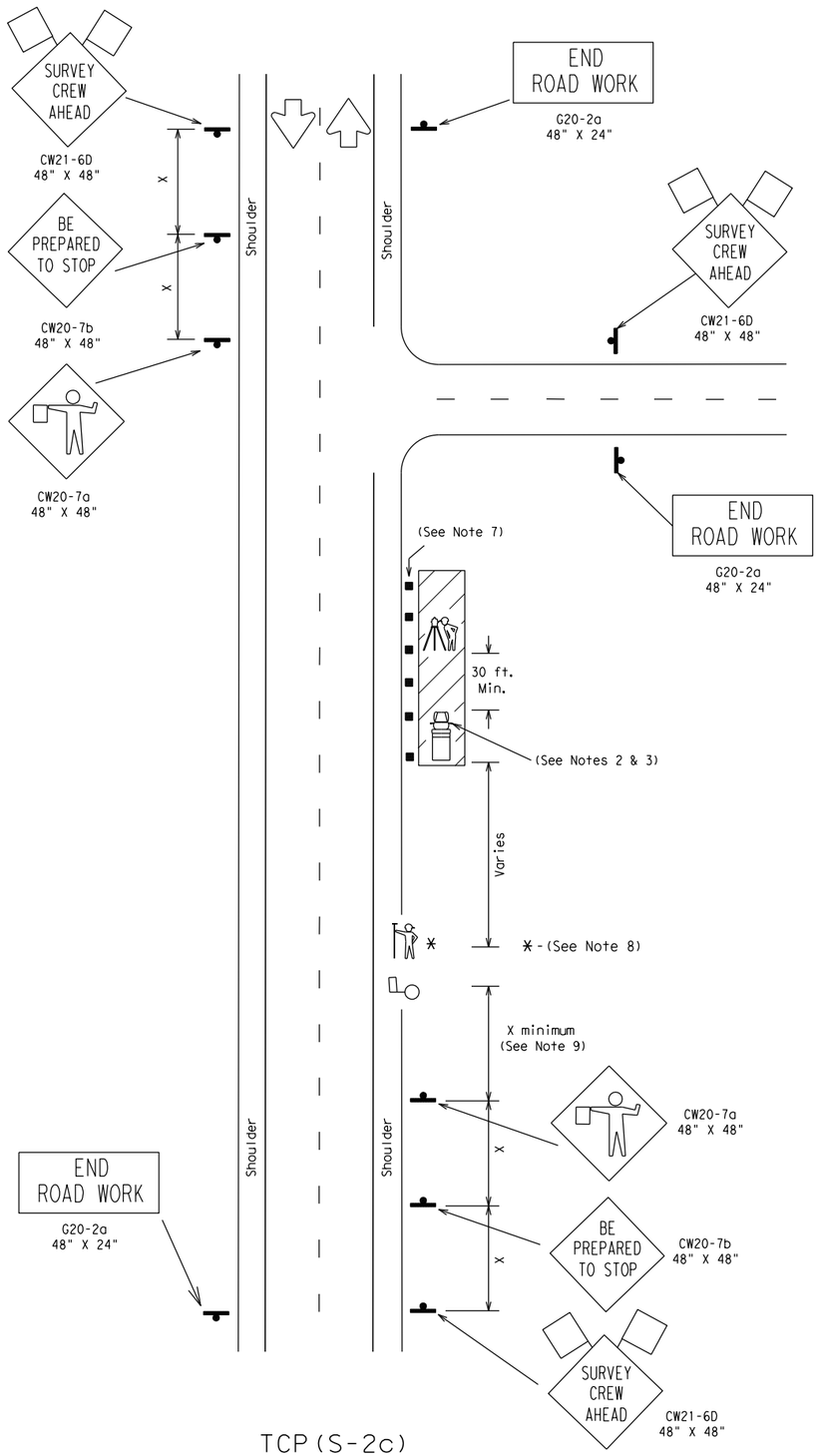

TCP(S-2c)

Stopping Sight Distance	
Posted Speed (mph)	Distance (ft)
20	115
25	155
30	200
35	250
40	305
45	360
50	425
55	495
60	570
65	645
70	730
75	820
80	910

LEGEND

Type III Barricade ■ ■ Channelizing Devices Flag

Work Vehicle Truck Mounted Attenuator (TMA)

Flagger Sign Post Survey Rodman Instrument Person

Posted Speed ✳	Formula	Minimum Desirable Taper Lengths ✳✳ 10′ Offset	11′ Offset	12′ Offset	Suggested Maximum Spacing of Device On a Taper	On a Tangent	Min. Sign Spacing "X" Distance	Longitudinal Buffer Space "B"
30	$L=\frac{WS^2}{60}$	150′	165′	180′	30′	60′-75′	120′	90′
35		205′	225′	245′	35′	70′-90′	160′	120′
40		265′	295′	320′	40′	80′-100′	240′	155′
45	L=WS	450′	495′	540′	45′	90′-110′	320′	195′
50		500′	550′	600′	50′	100′-125′	400′	240′
55		550′	605′	660′	55′	110′-140′	500′	295′
60		600′	660′	720′	60′	120′-150′	600′	350′
65		650′	715′	780′	65′	130′-165′	700′	410′
70		700′	770′	840′	70′	140′-175′	800′	475′
75		750′	825′	900′	75′	150′-185′	900′	540′

✳ Conventional Roads Only

✳✳ Taper lengths have been rounded off.
L=Length of Taper (FT.) W=Width of Offset (FT.) S=Posted Speed (MPH)

TYPICAL USAGE:				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓		

DEFINITIONS:

MOBILE - work that moves continously or intermittently (stopping up to approximately 15 minutes).

SHORT DURATION - work that occupies a location up to 1 hour.

SHORT TERM STATIONARY - daytime work that occupies a location for more than 1 hour within a single daylight period.

GENERAL NOTES:

1. The G20-2a "END ROAD WORK" sign may be placed on the back of the CW21-6D "SURVEY CREW AHEAD" sign or may be omitted for short duration (less than 1 hour) work.
2. Work Vehicle with high intensity rotating, flashing, oscillating or strobe lights should be used to protect work space.
3. When approved by the engineer, Type III barricades or other channelizing devices may be substituted for the Heavy Work Vehicle.
4. CW20-1D "ROAD WORK AHEAD" signs may be substituted for CW21-6D "SURVEY CREW AHEAD" SIGNS.
5. The CW21-6D "SURVEY CREW AHEAD" sign for low volume intersecting side roads may be omitted when approved by the Engineer.
6. The Surveying Instrument shall not be located on the paved surface.
7. Cones at edge of pavement adjacent to instrument person may be omitted when approved by the Engineer.
8. Rodman may only enter roadway when accompanied by flagger and as traffic allows.
9. The distance between the advance warning signs and the work should not exceed a two mile maximum.
10. Flaggers and Survey Crew should use two-way radios or other means of communication.
11. Survey Crew and Flaggers shall wear high-visibility apparel meeting the ANSI 107-2007 standard performance for Class 2 or Class 3 risk exposure.
12. Additional traffic control devices may be required to address local site conditions.
13. Stopping Sight Distance shall be maintained from approaching traffic to the flagger. See "Stopping Sight Distance" table.

SURVEY PARTIES SHOULD AVOID ANY UNNECCESSARY PERIODS OF TIME ON THE ROAD SURFACE.

This TCP is to cover two lane rural type roadways as determined by the Engineer. All other type roadways will be covered by other established Survey TCP'S.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC CONTROL PLAN FOR SURVEYING OPERATIONS

TCP(S-2c)-10

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS

CONT	SECT	JOB	HIGHWAY
0955	01	027	FM 166
DIST	COUNTY		SHEET NO.
BRY	BURLESON		72

212A

DATE: 3/31/2021 3:05:12 PM
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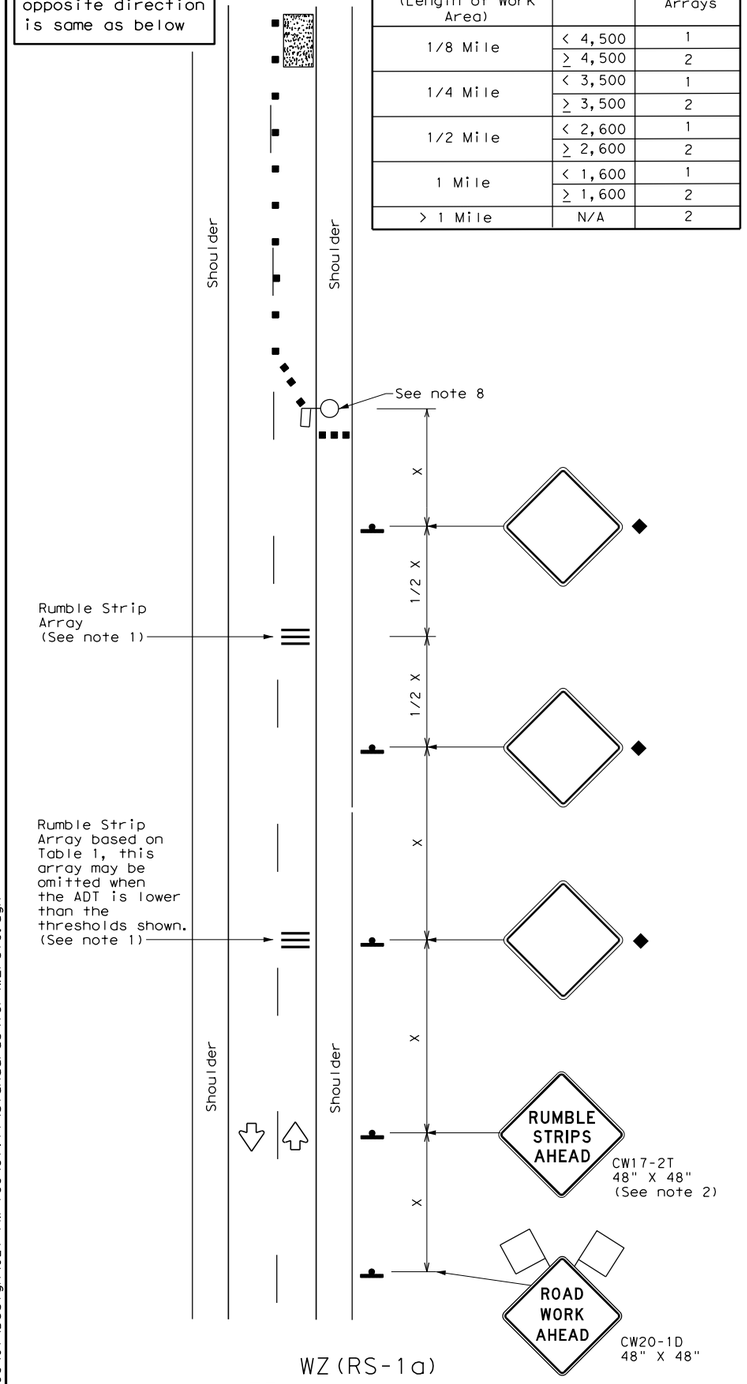
DATE: 3/31/2021 3:05:16 PM
FILE: P:\120\96\01\Design\027 FM 166\Civil\Standards\TCP\wzrs16.dgn

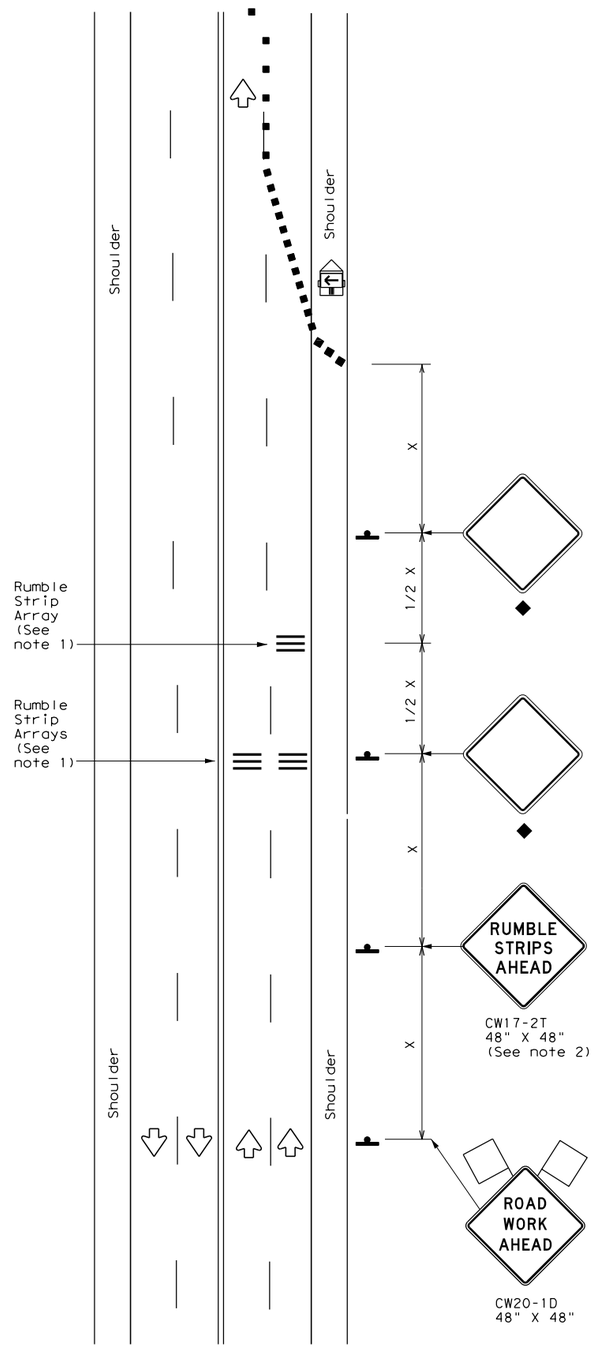
Warning sign and rumble strip sequence in opposite direction is same as below

TABLE 1		
Flagger to Flagger (Length of Work Area)	ADT	# of Rumble Strip Arrays
1/8 Mile	< 4,500	1
	≥ 4,500	2
1/4 Mile	< 3,500	1
	≥ 3,500	2
1/2 Mile	< 2,600	1
	≥ 2,600	2
1 Mile	< 1,600	1
	≥ 1,600	2
> 1 Mile	N/A	2



WZ(RS-1a)
75 mph or Less

RUMBLE STRIPS ON ONE-LANE TWO-WAY APPLICATION



WZ(RS-1b)
75 mph or Less

RUMBLE STRIPS FOR LANE CLOSURE ON CONVENTIONAL ROADWAY

GENERAL NOTES

1. Each Rumble Strip Array should consist of three rumble strips spaced center to center at the spacing shown in Table 2, placed transverse across the lane at locations shown.
2. The CW17-2T "RUMBLE STRIPS AHEAD" sign should be located after the CW20-1D "ROAD WORK AHEAD sign and spaced as shown. If traffic is observed to be queuing, or is expected to queue beyond the Rumble Strips, the CW17-2T sign and the first Rumble Strip Array may be located upstream of the CW20-1D sign as necessary to provide needed warning.
3. Temporary Rumble Strips will be considered subsidiary to Item 502, and shall be a product listed on the Compliant Work Zone Traffic Control Devices.
4. Removal of the Temporary Rumble Strips should be accomplished before removing the advance warning signs.
5. Temporary Rumble Strips should not be used on horizontal curves, loose gravel, soft or bleeding asphalt, heavily rutted pavements or unpaved surfaces.
6. Temporary Rumble Strips shall be installed and maintained as per manufacturer's recommendations.
7. This standard sheet shall be used in conjunction with other appropriate TCP standard, TMUTCD typical application or project specific detail for the project.
8. The one-lane two-way application may utilize a flagger, an AFAD or a portable traffic signal.
9. Temporary Rumble Strips may be used on freeways or expressways based on engineering judgment.

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Panel	M	Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices On a Taper	On a Tangent	Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'
35		205'	225'	245'	35'	70'	160'	120'
40		265'	295'	320'	40'	80'	240'	155'
45	L=WS	450'	495'	540'	45'	90'	320'	195'
50		500'	550'	600'	50'	100'	400'	240'
55		550'	605'	660'	55'	110'	500'	295'
60		600'	660'	720'	60'	120'	600'	350'
65		650'	715'	780'	65'	130'	700'	410'
70		700'	770'	840'	70'	140'	800'	475'
75		750'	825'	900'	75'	150'	900'	540'

* Conventional Roads Only

** Taper lengths have been rounded off.
L=Length of Taper(FT) W=Width of Offset(FT)
S=Posted Speed(MPH)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓		

◆ Signs are for illustrative purposes only. Signs required may vary depending on the TCP, TMUTCD Typical Application, or project specific details for the project.

TABLE 2	
Speed	Approximate distance between strips in an Array
≤ 40 MPH	10'
> 40 MPH & ≤ 55 MPH	15'
> 55 MPH	20'

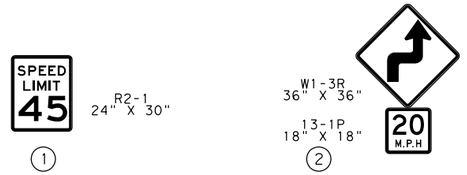
Texas Department of Transportation

Traffic Operations Division Standard

TEMPORARY RUMBLE STRIPS

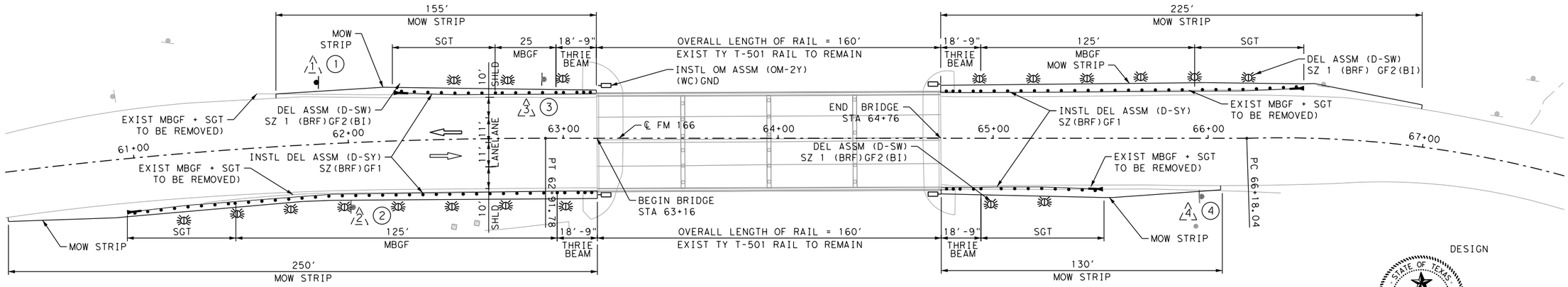
WZ(RS)-16

FILE: wzrs16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS	0955	01	027	FM 166
2-14	DIST	COUNTY		SHEET NO.
4-16	BRY	BURLESON		73



LEGEND

- TRAFFIC FLOW ARROW
- (X) EXIST SIGN TO REMAIN
- X PLACE NEW SIGN
- /X\ REMOVE EXIST SIGN
- PROP DELINEATOR
- PROP OBJECT MARKER



DAVIDSON CREEK BRIDGE

STA 63+10 TO STA 64+76
(NBI# 170260095501004)

NOTES

1. EXISTING METAL RAIL ELEMENT OF MBGF AND SGT TO BE REMOVED, SALVAGED, AND STOCKPILED AT TXDOT MAINTENANCE OFFICE.
2. COMPLETE RAIL REPLACEMENT ON ONE SIDE OF PAVEMENT BEFORE REMOVING RAIL ON THE OTHER SIDE OF PAVEMENT.
3. EXISTING RAIL ELEMENTS WILL REMAIN IN PLACE WHEN NOT IN CONFLICT WITH THE INSTALLATION OF THE PROPOSED RAIL.
4. PLACE WORK ZONE SIGNS PER TCP STANDARDS AND TMUTCD.
5. MAINTAIN ONE LANE OF TRAFFIC IN EACH DIRECTION DURING THE DAY IN ACCORDANCE WITH TCP (2-2b) DETAIL.
6. ONCE OLD RAIL IS REMOVED FROM BRIDGE, ALL HOLES TO BE FILLED WITH GROUT. THIS ITEM WILL BE SUBSIDIARY TO THE REMOVAL OF THE RAIL.
7. SEE SWPPP SUMMARIES FOR SEEDING, VEGETATIVE WATERING, AND SOIL RETENTION BLANKETS QUANTITIES.

DESIGN

STATE OF TEXAS — HEATHER McNEAL — 114428 — LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS — DAN THOMA — 98622 — LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

0 25 50 75
SCALE: 1"= 50′

PRINT DATE	REVISION DATE
3/31/2021	

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

FM 166

MBGF LAYOUT

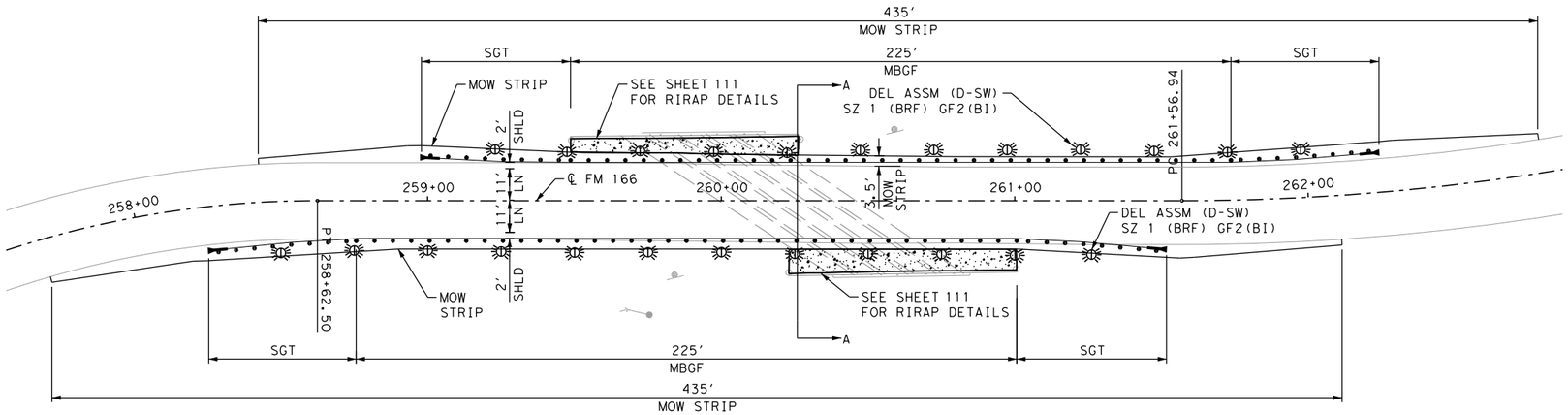
DAVIDSON CREEK

SHEET 1 OF 4 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

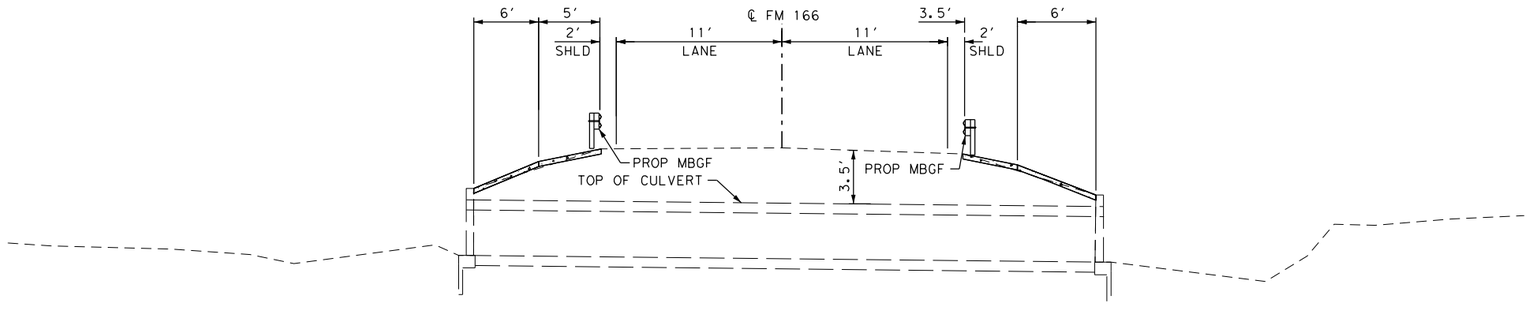
STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	74

Plotted on: 3/31/2021
Design Filename: P:\120\96\01\Design\027 FM 166\Civil\Roadway\1209601_Davidson_Crk_MBGF.dgn



BERRY CREEK BRIDGE

STA 259+99 TO STA 260+46
(NBI# 170260095501006)



A-A
NTS

NOTES

1. PLACE WORK ZONE SIGNS PER TCP STANDARDS AND TMUTCD.
2. MAINTAIN ONE LANE OF TRAFFIC IN EACH DIRECTION DURING THE DAY IN ACCORDANCE WITH TCP (2-2b) DETAIL.
3. SEE SWPPP SUMMARIES FOR SEEDING, VEGETATIVE WATERING, AND SOIL RETENTION BLANKETS QUANTITIES.

LEGEND

- TRAFFIC FLOW ARROW
- (X) EXIST SIGN TO REMAIN
- X PLACE NEW SIGN
- X REMOVE EXIST SIGN
- PROP DELINEATOR

NOTES

1. EXISTING METAL RAIL ELEMENT OF MBGF AND SGT TO BE REMOVED, SALVAGED, AND STOCKPILED AT TXDOT MAINTENANCE OFFICE; XXX-XX
2. COMPLETE RAIL REPLACEMENT ON ONE SIDE OF PAVEMENT BEFORE REMOVING RAIL ON THE OTHER SIDE OF PAVEMENT.
3. EXISTING RAIL ELEMENTS WILL REMAIN IN PLACE WHEN NOT IN CONFLICT WITH THE INSTALLATION OF THE PROPOSED RAIL.
4. PLACE WORK ZONE SIGNS PER TCP STANDARDS AND TMUTCD.
5. MAINTAIN ONE LANE OF TRAFFIC IN EACH DIRECTION DURING THE DAY IN ACCORDANCE WITH TCP (2-2b) DETAIL.
6. ONCE OLD RAIL IS REMOVED FROM BRIDGE, ALL HOLES TO BE FILLED WITH GROUT. THIS ITEM WILL BE SUBSIDIARY TO THE REMOVAL OF THE RAIL.

DESIGN

STATE OF TEXAS · HEATHER McNEAL · 114428 · LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS · DAN THOMA · 98622 · LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

0 25 50 75
SCALE: 1"= 50′

PRINT DATE	REVISION DATE
3/31/2021	

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

FM 166

MBGF LAYOUT

BERRY CREEK

SHEET 2 OF 4 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	75

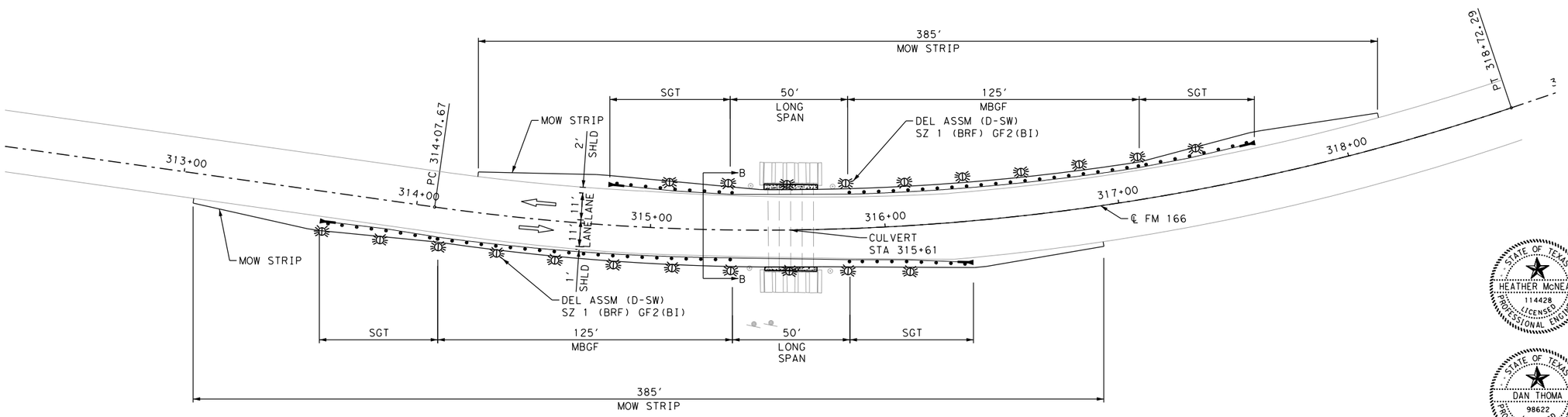
Plotted on: 3/31/2021

Design Filename: P:\120\96\01\Design\027 FM 166\Civil\Roadway\1209601_Culv315+61_MBGF.dgn

LEGEND

- TRAFFIC FLOW ARROW
- (X) EXIST SIGN TO REMAIN
- X PLACE NEW SIGN
- X REMOVE EXIST SIGN
- PROP DELINEATOR

N



CULVERT 315+61

NOTES

1. EXISTING METAL RAIL ELEMENT OF MBGF AND SGT TO BE REMOVED, SALVAGED, AND STOCKPILED AT TXDOT MAINTENANCE OFFICE.
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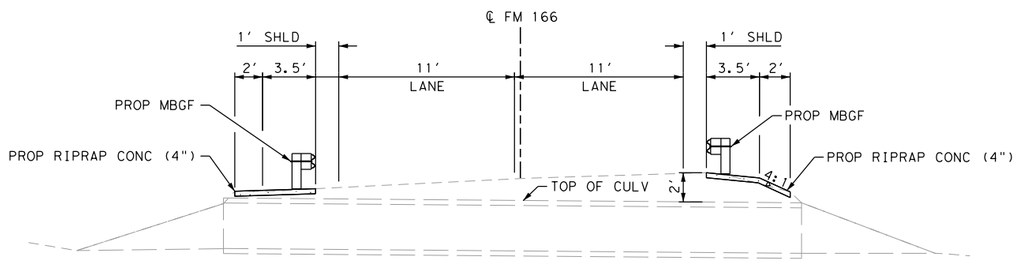


B-B

NTS

DESIGN

STATE OF TEXAS — HEATHER McNEAL — 114428 — LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS — DAN THOMA — 98622 — LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

0 25 50 75

SCALE: 1"= 50′

PRINT DATE	REVISION DATE
3/31/2021	

PAPE-DAWSON ENGINEERS

SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

Texas Department of Transportation ©2021

FM 166

MBGF LAYOUT

CULVERT 315+61

SHEET 3 OF 4 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

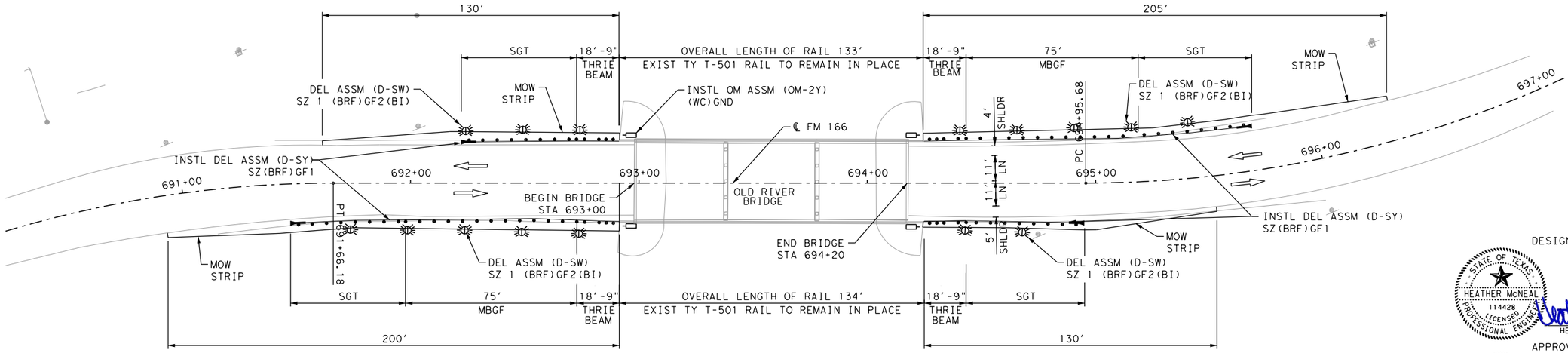
STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	76

Plotted on: 3/31/2021

Design Filename: P:\120\96\01\Design\027 FM 166\Civil\Roadway\1209601_OldRiver.dgn

LEGEND

- TRAFFIC FLOW ARROW
- (X) EXIST SIGN TO REMAIN
- X PLACE NEW SIGN
- X REMOVE EXIST SIGN
- PROP DELINEATOR
- PROP OBJECT MARKER



AT OLD RIVER BRIDGE

STA 693+00 TO STA 694+20
(NBI# 170260095501005)

NOTES

1. EXISTING METAL RAIL ELEMENT OF MBGF AND SGT TO BE REMOVED, SALVAGED, AND STOCKPILED AT TXDOT MAINTENANCE OFFICE.
2. COMPLETE RAIL REPLACEMENT ON ONE SIDE OF PAVEMENT BEFORE REMOVING RAIL ON THE OTHER SIDE OF PAVEMENT.
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7. SEE SWPPP SUMMARIES FOR SEEDING, VEGETATIVE WATERING, AND SOIL RETENTION BLANKETS QUANTITIES.

DESIGN

STATE OF TEXAS — HEATHER McNEAL — 114428 — LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS — DAN THOMA — 98622 — LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

0 25 50 75
SCALE: 1"= 50′

PRINT DATE	REVISION DATE
3/31/2021	

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

FM 166

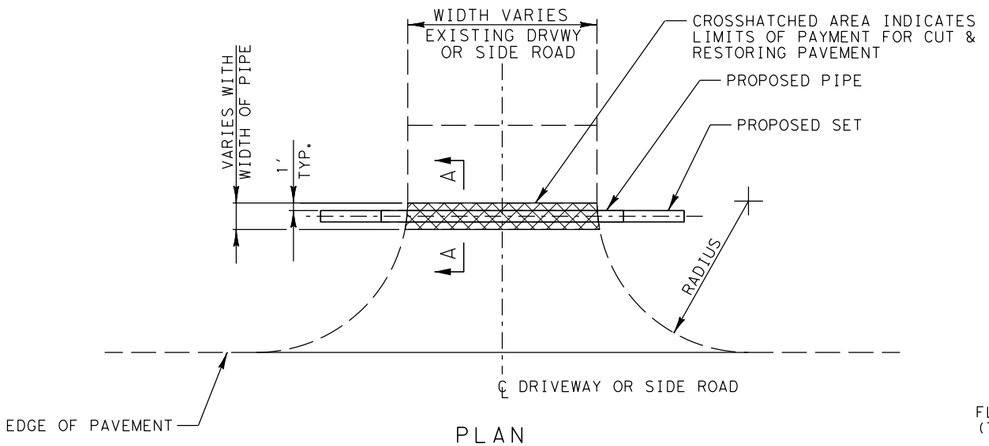
MBGF LAYOUT

OLD RIVER

SHEET 4 OF 4 SHEETS

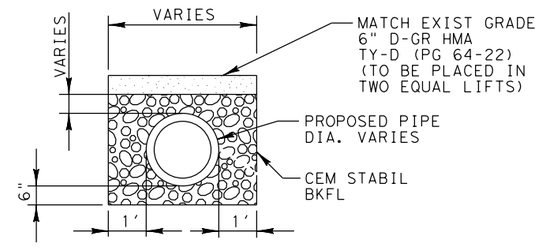
FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	77



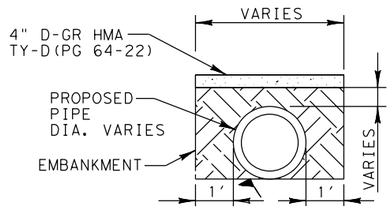
PLAN

DRIVEWAYS & SIDE ROADS



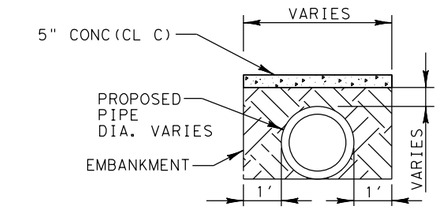
SECTION A-A

SIDE ROADS (ASPH)
CUT & RESTORE PAV
W/ CEM STABIL BKFL



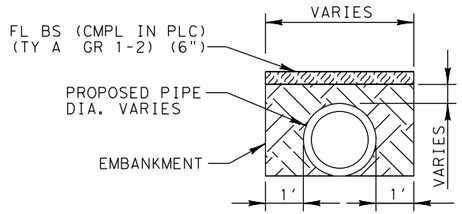
SECTION A-A

DRIVEWAYS (ASPH)
CUT & RESTORE PAV



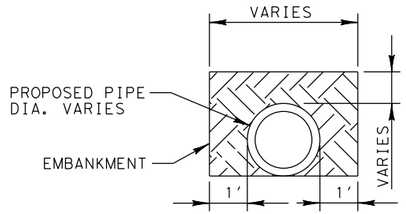
SECTION A-A

DRIVEWAYS (CONC)
CUT & RESTORE PAV



SECTION A-A

DRIVEWAYS & SIDE ROADS
(GRAVEL)



SECTION A-A

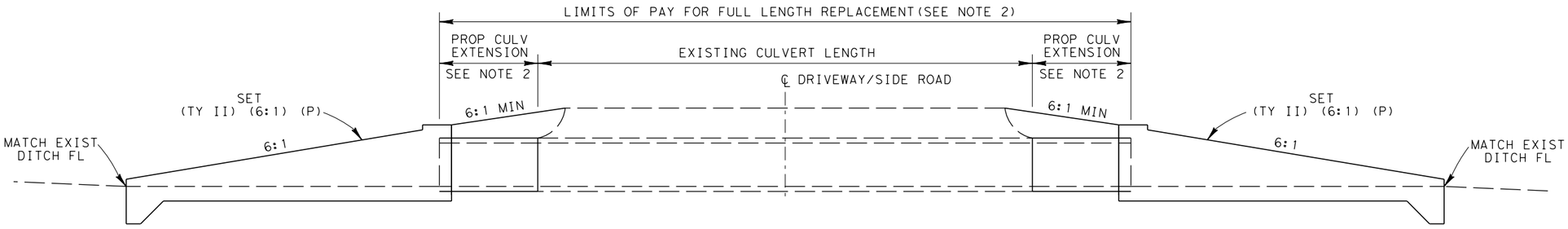
DRIVEWAYS & SIDE ROADS
(GRASS/DIRT)

CONCRETE DRIVEWAY NOTES:

1. USE REINFORCING STEEL CONSISTING OF NO. 3 OR 4 BARS MEETING THE REQUIREMENTS OF GRADE 60 REINFORCING STEEL. PLACE BARS ON 12 INCH CENTERS IN EACH DIRECTION, SUPPORTED ON REINFORCING CHAIRS. INSTALL DOWELLS SIX INCHES INTO EXISTING CONCRETE USING EPOXY GROUT.
2. WELDED WIRE FABRIC WILL NOT BE ALLOWED FOR REINFORCING.
3. UNLESS OTHERWISE DIRECTED, INSTALL ½ INCH PREMOLDED EXPANSION JOINT MATERIAL BETWEEN EXISTING CONCRETE AND NEW CONCRETE.
4. UNLESS OTHERWISE DIRECTED, CUT & RESTORE CONCRETE DRIVEWAYS AND SIDEROADS AS SHOWN ABOVE OR TO THE NEAREST JOINT.

DRIVEWAY NOTES:

LIMITS OF STRUCTURAL EXCAVATION SHOULD BE DEFINED BY SAWCUTTING AT ASPHALT AND CONCRETE DRIVEWAYS. THIS WORK WILL BE CONSIDERED SUBSIDIARY TO ITEM 400.



CULVERT NOTES:

1. PLACE FULL LENGTH CULVERT REPLACEMENTS SYMMETRICAL ABOUT DRIVEWAY/SIDE ROAD CENTERLINE & AT THE SAME HORIZONTAL OFFSET AS THE ORIGINAL PIPE UNLESS OTHERWISE DIRECTED.
2. IT WILL BE THE RESPONSIBILITY OF THE CONTRACTOR TO CONSTRUCT THE PROPOSED PARALLEL SETs IN SUCH A MANNER AS TO PROVIDE A MINIMUM SIDE SLOPE OF 6:1 BETWEEN THE EDGE OF THE DRIVEWAY OR SIDE ROAD PAVEMENT AND THE TOP OF THE SET HEADWALL. ADDITIONAL PIPE NEEDED TO ACQUIRE 6:1 MIN SLOPE WILL BE PAID FOR UNDER ITEM 464.

TYPICAL DETAIL
FOR EXTENDING OR REPLACING
PIPE CULVERTS AT DRIVEWAYS & SIDE ROADS

DESIGN

STATE OF TEXAS
HEATHER McNEAL
114428
LICENSED
PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS
DAN THOMA
98622
LICENSED
PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

PRINT DATE	REVISION DATE
3/31/2021	

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

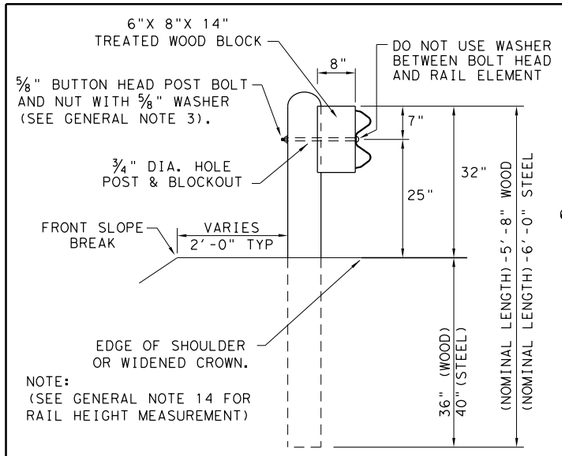
FM 166

CUT & RESTORE DETAILS

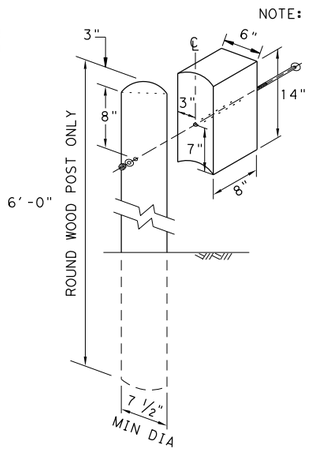
DRIVEWAY & SIDE ROAD PAVEMENT

FED.RD. DIV.NO.	PROJECT NUMBER		HIGHWAY NUMBER
6			FM 166
STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	78

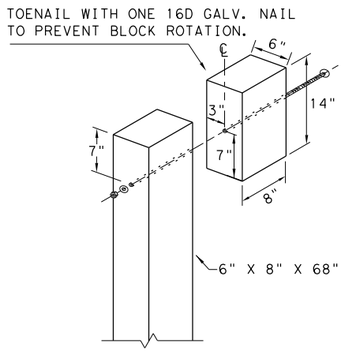
DATE: 3/31/2021
FILE: P:\120\96\01\Design\027 FM 166\Civil\Standards\Roadway\gf3119.dgn



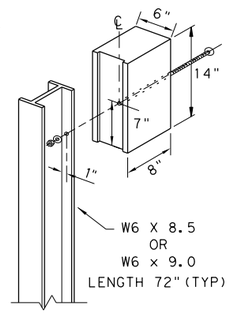
TYPICAL POST PLACEMENT



WOOD BLOCK TO
ROUND WOOD POST

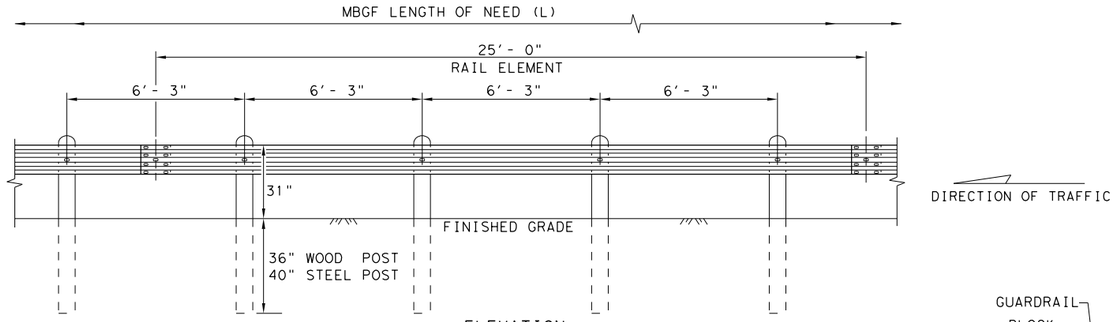


WOOD BLOCK TO
RECTANGULAR WOOD POST



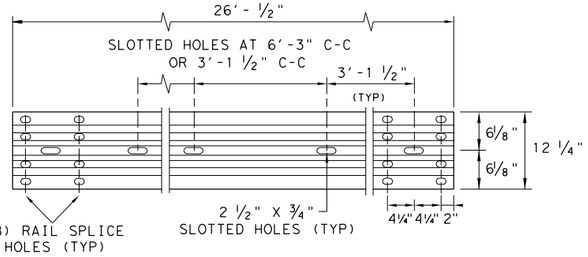
ROUTED WOOD BLOCK
TO I-BEAM STEEL POST

NOTE: ✻✻ "WOOD" INDICATES DIMENSIONS FOR BOTH ROUND AND RECTANGULAR WOOD POST SYSTEMS.



ELEVATION
MID-SPAN RAIL SPLICE

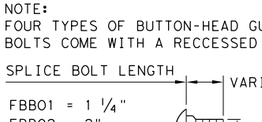
SHOWING A 25'- 0" SECTION OF W-BEAM RAIL. (SEE GENERAL NOTE 2)



ELEVATION 25'- 0"(NOM.) W-BEAM SECTION

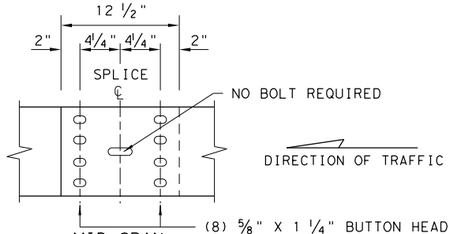
NOTES: SEE GENERAL NOTE 2 FOR ALLOWABLE RAIL TYPES.
SEE RAIL SPLICE DETAIL FOR REQUIRED HARDWARE.

NOTE:
FOUR TYPES OF BUTTON-HEAD GUARD RAIL
BOLTS COME WITH A RECCESSED NUT.



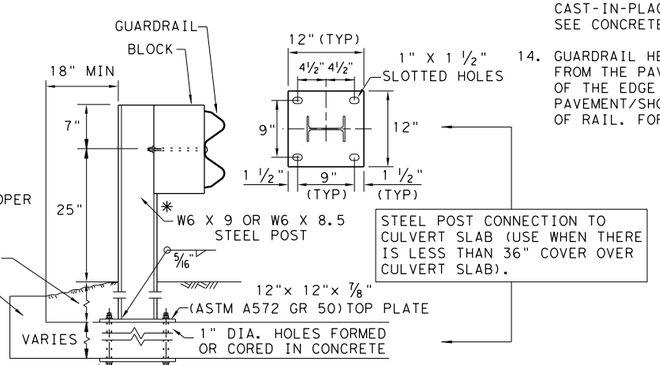
BUTTON HEAD BOLT

NOTE: SEE GENERAL NOTE 3 FOR SPLICE & POST BOLT DETAILS.



MID-SPAN
RAIL SPLICE DETAIL

NOTE: GF(31), MID-SPAN RAIL SPLICES ARE REQUIRED WITH 6'-3" POST SPACINGS.



LOW FILL CULVERT POST

STEEL POST CONNECTION TO CULVERT SLAB (USE WHEN THERE IS LESS THAN 36" COVER OVER CULVERT SLAB).

NOTE: TWO INSTALLATION OPTIONS.

1. BOLT-THROUGH OPTION: REQUIRES A 6" MIN. SLAB THICKNESS. ⅞" DIA (ASTM A449) HEAVY HEX BOLTS WITH TWO HARDENED WASHER EACH AND HEAVY HEX NUTS.
   NOTE: BOLT LENGTH = SLAB PLUS 2 ¼" MIN.

2. EPOXY ANCHOR OPTION: THIS OPTION MAY ONLY BE USED IF THE CULVERT SLAB IS 9" MIN. THICK. THREADED ANCHOR RODS MUST BE ⅞" DIA. ASTM A449 OR A193 GRADE B7 WITH HEAVY HEX NUT, AND ONE HARDENED WASHER EACH. EMBED ANCHOR RODS 6" WITH HILTI HIT RE 500 EPOXY ADHESIVE. OTHER TYPE III CLASS C EPOXY ADHESIVES MEETING THE REQUIREMENTS OF DMS-6100, "EPOXIES AND ADHESIVES", MAY BE USED IF IT CAN BE DEMONSTRATED THAT THEY MEET OR EXCEED THE STRENGTH OF HILTI HIT RE 500 WITH THE SAME EMBEDMENT DEPTH AND THREADED ROD DIA. FOLLOW THE MANUFACTURER'S REQUIREMENTS FOR INSTALLING EPOXIED THREADED RODS. EXTEND RODS ¼" MIN. BEYOND NUT.

NOTE: CULVERTS OF 25 FT. OR LESS, SEE GF(31)LS STANDARD FOR "LONG SPAN" OPTION.

NOTE: TRANSISTIONS TO BRIDGE RAILS OR TRAFFIC BARRIERS.
SEE GF(31)TL3 TR STANDARD FOR HIGH-SPEED TL-3 TRANSITIONS.
SEE GF(31)TL2 TR STANDARD FOR LOW-SPEED TL-2 TRANSITIONS.

GENERAL NOTES

1. THE TYPE OF POST (ROUND WOOD POST, RECTANGULAR WOOD POST, OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. THE EXACT POSITION OF MBGF SHALL BE SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER. STEEL POSTS TO BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING."
2. RAIL ELEMENTS SHALL MEET THE REQUIREMENTS OF ITEM 540,"METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED IN THE PLANS. THE CONTRACTOR MAY FURNISH RAIL ELEMENTS OF 25'- 0", OR 12'- 6" (NOM.) LENGTHS. RAIL ELEMENTS MAY HAVE SLOTTED HOLES AT 3'-1 ½" C-C OR 6'-3" C-C. A SPECIAL LENGTH OF RAIL MAY BE MANUFACTURED TO ACCOMMODATE THE DOWNSTREAM ANCHOR TERMINAL (DAT) AND THE TRANSITION SECTIONS OF GUARDRAIL.
3. BUTTON HEAD "POST BOLTS & NUTS" SHALL MEET THE REQUIREMENTS OF (ASTM A307), AND SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT AND ⅝" WASHER (FWC16a) AND NOT MORE THAN 1" BEYOND IT. TRIM REMAINING BOLT LENGTH TO MEET REQUIRED LENGTH.
4. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445,"GALVANIZING." FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
5. CROWN SHALL BE WIDENED TO ACCOMMODATE THE METAL BEAM GUARD FENCE.
6. THE LATERAL APPROACH TO THE GUARD FENCE, SHALL HAVE A MAXIMUM SLOPE OF 1V:10H.
7. IF SHOWN ELSEWHERE IN THE PLANS OR AS DIRECTED BY THE ENGINEER, THE GUARD FENCE MAY BE FLARED AT A RATE OF 25:1 OR FLATTER.
8. UNLESS OTHERWISE SHOWN IN THE PLANS, GUARD FENCE PLACED IN THE VICINITY OF CURBS SHALL BE POSITIONED SO THAT THE FACE OF CURB IS LOCATED DIRECTLY BELOW OR BEHIND THE FACE OF THE RAIL. RAIL PLACED OVER CURBS SHALL BE INSTALLED SO THAT THE POST BOLT IS LOCATED APPROXIMATELY 25 INCHES ABOVE THE GUTTER PAN OR EDGE OF SHOULDER.
9. APPLICATIONS IN SOLID ROCK ARE ONLY ALLOWED WITH STEEL POSTS. IF SOLID ROCK IS ENCOUNTERED WITHIN 0 TO 18" OF THE FINISHED GRADE, DRILL A 24" DIA. HOLE, 24" INTO THE ROCK. IF SOLID ROCK IS ENCOUNTERED BELOW 18", DRILL A 12" DIA. HOLE, 12" INTO THE ROCK OR TO THE STANDARD EMBEDMENT DEPTH, WHICHEVER MAYBE LESS. ANY EXCESS POST LENGTH, AFTER MEETING THESE DEPTHS, MAY BE FIELD CUT TO ENSURE PROPER GUARDRAIL MOUNTING HEIGHT. BACKFILL WITH COARSE AGGREGATE MATERIAL.
10. POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
11. SPECIAL FABRICATION WILL BE REQUIRED AT INSTALLATION LOCATIONS HAVING A CURVATURE OF LESS THAN 150 FT. RADIUS.
12. UNLESS OTHERWISE SHOWN IN THE PLANS, A COMPOSITE MATERIAL BLOCK THAT MEETS THE REQUIREMENTS OF DMS-7210,"COMPOSITE MATERIAL POSTS AND BLOCKS FOR METAL BEAM GUARD FENCE" MAY BE SUBSTITUTED FOR BLOCKS OF SIMILAR DIMENSIONS. THE CONSTRUCTION DIVISION, TXDOT MAINTAINS A MATERIAL PRODUCER LIST (MPL) FOR PRODUCERS OF MATERIALS CONFORMING TO DMS-7210 ONLY PRODUCERS ON THE MPL MAY FURNISH COMPOSITE MATERIAL BLOCKS.
13. FOR THE LOW FILL CULVERT OPTION, POSTS LOCATED PARTIALLY OR WHOLLY BETWEEN PRECAST BOX CULVERT UNITS, THE USE OF A CAST-IN-PLACE CONCRETE CLOSURE BETWEEN BOXES IS REQUIRED. THE LENGTH OF THE CAST-IN-PLACE CONCRETE CLOSURE SHALL ACCOMMODATE THE PLACEMENT OF THE LOW FILL CULVERT OPTION. SEE CONCRETE CLOSURE DETAILS ON BRIDGE STANDARD SCP-MD.
14. GUARDRAIL HEIGHT MEASUREMENT: WHEN THE GUARDRAIL IS LOCATED ABOVE PAVEMENT, MEASURE THE HEIGHT FROM THE PAVEMENT TO THE TOP OF THE W-BEAM RAIL. WHEN THE GUARDRAIL IS LOCATED UP TO 2 FT. OFF OF THE EDGE OF PAVEMENT OR FOR A PAVEMENT OVERLAY, USE A 10-FOOT STRAIGHTEDGE TO EXTEND THE PAVEMENT/SHOULDER SLOPE TO THE BACK OF RAIL, MEASURE FROM THE BOTTOM OF STRAIGHTEDGE TO THE TOP OF RAIL. FOR GUARDRAIL LOCATED DOWN A 10:1 SLOPE, MEASURE FROM THE NOMINAL TERRAIN.

Texas Department of Transportation

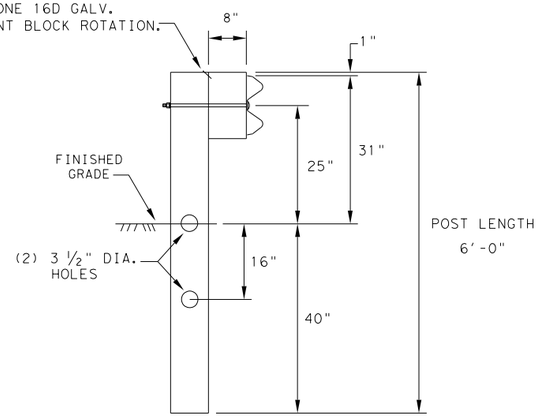
Design Division Standard

METAL BEAM GUARD FENCE
TL-3 MASH COMPLIANT
GF(31)-19

FILE: gf3119.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0955	01	027	FM 166
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		79

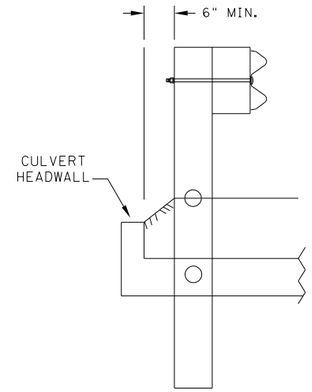
DATE: 3/31/2021
FILE: P:\120196101\Design\027 FM 166\Civil\Standards\Roadway\gf31ls19.dgn

NOTE: TOENAIL WITH ONE 16D GALV. NAIL TO PREVENT BLOCK ROTATION.



RECTANGULAR CRT POST
(6"X 8" X 6' LONG)

(6) CRT REQUIRED
SEE ELEVATION DETAIL FOR LOCATIONS



LATERAL OFFSET BETWEEN THE
GUARDRAIL AND THE CULVERT HEADWALL

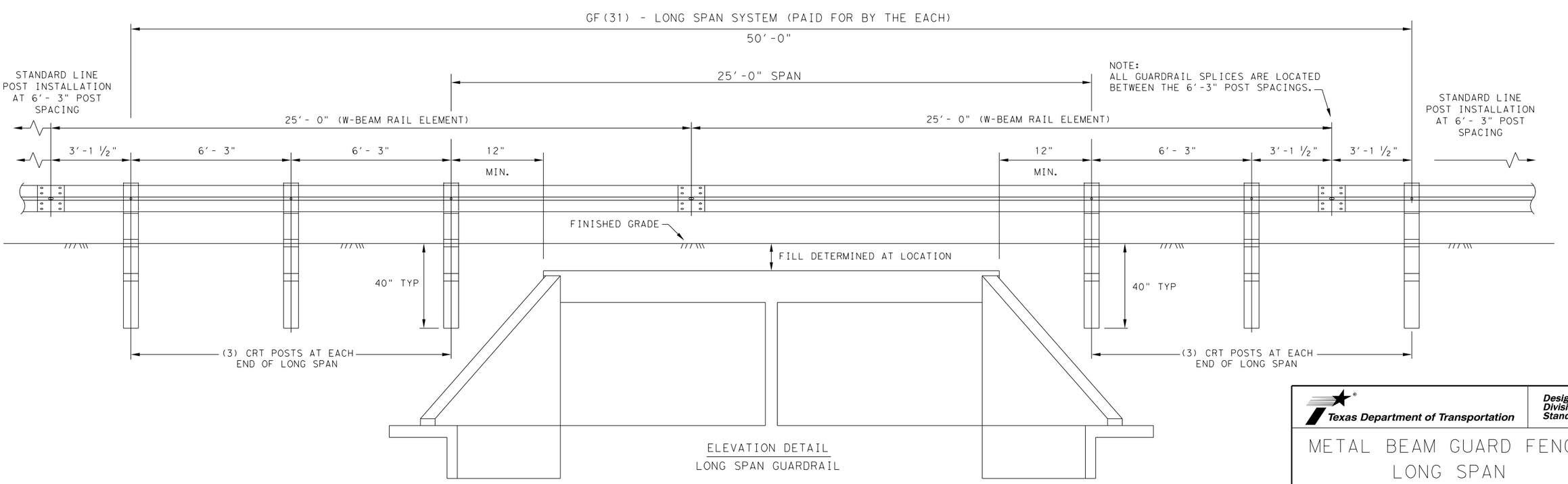
GENERAL NOTES

1. THE TYPE OF LINE POST (ROUND WOOD POST, RECTANGULAR WOOD POST, OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. THE EXACT POSITION OF THE TRANSITIONS SHALL BE AS SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER. STEEL POSTS TO BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING."
2. RAIL ELEMENT SHALL MEET ALL REQUIREMENTS OF ITEM 540, "METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED ON THE PLANS. THE CONTRACTOR MAY FURNISH RAIL ELEMENTS OF 12'- 6" OR 25'- 0" NOMINAL LENGTHS.
3. RAIL POST HOLES ARE OFFSET 3'- 1 ½" FROM STANDARD GUARDRAIL TO ACCOMMODATE THE MIDSPAN SPLICING.
4. BUTTON HEAD "POST BOLTS & NUTS" SHALL MEET THE REQUIREMENTS OF (ASTM A307), AND SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT AND ⅝" WASHER (FWC16a) AND NO MORE THAN 1" BEYOND IT.
5. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
6. WHERE SOLID ROCK IS ENCOUNTERED, CONTACT THE DESIGN DIVISION FOR ADDITIONAL GUIDANCE. (512) 416-2678
7. POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
8. REFER TO GF(31) STANDARD SHEET FOR ADDITIONAL DETAILS.
9. FLAME CUTTING OF HOLES IN GUARDRAIL SHALL NOT BE PERMITTED. IF YOU ENCOUNTER MIS-ALIGNED BOLT HOLES IN GUARDRAIL CONTACT THE DESIGN DIVISION FOR ADDITIONAL INFORMATION & OPTIONS.

NOTE: SEE GF(31) STANDARD FOR STANDARD LINE POSTS.

DIRECTION OF TRAFFIC

GF(31) - LONG SPAN SYSTEM (PAID FOR BY THE EACH)



ELEVATION DETAIL
LONG SPAN GUARDRAIL

Texas Department of Transportation

Design Division Standard

METAL BEAM GUARD FENCE
LONG SPAN
TL-3 MASH COMPLIANT

GF(31)LS-19

FILE: gf31ls19.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0955	01	027	FM 166
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	BRY	BURLESON		80

DATE: 3/31/2021
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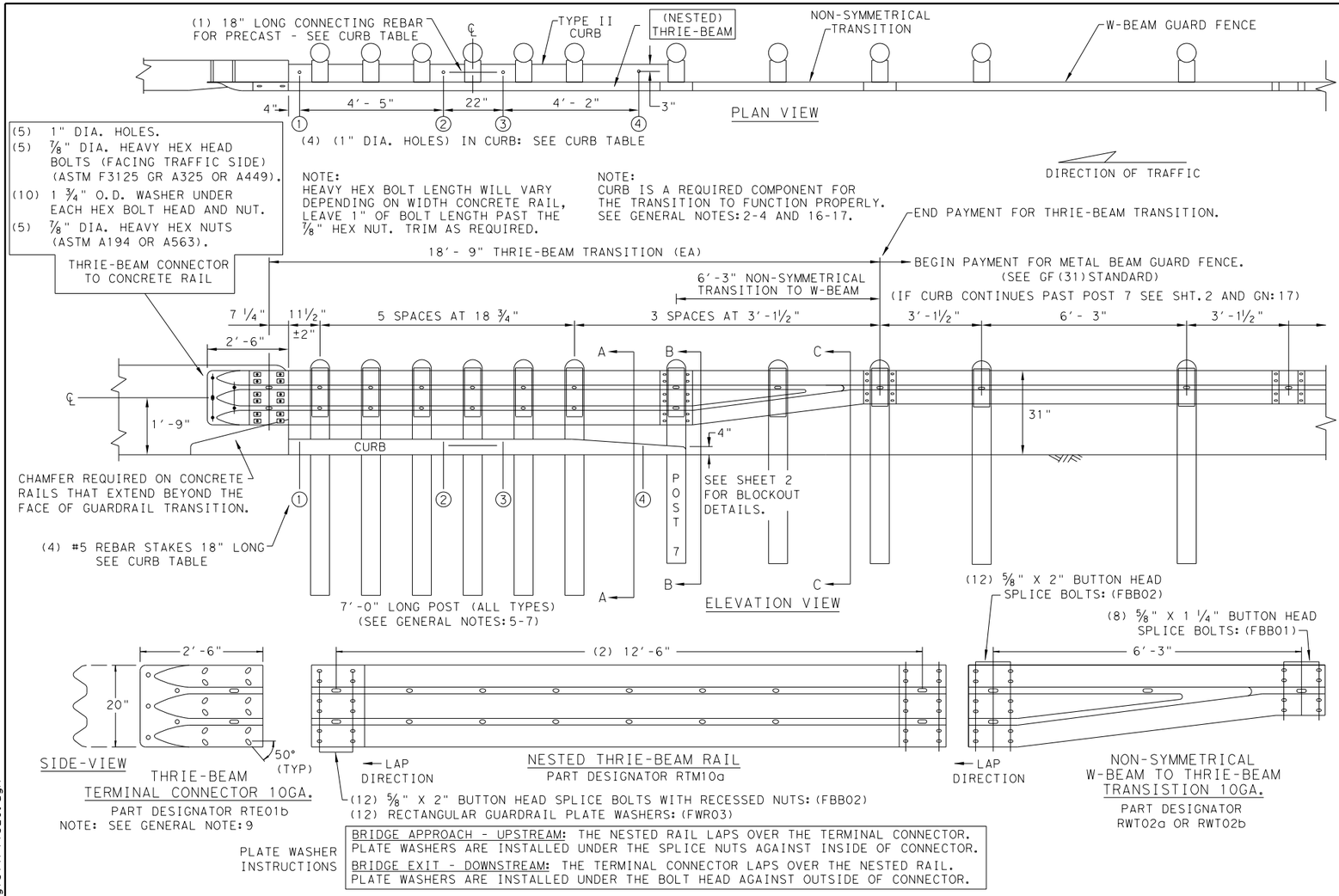


GENERAL NOTES

1. CONTACT THE DESIGN DIVISION FOR DRAINAGE CUT OUT OPTIONS NEEDED WITHIN THE CURB SECTION OF THE THRIE-BEAM TRANSITION. (512) 416-2678
2. CONCRETE CURB MAY BE CAST-IN-PLACE OR PRECAST AS SHOWN ON THIS SHEET. WHEN USED IN CONJUNCTION WITH THE THRIE-BEAM TRANSITIONS, CURB SHALL BE TYPE II (5- 3/4" HEIGHT); SEE CURRENT CCCG STANDARD SHEET FOR FURTHER DETAILS. IF OTHER CURB HEIGHTS ARE SHOWN IN THE PLANS IN CONJUNCTION WITH THE TRANSITION, THE CURB HEIGHT MAY BE FROM 4" TO 8" WITH A RELATIVELY VERTICAL FACE. CONCRETE CURB SHALL BE CONTINUOUS TO THE SEVENTH POST UNLESS OTHERWISE SHOWN IN THE PLANS. SEE GENERAL NOTE: 17 FOR CIRCUMSTANCES WHERE CURB CONTINUES PAST POST 7.
3. CONCRETE CURB TYPE II SUBSIDIARY TO "METAL BEAM GUARD FENCE TRANSITION". IF NO ADDITIONAL CURB IS INDICATED BEYOND THE TRANSITION, THEN ANY CURB HEIGHT GREATER THAN 4" WILL BE TAPERED DOWN BEGINNING AT THE LAST 7 FT. POST TO A MAXIMUM HEIGHT OF 4" AT POST 7. IF SHOWN ELSEWHERE IN THE PLANS, ADDITIONAL CURB UNDERNEATH GUARDRAIL WILL BE PAID FOR BY THE LINEAR FOOT.
4. UNLESS OTHERWISE SHOWN IN THE PLANS, TRANSITIONS SHALL BE PLACED WITH THE BLOCKOUT FACE IN FRONT OF OR DIRECTLY ABOVE THE CURB FACE. SEE SECTION A-A.
5. FOR ROUND WOOD POST SYSTEMS, ALL ROUND WOOD POSTS SHALL BE 7 1/2" DIA. MINIMUM THROUGHOUT THE THRIE-BEAM TRANSITION.
6. THE TYPE OF POST (ROUND WOOD POST, RECTANGULAR WOOD POST OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. REFER TO GF(31) STANDARD SHEET.
7. THE POST LENGTH SHALL BE MARKED ON ALL 7'- 0" LONG POSTS BY THE MANUFACTURER. THE MARK SHALL BE LOCATED WITHIN THE TOP 1 FT. REGION OF THE POST, AT LEAST 5/8" IN HEIGHT, AND VISIBLE AFTER INSTALLATION. WOODEN POSTS SHALL BE MARKED WITH A BRAND, AND STEEL POSTS WITH A STENCIL BEFORE GALVANIZING.
8. POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
9. RAIL ELEMENTS SHALL MEET THE REQUIREMENTS OF ITEM 540, "METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED ON THE PLANS. THE THRIE-BEAM TERMINAL CONNECTOR AND THE THRIE-BEAM TRANSITION TO W-BEAM SHALL BE OF THE SAME MATERIAL, BUT SHALL NOT BE LESS THAN 10 GAUGE. CONTRACTOR SHALL VERIFY THAT THE LOCATIONS OF BOLT HOLES MATCH THOSE IN THE THRIE-BEAM TERMINAL CONNECTOR PRIOR TO ORDERING MATERIALS.
10. BUTTON HEAD "POST BOLTS & NUTS" SHALL MEET THE REQUIREMENTS OF (ASTM A307), AND SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT AND 5/8" WASHER (FWC16a) AND NOT MORE THAN 1" BEYOND IT. TRIM REMAINING BOLT LENGTH TO MEET REQUIRED LENGTH.
11. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
12. CROWN SHALL BE WIDENED TO ACCOMMODATE TRANSITIONS.
13. WHERE SOLID ROCK IS ENCOUNTERED, CONTACT THE DESIGN DIVISION FOR ADDITIONAL GUIDANCE. (512) 416-2678
14. UNLESS OTHERWISE SHOWN IN THE PLANS, A COMPOSITE MATERIAL BLOCK THAT MEETS THE REQUIREMENTS OF DMS-7210, "COMPOSITE MATERIAL POSTS AND BLOCKS FOR METAL BEAM GUARD FENCE" MAY BE SUBSTITUTED FOR BLOCKS OF SIMILAR DIMENSIONS. TXDOT'S MATERIALS AND TESTS DIVISION MAINTAINS A MATERIAL PRODUCER LIST (MPL) FOR PRODUCERS OF MATERIALS CONFORMING TO DMS-7210. ONLY PRODUCERS ON THE MPL CAN FURNISH COMPOSITE MATERIAL BLOCKS.
15. REFER TO GF(31) STANDARD SHEET & BRIDGE RAILING DETAILS FOR ADDITIONAL DETAILS.
16. THE INSTALLATION OF THE TYPE II CURB IS CRITICAL FOR THE PERFORMANCE OF THE THRIE-BEAM TRANSITION SYSTEM. THE CURB PREVENTS (VEHICLE WHEEL SNAGGING) AT THE CONCRETE RAIL AND IS REQUIRED TO MEET MASH CRASH TEST CRITERIA.
17. IF CURB EXTENDS BEYOND POST 7, 25' OF NESTED W-BEAM GUARDRAIL SHALL BE INSTALLED BEYOND THE PAY LIMITS OF THRIE-BEAM TRANSITION SECTION, (SEE SHT.2). PAYMENT FOR THIS 25' SECTION WILL BE BY LINEAR FOOT, PAY ITEM "0540 6XXX MTL W-BEAM GD FEN (NESTED)(TIM POST)" OR "540 6XXX MTL W-BEAM GD FEN (NESTED)(STEEL POST)" AS APPLICABLE FOR POST TYPE. SEE SHT.2 FOR ADDITIONAL INFORMATION.

THRIE-BEAM TERMINAL - CURB TABLE

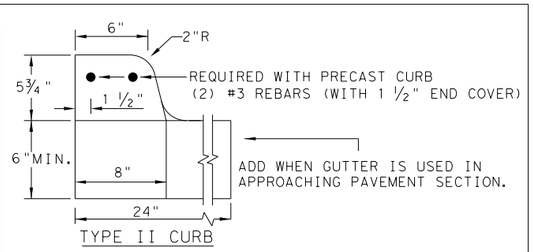
PRECAST CURB FULL LENGTH EQUALS 12'- 2"
THE PRECAST CURB MAY BE FORMED INTO TWO SECTIONS.

CURB (1) LENGTH 5'- 8"
CURB (2) LENGTH 6'- 6"
TAPER CURB (2) TO A HEIGHT OF 4" AT POST 7

CONNECTING PRECAST CURB SECTIONS (1) & (2):
FORM OR CORE 1" DIA. HOLE 9" LONG INTO EACH CURB END.
USE (1) #5 GR.60 REBAR 18" LONG TO CONNECT BOTH CURBS.

SECURING PRECAST OR CAST-IN-PLACE TO FINISHED GRADE *:
FORM OR CORE (4) 1" DIA. HOLES, SEE PLAN AND ELEVATION VIEWS FOR HOLE LOCATIONS. DRIVE (4) #5 GR.60 REBAR STAKES 18" LONG INTO THE GROUND AND 1/2" BELOW TOP OF CURB.
FILL HOLES WITH APPROVED GROUT MIXTURE.

* NOTES: NOT NEEDED FOR CAST-IN-PLACE.
SEE TYPE II CURB DETAIL FOR REBAR AND COVER REQUIREMENTS.
PERCUSSION DRILLING IS NOT PERMITTED WITH:
TYPE II CURB, BRIDGE RAIL OR CONCRETE TRAFFIC RAIL.



TYPE II CURB

NOTE: OPTIONS FOR TYPE II CURB:
1. PRECAST
2. CAST-IN-PLACE

TYPE II CURB DETAILS

HIGH-SPEED TRANSITION

SHEET 1 OF 2

Texas Department of Transportation — Design Division Standard

METAL BEAM GUARD FENCE THRIE-BEAM TRANSITION TL-3 MASH COMPLIANT

GF(31)TR TL3-20

FILE: gf31tr-t1320.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
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REVISIONS	0955	01	027	FM 166
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	BRY	BURLESON		81

DISCLAIMER:
THE USE OF THIS STANDARD IS GOVERNED BY THE "TEXAS ENGINEERING PRACTICE ACT". NO WARRANTY OF ANY KIND IS MADE BY TXDOT FOR ANY PURPOSE WHATSOEVER. TXDOT ASSUMES NO RESPONSIBILITY FOR THE CONVERSION OF THIS STANDARD TO OTHER FORMATS OR FOR INCORRECT RESULTS OR DAMAGES RESULTING FROM ITS USE.

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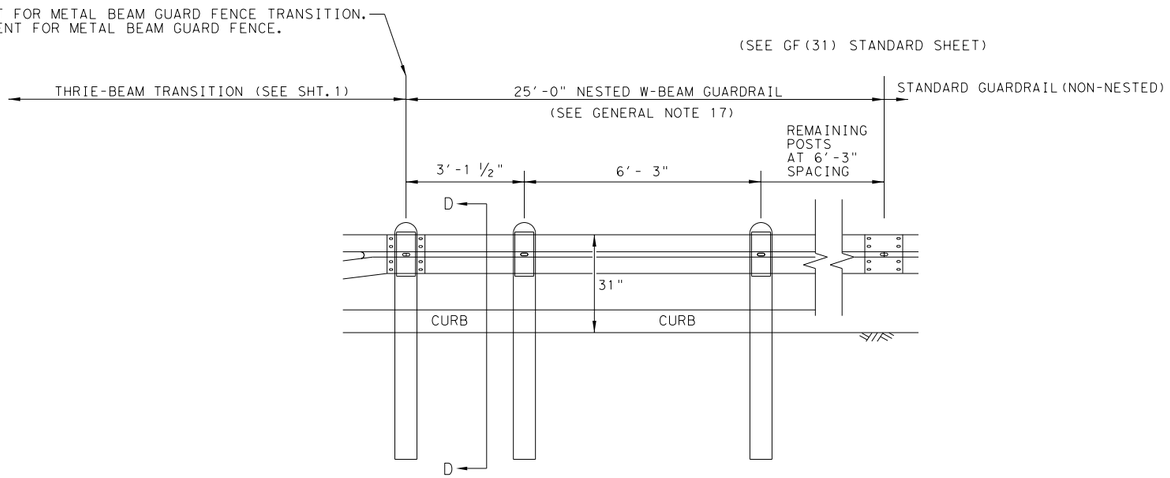
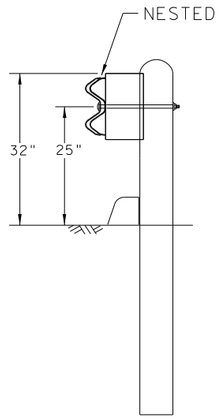
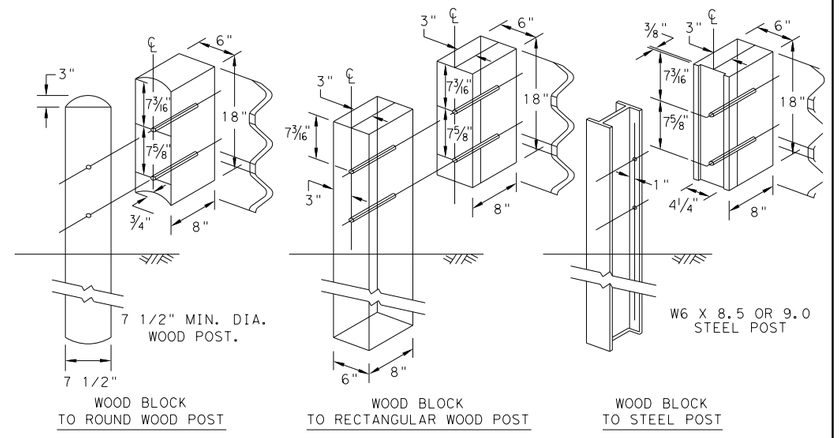
REQUIRED ALTERNATIVE FOR CONTINUOUS CURB EXTENDING PAST POST 7 (SEE SHT. 1 GENERAL NOTE 17)



ELEVATION VIEW



SECTION D-D



THRIE BEAM TRANSITION BLOCKOUT DETAILS

HIGH-SPEED TRANSITION

SHEET 2 OF 2

Texas Department of Transportation | Design Division Standard

METAL BEAM GUARD FENCE THRIE-BEAM TRANSITION TL-3 MASH COMPLIANT

GF(31)TR TL3-20

FILE: gf31trt1320.dgn	DN: TxDOT	CK: KM	DW: KM	CK: CGL/AG
©TxDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0955	01	027	FM 166
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		82

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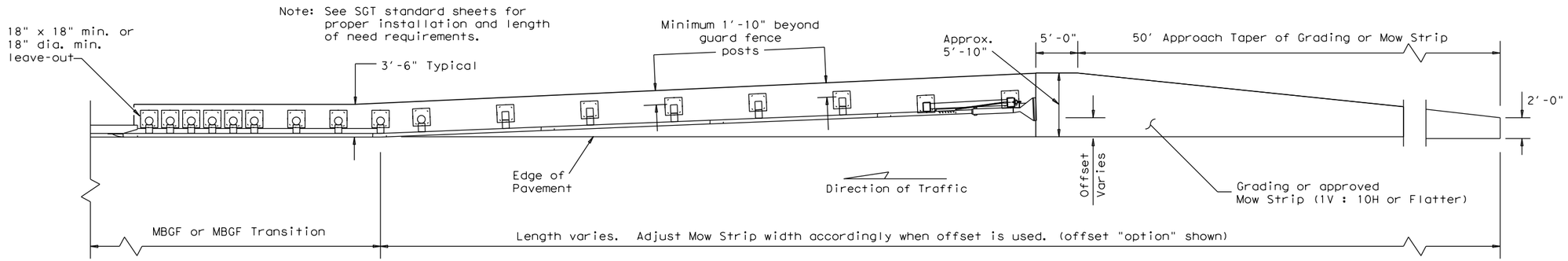
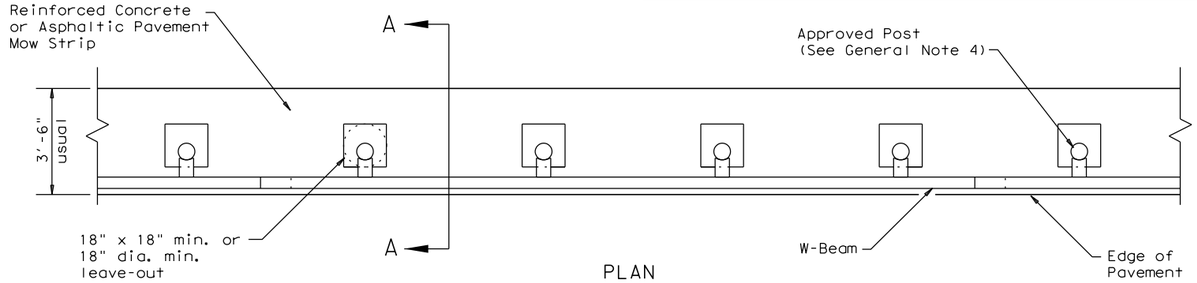
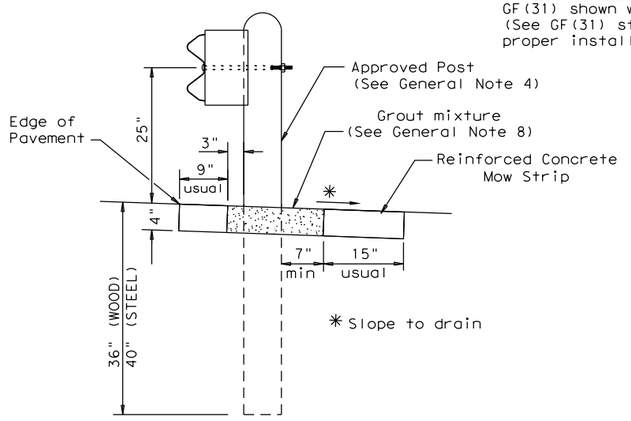


GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS



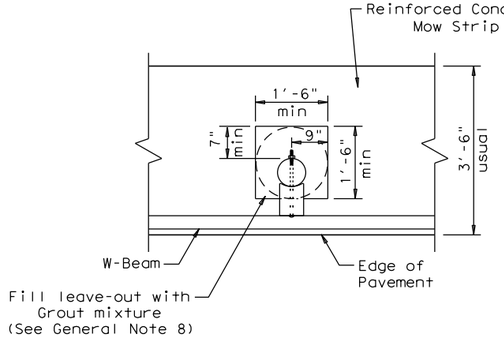
PLAN

GF(31) shown with Mow Strip
(See GF(31) standard sheet for proper installation)



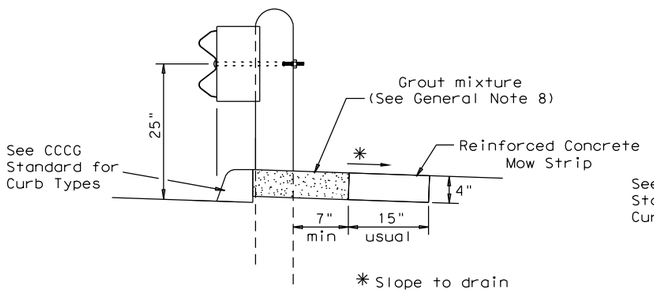
SECTION A-A

Typical



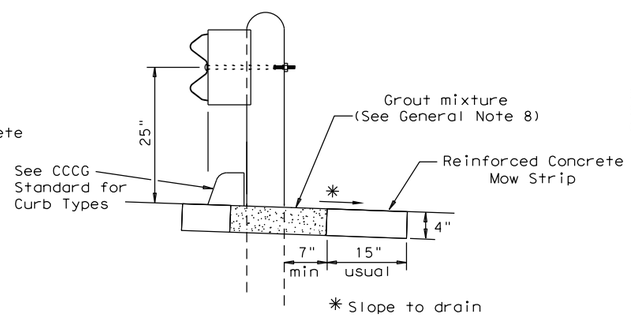
MOW STRIP DETAIL

Reinforced Concrete Mow Strip with 18" x 18" Square or 18" Dia. minimum leave-out.



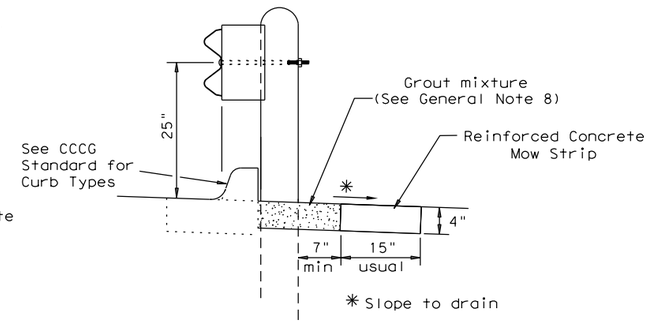
CURB OPTION (1)

This option will increase the post embedment throughout the system.



CURB OPTION (2)

Curb shown on top of mow strip



CURB OPTION (3)

Note: Site Condition(s)

Site conditions may exist where grading is required for the proper installation of metal guard fence and end treatments.

Approach grading or mow strip may be decreased or eliminated, as directed by the Engineer.

GENERAL NOTES

1. This mow strip design is for use with metal beam guard fence, guard fence transitions, and guard fence end treatments. See applicable GF(31) MBGF or GF(31) Transition Standard sheet for additional information.
2. Mow strips shall be reinforced concrete with (wire mesh or synthetic fiber), as shown on the plans and will be paid for under the pertinent bid item. Reinforced concrete shall be placed in accordance with Item 432, "Riprap." The use of the synthetic fiber in lieu of steel reinforcing is acceptable, provided the fiber producer is on the Department Material Producer List (MPL), maintained by TxDOT, Construction Division.
3. The leave-out behind the post shall be a minimum of 7".
4. Only steel (W6 x 8.5 or W6 x 9.0), or 7 ½" Dia. round wood posts are acceptable for use in the mow strip. See GF(31) Standard for additional details.
5. Other curb placement options may be used. Curbs are not considered part of the mow strip and will be paid for under other pertinent bid item.
6. Thickness of the mow strip will be 4".
7. The limits of payment for reinforced concrete will include leave-outs for the posts.
8. The leave-outs shall be filled with a Grout mixture consisting of: 2719 pounds sand, 188 pounds Type 1 or II cement, and 550 pounds of water per cubic yard, with a 28-day compressive strength of approximately 230 psi or less. Provide grout with a consistency that will flow into and completely fill all voids. Due to auger size, larger leave-out dimensions are acceptable from both an impact performance and maintenance repair standpoint (Suggested Maximum leave-out of 20"). Payment for furnishing and placing the grout mixture will be subsidiary to the pay item of riprap mow strip.

Texas Department of Transportation

Design Division Standard

METAL BEAM GUARD FENCE (MOW STRIP) TL-3 MASH COMPLIANT

GF(31)MS-19

FILE: gf31ms19.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
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REVISIONS	0955	01	027	FM 166
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		83

DATE: 3/31/2021
FILE: P:\120196\01\Design\027 FM 166\Civil\Standards\Roadway\sgt10s3116.dgn

NOTE: STEEL I-BEAM POST W6 X 8.5 (6'-0") PN: 533G
STANDARD WOOD BLOCKOUTS (6"X8"X14") PN: 4076B
AT (POSTS 2 THRU 8)

⅝" X 10" HGR BOLT PN: 3500G
⅝" HGR NUT PN: 3340G

LINE AT THE BACK OF POST #2 THRU #8

FROM THE CENTERLINE OF POST(1) & POST(0)

ANCHOR PADDLE PN: 15204A
ANGLE STRUT PN: 15202G
16"

POST(8) POST(7) POST(6) POST(5) POST(4) POST(3) POST(1) POST(0)

DO NOT BOLT ANCHOR RAIL TO - POST (2)
SEE DETAIL 1

PLAN VIEW

MASH TEST LEVEL 3 (TL-3) LENGTH OF SoftStop TERMINAL (50'-9 ½")
BEGIN LENGTH OF NEED

TRAFFIC FLOW

50'-9 ½" STANDARD INSTALLATION LENGTH (MASH TL-3 SoftStop)

BEGIN STANDARD MBGF
END PAYMENT FOR SGT

6¼" 3'-1 ½" 6'-3" 6'-3"
ANCHOR RAIL WITH SLOTS - (THREADED THRU HEAD)
SEE SoftStop MANUAL FOR COMPLETE DETAILS

MIDDLE SLOT CUTOUT (1) 1 ¾" X 6'-10 ¼"
OUTSIDE SLOTS CUTOUT (2)½" X 6'-9 ⅝"

SoftStop FACE SEE GN(3) & NOTE: B

MBGF LAPPED IN DIRECTION OF TRAFFIC FLOW

25'-0" DOWNSTREAM W-BEAM GUARDRAIL PN: 61G
SoftStop ANCHOR RAIL (12GA) PN: 15215G

3'-1 ½"(+/-) 6'-3" 6'-3" 6'-3" 6'-3" 6'-3" 6'-3" 5'-8" 4'-7"

ANCHOR PADDLE PN: 15204A
END OF ANCHOR RAIL PN: 15215G

SEE NOTE: C

POST 32" HEIGHT
31" RAIL HEIGHT
POST 40" DEPTH (TYP 1-8)

RAIL 25'-0" PN: 61G
RAIL 25'-0" PN: 15215G

DO NOT BOLT ANCHOR RAIL TO POST(2)
SEE DETAIL 2

SEE NOTE: A

(8) ⅝"x 1- ¼" GR BOLTS PN: 3360G
⅝" HEX NUTS PN: 3340G

(8) ⅝"x 1- ¼" HGR BOLTS PN: 3360G
⅝" HEX NUTS PN: 3340G

13/16" DIA. YIELDING HOLES

SEE DETAIL 3

6'-1⅜"

POST(8) POST(7) POST(6) POST(5) POST(4) POST(3) POST(2) 6'-0" (SYTP) PN: 15000G POST(1) 4'-9 ½" SYTP PN: 15203G POST(0) 6'-5 ⅜" PN: 15205A

ELEVATION VIEW

HARDWARE FOR POST(2) THRU POST(8)
(1) ⅝"x 10" HGR BOLT PN: 3500G
(1) ⅝" HGR HEX NUT PN: 3340G

NOTE: DO NOT BOLT ANCHOR RAIL PANEL TO POST(2)

(1) ⅝" x 1 ¾" HEX HD BOLT PN 3391G
ANGLE STRUT PN: 15202G
(2) ⅝" WASHERS PN 4372G
(1) ⅝" HGR HEX NUT PN 3340G

DETAIL 1
SHOWN AT POST(1) NEAR GROUND

(1) ⅝" HEX NUT
(1) ⅝" x 1- ½" HEX HD BOLT-GR-5 PN: 105286
(2) ⅝" ROUND WASHERS PN: 3240G

DETAIL 2
SHOWN AT POST(1)

ANCHOR KEEPER PLATE (24 GA) PN: 15207G
ANCHOR PLATE WASHER ½" THICK PN: 15206G
1" ROUND WASHER F463 PN: 4902G
(2) ⅝" x 2 ½" HEX HD BOLT GR-5 PN: 105285G
(2) ⅝" ROUND WASHER (WIDE) PN: 3240G
1" NUT PN: 3908G SHALL BE SECURELY TIGHTENED AFTER FINAL ASSEMBLY, BUT NOT DEFORMING THE KEEPER PLATE.

ALTERNATE BLOCKOUT SEE GENERAL NOTE: 6

ANCHOR PADDLE PN: 15204A
(2) ⅝" HEX NUT A563 GR.DH PN: 3245G
W-BEAM FLATTENED (4 PLIES)
ANGLE STRUT PN: 15202G
SEE NOTE: A
(2) ¾" x 2 ½" HEX BOLT (TYP) PN: 3717G
(4) ¾" FLAT WASHER (TYP) PN: 3701G
(2) ¾" HEX NUT (TYP) PN: 3704G
(2) ANCHOR POST ANGLE PN: 15201G
6'-1 ⅜" POST DEPTH

DETAIL 3
AT POST(0)
6'-5 ⅜" (W6 X 15) I-BEAM POST PN: 15205A

TRAFFIC FLOW

ALTERNATE BLOCKOUT SEE GENERAL NOTE: 6
4" X 7 ½" X 14" BLOCKOUT COMPOSITE PN: 6777B

6" X 8" X 14" BLOCKOUT WOOD PN: 4076B
NOTE: DO NOT BOLT ANCHOR RAIL TO POST(2)
8" 6" 14"
⅝" HGR NUT PN: 3340G
⅝" X 10" HGR POST BOLT PN: 3500G
13/16" DIAMETER YIELDING HOLES LOCATED IN FLANGES
FINISHED GRADE
(HOLES APROXIMATELY CENTERED AT FINISHED GRADE)

ISOMETRIC VIEW
POST(1 & 2)
W6 X 8.5 I-BEAM POST SHOWING STANDARD WOOD BLOCKOUT

NOTE: NO BLOCKOUT INSTALLED AT POST(1)

W-BEAM RAIL 25'-0"
6" X 8" X 14" BLOCKOUT WOOD
⅝" X 10" HGR POST BOLT PN: 3500G
⅝" HGR NUT PN: 3340G
POST HEIGHT 32"
31" RAIL HEIGHT
40"
FINISHED GRADE
LINE POST (3, 4, 5, 6, 7 & 8)

SECTION VIEW B-B
6'-0" (W6 X 8.5)
I-BEAM POST PN: 533G

6" X 8" X 14" BLOCKOUT WOOD
W-BEAM RAIL 25'-0"
⅝" X 10" HGR POST BOLT PN: 3500G
⅝" HGR NUT PN: 3340G
POST 32" HEIGHT
31" RAIL HEIGHT
40"
FINISHED GRADE
POST(2)

SECTION VIEW A-A
6'-0" (W6 X 8.5)
(SYTP) I-BEAM POST PN: 15000G

NOTE: DO NOT BOLT ANCHOR RAIL PANEL TO POST(2)

POST 17"- ½" HEIGHT
4'- 9 ½"
13/16" DIA. YIELDING HOLES
40"
POST(1)

FRONT VIEW POST(1)
4'-9 ½" (W6 X 8.5)
(SYTP) I-BEAM POST PN: 15203G

NOTE: NO BLOCKOUT INSTALLED AT POST(1)

APPROX 5'-10"
STANDARD MBGF
5'-0"
50' APPROACH GRADING
2'-0"
EDGE OF PAVEMENT
NOTE: ADJUST WIDTH ACCORDINGLY WHEN OFFSET IS USED. (OFFSET "OPTION" SHOWN)
2'-0" MAX. RAIL OFFSET
APPROACH GRADING (1V:10H OR FLATTER) SEE PRODUCT ASSEMBLY MANUAL FOR ADDITIONAL GUIDANCE.

APPROACH GRADING AT GUARDRAIL END TREATMENTS

NOTE:
THIS STANDARD IS A BASIC REPRESENTATION OF THE SoftStop END TERMINAL, IT IS NOT INTENDED TO REPLACE THE PRODUCT DESCRIPTION ASSEMBLY MANUAL.

GENERAL NOTES

1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: TRINITY HIGHWAY AT 1(888)323-6374. 2525 N. STEMMONS FREEWAY, DALLAS, TX 75207
2. FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE; SoftStop END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY MANUAL. PN: 620237B
3. APPLY HIGH INTENSITY REFLECTIVE SHEETING, "OBJECT MARKER" ON THE FRONT FACE OF THE DEVICE PER MANUFACTURER'S RECOMMENDATIONS. OBJECT MARKER SHALL CONFORM TO THE STANDARDS REQUIRED IN TEXAS MUTCD.
4. FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TXDOT'S LATEST ROADWAY MOW STRIP STANDARD.
5. HARDWARE (BOLTS, NUTS, & WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
6. A COMPOSITE MATERIAL BLOCKOUT THAT MEETS THE REQUIREMENTS OF DMS-7210, MAY BE SUBSTITUTED FOR BLOCKOUTS OF SIMILAR DIMENSIONS. SEE CONSTRUCTION DIVISION MATERIAL PRODUCER LIST (MPL) FOR CERTIFIED PRODUCERS.
7. IF SOLID ROCK IS ENCOUNTERED SEE THE MANUFACTURER'S INSTALLATION MANUAL AND REFER TO THE LATEST ROADWAY MBGF STANDARD FOR INSTALLATION GUIDANCE.
8. POSTS SHALL NOT BE SET IN CONCRETE.
9. IT IS ACCEPTABLE TO INSTALL THE SoftStop IMPACT HEAD PARALLEL TO THE GRADE LINE OR WITH AN UPWARD TILT.
10. DO NOT ATTACH THE SoftStop SYSTEM DIRECTLY TO A RIGID BARRIER.
11. UNDER NO CIRCUMSTANCES SHALL THE GUARDRAIL WITHIN THE SoftStop SYSTEM BE CURVED.
12. A FLARE RATE OF UP TO 25:1 MAY BE USED TO PREVENT THE TERMINAL HEAD FROM ENCROACHING ON THE SHOULDER. THE FLARE MAY BE DECREASED OR ELIMINATED FOR SPECIFIC INSTALLATIONS, IF DIRECTED BY THE ENGINEER.

NOTE: A	THE INSTALLATION HEIGHT OF FULLY ASSEMBLED ANCHOR POST WILL VARY FROM 3-¾" MIN. TO 4" MAX. ABOVE FINISHED GRADE.
NOTE: B	PART PN: 5852B RIGHT-SIDE (HIGH INTENSITY REFLECTIVE SHEETING) PART PN: 5851B LEFT-SIDE (HIGH INTENSITY REFLECTIVE SHEETING)
NOTE: C	W-BEAM SPLICE LOCATED BETWEEN LINE POST(4) AND LINE POST(5) GUARDRAIL PANEL 25'-0" PN: 61G ANCHOR RAIL 25'-0" PN: 15215G LAP GUARDRAIL IN DIRECTION OF TRAFFIC FLOW.

PART	QTY	MAIN SYSTEM COMPONENTS
620237B	1	PRODUCT DESCRIPTION ASSEMBLY MANUAL (LATEST REV.)
15208A	1	SoftStop HEAD (SEE MANUAL FOR RIGHT-LEFT APPROACH)
15215G	1	SoftStop ANCHOR RAIL (12GA) WITH CUTOUT SLOTS
61G	1	SoftStop DOWNSTREAM W-BEAM RAIL (12GA) (25'- 0")
15205A	1	POST #0 - ANCHOR POST (6'- 5 ⅞")
15203G	1	POST #1 - (SYTP) (4'- 9 ½")
15000G	1	POST #2 - (SYTP) (6'- 0")
533G	6	POST #3 THRU #8 - I-BEAM (W6 x 8.5) (6'- 0")
4076B	7	BLOCKOUT - WOOD (ROUTED) (6" x 8" x 14")
6777B	7	BLOCKOUT - COMPOSITE (4" x 7 ½" x 14")
15204A	1	ANCHOR PADDLE
15207G	1	ANCHOR KEEPER PLATE (24 GA)
15206G	1	ANCHOR PLATE WASHER (½" THICK)
15201G	2	ANCHOR POST ANGLE (10" LONG)
15202G	1	ANGLE STRUT
		HARDWARE
4902G	1	1" ROUND WASHER F436
3908G	1	1" HEAVY HEX NUT A563 GR.DH
3717G	2	¾" x 2 ½" HEX BOLT A325
3701G	4	¾" ROUND WASHER F436
3704G	2	¾" HEAVY HEX NUT A563 GR.DH
3360G	16	⅝" x 1 ¼" W-BEAM RAIL SPLICE BOLTS HGR
3340G	25	⅝" W-BEAM RAIL SPLICE NUTS HGR
3500G	7	⅝" x 10" HGR POST BOLT A307
3391G	1	⅝" x 1 ¾" HEX HD BOLT A325
4489G	1	⅝" x 9" HEX HD BOLT A325
4372G	4	⅝" WASHER F436
105285G	2	⅝" x 2 ½" HEX HD BOLT GR-5
105286G	1	⅝" x 1 ½" HEX HD BOLT GR-5
3240G	6	⅝" ROUND WASHER (WIDE)
3245G	3	⅝" HEX NUT A563 GR.DH
5852B	1	HIGH INTENSITY REFLECTIVE SHEETING - SEE NOTE: B

Texas Department of Transportation

Design Division Standard

TRINITY HIGHWAY
SOFTSTOP END TERMINAL
MASH - TL-3
SGT(10S)31-16

FILE: sgt10s3116	DN: TxDOT	CK: KM	DW: VP	CK: MB/VP
©TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0955	01	027	FM 166
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		84

DATE: 3/31/2021
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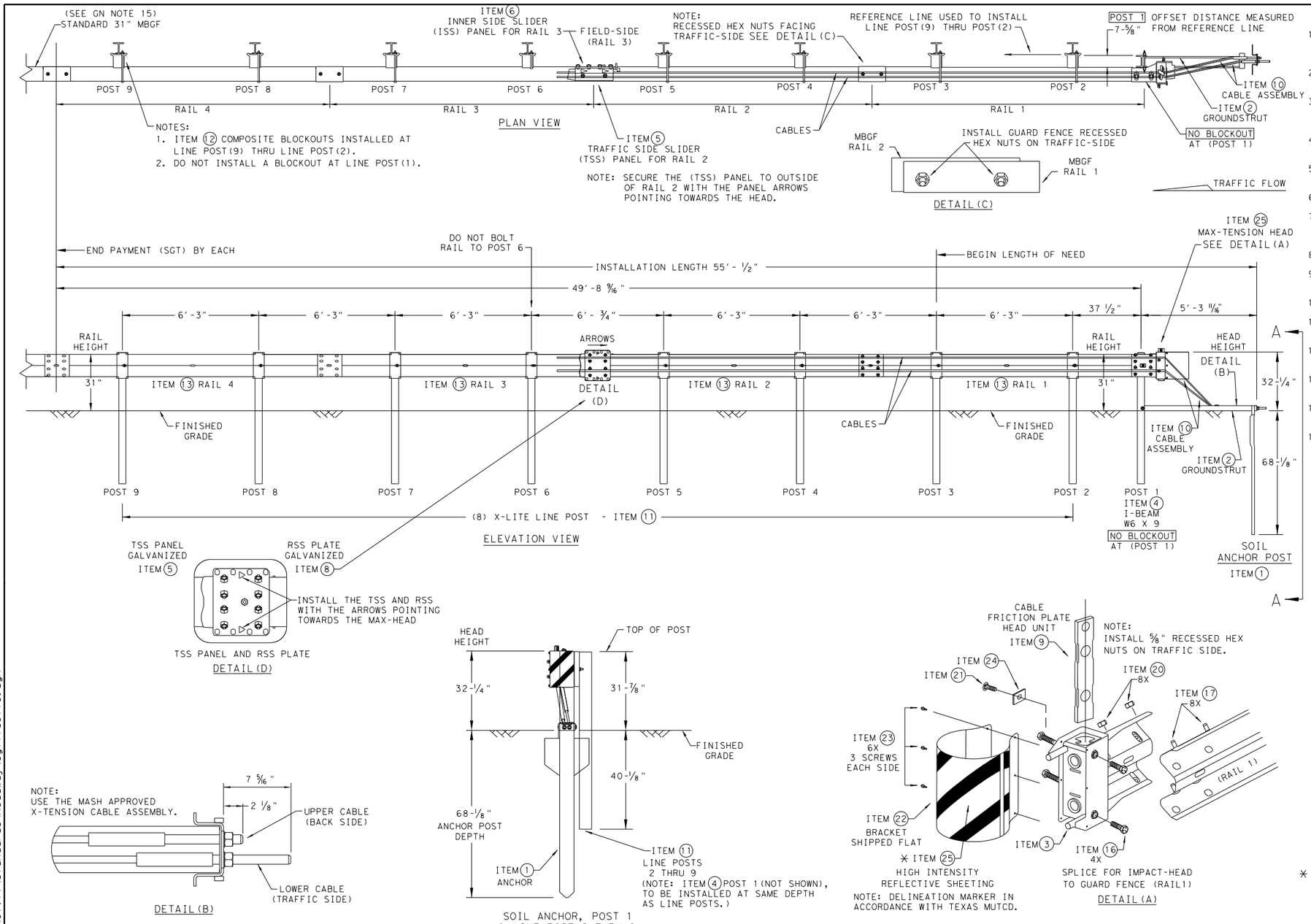
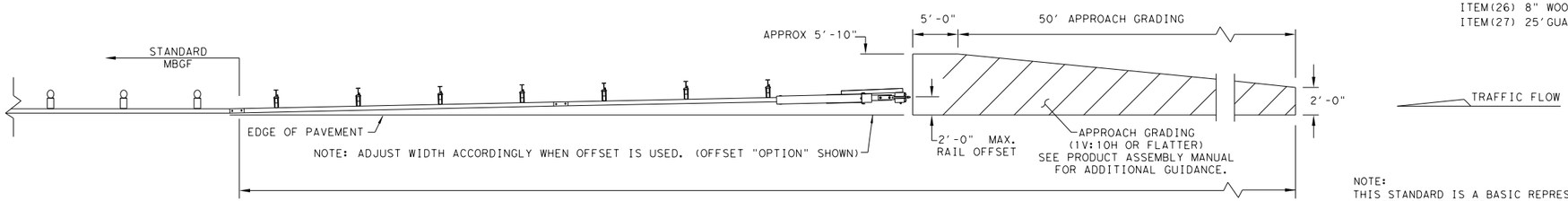


TSS PANEL AND RSS PLATE
DETAIL (D)

DETAIL (B)

SOIL ANCHOR, POST 1 & LINE POST 2 THRU 9
SECTION VIEW A-A

DETAIL (A)



NOTE: TXDOT GENERIC APPROACH GRADING LAYOUT USED FOR ALL TANGENT TYPE END TREATMENTS.

APPROACH GRADING AT GUARDRAIL END TREATMENTS

TRAFFIC FLOW

* TO BE PROVIDED BY DISTRIBUTOR OR CONTRACTOR.

** ALTERNATIVE ITEMS NOT SHOWN.
ITEM(26) 8" WOOD-BLOCKOUTS
ITEM(27) 25'GUARD FENCE PANELS

NOTE:
THIS STANDARD IS A BASIC REPRESENTATION OF THE MAX-TENSION END TERMINAL, IT IS NOT INTENDED TO REPLACE THE PRODUCT DESCRIPTION ASSEMBLY MANUAL.

GENERAL NOTES

1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: LINDSAY TRANSPORTATION SOLUTIONS (LTS) - BARRIER SYSTEMS, INC. AT (707) 374-6800
2. FOR INSTALLATION, REPAIR, & MAINTENANCE REFER TO THE; MAX-TENSION INSTALLATION INSTRUCTION MANUAL. P/N MANMAX REV D (ECN 3516).
3. APPLY HIGH INTENSITY REFLECTIVE SHEETING, "OBJECT MARKER" ON THE FRONT FACE OF THE DEVICE PER MANUFACTURE'S RECOMMENDATIONS. OBJECT MARKER SHALL CONFORM TO THE STANDARDS REQUIRED IN TEXAS MUTCD.
4. FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TXDOT'S LATEST ROADWAY MOW STRIP STANDARD.
5. ALL STEEL COMPONENTS ARE GALVANIZED PER ASTM A123 OR EQUIVALENT UNLESS OTHERWISE STATED.
6. SYSTEM SHOWN USING STEEL WIDE FLANGE POST WITH COMPOSITE BLOCKOUTS.
7. COMPOSITE MATERIAL BLOCKOUT THAT MEETS THE REQUIREMENTS OF DMS-7210, MAY BE SUBSTITUTED FOR BLOCKOUTS SIMILAR DIMENSIONS. SEE CONSTRUCTION DIVISION MATERIAL PRODUCER LIST(MPL)FOR CERTIFIED PRODUCERS.
8. REFER TO INSTALLATION MANUAL FOR SPECIFIC PANEL LAPPING GUIDANCE.
9. IF SOLID ROCK IS ENCOUNTERED SEE THE MANUFACTURER'S INSTALLATION MANUAL FOR INSTALLATION GUIDANCE.
10. POSTS SHALL NOT BE SET IN CONCRETE.
11. A DRIVING CAP WITH A TIMBER OR PLASTIC INSERT SHALL BE USED WHEN DRIVING POST TO PREVENT DAMAGE TO THE GALVANIZING ON TOP OF THE POST.
12. MAX-TENSION SYSTEM SHALL NEVER BE INSTALLED WITHIN A CURVED SECTION OF GUARDRAIL.
13. IF A DELINEATION MARKER IS REQUIRED, MARKER SHALL BE IN ACCORDANCE WITH TEXAS MUTCD.
14. THE SYSTEM IS SHOWN WITH 12'-6" MBGF PANELS, 25'-0" MBGF PANELS ARE ALSO ALLOWED.
15. A MINIMUM OF 12'-6" OF 12GA. MBGF IS REQUIRED IMMEDIATELY DOWNSTREAM OF THE MAX-TENSION SYSTEM.

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	BSI-1610060-00	SOIL ANCHOR - GALVANIZED	1
2	BSI-1610061-00	GROUND STRUT - GALVANIZED	1
3	BSI-1610062-00	MAX-TENSION IMPACT HEAD	1
4	BSI-1610063-00	W6x9 I-BEAM POST 6FT.-GALVANIZED	1
5	BSI-1610064-00	TSS PANEL - TRAFFIC SIDE SLIDER	1
6	BSI-1610065-00	ISS PANEL - INNER SIDE SLIDER	1
7	BSI-1610066-00	TOOTH - GEOMET	1
8	BSI-1610067-00	RSS PLATE - REAR SIDE SLIDER	1
9	B061058	CABLE FRICTION PLATE - HEAD UNIT	1
10	BSI-1610069-00	CABLE ASSEMBLY - MASH X-TENSION	2
11	BSI-1012078-00	X-LITE LINE POST-GALVANIZED	8
12	B090534	8" W-BEAM COMPOSITE-BLOCKOUT XT110	8
13	BSI-4004386	12'-6" W-BEAM GUARD FENCE PANELS 12GA.	4
14	BSI-1102027-00	X-LITE SQUARE WASHER	1
15	BSI-2001886	5/8" X 7" THREAD BOLT HH (GR.5)GEOMET	1
16	BSI-2001885	3/4" X 3" ALL-THREAD BOLT HH (GR.5)GEOMET	4
17	4001115	5/8" X 1 1/4" GUARD FENCE BOLTS (GR.2)MGAL	48
18	2001840	5/8" X 10" GUARD FENCE BOLTS MGAL	8
19	2001636	5/8" WASHER F436 STRUCTURAL MGAL	2
20	4001116	5/8" RECESSED GUARD FENCE NUT (GR.2)MGAL	59
21	BSI-2001888	5/8" X 2" ALL THREAD BOLT (GR.5)GEOMET	1
22	BSI-1701063-00	DELINEATION MOUNTING (BRACKET)	1
23	BSI-2001887	1/4" X 3/4" SCREW SD HH 410SS	7
24	4002051	GUARDRAIL WASHER RECT AASHTO FWR03	1
* 25	SEE NOTE BELOW	HIGH INTENSITY REFLECTIVE SHEETING	1
** 26	4002337	8" W-BEAM TIMBER-BLOCKOUT, PDB01B	8
** 27	BSI-4004431	25' W-BEAM GUARDRAIL PANEL,8-SPACE,12GA.	2
28	MANMAX Rev-(D)	MAX-TENSION INSTALLATION INSTRUCTIONS	1

Texas Department of Transportation

Design Division Standard

MAX-TENSION END TERMINAL
MASH - TL-3
SGT(11S)31-18

FILE: sgt11s3118.dgn	DN: TxDOT	CK: KM	DW: TxDOT	CK: CL
© TxDOT: FEBRUARY 2018	CONT	SECT	JOB	HIGHWAY
REVISIONS	0955	01	027	FM 166
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		85

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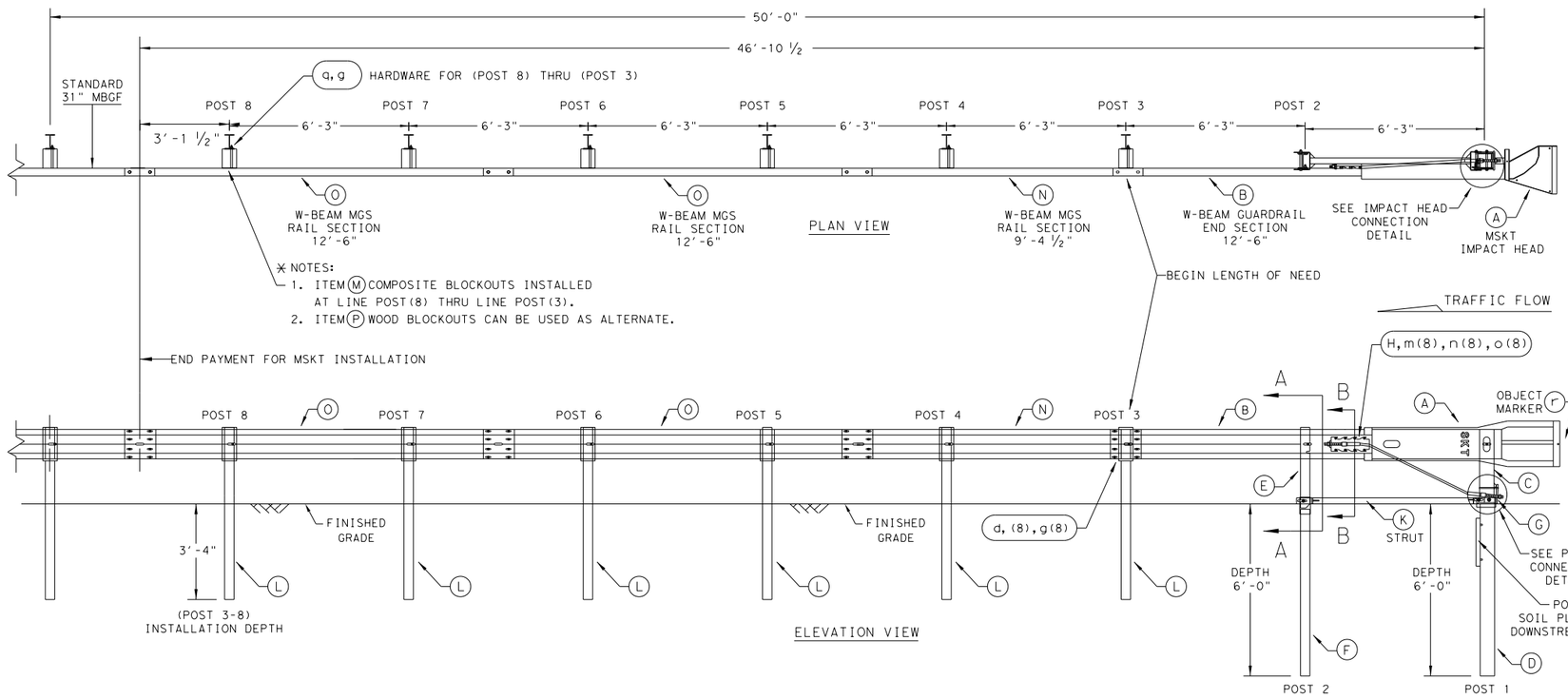


NOTE: SEE (GENERAL NOTE 14) FOR DRIVING CAP INFORMATION.

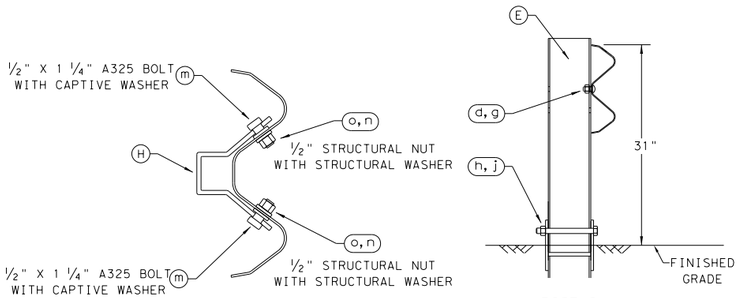
GENERAL NOTES

1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: ROAD SYSTEMS, INC. (432)263-2435. 3616 OLD HOWARD COUNTY AIRPORT, BIG SPRING, TX 79720
2. FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE; MSKT END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY MANUAL (PUBLICATION~062717).
3. APPLY HIGH INTENSITY REFLECTIVE SHEETING, "OBJECT MARKER" ON THE FRONT FACE OF THE DEVICE PER MANUFACTURER'S RECOMMENDATIONS. OBJECT MARKER SHALL CONFORM TO THE STANDARDS REQUIRED IN TEXAS MUTCD.
4. FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TXDOT'S LATEST ROADWAY MOW STRIP STANDARD.
5. HARDWARE (BOLTS, NUTS, & WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
6. SYSTEM SHOWN USING STEEL WIDE FLANGE POSTS WITH COMPOSITE BLOCKOUTS.
7. A COMPOSITE MATERIAL BLOCKOUTS THAT MEETS THE REQUIREMENTS OF DMS-7210, MAY BE SUBSTITUTED FOR BLOCKOUTS OF SIMILAR DIMENSIONS. SEE CONSTRUCTION DIVISION MATERIAL PRODUCER LIST (MPL) FOR CERTIFIED PRODUCERS.
8. IF SOLID ROCK IS ENCOUNTERED IN THE AREA OF (POST 1) AND / OR (POST 2) CONTACT THE MANUFACTURER, & REFER TO THE LATEST ROADWAY MBGF STANDARD FOR INSTALLATION GUIDANCE.
9. POSTS SHALL NOT BE SET IN CONCRETE.
10. SYSTEM MUST BE ATTACHED TO STANDARD 31" MBGF.
11. UNDER NO CIRCUMSTANCES SHALL THE GUARDRAIL WITHIN THE MSKT SYSTEM BE CURVED.
12. A FLARE RATE OF UP TO 25:1 MAY BE USED TO PREVENT THE TERMINAL HEAD FROM ENCROACHING ON THE SHOULDER. THE FLARE MAY BE DECREASED OR ELIMINATED FOR SPECIFIC INSTALLATIONS, IF DIRECTED BY THE ENGINEER.
13. THE SYSTEM IS SHOWN WITH TWO 12'-6" MBGF PANELS, ONE 25'-0" MBGF PANEL IS ALSO ALLOWED IN THEIR PLACE.
14. A DRIVING CAP WITH A TIMBER OR PLASTIC INSERT SHALL BE USED WHEN DRIVING POSTS 3-8 TO PREVENT DAMAGE TO THE GALVANIZING ON TOP OF THE POST. SPECIAL DRIVING CAP TO BE USED ON LOWER POSTS 1 & 2 TO PREVENT DAMAGE TO THE WELDED PLATES.

ITEM	QTY	MAIN SYSTEM COMPONENTS	ITEM NUMBERS
A	1	MSKT IMPACT HEAD	MS3000
B	1	W-BEAM GUARDRAIL END SECTION, 12 Ga.	SF1303
C	1	POST 1 - TOP (6" X 6" X 1/8" TUBE)	MTPHP1A
D	1	POST 1 - BOTTOM (6' W6X15)	MTPHP1B
E	1	POST 2 - ASSEMBLY TOP	UHP2A
F	1	POST 2 - ASSEMBLY BOTTOM (6' W6X9)	HP2B
G	1	BEARING PLATE	E750
H	1	CABLE ANCHOR BOX	S760
J	1	BCT CABLE ANCHOR ASSEMBLY	E770
K	1	GROUND STRUT	MS785
L	6	W6x9 OR W6x8.5 STEEL POST	P621
M	6	COMPOSITE BLOCKOUTS	CBSP-14
N	1	W-BEAM MGS RAIL SECTION (9'-4 1/2")	G12025
O	2	W-BEAM MGS RAIL SECTION (12'-6")	G1203A
P	6	WOOD BLOCKOUT 6" X 8" X 14"	P675
Q	1	W-BEAM MGS RAIL SECTION (25'-0")	G1209
		SMALL HARDWARE	
a	2	5/8" x 1" HEX BOLT (GRD 5)	B5160104A
b	4	5/8" WASHER	W0516
c	2	5/8" HEX NUT	N0516
d	25	5/8" Dia. x 1 1/4" SPLICE BOLT (POST 2)	B580122
e	2	5/8" Dia. x 9" HEX BOLT (GRD A449)	B580904A
f	3	5/8" WASHER	W050
g	33	5/8" Dia. H.G.R NUT	N050
h	1	3/4" Dia. x 8 1/2" HEX BOLT (GRD A449)	B340854A
j	1	3/4" Dia. HEX NUT	N030
k	2	1 ANCHOR CABLE HEX NUT	N100
l	2	1 ANCHOR CABLE WASHER	W100
m	8	1/2" x 1 1/4" A325 BOLT WITH CAPTIVE WASHER	SB12A
n	8	1/2" STRUCTURAL NUTS	N012A
o	8	1 1/16" O.D. x 9/16" I.D. STRUCTURAL WASHERS	W012A
p	1	BEARING PLATE RETAINER TIE	CT-100ST
q	6	5/8" x 10" H.G.R. BOLT	B581002
r	1	OBJECT MARKER 18" X 18"	E3151

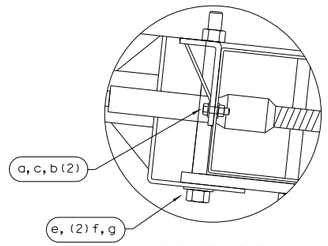
SEE NOTES: ✳

ALTERNATIVE ITEMS NOT SHOWN. ✳✳
✳ ITEM(P) 8" WOOD-BLOCKOUT
✳✳ ITEM(Q) 25'GUARD FENCE PANEL



SECTION B-B
ANCHOR BRACKET

POST 2
SECTION A-A



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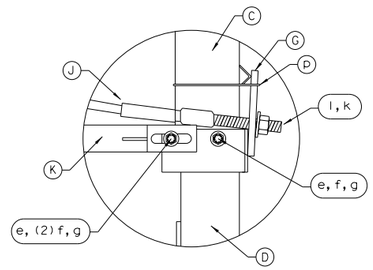
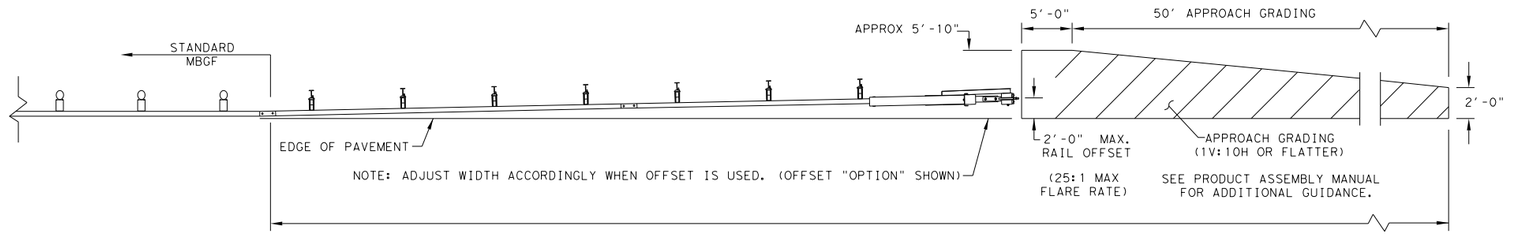
CONNECTION DETAIL



POST 1
CONNECTION DETAIL



APPROACH GRADING AT GUARDRAIL END TREATMENTS

TRAFFIC FLOW

NOTE: TXDOT GENERIC APPROACH GRADING LAYOUT USED FOR ALL TANGENT TYPE END TREATMENTS.

NOTE: THIS STANDARD IS A BASIC REPRESENTATION OF THE MSKT END TERMINAL, IT IS NOT INTENDED TO REPLACE THE PRODUCT DESCRIPTION ASSEMBLY MANUAL.

Texas Department of Transportation

Design Division Standard

SINGLE GUARDRAIL TERMINAL

MSKT-MASH-TL-3

SGT(12S)31-18

FILE: sgt12s3118.dgn	DN:TxDOT	CK:KM	DW:VP	CK:CL	
© TxDOT: APRIL 2018	CONT	SECT	JOB	HIGHWAY	
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	DIST	COUNTY		SHEET NO.	
	BRY	BURLESON		86	

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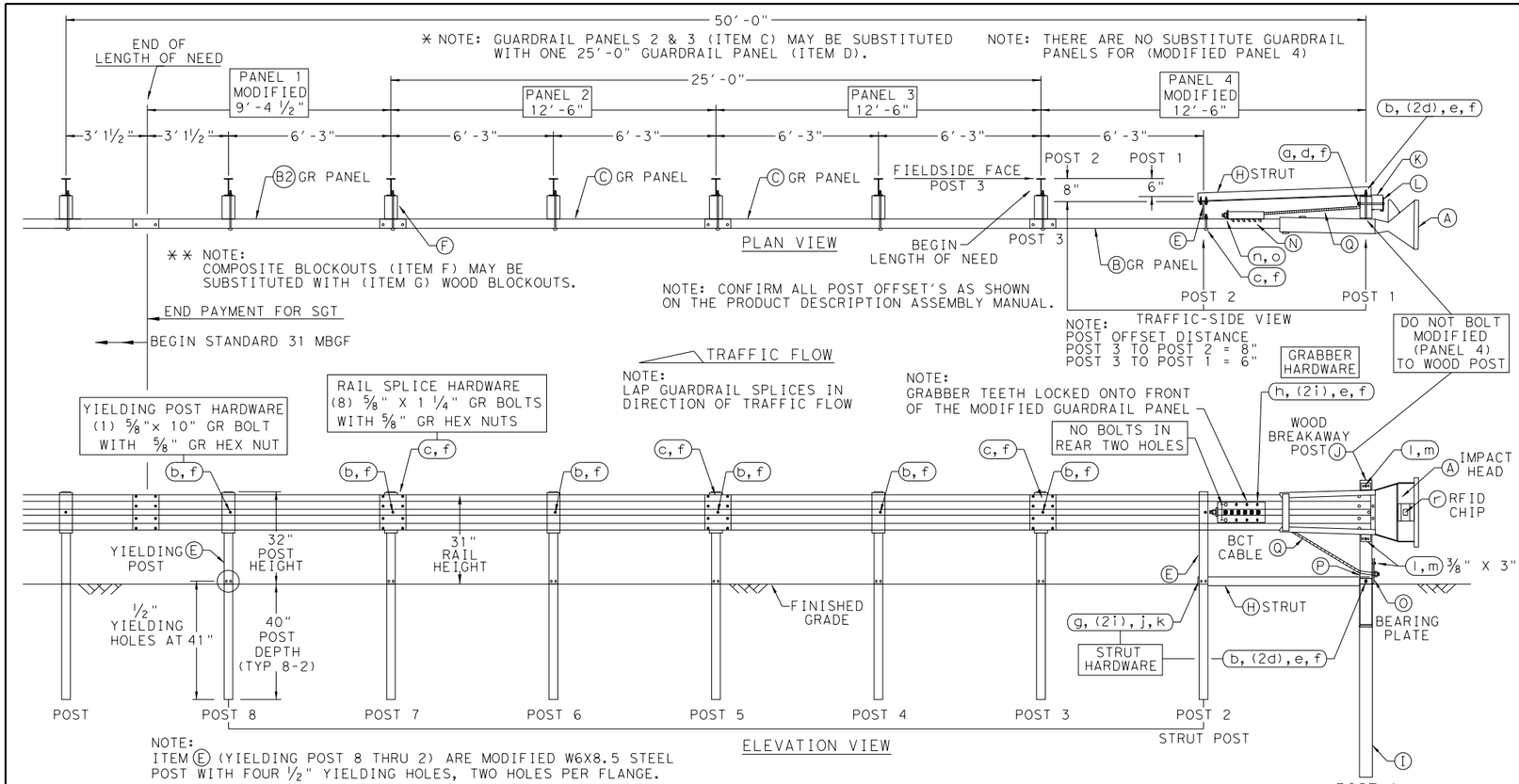
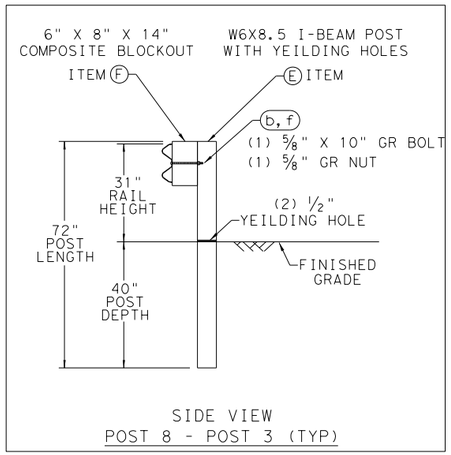


GENERAL NOTES

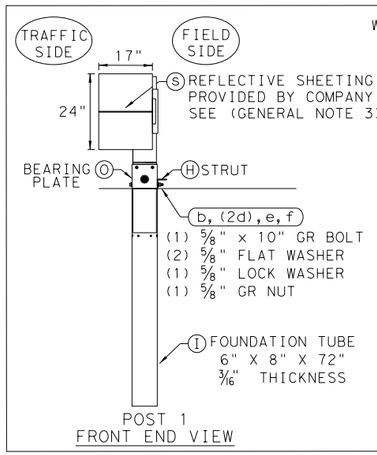
1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: SPIG INDUSTRY, INC. AT 1(267) 644-9510. 14675 INDUSTRIAL PARK RD; BRISTOL, VA 24202
2. FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE MANUFACTURER'S; SGET END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY MANUAL.
3. MANUFACTURER WILL APPLY HIGH INTENSITY REFLECTIVE SHEETING, "OBJECT MARKER" TO THE FACE PLATE OF THE DEVICE PER MANUFACTURER'S RECOMMENDATIONS. THE OBJECT MARKER SHALL CONFORM TO THE STANDARDS REQUIRED IN TEXAS MUTCD.
4. THE NOMINAL HEIGHT OF THE GUARDRAIL BEAM IS 31 INCHES WITH A TOLERANCE OF +/- ONE INCH.
5. FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TXDOT'S LATEST ROADWAY MOW STRIP STANDARD.
6. (POST 2 THROUGH POST 8) ARE MODIFIED STEEL-YIELDING POSTS WITH YIELDING HOLES AT GROUND LEVEL. THERE ARE NO SUBSTITUTE POSTS.
7. POSTS SHALL NOT BE SET IN CONCRETE.
8. IF SOLID ROCK IS ENCOUNTERED FOR ANY OF THE POSTS IN THE SYSTEM, CONTACT THE MANUFACTURER FOR SPECIFIC INSTALLATION GUIDANCE.
9. HARDWARE (BOLTS, NUTS, & WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445,"GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
10. A COMPOSITE MATERIAL BLOCKOUT THAT MEETS DMS-7210 REQUIREMENTS MAY BE SUBSTITUTED FOR AN APPROVED WOOD BLOCKOUT. SEE CONSTRUCTION DIVISION MATERIAL PRODUCER LIST (MPL) FOR CERTIFIED PRODUCERS.
11. THE ENTIRE SYSTEM MUST BE INSTALLED IN A STRAIGHT LINE WITHOUT ANY CURVE. HOWEVER, THE SYSTEM CAN BE OFFSET BY TWO FEET AS SHOWN ON THE APPROACH GRADING DETAIL TO HELP OFF-SET THE IMPACT HEAD FROM SHOULDER OF THE ROAD.

ITEM	QTY	MAIN SYSTEM COMPONENTS	ITEM #
A	1	SGET IMPACT HEAD	SIH1A
B	1	MODIFIED GUARDRAIL PANEL 12'-6" 12GA	126SPZGP
B2	1	MODIFIED GUARDRAIL PANEL 9'-4 1/2" 12GA	GP94
C	2	STANDARD GUARDRAIL PANEL 12'-6" 12GA	GP126
D	1	STANDARD GUARDRAIL PANEL 25'-0" 12GA	GP25
E	7	MODIFIED YIELDING I-BEAM POST W6x8.5	YP6MOD
F	6	COMPOSITE BLOCKOUT 6" X 8" X 14"	CBO8
G	6	WOOD BLOCKOUT 6" X 8" X 14"	WBO8
H	1	STRUT 3" X 3" X 80" x 1/4" A36 ANGLE	STR80
I	1	FOUNDATION TUBE 6" X 8" X 72" x 3/16"	FNDT6
J	1	WOOD BREAKAWAY POST 5 1/2" x 7 1/2" x 50"	WBRK50
K	1	WOOD STRIKE BLOCK	WSBLK14
L	1	STRIKE PLATE 1/4" A36 BENT PLATE	SPLT8
M	1	REINFORCEMENT PLATE 12 GA. GR55	REPLT17
N	1	GUARDRAIL GRABBER 2 1/2" X 2 1/2" X 16 1/2"	GGR17
O	1	BEARING PLATE 8" X 8 5/8" X 5/8" A36	BPLT8
P	1	PIPE SLEEVE 4 1/4" X 2 3/8" O.D. (2 1/8" I.D.)	PSLV4
Q	1	BCT CABLE 3/4" X 81" LENGTH	CBL81
		SMALL HARDWARE	
a	1	5/8" X 12" GUARDRAIL BOLT 307A HDG	12GRBLT
b	7	5/8" X 10" GUARDRAIL BOLT 307A HDG	10GRBLT
c	33	5/8" X 1 1/4" GR SPLICE BOLTS 307A HDG	1GRBLT
d	3	5/8" FLAT WASHER F436 A325 HDG	58FW436
e	1	5/8" LOCK WASHER HDG	58LW
f	39	5/8" GUARDRAIL HEX NUT HDG	58HN563
g	2	1/2" X 2" STRUT BOLT A325 HDG	2BLT
h	6	1/2" X 1 1/4" PLATE BOLT A325 HDG	125BLT
i	16	1/2" FLAT WASHER F436 A325 HDG	12FWF436
j	8	1/2" LOCK WASHER HDG	12LW
k	8	1/2" HEX NUT A563 HDG	12HN563
l	4	3/8" X 3" HEX LAG SCREW GR5 HDG	38LS
m	4	3/8" FLAT WASHER F436 A325 HDG	38FW844
n	2	1" FLAT WASHER F436 A325 HDG	1FWF436
o	2	1" HEX NUT A563DH HDG	1HN563
p	1	18" TO 24" LONG ZIP TIE RATED 175-200LB	ZPT18
q	1	1 1/2" X 4" SCH-40 PVC PIPE	PSPCR4
r	1	RFID CHIP RATED MIL-STD-810F	RFID810F
s	1	IMPACT HEAD REFLECTIVE SHEETING	RS30M

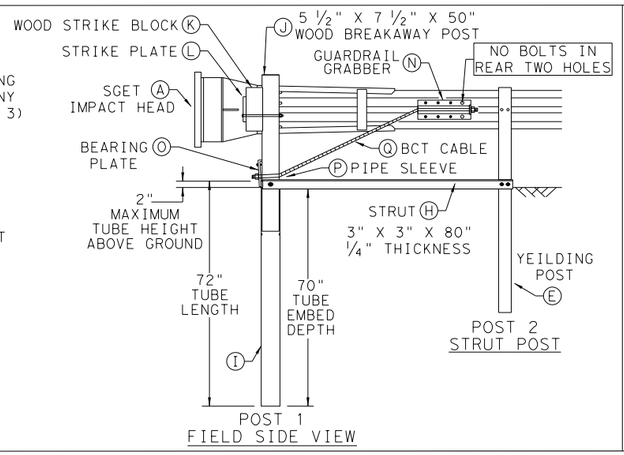
* ALTERNATIVE ITEMS
** NOTE: SEE PLAN VIEW



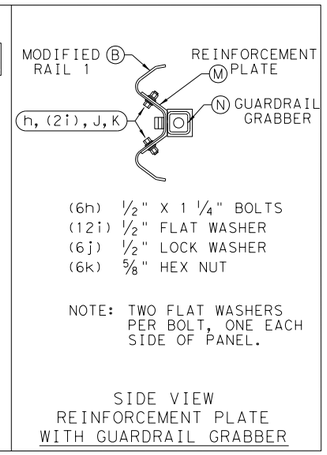
SIDE VIEW
POST 8 - POST 3 (TYP)



POST 1
FRONT END VIEW



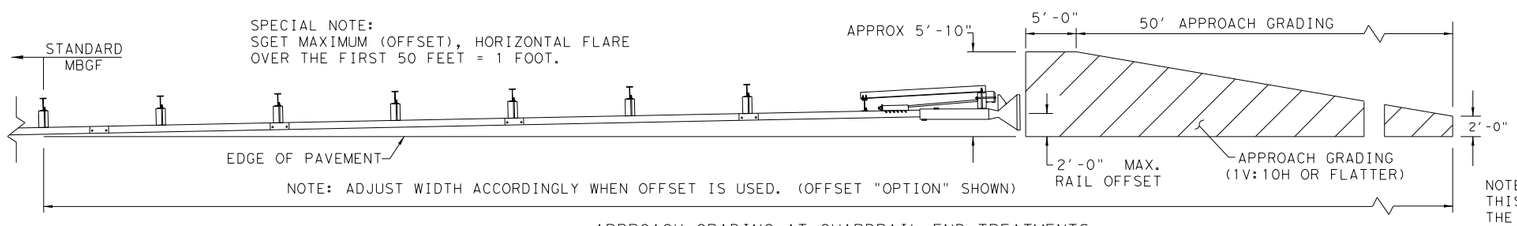
POST 1
FIELD SIDE VIEW



(6h) 1/2" X 1 1/4" BOLTS
(12i) 1/2" FLAT WASHER
(6j) 1/2" LOCK WASHER
(6k) 5/8" HEX NUT

NOTE: TWO FLAT WASHERS PER BOLT, ONE EACH SIDE OF PANEL.

SIDE VIEW
REINFORCEMENT PLATE
WITH GUARDRAIL GRABBER



APPROACH GRADING AT GUARDRAIL END TREATMENTS

NOTE:
THIS STANDARD IS A BASIC REPRESENTATION OF THE SGET TERMINAL SYSTEM AND IS NOT INTENDED TO REPLACE THE MANUFACTURER'S ASSEMBLY MANUAL.

Texas Department of Transportation

Design Division Standard

SPIG INDUSTRY, LLC
SINGLE GUARDRAIL TERMINAL
SGET - TL-3 - MASH
SGT(15)31-20

FILE: sgt153120.dgn	DN: TxDOT	CK: KM	DW: VP	CK: VP	
©TxDOT: APRIL 2020	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0955	01	027	FM 166	
	DIST	COUNTY		SHEET NO.	
	BRY	BURLESON		87	

DATE: 3/31/2021 3:05:59 PM
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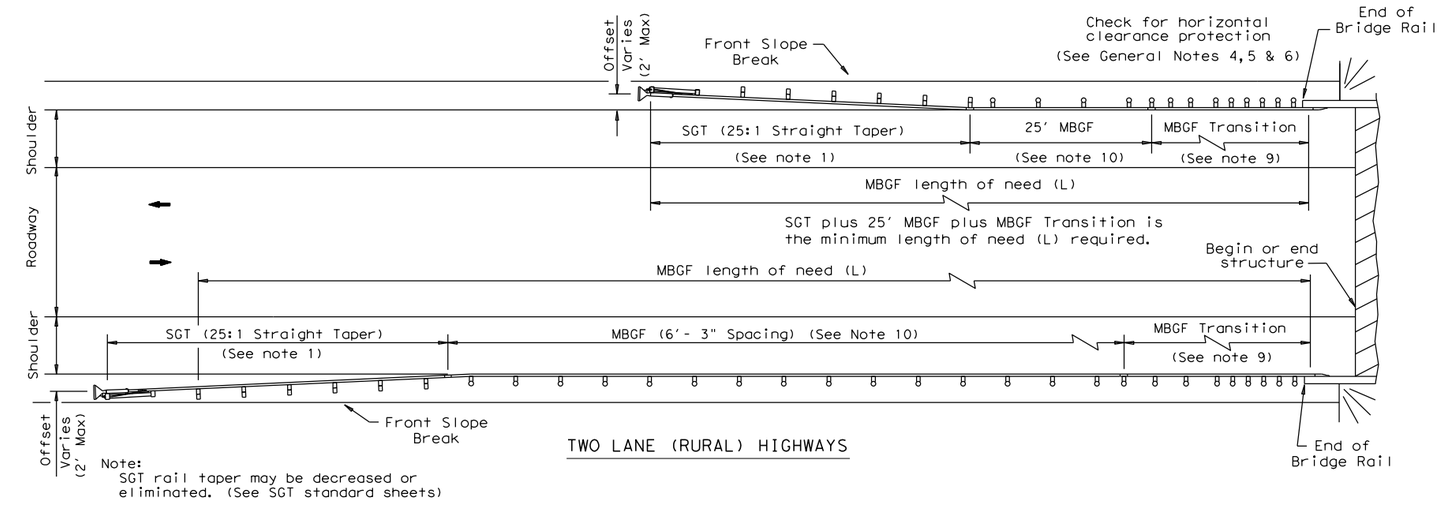
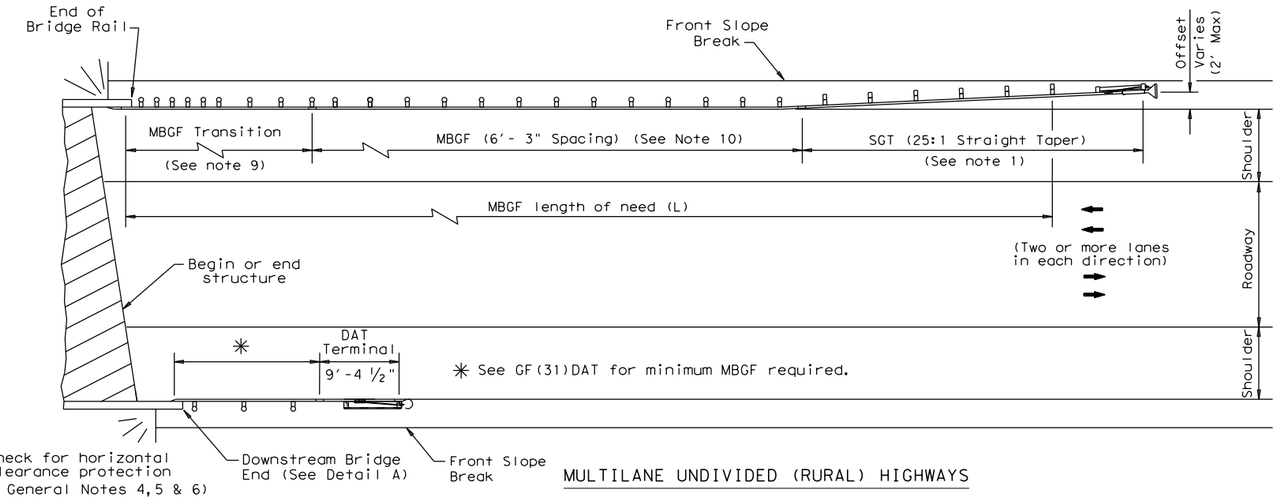
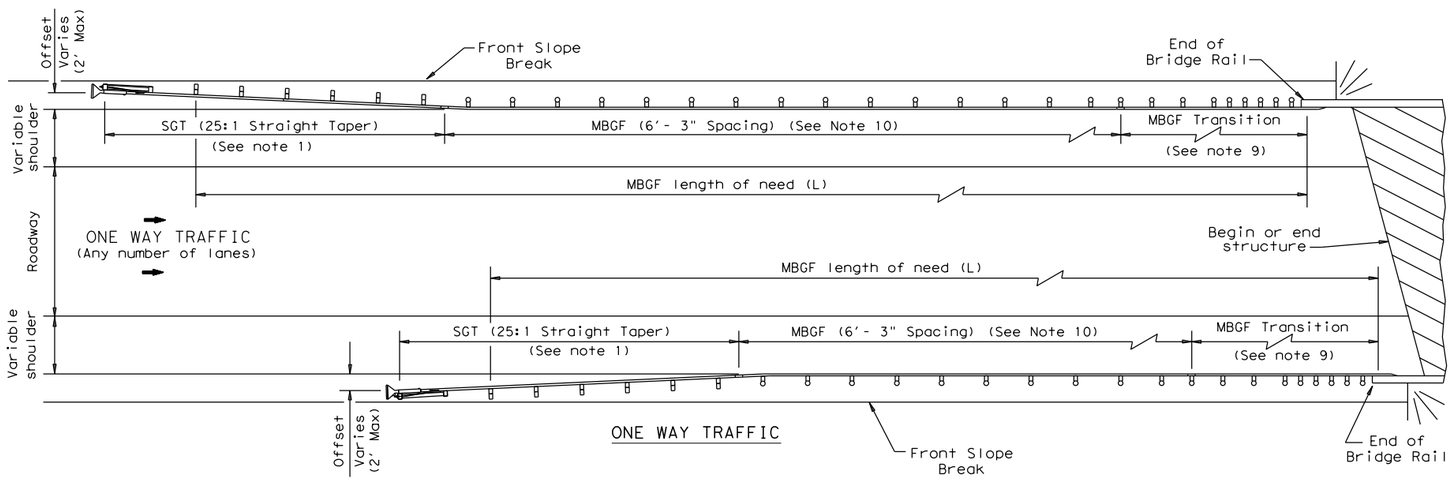


TWO LANE (RURAL) HIGHWAYS

Note:
SGT rail taper may be decreased or eliminated. (See SGT standard sheets)



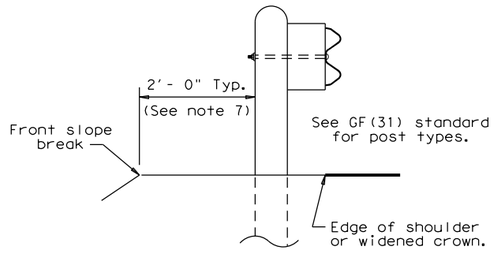
MULTILANE UNDIVIDED (RURAL) HIGHWAYS



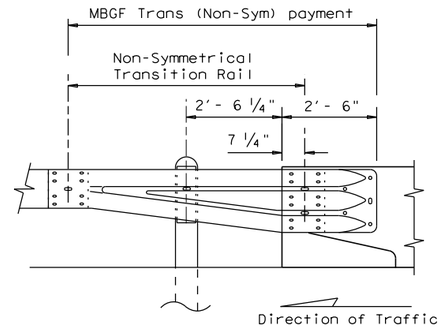
ONE WAY TRAFFIC

GENERAL NOTES

1. For more detail: See GF(31), SGT( )31, GF(31)TR, and GF(31)TL2 standard sheets.
2. Quantities of metal beam guard fence (MBGF) at individual bridge ends are as shown in the plans.
3. Use average daily traffic (ADT) for the current year to determine MBGF length of need in accordance with the Roadway Design Manual unless otherwise specified. Where significant traffic volume growth is anticipated on low volume (0-750 ADT) highways, use length determinations for the higher volume category.
4. MBGF may not be required to shield departure end of bridge unless other obstacles within the horizontal clearance limits or opposing traffic indicate a MBGF consideration.
5. Downstream anchor terminals (DAT) are only for downstream end anchorage use, outside the horizontal clearance area of opposing traffic.
6. Direct connection of MBGF to concrete rails are only for downstream rail connections outside the horizontal clearance area of opposing traffic. (This requires a minimum of three standard line posts plus the DAT terminal, See Detail A)
7. The crown shall be widened to accommodate MBGF. Typically the "front slope" break should be 2'- 0" from the back of the MBGF post. This applies to new construction on new alignment or where existing roadway cross section is to be widened to increase roadway width. This does not apply to rehabilitation work where existing roadway crown width is to be retained (See Typical Cross Section at MBGF).
8. For restrictive bridge widths: The MBGF should be properly transitioned from the existing bridge rail to the adjoining MBGF (See MBGF Transition Standards). Metal beam guard fence at these bridge location(s) shall be flared at the rate of 25:1 or flatter, and be of the length necessary to locate the terminal end at the 2 ft. "maximum" offset from the shoulder edge in the approach direction.
9. Transition length and post spacing will vary depending on the transition type. Transition type will be shown elsewhere in the plans.
10. A minimum 25' length of MBGF will be required.



TYPICAL CROSS SECTION AT MBGF



Note:
All rail elements shall be lapped in the direction of adjacent traffic.

DETAIL A
Showing Downstream Rail Attachment

Texas Department of Transportation

Design Division Standard

BRIDGE END DETAILS

(METAL BEAM GUARD FENCE APPLICATIONS TO RIGID RAILS)

BED-14

FILE: bed14.dgn	DN: TxDOT	CK: AM	DW: BD/VP	CK: CGL
© TxDOT: December 2011	CONT	SECT	JOB	HIGHWAY
REVISIONS REVISED APRIL 2014 SEE (MEMO 0414)	0955	01	027	FM 166
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		88

DATE: 3/31/2021 3:06:02 PM
FILE: P:\120\96\01\Design\027 FM 166\Civil\Standards\PavementMarkers\dom1-20.dgn

REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

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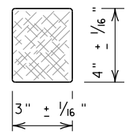
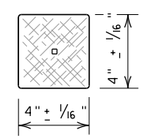
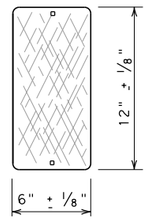
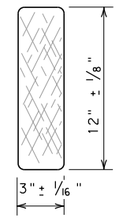
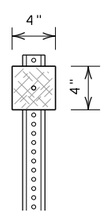
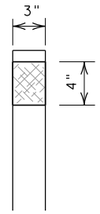
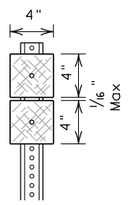
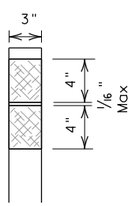
DEVICE				
SHEETING	Yellow, White or Red Type B or C reflective sheeting			

NOTE

1. Size 1 and 4 - Direct applied reflective sheeting for use on flexible post (flx).
2. Size 2 and 3 - For use on wing channel (wc) post only. Use approved metal, plastic or fiberglass backplate with 17/64" mounting holes.

DELINEATORS

	SINGLE		DOUBLE	
DEVICE				
	1-Size 2 reflector unit	1-Size 1 reflector unit	2-Size 2 reflector units	2-Size 1 reflector units
SHEETING	Yellow, White or Red Type B or C Reflective Sheeting			
POST TYPE	WC	YFLX, WFLX	WC	YFLX, WFLX
MOUNT TYPE	GND	GND, SRF	GND	GND, SRF

D & OM DESCRIPTIVE CODES

INSTL DEL ASSM (D-XX)SZ X (XXXX)XXX(XX)

NUMBER OF REFLECTORS
- S = Single
- D = Double

COLOR OF REFLECTORS
- W = White
- Y = Yellow
- R = Red

REFLECTOR UNIT SIZE
- 1 or 2

TYPE OF POST OR DELINEATOR
- WC = Wing Channel Post
- YFLX = Yellow Flexible Post
- WFLX = White Flexible Post
- BRF = Barrier Reflector

TYPE OF MOUNT
- GND = Embedded (drivable or set in concrete)
- CTB = Concrete Barrier Mount
- GF1 or GF2 = Guard Fence Attachment
- SRF = Surface Mount

DIRECTION
If Required
- BI = Bi-Directional
- BR = Bi-Directional with red on back

INSTL OM ASSM (OM-XX) (XXXX)XXX(XX)

TYPE OF OBJECT MARKER
- 1, 2, 3, or 4

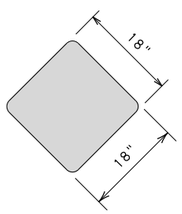
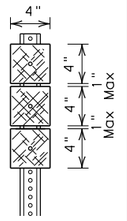
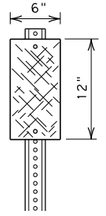
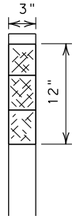
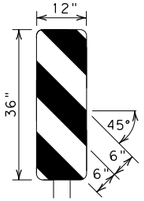
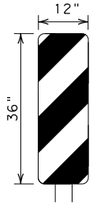
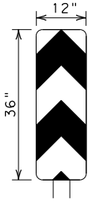
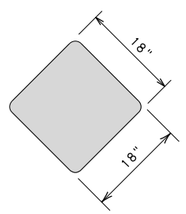
NUMBER OF REFLECTORS OR DIRECTION
- X = 3-Size 2 reflector units (Type 2 only)
- Y = 1-Size 3 reflector unit (Type 2 only)
- Z = 3-Size 1 or 1-Size 4 reflector unit(s)(Type 2 only)
- L = Left Side (Type 3 Object Marker only)
- R = Right Side (Type 3 Object Marker only)
- C = Center (Type 3 Object Marker only)

TYPE OF POST
- WC = Wing Channel Post
- WFLX = White Flexible Post
- TWT = Thin Walled Tubing

TYPE OF MOUNT
- GND = Embedded (drivable)
- SRF = Surface Mount
- WAS = Wedge Anchor Steel
- WAP = Wedge Anchor Plastic

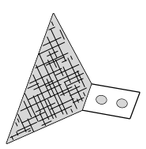
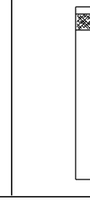
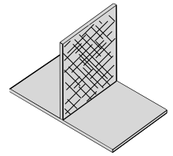
DIRECTION
If Required
- BI = Bi-Directional

OBJECT MARKERS

	Type 1 (OM-1)	Type 2 (OM-2)			Type 3 (OM-3)			Type 4 (OM-4)
	OM-1	OM-2X	OM-2Y	OM-2Z	OM-3L	OM-3R	OM-3C	OM-4
DEVICE								
		3-Size 2 reflector units	1-Size 3 reflector unit	3-Size 1 reflector units or 1-Size 4 reflector unit				
SHEETING	Yellow-Type B_{FL} or C_{FL} Sheeting	Yellow - Type B or C Sheeting			Alternating acrylic black and retroflective yellow - Type B_{FL} or C_{FL} Sheeting			Red -Type B_{FL} or C_{FL} Sheeting
POST TYPE	TWT	WC	WC	WFLX	TWT			TWT
MOUNT TYPE	WAS, WAP	GND	GND	GND, SRF	WAS, WAP			WAS, WAP

DEPARTMENTAL MATERIAL SPECIFICATIONS	
FLEXIBLE DELINEATOR & OBJECT MARKER POSTS (EMBEDDED & SURFACE MOUNT TYPES)	DMS-4400
SIGN FACE MATERIALS	DMS-8300
DELINEATORS, OBJECT MARKERS AND BARRIER REFLECTORS	DMS-8600

BARRIER REFLECTORS (BRF)

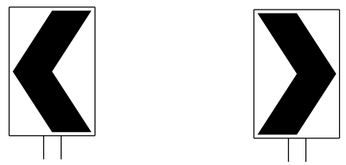
	GF1	GF2	CTB
DEVICE			

1. Barrier reflectors shall meet the requirements of DMS 8600.
2. Approved Barrier Reflectors are listed on the "Barrier Reflectors" Material Producer List at: www.txdot.gov.

SHEETING	Yellow, White, Red
NOTE	1. Reflective sheeting shall have a minimum dimension of 3 inches and minimum surface area of 9 square inches.

CHEVRONS

DEVICE



W1-8

SIZE (W x L)	18"x 24" (Conventional)	24"x 30" (Conventional Oversize)	30"x 36" (Expressway)	36" x 48" (Freeway)
MOUNTING HEIGHT	4'-0" or 7'-0"		7'-0" Only	

NOTE

1. CHEVRON (W1-8) signs and ONE DIRECTION LARGE ARROW (W1-6) Signs shall be installed per Sign Mounting Details (SMD) Standard Sheets and paid under Item 644 (Small Roadside Sign Assemblies).
2. When there is a need to increase conspicuity, the Texas version of the ONE DIRECTION LARGE ARROW sign (W1-9T) may be used instead of the ONE DIRECTION LARGE ARROW (W1-6).

ONE DIRECTION LARGE ARROW

DEVICE

W1-6

SIZE (W x L)	48" x 24" (Conventional)	60" x 30" (Expressway & Freeway)
MOUNTING HEIGHT	7'-0"	

NOTE:

Delineator and object marker substrates and sign substrates shall be 0.080" Aluminum sign blank to conform to ASTM B-209 Alloy 6061-T6 or approved alternative.

Texas Department of Transportation — Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION

D & OM(1)-20

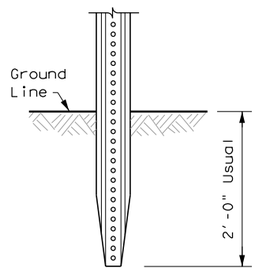
FILE: dom1-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0955	01	027	FM 166
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	BRY	BURLESON		89

20A

POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

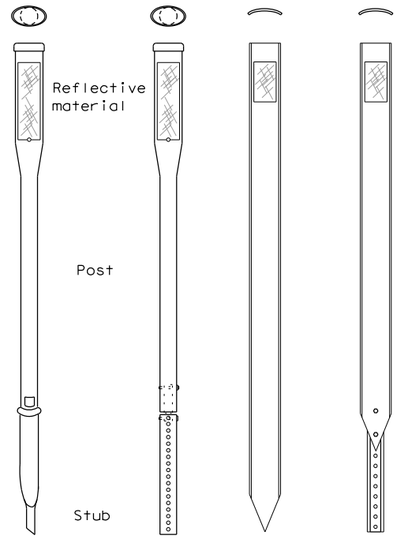


NOTES

1. Embedded Wing Channel (WC) post option may be used for Type 2 Object Markers and Delineators only.
2. 1.12 lbs/ft steel per ASTM A 1011 SS Gr. 50, or ASTM A499.

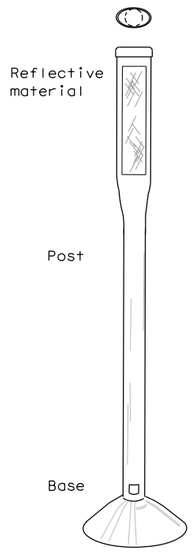
FLEXIBLE POSTS (YFLX, WFLX)

GND



EMBEDDED

SRF



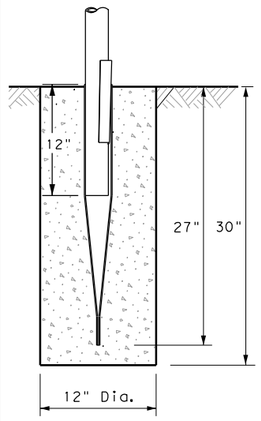
SURFACE MOUNT

NOTES

1. See "Flexible Delineator and Object Marker Posts" Material Producer List for approved devices.
2. Install per manufacturer's recommendations.
3. Post length may vary to meet field conditions.
4. When using yellow delineators with flexible posts to separate opposing direction of travel, such as centerline or median use, the flexible posts shall be yellow.

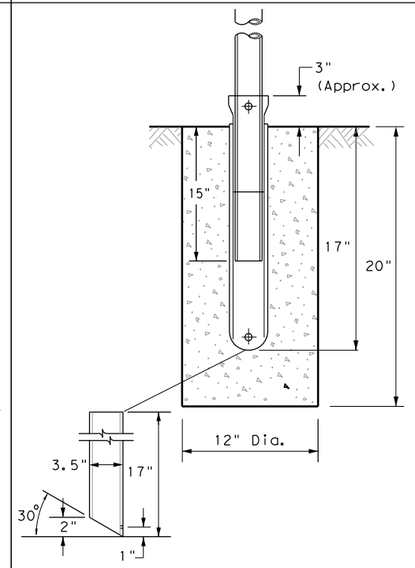
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

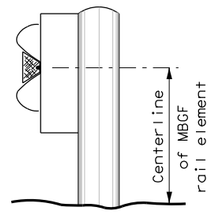
NOTE

1. Install per manufacturer's recommendations.

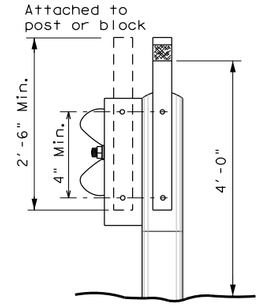
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

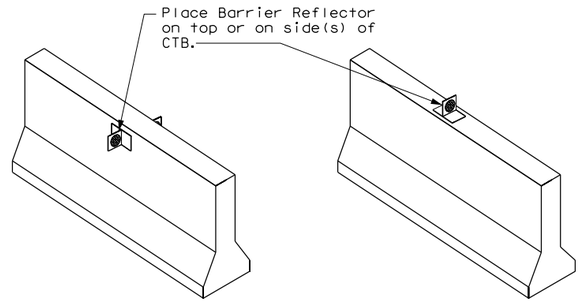
GF1



GF2



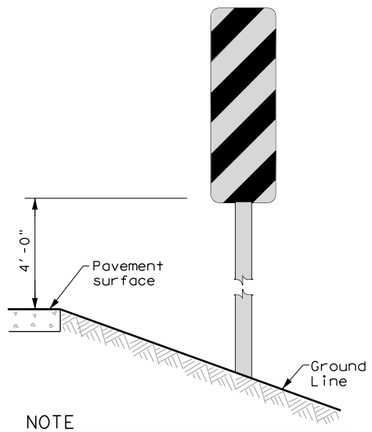
CONCRETE TRAFFIC BARRIER (CTB)



GENERAL NOTES

1. Place delineators on a section of roadway at a consistent distance from the edge of pavement.
2. Where a restriction prevents consistent placement from the pavement edge, place the affected object markers in line with the innermost edge of the obstruction.
3. When Type 2 object markers and delineators are more than 8'-0" from the edge of the pavement, it may not be possible to maintain a height of approximately 4'-0". If this is the case, place the object marker or delineator as close to the desired height as possible.
4. Install all delineators, object markers and barrier reflectors in accordance with the manufacturer's recommendation.
5. Barrier reflectors should be installed a minimum of 18 inches above the edge of the pavement surface.
6. Diagonal stripes on Type 3 object markers shall slope down toward the intended travel lane.

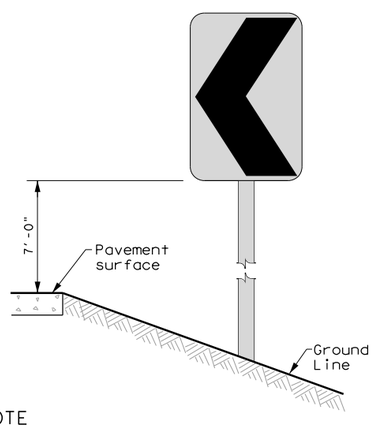
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



NOTE

Mounting at 4 feet to the bottom of the chevron is permitted for chevrons that will not exceed a height of 6'-6" to the top of the chevron (sizes 24" x 30" and smaller)

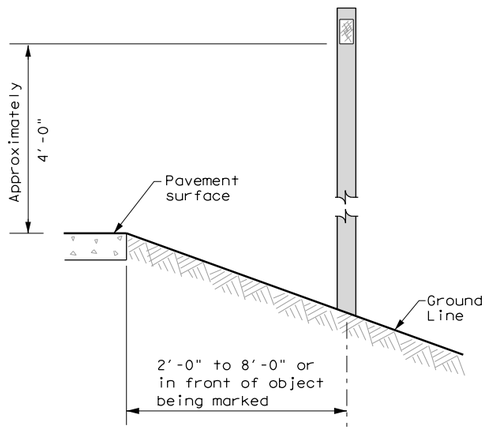
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



NOTE

Chevrons 30" x 36" and larger shall be mounted at a height of 7' to the bottom of the chevron. Chevron sign and ONE DIRECTION LARGE ARROW sign (W1-9T) shall be installed per SMD standard sheets and paid under item 644.

DELINEATORS AND TYPE 2 OBJECT MARKERS



See general notes 1, 2 and 3.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER INSTALLATION

D & OM(2)-20

FILE: dom2-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0955	01	027	FM 166
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	BRY	BURLESON		90

20B

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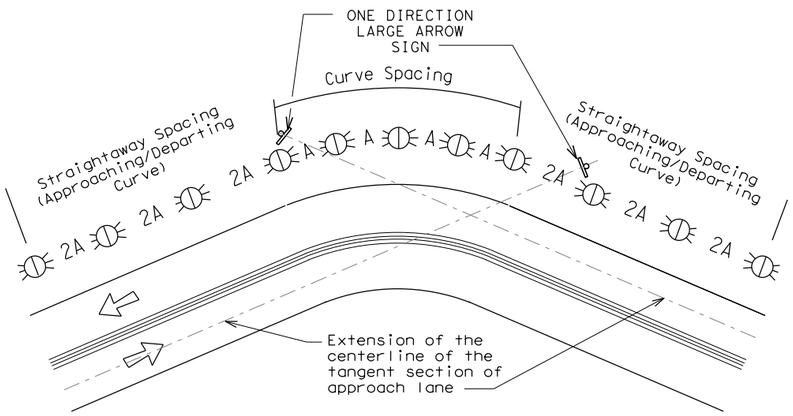
MINIMUM WARNING DEVICES AT CURVES WITH ADVISORY SPEEDS

Amount by which Advisory Speed is less than Posted Speed	Curve Advisory Speed	
	Turn (30 MPH or less)	Curve (35 MPH or more)
5 MPH & 10 MPH	• RPMs	• RPMs
15 MPH & 20 MPH	• RPMs and One Direction Large Arrow sign	• RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons.
25 MPH & more	• RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons	• RPMs and Chevrons

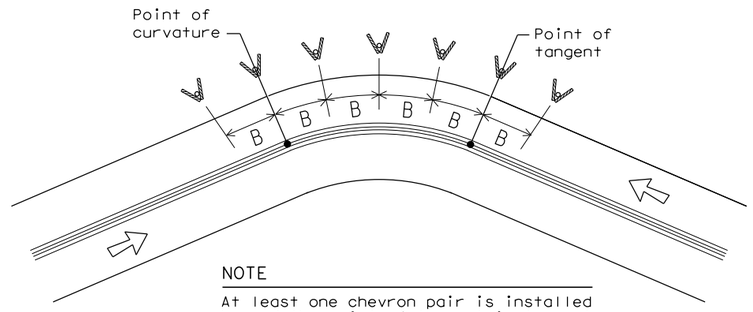
SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



NOTE

ONE DIRECTION LARGE ARROW (W1-6) sign should be located at approximately and perpendicular to the extension of the centerline of the tangent section of approach lane.

SUGGESTED SPACING FOR CHEVRONS ON HORIZONTAL CURVES



NOTE

At least one chevron pair is installed beyond the point of tangent in tangent section.

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS KNOWN

Degree of Curve	FEET			
	Radius of Curve	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
		A	2A	B
1	5730	225	450	——
2	2865	160	320	——
3	1910	130	260	200
4	1433	110	220	160
5	1146	100	200	160
6	955	90	180	160
7	819	85	170	160
8	716	75	150	160
9	637	75	150	120
10	573	70	140	120
11	521	65	130	120
12	478	60	120	120
13	441	60	120	120
14	409	55	110	80
15	382	55	110	80
16	358	55	110	80
19	302	50	100	80
23	249	40	80	80
29	198	35	70	40
38	151	30	60	40
57	101	20	40	40

Curve delineator approach and departure spacing should include 3 delineators spaced at 2A. This spacing should be used during design preparation or when the degree of curve is known.

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS NOT KNOWN

Advisory Speed (MPH)	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
	A	2xA	B
65	130	260	200
60	110	220	160
55	100	200	160
50	85	170	160
45	75	150	120
40	70	140	120
35	60	120	120
30	55	110	80
25	50	100	80
20	40	80	80
15	35	70	40

If the degree of curve is not known, delineator spacing may be determined based on the Advisory Speed of the curve. Use the delineator curve spacing for each Advisory Speed (MPH).

DELINEATOR AND OBJECT MARKER APPLICATION AND SPACING

CONDITION	REQUIRED TREATMENT	MINIMUM SPACING
Frwy./Exp. Tangent	RPMs	See PM-series and FPM-series standard sheets
Frwy./Exp. Curve	Single delineators on right side	See delineator spacing table
Frwy/Exp.Ramp	Single delineators on at least one side of ramp (should be on outside of curves) (see Detail 3 on D&OM(4))	100 feet on ramp tangents Use delineator spacing table for ramp curves ("straightway spacing" does not apply to ramp curves)
Acceleration/Deceleration Lane	Double delineators (see Detail 3 on D&OM(4))	100 feet (See Detail 3 on D & OM (4))
Truck Escape Ramp	Single red delineators on both sides	50 feet
Bridge Rail (steel or concrete)and Metal Beam Guard Fence	Bi-Directional Delineators when undivided with one lane each direction Single Delineators when multiple lanes each direction	Equal spacing (100'max) but not less than 3 delineators
Concrete Traffic Barrier (CTB) or Steel Traffic Barrier	Barrier reflectors matching the color of the edge line	Equal spacing 100' max
Cable Barrier	Reflectors matching the color of the edge line	Every 5th cable barrier post (up to 100'max)
Guard Rail Terminus/Impact Head	Divided highway - Object marker on approach end Undivided 2-lane highways - Object marker on approach and departure end	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5) and D & OM (6)
Bridges with no Approach Rail	Type 3 Object Marker (OM-3) at end of rail and 3 single delineators approaching rail	See D & OM(5)
Reduced Width Approaches to Bridge Rail	Type 2 and Type 3 Object Markers (OM-3) and 3 single delineators approaching bridge	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5)
Culverts without MBGF	Type 2 Object Markers	See Detail 2 on D & OM(4)
Crossovers	Double yellow delineators and RPMs	See Detail 1 on D & OM (4)
Pavement Narrowing (lane merge) on Freeways/Expressway	Single delineators adjacent to affected lane for full length of transition	100 feet

NOTES

1. Unless indicated otherwise, the delineator or barrier reflector color shall conform to the color of the pavement edge line on the side of the road where the delineators or barrier reflectors are placed.
2. Barrier reflectors may be used to replace required delineators.
3. Single red delineators may be mounted on the back side of delineator posts for wrong way driver applications

LEGEND

	Bi-directional Delineator
	Delineator
	Sign

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(3)-20

FILE: dom3-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
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REVISIONS	0955	01	027	FM 166
3-15 8-15	DIST	COUNTY		SHEET NO.
8-15 7-20	BRY	BURLESON		91

20C

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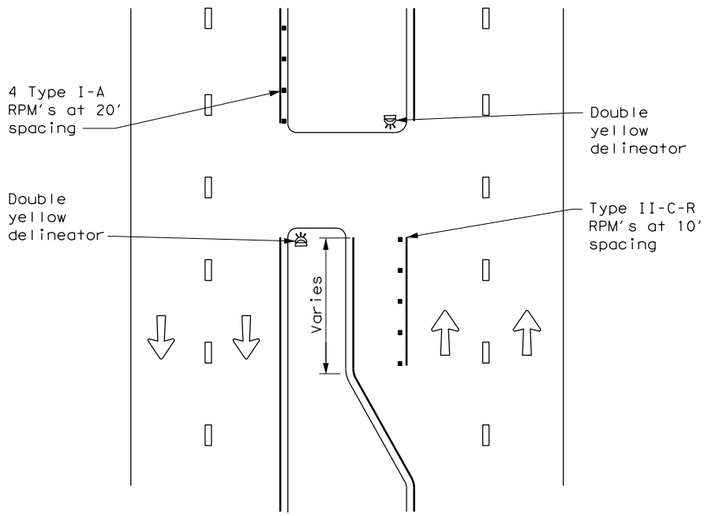
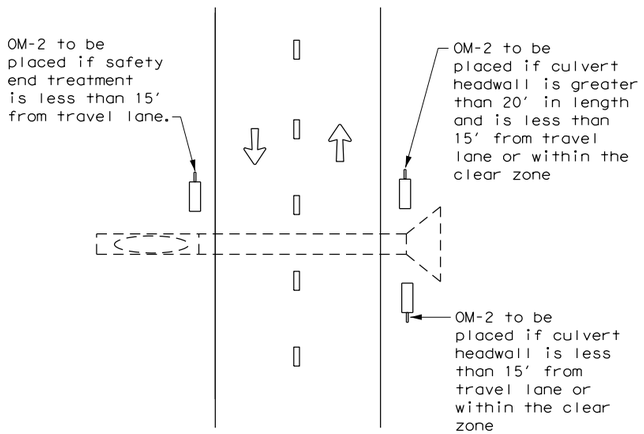
CROSSOVERS



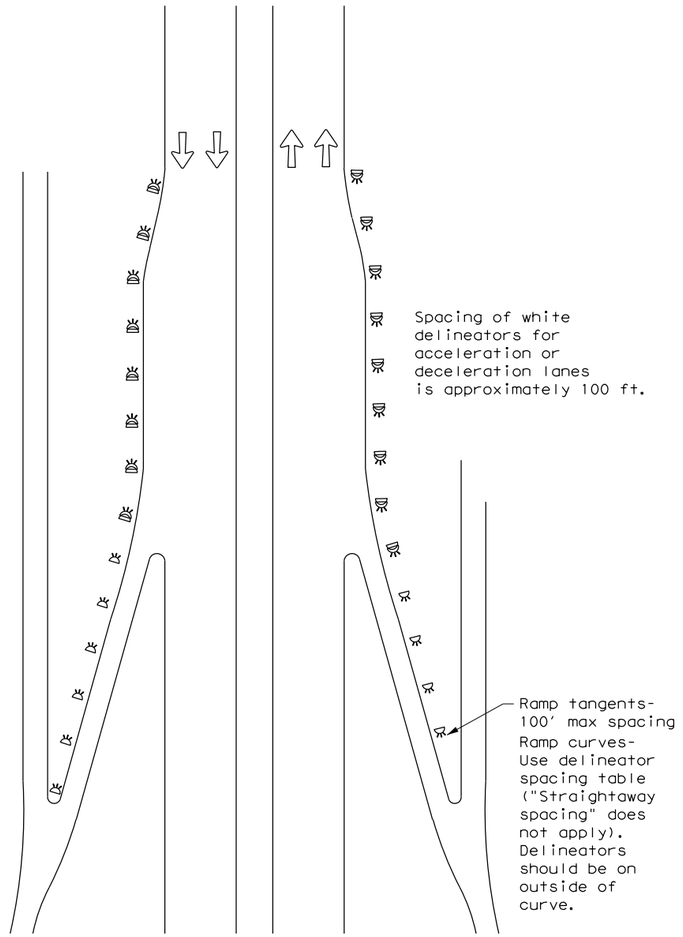
DETAIL 1

FOR CULVERTS WITHOUT MBGF



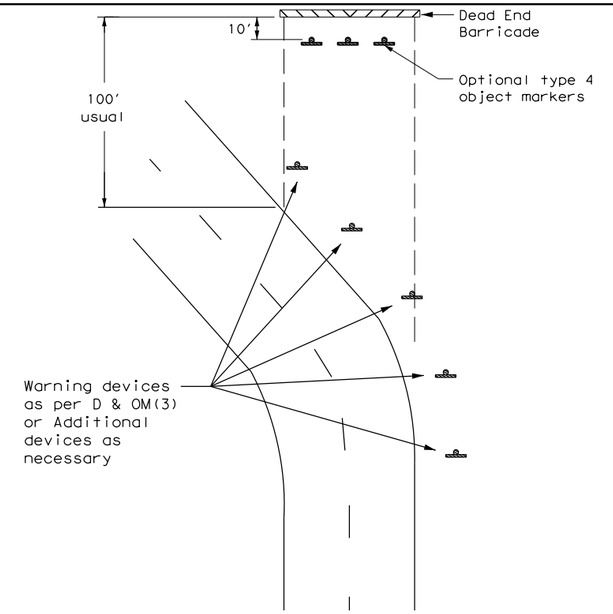
DETAIL 2

FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES



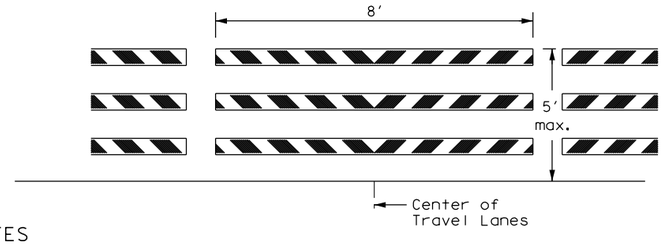
DETAIL 3

TYPICAL APPLICATION OF DEAD END BARRICADE



DETAIL 4

TYPICAL DEAD END BARRICADE INSTALLATION



NOTES

1. Barricade striping shall be red and white reflective sheeting for all permanent road closures.
2. Barricade striping is red and white sloping toward the center of the roadway.
3. Type 3 Barricade Supports should be anchored to soil or pavement as described in compliant Work Zone Traffic Control Devices List, section D.2.f and D.2.g.

DETAIL 5

LEGEND

	Bidirectional Delineator
	Delineator
	OM-3
	Barricade
	Sign
	OM-2
	Double Delineator

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(4)-20

FILE: dom4-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
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3-15	DIST	COUNTY		SHEET NO.
7-20	BRY	BURLESON		92

20D

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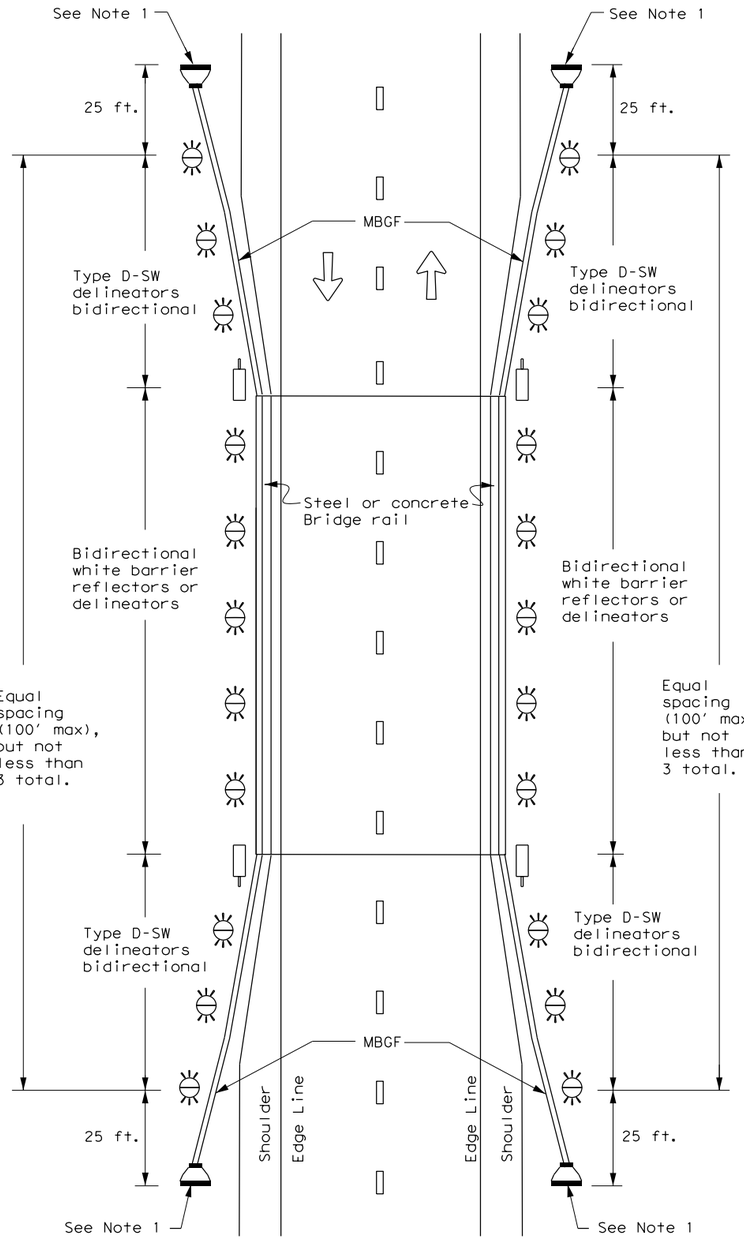
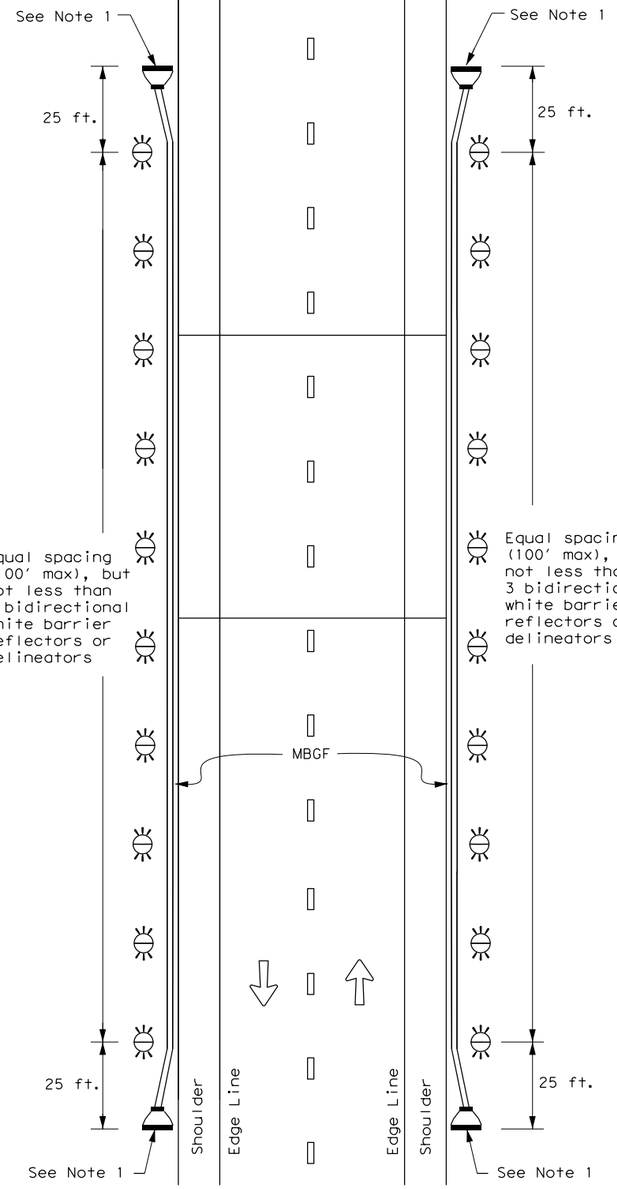
TWO-WAY, TWO LANE ROADWAY WITH REDUCED WIDTH APPROACH RAIL



NOTE:

1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

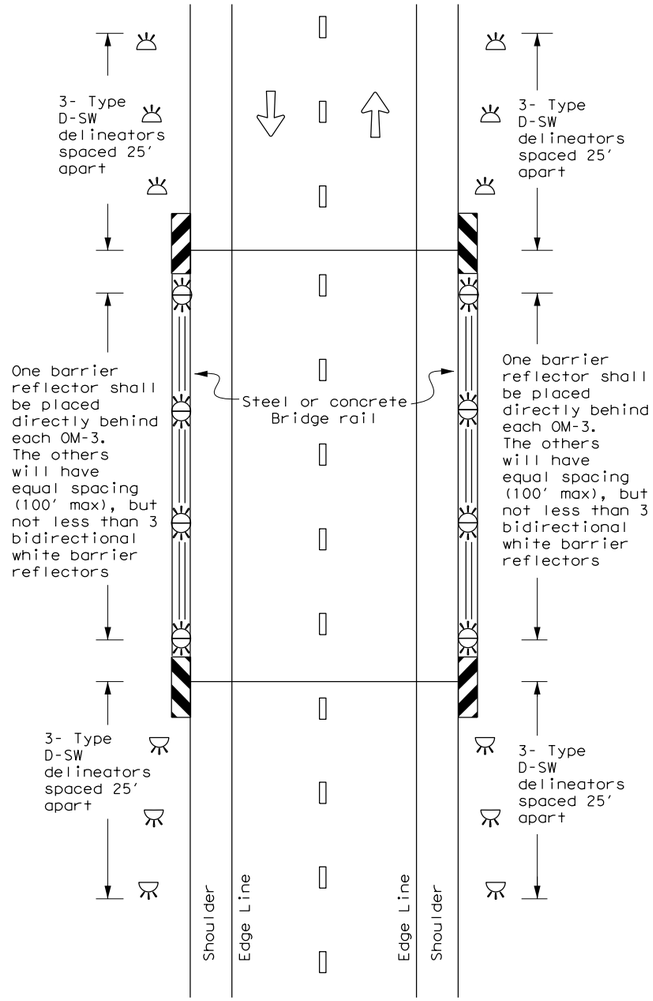
TWO-WAY, TWO LANE ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



NOTE:

1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

TWO-WAY, TWO LANE ROADWAY BRIDGE WITH NO APPROACH RAIL



LEGEND

	Bidirectional Delineator
	Delineator
	OM-3
	OM-2
	Terminal End
	Traffic Flow

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(5)-20

FILE: dom5-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	0955	01	027	FM 166
7-20	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		93

20E

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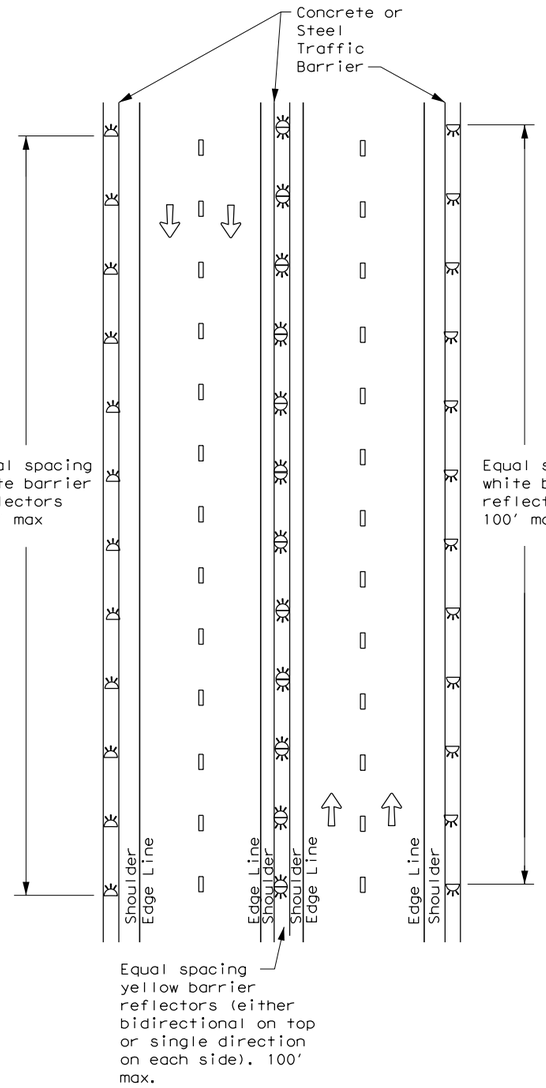
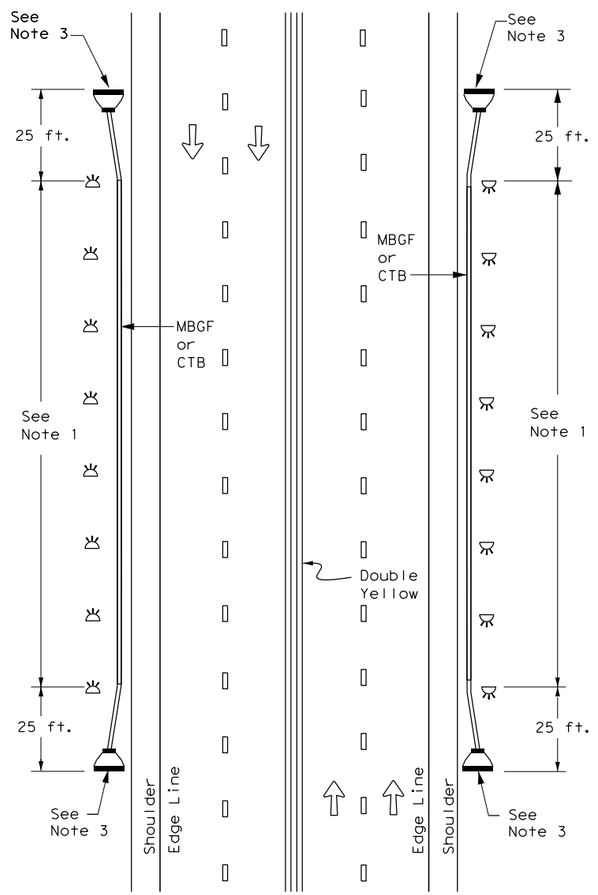
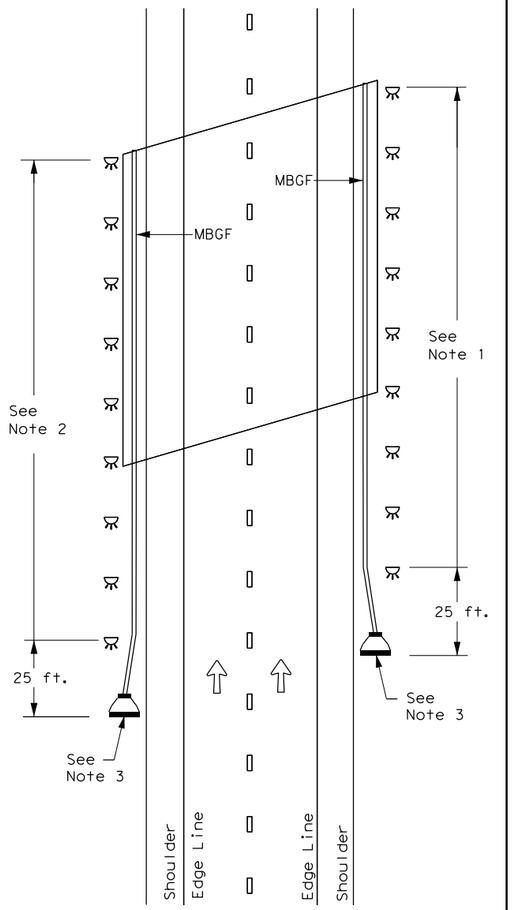
CONTINUOUS CONCRETE OR STEEL BARRIER



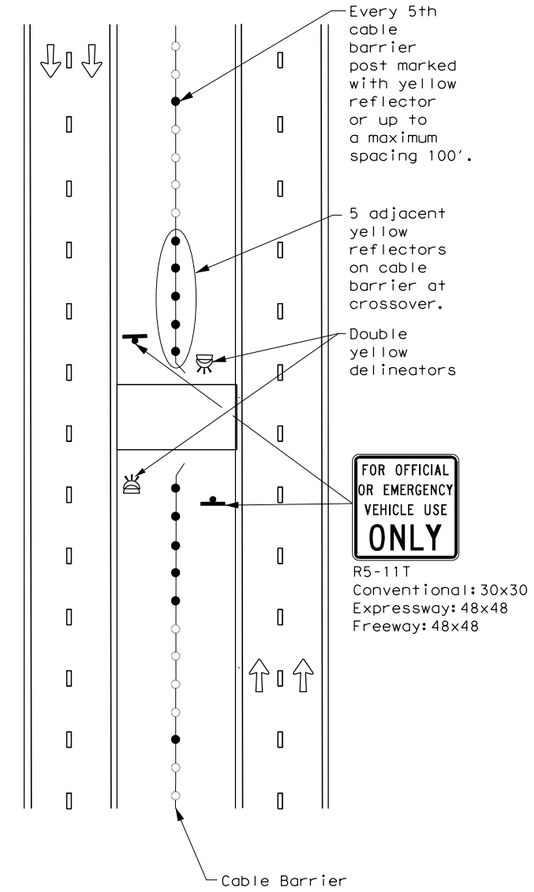
MULTI-LANE UNDIVIDED, TWO-WAY ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



DIVIDED ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



EMERGENCY CROSSOVER



NOTES

1. Equal spacing (100′ max), but not less than 3 single directional white barrier reflectors or delineators. On Continuos Barrier, equal spacing (100′ max.)
2. Equal spacing (100′ max), but not less than 3 single directional yellow barrier reflectors or delineators.
3. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3)in front of the terminal end.

LEGEND

	Bidirectional Delineator
	Delineator
	OM-3
	OM-2
	Terminal End
	Traffic Flow

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(6)-20

FILE: dom6-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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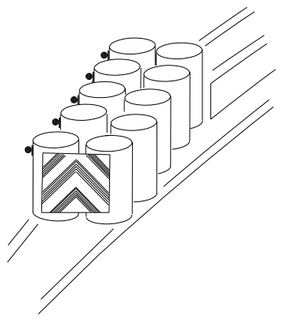
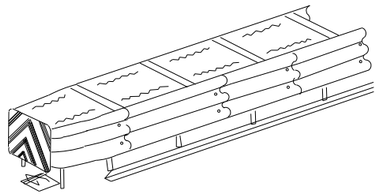
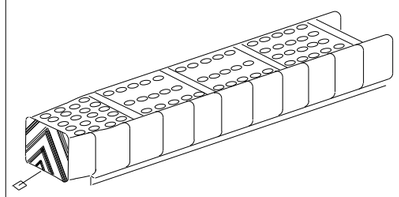
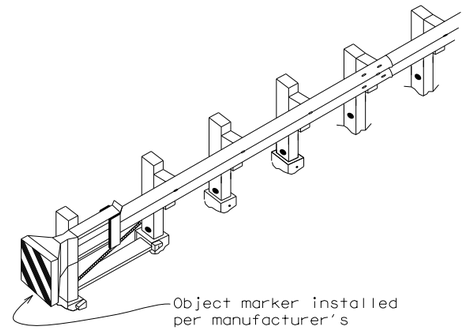
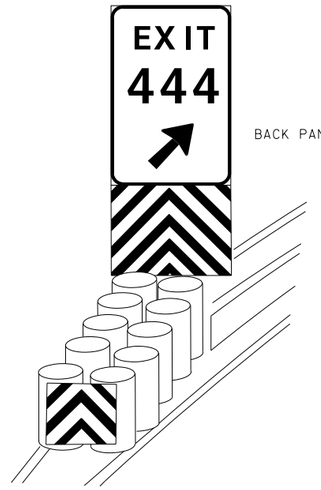
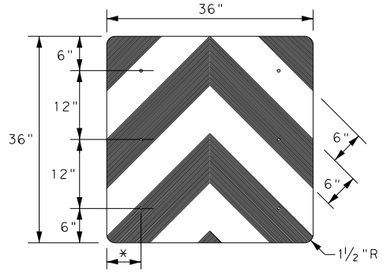


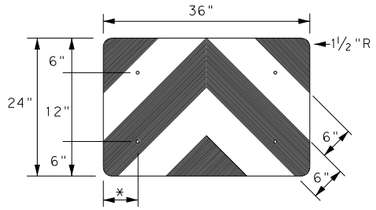




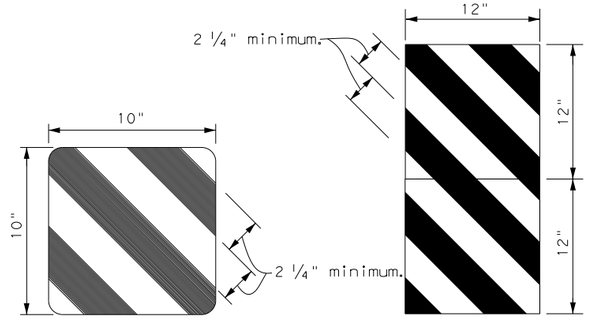




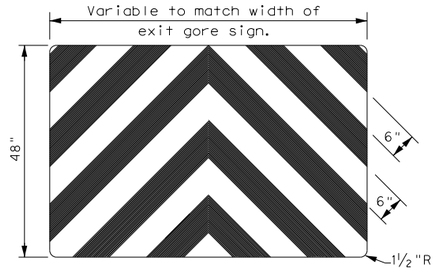


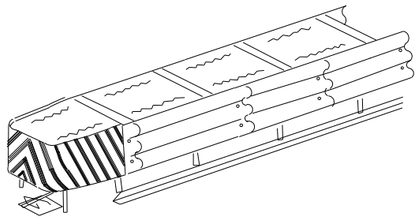


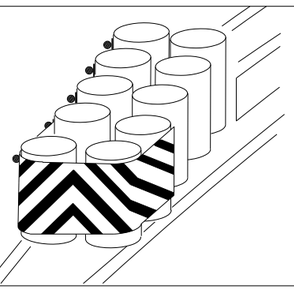
* Adjust to fit attenuator per manufacturer's recommendation, or as directed by the Engineer

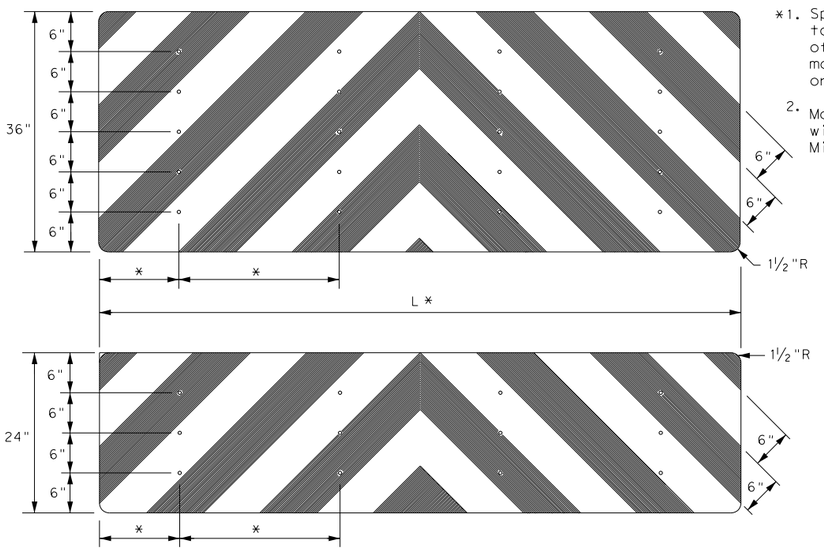


OBJECT MARKERS SMALLER THAN 3 FT^2









NOTES

*1. Spacing should be adjusted to attach through centerline of drum, per attenuator manufacturers recommendation, or as directed by the Engineer.

2. Mounting should be flush with top of attenuator. Minimum size 96" x 24".

NOTES

1. Object Markers shall conform to the Texas MUTCD and meet the color and reflectivity requirement of Department Material Specification DMS 8300. Background shall be yellow reflective sheeting (Type B or C) and Chevron shall be black.

2. Object Markers may be fabricated from adhesive backed reflective sheeting applied directly to guardrail end treatment, or applied directly to an "end cap" as per the manufacturer's recommendation. Direct applied sheeting shall provide a smooth surface and have no wrinkles, air bubbles, cuts or tears. A radius at the corners is not required for direct applied sheeting.

3. Object Marker size may be reduced to fit smaller devices. Width of alternating black and yellow stripes are typically 6". Object Markers smaller than 3ft may have reduced width stripes of a minimum of 2 ¼".

4. Pop rivets, screws, or nuts and bolts may be used to attach object markers and reflectors. Holes, slots or other openings may be cut or drilled through object markers to allow cable or other attachments.

5. Object Marker at nose of attenuator is subsidiary to the attenuator.

6. See D & OM (1-4) for required barrier reflectors.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS

D & OM(VIA)-20

FILE: domvia20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT December 1989	CONT	SECT	JOB	HIGHWAY
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4-92 8-04	DIST	COUNTY		SHEET NO.
8-95 3-15	BRY	BURLESON		95
4-98 7-20				
20G				

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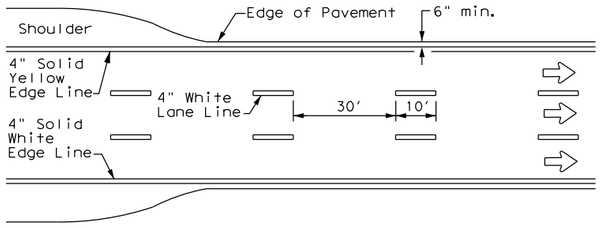
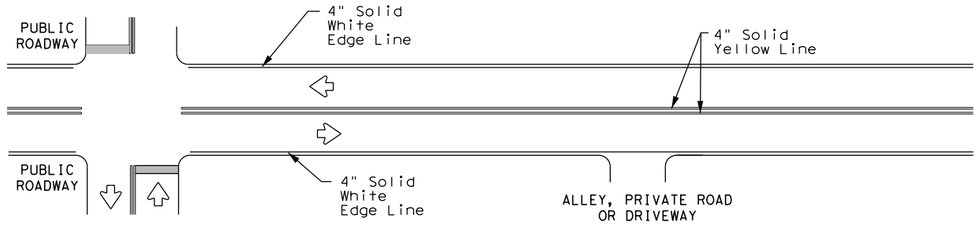
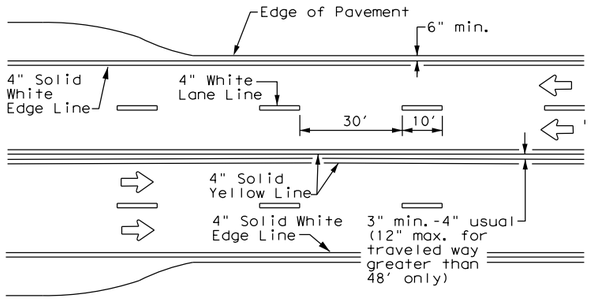


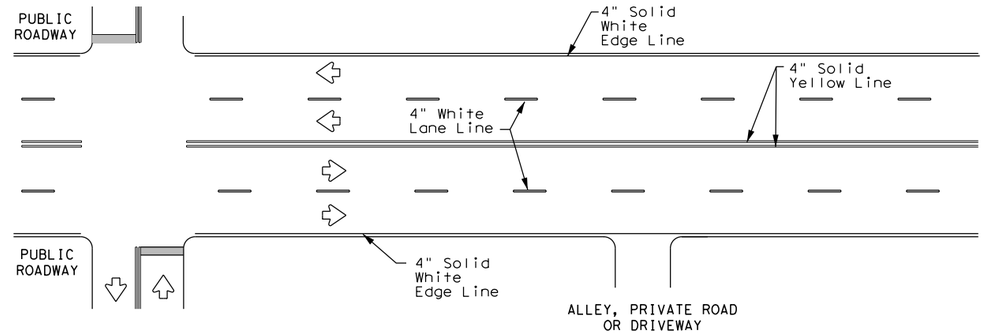
EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



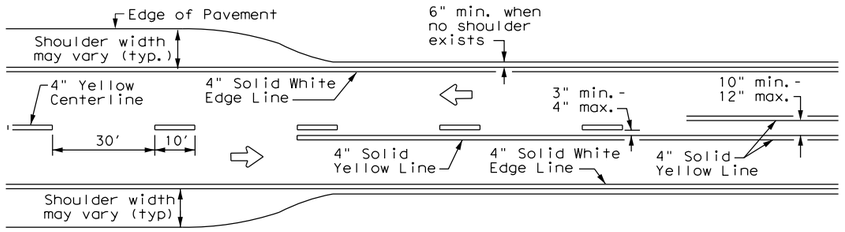
TYPICAL TWO-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



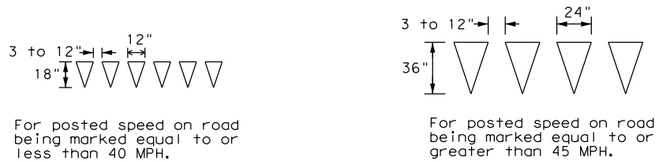
CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



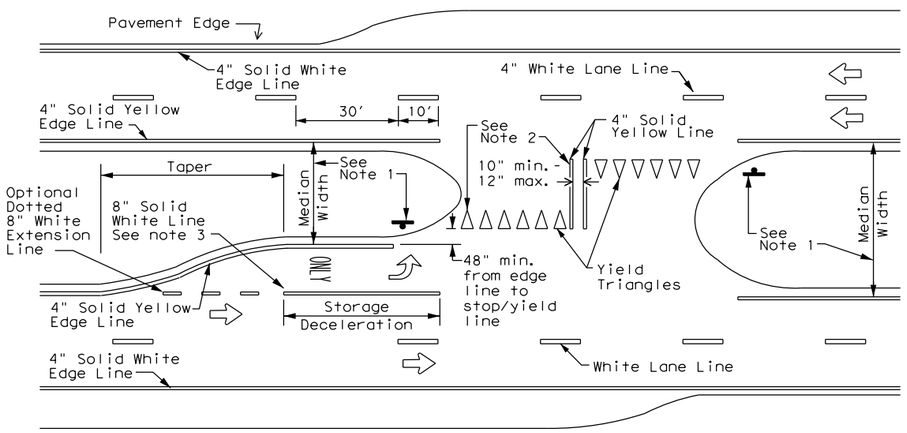
TYPICAL MULTI-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



YIELD LINES



FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTES

1. Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections. Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling width to determine if signs are required. Yield signs are the typical intersection control. Stop signs are optional as determined by the Engineer.

2. Install median striping (double yellow centerlines and stop bars/yield triangles) when a 50' or greater median centerline can be placed. Stop bars shall only be used with stop signs. Yield traingles shall only be used with yield signs.

3. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.

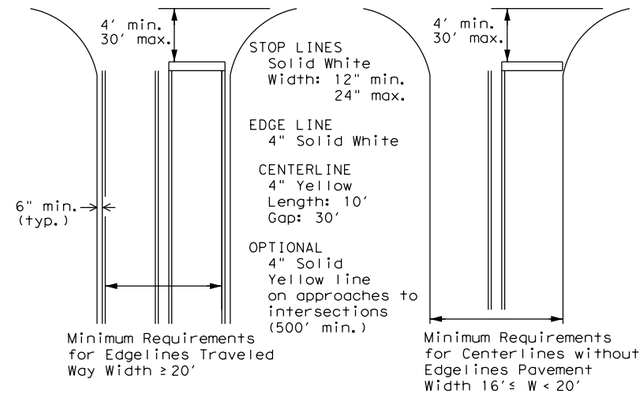
GENERAL NOTES

1. Edgeline striping shall be as shown in the plans or as directed by the Engineer. The edgeline should not be placed less less than 6 inches from the edge of pavement. This distance may vary due to pavement raveling or other conditions. Edgelines are not required in curb and gutter sections of roadways.

2. The traveled way includes only that portion of the roadway used for vehicular travel. It does not include the parking lanes, sidewalks, berms and shoulders. The traveled ways shall be measured from the inside of edgeline to the inside of edgeline of a two lane roadway.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



GUIDE FOR PLACEMENT OF STOP LINES, EDGE LINE & CENTERLINE

Based on Traveled Way and Pavement Widths for Undivided Highways

Texas Department of Transportation

Traffic Safety Division Standard

TYPICAL STANDARD PAVEMENT MARKINGS

PM(1)-20

FILE: pm1-20.dgn	DN:	CK:	DW:	CK:
©TxDOT November 1978	CONT	SECT	JOB	HIGHWAY
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5-00 2-12	DIST	COUNTY		SHEET NO.
8-00 6-20	BRY	BURLESON		96

22A

SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

SM RD SGN ASSM TY XXXXX(X)XX(X-XXXX)

Post Type

FRP = Fiberglass Reinforced Plastic Pipe (see SMD(FRP))
TWT = Thin-Walled Tubing (see SMD(TWT))
10BWG = 10 BWG Tubing (see SMD(SLIP-1) to (SLIP-3))
S80 = Schedule 80 Pipe (see SMD(SLIP-1) to (SLIP-3))

Number of Posts (1 or 2)

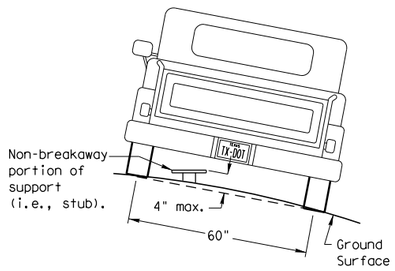
Anchor Type

UA = Universal Anchor - Concreted (see SMD(FRP) and (TWT))
UB = Universal Anchor - Bolted down (see SMD(FRP) and (TWT))
WS = Wedge Anchor Steel - (see SMD(TWT))
WP = Wedge Anchor Plastic (see SMD(TWT))
SA = Slipbase - Concreted (see SMD(SLIP-1) to (SLIP-3))
SB = Slipbase - Bolted Down (see SMD(SLIP-1) to (SLIP-3))

Sign Mounting Designation

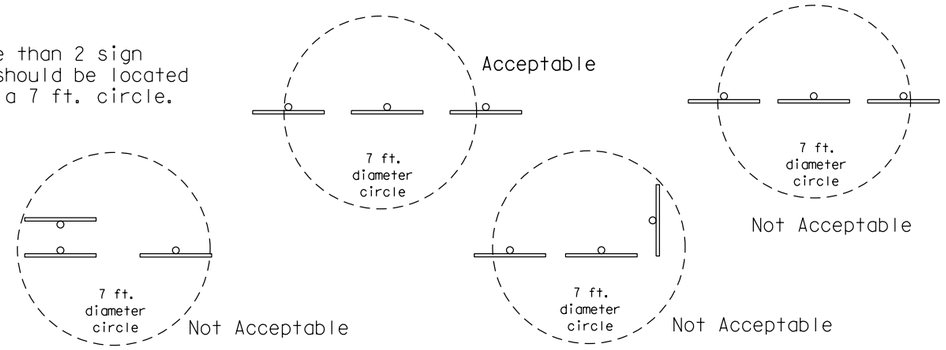
P = Prefab. "Plain" (see SMD(SLIP-1) to (SLIP-3), (TWT), (FRP))
T = Prefab. "T" (see SMD(SLIP-1) to (SLIP-3), (TWT))
U = Prefab. "U" (see SMD(SLIP-1) to (SLIP-3))
IF REQUIRED
1EXT or 2EXT = Number of Extensions (see SMD(SLIP-1) to (SLIP-3), (TWT))
BM = Extruded Wind Beam (see SMD(SLIP-1) to (SLIP-3))
WC = 1.12 #/ft Wing Channel (see SMD(SLIP-1) to (SLIP-3))
EXAL = Extruded Aluminum Sign Panels (see SMD(SLIP-1))

REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



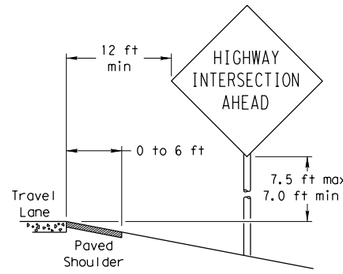
To avoid vehicle undercarriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).

No more than 2 sign posts should be located within a 7 ft. circle.



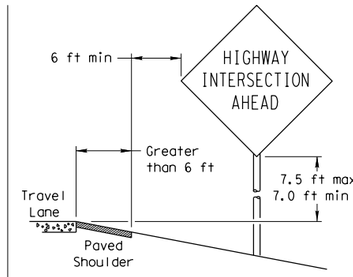
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

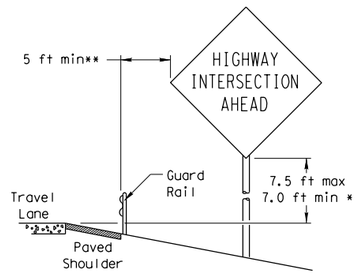
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



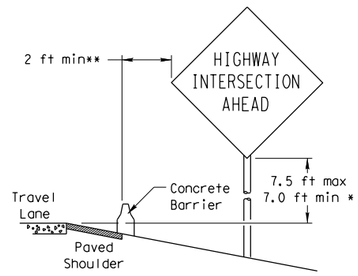
GREATER THAN 6 FT. WIDE

When the shoulder is greater than 6 ft in width, the sign must be placed at least 6 ft. from the edge of the shoulder.

BEHIND BARRIER



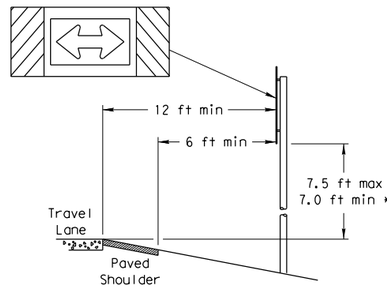
BEHIND GUARDRAIL



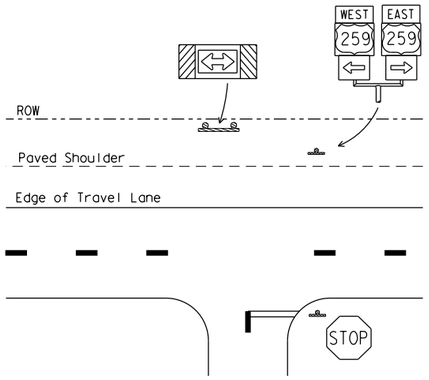
BEHIND CONCRETE BARRIER

**Sign clearance based on distance required for proper guard rail or concrete barrier performance.

T-INTERSECTION



When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.



* Signs shall be mounted using the following condition that results in the greatest sign elevation:

(1) a minimum of 7 to a maximum of 7.5 feet above the edge of the travel lane or

(2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.

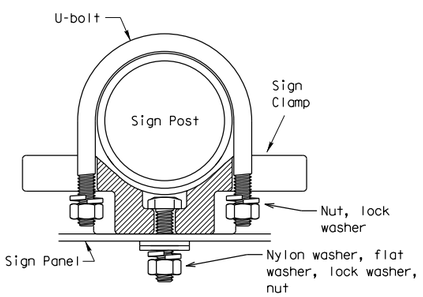
The maximum values may be increased when directed by the Engineer.

See the Traffic Operations Division website for detailed drawings of sign clamps, Triangular Slipbase System components and Wedge Anchor System components.

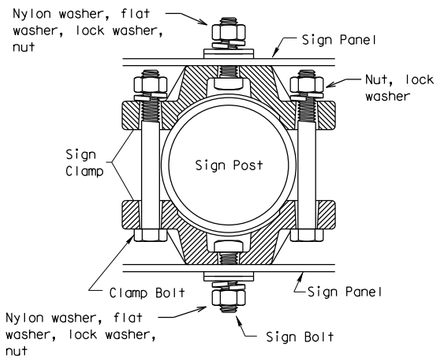
The website address is:
http://www.txdot.gov/publications/traffic.htm

TYPICAL SIGN ATTACHMENT DETAIL

Single Signs



Back-to-Back Signs



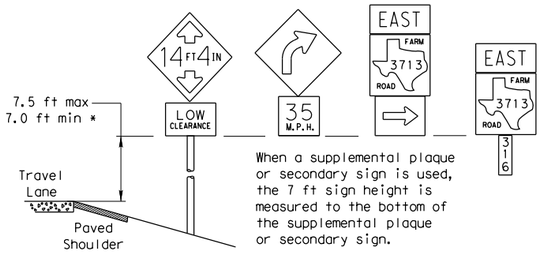
Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

When two sign clamps are used to mount signs back-to-back, use a 5/16-18 UNC galvanized hex head per ASTM A307 with nut and helical-spring lock washer. The approximate bolt lengths for various post sizes and sign clamp types are given in the table at right. The bolt length may need to be adjusted depending upon field conditions.

Sign clamps may be either the specific size clamp or the universal clamp.

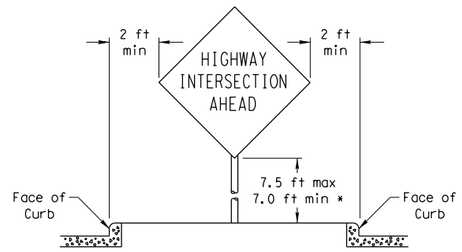
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



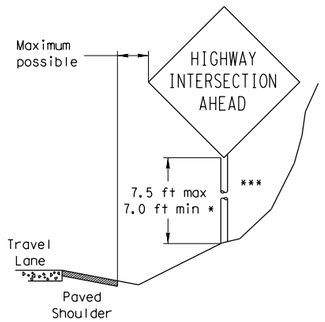
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

CURB & GUTTER OR RAISED ISLAND



RESTRICTED RIGHT-OF-WAY

(When 6 ft min. is not possible.)



Right-of-way restrictions may be created by rocks, water, vegetation, forest, buildings, a narrow island, or other factors.

In situations where a lateral restriction prevents the minimum horizontal clearance from the edge of the travel lane, signs should be placed as far from the travel lane as practical.

*** Post may be shorter if protected by guardrail or if Engineer determines the post could not be hit due to extreme slope.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD(GEN)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

9-08 REVISIONS

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BRY	BURLESON		97

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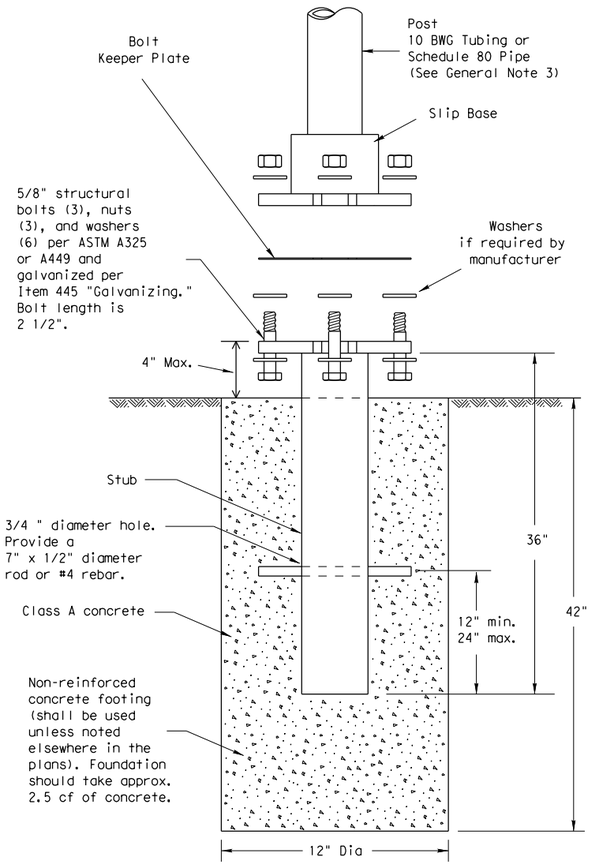
TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS



SM RD SGN ASSM TY XXXXX(X)SA(X-XXXX)

NOTE

There are various devices approved for the Triangular Slipbase System. Please reference the Material Producer List for approved slip base systems. http://www.txdot.gov/business/producer_list.htm The devices shall be installed per manufacturers' recommendations. Installation procedures shall be provided to the Engineer by Contractor.

GENERAL NOTES:

1. Slip base shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to approval of the TxDOT Traffic Standards Engineer.
2. Material used as post with this system shall conform to the following specifications:
   10 BWG Tubing (2.875" outside diameter)
   - 0.134" nominal wall thickness
   - Seamless or electric-resistance welded steel tubing or pipe
   - Steel shall be HSLAS Gr 55 per ASTM A1011 or ASTM A1008
   - Other steels may be used if they meet the following:
     - 55,000 PSI minimum yield strength
     - 70,000 PSI minimum tensile strength
     - 20% minimum elongation in 2"
   - Wall thickness (uncoated) shall be within the range of 0.122" to 0.138"
   - Outside diameter (uncoated) shall be within the range of 2.867" to 2.883"
   - Galvanization per ASTM A123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.

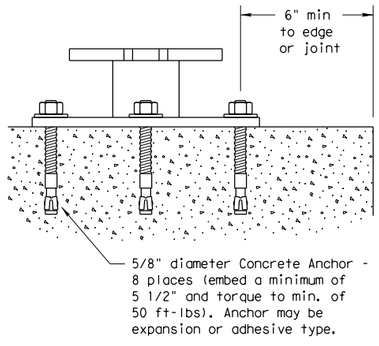
   Schedule 80 Pipe (2.875" outside diameter)
   - 0.276" nominal wall thickness
   - Steel tubing per ASTM A500 Gr C
   - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
     - 46,000 PSI minimum yield strength
     - 62,000 PSI minimum tensile strength
     - 21% minimum elongation in 2"
   - Wall thickness (uncoated) shall be within the range of 0.248" to 0.304"
   - Outside diameter (uncoated) shall be within the range of 2.855" to 2.895"
   - Galvanization per ASTM A123
3. See the Traffic Operations Division website for detailed drawings of sign clamps and Texas Universal Triangular Slipbase System components. The website address is: http://www.txdot.gov/publications/traffic.htm
4. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.

ASSEMBLY PROCEDURE

Foundation
1. Prepare 12-inch diameter by 42-inch deep hole. If solid rock is encountered, the depth of the foundation may be reduced such that it is embedded a minimum of 18 inches into the solid rock.
2. The Engineer may permit batches of concrete less than 2 cubic yards to be mixed with a portable, motor-driven concrete mixer. For small placements less than 0.5 cubic yards, hand mixing in a suitable container may be allowed by Engineer. Concrete shall be Class A.
3. Push the pipe end of the slip base stub into the center of the concrete. Rotate the stub back and forth while pushing it down into the concrete to assure good contact between the concrete and stub. Continue to work the stub into the concrete until it is between 2 to 4 inches above the ground.
4. Plumb the stub. Allow a minimum of 4 days to set, unless otherwise directed by the Engineer.
5. The triangular slipbase system is multidirectional and is designed to release when struck from any direction.

Support
1. Cut support so that the bottom of the sign will be 7 to 7.5 feet above the edge of the travelway (i.e., edge of the closest lane) when slip plate is below the edge of pavement or 7 to 7.5 feet above slip plate when the slip plate is above the edge of the travelway. The cut shall be plumb and straight.
2. Attach sign to support using connections shown. When multiple signs are installed on the same support, ensure the minimum clearance between each sign is maintained. See SMD(SLIP-2) for clearances based on sign types.

CONCRETE ANCHOR



SM RD SGN ASSM TY XXXXX(X)SB(X-XXXX)

Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. Heavy hex nut per ASTM A563, and hardened washer per ASTM F436. The stud bolt shall have a minimum yield and ultimate tensile strength of 50 and 75 KSI, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Adhesive type anchors shall have stud bolts installed with Type III epoxy per DMS-6100, "Epoxies and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations. Top of bolt shall extend at least flush with top of the nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 5 1/2" minimum embedment, shall have a minimum allowable tension and shear of 3900 and 3100 psi, respectively.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-1)-08

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9-08 REVISIONS	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		98

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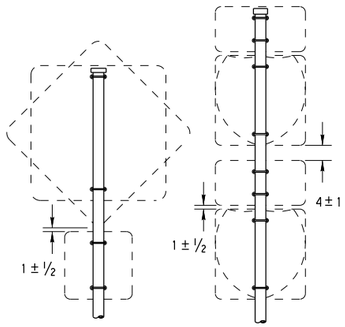

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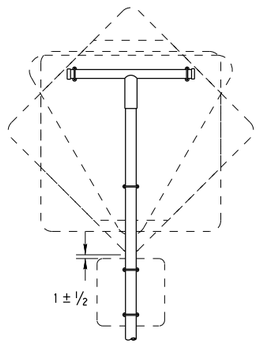
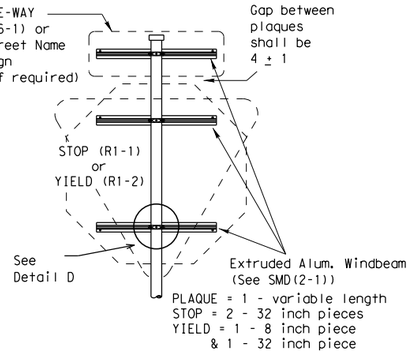
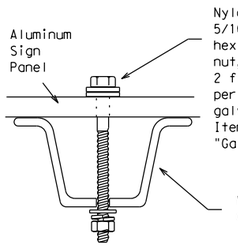


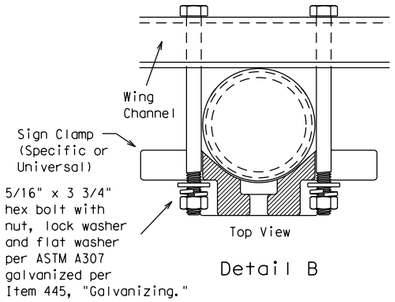
SM RD SGN ASSM TY XXXXX(1)XX(T)



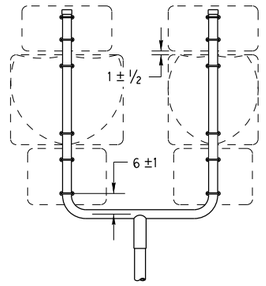
SM RD SGN ASSM TY XXXXX(1)XX(P-BM)



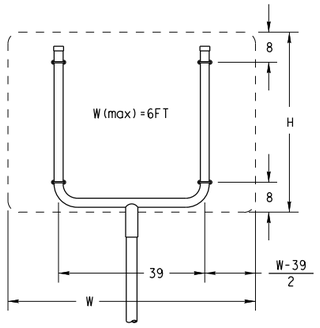
Detail A



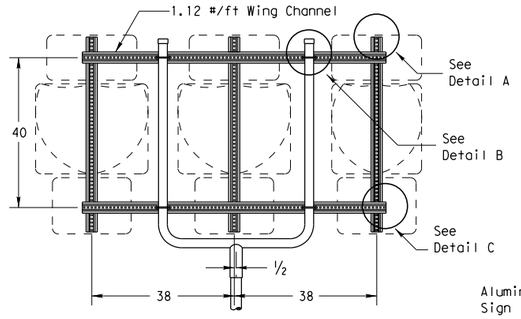
Detail B



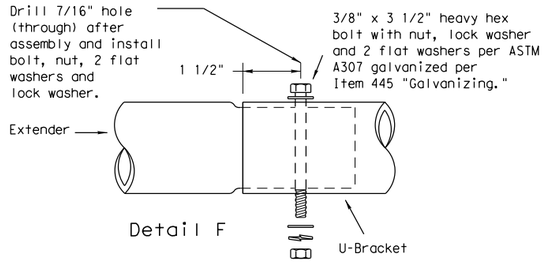
SM RD SGN ASSM TY XXXXX(1)XX(U)



SM RD SGN ASSM TY XXXXX(1)XX(U)

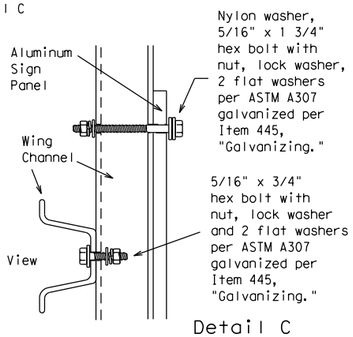


SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)

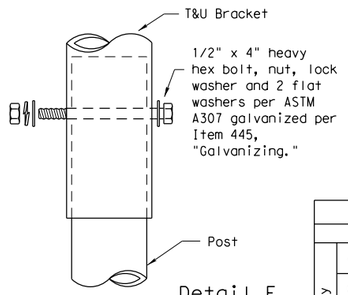


Detail F

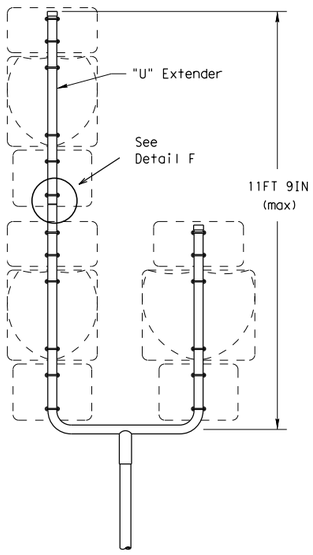
Splices shall only be allowed behind the sign substrate.



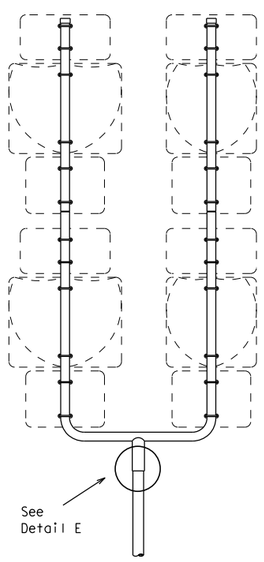
Detail C



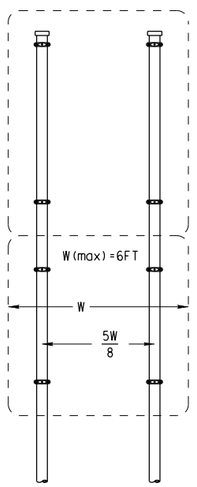
Detail E



SM RD SGN ASSM TY S80(1)XX(U-1EXT)

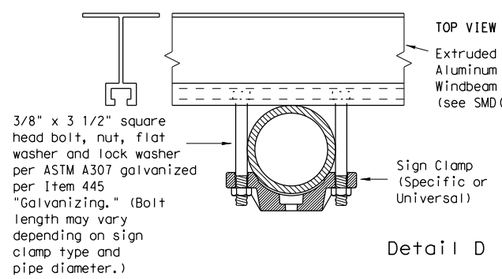


SM RD SGN ASSM TY S80(1)XX(U-2EXT)

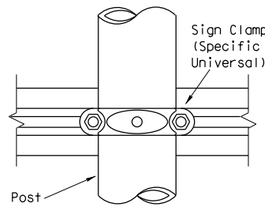


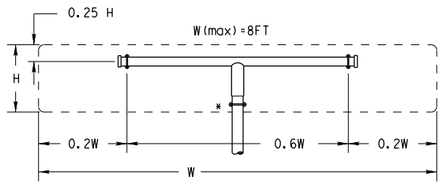
SM RD SGN ASSYM TY XXXXX(2)XX(P)

SIDE VIEW



Detail D

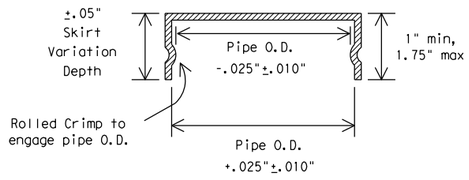




SM RD SGN ASSM TY XXXXX(1)XX(T)
(* - See Note 12)

All dimensions are in english unless detailed otherwise.

FRICTION CAP DETAIL



Friction caps may be manufactured from hot rolled or cold rolled steel sheets. The minimum sheet metal thickness shall be 24 gauge for all cap sizes.

The rim edges shall be reasonably straight and smooth. Caps shall be sized and formed in such a manner as to produce a drive-on friction fit and have no tendency to rock when seated on the pipe. The depth shall be sufficient to give positive protection against entrance of rainwater. They shall be free of sharp creases or indentations and show no evidence of metal fracture.

Caps shall have an electrodeposited coating of zinc in accordance with the requirements of ASTM B633 Class FE/ZN 8.

GENERAL NOTES:

1.

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

2. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
3. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
4. Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
5. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
6. For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
7. When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
8. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
9. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
10. Additional route markers may be added vertically, provided the total sign area does not exceed the maximum allowable amount per Note 1.
11. Additional sign clamp required on the "T-bracket" post for 24 inch height signs. Place the clamp 3 inches above bottom of sign when possible.
12. Post open ends shall be fitted with Friction Caps.
13. Sign blanks shall be the sizes and shapes shown on the plans.

REQUIRED SUPPORT

	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
Warning	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-2)-08

REVISIONS	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
9-08	CONT	SECT	JOB	HIGHWAY
	0955	01	027	FM 166
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		99

26C

DATE: 3/31/2021 3:06:42 PM
FILE: P:\120396\01\Design\027 FM 166\Civil\Standards\Signing\smds2.dgn

DATE: 3/31/2021 3:06:45 PM
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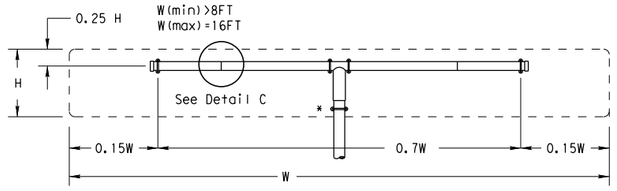
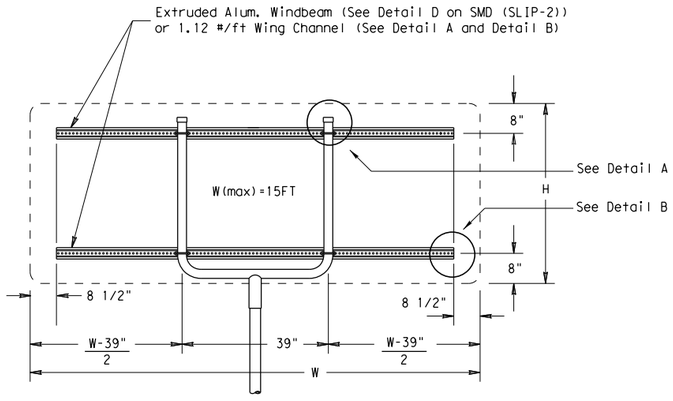
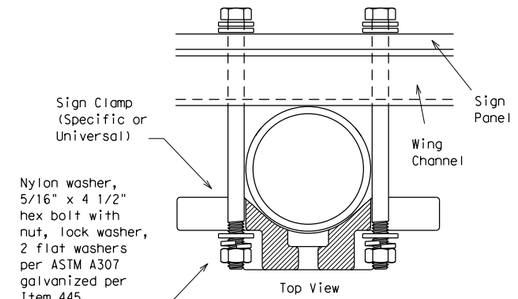


SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)
(* - See Note 12)

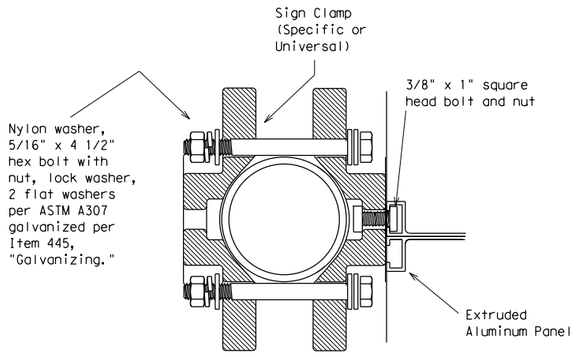


SM RD SGN ASSM TY XXXXX(1)XX(U-XX)

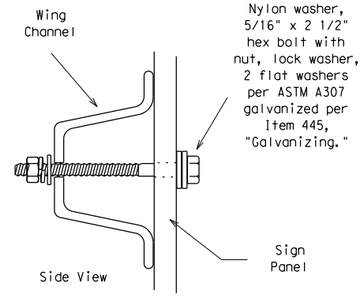


Top View

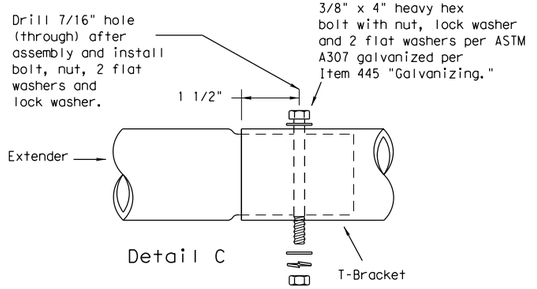
Detail A



Detail D
EXTRUDED ALUMINUM SIGN WITH T BRACKET

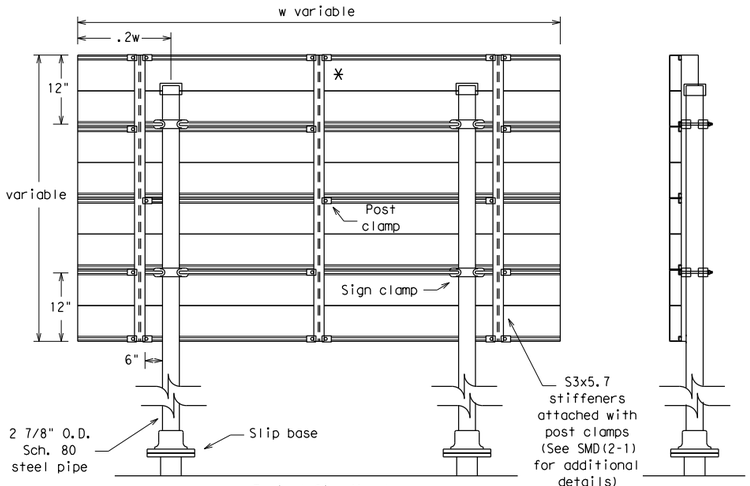


Detail B



Detail C

Splices shall only be allowed behind the sign substrate.

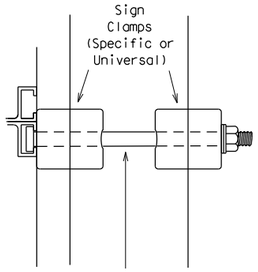


Typical Sign Mount

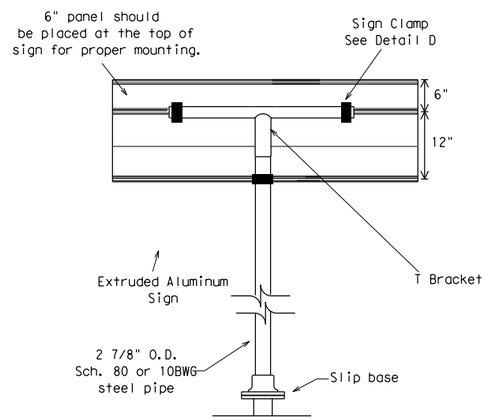
SM RD SGN ASSM TY S80(2)XX(P-EXAL)

* Additional stiffener placed at approximate center of signs when sign width is greater than 10'.

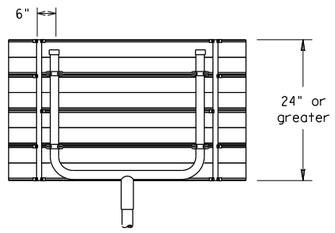
See Detail E
for clamp installation



Detail E



Extruded Aluminum Sign
With T Bracket



Use Extruded Alum. Windbeam as stiffeners
See SMD (2-1) for additional details

See Detail E
for clamp installation

GENERAL NOTES:

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

1. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
2. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
3. Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
4. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
5. For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
6. When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
7. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
8. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
9. Sign blanks shall be the sizes and shapes shown on the plans.
10. Additional sign clamp required on the "T-bracket" post for 24 inch high signs. Place the clamp 3 inches above bottom of sign when possible.
11. Post open ends shall be fitted with Friction Caps.

REQUIRED SUPPORT

	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
Warning	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-3)-08

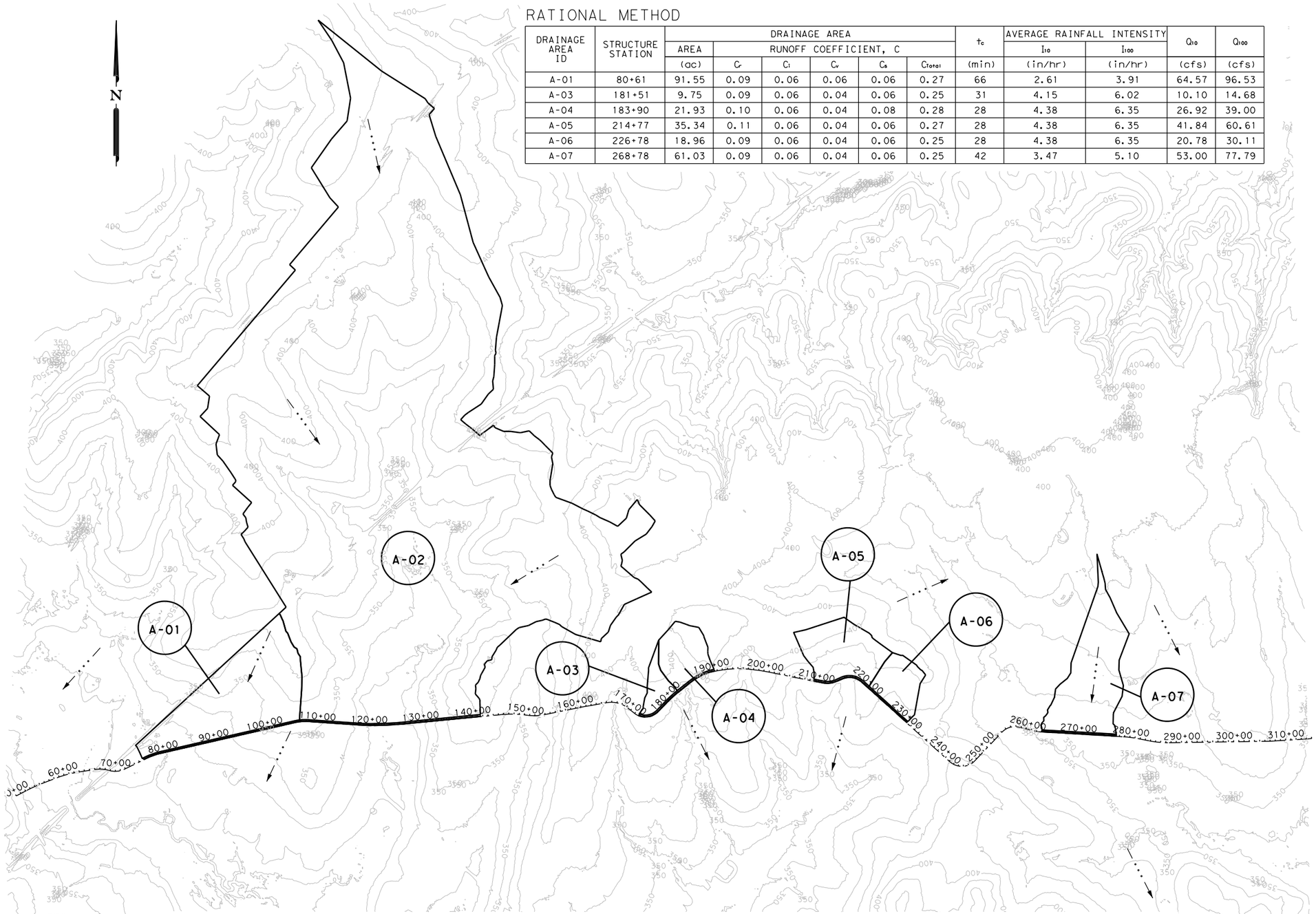
REVISIONS	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
9-08	CONT	SECT	JOB	HIGHWAY
	0955	01	027	FM 166
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		100

Plotted on: 3/31/2021

Design Filename: P:\120\96\01\Design\027 FM 166\Civil\Drainage\1209601_DA01.dgn

RATIONAL METHOD

DRAINAGE AREA ID	STRUCTURE STATION	DRAINAGE AREA						t_c	AVERAGE RAINFALL INTENSITY		Q_{10}	Q_{100}
		AREA	RUNOFF COEFFICIENT, C						I_{10}	I_{100}		
		(ac)	C_F	C_I	C_V	C_B	C_{Total}	(min)	(in/hr)	(in/hr)	(cfs)	(cfs)
A-01	80+61	91.55	0.09	0.06	0.06	0.06	0.27	66	2.61	3.91	64.57	96.53
A-03	181+51	9.75	0.09	0.06	0.04	0.06	0.25	31	4.15	6.02	10.10	14.68
A-04	183+90	21.93	0.10	0.06	0.04	0.08	0.28	28	4.38	6.35	26.92	39.00
A-05	214+77	35.34	0.11	0.06	0.04	0.06	0.27	28	4.38	6.35	41.84	60.61
A-06	226+78	18.96	0.09	0.06	0.04	0.06	0.25	28	4.38	6.35	20.78	30.11
A-07	268+78	61.03	0.09	0.06	0.04	0.06	0.25	42	3.47	5.10	53.00	77.79



NOTES:

1. EXISTING CONTOURS WERE DEVELOPED USING LIDAR DATA.
2. RATIONAL METHOD WAS USED TO CALCULATE TIME OF CONCENTRATION FOR AREAS SMALLER THAN 200 ACRES.
3. SCS METHOD WAS USED TO CALCULATE TIME OF CONCENTRATION FOR AREAS GREATER THAN 200 ACRES.
4. RATIONAL AND SCS METHODS REFERENCE THE TXDOT HYDRAULIC DESIGN MANUAL, SEPTEMBER 2019, USING ATLAS 14 DATA.

LEGEND

- DRAINAGE AREA BOUNDARY
- 850 EXISTING CONTOUR
- FLOW ARROW
- X-X DRAINAGE AREA

DESIGN

STATE OF TEXAS · HEATHER McNEAL · 114428 · LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS · DAN THOMA · 98622 · LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

0 1000 2000 3000

SCALE: 1"= 2000'

SCS METHOD

DRAINAGE AREA ID	STRUCTURE STATION	DRAINAGE AREA SIZE		LOSS PARAMETER (HEC-HMS)			TIME OF CONCENTRATION & LAG TIME					COMPUTED FLOW (HEC-HMS)	
							THE KIRPICH METHOD (CHANNEL FLOW)			TIME OF CONCENTRATION	KERBY-KIRPICH METHOD LAG		
		(AC)	(SQ. MI)	IMPERV %	CN	INITIAL ABSTR	L (FT)	S (FT/FT)	t_{CH} (MINUTES)	t_c (MINUTES)	TRADITIONAL (FOR HEC-HMS $0.6*t_c$)	Q_{10} (CFS)	Q_{100} (CFS)
A-02	122+09	1290.28	2.014	0	83	0	1804	0.004	19	207	125	1314.5	2382.6

PRINT DATE: 3/31/2021 | REVISION DATE:

PAPE-DAWSON ENGINEERS

SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

FM 166

DRAINAGE AREA MAP

SHEET 1 OF 3 SHEETS

FED.RD. DIV.NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	101

Plotted on: 3/31/2021

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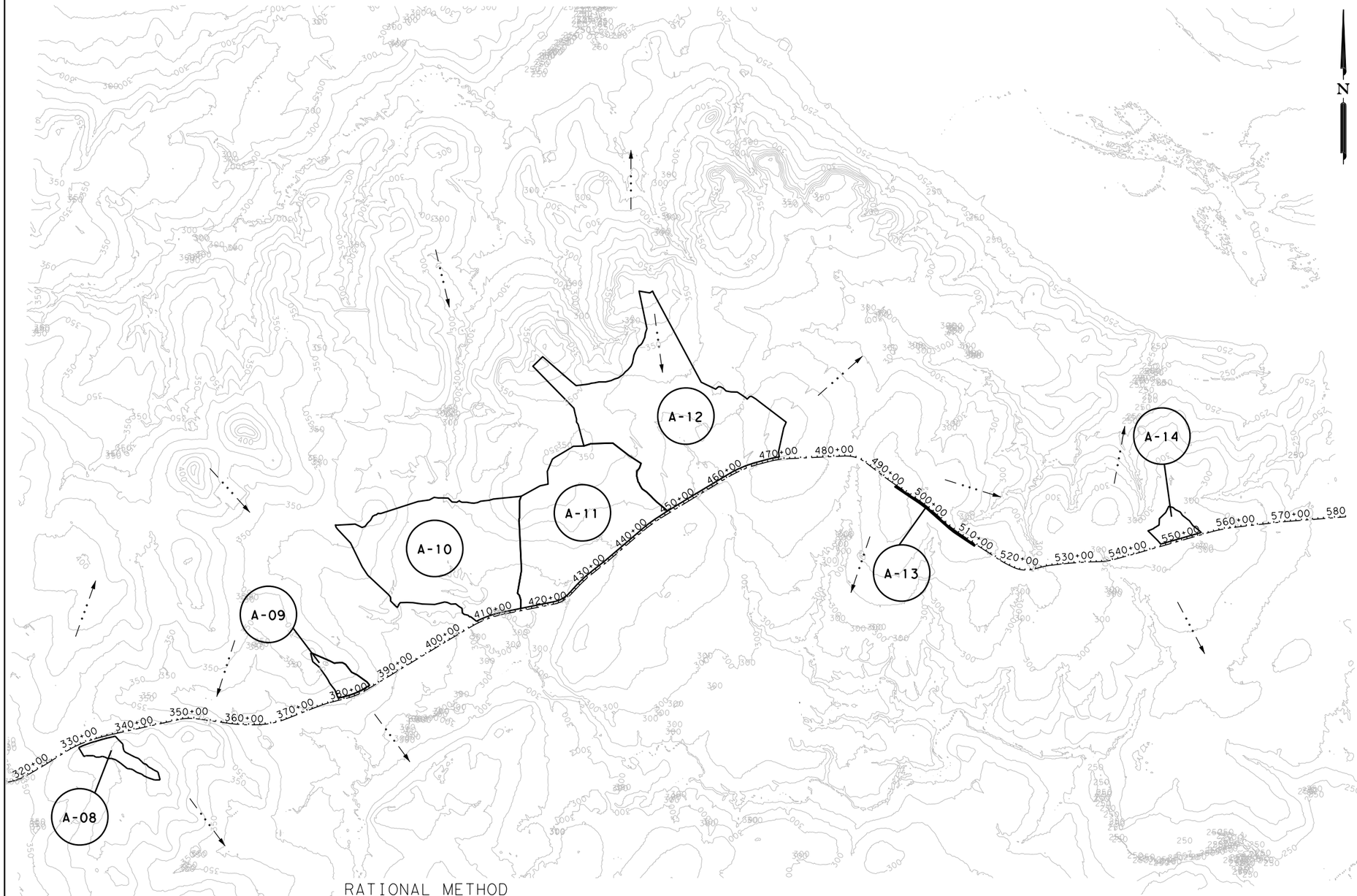

NOTES:

1. EXISTING CONTOURS WERE DEVELOPED USING LIDAR DATA.
2. RATIONAL METHOD WAS USED TO CALCULATE TIME OF CONCENTRATION FOR AREAS SMALLER THAN 200 ACRES.
3. SCS METHOD WAS USED TO CALCULATE TIME OF CONCENTRATION FOR AREAS GREATER THAN 200 ACRES.
4. RATIONAL AND SCS METHODS REFERENCE THE TXDOT HYDRAULIC DESIGN MANUAL, SEPTEMBER 2019, USING ATLAS 14 DATA.

LEGEND

- DRAINAGE AREA BOUNDARY
- 850 EXISTING CONTOUR
- FLOW ARROW
- X-X DRAINAGE AREA

RATIONAL METHOD

DRAINAGE AREA ID	STRUCTURE STATION	DRAINAGE AREA						t_c	AVERAGE RAINFALL INTENSITY		Q_{10}	Q_{100}
		AREA	RUNOFF COEFFICIENT, C						I_{10}	I_{100}		
		(ac)	C_r	C_t	C_v	C_s	C_{total}	(min)	(in/hr)	(in/hr)	(cfs)	(cfs)
A-08	331+78	9.33	0.10	0.06	0.04	0.06	0.26	30	4.22	6.13	10.24	14.87
A-09	392+92	8.72	0.10	0.06	0.04	0.06	0.26	21	5.09	7.33	11.55	16.62
A-10	411+60	122.65	0.09	0.06	0.07	0.06	0.28	34	3.93	5.73	135.10	196.84
A-11	416+90	111.41	0.09	0.06	0.04	0.06	0.25	47	3.24	4.78	90.33	133.14
A-12	456+30	163.50	0.09	0.06	0.06	0.06	0.27	46	3.29	4.84	145.08	213.65
A-13	506+70	1.07	0.09	0.06	0.04	0.06	0.25	28	4.38	6.35	1.17	1.70
A-14	551+77	7.97	0.09	0.06	0.04	0.06	0.25	28	4.38	6.35	8.73	12.65

DESIGN

STATE OF TEXAS · HEATHER McNEAL · 114428 · LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS · DAN THOMA · 98622 · LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

0 1000 2000 3000

SCALE: 1"= 2000'

PRINT DATE	REVISION DATE
3/31/2021	

PAPE-DAWSON ENGINEERS

SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

Texas Department of Transportation ©2021

FM 166

DRAINAGE AREA MAP

SHEET 2 OF 3 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	102

NOTES:

1. EXISTING CONTOURS WERE DEVELOPED USING LIDAR DATA.
2. RATIONAL METHOD WAS USED TO CALCULATE TIME OF CONCENTRATION FOR AREAS SMALLER THAN 200 ACRES.
3. SCS METHOD WAS USED TO CALCULATE TIME OF CONCENTRATION FOR AREAS GREATER THAN 200 ACRES.
4. RATIONAL AND SCS METHODS REFERENCE THE TXDOT HYDRAULIC DESIGN MANUAL, SEPTEMBER 2019, USING ATLAS 14 DATA.

LEGEND

- DRAINAGE AREA BOUNDARY
- 850 EXISTING CONTOUR
- FLOW ARROW
- X-X DRAINAGE AREA

RATIONAL METHOD

DRAINAGE AREA ID	STRUCTURE STATION	DRAINAGE AREA						t_c	AVERAGE RAINFALL INTENSITY		Q_{10}	Q_{100}
		AREA	RUNOFF COEFFICIENT, C						I_{10}	I_{100}		
		(ac)	C_r	C_t	C_v	C_a	C_{total}	(min)	(in/hr)	(in/hr)	(cfs)	(cfs)
A-15	604+40	27.08	0.08	0.06	0.04	0.06	0.24	48	3.20	4.72	20.80	30.68
A-16	607+21	10.96	0.08	0.06	0.04	0.06	0.24	44	3.38	4.96	8.88	13.06
A-17	723+28	1.51	0.08	0.06	0.04	0.06	0.24	86	2.19	3.31	0.79	1.20
A-18	796+37	4.89	0.08	0.06	0.08	0.06	0.28	44	3.38	4.96	4.62	6.80

DESIGN

STATE OF TEXAS — HEATHER McNEAL — 114428 — LICENSED PROFESSIONAL ENGINEER

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FM 166

DRAINAGE AREA MAP

SHEET 3 OF 3 SHEETS

FED. RD. DIV.NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	103

HYDRAULIC DATA (HY-8) (FM 166)

AREA ID	STR STATION NO	TYPE	STRUCTURE DESCRIPTION	ROADWAY ELEVATION	LENGTH	CULV		D.S. CHANNEL		FREQUENCY = 10 YR						FREQUENCY = 100 YR				
						SLOPE	MANNING	SLOPE	MANNING	Q	HW	TW	NORMAL DEPTH	VELOCITY		Q	HW	TW	NORMAL DEPTH	VELOCITY
														UNIFORM	OUTLET					UNIFORM
				(FT)	(FT)	(%)	"n"	(%)	"n"	(CFS)	(FT)	(FT)	(FT)	(FT/S)	(FT/S)	(CFS)	(FT)	(FT)	(FT)	(FT/S)
A-01	80+61	EXIST	36" CMP	326.42	40.00	3.58	0.024	15.00	0.04	64.57	326.51	321.44	2.14	12.92	10.54	96.53	326.78	321.68	2.22	14.34
		PROP	EXTEND-36" X 6' CMP		46.00	3.57	0.024				326.60	321.30	1.95	12.92	10.29		326.84	321.54	2.01	14.34
A-02	122+09	EXIST	3-6'X6' MBC	327.57	36.00	1.53	0.012	7.40	0.04	1314.50	328.44	321.28	3.14	20.08	15.64	2382.60	330.90	322.45	3.66	24.11
		PROP	EXTEND-3-6'X6'X 10' MBC		46.00	1.54	0.012				328.46	321.17	3.12	20.08	15.98		330.91	322.34	3.64	24.11
A-03	181+51	EXIST	24" CMP	389.99	41.00	9.76	0.024	1.43	0.04	10.10	387.42	382.66	0.68	3.33	9.51	14.68	387.93	382.83	0.84	3.68
		PROP	EXTEND- 24' X 12' CMP		53.00	12.45	0.024				387.73	380.03	0.68	3.33	15.50		388.32	380.19	0.84	3.68
A-04	183+90	EXIST	42" RCP	389.99	69.00	6.28	0.012	1.16	0.04	26.92	378.44	373.03	0.72	3.76	15.14	39.00	379.04	373.26	0.87	4.16
		PROP	EXTEND- 42" X 14' RCP		83.00	5.80	0.012				378.96	373.11	0.83	3.90	15.49		379.55	373.35	1.02	4.31
A-05	214+77	EXIST	(DES 8) 66"X38" CMP	373.82	36.00	0.17	0.024	2.26	0.04	41.84	371.06	370.00	3.17	5.53	5.70	60.61	371.85	370.26	3.17	6.07
		PROP	EXTEND- (DES) 8 66"X38" X 4' CMP		40.00	0.17	0.024				371.00	370.00	3.17	5.53	5.66		371.76	370.26	3.17	6.07
A-06	226+78	EXIST	24" CMP	376.61	38.00	1.45	0.024	5.85	0.04	20.78	376.66	373.37	2.00	4.73	7.18	30.11	376.78	373.47	2.00	5.22
		PROP	24" CMP		38.00	1.45	0.024				376.65	373.37	2.00	4.73	7.30		376.78	373.47	2.00	5.22
A-07	268+78	EXIST	(DES 4) 35"X24" CMP	355.03	39.00	0.28	0.024	12.46	0.04	53.00	355.30	352.24	2.00	12.10	7.84	77.79	355.48	352.49	2.00	13.48
		PROP	REMOVE-(DES 4) 35"X24" X 2' CMP		37.00	0.27	0.024				355.29	352.25	2.00	12.10	8.08		355.47	352.50	2.00	13.48
A-08	331+78	EXIST	24" CMP	368.92	44.00	0.84	0.024	5.27	0.04	10.24	367.12	365.87	1.46	5.75	5.52	14.87	367.74	366.03	2.00	6.31
		PROP	24" CMP		44.00	0.84	0.024				367.06	365.87	1.46	5.75	5.52		367.67	366.03	2.00	6.31
A-09	392+92	EXIST	30" CMP	316.82	45.00	2.44	0.024	15.60	0.04	11.55	315.17	312.96	0.97	9.06	6.37	16.62	315.63	313.09	1.19	10.02
		PROP	REMOVE-30" X 2' CMP		43.00	2.44	0.024				315.06	312.91	0.97	9.06	6.37		315.46	313.04	1.19	10.02
A-10	411+60	EXIST	2- 48" CMP	302.99	50.00	0.74	0.024	18.90	0.04	135.10	298.21	294.17	4.00	12.51	8.26	196.84	299.76	294.33	4.00	14.17
		PROP	EXTEND- 2- 48" X 12' CMP		56.00	0.74	0.024				300.16	295.07	1.84	12.51	10.91		301.48	295.23	2.31	14.17
A-11	416+90	EXIST	5'X5' SBC & 60"X16" CMP	305.28	48.00	2.08	0.024	1.37	0.04	90.33	301.75	298.64	2.27	5.75	9.62	133.14	303.20	299.06	2.87	6.35
		PROP	REPLACE W/ 60"X43" X 44' CMP		44.00	2.09	0.024				301.72	298.69	2.27	5.75	9.61		303.17	299.11	2.87	6.35
A-12	456+30	EXIST	2- 24" CMP	320.37	51.00	2.24	0.024	6.33	0.04	145.08	321.08	315.94	2.00	10.25	9.11	213.65	321.39	316.24	2.00	11.34
		PROP	2- 24" CMP		51.00	2.24	0.024				321.07	315.94	2.00	10.25	9.28		321.39	316.24	2.00	11.34
A-13	506+70	EXIST	24" RCP	321.25	39.00	11.56	0.012	0.84	0.04	1.17	316.80	312.13	0.16	1.12	9.59	1.70	316.90	312.18	0.19	1.23
		PROP	EXTEND- 24" X 12' RCP		45.00	10.25	0.012				317.49	312.09	0.33	1.12	7.84		317.59	312.13	0.39	1.23
A-14	551+77	EXIST	24" CMP	303.91	42.00	1.55	0.024	4.37	0.04	8.73	302.78	300.52	1.06	3.31	5.21	12.65	303.21	300.58	1.35	3.81
		PROP	EXTEND- 24" X 2' CMP		44.00	1.55	0.024				302.73	300.52	1.06	3.31	5.21		303.14	300.58	1.35	3.81
A-15	604+40	EXIST	24" RCP	265.05	45.00	0.56	0.012	2.61	0.04	20.80	264.21	262.12	2.00	4.06	7.57	30.68	265.14	262.27	2.00	4.48
		PROP	REMOVE-24" X 8' RCP		37.00	0.57	0.012				264.88	262.14	2.00	4.06	7.57		265.20	262.29	2.00	4.48
A-16	607+21	EXIST	24" CMP LT & 18" RCP RT	265.69	44.00	0.23	0.024	8.36	0.04	8.88	263.75	262.22	2.00	5.71	5.24	13.06	264.35	262.32	2.00	6.34
		PROP	REPLACE W/ DES3 X 46' RCP		46.00	0.24	0.012				263.40	262.22	1.29	5.71	5.38		264.18	262.32	1.29	6.34
A-17	723+28	EXIST	24" CMP	231.91	41.00	0.76	0.024	1.88	0.04	0.79	226.72	226.17	0.36	1.42	2.68	1.20	226.84	226.21	0.44	1.58
		PROP	EXTEND- 24" X 6' CMP		47.00	0.77	0.024				226.71	226.12	0.36	1.42	2.68		226.82	226.16	0.44	1.58
A-18	796+37	EXIST	24" CMP	228.28	40.00	1.82	0.024	11.10	0.04	4.62	226.13	224.65	0.70	4.55	4.37	6.80	226.42	224.71	0.87	5.01
		PROP	EXTEND- 24" X 2' CMP		42.00	1.83	0.024				226.13	224.61	0.70	4.55	4.54		226.39	224.67	0.87	5.01

NOTES:

1. CULVERTS ANALYZED USING HY-8 VERSION 7.50

DESIGN

STATE OF TEXAS
HEATHER McNEAL
114428
LICENSED
PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS
DAN THOMA
98622
LICENSED
PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

PRINT DATE	REVISION DATE
3/31/2021	

PAPE-DAWSON ENGINEERS
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2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

FM 166

HYDRAULIC DATA

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	104

Plotted on: 3/31/2021

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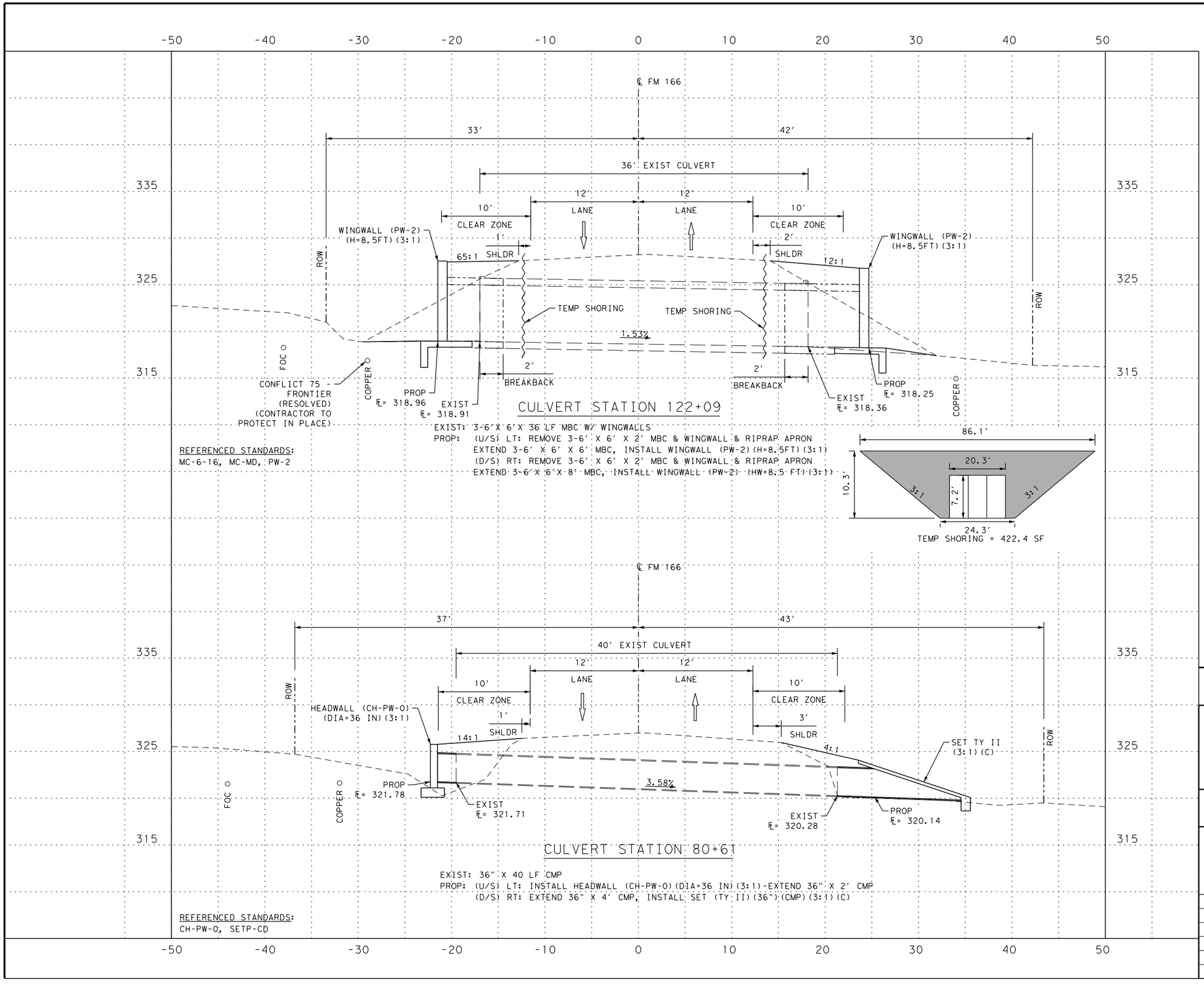

REFERENCED STANDARDS:
MC-6-16, MC-MD, PW-2

REFERENCED STANDARDS:
CH-PW-0, SETP-CD

NOTES

1. ALL SIDE SLOPES SHOWN ARE NORMAL TO ROADWAY PAVEMENT.
2. EXISTING FEATURES ARE SHOWN SCREENED BACK; i.e. FADED.
3. ALL PAVEMENT AND SUB-BASE REMOVAL AND RESTORATION SHALL BE PAID UNDER ITEM 400-6006 "CUT AND RESTORING PAV". SEE DRIVEWAY AND SIDE ROAD CUT & RESTORE PAVEMENT DETAILS FOR MORE INFORMATION.
4. PAVEMENT AND SUB-BASE THICKNESS ARE APPROXIMATE AND ARE FOR CONTRACTOR INFORMATION ONLY. CONTRACTOR SHALL MATCH EXISTING PAVEMENT STRUCTURE.
5. DEPTH OF UTILITIES ARE ASSUMED AT MINIMUM PER UTILITY ACCOMMODATION RULES (UAR).

DESIGN

STATE OF TEXAS · HEATHER McNEAL · 114428 · LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS · DAN THOMA · 98622 · LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

SCALE: H: 1"= 10′
V: 1"= 10′

PRINT DATE	REVISION DATE
3/31/2021	

PAPE-DAWSON ENGINEERS
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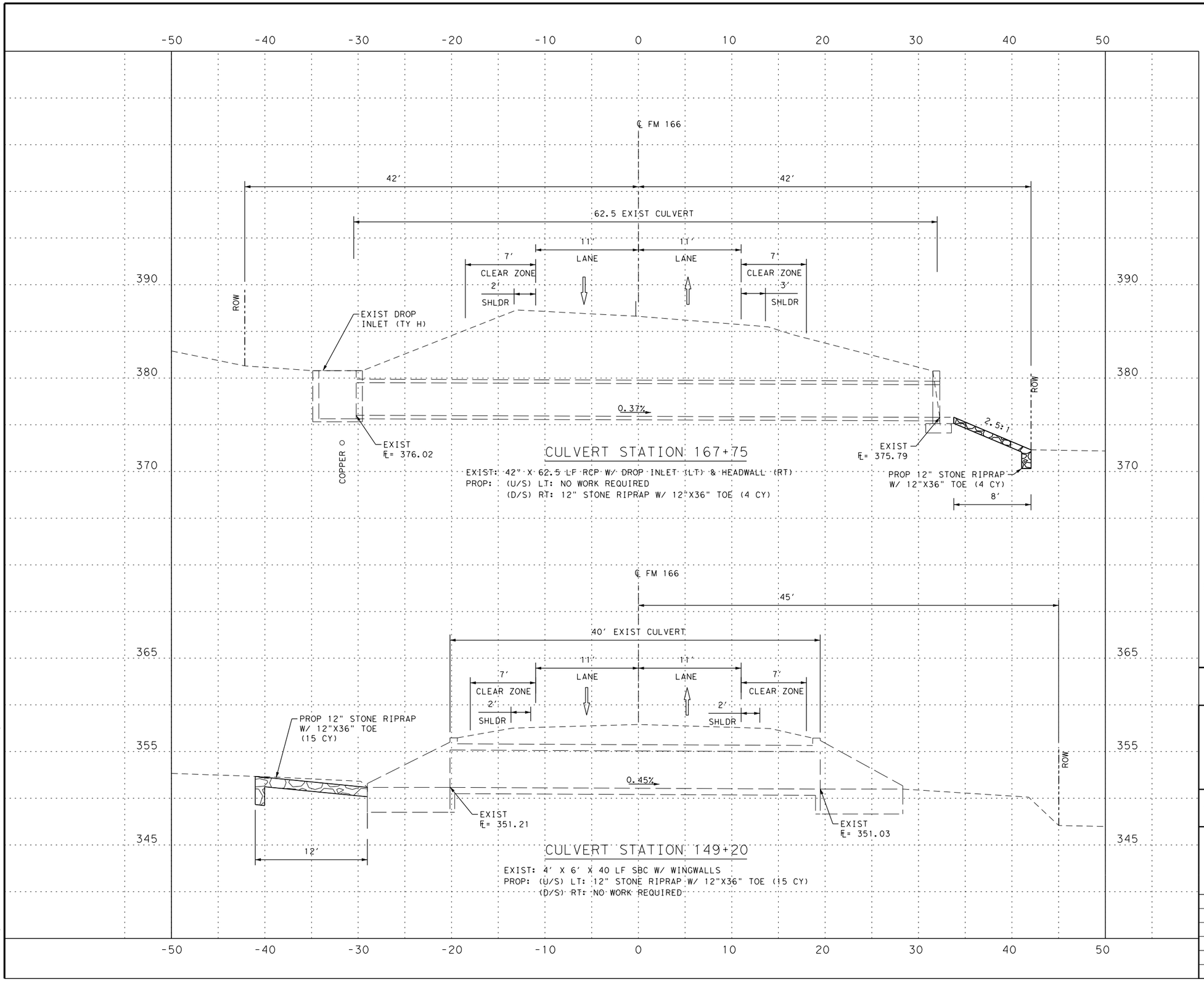
FM 166

CULVERT LAYOUT

SHEET 1 OF 26 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	105



Plotted on: 3/31/2021

Design Filename: ...\209601_culv_profile.dgn

NOTES

1. ALL SIDE SLOPES SHOWN ARE NORMAL TO ROADWAY PAVEMENT.
2. EXISTING FEATURES ARE SHOWN SCREENED BACK; i.e. FADED.
3. ALL PAVEMENT AND SUB-BASE REMOVAL AND RESTORATION SHALL BE PAID UNDER ITEM 400-6006 "CUT AND RESTORING PAV". SEE DRIVEWAY AND SIDE ROAD CUT & RESTORE PAVEMENT DETAILS FOR MORE INFORMATION.
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DESIGN

STATE OF TEXAS — HEATHER McNEAL — 114428 — LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS — DAN THOMA — 98622 — LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

SCALE: H: 1"= 10'
V: 1"= 10'

PRINT DATE	REVISION DATE
3/31/2021	

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FM 166

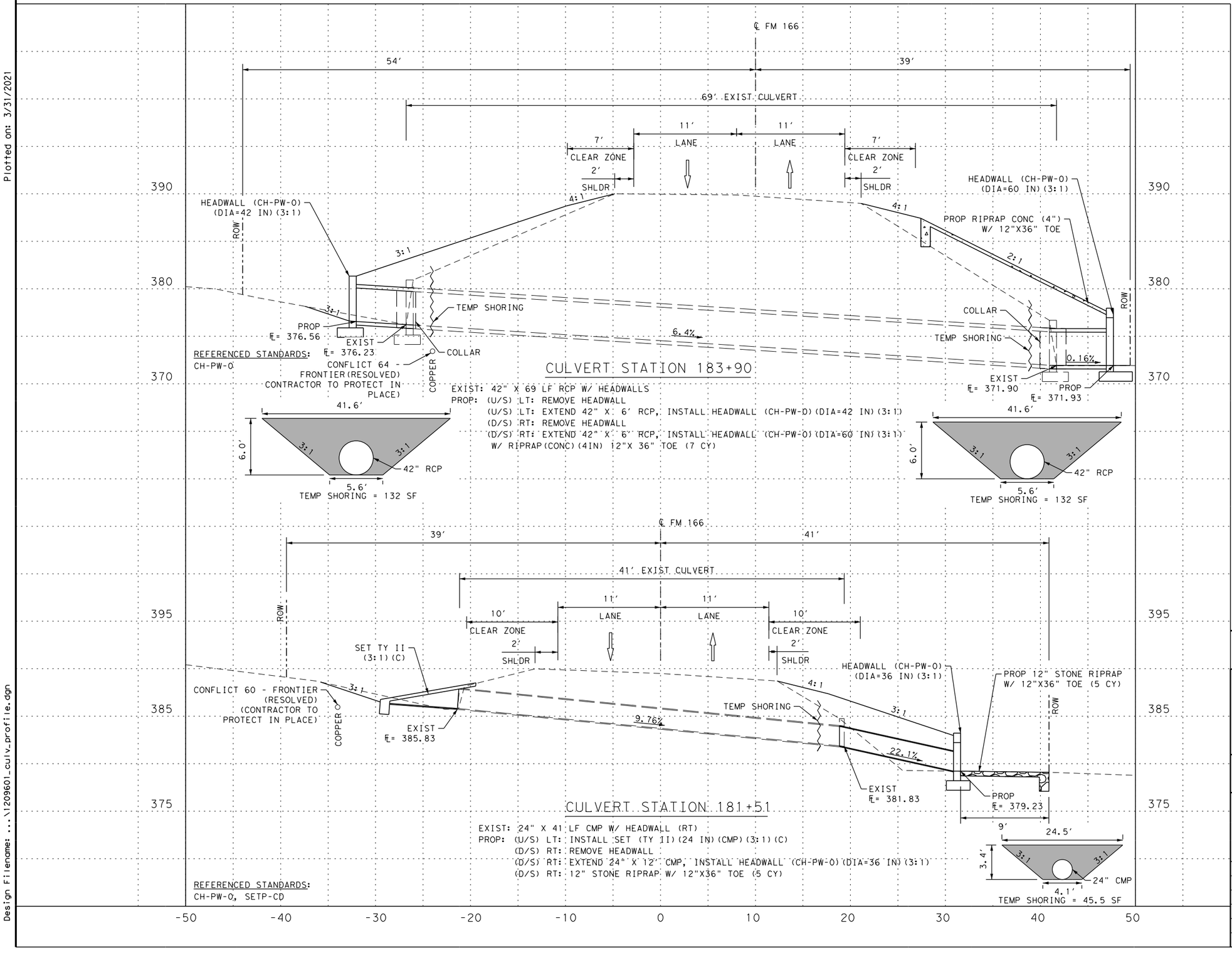
CULVERT LAYOUT

SHEET 2 OF 26 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	106

Plotted on: 3/31/2021



NOTES

1. ALL SIDE SLOPES SHOWN ARE NORMAL TO ROADWAY PAVEMENT.
2. EXISTING FEATURES ARE SHOWN SCREENED BACK; i.e. FADED.
3. ALL PAVEMENT AND SUB-BASE REMOVAL AND RESTORATION SHALL BE PAID UNDER ITEM 400-6006 "CUT AND RESTORING PAV". SEE DRIVEWAY AND SIDE ROAD CUT & RESTORE PAVEMENT DETAILS FOR MORE INFORMATION.
4. PAVEMENT AND SUB-BASE THICKNESS ARE APPROXIMATE AND ARE FOR CONTRACTOR INFORMATION ONLY. CONTRACTOR SHALL MATCH EXISTING PAVEMENT STRUCTURE.
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DESIGN

STATE OF TEXAS — HEATHER McNEAL — 114428 — LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS — DAN THOMA — 98622 — LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

SCALE: H: 1"= 10′
V: 1"= 10′

PRINT DATE	REVISION DATE
3/31/2021	

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TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

FM 166

CULVERT LAYOUT

SHEET 3 OF 26 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	107

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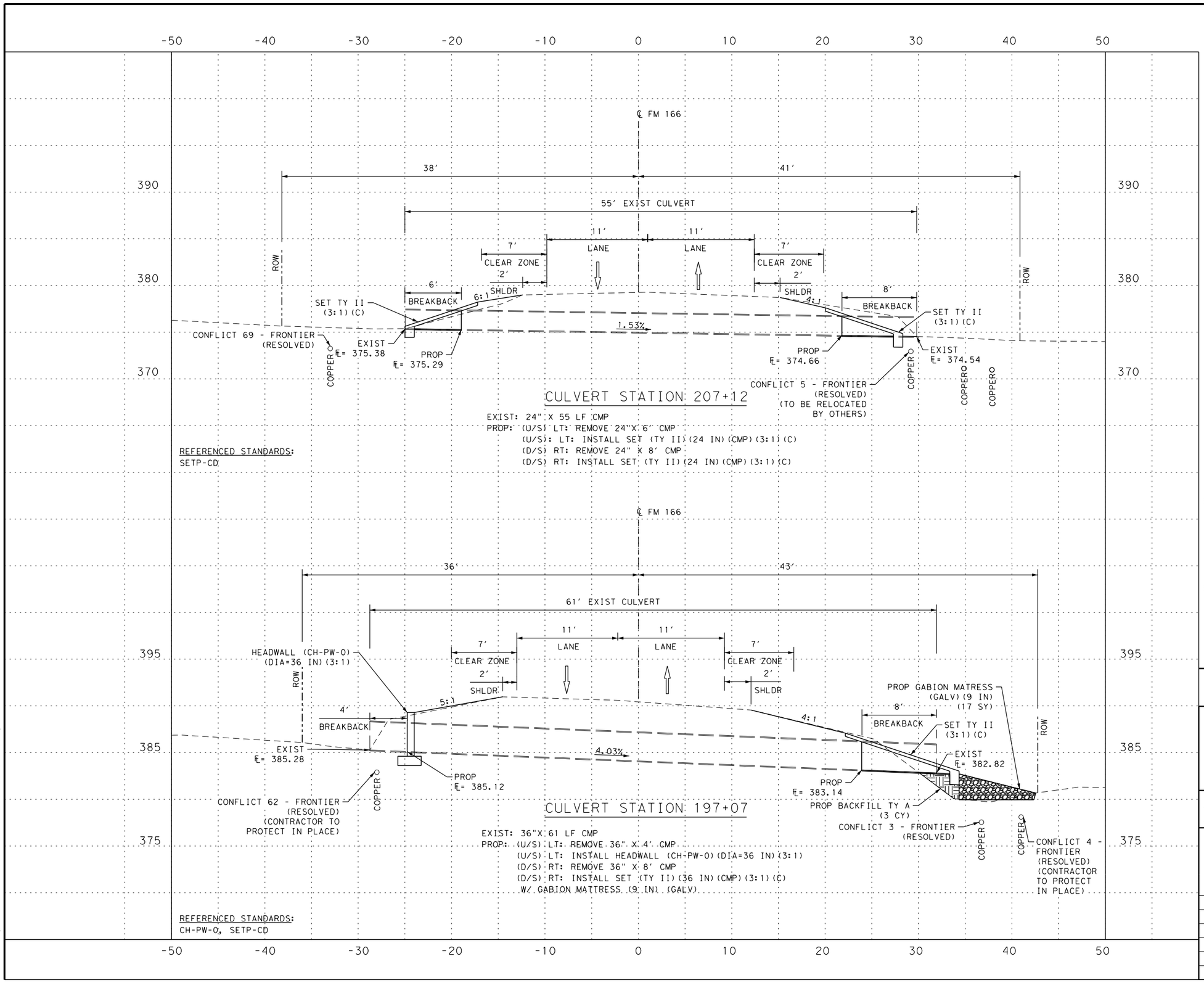

Plotted on: 3/31/2021

Design Filename: ...\209601_culv_profile.dgn

NOTES

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2. EXISTING FEATURES ARE SHOWN SCREENED BACK; i.e. FADED.
3. ALL PAVEMENT AND SUB-BASE REMOVAL AND RESTORATION SHALL BE PAID UNDER ITEM 400-6006 "CUT AND RESTORING PAV". SEE DRIVEWAY AND SIDE ROAD CUT & RESTORE PAVEMENT DETAILS FOR MORE INFORMATION.
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5. DEPTH OF UTILITIES ARE ASSUMED AT MINIMUM PER UTILITY ACCOMMODATION RULES (UAR).

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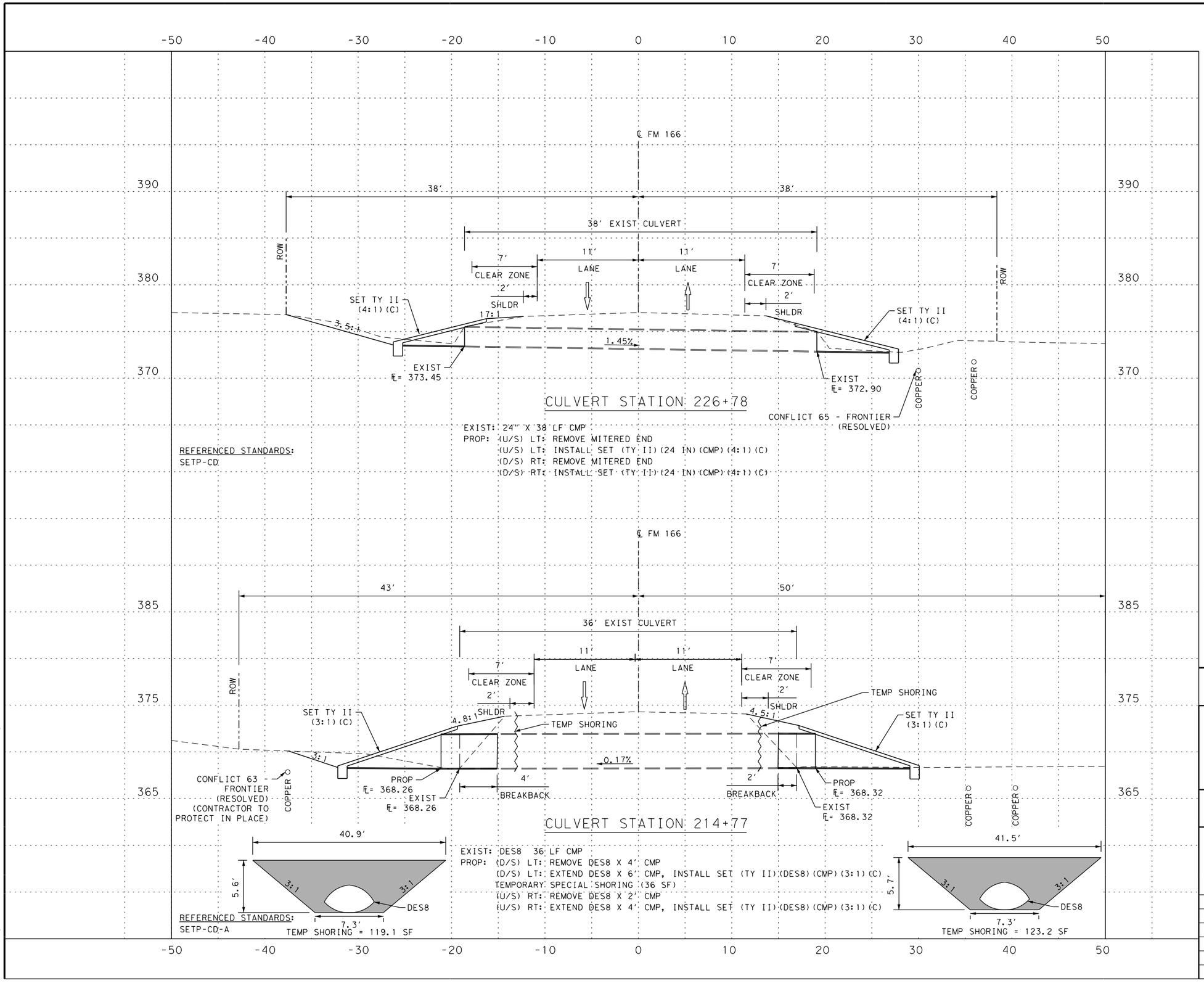
FM 166

CULVERT LAYOUT

SHEET 4 OF 26 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER		HIGHWAY NUMBER
6			FM 166
STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	108



Plotted on: 3/31/2021

Design Filename: ...\1209601_culv_profile.dgn

NOTES

1. ALL SIDE SLOPES SHOWN ARE NORMAL TO ROADWAY PAVEMENT.
2. EXISTING FEATURES ARE SHOWN SCREENED BACK; i.e. FADED.
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DESIGN

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HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

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TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

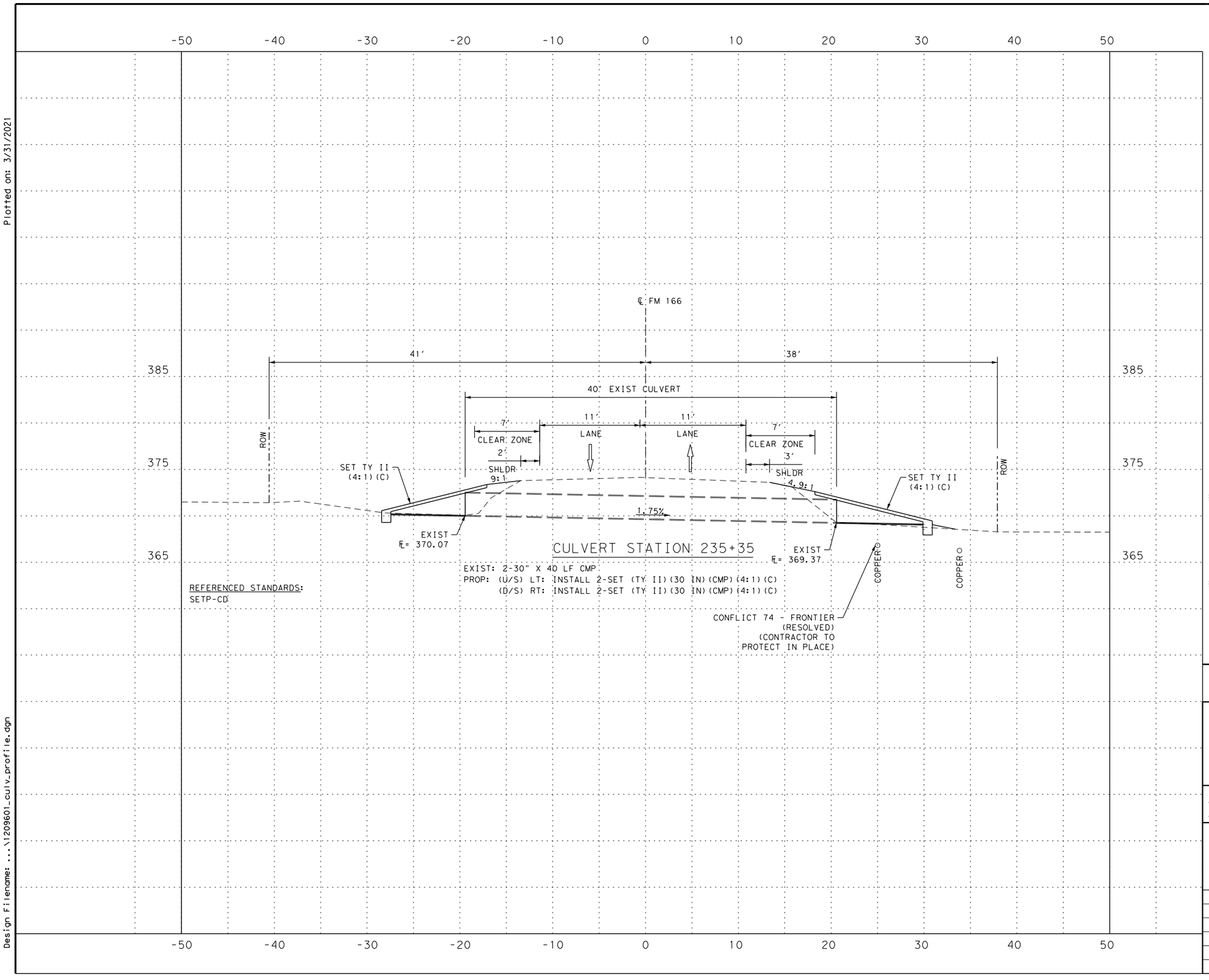
FM 166

CULVERT LAYOUT

SHEET 5 OF 26 SHEETS

FED. RD. DIV.NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	109



Plotted on: 3/31/2021

Design Filename: ...\1209601_culv_profile.dgn

NOTES

1. ALL SIDE SLOPES SHOWN ARE NORMAL TO ROADWAY PAVEMENT.
2. EXISTING FEATURES ARE SHOWN SCREENED BACK; i.e. FADED.
3. ALL PAVEMENT AND SUB-BASE REMOVAL AND RESTORATION SHALL BE PAID UNDER ITEM 400-6006 "CUT AND RESTORING PAV". SEE DRIVEWAY AND SIDE ROAD CUT & RESTORE PAVEMENT DETAILS FOR MORE INFORMATION.
4. PAVEMENT AND SUB-BASE THICKNESS ARE APPROXIMATE AND ARE FOR CONTRACTOR INFORMATION ONLY. CONTRACTOR SHALL MATCH EXISTING PAVEMENT STRUCTURE.
5. DEPTH OF UTILITIES ARE ASSUMED AT MINIMUM PER UTILITY ACCOMMODATION RULES (UAR).

DESIGN

STATE OF TEXAS · HEATHER McNEAL · 114428 · LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS · DAN THOMA · 98622 · LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

SCALE: H: 1"= 10'
V: 1"= 10'

PRINT DATE	REVISION DATE
3/31/2021	

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

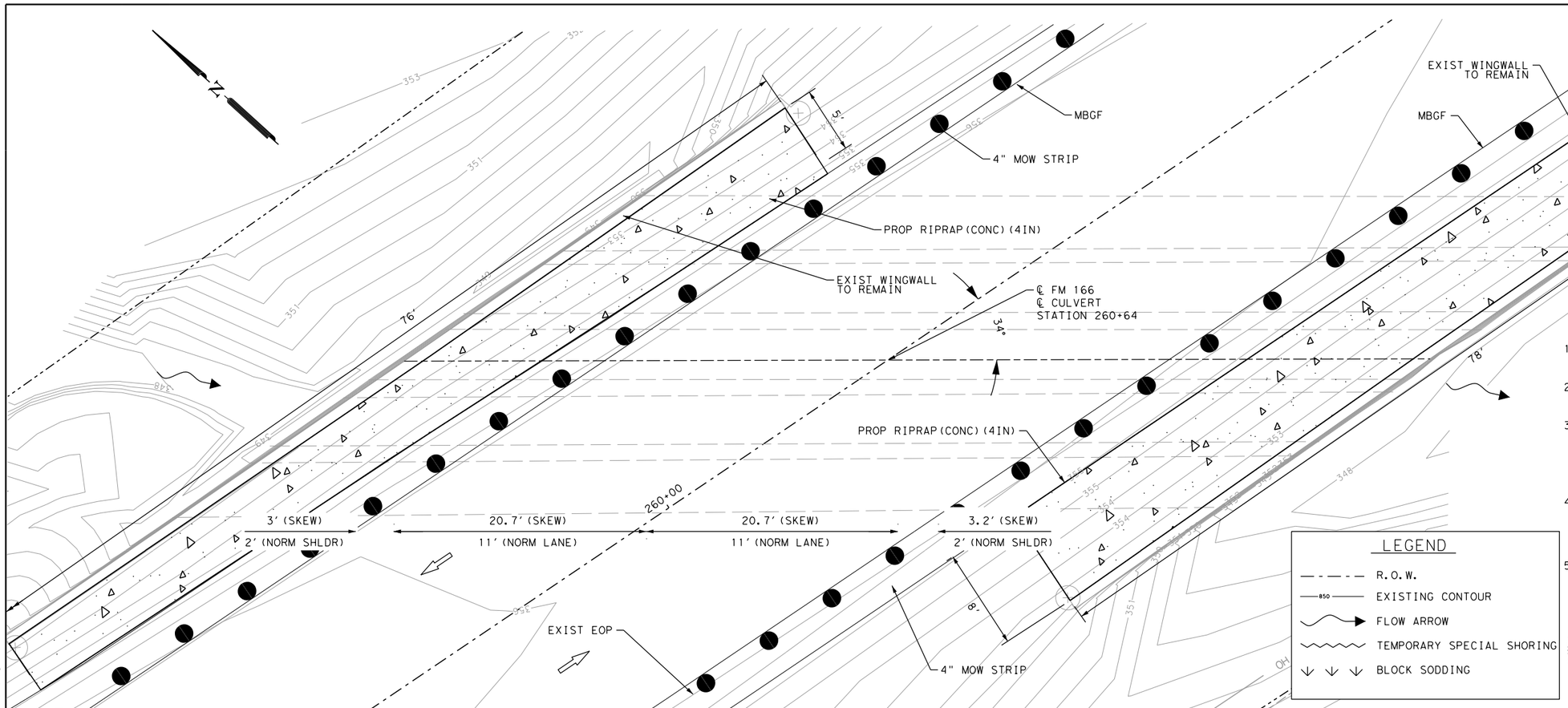
FM 166

CULVERT LAYOUT

SHEET 6 OF 26 SHEETS

FED. RD. DIV.NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	110



NOTES

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LEGEND

- R.O.W.
- 850 EXISTING CONTOUR
- FLOW ARROW
- TEMPORARY SPECIAL SHORING
- BLOCK SODDING

DESIGN

STATE OF TEXAS — HEATHER McNEAL — 114428 — LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS — DAN THOMA — 98622 — LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

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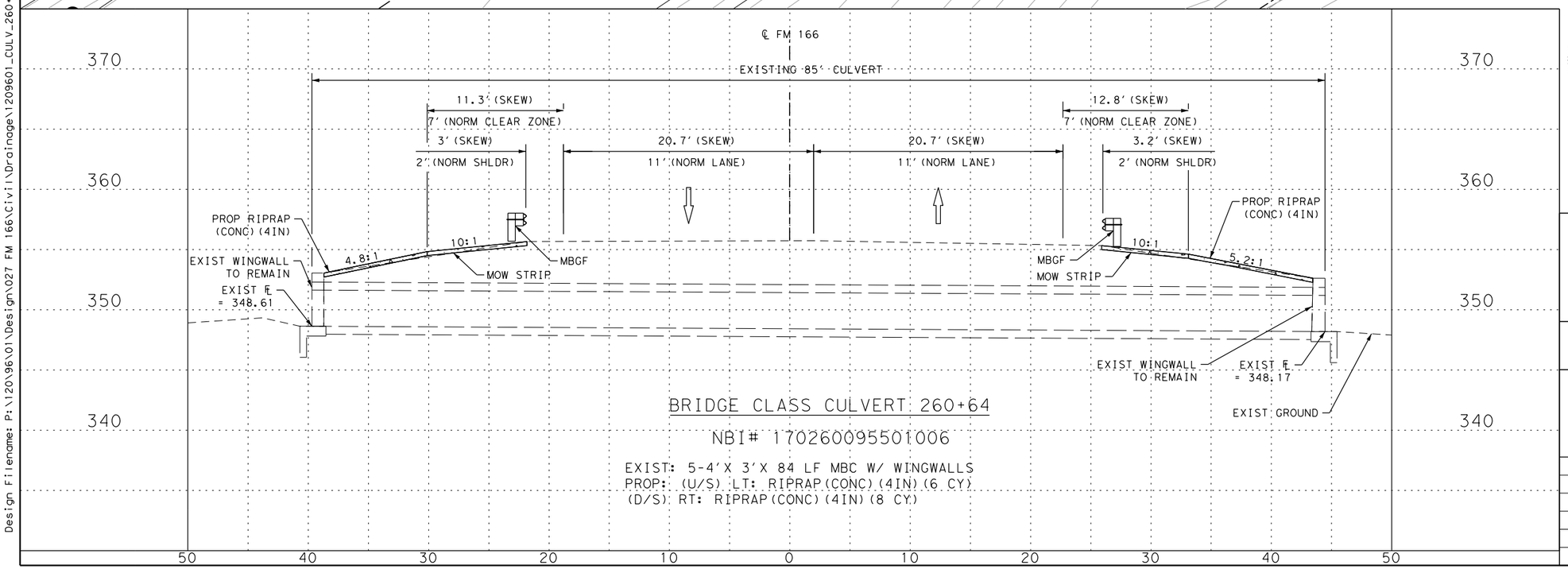
SCALE: 1"= 10'

SCALE: H: 1"= 10'
V: 1"= 10'

PRINT DATE	REVISION DATE
3/31/2021	



BRIDGE CLASS CULVERT 260+64

NBI# 170260095501006

EXIST: 5-4'X 3'X 84 LF MBC W/ WINGWALLS
PROP: (U/S) LT: RIPRAP(CONC)(4IN)(6 CY)
(D/S) RT: RIPRAP(CONC)(4IN)(8 CY)

PAPE-DAWSON ENGINEERS

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FM 166

CULVERT LAYOUT

STA 260+64
SHEET 7 OF 26 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	111

Plotted on: 3/31/2021

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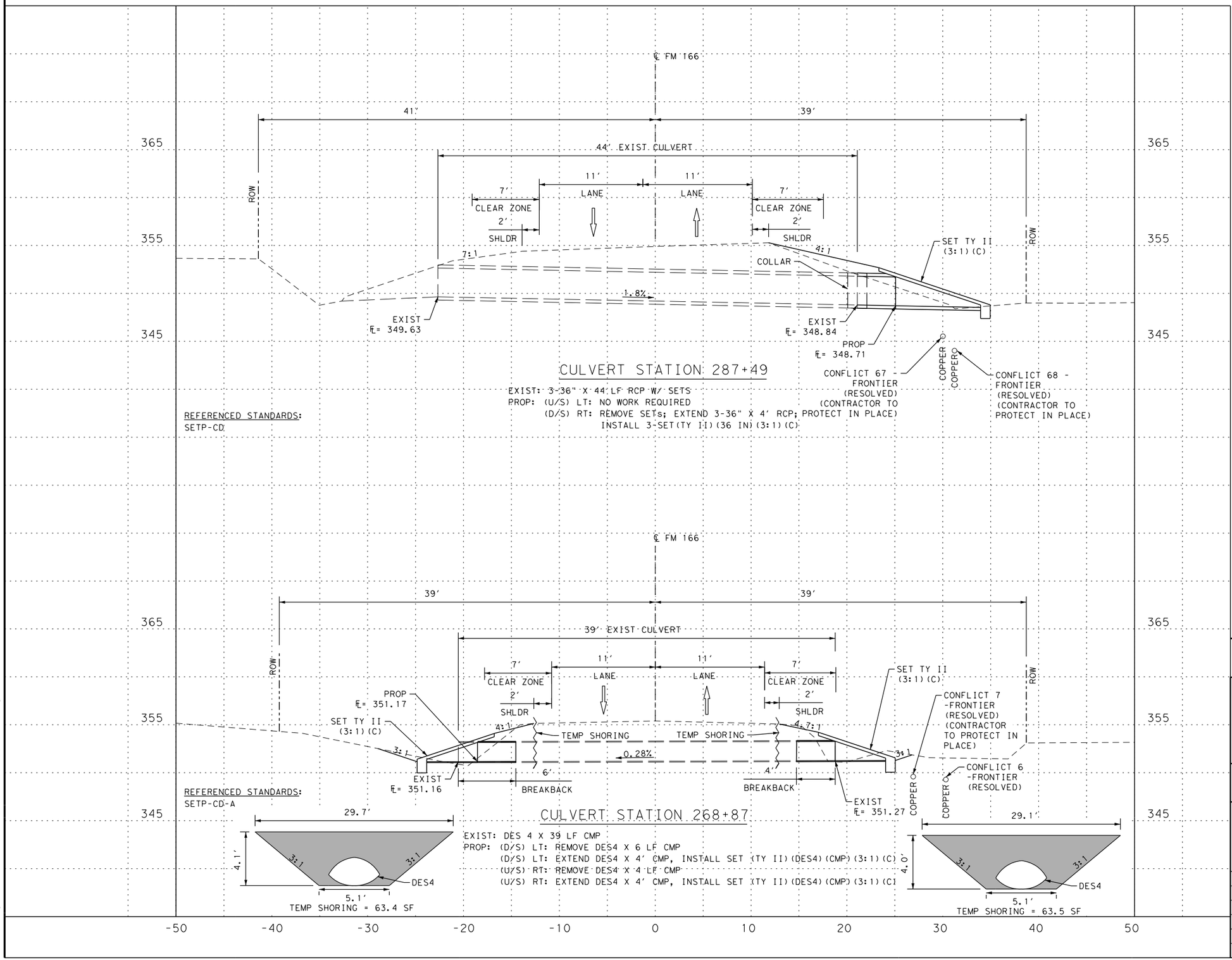
Plotted on: 3/31/2021



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NOTES

1. ALL SIDE SLOPES SHOWN ARE NORMAL TO ROADWAY PAVEMENT.
2. EXISTING FEATURES ARE SHOWN SCREENED BACK; i.e. FADED.
3. ALL PAVEMENT AND SUB-BASE REMOVAL AND RESTORATION SHALL BE PAID UNDER ITEM 400-6006 "CUT AND RESTORING PAV". SEE DRIVEWAY AND SIDE ROAD CUT & RESTORE PAVEMENT DETAILS FOR MORE INFORMATION.
4. PAVEMENT AND SUB-BASE THICKNESS ARE APPROXIMATE AND ARE FOR CONTRACTOR INFORMATION ONLY. CONTRACTOR SHALL MATCH EXISTING PAVEMENT STRUCTURE.
5. DEPTH OF UTILITIES ARE ASSUMED AT MINIMUM PER UTILITY ACCOMMODATION RULES (UAR).

DESIGN

STATE OF TEXAS · HEATHER McNEAL · 114428 · LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS · DAN THOMA · 98622 · LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

SCALE: H: 1"= 10'
V: 1"= 10'

PRINT DATE	REVISION DATE
3/31/2021	

PAPE-DAWSON ENGINEERS
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TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

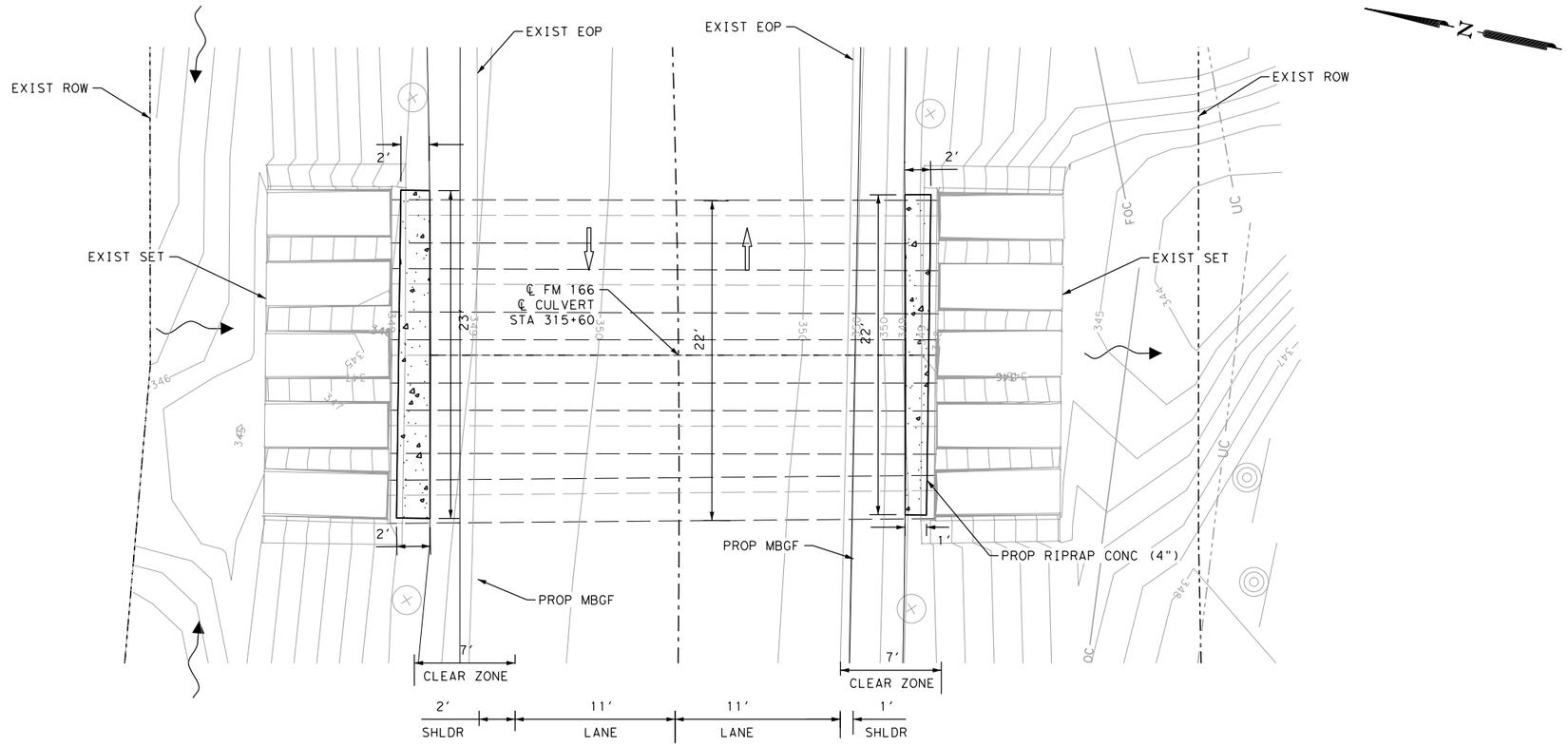
FM 166

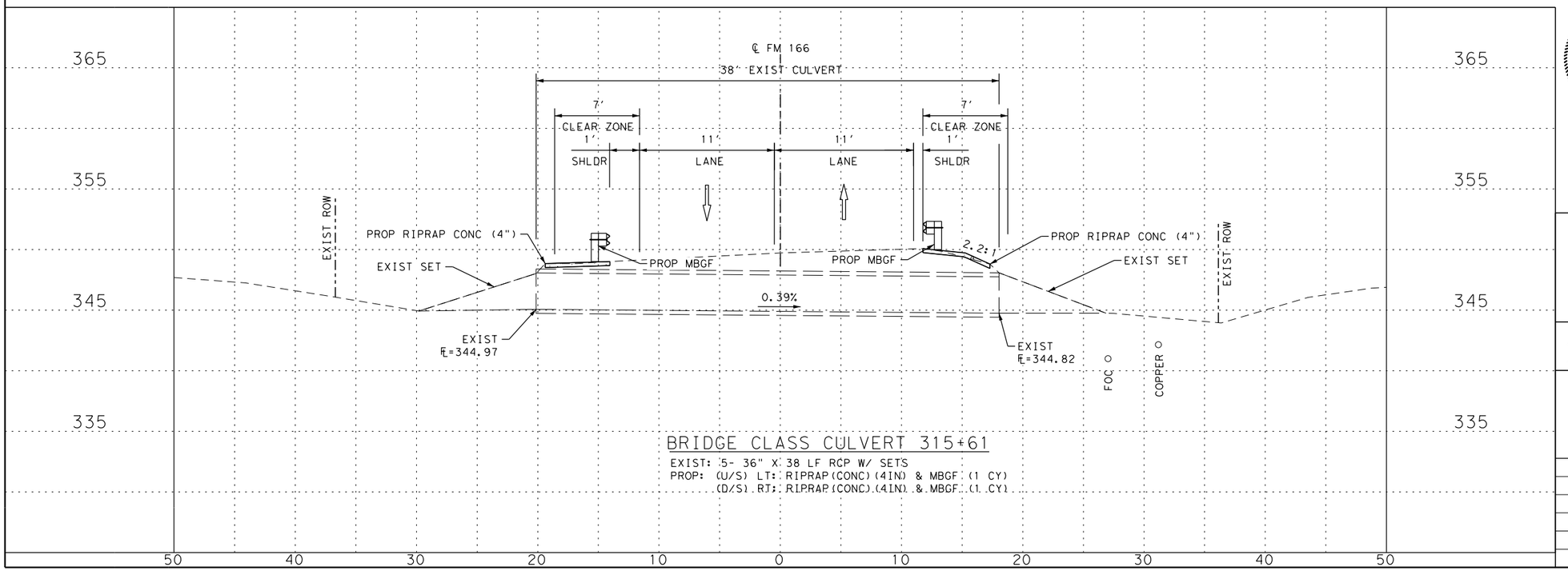
CULVERT LAYOUT

SHEET 8 OF 26 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	112





BRIDGE CLASS CULVERT 315+61

EXIST: 5- 36" X 38 LF RCP W/ SETS
PROP: (U/S) LT: RIPRAP(CONC)(4IN) & MBGF (1 CY)
(D/S) RT: RIPRAP(CONC)(4IN) & MBGF (1 CY)

LEGEND

- R.O.W.
- 850 EXISTING CONTOUR
- FLOW ARROW
- TEMPORARY SPECIAL SHORING
- BLOCK SODDING

NOTES

1. ALL SIDE SLOPES SHOWN ARE NORMAL TO ROADWAY PAVEMENT.
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DESIGN

STATE OF TEXAS · HEATHER McNEAL · 114428 · LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS · DAN THOMA · 98622 · LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

0 5 10 20
SCALE: 1"= 10'

SCALE: H: 1"= 10'
V: 1"= 10'

PRINT DATE	REVISION DATE
3/31/2021	

PAPE-DAWSON ENGINEERS
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2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

FM 166

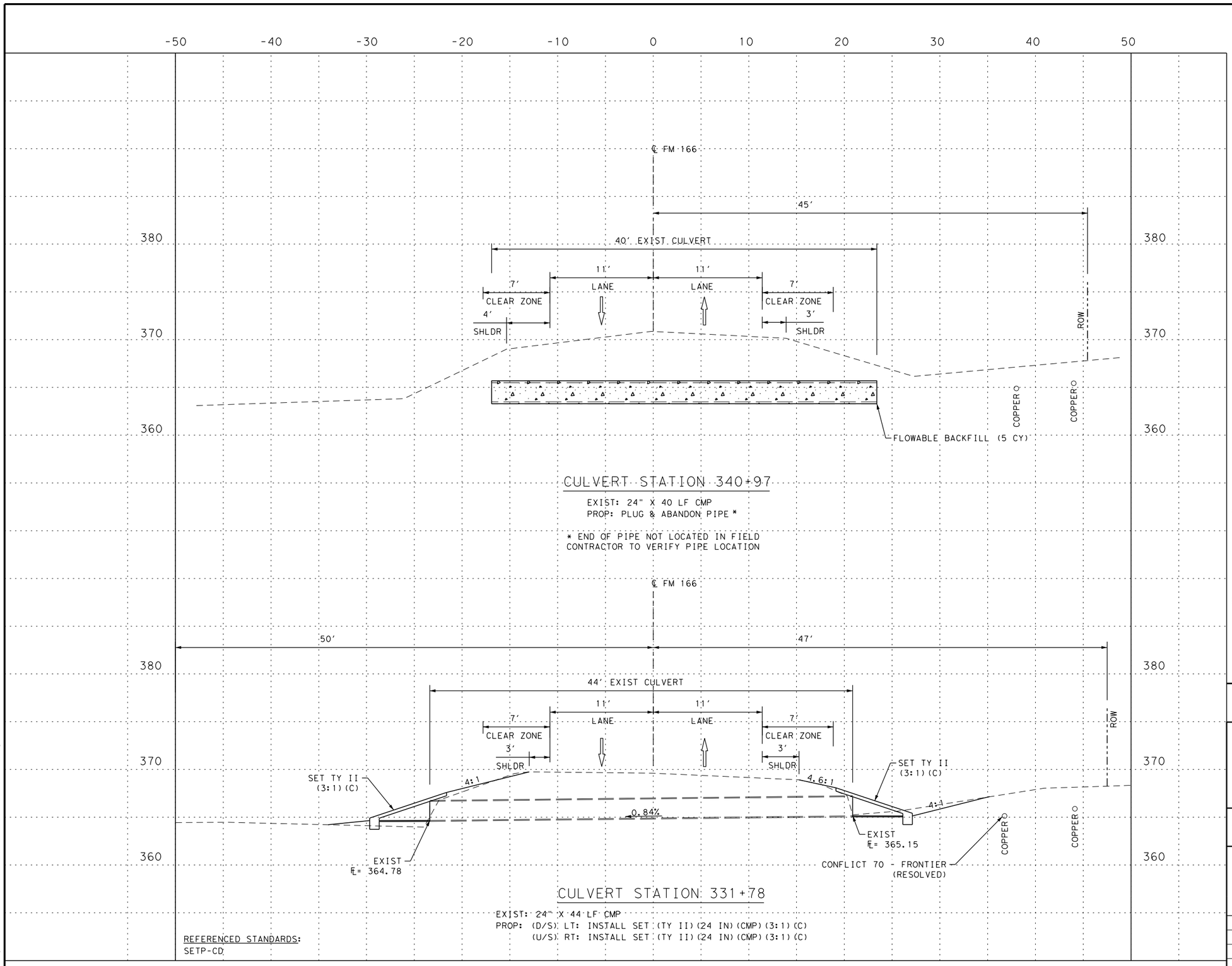
CULVERT LAYOUT

STA 315+61
SHEET 9 OF 26 SHEETS

FED.RD. DIV.NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	113

Plotted on: 3/31/2021
Design Filename: P:\120\96\01\Design\027 FM 166\Civil\Drainage\1209601_CULV_315+61.dgn



Plotted on: 3/31/2021

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NOTES

1. ALL SIDE SLOPES SHOWN ARE NORMAL TO ROADWAY PAVEMENT.
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DESIGN

STATE OF TEXAS · HEATHER McNEAL · 114428 · LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS · DAN THOMA · 98622 · LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

SCALE: H: 1" = 10'
V: 1" = 10'

PRINT DATE	REVISION DATE
3/31/2021	

PAPE-DAWSON ENGINEERS
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2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

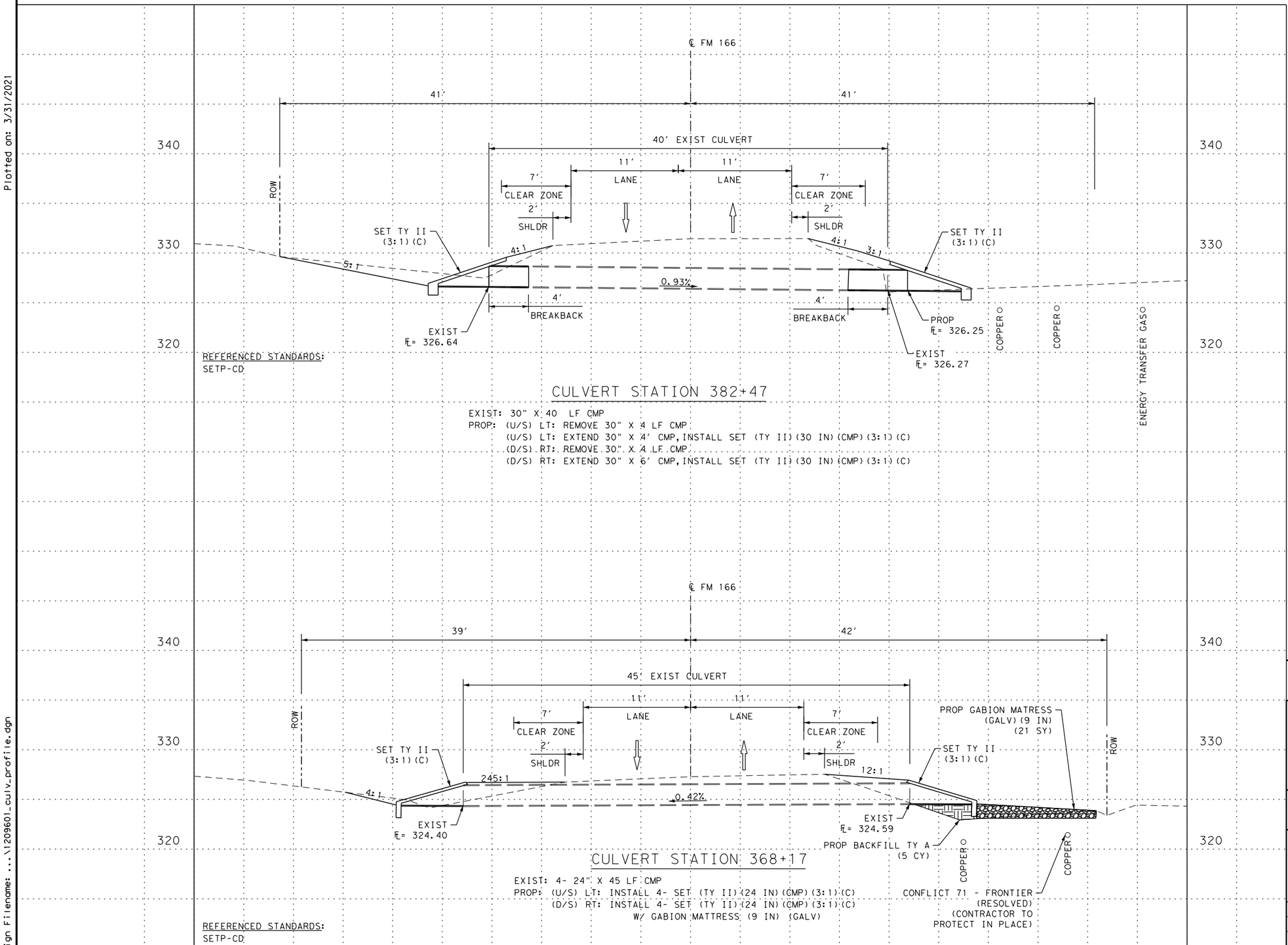
FM 166

CULVERT LAYOUT

SHEET 10 OF 26 SHEETS

FED.RD. DIV.NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	114



CULVERT STATION 382+47

EXIST: 30" X 40 LF CMP
PROP: (U/S) LT: REMOVE 30" X 4 LF CMP
(U/S) LT: EXTEND 30" X 4' CMP, INSTALL SET (TY II)(30 IN)(CMP)(3:1)(C)
(D/S) RT: REMOVE 30" X 4 LF CMP
(D/S) RT: EXTEND 30" X 6' CMP, INSTALL SET (TY II)(30 IN)(CMP)(3:1)(C)

CULVERT STATION 368+17

EXIST: 4- 24" X 45 LF CMP
PROP: (U/S) LT: INSTALL 4- SET (TY II)(24 IN)(CMP)(3:1)(C)
(D/S) RT: INSTALL 4- SET (TY II)(24 IN)(CMP)(3:1)(C)
W/ GABION MATTRESS (9 IN) (GALV)

NOTES

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DESIGN

STATE OF TEXAS · HEATHER McNEAL · 114428 · LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS · DAN THOMA · 98622 · LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

SCALE: H: 1"= 10'
V: 1"= 10'

PRINT DATE	REVISION DATE
3/31/2021	

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

FM 166

CULVERT LAYOUT

SHEET 11 OF 26 SHEETS

FED.RD. DIV.NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	115

Plotted on: 3/31/2021
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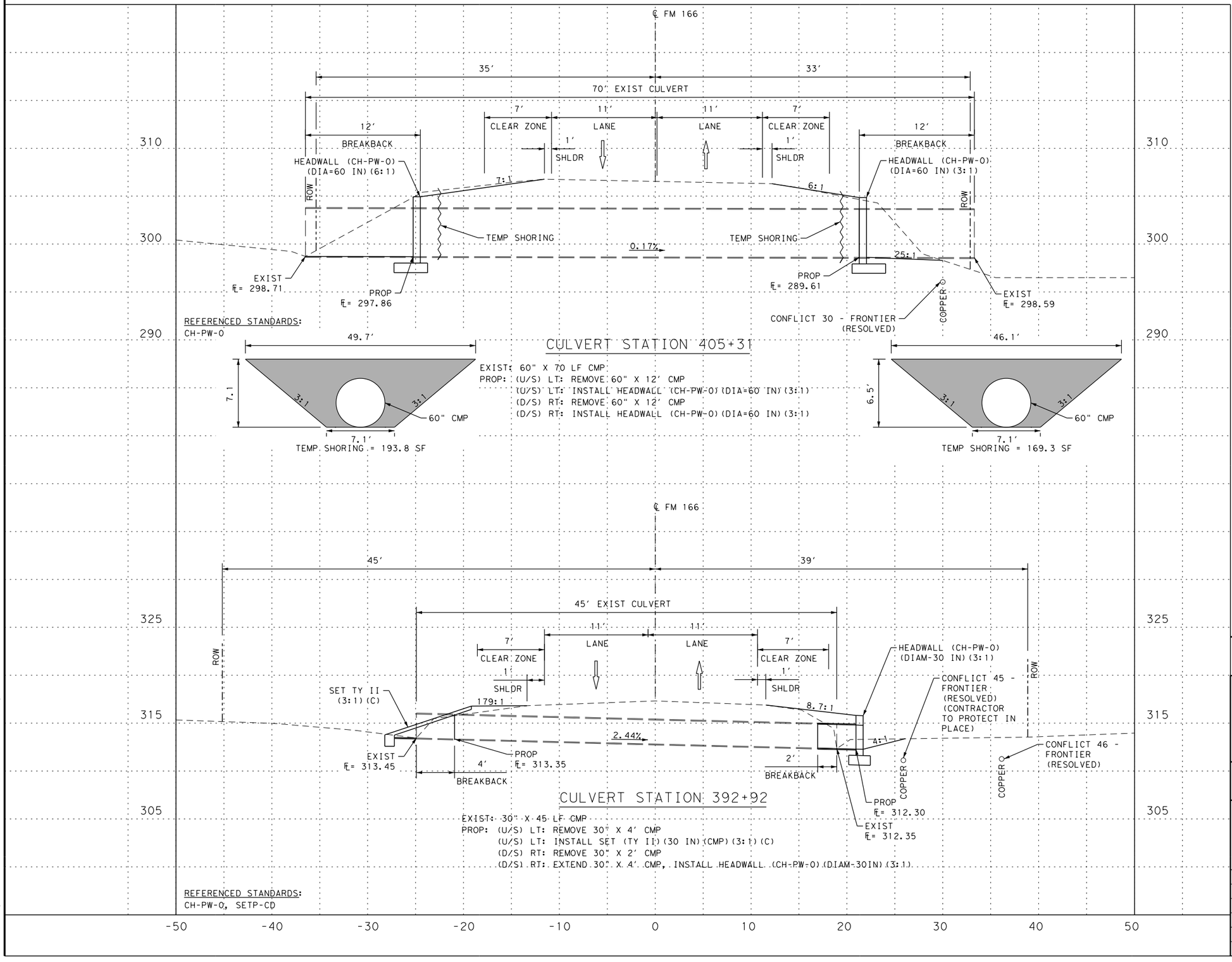

Plotted on: 3/31/2021

Design Filename: ...\209601_culv_profile.dgn

NOTES

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DESIGN

STATE OF TEXAS
HEATHER McNEAL
114428
LICENSED
PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS
DAN THOMA
98622
LICENSED
PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

SCALE: H: 1"= 10'
V: 1"= 10'

PRINT DATE	REVISION DATE
3/31/2021	

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

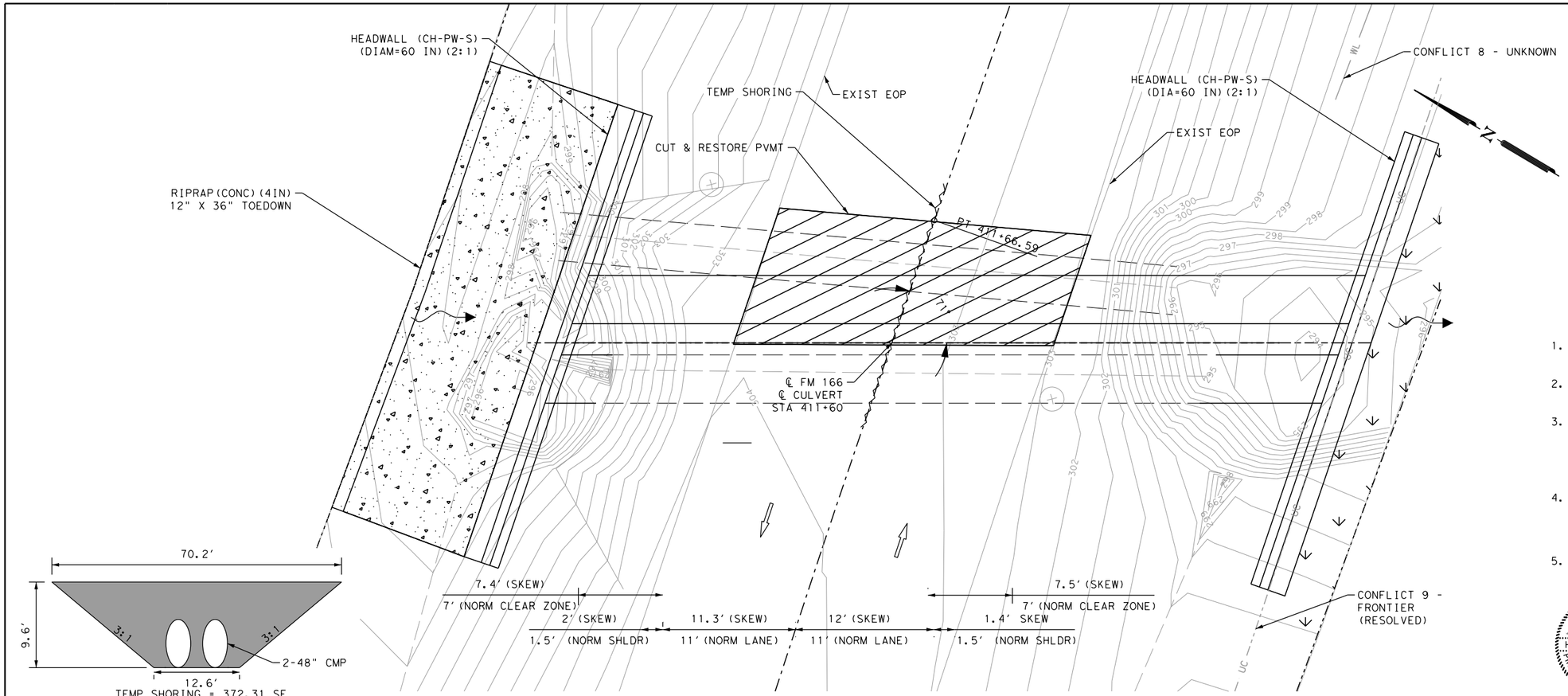
FM 166

CULVERT LAYOUT

SHEET 12 OF 26 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	116



LEGEND

- R.O.W.
- 850 EXISTING CONTOUR
- FLOW ARROW
- TEMPORARY SPECIAL SHORING
- BLOCK SODDING

NOTES

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DESIGN

STATE OF TEXAS · HEATHER McNEAL · 114428 · LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS · DAN THOMA · 98622 · LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

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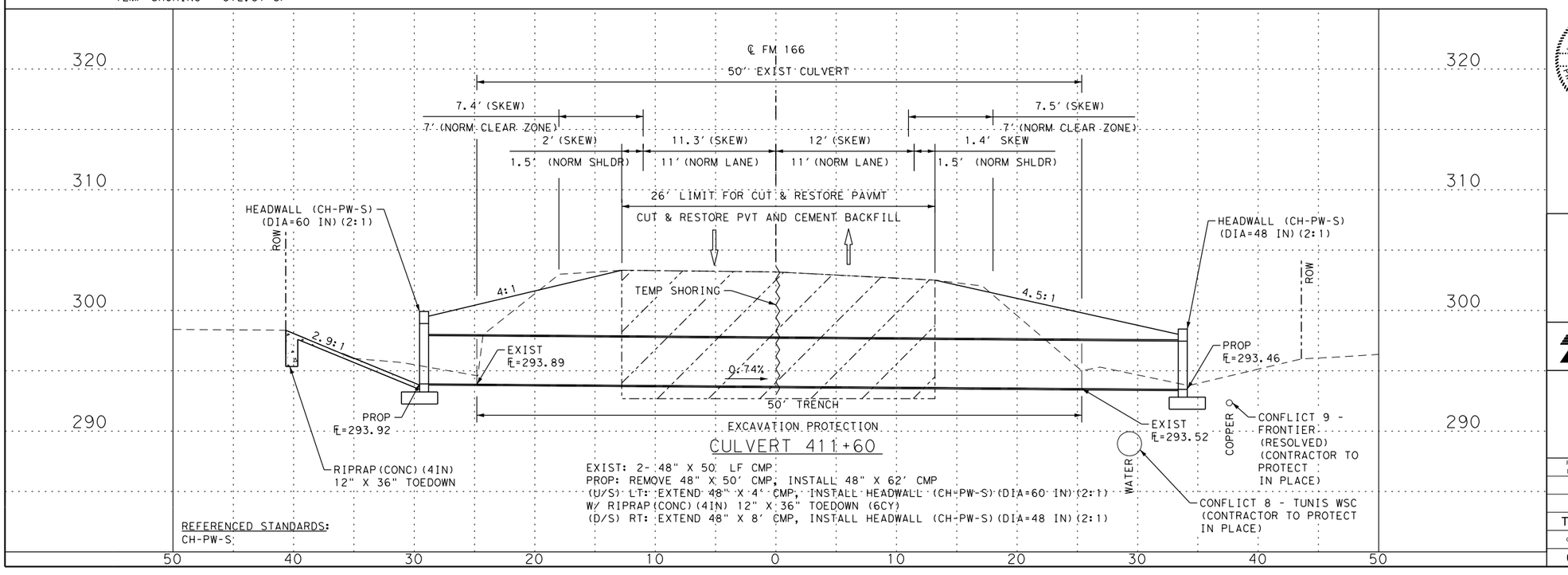
SCALE: 1"= 10'

SCALE: H: 1"= 10'
V: 1"= 10'

PRINT DATE	REVISION DATE
3/31/2021	



CULVERT 411+60

EXIST: 2- 48" X 50' LF CMP
PROP: REMOVE 48" X 50' CMP, INSTALL 48" X 62' CMP
(U/S) LT: EXTEND 48" X 4' CMP, INSTALL HEADWALL (CH-PW-S)(DIA=60 IN)(2:1) W/ RIPRAP(CONC)(4IN) 12" X 36" TOEDOWN (6CY)
(D/S) RT: EXTEND 48" X 8' CMP, INSTALL HEADWALL (CH-PW-S)(DIA=48 IN)(2:1)

REFERENCED STANDARDS:
CH-PW-S

PAPE-DAWSON ENGINEERS

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TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

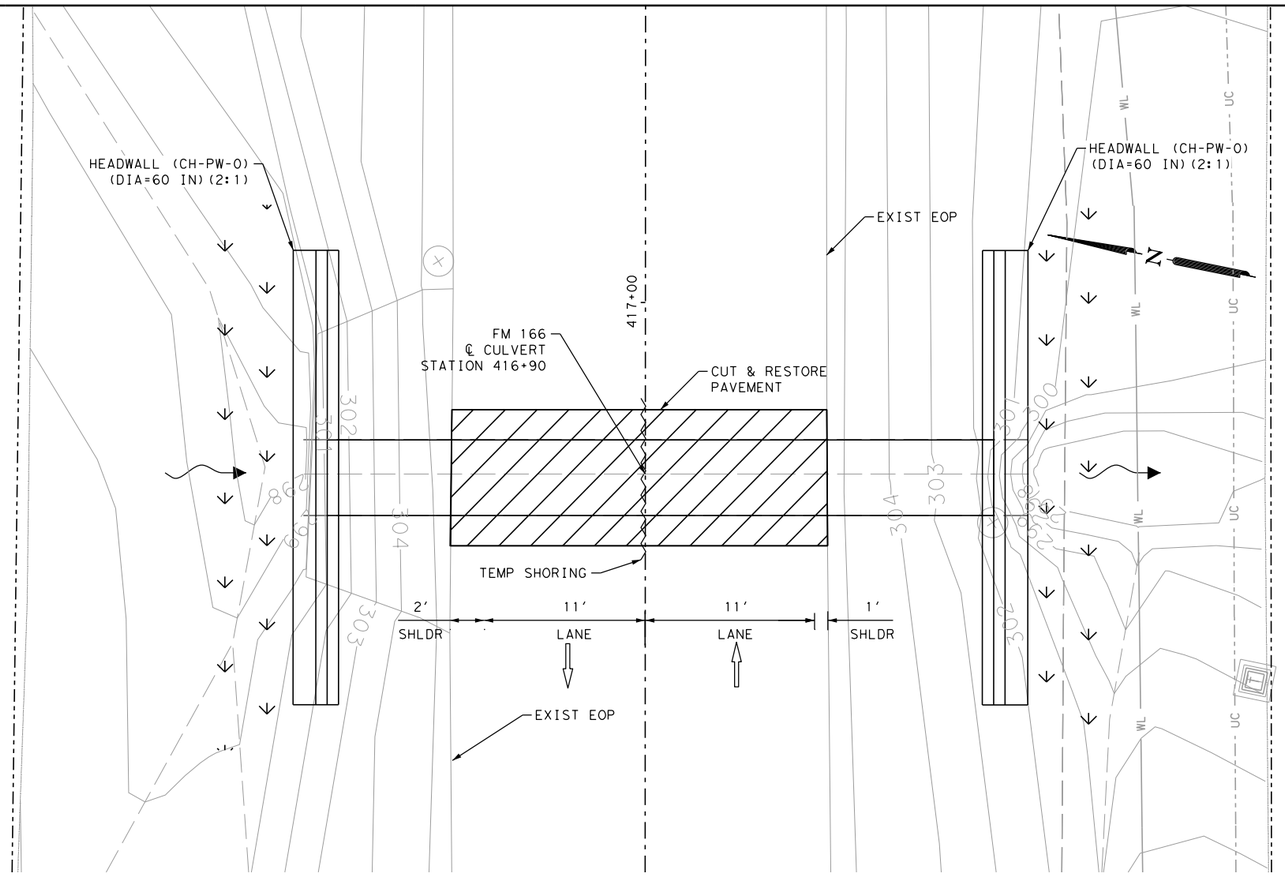
FM 166

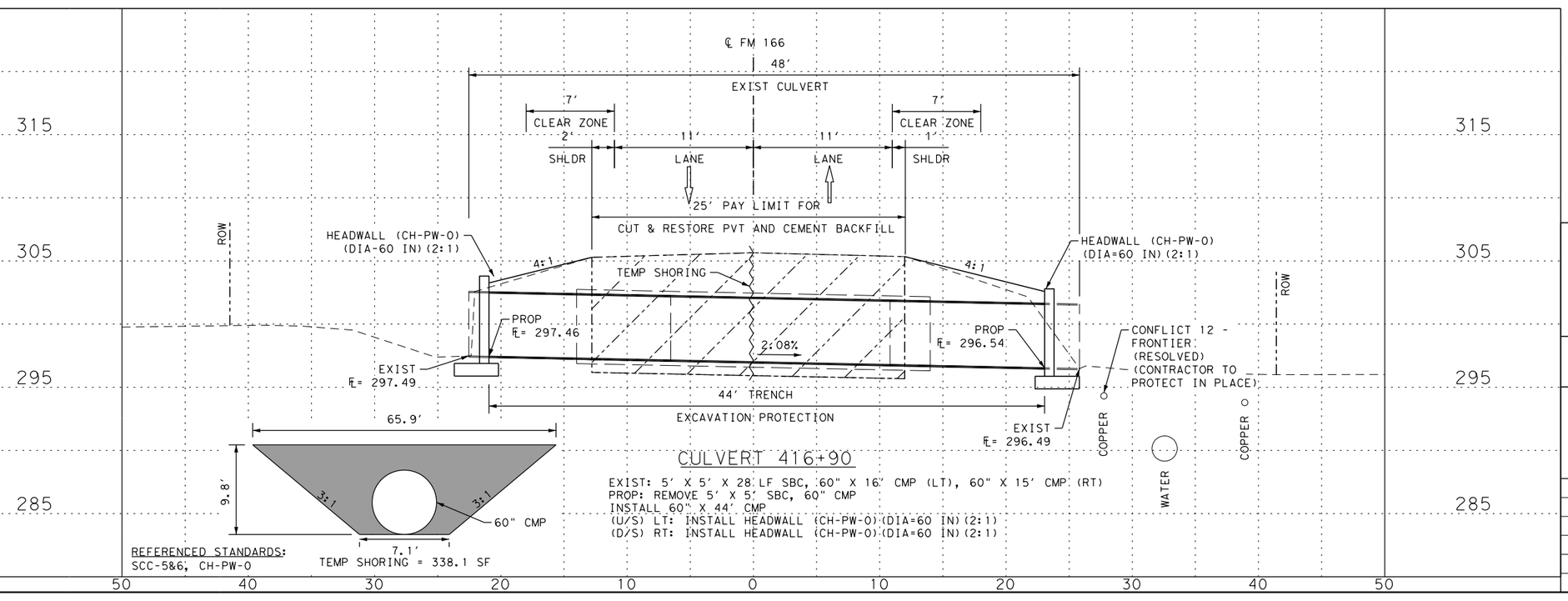
CULVERT LAYOUT

STA 411+60
SHEET 13 OF 26 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	117





REFERENCED STANDARDS:
SCC-5&6, CH-PW-O

TEMP SHORING = 338.1 SF

CULVERT 416+90

EXIST: 5' X 5' X 28 LF SBC, 60" X 16' CMP (LT), 60" X 15' CMP (RT)
PROP: REMOVE 5' X 5' SBC, 60" CMP
INSTALL 60" X 44' CMP
(U/S) LT: INSTALL HEADWALL (CH-PW-O)(DIA=60 IN)(2:1)
(D/S) RT: INSTALL HEADWALL (CH-PW-O)(DIA=60 IN)(2:1)

LEGEND

- R.O.W.
- 850 EXISTING CONTOUR
- FLOW ARROW
- TEMPORARY SPECIAL SHORING
- BLOCK SODDING

NOTES

1. ALL SIDE SLOPES SHOWN ARE NORMAL TO ROADWAY PAVEMENT.
2. EXISTING FEATURES ARE SHOWN SCREENED BACK; i.e. FADED.
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DESIGN

STATE OF TEXAS · HEATHER McNEAL · 114428 · LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS · DAN THOMA · 98622 · LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

0 5 10 20
SCALE: 1"= 10'

SCALE: H: 1"= 10'
V: 1"= 10'

PRINT DATE	REVISION DATE
3/31/2021	

PAPE-DAWSON ENGINEERS
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TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

FM 166

CULVERT LAYOUT

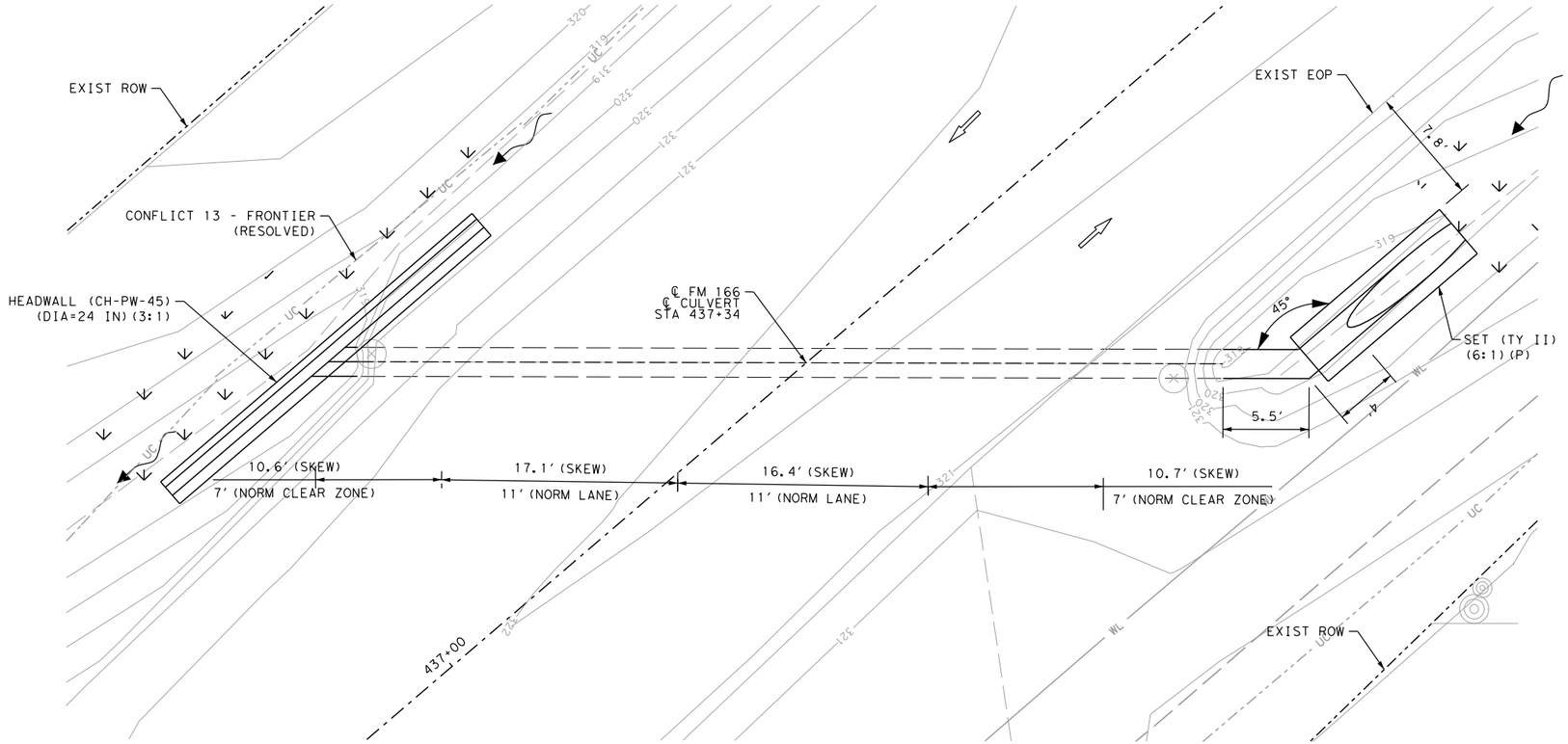
STA 416+90
SHEET 14 OF 26 SHEETS

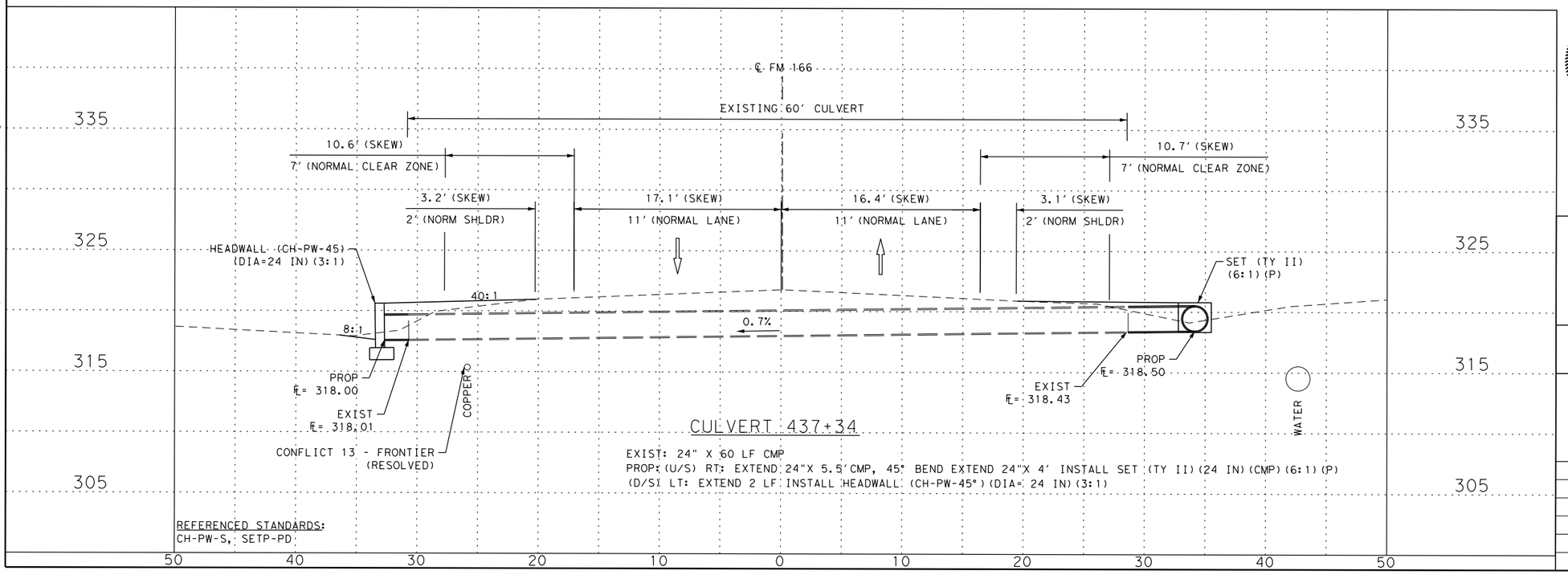
FED.RD. DIV.NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	118

Plotted on: 3/31/2021

Design Filename: P:\120\96\01\Design\027 FM 166\Civil\Drainage\1209601_CULV_416+88.dgn





CULVERT 437+34

EXIST: 24" X 60 LF CMP
PROP: (U/S) RT: EXTEND 24"X 5.5'CMP, 45° BEND EXTEND 24"X 4' INSTALL SET (TY II)(24 IN)(CMP)(6:1)(P)
(D/S) LT: EXTEND 2 LF INSTALL HEADWALL (CH-PW-45°)(DIA= 24 IN)(3:1)

REFERENCED STANDARDS:
CH-PW-S, SETP-PD

LEGEND

- R.O.W.
- 850 EXISTING CONTOUR
- FLOW ARROW
- TEMPORARY SPECIAL SHORING
- BLOCK SODDING

NOTES

1. ALL SIDE SLOPES SHOWN ARE NORMAL TO ROADWAY PAVEMENT.
2. EXISTING FEATURES ARE SHOWN SCREENED BACK; i.e. FADED.
3. ALL PAVEMENT AND SUB-BASE REMOVAL AND RESTORATION SHALL BE PAID UNDER ITEM 400-6006 "CUT AND RESTORING PAV". SEE DRIVEWAY AND SIDE ROAD CUT & RESTORE PAVEMENT DETAILS FOR MORE INFORMATION.
4. PAVEMENT AND SUB-BASE THICKNESS ARE APPROXIMATE AND ARE FOR CONTRACTOR INFORMATION ONLY. CONTRACTOR SHALL MATCH EXISTING PAVEMENT STRUCTURE.
5. DEPTH OF UTILITIES ARE ASSUMED AT MINIMUM PER UTILITY ACCOMMODATION RULES (UAR).

DESIGN

STATE OF TEXAS · HEATHER McNEAL · 114428 · LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS · DAN THOMA · 98622 · LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

0 5 10 20
SCALE: 1"= 10'

SCALE: H: 1"= 10'
V: 1"= 10'

PRINT DATE	REVISION DATE
3/31/2021	

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

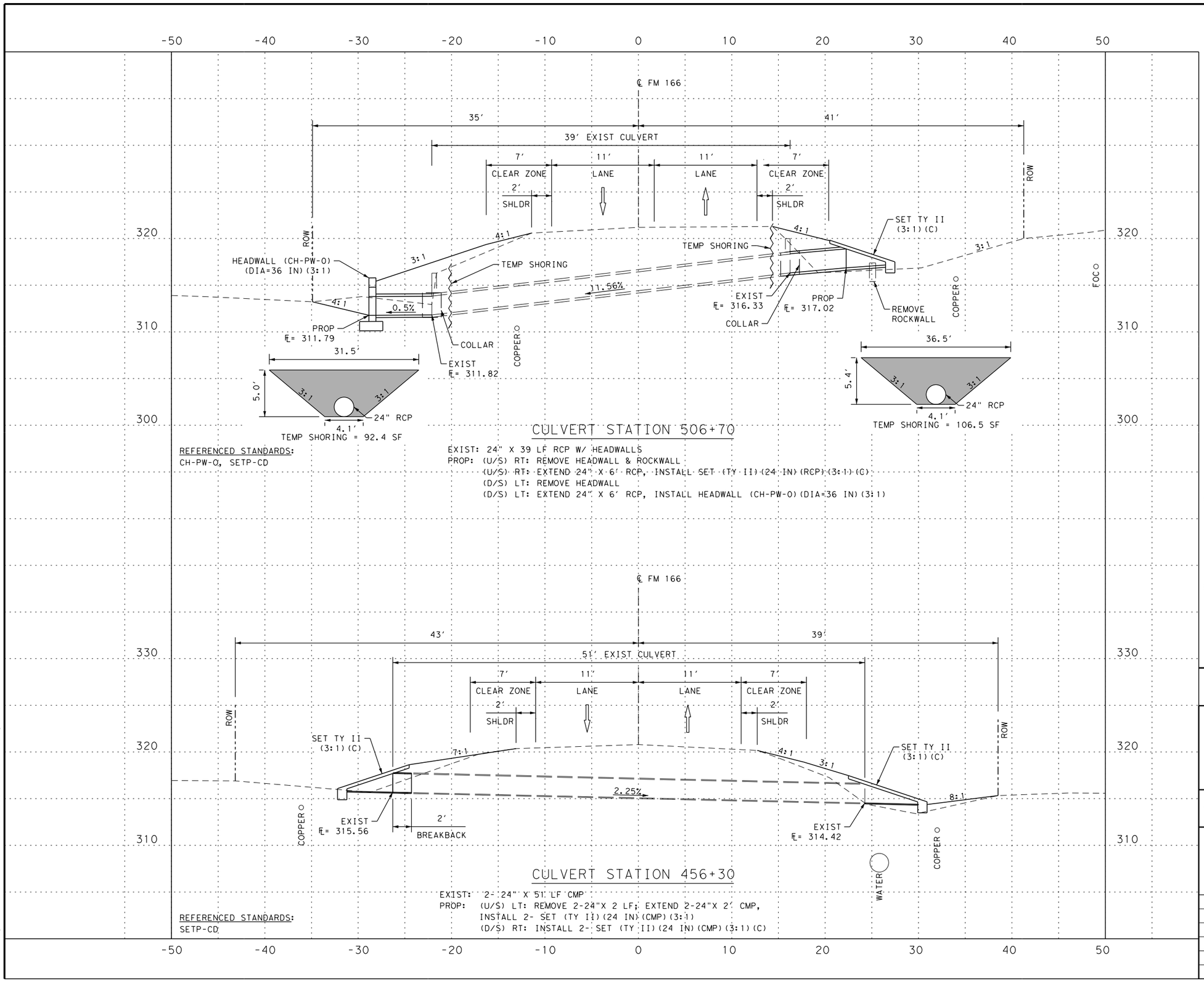
FM 166

CULVERT LAYOUT

STA 437+34
SHEET 15 OF 26 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	119



Plotted on: 3/31/2021

Design Filename: ...\1209601_culv_profile.dgn

NOTES

1. ALL SIDE SLOPES SHOWN ARE NORMAL TO ROADWAY PAVEMENT.
2. EXISTING FEATURES ARE SHOWN SCREENED BACK; i.e. FADED.
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DESIGN

STATE OF TEXAS
HEATHER McNEAL
114428
LICENSED
PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS
DAN THOMA
98622
LICENSED
PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

SCALE: H: 1"= 10′
V: 1"= 10′

PRINT DATE	REVISION DATE
3/31/2021	

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

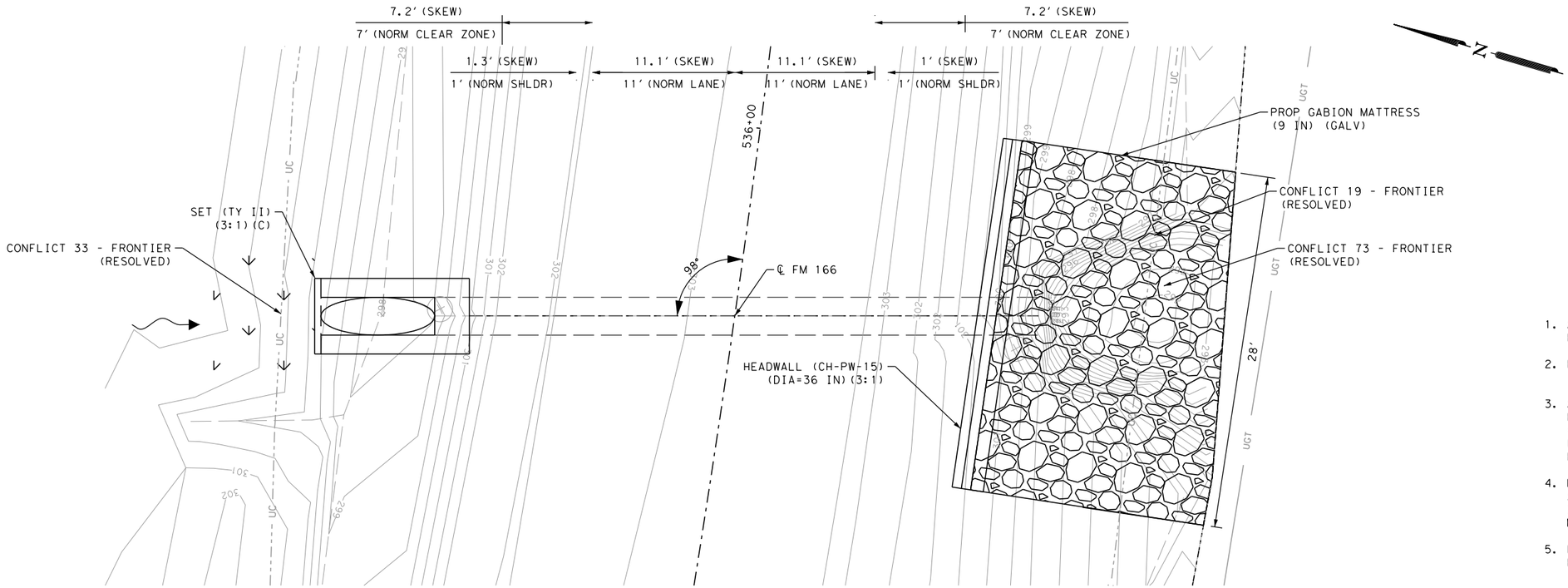
FM 166

CULVERT LAYOUT

SHEET 16 OF 26 SHEETS

FED. RD. DIV.NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	120



LEGEND

- R.O.W.
- 850 EXISTING CONTOUR
- FLOW ARROW
- TEMPORARY SPECIAL SHORING
- BLOCK SODDING

NOTES

1. ALL SIDE SLOPES SHOWN ARE NORMAL TO ROADWAY PAVEMENT.
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DESIGN

STATE OF TEXAS · HEATHER McNEAL · 114428 · LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

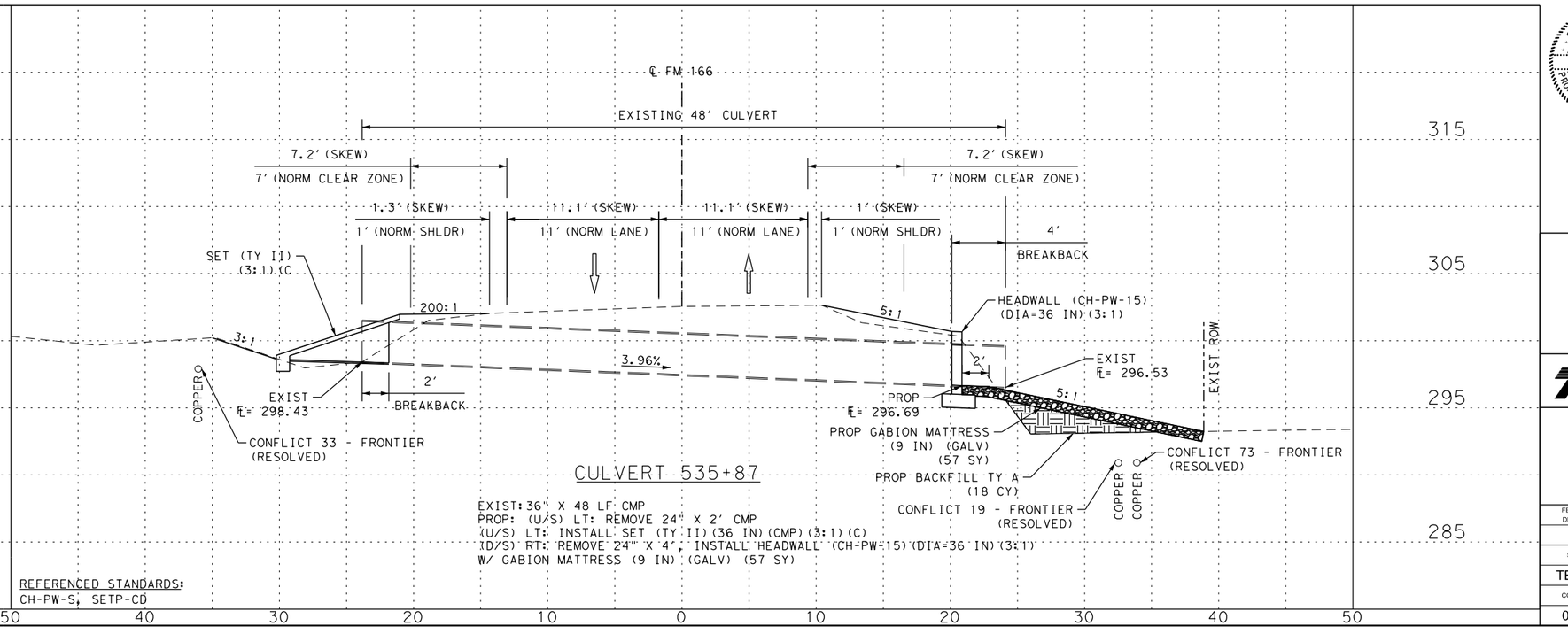
STATE OF TEXAS · DAN THOMA · 98622 · LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

0 5 10 20
SCALE: 1"= 10'

SCALE: H: 1"= 10'
V: 1"= 10'

PRINT DATE	REVISION DATE
3/31/2021	



CULVERT 535+87

EXIST: 36" X 48 LF CMP
PROP: (U/S) LT: REMOVE 24" X 2' CMP
(U/S) LT: INSTALL SET (TY II) (36 IN) (CMP) (3:1) (C)
(D/S) RT: REMOVE 24" X 4', INSTALL HEADWALL (CH-PW-15) (DIA=36 IN) (3:1)
W/ GABION MATTRESS (9 IN) (GALV) (57 SY)

REFERENCED STANDARDS:
CH-PW-S, SETP-CD

PAPE-DAWSON ENGINEERS
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TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

FM 166

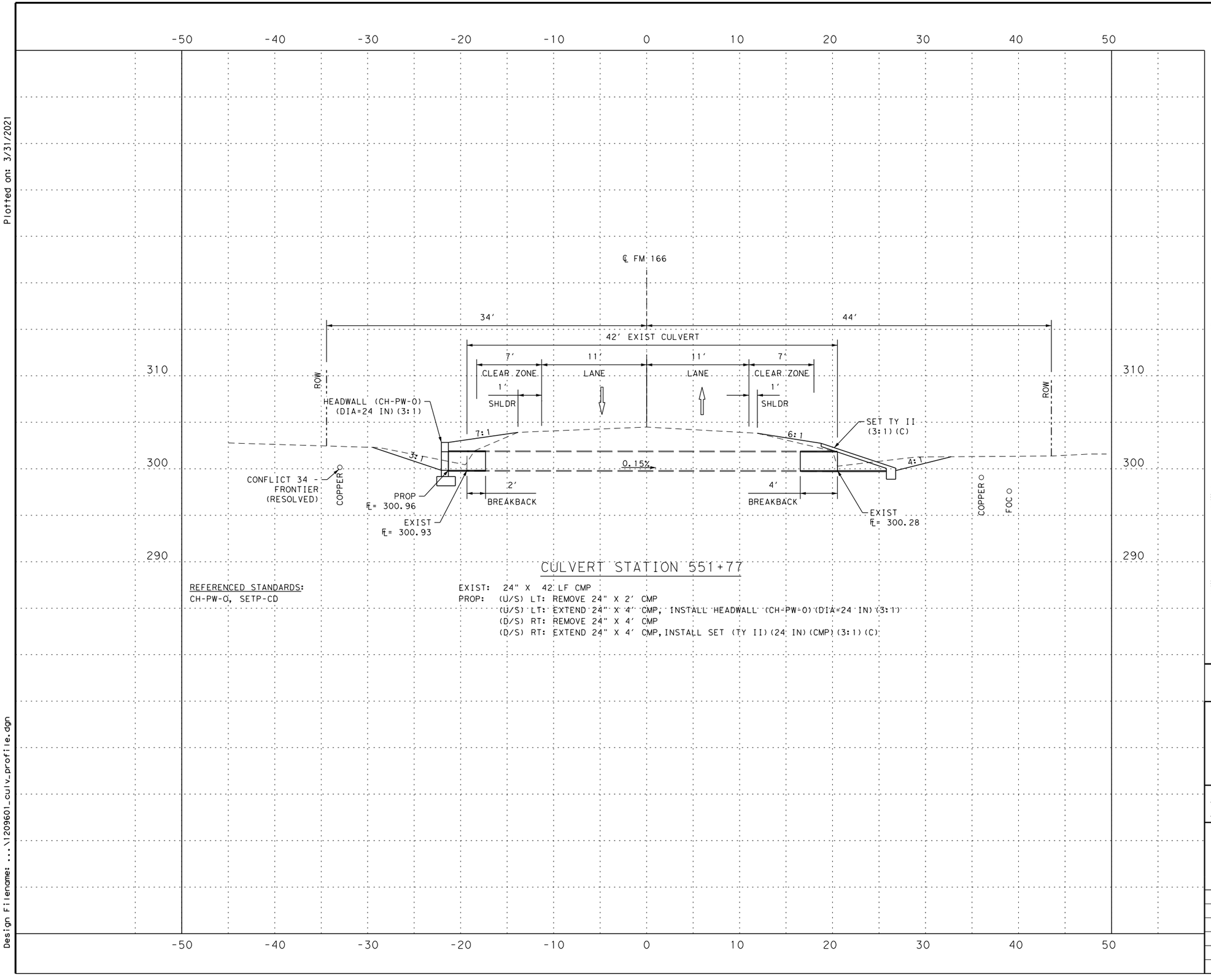
CULVERT LAYOUT

STA 535+87
SHEET 17 OF 26 SHEETS

FED.RD. DIV.NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	121

Plotted on: 3/31/2021



CULVERT STATION 551+77

REFERENCED STANDARDS:
CH-PW-O, SETP-CD

EXIST: 24" X 42 LF CMP
PROP: (U/S) LT: REMOVE 24" X 2' CMP
(U/S) LT: EXTEND 24" X 4' CMP, INSTALL HEADWALL (CH-PW-O)(DIA=24 IN)(3:1)
(D/S) RT: REMOVE 24" X 4' CMP
(D/S) RT: EXTEND 24" X 4' CMP, INSTALL SET (TY II)(24 IN)(CMP)(3:1)(C)

NOTES

1. ALL SIDE SLOPES SHOWN ARE NORMAL TO ROADWAY PAVEMENT.
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DESIGN

STATE OF TEXAS
HEATHER McNEAL
114428
LICENSED
PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS
DAN THOMA
98622
LICENSED
PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

SCALE: H: 1"= 10'
V: 1"= 10'

PRINT DATE	REVISION DATE
3/31/2021	

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

FM 166

CULVERT LAYOUT

SHEET 18 OF 26 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	122

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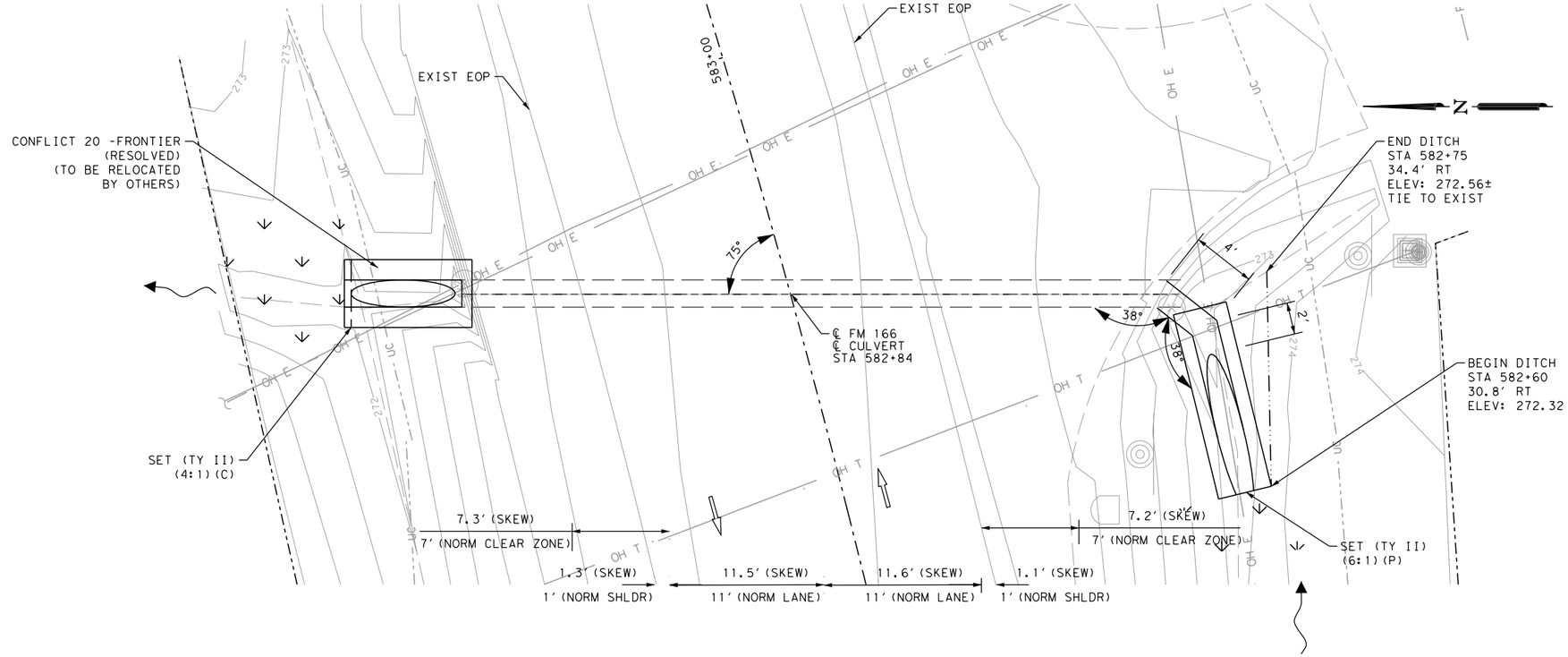

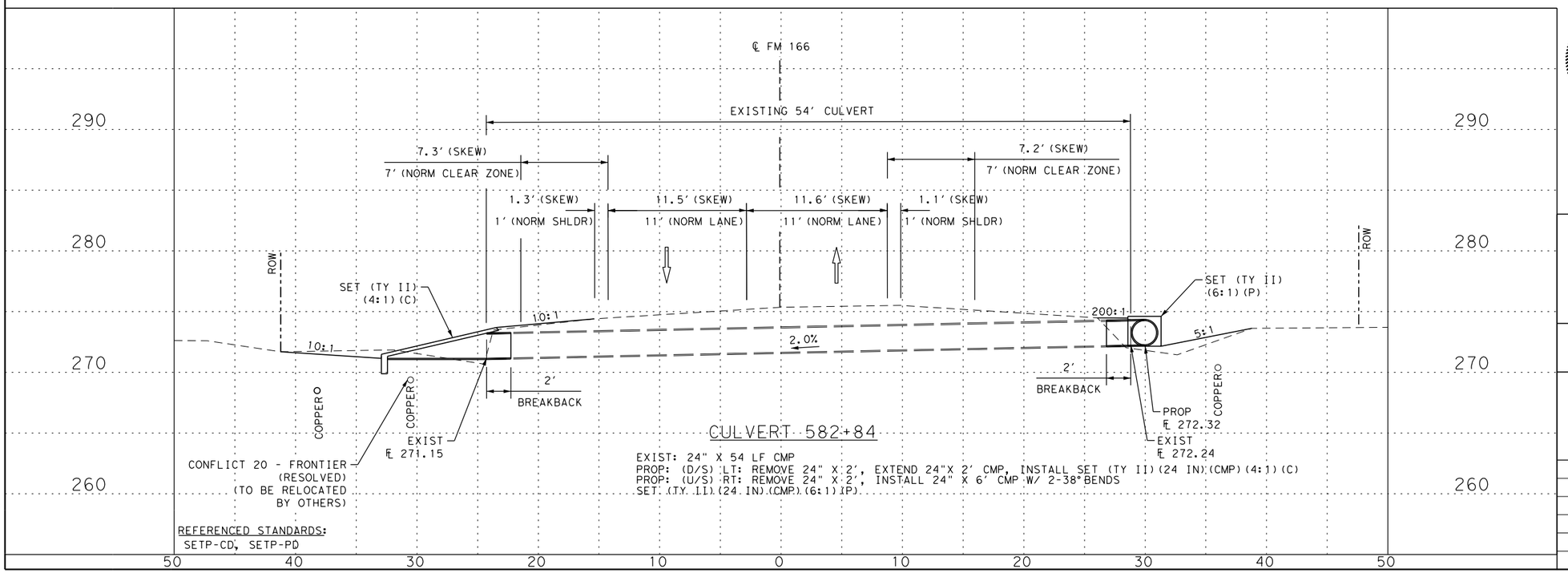

CULVERT 582+84

EXIST: 24" X 54 LF CMP
PROP: (D/S) LT: REMOVE 24" X 2', EXTEND 24"X 2' CMP, INSTALL SET (TY II)(24 IN)(CMP)(4:1)(C)
PROP: (U/S) RT: REMOVE 24" X 2', INSTALL 24" X 6' CMP W/ 2-38° BENDS
SET (TY II)(24 IN)(CMP)(6:1)(P)

REFERENCED STANDARDS:
SETP-CD, SETP-PD

LEGEND

- R.O.W.
- 850 EXISTING CONTOUR
- FLOW ARROW
- TEMPORARY SPECIAL SHORING
- BLOCK SODDING

NOTES

1. ALL SIDE SLOPES SHOWN ARE NORMAL TO ROADWAY PAVEMENT.
2. EXISTING FEATURES ARE SHOWN SCREENED BACK; i.e. FADED.
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DESIGN

STATE OF TEXAS · HEATHER McNEAL · 114428 · LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS · DAN THOMA · 98622 · LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

0 5 10 20
SCALE: 1"= 10'

SCALE: H: 1"= 10'
V: 1"= 10'

PRINT DATE	REVISION DATE
3/31/2021	

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

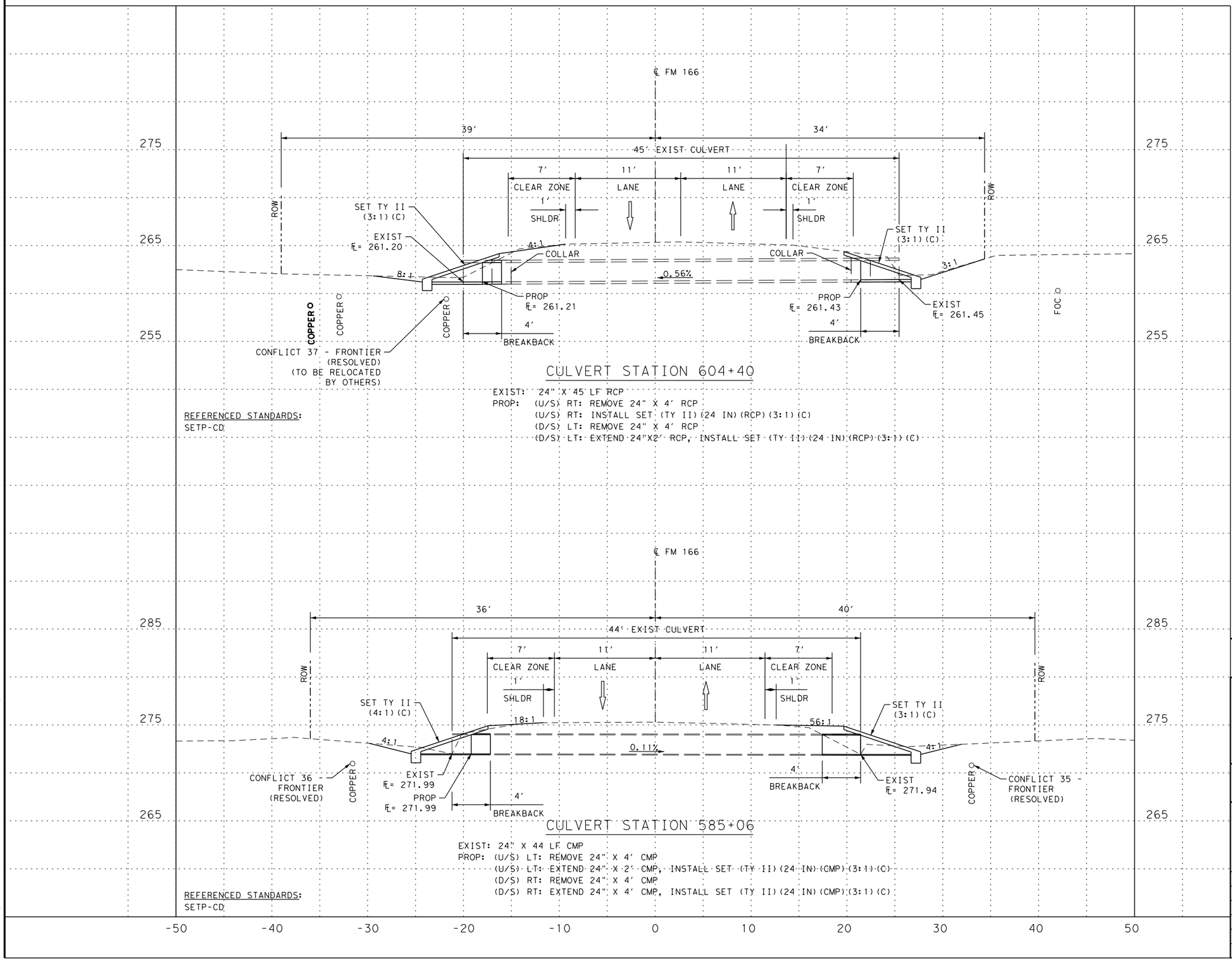
FM 166

CULVERT LAYOUT

STA 582+84
SHEET 19 OF 26 SHEETS

FED.RD. DIV.NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	123



NOTES

1. ALL SIDE SLOPES SHOWN ARE NORMAL TO ROADWAY PAVEMENT.
2. EXISTING FEATURES ARE SHOWN SCREENED BACK; i.e. FADED.
3. ALL PAVEMENT AND SUB-BASE REMOVAL AND RESTORATION SHALL BE PAID UNDER ITEM 400-6006 "CUT AND RESTORING PAV". SEE DRIVEWAY AND SIDE ROAD CUT & RESTORE PAVEMENT DETAILS FOR MORE INFORMATION.
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DESIGN

STATE OF TEXAS
HEATHER McNEAL
114428
LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS
DAN THOMA
98622
LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

SCALE: H: 1" = 10′
V: 1" = 10′

PRINT DATE	REVISION DATE
3/31/2021	

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

FM 166

CULVERT LAYOUT

SHEET 20 OF 26 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	124

Plotted on: 3/31/2021

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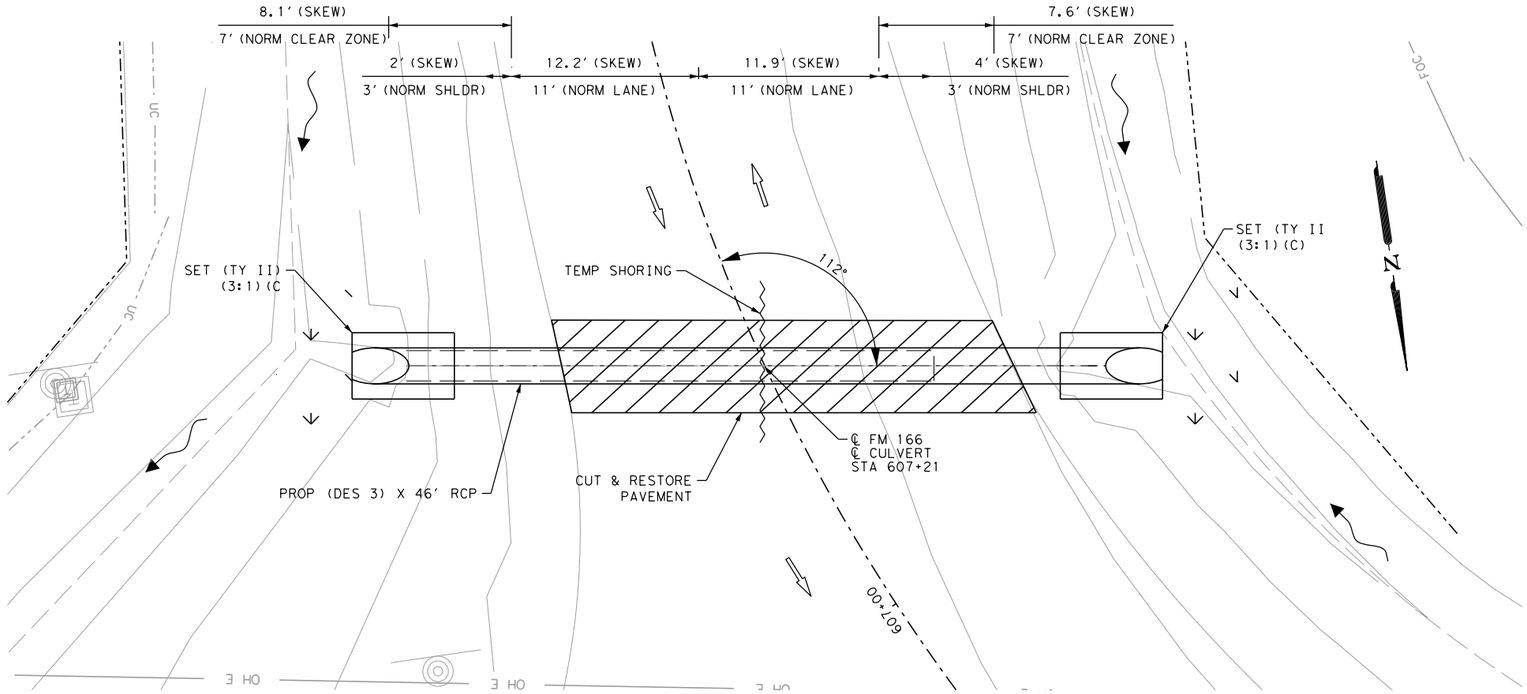

LEGEND

- R.O.W.
- 850 EXISTING CONTOUR
- FLOW ARROW
- TEMPORARY SPECIAL SHORING
- BLOCK SODDING

NOTES

1. ALL SIDE SLOPES SHOWN ARE NORMAL TO ROADWAY PAVEMENT.
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DESIGN

STATE OF TEXAS · HEATHER McNEAL · 114428 · LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

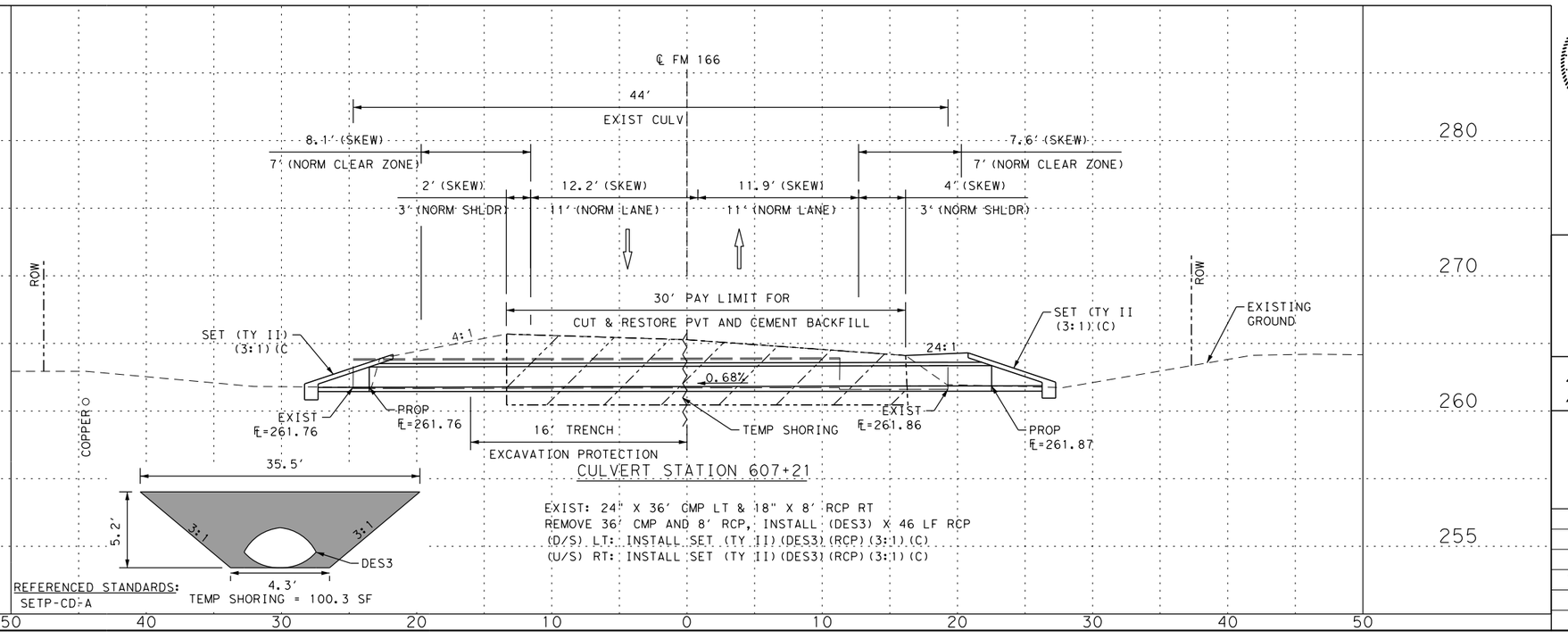
STATE OF TEXAS · DAN THOMA · 98622 · LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

0 5 10 20
SCALE: 1"= 10'

SCALE: H: 1"= 10'
V: 1"= 10'

PRINT DATE	REVISION DATE
3/31/2021	



CULVERT STATION 607+21

EXIST: 24" X 36' CMP LT & 18" X 8' RCP RT
REMOVE 36' CMP AND 8' RCP, INSTALL (DES3) X 46 LF RCP
(D/S) LT: INSTALL SET (TY II) (DES3) (RCP) (3:1) (C)
(U/S) RT: INSTALL SET (TY II) (DES3) (RCP) (3:1) (C)

REFERENCED STANDARDS:
SETP-CD-A

TEMP SHORING = 100.3 SF

PAPE-DAWSON ENGINEERS
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TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

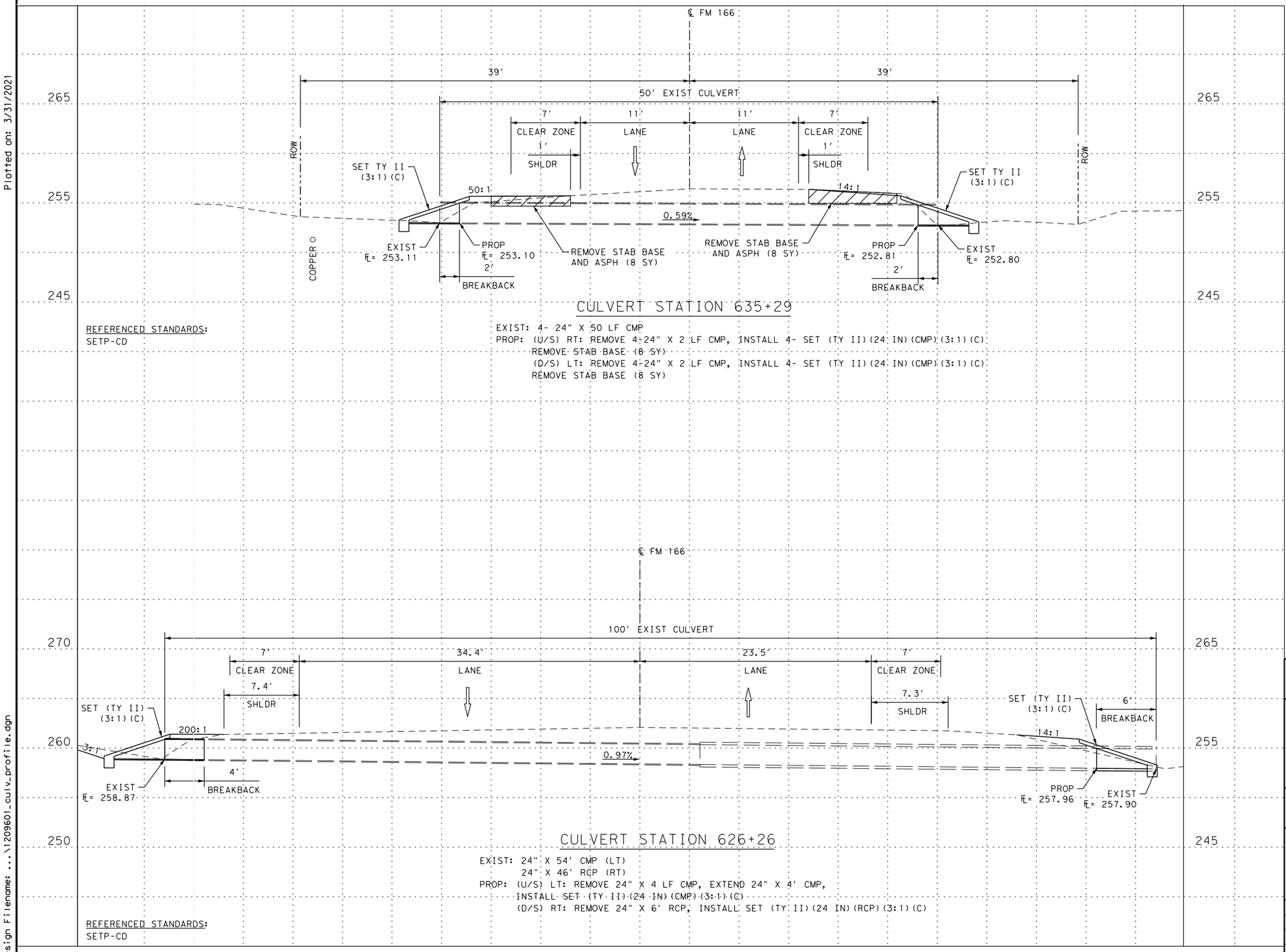
FM 166

CULVERT LAYOUT

STA 607+21
SHEET 21 OF 26 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	125



CULVERT STATION 635+29

REFERENCED STANDARDS:
SETP-CD

EXIST: 4- 24" X 50 LF CMP
PROP: (U/S) RT: REMOVE 4-24" X 2 LF CMP, INSTALL 4- SET (TY II)(24 IN)(CMP)(3:1)(C)
REMOVE STAB BASE (8 SY)
(D/S) LT: REMOVE 4-24" X 2 LF CMP, INSTALL 4- SET (TY II)(24 IN)(CMP)(3:1)(C)
REMOVE STAB BASE (8 SY)

CULVERT STATION 626+26

REFERENCED STANDARDS:
SETP-CD

EXIST: 24" X 54′ CMP (LT)
24" X 46′ RCP (RT)
PROP: (U/S) LT: REMOVE 24" X 4 LF CMP, EXTEND 24" X 4′ CMP,
INSTALL SET (TY II)(24 IN)(CMP)(3:1)(C)
(D/S) RT: REMOVE 24" X 6′ RCP, INSTALL SET (TY II)(24 IN)(RCP)(3:1)(C)

NOTES

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DESIGN

STATE OF TEXAS · HEATHER McNEAL · 114428 · LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS · DAN THOMA · 98622 · LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

SCALE: H: 1"= 10′
V: 1"= 10′

PRINT DATE	REVISION DATE
3/31/2021	

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

FM 166

CULVERT LAYOUT

SHEET 22 OF 26 SHEETS

FED.RD. DIV.NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166
STATE	DISTRICT	COUNTY
TEXAS	BRY	BURLESON
CONTROL	SECTION	JOB / SHEET NO.
0955	01	027 / 126

Plotted on: 3/31/2021
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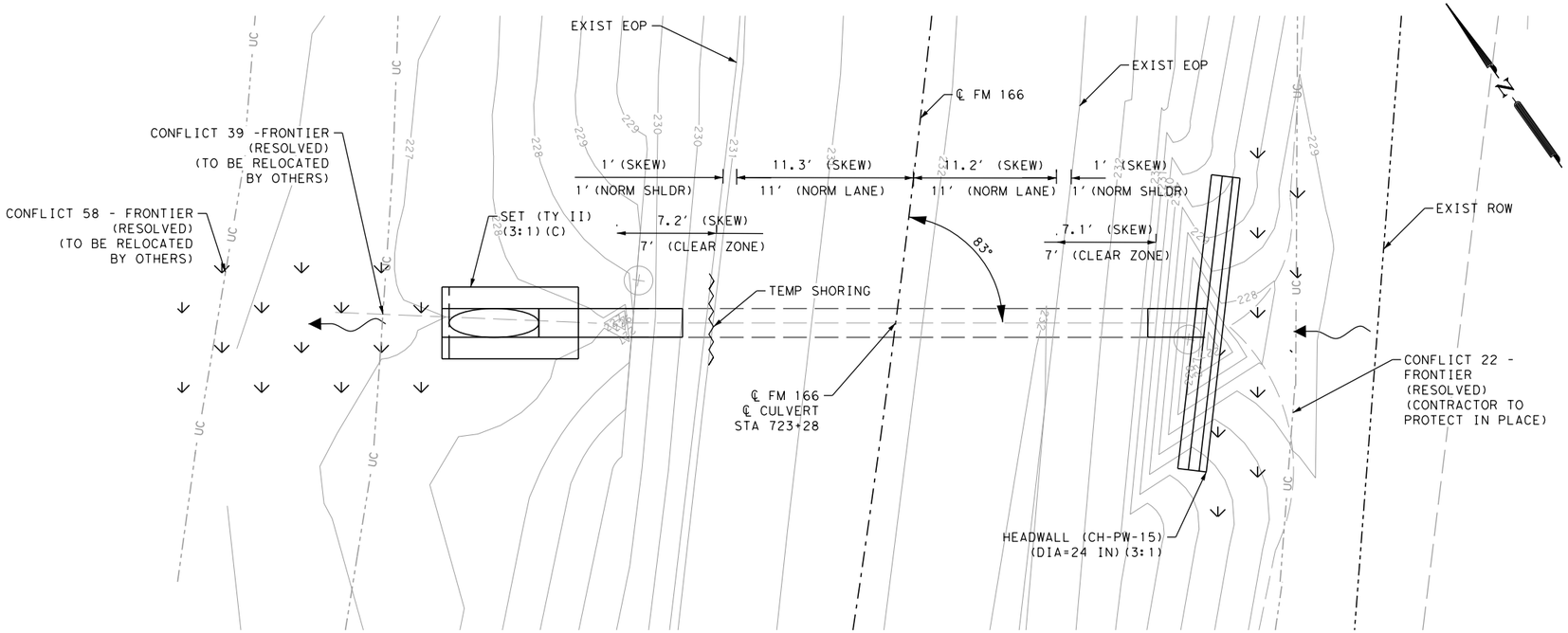

LEGEND

- R.O.W.
- 850 EXISTING CONTOUR
- FLOW ARROW
- TEMPORARY SPECIAL SHORING
- BLOCK SODDING

NOTES

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DESIGN

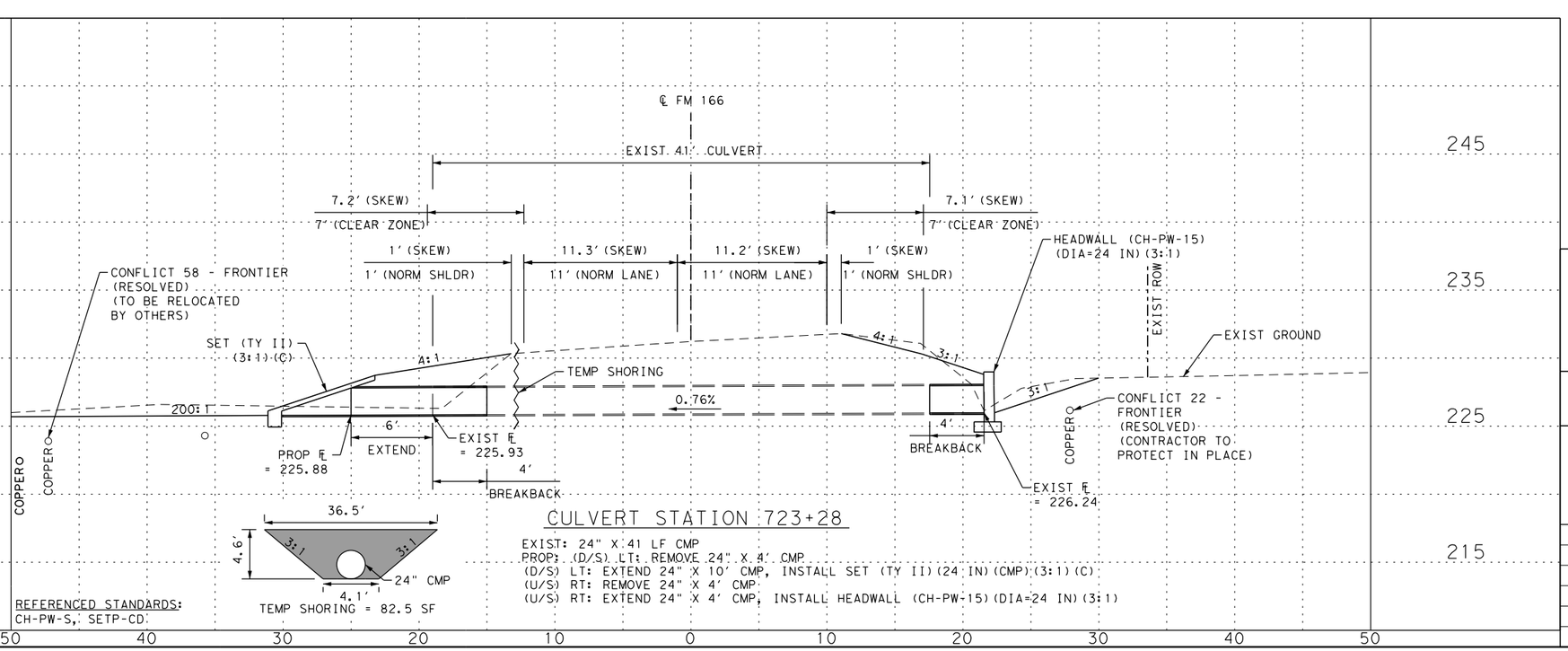
STATE OF TEXAS · HEATHER McNEAL · 114428 · LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS · DAN THOMA · 98622 · LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE



TEMP SHORING = 82.5 SF

REFERENCED STANDARDS:
CH-PW-S, SETP-CD.

CULVERT STATION 723+28

EXIST: 24" X 41 LF CMP
PROP: (D/S) LT: REMOVE 24" X 4' CMP
(D/S) LT: EXTEND 24" X 10' CMP, INSTALL SET (TY II) (24 IN) (CMP) (3:1) (C)
(U/S) RT: REMOVE 24" X 4' CMP
(U/S) RT: EXTEND 24" X 4' CMP, INSTALL HEADWALL (CH-PW-15) (DIA=24 IN) (3:1)

0 5 10 20
SCALE: 1"= 10'

SCALE: H: 1"= 10'
V: 1"= 10'

PRINT DATE	REVISION DATE
3/31/2021	

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

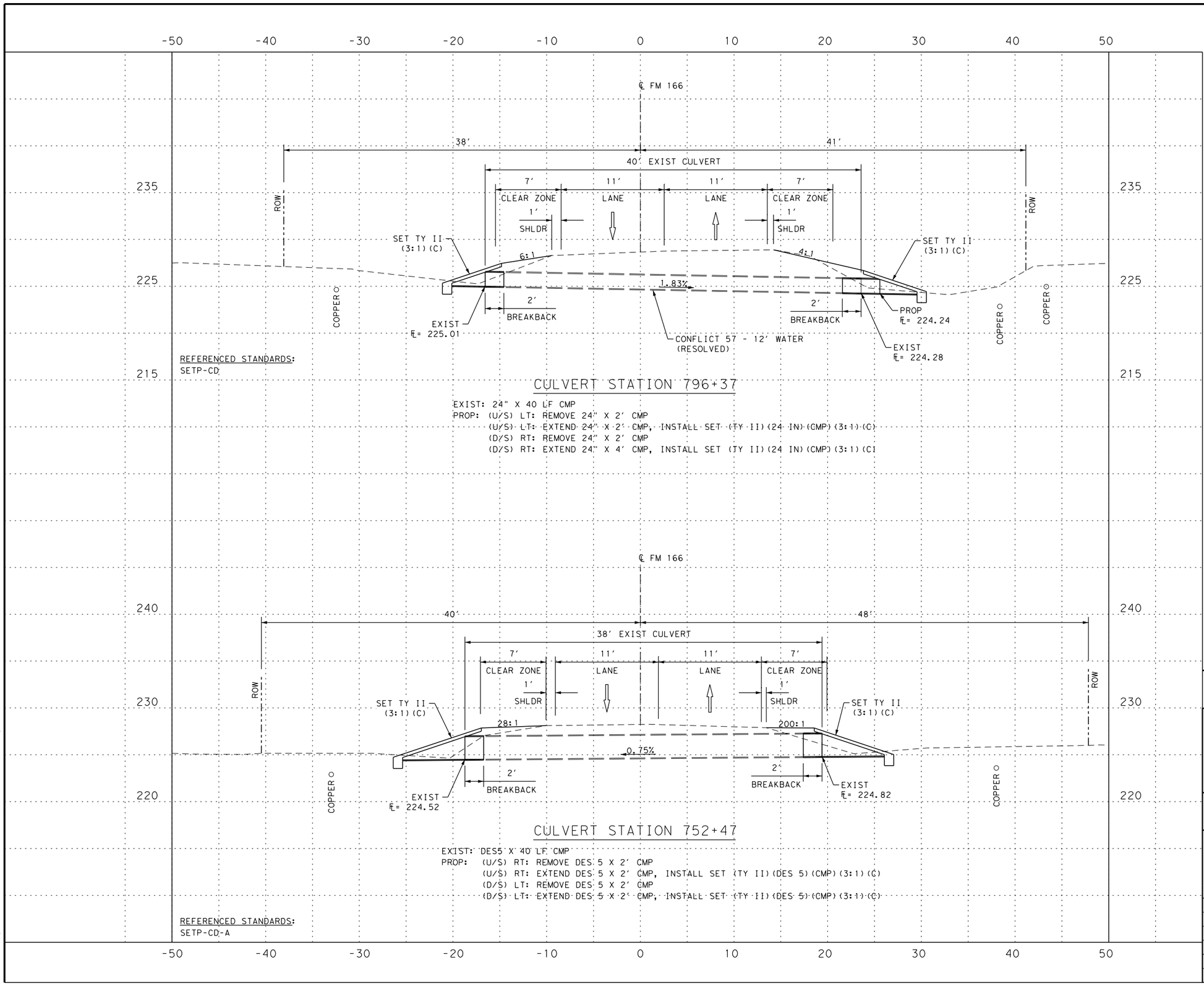
FM 166

CULVERT LAYOUT

STA 723+28
SHEET 23 OF 26 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	127



Plotted on: 3/31/2021

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NOTES

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5. DEPTH OF UTILITIES ARE ASSUMED AT MINIMUM PER UTILITY ACCOMMODATION RULES (UAR).

DESIGN

STATE OF TEXAS · HEATHER McNEAL · 114428 · LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS · DAN THOMA · 98622 · LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

SCALE: H: 1"= 10'
V: 1"= 10'

PRINT DATE	REVISION DATE
3/31/2021	

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2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

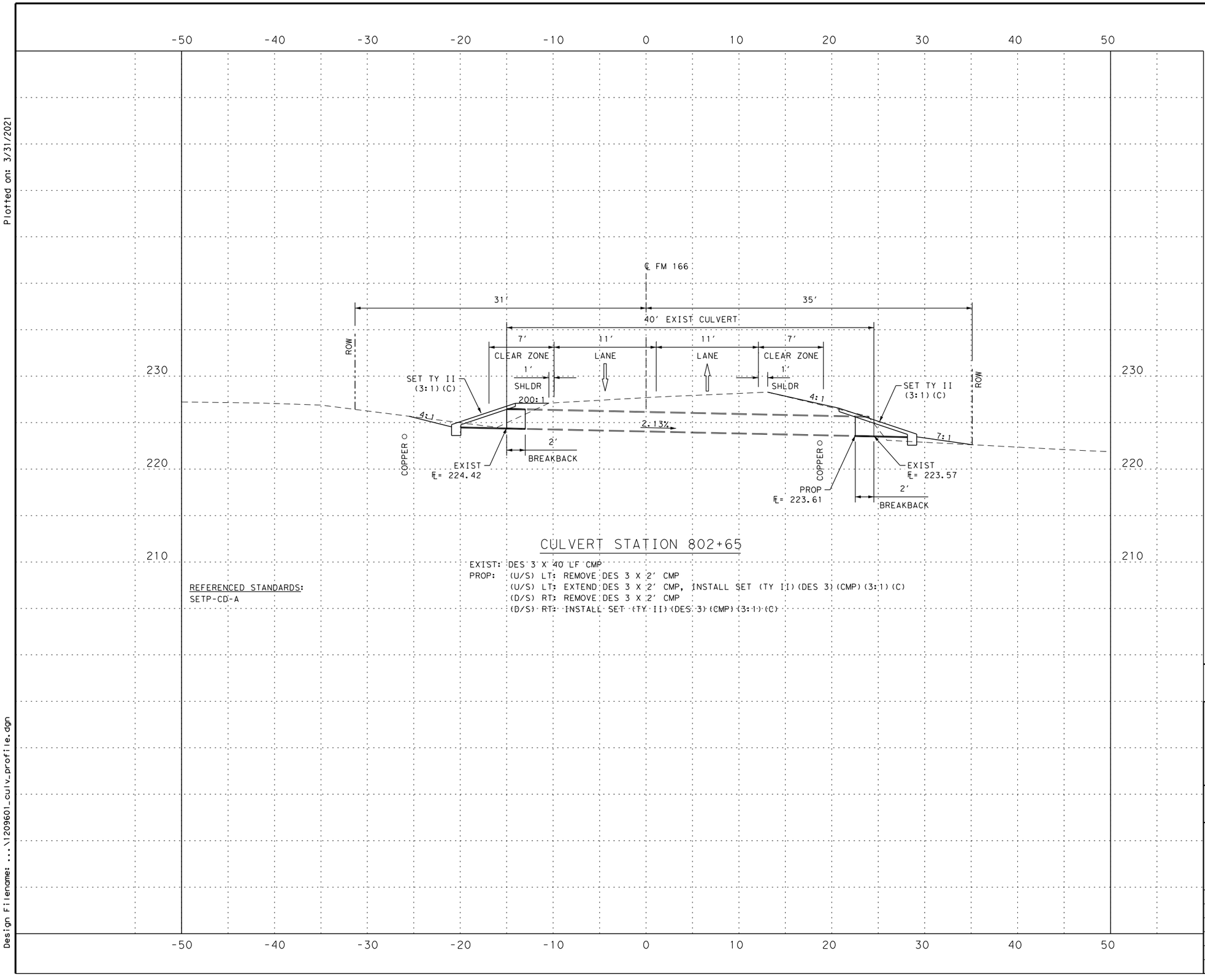
FM 166

CULVERT LAYOUT

SHEET 24 OF 26 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	128



CULVERT STATION 802+65

EXIST: DES 3 X 40 LF CMP
PROP: (U/S) LT: REMOVE DES 3 X 2' CMP
(U/S) LT: EXTEND DES 3 X 2' CMP, INSTALL SET (TY II) (DES 3) (CMP) (3:1) (C)
(D/S) RT: REMOVE DES 3 X 2' CMP
(D/S) RT: INSTALL SET (TY II) (DES 3) (CMP) (3:1) (C)

REFERENCED STANDARDS:
SETP-CD-A

NOTES

1. ALL SIDE SLOPES SHOWN ARE NORMAL TO ROADWAY PAVEMENT.
2. EXISTING FEATURES ARE SHOWN SCREENED BACK; i.e. FADED.
3. ALL PAVEMENT AND SUB-BASE REMOVAL AND RESTORATION SHALL BE PAID UNDER ITEM 400-6006 "CUT AND RESTORING PAV". SEE DRIVEWAY AND SIDE ROAD CUT & RESTORE PAVEMENT DETAILS FOR MORE INFORMATION.
4. PAVEMENT AND SUB-BASE THICKNESS ARE APPROXIMATE AND ARE FOR CONTRACTOR INFORMATION ONLY. CONTRACTOR SHALL MATCH EXISTING PAVEMENT STRUCTURE.
5. DEPTH OF UTILITIES ARE ASSUMED AT MINIMUM PER UTILITY ACCOMMODATION RULES (UAR).

DESIGN

STATE OF TEXAS · HEATHER McNEAL · 114428 · LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

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SCALE: H: 1"= 10'
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3/31/2021	

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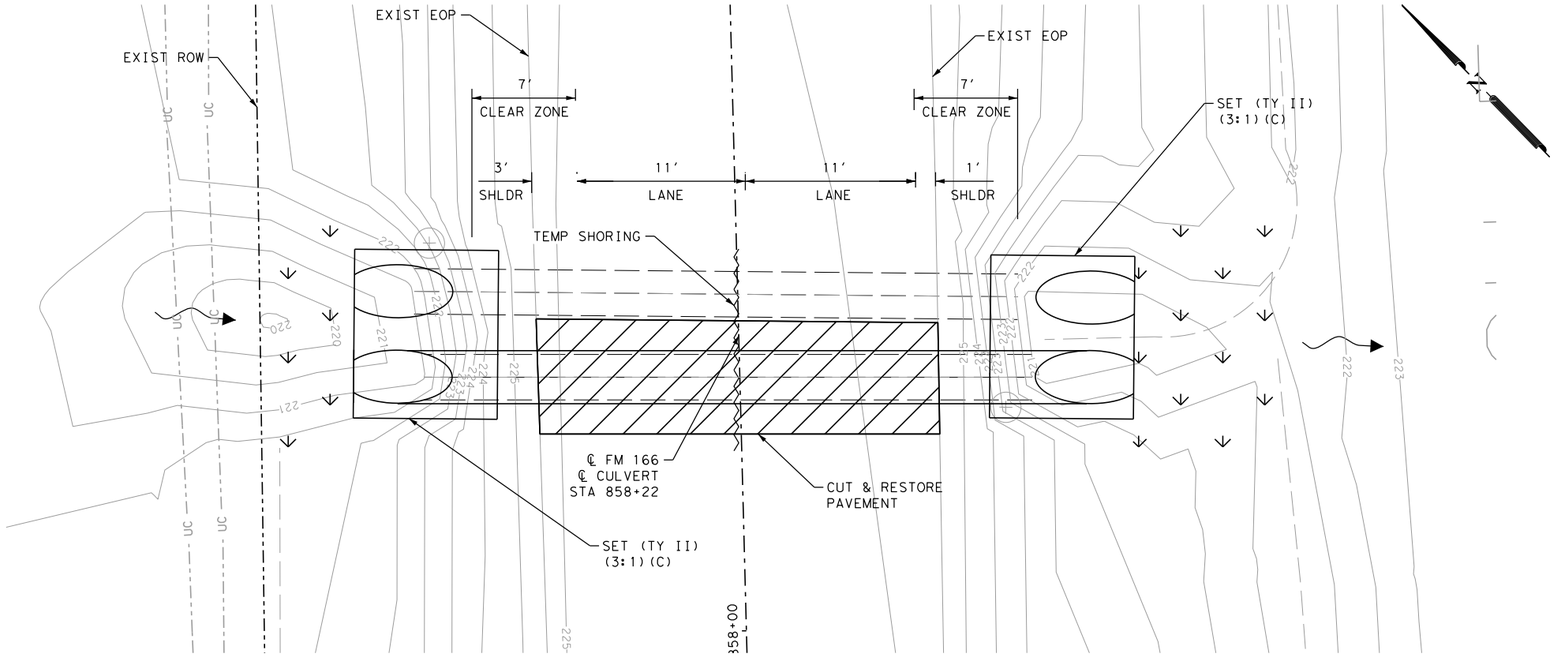
FM 166

CULVERT LAYOUT

SHEET 25 OF 26 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	129



LEGEND

- R.O.W.
- 850 EXISTING CONTOUR
- FLOW ARROW
- TEMPORARY SPECIAL SHORING
- BLOCK SODDING

NOTES

1. ALL SIDE SLOPES SHOWN ARE NORMAL TO ROADWAY PAVEMENT.
2. EXISTING FEATURES ARE SHOWN SCREENED BACK; i.e. FADED.
3. ALL PAVEMENT AND SUB-BASE REMOVAL AND RESTORATION SHALL BE PAID UNDER ITEM 400-6006 "CUT AND RESTORING PAV". SEE DRIVEWAY AND SIDE ROAD CUT & RESTORE PAVEMENT DETAILS FOR MORE INFORMATION.
4. PAVEMENT AND SUB-BASE THICKNESS ARE APPROXIMATE AND ARE FOR CONTRACTOR INFORMATION ONLY. CONTRACTOR SHALL MATCH EXISTING PAVEMENT STRUCTURE.
5. DEPTH OF UTILITIES ARE ASSUMED AT MINIMUM PER UTILITY ACCOMMODATION RULES (UAR).

DESIGN

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HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

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DAN THOMA, P.E. — 3/31/2021 DATE

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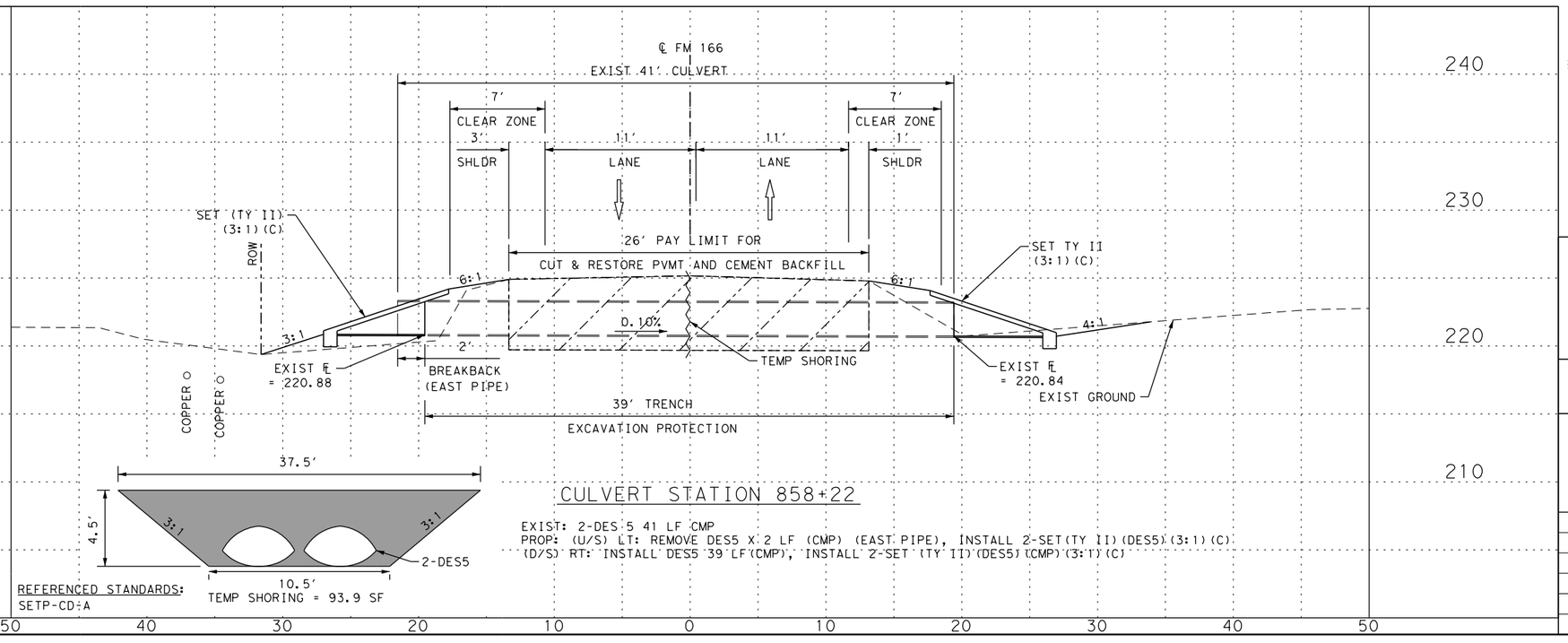
SCALE: 1"= 10'

SCALE: H: 1"= 10'
V: 1"= 10'

PRINT DATE	REVISION DATE
3/31/2021	



TEMP SHORING = 93.9 SF

REFERENCED STANDARDS:
SETP-CD-A

CULVERT STATION 858+22

EXIST: 2-DES 5 41 LF CMP
PROP: (U/S) LT: REMOVE DES5 X 2 LF (CMP) (EAST PIPE), INSTALL 2-SET(TY II)(DES5)(3:1)(C)
(D/S) RT: INSTALL DES5 39 LF (CMP), INSTALL 2-SET (TY II)(DES5)(CMP)(3:1)(C)

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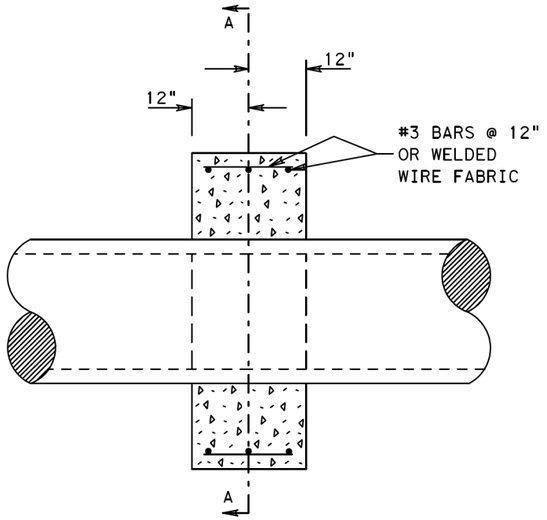
FM 166

CULVERT LAYOUT

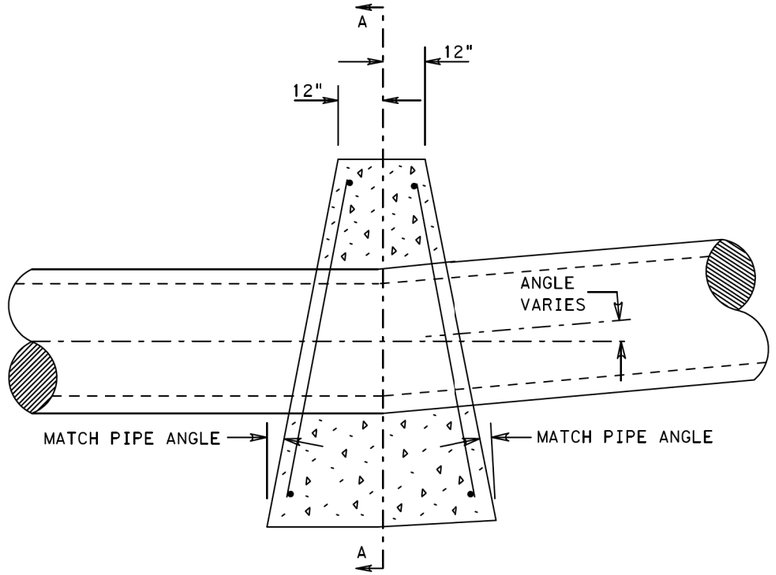
STA 858+22
SHEET 26 OF 26 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	130



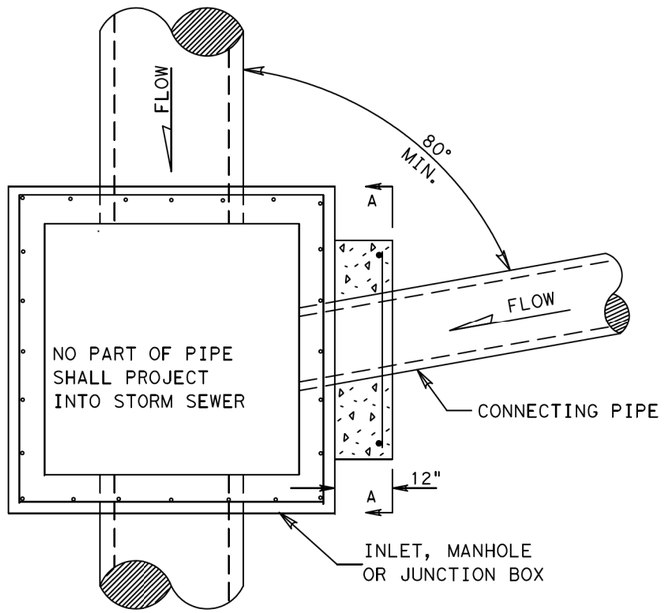
STRAIGHT DRAINAGE PIPE



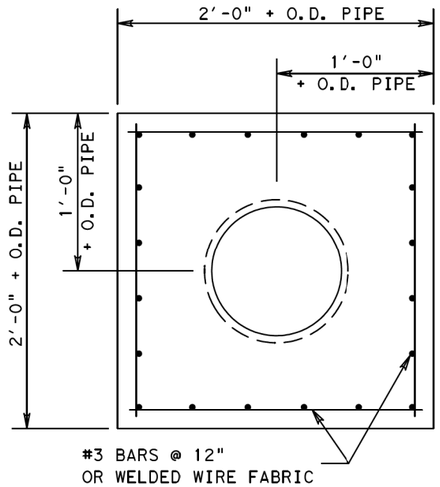
DRAINAGE PIPE W/HORIZ. & VERT. BENDS

NOTES :

1. ALL CONCRETE SHALL BE CLASS "A".
2. ALL REINFORCING STEEL SHALL HAVE A MINIMUM COVER OF 3 INCHES.
3. COLLAR MAY BE USED FOR CORRIGATED METAL OR REINFORCED CONCRETE PIPES.
4. PIPES MAY BE PLACED ON ANY SIDE AS INDICATED IN THE PLANS.
5. PROPOSED CONCRETE COLLAR WILL NOT BE PAID FOR DIRECTLY, BUT WILL BE SUBSIDIARY TO THE VARIOUS BID ITEMS.



TYPICAL DRAINAGE. PIPE
CONNECTION WITH MANHOLE



SECTION A-A

DETAIL FOR CONCRETE COLLARS FOR DRAINAGE PIPE CONNECTIONS AND DRAINAGE PIPE JUNCTIONS

DESIGN

STATE OF TEXAS · HEATHER McNEAL · 114428 · LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

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PRINT DATE	REVISION DATE
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FM 166

CONCRETE PIPE COLLAR AND CONNECTION DETAIL

FED.RD. DIV.NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	131

Culvert Station and/or Creek Name followed by applicable end (Lt, Rt or Both)	Description of Box Culvert No. Spans ~ Span X Height	Max Fill Height (Ft)	Applicable Box Culvert Standard (4)	Applicable Wingwall or End Treatment Standard	Skew Angle (0°,15°, 30° or 45°)	Side Slope or Channel Slope Ratio (SL:1)	T Culvert Top Slab Thickness (In)	U Culvert Wall Thickness (In)	C Estimated Curb Height (Ft)	Hw (1) Height of Wingwall (Ft)	A Curb to End of Wingwall (Ft)	B Offset of End of Wingwall (Ft)	Lw Length of Longest Wingwall (Ft)	Ltw Culvert Toewall Length (Ft)	Atw Anchor Toewall Length (Ft)	Riprap Apron (CY)	Class "C" Conc (Curb) (2) (CY)	Class "C" Conc (Wingwall) (3) (CY)	Total Wingwall Area (SF)
CULVERT 122+09 (BOTH)	3 ~ 6'x 6'	8.5'	MC-6-16	PW-2	0°	3:1	9"	7"	1.500'	8.500'	N/A	N/A	22.500'	20.333'	N/A	0.0	2.6	48.4	754
DRIVEWAY NO. 3 STA 53+98 (BOTH)	2 ~ 4'x 2'	3'	MC-4-23	SETB-PD	15°	6:1	8"	7"	0.250'	2.667'	N/A	N/A	14.500'	N/A	9.750'	0.0	0.2	9.2	N/A

DISCLAIMER:
The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE: 4/6/2021 5:14:51 PM
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NOTES:
Skew = 0° on SW-0, FW-0, SETB-CD, SETB-SW-0, and SETB-FW-0 standard sheets;
30° maximum for safety end treatment

SL:1 = Horizontal : 1 Vertical
- Side slope at culvert for flared or straight wingwalls.
- Channel slope for parallel wingwalls.
- Slope must be 3:1 or flatter for safety end treatments.

T = Box culvert top slab thickness. Dimension can be found on the applicable box culvert standard sheet.

U = Box culvert wall thickness. Dimension can be found on the applicable box culvert standard sheet.

C = Curb height

See applicable wing or end treatment standard sheets for calculations of Hw, A, B, Lw, Ltw, Atw, and Total Wingwall Area.

Hw = Height of wingwall

A = Distance from face of curb to end of wingwall (not applicable to parallel or straight wingwalls)

B = Offset of end of wingwall (not applicable to parallel or straight wingwalls)

Lw = Length of longest wingwall.

Ltw = Length of culvert toewall (not applicable when using riprap apron)

Atw = Length of anchor toewall (applicable to safety end treatment only)
Total Wingwall Area = Wingwall area in sq. ft. for two wingwalls (one structure end) if Lt or Rt.
Area for four wingwalls (two structure ends) if Both.

(1) Round the wall heights shown to the nearest foot for bidding purposes.

(2) Concrete volume shown is for box culvert curb only. For curbs using the Box Culvert Rail Mounting Details (RAC) standard sheet quantities shown must be increased by a factor of 2.25. If Class S concrete is required for the top slab of the culvert, also provide Class S concrete for the curb. Curb concrete is considered part of the Box Culvert for payment.

(3) Concrete volume shown is total of wings, footings, culvert toewall (if any), anchor toewalls (if any) and wingwall toewalls. Riprap aprons, culverts, and curb quantities are not included.

(4) Regardless of the type of culvert shown on this sheet, the Contractor has the option of furnishing cast-in-place or precast culverts unless otherwise shown elsewhere on the plans. If the Contractor elects to provide culverts of a different type than those shown on this sheet, it is the Contractor's responsibility to make the necessary adjustments to the dimensions and quantities shown.

SPECIAL NOTE:

This sheet is a supplement to the box culvert standards. It is to be filled out by the culvert specifier and provides dimensions for the construction of the box culvert wingwalls and safety end treatments.

An Excel 2010 spreadsheet to assist in completing this table can be downloaded from the Bridge Standards (English) web page on the TxDOT web site. The completed sheet must be signed, sealed, and dated by a licensed Professional Engineer.

DESIGN

STATE OF TEXAS · HEATHER McNEAL · 114428 · LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 4/6/2021 DATE

APPROVAL

STATE OF TEXAS · DAN THOMA · 98622 · LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 4/6/2021 DATE

Texas Department of Transportation

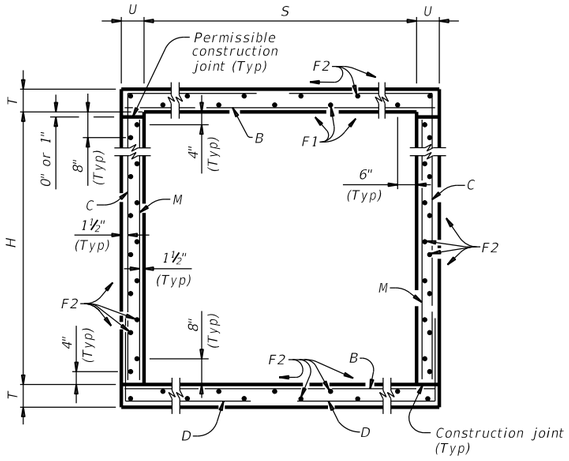
Bridge Division Standard

BOX CULVERT SUPPLEMENT
WINGS AND END TREATMENTS

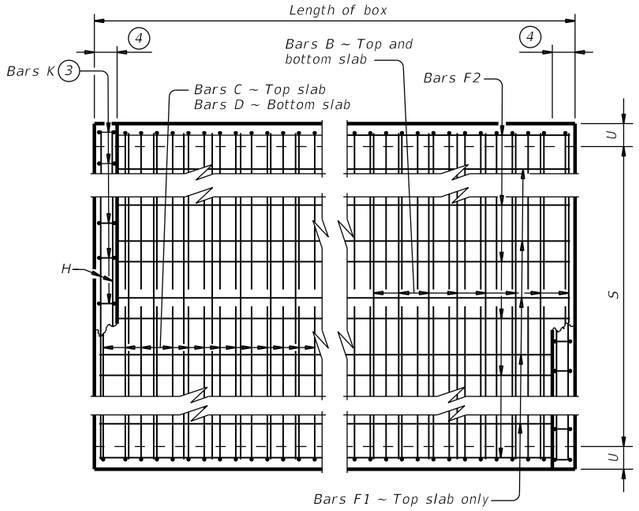
BCS

FILE: bcsstde1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0955	01	027	FM 166
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		131A

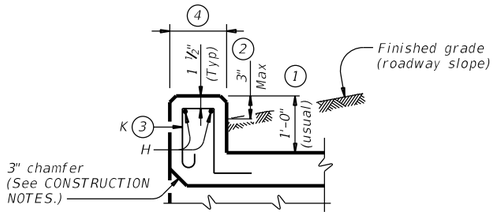
DATE: 5/21/2021 5:08:38 PM
FILE: D:\TXDOT\2020WorkFiles\Coldwell\100% changes\scc56ste-21.dgn



TYPICAL SECTION



PLAN OF REINF STEEL



SECTION THRU CURB

(1) 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Rail Anchorage Curb (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.

(2) For vehicle safety, the following requirements must be met:
- For structures without bridge rail, construct curbs no more than 3" above finished grade.
- For structures with bridge rail, construct curbs flush with finished grade.

Reduce curb heights, 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'-3" when the Rail Anchorage Curb (RAC) standard sheet is referred to elsewhere in the plans.

The Contractor may replace Bars B, C, D, E, F1, F2, M, Y, and/or Z with deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064. 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. The lap length required for WWR is never less than the lap length required for uncoated #4 bars.

Example conversion: Replacing No. 6 Gr 60 at 6" Spacing with WWR.
Required WWR = (0.44 sq. in. per 0.5 ft.) x (60 ksi / 70 ksi) = 0.755 sq. in. per ft.
If D30.6 wire is used to meet the 0.755 sq. in. per ft. requirement in this example, the required spacing = (0.306 sq. in.) / (0.755 sq. in. per ft.) x (12 in. per ft.) = 4.86" Max spacing. Required lap length for the provided D30.6 wire is 2'-1" (the same minimum lap length required for uncoated #5 bars, as listed under MATERIAL NOTES).

CONSTRUCTION NOTES:

Do not use permanent forms.
Chamfer the bottom edge of the top slab 3" at the entrance.
Optionally, raise construction joints shown at the flow line by a maximum of 6". If this option is taken, Bars M may be cut off or raised, Bars C and D may be reversed.

MATERIAL NOTES:

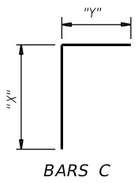
Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Provide Class C concrete (f'_c = 3,600 psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete (f'_c = 4,000 psi) for top slabs of:
- culverts with overlay,
- culverts with 1-to-2 course surface treatment, or
- culverts with the top slab as the final riding surface.

Provide bar laps, where required, as follows:
- Uncoated or galvanized ~ #4 = 1'-8" Min
- Uncoated or galvanized ~ #5 = 2'-1" Min
- Uncoated or galvanized ~ #6 = 2'-6" Min

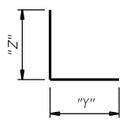
GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications for the range of fill heights shown.
See the Single Box Culverts Cast-In-Place Miscellaneous Detail (SCC-MD) standard sheet for details pertaining to skewed ends, angle sections, and lengthening.

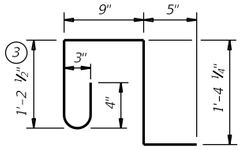
Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.



BARS C



BARS D



BARS K (#4)
(Spa = 1'-0" Max)
(Length = 4'-2")

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation — Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE
0' TO 30' FILL

SCC-5 & 6

FILE: scc56ste-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0955	01	027	FM 166
04/2021 Updated X values.	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		132

SECTION DIMENSIONS				FILL HEIGHT (5)	BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																										QUANTITIES					
					Bars B					Bars C							Bars D							Bars M ~ #4				Bars F1 ~ #4 at 18" Spa			Bars F2 ~ #4 at 18" Spa			Bars H 4 ~ #4		Bars K		Per Foot of Barrel		Curb		Total	
S	H	T	U		No.	Size	Spa	Length	Weight	No.	Size	Spa	Length	Weight	" X "	" Y "	No.	Size	Spa	Length	Weight	" Y "	" Z "	No.	Spa	Length	Weight	No.	Length	Wt	No.	Length	Weight	Length	Wt	No.	Wt	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)
5' – 0"	2' – 0"	8"	7"	26'	108	#6	9"	5' – 11"	960	108	#5	9"	6' – 3"	704	2' – 6"	3' – 9"	108	#5	9"	6' – 5"	723	3' – 9"	2' – 8"	108	9"	2' – 0"	144	4	39' – 9"	106	22	39' – 9"	584	5' – 11"	16	14	39	0.391	80.5	0.5	55	16.1	3,276
5' – 0"	2' – 0"	9"	7"	30'	108	#6	9"	5' – 11"	960	108	#5	9"	6' – 4"	713	2' – 7"	3' – 9"	108	#5	9"	6' – 6"	732	3' – 9"	2' – 9"	108	9"	2' – 0"	144	4	39' – 9"	106	22	39' – 9"	584	5' – 11"	16	14	39	0.429	81.0	0.5	55	17.6	3,294
5' – 0"	3' – 0"	8"	7"	26'	108	#6	9"	5' – 11"	960	108	#5	9"	7' – 3"	817	3' – 6"	3' – 9"	108	#5	9"	6' – 5"	723	3' – 9"	2' – 8"	108	9"	3' – 0"	216	4	39' – 9"	106	26	39' – 9"	690	5' – 11"	16	14	39	0.434	87.8	0.5	55	17.8	3,567
5' – 0"	3' – 0"	9"	7"	30'	108	#6	9"	5' – 11"	960	108	#5	9"	7' – 4"	826	3' – 7"	3' – 9"	108	#5	9"	6' – 6"	732	3' – 9"	2' – 9"	108	9"	3' – 0"	216	4	39' – 9"	106	26	39' – 9"	690	5' – 11"	16	14	39	0.472	88.3	0.5	55	19.3	3,585
5' – 0"	4' – 0"	8"	7"	26'	108	#6	9"	5' – 11"	960	108	#5	9"	8' – 3"	929	4' – 6"	3' – 9"	108	#5	9"	6' – 5"	723	3' – 9"	2' – 8"	108	9"	4' – 0"	289	4	39' – 9"	106	26	39' – 9"	690	5' – 11"	16	14	39	0.477	92.4	0.5	55	19.5	3,752
5' – 0"	4' – 0"	9"	7"	30'	108	#6	9"	5' – 11"	960	108	#5	9"	8' – 4"	939	4' – 7"	3' – 9"	108	#5	9"	6' – 6"	732	3' – 9"	2' – 9"	108	9"	4' – 0"	289	4	39' – 9"	106	26	39' – 9"	690	5' – 11"	16	14	39	0.515	92.9	0.5	55	21.1	3,771
5' – 0"	5' – 0"	8"	7"	26'	108	#6	9"	5' – 11"	960	108	#5	9"	9' – 3"	1,042	5' – 6"	3' – 9"	108	#5	9"	6' – 5"	723	3' – 9"	2' – 8"	108	9"	5' – 0"	361	4	39' – 9"	106	30	39' – 9"	797	5' – 11"	16	14	39	0.521	99.7	0.5	55	21.3	4,044
5' – 0"	5' – 0"	9"	7"	30'	108	#6	9"	5' – 11"	960	108	#5	9"	9' – 4"	1,051	5' – 7"	3' – 9"	108	#5	9"	6' – 6"	732	3' – 9"	2' – 9"	108	9"	5' – 0"	361	4	39' – 9"	106	30	39' – 9"	797	5' – 11"	16	14	39	0.559	100.2	0.5	55	22.8	4,062
6' – 0"	2' – 0"	8"	7"	20'	108	#6	9"	6' – 11"	1,122	108	#5	9"	6' – 7"	742	2' – 6"	4' – 1"	108	#5	9"	6' – 9"	760	4' – 1"	2' – 8"	108	9"	2' – 0"	144	5	39' – 9"	133	25	39' – 9"	664	6' – 11"	18	16	45	0.440	89.1	0.5	63	18.1	3,628
6' – 0"	2' – 0"	9"	7"	26'	108	#6	9"	6' – 11"	1,122	162	#5	6"	6' – 8"	1,126	2' – 7"	4' – 1"	162	#5	6"	6' – 10"	1,155	4' – 1"	2' – 9"	108	9"	2' – 0"	144	5	39' – 9"	133	25	39' – 9"	664	6' – 11"	18	16	45	0.485	108.6	0.5	63	19.9	4,407
6' – 0"	2' – 0"	10"	8"	30'	108	#6	9"	7' – 1"	1,149	162	#5	6"	6' – 10"	1,155	2' – 8"	4' – 2"	162	#5	6"	7' – 0"	1,183	4' – 2"	2' – 10"	82	12"	2' – 0"	110	5	39' – 9"	133	25	39' – 9"	664	7' – 1"	19	18	50	0.551	109.9	0.5	69	22.6	4,463
6' – 0"	3' – 0"	8"	7"	20'	108	#6	9"	6' – 11"	1,122	108	#5	9"	7' – 7"	854	3' – 6"	4' – 1"	108	#5	9"	6' – 9"	760	4' – 1"	2' – 8"	108	9"	3' – 0"	216	5	39' – 9"	133	29	39' – 9"	770	6' – 11"	18	16	45	0.484	96.4	0.5	63	19.9	3,918
6' – 0"	3' – 0"	9"	7"	26'	108	#6	9"	6' – 11"	1,122	162	#5	6"	7' – 8"	1,295	3' – 7"	4' – 1"	162	#5	6"	6' – 10"	1,155	4' – 1"	2' – 9"	108	9"	3' – 0"	216	5	39' – 9"	133	29	39' – 9"	770	6' – 11"	18	16	45	0.528	117.3	0.5	63	21.6	4,754
6' – 0"	3' – 0"	10"	8"	30'	108	#6	9"	7' – 1"	1,149	162	#5	6"	7' – 10"	1,324	3' – 8"	4' – 2"	162	#5	6"	7' – 0"	1,183	4' – 2"	2' – 10"	82	12"	3' – 0"	164	5	39' – 9"	133	29	39' – 9"	770	7' – 1"	19	18	50	0.601	118.1	0.5	69	24.6	4,792
6' – 0"	4' – 0"	8"	7"	20'	108	#6	9"	6' – 11"	1,122	108	#5	9"	8' – 7"	967	4' – 6"	4' – 1"	108	#5	9"	6' – 9"	760	4' – 1"	2' – 8"	108	9"	4' – 0"	289	5	39' – 9"	133	29	39' – 9"	770	6' – 11"	18	16	45	0.527	101.0	0.5	63	21.6	4,104
6' – 0"	4' – 0"	9"	7"	26'	108	#6	9"	6' – 11"	1,122	162	#5	6"	8' – 8"	1,464	4' – 7"	4' – 1"	162	#5	6"	6' – 10"	1,155	4' – 1"	2' – 9"	108	9"	4' – 0"	289	5	39' – 9"	133	29	39' – 9"	770	6' – 11"	18	16	45	0.571	123.3	0.5	63	23.4	4,996
6' – 0"	4' – 0"	10"	8"	30'	108	#6	9"	7' – 1"	1,149	162	#5	6"	8' – 10"	1,493	4' – 8"	4' – 2"	162	#5	6"	7' – 0"	1,183	4' – 2"	2' – 10"	82	12"	4' – 0"	219	5	39' – 9"	133	29	39' – 9"	770	7' – 1"	19	18	50	0.650	123.7	0.5	69	26.5	5,016
6' – 0"	5' – 0"	8"	7"	20'	108	#6	9"	6' – 11"	1,122	108	#5	9"	9' – 7"	1,080	5' – 6"	4' – 1"	108	#5	9"	6' – 9"	760	4' – 1"	2' – 8"	108	9"	5' – 0"	361	5	39' – 9"	133	33	39' – 9"	876	6' – 11"	18	16	45	0.570	108.3	0.5	63	23.3	4,395
6' – 0"	5' – 0"	9"	7"	26'	108	#6	9"	6' – 11"	1,122	162	#5	6"	9' – 8"	1,633	5' – 7"	4' – 1"	162	#5	6"	6' – 10"	1,155	4' – 1"	2' – 9"	108	9"	5' – 0"	361	5	39' – 9"	133	33	39' – 9"	876	6' – 11"	18	16	45	0.614	132.0	0.5	63	25.1	5,343
6' – 0"	5' – 0"	10"	8"	30'	108	#6	9"	7' – 1"	1,149	162	#5	6"	9' – 10"	1,661	5' – 8"	4' – 2"	162	#5	6"	7' – 0"	1,183	4' – 2"	2' – 10"	82	12"	5' – 0"	274	5	39' – 9"	133	33	39' – 9"	876	7' – 1"	19	18	50	0.700	131.9	0.5	69	28.5	5,345
6' – 0"	6' – 0"	8"	7"	20'	108	#6	9"	6' – 11"	1,122	108	#5	9"	10' – 7"	1,192	6' – 6"	4' – 1"	108	#5	9"	6' – 9"	760	4' – 1"	2' – 8"	108	9"	6' – 0"	433	5	39' – 9"	133	37	39' – 9"	982	6' – 11"	18	16	45	0.613	115.6	0.5	63	25.0	4,685
6' – 0"	6' – 0"	9"	7"	26'	108	#6	9"	6' – 11"	1,122	162	#5	6"	10' – 8"	1,802	6' – 7"	4' – 1"	162	#5	6"	6' – 10"	1,155	4' – 1"	2' – 9"	108	9"	6' – 0"	433	5	39' – 9"	133	37	39' – 9"	982	6' – 11"	18	16	45	0.657	140.7	0.5	63	26.8	5,690
6' – 0"	6' – 0"	10"	8"	30'	108	#6	9"	7' – 1"	1,149	162	#5	6"	10' – 10"	1,830	6' – 8"	4' – 2"	162	#5	6"	7' – 0"	1,183	4' – 2"	2' – 10"	82	12"	6' – 0"	329	5	39' – 9"	133	37	39' – 9"	982	7' – 1"	19	18	50	0.749	140.2	0.5	69	30.5	5,675

(5) For direct traffic culverts (fill height ≤ 2 ft.), identify the required box size and select the option with the minimum fill height.

DATE: 5/21/2021 5:11:07 PM
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HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE
0' TO 30' FILL

SCC-5 & 6

FILE: scc56ste-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0955	01	027	FM 166
04/2021 Updated X values.	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		133

DATE: 3/31/2021 3:09:10 PM
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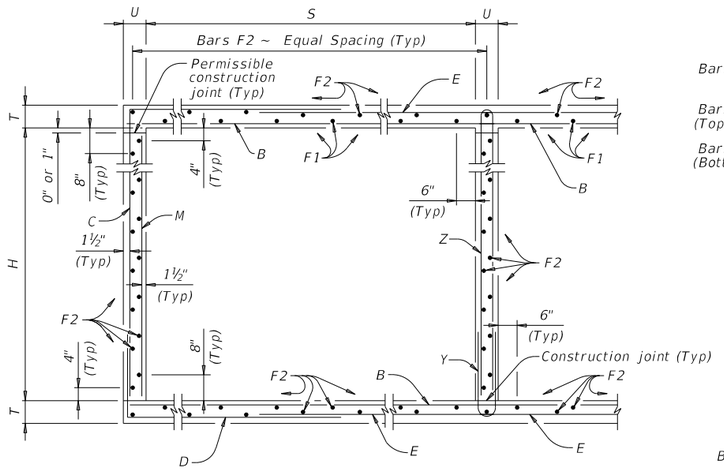
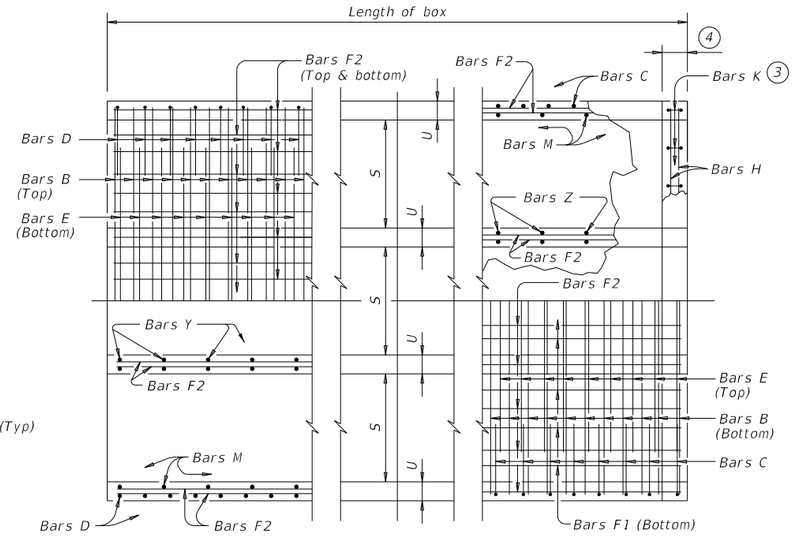
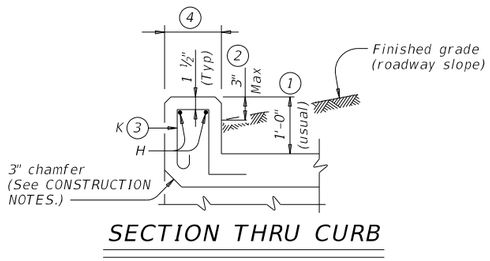


TYPICAL SECTION



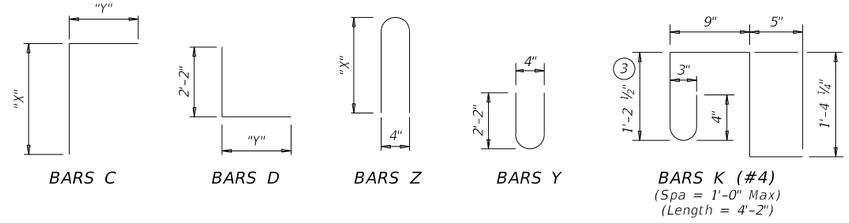
BOTTOM SLAB TOP SLAB

PART PLANS



SECTION THRU CURB

TABLE OF BAR DIMENSIONS		
H	"X"	"Y"
2'-0"	2'-6 ½"	2'-8"
3'-0"	3'-6 ½"	3'-8"



BARS C BARS D BARS Z BARS Y BARS K (#4)
(Spa = 1'-0" Max)
(Length = 4'-2")

1 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Rail Anchorage Curb (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.

2 For vehicle safety, the following requirements must be met:
- For structures without bridge rail, construct curbs no more than 3" above finished grade.
- For structures with bridge rail, construct curbs flush with finished grade.

Reduce curb heights, 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'-3" when the Rail Anchorage Curb (RAC) standard sheet is referred to elsewhere in the plans.

The Contractor may replace Bars B, C, D, E, F1, F2, M, Y, and/or Z with deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064. 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. The lap length required for WWR is never less than the lap length required for uncoated #4 bars.

Example conversion: Replacing No. 6 Gr 60 at 6" Spacing with WWR
Required WWR = (0.44 sq. in. per 0.5 ft.) x (60 ksi / 70 ksi) = 0.755 sq. in. per ft.
If D30.6 wire is used to meet the 0.755 sq. in. per ft. requirement in this example, the required spacing = (0.306 sq. in.) / (0.755 sq. in. per ft.) x (12 in. per ft.) = 4.86" Max spacing. Required lap length for the provided D30.6 wire is 2'-1" (the same minimum lap length required for uncoated #5 bars, as listed under MATERIAL NOTES).

CONSTRUCTION NOTES:

Do not use permanent forms.
Chamfer the bottom edge of the top slab 3" at the entrance.
Optionally, raise construction joints shown at the flow line by a maximum of 6". If this option is taken, Bars M may be cut off or raised, Bars C and D may be reversed, and Bars Y and Z may be reversed.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Provide Class C concrete (f'c = 3,600 psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete (f'c = 4,000 psi) for top slabs of:
- culverts with overlay,
- culverts with 1-to-2 course surface treatment, or
- culverts with the top slab as the final riding surface.

Provide bar laps, where required, as follows:
- Uncoated or galvanized ~ #4 = 1'-8" Min
- Uncoated or galvanized ~ #5 = 2'-1" Min

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications for the range of fill heights shown.
See the Multiple Box Culverts Cast-In-Place Miscellaneous Detail (MC-MD) standard sheet for details pertaining to skewed ends, angle sections, and lengthening.

Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.

Use this standard only when lengthening existing multiple box culverts.

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation — Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE
3'-0" SPAN
0' TO 23' FILL
FOR LENGTHENING ONLY
MC-3-23

FILE: mc323ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0955	01	027	FM 166
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		134

NUMBER OF SPANS	SECTION DIMENSIONS				BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																																QUANTITIES					
					Bars B					Bars C & D							Bars E					Bars F1 ~ #4				Bars F2 ~ #4				Bars M ~ #4				Bars Y & Z ~ #4								Bars H 4 ~ #4		Bars K		Per Foot of Barrel		Curb		Total	
	S	H	T	U	No.	Size	Spa	Length	Wt	No.	Size	Spa	Bars C		Bars D		No.	Size	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Bars Y		Bars Z		Length	Wt	No.	Wt	Conc (CY)	Renf (Lb)	Conc (CY)	Renf (Lb)	Conc (CY)	Renf (Lb)
													Length	Wt	Length	Wt																					Length	Wt	Length	Wt										
2	3' – 0"	2' – 0"	8"	7"	108	#5	9"	7' – 6"	845	108	#4	9"	5' – 4"	385	5' – 0"	361	108	#4	9"	5' – 11"	427	6	18"	39' – 9"	159	32	18"	39' – 9"	850	108	9"	2' – 0"	144	54	9"	4' – 7"	165	5' – 3"	189	7' – 6"	20	18	50	0.512	88.1	0.6	70	21.1	3,595
3	3' – 0"	2' – 0"	8"	7"	108	#5	9"	11' – 1"	1,248	108	#4	9"	5' – 4"	385	5' – 0"	361	108	#4	9"	9' – 6"	685	9	18"	39' – 9"	239	45	18"	39' – 9"	1,195	108	9"	2' – 0"	144	108	9"	4' – 7"	331	5' – 3"	379	11' – 1"	30	26	72	0.733	124.2	0.8	102	30.2	5,069
4	3' – 0"	2' – 0"	8"	7"	108	#5	9"	14' – 8"	1,652	108	#4	9"	5' – 4"	385	5' – 0"	361	108	#4	9"	13' – 1"	944	12	18"	39' – 9"	319	58	18"	39' – 9"	1,540	108	9"	2' – 0"	144	162	9"	4' – 7"	496	5' – 3"	568	14' – 8"	39	32	89	0.953	160.2	1.1	128	39.2	6,537
5	3' – 0"	2' – 0"	8"	7"	108	#5	9"	18' – 3"	2,056	108	#4	9"	5' – 4"	385	5' – 0"	361	108	#4	9"	16' – 8"	1,202	15	18"	39' – 9"	398	71	18"	39' – 9"	1,885	108	9"	2' – 0"	144	216	9"	4' – 7"	661	5' – 3"	758	18' – 3"	49	40	111	1.173	196.3	1.4	160	48.3	8,010
6	3' – 0"	2' – 0"	8"	7"	108	#5	9"	21' – 10"	2,459	108	#4	9"	5' – 4"	385	5' – 0"	361	108	#4	9"	20' – 3"	1,461	18	18"	39' – 9"	478	84	18"	39' – 9"	2,230	108	9"	2' – 0"	144	270	9"	4' – 7"	827	5' – 3"	947	21' – 10"	58	46	128	1.393	232.3	1.6	186	57.4	9,478
2	3' – 0"	3' – 0"	8"	7"	108	#5	9"	7' – 6"	845	108	#4	9"	6' – 4"	457	5' – 0"	361	108	#4	9"	5' – 11"	427	6	18"	39' – 9"	159	38	18"	39' – 9"	1,009	108	9"	3' – 0"	216	54	9"	4' – 7"	165	7' – 3"	262	7' – 6"	20	18	50	0.577	97.5	0.6	70	23.7	3,971
3	3' – 0"	3' – 0"	8"	7"	108	#5	9"	11' – 1"	1,248	108	#4	9"	6' – 4"	457	5' – 0"	361	108	#4	9"	9' – 6"	685	9	18"	39' – 9"	239	53	18"	39' – 9"	1,407	108	9"	3' – 0"	216	108	9"	4' – 7"	331	7' – 3"	523	11' – 1"	30	26	72	0.819	136.7	0.8	102	33.6	5,569
4	3' – 0"	3' – 0"	8"	7"	108	#5	9"	14' – 8"	1,652	108	#4	9"	6' – 4"	457	5' – 0"	361	108	#4	9"	13' – 1"	944	12	18"	39' – 9"	319	68	18"	39' – 9"	1,806	108	9"	3' – 0"	216	162	9"	4' – 7"	496	7' – 3"	785	14' – 8"	39	32	89	1.061	175.9	1.1	128	43.5	7,164
5	3' – 0"	3' – 0"	8"	7"	108	#5	9"	18' – 3"	2,056	108	#4	9"	6' – 4"	457	5' – 0"	361	108	#4	9"	16' – 8"	1,202	15	18"	39' – 9"	398	83	18"	39' – 9"	2,204	108	9"	3' – 0"	216	216	9"	4' – 7"	661	7' – 3"	1,046	18' – 3"	49	40	111	1.302	215.0	1.4	160	53.4	8,761
6	3' – 0"	3' – 0"	8"	7"	108	#5	9"	21' – 10"	2,459	108	#4	9"	6' – 4"	457	5' – 0"	361	108	#4	9"	20' – 3"	1,461	18	18"	39' – 9"	478	98	18"	39' – 9"	2,602	108	9"	3' – 0"	216	270	9"	4' – 7"	827	7' – 3"	1,308	21' – 10"	58	46	128	1.544	254.2	1.6	186	63.4	10,355

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Use this standard only when lengthening existing multiple box culverts.

HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

MULTIPLE BOX CULVERTS
CAST-IN-PLACE
3'-0" SPAN
0' TO 23' FILL
FOR LENGTHENING ONLY
MC-3-23

FILE: mc323ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0955	01	027	FM 166
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		135

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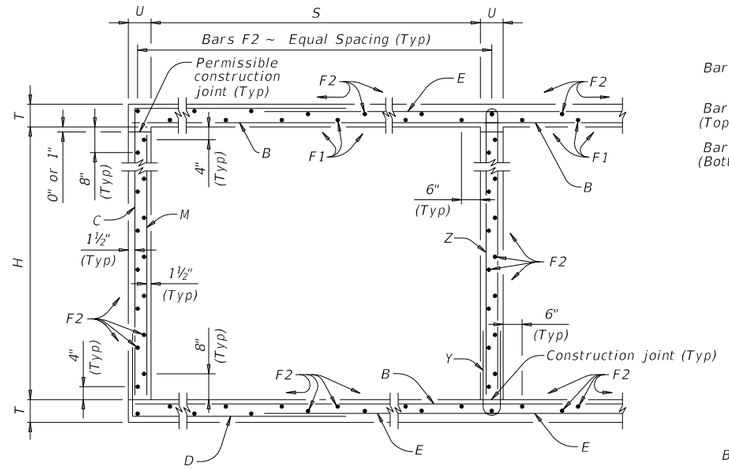
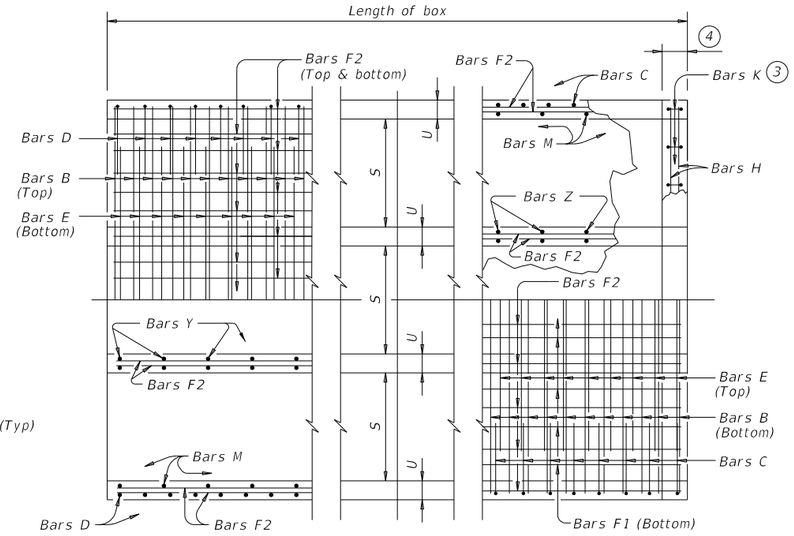
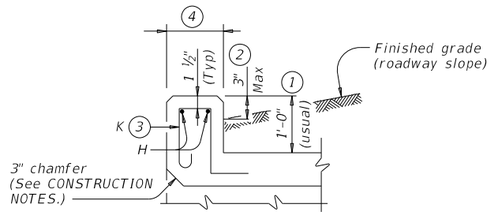


TYPICAL SECTION



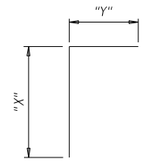
BOTTOM SLAB TOP SLAB

PART PLANS

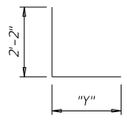


SECTION THRU CURB

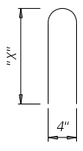
TABLE OF BAR DIMENSIONS		
H	"X"	"Y"
2'-0"	2'-6 ½"	3'-0"
3'-0"	3'-6 ½"	3'-0"
4'-0"	4'-0 ½"	3'-0"



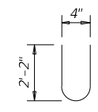
BARS C



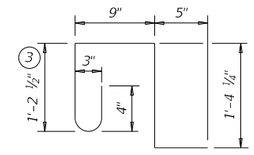
BARS D



BARS Z



BARS Y



BARS K (#4)
(Spa = 1'-0" Max)
(Length = 4'-2")

1. 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Rail Anchorage Curb (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.

2. For vehicle safety, the following requirements must be met:
   - For structures without bridge rail, construct curbs no more than 3" above finished grade.
   - For structures with bridge rail, construct curbs flush with finished grade.

   Reduce curb heights, 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'-3" when the Rail Anchorage Curb (RAC) standard sheet is referred to elsewhere in the plans.

The Contractor may replace Bars B, C, D, E, F1, F2, M, Y, and/or Z with deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064. 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. The lap length required for WWR is never less than the lap length required for uncoated #4 bars.

Example conversion: Replacing No. 6 Gr 60 at 6" Spacing with WWR
Required WWR = (0.44 sq. in. per 0.5 ft.) x (60 ksi / 70 ksi) = 0.755 sq. in. per ft.
If D30.6 wire is used to meet the 0.755 sq. in. per ft. requirement in this example, the required spacing = (0.306 sq. in.) / (0.755 sq. in. per ft.) x (12 in. per ft.) = 4.86"
Max spacing. Required lap length for the provided D30.6 wire is 2'-1" (the same minimum lap length required for uncoated #5 bars, as listed under MATERIAL NOTES).

CONSTRUCTION NOTES:

Do not use permanent forms.
Chamfer the bottom edge of the top slab 3" at the entrance.
Optionally, raise construction joints shown at the flow line by a maximum of 6". If this option is taken, Bars M may be cut off or raised, Bars C and D may be reversed, and Bars Y and Z may be reversed.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Provide Class C concrete (f'c = 3,600 psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete (f'c = 4,000 psi) for top slabs of:
- culverts with overlay,
- culverts with 1-to-2 course surface treatment, or
- culverts with the top slab as the final riding surface.

Provide bar laps, where required, as follows:
- Uncoated or galvanized ~ #4 = 1'-8" Min
- Uncoated or galvanized ~ #5 = 2'-1" Min

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications for the range of fill heights shown.
See the Multiple Box Culverts Cast-In-Place Miscellaneous Detail (MC-MD) standard sheet for details pertaining to skewed ends, angle sections, and lengthening.

Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.

Use this standard only when lengthening existing multiple box culverts.

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation — Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE
4'-0" SPAN
0' TO 23' FILL
FOR LENGTHENING ONLY
MC-4-23

FILE: mc423ste-20.dgn	DN: TBE	CK: TAR	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0955	01	027	FM 166
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		136

BILLS OF REINFORCING STEEL (For Box Length = 40 feet)

NUMBER OF SPANS	SECTION DIMENSIONS S	H	T	U	Bars B No.	Size	Spa	Length	Wt	Bars C & D No.	Size	Spa	Bars C Length	Bars C Wt	Bars D Length	Bars D Wt	Bars E No.	Size	Spa	Length	Wt	Bars F1 ~ #4 No.	Spa	Length	Wt	Bars F2 ~ #4 No.	Spa	Length	Wt	Bars M ~ #4 No.	Spa	Length	Wt	Bars Y & Z ~ #4 No.	Spa	Bars Y Length	Bars Y Wt	Bars Z Length	Bars Z Wt	Bars H 4 ~ #4 Length	Wt	Bars K No.	Wt	QUANTITIES Per Foot of Barrel Conc (CY)	Per Foot of Barrel Renf (Lb)	Curb Conc (CY)	Curb Renf (Lb)	Total Conc (CY)	Total Renf (Lb)
2	4' - 0"	2' - 0"	8"	7"	108	#5	9"	9' - 6"	1,070	162	#4	6"	5' - 8"	613	5' - 4"	577	108	#5	9"	7' - 4"	826	6	18"	39' - 9"	159	36	18"	39' - 9"	956	108	9"	2' - 0"	144	54	9"	4' - 7"	165	5' - 3"	189	9' - 6"	25	22	61	0.611	117.5	0.7	86	25.2	4,785
3	4' - 0"	2' - 0"	8"	7"	108	#5	9"	14' - 1"	1,586	162	#4	6"	5' - 8"	613	5' - 4"	577	108	#5	9"	11' - 11"	1,342	9	18"	39' - 9"	239	51	18"	39' - 9"	1,354	108	9"	2' - 0"	144	108	9"	4' - 7"	331	5' - 3"	379	14' - 1"	38	32	89	0.881	164.1	1.1	127	36.3	6,692
4	4' - 0"	2' - 0"	8"	7"	108	#5	9"	18' - 8"	2,103	162	#4	6"	5' - 8"	613	5' - 4"	577	108	#5	9"	16' - 6"	1,859	12	18"	39' - 9"	319	66	18"	39' - 9"	1,752	108	9"	2' - 0"	144	162	9"	4' - 7"	496	5' - 3"	568	18' - 8"	50	40	111	1.150	210.8	1.4	161	47.4	8,592
5	4' - 0"	2' - 0"	8"	7"	108	#5	9"	23' - 3"	2,619	162	#4	6"	5' - 8"	613	5' - 4"	577	108	#5	9"	21' - 1"	2,375	15	18"	39' - 9"	398	81	18"	39' - 9"	2,151	108	9"	2' - 0"	144	216	9"	4' - 7"	661	5' - 3"	758	23' - 3"	62	50	139	1.420	257.4	1.7	201	58.5	10,497
6	4' - 0"	2' - 0"	8"	7"	108	#5	9"	27' - 10"	3,135	162	#4	6"	5' - 8"	613	5' - 4"	577	108	#5	9"	25' - 8"	2,891	18	18"	39' - 9"	478	96	18"	39' - 9"	2,549	108	9"	2' - 0"	144	270	9"	4' - 7"	827	5' - 3"	947	27' - 10"	74	58	161	1.689	304.0	2.1	235	69.6	12,396
2	4' - 0"	3' - 0"	8"	7"	108	#5	9"	9' - 6"	1,070	162	#4	6"	6' - 8"	721	5' - 4"	577	108	#5	9"	7' - 4"	826	6	18"	39' - 9"	159	42	18"	39' - 9"	1,115	108	9"	3' - 0"	216	54	9"	4' - 7"	165	7' - 3"	262	9' - 6"	25	22	61	0.676	127.8	0.7	86	27.8	5,197
3	4' - 0"	3' - 0"	8"	7"	108	#5	9"	14' - 1"	1,586	162	#4	6"	6' - 8"	721	5' - 4"	577	108	#5	9"	11' - 11"	1,342	9	18"	39' - 9"	239	59	18"	39' - 9"	1,567	108	9"	3' - 0"	216	108	9"	4' - 7"	331	7' - 3"	523	14' - 1"	38	32	89	0.967	177.6	1.1	127	39.7	7,229
4	4' - 0"	3' - 0"	8"	7"	108	#5	9"	18' - 8"	2,103	162	#4	6"	6' - 8"	721	5' - 4"	577	108	#5	9"	16' - 6"	1,859	12	18"	39' - 9"	319	76	18"	39' - 9"	2,018	108	9"	3' - 0"	216	162	9"	4' - 7"	496	7' - 3"	785	18' - 8"	50	40	111	1.258	227.4	1.4	161	51.7	9,255
5	4' - 0"	3' - 0"	8"	7"	108	#5	9"	23' - 3"	2,619	162	#4	6"	6' - 8"	721	5' - 4"	577	108	#5	9"	21' - 1"	2,375	15	18"	39' - 9"	398	93	18"	39' - 9"	2,469	108	9"	3' - 0"	216	216	9"	4' - 7"	661	7' - 3"	1,046	23' - 3"	62	50	139	1.549	277.1	1.7	201	63.7	11,283
6	4' - 0"	3' - 0"	8"	7"	108	#5	9"	27' - 10"	3,135	162	#4	6"	6' - 8"	721	5' - 4"	577	108	#5	9"	25' - 8"	2,891	18	18"	39' - 9"	478	110	18"	39' - 9"	2,921	108	9"	3' - 0"	216	270	9"	4' - 7"	827	7' - 3"	1,308	27' - 10"	74	58	161	1.841	326.9	2.1	235	75.7	13,309
2	4' - 0"	4' - 0"	8"	7"	108	#5	9"	9' - 6"	1,070	162	#4	6"	7' - 8"	830	5' - 4"	577	108	#5	9"	7' - 4"	826	6	18"	39' - 9"	159	42	18"	39' - 9"	1,115	108	9"	4' - 0"	289	54	9"	4' - 7"	165	9' - 3"	334	9' - 6"	25	22	61	0.741	134.1	0.7	86	30.4	5,451
3	4' - 0"	4' - 0"	8"	7"	108	#5	9"	14' - 1"	1,586	162	#4	6"	7' - 8"	830	5' - 4"	577	108	#5	9"	11' - 11"	1,342	9	18"	39' - 9"	239	59	18"	39' - 9"	1,567	108	9"	4' - 0"	289	108	9"	4' - 7"	331	9' - 3"	667	14' - 1"	38	32	89	1.053	185.7	1.1	127	43.2	7,555
4	4' - 0"	4' - 0"	8"	7"	108	#5	9"	18' - 8"	2,103	162	#4	6"	7' - 8"	830	5' - 4"	577	108	#5	9"	16' - 6"	1,859	12	18"	39' - 9"	319	76	18"	39' - 9"	2,018	108	9"	4' - 0"	289	162	9"	4' - 7"	496	9' - 3"	1,001	18' - 8"	50	40	111	1.366	237.3	1.4	161	56.0	9,653
5	4' - 0"	4' - 0"	8"	7"	108	#5	9"	23' - 3"	2,619	162	#4	6"	7' - 8"	830	5' - 4"	577	108	#5	9"	21' - 1"	2,375	15	18"	39' - 9"	398	93	18"	39' - 9"	2,469	108	9"	4' - 0"	289	216	9"	4' - 7"	661	9' - 3"	1,335	23' - 3"	62	50	139	1.679	288.8	1.7	201	68.9	11,754
6	4' - 0"	4' - 0"	8"	7"	108	#5	9"	27' - 10"	3,135	162	#4	6"	7' - 8"	830	5' - 4"	577	108	#5	9"	25' - 8"	2,891	18	18"	39' - 9"	478	110	18"	39' - 9"	2,921	108	9"	4' - 0"	289	270	9"	4' - 7"	827	9' - 3"	1,668	27' - 10"	74	58	161	1.992	340.4	2.1	235	81.8	13,851

Use this standard only when lengthening existing multiple box culverts.

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HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE

4'-0" SPAN
0' TO 23' FILL
FOR LENGTHENING ONLY

MC-4-23

FILE: mc423ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0955	01	027	FM 166
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		137

DATE: 3/31/2021 3:09:18 PM
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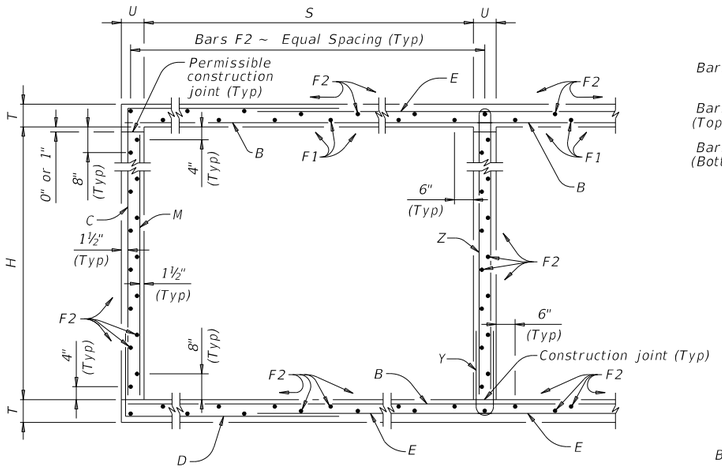
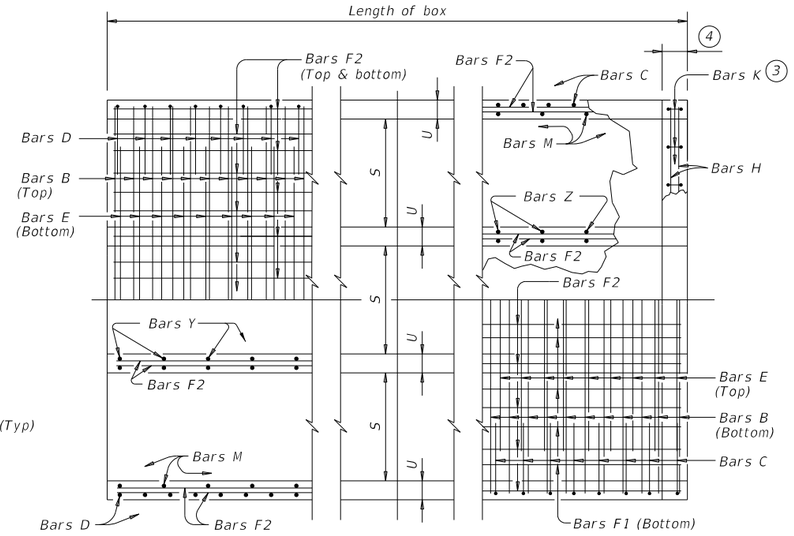
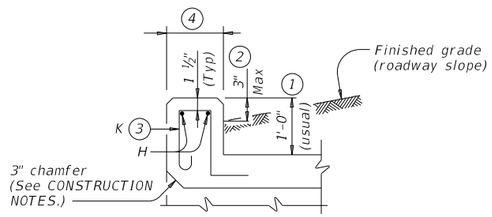


TYPICAL SECTION



PART PLANS



SECTION THRU CURB

TABLE OF BAR DIMENSIONS		
H	"X"	"Y"
2'-0"	2'-7 ½"	4'-1"
3'-0"	3'-7 ½"	4'-1"
4'-0"	4'-7 ½"	4'-1"
5'-0"	5'-7 ½"	4'-1"
6'-0"	6'-7 ½"	4'-1"

1. 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Rail Anchorage Curb (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.

2. For vehicle safety, the following requirements must be met:
   - For structures without bridge rail, construct curbs no more than 3" above finished grade.
   - For structures with bridge rail, construct curbs flush with finished grade.

   Reduce curb heights, 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'-3" when the Rail Anchorage Curb (RAC) standard sheet is referred to elsewhere in the plans.

The Contractor may replace Bars B, C, D, E, F1, F2, M, Y, and/or Z with deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064. 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. The lap length required for WWR is never less than the lap length required for uncoated #4 bars.

Example conversion: Replacing No. 6 Gr 60 at 6" Spacing with WWR
Required WWR = (0.44 sq. in. per 0.5 ft.) x (60 ksi / 70 ksi) = 0.755 sq. in. per ft.
If D30.6 wire is used to meet the 0.755 sq. in. per ft. requirement in this example, the required spacing = (0.306 sq. in.) / (0.755 sq. in. per ft.) x (12 in. per ft.) = 4.86" Max spacing. Required lap length for the provided D30.6 wire is 2'-1" (the same minimum lap length required for uncoated #5 bars, as listed under MATERIAL NOTES).

CONSTRUCTION NOTES:

Do not use permanent forms.
Chamfer the bottom edge of the top slab 3" at the entrance.
Optionally, raise construction joints shown at the flow line by a maximum of 6". If this option is taken, Bars M may be cut off or raised, Bars C and D may be reversed, and Bars Y and Z may be reversed.

MATERIAL NOTES:

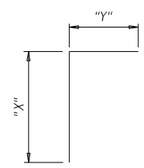
Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Provide Class C concrete (f'c = 3,600 psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete (f'c = 4,000 psi) for top slabs of:
- culverts with overlay,
- culverts with 1-to-2 course surface treatment, or
- culverts with the top slab as the final riding surface.

Provide bar laps, where required, as follows:
- Uncoated or galvanized ~ #4 = 1'-8" Min
- Uncoated or galvanized ~ #5 = 2'-1" Min
- Uncoated or galvanized ~ #6 = 2'-6" Min

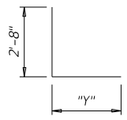
GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications for the range of fill heights shown.
See the Multiple Box Culverts Cast-In-Place Miscellaneous Detail (MC-MD) standard sheet for details pertaining to skewed ends, angle sections, and lengthening.

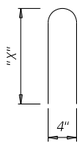
Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.



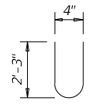
BARS C



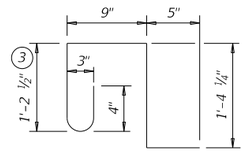
BARS D



BARS Z



BARS Y



BARS K (#4)
(Spa = 1'-0" Max)
(Length = 4'-2")

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation — Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE 6'-0" SPAN 0' TO 16' FILL

MC-6-16

FILE: mc616ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0955	01	027	FM 166
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		138

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BILLS OF REINFORCING STEEL (For Box Length = 40 feet)

NUMBER OF SPANS	SECTION DIMENSIONS				Bars B					Bars C & D								Bars E					Bars F1 ~ #4				Bars F2 ~ #4				Bars M ~ #4				Bars Y & Z ~ #4								Bars H 4 ~ #4		Bars K		QUANTITIES: Per Foot of Barrel		Curb		Total	
	S	H	T	U	No.	Size	Spa	Length	Wt	No.	Size	Spa	Bars C Length	Bars C Wt	Bars D Length	Bars D Wt	No.	Size	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Bars Y Length	Bars Y Wt	Bars Z Length	Bars Z Wt	Length	Wt	No.	Wt	No.	Wt	Conc (CY)	Renf (Lb)	Conc (CY)	Renf (Lb)	Conc (CY)	Renf (Lb)
2	6' – 0"	2' – 0"	9"	7"	108	#6	9"	13' – 6"	2,190	108	#5	9"	6' – 8"	751	6' – 9"	760	108	#6	9"	10' – 2"	1,649	10	18"	39' – 9"	266	44	18"	39' – 9"	1,168	108	9"	2' – 0"	144	54	9"	4' – 9"	171	5' – 5"	195	13' – 6"	36	30	84	0.894	182.4	1.0	120	36.8	7,414
3	6' – 0"	2' – 0"	9"	7"	108	#6	9"	20' – 1"	3,258	108	#5	9"	6' – 8"	751	6' – 9"	760	108	#6	9"	16' – 9"	2,717	15	18"	39' – 9"	398	63	18"	39' – 9"	1,673	108	9"	2' – 0"	144	108	9"	4' – 9"	343	5' – 5"	391	20' – 1"	54	44	122	1.302	260.9	1.5	176	53.6	10,611
4	6' – 0"	2' – 0"	9"	7"	108	#6	9"	26' – 8"	4,326	108	#5	9"	6' – 8"	751	6' – 9"	760	108	#6	9"	23' – 4"	3,785	20	18"	39' – 9"	531	82	18"	39' – 9"	2,177	108	9"	2' – 0"	144	162	9"	4' – 9"	514	5' – 5"	586	26' – 8"	71	56	156	1.711	339.4	2.0	227	70.4	13,801
5	6' – 0"	2' – 0"	9"	7"	108	#6	9"	33' – 3"	5,394	108	#5	9"	6' – 8"	751	6' – 9"	760	108	#6	9"	29' – 11"	4,853	25	18"	39' – 9"	664	101	18"	39' – 9"	2,682	108	9"	2' – 0"	144	216	9"	4' – 9"	685	5' – 5"	782	33' – 3"	89	70	195	2.120	417.9	2.5	284	87.3	16,999
6	6' – 0"	2' – 0"	9"	7"	108	#6	9"	39' – 10"	6,462	108	#5	9"	6' – 8"	751	6' – 9"	760	108	#6	9"	36' – 6"	5,921	30	18"	39' – 9"	797	120	18"	39' – 9"	3,186	108	9"	2' – 0"	144	270	9"	4' – 9"	857	5' – 5"	977	39' – 10"	106	82	228	2.529	496.4	3.0	334	104.1	20,189
2	6' – 0"	3' – 0"	9"	7"	108	#6	9"	13' – 6"	2,190	108	#5	9"	7' – 8"	864	6' – 9"	760	108	#6	9"	10' – 2"	1,649	10	18"	39' – 9"	266	50	18"	39' – 9"	1,328	108	9"	3' – 0"	216	54	9"	4' – 9"	171	7' – 5"	268	13' – 6"	36	30	84	0.958	192.8	1.0	120	39.3	7,832
3	6' – 0"	3' – 0"	9"	7"	108	#6	9"	20' – 1"	3,258	108	#5	9"	7' – 8"	864	6' – 9"	760	108	#6	9"	16' – 9"	2,717	15	18"	39' – 9"	398	71	18"	39' – 9"	1,885	108	9"	3' – 0"	216	108	9"	4' – 9"	343	7' – 5"	535	20' – 1"	54	44	122	1.389	274.4	1.5	176	57.1	11,152
4	6' – 0"	3' – 0"	9"	7"	108	#6	9"	26' – 8"	4,326	108	#5	9"	7' – 8"	864	6' – 9"	760	108	#6	9"	23' – 4"	3,785	20	18"	39' – 9"	531	92	18"	39' – 9"	2,443	108	9"	3' – 0"	216	162	9"	4' – 9"	514	7' – 5"	803	26' – 8"	71	56	156	1.819	356.1	2.0	227	74.7	14,469
5	6' – 0"	3' – 0"	9"	7"	108	#6	9"	33' – 3"	5,394	108	#5	9"	7' – 8"	864	6' – 9"	760	108	#6	9"	29' – 11"	4,853	25	18"	39' – 9"	664	113	18"	39' – 9"	3,000	108	9"	3' – 0"	216	216	9"	4' – 9"	685	7' – 5"	1,070	33' – 3"	89	70	195	2.250	437.7	2.5	284	92.5	17,790
6	6' – 0"	3' – 0"	9"	7"	108	#6	9"	39' – 10"	6,462	108	#5	9"	7' – 8"	864	6' – 9"	760	108	#6	9"	36' – 6"	5,921	30	18"	39' – 9"	797	134	18"	39' – 9"	3,558	108	9"	3' – 0"	216	270	9"	4' – 9"	857	7' – 5"	1,338	39' – 10"	106	82	228	2.681	519.3	3.0	334	110.2	21,107
2	6' – 0"	4' – 0"	9"	7"	108	#6	9"	13' – 6"	2,190	108	#5	9"	8' – 8"	976	6' – 9"	760	108	#6	9"	10' – 2"	1,649	10	18"	39' – 9"	266	50	18"	39' – 9"	1,328	108	9"	4' – 0"	289	54	9"	4' – 9"	171	9' – 5"	340	13' – 6"	36	30	84	1.023	199.2	1.0	120	41.9	8,089
3	6' – 0"	4' – 0"	9"	7"	108	#6	9"	20' – 1"	3,258	108	#5	9"	8' – 8"	976	6' – 9"	760	108	#6	9"	16' – 9"	2,717	15	18"	39' – 9"	398	71	18"	39' – 9"	1,885	108	9"	4' – 0"	289	108	9"	4' – 9"	343	9' – 5"	679	20' – 1"	54	44	122	1.475	282.6	1.5	176	60.5	11,481
4	6' – 0"	4' – 0"	9"	7"	108	#6	9"	26' – 8"	4,326	108	#5	9"	8' – 8"	976	6' – 9"	760	108	#6	9"	23' – 4"	3,785	20	18"	39' – 9"	531	92	18"	39' – 9"	2,443	108	9"	4' – 0"	289	162	9"	4' – 9"	514	9' – 5"	1,019	26' – 8"	71	56	156	1.927	366.1	2.0	227	79.1	14,870
5	6' – 0"	4' – 0"	9"	7"	108	#6	9"	33' – 3"	5,394	108	#5	9"	8' – 8"	976	6' – 9"	760	108	#6	9"	29' – 11"	4,853	25	18"	39' – 9"	664	113	18"	39' – 9"	3,000	108	9"	4' – 0"	289	216	9"	4' – 9"	685	9' – 5"	1,359	33' – 3"	89	70	195	2.380	449.5	2.5	284	97.7	18,264
6	6' – 0"	4' – 0"	9"	7"	108	#6	9"	39' – 10"	6,462	108	#5	9"	8' – 8"	976	6' – 9"	760	108	#6	9"	36' – 6"	5,921	30	18"	39' – 9"	797	134	18"	39' – 9"	3,558	108	9"	4' – 0"	289	270	9"	4' – 9"	857	9' – 5"	1,698	39' – 10"	106	82	228	2.832	533.0	3.0	334	116.2	21,652
2	6' – 0"	5' – 0"	9"	7"	108	#6	9"	13' – 6"	2,190	108	#5	9"	9' – 8"	1,089	6' – 9"	760	108	#6	9"	10' – 2"	1,649	10	18"	39' – 9"	266	56	18"	39' – 9"	1,487	108	9"	5' – 0"	361	54	9"	4' – 9"	171	11' – 5"	412	13' – 6"	36	30	84	1.088	209.6	1.0	120	44.5	8,505
3	6' – 0"	5' – 0"	9"	7"	108	#6	9"	20' – 1"	3,258	108	#5	9"	9' – 8"	1,089	6' – 9"	760	108	#6	9"	16' – 9"	2,717	15	18"	39' – 9"	398	79	18"	39' – 9"	2,098	108	9"	5' – 0"	361	108	9"	4' – 9"	343	11' – 5"	824	20' – 1"	54	44	122	1.562	296.2	1.5	176	64.0	12,024
4	6' – 0"	5' – 0"	9"	7"	108	#6	9"	26' – 8"	4,326	108	#5	9"	9' – 8"	1,089	6' – 9"	760	108	#6	9"	23' – 4"	3,785	20	18"	39' – 9"	531	102	18"	39' – 9"	2,708	108	9"	5' – 0"	361	162	9"	4' – 9"	514	11' – 5"	1,235	26' – 8"	71	56	156	2.035	382.7	2.0	227	83.4	15,536
5	6' – 0"	5' – 0"	9"	7"	108	#6	9"	33' – 3"	5,394	108	#5	9"	9' – 8"	1,089	6' – 9"	760	108	#6	9"	29' – 11"	4,853	25	18"	39' – 9"	664	125	18"	39' – 9"	3,319	108	9"	5' – 0"	361	216	9"	4' – 9"	685	11' – 5"	1,647	33' – 3"	89	70	195	2.509	469.3	2.5	284	102.8	19,056
6	6' – 0"	5' – 0"	9"	7"	108	#6	9"	39' – 10"	6,462	108	#5	9"	9' – 8"	1,089	6' – 9"	760	108	#6	9"	36' – 6"	5,921	30	18"	39' – 9"	797	148	18"	39' – 9"	3,930	108	9"	5' – 0"	361	270	9"	4' – 9"	857	11' – 5"	2,059	39' – 10"	106	82	228	2.983	555.9	3.0	334	122.3	22,570
2	6' – 0"	6' – 0"	9"	7"	108	#6	9"	13' – 6"	2,190	108	#5	9"	10' – 8"	1,202	6' – 9"	760	108	#6	9"	10' – 2"	1,649	10	18"	39' – 9"	266	62	18"	39' – 9"	1,646	108	9"	6' – 0"	433	54	9"	4' – 9"	171	13' – 5"	484	13' – 6"	36	30	84	1.153	220.0	1.0	120	47.1	8,921
3	6' – 0"	6' – 0"	9"	7"	108	#6	9"	20' – 1"	3,258	108	#5	9"	10' – 8"	1,202	6' – 9"	760	108	#6	9"	16' – 9"	2,717	15	18"	39' – 9"	398	87	18"	39' – 9"	2,310	108	9"	6' – 0"	433	108	9"	4' – 9"	343	13' – 5"	968	20' – 1"	54	44	122	1.648	309.7	1.5	176	67.4	12,565
4	6' – 0"	6' – 0"	9"	7"	108	#6	9"	26' – 8"	4,326	108	#5	9"	10' – 8"	1,202	6' – 9"	760	108	#6	9"	23' – 4"	3,785	20	18"	39' – 9"	531	112	18"	39' – 9"	2,974	108	9"	6' – 0"	433	162	9"	4' – 9"	514	13' – 5"	1,452	26' – 8"	71	56	156	2.144	399.4	2.0	227	87.7	16,204
5	6' – 0"	6' – 0"	9"	7"	108	#6	9"	33' – 3"	5,394	108	#5	9"	10' – 8"	1,202	6' – 9"	760	108	#6	9"	29' – 11"	4,853	25	18"	39' – 9"	664	137	18"	39' – 9"	3,638	108	9"	6' – 0"	433	216	9"	4' – 9"	685	13' – 5"	1,936	33' – 3"	89	70	195	2.639	489.1	2.5	284	108.0	19,849
6	6' – 0"	6' – 0"	9"	7"	108	#6	9"	39' – 10"	6,462	108	#5	9"	10' – 8"	1,202	6' – 9"	760	108	#6	9"	36' – 6"	5,921	30	18"	39' – 9"	797	162	18"	39' – 9"	4,302	108	9"	6' – 0"	433	270	9"	4' – 9"	857	13' – 5"	2,420	39' – 10"	106	82	228	3.134	578.9	3.0	334	128.3	23,488

HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation | Bridge Division Standard

MULTIPLE BOX CULVERTS
CAST-IN-PLACE
6'-0" SPAN
0' TO 16' FILL

MC-6-16

FILE: mc616ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0955	01	027	FM 166
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		139

DATE: 3/31/2021 3:09:23 PM
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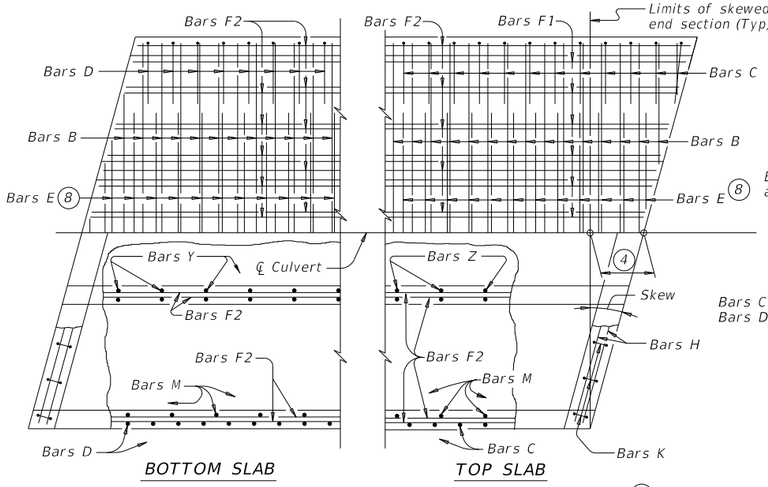
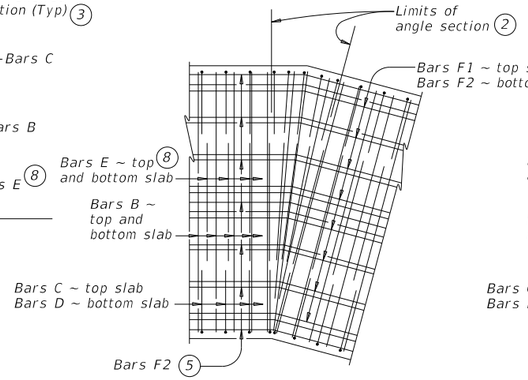
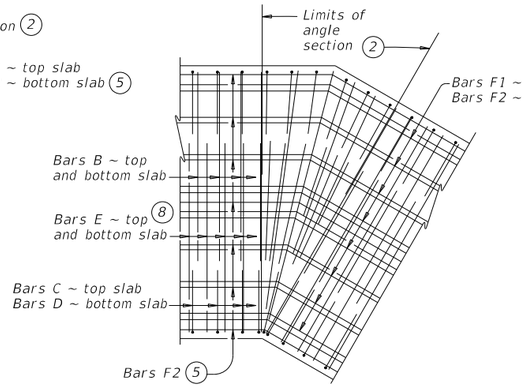


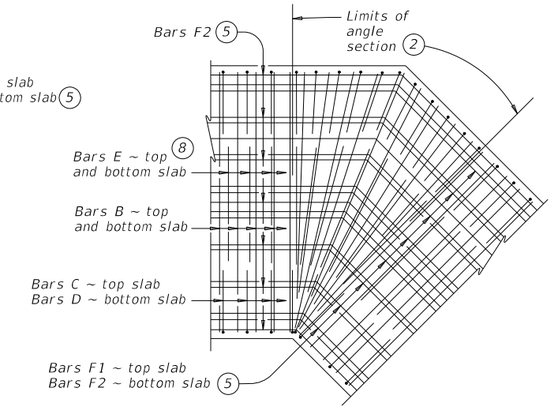
PLAN OF SKEWED ENDS ~ FROM 0° TO 15° 7



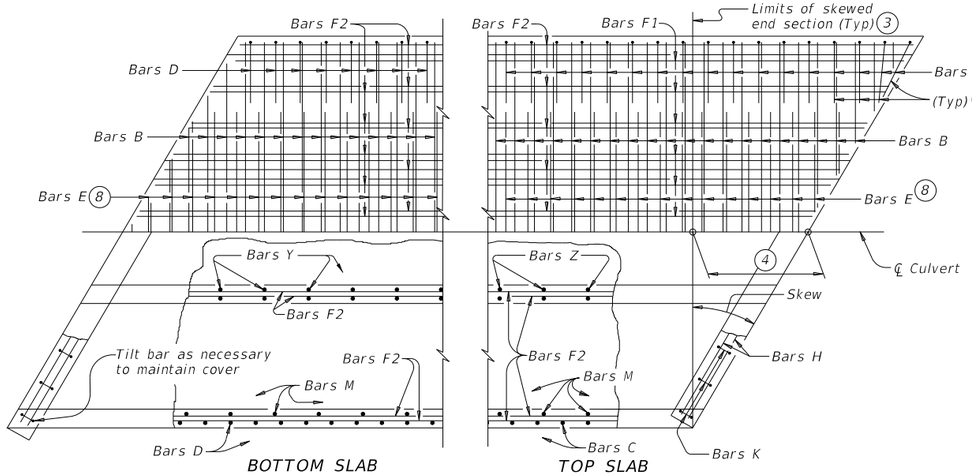
PLAN OF ANGLE SECTION ~ FROM 0° TO 15°



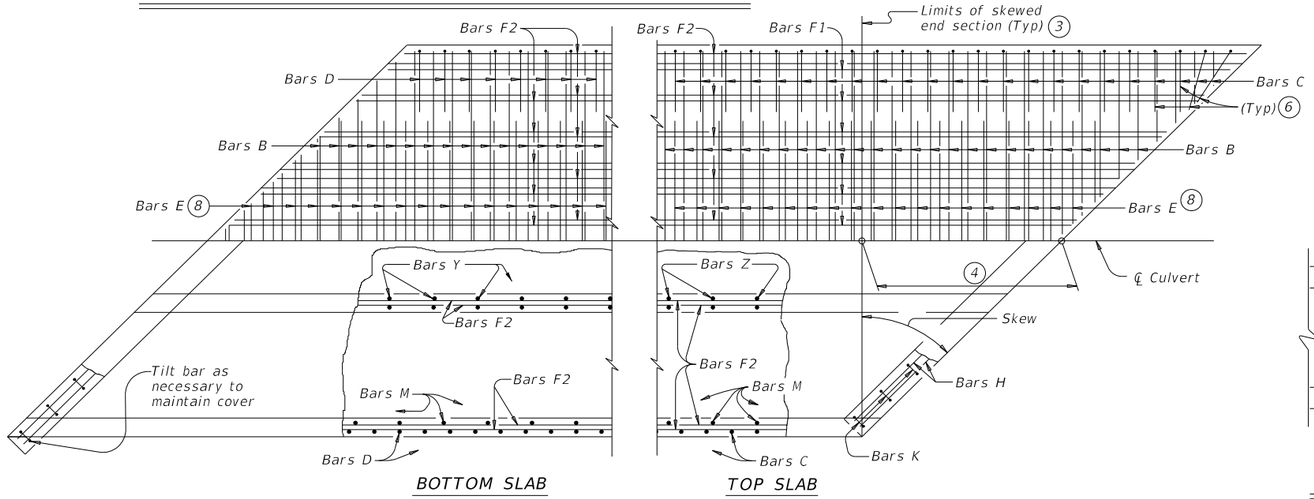
PLAN OF ANGLE SECTION ~ OVER 15° TO 30°



PLAN OF ANGLE SECTION ~ OVER 30° TO 45°

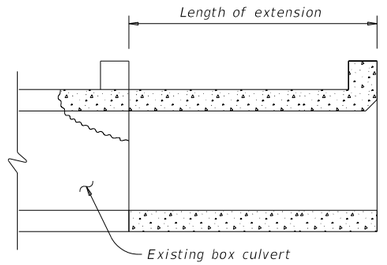


PLAN OF SKEWED ENDS ~ OVER 15° TO 30°



PLAN OF SKEWED ENDS ~ OVER 30° TO 45°

1. For skewed box culverts with less than 2'-0" of fill, break back the top slab to provide a 1'-10" minimum lap of the existing longitudinal bars with the longitudinal bars in the extension.
   For non-skewed box culverts with less than 2'-0" of fill and for skewed or non-skewed culverts with a fill depth of 2'-0" or greater, break back the top slab to provide a 1'-10" minimum lap of the existing longitudinal bars with the longitudinal bars in the extension. Alternatively, if the box is non-skewed, embed #6 anchor bars with a Type III, Class C, D, E, or F anchor adhesive into the existing walls, top and bottom slab at 1'-6" center-to-center spacing. Minimum embedment depth is 8". Anchor adhesive chosen must be able to achieve a basic bond strength in tension, Nba, of 26.4 kips. Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use. Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing." Test adhesive anchors in accordance with Item 450.3.3, "Tests." Test 3 anchors per 100 anchors installed.
   Break back wings and apron as necessary to install the extension. Clean and extend the exposed wingwall and apron reinforcing into the extension. When lengthening existing box culverts with dimensions different than current standard dimensions, form horizontal and vertical transitions as directed by the Engineer. Match bottom slabs to maintain an uninterrupted flow line. Field bend existing and new reinforcing into transitions and maintain specified cover requirements. For top slabs of culverts with overlay, with 1-to-2 course surface treatment, or with the top slab as the final riding surface, adjust the "H" dimension to provide a smooth riding surface.
2. When the spacing between Bars B or Bars E becomes less than half of the normal spacing, cut bars to avoid conflict.
3. The length of Bars B and Bars E will vary in the skewed end sections.
4. [One half of overall width] x [tangent of the skew angle]
5. Place Bars F1 and F2 continuously through the angle section. Bend Bars F1 and F2 to remain parallel to the walls of the box culvert.
6. When necessary to avoid conflict in acute corners, shorten the slab extension leg of Bars C and Bars D to a minimum of 1'-6" for skews of 30° thru 45°.
7. At the Contractor's option, for skews of 15° or less, place Bars B, C, D, and E parallel to the skewed end while maintaining spacing along centerline of box. Increase lengths of Bars B and Bars E shown on the Multiple Box Culverts Cast-In-Place (MC) standard sheets to accommodate the skew.
8. Extend Bars E as shown on the MC standard sheet for direct traffic culverts.



LENGTHENING DETAIL 1

CONSTRUCTION NOTES:
Do not use permanent forms.
When required, lap Bars H 1'-8" for uncoated or galvanized bars.
Provide a minimum of 1 ½" clear cover.

MATERIAL NOTES:
Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel, if required elsewhere in the plans.
Provide Class C concrete (f'c = 3,600 psi) with these exceptions: provide Class S concrete (f'c = 4,000 psi) for top slabs of culverts with overlay, with 1-to-2 course surface treatment, or with the top slab as the final riding surface.

GENERAL NOTES:
Designed according to AASHTO LRFD Bridge Design Specifications.
Refer to Multiple Box Culverts Cast-in-Place (MC) standard sheets for details of straight sections of culvert.
For skewed sections and angle sections, refer to Multiple Box Culverts Cast-in-Place (MC) standard sheets 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 Multiple Box Culverts Cast-In-Place (MC) standard sheets by the cosine of the skew angle.

Cover dimensions are clear dimensions, unless noted otherwise.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE MISCELLANEOUS DETAILS

MC-MD

FILE: mc-mdste-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0955	01	027	FM 166
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		140

DATE: 3/31/2021 3:09:26 PM
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TABLE OF DIMENSIONS AND REINFORCING STEEL
(Wings for one structure end)

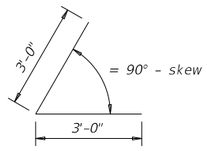
Dimensions					Variable Reinforcing				Estimated Quantities per ft of wing (2–wings) (4)		Estimated Quantities per ft of Toewall (1–toewall)	
					Bars J1		Bars J2					
Maximum Wingwall Height Hw	W	X	Y	Z	Size	Spa	Size	Spa	Reinf (Lb/Ft)	Conc (CY/Ft)	Reinf (Lb/Ft)	Conc (CY/Ft)
2'–6"	2'–10"	10"	1'–0"	7"	#4	1'–0"	#4	1'–0"	48.64	0.406	6.85	0.071
2'–9"	2'–10"	10"	1'–0"	7"	#4	1'–0"	#4	1'–0"	49.31	0.424	6.85	0.071
3'–0"	2'–10"	10"	1'–0"	7"	#4	1'–0"	#4	1'–0"	49.98	0.444	6.85	0.071
3'–3"	2'–10"	10"	1'–0"	7"	#4	1'–0"	#4	1'–0"	53.32	0.462	6.85	0.071
3'–6"	2'–10"	10"	1'–0"	7"	#4	1'–0"	#4	1'–0"	53.98	0.480	6.85	0.071
4'–0"	3'–2"	1'–2"	1'–0"	7"	#4	1'–0"	#4	1'–0"	55.77	0.532	6.85	0.071
4'–6"	3'–2"	1'–2"	1'–0"	7"	#4	1'–0"	#4	1'–0"	59.77	0.568	6.85	0.071
5'–0"	3'–9"	1'–7"	1'–2"	7"	#4	1'–0"	#4	1'–0"	63.45	0.632	6.96	0.075
5'–6"	3'–9"	1'–7"	1'–2"	7"	#4	1'–0"	#4	1'–0"	67.46	0.668	6.96	0.075
6'–0"	4'–4"	2'–0"	1'–4"	7"	#5	1'–0"	#5	1'–0"	80.67	0.730	7.07	0.078
6'–6"	4'–4"	2'–0"	1'–4"	7"	#5	1'–0"	#5	1'–0"	85.05	0.768	7.07	0.078
7'–0"	5'–0"	2'–3"	1'–9"	8"	#5	1'–0"	#5	1'–0"	92.15	0.864	8.07	0.093
7'–6"	5'–0"	2'–3"	1'–9"	8"	#5	1'–0"	#5	1'–0"	96.54	0.902	8.07	0.093
8'–0"	5'–6"	2'–8"	1'–10"	8"	#5	6"	#5	6"	139.04	0.962	8.13	0.095
8'–6"	5'–6"	2'–8"	1'–10"	8"	#5	6"	#5	6"	144.47	1.000	8.13	0.095
9'–6"	6'–0"	2'–10"	2'–2"	9"	#5	6"	#5	6"	156.93	1.136	8.41	0.110
10'–6"	6'–5"	3'–0"	2'–5"	9"	#6	6"	#5	6"	196.27	1.234	8.57	0.117
11'–6"	7'–2"	3'–6"	2'–8"	11"	#6	6"	#6	6"	230.13	1.438	9.52	0.140
12'–6"	7'–8"	3'–9"	2'–11"	1'–0"	#7	6"	#6	6"	283.41	1.592	9.74	0.157
13'–6"	8'–2"	4'–0"	3'–2"	1'–2"	#8	6"	#6	6"	348.72	1.804	10.02	0.186
14'–6"	8'–10"	4'–5"	3'–5"	1'–4"	#9	6"	#6	6"	432.94	2.046	10.30	0.218
15'–6"	9'–6"	4'–10"	3'–8"	1'–6"	#9	6"	#7	6"	489.52	2.302	11.24	0.253
16'–0"	9'–11"	5'–0"	3'–11"	1'–7"	#9	6"	#7	6"	505.72	2.448	11.47	0.279

TABLE OF WINGWALL REINFORCING
(2–wings)

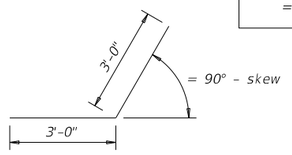
Bar	Size	No.	Spa
D1	#6	~	1'–0"
D2	#6	~	1'–0"
E1	#4	~	1'–0"
F	#4	~	1'–0"
G	#6	~	8"
M1	#4	4	~
P	#4	~	1'–0"
V	#4	~	1'–0"

TABLE OF TOEWALL REINFORCING

Bar	Size	No.	Spa
J3	#4	~	1'–0"
M2	#4	2	~
E2	#4	~	1'–0"



BARS D1



BARS D2

WING DIMENSION FORMULAS:

(All values are in feet.)

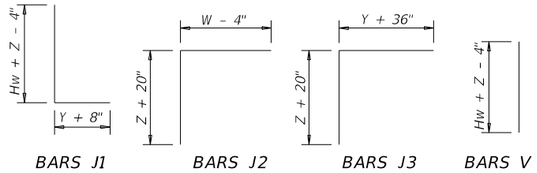
Hw = H + T + C
Lw = (Hw) (SL) ÷ cosine (θ) for Type PW–1
= (Hw – 1') (SL) ÷ cosine (θ) for Type PW–2 and Hw ≥ 4'
= (Hw – 0.5') (SL) ÷ cosine (θ) for Type PW–2 and Hw < 4'

For cast–in–place culverts:
Ltw = [(N) (S) + (N + 1) (U)] ÷ cosine (θ)

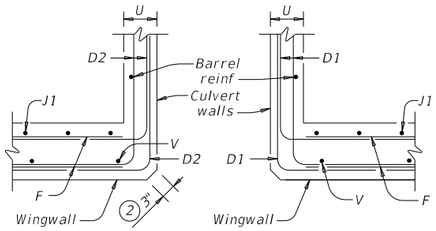
For precast culverts:
Ltw = [(N) (2 U + S) + (N – 1) (0.5')] ÷ cosine (θ)
Total Wingwall Area (two wings ~ SF)
= (2)(Hw)(Lw) for Type PW–1
= (2)(Hw)(Lw) – 6 SF for Type PW–2 and Hw ≥ 4'
= (2)(Hw)(Lw) – 1.5 SF for Type PW–2 and Hw < 4'

Hw = Height of wingwall
Lw = Length of wingwall
Ltw = Culvert toewall length
N = Number of culvert spans
SL:1 = Channel slope ratio. (horizontal: 1 vertical, usual value is 2:1)
θ = Culvert skew

See applicable box culvert standard sheet for S, H, T, and U values.



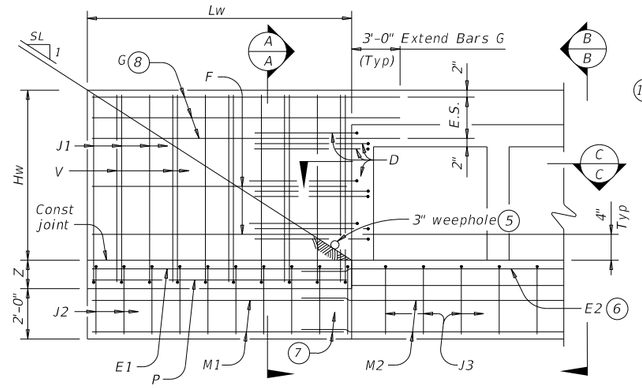
BARS J1 BARS J2 BARS J3 BARS V



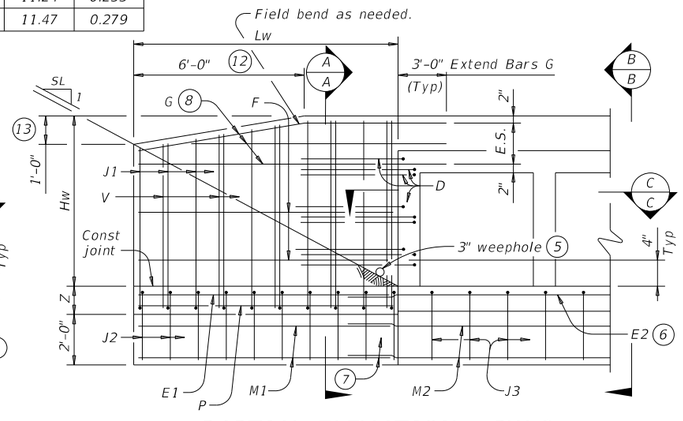
SECTION C-C - PW-1

1. Skew = 0°
2. At discharge end, chamfer may be ¾" minimum.
3. For 15° skew ~ 1"
   For 30° skew ~ 2"
   For 45° skew ~ 3"
4. Quantities shown are for two Type PW–1 wings. Adjust concrete volume for Type PW–2 wings. To determine estimated quantities for two wings, multiply the tabulated values by Lw. Quantities shown do not include weight of Bars D.
5. Provide weepholes for Hw = 5'–0" and greater. Fill around weepholes with coarse gravel.
6. Extend Bars E2 1'–6" minimum into the wingwall footing.
7. Lap Bars M1 1'–6" minimum with Bars M2.
8. Place Bars G as shown, equally spaced at 8" maximum. Provide at least two pairs of Bars G per wing.
9. 0" Min to 5'–0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'–0, refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631–CM) standard sheet. Refer to the Box Culvert Rail Mounting Details (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.
10. For vehicle safety, the following requirements must be met:
    - For structures without bridge rail, construct curbs no more than 3" above finished grade.
    - For structures with bridge rail, construct curbs flush with finished grade.

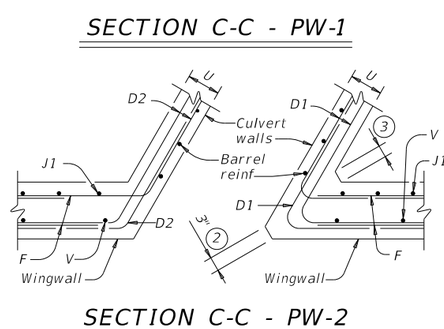
    Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
11. 1'–0" typical. 2'–3" when the Box Culvert Rail Mounting Details (RAC) standard sheet is referred to elswhere in the plans.
12. 3'–0" for Hw < 4'.
13. 6" for Hw < 4'.



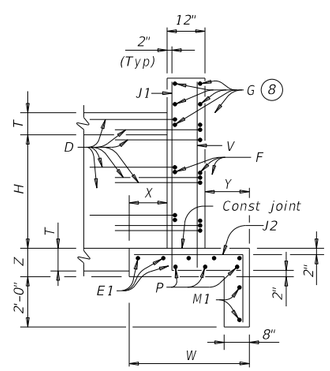
PARTIAL ELEVATION - PW-1



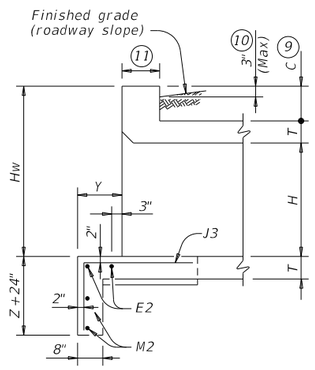
PARTIAL ELEVATION - PW-2



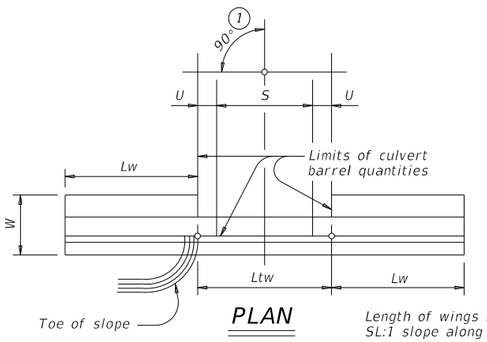
SECTION C-C - PW-2



SECTION A-A
(Showing wing reinforcement.)

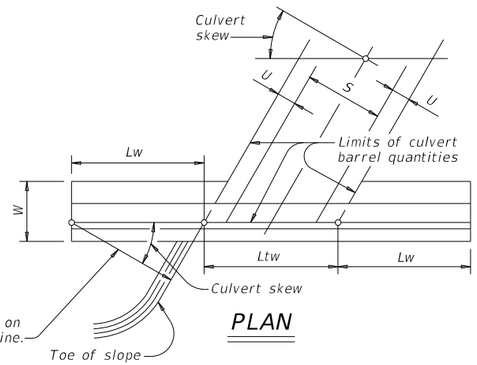


SECTION B-B
(Showing wing reinforcement.)



PLAN

DETAILS FOR NON-SKEWED BOX CULVERTS



PLAN

DETAILS FOR SKEWED BOX CULVERTS
(Showing 30° skew.)

DESIGNER NOTES:

Type PW–1 can be used for all applications and must be used if railing is to be mounted to the wingwall.
Type PW–2 can only be used for applications without a railing mounted to the wingwall.

MATERIAL NOTES:

Provide Class C concrete (f'c=3,600 psi).
Provide Grade 60 reinforcing steel.
Provide galvanized reinforing steel if required elsewhere in the plans.

GENERAL NOTES:

Designed in accordance with AASHTO LRFD Bridge Design Specifications.
Depth of toewalls for wingwalls and culverts may be reduced or eliminated when founded on solid rock, when directed by the Engineer.
See Box Culvert Supplement (BCS) standard sheet for wingwall type and additional dimensions and information.
Quantities for concrete and reinforcing steel resulting from the formulas given on this sheet are for the Contractor's information only.

Cover dimensions are clear dimensions, unless noted otherwise. Reinforcing dimensions are out–to–out of bars.

Texas Department of Transportation

Bridge Division Standard

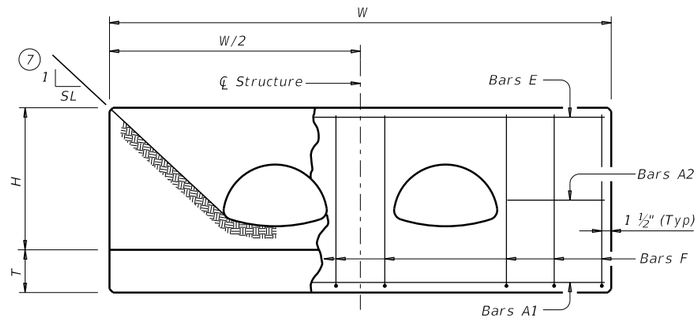
CONCRETE WINGWALLS
WITH PARALLEL WINGS FOR BOX CULVERTS
TYPES PW-1 AND PW-2

PW

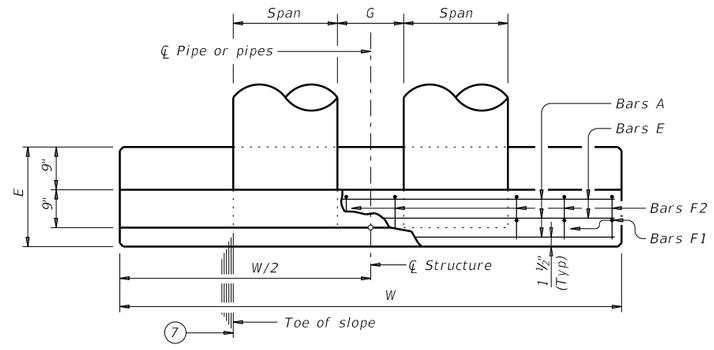
FILE: pwstde01-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0955	01	027	FM 166
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		141

TABLE OF VARIABLE DIMENSIONS (5) AND QUANTITIES FOR ONE HEADWALL

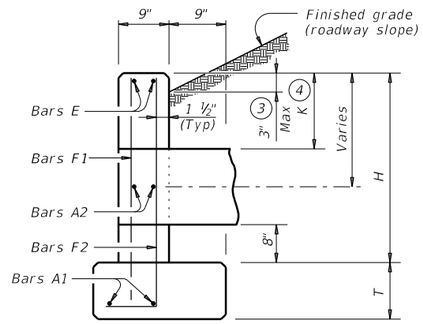
Slope	Design	Size of Pipe Arch Span	Size of Pipe Arch Rise	Values for One Pipe W	Values for One Pipe Reinf (Lbs) (1)	Values for One Pipe Conc (CY) (2)	Values To Be Added for Each Addt'l Pipe W	Values To Be Added for Each Addt'l Pipe Reinf (Lbs) (1)	Values To Be Added for Each Addt'l Pipe Conc (CY) (2)
2:1	1	17"	13"	9' – 9"	130	1.1	2' – 5"	28	0.3
	2	21"	15"	10' – 9"	139	1.3	2' – 11"	33	0.3
	3	28"	20"	13' – 0"	184	1.8	3' – 9"	43	0.5
	4	35"	24"	14' – 11"	249	2.2	4' – 7"	50	0.6
	5	42"	29"	17' – 2"	311	3.2	5' – 5"	69	0.9
	6	49"	33"	19' – 1"	342	3.8	6' – 3"	77	1.1
	7	57"	38"	21' – 5"	438	4.7	7' – 2"	86	1.4
	8	64"	43"	23' – 8"	508	5.6	8' – 2"	110	1.6
	9	71"	47"	25' – 7"	577	6.5	9' – 1"	120	2.0
3:1	1	17"	13"	13' – 11"	182	1.6	2' – 5"	28	0.3
	2	21"	15"	15' – 3"	196	1.8	2' – 11"	33	0.3
	3	28"	20"	18' – 4"	270	2.6	3' – 9"	42	0.5
	4	35"	24"	20' – 11"	356	3.2	4' – 7"	50	0.6
	5	42"	29"	24' – 0"	434	4.5	5' – 5"	70	0.9
	6	49"	33"	26' – 7"	499	5.4	6' – 3"	77	1.1
	7	57"	38"	29' – 9"	628	6.7	7' – 2"	87	1.4
	8	64"	43"	32' – 10"	715	7.9	8' – 2"	111	1.6
	9	71"	47"	35' – 5"	798	9.2	9' – 1"	120	2.0
4:1	1	17"	13"	18' – 1"	236	2.1	2' – 5"	28	0.3
	2	21"	15"	19' – 9"	268	2.4	2' – 11"	33	0.3
	3	28"	20"	23' – 8"	336	3.3	3' – 9"	42	0.5
	4	35"	24"	26' – 11"	460	4.2	4' – 7"	50	0.6
	5	42"	29"	30' – 10"	557	5.8	5' – 5"	69	0.9
	6	49"	33"	34' – 1"	653	6.9	6' – 3"	78	1.1
	7	57"	38"	38' – 1"	819	8.6	7' – 2"	87	1.4
	8	64"	43"	42' – 0"	950	10.2	8' – 2"	111	1.7
	9	71"	47"	45' – 3"	1,053	11.9	9' – 1"	120	2.0
6:1	1	17"	13"	26' – 5"	343	3.1	2' – 5"	29	0.3
	2	21"	15"	28' – 9"	381	3.5	2' – 11"	33	0.3
	3	28"	20"	34' – 4"	504	4.9	3' – 9"	42	0.5
	4	35"	24"	38' – 11"	673	6.1	4' – 7"	50	0.6
	5	42"	29"	44' – 6"	823	8.5	5' – 5"	70	0.9
	6	49"	33"	49' – 1"	945	10.1	6' – 3"	78	1.1
	7	57"	38"	54' – 9"	1,227	12.5	7' – 2"	87	1.4
	8	64"	43"	60' – 4"	1,407	14.8	8' – 2"	110	1.7
	9	71"	47"	64' – 11"	1,571	17.3	9' – 1"	119	2.0



ELEVATION



PLAN



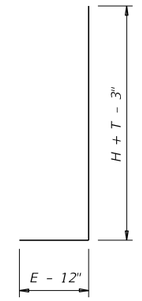
SECTION AT CENTER OF PIPE

TABLE OF CONSTANT DIMENSIONS

Design	Size of Pipe Arch Span	Size of Pipe Arch Rise	G	K (5)	H	T	E
1	17"	13"	1' – 0"	1' – 0"	2' – 7"	0' – 10"	1' – 6"
2	21"	15"	1' – 2"	1' – 0"	2' – 9"	0' – 10"	1' – 6"
3	28"	20"	1' – 5"	1' – 0"	3' – 2"	0' – 10"	1' – 10"
4	35"	24"	1' – 8"	1' – 0"	3' – 6"	0' – 10"	2' – 0"
5	42"	29"	1' – 11"	1' – 0"	3' – 11"	1' – 0"	2' – 4"
6	49"	33"	2' – 2"	1' – 0"	4' – 3"	1' – 0"	2' – 6"
7	57"	38"	2' – 5"	1' – 0"	4' – 8"	1' – 0"	2' – 10"
8	64"	43"	2' – 10"	1' – 0"	5' – 1"	1' – 0"	3' – 0"
9	71"	47"	3' – 2"	1' – 0"	5' – 5"	1' – 0"	3' – 4"

TABLE OF (6) REINFORCING STEEL

Bar	Size	Spa	No.
A1	#5	~	2
A2	#5	1' – 6"	~
E	#5	~	2
F	#5	1' – 0"	~



BARS F2

MATERIAL NOTES:
Provide Grade 60 reinforcing steel.
Provide Class C concrete (f'c = 3,600 psi).

GENERAL NOTES:
Designed according to AASHTO LRFD Bridge Design Specifications.
Do not mount bridge rails of any type directly to these culvert headwalls.
This standard may not be used for wall heights, H, exceeding the values shown.

(1) Total quantities include one 3'–1" lap for bars over 60 ft in length.

(2) Quantities shown are for metal pipe and will decrease slightly for concrete pipe installations.

(3) For vehicle safety, construct curbs no more than 3" above finished grade. Reduce curb heights if necessary, to meet these requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

(4) K is measure from top of curb to inside face of pipe.

(5) Dimensions shown are usual and maximum.

(6) Quantities shown are for one structure end only (one headwall).

(7) Indicated slope is perpendicular to centerline pipe or pipes.

Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing dimensions are out-to-out of bars.

Texas Department of Transportation

Bridge Division Standard

CONCRETE HEADWALLS WITH PARALLEL WINGS FOR NON-SKEWED ARCH PIPE CULVERTS

CH-PW-A-0

FILE: chpa0ste-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0955	01	027	FM 166
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		142

DATE: 3/31/2021 3:09:30 PM
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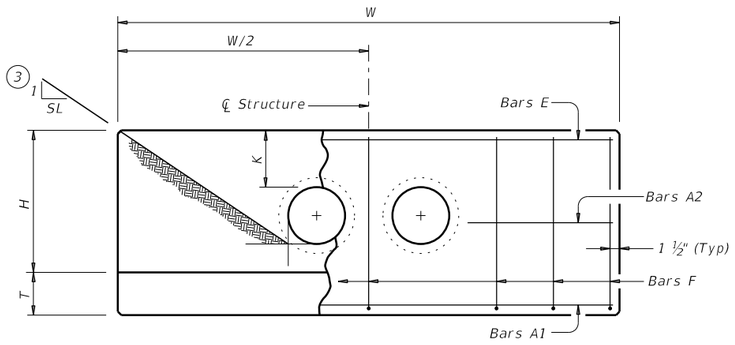
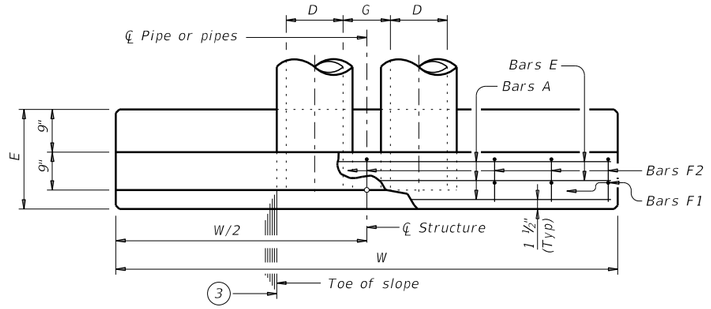
TABLE OF VARIABLE DIMENSIONS AND QUANTITIES FOR ONE HEADWALL (5)

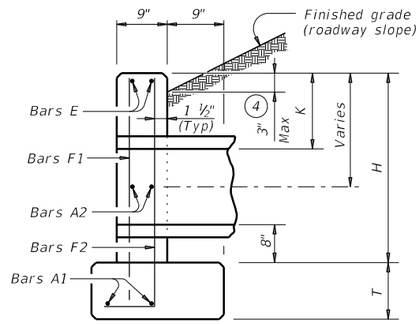
Slope	Dia of Pipe (D)	Values for One Pipe			Values To Be Added for Each Addt'l Pipe		
		W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)
2:1	12"	9' – 0"	122	1.1	1' – 9"	15	0.2
	15"	10' – 3"	136	1.3	2' – 2"	16	0.2
	18"	11' – 6"	163	1.5	2' – 8"	19	0.3
	21"	12' – 9"	200	1.8	3' – 1"	31	0.4
	24"	14' – 0"	217	2.1	3' – 7"	34	0.4
	27"	15' – 3"	254	2.4	3' – 11"	37	0.5
	30"	16' – 6"	272	2.7	4' – 4"	40	0.6
	33"	17' – 9"	314	3.1	4' – 8"	43	0.6
	36"	19' – 0"	371	3.9	5' – 1"	46	0.8
	42"	21' – 6"	442	4.9	5' – 10"	52	1.0
	48"	25' – 0"	569	6.4	6' – 7"	59	1.3
	54"	27' – 6"	701	7.5	7' – 6"	82	1.6
	60"	30' – 0"	794	8.8	8' – 3"	90	1.8
	66"	32' – 6"	894	10.2	8' – 9"	96	2.0
	72"	35' – 0"	1,055	11.7	9' – 4"	103	2.3
3:1	12"	13' – 0"	175	1.6	1' – 9"	14	0.2
	15"	14' – 9"	193	1.9	2' – 2"	17	0.2
	18"	16' – 6"	228	2.2	2' – 8"	19	0.3
	21"	18' – 3"	299	2.6	3' – 1"	31	0.4
	24"	20' – 0"	323	3.0	3' – 7"	33	0.4
	27"	21' – 9"	371	3.5	3' – 11"	37	0.5
	30"	23' – 6"	415	4.0	4' – 4"	40	0.5
	33"	25' – 3"	469	4.6	4' – 8"	43	0.6
	36"	27' – 0"	556	5.7	5' – 1"	46	0.8
	42"	30' – 6"	675	7.1	5' – 10"	52	1.0
	48"	35' – 6"	837	9.2	6' – 7"	59	1.3
	54"	39' – 0"	1,015	11.0	7' – 6"	84	1.6
	60"	42' – 6"	1,171	12.9	8' – 3"	91	1.8
	66"	46' – 0"	1,298	14.9	8' – 9"	98	2.0
	72"	49' – 6"	1,561	17.1	9' – 4"	103	2.3
4:1	12"	17' – 0"	229	2.0	1' – 9"	15	0.2
	15"	19' – 3"	266	2.4	2' – 2"	17	0.2
	18"	21' – 6"	308	2.9	2' – 8"	19	0.3
	21"	23' – 9"	382	3.5	3' – 1"	31	0.3
	24"	26' – 0"	430	3.9	3' – 7"	34	0.4
	27"	28' – 3"	486	4.7	3' – 11"	37	0.5
	30"	30' – 6"	539	5.2	4' – 4"	40	0.6
	33"	32' – 9"	603	6.0	4' – 8"	42	0.6
	36"	35' – 0"	738	7.5	5' – 1"	47	0.8
	42"	39' – 6"	881	9.3	5' – 10"	52	1.0
	48"	46' – 0"	1,102	12.1	6' – 7"	61	1.3
	54"	50' – 6"	1,364	14.4	7' – 6"	84	1.6
	60"	55' – 0"	1,547	16.9	8' – 3"	91	1.8
	66"	59' – 6"	1,741	19.5	8' – 9"	98	2.0
	72"	64' – 0"	2,077	22.4	9' – 4"	102	2.3
6:1	12"	25' – 0"	336	3.0	1' – 9"	14	0.2
	15"	28' – 3"	384	3.6	2' – 2"	17	0.2
	18"	31' – 6"	452	4.2	2' – 8"	19	0.3
	21"	34' – 9"	581	5.1	3' – 1"	31	0.4
	24"	38' – 0"	644	5.8	3' – 7"	34	0.4
	27"	41' – 3"	737	6.9	3' – 11"	37	0.5
	30"	44' – 6"	807	7.7	4' – 4"	39	0.6
	33"	47' – 9"	912	8.9	4' – 8"	44	0.6
	36"	51' – 0"	1,108	11.0	5' – 1"	48	0.8
	42"	57' – 6"	1,318	13.7	5' – 10"	54	1.0
	48"	67' – 0"	1,682	17.9	6' – 7"	59	1.3
	54"	73' – 6"	2,072	21.3	7' – 6"	83	1.6
	60"	80' – 0"	2,351	24.9	8' – 3"	89	1.8
	66"	86' – 6"	2,643	28.9	8' – 9"	96	2.0
	72"	93' – 0"	3,121	33.1	9' – 4"	101	2.3



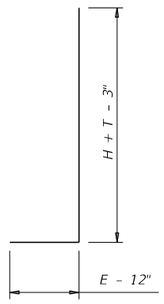
ELEVATION



PLAN OF NON-SKEWED PIPES



SECTION AT CENTER OF PIPE



BARS F2

(1) Total quantities include one 3'-1" lap for bars over 60' in length.

(2) Quantities shown are for concrete pipe and will increase slightly for metal pipe installations.

(3) Indicated slope is perpendicular to centerline pipe or pipes.

(4) For vehicle safety, construct curbs no more than 3" above finished grade. Reduce curb heights, if necessary, to meet these requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

(5) Dimensions shown are usual and maximum.

(6) Quantities shown are for one structure end only (one headwall).

TABLE OF CONSTANT DIMENSIONS

Dia of Pipe (D)	G	K (5)	H	T	E
12"	0' – 9"	1' – 0"	2' – 8"	0' – 9"	1' – 9"
15"	0' – 11"	1' – 0"	2' – 11"	0' – 9"	1' – 9"
18"	1' – 2"	1' – 0"	3' – 2"	0' – 9"	1' – 9"
21"	1' – 4"	1' – 0"	3' – 5"	0' – 9"	2' – 0"
24"	1' – 7"	1' – 0"	3' – 8"	0' – 9"	2' – 0"
27"	1' – 8"	1' – 0"	3' – 11"	0' – 9"	2' – 3"
30"	1' – 10"	1' – 0"	4' – 2"	0' – 9"	2' – 3"
33"	1' – 11"	1' – 0"	4' – 5"	0' – 9"	2' – 6"
36"	2' – 1"	1' – 0"	4' – 8"	1' – 0"	2' – 6"
42"	2' – 4"	1' – 0"	5' – 2"	1' – 0"	2' – 9"
48"	2' – 7"	1' – 3"	5' – 11"	1' – 0"	3' – 0"
54"	3' – 0"	1' – 3"	6' – 5"	1' – 0"	3' – 3"
60"	3' – 3"	1' – 3"	6' – 11"	1' – 0"	3' – 6"
66"	3' – 3"	1' – 3"	7' – 5"	1' – 0"	3' – 9"
72"	3' – 4"	1' – 3"	7' – 11"	1' – 0"	4' – 0"

TABLE OF REINFORCING STEEL (6)

Bar	Size	Spa	No.
A1	#5	~	2
A2	#5	1' – 6"	~
E	#5	~	2
F	#5	1' – 0"	~

MATERIAL NOTES:
Provide Grade 60 reinforcing steel.
Provide Class C concrete (f'c = 3,600 psi).

GENERAL NOTES:
Designed according to AASHTO LRFD Bridge Design Specifications.
Do not mount bridge rails of any type directly to these culvert headwalls.
This standard may not be used for wall heights, H, exceeding the values shown.

Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing dimensions are out-to-out of bars.

DATE: 3/31/2021 3:09:33 PM
FILE: P:\120396\01\Design\027 FM 166\Civil\Standards\Drainage\chpw0ste-20.dgn

Texas Department of Transportation | Bridge Division Standard

CONCRETE HEADWALLS WITH PARALLEL WINGS FOR NON-SKEWED PIPE CULVERTS

CH-PW-0

FILE: chpw0ste-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0955	01	027	FM 166
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		143

DATE: 3/31/2021 3:09:37 PM
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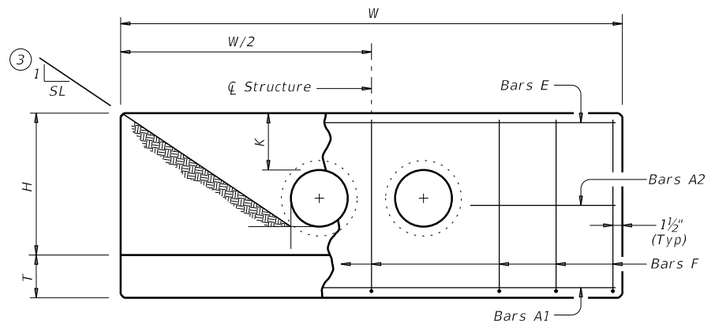
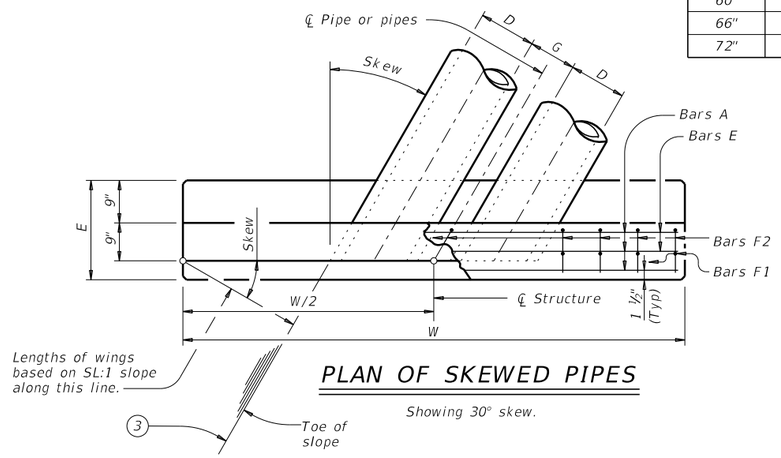
TABLE OF VARIABLE DIMENSIONS AND QUANTITIES FOR ONE HEADWALL (5)

Slope	Dia of Pipe (D)	15° Skew						30° Skew						45° Skew					
		Values for One Pipe			Values To Be Added for Each Addt'l Pipe			Values for One Pipe			Values To Be Added for Each Addt'l Pipe			Values for One Pipe			Values To Be Added for Each Addt'l Pipe		
		W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)
2:1	12"	9' – 4"	124	1.1	1' – 9 3/4"	15	0.2	10' – 5"	130	1.2	2' – 0"	16	0.2	12' – 9"	159	1.5	2' – 5 3/4"	17	0.3
	15"	10' – 7"	136	1.3	2' – 3"	17	0.2	11' – 10"	159	1.5	2' – 6"	18	0.2	14' – 6"	191	1.8	3' – 0 3/4"	20	0.3
	18"	11' – 11"	165	1.5	2' – 9"	19	0.3	13' – 3"	174	1.7	3' – 1"	29	0.3	16' – 3"	207	2.1	3' – 9 1/4"	33	0.4
	21"	13' – 2"	203	1.9	3' – 2 1/4"	31	0.4	14' – 9"	233	2.1	3' – 6 3/4"	33	0.4	18' – 0"	276	2.6	4' – 4 1/4"	36	0.5
	24"	14' – 6"	240	2.1	3' – 8 1/4"	34	0.4	16' – 2"	251	2.4	4' – 1 3/4"	36	0.5	19' – 10"	318	2.9	5' – 0 3/4"	39	0.6
	27"	15' – 9"	258	2.5	4' – 0 3/4"	38	0.5	17' – 7"	292	2.8	4' – 6 1/4"	39	0.6	21' – 7"	342	3.4	5' – 6 1/4"	44	0.7
	30"	17' – 1"	297	2.8	4' – 5 3/4"	40	0.6	19' – 1"	311	3.1	5' – 0"	42	0.6	23' – 4"	388	3.8	6' – 1 3/4"	47	0.8
	33"	18' – 5"	320	3.3	4' – 9 3/4"	43	0.6	20' – 6"	358	3.6	5' – 4 3/4"	46	0.7	25' – 1"	439	4.4	6' – 7 1/4"	51	0.9
	36"	19' – 8"	401	4.0	5' – 3"	47	0.9	21' – 11"	422	4.5	5' – 10 3/4"	50	0.9	26' – 10"	517	5.5	7' – 2 1/4"	55	1.2
	42"	22' – 3"	476	5.0	6' – 0 3/4"	53	1.1	24' – 10"	528	5.6	6' – 8 3/4"	56	1.2	30' – 5"	634	6.9	8' – 3"	76	1.4
	48"	25' – 11"	577	6.6	6' – 9 3/4"	60	1.3	28' – 10"	637	7.3	7' – 7 1/4"	79	1.5	35' – 4"	791	9.0	9' – 3 3/4"	88	1.8
	54"	28' – 6"	711	7.8	7' – 9"	83	1.6	31' – 9"	781	8.7	8' – 8"	81	1.8	38' – 11"	958	10.7	10' – 7 1/4"	97	2.2
	60"	31' – 1"	805	9.2	8' – 6 1/4"	91	1.9	34' – 8"	881	10.2	9' – 6 1/4"	97	2.1	42' – 5"	1,113	12.5	11' – 8"	124	2.6
	66"	33' – 8"	907	10.6	9' – 0 3/4"	98	2.1	37' – 6"	1,028	11.8	10' – 1 1/4"	102	2.4	46' – 0"	1,235	14.5	12' – 4 1/4"	132	2.9
	72"	36' – 3"	1,071	12.1	9' – 8"	105	2.4	40' – 5"	1,207	13.5	10' – 9 1/4"	110	2.6	49' – 6"	1,446	16.6	13' – 2 1/4"	141	3.2
3:1	12"	13' – 6"	178	1.6	1' – 9 3/4"	15	0.2	15' – 0"	189	1.8	2' – 0"	15	0.2	18' – 5"	237	2.2	2' – 5 3/4"	17	0.2
	15"	15' – 3"	212	1.9	2' – 3"	17	0.2	17' – 0"	223	2.1	2' – 6"	17	0.3	20' – 10"	276	2.6	3' – 0 3/4"	20	0.3
	18"	17' – 1"	231	2.3	2' – 9"	19	0.3	19' – 1"	259	2.5	3' – 1"	29	0.3	23' – 4"	318	3.1	3' – 9 1/4"	32	0.4
	21"	18' – 11"	306	2.7	3' – 2 1/4"	31	0.4	21' – 1"	339	3.0	3' – 6 3/4"	33	0.4	25' – 10"	413	3.7	4' – 4 1/4"	36	0.5
	24"	20' – 8"	345	3.1	3' – 8 3/4"	35	0.4	23' – 1"	384	3.5	4' – 1 3/4"	36	0.5	28' – 3"	462	4.2	5' – 0 3/4"	40	0.6
	27"	22' – 6"	376	3.7	4' – 0 3/4"	38	0.5	25' – 1"	438	4.1	4' – 6 1/4"	39	0.6	30' – 9"	522	5.0	5' – 6 1/4"	44	0.7
	30"	24' – 4"	422	4.1	4' – 5 3/4"	40	0.6	27' – 2"	466	4.6	5' – 0"	42	0.6	33' – 3"	578	5.6	6' – 1 3/4"	47	0.8
	33"	26' – 2"	476	4.8	4' – 10"	43	0.6	29' – 2"	522	5.3	5' – 4 3/4"	46	0.7	35' – 9"	644	6.5	6' – 7 1/4"	51	0.9
	36"	27' – 11"	590	5.9	5' – 3"	47	0.8	31' – 2"	645	6.6	5' – 10 3/4"	50	0.9	38' – 2"	787	8.0	7' – 2 1/4"	56	1.2
	42"	31' – 7"	684	7.3	6' – 0 1/4"	53	1.1	35' – 3"	776	8.2	6' – 8 3/4"	56	1.2	43' – 2"	933	10.0	8' – 3"	79	1.4
	48"	36' – 9"	880	9.6	6' – 9 3/4"	61	1.3	41' – 0"	953	10.7	7' – 7 1/4"	81	1.5	50' – 2"	1,166	13.1	9' – 3 3/4"	88	1.8
	54"	40' – 5"	1,065	11.4	7' – 9"	85	1.6	45' – 0"	1,185	12.7	8' – 8"	89	1.8	55' – 2"	1,435	15.5	10' – 7 1/4"	97	2.2
	60"	44' – 0"	1,224	13.3	8' – 6 1/4"	93	1.9	49' – 1"	1,356	14.8	9' – 6 1/4"	96	2.1	60' – 1"	1,635	18.2	11' – 8"	124	2.6
	66"	47' – 7"	1,357	15.4	9' – 1"	98	2.1	53' – 1"	1,497	17.2	10' – 1 1/4"	103	2.3	65' – 1"	1,892	21.1	12' – 4 1/4"	130	2.9
	72"	51' – 3"	1,624	17.7	9' – 8"	105	2.3	57' – 2"	1,787	19.7	10' – 9 1/4"	109	2.6	70' – 0"	2,218	24.1	13' – 2 1/4"	139	3.2
4:1	12"	17' – 7"	232	2.1	1' – 9 3/4"	15	0.2	19' – 8"	259	2.4	2' – 0"	16	0.2	24' – 0"	314	2.9	2' – 5 3/4"	18	0.2
	15"	19' – 11"	272	2.5	2' – 3"	17	0.2	22' – 3"	301	2.8	2' – 6"	18	0.3	27' – 3"	361	3.5	3' – 0 3/4"	21	0.3
	18"	22' – 3"	313	3.0	2' – 9"	19	0.3	24' – 10"	344	3.3	3' – 1"	29	0.3	30' – 5"	427	4.0	3' – 9 1/4"	32	0.4
	21"	24' – 7"	407	3.6	3' – 2 1/4"	31	0.4	27' – 5"	446	4.0	3' – 6 3/4"	33	0.4	33' – 7"	549	4.9	4' – 4 1/4"	36	0.5
	24"	26' – 11"	455	4.1	3' – 8 3/4"	35	0.4	30' – 0"	499	4.5	4' – 1 3/4"	36	0.5	36' – 9"	609	5.6	5' – 0 3/4"	40	0.6
	27"	29' – 3"	514	4.8	4' – 0 3/4"	38	0.5	32' – 7"	562	5.4	4' – 6 1/4"	40	0.6	39' – 11"	703	6.6	5' – 6 1/4"	43	0.7
	30"	31' – 7"	568	5.4	4' – 5 3/4"	40	0.6	35' – 3"	620	6.0	5' – 0"	42	0.6	43' – 2"	768	7.4	6' – 1 3/4"	49	0.8
	33"	33' – 11"	634	6.2	4' – 10"	43	0.7	37' – 10"	710	7.0	5' – 4 3/4"	46	0.7	46' – 4"	848	8.5	6' – 7 1/4"	52	0.9
	36"	36' – 3"	776	7.7	5' – 3"	48	0.9	40' – 5"	868	8.6	5' – 10 3/4"	49	0.9	49' – 6"	1,058	10.6	7' – 2 1/4"	56	1.1
	42"	40' – 11"	921	9.6	6' – 0 1/4"	53	1.0	45' – 7"	1,022	10.7	6' – 8 3/4"	57	1.2	55' – 10"	1,262	13.1	8' – 3"	78	1.4
	48"	47' – 7"	1,152	12.6	6' – 10"	61	1.3	53' – 1"	1,268	14.0	7' – 7 1/4"	80	1.5	65' – 1"	1,587	17.2	9' – 3 3/4"	86	1.8
	54"	52' – 3"	1,416	14.9	7' – 9 1/4"	86	1.6	58' – 4"	1,589	16.6	8' – 8"	89	1.8	71' – 5"	1,924	20.4	10' – 7 1/4"	95	2.2
	60"	56' – 11"	1,606	17.5	8' – 6 3/4"	92	1.9	63' – 6"	1,806	19.5	9' – 6 1/4"	95	2.1	77' – 9"	2,192	23.9	11' – 8"	122	2.6
	66"	61' – 7"	1,819	20.2	9' – 0 3/4"	97	2.1	68' – 8"	2,019	22.5	10' – 1 1/4"	101	2.4	84' – 2"	2,472	27.6	12' – 4 1/4"	131	2.9
	72"	66' – 3"	2,150	23.2	9' – 8"	104	2.4	73' – 11"	2,379	25.9	10' – 9 1/4"	108	2.6	90' – 6"	2,937	31.7	13' – 2 1/4"	138	3.2
6:1	12"	25' – 11"	342	3.1	1' – 9 3/4"	15	0.2	28' – 10"	374	3.5	2' – 0"	16	0.2	35' – 4"	456	4.3	2' – 5 3/4"	17	0.2
	15"	29' – 3"	390	3.7	2' – 3"	17	0.2	32' – 7"	442	4.2	2' – 6"	18	0.2	39' – 11"	549	5.1	3' – 0 3/4"	20	0.3
	18"	32' – 7"	459	4.4	2' – 9"	20	0.3	36' – 4"	515	4.9	3' – 1"	29	0.3	44' – 7"	629	6.0	3' – 9 1/4"	33	0.4
	21"	36' – 0"	608	5.3	3' – 2 1/4"	31	0.4	40' – 2"	660	5.9	3' – 6 3/4"	33	0.4	49' – 2"	823	7.2	4' – 4 1/4"	38	0.5
	24"	39' – 4"	672	6.0	3' – 8 3/4"	35	0.4	43' – 11"	748	6.7	4' – 1 3/4"	36	0.5	53' – 9"	920	8.2	5' – 0 3/4"	42	0.6
	27"	42' – 8"	770	7.1	4' – 0 3/4"	38	0.5	47' – 8"	852	8.0	4' – 6 1/4"	41	0.5	58' – 4"	1,039	9.7	5' – 6 1/4"	45	0.7
	30"	46' – 1"	839	8.0	4' – 5 3/4"	40	0.6	51' – 5"	949	8.9	5' – 0"	44	0.6	62' – 11"	1,162	10.9	6' – 1 3/4"	48	0.8
	33"	49' – 5"	947	9.2	4' – 10"	45	0.7	55' – 2"	1,040	10.3	5' – 4 3/4"	48	0.7	67' – 6"	1,292	12.6	6' – 7 1/4"	50	0.9
	36"	52' – 10"	1,151	11.4	5' – 3"	49	0.8	58' – 11"	1,287	12.7	5' – 10 3/4"	51	1.0	72' – 1"	1,583	15.6	7' – 2 1/4"	55	1.1
	42"	59' – 6"	1,365	14.2	6' – 0 1/4"	55	1.0	66' – 5"	1,530	15.8	6' – 8 3/4"	57	1.2	81' – 4"	1,875	19.4	8' – 3"	76	1.4
	48"	69' – 4"	1,737	18.5	6' – 10"	59	1.3	77' – 4"	1,942	20.7	7' – 7 1/4"	79	1.5	94' – 9"	2,368	25.3	9' – 3 3/4"	86	1.8
	54"	76' – 1"	2,138	22.0	7' – 9 1/4"	83	1.6	84' – 10"	2,378	24.6	8' – 8"	87	1.8	103' – 11"	2,912	30.1	10' – 7 1/4"	95	2.2
	60"	82' – 10"	2,426	25.8	8' – 6 3/4"	90	1.9	92' – 5"	2,681	28.8	9' – 6 1/4"	94	2.1	113' – 2"	3,294	35.3	11' – 8"	122	2.6
	66"	89' – 7"	2,730	29.9	9' – 0 3/4"	96	2.1	99' – 11"	3,038	33.3	10' – 1 1/4"	101	2.4	122' – 4"	3,697	40.8	12' – 4 1/4"	130	2.9
	72"	96' – 3"	3,218	34.2	9' – 8"	102	2.4	107' – 5"	3,580	38.2	10' – 9 1/4"	108	2.6	131' – 6"	4,372	46.8	13' – 2 1/4"	139	3.2

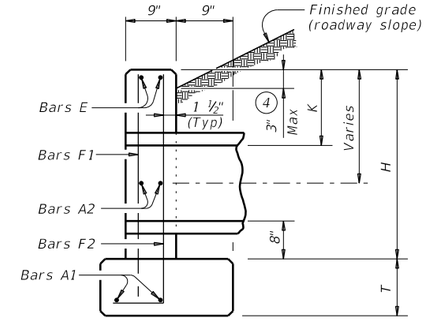


ELEVATION



PLAN OF SKEWED PIPES

Showing 30° skew.



SECTION AT CENTER OF PIPE

(1) Total quantites include one 3'–1" lap for bars over 60' in length.

(2) Quantities shown are for concrete pipe and will increase slightly for metal pipe installations.

(3) Indicated slope is perpendicular to centerline pipe or pipes.

(4) For vehicle safety, construct curbs no more than 3" above finished grade. Reduce curb heights, if necessary, to meet these requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

(5) Dimensions shown are usual and maximum.

(6) Quantities shown are for one structure end only (one headwall).

TABLE OF CONSTANT DIMENSIONS

Dia of Pipe (D)	G	K (5)	H	T	E
12"	0' – 9"	1' – 0"	2' – 8"	0' – 9"	1' – 9"
15"	0' – 11"	1' – 0"	2' – 11"	0' – 9"	1' – 9"
18"	1' – 2"	1' – 0"	3' – 2"	0' – 9"	1' – 9"
21"	1' – 4"	1' – 0"	3' – 5"	0' – 9"	2' – 0"
24"	1' – 7"	1' – 0"	3' – 8"	0' – 9"	2' – 0"
27"	1' – 8"	1' – 0"	3' – 11"	0' – 9"	2' – 3"
30"	1' – 10"	1' – 0"	4' – 2"	0' – 9"	2' – 3"
33"	1' – 11"	1' – 0"	4' – 5"	0' – 9"	2' – 6"
36"	2' – 1"	1' – 0"	4' – 8"	1' – 0"	2' – 6"
42"	2' – 4"	1' – 0"	5' – 2"	1' – 0"	2' – 9"
48"	2' – 7"	1' – 3"	5' – 11"	1' – 0"	3' – 0"
54"	3' – 0"	1' – 3"	6' – 5"	1' – 0"	3' – 3"
60"	3' – 3"	1' – 3"	6' – 11"	1' – 0"	3' – 6"
66"	3' – 3"	1' – 3"	7' – 5"	1' – 0"	3' – 9"
72"	3' – 4"	1' – 3"	7' – 11"	1' – 0"	4' – 0"

TABLE OF (6) REINFORCING STEEL

Bar	Size	Spa	No.
A1	#5	~	2
A2	#5	1' – 6"	~
E	#5	~	2
F	#5	1' – 0"	~

BARS F2

MATERIAL NOTES:
Provide Grade 60 reinforcing steel.
Provide Class C concrete (f'c = 3,600 psi).

GENERAL NOTES:
Designed according to AASHTO LRFD Bridge Design Specifications.
Do not mount bridge rails of any type directly to these culvert headwalls.
This standard may not be used for wall heights, H, exceeding the values shown.

Cover dimensions are clear dimensions, unless noted otherwise. Reinforcing dimensions are out-to-out of bars.

Texas Department of Transportation

Bridge Division Standard

CONCRETE HEADWALLS WITH PARALLEL WINGS FOR SKEWED PIPE CULVERTS

CH-PW-S

FILE: chpwsste-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020 REVISIONS	CONT	SECT	JOB	HIGHWAY
	0955	01	027	FM 166
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		144

DATE: 3/31/2021 3:09:41 PM
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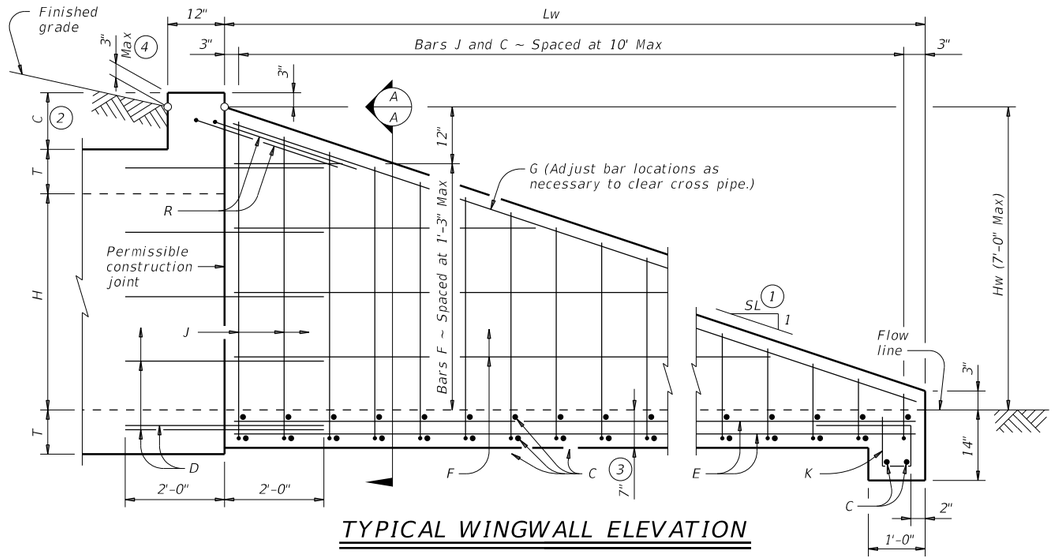
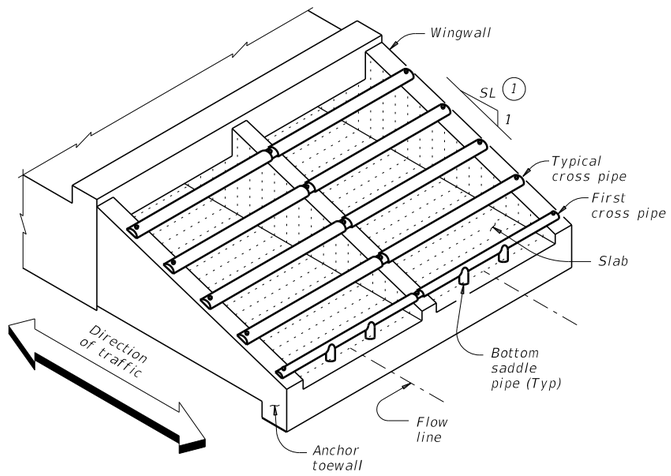


TYPICAL WINGWALL ELEVATION

(Cross pipes not shown for clarity.)



ISOMETRIC VIEW OF TYPICAL INSTALLATION

(Showing bolted anchor option.)

WING DIMENSION CALCULATIONS:

Hw = H + T + C - 0.250'
Lw = (Hw - 0.333') (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 (SF)
= (0.5) (Hw + 0.333') (Lw) (N - 1)
Total Concrete Volume (CY)
= [(Wingwall Area) (0.583') +
(Lw) (Atw) (0.583') +
(Atw) (1.167') (1.167' - 0.583')] ÷ (27)

PIPE RUNNER DIMENSION CALCULATIONS:

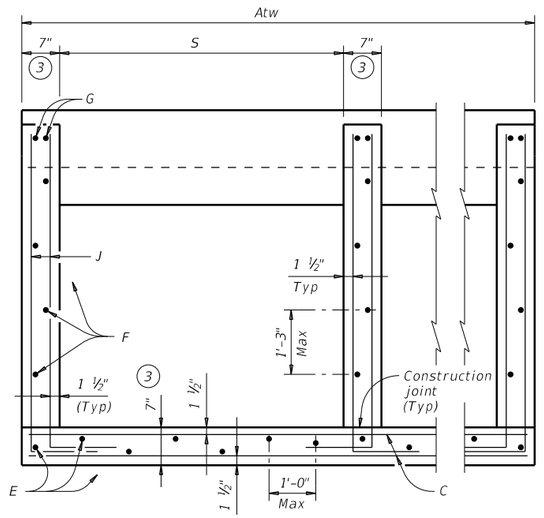
Pipe Runner Length (feet)
= (Lw) (K1) = (1.917')
Total Reinforcing (Lb)
= (1.55) (Lw) (Atw) +
(4.43) (Atw) +
(K2) (Hw) (N + 1) (√Lw)

C = Height of curb above top of top slab (feet)
Hw = Height of wingwall (feet)
K = Constant value for use in formulas

Slope SL:1	K1	K2
3:1	~	1.054 ~ 7.45
4:1	~	1.031 ~ 8.49
6:1	~	1.014 ~ 10.30

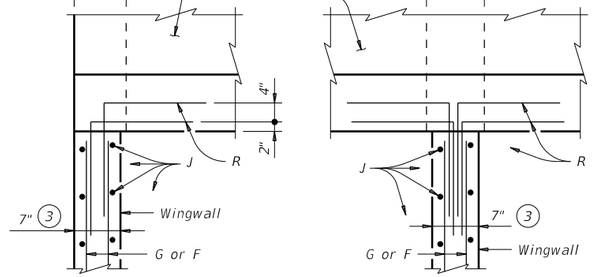
Atw = Anchor toewall length (feet)
Lw = Length of wingwall (feet)
N = Number of culvert barrels
SL:1 = Side slope ratio (horizontal : 1 vertical)

See applicable box culvert standard for H, S, T, and U values.



SECTION A-A

(Showing typical wingwall and wing slab reinforcing. Pipe runners not shown for clarity.)

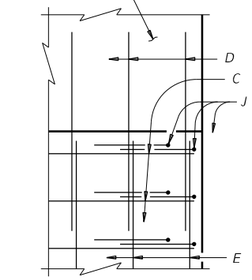


AT TOP OF EXTERIOR WINGWALL

(Cast-in-place culvert)

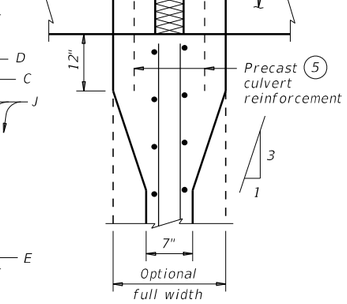
AT TOP OF INTERIOR WINGWALL

(Cast-in-place culvert)



AT OUTSIDE OF BOTTOM SLAB

(Cast-in-place culvert)



AT INTERIOR WINGWALL

(Precast culvert)

PLAN VIEWS OF CORNER DETAILS

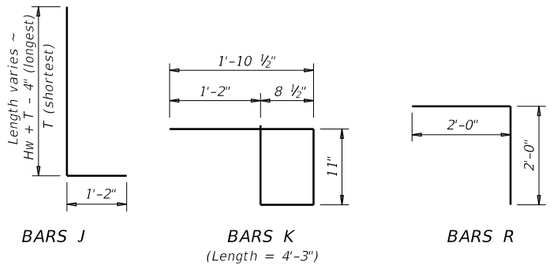
MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Adjust reinforcing as necessary to provide a minimum clear cover of 1½".
Provide Class "C" concrete (f`c = 3,600 psi).
Provide pipe runners, cross pipes, and anchor pipes meeting the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr B, or API 5LX52.
Provide ASTM A307 bolts.
Galvanize all steel components, except the concrete reinforcing, unless required elsewhere in the plans, after fabrication.
Repair galvanizing damaged during transport or construction in accordance with Item 445, "Galvanizing."

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design 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.
The quantities for concrete, reinforcing steel, and cross pipes resulting from the formulas given herein are for Contractor's information only.
See the Box Culvert Supplement (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.

Cover dimensions are clear dimensions, unless noted otherwise. Reinforcing dimensions are out-to-out of bars.



BARS J | BARS K (Length = 4'-3") | BARS R

TABLE OF REINFORCING BAR SIZES AND SPACING

Bar	Size	Spacing
C	#4	10" Max
D	#4	Match F and E
E	#4	1'- 0" Max
F	#4	1'- 3" Max
G	#6	As shown
J	#4	10" Max
K	#4	1'- 0" Max
R	#4	As shown

(1) *Provide 6:1 or flatter slope.*

(2) *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 Extended Curb Details the Extended Curb Details (ECD) standard sheet.*

(3) *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.*

(4) *For vehicle safety, reduce height, if necessary, to provide a maximum 3" projection above finished grade. No changes will be made in quantities and no additional compensation will be allowed for this work.*

(5) *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 Box Culvert Precast Miscellaneous Details (SCP-MD) standard sheet.*

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

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

SETB-PD

FILE: setbpdse-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0955	01	027	FM 166
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		145

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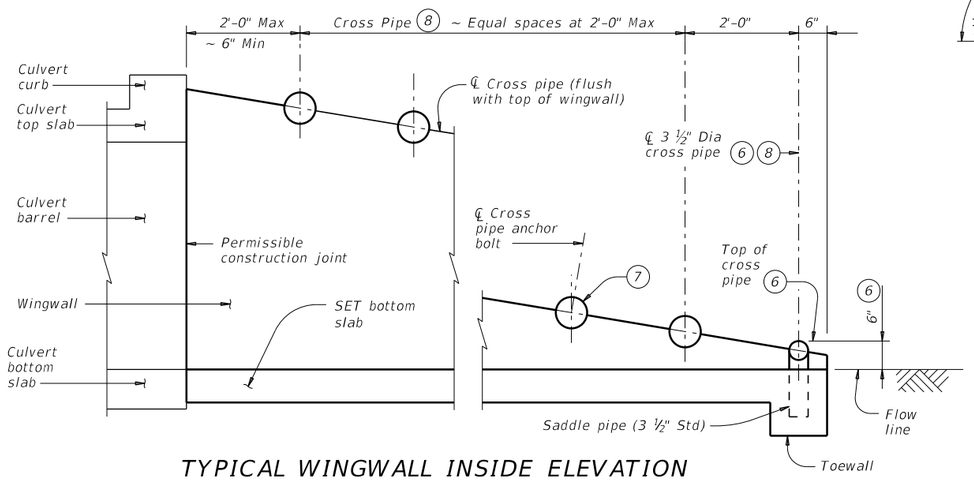
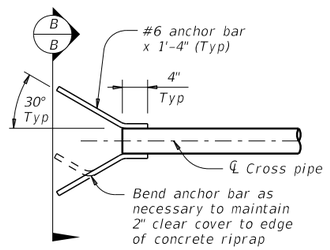
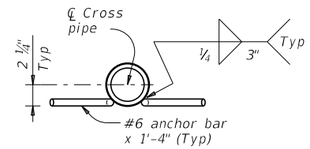


TYPICAL WINGWALL INSIDE ELEVATION

(Showing installation of cross pipes.)

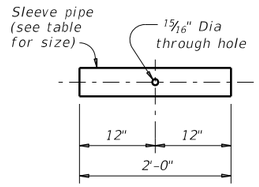


PART PLAN



SECTION B-B

OPTIONAL ANCHOR BAR DETAILS



SLEEVE PIPE DETAILS (9)

REQUIRED PIPE SIZES (8)		
Culvert Span Sizes	Cross Pipe Size	Sleeve Pipe Size (9)
First Pipe	3 ½" STD	2 ½" 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 ½" STD	2.875"	2.469"
3" STD	3.500"	3.068"
3 ½" STD	4.000"	3.548"
4" STD	4.500"	4.026"
5" STD	5.563"	5.047"
6" STD	6.625"	6.065"

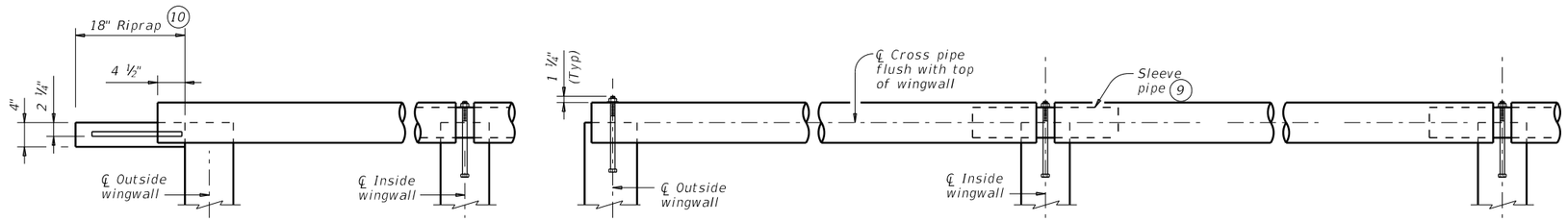
(6) The proper installation of the first cross pipe is critical for vechicle saftey. Place the top of the first cross pipe at no more than 6" above the flow line.

(7) Always install the third cross pipe from the bottom of the culvert using a bolted connection. Take care to ensure that concrete does not flow into this cross pipe so as to permit disassembly of the bolted connection to allow cleanout access.

(8) Provide cross pipes and sleeve pipes (if required) as shown in the Required Pipe Sizes table. Provide 3 1#2" saddle pipes for the 3 1#2" first cross pipe.

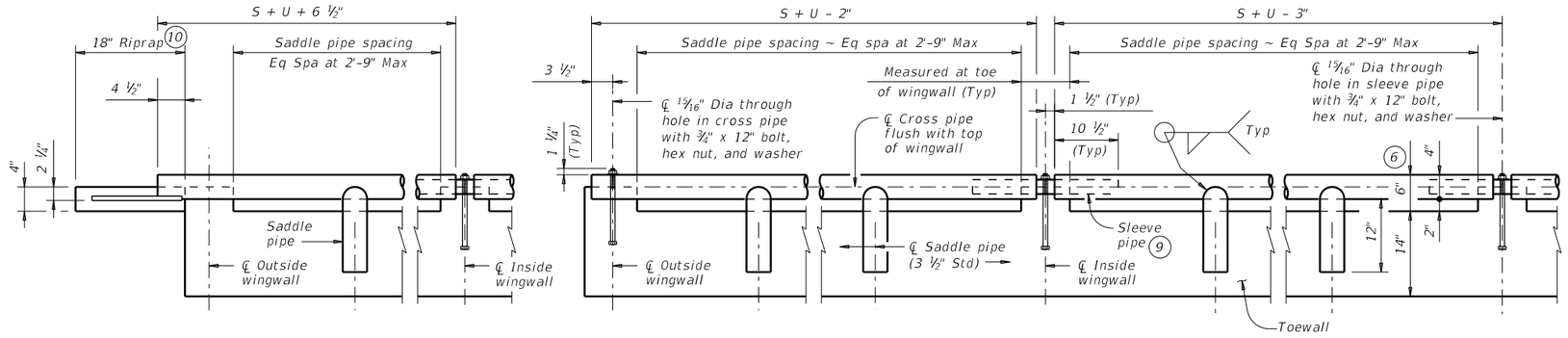
(9) At Contractor's option, make the cross pipe continuous across the inside wingwalls. If this option is selected, omit the sleeve pipe and make a 15#16" diameter throughhole in the cross pipe to accept the anchor bolt at the centerline of each interior wingwall.

(10) Provide riprap when using the Optional Anchor Bar details. Riprap is included in the bid price for Safety End Treatment. Provide 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 ½" First Cross Pipe detail.)



SECTION THROUGH INSTALLATION OF 3 ½" FIRST CROSS PIPE

OUTSIDE CULVERT BARREL WITH OPTIONAL ANCHOR BARS & RIPRAP

OUTSIDE CULVERT BARREL WITH BOLTED ANCHOR

INSIDE CULVERT BARREL

CROSS PIPE INSTALLATION DETAILS

SHEET 2 OF 2

Texas Department of Transportation

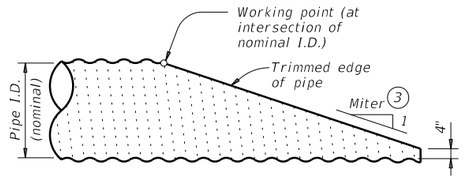
Bridge Division Standard

SAFETY END TREATMENT

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

SETB-PD

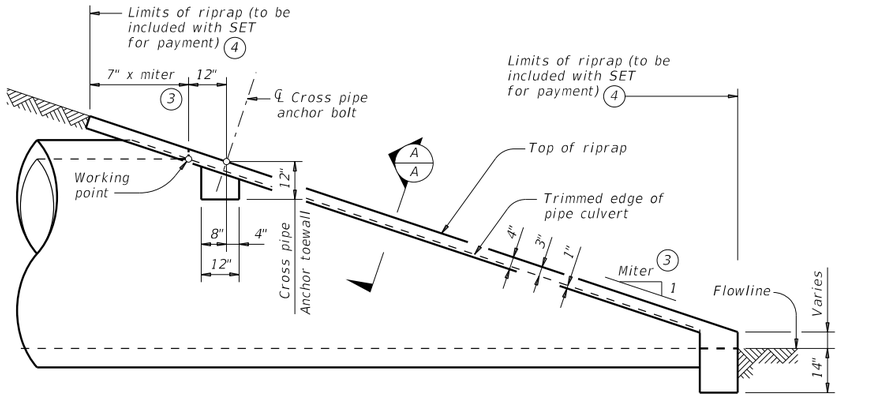
FILE: setbpdse-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0955	01	027	FM 166
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		146



NOTE: All pipe runners, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

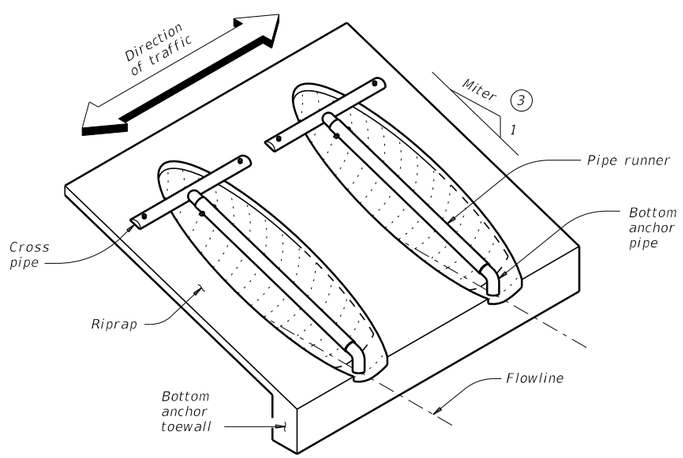
SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

(Showing corrugated metal pipe (CMP) culvert.
Details of reinforced concrete pipe (RCP) culvert are similar.)



SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

(Showing reinforced concrete pipe (RCP) culvert.
Details of corrugated metal pipe (CMP) culvert
are similar. Pipe runners not shown for clarity)



ISOMETRIC VIEW OF TYPICAL INSTALLATION

(Showing installation with no skew.)

CROSS PIPE LENGTHS AND PIPE RUNNER LENGTHS (1) (2)

Nominal Culvert I.D.	Pipe Culvert Spa ~ G	Cross Pipe Length	Pipe Runner Length											
			3:1 Side Slope				4:1 Side Slope				6:1 Side Slope			
			0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew
24"	1' – 7"	3' – 5"	N/A	N/A	N/A	5' – 10"	N/A	N/A	N/A	8' – 1"	N/A	N/A	N/A	12' – 9"
27"	1' – 8"	3' – 8"	N/A	N/A	5' – 5"	6' – 11"	N/A	N/A	7' – 7"	9' – 7"	N/A	N/A	11' – 11"	14' – 11"
30"	1' – 10"	3' – 11"	N/A	N/A	6' – 4"	8' – 0"	N/A	N/A	8' – 9"	11' – 0"	N/A	N/A	13' – 8"	17' – 0"
33"	1' – 11"	4' – 2"	6' – 2"	6' – 5"	7' – 3"	9' – 1"	8' – 6"	8' – 10"	10' – 0"	12' – 5"	13' – 3"	13' – 9"	15' – 5"	19' – 2"
36"	2' – 1"	4' – 5"	6' – 11"	7' – 3"	8' – 2"	10' – 2"	9' – 6"	9' – 11"	11' – 2"	13' – 10"	14' – 9"	15' – 3"	17' – 2"	21' – 3"
42"	2' – 4"	4' – 11"	8' – 6"	8' – 10"	9' – 11"	12' – 4"	11' – 7"	12' – 0"	13' – 6"	16' – 8"	17' – 9"	18' – 5"	20' – 8"	25' – 7"
48"	2' – 7"	5' – 5"	10' – 1"	10' – 5"	11' – 9"	N/A	13' – 7"	14' – 2"	15' – 10"	N/A	20' – 9"	21' – 6"	24' – 2"	N/A
54"	3' – 0"	5' – 11"	11' – 8"	12' – 1"	N/A	N/A	15' – 8"	16' – 3"	N/A	N/A	23' – 10"	24' – 8"	N/A	N/A
60"	3' – 3"	6' – 5"	13' – 3"	N/A	N/A	N/A	17' – 9"	N/A	N/A	N/A	26' – 10"	N/A	N/A	N/A

TYPICAL PIPE CULVERT MITERS (3)

Side Slope	0° Skew	15° Skew	30° Skew	45° Skew
3:1	3:1	3.106:1	3.464:1	4.243:1
4:1	4:1	4.141:1	4.619:1	5.657:1
6:1	6:1	6.212:1	6.928:1	8.485:1

CONDITIONS WHERE PIPE RUNNERS ARE NOT REQUIRED (2)

Nominal Culvert I.D.	Single Pipe Culvert	Multiple Pipe Culverts
12" thru 21"	Skews thru 45°	Skews thru 45°
24"	Skews thru 45°	Skews thru 30°
27"	Skews thru 30°	Skews thru 15°
30"	Skews thru 15°	Skews thru 15°
33"	Skews thru 15°	Always required
36"	Normal (no skew)	Always required
42" thru 60"	Always required	Always required

STANDARD PIPE SIZES AND MAX PIPE RUNNER LENGTHS (1)

Pipe Size	Pipe O.D.	Pipe I.D.	Max Pipe Runner Length
2" STD	2.375"	2.067"	N/A
3" STD	3.500"	3.068"	10' – 0"
4" STD	4.500"	4.026"	19' – 8"
5" STD	5.563"	5.047"	34' – 2"

ESTIMATED CONCRETE RIPRAP QUANTITIES (CY) (5)

Nominal Culvert I.D.	3:1 Side Slope				4:1 Side Slope				6:1 Side Slope			
	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew
12"	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.6	0.7	0.7	0.7	0.8
15"	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.9
18"	0.5	0.5	0.6	0.6	0.6	0.7	0.7	0.8	0.8	0.8	0.9	1.0
21"	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.9	0.9	0.9	1.0	1.2
24"	0.6	0.7	0.7	0.8	0.8	0.8	0.8	1.0	1.0	1.0	1.1	1.3
27"	0.7	0.7	0.8	0.9	0.8	0.9	0.9	1.1	1.1	1.1	1.2	1.4
30"	0.8	0.8	0.8	0.9	0.9	0.9	1.0	1.2	1.2	1.2	1.3	1.6
33"	0.8	0.8	0.9	1.0	1.0	1.0	1.1	1.3	1.3	1.4	1.5	1.7
36"	0.9	0.9	0.9	1.1	1.1	1.1	1.2	1.4	1.4	1.5	1.6	1.8
42"	1.0	1.0	1.1	1.3	1.2	1.3	1.3	1.6	1.6	1.7	1.8	2.1
48"	1.1	1.1	1.2	N/A	1.4	1.4	1.5	N/A	1.9	1.9	2.1	N/A
54"	1.3	1.3	N/A	N/A	1.6	1.6	N/A	N/A	2.1	2.1	N/A	N/A
60"	1.4	N/A	N/A	N/A	1.7	N/A	N/A	N/A	2.3	N/A	N/A	N/A

(1) Provide pipe runner of the size shown in the tables. Provide cross pipe of the same size as the pipe runner. Provide cross pipe stub out and bottom anchor pipe of the next smaller size pipe as shown in the Standard Pipe Sizes and Max Pipe Runner Lengths table.

(2) This standard allows for the placement of only one pipe runner across each culvert pipe opening. In order to limit the clear opening to be traversed by an errant vehicle, the following conditions must be met:

For 60" culvert pipes, the skew must not exceed 0°.
For 54" culvert pipes, the skew must not exceed 15°.
For 48" culvert pipes, the skew must not exceed 30°.
For all culvert pipe sizes 42" and less, the skew must not exceed 45°.

If the above conditions cannot be met, the designer should consider using a safety end treatment with flared wings. For further information, refer to the TxDOT Roadway Design Manual.

(3) Miter = slope of mitered end of pipe culvert.

(4) Riprap placed beyond the limits shown will be paid for as concrete riprap in accordance with Item 432, "Riprap".

(5) Quantities shown are for one end of one reinforced concrete pipe (RCP) culvert. For multiple pipe culverts or for corrugated metal pipe (CMP) culverts, quantities will need to be adjusted. Riprap quantities are for Contractor's information only.

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SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

FOR 12" DIA TO 60" DIA
PIPE CULVERTS
TYPE II ~ CROSS DRAINAGE

SETP-CD

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©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0955	01	027	FM 166
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	BRY	BURLESON		147

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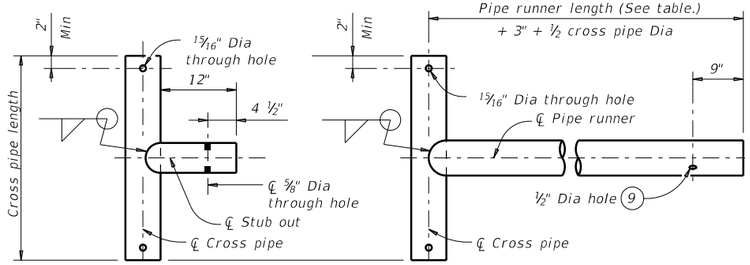
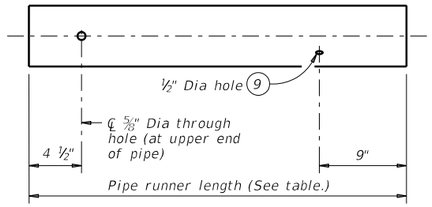


OPTION A1 OPTION A2

CROSS PIPE AND CONNECTIONS DETAILS

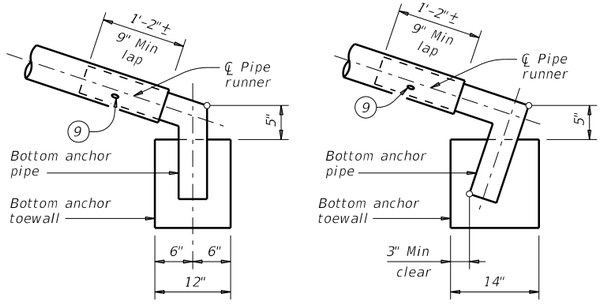


NOTE: The separate pipe runner shown is required when Cross Pipe Connection Option A1 is used.

PIPE RUNNER DETAILS

OPTION B1 OPTION B2

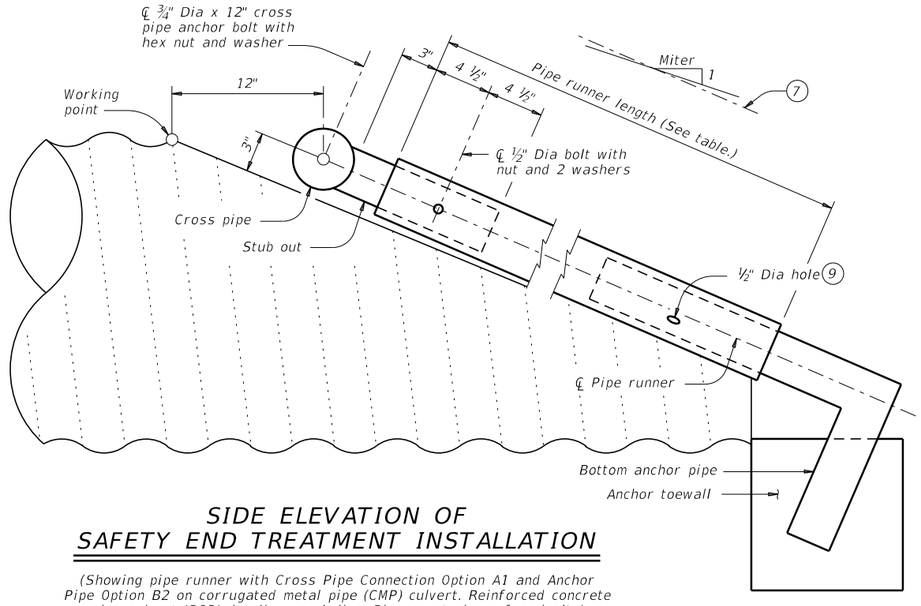
BOTTOM ANCHOR PIPE DETAILS (10)



OPTION B1 OPTION B2

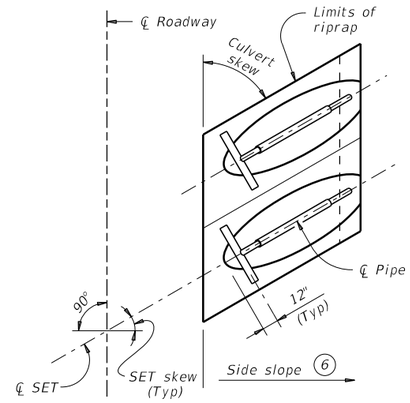
BOTTOM ANCHOR TOEWALL DETAILS

(Culvert and riprap not shown for clarity.)

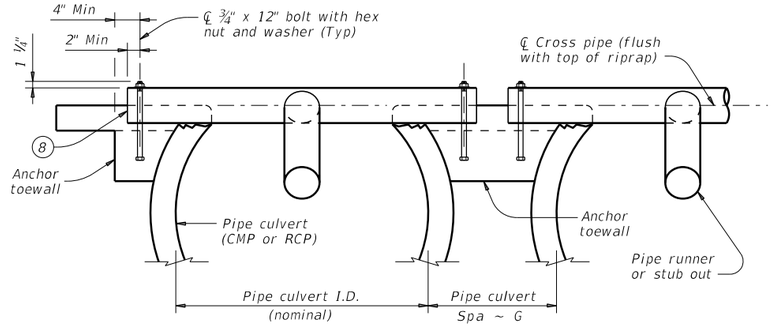


SIDE ELEVATION OF SAFETY END TREATMENT INSTALLATION

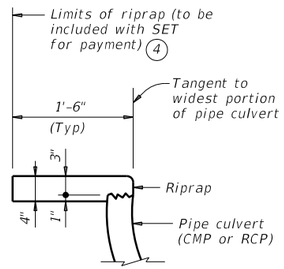
(Showing pipe runner with Cross Pipe Connection Option A1 and Anchor Pipe Option B2 on corrugated metal pipe (CMP) culvert. Reinforced concrete pipe culvert (RCP) details are similar. Riprap not shown for clarity)



PLAN OF SKEWED INSTALLATION



SHOWING CROSS PIPE AND ANCHOR TOEWALL



SHOWING TYPICAL PIPE CULVERT AND RIPRAP

SECTION A-A

(4) Riprap placed beyond the limits shown will be paid for as concrete riprap in accordance with Item 432, "Riprap".

(6) Recommended values of side slope are 3:1, 4:1, and 6:1. All quantities, calculations, and dimensions shown herein are based on these recommended values. Slope of 3:1 or flatter is required for vehicle safety.

(7) Note that actual slope of pipe runner may vary slightly from side slope of riprap and trimmed culvert pipe edge.

(8) Ensure that riprap concrete does not flow into the cross pipe so as to permit disassembly of the bolted connection to allow cleanout access.

(9) After installation, inspect the 1/2" hole to ensure that the lap of the pipe runner with the bottom anchor pipe is adequate.

(10) At fabricator's option, a heat bend to a smooth 5" radius or a manufactured elbow (of the same material as the runner) may be substituted for the mitered and welded joint in the bottom anchor pipe.

MATERIAL NOTES:
Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.
Provide pipe runners, cross pipes, and anchor pipes conforming to the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr B, or API 5LX52.
Provide ASTM A307 bolts and nuts.
Galvanize all steel components, except concrete reinforcing, after fabrication.
Repair galvanizing damaged during transport or construction in accordance with the specifications.

GENERAL NOTES:
Pipe runners are designed for a traversing load of 1,800 pounds at yield as recommended by Research Report 280-1, "Safety Treatment of Roadside Cross-Drainage Structures", Texas Transportation Institute, March 1981.
Safety end treatments (SET) shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the pipe runners.
Payment for riprap and toewall is included in the price bid for each safety end treatment.
Construct concrete riprap and all necessary inverts in accordance with the requirements of Item 432, "Riprap".

SHEET 2 OF 2

Texas Department of Transportation | Bridge Division Standard

SAFETY END TREATMENT
FOR 12" DIA TO 60" DIA
PIPE CULVERTS
TYPE II ~ CROSS DRAINAGE

SETP-CD

FILE: setpcdse-20.dgn	DN: GAF		CK: CAT	DW: JRP		CK: GAF	
©TxDOT February 2020	CONT	SECT	JOB		HIGHWAY		
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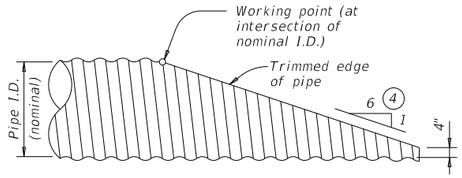
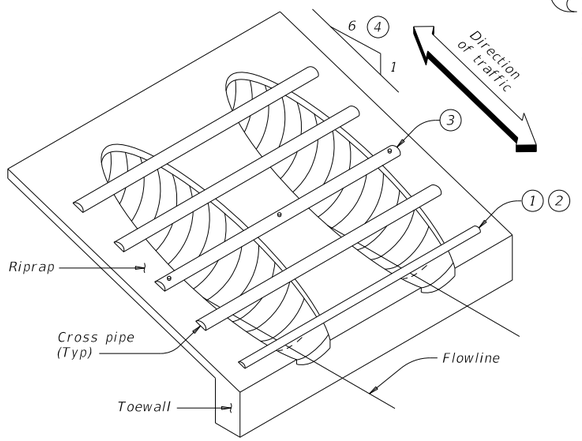


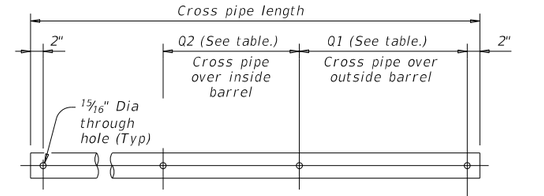
NOTE: All cross pipes, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

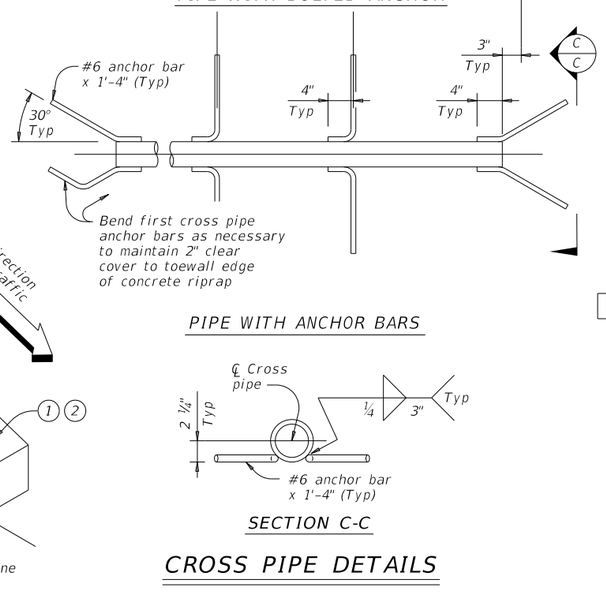
(Showing corrugated metal pipe (CMP) culvert Details at reinforced concrete pipe (RCP) culvert are similar.)



ISOMETRIC VIEW OF TYPICAL INSTALLATION



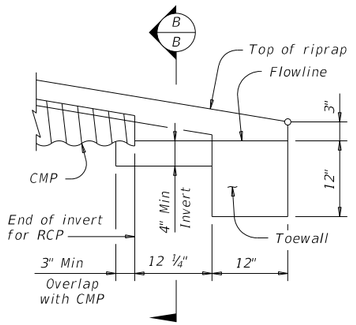
PIPE WITH BOLTED ANCHOR



PIPE WITH ANCHOR BARS

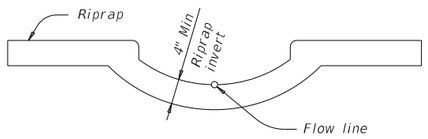
SECTION C-C

CROSS PIPE DETAILS



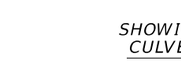
DETAIL "A"

(Showing invert with corrugated metal pipe (CMP) culvert. Reinforced concrete pipe (RCP) culvert details are similar. Cross pipes not shown for clarity.)

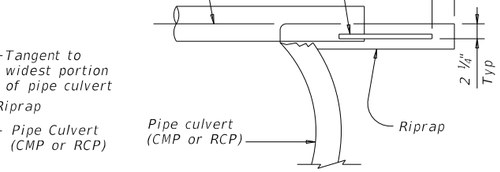


SECTION B-B

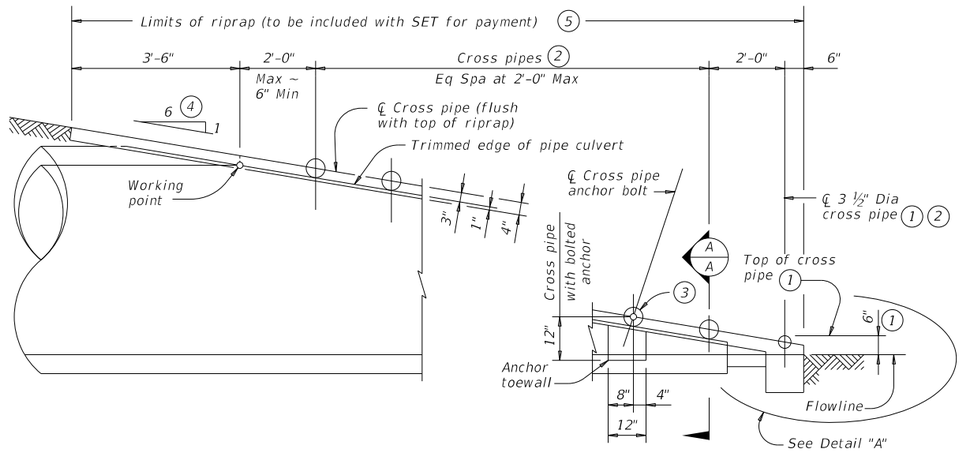
(Cross pipes not shown for clarity.)



SHOWING TYPICAL PIPE CULVERT AND RIPRAP

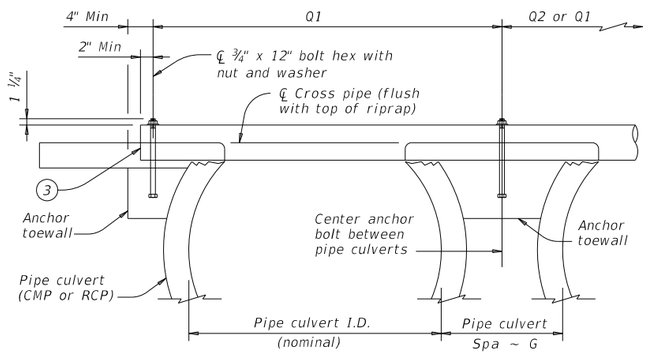


SHOWING CROSS PIPE WITH ANCHOR BAR



SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

(Showing reinforced concrete pipe (RCP) culvert. Details at corrugated metal pipe (CMP) culvert are similar.)



SHOWING CROSS PIPE WITH BOLTED ANCHOR

SECTION A-A

CROSS PIPE LENGTHS, REQUIRED PIPE SIZES, AND RIPRAP QUANTITIES (2)

Nominal Culvert I.D.	Conc Riprap (CY) (6)	Pipe Culvert Spa ~ G	Single Barrel ~ Q1	Multi-Barrel ~ Q1	Q2	Conditions for Use of Cross Pipes	Cross Pipe Sizes
12"	0.6	0' - 9"	N/A	2' - 1"	1' - 9"	3 or more pipe culverts	3" Std (3.500" O.D.)
15"	0.7	0' - 11"	N/A	2' - 5"	2' - 2"		
18"	0.8	1' - 2"	N/A	2' - 10"	2' - 8"		
21"	0.9	1' - 4"	N/A	3' - 2"	3' - 1"		
24"	0.9	1' - 7"	N/A	3' - 6"	3' - 7"		
27"	1.0	1' - 8"	N/A	3' - 10"	3' - 11"	3 or more pipe culverts	3 ½" Std (4.000" O.D.)
30"	1.1	1' - 10"	N/A	4' - 2"	4' - 4"	2 or more pipe culverts	
33"	1.2	1' - 11"	4' - 2"	4' - 5"	4' - 8"	All pipe culverts	
36"	1.3	2' - 1"	4' - 5"	4' - 9"	5' - 1"	All pipe culverts	4" Std (4.500" O.D.)
42"	1.5	2' - 4"	4' - 11"	5' - 5"	5' - 10"		
48"	1.7	2' - 7"	5' - 5"	6' - 0"	6' - 7"	All pipe culverts	5" Std (5.563" O.D.)
54"	2.0	3' - 0"	5' - 11"	6' - 9"	7' - 6"		
60"	2.2	3' - 3"	6' - 5"	7' - 4"	8' - 3"		
66"	2.4	3' - 3"	6' - 11"	7' - 10"	8' - 9"		
72"	2.7	3' - 4"	7' - 5"	8' - 5"	9' - 4"		

(1) The proper installation of the first cross pipe is critical for vehicle safety. Place the top of the first cross pipe no more than 6" above the flow line.

(2) Provide cross pipes, except the first bottom pipe, of the size shown in the table. Provide a 3 1#2" standard pipe (4" O.D.) for the first bottom pipe.

(3) Install the third cross pipe from the bottom of the culvert using a bolted connection. Ensure that riprap concrete does not flow into the cross pipe so as to permit disassembly of the bolted connection to allow cleanout access. At the Contractor's option, install all other cross pipes using the bolted connection details.

(4) Match cross slope as shown elsewhere in the plans. Cross slope of 6:1 or flatter is required for vehicle safety.

(5) Riprap placed beyond the limits shown will be paid for as concrete riprap in accordance with Item 432, "Riprap".

(6) Quantities shown are for one end of one reinforced concrete pipe (RCP) culvert. For multiple pipe culverts or for corrugated metal pipe (CMP) culverts, quantities will need to be adjusted. Riprap quantities are for contractor's information only.

MATERIAL NOTES:

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

Provide cross pipes that meet the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 (Gr B), or API 5LX52.

Provide ASTM A307 bolts and nuts.

Galvanize all steel components, except concrete reinforcing, after fabrication. Repair galvanizing damaged during transport or construction in accordance with the specifications.

GENERAL NOTES:

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.

Safety end treatments (SET) 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.

Construct concrete riprap and all necessary inverts in accordance with the requirements of Item 432, "Riprap".

Payment for riprap and toewall is included in the Price Bid for each Safety End Treatment.

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

FOR 12" DIA TO 72" DIA PIPE CULVERTS TYPE II ~ PARALLEL DRAINAGE

SETP-PD

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©TxDOT February 2020 REVISIONS	CONT	SECT	JOB	HIGHWAY
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	BRY	BURLESON		149

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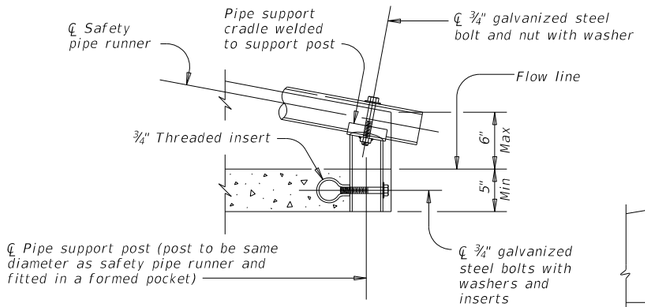
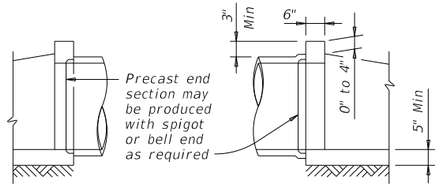
REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

Pipe I.D.	RCP Wall "B" Thickness	TP Wall Thickness (8)	"D" (1)	Slope	Min Length of Unit	Single Pipe Skew	Single Pipe Pipe Runners Required	Multiple Pipes Skew	Multiple Pipes Pipe Runners Required
12"	2"	1.15"	17.00"	3:1	2' – 11"	≤ 45°	No	≤ 45°	No
				4:1	3' – 6"				
				6:1	4' – 9"				
15"	2 ¼"	1.30"	20.50"	3:1	3' – 8"	≤ 45°	No	≤ 45°	No
				4:1	4' – 7"				
				6:1	6' – 5"				
18"	2 ½"	1.60"	24.00"	3:1	4' – 6"	≤ 45°	No	≤ 45°	No
				4:1	5' – 8"				
				6:1	8' – 0"				
24"	3"	1.95"	31.00"	3:1	6' – 2"	≤ 45°	No	= 30°	No
				4:1	7' – 10"			> 30°	Yes
				6:1	11' – 3"				
30"	3 ½"	2.65"	38.50"	3:1	7' – 10"	= 15°	No	= 15°	No
				4:1	10' – 1"	> 15°	Yes	> 15°	Yes
				6:1	14' – 8"				
36"	4"	2.75"	45.50"	3:1	9' – 5"	= 0°	No	≥ 0°	Yes
				4:1	12' – 3"	> 0°	Yes		
				6:1	17' – 11"				
42"	4 ½"	N/A	52.50"	3:1	11' – 1"	≥ 0°	Yes	≥ 0°	Yes
				4:1	14' – 5"				
				6:1	21' – 2"				



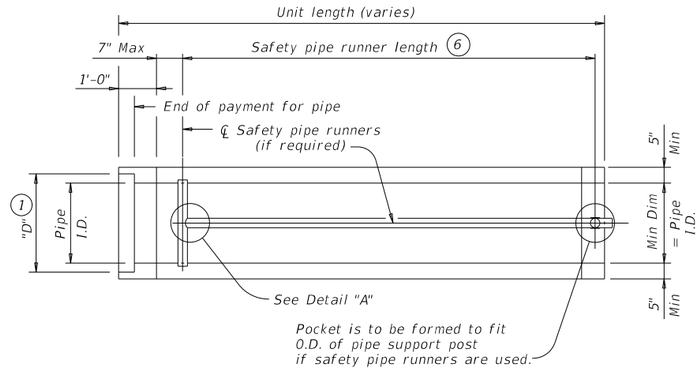
END DETAIL FOR INSTALLATION OF SAFETY PIPE RUNNERS

(If required)



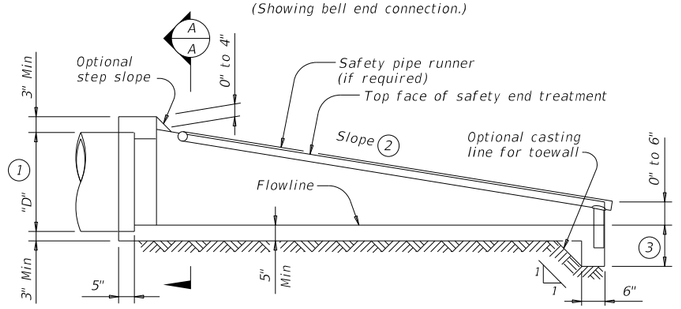
OPTIONAL JOINT FOR RCP

(Showing joint between RCP and precast safety end treatment)



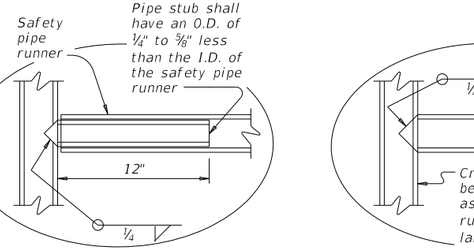
PLAN

(Showing bell end connection.)



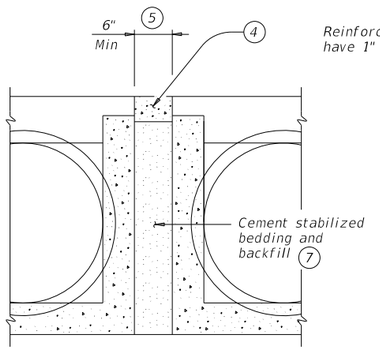
LONGITUDINAL ELEVATION

(Showing bell end connection.)

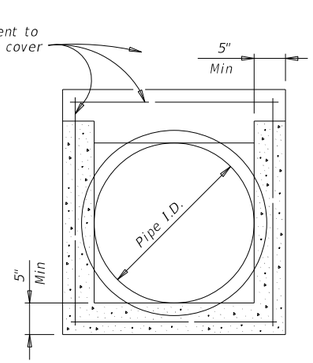


DETAIL A

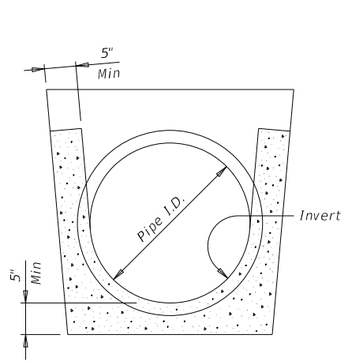
(If required)



MULTIPLE PIPE INSTALLATION

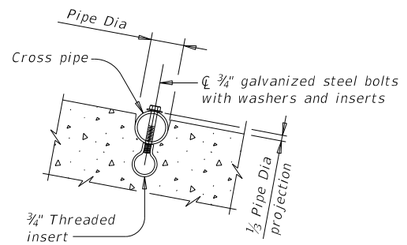


OPTION WITH SQUARE BOTTOM



OPTION WITH INVERT BOTTOM

SECTION A-A



INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)

SAFETY PIPE RUNNER DIMENSIONS

Max Safety Pipe Runner Length	Required Pipe Runner Size: Pipe Size	Pipe O.D.	Pipe I.D.
11' – 2"	3" STD	3.500"	3.068"
15' – 6"	3 ½" STD	4.000"	3.548"
20' – 10"	4" STD	4.500"	4.026"
35' – 4"	5" STD	5.563"	5.047"

(1) Dimension "D" is based on reinforced concrete pipe (RCP) meeting the requirements of ASTM C-76, Class III, (RCP Wall "B" thickness). Adjust "D" for any other wall thickness used. For thermoplastic pipe (TP) take into account the annular space requirements for grouted connections.

(2) Slope as shown elsewhere in plans. Slope of 3:1 or flatter is required for vehicle safety.

(3) Toewall to be used only when dimension is shown elsewhere in the plans.

(4) Fill the top 4" of void between precast end treatments with concrete riprap. Concrete riprap is considered subsidiary to the Item 467, "Safety End Treatment".

(5) Adjust clear distance between pipes to provide for the minimum distance between safety end treatments.

(6) Measured along slope.

(7) Provide cement stabilized bedding and backfill in accordance with the Item 400, "Excavation and Backfill for Structures". Bedding and backfill is considered subsidiary to the Item 467, "Safety End Treatment". When concrete riprap is specified around the safety end treatment, backfill as directed by Engineer.

(8) Thermoplastic pipe wall thickness may vary. Adjust accordingly. Thermoplastic pipe requires the safety end treatments to have a bell end for grouted connections.

GENERAL NOTES:

Precast safety end treatment for reinforced concrete pipe (RCP), and thermoplastic pipe (TP) may be used for TYPE II end treatment as specified in Item "Safety End Treatment".

When precast safety end treatment is used as a Contractor's alternate to mitered RCP, riprap will not be required unless noted otherwise on the plans.

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

Manufacture this product in accordance with Item 467, "Safety End Treatment" except as noted below :

A. Provide minimum reinforcing of #4 at 6" (Grade 40) or #4 at 9" (Grade 60) each way or 6"x6" – D12 x D12 or 5"x5" – D10 x D10 welded wire reinforcement (WWR).
B. For precast (steel formed) sections, provide Class "C" concrete (f'c = 3,600 psi).

At the option and expense of the Contractor, the next larger size of safety end treatment may be furnished as long as the "D" dimension cast is that of the required size of pipe.

Pipe runners are designed for a traversing load of 1,800 Lbs at yield as recommended by Research Report 280-1, "Safety Treatment of Roadside Cross-Drainage Structures", Texas Transportation Institute, March 1981.

Provide safety pipe runners, cross pipes, pipe support posts, and pipe stubs meeting the requirements of ASTM A53 (Type E or S, Grade B), ASTM A500 (Grade B), or API 5LX52.

Galvanize all steel components except reinforcing steel after fabrication. Repair galvanizing damaged during transport or construction in accordance with the specifications.

Connect RCP using the Optional Joint for RCP detail shown or in accordance with Item 464 "Reinforced Concrete Pipe". Connect TP by grouting. See PBGC standard for grouted connections with TP and precast safety end treatment.

Texas Department of Transportation — Bridge Division Standard

PRECAST SAFETY END TREATMENT

TYPE II ~ CROSS DRAINAGE

PSET-SC

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©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
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	BRY	BURLESON		150

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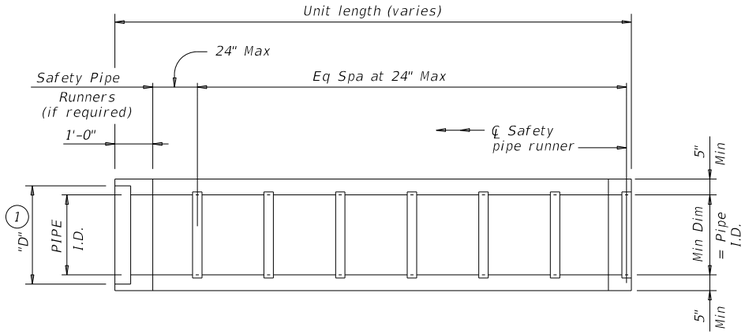
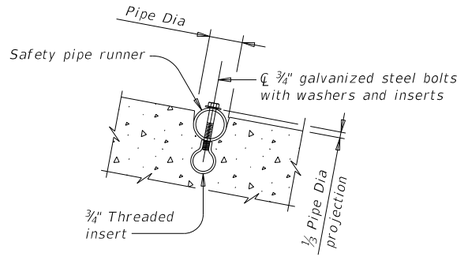


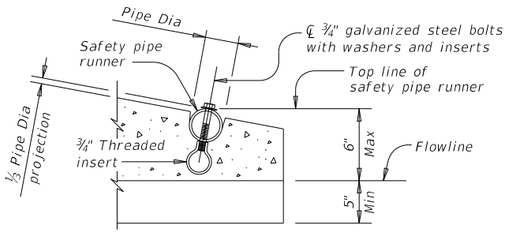
PLAN

(Showing bell end connection.)

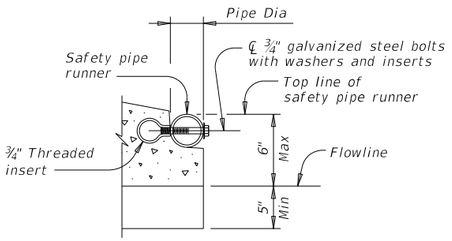


INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)



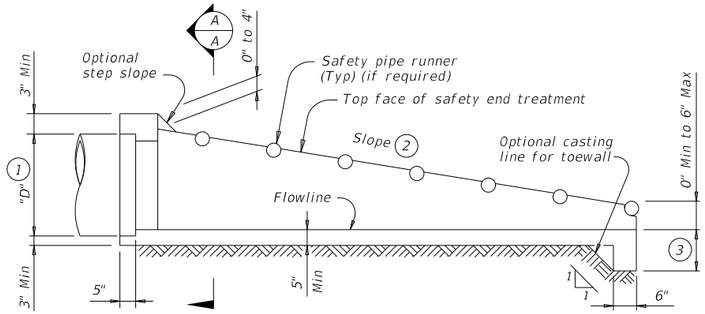
OPTION A



OPTION B

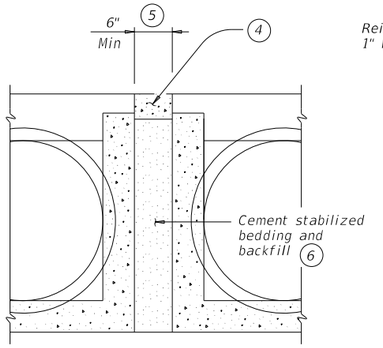
END DETAILS FOR INSTALLATION OF SAFETY PIPE RUNNERS

(If required)

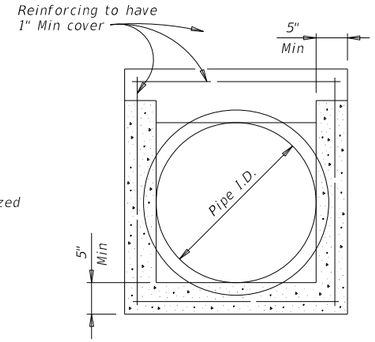


LONGITUDINAL ELEVATION

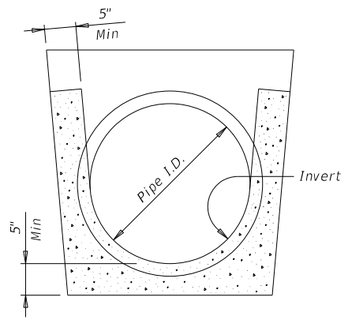
(Showing bell end connection.)



MULTIPLE PIPE INSTALLATION

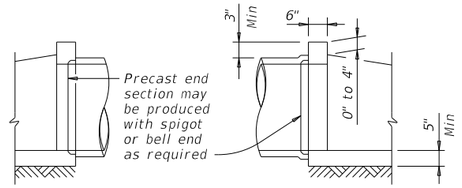


OPTION WITH SQUARE BOTTOM



OPTION WITH INVERT BOTTOM

SECTION A-A



OPTIONAL JOINT FOR RCP

(Showing joint between RCP and precast safety end treatment.)

REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

Pipe I.D.	RCP Wall "B" Thickness	TP Wall Thickness (7)	"D" (1)	Slope	Min Length	Pipe Runners Required		Required Pipe Runner Size		
						Single Pipe	Multiple Pipe	Nominal Dia.	O.D.	I.D.
12"	2"	1.15"	17.00"	6:1	4' – 9"	No	Yes, for > 2 pipes	3" STD	3.500"	3.068"
15"	2 ¼"	1.30"	20.50"	6:1	6' – 5"	No	Yes, for > 2 pipes	3" STD	3.500"	3.068"
18"	2 ½"	1.60"	24.00"	6:1	8' – 0"	No	Yes, for > 2 pipes	3" STD	3.500"	3.068"
24"	3"	1.95"	31.00"	6:1	11' – 3"	No	Yes, for > 2 pipes	3" STD	3.500"	3.068"
30"	3 ½"	2.65"	38.50"	6:1	14' – 8"	No	Yes	4" STD	4.500"	4.026"
36"	4"	2.75"	45.50"	6:1	17' – 11"	Yes	Yes	4" STD	4.500"	4.026"
42"	4 ½"	N/A	52.50"	6:1	21' – 2"	Yes	Yes	4" STD	4.500"	4.026"

(1) Dimension "D" is based on reinforced concrete pipe (RCP) meeting the requirements of ASTM C-76, Class III, (RCP Wall "B" thickness). Adjust "D" for any other wall thickness used. For thermoplastic pipe (TP) take into account the annular space requirements for grouted connections.

(2) Slope as shown elsewhere in the plans. Slope of 6:1 or flatter is required for vehicle safety.

(3) Toewall to be used only when dimension is shown elsewhere in the plans.

(4) Fill the top 4" of void between precast end treatments with concrete riprap. Concrete riprap is considered subsidiary to the Item 467, "Safety End Treatment".

(5) Adjust clear distance between pipes to provide for the minimum distance between safety end treatments.

(6) Provide cement stabilized bedding and backfill in accordance with the Item 400, "Excavation and Backfill for Structures". Bedding and backfill is considered subsidiary to the Item 467, "Safety End Treatment". When concrete riprap is specified around the safety end treatment, backfill as directed by Engineer.

(7) Thermoplastic pipe wall thickness may vary. Adjust accordingly. Thermoplastic pipe requires the safety end treatments to have a bell end for grouted connections.

GENERAL NOTES:

Precast safety end treatment for reinforced concrete pipe (RCP), and thermoplastic pipe (TP) may be used for TYPE II end treatment as specified in Item "Safety End Treatment".

When precast safety end treatment is used as a Contractor's alternate to mitered RCP, riprap will not be required unless noted otherwise on the plans.

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

Manufacture this product in accordance with Item 467, "Safety End Treatment" except as noted below :

A. Provide minimum reinforcing of #4 at 6" (Grade 40) or #4 at 9" (Grade 60) each way or 6"x6" – D12 x D12 or 5"x5" – D10 x D10 welded wire reinforcement (WWR).

B. For precast (steel formed) sections, provide Class "C" concrete (f'c = 3,600 psi).

At the option and expense of the Contractor the next larger size of safety end treatment may be furnished; as long as the "D" dimension cast is that of the required size of pipe.

Pipe runners are designed for a traversing load of 10,000 Lbs at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.

Provide pipe runners meeting the requirements of ASTM A53 (Type E or S, Grade B), ASTM A500 (Grade B), or API 5LX52.

Galvanize all steel components except reinforcing steel after fabrication. Repair galvanizing damaged during transport or construction in accordance with the specifications.

Connect RCP using the Optional Joint for RCP detail shown or in accordance with Item 464, "Reinforced Concrete Pipe". Connect TP by grouting. See PBGC standard for grouted connections with TP and precast safety end treatment.

Texas Department of Transportation

Bridge Division Standard

PRECAST SAFETY END TREATMENT

TYPE II ~ PARALLEL DRAINAGE

PSET-SP

FILE: psetspss-20.dgn	DN: RLW	CK: KLR	DW: JTR	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0955	01	027	FM 166
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		151

DATE: 3/31/2021 3:10:01 PM
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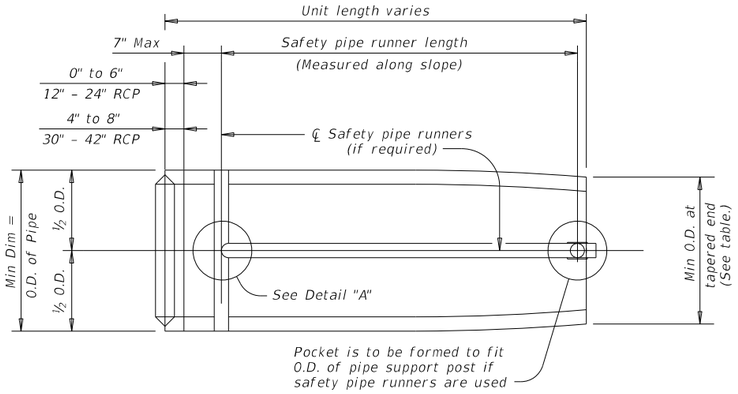
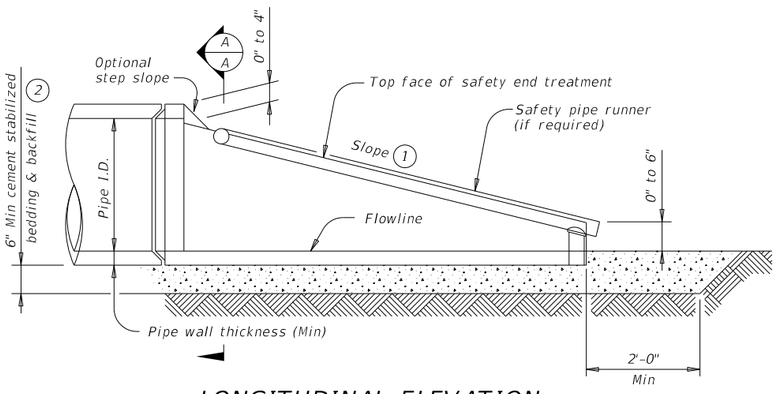


PLAN VIEW

(Showing spigot end connection.)



LONGITUDINAL ELEVATION

(Showing spigot end connection.)

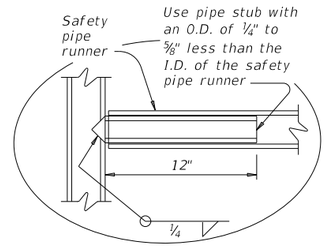
MAX SAFETY PIPE RUNNER LENGTHS AND REQUIRED SAFETY PIPE RUNNER SIZES

Max Safety Pipe Runner Length	Required Pipe Runner Size		
	Pipe Size	Pipe O.D.	Pipe I.D.
11' – 2"	3" STD	3.500"	3.068"
15' – 6"	3 ½" STD	4.000"	3.548"
20' – 10"	4" STD	4.500"	4.026"
35' – 4"	5" STD	5.563"	5.047"

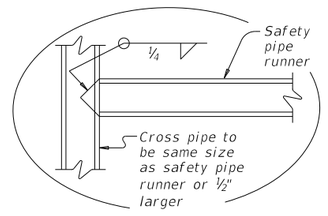
1. Slope as shown elsewhere in the plans. Slope of 3:1 or flatter is required for vehicle safety.
2. Provide cement stabilized bedding and backfill in accordance with the Item, "Excavation and Backfill for Structures". Bedding and backfill is considered subsidiary to the Item "Safety End Treatment". When concrete riprap is specified around the safety end treatment, backfill as directed by Engineer.
3. Fill the top 4" of void between precast end treatments with concrete riprap. Concrete riprap be considered subsidiary to the Item "Safety End Treatment".
4. Adjust clear distance between pipes to provide for the minimum distance between safety end treatments.

REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

Pipe I.D.	Min Wall Thickness	Min O.D.	Min O.D. at Tapered End	Min Reinf Requirements (sq. in. / ft. of pipe)	Slope	Minimum Length of Unit	Single Pipe		Multiple Pipe	
							Skew	Pipe Runners Required	Skew	Pipe Runners Required
12"	2"	16"	16"	0.07 Circ.	3:1	2' – 0"	≤ 45°	No	≤ 45°	No
					4:1	2' – 8"				
					6:1	4' – 0"				
15"	2 ¼"	19 ½"	19"	0.07 Circ.	3:1	2' – 10"	≤ 45°	No	≤ 45°	No
					4:1	3' – 9"				
					6:1	5' – 8"				
18"	2 ½"	23"	21 ½"	0.07 Circ.	3:1	3' – 8"	≤ 45°	No	≤ 45°	No
					4:1	4' – 10"				
					6:1	7' – 3"				
24"	3"	30"	27"	0.07 Circ.	3:1	5' – 3"	≤ 45°	No	≤ 30°	No
					4:1	7' – 0"			> 30°	Yes
					6:1	10' – 6"				
30"	3 ½"	37"	31"	0.18 Circ.	3:1	6' – 3"	≤ 15°	No	≤ 15°	No
					4:1	8' – 2"	> 15°	Yes	> 15°	Yes
					6:1	12' – 1"				
36"	4"	44"	36"	0.19 Ellip.	3:1	7' – 10"	= 0°	No	≥ 0°	Yes
					4:1	10' – 4"	> 0°	Yes		
					6:1	15' – 4"				
42"	4 ½"	51"	41 ½"	0.23 Ellip.	3:1	9' – 6"	≥ 0°	Yes	≥ 0°	Yes
					4:1	12' – 6"				
					6:1	18' – 7"				

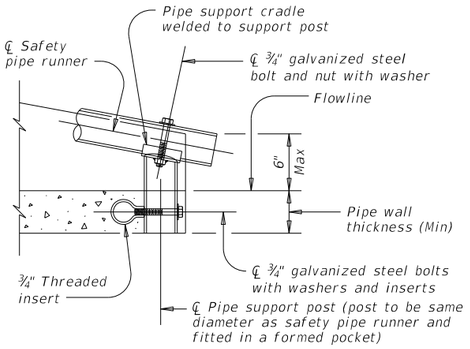


OPTION A



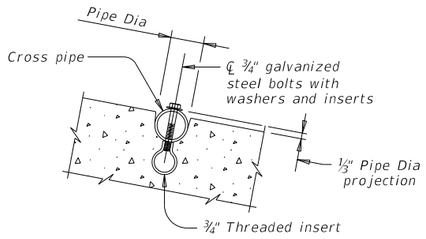
OPTION B

DETAIL A



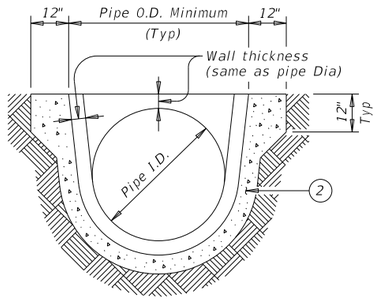
END DETAIL FOR INSTALLATION OF SAFETY PIPE RUNNERS

(If required)

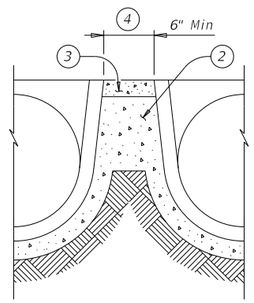


INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)



SECTION A-A



MULTIPLE PIPE INSTALLATION

MATERIAL NOTES:

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

Provide safety pipe runners, cross pipes, pipe support posts, and pipe stubs meeting the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr B, or API 5LX52.

Galvanize all steel components except reinforcing steel after fabrication. Repair galvanizing damaged during transport or construction in accordance with the specifications.

GENERAL NOTES:

Precast safety end treatment for reinforced concrete pipe (CRP) may be used for TYPE II end treatment as specified in Item 467, "Safety End Treatment".

When precast safety end treatment is used as a Contractor's alternate to mitered RCP, riprap will not be required unless noted otherwise on the plans.

Manufacture precast concrete end sections in accordance with Item 464, "Reinforced Concrete Pipe" and in accordance with ASTM Specification C-76, Class III, Wall B for circular pipe.

Provide precast concrete end sections with a spigot or bell end for compatibility to upstream or downstream end conditions with sufficient annular space to allow for grout, mortar, cold applied asphalt joint compound or pre-formed plastic gasket material.

Methods of lifting shall be provided by the manufacturer for ease of loading, unloading, and installation.

Pipe runners are designed for a traversing load of 1,800 Lbs at yield as recommended by Research Report 280-1, "Safety Treatment of Roadside Cross-Drainage Structures", Texas Transportation Institute, March 1981.

Texas Department of Transportation

Bridge Division Standard

PRECAST SAFETY END TREATMENT

TYPE II ~ CROSS DRAINAGE

PSET-RC

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©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0955	01	027	FM 166
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		152

DATE: 3/31/2021 3:10:04 PM
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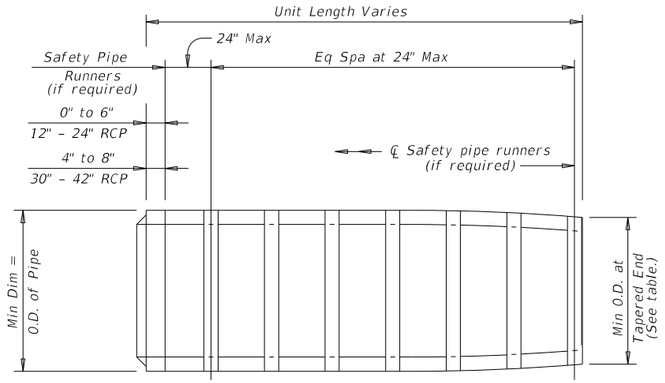
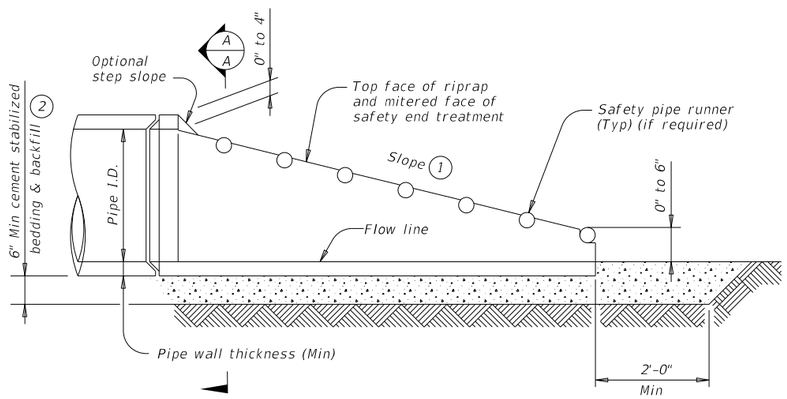


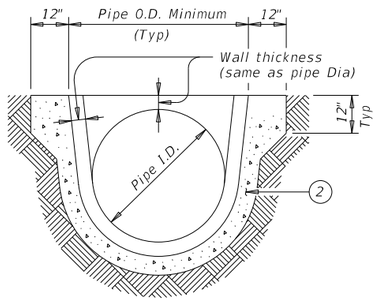
PLAN VIEW – 12" THRU 24"

(Showing spigot end connection.)

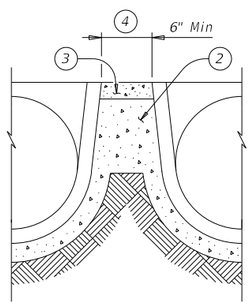


LONGITUDINAL ELEVATION - 12" THRU 24"

(Showing spigot end connection.)



SECTION A-A



MULTIPLE PIPE INSTALLATION

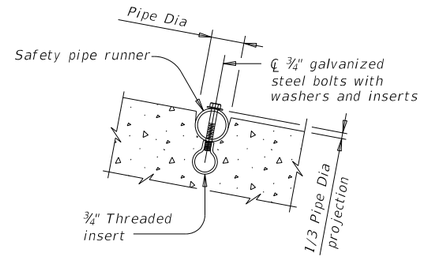
(1) Slope as shown elsewhere in the plans. Slope of 6:1 or flatter is required for vehicle safety.

Provide cement stabilized bedding and backfill in accordance with the Item, "Excavation and Backfill for Structures". Bedding and backfill is considered subsidiary to the Item 467, "Safety End Treatment". When concrete riprap is specified around the safety end treatment, backfill as directed by Engineer.

(3) Fill the top 4" of void between precast end treatments with concrete riprap. Concrete riprap is considered subsidiary to the Item 467, "Safety End Treatment".

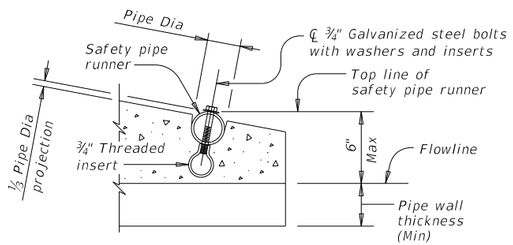
(4) Adjust clear distance between pipes to provide for the minimum distance between safety end treatments.

(5) Safety pipe runners are required for multiple pipe culverts with more than two pipes.

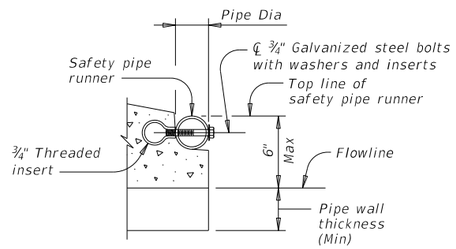


INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)



OPTION A



OPTION B

END DETAILS FOR INSTALLATION OF SAFETY PIPE RUNNERS

(If required)

REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

Pipe I.D.	Min Wall Thickness	Min O.D.	Min O.D. at Tapered End	Min Reinf Requirements (sq. in. per ft. of Pipe)	Max Slope	Min Length of Unit	Pipe Runner Requirements		Required Pipe Runner Sizes		
							Single Pipe	Multiple Pipe	Nominal Dia	O.D.	I.D.
12"	2"	16"	16"	0.07 Circ.	6:1	4'-0"	No	(5)	3" STD	3.500"	3.068"
15"	2 ¼"	19 ½"	19"	0.07 Circ.	6:1	5'-8"	No	(5)	3" STD	3.500"	3.068"
18"	2 ½"	23"	21 ½"	0.07 Circ.	6:1	7'-3"	No	(5)	3" STD	3.500"	3.068"
24"	3"	30"	27"	0.07 Circ.	6:1	10'-6"	No	(5)	3" STD	3.500"	3.068"
30"	3 ½"	37"	31"	0.18 Circ.	6:1	12'-1"	No	Yes	4" STD	4.500"	4.026"
36"	4"	44"	36"	0.19 Ellip.	6:1	15'-4"	Yes	Yes	4" STD	4.500"	4.026"
42"	4 ½"	51"	41 ½"	0.23 Ellip.	6:1	18'-7"	Yes	Yes	4" STD	4.500"	4.026"

MATERIAL NOTES:

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

Provide pipe runners meeting the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr B, or API 5LX52.

Galvanize steel components except reinforcing steel after fabrication. Repair galvanizing damaged during transport or construction in accordance with the specifications.

GENERAL NOTES:

Precast safety end treatment for reinforced concrete pipe (RCP) may be used for TYPE II end treatment as specified in Item 467, "Safety End Treatment".

When precast safety end treatment is used as a Contractor's alternate to mitered RCP, riprap will not be required unless noted otherwise on the plans.

Manufacture precast concrete end sections in accordance with Item 464, "Reinforced Concrete Pipe" and in accordance with ASTM Specification C-76, Class III, Wall B for circular pipe.

Provide precast concrete end sections with a spigot or bell end for compatibility to upstream or downstream end conditions with sufficient annular space to allow for grout, mortar, cold applied asphalt joint compound or pre-formed plastic gasket material.

Methods of lifting shall be provided by the manufacturer for ease of loading, unloading and installation.

Pipe runners are designed for a traversing load of 10,000 Lbs at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.

Texas Department of Transportation

Bridge Division Standard

PRECAST SAFETY END TREATMENT

TYPE II ~ PARALLEL DRAINAGE

PSET-RP

FILE: psetrpss-20.dgn	DN: RLW	CK: KLR	DW: JTR	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0955	01	027	FM 166
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		153

DATE: 3/31/2021 3:10:08 PM
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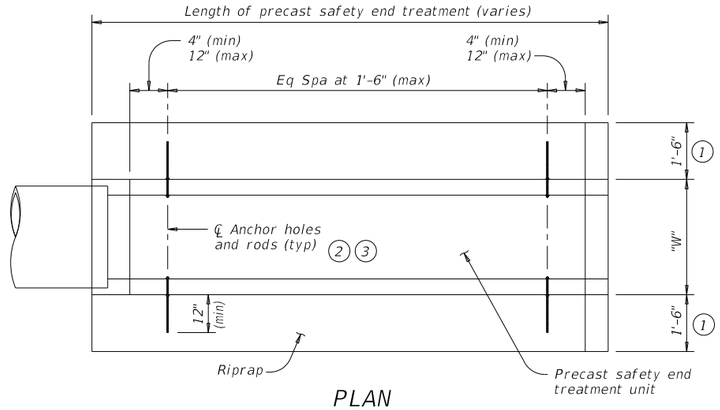
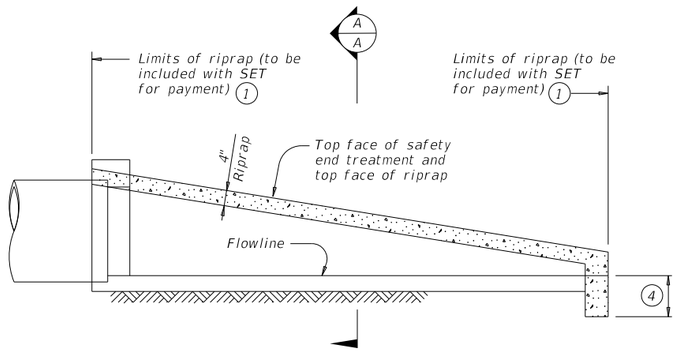
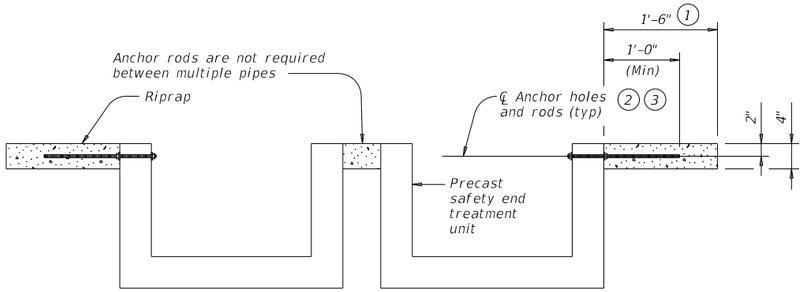


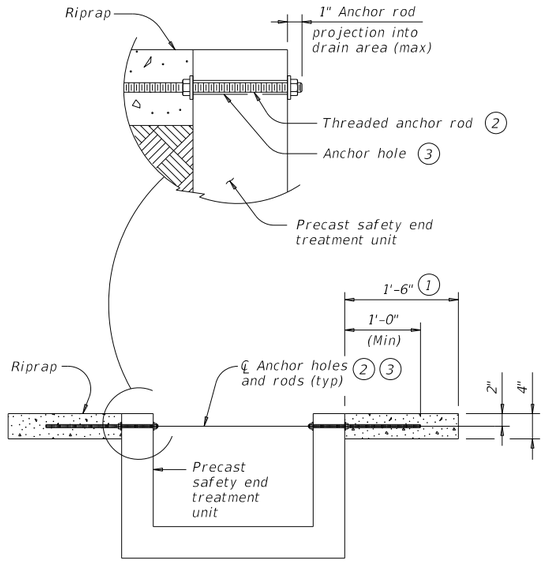
PLAN



LONGITUDINAL ELEVATION



MULTIPLE PIPE INSTALLATION



SINGLE PIPE INSTALLATION

SECTION A-A

ESTIMATED CONCRETE RIPRAP QUANTITIES (CY) 5

Nominal Culvert (Pipe) I.D.	PSET-SC and PSET-SP Standards				PSET-RC and PSET-RP Standards			
	Unit Width "W"	Side Slope			Unit Width "W"	Side Slope		
		3:1	4:1	6:1		3:1	4:1	6:1
12"	23.0"	0.1	0.2	0.2	16.0"	0.1	0.1	0.2
15"	26.5"	0.2	0.2	0.3	19.5"	0.1	0.2	0.2
18"	30.0"	0.2	0.2	0.3	23.0"	0.2	0.2	0.3
24"	37.0"	0.3	0.3	0.5	30.0"	0.2	0.3	0.4
30"	44.5"	0.3	0.4	0.6	37.0"	0.3	0.3	0.5
36"	51.5"	0.4	0.5	0.7	44.0"	0.3	0.4	0.6
42"	58.5"	0.5	0.6	0.8	51.0"	0.4	0.5	0.7

(1) Riprap placed beyond the limits shown will be paid as concrete riprap in accordance with Item 432, "Riprap". When riprap is cast integrally with the precast safety end treatment, this dimension is 1'-0" minimum.

(2) 1#2" Dia ASTM A307 Gr A threaded anchor rod with 2 nuts and 2 washers. Galvanize all components in accordance with Item 445, "Galvanizing". Repair galvanizing that is damaged during transport or construction in accordance with the specifications.

(3) 3#4" through holes in walls of safety end treatment for riprap anchor rods may be drilled with rotary (coring or masonry) type drilling equipment or may be formed. Do not use percussive (star) type drilling equipment. If holes are drilled, patch spalls in the inside face of the wall exceeding 1#2" from the holes.

(4) Provide riprap toe wall when dimension is shown elsewhere in the plans or when field conditions require a toe wall.

(5) Quantities shown are for one end of one reinforced concrete pipe culvert. For multiple pipe culverts, quantities will need to be adjusted. Riprap quantities are for Contractor's information only. Quantities are based on the minimum unit lengths shown on the Precast Saftey End Treatment (SET) standard sheets.

MATERIAL NOTES:

Provide Class "B" riprap in accordance with Item 432, "Riprap".

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise. The anchor rods shown are always required.

GENERAL NOTES:

Precast safety end treatment for reinforced concrete pipe may be used for TYPE II end treatment as specified in Item 467, "Safety End Treatment".

Refer to PSET-SC or PSET-SP standard sheets for details of square safety end treatments not shown. Refer to PSET-RC or PSET-RP standard sheets for details of round safety end treatments not shown.

For precast units with integrally cast riprap, substitute reinforcing steel in the amount on 0.26 in./ft. minimum for the threaded anchor rods shown. When requested, submit sealed engineering drawings for approval prior to construction. Shop drawings will not be required. Note that a proprietary precast unit with integral riprap is available from L&R Precast Concrete Works, Inc. (956) 583-6293 or www.lrprecast.com.

Payment for riprap and toewalls is included in the price bid for each safety end treatment.

These riprap details are only applicable when notes that require placement of riprap with precast safety end treatments are shown elsewhere in the plans.

Precast units with integrally cast riprap are permitted unless noted otherwise on the plans.

Texas Department of Transportation

Bridge Division Standard

PRECAST SAFETY END TREATMENT
TYPE II
RIPRAP DETAILS

PSET-RR

FILE: psetrrse-20.dgn	DN: GAF	CK: TxDOT	DW: JRP	CK: GAF
©TxDOT February 2020 REVISIONS	CONT	SECT	JOB	HIGHWAY
	0955	01	027	FM 166
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		154

During the planning phase of project development the following environmental permits, issues and commitments have been developed during coordination with resource agencies, local governmental entities and the general public. Any change orders and/or deviations from the final design must be reported to the Engineer prior to the commencement of construction activities. As additional environmental clearances may be required.

I. STORMWATER POLLUTION PREVENTION-CLEAN WATER ACT SECTION 402

TPDES TXR 150000: Stormwater Discharge Permit or Construction General Permit required for projects with 1 or more acres disturbed soil. Projects with any disturbed soil must protect for erosion and sedimentation in accordance with Item 506.

☒ Required Action ☐ No Action Required

Action No.

1. Prevent stormwater pollution by controlling erosion and sedimentation in accordance with TPDES Permit TXR 150000
2. Comply with the SW3P and revise when necessary to control pollution or required by the Engineer.
3. Post Construction Site Notice (CSN) with SW3P information on or near the site, accessible to the public and TCEQ, EPA or other inspectors.

Refer to 2014 TxDOT Standard Specification Items:
7.7.2 Texas Pollutant Discharge Elimination System (TPDES) Permits and Storm Water Pollution Prevention PLans (SWP3)
506 Temporary Erosion, Sedimentation and Environmental Controls
734 Litter Removal
735 Debris Removal
738 Cleaning and Sweeping Highways

II. WORK IN OR NEAR STREAMS, WATER BODIES AND WETLANDS CLEAN WATER ACT SECTIONS 401 AND 404

USACE Permit required for filling, dredging, excavating or other work in any water bodies, rivers, creeks, streams, wetlands or wet areas.
The Contractor must adhere to all of the terms and conditions associated with the following permit(s):

☐ No Permit Required

☒ Nationwide Permit 14 - PCN not Required (less than 1/10th acre waters or wetlands affected)

☐ Nationwide Permit 14 - PCN Required (1/10 to <1/2 acre, 1/3 in tidal waters)

☐ Individual 404 Permit Required

☐ Other Nationwide Permit Required: NWP#

Required Actions: List locations of waters of the US.

1. 149+20, 167+75, 181+51, 183+90, 260+24, 315+61, 392+92, 405+31, 411+60, 416+90, 456+30, 535+87,

Information regarding the USACE Nationwide Permit Program can be found at:
http://www.swf.usace.army.mil/Missions/Regulatory/Permitting/GeneralPermits.aspx

Refer to 2014 TxDOT Standard Specification Items:
7.7.3 Work in Waters of the United States
7.7.6 Project Specific Locations
496 Removing Structures
506 Temporary Erosion, Sedimentation and Environmental Controls
506.4.3.4 Restricted Activities and Required Precautions

III. CULTURAL RESOURCES

Refer to 2014 TxDOT Standard Specification Item 7.7.1 Cultural Resources, in the event historical issues or archeological artifacts are found during construction. Upon discovery of archeological artifacts (bones, burnt rock, flint, pottery, etc.) immediately cease work in the vicinity and contact the Engineer.

☐ Required Action ☒ No Action Required

IV. VEGETATION RESOURCES

Preserve native vegetation to the extent practical.

☒ Required Action ☐ No Action Required

Action No.

1. Any tree or brush removal to be done in accordance with the Migratory Bird Treaty Act (see Section V)

Refer to 2014 TxDOT Standard Specification Items:
160 Topsoil
161 Compost
162 Sodding for Erosion Control
164 Seeding for Erosion Control
166 Fertilizer
168 Vegetative Watering
169 Soil Retention Blankets
170 Irrigation System
180 Wildflower Seeding
192 Landscape Planting
193 Landscape Establishment
506 Temporary Erosion, Sedimentation, and Environmental Controls
730 Roadside Mowing
751 Landscape Maintenance
752 Tree and Brush Removal

V. FEDERAL LISTED, PROPOSED THREATENED, ENDANGERED SPECIES, CRITICAL HABITAT, STATE LISTED SPECIES, CANDIDATE SPECIES AND MIGRATORY BIRDS.

☒ Required Action ☐ No Action Required

Action No.

1. Do not kill snakes or other animals!
2. Do not destroy nests on structures within the project limits.

   Temporarily prevent the building of nests on any structures that require work within the project limits during the construction timeframe.

   This can be accomplished by application of bird repellant gel, netting, or removal by hand every 3-4 days.

   The nesting/breeding season for migratory birds is March 1 - September 1.

Under the Migratory Bird Treaty Act (MBTA), it is unlawful by any means or manner, to pursue, hunt, take, capture, [or] kill any migratory birds except as permitted by regulation (16 U.S.C. 703-704). Neither the statute nor its implementing regulations (Title 50, Code of Federal Regulations, Parts 10, 13, 21) exempt unintentional take of migratory birds. The unauthorized take (e.g. killing, capturing, or collecting) of migratory birds is a strict liability criminal offense that does not require knowledge or specific intent on the part of the offender. Even when engaged in an otherwise lawful activity for which the intent is not the killing of migratory birds, a violation may be committed.

3. If caves or sinkholes are discovered, cease work in the immediate area to verify the presence or absence of wildlife.
4. BMPs for T and E species will be discussed at the preconstruction meeting.

The Bryan District Environmental Section can be contacted at (979) 778-9766 to assist with the removal of wildlife that will not leave on their own with gentle persuasion.

Refer to 2014 TxDOT Standard Specification Item:
7.7.6 Project Specific Locations

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

General (applies to all projects):

Comply with the Hazard Communication Act (the Act) for personnel who will be working with hazardous materials by conducting safety meetings prior to beginning construction and making workers aware of potential hazards in the workplace. Ensure that all workers are provided with personal protective equipment appropiate for any hazardous materials used. Obtain and keep on-site Material Safety Data Sheets (MSDS) for all hazardous products used on the project, which may include, but are not limited to the following categories: Paints, acids, solvents, asphalt products, chemical additives, fuels and concrete curing compounds or additives. Provide protected storage, off bare ground and covered, for products which may be hazardous. Maintain product labelling as required by the Act.

Maintain an adequate supply of on-site spill response materials, as indicated in the MSDS. In the event of a spill, take actions to mitigate the spill as indicated in the MSDS, in accordance with safe work practices, and contact the Engineerimmediately. The Contractor shall be responsiblefor the proper containment and cleanup of all product spills.

Contact the Engineer if any of the follwing are detected:
* Dead or distressed vegetation (not identified as normal)
* Trash piles, drums, canister, barrels, etc.
* Undesirable smells or odors
* Evidence of leaching or seepage of substances

Does the project involve any bridge class structure rehabilitation or replacements (bridge class structures not including box culverts)?

☐ Yes ☒ No

If "No", then no further action is required.
If "Yes", then TxDOT is responsible for completing asbestos assessment/inspection.

Are the results of the asbestos inspection positive (is asbestos present)?

☐ Yes ☐ No

If "Yes", then TxDOT must retain a DSHS licensed asbestos consultant to assist with the notification, develop abatement/mitigation procedures, and perform management activities as necessary. The notification form to DSHS must be postmarked at least 15 working days prior to scheduled demolition.

If "No", then TxDOT is still required to notifiy DSHS 15 working days prior to any scheduled demolition.

In either case, the Contractor is responsible for providing the date(s) for abatement activities and/or demolition with careful coordination between the Engineer and asbestos consultant in order to minimize construction delays and subsequent claims.

Any other evidence indicating possible hazardous materials or contamination discoverd on site. Hazardous Materials or Contamination Issues Specific to this Project:

☒ Required Action ☐ No Action Required

Action No.

1. The Clean Water Act, in part, requires that any spill of oil that could enter a waterway, as defined by the Act, and that violates applicable water quality standards or causes a film or sheen on water require reporting to the TCEQ and local authorities.
   Contact the Bryan District Environmental Section at 979-778-9766.

   If potentially hazardous material and/or contaminated media (i.e. soil, groudwater, surface water, sediment, building materials) are unexpectedly encountered during construction, immediately cease work in the vicinity and contact the Engineer.

   Refer to 2014 TxDOT Standard Specification Items:
   6.10 Hazardous Materials
   7.12 Responsibility for Hazardous Materials

VII. OTHER ENVIRONMENTAL ISSUES

☐ Required Action ☒ No Action Required

Action No.

1.

Refer to 2014 TxDOT Standard Specification Items:
7.7.6 Project Specific Locations
751 Landscape Maintenance

Contacts:

Mr. John D. Moravec
Environmental Coordinator
Texas Department of Transportation
Bryan District
2591 N. Earl Rudder Freeway
Bryan, TX 77803
Phone: (979) 778-9766
Fax: (979) 778-9702
e-mail: John.Moravec@txdot.gov

PRINT DATE	REVISION DATE
$DATE$	4/22/2021

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS (EPIC)

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	155

SITE DESCRIPTION

PROJECT LIMITS:

CSJ 0955-01-027 -
From: SH 36(Latitude 30.5327528°, Longitude -96.6883754°)
To: FM 50(Latitude 30.5472319°, Longitude -96.4576297°)

PROJECT DESCRIPTION:

For the construction of safety treat fixed objects

SEQUENCE OF MAJOR SOIL DISTURBING ACTIVITIES:

Soil disturbing activities will include excavation and embankment for the proposed structure modifications and erosion controls used at that location.

TOTAL PROJECT AREA: 151.1 AC

TOTAL AREA TO BE DISTURBED: 4.1 AC
2.7% of total project.

EXISTING CONDITION OF SOIL & VEGETATIVE COVER AND % OF EXISTING VEGETATIVE COVER:

For Two thirds of the project the prevailing soil types are typically fine sandy loams with clay areas. Vegetation covers 90% of this area and is in good condition. Vegetation includes various native grasses.
The final third of the project the soil is silty clay loam and is primarily disturbed farm land.

NAME OF RECEIVING WATERS:

From STA 50+00 to STA 330+00 cross drainage structures collect water flow into Berry Creek and into Davidson Creek.

From STA 330+00 to STA 872+76 cross drainage structures collect water flow into Old River Creek and eventually into the Brazos River Basin (Segment No. 1242).

ANTICIPATED EFFECT OF STORM WATER ON THREATENED AND ENDANGERED SPECIES AND WILDLIFE HABITAT:

See Environmental Permits, Issues and Commitments (EPIC) sheet.

EROSION AND SEDIMENT CONTROLS AND TCEQ 401 CERTIFICATION

I. SOIL STABILIZATION PRACTICES AND EROSION CONTROL:

- [X] TEMPORARY SEEDING
- [X] PERMANENT PLANTING, SODDING, OR SEEDING
- [ ] MULCHING
- [X] SOIL RETENTION BLANKET
- [ ] BUFFER ZONES
- [X] PRESERVATION OF NATURAL RESOURCES
- [ ] SUBSURFACE DRAINS

OTHER:

II. STRUCTURAL PRACTICES AND SEDIMENTATION CONTROL: (T/P) *

- [T] SEDIMENT CONTROL FENCES
- [ ] HAY BALES
- [ ] ROCK BERMS
- [ ] STORM SEWERS
- [ ] CURBS AND GUTTERS
- [ ] VELOCITY CONTROL DEVICES
- [ ] PIPE SLOPE DRAINS
- [ ] PAVED FLUMES
- [ ] SAND BAG BERM
- [ ] GRAVEL BAG BERM
- [ ] BRUSH BERMS
- [ ] TRIANGULAR FILTER DIKE
- [ ] STONE OUTLET SEDIMENT TRAPS
- [ ] ROCK BEDDING AT CONSTRUCTION EXIT
- [ ] TIMBER MATTING AT CONSTRUCTION EXIT
- [ ] DIVERSION, INTERCEPTOR, OR PERIMETER DIKES
- [ ] DIVERSION, INTERCEPTOR, OR PERIMETER SWALES
- [ ] DIVERSION DIKE AND SWALE COMBINATIONS
- [T] ROCK FILTER DAMS
- [ ] CHANNEL LINERS
- [ ] SEDIMENT TRAPS
- [ ] SEDIMENT BASINS
- [ ] STORM INLET SEDIMENT TRAP
- [ ] STONE OUTLET STRUCTURES

* T means Temporary - P means Permanent

OTHER:

III. POST CONSTRUCTION: (IF COE PERMIT IS ISSUED)

- [ ] RETENTION/IRRIGATION
- [ ] EXTENDED DETENTION BASINS
- [ ] VEGETATION FILTER STRIPS
- [ ] CONSTRUCTION WETLANDS
- [ ] WET BASINS
- [X] VEGETATION LINED DRAINAGE DITCHES
- [ ] GRASSY SWALES
- [ ] SAND FILTER SYSTEMS

OTHER:

NARRATIVE - SEQUENCE OF CONSTRUCTION (STORM WATER MANAGEMENT) ACTIVITIES:

All work to be performed by the Contractor. Take care to disturb only the soil necessary to complete the work. Maintain all sedimentation control devices until stabilized.
The order of activities will be as follows:
1) Set advance signing and barricades.
2) Place SW3P as directed before disturbing soil.
3) Complete excavation, embankment and construction. Place topsoil immediately following construction.
4) Backfill pavement edges and place seeding.
5) Place permanent pavement markings and signing.
6) Remove SW3P after areas are stabilized and approved, Remove temporary controls and seed areas disturbed by their removal.
7) Final cleanup.

STORM WATER MANAGEMENT:

OTHER EROSION AND SEDIMENT CONTROLS:

MAINTENANCE:
All erosion and sediment controls will be maintained in good working order. If a repair is necessary, it will be done at the earliest date possible, but no later than 7 calendar days after the surrounding exposed ground has dried sufficiently to prevent further damage from heavy equipment. The areas adjacent to creeks and drainageways shall have priority. Sediment must be removed from sediment traps or sedimentation ponds when design capacity has been reduced by 50%.

INSPECTION:
A TxDOT inspector will perform an inspection every 7 days.

DESCRIPTION OF CONSTRUCTION MATERIALS TO BE STORED ON-SITE AND CONTROLS TO PREVENT THESE FROM ENTERING STORM WATER:
Store all construction materials (wood, flex base, aggregate, etc.) in locations where they will not enter storm water runoff. Structural controls may be required for flex base, aggregate and earth stockpiles.

WASTE MATERIALS:
A TxDOT inspector will perform an inspection every 7 days.

HAZARDOUS WASTE (INCLUDING SPILL REPORTING):
At a minimum, any products in the following categories are considered to be hazardous: paints, acids for cleaning masonry surfaces, cleaning solvents, asphalt products, chemical additives for soil stabilization or concrete curing compounds and additives. In the event of a spill which may be hazardous, the Engineer should be contacted immediately.

SANITARY WASTE:
All sanitary waste will be collected from the portable units as necessary or as required by local regulation by a licensed sanitary waste management director.

OFFSITE VEHICLE TRACKING:

- [ ] HAUL ROADS DAMPENED FOR DUST CONTROL
- [X] LOADED HAUL TRUCKS TO BE COVERED WITH TARPAULIN
- [X] EXCESS DIRT ON ROAD REMOVED DAILY
- [ ] STABILIZED CONSTRUCTION ENTRANCE

REMARKS:

PRINT DATE	REVISION DATE
$DATE$	1/11/2007

Texas Department of Transportation
Bryan District

TxDOT STORM WATER POLLUTION PREVENTION PLAN (SW3P)

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	156

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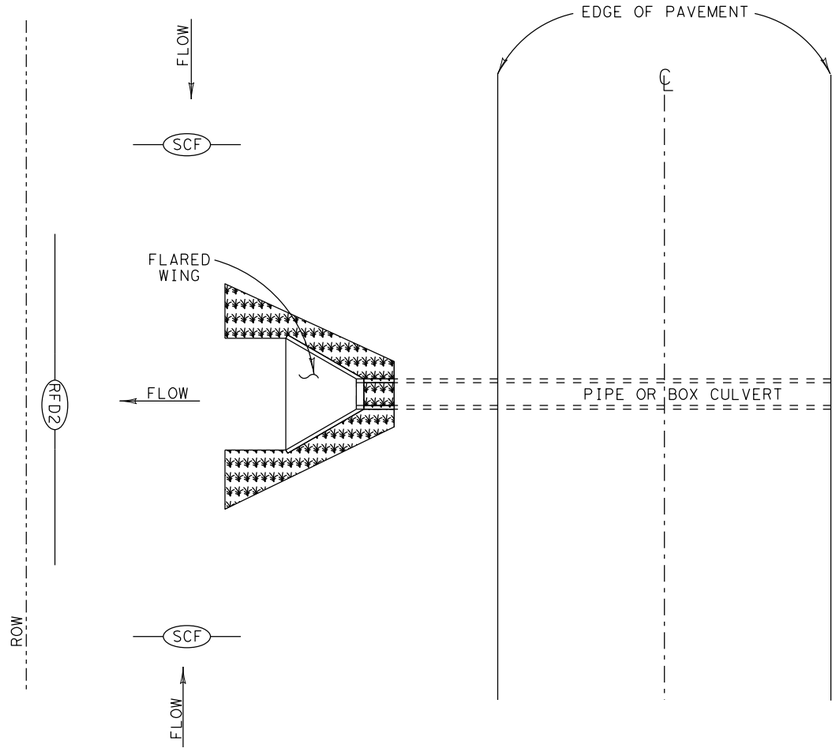
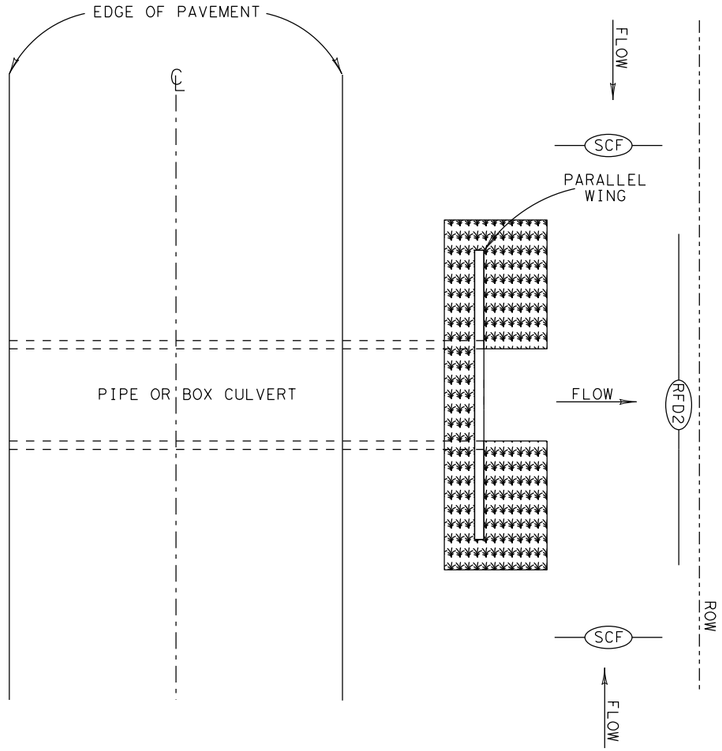
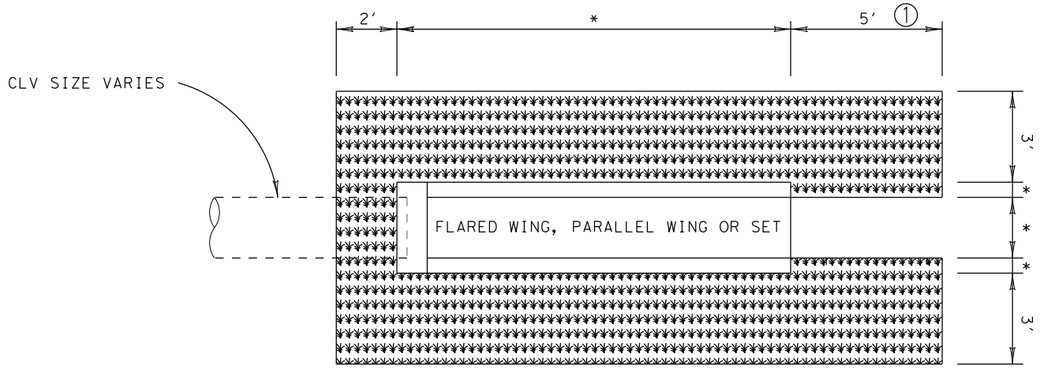


FLARED WING CROSS DRAINAGE DETAIL ①



PARALLEL WING CROSS DRAINAGE DETAIL ①

SYMBOL	DESCRIPTION
	SEEDING & SOIL BLANKET LIMITS
SCF	SEDIMENT CONTROL FENCE
RFD2	ROCK FILTER DAM (TYPE 2)
	ROW



* DIMENSION VARIES

SEEDING DETAIL

PLACE AT ALL PARALLEL & CROSSROAD CULVERTS WHERE WORK IS PROPOSED. DO NOT PLACE SEED DIRECTLY IN THE CHANNEL.

① DO NOT PLACE SEEDING WHERE RIPRAP (STONE COMMON OR CONCRETE) IS INSTALLED.

DESIGN

STATE OF TEXAS · HEATHER McNEAL · 114428 · LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS · DAN THOMA · 98622 · LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

PRINT DATE	REVISION DATE
3/31/2021	

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

FM 166

SW3P DETAILS

SHEET 1 OF 2 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	157

Plotted on: 3/31/2021

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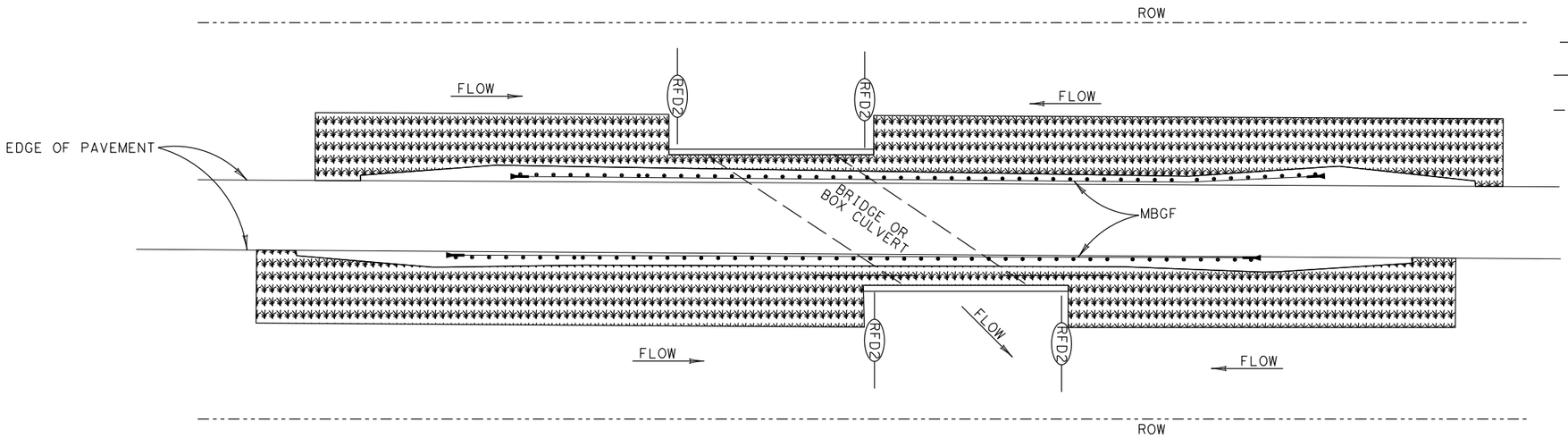

SYMBOL	DESCRIPTION
	SEEDING & SOIL BLANKET LIMITS
SCF	SEDIMENT CONTROL FENCE
RFD2	ROCK FILTER DAM (TYPE 2)
	ROW

MBGF DETAIL

PLACE AT ALL PARALLEL & CROSSROAD CULVERTS WHERE WORK IS PROPOSED.
DO NOT PLACE SEED DIRECTLY IN THE CHANNEL.
DO NOT PLACE SEED WHERE RIPRAP (STONE COMMON OR CONCRETE) IS INSTALLED.

SW3P DETAILS		
FLARED WING CROSS DRAINAGE	PARALLEL WING CROSS DRAINAGE	MBGF
CULV 80+61 (RT)	CULV 80+61 (LT)	BRIDGE 63+95 (RT/LT)
CULV 181+51 (LT)	CULV 122+09 (RT/LT)	CULV 260+24 (RT/LT)
CULV 197+07 (RT)	CULV 181+51 (RT)	CULV 315+61 (RT/LT)
CULV 207+12 (RT/LT)	CULV 183+90 (RT/LT)	BRIDGE 693+58 (RT/LT)
CULV 214+77 (RT/LT)	CULV 197+07 (LT)	
CULV 226+78 (RT/LT)	CULV 392+92 (RT)	
CULV 235+35 (RT/LT)	CULV 405+31 (RT/LT)	
CULV 268+87 (RT/LT)	CULV 411+60 (RT/LT)	
CULV 287+49 (RT)	CULV 416+90 (RT/LT)	
CULV 331+78 (RT/LT)	CULV 437+34 (LT)	
CULV 368+17 (RT/LT)	CULV 506+70 (LT)	
CULV 382+ 47 (RT/LT)	CULV 535+87 (RT)	
CULV 392+92 (LT)	CULV 551+77 (LT)	
CULV 437+35 (RT)	CULV 723+28 (RT)	
CULV 456+30 (RT/LT)		
CULV 506+70 (RT)		
CULV 535+87 (LT)		
CULV 551+77 (RT)		
CULV 582+84 (RT/LT)		
CULV 585+06 (RT/LT)		
CULV 604+40 (RT/LT)		
CULV 607+21 (RT/LT)		
CULV 626+26 (RT/LT)		
CULV 635+29 (RT/LT)		
CULV 723+28 (LT)		
CULV 752+47 (RT/LT)		
CULV 796+37 (RT/LT)		
CULV 802+65 (RT/LT)		

DESIGN

STATE OF TEXAS · HEATHER McNEAL · 114428 · LICENSED PROFESSIONAL ENGINEER

HEATHER McNEAL, P.E. — 3/31/2021 DATE

APPROVAL

STATE OF TEXAS · DAN THOMA · 98622 · LICENSED PROFESSIONAL ENGINEER

DAN THOMA, P.E. — 3/31/2021 DATE

PRINT DATE	REVISION DATE
3/31/2021	

PAPE-DAWSON ENGINEERS
SAN ANTONIO | AUSTIN | HOUSTON | FORT WORTH | DALLAS
2000 NW LOOP 410 | SAN ANTONIO, TX 78213 | 210.375.9000
TBPE FIRM REGISTRATION #470 | TBPLS FIRM REGISTRATION #10028800

FM 166

SW3P DETAILS

SHEET 2 OF 2 SHEETS

FED.RD. DIV.NO.	PROJECT NUMBER	HIGHWAY NUMBER
6		FM 166

STATE	DISTRICT	COUNTY	
TEXAS	BRY	BURLESON	
CONTROL	SECTION	JOB	SHEET NO.
0955	01	027	158

Plotted on: 3/31/2021

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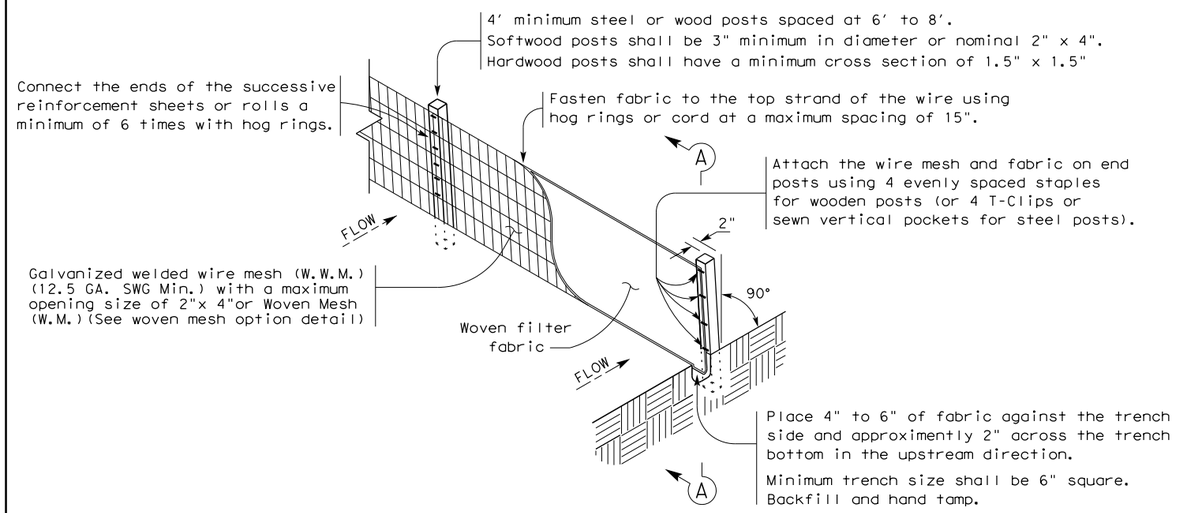
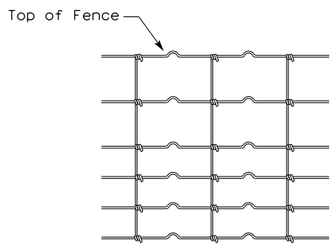
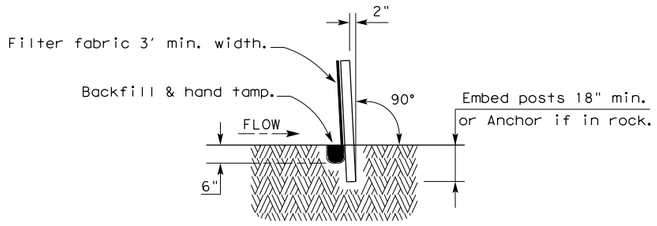


TEMPORARY SEDIMENT CONTROL FENCE

SCF





SECTION A-A

HINGE JOINT KNOT WOVEN MESH (OPTION) DETAIL

Galvanized hinge joint knot woven mesh (12.5 GA.SWG Min.) requires a minimum of five horizontal wires spaced at a maximum of 12 inches apart and all vertical wires spaced at a maximum of 12 inches apart.

SEDIMENT CONTROL FENCE USAGE GUIDELINES

A sediment control fence may be constructed near the downstream perimeter of a disturbed area along a contour to intercept sediment from overland runoff. A 2 year storm frequency may be used to calculate the flow rate to be filtered.

Sediment control fence should be sized to filter a maximum flow through rate of 100 GPM/FT^2. Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.

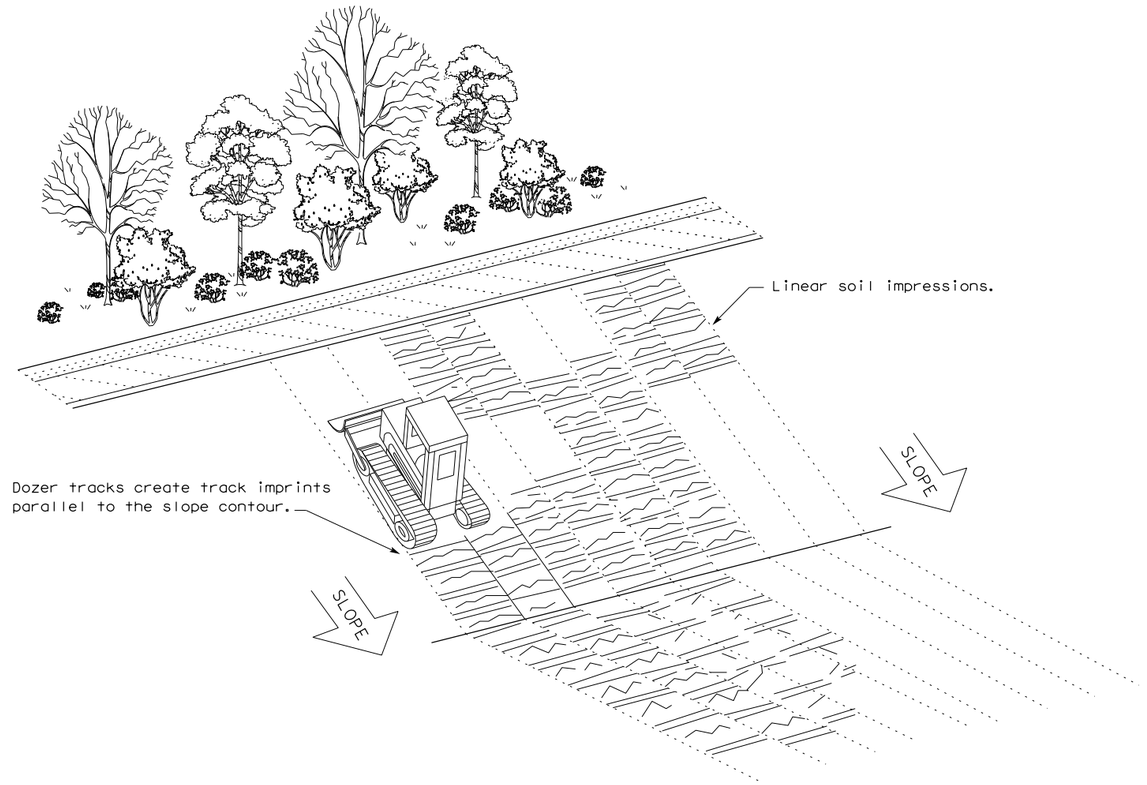
LEGEND

Sediment Control Fence

SCF

GENERAL NOTES

1. Vertical tracking is required on projects where soil distributing activities have occurred unless otherwise approved.
2. Perform vertical tracking on slopes to temporarily stabilize soil.
3. Provide equipment with a track undercarriage capable of producing linear soil impressions measuring a minimum of 12" in length by 2" to 4" in width by 1/2" to 2" in depth.
4. Do not exceed 12" between track impressions.
5. Install continous linear track impressions where the minimum 12" length impressions are perpendicular to the slope or direction of water flow.



VERTICAL TRACKING

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

FENCE & VERTICAL TRACKING

EC(1)-16

FILE: ec116	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0955	01	027	FM 166
	DIST	COUNTY		SHEET NO.
	BRY	BURLESON		159

DATE: 3/31/2021
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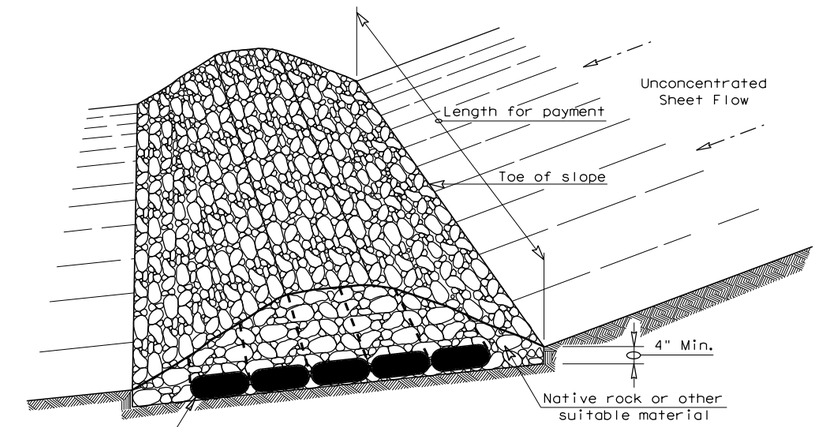
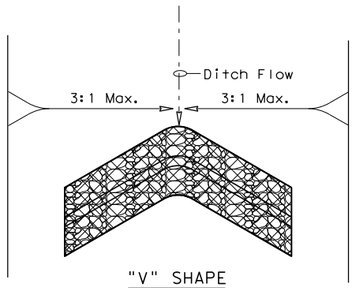
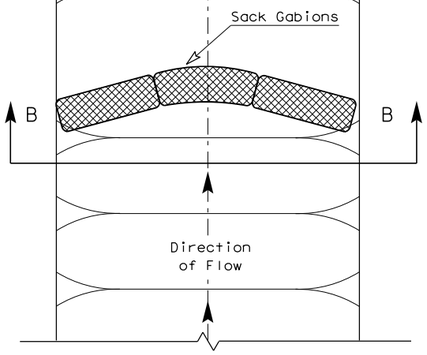


FILTER DAM AT TOE OF SLOPE

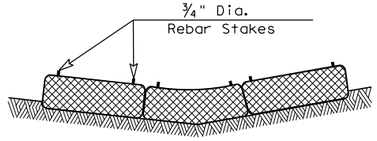
RFD1



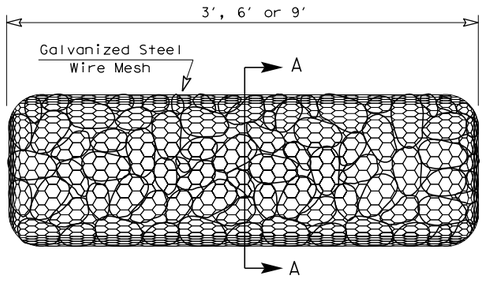
"V" SHAPE
PLAN VIEW



PLAN VIEW

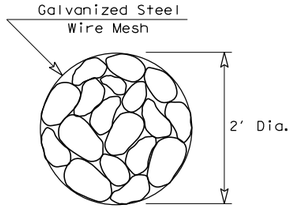


SECTION B-B

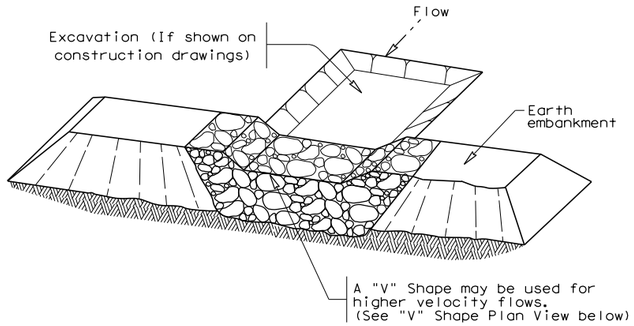


TYPE 4 (SACK GABIONS)

RFD4

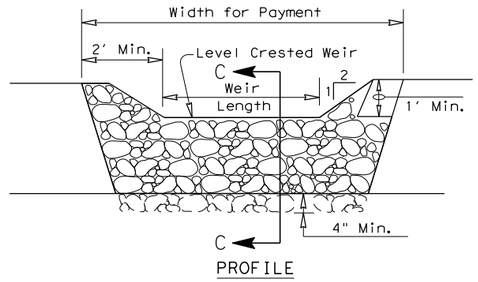


SECTION A-A

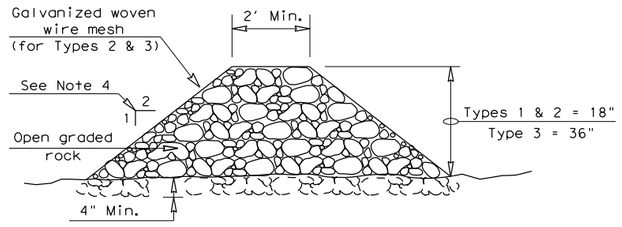


FILTER DAM AT SEDIMENT TRAP

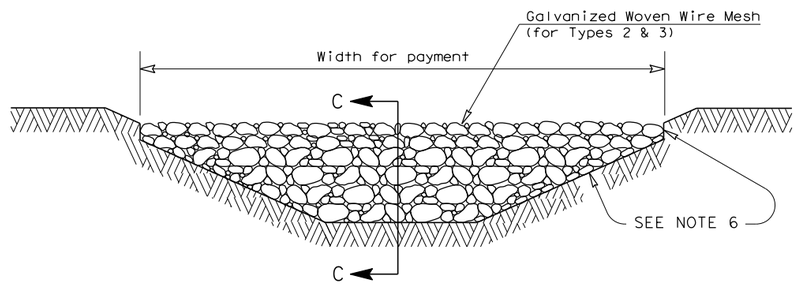
RFD1 OR RFD2



PROFILE



SECTION C-C



FILTER DAM AT CHANNEL SECTIONS

RFD1 OR RFD2 OR RFD3

GENERAL NOTES

1. If shown on the plans or directed by the Engineer, filter dams should be placed near the toe of slopes where erosion is anticipated, upstream and/or downstream at drainage structures, and in roadway ditches and channels to collect sediment.
2. Materials (aggregate, wire mesh, sandbags, etc.) shall be as indicated by the specification for "Rock Filter Dams for Erosion and Sedimentation Control".
3. The rock filter dam dimensions shall be as indicated on the SW3P plans.
4. Side slopes should be 2:1 or flatter. Dams within the safety zone shall have sideslopes of 6:1 or flatter.
5. Maintain a minimum of 1' between top of rock filter dam weir and top of embankment for filter dams at sediment traps.
6. Filter dams should be embedded a minimum of 4" into existing ground.
7. The sediment trap for ponding of sediment laden runoff shall be of the dimensions shown on the plans.
8. Rock filter dam types 2 & 3 shall be secured with 20 gauge galvanized woven wire mesh with 1" diameter hexagonal openings. The aggregate shall be placed on the mesh to the height & slopes specified. The mesh shall be folded at the upstream side over the aggregate and tightly secured to itself on the downstream side using wire ties or hog rings. For in stream use, the mesh should be secured or staked to the stream bed prior to aggregate placement.
9. Sack Gabions should be staked down with ¾" dia. rebar stakes, and have a double-twisted hexagonal weave with a nominal mesh opening of 2 ½" x 3 ¼"
10. Flow outlet should be onto a stabilized area (vegetation, rock, etc.).
11. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

ROCK FILTER DAM USAGE GUIDELINES

Rock Filter Dams should be constructed downstream from disturbed areas to intercept sediment from overland runoff and/or concentrated flow. The dams should be sized to filter a maximum flow through rate of 60 GPM/FT^2 of cross sectional area. A 2 year storm frequency may be used to calculate the flow rate.

Type 1 (18" high with no wire mesh) (3" to 6" aggregate): Type 1 may be used at the toe of slopes, around inlets, in small ditches, and at dike or swale outlets. This type of dam is recommended to control erosion from a drainage area of 5 acres or less. Type 1 may not be used in concentrated high velocity flows (approximently 8 Ft/Sec or more) in which aggregate wash out may occur. Sandbags may be used at the embedded foundation (4" deep min.) for better filtering efficiency of low flows if called for on the plans or directed by the Engineer.

Type 2 (18" high with wire mesh) (3" to 6" aggregate): Type 2 may be used in ditches and at dike or swale outlets.

Type 3 (36" high with wire mesh) (4" to 8" aggregate): Type 3 may be used in stream flow and should be secured to the stream bed.

Type 4 (Sack gabions) (3" to 6" aggregate): Type 4 May be used in ditches and smaller channels to form an erosion control dam.

Type 5: Provide rock filter dams as shown on plans.

PLAN SHEET LEGEND

Type 1 Rock Filter Dam	RFD1
Type 2 Rock Filter Dam	RFD2
Type 3 Rock Filter Dam	RFD3
Type 4 Rock Filter Dam	RFD4

Texas Department of Transportation — Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

ROCK FILTER DAMS

EC(2)-16

FILE: ec216	DN: TxDOT		CK: KM	DW: VP		DN/CK: LS
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