CONT	SECT	JOB	HIGHWAY
0289	04	032	SH 16
DIST	COUNTY		SHEET NO.
BWD	SAN SABA		1

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

FEDERAL AID PROJECT NO. F2023(446)

NET LENGTH OF PROJECT= 30,886.80 FT = 5.85 MI

FUNCTIONAL CLASSIFICATION = MAJOR COLLECTOR
DESIGN SPEED = 60 MPH
A.D.T.(2019) = 2,453
A.D.T.(2039) = 2,923

CSJ: 0289-04-032 ROADWAY = 30,774.67 FT. = 5.829 MI.
CSJ: 0289-04-032 BRIDGE = 112.13 FT. = 0.021 MI.
TOTAL PROJECT = 30,886.80 FT. = 5.850 MI.

SAN SABA COUNTY
SH 16

FROM: FM 1480 TO: 0.4 MI SOUTH OF CR 140

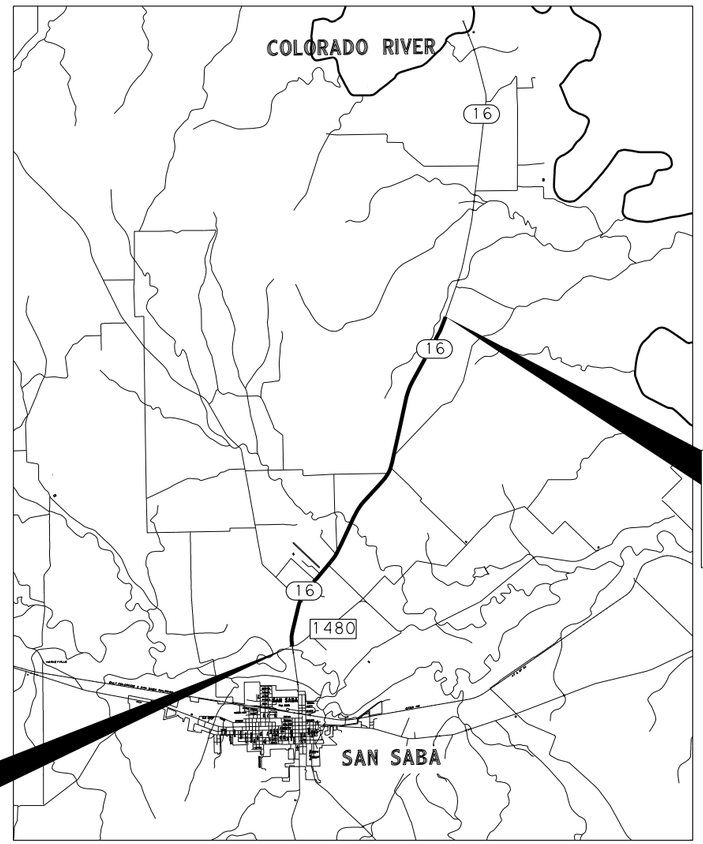
FOR THE CONSTRUCTION OF HIGHWAY IMPROVEMENT

CONSISTING OF CONSTRUCTION OF SUPER 2 HIGHWAY INCLUDING SAFETY TREAT FIXED OBJECTS, CENTER & EDGELINE PROFILE MARKS, PAVEMENT STRUCTURE REPAIR, AND SURFACING.

INDEX OF SHEETS

THE CONSTRUCTION WORK WAS PERFORMED IN ACCORDANCE WITH THE PLANS AND CONTRACT.

P.E. _____ DATE _____



BEGIN PROJECT
CSJ: 0289-04-032
STA 56+13.20
REF MRKR: 412+0.543
MILE PT: 10.361
DFO: 185.224

END PROJECT
CSJ: 0289-04-032
STA 365+00.00
REF MRKR: 406+0.386
MILE PT: 4.476
DFO: 179.339

LOCATION MAP NOT TO SCALE

FINAL PLANS

LETTING DATE: _____

DATE CONTRACTOR BEGAN WORK: _____

DATE WORK WAS COMPLETED & ACCEPTED: _____

FINAL CONTRACT COST: $ _____

CONTRACTOR: _____

STATE OF TEXAS
GERALD A. LANKES
107484
REGISTERED
PROFESSIONAL ENGINEER
11/22/2022

Seiler Lankes Group TBPE License No. 12670
PLANNING • ENGINEERING • CONSTRUCTION

SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, NOVEMBER 2014 AND SPECIFICATION ITEMS LISTED AND DATED AS FOLLOWS SHALL GOVERN FOR THIS PROJECT: REQUIRED CONTRACT PROVISIONS FOR ALL FEDERAL-AID CONSTRUCTION CONTRACTS (FORM FHWA 1273, MAY 2012)

EXCEPTIONS: NONE
NO EQUATIONS
NO RAILROAD CROSSINGS

Texas Department of Transportation®

SUBMITTED FOR LETTING: 12/2/2022

DocuSigned by: JH Stitt, P.E.
77D14777834646F...
DISTRICT DESIGN ENGINEER

RECOMMENDED FOR LETTING: 12/2/2022

DocuSigned by: JH Stitt, P.E.
77D14777834646F...
DISTRICT DIRECTOR OF TRANSPORTATION PLANNING AND DEVELOPMENT

RECOMMENDED FOR LETTING: 12/2/2022

DocuSigned by: Elias H. Ruiz
BB9FD402431A4A3...
DISTRICT ENGINEER

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DATE: 11/22/2022 3:07

SHEET NUMBER	DESCRIPTION
	GENERAL
1	TITLE SHEET
2	SUPPLEMENTAL INDEX OF SHEETS
3 - 7	TYPICAL SECTIONS
8, 8A - 8	GENERAL NOTES
9, 9A - 9	ESTIMATE AND QUANTITY SHEET
10 - 15	QUANTITY SUMMARIES
16 - 30	SOSS
	TRAFFIC CONTROL PLAN
31 - 32	SEQUENCE OF CONSTRUCTION
33 - 34	TCP TYPICAL SECTIONS
35 - 41	TCP LAYOUTS
42 - 46	TCP DETAILS
47	OMITTED
48	TREATMENT FOR VARIOUS EDGE CONDITIONS
	***TRAFFIC CONTROL PLAN STANDARDS** *
49 - 60	BC(1)-21 THRU BC(12)-21
61	ABSORB (M)-19
62	SLED-19
63 - 64	SSCB(2)-10
65	SSCB(5)-10
66	TCP(1-1)-18
67	TCP(1-3)-18
68	TCP(2-1)-18
69	TCP(2-3)-18
70	TCP(2-8)-18
71	TCP(3-1)-13
72	TCP(3-3)-14
73	TCP(7-1)-13
74	WZ(TD)-17
75	WZ(STPM)-13
76	WZ(RCD)-13
77	WZ(RS)-22
	ROADWAY
78 - 80	HORIZONTAL ALIGNMENT DATA
81	HORIZONTAL AND VERTICAL CONTROL INDEX SHEET
82 - 83	HORIZONTAL AND VERTICAL CONTROL DETAIL SHEET
84 - 90	PROJECT LAYOUTS
91	DRIVEWAY DETAILS
92	DRIVEWAY DETAILS PLAN & PROFILE

SHEET NUMBER	DESCRIPTION
	ROADWAY (CONTINUED)
93	MAILBOX TURNOUT DETAIL
94 - 96	ROADWAY PLAN AND PROFILE
	***ROADWAY STANDARDS** *
97	CRR
98 - 101	MB-21 (1)-(4)
102	GF (31)-19
103	GF (31)-MS-19
104	SGT (10S) 31-16
105	SGT (11S) 31-18
106	SGT (12S) 31-18
107	SGT (15) 31-20
	DRAINAGE
108	DRAINAGE AREA MAP
109	CULVERT RUNOFF DRAINAGE CALCULATIONS
110	HYDRAULIC DATA SHEET (BRIDGE AT JERRY'S BRANCH)
111 - 116	CULVERT LAYOUTS
117 - 127	CULVERT CALCULATIONS
128	DRAINAGE DETAILS
	***DRAINAGE STANDARDS** *
129	BCS
130	ECD
131 - 132	MC-6-16
133	MC-MD
134 - 135	OMITTED
136	SCC-MD
137 - 139	SETB-FW-0
140	SP
141	PW
	BRIDGE
142	BRIDGE RAIL REPLACEMENT STRUCTURE LAYOUT
143	BRIDGE RAIL REPLACEMENT DETAILS
144	CLEANING AND SEALING EXISTING BRIDGE JOINTS
	BRIDGE STANDARDS
145 - 146	T631

SHEET NUMBER	DESCRIPTION
	TRAFFIC
147 - 153	PAVEMENT MARKING & DELINEATION PLAN
154	SIGN DETAILS
	***TRAFFIC STANDARDS** *
155 - 157	D&OM(1)-20, D&OM(2)-20 & D&OM(3)-20
158 - 160	D&OM(4)-20, D&OM(5)-20 & D&OM(VIA)-20
161	PM(1)-20
162	PM(2)-20
163	PM(3)-20
164	SPRFBA(1)-13
165	SMD(GEN)-08
166 - 168	SMD(SLIP-1)-08 THRU SMD(SLIP-3)-08
169	SMD(TWT)-08
170	TSR(3)-13
171	TSR(4)-13
172	TSR(5)-13
173	TS2(PL-1)-18(MOD)
174	TS2(PL-2)-18(MOD)
175 - 176	RS(3)-13 & RS(4)-13
176A	ED(1)-14
176B	ED(3)-14
176C	ED(4)-14
176D	ED(12)-14
	ENVIRONMENTAL ISSUES
177	ENVIRONMENTAL PERMITS, ISSUES, AND COMMITMENTS (EPIC)
178	STORM WATER POLLUTION PREVENTION PLAN (SW3P)
179 - 185	SW3P LAYOUTS
	***EROSION CONTROL STANDARDS** *
186	EC(1)-16
187	EC(2)-16
188	EC(3)-16
189	EC(4)-16
190 - 192	EC(9)-16

THE STANDARDS SPECIFICALLY IDENTIFIED BY AN * HAVE BEEN SELECTED BY ME, OR UNDER MY SUPERVISION, AND ARE APPLICABLE TO THIS PROJECT.

NO.	REVISION	BY	DATE

STATE OF TEXAS
GERALD A. LANKES
107484
REGISTERED PROFESSIONAL ENGINEER

11/29/2022

Texas Department of Transportation

Seiler Lankes Group
TBPE License No. 12670
PLANNING • ENGINEERING • CONSTRUCTION

SH 16
SUPPLEMENTAL INDEX OF SHEETS

11/29/2022 SHEET 1 OF 1

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.		HIGHWAY No.	
CHECKED:	6	TEXAS			SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	BWD	SAN SABA	0289	04	032	2

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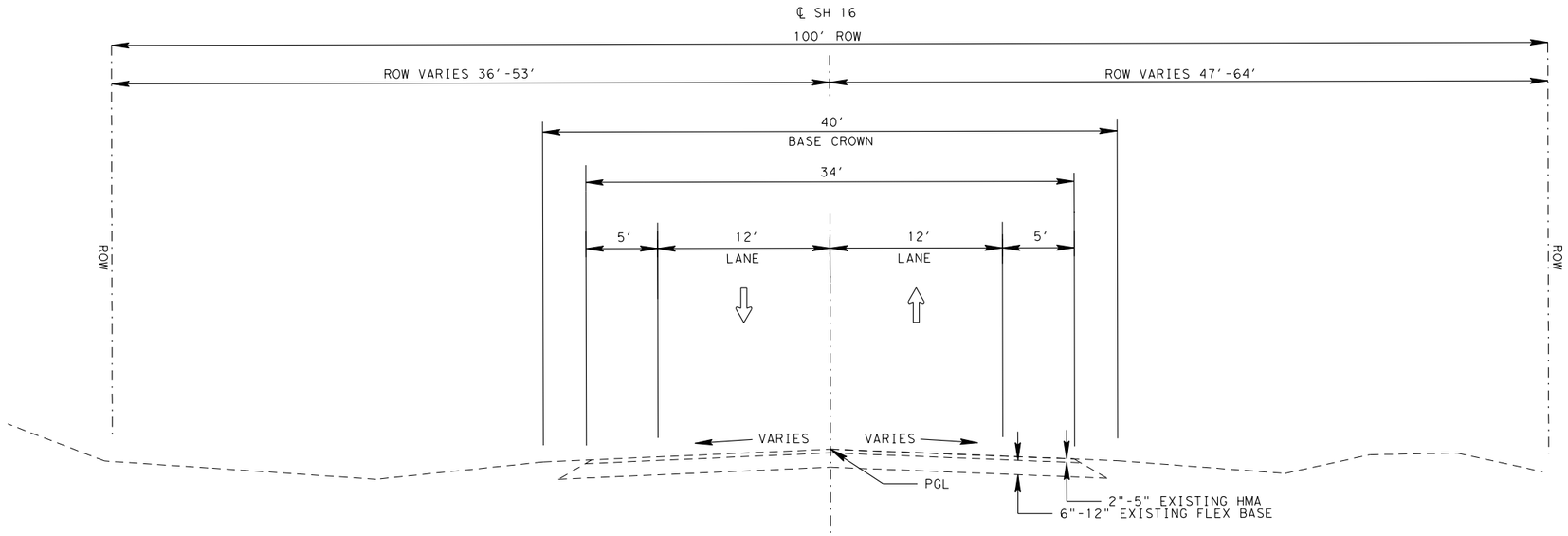
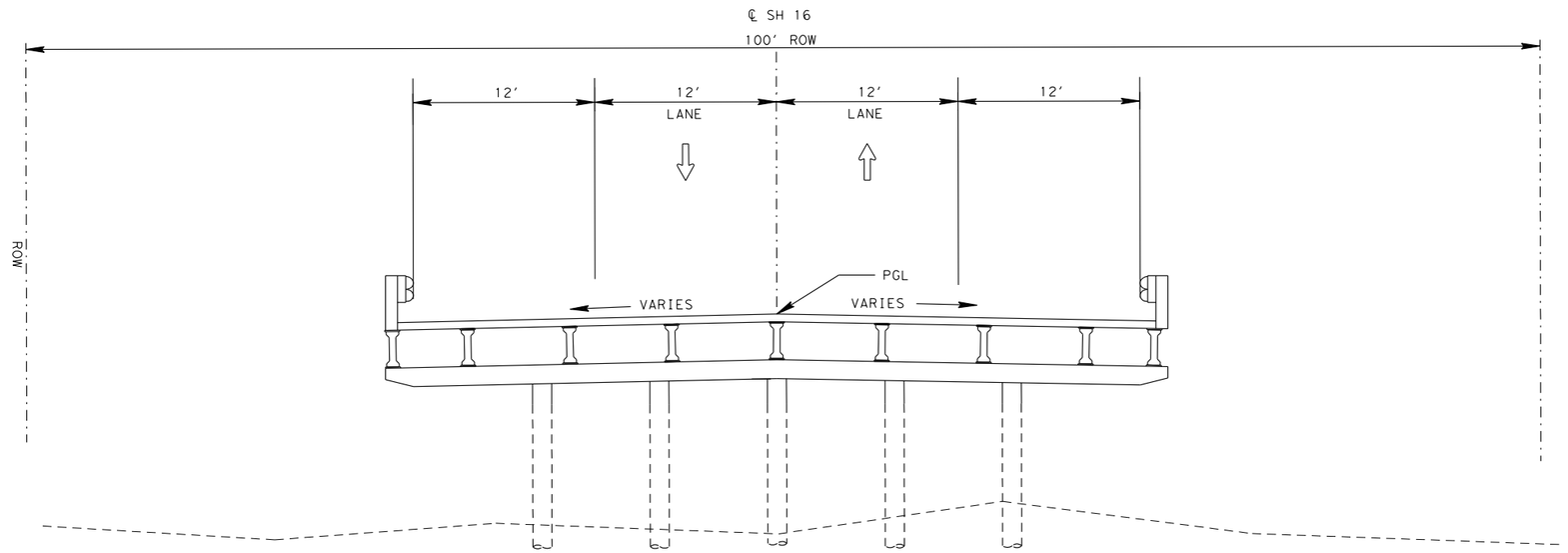


EXISTING TYPICAL SECTION
STA. 56+13.20 TO STA. 170+83.33
STA. 171+94.45 TO STA. 365+00.00



EXISTING TYPICAL SECTION
STA. 170+82.68 TO STA. 171+94.81

STATE OF TEXAS
ARMANDO CASTRO JR
111324
REGISTERED PROFESSIONAL ENGINEER
11/22/2022

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PLANNING • ENGINEERING • CONSTRUCTION

SH 16

TYPICAL SECTIONS

11/22/2022 SHEET 1 OF 5

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.		HIGHWAY No.	
CHECKED:	6	TEXAS			SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
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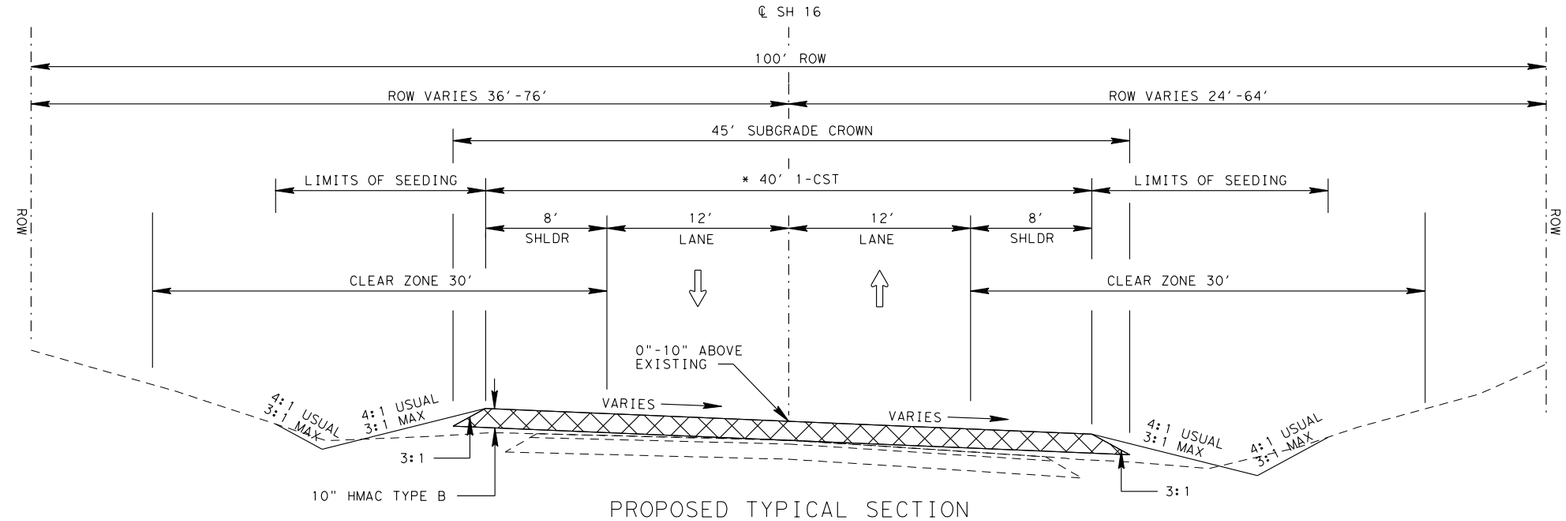


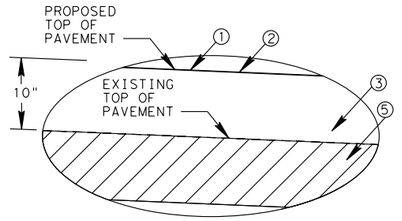
PROPOSED TYPICAL SECTION

STA. 56+13.20 TO STA. 67+00.00
APPROX. 10.87 STATIONS

* STA. 63+50.00 TO 64+50.00
TRANSITION FROM 40' TO 48'

LEGEND

① 2-CST
② PRIME COAT (MC-30 ASPH)
③ 10" FLEXIBLE BASE (TY A) (TWO 5" LIFTS), PAID FOR UNDER ITEM 247 6231.
④ TEMPORARY WIDENING TO BE UNIFORMLY MIXED WITH EXISTING ROADWAY TO AN 8" THICKNESS.
⑤ RWRK BS MTL 8" (DENS CONT) MATERIAL TAKEN FROM EXISTING PAVEMENT AND MIXED WITH NEW BASE IF NEEDED TO A FINAL THICKNESS OF 8"(PAID FOR UNDER ITEM 247 6013).



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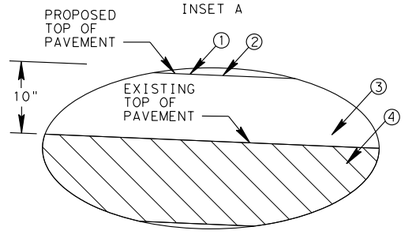

INSET B
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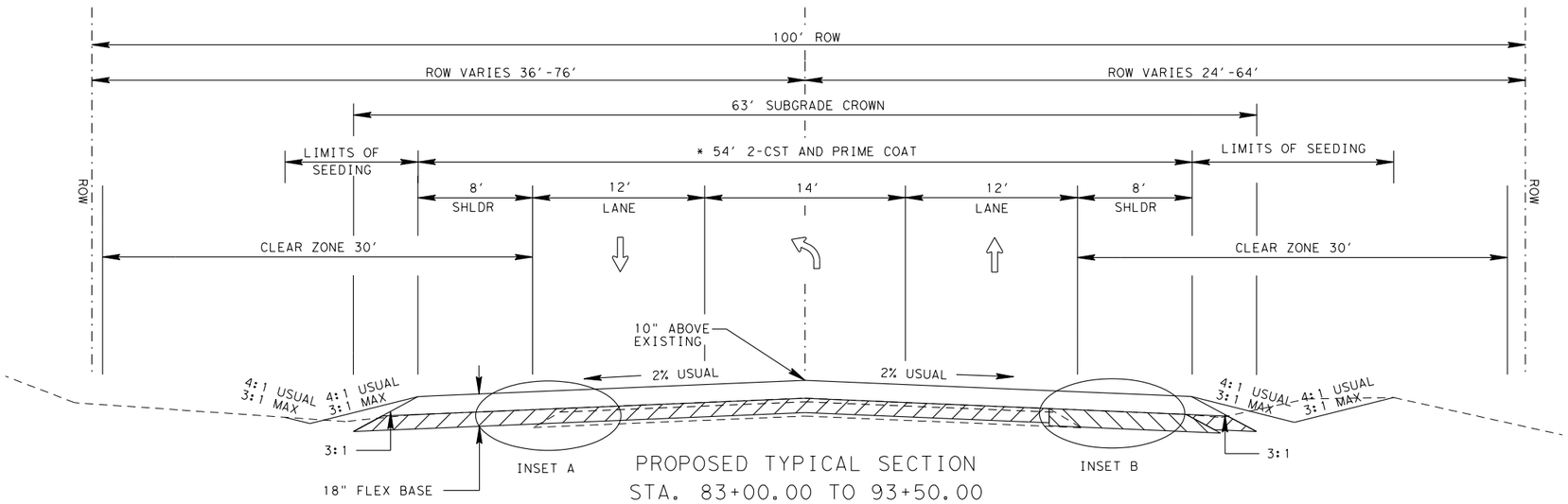

PROPOSED TYPICAL SECTION
STA. 83+00.00 TO 93+50.00
APPROX. 10.50 STATIONS

* STA. 81+50.00 TO 83+00.00
TRANSITION FROM 48' TO 54'

STATE OF TEXAS
ARMANDO CASTRO JR
111324
REGISTERED PROFESSIONAL ENGINEER
11/30/2022

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PLANNING • ENGINEERING • CONSTRUCTION

SH 16

TYPICAL SECTIONS

11/30/2022 SHEET 2 OF 5

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.	
CHECKED:	6	TEXAS				SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.	
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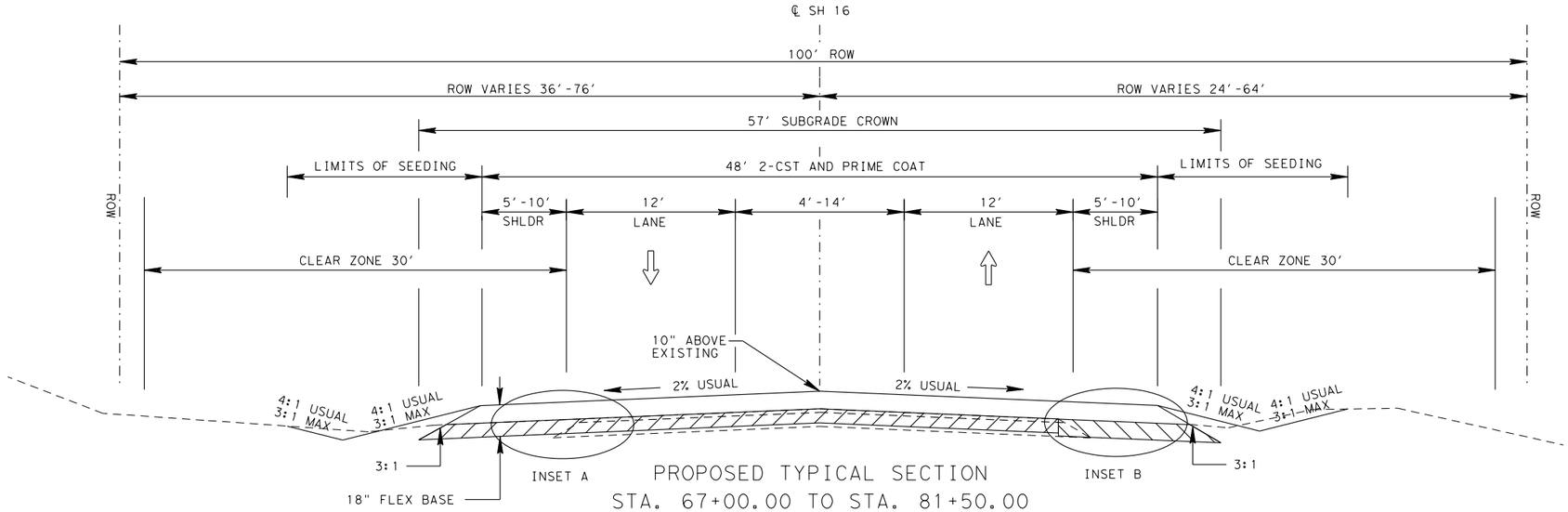
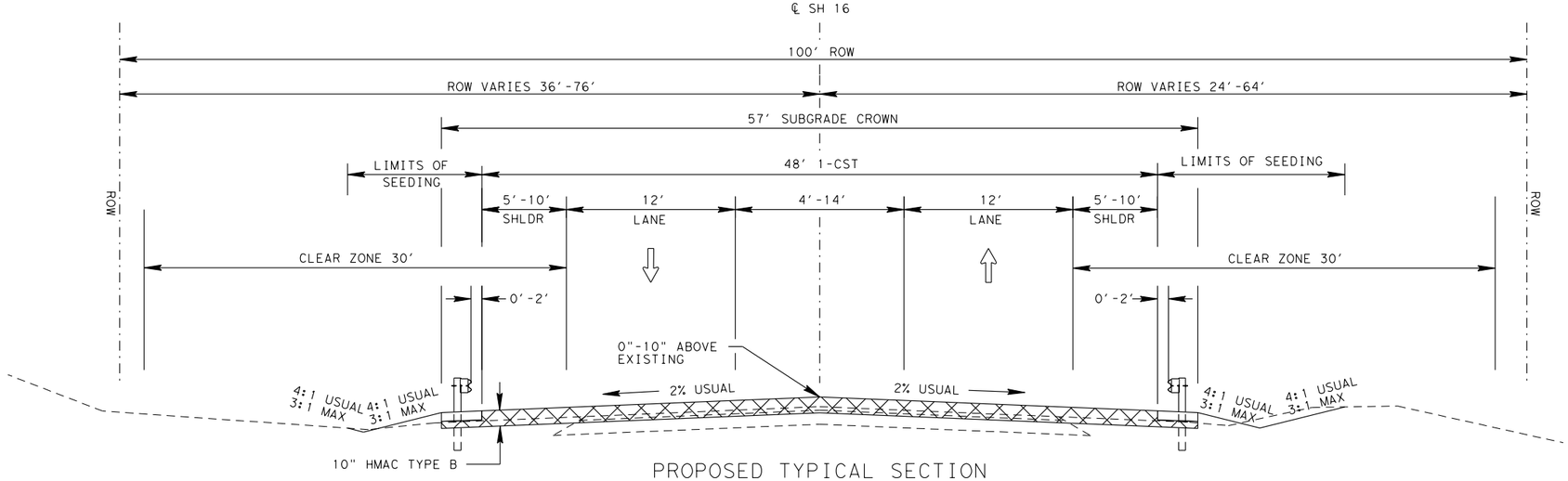


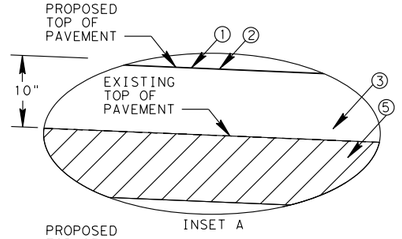
PROPOSED TYPICAL SECTION
STA. 67+00.00 TO STA. 81+50.00
STA. 93+50.00 TO STA. 165+62.68
STA. 177+14.81 TO STA. 365+00.00
APPROX. 274.48 STATIONS



PROPOSED TYPICAL SECTION
PROFILE TRANSITION AREAS
STA. 165+62.68 TO STA. 170+82.68
STA. 171+94.81 TO STA. 177+14.81
APPROX. 10.00 STATIONS

LEGEND

① 2-CST
② PRIME COAT (MC-30 ASPH)
③ 10" FLEXIBLE BASE (TY A) (TWO 5" LIFTS), PAID FOR UNDER ITEM 247 6231.
④ TEMPORARY WIDENING TO BE UNIFORMLY MIXED WITH EXISTING ROADWAY TO AN 8" THICKNESS.
⑤ RWRK BS MTL 8" (DENS CONT) MATERIAL TAKEN FROM EXISTING PAVEMENT AND MIXED WITH NEW BASE IF NEEDED TO A FINAL THICKNESS OF 8"(PAID FOR UNDER ITEM 247 6013).



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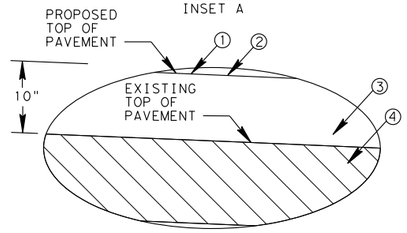

INSET B

N.T.S.

STATE OF TEXAS
ARMANDO CASTRO JR
111324
REGISTERED PROFESSIONAL ENGINEER
11/30/2022

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PLANNING • ENGINEERING • CONSTRUCTION

SH 16

TYPICAL SECTIONS

11/30/2022 SHEET 3 OF 5

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.	
CHECKED:	6	TEXAS				SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.	
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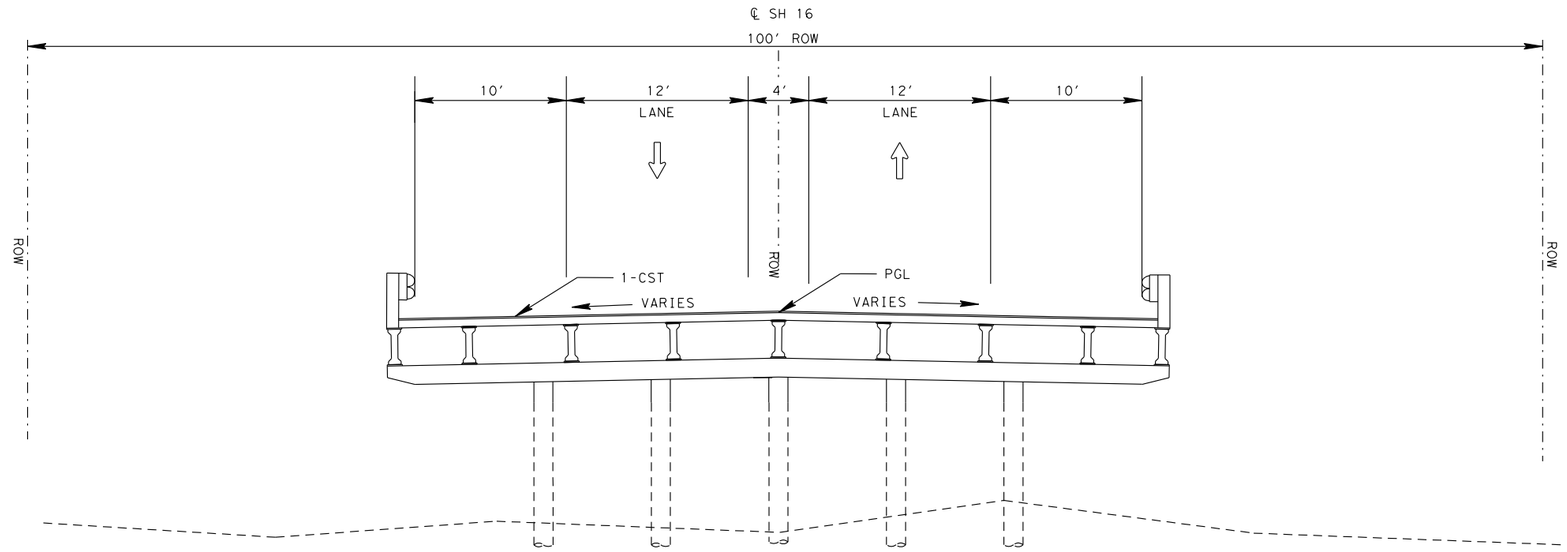
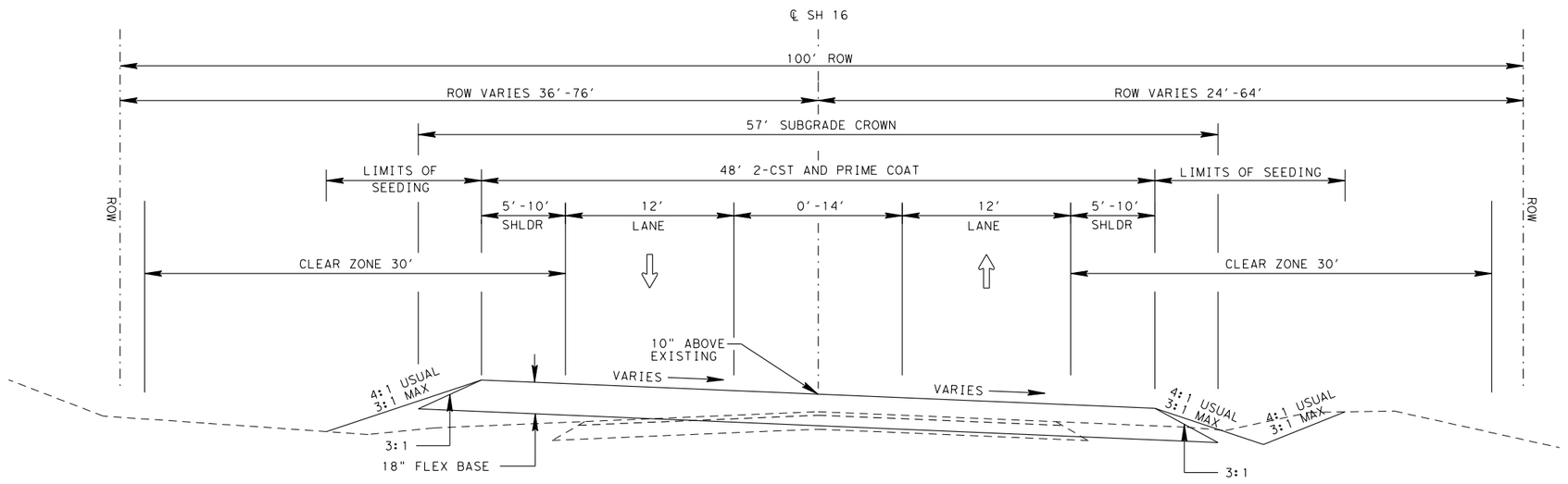


PROPOSED TYPICAL SECTION
STA. 170+82.68 TO STA. 171+94.81

N.T.S.



PROPOSED SUPERELEVATION TYPICAL SECTION
SEE CROSS SLOPE TRANSITIONS
ON PROJECT LAYOUT SHEETS AND
PROPOSED CROSS SECTIONS
(EXCEPT BETWEEN STA. 56+13.20 AND STA. 63+50.00)

NO.	REVISION	BY	DATE

STATE OF TEXAS
ARMANDO CASTRO JR
111324
REGISTERED
PROFESSIONAL ENGINEER
11/22/2022

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SH 16

TYPICAL SECTIONS

11/22/2022 SHEET 4 OF 5

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.	
CHECKED:	6	TEXAS				SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.	
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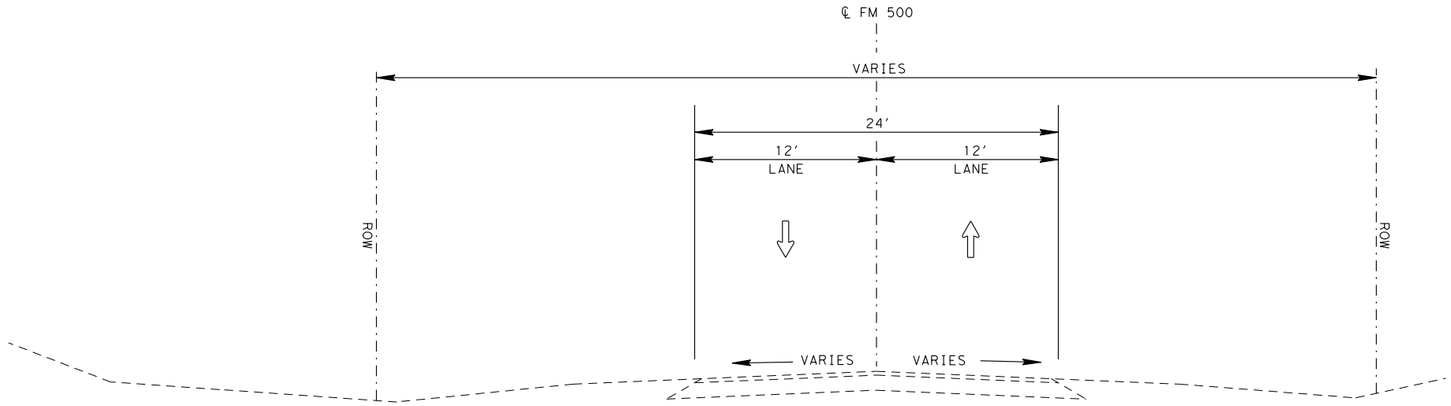
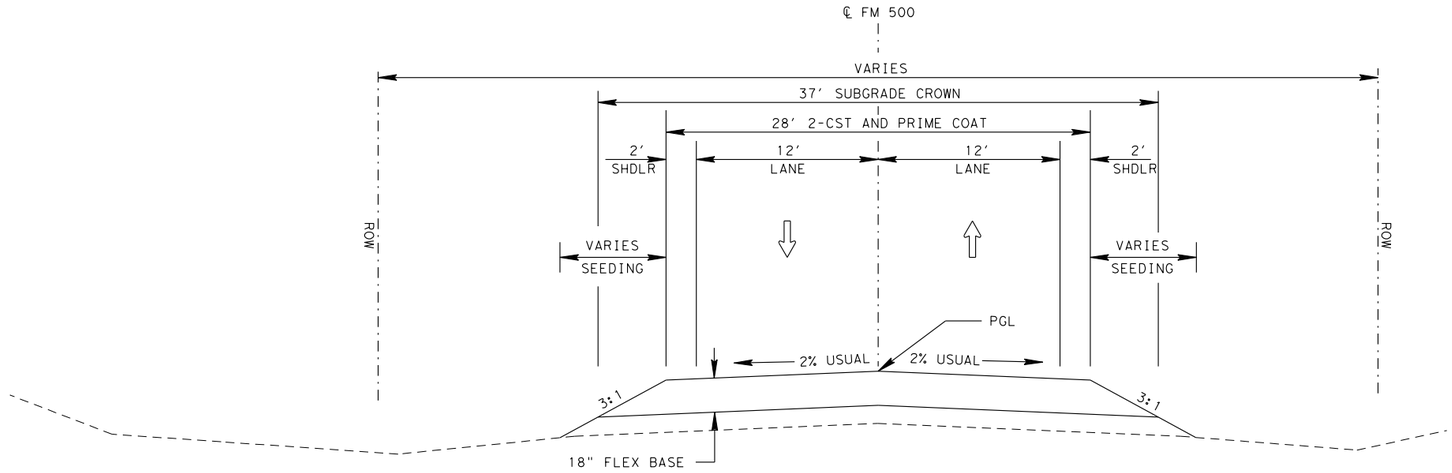


EXISTING TYPICAL SECTION FOR FM 500
STA. 11+01.80 TO STA. 13+94.79



PROPOSED TYPICAL SECTION
STA. 11+01.80 TO STA. 13+94.79
APPROX. 2.93 STATIONS

N.T.S.

NO.	REVISION	BY	DATE

STATE OF TEXAS
ARMANDO CASTRO JR
111324
REGISTERED
PROFESSIONAL ENGINEER
11/30/2022

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PLANNING • ENGINEERING • CONSTRUCTION

SH 16

TYPICAL SECTIONS

11/30/2022 SHEET 5 OF 5

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.	
CHECKED:	6	TEXAS				SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.	
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GENERAL NOTES

TEST TO BE IN ACCORDANCE WITH
TEXAS DEPARTMENT OF TRANSPORTATION
STANDARD TEST METHODS.

Item	Description	Soil Constants		
		Max LL.	Max. PI	Min. PI
* 132	Embankment (Final)(Dens Cont)(Ty C)	40	25	3
247	Fl Bs (Cmp In Plc) (Ty D Gr1-2)(Fnal Pos)			3

* Applies to borrow only.

Job control samples for gradation and P.I. testing will be taken from the windrow after blade mixing.

Asphalt Surface Areas-SY

Item	Description	Course	Roadway	Detour
310	Asph (MC-30)	Prime	167,363	X
316	Asph (RC-250) (Winter)	1st	83,681	
316	Aggr (TY-B GR-4)(SAC-B) (Winter)	1st	83,681	
316	Asph (AC-20-5TR) (Summer)	1st	83,681	X
316	Aggr (TY-PB GR-3)(SAC-B) (Summer)	1st	83,681	X
316	Asph (AC-20-5TR)	2nd	154,687	
316	Aggr (TY-PB GR-4)(SAC-B)	2nd	154,687	
3076	D-GR HMA TY-B PG64-22	1st Lift	11,794	

Basis of Estimate

The Contractor will not be allowed to store equipment, materials, incidentals, hazardous chemicals, petroleum products, concrete washouts, etc. in the Department's R.O.W. without written permission from the Engineer.

Trees that are to be trimmed and brush that is to be trimmed or removed that are not over the roadway or bridge(s), will be trimmed or removed in accordance with the Roadside Vegetation Management Manual to a height of fourteen feet. Remove limbs at the trunk with less than twenty-one feet of clearance above the pavement or bridge(s).

See the "Environmental" section of the plans for additional information.

County: San Saba **Sheet:** 8

Highway: SH 16 **Control:** 0289-04-032

TEXAS ONE CALL

Fiber optic cable systems, gas lines, underground power lines, water lines, sewer lines, and other various utilities may be buried within the project limits. Protection of these utility systems is of extreme importance since any break could disrupt service to users resulting in business interruption and loss of revenue and profits. The Contractor will telephone Texas One Call at 1-800-344-8377 (a 24-hour number), to determine if utilities are buried anywhere on the project in accordance with all UNDERGROUND FACILITY DAMAGE PREVENTION AND SAFETY laws. This action; however, will in no way be interpreted as relief of responsibilities under the terms of the Contract as set out in the plans and specifications. Coordinate the repair of all damages caused by daily operations and have facilities restored to service in a timely manner as directed at no additional cost to TxDOT.

GENERAL

Unless specifically noted as applying to only a certain project or projects, these general notes will apply to all projects associated to this contract.

Contractor questions on this project are to be addressed to the following individual(s):

Name	Email Address
Bart Fris P.E.	bart.fris@txdot.gov

Contractor questions will be accepted through email, phone, and in person by the above individual(s).

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.

The term "Article" or "Section" referred to hereon is defined in the forward of the *Standard Specifications for Construction and Maintenance of Highways, Streets, And Bridges* adopted by the Texas Department of Transportation November 2014.

A "Regulatory Construction Speed Zone" has been requested for this project.

Saw-Cutting with approved equipment as directed by the Engineer will be required at project limits, longitudinally, and/or at notch downs to establish clean and straight joints. This work will not be paid for directly but will be considered subsidiary to various bids.

The following standard sheets have been modified:
TS2(PL-1)-18(MOD)
TS2(PL-2)-18(MOD)

The Contractor will establish drainage in ditches before seeding or as directed by the Engineer.

Watering for dust control will be required as Directed by the Engineer and will be considered subsidiary to the various bid items.

SURVEY CONTROL - PROJECT CONTROL DATUM

Horizontal – NAD83(2011) Epoch 2010.00
Vertical – NAVD88(Geiod12B)
Coordinate System – Texas State Plane
Zone – Texas North Central (4202)
Units – U.S. Survey Foot
Project Combined Scale Factor 1.00012

The Contractor Force Account "Mowing" that has been established for this project is intended for full width mowing of the entire right of way, as directed by the Engineer. When required, mowing will be restricted to 2 times a year and within the project sign limits. Unless otherwise directed, summer mowing will be required during the 1st week of June and winter mowing will be required during the 3rd week of October. Mowing for this project has been estimated for 2 years (4 mowing's).

ITEM 5 CONTROL OF WORK

The responsibility for the construction surveying on this contract will be in accordance with Section 5.9.1. "Method A".

The contractor will be required to place and maintain Blue Tops with wooden hubs for each layer of pavement structure material unless otherwise directed by the Engineer.

Prior to contract letting, bidders may obtain a computerized transfer of files (from the Engineer's office) that contains the earthwork information.

When a precast or cast-in-place concrete element is included in the plans, a precast concrete alternate may be submitted in accordance with "Standard Operating Procedure for Alternate Precast Proposal Submission" found online at https://www.txdot.gov/inside-txdot/forms-publications/consultants-contractors/publications/bridge.html#design. Acceptance or denial of an alternate is at the sole discretion of the Engineer. Impacts to the project schedule and any additional costs resulting from the use of alternates are the sole responsibility of the Contractor.

ITEM 6 CONTROL OF MATERIALS

County: San Saba **Sheet:** 8A

Highway: SH 16 **Control:** 0289-04-032

To comply with the latest provisions of Build America, Buy America Act (BABA Act) of the Bipartisan Infrastructure Law, the contractor must submit a notarized original of the TxDOT Construction Material Buy America Certification Form for all items classified as construction materials. This form is not required for materials classified as a manufactured product.

Refer to the Buy America Material Classification Sheet for clarification on material categorization.

The Buy America Material Classification Sheet is located at the below link.
https://www.txdot.gov/business/resources/materials/buy-america-material-classification-sheet.html
for clarification on material categorization.

In accordance with **Section 6.10.2**, the Contractor will dispose of all painted steel at a steel recycling or smelting facility and a receipt will be required. In lieu of this, the Contractor has the option to either show proof that the paint is lead free or show proof that the lead paint has been abated by an abatement certified company. The Department will not be obligated for the cost of paint testing and/or abatement materials, processes, personnel, incidentals, etc.

ITEM 7 LEGAL RELATIONS AND RESPONSIBILITIES

No significant traffic generator events identified.

ITEM 8 PROSECUTION AND PROGRESS

Working days will be computed and charged in accordance with Section 8.3.1.4. "Standard Workweek".

Work will not be performed without time being charged unless otherwise exempted by the Section as defined above.

Working day charges will be in accordance with **SP 008---002** (60 calendar days after the date of the written authorization to begin work. Do not begin any work before the end of this period unless authorized in writing by the Engineer.) **This delay is for the production of base material and test submittals for approval.**

Construction will be completed in order, sequentially; as described in the traffic control plan phasing. Each step/phase will be completed before starting on the next step/phase unless otherwise approved by the Engineer.

Contractor will not be allowed to move to the opposite side of the road until the Engineer approves substantial completion on the current side.

PROJECT SCHEDULES

Critical Path Method (CPM) scheduling will be required to be submitted and maintained monthly by the Contractor unless otherwise directed by the Engineer. (8.5.2.)

For monthly submittals, the Contractor will provide the schedule in an Adobe Acrobat compatible format (PDF file). If the Engineer requests the schedule in an electronic format, the Contractor will submit a schedule that is fully compatible with Primavera P6 Professional Release 15.

ITEM 9 MEASUREMENT AND PAYMENT

Monthly estimates will be computed from the 28th of the previous month through the 27th of the current month unless otherwise approved in writing by the Engineer.

ITEM 100 PREPARING RIGHT OF WAY

Remove all trees, brush, and shrubs within the R.O.W., unless otherwise directed by the Engineer. Perform Preparing Right of Way in such a manner that does not disturb the native grasses unnecessarily.

Within the construction limits, blade and windrow the top 8 inches of vegetative material to just outside the construction limits. Once ditch slopes and drainage have been established and approved, blade the windrow evenly over the disturbed area within the construction limits. This work is to be done as the job progresses and in conjunction with seeding. Work on the project may be suspended, if in the opinion of the Engineer, the Contractor does not make a good faith effort to stabilize loose material as the project progresses. Time will not be suspended. This work is subsidiary to Item 100.

ITEM 104 REMOVING CONCRETE

The Contractor will make a 1" cut to use as a guide before full depth cutting. Saw-Cut the full depth through the concrete before existing pavement removal.

ITEM 132 EMBANKMENT

Refer to Item 210 "Rolling" for additional roller requirements.

Shape the embankment, near the drainage structures, to the slope of the safety end treatment.

Embankment for the drainage structures is included in the quantities shown on the plan & profile sheets.

Density Control testing may be waved for the detour construction as directed by the Engineer.

"Final" embankment that is not accounted for in the cross section(s) or typical section(s) but that has been estimated or shown for informational purposes, e.g., additional areas under guard fence, around S.E.T.s, etc.; will be measured in its final position as defined in Section 132.4.1. Shrinkage or swell factors will not be considered in determining the calculated quantities.

Embankment as shown in the plans or placed as directed will be placed before the installation of MBGF.

ITEM 150 BLADING

County: San Saba **Sheet:** 8B

Highway: SH 16 **Control:** 0289-04-032

Blading will be used as directed by the Engineer.

ITEM 164 SEEDING FOR EROSION CONTROL

The Contractor should anticipate multiple mobilizations for seeding at each project location.

Additional wildflower seed will be required to be added to the seeding mixture. The wildflower seed will be provided by TxDOT and is estimated at 5 lbs/acre in addition to the required seeding as specified in Item 164. The Contractor will notify the Area Engineer a minimum of 4 weeks in advance of permanentt/final seeding to ensure time for the proper seed to be acquired. The Contractor can acquire this additional seed at the County Maintenance office. The equipment, labor, tools, and incidentals to mix and apply this seed will be considered subsidiary to Item 164.

ITEM 166 FERTILIZER

Fertilize all areas of project to be seeded.

Furnish and apply fertilizer with analysis of 20-10-10 at a rate of 300 bulk pounds per acre.

ITEM 168 VEGETATIVE WATERING

Water all areas of project to be seeded or sodded.

Vegetative watering is estimated at 1 inch per week for 4 weeks. *Acres x 108.61686 or Square Yards x 0.0224415.*

Vegetative watering may be adjusted as directed by the Engineer to ensure saturation for vegetative establishment.

ITEM 210 ROLLING

Required Roller Type and Size for Compacted Layers

Thickness of compacted lift	Minimum Static weight of roller (tons)	Drum Type
< 6 inches	12	Smooth
6 to 7 inches	15	Smooth or Padfoot
8 to 9 inches	18	Padfoot
10 inches or greater	20	Padfoot

ITEM 216 PROOF ROLLING

Proof Rolling to be used as directed by the Engineer.

ITEM 247 FLEXIBLE BASE

Refer to Item 210 for additional roller requirements.

Ride quality will be measured before the application of prime coat unless otherwise approved in writing by the Engineer.

A grader (a road grader, a blade, a maintainer, or a motor grader) will be used to process base unless otherwise approved by the Engineer.

Do not add field sand to modify the finish material to meet requirements.

Place new flexible base in lifts of approximately equal depth not to exceed 6 inches unless otherwise directed.

Density requirements for this item may be waived for the construction of detours as directed by the Engineer.

PROPERTY	Grade 4
Master gradation sieve size (cumulative % retained)	-----
2-1/2"	0
1-3/4"	0-10
7/8"	-----
3/8"	-----
#4	45-75
#40	50-85
Liquid Limit, % Max	40
Plasticity Index, Max	14
Plasticity Index, Min	3
Wet ball mill, % Max	-----
Wet ball mill, % Max increase passsing the # 40 sieve	-----
Min compressive strength, psi	-----
lateral pressure 0 psi	-----
lateral pressure 3 psi	-----
lateral pressure 15 psi	-----

ITEM 251 REWORKING BASE COURSES

Refer to Item 210 for additional roller requirements.

Grade flexible base to typical section and profile to match existing grade. Contractor will establish grade to produce a smooth ride as directed.

County: San Saba **Sheet:** 8C

Highway: SH 16 **Control:** 0289-04-032

Reworking Base Material Ty A will consist of a light scarifying to create a non-slip plane as directed by the Engineer.

In accordance with Section 251.4.2.2, windrowing of the salvaged material will be allowed.

In accordance with Section 251.4.2.3, proof rolling will be required and soft spots will corrected as approved or directed by the Engineer.

ITEM 310 PRIME COAT

Cure prime placed with a cutback asphalt binder for 21 days before placing subsequent surface courses unless otherwise directed by the Engineer.

Finished base must be dampened before the application of a cutback asphalt binder is placed. This work will not be paid for directly but will be considered subsidiary to Item 310.

If MC-30 is used for prime, sanding may be required at intersections, drives and other areas as directed.

ITEM 316 SURFACE TREATMENTS

All precoated aggregate will use PG 64-22 asphalt.

Furnish aggregate with a minimum B surface aggregate classification.

Warm season asphalts are not to be placed between September 1st and April 30th unless otherwise directed/approved.

CRS-2P will be used for cool season use, unless otherwise directed by the Engineer; and can be placed between September 1st and April 30th in accordance with the suppliers recommendations. A 90 day cure time may be required prior to placing 2nd course.

Protect all existing bridges, and other exposed concrete surfaces within the limits of this project(s), as much as practical, from asphalt materials by any means approved by the Engineer at the contractor's expense.

Use a medium pneumatic roller meeting the requirements of Item 210 as directed by the Engineer. This work will be subsidiary to the various bid items.

ITEM 354 PLANING AND TEXTURING PAVEMENT

Grade Referencing will be required as defined in Article 354.3.1 or as directed by the Engineer.

The planed asphaltic material will become property of the Contractor. *Verify each time.*

The planed asphaltic material will be stockpiled 3.5 miles North of US 180 on US 183 at the intersection of US 183 and FM 578. This material will remain property of the Department.

The planed asphaltic material will be stockpiled 2.4 miles North of the North Breckenridge City Limits along US 183 on the West side (Lat/Long 32.800357°, -98.903441°). This material will remain property of the Department.

Contractor will provide a 12-foot minimum milling drum. The drum will have a maximum tooth spacing of 5/8 inches and have a minimum of 3 wraps of teeth.

Contractor will provide a 12-foot minimum fine tooth milling drum with a teeth spacing range of ¼ to ½ inch apart.

Milling operations will not advance faster than 30 feet per minute (fpm) or be based as a function of the RPMs of the milling drum such that the full uniform texture pattern is achieved with the speed of the milling operation in fpm limited to 30% of the drums RPMs. Any proposal to advance faster than this speed will be discussed with the Engineer and proven on a test strip of the Engineer's choosing, and will result in no repeated inconsistencies in texture during production milling. If inconsistencies are present, the machine speed will be reduced as directed by the Engineer.

ITEM 401 FLOWABLE BACKFILL

All flowable backfill will be "Non-Excavatable" unless otherwise specified.

ITEM 432 RIPRAP

Locations and quantities may be varied as directed by the Engineer to accommodate field conditions.

Mow Strip(s) will be installed before the final lift of ACP is installed.

Riprap (Conc) (Cl B) is required inside all Type I safety end treatments, unless otherwise directed by the Engineer.

Limit excavation to within 1' of riprap. If excavation exceeds these limits without the Engineer's approval, riprap will be extended to the limits of the disturbance. No additional compensation will be allowed for this work.

ITEM 438 CLEANING AND SEALING JOINTS

Clean all joints full depth from top of the slab to the top of cap. This includes joints that have end diaphragms sitting on caps.

Clean all caps of loose material.
Clean all steel and concrete with a 5000 psi water pressure blast clean and allow to dry thoroughly prior to placing joint material and sealant.

County: San Saba **Sheet:** 8D

Highway: SH 16 **Control:** 0289-04-032

ITEM 451 RETROFIT RAILING

Salvage existing rail elements and stockpile (palletize, block off the ground, or other approved method) at the San Saba County Maintenance yard. Notify the Maintenance Supervisor(s) 5 working days before delivering the rail elements to the designated location(s). Stockpile rail elements in an area designated by the Maintenance Supervisor(s).

The San Saba County Maintenance yard is located at 2502 West Wallace (US 190), San Saba, TX 76877.
Lat/Long: 31.198003, -98.745075
Phone: (325) 372-3527

ITEM 467 SAFETY END TREATMENT

For SET's being installed on existing corrugated metal pipe, upon removal of the existing SET and if there is damage to the existing end of pipe, the Contractor will saw cut a straight end and remove 3ft minimum of existing CMP. This new length of pipe will be supplied by the Contractor before installing the proposed SET. The removal and replacement of the length of pipe will be considered subsidiary to the SET. Any deviation to this process will have to approved in writing by the Engineer.

ITEM 496 REMOVING STRUCTURES

Handle materials when removing structures in accordance with Item 6.

ITEM 500 MOBILIZATION

The final 3% mobilization payment will not be paid on the Final Estimate unless all required paperwork and documents are received within 45 calendar days of Final Acceptance.

ITEM 502 BARRICADES, SIGNS, AND TRAFFIC HANDLING

The Contractor will be required to keep all TCP devices clean. If notified by the Engineer to clean the TCP devices, the Contractor will have until the end of that daylight period to comply. Failure to comply will result in a suspension of all work until the TCP devices are clean. Time will not be suspended.

Work zone lengths will be limited to 2 mile sections unless otherwise approved by the Engineer.

Work zone lengths will be limited to a 20-minute turnaround time unless otherwise approved by the Engineer.

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.

The Engineer will determine the locations of regulatory construction speed zone signs. The Contractor will furnish, install and remove speed zone signs at locations as directed by the Engineer.

Excavations in Intersections adjacent to travel lanes will not be exposed or open overnight. Backfilling will take place the day excavations are made.

The Contractor will be responsible for maintaining the edge of the roadway throughout the project in a traversable condition and/or as directed by the Engineer. Salvaged milling may be used as directed by the Engineer. This work will not be paid for directly and will be considered subsidiary to Item 502 "Barricades, Signs, and Traffic Handling".

All devices shown on the TCP Standards are required and considered subsidiary to Item 502 unless specifically outlined elsewhere in the plans.

All signs will be constructed in accordance with the details shown in the current Standard Highway Sign Designs for Texas manual.

ITEM 504 FIELD OFFICE AND LABORATORY

One Type B Structure (Field Office and Laboratory) located at or near the project location will be required for this project.

Fencing of the facility and parking area is required.

Internet connectivity and a printer/scanner/copier will be required.

Additionally, furnish and provide a Type E structure that meets all of the following requirements:

1. Provide at least 325 square feet of gross floor area in rooms 8 feet high. Partition the floor area into at least 2 interconnected rooms with doors, 2 exterior doors, and at least 2 windows in each room. One exterior door opening must be 48-inch minimum width. If steps are required to gain access to the 48-inch door, provide handrails and a strong and sturdy loading dock with minimum dimensions of 60 inches wide by 60 inches deep.
2. The strong floor and landing of the facility shall support the weight of all equipment and personnel, providing a stable, essentially zero deflection, during testing operations, acceptable to the Engineer.
3. Conforms to Laboratory requirements in Item 504.2.1.2.2 and conforms to Asphalt Content by Ignition Method in Item 504.2.2.4.1
4. Provide water, electricity, chairs, trash disposal, and janitorial services.

5. Furnish and install adequate equipment, outlets, lighting, air-conditioning, heating, and ventilation. Provide a partitioned restroom furnished with restroom supplies, a lavatory, and a flush toilet connected to a sewer or septic tank.

This structure type will be located at each HMAC plant for the sole use of the Engineer and will be separate from the Contractors' testing lab. In addition, provide the following:

The Contractor will furnish the Superpave or Texas Gyratory Compactor to the Engineer under the asphalt concrete pavement Item(s) of work.

The remaining lab testing equipment and calibrations will be provided by TxDOT.

No direct payment will be made for Engineer field labs. All construction, maintenance, utilities, custodial services, security, and permits necessary to establish and maintain readiness of this facility will be the responsibility of the Contractor.

ITEM 506 TEMPORARY EROSION, SEDIMENTATION, AND ENVIRONMENTAL CONTROLS

The Contractor should anticipate multiple mobilizations for the installation of BMP's on this project.

The Engineer will determine actual time and placement locations of BMP's and temporary measures. Contractor will not install BMPs until locations are approved by the Engineer.

Stockpile sites may be cleared of cover vegetation, but the vegetation root system will not be destroyed.

ITEM 508 CONSTRUCTING DETOURS

Flexible Base used for detour construction will be Ty-D GR-1-2.

Density Control testing is waived for the detour construction.

ITEM 512 PORTABLE TRAFFIC BARRIER

Portable Concrete Traffic Barrier will be supplied by the Contractor.

Portable Concrete Traffic Barrier will be used at specified locations for protection of workmen and the traveling public. When barrier sections are stockpiled on the project they will be placed in a location that will not endanger the traveling public.

ITEM 530 INTERSECTIONS, DRIVEWAYS, AND TURNOUTS

The Contractor will always maintain access to driveways unless otherwise coordinated with the property owner(s) and approved by the Engineer.

All intersections, driveways, and turnouts will be primed and receive a two course surface treatment matching the rates as shown on the basis of estimate for “ROADWAY” unless otherwise shown on the plans or directed by the Engineer.

ITEM 540 METAL BEAM GUARD FENCE

The area shown on the Roadway Details – MBGF sheets having a one course surface treatment will match the rates as shown on the basis of estimate for “ROADWAY” unless otherwise directed by the Engineer.

Metal beam guard fence will not be installed until the embankment, flex base, and/or one course surface treatment is complete.

ITEM 545 CRASH CUSHION ATTENUATORS

Crash Cushion Attenuators will be supplied by the Contractor.

ITEM 560 MAILBOX ASSEMBLIES

Mailboxes will be kept in a position accessible to the carrier’s vehicle along the travel way except when performance of grading operations necessitates the moving of mailboxes. When grading operations necessitate the moving of mailboxes, the contractor will place them at a nearby location which will be accessible to the carrier’s vehicle. Mailboxes will be returned to a position accessible to the carrier’s vehicle along the travel way when grading operations are not in progress. This work will not be paid for directly but will be subsidiary to Item 560.

A Type 2 Object Marker in accordance with Traffic Engineering standard Delineators & Object Markers or tube type post wrapped with 12” Conformable Reflective Sheeting in accordance with DMS 8300 will be required on both the approach and departure side of each mailbox assembly and will not be paid for directly but will be considered subsidiary to Item 560 Mailbox Assemblies.

ITEM 585 RIDE QUALITY FOR PAVEMENT SURFACES

Surface Test Type B will be required on this project.

Schedule 2 will be used when calculating Pay Adjustment for Ride quality.

Diamond grinding will not be allowed unless otherwise approved by the Engineer.

Refer to Item 247 and **SP 247-003** for ride quality requirements.

ITEM 618 CONDUIT

Where PVC, duct cable, and HDPE conduit 1” and larger is allowed and installed as per TxDOT standards, provide a PVC elbow at all ground boxes and foundations.

County: San Saba **Sheet:** 8F

Highway: SH 16 **Control:** 0289-04-032

See plans & specifications regarding type of conduit. High density polyethylene (HDPE) may be substituted where PVC is called out. High density polyethylene (HDPE) may be threaded and used with threaded PVC connectors or couplings. All couplings & connections will be tight & waterproof. Each end of every PVC pipe connection and/or coupling will be cleaned with PVC cleaner and glued thoroughly with PVC sealer. Proposed and existing conduit will be brought into a pull box and elbowed unless otherwise shown. Where a rigid metal conduit run terminates, a bushing will be provided to protect the wire from abrasion.

The conduit will be placed at a minimum depth of two 2 ft. unless otherwise shown on the plans or directed by the Engineer. If utility lines or other obstacles are at the 2 ft. minimum depth then the conduit will be routed under the utility or obstacle unless otherwise approved by the Engineer.

The conduit will be placed on a 2 in. Sand cushion and then backfilled with a minimum of six inch (6”) sand fill. The remainder of the trench will be backfilled with flexible base or soil as required by location of conduit on the project.

Flexible metal will not be permitted on this project.

Do not use cast iron junction boxes in concrete traffic barriers and single slope traffic barriers. Use polymer concrete junction boxes instead of the cast iron junction boxes shown on standard sheets CTBI (3), CTBI (4), and SSCB (4). Mount the junction boxes flush (+ 0”, - ½”) with concrete surface of concrete barrier.

Use materials from prequalified material producers list as shown on the Texas Department of Transportation (TxDOT) - Construction Division’s (CST) material producer list. Category is “Roadway Illumination and Electrical Supplies.”
The polymer concrete barrier box will not be paid for separately, but will be considered subsidiary to ITEM 618, “CONDUIT”.

ITEM 624 GROUND BOXES

All concrete used on ground boxes with aprons or cast in various slabs, will be as thick as the ground box depth within the dimensions as shown on TxDOT’s ED Standard Sheets. No variance from this will be allowed.

ITEM 644 SMALL ROADSIDE SIGN ASSEMBLIES

The Contractor will notify the Engineer 5 working days before installing any sign base. The Engineer will coordinate with the Contractor and the Maintenance office to assure proposed sign placements are in accordance with the current version of the Sign Crew Field Book and the TMUTCD. Any signs that are placed without this coordination by the Contractor that are not located correctly will be removed and relocated at the Contractor’s expense.

For Triangular Slip Base systems use HWYCOM (3 way set screw), Southern Plains (2 bolt clamp), or approved equivalent.

Build signs not detailed in the plans according to the latest edition of the Standard Highway Sign Designs for Texas.

TxDOT will mark the locations of the SPEED LIMIT (R2-1) and REDUCED SPEED LIMIT AHEAD (W3-5) signs.

Existing roadside signs are to be removed/relocated and mounted on temporary supports and placed during construction as directed by the Engineer. The removal/relocation and temporary mounting of any existing sign (stop, yield, warning, etc.) will not be paid for directly but will be considered subsidiary to Item 644 unless otherwise directed by the Engineer.

Signs that are to be transferred to new posts must be placed upon the new supports before the end of the working day. Regulatory signs must be transferred immediately.

Conformable Retroreflective Sheeting in accordance with DMS 8300 will be required on all Warning, Stop, and Yield signs. Retroreflective sheeting wrapped around a sign support is yellow unless the sign on the support is a Stop or Yield, in which case the sheeting will be red. Retroreflective sheeting will have a height on the post of 12 inches and the bottom of the sheeting will be 4 feet above the edge of the travel lane. Retroreflective sheeting will not be paid for directly but will be considered subsidiary to Item 644 Small Roadside Sign Assemblies.

ITEM 662 WORK ZONE PAVEMENT MARKINGS

Removable work zone pavement markings will be raised pavement markers unless otherwise approved by the Engineer.

Removable work zone pavement markings will be pavement tape markings unless otherwise approved by the Engineer.

Bituminous material used for raised pavement markers will be removed before the next lift of pavement material is placed.

Temporary tabs will not be placed on a road more than 24 hours prior to operations beginning on the road.

The temporary tabs will be removed by an acceptable method approved by the Engineer once final striping has been placed.

ITEM 666 RETROREFLECTORIZED PAVEMENT MARKINGS

A mobile retroreflectometer is not required for this project.

Furnish a needlepoint micrometer gauge Mitutoyo - Model 342-711-30 or equivalent.

County: San Saba **Sheet:** 8G

Highway: SH 16 **Control:** 0289-04-032

Sealed roadways will be allowed to cure for 3 days before final striping is placed unless otherwise directed by the Engineer.

All raised profile striping (edgeline and centerline) will use transverse bar profiles as described in section 666.4.3.1.2.

Unless otherwise approved, all 6 in. longitudinal striping (centerline, edgeline, etc.) will be placed and approved before any other striping (crosswalks, stop bars, arrows, numbers, etc.) is allowed to begin.

At all super-2 and climbing lane locations, double yellow will be placed to separate traffic. Passing zones that allow traffic to cross the centerline in to an oncoming lane will not be allowed.

ITEM 672 RAISED PAVEMENT MARKERS

Place raised pavement markers no sooner than 24 hours after final striping has been placed or as directed.

ITEM 677 ELIMINATING EXISTING PAVEMENT MARKINGS AND MARKERS

Use “Surface Treatment Method” in accordance with 677.4.1. for eliminating existing pavement markings. Measurement for eliminating existing pavement markings using the “Surface Treatment Method” will be by the linear foot for each application of the 2 ft. wide minimum treated area (677.4.1.) regardless of how many pavement markings it covers. Use RC-250 (0.20 Gal/Sy) with a Ty B Gr 5 (130 Sy/Cy) aggregate for eliminating pavement markings.

Mechanical method as shown in 677.4.4. may be used on the Type B ACP only.

Removal of the transverse centerline rumble strips will be considered subsidiary to the removal of the adjacent profile pavement markings.

ITEM 685 ROADSIDE FLASHING BEACON ASSEMBLIES

One-Pole Solar Powered Roadside Flashing Beacon will consist of an installation with one foundation, pole and transformer base and the use of a ground box/battery vault as shown on standard sheet(s).

This roadside flashing beacon will have one pole as described in the plans.

Batteries will be placed in ground vault/battery box.

The flasher assembly will be capable of supporting two 12” LED beacons flashing for a 24 hour period.

Roadside Flashing Beacon foundations will be of the Screw-in Anchor type.

Roadside Flashing Beacon foundations will be Drilled Shafts. See **TxDOT Standard TS-FD** for additional information.

ITEM 3076 DENSE – GRADED HOT-MIX ASPHALT (QCQA)

RAS will not be allowed.

A Superpave Gyratory Compactor (SGC) is required for this project.

Power washing each lift of hot-mix before the placement of consecutive lifts may be required as directed by the Engineer to ensure proper surface preparation. (Article 3076.4.7.)

During paving operations; proper adjustment of Surge Volume Remixing MTV is required to ensure clean pickup of HMAC and to have residual HMAC not be in excess of 1/4" to 3/8" as approved by the Engineer. HMAC will not be dumped in a windrow that is determined by the Engineer to be an excessive distance from the paving operation.

Belly dumps will not be allowed if a spray paver is used.

See item 504 for additional structure requirements located at HMAC plant(s).

ITEM 6001 PORTABLE CHANGEABLE MESSAGE SIGN

2 portable changeable message signs are estimated for this project and will be placed as directed by the Engineer. (XX PCMB X XX Days = TOTAL)

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

Provide the number of vehicles with truck mounted attenuators (TMA) listed in the table below. 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.

STANDARD / PHASE	# TMA'S REQUIRED
TCP(1-1)	1
TCP(1-2)	1
TCP(1-3)	1 per workspace
TCP(1-4)	1
TCP(1-5)	1
TCP(1-6)	1
TCP(2-1)	1
TCP(2-2)	1
TCP(2-3)	1 per workspace
TCP(2-4)	1
TCP(2-5)	1
TCP(2-6)	1

TCP(2-7)	0
TCP(2-8)	0
TCP(3-1)	2
TCP(3-2)	3
TCP(3-3)	2 or 3
TCP(3-4)	1 or 2 per workspace
TCP(3-5)	1
TCP(5-1)	1
TCP(6-1)	1 or 2
TCP(6-2)	1
TCP(6-3)	1
TCP(6-4)	1 or 2
TCP(6-5)	1 or 2
TCP(6-6)	1 per lane
TCP(6-7)	Refer to TCP(6-6)
TCP(6-8)	1
TCP(6-9)	1
TCP(7-1)	N/A to be used in conjunction with another TCP
WZ(BTS-1) & WZ(BTS-2)	1

Stationary shadow vehicle(s) with TMA are estimated at 150 days for this project. (75 days x 2 TMA's)

Mobile shadow vehicle(s) with TMA are estimated at 160 hours for this project. (10 days x 8 hrs/day x 2 TMA's)

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0289-04-032 **DISTRICT** Brownwood **COUNTY** San Saba
HIGHWAY SH 16

			CONTROL SECTION JOB		**0289-04-032**	TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00176139**		
			COUNTY		**San Saba**		
			HIGHWAY		**SH 16**		
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	100-6002	PREPARING ROW	STA	309.000		309.000	
	104-6017	REMOVING CONC (DRIVEWAYS)	SY	209.000		209.000	
	110-6001	EXCAVATION (ROADWAY)	CY	15,063.000		15,063.000	
	132-6006	EMBANKMENT (FINAL)(DENS CONT)(TY C)	CY	17,691.000		17,691.000	
	150-6002	BLADING	HR	40.000		40.000	
	164-6033	DRILL SEEDING (PERM) (RURAL) (SANDY)	SY	102,544.000		102,544.000	
	164-6041	DRILL SEEDING (TEMP) (WARM)	SY	51,272.000		51,272.000	
	164-6043	DRILL SEEDING (TEMP) (COOL)	SY	51,272.000		51,272.000	
	168-6001	VEGETATIVE WATERING	MG	1,128.000		1,128.000	
	216-6001	PROOF ROLLING	HR	40.000		40.000	
	247-6013	FL BS (CMP IN PLACE)(TYD GR1-2)(IN VEH)	CY	14,228.000		14,228.000	
	247-6231	FL BS (CMP IN PLACE)(TY A GR 1-2)(10")	SY	164,829.000		164,829.000	
	251-6036	REWORK BS MTL (TY C) (8") (DENS CONT)	SY	146,094.000		146,094.000	
	310-6009	PRIME COAT (MC-30)	GAL	25,090.000		25,090.000	
	316-6017	ASPH (AC-20-5TR)	GAL	79,324.000		79,324.000	
	316-6029	ASPH (RC-250)	GAL	31,781.000		31,781.000	
	316-6175	AGGR(TY-B GR-4 SAC-B)	CY	760.000		760.000	
	316-6224	AGGR(TY-PB GR-4 SAC-B)	CY	1,985.000		1,985.000	
	354-6122	PLAN & TEXT ASPH CONC PAV (0" TO 10")	SY	8,870.000		8,870.000	
	400-6006	CUT & RESTORING PAV	SY	55.000		55.000	
	401-6001	FLOWABLE BACKFILL	CY	37.000		37.000	
	403-6001	TEMPORARY SPL SHORING	SF	491.000		491.000	
	432-6001	RIPRAP (CONC)(4 IN)	CY	8.000		8.000	
	432-6002	RIPRAP (CONC)(5 IN)	CY	139.000		139.000	
	432-6045	RIPRAP (MOW STRIP)(4 IN)	CY	159.000		159.000	
	438-6004	CLEANING AND SEALING EXIST JOINTS(CL7)	LF	151.000		151.000	
	451-6019	RETROFIT RAIL (TY T631)	LF	250.000		250.000	
	462-6010	CONC BOX CULV (6 FT X 3 FT)	LF	65.000		65.000	
	462-6092	CONC BOX CULV(5'X 6.5')	LF	26.000		26.000	
	464-6005	RC PIPE (CL III)(24 IN)	LF	678.000		678.000	
	464-6007	RC PIPE (CL III)(30 IN)	LF	156.000		156.000	
	466-6179	WINGWALL (PW - 1) (HW=4 FT)	EA	1.000		1.000	
	466-6183	WINGWALL (PW - 1) (HW=8 FT)	EA	2.000		2.000	
	467-6217	SET (TY I)(S= 6 FT)(HW= 5 FT)(3:1) (C)	EA	6.000		6.000	
	467-6395	SET (TY II) (24 IN) (RCP) (6: 1) (P)	EA	32.000		32.000	
	467-6423	SET (TY II) (30 IN) (RCP) (6: 1) (P)	EA	10.000		10.000	
	496-6016	REMOV STR (PIPE)	EA	12.000		12.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0289-04-032 **DISTRICT** Brownwood **COUNTY** San Saba
HIGHWAY SH 16

			CONTROL SECTION JOB		**0289-04-032**	TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00176139**		
			COUNTY		**San Saba**		
			HIGHWAY		**SH 16**		
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	500-6001	MOBILIZATION	LS	1.000		1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	28.000		28.000	
	506-6003	ROCK FILTER DAMS (INSTALL) (TY 3)	LF	380.000		380.000	
	506-6011	ROCK FILTER DAMS (REMOVE)	LF	1,420.000		1,420.000	
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	12,730.000		12,730.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	12,730.000		12,730.000	
	506-6053	ROCK FILTER DAMS (INSTALL) (TY 2) (6:1)	LF	1,040.000		1,040.000	
	508-6001	CONSTRUCTING DETOURS	SY	37,290.000		37,290.000	
	510-6003	ONE-WAY TRAF CONT (PORT TRAF SIG)	MO	3.500		3.500	
	512-6001	PORT CTB (FUR & INST)(SGL SLOPE)(TY 1)	LF	390.000		390.000	
	512-6025	PORT CTB (MOVE)(SGL SLP)(TY 1)	LF	390.000		390.000	
	512-6049	PORT CTB (REMOVE)(SGL SLP)(TY 1)	LF	390.000		390.000	
	530-6004	DRIVEWAYS (CONC)	SY	165.000		165.000	
	530-6006	DRIVEWAYS (SURF TREAT)	SY	2,373.000		2,373.000	
	530-6008	TURNOUTS (ACP)	SY	95.000		95.000	
	540-6002	MTL W-BEAM GD FEN (STEEL POST)	LF	1,400.000		1,400.000	
	542-6001	REMOVE METAL BEAM GUARD FENCE	LF	794.000		794.000	
	544-6001	GUARDRAIL END TREATMENT (INSTALL)	EA	12.000		12.000	
	544-6003	GUARDRAIL END TREATMENT (REMOVE)	EA	8.000		8.000	
	545-6003	CRASH CUSH ATTEN (MOVE & RESET)	EA	2.000		2.000	
	545-6005	CRASH CUSH ATTEN (REMOVE)	EA	2.000		2.000	
	545-6019	CRASH CUSH ATTEN (INSTL)(S)(N)(TL3)	EA	2.000		2.000	
	560-6003	MAILBOX INSTALL-M (TWG-POST) TY 1	EA	2.000		2.000	
	560-6007	MAILBOX INSTALL-S (WC-POST) TY 3	EA	7.000		7.000	
	560-6008	MAILBOX INSTALL-D (WC-POST) TY 3	EA	1.000		1.000	
	618-6023	CONDT (PVC) (SCH 40) (2")	LF	10.000		10.000	
	624-6006	GROUND BOX TY BATTERY (162915)W/APRON	EA	1.000		1.000	
	636-6001	ALUMINUM SIGNS (TY A)	SF	9.000		9.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	71.000		71.000	
	644-6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	EA	3.000		3.000	
	644-6007	IN SM RD SN SUP&AM TY10BWG(1)SA(U)	EA	6.000		6.000	
	644-6031	IN SM RD SN SUP&AM TYS80(1)SA(T-2EXT)	EA	1.000		1.000	
	644-6036	IN SM RD SN SUP&AM TYS80(1)SA(U-BM)	EA	1.000		1.000	
	644-6060	IN SM RD SN SUP&AM TYTWT(1)WS(P)	EA	38.000		38.000	
	658-6081	INSTL DEL ASSM (D-SW)SZ 1(WFLX)GND(BI)	EA	26.000		26.000	
	662-6001	WK ZN PAV MRK NON-REMOV (W)4"(BRK)	LF	29,767.000		29,767.000	
	662-6004	WK ZN PAV MRK NON-REMOV (W)4"(SLD)	LF	223,793.000		223,793.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0289-04-032 **DISTRICT** Brownwood **COUNTY** San Saba
HIGHWAY SH 16

		CONTROL SECTION JOB		**0289-04-032**		TOTAL EST.	TOTAL FINAL
		PROJECT ID		**A00176139**			
		COUNTY		**San Saba**			
		HIGHWAY		**SH 16**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	662-6012	WK ZN PAV MRK NON-REMOV (W)8"(SLD)	LF	2,160.000		2,160.000	
	662-6016	WK ZN PAV MRK NON-REMOV (W)24"(SLD)	LF	52.000		52.000	
	662-6032	WK ZN PAV MRK NON-REMOV (Y)4"(BRK)	LF	201,356.000		201,356.000	
	662-6034	WK ZN PAV MRK NON-REMOV (Y)4"(SLD)	LF	9,950.000		9,950.000	
	662-6063	WK ZN PAV MRK REMOV (W)4"(SLD)	LF	660.000		660.000	
	662-6075	WK ZN PAV MRK REMOV (W)24"(SLD)	LF	48.000		48.000	
	662-6095	WK ZN PAV MRK REMOV (Y)4"(SLD)	LF	1,200.000		1,200.000	
	662-6109	WK ZN PAV MRK SHT TERM (TAB)TY W	EA	1,584.000		1,584.000	
	662-6110	WK ZN PAV MRK SHT TERM (TAB)TY Y	EA	792.000		792.000	
	662-6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	EA	5,895.000		5,895.000	
	666-6017	REFL PAV MRK TY I (W)6"(DOT)(090MIL)	LF	723.000		723.000	
	666-6035	REFL PAV MRK TY I (W)8"(SLD)(090MIL)	LF	1,405.000		1,405.000	
	666-6053	REFL PAV MRK TY I (W)(ARROW)(090MIL)	EA	8.000		8.000	
	666-6071	REFL PAV MRK TY I(W)(LNDP ARW)(090MIL)	EA	4.000		4.000	
	666-6077	REFL PAV MRK TY I (W)(WORD)(090MIL)	EA	4.000		4.000	
	666-6285	REF PROF PAV MRK TY I(W)6"(SLD)(090MIL)	LF	61,387.000		61,387.000	
	666-6289	REF PROF PAV MRK TY I(Y)6"(SLD)(090MIL)	LF	72,362.000		72,362.000	
	666-6293	REF PROF PAV MRK TY I(Y)6"(BRK)(090MIL)	LF	1,740.000		1,740.000	
	666-6305	RE PM W/RET REQ TY I (W)6"(BRK)(090MIL)	LF	4,580.000		4,580.000	
	672-6007	REFL PAV MRKR TY I-C	EA	70.000		70.000	
	672-6009	REFL PAV MRKR TY II-A-A	EA	1,980.000		1,980.000	
	672-6010	REFL PAV MRKR TY II-C-R	EA	230.000		230.000	
	677-6001	ELIM EXT PAV MRK & MRKS (4")	LF	5,200.000		5,200.000	
	682-6003	VEH SIG SEC (12")LED(YEL)	EA	2.000		2.000	
	684-6010	TRF SIG CBL (TY A)(12 AWG)(5 CONDR)	LF	10.000		10.000	
	685-6004	INSTL RDSD FLSH BCN ASSM (SOLAR PWRD)	EA	1.000		1.000	
	685-6006	REMOV RDSD FLSH BCN AM (SOLAR PWRD)	EA	1.000		1.000	
	3076-6001	D-GR HMA TY-B PG64-22	TON	6,509.000		6,509.000	
	6001-6001	PORTABLE CHANGEABLE MESSAGE SIGN	DAY	92.000		92.000	
	6185-6002	TMA (STATIONARY)	DAY	532.000		532.000	
	6185-6003	TMA (MOBILE OPERATION)	HR	264.000		264.000	
	18	ENVIRONMENTAL: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000	
		SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000	

BASIS OF ESTIMATE

	ITEM	DESCRIPTION	RATE
[1]	0166	FERTILIZER	1 LB/9 SY
	0168	VEGETATIVE WATERING	11 GAL/SY
		INVERTED PRIME	
	310	MC-30	0.15 GAL/SY
		TWO COURSE SURFACE TREATMENT	
	0316	ASPH (AC-20-5TR) - 1ST COURSE	0.38 GAL/SY
	0316	ASPH (RC 250) - 1ST COURSE	0.38 GAL/SY
	0316	AGGR (TY-PB GR-4 SAC-B) - 1ST COURSE	120 SY/CY
	0316	AGGR (TY-B GR-4 SAC-B) - 1ST COURSE	110 SY/CY
	0316	ASPH (AC-20-5TR) - 2ND COURSE	0.34 GAL/SY
	0316	AGGR (TY-PB GR-4 SAC-B) - 2ND COURSE	120 SY/CY
	3076	D-GR HMA TY-B PG64-22	110LBS/SY/IN

[1] FOR INFORMATION ONLY.

SUMMARY OF ROADWAY QUANTITIES

SH 16		100 6002 [1] PREPARING ROW	110 6001 EXCAVATION (ROADWAY)	132 6006 EMBANKMENT (FINAL) (DENS CONT) TY C	150 6002 BLADING	216 6001 PROOF ROLLING	247 6231 FL BS (CMP IN PLC) (TY A GR1-2) (10 IN)	247 6013 FL BS (RDWY DEL) (TY D GR1-2) (IN VEH)	251 6036 REWORK BS MTL (TY C) (8") (DENS CONT)	310 6009 PRIME COAT (MC-30)	316 6029 ASPH (RC250)	316 6017 ASPH (AC-20-5TR)	316 6175 AGGR (TY-B GR-4 SAC-B)	316 6224 AGGR (TY-PB GR-4 SAC-B)	354 6122 PLANE & TEXT ASPH CONC PAV (0 TO 10)
STA	STA	STA	CY	CY	HR	HR	SY	CY	SY	GAL	GAL	GAL	CY	CY	SY
56+13.20	102+00.00	46.00	1375	4072			21689	1998	17066	3862	4892	10711	117	269	2222
102+00.00	150+00.00	48.00	3852	1624			27364	2929	23644	3923	4969	13075	119	327	
150+00.00	198+00.00	48.00	501	3072			20241	2146	23070	3831	4853	10624	116	267	6648
198+00.00	246+00.00	48.00	2515	3028			28290	2306	23497	3954	5009	13181	120	330	
246+00.00	294+00.00	48.00	2195	2796			27407	2213	23768	3840	4864	12800	116	320	
294+00.00	342+00.00	48.00	2225	1933			26933	1890	23682	3840	4864	12800	116	320	
342+00.00	365+00.00	23.00	2400	1166			12905	746	11367	1840	2331	6133	56	153	
TOTAL		309.00	15063	17691	40	40	164829	14228	146094	25090	31781	79324	760	1985	8870

FOR ITEM 100 (PREP ROW), REFER TO GENERAL NOTES FOR QUANTITIES AND INFORMATION REGARDING WORK TO BE PERFORMED.

SUMMARY OF ROADWAY QUANTITIES (CONT.)

SH 16		432 6001 RIPRAP (CONC) (4IN)	432 6002 RIPRAP (CONC) (5 IN)	432 6045 RIPRAP (MOW STRIP) (4IN)	438 6004 CLEANING AND SEALING EXISTING JOINTS (CL7)	451 6019 RETROFIT RAIL (TY T631)	540 6002 MTL W-BEAM GD FEN (STEEL POST)	542 6001 REMOVE METAL BEAM GUARD FENCE	544 6001 GUARDRAIL END TREATMENT (INSTALL)	544 6003 GUARDRAIL END TREATMENT (REMOVE)	3076 6001 D-GR HMA TY-B PG64-22
STA	STA	CY	CY	CY	LF	LF	LF	LF	EA	EA	TON
56+13.20	102+00.00		84								2969
102+00.00	150+00.00										
150+00.00	198+00.00			65	151	250	625	337	4	4	3540
198+00.00	246+00.00										
246+00.00	294+00.00	4		54			425	457	5	4	
294+00.00	342+00.00	4	46	40			350		3		
342+00.00	365+00.00										
TOTAL		8	130	159	151	250	1400	794	12	8	6509

FOR ITEM 100 (PREP ROW), REFER TO GENERAL NOTES FOR QUANTITIES AND INFORMATION REGARDING WORK TO BE PERFORMED.

NO.	REVISION	BY	DATE

Seiler Lankes Group
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SH 16
QUANTITY SUMMARIES

11/30/2022 SHEET 1 OF 6

DESIGNED:	FED. RD DIV. NO.	STATE	FEDERAL AID PROJECT No.	HIGHWAY No.
CHECKED:	6	TEXAS		SH 16

DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	BWD	SAN SABA	0289	04	032	10

USER: mcastro
DATE: 11/30/2022 7:41
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SUMMARY OF TRAFFIC CONTROL QUANTITIES

STATION	508 6001	510 6003	512 6001	512 6025	512 6049	545 6003	545 6005	545 6019	662 6001	662 6004	662 6012	662 6016	662 6032	662 6034	662 6063	662 6075	662 6095	662 6109	662 6110	662 6111	677 6001	6001 6001	6185 6002	6185 6003
	CONSTRUCTING DETOURS	ONE-WAY TRAF CONT (PORT TRAF SIG)	PORT CTB (FUR & INST) (SGL SLP) (TY 1)	PORT CTB (MOVE) (SGL SLP) (TY 1)	PORT CTB (REMOVE) (SGL SLP) (TY 1)	CRASH CUSH ATTEN (MOVE & RESET)	CRASH CUSH ATTEN (REMOVE)	CRASH CUSH ATTEN (INSTL) (S)(N) (TL3)	WK ZN PAV MRK NON-REMOV (W) 4" (BRK)	WK ZN PAV MRK NON-REMOV (W) 4" (SLD)	WK ZN PAV MRK NON-REMOV (W) 8" (SLD)	WK ZN PAV MRK NON-REMOV (W) 24" (SLD)	WK ZN PAV MRK NON-REMOV (Y) 4" (SLD)	WK ZN PAV MRK NON-REMOV (Y) 4" (BRK)	WK ZN PAV MRK REMOV (W) 4" (SLD)	WK ZN PAV MRK REMOV (W) 24" (SLD)	WK ZN PAV MRK REMOV (Y) 4" (SLD)	WK ZN PAV MRK SHT TERM (TAB) TY W	WK ZN PAV MRK SHT TERM (TAB) TY Y	WK ZN PAV MRK SHT TERM (TAB) TY Y-2	ELIM EXT EXT PAV MRK & MRKS 4"	PORTABLE CHANGEABLE MESSAGE SIGN	TMA (STATIONARY)	TMA (MOBILE OPERATION)
	SY	MO	LF	LF	LF	EA	EA	EA	LF	LF	LF	LF	LF	LF	LF	LF	LF	EA	EA	EA	LF	DAY	DAY	HR
PHASE 1																								
(JERRY'S CREEK)			390	390	390	2	2	2																
CULVERT #1		1.5													660	48	1200				1200	24	24	8
PHASE 2	14684	1							10666	87758			78037								2000	20	208	48
PHASE 3	22606	1							19101	136036	2160	52	123319	9950							2000	20	269	48
PHASE 4																		1584	792	5895			31	160
PROJECTWIDE																						28		
TOTAL	37290	3.5	390	390	390	2	2	2	29767	223793	2160	52	201356	9950	660	48	1200	1584	792	5895	5200	92	532	264

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Texas Department of Transportation

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SH 16
QUANTITY SUMMARIES

11/29/2022 SHEET 2 OF 6

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.	
CHECKED:	6	TEXAS				SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.	
CHECKED:	BWD	SAN SABA	0289	04	032	11	

USER: mcastro
DATE: 11/29/2022 6:12
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SUMMARY OF SW3P QUANTITIES

SH 16		164 6033	164 6041	164 6043	166 6001	168 6001	506 6003	506 6011	506 6053	506 6038	506 6039
		DRILL SEEDING (PERM)(RURAL) (SANDY)	DRILL SEEDING (TEMP) (WARM)	DRILL SEEDING (TEMP) (COOL)	[2] FERTILIZER	VEGETATIVE WATERING	ROCK FILTER DAMS (INSTALL) (TY 3)	ROCK FILTER DAMS (REMOVE)	ROCK FILTER DAMS (INSTALL) (TY 2) (6:1)	TEMP SEDMT CONT FENCE (INSTALL)	TEMP SEDMT CONT FENCE (REMOVE)
STA	STA	SY	SY	SY	AC	MG	LF	LF	LF	LF	LF
56+13.20	102+00.00	14133	7067	7067	2.92	155.5	30	150	120	2687	2687
102+00.00	150+00.00	15259	7629	7629	3.15	167.8		160	160		
150+00.00	198+00.00	20026	10013	10013	4.14	220.3		240	240	1251	1251
198+00.00	246+00.00	13191	6596	6596	2.73	145.1	40	180	140	2134	2134
246+00.00	294+00.00	13186	6593	6593	2.72	145.0	70	230	160	1753	1753
294+00.00	342+00.00	13643	6822	6822	2.82	150.1	180	340	160	2954	2954
342+00.00	390+00.00	13105	6552	6552	2.71	144.2	60	120	60	1951	1951
TOTAL		102544	51272	51272	21	1128.0	380	1420	1040	12730	12730

[2] SUBSIDIARY TO ITEM 164

SUMMARY OF MAILBOXES

STATION	NO.	LT/RT	530 6008 TURNOUTS (ACP)	560 6003 MAILBOX INSTALL-M (TWG-POST) TY 1	560 6007 MAILBOX INSTALL-S (WC-POST) TY 3	560 6008 MAILBOX INSTALL-D (WC-POST) TY 3	SMALL	MEDIUM	LARGE
			SY	EA	EA	EA			
100+44	1	LT	11	1			3		
107+76	2	LT	12	1			3	1	
113+25	3	LT	10		1		1		
128+10	4	LT			1		1		
141+97	5	LT	9		1		1		
165+00	6	LT	11		1		1		
177+17	7	LT	10			1		2	
224+74	8	LT	12		1		1		
278+41	9	RT	9		1				1
362+94	10	RT	11		1		1		
TOTAL			95	2	7	1	12	3	1

NO.	REVISION	BY	DATE

Texas Department of Transportation
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SH 16
QUANTITY SUMMARIES

11/22/2022 SHEET 3 OF 6

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.	
CHECKED:	6	TEXAS				SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.	
CHECKED:	BWD	SAN SABA	0289	04	032	12	

USER: jsalinas
DATE: 11/22/2022 2:33
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FILE: pw://server.sigeng.com:Sig-ds/Documents/TxDOT0103 Brownwood SH 16\Design_Data\4 - Design\Plan_Set_101_General\SH16 SUM02_B.dgn

SUMMARY OF DRAINAGE STRUCTURES

ID	ROADWAY	CULVERT STATION	DESC	400 6006 CUT & RESTORING PAV (SY)	401 6001 FLOWABLE BACKFILL (CY)	403 6001 TEMPORARY SPL SHORING (SF)	432 6002 RIPRAP (CONC)(5 IN) (CY)	462 6010 CONC BOX CULV (6 FT X 3 FT) (LF)	462 6092 CONC BOX CULV(5'X 6.5') (LF)	466 6179 WINGWALL (PW - 1) (HW=4 FT) (EA)	466 6183 WINGWALL (PW - 1) (HW=8 FT) (EA)	467 6217 SET (TY I) (S= 6 FT) (HW= 5 FT) (3:1) (C) (EA)
Culvert #1	SH 16	95+93	3 - 6' X 3' MBC	46	32		9	65				6
Culvert #2	SH 16	216+96	No Work To Be Done									
Culvert #3	SH 16	252+69	No Work To Be Done									
Culvert #4	SH 16	288+68	1 - 6.5' X 5' SBC	9	5	410			26		2	
Culvert #5	SH 16	294+12	1 - 3' X 2' SBC			81				1		
Culvert #6	SH 16	299+17	*									
Culvert #7	SH 16	308+03	No Work To Be Done									
Culvert #8	SH 16	316+57	No Work To Be Done									
Culvert #9	SH 16	326+07	No Work To Be Done									
Culvert #10	SH 16	338+91	No Work To Be Done									
Culvert #11	SH 16	347+27	No Work To Be Done									
			TOTAL CSJ: 0289-04-032	55	37	491	9	65	26	1	2	6

* Adding MBGF. See Roadway Sheets for MBGF layout

Note: All 11 culvert crossings to be cleaned out. This work will be considered subsidiary.

NO.	REVISION	BY	DATE

Texas Department of Transportation

RTG RODRIGUEZ TRANSPORTATION GROUP
FIRM #587

SH 16
SUMMARY OF DRAINAGE

11/22/2022 SHEET 4 OF 6

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.		HIGHWAY No.	
CHECKED:		TEXAS			SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	BWD	SAN SABA	0289	04	032	13

USER: jsalinas
DATE: 11/22/2022 2:33
SCRIPT: pw://server.stgeng.com:Stg-ds/Documents/TxDOT0103 Brownwood SH 16\Design_Data\4 - Design\Miscellaneous\SH16_pkt.dpen
FILE: pw://server.stgeng.com:Stg-ds/Documents/TxDOT0103 Brownwood SH 16\Design_Data\4 - Design\Plan_Set_1105_Drainage\SH16_DRN_SUMMARY01.dgn

SUMMARY OF PAVEMENT MARKING, DELINEATOR, AND SIGNING ITEMS

LOCATION	STATION	618 6023	624 6006	636 6001	644 6001	644 6004	644 6007	644 6031	644 6036	644 6060	* 644 6076	658 6081
		CONDT (PVC) (SCH 40) (2")	0624 6006 GROUND BOX TY BATTERY (162915)W/ APRON	ALUMINUM SIGNS (TY A)	IN SM RD SN SUP & AM TY10BWG (1) SA (P)	IN SM RD SN SUP & AM TY10BWG (1) SA (T)	IN SM RD SN SUP & AM TY10BWG (1) SA (U)	IN SM RD SN SUP & AM TYS80 (1) SA (T - 2EXT)	IN SM RD SN SUP & AM TYS80 (1) SA (U - BM)	IN SM RD SN SUP & AM TYTWT (1) WS (P)	REMOVE SM RD SN SUP&AM	INSTL DEL ASSM (D-SW)SZ 1(WFLX)GND (BI)
		LF	EA	SF	EA	EA	EA	EA	EA	EA	EA	EA
SHEET 1 OF 7 (SHT #147)	BEGIN PROJECT TO STA 102+00.00	10	1	9	19	2	3		1	14	32	13
SHEET 2 OF 7 (SHT #148)	STA 102+00.00 TO STA 150+00.00				12		2	1		9	13	13
SHEET 3 OF 7 (SHT #149)	STA 150+00.00 TO STA 198+00.00				10					4	3	
SHEET 4 OF 7 (SHT #150)	STA 198+00.00 TO STA 246+00.00				13					8	19	
SHEET 5 OF 7 (SHT #151)	STA 246+00.00 TO STA 294+00.00				5					3	3	
SHEET 6 OF 7 (SHT #152)	STA 294+00.00 TO STA 342+00.00				4							
SHEET 7 OF 7 (SHT #153)	STA 342+00.00 TO STA 390+00.00				8	1	1					
PROJECT TOTALS		10	1	9	71	3	6	1	1	38	70	26

* FOR CONTRACTOR INFORMATION ONLY.

SUMMARY OF PAVEMENT MARKING, DELINEATOR, AND SIGNING ITEMS

LOCATION	STATION	666 6017	666 6035	666 6053	666 6071	666 6077	666 6285	666 6289	666 6293	666 6305	672 6007	672 6009
		REFL PAV MRK TY I (W)6"(DOT) (090MIL)	REFL PAV MRK TY I (W)8"(SLD) (090MIL)	REFL PAV MRK TY I (W)(ARROW) (090MIL)	REFL PAV MRK TY I(W)(LNDP ARW)(090MIL)	REFL PAV MRK TY I (W)(WORD)(090MIL)	REF PROF PAV MRK TY I(W)6"(SLD)(090MIL)	REF PROF PAV MRK TY I(Y)6"(SLD)(090MIL)	REF PROF PAV MRK TY I(Y)6"(BRK)(090MIL)	RE PM W/RET REQ TY I (W)6"(BRK) (090MIL)	REFL PAV MRKR TY I-C	REFL PAV MRKR TY II-A-A
		LF	LF	EA	EA	EA	LF	LF	LF	LF	EA	EA
SHEET 1 OF 7 (SHT #147)	BEGIN PROJECT TO STA 102+00.00		860	4		2	9073	14778	400		43	456
SHEET 2 OF 7 (SHT #148)	STA 102+00.00 TO STA 150+00.00	111	545	4		2	9,385	10,289	1,340	460	27	341
SHEET 3 OF 7 (SHT #149)	STA 150+00.00 TO STA 198+00.00						9,600	9,605		1,200		240
SHEET 4 OF 7 (SHT #150)	STA 198+00.00 TO STA 246+00.00	243			2		9,529	11,342		690		284
SHEET 5 OF 7 (SHT #151)	STA 246+00.00 TO STA 294+00.00	243			2		9,600	12,148		580		304
SHEET 6 OF 7 (SHT #152)	STA 294+00.00 TO STA 342+00.00						9,600	9,598		1,200		240
SHEET 7 OF 7 (SHT #153)	STA 342+00.00 TO STA 390+00.00	126					4,600	4,602		450		115
PROJECT TOTALS		723	1,405	8	4	4	61,387	72,362	1,740	4,580	70	1,980

SUMMARY OF PAVEMENT MARKING, DELINEATOR, AND SIGNING ITEMS

LOCATION	STATION	672 6010	682 6003	684 6010	685 6004	685 6006
		REFL PAV MRKR TY II-C-R	VEH SIG SEC (12")LED(YEL)	TRF SIG CBL (TY A)(12 AWG)(5 CONDR)	INSTL RDSD FLSH BCN ASSM (SOLAR PWRD)	REMOV RDSD FLSH BCN AM (SOLAR PWRD)
		EA	EA	LF	EA	EA
SHEET 1 OF 7 (SHT #147)	BEGIN PROJECT TO STA 102+00.00		2	10	1	1
SHEET 2 OF 7 (SHT #148)	STA 102+00.00 TO STA 150+00.00	23				
SHEET 3 OF 7 (SHT #149)	STA 150+00.00 TO STA 198+00.00	60				
SHEET 4 OF 7 (SHT #150)	STA 198+00.00 TO STA 246+00.00	35				
SHEET 5 OF 7 (SHT #151)	STA 246+00.00 TO STA 294+00.00	29				
SHEET 6 OF 7 (SHT #152)	STA 294+00.00 TO STA 342+00.00	60				
SHEET 7 OF 7 (SHT #153)	STA 342+00.00 TO STA 390+00.00	23				
PROJECT TOTALS		230	2	10	1	1

Jacobs
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DALLAS, TX 75201-3136
Phone: +1 (214) 638-0145
Firm Registration: F-2966

SH 16
QUANTITY SUMMARY

PAVEMENT MARKING & DELINEATION

11/29/2022 SHEET 5 OF 6

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.	HIGHWAY No.
CHECKED:	6	TEXAS		SH 16

DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	BWD	SAN SABA	0289	04	032	14

SUMMARY OF DRIVEWAY AND INTERSECTION QUANTITIES

PROJECT LAYOUT SHEET NO.	NO.	CR/ DVWY/ MBX T.O.	STA	LT/RT	D (to row)	104 6017 REMOVING CONC (DRIVEWAYS)	464 6005 RC PIPE (CL III) (24 IN)	464 6007 RC PIPE (CL III) (30 IN)	467 6395 SET (TY II) (24IN) (RCP) (6:1)(P)	467 6423 SET (TY II) (30 IN) (RCP) (6:1)(P)	496 6016 REMOV STR (PIPE)	530 6004 DRIVEWAYS (CONC)	530 6006 DRIVEWAYS (SURF TREAT)
					FT	SY	LF	LF	EA	EA	EA	SY	SY
80	1	DVWY	58+10.20	LT	15		58		2		1		203
80	2	DVWY	93+67.67	RT	26								62
80	3	DVWY	98+12.05	RT	26		29		2				49
80	4	DVWY	100+01.69	RT	26								67
80	5	DVWY	101+39.39	RT	26		34		2				46
81	6	DVWY	108+27.79	RT	27		68		2				146
81	7	DVWY	108+27.79	RT	27								
81	8	DVWY	113+56.20	LT	25			28		2	1		50
81	9	CR 103	114+63.39	LT	25			36		2	1		102
81	10	DVWY	117+97.74	LT	49			40		2	1		96
81	11	CR 105	121+12.41	LT	26		39		2		1		135
81	12	DVWY	128+11.38	RT	25								57
81	13	CR 116	131+15.61	RT	25								125
81	14	DVWY	131+68.59	RT	25								59
81	15	DVWY	140+20.72	RT	25		49		2				76
81	16	DVWY	142+28.51	LT	26		32		2				65
82	17	DVWY	165+33.43	RT	26		32		2		1		46
82	18	DVWY	168+27.72	LT	26		42		2		1		59
82	19	DVWY	176+09.30	RT	26			27		2	1		56
82	20	DVWY	177+06.59	RT	25			25		2	1		51
82	21	DVWY	177+48.69	LT	27		28		2				62
SEE CR 111 PLAN AND PROFILE							47		2				
83	22	DVWY	225+07.70	LT	25		28		2		1		49
SEE CR 122 PLAN AND PROFILE							61		2				
83	23	DVWY	237+83.55	RT	48								321
83	24	DVWY	239+33.41	LT	26								48
84	25	DVWY	275+57.49	LT	27		44		2		1		73
84	26	DVWY	278+70.87	RT	25		46		2		1		56
85	27	DVWY	307+42.74	LT	26								54
85	28	DVWY	318+02.71	LT	26	209						165	
85	29	DVWY	329+74.01	LT	27								64
86	30	DVWY	363+19.07	LT	26		41		2				96
TOTAL						209	678	156	32	10	12	165	2373

NO.	REVISION	BY	DATE

Texas Department of Transportation

Seiler Lankes Group
TBPE License No. 12670
PLANNING • ENGINEERING • CONSTRUCTION

SH 16
QUANTITY SUMMARIES

11/22/2022 SHEET 6 OF 6

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.	
CHECKED:	6	TEXAS				SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.	
CHECKED:	BWD	SAN SABA	0289	04	032	15	

USER: jsalinas
DATE: 11/22/2022 2:33
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FILE: pw://server.slgeng.com:Slge-ds/Documents/TxDOT0103 Brownwood SH 16\Design_Data\4 - Design\Plan_Set_101_General\SH16 SUM04.dgn

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)					BRIDGE MOUNT CLEARANCE SIGNS (See Note 2)
							POST TYPE	POSTS	ANCHOR TYPE	MOUNTING DESIGNATION		TY = TYPE
							FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	1 or 2	UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	TY N TY S
1	1	D15-10T	PASSING LANE 2 MILES	54X42	X		10BWG	1	SA	U		
1	2	W1-8L		18X24	X		10BWG	1	SA	P		
1		W1-8R		18X24	X		BACK MNT					
1	3	W1-8L		18X24	X		10BWG	1	SA	P		
1		W1-8R		18X24	X		BACK MNT					
1	4	W1-8L		18X24	X		10BWG	1	SA	P		
1		W1-8R		18X24	X		BACK MNT					
1	5	M3-1	NORTH	24X12	X		TWT	1	WS	P		
1		M1-6T(16)	16 TEXAS	24X24	X							
1	6	W1-8L		18X24	X		10BWG	1	SA	P		
1		W1-8R		18X24	X		BACK MNT					
1	7	W1-8L		18X24	X		10BWG	1	SA	P		
1		W1-8R		18X24	X		BACK MNT					
1	8	R2-1	SPEED LIMIT 70	30X36	X		TWT	1	WS	P		
1	9	D7-6aTR	HISTORICAL MARKER 1 MILE ON RIGHT 4712	48X48	X		10BWG	1	SA	U		

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).

11/22/2022 SHEET 1 OF 15

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	0289	04	032	SH 16
4-16	DIST	COUNTY		SHEET NO.
8-16	BWD	SAN SABA		16

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DATE: 11/22/2022 1:26
FILE: pw://server.sig-eng.com:Sig-ds/Documents/TxDOT0103 Brownwood SH 16/Design/sums16.dgn

SUMMARY OF SMALL SIGNS

SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX)

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	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"	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
1	10	W1-8L		18X24	X		10BWG	1	SA	P		
1		W1-8R		18X24	X		BACK MNT					
1	11	W1-8L		18X24	X		10BWG	1	SA	P		
1		W1-8R		18X24	X		BACK MNT					
1	12	W8-13aT	BRIDGE MAY ICE IN COLD WEATHER	36X36	X		TWT	1	WS	P		
1	13	W1-8L		18X24	X		10BWG	1	SA	P		
1		W1-8R		18X24	X		BACK MNT					
1	14	W1-8L		18X24	X		10BWG	1	SA	P		
1		W1-8R		18X24	X		BACK MNT					
1	15	W1-2L		36X36	X		10BWG	1	SA	P		
1		W13-1P	60 MPH	24X24	X							
1	16	M2-1	JCT	21X15	X		TWT	1	WS	P		
1		M1-6F (1480)	FARM 1480 MAP	24X24	X							
1	17	W2-2L		36X36	X		TWT	1	WS	P		
1	18	W1-2aT	HIGHWAY INTERSECTION AHEAD	48X48	X		INST FBA (SOLAR)					

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"

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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).

11/22/2022 SHEET 2 OF 15

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	0289	04	032	SH 16
4-16	DIST	COUNTY		SHEET NO.
8-16	BWD	SAN SABA		17

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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	POSTS	ANCHOR TYPE	MOUNTING DESIGNATION PREFABRICATED	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
							FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	1 or 2	UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	P = "Plain" T = "T" U = "U"		TY N TY S
1	19	M2-1	JCT	21X15	X		TWT	1	WS	P		
1		M1-6F(500)	FARM 500 RANCH	24X24	X							
1	20	M3-1	NORTH	24X12	X		TWT	1	WS	P		
1		M1-6T(16)	16 TEXAS	24X24	X							
1		D10-7aT	4 1 2	3x10	X							
1		D10-7aT	4 1 2	3x10	X		BACK MNT					
1	21	R2-1	SPEED LIMIT 70	30X36	X		TWT	1	WS	P		
1	22	W1-2R		36X36	X		10BWG	1	SA	P		
1		W13-1P	60 MPH	24X24	X							
1	23	D3-1(RBL)	← Regency Bridge	60X24	X		10BWG	1	SA	T		
1	24	W1-8L		18X24	X		10BWG	1	SA	P		
1		W1-8R		18X24	X		BACK MNT					
1	25	W1-8L		18X24	X		10BWG	1	SA	P		
1		W1-8R		18X24	X		BACK MNT					
1	26	M3-3	SOUTH	24X12	X		TWT	1	WS	P		

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.

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NOTE:

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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).

11/22/2022 SHEET 3 OF 15

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	0289	04	032	SH 16
4-16	DIST	COUNTY		SHEET NO.
8-16	BWD	SAN SABA		18

18

DATE: 11/22/2022 1:26
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DGN: C:\PPIOG\PSE_9708.TMP

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"	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
1		M1-6T(16)		24X24	X							
1	27	W1-8L		18X24	X		10BWG	1	SA	P		
1		W1-8R		18X24	X		BACK MNT					
1	28	W1-8L		18X24	X		10BWG	1	SA	P		
1		W1-8R		18X24	X		BACK MNT					
1	29	M1-6F(500)		24X24	X		10BWG	1	SA	U		
1		M6-1L		21X15	X							
1		M1-6T(16)		24X24	X							
1		M6-4		21X15	X							
1	30	W1-7T		96X36	X		S80	1	SA	U	BM	
1	31	R1-1		36X36	X		TWT	1	WS	P		
1	32	R3-9b		24X36	X		TWT	1	WS	P		
1	33	M1-6F(500)		24X24	X		TWT	1	WS	P		
1		M6-1R		21X15	X							
1	34	W1-8L		18X24	X		10BWG	1	SA	P		

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"

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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 4-16 8-16	0289	04	032	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	SAN SABA		19

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DATE: 11/29/2022 12:19
FILE: pw://server.sig-eng.com:Sig-ds/Documents/TxDOT0103 Brownwood SH 16/Design/SOSS2004.dgn

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"	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
1		W1-8R		18X24	X		BACK MNT					
1	35	M3-1		24X12	X		TWT	1	WS	P		
1		M1-6T(16)		24X24	X							
1	36	W1-8L		18X24	X		10BWG	1	SA	P		
1		W1-8R		18X24	X		BACK MNT					
1	37	W1-8L		18X24	X		10BWG	1	SA	P		
1		W1-8R		18X24	X		BACK MNT					
1	38	D3-1(RBR)		54X24	X		10BWG	1	SA	T		
1	39	R2-1		30X36	X		TWT	1	WS	P		
1	40	W1-8L		18X24	X		10BWG	1	SA	P		
1		W1-8R		18X24	X		BACK MNT					
2	1	W1-8L		18X24	X		10BWG	1	SA	P		
2		W1-8R		18X24	X		BACK MNT					
2	2	W1-2L		36X36	X		10BWG	1	SA	P		
2		W13-1P		24X24	X							

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

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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	0289	04	032	SH 16
4-16	DIST	COUNTY		SHEET NO.
8-16	BWD	SAN SABA		20

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DATE: 11/29/2022 12:21
FILE: pw://server.sig-eng.com:Sig-ds/Documents/TxDOT0103 Brownwood SH 16/Design/sums16.dgn

SUMMARY OF SMALL SIGNS

SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX)

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	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"	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
2	3	D2-2(CG)	Comanche 19 Goldthwaite 52	102X30		X	S80	1	SA	T	2EXT	
2	4	D20-1TL(103)	CO RD 103 ←	24X24	X		TWT	1	WS	P		
2	5	M2-1	JCT	21X15	X		TWT	1	WS	P		
2		M1-6F(500)	FARM 500 RANCH	24X24	X							
2	6	R1-1	STOP	36X36	X		TWT	1	WS	P		
2	7	I-5		24X24	X		10BWG	1	SA	U		
2		D20-1TL(105)	CO RD 105 ←	24X24	X							
2	8	D20-1TR(103)	CO RD 103 →	24X24	X		TWT	1	WS	P		
2	9	R1-1	STOP	36X36	X		TWT	1	WS	P		
2	10	I-5		24X24	X		10BWG	1	SA	U		
2		D20-1TR(105)	CO RD 105 →	24X24	X							
2	11	D20-1TR(116)	CO RD 116 →	24X24	X		TWT	1	WS	P		
2	12	R3-9b	CENTER LANE ONLY	24X36	X		TWT	1	WS	P		
2	13	R1-1	STOP	36X36	X		TWT	1	WS	P		
2	14	W1-2L		36X36	X		10BWG	1	SA	P		

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
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Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	0289	04	032	SH 16
4-16	DIST	COUNTY		SHEET NO.
8-16	BWD	SAN SABA		21

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DATE: 11/22/2022 1:26
FILE: pw://server.sig-eng.com:Sig-ds/Documents/TxDOT0103 Brownwood SH 16/Design/sums16.dgn

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	POSTS	ANCHOR TYPE	MOUNTING DESIGNATION PREFABRICATED	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
							FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	1 or 2	UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	P = "Plain" T = "T" U = "U"		TY N TY S
2		W13-1P	60 MPH	24X24	X							
2	15	D20-1TL(116)	CO RD 116	24X24	X		TWT	1	WS	P		
2	16	W1-8L		18X24	X		10BWG	1	SA	P		
2		W1-8R		18X24	X		BACK MNT					
2	17	W1-8L		18X24	X		10BWG	1	SA	P		
2		W1-8R		18X24	X		BACK MNT					
2	18	W1-8L		18X24	X		10BWG	1	SA	P		
2		W1-8R		18X24	X		BACK MNT					
2	19	R4-2aT	LEFT LANE FOR PASSING ONLY	36X54	X		10BWG	1	SA	P		
2	20	W1-8L		18X24	X		10BWG	1	SA	P		
2		W1-8R		18X24	X		BACK MNT					
2	21	W1-8L		18X24	X		10BWG	1	SA	P		
2		W1-8R		18X24	X		BACK MNT					
2	22	W1-8L		18X24	X		10BWG	1	SA	P		
2		W1-8R		18X24	X		BACK MNT					

ALUMINUM SIGN BLANKS THICKNESS	
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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	0289	04	032	SH 16
4-16	DIST	COUNTY		SHEET NO.
8-16	BWD	SAN SABA		22

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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)					BRIDGE MOUNT CLEARANCE SIGNS (See Note 2)
							POST TYPE	POSTS	ANCHOR TYPE	MOUNTING DESIGNATION		TY = TYPE
							FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	1 or 2	UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	TY N TY S
2	23	W1-8L		18X24	X		10BWG	1	SA	P		
2		W1-8R		18X24	X		BACK MNT					
2	24	W1-2R		36X36	X		10BWG	1	SA	P		
2		W13-1P	60 MPH	24X24	X							
3	1	W11-3		36X36	X		TWT	1	WS	P		
3	2	W8-13aT	BRIDGE MAY ICE IN COLD WEATHER	36X36	X		TWT	1	WS	P		
3	3	W1-2R		36X36	X		10BWG	1	SA	P		
3		W13-1P	60 MPH	24X24	X							
3	4	W8-13aT	BRIDGE MAY ICE IN COLD WEATHER	36X36	X		TWT	1	WS	P		
3	5	W1-8L		18X24	X		10BWG	1	SA	P		
3		W1-8R		18X24	X		BACK MNT					
3	6	W1-8L		18X24	X		10BWG	1	SA	P		
3		W1-8R		18X24	X		BACK MNT					
3	7	W1-8L		18X24	X		10BWG	1	SA	P		
3		W1-8R		18X24	X		BACK MNT					

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
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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	0289	04	032	SH 16
4-16	DIST	COUNTY		SHEET NO.
8-16	BWD	SAN SABA		23

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DATE: 11/22/2022 1:26
FILE: pw://server.sig-eng.com:Sig-ds/Documents/TxDOT0103 Brownwood SH 16/Design/Dgn/sums16.dgn

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)					BRIDGE MOUNT CLEARANCE SIGNS (See Note 2)
							POST TYPE	POSTS	ANCHOR TYPE	MOUNTING DESIGNATION		TY = TYPE
							FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	1 or 2	UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	TY N TY S
3	8	W1-8L		18X24	X		10BWG	1	SA	P		
3		W1-8R		18X24	X		BACK MNT					
3	9	M3-3	NORTH	24X12	X		TWT	1	WS	P		
3		M1-6T(16)	16 TEXAS	24X24	X							
3		D10-7aT	4 1 0	3x10	X							
3		D10-7aT	4 1 0	3x10	X		BACK MNT					
3	10	W1-8L		18X24	X		10BWG	1	SA	P		
3		W1-8R		18X24	X		BACK MNT					
3	11	W1-8L		18X24	X		10BWG	1	SA	P		
3		W1-8R		18X24	X		BACK MNT					
3	12	W1-8L		18X24	X		10BWG	1	SA	P		
3		W1-8R		18X24	X		BACK MNT					
3	13	W1-8L		18X24	X		10BWG	1	SA	P		
3		W1-8R		18X24	X		BACK MNT					
3	14	W1-2L		36X36	X		10BWG	1	SA	P		

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080"
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Texas Department of Transportation — Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	0289	04	032	SH 16
4-16	DIST	COUNTY		SHEET NO.
8-16	BWD	SAN SABA		24

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DATE: 11/22/2022 1:26
FILE: pw://server.sig-eng.com:Sig-ds/Documents/TxDOT0103 Brownwood SH 16/Design/sums16.dgn

SUMMARY OF SMALL SIGNS

SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX)

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	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"	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
3		W13-1P		24X24	X							
4	1	W1-2L		36X36	X		10BWG	1	SA	P		
4		W13-1P		24X24	X							
4	2	W1-8L		18X24	X		10BWG	1	SA	P		
4		W1-8R		18X24	X		BACK MNT					
4	3	W1-8L		18X24	X		10BWG	1	SA	P		
4		W1-8R		18X24	X		BACK MNT					
4	4	D20-1TL(111)		24X24	X		TWT	1	WS	P		
4	5	W1-8L		18X24	X		10BWG	1	SA	P		
4		W1-8R		18X24	X		BACK MNT					
4	6	W9-1L		36X36	X		TWT	1	WS	P		
4	7	W1-8L		18X24	X		10BWG	1	SA	P		
4		W1-8R		18X24	X		BACK MNT					
4	8	D20-1TR(122)		24X24	X		TWT	1	WS	P		
4	9	W1-8L		18X24	X		10BWG	1	SA	P		

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SUMMARY OF SMALL SIGNS

SOSS

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	0289	04	032	SH 16
4-16	DIST	COUNTY		SHEET NO.
8-16	BWD	SAN SABA		25

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DATE: 11/22/2022 1:26
FILE: pw://server.sig-eng.com:Sig-ds/Documents/TxDOT0103 Brownwood SH 16/Design/sums16.dgn

SUMMARY OF SMALL SIGNS

SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX)

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	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"	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
4		W1-8R		18X24	X		BACK MNT					
4	10	W9-2TR	LANE ENDS MERGE RIGHT	36X36	X		TWT	1	WS	P		
4	11	R1-1	STOP	36X36	X		TWT	1	WS	P		
4	12	W1-8L		18X24	X		10BWG	1	SA	P		
4		W1-8R		18X24	X		BACK MNT					
4	13	W1-8L		18X24	X		10BWG	1	SA	P		
4		W1-8R		18X24	X		BACK MNT					
4	14	W1-8L		18X24	X		10BWG	1	SA	P		
4		W1-8R		18X24	X		BACK MNT					
4	15	R1-1	STOP	36X36	X		TWT	1	WS	P		
4	16	D20-1TR(111)	CO RD 111	24X24	X		TWT	1	WS	P		
4	17	W1-8L		18X24	X		10BWG	1	SA	P		
4		W1-8R		18X24	X		BACK MNT					
4	18	W1-8L		18X24	X		10BWG	1	SA	P		
4		W1-8R		18X24	X		BACK MNT					

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
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SUMMARY OF SMALL SIGNS

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FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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4-16	DIST	COUNTY		SHEET NO.
8-16	BWD	SAN SABA		26

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DATE: 11/22/2022 1:26
FILE: pw://server.sig-eng.com:Sig-ds/Documents/TxDOT0103 Brownwood SH 16/Design/sums16.dgn

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	POSTS	ANCHOR TYPE	MOUNTING DESIGNATION PREFABRICATED	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
							FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	1 or 2	UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	P = "Plain" T = "T" U = "U"		TY N TY S
4	19	D20-1TL(122)	CO RD 122	24X24	X		TWT	1	WS	P		
4	20	W1-8L		18X24	X		10BWG	1	SA	P		
4		W1-8R		18X24	X		BACK MNT					
4	21	W1-2R		36X36	X		10BWG	1	SA	P		
4		W13-1P	60 MPH	24X24	X							
5	1	W9-2TR	LANE ENDS MERGE RIGHT	36X36	X		TWT	1	WS	P		
5	2	W9-1L	LEFT LANE ENDS	36X36	X		TWT	1	WS	P		
5	3	W1-2R		36X36	X		10BWG	1	SA	P		
5		W13-1P	60 MPH	24X24	X							
5	4	W1-8L		18X24	X		10BWG	1	SA	P		
5		W1-8R		18X24	X		BACK MNT					
5	5	M3-1	NORTH	24X12	X		TWT	1	WS	P		
5		M1-6T(16)	16 TEXAS	24X24	X							
5		D10-7aT	4 0 8	3x10	X							
5		D10-7aT	4 0 8	3x10	X		BACK MNT					

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).

11/22/2022 SHEET 12 OF 15

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 4-16 8-16	0289	04	032	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	SAN SABA		27

18

DATE: 11/22/2022 1:26
FILE: pw://server.sig-eng.com:Sig-ds/Documents/TxDOT0103 Brownwood SH 16/Design/SOSS

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	POSTS	ANCHOR TYPE	MOUNTING DESIGNATION PREFABRICATED	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
							FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	1 or 2	UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	P = "Plain" T = "T" U = "U"		TY N TY S
5	6	W1-8L		18X24	X		10BWG	1	SA	P		
5		W1-8R		18X24	X		BACK MNT					
5	7	W1-8L		18X24	X		10BWG	1	SA	P		
5		W1-8R		18X24	X		BACK MNT					
5	8	W1-8L		18X24	X		10BWG	1	SA	P		
5		W1-8R		18X24	X		BACK MNT					
6	1	W1-8L		18X24	X		10BWG	1	SA	P		
6		W1-8R		18X24	X		BACK MNT					
6	2	W1-8L		18X24	X		10BWG	1	SA	P		
6		W1-8R		18X24	X		BACK MNT					
6	3	W1-8L		18X24	X		10BWG	1	SA	P		
6		W1-8R		18X24	X		BACK MNT					
6	4	W1-2L		36X36	X		10BWG	1	SA	P		
6		W13-1P		24X24	X							
7	1	W1-2L		36X36	X		10BWG	1	SA	P		

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"

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NOTE:

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11/22/2022 SHEET 13 OF 15

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 4-16 8-16	0289	04	032	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	SAN SABA		28

18

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	POSTS	ANCHOR TYPE	MOUNTING DESIGNATION PREFABRICATED	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
							FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	1 or 2	UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	P = "Plain" T = "T" U = "U"		TY N TY S
7		W13-1P	60 MPH	24X24	X							
7	2	W1-8L		18X24	X		10BWG	1	SA	P		
7		W1-8R		18X24	X		BACK MNT					
7	3	W1-8L		18X24	X		10BWG	1	SA	P		
7		W1-8R		18X24	X		BACK MNT					
7	4	W1-8L		18X24	X		10BWG	1	SA	P		
7		W1-8R		18X24	X		BACK MNT					
7	5	W1-8L		18X24	X		10BWG	1	SA	P		
7		W1-8R		18X24	X		BACK MNT					
7	6	W1-8L		18X24	X		10BWG	1	SA	P		
7		W1-8R		18X24	X		BACK MNT					
7	7	W1-8L		18X24	X		10BWG	1	SA	P		
7		W1-8R		18X24	X		BACK MNT					
7	8	W1-2R		36X36	X		10BWG	1	SA	P		
7		W13-1P	60 MPH	24X24	X							

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3. For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD(GEN).

11/22/2022 SHEET 14 OF 15

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 4-16 8-16	0289	04	032	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	SAN SABA		29

18

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	POSTS	ANCHOR TYPE	MOUNTING DESIGNATION PREFABRICATED	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
							FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	1 or 2	UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	P = "Plain" T = "T" U = "U"		TY N TY S
7	9	R4-2aT	LEFT LANE FOR PASSING ONLY	36X54	X		10BWG	1	SA	T		
7	10	D15-10T	PASSING LANE 2 MILES	54X42	X		10BWG	1	SA	U		

ALUMINUM SIGN BLANKS THICKNESS	
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11/29/2022 SHEET 15 OF 15

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	0289	04	032	SH 16
4-16	DIST	COUNTY		SHEET NO.
8-16	BWD	SAN SABA		30

18

DATE: 11/29/2022 12:22
FILE: pw://server.sig-eng.com:Sig-ds/Documents/TxDOT0103 Brownwood SH 16/Design/sums16.dgn

SEQUENCE OF CONSTRUCTION

PHASE 1 - CULVERT EXTENSIONS AND BRIDGE RAIL REPLACEMENT

A. SET UP TRAFFIC CONTROL SIGNS ALONG SH 16. SET UP SW3P BMPS AT CROSS CULVERT EXTENSION SITES AND AT JERRY'S CREEK BRIDGE, BOTH SIDES.

B. EXTEND CROSS CULVERTS AND CONSTRUCT SAFETY END TREATMENTS, PER THE CULVERT LAYOUT SHEETS, BETWEEN FM 1480 AND JERRY'S CREEK. COMPLETE CULVERT WORK WITHIN THESE LIMITS BEFORE PROCEEDING TO OTHER CULVERT WORK ON THE PROJECT. FOR ALL CULVERTS EXCEPT CULVERT #1, USE TCP SET-UP SHOWN ON "CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN PROJECT LIMITS" DETAIL IN BC(10)-21.

   FOR CULVERT #1, USE A TWO STEP CONSTRUCTION PROCESS USING A ONE-LANE, TWO-WAY OPERATION FOR EACH STEP. USE TCP SET-UP SHOWN ON "ONE LANE TRAFFIC CONTROL AT CULVERTS" DETAIL SHEET.

C. CONSTRUCT BRIDGE RAIL AND MBGF TIES AT JERRY'S CREEK BRIDGE. LIMITS OF MBGF REPLACEMENT WORK IN THIS PHASE INCLUDES 25' OF MBGF. TIE NEW MBGF TIE TO EXISTING MBGF AT ALL APPROACHES. USE TCP SET-UP SHOWN ON THE "BRIDGE RAIL / MBGF REPLACEMENT DETAIL" SHEET.

D. EXTEND CROSS CULVERTS AND CONSTRUCT SAFETY END TREATMENTS, PER THE CULVERT LAYOUT SHEETS, BETWEEN JERRY'S CREEK BRIDGE AND STA 365+00. USE TCP SET-UP SHOWN ON "CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN PROJECT LIMITS" DETAIL IN BC(10)-21.

E. SETUP SW3P BMPS FOR PAVEMENT RECONSTRUCTION WORK FOR THE LENGTH OF THE PROJECT AS SHOWN ON THE SW3P LAYOUT SHEETS.

PHASE 2 - PAVEMENT RECONSTRUCTION (FM 1480 TO JERRY'S CREEK)

A. (STEP 1)- CONSTRUCT PAVEMENT WIDENING (10" FLEX BASE AND 1-CST) ON RIGHT SIDE OF SH 16 AS SHOWN ON THE TCP TYPICAL SECTION STEP 1 FROM STA. 67+00.00 TO STA. 180+20.00. CONSTRUCT TEMPORARY PAVEMENT ALONG RIGHT SIDE OF SH 16 FROM STA. 59+54.16 TO STA. 67+00.00 AND ALONG LEFT SIDE OF SH 16 FROM STA. 171+94.81 TO STA. 177+20.00 AS SHOWN ON TCP LAYOUT SHEETS. PREP SUBGRADE IN ACCORDANCE WITH ITEM 247. USE DAYTIME SHOULDER AND/OR LANE CLOSURES TCP OPERATIONS AS DETAILED IN TCP (1-2)-18 TO PERFORM THIS WORK.

B. REHABILITATE EXISTING PAVEMENT ON LEFT SIDE OF SH 16 TO THE PHASE 2 LIMITS SHOWN ON THE TCP LAYOUT SHEETS. CONSTRUCTION ACTIVITIES INCLUDE:

1. PLACE WORK ZONE PAVEMENT MARKINGS ON RIGHT SIDE OF SH 16 AS INDICATED IN TCP TYPICAL SECTION STEP 2. REMOVE EXISTING MARKINGS IN CONFLICT WITH TCP STRIPING. USE TCP STANDARD TCP (3-1)-14, MOBILE OPERATIONS UNDIVIDED HIGHWAYS, TO PERFORM THIS WORK. USE NON-REMOVABLE WORK ZONE PAVEMENT MARKINGS WITHIN THE LIMITS SHOWN ON THE TYPICAL STEP 2. DETAIL.

2. SHIFT TRAFFIC TO RIGHT SIDE OF SH 16.

3. (STEP 2A)- REWORK EIGHT INCHES OF EXISTING FLEX BASE ON THE SIDE OF SH 16 FROM STA. 67+00.00 TO STA. 165+62.68 AS SHOWN ON THE TCP TYPICAL SECTION STEP 2. ADD ADDITIONAL BASE AS NEEDED TO CONSTRUCT AN EIGHT-INCH LAYER.

4. (STEP 2A)- CONSTRUCT A TEN-INCH FLEX BASE LAYER ON RE-WORKED EIGHT-INCH FLEX BASE LAYER AS SHOWN ON THE TCP TYPICAL SECTION STEP 2. CONSTRUCT TEN-INCH LAYER IN TWO FIVE-INCH LIFTS.

5. (STEP 2A)- RECONSTRUCT CROSS-STREET APPROACHES ALONG LEFT SIDE OF SH 16 WITHIN THE LIMITS OF THIS PHASE (FM 500, CR 103, CR 105, CR 109) TO THE LIMITS SHOWN ON THE CROSS STREET PLAN AND PROFILE SHEETS OR DRIVEWAY AND INTERSECTION GEOMETRY TABLE. COMPLETE THIS WORK WITH INTERSECTION OPEN TO TRAFFIC BY MAINTAINING ONE LANE OPEN WHILE WORKING. USE WORK ZONE DETAILS ON TCP (2-8)-18 AND FLAGGERS DURING WORK ACTIVITIES. OPEN INTERSECTION TO TWO-WAY TRAFFIC AT NIGHTS AND WHEN WORK IS NOT IN PROGRESS.

6. (STEP 2B)- CONSTRUCT THE PROFILE TRANSITION BETWEEN STA. 56+13.20 AND STA. 61+13.20 AND FULL DEPTH SECTION BETWEEN STA. 61+13.20 AND STA. 67+00.00 USING 10 INCHES OF TY B ACP AS SHOWN ON THE PROJECT TYPICAL SECTIONS AND THE ROADWAY PLAN AND PROFILE SHEETS. CONSTRUCT TEMPORARY PAVEMENT ALONG LEFT SIDE OF SH 16 FROM STA. 62+74.29 TO STA. 64+09.90 AS SHOWN ON TCP LAYOUT SHEET. USE THE TCP DETAILS SHOWN ON TYPICAL PERMANENT PROFILE TRANSITION CONSTRUCTION DETAIL DETAIL SHEET TO PERFORM THIS WORK.

7. (STEP 2C)- CONSTRUCT THE PROFILE TRANSITION AND FULL DEPTH RECONSTRUCTION BETWEEN STA. 165+62.68 AND STA. 170+82.68 USING 10 INCHES OF TY B ACP AS SHOWN ON THE PROJECT TYPICAL SECTIONS AND THE ROADWAY PLAN AND PROFILE SHEETS. USE THE TCP DETAILS SHOWN ON TYPICAL PERMANENT PROFILE TRANSITION CONSTRUCTION DETAIL SHEET TO PERFORM THIS WORK.

8. PLACE A 1-CST ON THE TEN-INCH FLEX BASE LAYER AND FULL DEPTH ACP TO THE LIMITS SHOWN ON THE TCP TYPICAL SECTION STEP 2.

9. COMPLETE LEFT SIDE ROADSIDE DITCH GRADING, PERFORM TEMPORARY SOIL STABILIZATION, RECONSTRUCT DRIVEWAYS AND PLACE DRIVEWAY PIPES AND SAFETY END TREATMENTS.

C. REHABILITATE EXISTING PAVEMENT ON RIGHT SIDE OF SH 16 TO THE PHASE 2 LIMITS SHOWN ON THE TCP LAYOUT SHEETS. CONSTRUCTION ACTIVITIES INCLUDE:

1. PLACE WORK ZONE PAVEMENT MARKINGS ON LEFT SIDE OF SH 16 AS INDICATED IN TCP TYPICAL SECTION STEP 3.

2. SHIFT TRAFFIC TO LEFT SIDE OF SH 16.

3. (STEP 3A)- SCARIFY AND UNIFORMLY MIX EXISTING ROADWAY AND STEP 1 WIDENING TO A DEPTH OF EIGHT INCHES ON THE RIGHT SIDE OF SH 16 FROM STA. 67+00.00 TO STA. 165+62.68 AS SHOWN ON THE TCP TYPICAL SECTION STEP 3. CONSTRUCT AN EIGHT-INCH LAYER.

4. (STEP 3A)- CONSTRUCT A TEN-INCH FLEX BASE LAYER ON RE-WORKED EIGHT-INCH FLEX BASE LAYER FROM STA. 67+00.00 TO STA. 165+62.68 AS SHOWN ON THE TCP TYPICAL SECTION STEP 3. CONSTRUCT TEN-INCH LAYER IN TWO FIVE-INCH LIFTS.

5. (STEP 3A)- RECONSTRUCT CROSS-STREET APPROACHES ALONG RIGHT SIDE OF SH 16 WITHIN THE LIMITS OF THIS PHASE (CR 116) TO THE LIMITS SHOWN ON THE CROSS STREET PLAN AND PROFILE SHEETS OR DRIVEWAY AND INTERSECTION GEOMETRY TABLE. COMPLETE THIS WORK WITH INTERSECTION OPEN TO TRAFFIC BY MAINTAINING ONE LANE OPEN WHILE WORKING. USE WORK ZONE DETAILS ON TCP (2-8)-18 AND FLAGGERS DURING WORK ACTIVITIES. OPEN INTERSECTION TO TWO-WAY TRAFFIC AT NIGHTS AND WHEN WORK IS NOT IN PROGRESS.

6. (STEP 3B)- CONSTRUCT THE PROFILE TRANSITION AND FULL DEPTH RECONSTRUCTION BETWEEN STA. 56+13.20 AND STA. 61+13.20 AND FULL DEPTH SECTION BETWEEN STA. 61+13.20 AND STA. 67+00.00 USING 10 INCHES OF TY B ACP AS SHOWN ON THE PROJECT TYPICAL SECTIONS AND THE ROADWAY PLAN AND PROFILE SHEETS. USE THE TCP DETAILS SHOWN ON PERMANENT PROFILE TRANSITION CONSTRUCTION DETAIL SHEET TO PERFORM THIS WORK.

7. (STEP 3C)- CONSTRUCT THE PROFILE TRANSITION AND FULL DEPTH RECONSTRUCTION BETWEEN STA. 165+62.68 AND STA. 170+82.68 USING 10 INCHES OF TY B ACP AS SHOWN ON THE PROJECT TYPICAL SECTIONS AND AND THE ROADWAY PLAN AND PROFILE SHEETS. USE THE TCP DETAILS SHOWN ON PERMANENT PROFILE TRANSITION CONSTRUCTION DETAIL SHEET TO PERFORM THIS WORK.

NO.	REVISION	BY	DATE

STATE OF TEXAS
EDUARDO GUTIERREZ
75994
REGISTERED
PROFESSIONAL ENGINEER
11/29/2022

Texas Department of Transportation

Seiler Lankes Group
TBPE License No. 12670
PLANNING • ENGINEERING • CONSTRUCTION

SH 16 SEQUENCE OF CONSTRUCTION

11/29/2022 SHEET 1 OF 2

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.				HIGHWAY No.	
CHECKED:	6	TEXAS					SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.		
CHECKED:	BWD	SAN SABA	0289	04	032	31		

USER: mcastro 10:30
DATE: 11/29/2022
SCRIPT: pw://server.slkeng.com:Slk-dsDocuments/TxDOT0103 Brownwood SH 16/Design_Data/4 - Design/Miscellaneous/SH16_plot.pen
FILE: pw://server.slkeng.com:Slk-dsDocuments/TxDOT0103 Brownwood SH 16/Design_Data/4 - Design/Plan Set_1/02_TCP/SH16_SOC_01.dgn

8. PLACE A 1-CST ON THE TEN-INCH FLEX BASE LAYER TO THE LIMITS SHOWN ON THE TCP TYPICAL SECTION STEP 3.

9. COMPLETE RIGHT SIDE ROADSIDE DITCH GRADING, PERFORM TEMPORARY SOIL STABILIZATION, RECONSTRUCT DRIVEWAYS AND PLACE DRIVEWAY PIPES AND SAFETY END TREATMENTS.

PHASE 3 - PAVEMENT RECONSTRUCTION (STA.171+95.61 TO STA. 360+00.00)

A. (STEP 1)- CONSTRUCT PAVEMENT WIDENING (10" FLEX BASE AND 1-CST) ON RIGHT SIDE OF SH 16 AS SHOWN ON THE TCP TYPICAL SECTION STEP 1 FROM STA. 171+94.81 TO STA. 378+25.00. CONSTRUCT TEMPORARY PAVEMENT ALONG WEST SIDE OF SH 16 FROM STA. 365+00.00 TO STA. 371+25.00 AS SHOWN ON THE TCP LAYOUT SHEETS. PREP SUBGRADE IN ACCORDANCE WITH ITEM 247. USE DAYTIME SHOULDER AND/OR LANE CLOSURES TCP OPERATIONS AS DETAILED IN TCP (1-2)-18 TO PERFORM THIS WORK.

B. REHABILITATE EXISTING PAVEMENT ON LEFT SIDE OF SH 16 TO THE PHASE 3 LIMITS SHOWN ON THE TCP LAYOUT SHEETS. CONSTRUCTION ACTIVITIES INCLUDE:

1. PLACE WORK ZONE PAVEMENT MARKINGS ON RIGHT SIDE OF SH 16 AS INDICATED IN TCP TYPICAL SECTION STEP 2. REMOVE EXISTING MARKINGS IN CONFLICT WITH TCP STRIPING. USE TCP STANDARD TCP (3-1)-14, MOBILE OPERATIONS UNDIVIDED HIGHWAYS, TO PERFORM THIS WORK. USE NON-REMOVABLE WORK ZONE PAVEMENT MARKINGS WITHIN THE LIMITS SHOWN ON THE TYPICAL STEP 2 DETAIL.

2. SHIFT TRAFFIC TO RIGHT SIDE OF SH 16.

3. (STEP 2A)- REWORK EIGHT INCHES OF EXISTING FLEX BASE ON THE LEFT SIDE OF SH 16 FROM STA. 177+14.81 TO STA. 365+00.00 AS SHOWN ON THE TCP TYPICAL SECTION STEP 2. ADD ADDITIONAL BASE AS NEEDED TO CONSTRUCT AN EIGHT-INCH LAYER.

4. (STEP 2A)- CONSTRUCT A TEN-INCH FLEX BASE LAYER ON RE-WORKED EIGHT INCH FLEX BASE LAYER FROM STA. 177+14.81 TO STA. 360+00.00 AS SHOWN ON THE TCP TYPICAL SECTION STEP 2. CONSTRUCT TEN-INCH LAYER IN TWO FIVE-INCH LIFTS.

5. (STEP 2A)- RECONSTRUCT CROSS-STREET APPROACHES ALONG LEFT SIDE OF SH 16 WITHIN THE LIMITS OF THIS PHASE (CR 111, CR 109) TO THE LIMITS SHOWN ON THE CROSS STREET PLAN AND PROFILE SHEETS OR DRIVEWAY AND INTERSECTION GEOMETRY TABLE. COMPLETE THIS WORK WITH INTERSECTION OPEN TO TRAFFIC BY MAINTAINING ONE LANE OPEN WHILE WORKING. USE WORK ZONE DETAILS ON TCP (2-8)-18 AND FLAGGERS DURING WORK ACTIVITIES. OPEN INTERSECTION TO TWO-WAY TRAFFIC AT NIGHTS AND WHEN WORK IS NOT IN PROGRESS.

6. (STEP 2B)- CONSTRUCT THE PROFILE TRANSITION AND FULL DEPTH RECONSTRUCTION BETWEEN STA. 171+94.81 AND STA. 177+14.81 USING 10 INCHES OF TY B ACP AS SHOWN ON THE PROJECT TYPICAL SECTIONS AND THE ROADWAY PLAN AND PROFILE SHEETS. USE THE TCP DETAILS SHOWN ON TYPICAL PERMANENT PROFILE TRANSITION CONSTRUCTION DETAIL SHEET TO PERFORM THIS WORK.

7. (STEP 2C)- CONSTRUCT THE TEMPORARY PROFILE TRANSITION BETWEEN STA. 360+00.00 AND STA. 365+00.00 USING FLEX BASE AS SHOWN ON THE TCP TEMPORARY PROFILE TRANSITION DETAIL SHEET. USE THE TCP DETAILS SHOWN ON TEMPORARY PROFILE TRANSITION CONSTRUCTION DETAIL SHEET TO PERFORM THIS WORK.

8. PLACE A 1-CST ON THE TEN-INCH FLEX BASE LAYER TO THE LIMITS SHOWN ON THE TCP TYPICAL SECTION STEP 2.

9. COMPLETE LEFT SIDE ROADSIDE DITCH GRADING, PERFORM TEMPORARY SOIL STABILIZATION, RECONSTRUCT DRIVEWAYS AND PLACE DRIVEWAY PIPES AND SAFETY END TREATMENTS.

C. REHABILITATE EXISTING PAVEMENT ON RIGHT SIDE OF SH 16 TO THE PHASE 3 LIMITS SHOWN ON THE TCP LAYOUT SHEETS. CONSTRUCTION ACTIVITIES INCLUDE:

1. PLACE WORK ZONE PAVEMENT MARKINGS ON LEFT SIDE OF SH 16 AS INDICATED IN TCP TYPICAL SECTION STEP 1.

2. SHIFT TRAFFIC TO LEFT SIDE OF SH 16.

3. (STEP 3A)- SCARIFY AND UNIFORMLY MIX EXISTING ROADWAY AND STEP 1 WIDENING TO A DEPTH OF EIGHT INCHES ON THE RIGHT SIDE OF SH 16 FROM STA.177+14.81 TO STA. 365+00.00 AS SHOWN ON THE TCP TYPICAL SECTION STEP 3. CONSTRUCT AN EIGHT-INCH LAYER.

4. (STEP 3A)- CONSTRUCT A TEN-INCH FLEX BASE LAYER ON RE-WORKED EIGHT-INCH FLEX BASE LAYER FROM STA. 177+14.81 TO STA. 360+00.00 TO THE LIMITS SHOWN ON THE TCP TYPICAL SECTION STEP 3. CONSTRUCT TEN-INCH LAYER IN TWO FIVE-INCH LIFTS.

5. (STEP 3A)- RECONSTRUCT CROSS-STREET APPROACHES ALONG RIGHT SIDE OF SH 16 WITHIN THE LIMITS OF THIS PHASE (CR 111, CR CR122, CR124, CR 109) TO THE LIMITS SHOWN ON THE CROSS STREET PLAN AND PROFILE SHEETS OR DRIVEWAY AND INTERSECTION GEOMETRY TABLE. COMPLETE THIS WORK WITH INTERSECTION OPEN TO TRAFFIC BY MAINTAINING ONE LANE OPEN WHILE WORKING. USE WORK ZONE DETAILS ON TCP (2-8)-18 AND FLAGGERS DURING WORK ACTIVITIES. OPEN INTERSECTION TO TWO-WAY TRAFFIC AT NIGHTS AND WHEN WORK IS NOT IN PROGRESS.

6. (STEP 3B)- CONSTRUCT THE PROFILE TRANSITION AND FULL DEPTH RECONSTRUCTION BETWEEN STA. 171+94.81 AND STA. 177+14.81 USING 10 INCHES OF TY B ACP AS SHOWN ON THE PROJECT TYPICAL SECTIONS AND THE ROADWAY PLAN AND PROFILE SHEETS. USE THE TCP DETAILS SHOWN ON TYPICAL PERMANENT PROFILE TRANSITION CONSTRUCTION DETAIL SHEET TO PERFORM THIS WORK.

7. (STEP 3C)- CONSTRUCT THE TEMPORARY PROFILE TRANSITION BETWEEN STA. 360+00.00 AND STA. 365+00.00 USING FLEX BASE AS SHOWN ON THE TYPICAL TEMPORARY PROFILE TRANSITION DETAILS SHOWN ON THE TCP TEMPORARY PROFILE TRANSITION DETAIL SHEET. USE THE TCP DETAILS SHOWN ON TEMPORARY PROFILE TRANSITION CONSTRUCTION DETAIL SHEET TO PERFORM THIS WORK.

8. PLACE A 1-CST ON THE TEN-INCH FLEX BASE LAYER TO THE LIMITS SHOWN ON THE TCP TYPICAL SECTION STEP 3.

9. COMPLETE RIGHT SIDE ROADSIDE DITCH GRADING, PERFORM TEMPORARY SOIL STABILIZATION, RECONSTRUCT DRIVEWAYS AND PLACE DRIVEWAY PIPES AND SAFETY END TREATMENTS.

PHASE 4

A. PLACE WORK ZONE PAVEMENT MARKINGS ON SH 16 AS INDICATED IN TCP TYPICAL SECTION STEP 4. USE TCP STANDARD TCP (3-1)-14, "MOBILE OPERATIONS UNDIVIDED HIGHWAYS", TO PERFORM THIS WORK. USE REMOVABLE BUTTONS AND MARKERS FOR ALL WORK ZONE MARKINGS.

B. PLACE SECOND COURSE OF THE 2-CST ON SH 16. USE TCP STANDARD TCP (7-1)-13 FOR SIGNS AND CHANNELIZING DEVICES TO PERFORM THIS WORK.

C. PLACE ROADSIDE SIGNS AND STRIPE SH 16 TO THE FINAL CONFIGURATION AS SHOWN ON SIGNING AND STRIPING LAYOUTS.

D. COMPLETE SOIL STABILIZATION AND REVEGETATION WORK AND REMOVE SW3P BMPS.

E. COMPLETE PROJECT SITE CLEAN-UP.

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SH 16 SEQUENCE OF CONSTRUCTION

11/29/2022 SHEET 2 OF 2

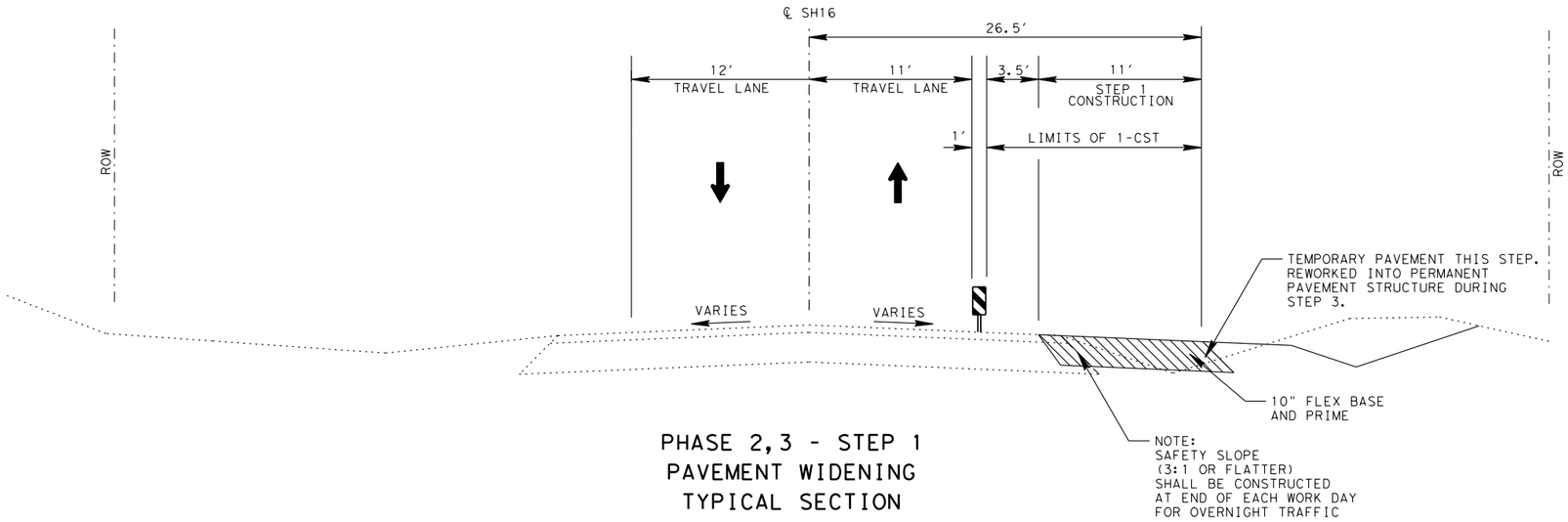
DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.	
CHECKED:	6	TEXAS				SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.	
CHECKED:	BWD	SAN SABA	0289	04	032	32	

USER: mcastro
DATE: 11/29/2022 10:31
SCRIPT: pw://server.slg-eng.com:Slg-cts/Documents/TxDOT0103 Brownwood SH 16\Design_Data\4 - Design\Miscellaneous\SH16_Mtd.cpen
FILE: pw://server.slg-eng.com:Slg-cts/Documents/TxDOT0103 Brownwood SH 16\Design_Data\4 - Design\Plan_Set_1\02_TCP\SH16_SOC_02.dgn

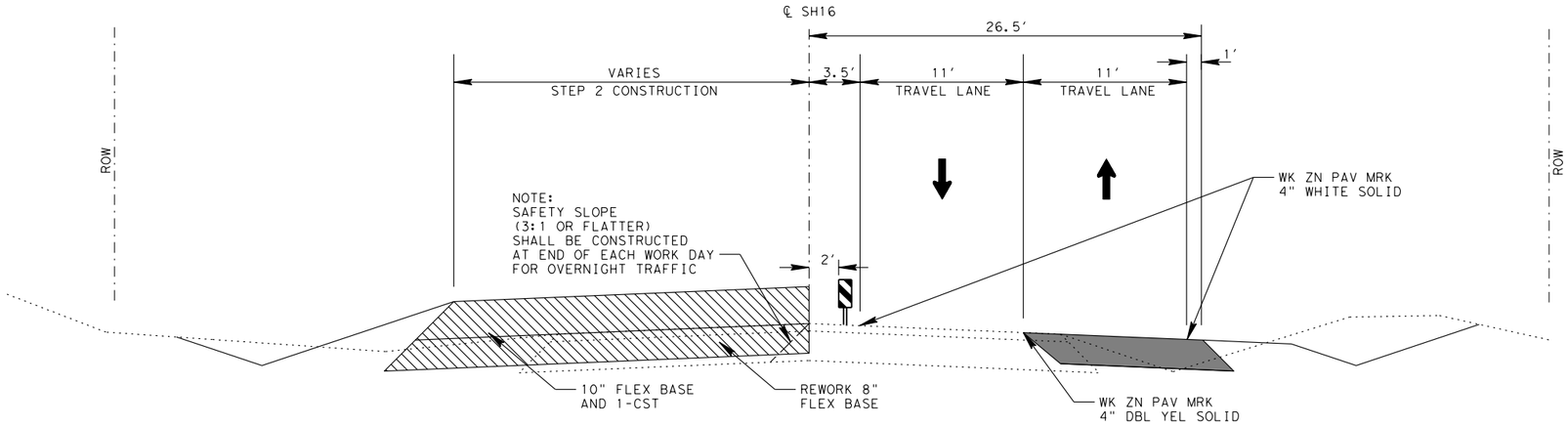
LEGEND

PERMANENT ROADWAY CONSTRUCTION THIS STEP

PERMANENT ROADWAY CONSTRUCTION PREVIOUS STEP



PHASE 2,3 - STEP 1
PAVEMENT WIDENING
TYPICAL SECTION



PHASE 2,3 - STEP 2
BASE REWORK AND FLEX BASE
TYPICAL SECTION

N. T. S.

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SH 16
TRAFFIC CONTROL PLAN
TYPICAL SECTIONS

11/22/2022 SHEET 1 OF 2

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.	
CHECKED:	6	TEXAS				SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.	
CHECKED:	BWD	SAN SABA	0289	04	032	33	

USER: jsallnas
DATE: 11/22/2022 1:26
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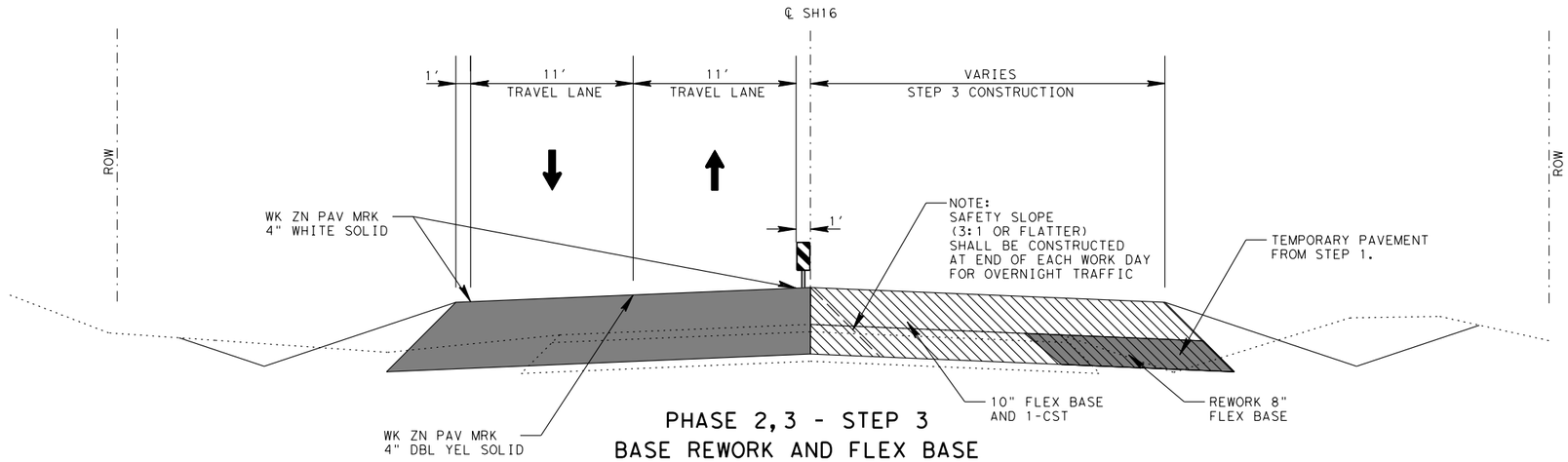
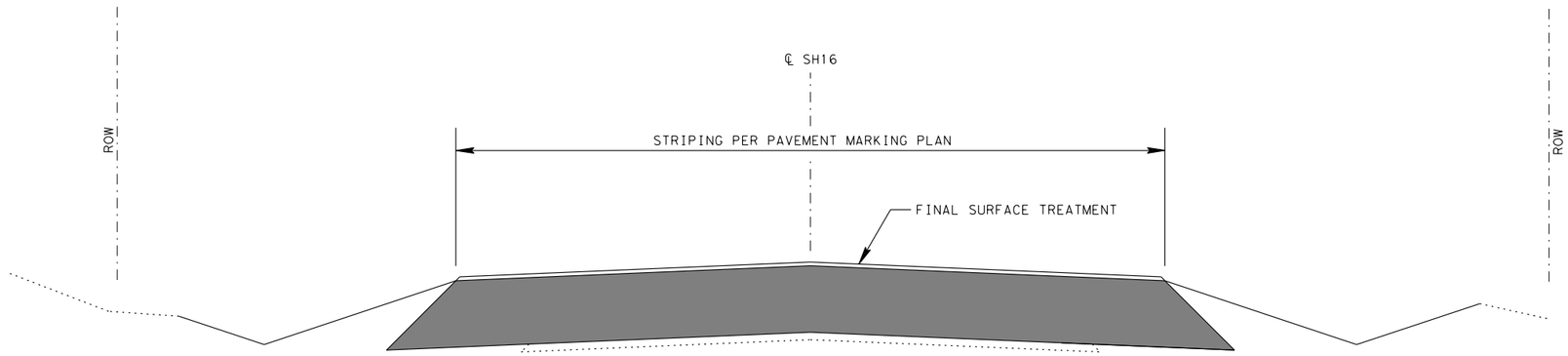


PHASE 2,3 - STEP 3
BASE REWORK AND FLEX BASE
TYPICAL SECTION



PHASE 4
FINAL SURFACE
TYPICAL SECTION

LEGEND

- PERMANENT ROADWAY CONSTRUCTION THIS STEP
- PERMANENT ROADWAY CONSTRUCTION PREVIOUS STEP

N.T.S.

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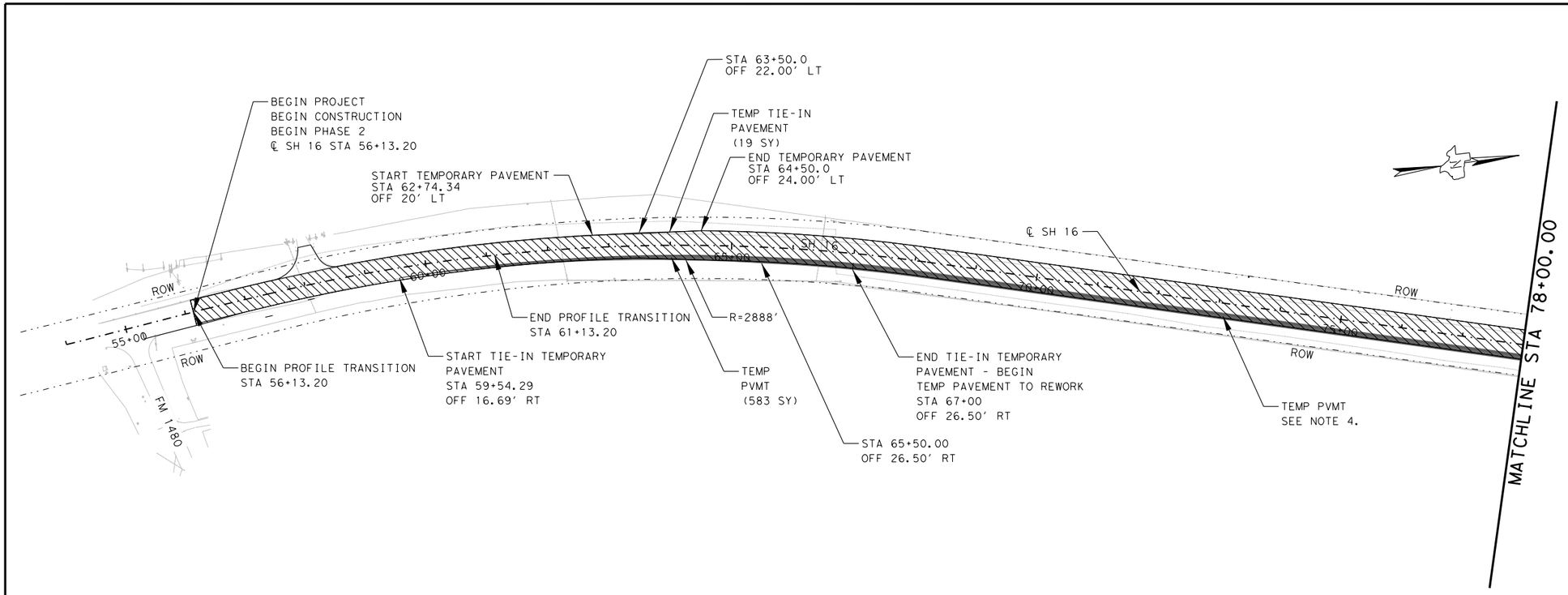
SH 16
TRAFFIC CONTROL PLAN
TYPICAL SECTIONS

11/22/2022 SHEET 2 OF 2

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.	
CHECKED:	6	TEXAS				SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.	
CHECKED:	BWD	SAN SABA	0289	04	032	34	



0 100 200

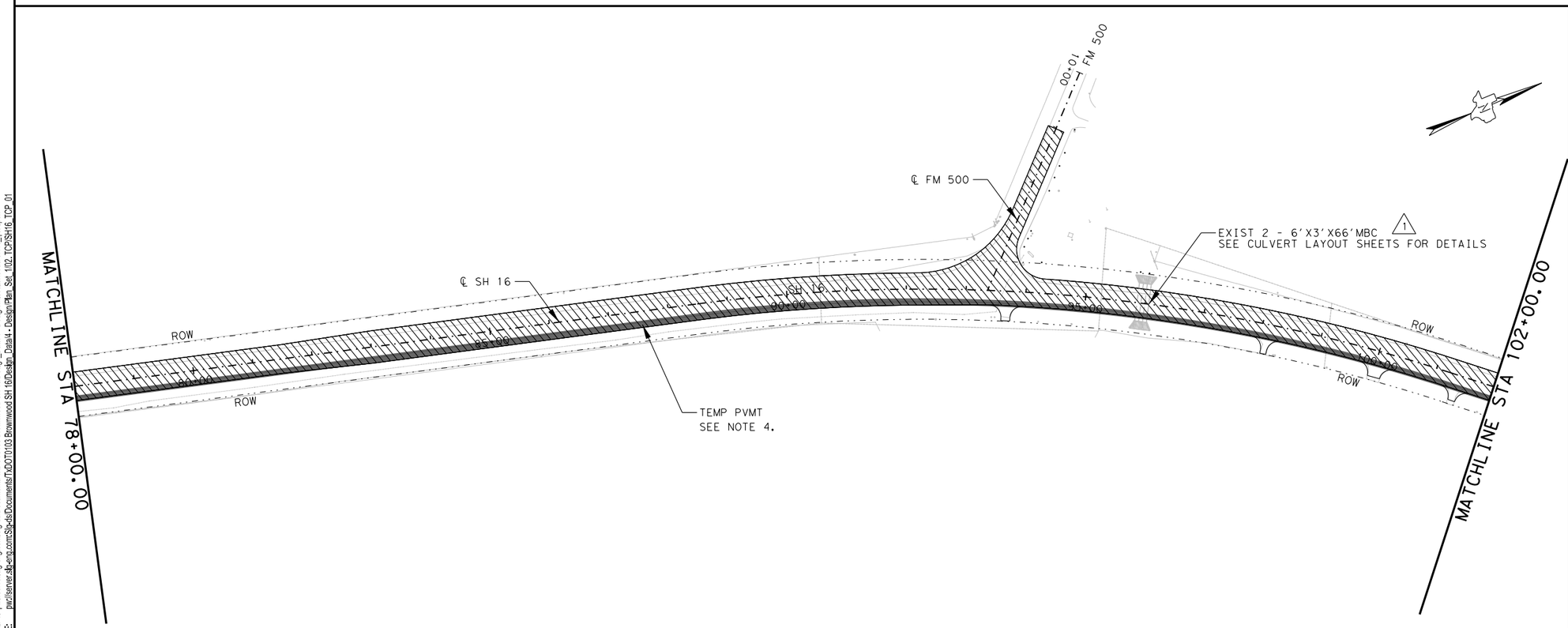
SCALE: 1" =200'

LEGEND

- PERMANENT ROADWAY CONSTRUCTION PHASE 2
- PERMANENT ROADWAY CONSTRUCTION PHASE 3
- △# CROSS CULVERT NUMBER

NOTES:

1. REFER TO TCP STANDARDS AND TCP DETAIL SHEETS FOR ADDITIONAL INFORMATION ON TCP CONFIGURATONS.
2. CONSTRUCTION WILL ONLY BE PERMITTED ON ONE SIDE OF THE ROAD AT A TIME.
3. UNLESS PERMITTED BY THE ENGINEER, CONSTRUCTION WILL ONLY BE PERMITTED ON ONE PHASE AT A TIME.
4. TEMPORARY PAVEMENT ALONG NORTHBOUND EDGE OF PAVEMENT WILL BE REWORKED INTO PERMANENT PAVEMENT STRUCTURE.



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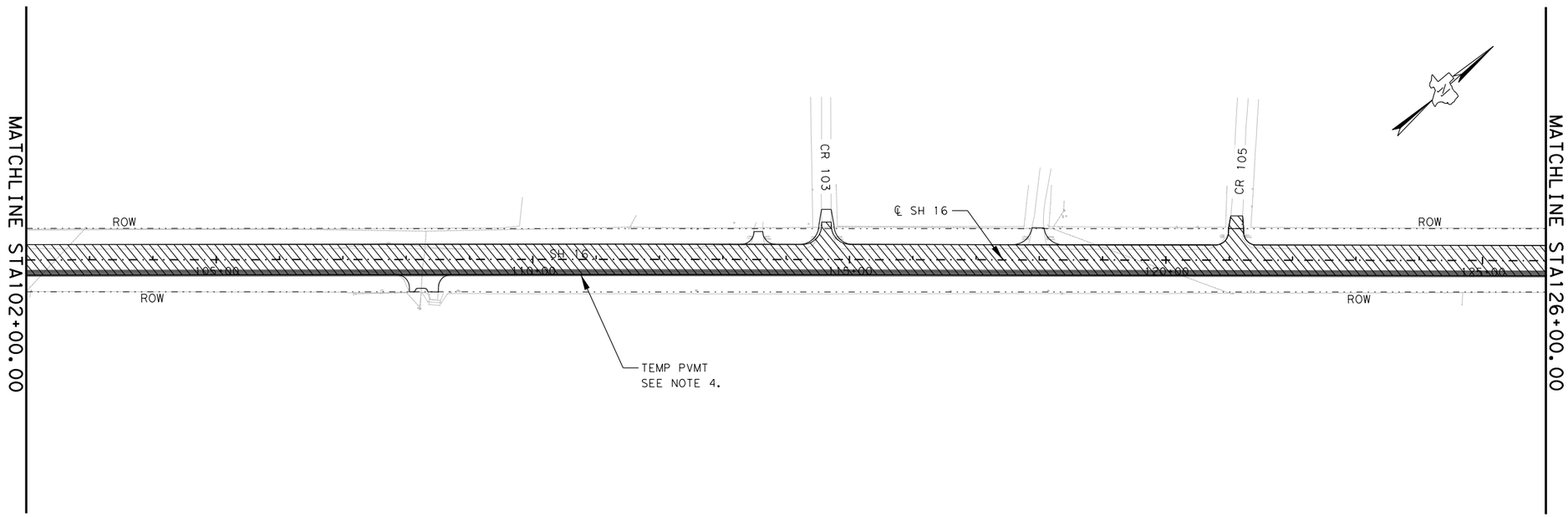
SH 16
TRAFFIC CONTROL PLAN LAYOUTS
BEGIN PROJECT TO STA 102+00.00

11/22/2022 SHEET 1 OF 7

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.	
CHECKED:	6	TEXAS				SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.	
CHECKED:	BWD	SAN SABA	0289	04	032	35	

USER: jsalinas
DATE: 11/22/2022 1:26
SCRIPT: pw://server.sls-eng.com:SlsDsDocuments/TxDOT0103 Brownwood SH 16\Design_Data\4 - Design\Miscellaneous\SH16_plot.pen
FILE: pw://server.sls-eng.com:SlsDsDocuments/TxDOT0103 Brownwood SH 16\Design_Data\4 - Design\Plan Set - 1\02_TCP\SH16_TCP_01



0 100 200

SCALE: 1" =200'

LEGEND

- PERMANENT ROADWAY CONSTRUCTION PHASE 2
- PERMANENT ROADWAY CONSTRUCTION PHASE 3
- (#) CROSS CULVERT NUMBER

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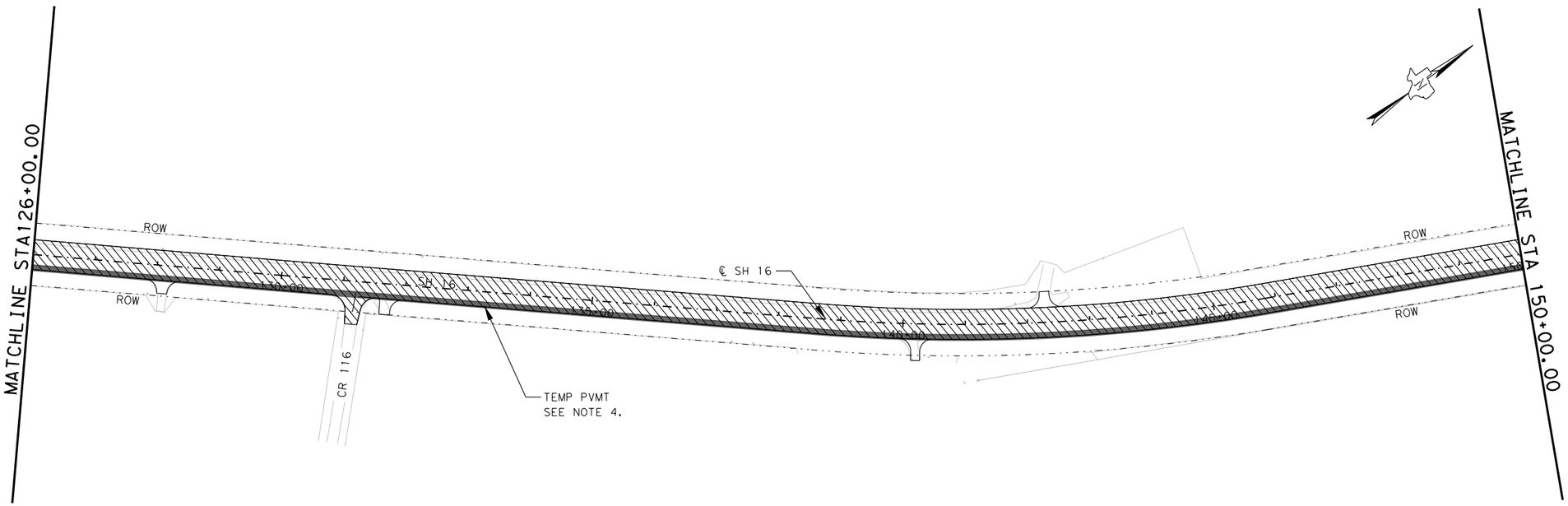

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SH 16
TRAFFIC CONTROL PLAN LAYOUTS
STA 102+00.00 TO STA 150+00.00

11/22/2022 SHEET 2 OF 7

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.	
CHECKED:	6	TEXAS				SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.	
CHECKED:	BWD	SAN SABA	0289	04	032	36	

USER: jsalinas
DATE: 11/22/2022 1:26
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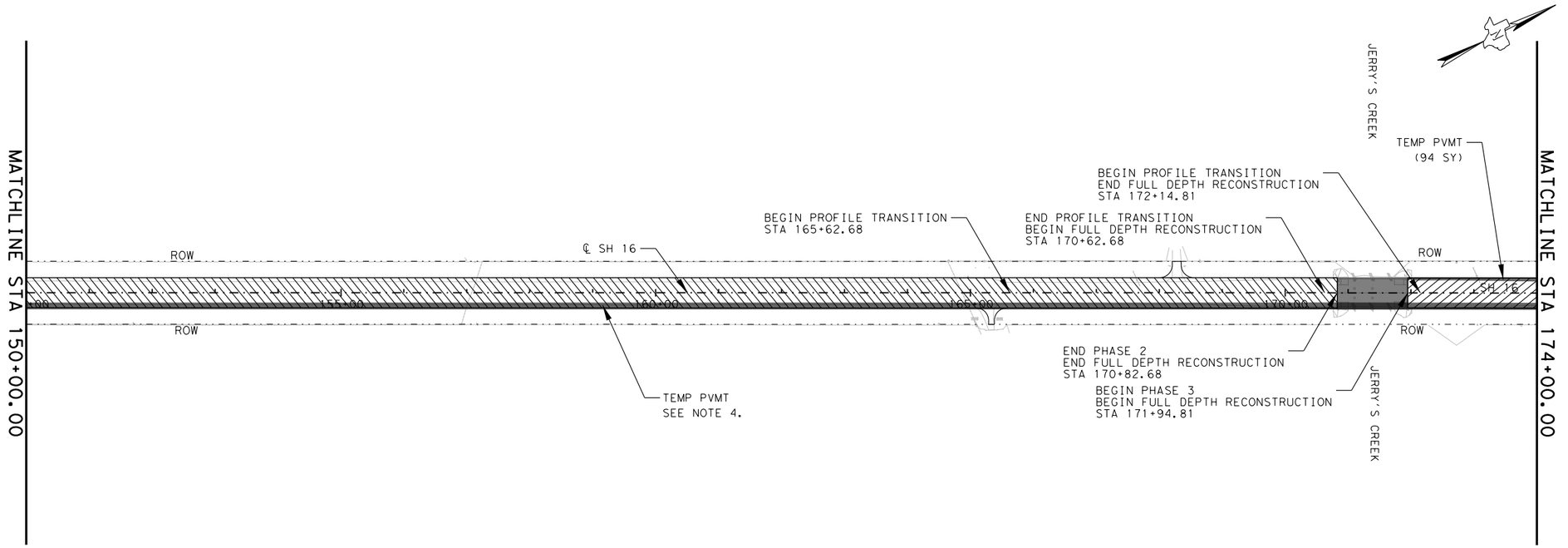

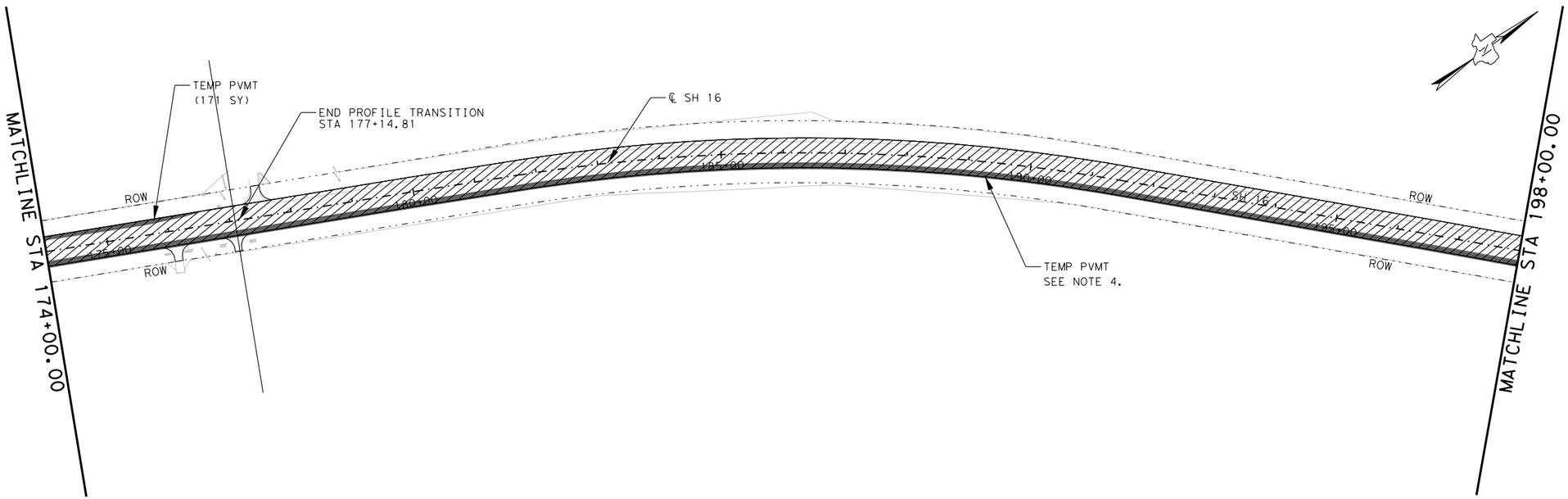

0 100 200

SCALE: 1" =200'

LEGEND

- PERMANENT ROADWAY CONSTRUCTION PHASE 2
- PERMANENT ROADWAY CONSTRUCTION PHASE 3
- (#) CROSS CULVERT NUMBER

NOTES:

1. REFER TO TCP STANDARDS AND TCP DETAIL SHEETS FOR ADDITIONAL INFORMATION ON TCP CONFIGURATONS.
2. CONSTRUCTION WILL ONLY BE PERMITTED ON ONE SIDE OF THE ROAD AT A TIME.
3. UNLESS PERMITTED BY THE ENGINEER, CONSTRUCTION WILL ONLY BE PERMITTED ON ONE PHASE AT A TIME.
4. TEMPORARY PAVEMENT ALONG NORTHBOUND EDGE OF PAVEMENT WILL BE REWORKED INTO PERMANENT PAVEMENT STRUCTURE.

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SH 16
TRAFFIC CONTROL PLAN LAYOUTS
STA 150+00.00 TO STA 198+00.00

11/22/2022 SHEET 3 OF 7

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.	
CHECKED:	6	TEXAS				SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.	
CHECKED:	BWD	SAN SABA	0289	04	032	37	

USER: jsallnas
DATE: 11/22/2022 1:26
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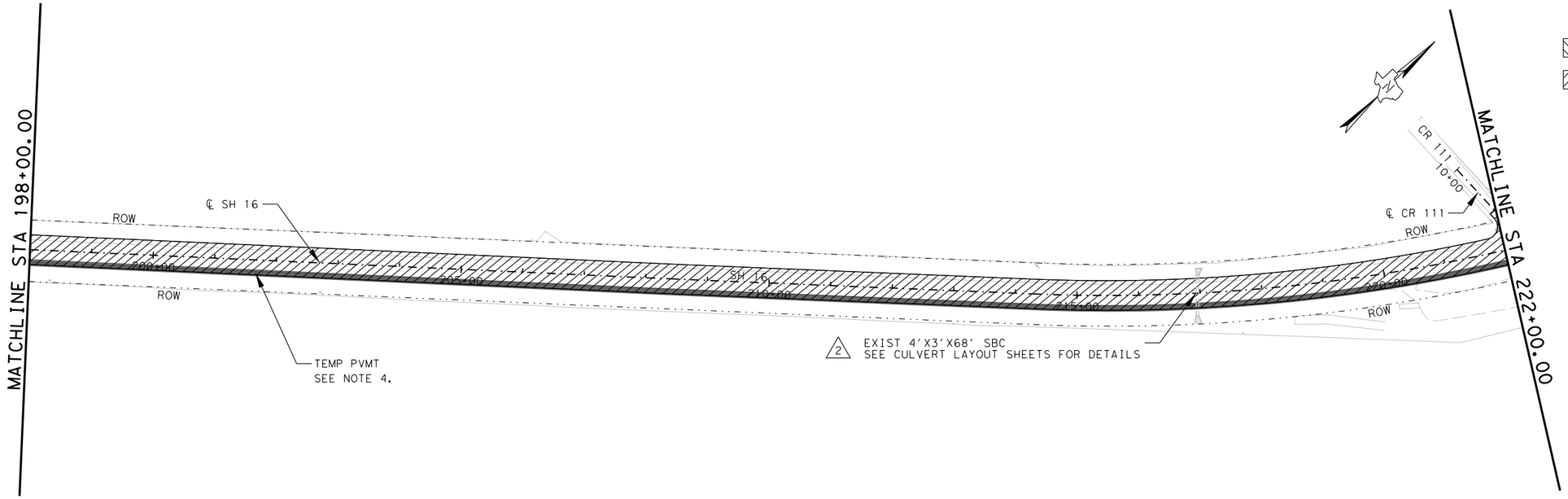

0 100 200

SCALE: 1" =200'

LEGEND

- PERMANENT ROADWAY CONSTRUCTION PHASE 2
- PERMANENT ROADWAY CONSTRUCTION PHASE 3
- # CROSS CULVERT NUMBER

NOTES:

1. REFER TO TCP STANDARDS AND TCP DETAIL SHEETS FOR ADDITIONAL INFORMATION ON TCP CONFIGURATONS.
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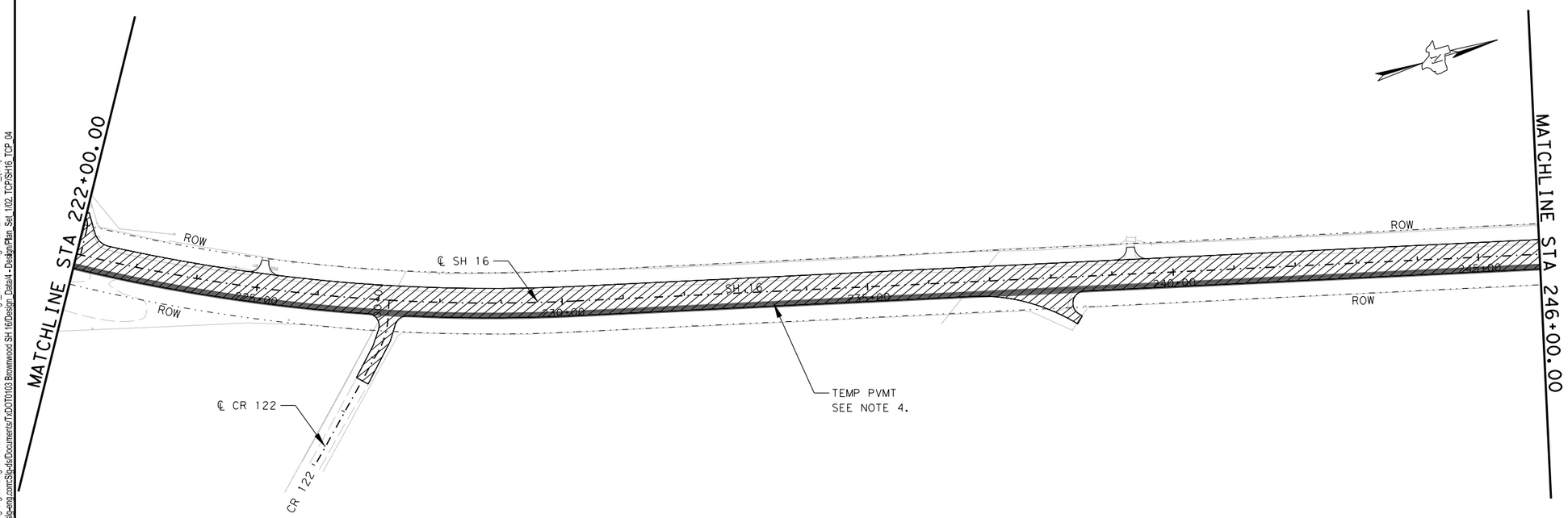

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SH 16
TRAFFIC CONTROL PLAN LAYOUTS
STA 198+00.00 TO STA 246+00.00

11/22/2022 SHEET 4 OF 7

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.	
CHECKED:	6	TEXAS				SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.	
CHECKED:	BWD	SAN SABA	0289	04	032	38	

USER: jsallnas
DATE: 11/22/2022 1:26
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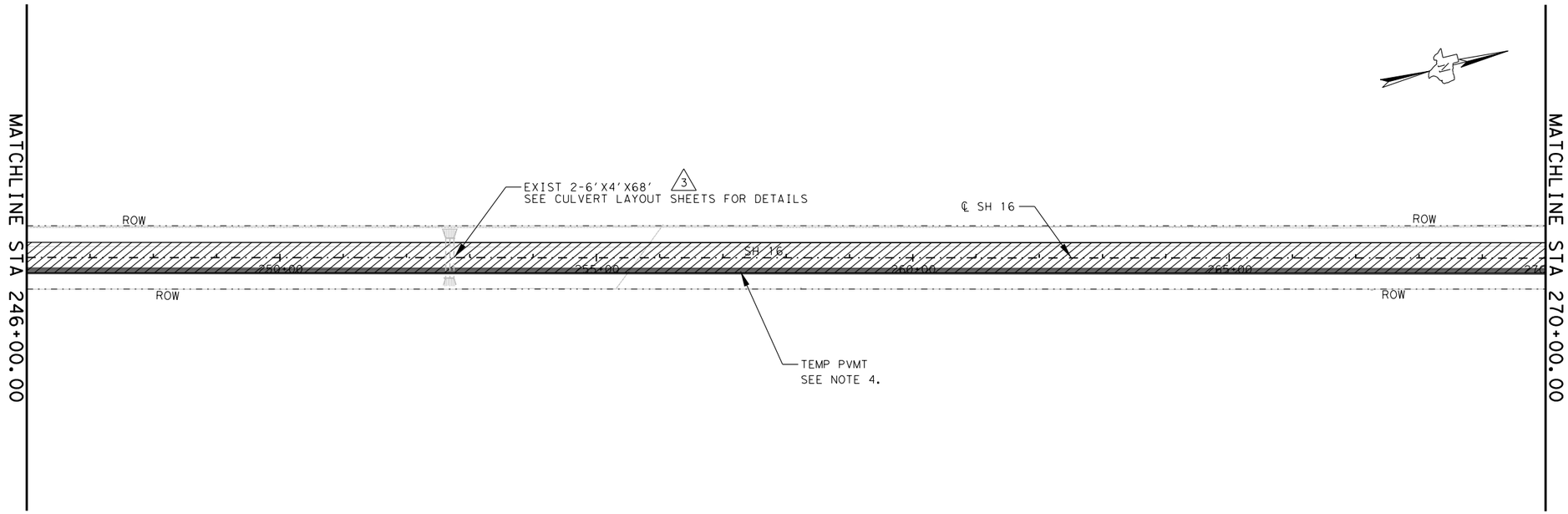

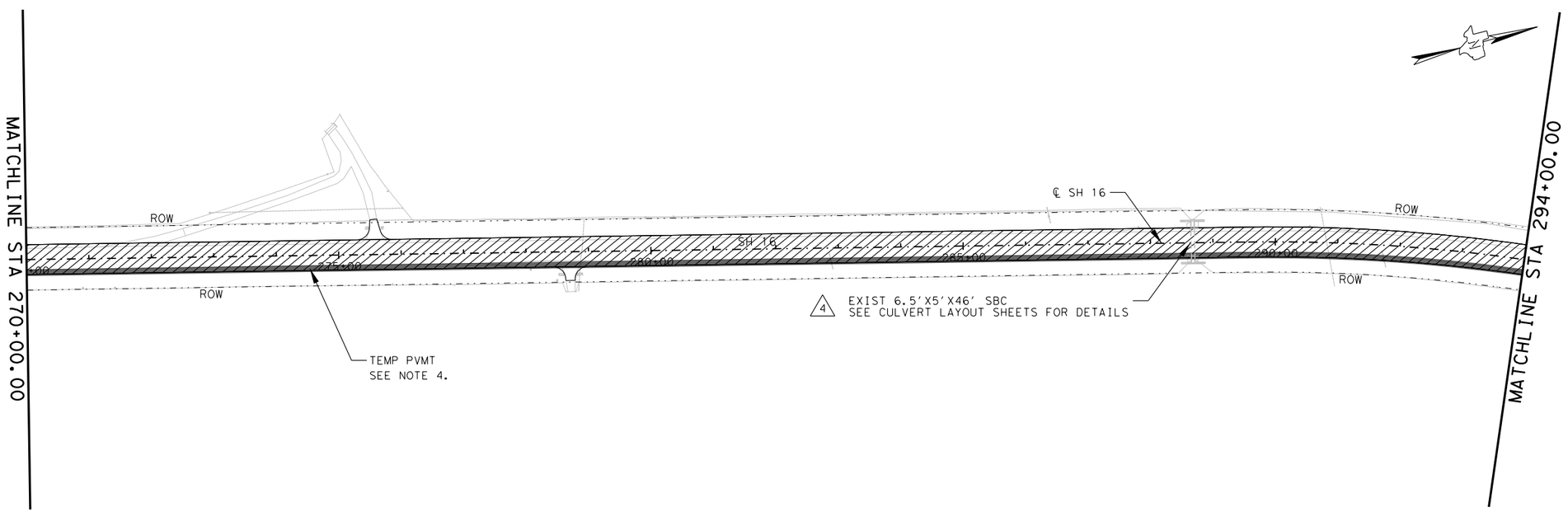

0 100 200

SCALE: 1" =200'

LEGEND

- PERMANENT ROADWAY CONSTRUCTION PHASE 2
- PERMANENT ROADWAY CONSTRUCTION PHASE 3
- △ # CROSS CULVERT NUMBER

NOTES:

1. REFER TO TCP STANDARDS AND TCP DETAIL SHEETS FOR ADDITIONAL INFORMATION ON TCP CONFIGURATONS.
2. CONSTRUCTION WILL ONLY BE PERMITTED ON ONE SIDE OF THE ROAD AT A TIME.
3. UNLESS PERMITTED BY THE ENGINEER, CONSTRUCTION WILL ONLY BE PERMITTED ON ONE PHASE AT A TIME.
4. TEMPORARY PAVEMENT ALONG NORTHBOUND EDGE OF PAVEMENT WILL BE REWORKED INTO PERMANENT PAVEMENT STRUCTURE.

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SH 16
TRAFFIC CONTROL PLAN LAYOUTS
STA 246+00.00 TO STA 294+00.00

11/22/2022 SHEET 5 OF 7

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.	
CHECKED:	6	TEXAS				SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.	
CHECKED:	BWD	SAN SABA	0289	04	032	39	

USER: jsallnas
DATE: 11/22/2022 1:26
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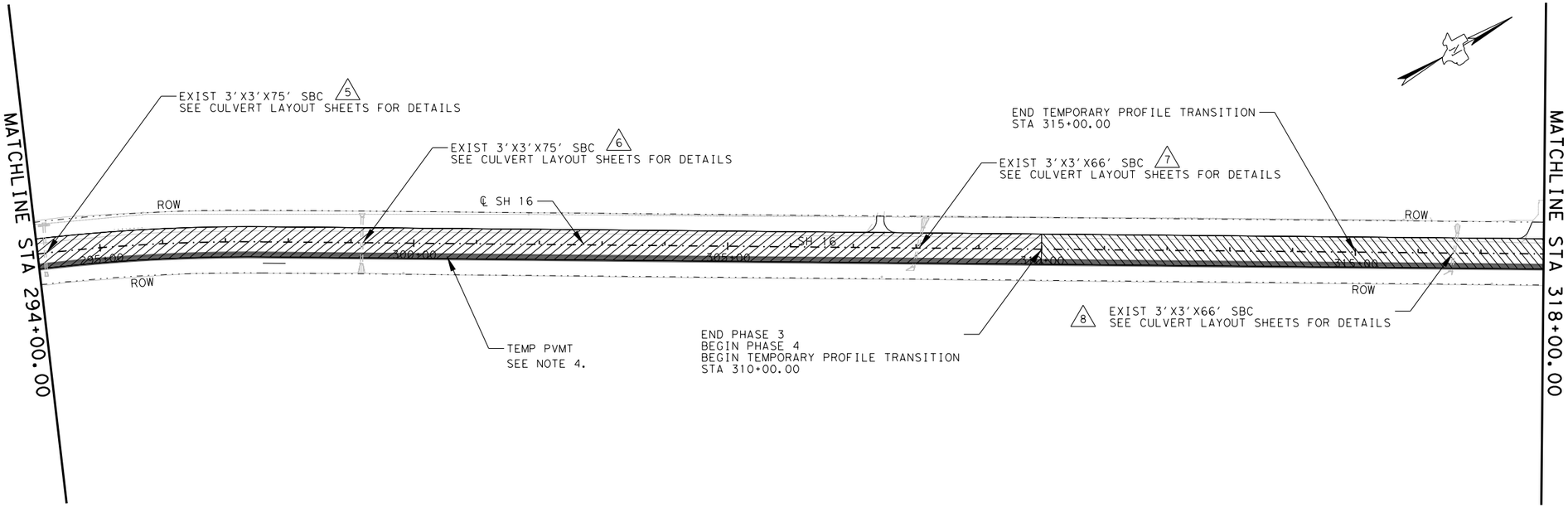

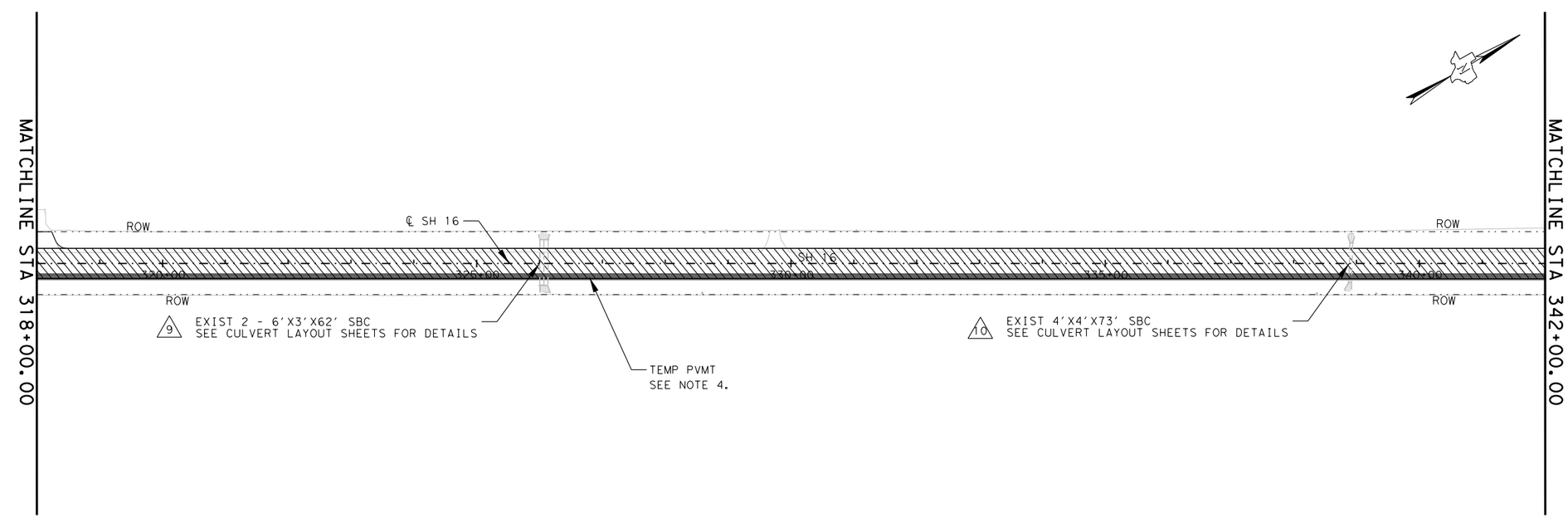

0 100 200

SCALE: 1" =200'

LEGEND

- PERMANENT ROADWAY CONSTRUCTION PHASE 2
- PERMANENT ROADWAY CONSTRUCTION PHASE 3
- △ # CROSS CULVERT NUMBER

NOTES:

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4. TEMPORARY PAVEMENT ALONG NORTHBOUND EDGE OF PAVEMENT WILL BE REWORKED INTO PERMANENT PAVEMENT STRUCTURE.

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SH 16
TRAFFIC CONTROL PLAN LAYOUTS
STA 294+00.00 TO STA 342+00.00

11/22/2022 SHEET 6 OF 7

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.	
CHECKED:	6	TEXAS				SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.	
CHECKED:	BWD	SAN SABA	0289	04	032	40	

USER: jsalinas
DATE: 11/22/2022 1:26
SCRPT: pw://server.slgeng.com:Slge-ds/Documents/TxDOT0103 Brownwood SH 16\Design_Data\4 - Design\Miscellaneous\SH16_pltd.cpen
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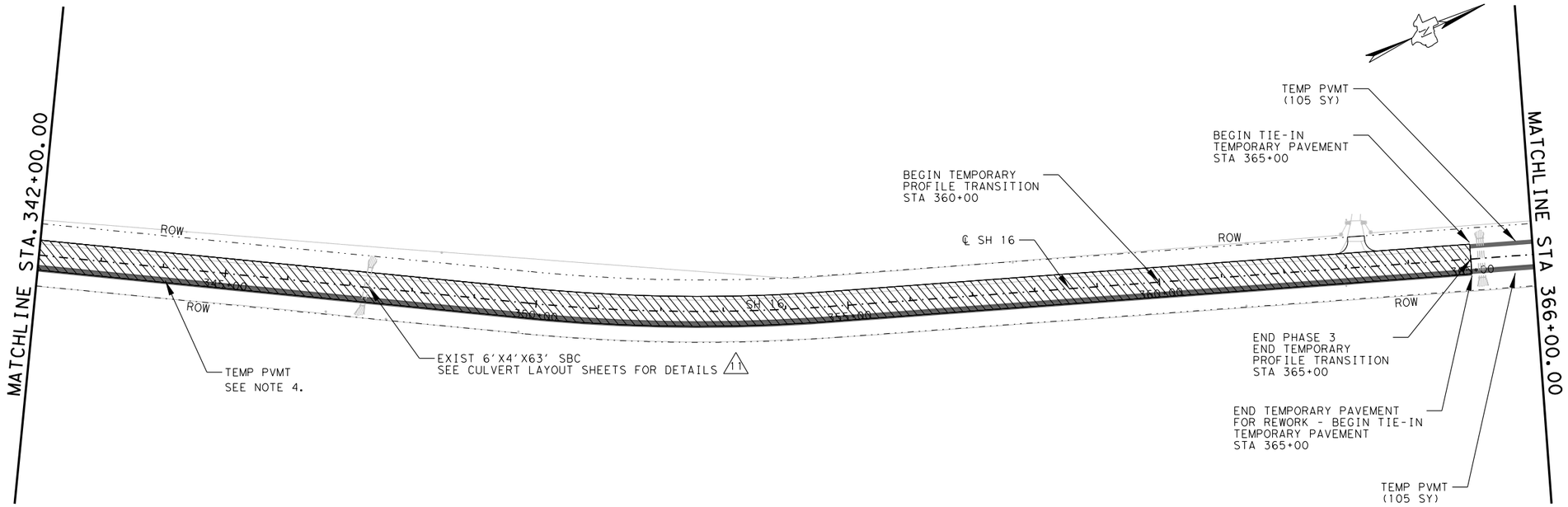

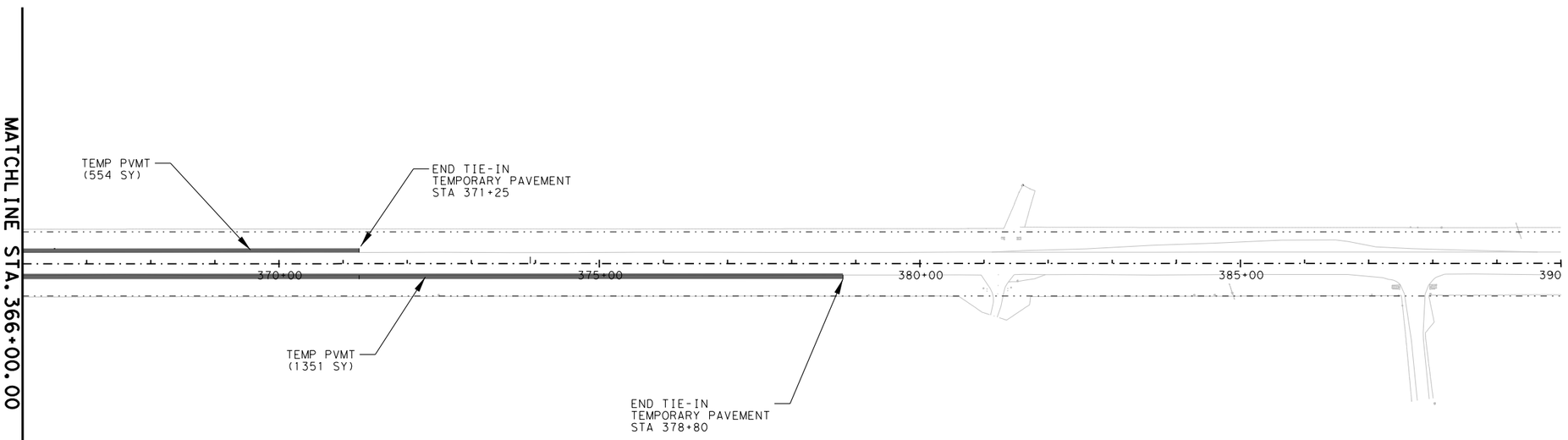

0 100 200

SCALE: 1" =200'

LEGEND

- PERMANENT ROADWAY CONSTRUCTION PHASE 2
- PERMANENT ROADWAY CONSTRUCTION PHASE 3
- CROSS CULVERT NUMBER

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NO.	REVISION	BY	DATE

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SH 16
TRAFFIC CONTROL PLAN LAYOUTS
STA 342+00.00 TO END PROJECT

11/22/2022 SHEET 7 OF 7

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.	
CHECKED:	6	TEXAS				SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.	
CHECKED:	BWD	SAN SABA	0289	04	032	41	

USER: jsalinas
DATE: 11/22/2022 1:26
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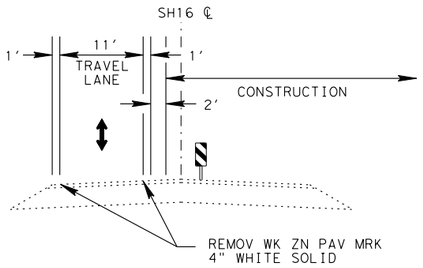
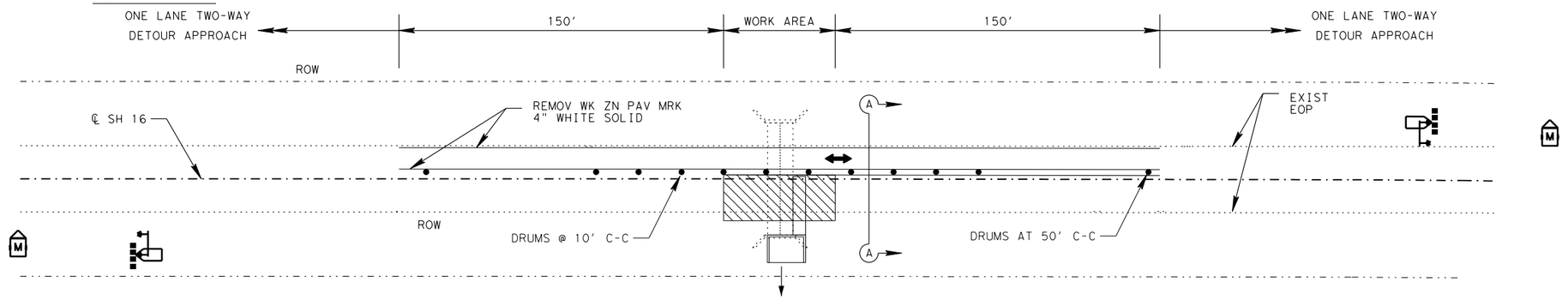


SECTION A-A



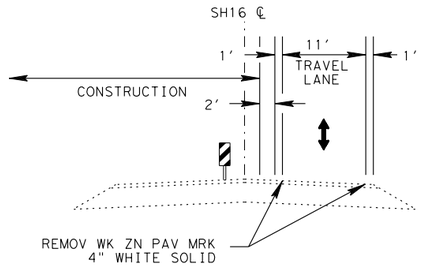
STEP 1

LEGEND

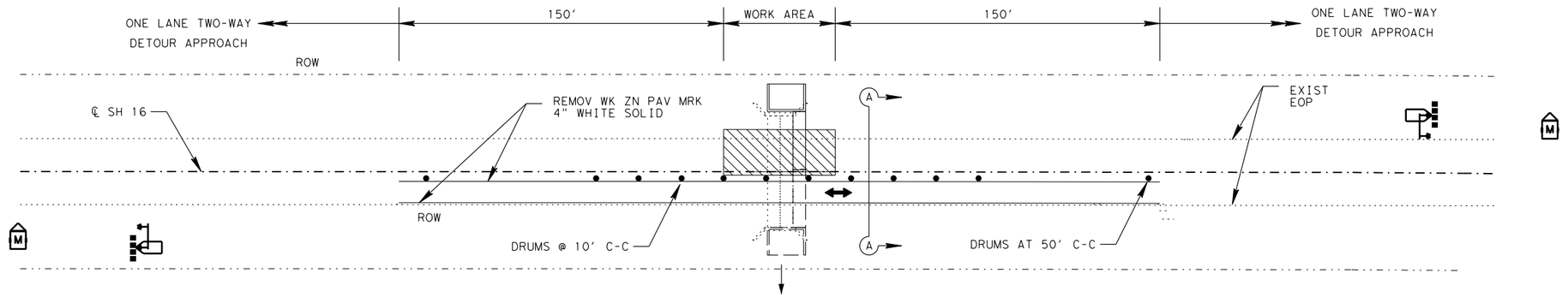
- WORK AREA
- PORTABLE CHANGEABLE MESSAGE BOARD (PCMB)
- TEMPORARY SIGNAL

NOTES:

1. USE ONE LANE TWO-WAY TCP OPERATION FOR CONSTRUCTION OF CULVERT REPLACEMENT / ADDITION UNDER ROADWAY.
2. SEE CULVERT LAYOUTS FOR TYPE OF WORK AT EACH CULVERT SITE. LENGTH OF WORK AREA AT EACH SITE BASED ON TYPE OF WORK.
3. REFER TO TCP STANDARD, TCP (2-8)-18 FOR ADVANCED SIGNING AND STRIPING FOR ONE LANE TWO-WAY DETOUR SETUP.
4. PLACE TRAFFIC SIGNAL AT PUBLIC ROADWAY APPROACHES THAT INTERSECT BETWEEN THE TWO SIGNALS ON THE PRIMARY ROAD.
5. BEGIN CONSTRUCTION FROM THE DOWNSTREAM SIDE OF THE CULVERT.



SECTION A-A



STEP 2

NO.	REVISION	BY	DATE

STATE OF TEXAS
EDUARDO GUTIERREZ
75994
REGISTERED PROFESSIONAL ENGINEER
11/29/2022

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SH 16
TCP DETAIL
ONE LANE TRAFFIC CONTROL AT CULVERTS

11/29/2022 SHEET 1 OF 5

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.	
CHECKED:	6	TEXAS				SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.	
CHECKED:	BWD	SAN SABA	0289	04	032	42	

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DATE: 11/29/2022 10:56
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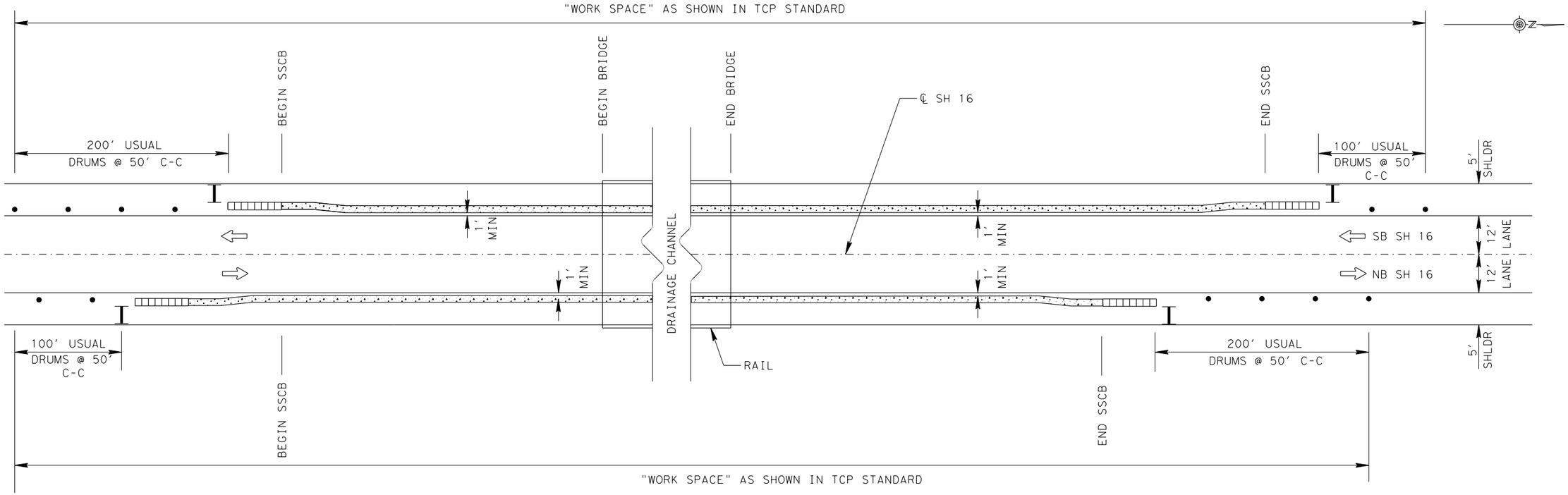
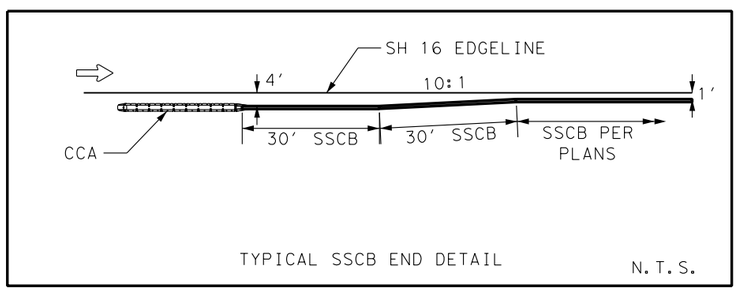


BRIDGE RAIL / MBGF
REPLACEMENT DETAIL

NOTES:

1. CONTRACTOR MAY ONLY WORK ON ONE SIDE OF A BRIDGE AT A TIME.
2. REFER TO TCP (2-1)-18 FOR ADVANCE SHOULDER CLOSURE DETAILS.
3. BARRIER QUANTITIES SHOWN IN TCP SUMMARY ARE BASED ON WORK BEING PERFORMED ON ONE SIDE OF THE BRIDGE AT A TIME.
4. ONCE WORK BEGINS, IT SHALL BE CONTINUOUS UNTIL COMPLETED.



TYPICAL SSCB END DETAIL N.T.S.

SSCB PLACEMENT DATA				
LOCATION	SH 16 C/L STATION			
	BEGIN SSCB	BEGIN BRIDGE	END BRIDGE	END SSCB
NB JERRY'S CREEK BRIDGE	169+00.00	170+83.46	171+95.61	172+90.00
SB JERRY'S CREEK BRIDGE	169+75.00	170+83.46	171+95.61	173+65.00

LEGEND

- TYPE 3 BARRICADE
- SSCB
- DRUM
- CRASH CUSHION

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SH 16
TCP DETAIL
BRIDGE RAIL / MBGF REPLACEMENT

11/29/2022 SHEET 2 OF 5

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.		HIGHWAY No.	
CHECKED:	6	TEXAS			SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	BWD	SAN SABA	0289	04	032	43

USER: mcastro
DATE: 11/29/2022 10:57
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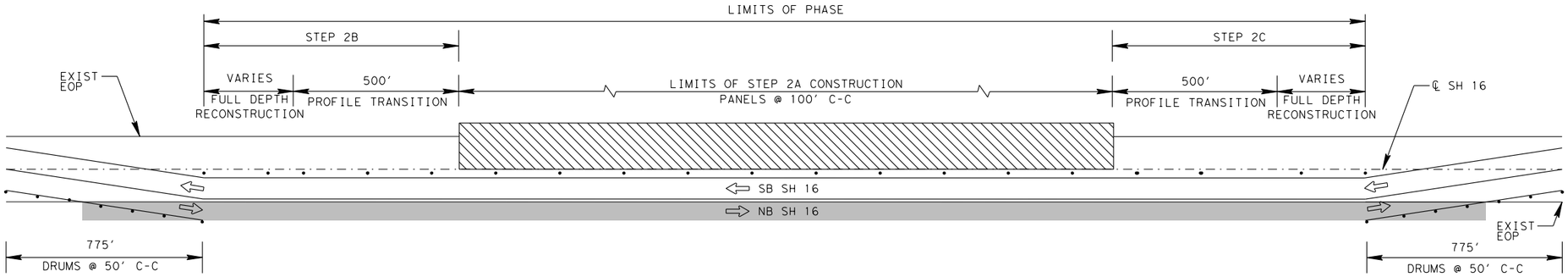


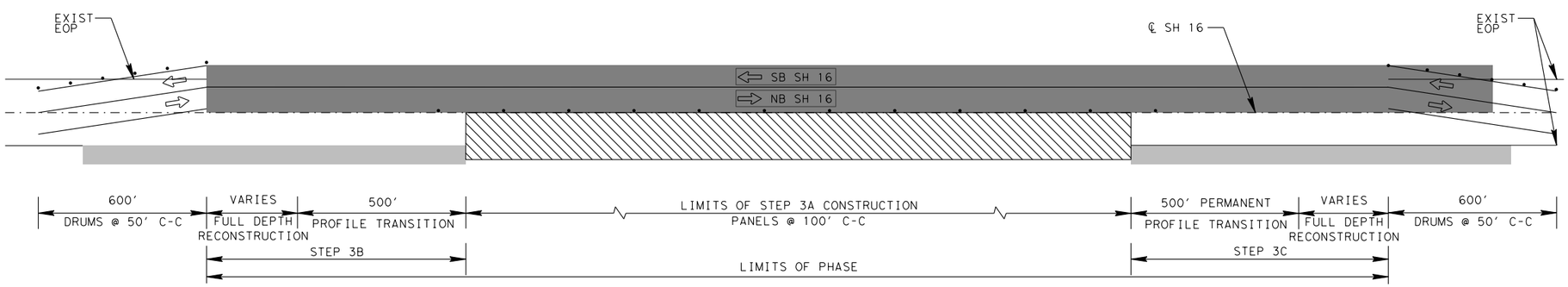
STEP 2

LEGEND

- STEP 1
- STEP 2A, STEP 3A
- CONSTRUCTION FROM PREVIOUS STEP

NOTES:

1. SEE TCP LAYOUTS AND SEQUENCE OF CONSTRUCTION FOR LIMITS OF PROFILE TRANSITIONS AND FULL DEPTH RECONSTRUCTION AT ENDS OF CONSTRUCTION PHASES.
2. REFER TO TCP STANDARD, TCP (2-3)-18 FOR ADVANCE SIGNING AND STRIPING FOR TRAFFIC DETOUR SETUP.
3. SEE TCP TYPICAL SECTIONS FOR WORK ZONE STRIPING CONFIGURATIONS.



STEP 3

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11/29/2022

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SH 16
TCP DETAIL
LATERAL SHIFT DETAIL

11/29/2022 SHEET 3 OF 5

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.	HIGHWAY No.
CHECKED:	6	TEXAS		SH 16

DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	BWD	SAN SABA	0289	04	032	44

USER: mcastro
DATE: 11/29/2022 10:57
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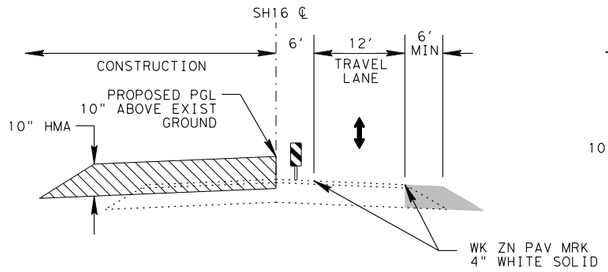
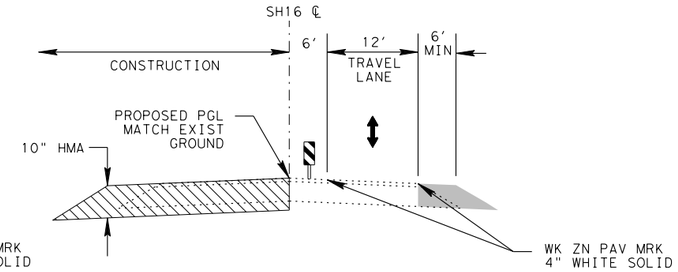
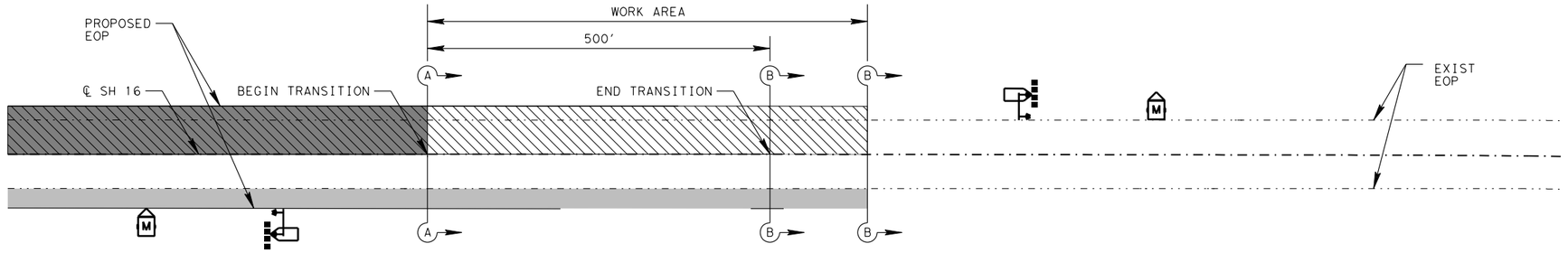


SECTION A-A



SECTION B-B



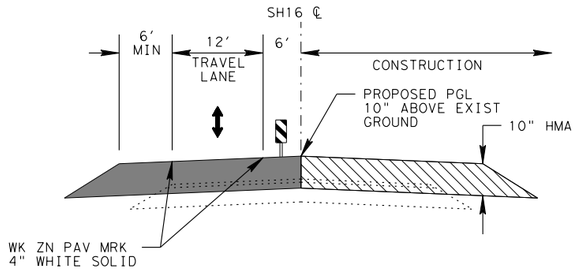
STEP 2

LEGEND

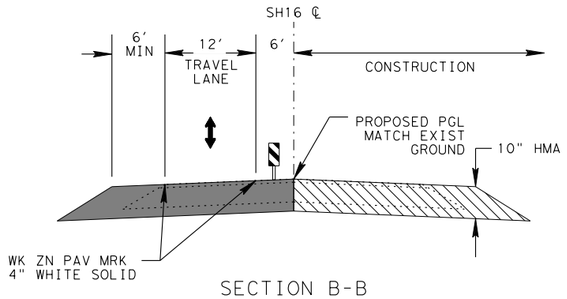
- CONSTRUCTION FROM PREVIOUS STEP
- STEP 1
- STEP 2A
- STEP 2B, 2C, 3B OR 3C
- STEP 3A
- PORTABLE CHANGEABLE MESSAGE BOARD (PCMB)
- TEMPORARY SIGNAL

NOTES:

1. SEE TCP LAYOUTS FOR LIMITS OF PROFILE TRANSITIONA AND FULL DEPTH RECONSTRUCTION AT ENDS OF CONSTRUCTION PHASES.
2. REFER TO TCP STANDARD, TCP (2-8)-18 FOR TRAFFIC SIGNALS ADVANCE SIGNING AND STRIPING FOR TWO-WAY, ONE-LANE TRAFFIC CONTROL SET-UP. STRIPING AND SIGN PLACEMENT BASED ON WORK AREA LIMITS SHOWN ON DETAILS.



SECTION A-A



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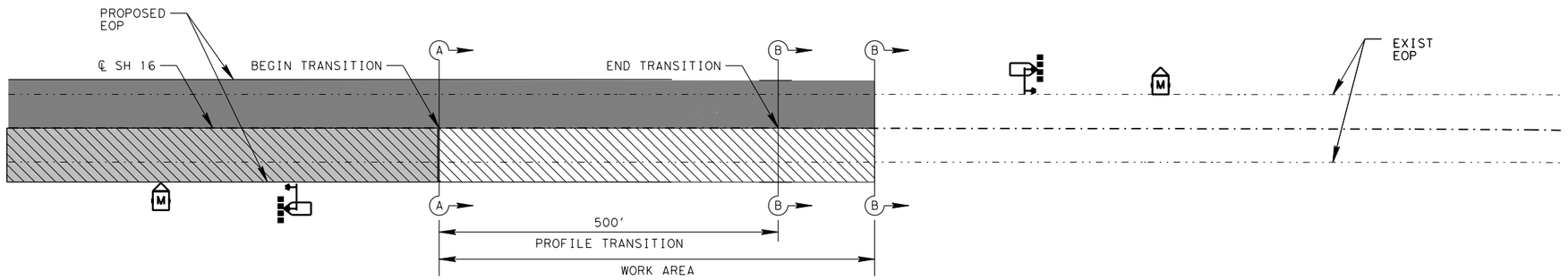

STEP 3

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75994
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PROFESSIONAL ENGINEER
11/29/2022

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SH 16
TCP DETAIL
PERMANENT PROFILE TRANSITION DETAIL

11/29/2022 SHEET 4 OF 5

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.
CHECKED:	6	TEXAS				SH 16
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	BWD	SAN SABA	0289	04	032	45

USER: mcastro
DATE: 11/29/2022 10:58
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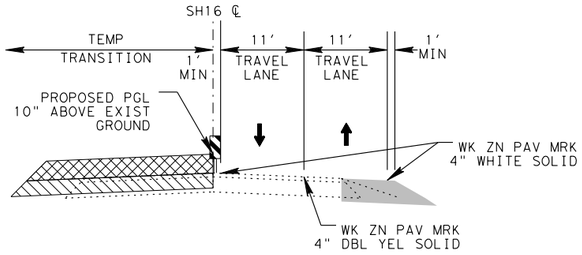
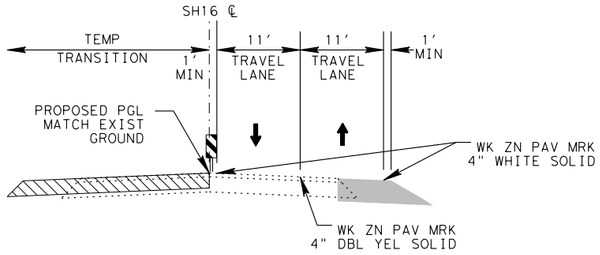
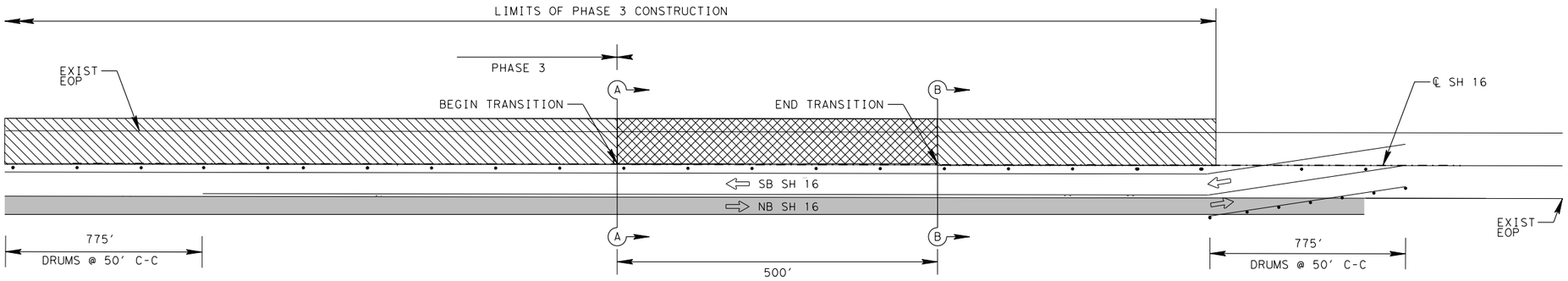
FILE: pw://server.slgeng.com:Slg-ds/Documents/TxDOT0103 Brownwood SH 16\Design_Data\4 - Design\Plan_Set_1\02_TCP\SH16_TCP_PERMANENT_PROFILE_TRANSITION_DETAIL.dgn



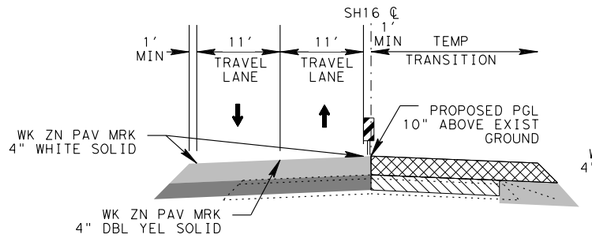
SECTION A-A



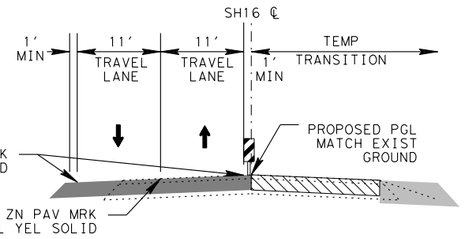
SECTION B-B



STEP 2



SECTION A-A



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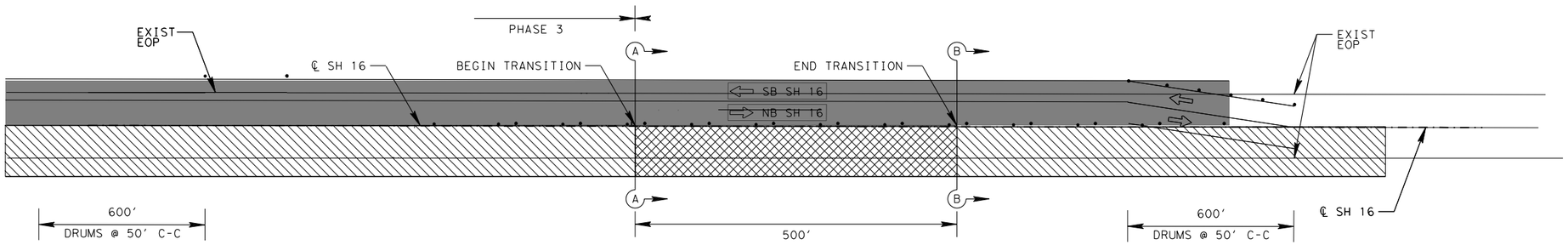

STEP 3

LEGEND

- STEP 1
- STEP 2A, STEP 3A
- STEP 2B, STEP 3B
- CONSTRUCTION FROM PREVIOUS STEP

NOTES:

1. SEE TCP LAYOUTS FOR LIMITS OF TEMPORARY PROFILE TRANSITIONS AT THE END OF PHASE 3 CONSTRUCTION.
2. REFER TO TCP STANDARD, TCP (2-3)-18 FOR ADVANCED SIGNING AND STRIPING FOR TRAFFIC DETOUR SETUP.
3. SEE TCP TYPICAL SECTIONS FOR ADDITIONAL INFORMATION ON WORK ZONE STRIPING.

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SH 16
TCP DETAIL
TEMPORARY PROFILE TRANSITION DETAIL

11/29/2022 SHEET 5 OF 5

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.	
CHECKED:	6	TEXAS				SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.	
CHECKED:	BWD	SAN SABA	0289	04	032	46	

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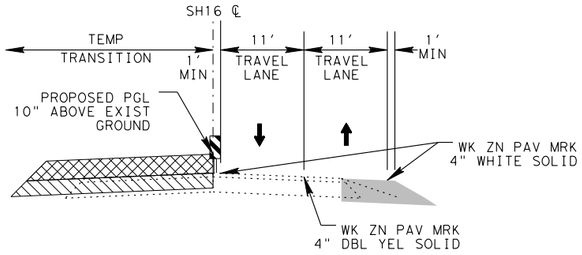
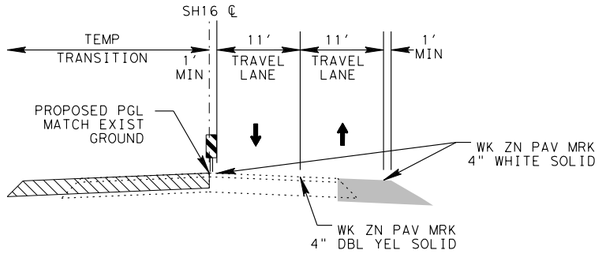
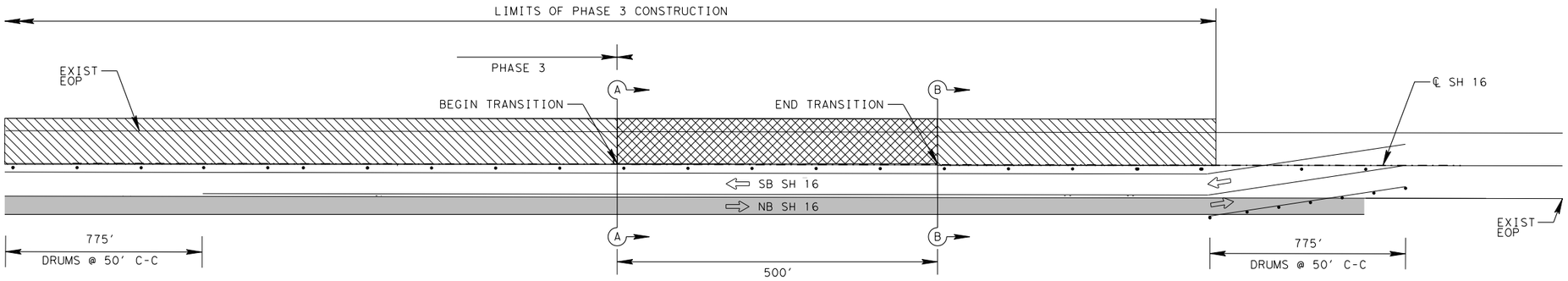


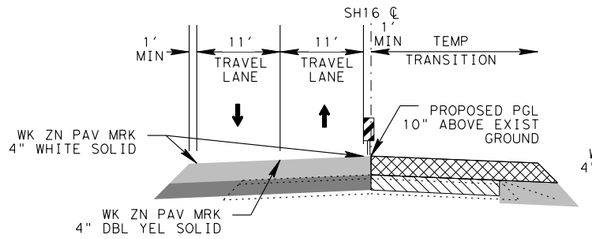
SECTION A-A



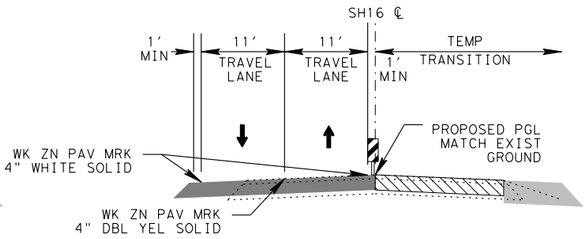
SECTION B-B



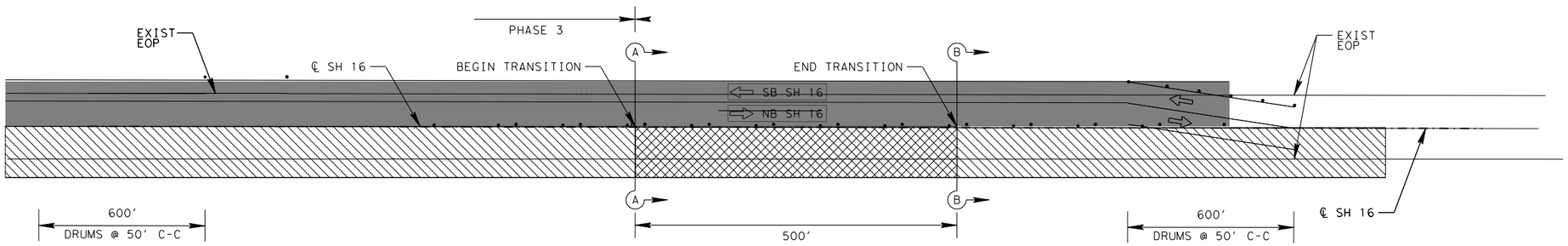
STEP 2



SECTION A-A



SECTION B-B



STEP 3

LEGEND

- STEP 1
- STEP 2A, STEP 3A
- STEP 2B, STEP 3B
- CONSTRUCTION FROM PREVIOUS STEP

NOTES:

1. SEE TCP LAYOUTS FOR LIMITS OF TEMPORARY PROFILE TRANSITIONS AT THE END OF PHASE 3 CONSTRUCTION.
2. REFER TO TCP STANDARD, TCP (2-3)-18 FOR ADVANCED SIGNING AND STRIPING FOR TRAFFIC DETOUR SETUP.
3. SEE TCP TYPICAL SECTIONS FOR ADDITIONAL INFORMATION ON WORK ZONE STRIPING.

NO.	REVISION	BY	DATE

STATE OF TEXAS
EDUARDO GUTIERREZ
75994
REGISTERED PROFESSIONAL ENGINEER
11/22/2022

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SH 16
TCP DETAIL
TEMPORARY PROFILE TRANSITION DETAIL

11/22/2022 SHEET 6 OF 6

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.	
CHECKED:	6	TEXAS				SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.	
CHECKED:	BWD	SAN SABA	0289	04	032	47	

USER: jsallnas
DATE: 11/22/2022 1:26
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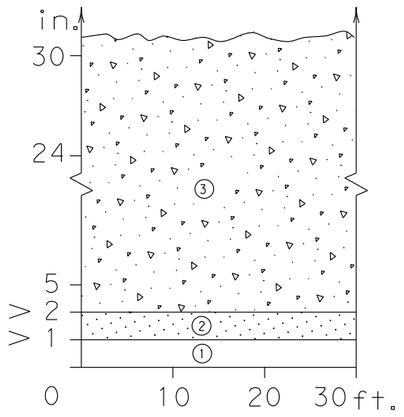
FILE: pw://server.sllgeng.com:Sllgeng/Documents/TxDOT0103 Brownwood SH 16\Design_Data\4 - Design\Plan_Set_1\02_TCP\SH16_TCP_TEMPORARY_PROFILE_TRANSITION_DETAIL.dgn

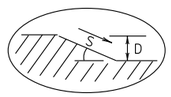
DATE: 11/22/2022
FILE:

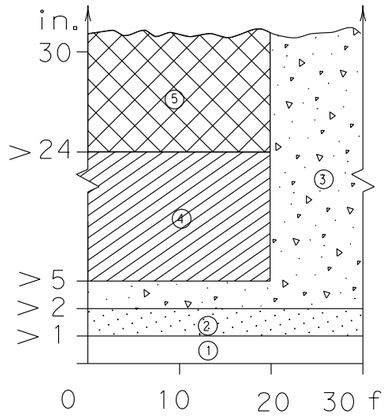
DEFINITION OF TREATMENT ZONES FOR VARIOUS EDGE CONDITIONS

Edge Height (D) in Inches versus Lateral Clearance (Y) in Feet

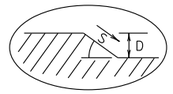


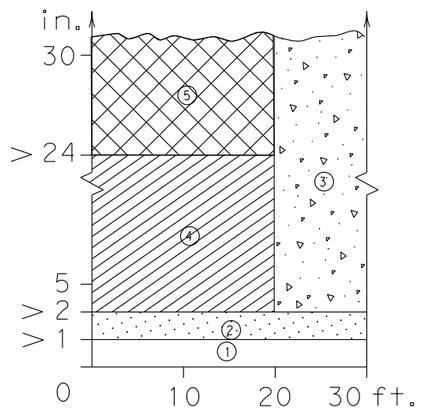
Edge Condition I
S = (3:1) (or flatter)



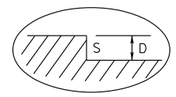


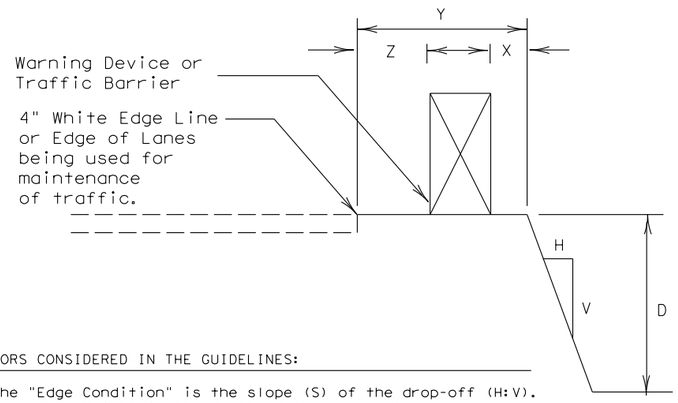
Edge Condition II
S = ((2.99):1) to (1:1)





Edge Condition III
S is steeper than (1:1)





FACTORS CONSIDERED IN THE GUIDELINES:

1. The "Edge Condition" is the slope (S) of the drop-off (H:V). The "Edge Height is the depth of the drop-off "D".

2. Distance "X" is to be the maximum practical under job conditions. Two feet minimum for high speed conditions. Distance "Y" is the lateral clearance from edge of travel lane to edge of dropoff. Distance "Z" does not have a minimum.

3. In addition to the factors considered in the guidelines, each construction zone drop-off situation should be analyzed individually, taking into account other variables, such as: traffic mix, posted speed in the construction zone, horizontal curvature, and the practicality of the treatment options.

4. The conditions for indicating the use of positive or protective barriers are given by Zone-5 and Figure-1. Traffic barriers are primarily applicable for high speed conditions. Urban areas with speeds of 30 mph or less may have a lesser need for signing, delineation, and barriers. Right-angled edges, however, with "D" greater than 2 inches and located within a lateral offset of 6 feet, may indicate a higher level of treatment.

5. If the distance "Y" must be less than 3 feet, the use of a positive barrier may not be feasible. In such a case, consider either: 1) narrowing the lanes to a desired 11 to 12 feet or 10 foot minimum (see CW20-8T "Narrow Lanes Ahead" sign), or 2) provide an edge slope such as Edge Condition I.

Zone	Treatment Types Guidelines:
①	No treatment.
②	CW 8-17 "Shoulder Drop-Off <Symbol>" with CW 8-17P "Shoulder Drop-Off <Plaque>" or CW 8-11 "Uneven Lanes" signs.
③	CW 8-17 with CW 8-17P or CW 8-11 signs plus vertical panels.
④	CW 8-17 with CW 8-17P or CW 8-11, signs plus drums. Where restricted space precludes the use of drums, use vertical panels. An edge fill may be provided to change the edge slope to that of the preferable Edge Condition I.
⑤	Check indications (Figure-1) for positive barrier. Where positive barrier is not indicated, the treatment shown above for Zone- 4 may be used after consideration of other applicable factors.

Edge Condition Notes:

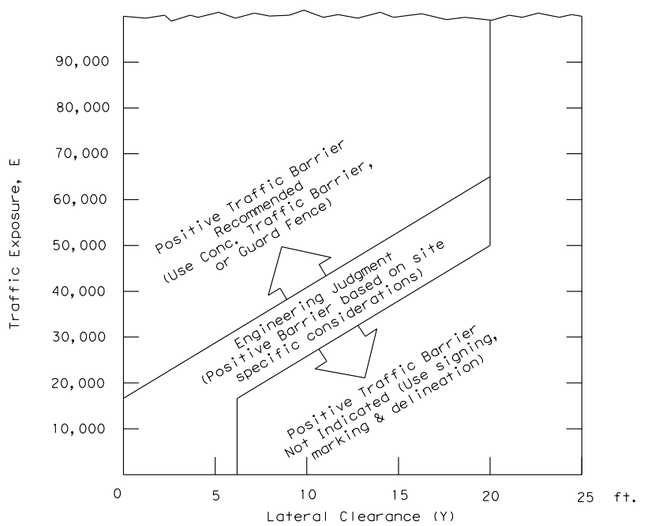
1. Edge Condition I: Most vehicles are able to traverse an edge condition with a slope rate of (3 to 1) or flatter. The slope must be constructed with a compacted material capable of supporting vehicles.

2. Edge Condition II: Most vehicles are able to traverse an edge condition with a slope between (2.99 to 1) and (1to 1) so long as "D" does not exceed 5 inches. Under-carriage drag on most automobiles will occur when "D" exceeds 6 inches. As "D" exceeds 24 inches, the possibility for rollover is greater in most vehicles.

3. Edge Condition III: When slopes are greater than (1 to 1) and where "D" is greater than 2 inches, a more difficult control factor may exist for some vehicles, if not properly treated. For example, where "D" is greater than 2 inches and up to 24 inches different types of vehicles may experience different steering control at different edge heights. Automobiles might experience more steering control differential when "D" is greater than 2 inches and up to 5 inches. Trucks, particularly those with high loads, have more steering control differential when "D" is greater than 5 inches and up to 24 inches. When "D" exceeds 24 inches, the possibility of rollover is greater for most vehicles.

4. Milling or overlay operations that result in Edge Condition III should not be in place without appropriate warning treatments, and these conditions should not be left in place for extended periods of time.

FIGURE-1: CONDITIONS INDICATING USE OF POSITIVE BARRIER FOR ZONE 5 (▨)



1 E = ADT x T
Where ADT is that portion of the average daily traffic volume traveling within 20 feet (generally two adjacent lanes) of the edge dropoff condition; and, T is the duration time in years of the dropoff condition.

2 Figure-1 provides a practical approach to the use of positive barriers for the protection of vehicles from pavement drop-offs. Other factors, such as the presence of heavy machinery, construction workers, or the mix and volume of traffic may make the use of positive barriers appropriate, even when the edge condition alone may not justify the use of a barrier.

3 An approved end treatment should be provided for any positive barrier end located within a lateral offset of 20 feet from the edge of the travel lane.

These guidelines apply to temporary traffic control areas or work zones where continuous pavement edges or drop-offs exists parallel and adjacent to a lane used by traffic. The edge conditions may be present between shoulders and travel lanes, between adjacent or opposing travel lanes, or at intermediate points across the width of the paved surface. Due to the variability in construction operations, tolerances in the variables may be allowed by the engineer. These guidelines do not apply to short term operations. These guidelines do not constitute a rigid standard or policy; rather, they are guidance to be used in conjunction with engineering judgement. These guidelines may be updated on the Design Division's online manuals.

Texas Department of Transportation
Traffic Operations Division

TREATMENT FOR VARIOUS EDGE CONDITIONS

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REVISIONS	CONT	SECT	JOB	HIGHWAY	
03-01	0289	04	032	SH 16	
08-01 correct typos	DIST	COUNTY		SHEET NO.	
11-13 update sign nomenclature	BWD	SAN SABA		48	

DATE: 11/22/2022
FILE: pw://server.sig-eng.com:Sig-ds/Documents/TxDOT0103 Brownwood SH 16/Design•Data/4 - Design/Plan•Set•1/02. TCP/Standards/bc-21(1).dgn

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. Where highway construction or maintenance work is being undertaken, other than mobile operations as defined by the Texas Manual on Uniform Traffic Control Devices, CSJ limit signs are required. CSJ limit signs are shown on BC(2). The OBEY WARNING SIGNS STATE LAW sign, STAY ALERT TALK OR TEXT LATER and the WORK ZONE TRAFFIC FINES DOUBLE sign with plaque shall be erected in advance of the CSJ limits. The BEGIN ROAD WORK NEXT X MILES, CONTRACTOR and END ROAD WORK signs shall be erected at or near the CSJ limits. For mobile operations, CSJ limit signs are not required.

11. 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 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.

2. Except in emergency situations, flagger stations shall be illuminated when flagging is used at night.

COMPLIANT WORKZONE TRAFFIC CONTROL DEVICES

1. Only pre-qualified products shall be used. The "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources.

2. Work zone traffic control devices shall be compliant with the Manual for Assessing safety Hardware (MASH).

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

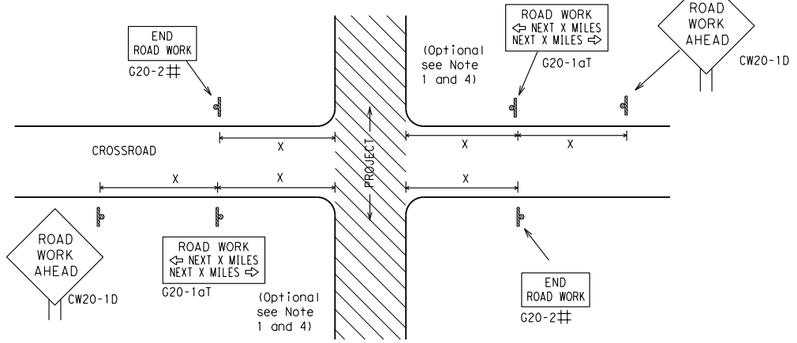
Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0289	04	032	SH 16
4-03 7-13	DIST	COUNTY		SHEET NO.
9-07 8-14	BWD	SAN SABA		49
5-10 5-21				

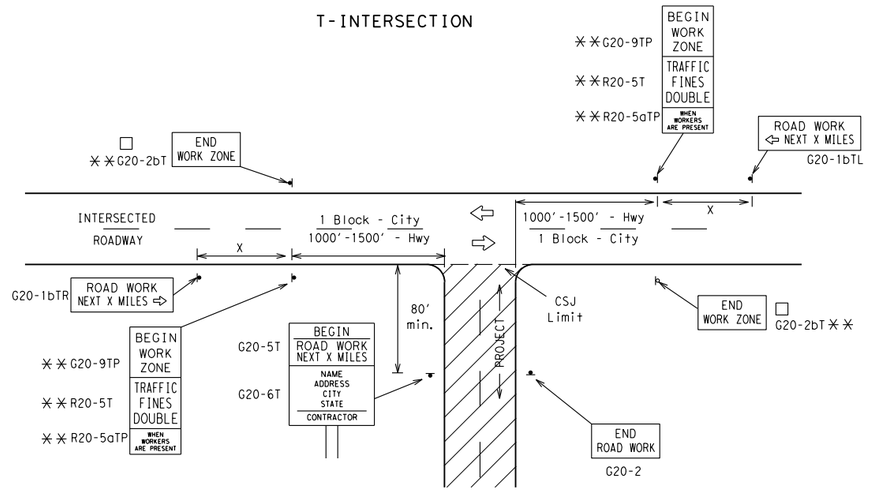
TYPICAL LOCATION OF CROSSROAD SIGNS



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 as per TMUTCD Part 5. 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

Sign Number or Series	Conventional Road	Expressway/ Freeway
CW20[4] CW21 CW22 CW23 CW25	48" x 48"	48" x 48"
CW1, CW2, CW7, CW8, CW9, CW11, CW14	36" x 36"	48" x 48"
CW3, CW4, CW5, CW6, CW8-3, CW10, CW12	48" x 48"	48" x 48"

SPACING

Posted Speed	Sign △ Spacing "X"
MPH	Feet (Apprx.)
30	120
35	160
40	240
45	320
50	400
55	500[2]
60	600[2]
65	700[2]
70	800[2]
75	900[2]
80	1000[2]
✳	✳[3]

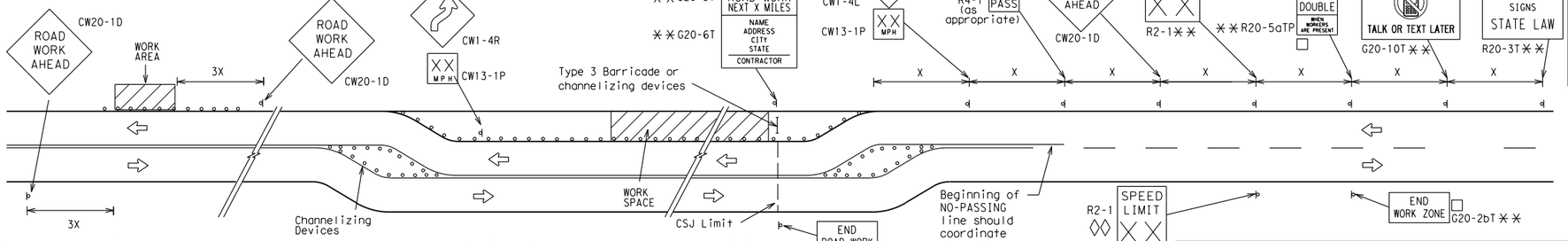
✳ For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

△ 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 as per TMUTCD Part 5. 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.

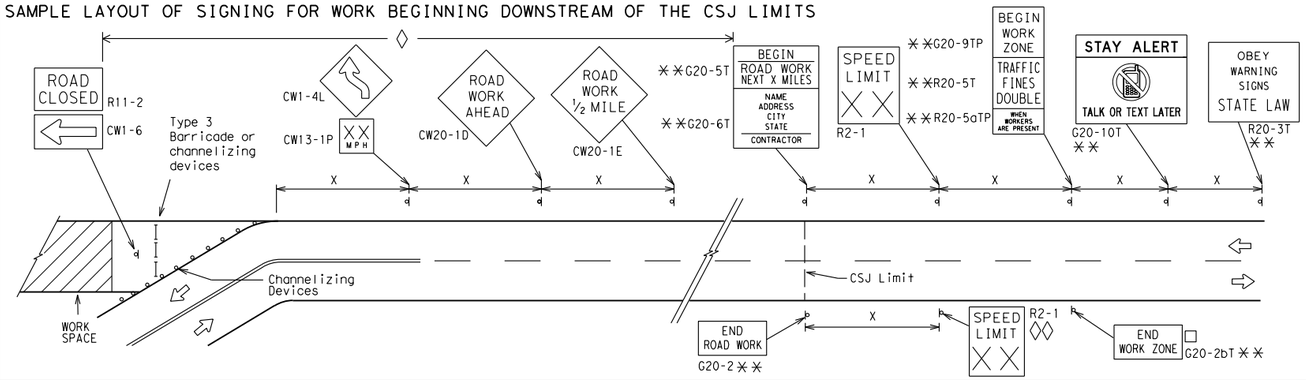
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



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.

✳✳ CSJ limit signing is required for highway construction and maintenance work, with the exception of mobile operations.

◊ 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 Safety Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	0289	04	032	SH 16
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	BWD	SAN SABA		50

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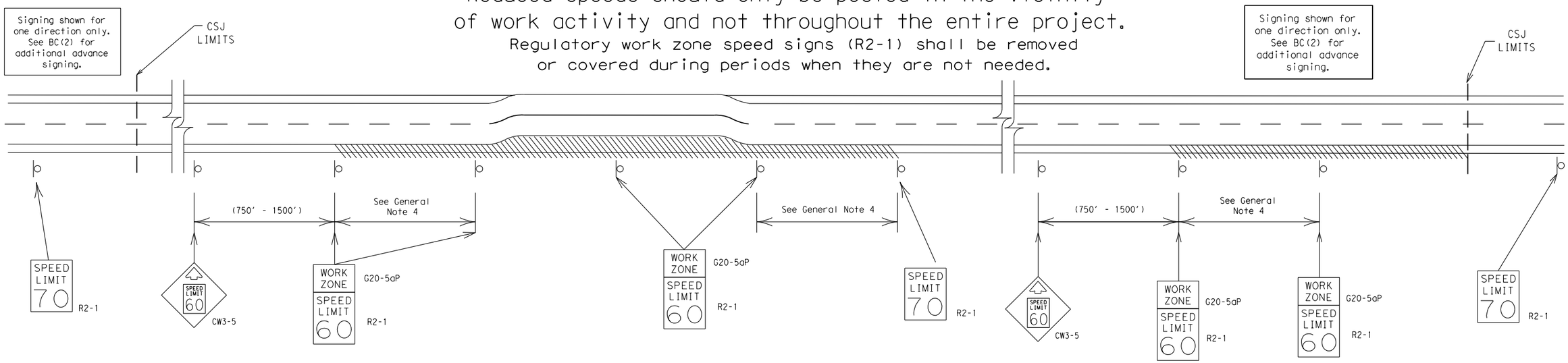
TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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 traveled 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.

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SHEET 3 OF 12

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	BWD	SAN SABA		51

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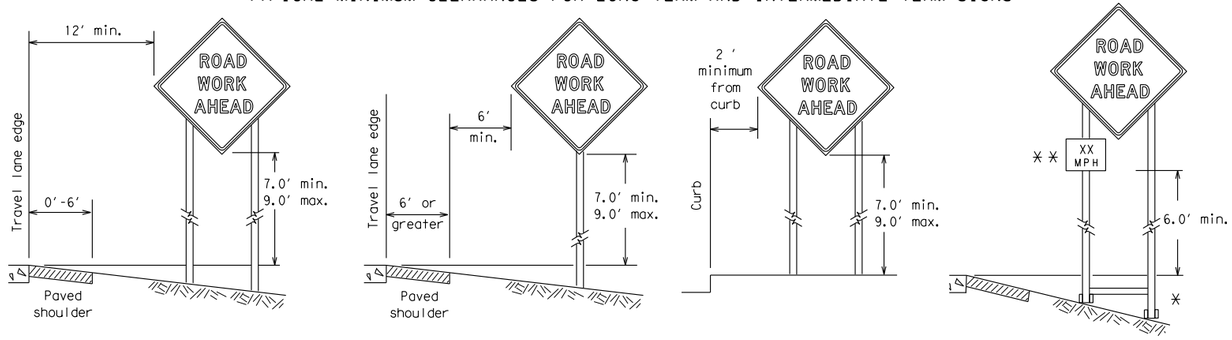
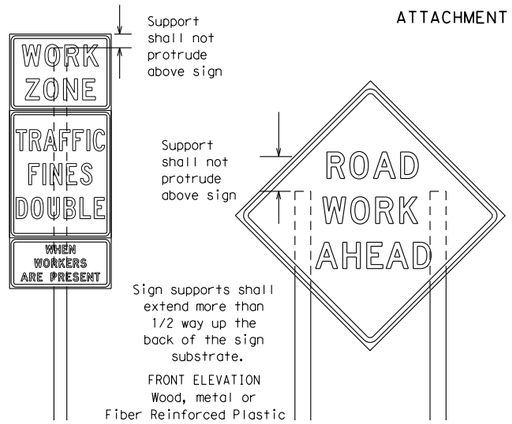
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

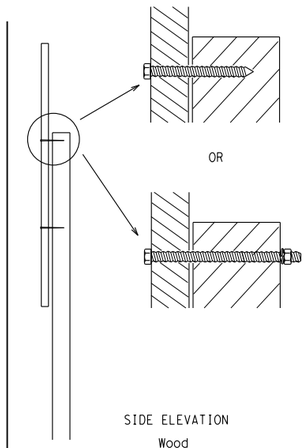


⚹ When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

⚹⚹ 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





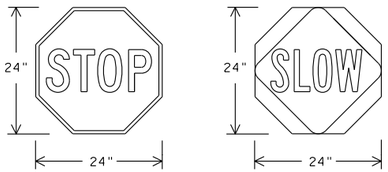
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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.

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.

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".
2. STOP/SLOW paddles shall be retroreflectorized when used at night.
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.



Background - Red
Legend & Border - White

Background - Orange
Legend & Border - Black

SHEETING REQUIREMENTS (WHEN USED AT NIGHT)		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	ORANGE	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND & BORDER	WHITE	TYPE B OR C SHEETING
LEGEND & BORDER	BLACK	ACRYLIC NON-REFLECTIVE FILM

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, specific service (LOGO), 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. For details for covering large guide signs see the TS-CD standard.
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 standard sheets, TLRS standard sheets or the CWZTCD list. The signs shall meet the required mounting heights shown on the BC, or the SMD standard sheets 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) for small roadside signs. Supports for temporary large roadside signs shall meet the requirements detailed on the Temporary Large Roadside Signs (TLRS) standard sheets.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

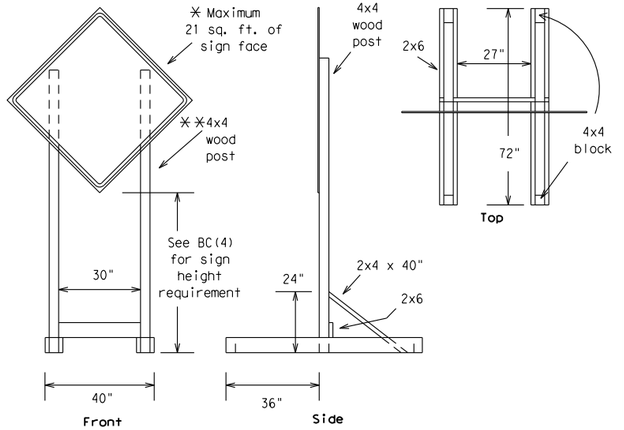
Traffic Safety Division Standard

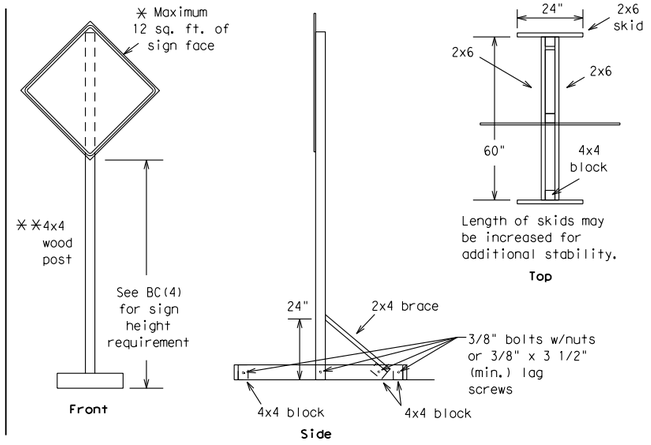
BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0289	04	032	SH 16
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	BWD	SAN SABA		52

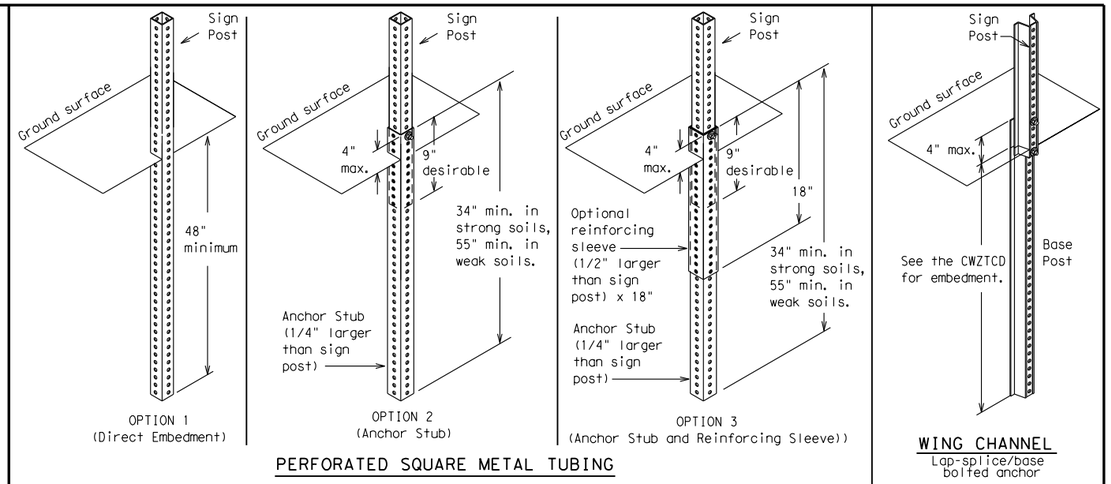
DATE: 11/22/2022
FILE: pw://server.sig-eng.com:Sig-ds/Documents/TxDOT0103 Brownwood SH 16/Design_Data/4 - Design/Plan_Set_1/02. TCP/Standards/bc-21(5).dgn





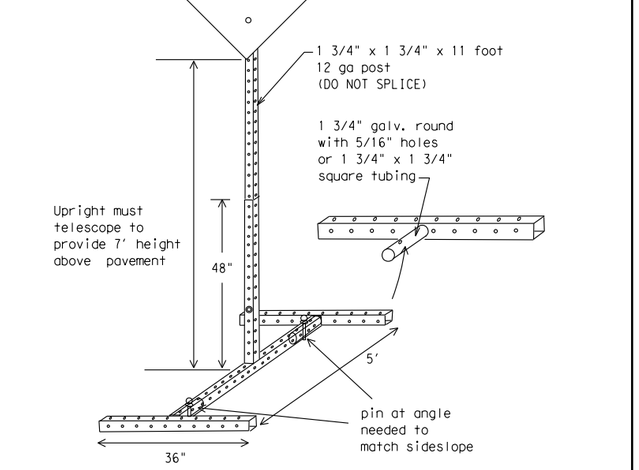
SKID MOUNTED WOOD SIGN SUPPORTS

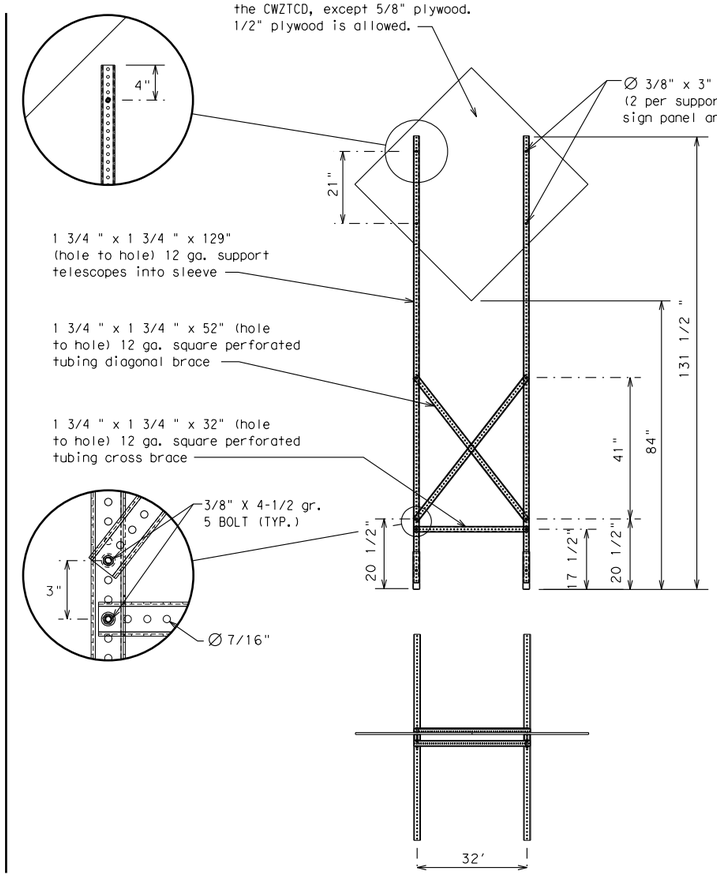
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS

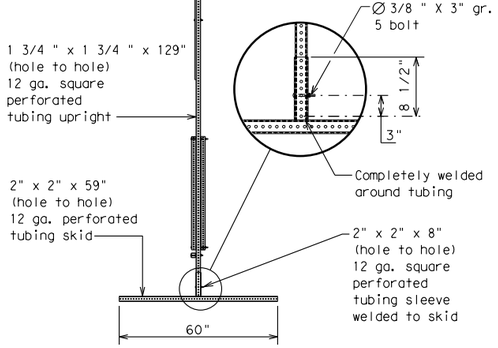


GROUND MOUNTED SIGN SUPPORTS

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.







SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED 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 Safety Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0289	04	032	SH 16
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	BWD	SAN SABA		53

DATE: 11/22/2022
FILE: pw://server.slg-eng.com:Slg-ds/Documents/TxDOT0103 Brownwood SH 16/Design_Data/4 - Design/Plan_Set_1/02. TCP/Standards/bc-21(6).dgn

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 Safety Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
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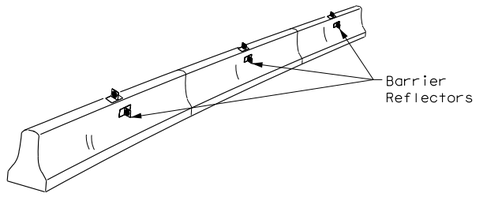
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	BWD	SAN SABA		54

100

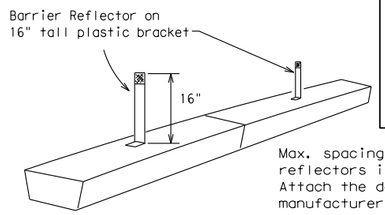
DATE: 11/22/2022
FILE: pw://server.slg-eng.com:Slg-ds/Documents/TxDOT0103 Brownwood SH 16/Design_Data/4 - Design/Plan_Set_1/02. TCP/Standards/bc-21(7).dgn

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.

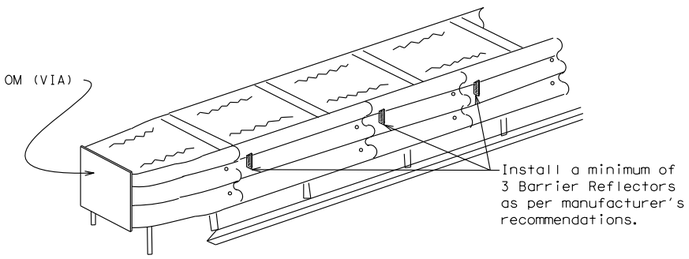


Max. spacing of barrier reflectors is 20 feet. Attach the delineators as per manufacturer's recommendations.

LOW PROFILE CONCRETE BARRIER (LPCB)

LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES

LPCB is approved for use in work zone locations, where the posted speed is 45mph, or less. See Roadway Standard Sheet LPCB.

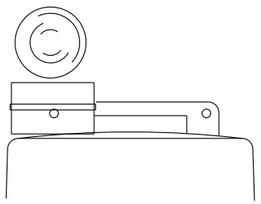


DELINEATION OF END TREATMENTS

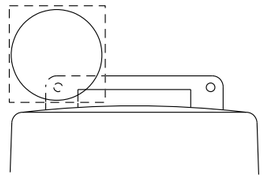
END TREATMENTS FOR CTB'S USED IN WORK ZONES

End treatments used on CTB's in work zones shall meet the apppropriate crashworthy standards as defined in the Manual for Assessing Safety Hardware (MASH). 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

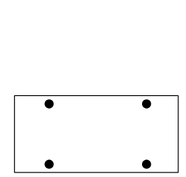
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing 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.

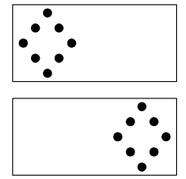
Arrow Boards may be located behind channelizing devices in place for a shoulder taper or merging taper, otherwise they shall be delineated with four (4) channelizing devices placed perpendicular to traffic on the upstream side of traffic.

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:

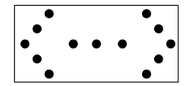


4 CORNER CAUTION

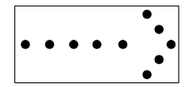
OR



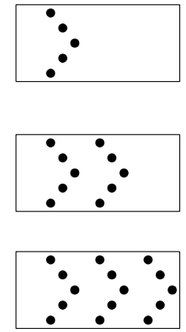
ALTERNATING DIAMOND CAUTION



DOUBLE ARROW



RIGHT/LEFT ARROW
(right arrow shown; left is similar)



RIGHT/LEFT SEQUENTIAL CHEVRON
(right chevron shown; left is similar)

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 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 Safety Division Standard

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

BC(7)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0289	04	032	SH 16
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	BWD	SAN SABA		55

101

DATE: 11/22/2022
FILE: pw://server.sig-eng.com:Sig-ds/Documents/TxDOT0103 Brownwood SH 16/Design_Data/4 - Design/Plan_Set_1/02. TCP/Standards/bc-21(8).dgn

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:

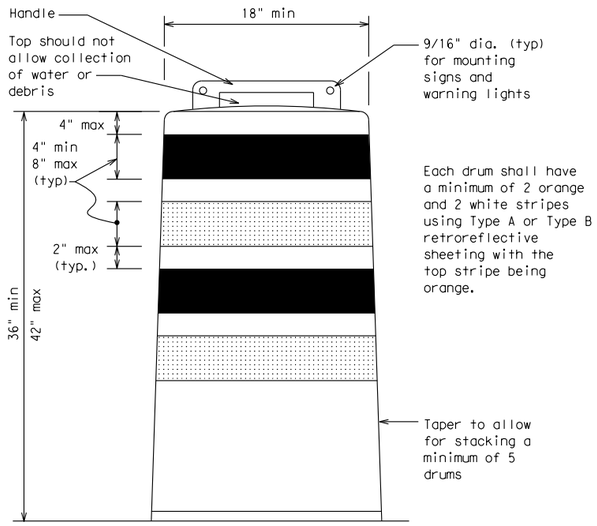
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents 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.

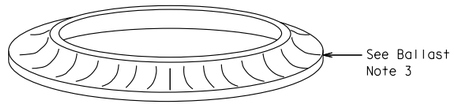
RETROREFLECTIVE SHEETING

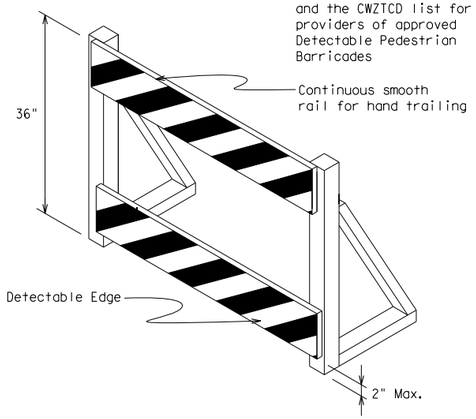
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall 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.

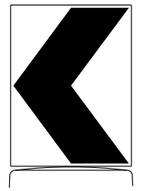




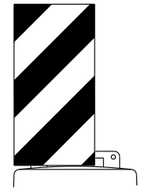


DETECTABLE PEDESTRIAN BARRICADES

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. Refer to WZ(BTS-2) for Pedestrian Control requirements for Sidewalk Diversions, Sidewalk Detours and Crosswalk Closures.
2. Where pedestrians with visual disabilities normally use the closed sidewalk, a Detectable Pedestrian Barricade shall be placed across the full width of the closed sidewalk instead of a Type 3 Barricade.
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 (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 should 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 or Type B. 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 Safety Division Standard

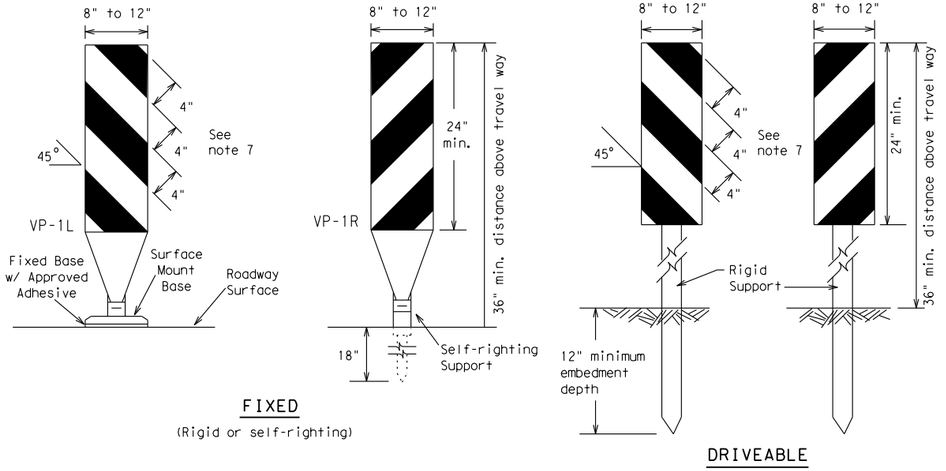
BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0289	04	032	SH 16
4-03 8-14	DIST	COUNTY		SHEET NO.
9-07 5-21	BWD	SAN SABA		56
7-13				

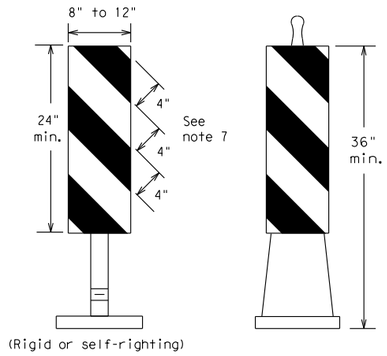
102

DATE: 11/22/2022
FILE: pw://server.slg-eng.com:Slg-ds/Documents/TxDOT0103 Brownwood SH 16/Design_Data/4 - Design/Plan_Set_1/02. TCP/Standards/bc-21(9).dgn



FIXED
(Rigid or self-righting)

DRIVEABLE

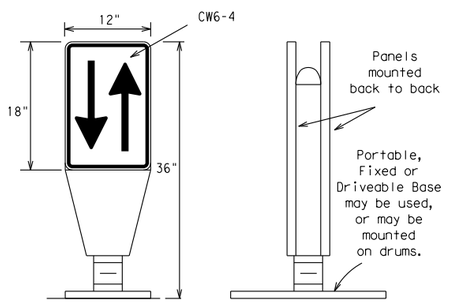


(Rigid or self-righting)

PORTABLE

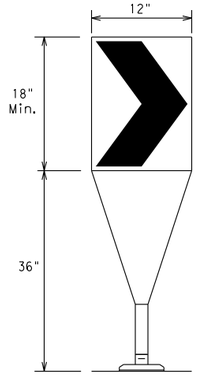
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is required. The Engineer/Inspector shall refer to the Roadway Design Manual for additional requirements on the use 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 or Type B 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.

VERTICAL PANELS (VPs)



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.

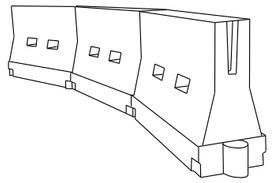
OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



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



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). Place reflective sheeting 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 Manual for Assessing Safety Hardware (MASH) 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

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.

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	0289	04	032	SH 16
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	BWD	SAN SABA		57

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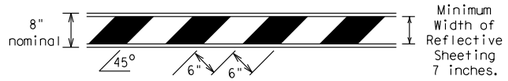
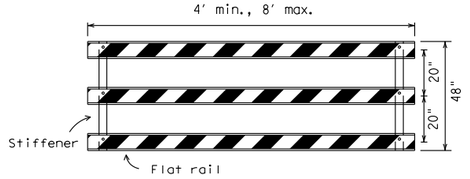
TYPE 3 BARRICADES

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 or Type B conforming to Departmental Material Specification DMS-8300 unless otherwise noted.

Barricades shall NOT be used as a sign support.



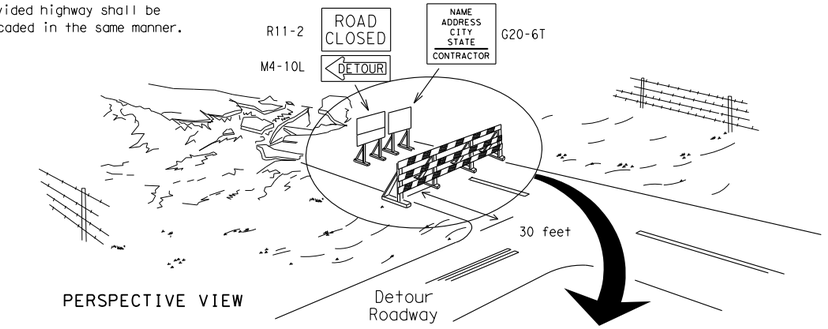
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

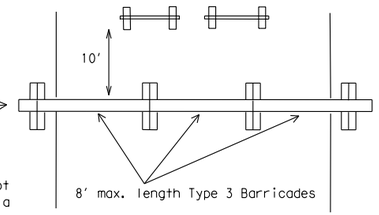
Each roadway of a divided highway shall be barricaded in the same manner.



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.

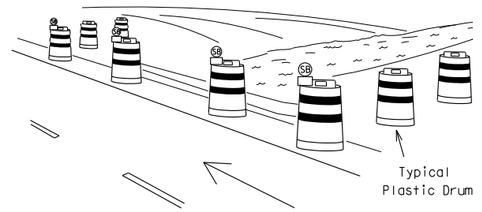
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

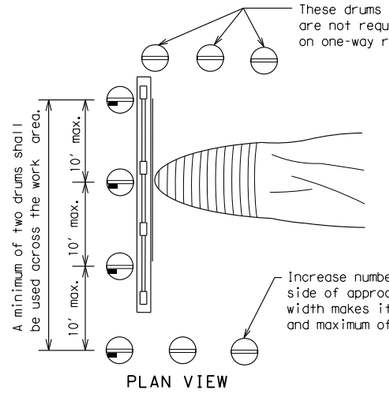
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

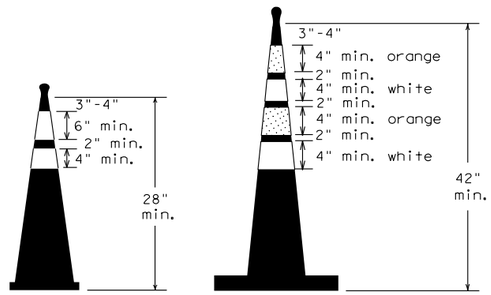
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder 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.



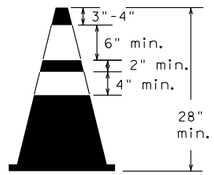
PLAN VIEW

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

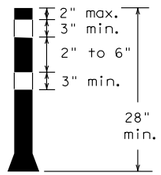
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



Two-Piece cones



One-Piece cones

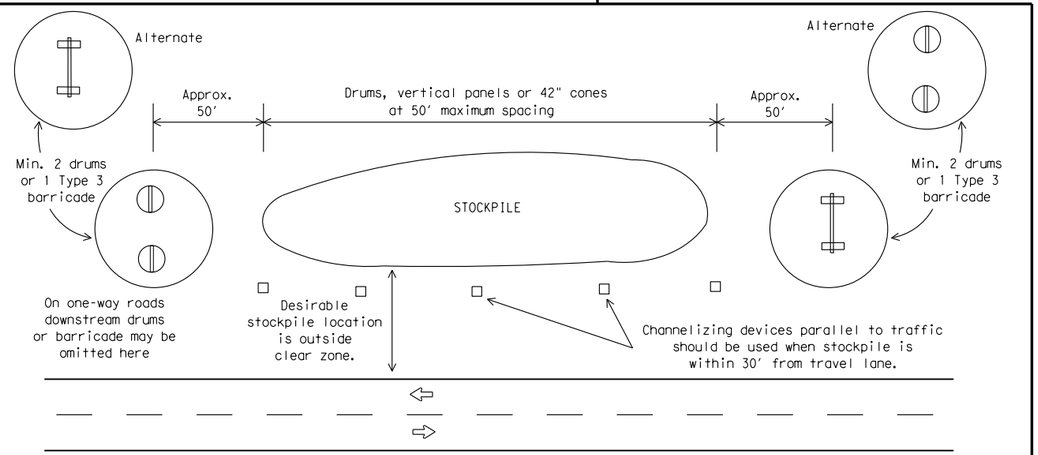


Tubular Marker

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 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 or Type B.
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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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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.

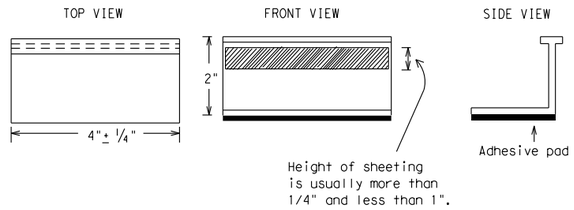
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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 Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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11-02 8-14				

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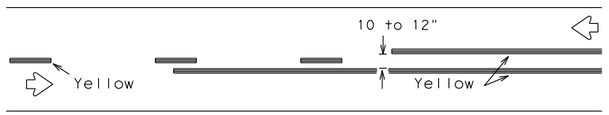
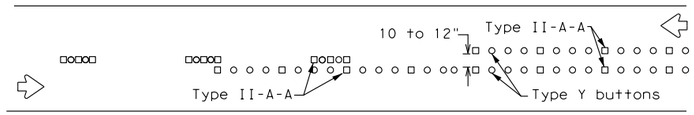
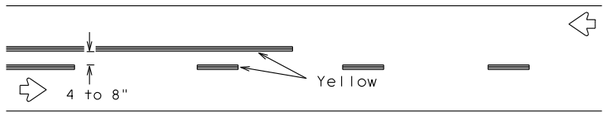
PAVEMENT MARKING PATTERNS



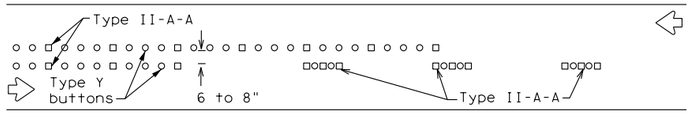
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



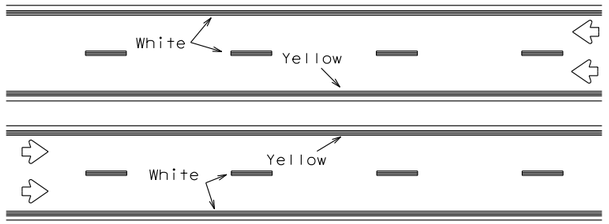
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



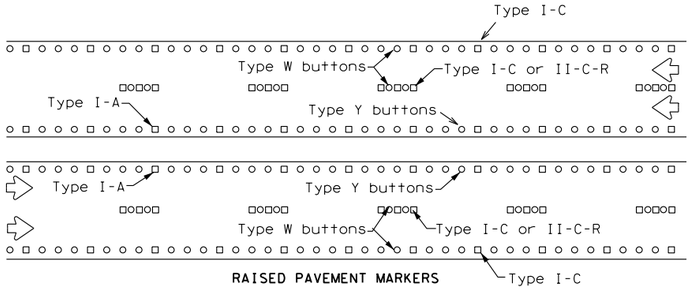
RAISED PAVEMENT MARKERS - PATTERN B

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



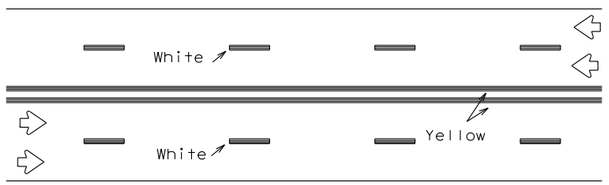
REFLECTORIZED PAVEMENT MARKINGS



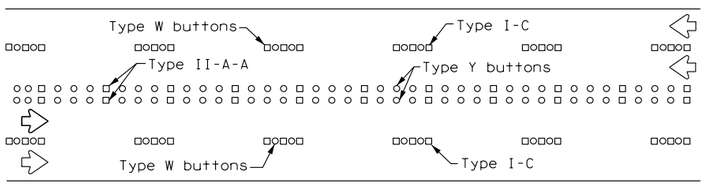
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



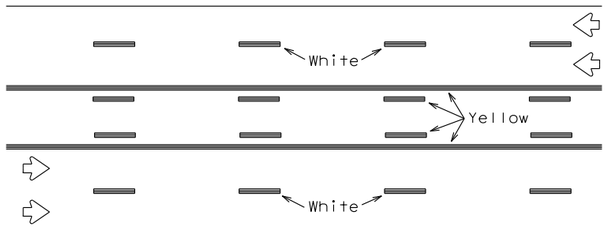
REFLECTORIZED PAVEMENT MARKINGS



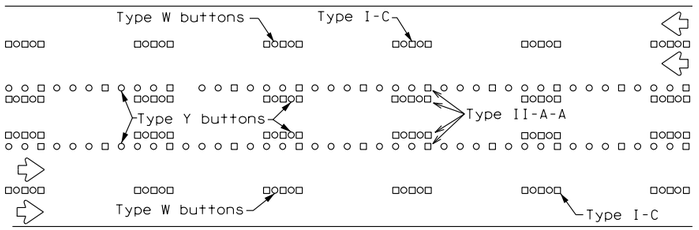
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

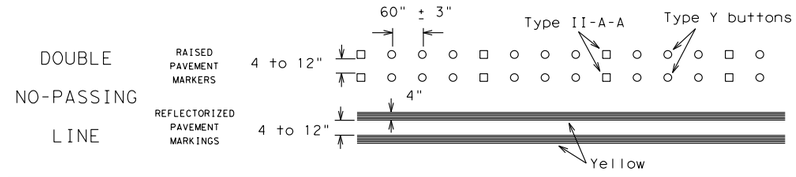
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

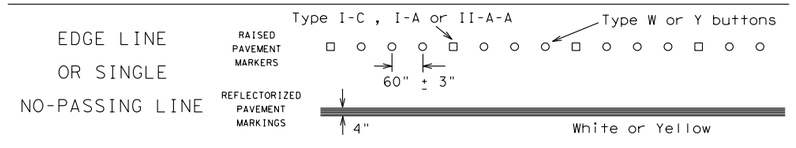
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

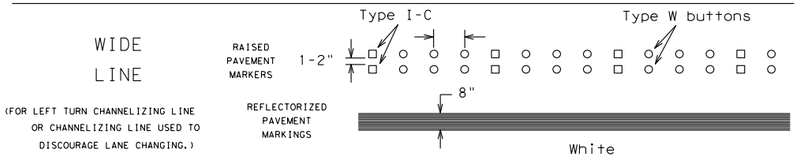


EDGE LINE OR SINGLE NO-PASSING LINE



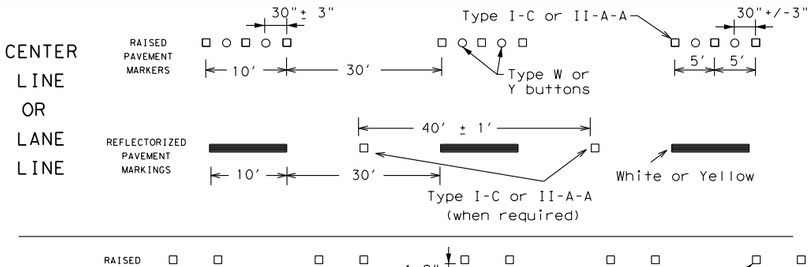
WIDE LINE

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

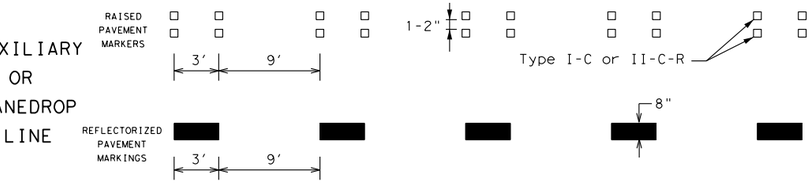


BROKEN LINES

CENTER LINE OR LANE LINE

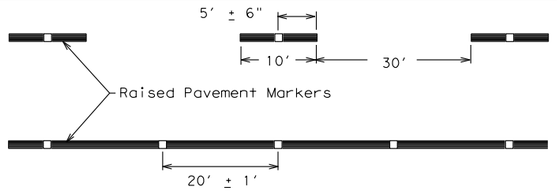


AUXILIARY OR LANEDROP LINE



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 Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-21

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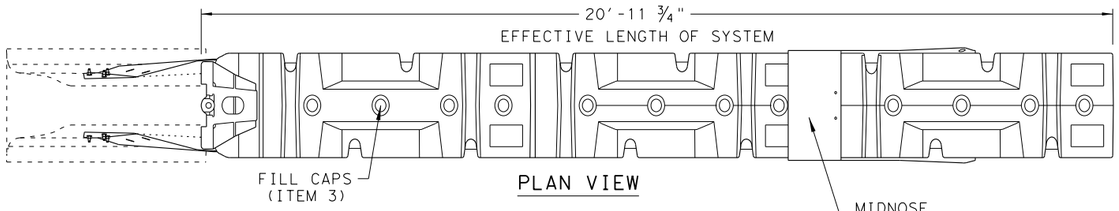
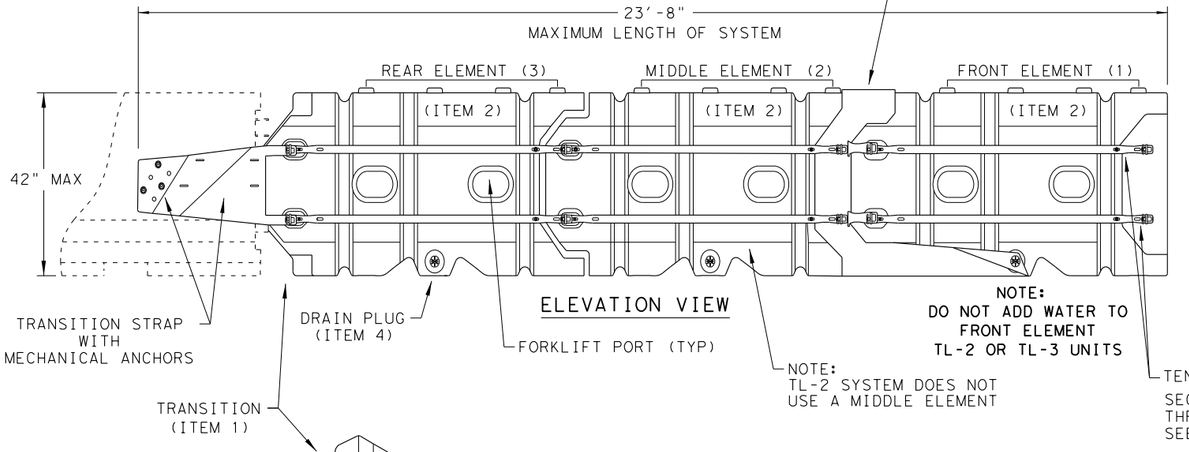
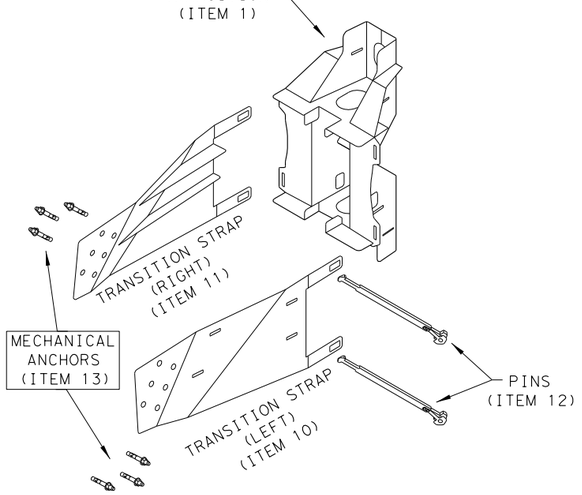
REVISIONS 1-97 9-07 5-21 2-98 7-13 11-02 8-14	0289	04	032	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	SAN SABA		60

DATE: 11/22/2022
FILE: pw://server.slg-eng.com:Slg-ds/Documents/TxDOT0103 Brownwood SH 16/Design_Data/4 - Design/Plan_Set_1/02. TCP/Standards/absorbm19.dgn

SYSTEM SHOWN - ABSORB-M TL-3







THE ABSORB-M IS A NON-REDIRECTIVE, GATING, CRASH CUSHION DESIGNED TO MEET THE LATEST TL-3 & TL-2 MASH REQUIREMENTS.

THE SYSTEM IS DESIGNED TO ACCOMMODATE A VARIETY OF F-SHAPE AND SINGLE SLOPE CONCRETE BARRIERS. CONTACT THE MANUFACTURER FOR GUIDANCE REGARDING OTHER ALLOWABLE SHAPES.

TEST LEVEL	NUMBER OF ELEMENTS	EFFECTIVE LENGTH	MAXIMUM LENGTH
TL-2	2	14'- 7 3/4"	17'- 4"
TL-3	3	20'- 11 3/4"	23'- 8"

NOTE:
CROSS SLOPES OF UP TO 8% (OR 1:12 SLOPE) CAN BE ACCOMMODATED WITH STANDARD HARDWARE SHOWN WITHIN THE INSTRUCTIONS MANUAL. FOR SLOPES WITH EXCESS OF 8% (OR 1:12) CONTACT, LINDSAY TRANSPORTATION SOLUTIONS.

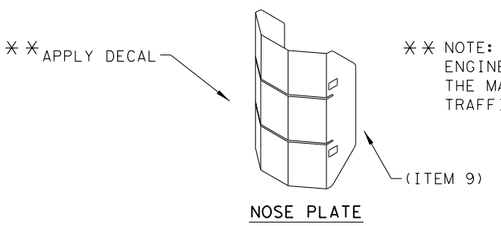
GENERAL NOTES

1. FOR SPECIFIC INFORMATION REGARDING THE INSTALLATION AND TECHNICAL GUIDANCE, CONTACT: LINDSAY TRANSPORTATION SOLUTIONS (LTS) - BARRIER SYSTEMS, INC. AT (707) 374-6800. 180 RIVER ROAD, RIO VISTA, CA 94571
2. THE ABSORB-M SYSTEM IS ONLY APPROVED FOR USE IN (TEMPORARY WORK ZONE) LOCATIONS.
3. THE ABSORB-M IS A WATER FILLED NON-REDIRECTIVE, GATING CRASH CUSHION THAT DOES NOT NEED TO BE ATTACHED TO A FOUNDATION AND CAN BE INSTALLED ON TOP OF CONCRETE, ASPHALT, OR ANY SURFACE CAPABLE OF BEARING THE WEIGHT OF THE SYSTEM.
4. MAXIMUM PERMISSIBLE CROSS-SLOPE IS 8%.
5. THE INSTALLATION AREA SHOULD BE FREE FROM CURBS, ELEVATED OBJECTS, OR DEPRESSIONS.
6. THE ABSORB-M SHOULD BE LOCATED APPROXIMATELY PARALLEL WITH THE BARRIER.
7. THE USE OF THE ABSORB-M IS RESTRICTED TO A BARRIER HEIGHT OF UP TO 42 INCHES.
8. DO NOT ADD WATER TO FRONT ELEMENT (TL-2 OR TL-3 UNIT).

BILL OF MATERIALS (BOM) ABSORB-M TL-3 & TL-2 SYSTEMS			QTY	QTY
ITEM #	PART NUMBER	PART DESCRIPTION	TL-2 SYSTEM	TL-3 SYSTEM
1	BSI-1809036-00	TRANSITION-(GALV)	1	1
* 2	BSI-1808002-00	PRE-ASSEMBLED ABSORBING (ELEMENTS)	2	3
* 3	BSI-4004598	FILL CAPS	8	12
* 4	BSI-4004599	DRAIN PLUGS	2	3
* 5	BSI-1809053-00	TENSION STRAP-(GALV)	8	12
* 6	BSI-2001998	C-SCR FH 3/8-16 X 1 1/2 GR5 PLT	8	12
* 7	BSI-2001999	C-SCR FH 3/8-16 X 1 GR5 PLT	8	12
8	BSI-1809035-00	MIDNOSE-(GALV)	1	1
9	BSI-1808014-00	NOSE PLATE	1	1
10	BSI-1809037-00	TRANSITION STRAP (LEFT-HAND)-(GALV)	1	1
11	BSI-1809038-00	TRANSITION STRAP (RIGHT-HAND)-(GALV)	1	1
12	BSI-1808005-00	PIN ASSEMBLY	8	10
13	BSI-2002001	ANC MECH 5/8-11X5 (GALV)	6	6
14	ABSORB-M	INSTALLATION AND INSTRUCTIONS MANUAL	1	1

* COMPONENTS PRE-ASSEMBLED WITH ELEMENT ASSEMBLY

DELINEATION DECAL PLACEMENT GUIDE



** NOTE: (PROVIDED BY OTHERS)
ENGINEER OR CONTRACTOR SHALL COORDINATE WITH THE MANUFACTURER FOR THE CORRECT DECAL PER TRAFFIC FLOW, LEFT, RIGHT OR BOTH-SIDES.

NOTE:
APPLY A HIGH REFLECTIVE DECAL TO THE NOSE PLATE. DELINEATION DECAL ORIENTATION IS SHOWN ON THE CONSTRUCTION PLAN SET AND SHALL BE IN ACCORDANCE WITH THE TEXAS MUTCD FOR (TRAFFIC CONTROL DEVICES). DECALs ARE AVAILABLE FOR TRAFFIC FLOW ON THE LEFT-SIDE, BOTH -SIDES AND RIGHT-SIDE.

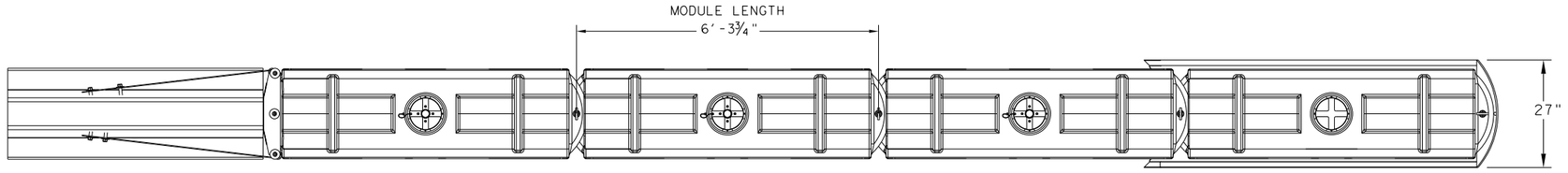
NOTE:
THIS STANDARD IS A BASIC REPRESENTATION OF THE ABSORB-M, IT IS NOT INTENDED TO REPLACE THE INSTALLATION INSTRUCTIONS MANUAL.

SACRIFICIAL

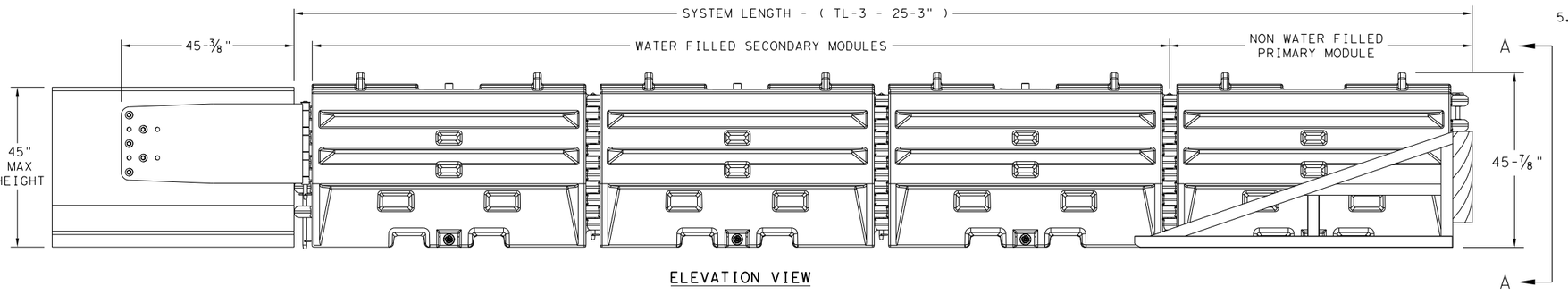
Texas Department of Transportation — Design Division Standard

LINDSAY TRANSPORTATION SOLUTIONS
CRASH CUSHION
(MASH TL-3 & TL-2)
TEMPORARY - WORK ZONE
ABSORB(M)-19

FILE: absorbm19	DN: TxDOT	CK: KM	DW: VP	CK:
© TxDOT: JULY 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0289	04	032	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	SAN SABA		61



PLAN VIEW



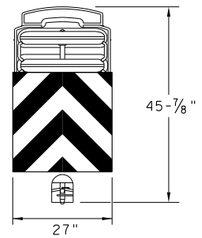
ELEVATION VIEW

GENERAL NOTES

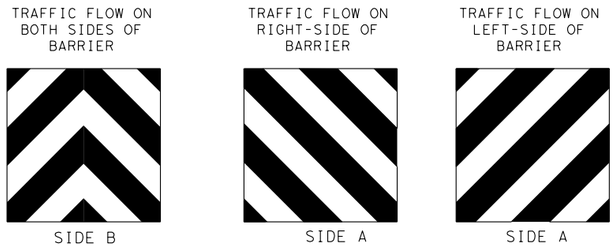
1. REFER TO THE INSTALLATION MANUAL FOR SPECIFIC SYSTEM ASSEMBLY AND MODULE ORIENTATION. FOR ADDITIONAL INFORMATION, CONTACT TRAFFIX, INC. AT (949) 361-5663.
2. THE SLED SYSTEM IS A MASH APPROVED TEST LEVEL 3 (TL-3) CRASH CUSHION APPROVED FOR USE IN TEMPORARY WORK ZONES. THE SLED SYSTEM IS A NON-REDIRECTIVE, GATING CRASH CUSHION THAT DOES NOT NEED TO BE ATTACHED TO THE GROUND AND CAN BE INSTALLED ON CONCRETE, ASPHALT, GRAVEL OR COMPACTED SOIL.
3. MAXIMUM PERMISSIBLE CROSS SLOPE IS 8° (DEGREES) (14%).
4. THE INSTALLATION AREA SHOULD BE FREE FROM CURBS, ELEVATED OBJECTS, OR DEPRESSIONS.
5. THE SLED SYSTEM CAN BE ATTACHED TO:

- CONCRETE BARRIER, TEMPORARY OR PERMANENT, 45" MAXIMUM HEIGHT
- STEEL BARRIER
- PLASTIC BARRIER
- CONCRETE BRIDGE ABUTMENTS
- W-BEAM GUARD RAIL
- THRIE BEAM GUARD RAIL

TEST LEVEL	NUMBER OF SECONDARY MODULES	SYSTEM LENGTH
TL-3	3	25′ 3"

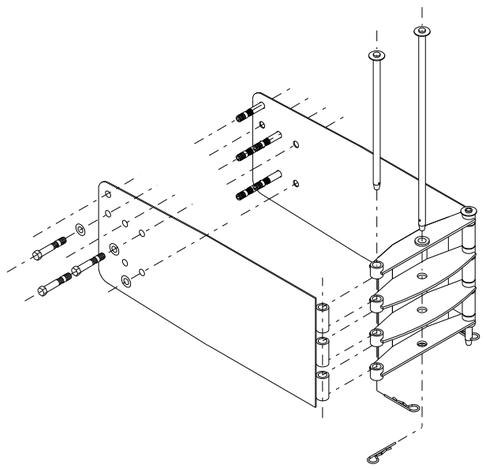


SECTION A-A



NOSE SHEETING PANEL DELINEATION

NOTE:
SEE INSTALLATION MANUAL FOR CUSTOMIZED DELINEATION NOSE SHEETING FOR DECAL PLACEMENT.



SLED TRANSITION COMPONENTS FOR ATTACHMENT TO CMB

NOTE:
SEE MANUFACTURER'S INSTALLATION MANUAL FOR FURTHER DETAILS.

TRANSITION OPTIONS
SLED TRANSITION TO CONCRETE TRAFFIC BARRIER (TEMPORARY OR PERMANENT)
SLED TRANSITION TO STEEL TRAFFIC BARRIER (CONTACT MFGR FOR PROPER TRANSITION)
SLED TRANSITION TO PLASTIC TRAFFIC BARRIER (CONTACT MFGR FOR PROPER TRANSITION)
SLED TRANSITION TO W-BEAM OR THRIE BEAM GUARD RAIL (CONTACT MFGR FOR PROPER TRANSITION)
SLED TRANSITION TO CONCRETE BRIDGE ABUTMENT

NOTE:
THIS STANDARD IS A BASIC REPRESENTATION OF THE SLED, IT IS NOT INTENDED TO REPLACE THE INSTALLATION INSTRUCTIONS MANUAL.

SACRIFICIAL

BILL OF MATERIAL

PART NUMBER	DESCRIPTION	QTY: TL-3
45131	TRANSITION FRAME, GALVANIZED	1
45150	TRANSITION PANEL, GALVANIZED	2
45147-CP	TRANSITION SHORT DROP PIN W/ KEEPER PIN, GALVANIZED	2
45148-CP	TRANSITION LONG DROP PIN W/ KEEPER PIN, GALVANIZED	1
45050	ANCHOR BOLTS	9
12060	WASHER, 3/4" ID X 2" OD	9
45044-Y	SLED YELLOW WATER FILLED MODULE	3
45044-YH	SLED YELLOW "NO FILL" MODULE	1
45044-S	CIS (CONTAINMENT IMPACT SLED), GALVANIZED	1
45043-CP	T-PIN W/ KEEPER PIN	4
18009-B-I	FILL CAP W/ "DRIVE BY" FLOAT INDICATOR	3
45033-RC-B	DRAIN PLUG	3
45032-DPT	DRAIN PLUG REMOVAL TOOL	1

Texas Department of Transportation

Design Division Standard

SLED
CRASH CUSHION
TL-3 MASH COMPLIANT
(TEMPORARY, WORK ZONE)
SLED-19

FILE: sled19.dgn	DN: TxDOT	CK: KM	DW: VP	CK:
© TxDOT: DECEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0289	04	032	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	SAN SABA		62

DATE: 11/22/2022
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DATE: 11/22/2022
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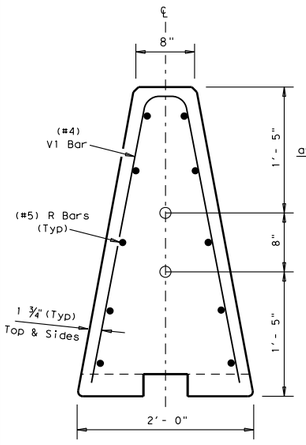
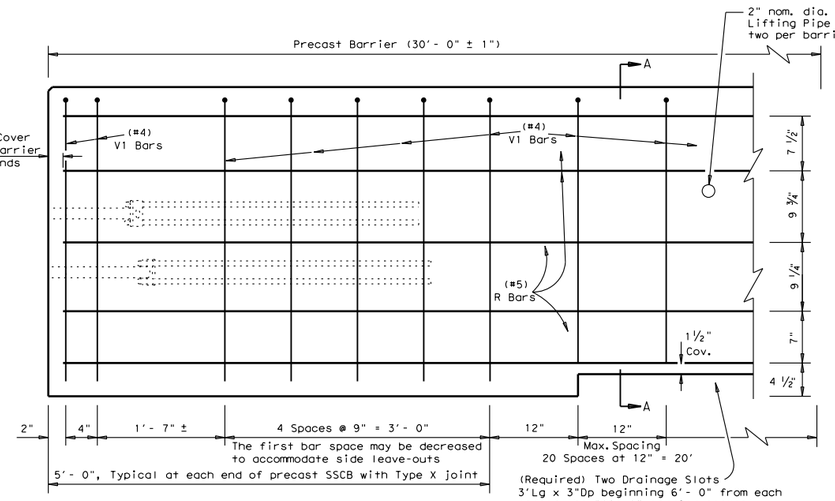


End View Precast Barrier

Pipe locations for Joint Type X connection



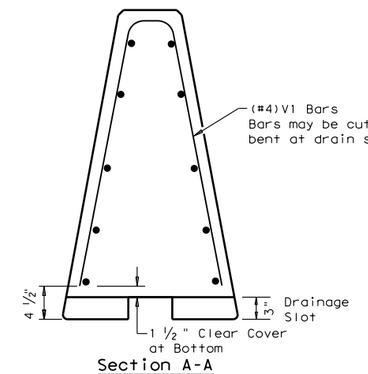
Reinforcement for Precast (SSCB) Single Slope Concrete Barrier (Type 1)

Showing reinforcement for Joint Connection (Type X)

V1 Bar

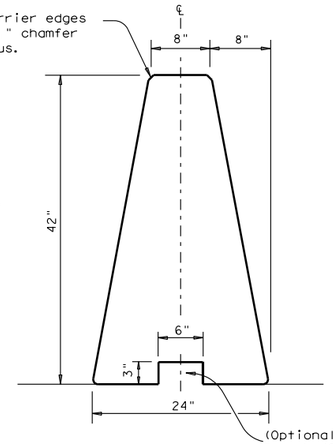
#4 Rebar

Note:
V1 Bars above the drainage slots may bent to accomadate 1 ½" clear cover as directed by the Engineer.



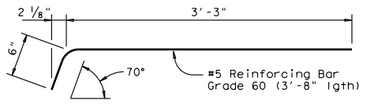
Section A-A

Steel Placement at (Required) Drainage Slots



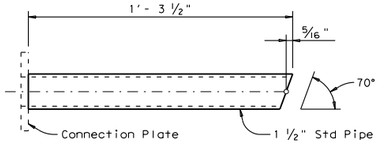
Single Slope Concrete Traffic Barrier

Precast SSCB barrier may be connected to cast-in-place SSBC. The joint connection "Types" may be used in the cast-in-place barrier, to match the precast barrier connection.



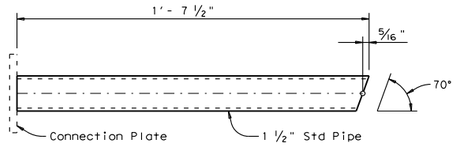
DEFORMED BAR ANCHOR DETAILS

Two (2) Bars required per assembly.
Eight (8) required per Joint.



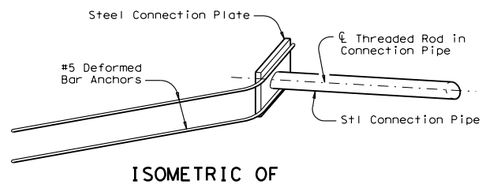
UPPER CONNECTION PIPE DETAILS

One (1) Steel Pipe required per Upper Assembly.
Two (2) required per Joint.



LOWER CONNECTION PIPE DETAILS

One (1) Steel Pipe required per Lower Assembly.
Two (2) required per Joint.

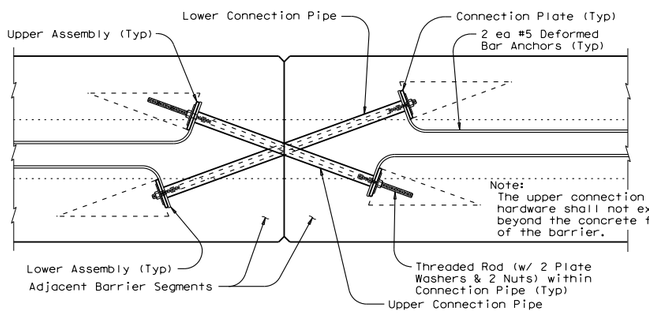


ISOMETRIC OF TYPICAL WELDED ASSEMBLY

Four (4) [2 Upper & 2 Lower] Assemblies required per Joint.

General Notes

1. Concrete shall be Class H with a minimum compressive strength of 3,600 psi.
2. Where used, rebar reinforcement shall be Grade 60 and conform to ASTM A615.
3. Precast barrier length shall be 30 ft. unless otherwise specified on the plans.
4. All precast barrier edges shall have a ¾" chamfer or a tooled radius.
5. All concrete, reinforcement, joint connection systems, grout etc. as shown, are considered as part of the barrier payment.
6. Conduit trough when required shall be shown elsewhere on the plans, or as directed by the Engineer.
7. Regardless of the method of handling, barrier lifting points shall be approx. 7.5 feet from the ends of the barrier. Lifting devices and attachments to barrier sections shall be approved by the Engineer.
8. Surface finishing and grouting (where required) shall be two parts sand one part cement with enough water to make the mixture plastic. Grouting shall be done in a manner that will assure a smooth surface. Surface finishing shall be considered subsidiary to the various bid items.
9. All steel assemblies shall be galvanized after fabrication in accordance with Item 445, "Galvanizing."



TYPE X JOINT INSTALLATION DETAIL

Barrier reinforcing and Type X Joint Leave-Out dimensions not shown for clarity.

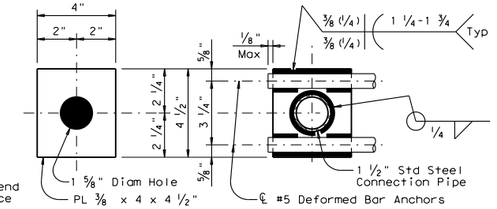
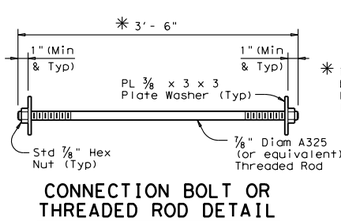


PLATE DIMENSIONS

WELDING DETAILS

CONNECTION PLATE DETAILS

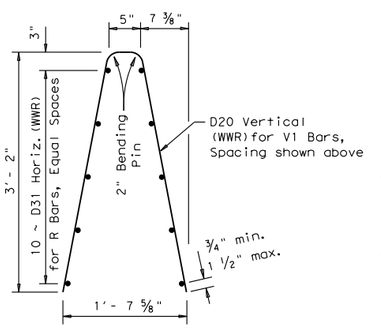
One (1) Plate required per assembly.
Four (4) required per Joint. All steel fittings for joint Type X shall be galvanized after fabrication in accordance with Item 445.



CONNECTION BOLT OR THREADED ROD DETAIL

Two (2) Threaded Rods (Or Equivalent Hex Hd. Bolts) (w/ Two (2) PL ⅜ x 3 x 3 Plate Washers & Two (2) Std Hex Nuts) required per Joint.

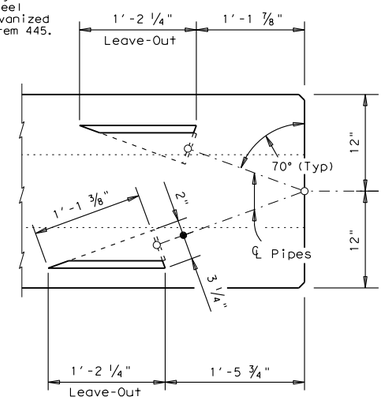
Weight of one precast 30 ft. (SSCB) segment = Approx. 10.5 Tons or 717 lbs per ft.



Welded Wire Reinforcement (WWR) Option for Bars R and V1

(WWR) General Notes

1. Deformed Welded Wire Reinforcement (WWR) shall conform to ASTM A497.
2. Welded wire cage may be cut or bent to accommodate the Type X joint connection and drainage slots, as directed by the Engineer.
3. All reinforcement shall comply with Item 440, "Reinforcing Steel."
4. Combinations of reinforcing steel and WWR will be permitted, as directed by the Engineer. The dimension from the end of the barrier section to the first wire shall not exceed 3".



BARRIER PLAN AT JOINT

SHEET 1 OF 2

Texas Department of Transportation

Design Division Standard

SINGLE SLOPE CONCRETE BARRIER

PRECAST BARRIER (TYPE 1)

SSCB(2)-10

FILE: sscb210.dgn	DN: TxDOT	CK: AM	DW: BD	CK:
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REVISIONS	0289	04	032	SH 16
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	BWD	SAN SABA		63

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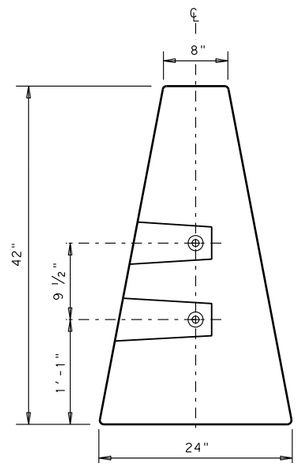
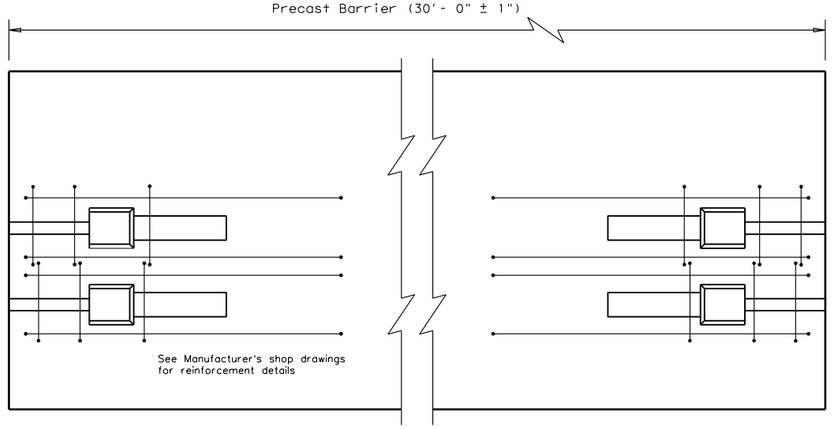
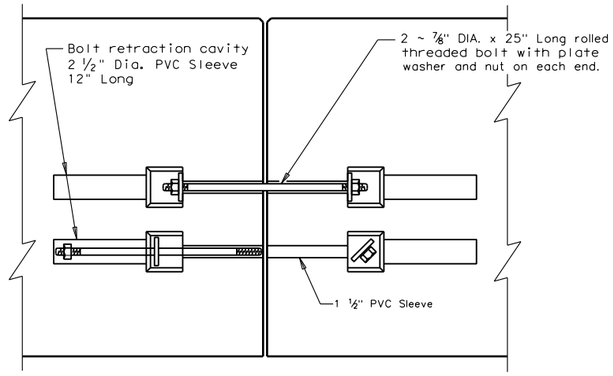


END VIEW
"QUICK-BOLT" POCKET LOCATIONS

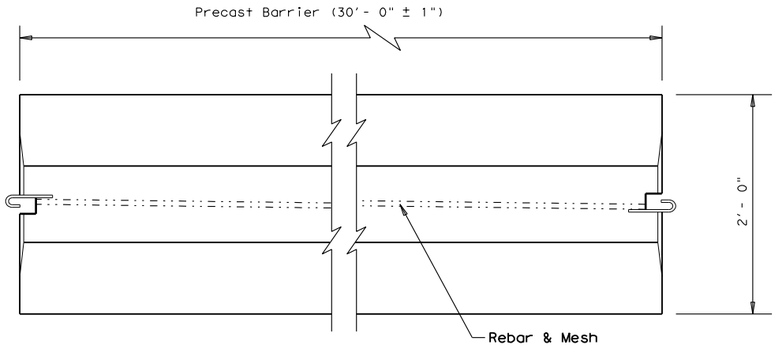


ELEVATION VIEW
"QUICK-BOLT" (SSCB)
See Manufacturer's shop drawing for additional details

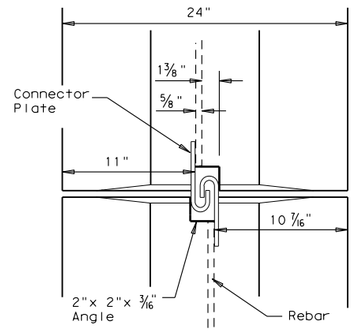


ELEVATION VIEW SHOWING JOINT CONNECTION
"QUICK-BOLT"

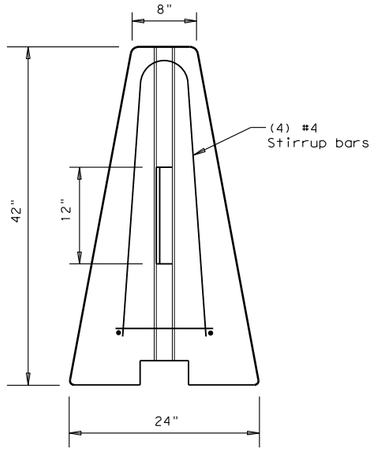
Joint Connection (Type Q)



TOP VIEW
PRECAST (SSCB) WITH J-J HOOKS
See Manufacturer's shop drawing for additional details



VIEW FROM ABOVE
J-J HOOK CONNECTION



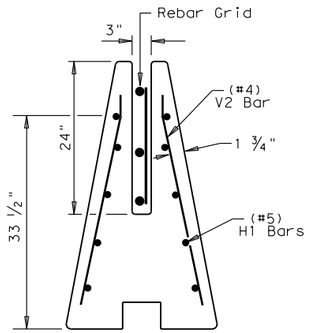
END VIEW

Proprietary Joint Connections (SSCB)

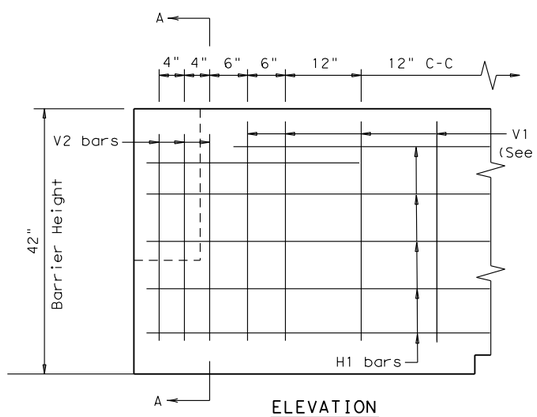
Two proprietary joint connections are acceptable as alternates to the (Type X) connection shown, here on. These joint connections types are:

J-J Hooks by Easi-Set Industries, (800)547-4045
Quick-Bolt by Bexar Concrete, (210)497-3773

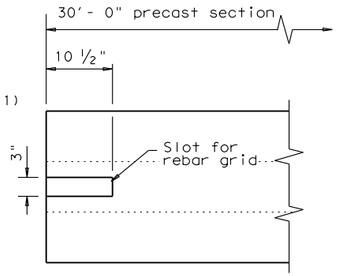
If one of these connection systems are exclusively specified in the plans, prior approval for sole source use must be obtained. Details of the connection components and barrier reinforcement for these systems, will be shown on the manufacturer's shop drawing(s) furnished to the Engineer.



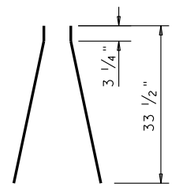
SECTION A-A
Showing (Type R) Rebar Grid



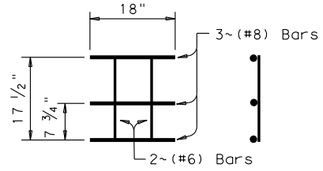
ELEVATION
V1 Bars (See Sheet 1)



TOP VIEW
JOINT CONNECTION
Typical at both ends of barrier segment



(#4) V2 BARS
6 ~ two piece bars per barrier segment



WELDED REBAR GRID

Joint Connection (Type R)

SHEET 2 OF 2

Texas Department of Transportation — Design Division Standard

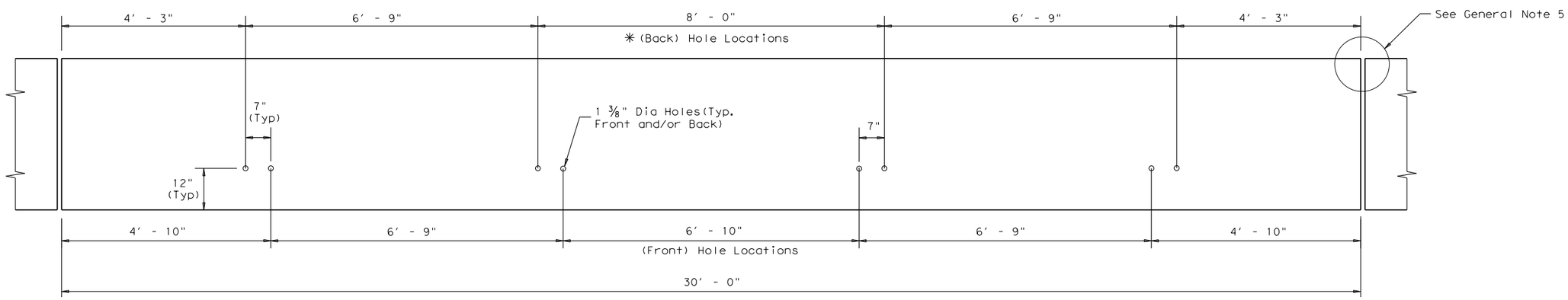
SINGLE SLOPE CONCRETE BARRIER

PRECAST BARRIER
(TYPE 1)

SSCB(2)-10

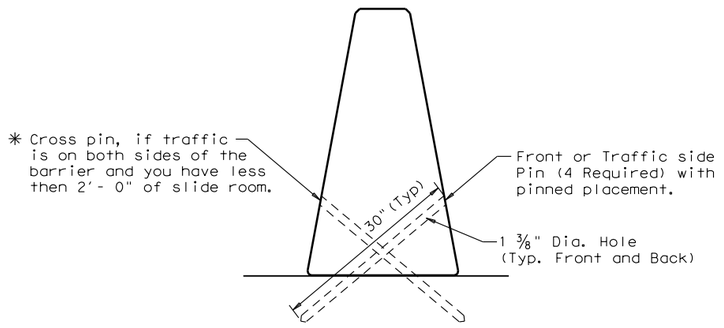
FILE: sscb210.dgn	DN: TxDOT	CK: AM	DW: VP	CK:
©TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	0289	04	032	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	SAN SABA		64

DATE: 11/22/2022
FILE: pw://server.slg-eng.com:Slg-ds/Documents/TxDOT0103 Brownwood SH 16/Design_Data/4 - Design/Plan_Set_1/02. TCP/Standards/sscb510.dgn



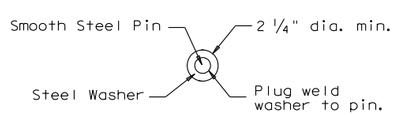
DETAIL 1

Precast SSCB(42")
Showing hole locations

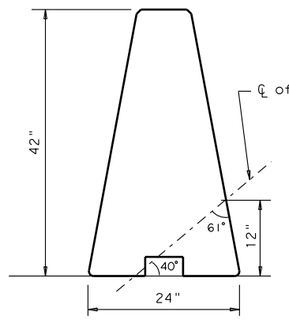


DETAIL 2

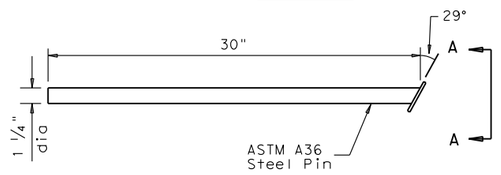
Placement on (ACP)
Asphalt Conc. Pavement
or Treated Base Material
(30" Pin required)



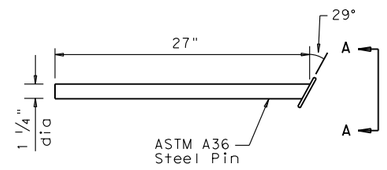
VIEW A-A



HOLE LOCATION DETAIL



(30") PIN DETAIL
See Detail 2

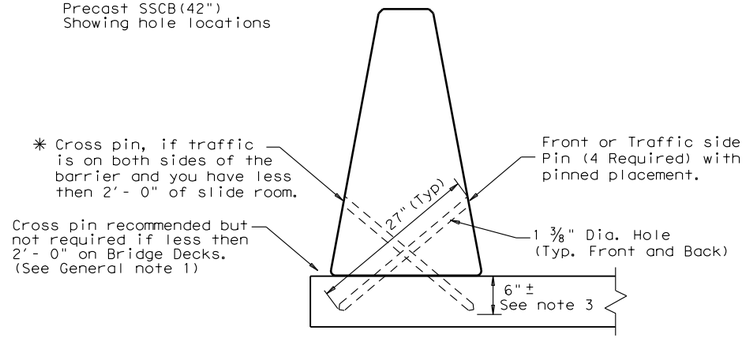


(27") PIN DETAIL
See Detail 3

Note:
Steel washer welded to pin at 29° angle so that the washer is flush with barrier surface. (See View A-A)

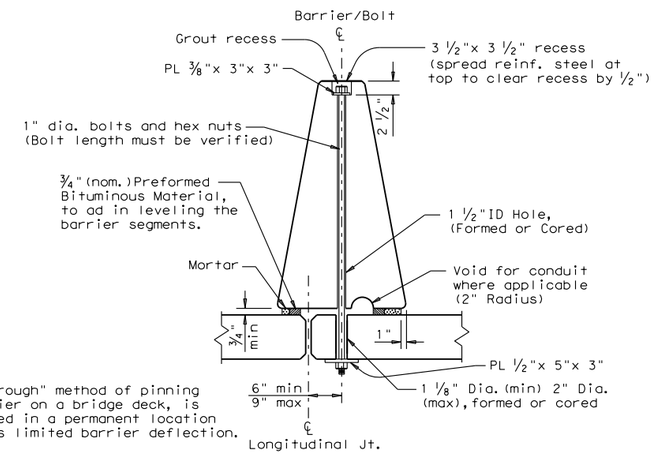
DETAIL 3

Bridge Deck or CRCP
(27" Pin required).



CORE DRILLING EXISTING BARRIER

Core drilling existing concrete barrier is permitted. Holes shall be drilled with coring or masonry drilling type equipment. Percussion (star) drilling shall not be used. A special drill bit (to cut through existing reinforcing) will likely be required. Spalls in the concrete exceeding ½" shall be patched.



Note:
The "Bolt Through" method of pinning precast barrier on a bridge deck, is primarily used in a permanent location that requires limited barrier deflection.

PRECAST SSCB (BOLT THROUGH) PLACEMENT OVER LONGITUDINAL EXPANSION JOINT

For bolt through locations, use the (Front) hole locations shown on Detail 1.

GENERAL NOTES

1. These details provide a method of laterally restraining precast concrete barrier to limit deflections under normally expected passenger vehicle impacts. These details are intended for use in work zones, primarily on bridge decks, or pavement where temporary barrier must be placed less then 2 ft. from the longitudinal edge of the deck or dropoff and parallel to the direction of travel. Other applications of these details are acceptable as directed by the Engineer.
2. Each precast concrete barrier section shall have a minimum of four or total of eight 1 ⅜in. ID holes formed or cored through the barrier. The center lines of the holes are shown in the hole location detail. If rebar is encountered, the entry point may be shifted 2" plus or minus longitudinally along the barrier. The eight holes are spaced along the length of the barrier as shown in Detail 1.
3. The drilling of the travel surface is accomplished by placing the pre-drilled barrier section on the travel surface in the desired position. Then the hole is drilled with the bit passing though the hole in the barrier. The bit is to be inserted into the hole in the barrier so that the travel surface is drilled to a point which is slightly more than the pin length.
4. Note that steel washers have been welded to the top of the steel pins to aid in the removal of the pins, when the barrier is removed.
5. See SSCB(2) standard sheet for reinforcement requirements and joint connection types.
6. The forming or coring of holes in the barrier, drilling of holes in bridge deck or pavement, fabrication and materials for the 1 ¼in. pins, installation of pins, and any repair to the barrier shall be considered as subsidiary to the barrier bid items.
7. The barrier and travel surface will be repaired as directed by the Engineer in accordance with Item 429, "Concrete Structure Repair."
8. All steel pins shall be galvanized after fabrication in accordance with Item 445, "Galvanizing."
9. Weight of barrier is approx. 700 lbs per foot.

Texas Department of Transportation

Design Division Standard

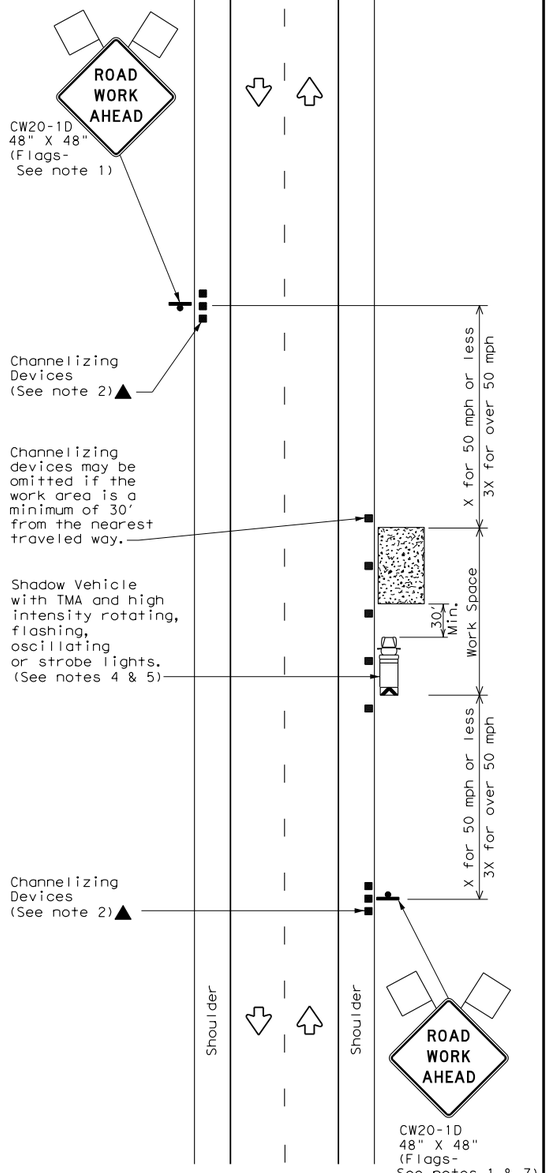
SINGLE SLOPE CONCRETE BARRIER

PRECAST BARRIER
(TYPE 1)
PINNED PLACEMENT

SSCB(5)-10

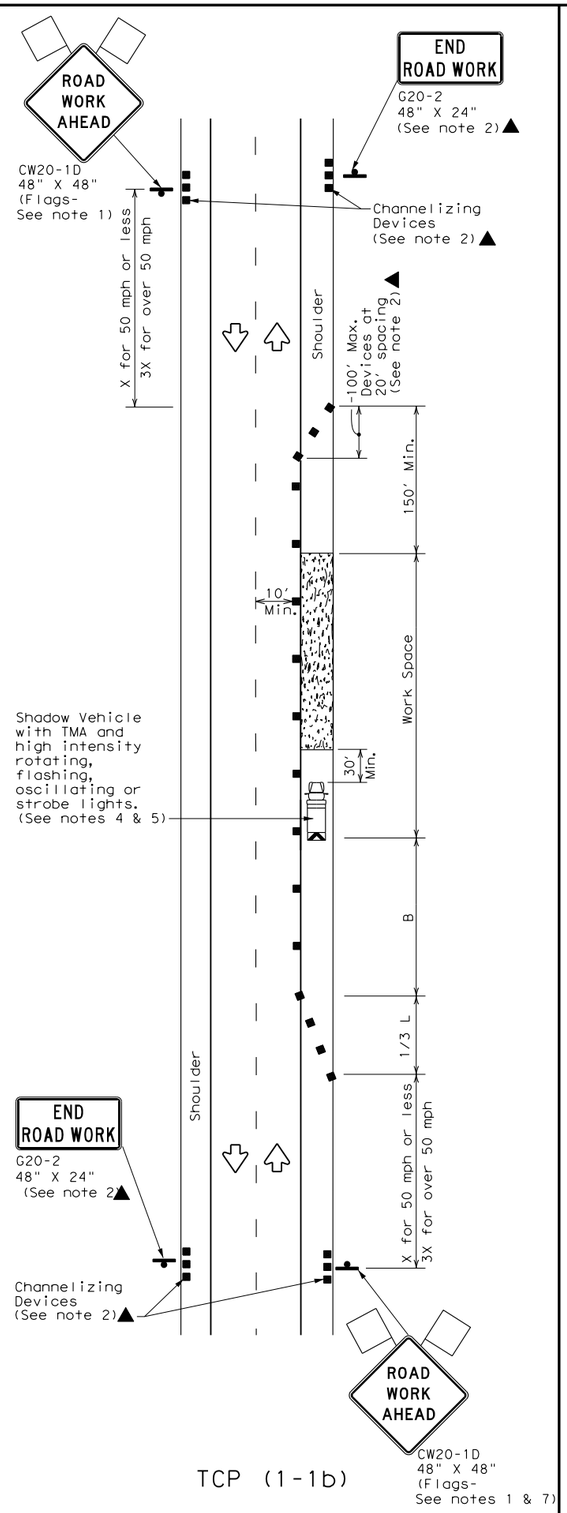
FILE: sscb510.dgn	DN: TxDOT	CK: AM	DW: BD	CK:
©TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	0289	04	032	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	SAN SABA		65

DATE: 11/22/2022
FILE: pw://server.sig-eng.com:Sig-ds/Documents/TxDOT0103 Brownwood SH 16/Design_Data/4 - Design/Plan_Set_1/02. TCP/Standards/tcp1-1-18.dgn



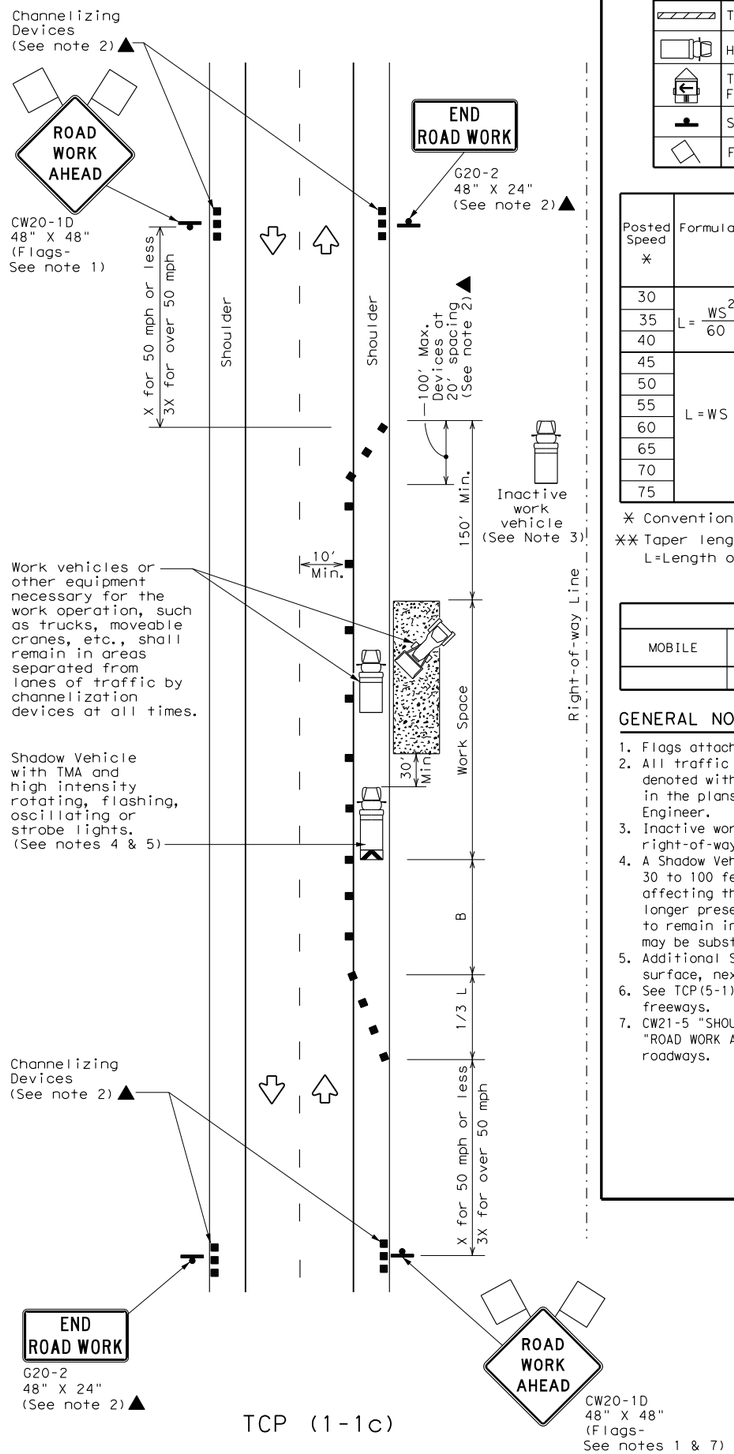
TCP (1-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (1-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (1-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

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"
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
	✓	✓		

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. Inactive work vehicles or other equipment should be parked near the right-of-way line and not parked on the paved shoulder.
4. 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.
5. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.
6. See TCP(5-1) for shoulder work on divided highways, expressways and freeways.
7. CW21-5 "SHOULDER WORK" signs may be used in place of CW20-1D "ROAD WORK AHEAD" signs for shoulder work on conventional roadways.

Texas Department of Transportation

Traffic Operations Division Standard

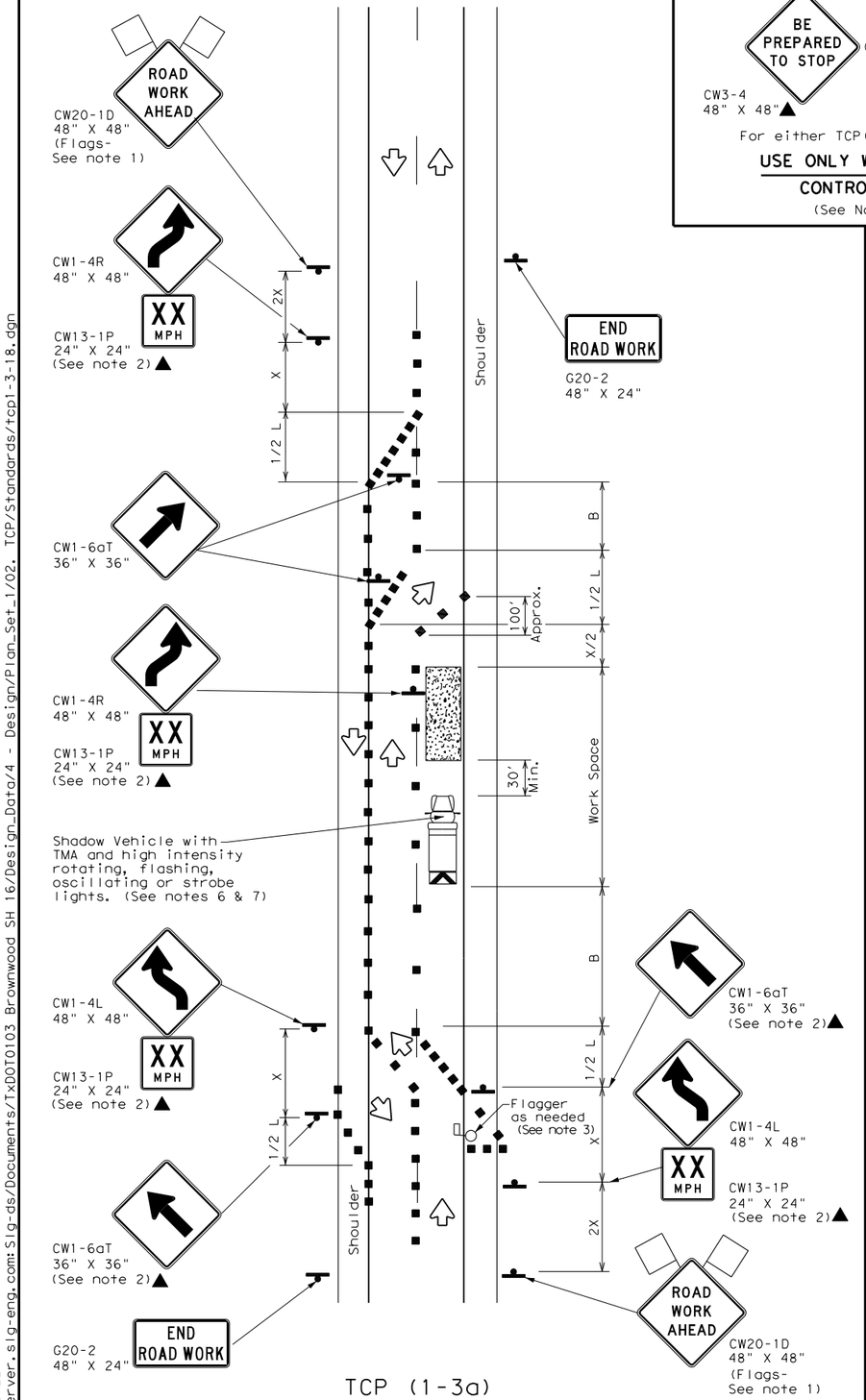
TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(1-1)-18

FILE: tcp1-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0289	04	032	SH 16
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	BWD	SAN SABA		66
1-97 2-18				

151

DATE: 11/22/2022
FILE: pw://server.slg-eng.com:Slg-ds/Documents/TxDOT0103 Brownwood SH 16/Design_Data/4 - Design/Plan_Set_1/02. TCP/Standards/tcp1-3-18.dgn

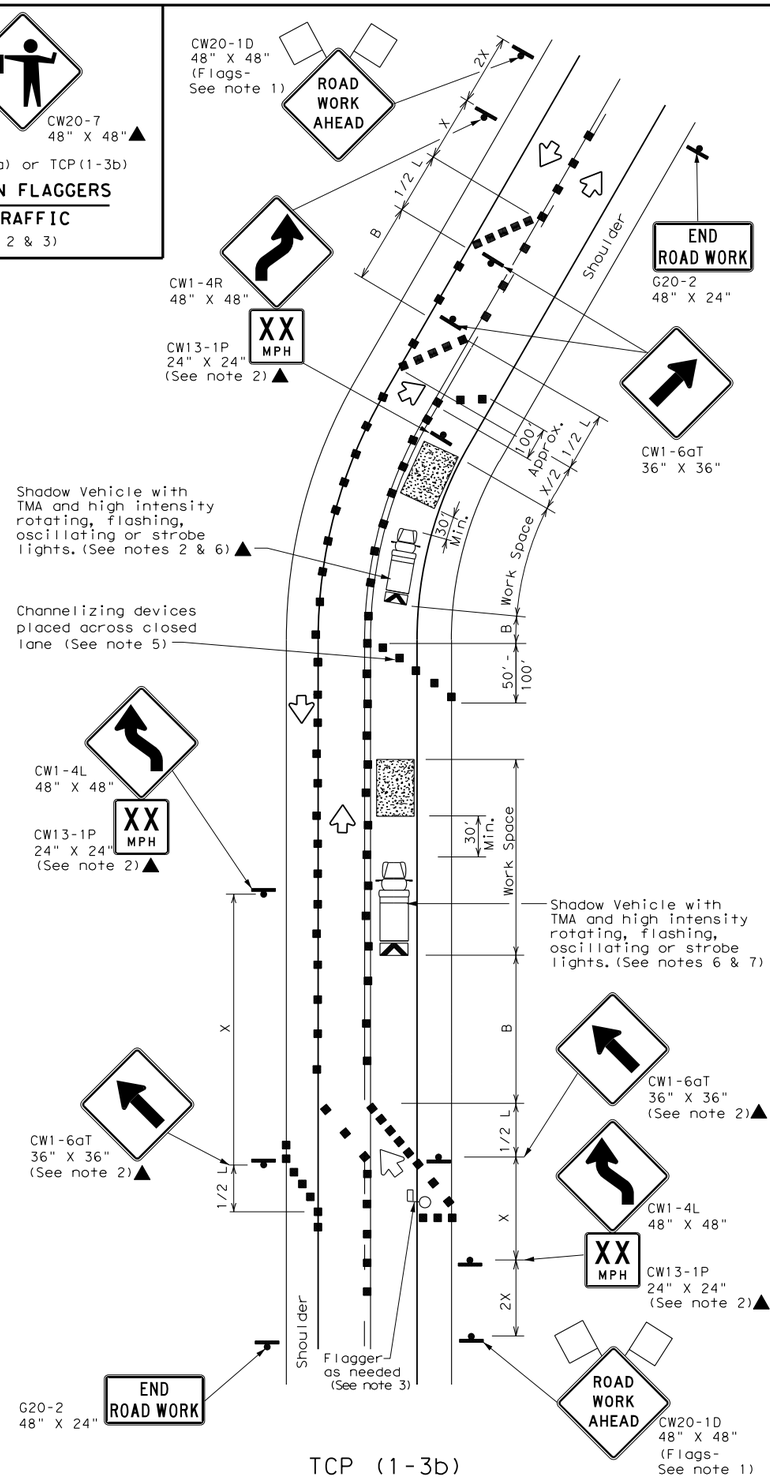


TCP (1-3a)
2-LANE ROADWAY WITH PAVED SHOULDERS

ONE LANE CLOSED
ADEQUATE FIELD OF VIEW

BE PREPARED TO STOP
CW3-4 48" X 48"
CW20-7 48" X 48"
For either TCP(1-3a) or TCP(1-3b)

USE ONLY WHEN FLAGGERS CONTROL TRAFFIC
(See Notes 2 & 3)



TCP (1-3b)
2-LANE ROADWAY WITH PAVED SHOULDERS

ONE LANE CLOSED
INADEQUATE FIELD OF VIEW

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"
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
	✓	✓		

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. Flagger control should NOT be used unless roadway conditions or heavy traffic volume require additional emphasis to safely control traffic. Additional flaggers may be positioned in advance of traffic queues to alert traffic to reduce speed.
4. DO NOT PASS, PASS WITH CARE and construction regulatory speed zone signs may be installed downstream of the ROAD WORK AHEAD signs.
5. When the work zone is made up of several work spaces, channelizing devices should be placed laterally across the closed lane to re-emphasize closure. Laterally placed channelizing devices should be repeated every 500 to 1000 feet in urban areas and every 1/4 to 1/2 mile in rural areas.
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 wider work spaces.
8. Where traffic is directed over a yellow centerline, channelizing devices which separate two-way traffic should be spaced on tapers at 20', or 15' if posted speed are 35 mph or slower, and for tangent sections, at 1/2S where S is the speed in mph. This tighter device spacing is intended for the area of conflicting markings not the entire work zone.

Texas Department of Transportation

Traffic Operations Division Standard

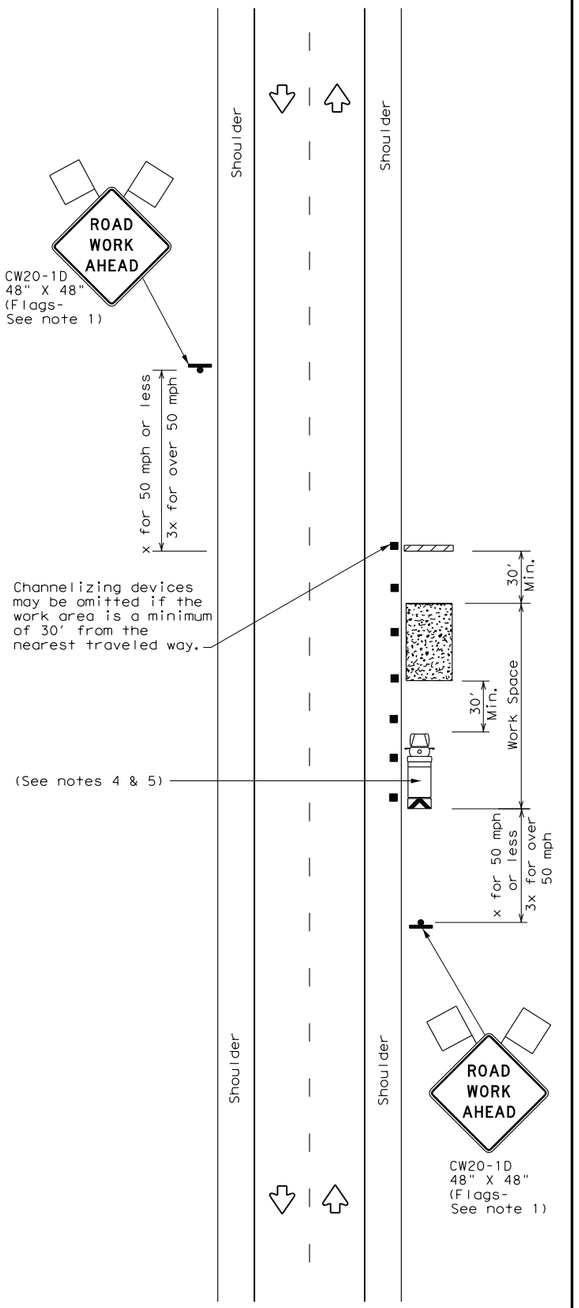
TRAFFIC CONTROL PLAN TRAFFIC SHIFTS ON TWO LANE ROADS

TCP(1-3)-18

FILE: tcp1-3-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0289	04	032	SH 16
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	BWD	SAN SABA		67
1-97 2-18				

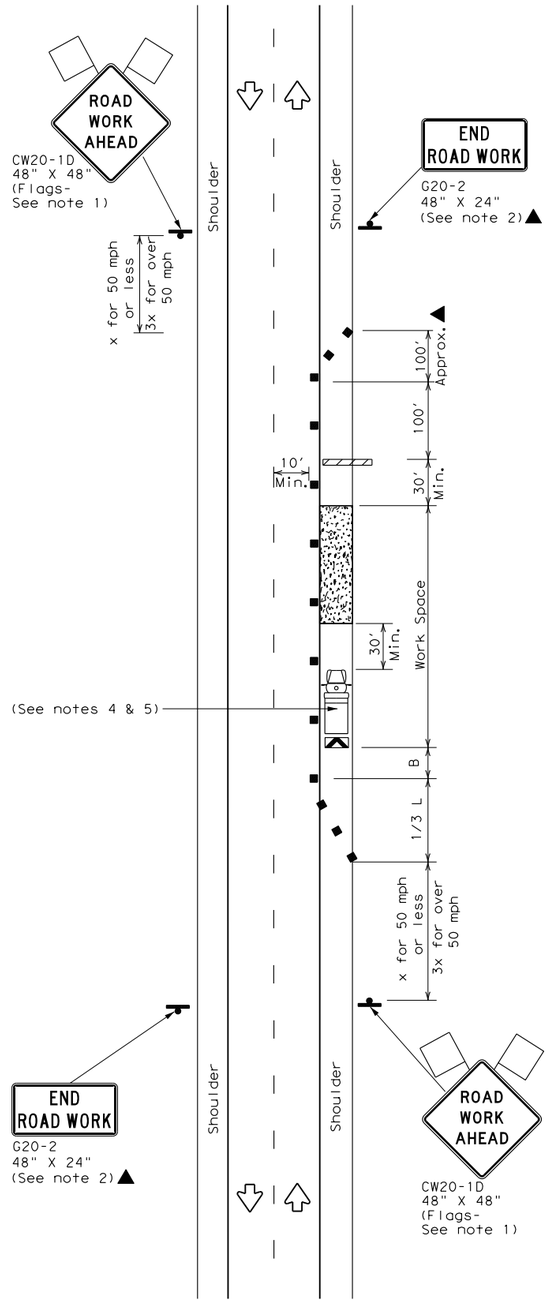
153

DATE: 11/22/2022
FILE: pw://server.sig-eng.com:Sig-ds/Documents/TxDOT0103 Brownwood SH 16/Design_Data/4 - Design/Plan_Set_1/02. TCP/Standards/tcp2-1-18.dgn



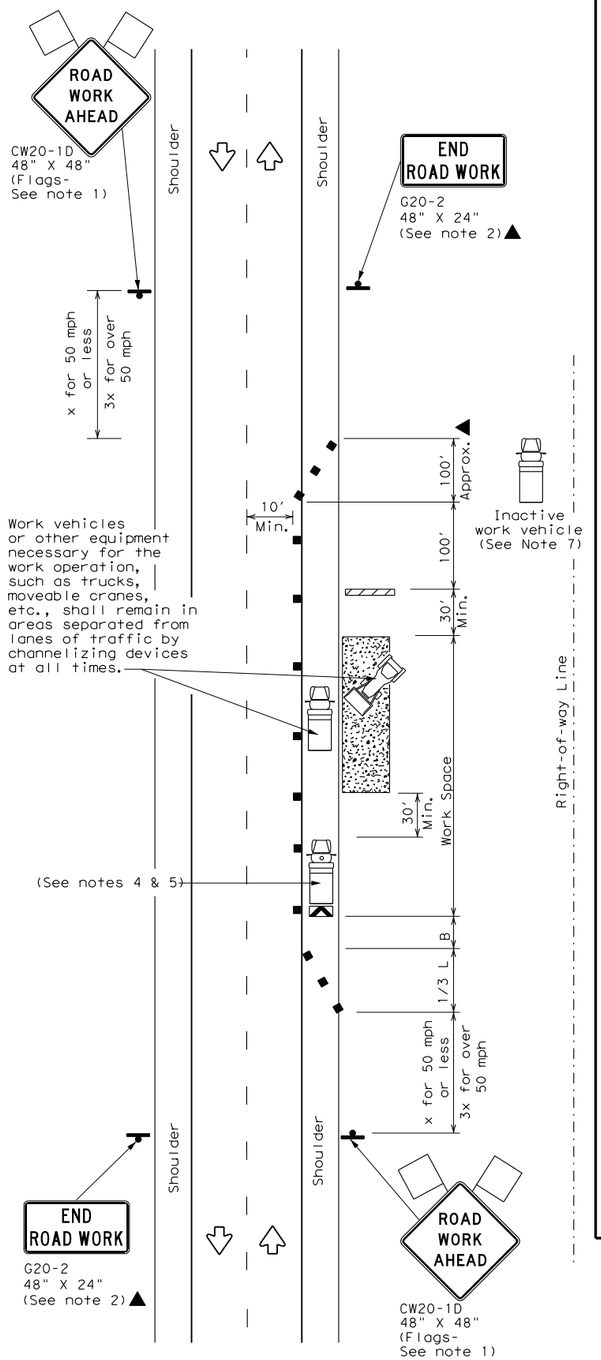
TCP (2-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (2-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (2-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

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"
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
	✓	✓	✓	✓

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 in the plans, or for routine maintenance work, when approved by the Engineer.
3. Stockpiled material should be placed a minimum of 30 feet from nearest traveled way.
4. Shadow Vehicle with TMA and high intensity rotating, flashing, oscillating or strobe lights. 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.
5. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect a wider work space.
6. See TCP(5-1) for shoulder work on divided highways, expressways and freeways.
7. Inactive work vehicles or other equipment should be parked near the right-of-way line and not parked on the paved shoulder.
8. CW21-5 "SHOULDER WORK" signs may be used in place of CW21-1D "ROAD WORK AHEAD" signs for shoulder work on conventional roadways.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(2-1)-18

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©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0289	04	032	SH 16
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	BWD	SAN SABA		68
1-97 2-18				

DATE: 11/22/2022
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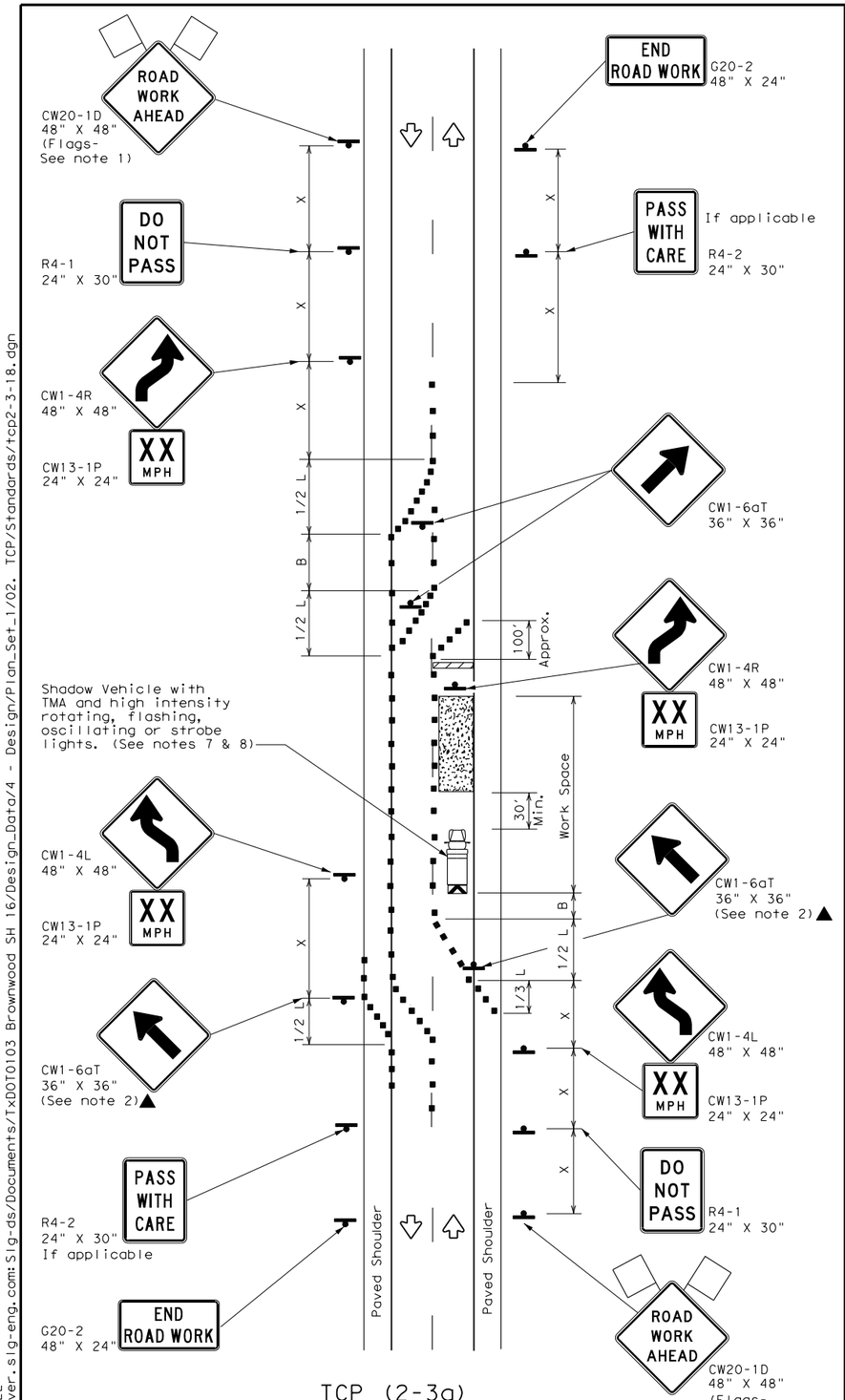
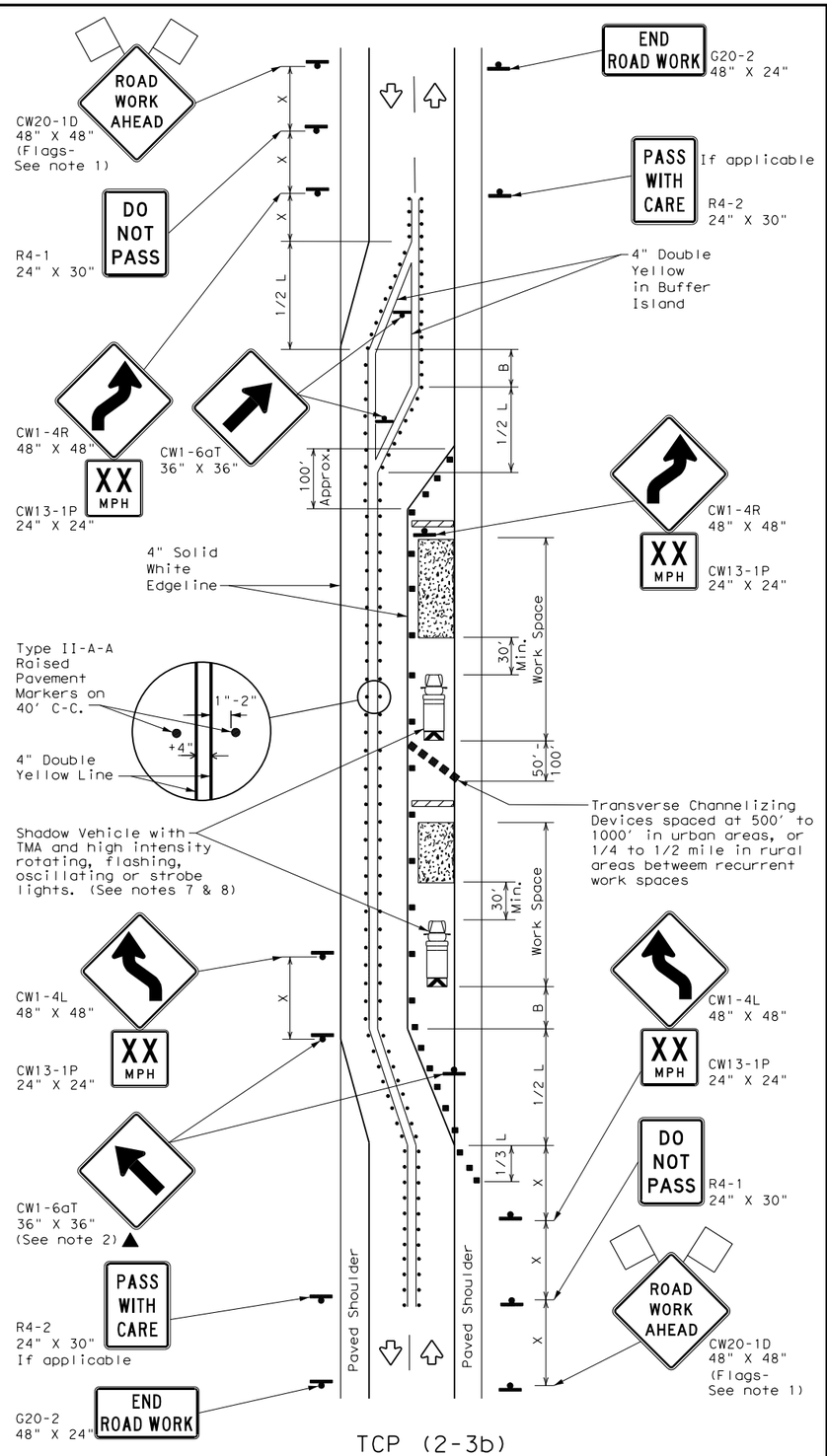


TCP (2-3a)
2-LANE ROADWAY WITH PAVED SHOULDERS

ONE LANE CLOSED
ADEQUATE FIELD OF VIEW



TCP (2-3b)
2-LANE ROADWAY WITH PAVED SHOULDERS

ONE LANE CLOSED
INADEQUATE FIELD OF VIEW

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board		Raised Pavement Markers Ty II-AA
	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
				TCP(2-3b)ONLY
			✓	✓

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. When work space will be in place less than three days existing pavement markings may remain in place. Channelizing devices shall be used to separate traffic.
4. Flagger control should NOT be used unless roadway conditions or heavy traffic volume require additional emphasis to safely control traffic. Flagger should be positioned at end of traffic queue.
5. The R4-1 "DO NOT PASS," R4-2 " PASS WITH CARE" and construction regulatory speed zone signs may be installed within CW20-1D "ROAD WORK AHEAD" signs. Proper spacing of signs shall be maintained.
6. Conflicting pavement marking shall be removed for long term projects.
7. 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.
8. 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 (2-3a)

9. Conflicting pavement markings shall be removed for long-term projects. For shorter durations where traffic is directed over a yellow centerline, channelizing devices which separate two-way traffic should be spaced on tapers at 20' or 15' if posted speeds are 35 mph or slower, and for tangent sections, at 1/2(S) where S is the speed in mph. This tighter device spacing is intended for the area of the conflicting markings, not the entire work zone.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN TRAFFIC SHIFTS ON TWO-LANE ROADS

TCP(2-3)-18

FILE: tcp(2-3)-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0289	04	032	SH 16
8-95 3-03	DIST	COUNTY		SHEET NO.
1-97 2-12	BWD	SAN SABA		69
4-98 2-18				

DATE: 11/22/2022
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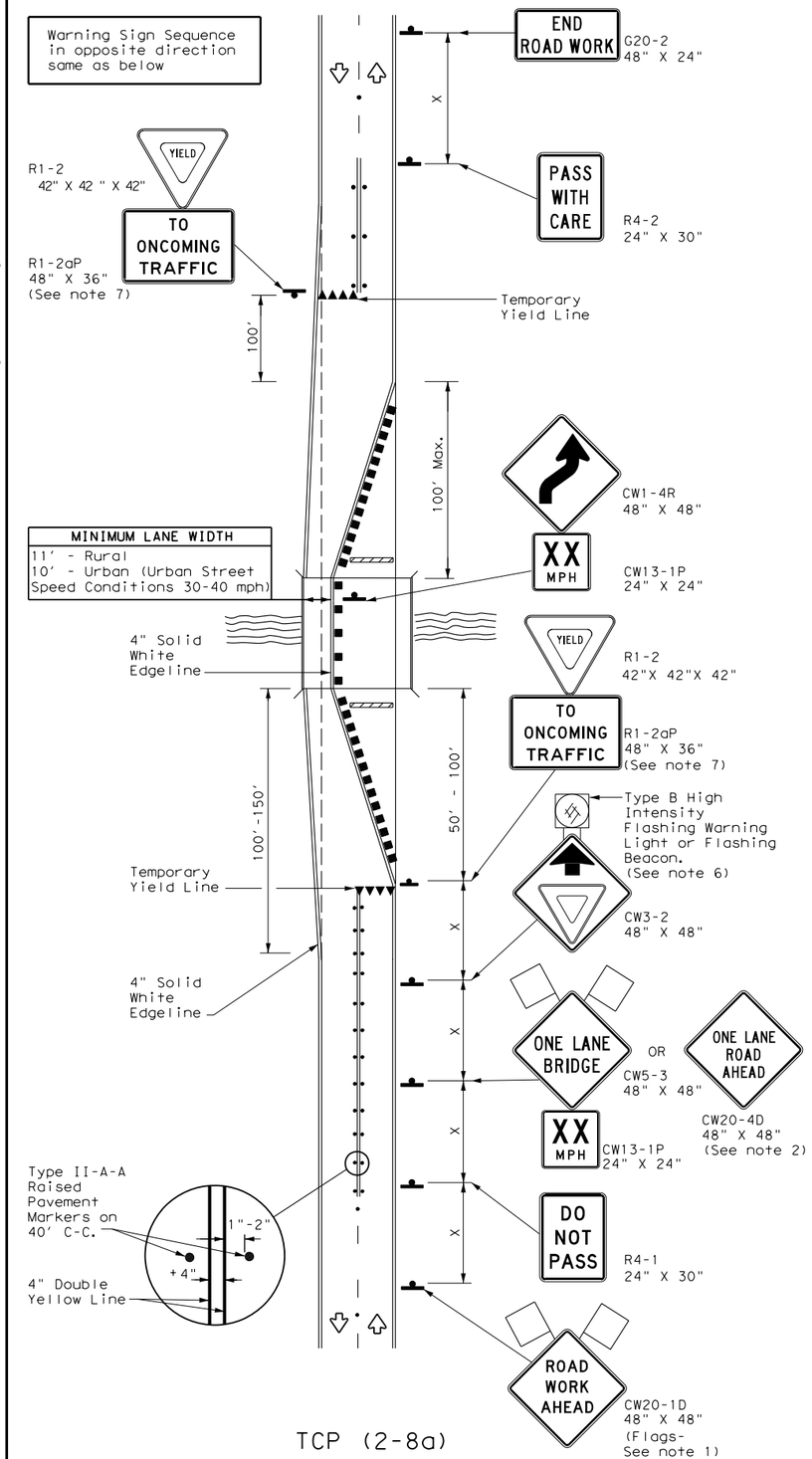
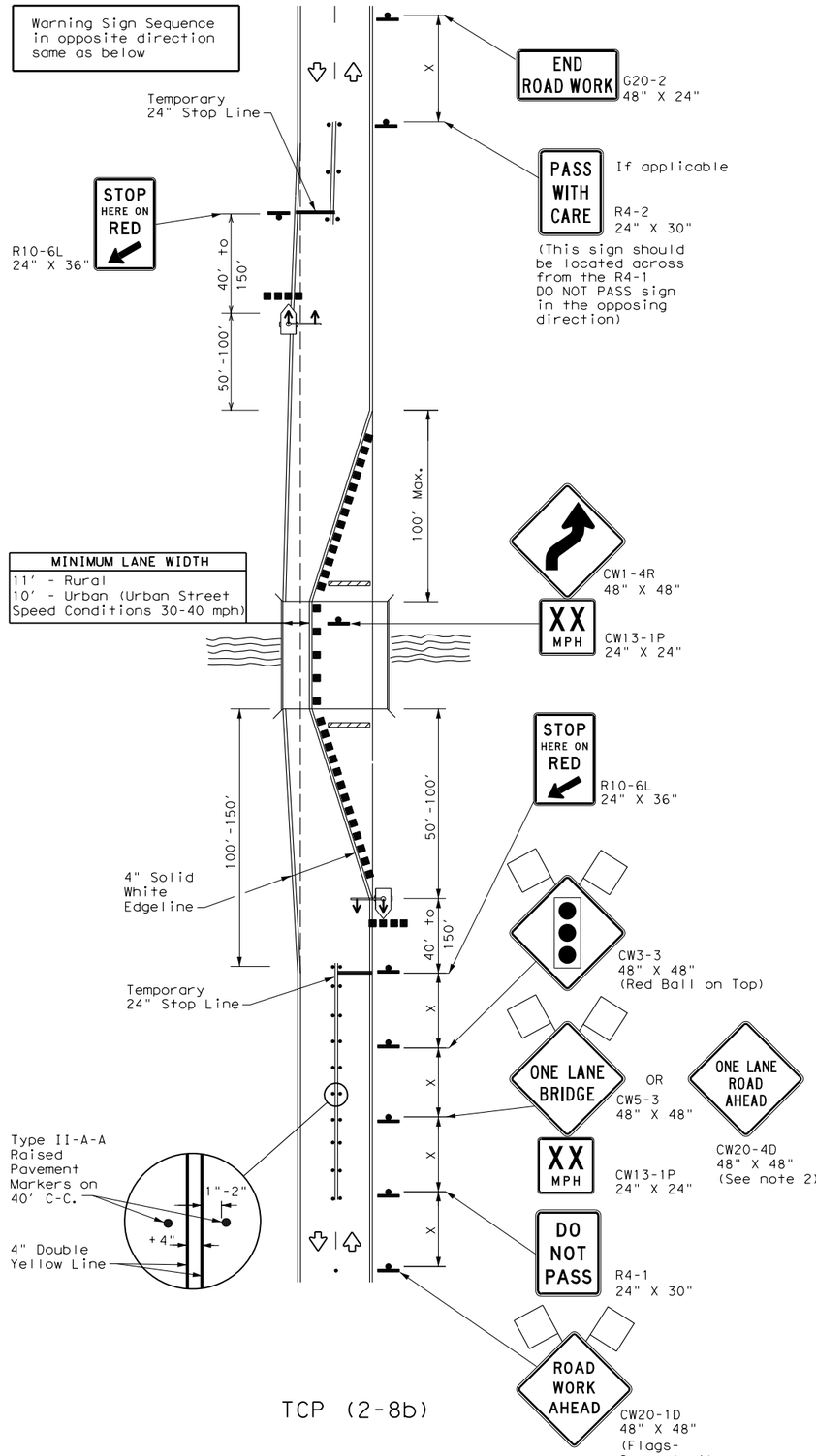


TCP (2-8a)

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
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8-95 3-03	DIST	COUNTY		SHEET NO.
1-97 2-12	BWD	SAN SABA		70
4-98 2-18				

DATE: 11/22/2022
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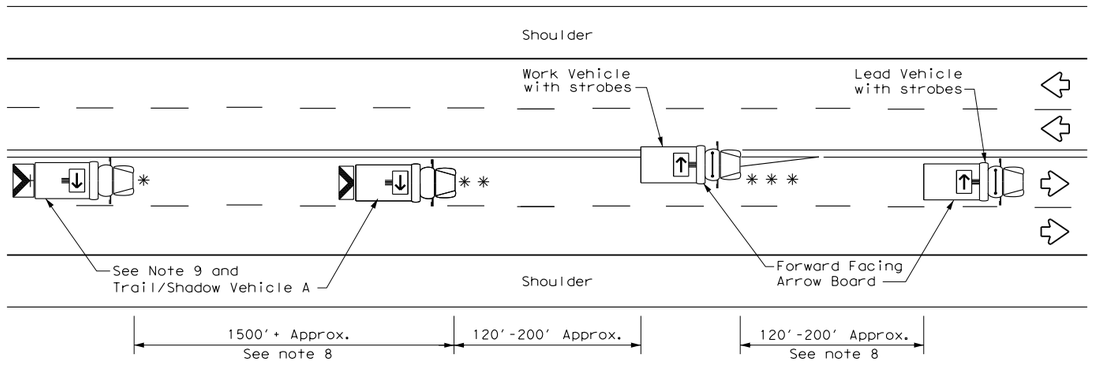
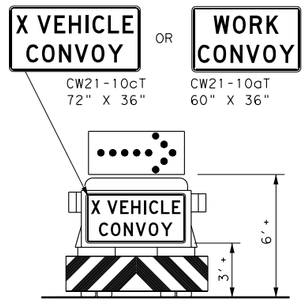


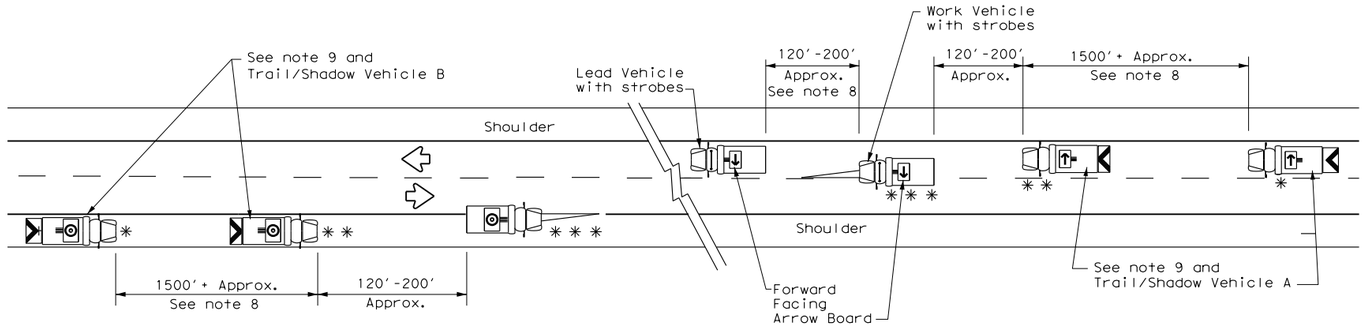
TCP (3-1a)

UNDIVIDED MULTILANE ROADWAY



TRAIL/SHADOW VEHICLE A

with RIGHT Directional display Flashing Arrow Board

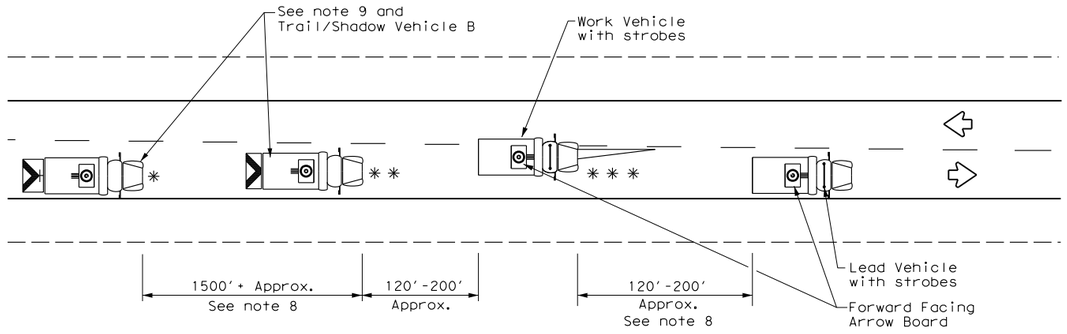


WORK ON SHOULDER

WORK ON TRAVEL LANE

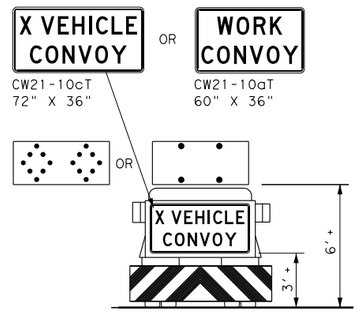
TCP (3-1b)

TWO-WAY ROADWAY WITH PAVED SHOULDERS



TCP (3-1c)

TWO-WAY ROADWAY WITHOUT PAVED SHOULDERS



TRAIL/SHADOW VEHICLE B

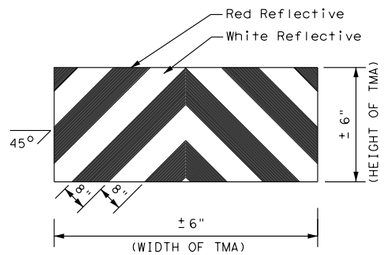
with Flashing Arrow Board in CAUTION display

LEGEND			
*	Trail Vehicle	ARROW BOARD DISPLAY	
* *	Shadow Vehicle		
* * *	Work Vehicle		RIGHT Directional
	Heavy Work Vehicle		LEFT Directional
	Truck Mounted Attenuator (TMA)		Double Arrow
	Traffic Flow		CAUTION (Alternating Diamond or 4 Corner Flash)

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

GENERAL NOTES

1. TRAIL, SHADOW, and LEAD vehicles shall be equipped with arrow boards as illustrated. When a LEAD vehicle is not used the WORK vehicle must be equipped with an arrow board. The Engineer will determine if the LEAD VEHICLE and/or TRAIL VEHICLE are required based on prevailing roadway conditions, traffic volume, and sight distance restrictions.
2. The use of amber high intensity rotating, flashing, oscillating, or strobe lights on vehicles are required. Blue high intensity rotating, flashing, oscillating or strobe lights when mounted on the driver's side of the vehicle may be operated simultaneously with the amber beacons or strobe lights.
3. The use of truck mounted attenuators (TMA) on the SHADOW VEHICLE and TRAIL VEHICLE are required.
4. Reflective sheeting on the rear of the TMA shall meet or exceed the reflectivity and color requirements of DEPARTMENTAL MATERIAL SPECIFICATION DMS 8300, Type A.
5. Flashing arrow boards shall be Type B or Type C as per the Barricade and Construction (BC) standards. The board shall be controlled from inside the vehicle.
6. Each vehicle shall have two-way radio communication capability.
7. When work convoys must change lanes, the TRAIL VEHICLE should change lanes first to shadow the other convoy vehicles.
8. Vehicle spacing between the TRAIL VEHICLE and the SHADOW VEHICLE will vary depending on sight distance restrictions. Motorists approaching the work convoy should be able to see the TRAIL VEHICLE in time to slow down and/or change lanes as they approach the TRAIL VEHICLE. Vehicle spacing between the WORK VEHICLE and SHADOW VEHICLE and vehicle spacing between WORK VEHICLE and LEAD VEHICLE may vary according to terrain, work activity and other factors.
9. "X VEHICLE CONVOY" (CW21-10cT) or "WORK CONVOY" (CW21-10aT) signs shall be used on TRAIL VEHICLES and SHADOW VEHICLES as shown. As an option 48" X 48" diamond shaped "WORK CONVOY"(CW21-10T) or "X VEHICLE CONVOY" (CW21-10bT) signs may be used where adequate mounting space exists. When used, the X VEHICLE CONVOY sign shall have the number of the convoy vehicles displayed on the sign in the number designation "X" location. The "X VEHICLE CONVOY" sign shall not be used on the SHADOW VEHICLE if a TRAIL VEHICLE is used.
10. On two-lane two-way roadways, the work and protection vehicles should pull over periodically to allow motor vehicle traffic to pass. If motorists are not allowed to pass the work convoy, a "DO NOT PASS" (R4-1) sign should be placed on the back of the rearmost protection vehicle.



STRIPING FOR TMA

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS UNDIVIDED HIGHWAYS

TCP(3-1)-13

FILE: tcp3-1.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 7-13 1-97	0289	04	032	SH 16
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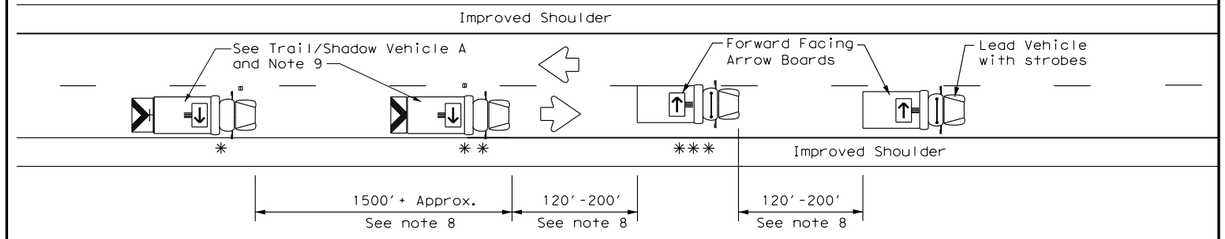
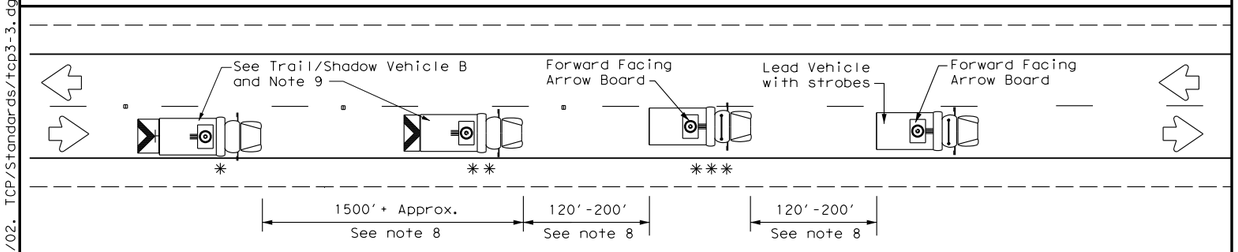
	BWD	SAN SABA		71



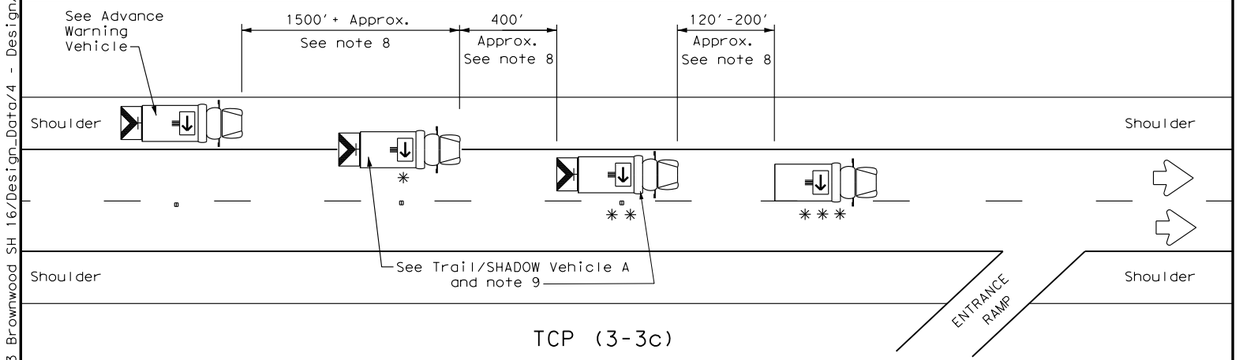
TCP (3-3a)

TWO LANE HIGHWAY WITH PAVED SHOULDERS (WORK ON TRAVEL LANE)



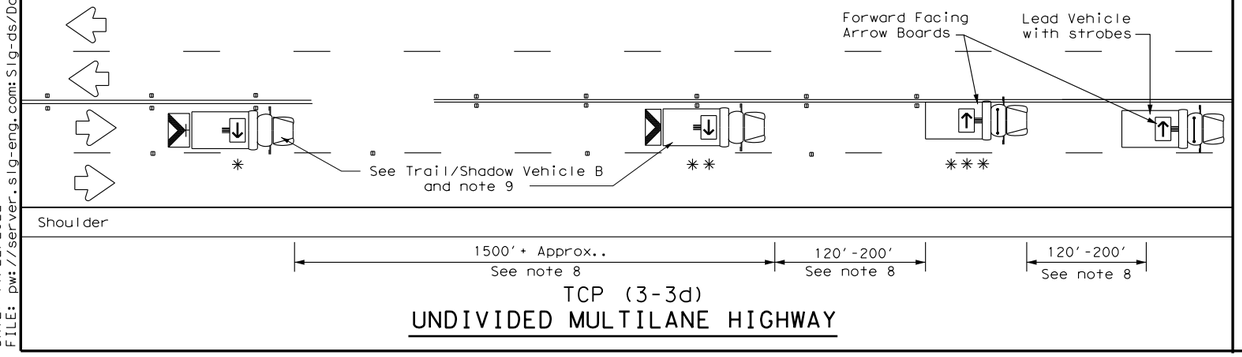
TCP (3-3b)

TWO LANE HIGHWAY WITHOUT PAVED SHOULDERS (WORK ON TRAVEL LANE)



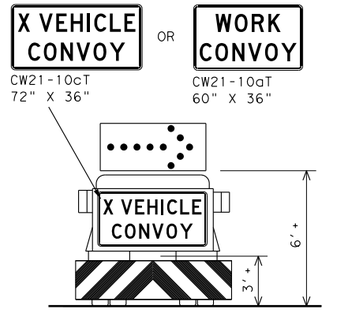
TCP (3-3c)

DIVIDED MULTILANE HIGHWAY



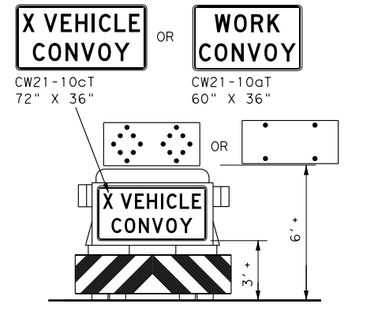
TCP (3-3d)

UNDIVIDED MULTILANE HIGHWAY



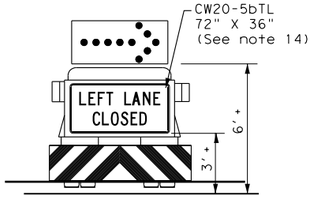
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display
Flashing Arrow Board

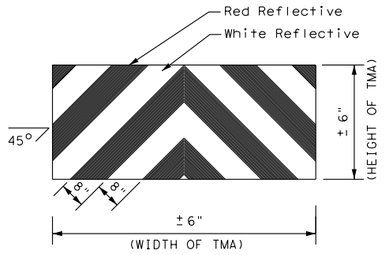


TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board
in Caution Mode



ADVANCE WARNING VEHICLE



STRIPING FOR TMA

LEGEND			
*	Trail Vehicle	ARROW BOARD DISPLAY	
**	Shadow Vehicle		
***	Work Vehicle		RIGHT Directional
	Heavy Work Vehicle		LEFT Directional
	Truck Mounted Attenuator (TMA)		Double Arrow
	Traffic Flow		CAUTION (Alternating Diamond or 4 Corner Flash)

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

GENERAL NOTES

1. TRAIL, SHADOW, and LEAD vehicles shall be equipped with arrow boards as illustrated. When a LEAD vehicle is not used on two way roads the WORK vehicle must have an arrow board. For divided roadways, the arrow board on the WORK vehicle is optional based on the type of work being performed. The Engineer will determine if the LEAD vehicle and/or TRAIL vehicle are required based on prevailing roadway conditions, traffic volume, and sight distance restrictions.
2. The use of amber high intensity rotating, flashing, oscillating, or strobe lights on vehicles are required. Blue high intensity rotating, flashing, oscillating, or strobe lights when mounted on the driver's side of the vehicle may be operated simultaneously with the amber beacons or strobe lights.
3. The use of truck mounted attenuators (TMA) on the SHADOW VEHICLE, ADVANCE WARNING and TRAIL VEHICLE are required.
4. Reflective sheeting on the rear of the TMA shall meet or exceed the reflectivity and color requirements of DEPARTMENTAL MATERIAL SPECIFICATION DMS 8300, Type A.
5. Flashing arrow boards shall be Type B or Type C as per the Barricade and Construction (BC) standards. The board shall be controlled from inside the vehicle.
6. Each vehicle shall have two-way radio communication capability.
7. When work convoys must change lanes, the TRAIL VEHICLE should change lanes first to shadow the other convoy vehicles.
8. Vehicle spacing between the TRAIL VEHICLE and the SHADOW VEHICLE will vary depending on sight distance restrictions. Motorists approaching the convoy should be able to see the TRAIL VEHICLE in time to slow down and/or change lanes as they approach the TRAIL VEHICLE. Vehicle spacing between the WORK VEHICLE and SHADOW VEHICLE and vehicle spacing between WORK VEHICLE and LEAD VEHICLE may vary according to terrain, work activity and other factors.
9. X VEHICLE CONVOY (CW21-10cT) or WORK CONVOY (CW21-10aT) signs shall be used on TRAIL VEHICLES and SHADOW VEHICLES as shown. As an option 48" x 48" diamond shaped WORK CONVOY (CW21-10T) or X VEHICLE CONVOY (CW21-10bT) signs may be used where adequate mounting space exists. When used, the X VEHICLE CONVOY sign shall have the number of the convoy vehicles displayed on the sign in the number designation "X" location. The X VEHICLE CONVOY sign shall not be used on the SHADOW VEHICLE if a TRAIL VEHICLE is used.
10. For divided highways with two or three lanes in one direction, the appropriate LEFT LANE CLOSED (CW20-5bTL), RIGHT LANE CLOSED (CW20-5bTR), or CENTER LANE CLOSED (CW20-5dT) sign should be used on the Advance Warning Vehicle. As an option, a portable changeable message sign (PCMS) or truck mounted changeable message sign (TMCMS) with a minimum character height of 12", and displaying the same legend may be substituted for these signs. An appropriate directional arrow display, simulating the size and legibility of the flashing arrow board may be used in the second phase of the PCMS/TMCMS message. When this is done, the arrow board will not be required on the Advance Warning Vehicle.
11. A double arrow shall not be displayed on the arrow board on the Advance Warning Vehicle.
12. For divided highways with three or four lanes in each direction, use TCP(3-2).
13. Standard diamond shape versions of the CW20-5 series signs may be used as an option if the rectangular signs shown are not available.
14. The Advance Warning Vehicle may straddle the edgeline when Shoulder width makes it necessary.
15. On two-lane two-way roadways, the work and protection vehicles should pull over periodically to allow motor vehicle traffic to pass. If motorists are not allowed to pass the work convoy, a DO NOT PASS (R4-1) sign should be placed on the back of the rearmost protection vehicle.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS RAISED PAVEMENT MARKER INSTALLATION/ REMOVAL

TCP(3-3)-14

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©TxDOT September 1987	CONT	SECT	JOB	HIGHWAY
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2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 7-13	BWD	SAN SABA		72
1-97 7-14				

DATE: 11/22/2022
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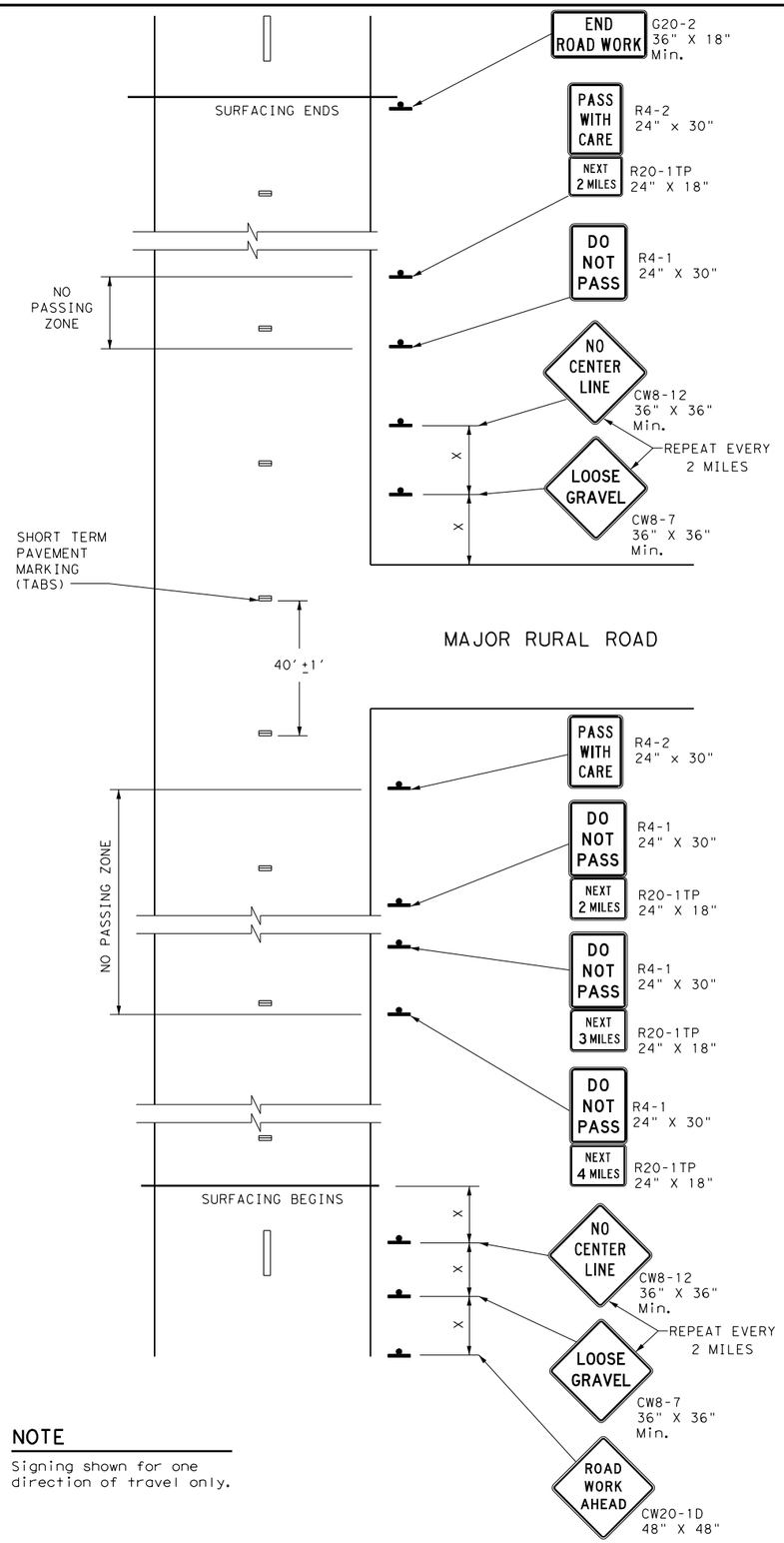
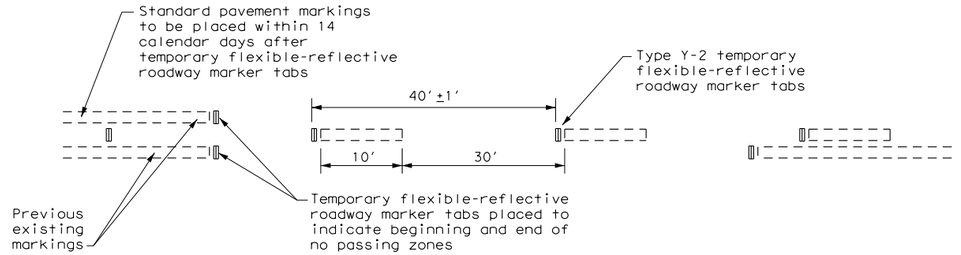


NOTE

Signing shown for one direction of travel only.

NO PASSING ZONES ON TWO-LANE TWO-WAY ROADS



TABS ON CENTERLINES OF TWO-LANE TWO-WAY ROADS

For seal coat, micro-surface or similar operations

"DO NOT PASS" SIGN (R4-1) and NO-PASSING ZONES

A. Prior to the beginning of construction, all currently striped no-passing zones shall be signed with the DO NOT PASS (R4-1) signs and PASS WITH CARE (R4-2) signs placed at the beginning and end of each zone for each direction of travel except as otherwise provided herein. Signs marking these individual no-passing zones need not be covered prior to construction if the signs supplement the existing pavement markings.

B. At the discretion of the Engineer, in areas of numerous no-passing zones, several zones may be combined as a single zone. If passing is to be prohibited over one or more lengthy sections, a DO NOT PASS sign and a NEXT XX MILES (R20-1TP) plaque may be used at the beginning of such zones. The DO NOT PASS sign and the NEXT XX MILES plaque should be repeated every mile to the end of the no-passing zone. In areas where there is considerable distance between no-passing zones, the end of the no-passing zone may be signed with a PASS WITH CARE sign and a NEXT XX MILES plaque.

C. Depending on traffic volumes and length of sections, it may be desirable to prohibit passing throughout the project to prevent damage to windshield and lights. The DO NOT PASS sign and NEXT XX MILES plaque should be used and repeated as often as necessary for this purpose. Where several existing zones are to be combined into one individual no-passing zone, the sign at the beginning of the zone should be covered until the surfacing operation has passed this location so as not to have the DO NOT PASS sign conflict with the existing pavement markings. Also, unless one days operation completes the entire length of such combined zones, appropriate DO NOT PASS and PASS WITH CARE signs should be placed at the beginning and end of the no-passing zones where the surfacing operation has stopped for the day.

D. R4-1 and R4-2 are to remain in place until standard pavement markings are installed.

"NO CENTER LINE" SIGN (CW8-12)

A. Center line markings are yellow pavement markings that delineate the separation of travel lanes that have opposite directions of travel on a roadway. Divided highways do not typically have center line markings.

B. At the time construction activity obliterates the existing center line markings(low volume roads may not have an existing centerline), a NO CENTER LINE (CW8-12) sign should be erected at the beginning of the work area, at approximately 2 mile intervals within the work area, beyond major intersections and other locations deemed necessary by the Engineer.

C. The NO CENTER LINE signs are to remain in place until standard pavement markings are installed.

"LOOSE GRAVEL" SIGN (CW8-7)

A. When construction begins, a LOOSE GRAVEL (CW8-7) sign should be erected at each end of the work area and repeated at intervals of approximately 2 miles in rural areas and closer in urban areas.

B. The LOOSE GRAVEL signs are to remain in place until the condition no longer exists.

PAVEMENT MARKINGS

A. Temporary markings for surfacing projects shall be Temporary Flexible-reflective Roadway Marker Tabs unless otherwise approved by the Engineer. Tabs are to be installed to provide true alignment for striping crews or as directed by the Engineer. Tabs will be placed at the spacing indicated. Tabs should be applied to the pavement
no more than two (2) days before the surfacing is applied. After the surfacing is rolled and swept, the cover over the reflective strip shall be removed.

B. Tabs shall not be used to simulate edge lines.

C. Tab placement for overlay/inlay operations shall be as shown on the WZ(STPM) standard sheet.

COORDINATION OF SIGN LOCATIONS

A. The location of warning signs at the beginning and end of a work area are to be coordinated with other signing typically shown on the Barricade and Construction Standards for project limits to ensure adequate sign spacing.

B. Where possible the ROAD WORK AHEAD (CW20-1D), LOOSE GRAVEL (CW8-7), and NO CENTER LINE (CW8-12) signs should be placed in the sequence shown following the OBEY WARNING SIGNS STATE LAW (R20-3T) and the TRAFFIC FINES DOUBLE (R20-5T) sign, and one "X" sign spacing prior to the CONTRACTOR (G20-6T)sign typically located at or near the limits of surfacing. LOOSE GRAVEL and NO CENTER LINE signs will then be repeated as described above.

Posted Speed *	Minimum Sign Spacing "X" Distance
30	120'
35	160'
40	240'
45	320'
50	400'
55	500'
60	600'
65	700'
70	800'
75	900'

* Conventional Roads Only

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

GENERAL NOTES

1. The traffic control devices detailed on this sheet will be furnished and erected as directed by the Engineer on sections of roadway where tabs must be placed prior to the surfacing operation which will cover or obliterate the existing pavement markings.
2. The devices shown on this sheet are to be used to supplement those required by the BC Standards or others required elsewhere in the plans.
3. Signs shall be erected as detailed on the BC Standards or the Compliant Work Zone Traffic Control Devices List (CWZTCD) on supports approved for Long-Term / Intermediate-Term Work Zone Sign Supports.
4. When surfacing operations take place on divided highways, freeways or expressways, the size of diamond shaped construction warning signs shall be 48" x 48".
5. Signs on divided highways, freeways and expressways will be placed on both right and left sides of the roadway based on roadway conditions as directed by the Engineer.

Texas Department of Transportation

Traffic Operations Division Standard

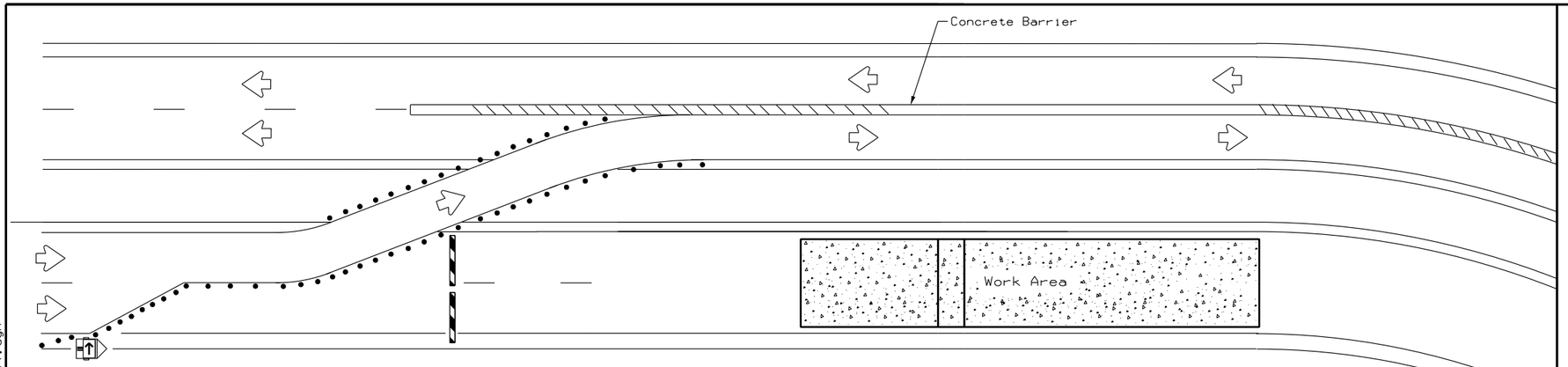
TRAFFIC CONTROL DETAILS FOR SURFACING OPERATIONS

TCP(7-1)-13

FILE:	tcp7-1.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT	March 1991	CONT	SECT	JOB	HIGHWAY
REVISIONS		0289	04	032	SH 16
4-92 4-98		DIST	COUNTY		SHEET NO.
1-97 7-13		BWD	SAN SABA		73

210

DATE: 11/22/2022
FILE: pw://server.slg-eng.com:Slg-ds/Documents/TxDOT0103 Brownwood SH 16/Design_Data/4 - Design/Plan_Set_1/02. TCP/Standards/wztd-17.dgn



NOTES:

1. Length of Safety Glare screen will be specified elsewhere in the plans.
2. The cumulative nominal length of the modular safety glare screen units shall equal the length of the individual sections of temporary concrete traffic barrier on which they are installed so the joint between barrier sections will not be spanned by any one safety glare screen unit.
3. Screen Panel/blades will be designed such that reflective sheeting conforming with Departmental Material Specification DMS-8300, Sign Face Materials, Type B or C Yellow, minimum size of 2 inches by 12 inches can be attached to the edge of the panel/blade. The sheeting shall be attached to one glare screen panel/blade per section of concrete barrier not to exceed a spacing of 30 feet. Barrier reflectors are not necessary when panel/blades are installed with reflective sheeting as described.
4. Payment for these devices will be under statewide Special Specification "Modular Glare Screens for Headlight Barrier."
5. This detail is only intended to show types of locations where Glare Screens would be appropriate. Required signing and other devices shall be as shown elsewhere in the plans.

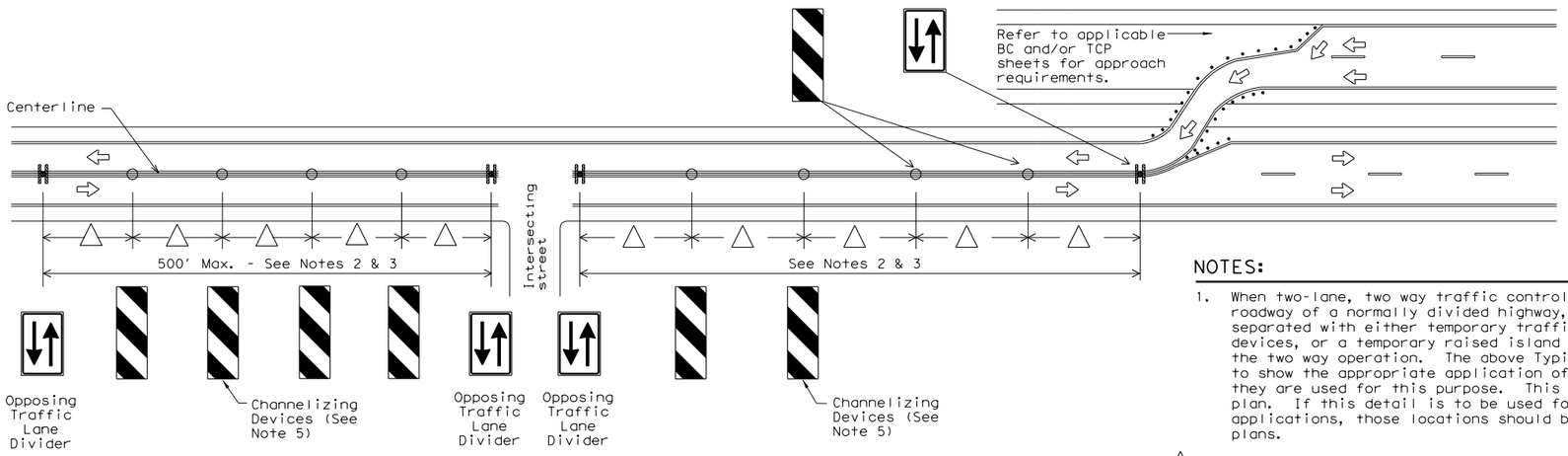
BARRIER DELINEATION WITH MODULAR GLARE SCREENS

LEGEND	
	Type 3 Barricade
• • •	Channelizing Devices
	Trailer Mounted Flashing Arrow Board
	Sign
\\\\	Safety glare screen

DEPARTMENTAL MATERIAL SPECIFICATIONS	
SIGN FACE MATERIALS	DMS-8300
DELINEATORS AND OBJECT MARKERS	DMS-8600
MODULAR GLARE SCREENS FOR HEADLIGHT BARRIER	DMS-8610

Only pre-qualified products shall be used. A copy of the Compliant Work Zone Traffic Control Devices List" CWZTCD)describes pre-qualified products and their sources and may be found at the following web address:

http://www.txdot.gov/business/resources/producer-list.html



VERTICAL PANELS & OPPOSING TRAFFIC LANE DIVIDERS (OTLD) SEPARATING TWO-WAY TRAFFIC ON NORMALLY DIVIDED HIGHWAYS

NOTES:

1. When two-lane, two way traffic control must be maintained on one roadway of a normally divided highway, opposing traffic shall be separated with either temporary traffic barriers, channelizing devices, or a temporary raised island throughout the length of the two way operation. The above Typical Application is intended to show the appropriate application of channelizing devices when they are used for this purpose. This is not a traffic control plan. If this detail is to be used for other types of roads or applications, those locations should be stated elsewhere in the plans.

△ 2. Space devices according to the Tangent Spacing shown on the Device Spacing table on BC(9) but not exceeding 100'.

3. Every fifth device should be an OTLD except when spaced closer to accommodate an intersection. An OTLD should be the first device on each side of intersecting streets or roads.
4. Locations where surface mount bases with adhesives or self-righting devices will be required in order to maintain them in their proper position should be noted elsewhere in the plans.
5. Channelizing devices are to be vertical panels, 42" cones or tubular markers that are at least 36" tall. Tubular markers used to separate traffic should have a rubber base weighing at least 30 pounds. Tubular markers that are 42" tall or more shall have four bands of reflective material as detailed for 42" cones on BC(10). Tubular markers less than 42" but at least 36" tall shall have three bands of 3" wide white reflective material spaced 2" apart. Reflective material shall meet DMS-8300, Type A.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN TYPICAL DETAILS

WZ(TD)-17

FILE: wztd-17.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-98 2-17 3-03 7-13	0289	04	032	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	SAN SABA		74

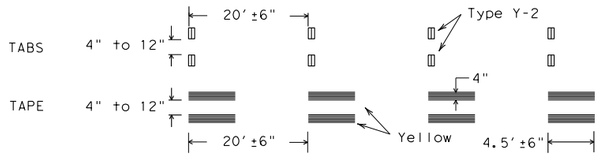
110

DATE: 11/22/2022
FILE: pw://server.sig-eng.com:Sig-ds/Documents/TxDOT0103 Brownwood SH 16/Design_Data/4 - Design/Plan_Set_1/02. TCP/Standards/wzstpm-13.dgn

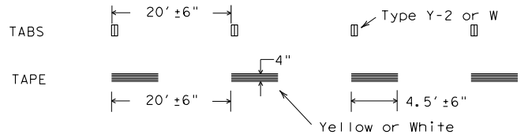
WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

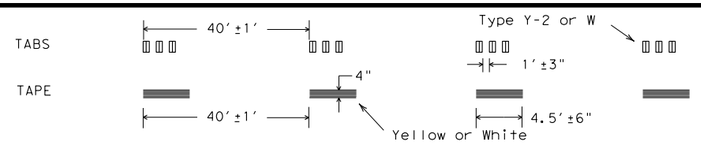


SINGLE NO-PASSING LINE or CHANNELIZATION LINE



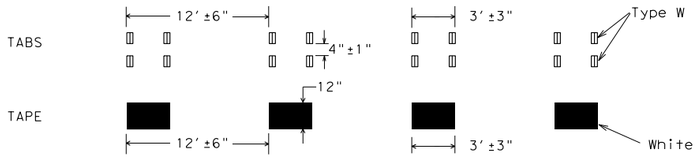
BROKEN LINES

(FOR CENTER LINE OR LANE LINE)

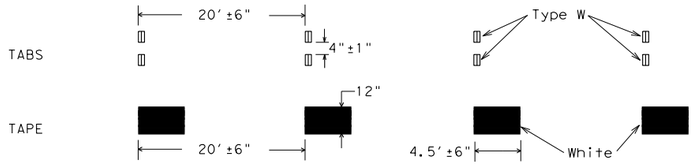


WIDE DOTTED LINES

(FOR LANE DROP LINES)



WIDE GORE MARKINGS



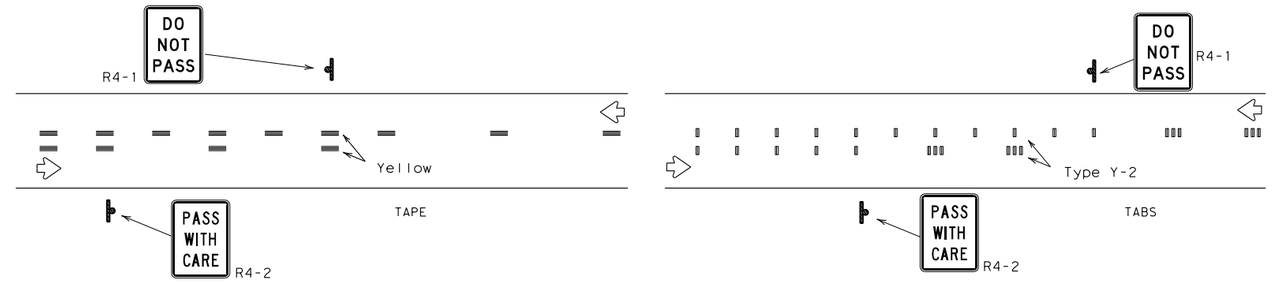
NOTES:

1. Short term pavement markings may be prefabricated markings (stick down tape) or temporary flexible-reflective roadway marker tabs unless otherwise specified elsewhere in plans.
2. Short term pavement markings shall NOT be used to simulate edge lines.
3. Dimensions indicated on this sheet are typical and approximate. Variations in size and height may occur between markers or devices made by manufacturers, by as much as 1/4 inch, unless otherwise noted.
4. Temporary flexible-reflective roadway marker tabs will require normal maintenance replacement when used on roadways with an ADT per lane of up to 7500 vehicles with no more than 10% truck mix. When roadways exceed these values, additional maintenance replacement of devices should be planned.
5. No segment of roadway open to traffic shall remain without permanent pavement markings for a period greater than 14 calendar days. The Contractor will be responsible for maintaining short term pavement markings until permanent pavement markings are in place. When the Contractor is responsible for placement of permanent pavement markings, no segment of roadway shall remain without permanent pavement markings for a period greater than 14 calendar days unless weather conditions prohibit placement. Permanent pavement markings shall be placed as soon as weather permits.
6. For two lane, two-way roadways, DO NOT PASS signs shall be erected to mark the beginning of sections where passing is prohibited and PASS WITH CARE signs shall be erected to mark the beginning of sections where passing is permitted. Signs shall be in accordance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) and may be used to indicate the limits of no-passing zones for up to 14 calendar days. Permanent pavement markings should then be placed.
7. For low volume two lane, two-way roadways of 4000 ADT or less, no-passing lines may be omitted when approved by the Engineer. DO NOT PASS and PASS WITH CARE signs shall be erected (see note 6).
8. For exit gores where a lane is being dropped place wide gore markings or retroreflective channelizing devices to guide motorist through the exit. If channelizing devices are to be used it should be noted elsewhere in the plans. One piece cones are not allowed for this purpose.

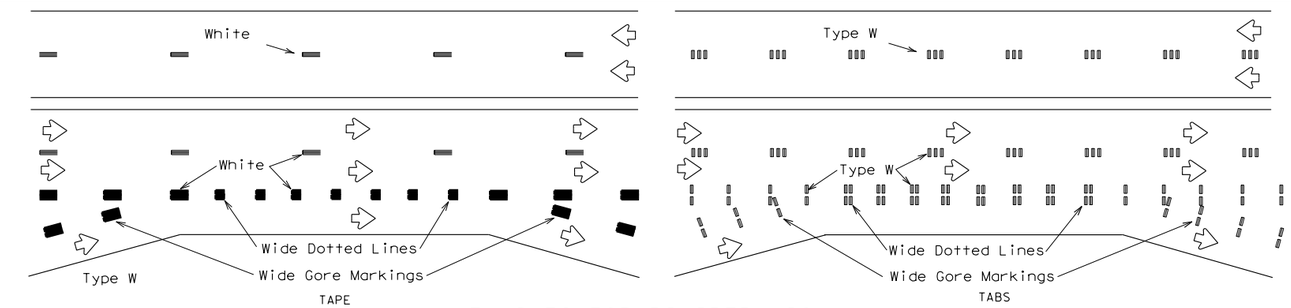
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS (TABS)

1. Temporary flexible-reflective roadway marker tabs detailed on this sheet will be designated Type Y-2 (two amber reflective surfaces with yellow body); Type Y (one amber reflective surface with yellow body); and Type W (one white or silver reflective surface with white body). Additional details may be found on BC(11).
2. Tabs shall meet requirements of Departmental Material Specification DMS-8242.
3. When dry, tabs shall be visible for a minimum distance of 200 feet during normal daylight hours and when illuminated by automobile low-beam head light at night, unless sight distance is restricted by roadway geometrics.
4. No two consecutive tabs nor four tabs per 1000 feet of line shall be missing or fail to meet the visual performance requirements of Note 3.

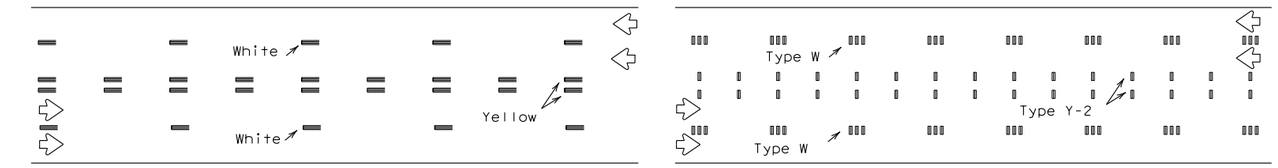
WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS



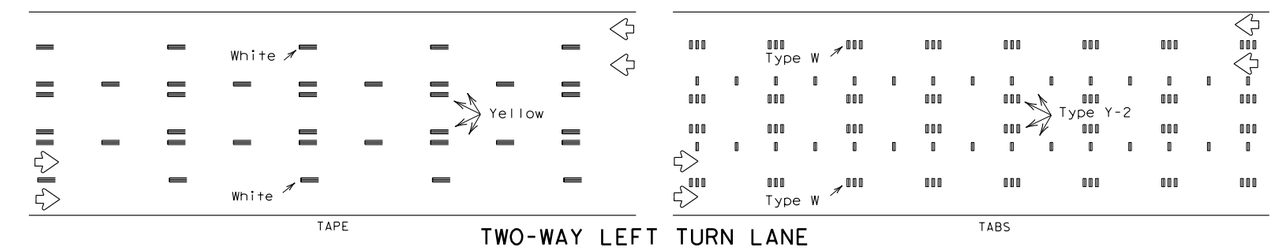
CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO LANE TWO-WAY HIGHWAYS



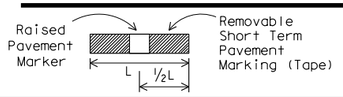
LANE LINES FOR DIVIDED HIGHWAY



LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



TWO-WAY LEFT TURN LANE



If raised pavement markers are used to supplement REMOVABLE short term markings, the markers shall be applied to the top of the tape at the approximate mid length of the tape. This allows an easier removal of raised markers and tape.

PREFABRICATED PAVEMENT MARKINGS

1. Temporary Removable Prefabricated Pavement Markings shall meet the requirements of DMS-8241.
2. Non-removable Prefabricated Pavement Markings shall meet the requirements of either DMS-8240 "Permanent Prefabricated Pavement Markings" or DMS-8243 "Temporary Costruction-Grade Prefabricated Pavement Markings."

RAISED PAVEMENT MARKERS

1. All raised pavement markers used for work zone markings shall meet the requirements of Item 672, "RAISED PAVEMENT MARKERS" and DMS-4200.

DEPARTMENTAL MATERIAL SPECIFICATIONS (DMS) & MATERIAL PRODUCER LISTS (MPL)

1. DMSs referenced above can be found along with embedded links to their respective MPLs at the following website:
   http://www.txdot.gov/business/contractors_consultants/material_specifications/default.htm

Texas Department of Transportation

Traffic Operations Division Standard

WORK ZONE SHORT TERM PAVEMENT MARKINGS

WZ(STPM)-13

FILE:	wzstpm-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT	April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS		0289	04	032	SH 16
1-97		DIST	COUNTY		SHEET NO.
3-03		BWD	SAN SABA		75
7-13					

111

DATE: 11/22/2022
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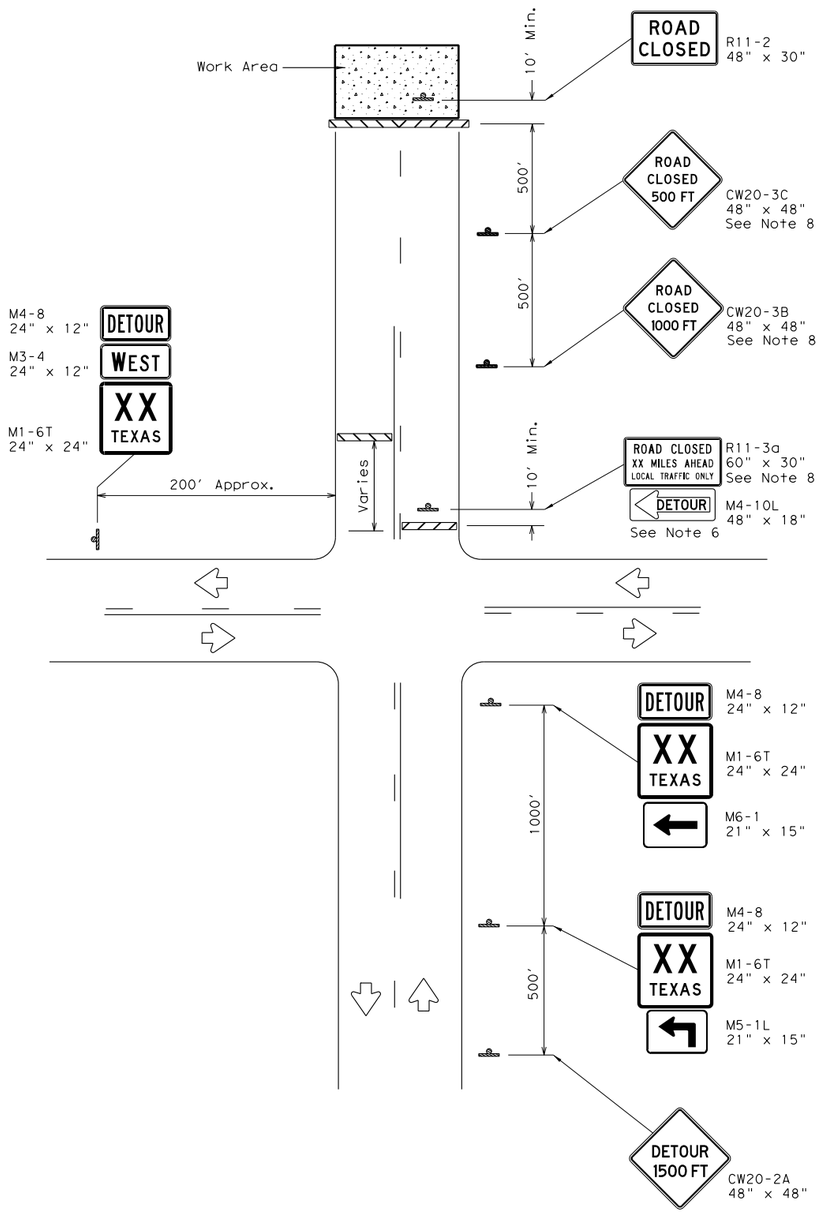
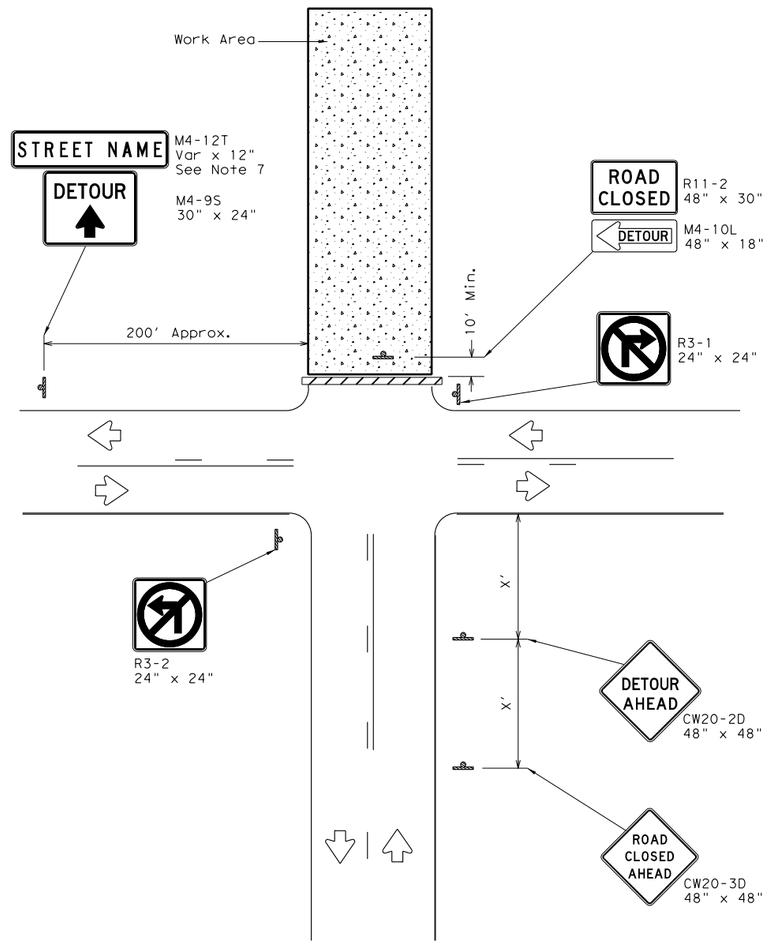


ROAD CLOSURE BEYOND THE INTERSECTION

Signing for a Numbered Route with an Off-Site Detour



ROAD CLOSURE AT THE INTERSECTION

Signing for an Un-numbered Route with an Off-Site Detour

LEGEND	
	Type 3 Barricade
	Sign

Posted Speed *	Minimum Sign Spacing "X" Distance
30	120'
35	160'
40	240'
45	320'
50	400'
55	500'
60	600'
65	700'
70	800'
75	900'

* Conventional Roads Only

GENERAL NOTES

1. This sheet is intended to provide details for temporary work zone road closures. For permanent road closure details see the D&OM standards.
2. Barricades used shall meet the requirements shown on Barricade and Construction Standard BC(10) and listed on the Compliant Work Zone Traffic Control Devices list (CWZTCD).
3. Stockpiled materials shall not be placed on the traffic side of barricades.
4. Barricades at the road closure should extend from pavement edge to pavement edge.
5. Detour signing shown is intended to illustrate the type of signing that is appropriate for numbered routes or un-numbered routes as labeled. It does not indicate the full extent of detour signing required. Detour routes should be signed as shown elsewhere in the plans.
6. If the road is open for a significant distance beyond the intersection or there are significant origin/destination points beyond the intersection, the signs and barricades at this location should be located at the edge of the traveled way.
7. The Street Name (M4-12T) sign is to be placed above the DETOUR (M4-9S) sign.
8. For urban areas where there is a shorter distance between the intersection and the actual closure location, the ROAD CLOSED XX MILES AHEAD (R11-3a) sign may be replaced with a ROAD CLOSED TO THRU TRAFFIC (R11-4) sign. If adequate space does not exist between the intersection and the closure a single ROAD CLOSED AHEAD (CW20-3D) sign spaced as per the table above may replace the ROAD CLOSED 1000 FT (CW20-3B) and ROAD CLOSED 500 FT (CW20-3C) signs.
9. Signs and barricades shown shall be subsidiary to Item 502. Locations where these details will be required shall be as shown elsewhere in the plans.

Texas Department of Transportation

Traffic Operations Division Standard

WORK ZONE ROAD CLOSURE DETAILS

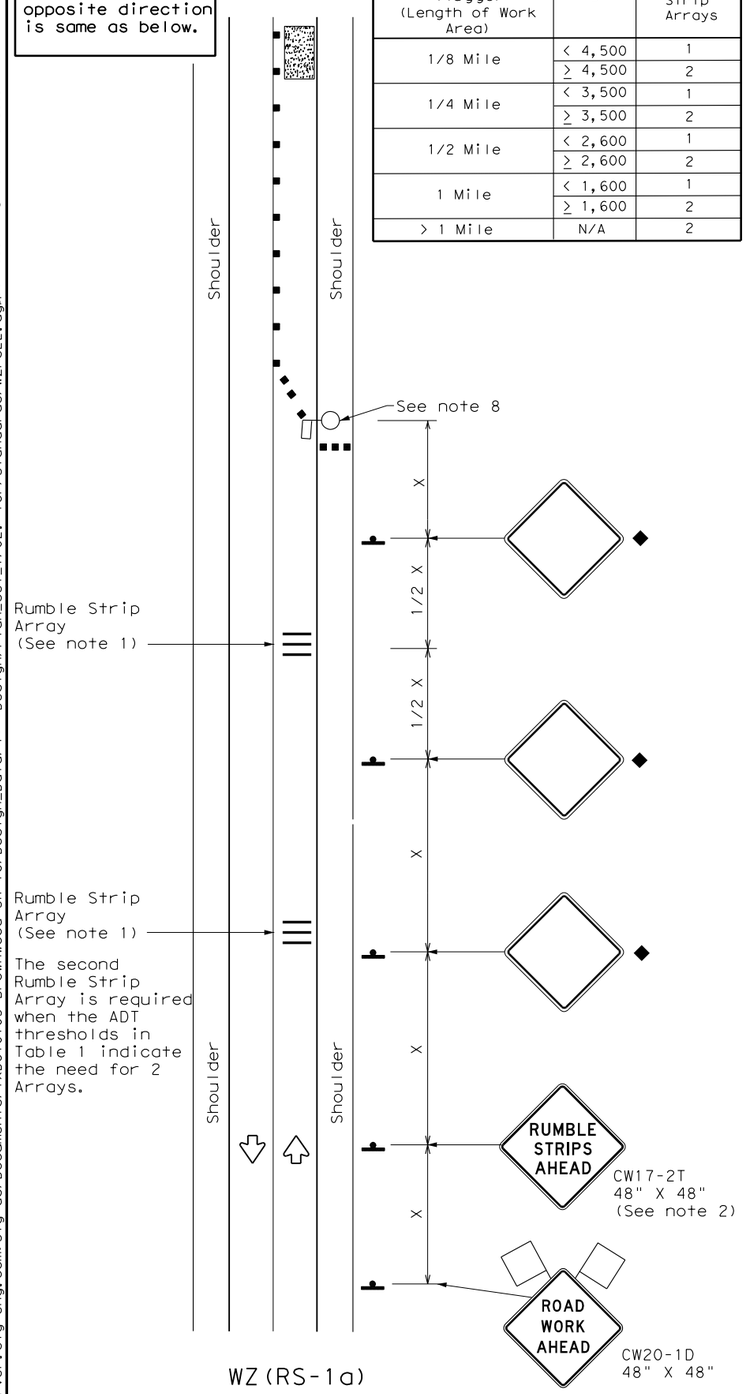
WZ(RCD)-13

FILE: wzrcd-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 1995	CONT	SECT	JOB	HIGHWAY
REVISIONS	0289	04	032	SH 16
1-97 4-98 7-13	DIST	COUNTY		SHEET NO.
2-98 3-03	BWD	SAN SABA		76

DATE: 11/22/2022 1:27
FILE: pw://server.sig-eng.com:Sig-ds/Documents/TxDOT0103 Brownwood SH 16/Design/wzrs22.dgn

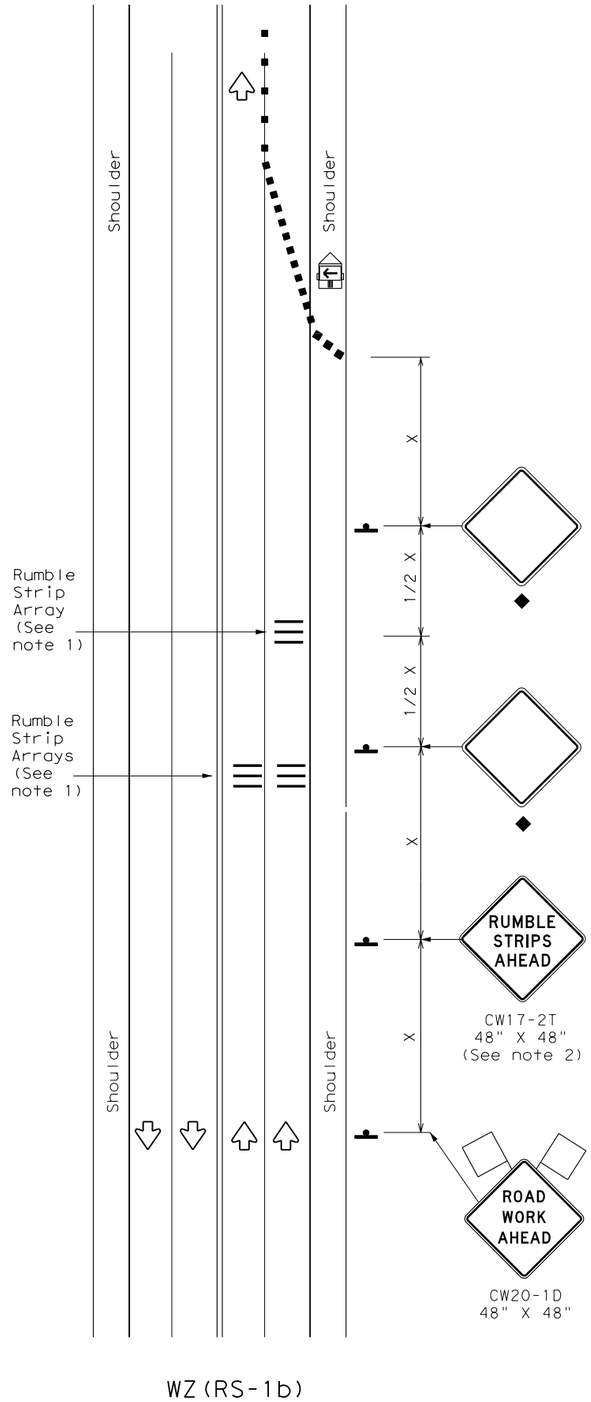
Warning sign and rumble strip sequence in opposite direction is same as below.

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)

RUMBLE STRIPS ON ONE-LANE TWO-WAY APPLICATION



WZ(RS-1b)

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. Remove Temporary Rumble Strips before removing the advanced 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 Automated Flagger Assistance Device (AFAD) or a Portable Traffic Signal (PTS).
9. Replace defective Temporary Rumble Strips as directed by the Engineer.
10. Temporary Rumble Strips may be used on freeways or expressways based on engineering judgment and written direction from the Engineer.

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.

* For posted speeds in excess of 65 MPH, it is recommended that spacing is increased as speed limits increase. Increasing space between rumble strips will improve effectiveness.

TABLE 2	
Speed	Approximate distance between strips in an array
≤ 40 MPH	10'
> 40 MPH & ≤ 55 MPH	15'
= 60 MPH	20'
≥ 65 MPH	* 35' +

Texas Department of Transportation

Traffic Safety Division Standard

TEMPORARY RUMBLE STRIPS

WZ(RS)-22

FILE: wzrs22.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-14 1-22 4-16	0289	04	032	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	SAN SABA		77

<* 4 DESCRIBE CHAIN SH16 (℄ SH 16)
Chain SH16 contains:
CL100 CL101 CUR SH161 CUR SH162 CL102 CL103 CUR SH163 CL104 CL105 CUR SH164 CL-
106 CL107 CUR SH165 CUR SH166 CUR SH167 CUR SH168 CUR SH169 CL108 CL109 CUR SH1-
610 CL110 CUR SH1611 CUR SH1612 CL111 CUR SH1613 CL112

Beginning chain SH16 description
==========

Point CL100 N 10,410,049.8285 E 2,801,262.6583 Sta 54+00.00

Course from CL100 to CL101 N 8° 39′ 11.3273" W Dist 232.6486

Point CL101 N 10,410,279.8289 E 2,801,227.6558 Sta 56+32.65

Course from CL101 to PC SH161 N 7° 41′ 35.4811" W Dist 105.3312

Curve Data

Curve SH161
P.I. Station = 62+85.11 N 10,410,926.4153 E 2,801,140.3121
Delta = 21° 17′ 47.3202" (RT)
Degree = 1° 58′ 08.1377"
Tangent = 547.1279
Length = 1,081.6285
Radius = 2,910.0000
External = 50.9878
Long Chord = 1,075.4129
Mid. Ord. = 50.1098
P.C. Station = 57+37.98 N 10,410,384.2121 E 2,801,213.5553
P.T. Station = 68+19.61 N 10,411,458.1949 E 2,801,268.9955
C.C. N 10,410,773.7691 E 2,804,097.3627
Back = N 7° 41′ 35.4811" W
Ahead = N 13° 36′ 11.8390" E
Chord Bear = N 2° 57′ 18.1789" E

Course from PT SH161 to PC SH162 N 13° 36′ 11.8391" E Dist 2,030.0966

Curve Data

Curve SH162
P.I. Station = 94+97.01 N 10,414,060.4932 E 2,801,898.7158
Delta = 25° 30′ 21.6299" (RT)
Degree = 2° 00′ 12.0562"
Tangent = 647.3096
Length = 1,273.1685
Radius = 2,860.0000
External = 72.3386
Long Chord = 1,262.6818
Mid. Ord. = 70.5541
P.C. Station = 88+49.70 N 10,413,431.3423 E 2,801,746.4699
P.T. Station = 101+22.87 N 10,414,562.7692 E 2,802,307.0398
C.C. N 10,412,758.6763 E 2,804,526.2398
Back = N 13° 36′ 11.8390" E
Ahead = N 39° 06′ 33.4690" E
Chord Bear = N 26° 21′ 22.6540" E

Course from PT SH162 to CL102 N 39° 06′ 33.4690" E Dist 1,029.8854

Point CL102 N 10,415,361.9026 E 2,802,956.6932 Sta 111+52.76

Course from CL102 to CL103 N 39° 14′ 28.4725" E Dist 1,847.1342

Point CL103 N 10,416,792.4884 E 2,804,125.1662 Sta 129+99.89

Course from CL103 to PC SH163 N 39° 03′ 54.2292" E Dist 860.8441

Curve Data

Curve SH163
P.I. Station = 142+24.66 N 10,417,743.4346 E 2,804,897.0169
Delta = 14° 24′ 13.1873" (LT)
Degree = 1° 59′ 21.9724"
Tangent = 363.9221
Length = 724.0071
Radius = 2,880.0000
External = 22.9019
Long Chord = 722.1021
Mid. Ord. = 22.7212
P.C. Station = 138+60.74 N 10,417,460.8743 E 2,804,667.6723
P.T. Station = 145+84.74 N 10,418,074.1632 E 2,805,048.8653
C.C. N 10,419,275.8574 E 2,802,431.5515
Back = N 39° 03′ 54.2291" E
Ahead = N 24° 39′ 41.0418" E
Chord Bear = N 31° 51′ 47.6355" E

Course from PT SH163 to CL104 N 24° 39′ 41.0418" E Dist 2,450.0060

Point CL104 N 10,420,300.7030 E 2,806,071.1423 Sta 170+34.75

Course from CL104 to CL105 N 24° 44′ 19.5923" E Dist 966.8507

Point CL105 N 10,421,178.8211 E 2,806,475.7518 Sta 180+01.60

Course from CL105 to PC SH164 N 25° 03′ 38.1377" E Dist 169.0725

Curve Data

Curve SH164
P.I. Station = 186+62.26 N 10,421,777.2860 E 2,806,755.5915
Delta = 18° 51′ 31.8408" (RT)
Degree = 1° 56′ 08.4056"
Tangent = 491.5866
Length = 974.2808
Radius = 2,960.0000
External = 40.5429
Long Chord = 969.8888
Mid. Ord. = 39.9950
P.C. Station = 181+70.67 N 10,421,331.9772 E 2,806,547.3669
P.T. Station = 191+44.95 N 10,422,131.3836 E 2,807,096.5787
C.C. N 10,420,078.1907 E 2,809,228.7135
Back = N 25° 03′ 38.1379" E
Ahead = N 43° 55′ 09.9786" E
Chord Bear = N 34° 29′ 24.0582" E

Course from PT SH164 to CL106 N 43° 55′ 09.9787" E Dist 515.7308

Point CL106 N 10,422,502.8727 E 2,807,454.3134 Sta 196+60.69

Course from CL106 to CL107 N 44° 11′ 49.4484" E Dist 1,179.2273

Point CL107 N 10,423,348.3153 E 2,808,276.3863 Sta 208+39.91

Course from CL107 to PC SH165 N 43° 57′ 35.4531" E Dist 588.7927

Curve Data

Curve SH165
P.I. Station = 222+46.09 N 10,424,360.5157 E 2,809,252.4870
Delta = 31° 41′ 21.1698" (LT)
Degree = 1° 59′ 21.9724"
Tangent = 817.3801
Length = 1,592.8736
Radius = 2,880.0000
External = 113.7452
Long Chord = 1,572.6487
Mid. Ord. = 109.4235
P.C. Station = 214+28.71 N 10,423,772.1439 E 2,808,685.0992
P.T. Station = 230+21.58 N 10,425,159.2225 E 2,809,426.2044
C.C. N 10,425,771.3077 E 2,806,611.9991
Back = N 43° 57′ 35.4532" E
Ahead = N 12° 16′ 14.2834" E
Chord Bear = N 28° 06′ 54.8683" E

Course from PT SH165 to PC SH166 N 12° 16′ 14.2834" E Dist 5,935.3470

Curve Data

Curve SH166
P.I. Station = 293+61.06 N 10,431,353.8773 E 2,810,773.5321
Delta = 16° 11′ 51.9914" (RT)
Degree = 2° 01′ 02.8453"
Tangent = 404.1356
Length = 802.8808
Radius = 2,840.0000
External = 28.6104
Long Chord = 800.2098
Mid. Ord. = 28.3250
P.C. Station = 289+56.93 N 10,430,958.9743 E 2,810,687.6413
P.T. Station = 297+59.81 N 10,431,709.1448 E 2,810,966.1731
C.C. N 10,430,355.3902 E 2,813,462.7605
Back = N 12° 16′ 14.2834" E
Ahead = N 28° 28′ 06.2748" E
Chord Bear = N 20° 22′ 10.2791" E

Course from PT SH166 to PC SH167 N 28° 28′ 06.2748" E Dist 5,227.4661

NO.	REVISION	BY	DATE

STATE OF TEXAS
ARMANDO CASTRO JR
111324
REGISTERED PROFESSIONAL ENGINEER
11/22/2022

Seiler Lankes Group TBPE License No. 12170
PLANNING • ENGINEERING • CONSTRUCTION

SH 16 HORIZONTAL ALIGNMENT DATA

11/22/2022 SHEET 1 OF 3

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.	
CHECKED:	6	TEXAS				SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.	
CHECKED:	BWD	SAN SABA	0289	04	032	78	

USER: jsallmas
DATE: 11/22/2022 1:27
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Curve Data

Curve SH167

P.I. Station		352+28.05	N	10,436,516.1713	E	2,813,572.7449
Delta	=	9° 49′ 47.6023" (LT)				
Degree	=	2° 02′ 46.6002"				
Tangent	=	240.7804				
Length	=	480.3790				
Radius	=	2,800.0000				
External	=	10.3336				
Long Chord	=	479.7901				
Mid. Ord.	=	10.2956				
P.C. Station		349+87.27	N	10,436,304.5061	E	2,813,457.9711
P.T. Station		354+67.65	N	10,436,744.3237	E	2,813,649.6974
C.C.			N	10,437,639.1937	E	2,810,996.5469
Back	= N	28° 28′ 06.2748" E				
Ahead	= N	18° 38′ 18.6725" E				
Chord Bear	= N	23° 33′ 12.4737" E				

Course from PT SH167 to PC SH168 N 18° 38′ 18.6725" E Dist 4,504.2901

NO.	REVISION	BY	DATE

STATE OF TEXAS
ARMANDO CASTRO JR
111324
REGISTERED
PROFESSIONAL ENGINEER
11/22/2022

Texas Department of Transportation

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SH 16
HORIZONTAL ALIGNMENT DATA

11/22/2022 SHEET 2 OF 3

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.	
CHECKED:	6	TEXAS				SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.	
CHECKED:	BWD	SAN SABA	0289	04	032	79	

USER: jsalinas
DATE: 11/22/2022 1:27
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<* 1 DESCRIBE CHAIN FM500 (℄ FM 500)

Chain FM500 contains:
FM5001 FM5002

Beginning chain FM500 description
==========

Point FM5001 N 10,414,166.5081 E 2,801,616.7011 Sta 10+00.00

Course from FM5001 to FM5002 S 45° 55′ 28.9810" E Dist 394.7871

Point FM5002 N 10,413,891.8930 E 2,801,900.3266 Sta 13+94.79

==========
Ending chain FM500 description

<* 2 DESCRIBE CHAIN CR111 (℄ CR 111)

Chain CR111 contains:
CR11101 CUR CR1111 CR11102

Beginning chain CR111 description
==========

Point CR11101 N 10,424,420.3949 E 2,808,990.6798 Sta 10+00.00

Course from CR11101 to PC CR1111 N 88° 57′ 01.9280" E Dist 100.6386

Curve Data

Curve CR1111
P.I. Station 11+07.23 N 10,424,422.3588 E 2,809,097.8907
Delta = 29° 32′ 08.0704" (RT)
Degree = 229° 10′ 59.2250"
Tangent = 6.5903
Length = 12.8873
Radius = 25.0000
External = 0.8540
Long Chord = 12.7451
Mid. Ord. = 0.8258
P.C. Station 11+00.64 N 10,424,422.2381 E 2,809,091.3016
P.T. Station 11+13.53 N 10,424,419.2156 E 2,809,103.6831
C.C. N 10,424,397.2423 E 2,809,091.7595
Back = N 88° 57′ 01.9279" E
Ahead = S 61° 30′ 50.0017" E
Chord Bear = S 76° 16′ 54.0369" E

Course from PT CR1111 to CR11102 S 61° 30′ 50.0019" E Dist 45.1028

Point CR11102 N 10,424,397.7040 E 2,809,143.3254 Sta 11+58.63

==========
Ending chain FM111 description

<* 3 DESCRIBE CHAIN CR122 (℄ CR 122)

Chain CR122 contains:
CR12201 CUR CR1221 CR12202

Beginning chain CR122 description
==========

Point CR12201 N 10,424,865.3688 E 2,809,345.8013 Sta 10+00.00

Course from CR12201 to PC CR1221 S 71° 41′ 41.4125" E Dist 29.5651

Curve Data

Curve CR1221
P.I. Station 10+58.13 N 10,424,847.1120 E 2,809,400.9881
Delta = 25° 44′ 34.1256" (RT)
Degree = 45° 50′ 11.8450"
Tangent = 28.5632
Length = 56.1621
Radius = 125.0000
External = 3.2219
Long Chord = 55.6909
Mid. Ord. = 3.1409
P.C. Station 10+29.57 N 10,424,856.0831 E 2,809,373.8703
P.T. Station 10+85.73 N 10,424,827.2532 E 2,809,421.5181
C.C. N 10,424,737.4084 E 2,809,334.6106
Back = S 71° 41′ 41.4157" E
Ahead = S 45° 57′ 07.2901" E
Chord Bear = S 58° 49′ 24.3529" E

Course from PT CR1221 to CR12202 S 45° 57′ 07.2902" E Dist 215.5805

Point CR12202 N 10,424,677.3686 E 2,809,576.4683 Sta 13+01.31

==========
Ending chain CR122 description

NO.	REVISION	BY	DATE

STATE OF TEXAS
ARMANDO CASTRO JR
111324
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PROFESSIONAL ENGINEER
11/22/2022

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SH 16
HORIZONTAL ALIGNMENT DATA

11/22/2022 SHEET 3 OF 3

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.	
CHECKED:	6	TEXAS				SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.	
CHECKED:	BWD	SAN SABA	0289	04	032	80	

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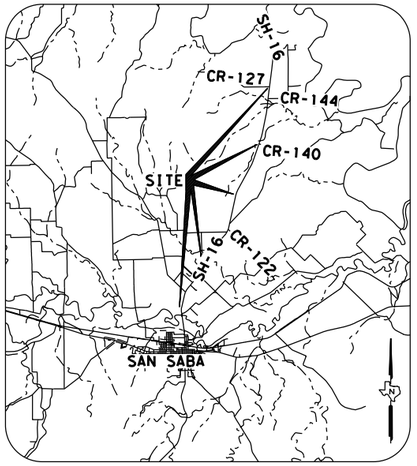
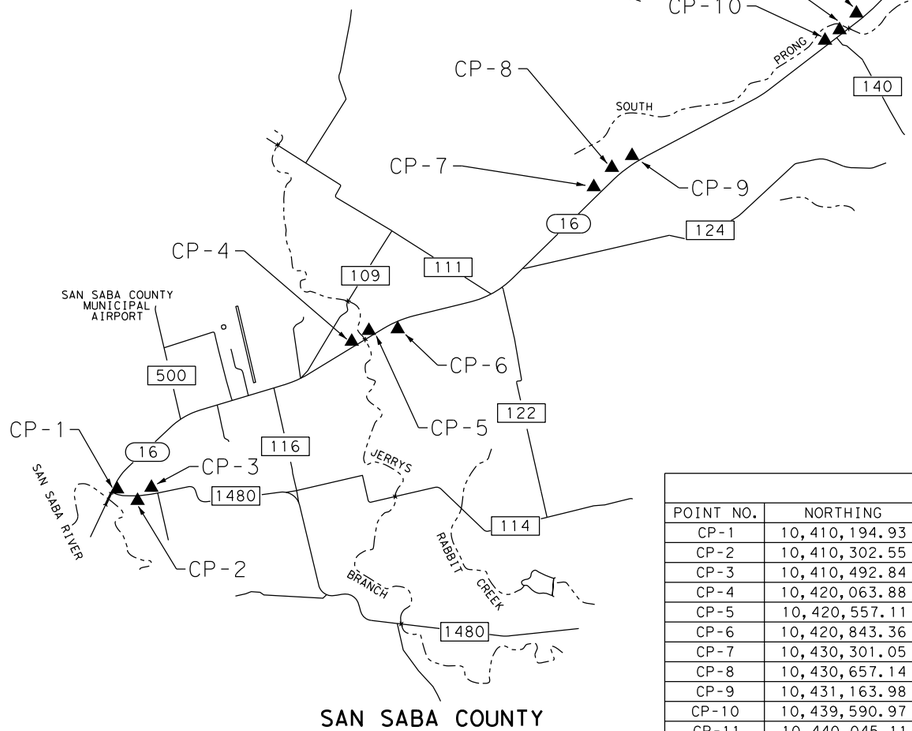


VICINITY MAP
NOT TO SCALE

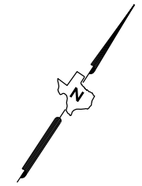


SAN SABA COUNTY

GRAPHIC SCALE

0′ 1000′ 2000′ 4000′

SCALE 1" = 1000′ 22" X 34"
SCALE 1" = 2000′ 11" X 17"



NOTES:

1. PRIMARY CONTROL WAS ESTABLISHED USING GPS METHODS CONFORMING TO THE "TxDOT SURVEY MANUAL 2016-01".

2. ALL BEARINGS AND COORDINATES SHOWN ARE REFERENCED TO THE TEXAS COORDINATE SYSTEM, NORTH CENTRAL ZONE (4202), NORTH AMERICAN DATUM OF 1983, (2011) EPOCH 2010.0 AND ESTABLISHED UTILIZING MULTIPLE STATIC GPS OBSERVATIONS. TxDOT REGIONAL REFERENCE POINTS USED TO POST-PROCESS STATIC DATA INCLUDED: TXEA AND TXAB.

PROJECT COORDINATES =
GRID COORDINATES x 1.00012
UNITS: US SURVEY FEET

3. ALL ELEVATIONS SHOWN HEREON ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988 AND WERE ESTABLISHED USING TxDOT LEVEL 2 AND LEVEL 3 GPS SPECIFICATIONS AND DIGITAL DIFFERENTIAL LEVELING.

LEGEND

- SURVEY CONTROL MONUMENT
- POLE
- SIGN
- MARKER POST
- TELEPHONE PEDESTAL

THIS SURVEY CONTROL INFORMATION HAS BEEN ACCEPTED AND INCORPORATED INTO THE PS&E.

PRIMARY CONTROL

POINT NO.	NORTHING	EASTING	ELEVATION	DESCRIPTION
CP-1	10,410,194.93	2,801,276.18	1,205.18′	3-1/4" "TEXAS DEPT OF TRANSPORTATION CONTROL MARK" ALUMINUM CAP SET
CP-2	10,410,302.55	2,801,738.16	1,219.39′	3-1/4" "TEXAS DEPT OF TRANSPORTATION CONTROL MARK" ALUMINUM CAP SET
CP-3	10,410,492.84	2,802,028.40	1,222.88′	3-1/4" "TEXAS DEPT OF TRANSPORTATION CONTROL MARK" ALUMINUM CAP SET
CP-4	10,420,063.88	2,805,939.55	1,225.51′	3-1/4" "TEXAS DEPT OF TRANSPORTATION CONTROL MARK" ALUMINUM CAP SET
CP-5	10,420,557.11	2,806,159.77	1,225.22′	3-1/4" "TEXAS DEPT OF TRANSPORTATION CONTROL MARK" ALUMINUM CAP SET
CP-6	10,420,843.36	2,806,373.49	1,224.96′	3-1/4" "TEXAS DEPT OF TRANSPORTATION CONTROL MARK" ALUMINUM CAP SET
CP-7	10,430,301.05	2,810,568.20	1,268.81′	3-1/4" "TEXAS DEPT OF TRANSPORTATION CONTROL MARK" ALUMINUM CAP SET
CP-8	10,430,657.14	2,810,575.22	1,261.91′	3-1/4" "TEXAS DEPT OF TRANSPORTATION CONTROL MARK" ALUMINUM CAP SET
CP-9	10,431,163.98	2,810,765.36	1,258.62′	3-1/4" "TEXAS DEPT OF TRANSPORTATION CONTROL MARK" ALUMINUM CAP SET
CP-10	10,439,590.97	2,814,658.08	1,198.98′	3-1/4" "TEXAS DEPT OF TRANSPORTATION CONTROL MARK" ALUMINUM CAP SET
CP-11	10,440,045.11	2,814,711.40	1,195.34′	3-1/4" "TEXAS DEPT OF TRANSPORTATION CONTROL MARK" ALUMINUM CAP SET
CP-12	10,440,604.19	2,814,998.40	1,197.75′	3-1/4" "TEXAS DEPT OF TRANSPORTATION CONTROL MARK" ALUMINUM CAP SET
CP-13	10,449,303.60	2,816,393.74	1,191.52′	3-1/4" "TEXAS DEPT OF TRANSPORTATION CONTROL MARK" ALUMINUM CAP SET
CP-14	10,449,848.86	2,816,454.40	1,195.27′	3-1/4" "TEXAS DEPT OF TRANSPORTATION CONTROL MARK" ALUMINUM CAP SET
CP-15	10,450,679.28	2,816,545.17	1,200.48′	3-1/4" "TEXAS DEPT OF TRANSPORTATION CONTROL MARK" ALUMINUM CAP SET

STATE OF TEXAS
REGISTERED
CHRISTOPHER W TERRY
6649
PROFESSIONAL
LAND SURVEYOR

9/27/2021

CHRISTOPHER W. TERRY
REGISTERED PROFESSIONAL LAND SURVEYOR
TEXAS NUMBER 6649
TBPLS FIRM NO. 10194385
CTERRY@DOUCETENGINEERS.COM

Texas Department of Transportation

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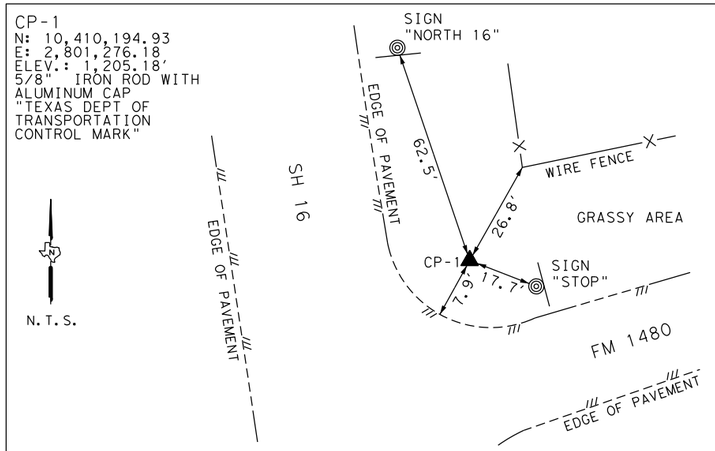
San Antonio, Texas 78258
TELEPHONE: (210)-469-4564
www.doucetengineers.com
TBPLS Firm No: 10194385

SH-16
PLAN OF PROPOSED
RIGHT-OF-WAY WIDENING

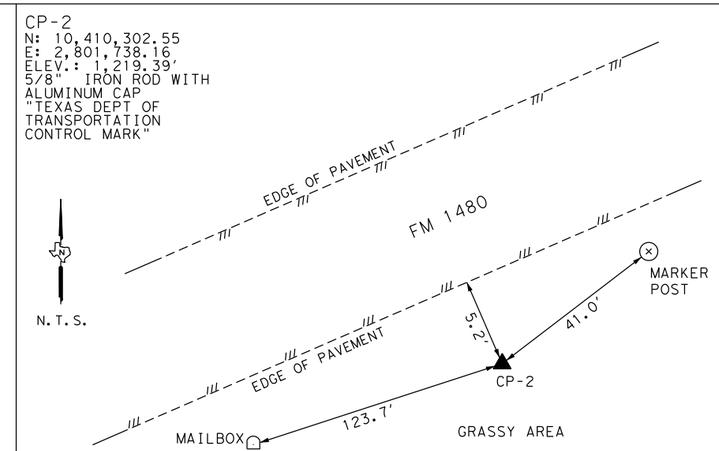
FED. RD. DIV. NO.	STATE	COUNTY			HIGHWAY NO.
-	TEXAS	SAN SABA			SH 16
STATE DIST. NO.	FED. NO.	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
18		0289	04	032	

CP-1
N: 10,410,194.93
E: 2,801,276.18
ELEV.: 1,205.18'
5/8" IRON ROD WITH ALUMINUM CAP "TEXAS DEPT OF TRANSPORTATION CONTROL MARK"



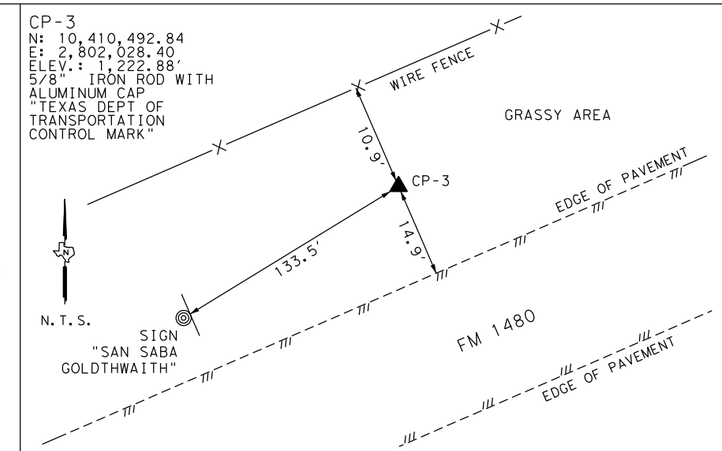
CONTROL POINT CP-1 IS LOCATED IN THE EAST SIDE OF SH 16, AT THE INTERSECTION OF SH 16 AND FM 1480, SAID POINT IS 7.9 FEET NORTHEAST OF THE EAST EDGE OF THE NORTHBOUND PAVEMENT OF SH 16, 17.7 FEET WEST OF A "STOP" SIGN, 62.5 FEET SOUTH OF A "NORTH 16" SIGN AND 26.8 FEET SOUTHEAST OF A FENCE CORNER.

CP-2
N: 10,410,302.55
E: 2,801,738.16
ELEV.: 1,219.39'
5/8" IRON ROD WITH ALUMINUM CAP "TEXAS DEPT OF TRANSPORTATION CONTROL MARK"



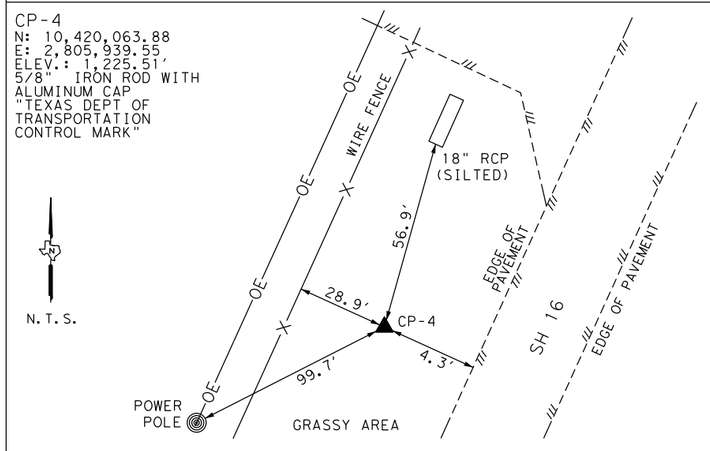
CONTROL POINT CP-2 IS LOCATED IN THE SOUTH SIDE OF FM 1480, 520 FEET FROM THE INTERSECTION OF SH 16 AND FM 1480, SAID POINT IS 5.2 FEET SOUTH OF THE SOUTH EDGE OF THE EASTBOUND PAVEMENT OF FM 1480, 41.0 FEET WEST OF A MAILBOX AND 123.7 FEET EAST OF A MAILBOX.

CP-3
N: 10,410,492.84
E: 2,802,028.40
ELEV.: 1,222.88'
5/8" IRON ROD WITH ALUMINUM CAP "TEXAS DEPT OF TRANSPORTATION CONTROL MARK"



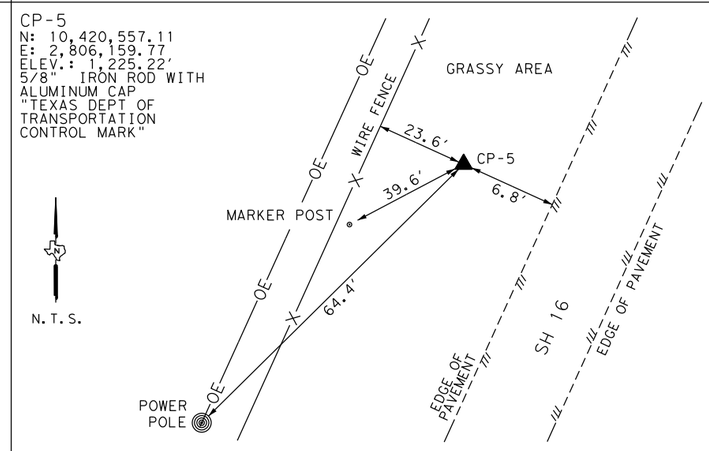
CONTROL POINT CP-3 IS LOCATED IN THE NORTH SIDE OF FM 1480, 860 FEET FROM THE INTERSECTION OF SH 16 AND FM 1480, SAID POINT IS 14.9 FEET NORTH OF THE NORTH EDGE OF THE WESTBOUND PAVEMENT OF FM 1480, 133.5 FEET EAST OF A "SAN SABA GOLDTHWAITH" SIGN AND 10.9 FEET SOUTH OF A WIRE FENCE.

CP-4
N: 10,420,063.88
E: 2,805,939.55
ELEV.: 1,225.51'
5/8" IRON ROD WITH ALUMINUM CAP "TEXAS DEPT OF TRANSPORTATION CONTROL MARK"



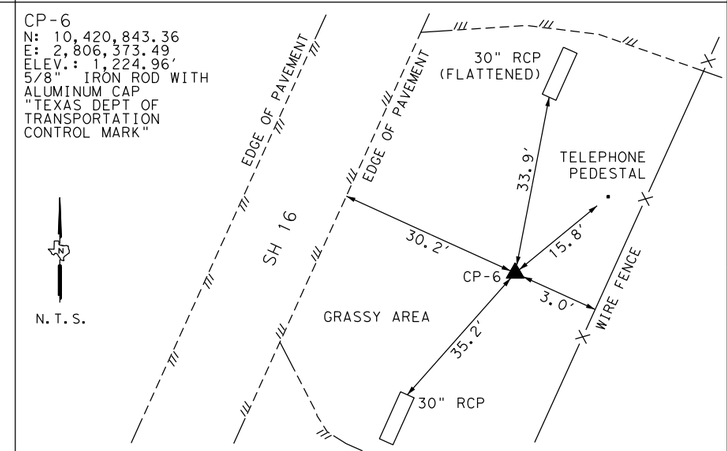
CONTROL POINT CP-4 IS LOCATED IN THE NORTHWEST SIDE OF SH 16, 2,520 FEET FROM THE INTERSECTION OF SH 16 AND COUNTY ROAD 109, SAID POINT IS 4.3 FEET NORTHWEST OF THE NORTHWEST EDGE OF THE SOUTHBOUND PAVEMENT OF SH 16, 56.9 FEET SOUTH OF AN 18-INCH RCP (SILTED), 99.7 FEET NORTHEAST OF A POWER POLE AND 28.9 FEET SOUTHEAST OF A WIRE FENCE.

CP-5
N: 10,420,557.11
E: 2,806,159.77
ELEV.: 1,225.22'
5/8" IRON ROD WITH ALUMINUM CAP "TEXAS DEPT OF TRANSPORTATION CONTROL MARK"



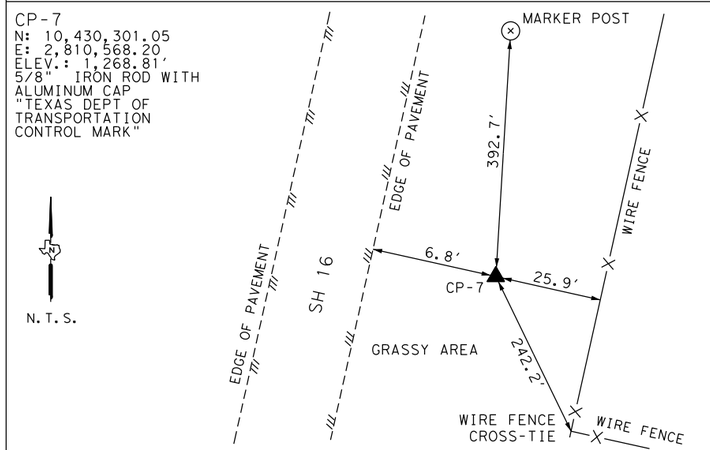
CONTROL POINT CP-5 IS LOCATED IN THE NORTHWEST SIDE OF SH 16, 3,070 FEET FROM THE INTERSECTION OF SH 16 AND COUNTY ROAD 109, SAID POINT IS 6.8 FEET NORTHWEST OF THE NORTHWEST EDGE OF THE SOUTHBOUND PAVEMENT OF SH 16, 39.6 FEET NORTHEAST OF A MARKER POST, 64.4 FEET NORTHEAST OF A POWER POLE AND 23.6 FEET SOUTHEAST OF A WIRE FENCE.

CP-6
N: 10,420,843.36
E: 2,806,373.49
ELEV.: 1,224.96'
5/8" IRON ROD WITH ALUMINUM CAP "TEXAS DEPT OF TRANSPORTATION CONTROL MARK"



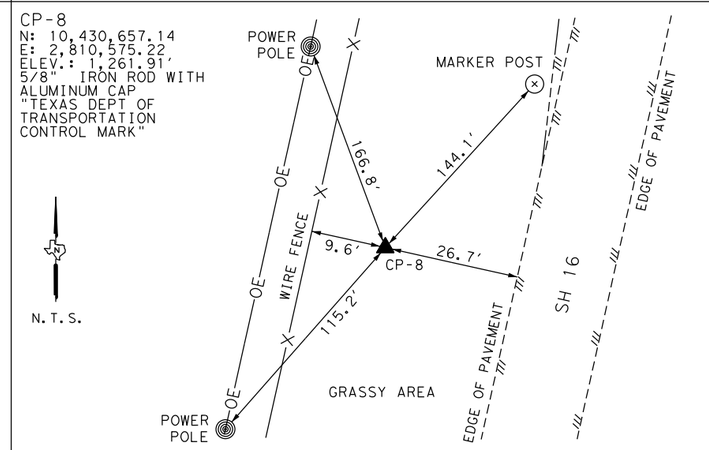
CONTROL POINT CP-6 IS LOCATED IN THE SOUTHEAST SIDE OF SH 16, 3,420 FEET FROM THE INTERSECTION OF SH 16 AND COUNTY ROAD 109, SAID POINT IS 30.2 FEET SOUTHEAST OF THE SOUTHEAST EDGE OF THE NORTHBOUND PAVEMENT OF SH 16, 33.9 FEET SOUTH OF AN 30-INCH RCP (FLATTENED), 35.2 FEET NORTH OF AN 30-INCH RCP AND 3.0 FEET NORTHWEST OF A WIRE FENCE.

CP-7
N: 10,430,301.05
E: 2,810,568.20
ELEV.: 1,268.81'
5/8" IRON ROD WITH ALUMINUM CAP "TEXAS DEPT OF TRANSPORTATION CONTROL MARK"



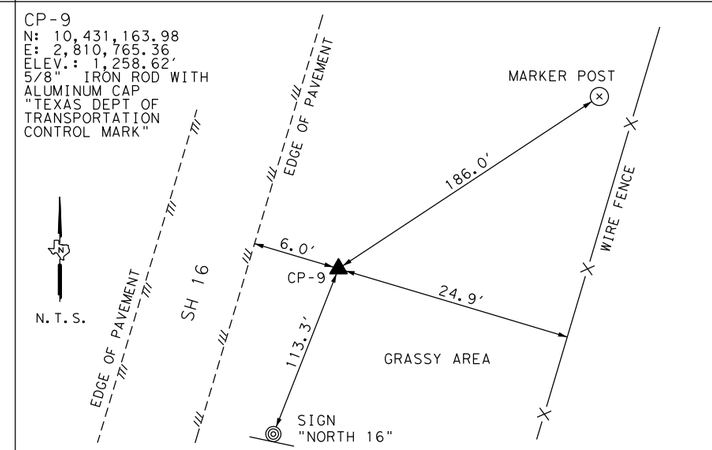
CONTROL POINT CP-7 IS LOCATED IN THE SOUTHEAST SIDE OF SH 16, 4,480 FEET FROM THE INTERSECTION OF SH 16 AND COUNTY ROAD 124, SAID POINT IS 6.8 FEET SOUTHEAST OF THE SOUTHEAST EDGE OF THE NORTHBOUND PAVEMENT OF SH 16, 392.7 FEET SOUTH OF A MARKER POST, 242.2 FEET NORTH OF A WIRE FENCE CROSS-TIE AND 3.0 FEET WEST OF A WIRE FENCE.

CP-8
N: 10,430,657.14
E: 2,810,575.22
ELEV.: 1,261.91'
5/8" IRON ROD WITH ALUMINUM CAP "TEXAS DEPT OF TRANSPORTATION CONTROL MARK"



CONTROL POINT CP-8 IS LOCATED IN THE NORTHWEST SIDE OF SH 16, 4,860 FEET FROM THE INTERSECTION OF SH 16 AND COUNTY ROAD 124, SAID POINT IS 26.7 FEET NORTHWEST OF THE NORTHWEST EDGE OF THE SOUTHBOUND PAVEMENT OF SH 16, 144.1 FEET SOUTH OF A MARKER POST, 115.2 FEET NORTH OF A POWER POLE AND 9.6 FEET SOUTHWEST OF A WIRE FENCE.

CP-9
N: 10,431,163.98
E: 2,810,765.36
ELEV.: 1,258.62'
5/8" IRON ROD WITH ALUMINUM CAP "TEXAS DEPT OF TRANSPORTATION CONTROL MARK"



CONTROL POINT CP-9 IS LOCATED IN THE SOUTHEAST SIDE OF SH 16, 1 MILE FROM THE INTERSECTION OF SH 16 AND COUNTY ROAD 124, SAID POINT IS 6.0 FEET SOUTHEAST OF THE SOUTHEAST EDGE OF THE NORTHBOUND PAVEMENT OF SH 16, 186.0 FEET SOUTH OF A MARKER POST, 113.3 FEET NORTH OF A "NORTH 16" SIGN AND 24.9 FEET NORTHWEST OF A WIRE FENCE.

NOTES:

1. PRIMARY CONTROL WAS ESTABLISHED USING GPS METHODS CONFORMING TO THE "TxDOT SURVEY MANUAL 2016-01".

2. ALL BEARINGS AND COORDINATES SHOWN ARE REFERENCED TO THE TEXAS COORDINATE SYSTEM, NORTH CENTRAL ZONE (4202), NORTH AMERICAN DATUM OF 1983, (2011) EPOCH 2010.0 AND ESTABLISHED UTILIZING MULTIPLE STATIC GPS OBSERVATIONS. TxDOT REGIONAL REFERENCE POINTS USED TO POST-PROCESS STATIC DATA INCLUDED: TXEA AND TXAB.

PROJECT COORDINATES = GRID COORDINATES x 1.00012
UNITS: US SURVEY FEET

3. ALL ELEVATIONS SHOWN HEREON ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988 AND WERE ESTABLISHED USING TxDOT LEVEL 2 AND LEVEL 3 GPS SPECIFICATIONS AND DIGITAL DIFFERENTIAL LEVELING.

LEGEND

- SURVEY CONTROL MONUMENT
- POLE
- SIGN
- MARKER POST
- TELEPHONE PEDESTAL

THIS SURVEY CONTROL INFORMATION HAS BEEN ACCEPTED AND INCORPORATED INTO THE PS&E.

STATE OF TEXAS
REGISTERED
CHRISTOPHER W TERRY
6649
PROFESSIONAL
LAND SURVEYOR

9/27/2021

CHRISTOPHER W. TERRY
REGISTERED PROFESSIONAL LAND SURVEYOR
TEXAS NUMBER 6649
TBPLS FIRM NO. 10194385
CTERRY@DOUCETENGINEERS.COM

Texas Department of Transportation

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18618 Tuscany Stone, Ste. 140
San Antonio, Texas 78258
TELEPHONE: (210)-469-4564
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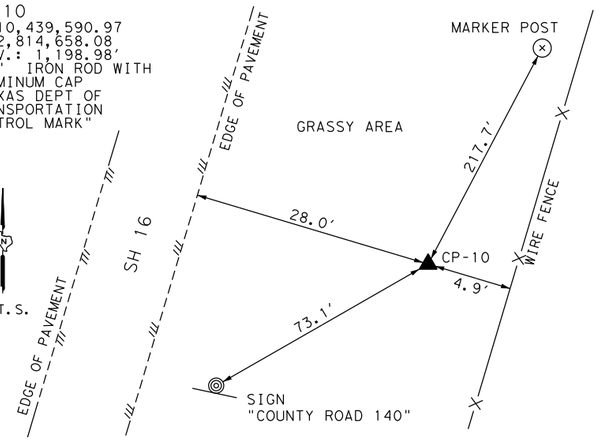
TBPLS Firm No: 10194385

SH-16
PLAN OF PROPOSED RIGHT-OF-WAY WIDENING

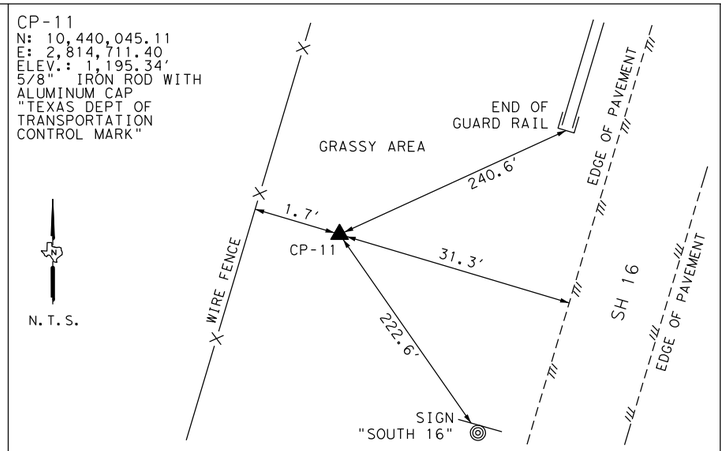
FED. RD. DIV. NO.	STATE	COUNTY			HIGHWAY NO.
	TEXAS	SAN SABA			SH 16
STATE DIST. NO.	FED. NO.	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
18		0289	04	032	

CP-10
N: 10,439,590.97
E: 2,814,658.08
ELEV.: 1,198.98'
5/8" IRON ROD WITH ALUMINUM CAP "TEXAS DEPT OF TRANSPORTATION CONTROL MARK"



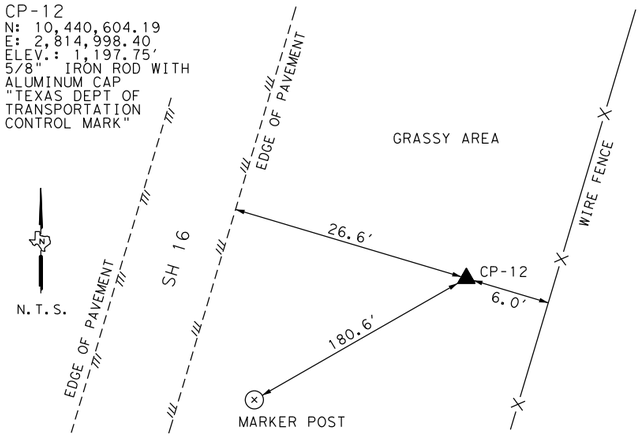
CONTROL POINT CP-10 IS LOCATED IN THE SOUTHEAST SIDE OF SH 16, 280 FEET FROM THE INTERSECTION OF SH 16 AND COUNTY ROAD 140, SAID POINT IS 28.0 FEET SOUTHEAST OF THE SOUTHEAST EDGE OF THE NORTHBOUND PAVEMENT OF SH 16, 217.7 FEET SOUTH OF A MARKER POST, 73.1 FEET NORTH OF A "COUNTY ROAD 140" SIGN AND 4.9 FEET NORTHWEST OF A WIRE FENCE.

CP-11
N: 10,440,045.11
E: 2,814,711.40
ELEV.: 1,195.34'
5/8" IRON ROD WITH ALUMINUM CAP "TEXAS DEPT OF TRANSPORTATION CONTROL MARK"



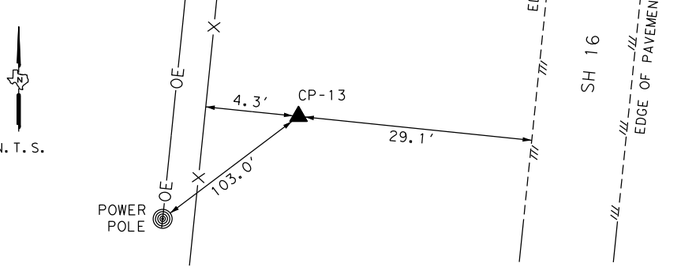
CONTROL POINT CP-11 IS LOCATED IN THE NORTHWEST SIDE OF SH 16, 170 FEET FROM THE INTERSECTION OF SH 16 AND COUNTY ROAD 140, SAID POINT IS 31.3 FEET NORTHWEST OF THE NORTHWEST EDGE OF THE SOUTHBOUND PAVEMENT OF SH 16, 240.6 FEET SOUTH OF THE END OF A GUARD RAIL, 222.6 FEET NORTH OF A "SOUTH 16" SIGN AND 1.7 FEET SOUTHEAST OF A WIRE FENCE.

CP-12
N: 10,440,604.19
E: 2,814,998.40
ELEV.: 1,197.75'
5/8" IRON ROD WITH ALUMINUM CAP "TEXAS DEPT OF TRANSPORTATION CONTROL MARK"



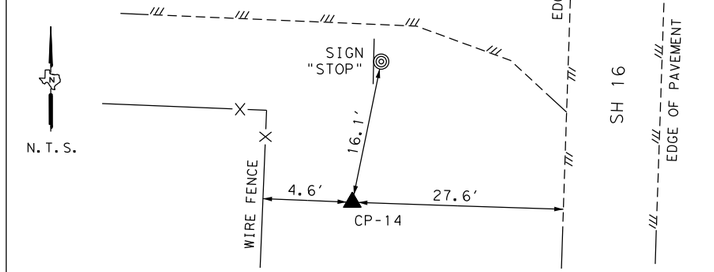
CONTROL POINT CP-12 IS LOCATED IN THE SOUTHEAST SIDE OF SH 16, 780 FEET FROM THE INTERSECTION OF SH 16 AND COUNTY ROAD 140, SAID POINT IS 26.6 FEET SOUTHEAST OF THE SOUTHEAST EDGE OF THE NORTHBOUND PAVEMENT OF SH 16, 180.6 FEET NORTH OF A MARKER POST AND 6.0 FEET NORTHWEST OF A WIRE FENCE.

CP-13
N: 10,449,303.60
E: 2,816,393.74
ELEV.: 1,191.52'
5/8" IRON ROD WITH ALUMINUM CAP "TEXAS DEPT OF TRANSPORTATION CONTROL MARK"



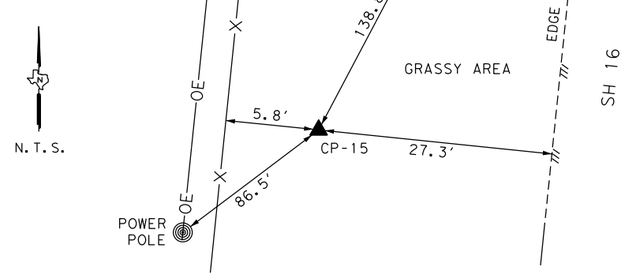
CONTROL POINT CP-13 IS LOCATED IN THE WEST SIDE OF SH 16, 590 FEET FROM THE INTERSECTION OF SH 16 AND COUNTY ROAD 127, SAID POINT IS 29.1 FEET WEST OF THE WEST EDGE OF THE SOUTHBOUND PAVEMENT OF SH 16, 103.0 FEET NORTH OF A POWER POLE AND 4.3 FEET EAST OF A WIRE FENCE.

CP-14
N: 10,449,848.86
E: 2,816,454.40
ELEV.: 1,195.27'
5/8" IRON ROD WITH ALUMINUM CAP "TEXAS DEPT OF TRANSPORTATION CONTROL MARK"



CONTROL POINT CP-14 IS LOCATED IN THE WEST SIDE OF SH 16, AT THE INTERSECTION OF SH 16 AND FM 127, SAID POINT IS 27.6 FEET WEST OF THE WEST EDGE OF THE SOUTHBOUND PAVEMENT OF SH 16, 16.1 FEET SOUTH OF A "STOP" SIGN AND 4.6 FEET EAST OF A WIRE FENCE.

CP-15
N: 10,450,679.28
E: 2,816,545.17
ELEV.: 1,200.48'
5/8" IRON ROD WITH ALUMINUM CAP "TEXAS DEPT OF TRANSPORTATION CONTROL MARK"



CONTROL POINT CP-15 IS LOCATED IN THE WEST SIDE OF SH 16, 800 FEET FROM THE INTERSECTION OF SH 16 AND COUNTY ROAD 127, SAID POINT IS 27.3 FEET WEST OF THE WEST EDGE OF THE SOUTHBOUND PAVEMENT OF SH 16, 138.8 FEET SOUTH OF A MARKER POST, 86.5 FEET NORTH OF A POWER POLE AND 5.8 FEET EAST OF A WIRE FENCE.

NOTES:

1. PRIMARY CONTROL WAS ESTABLISHED USING GPS METHODS CONFORMING TO THE "TxDOT SURVEY MANUAL 2016-01".

2. ALL BEARINGS AND COORDINATES SHOWN ARE REFERENCED TO THE TEXAS COORDINATE SYSTEM, NORTH CENTRAL ZONE (4202), NORTH AMERICAN DATUM OF 1983, (2011) EPOCH 2010.0 AND ESTABLISHED UTILIZING MULTIPLE STATIC GPS OBSERVATIONS. TxDOT REGIONAL REFERENCE POINTS USED TO POST-PROCESS STATIC DATA INCLUDED: TXEA AND TXAB.

PROJECT COORDINATES = GRID COORDINATES x 1.00012
UNITS: US SURVEY FEET

3. ALL ELEVATIONS SHOWN HEREON ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988 AND WERE ESTABLISHED USING TxDOT LEVEL 2 AND LEVEL 3 GPS SPECIFICATIONS AND DIGITAL DIFFERENTIAL LEVELING.

LEGEND

- SURVEY CONTROL MONUMENT
- POLE
- SIGN
- MARKER POST
- TELEPHONE PEDESTAL

THIS SURVEY CONTROL INFORMATION HAS BEEN ACCEPTED AND INCORPORATED INTO THE PS&E.

STATE OF TEXAS
REGISTERED
CHRISTOPHER W TERRY
6649
PROFESSIONAL
LAND SURVEYOR

Chris Terry 9/27/2021

CHRISTOPHER W. TERRY
REGISTERED PROFESSIONAL LAND SURVEYOR
TEXAS NUMBER 6649
TBPLS FIRM NO. 10194385
CTERRY@DOUCETENGINEERS.COM

Texas Department of Transportation

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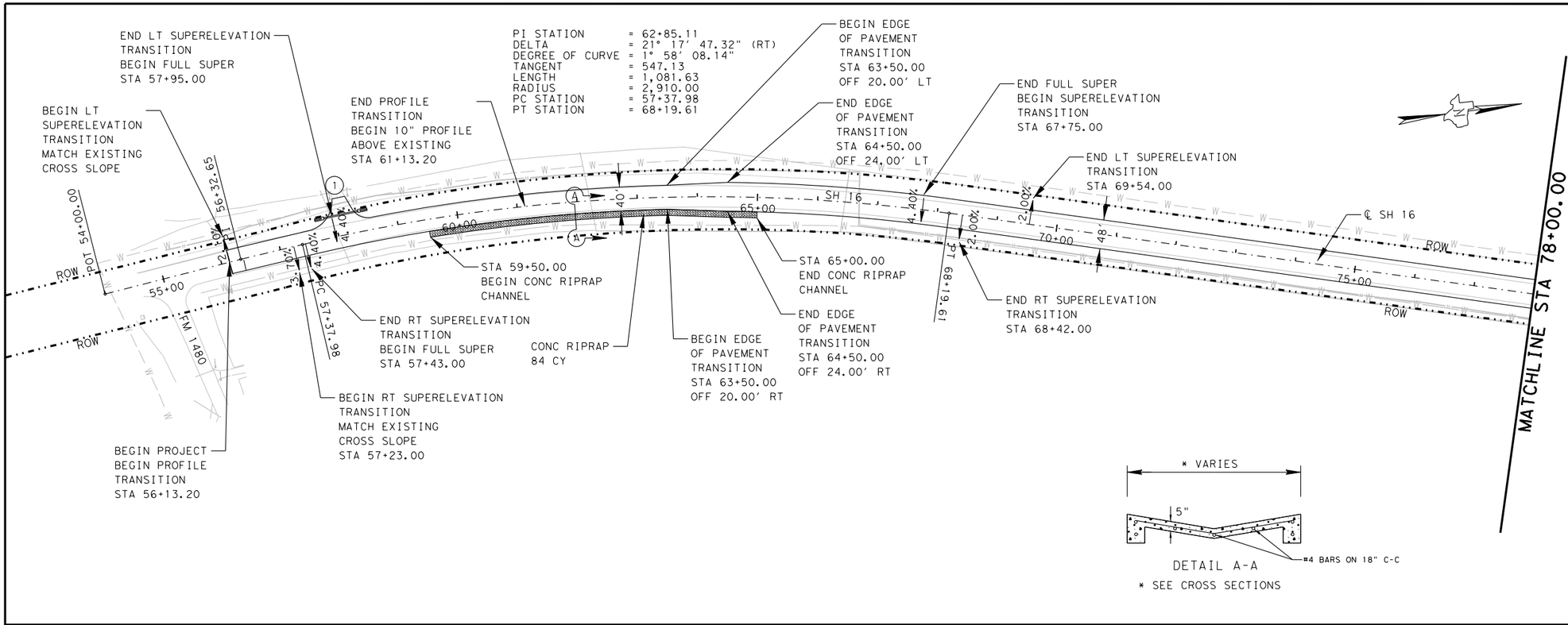
18618 Tuscany Stone, Ste. 140
San Antonio, Texas 78258
TELEPHONE: (210)-469-4564
www.doucetengineers.com
TBPLS Firm No: 10194385

SH-16
PLAN OF PROPOSED RIGHT-OF-WAY WIDENING

FED. RD. DIV. NO.	STATE	COUNTY			HIGHWAY NO.
-	TEXAS	SAN SABA			SH 16
STATE DIST. NO.	FED. NO.	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
18		0289	04	032	



LEGEND

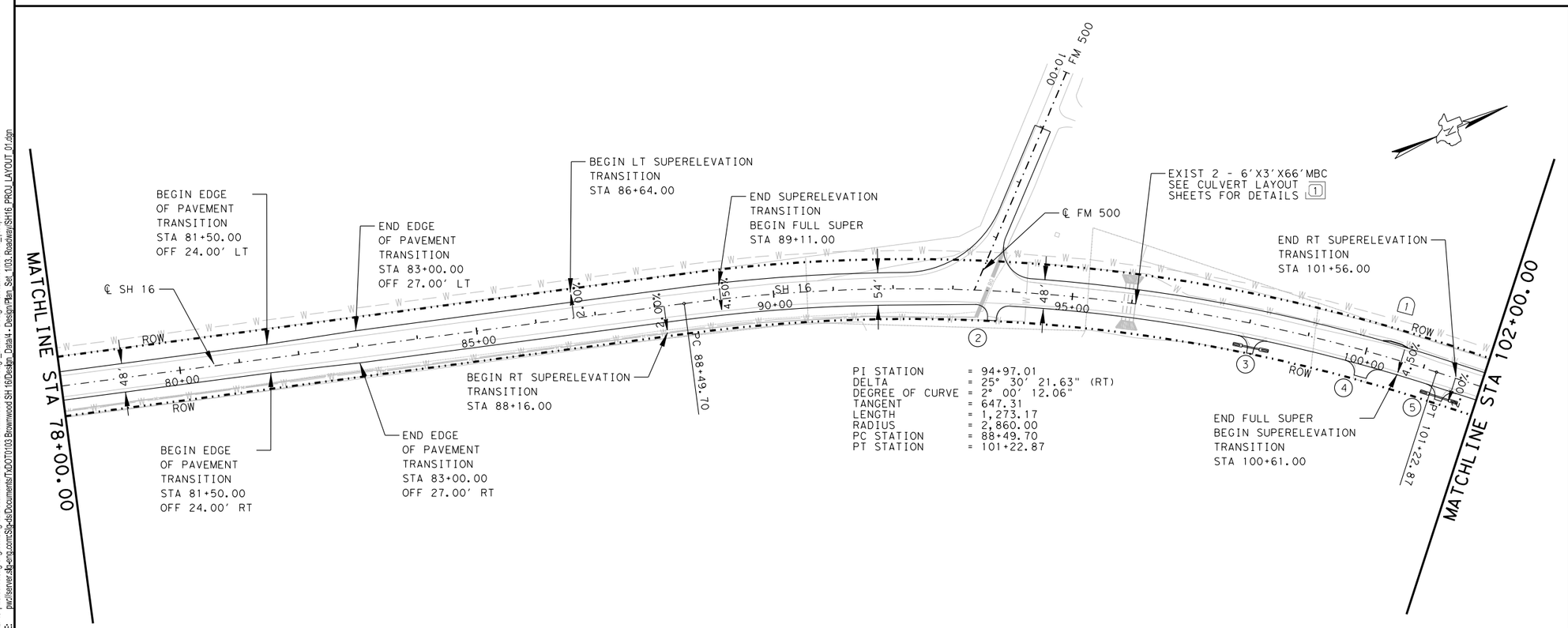
- ℄ SH 16
- CROSS CULVERT NUMBER
- DRIVEWAY NUMBER
- MAILBOX ASSEMBLY NUMBER

UTILITY LEGEND

- NORTH SAN SABA WATER SUPPLY CORPORATION
- SAN SABA RAW WATER SUPPLY LINE
- FIBER OPTIC CABLE

NOTES:

1. THE STATIONS SHOWN HERE AND ELSEWHERE WITHIN THE PLANS ARE BASED ON A BEST FIT ALIGNMENT USING AVAILABLE DATA. THE ALIGNMENT IS NOT TO BE USED FOR CONSTRUCTION PURPOSES BUT AS A POINT OF REFERENCE.
2. REFER TO GENERAL NOTES ITEM 100 PREP ROW FOR ADDITIONAL INFORMATION REGARDING SUBSIDIARY WORK INVOLVED IN PREP ROW.
3. EXISTING WATER LINES ARE SHOWN AT APPROXIMATE LOCATION AND ARE TO BE USED FOR INFORMATIONAL PURPOSES.
4. SEE PROJECT LAYOUT SHEET 7 OF 7 FOR PROFILE TRANSITION DETAIL.



NO.	REVISION	BY	DATE

STATE OF TEXAS
GERALD A. LANKES
107484
REGISTERED PROFESSIONAL ENGINEER
11/22/2022

Texas Department of Transportation
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PLANNING • ENGINEERING • CONSTRUCTION

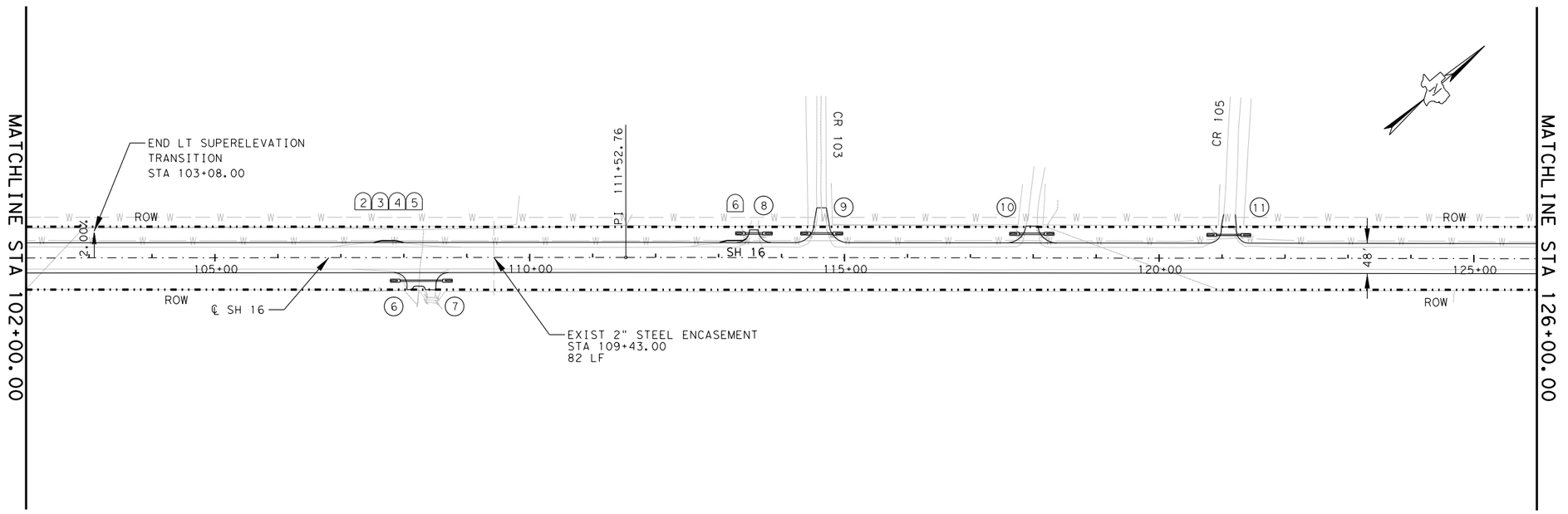
SH 16
PROJECT LAYOUT

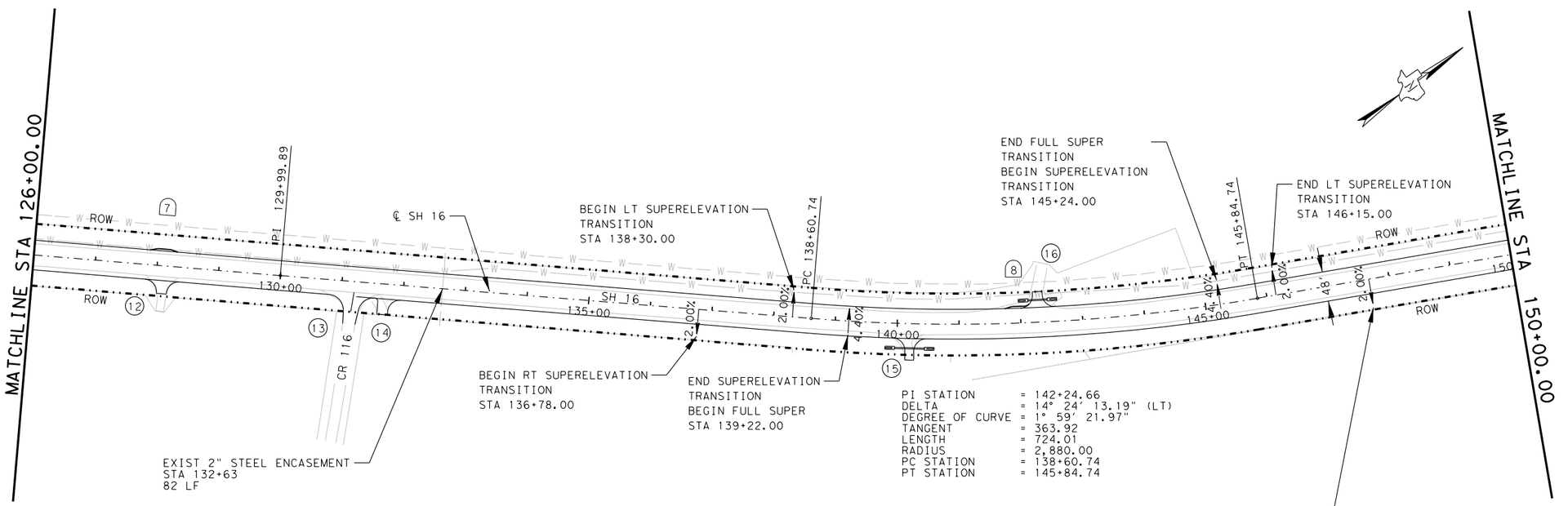
BEGIN PROJECT TO STA 102+00.00

11/22/2022 SHEET 1 OF 7

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.	
CHECKED:	6	TEXAS				SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.	
CHECKED:	BWD	SAN SABA	0289	04	032	84	

USER: jsalinas
DATE: 11/22/2022 1:27
SCRIPT: pw://server.slgeng.com:Slge-ds/Documents/TxDOT/103 Brownwood SH 16/Design_Data/4 - Design/Miscellaneous/SH16_plot.pen
FILE: pw://server.slgeng.com:Slge-ds/Documents/TxDOT/103 Brownwood SH 16/Design_Data/4 - Design/Plan_Set_1/03_Roadway/SH16_PROJ_LAYOUT_01.dgn





0 100 200

SCALE: 1" =200'

LEGEND

- ℄ SH 16
- CROSS CULVERT NUMBER
- DRIVEWAY NUMBER
- MAILBOX ASSEMBLY NUMBER

UTILITY LEGEND

- NORTH SAN SABA WATER SUPPLY CORPORATION
- SAN SABA RAW WATER SUPPLY LINE
- FOC FIBER OPTIC CABLE

NOTES:

1. THE STATIONS SHOWN HERE AND ELSEWHERE WITHIN THE PLANS ARE BASED ON A BEST FIT ALIGNMENT USING AVAILABLE DATA. THE ALIGNMENT IS NOT TO BE USED FOR CONSTRUCTION PURPOSES BUT AS A POINT OF REFERENCE.
2. REFER TO GENERAL NOTES ITEM 100 PREP ROW FOR ADDITIONAL INFORMATION REGARDING SUBSIDIARY WORK INVOLVED IN PREP ROW.
3. EXISTING WATER LINES ARE SHOWN AT APPROXIMATE LOCATION AND ARE TO BE USED FOR INFORMATIONAL PURPOSES.
4. SEE PROJECT LAYOUT SHEET 7 OF 7 FOR PROFILE TRANSITION DETAIL.

NO.	REVISION	BY	DATE

STATE OF TEXAS
GERALD A. LANKES
107484
REGISTERED PROFESSIONAL ENGINEER
11/22/2022

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PLANNING • ENGINEERING • CONSTRUCTION

SH 16
PROJECT LAYOUT

STA 102+00.00 TO STA 150+00.00

11/22/2022 SHEET 2 OF 7

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.	
CHECKED:	6	TEXAS				SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.	
CHECKED:	BWD	SAN SABA	0289	04	032	85	

USER: jsallnas
DATE: 11/22/2022 1:27
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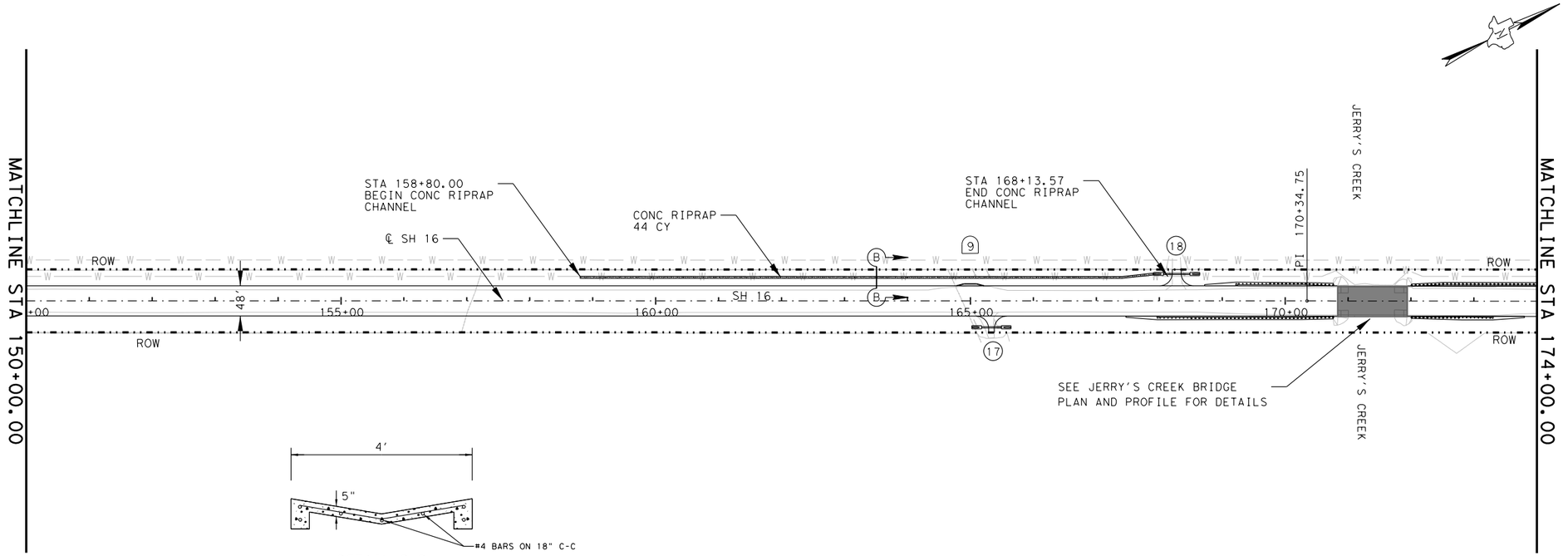
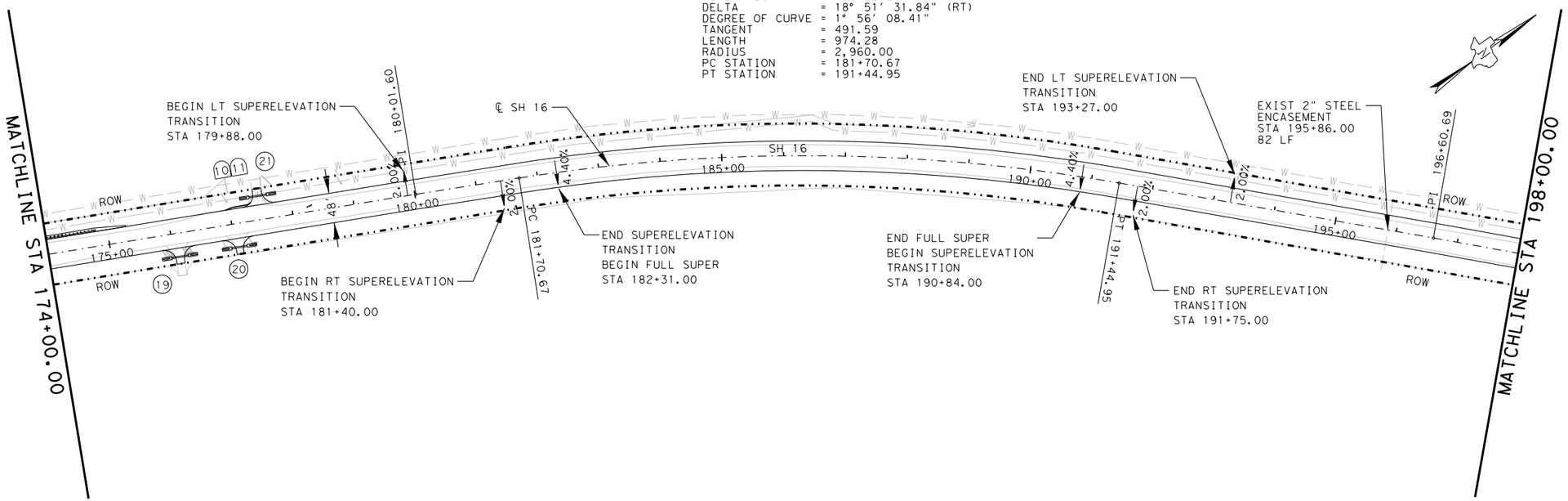
FILE: pw://server.sls-eng.com:SLS-ds1/Documents/TxDOT/103 Brownwood SH 16/Design_Data/4 - Design/Plan_Set_1/03_Roadway/SH16_PROJ_LAYOUT_02.dgn





0 100 200

SCALE: 1" =200'

LEGEND

- ℄ SH 16
- (#) CROSS CULVERT NUMBER
- # DRIVEWAY NUMBER
- # MAILBOX ASSEMBLY NUMBER

UTILITY LEGEND

- W NORTH SAN SABA WATER SUPPLY CORPORATION
- W SAN SABA RAW WATER SUPPLY LINE
- FOC FIBER OPTIC CABLE

NOTES:

1. THE STATIONS SHOWN HERE AND ELSEWHERE WITHIN THE PLANS ARE BASED ON A BEST FIT ALIGNMENT USING AVAILABLE DATA. THE ALIGNMENT IS NOT TO BE USED FOR CONSTRUCTION PURPOSES BUT AS A POINT OF REFERENCE.
2. REFER TO GENERAL NOTES ITEM 100 PREP ROW FOR ADDITIONAL INFORMATION REGARDING SUBSIDIARY WORK INVOLVED IN PREP ROW.
3. EXISTING WATER LINES ARE SHOWN AT APPROXIMATE LOCATION AND ARE TO BE USED FOR INFORMATIONAL PURPOSES.
4. SEE PROJECT LAYOUT SHEET 7 OF 7 FOR PROFILE TRANSITION DETAIL.

NO.	REVISION	BY	DATE

STATE OF TEXAS
GERALD A. LANKES
107484
REGISTERED PROFESSIONAL ENGINEER
11/22/2022

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PLANNING • ENGINEERING • CONSTRUCTION

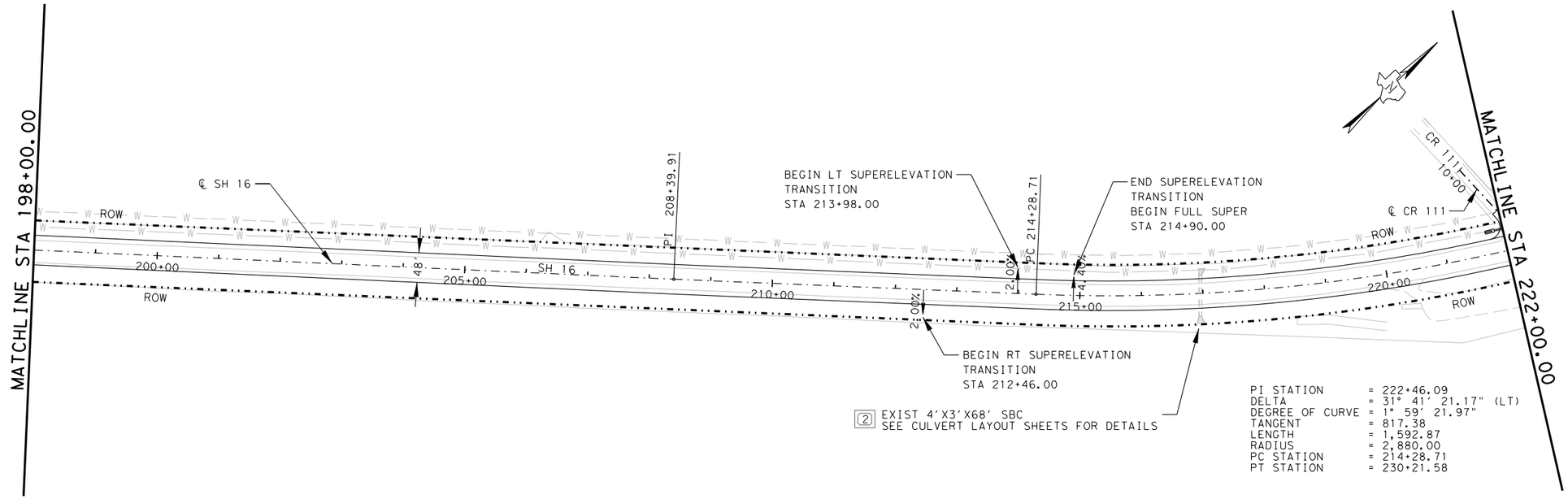
SH 16
PROJECT LAYOUT

STA 150+00.00 TO STA 198+00.00

11/22/2022 SHEET 3 OF 7

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.	
CHECKED:	6	TEXAS				SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.	
CHECKED:	BWD	SAN SABA	0289	04	032	86	

USER: jsallnas
DATE: 11/22/2022 1:27
SCRIPT: pw://server.slgeng.com:SlgLnds\Documents\TxDOT0103 Brownwood SH 16\Design_Data\4 - Design\Miscellaneous\SH16_plot.cpen
FILE: pw://server.slgeng.com:SlgLnds\Documents\TxDOT0103 Brownwood SH 16\Design_Data\4 - Design\Plan_Set_1103_Roadway\SH16_PROJ_LAYOUT_03.dgn



PI STATION	= 222+46.09
DELTA	= 31° 41' 21.17" (LT)
DEGREE OF CURVE	= 1° 59' 21.97"
TANGENT	= 817.38
LENGTH	= 1,592.87
RADIUS	= 2,880.00
PC STATION	= 214+28.71
PT STATION	= 230+21.58

0 100 200

SCALE: 1" =200'

LEGEND

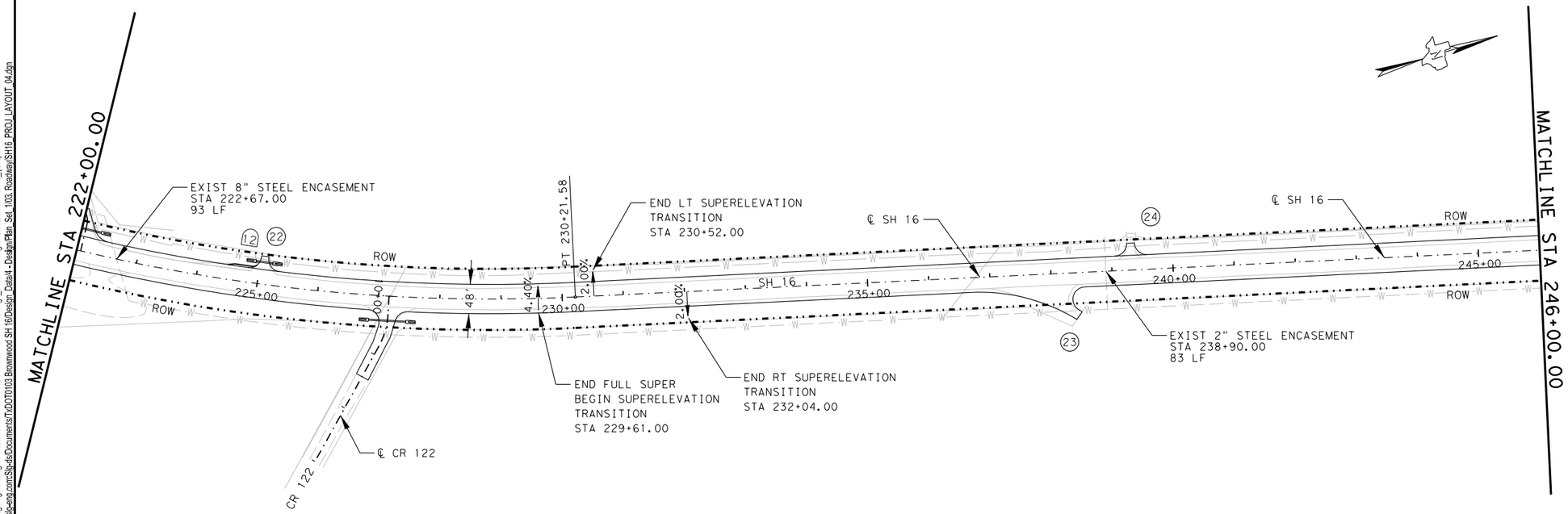
- ℄ SH 16
- (#) CROSS CULVERT NUMBER
- # DRIVEWAY NUMBER
- # MAILBOX ASSEMBLY NUMBER

UTILITY LEGEND

- W NORTH SAN SABA WATER SUPPLY CORPORATION
- W SAN SABA RAW WATER SUPPLY LINE
- FOC FIBER OPTIC CABLE

NOTES:

1. THE STATIONS SHOWN HERE AND ELSEWHERE WITHIN THE PLANS ARE BASED ON A BEST FIT ALIGNMENT USING AVAILABLE DATA. THE ALIGNMENT IS NOT TO BE USED FOR CONSTRUCTION PURPOSES BUT AS A POINT OF REFERENCE.
2. REFER TO GENERAL NOTES ITEM 100 PREP ROW FOR ADDITIONAL INFORMATION REGARDING SUBSIDIARY WORK INVOLVED IN PREP ROW.
3. EXISTING WATER LINES ARE SHOWN AT APPROXIMATE LOCATION AND ARE TO BE USED FOR INFORMATIONAL PURPOSES.
4. SEE PROJECT LAYOUT SHEET 7 OF 7 FOR PROFILE TRANSITION DETAIL.



NO.	REVISION	BY	DATE

STATE OF TEXAS
GERALD A. LANKES
107484
REGISTERED PROFESSIONAL ENGINEER
11/22/2022

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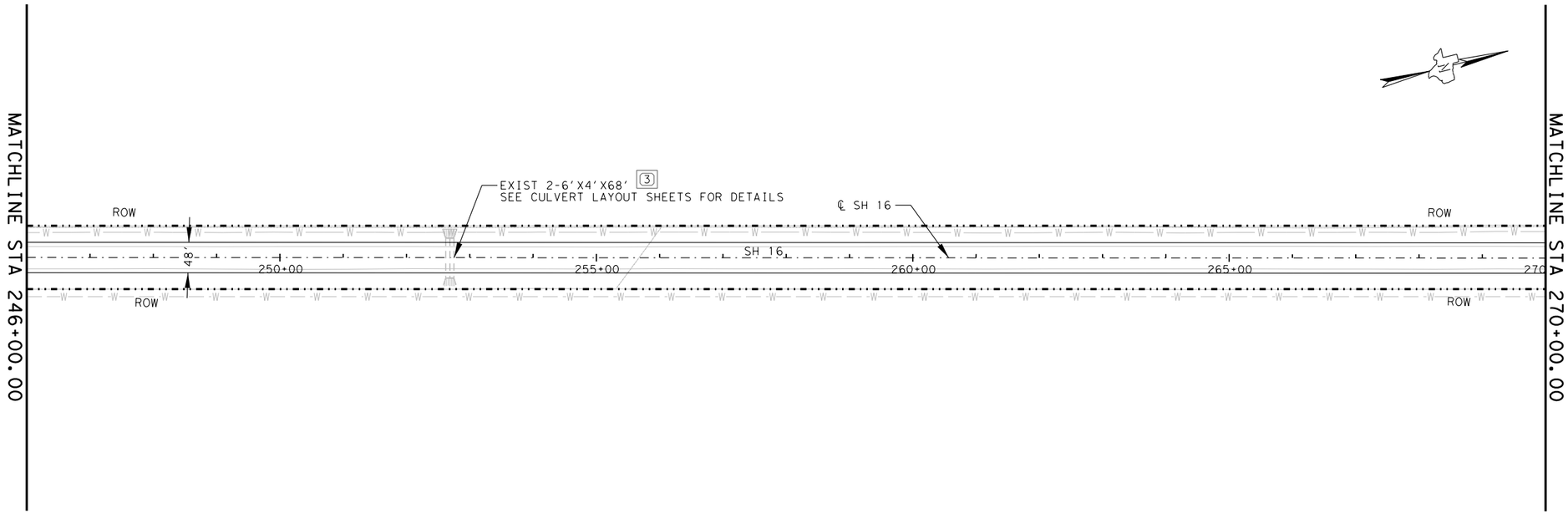
SH 16
PROJECT LAYOUT

STA 198+00.00 TO STA 246+00.00

11/22/2022 SHEET 4 OF 7

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.	
CHECKED:	6	TEXAS				SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.	
CHECKED:	BWD	SAN SABA	0289	04	032	87	

USER: jsallnas
DATE: 11/22/2022 1:27
SCRIPT: pw://server.sls-eng.com:SLS-ds1/Documents/TxDOT0103 Brownwood SH 16\Design_Data\4 - Design\Miscellaneous\SH16_plot.cpen
FILE: pw://server.sls-eng.com:SLS-ds1/Documents/TxDOT0103 Brownwood SH 16\Design_Data\4 - Design\Plan_Set_1103_Roadway\SH16_PROJ_LAYOUT_04.dgn



0 100 200

SCALE: 1" =200'

LEGEND

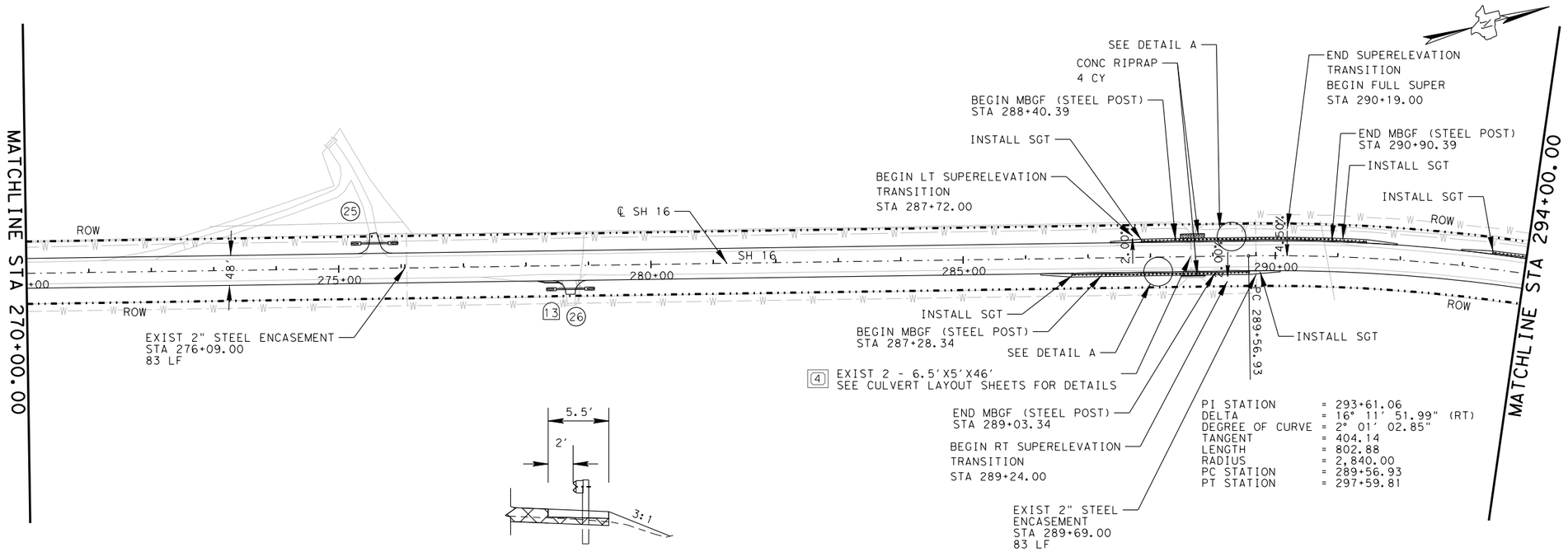
- ℄ SH 16
- (#) CROSS CULVERT NUMBER
- (#) DRIVEWAY NUMBER
- (#) MAILBOX ASSEMBLY NUMBER

UTILITY LEGEND

- — W — NORTH SAN SABA WATER SUPPLY CORPORATION
- — W — SAN SABA RAW WATER SUPPLY LINE
- — FOC — FIBER OPTIC CABLE

NOTES:

1. THE STATIONS SHOWN HERE AND ELSEWHERE WITHIN THE PLANS ARE BASED ON A BEST FIT ALIGNMENT USING AVAILABLE DATA. THE ALIGNMENT IS NOT TO BE USED FOR CONSTRUCTION PURPOSES BUT AS A POINT OF REFERENCE.
2. REFER TO GENERAL NOTES ITEM 100 PREP ROW FOR ADDITIONAL INFORMATION REGARDING SUBSIDIARY WORK INVOLVED IN PREP ROW.
3. EXISTING WATER LINES ARE SHOWN AT APPROXIMATE LOCATION AND ARE TO BE USED FOR INFORMATIONAL PURPOSES.
4. SEE PROJECT LAYOUT SHEET 7 OF 7 FOR PROFILE TRANSITION DETAIL.



DETAIL A

NO.	REVISION	BY	DATE

STATE OF TEXAS
GERALD A. LANKES
107484
REGISTERED PROFESSIONAL ENGINEER
11/22/2022

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SH 16
PROJECT LAYOUT

STA 246+00.00 TO STA 294+00.00

11/22/2022 SHEET 5 OF 7

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.	
CHECKED:	6	TEXAS				SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.	
CHECKED:	BWD	SAN SABA	0289	04	032	88	

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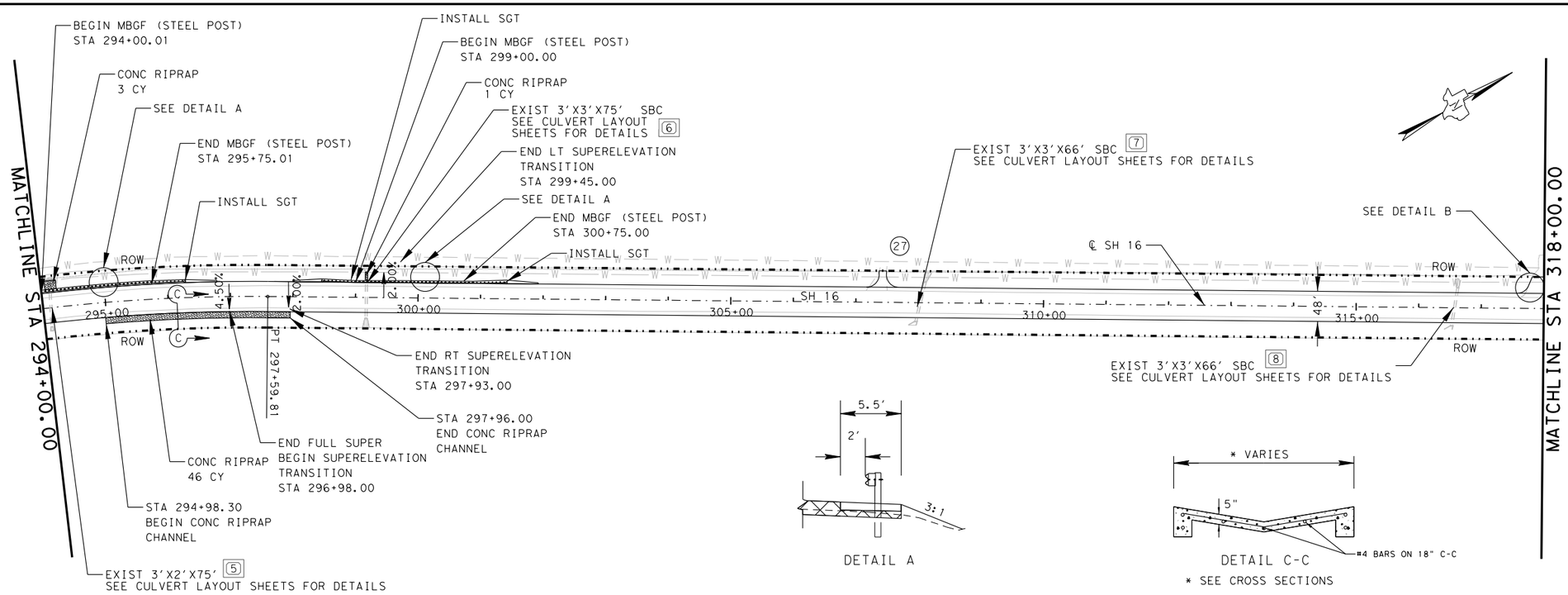

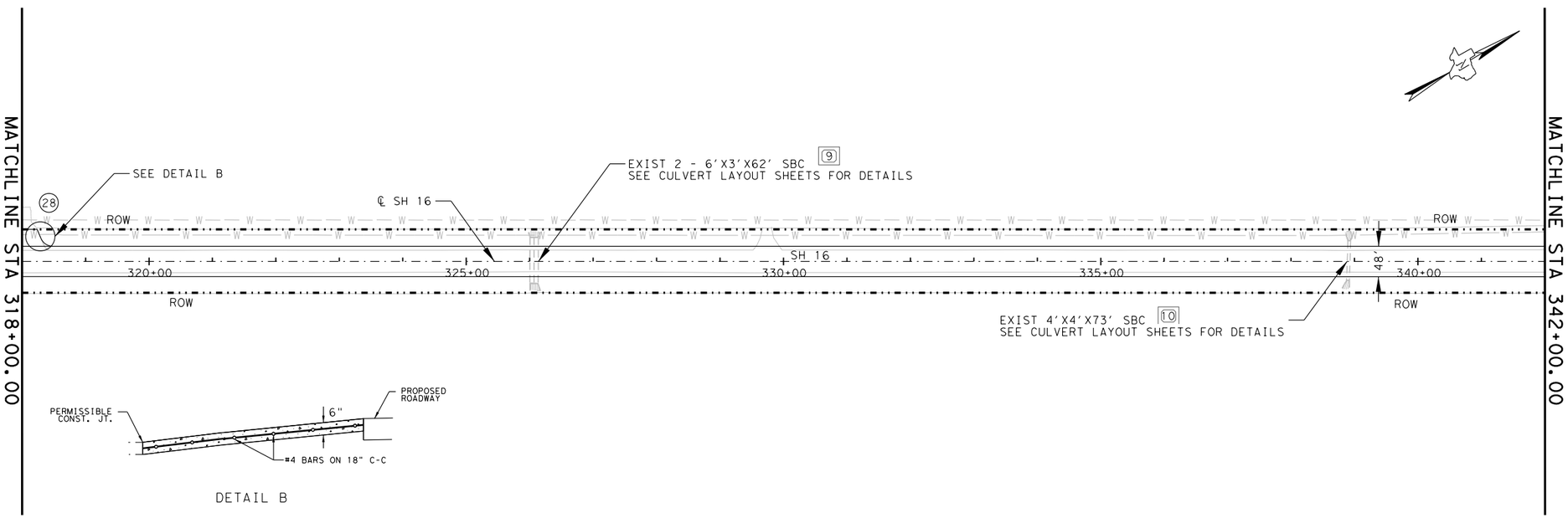

0 100 200

SCALE: 1" =200'

LEGEND

- ℄ SH 16
- CROSS CULVERT NUMBER
- DRIVEWAY NUMBER
- MAILBOX ASSEMBLY NUMBER

UTILITY LEGEND

- NORTH SAN SABA WATER SUPPLY CORPORATION
- SAN SABA RAW WATER SUPPLY LINE
- FOC FIBER OPTIC CABLE

NOTES:

1. THE STATIONS SHOWN HERE AND ELSEWHERE WITHIN THE PLANS ARE BASED ON A BEST FIT ALIGNMENT USING AVAILABLE DATA. THE ALIGNMENT IS NOT TO BE USED FOR CONSTRUCTION PURPOSES BUT AS A POINT OF REFERENCE.
2. REFER TO GENERAL NOTES ITEM 100 PREP ROW FOR ADDITIONAL INFORMATION REGARDING SUBSIDIARY WORK INVOLVED IN PREP ROW.
3. EXISTING WATER LINES ARE SHOWN AT APPROXIMATE LOCATION AND ARE TO BE USED FOR INFORMATIONAL PURPOSES.
4. SEE PROJECT LAYOUT SHEET 7 OF 7 FOR PROFILE TRANSITION DETAIL.

NO.	REVISION	BY	DATE

STATE OF TEXAS
GERALD A. LANKES
107484
REGISTERED PROFESSIONAL ENGINEER
11/22/2022

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SH 16
PROJECT LAYOUT

STA 294+00.00 TO STA 342+00.00

11/22/2022 SHEET 6 OF 7

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.	
CHECKED:	6	TEXAS				SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.	
CHECKED:	BWD	SAN SABA	0289	04	032	89	

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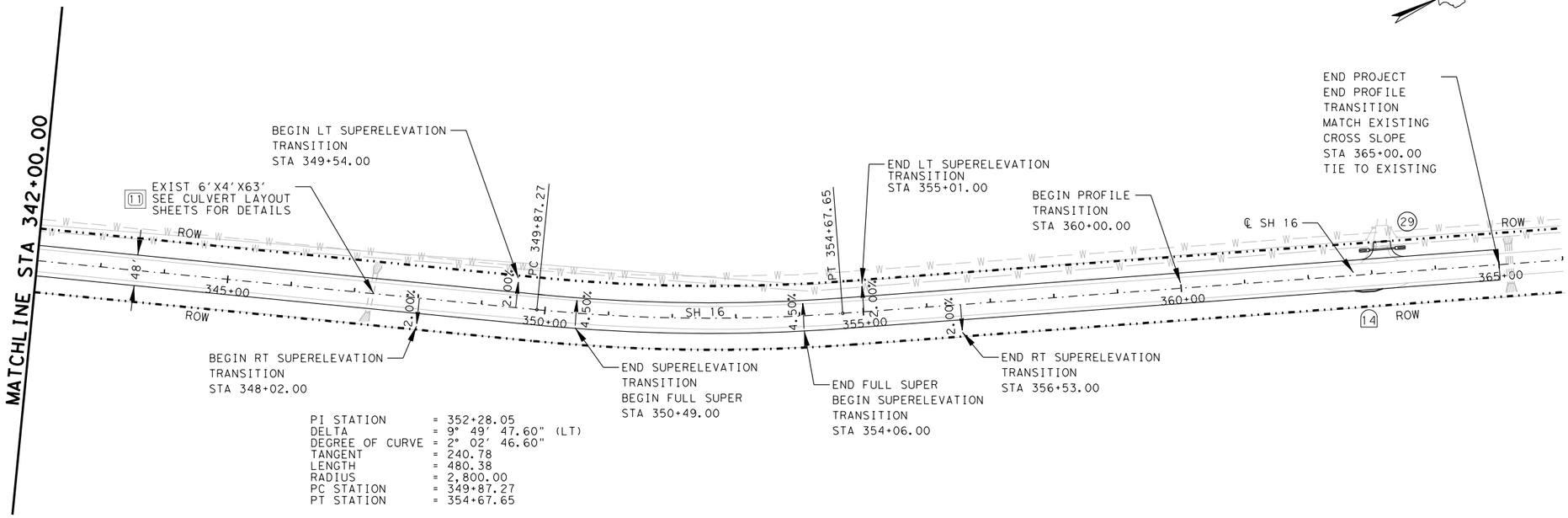


PI STATION = 352+28.05
DELTA = 9° 49' 47.60" (LT)
DEGREE OF CURVE = 2° 02' 46.60"
TANGENT = 240.78
LENGTH = 480.38
RADIUS = 2,800.00
PC STATION = 349+87.27
PT STATION = 354+67.65

0 100 200
SCALE: 1" =200'

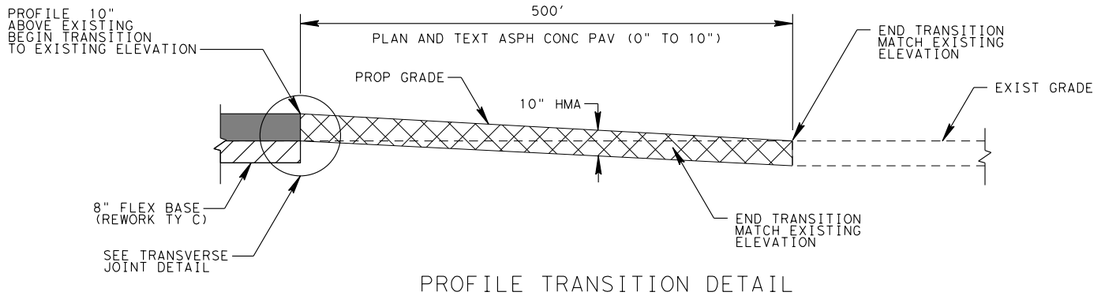
LEGEND

- ℄ SH 16
- (#) CROSS CULVERT NUMBER
- (#) DRIVEWAY NUMBER
- (#) MAILBOX ASSEMBLY NUMBER

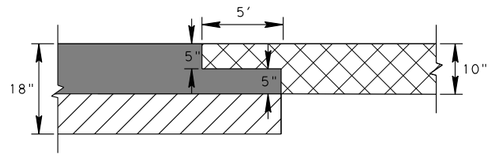
UTILITY LEGEND

- W — NORTH SAN SABA WATER SUPPLY CORPORATION
- W — SAN SABA RAW WATER SUPPLY LINE
- FOC — FIBER OPTIC CABLE

NOTES:
1. THE STATIONS SHOWN HERE AND ELSEWHERE WITHIN THE PLANS ARE BASED ON A BEST FIT ALIGNMENT USING AVAILABLE DATA. THE ALIGNMENT IS NOT TO BE USED FOR CONSTRUCTION PURPOSES BUT AS A POINT OF REFERENCE.
2. REFER TO GENERAL NOTES ITEM 100 PREP ROW FOR ADDITIONAL INFORMATION REGARDING SUBSIDIARY WORK INVOLVED IN PREP ROW.
3. EXISTING WATER LINES ARE SHOWN AT APPROXIMATE LOCATION AND ARE TO BE USED FOR INFORMATIONAL PURPOSES.
4. SEE PROJECT LAYOUT SHEET 7 OF 7 FOR PROFILE TRANSITION DETAIL.



PROFILE TRANSITION DETAIL



TRANSVERSE JOINT DETAIL

NO.	REVISION	BY	DATE

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GERALD A. LANKES
107484
REGISTERED
PROFESSIONAL ENGINEER
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SH 16
PROJECT LAYOUT

STA 342+00.00 TO END PROJECT

11/22/2022 SHEET 7 OF 7

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.	
CHECKED:	6	TEXAS				SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.	
CHECKED:	BWD	SAN SABA	0289	04	032	90	

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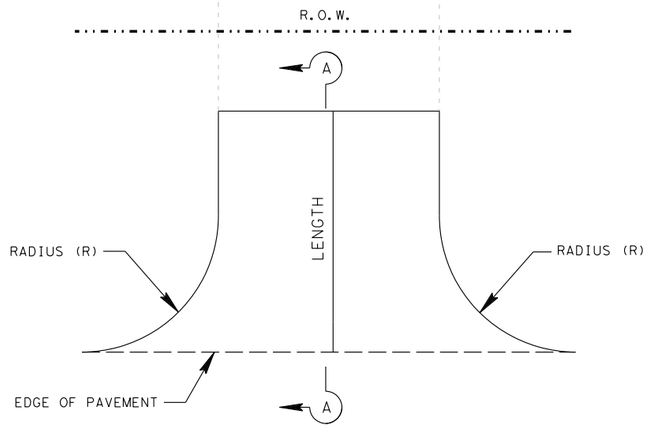
90% SUBMITTAL



DRIVEWAY PLAN VIEW

NOTE:

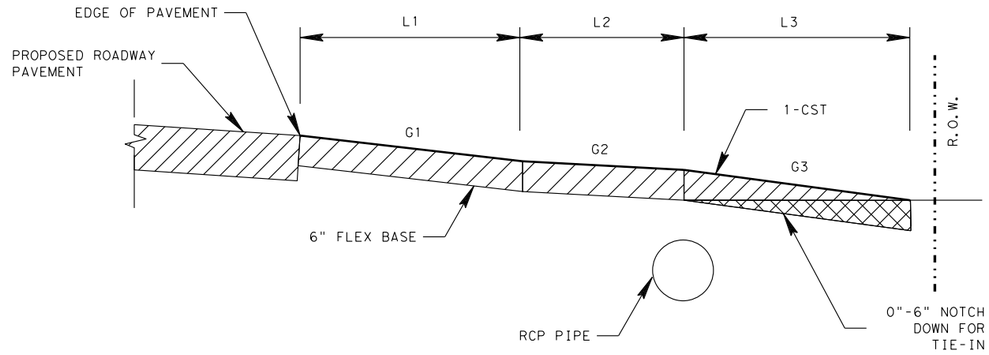
FLEX BASE AND 1-CST TYPES AND RATES SHALL MATCH THOSE FOUND ON THE PROPOSED BASIS OF ESTIMATE FOR "ROADWAY" OR AS DIRECTED BY THE ENGINEER.

STATIONS SHOWN IN SUMMARY ARE APPROXIMATE AND MAY BE CHANGED IN THE FIELD OR AS DIRECTED BY THE ENGINEER.

REFER TO DRIVEWAY SUMMARY FOR EXTENT OF DRIVEWAY WORK. EXCAVATION AND EMBANKMENT RELATED TO DRIVEWAY WORK SUBSIDIARY TO DRIVEWAY BID ITEM.

MINIMUM COVER BETWEEN DRIVEWAY SURFACE AND TOP OF RCP PIPE IS 12 INCHES.

CONSTRUCT DRIVEWAYS AS SHOWN ON SUMMARY OR AS DIRECTED BY THE ENGINEER.



SECTION A-A

OCST DRIVEWAY

N.T.S.

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ARMANDO CASTRO JR
111324
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SH 16
DRIVEWAY DETAILS

11/22/2022 SHEET 1 OF 1

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.		HIGHWAY No.	
CHECKED:		TEXAS			SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	BWD	SAN SABA	0289	04	032	91

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SUMMARY OF DRIVEWAY AND INTERSECTION GEOMETRY

SHEET NO.	NO.	CR/ DVWY/ MBX T.O.	STA	LT/RT	D (to row) FT	LENGTH (TOTAL) FT	WIDTH FT	RADIUS FT	LENGTH L1 FT	GRADE G1 %	LENGTH L2 FT	GRADE G2 %	LENGTH L3 FT	GRADE G3 %
80	1	DVWY	58+10.20	LT	19	19	22	30	14.73	2.95	4.67	10.95		
80	2	DVWY	93+67.67	RT	26	26	15	20	26.36	9.70				
80	3	DVWY	98+12.05	RT	26	26	10	20	26.43	9.80				
80	4	DVWY	100+01.69	RT	26	26	21	20	26.37	6.80				
80	5	DVWY	101+39.39	RT	26	26	12	20	26.35	6.20				
81	6	DVWY	108+27.79	RT	27	27	9	20 LT/ 5 RT	27.06	3.30				
81	7	DVWY	108+27.79	RT			17	5 LT/ 20 RT						
81	8	DVWY	113+56.20	LT	25	24	14	20	13.37	4.40	10.41	7.20		
81	9	CR 103	114+63.39	LT	25	25	24	30	14.38	1.37	10.63	0.49		
81	10	DVWY	117+97.74	LT	25	25	19	30	14.35	1.42	11.08	6.52		
81	11	CR 105	121+12.41	LT	26	26	24	20	12.93	0.14	12.90	3.77		
81	12	DVWY	128+11.38	RT	25	25	16	20	25.28	4.20				
81	13	CR 116	131+15.61	RT	25	25	20	25	25.25	8.61				
81	14	DVWY	131+68.59	RT	25	25	17	5 LT / 20 RT	25.34	6.20				
81	15	DVWY	140+20.72	RT	27	39	15	20	16.82	3.60	21.89	11.60		
81	16	DVWY	142+28.51	LT	26	26	16	20	12.06	1.96	13.48	6.00		
82	17	DVWY	165+33.43	RT	26	26	9	20	26.16	10.56				
82	18	DVWY	168+27.72	LT	26	26	14	20	26.12	8.82				
82	19	DVWY	176+09.30	RT	26	45	13	20	14.20	1.70	30.35	6.30		
82	20	DVWY	177+06.59	RT	25	25	11	20	24.91	5.00				
82	21	DVWY	177+48.69	LT	27	27	15	20	14.64	2.80	12.02	9.41		
83	22	DVWY	225+07.70	LT	25	25	12	20	12.18	1.69	13.02	1.90		
83	23	DVWY	237+83.55	RT	26	41	15	300 LT / 20 RT	26.19	10.00	15.08	8.00		
83	24	DVWY	239+33.41	LT	26	26	13	20	25.87	7.81				
84	25	DVWY	275+57.49	LT	27	27	11	20.00	27.27	5.65				
84	26	DVWY	278+70.87	RT	25	25	15	20.00	24.61	1.80				
85	27	DVWY	307+42.74	LT	26	73	12	20	10.00	10.00	10.00	12.00	52.82	8.00
85	28	DVWY	318+02.71	LT	26	26	43	20	16.90	10.00	9.57	12.00		
85	29	DVWY	329+74.01	LT	26	26	27	20	17.10	10.00	9.40	12.00		
86	30	DVWY	363+19.07	LT	26	35	27	20	9.11	8.70	16.63	8.00		

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STATE OF TEXAS
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SH 16
DRIVEWAY DETAILS

11/22/2022 SHEET 1 OF 1

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.	
CHECKED:	6	TEXAS				SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.	
CHECKED:	BWD	SAN SABA	0289	04	032	92	

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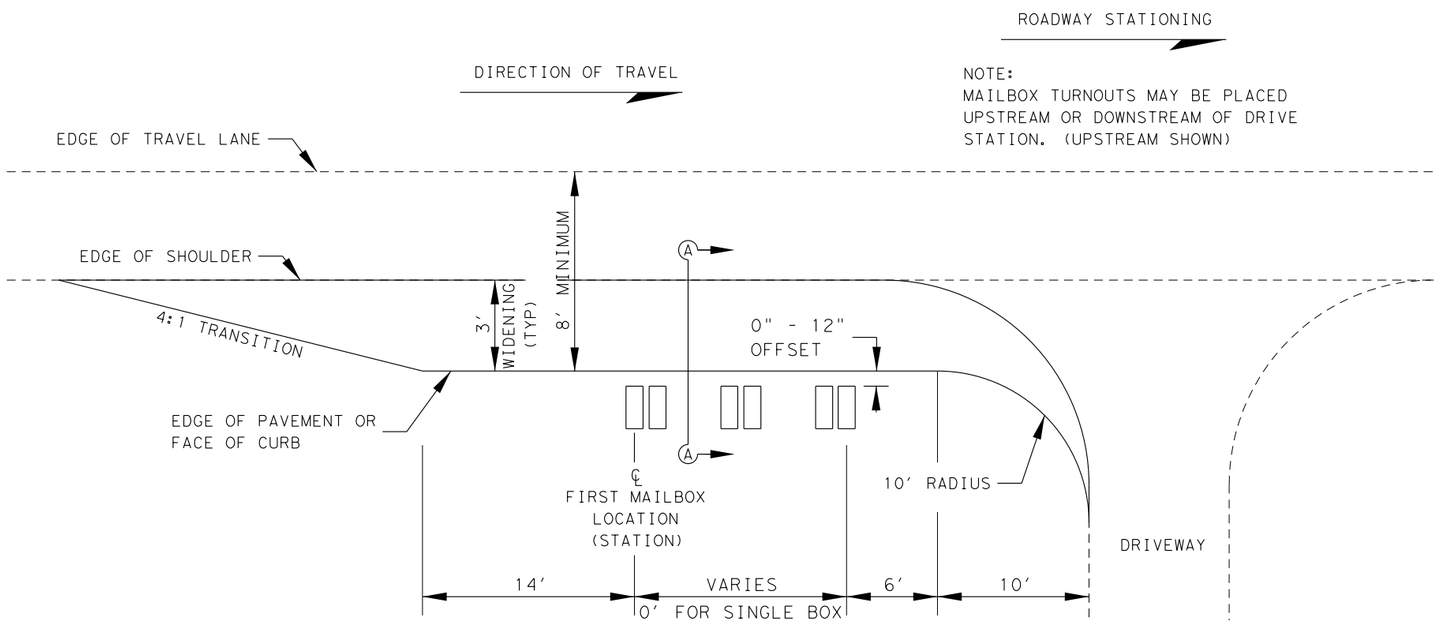
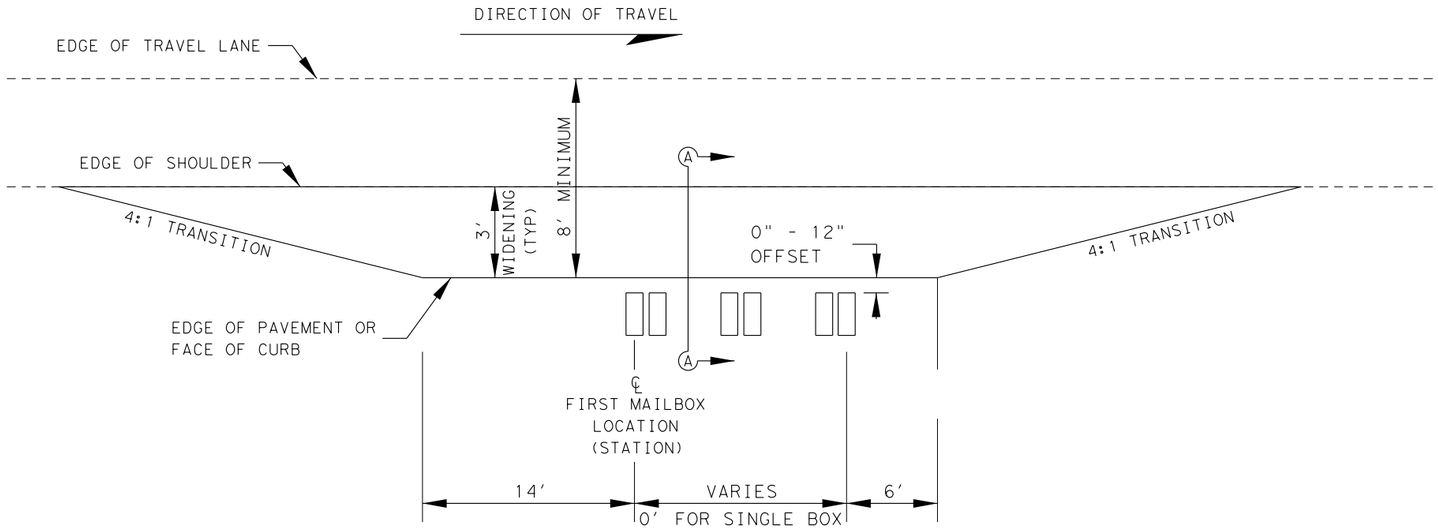
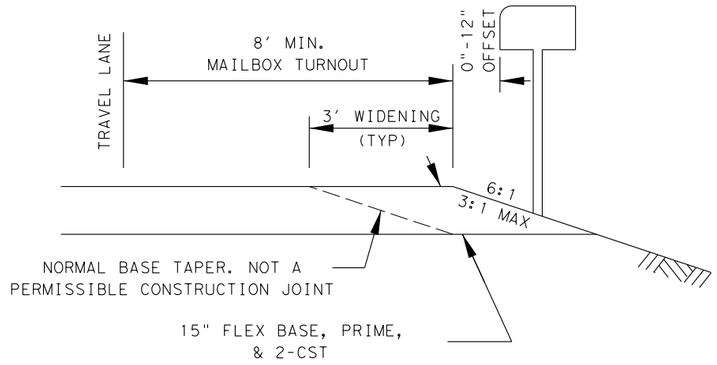


MAILBOX TURNOUT AT DRIVEWAY



STANDARD MAILBOX TURNOUT



SECTION A-A

NOTES: ALL TURNOUTS SHALL RECEIVE PRIME, AND 2-CST SURFACE.

ASPHALTS & AGGREGATE TYPES AND RATES SHALL MATCH THOSE FOUND ON THE PROPOSED BASIS OF ESTIMATE FOR (ROADWAY) OR AS DIRECTED BY THE ENGINEER.

STATIONS SHOWN IN SUMMARY ARE APPROXIMATE AND MAY BE CHANGED IN THE FIELD AS DIRECTED BY THE ENGINEER.

CONSTRUCT TURNOUTS AS SHOWN OR AS DIRECTED BY THE ENGINEER.

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STATE OF TEXAS
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111324
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11/22/2022

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SH 16
MAILBOX TURNOUT DETAIL

11/22/2022

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.	
CHECKED:	6	TEXAS				SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.	
CHECKED:	BWD	SAN SABA	0289	04	032	93	

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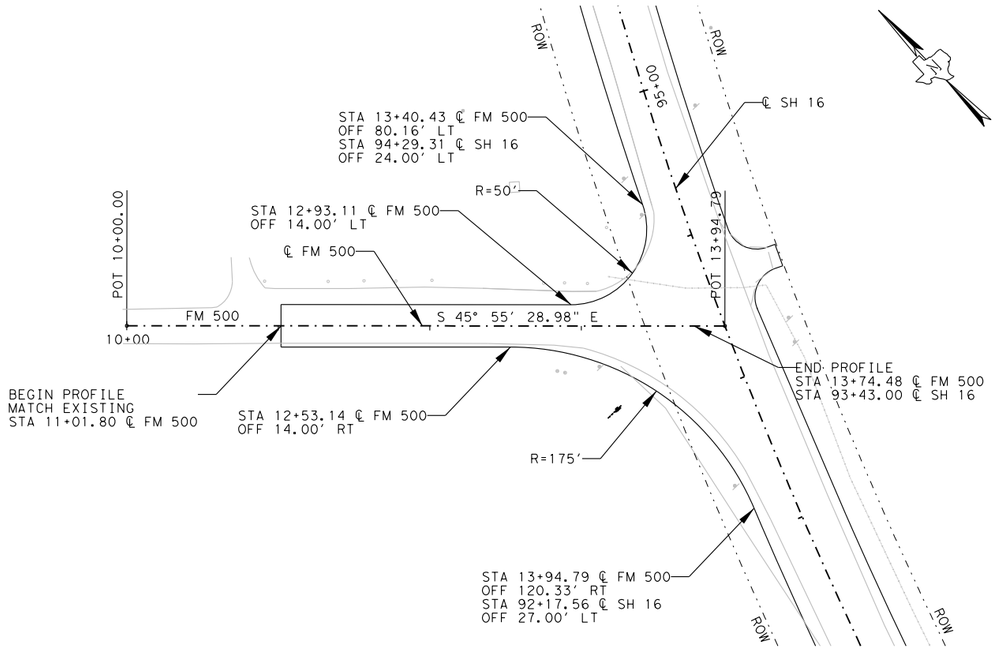

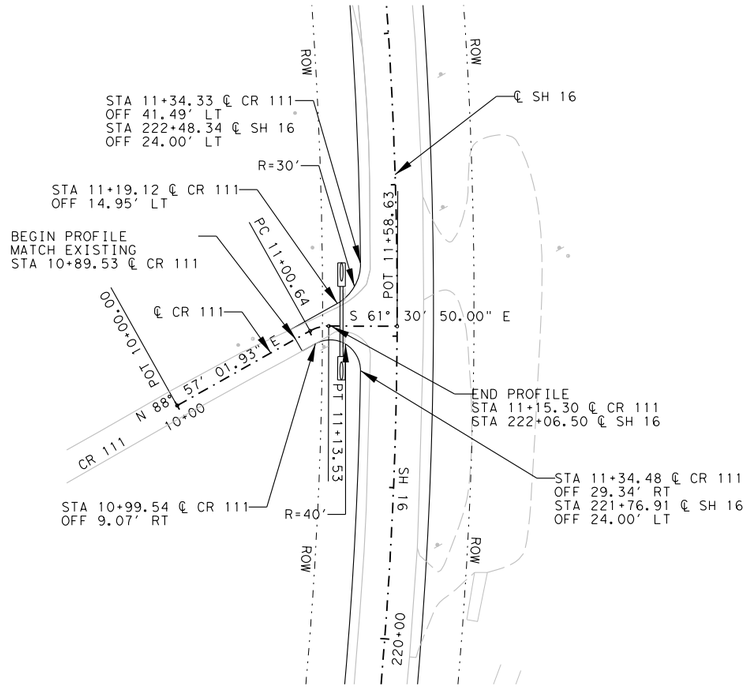

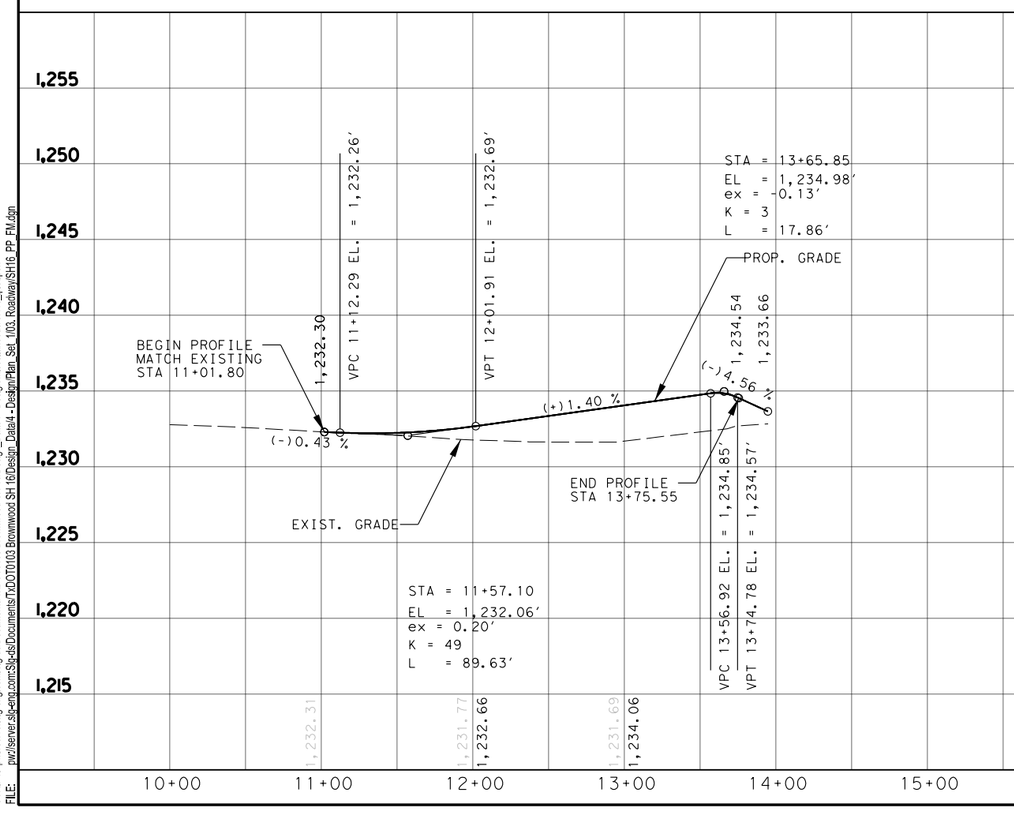

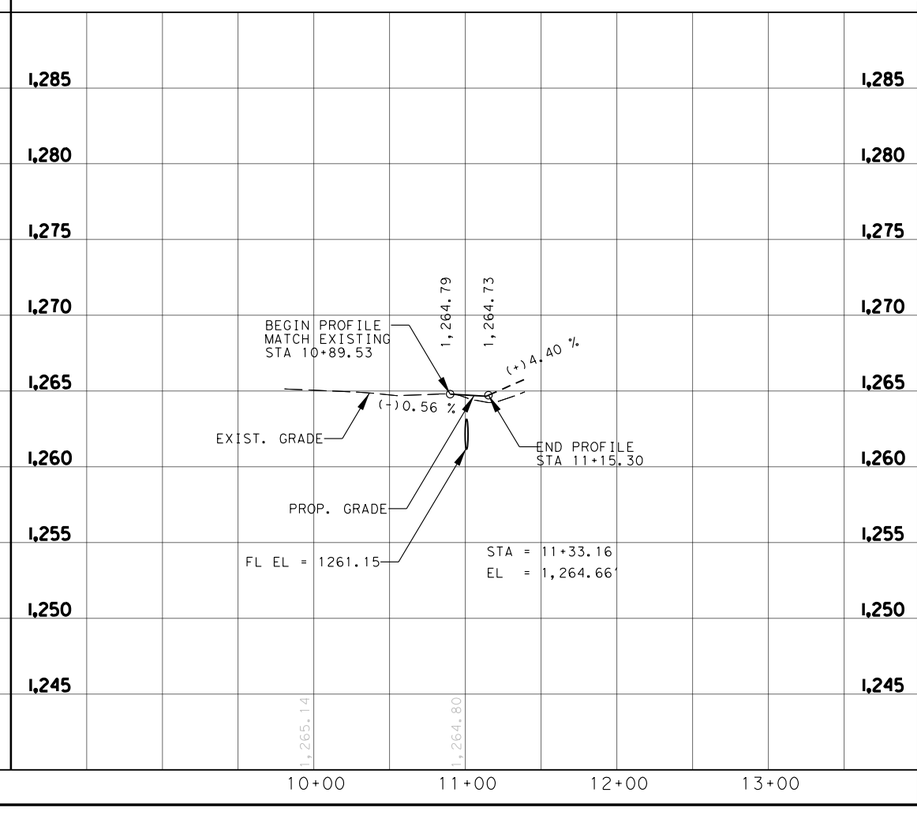

0 50 100
0 5 10
HORIZ. SCALE: 1" = 100'
VERT. SCALE: 1" = 10'

NO.	REVISION	BY	DATE

STATE OF TEXAS
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SH 16
ROADWAY PLAN AND PROFILE CROSS STREETS

11/22/2022 SHEET 1 OF 3

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.	
CHECKED:	6	TEXAS				SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.	
CHECKED:	BWD	SAN SABA	0289	04	032	94	

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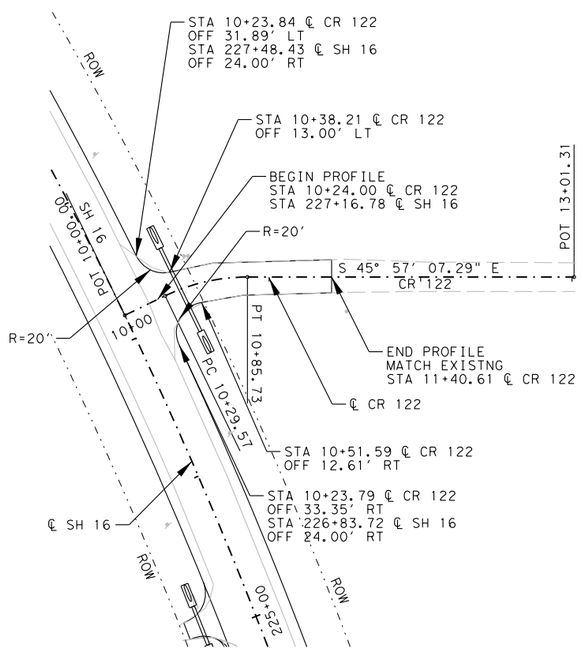

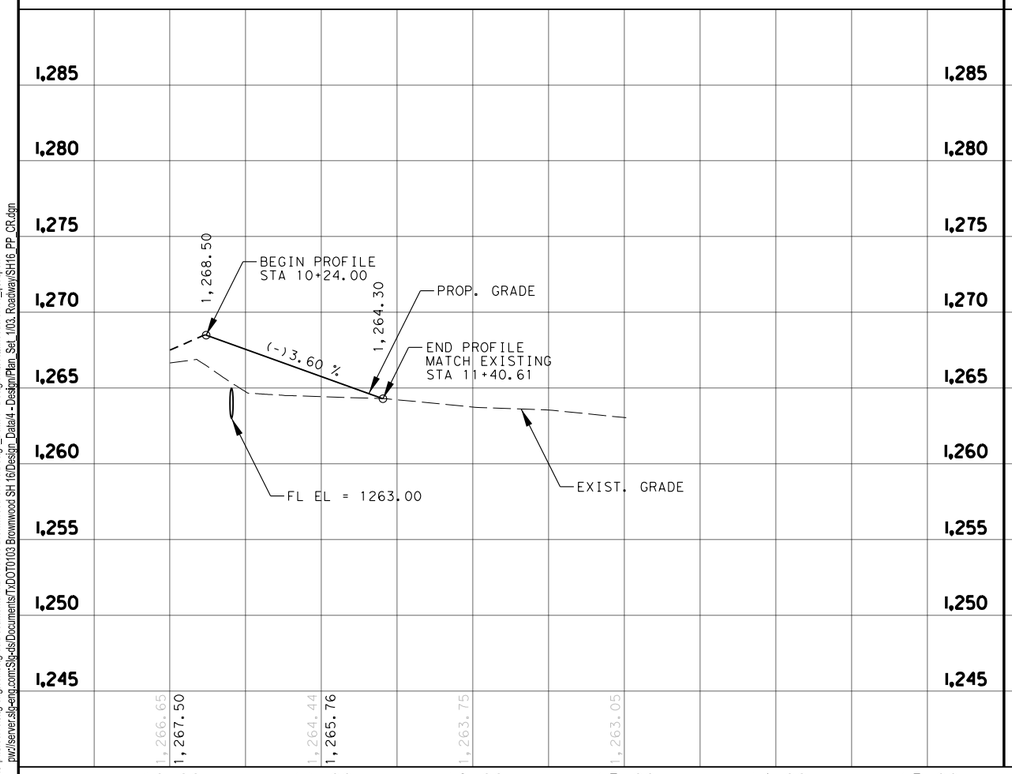

0 50 100
0 5 10
HORIZ. SCALE: 1" = 100'
VERT. SCALE: 1" = 10'

NO.	REVISION	BY	DATE

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SH 16
ROADWAY PLAN AND PROFILE CROSS STREETS

11/22/2022 SHEET 2 OF 3

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.	
CHECKED:	6	TEXAS				SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.	
CHECKED:	BWD	SAN SABA	0289	04	032	95	

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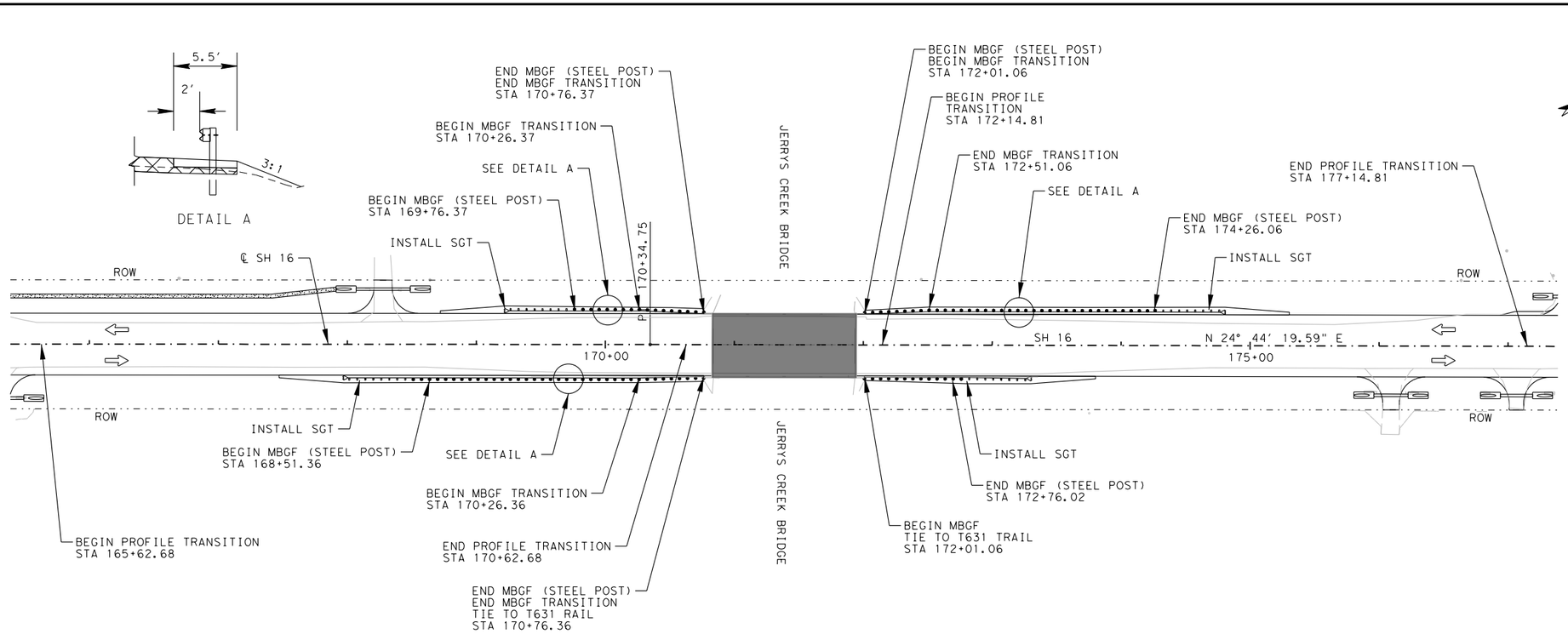

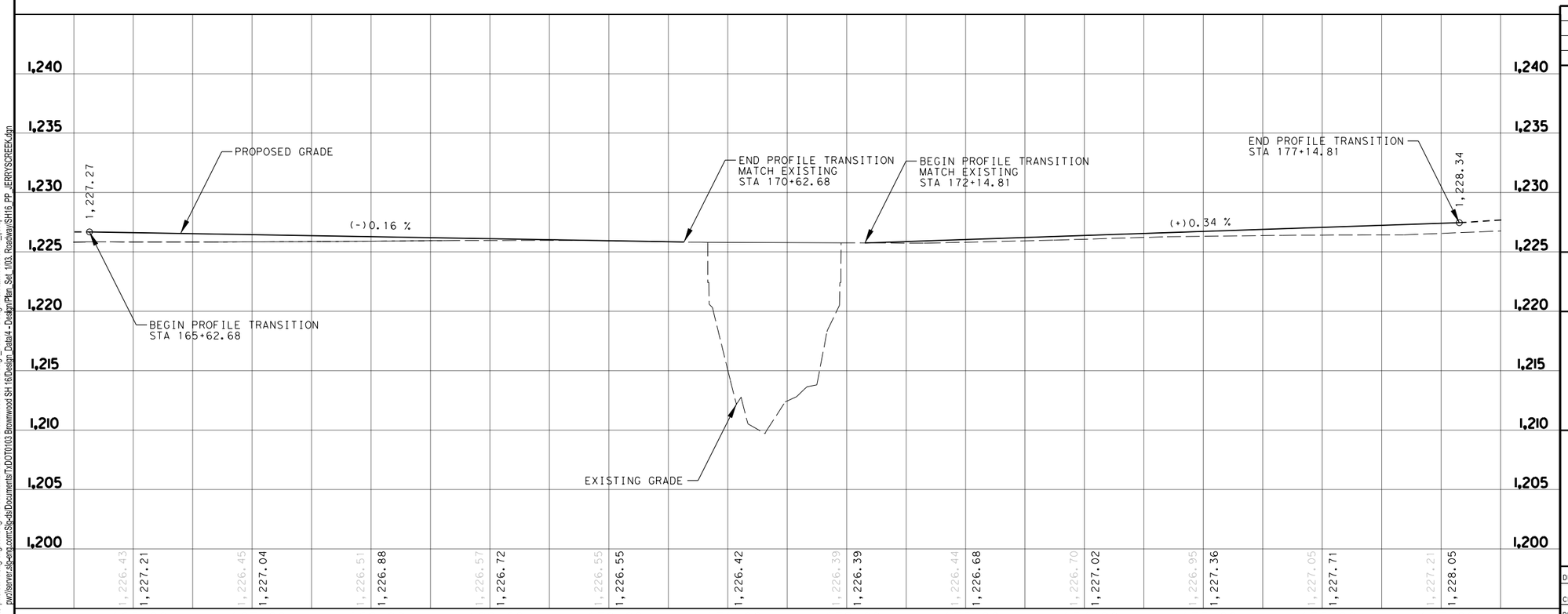

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SH 16
ROADWAY PLAN AND PROFILE JERRY'S CREEK BRIDGE

11/22/2022 SHEET 3 OF 3

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.	HIGHWAY No.
CHECKED:	6	TEXAS		SH 16

DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	BWD	SAN SABA	0289	04	032	96

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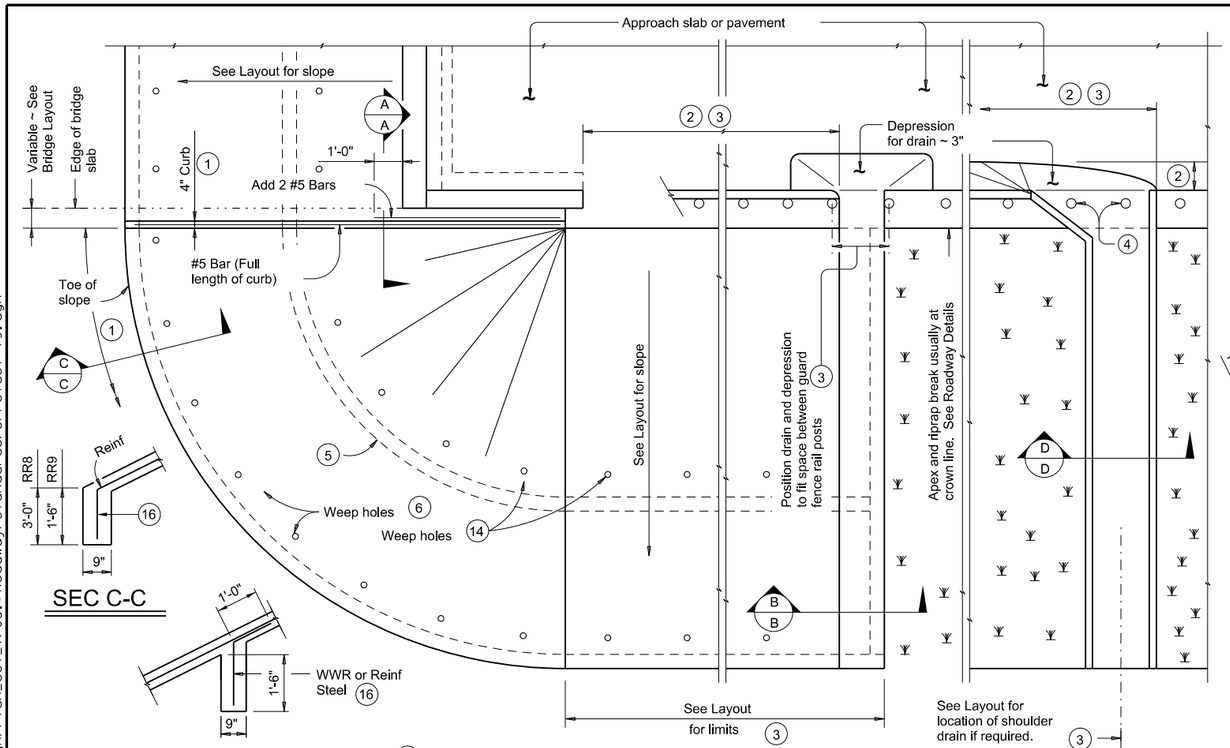
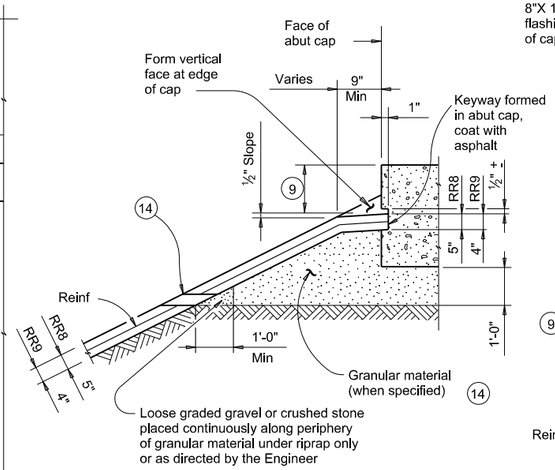
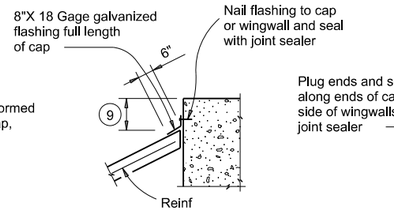
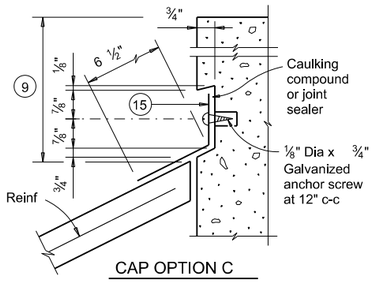
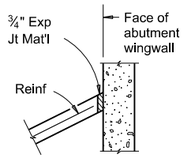


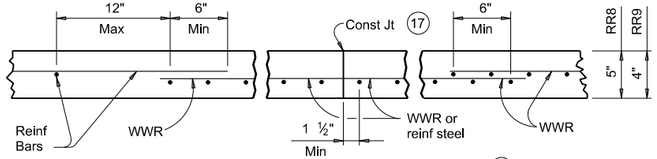








SECTIONS THRU RIPRAP AT CAP



See General Notes for optional synthetic fiber reinforcement.

1. When riprap is shown extended around header on layout, extend slab and toewall as shown and eliminate 4" curb.
2. Limits and configuration of drains and depressions are as shown elsewhere in plans or as directed by the Engineer.
3. Location of shoulder drain must consider limitations imposed by rail transition. Do not locate shoulder drains at expansion joints between approach slab and concrete pavement.
4. See details elsewhere in plans for installation of guard fence posts through concrete riprap.
5. Provide intermediate toewall only when designated elsewhere in the plans or included in the specifications.
6. Provide lower level of 2" Dia weep holes at 10' c-c backed by 1 CF packet of gravel and galvanized hardware cloth at all locations unless directed by the Engineer to eliminate.
7. Use wider or other drain configurations if shown elsewhere in plans or if directed by the Engineer.
8. Wall extension may be reduced or modified if approved by the Engineer. Increase wall extension to 1'-6" whenever the optional intermediate toewall is called for in the plans.
9. Top of cap to top of riprap dimension varies as directed by the Engineer. Should be 9" Min for beam/slab type bridges and 1'-6" for slab span, box beam, or slab beam bridges.
10. #5 bars shown are required even when synthetic fiber reinforcing option is selected.
11. Provide sealing option for joint between the face of cap and riprap as designated by the Engineer or as shown elsewhere on plans.
12. Flashing (shown in Cap Option A) may be used at wingwall in addition to Exp Jt Mat'l if shown on plans or directed by the Engineer.
13. Provide #3 reinforcing bars at 18" Spa c-c. Provide Welded Wire Reinforcement (WWR) as 6x6-D2.9xD2.9 or D3xD3. Combinations of WWR and reinforcing bars may be used if both are permitted. Use lap splices of a minimum 6 inches, measured from the transverse wire of WWR, and the ends of reinforcing bars.
14. If granular material is specified, provide upper level of 2" Dia weep holes at 10' c-c backed by galvanized hardware cloth.
15. 8" x 18 Gage Galv Sheet Metal
16. Provide WWR or #3 bars, with 1'-0" extension into slope.
17. WWR or reinforcing steel is continuous through riprap construction joints. Provide WWR or reinforcing steel that extends 1'-1" minimum into adjacent riprap on each side of construction joint even if synthetic reinforcing fiber is utilized.

FOR CONTRACTOR'S INFORMATION ONLY:
5" of RR8 = 0.015 CY/SF
4" of RR9 = 0.012 CY/SF
#3 Reinf at 18" c-c = 0.501 Lbs/SF
6x6-D3xD3 = 0.408 Lbs/SF

GENERAL NOTES:

Provide Class "B" concrete (f'c = 2,000 psi) unless noted elsewhere in plans.

Provide Grade 60 reinforcing steel.

Provide deformed welded wire reinforcement (WWR) meeting ASTM A1064, unless otherwise shown.

Provide reinforcing bars, deformed WWR, or any suitable combination of both types for riprap reinforcing, unless specified elsewhere in the plans.

Optionally synthetic fibers may be used if approved by the Engineer. Provide synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) in lieu of steel reinforcing in riprap concrete.

Install construction joints or grooved joints extending the full slant slope height at intervals of approximately 20 feet unless otherwise directed by the Engineer.

Hardware cloth, loose grade stone behind weep holes, flashing, or other sealing material are subsidiary to the bid item "Riprap".

See Layout for limits of riprap.

RR8 is to be used on stream crossings.

RR9 is to be used on other embankments.

Texas Department of Transportation

Bridge Division Standard

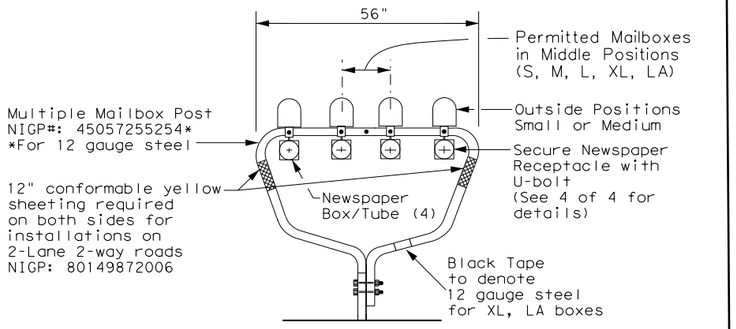
CONCRETE RIPRAP AND SHOULDER DRAINS
EMBANKMENTS AT BRIDGE ENDS (TYPES RR8 & RR9)

CRR

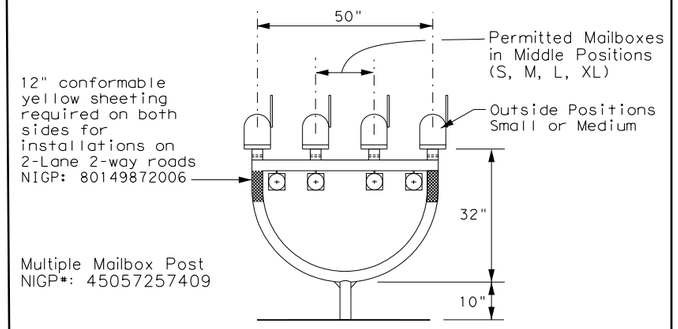
FILE: crrstde1-19.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0289	04	032	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	SAN SABA		97

DATE: 11/22/2022
FILE: pw://server.sig-eng.com:Sig-ds/Documents/TxDOT0103 Brownwood SH 16/Design_Data/4 - Design/Plan_Set_1/03. Roadway/Standards/mb-21(1).dgn

TYPE 1 - MULTIPLE



TYPE 4 - MULTIPLE



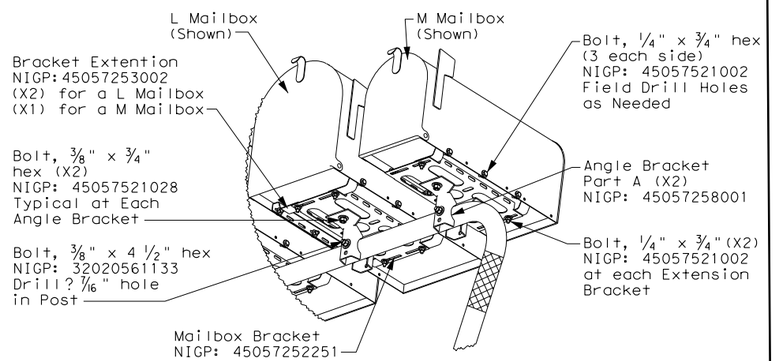
MAILBOX SIZES

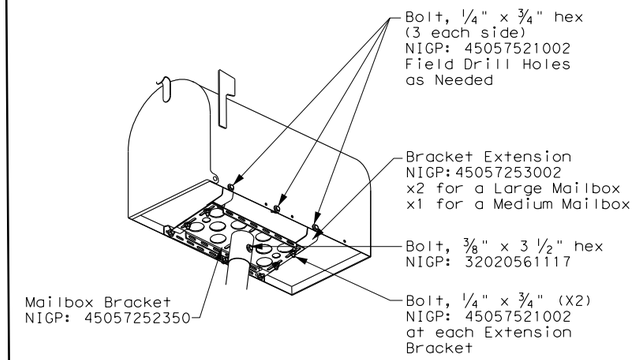
MAILBOX SIZE	TYPICAL DIMENSIONS			MAX **
	LENGTH	WIDTH	HEIGHT	WEIGHT
SMALL	19 ½"	6"	7"	6 LBS
MEDIUM	22 ½" *	8" *	11 ½" *	8 LBS
LARGE	23 ½"	11 ½"	13 ½"	11 LBS
EXTRA LARGE	18"	14"	12"	13 LBS
LOCKABLE	18"	11 ½"	15"	23 LBS

* See Note 1.
** Excluding Molded Plastic on 4 X 4 Post

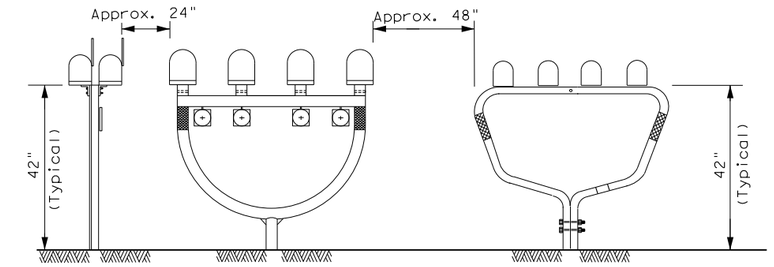
GENERAL NOTES:

1. Dimensions shown (length, width, and height) are typical, not maximums. However, anytime a medium size mailbox is mounted on a single/double mount or on the outside position on a multi mount, the dimensions shown are maximums.
2. Mailboxes shall be made of light weight sheet metal or light weight plastic. Heavy steel, cast iron or decorative mailboxes shall not be used on the state highway system.





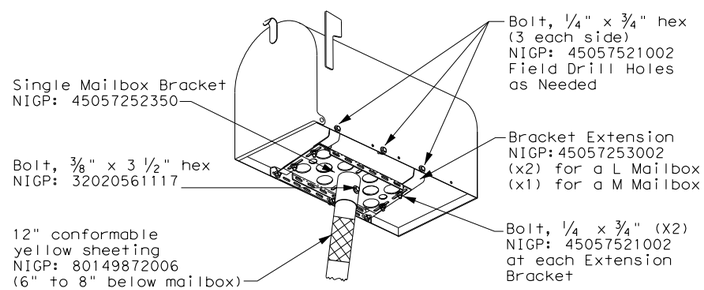
TYPICAL INSTALLATION MEASUREMENTS

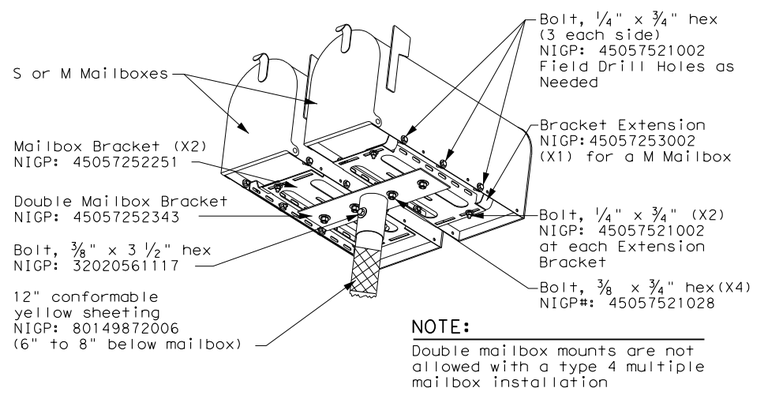


NOTE:

Mailbox installations in sidewalk areas shall be in accordance with the latest TxDOT Design Standard sheets PED-Pedestrian Facilities Curb Ramps.

TYPE 2 and 4 - SINGLE/DOUBLE

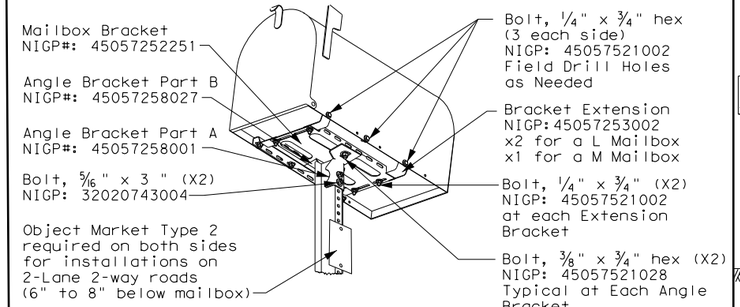


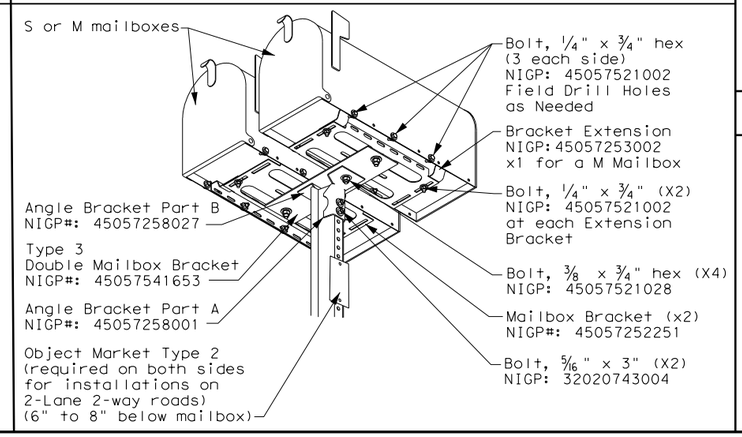


NOTE:

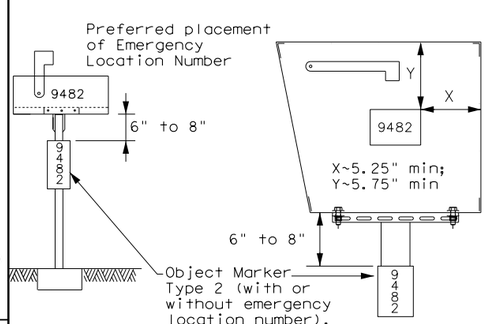
Double mailbox mounts are not allowed with a type 4 multiple mailbox installation

TYPE 3 - SINGLE/DOUBLE





PLACEMENT OF EMERGENCY LOCATION NUMBER

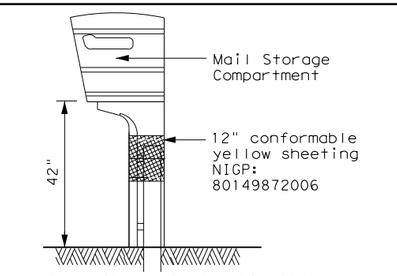


NOTES:

1. Location numbers are provided by homeowner. Minimum size 1" height.
2. Location number is typically placed on the mailbox in a contrasting color.
3. Black numbers may be placed on the Type 2 object marker if the numbers cannot be placed on the mailbox.
4. Alternatively, a green or blue plate with white numbers attached may be mounted below the object marker. Other contrasting color configuration, as approved, may be used.
5. See 3 of 4 for Foundation details.
6. See 4 of 4 for Hardware details.

SHEET 1 OF 4

TYPE 5



Typical Molded Plastic Mailbox

Texas Department of Transportation — Maintenance Division Standard

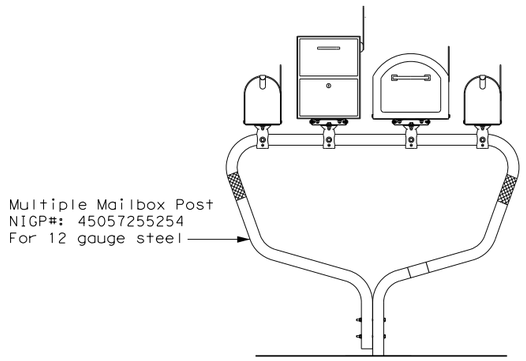
MAILBOX MOUNTING AND ASSEMBLY

MB(1)-21

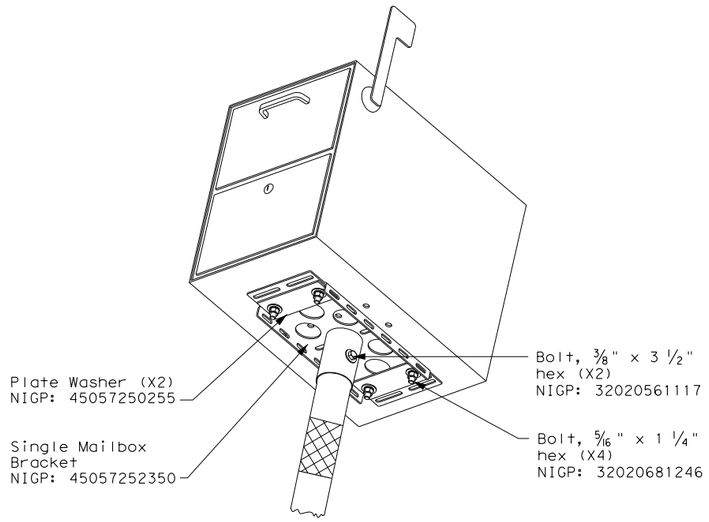
FILE: MB-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT March 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS 2/2005 11/2009 4/2015 6/2005 1/2011 11/2006 7/2014	0289	04	032	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	SAN SABA		98

DATE:1/22/2022
FILE:6/Design*Data/4 - Design/Plans*Set*1/03. Roadway/Standards/mb-21(2).dgn
DN: TxDOT CK: TxDOT DW: TxDOT CK: TxDOT
Norwood

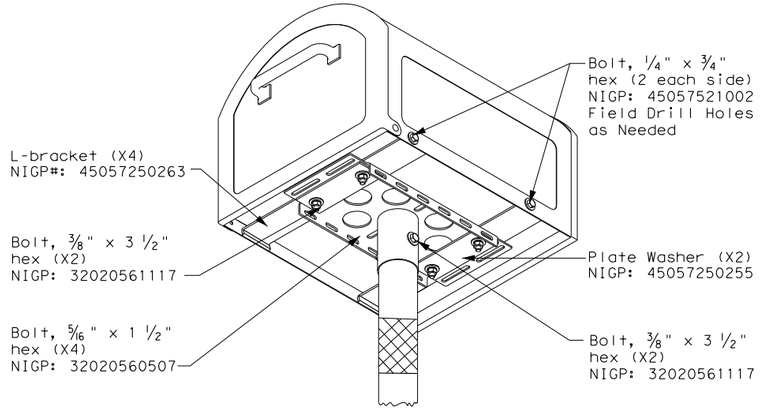
TYPE 1- MULTI LOCKABLE AND XL MAILBOX



TYPE 2/4 - SINGLE LOCKABLE MAILBOX

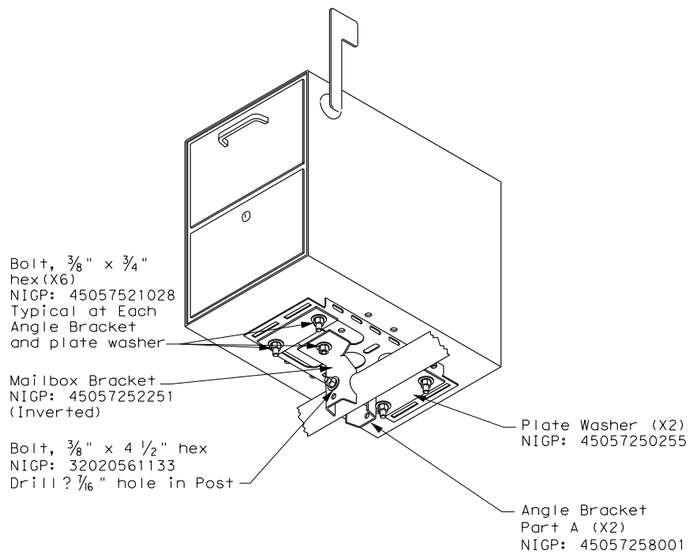


TYPE 2/4 - SINGLE XL MAILBOX

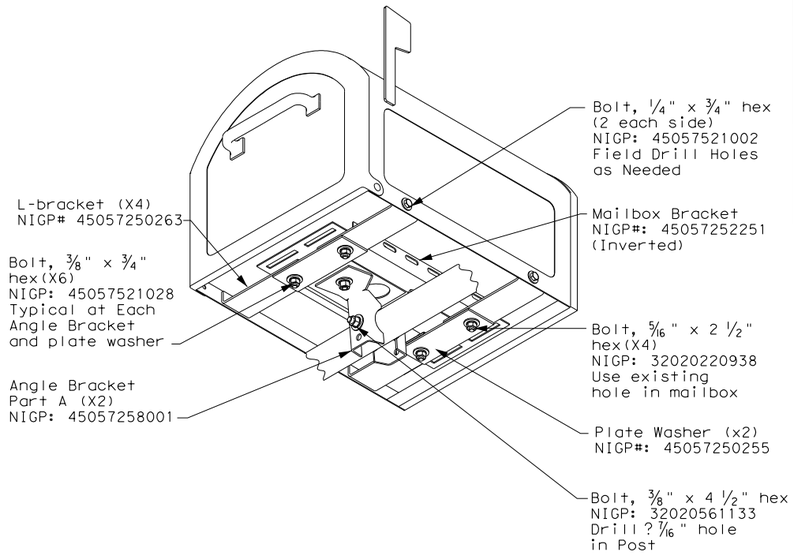


NOTE:
Follow same configuration when mounting an XL mailbox on a Type 4 multi post.

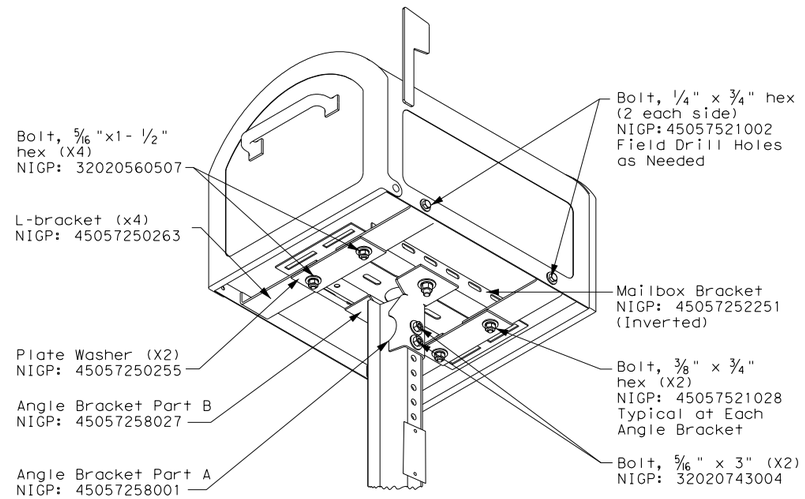
TYPE 1 MULTI - LOCKABLE ARCHITECTURAL (LA)



TYPE 1 MULTI - XL MAILBOX



TYPE 3 - XL MAILBOX MOUNTING



Texas Department of Transportation | Maintenance Division Standard

XL AND LOCKABLE ARCHITECTURAL MAILBOX ASSEMBLY

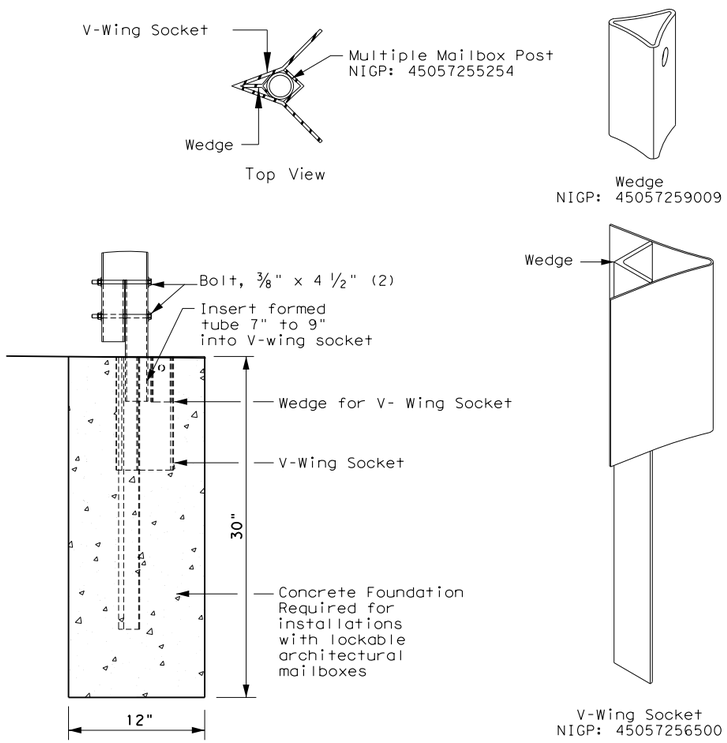
MB(2)-21

FILE: MB-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT March 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS 2/2005 11/2009 4/2015 6/2005 1/2011 11/2006 7/2014	0289	04	032	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	SAN SABA		99

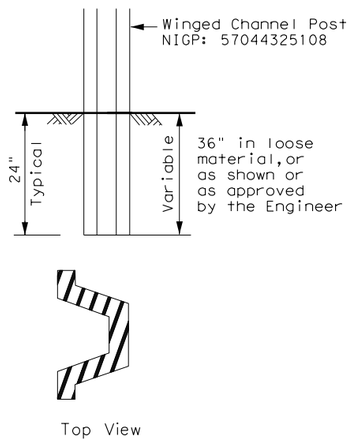
DATE: 11/22/2022 1:28
FILE: pw://server.sig-eng.com:Sig-ds/Documents/TxDOT0103 Brownwood SH 16/Design_Data/4 - Design/Plan_Set_1/03. Roadway/Standards/mb-21(3).dgn

TYPE 1 - SUPPORT/FOUNDATION

Thin Wall Tube w/ V-LOC Anchorage



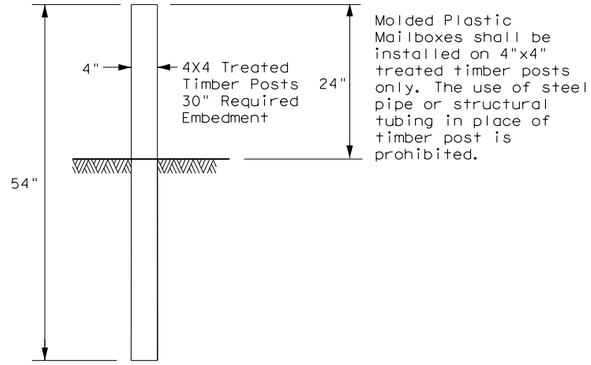
TYPE 3 - SUPPORT/FOUNDATION



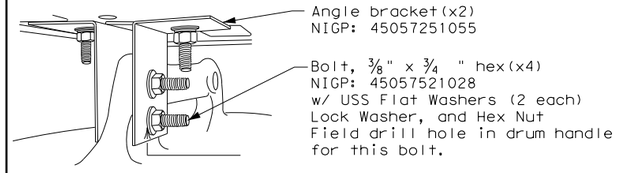
NOTES:

1. Attach Object Marker(OM) facing direction of traffic.
2. OM will also be required on opposite side if installed on a 2-Lane, 2-Way roadway.

TYPE 5 - SUPPORT/FOUNDATION



TYPE 6 - TEMPORARY MAILBOX SUPPORT



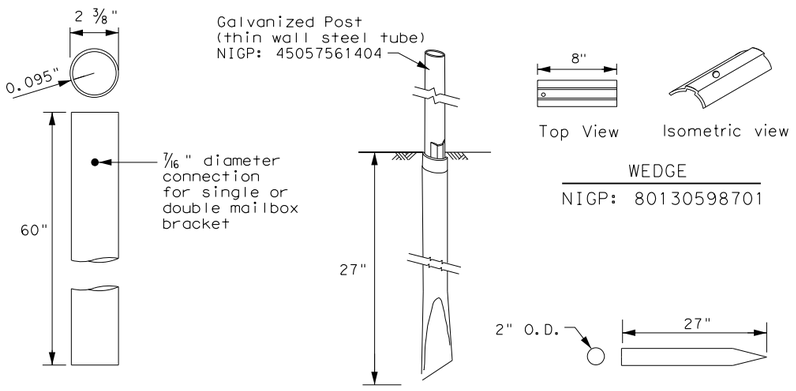
Plastic Drum NIGP: 55093383655
Rubber Collar NIGP: 55093387102

NOTES:

1. Place on approved plastic drum as shown in the Compliant Work Zone Traffic Control Devices (CWZTCD).
2. Existing attachment hardware shall be used unless damaged. Damaged hardware shall be replaced.

TYPE 2 - SUPPORT/FOUNDATION

Thin Wall Steel Tube w/Wedge Anchor System

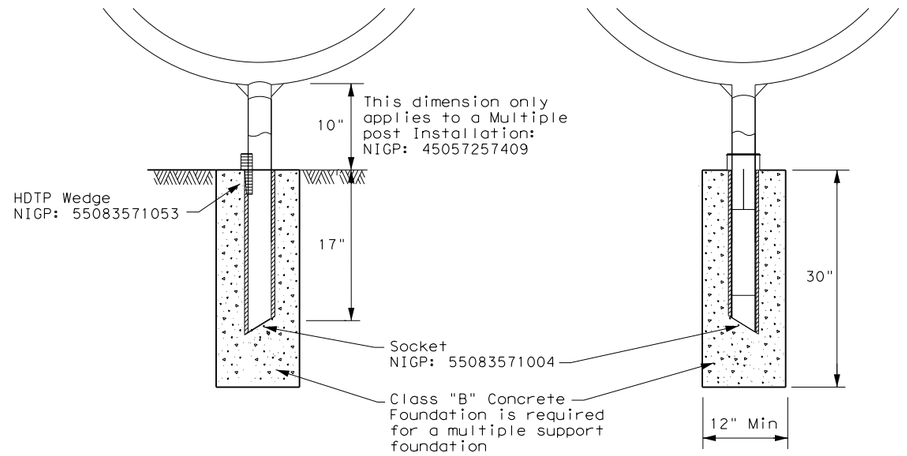


MAILBOX POST

WEDGE ANCHOR
NIGP: 80130238407

TYPE 4 - SUPPORT/FOUNDATION

Whitecoated steel post NIGP: 45057561107
Multiple post NIGP: 45057257409
Recycled Rubber post (RR) NIGP: 45057561057



GENERAL NOTES:

1. Erect post plumb or vertical.
2. When galvanized part is required galvanize in accordance with Item 445.
3. Use a concrete footing as shown or when directed. Concrete footing will be required when soils do not hold the support/foundations in a stable condition, only on Type 1, Type 2, and Type 4

Texas Department of Transportation

Maintenance Division Standard

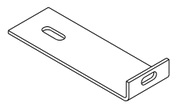
MAILBOX SUPPORT AND FOUNDATION

MB(3)-21

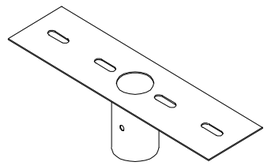
FILE: MB-21.dgn	DN:	CK:	DW:	CK:
©TxDOT March 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS 2/2005 11/2009 4/2015 6/2005 1/2011 11/2006 7/2014	0289	04	032	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	SAN SABA		100

DATE: 11/22/2022 1:28
FILE: pw://server.sig-eng.com:Sig-ds/Documents/TxDOT0103 Brownwood SH 16/Design_Data/4 - Design/Plan_Set_1/03. Roadway/Standards/mb-21(4).dgn

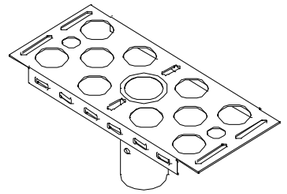
TYPE	TYPE 1	TYPE 2	TYPE 3	TYPE 4			TYPE 5	TYPE 6
Configuration	Multiple	Single or Double	Single or Double	Single	Double	Multiple	Single	Single
Mailbox Size NIGP •	Outside Position: S or M Inside Position: S, M, L, XL, or LA	Single: S, M, L, XL, or LA Double: SS, SM, MM	Single: S, M, L, or XL Double: SS, SM, MM	S, M, L, XL, or LA	SS, SM, or MM	Outside Position: S or M Inside Position: S, M, L, or XL	Molded Plastic	S, or M
Mailbox Post NIGP •	45057255254 (Galvanized Multiple)	45057561404 (Thin Walled Gavanize)	57044325108 (Wing Channel Post)	45057561107 (Thin walled white powder coated) 45057561057 (Recycled Rubber Post: S or M only)	45057561107 (Thin Walled White Powder Coated)	45057257409 (White Powder Coated Multiple)	4x4 Timber	Construction Barrel
Post and Mailbox Hardware NIGP •	45057259009 (Wedge) 45057256500 (V-Wing Socket) 45057253002 (Bracket Extension) 45057252251 (Mailbox Bracket) 45057258001 (Part A Angle Bracket x2) 45057250255 (Plate Washer for XL/LA x2) 45057250263 (L-Bracket for XL x4)	80130598701 (Wedge) 80130238407 (Wedge Anchor) 45057253002 (Bracket Extension) 45057252343 (Double MB Bracket) 45057252350 (S. Mailbox Bracket) 45057252251 (Mailbox Bracket) 45057250255 (Plate Washer for XL/LA x2) 45057250263 (L-Bracket forXL x4)	45057541653 (Type 3 Double Mailbox Bracket) 45057252251 (Mailbox Bracket) 45057253002 (Bracket Extension) 45057258001 (Part A Angle Bracket) 45057258027 (Part B Angle Bracket) 45057250255 (Plate Washer for XL x2) 45057250263 (L-Bracket for XL x4)	55083571053 (Wedge) 55083571004 (Socket) 45057252350 (Single Mailbox Bracket) 45057253002 (Bracket Extension) 45057250255 (Plate Washer for XL/LA x2) 45057250263 (L-Bracket for XL x4)	55083571053 (Wedge) 55083571004 (Socket) 45057253002 (Bracket Extension) 45057252343 (Double Mount Bracket) 45057252251 (Mailbox Bracket x2)	55083571053 (Wedge) 55083571004 (Socket) 45057253002 (Bracket Extension) 45057252350 (Single Mount Bracket) 45057250255 (Plate Washer for XL x2) 45057250263 (L-Bracket for XL x4)	None	45057251055 Angle Bracket (x2)
Foundation Used	Class B Concrete (Required for LA Mailboxes)	Class B Concrete (Required for LA Mailboxes)	None	Class B Concrete (not used with recycled rubber post, required for LA Mailboxes)	Class B Concrete (not required)	Class B Concrete	None	None



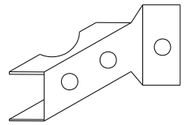
NIGP: 45057250263
L-Bracket x4 for
XL sized mailboxes



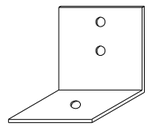
NIGP: 45057252343
Double Mailbox Bracket
For Type 2 and Type 4
double mount



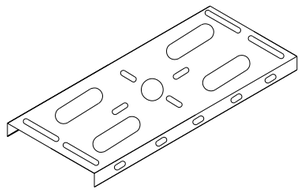
NIGP: 45057252350
Single Mailbox Bracket
For Type 2 single and for
Type 4 single and multi mount



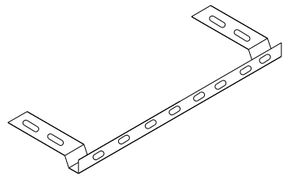
NIGP: 45057258001
Part "A" Angle Bracket
For Type 1 multi (2 per mailbox)
and Type 3 single and double



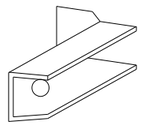
NIGP: 45057251055
Type 6 Angle Bracket
(2 per mailbox)



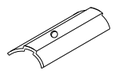
NIGP: 45057252251
Mailbox Bracket
For Type 1 multi and
any double mount (use 2)



NIGP: 45057253002
Bracket Extension
Use 1 for a medium Mailbox
Use 2 for a Large Mailbox



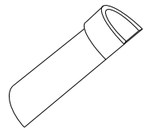
NIGP: 45057258027
Part "B" Angle Bracket
For Type 3 single
and double



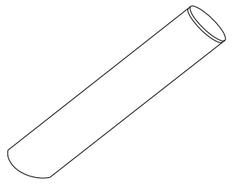
NIGP: 80130598701
Wedge for Type 2

NIGP: 45057250255
Plate Washer for Architecural
and XL Mailboxes

NIGP: 45057541653
Type 3 double mailbox bracket

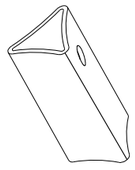


NIGP: 55083571053
Type 4 Mailbox Wedge

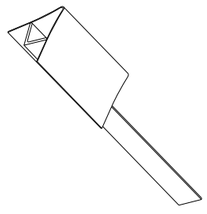


NIGP: 55083571004
Type 4 Mailbox Socket

NIGP: 80130238407
Type 2 Wedge Anchor



NIGP: 45057259009
Wedge for Type 1 V-wing Socket



NIGP: 45057256500
V-wing Socket for
Type 1 Foundation

NIGP •	OBJECT MARKERS AND CONFORMABLE SHEETING
55008311759	Type 2 OM 4"x4" (3 Needed) for Type 3 Wing Channel Post
55008312906	Type 2 OM 6"x12" (1 needed) for Type 3 Wing Channel Post
80149872006	12" Conformable Reflective Yellow Sheeting for Flexible Posts

NOTES:

1. Type 2 object marker in accordance with Traffic Engineering Standard Delineators & Object Markers.
2. A light weight receptacle for newspaper delivery can be attached to mailbox posts if the receptacle does not touch the mailbox, present a hazard to traffic or delivery of the mail, extend beyond the front of the mailbox, or display advertising, except the publication title.

BID CODES FOR CONTRACTS

MB-(X) ASSM TY (XXX) (X)

Type of Mailbox
- S = Single
- D = Double
- M = Multiple
- MP = Molded Plastic

Type of Post
- WC = Winged Channel Post
- RR = Recycled Rubber
- TWW = Thin Walled White Tubing
- TWG = Thin Walled Galvanized Tubing
- TIM = Timber

Type of Foundation
- Ty 1 = V-Loc
- Ty 2 = Wedge Anchor Steel System
- Ty 3 = Winged Channel post
- Ty 4 = Wedge Anchor Plastic System
- Ty 5 = 4 X 4 Post

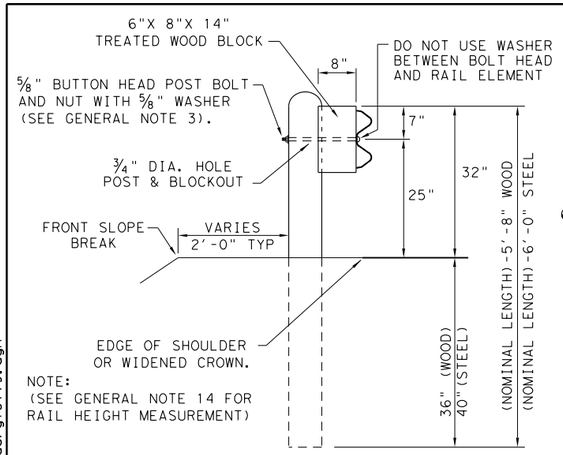
Texas Department of Transportation — Maintenance Division Standard

NIGP PARTS LIST AND COMPATIBILITY

MB(4)-21

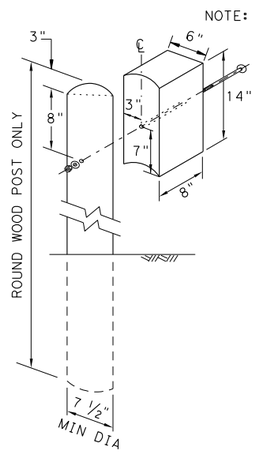
FILE: MB-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT March 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS 2/2005 11/2009 4/2015 6/2005 1/2011 11/2006 7/2014	0289	04	032	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	SAN SABA		101

DATE: 11/22/2022
FILE: pw://server.sig-eng.com:Sig-ds/Documents/TxDOT0103 Brownwood SH 16/Design_Data/4 - Design/Plan_Set_1/03. Roadway/Standards/gf3119.dgn



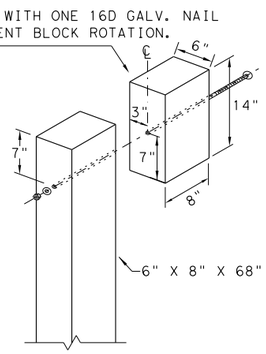
NOTE:
(SEE GENERAL NOTE 14 FOR RAIL HEIGHT MEASUREMENT)

TYPICAL POST PLACEMENT

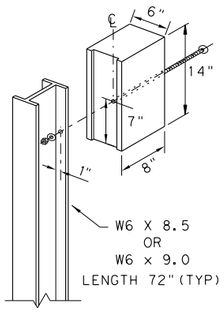


WOOD BLOCK TO ROUND WOOD POST

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

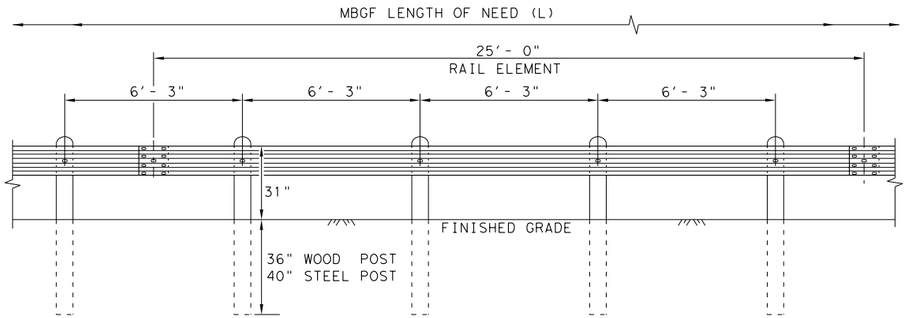


WOOD BLOCK TO RECTANGULAR WOOD POST



ROUTED WOOD BLOCK TO I-BEAM STEEL POST

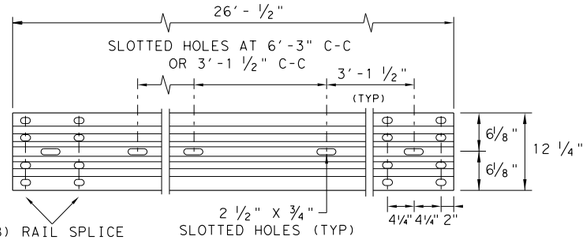
NOTE: ** "WOOD" INDICATES DIMENSIONS FOR BOTH ROUND AND RECTANGULAR WOOD POST SYSTEMS.



DIRECTION OF TRAFFIC

ELEVATION
MID-SPAN RAIL SPLICE

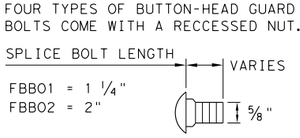
SHOWING A 25'- 0" SECTION OF W-BEAM RAIL. (SEE GENERAL NOTE 2)



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

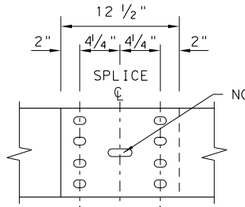
NOTES: SEE GENERAL NOTE 2 FOR ALLOWABLE RAIL TYPES.
SEE RAIL SPLICE DETAIL FOR REQUIRED HARDWARE.

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



BUTTON HEAD BOLT

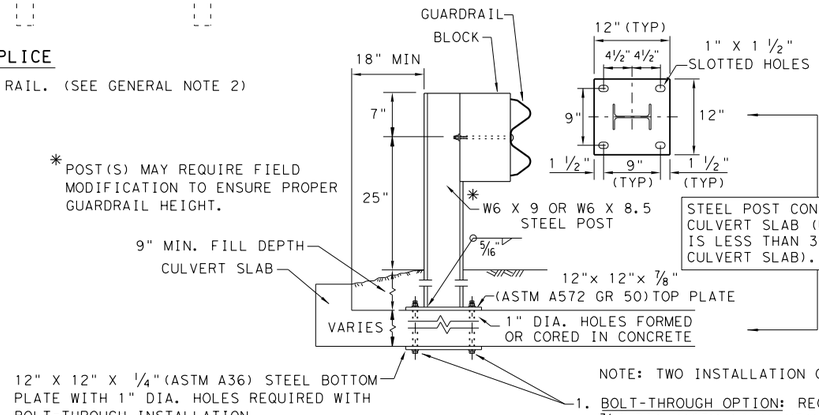
NOTE: SEE GENERAL NOTE 3 FOR SPLICE & POST BOLT DETAILS.



DIRECTION OF TRAFFIC

MID-SPAN RAIL SPLICE DETAIL

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



LOW FILL CULVERT POST

NOTE: TWO INSTALLATION OPTIONS.

1. BOLT-THROUGH OPTION: REQUIRES A 6" MIN. SLAB THICKNESS. 7/8" DIA (ASTM A449) HEAVY HEX BOLTS WITH TWO HARDENED WASHER EACH AND HEAVY HEX NUTS.
   NOTE: BOLT LENGTH = SLAB PLUS 2 1/4" MIN.

2. EPOXY ANCHOR OPTION: THIS OPTION MAY ONLY BE USED IF THE CULVERT SLAB IS 9" MIN. THICK. THREADED ANCHOR RODS MUST BE 7/8" 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 1/4" 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 1/2" 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 5/8" 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.

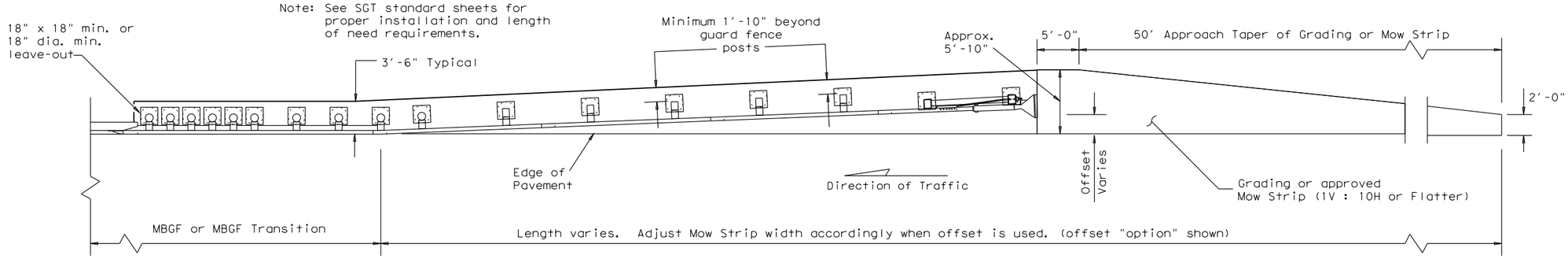
Texas Department of Transportation

Design Division Standard

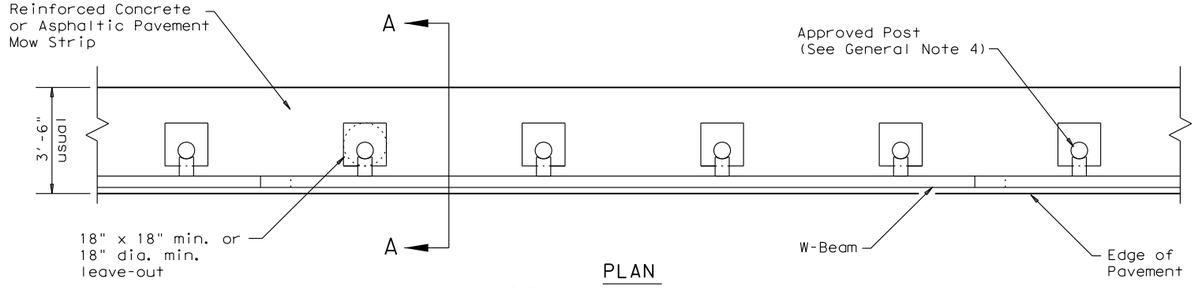
METAL BEAM GUARD FENCE
TL-3 MASH COMPLIANT
GF(31)-19

FILE: gf3119.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0289	04	032	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	SAN SABA		102

DATE: 11/22/2022
FILE: pw://server.sig-eng.com:Sig-ds/Documents/TxDOT0103 Brownwood SH 16/Design_Data/4 - Design/Plan_Set_1/03. Roadway/Standards/gf31ms19.dgn

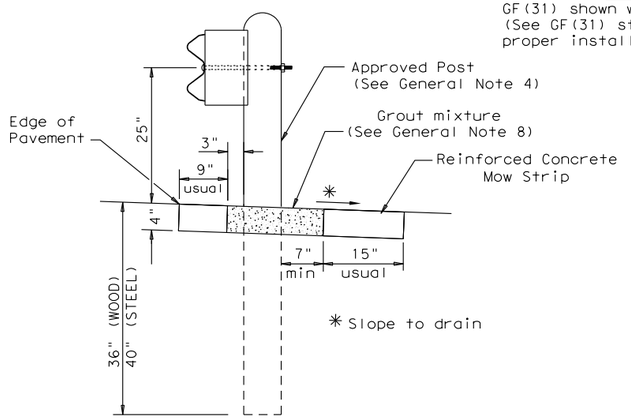


GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS



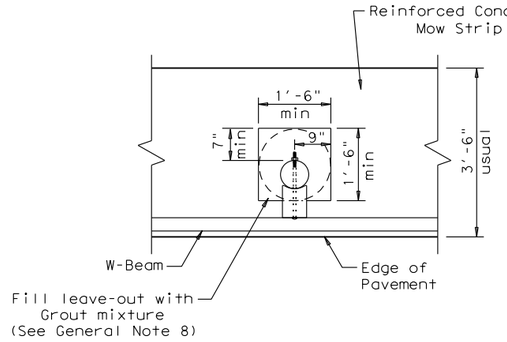
PLAN

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



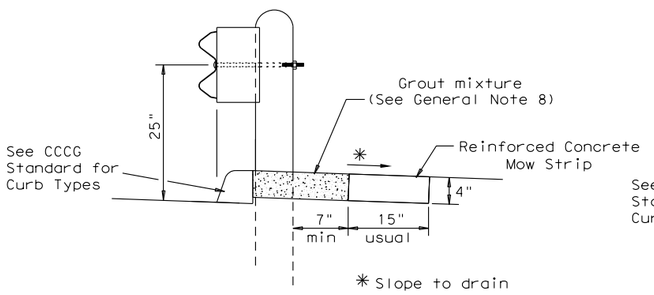
SECTION A-A

Typical



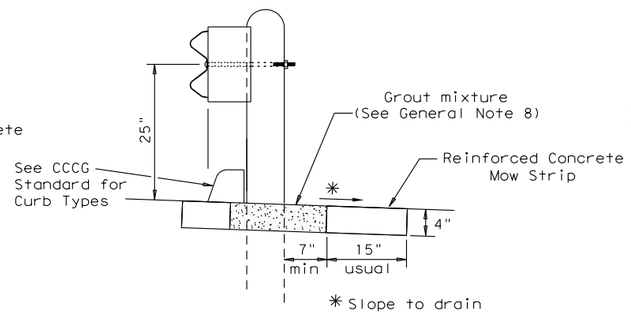
MOW STRIP DETAIL

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



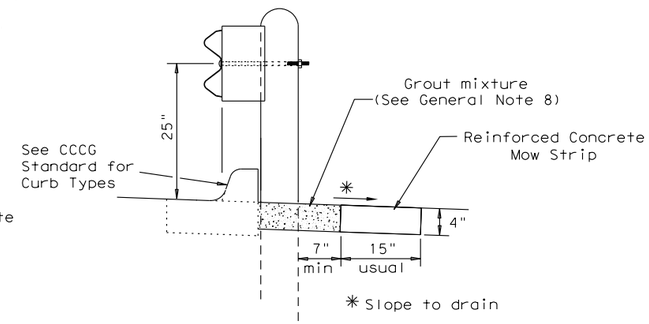
CURB OPTION (1)

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
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0289	04	032	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	SAN SABA		103

DATE: 11/22/2022
FILE: pw://server.sig-eng.com:Sig-ds/Documents/TxDOT0103 Brownwood SH 16/Design_Data/4 - Design/Plan_Set_1/03. Roadway/Standards/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

BEGIN LENGTH OF NEED

PLAN VIEW

TRAFFIC FLOW

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

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"

MBGF LAPPED IN DIRECTION OF TRAFFIC FLOW

25'-0" DOWNSTREAM W-BEAM GUARDRAIL PN: 61G

SoftStop ANCHOR RAIL (12GA) PN: 15215G

SoftStop FACE SEE GN(3) & NOTE: B

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

SEE NOTE: A

POST 32" HEIGHT

31"

RAIL HEIGHT

RAIL 25'-0" PN: 61G

RAIL 25'-0" PN: 15215G

(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

DO NOT BOLT ANCHOR RAIL TO POST(2)

SEE DETAIL 2

SEE DETAIL 3

13/16" DIA. YIELDING HOLES

13/16" DIA. YIELDING HOLES

POST 40" DEPTH (TYP 1-8)

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

6'-1⅜"

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)

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)

(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

ALTERNATE BLOCKOUT SEE GENERAL NOTE: 6

(2) ⅝" ROUND WASHER (WIDE) PN: 3240G

ANCHOR PADDLE PN: 15204A

(2) ⅝" HEX NUT A563 GR. DH PN: 3245G

1" NUT PN: 3908G SHALL BE SECURELY TIGHTENED AFTER FINAL ASSEMBLY, BUT NOT DEFORMING THE KEEPER PLATE.

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

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

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

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)

STANDARD MBGF

APPROX 5'-10"

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

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 ⅜")
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

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

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	0289	04	032	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	SAN SABA		104

DATE: 11/22/2022
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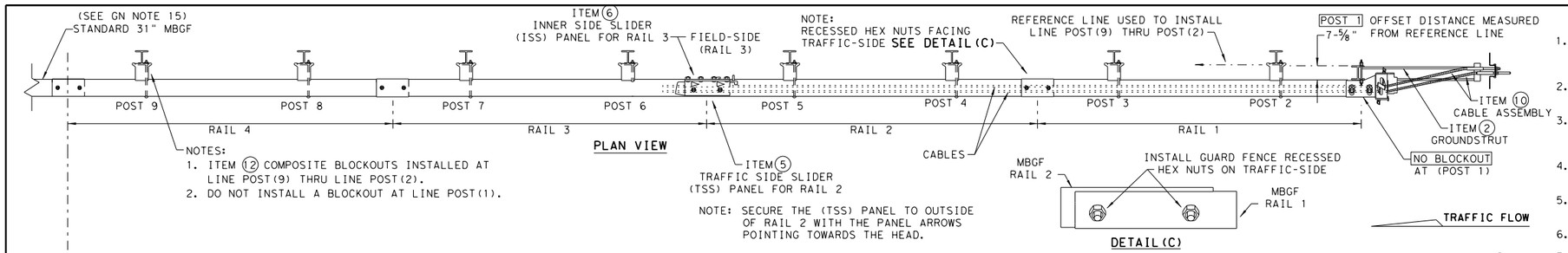

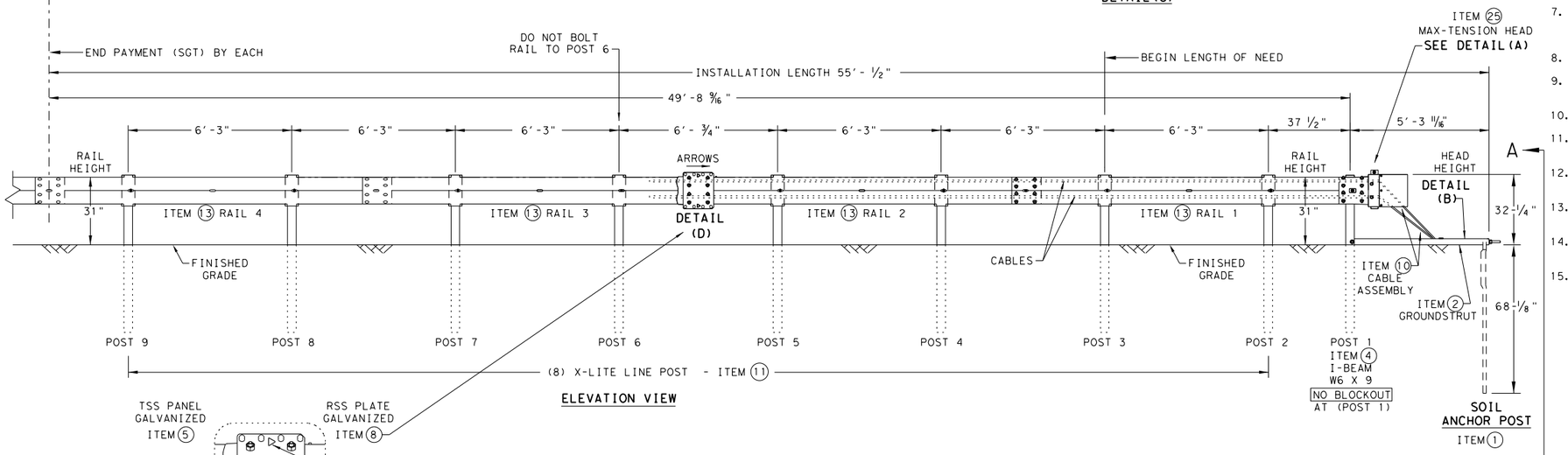

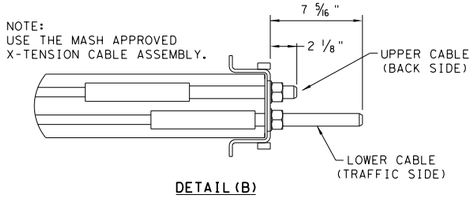

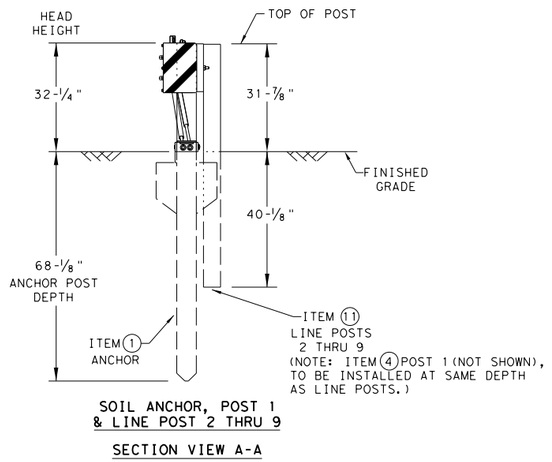

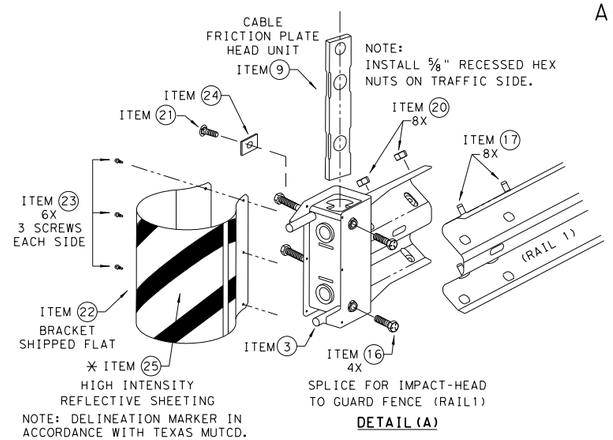

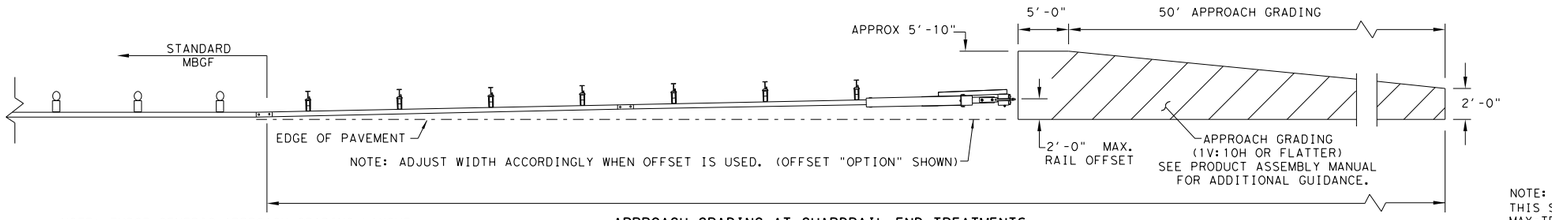

GENERAL NOTES

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

* 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.

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
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REVISIONS	0289	04	032	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	SAN SABA		105

DATE: 11/22/2022
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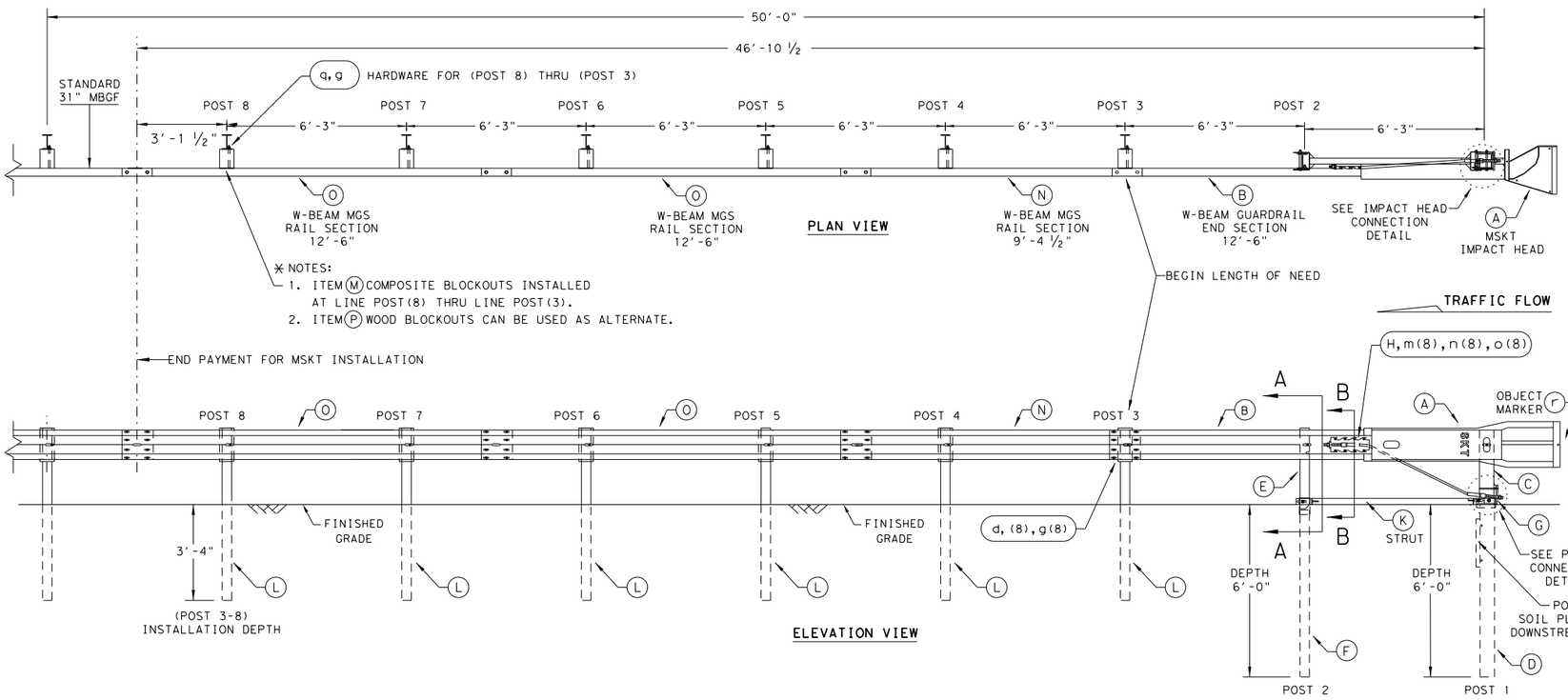
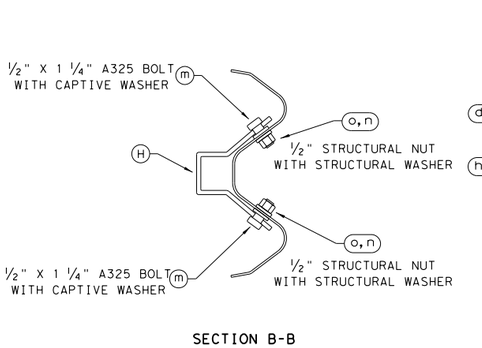
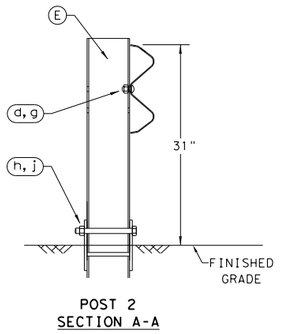


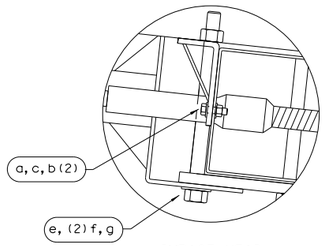
NOTE: SEE (GENERAL NOTE 14) FOR DRIVING CAP INFORMATION.



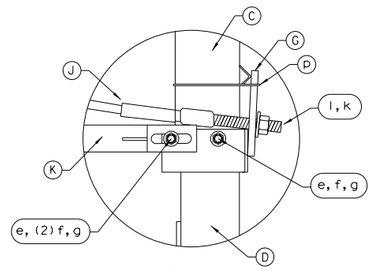
SECTION B-B
ANCHOR BRACKET



POST 2
SECTION A-A



IMPACT HEAD
CONNECTION DETAIL



POST 1
CONNECTION DETAIL

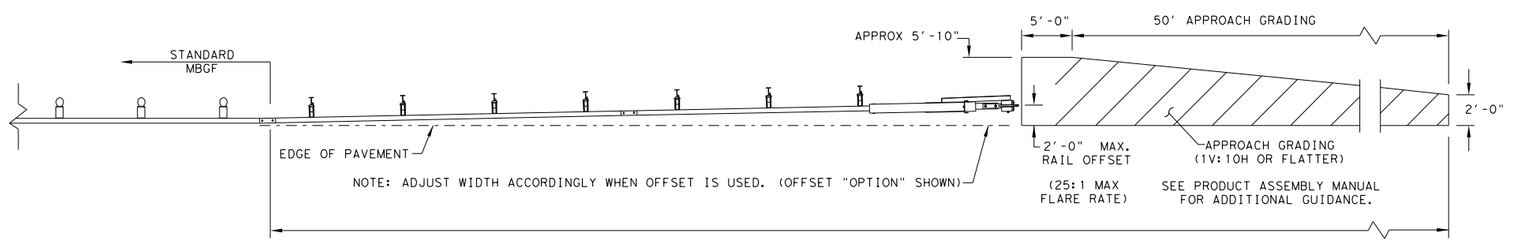
GENERAL NOTES

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 3/16" 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



APPROACH GRADING AT GUARDRAIL END TREATMENTS

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	
REVISIONS	0289	04	032	SH 16	
	DIST	COUNTY		SHEET NO.	
	BWD	SAN SABA		106	

DATE: 11/22/2022
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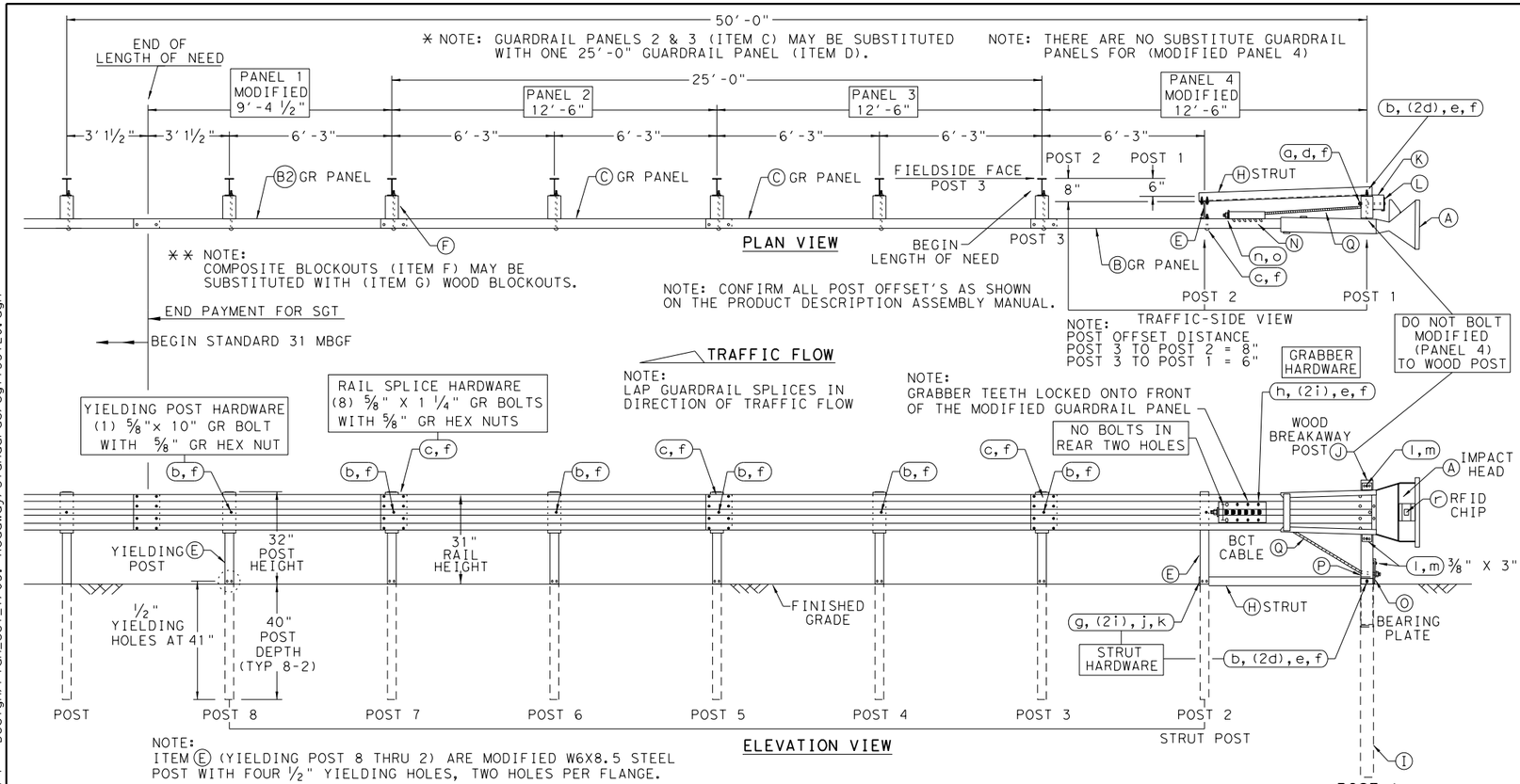
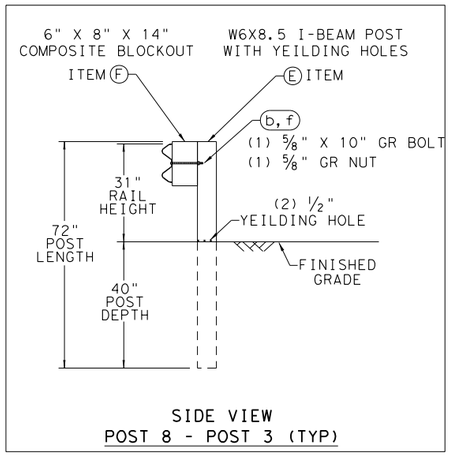


GENERAL NOTES

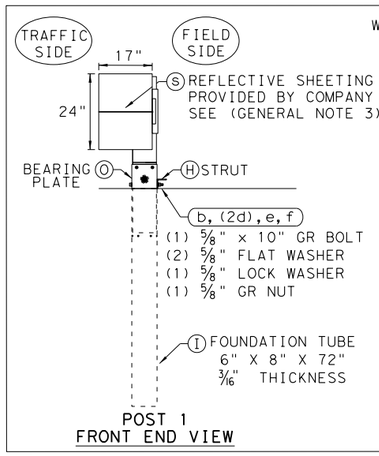
1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: SPIG INDUSTRY, INC. AT 1(267) 644-9510. 14675 INDUSTRIAL PARK RD; BRISTOL, VA 24202
2. FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE MANUFACTURER'S; SGET END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY 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

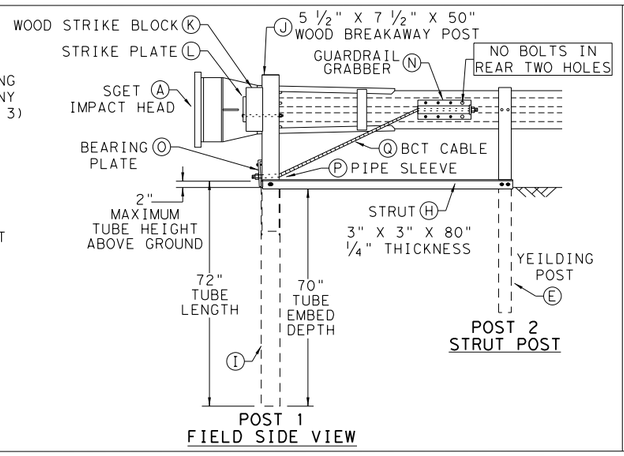
* ALTERNATIVE ITEMS
** NOTE: SEE PLAN VIEW



SIDE VIEW
POST 8 - POST 3 (TYP)

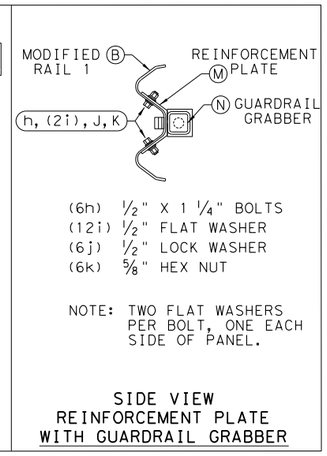


POST 1
FRONT END VIEW

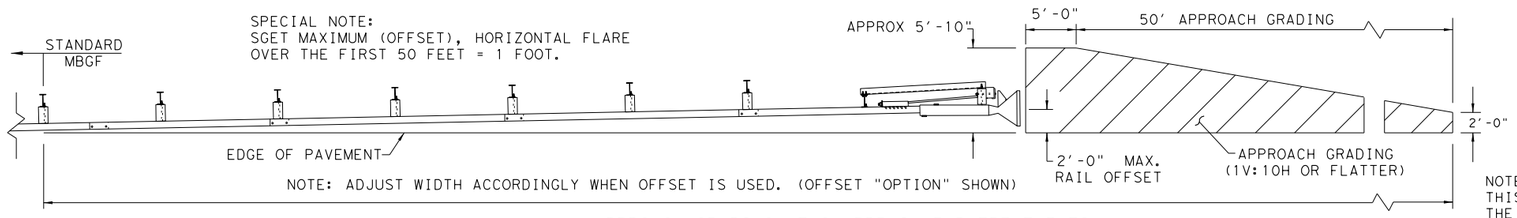


POST 1
FIELD SIDE VIEW

POST 2
STRUT POST



SIDE VIEW
REINFORCEMENT PLATE
WITH GUARDRAIL GRABBER



APPROACH GRADING AT GUARDRAIL END TREATMENTS

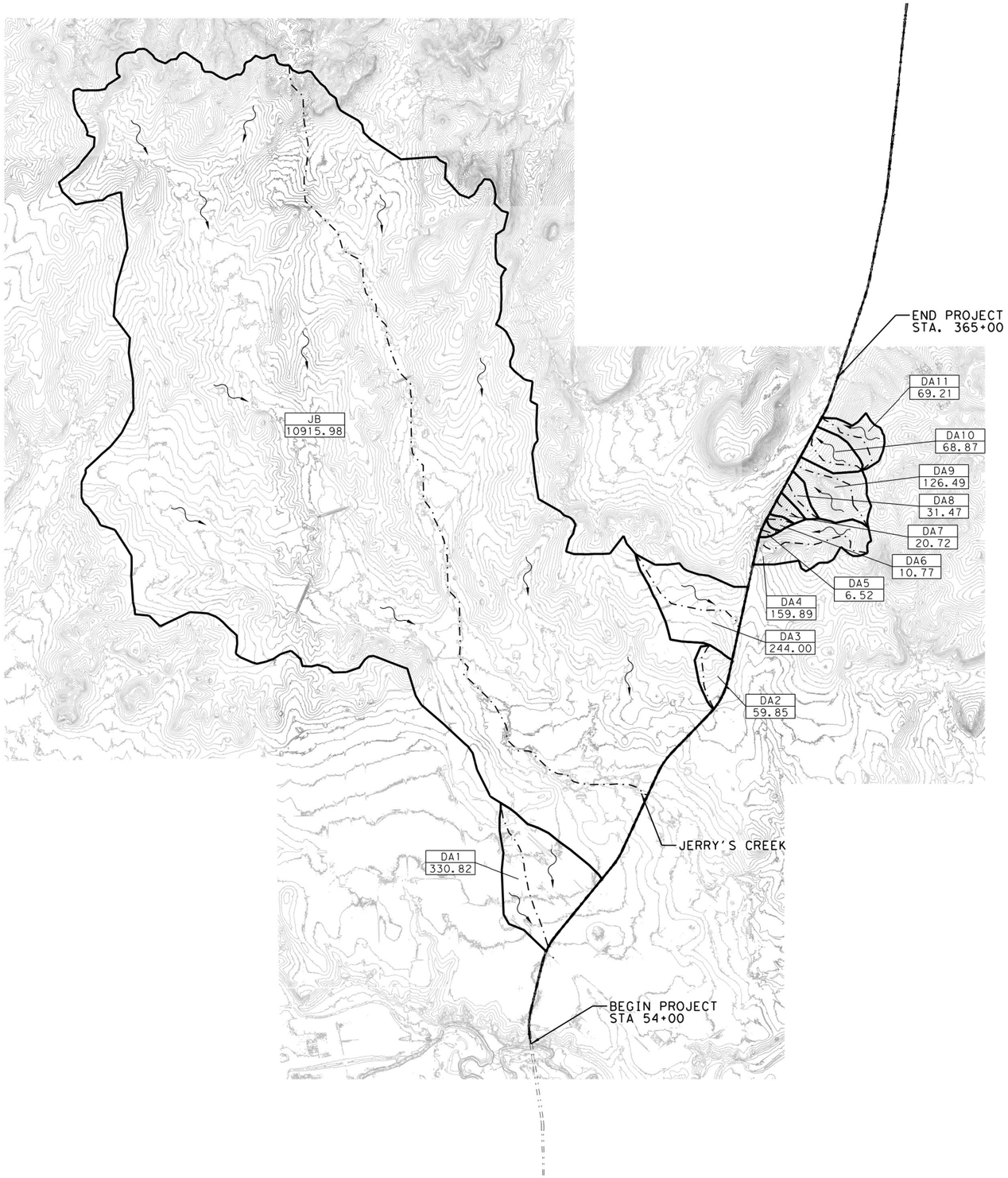
NOTE:
THIS STANDARD IS A BASIC REPRESENTATION OF THE SGET TERMINAL SYSTEM AND IS NOT INTENDED TO REPLACE THE MANUFACTURER'S ASSEMBLY MANUAL.

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	0289	04	032		SH 16	
	DIST	COUNTY			SHEET NO.	
	BWD	SAN SABA			107	



0 100 200

SCALE: 1" =200'

LEGEND

DA1 / 0.18	AREA I.D. / AREA IN ACRES
	DIRECTION OF FLOW (ON GROUND)
	DRAINAGE AREA BOUNDARY
	TIME OF CONCENTRATION PATH

NOTES:

1. ELEVATION CONTOURS OBTAINED FROM TNRIS ELEVATION WEBSITE.
2. CONTOURS ARE SHOWN AT 5' INTERVALS.
3. DRAINAGE AREAS SHOWN ARE FOR CROSS DRAINAGE BRIDGE AND CULVERT STRUCTURES.

NO.	REVISION	BY	DATE

STATE OF TEXAS
ANDRES M. CARDENAS
88453
LICENSED PROFESSIONAL ENGINEER
1/3/2023

RTG RODRIGUEZ TRANSPORTATION GROUP
FIRM #587

SH 16
DRAINAGE AREA MAP

1/3/2023 SHEET 1 OF 1

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.		HIGHWAY No.	
CHECKED:		TEXAS			SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	BWD	SAN SABA	0289	04	032,ETC	108

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Rational Method Calculations

Rainfall Intensity Equation:

I = b / (Tc + d)e

Where: I = Rainfall Intensity, in/hr.
Tc = Time of Concentration, min.
b, d, and e = Coefficients for specific rainfall frequencies.

Basin ID	Drainage Area		Base Runoff Coefficient					Tc	50% AEP (2-year)			20% AEP (5-year)			10% AEP (10-year)			4% AEP (25-year)			2% AEP (50-year)			1% AEP (100-year)		
			Pavement	Undeveloped / Rural	Single Family	Industrial / Commercial	Lawns/ Unimproved		C	i	Q	C	i	Q	C	i	Q	C	i	Q	C	i	Q	C	i	Q
	(Acre)	(Sq. Mile)	0.9	0.35	0.4	0.6	0.25	(min)		(in/hr)	(cfs)		(in/hr)	(cfs)		(in/hr)	(cfs)		(in/hr)	(cfs)		(in/hr)	(cfs)		(in/hr)	(cfs)
DA #2	59.85	0.09352	1.19	36.74	8.08		13.84	36	0.34	2.32	47.88	0.34	2.92	60.18	0.34	3.43	70.76	0.34	4.16	85.75	0.34	4.73	97.57	0.34	5.34	110.14
DA #4	159.89	0.24983	0.82	143.71	15.37			45	0.36	2.01	115.10	0.36	2.53	144.80	0.36	2.98	170.50	0.36	3.62	207.06	0.36	4.13	236.04	0.36	4.67	267.02
DA #5	6.52	0.01018	0.26	6.26				10	0.37	4.49	10.87	0.37	5.62	13.60	0.37	6.55	15.86	0.37	7.84	18.98	0.37	8.82	21.37	0.37	9.82	23.78
DA #6	10.77	0.01683	0.52	10.24				15	0.38	3.77	15.29	0.38	4.72	19.14	0.38	5.52	22.38	0.38	6.63	26.89	0.38	7.49	30.37	0.38	8.37	33.96
DA #7	20.72	0.03237	0.28	20.44				19	0.36	3.35	24.81	0.36	4.20	31.10	0.36	4.92	36.41	0.36	5.92	43.85	0.36	6.70	49.63	0.36	7.51	55.64
DA #8	31.47	0.04917	0.54	30.93				18	0.36	3.45	38.97	0.36	4.32	48.83	0.36	5.05	57.16	0.36	6.08	68.79	0.36	6.88	77.82	0.36	7.71	87.19
DA #9	126.49	0.19763	0.65	125.84				29	0.35	2.65	118.19	0.35	3.33	148.39	0.35	3.90	174.24	0.35	4.72	210.70	0.35	5.36	239.32	0.35	6.04	269.55
DA #10	68.87	0.10761	0.55	68.32				22	0.35	3.10	75.64	0.35	3.89	94.86	0.35	4.56	111.18	0.35	5.49	134.08	0.35	6.23	151.93	0.35	6.99	170.62
DA #11	69.21	0.10815	0.65	68.57				41	0.36	2.14	52.56	0.36	2.69	66.09	0.36	3.16	77.78	0.36	3.84	94.37	0.36	4.37	107.49	0.36	4.94	121.50

Hydrograph Calculation Summary

Basin ID	Area		CN	% Impervious	Tc	Lag Time	10% AEP (10-year)	4% AEP (25-year)	1% AEP (100-year)
							Q	Q	Q
	(Acre)	(Sq. Mile)		%	(min)	(min)	(cfs)	(cfs)	(cfs)
DA #1	330.82	0.51691	78	2.86	121	72.6	332.8	452.8	656.3
DA #3	244.00	0.38125	70	0.72	79	47.4	240.3	346.4	528.8

OMEGA EM REGRESSION CALCULATIONS

ESTIMATION OF ANNUAL PEAK-STREAMFLOW FREQUENCY FOR UNDEVELOPED WATERSHEDS IN TEXAS (CFS)

DRAINAGE AREA PROPERTIES					Q25 (DESIGN)						Q100					
DRAINAGE AREA ID	DRAINAGE AREA	MEAN ANNUAL PRECIPITATION SEE FIG. 2	MAIN CHANNEL SLOPE	OmegaEM PARAMETER	REGRESSION COEFFICIENTS					PRESS -MIN POWER	REGRESSION COEFFICIENTS					PRESS -MIN POWER
	A	P	S	SEE FIG. 1	a	b	c	d	e	f	a	b	c	d	e	f
	(MI2)	(IN)	(FT/FT)		11.79	-9.819	1.140	0.446	0.945	-0.0374	10.82	-8.448	1.071	0.507	0.969	-0.0467
JB	17.0562	29	0.00707	-0.106	**3,690**						**6,213**					

NOTES:

1. PEAK FLOW RATES FOR WATERSHEDS LESS THAN 200 ACRES WERE CALCULATED USING THE RATIONAL METHOD. PEAK FLOW RATES FOR WATERSHEDS LARGER THAN 200 ACRES WERE CALCULATED USING THE NRCS HYDROGRAPH METHOD WITH HEC-HMS (VERSION 4.9). PEAK FLOW RATES FOR JERRY'S BRANCH WERE CALCULATED USING OMEGA EM REGRESSION EQUATIONS.
2. TIME OF CONCENTRATION CALCULATIONS WERE COMPLETED USING METHODOLOGY FOUND IN THE TxDOT HYDRAULIC DESIGN MANUAL (NRCS METHOD).A MINIMUM TIME OF CONCENTRATION OF 10 MINUTES WAS USED FOR ALL CALCULATIONS.
3. PRECIPITATION DEPTHS USED FOR NRCS HYDROGRAPH COMPUTATIONS WERE OBTAINED FROM THE NOAA ATLAS 14, VOLUME 11, VERSION 2.
4. LAG TIME = 0.6 X TIME OF CONCENTRATION (Tc)
5. COMPOSITE NRCS CURVE NUMBERS WERE CALCULATED USING WIN-TR55 AND ACCOUNTED FOR DIFFERING LAND USE AND HYDROLOGIC SOIL GROUPS FOUND WITHIN THE RESPECTIVE WATERSHEDS.

NO.	REVISION	BY	DATE

STATE OF TEXAS
ANDRES M. CARDENAS
88453
LICENSED PROFESSIONAL ENGINEER
11/16/2022

Texas Department of Transportation

RTG RODRIGUEZ TRANSPORTATION GROUP FIRM #587

SH 16 CULVERT RUNOFF DRAINAGE CALCULATIONS

11/16/2022 SHEET 1 OF 1

DESIGNED:	FED. RD DIV. NO.	STATE	FEDERAL AID PROJECT No.	HIGHWAY No.
CHECKED:		TEXAS		SH 16

DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	BWD	SAN SABA	0289	04	032,ETC	109

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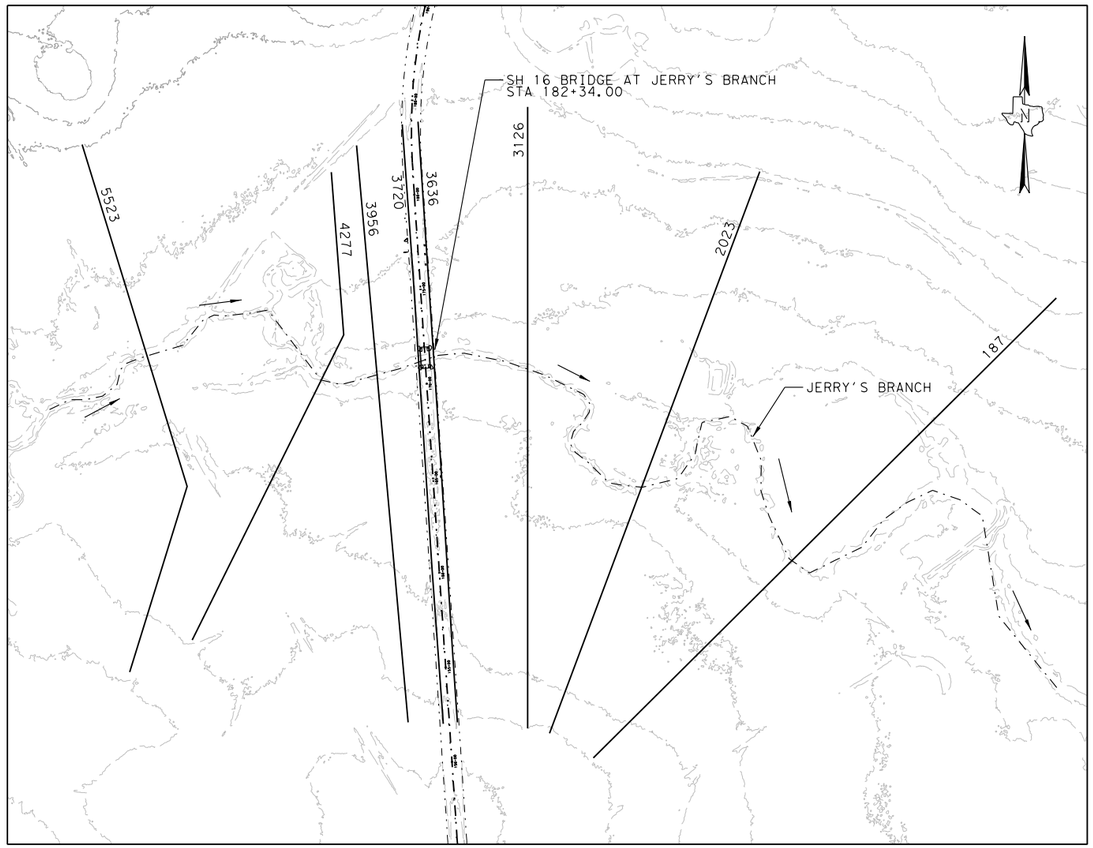
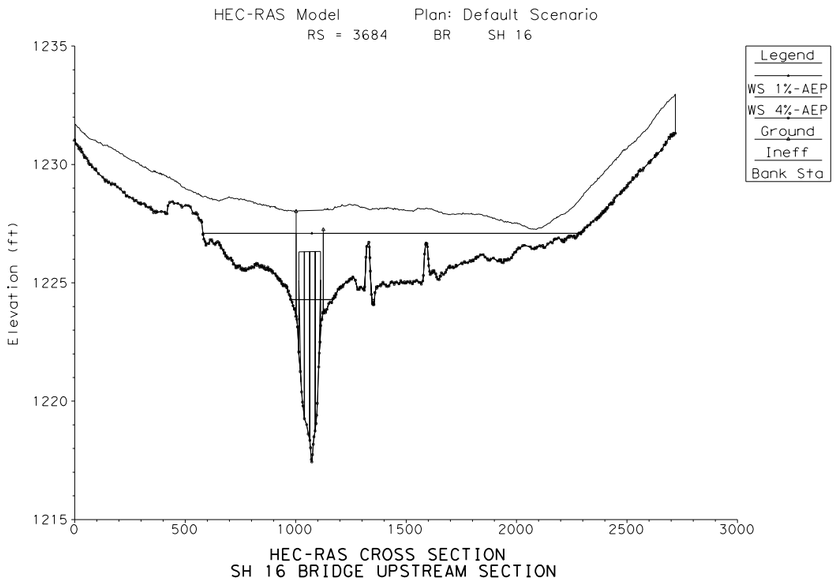
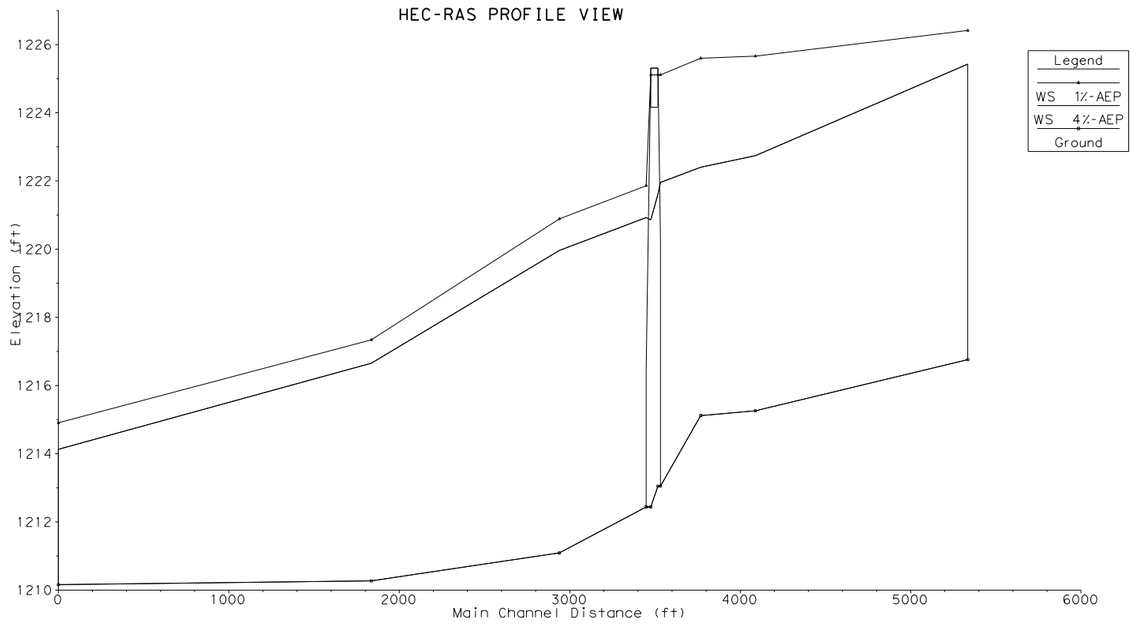


HEC-RAS CROSS SECTION LAYOUT
SCALE: 1" = 800'



HEC-RAS CROSS SECTION
SH 16 BRIDGE UPSTREAM SECTION



HEC-RAS SUMMARY TABLE
EXISTING CONDITION
(NO BRIDGE WORK PROPOSED)

River Sta	Profile	Q Total (cfs)	W.S. Elev (ft)	Vel Chnl (ft/s)
5523	4%-AEP	3690	1225.43	7.9
5523	1%-AEP	6213	1226.42	8.88
4277	4%-AEP	3690	1222.75	5.44
4277	1%-AEP	6213	1225.66	3.68
3956	4%-AEP	3690	1222.4	4.08
3956	1%-AEP	6213	1225.6	2.48
3720	4%-AEP	3690	1221.96	4.87
3720	1%-AEP	6213	1225.11	5.22
3684		Bridge		
3636	4%-AEP	3690	1220.93	6.51
3636	1%-AEP	6213	1221.86	8.81
3126	4%-AEP	3690	1219.97	4.85
3126	1%-AEP	6213	1220.89	5.74
2023	4%-AEP	3690	1216.66	7.53
2023	1%-AEP	6213	1217.34	8.57
187	4%-AEP	3690	1214.13	2.57
187	1%-AEP	6213	1214.91	2.99

NOTES:

1. HEC-RAS VERSION 5.0.7 WAS USED FOR THE HYDRAULIC ANALYSIS.
2. NORMAL DPETH COMPUTATION WAS USED FOR THE DOWNSTREAM BOUNDARY CONDITION FOR THE HYDRAULIC ANALYSIS. SLOPE = 0.000818 FT/FT.
3. THE PROJECT LOCATION IS WITHIN A ZONE A SPECIAL FLOOD HAZARD AREA PER FEMA FIRM PANEL 48411C0120C EFFECTIVE DATE: JULY 2, 1991
4. COORDINATE SYSTEM: TEXAS STATE PLANE CENTRAL ZONE, FIPS 4203, NAD 83 VERTICAL DATUM: NAVD88
5. NO WORK IS PROPOSED AT THIS LOCATION, THUS NO COORDINATION WITH THE LOCAL FLOODPLAIN ADMINISTRATOR IS REQUIRED.

NO.	REVISION	BY	DATE

STATE OF TEXAS
ANDRES M. CARDENAS
88453
LICENSED PROFESSIONAL ENGINEER
11/16/2022

Texas Department of Transportation
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RTG RODRIGUEZ TRANSPORTATION GROUP
FIRM #587

SH 16
HYDRAULIC DATA SHEET
BRIDGE
AT JERRY'S BRANCH

11/16/2022 SHEET 1 OF 1

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.		HIGHWAY No.
CHECKED:		TEXAS			SH 16
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	BWD	SAN SABA	0289	04	032,ETC	110

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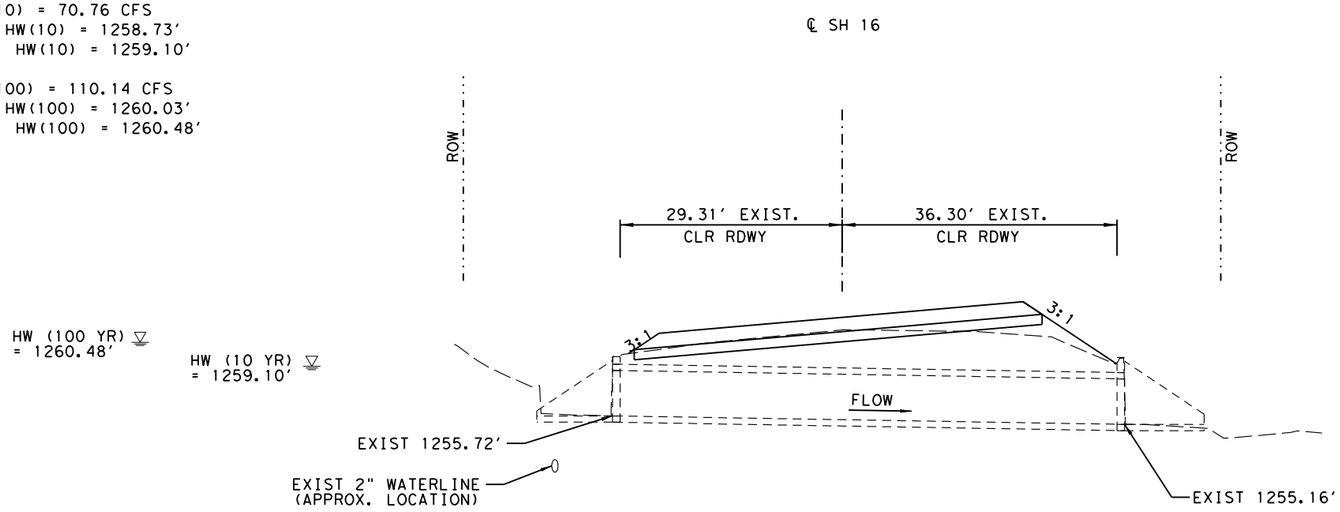
Q(10) = 70.76 CFS
EX HW(10) = 1258.73'
PR. HW(10) = 1259.10'

Q(100) = 110.14 CFS
EX HW(100) = 1260.03'
PR. HW(100) = 1260.48'



EX. V(10) = 9.70 FPS
PR. V(10) = 10.08 FPS
EX. TW(10) = 1256.04'
PR. TW(10) = 1256.10'

EX. V(100) = 10.79 FPS
PR. V(100) = 11.05 FPS
EX. TW(100) = 1256.24'
PR. TW(100) = 1256.32'

0 10 20
SCALE: 1" = 20'
VERTICAL SCALE: 1" = 10'

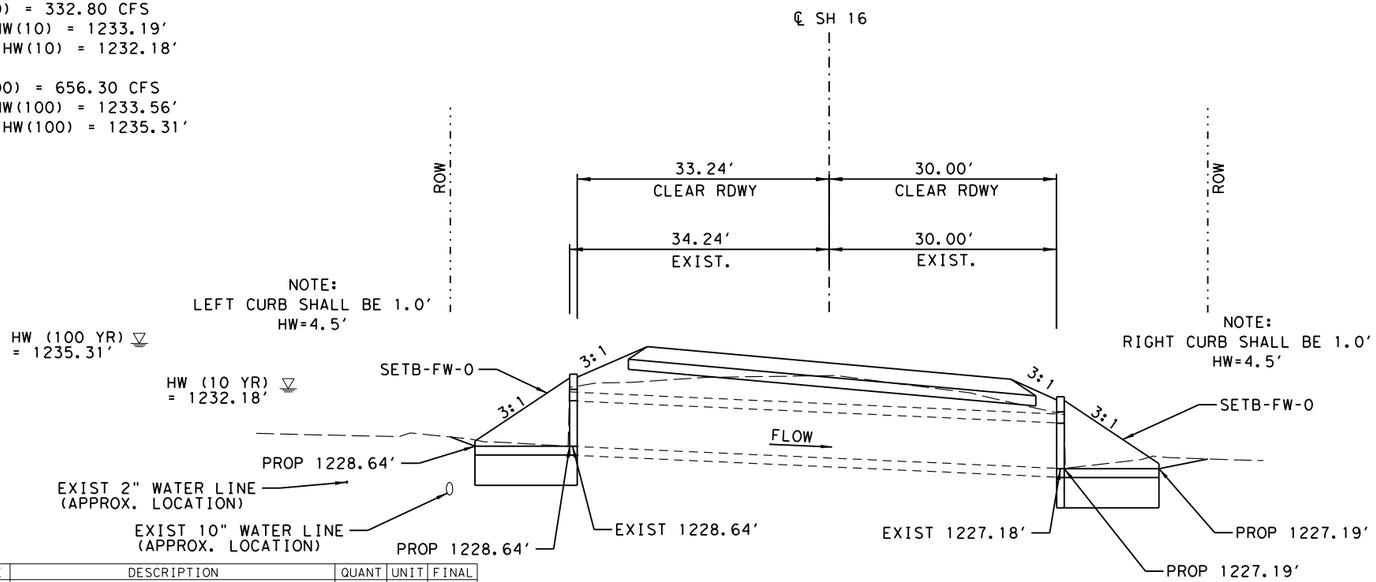
NOTES:

1. ALL DIMENSIONS ARE MEASURED NORMAL TO THE ℄ UNLESS OTHERWISE NOTED.
2. HY-8 WAS USED TO CALCULATE THE NORMAL DEPTH TAILWATER ELEVATION OF THE CULVERT.
3. CULVERT CLEANING TO BE CONSIDERED SUBSIDARY.
4. ALL UTILITIES SHOWN ARE TO BE CONSIDERED APPROXIMATE AND FOR CONTRACTOR'S INFORMATION ONLY. CONTRACTOR TO VERIFY LOCATIONS AND DEPTHS PRIOR TO CONSTRUCTION.

CULVERT 2 - STA. 216+96
EXIST: 1 - 4' X 3' X 67' SBC
PROP: CLEAN CULVERT

Q(10) = 332.80 CFS
EX HW(10) = 1233.19'
PR. HW(10) = 1232.18'

Q(100) = 656.30 CFS
EX HW(100) = 1233.56'
PR. HW(100) = 1235.31'



EX. V(10) = 13.96 FPS
PR. V(10) = 13.35 FPS
EX. TW(10) = 1229.91'
PR. TW(10) = 1229.66'

EX. V(100) = 8.06 FPS
PR. V(100) = 15.45 FPS
EX. TW(100) = 1230.89'
PR. TW(100) = 1230.61'

ITEM	CODE	DESCRIPTION	QUANT	UNIT	FINAL
400	6006	CUT & RESTORING PAV	46	SY	
401	6001	FLOWABLE BACKFILL	32	CY	
432	6002	RIPRAP (CONC)(5 IN)	9	CY	
462	6010	CONC BOX CULV (6 FT X 3 FT)	65	LF	
467	6217	SET (TY I)(S=6 FT)(HW=5 FT)(3:1)(C)	6	EA	

CULVERT 1 - STA. 95+93
EXIST: 2 - 6' X 3' X 65' MBC

PROP: ADD 1 - 6' X 3' X 65' MBC

PROP: CLEAN CULVERT
PROP END TREATMENT: INSTALL WINGWALL (SETB-FW-0) (HW=5 FT) (3:1) (UPSTREAM)
PROP END TREATMENT: INSTALL WINGWALL (SETB-FW-0) (HW=5 FT) (3:1) (DOWNSTREAM)
USING STANDARDS: SETB-FW-0, MC-6-16, MC-MD, BCS

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ANDRES M. CARDENAS
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RTG RODRIGUEZ TRANSPORTATION GROUP
FIRM #587

SH 16

CULVERT LAYOUT

11/16/2022 SHEET 1 OF 6

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.		HIGHWAY No.
CHECKED:		TEXAS			SH 16
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	BWD	SAN SABA	0289	04	032,ETC	111

USER: acardenas 4x1
DATE: 11/16/2022
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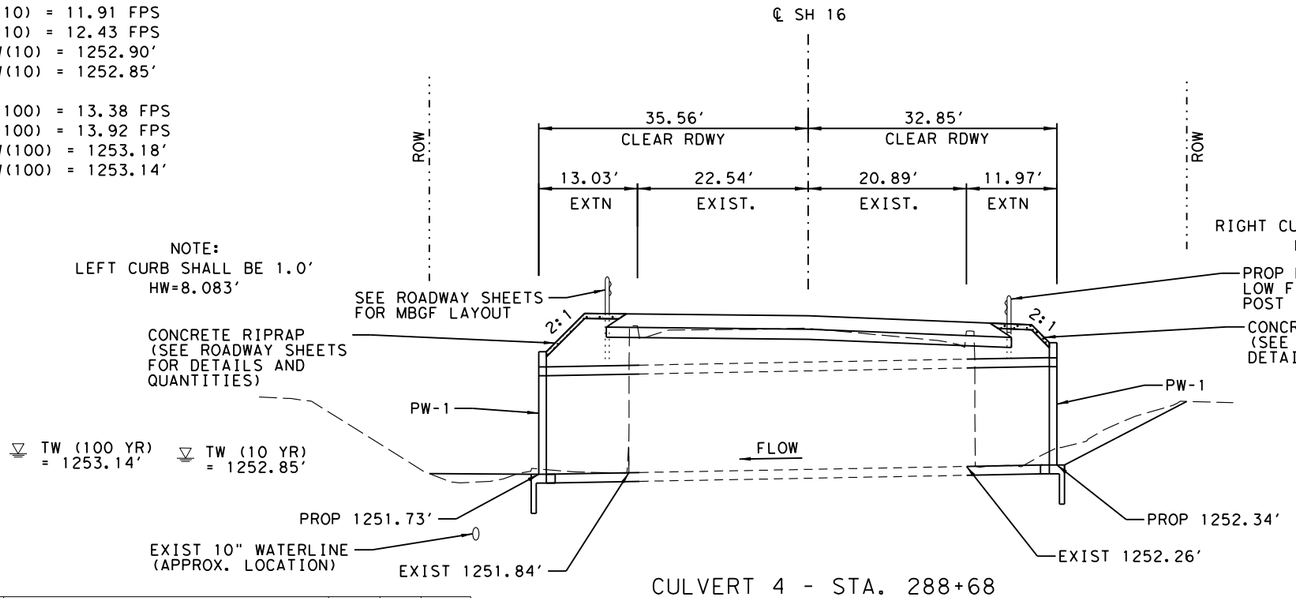
FILE: pw://server.stgeng.com:Stg-ds/Documents/TxDOT0103 Brownwood SH 16\Design_Data\4 - Design/Plan_Set_1\05_Drainage\SH16_DRN_CULV01.dgn

EX. V(10) = 11.91 FPS
PR. V(10) = 12.43 FPS
EX. TW(10) = 1252.90'
PR. TW(10) = 1252.85'

EX. V(100) = 13.38 FPS
PR. V(100) = 13.92 FPS
EX. TW(100) = 1253.18'
PR. TW(100) = 1253.14'



Q(10) = 170.50 CFS
EX HW(10) = 1257.46'
PR. HW(10) = 1257.53'

Q(100) = 267.02 CFS
EX HW(100) = 1259.35'
PR. HW(100) = 1259.45'

0 10 20
SCALE: 1" = 20'
VERTICAL SCALE: 1" = 10'

ITEM	CODE	DESCRIPTION	QUANT	UNIT	FINAL
400	6006	CUT & RESTORING PAV	9	SY	
401	6001	FLOWABLE BACKFILL	5	CY	
403	6001	TEMPORARY SPL SHORING	410	SF	
462	6092	CONC BOX CULV(5'X6.5')	26	LF	
466	6183	WINGWALL (PW-1)(HW=8 FT)	2	EA	

CULVERT 4 - STA. 288+68

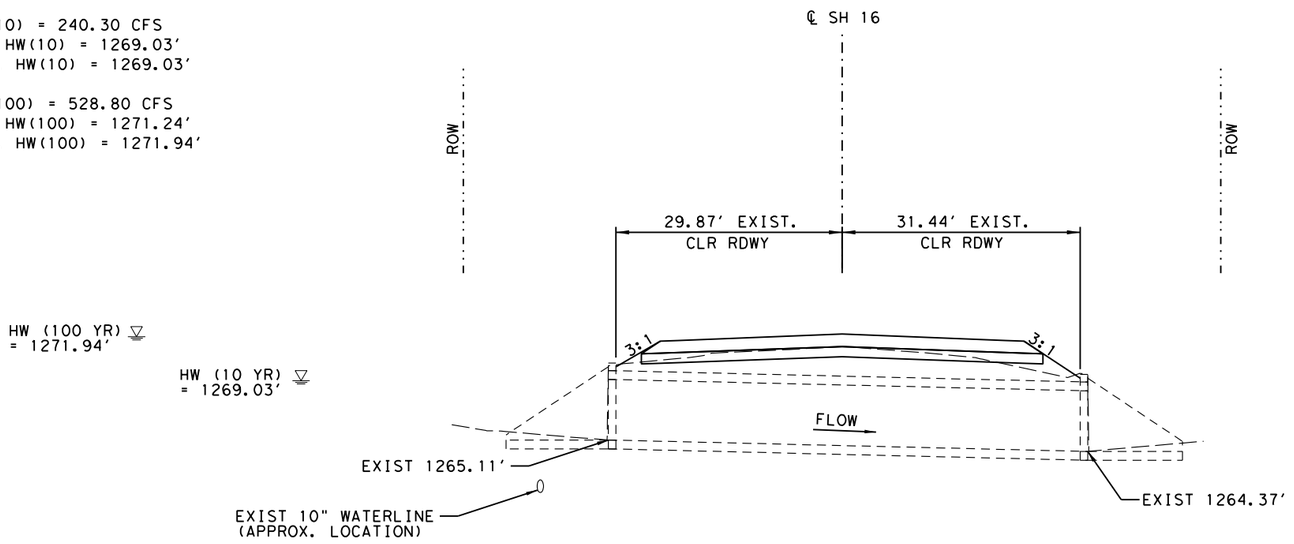
EXIST: 1 - 5' X 6.5' X 45' SBC
PROP: CLEAN CULVERT
PROP: EXTEND EXIST W/ 1 - 5' X 6.5' X 12' SBC (UPSTREAM)
PROP: EXTEND EXIST W/ 1 - 5' X 6.5' X 13' SBC (DOWNSTREAM)
PROP END TREATMENT: INSTALL WINGWALL (PW-1) (HW=8 FT) (UPSTREAM)
PROP END TREATMENT: INSTALL WINGWALL (PW-1) (HW=8 FT) (DOWNSTREAM)
USING STANDARDS: PW, SP, ECD, BCS

NOTES:

1. ALL DIMENSIONS ARE MEASURED NORMAL TO THE ℄ UNLESS OTHERWISE NOTED.
2. HY-8 WAS USED TO CALCULATE THE NORMAL DEPTH TAILWATER ELEVATION OF THE CULVERT.
3. CULVERT CLEANING TO BE CONSIDERED SUBSIDARY.
4. ALL UTILITIES SHOWN ARE TO BE CONSIDERED APPROXIMATE AND FOR CONTRACTOR'S INFORMATION ONLY. CONTRACTOR TO VERIFY LOCATIONS AND DEPTHS PRIOR TO CONSTRUCTION.

Q(10) = 240.30 CFS
EX HW(10) = 1269.03'
PR. HW(10) = 1269.03'

Q(100) = 528.80 CFS
EX HW(100) = 1271.24'
PR. HW(100) = 1271.94'



EX. V(10) = 11.67 FPS
PR. V(10) = 11.67 FPS
EX. TW(10) = 1265.70'
PR. TW(10) = 1265.70'

EX. V(100) = 13.39 FPS
PR. V(100) = 13.74 FPS
EX. TW(100) = 1266.34'
PR. TW(100) = 1266.34'

CULVERT 3 - STA. 252+69

EXIST: 2 - 6' X 4' X 63' SBC
PROP: CLEAN CULVERT

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FIRM #587

SH 16

CULVERT LAYOUT

11/28/2022 SHEET 2 OF 6

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.		HIGHWAY No.
CHECKED:		TEXAS			SH 16
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	BWD	SAN SABA	0289	04	032,ETC	112

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DATE: 11/28/2022 5:35
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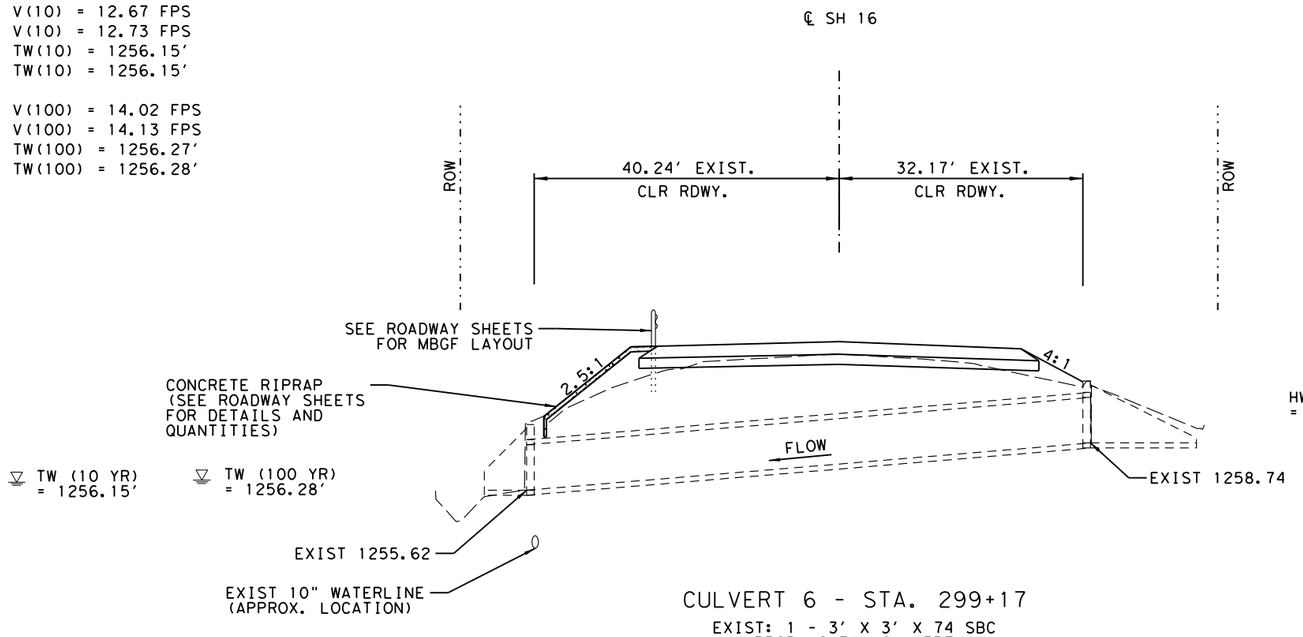
FILE: pw:\\server.sigeng.com:Sigeds\Documents\TxDOT0103 Brownwood SH 16\Design_Data\4 - Design\Plan_Set_1\05_Drainage\SH16_DRN_CULV03.dgn

EX. V(10) = 12.67 FPS
PR. V(10) = 12.73 FPS
EX. TW(10) = 1256.15'
PR. TW(10) = 1256.15'

EX. V(100) = 14.02 FPS
PR. V(100) = 14.13 FPS
EX. TW(100) = 1256.27'
PR. TW(100) = 1256.28'



Q(10) = 22.38 CFS
EX HW(10) = 1260.69'
PR. HW(10) = 1260.72

Q(100) = 33.96 CFS
EX HW(100) = 1261.31'
PR. HW(100) = 1261.36

0 10 20
SCALE: 1" = 20'
VERTICAL SCALE: 1" = 10'

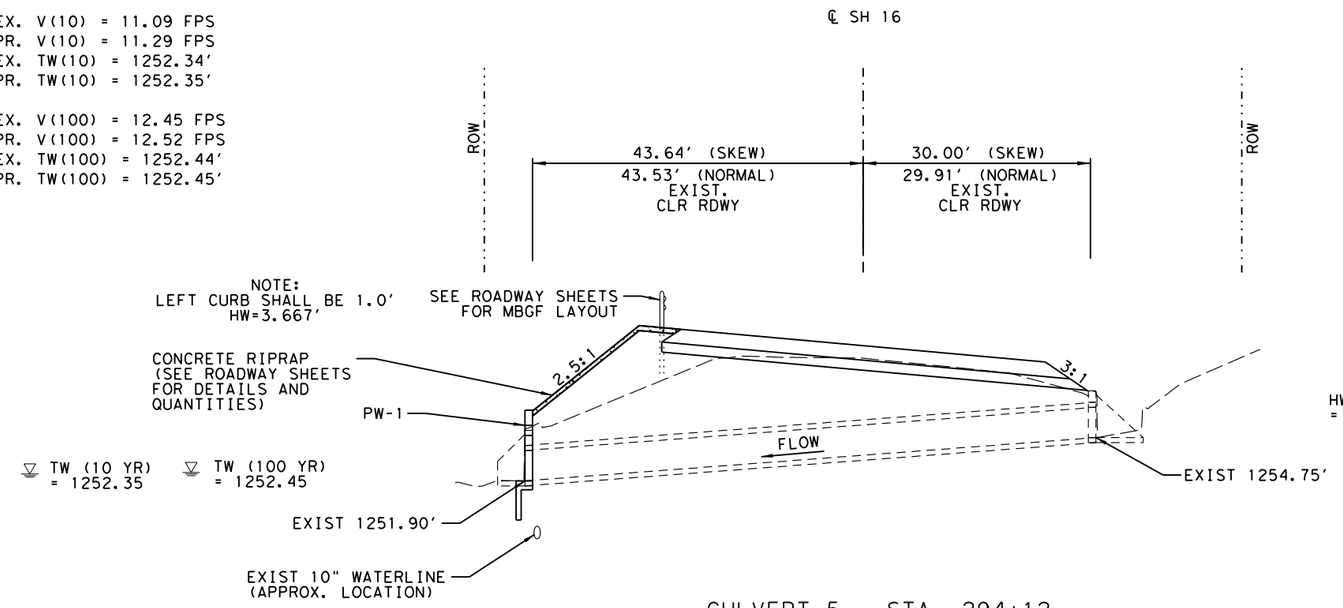
CULVERT 6 - STA. 299+17
EXIST: 1 - 3' X 3' X 74 SBC
PROP: CLEAN CULVERT

NOTES:

1. ALL DIMENSIONS ARE MEASURED NORMAL TO THE ℄ UNLESS OTHERWISE NOTED.
2. HY-8 WAS USED TO CALCULATE THE NORMAL DEPTH TAILWATER ELEVATION OF THE CULVERT.
3. CULVERT CLEANING TO BE CONSIDERED SUBSIDARY.
4. ALL UTILITIES SHOWN ARE TO BE CONSIDERED APPROXIMATE AND FOR CONTRACTOR'S INFORMATION ONLY. CONTRACTOR TO VERIFY LOCATIONS AND DEPTHS PRIOR TO CONSTRUCTION.

EX. V(10) = 11.09 FPS
PR. V(10) = 11.29 FPS
EX. TW(10) = 1252.34'
PR. TW(10) = 1252.35'

EX. V(100) = 12.45 FPS
PR. V(100) = 12.52 FPS
EX. TW(100) = 1252.44'
PR. TW(100) = 1252.45'



Q(10) = 15.86 CFS
EX HW(10) = 1256.30'
PR. HW(10) = 1256.33'

Q(100) = 23.78 CFS
EX HW(100) = 1256.80'
PR. HW(100) = 1256.84'

CULVERT 5 - STA. 294+12
EXIST: 1 - 3' X 2' X 75' SBC @ 4° LFS
PROP: CLEAN CULVERT
PROP END TREATMENT: INSTALL WINGWALL (PW-1) (HW=4 FT) (DOWNSTREAM)
USING STANDARDS: PW, SCC-MD, BCS

ITEM	CODE	DESCRIPTION	QUANT	UNIT	FINAL
403	6001	TEMPORARY SPL SHORING	81	SF	
466	6179	WINGWALL (PW-1)(HW=4 FT)	1	EA	

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SH 16

CULVERT LAYOUT

11/28/2022 SHEET 3 OF 6

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.		HIGHWAY No.	
CHECKED:		TEXAS			SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	BWD	SAN SABA	0289	04	032,ETC	113

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DATE: 11/28/2022 5:35
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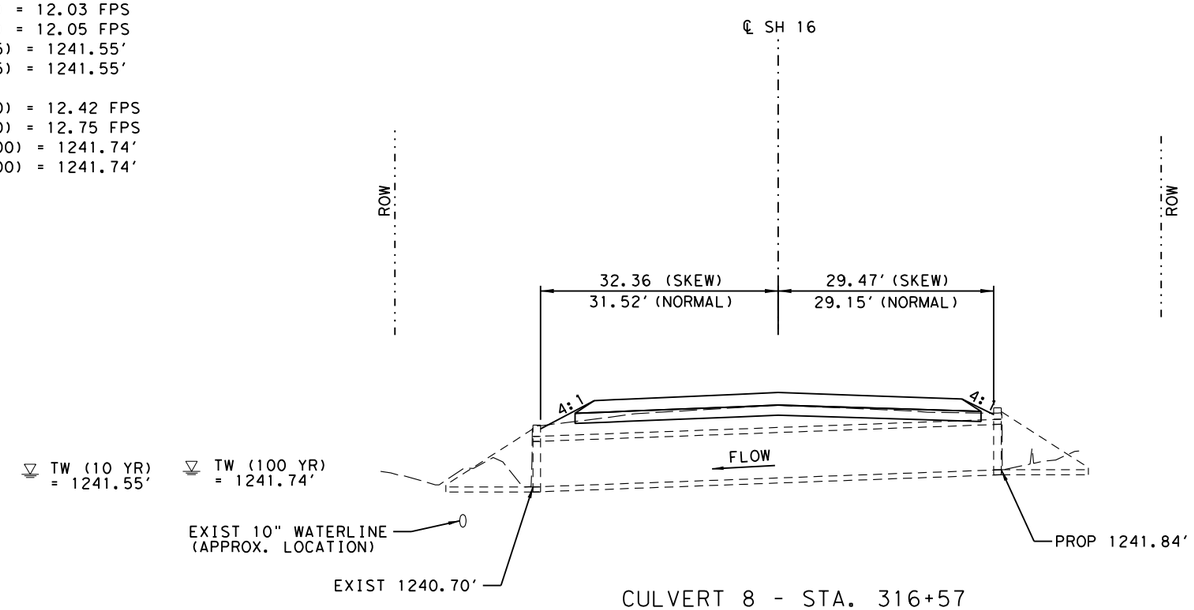
FILE: pw:\\server.sfgeng.com:SfgArcGISDocuments\TxDOT0103 Brownwood SH 16\Design_Data\4 - Design\Plan_Set_1\05_Drainage\SH16_DRN_CULV05.dgn

EX. V(25) = 12.03 FPS
PR. V(25) = 12.05 FPS
EX. TW(25) = 1241.55'
PR. TW(25) = 1241.55'

EX. V(100) = 12.42 FPS
PR. V(100) = 12.75 FPS
EX. TW(100) = 1241.74'
PR. TW(100) = 1241.74'



CULVERT 8 - STA. 316+57

EXIST: 1 - 3' X 3' X 62' SBC AT 9° LT. FWD SKEW
PROP: CLEAN CULVERT

Q(10) = 57.16 CFS
EX HW(10) = 1245.40'
PR. HW(10) = 1245.42'

Q(100) = 87.19 CFS
EX HW(100) = 1245.89'
PR. HW(100) = 1246.40'

HW (100 YR) = 1246.40'
HW (10 YR) = 1245.42'

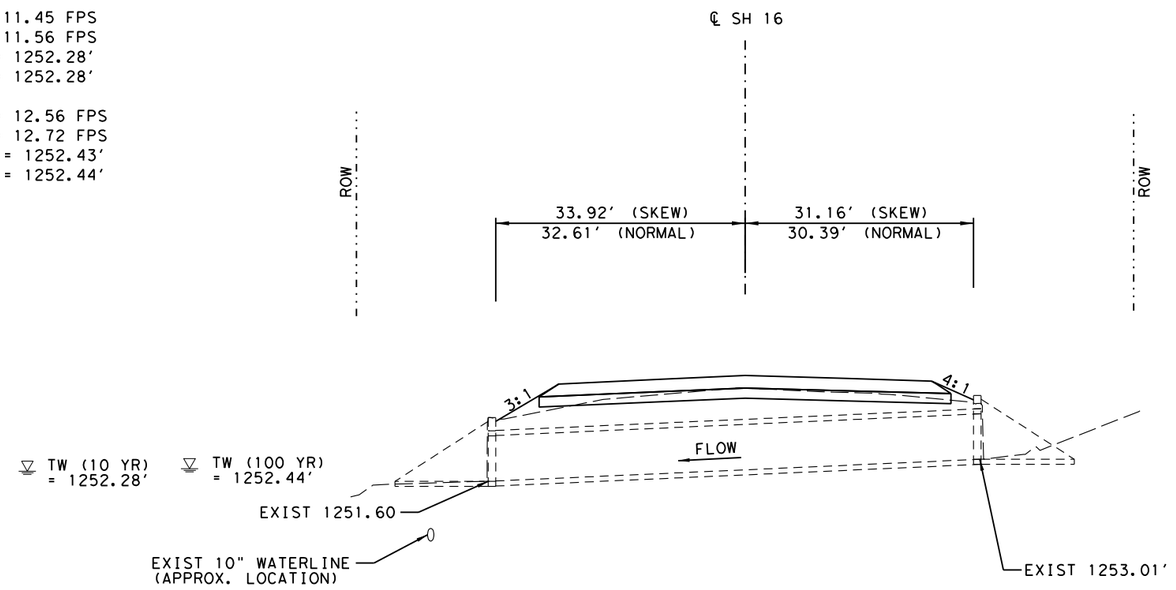
0 10 20
SCALE: 1" = 20'
VERTICAL SCALE: 1" = 10'

NOTES:

1. ALL DIMENSIONS ARE MEASURED NORMAL TO THE ℄ UNLESS OTHERWISE NOTED.
2. HY-8 WAS USED TO CALCULATE THE NORMAL DEPTH TAILWATER ELEVATION OF THE CULVERT.
3. CULVERT CLEANING TO BE CONSIDERED SUBSIDARY.
4. ALL UTILITIES SHOWN ARE TO BE CONSIDERED APPROXIMATE AND FOR CONTRACTOR'S INFORMATION ONLY. CONTRACTOR TO VERIFY LOCATIONS AND DEPTHS PRIOR TO CONSTRUCTION.

EX. V(10) = 11.45 FPS
PR. V(10) = 11.56 FPS
EX. TW(10) = 1252.28'
PR. TW(10) = 1252.28'

EX. V(100) = 12.56 FPS
PR. V(100) = 12.72 FPS
EX. TW(100) = 1252.43'
PR. TW(100) = 1252.44'



CULVERT 7 - STA. 308+03

EXIST: 1 - 3' X 3' X 65' SBC AT 13° LT FWD SKEW
PROP: CLEAN CULVERT

Q(10) = 36.41 CFS
EX HW(10) = 1255.53'
PR. HW(10) = 1255.60'

Q(100) = 55.64 CFS
EX HW(100) = 1256.47'
PR. HW(100) = 1256.49'

HW (100 YR) = 1256.49'
HW (10 YR) = 1255.60'

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SH 16

CULVERT LAYOUT

11/16/2022 SHEET 4 OF 6

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.		HIGHWAY No.
CHECKED:		TEXAS			SH 16
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	BWD	SAN SABA	0289	04	032,ETC	114

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DATE: 11/16/2022
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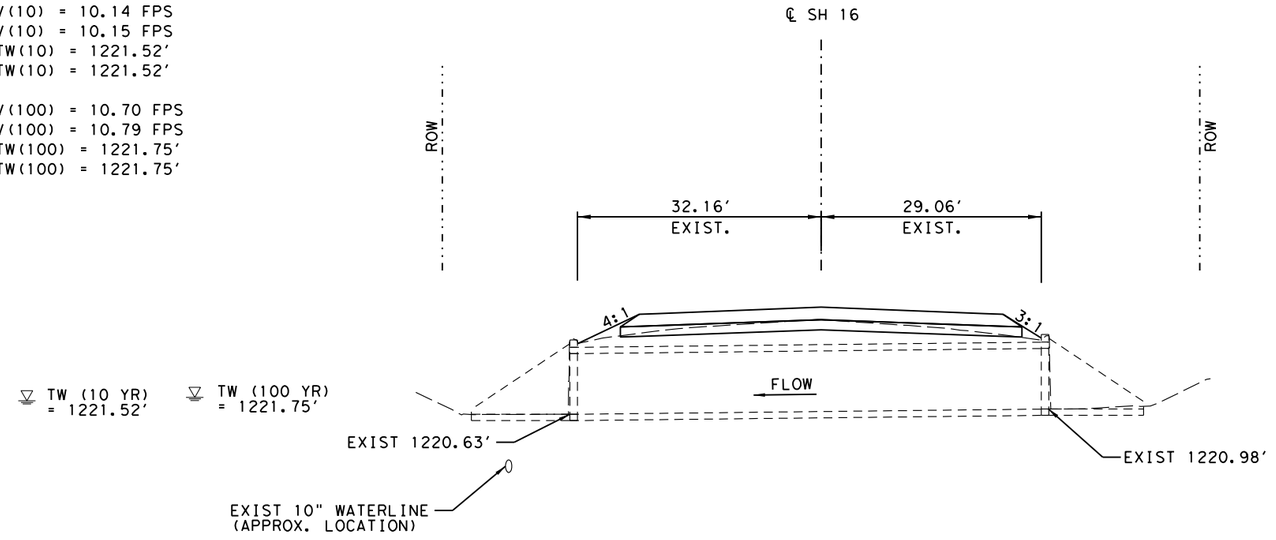
4:41

EX. V(10) = 10.14 FPS
PR. V(10) = 10.15 FPS
EX. TW(10) = 1221.52'
PR. TW(10) = 1221.52'

EX. V(100) = 10.70 FPS
PR. V(100) = 10.79 FPS
EX. TW(100) = 1221.75'
PR. TW(100) = 1221.75'



CULVERT 10 - STA. 338+91
EXIST: 1 - 4' X 4' X 63' SBC
PROP: CLEAN CULVERT

Q(10) = 111.18 CFS
EX HW(10) = 1225.54'
PR. HW(10) = 1225.56'

Q(100) = 170.62 CFS
EX HW(100) = 1226.67'
PR. HW(100) = 1226.85'

HW (100 YR)
= 1227.93'

HW (10 YR)
= 1226.00'

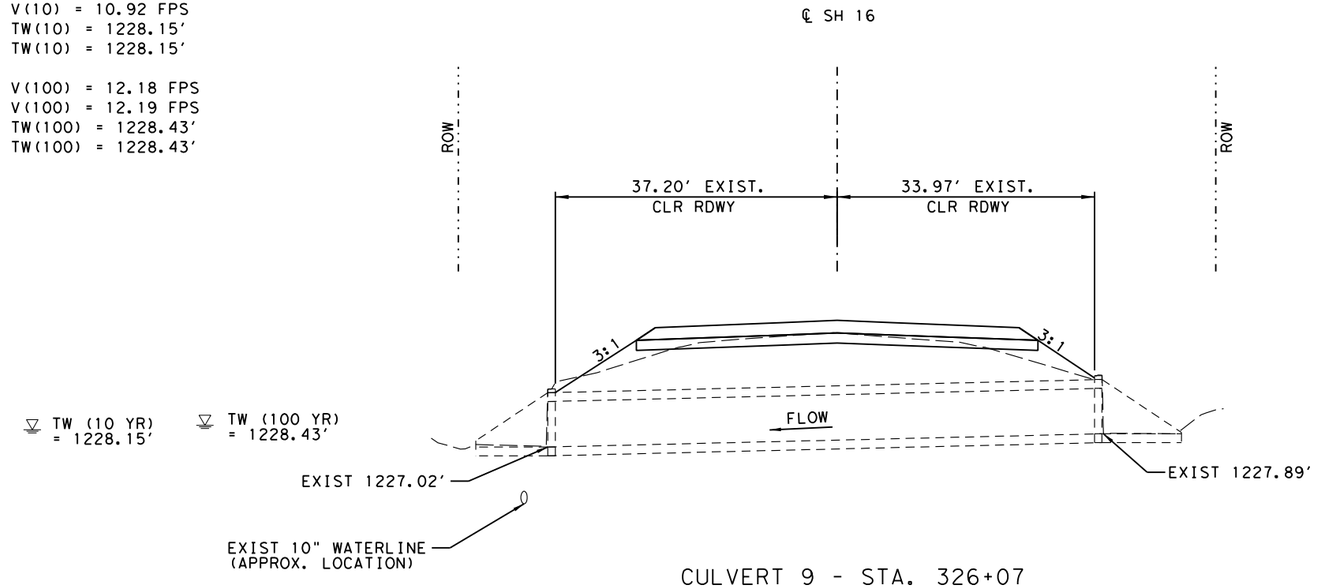
0 10 20
SCALE: 1" = 20'
VERTICAL SCALE: 1" = 10'

NOTES:

1. ALL DIMENSIONS ARE MEASURED NORMAL TO THE ℄ UNLESS OTHERWISE NOTED.
2. HY-8 WAS USED TO CALCULATE THE NORMAL DEPTH TAILWATER ELEVATION OF THE CULVERT.
3. CULVERT CLEANING TO BE CONSIDERED SUBSIDARY.
4. ALL UTILITIES SHOWN ARE TO BE CONSIDERED APPROXIMATE AND FOR CONTRACTOR'S INFORMATION ONLY. CONTRACTOR TO VERIFY LOCATIONS AND DEPTHS PRIOR TO CONSTRUCTION.

EX. V(10) = 10.91 FPS
PR. V(10) = 10.92 FPS
EX. TW(10) = 1228.15'
PR. TW(10) = 1228.15'

EX. V(100) = 12.18 FPS
PR. V(100) = 12.19 FPS
EX. TW(100) = 1228.43'
PR. TW(100) = 1228.43'



CULVERT 9 - STA. 326+07
EXIST: 2 - 6' X 3' X 73' SBC
PROP: CLEAN CULVERT

Q(10) = 174.24 CFS
EX HW(10) = 1231.06'
PR. HW(10) = 1231.06'

Q(100) = 269.55 CFS
EX HW(100) = 1232.46'
PR. HW(100) = 1232.47'

HW (100 YR)
= 1232.47'

HW (10 YR)
= 1231.06'

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SH 16

CULVERT LAYOUT

11/16/2022 SHEET 5 OF 6

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.		HIGHWAY No.
CHECKED:		TEXAS			SH 16

DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	BWD	SAN SABA	0289	04	032,ETC	115

USER: acardenas
DATE: 11/16/2022 4:41
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0 10 20

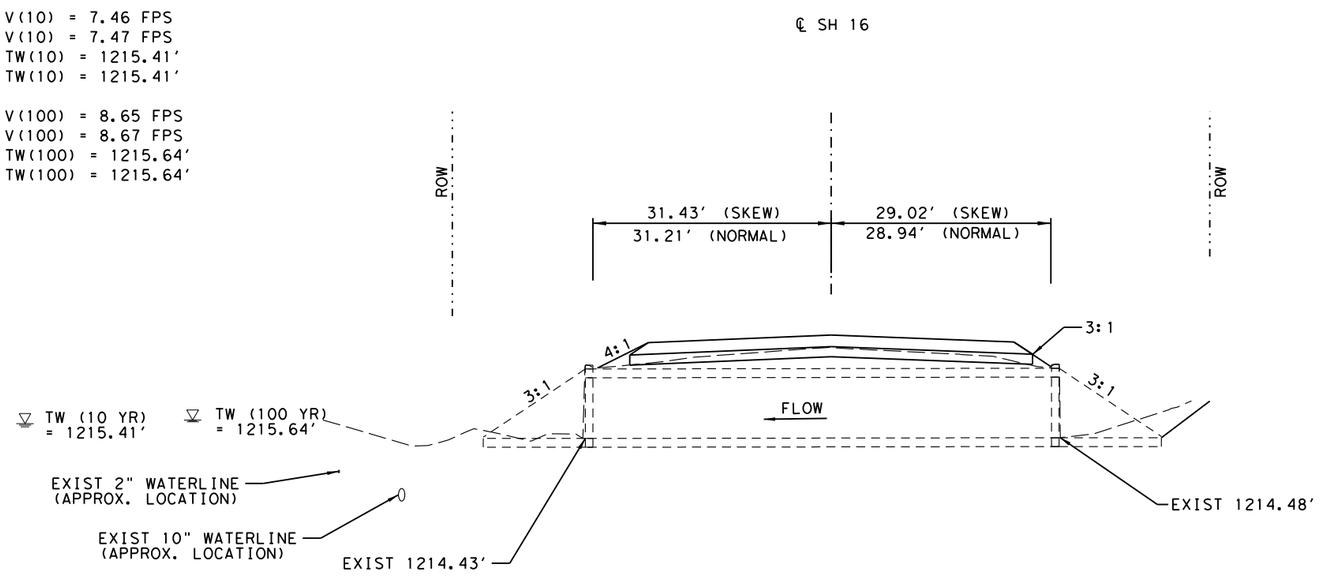
SCALE: 1" = 20'
VERTICAL SCALE: 1" = 10'

NOTES:

1. ALL DIMENSIONS ARE MEASURED NORMAL TO THE ℄ UNLESS OTHERWISE NOTED.
2. HY-8 WAS USED TO CALCULATE THE NORMAL DEPTH TAILWATER ELEVATION OF THE CULVERT.
3. CULVERT CLEANING TO BE CONSIDERED SUBSIDARY.
4. ALL UTILITIES SHOWN ARE TO BE CONSIDERED APPROXIMATE AND FOR CONTRACTOR'S INFORMATION ONLY. CONTRACTOR TO VERIFY LOCATIONS AND DEPTHS PRIOR TO CONSTRUCTION.

EX. V(10) = 7.46 FPS
PR. V(10) = 7.47 FPS
EX. TW(10) = 1215.41'
PR. TW(10) = 1215.41'

EX. V(100) = 8.65 FPS
PR. V(100) = 8.67 FPS
EX. TW(100) = 1215.64'
PR. TW(100) = 1215.64'



CULVERT 11 - STA. 347+27
EXIST: 1 - 6' X 4' X 63' SBC AT 6° LT FWD SKEW
PROP: CLEAN CULVERT

Q(10) = 77.78 CFS
EX HW(10) = 1217.40'
PR. HW(10) = 1217.47'

Q(100) = 121.50 CFS
EX HW(100) = 1218.40'
PR. HW(100) = 1218.42'

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SH 16

CULVERT LAYOUT

11/16/2022 SHEET 6 OF 6

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.
CHECKED:		TEXAS				SH 16
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	BWD	SAN SABA	0289	04	032,ETC	116

USER: acardenas
DATE: 11/16/2022
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4:41

HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Recurrence

Table 1 - Summary of Culvert Flows at Crossing: Culvert 1 EXIST

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1233.19	10 yr	332.80	268.86	63.42	11
1233.56	100 yr	656.30	290.29	365.56	4
1233.02	Overtopping	258.42	258.42	0.00	Overtopping

Table 2 - Culvert Summary Table: Culvert 1

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
10 yr	332.80	268.86	1233.19	4.550	2.804	5-S2n	1.292	2.498	1.604	2.725	13.964	2.699
100 yr	656.30	290.29	1233.56	4.923	4.039	5-JS1f	1.361	2.629	3.000	3.705	8.064	3.217

****

Straight Culvert

Inlet Elevation (invert): 1228.64 ft, Outlet Elevation (invert): 1227.18 ft

Culvert Length: 65.02 ft, Culvert Slope: 0.0224

****

Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 1228.64 ft

Outlet Station: 65.00 ft

Outlet Elevation: 1227.18 ft

Number of Barrels: 2

Culvert Data Summary - Culvert 1

Barrel Shape: Concrete Box

Barrel Span: 6.00 ft

Barrel Rise: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90 & 15° flare) Wingwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: Culvert 1 EXIST)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
332.80	1229.91	2.73	2.70	0.34	0.36
656.30	1230.89	3.71	3.22	0.46	0.38

Tailwater Channel Data - Culvert 1 EXIST

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 18.00 ft

Side Slope (H:V): 10.00 (_:1)

Channel Slope: 0.0020

Channel Manning's n: 0.0350

Channel Invert Elevation: 1227.18 ft

Roadway Data for Crossing: Culvert 1 EXIST

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 300.00 ft

Crest Elevation: 1233.02 ft

Roadway Surface: Paved

Roadway Top Width: 35.00 ft

Crossing Discharge Data

Discharge Selection Method: Recurrence

Table 4 - Summary of Culvert Flows at Crossing: Culvert 1 PROP

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1232.18	10 yr	332.80	332.80	0.00	1
1235.31	100 yr	656.30	621.27	34.61	11
1235.22	Overtopping	593.48	593.48	0.00	Overtopping

Table 5 - Culvert Summary Table: Culvert 1

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
10 yr	332.80	332.80	1232.18	3.538	1.889	5-S2n	1.137	2.198	1.385	2.470	13.353	2.657
100 yr	656.30	621.27	1235.31	6.668	4.998	5-S2n	1.747	3.000	2.234	3.421	15.447	3.186

****

Straight Culvert

Inlet Elevation (invert): 1228.64 ft, Outlet Elevation (invert): 1227.19 ft

Culvert Length: 65.30 ft, Culvert Slope: 0.0222

****

Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 1228.64 ft

Outlet Station: 65.28 ft

Outlet Elevation: 1227.19 ft

Number of Barrels: 3

Culvert Data Summary - Culvert 1

Barrel Shape: Concrete Box

Barrel Span: 6.00 ft

Barrel Rise: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: 1:1 Bevel (45° flare) Wingwall

Inlet Depression: None

Table 6 - Downstream Channel Rating Curve (Crossing: Culvert 1 PROP)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
332.80	1229.66	2.47	2.66	0.31	0.36
656.30	1230.61	3.42	3.19	0.43	0.38

Tailwater Channel Data - Culvert 1 PROP

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 26.00 ft

Side Slope (H:V): 10.00 (_:1)

Channel Slope: 0.0020

Channel Manning's n: 0.0350

Channel Invert Elevation: 1227.19 ft

Roadway Data for Crossing: Culvert 1 PROP

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Irregular Roadway Cross-Section:

Coord No.	Station (ft)	Elevation (ft)
0	9500.00	1234.94
1	9589.62	1235.22
2	9700.00	1235.26

Roadway Surface: Paved

Roadway Top Width: 48.00 ft

NO.	REVISION	BY	DATE

STATE OF TEXAS
ANDRES M. CARDENAS
88453
LICENSED
PROFESSIONAL ENGINEER

11/16/2022

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FIRM #587

SH 16
CULVERT CALCULATIONS

CULVERT 1

11/16/2022 SHEET 1 OF 11

DESIGNED:	FED. RD DIV. NO.	STATE	FEDERAL AID PROJECT No.	HIGHWAY No.
CHECKED:		TEXAS		SH 16
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	BWD	SAN SABA	0289	04	032,ETC	117

USER: acardenas
DATE: 11/16/2022
SCRIPT: pw://server.a9eng.com:Sky-de/Documents/TxDOT0103 Brownwood SH 16/Design_Data/4 - Design/Plan_Set_1/05. Drainage/Plotting/SH 16_DRAINAGE.pen
FILE: pw://server.a9eng.com:Sky-de/Documents/TxDOT0103 Brownwood SH 16/Design_Data/4 - Design/Plan_Set_1/05. Drainage/SH16_DRN_CALC01.dgn
4/41

HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Recurrence

Table 1 - Summary of Culvert Flows at Crossing: Culvert 2 EXIST

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1259.01	10 yr	61.03	61.03	0.00	1
1260.06	100 yr	95.00	84.93	9.62	6
1260.01	Overtopping	83.89	83.89	0.00	Overtopping

Table 2 - Culvert Summary Table: Culvert 2

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
10 yr	61.03	61.03	1259.01	3.294	2.114	5-S2n	1.493	1.934	1.573	0.877	9.698	4.148
100 yr	95.00	84.93	1260.06	4.339	3.579	5-S2n	1.903	2.410	2.009	1.082	10.568	4.664

****

Straight Culvert

Inlet Elevation (invert): 1255.72 ft, Outlet Elevation (invert): 1255.16 ft

Culvert Length: 67.00 ft, Culvert Slope: 0.0084

****

Site Data - Culvert 2

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 1255.72 ft

Outlet Station: 67.00 ft

Outlet Elevation: 1255.16 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 2

Barrel Shape: Concrete Box

Barrel Span: 4.00 ft

Barrel Rise: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90 & 15º flare) Wingwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: Culvert 2 EXIST)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
61.03	1256.04	0.88	4.15	1.09	0.96
95.00	1256.24	1.08	4.66	1.35	0.99

Tailwater Channel Data - Culvert 2 EXIST

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 8.00 ft

Side Slope (H:V): 10.00 (_:1)

Channel Slope: 0.0200

Channel Manning's n: 0.0350

Channel Invert Elevation: 1255.16 ft

Roadway Data for Crossing: Culvert 2 EXIST

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 300.00 ft

Crest Elevation: 1260.01 ft

Roadway Surface: Paved

Roadway Top Width: 35.00 ft

Crossing Discharge Data

Discharge Selection Method: Recurrence

Table 4 - Summary of Culvert Flows at Crossing: Culvert 2 PROP

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	Culvert 2 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1259.10	10 yr	70.76	70.76	0.00	1
1260.48	100 yr	110.14	101.77	8.21	11
1261.17	Overtopping	94.29	94.29	0.00	Overtopping

Table 5 - Culvert Summary Table: Culvert 2

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
10 yr	70.76	70.76	1259.10	3.376	2.515	5-S2n	1.663	2.134	1.755	0.942	10.080	4.315
100 yr	110.14	101.77	1260.48	4.765	4.247	5-S2n	2.181	2.719	2.303	1.159	11.049	4.849

****

Straight Culvert

Inlet Elevation (invert): 1255.72 ft, Outlet Elevation (invert): 1255.16 ft

Culvert Length: 67.00 ft, Culvert Slope: 0.0084

****

Site Data - Culvert 2

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 1255.72 ft

Outlet Station: 67.00 ft

Outlet Elevation: 1255.16 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 2

Barrel Shape: Concrete Box

Barrel Span: 4.00 ft

Barrel Rise: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (30-75º flare) Wingwall

Inlet Depression: None

Table 6 - Downstream Channel Rating Curve (Crossing: Culvert 2 PROP)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
70.76	1256.10	0.94	4.31	1.18	0.97
110.14	1256.32	1.16	4.85	1.45	1.00

Tailwater Channel Data - Culvert 2 PROP

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 8.00 ft

Side Slope (H:V): 10.00 (_:1)

Channel Slope: 0.0200

Channel Manning's n: 0.0350

Channel Invert Elevation: 1255.16 ft

Roadway Data for Crossing: Culvert 2 PROP

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Irregular Roadway Cross-Section:

Coord No.	Station (ft)	Elevation (ft)
0	21600.00	1260.11
1	21696.75	1261.17
2	21800.00	1261.87

Roadway Surface: Paved

Roadway Top Width: 48.00 ft

NO.	REVISION	BY	DATE

STATE OF TEXAS
ANDRES M. CARDENAS
88453
LICENSED
PROFESSIONAL ENGINEER

11/16/2022

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FIRM #587

SH 16
CULVERT CALCULATIONS

CULVERT 2

11/16/2022 SHEET 2 OF 11

DESIGNED:	FED. RD DIV. NO.	STATE	FEDERAL AID PROJECT No.	HIGHWAY No.
CHECKED:		TEXAS		SH 16

DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	BWD	SAN SABA	0289	04	032,ETC	118

USER: acardenas
DATE: 11/16/2022
SCRIPT: pw://server.rtg-eng.com:Rtg-fs/Documents/TxDOT0103 Brownwood SH 16/Design_Data/4 - Design/Plan_Set_1/05. Drainage/Plotting/SH 16_DRAINAGE.pen
FILE: pw://server.rtg-eng.com:Rtg-fs/Documents/TxDOT0103 Brownwood SH 16/Design_Data/4 - Design/Plan_Set_1/05. Drainage/SH16_DRN_CALC02.dgn
442

HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Recurrence

Table 1 - Summary of Culvert Flows at Crossing: Culvert 3 EXIST

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1269.03	10 yr	240.30	240.30	0.00	1
1271.24	100 yr	528.80	415.85	112.01	7
1270.98	Overtopping	398.37	398.37	0.00	Overtopping

Table 2 - Culvert Summary Table: Culvert 3

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
10 yr	240.30	240.30	1269.03	3.907	2.227	1-S2n	1.482	2.318	1.715	1.336	11.674	5.737
100 yr	528.80	415.85	1271.24	6.115	4.904	5-S2n	2.183	3.341	2.588	1.971	13.389	7.115

****

Straight Culvert

Inlet Elevation (invert): 1265.12 ft, Outlet Elevation (invert): 1264.37 ft

Culvert Length: 63.00 ft, Culvert Slope: 0.0120

****

Site Data - Culvert 3

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 1265.12 ft

Outlet Station: 63.00 ft

Outlet Elevation: 1264.37 ft

Number of Barrels: 2

Culvert Data Summary - Culvert 3

Barrel Shape: Concrete Box

Barrel Span: 6.00 ft

Barrel Rise: 4.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90 & 15° flare) Wingwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: Culvert 3 EXIST)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
240.30	1265.70	1.34	5.74	1.67	1.04
528.80	1266.34	1.97	7.11	2.46	1.10

Tailwater Channel Data - Culvert 3 EXIST

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 18.00 ft

Side Slope (H:V): 10.00 (_:1)

Channel Slope: 0.0200

Channel Manning's n: 0.0350

Channel Invert Elevation: 1264.37 ft

Roadway Data for Crossing: Culvert 3 EXIST

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 300.00 ft

Crest Elevation: 1270.98 ft

Roadway Surface: Paved

Roadway Top Width: 35.00 ft

Crossing Discharge Data

Discharge Selection Method: Recurrence

Table 4 - Summary of Culvert Flows at Crossing: Culvert 3 PROP

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	Culvert 3 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1269.03	10 yr	240.30	240.30	0.00	1
1271.94	100 yr	528.80	461.75	66.97	6
1271.64	Overtopping	428.29	428.29	0.00	Overtopping

Table 5 - Culvert Summary Table: Culvert 3

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
10 yr	240.30	240.30	1269.03	3.907	2.227	1-S2n	1.482	2.318	1.715	1.336	11.674	5.737
100 yr	528.80	461.75	1271.94	6.821	5.488	5-S2n	2.355	3.583	2.801	1.971	13.739	7.115

* **********

Straight Culvert

Inlet Elevation (invert): 1265.12 ft, Outlet Elevation (invert): 1264.37 ft

Culvert Length: 63.00 ft, Culvert Slope: 0.0120

****

Site Data - Culvert 3

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 1265.12 ft

Outlet Station: 63.00 ft

Outlet Elevation: 1264.37 ft

Number of Barrels: 2

Culvert Data Summary - Culvert 3

Barrel Shape: Concrete Box

Barrel Span: 6.00 ft

Barrel Rise: 4.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90 & 15° flare) Wingwall

Inlet Depression: None

Table 6 - Downstream Channel Rating Curve (Crossing: Culvert 3 PROP)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
240.30	1265.70	1.34	5.74	1.67	1.04
528.80	1266.34	1.97	7.11	2.46	1.10

Tailwater Channel Data - Culvert 3 PROP

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 18.00 ft

Side Slope (H:V): 10.00 (_:1)

Channel Slope: 0.0200

Channel Manning's n: 0.0350

Channel Invert Elevation: 1264.37 ft

Roadway Data for Crossing: Culvert 3 PROP

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Irregular Roadway Cross-Section:

Coord No.	Station (ft)	Elevation (ft)
0	25200.00	1271.42
1	25269.88	1271.64
2	25300.00	1271.73

Roadway Surface: Paved

Roadway Top Width: 48.00 ft

NO.	REVISION	BY	DATE

STATE OF TEXAS
ANDRES M. CARDENAS
88453
LICENSED
PROFESSIONAL ENGINEER

11/16/2022

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FIRM #587

SH 16
CULVERT CALCULATIONS

CULVERT 3

11/16/2022 SHEET 3 OF 11

DESIGNED:	FED. RD DIV. NO.	STATE	FEDERAL AID PROJECT No.		HIGHWAY No.	
CHECKED:		TEXAS			SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	BWD	SAN SABA	0289	04	032,ETC	119

USER: acardenas
DATE: 11/16/2022
SCRIPT: pw://server.allgeng.com:Sky-ds/Documents/TxDOT0103 Brownwood SH 16/Design_Data/4 - Design/Plan_Set_1/05. Drainage/Plotting/SH 16_DRAINAGE.pen
FILE: pw://server.allgeng.com:Sky-ds/Documents/TxDOT0103 Brownwood SH 16/Design_Data/4 - Design/Plan_Set_1/05. Drainage/SH16_DRN_CALC02.dgn
442

HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: User Defined

Table 1 - Summary of Culvert Flows at Crossing: Culvert 4 EXIST

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	Culvert 4 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1257.46	10 yr	154.16	154.16	0.00	1
1259.35	100 yr	241.43	241.43	0.00	1
1261.06	Overtopping	315.06	315.06	0.00	Overtopping

Table 2 - Culvert Summary Table: Culvert 4

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
10 yr	154.16	154.16	1257.46	5.202	3.236	1-S2n	2.285	3.091	2.590	1.064	11.905	5.060
100 yr	241.43	241.43	1259.35	7.093	5.135	5-S2n	3.210	4.168	3.608	1.339	13.384	5.744

****

Straight Culvert

Inlet Elevation (invert): 1252.26 ft, Outlet Elevation (invert): 1251.84 ft

Culvert Length: 45.00 ft, Culvert Slope: 0.0093

****

Site Data - Culvert 4

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 1252.26 ft

Outlet Station: 45.00 ft

Outlet Elevation: 1251.84 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 4

Barrel Shape: Concrete Box

Barrel Span: 5.00 ft

Barrel Rise: 6.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90°) Headwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: Culvert 4 EXIST)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
154.16	1252.90	1.06	5.06	1.33	1.01
241.43	1253.18	1.34	5.74	1.67	1.04

Tailwater Channel Data - Culvert 4 EXIST

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 18.00 ft

Side Slope (H:V): 10.00 (_:1)

Channel Slope: 0.0200

Channel Manning's n: 0.0350

Channel Invert Elevation: 1251.84 ft

Roadway Data for Crossing: Culvert 4 EXIST

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 300.00 ft

Crest Elevation: 1261.06 ft

Roadway Surface: Paved

Roadway Top Width: 35.00 ft

Crossing Discharge Data

Discharge Selection Method: User Defined

Table 4 - Summary of Culvert Flows at Crossing: Culvert 4 PROP

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	Culvert 4 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1257.53	10 yr	170.50	170.50	0.00	1
1259.45	100 yr	267.02	267.02	0.00	1
1261.11	Overtopping	345.93	345.93	0.00	Overtopping

Table 5 - Culvert Summary Table: Culvert 4

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
10 yr	170.50	170.50	1257.53	5.190	3.285	1-S2n	2.506	3.305	2.743	1.121	12.431	5.208
100 yr	267.02	267.02	1259.45	7.105	5.294	5-S2n	3.534	4.458	3.836	1.409	13.921	5.908

****

Straight Culvert

Inlet Elevation (invert): 1252.34 ft, Outlet Elevation (invert): 1251.73 ft

Culvert Length: 68.41 ft, Culvert Slope: 0.0089

****

Site Data - Culvert 4

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 1252.34 ft

Outlet Station: 68.41 ft

Outlet Elevation: 1251.73 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 4

Barrel Shape: Concrete Box

Barrel Span: 5.00 ft

Barrel Rise: 6.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: 1:1 Bevel Headwall

Inlet Depression: None

Table 6 - Downstream Channel Rating Curve (Crossing: Culvert 4 PROP)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
170.50	1252.85	1.12	5.21	1.40	1.02
267.02	1253.14	1.41	5.91	1.76	1.05

Tailwater Channel Data - Culvert 4 PROP

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 18.00 ft

Side Slope (H:V): 10.00 (_:1)

Channel Slope: 0.0200

Channel Manning's n: 0.0350

Channel Invert Elevation: 1251.73 ft

Roadway Data for Crossing: Culvert 4 PROP

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Irregular Roadway Cross-Section:

Coord No.	Station (ft)	Elevation (ft)
0	28800.00	1262.19
1	28869.32	1261.38
2	28900.00	1261.11

Roadway Surface: Paved

Roadway Top Width: 48.00 ft

NO.	REVISION	BY	DATE

ANDRES M. CARDENAS
88453
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS
11/28/2022

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FIRM #587

SH 16
CULVERT CALCULATIONS

CULVERT 4

11/28/2022 SHEET 4 OF 11

DESIGNED:	FED. RD DIV. NO.	STATE	FEDERAL AID PROJECT No.	HIGHWAY No.
CHECKED:		TEXAS		SH 16

DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	BWD	SAN SABA	0289	04	032,ETC	120

USER: acardenas
DATE: 11/28/2022 5:35
SCRPT: pw://server.aligeng.com:Sky-ds/Documents/TxDOT/0103 Brownwood SH 16/Design_Data/4 - Design/Plan_Set_1/05. Drainage/Plotting/SH 16_DRAINAGE.pen
FILE: pw://server.aligeng.com:Sky-ds/Documents/TxDOT/0103 Brownwood SH 16/Design_Data/4 - Design/Plan_Set_1/05. Drainage/SH16_DRN_CALC04.dgn

HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Recurrence

Table 1 - Summary of Culvert Flows at Crossing: Culvert 5 EXIST

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1256.30	10 yr	15.46	15.46	0.00	1
1256.80	100 yr	23.18	23.18	0.00	1
1259.68	Overtopping	55.14	55.14	0.00	Overtopping

Table 2 - Culvert Summary Table: Culvert 5

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
10 yr	15.46	15.46	1256.30	1.550	0.0*	1-S2n	0.438	0.938	0.465	0.440	11.087	2.832
100 yr	23.18	23.18	1256.80	2.053	0.0*	5-S2n	0.574	1.229	0.621	0.543	12.452	3.180

* Full Flow Headwater elevation is below inlet invert.

****

Straight Culvert

Inlet Elevation (invert): 1254.75 ft, Outlet Elevation (invert): 1251.90 ft

Culvert Length: 75.05 ft, Culvert Slope: 0.0380

****

Site Data - Culvert 5

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 1254.75 ft

Outlet Station: 75.00 ft

Outlet Elevation: 1251.90 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 5

Barrel Shape: Concrete Box

Barrel Span: 3.00 ft

Barrel Rise: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90 & 15º flare) Wingwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: Culvert 5 EXIST)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
15.46	1252.34	0.44	2.83	0.55	0.88
23.18	1252.44	0.54	3.18	0.68	0.90

Tailwater Channel Data - Culvert 5 EXIST

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 8.00 ft

Side Slope (H:V): 10.00 (_:1)

Channel Slope: 0.0200

Channel Manning's n: 0.0350

Channel Invert Elevation: 1251.90 ft

Roadway Data for Crossing: Culvert 5 EXIST

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 300.00 ft

Crest Elevation: 1259.68 ft

Roadway Surface: Paved

Roadway Top Width: 35.00 ft

Crossing Discharge Data

Discharge Selection Method: Recurrence

Table 4 - Summary of Culvert Flows at Crossing: Culvert 5 PROP

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	Culvert 5 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1256.22	10 yr	15.86	15.86	0.00	1
1256.69	100 yr	23.78	23.78	0.00	1
1259.72	Overtopping	61.93	61.93	0.00	Overtopping

Table 5 - Culvert Summary Table: Culvert 5

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
10 yr	15.86	15.86	1256.22	1.470	0.0*	1-S2n	0.445	0.954	0.468	0.446	11.293	2.854
100 yr	23.78	23.78	1256.69	1.944	0.0*	1-S2n	0.584	1.250	0.633	0.550	12.518	3.203

* Full Flow Headwater elevation is below inlet invert.

****

Straight Culvert

Inlet Elevation (invert): 1254.75 ft, Outlet Elevation (invert): 1251.90 ft

Culvert Length: 75.05 ft, Culvert Slope: 0.0380

****

Site Data - Culvert 5

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 1254.75 ft

Outlet Station: 75.00 ft

Outlet Elevation: 1251.90 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 5

Barrel Shape: Concrete Box

Barrel Span: 3.00 ft

Barrel Rise: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: 1:1 Bevel Headwall

Inlet Depression: None

Table 6 - Downstream Channel Rating Curve (Crossing: Culvert 5 PROP)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
15.86	1252.35	0.45	2.85	0.56	0.88
23.78	1252.45	0.55	3.20	0.69	0.90

Tailwater Channel Data - Culvert 5 PROP

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 8.00 ft

Side Slope (H:V): 10.00 (_:1)

Channel Slope: 0.0200

Channel Manning's n: 0.0350

Channel Invert Elevation: 1251.90 ft

Roadway Data for Crossing: Culvert 5 PROP

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Irregular Roadway Cross-Section:

Coord No.	Station (ft)	Elevation (ft)
0	29300.00	1259.70
1	29414.11	1259.72
2	29500.00	1259.98

Roadway Surface: Paved

Roadway Top Width: 48.00 ft

NO.	REVISION	BY	DATE

STATE OF TEXAS
ANDRES M. CARDENAS
88453
LICENSED PROFESSIONAL ENGINEER

11/16/2022

Texas Department of Transportation
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FIRM #587

SH 16
CULVERT CALCULATIONS

CULVERT 5

11/16/2022 SHEET 5 OF 11

DESIGNED:	FED. RD DIV. NO.	STATE	FEDERAL AID PROJECT No.		HIGHWAY No.	
CHECKED:		TEXAS			SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	BWD	SAN SABA	0289	04	032,ETC	121

USER: acardenas
DATE: 11/16/2022
SCRPT: pw://server.stg-eng.com:Stg-ds/Documents/TxDOT0103 Brownwood SH 16/Design_Data/4 - Design/Plan_Set_1/05. Drainage/Plotting/SH 16_DRAINAGE.pen
FILE: pw://server.stg-eng.com:Stg-ds/Documents/TxDOT0103 Brownwood SH 16/Design_Data/4 - Design/Plan_Set_1/05. Drainage/SH16_DRN_CALC05.dgn
442

HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Recurrence

Table 1 - Summary of Culvert Flows at Crossing: Culvert 6 EXIST

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1260.68	10 yr	21.74	21.74	0.00	1
1261.31	100 yr	32.98	32.98	0.00	1
1264.30	Overtopping	81.24	81.24	0.00	Overtopping

Table 2 - Culvert Summary Table: Culvert 6

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
10 yr	21.74	21.74	1260.68	1.938	0.0*	1-S2n	0.531	1.177	0.572	0.525	12.668	3.123
100 yr	32.98	32.98	1261.31	2.566	0.0*	1-S2n	0.704	1.554	0.784	0.649	14.016	3.509

* Full Flow Headwater elevation is below inlet invert.

****

Straight Culvert

Inlet Elevation (invert): 1258.74 ft, Outlet Elevation (invert): 1255.62 ft

Culvert Length: 74.07 ft, Culvert Slope: 0.0422

****

Site Data - Culvert 6

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 1258.74 ft

Outlet Station: 74.00 ft

Outlet Elevation: 1255.62 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 6

Barrel Shape: Concrete Box

Barrel Span: 3.00 ft

Barrel Rise: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90 & 15º flare) Wingwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: Culvert 6 EXIST)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
21.74	1256.15	0.53	3.12	0.66	0.90
32.98	1256.27	0.65	3.51	0.81	0.92

Tailwater Channel Data - Culvert 6 EXIST

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 8.00 ft

Side Slope (H:V): 10.00 (_:1)

Channel Slope: 0.0200

Channel Manning's n: 0.0350

Channel Invert Elevation: 1255.62 ft

Roadway Data for Crossing: Culvert 6 EXIST

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 300.00 ft

Crest Elevation: 1264.30 ft

Roadway Surface: Paved

Roadway Top Width: 35.00 ft

Crossing Discharge Data

Discharge Selection Method: Recurrence

Table 4 - Summary of Culvert Flows at Crossing: Culvert 6 PROP

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	Culvert 6 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1260.72	10 yr	22.38	22.38	0.00	1
1261.36	100 yr	33.96	33.96	0.00	1
1264.73	Overtopping	69.57	69.57	0.00	Overtopping

Table 5 - Culvert Summary Table: Culvert 6

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
10 yr	22.38	22.38	1260.72	1.976	0.0*	1-S2n	0.541	1.200	0.586	0.533	12.727	3.149
100 yr	33.96	33.96	1261.36	2.618	0.0*	1-S2n	0.718	1.585	0.801	0.658	14.129	3.537

* Full Flow Headwater elevation is below inlet invert.

****

Straight Culvert

Inlet Elevation (invert): 1258.74 ft, Outlet Elevation (invert): 1255.62 ft

Culvert Length: 74.07 ft, Culvert Slope: 0.0422

****

Site Data - Culvert 6

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 1258.74 ft

Outlet Station: 74.00 ft

Outlet Elevation: 1255.62 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 6

Barrel Shape: Concrete Box

Barrel Span: 3.00 ft

Barrel Rise: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90 & 15º flare) Wingwall

Inlet Depression: None

Table 6 - Downstream Channel Rating Curve (Crossing: Culvert 6 PROP)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
22.38	1256.15	0.53	3.15	0.67	0.90
33.96	1256.28	0.66	3.54	0.82	0.93

Tailwater Channel Data - Culvert 6 PROP

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 8.00 ft

Side Slope (H:V): 10.00 (_:1)

Channel Slope: 0.0200

Channel Manning's n: 0.0350

Channel Invert Elevation: 1255.62 ft

Roadway Data for Crossing: Culvert 6 PROP

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Irregular Roadway Cross-Section:

Coord No.	Station (ft)	Elevation (ft)
0	29800.00	1263.42
1	29918.96	1264.73
2	30000.00	1265.56

Roadway Surface: Paved

Roadway Top Width: 48.00 ft

NO.	REVISION	BY	DATE

STATE OF TEXAS
ANDRES M. CARDENAS
88453
LICENSED
PROFESSIONAL ENGINEER

11/16/2022

Texas Department of Transportation
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FIRM #587

SH 16
CULVERT CALCULATIONS

CULVERT 6

11/16/2022 SHEET 6 OF 11

DESIGNED:	FED. RD DIV. NO.	STATE	FEDERAL AID PROJECT No.	HIGHWAY No.
CHECKED:		TEXAS		SH 16

DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	BWD	SAN SABA	0289	04	032,ETC	122

USER: acardenas
DATE: 11/16/2022
SCRIPT: pw://server.rtg-eng.com:Rtg-ds/Documents/TxDOT0103 Brownwood SH 16/Design_Data/4 - Design/Plan_Set_1/05. Drainage/Plotting/SH 16_DRAINAGE.pen
FILE: pw://server.rtg-eng.com:Rtg-ds/Documents/TxDOT0103 Brownwood SH 16/Design_Data/4 - Design/Plan_Set_1/05. Drainage/SH16_DRN_CALC06.dgn
442

HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Recurrence

Table 1 - Summary of Culvert Flows at Crossing: Culvert 7 EXIST

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1255.77	10 yr	36.04	36.04	0.00	1
1256.80	100 yr	55.06	55.06	0.00	1
1257.46	Overtopping	65.67	65.67	0.00	Overtopping

Table 2 - Culvert Summary Table: Culvert 7

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
10 yr	36.04	36.04	1255.77	2.759	0.711	1-S2n	0.945	1.649	1.049	0.678	11.452	3.596
100 yr	55.06	55.06	1256.80	3.792	1.880	5-S2n	1.284	2.187	1.462	0.835	12.557	4.034

****

Straight Culvert

Inlet Elevation (invert): 1253.01 ft, Outlet Elevation (invert): 1251.60 ft

Culvert Length: 65.02 ft, Culvert Slope: 0.0217

****

Site Data - Culvert 7

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 1253.01 ft

Outlet Station: 65.00 ft

Outlet Elevation: 1251.60 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 7

Barrel Shape: Concrete Box

Barrel Span: 3.00 ft

Barrel Rise: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90 & 15º flare) Wingwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: Culvert 7 EXIST)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
36.04	1252.28	0.68	3.60	0.85	0.93
55.06	1252.43	0.83	4.03	1.04	0.96

Tailwater Channel Data - Culvert 7 EXIST

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 8.00 ft

Side Slope (H:V): 10.00 (_:1)

Channel Slope: 0.0200

Channel Manning's n: 0.0350

Channel Invert Elevation: 1251.60 ft

Roadway Data for Crossing: Culvert 7 EXIST

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 300.00 ft

Crest Elevation: 1257.46 ft

Roadway Surface: Paved

Roadway Top Width: 35.00 ft

Crossing Discharge Data

Discharge Selection Method: Recurrence

Table 4 - Summary of Culvert Flows at Crossing: Culvert 7 PROP

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	Culvert 7 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1255.60	10 yr	36.41	36.41	0.00	1
1256.55	100 yr	55.64	55.60	0.04	3
1256.49	Overtopping	54.52	54.52	0.00	Overtopping

Table 5 - Culvert Summary Table: Culvert 7

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
10 yr	36.41	36.41	1255.60	2.537	0.657	1-S2n	0.941	1.660	1.050	0.682	11.564	3.606
100 yr	55.64	55.60	1256.55	3.487	1.807	5-S2n	1.277	2.201	1.457	0.839	12.717	4.045

****

Straight Culvert

Inlet Elevation (invert): 1253.06 ft, Outlet Elevation (invert): 1251.60 ft

Culvert Length: 65.10 ft, Culvert Slope: 0.0224

****

Site Data - Culvert 7

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 1253.06 ft

Outlet Station: 65.08 ft

Outlet Elevation: 1251.60 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 7

Barrel Shape: Concrete Box

Barrel Span: 3.00 ft

Barrel Rise: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (30-75º flare) Wingwall

Inlet Depression: None

Table 6 - Downstream Channel Rating Curve (Crossing: Culvert 7 PROP)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
36.41	1252.28	0.68	3.61	0.85	0.93
55.64	1252.44	0.84	4.05	1.05	0.96

Tailwater Channel Data - Culvert 7 PROP

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 8.00 ft

Side Slope (H:V): 10.00 (_:1)

Channel Slope: 0.0200

Channel Manning's n: 0.0350

Channel Invert Elevation: 1251.60 ft

Roadway Data for Crossing: Culvert 7 PROP

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Irregular Roadway Cross-Section:

Coord No.	Station (ft)	Elevation (ft)
0	30700.00	1260.17
1	30804.83	1258.21
2	30900.00	1256.49

Roadway Surface: Paved

Roadway Top Width: 48.00 ft

NO.	REVISION	BY	DATE

STATE OF TEXAS
ANDRES M. CARDENAS
88453
LICENSED
PROFESSIONAL ENGINEER

11/16/2022

Texas Department of Transportation
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FIRM #587

SH 16
CULVERT CALCULATIONS

CULVERT 7

11/16/2022 SHEET 7 OF 11

DESIGNED:	FED. RD DIV. NO.	STATE	FEDERAL AID PROJECT No.		HIGHWAY No.	
CHECKED:		TEXAS			SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	BWD	SAN SABA	0289	04	032,ETC	123

USER: acardenas
DATE: 11/16/2022
SCRIPT: pw://server.sljeng.com:Slj-dsl/Documents/TxDOT0103 Brownwood SH 16/Design_Data/4 - Design/Plan_Set_1/05. Drainage/Plotting/SH 16_DRAINAGE.pen
FILE: pw://server.sljeng.com:Slj-dsl/Documents/TxDOT0103 Brownwood SH 16/Design_Data/4 - Design/Plan_Set_1/05. Drainage/SH16_DRN_CALC07.dgn
442

HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Recurrence

Table 1 - Summary of Culvert Flows at Crossing: Culvert 8 EXIST

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1245.74	10 yr	56.81	56.81	0.00	1
1245.90	100 yr	86.66	59.46	26.86	5
1245.80	Overtopping	57.85	57.85	0.00	Overtopping

Table 2 - Culvert Summary Table: Culvert 8

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
10 yr	56.81	56.81	1245.74	3.900	2.256	5-S2n	1.397	2.233	1.574	0.848	12.030	4.068
100 yr	86.66	59.46	1245.90	4.059	2.785	5-S2n	1.445	2.302	1.632	1.037	12.148	4.552

****

Straight Culvert

Inlet Elevation (invert): 1241.84 ft, Outlet Elevation (invert): 1240.70 ft

Culvert Length: 62.01 ft, Culvert Slope: 0.0184

****

Site Data - Culvert 8

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 1241.84 ft

Outlet Station: 62.00 ft

Outlet Elevation: 1240.70 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 8

Barrel Shape: Concrete Box

Barrel Span: 3.00 ft

Barrel Rise: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90 & 15º flare) Wingwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: Culvert 8 EXIST)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
56.81	1241.55	0.85	4.07	1.06	0.96
86.66	1241.74	1.04	4.55	1.29	0.99

Tailwater Channel Data - Culvert 8 EXIST

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 8.00 ft

Side Slope (H:V): 10.00 (_:1)

Channel Slope: 0.0200

Channel Manning's n: 0.0350

Channel Invert Elevation: 1240.70 ft

Roadway Data for Crossing: Culvert 8 EXIST

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 300.00 ft

Crest Elevation: 1245.80 ft

Roadway Surface: Paved

Roadway Top Width: 35.00 ft

Crossing Discharge Data

Discharge Selection Method: Recurrence

Table 4 - Summary of Culvert Flows at Crossing: Culvert 8 PROP

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	Culvert 8 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1245.42	10 yr	57.16	57.16	0.00	1
1246.40	100 yr	87.19	73.54	13.61	3
1245.88	Overtopping	65.33	65.33	0.00	Overtopping

Table 5 - Culvert Summary Table: Culvert 8

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
10 yr	57.16	57.16	1245.42	3.576	2.217	5-S2n	1.402	2.242	1.581	0.850	12.050	4.075
100 yr	87.19	73.54	1246.40	4.559	3.531	5-S2n	1.694	2.653	1.923	1.040	12.745	4.560

****

Straight Culvert

Inlet Elevation (invert): 1241.84 ft, Outlet Elevation (invert): 1240.70 ft

Culvert Length: 61.84 ft, Culvert Slope: 0.0184

****

Site Data - Culvert 8

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 1241.84 ft

Outlet Station: 61.83 ft

Outlet Elevation: 1240.70 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 8

Barrel Shape: Concrete Box

Barrel Span: 3.00 ft

Barrel Rise: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (30-75º flare) Wingwall

Inlet Depression: None

Table 6 - Downstream Channel Rating Curve (Crossing: Culvert 8 PROP)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
57.16	1241.55	0.85	4.07	1.06	0.96
87.19	1241.74	1.04	4.56	1.30	0.99

Tailwater Channel Data - Culvert 8 PROP

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 8.00 ft

Side Slope (H:V): 10.00 (_:1)

Channel Slope: 0.0200

Channel Manning's n: 0.0350

Channel Invert Elevation: 1240.70 ft

Roadway Data for Crossing: Culvert 8 PROP

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Irregular Roadway Cross-Section:

Coord No.	Station (ft)	Elevation (ft)
0	31600.00	1247.33
1	31658.96	1246.50
2	31700.00	1245.88

Roadway Surface: Paved

Roadway Top Width: 48.00 ft

NO.	REVISION	BY	DATE

STATE OF TEXAS
ANDRES M. CARDENAS
88453
LICENSED
PROFESSIONAL ENGINEER

11/16/2022

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RTG RODRIGUEZ TRANSPORTATION GROUP
FIRM #587

SH 16
CULVERT CALCULATIONS

CULVERT 8

11/16/2022 SHEET 8 OF 11

DESIGNED:	FED. RD DIV. NO.	STATE	FEDERAL AID PROJECT No.		HIGHWAY No.	
CHECKED:		TEXAS			SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	BWD	SAN SABA	0289	04	032,ETC	124

HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Recurrence

Table 1 - Summary of Culvert Flows at Crossing: Culvert 9 EXIST

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1231.06	10 yr	173.89	173.89	0.00	1
1232.46	100 yr	269.02	269.02	0.00	1
1234.24	Overtopping	359.99	359.99	0.00	Overtopping

Table 2 - Culvert Summary Table: Culvert 9

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
10 yr	173.89	173.89	1231.06	3.166	1.647	5-S2n	1.188	1.868	1.328	1.132	10.909	5.237
100 yr	269.02	269.02	1232.46	4.568	3.440	5-S2n	1.603	2.499	1.840	1.414	12.184	5.920

****

Straight Culvert

Inlet Elevation (invert): 1227.89 ft, Outlet Elevation (invert): 1227.02 ft

Culvert Length: 73.01 ft, Culvert Slope: 0.0120

****

Site Data - Culvert 9

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 1227.89 ft

Outlet Station: 73.00 ft

Outlet Elevation: 1227.02 ft

Number of Barrels: 2

Culvert Data Summary - Culvert 9

Barrel Shape: Concrete Box

Barrel Span: 6.00 ft

Barrel Rise: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90 & 15° flare) Wingwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: Culvert 9 EXIST)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
173.89	1228.15	1.13	5.24	1.41	1.02
269.02	1228.43	1.41	5.92	1.76	1.05

Tailwater Channel Data - Culvert 9 EXIST

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 18.00 ft

Side Slope (H:V): 10.00 (_:1)

Channel Slope: 0.0200

Channel Manning's n: 0.0350

Channel Invert Elevation: 1227.02 ft

Roadway Data for Crossing: Culvert 9 EXIST

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 300.00 ft

Crest Elevation: 1234.24 ft

Roadway Surface: Paved

Roadway Top Width: 35.00 ft

Crossing Discharge Data

Discharge Selection Method: Recurrence

Table 4 - Summary of Culvert Flows at Crossing: Culvert 9 PROP

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	Culvert 9 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1231.06	10 yr	174.24	174.24	0.00	1
1232.47	100 yr	269.55	269.55	0.00	1
1234.50	Overtopping	371.31	371.31	0.00	Overtopping

Table 5 - Culvert Summary Table: Culvert 9

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
10 yr	174.24	174.24	1231.06	3.170	1.652	5-S2n	1.189	1.871	1.330	1.133	10.916	5.241
100 yr	269.55	269.55	1232.47	4.577	3.447	5-S2n	1.605	2.502	1.843	1.415	12.190	5.923

****

Straight Culvert

Inlet Elevation (invert): 1227.89 ft, Outlet Elevation (invert): 1227.02 ft

Culvert Length: 73.01 ft, Culvert Slope: 0.0120

****

Site Data - Culvert 9

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 1227.89 ft

Outlet Station: 73.00 ft

Outlet Elevation: 1227.02 ft

Number of Barrels: 2

Culvert Data Summary - Culvert 9

Barrel Shape: Concrete Box

Barrel Span: 6.00 ft

Barrel Rise: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90 & 15° flare) Wingwall

Inlet Depression: None

Table 6 - Downstream Channel Rating Curve (Crossing: Culvert 9 PROP)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
174.24	1228.15	1.13	5.24	1.41	1.02
269.55	1228.43	1.42	5.92	1.77	1.05

Tailwater Channel Data - Culvert 9 PROP

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 18.00 ft

Side Slope (H:V): 10.00 (_:1)

Channel Slope: 0.0200

Channel Manning's n: 0.0350

Channel Invert Elevation: 1227.02 ft

Roadway Data for Crossing: Culvert 9 PROP

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Irregular Roadway Cross-Section:

Coord No.	Station (ft)	Elevation (ft)
0	32500.00	1235.39
1	32608.57	1234.90
2	32700.00	1234.50

Roadway Surface: Paved

Roadway Top Width: 48.00 ft

NO.	REVISION	BY	DATE

STATE OF TEXAS
ANDRES M. CARDENAS
88453
LICENSED
PROFESSIONAL ENGINEER

11/16/2022

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FIRM #587

SH 16
CULVERT CALCULATIONS

CULVERT 9

11/16/2022 SHEET 9 OF 11

DESIGNED:	FED. RD DIV. NO.	STATE	FEDERAL AID PROJECT No.	HIGHWAY No.
CHECKED:		TEXAS		SH 16

DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	BWD	SAN SABA	0289	04	032,ETC	125

HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Recurrence

Table 1 - Summary of Culvert Flows at Crossing: Culvert 10 EXIST

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1225.98	10 yr	110.63	110.63	0.00	1
1226.70	100 yr	169.77	129.04	40.23	8
1226.57	Overtopping	125.93	125.93	0.00	Overtopping

Table 2 - Culvert Summary Table: Culvert 10

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
10 yr	110.63	110.63	1225.98	4.998	3.832	5-S2n	2.714	2.875	2.729	0.894	10.135	4.595
100 yr	169.77	129.04	1226.70	5.721	5.022	5-S2n	3.063	3.185	3.072	1.118	10.501	5.202

****

Straight Culvert

Inlet Elevation (invert): 1220.98 ft, Outlet Elevation (invert): 1220.63 ft

Culvert Length: 63.00 ft, Culvert Slope: 0.0056

****

Site Data - Culvert 10

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 1220.98 ft

Outlet Station: 63.00 ft

Outlet Elevation: 1220.63 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 10

Barrel Shape: Concrete Box

Barrel Span: 4.00 ft

Barrel Rise: 4.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90 & 15º flare) Wingwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: Culvert 10 EXIST)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
110.63	1221.52	0.89	4.60	1.12	0.99
169.77	1221.75	1.12	5.20	1.40	1.02

Tailwater Channel Data - Culvert 10 EXIST

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 18.00 ft

Side Slope (H:V): 10.00 (_:1)

Channel Slope: 0.0200

Channel Manning's n: 0.0350

Channel Invert Elevation: 1220.63 ft

Roadway Data for Crossing: Culvert 10 EXIST

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 300.00 ft

Crest Elevation: 1226.57 ft

Roadway Surface: Paved

Roadway Top Width: 35.00 ft

Crossing Discharge Data

Discharge Selection Method: Recurrence

Table 4 - Summary of Culvert Flows at Crossing: Culvert 10 PROP

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	Culvert 10 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1225.56	10 yr	111.18	111.18	0.00	1
1226.85	100 yr	170.62	145.52	24.94	10
1226.33	Overtopping	132.49	132.49	0.00	Overtopping

Table 5 - Culvert Summary Table: Culvert 10

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
10 yr	111.18	111.18	1225.56	4.582	3.779	5-S2n	2.725	2.884	2.739	0.896	10.147	4.602
100 yr	170.62	145.52	1226.85	5.872	5.510	5-S2n	3.371	3.451	3.371	1.121	10.793	5.209

****

Straight Culvert

Inlet Elevation (invert): 1220.98 ft, Outlet Elevation (invert): 1220.63 ft

Culvert Length: 63.00 ft, Culvert Slope: 0.0056

****

Site Data - Culvert 10

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 1220.98 ft

Outlet Station: 63.00 ft

Outlet Elevation: 1220.63 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 10

Barrel Shape: Concrete Box

Barrel Span: 4.00 ft

Barrel Rise: 4.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (30-75º flare) Wingwall

Inlet Depression: None

Table 6 - Downstream Channel Rating Curve (Crossing: Culvert 10 PROP)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
111.18	1221.52	0.90	4.60	1.12	0.99
170.62	1221.75	1.12	5.21	1.40	1.02

Tailwater Channel Data - Culvert 10 PROP

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 18.00 ft

Side Slope (H:V): 10.00 (_:1)

Channel Slope: 0.0200

Channel Manning's n: 0.0350

Channel Invert Elevation: 1220.63 ft

Roadway Data for Crossing: Culvert 10 PROP

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Irregular Roadway Cross-Section:

Coord No.	Station (ft)	Elevation (ft)
0	33800.00	1227.62
1	33892.33	1227.23
2	34000.00	1226.33

Roadway Surface: Paved

Roadway Top Width: 48.00 ft

NO.	REVISION	BY	DATE

STATE OF TEXAS
ANDRES M. CARDENAS
88453
LICENSED
PROFESSIONAL ENGINEER

11/16/2022

Texas Department of Transportation
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RTG RODRIGUEZ TRANSPORTATION GROUP
FIRM #587

SH 16
CULVERT CALCULATIONS

CULVERT 10

11/16/2022 SHEET 10 OF 11

DESIGNED:	FED. RD DIV. NO.	STATE	FEDERAL AID PROJECT No.	HIGHWAY No.
CHECKED:		TEXAS		SH 16

DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	BWD	SAN SABA	0289	04	032,ETC	126

HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Recurrence

Table 1 - Summary of Culvert Flows at Crossing: Culvert 11 EXIST

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1217.46	10 yr	77.31	77.31	0.00	1
1218.48	100 yr	120.77	120.77	0.00	1
1220.12	Overtopping	190.42	190.42	0.00	Overtopping

Table 2 - Culvert Summary Table: Culvert 11

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
10 yr	77.31	77.31	1217.46	2.929	2.976	2-M2c	2.851	1.728	1.728	0.982	7.458	4.417
100 yr	120.77	120.77	1218.48	3.943	4.001	7-M2c	4.000	2.326	2.326	1.210	8.654	4.967

****

Straight Culvert

Inlet Elevation (invert): 1214.48 ft, Outlet Elevation (invert): 1214.43 ft

Culvert Length: 62.52 ft, Culvert Slope: 0.0008

****

Site Data - Culvert 11

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 1214.48 ft

Outlet Station: 62.52 ft

Outlet Elevation: 1214.43 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 11

Barrel Shape: Concrete Box

Barrel Span: 6.00 ft

Barrel Rise: 4.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90 & 15º flare) Wingwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: Culvert 11 EXIST)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
77.31	1215.41	0.98	4.42	1.23	0.98
120.77	1215.64	1.21	4.97	1.51	1.01

Tailwater Channel Data - Culvert 11 EXIST

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 8.00 ft

Side Slope (H:V): 10.00 (_:1)

Channel Slope: 0.0200

Channel Manning's n: 0.0350

Channel Invert Elevation: 1214.43 ft

Roadway Data for Crossing: Culvert 11 EXIST

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 300.00 ft

Crest Elevation: 1220.12 ft

Roadway Surface: Paved

Roadway Top Width: 35.00 ft

Crossing Discharge Data

Discharge Selection Method: Recurrence

Table 4 - Summary of Culvert Flows at Crossing: Culvert 11 PROP

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	Culvert 11 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1217.41	10 yr	77.78	77.78	0.00	1
1218.42	100 yr	121.50	121.50	0.00	1
1220.74	Overtopping	231.45	231.45	0.00	Overtopping

Table 5 - Culvert Summary Table: Culvert 11

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
10 yr	77.78	77.78	1217.41	2.679	2.929	2-M2c	2.864	1.735	1.735	0.985	7.474	4.425
100 yr	121.50	121.50	1218.42	3.621	3.935	2-M2c	4.000	2.335	2.335	1.213	8.671	4.975

****

Straight Culvert

Inlet Elevation (invert): 1214.48 ft, Outlet Elevation (invert): 1214.43 ft

Culvert Length: 62.52 ft, Culvert Slope: 0.0008

****

Site Data - Culvert 11

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 1214.48 ft

Outlet Station: 62.52 ft

Outlet Elevation: 1214.43 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 11

Barrel Shape: Concrete Box

Barrel Span: 6.00 ft

Barrel Rise: 4.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (30-75º flare) Wingwall

Inlet Depression: None

Table 6 - Downstream Channel Rating Curve (Crossing: Culvert 11 PROP)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
77.78	1215.41	0.98	4.42	1.23	0.98
121.50	1215.64	1.21	4.97	1.51	1.01

Tailwater Channel Data - Culvert 11 PROP

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 8.00 ft

Side Slope (H:V): 10.00 (_:1)

Channel Slope: 0.0200

Channel Manning's n: 0.0350

Channel Invert Elevation: 1214.43 ft

Roadway Data for Crossing: Culvert 11 PROP

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Irregular Roadway Cross-Section:

Coord No.	Station (ft)	Elevation (ft)
0	34600.00	1221.91
1	34728.42	1220.86
2	34800.00	1220.74

Roadway Surface: Paved

Roadway Top Width: 48.00 ft

NO.	REVISION	BY	DATE

STATE OF TEXAS
ANDRES M. CARDENAS
88453
LICENSED
PROFESSIONAL ENGINEER

11/16/2022

Texas Department of Transportation
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FIRM #587

SH 16
CULVERT CALCULATIONS

CULVERT 11

11/16/2022 SHEET 11 OF 11

DESIGNED:	FED. RD DIV. NO.	STATE	FEDERAL AID PROJECT No.		HIGHWAY No.	
CHECKED:		TEXAS			SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	BWD	SAN SABA	0289	04	032,ETC	127

USER: acardenas
DATE: 11/16/2022
SCRIPT: pw://server.allgeng.com:Sky-ds/Documents/TxDOT0103 Brownwood SH 16/Design_Data/4 - Design/Plan_Set_1/05. Drainage/Plotting/SH 16_DRAINAGE.pen
FILE: pw://server.allgeng.com:Sky-ds/Documents/TxDOT0103 Brownwood SH 16/Design_Data/4 - Design/Plan_Set_1/05. Drainage/SH16_DRN_CALC11.dgn
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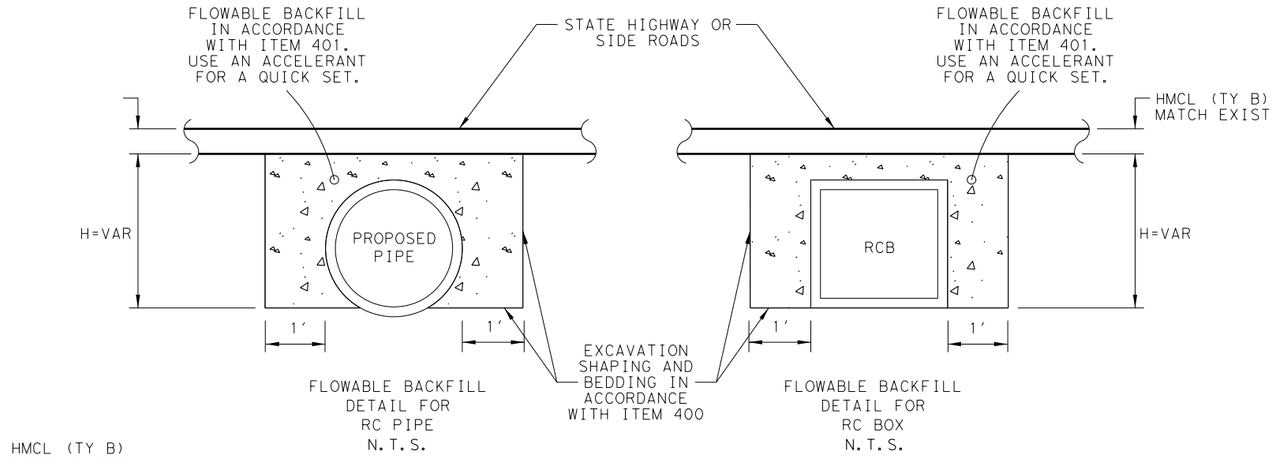
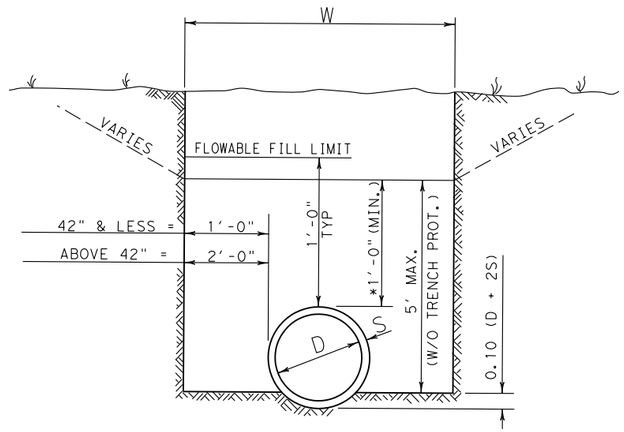


CUT & RESTORE PAVE

NOTE: EXCAVATION, SHAPING, BEDDING, AND BACKFILL ARE SUBSIDIARY TO ITEM 464.
FLOWABLE BACKFILL WILL BE PAID FOR AS PROVIDED IN ITEM 401, "FLOWABLE BACKFILL".



CLASS "C" BEDDING EXCEPT AS NOTED

*SEE STANDARD SPECIFICATION ITEM 400,
EXCEPT WHERE NEGATIVE PROJECTION IS USED.

THE LIMITS OF FLOWABLE FILL SHALL TYPICALLY BE 1' ABOVE THE TOP OF PIPE/BOX. THE TRENCH SHALL BE UNDERCUT BY 4" AS SPECIFIED IN ITEM 400.

STRUCTURE EXCAVATION (TRENCH)

SCALE: NTS

NO.	REVISION	BY	DATE

STATE OF TEXAS
ANDRES M. CARDENAS
88453
LICENSED PROFESSIONAL ENGINEER
11/16/2022

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FIRM #587

SH 16
DRAINAGE DETAILS

11/16/2022 SHEET 1 OF 1

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.
CHECKED:		TEXAS				SH 16
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	BWD	SAN SABA	0289	04	032,ETC	128

USER: acardenas
DATE: 11/16/2022
SCRPT: pw:\\server.sfgeng.com:Sfg-ds\Documents\TxDOT0103 Brownwood SH 16\Design_Data\4 - Design\Plan_Set_1\05_Drainage\Plotting\SH 16_DRAINAGE.pen
FILE: pw:\\server.sfgeng.com:Sfg-ds\Documents\TxDOT0103 Brownwood SH 16\Design_Data\4 - Design\Plan_Set_1\05_Drainage\SH16_DRN_DETAILS1.dgn

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" (2) Conc (Curb) (CY)	Class "C" (3) Conc (Wingwall) (CY)	Total Wingwall Area (SF)
Culvert 1 - SH 16 STA. 95+93 (Both)	3 ~ 6'x 3'	3'	MC-6-16	SETB-FW-0	0°	3:1	9"	7"	1.000'	4.500'	12.500'	7.217'	14.434'	N/A	33.600'	8.4	1.6	14.2	N/A
Culvert 4 - SH 16 STA. 288+68 (Both)	1 ~ 5'x 5'	5'	SCC-5&6	PW-1	0°	2:1	8"	7"	2.426'	8.083'	N/A	N/A	16.167'	6.167'	N/A	0.0	1.2	33.6	522
Culvert 5 - SH 16 STA. 294+12 (Lt)	1 ~ 3'x 2'	7'	SCC-3&4	PW-1	0°	2:1	8"	7"	1.000'	3.667'	N/A	N/A	7.333'	4.167'	N/A	0.0	0.2	4.2	54

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.

STATE OF TEXAS
ANDRES M. CARDENAS
88453
LICENSED PROFESSIONAL ENGINEER

11/16/2022

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.

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	0289	04	032,ETC	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	SAN SABA		129

DATE: 11/16/2022 4:42:
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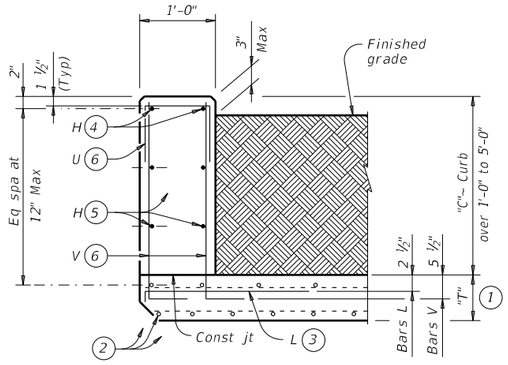
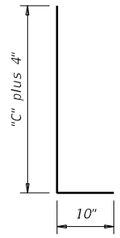


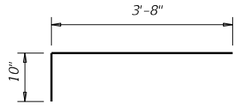
TYPICAL SECTION

Used for curbs over 1'–0" to 5'–0"



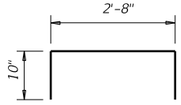
BARS V (#5) (6)

Spaced at 12" Max



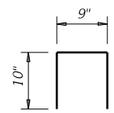
BARS L (#5) (3)

Spaced at 12" Max



OPTIONAL BARS L (#5) (3) (7)

Spaced at 12" Max



BARS U (#4) (6)

Spaced at 12" Max

(1) "T" is equal to the culvert top slab thickness. For precast boxes with slabs less than 8" thick, see SCP-MD standard for additional details.

(2) Adjust normal culvert slab bars as necessary to clear obstructions.

(3) Place bars L as shown. Tilt hook as necessary to maintain cover.

(4) Place normal culvert curb bars H(#4) as shown. Adjust as necessary to clear obstructions.

(5) Additional bars H(#4) as required to maintain 12" Max spacing.

(6) Replace normal culvert curb bars K with one bar U and two bars V as shown spaced at 12" Max. Adjust length of bars V as necessary to maintain clear cover.

(7) Optional bars L are to be used only for precast box culverts with 3'–0" closure pour.

(8) Quantities shown are for Contractor's information only. Quantities are per linear foot of curb length. The value in table can be interpolated for intermediate values of curb height, "C". Quantity includes bars K (when applicable).

TABLE OF ESTIMATED CURB QUANTITIES (8)

Curb Height "C"	Conc (CY/LF)	Reinf Steel (Lb/LF)
1'–0"	0.037	10.4
1'–6"	0.056	14.5
2'–0"	0.074	15.6
2'–6"	0.093	18.0
3'–0"	0.111	19.0
3'–6"	0.130	21.3
4'–0"	0.148	22.4
4'–6"	0.167	24.8
5'–0"	0.185	25.9

CONSTRUCTION NOTES:

Adjust reinforcing steel as necessary to provide 1 ¼" cover.

For vehicle safety, top of the curb must not project more than 3" above the finished grade.

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) minimum for curbs.

Provide bar laps, where required, as follows:

- Uncoated or galvanized ~ #4 = 1'–8" Min

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

These extended curb details have sufficient strength to allow for future retrofit of Type T631 or T631LS railing. These details are suitable for use with PR11, PR22 and PR3 type rails. These details are not suitable for the mounting of other rail types. For new construction using T631 or T631LS railing, use the T631-CM standard.

This Curb is considered as part of the Box Culvert for payment.

Cover dimensions are clear dimensions, unless noted otherwise.

Reinforcing bar dimensions shown are out-to-out of bar.

Texas Department of Transportation

Bridge Division Standard

EXTENDED CURB DETAILS

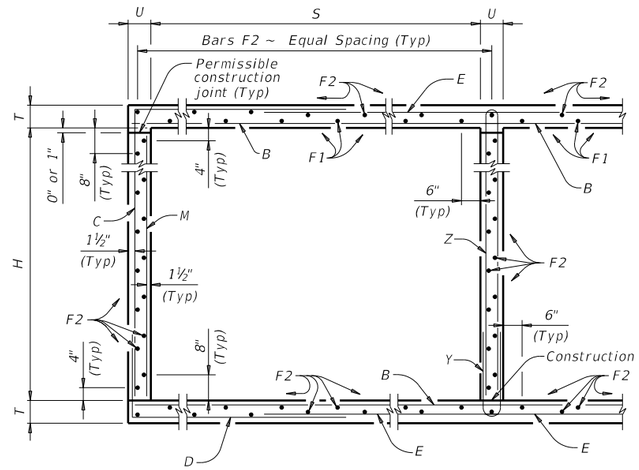
FOR BOX CULVERTS WITH CURBS OVER 1'-0" TO 5'-0" TALL

ECD

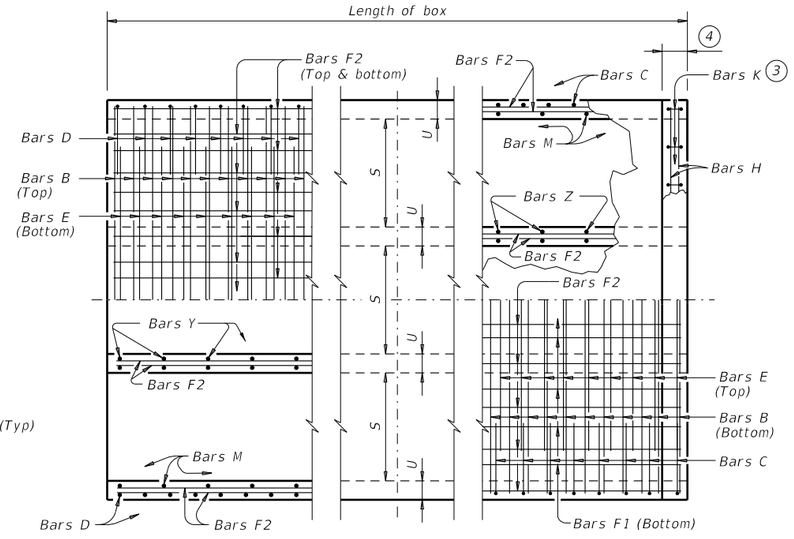
FILE: ecdstde1-20.dgn	DN: GAF	CK: TxDOT	DW: TxDOT	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0289	04	032,ETC	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	SAN SABA		130

DATE: 11/16/2022 4:42
FILE: pw://server.slg-eng.com:Slg-ds/Documents/TxDOT0103 Brownwood SH 16/Design/Standards/ecdstde1-20.dgn

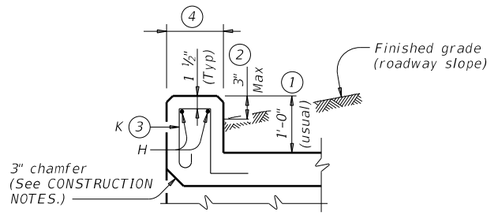
DATE: 11/16/2022 4:42
FILE: pw://server.sig-eng.com:Sig-ds/Documents/TxDOT0103 Brownwood SH 16/Design_Stage4 to Design_Stage4/mc616ste-20.dgn



TYPICAL SECTION

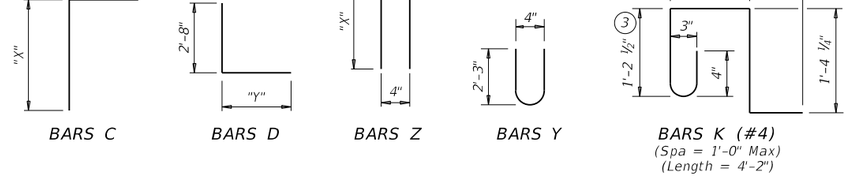


PART PLANS



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.

HL93 LOADING

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	0289	04	032, ETC	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	SAN SABA		131

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	0289	04	032,ETC	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	SAN SABA		132

DATE: 11/16/2022 4:42
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DATE: 11/16/2022 4:42:
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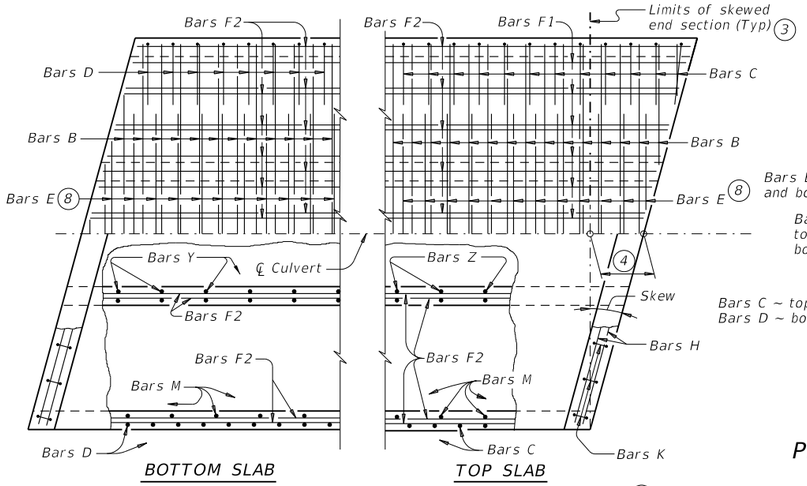
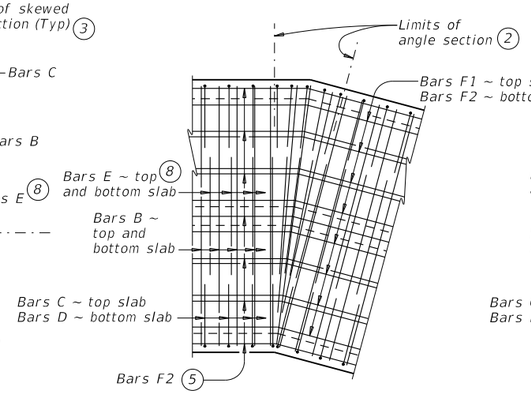
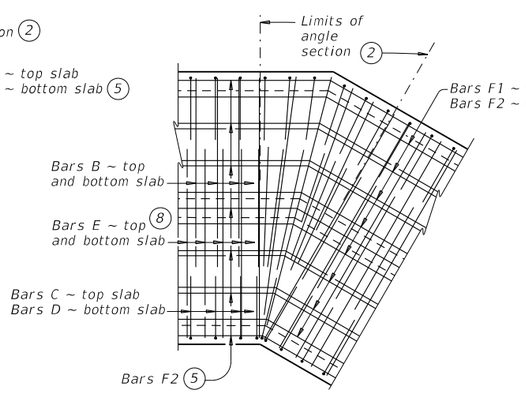


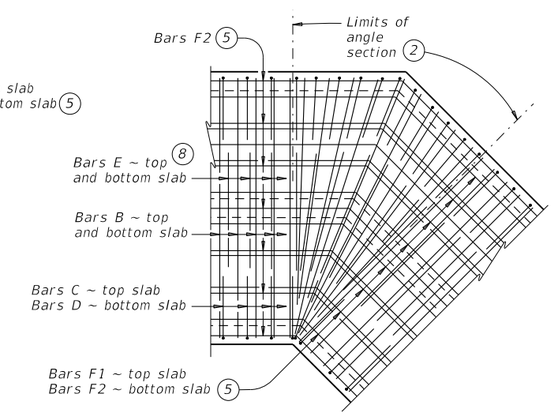
PLAN OF SKEWED ENDS ~ FROM 0° TO 15° 7



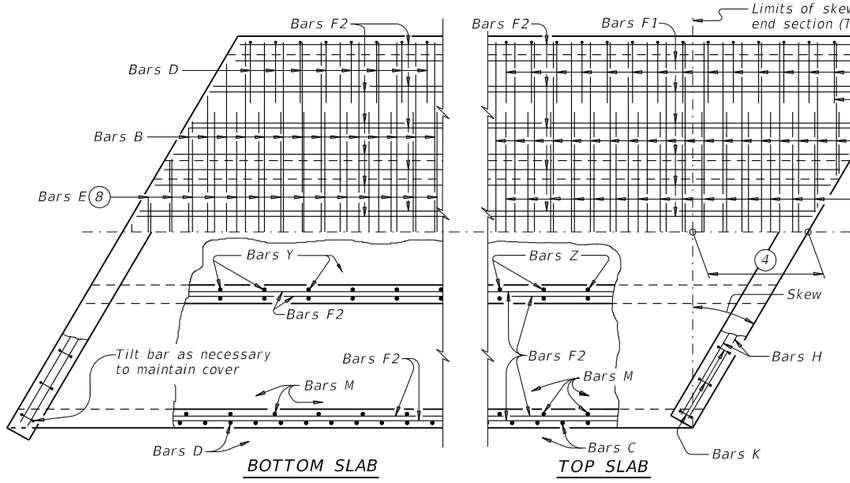
PLAN OF ANGLE SECTION ~ FROM 0° TO 15°



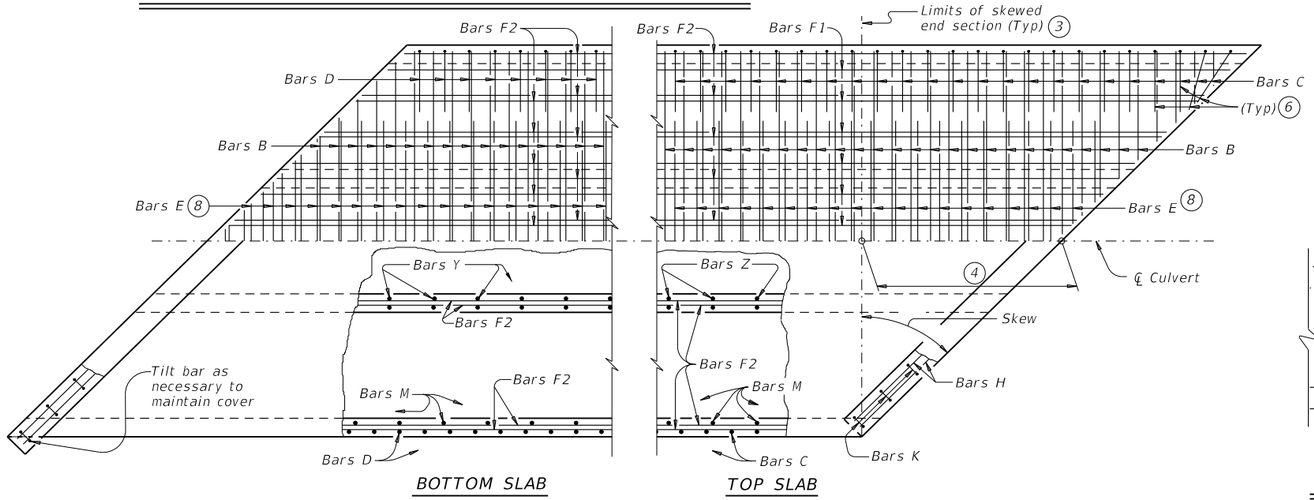
PLAN OF ANGLE SECTION ~ OVER 15° TO 30°



PLAN OF ANGLE SECTION ~ OVER 30° TO 45°

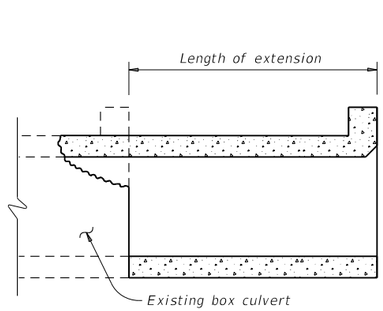


PLAN OF SKEWED ENDS ~ OVER 15° TO 30°



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

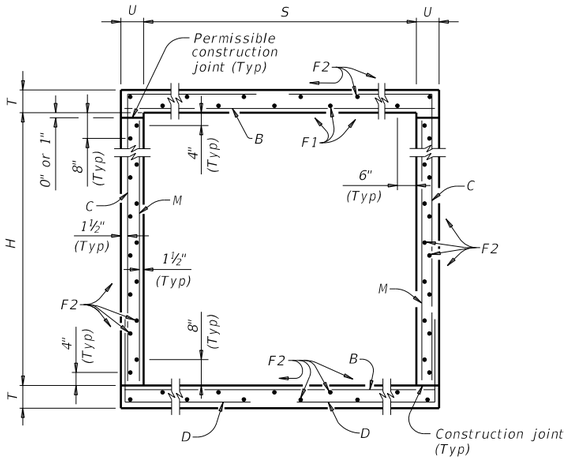
Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE MISCELLANEOUS DETAILS

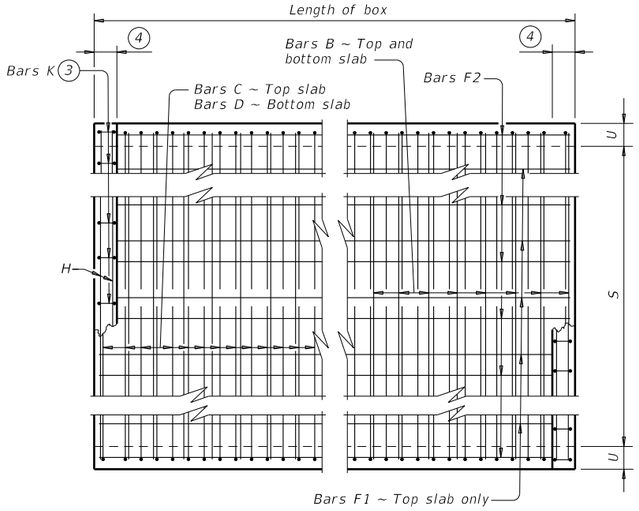
MC-MD

FILE: mc-mdste-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0289	04	032,ETC	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	SAN SABA		133

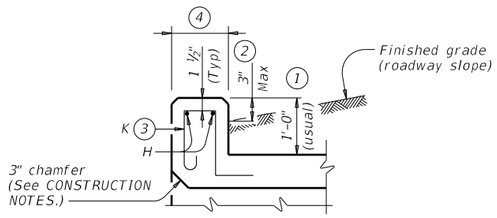
DATE: 11/16/2022 4:42
FILE: pw://server.sig-eng.com:Sig-ds/Documents/TxDOT0103 Brownwood SH 16/Des Grp/#4 to ODES Grp/#4 on Se#2/scc56ste-21.dgn



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:

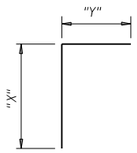
Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Provide Class C concrete (f'c = 3,600 psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete (f'c = 4,000 psi) for top slabs of:
- culverts with overlay,
- culverts 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

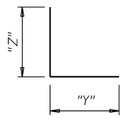
GENERAL NOTES:

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.

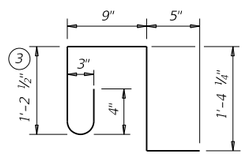
Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.



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 04/2021 Updated X values.	0289	04	032,ETC	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	SAN SABA		134

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.

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	0289	04	032,ETC	SH 16
04/2021 Updated X values.	DIST	COUNTY		SHEET NO.
	BWD	SAN SABA		135

DATE: 11/16/2022 4:42
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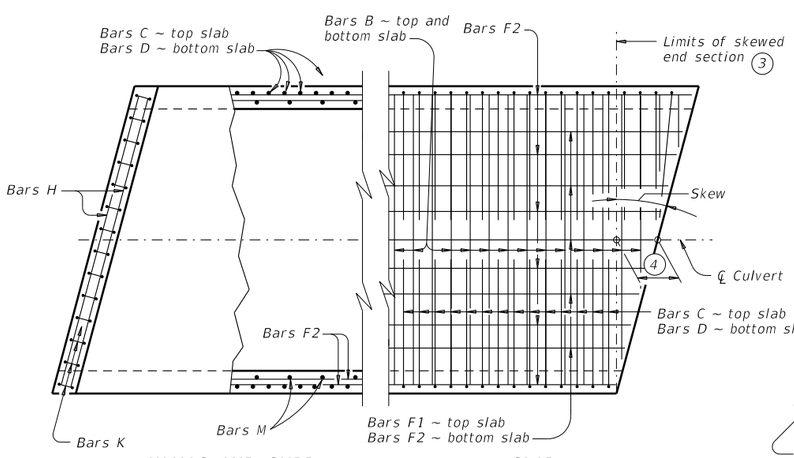
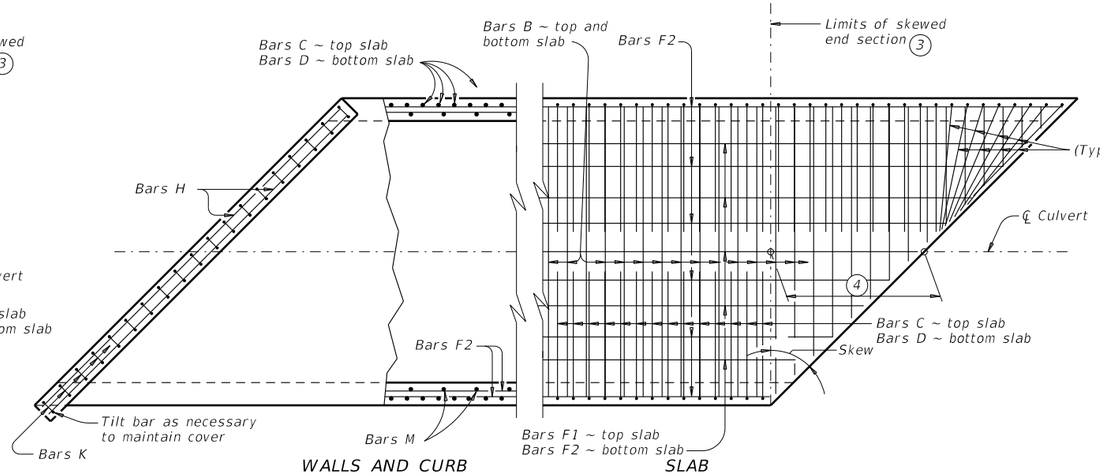
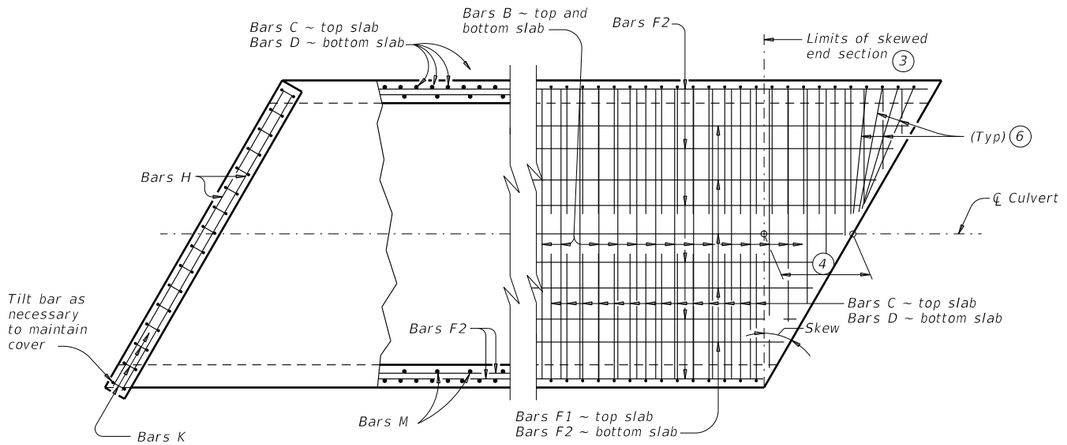


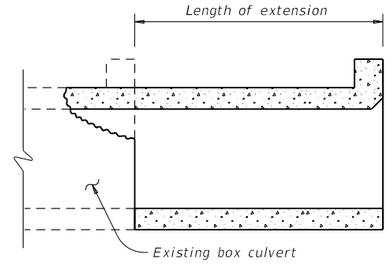
PLAN OF SKEWED ENDS ~ FROM 0° TO 15° (7)



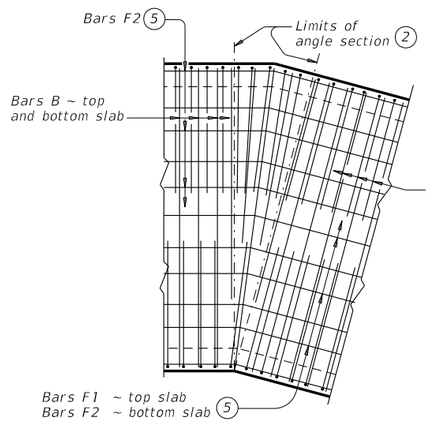
PLAN OF SKEWED ENDS ~ OVER 30° TO 45°



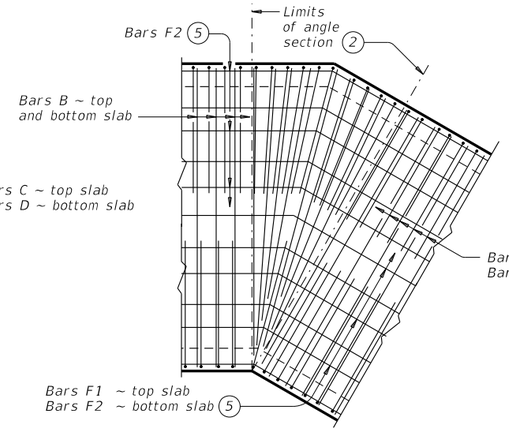
PLAN OF SKEWED ENDS ~ OVER 15° TO 30°



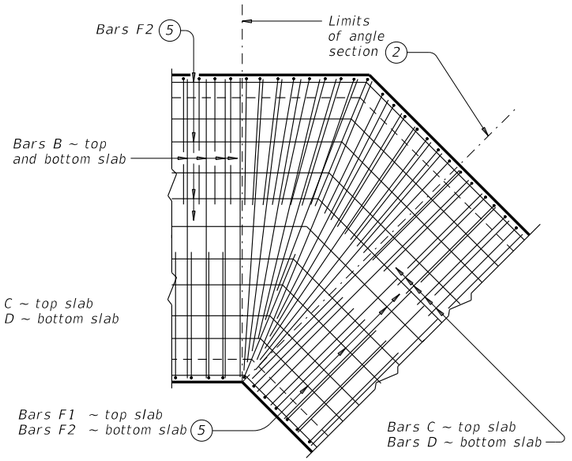
LENGTHENING DETAIL (1)



PLAN OF ANGLE SECTION ~ FROM 0° TO 15°



PLAN OF ANGLE SECTION ~ OVER 15° TO 30°



PLAN OF ANGLE SECTION ~ 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, C, D , E, or F ancher 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 becomes less than half of the normal spacing, cut bars to avoid conflict.

(3) The length of Bars B 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 conflictin 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, and D parallel to the skewed end while maintaining spacing along centerline of box. Increase lengths of Bars B shown on the Single Box Culverts Cast-In-Place (SCC) standards sheets to accommodate the skew.

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 Single Box Culverts Cast-in-Place (SCC) standard sheets for details of straight sections of culvert.

For skewed sections and angle sections, refer to Single Box Culverts Cast-in-Place (SCC) 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 culvert Single Box Culverts Cast-In-Place (SCC) 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

SINGLE BOX CULVERTS CAST-IN-PLACE MISCELLANEOUS DETAILS

SCC-MD

FILE: sccmdste-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0289	04	032,ETC	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	SAN SABA		136

DATE: 11/16/2022 4:42
FILE: pw://server.sig-eng.com:Sig-ds/Documents/TxDOT0103 Brownwood SH 16/Design/sccmdste-20.dgn
DESIGN: TxDOT DETAIL: TxDOT CK: TxDOT

TABLE OF DIMENSIONS AND REINFORCING STEEL
(Wings for One Structure End)

Maximum Wingwall Height Hw (9)	W	X	Y	Z	Variable Reinforcing Bars J1 Size	Bars J1 Spa	Bars J2 Size	Bars J2 Spa	Estimated Quantities (3) per ft of wing length (Two~Wings) Reinf (Lb/Ft)	Conc (CY/Ft)
2'-6"	2'- 5"	1'- 0"	9"	7"	#4	1'-0"	#4	1'-0"	33.73	0.248
3'-0"	2'- 5"	1'- 0"	9"	7"	#4	1'-0"	#4	1'-0"	37.07	0.261
3'-6"	2'- 5"	1'- 0"	9"	7"	#4	1'-0"	#4	1'-0"	37.74	0.273
4'-0"	2'- 5"	1'- 0"	9"	7"	#4	1'-0"	#4	1'-0"	38.41	0.285
4'-6"	3'- 2"	1'- 6"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	41.75	0.330
5'-0"	3'- 2"	1'- 6"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	45.09	0.343
5'-6"	3'- 2"	1'- 6"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	45.75	0.355
6'-0"	3'- 2"	1'- 6"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	46.42	0.367
7'-0"	3'- 8"	1'- 9"	1'- 3"	7"	#4	1'-0"	#4	1'-0"	52.77	0.414
8'-0"	4'- 2"	2'- 0"	1'- 6"	8"	#5	1'-0"	#4	1'-0"	60.19	0.486
9'-0"	4'- 8"	2'- 3"	1'- 9"	8"	#4	6"	#4	6"	81.49	0.535
10'-0"	5'- 2"	2'- 6"	2'- 0"	8"	#5	6"	#4	6"	97.25	0.584
11'-0"	5'- 8"	2'- 9"	2'- 3"	8"	#6	6"	#5	6"	133.65	0.634
12'-0"	6'- 2"	3'- 0"	2'- 6"	9"	#7	6"	#5	6"	162.29	0.721

TABLE OF WING WALL REINFORCING (Two~Wings)

Bar	Size	No.	Spa
D	#5	~	1'-0"
E	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	4	~
M	#4	4	~
P	#4	~	1'-0"
R	#5	6	~
V	#4	~	1'-0"

TABLE OF ESTIMATED CULVERT TOEWALL QUANTITIES

Bar	Size	No.	Spa
L	#4	~	1'-6"
Q	#4	1	~
Reinf (Lb/Ft)			2.45
Conc (CY/Ft)			0.037

TABLE OF ESTIMATED ANCHOR TOEWALL QUANTITIES

Bar	Size	No.	Spa
K	#4	~	1'-0"
N	#5	6	~
OL	#4	6	~
Reinf (Lb/Ft)			9.82
Conc (CY/Ft)			0.074

(1) Extend Bars P 3'-0" Min into bottom slab of box culvert.

(2) Adjust to fit as necessary to maintain 1 1#2" clear cover and 4" Min between bars.

(3) Quantities shown are based on an average wing height for two wings (one structure end). To determine total quantities for two wings multiply the tabulated values by Lw.

(4) Recommended values of slope are: 3:1, 4:1, and 6:1. Provide 3:1 or flatter slope.

(5) When shown elsewhere on the plans, construct 5" deep concrete riprap. Payment for riprap is as required by Item 432, "Riprap". Unless otherwise shown on the plans or directed by the Engineer, extend construction joints or grooved joints, oriented in the direction of flow, across the full distance of the riprap, at intervals of approximately 20'. When such riprap is provided, the culvert toewall shown in SECTION B-B is not required.

(6) At Contractor's option, end the culvert toewall flush with wingwall toewall. Adjust reinforcing as needed.

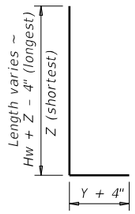
(7) 3" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures without railing and curbs taller than 1'-0", refer to the Extend Curb Details (ECD) standard sheet.

(8) For vehicle safety, reduce curb heights, 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.

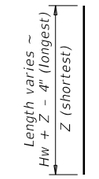
(9) See Table of Maximum Wing Heights for various slopes. Height is limited based on a 33'-6" maximum safety pipe runner length.

TABLE OF MAXIMUM WING HEIGHTS (9)

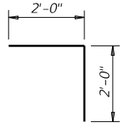
Side Slope	Hw Max
3:1	11'- 5"
4:1	8'-10"
6:1	6'- 1"



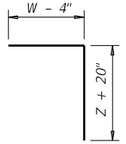
BARS J1



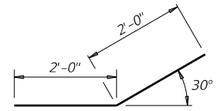
BARS V



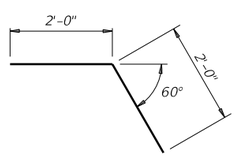
BARS L



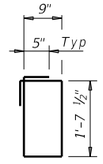
BARS J2



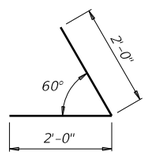
BARS D



BARS R



BARS K
(Length = 5'-5")



BARS OL

WING DIMENSION CALCULATIONS:

Hw = H + T + C – 0.250' (9)
A = (Hw – 0.333') (SL)
B = (A) (tan (30°))
Lw = (A) ÷ cos (30°))

For cast–in–place culverts:
Ltw = (N) (S) + (N + 1) (U)
For precast culverts:
Ltw = (N) (2U + S) + (N – 1) (0.500')

Lc = (Ltw) – (2U)
Atw = (Lc) + (2B)
Total Wingwall Area (two wings ~ SF) = (Hw + 0.333') (Lw)

Hw = Height of wingwall (feet)
Atw = Anchor toewall length (feet)
Lw = Length of wingwall (feet)
N = Number of culvert barrels
SL:1 = Side slope ratio (horizontal : 1 vertical)
Ltw = Culvert toewall length (feet)
Lc = Culvert curb between wings (feet)

See applicable box culvert standard for H, S, T, and U values.
See Table of Maximum Wall Heights for limits on Hw.

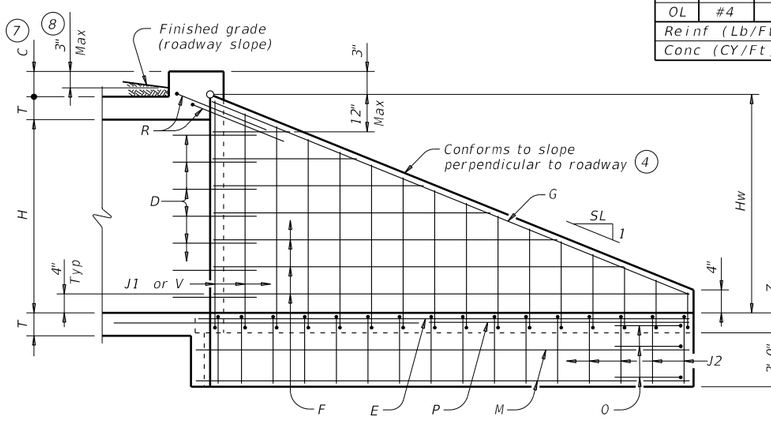
MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in 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.
Provide Class "C" concrete (f`c = 3,600 psi).
Adjust reinforcing as necessary to provide a minimum clear cover of 1 ½".
Provide pipe runners 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 and nuts.
Provide ASTM A36 steel plates.
Galvanize all steel components, except reinforcing unless required elsewhere in the plans, after fabrication.
Repair galvanizing damaged during transport or construction in accordance with the Item 445, "Galvanizing".
For optional adhesive anchors, install adhesive anchorages in accordance with the manufacturer's instructions including hole size, drilling equipment and method, hole cleaning equipment and method, mixing and dispensing adhesive, and anchor insertion. Do not alter the manufacturer's mixing nozzle or dispenser. Provide anchorage rods that are clean and free of grease, oil, or any other foreign material. Demonstrate hole cleaning method to the Engineer for approval and continue the approved process for all anchorage locations. Test adhesive anchors in accordance with Item 450.3.3, "Tests." Test 3 anchors per 100 anchors installed.

GENERAL NOTES:

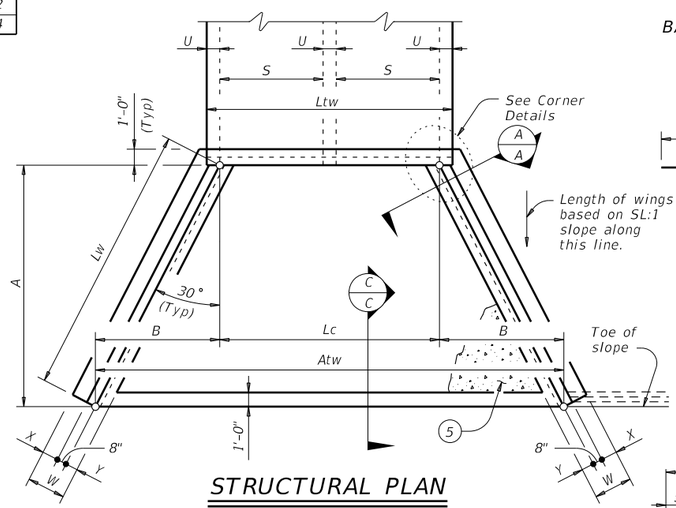
Designed according to AASHTO LRFD Bridge Design Specifications.
The safety end treatments shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the pipe runners.
Pipe runners are designed for a traversing 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.
When structure is founded on solid rock, depth of toewalls for culverts and wingwalls may be reduced or eliminated as directed by the Engineer.
All bolts, nuts, washers, brackets, angles, and pipe runners are considered parts of the safety end treatment for payment.
The quantities for pipe runners, reinforcing steel, and concrete, 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.

Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing dimensions are out–to–out of bars.



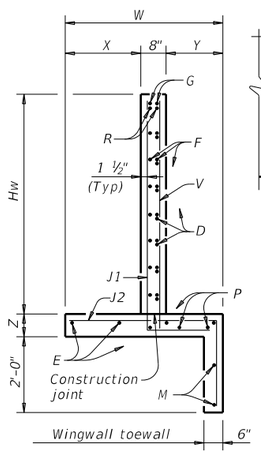
INSIDE ELEVATION OF WINGWALL

(Showing reinforcing. Culvert and culvert toewall reinforcing not shown for clarity.)

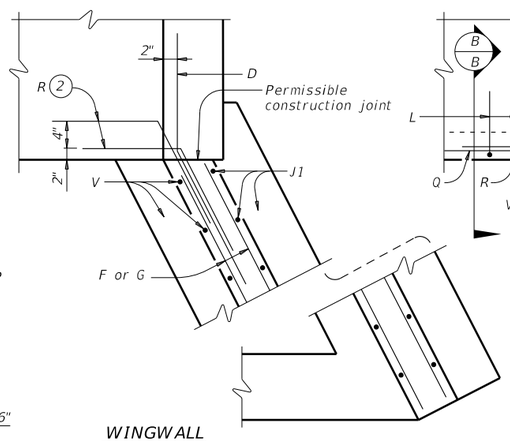


STRUCTURAL PLAN

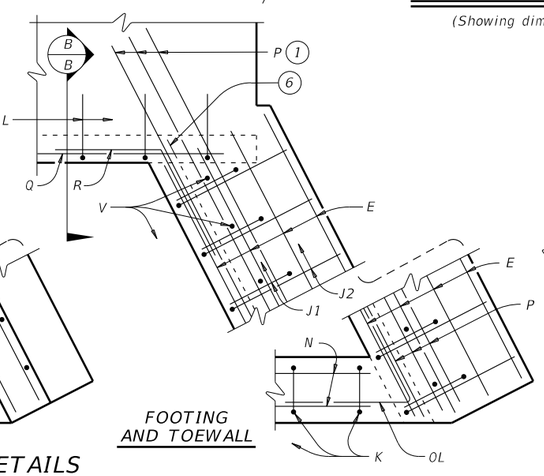
(Showing dimensions.)



SECTION A-A



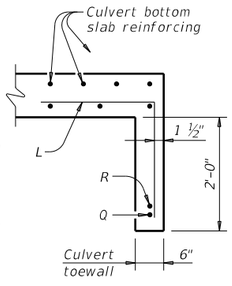
WINGWALL



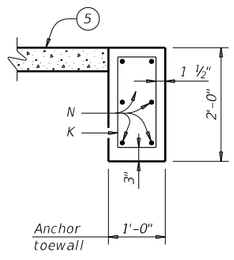
FOOTING AND TOEWALL

CORNER DETAILS

(Culvert and culvert toewall reinforcing not shown for clarity.)



SECTION B-B (5)



SECTION C-C

SHEET 1 OF 3

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT WITH FLARED WINGS

FOR 0° SKEW BOX CULVERTS
TYPE I ~ CROSS DRAINAGE

SETB-FW-0

FILE:	setbf0se-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
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		DIST	COUNTY		SHEET NO.
		BWD	SAN SABA		137

DATE: 11/16/2022 4:42
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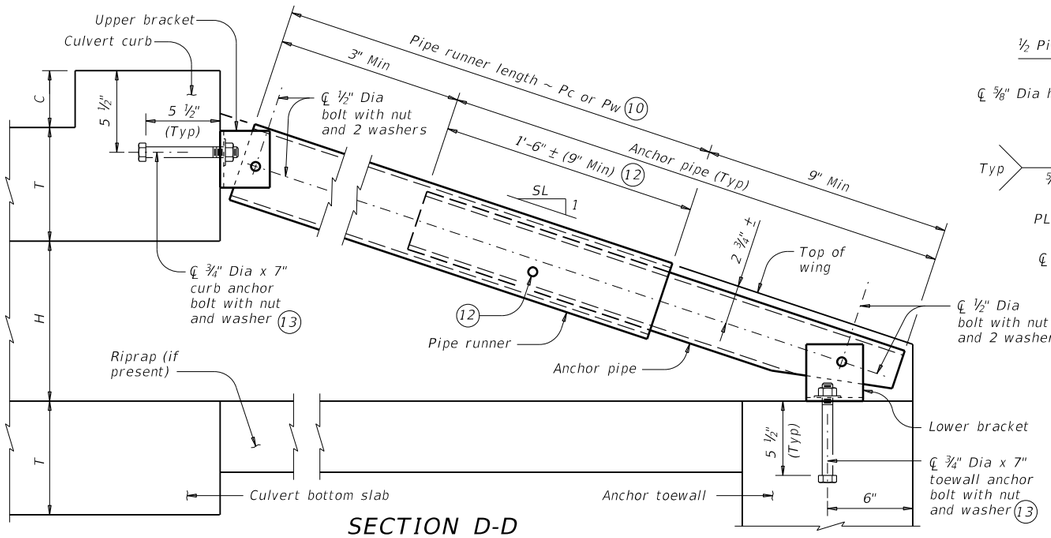
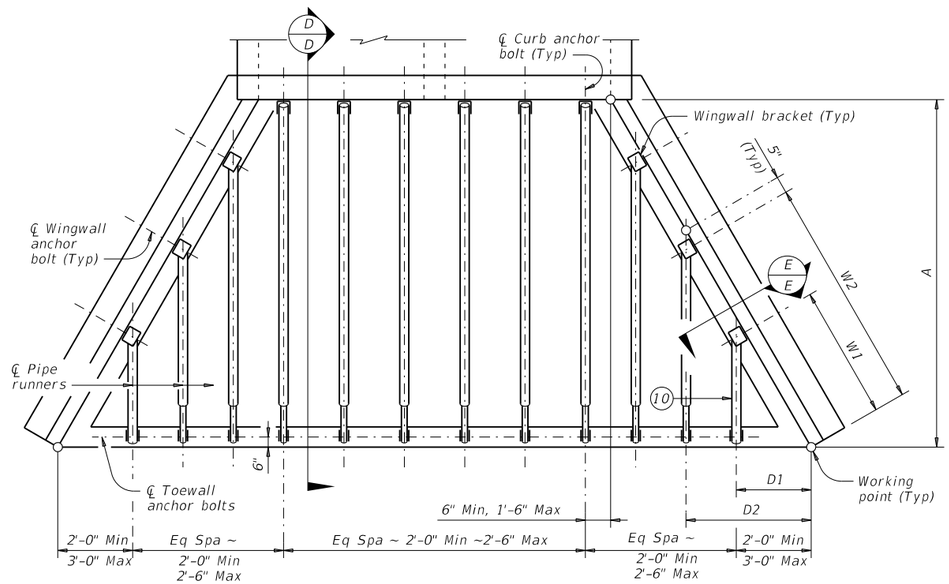
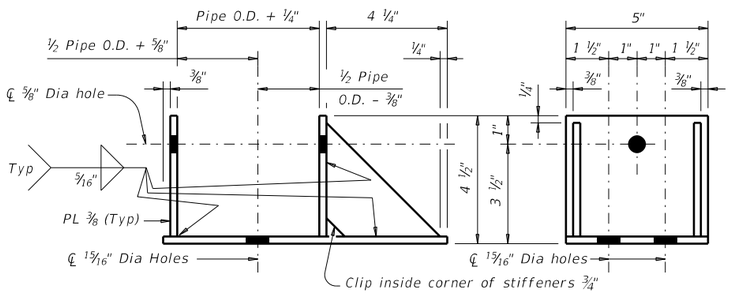


SECTION D-D

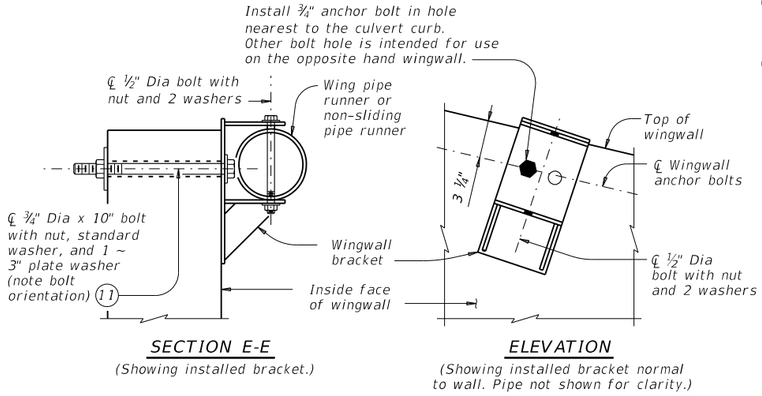
(Showing curb pipe runner. Except for upper bracket, wingwall pipe runners are similar.)



PIPE RUNNER PLAN



ELEVATION SIDE VIEW

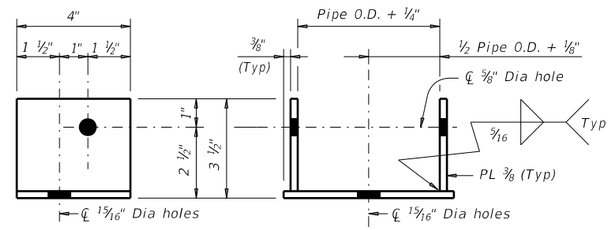


SECTION E-E
(Showing installed bracket.)

ELEVATION
(Showing installed bracket normal to wall. Pipe not shown for clarity.)

Note: Match wingwall bracket to the upper curb bracket size.

WINGWALL BRACKET DETAILS



SIDE VIEW ELEVATION

Note: Match upper and lower brackets, except for the brackets used with non-sliding pipe runners, to the required pipe diameters as shown in the table.

UPPER AND LOWER BRACKET DETAILS

MAXIMUM PIPE RUNNER LENGTHS AND REQUIRED PIPE RUNNER SIZES

Maximum Pipe Runner Length (Pc or Pw)	Required Pipe Runner Size			Required Anchor Pipe Size		
	Pipe Size	Pipe O.D.	Pipe I.D.	Pipe Size	Pipe O.D.	Pipe I.D.
9'-4"	3" STD	3.500"	3.068"	2" STD	2.375"	2.067"
19'-0"	4" STD	4.500"	4.026"	3" STD	3.500"	3.068"
33'-6"	5" STD	5.563"	5.047"	4" STD	4.500"	4.026"

(10) If pipe runner length (Pw) is 1'-9" or less replace the normal pipe runner and anchor pipe with a single non-sliding pipe runner. See Non-Sliding Pipe Runner Details for additional information.

(11) At Contractor's option, ⅞" diameter hole may be formed or cored drilled. Percussion drilling is not permitted. Adjust placement of reinforcing steel as necessary to avoid bolt holes.

(12) After installation of pipe runner, use the ½" inspection hole to ensure that the lap of the anchor pipe with the pipe runner is adequate.

(13) At Contractor's option, an adhesive anchor may be used. Provide ¾" Dia adhesive anchors that meet the requirements of ASTM A307 Gr A fully threaded rods. Embed threaded rods into curb, wingwalls, and toewall using a Type III, Class C, D, E, or F anchor adhesive. Minimum embedment depth is 5 ½". Provide anchor adhesive able to achieve a basic bond strength in tension, Nba, of 20 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.

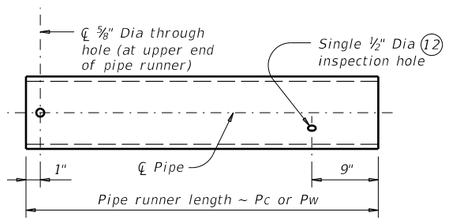
PIPE RUNNER DIMENSION CALCULATIONS:

Wn = (2.000) (Dn) - (0.416')
Pwn = (Dn) (K2) - (2.063')
Pw1 Non-Sliding Pipe Runner (If required) = (D1) (K2) - (0.563')
Pc = (A) (K1) - (1.688')

Wn = Distance from working point to centerline anchor bolt measured along bottom inside face of wing (feet)
Dn = Distance from working point to centerline pipe runner measured along outside face of anchor toewall (feet)
Pw = Wingwall pipe runner length (feet)
Pc = Curb pipe runner length (feet)
K = Constant values for use in formulas

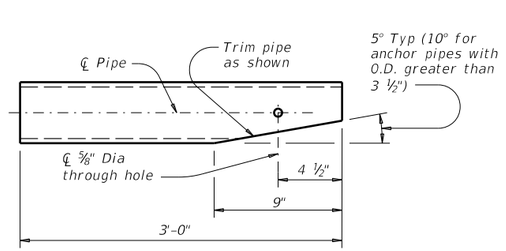
Slope SL:1	K1	K2
3:1	~ 1.054	~ 1.826
4:1	~ 1.031	~ 1.785
6:1	~ 1.014	~ 1.756

n = Wing pipe runner number

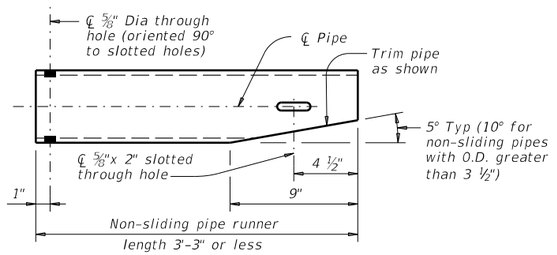


Note: Pipe diameter required for curb pipe runner is also used for wingwall pipe runner.

PIPE RUNNER DETAILS



ANCHOR PIPE DETAILS



Note: Pipe size is the same as required for curb pipe runner. Adjust the corresponding lower bracket accordingly.

NON-SLIDING PIPE RUNNER DETAILS

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT WITH FLARED WINGS

FOR 0° SKEW BOX CULVERTS
TYPE I ~ CROSS DRAINAGE

SETB-FW-0

FILE: setbf0se-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
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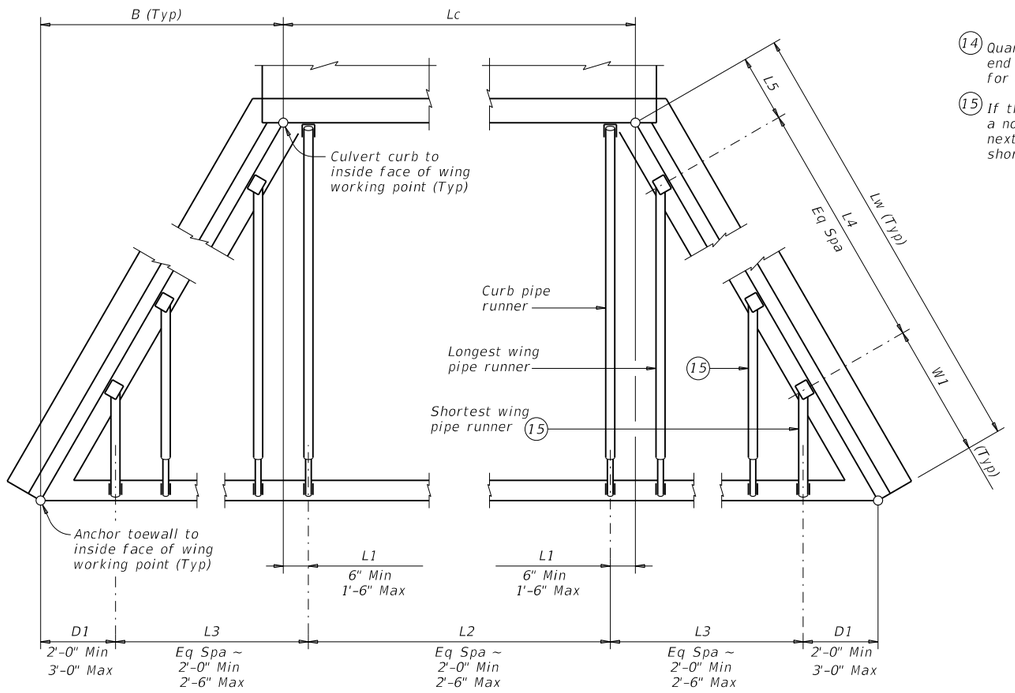
REVISIONS	0289	04	032,ETC	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	SAN SABA		138

Culvert Station and/or Creek name followed by applicable end (Lt, Rt or Both) (14)	Lc (Ft)	L1 (Ft)	L2 No. Spa	L2 Spa at (Ft)	L2 Overall Length (Ft)	D1 (Ft)	L3 No. Spa	L3 Spa at (Ft)	L3 Overall Length (Ft)	W1 (Ft)	L4 No. Spa	L4 Spa at (Ft)	L4 Overall Length (Ft)	L5 (Ft)	Curb Pipe Runner (Pc) No.	Curb Pipe Runner (Pc) Length (Ft)	Longest Wing Pipe Runner (Pw) (Ft)	Shortest Wing Pipe Runner (Pw) (Ft)	Non-Sliding Wing Pipe Runner (if applicable) (Ft)	Curb, Wing, and/or Non-Sliding Pipe Runners Size (3",4" or 5")	Curb, Wing, and/or Non-Sliding Pipe Runners Total (14) Length (Ft)	3'-0" Anchor Pipe Size (2",3" or 4")	3'-0" Anchor Pipe Total (14) Length (Ft)
Culvert 1-SH 16 STA.95+93 (Both)	19.167 '	0.500 '	8	2.271 '	18.167 '	3.000 '	2	2.358 '	4.717 '	5.583 '	1	4.717 '	4.717 '	4.134 '	9	11.479 '	7.729 '	3.417 '	N/A	4"	251.208 '	3"	78.000



PIPE RUNNER LAYOUT

(14) Quantities shown are for one structure end if Lt or Rt. Quantities shown are for two structure ends if Both.

(15) If the outermost wing pipe runner is a non-sliding pipe runner, consider the next outermost wing pipe runner as the shortest.

STATE OF TEXAS
ANDRES M. CARDENAS
88453
LICENSED PROFESSIONAL ENGINEER
11/16/2022

SPECIAL NOTE:

This tabular sheet is to be filled out by the culvert specifier and provides information for the construction details and quantities of pipe runners.

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.

Note that the tabular quantities are given for estimating purposes only. It is likely that these quantities will change due to field conditions. Therefore, all dimensions must be verified by the Contractor in the field prior to fabrication of the safety end treatment components.

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SHEET 3 OF 3

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT WITH FLARED WINGS

FOR 0° SKEW BOX CULVERTS TYPE I ~ CROSS DRAINAGE

SETB-FW-0

FILE: setbf0se-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0289	04	032,ETC	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	SAN SABA		139

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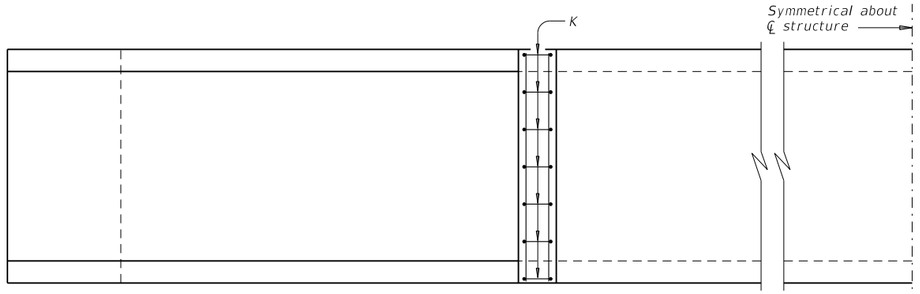
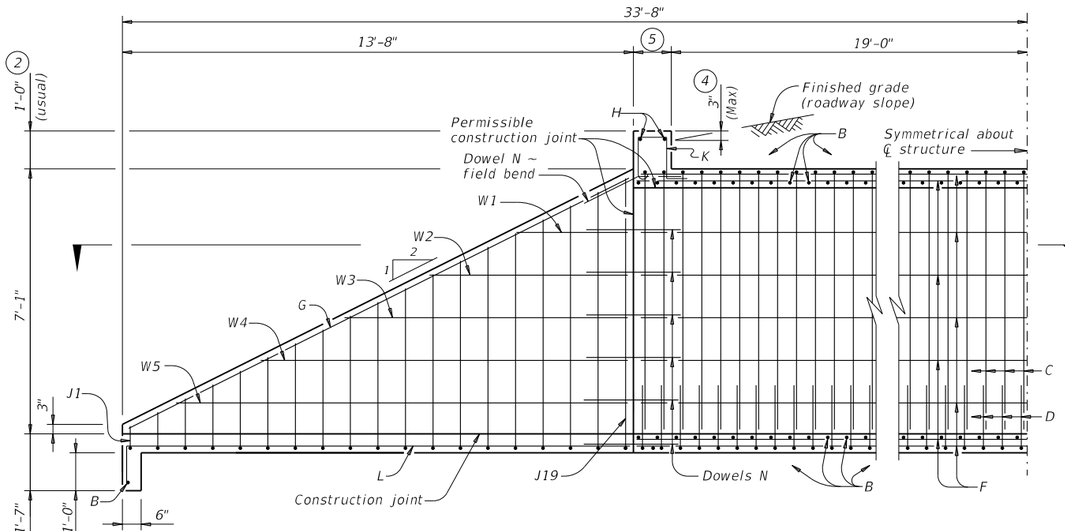
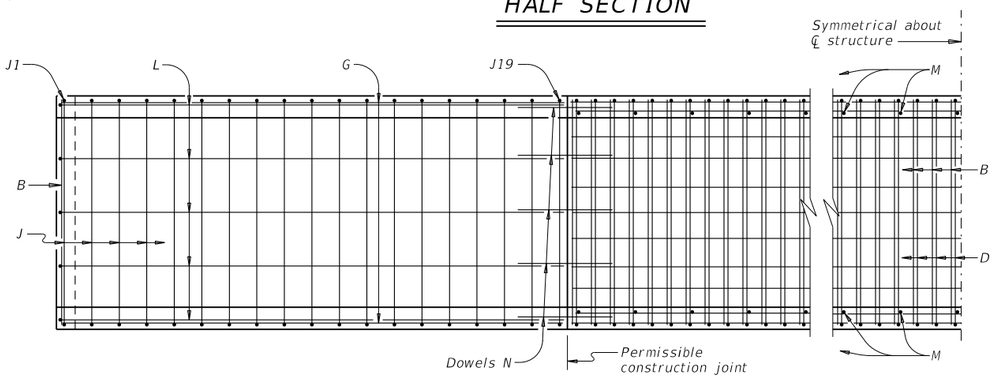


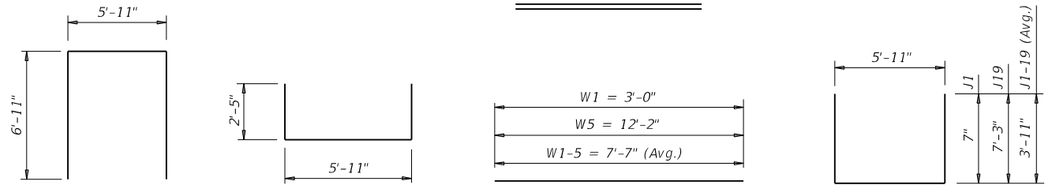
HALF PLAN



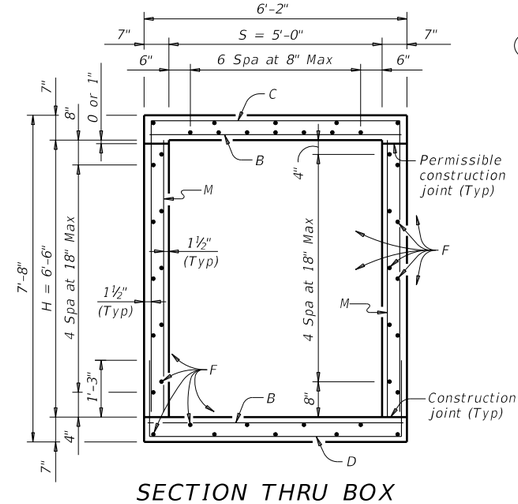
HALF SECTION



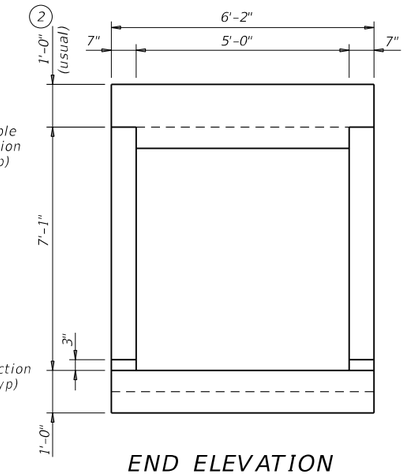
SECTION A-A



BARS C | BARS D | BARS W | BARS J



SECTION THRU BOX



END ELEVATION

ESTIMATED QUANTITIES FOR ONE STOCK PASS (1)

Bar	No.	Size	Spa	Length	Weight
B	163	#5	6"	5' - 10"	992
C	81	#4	6"	19' - 9"	1,069
D	81	#4	6"	10' - 9"	582
F	41	#4	Shown	39' - 8"	1,086
G	4	#4	~	15' - 0"	40
H	4	#4	~	5' - 10"	16
J1-19	38	#4	9"	13' - 8"Av	347
K	14	#4	12"	4' - 2"	39
L	10	#4	17"±	14' - 4"	96
M	110	#4	9"	6' - 6"	478
N	34	#6	~	3' - 0"	153
W1-5	20	#4	~	7' - 7"Av	101
Reinforcing Steel				Lb	5,002
Concrete				CY	30.6

(1) Quantities shown are for 38'-0" roadway width with two ends (4 wings and 2 aprons). For each 1'-0" variation in roadway width, make the following adjustments:
- reinforcing steel, 104.3 lb.
- concrete, 0.55 CY

For boxes with no wings or with alternate wings, make the following adjustments:
- omit Bars G, J, L, N, and W;
- subtract 730 lb. from reinforcing steel total; and
- subtract 8.3 CY from concrete total.

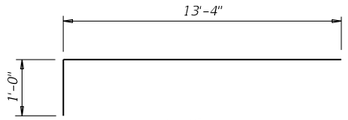
(2) 0" Min to 1'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Rail Anchorage Curb (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.

(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.

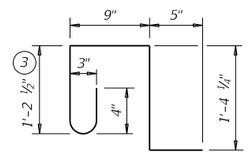
(4) For vehicle safety, the following requirements must be met:
- For structures without bridge rail, construct curbs no more than 3" above finished grade.
- For structures with bridge rail, construct curbs flush with finished grade.

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.

(5) 1'-0" typical. 2'-3" when the Rail Anchorage Curb (RAC) standard sheet is referred to elsewhere in the plans.



BARS L



BARS K (#4)
(Spa = 1'-0" Max)
(Length = 4'-2")

The Contractor may replace Bars B, C, D, F, or M 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 Gr 60 #4 Bars at 9" Spacing with WWR
Required WWR = (0.20 sq. in. per 0.75 ft.) x (60 ksi / 70 ksi) = 0.229 sq. in. per ft.
If D23 wire is used to meet the 0.229 sq. in. per ft. requirement in this example, the required spacing = (0.230 sq. in.) / (0.229 sq. in. per ft.) x (12 in. per ft.) = 12.05" Max spacing. Required lap length for the provided D19.6 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.
Adjust reinforcing bars to provide a minimum of 1 ½" clear cover.
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 and Bars C and Bars 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 the top slabs of:
- culverts with overlay,
- culverts with 1-to-2 course surface treatment, or
- culverts with the top slab as teh final riding surface.

Provide bar laps, where required, as follows:
- Uncoated or galvanized ~ #4 = 1'-8"
- Uncoated or galvanized ~ #5 = 2'-1"
- Uncoated or galvanized ~ #6 = 2'-6"

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 Details (SCC-MD) standard sheet for lengthening details.
For wingwalls other than those shown here, refer to wingwall standards and details shown elsewhere in the plans.

Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

STOCK PASS

SIZE 5'-0" X 6'-6"
0' TO 14' FILL

SP

FILE: spe01ste-20.dgn	DN: TBE	CK: TAR	DW: TxDOT	CK: TxDOT
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TABLE OF DIMENSIONS AND REINFORCING STEEL
(Wings for one structure end)

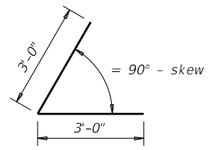
Dimensions					Variable Reinforcing				Estimated Quantities per ft of wing (2~wings) (4)		Estimated Quantities per ft of Toewall (1~toewall)	
					Bars J1		Bars J2					
Maximum Wingwall Height Hw	W	X	Y	Z	Size	Spa	Size	Spa	Reinf (Lb/Ft)	Conc (CY/Ft)	Reinf (Lb/Ft)	Conc (CY/Ft)
2'-6"	2'-10"	10"	1'-0"	7"	#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)

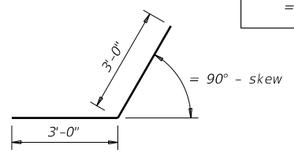
Bar	Size	No.	Spa
D1	#6	~	1'-0"
D2	#6	~	1'-0"
E1	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	~	8"
M1	#4	4	~
P	#4	~	1'-0"
V	#4	~	1'-0"

TABLE OF TOEWALL REINFORCING

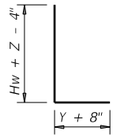
Bar	Size	No.	Spa
J3	#4	~	1'-0"
M2	#4	2	~
E2	#4	~	1'-0"



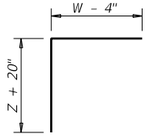
BARS D1



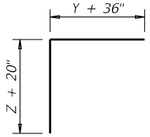
BARS D2



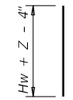
BARS J1



BARS J2



BARS J3



BARS V

WING DIMENSION FORMULAS:
(All values are in feet.)

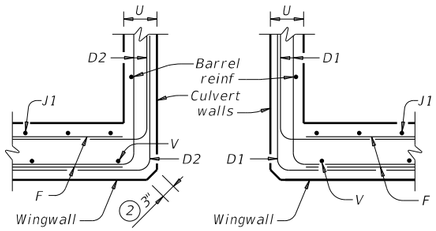
Hw = H + T + C
Lw = (Hw) (SL) ÷ cosine (θ) for Type PW-1
= (Hw - 1') (SL) ÷ cosine (θ) for Type PW-2 and Hw ≥ 4'
= (Hw - 0.5') (SL) ÷ cosine (θ) for Type PW-2 and Hw < 4'

For cast-in-place culverts:
Ltw = [(N) (S) + (N + 1) (U)] ÷ cosine (θ)

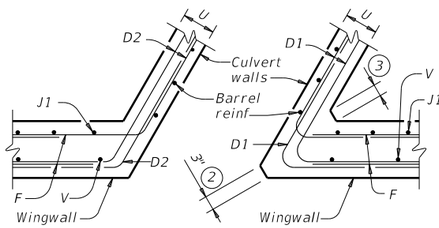
For precast culverts:
Ltw = [(N) (2 U + S) + (N - 1) (0.5')] ÷ cosine (θ)
Total Wingwall Area (two wings ~ SF)
= (2)(Hw)(Lw) for Type PW-1
= (2)(Hw)(Lw) - 6 SF for Type PW-2 and Hw ≥ 4'
= (2)(Hw)(Lw) - 1.5 SF for Type PW-2 and Hw < 4'

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

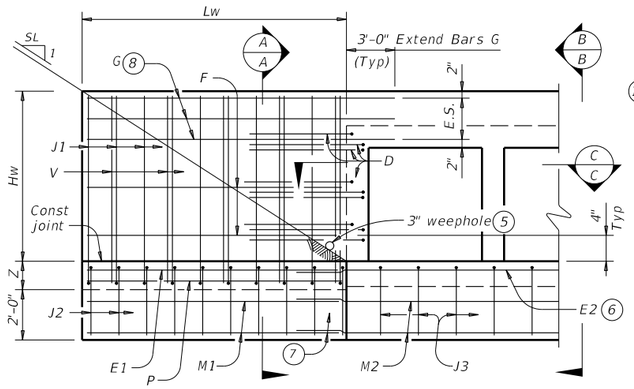
See applicable box culvert standard sheet for S, H, T, and U values.



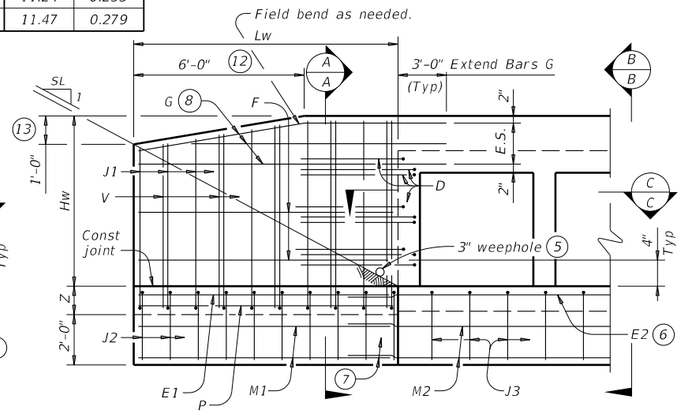
SECTION C-C - PW-1



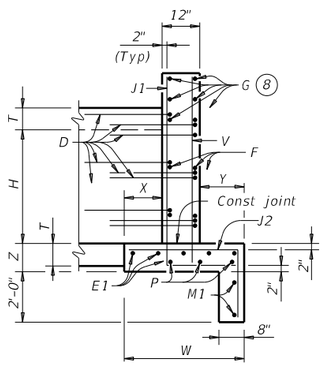
SECTION C-C - PW-2



PARTIAL ELEVATION - PW-1



PARTIAL ELEVATION - PW-2



SECTION A-A
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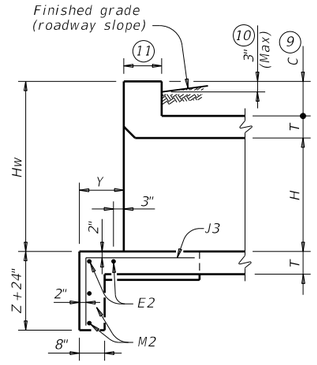
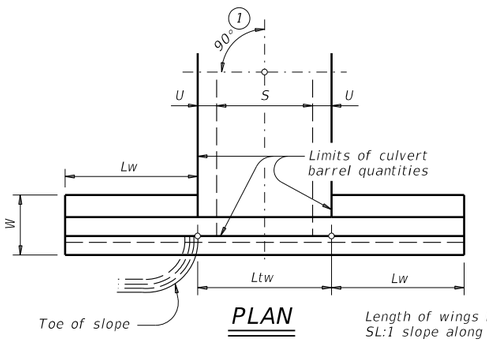
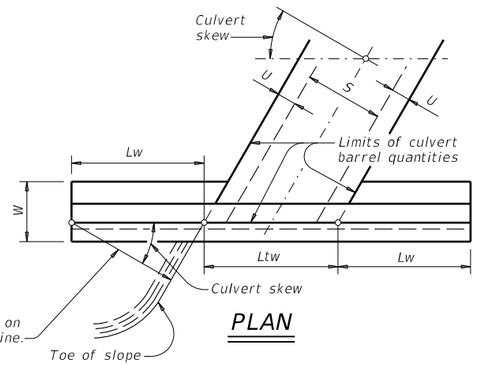


SECTION B-B
(Showing wing reinforcement.)



PLAN

DETAILS FOR NON-SKEWED BOX CULVERTS



PLAN

DETAILS FOR SKEWED BOX CULVERTS
(Showing 30° skew.)

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'.

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.

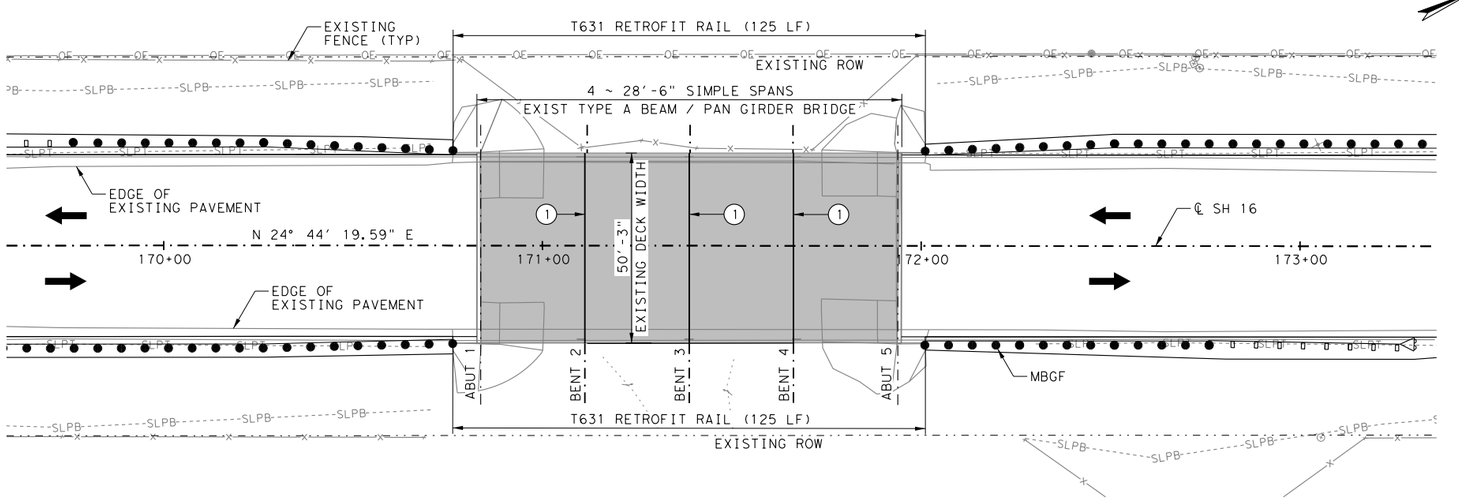
Cover dimensions are clear dimensions, unless noted otherwise. Reinforcing dimensions are out-to-out of bars.

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	0289	04	032,ETC	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	SAN SABA		141



PLAN - JERRYS CREEK BRIDGE

GENERAL NOTES:

1. ALL DIMENSIONS AND OTHER INFORMATION PERTAINING TO EXISTING CONSTRUCTION ARE BASED ON AS-BUILT PLANS. CONTRACTOR TO VERIFY DIMENSIONS PRIOR TO ORDERING MATERIALS AND COMMENCING WORK.
2. SEE "BRIDGE RAIL REPLACEMENT DETAILS" SHEET FOR RAIL REPLACEMENT DETAILS.

(1) SEE "CLEANING AND SEALING EXISTING BRIDGE JOINTS" SHEET FOR JOINT CLEANING AND SEALING DETAILS AT INTERIOR BENTS.

ESTIMATED QUANTITIES

BRIDGE	NBI NUMBER	ITEM	DESCRIPTION	UNIT	QUANTITY
JERRYS CREEK	23-206-0-0289-04-037	451-6019	RETROFIT RAIL (TY T631)	LF	250
		438-6002	CLEANING AND SEALING EXISTING JOINTS(CL3)	LF	151

NO.	REVISION	BY	DATE

ANDY ZHU
88707
LICENSED
PROFESSIONAL ENGINEER
STATE OF TEXAS
11/22/2022

Texas Department of Transportation
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TBPE FIRM NO. F-3379

SH 16
BRIDGE RAIL REPLACEMENT STRUCTURE LAYOUT
JERRYS CREEK BRIDGE

11/22/2022 SHEET 1 OF 1

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.	HIGHWAY No.
CHECKED:	6	TEXAS		SH 16

DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
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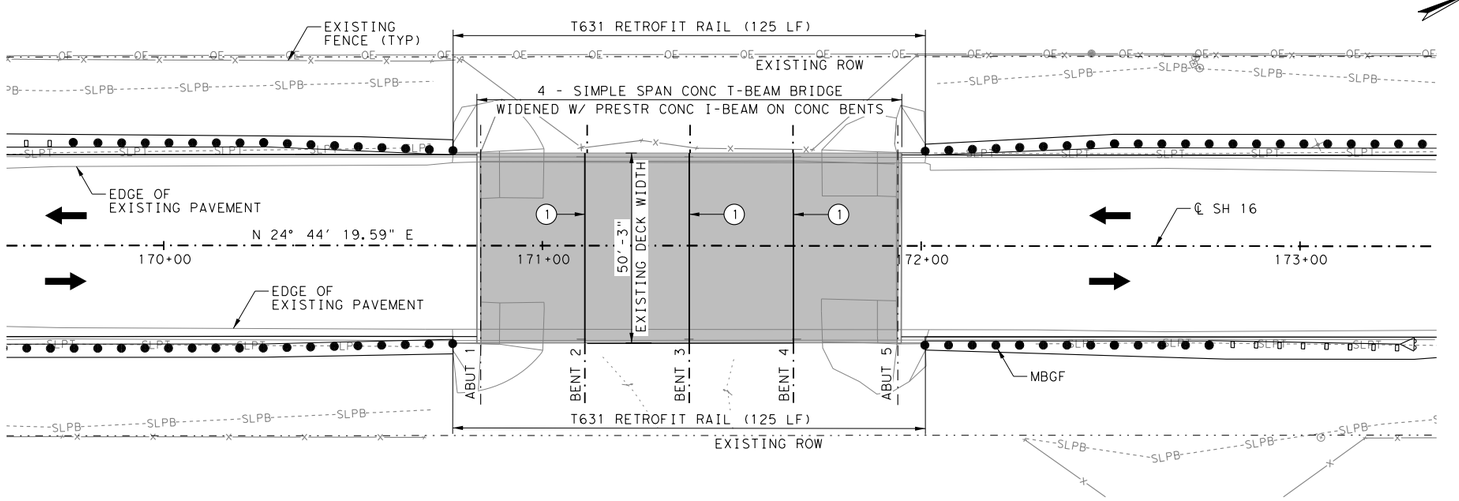


PLAN - JERRYS CREEK BRIDGE

GENERAL NOTES:

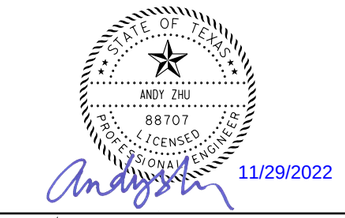
1. ALL DIMENSIONS AND OTHER INFORMATION PERTAINING TO EXISTING CONSTRUCTION ARE BASED ON AS-BUILT PLANS. CONTRACTOR TO VERIFY DIMENSIONS PRIOR TO ORDERING MATERIALS AND COMMENCING WORK.
2. SEE "BRIDGE RAIL REPLACEMENT DETAILS" SHEET FOR RAIL REPLACEMENT DETAILS.

(1) SEE "CLEANING AND SEALING EXISTING BRIDGE JOINTS" SHEET FOR JOINT CLEANING AND SEALING DETAILS AT INTERIOR BENTS.

ESTIMATED QUANTITIES

BRIDGE	NBI NUMBER	ITEM	DESCRIPTION	UNIT	QUANTITY
JERRYS CREEK	23-206-0-0289-04-037	451-6019	RETROFIT RAIL (TY T631)	LF	250
		438-6004	CLEANING AND SEALING EXISTING JOINTS(CL7)	LF	151

NO.	REVISION	BY	DATE



Texas Department of Transportation

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8436 SPICEWOOD SPRINGS ROAD
AUSTIN, TX 78759
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SH 16
BRIDGE RAIL REPLACEMENT STRUCTURE LAYOUT
JERRYS CREEK BRIDGE

11/29/2022 SHEET 1 OF 1

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.	
CHECKED:	6	TEXAS				SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.	
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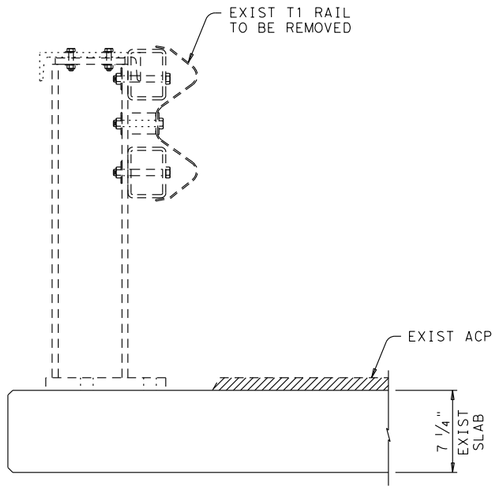
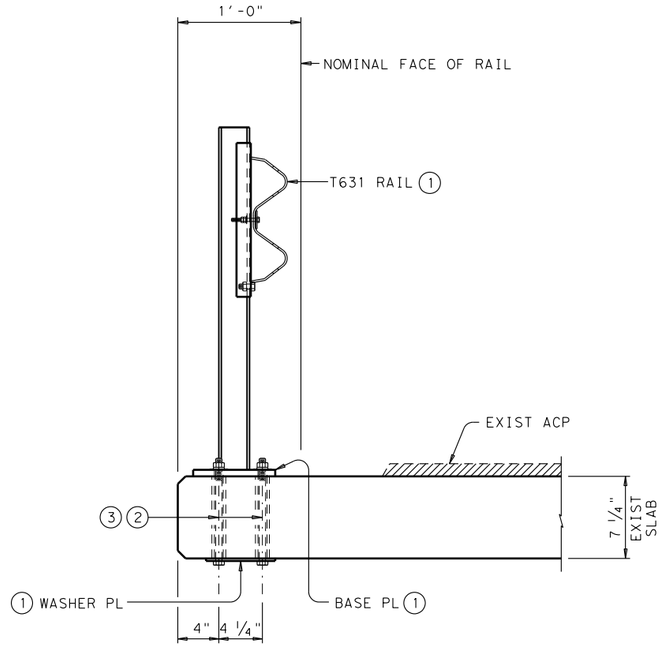


EXISTING T1 RAIL

(SHOWING EXISTING RAIL ON BRIDGE SPANS,
EXISTING RAIL ON WINGWALL SIMILAR)



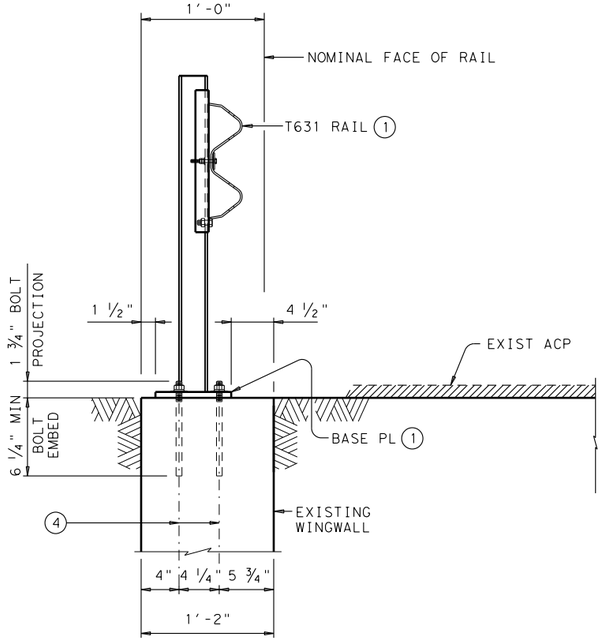
T631 RETROFIT ON BRIDGE SPANS

(1) SEE T631 RAIL STANDARD FOR RAIL DETAILS NOT SHOWN.

(2) ℄ 7/8" DIA HOLES FOR 5/8" DIA ANCHOR BOLTS. SEE T631 RAIL STANDARD FOR ANCHOR BOLT INFORMATION. CORE DRILL HOLES THROUGH EXISTING DECK (PERCUSSION DRILLING NOT PERMITTED). CONCRETE SPALS IN THE BOTTOM OF DECK EXCEEDING 1/2" FROM EDGE OF HOLES WILL BE PATCHED IN ACCORDANCE WITH ITEM 429, "CONCRETE STRUCTURE REPAIR" AT THE CONTRACTOR'S EXPENSE.

(3) CONTRACTOR TO FIELD VERIFY EXISTING ANCHOR BOLT LOCATIONS FROM THE T1 RAILING. ADJUST RETROFIT RAIL POST LOCATIONS TO AVOID CONFLICT WITH EXISTING HOLES. CONTRACTOR TO FIELD VERIFY THESE LOCATIONS PRIOR TO FABRICATION OF RAIL.

(4) ℄ EPOXY ADHESIVE BOLTS. EPOXY ADHESIVE ANCHOR BOLTS SHALL BE 5/8" DIA ASTM-A193 GR B7 OR F1554 GR 105 FULLY THREADED RODS WITH ONE HARDENED WASHER AND ONE REGULAR LOCK WASHER PLACED UNDER EACH HEAVY HEX NUT. NUT SHALL COMPLY WITH ASTM-A563. EMBED THREADED RODS 6 1/4" MIN INTO WINGWALL USING A TYPE III, CLASS C, D, E OR F EPOXY ADHESIVE ANCHORAGE SYSTEM CAPABLE OF OBTAINING AN ULTIMATE LOAD, PER THREADED ROD, OF 8 KIPS IN TENSION. SUBMIT SIGNED AND SEALED CALCULATIONS OR THE MANUFACTURER'S PUBLISHED LITERATURE SHOWING THE PROPOSED EPOXY ADHESIVE ANCHORAGE SYSTEM'S ABILITY TO DEVELOP THIS LOAD TO THE ENGINEER FOR APPROVAL PRIOR TO USE. ANCHOR INSTALLATION INCLUDING HOLE SIZE, DRILLING, AND CLEAN-OUT SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTION. SEE RAIL T631 STANDARD FOR ADDITIONAL INFORMATION. CONNECTION IS SUBSIDIARY TO RAILING STANDARD.



T631 RETROFIT ON WINGWALL

GENERAL NOTES:

DESIGNED IN ACCORDANCE WITH AASHTO LRFD SPECIFICATIONS.

ALL DIMENSIONS AND OTHER INFORMATION PERTAINING EXISTING CONSTRUCTION ARE BASED ON AS-BUILT PLANS. CONTRACTOR TO VERIFY DIMENSIONS PRIOR TO ORDERING MATERIALS AND COMMENCING WORK.

PRIOR TO CONSTRUCTION, CONTRACTOR SHALL VERIFY THAT EXISTING STRUCTURAL MATERIALS DETAILED IN PLANS ARE FREE OF DETERIORATION. EXISTING CONCRETE WHERE THE NEW RAIL WILL BE MOUNTED SHALL BE FREE OF ANY MAJOR SPALLING, DELAMINATION, CRACKING AND EXPOSED REINFORCING. FOUNDING GROUND SHALL BE STABLE, FREE OF ANY VOIDS AND EROSION THAT MAY CAUSE UNDERPINNING. WHEN FOUND, CONTRACTOR SHALL NOTIFY ENGINEER OF THE SEVERITY OF DETERIORATION.

AS-BUILT PLANS FOR EXISTING BRIDGES ARE AVAILABLE AT TxDOT OFFICE UPON REQUEST.

NO.	REVISION	BY	DATE

STATE OF TEXAS
ANDY ZHU
88707
LICENSED
PROFESSIONAL ENGINEER

11/22/2022

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TBPE FIRM NO. F-3379

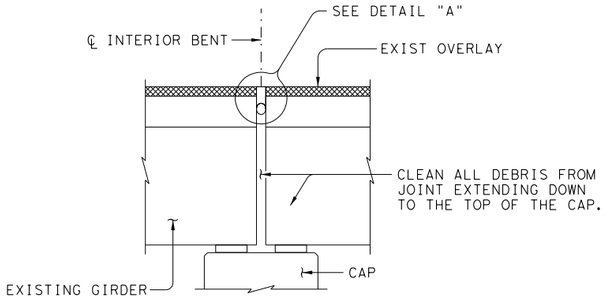
SH 16
BRIDGE RAIL REPLACEMENT DETAILS

JERRYS CREEK BRIDGE

11/22/2022 SHEET 1 OF 1

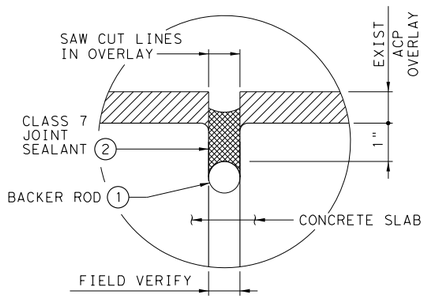
DESIGNED:	FED. RD DIV. NO.	STATE	FEDERAL AID PROJECT No.	HIGHWAY No.
CHECKED:	6	TEXAS		SH 16

DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	BWD	SAN SABA	0289	04	032	143



JOINT W/ SILICONE SEALANT

(USED WITH ACP OVERLAY)



DETAIL "A"

PROCEDURE FOR CLEANING AND SEALING EXISTING JOINT WITH SILICONE SEAL:

1) SAW CUT THROUGH THE ASPHALT AT THE CENTERLINE OF JOINT. MAKE MULTIPLE SAW CUTS TO CREATE A ½" MINIMUM JOINT OPENING OR MATCH THE EXISTING JOINT OPENING. CLEAN JOINT OPENING OF ALL OLD EXPANSION MATERIALS/DEVICES, BITUMINOUS MATERIALS, DIRT, GREASE AND ALL OTHER DELETERIOUS MATERIALS IN ACCORDANCE WITH ITEM 438, "CLEANING AND SEALING JOINTS."

2) OBTAIN APPROVAL OF CLEANED JOINT PRIOR TO PROCEEDING WITH JOINT SEALING OPERATION.

3) PLACE BACKER ROD INTO JOINT OPENING 1" BELOW THE TOP OF CONCRETE.

4) SEAL THE JOINT OPENING WITH A CLASS 7 JOINT SEALANT. RECESS SEAL TO 1/2" BELOW THE TOP OF TRAVEL LANES.

GENERAL NOTES:

CLEANING OF EXISTING JOINT OPENING OF ALL DEBRIS (FULL DEPTH TO TOP OF BENT CAP), PROVIDING AND PLACING BACKER ROD, SAW-CUTTING JOINT OPENING, AND SEALING JOINT IS PAID FOR BY ITEM 438, "CLEANING AND SEALING JOINTS" AND MEASURED BY THE LINEAR FOOT. OBTAIN APPROVAL FOR ALL TOOLS, EQUIPMENT, MATERIALS AND TECHNIQUES PROPOSED FOR USED TO PREPARE THE JOINT. PROVIDE CLASS 7 SILICONE JOINT SEALANT IN ACCORDANCE WITH DMS-6310, "JOINT SEALANTS AND FILLERS". EXTEND SEALANT UP INTO RAIL OR CURB 3 INCHES ON LOW SIDE OR SIDES OF DECK. PREPARE SURFACES WHERE SEALANT IS TO BE PLACED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.

(1) PROVIDE BACKER ROD 25% LARGER THAN JOINT OPENING COMPATIBLE WITH THE SEALANT. USE OF MULTIPLE PIECES TO CREATE A BACKER ROD CROSS SECTION IS NOT PERMITTED. TOP OF BACKER ROD MUST BE CONVEX AS SHOWN.

(2) USE CLASS 7 SILICONE JOINT SEALANT IN ACCORDANCE WITH DMS-6310 "JOINT SEALANTS AND FILLERS". PREPARE JOINT AND SEAL IN ACCORDANCE WITH ITEM 438, "CLEANING AND SEALING JOINTS."

NO.	REVISION	BY	DATE

STATE OF TEXAS
ANDY ZHU
88707
LICENSED
PROFESSIONAL ENGINEER
11/29/2022

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SH 16

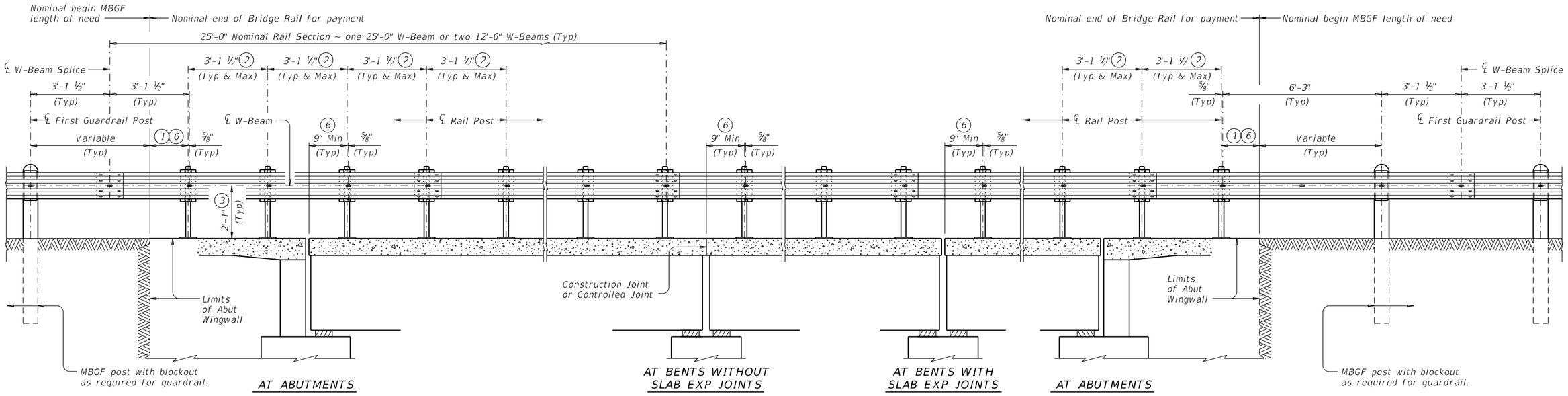
CLEANING AND SEALING EXISTING BRIDGE JOINTS

JERRYS CREEK BRIDGE

11/29/2022 SHEET 1 OF 1

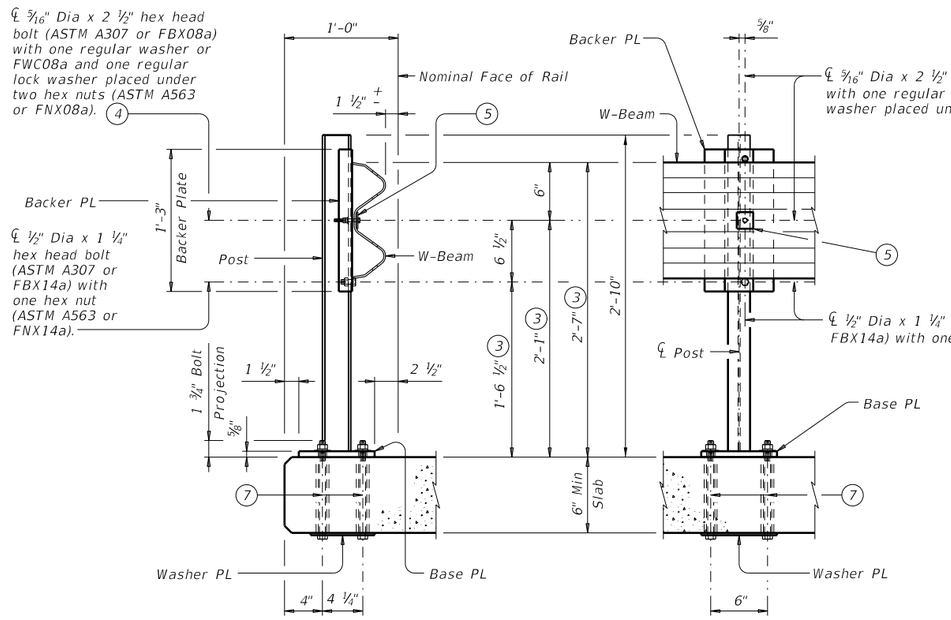
DESIGNED:	FED. RD DIV. NO.	STATE	FEDERAL AID PROJECT No.	HIGHWAY No.
CHECKED:	6	TEXAS		SH 16

DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	BWD	SAN SABA	0289	04	032	144



ROADWAY ELEVATION OF RAIL

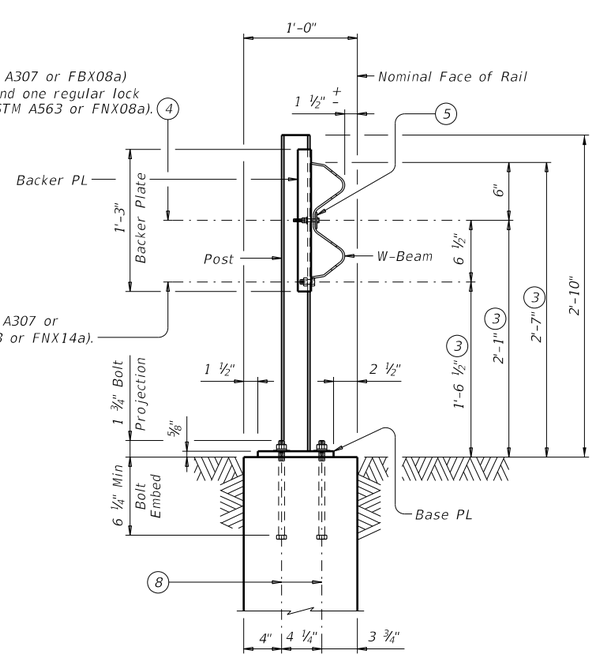
Showing without overlay.



RAIL SECTION *TRAFFIC SIDE RAIL VIEW*

RAIL DETAILS ON BRIDGE SLAB

Showing without overlay.



RAIL SECTION ON ABUTMENT WINGWALL

Showing without overlay.

(1) *9" Min, 5'-9" Max*

(2) *Maintain 3'-1 ½" Rail Post spacing wherever possible for use with nominal 25'-0" or 12'-6" W-Beam sections. Symmetry of post spacing on both sides and along the structure is not necessary.*

(3) *Increase 2" for structures with overlay.*

(4) *Tighten the first hex nut by hand until the top and bottom edges of the W-Beam engage the Backer Plate (Backer Plate should be snug against the post). Then tighten hex nut one revolution with wrench and secure with the second hex nut.*

(5) *PL ⅛ x 1 ¾ x 1¾ with ⅜ Dia Hole centered in PL (ASTM A36). Square Guardrail Washer (FWR01).*

(6) *The post nearest to a slab joint or end of structure may be shifted up to 9" in order to satisfy the minimum offset dimension. Drill a new ¾" Dia hole on the centerline of W-beam for shifted post. Paint hole with two coats of zinc-rich paint conforming to the Item "Galvanizing". All other posts must remain on the typical spacing.*

(7) *℄ ⅞" Dia formed holes for ℄ ⅝" Dia heavy hex head anchor bolt (ASTM F3125 Gr A325 or A449) or threaded rod (ATSM A193 Gr B7 or F1554 Gr 105) with one hardened steel washer (ASTM F436) and one regular lock washer placed under heavy hex nut (ASTM A563). One additional heavy hex nut must be furnished and tack weled for each threaded rod. See "Cast-In-Place & Formed Hole Anchor Bolt Options".*

(8) *℄ ⅝" Dia heavy hex head anchor bolt (ASTM F3125 Gr A325 or A449) or threaded rod (ATSM A193 Gr B7 or F1554 Gr 105) with one hardened steel washer (ASTM F436) and one regular lock washer placed under heavy hex nut (ASTM A563). One additional heavy hex nut must be furnished and tack weled for each threaded rod. See "Cast-In-Place & Formed Hole Anchor Bolt Options".*

DATE:
FILE:

Texas Department of Transportation

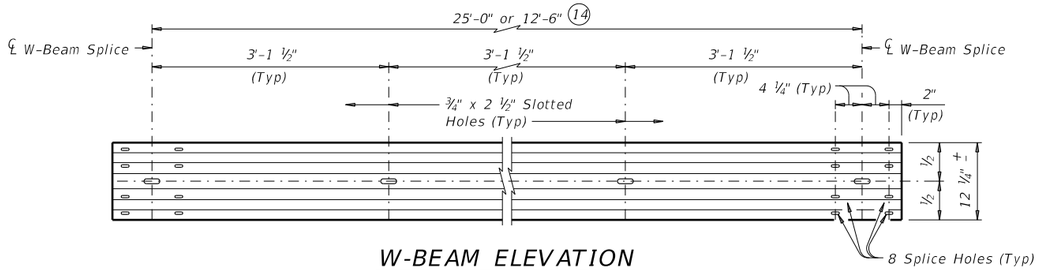
Bridge Division Standard

TRAFFIC RAIL

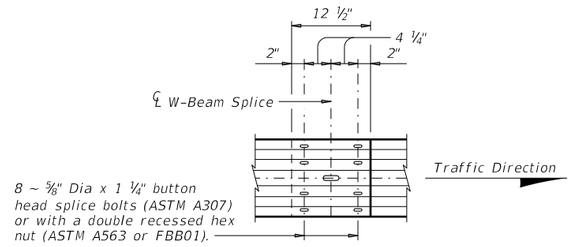
TYPE T631

FILE: ristd038-20.dgn	DN: TxDOT	CK: AES	DW: JTR	CK: AES
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0289	04	032	SH 16
07-20: Allowing 9'-4 ½" or 6'-3" W-Beam sections.	DIST	COUNTY		SHEET NO.
	BWD	SAN SABA		145

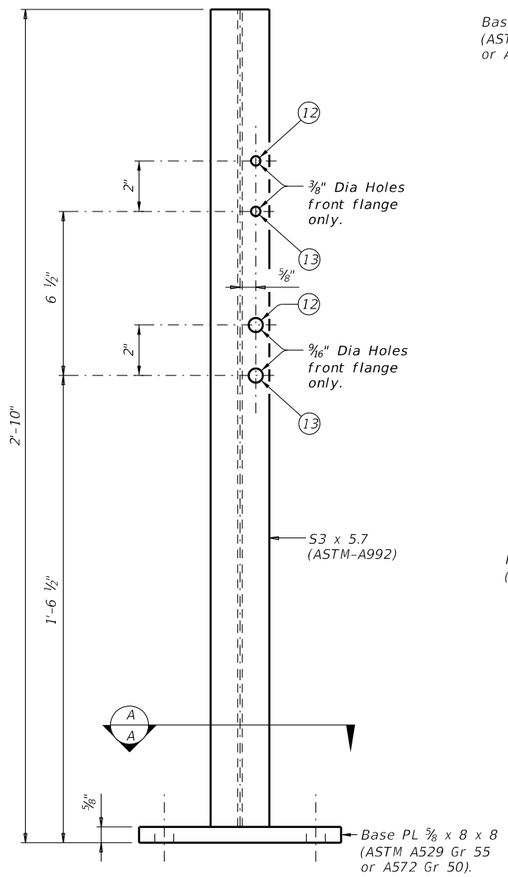
DATE:
FILE:



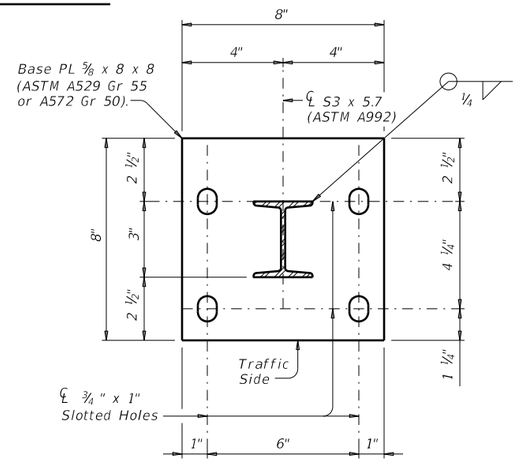
W-BEAM ELEVATION



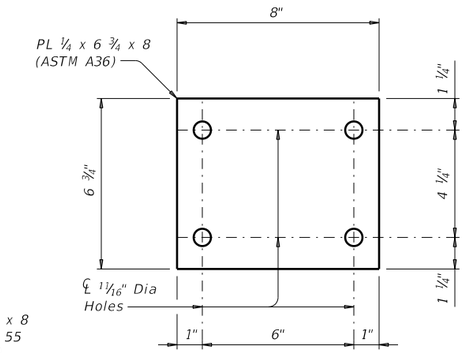
W-BEAM SPLICE ELEVATION



POST ELEVATION

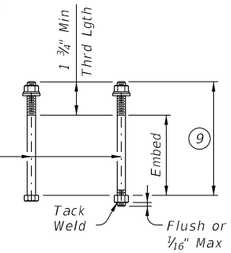


SECTION A-A



WASHER PLATE DETAIL

℄ ⅝" Dia heavy hex head anchor bolt (ASTM F3125 Gr A325 or A449) or threaded rod (ATSM A193 Gr B7 or F1554 Gr 105) with one hardened steel washer (ASTM F436) and one regular lock washer placed under heavy hex nut (ASTM A563). One additional heavy hex nut must be furnished and tack welded for each threaded rod.



CAST-IN-PLACE & FORMED HOLE ANCHOR BOLT OPTIONS (10)

(9) See "Rail Details On Bridge Slab" and/or "Rail Section On Abutment Wingwall".

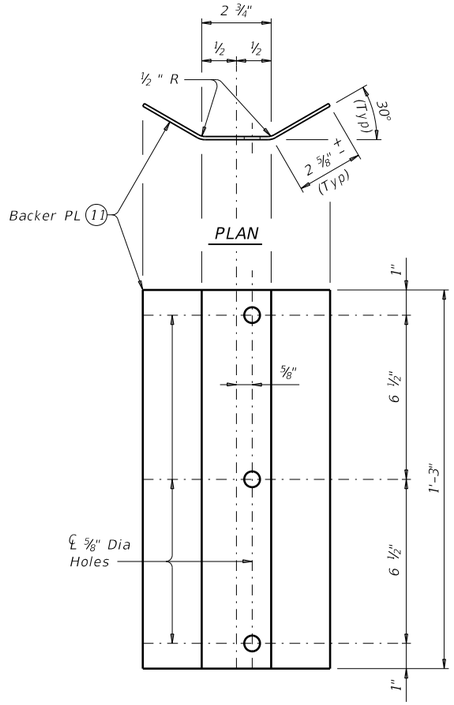
(10) See "Material Notes" for anchor bolt information.

(11) Backer PL ⅛ x 8 x 1'-3" (ASTM A1011 CS or SS Gr 33, or A1008 CS or SS Gr 33 (11 Gage acceptable)).

(12) Used for structures with overlay.

(13) Used for structures without overlay.

(14) At the nominal end of the bridge rail for payment, one 9'-4 ½" or 6'-3" W-beam section is permitted in order to achieve the required W-Beam splice location on the MBGF.



BACKER PLATE

MBGF AND END TREATMENT NOTES:

This traffic railing must be anchored by metal beam guard fence (MBGF) and guard fence end treatments. Determine MBGF length of need in accordance with the Roadway Design Manual, unless otherwise specified. The minimum MBGF length of need required for anchoring the railing is 25' of MBGF plus the appropriate end treatment.

CONSTRUCTION NOTES:

Face of rail post must be plumb unless otherwise approved by the Engineer. Post must be perpendicular to adjacent roadway grade. Use epoxy mortar under post base plates if gaps larger than 1/16" exist.

Fully anchored guardrail must be attached to each end of rail. A metal beam guard fence transition is not used with this rail.

At the Contractor's option anchor bolts may be an adhesive anchor system. See "Material Notes".

Test adhesive anchors in accordance with Item 450.3.3, "Tests". Test 3 anchors per 100 anchors installed. Perform corrective measures to provide adequate capacity if any of the tests do not meet the required test load. Repair damage from testing as directed.

It is recommended to show a Rail Layout with rail posts and W-beam splices. Fabricator must submit erection drawings to the Engineer for approval.

Round or chamfer exposed edges of rail post and backer plate to approximately 1/16" by grinding.

Shop drawings are not required for this rail.

MATERIAL NOTES:

Galvanize all steel components.

Anchor bolts for base plate must be ⅝" Dia ASTM F3125 Gr A325 or A449 bolts (or ASTM A193 Gr B7 or F1554 Gr 105 threaded rods with one tack welded heavy hex nut each) with one hardened steel washer (ASTM F436) and one regular lock washer placed under each heavy hex nut. Nuts must conform to ASTM A563 requirements.

Optional adhesive anchorage system must be ⅝" Dia ASTM A193 Gr B7 or F1554 Gr 105 fully threaded rods with one hardened steel washer (ASTM F436) and one regular lock washer placed under each heavy hex nut. Nuts must conform to ASTM A563 requirements. Embed fully threaded rod into slab and/or abutment wingwall using a Type III, Class C, D, E, or F anchor adhesive. Minimum adhesive anchor embedment depth is 4 ¾". Anchor adhesive chosen must be able to achieve a nominal bond strength in tension of a single anchor, Na, of 8 kips (edge distance must be accounted for). 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."

W-beam must 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" (Nominal) lengths and a single rail element of 9'-4 ½" or 6'-3" (Nominal) length.

W-Beam must have slotted holes at 3'-1 ½".

Some part numbers from the "Task Force 13" Guide to Standardized Highway Barrier Hardware have been furnished for quick reference.

GENERAL NOTES:

This railing has been successfully evaluated by full-scale crash test to meet MASH TL-3 criteria. This railing can be used for speeds of 50 mph and greater.

This rail is designed to deflect approximately 4' to 4'-6" as it contains and redirects the errant vehicle. This rail may not be installed on top of or behind curbs that project above finished grade, on bridges with expansion joints providing more than 5" movement, on retaining walls, or on grade separations and interchanges.

Repairs to impact-damaged post and base plate unit are not permitted. Replace all impact-damaged posts with a new post and base plate unit.

Average weight of railing with no overlay: 20 plf total.

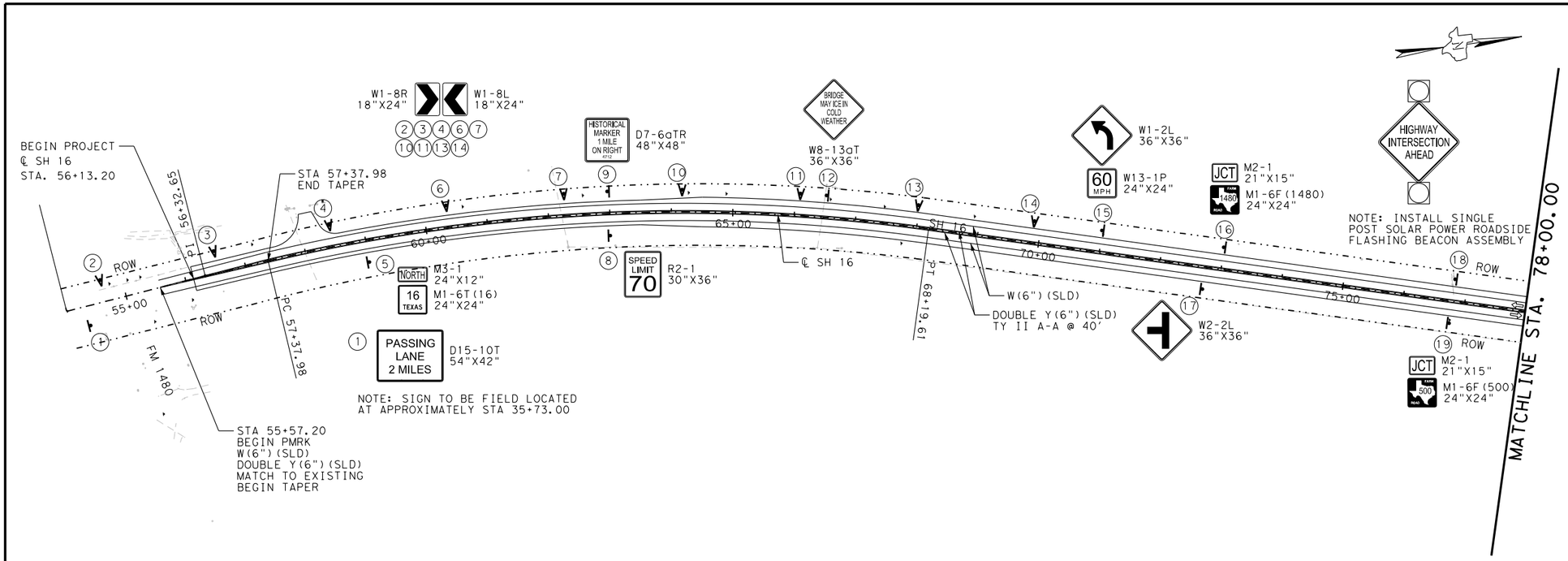
Texas Department of Transportation

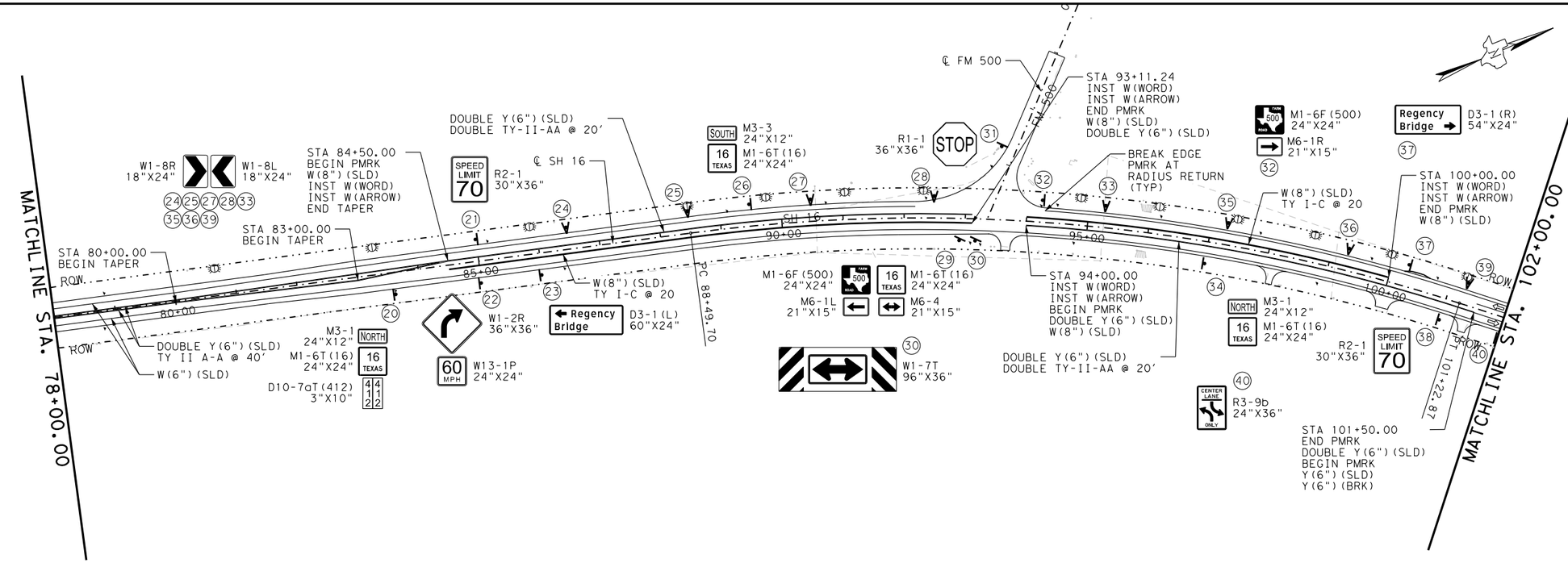
Bridge Division Standard

TRAFFIC RAIL

TYPE T631

FILE:	rlstd038-20.dgn	DN: TxDOT	CK: AES	DW: JTR	CK: AES
©TxDOT	September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS		0289	04	032	SH 16
07-20: Allowing 9'-4 ½" or 6'-3" W-Beam sections.		DIST	COUNTY		SHEET NO.
		BWD	SAN SABA		146





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SCALE: 1" =200'

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2	54+65.36	36' L
3	56+55.87	36' L
4	38+47.13	36' L
5	59+00.00	36' R
6	60+37.30	36' L
7	62+27.50	36' L
8	63+00.00	36' R
9	63+00.00	36' L
10	64+14.76	36' L
11	66+08.07	36' L
12	66+50.00	36' L
13	68+00.00	36' L
14	69+88.72	36' L
15	71+00.00	36' L
16	73+00.00	36' L
17	72+75.00	36' R
18	76+80.00	36' L
19	76+80.00	36' R
20	83+59.00	36' R
21	85+00.00	36' L
22	85+00.00	36' R
23	86+00.00	36' R
24	86+48.65	36' L
25	88+26.70	36' L
26	89+50.00	36' L
27	90+49.03	36' L
28	92+49.33	36' L
29	92+89.58	36' R
30	93+16.89	36' R
31	93+56.57	120' L
32	94+24.63	36' L
33	95+27.14	36' L
34	97+00.00	36' R
35	97+27.17	36' L
36	99+27.21	36' L
37	100+27.21	36' L
38	101+00.00	36' R
39	101+27.22	36' L
40	102+00.00	36' R

NOTES:
1. ALL EXISTING TRAFFIC SIGNS WITHIN PROJECT LIMITS ARE TO BE REMOVED, EXCEPT SIGNS TO BE RELOCATED AS NOTED. SIGN REMOVAL IS PAID AS PART OF PREP ROW.

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Jacobs Engineering Group
STATE OF TEXAS
EDWARD M. PENTON
100190
LICENSED
PROFESSIONAL ENGINEER
F-2966

11/22/2022

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SH 16
PAVEMENT MARKING & DELINEATION PLAN

BEGIN PROJECT TO STA 102+00.00

11/22/2022 SHEET 1 OF 7

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.	HIGHWAY No.
CHECKED:	6	TEXAS		SH 16
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	BWD	SAN SABA	0289	04	032	147

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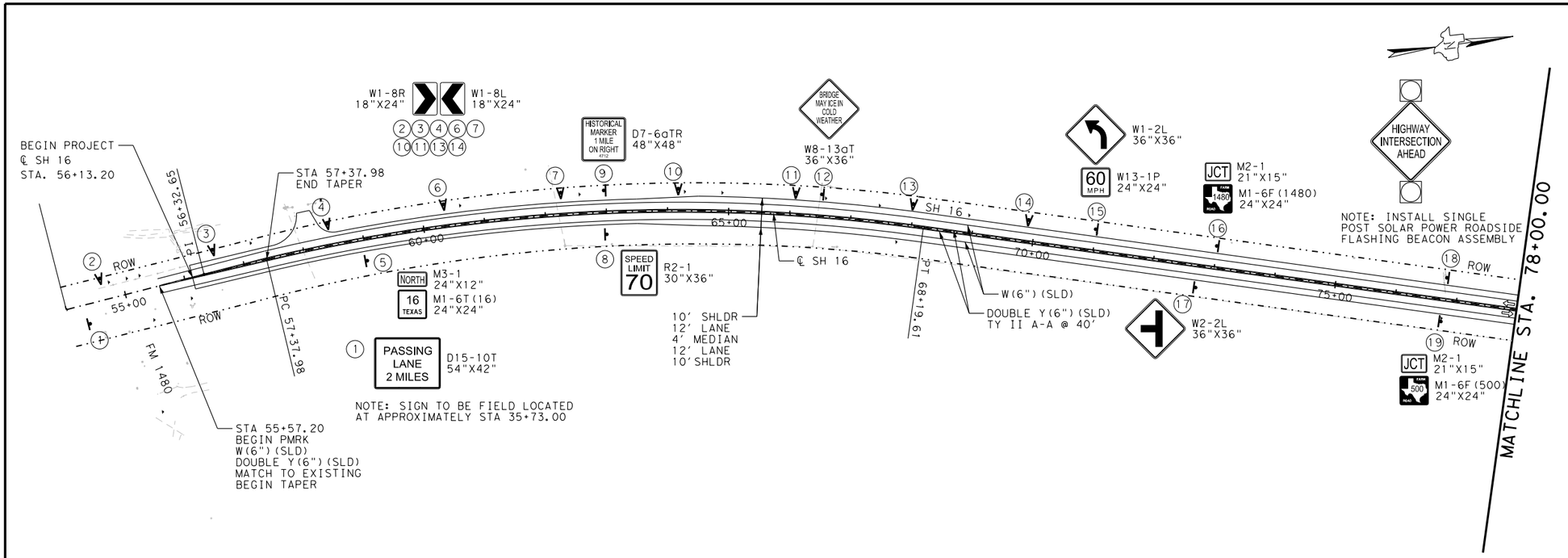

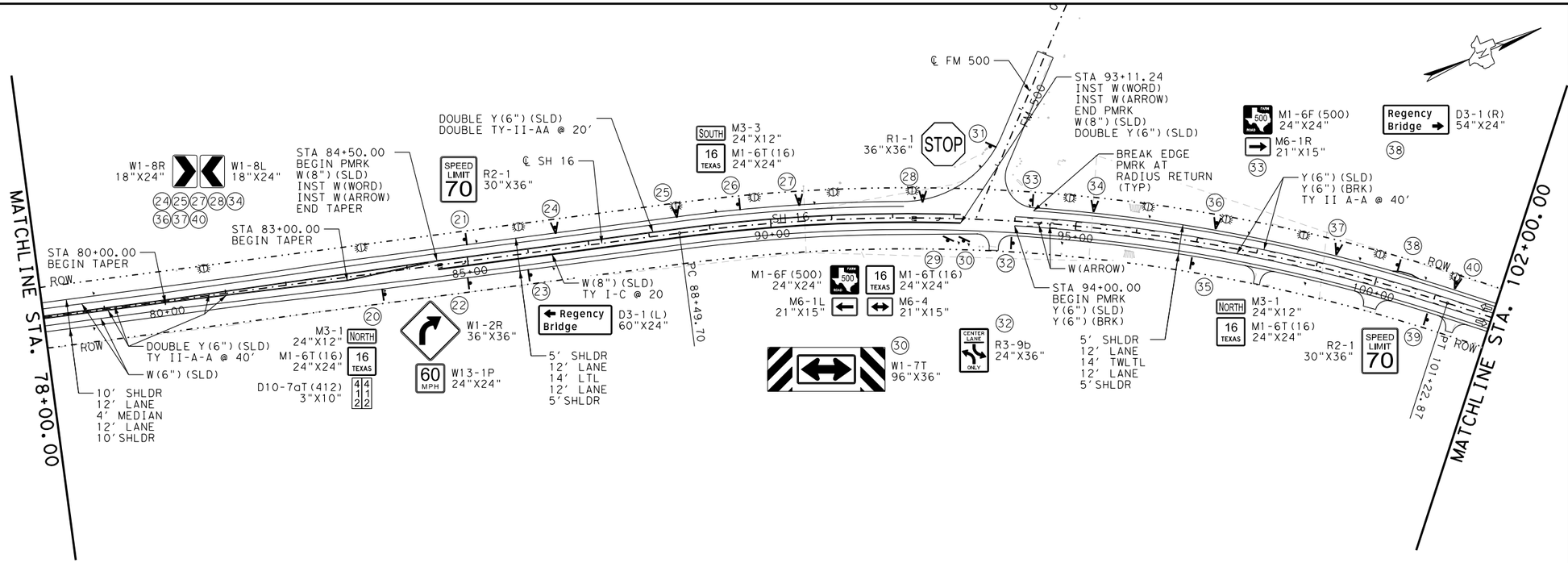

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SCALE: 1" =200'

SIGN	STATION	OFFSET
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2	54+65.36	36' L
3	56+55.87	36' L
4	38+47.13	36' L
5	59+00.00	36' R
6	60+37.30	36' L
7	62+27.50	36' L
8	63+00.00	36' R
9	63+00.00	36' L
10	64+14.76	36' L
11	66+08.07	36' L
12	66+50.00	36' L
13	68+00.00	36' L
14	69+88.72	36' L
15	71+00.00	36' L
16	73+00.00	36' L
17	72+75.00	36' R
18	76+80.00	36' L
19	76+80.00	36' R
20	83+59.00	36' R
21	85+00.00	36' L
22	85+00.00	36' R
23	86+00.00	36' R
24	86+48.65	36' L
25	88+26.70	36' L
26	89+50.00	36' L
27	90+49.03	36' L
28	92+49.33	36' L
29	92+89.58	36' R
30	93+16.89	36' R
31	93+56.57	120' L
32	94+00.00	36' R
33	94+24.63	36' L
34	95+27.14	36' L
35	97+00.00	36' R
36	97+27.17	36' L
37	99+27.21	36' L
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NOTES:
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SH 16
PAVEMENT MARKING & DELINEATION PLAN

BEGIN PROJECT TO STA 102+00.00

11/29/2022 SHEET 1 OF 7

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.	HIGHWAY No.
CHECKED:	6	TEXAS		SH 16
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	BWD	SAN SABA	0289	04	032	147

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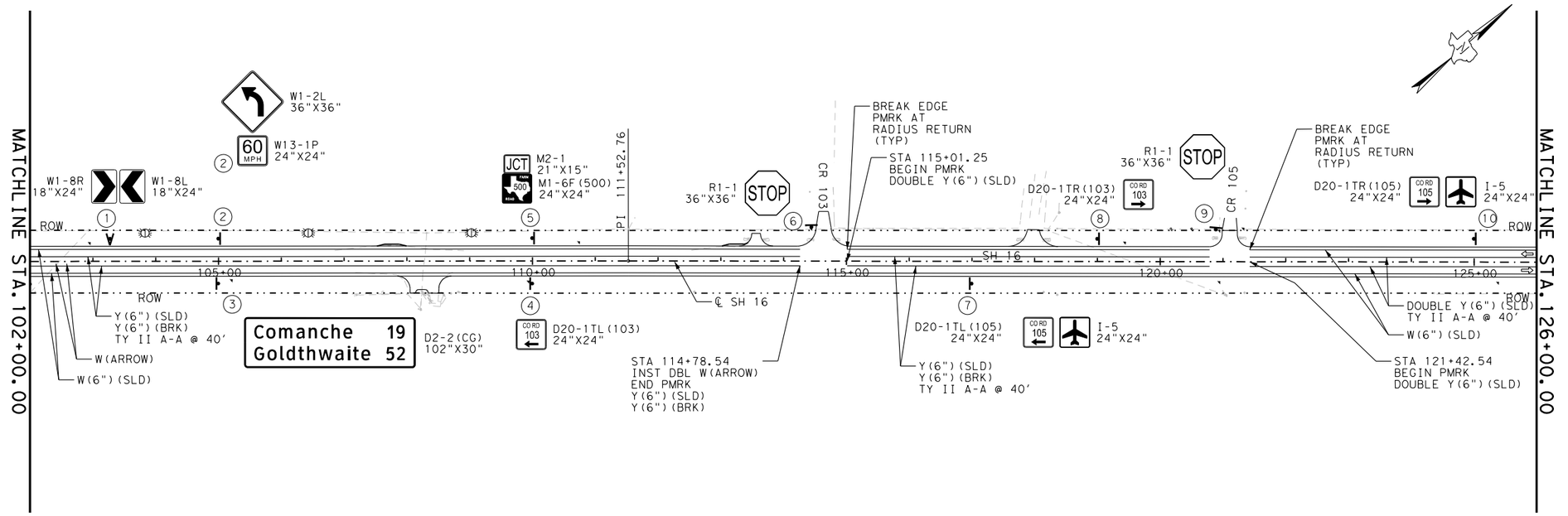

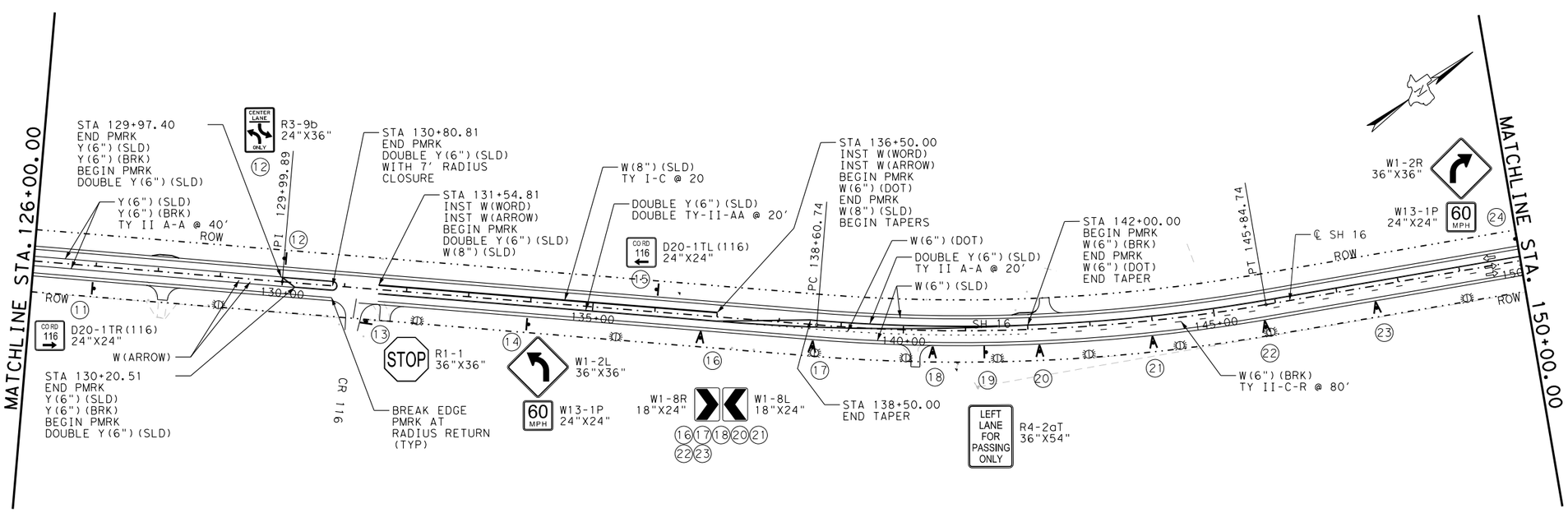

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7	117+00.00	36' R
8	119+00.00	36' L
9	120+88.16	51.32' L
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13	131+79.21	52.64' R
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16	136+75.90	36' R
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NOTES:
1. ALL EXISTING TRAFFIC SIGNS WITHIN PROJECT LIMITS ARE TO BE REMOVED, EXCEPT SIGNS TO BE RELOCATED AS NOTED. SIGN REMOVAL IS PAID AS PART OF PREP ROW.

NO.	REVISION	BY	DATE

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11/22/2022

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SH 16
PAVEMENT MARKING & DELINEATION PLAN

STA 102+00.00 TO STA 150+00.00

11/22/2022 SHEET 2 OF 7

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.	HIGHWAY No.
CHECKED:	6	TEXAS		SH 16

DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	BWD	SAN SABA	0289	04	032	148

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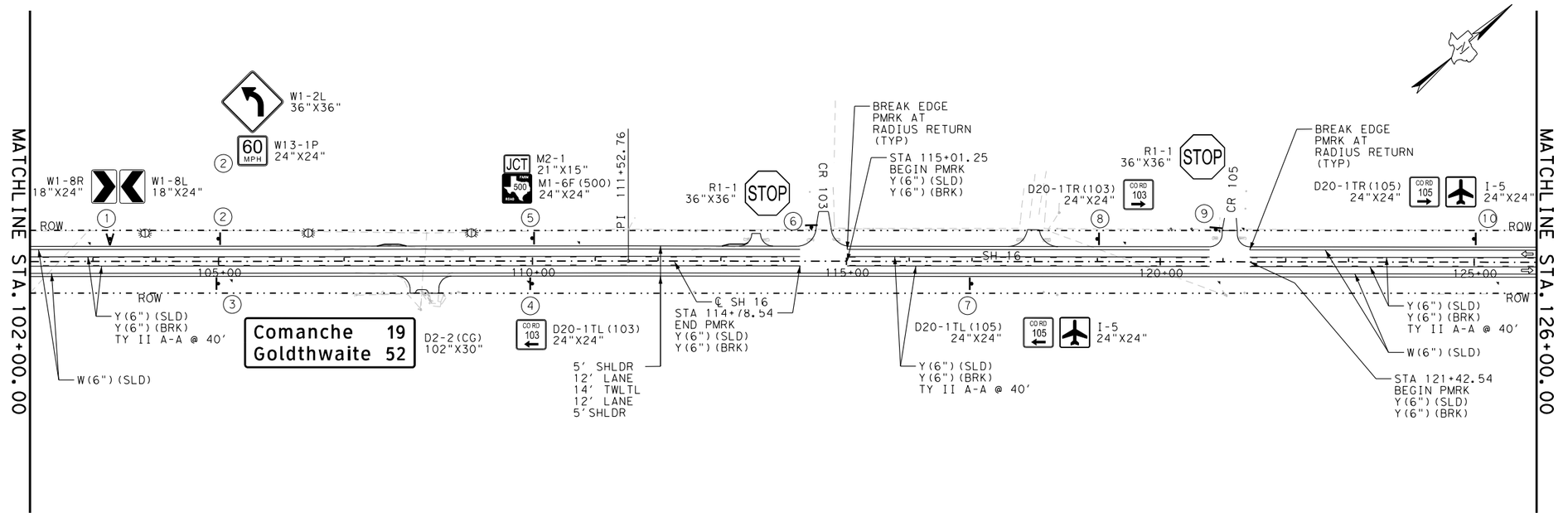

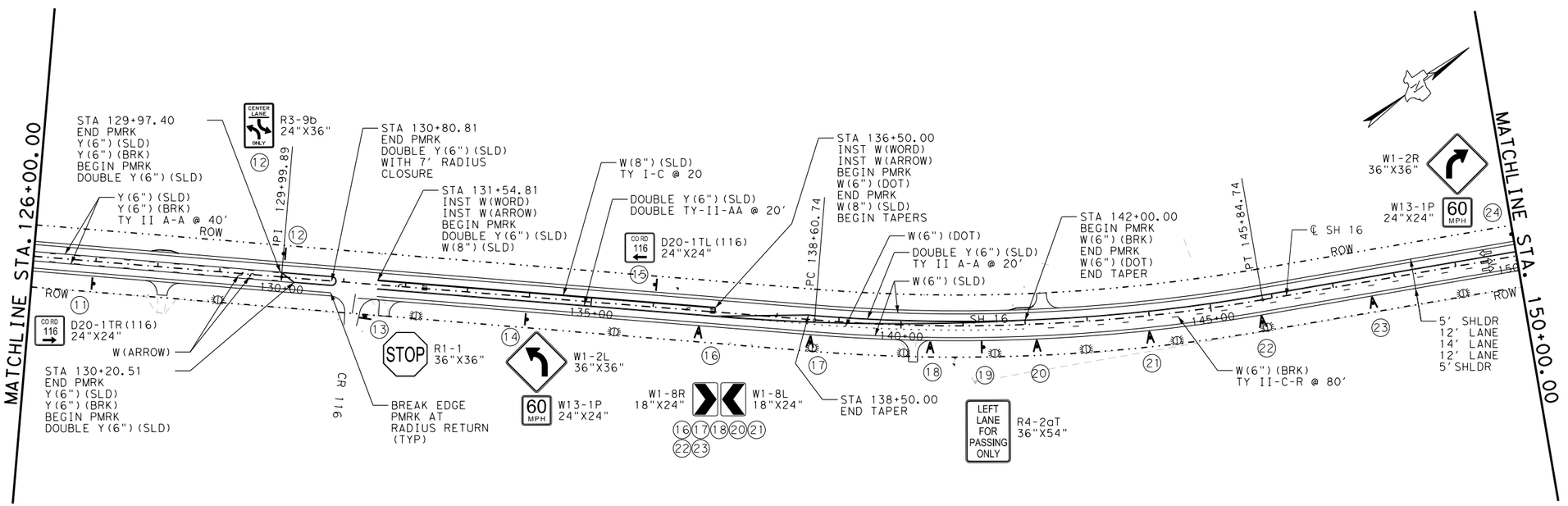

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SCALE: 1" =200'

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5	110+00.00	36' L
6	114+44.15	54.29' L
7	117+00.00	36' R
8	119+00.00	36' L
9	120+88.16	51.32' L
10	125+00.00	36' L
11	127+00.00	36' R
12	130+00.00	36' L
13	131+79.21	52.64' R
14	134+00.00	36' R
15	136+00.00	36' L
16	136+75.90	36' R
17	138+56.40	36' R
18	140+48.21	36' R
19	141+32.90	36' R
20	142+17.64	36' R
21	143+99.11	36' R
22	145+79.39	36' R
23	147+58.86	36' R
24	150+00.00	36' L

NOTES:
1. ALL EXISTING TRAFFIC SIGNS WITHIN PROJECT LIMITS ARE TO BE REMOVED, EXCEPT SIGNS TO BE RELOCATED AS NOTED. SIGN REMOVAL IS PAID AS PART OF PREP ROW.

NO.	REVISION	BY	DATE

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11/29/2022

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SH 16
PAVEMENT MARKING & DELINEATION PLAN

STA 102+00.00 TO STA 150+00.00

11/29/2022 SHEET 2 OF 7

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.	HIGHWAY No.
CHECKED:	6	TEXAS		SH 16

DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	BWD	SAN SABA	0289	04	032	148

USER: mcastro
DATE: 11/29/2022 12:29
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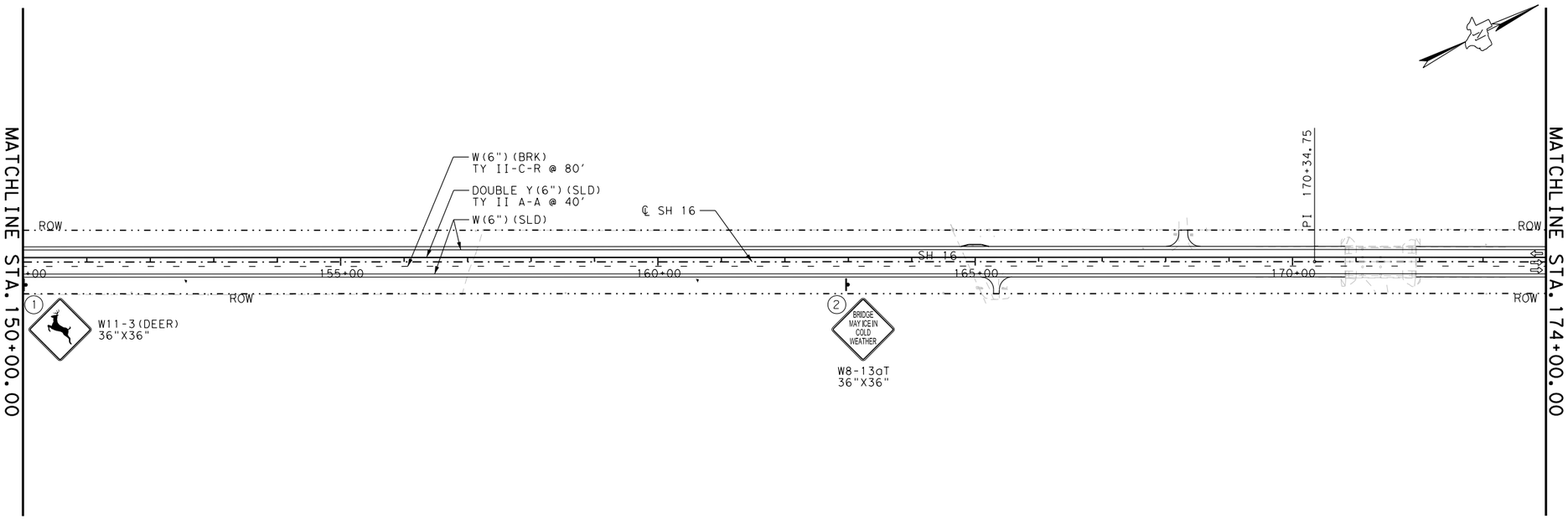

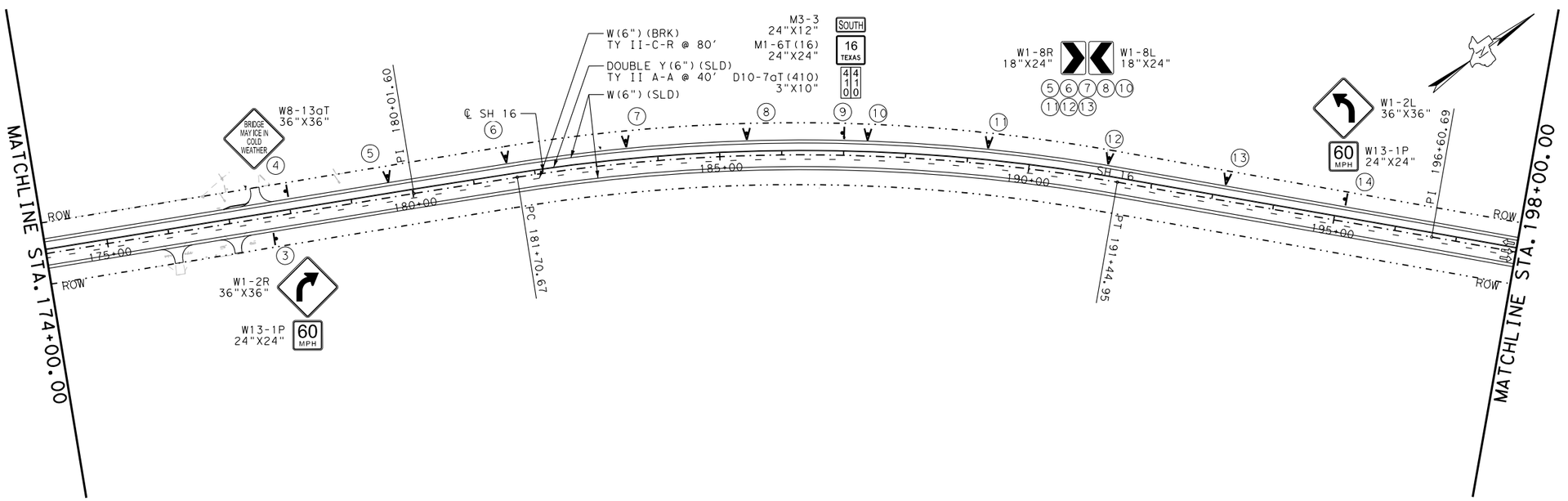

SIGN	STATION	OFFSET
1	150+00.00	36' R
2	163+00.00	36' R
3	177+70.00	36' R
4	178+00.00	36' L
5	179+63.60	36' L
6	181+57.00	36' L
7	183+51.31	36' L
8	185+44.76	36' L
9	187+00.00	36' L
10	187+38.22	36' L
11	189+31.77	36' L
12	191+25.80	36' L
13	193+18.45	36' L
14	195+11.64	36' L

0 100 200

SCALE: 1" =200'

NOTES:
1. ALL EXISTING TRAFFIC SIGNS WITHIN PROJECT LIMITS ARE TO BE REMOVED, EXCEPT SIGNS TO BE RELOCATED AS NOTED. SIGN REMOVAL IS PAID AS PART OF PREP ROW.

NO.	REVISION	BY	DATE

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SH 16
PAVEMENT MARKING & DELINEATION PLAN

STA 150+00.00 TO STA 198+00.00

11/22/2022 SHEET 3 OF 7

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.	
CHECKED:	6	TEXAS				SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.	
CHECKED:	BWD	SAN SABA	0289	04	032	149	

USER: jsalinas
DATE: 11/22/2022 1:30
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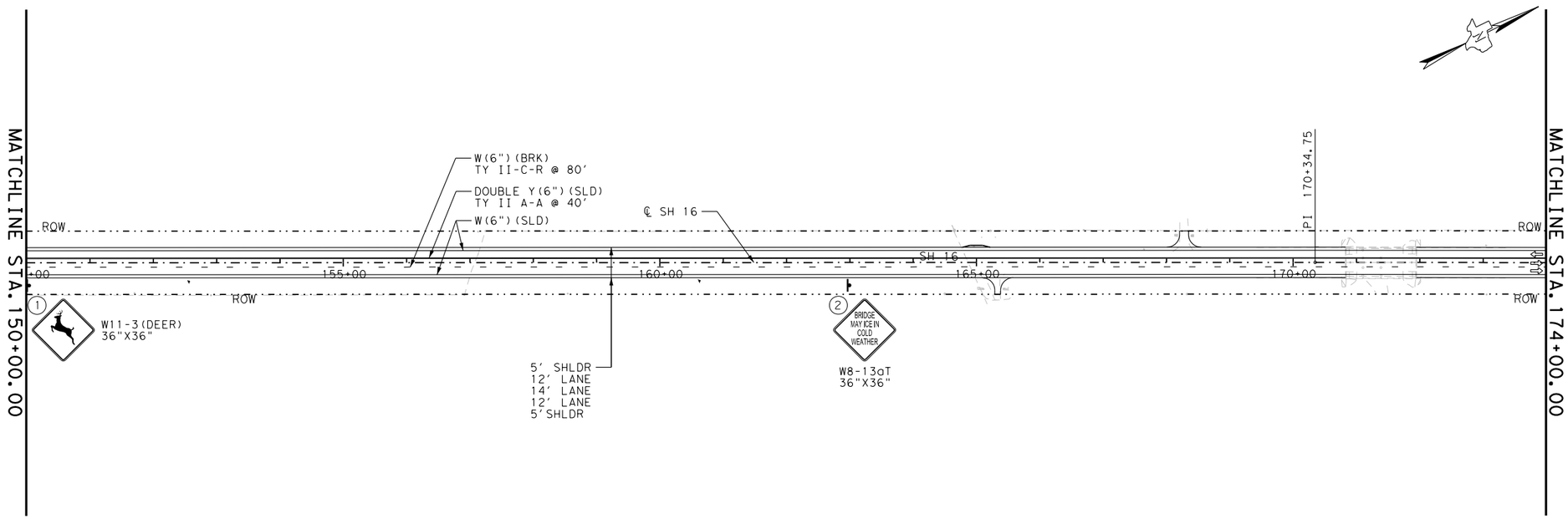
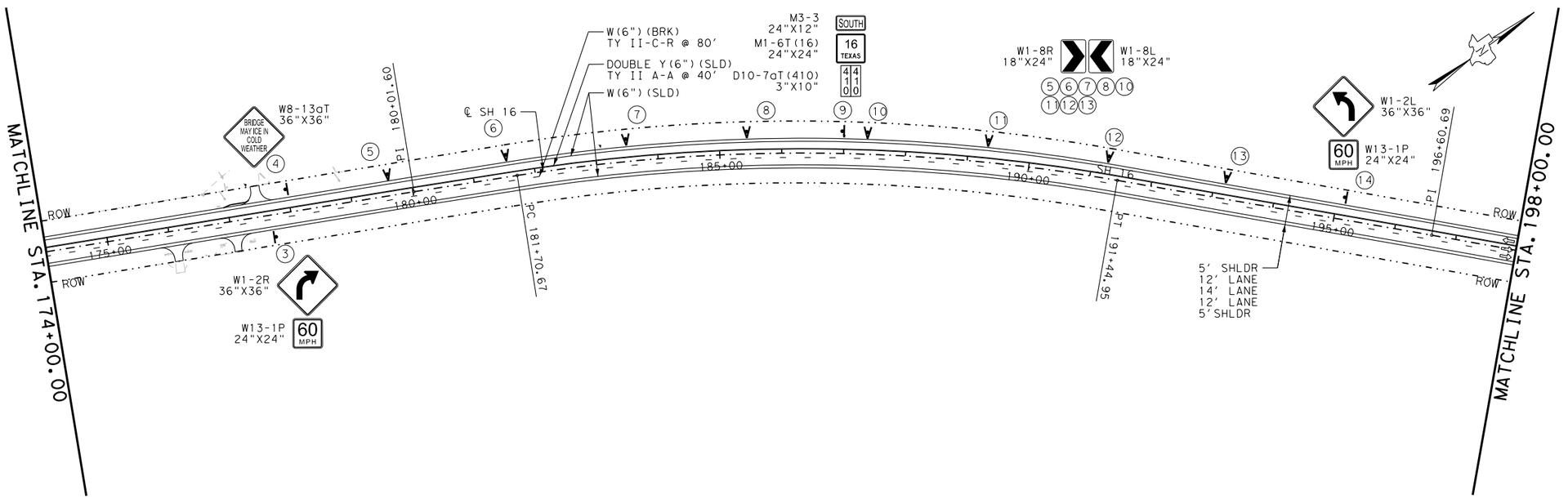


0 100 200

SCALE: 1" =200'

SIGN	STATION	OFFSET
1	150+00.00	36' R
2	163+00.00	36' R
3	177+70.00	36' R
4	178+00.00	36' L
5	179+63.60	36' L
6	181+57.00	36' L
7	183+51.31	36' L
8	185+44.76	36' L
9	187+00.00	36' L
10	187+38.22	36' L
11	189+31.77	36' L
12	191+25.80	36' L
13	193+18.45	36' L
14	195+11.64	36' L

NOTES:
1. ALL EXISTING TRAFFIC SIGNS WITHIN PROJECT LIMITS ARE TO BE REMOVED, EXCEPT SIGNS TO BE RELOCATED AS NOTED. SIGN REMOVAL IS PAID AS PART OF PREP ROW.



NO.	REVISION	BY	DATE

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SH 16
PAVEMENT MARKING & DELINEATION PLAN

STA 150+00.00 TO STA 198+00.00

11/29/2022 SHEET 3 OF 7

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.	
CHECKED:	6	TEXAS				SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.	
CHECKED:	BWD	SAN SABA	0289	04	032	149	

USER: mcastro
DATE: 11/29/2022 12:29
SCRIPT: pw://server.sljeng.com:Sljeng-ds/Documents/TxDOT0103 Brownwood SH 16\Design_Data\4 - Design\Miscellaneous\SH16_plot.pen
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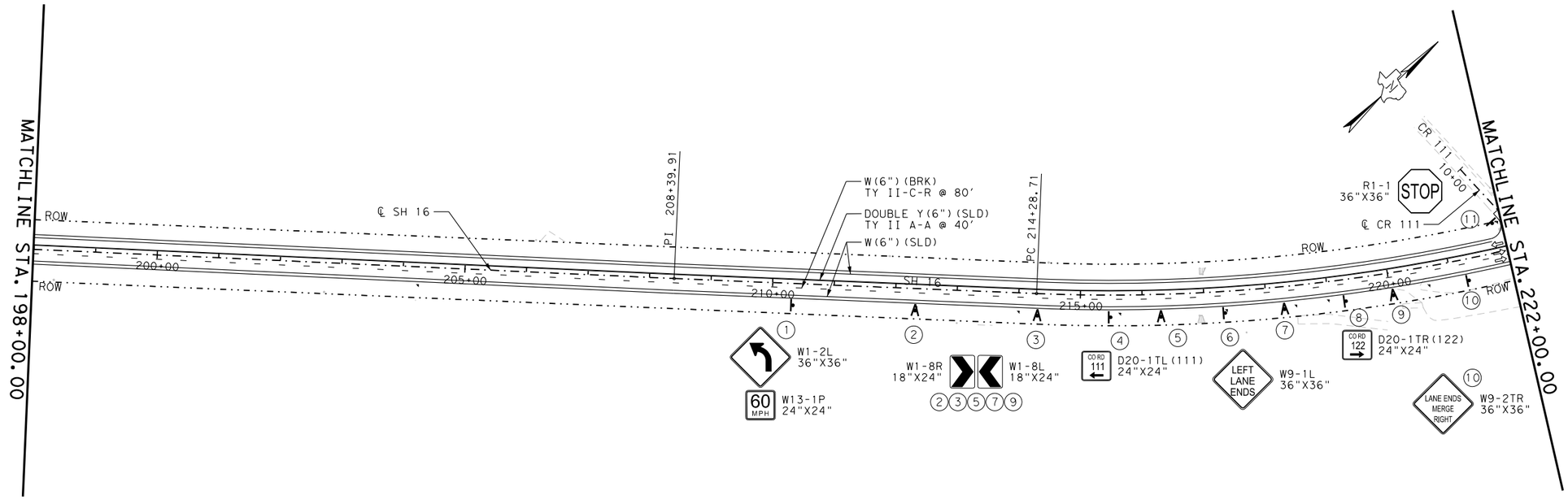
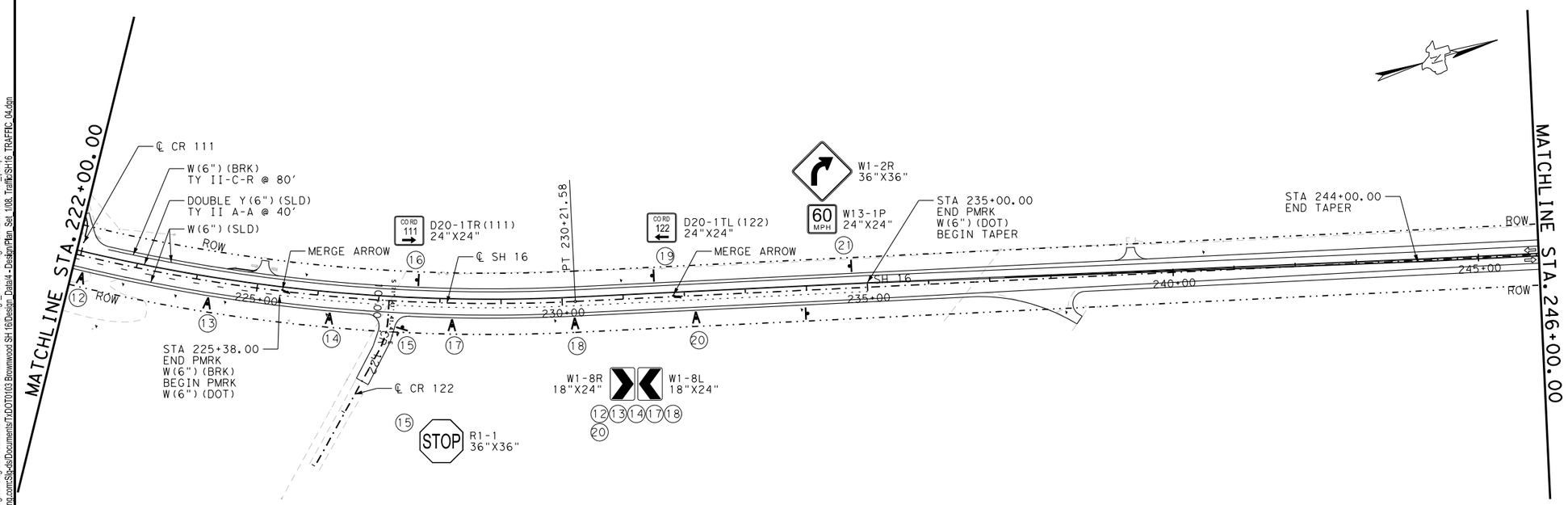


0 100 200

SCALE: 1" =200'

SIGN	STATION	OFFSET
1	210+34.27	36' R
2	212+32.77	36' R
3	214+31.27	36' R
4	215+49.51	36' R
5	216+30.14	36' R
6	217+33.41	36' R
7	218+28.63	36' R
8	219+27.85	36' R
9	220+04.29	36' R
10	221+28.07	36' R
11	221+82.56	47.97' L
12	222+16.03	36' R
13	224+23.99	36' R
14	226+22.43	36' R
15	227+41.38	42' R
16	227+59.98	36' L
17	228+20.87	36' R
18	230+19.33	36' R
19	231+50.00	36' L
20	232+17.55	36' R
21	234+75.00	36' L

NOTES:
1. ALL EXISTING TRAFFIC SIGNS WITHIN PROJECT LIMITS ARE TO BE REMOVED, EXCEPT SIGNS TO BE RELOCATED AS NOTED. SIGN REMOVAL IS PAID AS PART OF PREP ROW.



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SH 16
PAVEMENT MARKING & DELINEATION PLAN

STA 198+00.00 TO STA 246+00.00

11/22/2022 SHEET 4 OF 7

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.	HIGHWAY No.	
CHECKED:	6	TEXAS		SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	BWD	SAN SABA	0289	04	032	150

USER: jsallnas
DATE: 11/22/2022 1:30
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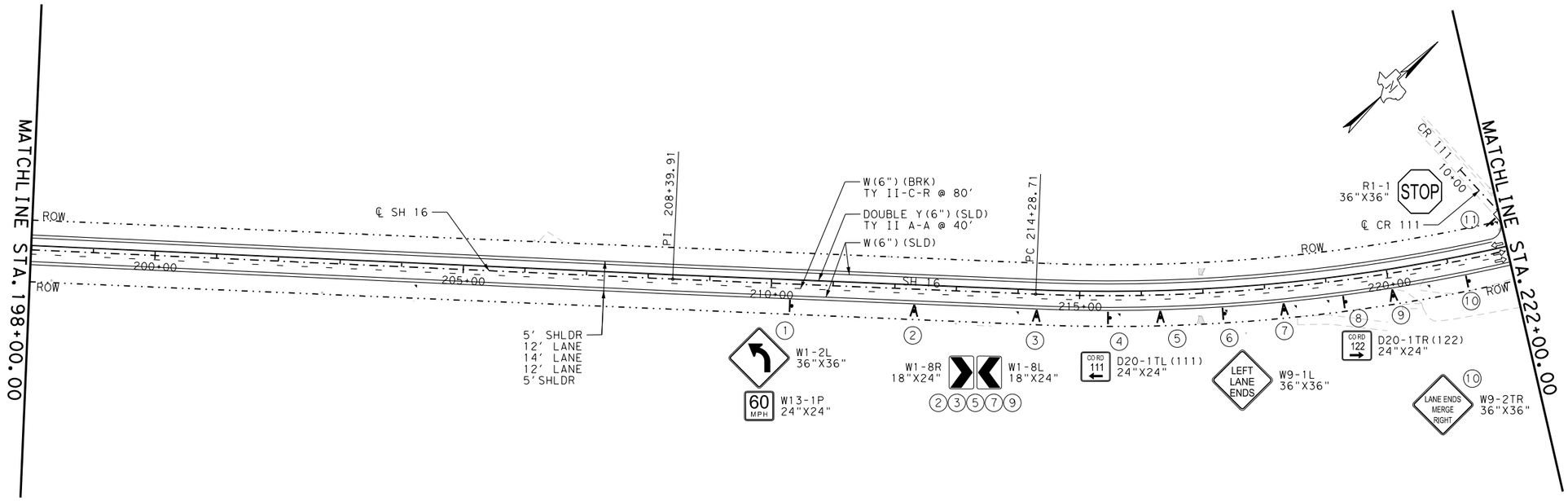
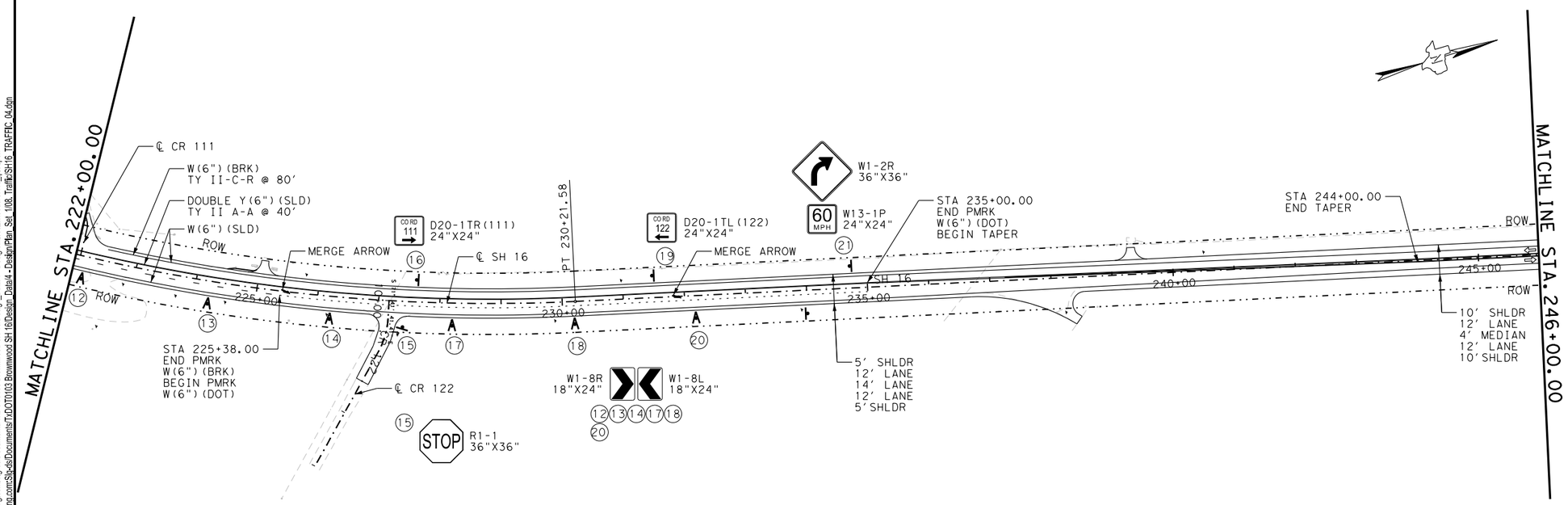


SIGN	STATION	OFFSET
1	210+34.27	36' R
2	212+32.77	36' R
3	214+31.27	36' R
4	215+49.51	36' R
5	216+30.14	36' R
6	217+33.41	36' R
7	218+28.63	36' R
8	219+27.85	36' R
9	220+04.29	36' R
10	221+28.07	36' R
11	221+82.56	47.97' L
12	222+16.03	36' R
13	224+23.99	36' R
14	226+22.43	36' R
15	227+41.38	42' R
16	227+59.98	36' L
17	228+20.87	36' R
18	230+19.33	36' R
19	231+50.00	36' L
20	232+17.55	36' R
21	234+75.00	36' L

SCALE: 1" =200'

NOTES:
1. ALL EXISTING TRAFFIC SIGNS WITHIN PROJECT LIMITS ARE TO BE REMOVED, EXCEPT SIGNS TO BE RELOCATED AS NOTED. SIGN REMOVAL IS PAID AS PART OF PREP ROW.



NO.	REVISION	BY	DATE

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SH 16
PAVEMENT MARKING & DELINEATION PLAN

STA 198+00.00 TO STA 246+00.00

11/29/2022 SHEET 4 OF 7

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.	HIGHWAY No.
CHECKED:	6	TEXAS		SH 16
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	BWD	SAN SABA	0289	04	032	150

USER: mcastro
DATE: 11/29/2022 12:30
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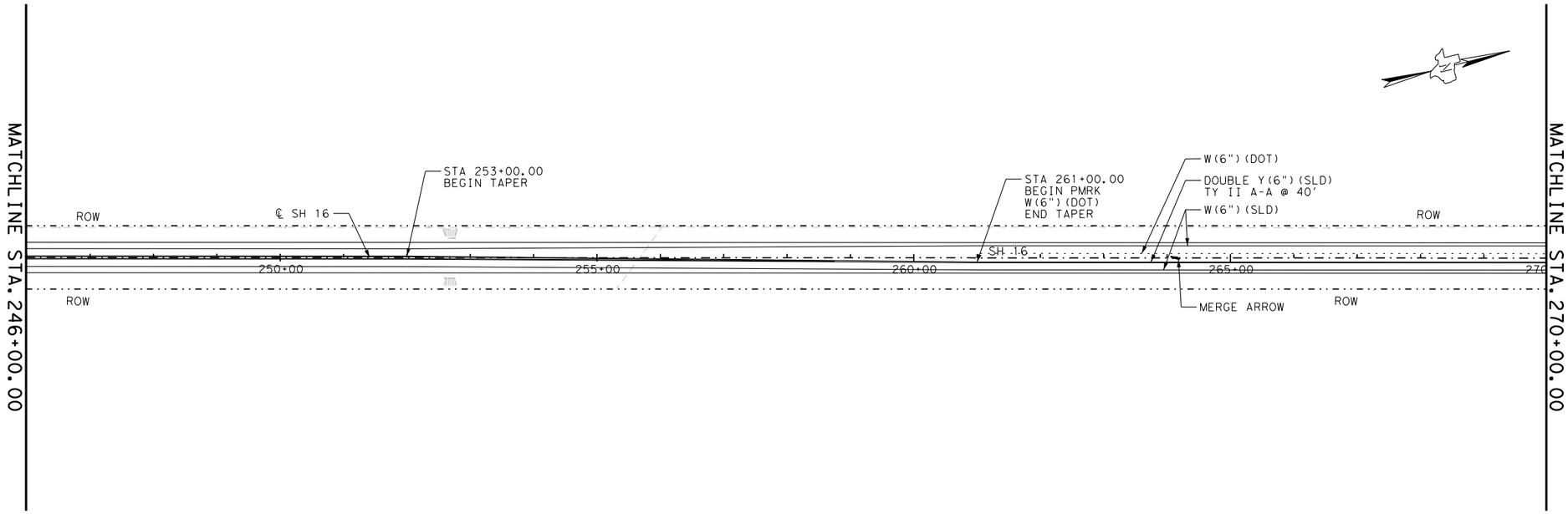
0 100 200

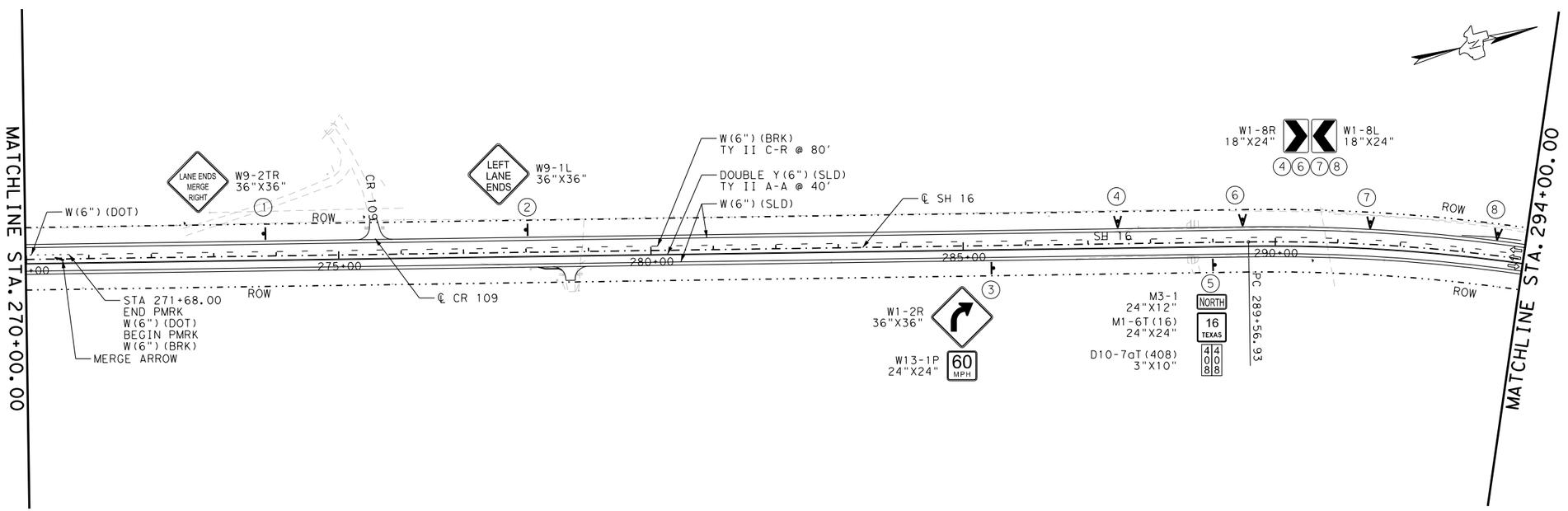
SCALE: 1" =200'

SIGN	STATION	OFFSET
1	273+80.00	36' L
2	278+00.00	36' L
3	285+48.00	36' R
4	287+47.98	36' L
5	289+00.00	36' R
6	289+47.98	36' L
7	291+51.10	36' L
8	293+53.52	36' L



NOTES:

1. ALL EXISTING TRAFFIC SIGNS WITHIN PROJECT LIMITS ARE TO BE REMOVED, EXCEPT SIGNS TO BE RELOCATED AS NOTED. SIGN REMOVAL IS PAID AS PART OF PREP ROW.



NO.	REVISION	BY	DATE

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SH 16
PAVEMENT MARKING & DELINEATION PLAN

STA 246+00.00 TO STA 294+00.00

11/22/2022 SHEET 5 OF 7

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.	HIGHWAY No.
CHECKED:	6	TEXAS		SH 16

DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	BWD	SAN SABA	0289	04	032	151

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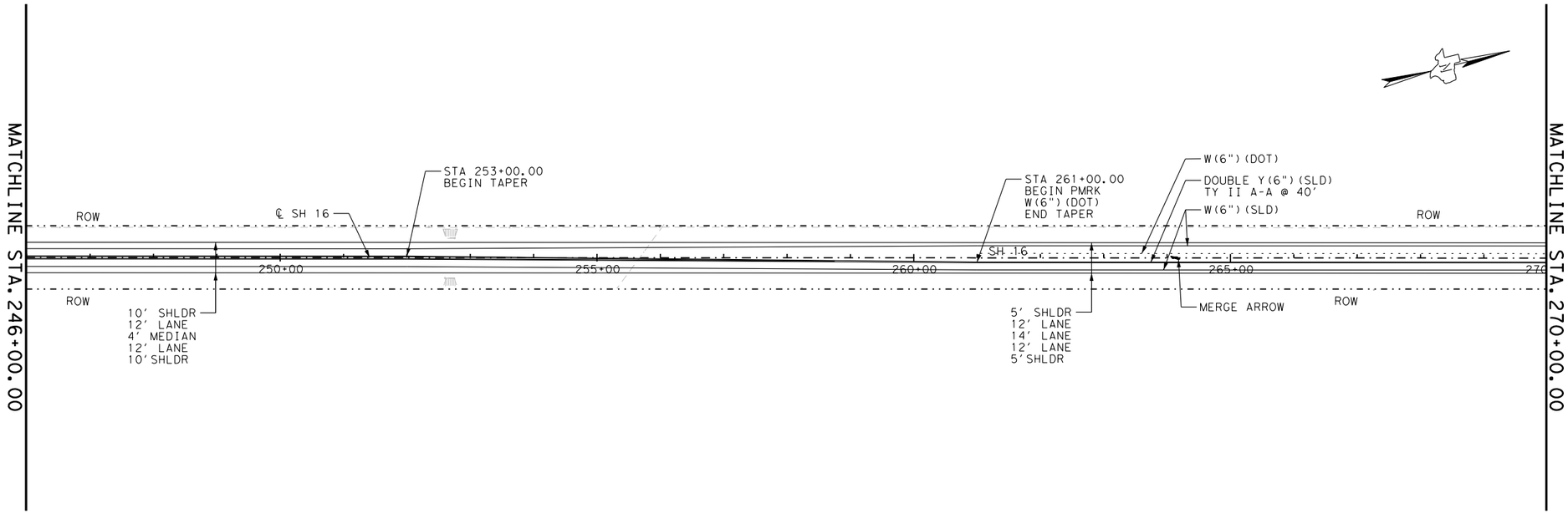
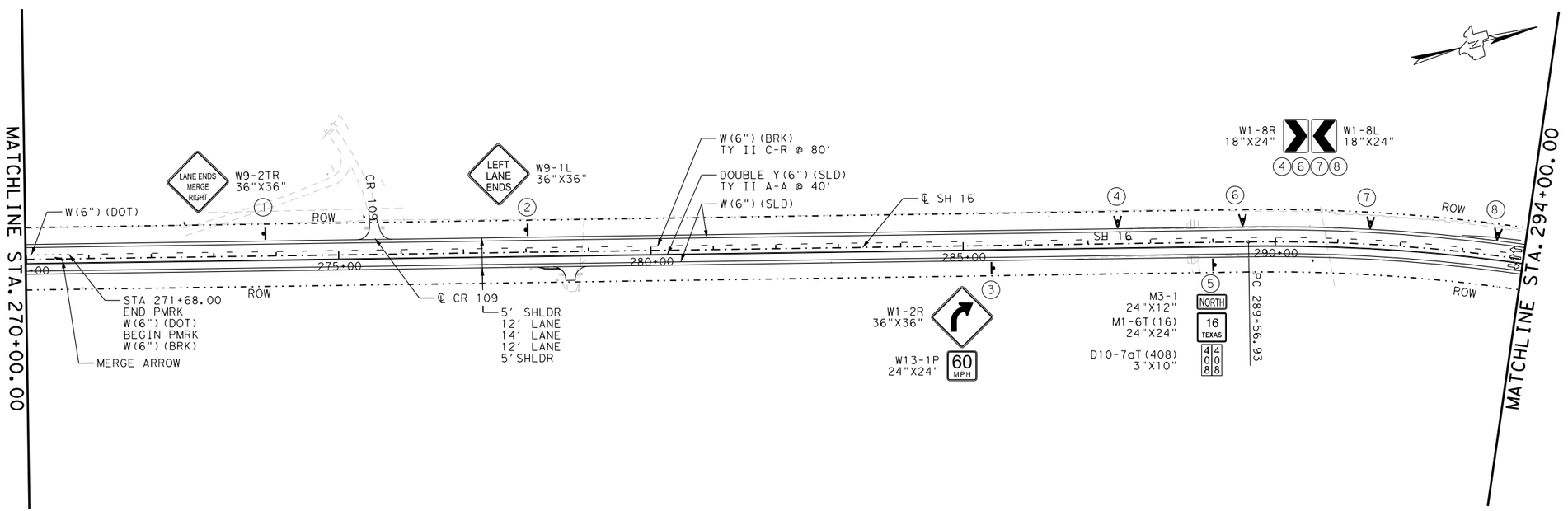
0 100 200

SCALE: 1" =200'

SIGN	STATION	OFFSET
1	273+80.00	36' L
2	278+00.00	36' L
3	285+48.00	36' R
4	287+47.98	36' L
5	289+00.00	36' R
6	289+47.98	36' L
7	291+51.10	36' L
8	293+53.52	36' L



NOTES:
1. ALL EXISTING TRAFFIC SIGNS WITHIN PROJECT LIMITS ARE TO BE REMOVED, EXCEPT SIGNS TO BE RELOCATED AS NOTED. SIGN REMOVAL IS PAID AS PART OF PREP ROW.



NO.	REVISION	BY	DATE

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SH 16
PAVEMENT MARKING & DELINEATION PLAN

STA 246+00.00 TO STA 294+00.00

11/29/2022 SHEET 5 OF 7

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.	HIGHWAY No.
CHECKED:	6	TEXAS		SH 16

DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	BWD	SAN SABA	0289	04	032	151

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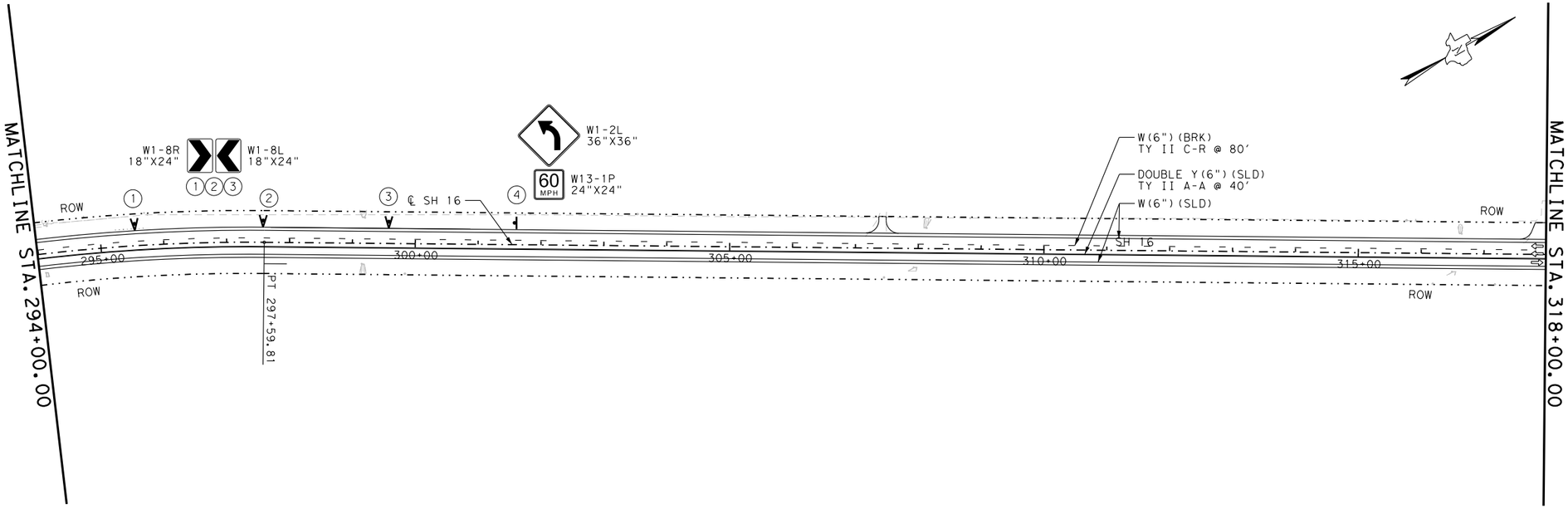

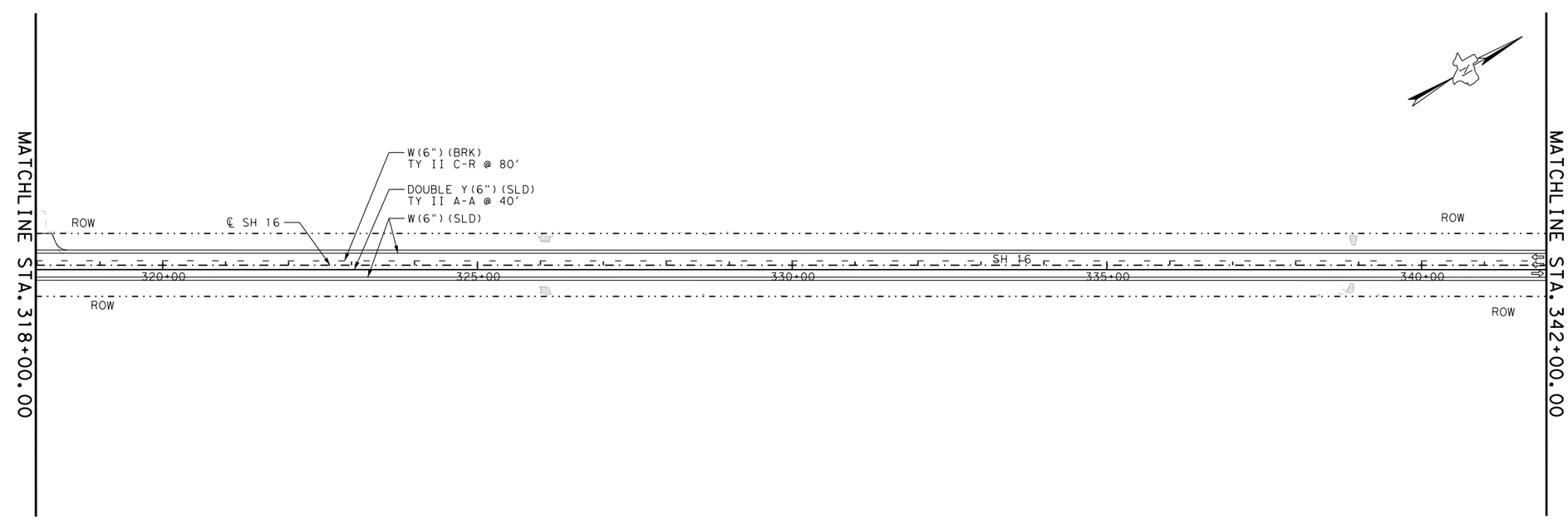

0 100 200

SCALE: 1" =200'

SIGN	STATION	OFFSET
1	295+55.97	36' L
2	297+58.44	36' L
3	299+57.72	36' L
4	301+57.72	36' L

NOTES:
1. ALL EXISTING TRAFFIC SIGNS WITHIN PROJECT LIMITS ARE TO BE REMOVED, EXCEPT SIGNS TO BE RELOCATED AS NOTED. SIGN REMOVAL IS PAID AS PART OF PREP ROW.

NO.	REVISION	BY	DATE

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SH 16
PAVEMENT MARKING & DELINEATION PLAN

STA 294+00.00 TO STA 342+00.00

11/22/2022 SHEET 6 OF 7

DESIGNED:	FED. RD DIV. NO.	STATE	FEDERAL AID PROJECT No.	HIGHWAY No.
CHECKED:	6	TEXAS		SH 16

DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	BWD	SAN SABA	0289	04	032	152

USER: jsdhas
DATE: 11/22/2022 1:20
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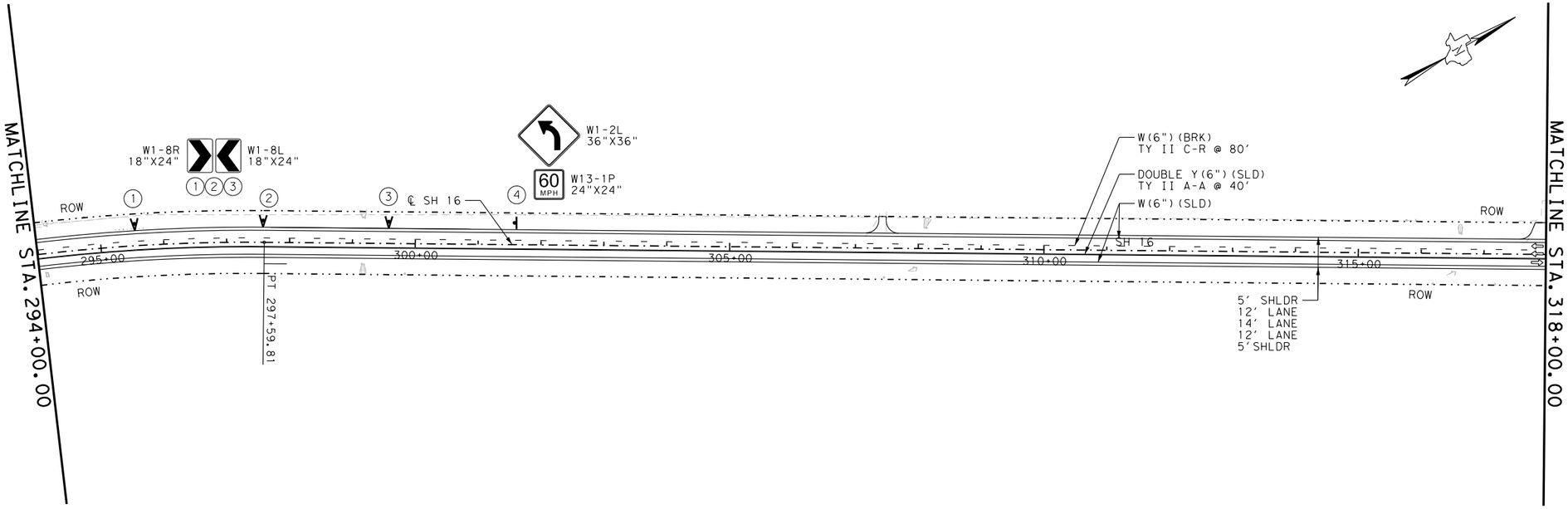

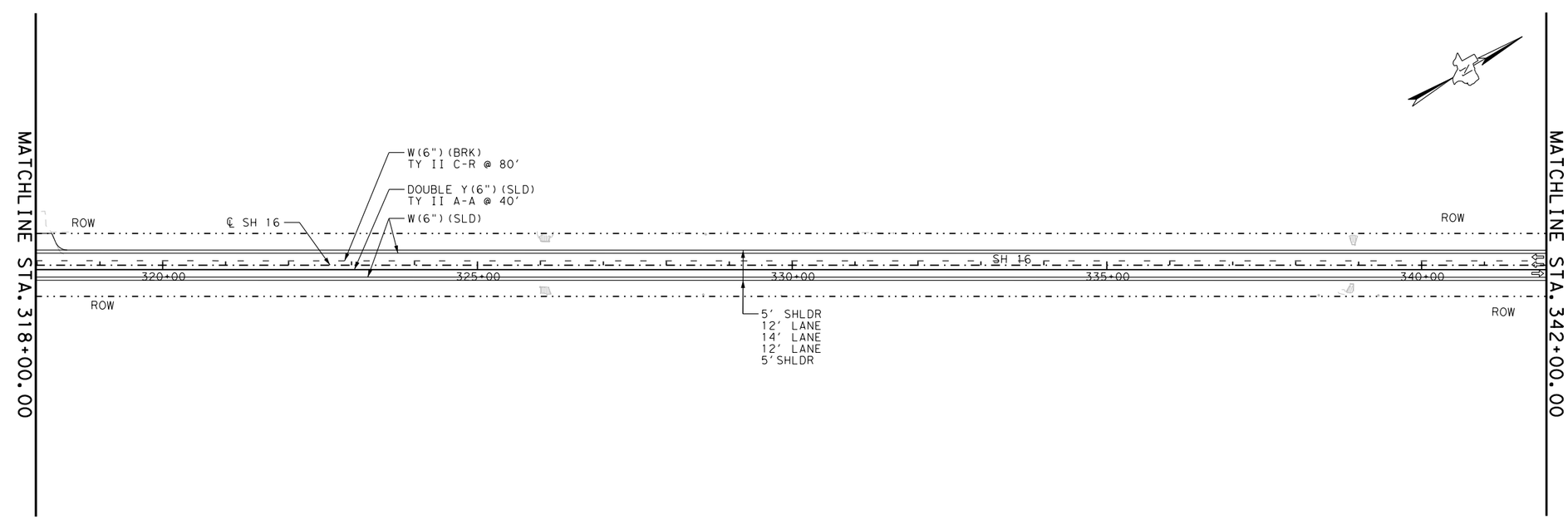

0 100 200

SCALE: 1" =200'

SIGN	STATION	OFFSET
1	295+55.97	36' L
2	297+58.44	36' L
3	299+57.72	36' L
4	301+57.72	36' L

NOTES:
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NO.	REVISION	BY	DATE

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Firm Registration: F-2966

SH 16
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STA 294+00.00 TO STA 342+00.00

11/29/2022 SHEET 6 OF 7

DESIGNED:	FED. RD DIV. NO.	STATE	FEDERAL AID PROJECT No.	HIGHWAY No.
CHECKED:	6	TEXAS		SH 16

DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	BWD	SAN SABA	0289	04	032	152

USER: mcastro
DATE: 11/29/2022 12:31
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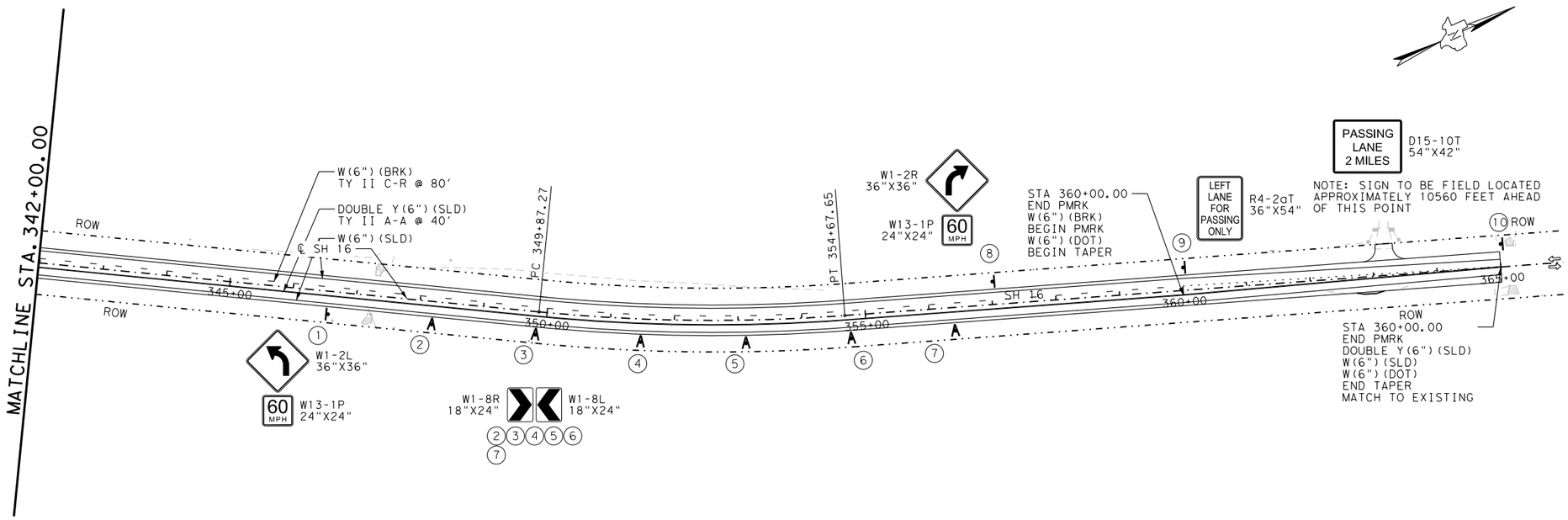

0 100 200

SCALE: 1" =200'

SIGN	STATION	OFFSET
1	346+57.89	36' R
2	348+21.39	36' R
3	347+84.89	36' R
4	351+49.02	36' R
5	353+12.04	36' R
6	355+76.32	36' R
7	356+38.95	36' R
8	357+00.00	36' L
9	360+00.00	36' L

NOTES:
1. ALL EXISTING TRAFFIC SIGNS WITHIN PROJECT LIMITS ARE TO BE REMOVED, EXCEPT SIGNS TO BE RELOCATED AS NOTED. SIGN REMOVAL IS PAID AS PART OF PREP ROW.

NO.	REVISION	BY	DATE

Jacobs Engineering Group
STATE OF TEXAS
EDWARD M. PENTON
100190
LICENSED
PROFESSIONAL ENGINEER
F-2966

11/22/2022

Texas Department of Transportation
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1999 BRYAN ST, SUITE 1200
DALLAS, TX 75201-3136
Phone: +1 (214) 638-0145
Firm Registration: F-2966

SH 16
PAVEMENT MARKING & DELINEATION PLAN

STA 342+00.00 TO END PROJECT

11/22/2022 SHEET 7 OF 7

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.	
CHECKED:	6	TEXAS				SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.	
CHECKED:	BWD	SAN SABA	0289	04	032	153	

USER: jsallnas
DATE: 11/22/2022 1:30
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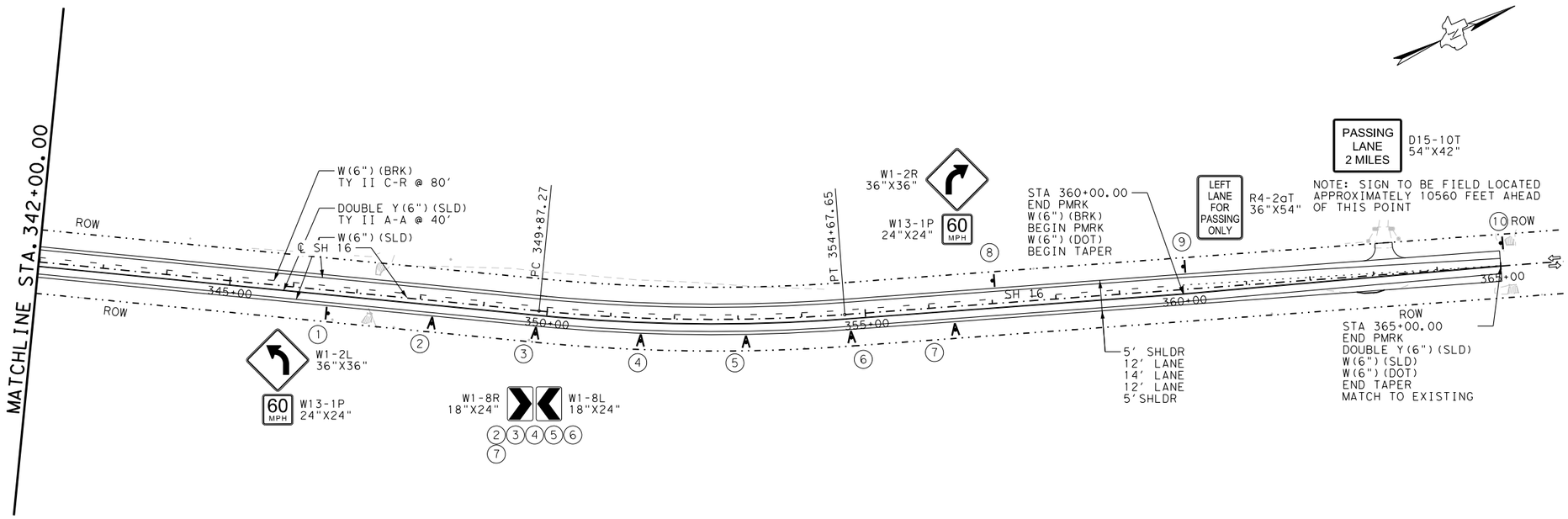

0 100 200

SCALE: 1" =200'

SIGN	STATION	OFFSET
1	346+57.89	36' R
2	348+21.39	36' R
3	347+84.89	36' R
4	351+49.02	36' R
5	353+12.04	36' R
6	355+76.32	36' R
7	356+38.95	36' R
8	357+00.00	36' L
9	360+00.00	36' L

NOTES:
1. ALL EXISTING TRAFFIC SIGNS WITHIN PROJECT LIMITS ARE TO BE REMOVED, EXCEPT SIGNS TO BE RELOCATED AS NOTED. SIGN REMOVAL IS PAID AS PART OF PREP ROW.

NO.	REVISION	BY	DATE

Jacobs Engineering Group
STATE OF TEXAS
EDWARD M. PENTON
100190
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F-2966

11/29/2022

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Phone: +1 (214) 638-0145
Firm Registration: F-2966

SH 16
PAVEMENT MARKING & DELINEATION PLAN

STA 342+00.00 TO END PROJECT

11/29/2022 SHEET 7 OF 7

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.	
CHECKED:	6	TEXAS				SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.	
CHECKED:	BWD	SAN SABA	0289	04	032	153	

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DATE: 11/29/2022 6:46
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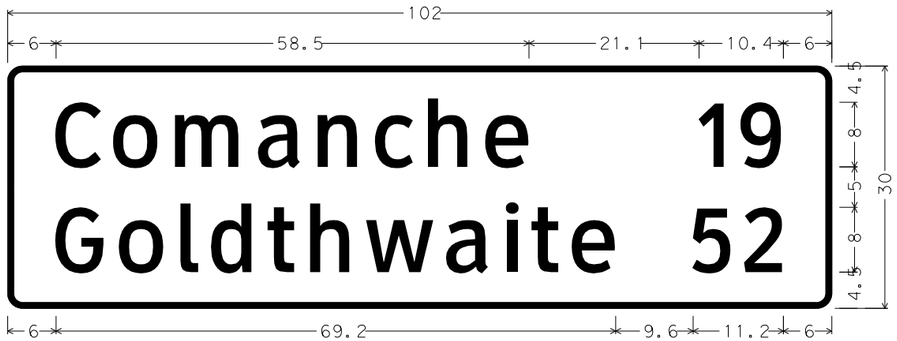
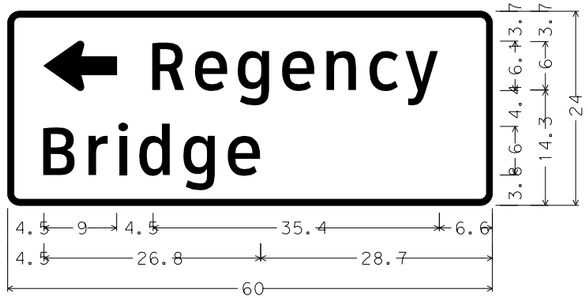


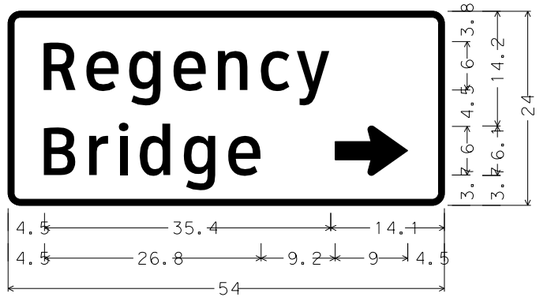
D2-2 8in;

1.9" Radius, 0.8" Border, White on, Green;
"Comanche", ClearviewHwy-3-W; "19", ClearviewHwy-3-W;

1.9" Radius, 0.8" Border, White on, Green;
"Goldthwaite", ClearviewHwy-3-W; "52", ClearviewHwy-3-W;



1.5" Radius, 0.8" Border, White on, Green;
Standard Arrow Custom 9.0" X 6.1" 180';
"Regency", ClearviewHwy-3-W;
"Bridge", ClearviewHwy-3-W;



1.5" Radius, 0.8" Border, White on, Green;
Standard Arrow Custom 9.0" X 6.1" 0';
"Regency", ClearviewHwy-3-W;
"Bridge", ClearviewHwy-3-W;

NO.	REVISION	BY	DATE

Jacobs Engineering Group
STATE OF TEXAS
EDWARD M. PENTON
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SH 16
SIGN DETAILS

11/22/2022 SHEET 1 OF 1

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.		HIGHWAY No.	
CHECKED:	6	TEXAS			SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	BWD	SAN SABA	0289	04	032	154

USER: jsallings
DATE: 11/22/2022 1:20
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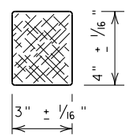
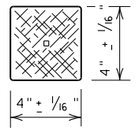
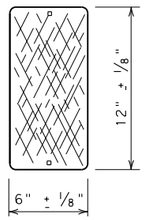
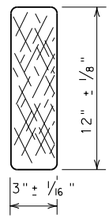
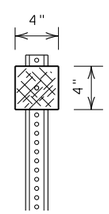
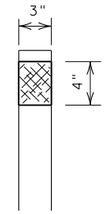
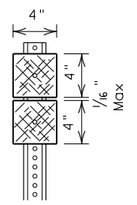
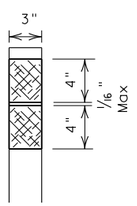
DATE: 11/22/2022 1:30
FILE: pw://server.sig-eng.com:Sig-ds/Documents/TxDOT0103 Brownwood SH 16/Design_Data/4 - Design/Plan_Set_1/08. Traffic/Standards/dom1-20.dgn

REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

	SIZE 1	SIZE 2	SIZE 3	SIZE 4
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

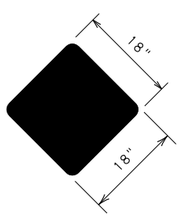
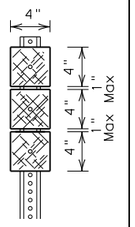
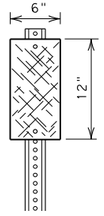
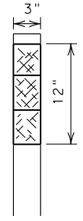
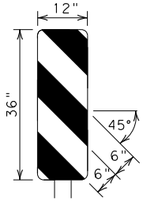
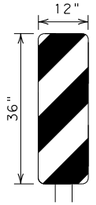
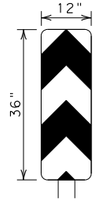
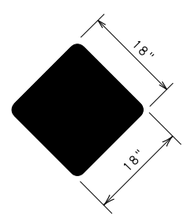
NUMBER OF REFLECTORS OR DIRECTION
- X = 3-Size 2 reflector units (Type 2 only)
- Y = 1-Size 3 reflector unit (Type 2 only)
- Z = 3-Size 1 or 1-Size 4 reflector unit(s)(Type 2 only)
- L = Left Side (Type 3 Object Marker only)
- R = Right Side (Type 3 Object Marker only)
- C = Center (Type 3 Object Marker 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

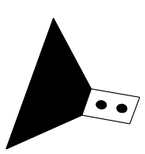
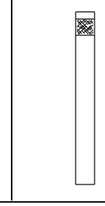
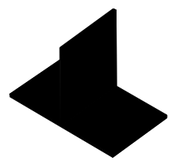
OBJECT MARKERS

	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

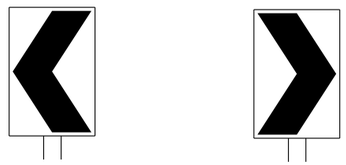
DEPARTMENTAL MATERIAL SPECIFICATIONS

FLEXIBLE DELINEATOR & OBJECT MARKER POSTS (EMBEDDED & SURFACE MOUNT TYPES)	DMS-4400
SIGN FACE MATERIALS	DMS-8300
DELINEATORS, OBJECT MARKERS AND BARRIER REFLECTORS	DMS-8600

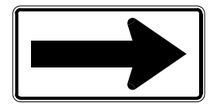
BARRIER REFLECTORS (BRF)

	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	0289	04	032	SH 16
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	BWD	SAN SABA		155

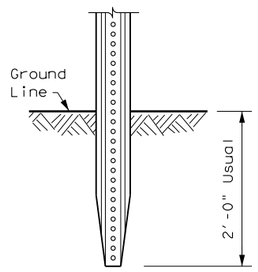
20A

DATE: 11/22/2022 1:30
FILE: pw://server.sig-eng.com:Sig-ds/Documents/TxDOT0103 Brownwood SH 16/Design_Data/4 - Design/Plan_Set_1/08. Traffic/Standards/dom2-20.dgn

POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

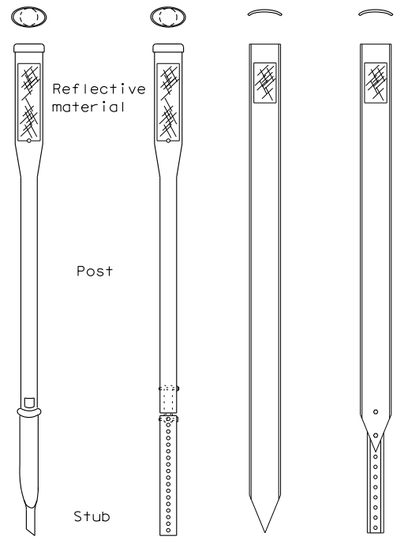


NOTES

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.

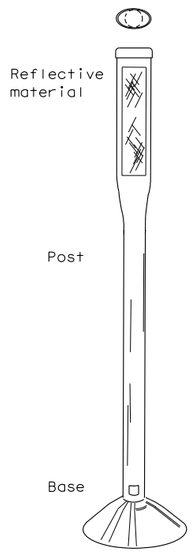
FLEXIBLE POSTS (YFLX, WFLX)

GND



EMBEDDED

SRF



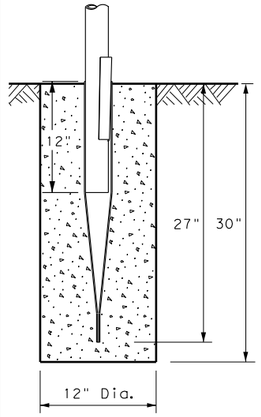
SURFACE MOUNT

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.

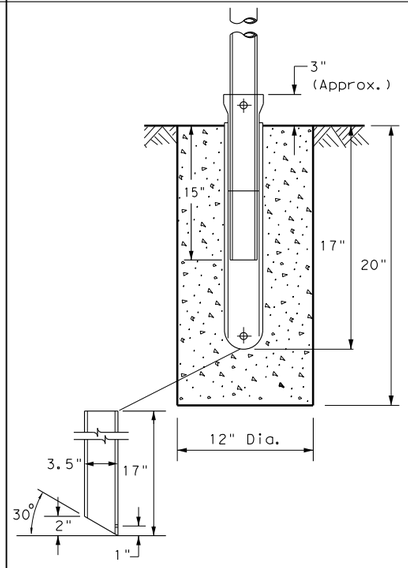
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

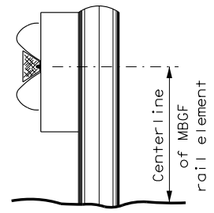
NOTE

1. Install per manufacturer's recommendations.

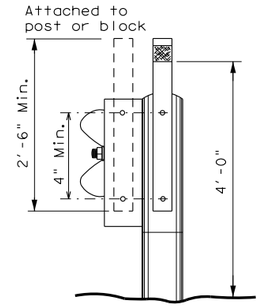
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

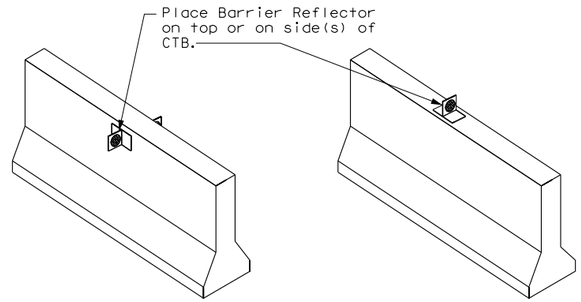
GF1



GF2



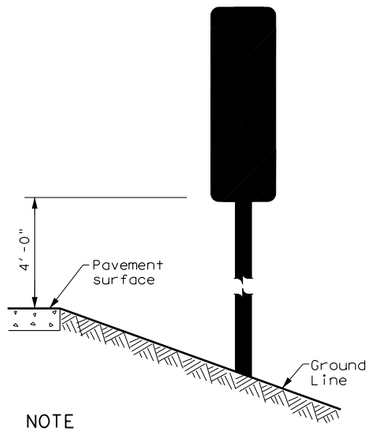
CONCRETE TRAFFIC BARRIER (CTB)



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.

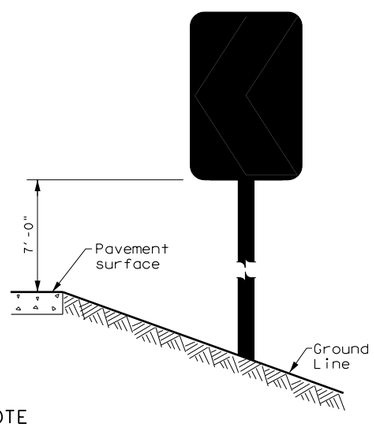
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



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)

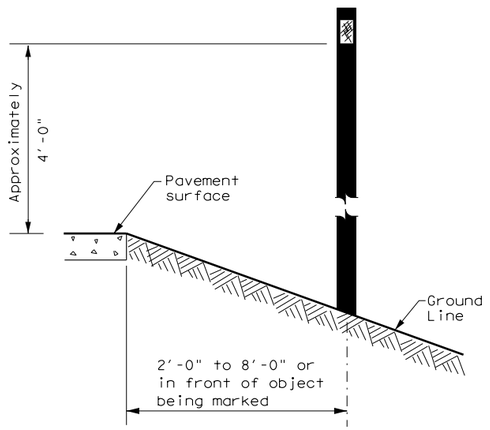
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



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.

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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	0289	04	032	SH 16
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	BWD	SAN SABA		156

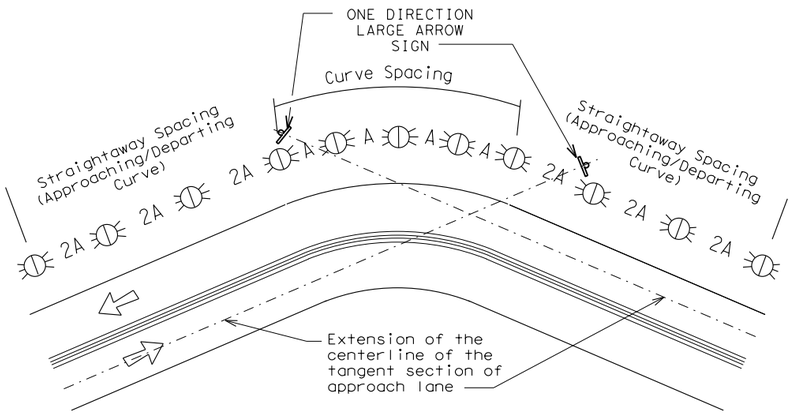
20B

DATE: 11/22/2022 1:30
FILE: pw://server.sig-eng.com:Sig-ds/Documents/TxDOT0103 Brownwood SH 16/Design_Data/4 - Design/Plan_Set_1/08. Traffic/Standards/dom3-20.dgn

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

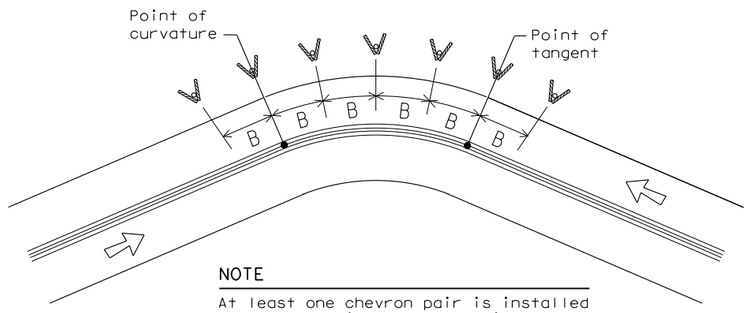
SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



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

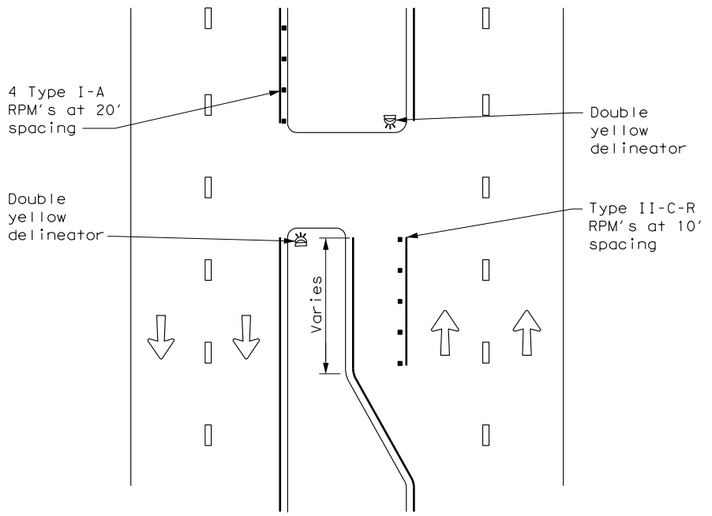
D & OM(3)-20

FILE: dom3-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0289	04	032	SH 16
3-15 8-15 8-15 7-20	DIST	COUNTY		SHEET NO.
	BWD	SAN SABA		157

20C

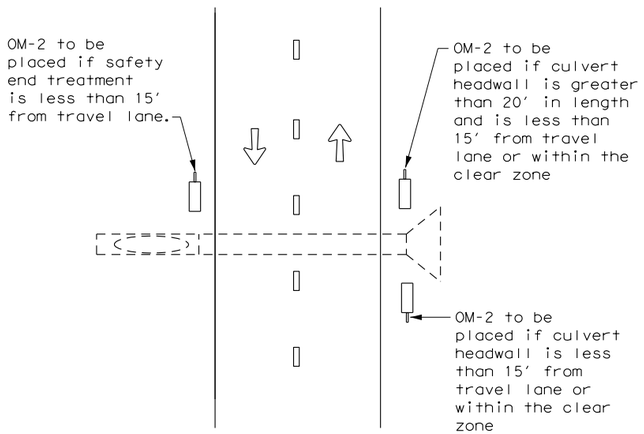
DATE: 11/22/2022 1:30
FILE: pw://server.sig-eng.com:Sig-ds/Documents/TxDOT0103 Brownwood SH 16/Design_Data/4 - Design/Plan_Set_1/08. Traffic/Standards/dom4-20.dgn

CROSSOVERS



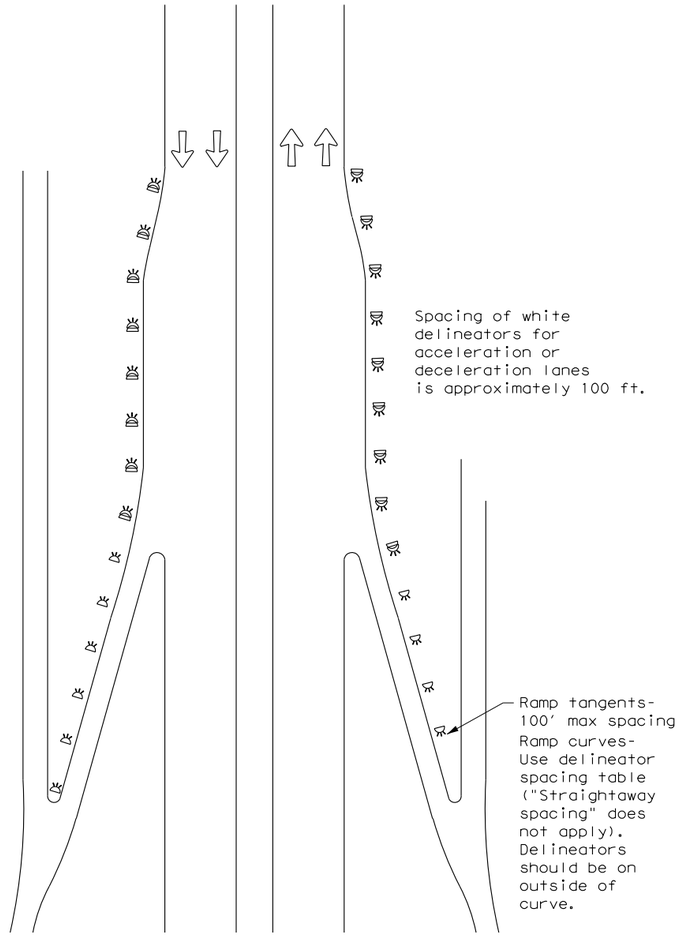
DETAIL 1

FOR CULVERTS WITHOUT MBGF



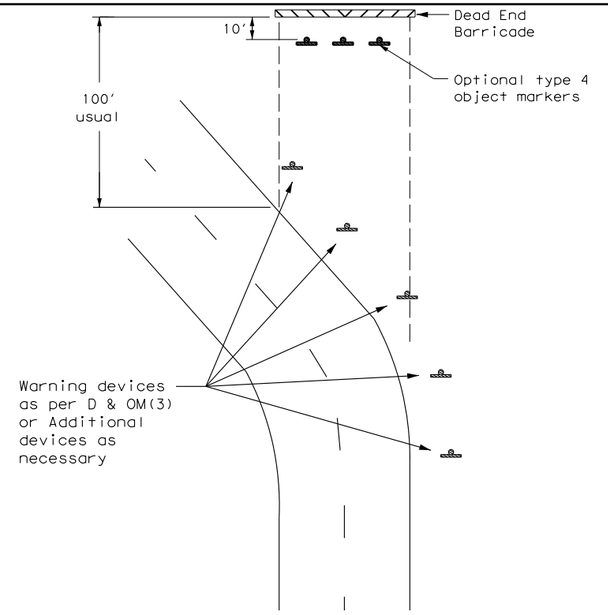
DETAIL 2

FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES



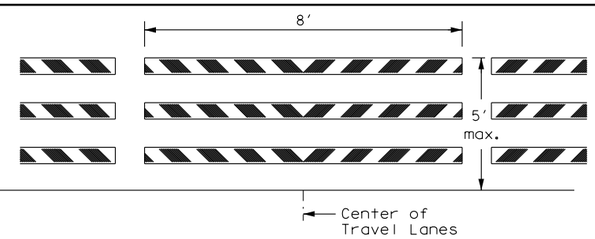
DETAIL 3

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

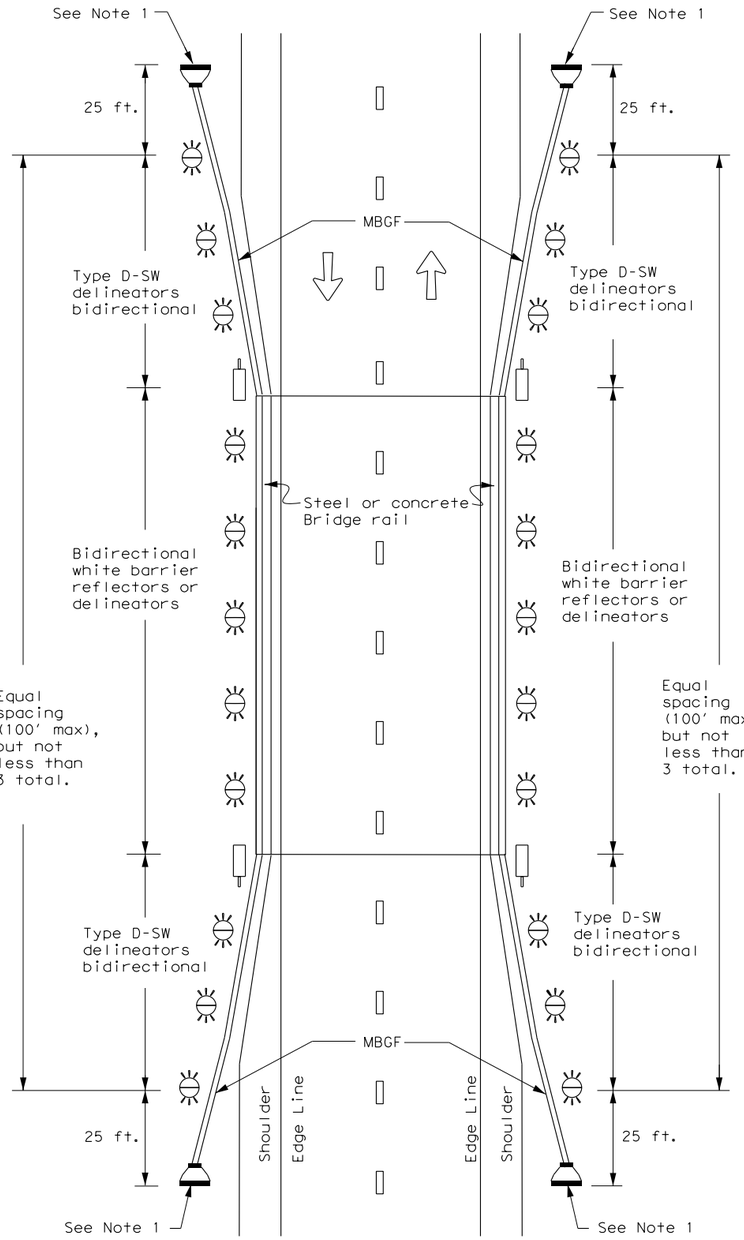
D & OM(4)-20

FILE: dom4-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0289	04	032	SH 16
3-15	DIST	COUNTY		SHEET NO.
7-20	BWD	SAN SABA		158

20D

DATE: 11/22/2022 1:30
FILE: pw://server.sig-eng.com:Sig-ds/Documents/TxDOT0103 Brownwood SH 16/Design_Data/4 - Design/Plan_Set_1/08. Traffic/Standards/dom5-20.dgn

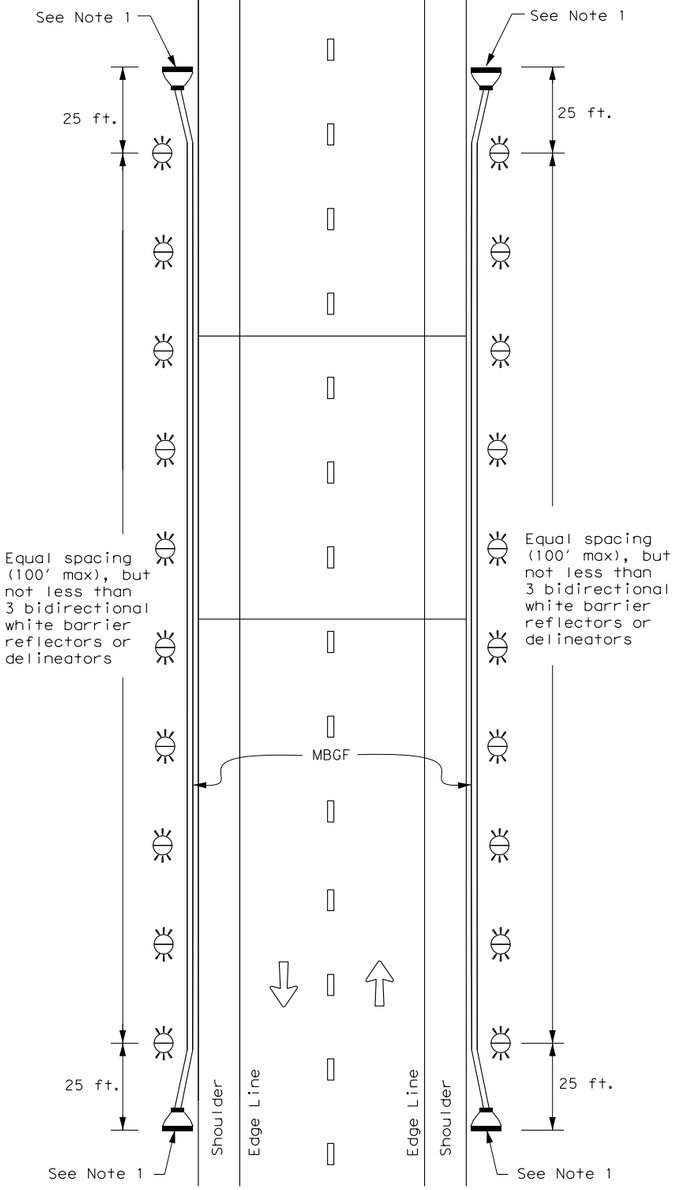
TWO-WAY, TWO LANE ROADWAY WITH REDUCED WIDTH APPROACH RAIL



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.

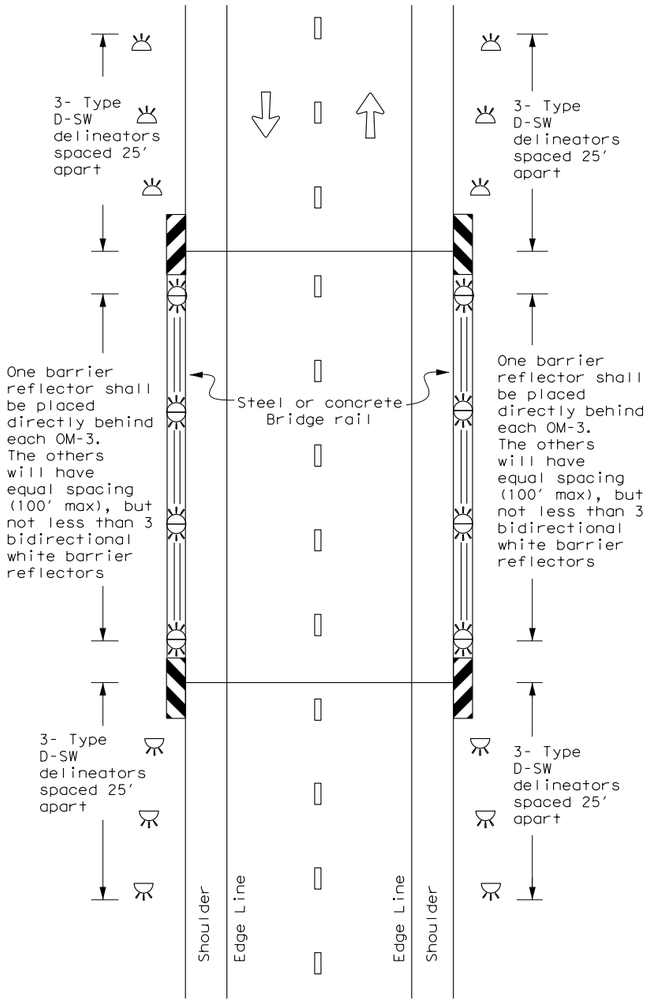
TWO-WAY, TWO LANE ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



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
© TxDOT August 2015	CONT	SECT	JOB	HIGHWAY
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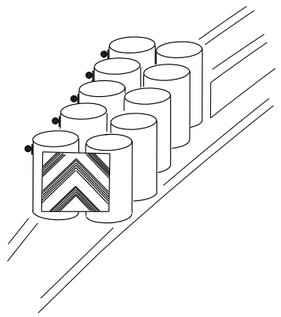
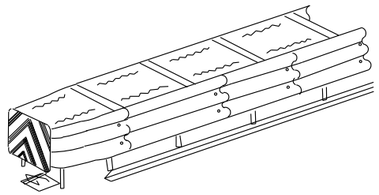
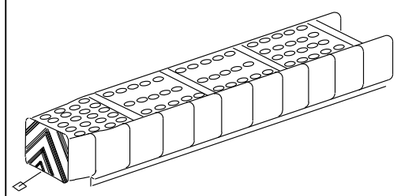
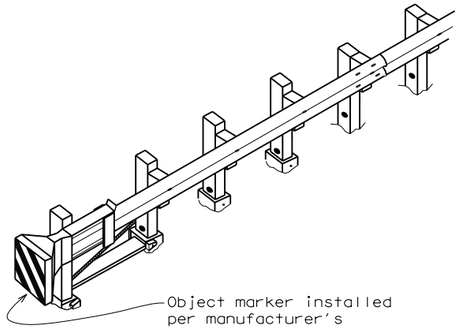
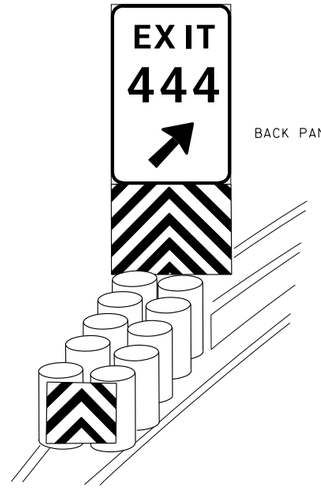
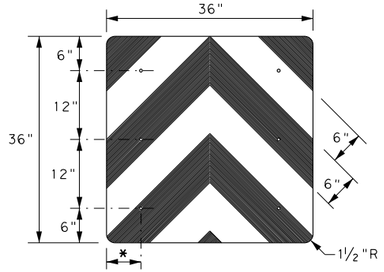


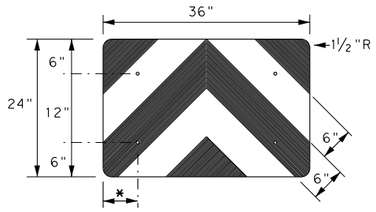




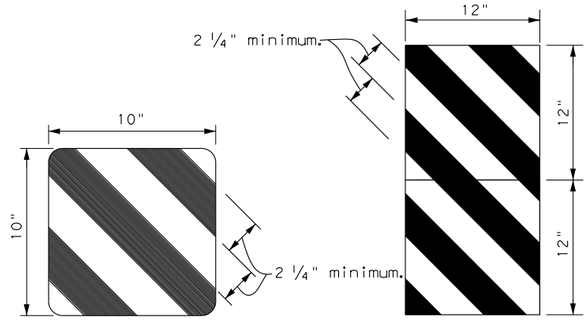




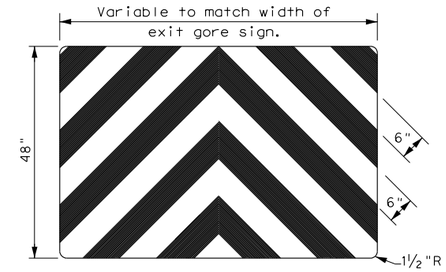


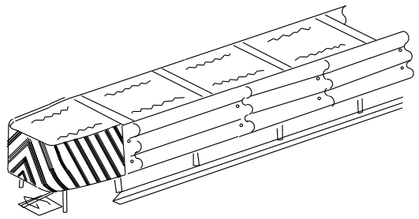


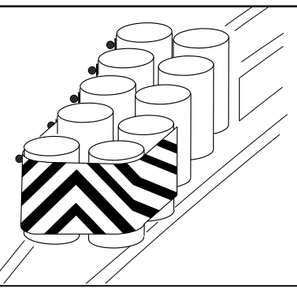
* Adjust to fit attenuator per manufacturer's recommendation, or as directed by the Engineer

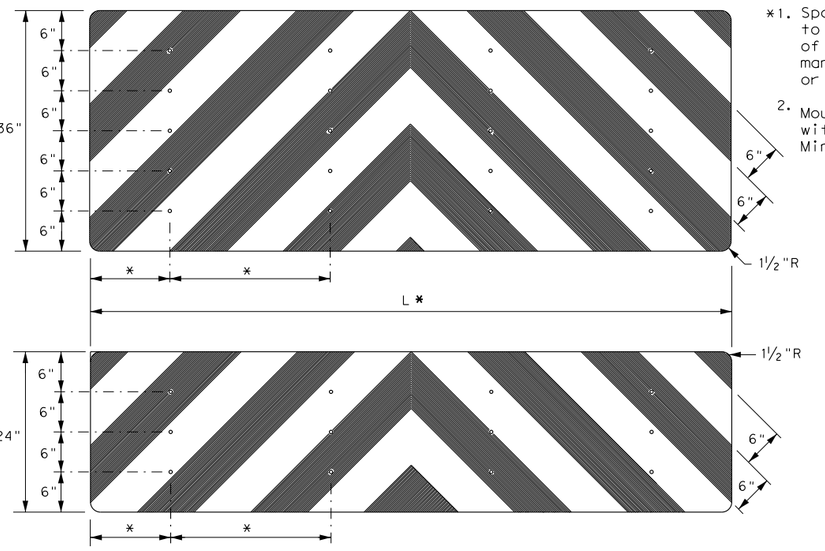


OBJECT MARKERS SMALLER THAN 3 FT^2









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
REVISIONS	0289	04	032	SH 16
4-92 8-04	DIST	COUNTY		SHEET NO.
8-95 3-15	BWD	SAN SABA		160
4-98 7-20				

20G

DATE: 11/22/2022 1:30
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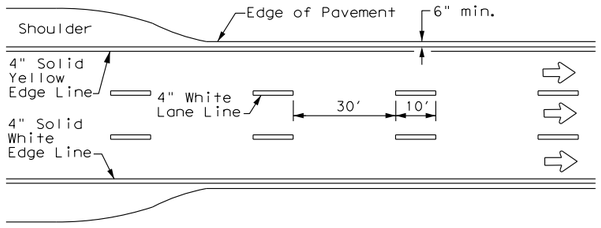
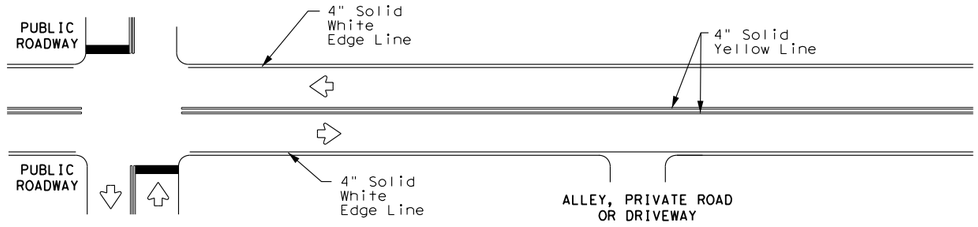
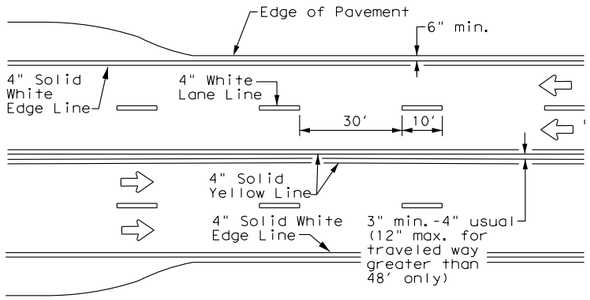


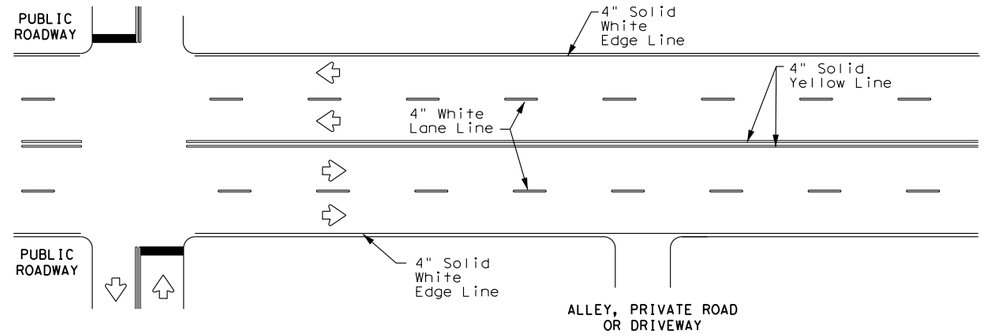
EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



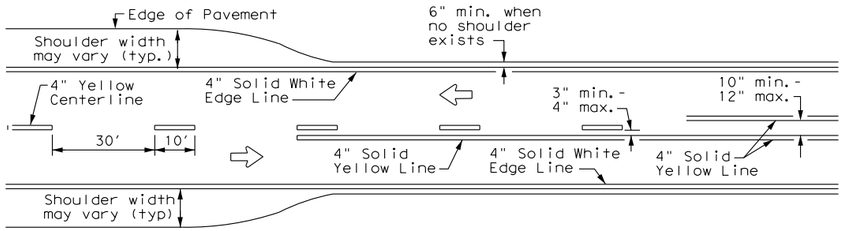
TYPICAL TWO-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



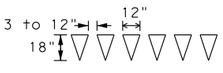
CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



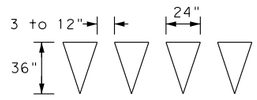
TYPICAL MULTI-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS

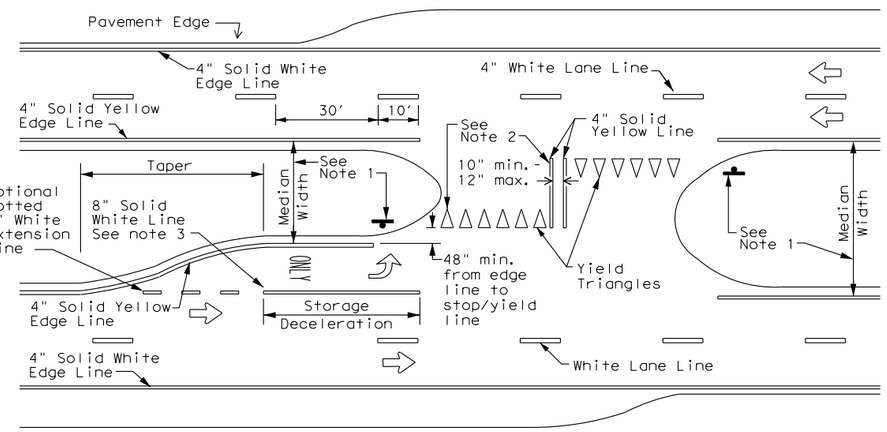


For posted speed on road being marked equal to or less than 40 MPH.



For posted speed on road being marked equal to or greater than 45 MPH.

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.

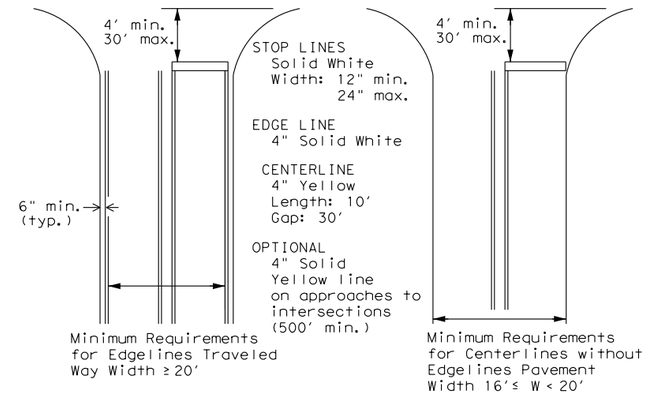
GENERAL NOTES

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

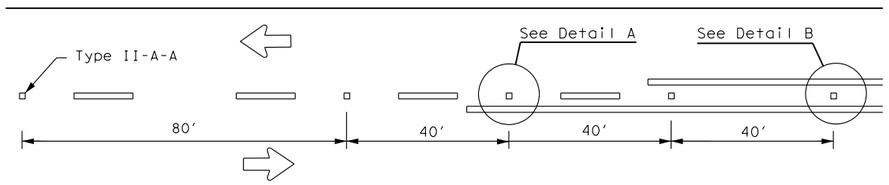
TYPICAL STANDARD PAVEMENT MARKINGS

PM(1)-20

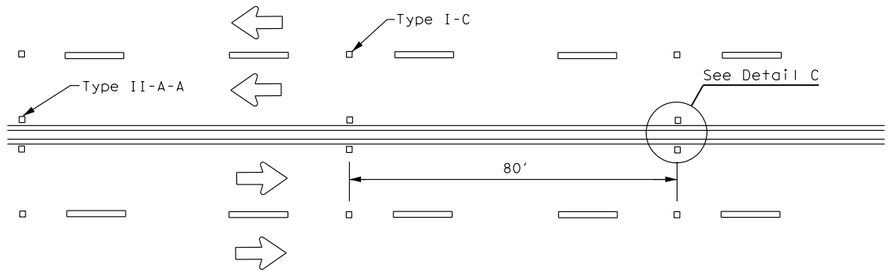
FILE: pm1-20.dgn	DN:	CK:	DW:	CK:
©TxDOT November 1978	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03	0289	04	032	SH 16
5-00 2-12	DIST	COUNTY		SHEET NO.
8-00 6-20	BWD	SAN SABA		161

22A

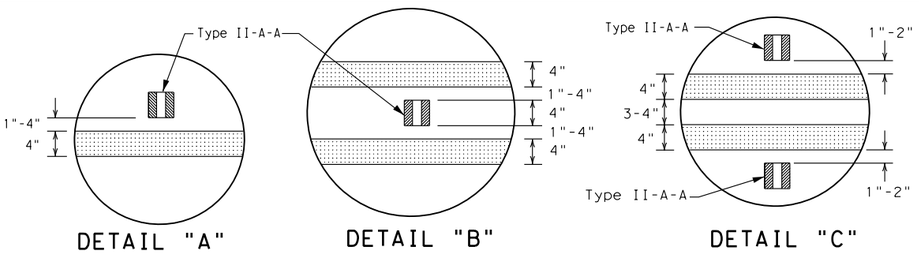
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE



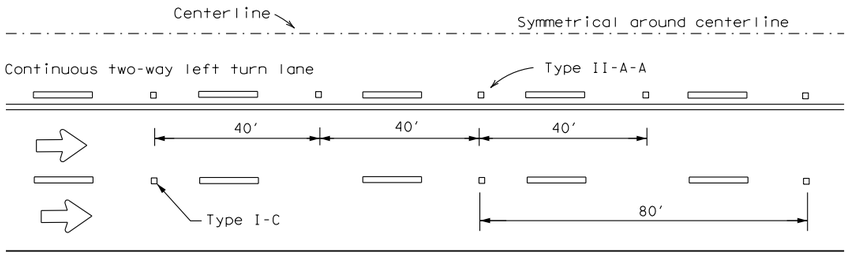
CENTERLINE FOR ALL TWO LANE ROADWAYS



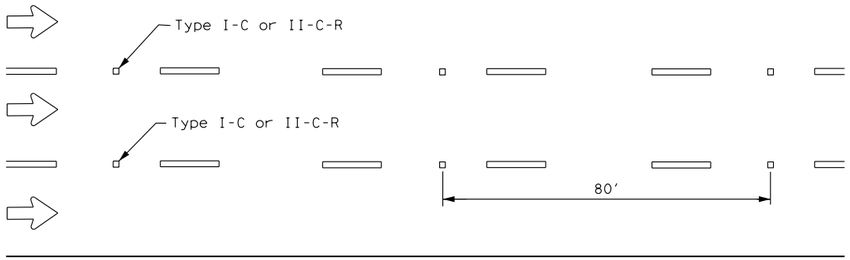
CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY HIGHWAYS



DETAIL "A" DETAIL "B" DETAIL "C"



CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE

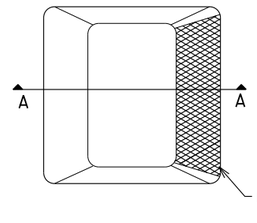


LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

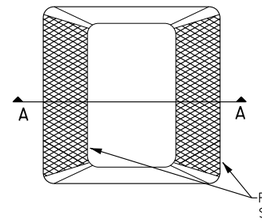
Raised pavement markers Type II-C-R shall have clear face toward normal traffic and red face toward wrong-way traffic.

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

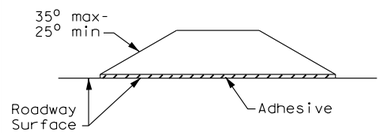
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)

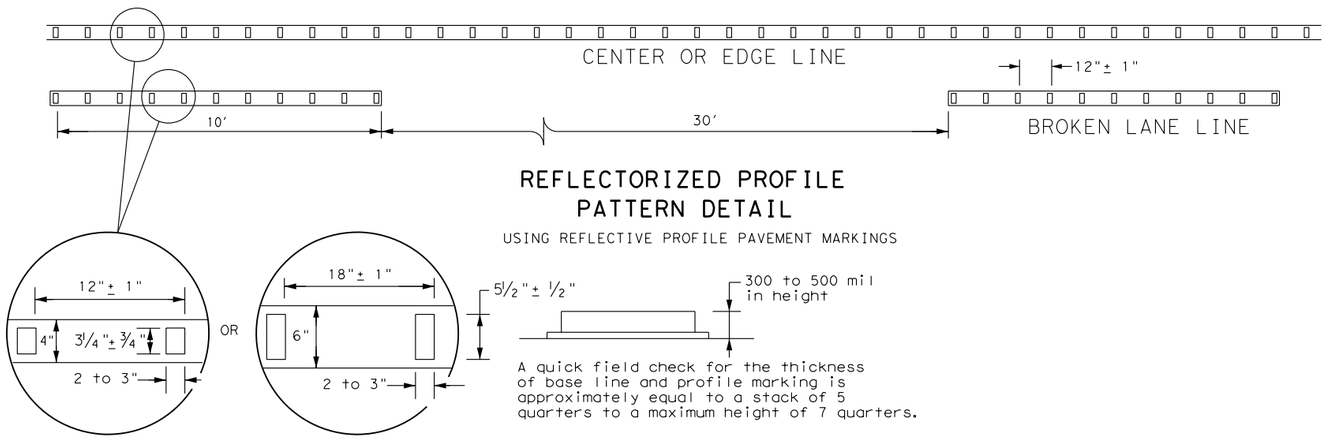


Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS



REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS

A quick field check for the thickness of base line and profile marking is approximately equal to a stack of 5 quarters to a maximum height of 7 quarters.

4" EDGE LINE, CENTER LINE OR LANE LINE

OPTIONAL 6" EDGE LINE, CENTER LINE OR LANE LINE

NOTE

Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

1. All raised pavement markers placed in broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.

Texas Department of Transportation

Traffic Safety Division Standard

POSITION GUIDANCE USING RAISED MARKERS RELECTORIZED PROFILE MARKINGS PM(2)-20

FILE: pm2-20.dgn	DN:	CK:	DW:	CK:
©TxDOT April 1977	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-92 2-10	0289	04	032	SH 16
5-00 2-12	DIST	COUNTY		SHEET NO.
8-00 6-20	BWD	SAN SABA		162

22B

DATE: 11/22/2022 1:30
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DATE: 11/22/2022 1:30
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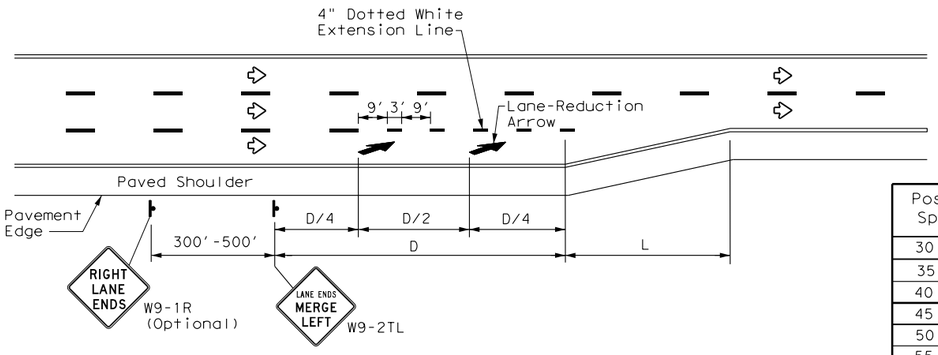
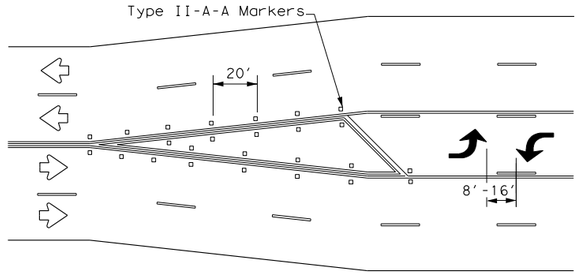


LANE REDUCTION

Posted Speed	D (ft)	L (ft)
30 MPH	460	$L=\frac{WS^2}{60}$
35 MPH	565	
40 MPH	670	
45 MPH	775	L=WS
50 MPH	885	
55 MPH	990	
60 MPH	1,100	
65 MPH	1,200	
70 MPH	1,250	
75 MPH	1,350	

NOTES

1. Lane reduction pavement markings are used where the number of through lanes is reduced because of narrowing of the roadway or because of a section of on-street parking in what would otherwise be a through lane. For Texas Super 2 Passing Lanes, see TS2(PL) standard sheets.
2. On divided highways, an additional W9-1R "RIGHT LANE ENDS" sign may be installed in the median aligned with the W9-1R sign on the right side of the highway.
3. Lane reduction arrows are required for speeds of 45 mph or greater. An optional third lane reduction arrow may be added based on engineering judgement. If used, the optional third lane reduction arrow should be centered between the first and last lane reduction arrow.
4. For lane reductions on Freeways and Expressways, signing shall conform to the TxDOT Freeway Signing Handbook.



A two-way left-turn (TWLT) lane-use arrow pavement marking should be used at or just downstream from the beginning of a two-way left-turn lane within a corridor. Repeating the marking after each intersection or dedicated turn bay is not required unless stated elsewhere in the plans.

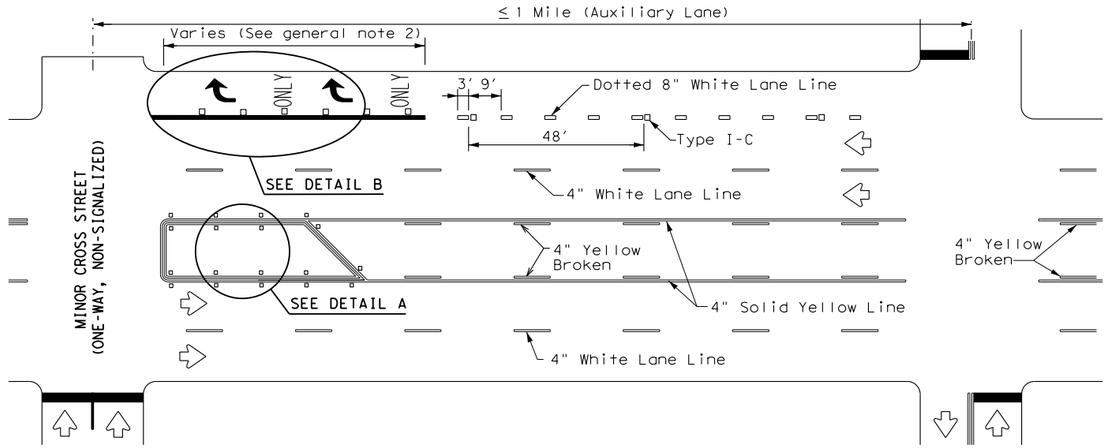
TYPICAL TRANSITION FOR TWLTL AND DIVIDED HIGHWAY

GENERAL NOTES

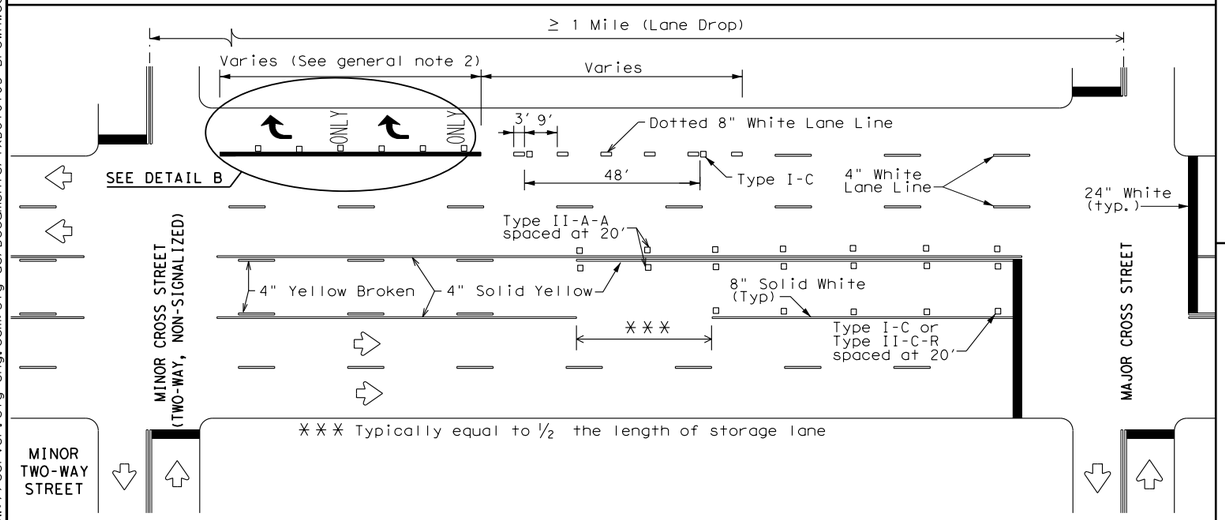
1. Lane use word and arrow markings shall be used where through lanes approaching an intersection become mandatory turn lanes. Lane use word and arrow markings should be used in auxiliary lanes of substantial length. Lane use arrow markings or word and arrow markings may be used in other lanes and turn bays for emphasis. Details for words and arrows are as shown in the Standard Highway Sign Designs for Texas.
2. When lane-use words and arrow markings are used, two sets of arrows should be used if the length of the bay is greater than 180 feet. When a single lane use arrow or word and arrow marking is used for a short turn lane, it should be located at or near the upstream end of the full-width turn lane.
3. Use raised pavement marker Type I-C with undivided highways, flush medians and two way left turn lanes. Use raised pavement marker Type II-C-R with divided highways and raised medians.
4. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.

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

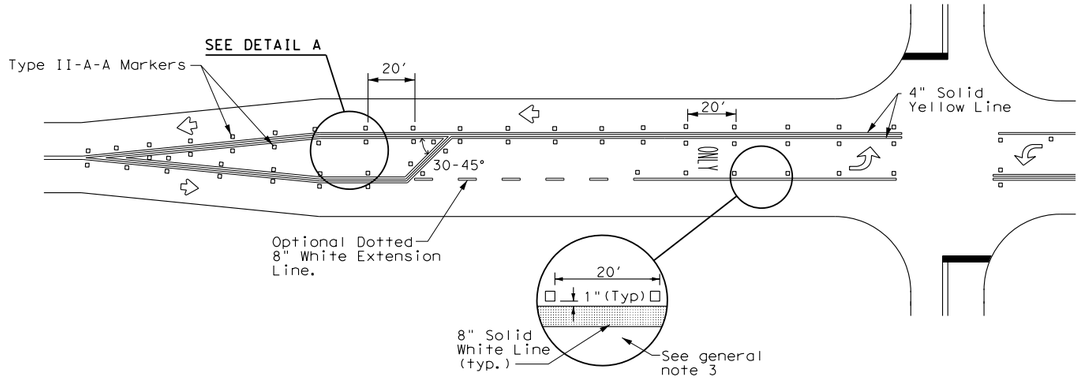
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



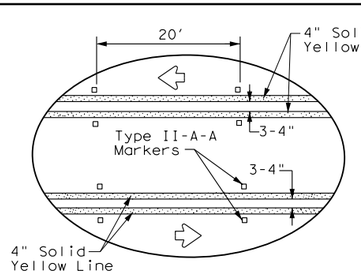
TYPICAL TWLTL AT ONE-WAY STREET AND RIGHT TURN AUXILIARY LANE



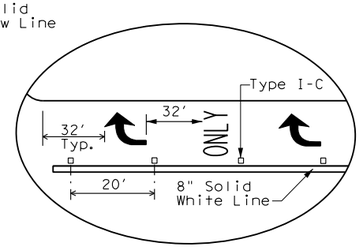
TYPICAL TWLTL AT TWO-WAY CROSS STREET AND RIGHT TURN LANE DROP



TYPICAL TWO-LANE HIGHWAY INTERSECTION WITH LEFT TURN BAYS



DETAIL A



DETAIL B

Texas Department of Transportation

Traffic Safety Division Standard

TWO-WAY LEFT TURN LANES, RURAL LEFT TURN BAYS, AND LANE REDUCTION PAVEMENT MARKINGS

PM(3)-20

FILE: pm3-20.dgn	DN:	CK:	DW:	CK:
©TxDOT April 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	0289	04	032	SH 16
5-00 2-10	DIST	COUNTY		SHEET NO.
8-00 2-12	BWD	SAN SABA		163
3-03 6-20				

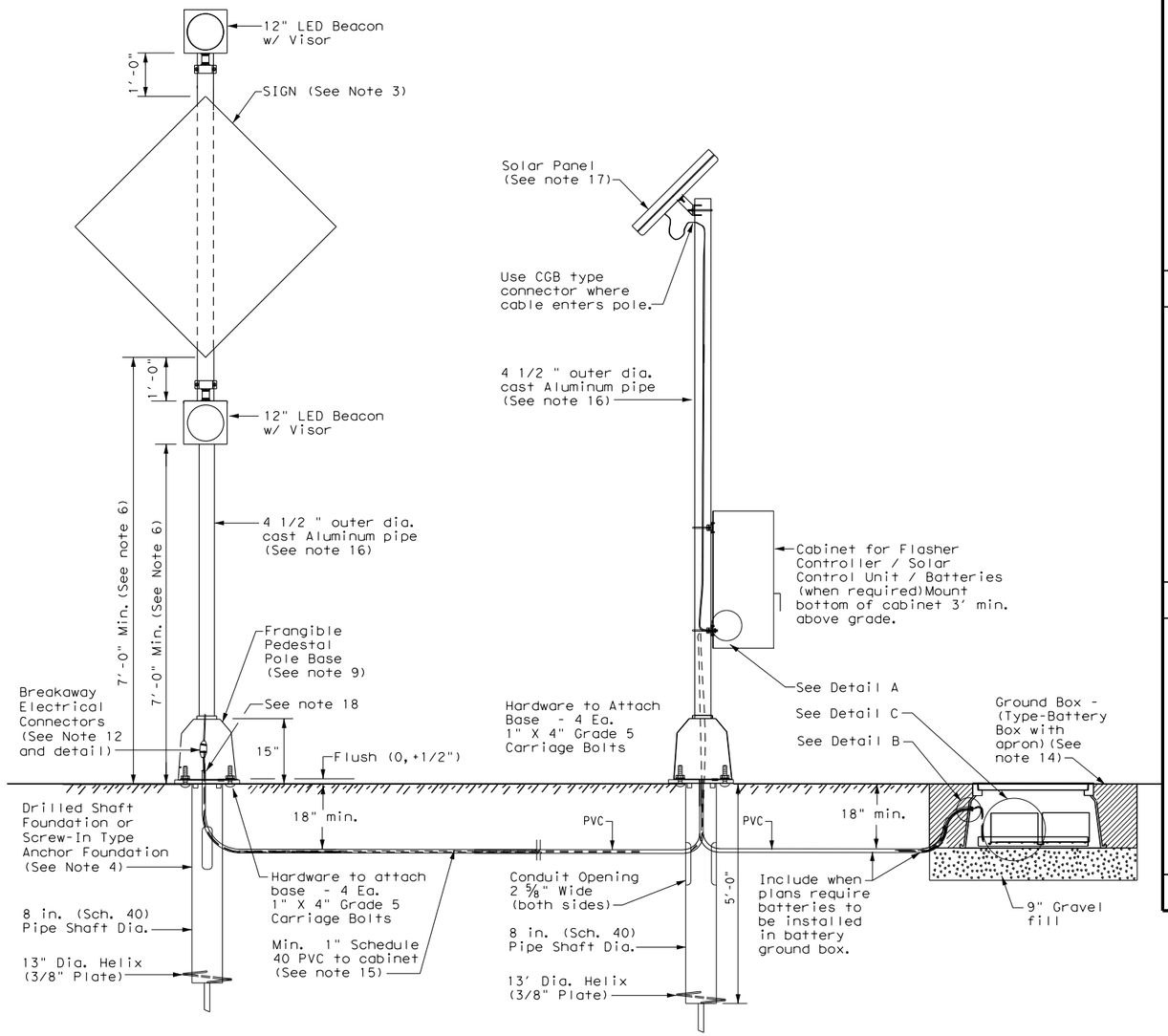
22C

GENERAL NOTES:

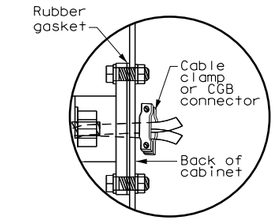
1. Details show a typical warning sign with two flashing beacon heads, other arrangements are possible. When only one beacon is required, install the upper beacon.
2. See Item 685, "Roadside Flashing Beacon Assemblies" for further requirements.
3. See SMD standard sheets for lateral and vertical clearances and sign mounting details. Install signs as shown on the sign layout sheets.
4. Use either a Screw-In Type Anchor Foundation or a Drilled Shaft Foundation as shown elsewhere in the plans. When plans require a Drilled Shaft Foundation, see standard sheet TS-FD. Install the Screw-In Type Anchor Foundation as per manufacturer's recommendations. On a slope, install one edge at ground level. Screw-In/Drilled Shaft Foundation is subsidiary to Item 685. Installation of a ground rod is not required for solar powered flashing beacon assemblies.
5. When used, provide Screw-In Type Anchor Foundations as shown on TxDOT's Material Producer List (MPL) in the file "Highway Traffic Signals".
6. Provide clearance as shown above the sidewalk or pavement grade at the edge of the road. When a bottom beacon is not used, mount the bottom of the sign at least 7 ft. above the sidewalk or pavement grade at the edge of the road.
7. Use materials specifically designed for attaching cabinets, beacon heads, solar panels, etc., to poles.
8. Conduit in foundation and within 6 in. of foundation is subsidiary to the Item 685, "Roadside Flashing Beacon Assemblies."
9. Per manufacturer's recommendations, engage all threads on the pedestal pole base and pipe unless the pipe is fully seated into base. In high winds, use a pole and base collar assembly to add strength and prevent loosening on connection.
10. Install beacon heads as shown here, as shown elsewhere on the plans, or as directed. Use hardware specifically designed for mounting beacon heads on poles.
11. Install the cable clamp in the bottom third of the back of the cabinet. See Detail A.
12. Provide single pole non-fused watertight breakaway electrical connectors for frangible pedestal pole bases, as shown on TxDOT's MPL in the file "Roadway Illumination and Electrical Supplies". Approved models are listed under Item 685. For ungrounded (hot) conductors, install a breakaway connector with a dummy fuse (slug). For grounded (neutral) conductors, install a breakaway connector with a white colored marking and a permanently installed dummy fuse (slug).
13. Install the batteries in a battery box. Place the batteries on a 3/16" thick plastic sheet and connect together. Place a plastic cover (battery bell jar) over the top of each battery and secure the battery bell jar to the battery with a strap. The batteries, bell jars, straps and 3/16 " plastic sheet are subsidiary to the Item 685, "Roadside Flashing Beacon Assemblies." When required, install batteries in the flasher cabinet. Wire batteries according to manufacturers recommendations. Provide the number of batteries as required by the manufacturer.
14. See standard sheet Electrical Details (ED) for additional requirements regarding the installation of ground boxes/battery boxes, conduit, and cabinets.
15. Unless otherwise shown on the plans or recommended by the manufacturer, use the following table to determine the wire size from cabinet to beacons.

Distance from Cabinet to Beacons (ft.)	Minimum Required Wire Size (AWG)
0 - 35	#14
35 - 60	#12
60 - 100	#10
> 100	#8

16. Unless otherwise shown on the plans, pole shaft shall be one piece, Schedule 40 Aluminum pipe, ASTM B429 or B221 (Alloy 6061-T6 only). Aluminum conduit will not develop the necessary strength and will not be allowed.
17. Orient solar panel for optimum exposure to sunlight (face to the south). Prior to installation, check the location to ensure there is no overhead obstruction that would block the solar panel from receiving full sunlight. Unless specified elsewhere, mount a minimum of 14' above grade.
18. Ensure height of conduit is below top of anchor bolts.

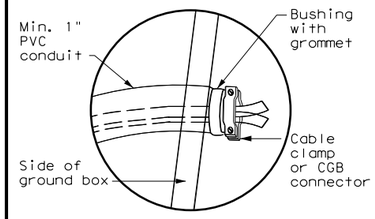


DETAIL FOR SOLAR PANEL, CABINET, AND BATTERIES LOCATED OUT OF CLEAR ZONE ON SEPARATE ALUMINUM POLE ASSEMBLY

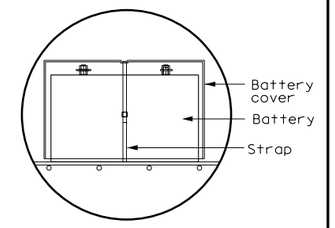


Pull conductors to remove slack in run between cabinet and ground box. Clamp cable at conduit end in ground box and in cabinet at entry as shown.

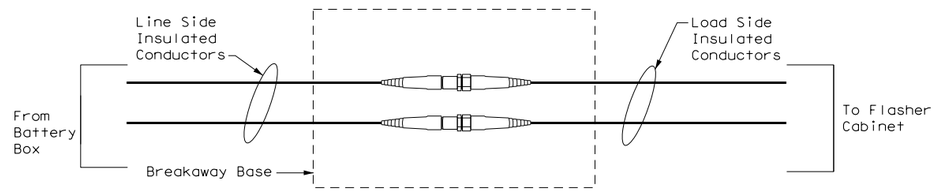
DETAIL A



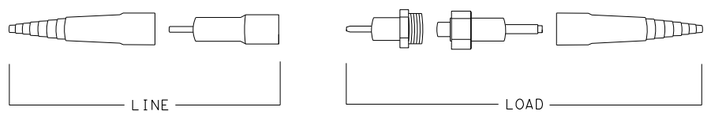
DETAIL B



DETAIL C



NON-FUSED BREAKAWAY ELECTRICAL CONNECTORS



NON-FUSED BREAKAWAY ELECTRICAL CONNECTORS EXPLODED VIEW

Texas Department of Transportation

Traffic Operations Division Standard

SOLAR POWERED ROADSIDE FLASHING BEACON ASSEMBLY DETAILS (ALUMINUM)

SPRFBA(3)-13

FILE: spb3-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT May 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS				
DATE: 12-04	DIST	COUNTY		SHEET NO.
FILE: 3-13				

75C

DATE: 11/22/2022 1:30
FILE: pw://server.sig-eng.com:Sig-ds/Documents/TxDOT0103 Brownwood SH 16/Design*Data/4 - Design/Plan*Set*1/08. Traffic/Standards/smdgen.dgn

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)

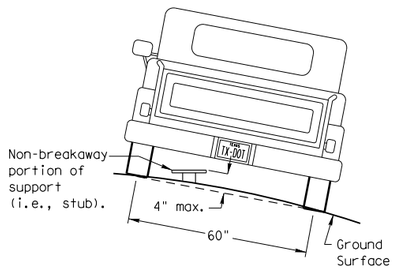
Anchor Type

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

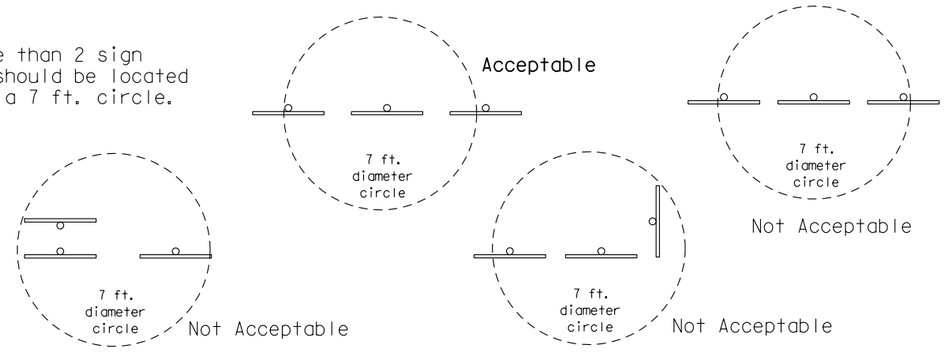
P = Prefab. "Plain" (see SMD(SLIP-1) to (SLIP-3), (TWT), (FRP))
T = Prefab. "T" (see SMD(SLIP-1) to (SLIP-3), (TWT))
U = Prefab. "U" (see SMD(SLIP-1) to (SLIP-3))
IF REQUIRED
1EXT or 2EXT = Number of Extensions (see SMD(SLIP-1) to (SLIP-3), (TWT))
BM = Extruded Wind Beam (see SMD(SLIP-1) to (SLIP-3))
WC = 1.12 #/ft Wing Channel (see SMD(SLIP-1) to (SLIP-3))
EXAL = Extruded Aluminum Sign Panels (see SMD(SLIP-3))

REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



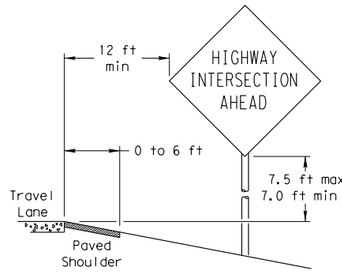
To avoid vehicle undercarriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).

No more than 2 sign posts should be located within a 7 ft. circle.



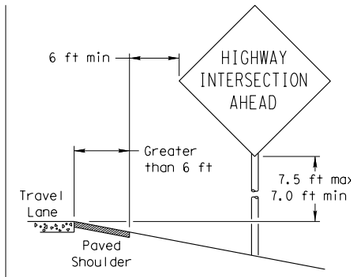
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

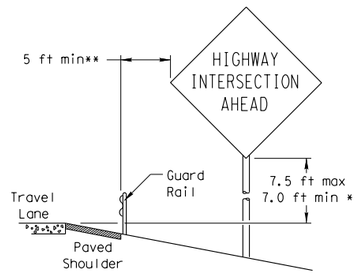
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



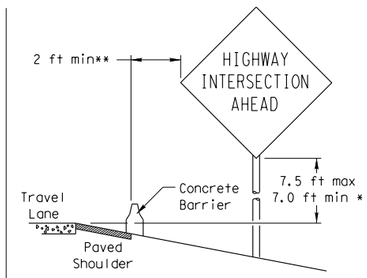
GREATER THAN 6 FT. WIDE

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



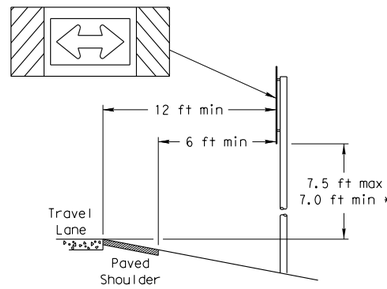
BEHIND GUARDRAIL



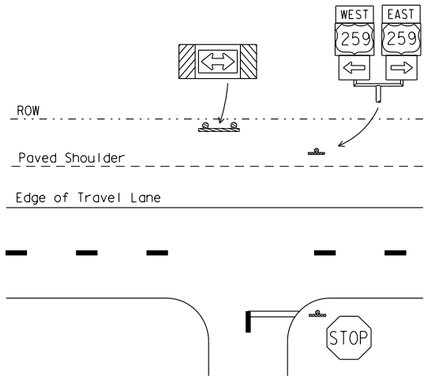
BEHIND CONCRETE BARRIER

**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.

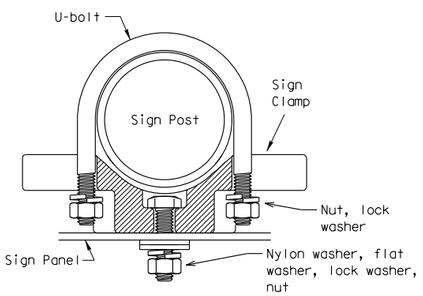
The maximum values may be increased when directed by the Engineer.

See the Traffic Operations Division website for detailed drawings of sign clamps, Triangular Slipbase System components and Wedge Anchor System components.

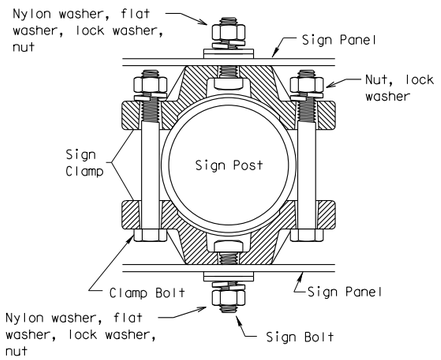
The website address is:
http://www.txdot.gov/publications/traffic.htm

TYPICAL SIGN ATTACHMENT DETAIL

Single Signs



Back-to-Back Signs



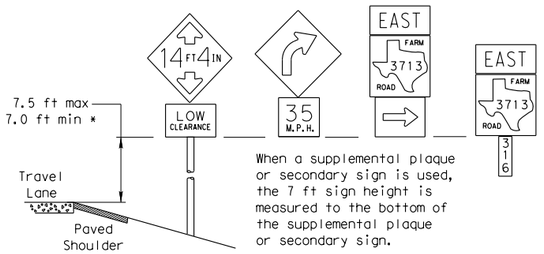
Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

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.

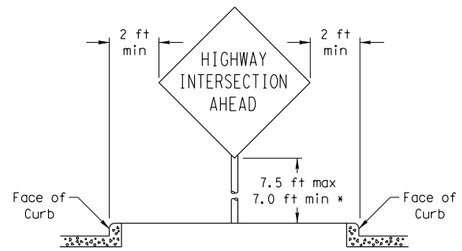
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



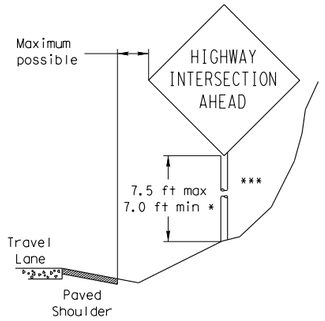
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

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.

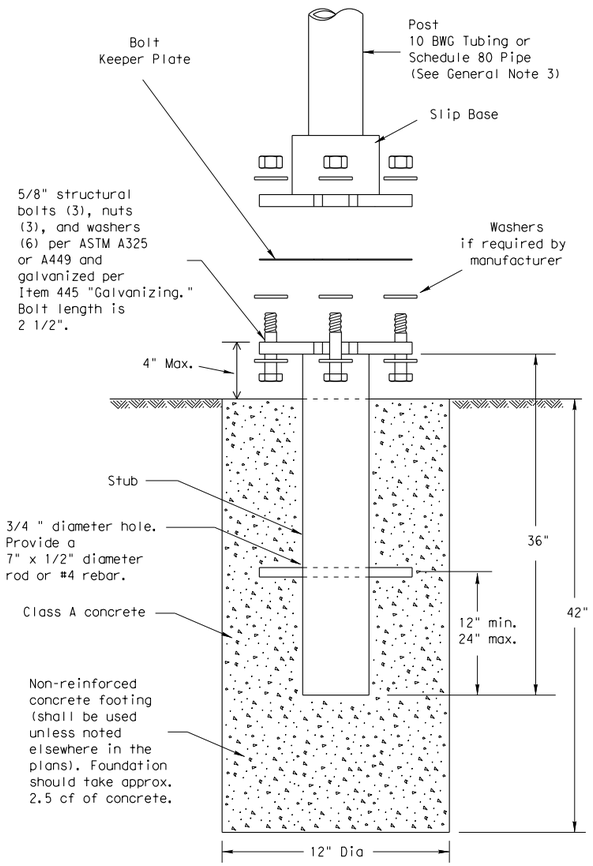
Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD(GEN)-08

REVISIONS	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
9-08	CONT	SECT	JOB	HIGHWAY
	0289	04	032	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	SAN SABA		165

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.

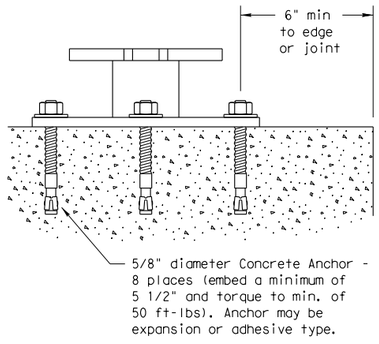
   Schedule 80 Pipe (2.875" outside diameter)
   - 0.276" nominal wall thickness
   - Steel tubing per ASTM A500 Gr C
   - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
     - 46,000 PSI minimum 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

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

REVISIONS
9-08

CONT	SECT	JOB	HIGHWAY
0289	04	032	SH 16

DIST	COUNTY	SHEET NO.
BWD	SAN SABA	166

DATE: 11/22/2022 1:31
FILE: pw://server.sig-eng.com:Sig-ds/Documents/TxDOT0103 Brownwood SH 16/Design*Data/4 - Design/Plan*Set*1/08. Traffic/Standards/smdsl.dgn

DATE: 11/22/2022 1:31
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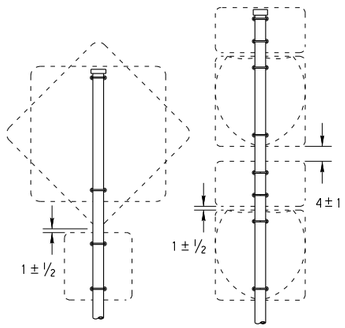
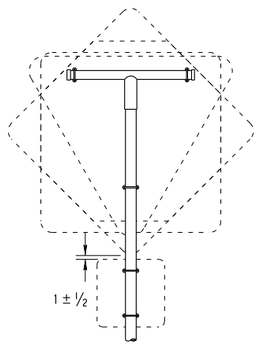


SM RD SGN ASSM TY XXXXX(1)XX(P)



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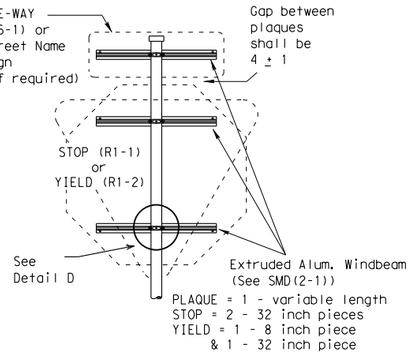
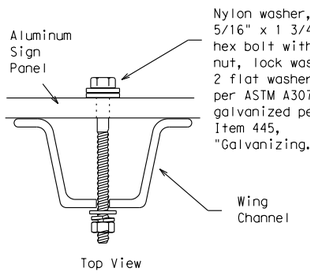
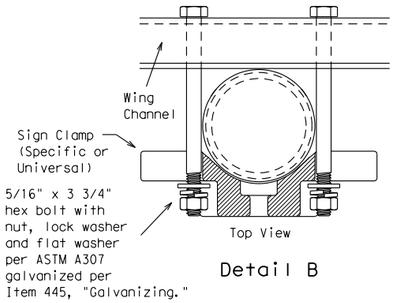


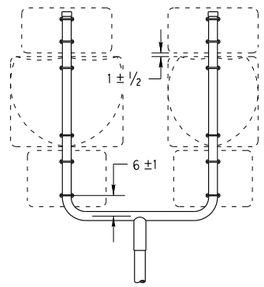
SM RD SGN ASSM TY XXXXX(1)XX(P-BM)



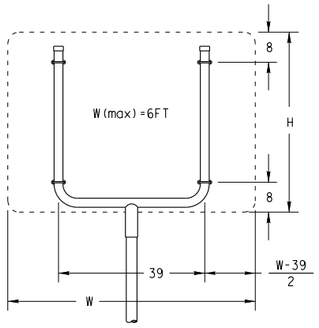
Detail A



Detail B



SM RD SGN ASSM TY XXXXX(1)XX(U)



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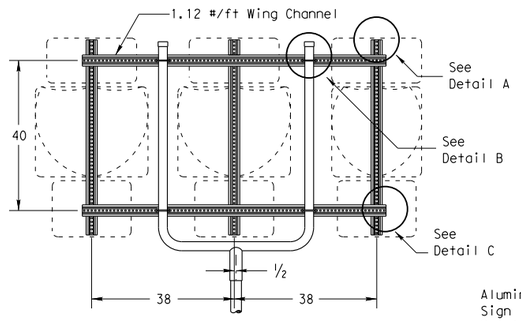
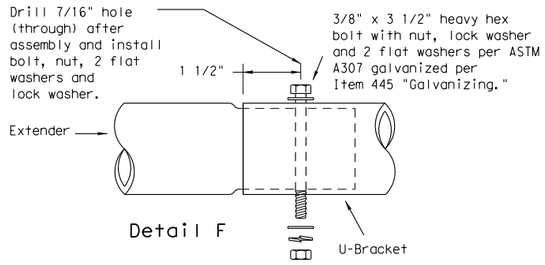
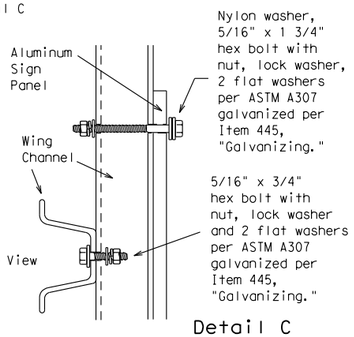


SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)

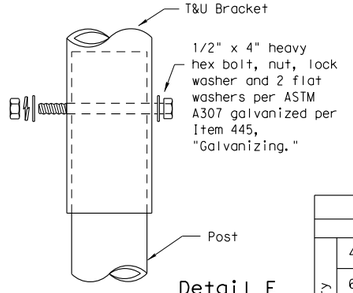


Detail F

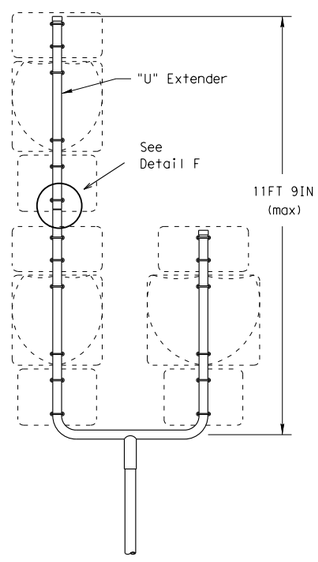
Splices shall only be allowed behind the sign substrate.



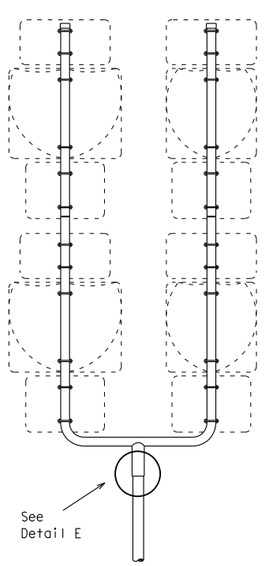
Detail C



Detail E



SM RD SGN ASSM TY S80(1)XX(U-1EXT)



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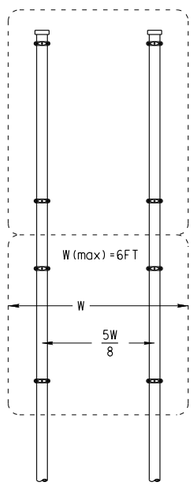
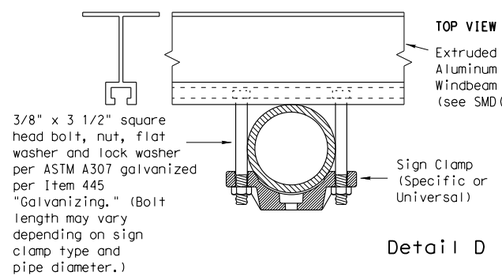
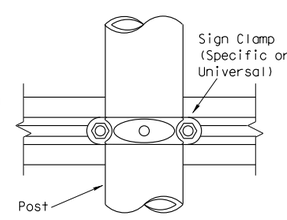


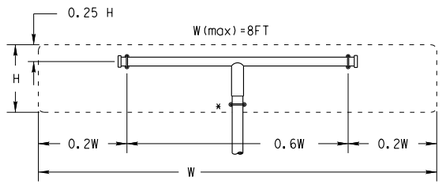
SM RD SGN ASSYM TY XXXXX(2)XX(P)

SIDE VIEW



Detail D

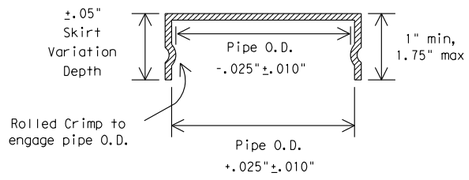




SM RD SGN ASSM TY XXXXX(1)XX(T)
(* - See Note 12)

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
	0289	04	032	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	SAN SABA		167

26C

DATE: 11/22/2022 1:31
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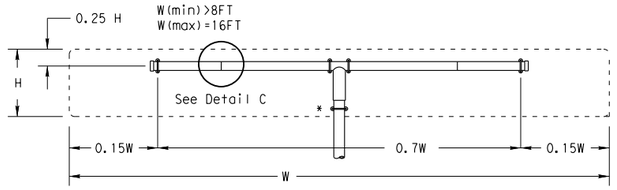
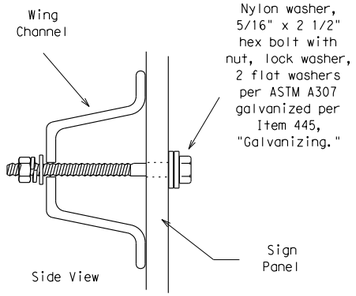
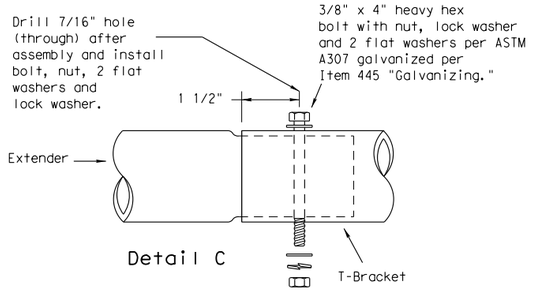


SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)
(* - See Note 12)



Detail B



Detail C

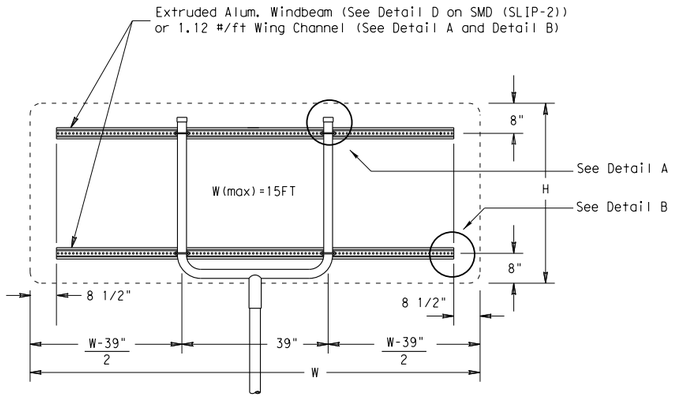
Splices shall only be allowed behind the sign substrate.

GENERAL NOTES:

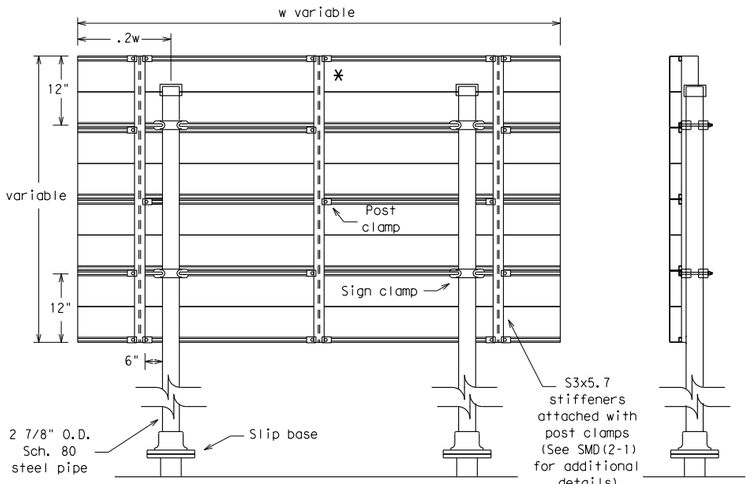
1.

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. Sign blanks shall be the sizes and shapes shown on the plans.
11. 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.
12. Post open ends shall be fitted with Friction Caps.



SM RD SGN ASSM TY XXXXX(1)XX(U-XX)

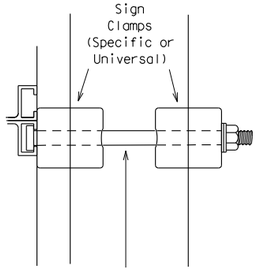


Typical Sign Mount

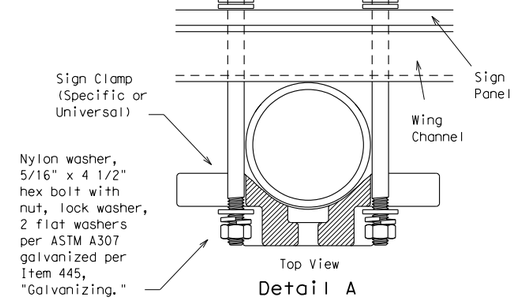
SM RD SGN ASSM TY S80(2)XX(P-EXAL)

* Additional stiffener placed at approximate center of signs when sign width is greater than 10'.

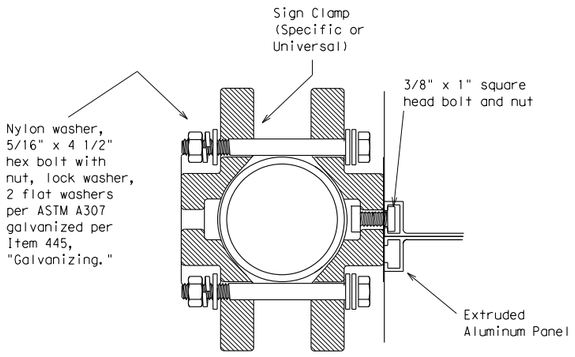
See Detail E
for clamp installation



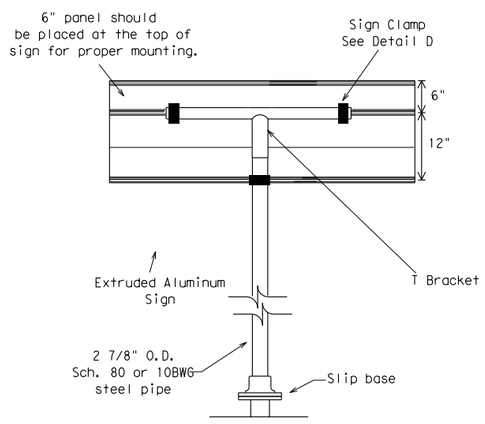
Detail E



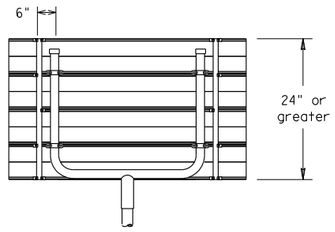
Detail A



Detail D
EXTRUDED ALUMINUM SIGN WITH T BRACKET



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

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

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

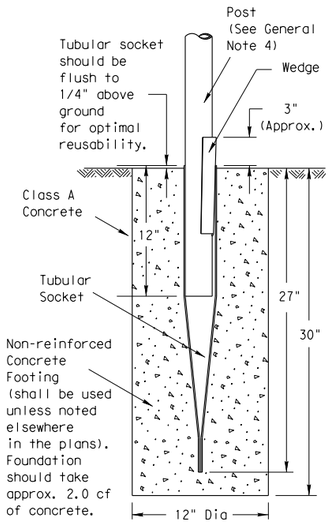
REVISIONS
9-08

CONT	SECT	JOB	HIGHWAY
0289	04	032	SH 16

DIST	COUNTY	SHEET NO.
BWD	SAN SABA	168

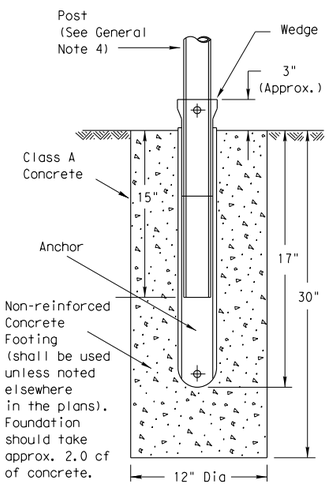
DATE: 11/22/2022 1:31
FILE: pw://server.sig-eng.com:Sig-ds/Documents/TxDOT0103 Brownwood SH 16/Design*Data/4 - Design/Plan*Set*1/08. Traffic/Standards/smdtwt.dgn

Wedge Anchor Steel System



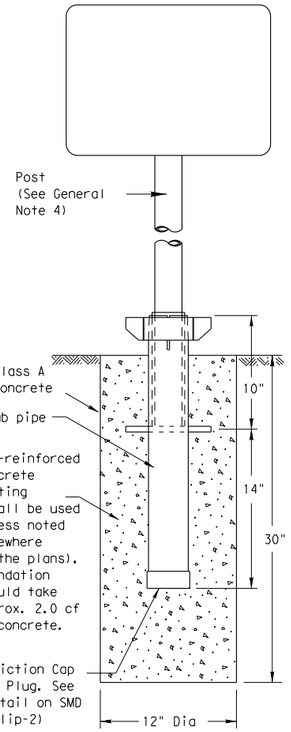
SM RD SGN ASSM TY TWT(X)WS(X)

Wedge Anchor High Density Polyethylene (HDPE) System

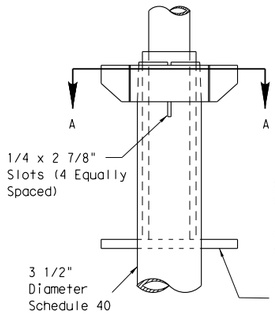


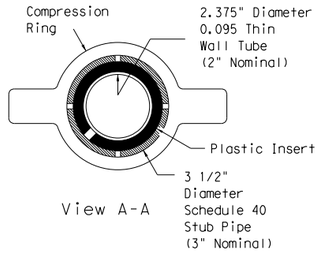
SMD RD SGN ASSM TY TWT(X)WP(X)

Universal Anchor System with Thin-Walled Tubing Post



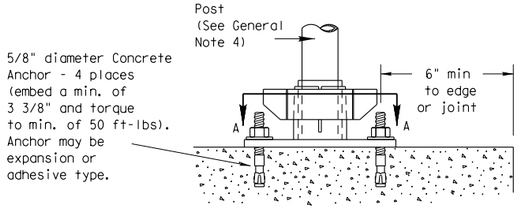
SM RD SGN ASSM TY TWT(X)UA(P)



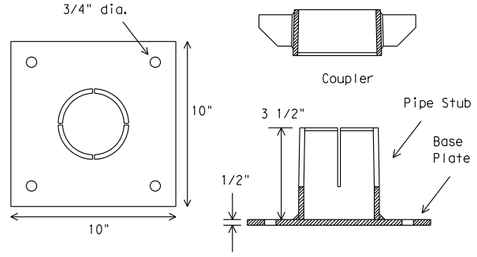


View A-A

Plastic insert must be used when using the TWT with either the Universal Anchor System or the Bolt Down Universal Anchor System. The insert should be approx. 10" long and cover the tubing from just above the top of the stub pipe to the bottom of the sign post when using the Universal Anchor System. The insert should be cut to approx. 4 1/2" when used with the Bolt Down Universal Anchor System.

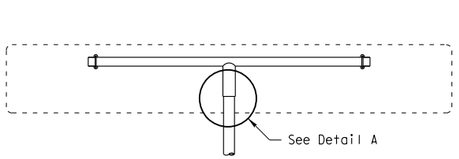


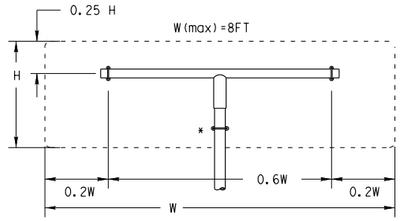
Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. A heavy hex nut per ASTM A563 and hardened washer per ASTM F436. The stud bolt shall have minimum yield and ultimate tensile strengths of 50 and 75 ksi, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Top of bolt shall extend at least flush with top of nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 3 3/8" minimum embedment, shall have a minimum allowable tension and shear of 2450 and 1525 psi, respectively. 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.



SM RD SGN ASSM TY TWT(X)UB(P)

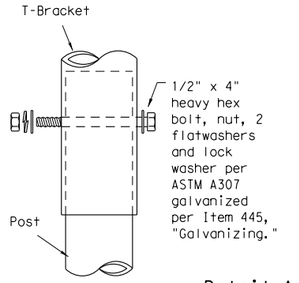
Sign Installation Using a Prefabricated T-Bracket for Thin-Wall Tubing Post





SM RD SGN ASSM TY TWT(X)XX(T)

(* - See General Note 6)



Detail A

9/16" hole may need to be drilled through post to accommodate bolt.

NOTE

The devices shall be installed per manufacturer's recommendations. Installation procedures shall be provided to the Engineer by Contractor.

GENERAL NOTES:

1. The Wedge Anchor System and the Universal Anchor System with thin wall tubing post may be used to support up to 10 square feet of sign area.
2. The tubular socket, wedge and prefabricated T-bracket shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to the approval of the TxDOT Traffic Standards Engineer.
3. Except for posts (13 BWG Tubing), clamps, nuts and bolts, all components shall be prequalified. A list of prequalified vendors may be obtained from the Material Producer List web page. The website address is: http://www.txdot.gov/business/producer list.htm
4. Material used as post with this system shall conform to the following specifications:
   13 BWG Tubing (2.375" outside diameter) (TWT)
   0.095" nominal wall thickness
   Seamless or electric-resistance welded steel tubing
   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
   18% minimum elongation in 2"
   Wall thickness (uncoated) shall be within the range of .083" to .099"
   Outside diameter (uncoated) shall be within the range of 2.369" to 2.381"
   Galvanization per ASTM 123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.
5. Sign blanks shall be the sizes and shapes shown on the plans.
6. Additional sign clamp required on the "T-bracket" post for 24" high signs. Place clamp at least 3" above bottom of sign when possible.
7. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
8. See the Traffic Operations Division website for detailed drawings of sign clamps and Wedge Anchor System components. The website address is: http://www.txdot.gov/publications/traffic.htm

WEDGE ANCHOR SYSTEM INSTALLATION PROCEDURE

1. Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18". When solid rock is encountered below ground level, the foundation shall extend in the solid rock a minimum depth of 18" or provide a minimum foundation depth of 30". If solid rock is encountered, the socket/stub may be reduced in length as required to a minimum length of 18". Any material removed from the socket/stub shall be from the bottom and the clearance requirements given on SMD(GEN) must be followed. The inner surfaces of the socket/stub must remain free of concrete or other debris.
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. Place concrete into hole until it is approximately flush with the ground. Concrete shall be Class A.
3. Insert tubular socket into concrete until top of socket is approximately 1/4 " above the concrete footing.
4. Plumb the socket. Allow a minimum 4 days for concrete to set, unless otherwise directed by Engineer..
5. Attach the sign to the sign post.
6. Insert the sign post into socket and align sign face with roadway.
7. Drive the wedge into the socket to secure post. This will leave approximately 3 inches of the wedge exposed.

UNIVERSAL ANCHOR SYSTEM INSTALLATION PROCEDURE

1. Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18". When solid rock is encountered below ground level, the foundation shall extend in the solid rock a minimum depth of 18" or provide a minimum foundation depth of 30". If solid rock is encountered, the socket/stub may be reduced in length as required to a minimum length of 18". Any material removed from the socket/stub shall be from the bottom and the clearance requirements given on SMD(GEN) must be followed. The inner surfaces of the socket/stub must remain free of concrete or other debris.
2. Insert base post in hole to depths shown and backfill hole with concrete.
3. Level and plumb the base post using a torpedo level and allow concrete adequate time to set. The bottom of the slots provided in the stub pipe shall remain above the top of the concrete foundation.
4. Attach the sign to the sign post.
5. Install plastic insert around bottom of post.
6. Insert sign post into base post. Lower until the post comes to rest on steel rod.
7. Seat compression ring using a hammer. Typically, the top of compression ring will be approximately level with top of stub post when optimally installed.
8. Check sign post by hand to ensure it is unable to turn. If loose, increase the tightening of the compression ring.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS WEDGE & UNIVERSAL ANCHOR WITH THIN WALL TUBING POST

SMD(TWT)-08

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

REVISIONS	CONT	SECT	JOB	HIGHWAY
9-08	0289	04	032	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	SAN SABA		169

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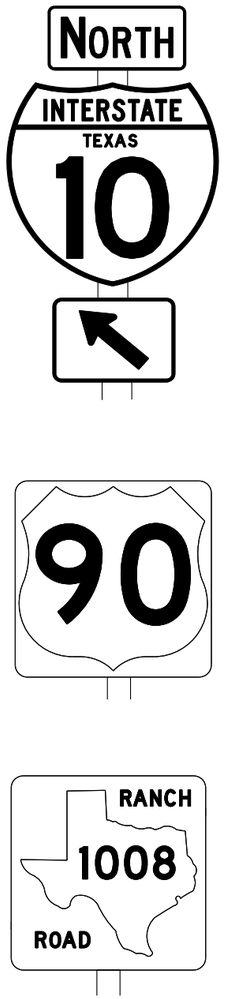
DATE: 11/22/2022 1:31
FILE: pw://server.sig-eng.com:Sig-ds/Documents/TxDOT0103 Brownwood SH 16/Design_Data/4 - Design/Plan_Set_1/08. Traffic/Standards/tsr3-13.dgn

REQUIREMENTS FOR INDEPENDENT MOUNTED ROUTE SIGNS

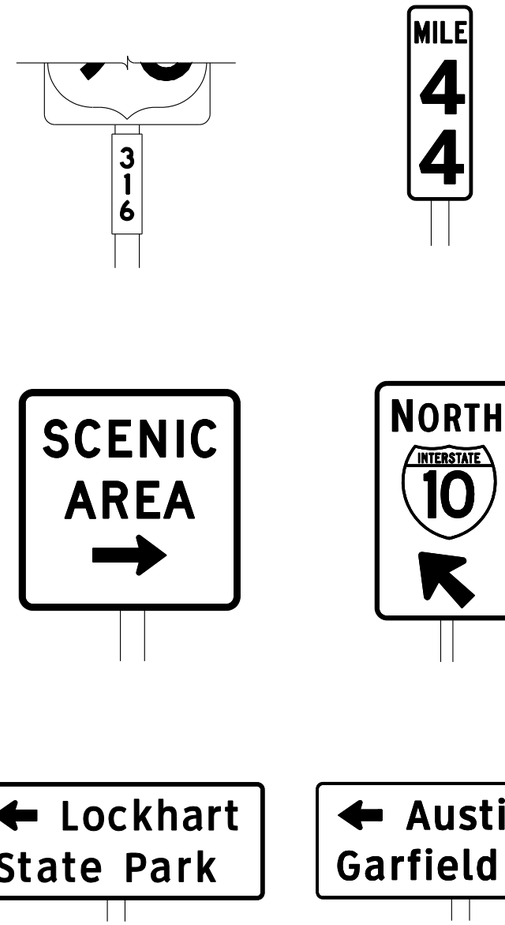
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE A SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & BORDERS	ALL OTHERS	TYPE B or C SHEETING



TYPICAL EXAMPLES

REQUIREMENTS FOR BLUE, BROWN & GREEN D AND I SERIES GUIDE SIGNS

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	ALL	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE D SHEETING
LEGEND, SYMBOLS & BORDERS	ALL OTHERS	TYPE B OR C SHEETING



TYPICAL EXAMPLES

GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).

2. White legend shall use the Clearview Alphabet. The following Clearview fonts shall be used to replace the existing white Federal Highway Administration (FHWA) Standard Highway Alphabets, when not specified in the SHSD, or in the plans.

B	CV-1W
C	CV-2W
D	CV-3W
E	CV-4W
Emod	CV-5WR
F	CV-6W

3. Route sign legend (ie. IH, US, SH and FM shields) shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets B, C, D, E, Emod or F).

4. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.

5. Independent mounted route sign with white or colored legend and borders shall be applied by screening process with transparent color ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof. White legend, symbols and borders on all other signs shall be cut-out white sheeting applied to colored background sheeting.

6. Information regarding borders and radii for signs is found in the "Standard Highway Sign Designs for Texas". Dimensions shown and described for borders and corner radii on parent sign are nominal. Borders may vary in width as much as 1/2 inch. Corner radii above 3 inches may vary in width as much as 1 inch. Borders and corner radii within a parent sign must be of matching widths. The sign area outside the corner radius should be trimmed or rounded.

7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.

8. Mounting details of roadside signs are shown in the "SMD series" Standard Plan Sheets.

DEPARTMENTAL MATERIAL SPECIFICATIONS	
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

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/

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

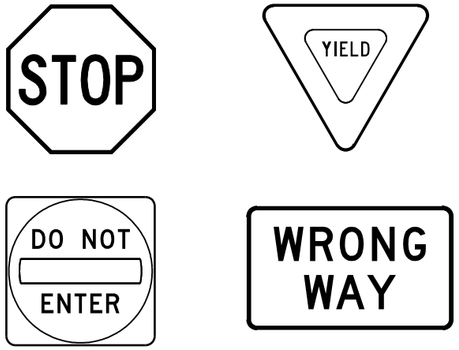
TSR(3)-13

FILE: tsr3-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0289	04	032	SH 16
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	BWD	SAN SABA		170

DATE: 11/22/2022 1:31
FILE: pw://server.sig-eng.com:Sig-ds/Documents/TxDOT0103 Brownwood SH 16/Design_Data/4 - Design/Plan_Set_1/08. Traffic/Standards/tsr4-13.dgn

REQUIREMENTS FOR RED BACKGROUND REGULATORY SIGNS

(STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)



REQUIREMENTS FOR FOUR SPECIFIC SIGNS ONLY

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	WHITE	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE B OR C SHEETING
LEGEND	RED	TYPE B OR C SHEETING

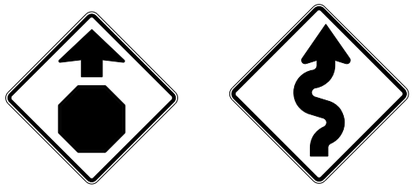
REQUIREMENTS FOR WHITE BACKGROUND REGULATORY SIGNS

(EXCLUDING STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)

TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND, BORDERS AND SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

REQUIREMENTS FOR WARNING SIGNS



TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	FLOURESCENT YELLOW	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

REQUIREMENTS FOR SCHOOL SIGNS

TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	FLOURESCENT YELLOW GREEN	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
SYMBOLS	RED	TYPE B OR C SHEETING

GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).
2. Sign legend shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets (B, C, D, E, Emod or F).
3. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.
4. Black legend and borders shall be applied by screening process or cut-out acrylic non-reflective black film to background sheeting, or combination thereof.
5. White legend and borders shall be applied by screening process with transparent colored ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof.
6. Colored legend shall be applied by screening process with transparent colored ink, transparent colored overlay film or colored sheeting to background sheeting, or combination thereof.
7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.
8. Mounting details for roadside mounted signs are shown in the "SMD series" Standard Plan Sheets.

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

DEPARTMENTAL MATERIAL SPECIFICATIONS	
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

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

http://www.txdot.gov/

Texas Department of Transportation

Traffic Operations Division Standard

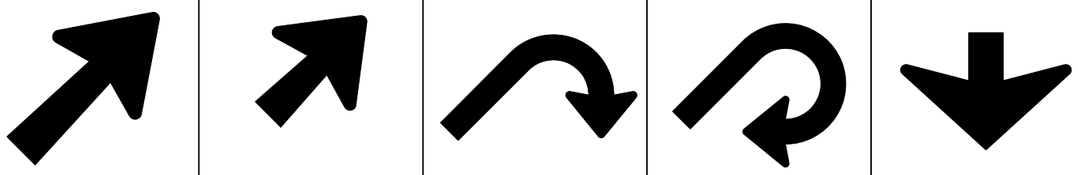
TYPICAL SIGN REQUIREMENTS

TSR(4)-13

FILE: tsr4-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0289	04	032	SH 16
12-03 7-13 9-08	DIST	COUNTY		SHEET NO.
	BWD	SAN SABA		171

ARROW DETAILS

for Large Ground-Mounted and Overhead Guide Signs



Type A | Type B | E-3 | E-4 | Down Arrow

TYPE	LETTER SIZE	USE
A-1	10.67" U/L and 10" Caps	Single Lane Exits
A-2	13.33" U/L and 12" Caps	
A-3	16" & 20" U/L	
B-1	10.67" U/L and 10" Caps	Multiple Lane Exits
B-2	13.33" U/L and 12" Caps	
B-3	16" & 20" U/L	

CODE	USED ON SIGN NO.
E-3	E5-1aT
E-4	E5-1bT

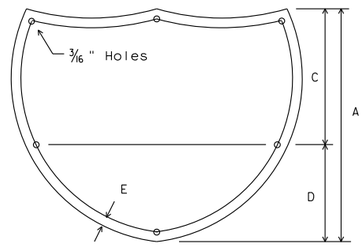
NOTE

Arrow dimensions are shown in the "Standard Highway Sign Designs for Texas" manual.

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

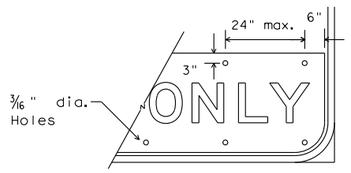
http://www.txdot.gov/

SIGN BLANK PUNCHING DETAILS FOR ATTACHMENTS WHEN SPECIFIED TO BE TYPE A ALUMINUM SIGNS (FOR MOUNTING TO GUIDE SIGN FACE)

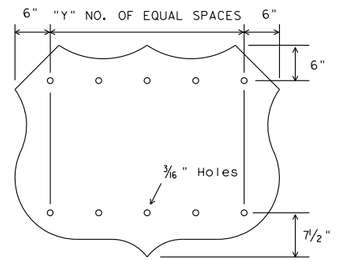


INTERSTATE ROUTE MARKERS

A	C	D	E
36	21	15	11/2
48	28	20	13/4

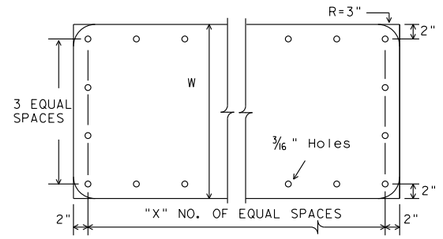


EXIT ONLY PANEL



U.S. ROUTE MARKERS

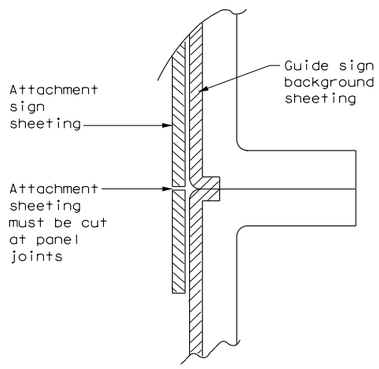
Sign Size	"Y"
24x24	2
30x24	3
36x36	3
45x36	4
48x48	4
60x48	5



STATE ROUTE MARKERS

No. of Digits	W	X
4	24	4
4	36	5
4	48	6
3	24	3
3	36	4
3	48	5

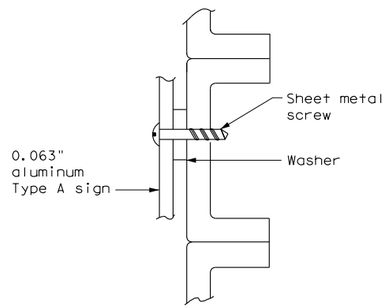
MOUNTING DETAILS OF ATTACHMENTS TO GUIDE SIGN FACE ("EXIT ONLY" AND "LEFT EXIT" PANELS, ROUTE MARKERS AND OTHER ATTACHMENTS)



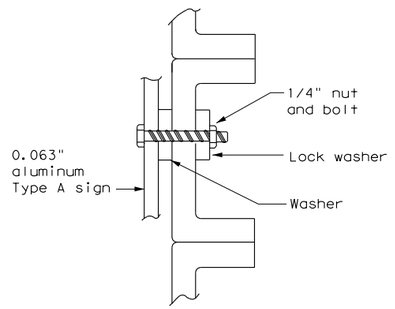
DIRECT APPLIED ATTACHMENT

NOTE:

1. Sheeting for legend, symbols, and borders must be cut at panel joints.
2. Direct applied attachment signs will be subsidiary to "Aluminum Signs" or "Fiberglass Signs".



SCREW ATTACHMENT



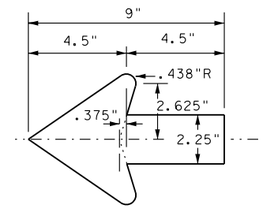
NUT/BOLT ATTACHMENT

NOTE:

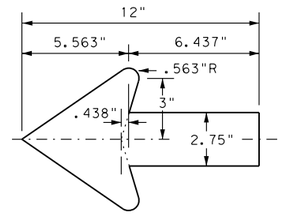
Furnish Type A aluminum sign attachments only when specified in the plans. These signs will be paid for under "Aluminum Signs".

ARROW DETAILS

for Destination Signs (Type D)



Standard arrow to be used with 6 inch letters.



Standard arrow to be used with 8 inch letters.

Texas Department of Transportation

Traffic Operations Division Standard

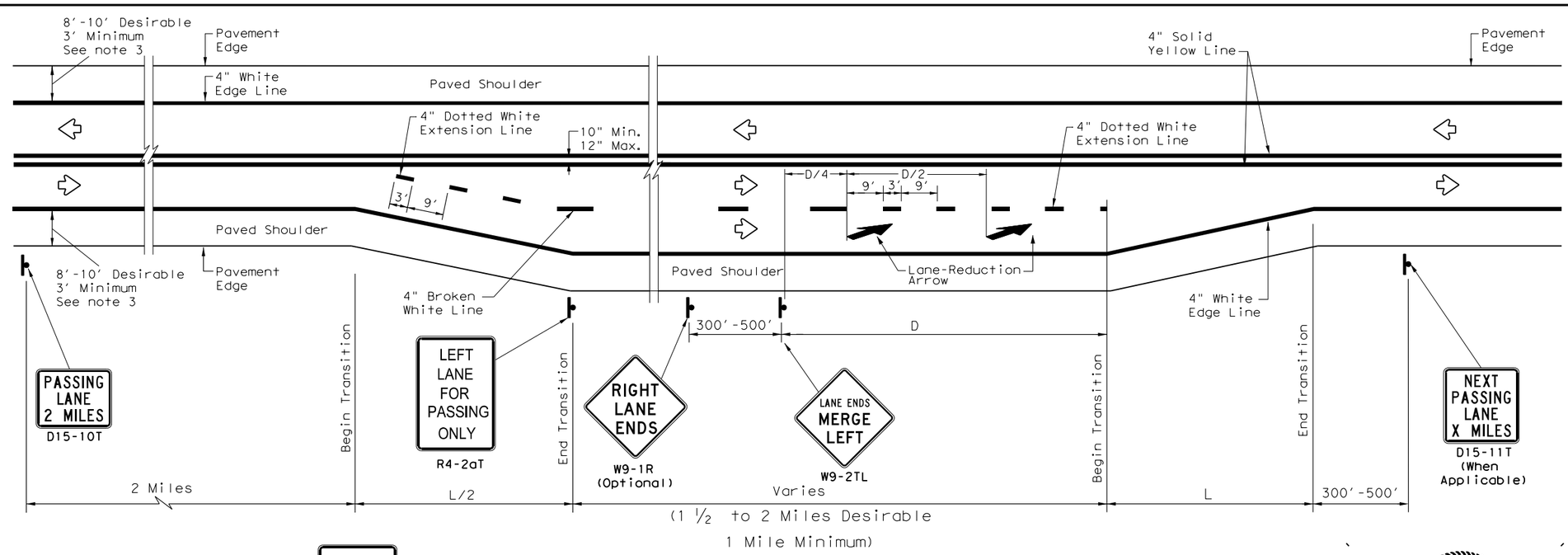
TYPICAL SIGN REQUIREMENTS

TSR(5)-13

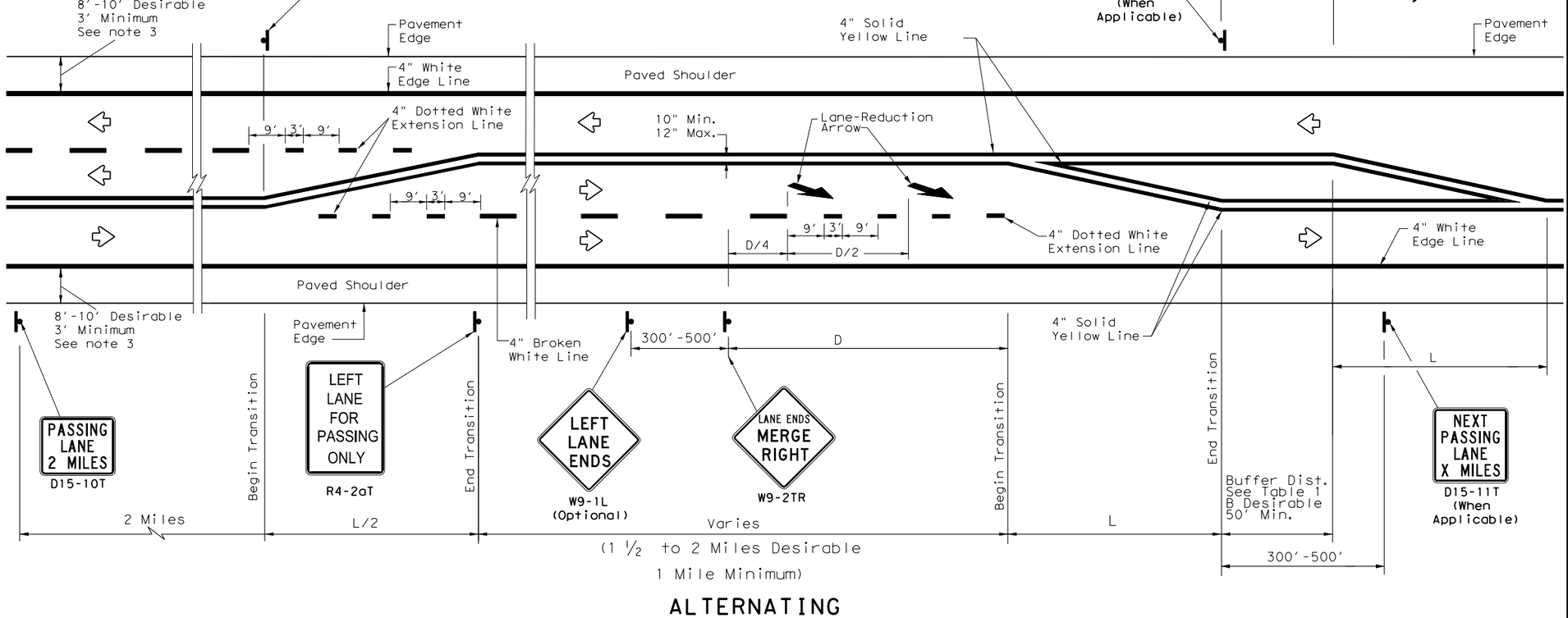
FILE: tsr5-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0289	04	032	SH 16
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	BWD	SAN SABA		172

DATE: 1/22/2022
File: ...SH 16/Design*Data/4 - Design/Plan*Set*1/08. Traffic/Standards/tsr5-13.dgn

DATE: 11/29/2022 6:18
FILE: pw://server.sig-eng.com:Sig-ds/Documents/TxDOT0103 Brownwood SH 16/Design_Data/4 - Design/Plan_Set_1/08. Traffic/Standards/TS2(PL-1)-18(MOD).dgn



SEPARATED



ALTERNATING

LEGEND	
	Sign
	Traffic Flow

TYPICAL TAPER LENGTH (L)	
Formula *	L = WS

* Transition length should be rounded up to nearest 5 foot increment.

L=Length of Transition (FT)
W=Width of Offset (FT)
S=Posted Speed (MPH)

EXAMPLE

A 12 foot lane is added on a 70 mph roadway. The length of the transition should be:

L=12x70=840 ft

TABLE 1
ADVANCE WARNING SIGN DISTANCE (D) AND BUFFER DISTANCE (B)

Posted Speed	D (FT)	B (FT)
40	670	305
45	775	360
50	885	425
55	990	495
60	1100	570
65	1200	645
70	1250	730
75	1350	820

STATE OF TEXAS
GERALD A. LANKES
107484
REGISTERED PROFESSIONAL ENGINEER
11/29/2022

GENERAL NOTES

1. For minimum and desirable design details, see the Roadway Design Manual, Chapter 4, Section 6, Super 2 Highways.
2. For Raised Pavement Markers (RPM) details, see Pavement Markings Standard sheet, PM(2). Note that RPMs are not recommended on the 4" dotted white extension lines.
3. For rumble strip options available for the designed shoulder width, see rumble strip standard sheet RS(4).

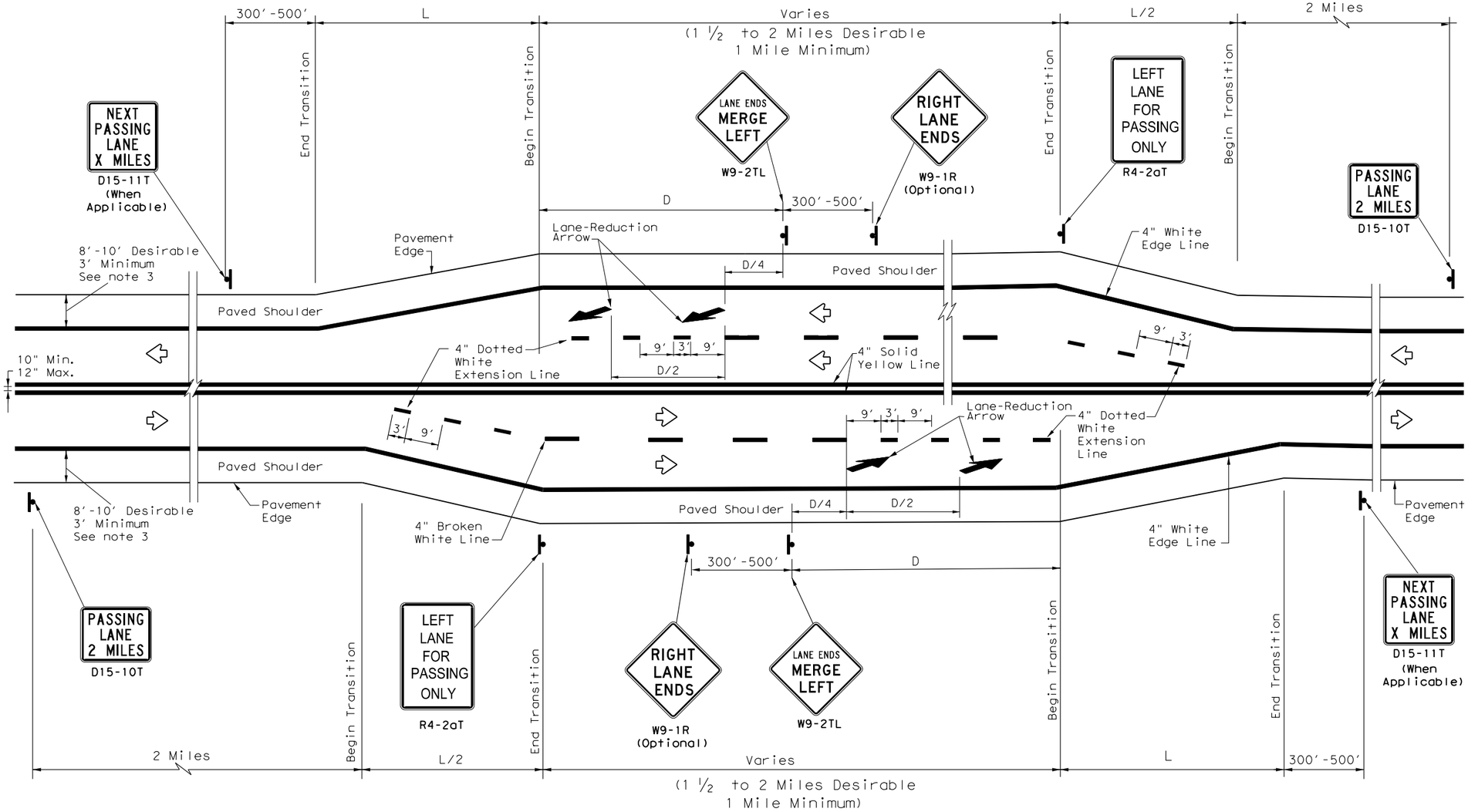
Texas Department of Transportation

Traffic Operations Division Standard

TEXAS SUPER 2 PASSING LANES

TS2(PL-1)-18(MOD)

FILE: TS2(PL-1)-18(MOD).dgn	DN:	CK:	DW:	CK:
© TxDOT May 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-12 4-18 BWD ADDED 3-12 R4-2aT SIGNAGE 3-18	0289	04	032	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	SAN SABA		173



SIDE BY SIDE PASSING LANES

LEGEND	
	Sign
	Traffic Flow

TYPICAL TAPER LENGTH (L)	
Formula *	L = WS

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W=Width of Offset (FT)
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75	1350

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STATE OF TEXAS
GERALD A. LANKES
107484
REGISTERED PROFESSIONAL ENGINEER
11/29/2022

Texas Department of Transportation

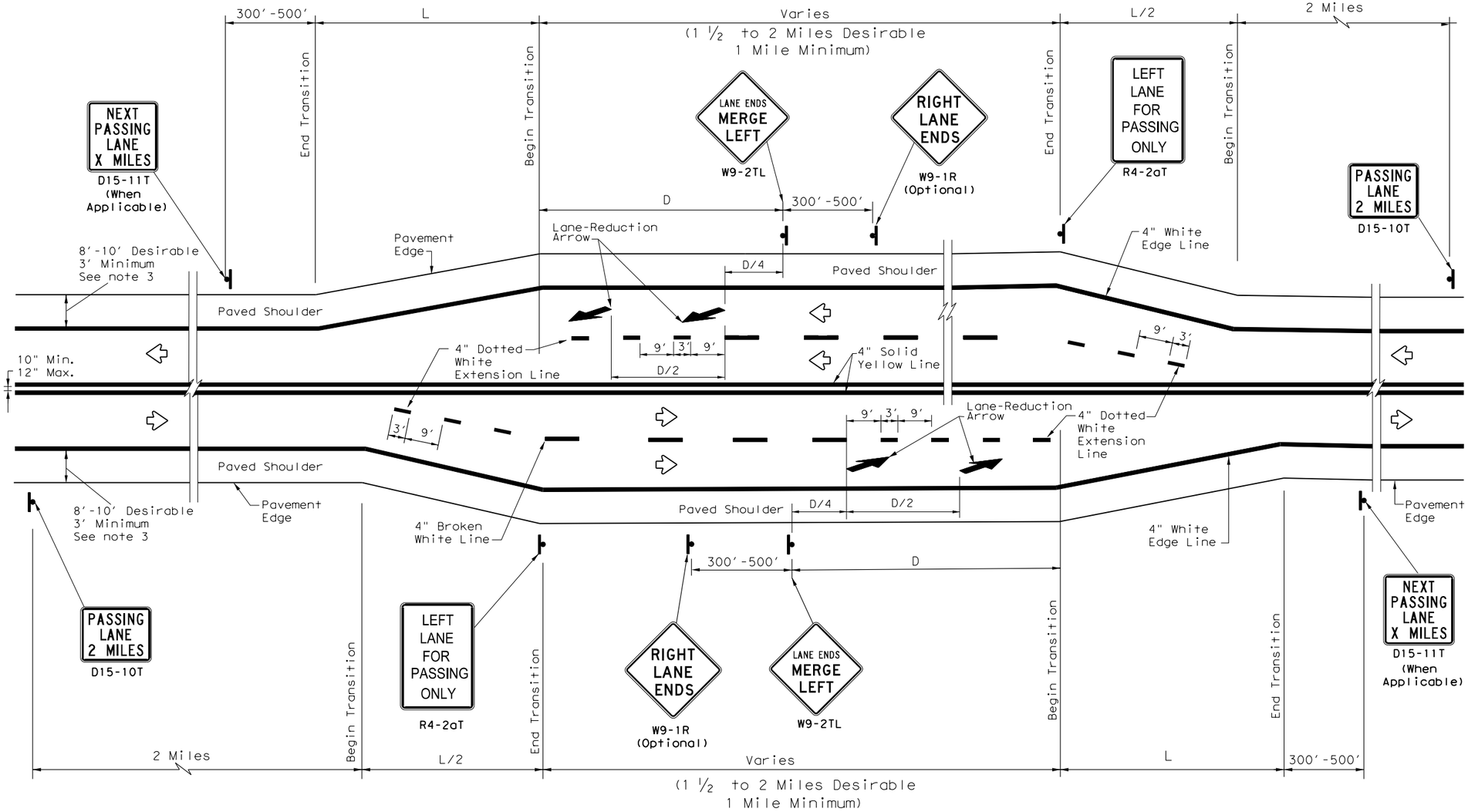
Traffic Operations Division Standard

TEXAS SUPER 2 PASSING LANES

TS2(PL-2)-18(MOD)

FILE: ts2-2-18.dgn	DN:	CK:	DW:	CK:
© TxDOT May 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-12 4-18 BWD ADDED 3-12 R4-2aT SIGNAGE 3-18	0289	04	032	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	SAN SABA		174

DATE: 11/29/2022 6:18
FILE: pw://server.sig-eng.com:Sig-ds/Documents/TxDOT0103 Brownwood SH 16/Design_Data/4 - Design/Plan_Set_1/08. Traffic/Standards/TS2(PL-2)-18(MOD).dgn



SIDE BY SIDE PASSING LANES

LEGEND	
	Sign
	Traffic Flow

TYPICAL TAPER LENGTH (L)	
Formula *	L = WS

* Transition length should be rounded up to nearest 5 foot increment.

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W=Width of Offset (FT)
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Posted Speed	D (FT)
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55	990
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3. For rumble strip options available for the designed shoulder width, see rumble strip standard sheet RS(4).

Texas Department of Transportation

Traffic Operations Division Standard

TEXAS SUPER 2 PASSING LANES

TS2(PL-2)-18(MOD)

EDUARDO GUTIERREZ
75994
REGISTERED PROFESSIONAL ENGINEER
STATE OF TEXAS

FILE: ts2-2-18.dgn	DN:	CK:	DW:	CK:
© TxDOT May 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-12 4-18 BWD ADDED 3-12 R4-2aT SIGNAGE 3-18	0289	04	032	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	SAN SABA		174

25

DATE: 11/22/2022 1:31
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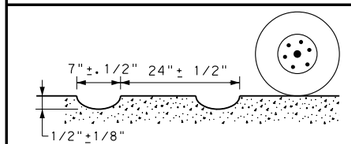
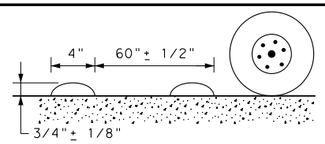
DATE:
FILE:

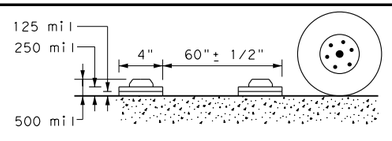
CENTERLINE RUMBLE STRIPS



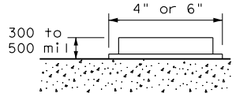
MILLED RUMBLE STRIPS



RAISED TRAFFIC BUTTONS

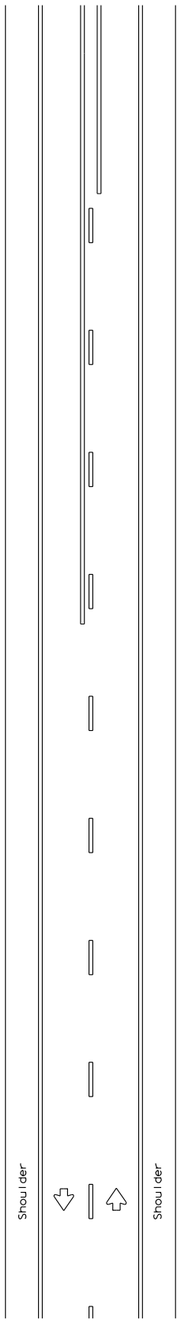


PREFORMED THERMOPLASTIC STRIPS

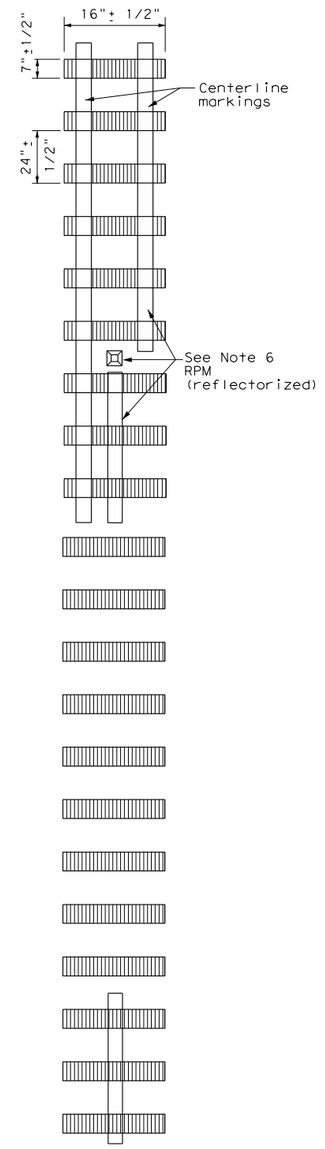


PROFILE MARKINGS

PROFILE VIEW

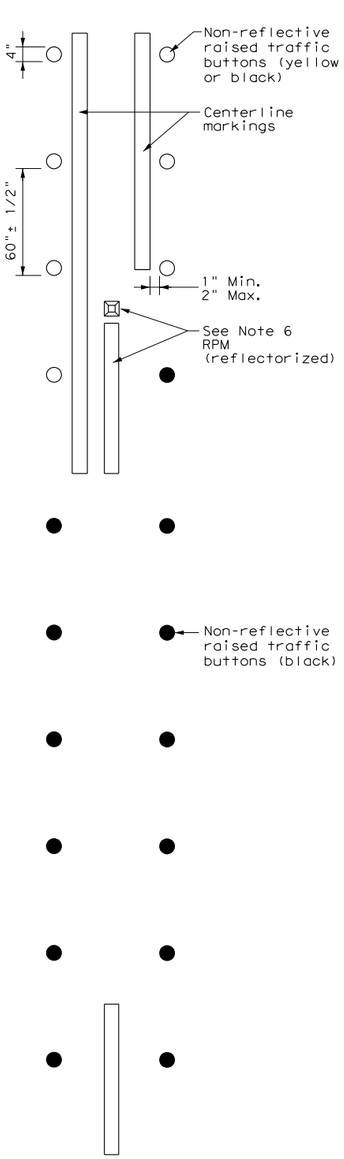


TWO LANE TWO-WAY ROADWAYS



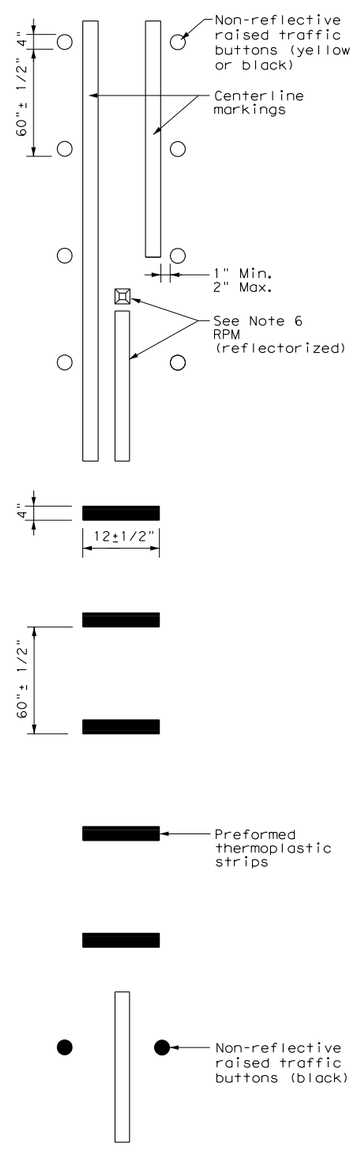
PLAN VIEW
OPTION 1

MILLED CENTERLINE RUMBLE STRIPS



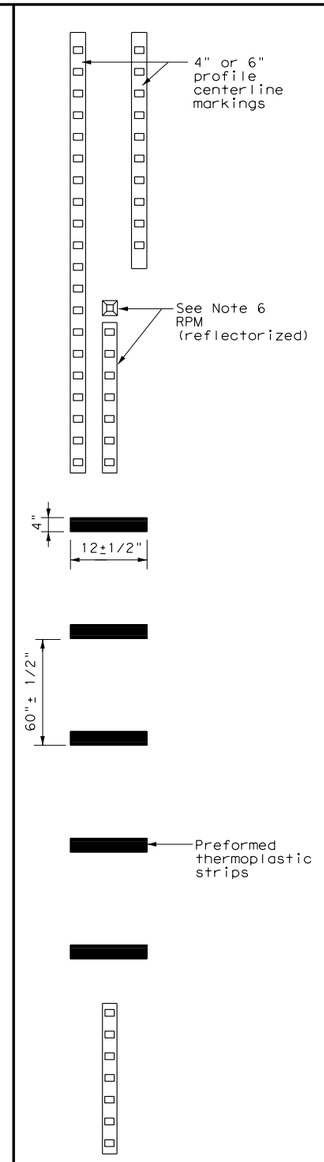
PLAN VIEW
OPTION 2

RAISED CENTERLINE RUMBLE STRIPS



PLAN VIEW
OPTION 3

RAISED CENTERLINE RUMBLE STRIPS AND PREFORMED THERMOPLASTIC STRIPS



PLAN VIEW
OPTION 4

PROFILE CENTERLINE MARKINGS AND PREFORMED THERMOPLASTIC STRIPS

GENERAL NOTES

1. This standard sheet provides guidelines for installing centerline rumble strips on two-lane highways with or without shoulders.
2. Centerline and edgeline rumble strips or profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
3. Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
4. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Operations Division.
5. Breaks in milled centerline rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections and driveways with high usage of large trucks.
6. Use Standard Sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, and dimensions pavement markings and profile markings.
7. Consideration should be given to noise levels when centerline rumble strips are installed near residential areas, schools, churches, etc. A minimum of 3/8 inch depth of milled rumble strip may be considered in these areas.
8. Pavement markings must be applied over milled centerline rumble strips.

WHEN INSTALLING CENTERLINE RUMBLE STRIPS:

9. Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per manufacturer's recommendations.
10. When using non-reflective raised traffic buttons as a centerline rumble strip, the button shall be placed adjacent to the pavement marking delineating the centerline. The buttons will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
11. The color of the button should be yellow for a continuous no passing roadway. Black buttons should be used in areas where passing is allowed.

WHEN INSTALLING EDGELINE RUMBLE STRIPS WITH OR WITHOUT CENTERLINE RUMBLE STRIPS ON UNDIVIDED HIGHWAYS:

12. See standard sheet RS(4).

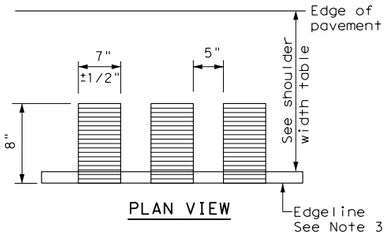
Texas Department of Transportation®

Traffic Operations Division Standard

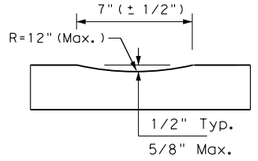
CENTERLINE RUMBLE STRIPS ON TWO LANE TWO-WAY HIGHWAYS

RS(3)-13

FILE: rs(3)-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2013 REVISIONS	CONT	SECT	JOB	HIGHWAY
	DIST	COUNTY		SHEET NO.

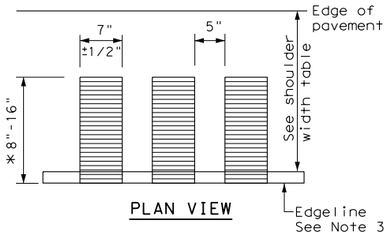


PLAN VIEW

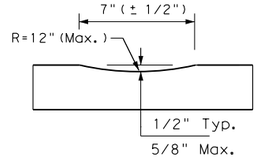


PROFILE VIEW
OPTION 1

CONTINUOUS MILLED DEPRESSIONS
(Rumble Stripes)



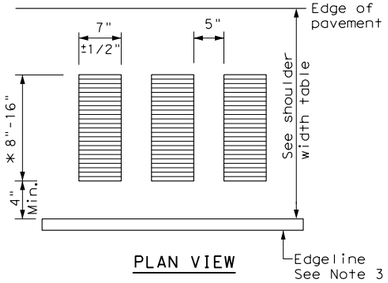
PLAN VIEW



* This distance may vary based on width of shoulder

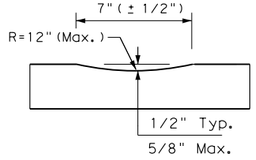
PROFILE VIEW
OPTION 2

CONTINUOUS MILLED DEPRESSIONS
(Rumble Stripes)



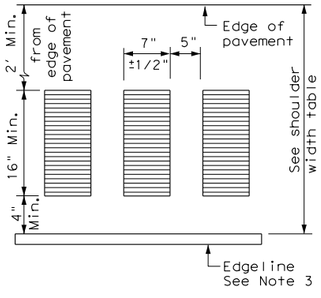
PLAN VIEW

* This distance may vary based on width of shoulder

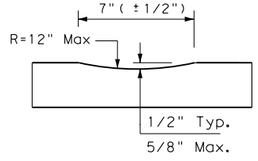


PROFILE VIEW
OPTION 3

CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)

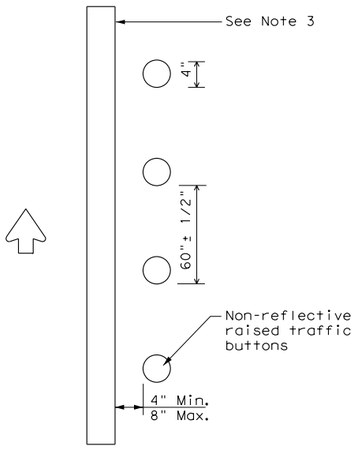


PLAN VIEW



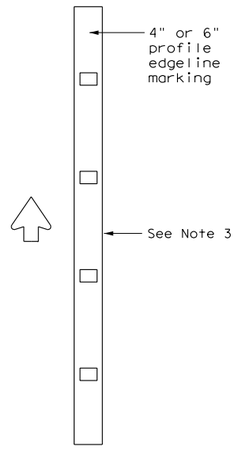
PROFILE VIEW
OPTION 4

CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)



PLAN VIEW
OPTION 5

RAISED EDGELINE RUMBLE STRIPS



PLAN VIEW
OPTION 6

PROFILE EDGELINE MARKINGS

SHOULDER WIDTH TABLE		
EQUAL TO OR LESS THAN 2 FEET	GREATER THAN 2 FEET LESS THAN 4 FEET	EQUAL TO OR GREATER THAN 4 FEET
Option 1, 5 OR 6	Option 1, 2, 3 5 OR 6	Option 2, 4, 5 OR 6

GENERAL NOTES

1. Rumble strips and profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
2. Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
3. Use Standard Sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, pavement markings, and profile markings.
4. See the table below for determining what options may be used for edgeline rumble strips.

WHEN INSTALLING MILLED DEPRESSION EDGELINE RUMBLE STRIPS:

5. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Operations Division.
6. Pavement markings can be applied over milled shoulder rumble strips to create an edgeline rumble stripe.
7. Breaks in edgeline rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections and driveways with high usage of large trucks when installed on conventional highways.
8. Rumble strips shall not be placed across exit or entrance ramps, acceleration and deceleration lanes, crossovers, gore areas or intersections with other roadways.
9. Consideration should be given to noise levels when edgeline rumble strips are installed near residential areas, schools, churches, etc. A minimum of 3/8 inches depth of milled rumble strip may be considered in these areas.
10. On roadways with high bicycle activity, consideration should be given before the installation of edgeline rumble strips. Things to consider include size of rumble strips, rumble strip material and location of rumble strips on the shoulder. If the designer determines that gaps are needed in the rumble strips due to bicycle use of the road, then follow the requirement shown in FHWA Technical Advisory T5040.39, or latest version. A detail of the spacing shall be included in the plans.

WHEN INSTALLING RAISED OR PROFILE EDGELINE RUMBLE STRIPS:

11. Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per the manufacturer's recommendations.
12. Non-reflective traffic buttons shall be placed adjacent to the pavement marking delineating the edgeline when used as a rumble strip. The color of the button should match the color of the adjacent edgeline marking (white or yellow). The buttons will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
13. Non-reflective traffic buttons shall not be placed across exit or entrance ramps, acceleration and deceleration lanes, crossovers, gore areas or intersections with other roadways.
14. Breaks in edgeline rumble strips using raised traffic buttons shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossing, intersections and driveways with high usage of large trucks when installed on conventional highways.
15. The minimum distance between the edgeline and the buttons should be used if the shoulder is less than 8 feet in width.
16. Raised profile thermoplastic markings used as edgelines may substitute for buttons.

Texas Department of Transportation

Traffic Operations Division Standard

EDGELINE RUMBLE STRIPS ON UNDIVIDED OR TWO LANE HIGHWAYS
RS(4)-13

FILE: rs(4)-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS				
	DIST	COUNTY		SHEET NO.

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GENERAL NOTES FOR ALL ELECTRICAL WORK

1. The location of all conduits, junction boxes, ground boxes, and electrical services is diagrammatic and may be shifted to accommodate field conditions.

2. Provide new and unused materials. Ensure that all materials and installations comply with the applicable articles of the National Electrical Code (NEC), TxDOT standards and specifications, National Electrical Manufacturers Association (NEMA), and are listed by Underwriters Laboratories (UL) or a Nationally Recognized Testing Lab (NRTL). NRTLs such as Canadian Standard Association (CSA), Intertek Testing Services NA Inc., or FM Approvals LLC can be considered equivalent to UL. Where reference is made to NEMA listed devices, International Electrotechnical Commission (IEC) listed devices will not be considered an acceptable equal to a NEMA listed device. Acceptable devices may have both a NEMA and IEC listing. Faulty fabrication or poor workmanship in any material, equipment, or installation is justification for rejection. Replace or reinstall rejected material or equipment at no additional cost to the Department.

3. Miscellaneous nuts, bolts and hardware, except for high strength bolts, may be stainless steel when plans specify galvanized, provided the bolt size is ½ in. or less in diameter.

4. Provide the following test equipment as required by the Engineer to confirm compliance with the contract and the NEC: voltmeter, ammeter, megohm meter (1000 volt DC), ground resistance tester, torque wrenches, and torque screwdrivers. Ensure all equipment has been properly calibrated within the last year. Provide calibration certification to the Engineer upon request. Operate test equipment during inspection as requested by the Engineer.

5. Install grounding as shown on the plans and in accordance with the NEC. Ensure all metallic conduits; metal poles; luminaires; and metal enclosures are bonded to the equipment grounding conductor. Provide stranded bare copper or green insulated grounding conductors. Ground rods, connectors, and bonding jumpers are subsidiary to the various bid items.

6. When required by the Engineer, notify the Department in writing of materials from the Material Producers List (MPL) intended for use on each project. Prequalified materials are listed on the MPL on TxDOT's website under "Roadway Illumination and Electrical Supplies." No substitutions will be allowed for materials on this list.

CONDUIT

A. MATERIALS

1. Provide conduit, junction boxes, fittings, and hardware as per TxDOT Departmental Material Specification (DMS) 11030 "Conduit" and Item 618 "Conduit" of TxDOT's "Standard Specifications For Construction And Maintenance Of Highways, Streets, And Bridges," latest edition. Provide conduits listed under Item 618 on the MPL under "Roadway Illumination and Electrical Supplies." Provide conduit types according to the descriptive code or as shown on the plans. Do not substitute other types of conduits for those shown. Provide liquidtight flexible metal conduit (LFMC) when flexible conduit is called for on galvanized steel rigid metallic conduit (RMC) systems. Provide liquidtight flexible nonmetallic conduit (LFNC) when flexible conduit is called for on polyvinyl chloride (PVC) systems.

2. Provide galvanized steel RMC for all exposed conduits, unless otherwise shown on the plans. Properly bond all metal conduits.

3. Unless otherwise shown on the plans, provide junction boxes with a minimum size as shown in the following table, which applies to the greatest number of conductors entering the box through one conduit with no more than four conduits per box. When a mixture of conductor sizes is present, count the conductors as if all are of the larger size. For situations not applicable to the table, size junction boxes in accordance with NEC.

AWG	3 CONDUCTORS	5 CONDUCTORS	7 CONDUCTORS
#1	10" x 10" x 4"	12" x 12" x 4"	16" x 16" x 4"
#2	8" x 8" x 4"	10" x 10" x 4"	12" x 12" x 4"
#4	8" x 8" x 4"	10" x 10" x 4"	10" x 10" x 4"
#6	8" x 8" x 4"	8" x 8" x 4"	10" x 10" x 4"
#8	8" x 8" x 4"	8" x 8" x 4"	8" x 8" x 4"

4. Junction boxes with an internal volume of less than 100 cu. in. and supported by entering raceways must have threaded entries or hubs identified for the intended purpose and supported by connection of two or more rigid metal conduits. Secure conduit within 3 ft. of the enclosure or within 18 in. of the enclosure if all conduit entries are on the same side. Mechanically secure all junction boxes with an internal volume greater than 100 cu. inches.

5. Provide hot dipped galvanized cast iron or sand cast aluminum outlet boxes for junction boxes containing only 10 AWG or 12 AWG conductors. Do not use die cast aluminum boxes. Size outlet boxes according to the NEC.

6. Do not use intermediate metal conduit (IMC) or electrical metallic tubing (EMT) unless specifically required by the plan sheets. When EMT is called for, provide junction boxes made from galvanized steel sheeting, listed and approved for outdoor use, unless otherwise noted on the plans. Size all galvanized steel junction boxes in accordance with the NEC. Provide junction boxes for IMC conduit systems that meet the same requirements for junction boxes used with RMC systems.

7. Provide PVC junction boxes intended for outdoor use on PVC conduit systems, unless otherwise noted on the plans.

8. Provide PVC elbows in PVC conduit systems, unless otherwise shown on the plans. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the PVC conduit system. When galvanized steel RMC elbows are specifically called for in the plans and any portion of the RMC elbow is buried less than 18 in., ground the RMC elbow by means of a grounding bushing on a rigid metal extension. Grounding of the rigid metal elbow is not required if the entire RMC elbow is encased in a minimum of 2 in. of concrete. PVC extensions are allowed on these concrete encased rigid metal elbows. RMC or PVC elbows are subsidiary to various bid items.

9. When required, provide High-Density Polyethylene (HDPE) conduit with factory installed internal conductors according to Item 622 "Duct Cable." At the Contractor's request and with approval by the Engineer, substitute HDPE conduit with no conductors for bored schedule 40 or schedule 80 PVC conduit bid under Item 618. Ensure bored HDPE substituted for PVC is schedule 40 and of the same size PVC called for in the plans. Ensure the substituted HDPE meets the requirements of Item 622, except that the conduit is supplied without factory-installed conductors. Make the transition of the HDPE conduit to PVC (or RMC elbow when required) at the bore pit. Provide conduit of the size and schedule as shown on the plans. Do not extend substituted conduit into ground boxes or foundations. Provide PVC or galvanized steel RMC elbows as called for at all ground boxes and foundations.

10. Use two-hole straps when supporting 2 in. and larger conduits. On electrical service poles, properly sized stainless steel or hot dipped galvanized one-hole standoff straps are allowed on the service riser conduit.

B. CONSTRUCTION METHODS

1. Provide and install expansion joint conduit fittings on all structure-mounted conduits at the structure's expansion joints to allow for movement of the conduit. In addition, provide and install expansion joint fittings on all continuous runs of galvanized steel RMC conduit externally exposed on structures such as bridges at maximum intervals of 150 ft. When requested by the project Engineer, supply manufacturer's specification sheet for expansion joint conduit fittings. Repair or replace expansion joint fittings that do not allow for movement at no additional cost to the Department. Provide the method of determining the amount of expansion to the Engineer upon request. Do not use LFMC or LFNC as a substitute for the required expansion conduit fittings.

2. Space all conduit supports at maximum intervals of 5 ft. Install conduit spacers when attaching metal conduit to surface of concrete structures. See "Conduit Mounting Options" on ED(2). Install conduit support within 3 ft. of all enclosures and conduit terminations.

3. Do not attach conduit supports directly to pre-stressed concrete beams except as shown specifically in the plans or as approved by the Engineer.

4. Unless otherwise shown on the plans, jack or bore conduit placed beneath existing roadways, driveways, sidewalks, or after the base or surfacing operation has begun. Backfill and compact the bore pits below the conduit per Item 476 "Jacking, Boring, or Tunneling Pipe or Box" prior to installing conduit or duct cable to prevent bending of the connections.

5. When placing conduit in the sub-grade of new roadways, backfill all trenches with excavated material unless otherwise noted on the plans. When placing conduit in the sub-base of new roadways, backfill all trenches with cement-stabilized base as per requirements of Items 110 "Excavation", 400 "Excavation and Backfill for Structures", 401 "Flowable Backfill", 402 "Trench Excavation Protection", and 403 "Temporary Special Shoring."

6. Provide and place warning tape approximately 10 in. above all trenched conduit as per Item 618.

7. During construction, temporarily cap or plug open ends of all conduit and raceways immediately after installation to prevent entry of dirt, debris and animals. Temporary caps constructed of durable duct tape are allowed. Tightly fix the tape to the conduit opening. Clean out the conduit and prove it clear in accordance with Item 618 prior to installing any conductors.

8. Ensure conduit entry into the top of any enclosure is waterproof by installing conduit sealing hubs or using boxes with threaded bosses. This includes surface mounted safety switches, meter cans, service enclosures, auxiliary enclosures and junction boxes. Grounding bushings on water tight sealing hubs are not required.

9. Fit the ends of all PVC conduit terminations with bushings or bell end fittings. Provide and install a grounding type bushing on all metal conduit terminations.

10. Install a bonding jumper from each grounding bushing to the nearest ground rod, grounding lug, or equipment grounding conductor. Ensure all bonding jumpers are the same size as the equipment grounding conductor. Bonding of conduit used as a casing under roadways for duct cable is not required, if the duct extends the full length through the casing.

11. At all electrical services, install a 6 AWG solid copper grounding electrode conductor.

12. Place conduits entering ground boxes so that the conduit openings are between 3 in. and 6 in. from the bottom of the box. See the ground box detail on sheet ED(4).

13. Seal ends of all conduits with duct seal, expandable foam, or by other methods approved by the Engineer. Seal conduit immediately after completion of conductor installation and pull tests. Do not use duct tape as a permanent conduit sealant. Do not use silicone caulk as a conduit sealant.

14. File smooth the cut ends of all mounting strut and conduit. Before installing, paint the field cut ends of all mounting strut and RMC (threaded or non-threaded) with zinc rich paint (94% or more zinc content) to alleviate overspray. Use zinc rich paint to touch up galvanized material as allowed under Item 445 "Galvanizing." Do not paint non-galvanized material with a zinc rich paint as an alternative for materials required to be galvanized.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS CONDUITS & NOTES

ED(1)-14

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	REVISIONS	0289	04	032	SH 16
		DIST	COUNTY		SHEET NO.
		BWD	SAN SABA		176A

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ELECTRICAL CONDUCTORS

A. MATERIAL INFORMATION

1. Provide Type XHHW insulated conductors in accordance with Departmental Material Specification (DMS)11040 "Conductors" and Item 620 "Electrical Conductors." Provide conductors as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies" Item 620. Color code insulated conductors in conformance with the NEC. Identify grounded (neutral) conductors with white insulation. Identify grounding conductors (ground wires) with green insulation or bare conductors. Identify ungrounded (hot) conductors with any color insulation except green, white, or gray. Keep color scheme consistent throughout the wiring system. Identify conductors 6 American Wire Gauge (AWG) and smaller by continuous color jacket. Identify electrical conductors 4 AWG and larger by continuous color jacket or by colored tape. When identifying conductors with colored tape, mark at least 6 in. of the conductor's insulation with half laps of tape.
2. Provide a solid copper 6 AWG grounding electrode conductor to bond the electrical service equipment to the concrete encased grounding electrode or the ground rod at the service location. Connect the grounding electrode conductor to the ground rod with a UL listed connector in accordance with DMS 11040. Connect the grounding electrode conductor to the concrete encased grounding electrode as shown in the plans.
3. Where two or more circuits are present in one conduit or enclosure, permanently identify the conductors of each branch circuit by attaching a non-metallic tag around both circuit conductors at each accessible location. Provide tags with two straps, large enough to indicate circuit number, letter, or other identification as shown in the plans. Print circuit identification on the tag with a permanent marker.
4. Use listed compression or screw type pressure connectors, terminal blocks, or split bolt connectors for splicing as specified in DMS 11040. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Provide UL listed gel-filled insulating splice covers. Splicing materials, insulating materials, breakaway disconnects, splice covers, and fuse holders are subsidiary to various bid items.

B. CONSTRUCTION METHODS

1. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the conduit system. After installing conductors in conduit, perform conductor pull test. If a conductor cannot be freely pulled, make any needed alterations or repairs at no additional cost to the department. Perform insulation resistance tests in accordance with Item 620. Coordinate with the Engineer to witness the tests.
2. Leave 2 ft. minimum, 3 ft. maximum length for each conductor up to the splice in ground boxes. Leave 3 ft. minimum, 4 ft. maximum length of conductor in ground boxes when pulled through with no splice. Leave 1 ft. minimum, 1.5 ft. maximum length of conductor at enclosures, weatherheads and pole bases.
3. Make splices only in junction boxes, ground boxes, pole bases, or electrical enclosures and use only listed compression or screw type pressure connectors, terminal blocks, or split bolt connectors. Insulate splices with heavy wall heat shrink tubing or gel-filled insulating splice covers to provide a watertight splice. Overlap conductor insulation with heat shrink tubing a minimum of 2 in. past both sides of the splice. Where heat shrink tubing may not shrink sufficiently to provide a watertight seal around the individual conductors, prior to heating the tubing, increase the diameter of the conductor insulation using hot melt adhesive tape to provide a watertight seal between the individual conductors and the heat shrink tubing. Ensure the tape extends past the heat shrink tubing. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Heat shrink tubing that appears to have been burned, or overheated, is considered defective and must be replaced.
4. Size and install gel-filled insulating splice covers according to manufacturer's specifications when used in place of heat shrink tubing.
5. Wire nuts with factory applied waterproof sealant may be used for 8 AWG or smaller conductors in above ground junction boxes, but not in pole bases or ground boxes. Install wire nuts in an upright position to prevent the accumulation of water.
6. Support conductors in illumination poles with a J-hook at the top of the pole.
7. When terminating conductors, remove the insulation and jacketing material without nicking the individual strands of the conductor. Conductors with nicked individual conductor strands or removed strands will be considered damaged.
8. Replace conductors and cables that are damaged beyond repair or that fail an insulation resistance test at no additional cost to the department.
9. Do not repair damaged conductors with duct tape, electrical tape, or wire nuts. Use only approved splicing methods.
10. Do not terminate more than one conductor under a single connector, unless the connector is rated for multiple conductors. Do not exceed the pressure connector's listing for maximum number and size of conductors allowed.
11. Install breakaway connectors on conductors bid under Item 620 whenever those conductors pass through a breakaway support device. Follow manufacturer's instructions when terminating conductors to breakaway connectors. Properly torque threaded connections. Proper terminations are critical to the safe operation of breakaway devices. Trim waterproofing boots on breakaway connectors to fit snugly around the conductor to ensure waterproof connection. Only one conductor may enter a single opening in a boot. Provide waterproof boots with the correct number of openings. Leave unused openings factory sealed. Use prequalified breakaway connectors as shown on the MPL.
12. Provide and install a separate stranded equipment grounding conductor (EGC) in all conduits that contain circuit wiring of 50 volts or more. Unless shown elsewhere, size the EGC to be the same size as the largest current carrying conductor contained in the conduit. Ensure all EGCs are bonded together at every accessible location. For traffic signal installations, provide a minimum size 8 AWG EGC. The EGC is paid for under Item 620.

C. TEMPORARY WIRING

1. Install temporary conductors and electrical equipment in accordance with the NEC article "Temporary Installations" and Department standard sheets.
2. Provide a ground fault circuit interrupter (GFCI) for power outlets for portable electrical equipment, power tools, ice machines, ice storage bins and refrigerators located outdoors at grade. GFCI may be any one of the following: molded cord and plug set, receptacle, or circuit breaker type.
3. Use listed wire nuts with factory applied sealant for temporary wiring where approved.
4. Enclose conductor splices within a listed enclosure or ground box, or ensure the splices are more than 10 ft. above grade vertically and more than 5 ft. horizontally from any metal structure. Where installing temporary conductors in areas subject to vehicle traffic or mobile construction equipment, ensure the vertical clearance to ground is at least 18 ft. when measured at the lowest point. Ground messenger wires that support power conductors in conformance with the NEC.
5. Protect and when necessary repair any existing electrical conduits uncovered during the construction process in a timely manner and in conformance with the NEC.

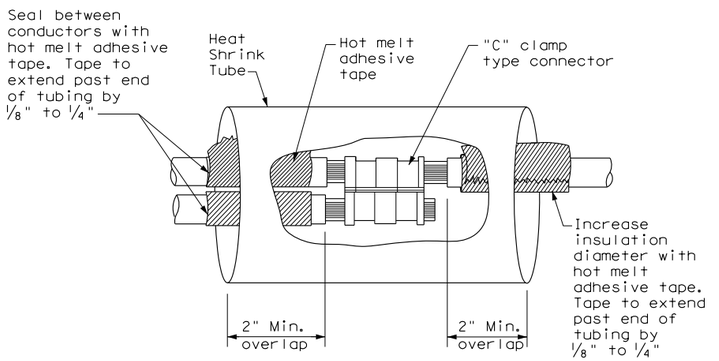
GROUND RODS & GROUNDING ELECTRODES

A. MATERIAL INFORMATION

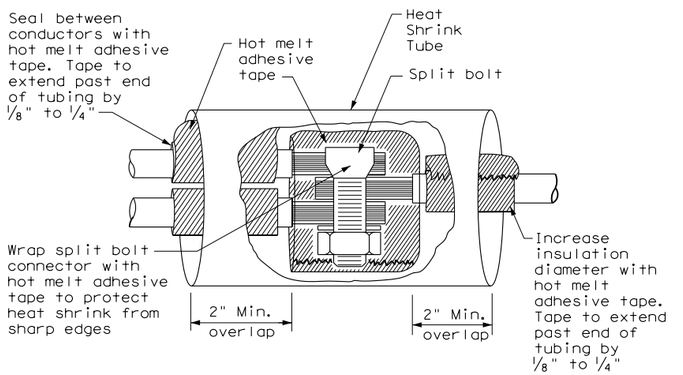
1. Provide and install a grounding electrode at electrical services. Provide ground rods according to DMS 11040 and the plans. Larger diameter or longer length rods may be called for in some specific locations, see the individual plans sheets. Concrete encased grounding electrodes may be called for in specific locations including electrical service, see individual plan sheets.

B. CONSTRUCTION METHODS

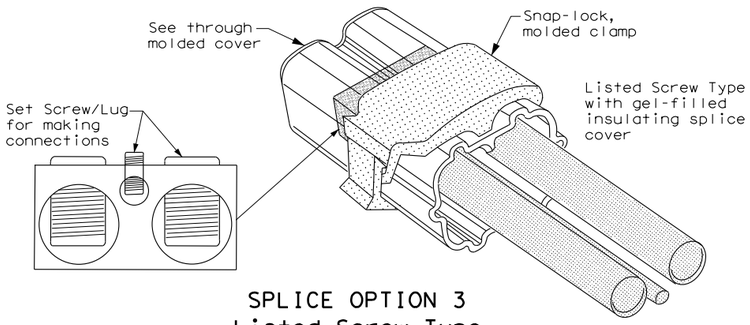
1. Furnish auxiliary ground rods for lightning protection and install in soil, concrete, or both, as called for in the plans. For ground rods installed in concrete, ensure the connection of the conductor to the ground rod is readily accessible for inspection or repairs. For ground rods installed in soil, ensure that the upper end is between 2 to 4 in. below finished grade.
2. Do not place ground rods in the same drilled hole as a timber pole.
3. Install ground rods so the imprinted part number is at the upper end of the rod.
4. Remove all non-conductive coatings such as concrete splatter from the rod at the clamp location.
5. Route all conductors as short and straight as possible for connection to lightning protection ground rods. When a bend is required, ensure a minimum radius bend of four inches for these conductors.
6. Unless otherwise called for in the plans, protect grounding electrode conductors with non-metallic conduit. When protecting grounding electrode conductors with metal conduit, provide and install a grounding type bushing and properly sized bonding jumper on each end of the metal conduit.
7. Written authorization is required before installing a ground rod in a horizontal trench for rocky soil or a solid rock bottom.



SPLICE OPTION 1
Compression Type



SPLICE OPTION 2
Split Bolt Type



SPLICE OPTION 3
Listed Screw Type

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS CONDUCTORS

ED(3)-14

FILE:	ed3-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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		BWD	SAN SABA		176B

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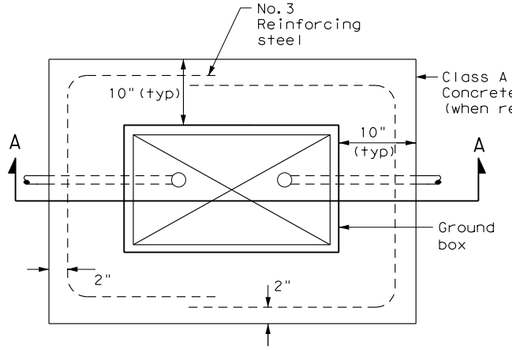
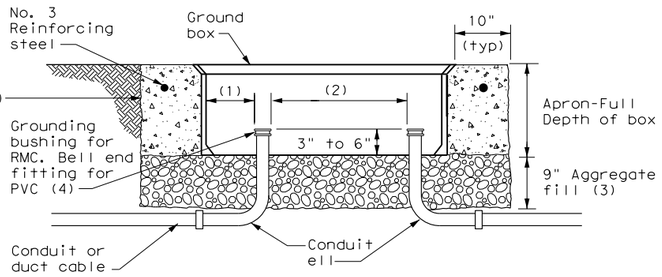


PLAN VIEW



SECTION A - A

APRON FOR GROUND BOX

(1) Uniformly space ends of conduits within the ground box. Position ends of conduits so that ground box walls do not interfere with the installation of grounding bushings or bell end fittings.

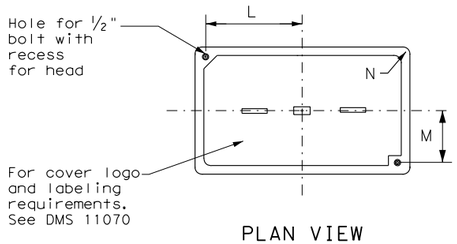
(2) Maintain sufficient space between conduits to allow for proper installation of bushing.

(3) Place aggregate under the box, not in the box. Aggregate should not encroach on the interior volume of the box.

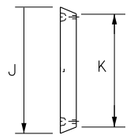
(4) Install a grounding bushing on the upper end of all RMC terminating in a ground box. Ground RMC elbows when any part of the elbow is less than 18 in. below the bottom of the ground box. Install a PVC bushing or bell end fitting on the upper end of all PVC conduits terminating in a ground box.

GROUND BOX DIMENSIONS	
TYPE	OUTSIDE DIMENSIONS (INCHES) (Width x Length X Depth)
A	12 X 23 X 11
B	12 X 23 X 22
C	16 X 29 X 11
D	16 X 29 X 22
E	12 X 23 X 17

GROUND BOX COVER DIMENSIONS								
TYPE	DIMENSIONS (INCHES)							
	H	I	J	K	L	M	N	P
A, B & E	23 1/4	23	13 3/4	13 1/2	9 7/8	5 1/8	1 3/8	2
C & D	30 1/2	30 1/4	17 1/2	17 1/4	13 1/4	6 3/4	1 3/8	2



PLAN VIEW



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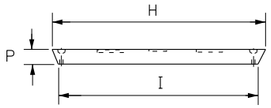


SIDE

GROUND BOX COVER

GROUND BOXES

A. MATERIALS

1. Provide polymer concrete ground boxes measuring 16x30x24 in. (WxLxD) or smaller in accordance with Departmental Material Specification (DMS) 11070 "Ground Boxes" and Item 624 "Ground Boxes."

2. Provide Type A, B, C, D, and E ground boxes as shown in the plans, and as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies," Item 624.

3. Ensure ground box cover is correctly labeled in accordance with DMS 11070.

4. Provide larger ground boxes in accordance with Item 624 and as shown in the plans.

B. CONSTRUCTION METHODS

1. Remove all gravel and dirt from conduit. Cap all conduits prior to placing aggregate and setting ground box. Provide Grade 3 or 4 coarse aggregate as shown on Table 2 of Item 302 "Aggregates for Surface Treatments." Ensure aggregate bed is in place and at least 9 inches deep, prior to setting the ground box. Install ground box on top of aggregate.

2. Cast ground box aprons in place. Reinforcing steel may be field bent. Ensure the depth of concrete for the apron extends from finished grade to the top of the aggregate bed under the box. Ground box aprons, including concrete and reinforcing steel, are subsidiary to ground boxes when called for by descriptive code.

3. Keep bolt holes in the box clear of dirt. Bolt covers down when not working in ground boxes.

4. Install all conduits and ells in a neat and workmanlike manner. Uniformly space conduits so grounding bushings and bell end fittings can easily be installed.

5. Temporarily seal all conduits in the ground box until conductors are installed.

6. Permanently seal conduits immediately after the completion of conductor installation and pull tests. Permanently seal the ends of all conduits with duct seal, expandable foam, or other method as approved. Do not use duct tape as a permanent conduit sealant. Do not use silicone caulk as a sealant.

7. When a ground rod is present in a ground box, bond all equipment grounding conductors together and to the ground rod with listed connectors.

8. When a type B or D ground box is stacked to meet volume requirements, it is allowable to cut an appropriately sized hole for conduit entry in the side wall at least 18 inches below grade.

9. If an existing ground box in the contract has a metal cover, bond the cover to the equipment grounding conductor with a 3 ft. long stranded bonding jumper the same size as the grounding conductor. The bonding jumper is subsidiary to various bid items. Verify existing ground boxes with metal covers are shown on the plans, with notes fully describing the work required.

10. If other ground boxes with metal covers are within the project limits but are not part of the contract, the Engineer may direct the Contractor to bond the metal covers, identifying the specific boxes in writing. This work will be paid for separately.

11. Bond metal ground box covers to the grounding conductor with a tank ground type lug.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS
GROUND BOXES

ED(4)-14

FILE: ed4-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
	CONT	SECT	JOB	HIGHWAY
REVISIONS	0289	04	032	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	SAN SABA		176C

71D

BATTERY BOX GROUND BOXES NOTES

A. MATERIALS

1. Provide polymer concrete or fiberglass reinforced plastic (FRP) battery box ground box and cover in accordance with Departmental Material Specification (DMS) 11071 "Battery Box Ground Boxes." Battery box will accommodate up to 4 batteries, each measuring 8 in. x 13.5 in. x 10 in. (W x L x D). Label battery box ground box cover in accordance with DMS 11071.

2. Supply a marine grade batteries with covers. Secure the marine grade batteries with covers to the stainless steel rack in the bottom of the ground box with tie down straps.

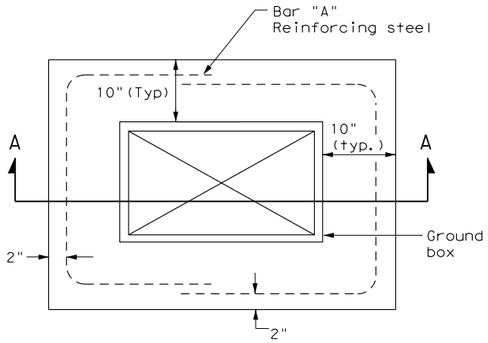
B. CONSTRUCTION METHODS

1. Ensure conduit entry will not interfere with placement of the batteries in the battery box ground box.

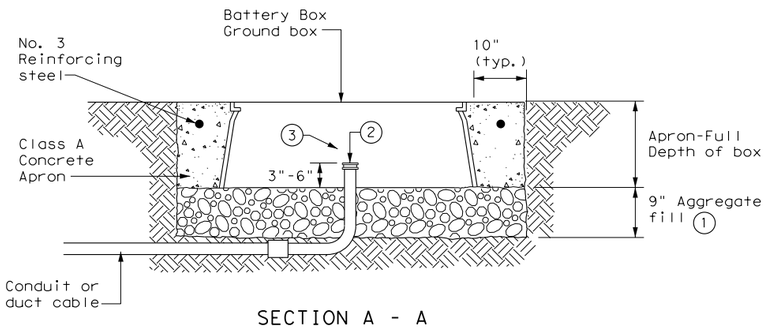
2. Remove all gravel and dirt from conduit. Cap all conduits prior to placing aggregate and setting battery box ground box. Provide Grade 3 or 4 coarse aggregate as shown on Table 2 of Item 302 "Aggregates for Surface Treatments." Ensure the aggregate bed is in place and is a minimum of 9 in. deep prior to setting the box. Install battery box ground box on top of aggregate.

3. Cast battery box aprons in place. Reinforcing steel may be field bent. Ensure the depth of concrete for the apron extends from finished grade to the top of the aggregate bed under the box. Battery box ground box aprons, including concrete and reinforcing steel, are subsidiary to battery box ground boxes when called for by descriptive code.

4. Bolt covers down when not working in battery box ground boxes. Keep bolt holes in the box clear of dirt.



PLAN VIEW



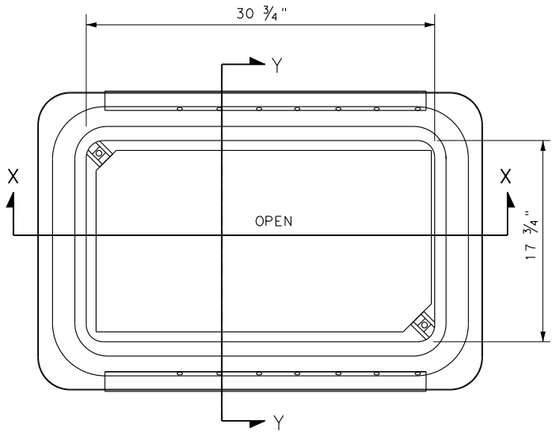
SECTION A - A

APRON FOR BATTERY BOX GROUND BOXES

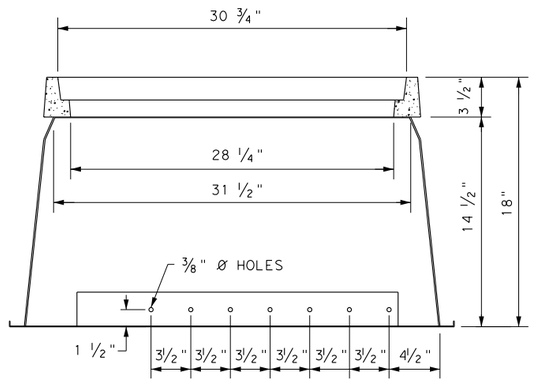
(1) Place aggregate under the box and not in the box. Aggregate should not encroach on the interior volume of the box.

(2) Install bushing or bell end fitting on the upper end of all ells.

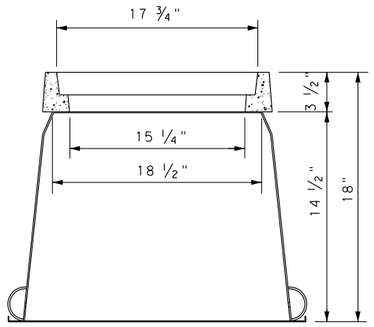
(3) Install all conduits in a neat and workmanlike manner.



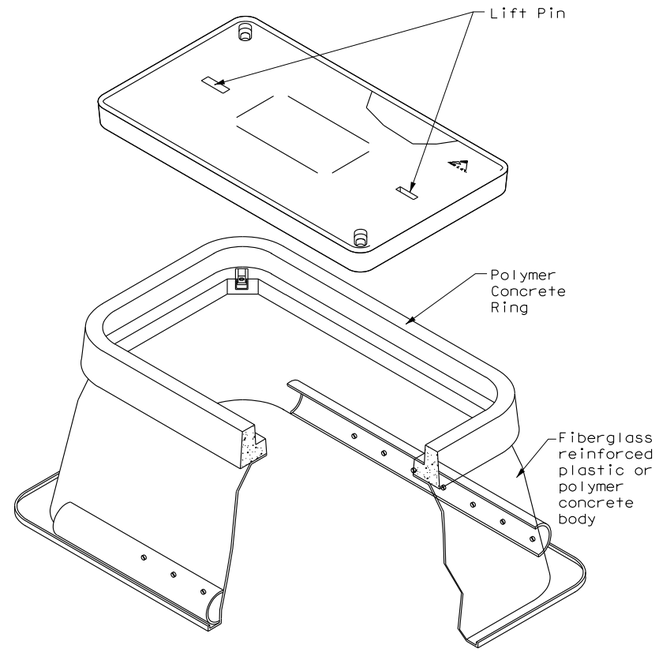
BATTERY BOX TOP VIEW



SECTION X-X



SECTION Y-Y



Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS BATTERY BOX GROUND BOXES

ED(12)-14

FILE: ed12-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0289	04	032	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	SAN SABA		176D

71M

DATE: $DATE$ $TIME$
FILE: $FILE$

DATE: 11/22/2022
FILE: pw://server.slg-eng.com:Slg-ds/Documents/TxDOT0103 Brownwood SH 16/Design_Data/4 - Design/Plan_Set_1/09. Environmental/epic.dgn

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.

List MS4 Operator(s) that may receive discharges from this project. They may need to be notified prior to construction activities.

1.

2.

☐ No Action Required ☐ Required Action

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.
4. When Contractor project specific locations (PSL's) increase disturbed soil area to 5 acres or more, submit NOI to TCEQ and the Engineer.

II. WORK IN OR NEAR STREAMS, WATERBODIES 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 waters of the US permit applies to, location in project and check Best Management Practices planned to control erosion, sedimentation and post-project TSS.

1.

2.

3.

4.

The elevation of the ordinary high water marks of any areas requiring work to be performed in the waters of the US requiring the use of a nationwide permit can be found on the Bridge Layouts.

Best Management Practices:

Erosion	Sedimentation	Post-Construction TSS
☐ Temporary Vegetation	☐ Silt Fence	☐ Vegetative Filter Strips
☐ Blankets/Matting	☐ Rock Berm	☐ Retention/Irrigation Systems
☐ Mulch	☐ Triangular Filter Dike	☐ Extended Detention Basin
☐ Sodding	☐ Sand Bag Berm	☐ Constructed Wetlands
☐ Interceptor Swale	☐ Straw Bale Dike	☐ Wet Basin
☐ Diversion Dike	☐ Brush Berms	☐ Erosion Control Compost
☐ Erosion Control Compost	☐ Erosion Control Compost	☐ Mulch Filter Berm and Socks
☐ Mulch Filter Berm and Socks	☐ Mulch Filter Berm and Socks	☐ Compost Filter Berm and Socks
☐ Compost Filter Berm and Socks	☐ Compost Filter Berm and Socks	☐ Vegetation Lined Ditches
	☐ Stone Outlet Sediment Traps	☐ Sand Filter Systems
	☐ Sediment Basins	☐ Grassy Swales

III. CULTURAL RESOURCES

Refer to TxDOT Standard Specifications in the event historical issues or archeological artifacts are found during construction. Upon discovery of archeological artifacts (bones, burnt rock, flint, pottery, etc.) cease work in the immediate area and contact the Engineer immediately.

☐ No Action Required ☐ Required Action

Action No.

1.

2.

3.

4.

IV. VEGETATION RESOURCES

Preserve native vegetation to the extent practical.
Contractor must adhere to Construction Specification Requirements Specs 162, 164, 192, 193, 506, 730, 751, 752 in order to comply with requirements for invasive species, beneficial landscaping, and tree/brush removal commitments.

☐ No Action Required ☐ Required Action

Action No.

1.

2.

3.

4.

V. FEDERAL LISTED, PROPOSED THREATENED, ENDANGERED SPECIES, CRITICAL HABITAT, STATE LISTED SPECIES, CANDIDATE SPECIES AND MIGRATORY BIRDS.

☐ No Action Required ☐ Required Action

Action No.

1.

2.

3.

4.

If any of the listed species are observed, cease work in the immediate area, do not disturb species or habitat and contact the Engineer immediately. The work may not remove active nests from bridges and other structures during nesting season of the birds associated with the nests. If caves or sinkholes are discovered, cease work in the immediate area, and contact the Engineer immediately.

LIST OF ABBREVIATIONS

BMP:	Best Management Practice	SPCC:	Spill Prevention Control and Countermeasure
CGP:	Construction General Permit	SW3P:	Storm Water Pollution Prevention Plan
DSHS:	Texas Department of State Health Services	PCN:	Pre-Construction Notification
FHWA:	Federal Highway Administration	PSL:	Project Specific Location
MOA:	Memorandum of Agreement	TCEQ:	Texas Commission on Environmental Quality
MOU:	Memorandum of Understanding	TPDES:	Texas Pollutant Discharge Elimination System
MS4:	Municipal Separate Stormwater Sewer System	TPWD:	Texas Parks and Wildlife Department
MBTA:	Migratory Bird Treaty Act	TxDOT:	Texas Department of Transportation
NOT:	Notice of Termination	T&E:	Threatened and Endangered Species
NWP:	Nationwide Permit	USACE:	U.S. Army Corps of Engineers
NOI:	Notice of Intent	USFWS:	U.S. Fish and Wildlife Service

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 appropriate 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 District Spill Coordinator immediately. The Contractor shall be responsible for the proper containment and cleanup of all product spills.

Contact the Engineer if any of the following 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 notify 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 discovered on site. Hazardous Materials or Contamination Issues Specific to this Project:

☐ No Action Required ☐ Required Action

Action No.

1.

2.

3.

VII. OTHER ENVIRONMENTAL ISSUES

(includes regional issues such as Edwards Aquifer District, etc.)

☐ No Action Required ☐ Required Action

Action No.

1.

2.

3.

STATE OF TEXAS
EDUARDO GUTIERREZ
75994
REGISTERED
PROFESSIONAL ENGINEER
11/22/2022

Texas Department of Transportation — Design Division Standard

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

EPIC

FILE: epic.dgn	DN: TxDOT	CK: RG	DW: VP	CK: AR		
©TxDOT: February 2015	CONT	SECT	JOB		HIGHWAY	
REVISIONS 12-12-2011 (DS)	0289	04	032		SH 16	
05-07-14 ADDED NOTE SECTION IV.	DIST	COUNTY			SHEET NO.	
01-23-2015 SECTION I (CHANGED ITEM 1122 TO ITEM 506, ADDED GRASSY SWALES.	BWD	SAN SABA			177	

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. Clean Water Act, Sec. 402 Texas Pollutant Discharge Elimination System

(Addresses CGP and MS4 Storm Water requirements for the project.)

(In the event that the Contractor implements a PSL on or within one mile of the project, a Site Notice and/or a NOI will apply.)

☐ No Action Required ☑ Required Action

Action No. 1
The project disturbs five or more acres of of surface area: TxDOT must file a NOI and coordinate with TCEQ for CGP. The contractor is responsible for the PSL as defined in the Standard Specifications for construction and Maintenance of Highways, Streets, and Bridges (2014 Edition, Section 7.7.6, Page 42). The total disturbed acreage is the combined acreage to be disturbed on the project and the contractor's PSL. This includes, as required, posting a site notice and NOI for the PSL.

Identify all MS4 Permit holders that may be impacted by the project:

Action No. 2
TxDOT must file a NOT for the project when final stabilization has been achieved.

Commitment No. 1
Comply with TPDES CGP. The project requires that a NOI and a Large Site Notice be posted. TxDOT must file an NOI with TCEQ and send a copy to any non-TXDOT MS4 operator that receives discharge from the project. Implement and maintain the SW3P. Refer to the SW3P Plan Sheet, BMPS, and Detail.

Commitment No. 2
The contractor must stabilize the project site as stated in the SW3P.

MS4 operators that receives discharge from the project: -N/A-

II. Clean Water Act, Section 401 and 404 Compliance

(Addresses Nationwide Permits, Individual Permits, and Wetlands.)

(Filling, dredging, or excavating in any water bodies, rivers, creeks, streams, wetlands, or wet area is prohibited unless specified in the USACE permit and approved by the Engineer.)

(When temporary fill is implemented, only stated TxDOT standards will be used unless written authorization for an alternative is obtained from the Engineer. No equipment is allowed in any stream channel below the Ordinary High Water Mark except on temporary stream crossings or drill pads.)

☐ No Action Required ☑ 404 Permit and 401 Certification Required

Permit	Required Action	Waters of the US	App. Plan Sheet(s)
NWP 3(a)	Follow permit conditions	Tributaries of San Saba and Colorado Rivers	culvert/SW3P layouts

Best Management Practices for applicable 401 General Conditions:

General Condition 12 - Categories I and II BMPs required

Category I (Erosion Control)

- ☑ Temporary Vegetation
- ☐ Mulch
- ☐ Interceptor Swale
- ☐ Erosion Control Compost
- ☐ Compost Filter Berms and Socks
- ☐ Blankets, Matting
- ☐ Sod
- ☐ Diversion Dike
- ☑ Mulch Filter Berms and Socks
- ☐ Compost Blankets

Category II (Sedimentation Control)

- ☐ Sand Bag Berm
- ☑ Silt Fence
- ☐ Triangular Filter Dike
- ☐ Stone Outlet Sediment Traps
- ☐ Erosion Control Compost
- ☐ Compost Filter Berms and Socks
- ☑ Rock Berm
- ☐ Hay Bale Dike
- ☐ Brush Berms
- ☐ Sediment Basins
- ☑ Mulch Filter Berms and Socks

General Condition 25 - Category III BMPs required

Category III (Post-Construction TSS Control)

- ☐ Retention/Irrigation
- ☐ Extended Detention Basin
- ☐ Vegetative Filter Strips
- ☐ Grassy Swales
- ☐ Erosion Control Compost
- ☐ Compost Filter Berms and Socks
- ☐ Constructed Wetlands
- ☐ Wet Basins
- ☐ Vegetation-Lined Ditches
- ☐ Sand Filter Systems
- ☐ Mulch filter Berms and Socks
- ☐ Sedimentation Chambers

III. Cultural Resources

(Addresses any special circumstances associated with cultural resources, such as archeological or historic sites.)

(Upon discovery of archeological artifacts (bones, burnt rock, flint, pottery, etc.;cease work in the immediate area and contact the Engineer immediately.)

☑ No Action Required ☐ Required Action

Action No.	Station (Rt/Lt)	Commitment

IV. Vegetation Resources

(Addresses any special circumstances associated with vegetation, such as large trees to be avoided, or mitigation that will occur as part of the project.)

☐ No Action Required ☑ Required Action

Action No.	Station (Rt/Lt)	Commitment
1.	Project Limits	Preserve native vegetation to the extent practical. Contractor must adhere to Construction Specification Requirements Specs 162, 164, 192, 193, 506, 730, 751, 752 in order to comply with requirements for invasive species, beneficial landscaping, and tree/brush removal commitments.

V. Federal Listed, Proposed, Threatened, Endangered Species, Critical Habitat, State Listed Species, Candidate Species, and Migratory Bird Treaty Act (MBTA)

(Addresses any special habitat that may need to be avoided, lists any threatened or endangered species where habitat was observed and might be impacted within the project area, and lists any precautions such as nesting seasons for migratory birds.)

☐ No Action Required ☑ Required Action

Species Potentially within Project Area & Description — Habitat Description

Construction personnel are advised to avoid impacts to species in the project area. When removing vegetation be aware of nests and report large nests to the District Environmental Coordinator, Andrew Chisholm, 325-203-0414. These could be nests of the Zone-tailed Hawk or other large bird species.

- Avoid harm to all species encountered in the project area.

The Migratory Bird Treaty Act of 1918 states that it is unlawful to kill, capture, collect, possess, buy, sell, trade, or transport any migratory bird, nest, young, feather, or egg in part or in whole, without a federal permit issued in accordance within the Act's policies and regulations. Migration patterns would not be affected by the proposed project. The contractor will remove all old migratory bird nests from any structure where work would be done from September 1 through the end of February. In addition, the contractor will be prepared to prevent migratory birds from building nests between March 1 and August 31, per the Environmental Permits, Issues, and Commitments (EPIC) plans. In the event that migratory birds are encountered on-site during project construction, adverse impacts on protected birds, active nests, eggs, and/or young shall be avoided.

VI. Hazardous Material or Contamination Issues

(Addresses any previously identified high risk sites associated with hazardous materials that may be encountered during construction.)

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 appropriate 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 District Spill Coordinator immediately. The Contractor shall be responsible for the proper containment and cleanup of all product spills.

Contractor will follow all applicable storage and management requirements for liquid oil products, liquid petroleum products, and other chemical liquids as per 40 CFR 112 (a.k.a. SPCC) and/or TCEQ Construction General Permit for storm water management.

Contact the Engineer if any of the following are detected:
- Dead or distressed vegetation (not identified as normal)
- Trash piles, drums, canisters, barrels, etc.
- Undesirable smells/odors
- Underground storage tanks
- Evidence of leaching or seepage of substances
- Any other evidence indicating possible hazardous materials or contamination discovered on-site

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Does the project involve any bridge class structure rehabilitation or replacements (bridge class structure not including box culverts)?

☑ Yes ☐ No

If "No", then no further action is required.
If "Yes", then TxDOT is responsible for completing an asbestos assessment/inspection.
Are the results of the asbestos inspection positive (is asbestos present)?

☐ Yes ☐ No

If "Yes", then TxDOT must retain a Texas Department of State Health Services (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 abatement and/or demolition.

If "No", then TxDOT is still required to notify 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.

Bridges on this project may contain Lead-Containing Paint (LCP) or other items that contain lead. The location of (LCP) is identified in the General Notes. Item 6.10.1.2 in the 2014 TxDOT Standard Specifications shall be utilized for this project.

See below in Section VII for other required actions.

VII. Other Environmental Issues

(Addresses any other environmental issues that may not have been covered in other sections.)

☑ No Action Required ☐ Required Action

Action No.	Station (Rt/Lt)	Commitment

LIST OF ABBREVIATIONS

BMP: Best Management Practice
CGP: Construction General Permit
DSHS: Texas Department of State Health Services
FEMA: Federal Emergency Management Agency
FHWA: Federal Highway Administration
MOA: Memorandum of Agreement
MOU: Memorandum of Understanding
MS4: Municipal Separate Stormwater Sewer System
MBTA: Migratory Bird Treaty Act
NOI: Notice of Intent
NOT: Notice of Termination
NWP: Nationwide Permit
SPCC: Spill Prevention Control and Countermeasure
SW3P: Storm Water Pollution Prevention Plan
PCN: Pre-Construction Notification
PSL: Project Specific Location
TCEQ: Texas Commission on Environmental Quality
TPDES: Texas Pollutant Discharge Elimination System
TPWD: Texas Parks and Wildlife Department
TxDOT: Texas Department of Transportation
T&E: Threatened and Endangered Species
USACE: U.S. Army Corp of Engineers
USFWS: U.S. Fish and Wildlife Service

SH 16 ENVIRONMENTAL PERMITS, ISSUES, AND COMMITMENTS (EPIC)

Texas Department of Transportation
BROWNWOOD DISTRICT

CONT	SECT	JOB	HIGHWAY
0289	04	032	SH 16
DIST	COUNTY		SHEET NO.
BWD	SAN SABA		177

SITE DESCRIPTION

PROJECT LIMITS:

CSJ 0289-04-032
FROM: FM 1480 TO: MILLS COUNTY LINE
Beg Latitude = 31.214319
Beg Longitude = 98.719994
End Latitude = 31.352128
End Longitude = 98.671264

LOCATION MAPS:

Refer to title sheet for project location map.

PROJECT DESCRIPTION:

CSJ 0289-04-032

Consisting of construct super 2 highway including safety treat fixed objects, center and edgeline profile marks, pavement structure repair, and surfacing.

MAJOR SOIL DISTURBING ACTIVITIES:

Roadway excavation for widening; drainage structure extensions full pavement reconstruction.

TOTAL PROJECT AREA:	126.03 AC.
TOTAL AREA TO BE DISTURBED:	46.73 AC.

EXISTING CONDITION OF SOIL & VEGETATIVE COVER AND % OF EXISTING VEGETATIVE COVER:

The surrounding land is used as rangeland. The existing soils are primarily sandy.
Much of the R.O.W. has densely spaced grass vegetative cover. Percent coverage within the project exceeds 90%.

NAME OF RECEIVING WATERS:

Surface waters within the project run along roadside ditches to multiple outfalls along the project limits. Outfalls drain to multiple named and unnamed tributaries that flow in a easterly and southeasterly direction to the San Saba River (Segment 1416) and the Colorado River (Segment 1410).

EROSION AND SEDIMENT CONTROLS

OTHER EROSION AND SEDIMENT CONTROLS:

MAINTENANCE:
All erosion controls will be maintained in good working order. If a repair is necessary, it will be made at the earliest possible date, but no later than seven (7) calendar days after the ground has dried sufficiently to prevent further damage from equipment. The areas around creeks and drainage ways shall have priority over other areas on the project site.

INSPECTION:
An inspection will be performed by a TxDOT inspector at least once every seven (7) calendar days. An inspection and maintenance report will be made per each inspection. Stormwater controls will be modified as directed by the Engineer based on these reports.

WASTE MATERIALS:
Any waste materials generated during construction will be disposed of in accordance with existing federal, state, and local laws.

HAZARDOUS WASTE (INCLUDING SPILL REPORTING):
At a minimum, any products in the following categories are considered to be hazardous: Fuels, Lubricating products, Asphalt products, or Concrete curing compounds and any additives. In the event of a spill which may be hazardous, clean-up will be done in accordance with federal, state, and local regulations.

SANITARY WASTE:
Sanitary waste from portable units will be collected by a licensed sanitary waste management contractor.

VEHICLE TRACKING AND DUST CONTROL (ON & OFF SITE):
Watering for dust control (on site) will be required as Directed by the Engineer and shall be considered subsidiary to various bid items. Other requirements are as follows:

__X__ DUST CONTROL (OFF SITE) AS NEEDED- PER ENGINEER
____ 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:
Disposal areas, stockpiles, and haul roads shall be constructed in a manner that will minimize and control the amount of sediment that may enter receiving waters. Disposal areas shall not be located in any wetland, water body or stream bed. Construction staging area and vehicle maintenance area shall be constructed by the contractor in a manner to minimize the runoff of pollutants. All waterways shall be cleared as soon as practicable of temporary embankment, temporary bridges, matting, false work, piling, debris or other obstructions placed during construction operations that are not a part of the finished work.

For off R.O.W. facilities the contractor shall comply with TCEQ requirements.

The contractor is responsible for ensuring that all subcontractors are aware of and comply with all components of the SW3P per Item 506.

Furnish one SW3P permit posting sign and sign support as detailed on the SW3P Sheet. Install this sign in a location selected by the Engineer. The sign and support should be removed upon completion of the project and is the property of the Contractor. The purchase of the sign and support, installation, relocation(s) if determined necessary by the Engineer and removal at project end shall be subsidiary to Item 506.

Best Management Practices:

Erosion	*Sedimentation*	*Post-Construction TSS*
[X] Temporary Vegetation	[X] Silt Fence	[ ] Vegetative Filter Strips
[ ] Blankets/Matting	[X] Rock Berm	[ ] Retention/Irrigation Systems
[ ] Mulch	[ ] Triangular Filter Dike	[ ] Extended Detention Basin
[ ] Sodding	[ ] Sand Bag Berm	[ ] Constructed Wetlands
[ ] Interceptor Swale	[ ] Straw Bale Dike	[ ] Wet Basin
[ ] Diversion Dike	[ ] Brush Berms	[ ] Erosion Control Compost
[ ] Erosion Control Compost	[ ] Erosion Control Compost	[ ] Mulch Filter Berm and Socks
[ ] Mulch Filter Berm and Socks	[X] Mulch Filter Berm and Socks	[ ] Compost Filter Berm and Socks
[ ] Compost Filter Berm and Socks	[ ] Compost Filter Berm and Socks	[ ] Vegetation Lined Ditches
	[ ] Stone Outlet Sediment Traps	[ ] Sand Filter Systems
	[ ] Sediment Basins	

NARRATIVE - SEQUENCE OF CONSTRUCTION (STORM WATER MANAGEMENT) ACTIVITIES:

The order of activities will be as follows:

1. Place SW3P measures as directed.

2. Extend drainage structures.

3. Complete earthwork (excavation/embankment) along roadway edge of pavement to subgrade level for widening. Reuse existing pavement and place as bottom base layer to exisitng grades. Place flexible base and grade ditches. Establish vegetation measures as work progresses.

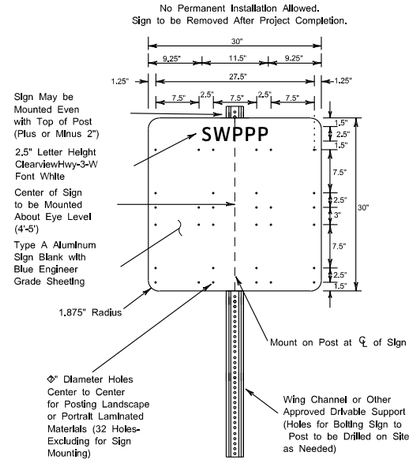
4. Place 2-CST and HMAC surface when all construction activity is complete and the site is stabilized and approved.

5. Remove all temporary structural controls and re-seed any area disturbed during removal.

STORM WATER MANAGEMENT:

Storm water will be carried to cross drainage structures by side road ditches and culverts which will empty into the various natural runoff channels.

STORM WATER POLLUTION PREVENTION PLAN PERMIT POSTING



Texas Department of Transportation
Brownwood District Office
2495 Highway 183 North
Brownwood Texas, 76802

STATE OF TEXAS
EDUARDO GUTIERREZ
75994
REGISTERED PROFESSIONAL ENGINEER
11/29/2022

SH 16
BROWNWOOD DIST.
STORM WATER POLLUTION PREVENTION PLAN

Texas Department of Transportation®

CONT	SECT	JOB	HIGHWAY
0289	04	032	SH 16
DIST	COUNTY		SHEET NO.
BWD	SAN SABA		178

DATE: 11/29/2022 7:25
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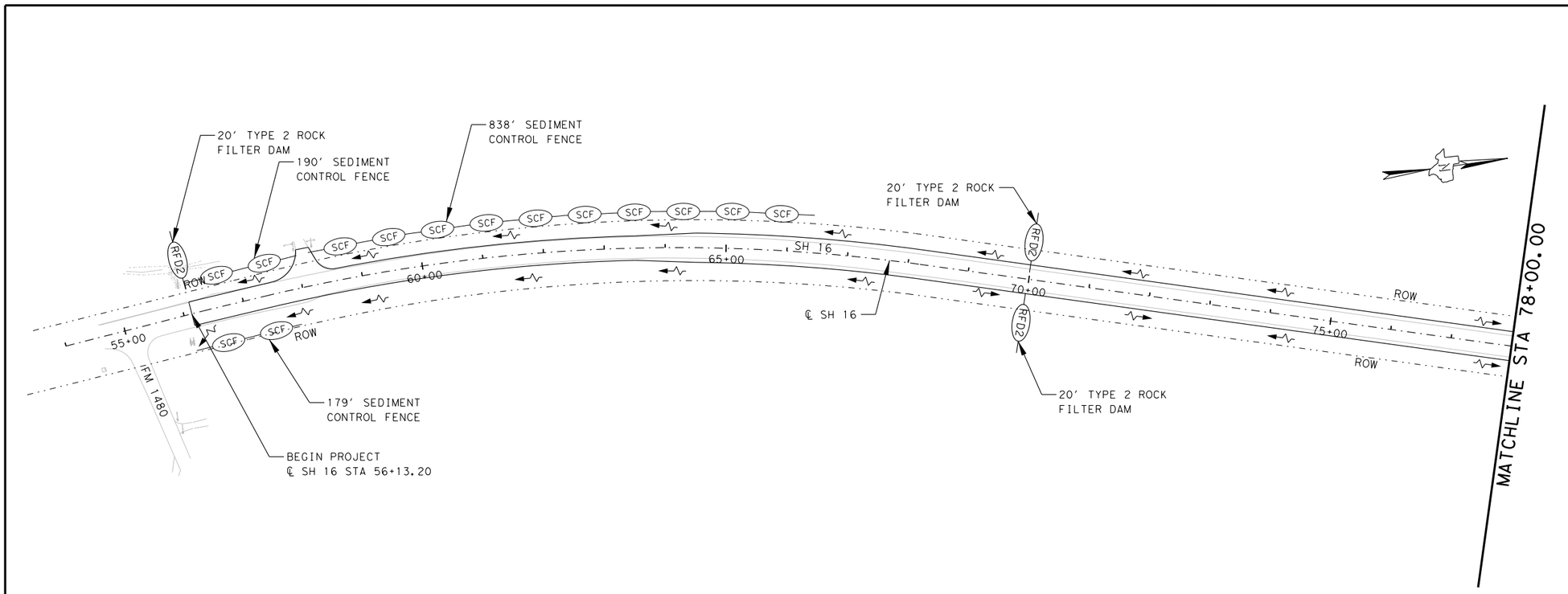
UPDATED 6/1/2017



SCALE: 1" =200'

LEGEND

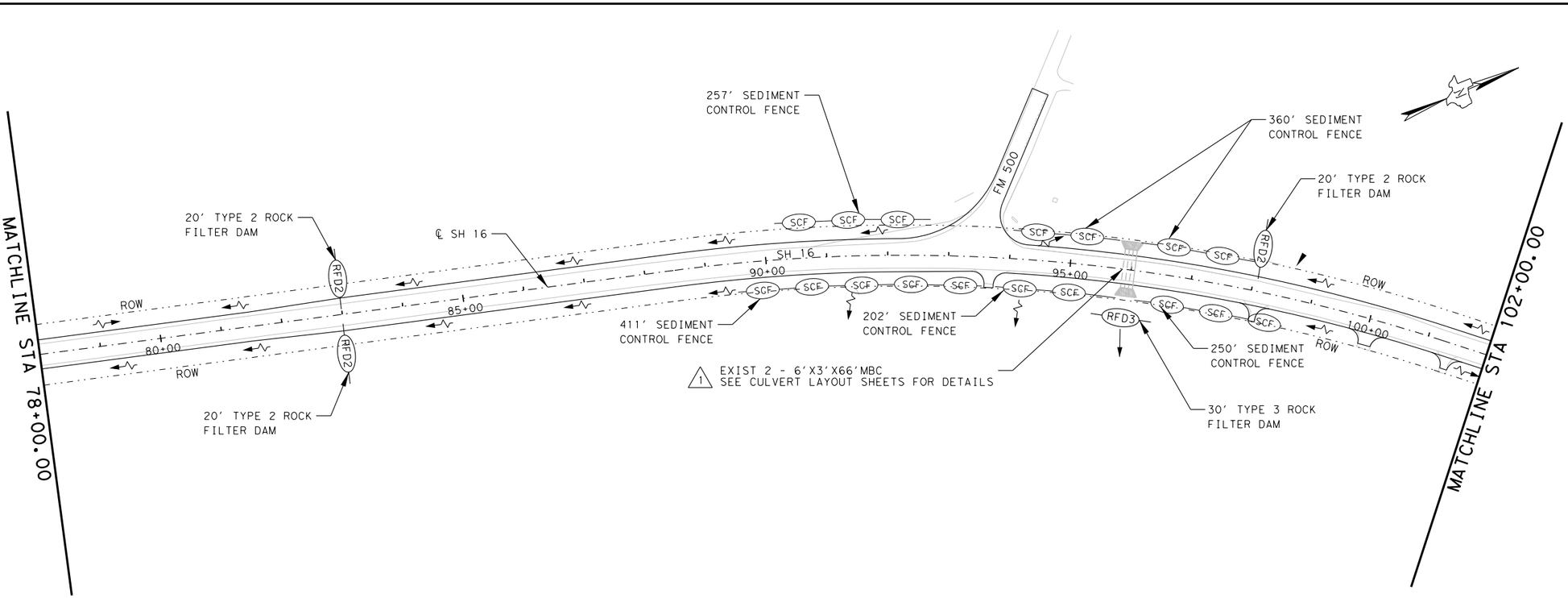
	FLOW DIRECTION
	OUTFALL DIRECTION
SCF	SEDIMENT CONTROL FENCE
CL-D	EROSION CONTROL LOG
RFD2	ROCK FILTER DAM TY 2 (6:1)
RFD3	ROCK FILTER DAM TY 3
#	CROSS CULVERT NUMBER

SW3P QUANTITIES

DESCRIPTION	UNIT	QTY
ROCK FILTER DAMS (INSTALL)(TY 2)(6:1)	LF	120
ROCK FILTER DAMS (INSTALL)(TY 3)	LF	30
ROCK FILTER DAMS (REMOVE)	LF	150
TEMP SEDMT CONT FENCE (INSTALL)	LF	2687
TEMP SEDMT CONT FENCE (REMOVE)	LF	2687

NOTES:

1. PLACE ALL ROCK FILTER DAMS A MINIMUM OF 30' FROM THE NEAREST EDGE OF TRAVEL LANE
2. WINDROW TOPSOIL FOR AN EARTHEN DIKE AS SHOWN ON EC(4)-16 FOR EROSION CONTROL.
3. AFTER FINAL SURFACE PLACEMENT, BLADE WINDROW TOPSOIL BACK TO EDGE OF PAVEMENT TO ELIMINATE PAVEMENT EDGE DROP-OFFS.
4. PLACE SCF 1' INSIDE ROADWAY ROW.



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11/22/2022

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SH 16
SW3P LAYOUTS

BEGIN PROJECT TO STA 102+00.00

11/22/2022 SHEET 1 OF 7

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.	
CHECKED:	6	TEXAS				SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.	
CHECKED:	BWD	SAN SABA	0289	04	032	179	

USER: jsalinas
DATE: 11/22/2022 1:31
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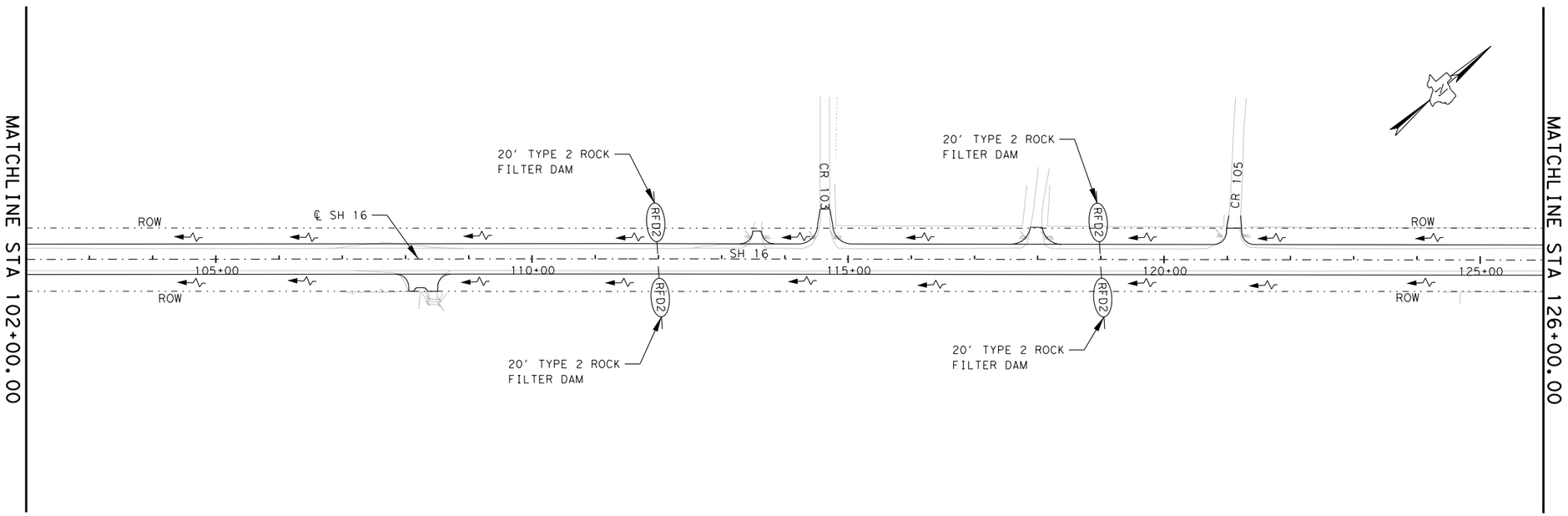


LEGEND

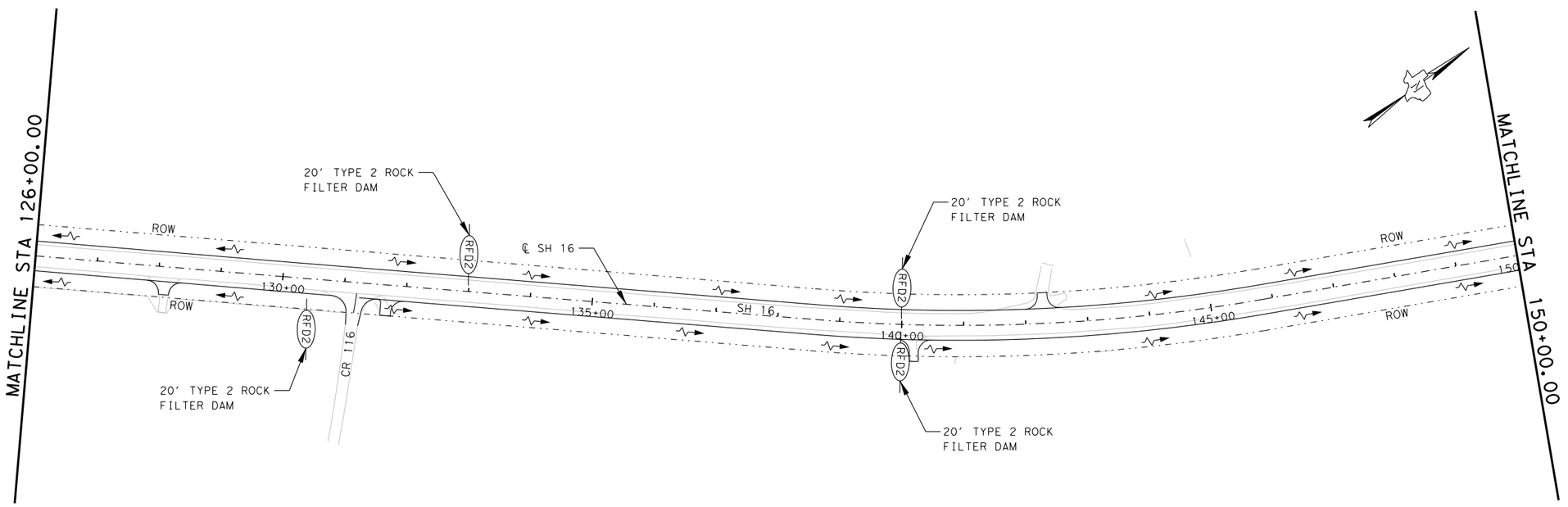
- FLOW DIRECTION
- OUTFALL DIRECTION
- SCF — SEDIMENT CONTROL FENCE
- CL-D — EROSION CONTROL LOG
- RFD2 — ROCK FILTER DAM TY 2 (6:1)
- RFD3 — ROCK FILTER DAM TY 3
- # — CROSS CULVERT NUMBER

SW3P QUANTITIES

DESCRIPTION	UNIT	QTY
ROCK FILTER DAMS (INSTALL)(TY 2)(6:1)	LF	160
ROCK FILTER DAMS (INSTALL)(TY 3)	LF	0
ROCK FILTER DAMS (REMOVE)	LF	160
TEMP SEDMT CONT FENCE (INSTALL)	LF	0
TEMP SEDMT CONT FENCE (REMOVE)	LF	0

NOTES:

1. PLACE ALL ROCK FILTER DAMS A MINIMUM OF 30' FROM THE NEAREST EDGE OF TRAVEL LANE
2. WINDROW TOPSOIL FOR AN EARTHEN DIKE AS SHOWN ON EC(4)-16 FOR EROSION CONTROL.
3. AFTER FINAL SURFACE PLACEMENT, BLADE WINDROW TOPSOIL BACK TO EDGE OF PAVEMENT TO ELIMINATE PAVEMENT EDGE DROP-OFFS.
4. PLACE SCF 1' INSIDE ROADWAY ROW.



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11/22/2022

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SH 16
SW3P LAYOUTS

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11/22/2022 SHEET 2 OF 7

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.	HIGHWAY No.
CHECKED:	6	TEXAS		SH 16

DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	BWD	SAN SABA	0289	04	032	180

USER: jsalinas
DATE: 11/22/2022 1:31
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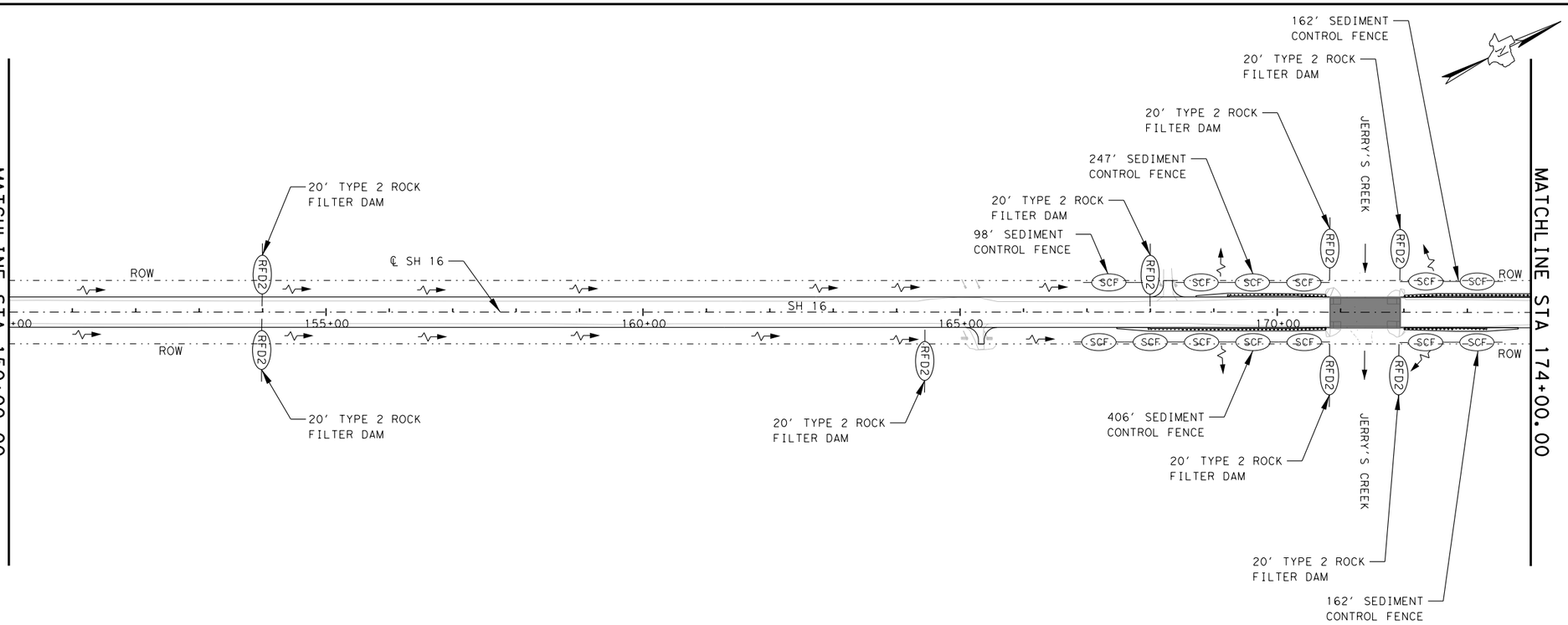

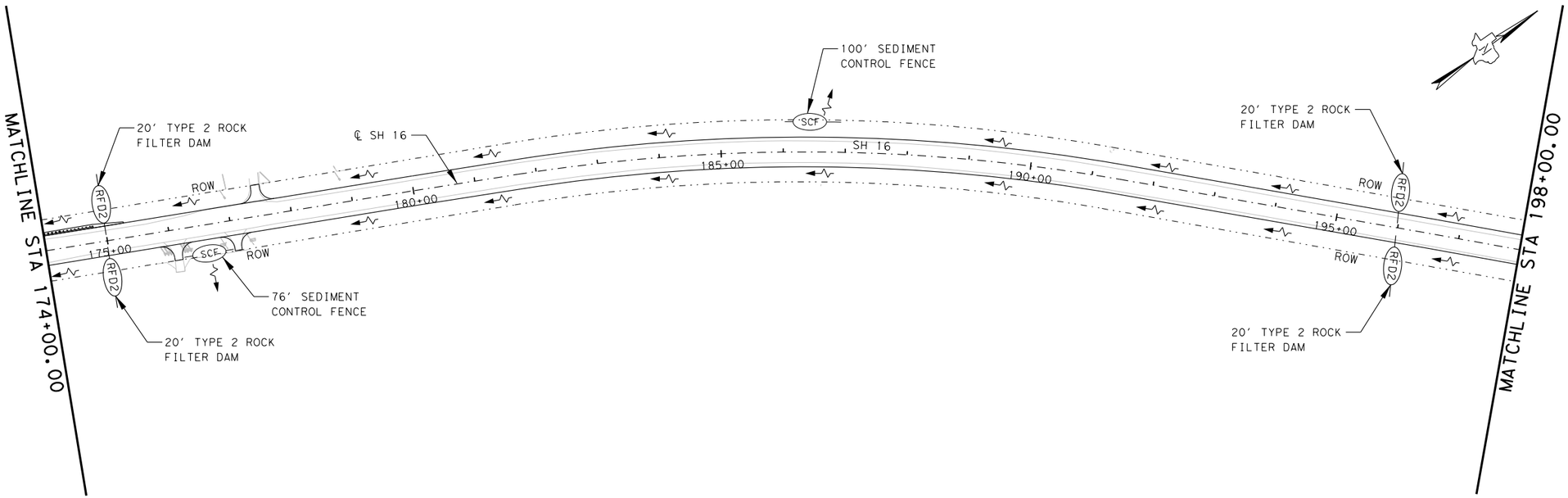

0 100 200

SCALE: 1" =200'

LEGEND

~►	FLOW DIRECTION
——►	OUTFALL DIRECTION
SCF	SEDIMENT CONTROL FENCE
CL-D	EROSION CONTROL LOG
RFD2	ROCK FILTER DAM TY 2 (6:1)
RFD3	ROCK FILTER DAM TY 3
#	CROSS CULVERT NUMBER

SW3P QUANTITIES

DESCRIPTION	UNIT	QTY
ROCK FILTER DAMS (INSTALL)(TY 2)(6:1)	LF	240
ROCK FILTER DAMS (INSTALL)(TY 3)	LF	0
ROCK FILTER DAMS (REMOVE)	LF	240
TEMP SEDMT CONT FENCE (INSTALL)	LF	1251
TEMP SEDMT CONT FENCE (REMOVE)	LF	1251

NOTES:

1. PLACE ALL ROCK FILTER DAMS A MINIMUM OF 30' FROM THE NEAREST EDGE OF TRAVEL LANE
2. WINDROW TOPSOIL FOR AN EARTHEN DIKE AS SHOWN ON EC(4)-16 FOR EROSION CONTROL.
3. AFTER FINAL SURFACE PLACEMENT, BLADE WINDROW TOPSOIL BACK TO EDGE OF PAVEMENT TO ELIMINATE PAVEMENT EDGE DROP-OFFS.
4. PLACE SCF 1' INSIDE ROADWAY ROW.

NO.	REVISION	BY	DATE

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EDUARDO GUTIERREZ
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11/22/2022

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SH 16
SW3P LAYOUTS

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11/22/2022 SHEET 3 OF 7

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.	
CHECKED:	6	TEXAS				SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.	
CHECKED:	BWD	SAN SABA	0289	04	032	181	

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DATE: 11/22/2022 1:31
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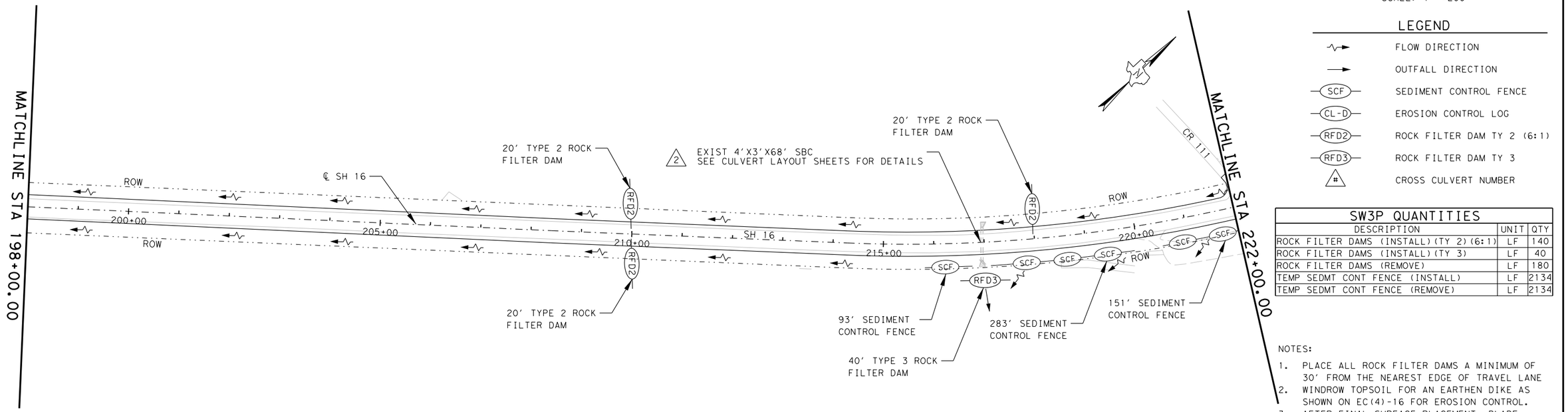

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SCALE: 1" =200'

LEGEND

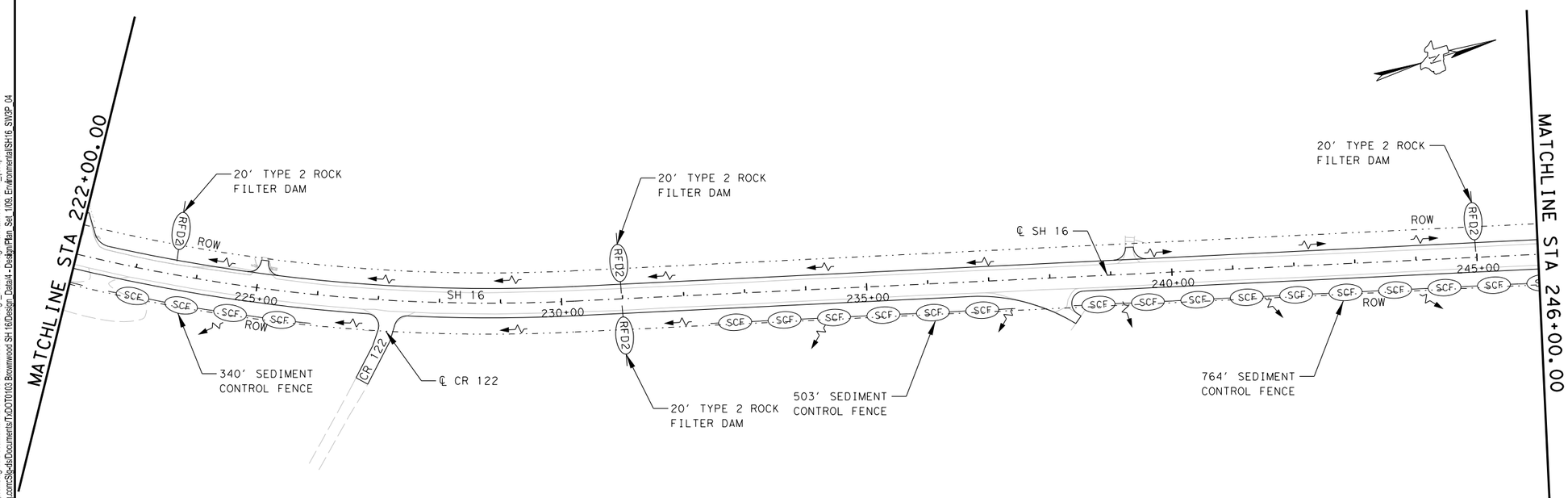
- FLOW DIRECTION
- OUTFALL DIRECTION
- SCF — SEDIMENT CONTROL FENCE
- CL-D — EROSION CONTROL LOG
- RFD2 — ROCK FILTER DAM TY 2 (6:1)
- RFD3 — ROCK FILTER DAM TY 3
- # — CROSS CULVERT NUMBER

SW3P QUANTITIES

DESCRIPTION	UNIT	QTY
ROCK FILTER DAMS (INSTALL)(TY 2)(6:1)	LF	140
ROCK FILTER DAMS (INSTALL)(TY 3)	LF	40
ROCK FILTER DAMS (REMOVE)	LF	180
TEMP SEDMT CONT FENCE (INSTALL)	LF	2134
TEMP SEDMT CONT FENCE (REMOVE)	LF	2134

NOTES:

1. PLACE ALL ROCK FILTER DAMS A MINIMUM OF 30' FROM THE NEAREST EDGE OF TRAVEL LANE
2. WINDROW TOPSOIL FOR AN EARTHEN DIKE AS SHOWN ON EC(4)-16 FOR EROSION CONTROL.
3. AFTER FINAL SURFACE PLACEMENT, BLADE WINDROW TOPSOIL BACK TO EDGE OF PAVEMENT TO ELIMINATE PAVEMENT EDGE DROP-OFFS.
4. PLACE SCF 1' INSIDE ROADWAY ROW.



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11/22/2022

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SH 16
SW3P LAYOUTS

STA 198+00.00 TO STA 246+00.00

11/22/2022 SHEET 4 OF 7

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.	
CHECKED:	6	TEXAS				SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.	
CHECKED:	BWD	SAN SABA	0289	04	032	182	

USER: jsalinas
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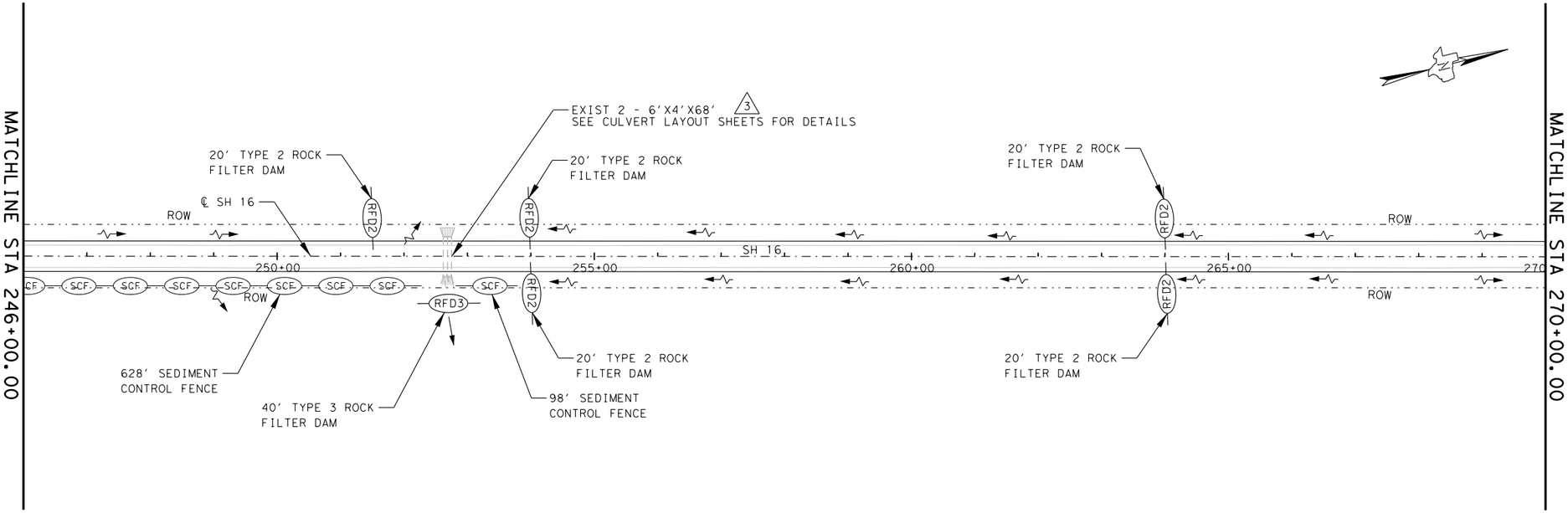

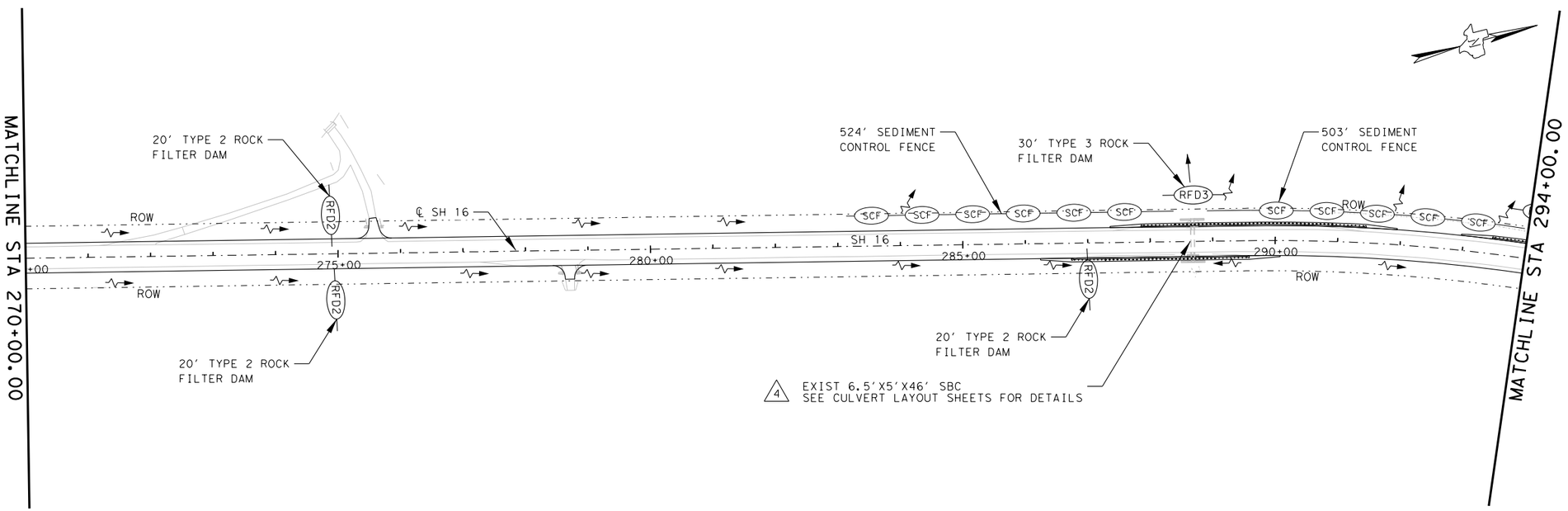

0 100 200

SCALE: 1" =200'

LEGEND

	FLOW DIRECTION
	OUTFALL DIRECTION
SCF	SEDIMENT CONTROL FENCE
CL-D	EROSION CONTROL LOG
RFD2	ROCK FILTER DAM TY 2 (6:1)
RFD3	ROCK FILTER DAM TY 3
#	CROSS CULVERT NUMBER

SW3P QUANTITIES

DESCRIPTION	UNIT	QTY
ROCK FILTER DAMS (INSTALL)(TY 2)(6:1)	LF	160
ROCK FILTER DAMS (INSTALL)(TY 3)	LF	70
ROCK FILTER DAMS (REMOVE)	LF	230
TEMP SEDMT CONT FENCE (INSTALL)	LF	1753
TEMP SEDMT CONT FENCE (REMOVE)	LF	1753

NOTES:

1. PLACE ALL ROCK FILTER DAMS A MINIMUM OF 30' FROM THE NEAREST EDGE OF TRAVEL LANE
2. WINDROW TOPSOIL FOR AN EARTHEN DIKE AS SHOWN ON EC(4)-16 FOR EROSION CONTROL.
3. AFTER FINAL SURFACE PLACEMENT, BLADE WINDROW TOPSOIL BACK TO EDGE OF PAVEMENT TO ELIMINATE PAVEMENT EDGE DROP-OFFS.
4. PLACE SCF 1' INSIDE ROADWAY ROW.

NO.	REVISION	BY	DATE

STATE OF TEXAS
EDUARDO GUTIERREZ
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11/22/2022

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SH 16
SW3P LAYOUTS

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11/22/2022 SHEET 5 OF 7

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.	
CHECKED:	6	TEXAS				SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.	
CHECKED:	BWD	SAN SABA	0289	04	032	183	

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DATE: 11/22/2022 1:31
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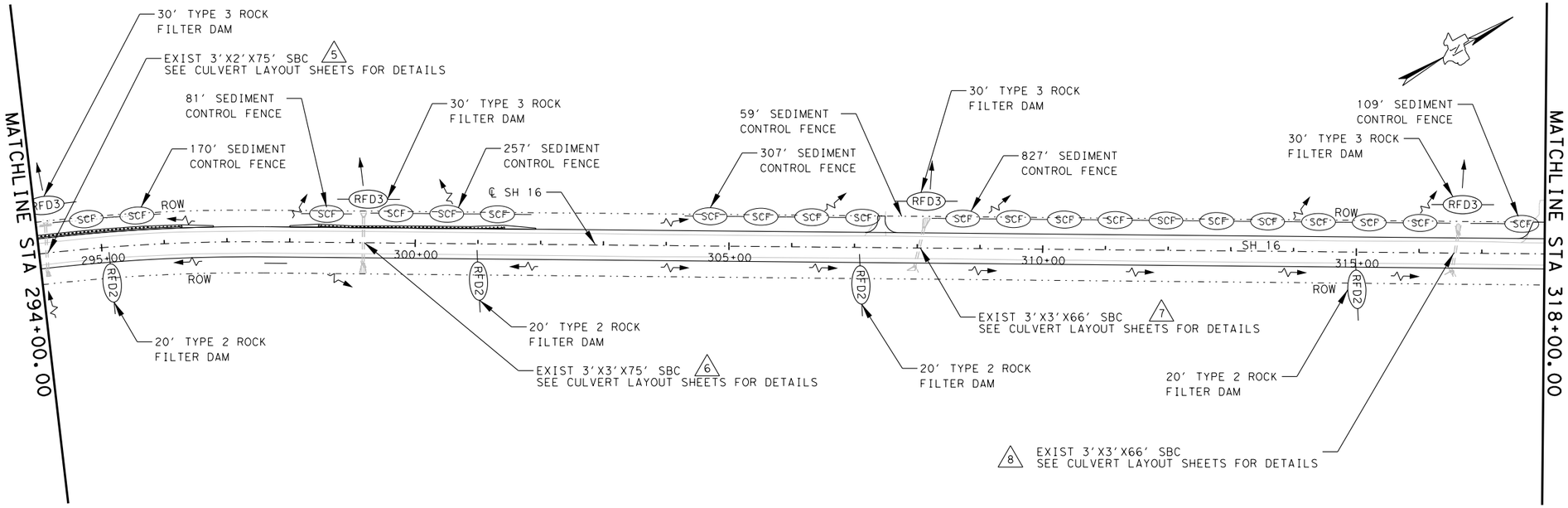

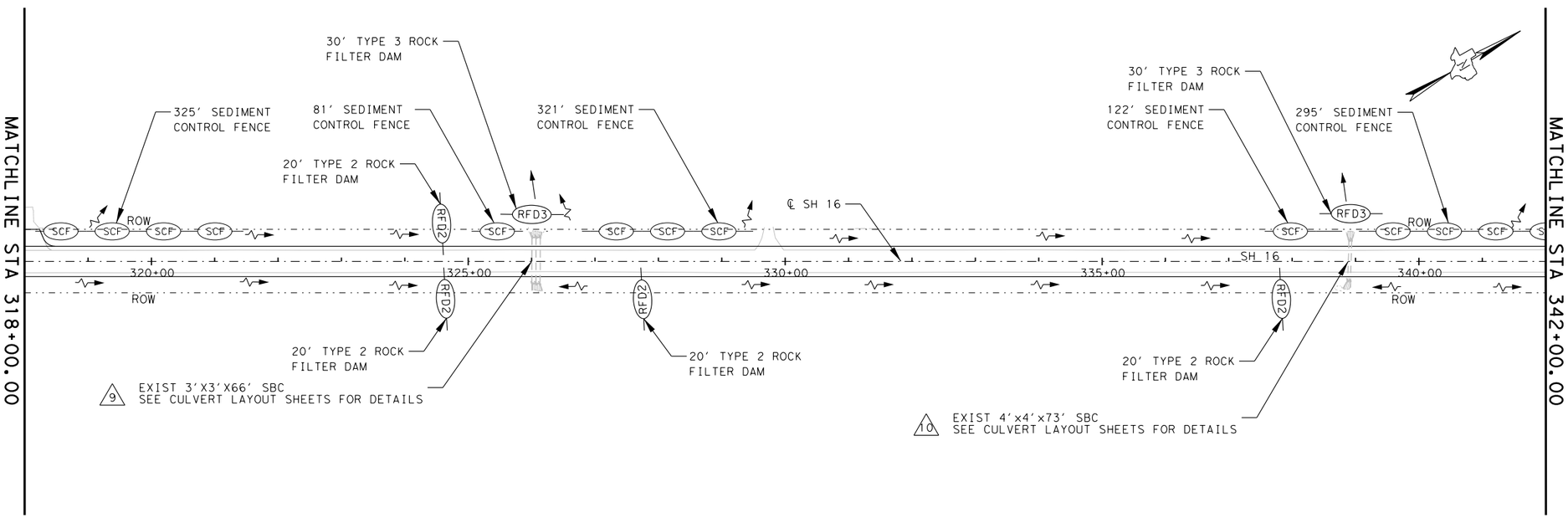

0 100 200

SCALE: 1" =200'

LEGEND

FLOW DIRECTION	
OUTFALL DIRECTION	
SCF	SEDIMENT CONTROL FENCE
CL-D	EROSION CONTROL LOG
RFD2	ROCK FILTER DAM TY 2 (6:1)
RFD3	ROCK FILTER DAM TY 3
#	CROSS CULVERT NUMBER

SW3P QUANTITIES

DESCRIPTION	UNIT	QTY
ROCK FILTER DAMS (INSTALL)(TY 2)(6:1)	LF	160
ROCK FILTER DAMS (INSTALL)(TY 3)	LF	180
ROCK FILTER DAMS (REMOVE)	LF	340
TEMP SEDMT CONT FENCE (INSTALL)	LF	2954
TEMP SEDMT CONT FENCE (REMOVE)	LF	2954

NOTES:

1. PLACE ALL ROCK FILTER DAMS A MINIMUM OF 30' FROM THE NEAREST EDGE OF TRAVEL LANE
2. WINDROW TOPSOIL FOR AN EARTHEN DIKE AS SHOWN ON EC(4)-16 FOR EROSION CONTROL.
3. AFTER FINAL SURFACE PLACEMENT, BLADE WINDROW TOPSOIL BACK TO EDGE OF PAVEMENT TO ELIMINATE PAVEMENT EDGE DROP-OFFS.
4. PLACE SCF 1' INSIDE ROADWAY ROW.

NO.	REVISION	BY	DATE

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EDUARDO GUTIERREZ
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11/22/2022

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SH 16
SW3P LAYOUTS

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11/22/2022 SHEET 6 OF 7

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.	HIGHWAY No.
CHECKED:	6	TEXAS		SH 16

DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.
CHECKED:	BWD	SAN SABA	0289	04	032	184

USER: jsalinas
DATE: 11/22/2022 1:31
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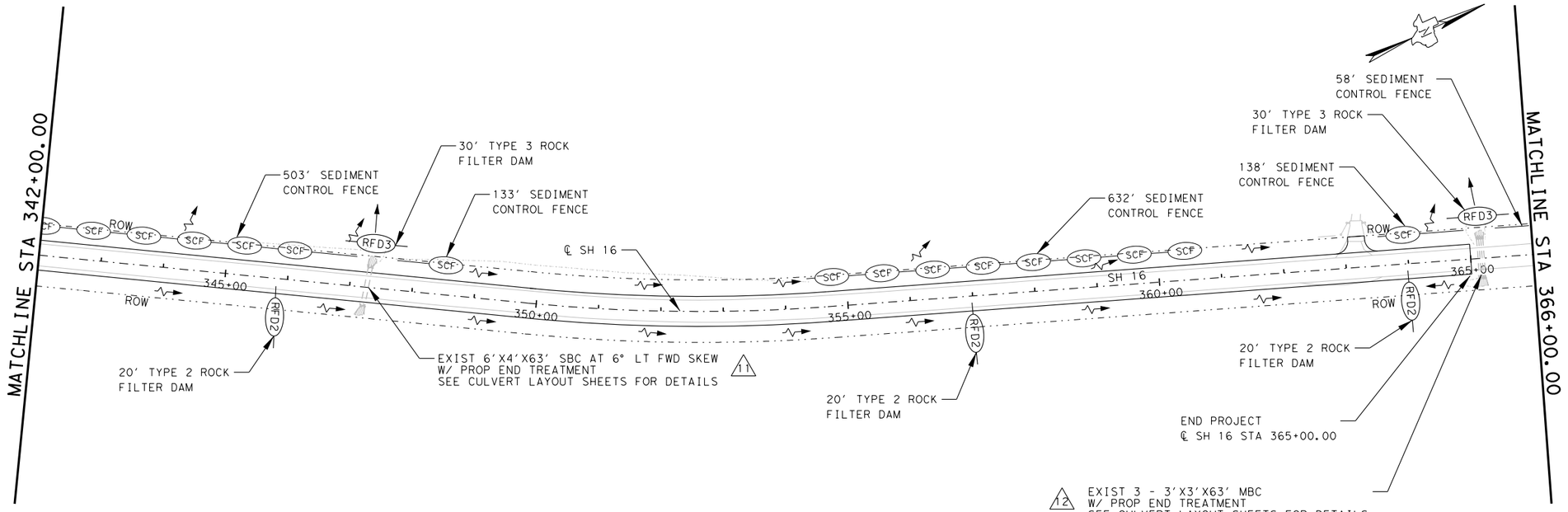

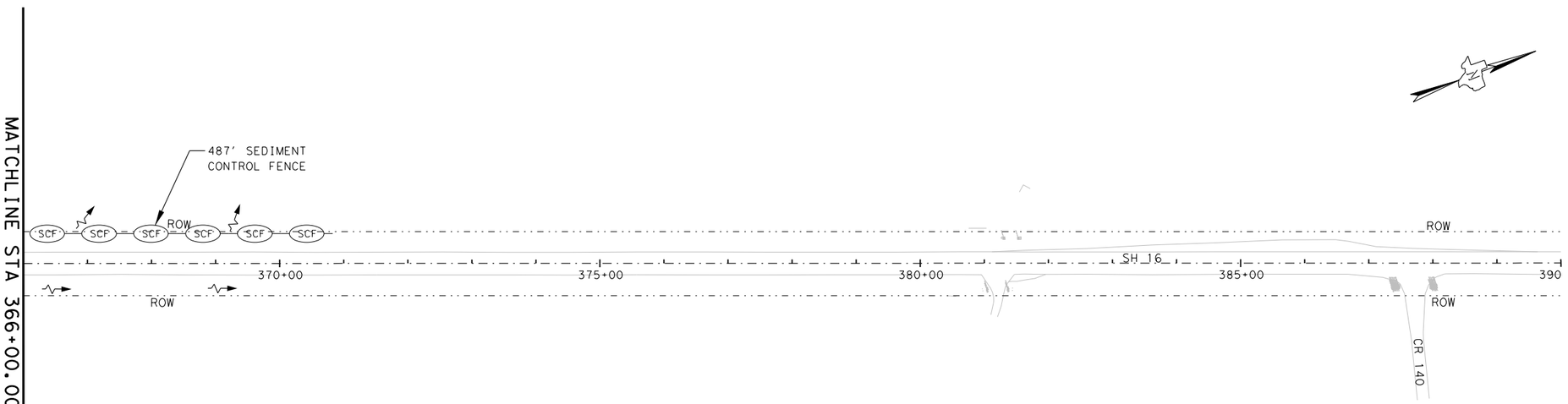

0 100 200

SCALE: 1" =200'

LEGEND

	FLOW DIRECTION
	OUTFALL DIRECTION
SCF	SEDIMENT CONTROL FENCE
CL-D	EROSION CONTROL LOG
RFD2	ROCK FILTER DAM TY 2 (6:1)
RFD3	ROCK FILTER DAM TY 3
#	CROSS CULVERT NUMBER

SW3P QUANTITIES

DESCRIPTION	UNIT	QTY
ROCK FILTER DAMS (INSTALL)(TY 2)(6:1)	LF	60
ROCK FILTER DAMS (INSTALL)(TY 3)	LF	60
ROCK FILTER DAMS (REMOVE)	LF	120
TEMP SEDMT CONT FENCE (INSTALL)	LF	1951
TEMP SEDMT CONT FENCE (REMOVE)	LF	1951

NOTES:

1. PLACE ALL ROCK FILTER DAMS A MINIMUM OF 30' FROM THE NEAREST EDGE OF TRAVEL LANE
2. WINDROW TOPSOIL FOR AN EARTHEN DIKE AS SHOWN ON EC(4)-16 FOR EROSION CONTROL.
3. AFTER FINAL SURFACE PLACEMENT, BLADE WINDROW TOPSOIL BACK TO EDGE OF PAVEMENT TO ELIMINATE PAVEMENT EDGE DROP-OFFS.
4. PLACE SCF 1' INSIDE ROADWAY ROW.

NO.	REVISION	BY	DATE

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11/22/2022

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SH 16
SW3P LAYOUTS

STA 342+00.00 TO END PROJECT

11/22/2022 SHEET 7 OF 7

DESIGNED:	FED. RD DIV. No.	STATE	FEDERAL AID PROJECT No.			HIGHWAY No.	
CHECKED:	6	TEXAS				SH 16	
DRAWN:	STATE DISTRICT	COUNTY	CONTROL No.	SECTION No.	JOB No.	SHEET No.	
CHECKED:	BWD	SAN SABA	0289	04	032	185	

USER: jsallnas
DATE: 11/22/2022 1:31
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DATE 11/22/2022
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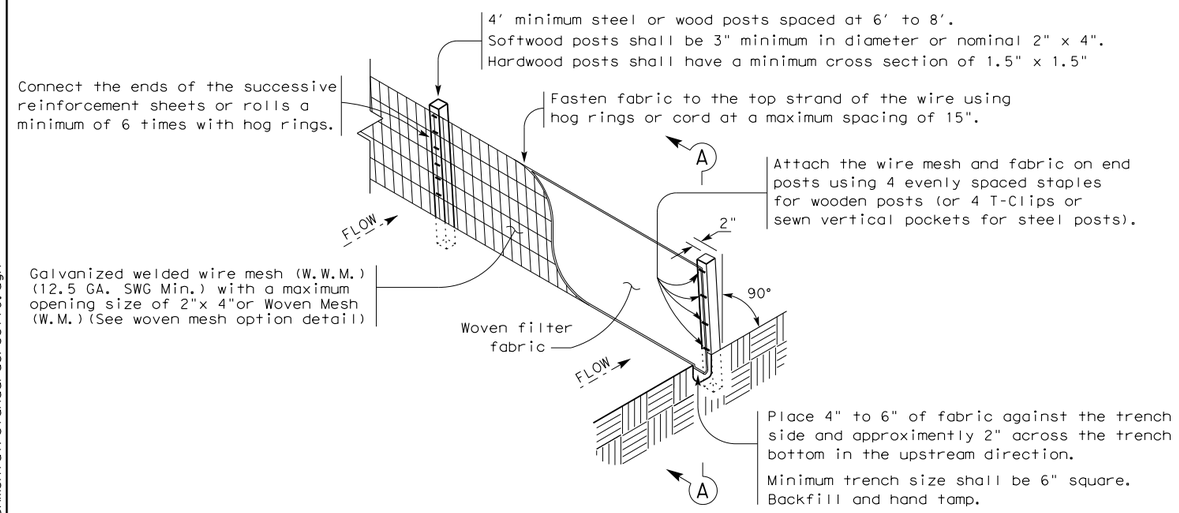
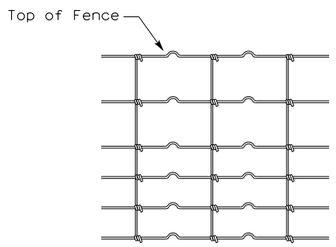
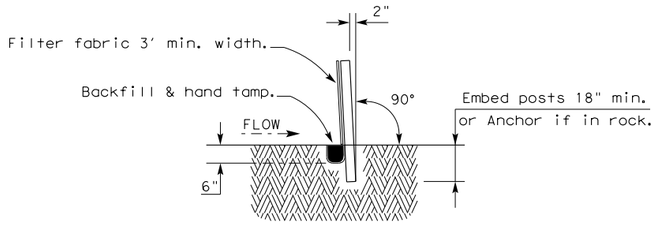


TEMPORARY SEDIMENT CONTROL FENCE

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.

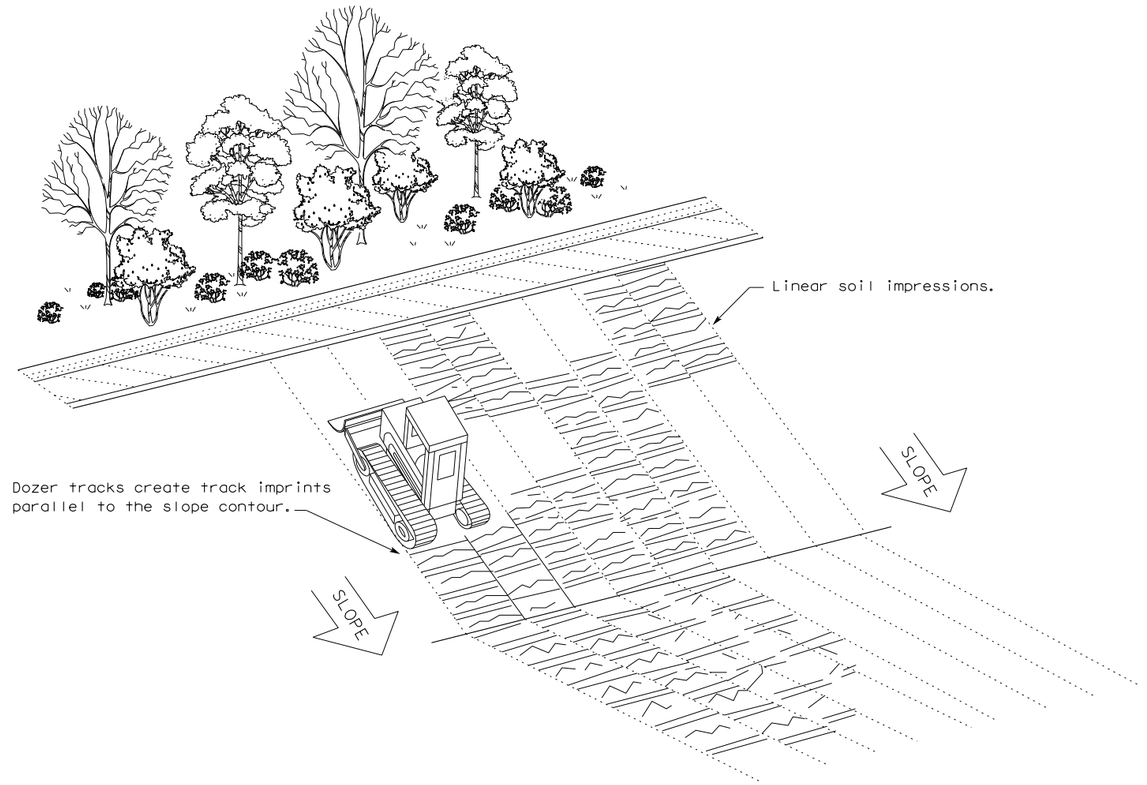
LEGEND

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	0289	04	032	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	SAN SABA		186

DATE: 11/22/2022
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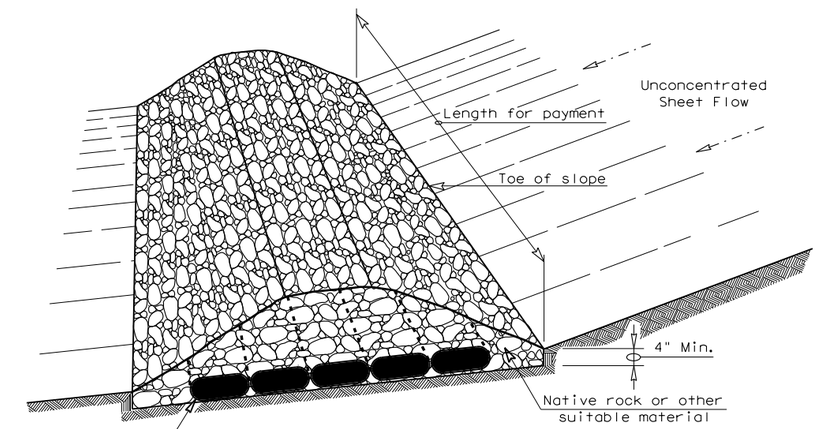
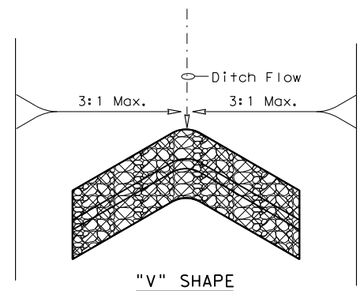
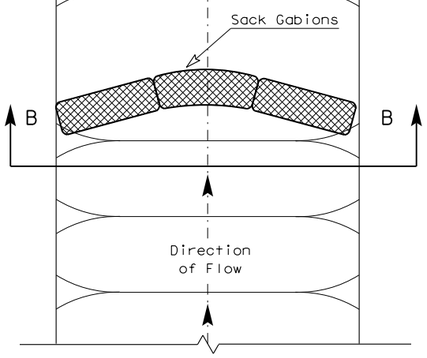


FILTER DAM AT TOE OF SLOPE

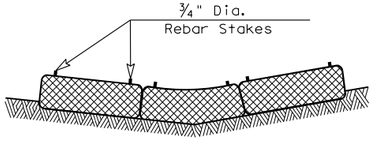
RFD1



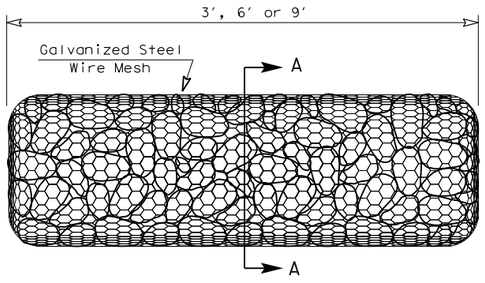
"V" SHAPE
PLAN VIEW



PLAN VIEW

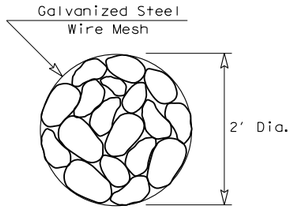


SECTION B-B

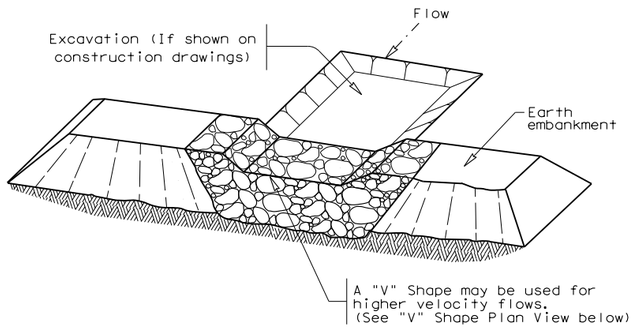


TYPE 4 (SACK GABIONS)

RFD4

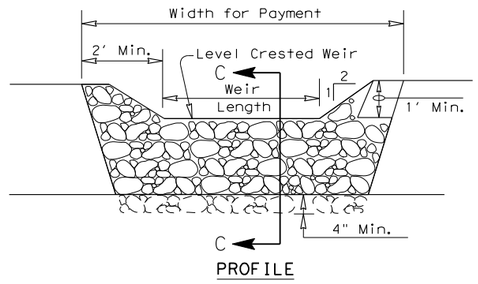


SECTION A-A

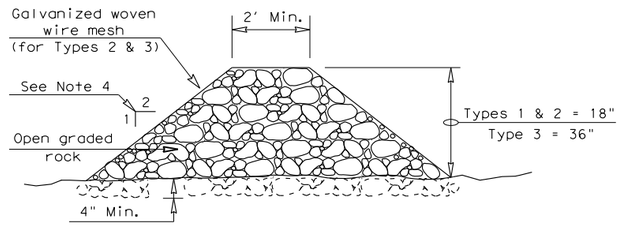


FILTER DAM AT SEDIMENT TRAP

RFD1 OR RFD2



PROFILE



SECTION C-C

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.

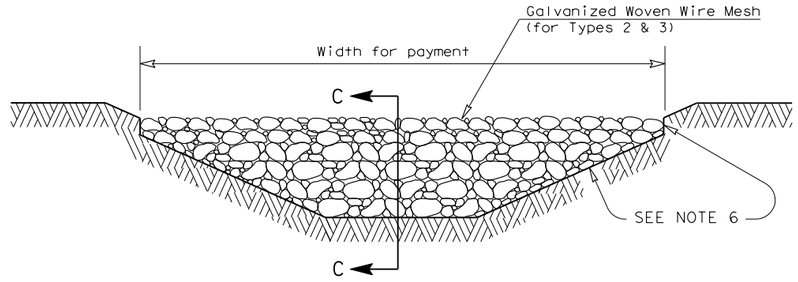
Type 1 (18" high with no wire mesh) (3" to 6" aggregate): Type 1 may be used at the toe of slopes, around inlets, in small ditches, and at dike or swale outlets. This type of dam is recommended to control erosion from a drainage area of 5 acres or less. Type 1 may not be used in concentrated high velocity 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.



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.

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

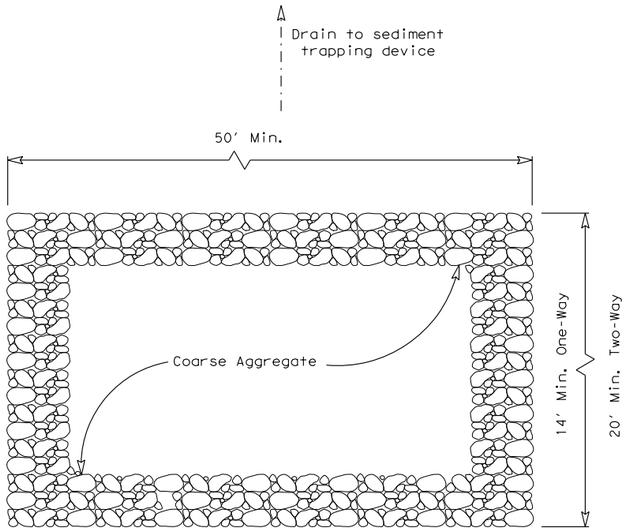
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

ROCK FILTER DAMS

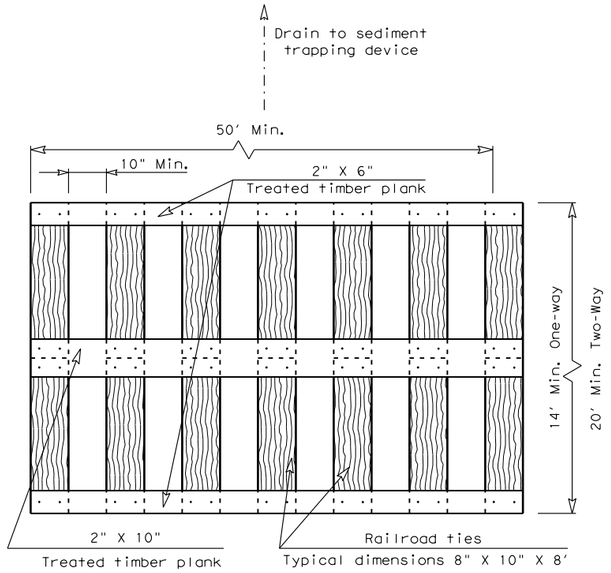
EC(2)-16

FILE: ec216	DN: TxDOT		CK: KM		DW: VP		DN/CK: LS
	CONT	SECT	JOB		HIGHWAY		
REVISIONS	0289	04	032		SH 16		
	DIST	COUNTY			SHEET NO.		
	BWD	SAN SABA			187		

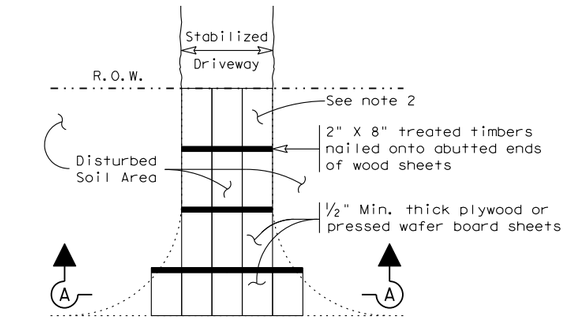
DATE: 11/22/2022
FILE: pw://server.slg-eng.com:Slg-ds/Documents/TxDOT0103 Brownwood SH 16/Design_Data/4 - Design/Plan_Set_1/09. Environmental/Standards/ec316.dgn



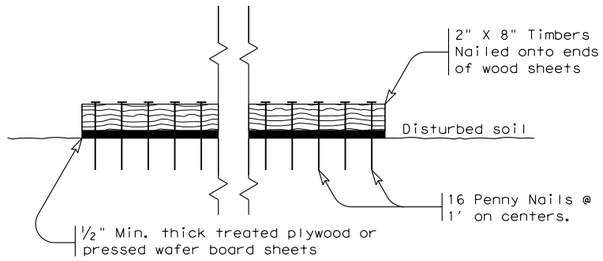
PLAN VIEW



PLAN VIEW



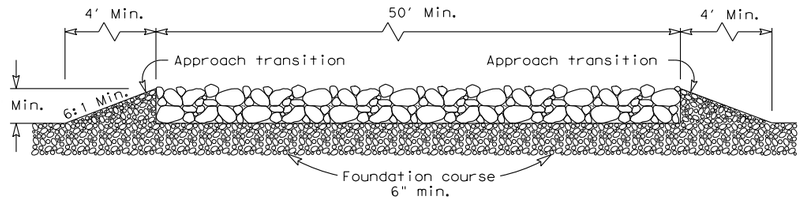
PLAN VIEW



SECTION A-A

CONSTRUCTION EXIT (TYPE 3)

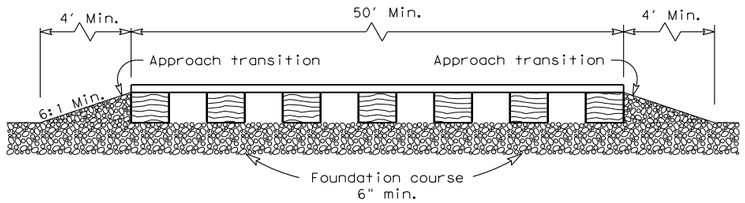
SHORT TERM



ELEVATION VIEW

CONSTRUCTION EXIT (TYPE 1)

ROCK CONSTRUCTION (LONG TERM)



ELEVATION VIEW

CONSTRUCTION EXIT (TYPE 2)

TIMBER CONSTRUCTION (LONG TERM)

GENERAL NOTES (TYPE 1)

1. The length of the type 1 construction exit shall be as indicated on the plans, but not less than 50′.
2. The coarse aggregate should be open graded with a size of 4" to 8".
3. The approach transitions should be no steeper than 6:1 and constructed as directed by the Engineer.
4. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other materialas approved by the Engineer.
5. The construction exit shall be graded to allow drainage to a sediment trapping device.
6. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
7. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.

GENERAL NOTES (TYPE 2)

1. The length of the type 2 construction exit shall be as indicated on the plans, but not less than 50′.
2. The treated timber planks shall be attached to the railroad ties with ½"x 6" min. lag bolts. Other fasteners may be used as approved by the Engineer.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The approach transitions shall be no steeper than 6:1 and constructed as directed by the Engineer.
5. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other material as approved by the Engineer.
6. The construction exit should be graded to allow drainage to a sediment trapping device.
7. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
8. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.

GENERAL NOTES (TYPE 3)

1. The length of the type 3 construction exit shall be as shown on the plans, or as directed by the Engineer.
2. The type 3 construction exit may be constructed from open graded crushed stone with a size of two to four inches spread a min. of 4" thick to the limits shown on the plans.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

CONSTRUCTION EXITS

EC(3)-16

FILE: ec316	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
©TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0289	04	032	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	SAN SABA		188

DATE: 11/22/2022
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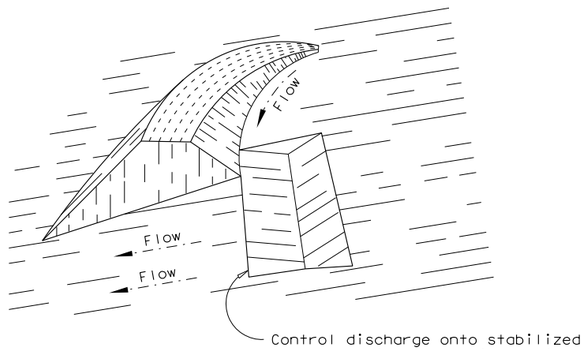
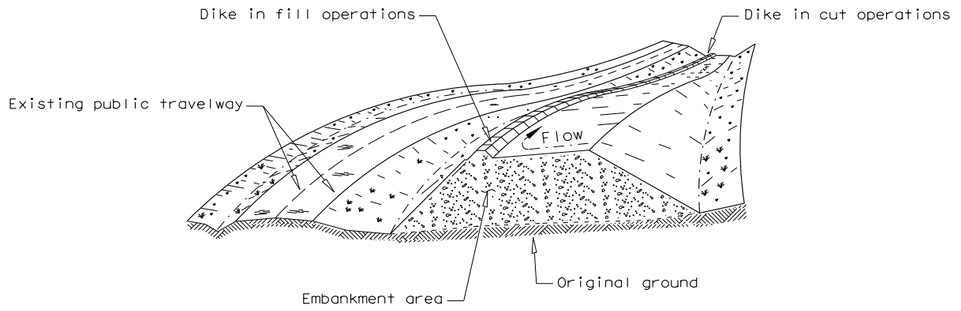
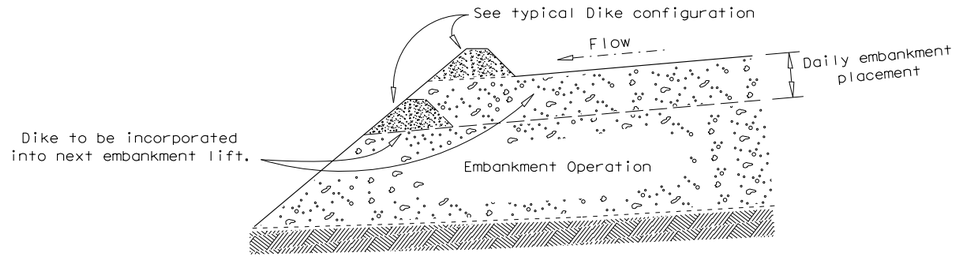


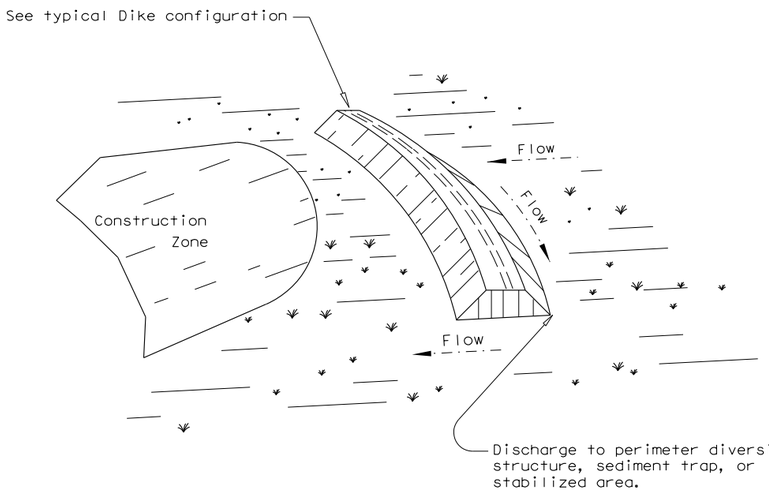
PERIMETER DIKE



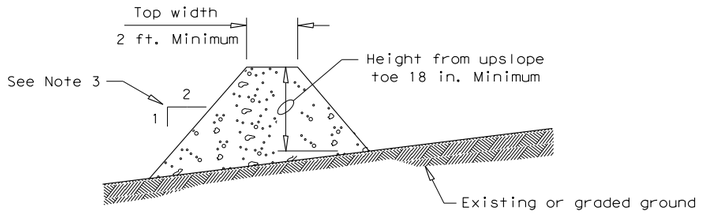
DIVERSION DIKE



EMBANKMENT SECTION - DIVERSION DIKE



INTERCEPTOR DIKE



TYPICAL DIKE CONFIGURATION

GENERAL NOTE

1. Soil used in dike construction shall be machine compacted.
2. Top width and height of dike may be modified with prior approval of the Engineer.
3. Side slopes within the safety clear zone of a roadway shall be 6:1 or flatter.
4. Grading shall be shown elsewhere in the plans or as directed by the Engineer.
5. The Engineer reserves the right to modify the dimensions shown for the dike dependent on runoff volume characteristics.
6. Dikes that are in place for more than 14 calendar days should be stabilized to prevent sediment runoff.
7. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
8. Remove sediment and debris when accumulation affects the performance of the devices, after a rain and when directed by the engineer.

DIKE USAGE GUIDELINES

A Dike may be used to intercept runoff and divert it around unstabilized areas or to divert sediment laden runoff to an erosion control device (sediment basin or trap, rock filter dam, etc.).

The drainage area contributing runoff to a dike should not exceed 5 acres. The spacing of dikes should be as follows:

Slope of disturbed areas above dike	greater than 10%	5 - 10%	less than 5%
Maximum distance between dikes	100′	200′	300′

Intercepted runoff flowing along a dike should outlet to a stabilized area (vegetation, rock, etc.).

PLANS SHEET LEGEND

DIKE →(D)←

Texas Department of Transportation | Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES DIKES (EARTHWORK FOR EROSION CONTROL)

EC(4)-16

FILE: ec416	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0289	04	032	SH 16
	DIST	COUNTY		SHEET NO.
	BWD	SAN SABA		189

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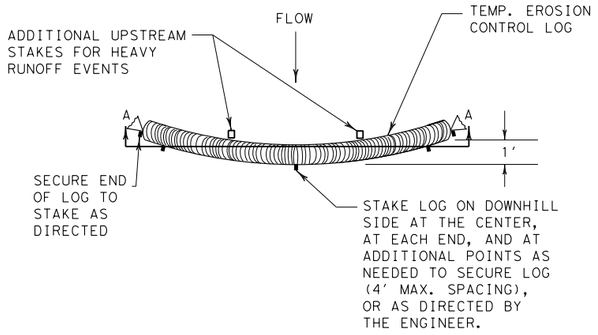
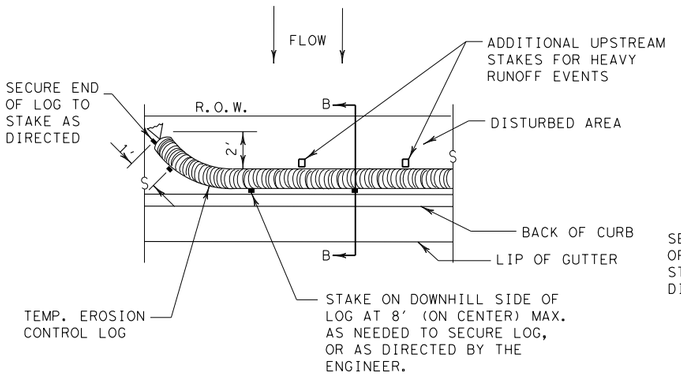
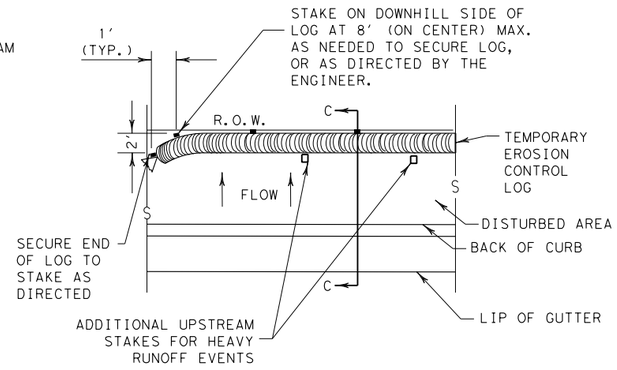


PLAN VIEW



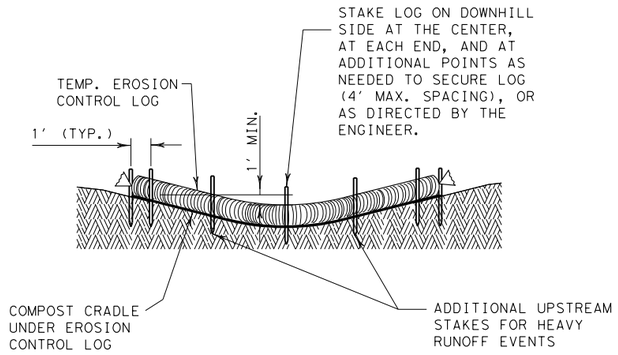
PLAN VIEW



PLAN VIEW

GENERAL NOTES:

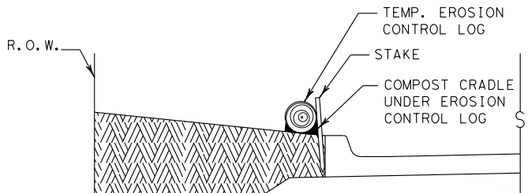
1. EROSION CONTROL LOGS SHALL BE INSTALLED IN ACCORDANCE WITH MANFACTURER'S RECOMMENDATIONS, OR AS DIRECTED BY THE ENGINEER.
2. LENGTHS OF EROSION CONTROL LOGS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND AS REQUIRED FOR THE PURPOSE INTENDED.
3. UNLESS OTHERWISE DIRECTED, USE BIODEGRADABLE OR PHOTODEGRADABLE CONTAINMENT MESH ONLY WHERE LOG WILL REMAIN IN PLACE AS PART OF A VEGETATIVE SYSTEM. FOR TEMPORARY INSTALLATIONS, USE RECYCLABLE CONTAINMENT MESH.
4. FILL LOGS WITH SUFFICIENT FILTER MATERIAL TO ACHIEVE THE MINIMUM COMPACTED DIAMETER SPECIFIED IN THE PLANS WITHOUT EXCESSIVE DEFORMATION.
5. STAKES SHALL BE 2" X 2" WOOD OR #3 REBAR, 2'-4' LONG, EMBEDDED SUCH THAT 2" PROTRUDES ABOVE LOG, OR AS DIRECTED BY THE ENGINEER.
6. DO NOT PLACE STAKES THROUGH CONTAINMENT MESH.
7. COMPOST CRADLE MATERIAL IS INCIDENTAL & WILL NOT BE PAID FOR SEPARATELY.
8. SANDBAGS USED AS ANCHORS SHALL BE PLACED ON TOP OF LOGS & SHALL BE OF SUFFICIENT SIZE TO HOLD LOGS IN PLACE.
9. TURN THE ENDS OF EACH ROW OF LOGS UPSLOPE TO PREVENT RUNOFF FROM FLOWING AROUND THE LOG.
10. FOR HEAVY RUNOFF EVENTS, ADDITIONAL UPSTREAM STAKES MAY BE NECESSARY TO KEEP LOG FROM FOLDING IN ON ITSELF.



SECTION A-A

EROSION CONTROL LOG DAM

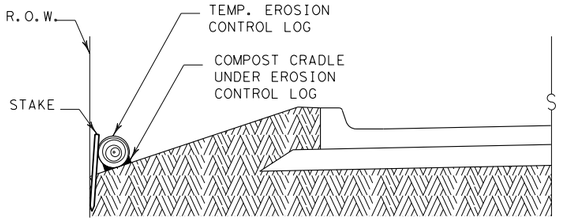
CL-D



SECTION B-B

EROSION CONTROL LOG AT BACK OF CURB

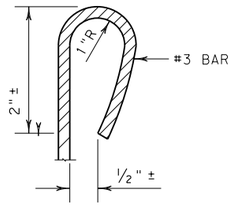
CL-BOC



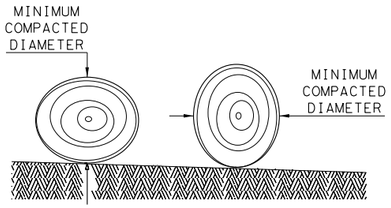
SECTION C-C

EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY

CL-ROW



REBAR STAKE DETAIL



DIAMETER MEASUREMENTS OF EROSION CONTROL LOGS SPECIFIED IN PLANS

LEGEND

CL-D	EROSION CONTROL LOG DAM
CL-BOC	EROSION CONTROL LOG AT BACK OF CURB
CL-ROW	EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY
CL-SST	EROSION CONTROL LOGS ON SLOPES STAKE AND TRENCHING ANCHORING
CL-SSL	EROSION CONTROL LOGS ON SLOPES STAKE AND LASHING ANCHORING
CL-DI	EROSION CONTROL LOG AT DROP INLET
CL-CI	EROSION CONTROL LOG AT CURB INLET
CL-GI	EROSION CONTROL LOG AT CURB & GRATE INLET

SEDIMENT BASIN & TRAP USAGE GUIDELINES

An erosion control log sediment trap may be used to filter sediment out of runoff draining from an unstabilized area.

Log Traps: The drainage area for a sediment trap should not exceed 5 acres. The trap capacity should be 1800 CF/Acre (0.5" over the drainage area).

Control logs should be placed in the following locations:

1. Within drainage ditches spaced as needed or min. 500' on center
2. Immediately preceding ditch inlets or drain inlets
3. Just before the drainage enters a water course
4. Just before the drainage leaves the right of way
5. Just before the drainage leaves the construction limits where drainage flows away from the project.

The logs should be cleaned when the sediment has accumulated to a depth of 1/2 the log diameter.

Cleaning and removal of accumulated sediment deposits is incidental and will not be paid for separately.

SHEET 1 OF 3

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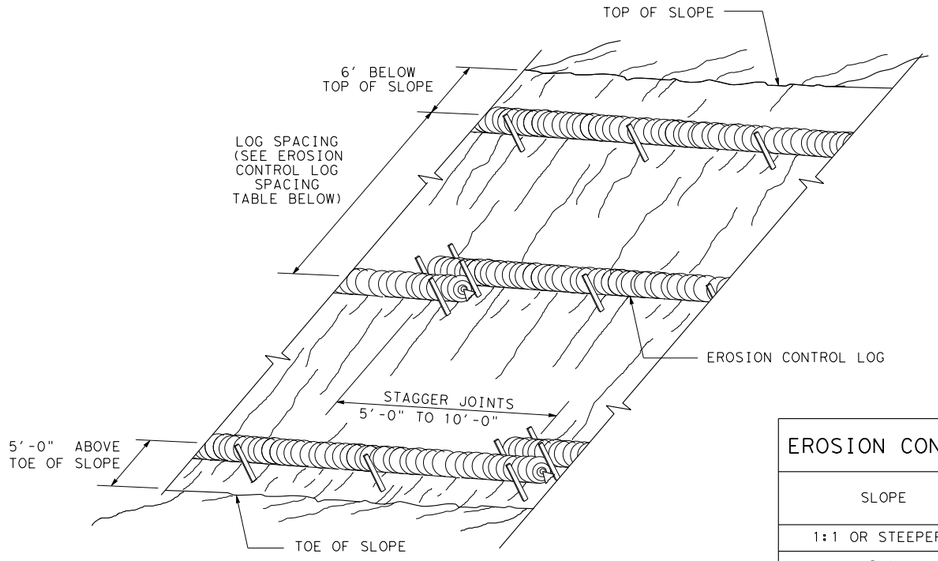
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

EC(9)-16

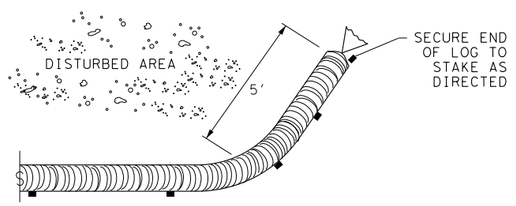
FILE: ec916	DN: TxDOT		CK: KM		DW: LS/PT		CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY		
REVISIONS	0289	04	032		SH 16		
	DIST	COUNTY			SHEET NO.		
	BWD	SAN SABA			190		

DATE: 11/22/2022
FILE: pw://server.slg-eng.com:Slg-ds/Documents/TxDOT0103 Brownwood SH 16/Design_Data/4 - Design/Plan_Set_1/09. Environmental/Standards/ec916_2.dgn



EROSION CONTROL LOGS ON SLOPES
STAKE AND TRENCHING ANCHORING

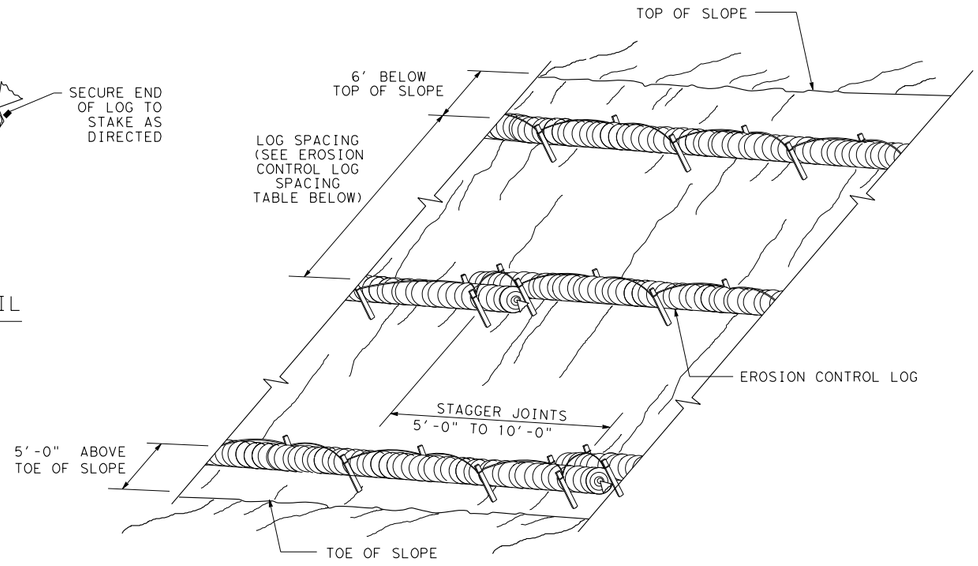
CL-SST



END SECTION RAP DETAIL

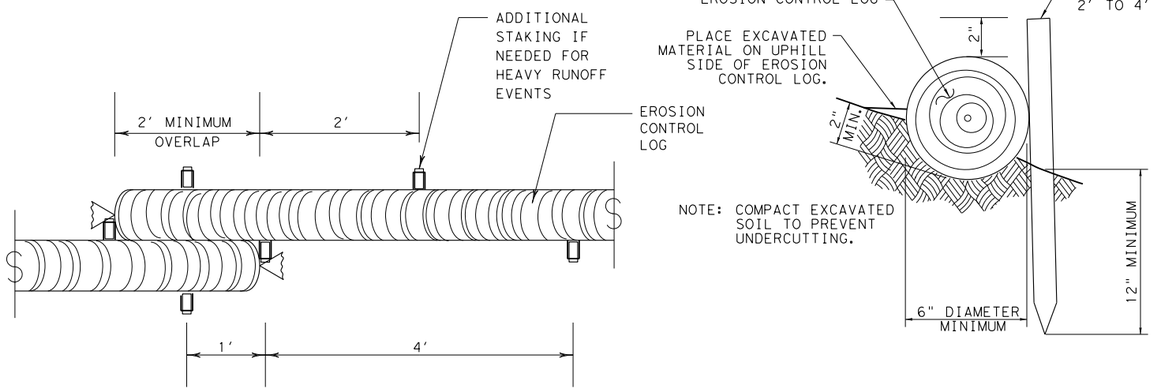
EROSION CONTROL LOG SPACING TABLE				
SLOPE	LOG DIAMETER			
	6"	8"	12"	18"
1:1 OR STEEPER	5'	10'	15'	20'
2:1	10'	20'	30'	40'
3:1	15'	30'	45'	60'
4:1 OR FLATTER	20'	40'	60'	80'

* ADJUSTMENTS CAN BE MADE FOR SOIL TYPE:
SOFT, LOAMY SOILS-ADJUST ROWS CLOSER TOGETHER;
HARD, ROCKY SOILS- ADJUST ROWS FARTHER APART



EROSION CONTROL LOGS ON SLOPES
STAKE AND LASHING ANCHORING

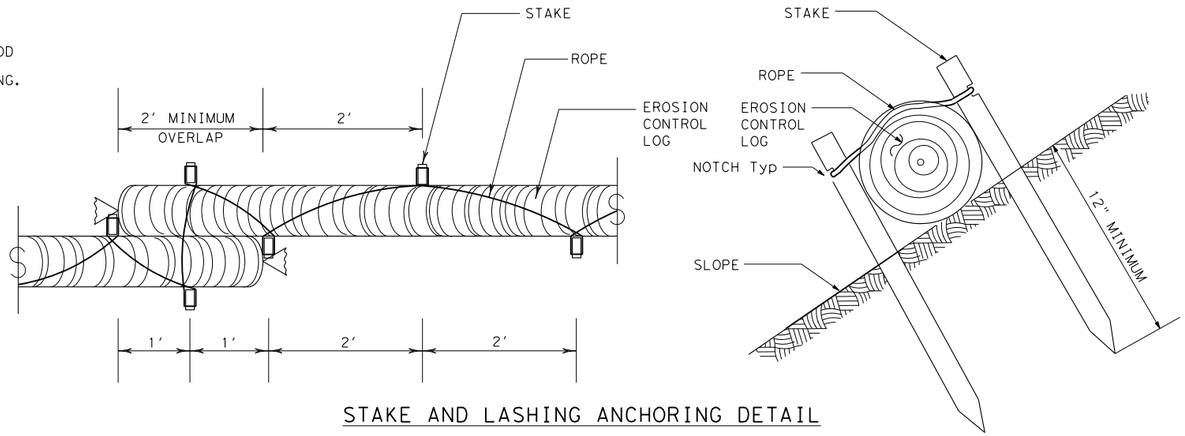
CL-SSL



STAKE AND TRENCHING ANCHORING DETAIL

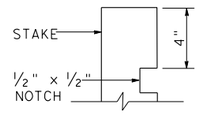
CL-SST

TRENCH DEPTH TABLE	
LOG DIAMETER	DEPTH
6"	2"
8"	3"
12"	4"
18"	5"



STAKE AND LASHING ANCHORING DETAIL

CL-SSL



STAKE NOTCH DETAIL

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TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

EC(9)-16

FILE: ec116	DN: TxDOT	CK: KM	DW: LS/PT	CK: LS
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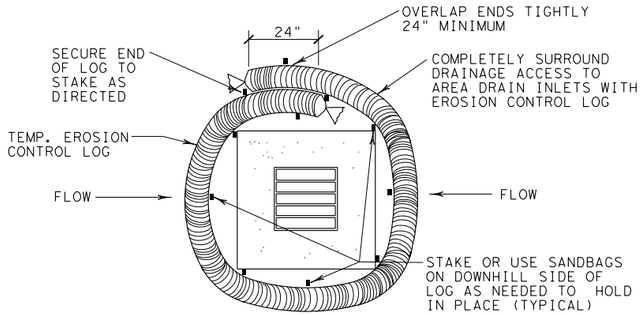
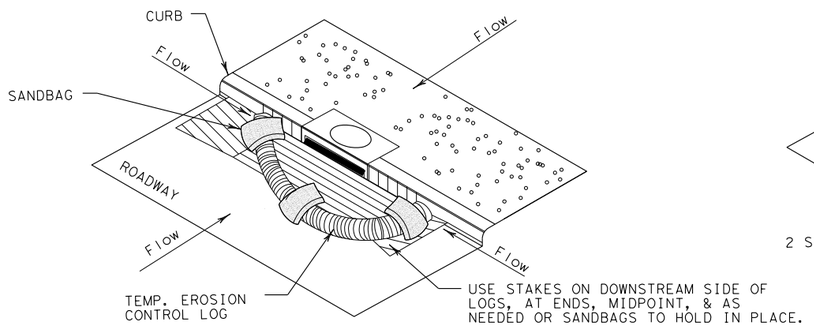
	BWD	SAN SABA		191

DATE: 11/22/2022
FILE: pw://server.slg-eng.com:Slg-ds/Documents/TxDOT0103 Brownwood SH 16/Design_Data/4 - Design/Plan_Set_1/09. Environmental/Standards/ec916_3.dgn



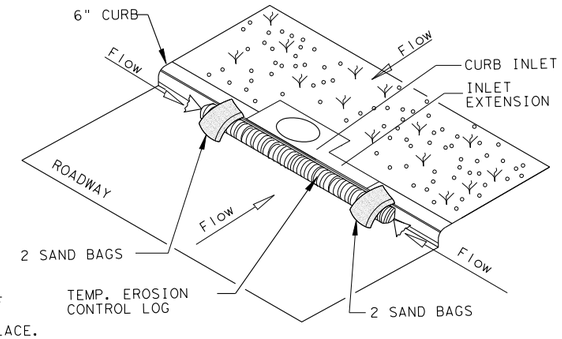
EROSION CONTROL LOG AT DROP INLET

CL-DI



EROSION CONTROL LOG AT CURB INLET

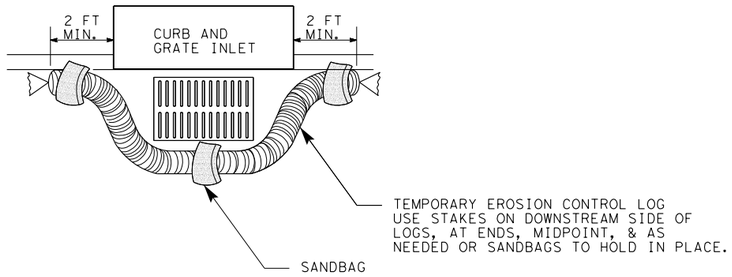
CL-CI



EROSION CONTROL LOG AT CURB INLET

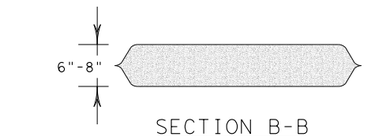
CL-CI

NOTE:
EROSION CONTROL LOGS USED AT CURB INLETS SHOULD ONLY BE USED IF THEY WILL NOT IMPEDE TRAFFIC OR FLOOD THE ROADWAY OR WHEN THE STORM SEWER SYSTEM IS NOT FULLY FUNCTIONAL.

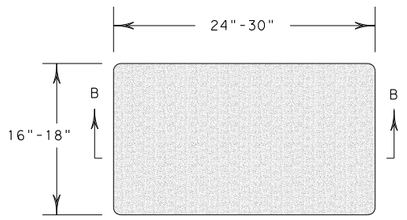


EROSION CONTROL LOG AT CURB & GRADE INLET

CL-GI



SECTION B-B



SANDBAG DETAIL

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

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	BWD	SAN SABA					192