STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

FEDERAL AID PROJECT NO.			
F 2023(378)			
CONT	SECT	JOB	HIGHWAY
3469	01	014	FM 3099
DIST	COUNTY		SHEET NO.
BWD	STEPHENS		1

REGISTERED ACCESSIBILITY SPECIALIST (RAS)
INSPECTION REQUIRED
RAS NO. 1184

FUNCTIONAL CLASSIFICATION = MAJOR COLLECTOR
DESIGN SPEED = 50 MPH
A.D.T. (2018) = 969
A.D.T. (2038) = 1,163

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

FEDERAL PROJECT NO. F 2023(378)

STEPHENS COUNTY
FM 3099

FOR THE CONSTRUCTION OF HAZARD ELIMINATION CONSISTING OF REALIGN INTERSECTION

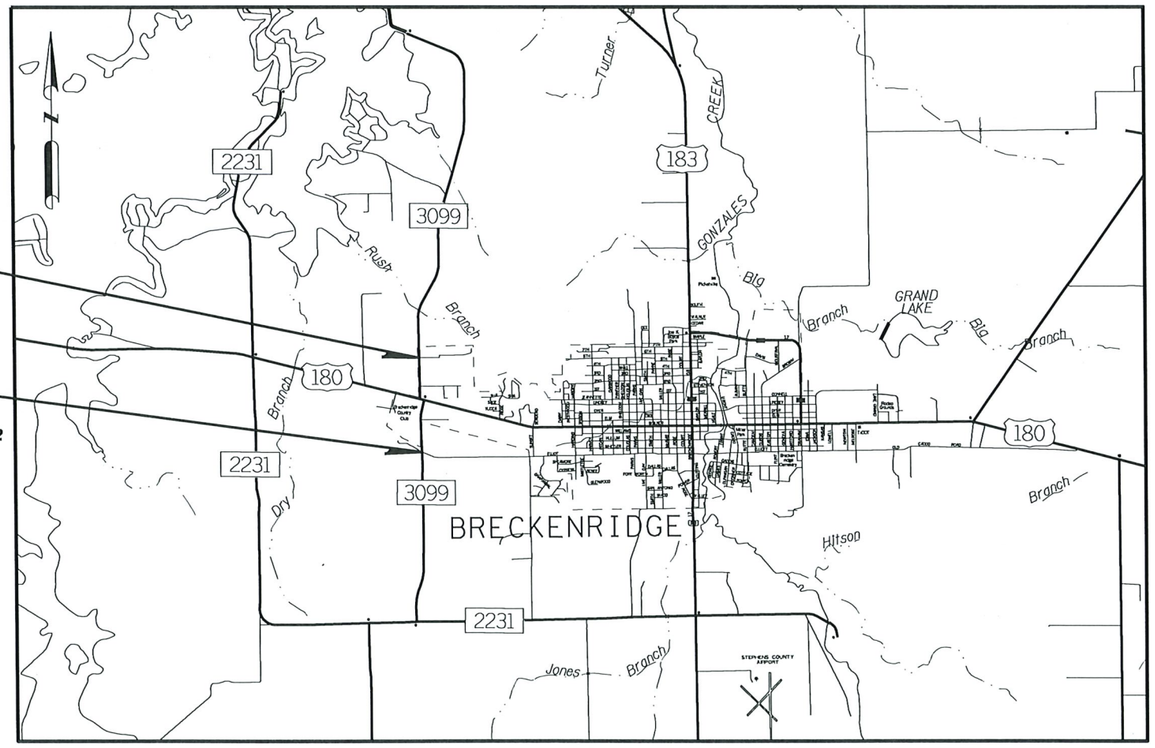
LIMITS: FROM NEAR NORTHGLEN RD. TO 0.2 MILES SOUTH OF US 180

INDEX OF SHEETS

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

_____ _____ 20____
AREA ENGINEER

3469-01-014 NET LENGTH OF ROADWAY= 3,028.90 FT =0.574 MI
NET LENGTH OF BRIDGE = 26.10 FT =0.005 MI
NET LENGTH OF PROJECT= 3,055.00 FT =0.579 MI



SIGN BASES WILL BE SUPPLIED BY TxDOT, SEE GENERAL NOTES FOR ADDITIONAL INFORMATION.

SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, NOVEMBER 1, 2014 AND SPECIFICATION ITEMS LISTED AND DATED AS FOLLOWS, SHALL GOVERN ON THIS PROJECT: REQUIRED CONTRACT PROVISIONS FOR ALL FEDERAL-AID CONTRUCTION CONTRACTS (FORM FHWA 1273, JULY 2022).

NO EXCEPTIONS
NO EQUATIONS
NO RAILROAD CROSSINGS

FINAL PLANS

LETTING DATE: _____

DATE CONTRACTOR BEGAN WORK: _____

DATE WORK WAS COMPLETED & ACCEPTED: _____

FINAL CONTRACT COST: $ _____

CONTRACTOR : _____

REQUIRED SIGNS SHALL BE IN ACCORDANCE WITH BC (1)- 21 THRU BC (12)- 21 AND THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES".

TDLR INSPECTION REQUIRED

TDLR PROJECT #: _____

11/02/2022

MAYOR, CITY OF BRECKENRIDGE

Texas Department of Transportation®

SUBMITTED FOR LETTING: 11/29/2022

DocuSigned by:
J H Stott, P.E.
77D14777834646F...
DISTRICT DESIGN ENGINEER

RECOMMENDED FOR LETTING: 11/29/2022

DocuSigned by:
J H Stott, P.E.
77D14777834646F...
DISTRICT DIRECTOR OF TRANSPORTATION PLANNING AND DEVELOPMENT

RECOMMENDED FOR LETTING: 11/30/2022

DocuSigned by:
Elias H. Rmeili
BB9FD402431A43...
DISTRICT ENGINEER

STATE OF TEXAS
CHUN-HOI WONG
87943
LICENSED PROFESSIONAL ENGINEER

10/28/2022

IEA
1225 NORTH LOOP WEST
SUITE 320
HOUSTON, TEXAS 77008
(832-494-3800)

Firm Registration No. F-10161

DATE: 10/27/2022 9:20:10 AM
FILE: T:\BWDSGTEAM_Design Projects\Culverts - Maintenance\Culvert Maintenance\BCS\06.04.01 General\001_2079G TITLE_SHT.dgn

FINAL SUBMITTAL

$USER$
OFFICE:IEA OFFICE:HOUSTON
PROJECT # 20796 TxDOT FM 3099

INDEX OF SHEETS

*** THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ABOVE WITH A TRIPLE ASTERISK SIGN (***) HAVE BEEN SELECTED BY ME, OR UNDER MY RESPONSIBLE SUPERVISION AS BEING APPLICABLE TO THIS PROJECT.

STATE OF TEXAS
JUAN SEBASTIAN HERNANDEZ
131592
LICENSED PROFESSIONAL ENGINEER

** THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ABOVE WITH A DOUBLE ASTERISK SIGN (**) HAVE BEEN SELECTED BY ME, OR UNDER MY RESPONSIBLE SUPERVISION AS BEING APPLICABLE TO THIS PROJECT.

JUAN SEBASTIAN HERNANDEZ, P.E. — 10/27/2022 DATE

STATE OF TEXAS
JORDAN HASLER
137316
LICENSED PROFESSIONAL ENGINEER

* THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ABOVE WITH AN ASTERISK SIGN (*) HAVE BEEN SELECTED BY ME, OR UNDER MY RESPONSIBLE SUPERVISION AS BEING APPLICABLE TO THIS PROJECT.

JORDAN HASLER, P.E. — 10/27/2022 DATE

NO.	REVISION	BY	DATE

STATE OF TEXAS
CHUN-HOI WONG
87943
LICENSED PROFESSIONAL ENGINEER
10/28/2022

IEA
1225 North Loop West
SUITE 320
HOUSTON, TEXAS 77008
(832) 494-3800
Firm Registration No. F-10161

FM 3099 REALIGNMENT

INDEX OF SHEETS

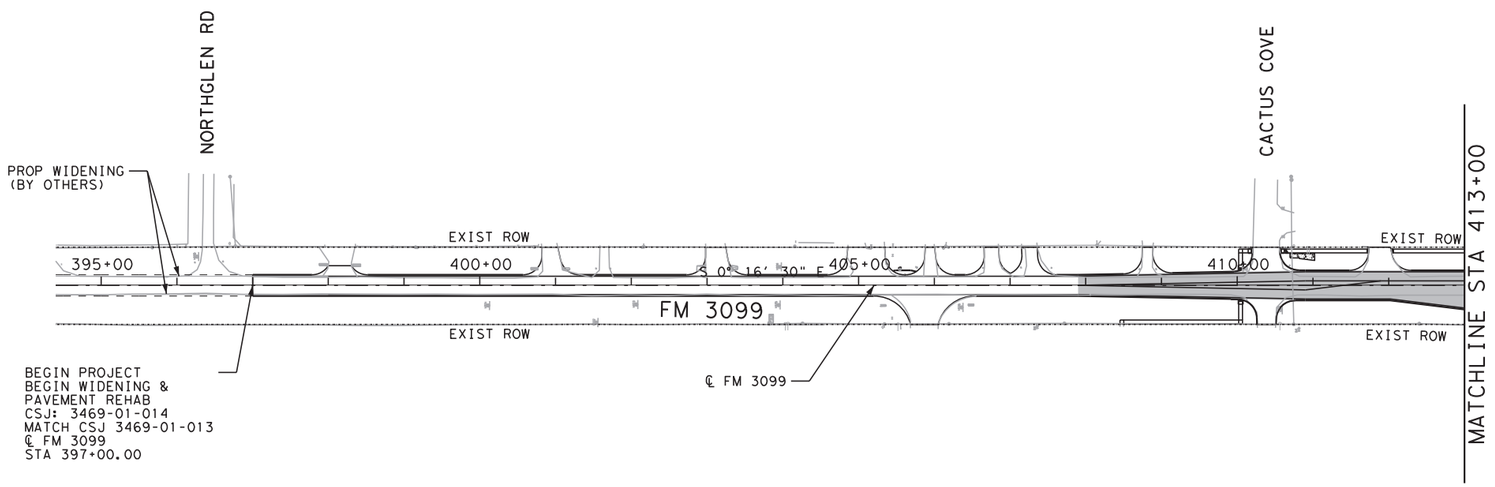
SHEET 1 OF 1

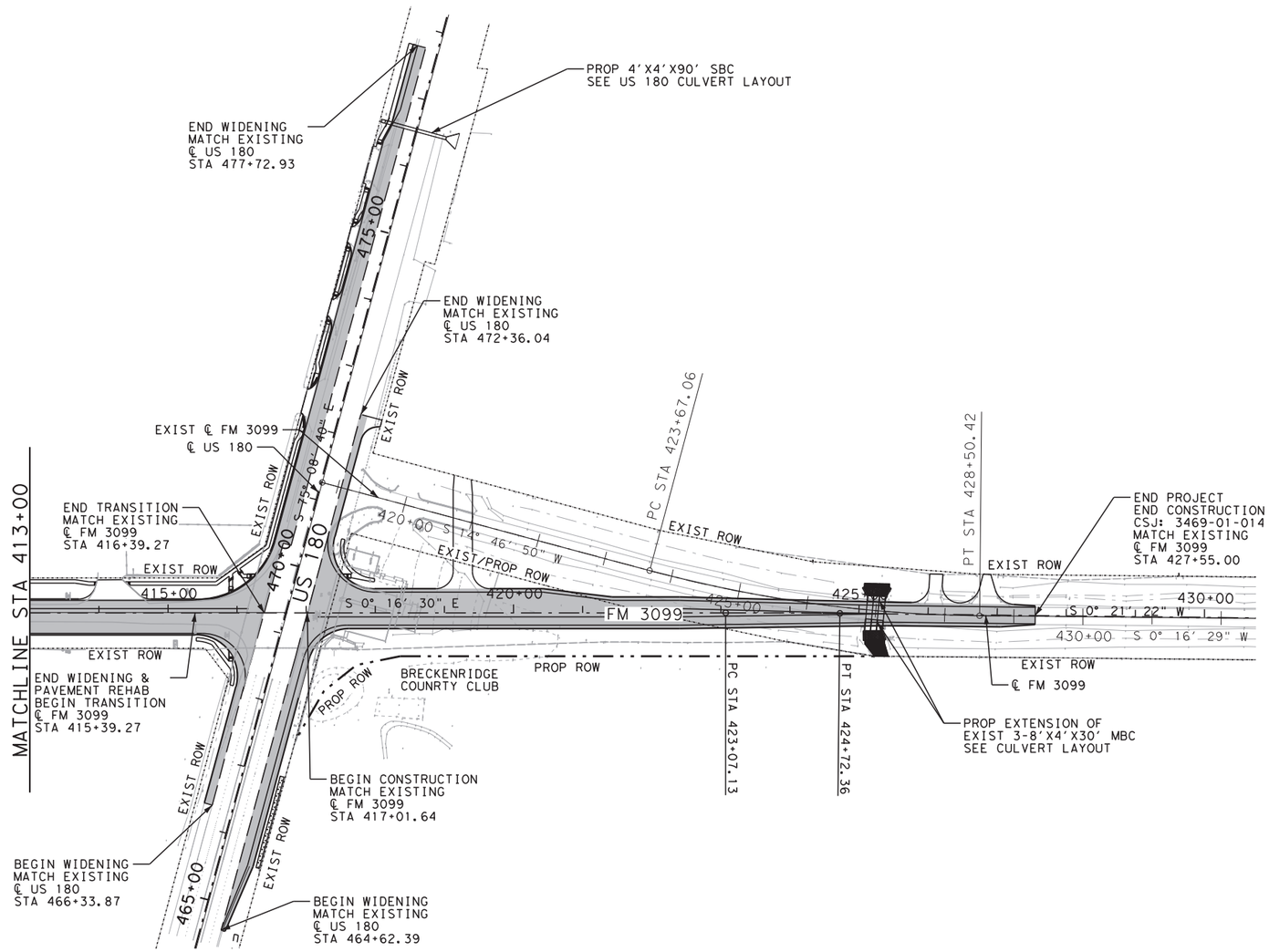
FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
6	SEE TITLE SHEET		2
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

DATE:10/26/2022 TIME:8:02:55 AM
FILE:$FILEL$

TIME:8:02:55 AM FILE:$FILES$

FINAL SUBMITTAL





LEGEND

- LIMITS OF FULL CONSTRUCTION
- EXIST ROW - RIGHT OF WAY
- PROPOSED ROW - RIGHT OF WAY
- SAWCUT

0 100 200 400

SCALE: 1"=200'

NO.	REVISION	BY	DATE

JORDAN HASLER
137316
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS

8/27/2021

IEA
1225 North Loop West
SUITE 320
HOUSTON, TEXAS 77008
(832) 494-3800
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Texas Department of Transportation®

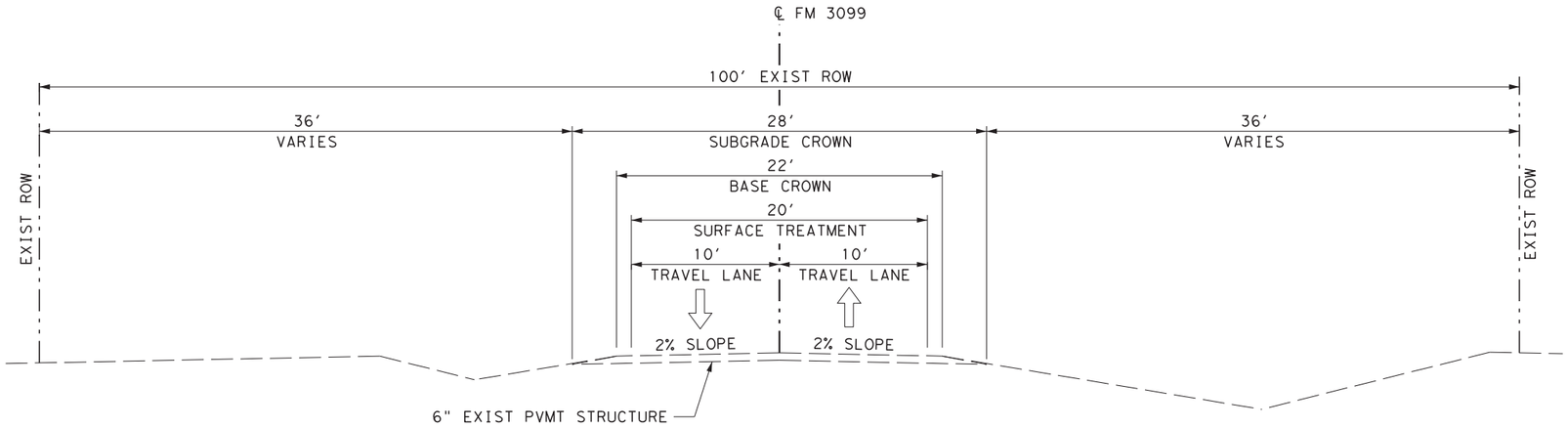
FM 3099 REALIGNMENT

PROJECT LAYOUT

SHEET 1 OF 1

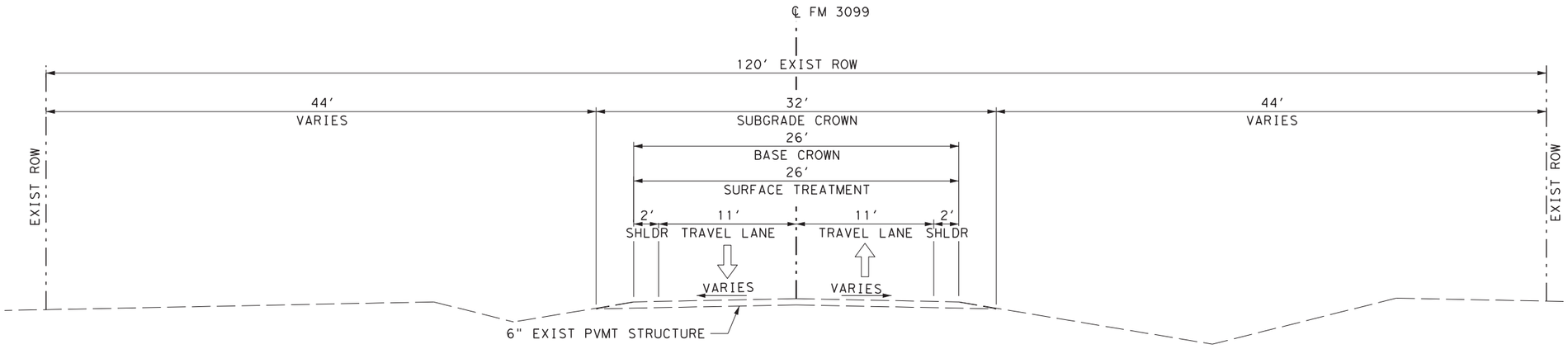
FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
6	SEE TITLE SHEET		3
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014,	FM 3099

FINAL SUBMITTAL



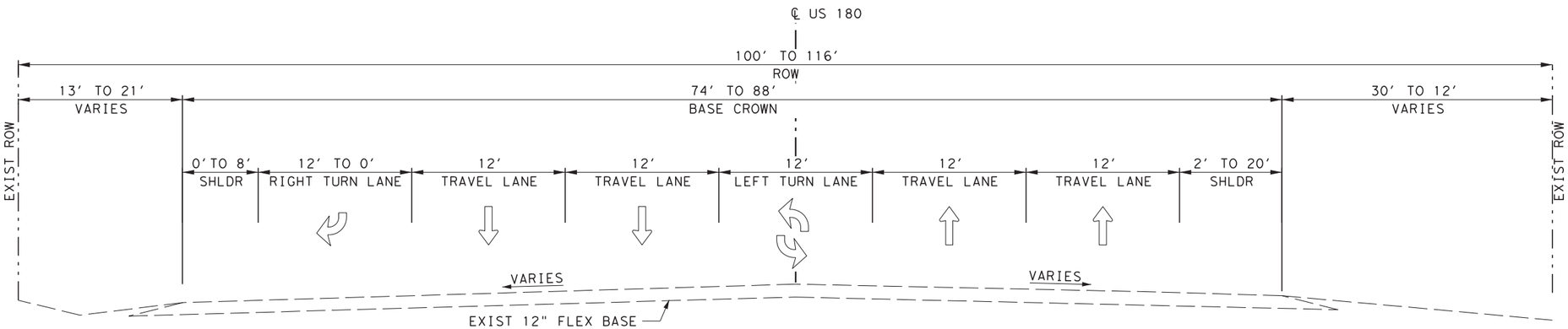
FM 3099 EXIST TYPICAL SECTION

(STA 397+00.00 TO STA 416+39.27)



FM 3099 EXIST TYPICAL SECTION

(STA 417+01.64 TO STA 427+55.00)



US 180 EXIST TYPICAL SECTION

(STA 464+62.39 TO STA 477+72.93

NOT TO SCALE

NO.	REVISION	BY	DATE

STATE OF TEXAS
JORDAN HASLER
137316
LICENSED PROFESSIONAL ENGINEER

8/27/2021

IEA
1225 North Loop West
SUITE 320
HOUSTON, TEXAS 77008
(832) 494-3800
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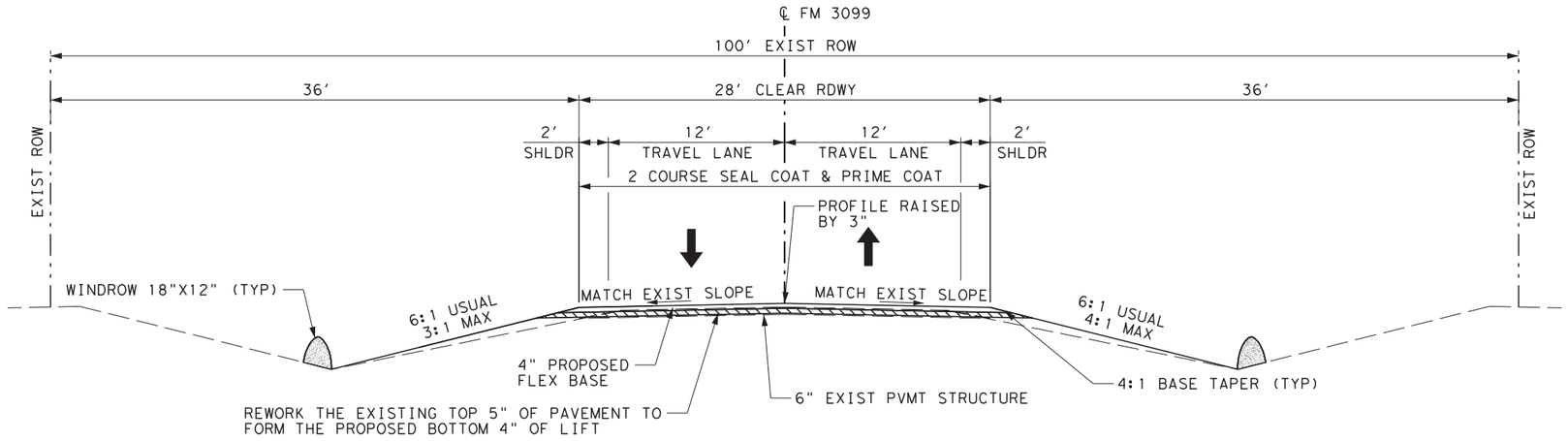
FM 3099 REALIGNMENT

EXIST TYPICAL SECTIONS

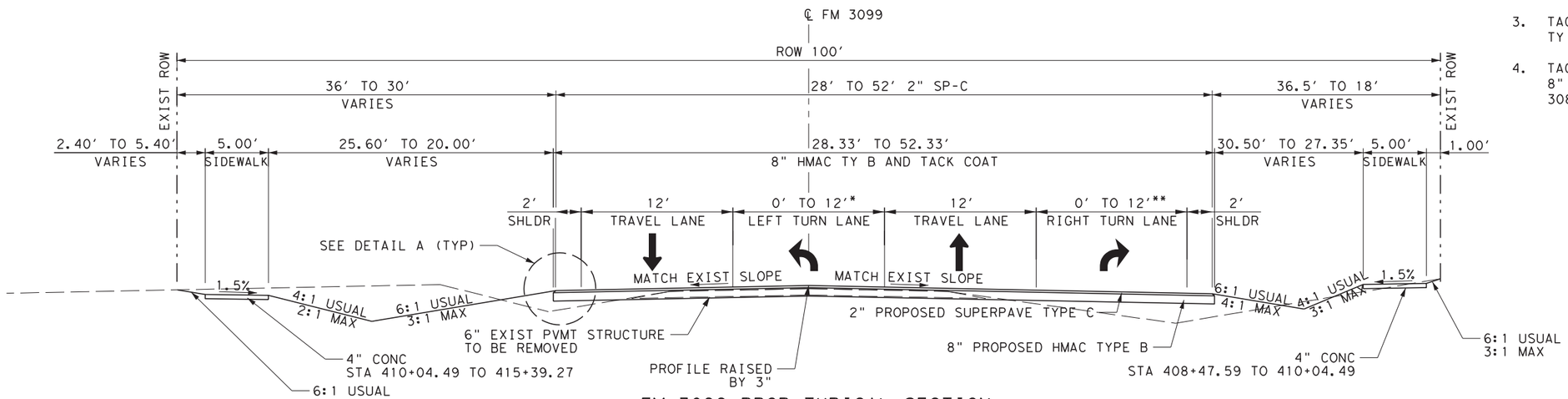
SHEET 1 OF 1

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
6	SEE TITLE SHEET		4
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

FINAL SUBMITTAL

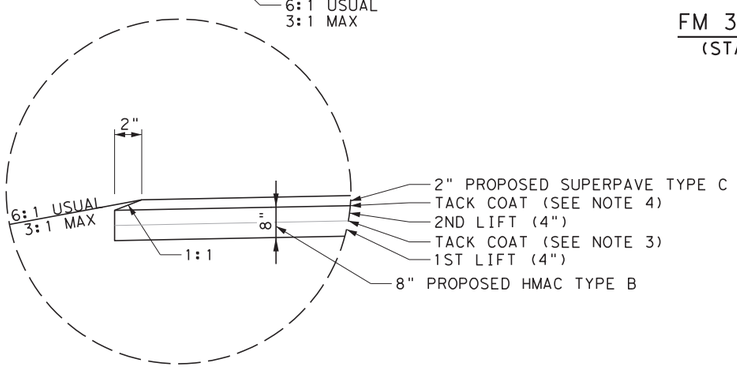


FM 3099 PROP TYPICAL SECTION
(STA 397+00.00 TO STA 407+89.86)

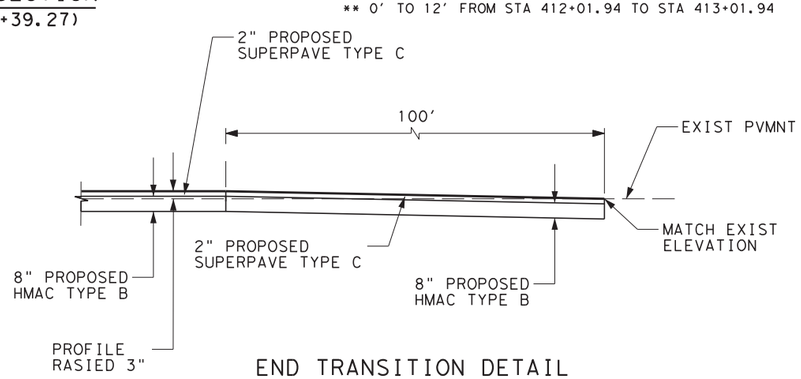


FM 3099 PROP TYPICAL SECTION
(STA 407+89.86 TO STA 415+39.27)

* 0' TO 12' FROM STA 407+89.86 TO STA 410+89.86
** 0' TO 12' FROM STA 412+01.94 TO STA 413+01.94



DETAIL A



END TRANSITION DETAIL
STA 415+39.27 TO STA 416+39.27

NOTES:

1. SEE ROADWAY PLAN AND PROFILE FOR CROSS SLOPE TRANSITION INFORMATION.
2. SEE INTERSECTION LAYOUT FOR TURNING RADII AND PROPOSED CORNER CLIP AT INTERSECTION OF SOUTHWEST QUADRANT.
3. TACK COAT PLACED BETWEEN LIFTS OF HMAC TY B TO BE PAID UNDER ITEM 3076 6066.
4. TACK COAT PLACED BETWEEN 2" SP-C AND 8" HMAC TY B TO BE PAID UNDER ITEM 3084 6001.

NOT TO SCALE

NO.	REVISION	BY	DATE

JORDAN HASLER
137316
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS

8/27/2021

IEA
1225 North Loop West
SUITE 320
HOUSTON, TEXAS 77008
(832) 494-3800
Firm Registration No. F-10161

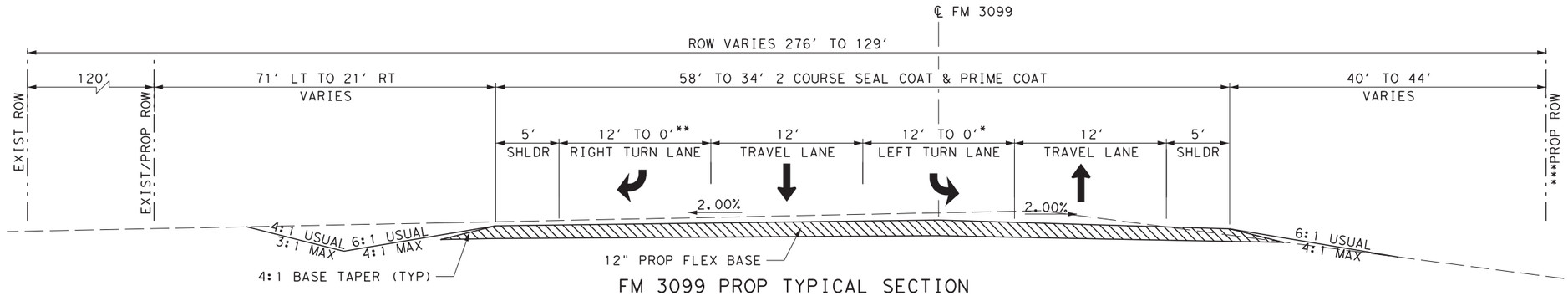
FM 3099 REALIGNMENT

PROPOSED
TYPICAL SECTIONS

SHEET 1 OF 4

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
6	SEE TITLE SHEET		5
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

FINAL SUBMITTAL



FM 3099 PROP TYPICAL SECTION

(STA 417+01.64 TO STA 425+40.16)

* 12' TO 0' FROM STA 422+40.16 TO STA 425+40.16
** 12' TO 0' FROM STA 420+42.91 TO STA 421+42.91

*** SEE ROADWAY PLAN FOR PROPOSED ROW LIMITS

NOTES:

1. SEE ROADWAY PLAN AND PROFILE FOR CROSS SLOPE TRANSITION INFORMATION.
2. SEE INTERSECTION LAYOUT FOR TURNING RADII AND PROPOSED CORNER CLIP AT INTERSECTION OF SOUTHWEST QUADRANT.
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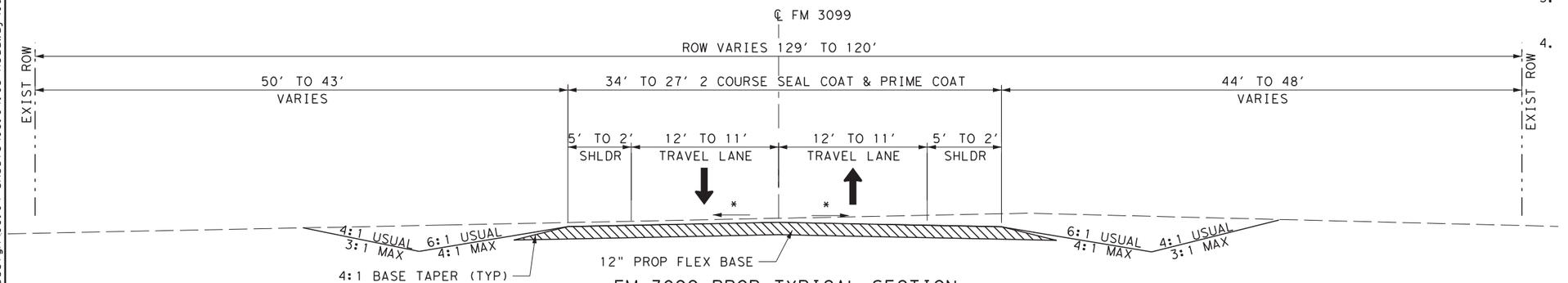


FM 3099 PROP TYPICAL SECTION

(STA 425+40.16 TO STA 427+55.00)

* SEE ROADWAY PLAN AND PROFILE SHEETS FOR CROSS SLOPE INFORMATION

NOT TO SCALE

NO.	REVISION	BY	DATE

STATE OF TEXAS
JORDAN HASLER
137316
LICENSED PROFESSIONAL ENGINEER

8/27/2021

IEA
1225 North Loop West
SUITE 320
HOUSTON, TEXAS 77008
(832) 494-3800
Firm Registration No. F-10161

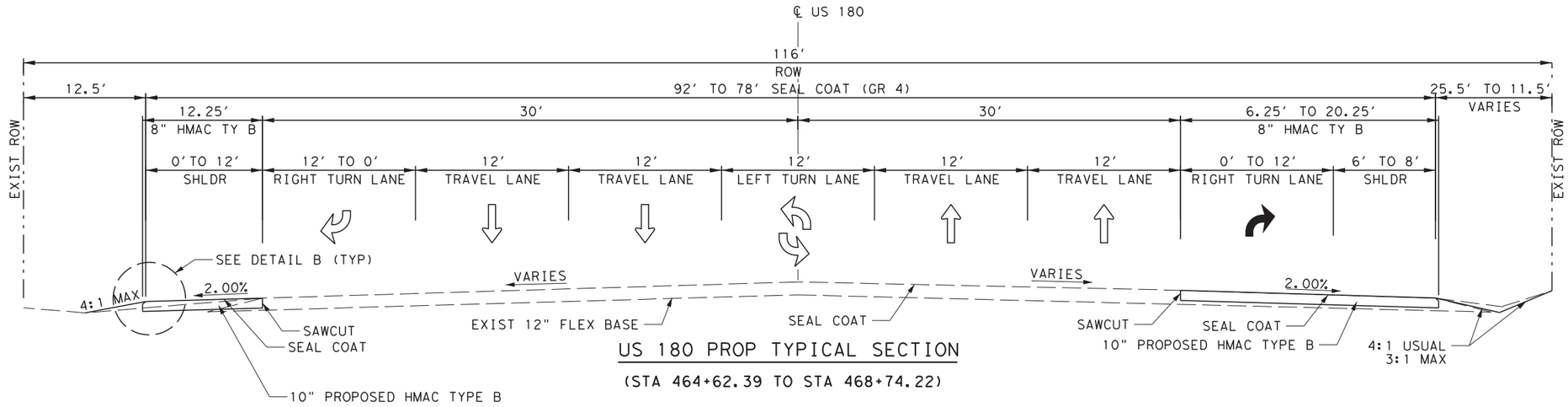
FM 3099 REALIGNMENT

PROPOSED
TYPICAL SECTIONS

SHEET 2 OF 4

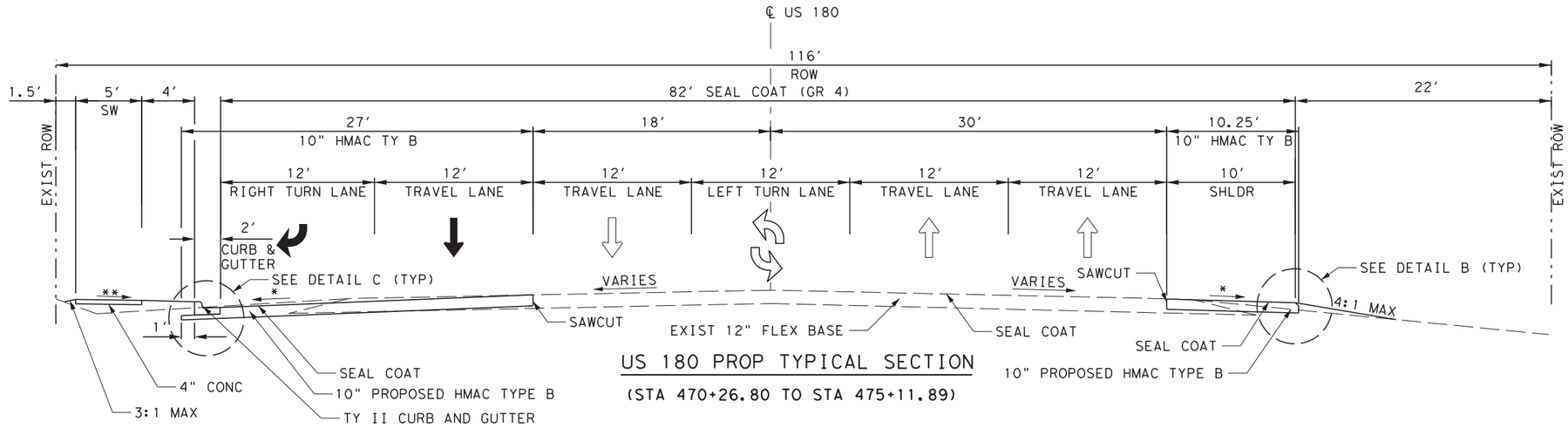
FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
6	SEE TITLE SHEET		6
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

FINAL SUBMITTAL



US 180 PROP TYPICAL SECTION

(STA 464+62.39 TO STA 468+74.22)

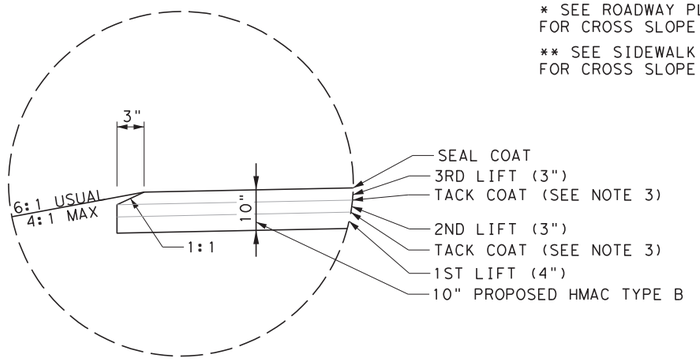


US 180 PROP TYPICAL SECTION

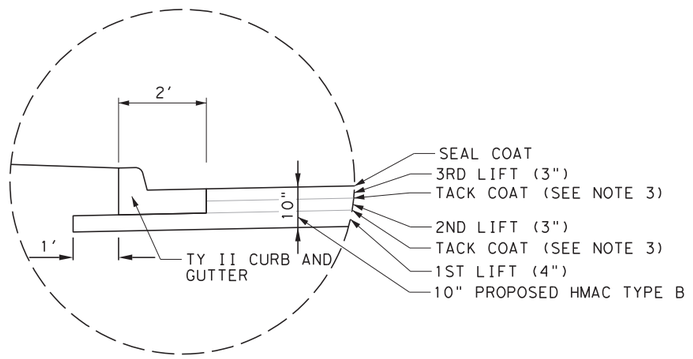
(STA 470+26.80 TO STA 475+11.89)

* SEE ROADWAY PLAN AND PROFILE SHEETS FOR CROSS SLOPE INFORMATION

** SEE SIDEWALK PLAN AND PROFILE SHEETS FOR CROSS SLOPE INFORMATION



DETAIL B



DETAIL C

NOTES:

1. SEE ROADWAY PLAN AND PROFILE FOR CROSS SLOPE TRANSITION INFORMATION.
2. SEE INTERSECTION LAYOUT FOR TURNING RADII AND PROPOSED CORNER CLIP AT INTERSECTION OF SOUTHWEST QUADRANT.
3. TACK COAT PLACED BETWEEN LIFTS OF HMAC TY B TO BE PAID UNDER ITEM 3076 6066.
4. TACK COAT PLACED BETWEEN 2" SP-C AND 8" HMAC TY B TO BE PAID UNDER ITEM 3084 6001.

NOT TO SCALE

NO.	REVISION	BY	DATE

STATE OF TEXAS
JORDAN HASLER
137316
LICENSED PROFESSIONAL ENGINEER

8/27/2021

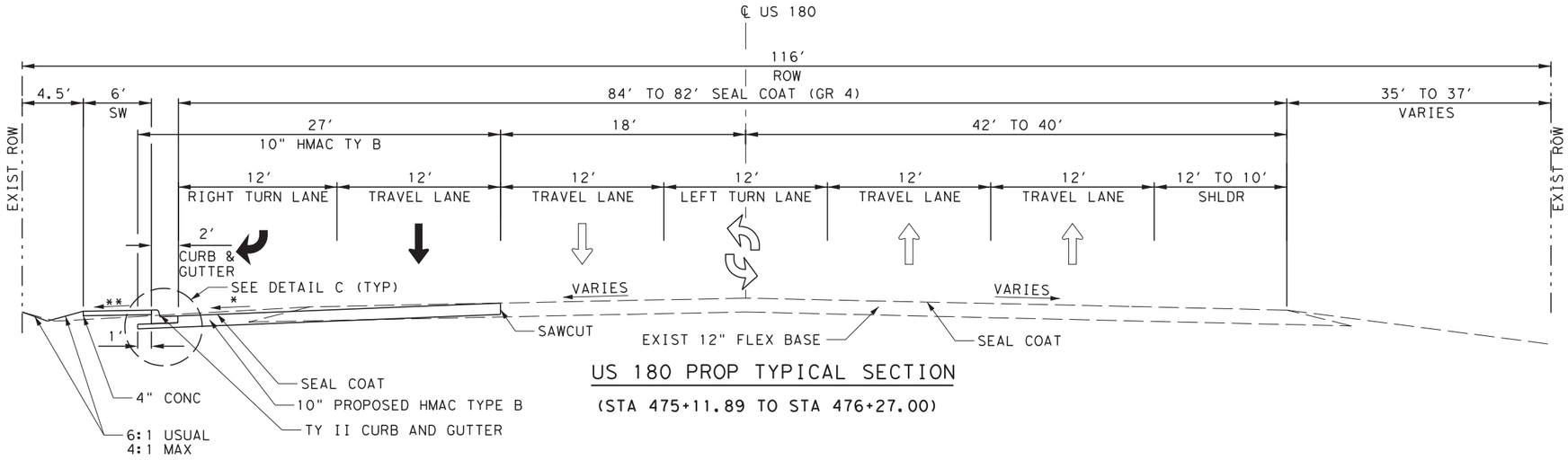
IEA
1225 North Loop West
SUITE 320
HOUSTON, TEXAS 77008
(832) 494-3800
Firm Registration No. F-10161

FM 3099 REALIGNMENT

PROPOSED
TYPICAL SECTIONS

SHEET 3 OF 4

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
6	SEE TITLE SHEET		7
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

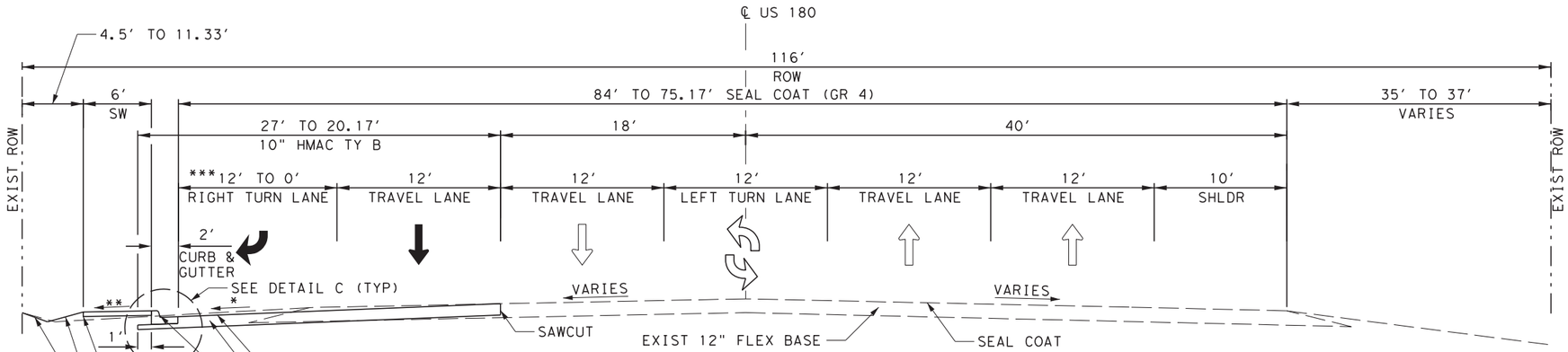


US 180 PROP TYPICAL SECTION

(STA 475+11.89 TO STA 476+27.00)

* SEE ROADWAY PLAN AND PROFILE SHEETS FOR CROSS SLOPE INFORMATION

** SEE SIDEWALK PLAN AND PROFILE SHEETS FOR CROSS SLOPE INFORMATION



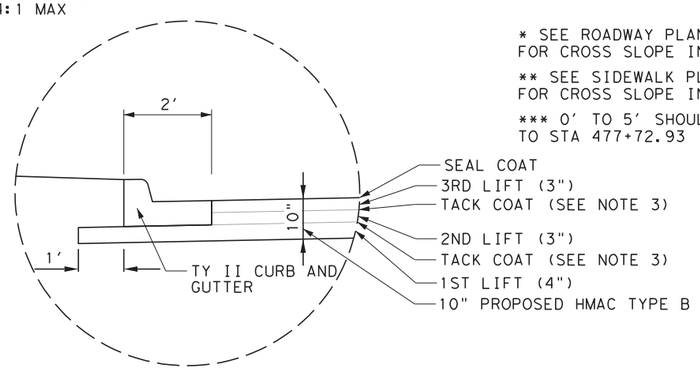
US 180 PROP TYPICAL SECTION

(STA 476+27.00 TO STA 477+72.93)

* SEE ROADWAY PLAN AND PROFILE SHEETS FOR CROSS SLOPE INFORMATION

** SEE SIDEWALK PLAN AND PROFILE SHEETS FOR CROSS SLOPE INFORMATION

*** 0′ TO 5′ SHOULDER FROM STA 476+55.47 TO STA 477+72.93



DETAIL C

NOTES:

1. SEE ROADWAY PLAN AND PROFILE FOR CROSS SLOPE TRANSITION INFORMATION.
2. SEE INTERSECTION LAYOUT FOR TURNING RADII AND PROPOSED CORNER CLIP AT INTERSECTION OF SOUTHWEST QUADRANT.
3. TACK COAT PLACED BETWEEN LIFTS OF HMAC TY B TO BE PAID UNDER ITEM 3076 6066.
4. TACK COAT PLACED BETWEEN 2" SP-C AND 8" HMAC TY B TO BE PAID UNDER ITEM 3084 6001.

NOT TO SCALE

NO.	REVISION	BY	DATE

8/27/2021

IEA
1225 North Loop West
SUITE 320
HOUSTON, TEXAS 77008
(832) 494-3800
Firm Registration No. F-10161

Texas Department of Transportation®

FM 3099 REALIGNMENT

PROPOSED TYPICAL SECTIONS

SHEET 4 OF 4

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.	SHEET
6	SEE TITLE SHEET	8

STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014,	FM 3099

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	30	3
247	FI 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 (RC-250)	Prime	9,159	406*
316	Aggr (TY-B GR-5)(SAC-B)	Prime	9,159	406*
316	Asph (AC-20-5TR)	1st	21,431	406*
316	Aggr (TY-PB GR-4)(SAC-B)	1st	21,431	406*
316	Asph (AC-20-5TR)	2nd	9,160	406*
316	Aggr (TY-PB GR-4)(SAC-B)	2nd	9,160	406*
3076	D-GR HMA TY-B PG64-22	8" Section	4,615	
3076	D-GR HMA TY-B PG64-22	10" Section	3,255	
3077	SUPERPAVE MIXTURES SP-C SAC-B PG 70-22	Final Lift	4,573	

* Subsidiary to Item 508

Basis of Estimate

Item	Description	Course	Rate	SY	Quantity
310	Asph (RC-250)	Prime	0.22 Gal/SY	9,159	2,015 Gal
316	Aggr (TY-B GR-5)(SAC-B)	Prime	125 SY/CY	9,159	73 CY
316	Asph (AC-20-5TR)	1st	0.42 Gal/SY	21,431	9,001 Gal
316	Aggr (TY-PB GR-4)(SAC-B)	1st	120 SY/CY	21,431	179 CY
316	Asph (AC-20-5TR)	2nd	0.42 Gal/SY	9,160	3,847 Gal
316	Aggr (TY-PB GR-4)(SAC-B)	2nd	120 SY/CY	9,160	77 CY
3076	D-GR HMA TY-B PG64-22	8" Section	110 lbs/sy/in	4,615	2,031 TONS
3076	D-GR HMA TY-B PG64-22	10" Section	110 lbs/sy/in	3,255	1,790 TONS
3077	SUPERPAVE MIXTURES SP-C PG 76-22	Final Lift	113 lbs/sy/in	4,573	517 TONS

County: Stephens **Sheet** 9

Highway: FM 3099 **Control:** 3469-01-014

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.

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
Jordan Perry, P.E..	Jordan.perry@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.

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 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.

ITEM 5 CONTROL OF WORK

The responsibility for the construction surveying on this contract will be in accordance with Section 5.9.1. “Method B”.

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

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.

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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.

Hazardous Materials

Any soil excavated from the project area identified as a red polygon on Figure 1 in Environmental General Notes sheet of plans is suitable for reuse within the right-of-way (ROW) within project area. Any soil excavated from the indicated area that is planned to be removed and relocated away from the ROW should be properly characterized and profiled to allow disposal at an appropriately selected landfill. Impacted soil to be removed from the ROW should be segregated from non-impacted soil and stockpiled in a designated and defined area to await loading and transport. Impacted soil should be placed on plastic sheeting and covered with plastic sheeting to prevent contact with rainfall and potential runoff. Prior to off-site disposal, impacted soil must be properly characterized as directed by selected landfill.

Figure 1 indicates location of area of concern within project. Soil disturbed during construction activities shall be handled according to the above recommendations.

The 1991 Limited Subsurface Investigation Report and the 1998 Assessment Report Form for the site are available for review upon request at the Eastland Area Office, 254-629-6310, 906 E. Main Street, Eastland, TX 76448.

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---004** (120 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 traffic signals, luminaires, and 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.

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. Preform 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.

The removal of existing and temporary fence will not be paid for directly but will be considered subsidiary to Item 100 “Preparing Right Of Way”.

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.

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“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 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.

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 will be required for each traffic lane (travel lanes, center turn lanes, right-hand/left-hand turn lanes, deceleration lanes, acceleration lanes, etc.) throughout the entire project and is estimated at 19 hours.

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.

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.

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 be 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.

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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.

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 334 HOT-MIX COLD-LAID ASPHALT CONCRETE PAVEMENT

100 tons of hot-mix cold-laid asphalt concrete pavement is estimated for this project and will be used as directed by the Engineer.

ITEM 401 FLOWABLE BACKFILL

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

ITEM 420 CONCRETE SUBSTRUCTURES

Culverts will be constructed in conjunction with roadway construction phasing, unless otherwise directed by the Engineer.

All Class C Concrete has been measured for plan quantity payment.

No. 6 dowels by three feet (3') long placed on one foot (1') spacing will be required at interior walls for all multiple box culvert extensions. All materials, tools, labor, equipment and incidentals necessary to complete this work will not be paid for directly but will be subsidiary to Item 420 "Concrete Substructures".

Unless otherwise shown on the plans, all culvert extensions and safety end treatments will conform to the existing culvert slope

ITEM 421 HYDRAULIC CEMENT CONCRETE

Furnish dome lids with 4” x 8” cylinder test molds.

Strength testing equipment is not required for Contract controlling test.

ITEM 422 CONCRETE SUPERSTRUCTURES

Transverse saw-cut grooves will be required in the bridge deck and will not be paid for directly but will be considered subsidiary to the various bridge items

ITEM 427 SURFACE FINISHES FOR CONCRETE

Surface Area II will receive a rub finish.

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.

Provide fiber reinforced concrete for slip formed cable median barrier mow strip.

Meet the following requirements when using fiber reinforcement:

- Use Class A Concrete for riprap.
- Use an approved method that ensure adequate concrete consolidation. Sprinkle and consolidate the subgrade before the concrete is placed. Finish the surface with wood float or broom finish as approved. Immediately after finishing operation, cure the riprap according to Item 420 “Concrete Structures”.
- Reinforce with fibers made from 100% virgin homopolymer graded, fibrillated polypropylene fibers, containing no reprocessed olefin materials, conforming to ASTM C1116 Types I and III. The polypropylene fibers will be of a multi-length gradation, with no fibers over 2” in length, alkai-resistant and absorptive. Minimum dosage will be 3 lbs/cubic yard of concrete. The minimum average residual strength is 80 psi, per ASTM C13989. Provide evidence of material performance in concrete.

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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 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.

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 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.

Erosion Control Logs Dam (CL-D) shall have stakes placed upstream in an alternating pattern of the downstream stakes as shown for CL-SST or CL-SSL details on the Erosion Control Standards.

ITEM 508 CONSTRUCTING DETOURS

Temporary detour section shall be a minimum of 8" flexible base with prime coat and a one course surface treatment. See plans for additional detail.

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

Density Control testing is waived for the detour construction.

ITEM 529 CONCRETE CURB, GUTTER, AND COMBINED CURB AND GUTTER

Reinforcing steel will be required in all curb and gutter.

Construct tooled joints every 8' corresponding to the joints in the sidewalk where applicable or as directed by the Engineer.

Construct expansion joints to correspond to the sidewalk or as directed by the Engineer.

ITEM 530 INTERSECTIONS, DRIVEWAYS, AND TURNOUTS

Only two adjacent intersections may be closed at a time unless otherwise approved by the Engineer.

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.

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ITEM 531 SIDEWALKS

Expansion joints will be either Redwood timber boards or asphalt board, minimum one-half inch (1/2") thickness. Contractor will choose one joint material for use throughout the project.

Fiber board will be required around existing features such as signs, fireplugs, utility poles, etc. as directed by the Engineer. When existing features are in the proposed sidewalk area, provide a four foot (4') minimum pathway.

Any excavation/embankment necessary for establishing new ramps to proper grade will be considered subsidiary to the various bid items.

The Contractor will be required to use orange pedestrian safety barriers to protect excavated areas as directed by the Engineer.

Unless otherwise shown in the plans, reinforcement will be #4 bars on eighteen inch (18") centers or equivalent.

Fiber reinforced concrete will not be used for sidewalk on this project.

Sidewalks will be saw cut one third the depth of concrete or marked every 4 feet in length, by the use of an approved jointing tool. These joints shall correspond to the joints in the curb & gutter where applicable.

Sidewalks that are adjacent to other concrete areas will be poured separately to ensure compliant cross slope on the walking path.

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.

Mailboxes that create a protrusion of more than 4" into the pedestrian circulation path will have an additional curb or foundation at the bottom to provide a maximum 4" overhang. This work 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 600 ELECTRIC GENERAL

Electrical materials, wiring, and fittings not covered by the plans and specifications for this project will conform to the requirements of the current edition of the National Electrical Code as published by the National Fire Protection Association.

Contractor will maintain signals through construction with the exception of camera detection. Contractor will notify the District Director of Operations at 325-643-0417, 48 hours prior to beginning any electrical related work items and 48 hours prior to traffic switch so the district signal personnel can adjust the camera detection.

Electrical Contractor, Signal Shop personnel and Project Inspector will conduct a 'Tool Box' meeting to discuss upcoming electrical work.

All materials will be from the pre-qualified material producer list, "Roadway Illumination and Electrical Supplies" located on the TxDOT website. Electrical submittals will be required for all materials not on the pre-qualified list.

All electrical submittals will be forwarded to District Director of Operations (325-643-0417). No electrical work will be performed prior to approval of electrical materials.

ITEM 610 ROADWAY ILLUMINATION ASSEMBLIES

All luminaire poles will be steel.

For both transformer and shoe-base type illumination poles, provide double-pole breakaway fuse holder as shown on the Texas Department of Transportation (TxDOT)-Construction Division's (CST) material producers list. Category is "Roadway Illumination and Electrical Supplies". Fuse holder is shown on list under Items 610 & 620. Provide 10 amp time delay fuses.

For instructions on submitting shop drawings electronically go to TxDOT home page, Divisions (bottom left), Bridge, Shop Drawings, Electronic Submission of Shop Drawings, Guide to Electronic Shop Drawing Submittal.pdf or click on the following link:

http://ftp.dot.state.tx.us/pub/txdot-info/library/pubs/bus/bridge/e_submit_guide.pdf

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For project specific shop drawings, furnish drawings of the complete assembly in accordance with Item 441, "Steel Structures". Submit shop drawings electronically.

Pre-approved shop drawing manufacturers and assembly model numbers can be found on the Texas Department of Transportation(TxDOT) – Construction Division's(CST) material producer list. Category is "Roadway Illumination and Electrical Supplies."

Use 480 volt electronic LED drivers for luminaires on this project.

Provide 12 circuit Buchanan Type 112SN, Kulka Type 985-GP-10 CU, or equal terminal strip in the luminaire pole access compartment. The conductors for the line and load side of the terminal strip will be identified with a plastic label with two straps per tag. The load side will have each signal head and ped head identified on the tag.

Fabricate steel roadway illumination poles in accordance with TxDOT standards RIP (Roadway Illumination Poles -2011). Poles fabricated according to RIP require no shop drawings. Alternate designs to RIP or the use of aluminum to fabricate poles will require the submission of shop drawings electronically.

Limitations on Use of the RIP Standard

The Roadway Illumination Pole (RIP) standard details were developed for installations in locations where the 3-second gust basic maximum wind speed is 110 mph, and where the elevation of the base of the pole is less than (i.e. not more than) 25' above the elevation of surrounding terrain, in accordance with the "AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals," 4th Edition (2001) (AASHTO Design Specifications). For poles to be installed in regions where the maximum basic wind speed exceeds 110 mph or to be mounted more than 25' above the surrounding terrain, the contractor will provide poles meeting the following requirements:

- Submittals. Following the electronic shop drawing submittal process (see http://ftp.dot.state.tx.us/pub/txdot-info/library/pubs/bus/bridge/e_submit_guide.pdf) the contractor will submit to the Engineer, for approval, fabrication drawings and calculations for the poles. The drawings and calculations will be sealed by a Texas registered or licensed professional engineer (P.E.).

- Luminaire Structural Support Requirements. Lighting poles, arms, and anchor bolt assemblies will have a 25 year design life to safely resist dead loads, ice loads and the required basic wind speeds at the location of installation in accordance with the current edition of the AASHTO Design Specifications. For transformer base poles, the fabricator will include transformer base and connecting hardware in calculations and shop drawing submittals. All transformer bases will have been structurally tested to resist the theoretical plastic moment capacity of the pole. Certification of the plastic moment load test and FHWA breakaway requirement test of the model of base being furnished will be submitted with the shop drawings. Shop drawings will show breakaway base model number, and manufacturer's name and logo. Manufacturer's shop drawings will include the ASTM designations for all materials to be used.

ITEM 618 CONDUIT

All conduit will be SCH 80 PVC.

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.

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 620 ELECTRICAL CONDUCTORS

Labeling conductors with label maker is acceptable.

Grounding conductors that share the same conduit, junction box, ground box or structure will be bonded together at every accessible point in accordance with the National Electrical Code.

For Flashing Beacons (Item 685) and Ped poles (Item 687) within the project, provide single-pole breakaway disconnects. Use Bussman HEBW, Littlefuse LEB, Ferraz-Shawmut FEB, or equal on ungrounded conductors.

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For all grounded conductors use Bussman HET, Littlefuse LET, Ferraz-Shawmut FEBN, or equal. These breakaway connectors have a white colored marking and a permanently installed solid neutral.

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 628 ELECTRICAL SERVICE

Any service installed by others will comply with all TxDOT standards from weather-head to fixtures.

Coordinate setting up the electrical service with the Area Engineer to insure the meter is installed under the proper account name.

Photocell enclosed in pedestal services will be orientated in a northerly direction unless otherwise directed.

The Contractor will verify conductor slack length at the weather head with the utility provider. If the utility provider requires a conductor slack length that does not meet the requirements shown on ED(7) notify the Engineer immediately for a resolution.

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.

Triangular Slip Bases will be supplied by TxDOT. All other components of the sign assembly (stubs, posts, hardware, signs, etc.) will be supplied by the Contractor. The Contractor can acquire the bases at the Stephens County Maintenance office located at 1517 US Hwy 180 East, Breckenridge, Tx. Contact the Stephens County Maintenance Supervisor (Jeremy Robinson) at (254) 559-8203 for further information.

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 656 FOUNDATIONS FOR TRAFFIC CONTROL DEVICES

Drilled shaft foundations for electrical use will be grounded using an 8' ground rod unless otherwise specified.

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.

TY II Paint will be allowed for non-removable work zone pavement markings.

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.

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

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Crosswalks will be 24 inch wide "longitudinal" style in accordance with TMUTCD 3B.18.15 or as 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 4 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.

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 "Blasting Method" in accordance with 677.4.3 for eliminating existing pavement markings. Water blasting will be the only allowable option. A vacuum recovery system will be required as approved.

ITEM 680 INSTALLATION OF HIGHWAY TRAFFIC SIGNALS

Contractor will be responsible for all temporary control and operation of the traffic signal. Any components needed to facilitate this work will be the responsibility of the Contractor.

Traffic signals will be made of polycarbonate and be highway yellow in color. Cover heads until signal system is put into operation. All faces will be equipped with tunnel visors and backplates. Backplates will be black polycarbonate.

Controller cabinet will be grounded using a ground rod.

Wire nuts will not be permitted unless approved by the Engineer.

Signal signs will be subsidiary to this Item. (**Section 680.5.1.**)

The Traffic Signal Cabinet, Controller, and preformed cabinet base will be provided by TxDOT and installed by Contractor. Concrete pad will be provided by the Contractor.

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 3077 SUPERPAVE MIXTURES

Binder substitution is not allowed.

RAP and RAS will not be allowed.

Superpave Mix to be placed in one lift.

Surge Volume and Remixing MTV will be required for this project.

During paving operations; proper adjustment of Surge Volume and 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.

ITEM 3084 BONDING COURSE

Rates will be adjusted in the field based on the exposed surface as directed by the Engineer.

A test strip will be required.

ITEM 6002 VIDEO IMAGING VEHICLE DETECTION SYSTEM

The primary communications link between the VIVDS camera and the VIVDS Processor System will be coaxial cable accompanied by a three conductor 16 AWG, 24 DC or 115 VAC camera power cable.

All connection cables run from the equipment cabinet to the cameras will be continuous without splices from terminal point to terminal point.

Camera assemblies will be mounted on pedestals attached to the signal mast arms. Pedestals will not be paid for directly.

The VIVDS will be tested and will meet the performance standards for detection accuracy.

The Video Imaging Vehicle Detection System supplied and installed for this project will be communications compatible with latest version of Iteris VRAS Gold video software.

The removed cameras will be returned to the District Signal Shop. All VIVDS cameras will be color.

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(1-2)	1
TCP(1-3)	1 per workspace
TCP(1-4)	1
TCP(2-2)	1
TCP(2-4)	1
TCP(3-3)	2 or 3
WZ(BTS-1) & WZ(BTS-2)	1

Stationary shadow vehicle(s) with TMA are estimated at 224 days for this project. (224 days x 2 TMA's)

Mobile shadow vehicle(s) with TMA are estimated at 166 hours for this project. (11 days x 8 hrs/day x 2 TMA's)

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 3469-01-014 **DISTRICT** Brownwood **COUNTY** Stephens
HIGHWAY FM 3099

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**3469-01-014**			
		PROJECT ID		**A00061769**			
		COUNTY		**Stephens**			
		HIGHWAY		**FM 3099**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	100-6002	PREPARING ROW	STA	10.530		10.530	
	104-6017	REMOVING CONC (DRIVEWAYS)	SY	681.000		681.000	
	104-6022	REMOVING CONC (CURB AND GUTTER)	LF	644.000		644.000	
	105-6015	REMOVING STAB BASE & ASPH PAV (8"-10")	SY	2,658.000		2,658.000	
	105-6043	REMOVING STAB BASE & ASPH PAV (0-6")	SY	4,032.000		4,032.000	
	106-6002	OBLITERATING ABANDONED ROAD	SY	1,907.000		1,907.000	
	110-6001	EXCAVATION (ROADWAY)	CY	6,455.000		6,455.000	
	132-6006	EMBANKMENT (FINAL)(DENS CONT)(TY C)	CY	7,986.000		7,986.000	
	164-6035	DRILL SEEDING (PERM) (RURAL) (CLAY)	SY	25,126.000		25,126.000	
	164-6043	DRILL SEEDING (TEMP) (COOL)	SY	25,126.000		25,126.000	
	166-6001	FERTILIZER	AC	2.700		2.700	
	168-6001	VEGETATIVE WATERING	MG	6.400		6.400	
	216-6001	PROOF ROLLING	HR	19.000		19.000	
	247-6053	FL BS (CMP IN PLC)(TYD GR1-2)(FNAL POS)	CY	2,465.000		2,465.000	
	251-6214	REWORK BS MTL (TY B) (5") (DENS CONT)	SY	2,797.000		2,797.000	
	310-6012	PRIME COAT (RC-250)	GAL	2,015.000		2,015.000	
	316-6017	ASPH (AC-20-5TR)	GAL	12,848.000		12,848.000	
	316-6177	AGGR(TY-B GR-5 SAC-B)	CY	73.000		73.000	
	316-6224	AGGR(TY-PB GR-4 SAC-B)	CY	256.000		256.000	
	334-6078	HMCL ACP TY-D SAC-B AC-1.5	TON	100.000		100.000	
	351-6006	FLEXIBLE PAVEMENT STRUCTURE REPAIR(10")	SY	68.000		68.000	
	400-6005	CEM STABIL BKFL	CY	134.000		134.000	
	402-6001	TRENCH EXCAVATION PROTECTION	LF	93.000		93.000	
	416-6029	DRILL SHAFT (RDWY ILL POLE) (30 IN)	LF	50.000		50.000	
	416-6030	DRILL SHAFT (TRF SIG POLE) (24 IN)	LF	18.000		18.000	
	416-6032	DRILL SHAFT (TRF SIG POLE) (36 IN)	LF	14.000		14.000	
	416-6034	DRILL SHAFT (TRF SIG POLE) (48 IN)	LF	66.000		66.000	
	420-6002	CL A CONC (MISC)	CY	0.500		0.500	
	420-6054	CL C CONC (HEADWALL)	CY	0.500		0.500	
	432-6002	RIPRAP (CONC)(5 IN)	CY	23.500		23.500	
	432-6006	RIPRAP (CONC)(CL B)	CY	1.750		1.750	
	432-6033	RIPRAP (STONE PROTECTION)(18 IN)	CY	53.000		53.000	
	442-6007	STR STEEL (MISC NON - BRIDGE)	LB	617.000		617.000	
	450-6048	RAIL (HANDRAIL)(TY B)	LF	64.000		64.000	
	450-6103	RAIL (TY PR11)	LF	14.000		14.000	
	460-6010	CMP AR (GAL STL DES 3)	LF	1,395.000		1,395.000	
	462-6005	CONC BOX CULV (4 FT X 4 FT)	LF	93.300		93.300	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 3469-01-014 **DISTRICT** Brownwood **COUNTY** Stephens
HIGHWAY FM 3099

			CONTROL SECTION JOB		**3469-01-014**	TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00061769**		
			COUNTY		**Stephens**		
			HIGHWAY		**FM 3099**		
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	462-6063	CONC BOX CULV (8 FT X 4 FT)(EXTEND)	LF	72.000		72.000	
	465-6012	JCTBOX(COMPL)(PJB)(8FTX8FT)	EA	1.000		1.000	
	465-6372	INLET (COMPL) (DROP) (SPL)	EA	1.000		1.000	
	465-6558	INL(CMP)(PAZD-CZ)(FG)(3FTX3FT-3FTX3FT)	EA	1.000		1.000	
	467-6154	SET (TY I)(S= 4 FT)(HW= 6 FT)(3:1) (C)	EA	1.000		1.000	
	467-6275	SET (TY I)(S= 8 FT)(HW= 5 FT)(3:1) (C)	EA	6.000		6.000	
	467-6537	SET (TY II) (DES 3) (CMP) (6: 1) (P)	EA	36.000		36.000	
	496-6004	REMOV STR (SET)	EA	4.000		4.000	
	496-6006	REMOV STR (HEADWALL)	EA	2.000		2.000	
	496-6007	REMOV STR (PIPE)	LF	592.000		592.000	
	496-6099	REMOVE STR (RAIL)	LF	52.000		52.000	
	500-6001	MOBILIZATION	LS	1.000		1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	14.000		14.000	
	506-6003	ROCK FILTER DAMS (INSTALL) (TY 3)	LF	50.000		50.000	
	506-6011	ROCK FILTER DAMS (REMOVE)	LF	170.000		170.000	
	506-6020	CONSTRUCTION EXITS (INSTALL) (TY 1)	SY	330.000		330.000	
	506-6024	CONSTRUCTION EXITS (REMOVE)	SY	330.000		330.000	
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	5,022.000		5,022.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	5,022.000		5,022.000	
	506-6041	BIODEG EROSN CONT LOGS (INSTL) (12")	LF	500.000		500.000	
	506-6043	BIODEG EROSN CONT LOGS (REMOVE)	LF	500.000		500.000	
	506-6053	ROCK FILTER DAMS (INSTALL) (TY 2) (6:1)	LF	120.000		120.000	
	508-6001	CONSTRUCTING DETOURS	SY	406.000		406.000	
	510-6001	ONE-WAY TRAF CONT (FLAGGER CONT)	HR	160.000		160.000	
	510-6002	ONE-WAY TRAF CONT (PILOT CAR)	HR	160.000		160.000	
	529-6008	CONC CURB & GUTTER (TY II)	LF	877.000		877.000	
	530-6004	DRIVEWAYS (CONC)	SY	530.000		530.000	
	530-6005	DRIVEWAYS (ACP)	SY	2,296.000		2,296.000	
	530-6009	TURNOUTS (SURF TREAT)	SY	15.000		15.000	
	531-6001	CONC SIDEWALKS (4")	SY	828.000		828.000	
	531-6010	CURB RAMPS (TY 7)	EA	16.000		16.000	
	531-6013	CURB RAMPS (TY 10)	EA	4.000		4.000	
	542-6001	REMOVE METAL BEAM GUARD FENCE	LF	148.000		148.000	
	542-6002	REMOVE TERMINAL ANCHOR SECTION	EA	4.000		4.000	
	560-6002	MAILBOX INSTALL-D (TWG-POST) TY 1	EA	1.000		1.000	
	610-6009	REMOVE RD IL ASM (TRANS-BASE)	EA	3.000		3.000	
	610-6290	IN RD IL (TY SA) 50T-12 (400W EQ) LED	EA	5.000		5.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 3469-01-014 **DISTRICT** Brownwood **COUNTY** Stephens
HIGHWAY FM 3099

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**3469-01-014**			
		PROJECT ID		**A00061769**			
		COUNTY		**Stephens**			
		HIGHWAY		**FM 3099**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	618-6046	CONDT (PVC) (SCH 80) (2")	LF	1,355.000		1,355.000	
	618-6047	CONDT (PVC) (SCH 80) (2") (BORE)	LF	2,025.000		2,025.000	
	620-6007	ELEC CONDR (NO.8) BARE	LF	3,135.000		3,135.000	
	620-6008	ELEC CONDR (NO.8) INSULATED	LF	2,820.000		2,820.000	
	624-6010	GROUND BOX TY D (162922)W/APRON	EA	7.000		7.000	
	624-6028	REMOVE GROUND BOX	EA	3.000		3.000	
	628-6002	REMOVE ELECTRICAL SERVICES	EA	1.000		1.000	
	628-6116	ELC SRV TY D 120/240 060(NS)AL(E)SP(O)	EA	1.000		1.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	24.000		24.000	
	644-6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	EA	12.000		12.000	
	644-6007	IN SM RD SN SUP&AM TY10BWG(1)SA(U)	EA	2.000		2.000	
	644-6076	REMOVE SM RD SN SUP&AM	EA	23.000		23.000	
	658-6047	INSTL OM ASSM (OM-2Y)(WC)GND	EA	4.000		4.000	
	662-6060	WK ZN PAV MRK REMOV (W)4"(BRK)	LF	1,532.000		1,532.000	
	662-6063	WK ZN PAV MRK REMOV (W)4"(SLD)	LF	9,214.000		9,214.000	
	662-6075	WK ZN PAV MRK REMOV (W)24"(SLD)	LF	56.000		56.000	
	662-6093	WK ZN PAV MRK REMOV (Y)4"(BRK)	LF	1,753.000		1,753.000	
	662-6095	WK ZN PAV MRK REMOV (Y)4"(SLD)	LF	10,789.000		10,789.000	
	666-6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF	2,946.000		2,946.000	
	666-6042	REFL PAV MRK TY I (W)12"(SLD)(100MIL)	LF	72.000		72.000	
	666-6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF	768.000		768.000	
	666-6054	REFL PAV MRK TY I (W)(ARROW)(100MIL)	EA	23.000		23.000	
	666-6078	REFL PAV MRK TY I (W)(WORD)(100MIL)	EA	23.000		23.000	
	666-6141	REFL PAV MRK TY I (Y)12"(SLD)(100MIL)	LF	268.000		268.000	
	666-6300	RE PM W/RET REQ TY I (W)4"(BRK)(100MIL)	LF	960.000		960.000	
	666-6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	LF	9,936.000		9,936.000	
	666-6312	RE PM W/RET REQ TY I (Y)4"(BRK)(100MIL)	LF	260.000		260.000	
	666-6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	LF	11,372.000		11,372.000	
	672-6007	REFL PAV MRKR TY I-C	EA	246.000		246.000	
	672-6009	REFL PAV MRKR TY II-A-A	EA	289.000		289.000	
	677-6001	ELIM EXT PAV MRK & MRKS (4")	LF	10,874.000		10,874.000	
	680-6002	INSTALL HWY TRF SIG (ISOLATED)	EA	1.000		1.000	
	682-6001	VEH SIG SEC (12")LED(GRN)	EA	8.000		8.000	
	682-6002	VEH SIG SEC (12")LED(GRN ARW)	EA	4.000		4.000	
	682-6003	VEH SIG SEC (12")LED(YEL)	EA	8.000		8.000	
	682-6004	VEH SIG SEC (12")LED(YEL ARW)	EA	4.000		4.000	
	682-6005	VEH SIG SEC (12")LED(RED)	EA	8.000		8.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 3469-01-014 **DISTRICT** Brownwood **COUNTY** Stephens
HIGHWAY FM 3099

							TOTAL EST.	TOTAL FINAL
			CONTROL SECTION JOB		**3469-01-014**			
			PROJECT ID		**A00061769**			
			COUNTY		**Stephens**			
			HIGHWAY		**FM 3099**			
ALT	**BID CODE**	**DESCRIPTION**		**UNIT**	EST.	FINAL		
	682-6006	VEH SIG SEC (12")LED(RED ARW)		EA	8.000		8.000	
	682-6051	BACKPLATE W/REFL BRDR(3 SEC)ALUM		EA	12.000		12.000	
	684-6012	TRF SIG CBL (TY A)(12 AWG)(7 CONDR)		LF	1,010.000		1,010.000	
	684-6017	TRF SIG CBL (TY A)(12 AWG)(12 CONDR)		LF	1,120.000		1,120.000	
	686-6041	INS TRF SIG PL AM(S)1 ARM(40')		EA	1.000		1.000	
	686-6057	INS TRF SIG PL AM(S)1 ARM(55')		EA	1.000		1.000	
	686-6063	INS TRF SIG PL AM(S)1 ARM(60')LUM		EA	2.000		2.000	
	687-6001	PED POLE ASSEMBLY		EA	4.000		4.000	
	688-6001	PED DETECT PUSH BUTTON (APS)		EA	4.000		4.000	
	688-6003	PED DETECTOR CONTROLLER UNIT		EA	4.000		4.000	
	690-6127	REMOVE LUMINAIRE POLE		EA	4.000		4.000	
	3076-6001	D-GR HMA TY-B PG64-22		TON	3,821.000		3,821.000	
	3076-6066	TACK COAT		GAL	1,124.000		1,124.000	
	3077-6032	SP MIXESSP-CPG76-22		TON	517.000		517.000	
	3084-6001	BONDING COURSE		GAL	460.000		460.000	
	6000-6060	REMOVE FOUNDATION		EA	1.000		1.000	
	6001-6001	PORTABLE CHANGEABLE MESSAGE SIGN		DAY	90.000		90.000	
	6185-6002	TMA (STATIONARY)		DAY	224.000		224.000	
	6185-6003	TMA (MOBILE OPERATION)		HR	88.000		88.000	
	6306-6009	VIVDS PROSR SYS (INSTALL ONLY)		EA	1.000		1.000	
	6306-6010	VIVDS CAM ASSY (INSTALL ONLY)		EA	4.000		4.000	
	6306-6012	VIVDS CABLING (INSTALL ONLY)		LF	1,072.000		1,072.000	
	18	SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)		LS	1.000		1.000	
		EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)		LS	1.000		1.000	

100% SUBMITTAL

SUMMARY OF TCP QUANTITIES									
ITEM NO.	502	508	510	510	662				
DESC. CODE	6001	6001	6001	6002	6060	6063	6075	6093	6095
DESCRIPTION	BARRICADES, SIGN AND TRAFFIC HANDLING	CONSTRUCTING DETOURS	ONE-WAY TRAF CONT (FLAGGER CONT)	ONE-WAY TRAF CONT (PILOT CAR)	WK ZN PAV MRK REMOV (W)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"(BRK)	WK ZN PAV MRK REMOV (Y)4"(SLD)
UNIT	MO	SY	HR	HR	LF	LF	LF	LF	LF
PHASE 1	8	406	160	160	1532	9214	56	1753	10789
PHASE 2	6								
TOTAL CSJ: 3469-01-014	14	406	160	160	1532	9214	56	1753	10789

SUMMARY OF TCP QUANTITIES				
ITEM NO.	677	6001	6185	
DESC. CODE	6001	6001	6002	6003
DESCRIPTION	ELIM EXT PAV MRK & MRKS (4")	PORTABLE CHANGEABLE MESSAGE SIGN	TMA (STATIONARY)	TMA (MOBILE OPERATION)
UNIT	LF	DAY	DAY	HR
PHASE 1	10874		129	48
PHASE 2		90	95	40
TOTAL CSJ: 3469-01-014	10874	90	224	88

NO.	REVISION	BY	DATE

ENTECH CIVIL ENGINEERS, INC
F-6932
15021 Katy Freeway,
Suite 500
Houston, Texas, 77094
281-945-0069 PH
281-945-0081 FX

Texas Department of Transportation®

FM 3099 REALIGNMENT

SUMMARY OF TRAFFIC CONTROL QUANTITIES

SHEET 1 OF 1

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
06	SEE TITLE SHEET		11
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

SHernandez
8/27/2021 9:53:00 AM
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...\TxDOT-BW-HALF_PDF.pltcfg

FINAL SUBMITTAL

USER:jnasier
OFFICE:IEA OFFICE:Houston
PROJECT #:2079G TxDOT FM 3099

REMOVAL SUMMARY			104 6017	104 6022	105 6015	105 6043	106 6002	496 6004	496 6006	496 6007	496 6099	542 6001	542 6002	690 6127	6000 6060
			REMOVING CONC (DRIVEWAYS)	REMOVING CONC (CURB AND GUTTER)	REMOVING STAB BASE & ASPH PAV (8"-10")	REMOVING STAB BASE & ASPH PAV (0-6")	OBLITERATING ABANDONED ROAD	REMOV STR (SET)	REMOV STR (HEADWALL)	REMOV STR (PIPE)	REMOVE STR (RAIL)	REMOVE METAL BEAM GUARD FENCE	REMOVE TERMINAL ANCHOR SECTION	REMOVE LUMINAIRE POLE	REMOVE FOUNDATION
DESCRIPTION	STATIONS		SY	LF	SY	SY	SY	EA	EA	LF	LF	LF	EA	EA	EA
FM 3099 WIDENING	397+00.00	415+39.27	379			2096		4	2	428				1	
FM 3099 TRANSITION AREA	415+39.27	416+39.27				710									
FM 3099 REALIGNMENT	417+01.64	427+55.00		644		1226	1907			56	52	148	4	2	
US 180 WIDENING	464+62.39	477+72.93	302		2658					108				1	1
TOTAL			681	644	2658	4032	1907	4	2	592	52	148	4	4	1

NO.	REVISION	BY	DATE

IEA
1225 North Loop West
SUITE 320
HOUSTON, TEXAS 77008
(832) 494-3800

Firm Registration No.
F-10161

FM 3099 REALIGNMENT

SUMMARY OF REMOVAL QUANTITIES

SHEET 1 OF 1

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
6	SEE TITLE SHEET		12
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

DATE:8/27/2021 TIME:10:44:31 AM
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TIME:10:44:31 AM FILE:013*2079G REM*QTY*01.dgn

FINAL SUBMITTAL

$USER$
OFFICE:$OFFICE$
PROJECT # AVO

ROADWAY SUMMARY			100 6002	110 6001	132 6006	216 6001	247 6053	251 6214	310 6012	316 6017	316 6177	316 6224
			PREPARING ROW	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL)(DENS CONT)(TY C)	PROOF ROLLING	FL BS (CMP IN PLC) (TYD GR1-2) (FNAL POS)	REWORK BS MTL (TY B) (5") (DENS CONT)	PRIME COAT (RC-250)	ASPH (AC-20-5TR)	AGGR (TY-B GR-5 SAC-B)	AGGR (TY-PB GR-4 SAC-B)
			STA	CY	CY	HR	CY	SY	GAL	GAL	CY	CY
RATE									0.22 GAL/SY	0.42 GAL/SY	125 SY/CY	120 SY/CY
DESCRIPTION	STATIONS											
FM 3099 WIDENING	397+00.00	415+39.27		2696	236	8	395	2797	746	2848	27	57
FM 3099 TRANSITION AREA	415+39.27	416+39.27		172	11	2						
FM 3099 REALIGNMENT	417+01.64	427+55.00	10.53	3139	7580	5	2070		1269	4846	46	97
US 180 WIDENING	464+62.39	477+72.93		448	159	4				5154		102
TOTAL			10.53	6455	7986	19	2465	2797	2015	12848	73	256

ROADWAY SUMMARY			351 6006	442 6007	450 6048	450 6103	529 6008	530 6004	530 6005	530 6009	531 6001	531 6010
			FLEXIBLE PAVEMENT STRUCTURE REPAIR(10")	STR STEEL (MISC NON - BRIDGE)	RAIL (HANDRAIL) (TY B)	RAIL (TYPE PR11)	CONC CURB & GUTTER (TY II)	DRIVEWAYS (CONC)	DRIVEWAYS (ACP)	TURNOUTS (SURF TREAT)	CONC SIDEWALKS (4")	CURB RAMPS (TY 7)
			SY	LB	LF	LF	LF	SY	SY	SY	SY	EA
RATE												
DESCRIPTION	STATIONS											
FM 3099 WIDENING	397+00.00	415+39.27		207	44			371	1426	15	336	8
FM 3099 TRANSITION AREA	415+39.27	416+39.27		410	20		238				146	3
FM 3099 REALIGNMENT	417+01.64	427+55.00					103		775		54	1
US 180 WIDENING	464+62.39	477+72.93	68			14	536	159	95		292	4
TOTAL			68	617	64	14	877	530	2296	15	828	16

ROADWAY SUMMARY			531 6013	560 6002	644 6001	3076 6001	3076 6066	3077 6032	3084 6001
			CURB RAMPS (TY 10)	MAILBOX INSTALL-D (TWG-POST) TY 1	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	D-GR HMA TY-B PG64-22	TACK COAT	SP MIXES SP-C PG76-22	BONDING COURSE
			EA	EA	EA	TON	GAL	TON	GAL
RATE						110 LBS/SY/IN	0.1 GAL/SY	113 LBS/SY/IN	0.1 GAL/SY
DESCRIPTION	STATIONS								
FM 3099 WIDENING	397+00.00	415+39.27		1	4*	1555	354	397	354
FM 3099 TRANSITION AREA	415+39.27	416+39.27				476	115	120	106
FM 3099 REALIGNMENT	417+01.64	427+55.00							
US 180 WIDENING	464+62.39	477+72.93	4			1790	655		
TOTAL			4	1	4	3821	1124	517	460

* SEE SIDEWALK DETAIL SHEET 1 FOR MORE INFORMATION

NO.	REVISION	BY	DATE

IEA
1225 North Loop West
SUITE 320
HOUSTON, TEXAS 77008
(832) 494-3800
Firm Registration No. F-10161

Texas Department of Transportation®

FM 3099 REALIGNMENT

SUMMARY OF ROADWAY QUANTITIES

SHEET 1 OF 1

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
6	SEE TITLE SHEET		13
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

DATE:10/10/2022 TIME:1:26:04 PM
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TIME:1:26:04 PM FILE:$FILES$

FINAL SUBMITTAL

USER: jhasler
OFFICE:IEA OFFICE: Dallas
PROJECT #

DATE:8/31/2021 TIME:10:43:53 AM
FILE:\\pusscshrfi101\J-Jobs\2079G TxDOT FM 3099 ReAlign\06.00 Design\06.04 Sheets\06.04.01 General\015*2079G EW*QS*01.dgn

FM 3099 WIDENING

Note: All units in this report are in feet, square feet and cubic yards unless

Baseline Station	Area	Volume	Adjusted	Area	Volume	Adjusted
397+00.00	11.489	0	0	0.1876	0	0
397+50.00	11.223	21	0	0.4591	1	1
398+00.00	13.126	23	0	0.2637	1	1
398+50.00	10.541	22	0	1.3414	1	1
399+00.00	10.152	19	0	2.6241	4	4
399+50.00	11.983	20	0	6.3812	8	8
400+00.00	21.1541	31	9	8.1468	13	13
400+50.00	28.4314	46	24	3.0662	10	10
401+00.00	60.863	83	61	1.5394	4	4
401+50.00	27.305	82	60	5.9203	7	7
402+00.00	19.333	43	21	4.7757	10	10
402+50.00	15.577	32	10	12.792	16	16
403+00.00	67.601	77	55	2.7239	14	14
403+50.00	41.4791	101	79	2.748	5	5
404+00.00	39.2017	75	53	4.2936	7	7
404+50.00	67.629	99	77	1.5593	5	5
405+00.00	111.03	165	142	2.6778	4	4
405+50.00	43.0551	143	120	10.206	12	12
406+00.00	124.66	155	132	0.0304	9	9
406+50.00	54.397	166	143	4.3308	4	4
407+00.00	66.359	112	89	0.5014	4	4
407+50.00	73.954	130	107	0.6436	1	1
408+00.00	53.333	118	95	6.7824	7	7
408+50.00	76.321	120	97	8.0238	14	14
409+00.00	102.59	166	143	6.3484	13	13
409+50.00	87.34	176	153	7.8307	13	13
410+00.00	93.712	168	146	4.6125	12	12
410+50.00	106.46	185	163	0.2551	5	5
411+00.00	53.868	148	126	5.8305	6	6
411+50.00	54.098	100	78	3.1497	8	8
412+00.00	55.549	102	80	2.0764	5	5
412+50.00	44.310	92	70	1.5112	3	3
413+00.00	44.330	82	60	0.6491	2	2
413+50.00	48.836	86	64	0.1689	1	1
414+00.00	45.964	88	66	0.8488	1	1
414+50.00	57.026	95	73	0.7028	1	1
415+00.00	37.993	88	66	1.1743	2	2
415+39.27	33.99	52	34	0.8037	1	1
Grand Total:		3511	*2696		236	236

* VOLUME ADJUSTED FOR PAVEMENT REMOVAL DEPTH

FM 3099 TRANSITION

Note: All units in this report are in feet, square feet and cubic yards unless

Baseline Station	Area	Volume	Adjusted	Area	Volume	Adjusted
415+39.27	41.4119	0	0	1.4605	0	0
415+50.00	44.1721	17	5	1.6849	1	1
416+00.00	113.480	146	90	4.8872	6	6
416+39.27	53.5937	121	77	1.5855	5	5
Grand Total:		284	*172		11	11

* VOLUME ADJUSTED FOR PAVEMENT REMOVAL DEPTH

FM 3099 REALIGNMENT

Note: All units in this report are in feet, square feet and cubic yards unless specified otherwise.

Baseline Station	Area	Volume	Adjusted	Area	Volume	Adjusted
417+01.65	62.3933	0	0	0	0	0
417+50.00	172.186	210	210	0	0	80
418+00.00	253.872	395	395	0	0	80
418+50.00	198.448	324	324	0.0043	0	80
419+00.00	26.6193	208	208	65.1036	60	140
419+50.00	17.5506	41	41	264.861	306	386
420+00.00	12.4859	28	28	563.061	767	767
420+50.00	39.7438	48	48	593.049	1070	1070
421+00.00	37.5888	72	72	514.537	1026	1026
421+50.00	38.087	70	70	411.068	857	857
422+00.00	36.5247	69	69	305.091	663	663
422+50.00	58.5575	88	88	196.582	465	465
423+00.00	62.9803	113	113	130.826	303	303
423+50.00	58.9857	113	113	82.4186	197	197
424+00.00	37.8456	90	90	51.9462	124	124
424+50.00	15.9631	50	50	28.7321	75	75
425+00.00	3.8026	18	18	38.8552	63	63
425+50.00	10.3652	13	13	25.7839	60	60
426+00.00	7.0922	16	16	23.7771	46	46
426+50.00	21.4133	26	26	17.5369	38	38
427+00.00	32.1639	50	50	7.4117	23	23
427+50.00	33.2943	61	61	0.3735	7	7
427+54.99	34.0062	6	6	0	0	0
Grand Total:		2109	2109		6150	*6550

* VOLUME ADJUSTED PER ASSUMED FINISHED GRADE OF 6" BELOW EXISTING AFTER THE GAS STATION REMOVAL

US 180

Note: All units in this report are in feet, square feet and cubic yards unless specified

Baseline Station	Area	Volume	Adjusted	Area	Volume	Adjusted
465+66.21	0	0	0	0	0	0
466+00.00	40.8689	26	6	0	0	0
466+50.00	54.3173	88	57	0.524	0	0
467+00.00	30.5974	79	48	0.981	1	1
467+50.00	26.5899	53	23	1.3988	2	2
468+00.00	52.5695	73	42	1.6976	3	3
468+50.00	33.8467	80	49	0.4802	2	2
469+00.00	0	31	1	0	0	0
469+50.00	0	0	0	0	0	0
470+00.00	0	0	0	0	0	0
470+50.00	25.9715	24	0	0.7226	1	1
471+00.00	31.2505	53	23	2.6308	3	3
471+50.00	31.4824	58	28	2.891	5	5
472+00.00	32.0865	59	28	0.9895	4	4
472+50.00	28.2758	56	26	0.2467	1	1
473+00.00	23.725	48	18	1.819	2	2
473+50.00	25.0348	45	15	1.3113	3	3
474+00.00	22.1694	44	14	2.9005	4	4
474+50.00	20.0071	39	9	3.3576	6	6
475+00.00	23.3064	40	10	1.9959	5	5
475+50.00	25.4464	45	15	4.7742	6	6
476+00.00	27.8344	49	19	0.69	5	5
476+50.00	21.4741	46	17	0	1	1
477+00.00	0	0	0	0	0	41
477+50.00	0	0	0	0	0	41
477+77.93	0	0	0	0	0	23
Grand Total:		1036	*448		54	**159

* VOLUME ADJUSTED FOR PAVEMENT REMOVAL DEPTH
** VOLUME ADJUSTED FOR US 180 CULVERT INSTALLATION

NO.	REVISION	BY	DATE

IEA
1225 North Loop West
SUITE 320
HOUSTON, TEXAS 77008
(832) 494-3800
Firm Registration No. F-10161

FM 3099 REALIGNMENT

SUMMARY OF EARTHWORK QUANTITIES

SHEET 1 OF 1

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
6	SEE TITLE SHEET		14
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

TIME:10:43:53 AM FILE:015*2079G EW*QS*01.dgn

FINAL SUBMITTAL

$USER$
OFFICE:$OFFICE$
PROJECT # AVO

DRAINAGE SUMMARY			400 6005 CEM STABIL BKFL	402 6001 TRENCH EXCAVATION PROTECTION	420 6002 CL A CONC (MISC)	420 6054 CL C CONC (HEADWALL)	432 6002 RIPRAP (CONC)(5 IN)	432 6033 RIPRAP (STONE PROTECTION)(18 IN)	460 6010 CMP AR (GAL STL DES 3)	462 6005 CONC BOX CULV (4FT X 4FT	462 6063 CONC BOX CULV (8 FT X 4 FT) (EXTEND)	465 6012 JCT BOX (COML) (PJB) (8FTX8FT)	465 6372 INLET (COMPL) (DROP) (SPL)	465 6558 INL (CMP) (PAZD-CZ) (FG) (3FTX3FT-3FT X3FT)	467 6154 SET(TYI)(S=4 FT)(HW=6FT)(3:1)(C)	467 6275 SET (TY I) (S = 8FT) (HW = 5FT) (3:1)(C)	467 6537 SET (TY II) (DES 3) (CMP) (6:1) (P)
DESCRIPTION	STATIONS		CY	LF	CY	CY	CY	CY	LF	LF	LF	EA	EA	EA	EA	EA	EA
FM 3099 WIDENING	397+00.00	415+39.27					4		1205			1		1			32
FM 3099 TRANSITION AREA	415+39.27	416+39.27															
FM 3099 REALIGNMENT	417+01.64	427+55.00					11	48	190		72					6	4
US 180 WIDENING	464+62.39	477+72.93	134	93	0.5	0.5	8.5	5		93.3			1		1		
TOTAL			134	93	0.5	0.5	23.5	53	1395	93.3	72	1	1	1	1	6	36

NO.	REVISION	BY	DATE

IEA
1225 North Loop West
SUITE 320
HOUSTON, TEXAS 77008
(832) 494-3800
Firm Registration No. F-10161

FM 3099 REALIGNMENT

SUMMARY OF DRAINAGE QUANTITIES

SHEET 1 OF 1

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
6	SEE TITLE SHEET		15
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

DATE:10/6/2022 TIME:10:54:52 AM
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100% SUBMITTAL

SUMMARY OF TRAFFIC SIGNAL ITEMS								
ITEM	416	416	416	618	618	620	620	624
DESC. CODE	6030	6032	6034	6046	6047	6007	6008	6010
DESCRIPTION	DRILL SHAFT (TRF SIG POLE) (24 IN)	DRILL SHAFT (TRF SIG POLE) (36 IN)	DRILL SHAFT (TRF SIG POLE) (48 IN)	CONDT (PVC) (SCH 80) (2")	CONDT (PVC) (SCH 80) (2") (BORE)	ELEC CONDR (NO. 8) BARE	ELEC CONDR (NO. 8) INSULATED	GROUND BOX TY D (162922) W/APRON
UNIT	LF	LF	LF	LF	LF	LF	LF	EA
TOTAL CSJ: 3469-01-014	18	14	66	935	2025	2715	1980	5

SUMMARY OF TRAFFIC SIGNAL ITEMS									
ITEM	628	680	682	682	682	682	682	682	682
DESC. CODE	6116	6002	6001	6002	6003	6004	6005	6006	6051
DESCRIPTION	ELC SRV TY D 120/240 060(NS) AL (E) SP (O)	INSTALL HWY TRF SIG (ISOLATED)	VEH SIG SEC (12") LED (GRN)	VEH SIG SEC (12") LED (GRN ARW)	VEH SIG SEC (12") LED (YEL)	VEH SIG SEC (12") LED (YEL ARW)	VEH SIG SEC (12") LED (RED)	VEH SIG SEC (12") LED (RED ARW)	BLACKPLATE W/REFL BRDR (3SEC) ALUM
UNIT	EA	EA	EA	EA	EA	EA	EA	EA	EA
TOTAL CSJ: 3469-01-014	1	1	8	4	8	4	8	8	12

SUMMARY OF TRAFFIC SIGNAL ITEMS											
ITEM	684	684	686	686	686	687	688	688	6306 **	6306 **	6306 **
DESC. CODE	6012	6017	6041	6057	6063	6001	6001	6003	6009	6010	6012
DESCRIPTION	TRF SIG CBL (TY A) (12 AWG) (7 CONDR)	TRF SIG CBL (TY A) (12 AWG) (12 CONDR)	INS TRF SIG PL AM(S) 1 ARM (40')	INS TRF SIG PL AM(S) 1 ARM (55')	INS TRF SIG PL AM(S) 1 ARM (60') LUM	PED POLE ASSEMBLY	PED DETECT PUSH BUTTON (APS)	PED DETECTOR CONTROLLER UNIT	VIVDS PROSR SYS (INSTALL ONLY)	VIVDS CAM ASSY (INSTALL ONLY)	VIVDS CABLING (INSTALL ONLY)
UNIT	LF	LF	EA	EA	EA	EA	EA	EA	EA	EA	LF
TOTAL CSJ: 3469-01-014	1010	1120	1	1	2	4	4	4	1	4	1072

SUMMARY OF ILLUMINATION ITEMS										
ITEM	416	432	610	610	618	620	620	624	624	628
DESC. CODE	6029	6006	6009	6290	6046	6007	6008	6010	6028	6002
DESCRIPTION	DRILL SHAFT (RDWY ILL POLE) (30 IN)	RIPRAP (CONC) (CL B)	REMOVE RD IL ASM (TRANS-BASE)	IN RD IL (TY SA) 50T-12 (400W EQ) LED	CONDT (PVC) (SCH 80) (2")	ELEC CONDR (NO. 8) BARE	ELEC CONDR (NO. 8) INSULATED	GROUND BOX TY D (162922) W/APRON	REMOVE GROUND BOX	REMOVE ELECTRICAL SERVICES
UNIT	LF	CY	EA	EA	LF	LF	LF	EA	EA	EA
TOTAL CSJ: 3469-01-014	50	1.75	3	5	420	420	840	2	3	1

ITEM NO.	CODE NO.	DESCRIPTION	UNIT	TOTAL
680	6002	INSTALL HWY TAF SIG (ISOLATED)	EA	1
*		CONTROLLER, FULL ACTUATED W/CABINET	EA	1**
*		CONTROLLER FOUNDATION	EA	1
*		DETECTOR CARD RACK (12 SLOT)	EA	1
*		SIGN, "US 180" (48"X18")	EA	2
*		SIGN, "FM 3099" (54"X18")	EA	2
*		POWER SUPPLY	EA	1
*		DETECTOR UNIT	EA	12
*		MAST ARM DAMPING PLATE	EA	4
*		LED. RDWY LUMINAIRE (.25 KW EQ)	EA	2

NOTE:

* MATERIALS SUBSIDIARY TO ITEM 680

** MATERIAL TO BE FURNISH BY TXDOT AND INSTALLED BY CONTRACTOR

NO.	REVISION	BY	DATE

ENTECH CIVIL ENGINEERS, INC
F-6932
15021 Katy Freeway, Suite 500
Houston, Texas, 77094
281-945-0068 PH
281-945-0081 FX

Texas Department of Transportation®

FM 3099 REALIGNMENT

SUMMARY OF TRAFFIC SIGNAL & ILLUMINATION QUANTITIES

SHEET 1 OF 1

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
06	SEE TITLE SHEET		16
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

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100% SUBMITTAL

SUMMARY OF SIGN QUANTITIES				
ITEM	644	644	644	644
DESC. CODE	6001	6004	6007	6076
DESCRIPTION	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)	REMOVE SM RD SN SUP&AM
UNIT	EA	EA	EA	EA
SHEET 1	8	1		7
SHEET 2	11	5	2	15
SHEET 3	1			1
TOTAL CSJ: 3469-01-014	20	6	2	23

NO.	REVISION	BY	DATE

ENTECH CIVIL ENGINEERS, INC
F-6932
15021 Katy Freeway,
Suite 500
Houston, Texas, 77094
281-945-0069 PH
281-945-0081 FX

FM 3099 REALIGNMENT

SUMMARY OF SIGN QUANTITIES

SHEET 1 OF 1

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
06	SEE TITLE SHEET		17
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

SHernandez
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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 SBO = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	MOUNTING DESIGNATION 1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL = Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
1	1	M2-1	JCT	21" X 15"	X		10BWG	1	SA	P		
		M1-4	180	30" X 24"	X							
		STA 397+47 (RT)										
	2	R2-1	SPEED LIMIT 55	24" X 30"	X		10BWG	1	SA	P		
		STA 403+44 (LT)										
	3	R2-1	SPEED LIMIT 40	24" X 30"	X		10BWG	1	SA	P		
		STA 403+44 (RT)										
	4	R1-1	STOP	36" X 36"	X		10BWG	1	SA	P		
		STA 406+19 (RT)										
	5	D3-1G	Cactus Cove	36" X 6"	X		10BWG	1	SA	P		
		R1-1	STOP	36" X 36"	X							
		STA 410+11 (LT)										
	6	R1-1	STOP	36" X 36"	X		10BWG	1	SA	P		
		STA 410+59 (RT)										
	7	R3-8B	LANE DESIGNATION	48" X 30"	X		10BWG	1	SA	T		
		STA 410+91 (RT)										
	8	R3-7R	RIGHT LANE MUST TURN RIGHT	36" X 36"	X		10BWG	1	SA	P		
		STA 413+08 (RT)										
	9	R2-1	SPEED LIMIT 40	24" X 30"	X		10BWG	1	SA	P		
		STA 409+50 (LT)										
2	1	M3-1	NORTH	24" X 12"	X		10BWG	1	SA	P		
		M1-6F	FARM ROAD 3099	24" X 24"	X							
		STA 413+61 (LT)										
	2	M1-6F	FARM ROAD 3099	24" X 24"	X		10BWG	1	SA	P		
		M6-4	DIRECTIONAL ARROW	21" X 15"	X							
		STA 469+84 (LT)*										
	3	R3-7R	RIGHT LANE MUST TURN RIGHT	48" X 48"	X		10BWG	1	SA	T		
		STA 470+55 (LT)*										
	4	M1-6F	FARM ROAD 3099	24" X 24"	X		10BWG	1	SA	P		
		M6-4	DIRECTIONAL ARROW	21" X 15"	X							
		STA 468+63 (RT)*										
	5	M1-4	180	30" X 24"	X		10BWG	1	SA	P		
		M6-4	DIRECTIONAL ARROW	21" X 15"	X							
		STA 417+86 (LT)										
	6	R3-7R	RIGHT LANE MUST TURN RIGHT	36" X 36"	X		10BWG	1	SA	P		
		STA 420+37 (LT)										
	7	R3-8B	DIRECTIONAL TRAFFIC ARROWS	48" X 30"	X		10BWG	1	SA	T		
		STA 421+42 (LT)										
	8	R3-7R	RIGHT LANE MUST TURN RIGHT	36" X 36"	X		10BWG	1	SA	P		
		STA 414+56 (RT)										
	9	M1-4	180	30" X 24"	X		10BWG	1	SA	P		
		M6-4	DIRECTIONAL ARROW	21" X 15"	X							
		STA 414+56 (RT)										
	10	M3-4	WEST	24" X 12"	X		10BWG	1	SA	P		
		M1-4	180	30" X 24"	X							
		STA 466+33 (LT)*										

* REFER TO US 180 BASE LINE

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).

DATE: 8/27/2021
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Texas Department of Transportation

Traffic Operations Division Standard

FM 3099 REALIGNMENT

SUMMARY OF SMALL SIGNS

SOSS

SHEET 1 OF 3

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	3469	01	014	FM 3099
4-16	DIST	COUNTY		SHEET NO.
8-16	BWD	STEPHENS		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	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE
							FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG SBO = 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"	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	11	R3-8LSSR	DIRECTIONAL TRAFFIC ARROWS	66" X 30"	X		10BWG	1	SA	U		
		STA 463+60 (RT)*										
	12	R3-7R	RIGHT LANE MUST TURN RIGHT	48" X 48"	X		10BWG	1	SA	T		
		STA 465+67 (RT)*										
	13	R3-7R	RIGHT LANE MUST TURN RIGHT	48" X 48"	X		10BWG	1	SA	T		
		STA 468+06 (RT)*										
	14	M3-3	SOUTH	24" X 12"	X		10BWG	1	SA	P		
		M1-6F	FARM ROAD 3099	24" X 24"	X							
		STA 419+93 (RT)										
	15	R2-1	SPEED LIMIT 70	24" X 30"	X		10BWG	1	SA	P		
		STA 421+85 (RT)										
	16	R3-7R	RIGHT LANE MUST TURN RIGHT	48" X 48"	X		10BWG	1	SA	T		
		STA 475+50 (LT)*										
	17	R3-8LSSR	DIRECTIONAL TRAFFIC ARROWS	66" X 30"	X		10BWG	1	SA	U		
		STA 477+73 (LT)*										
	18	M3-2	EAST	24" X 12"	X		10BWG	1	SA	P		
		M1-4	180	30" X 24"	X							
		STA 476+00 (RT)*										
3	1	M2-1	JCT	21" X 15"	X		10BWG	1	SA	P		
		M1-4	180	30" X 24"	X							
		STA 4217+55 (LT)										

* REFER TO US 180 BASE LINE

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).

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Texas Department of Transportation

Traffic Operations Division Standard

FM 3099 REALIGNMENT

SUMMARY OF SMALL SIGNS

SOSS

SHEET 2 OF 3

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	3469	01	014	FM 3099
4-16	DIST	COUNTY		SHEET NO.
8-16	BWD	STEPHENS		19

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
76	1	W11-2 / W16-7PR	PEDESTRIAN CROSSING (BACK TO BACK)	36"X36"	X		10BWG	1	SA	T		
		W16-7PL / W16-7PR	SUPPLEMENTAL ARROW (BACK TO BACK)	24"X12"	X							
		R10-25	PUSH BUTTON TO TURN ON WAITING	9"X12"	X							
		STA 410+09 (LT)										
	2	W11-2 / W16-7PR	PEDESTRIAN CROSSING (BACK TO BACK)	36"X36"	X		10BWG	1	SA	T		
		W16-7PL / W16-7PR	SUPPLEMENTAL ARROW (BACK TO BACK)	24"X12"	X							
		R10-25	PUSH BUTTON TO TURN ON WAITING	9"X12"	X							
		STA 409+99 (RT)										
	3	W11-2	PEDESTRIAN CROSSING	36"X36"	X		10BWG	1	SA	T		
		W16-9P	AHEAD	24"X12"	X							
		STA 407+63 (RT)										
	4	W11-2	PEDESTRIAN CROSSING	36"X36"	X		10BWG	1	SA	T		
		W16-9P	AHEAD	24"X12"	X							
		STA 412+46 (LT)										
	5	R1-5bL	STOP HERE FOR PEDESTRIANS	36"X36"	X		10BWG	1	SA	T		
		STA 409+54 (RT)										
	6	R1-5bL	STOP HERE FOR PEDESTRIANS	36"X36"	X		10BWG	1	SA	T		
		STA 410+80 (LT)										

* SEE SIDEWALK DETAILS SHEET 1 FOR SIGN INFORMATION

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

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

http://www.txdot.gov/

NOTE:

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

Texas Department of Transportation

Traffic Operations Division Standard

FM 3099 REALIGNMENT

SUMMARY OF SMALL SIGNS

SOSS

SHEET 3 OF 3

FILE:	sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT	May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS		3469	01	014	FM 3099
4-16		DIST	COUNTY		SHEET NO.
8-16		BWD	STEPHENS		20

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SUMMARY OF PAVEMENT MARKINGS QUANTITIES											
ITEM	658	666	666	666	666	666	666	666	666	666	666
DESC. CODE	6047	6036	6042	6048	6054	6078	6141	6300	6303	6312	6315
DESCRIPTION	INSTL OM ASSM (OM-2Y) (WC) GND	REFL PAV MRK TY I (W) 8" (SLD) (100MIL)	REFL PAV MRK TY I (W) 12" (SLD) (100MIL)	REFL PAV MRK TY I (W) 24" (SLD) (100MIL)	REFL PAV MRK TY I (W) (ARROW) (100MIL)	REFL PAV MRK TY I (W) (WORD) (100MIL)	REFL PAV MRK TY I (Y) 12" (SLD) (100MIL)	RE PM W/RET REQ TY I (W) 4" (BRK) (100MIL)	RE PM W/RET REQ TY I (W) 4" (SLD) (100MIL)	RE PM W/RET REQ TY I (Y) 4" (BRK) (100MIL)	RE PM W/RET REQ TY I (Y) 4" (SLD) (100MIL)
UNIT	EA	LF	LF	LF	EA	EA	LF	LF	LF	LF	LF
SHEET 1		96		80	3	3	146		3300		4056
SHEET 2	2	2850	72	622	20	20	68	860	5290	160	5544
SHEET 3	2						54	100	1346	100	1772
TOTAL CSJ: 3469-01-014	4	2946	72	702	23	23	268	960	9936	260	11372

SUMMARY OF PAVEMENT MARKINGS QUANTITIES		
ITEM	672	672
DESC. CODE	6007	6009
DESCRIPTION	REFL PAV MRKR TY I-C	REFL PAV MRKR TY II-A-A
UNIT	EA	EA
SHEET 1	4	102
SHEET 2	236	164
SHEET 3	6	23
TOTAL CSJ: 3469-01-014	246	289

NO.	REVISION	BY	DATE

ENTECH CIVIL ENGINEERS, INC
F-6932
15021 Katy Freeway,
Suite 500
Houston, Texas, 77094
281-945-0069 PH
281-945-0081 FX

FM 3099 REALIGNMENT

SUMMARY OF PAVEMENT MARKINGS QUANTITIES

SHEET 1 OF 1

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
06	SEE TITLE SHEET		21
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

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SUMMARY OF SW3P QUANTITIES				
ITEM NO.	164		166	168
DESC. CODE	6035	6043	6001	6001
DESCRIPTION	DRILL SEEDING (PERM) (RURAL) (CLAY)	DRILL SEEDING (TEMP) (COOL)	FERTLIZER	VEGETATIVE WATERING
UNIT	SY	SY	AC	MG
SHEET 1	11116	11116	1.2	2.8
SHEET 2	9344	9344	1	2.4
SHEET 3	4666	4666	0.5	1.2
TOTAL CSJ: 3469-01-014	25126	25126	2.7	6.4

SUMMARY OF SW3P QUANTITIES									
ITEM NO.	506								
DESC. CODE	6003	6011	6020	6024	6038	6039	6041	6043	6053
DESCRIPTION	ROCK FILTER DAMS (INSTALL) (TY 3)	ROCK FILTER DAMS (REMOVE)	CONSTRUCTION EXITS (INSTALL) (TY 1)	CONSTRUCTION EXITS (REMOVE)	TEMPORARY SEDIMENT CONTROL FENCE INSTALL	TEMPORARY SEDIMENT CONTROL FENCE REMOVE	BIODEG EROSN CONT LOGS (INSTL) (12")	BIODEG EROSN CONT LOGS (REMOVE)	ROCK FILTER DAMS (INSTALL) (TY 2) (6:1)
UNIT	LF	LF	SY	SY	LF	LF	LF	LF	LF
SHEET 1			110	110	2479	2479	450	450	
SHEET 2			110	110	1028	1028	50	50	
SHEET 3	50	170	110	110	1515	1515			120
TOTAL CSJ: 3469-01-014	50	170	330	330	5022	5022	500	500	120

NO.	REVISION	BY	DATE

ENTECH CIVIL ENGINEERS, INC
F-6932
15021 Katy Freeway,
Suite 500
Houston, Texas, 77094
281-945-0069 PH
281-945-0081 FX

Texas Department of Transportation®

FM 3099 REALIGNMENT

SUMMARY OF SW3P QUANTITIES

SHEET 1 OF 1

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
06	SEE TITLE SHEET		22
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

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DETOURS, BARRICADES, WARNING SIGNS, SEQUENCE OF WORK, ETC.

THE CONTRACTOR'S ATTENTION IS DIRECTED TO THE REQUIREMENTS OF ITEM 7, "LEGAL RELATIONS AND RESPONSIBILITIES TO THE PUBLIC", OF THE STANDARD SPECIFICATIONS. IN ADDITION TO THESE REQUIREMENTS, THE FOLLOWING PROVISIONS SHALL ALSO GOVERN ON THIS CONTRACT:

1. GENERAL

1. TRAFFIC MUST BE HANDLED THROUGHOUT THE PROJECT DURING CONSTRUCTION. THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING A SAFE AND COMFORTABLE PASSAGE FOR VEHICULAR AND PEDESTRIAN TRAFFIC WITH MINIMAL INCONVENIENCE TO THE PUBLIC, AS SHOWN IN THE PLANS OR AS DIRECTED / APPROVED BY THE ENGINEER.
2. THE CONTRACTOR MAY PROPOSE/RECOMMEND MODIFICATIONS TO THE SEQUENCE OF WORK FOR CONSIDERATION BY THE ENGINEER. ANY MAJOR RECOMMENDED MODIFICATIONS BY THE CONTRACTOR SHALL INCLUDE ANY CHANGES TO THE VARIOUS BID ITEMS, IMPACT TO TRAFFIC, EFFECT OF OVERALL PROJECT IN TIME AND COST, ETC. IF THIS PROPOSAL IS IMPLEMENTED, THE CONTRACTOR WILL BE RESPONSIBLE FOR DEVELOPING DETAILED PLAN SHEETS TO BE SEALED BY A LICENSED PROFESSIONAL ENGINEER FOR INCLUSION IN THE CHANGE ORDER. THE CONTRACTOR CANNOT PROCEED WITH ANY CONSTRUCTION OPERATIONS BASED ON A REVISED PHASE/SEQUENCE UNTIL WRITTEN APPROVAL IS OBTAINED FROM THE ENGINEER. IF AT ANY TIME DURING CONSTRUCTION THE CONTRACTOR'S PROPOSED PLAN OF OPERATION FOR HANDLING TRAFFIC DOES NOT PROVIDE FOR SAFE AND COMFORTABLE MOVEMENT, THE CONTRACTOR WILL IMMEDIATELY CHANGE THEIR OPERATION TO CORRECT THE UNSATISFACTORY CONDITION.
3. TRAFFIC SHALL NOT BE PERMITTED ON UNPREPARED SUBGRADE.
4. DO NOT STORE ANY CONSTRUCTION MATERIAL OR EQUIPMENT AT ANY LOCATION THAT WILL CONSTITUTE A HAZARD AND WILL ENDANGER TRAFFIC.
5. ACCESS TO ADJOINING PROPERTY MUST BE MAINTAINED AT ALL TIMES.
6. CONTRACTOR IS TO MAINTAIN POSITIVE DRAINAGE AT ALL TIMES.
7. ALL SEQUENCE OF WORK ON THIS PROJECT SHALL BE COORDINATED TO COINCIDE WITH ANY PROJECTS WITHIN OR ADJACENT TO THIS PROJECT.
8. THE ROADWAY SHALL BE EVALUATED BY THE ENGINEER PRIOR TO ANY OVERLAY OPERATIONS. IF ANY ROADWAY CONDITIONS HAVE CHANGED, THE ENGINEER RETAINS THE RIGHT TO ADJUST WORK AREAS AND RATES. AFTER OVERLAY OPERATIONS ARE COMPLETE, IF ANY AREAS ARE DETERMINED TO BE UNACCEPTABLE, THE AREA SHALL BE REPAIRED BEFORE PROCEEDING WITH OTHER REFERENCED LOCATIONS. REPAIR METHODS MUST BE APPROVED BY THE ENGINEER AND WILL NOT BE PAID FOR SEPARATELY, BUT SHALL BE CONSIDERED SUBSIDIARY TO THE VARIOUS BID ITEMS. THE CONTRACTOR SHALL SUBMIT THE REPAIR PROCEDURES AT THE PRE-CONSTRUCTION MEETING.
9. EGRESS AND INGRESS TO THE CONSTRUCTION ZONES IN MAINLANE AREAS SHALL BE MAINTAINED BY CONTRACTOR AND SHALL INCORPORATE BARRIERS AS SHOWN ON PERTINENT STANDARD SHEETS AND / OR AS DIRECTED BY THE ENGINEER.
10. THE CONTRACTOR SHALL INSTALL AND MAINTAIN AN ADEQUATE NUMBER OF BARRICADES, WARNING AND DIRECTIONAL SIGNS TO DELINEATE TRAFFIC FOR ANY DETOURS OR CLOSURES. THE CONTRACTOR MAY, WITH THE APPROVAL AND/ OR AS DIRECTED BY THE ENGINEER, BE REQUIRED TO VARY THE NUMBER AND LOCATION OF SIGNS AND BARRICADES FROM THAT INDICATED ON THE PLANS.
11. COVER PERMANENT SIGNS IN CONFLICT TO TRAFFIC PHASING. THIS IS SUBSIDIARY TO ITEM 502.
12. REMOVAL AND DISPOSAL OF EXISTING ABANDONED UTILITIES (EITHER PREVIOUSLY ABANDONED OR ABANDONED DURING THIS PROJECT) REQUIRED TO SUPPORT THIS PROJECT'S CONSTRUCTION SHALL BE PERFORMED UNDER THE OVERALL PREPARE RIGHT-OF-WAY ITEM (ITEM 100).
13. CONTRACTOR RESPONSIBLE FOR DAMAGE TO ANY MAILBOXES OR ANY APPURTENANCES WITHIN THE PROJECT LIMITS.

2. LANE CLOSURES

1. IN ADDITION TO THE PREVIOUSLY MENTIONED REQUIREMENTS, THE FOLLOWING PROVISIONS SHALL ALSO GOVERN ON THIS CONTRACT:
   A. ALL TRAFFIC SIGNAL WORK, DETOURS, HORIZONTAL TRAFFIC MOVEMENTS, LANE CLOSURES, ETC. ARE DIRECTLY RELATED TO THE SEQUENCE OF WORK.
   B. THE CONTRACTOR SHALL NOTIFY THE ENGINEER OF IMPENDING / UPCOMING LANE CLOSURES AT LEAST FIVE WORKING DAYS IN ADVANCE OF CLOSURES.

3. SEQUENCE OF WORK

GENERAL NOTES / BARRICADES AND WARNING SIGNS

1. PLACE SIGNS, BARRICADES, WORK ZONE PAVEMENT MARKINGS AND TRAFFIC HANDLING DEVICES IN ACCORDANCE WITH TMUTCD FOR PHASE I AS SHOWN ON TRAFFIC CONTROL TYPICAL SECTIONS, PER APPLICABLE "BC" STANDARDS, "TCP" STANDARDS AND/OR AS DIRECTED BY THE ENGINEER.
2. UTILIZE PILOT CAR AND FLAGGERS FOR ONE LANE TWO WAY TRAFFIC.
3. PLACE SW3P CONTROLS FOR ENTIRE CORRIDOR.
4. CONTRACTOR SHALL MAINTAIN REASONABLE AND SAFE ACCESS TO DRIVEWAYS DURING CONSTRUCTION, WHICH INCLUDES PROPER ELEVATION FOR SIGHT DISTANCE. CONTRACTOR SHALL COORDINATE DRIVEWAY CONSTRUCTION WITH PROPERTY OWNERS.
5. CONTRACTOR SHALL MAINTAIN A 3:1 SAFETY SLOPE IN ALL AREAS. 3:1 SAFETY SLOPE SHALL BE IN PLACE WHEN NO WORK IS BEING PERFORMED IN IMMEDIATE AREA.
6. DURING ONE-WAY TRAFFIC CONTROL, CONTRACTOR SHALL CONSTRUCT LENGTH OF PROPOSED IMPROVEMENTS THAT CAN BE FINALIZED AT THE END OF EACH DAY TO ALLOW BOTH LANES TO BE OPEN TO TRAFFIC OVER NIGHT. OR AS DIRECTED BY THE ENGINEER.

PHASE 1 CONSTRUCT PAVEMENT NORTH OF US 180, AND NEW PAVEMENT SOUTH OF US 180

1. CONSTRUCT PROPOSED WIDENING AT SOUTHBOUND TIE-IN OF US 180 INTERSECTION, UTILIZING TEMPORARY PAVEMENT IN ORDER TO MAINTAIN 2 WAY TRAFFIC AT INTERSECTION. UPON COMPLETION, SHIFT TRAFFIC AT INTERSECTION AND CONSTRUCT NORTHBOUND TIE-IN. UPON COMPLETION, CONSTRUCT PROP US 180 CULVERT USING JACK & BORE AND CONSTRUCT WB WIDENING ALONG US 180. UPON COMPLETION, CONSTRUCT EB WIDENING ALONG US 180. ALL STEP 1 WORK TO BE CONSTRUCTED WITH A CONSTRUCTION MILESTONE.
2. CONSTRUCT PROPOSED IMPROVEMENTS FOR SOUTHBOUND LANE NORTH OF US 180 THAT MAY BE FINALIZED AT END OF EACH DAY TO ALLOW BOTH LANES TO BE OPEN TO TRAFFIC OVER NIGHT. DAYTIME PILOT CAR OPERATIONS.
3. CONSTRUCT PROPOSED IMPROVEMENTS FOR NORTHBOUND LANE NORTH OF US 180 THAT MAY BE FINALIZED AT END OF EACH DAY TO ALLOW BOTH LANES TO BE OPEN TO TRAFFIC OVER NIGHT. DAYTIME PILOT CAR OPERATIONS.
4. CONSTRUCT NEW PAVEMENT SOUTH OF US 180 FROM 417+01.64 TO 422+40, INCLUDING TIE-IN FOR US 180 INTERSECTION.
5. CONTRACTOR SHALL MAINTAIN REASONABLE AND SAFE ACCESS TO DRIVEWAYS DURING CONSTRUCTION, WHICH INCLUDES PROPER ELEVATION FOR SIGHT DISTANCE. CONTRACTOR SHALL COORDINATE DRIVEWAY CONSTRUCTION WITH PROPERTY OWNERS.

PHASE 2 DETOUR USING FM 2231 & CONSTRUCT CULVERT EXTENSION, AND PAVEMENT AT EXIST FM 3099 TIE-IN

1. DETOUR TRAFFIC THROUGH THE USE OF FM 2231. FM 3099 BETWEEN US 180 AND FM 2231 WILL BE CLOSED TO THROUGH TRAFFIC.
2. DEMOLISH EXIST FM 3099 ROADWAY AT US 180 PER REMOVAL PLANS.
3. CONSTRUCT EXTENSIONS OF THE BRIDGE CLASS CULVERT WITH A CONSTRUCTION MILESTONE. CROSS CULVERT TO BE COMPLETED PRIOR TO REMAINING ROADWAY CONSTRUCTION.
4. SAWCUT EDGE OF PAVEMENT TO PROVIDE CLEAN JOINT.
5. CONSTRUCT FM 3099 TIE-IN FROM STA 422+40 TO 427+55 WITH A CONSTRUCTION MILESTONE. CONTRACTOR SHALL MAINTAIN REASONABLE AND SAFE ACCESS TO DRIVEWAYS, PARTICULARLY AT STA 426+10.44 AND STA 427+84.52 DURING CONSTRUCTION, WHICH INCLUDES PROPER ELEVATION FOR SIGHT DISTANCE. DURING ONE LANE TWO WAY TRAFFIC CONTROL, EACH PROPERTY SHALL HAVE ONLY ONE DRIVEWAY ACCESS POINT TO FM 3099 OPEN TO TRAFFIC. CONTRACTOR SHALL COORDINATE DRIVEWAY CONSTRUCTION WITH PROPERTY OWNERS.
6. CONSTRUCT REMAINDER OF FM 3099 DRIVEWAY AT STA 419+26.
7. CONSTRUCT PROPOSED SIDEWALK.
8. INSTALL 4-WAY TRAFFIC SIGNAL AT US 180 INTERSECTION.
9. PERFORM SEAL COAT OPERATIONS. PLACE FINAL STRIPING.
10. PERFORM PROJECT CLEAN UP USING TCP(2-2b)-18 STANDARD.

4. SAFETY

1. THE CONTRACTOR WILL PROVIDE, CONSTRUCT AND MAINTAIN BARRICADES AND SIGNS IN ACCORDANCE WITH STATE STANDARDS BC (1-12)-14. ANY SIGNS REQUIRED THAT ARE NOT DETAILED IN THE STANDARD SHEETS SHALL BE IN CONFORMANCE WITH THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS" AND THE "STANDARD HIGHWAY SIGN DESIGNS FOR TEXAS."
2. BARRICADES AND WARNING SIGNS SHALL BE PLACED AS INDICATED ON THE STANDARDS. THIS SHALL BE CONSIDERED THE MINIMUM REQUIREMENT TO PROVIDE FOR THE SAFETY OF TRAFFIC DURING CONSTRUCTION. THE CONTRACTOR SHALL PROVIDE AND MAINTAIN OTHER SUCH BARRICADES AND SIGNS DEEMED NECESSARY BY THE ENGINEER OR AS DIRECTED BY FIELD CONDITIONS, TO PROVIDE FOR THE SAFETY OF THE TRAVELING PUBLIC AND THE CONTRACTOR'S PERSONNEL.
3. THE CONTRACTOR SHALL PROVIDE AND MAINTAIN FLAGGERS AS DIRECTED/APPROVED BY THE ENGINEER, AT SUCH POINTS, AND FOR SUCH PERIODS OF TIME AS MAY BE REQUIRED, TO PROVIDE FOR THE SAFETY OF THE TRAVELING PUBLIC AND THE CONTRACTOR'S PERSONNEL.
4. THE CONTRACTOR SHALL KEEP THE ROADWAY CLEAN AND FREE OF DIRT OR OTHER MATERIALS DURING HAULING OPERATIONS. IF THE CONTRACTOR DOES NOT MAINTAIN A CLEAN ROADWAY, THEY SHALL CEASE ALL CONSTRUCTION OPERATIONS, WHEN DIRECTED BY THE ENGINEER, TO CLEAN THE ROADWAY TO THE SATISFACTION OF THE ENGINEER.

5. HAULING EQUIPMENT

1. THE USE OF RUBBER-TIRED EQUIPMENT WILL BE REQUIRED FOR MOVING DIRT OR OTHER MATERIALS ALONG OR ACROSS PAVEMENTED SURFACES. WHERE THE CONTRACTOR DESIRES TO MOVE ANY EQUIPMENT NOT LICENSED FOR OPERATION ON PUBLIC HIGHWAYS, ON OR ACROSS PAVEMENT, THEY SHALL PROTECT THE PAVEMENT FROM DAMAGE AS DIRECTED/APPROVED BY THE ENGINEER.
2. THROUGHOUT CONSTRUCTION OPERATIONS, THE CONTRACTOR WILL BE REQUIRED TO CONDUCT THEIR HAULING OPERATIONS IN A MANNER SUCH THAT VEHICLES WILL NOT HAUL OVER PREVIOUSLY RECOMPACTED SUBGRADE OR COMPACTED BASE MATERIAL, EXCEPT IN SHORT SECTIONS FOR DUMPING MANIPULATIONS.

6. FINAL CLEANUP

1. UPON COMPLETION OF THE WORK AND BEFORE FINAL ACCEPTANCE AND FINAL PAYMENT IS MADE, THE CONTRACTOR SHALL CLEAR AND REMOVE FROM THE SITE ALL SURPLUS AND DISCARDED MATERIALS AND DEBRIS OF EVERY KIND AND LEAVE THE ENTIRE PROJECT IN A SMOOTH, NEAT AND SIGHTLY CONDITION.

7. PAYMENT

1. ALL BARRICADES AND SIGNS SHALL BE SUBSIDIARY TO ITEM 502 BARRICADES, SIGNS AND TRAFFIC HANDLING. ALL EROSION AND SEDIMENT CONTROL DEVICES WILL BE PAID FOR UNDER ITEM 506 TEMPORARY EROSION, SEDIMENTATION, ENVIRONMENTAL CONTROLS, AND BIODEGRADABLE EROSION CONTROL LOGS. ALL WORK ZONE PAVEMENT MARKINGS WILL BE PAID FOR UNDER ITEM 662 WORK ZONE PAVEMENT MARKINGS. ALL OTHER WORK AND MATERIALS SHALL BE SUBSIDIARY TO THE VARIOUS BID ITEMS UNLESS INDICATED IN THE PLANS.

NO.	REVISION	BY	DATE

STATE OF TEXAS
JUAN SEBASTIAN HERNANDEZ
131592
LICENSED PROFESSIONAL ENGINEER

08/27/2021

ENTECH CIVIL ENGINEERS, INC
F-6932
15021 Katy Freeway, Suite 500
Houston, Texas, 77094
281-945-0069 Ph
281-945-0081 Fx

FM 3099 REALIGNMENT

TRAFFIC CONTROL PLAN NARRATIVE

SHEET 1 OF 1

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
06	SEE TITLE SHEET		23
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014,	FM 3099

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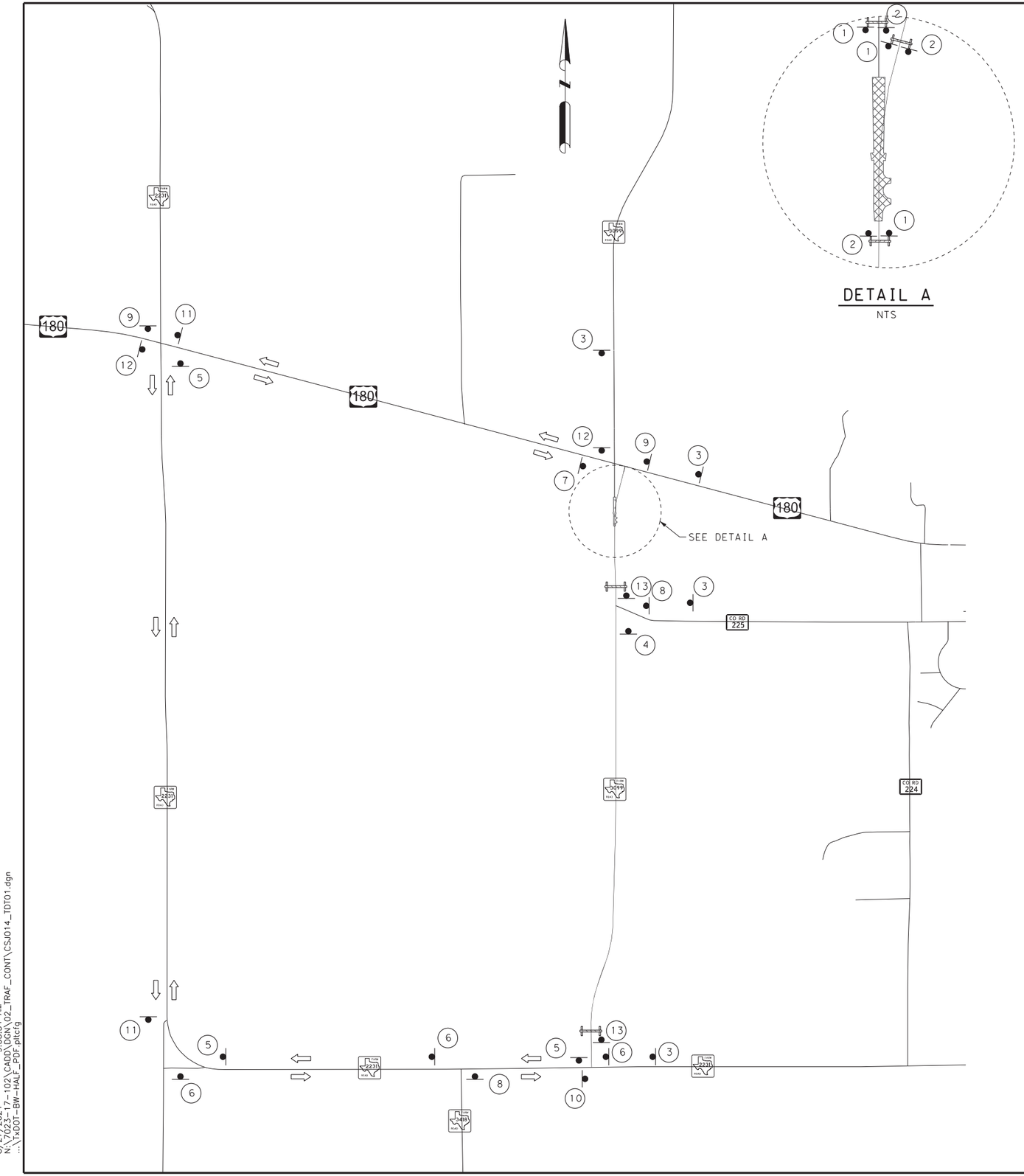

DETAIL A
NTS

NOTES:

1. THIS LAYOUT IS FOR PHASE II. TIE-IN REALIGNED FM 3099 TO EXIST FM 3099.
2. CONTRACTOR MAY, WITH THE APPROVAL OF OR AS DIRECTED BY THE ENGINEER, BE REQUIRED TO VARY THE NUMBER AND LOCATIONS OF SIGNS AND BARRICADES FROM THAT INDICATED ON THE PLANS. THIS MAY BE DONE IN ORDER TO MAINTAIN A SAFE AND UNINTERRUPTED FLOW OF TRAFFIC.
3. SIGNS AND BARRICADE MAINTENANCE SHALL BE PERFORMED ON A DAILY BASIS.
4. ALL TRAFFIC CONTROL WORK AND DEVICES SHALL BE IN ACCORDANCE WITH THE LATEST VERSION OF THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD).

LEGEND:

- WORK ZONE
- M — PORTABLE CHANGEABLE MESSAGE SIGN
- TYPE 3 BARRICADE
- SIGN
- DIRECTION OF TRAFFIC FLOW

1	NAME ADDRESS CITY STATE CONTRACTOR	G20-6T 48"X30"
2	ROAD CLOSED	R11-2 48"X30"
3	DETOUR AHEAD	CW20-2D 48"X48"
4	ROAD CLOSED AHEAD	CW20-3D 48"X48"
5	NORTH FARM 3099 ROAD / DETOUR	M3-1 24" X 12"; M1-6G 24" X 24"; M4-9R 30"X24"
6	NORTH FARM 3099 ROAD / DETOUR	M3-1 24" X 12"; M3-1 24" X 12"; M4-9S 30"X24"
7	NORTH FARM 3099 ROAD / END DETOUR	M3-1 24" X 12"; M1-6G 24" X 24"; M4-8a 24"X18"
8	NORTH FARM 3099 ROAD / DETOUR	M3-1 24" X 12"; M3-1 24" X 12"; M4-9L 30"X24"
9	SOUTH FARM 3099 ROAD / DETOUR	M3-1 24" X 12"; M3-1 24" X 12"; M4-9S 30"X24"
10	SOUTH FARM 3099 ROAD / END DETOUR	M3-1 24" X 12"; M1-6G 24" X 24"; M4-8a 24"X18"
11	SOUTH FARM 3099 ROAD / DETOUR	M3-1 24" X 12"; M3-1 24" X 12"; M4-9L 30"X24"
12	SOUTH FARM 3099 ROAD / DETOUR	M3-1 24" X 12"; M1-6G 24" X 24"; M4-9R 30"X24"
13	ROAD CLOSED TO THRU TRAFFIC	R11-4 60" x 30"

NOT TO SCALE

NO.	REVISION	BY	DATE

STATE OF TEXAS
JUAN SEBASTIAN HERNANDEZ
131592
LICENSED
PROFESSIONAL ENGINEER

08/27/2021

ENTECH CIVIL ENGINEERS, INC
F-6932
15021 Katy Freeway, Suite 500
Houston, Texas, 77094
281-945-0068 PH
281-945-0081 FX

FM 3099 REALIGNMENT

TRAFFIC CONTROL PLAN DETOUR

SHEET 1 OF 1

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
06	SEE TITLE SHEET		24
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

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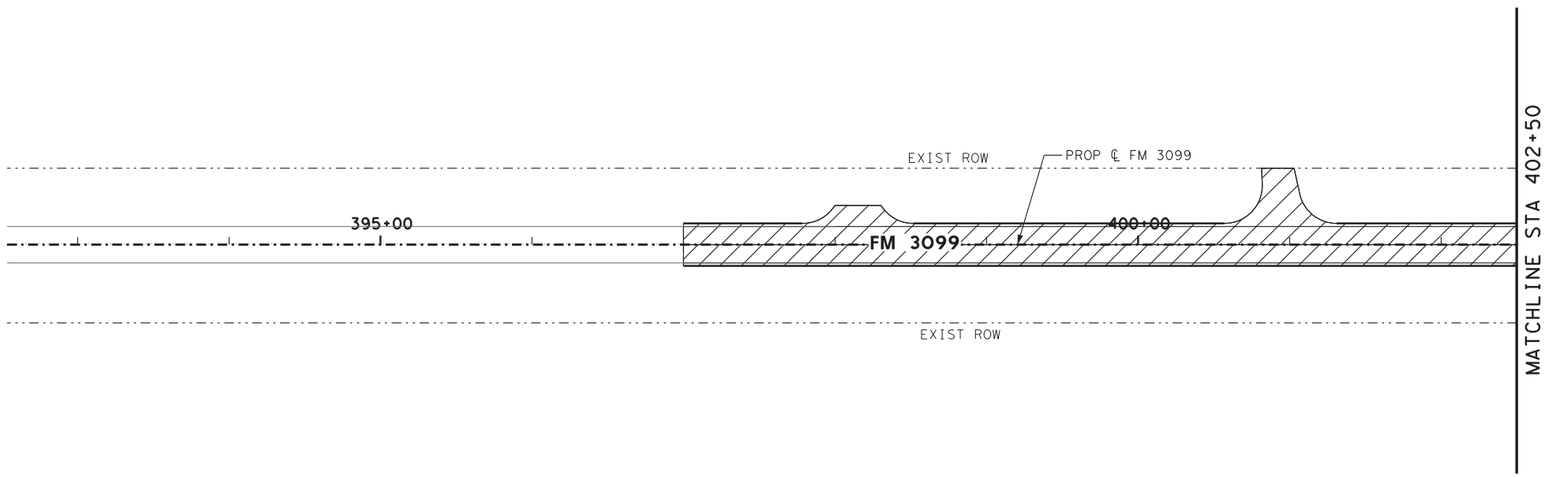
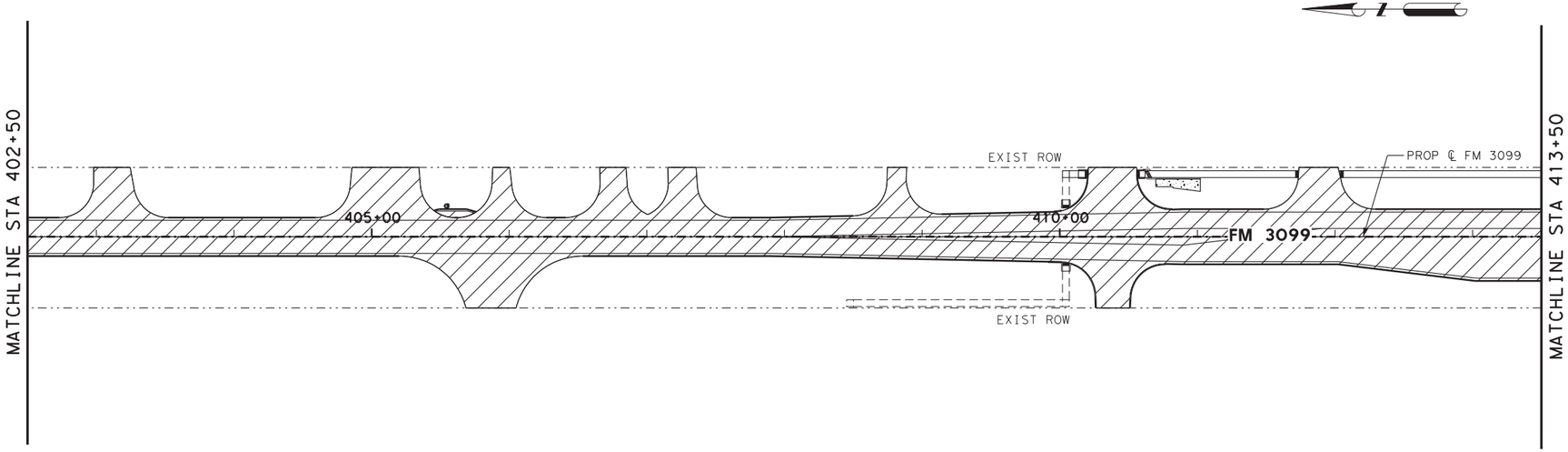


LEGEND

- PHASE 1
- PHASE 2
- TEMP PAV PHASE 1 STEP 1A
- TEMP PAV PHASE 1 STEP 1B

NOTES:

1. PLACE ALL ADVANCE WARNING SIGNS IN ACCORDANCE WITH APPLICABLE TCP STANDARDS.
2. CONTRACTOR SHALL MAINTAIN REASONABLE AND SAFE ACCESS TO DRIVEWAYS DURING CONSTRUCTION, WHICH INCLUDES PROPER ELEVATION FOR SIGHT DISTANCE. CONTRACTOR SHALL COORDINATE DRIVEWAY CONSTRUCTION WITH PROPERTY OWNERS.



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SCALE: 1"=100'H

NO.	REVISION	BY	DATE

STATE OF TEXAS
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PROFESSIONAL ENGINEER

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CIVIL ENGINEERS, INC

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OVERALL TCP LAYOUT

BEGIN PROJECT TO STA 413+50

SHEET 1 OF 3

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
06	SEE TITLE SHEET		25
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

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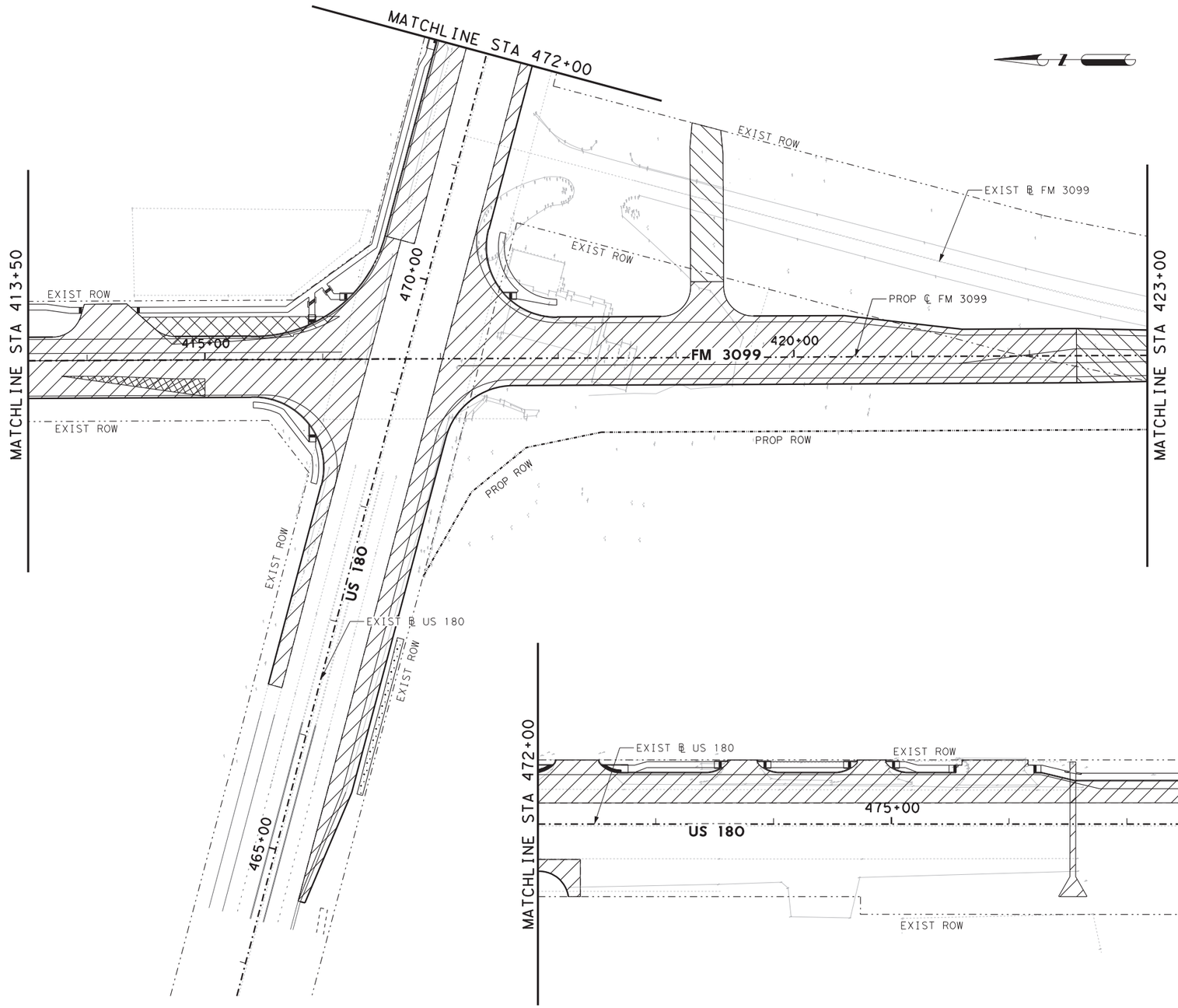

LEGEND

- PHASE 1
- PHASE 2
- TEMP PAV PHASE 1 STEP 1A
- TEMP PAV PHASE 1 STEP 1B

NOTES:

1. PLACE ALL ADVANCE WARNING SIGNS IN ACCORDANCE WITH APPLICABLE TCP STANDARDS.
2. CONTRACTOR SHALL MAINTAIN REASONABLE AND SAFE ACCESS TO DRIVEWAYS DURING CONSTRUCTION, WHICH INCLUDES PROPER ELEVATION FOR SIGHT DISTANCE. CONTRACTOR SHALL COORDINATE DRIVEWAY CONSTRUCTION WITH PROPERTY OWNERS.

0 50 100 200

SCALE: 1"=100'H

NO.	REVISION	BY	DATE

STATE OF TEXAS
JUAN SEBASTIAN HERNANDEZ
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LICENSED PROFESSIONAL ENGINEER

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OVERALL TCP LAYOUT

STA 413+50 TO STA 423+00

SHEET 2 OF 3

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
06	SEE TITLE SHEET		26
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

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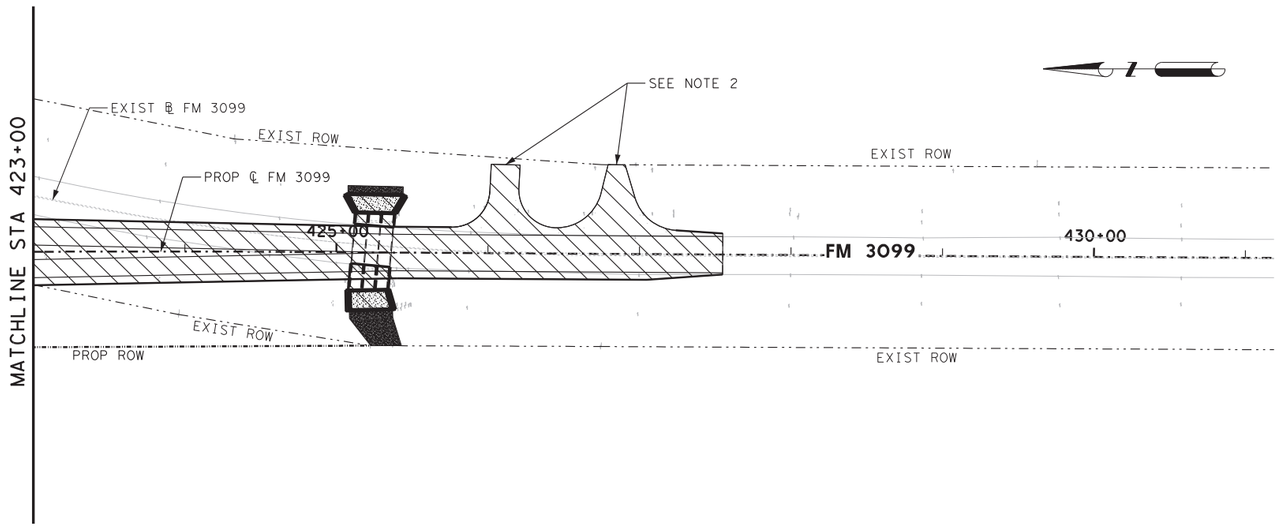

LEGEND

- PHASE 1
- PHASE 2
- TEMP PAV PHASE 1 STEP 1A
- TEMP PAV PHASE 1 STEP 1B

NOTES:

1. PLACE ALL ADVANCE WARNING SIGNS IN ACCORDANCE WITH APPLICABLE TCP STANDARDS.
2. CONTRACTOR SHALL MAINTAIN REASONABLE AND SAFE ACCESS TO DRIVEWAYS DURING CONSTRUCTION, WHICH INCLUDES PROPER ELEVATION FOR SIGHT DISTANCE. CONTRACTOR SHALL COORDINATE DRIVEWAY CONSTRUCTION WITH PROPERTY OWNERS.

0 50 100 200

SCALE: 1"=100'H

NO.	REVISION	BY	DATE

STATE OF TEXAS
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OVERALL TCP LAYOUT

STA 423+00 TO END PROJECT

SHEET 3 OF 3

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
06	SEE TITLE SHEET		27
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

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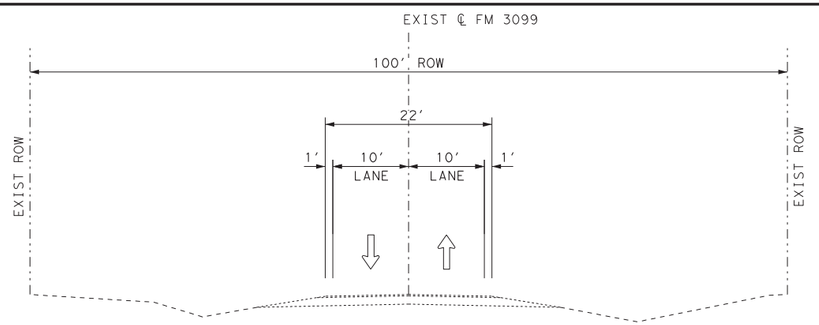
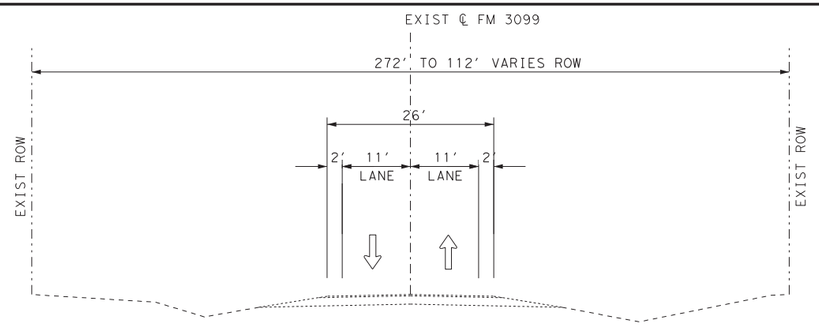
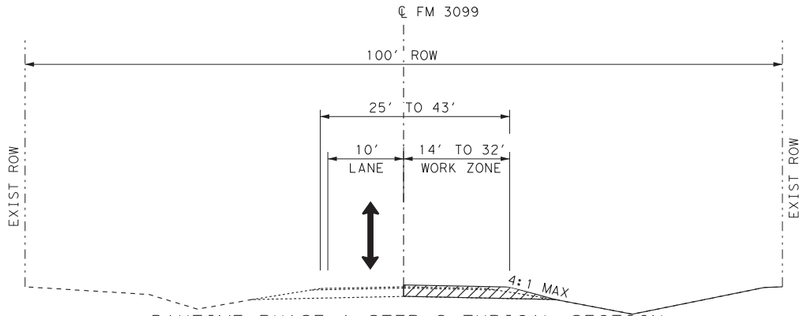


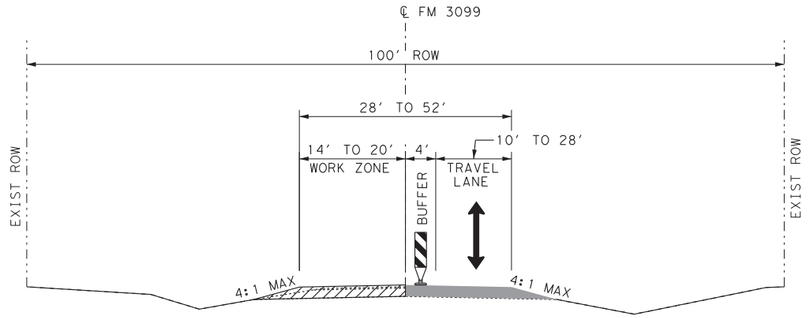
EXISTING TYPICAL SECTION
STA 397+00 TO 416+35.49
N.T.S.



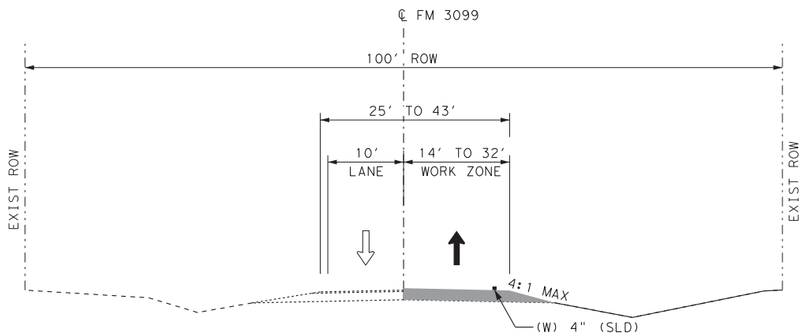
EXISTING TYPICAL SECTION
STA 417+01.64 TO 429+50
N.T.S.



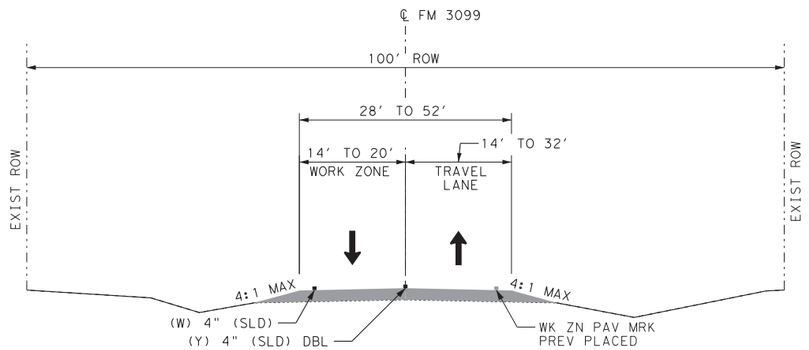
DAYTIME PHASE 1 STEP 2 TYPICAL SECTION
WITH A PILOT CAR
STA 397+00 TO 415+00
N.T.S.



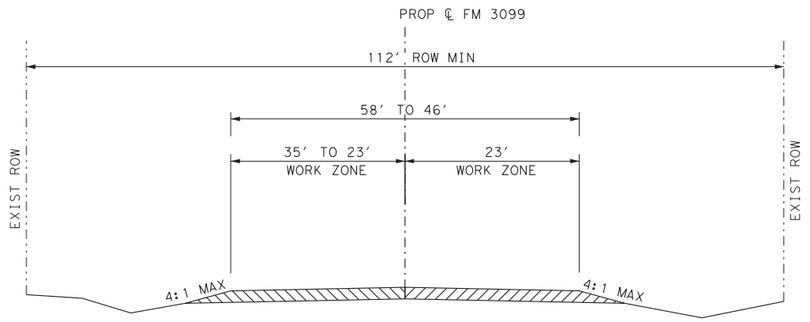
DAYTIME PHASE 1 STEP 3 TYPICAL SECTION
STA 397+00 TO 415+00
N.T.S.



NIGHTTIME PHASE 1 STEP 2 TYPICAL SECTION
STA 397+00 TO 415+00
N.T.S.



NIGHTTIME PHASE 1 STEP 3 TYPICAL SECTION
STA 397+00 TO 415+00
N.T.S.



PHASE 1 STEP 4 TYPICAL SECTION
STA 417+01.64 TO 422+40
N.T.S.

LEGEND

WORK ZONE

PROP WORK COMPLETE

NOTES:

1. CHANNELIZING DEVICES ON THE CENTER LINE MAY BE OMITTED WHEN A PILOT CAR IS LEADING TRAFFIC AND APPROVED BY THE ENGINEER PER STANDARD TCP(2-2b)-18
2. CONTRACTOR TO USE PILOT CAR WHEN CONSTRUCTION IS BEING PERFORMED ADJACENT TO THE CENTERLINE, UNLESS OTHERWISE DIRECTED BY THE ENGINEER

NO.	REVISION	BY	DATE

STATE OF TEXAS
JUAN SEBASTIAN HERNANDEZ
131592
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TRAFFIC CONTROL PLAN TYPICAL SECTIONS

SHEET 1 OF 2

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
06	SEE TITLE SHEET		28
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

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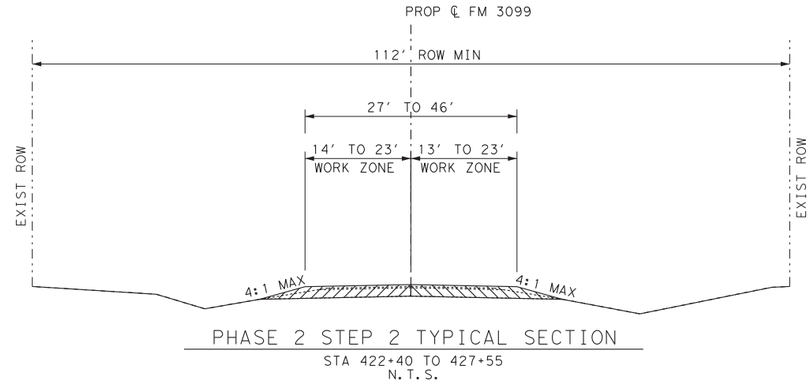

PHASE 2 STEP 2 TYPICAL SECTION

STA 422+40 TO 427+55
N.T.S.

LEGEND

WORK ZONE

PROP WORK COMPLETE

NOTES:

1. CHANNELIZING DEVICES ON THE CENTER LINE MAY BE OMITTED WHEN A PILOT CAR IS LEADING TRAFFIC AND APPROVED BY THE ENGINEER PER STANDARD TCP(2-2b)-18

2. CONTRACTOR TO USE PILOT CAR WHEN CONSTRUCTION IS BEING PERFORMED ADJACENT TO THE CENTERLINE, UNLESS OTHERWISE DIRECTED BY THE ENGINEER

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STATE OF TEXAS
JUAN SEBASTIAN HERNANDEZ
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TRAFFIC CONTROL PLAN TYPICAL SECTIONS

SHEET 2 OF 2

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
06	SEE TITLE SHEET		29
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014,	FM 3099

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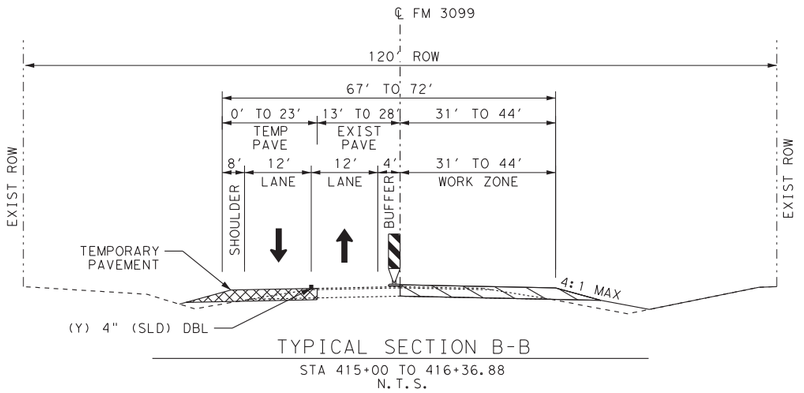
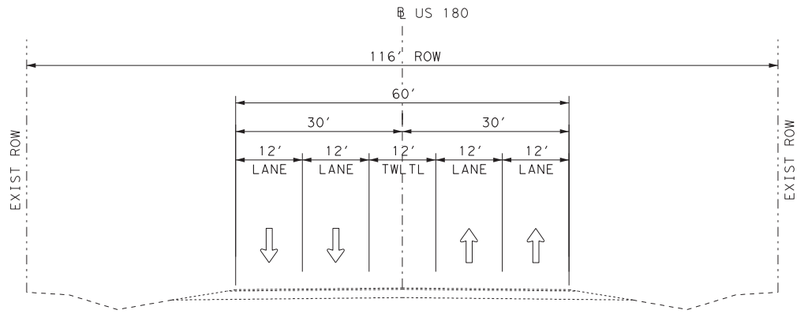


TYPICAL SECTION B-B
STA 415+00 TO 416+36.88
N.T.S.



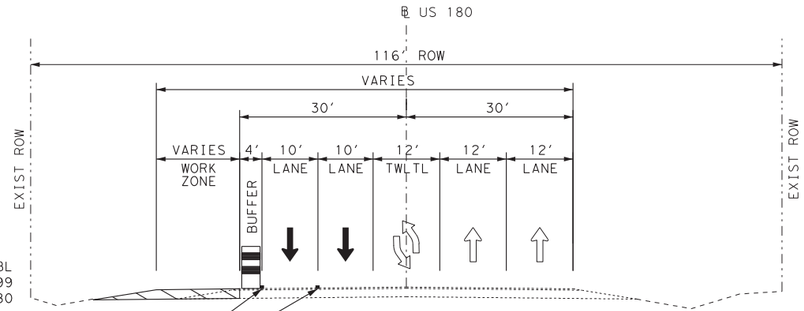
EXIST US 180
STA 461+00 TO 482+00
N.T.S.

LEGEND

- CONSTRUCTION THIS STEP
- TEMPORARY PAVEMENT STEP 1A
- TEMPORARY PAVEMENT STEP 1B
- COMPLETED CONSTRUCTION

NOTES:

1. PLACE ALL ADVANCE WARNING SIGNS IN ACCORDANCE WITH APPLICABLE TCP STANDARDS.
2. TEMPORARY PAVEMENT STEP 1A TO BE CONSTRUCTED PRIOR TO ANY ROADWAY CONSTRUCTION.
3. UPON COMPLETION OF THE CONSTRUCTION OF TEMPORARY PAVEMENT STEP 1A, SHIFT TRAFFIC AS SHOWN. THEN CONSTRUCT THE PROPOSED WIDENING AS SHOWN, FOLLOWED BY TEMPORARY PAVEMENT STEP 1B.
4. CONTRACTOR SHALL PRIORITIZE CONSTRUCTION AT CENTER OF THE INTERSECTION TO PROVIDE SAFE TURNING MOVEMENTS.
5. CONTRACTOR SHALL MAINTAIN REASONABLE AND SAFE ACCESS TO DRIVEWAYS DURING CONSTRUCTION, WHICH INCLUDES PROPER ELEVATION FOR SIGHT DISTANCE. CONTRACTOR SHALL COORDINATE DRIVEWAY CONSTRUCTION WITH PROPERTY OWNERS.



TYPICAL SECTION A-A
STA 466+34 TO 469+23
N.T.S.

0 50 100 200
SCALE: 1"=100'H

NO.	REVISION	BY	DATE

STATE OF TEXAS
JUAN SEBASTIAN HERNANDEZ
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TRAFFIC CONTROL PLAN
US 180 INTERSECTION LAYOUT
PHASE 1 STEP 1A

SHEET 1 OF 4

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
06	SEE TITLE SHEET		30
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

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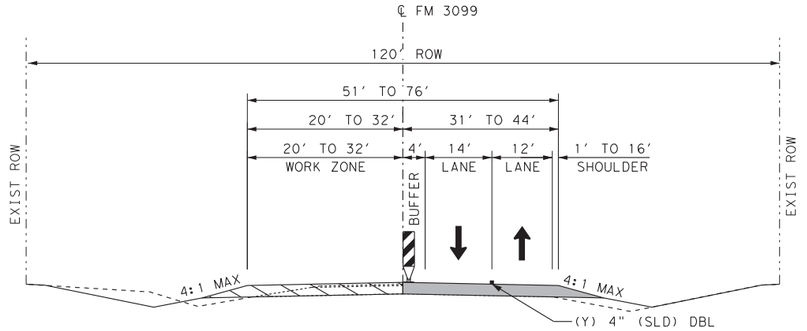

TYPICAL SECTION B-B
STA 415+00 TO 416+36.88
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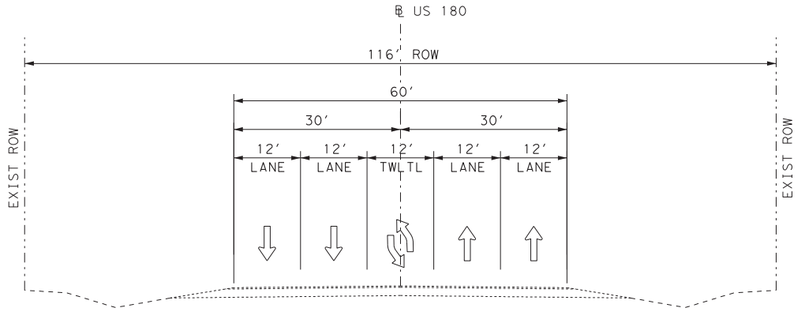
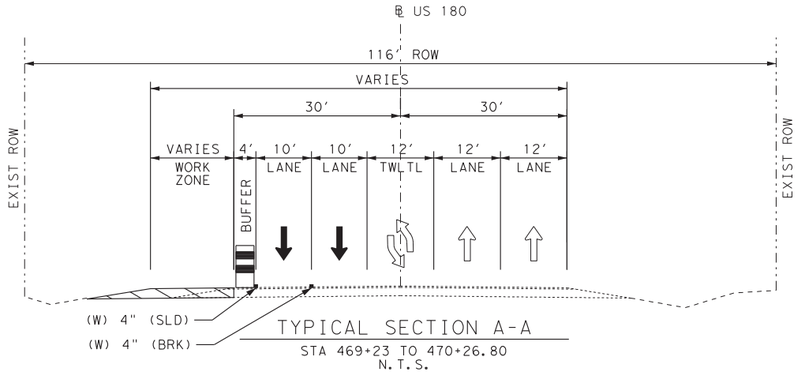


EXIST US 180
STA 461+00 TO 482+00
N.T.S.



TYPICAL SECTION A-A
STA 469+23 TO 470+26.80
N.T.S.

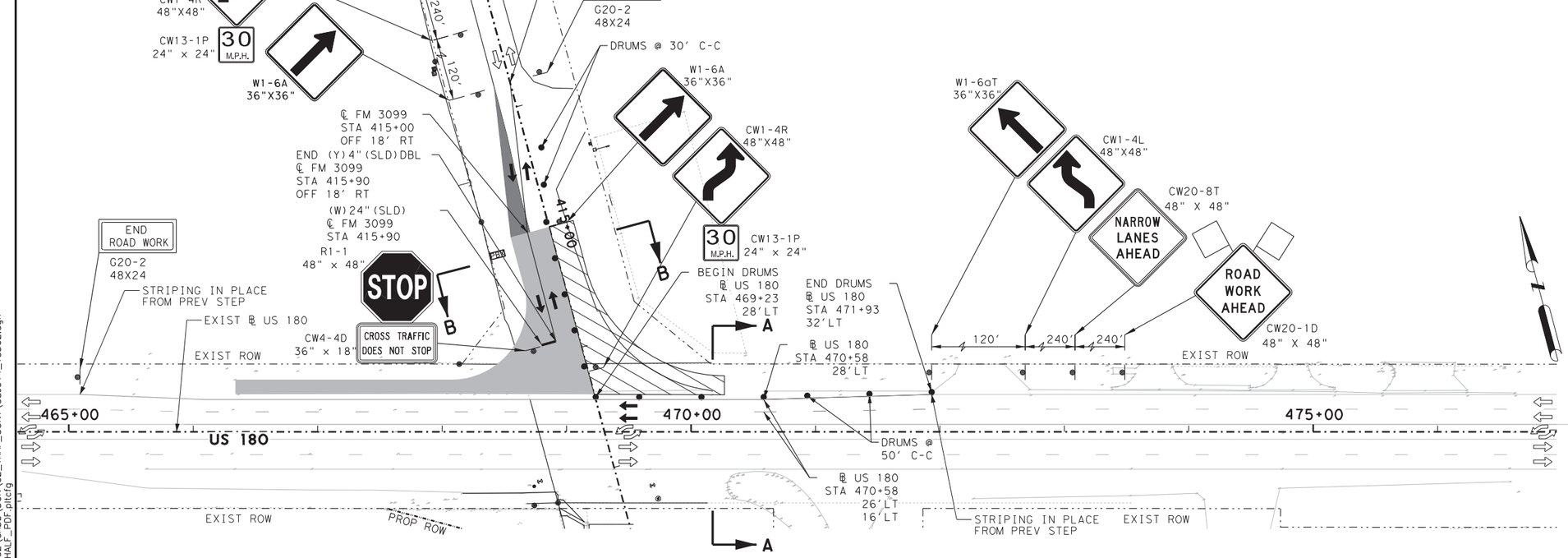
LEGEND

- CONSTRUCTION THIS STEP
- COMPLETED CONSTRUCTION
- COMPLETED TEMP PAVE

NOTES:

1. PLACE ALL ADVANCE WARNING SIGNS IN ACCORDANCE WITH APPLICABLE TCP STANDARDS.
2. CONTRACTOR SHALL MAINTAIN REASONABLE AND SAFE ACCESS TO DRIVEWAYS DURING CONSTRUCTION, WHICH INCLUDES PROPER ELEVATION FOR SIGHT DISTANCE. CONTRACTOR SHALL COORDINATE DRIVEWAY CONSTRUCTION WITH PROPERTY OWNERS.

0 50 100 200
SCALE: 1"=100'H



NO.	REVISION	BY	DATE

STATE OF TEXAS
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TRAFFIC CONTROL PLAN
US 180 INTERSECTION LAYOUT
PHASE 1 STEP 1B

SHEET 2 OF 4

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
06	SEE TITLE SHEET		31
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

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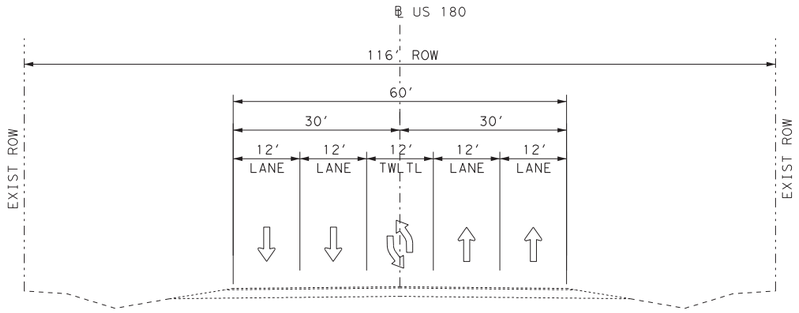
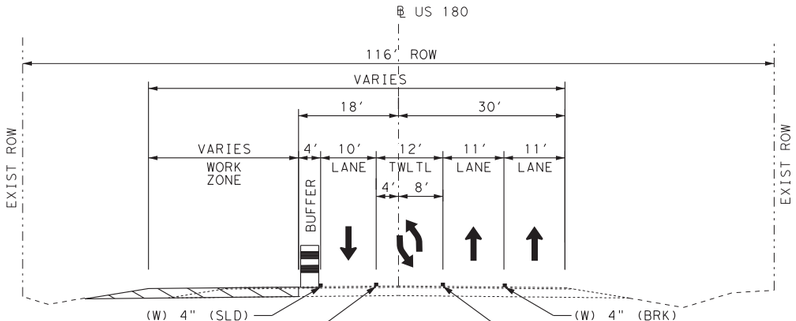


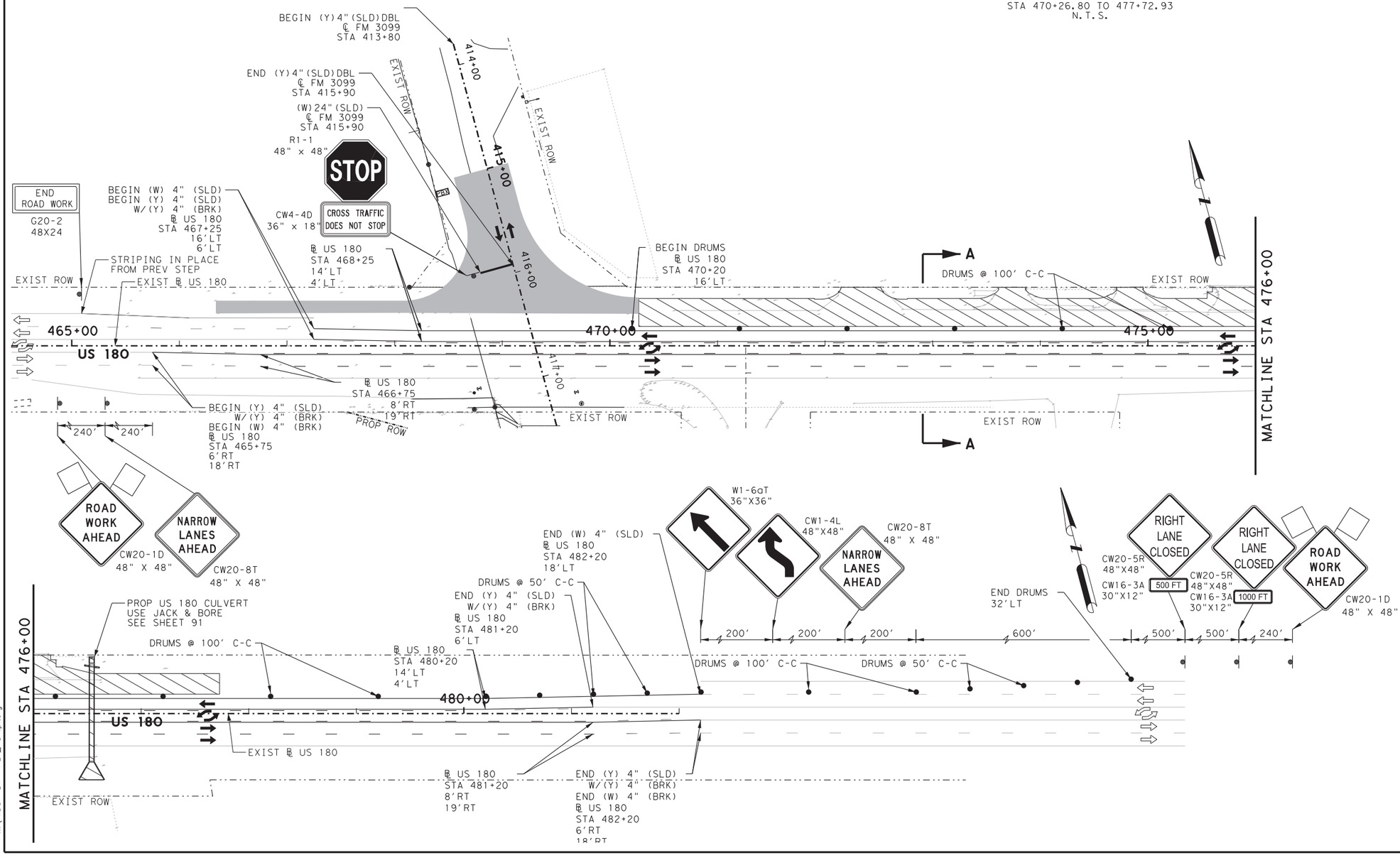
EXIST US 180
STA 461+00 TO 482+00
N.T.S.



TYPICAL SECTION A-A
STA 470+26.80 TO 477+72.93
N.T.S.

LEGEND

- CONSTRUCTION THIS STEP
- COMPLETED CONSTRUCTION
- COMPLETED TEMP PAVE



NOTES:

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0 50 100 200
SCALE: 1"=100'H

NO.	REVISION	BY	DATE

STATE OF TEXAS
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LICENSED PROFESSIONAL ENGINEER

08/27/2021

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281-945-0069 Ph
281-945-0081 Fx

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TRAFFIC CONTROL PLAN
US 180 INTERSECTION LAYOUT
PHASE 1 STEP 1C

SHEET 3 OF 4

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
06	SEE TITLE SHEET		32
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

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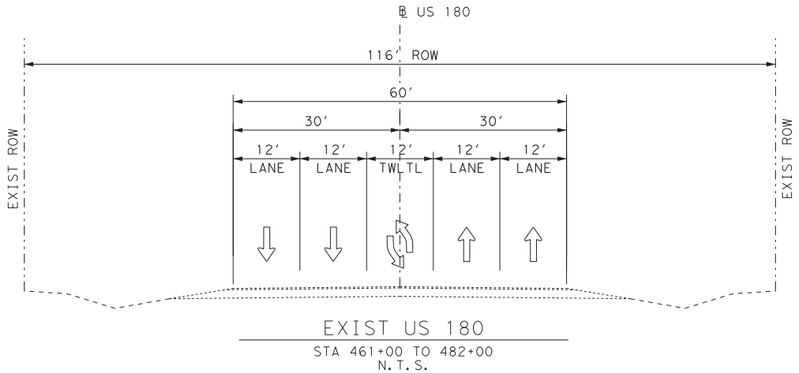
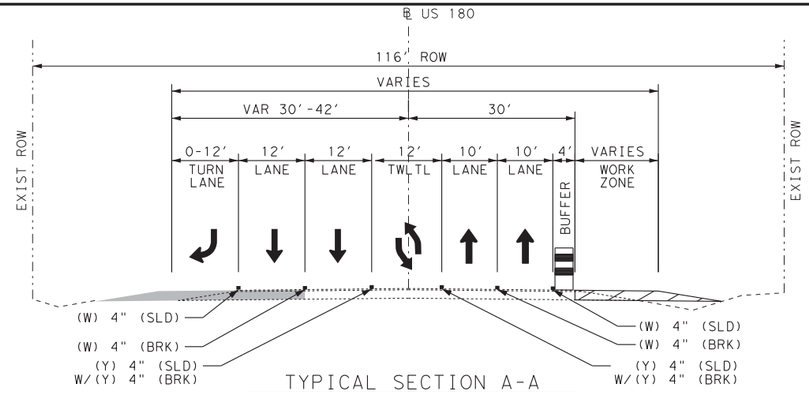


EXIST US 180
STA 461+00 TO 482+00
N.T.S.



TYPICAL SECTION A-A
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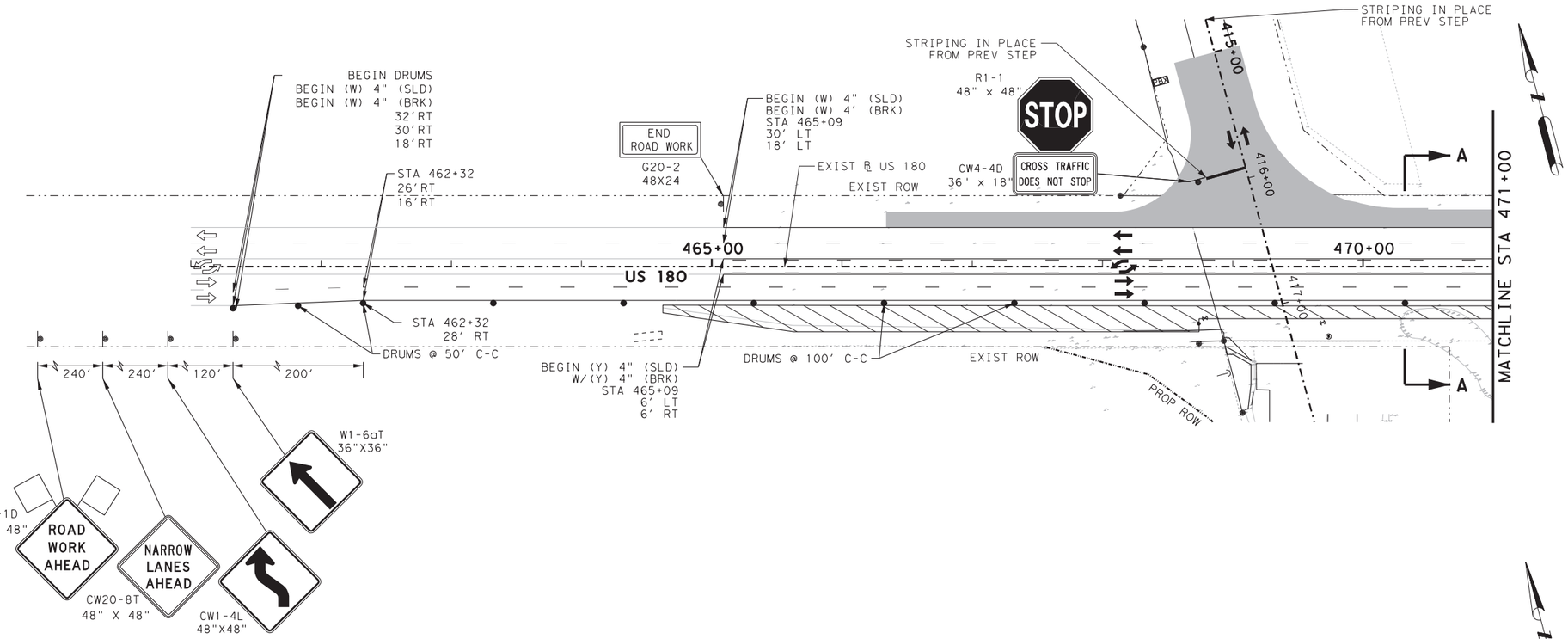
N.T.S.

LEGEND

- CONSTRUCTION THIS STEP
- COMPLETED CONSTRUCTION
- COMPLETED TEMP PAVE



NOTES:

1. PLACE ALL ADVANCE WARNING SIGNS IN ACCORDANCE WITH APPLICABLE TCP STANDARDS.
2. CONTRACTOR SHALL MAINTAIN REASONABLE AND SAFE ACCESS TO DRIVEWAYS DURING CONSTRUCTION, WHICH INCLUDES PROPER ELEVATION FOR SIGHT DISTANCE. CONTRACTOR SHALL COORDINATE DRIVEWAY CONSTRUCTION WITH PROPERTY OWNERS.

0 50 100 200
SCALE: 1"=100'H

NO.	REVISION	BY	DATE

STATE OF TEXAS
JUAN SEBASTIAN HERNANDEZ
131592
LICENSED PROFESSIONAL ENGINEER

08/27/2021

ENTECH CIVIL ENGINEERS, INC
F-6932
15021 Katy Freeway, Suite 500
Houston, Texas, 77094
281-945-0069 PH
281-945-0081 FX

FM 3099 REALIGNMENT

TRAFFIC CONTROL PLAN
US 180 INTERSECTION LAYOUT
PHASE 1 STEP 1D

SHEET 4 OF 4

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
06	SEE TITLE SHEET		33
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

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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	3469	01	014	FM 3099
4-03 7-13	DIST	COUNTY		SHEET NO.
9-07 8-14	BWD	STEPHENS		34
5-10 5-21				

DATE: 10/27/2022 9:59:41 AM
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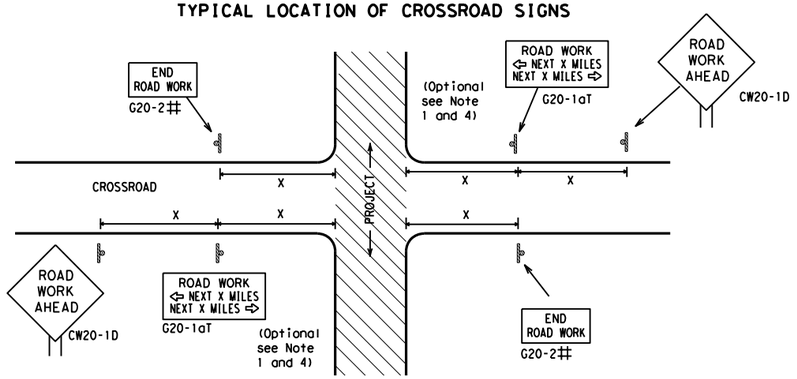
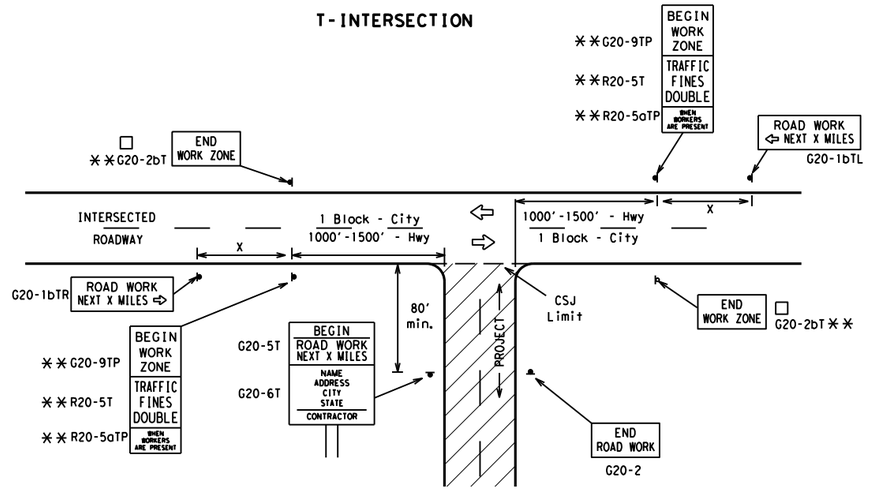
TYPICAL LOCATION OF CROSSROAD SIGNS



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]

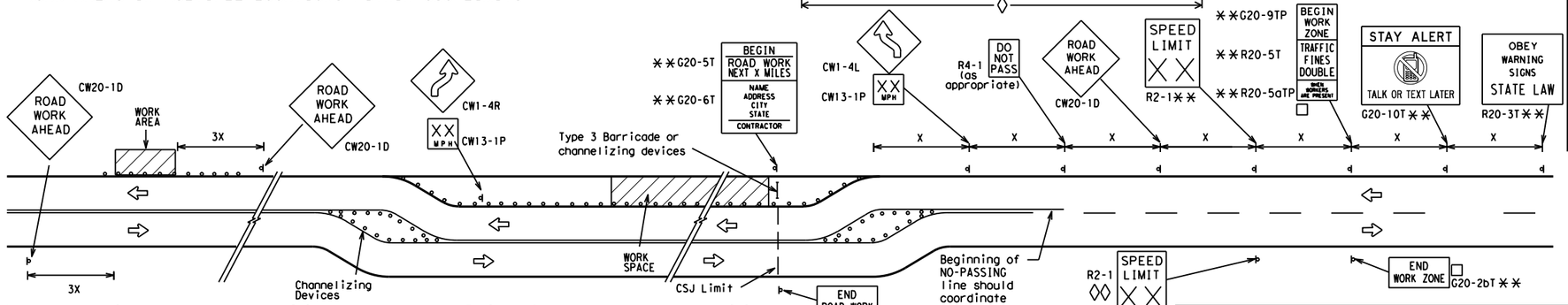
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

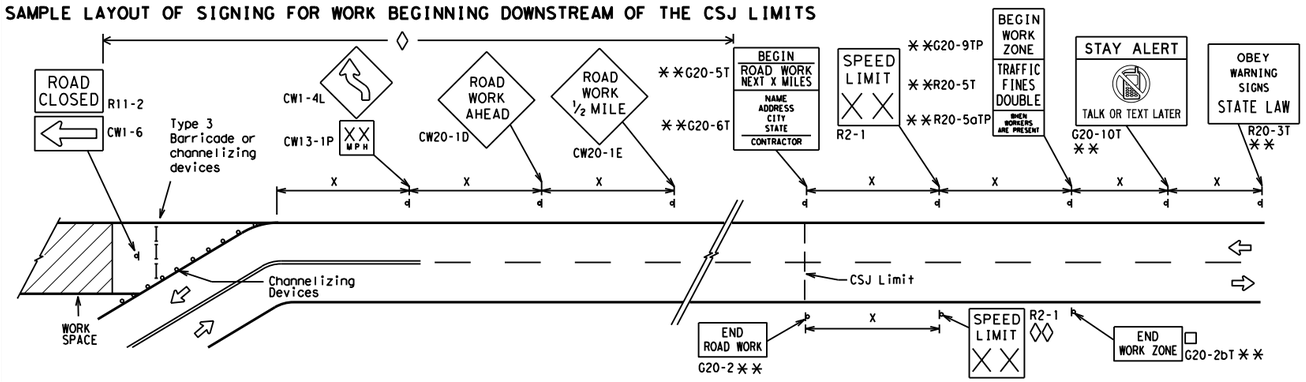
1. Special or larger size signs may be used as necessary.
2. Distance between signs should be increased as required to have 1500 feet advance warning.
3. Distance between signs should be increased as required to have 1/2 mile or more advance warning.
4. 36" x 36" "ROAD WORK AHEAD" (CW20-1D)signs may 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 DOWNSTREAM OF THE CSJ LIMITS



SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT 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
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	3469	01	014	FM 3099
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	BWD	STEPHENS		35

DATE: 10/27/2022 10:00:21 AM
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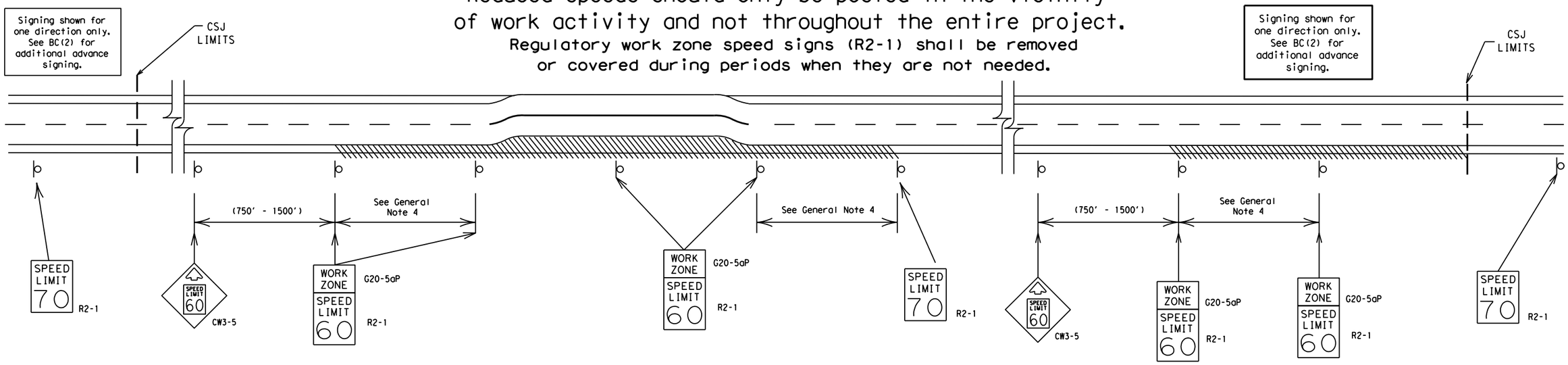
TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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.

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-21

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©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	3469	01	014	FM 3099
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	BWD	STEPHENS		36

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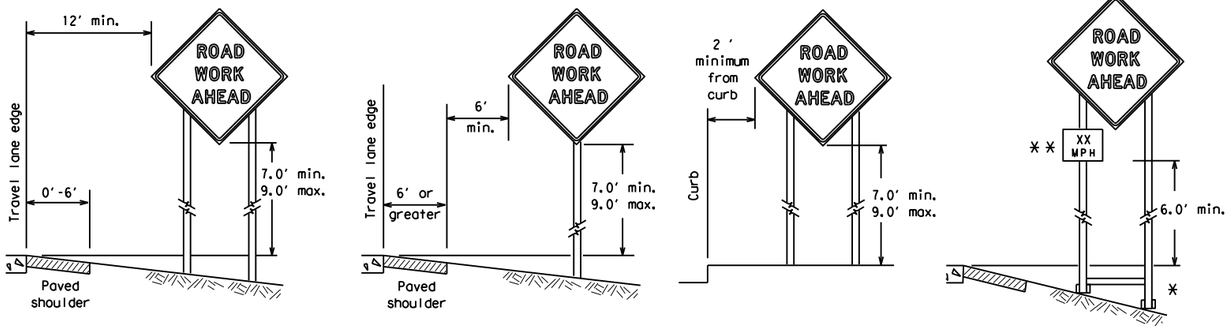
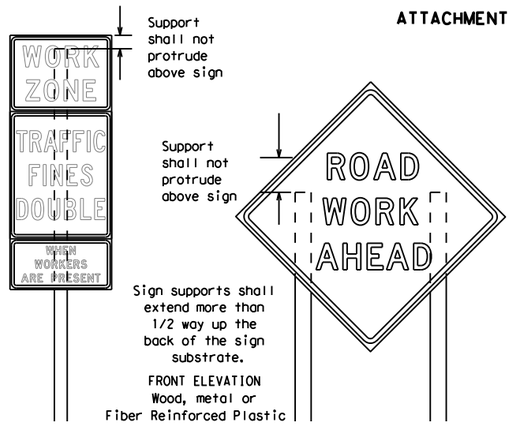
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

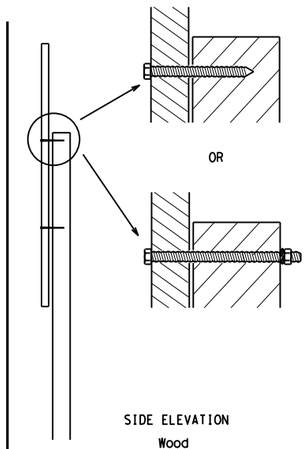


* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

** 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





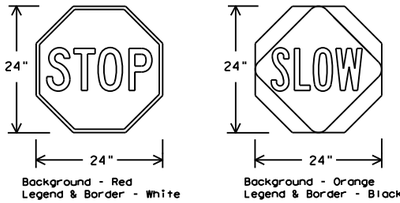
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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.



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	3469	01	014	FM 3099
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7-13 5-21	BWD	STEPHENS		37

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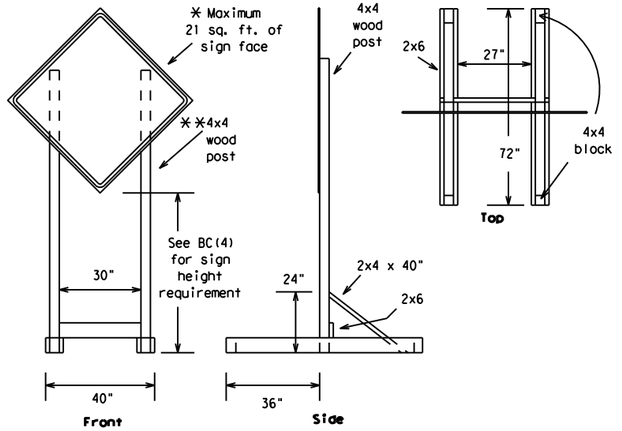
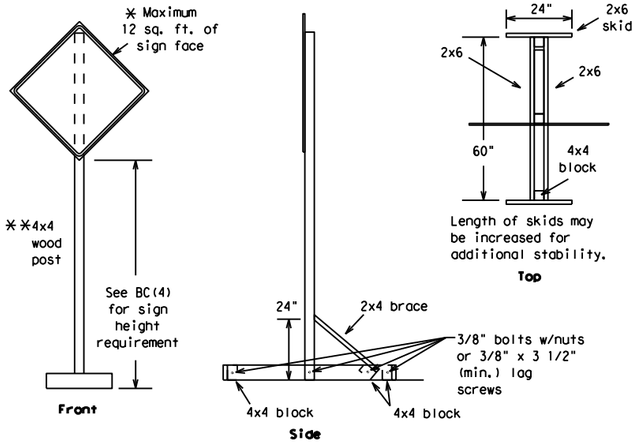
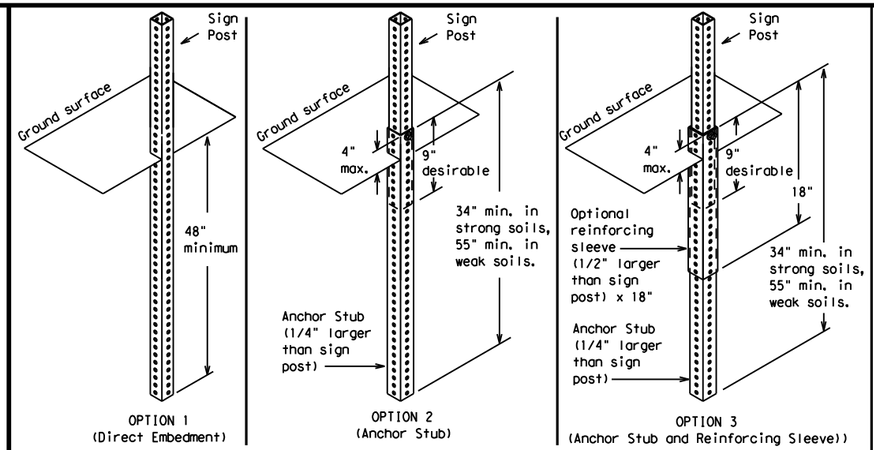




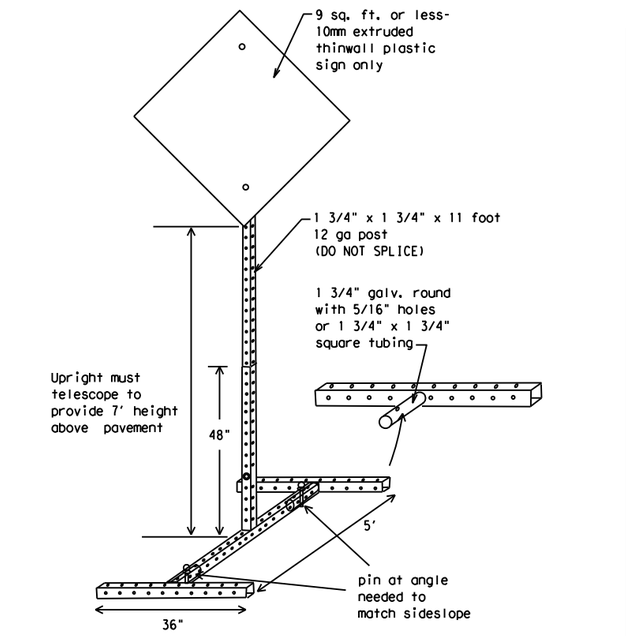
SKID MOUNTED WOOD SIGN SUPPORTS

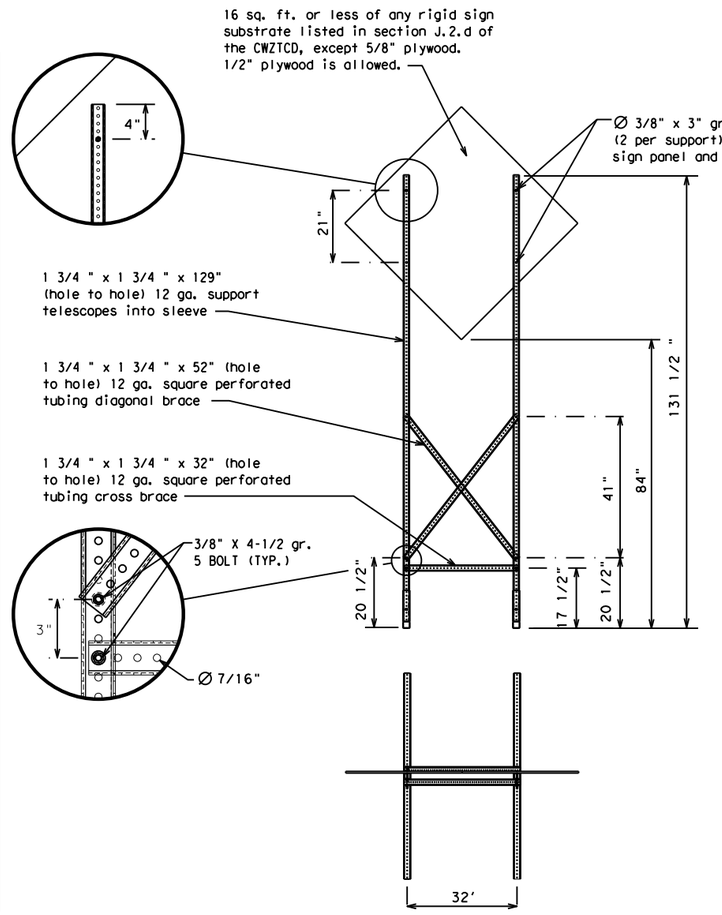
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS

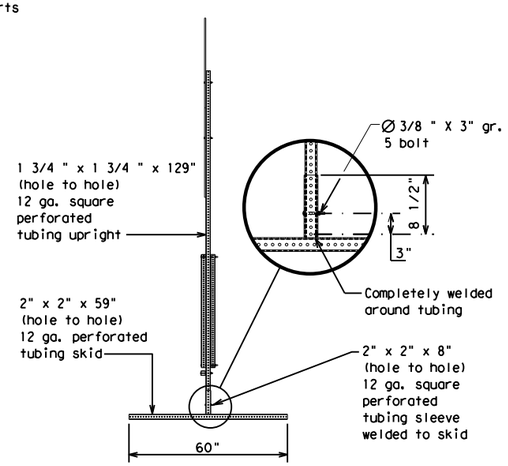


GROUND MOUNTED SIGN SUPPORTS

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







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
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REVISIONS	3469	01	014	FM 3099
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	BWD	STEPHENS		38

DATE: 10/27/2022 10:01:26 AM
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WHEN NOT IN USE, REMOVE THE PCMS FROM THE RIGHT-OF-WAY OR PLACE THE PCMS BEHIND BARRIER OR GUARDRAIL WITH SIGN PANEL TURNED PARALLEL TO TRAFFIC

PORTABLE CHANGEABLE MESSAGE SIGNS

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

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

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

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

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

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

Other Condition List

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

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

Phase 2: Possible Component Lists

Action to Take/Effect on Travel List

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

Location List

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

Warning List

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

** Advance Notice List

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

** 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

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©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
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9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	BWD	STEPHENS		39

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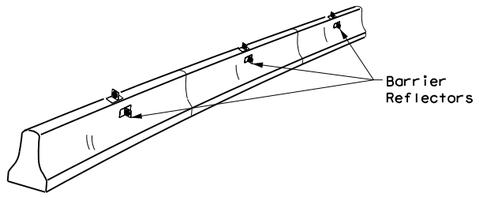
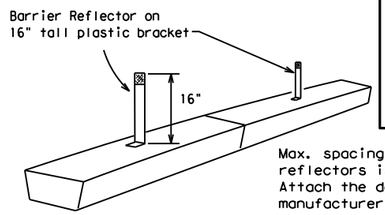
1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost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

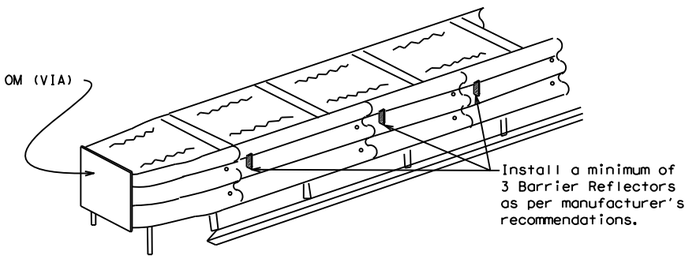


Max. spacing of barrier reflectors is 20 feet. Attach the delineators as per manufacturer's recommendations.

LOW PROFILE CONCRETE BARRIER (LPCB) 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.

LOW PROFILE CONCRETE BARRIER (LPCB)

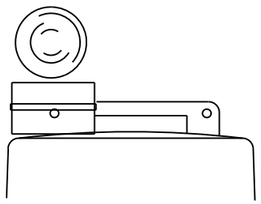


DELINEATION OF END TREATMENTS

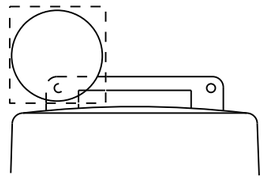
END TREATMENTS FOR CTB'S USED IN WORK ZONES

End treatments used on CTB's in work zones shall meet 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

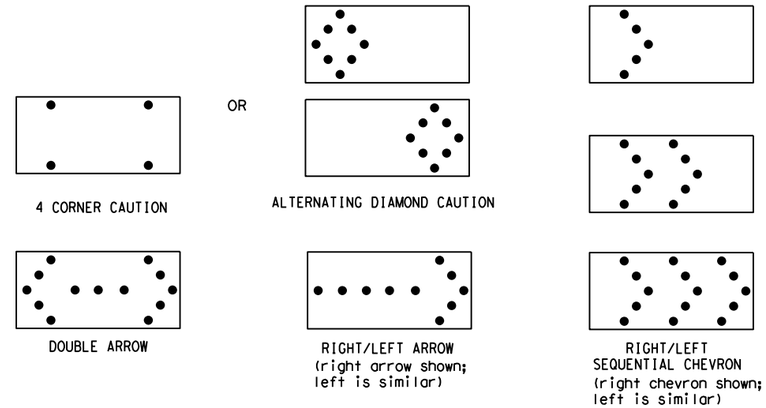
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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



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

SHEET 7 OF 12

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	3469	01	014	FM 3099
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	BWD	STEPHENS		40

101

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GENERAL NOTES

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

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

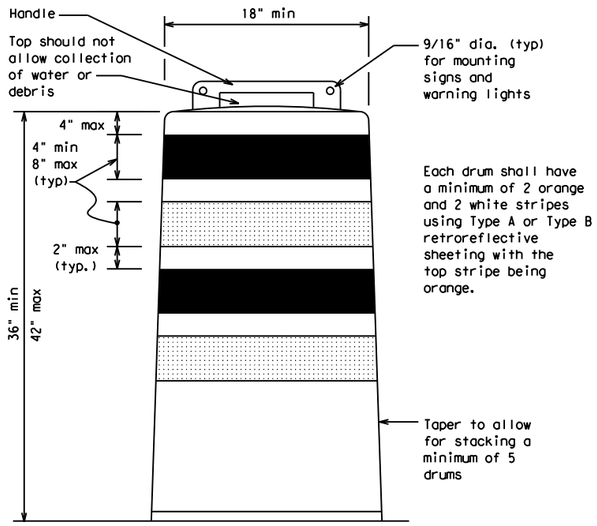
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

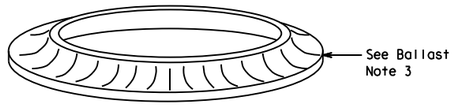
RETROREFLECTIVE SHEETING

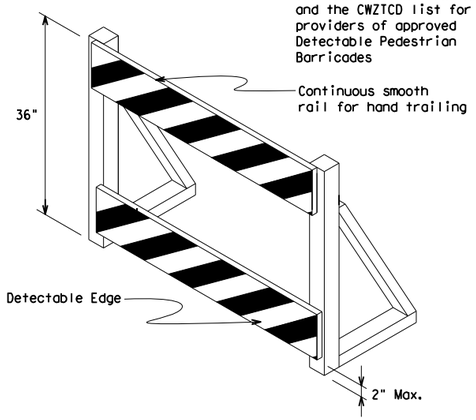
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall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

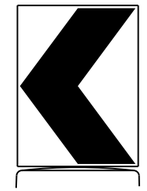




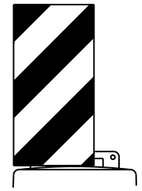


DETECTABLE PEDESTRIAN BARRICADES

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	3469	01	014	FM 3099
4-03 8-14	DIST	COUNTY		SHEET NO.
9-07 5-21	BWD	STEPHENS		41
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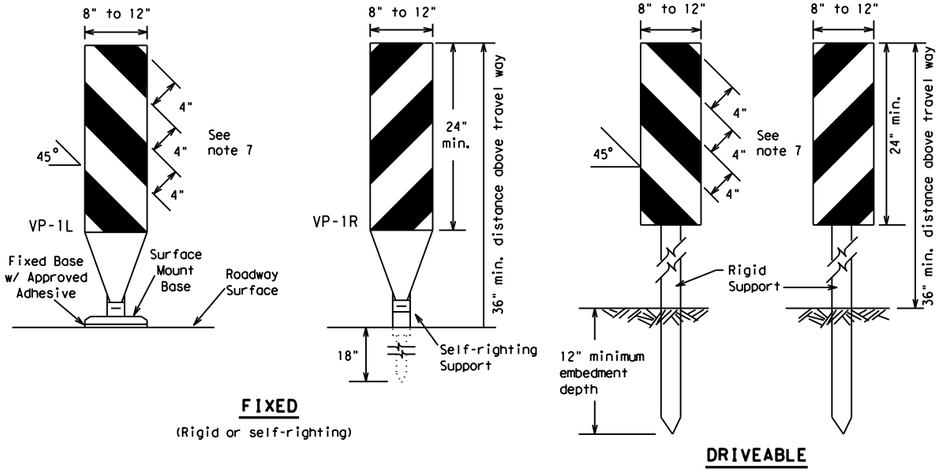
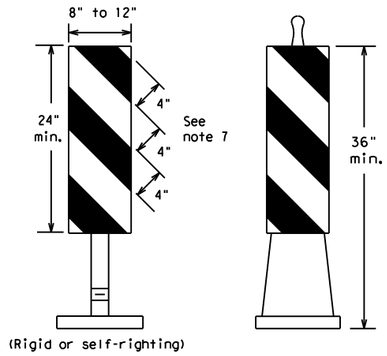


FIXED
(Rigid or self-righting)

DRIVEABLE

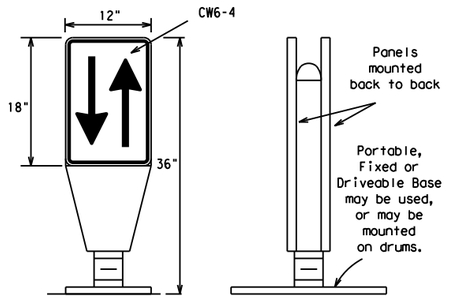


(Rigid or self-righting)

PORTABLE

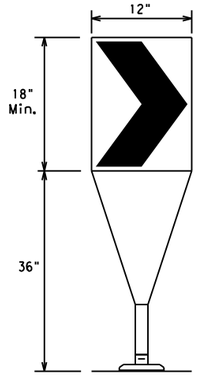
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is 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)



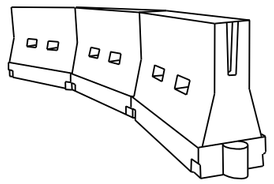
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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

GENERAL NOTES

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



LONGITUDINAL CHANNELIZING DEVICES (LCD)

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

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

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

SHEET 9 OF 12

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	3469	01	014	FM 3099
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	BWD	STEPHENS		42

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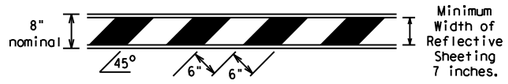
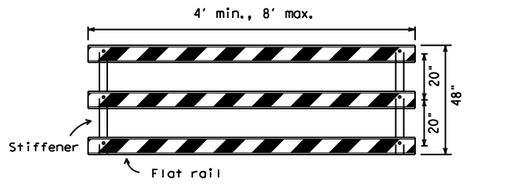
TYPE 3 BARRICADES

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.



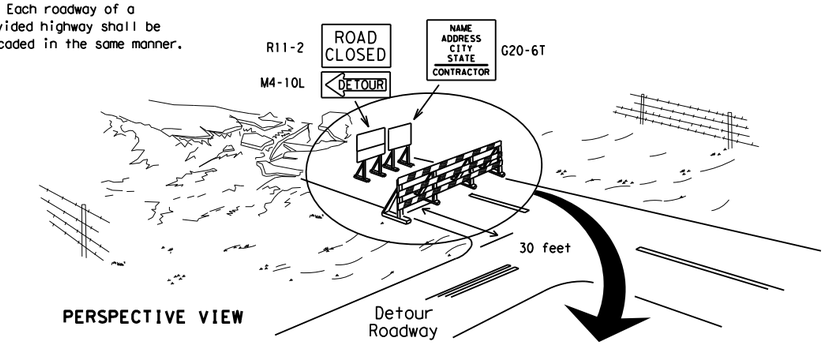
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

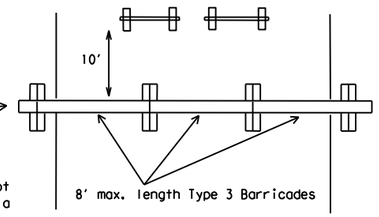
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

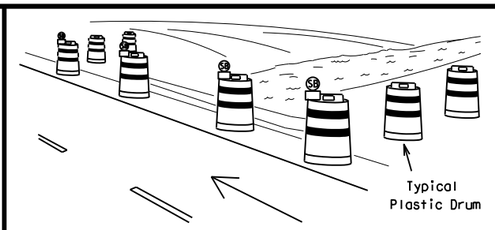
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

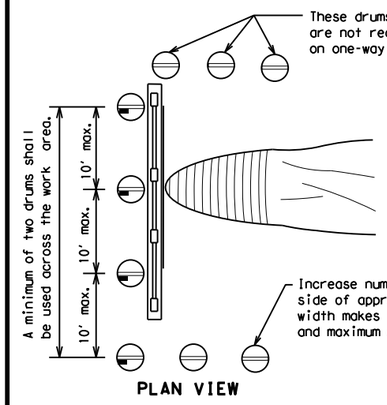
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

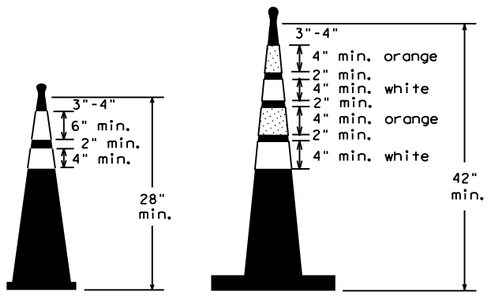
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



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

PLAN VIEW

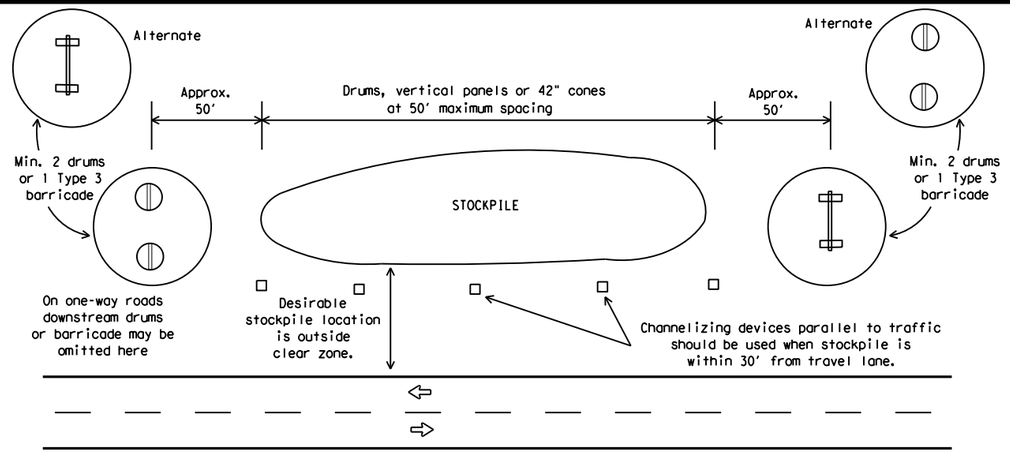
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



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

SHEET 10 OF 12

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
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	3469	01	014	FM 3099
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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.

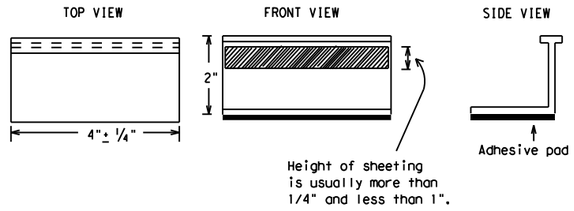
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

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11-02 8-14				

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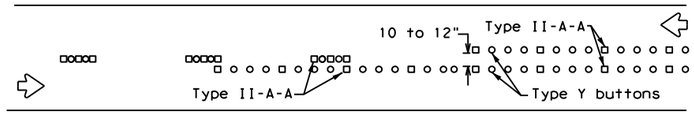
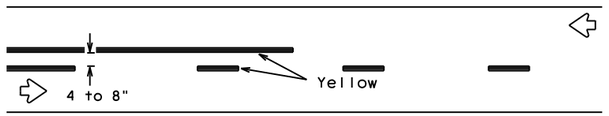
PAVEMENT MARKING PATTERNS

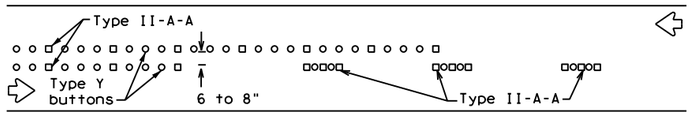
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



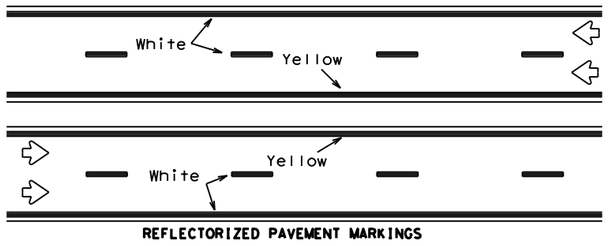
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



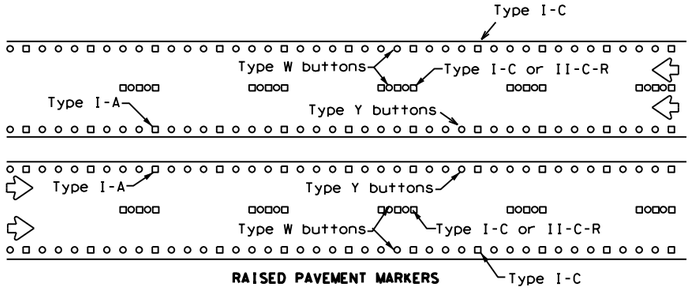
RAISED PAVEMENT MARKERS - PATTERN B

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



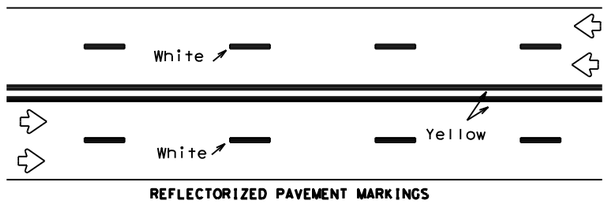
REFLECTORIZED PAVEMENT MARKINGS



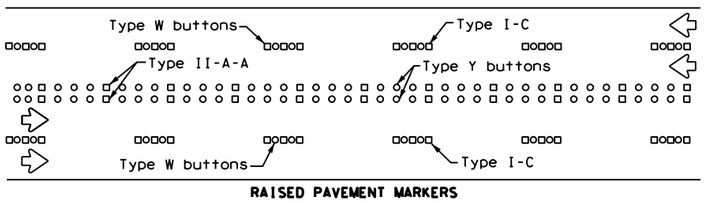
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



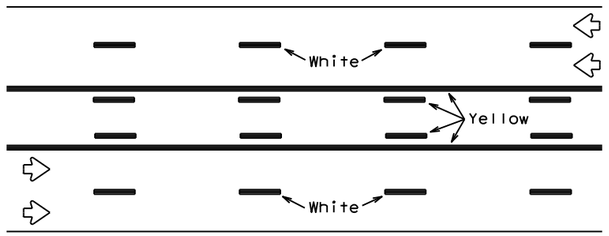
REFLECTORIZED PAVEMENT MARKINGS



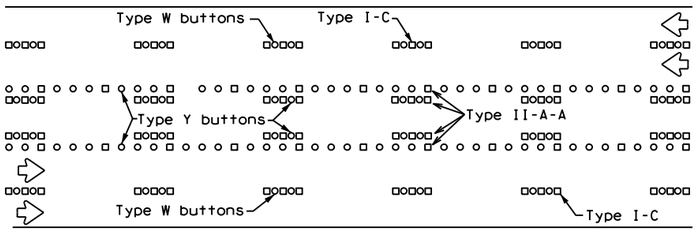
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

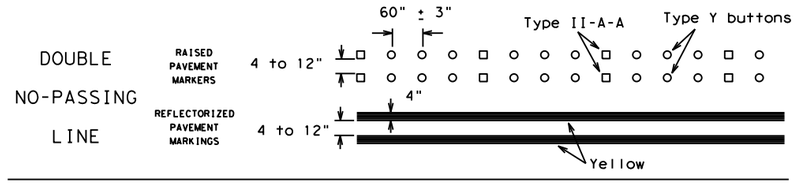
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

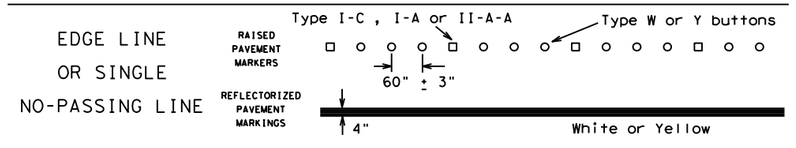
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

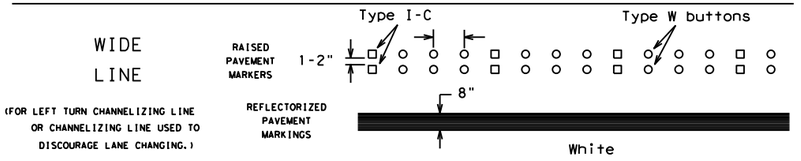


EDGE LINE OR SINGLE NO-PASSING LINE



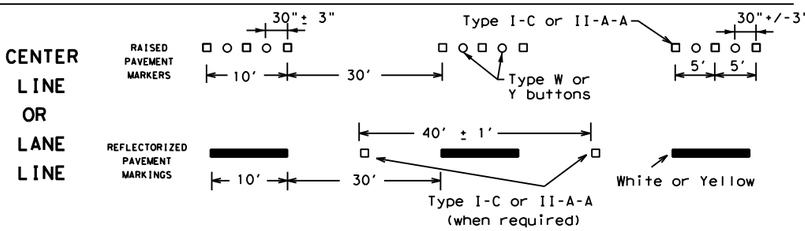
WIDE LINE

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

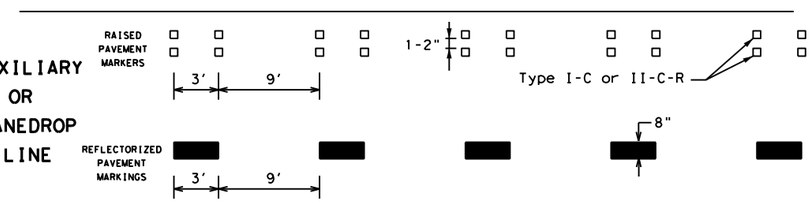


BROKEN LINES

CENTER LINE OR LANE LINE

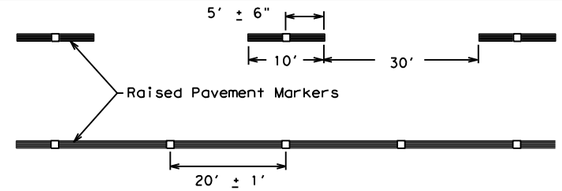


AUXILIARY OR LANEDROP LINE



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."

SHEET 12 OF 12

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-21

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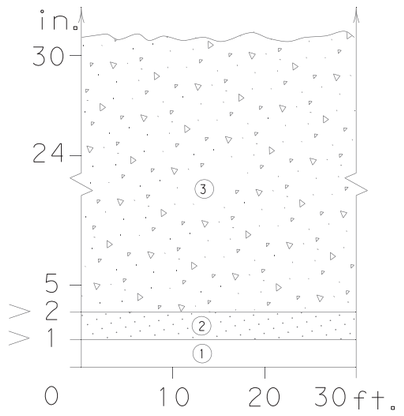
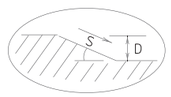
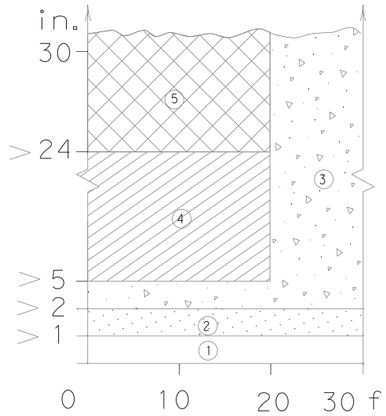
DEFINITION OF TREATMENT ZONES FOR VARIOUS EDGE CONDITIONS

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

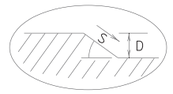


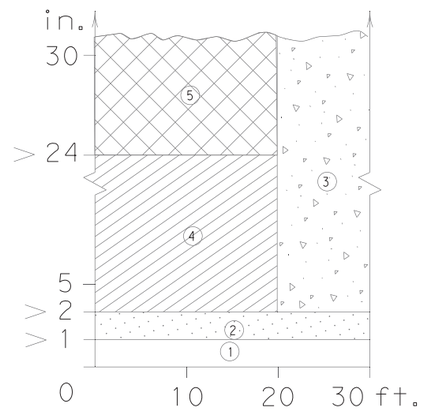
Edge Condition I
S = (3:1) (or flatter)



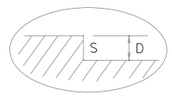


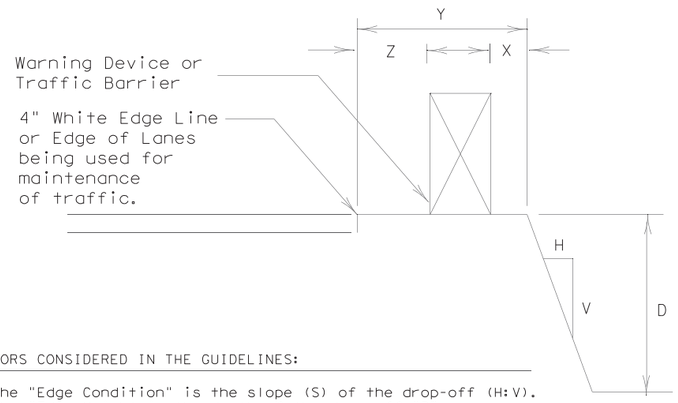
Edge Condition II
S = ((2.99):1) to (1:1)





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:

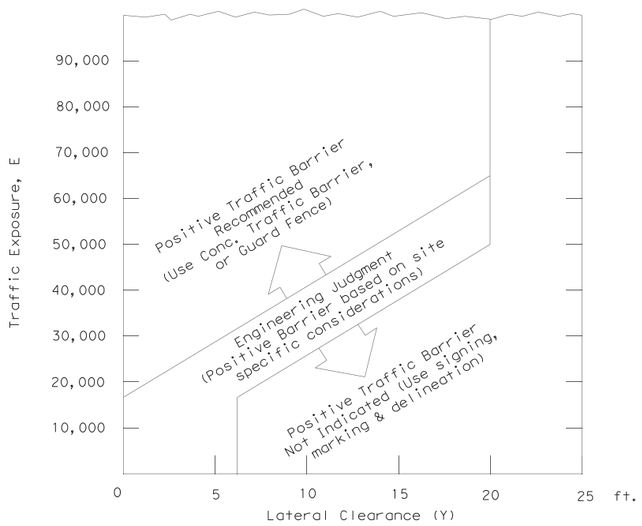
1. Edge Condition I: Most vehicles are able to traverse an edge condition with a slope rate of (3 to 1) or flatter. The slope must be constructed with a compacted material capable of supporting vehicles.

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.

STATE OF TEXAS
JUAN SEBASTIAN HERNANDEZ
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LICENSED
PROFESSIONAL ENGINEER

08/27/2021

Texas Department of Transportation
Traffic Operations Division

TREATMENT FOR VARIOUS EDGE CONDITIONS

© TxDOT August 2000	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
REVISIONS	CONT	SECT	JOB	HIGHWAY
03-01	3469	01	014	FM 3099
08-01 correct typos	DIST	COUNTY		SHEET NO.
11-13 update sign nomenclature	BWD	STEPHENS		46

DATE: 8/27/2021 9:54:18 AM
FILE: N:\7023-17-102\CADD\DGN\02_TRAF_CONT\StdDetails\014vedgecon.dgn

DATE: 8/27/2021
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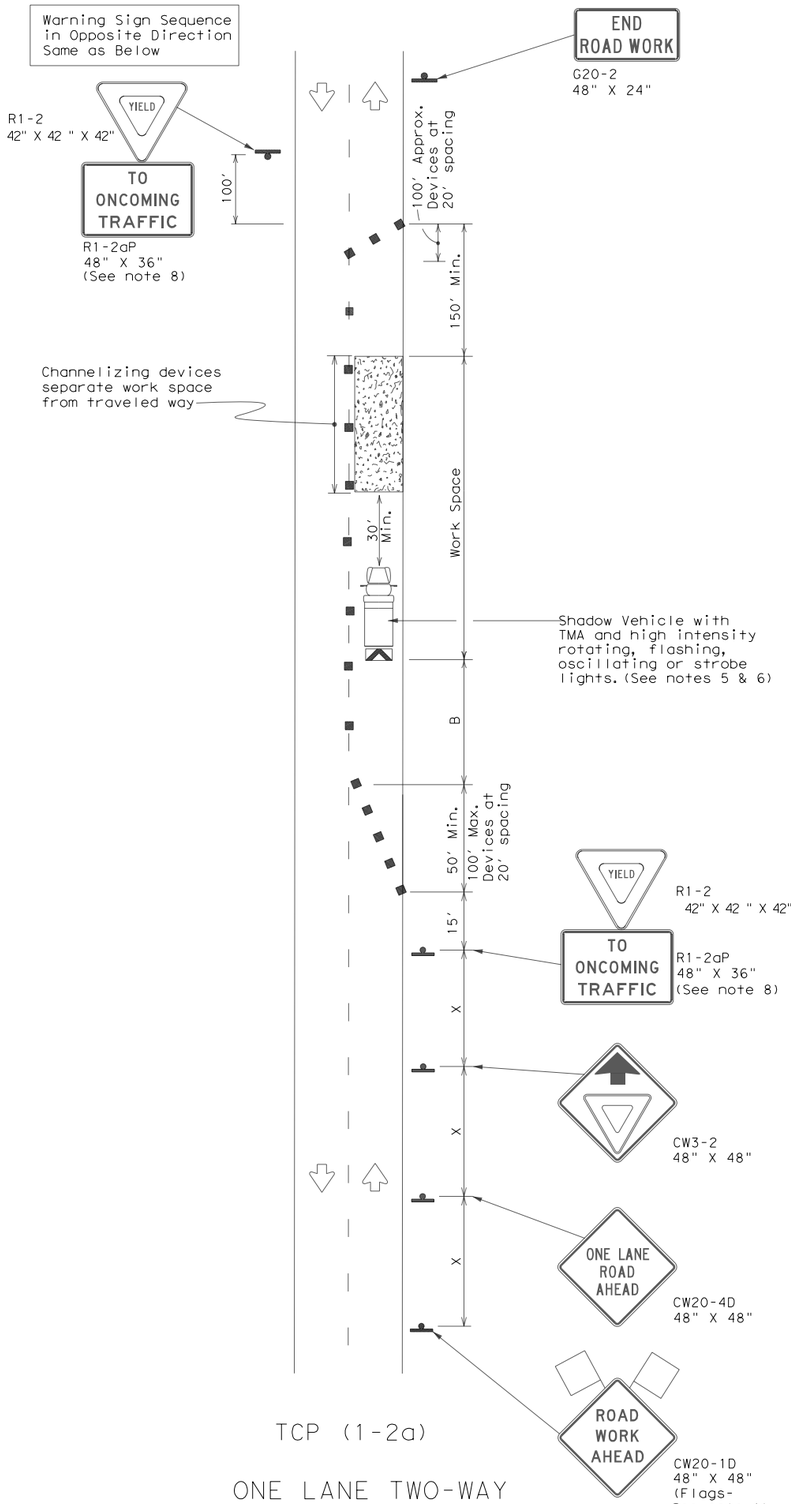
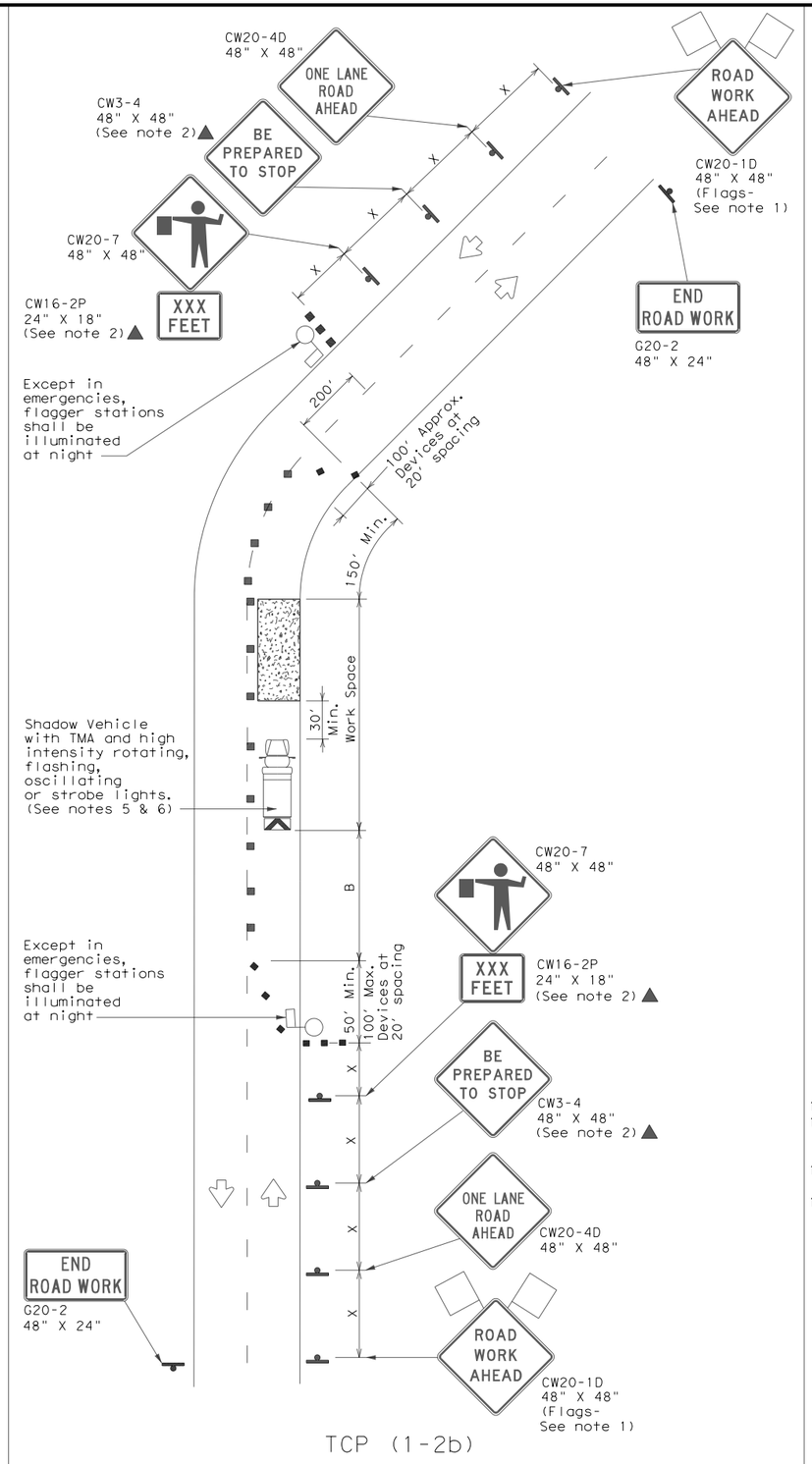


TCP (1-2a)

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



TCP (1-2b)

ONE LANE TWO-WAY
CONTROL WITH FLAGGERS

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

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

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

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

GENERAL NOTES

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

TCP (1-2a)

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

TCP (1-2b)

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
ONE-LANE TWO-WAY
TRAFFIC CONTROL

TCP(1-2)-18

FILE: tcp1-2-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	3469	01	014	FM 3099
4-90 4-98	DIST	COUNTY		SHEET NO.
2-94 2-12	BWD	STEPHENS		47
1-97 2-18				

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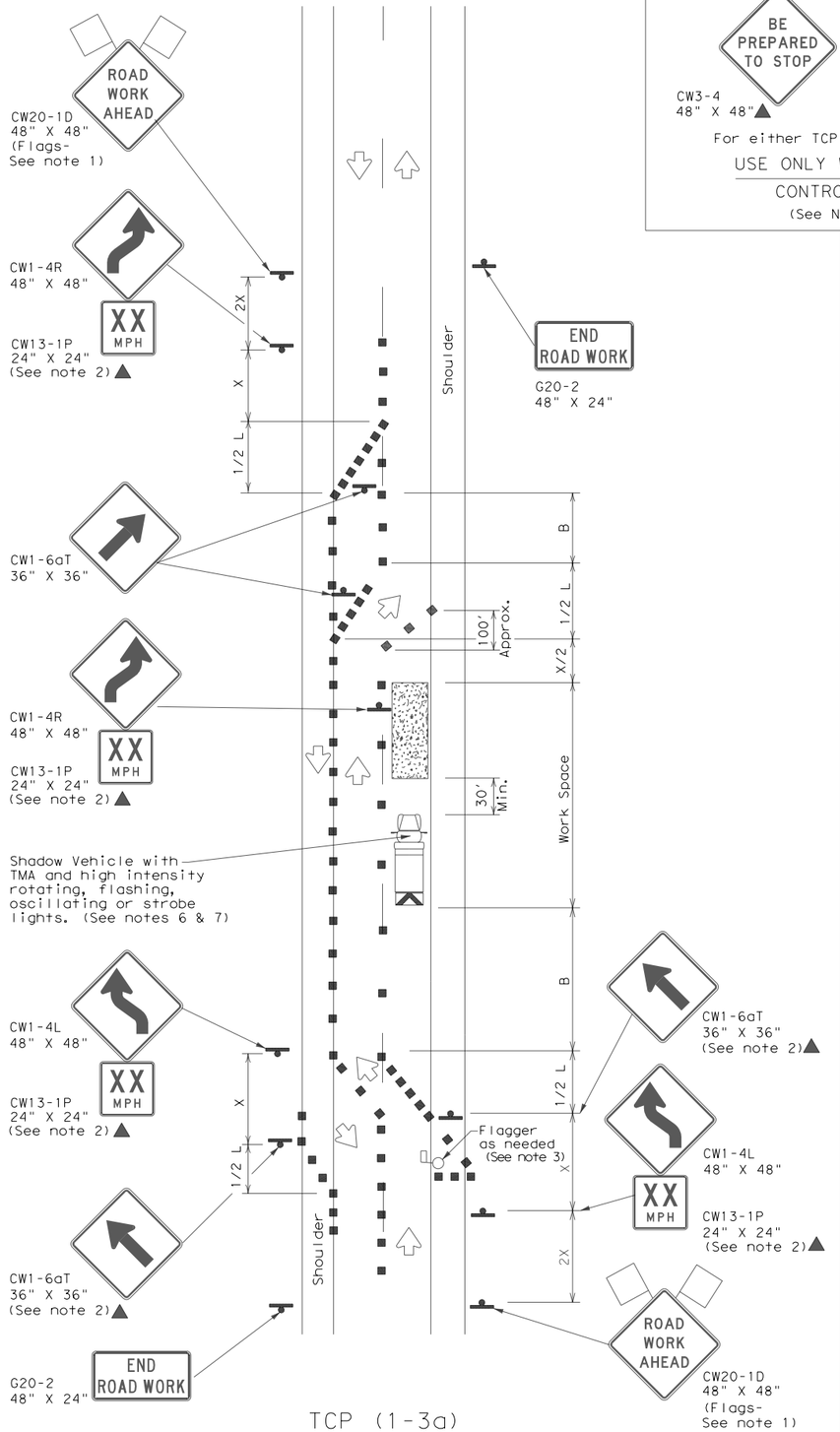
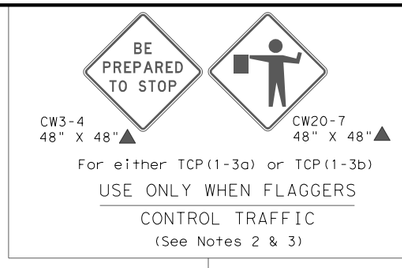
DATE: DATE TIME
FILE: DOCUMENT NAME



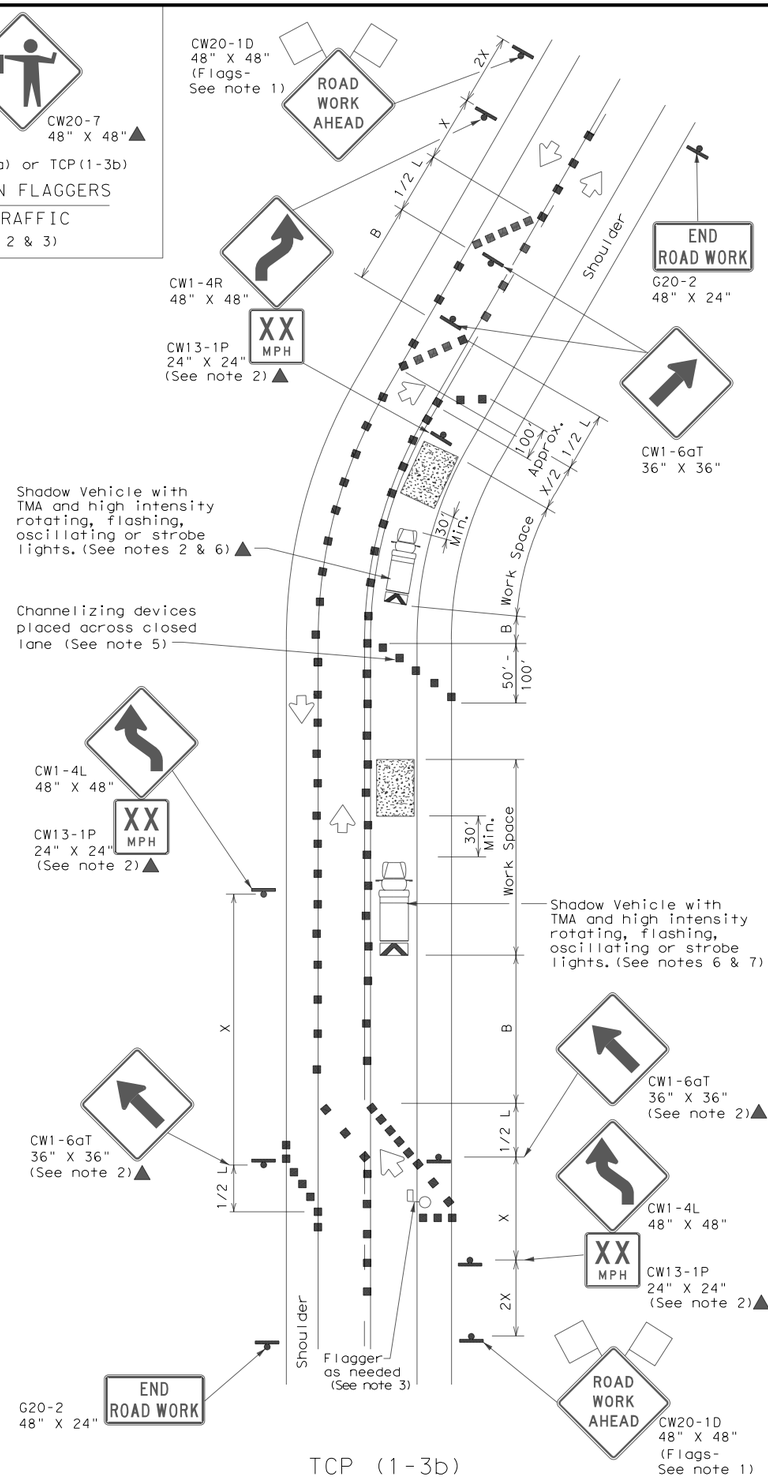
TCP (1-3a)
2-LANE ROADWAY WITH PAVED SHOULDERS

ONE LANE CLOSED
ADEQUATE FIELD OF VIEW



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	3469	01	014	FM 3099
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	BWD	STEPHENS		48
1-97 2-18				

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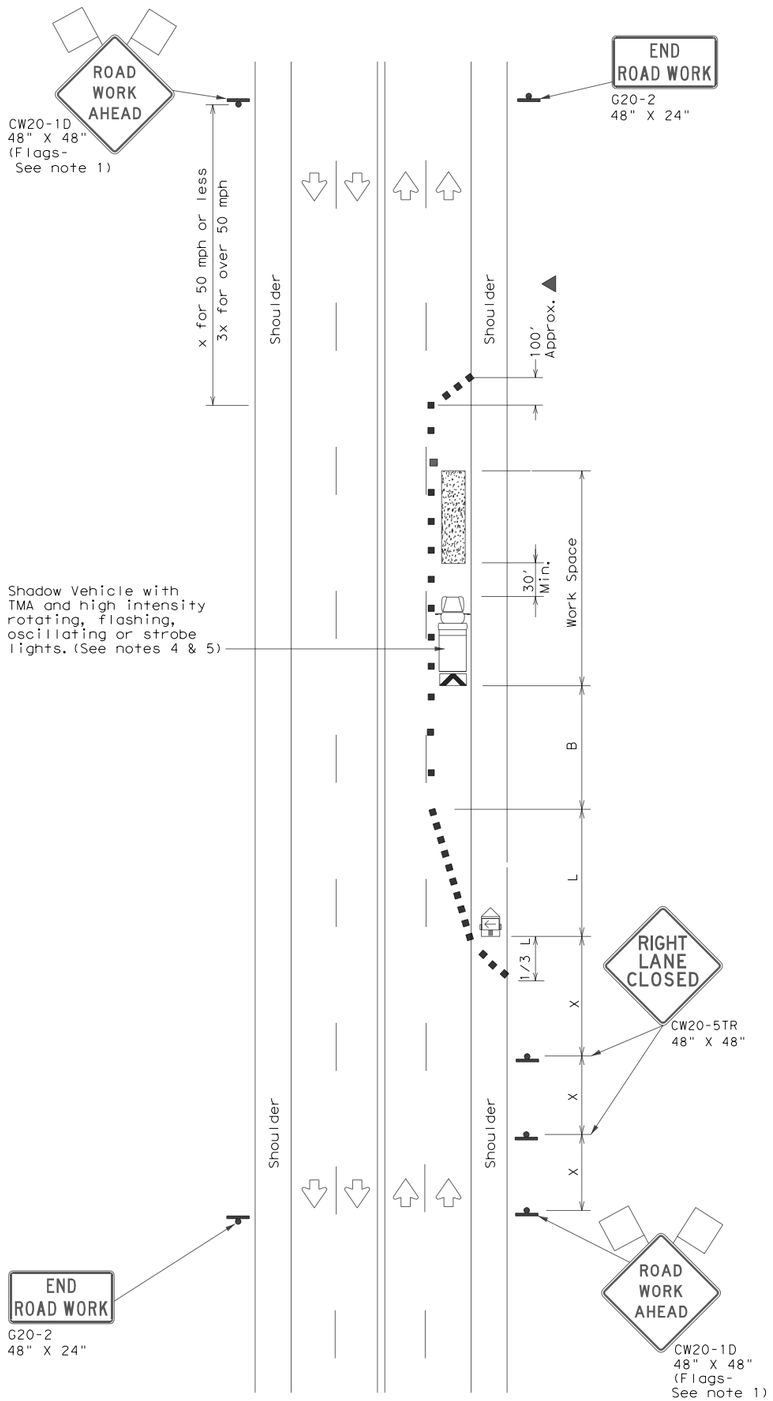
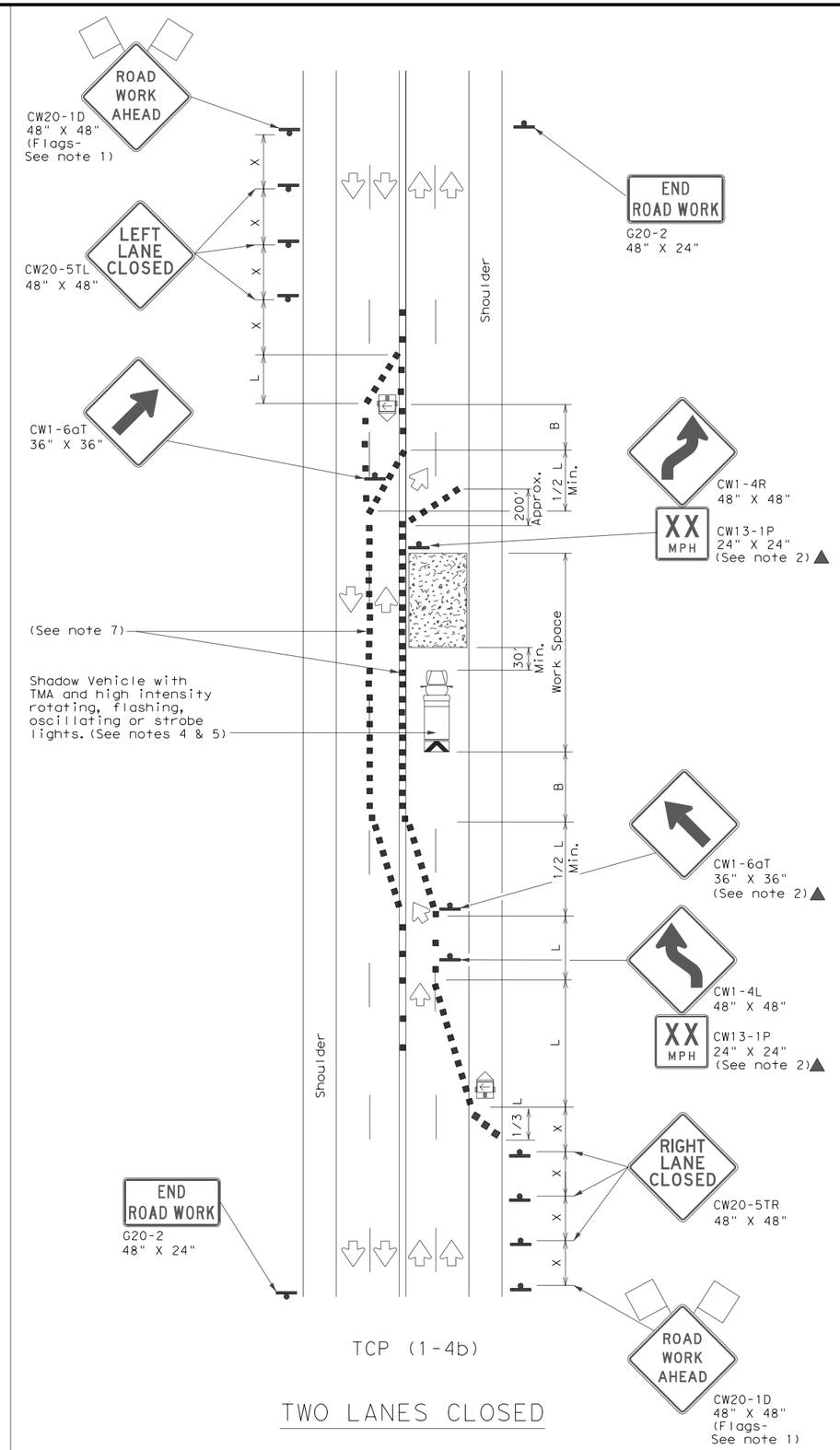
DATE: DATE TIME
FILE: DOCUMENT NAME



TCP (1-4a)

ONE LANE CLOSED



TCP (1-4b)

TWO LANES CLOSED

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. The CW20-1D "ROAD WORK AHEAD" sign may be repeated if the visibility of the work zone is less than 1500 feet.
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.

TCP (1-4a)

6. If this TCP is used for a left lane closure , CW20-5TL "LEFT LANE CLOSED" signs shall be used and channelizing devices shall be placed on the centerline where needed to protect the work space from opposing traffic with the arrow panel placed in the closed lane near the end of the merging taper.

TCP (1-4b)

7. 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 1/2S where S is the speed in mph. This tighter device spacing is intended for the areas of conflicting markings, not the entire work zone.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LANE CLOSURES ON MULTILANE CONVENTIONAL ROADS

TCP(1-4)-18

FILE: tcp1-4-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	3469	01	014	FM 3099
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	BWD	STEPHENS		49
1-97 2-18				

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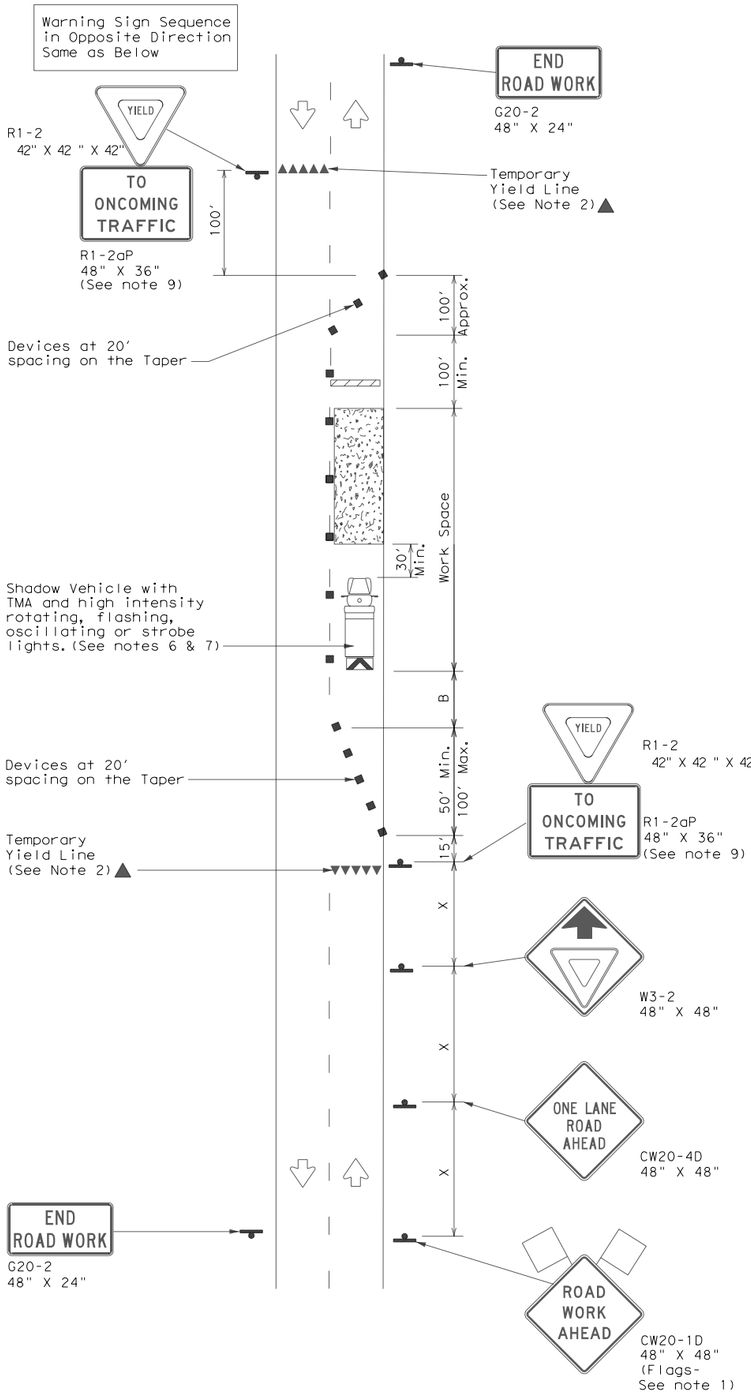
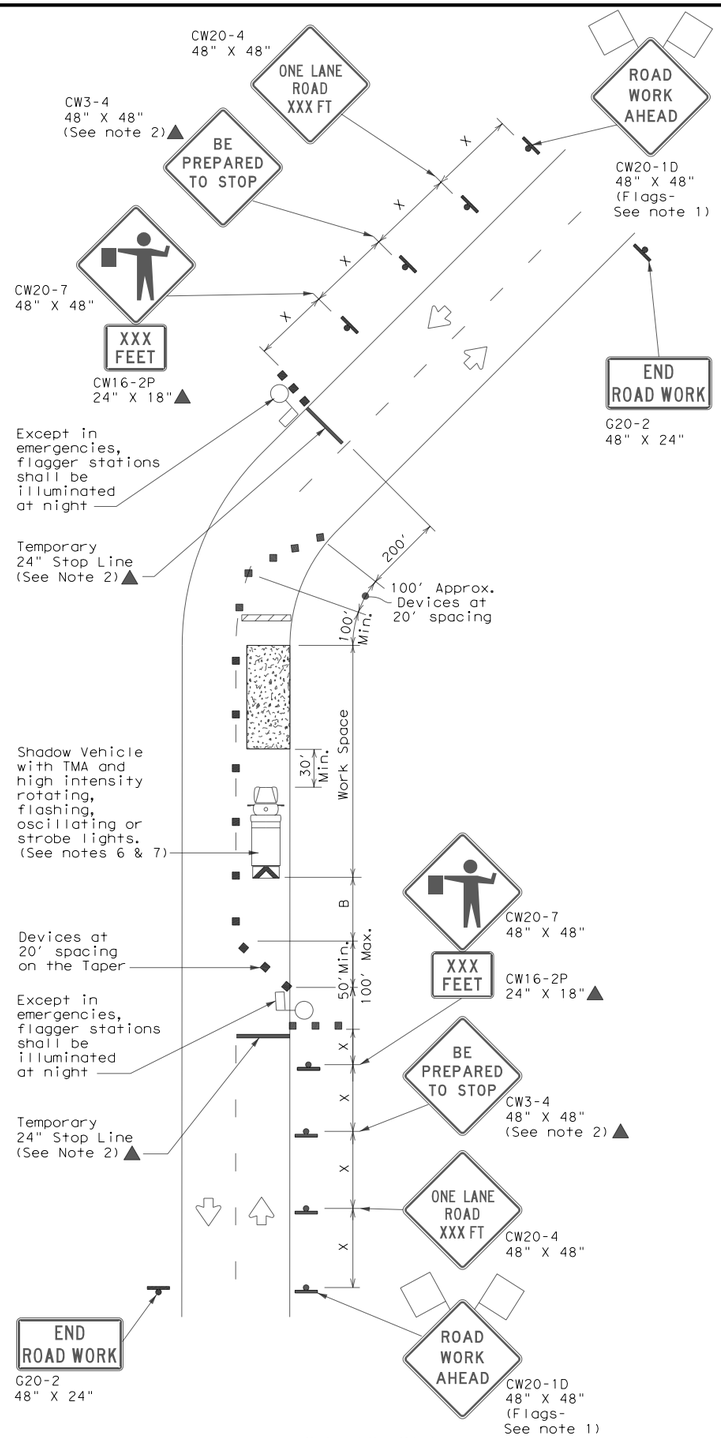


TCP (2-2a)
2-LANE ROADWAY WITHOUT PAVED SHOULDERS
ONE LANE TWO-WAY
CONTROL WITH YIELD SIGNS
(Less than 2000 ADT - See Note 9)



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

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

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

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

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

GENERAL NOTES

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

TCP (2-2a)

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

TCP (2-2b)

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

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
ONE-LANE TWO-WAY
TRAFFIC CONTROL

TCP(2-2)-18

FILE: tcp2-2-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	3469	01	014	FM 3099
8-95 3-03	DIST	COUNTY		SHEET NO.
1-97 2-12	BWD	STEPHENS		50
4-98 2-18				

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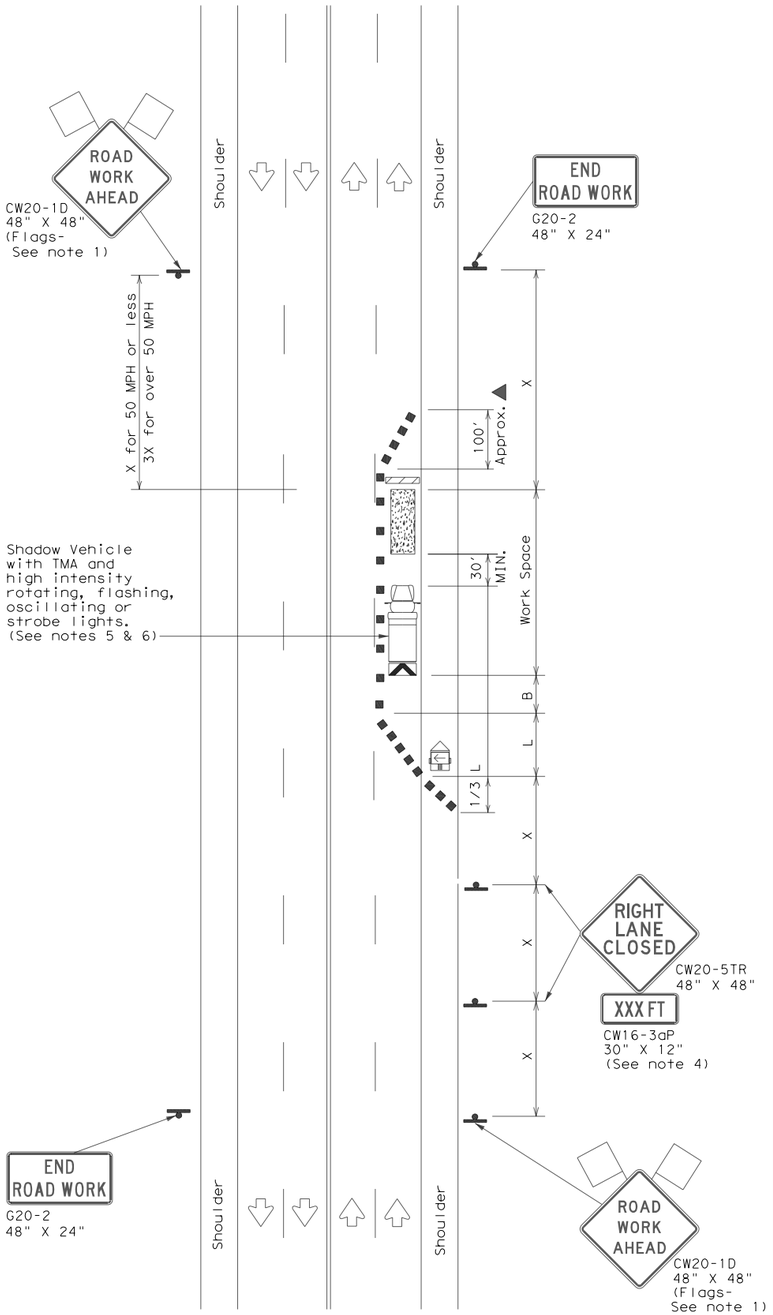
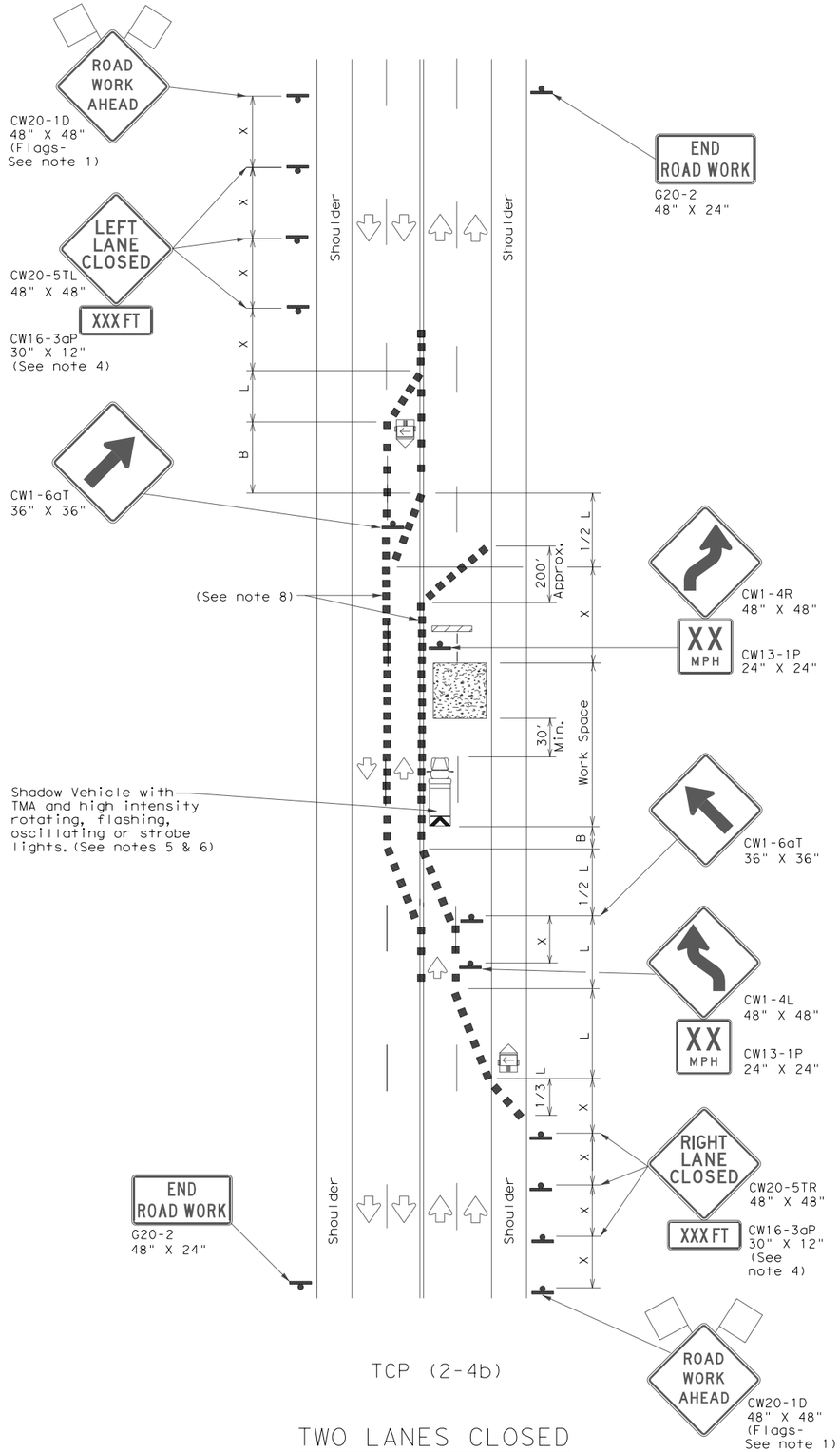
FILE: DOCUMENT NAME



TCP (2-4a)

ONE LANE CLOSED



TCP (2-4b)

TWO LANES CLOSED

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. The downstream taper is optional. When used, it should be 100 feet minimum length per lane.
4. For short term applications, when post mounted signs are not used, the distance legend may be shown on the sign face rather than on a CW16-3aP supplemental plaque.
5. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
6. Additional Shadow Vehicles with TMAs may be positioned in each closed lane, on the shoulder or off the paved surface, next to those shown in order to protect a wider work space.

TCP (2-4a)

7. If this TCP is used for a left lane closure, CW20-5TL "LEFT LANE CLOSED"signs shall be used and channelizing devices shall be placed on the centerline to protect the work space from opposing traffic with the arrow board placed in the closed lane near the end of the merging taper.

TCP (2-4b)

8. 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 devices 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
LANE CLOSURES ON MULTILANE CONVENTIONAL ROADS

TCP(2-4)-18

FILE: tcp2-4-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03	3469	01	014	FM 3099
1-97 2-12	DIST	COUNTY		SHEET NO.
4-98 2-18	BWD	STEPHENS		51

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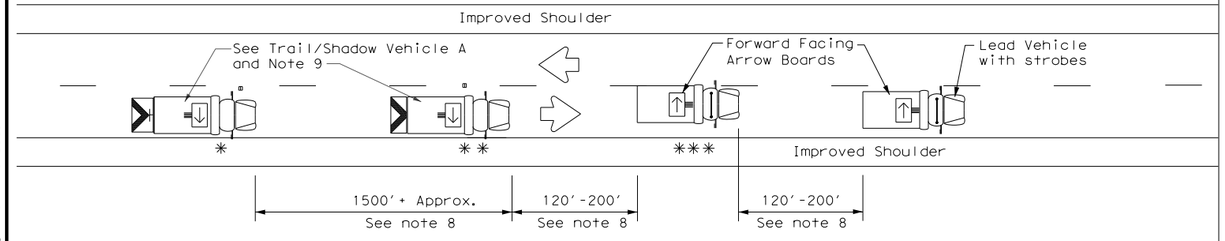
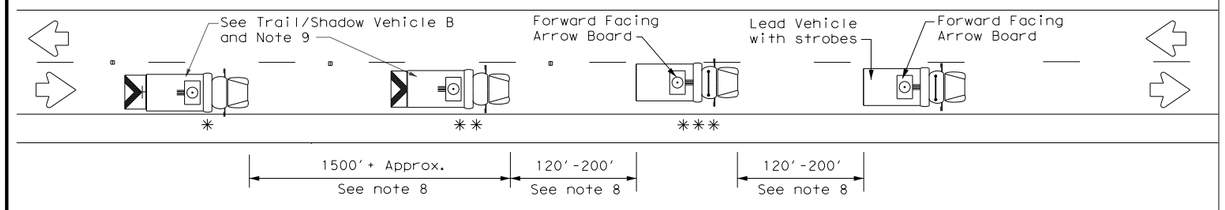


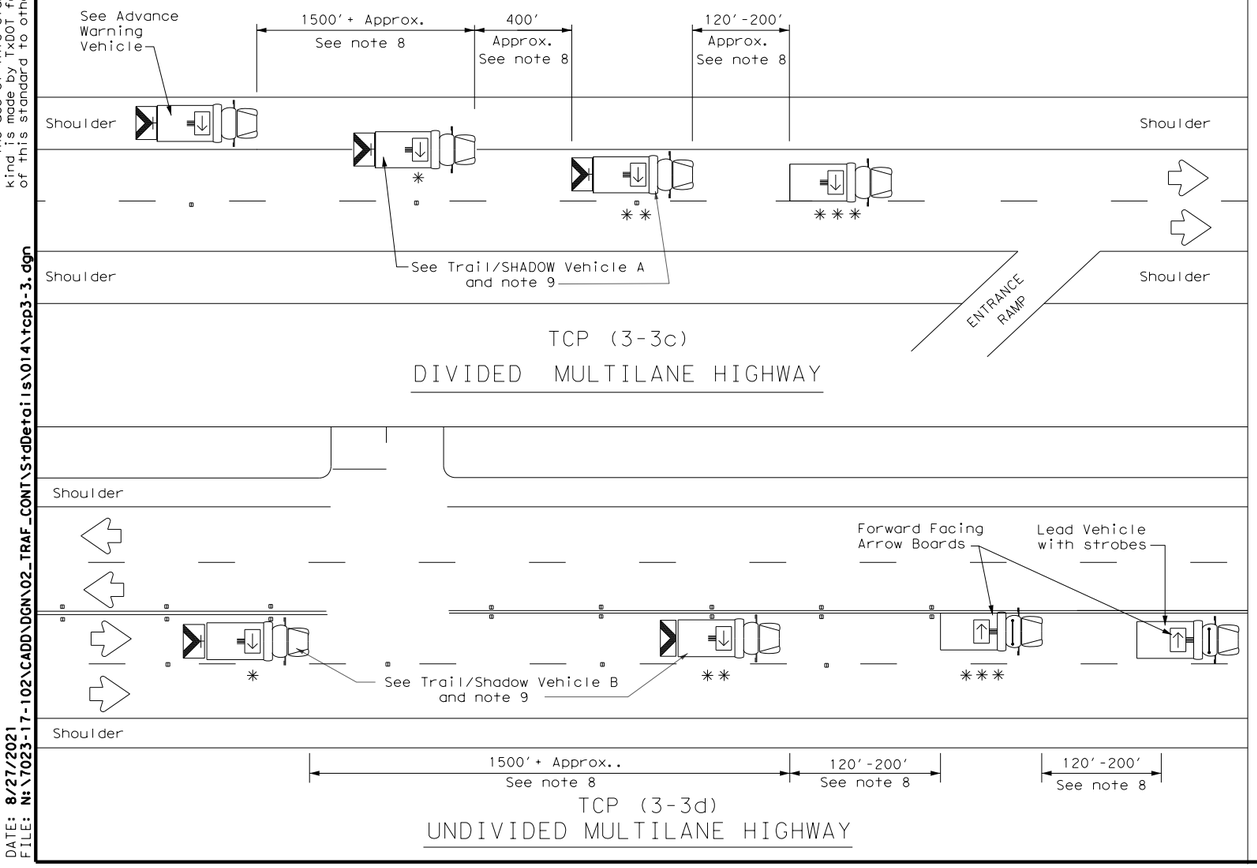
TCP (3-3a)

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



TCP (3-3b)

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

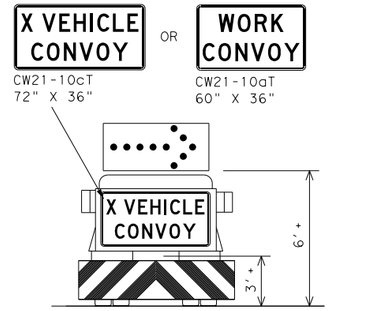


TCP (3-3c)

DIVIDED MULTILANE HIGHWAY

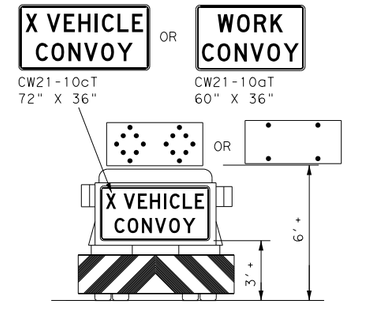
TCP (3-3d)

UNDIVIDED MULTILANE HIGHWAY



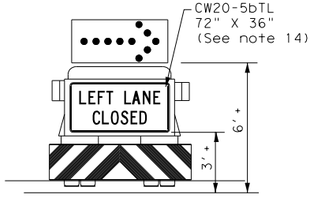
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display
Flashing Arrow Board

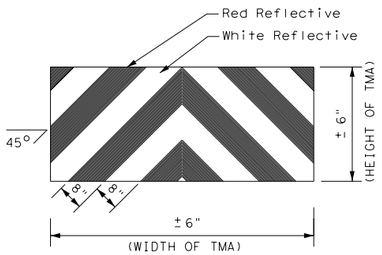


TRAIL/SHADOW VEHICLE B

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

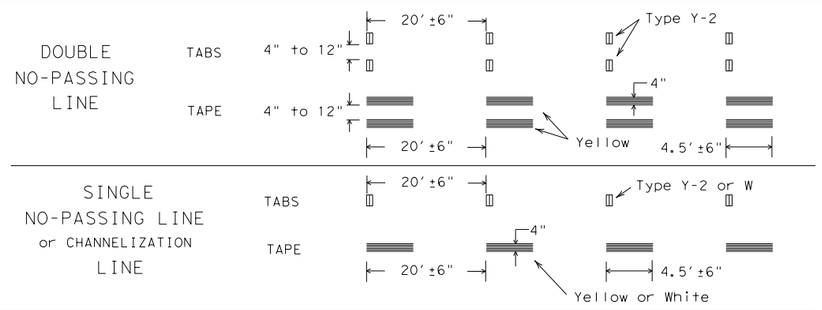
TRAFFIC CONTROL PLAN MOBILE OPERATIONS RAISED PAVEMENT MARKER INSTALLATION/ REMOVAL

TCP(3-3)-14

FILE: tcp3-3.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT September 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	3469	01	014	FM 3099
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 7-13	BWD	STEPHENS		52
1-97 7-14				

DATE: 8/21/2021
FILE: N:\7023-17-102\CADD\DGN\02_TRAF_CONTSTdDetails\014\wzstpm-13.dgn

WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS



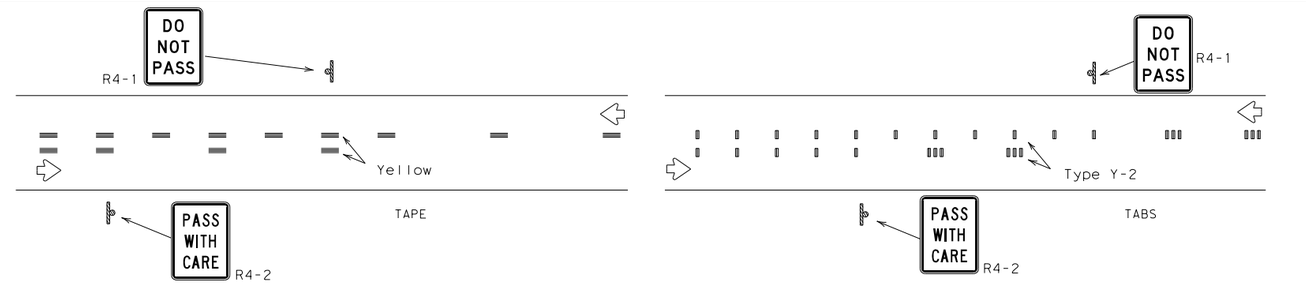
NOTES:

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.

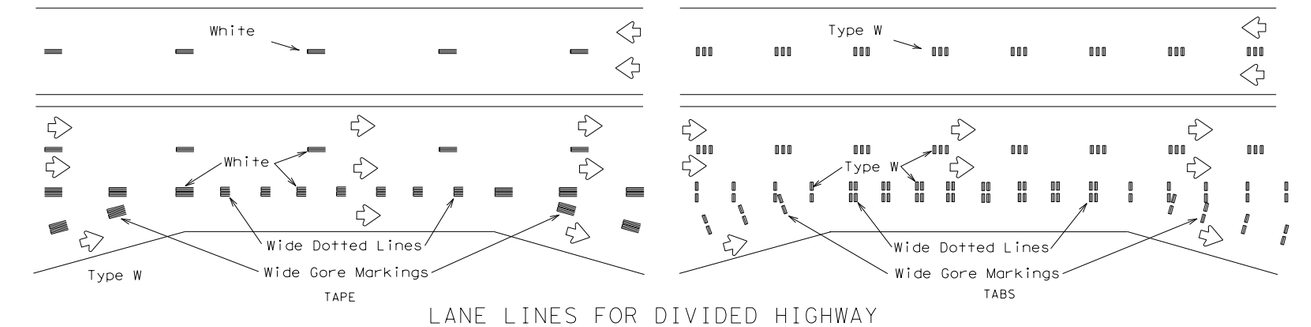
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS (TABS)

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.

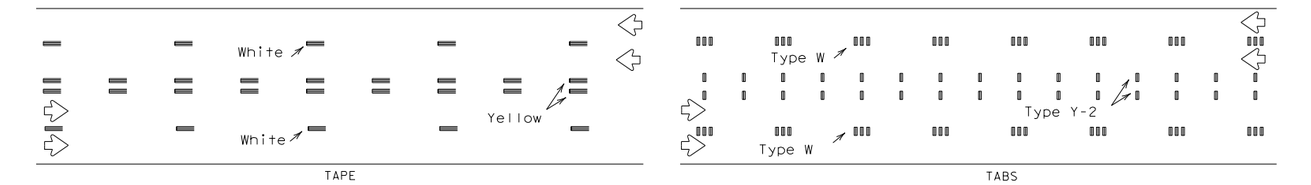
WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS



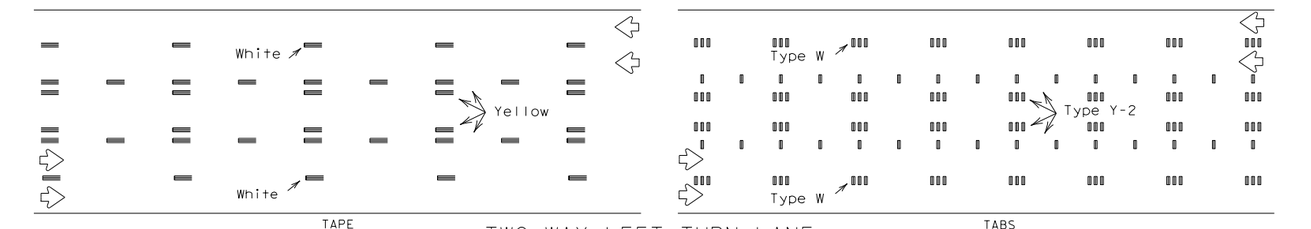
CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO LANE TWO-WAY HIGHWAYS



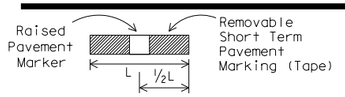
LANE LINES FOR DIVIDED HIGHWAY



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

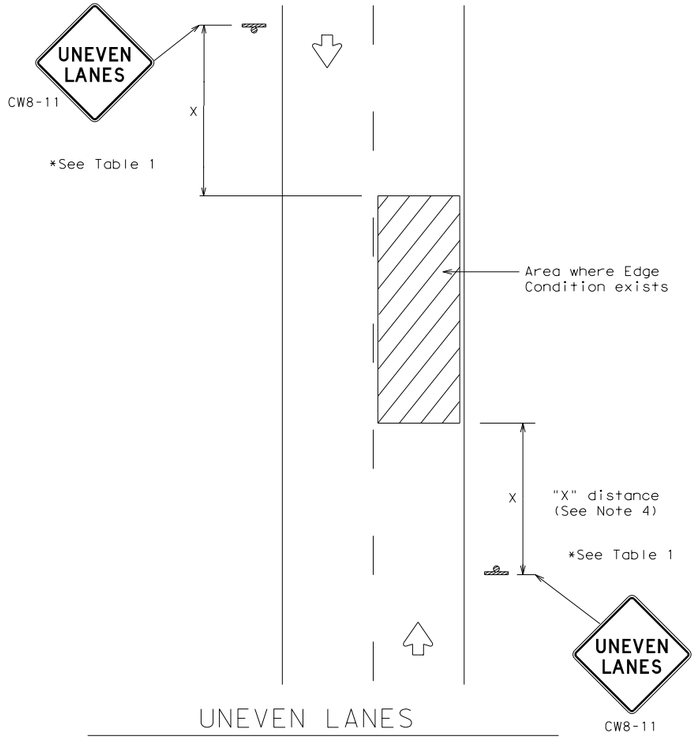
WORK ZONE SHORT TERM PAVEMENT MARKINGS

WZ(STPM)-13

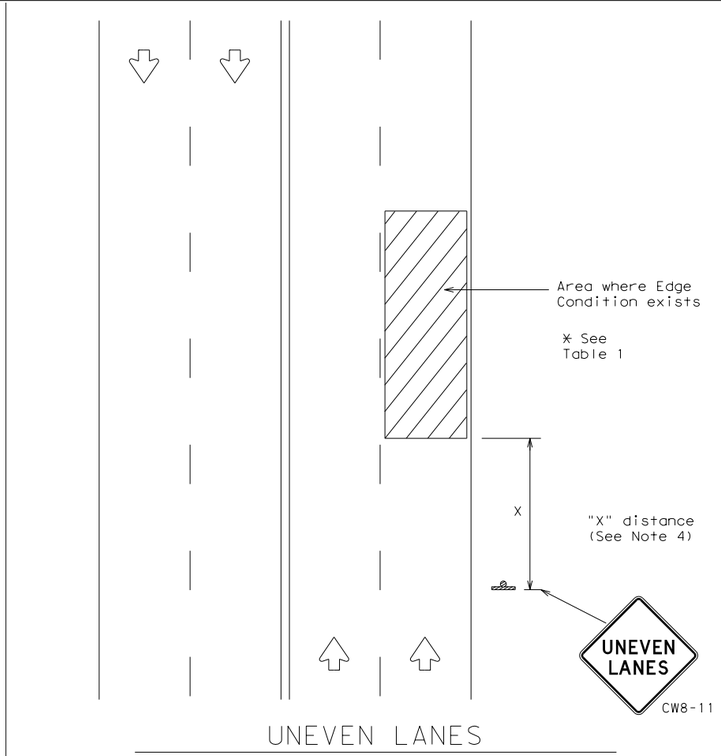
FILE:	wzstpm-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT	April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS		3469	01	014	FM 3099
1-97		DIST	COUNTY		SHEET NO.
3-03		BWD	STEPHENS		53
7-13					

111

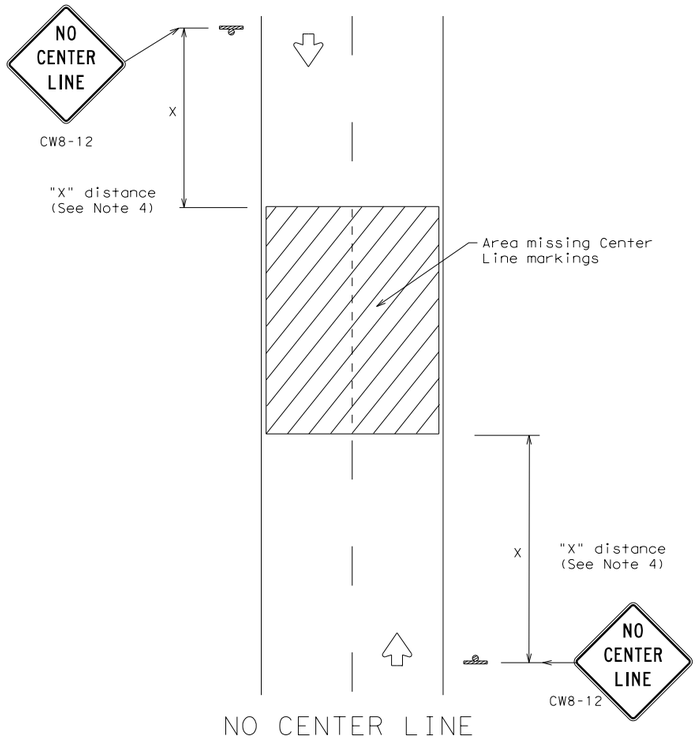
DATE: 8/27/2021
FILE: N:\T023-17-102\CADD\DGN\02_TRAF_CONT\StdDetails\014\wzul-13.dgn



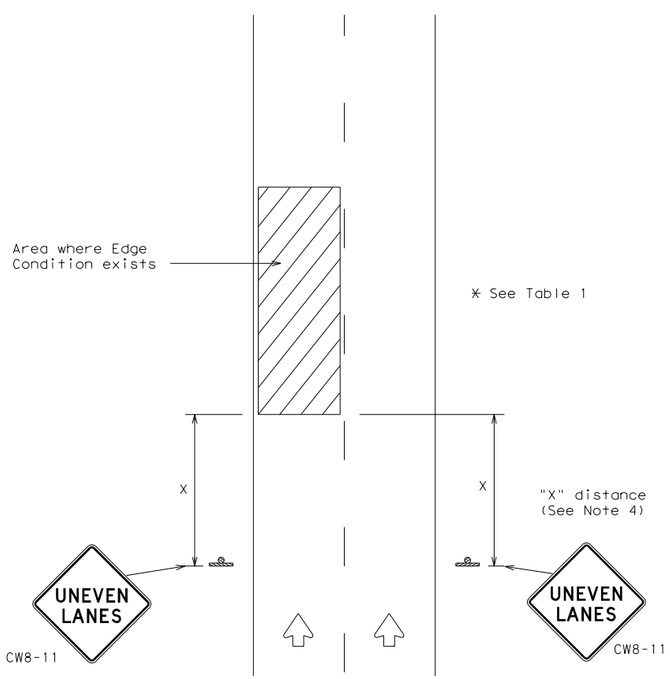
UNEVEN LANES
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
FOUR LANE CONVENTIONAL ROAD



NO CENTER LINE
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
DIVIDED ROADWAY

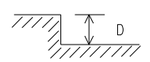
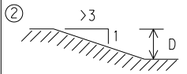
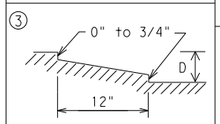
DEPARTMENTAL MATERIAL SPECIFICATIONS	
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY (REMOVABLE) PREFABRICATED PAVEMENT MARKINGS	DMS-8241
SIGN FACE MATERIALS	DMS-8300

COLOR	USAGE	SHEETING MATERIAL
ORANGE	BACKGROUND	TYPE B_{FL} OR TYPE C_{FL} SHEETING
BLACK	LEGEND & BORDERS	ACRYLIC NON-REFLECTIVE SHEETING

GENERAL NOTES

1. If spalling or holes occur, ROUGH ROAD (CW8-8) signs should be placed in advance of the condition and be repeated every two miles where the condition persists.
2. UNEVEN LANES (CW8-11) signs shall be installed in advance of the condition and repeated every mile. Signs installed along the uneven lane condition may be supplemented with the NEXT XX MILES (CW7-3aP) plaque or Advisory Speed (CW13-1P) plaque.
3. NO CENTER LINE (CW8-12) signs and temporary pavement markings as per the WZ(STPM) standard shall be installed if yellow centerlines separating two way traffic are obscured or obliterated. Repeat NO CENTER LINE signs every two miles where the center line markings are not in place. The signs and markings shall remain in place until permanent pavement markings are installed.
4. Signs shall be spaced at the distances recommended as per BC standards.
5. Additional signs may be required as directed by the Engineer. Signs shall remain in place until final surface is applied. Signs shall be considered subsidiary to Item 502 "BARRICADES, SIGNS AND TRAFFIC HANDLING."
6. Signs shall be fabricated and mounted on supports as shown on the BC standards and/or listed on the "Compliant Work Zone Traffic Control Devices" list.
7. Short term markings shall not be used to simulate edge lines.
8. All signs shall be constructed in accordance with the details found in the "Standard Highway Sign Designs for Texas," latest edition.

TABLE 1

Edge Condition	Edge Height (D)	* Warning Devices
① 	Less than or equal to: 1¼" (maximum-planing) 1½" (typical-overlay)	Sign: CW8-11
	Distance "D" may be a maximum of 1 1/4 " for planing operations and 2" for overlay operations if uneven lanes with edge condition 1 are open to traffic after work operations cease.	
② 	Less than or equal to 3"	Sign: CW8-11
③  Notched Wedge Joint	Distance "D" may be a maximum of 3" if uneven lanes with edge condition 2 or 3 are open to traffic after work operations cease. Uneven lanes should not be open to traffic when "D" is greater than 3".	

TRAFFIC CONTROL DURING PLANING, OVERLAY AND LEVELING OPERATIONS ARE SHOWN ELSEWHERE IN THE PLANS.

MINIMUM WARNING SIGN SIZE	
Conventional roads	36" x 36"
Freeways/expressways, divided roadways	48" x 48"

Texas Department of Transportation

Traffic Operations Division Standard

SIGNING FOR UNEVEN LANES

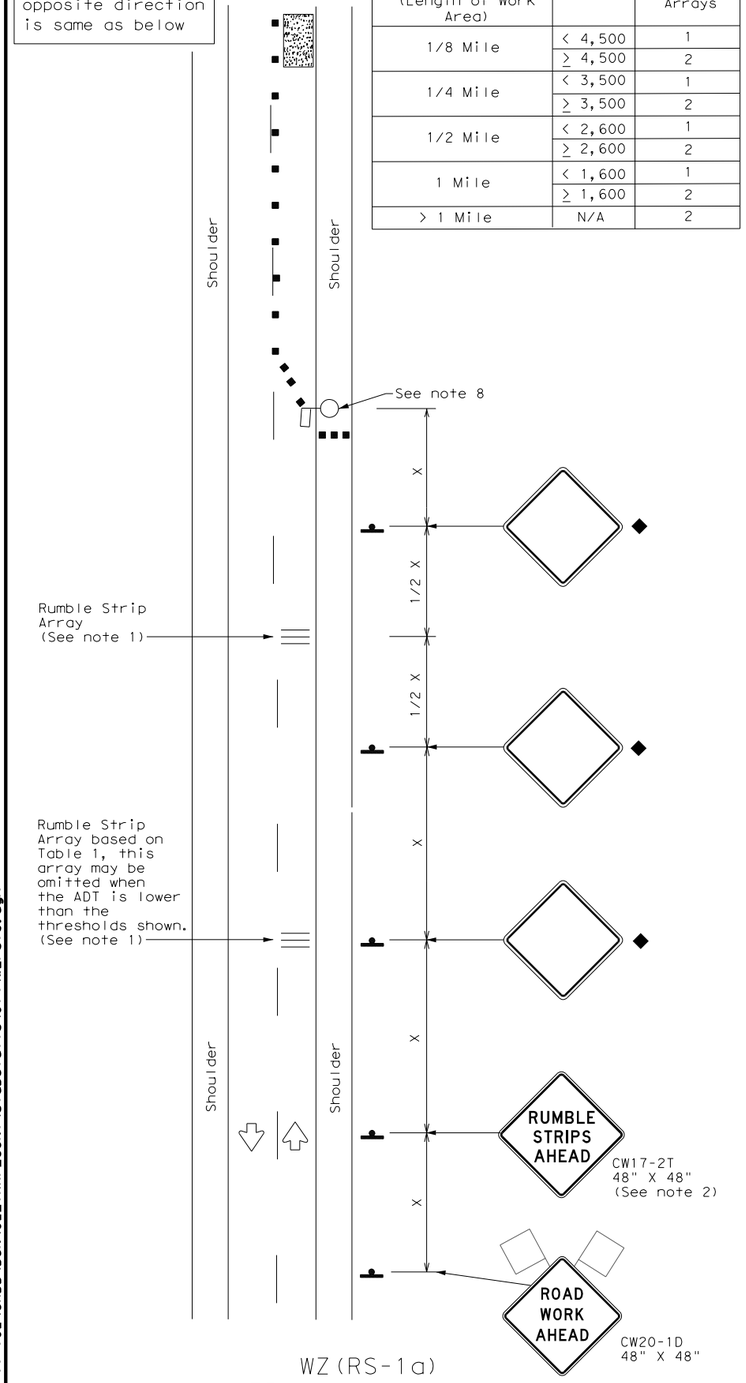
WZ(UL)-13

FILE: wzul-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS	3469	01	014	FM 3099
8-95 2-98 7-13	DIST	COUNTY		SHEET NO.
1-97 3-03	BWD	STEPHENS		54

DATE: 8/27/2021
FILE: N:\7023-17-102\CADD\DGN\02_TRAF_CONT\StdDetails\014\wzrs16.dgn

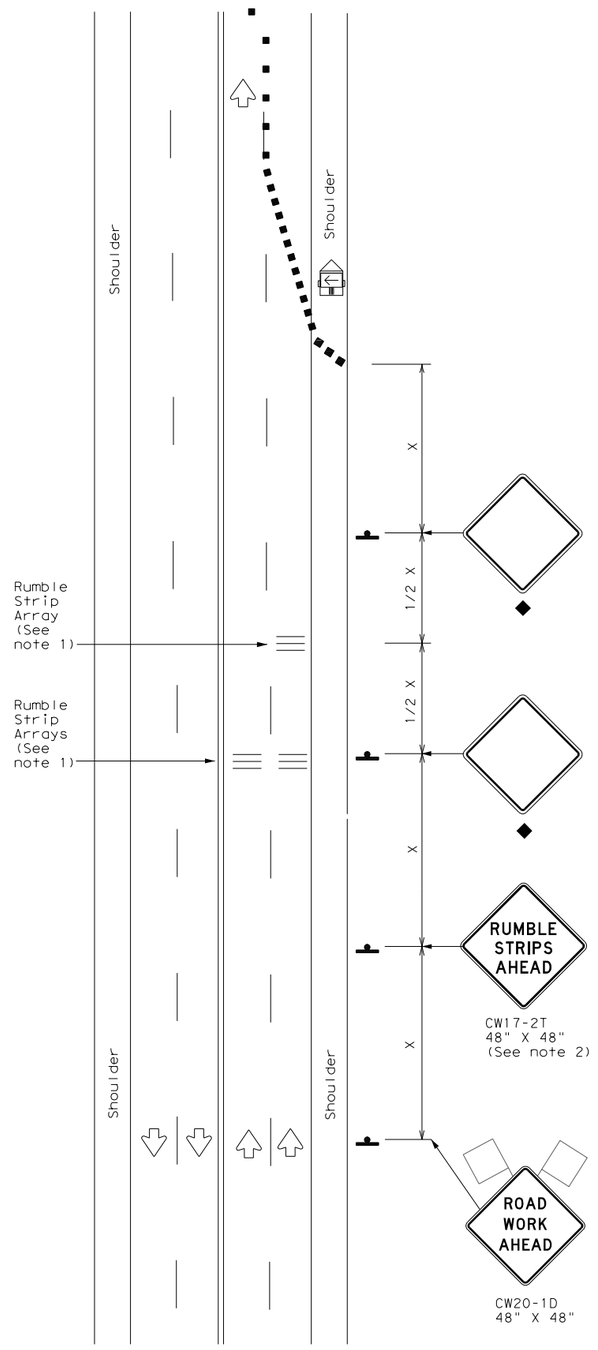
Warning sign and rumble strip sequence in opposite direction is same as below

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



WZ(RS-1a)
75 mph or Less

RUMBLE STRIPS ON ONE-LANE
TWO-WAY APPLICATION



WZ(RS-1b)
75 mph or Less

RUMBLE STRIPS FOR LANE CLOSURE
ON CONVENTIONAL ROADWAY

GENERAL NOTES

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

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

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

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

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

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

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

Texas Department of Transportation
Traffic Operations Division Standard

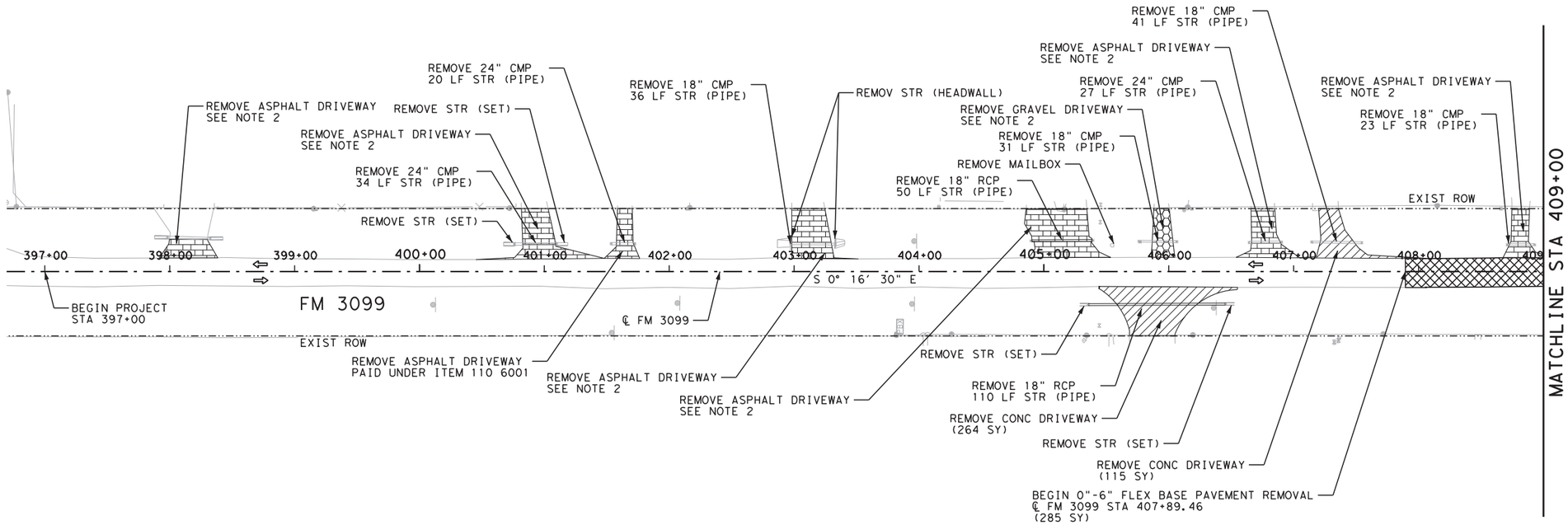
TEMPORARY RUMBLE STRIPS

WZ(RS)-16

FILE: wzrs16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS	3469	01	014	FM 3099
2-14 4-16	DIST	COUNTY		SHEET NO.
	BWD	STEPHENS		55

FINAL SUBMITTAL

USER:jhasler
OFFICE:IEA OFFICE:Houston
PROJECT # 2079G TxDOT FM 3099



LEGEND

- REMOVE FLEXBASE PAVEMENT
- OBLITERATE ABANDONED ROAD
- REMOVE ASPHALT PAVEMENT
- REMOVE CONCRETE DRIVEWAY
- REMOVE ASPHALT DRIVEWAY
- REMOVE GRAVEL DRIVEWAY
- REMOVAL BY OTHERS
- EXISTING LANE

NOTES:

1. EXISTING PAVEMENT MATERIAL SHALL BE REMOVED TO STOCKPILE LOCATION AS DIRECTED BY ENGINEER.
2. EXISTING GRAVEL AND ASPHALT DRIVEWAY REMOVALS SHALL BE SUBSIDIARY TO ITEM 530.
3. EXISTING FENCE AND RETAINING WALL REMOVAL SHALL BE SUBSIDIARY TO ITEM 100 6002.
4. EXISTING MAILBOX REMOVAL SHALL BE SUBSIDIARY TO ITEM 560 6002.

0 50 100 200

SCALE: 1"=100'

NO.	REVISION	BY	DATE

JORDAN HASLER
137316
LICENSED PROFESSIONAL ENGINEER

8/27/2021

IEA
1225 North Loop West
SUITE 320
HOUSTON, TEXAS 77008
(832) 494-3800
Firm Registration No. F-10161

Texas Department of Transportation®

FM 3099
ROADWAY REALIGNMENT

REMOVAL PLAN

SHEET 1 OF 3

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
6	SEE TITLE SHEET		56
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

DATE:8/27/2021 TIME:10:44:49 AM
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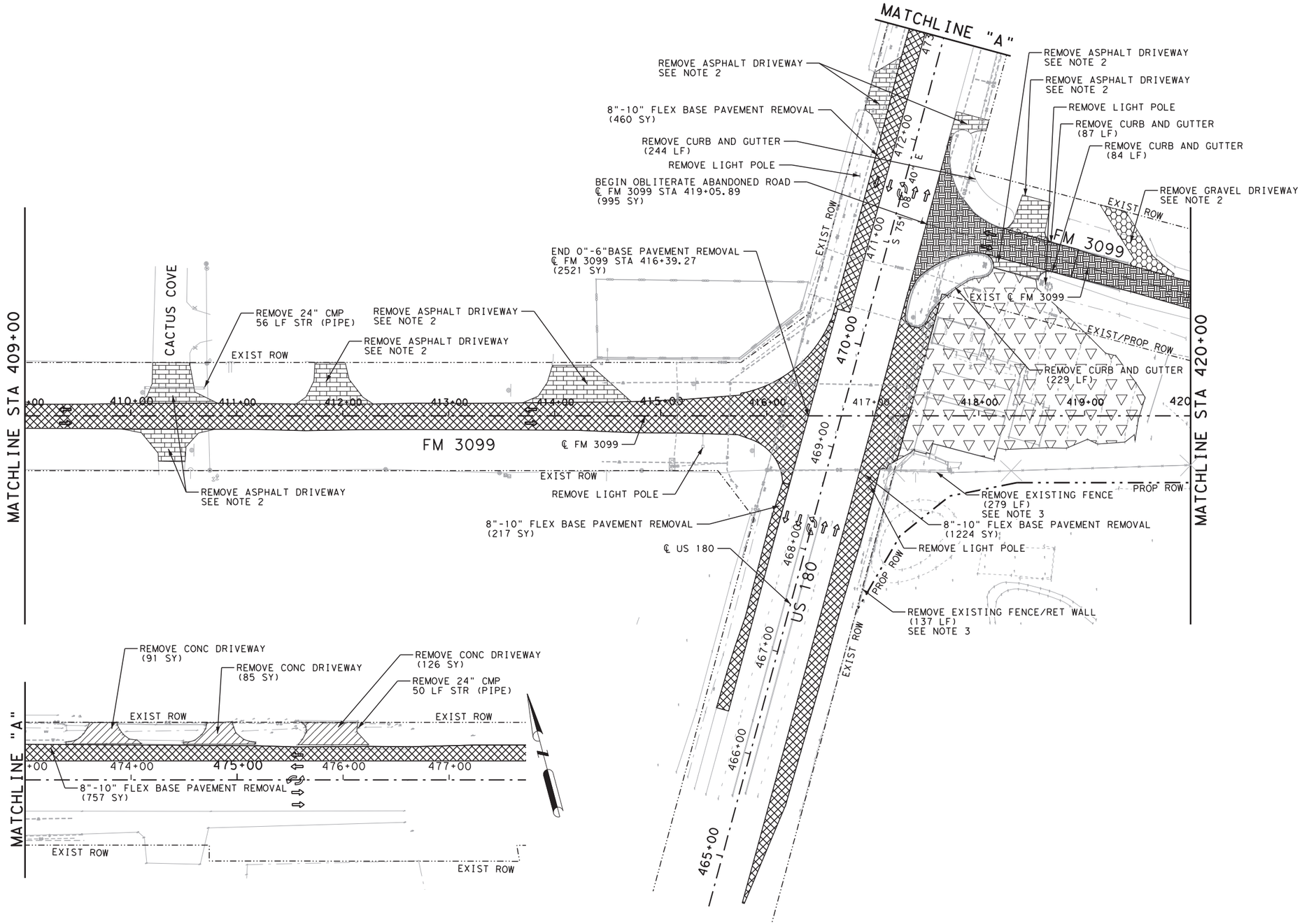
TIME:10:44:49 AM FILE:2079G RDWY*DEMOLITION*1.dgn

FINAL SUBMITTAL

USER:jhasler
OFFICE:IEA OFFICE:Houston
PROJECT # 2079G TxDOT FM 3099



LEGEND

- REMOVE FLEXBASE PAVEMENT
- OBLITERATE ABANDONED ROAD
- REMOVE ASPHALT PAVEMENT
- REMOVE CONCRETE DRIVEWAY
- REMOVE ASPHALT DRIVEWAY
- REMOVE GRAVEL DRIVEWAY
- REMOVAL BY OTHERS
- EXISTING LANE

NOTES:

1. EXISTING PAVEMENT MATERIAL SHALL BE REMOVED TO STOCKPILE LOCATION AS DIRECTED BY ENGINEER.
2. EXISTING GRAVEL AND ASPHALT DRIVEWAY REMOVALS SHALL BE SUBSIDIARY TO ITEM 530.
3. EXISTING FENCE AND RETAINING WALL REMOVAL SHALL BE SUBSIDIARY TO ITEM 100 6002.
4. EXISTING MAILBOX REMOVAL SHALL BE SUBSIDIARY TO ITEM 560 6002.

0 50 100 200
SCALE: 1"=100'

NO.	REVISION	BY	DATE

STATE OF TEXAS
JORDAN HASLER
137316
LICENSED PROFESSIONAL ENGINEER

8/27/2021

IEA
1225 North Loop West
SUITE 320
HOUSTON, TEXAS 77008
(832) 494-3800
Firm Registration No. F-10161

FM 3099 ROADWAY REALIGNMENT

REMOVAL PLAN

SHEET 2 OF 3

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
6	SEE TITLE SHEET		57
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

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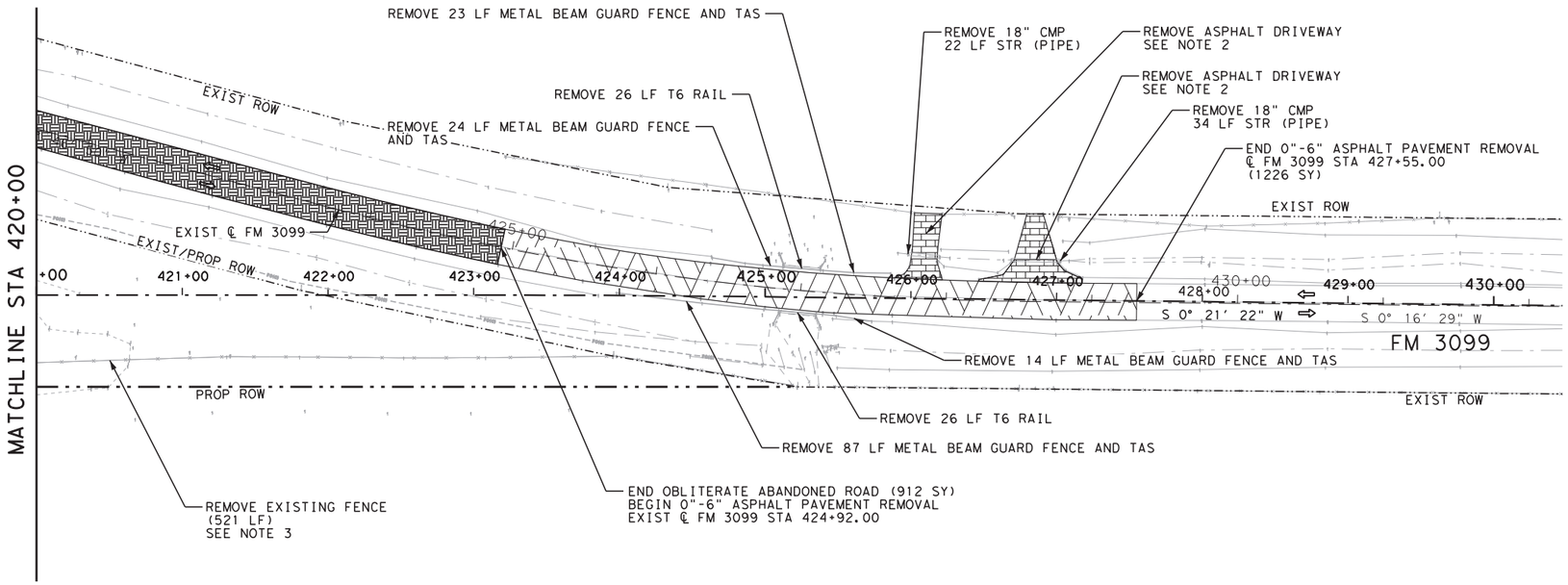
FINAL SUBMITTAL

USER:jhasler
OFFICE:IEA OFFICE:Houston
PROJECT # 2079G TxDOT FM 3099



LEGEND

- REMOVE FLEXBASE PAVEMENT
- OBLITERATE ABANDONED ROAD
- REMOVE ASPHALT PAVEMENT
- REMOVE CONCRETE DRIVEWAY
- REMOVE ASPHALT DRIVEWAY
- REMOVE GRAVEL DRIVEWAY
- REMOVAL BY OTHERS
- EXISTING LANE

NOTES:

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4. EXISTING MAILBOX REMOVAL SHALL BE SUBSIDIARY TO ITEM 560 6002.

0 50 100 200

SCALE: 1"=100'

NO.	REVISION	BY	DATE

STATE OF TEXAS
JORDAN HASLER
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LICENSED PROFESSIONAL ENGINEER

8/27/2021

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FM 3099 REALIGNMENT

REMOVAL PLAN

SHEET 3 OF 3

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
6	SEE TITLE SHEET		58
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

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TIME:10:44:57 AM FILE:2079G RDWY*DEMOLITION*3.dgn

TxDOT - Brownwood District 3469-01-013 US180&FM 3099	Texas State Plane	Texas North Central Zone 4202	Project Vertical Datum	CSF- 1.00012	US Survey Feet					
Breckenridge - Stephens County	NAD83(2011)	NAVD88	Geiod 12B	TxDOT VRS						
Monument/Target Number	**Surface Northing**	**Surface Easting**	**Elevation**	**Description**	**Grid Northing**	**Grid Easting**	**Latitude (N)**	**Longitude (W)**	**Station**	**Offset**
CP1	6960142.5960	1832501.6340	1252.4700	CAP IN CONC FND	6959307.4791	1832281.7602	N32 45 31.90939	W98 56 35.27073	NA	NA
CP2	6960309.1560	1831472.2260	1242.1100	5/8IN W/ALC	6959474.0191	1831252.4757	N32 45 33.51424	W98 56 47.33297	NA	NA
CP3	6958308.7570	1831795.1580	1243.2400	5/8IN W/ALC	6957473.8601	1831575.3690	N32 45 13.73549	W98 56 43.45224	NA	NA

ALC - Aluminum Cap
IN CONC FND - Aluminum Disc in Concrete
Nail-60D

Surveyed 09/2018

*Lat/*Long conversion from CORPSCON 6.0 & NOAA NCAT (ngs.noaa.gov) (input/output) TX East HPGN/HARN

TxDOT Brownwood District
Chet M. Glasscock, RPLS
Travis Jordan

Form Completed 07/29/2020

STATE OF TEXAS
REGISTERED
CHET M. GLASSCOCK
4626
PROFESSIONAL
LAND SURVEYOR

7/30/20

CHET M. GLASSCOCK, RPLS No.4626
State of Texas, TxDOT
Brownwood District 23
Brownwood, Texas

Direction Control - Bearing Basis

Bearings and distances are referenced to the Texas State Plane Coordinate System North Central Zone 4202, NAD83(2011)
All distances and acreage are in Surface.
Can be converted to Grid by multiplying a Combined Grid Scale Factor of 0.99988001439827. (Surface 1.00012)

FM 3099 SURVEY CONTROL

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CONT	SECT	JOB	HIGHWAY
3469	01	014	FM 3099
DIST	COUNTY		SHEET NO.
BWD	STEPHENS		59

DATE: $DATE$ $TIME$
FILE: $FILE$

FINAL SUBMITTAL

USER:jhasler
OFFICE:IEA OFFICE:Houston
PROJECT # 2079G TxDOT FM 3099

FM3099_CL

<* 1 Describe Chain FM3099_CL

Chain FM3099_CL contains:
 44 CUR FM3099_CL_1 45

Beginning chain FM3099_CL description
==========

Point 44 N 6,963,539.3374 E 1,831,709.8493 Sta 384+36.20

Course from 44 to PC FM3099_CL_1 S 0° 16′ 30.34" E Dist 3,870.9332

Curve Data

Curve FM3099_CL_1
P.I. Station = 423+89.75 N 6,959,585.8330 E 1,831,728.8314
Delta = 0° 37′ 52.10" (RT)
Degree = 0° 22′ 55.10"
Tangent = 82.6167
Length = 165.2317
Radius = 15,000.0000
External = 0.2275
Long Chord = 165.2309
Mid. Ord. = 0.2275
P.C. Station = 423+07.13 N 6,959,668.4487 E 1,831,728.4348
P.T. Station = 424+72.36 N 6,959,503.2179 E 1,831,728.3180
C.C. N 6,959,596.4293 E 1,816,728.6076
Back = S 0° 16′ 30.34" E
Ahead = S 0° 21′ 21.76" W
Chord Bear = S 0° 02′ 25.71" W

Course from PT FM3099_CL_1 to 45 S 0° 21′ 21.76" W Dist 681.8406

Point 45 N 6,958,821.3905 E 1,831,724.0810 Sta 431+54.21

==========
Ending chain FM3099_CL description

EXIST_FM3099_CL

<* 2 Describe Chain EXIST_FM3099_CL

Chain EXHORIZ contains:
 EXHORIZ1 CUR EXHORIZ_1 EXHORIZ6 EXHORIZ7

Beginning chain EXHORIZ description
==========

Point EXHORIZ1 N 6,960,253.3606 E 1,831,914.2183 Sta 418+76.36

Course from EXHORIZ1 to PC EXHORIZ_1 S 14° 46′ 50.42" W Dist 490.7011

Curve Data

Curve EXHORIZ_1
P.I. Station = 426+10.04 N 6,959,543.9574 E 1,831,727.0418
Delta = 14° 30′ 21.00" (LT)
Degree = 3° 00′ 03.72"
Tangent = 242.9800
Length = 483.3615
Radius = 1,909.2025
External = 15.3997
Long Chord = 482.0716
Mid. Ord. = 15.2764
P.C. Station = 423+67.06 N 6,959,778.8971 E 1,831,789.0308
P.T. Station = 428+50.42 N 6,959,300.9802 E 1,831,725.8763
C.C. N 6,959,291.8221 E 1,833,635.0569
Back = S 14° 46′ 50.42" W
Ahead = S 0° 16′ 29.42" W
Chord Bear = S 7° 31′ 39.92" W

Course from PT EXHORIZ_1 to EXHORIZ6 S 0° 16′ 29.42" W Dist 550.5800

Point EXHORIZ6 N 6,958,750.4065 E 1,831,723.2353 Sta 434+01.00

Course from EXHORIZ6 to EXHORIZ7 S 1° 45′ 24.58" E Dist 876.9900

Point EXHORIZ7 N 6,957,873.8288 E 1,831,750.1217 Sta 442+77.99

==========
Ending chain EXHORIZ description

US180_CL

<* 3 DESCRIBE CHAIN US180_CL

Chain US180_CL contains:
 145 146

Beginning chain US180_CL description
Feature: Road_Centerline
==========

Point 145 N 6,960,517.9644 E 1,830,922.6823 Sta 461+00.00

Course from 145 to 146 S 75° 08′ 40.19" E Dist 2,100.0000

Point 146 N 6,959,979.5618 E 1,832,952.4908 Sta 482+00.00

==========
Ending chain US180_CL description

CULVERT1_CL

<* 4 Describe Chain CULVERT1_CL

Chain CULVERT1_CL contains:
 47 48 49 50 51

Beginning chain CULVERT1_CL description
==========

Point 47 N 6,959,449.5585 E 1,831,777.8934 Sta 10+00.00

Course from 47 to 48 N 88° 48′ 48.12" W Dist 24.2321

Point 48 N 6,959,450.0603 E 1,831,753.6665 Sta 10+24.23

Course from 48 to 49 N 84° 51′ 51.81" W Dist 50.2816

Point 49 N 6,959,454.5612 E 1,831,703.5867 Sta 10+74.51

Course from 49 to 50 S 88° 53′ 42.43" W Dist 14.0000

Point 50 N 6,959,454.2912 E 1,831,689.5893 Sta 10+88.51

Course from 50 to 51 S 59° 03′ 38.69" W Dist 29.0772

Point 51 N 6,959,439.3418 E 1,831,664.6494 Sta 11+17.59

==========
Ending chain CULVERT1_CL description

NO.	REVISION	BY	DATE

STATE OF TEXAS
JORDAN HASLER
137316
LICENSED
PROFESSIONAL ENGINEER

8/27/2021

IEA
1225 North Loop West
SUITE 320
HOUSTON, TEXAS 77008
(832) 494-3800
Firm Registration No. F-10161

Texas Department of Transportation®

FM 3099 REALIGNMENT

HORIZONTAL ALIGNMENT DATA

SHEET 1 OF 2

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
6	SEE TITLE SHEET		60
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014_	FM 3099

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TIME:10:44:58 AM FILE:048*2079G HORIZ DATA 1.dgn

FINAL SUBMITTAL

USER:jhasler
OFFICE:IEA OFFICE:Houston
PROJECT # 2079G TxDOT FM 3099

3099_SW_CL

<* 1 DESCRIBE CHAIN 3099_SW_CL

Chain 3099_SW_CL contains:
147 148 149 150 151 152 153 154 200 201 202 203 204 205 206 207 208

Beginning chain 3099_SW_CL description

Point 147	N 6,961,127.7118	E 1,831,666.8185	Sta	10+00.00
Course from 147 to 148 N 89° 43′ 33.20" E Dist 6.5000				
Point 148	N 6,961,127.7429	E 1,831,673.3185	Sta	10+06.50
Course from 148 to 149 S 0° 16′ 26.80" E Dist 156.9027				
Point 149	N 6,960,970.8420	E 1,831,674.0691	Sta	11+63.40
Course from 149 to 150 N 89° 43′ 29.66" E Dist 93.6119				
Point 150	N 6,960,971.2915	E 1,831,767.6799	Sta	12+57.01
Course from 150 to 151 S 0° 16′ 30.34" E Dist 361.0206				
Point 151	N 6,960,610.2750	E 1,831,769.4132	Sta	16+18.04
Course from 151 to 152 S 8° 15′ 20.41" W Dist 20.2237				
Point 152	N 6,960,590.2608	E 1,831,766.5093	Sta	16+38.26
Course from 152 to 153 S 0° 16′ 30.34" E Dist 184.2826				
Point 153	N 6,960,405.9803	E 1,831,767.3941	Sta	18+22.54
Course from 153 to 154 S 35° 59′ 57.03" E Dist 91.6030				
Point 154	N 6,960,331.8712	E 1,831,821.2359	Sta	19+14.14
Course from 154 to 200 S 75° 08′ 40.19" E Dist 157.8244				
Point 200	N 6,960,291.4078	E 1,831,973.7852	Sta	20+71.97
Course from 200 to 201 S 55° 51′ 16.03" E Dist 10.5948				
Point 201	N 6,960,285.4609	E 1,831,982.5536	Sta	20+82.56
Course from 201 to 202 S 75° 08′ 40.19" E Dist 98.5450				
Point 202	N 6,960,260.1958	E 1,832,077.8048	Sta	21+81.11
Course from 202 to 203 N 85° 33′ 55.64" E Dist 10.5948				
Point 203	N 6,960,261.0149	E 1,832,088.3679	Sta	21+91.70
Course from 203 to 204 S 75° 08′ 40.19" E Dist 219.2933				
Point 204	N 6,960,204.7920	E 1,832,300.3314	Sta	24+11.00
Course from 204 to 205 S 55° 51′ 16.03" E Dist 10.5948				
Point 205	N 6,960,198.8452	E 1,832,309.0999	Sta	24+21.59
Course from 205 to 206 S 75° 08′ 40.19" E Dist 105.5391				
Point 206	N 6,960,171.7869	E 1,832,411.1114	Sta	25+27.13
Course from 206 to 207 S 61° 38′ 55.55" E Dist 29.2807				
Point 207	N 6,960,157.8822	E 1,832,436.8800	Sta	25+56.41
Course from 207 to 208 S 75° 08′ 40.19" E Dist 127.0206				
Point 208	N 6,960,125.3163	E 1,832,559.6549	Sta	26+83.43

Ending chain 3099_SW_CL description

NO.	REVISION	BY	DATE

STATE OF TEXAS
JORDAN HASLER
137316
LICENSED
PROFESSIONAL ENGINEER

8/27/2021

IEA
1225 North Loop West
SUITE 320
HOUSTON, TEXAS 77008
(832) 494-3800
Firm Registration No. F-10161

Texas Department of Transportation®

FM 3099 REALIGNMENT

HORIZONTAL ALIGNMENT DATA

SHEET 2 OF 2

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
6	SEE TITLE SHEET		61
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

DATE:8/27/2021 TIME:10:45:00 AM
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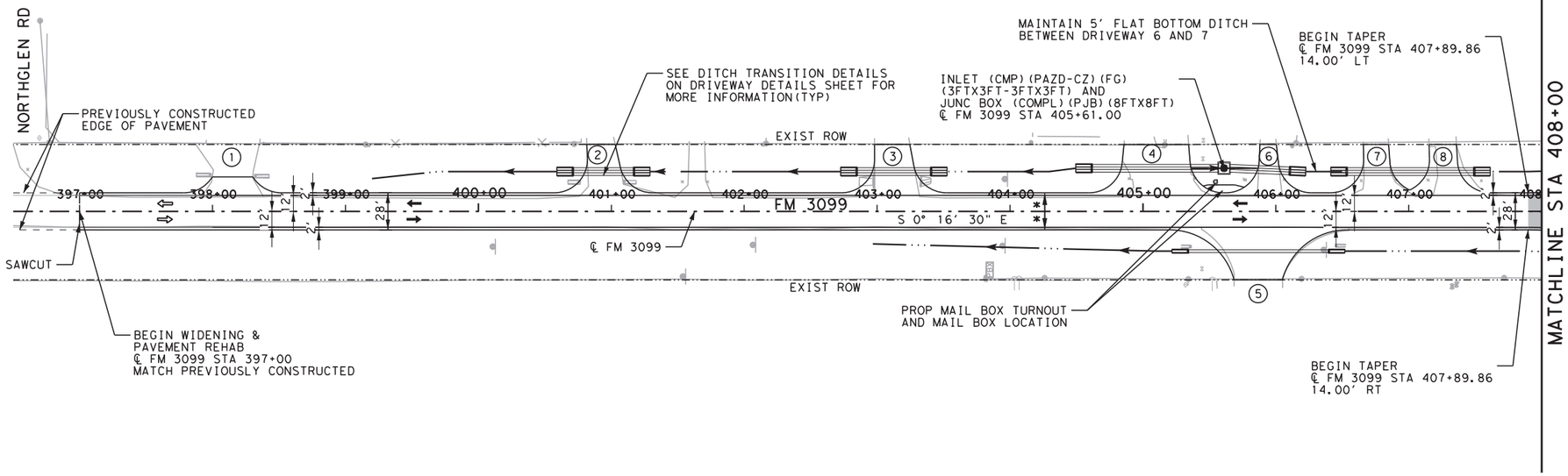
TIME:10:45:00 AM FILE:048*2079G HORIZ DATA 2.dgn

FINAL SUBMITTAL



* MATCH EXISTING CROSS SLOPES

LEGEND

- PROPOSED LANE
- EXISTING LANE
- SAWCUT
- FM 3099-X — CURVE DATA
- PROP PAVEMENT
- PROPOSED DITCH
- # — PROPOSED DRIVEWAY NUMBER

NOTES:

1. ALL DIMENSIONS ARE TO EDGE OF PAVEMENT OR FACE OF CURB UNLESS OTHERWISE NOTED.
2. REFER TO HORIZONTAL ALIGNMENT DATA SHEET FOR HORIZONTAL CURVE DATA.
3. REFER TO DRIVEWAY SUMMARY SHEET AND DRIVEWAY PROFILES SHEET FOR MORE INFORMATION.

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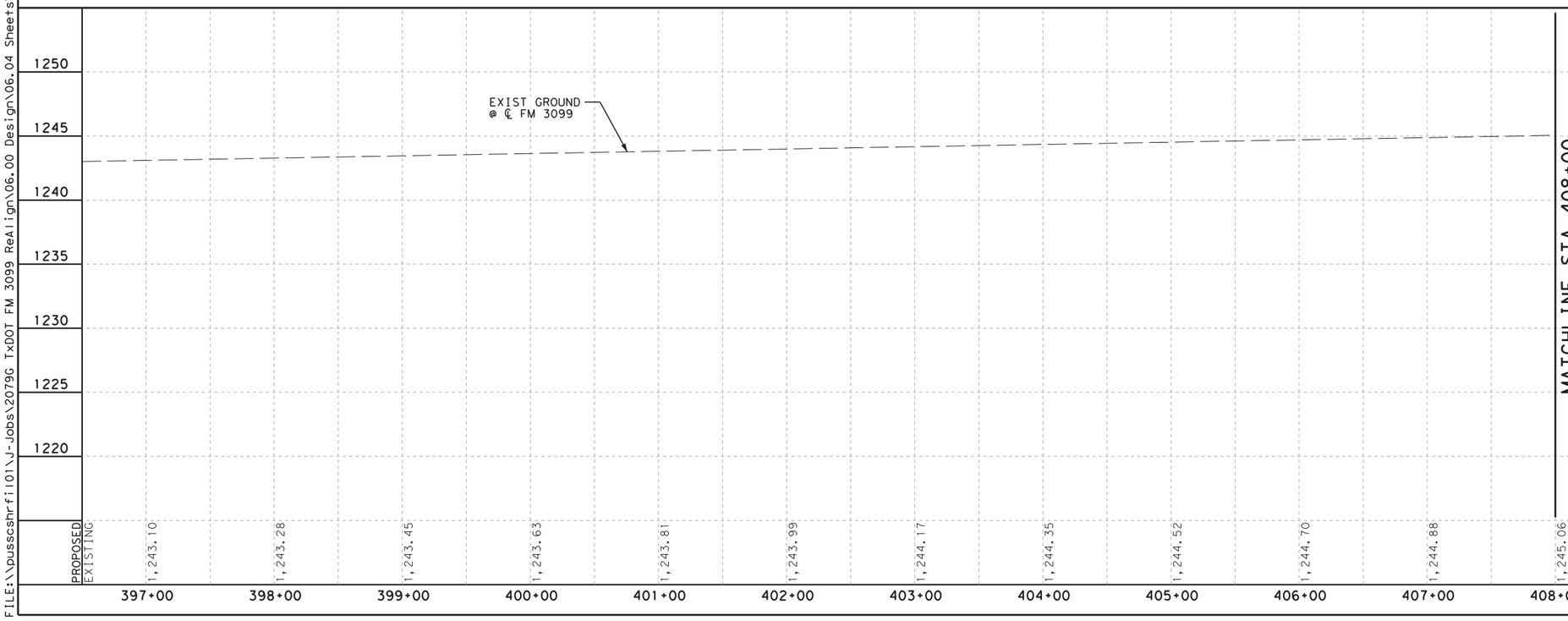
SCALE: 1"=100'
1"=10'V



NO.	REVISION	BY	DATE

STATE OF TEXAS
JORDAN HASLER
137316
LICENSED PROFESSIONAL ENGINEER

8/27/2021

IEA
1225 North Loop West
SUITE 320
HOUSTON, TEXAS 77008
(832) 494-3800
Firm Registration No. F-10161

FM 3099 REALIGNMENT

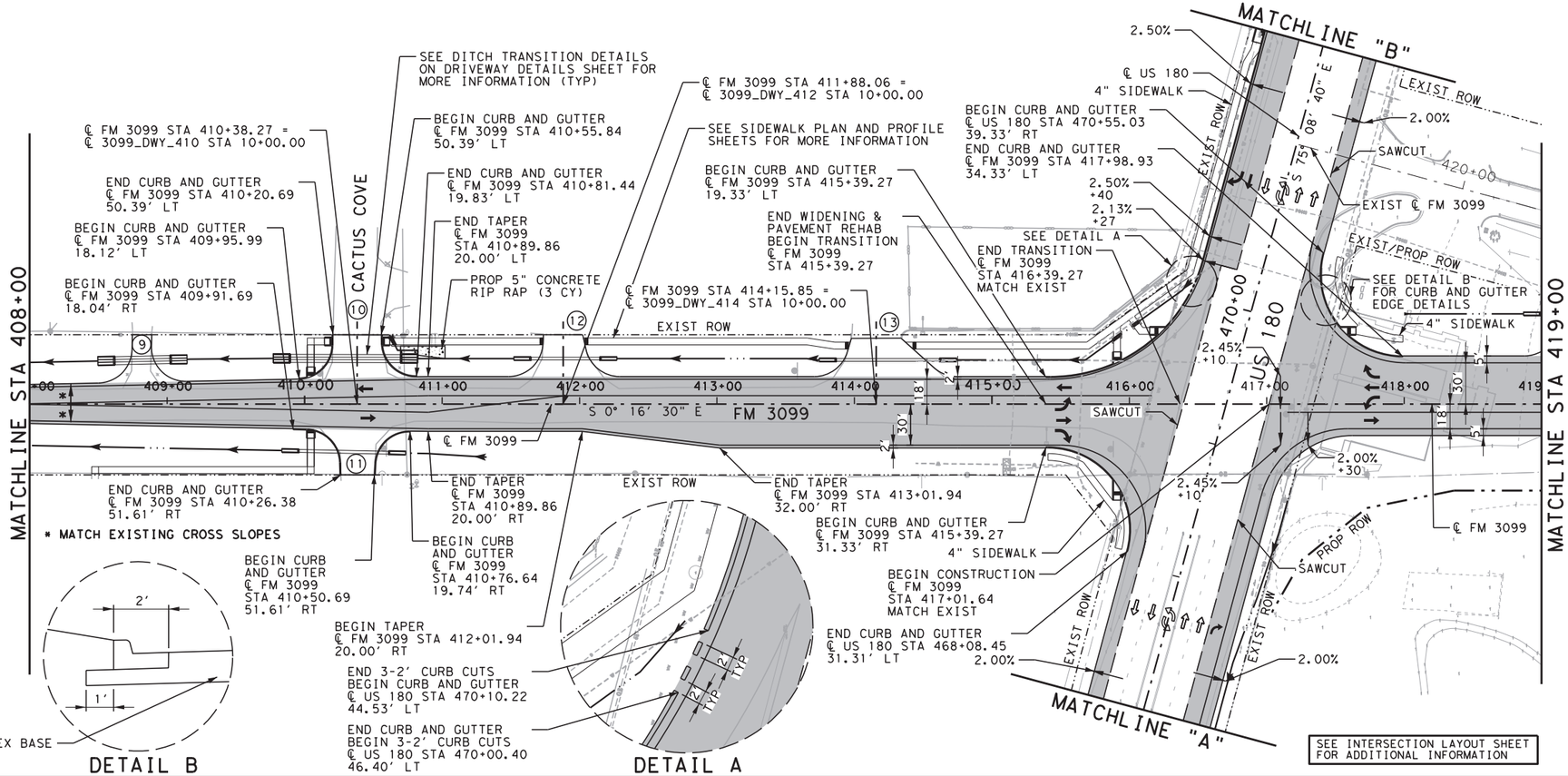
ROADWAY
PLAN & PROFILE

SHEET 1 OF 4

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
6	SEE TITLE SHEET		62
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

FINAL SUBMITTAL

USER: jhasler
OFFICE: IEA OFFICE: Houston
PROJECT # 20796 TxDOT FM 3099



LEGEND

- PROPOSED LANE
- EXISTING LANE
- SAWCUT
- FM 3099-X CURVE DATA
- PROP PAVEMENT
- PROPOSED DITCH
- (#) PROPOSED DRIVEWAY NUMBER

NOTES:

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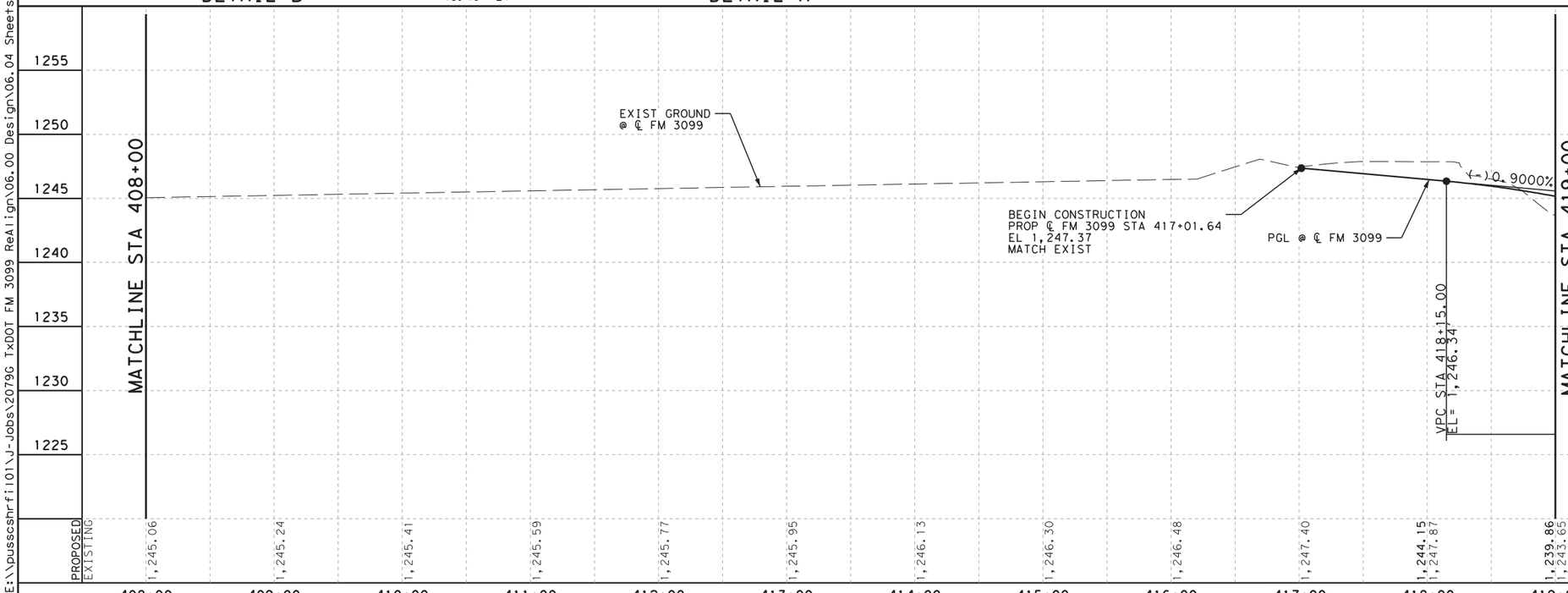
0 50 100 200

SCALE: 1"=100'
1"=10'V



NO.	REVISION	BY	DATE

STATE OF TEXAS
JORDAN HASLER
137316
LICENSED PROFESSIONAL ENGINEER

8/27/2021

IEA
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SUITE 320
HOUSTON, TEXAS 77008
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FM 3099 REALIGNMENT

ROADWAY
PLAN & PROFILE

SHEET 2 OF 4

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
6	SEE TITLE SHEET		63
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014,	FM 3099

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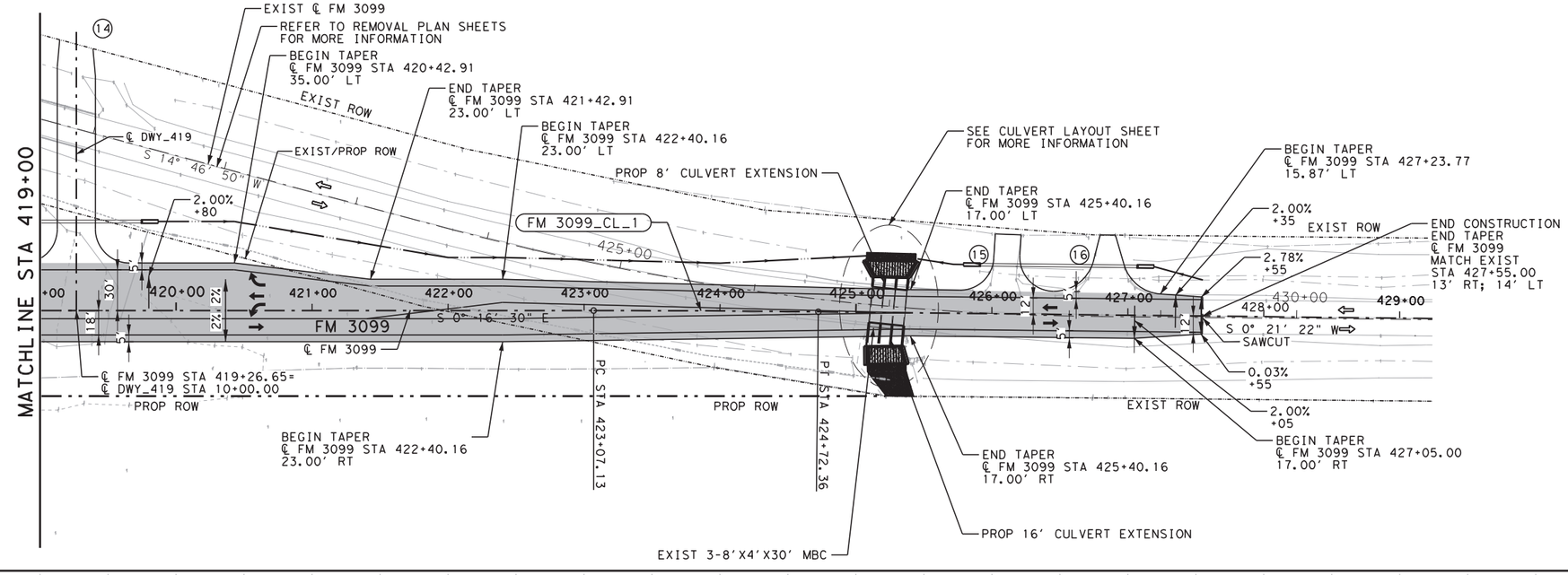
FINAL SUBMITTAL

USER:jhasler
OFFICE:IEA OFFICE:Houston
PROJECT # 2079G TxDOT FM 3099



LEGEND

- PROPOSED LANE
- EXISTING LANE
- SAWCUT
- FM 3099-X — CURVE DATA
- PROP PAVEMENT
- PROPOSED DITCH
- (#) PROPOSED DRIVEWAY NUMBER

NOTES:

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3. REFER TO DRIVEWAY SUMMARY SHEET AND DRIVEWAY PROFILES SHEET FOR MORE INFORMATION.

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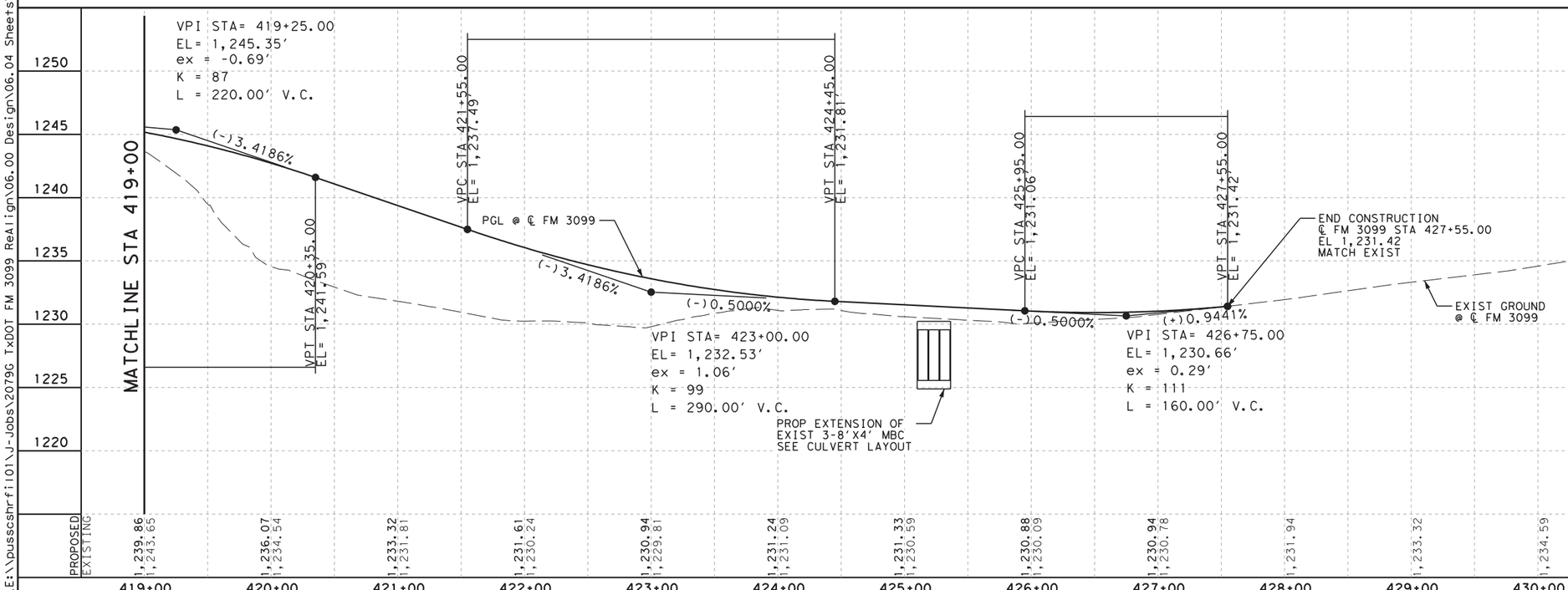
SCALE: 1"=100'
1"=10'V



NO.	REVISION	BY	DATE

STATE OF TEXAS
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8/27/2021

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ROADWAY
PLAN & PROFILE

SHEET 3 OF 4

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
6	SEE TITLE SHEET		64
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

DATE:8/27/2021 TIME:10:45:21 AM
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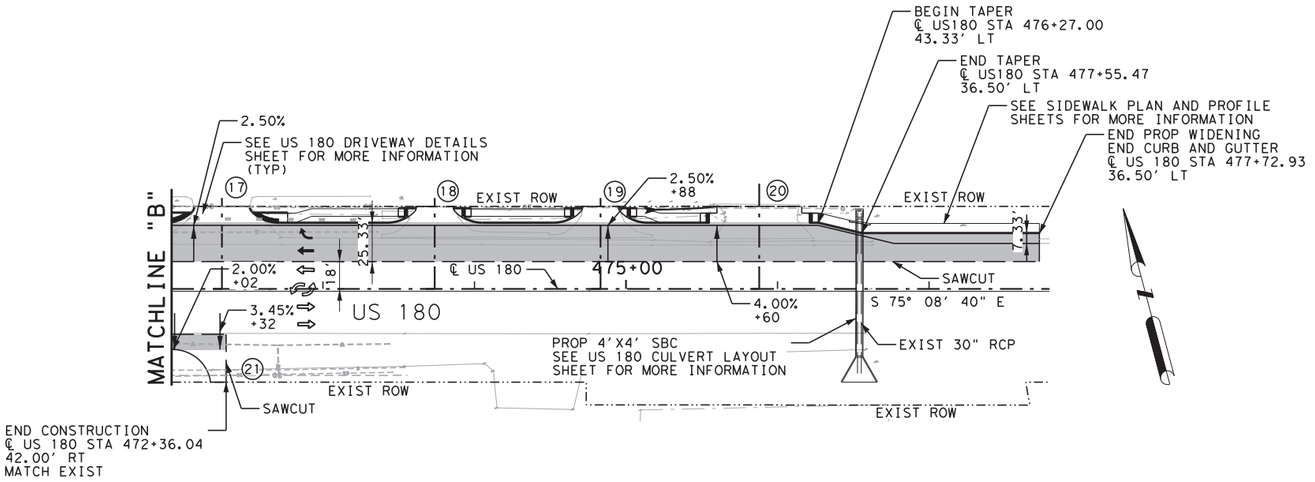
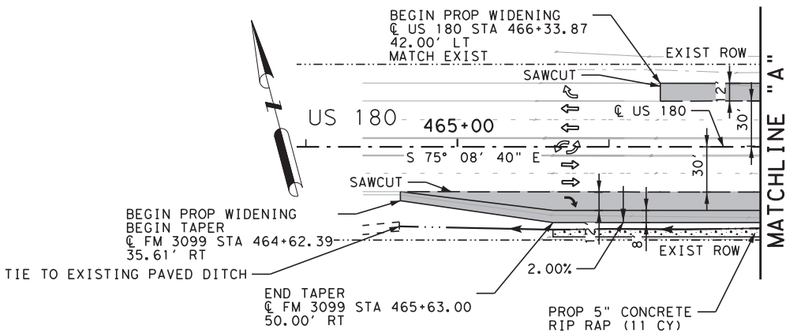
FINAL SUBMITTAL

LEGEND

- PROPOSED LANE
- EXISTING LANE
- SAWCUT
- FM 3099-X — CURVE DATA
- PROP PAVEMENT
- PROPOSED DITCH
- (#) PROPOSED DRIVEWAY NUMBER



SEE INTERSECTION LAYOUT SHEET
FOR ADDITIONAL INFORMATION



NOTES:

1. ALL DIMENSIONS ARE TO EDGE OF PAVEMENT OR FACE OF CURB UNLESS OTHERWISE NOTED.
2. REFER TO HORIZONTAL ALIGNMENT DATA SHEET FOR HORIZONTAL CURVE DATA.
3. REFER TO DRIVEWAY SUMMARY SHEET AND DRIVEWAY PROFILES SHEET FOR MORE INFORMATION.

0 50 100 200

SCALE: 1"=100'
1"=10'V

NO.	REVISION	BY	DATE

STATE OF TEXAS
JORDAN HASLER
137316
LICENSED
PROFESSIONAL ENGINEER

8/27/2021

IEA
1225 North Loop West
SUITE 320
HOUSTON, TEXAS 77008
(832) 494-3800
Firm Registration No. F-10161

Texas Department of Transportation®

FM 3099 REALIGNMENT

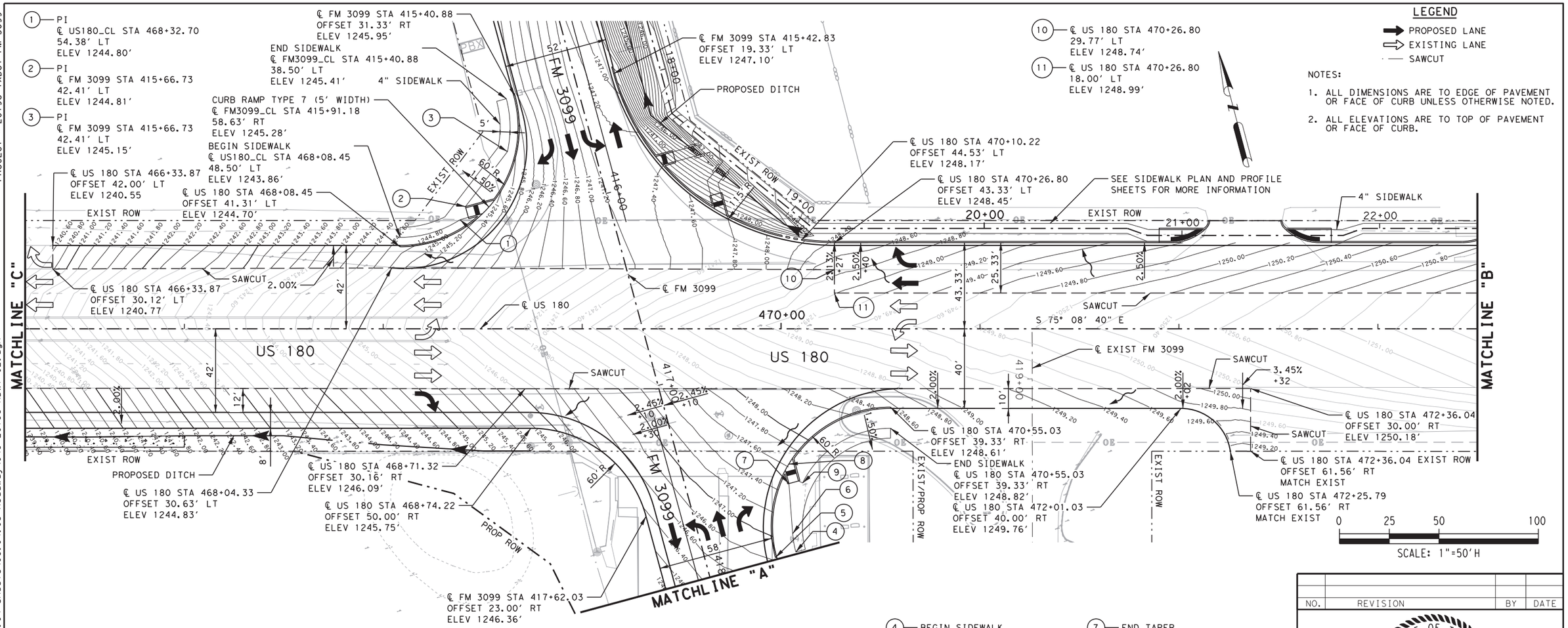
ROADWAY
PLAN & PROFILE

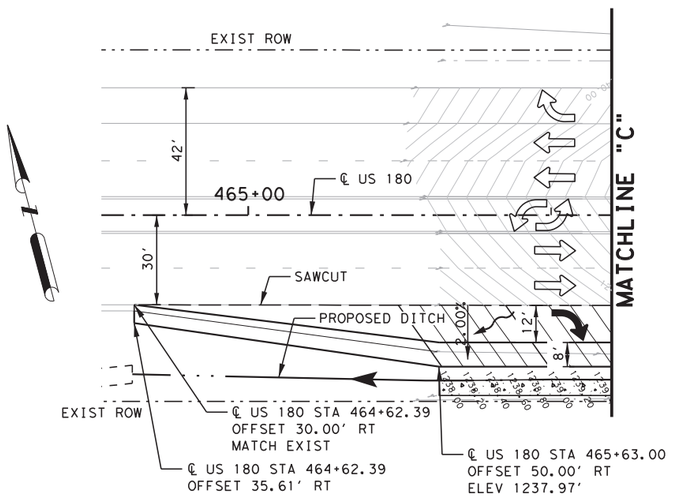
SHEET 4 OF 4

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
6	SEE TITLE SHEET		65
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014,	FM 3099

FINAL SUBMITTAL

USER: jhasler
OFFICE: IEA OFFICE: Houston
PROJECT # 20796 TxDOT FM 3099





4 BEGIN SIDEWALK ℄ FM3099_CL STA 417+98.93 45.00' LT ELEV 1245.81'

5 ℄ FM 3099 STA 417+98.93 OFFSET 34.33' LT ELEV 1246.83'

6 BEGIN TAPER ℄ FM 3099 STA 417+89.66 45.88' LT ELEV 1246.19'

7 END TAPER ℄ FM 3099 STA 417+64.79 50.64' LT ELEV 1247.23'

8 CURB RAMP TYPE 7 (5' WIDTH) ℄ FM 3099 STA 417+55.37 53.07' LT ELEV 1247.63'

9 PI ℄ FM 3099 STA 417+66.29 57.34' LT ELEV 1247.62'

NO.	REVISION	BY	DATE

STATE OF TEXAS
JORDAN HASLER
137316
LICENSED PROFESSIONAL ENGINEER

8/27/2021

IEA
1225 North Loop West
SUITE 320
HOUSTON, TEXAS 77008
(832) 494-3800
Firm Registration No. F-10161

FM 3099 REALIGNMENT

INTERSECTION LAYOUT

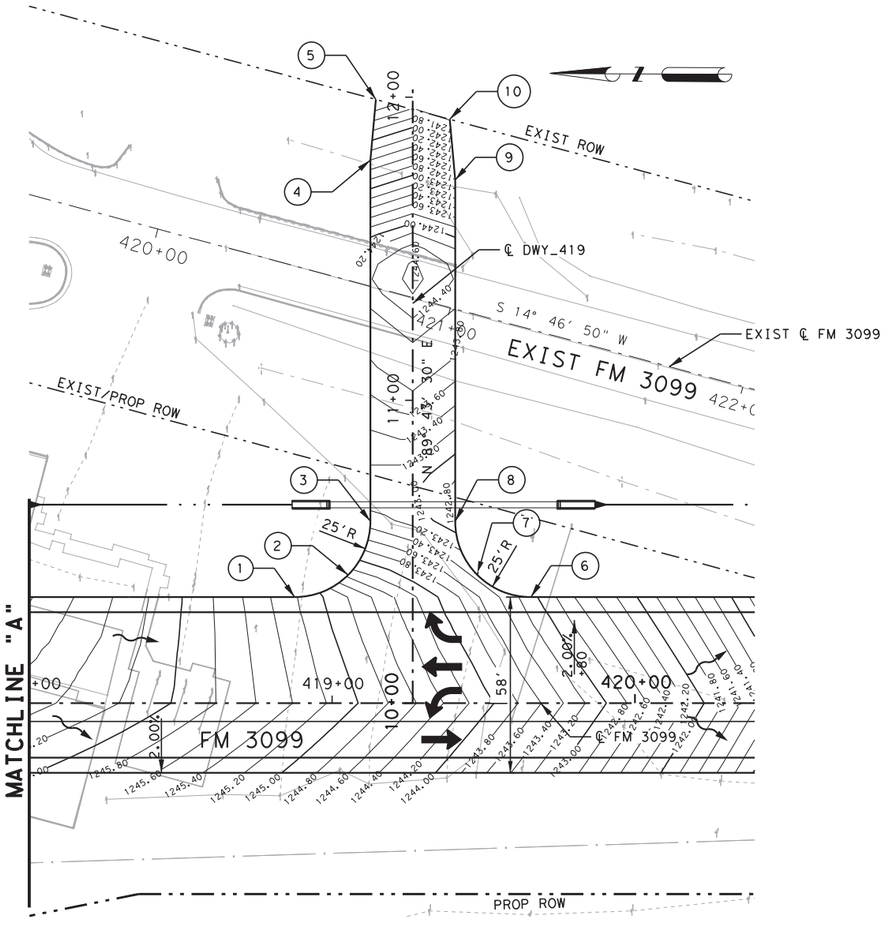
SHEET 1 OF 2

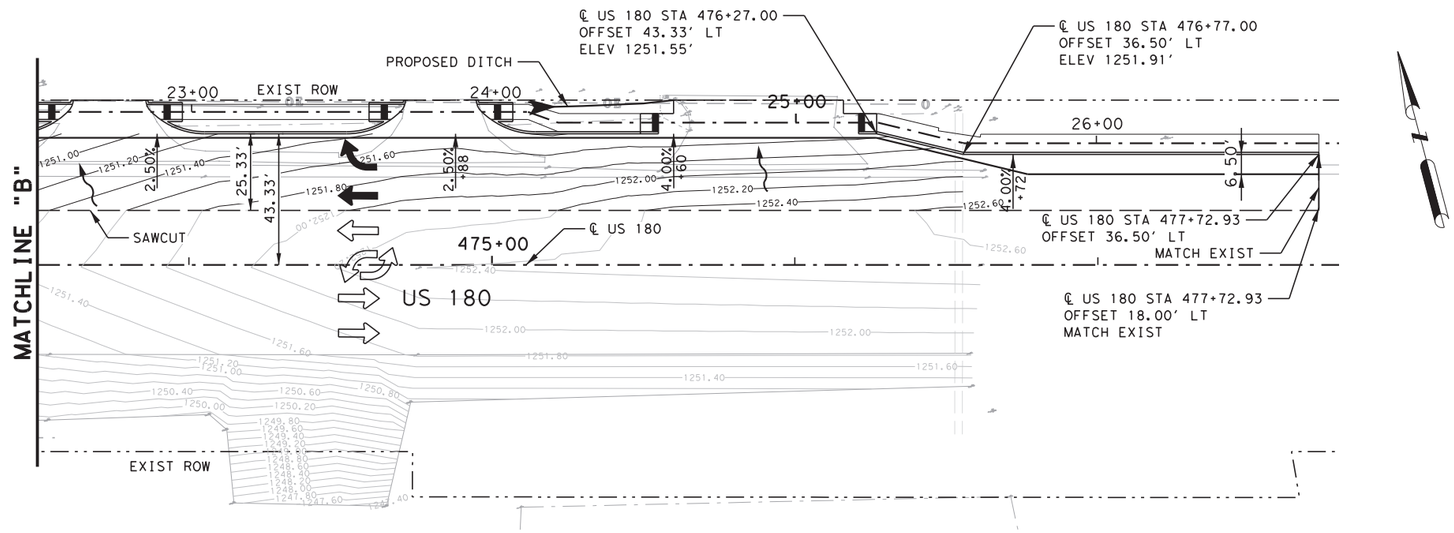
FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.	SHEET
6	SEE TITLE SHEET	66

STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

FINAL SUBMITTAL

POINT NO.	POINT TYPE	CHAIN	STATION	OFFSET	ELEVATION
1	PC	FM 3099	418+87.65	35.00' LT	1245.22
2	1/2R	DWY 419	10+42.32	21.32' LT	1245.35
3	PT	DWY 419	10+60.00	14.00' LT	1243.30
4	PI	DWY 419	11+79.25	14.00' LT	1242.40
5	PI	DWY 419	11+99.25	12.19' LT	MATCH EXIST
6	PC	FM 3099	419+65.65	35.00' LT	1243.07
7	1/2R	DWY 419	10+42.32	21.32' RT	1243.35
8	PT	DWY 419	10+60.00	14.00' RT	1242.86
9	PI	DWY 419	11+72.70	14.00' RT	1242.82
10	PI	DWY 419	11+92.70	12.19' RT	MATCH EXIST





LEGEND

- PROPOSED LANE
- EXISTING LANE
- SAWCUT

NOTES:

1. ALL DIMENSIONS ARE TO EDGE OF PAVEMENT OR FACE OF CURB UNLESS OTHERWISE NOTED.
2. ALL ELEVATIONS ARE TO TOP OF PAVEMENT OR FACE OF CURB.

0 25 50 100

SCALE: 1"=50'

NO.	REVISION	BY	DATE

STATE OF TEXAS
JORDAN HASLER
137316
LICENSED PROFESSIONAL ENGINEER

8/27/2021

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1225 North Loop West
SUITE 320
HOUSTON, TEXAS 77008
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Firm Registration No. F-10161

FM 3099 REALIGNMENT

INTERSECTION LAYOUT

SHEET 2 OF 2

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
6	SEE TITLE SHEET		67
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

TIME:10:45:37 AM FILE:049*2079G RDWY*IL02.dgn

FINAL SUBMITTAL

DRIVEWAY ID	STATION	SIDE	US 180 FM3099	EXISTING				PROPOSED						460 610	465 6012	530 6004	530 6005	467 6537
				RADIUS (FT)		MATERIAL	TYPE	RADIUS (FT)		PROP DRIVEWAY LENGTH	PROP DRIVEWAY WIDTH	US CULVERT FL ELEV	DS CULVERT FL ELEV	CMP AR (GAL STL DES 3)	JCTBOX(COMPL)(PJB)(8FTX8FT)	DRIVEWAYS (CONC)	DRIVEWAYS (ACP)	SET (TY II)(DES 3)(CMP)(6:1)(P)
				LT	RT			LT	RT	FT	FT	FT	FT	LF	EA	SY	SY	EA
1	398+15.11	LT	FM 3099	25	25	ASPH	COM	25	25	12	31	N/A	N/A				57	
2	400+92.30	LT	FM 3099	15	15	ASPH	COM	25	25	36	21	1231.91	1230.28	90			125	4
3	403+11.36	LT	FM 3099	N/A	N/A	ASPH	COM	25	25	36	27	1235.44	1234.83	110			145	4
4	405+10.10	LT	FM 3099	25	25	ASPH	COM	25	25	36	49	1236.48	1235.93	190	1		234	2
5	405+86.79	RT	FM 3099	50	50	CONC	COM	50	50	38	36	1240.83	1238.72	105		257		2
6	405+94.21	LT	FM 3099	N/A	N/A	GRAVEL	COM	25	25	36	12	1239.42	1236.73	90			87	2
7	406+75.32	LT	FM 3099	15	25	ASPH	COM	25	25	36	19	N/A	1240.37	95			108	2
8	407+25.57	LT	FM 3099	25	25	CONC	COM	25	25	36	21	1240.97	N/A	95		114		2
9	408+81.77	LT	FM 3099	25	25	ASPH	COM	25	25	35	14	1241.82	1241.62	80			84	4
10	410+38.27	LT	FM 3099	20	20	ASPH	COM	25	25	31	35	1242.32	1242.01	160			153	4
11	410+38.54	RT	FM 3099	25	25	ASPH	COM	25	25	33	24	1242.94	1242.49	65			120	2
12	411+88.06	LT	FM 3099	25	25	ASPH	COM	25	25	30	29	1242.76	1242.53	50			133	2
13	414+15.85	LT	FM 3099	25	25	ASPH	COM	25	25	28	36	1243.50	1243.2	75			181	2
14	419+26.65	LT	FM 3099	8	8	ASPH	COM	25	25	161	28	1239.90	1235.07	75			527	2
15	426+11.34	LT	FM 3099	N/A	N/A	ASPH	RES	25	25	42	19	N/A	1226.16	57.5			118	1
16	426+84.56	LT	FM 3099	25	25	ASPH	RES	25	25	42	12	1227.74	N/A	57.5			130	1
17	472+33.33	LT	US 180	30	30	ASPH	COM	25	25	11	36	N/A	N/A				56	
18	473+73.78	LT	US 180	20	25	CONC	COM	25	25	11	24	N/A	N/A			42		
19	474+83.18	LT	US 180	20	20	CONC	COM	25	25	11	24	N/A	N/A			41		
20	475+88.00	LT	US 180	15	15	CONC	COM	N/A*	N/A*	11	56	N/A	N/A			76		
21	472+36.04	RT	US 180	N/A	10	ASPH	COM	N/A	25	22	10	N/A	N/A				39	

* SEE DETAIL "CONCRETE DRIVE WITH SIDEWALK" ON DRIVEWAY DETAILS SHEET FOR MORE INFORMATION

NOTE:

1. ASPHALT & AGGREGATE TYPES AND RATES SHALL MATCH THOSE FOUND ON THE PROPOSED BASIS OF ESTIMATE FOR "ROADWAY" OR AS DIRECTED BY THE ENGINEER.
2. STATIONS ARE APPROXIMATE AND MAY BE CHANGED IN THE FIELD OR AS DIRECTED BY THE ENGINEER.
3. CONSTRUCT DRIVES AS SHOWN OR AS DIRECTED BY THE ENGINEER.
4. SEE SUMMARY OF QUANTITIES ROADWAY FOR ADDITIONAL DETAILS.

NOT TO SCALE

NO.	REVISION	BY	DATE

STATE OF TEXAS
JORDAN HASLER
137316
LICENSED PROFESSIONAL ENGINEER

8/27/2021

IEA
1225 North Loop West
SUITE 320
HOUSTON, TEXAS 77008
(832) 494-3800
Firm Registration No. F-10161

FM 3099 REALIGNMENT

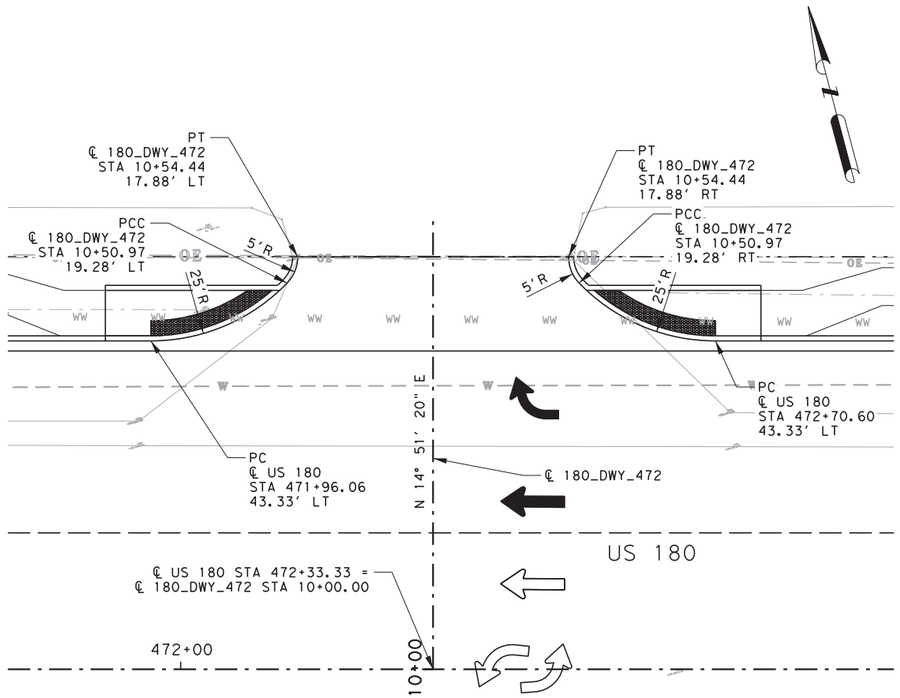
DRIVEWAY TABLE

SHEET 1 OF 1

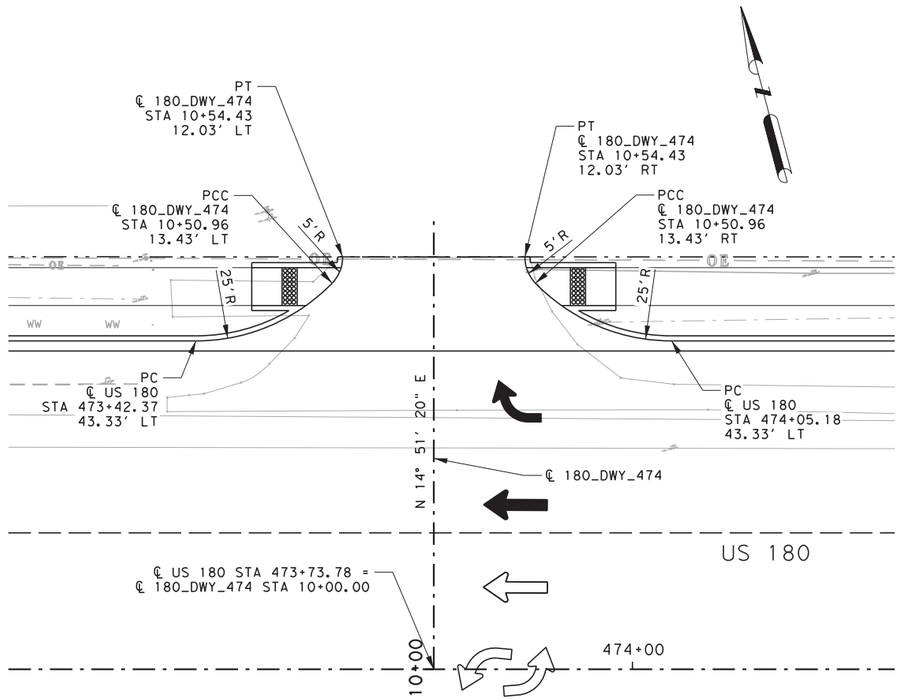
FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
6	SEE TITLE SHEET		68
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

FINAL SUBMITTAL

USER: jhasler
OFFICE:IEA OFFICE: Dallas
PROJECT #



180 DWY 472



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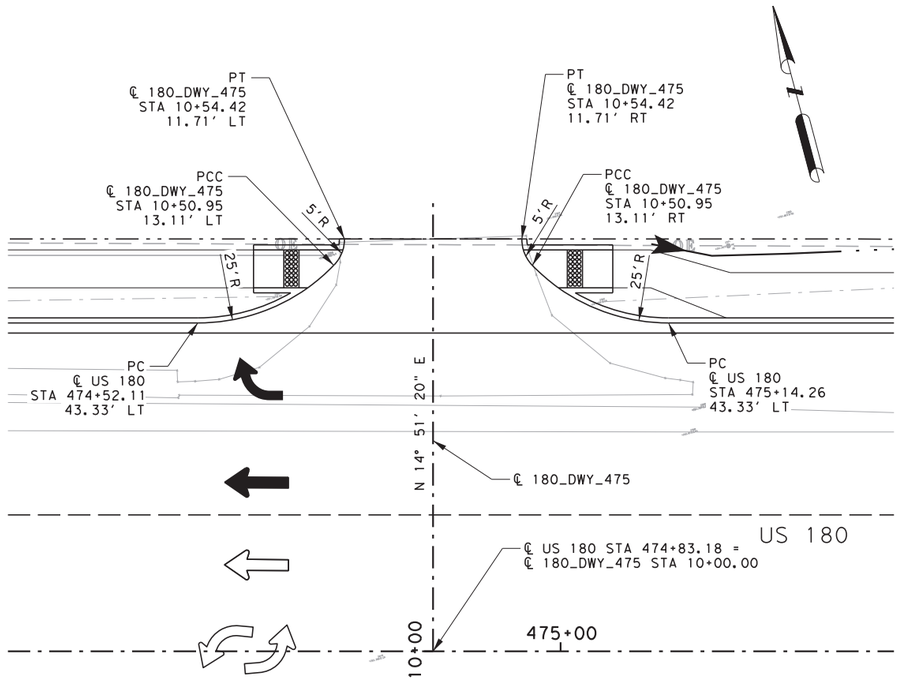

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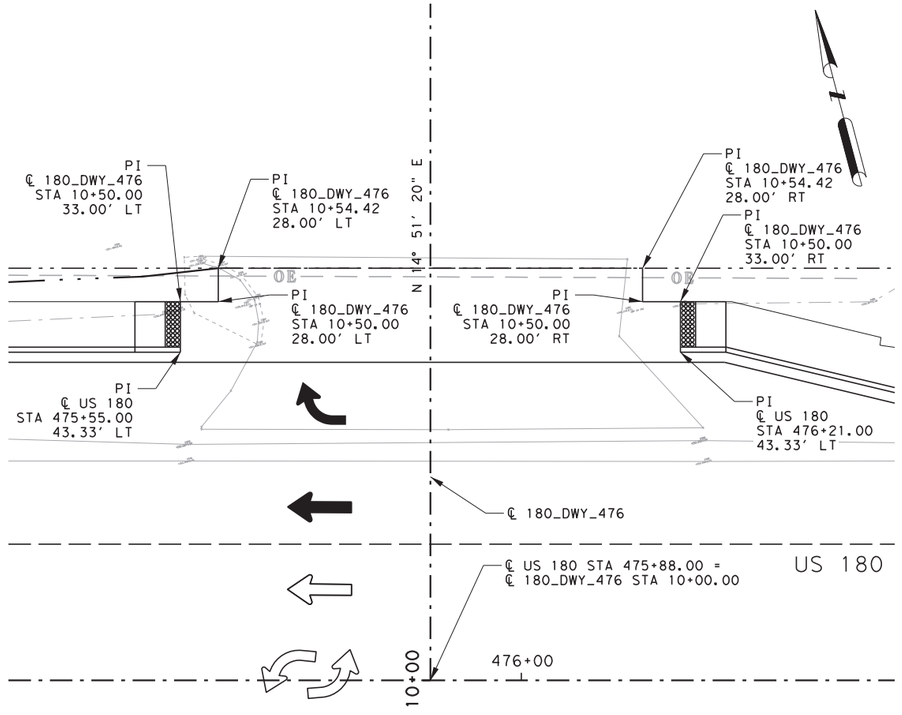

180 DWY 476

LEGEND

- PROPOSED LANE
- EXISTING LANE
- SAWCUT

NOTES:

1. ALL DIMENSIONS ARE TO EDGE OF PAVEMENT OR FACE OF CURB UNLESS OTHERWISE NOTED.
2. ALL ELEVATIONS ARE TO TOP OF PAVEMENT OR FACE OF CURB.
3. SEE SIDEWALK PLAN AND PROFILE SHEETS FOR PEDESTRIAN RAMP INFORMATION.

0 10 20 40

SCALE: 1"=20'

NO.	REVISION	BY	DATE

STATE OF TEXAS
JORDAN HASLER
137316
LICENSED
PROFESSIONAL ENGINEER

8/27/2021

IEA
1225 North Loop West
SUITE 320
HOUSTON, TEXAS 77008
(832) 494-3800
Firm Registration No. F-10161

FM 3099 REALIGNMENT

US 180 DRIVEWAY LAYOUTS

SHEET 1 OF 1

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
6	SEE TITLE SHEET		69
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

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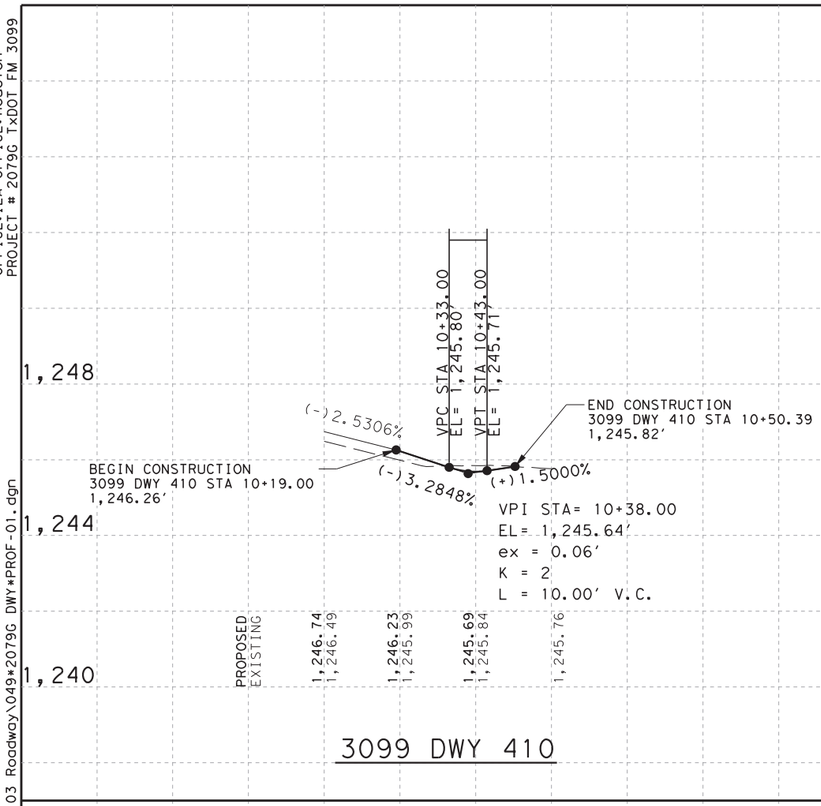
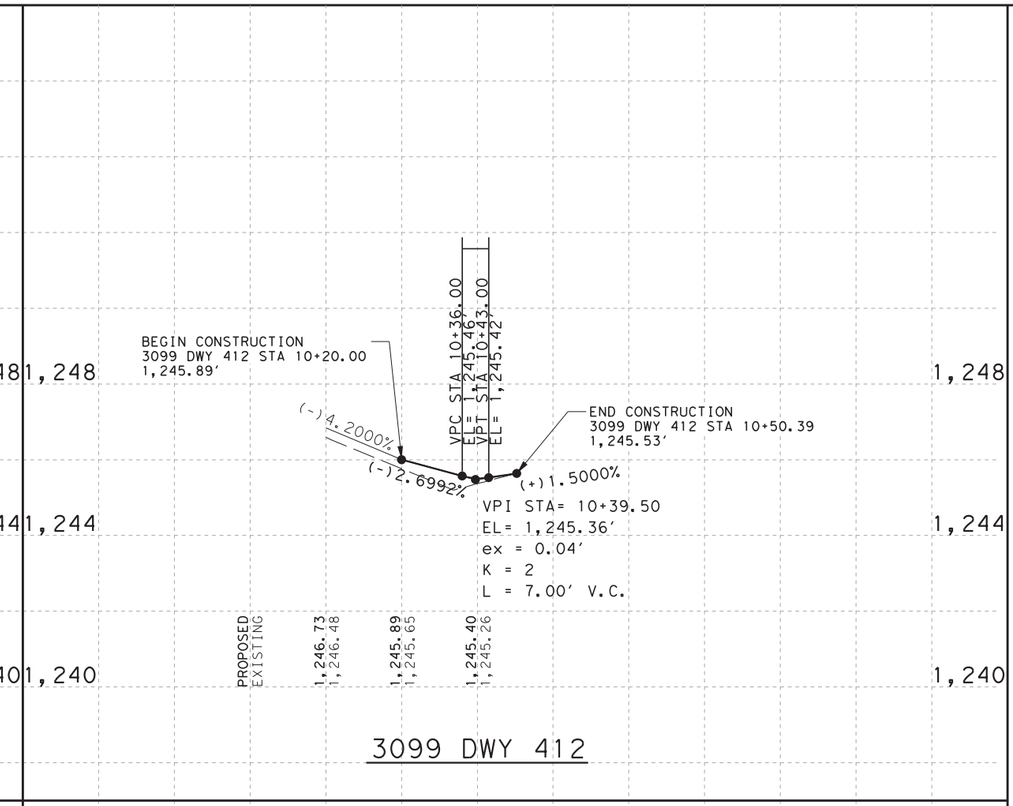
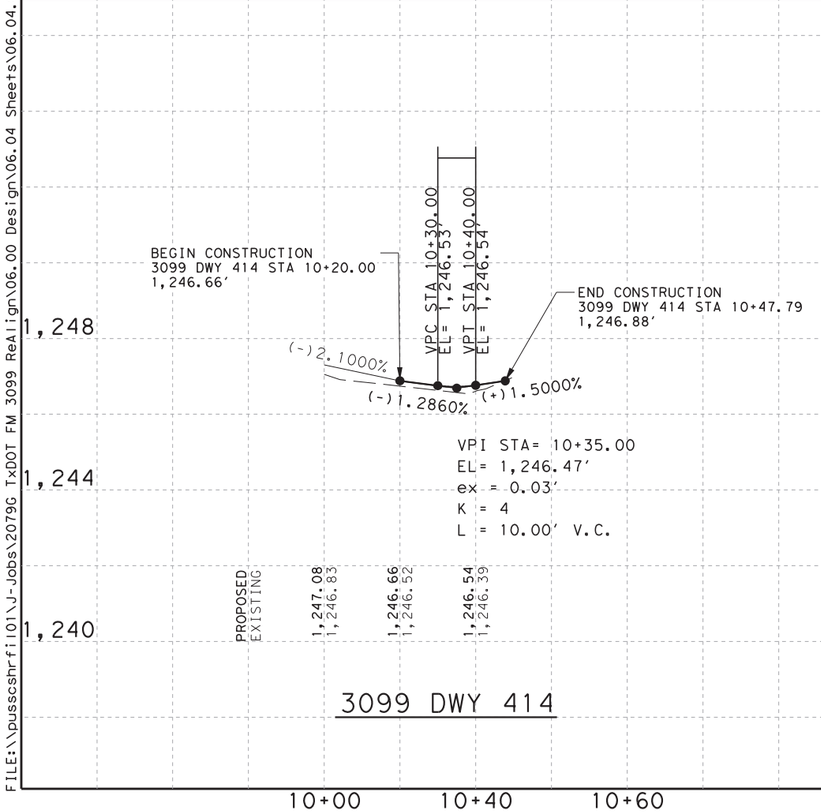
FINAL SUBMITTAL







0 20 40 80

SCALE: 1"=40'
1"= 4'V

NO.	REVISION	BY	DATE

STATE OF TEXAS
JORDAN HASLER
137316
LICENSED
PROFESSIONAL ENGINEER

8/27/2021

IEA
1225 North Loop West
SUITE 320
HOUSTON, TEXAS 77008
(832) 494-3800
Firm Registration No. F-10161

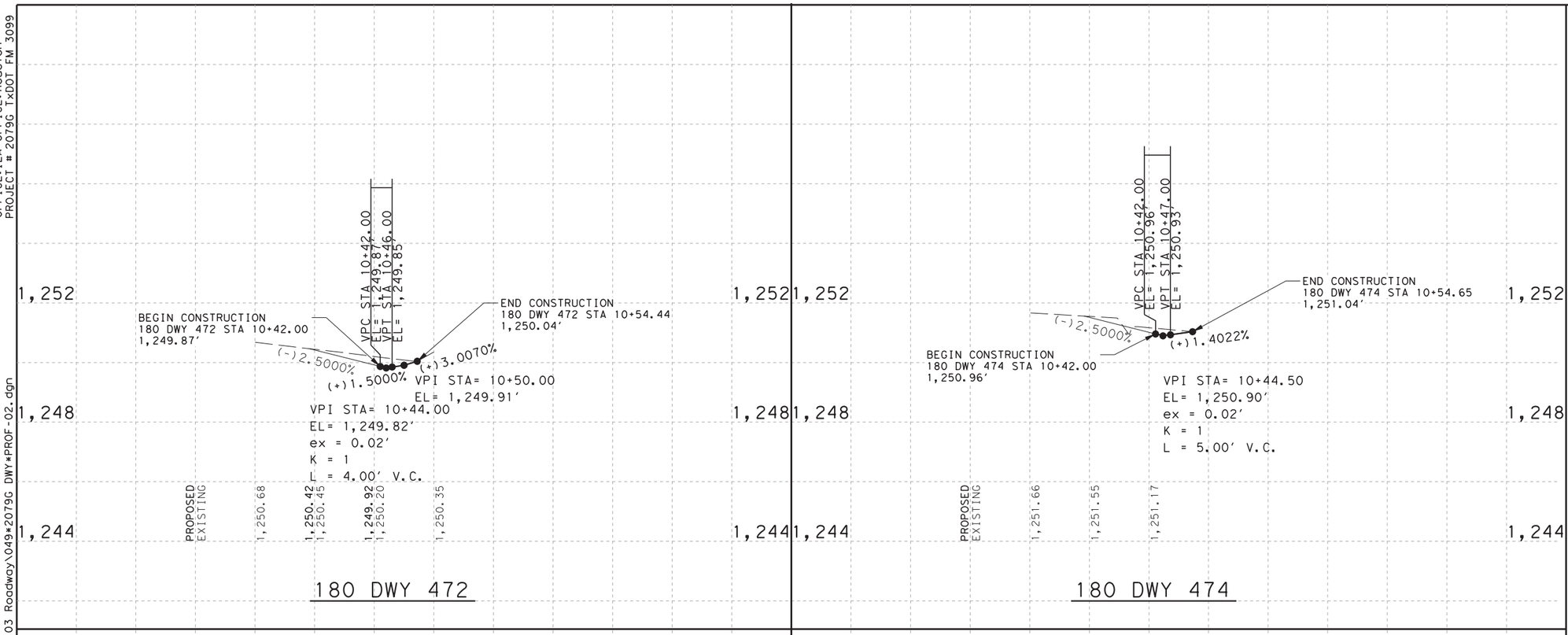
FM 3099
ROADWAY REALIGNMENT

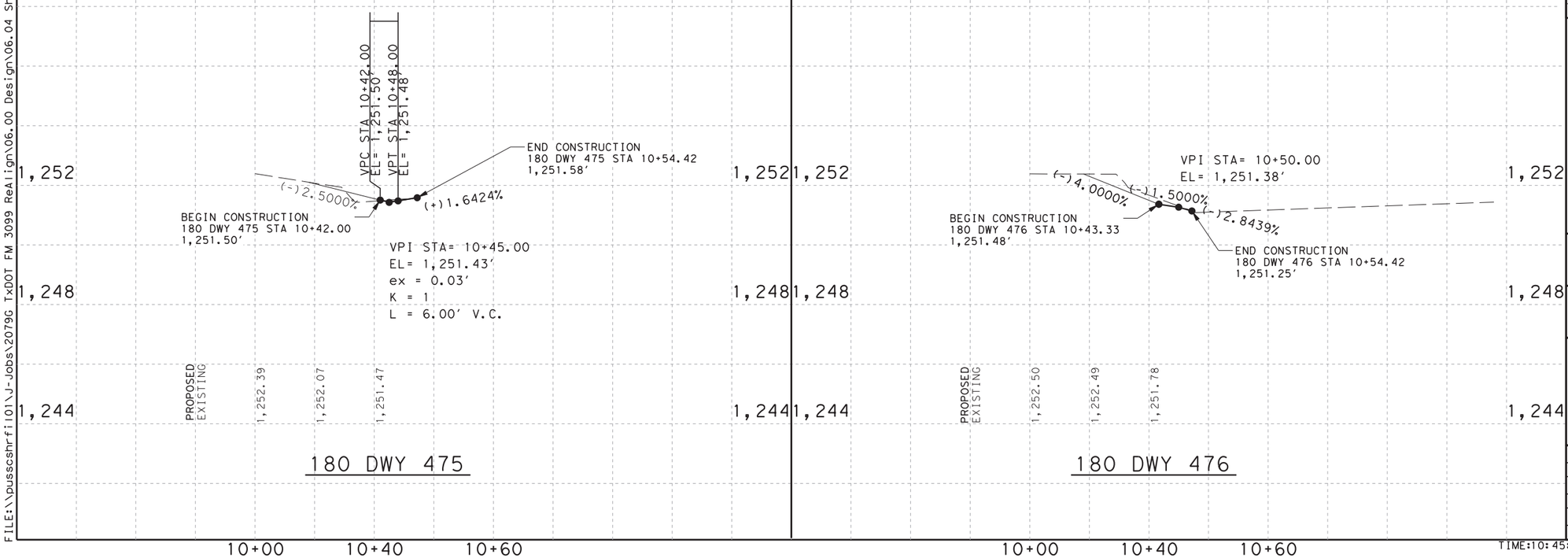
DRIVEWAY PROFILES

SHEET 1 OF 2

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
6			70
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

FINAL SUBMITTAL





0 20 40 80

SCALE: 1"=40'
1"=10'V

NO.	REVISION	BY	DATE

STATE OF TEXAS
JORDAN HASLER
137316
LICENSED
PROFESSIONAL ENGINEER

8/27/2021

IEA
1225 North Loop West
SUITE 320
HOUSTON, TEXAS 77008
(832) 494-3800
Firm Registration No. F-10161

FM 3099
ROADWAY REALIGNMENT

DRIVEWAY PROFILES

SHEET 2 OF 2

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
6			71
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

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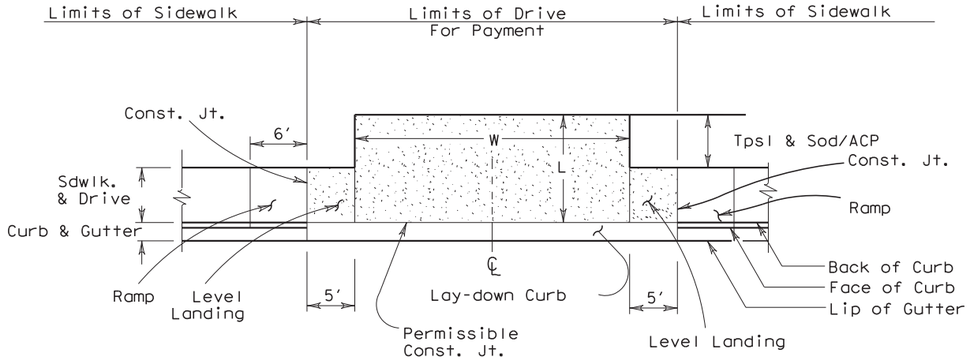
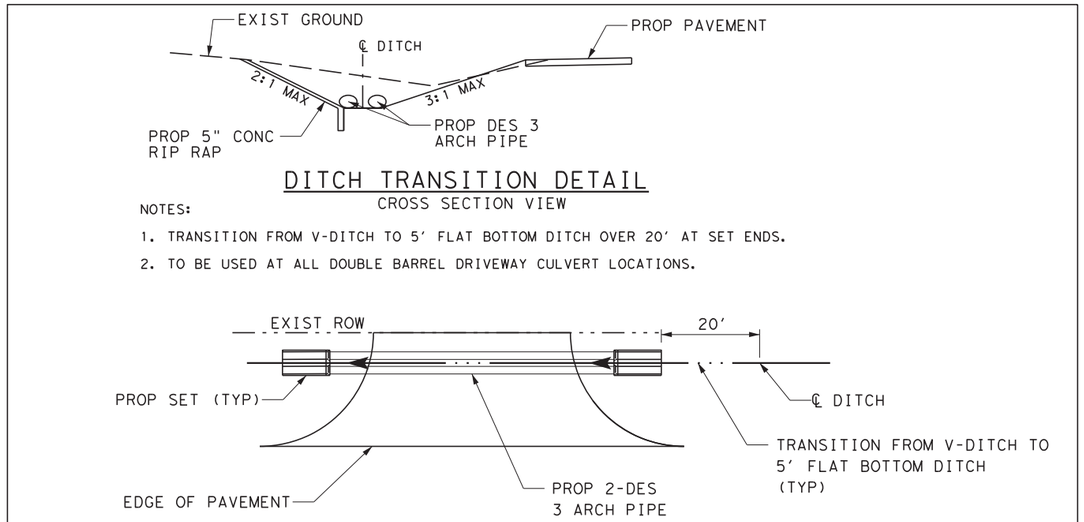
FINAL SUBMITTAL



CONCRETE DRIVE W/SIDEWALK

* Level Landings may be omitted/shortened to accommodate inlets, power poles, etc. as directed by the Engineer. Level Landing will be required at the top of sidewalk ramps where longitudinal grade exceeds 2%.



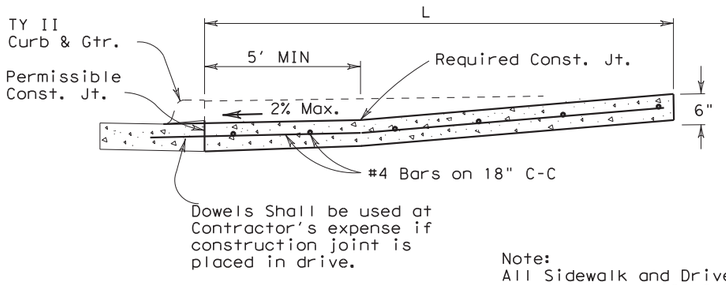
DITCH TRANSITION DETAIL
CROSS SECTION VIEW

NOTES:

1. TRANSITION FROM V-DITCH TO 5' FLAT BOTTOM DITCH OVER 20' AT SET ENDS.
2. TO BE USED AT ALL DOUBLE BARREL DRIVEWAY CULVERT LOCATIONS.

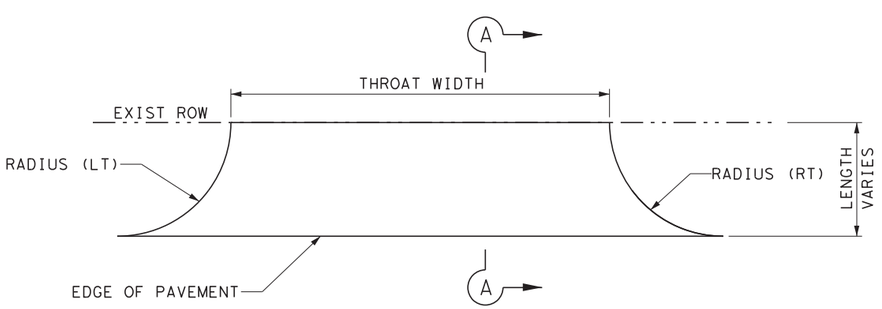
DITCH TRANSITION DETAIL
PLAN VIEW

Note:
All Sidewalk within the W portion of drive shall be a minimum of 5' wide, 6" depth and maintain 1/4 " slope per ft.



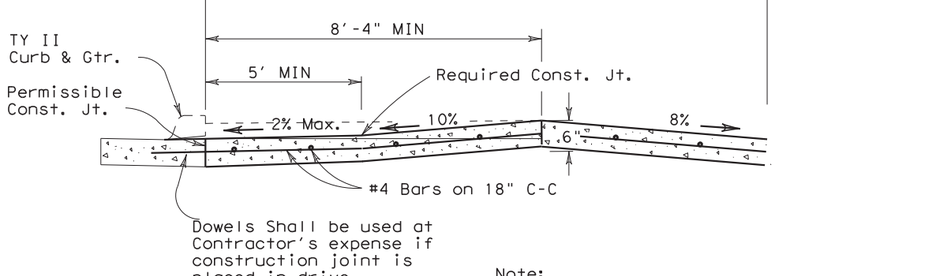
Note:
All Sidewalk and Drive Reinforcing Shall be #4 Rebar on 18" Centers.

TYPICAL PROPOSED CONC DRIVE CUT SECTION



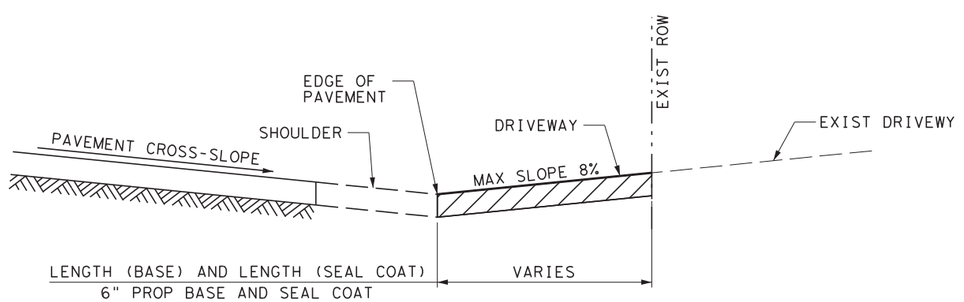
DRIVEWAY DETAIL

Note:
All Sidewalk within the W portion of drive shall be a minimum of 5' wide, 6" depth and maintain 1/4 " slope per ft.



Note:
All Sidewalk and Drive Reinforcing Shall be #4 Rebar on 18" Centers.

TYPICAL PROPOSED CONC DRIVE FILL SECTION



SECTION A-A
PAVED DRIVEWAYS

NOT TO SCALE

NO.	REVISION	BY	DATE

STATE OF TEXAS
JORDAN HASLER
137316
LICENSED PROFESSIONAL ENGINEER

8/27/2021

IEA
1225 North Loop West
SUITE 320
HOUSTON, TEXAS 77008
(832) 494-3800
Firm Registration No. F-10161

FM 3099 REALIGNMENT

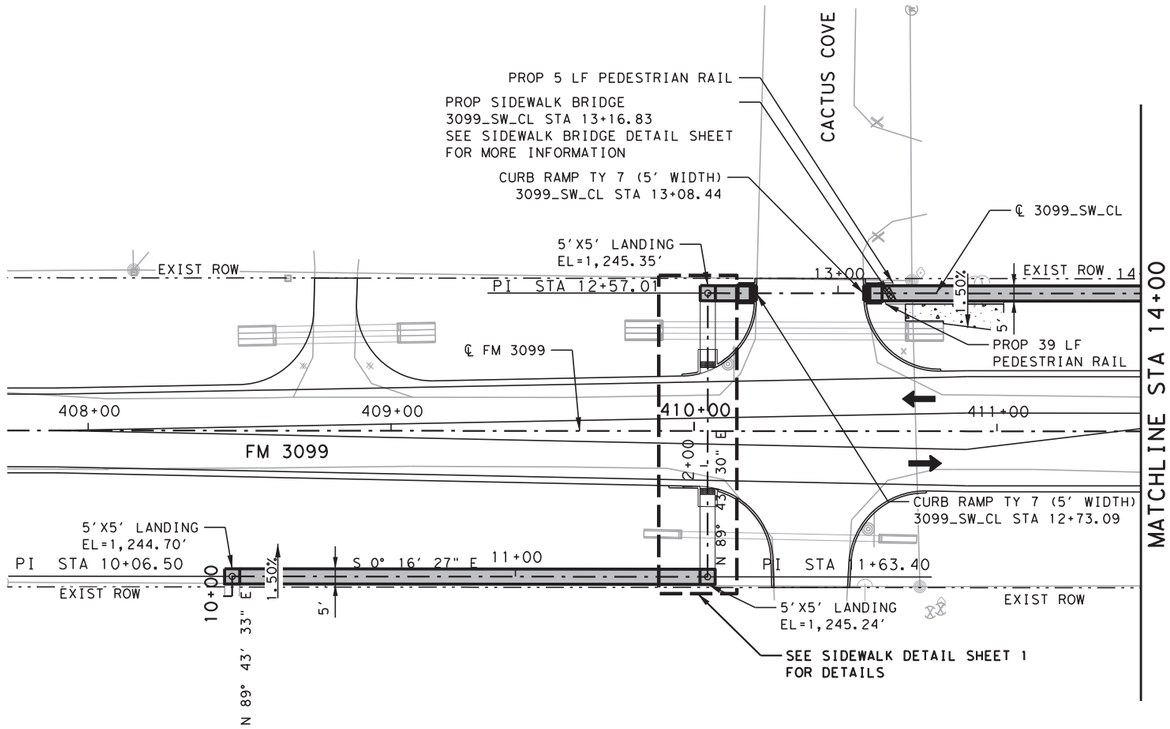
DRIVEWAY DETAILS

SHEET 1 OF 1

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
6	SEE TITLE SHEET		72
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

FINAL SUBMITTAL

USER:jhasler
OFFICE:IEA OFFICE:Houston
PROJECT # 2079G TxDOT FM 3099

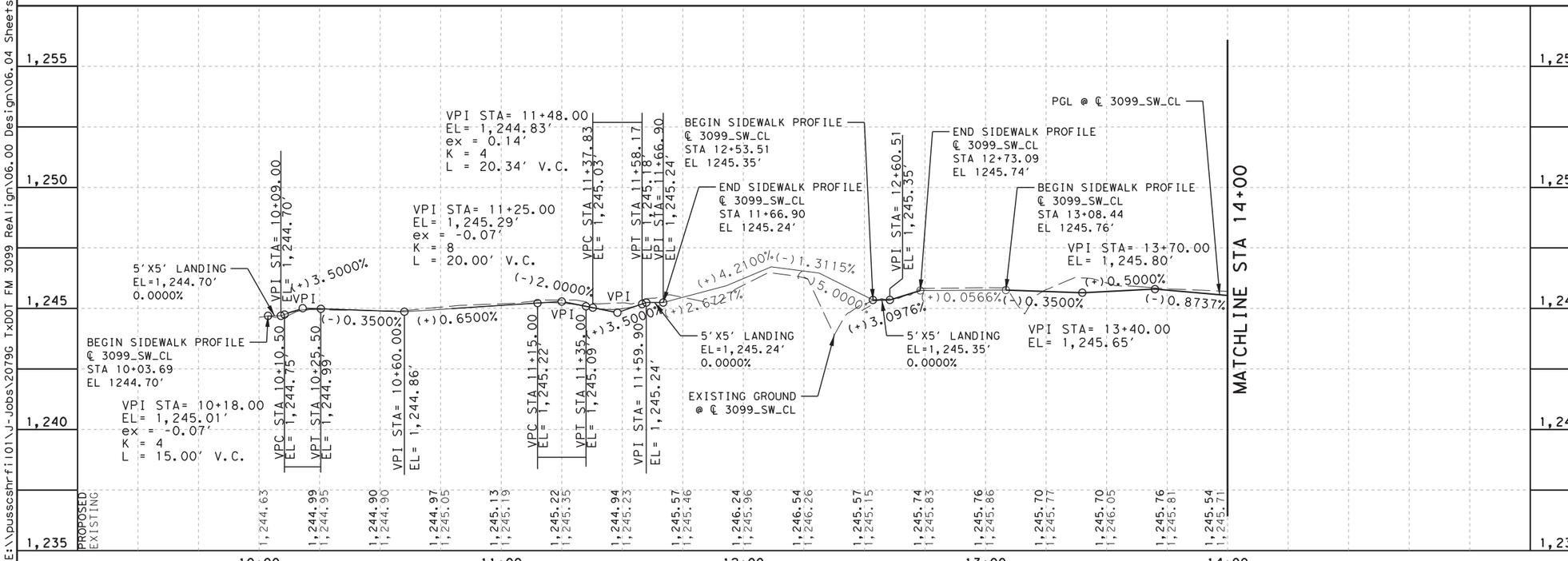


LEGEND

- PROPOSED LANE
- EXISTING LANE
- SAWCUT
- PROPOSED SIDEWALK

0 25 50 100

SCALE: 1"=50'
1"=5' V



NO.	REVISION	BY	DATE

STATE OF TEXAS
JORDAN HASLER
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LICENSED PROFESSIONAL ENGINEER

8/27/2021

IEA
1225 North Loop West
SUITE 320
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Firm Registration No. F-10161

FM 3099 REALIGNMENT

SIDEWALK PLAN AND PROFILE

SHEET 1 OF 3

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
6	SEE TITLE SHEET		73
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

DATE:8/27/2021 TIME:10:46:17 AM
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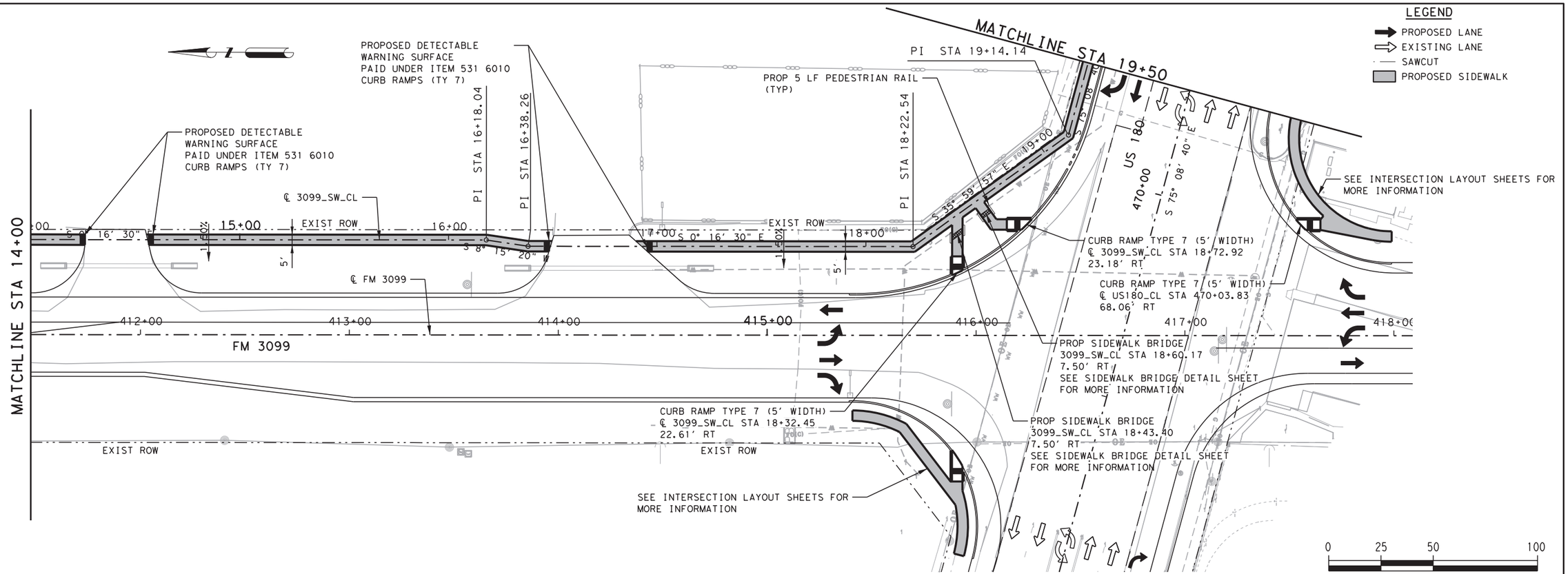
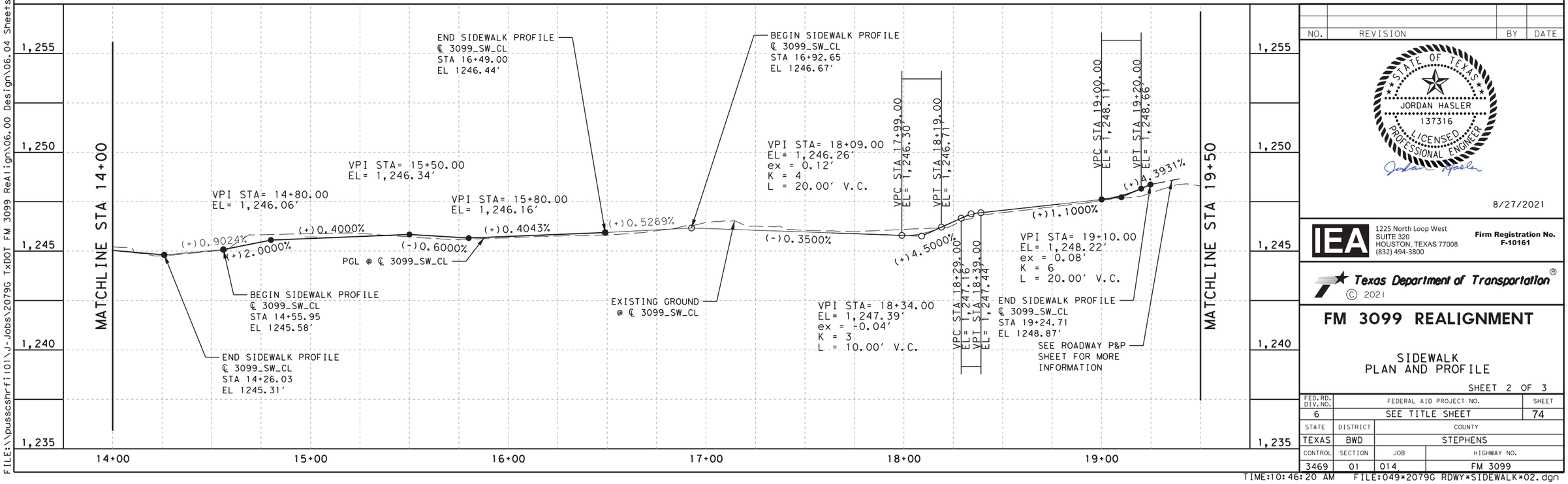
TIME:10:46:17 AM FILE:049*2079G RDWY*SIDEWALK*01.dgn

FINAL SUBMITTAL

USER:jhasler
OFFICE:IEA OFFICE:Houston
PROJECT # 2079G TxDOT FM 3099





NO.	REVISION	BY	DATE

STATE OF TEXAS
JORDAN HASLER
137316
LICENSED PROFESSIONAL ENGINEER

8/27/2021

IEA
1225 North Loop West
SUITE 320
HOUSTON, TEXAS 77008
(832) 494-3800
Firm Registration No. F-10161

FM 3099 REALIGNMENT

SIDEWALK PLAN AND PROFILE

SHEET 2 OF 3

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
6	SEE TITLE SHEET		74
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

DATE:8/27/2021 TIME:10:46:20 AM
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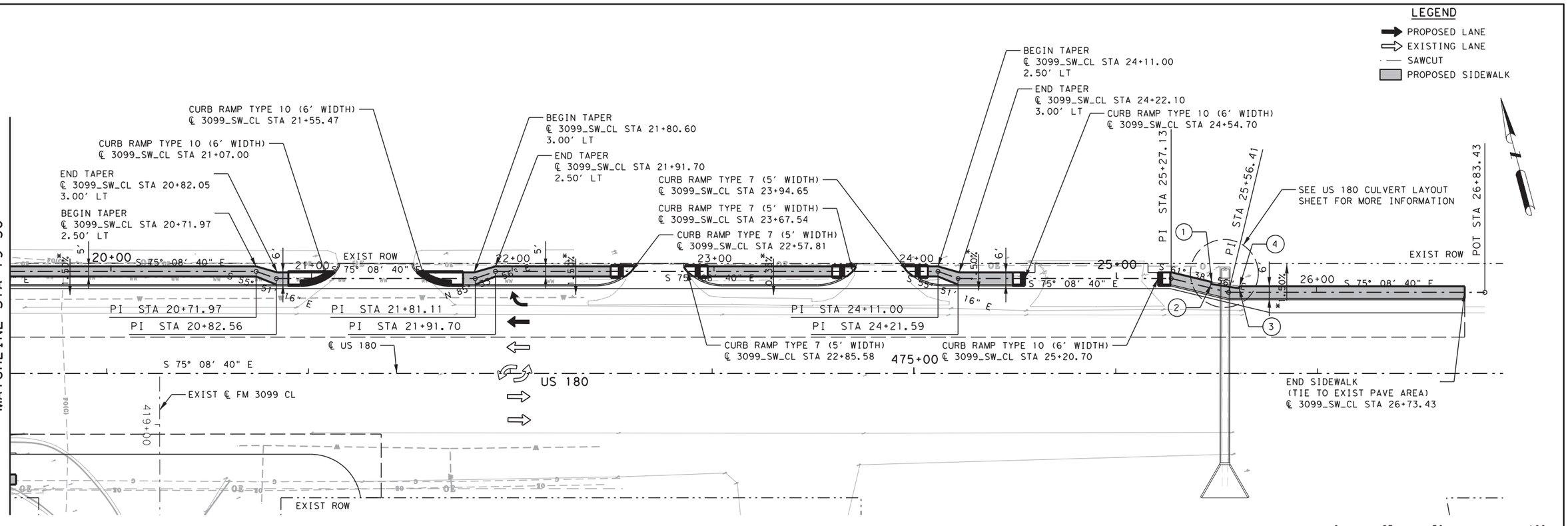
TIME:10:46:20 AM FILE:049*2079G RDWY*SIDEWALK*02.dgn

FINAL SUBMITTAL



* TRANSITION SIDEWALK CROSS SLOPE
TO MATCH DRIVEWAY GRADE OVER 10'

NO.	REVISION	BY	DATE

STATE OF TEXAS
JORDAN HASLER
137316
LICENSED
PROFESSIONAL ENGINEER

8/27/2021

IEA
1225 North Loop West
SUITE 320
HOUSTON, TEXAS 77008
(832) 494-3800
Firm Registration No.
F-10161

Texas Department of Transportation®

FM 3099 REALIGNMENT

SIDEWALK
PLAN AND PROFILE

SHEET 3 OF 3

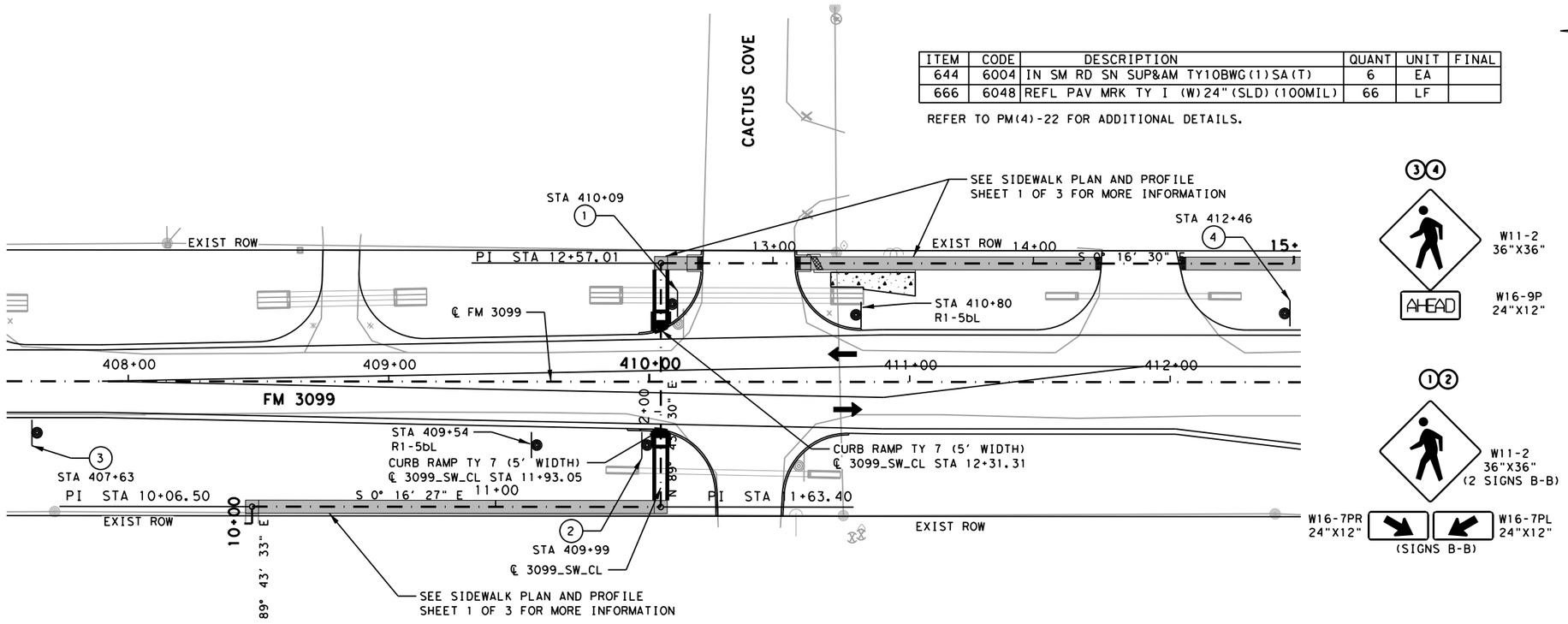
FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
6	SEE TITLE SHEET		75
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

FINAL SUBMITTAL

ITEM	CODE	DESCRIPTION	QUANT	UNIT	FINAL
644	6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	6	EA	
666	6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	66	LF	

REFER TO PM(4)-22 FOR ADDITIONAL DETAILS.

LEGEND
- PROPOSED LANE
- EXISTING LANE
- SAWCUT
- PROPOSED SIDEWALK
- PROPOSED SMALL POST



0 25 50 100
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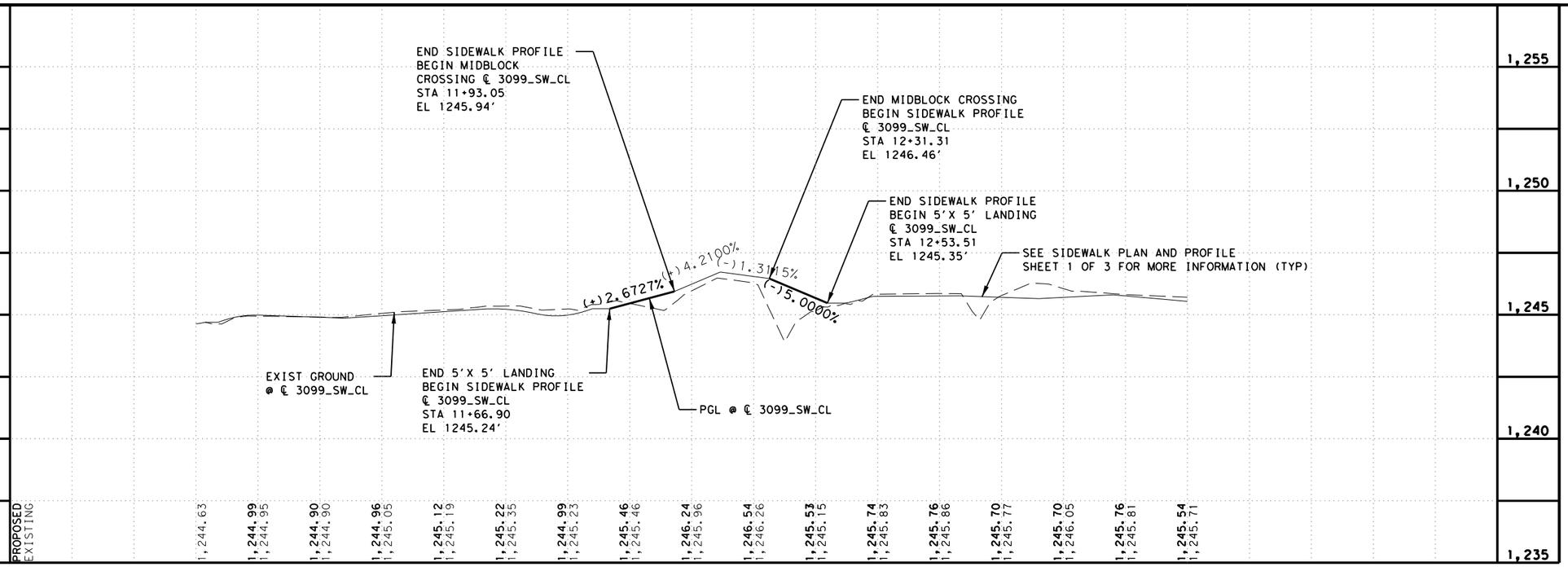
1"=5'V



STATE OF TEXAS
DAN HOHMANN
97588
LICENSED PROFESSIONAL ENGINEER

FM 3099 SIDEWALK DETAIL SHEET 1

Texas Department of Transportation®

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
3469	01	014	FM 3099
DIST	COUNTY		SHEET NO.
BWD	STEPHENS		76

DATE: 10/20/2022 5:36:17 PM
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DATE: 8/27/2021
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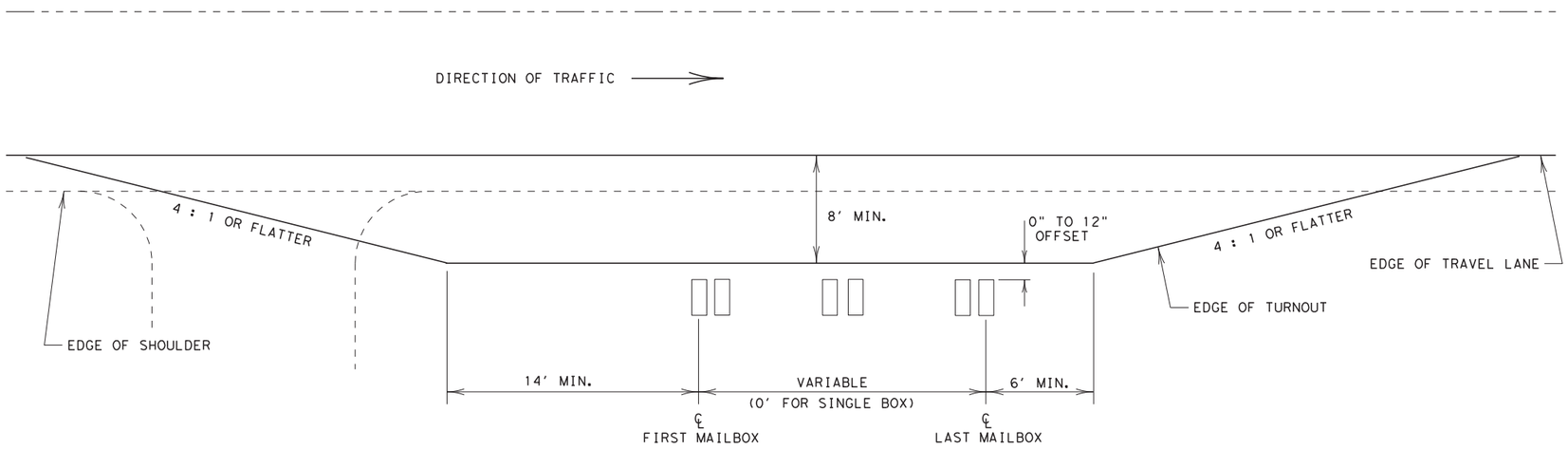
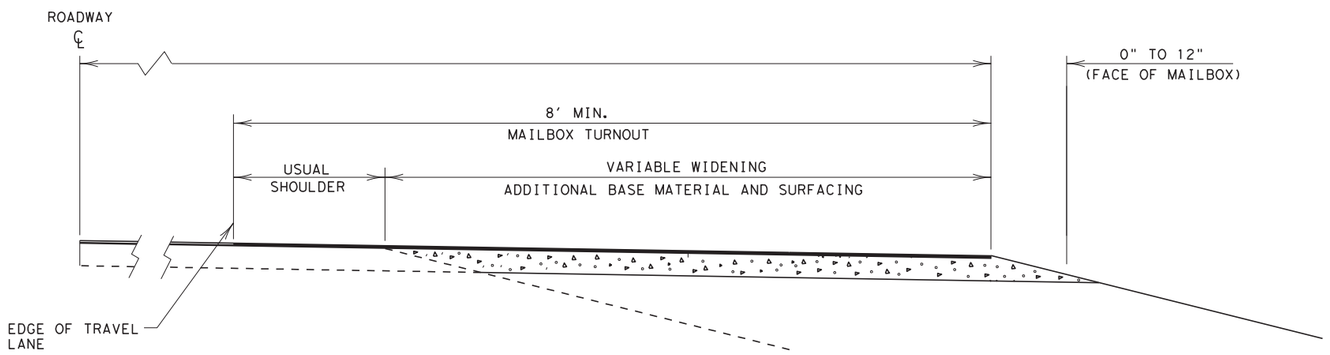


PLAN



TYPICAL SECTION

SUMMARY OF MAILBOX TURNOUTS

LOCATION (STATION)	FLEX BASE	PRIME COAT	SURFACE TREATMENT	ASPHALTIC CONCRETE PAVEMENT	
405+55.00 LT	2 CY	3 GAL	15 SY		
TOTALS	2 CY	3 GAL	15 SY		

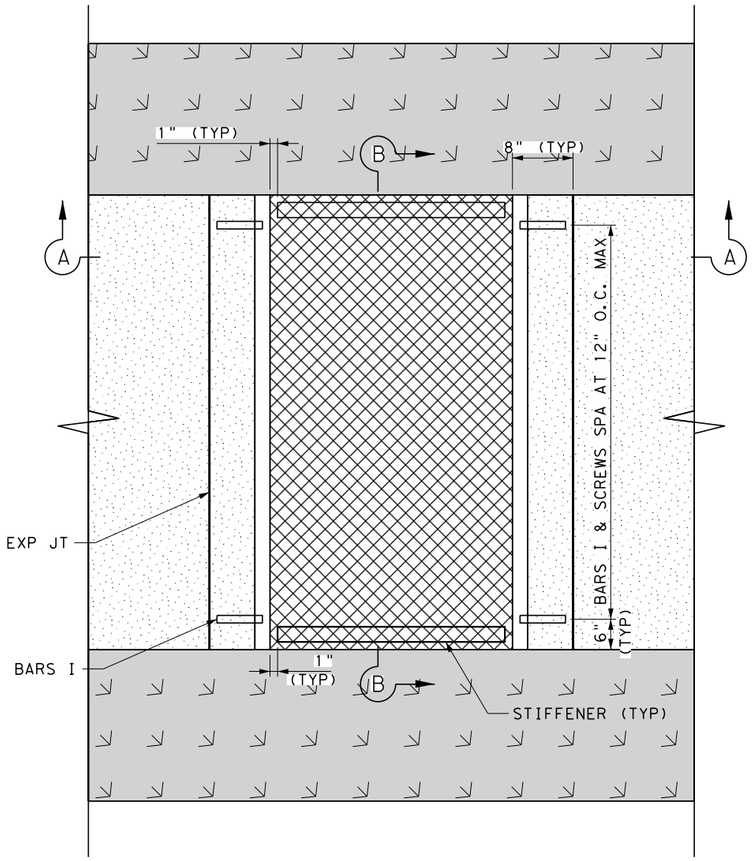
STATE OF TEXAS
JORDAN HASLER
137316
LICENSED PROFESSIONAL ENGINEER

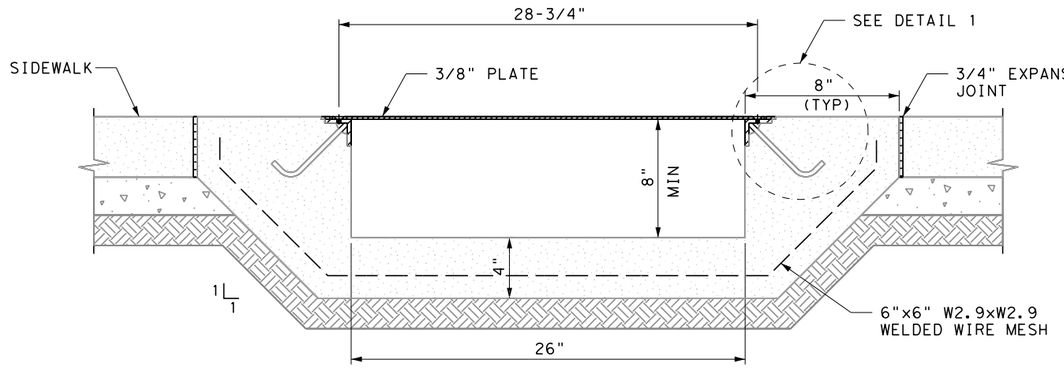
8/27/2021

DESIGN DETAILS FOR TYPICAL MAILBOX TURNOUTS

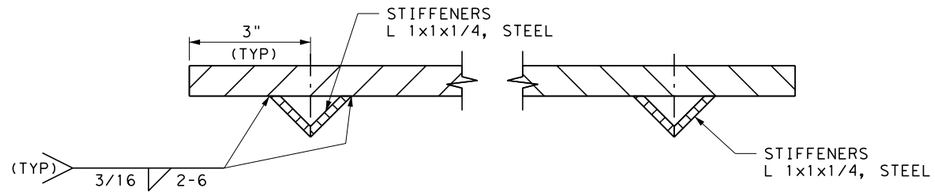
MBTRNOUT

FILE: mbtrnout.dgn	DN: TxDOT	CK:	DW:	CK:
©TxDOT 1989	CONT	SECT	JOB	HIGHWAY
REVISIONS	3469	01	014,	FM 3099
	DIST	COUNTY		SHEET NO.
	BWD	STEPHENS		77

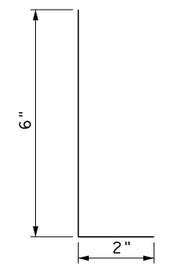




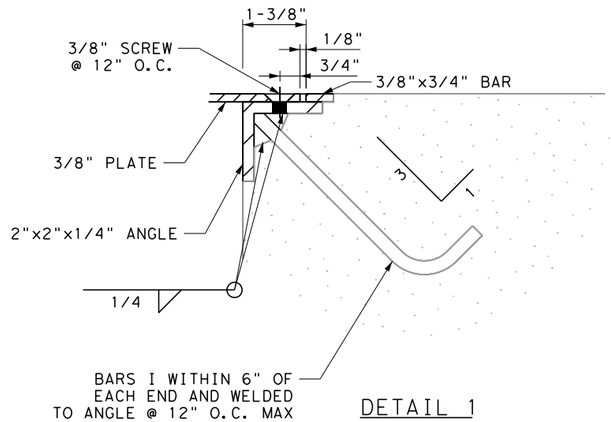
SECTION A-A



SECTION B-B



BARS I (#3)



DETAIL 1

NOT TO SCALE

FABRICATION NOTES:

1. SHOP DRAWINGS FOR THE FABRICATION OF SIDEWALK DRAINAGE COVER PLATE WILL NOT REQUIRE THE ENGINEER'S APPROVAL IF FABRICATION IS IN ACCORDANCE WITH THE DETAILS SHOWN.
2. SIDEWALK DRAINAGE COVER PLATES MUST BE HOT-DIPPED GALVANIZED 3/8" SLIP RESISTANT STEEL PLATE. CHECKER PLATE OR DIAMOND PLATE IS NOT ALLOWED NOR ARE SLIP RESISTANT TAPES, FILMS AND NON-METALLIC COATINGS.
3. MINIMUM REQUIRED YEILD STRENTGH OF STEEL PLATE IS 36 ksi.
4. HOT-DIP GALVANIZE SLIP RESISTANT STEEL PLATE AFTER FABRICATION IN ACCORDANCE WITH ITEM 445, "GALVANIZING".
5. PROVIDE STAINLESS STEEL FLAT HEAD SLEEVE ANCHORS MEETING THE REQUIREMENTS OF ASTM F 593, GROUP I, ALLOY 304. COUNTERSINK HOLES IN SLIP-RESISTANT PLATE FOR SLEEVE ANCHORS. DRILL HOLES IN SIDEWALK AS PER SLEEVE ANCHOR MANUFACTURER'S RECOMMENDATIONS. INSTALL SLEEVE ANCHORS FLUSH WITH, OR SLIGHTY RECESSED BELOW, TOP SURFACE OF SIDEWALK DRAINAGE COVER PLATE.
6. DETAILS PROVIDED ARE APPLICABLE TO CONCRETE WALKWAY SURFACES ONLY.
7. SIDEWALK DRAINAGE COVER PLATE, INCLUDING ALL LABOR, ANCHORS, ANGLES, STIFFENERS, EXPANSION JOINTS, AND OTHER MATERIALS SHALL BE SUBSIDIARY TO ITEM 442 6007.

NO.	REVISION	BY	DATE

STATE OF TEXAS
CHUN-HOI WONG
87943
LICENSED PROFESSIONAL ENGINEER
08/30/2021

IEA
1225 North Loop West
SUITE 320
HOUSTON, TEXAS 77008
(832) 494-3800
Firm Registration No. F-10161

FM 3099 REALIGNMENT

SIDEWALK DRAINAGE DETAIL

SHEET 1 OF 1

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
6	SEE TITLE SHEET		78
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

ITEM	CODE	DESCRIPTION	QUANT	UNIT
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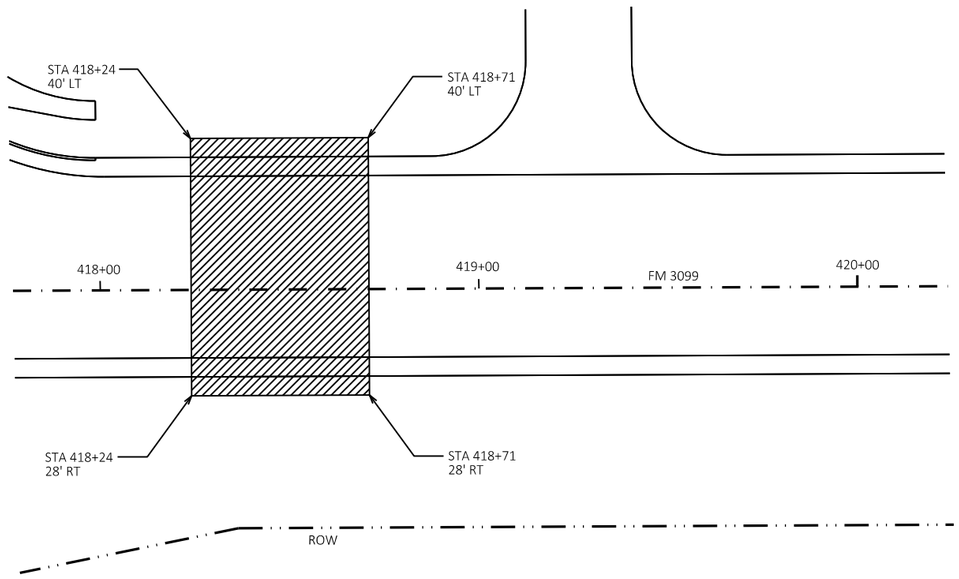
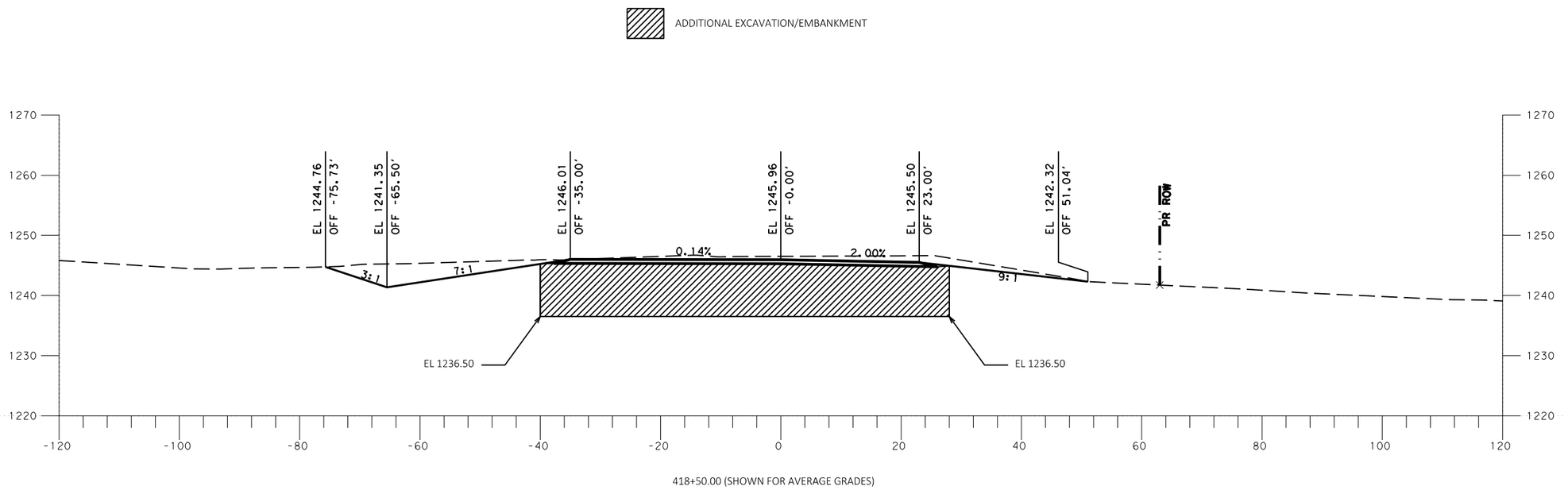
0132	6006	EMBANKMENT (FINAL) (DENS CONT) (TY C)	1030	CY





418+50.00 (SHOWN FOR AVERAGE GRADES)

STATE OF TEXAS
JASON H. SCANTLING
96633
LICENSED
PROFESSIONAL ENGINEER

11/29/2022

FM 3099 ROADWAY DETAILS

Texas Department of Transportation®

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
3469	01	014,	FM 3099
DIST	COUNTY		SHEET NO.
BWD	STEPHENS		78A

DATE: 10/10/2022 9:16:58 AM
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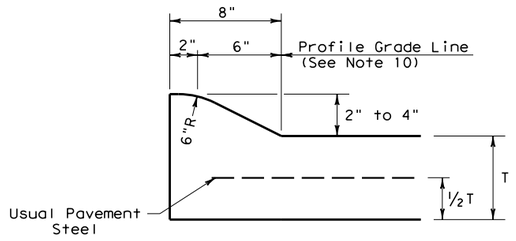
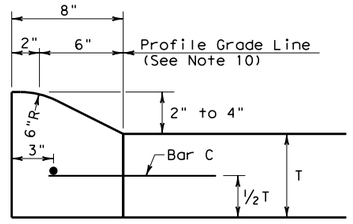
DATE: 8/27/2021
FILE: \\pussccsnrfil01\J-Jobs\20796 TxDOT FM 3099 ReAlign\06.00 Design\06.04 Sheets\06.04.11 Standards\ROADWAY STD\cccg21.dgn



TYPE I CURB (MONOLITHIC)
2" - 4" HEIGHT



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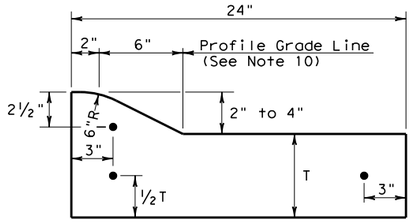
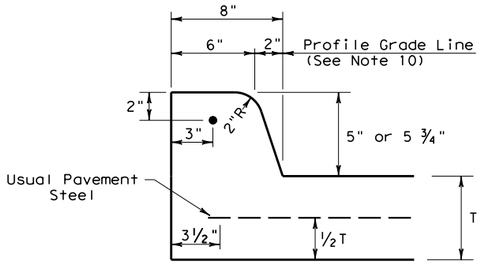


TYPE I CURB AND GUTTER
2" - 4" HEIGHT



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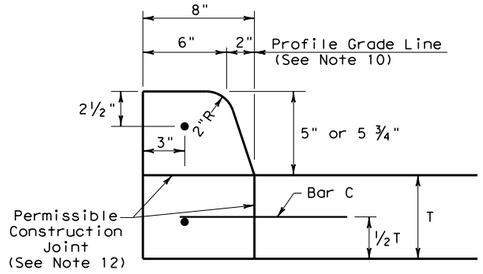
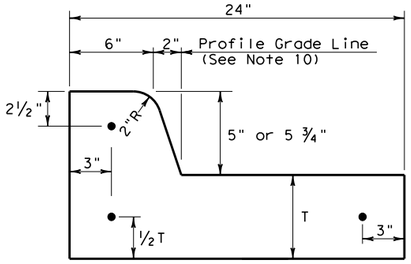
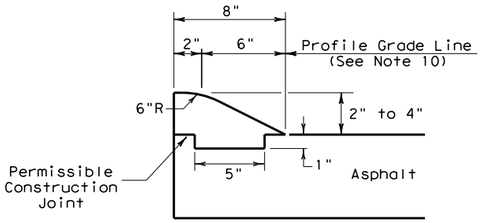


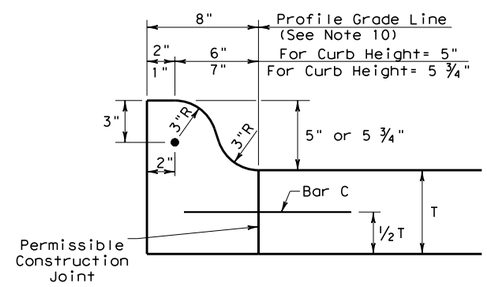
TYPE II CURB
5" - 5 ¾" HEIGHT



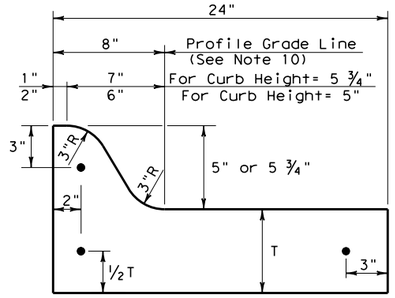
TYPE II CURB AND GUTTER
5" - 5 ¾" HEIGHT



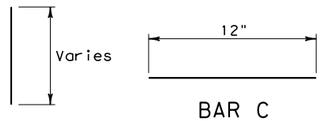
TYPE III CURB (KEYED)
2" - 4" HEIGHT



TYPE IIa CURB
5" - 5 ¾" HEIGHT

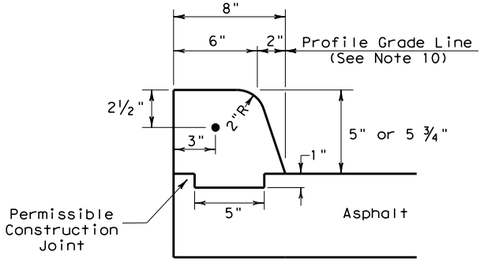


TYPE IIa CURB AND GUTTER
5" - 5 ¾" HEIGHT



BAR B

BAR C



TYPE IV CURB (KEYED)
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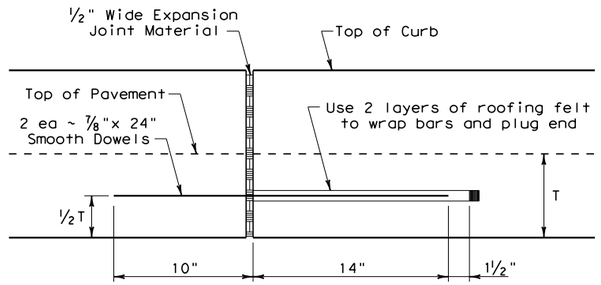
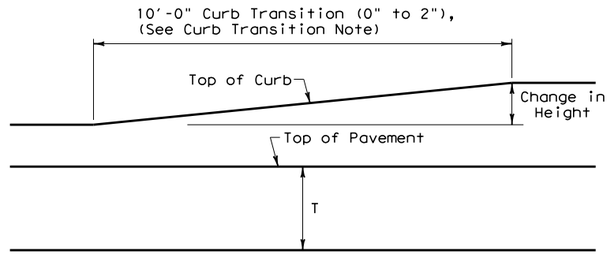


EXPANSION JOINT DETAIL

CURB TRANSITION NOTE:
Field conditions may require a longer or shorter transition, and shall be shown elsewhere in the plans, or as directed by the Engineer.



CURB TRANSITION
Note: To be paid for as Highest Curb

GENERAL NOTES

1. All materials and construction shall be in accordance with Item 529, "Concrete Curb, Gutter, and Combined Curb and Gutter."
2. Concrete shall be Class A.
3. When reinforcing bars are used, they shall be No.4 unless otherwise shown. The use of fiber reinforced concrete in lieu of reinforcing steel is acceptable. Use fibers meeting the requirements of DMS 4550, "Fibers for Concrete," and dose fibers in accordance with Material Producers List (MPL) "Fibers for Class A and B Concrete Applications."
4. Round exposed sharp edges with a rounding tool, to a minimum radius of ¼ inch.
5. All existing curbs and driveways to be removed shall be sawed or removed at existing joints.
6. Where concrete curb is to be placed on existing concrete pavement, Bar B may be drilled and the grouted in place, or may be inserted into fresh concrete.
7. Expansion and contraction joints shall be constructed to match pavement joints in all curbs and curb and gutter adjacent to jointed concrete pavement. Where placement of curb or curb and gutter is not adjacent to concrete pavement, expansion joints shall be provided at structures, curb returns at streets, and at locations directed by The Engineer.
8. Vertical and horizontal dowel bars and transverse reinforcing bars shall be placed at four feet C~C.
9. Dimension 'T' shown is the thickness of concrete pavement. When curb is installed adjacent to flexible pavement dimension 'T' is 8" maximum.
10. Usual profile grade line. Refer to typical sections and plan-profile sheets for exact locations.
11. One-half inch expansion joint material shall be provided where curb or curb and gutter is adjacent to sidewalk or riprap.
12. When horizontal permissible construction joints are used, the longitudinal pavement steel shall be placed in accordance with pavement details shown elsewhere in the plans. Reinforcing steel for curb section shall then conform to that required for concrete curb.
13. Bar B used as needed to support curb reinforcing steel during concrete placement.

Texas Department of Transportation

Design Division Standard

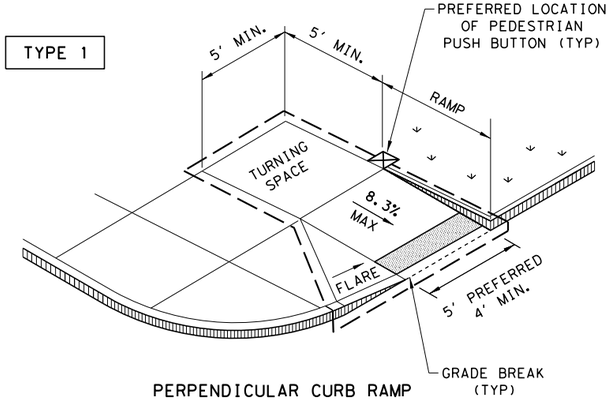
CONCRETE CURB AND CURB AND GUTTER

CCCG-21

FILE: cccg21.dgn	DN: TXDOT	CK: AN	DW: SS	CK: KM
©TxDOT: FEBRUARY 2021	CONT	SECT	JOB	HIGHWAY
REVISIONS	3469	01	013	FM 3099
	DIST	COUNTY		SHEET NO.
	BWD	STEPHENS		79

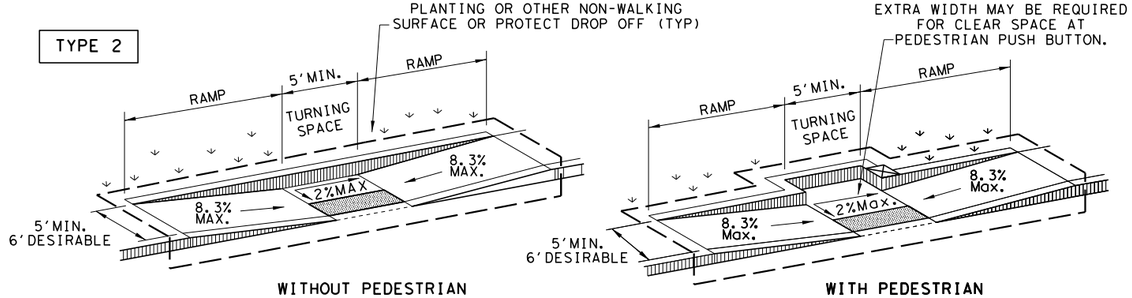
DATE: 8/27/2021
FILE: \\pussc$hrfil01\J-Jobs\20796 TxDOT FM 3099 ReAlign\06.00 Design\06.04 Sheets\06.04.11 Standards\ROADWAY STD\ped18.dgn

TYPE 1



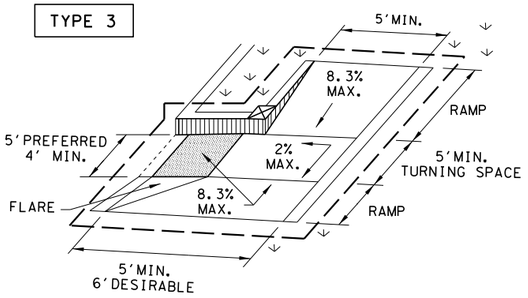
PERPENDICULAR CURB RAMP

TYPE 2



PARALLEL CURB RAMP

TYPE 3



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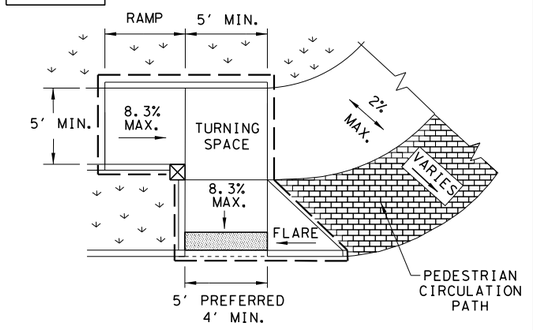
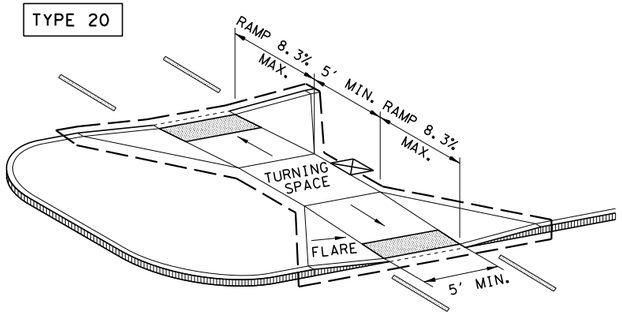


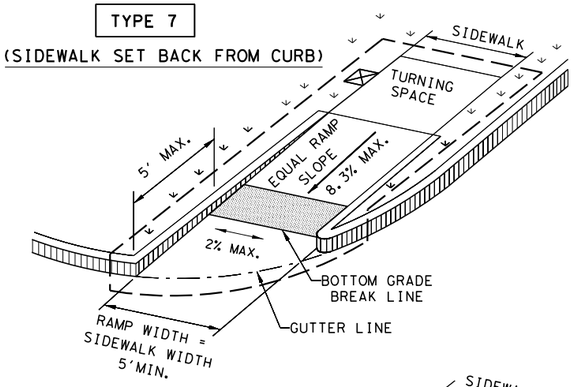
COMBINATION CURB RAMPS

TYPE 20

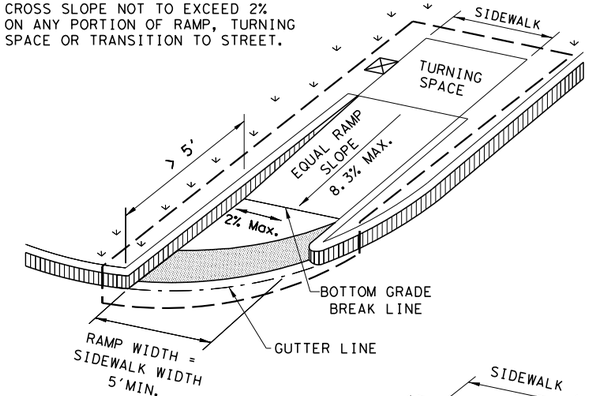


CURB RAMPS AT MEDIAN ISLANDS

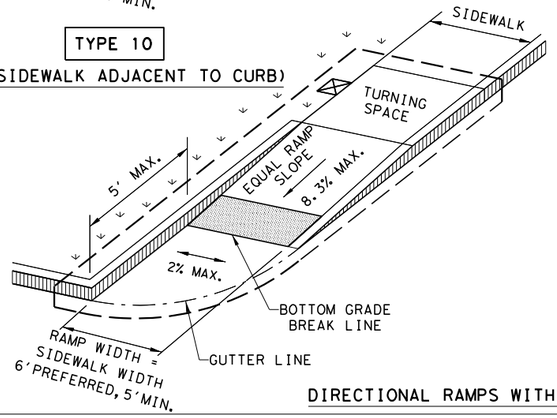
TYPE 7
(SIDEWALK SET BACK FROM CURB)



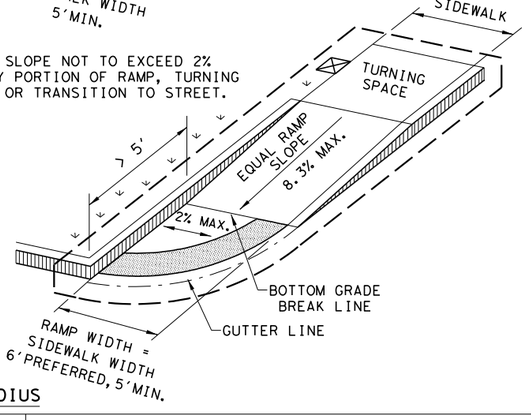
CROSS SLOPE NOT TO EXCEED 2% ON ANY PORTION OF RAMP, TURNING SPACE OR TRANSITION TO STREET.



TYPE 10
(SIDEWALK ADJACENT TO CURB)

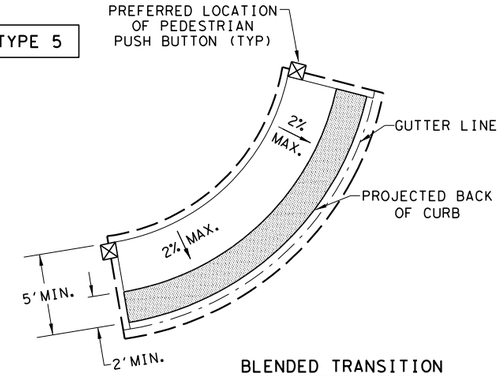


CROSS SLOPE NOT TO EXCEED 2% ON ANY PORTION OF RAMP, TURNING SPACE OR TRANSITION TO STREET.



DIRECTIONAL RAMPS WITHIN RADIUS

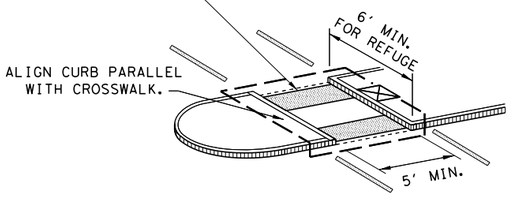
TYPE 5



BLENDED TRANSITION
(FLUSH LANDING)

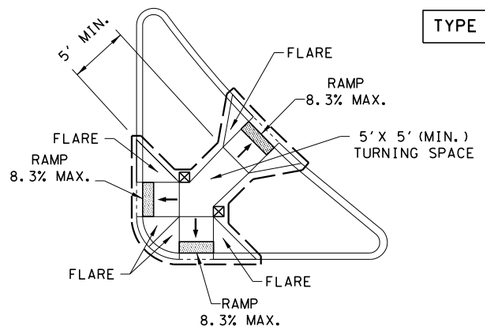
INSTALL DETECTABLE WARNING SURFACE AT EACH END OF THE CUT-THROUGH RAMP WITH A MINIMUM 2' USUAL SIDEWALK SURFACE BETWEEN. IF MEDIAN IS LESS THAN 6' WIDE, ELIMINATE DETECTABLE WARNING SURFACES.

TYPE 21



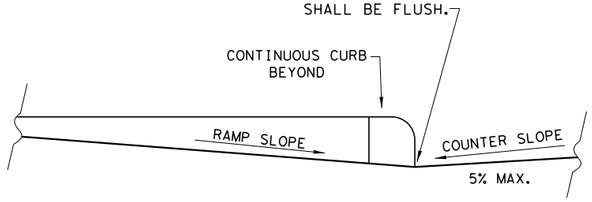
NOTE: CURB DETAILS ARE SHOWN ELSEWHERE IN THE PLANS.

TYPE 22



COMBINATION ISLAND RAMPS

BOTTOM GRADE BREAK OF CURB RAMP WILL NORMALLY BE AT GUTTER LINE. SURFACE SLOPES AT GRADE BREAKS SHALL BE FLUSH.



TYPICAL SECTION OF PERPENDICULAR CURB RAMP AT CONNECTION TO ROADWAY

NOTES / LEGEND:

SEE GENERAL NOTES ON SHEET 2 OF 4 FOR MORE INFORMATION.

DENOTES PLANTING OR NON-WALKING SURFACE NOT PART OF PEDESTRIAN CIRCULATION PATH.

DETECTABLE WARNING SURFACE

DENOTES PREFERRED LOCATION OF PEDESTRIAN PUSH BUTTON IF APPLICABLE.

GUTTER LINE

GRADE BREAK

RAMP LIMITS OF PAYMENT

Texas Department of Transportation

Design Division Standard

PEDESTRIAN FACILITIES CURB RAMPS

PED-18

FILE: ped18	DN: TxDOT	DW: VP	CK: KM	CK: PK & JG
© TxDOT: MARCH, 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	3469	01	014,	FM 3099
REVISED 08,2005 REVISED 06,2012 REVISED 01,2018	DIST	COUNTY		SHEET NO.
	BWD	STEPHENS		80

DATE: 8/27/2021
FILE: \\pusscshrfil01\J-Jobs\2079G TxDOT FM 3099 ReAlign\06.00 Design\06.04 Sheets\06.04.11 Standards\ROADWAY STD\ped18.dgn

GENERAL NOTES

CURB RAMPS

1. Install a curb ramp or blended transition at each pedestrian street crossing.
2. All slopes shown are maximum allowable. Cross slopes of 1.5% and lesser running should be used. Adjust curb ramp length or grade of approach sidewalks as directed.
3. Maximum allowable cross slope on sidewalk and curb ramp surfaces is 2%.
4. The minimum sidewalk width is 5′. Where the sidewalk is adjacent to the back of curb, a 6′ sidewalk width is desirable. Where a 5′ sidewalk cannot be provided due to site constraints, sidewalk width may be reduced to 4′ for short distances. 5′x 5′ passing areas at intervals not to exceed 200′ are required.
5. Turning Spaces shall be 5′x 5′ minimum. Cross slope shall be maximum 2%.
6. Clear space at the bottom of curb ramps shall be a minimum of 4′x 4′ wholly contained within the crosswalk and wholly outside the parallel vehicular travel path.
7. Provide flared sides where the pedestrian circulation path crosses the curb ramp. Flared sides shall be sloped at 10% maximum, measured parallel to the curb. Returned curbs may be used only where pedestrians would not normally walk across the ramp, either because the adjacent surface is planted, substantially obstructed, or otherwise protected.
8. Additional information on curb ramp location, design, light reflective value and texture may be found in the latest draft of the Proposed Guidelines for Pedestrian Facilities in the Public Right of Way (PROWAG) as published by the U.S. Architectural and Transportation Barriers Compliance Board (Access Board).
9. To serve as a pedestrian refuge area, the median should be a minimum of 6′ wide, measured from back of curbs. Medians should be designed to provide accessible passage over or through them.
10. Small channelization islands, which do not provide a minimum 5′x 5′ landing at the top of curb ramps, shall be cut through level with the surface of the street.
11. Crosswalk dimensions, crosswalk markings and stop bar locations shall be as shown elsewhere in the plans. At intersections where crosswalk markings are not required, curb ramps shall align with theoretical crosswalks unless otherwise directed.
12. Provide curb ramps to connect the pedestrian access route at each pedestrian street crossing. Handrails are not required on curb ramps.
13. Curb ramps and landings shall be constructed and paid for in accordance with Item 531 "Sidewalks".
14. Place concrete at a minimum depth of 5" for ramps, flares and landings, unless otherwise directed.
15. Furnish and install No. 3 reinforcing steel bars at 18" o.c. both ways, unless otherwise directed.
16. Provide a smooth transition where the curb ramps connect to the street.
17. Curbs shown on sheet 1 within the limits of payment are considered part of the curb ramp for payment, whether it is concrete curb, gutter, or combined curb and gutter.
18. Existing features that comply with applicalble standards may remain in place unless otherwise shown on the plans.

DETECTABLE WARNING MATERIAL

19. Curb ramps must contain a detectable warning surface that consists of raised truncated domes complying with PROWAG. The surface must contrast visually with adjoining surfaces, including side flares. Furnish and install an approved cast-in-place dark brown or dark red detectable warning surface material adjacent to uncolored concrete, unless specified elsewhere in the plans.
20. Detectable Warning Materials must meet TxDOT Departmental Materials Specification DMS 4350 and be listed on the Material Producer List. Install products in accordance with manufacturer's specifications.
21. Detectable warning surfaces must be firm, stable and slip resistant.
22. Detectable warning surfaces shall be a minimum of 24 inches in depth in the direction of pedestrian travel, and extend the full width of the curb ramp or landing where the pedestrian access route enters the street.
23. Detectable warning surfaces shall be located so that the edge nearest the curb line is at the back of curb and neither end of that edge is greater than 5 feet from the back of curb. Detectable warning surfaces may be curved along the corner radius.
24. Shaded areas on Sheet 1 of 4 indicate the approximate location for the detectable warning surface for each curb ramp type.

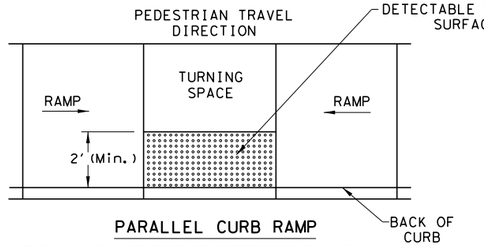
DETECTABLE WARNING PAVERS (IF USED)

25. Furnish detectable warning paver units meeting all requirements of ASTM C-936, C-33. Lay in a two by two unit basket weave pattern or as directed.
26. Lay full-size units first followed by closure units consisting of at least 25 percent (25%) of a full unit. Cut detectable warning paver units using a power saw.

SIDEWALKS

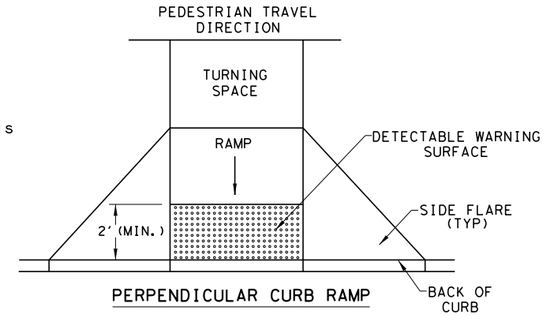
27. Provide clear ground space at operable parts, including pedestrian push buttons. Operable parts shall be placed within unobstructed reach range specified in PROWAG section R406.
28. Place traffic signal or illumination poles, ground boxes, controller boxes, signs, drainage facilities and other items so as not to obstruct the pedestrian access route or clear ground space.
29. Street grades and cross slopes shall be as shown elsewhere in the plans.
30. Changes in level greater than 1/4 inch are not permitted.
31. The least possible grade should be used to maximize accessibility. The running slope of sidewalks and crosswalks within the public right of way may follow the grade of the parallel roadway. Where a continuous grade greater than five percent (5%) must be provided, handrails may be desirable to improve accessibility. Handrails may also be needed to protect pedestrians from potentially hazardous conditions. If provided, handrails shall comply with PROWAG R409.
32. Handrail extensions shall not protrude into the usable landing area or into intersecting pedestrian routes.
33. Driveways and turnouts shall be constructed and paid for in accordance with Item "Intersections, Driveways and Turnouts". Sidewalks shall be constructed and paid for in accordance with Item, "Sidewalks".
34. Sidewalk details are shown elsewhere in the plans.

DETECTABLE WARNING SURFACE DETAILS



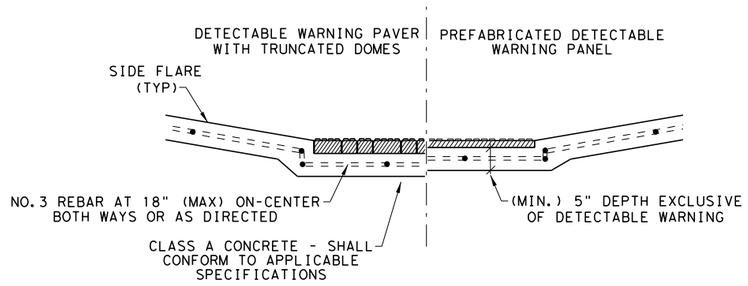
PARALLEL CURB RAMP

TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON LANDING AT STREET EDGE.

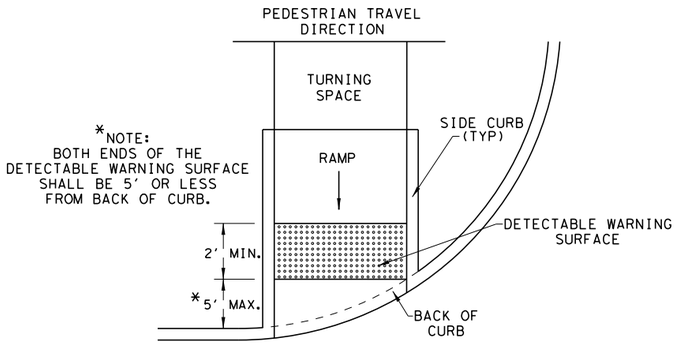


PERPENDICULAR CURB RAMP

TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON SLOPING RAMP RUN.



SECTION VIEW DETAIL
CURB RAMP AT DETECTIBLE WARNINGS



DIRECTIONAL CURB RAMP

TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON SLOPING RAMP RUN.

Texas Department of Transportation

Design Division Standard

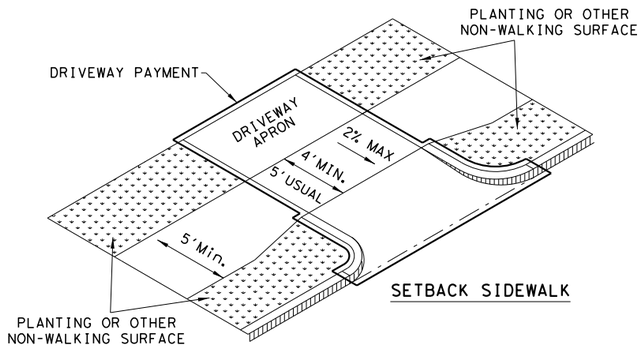
PEDESTRIAN FACILITIES CURB RAMPS

PED-18

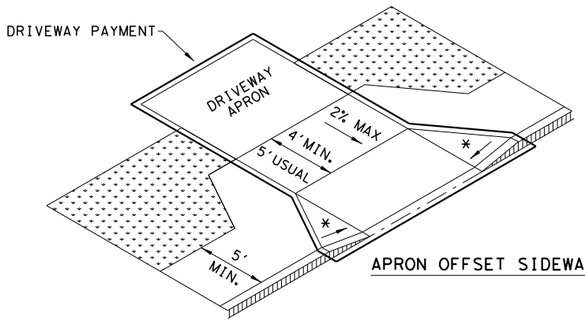
FILE: ped18	DN: TxDOT	DW: VP	CK: KM	CK: PK & JG
© TxDOT: MARCH, 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	3469	01	014,	FM 3099
REVISED 08,2005 REVISED 06,2012 REVISED 01,2018	DIST	COUNTY		SHEET NO.
	BWD	STEPHENS		81

DATE: 8/27/2021
FILE: \\pusscshrfil01\J-Jobs\2079G TxDOT FM 3099 ReAlign\06.00 Design\06.04 Sheets\06.04.11 Standards\ROADWAY STD\ped18.dgn

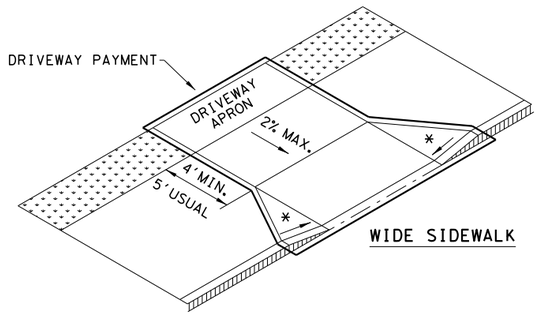
SIDEWALK TREATMENT AT DRIVEWAYS



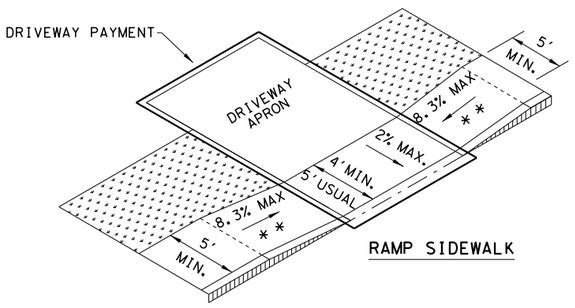
SETBACK SIDEWALK



APRON OFFSET SIDEWALK



WIDE SIDEWALK

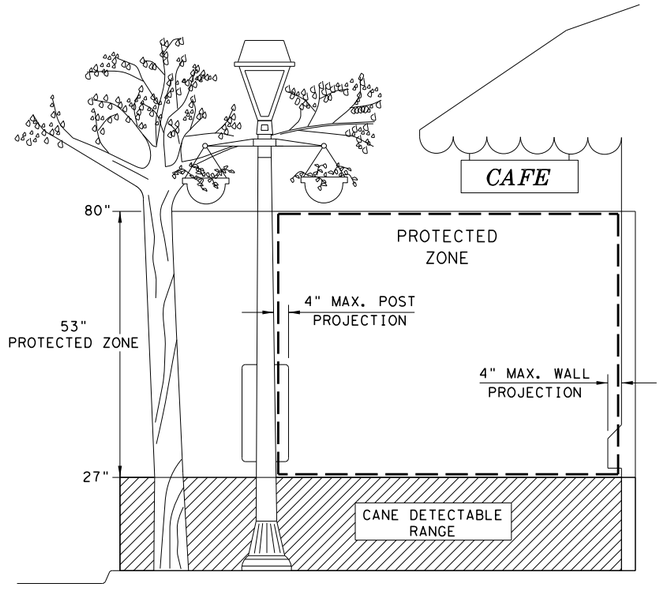


RAMP SIDEWALK

NOTES:

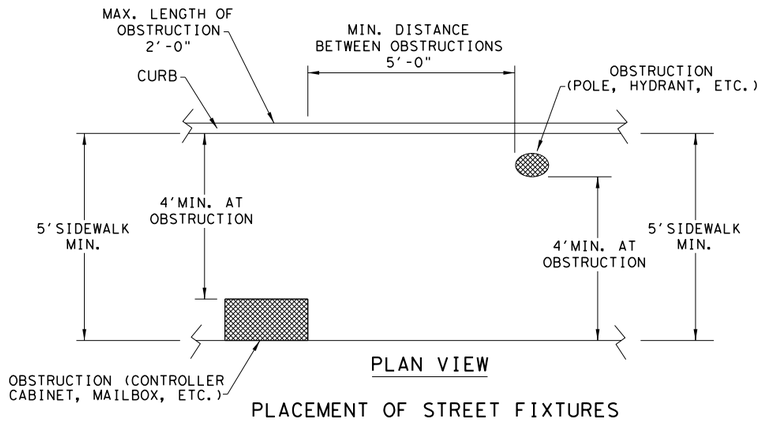
* WHERE DRIVEWAYS CROSS THE PEDESTRIAN ROUTE, SIDES SHALL BE FLARED AT 10% MAX SLOPE.

* * IF CURB HEIGHT IS GREATER THAN 6 INCHES, USE GRADE LESS THAN OR EQUAL TO 5%. HANDRAIL AND DETECTABLE WARNING ARE NOT REQUIRED.



PROTECTED ZONE

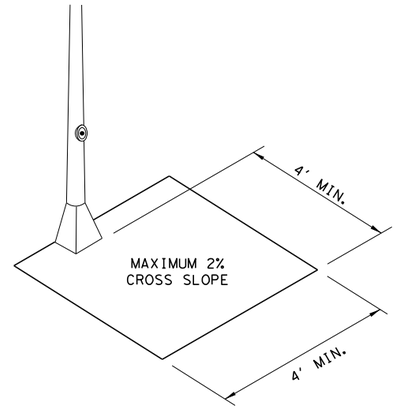
NOTE: IN PEDESTRIAN CIRCULATION AREA, MAXIMUM 4" PROJECTION FOR POST OR WALL MOUNTED OBJECTS BETWEEN 27" AND 80" ABOVE THE SURFACE.



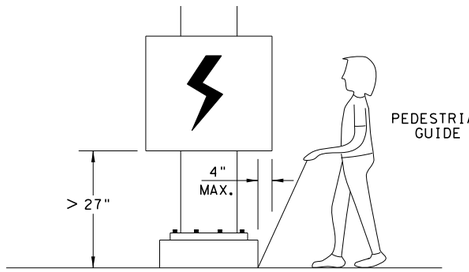
PLAN VIEW

PLACEMENT OF STREET FIXTURES

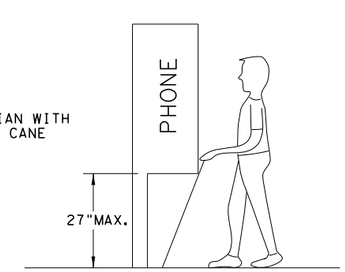
NOTE: ITEMS NOT INTENDED FOR PUBLIC USE. MINIMUM 4' X 4' CLEAR GROUND SPACE REQUIRED AT PUBLIC USE FIXTURES.



CLEAR SPACE ADJACENT TO PEDESTRIAN PUSH BUTTON



WHEN AN OBSTRUCTION OF A HEIGHT GREATER THAN 27" FROM THE SURFACE WOULD CREATE A PROTRUSION OF MORE THAN 4" INTO THE PEDESTRIAN CIRCULATION AREA, CONSTRUCT ADDITIONAL CURB OR FOUNDATION AT THE BOTTOM TO PROVIDE A MAXIMUM 4" OVERHANG.



PROTRUDING OBJECTS OF A HEIGHT ≤ 27" ARE DETECTABLE BY CANE AND DO NOT REQUIRE ADDITIONAL TREATMENT.

DETECTION BARRIER FOR VERTICAL CLEARANCE < 80"

Texas Department of Transportation

Design Division Standard

PEDESTRIAN FACILITIES
CURB RAMPS

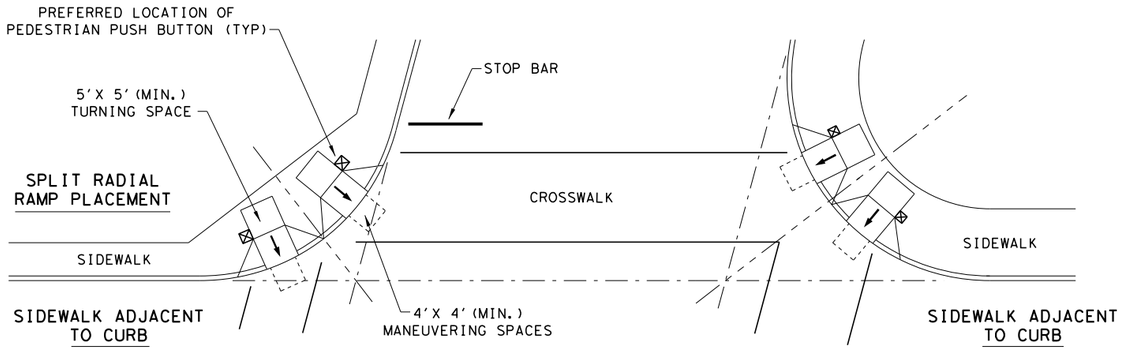
PED-18

FILE: ped18	DN: TxDOT		DW: VP	CK: KM	CK: PK & JG
© TxDOT: MARCH, 2002	CONT	SECT	JOB		HIGHWAY
REVISIONS	3469	01	014,		FM 3099
REVISED 08,2005 REVISED 06,2012 REVISED 01,2018	DIST		COUNTY		SHEET NO.
	BWD		STEPHENS		82

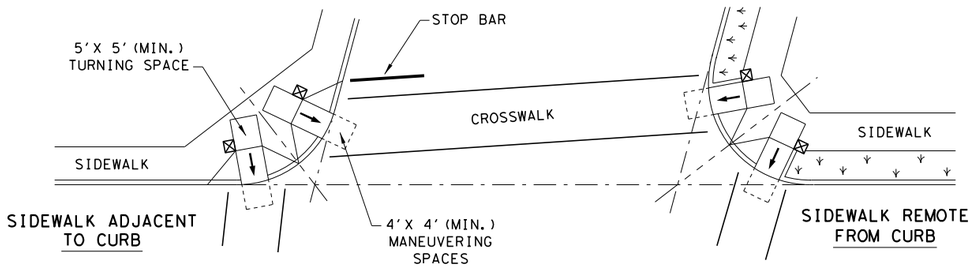
DATE: 8/27/2021
FILE: \\pussdsnrfil01\J-Jobs\2079G TxDOT FM 3099 ReAlign\06.00 Design\06.04 Sheets\06.04.11 Standards\ROADWAY STD\ped18.dgn

TYPICAL CROSSING LAYOUTS

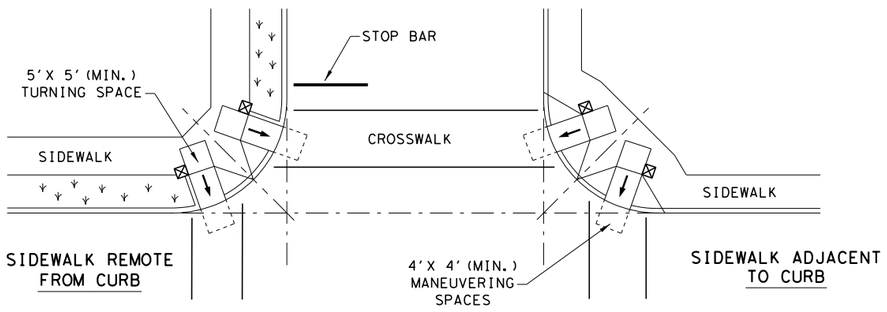
SEE SHEET 1 OF 4 FOR DETAILS AND DIMENSIONS



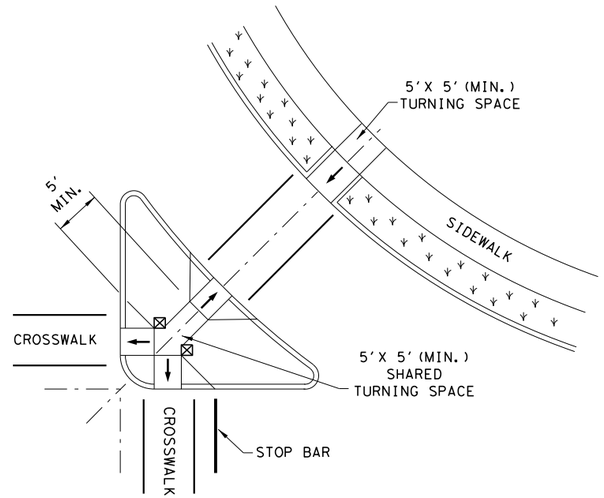
SKEWED INTERSECTION WITH "LARGE" RADIUS



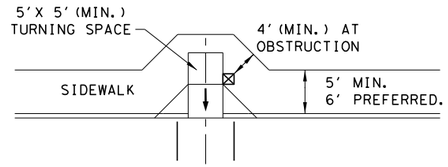
SKEWED INTERSECTION WITH "SMALL" RADIUS

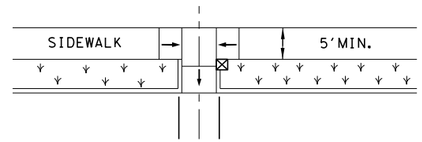


NORMAL INTERSECTION WITH "SMALL" RADIUS



AT INTERSECTION
W/FREE RIGHT TURN & ISLAND





MID-BLOCK PLACEMENT
PERPENDICULAR RAMPS

LEGEND:

SHOWS DOWNWARD SLOPE. →

DENOTES PREFERRED LOCATION OF PEDESTRIAN PUSH BUTTON (IF APPLICABLE). ☒

DENOTES PLANTING OR NON-WALKING SURFACE NOT PART OF PEDESTRIAN CIRCULATION PATH.

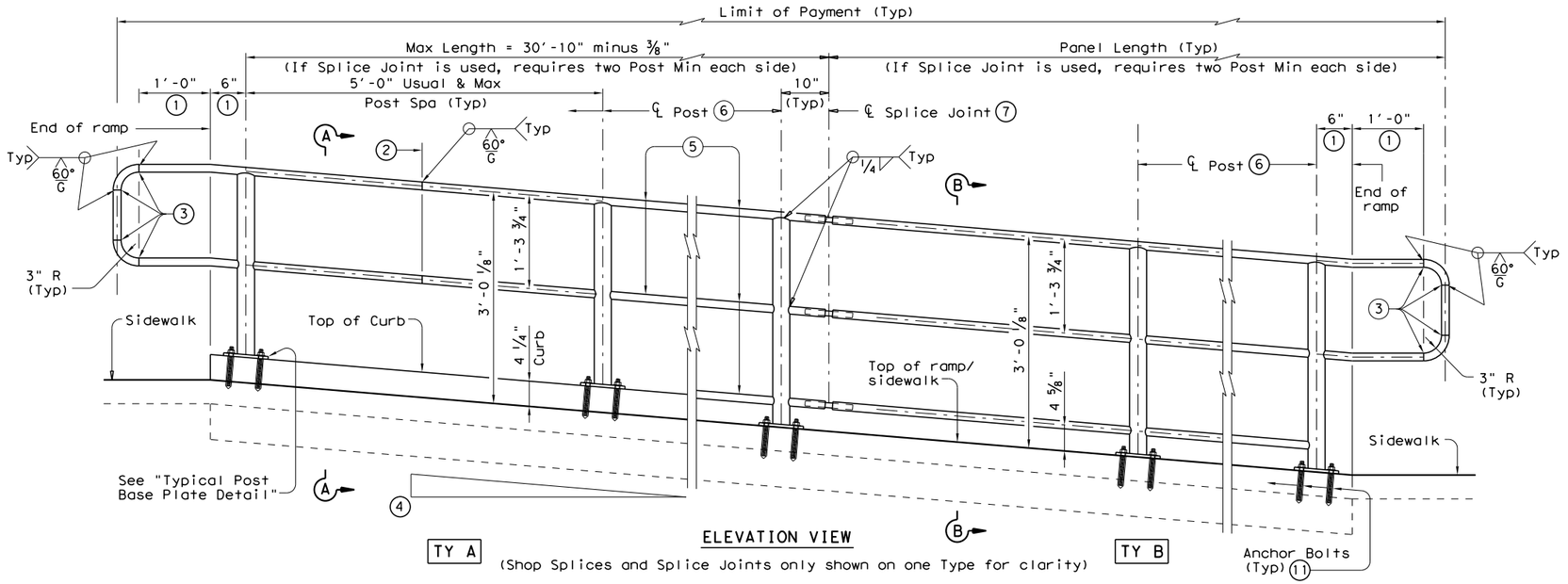
Texas Department of Transportation — Design Division Standard

PEDESTRIAN FACILITIES CURB RAMPS

PED-18

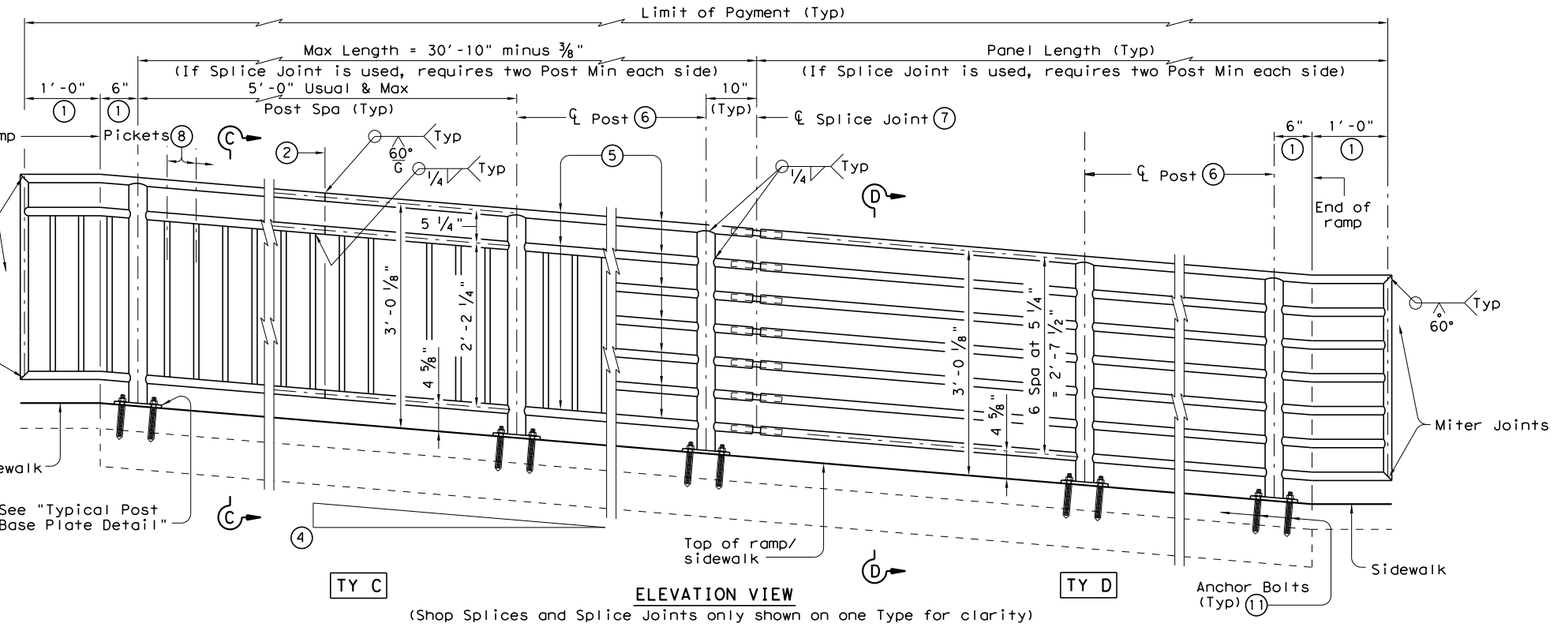
FILE: ped18	DN: TxDOT	DW: VP	CK: KM	CK: PK & JG
© TxDOT: MARCH, 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	3469	01	014,	FM 3099
REVISED 08, 2005 REVISED 06, 2012 REVISED 01, 2018	DIST	COUNTY		SHEET NO.
	BWD	STEPHENS		83

DATE: 8/27/2021
FILE: \\pussccshrfil01\J-Jobs\20796 TxDOT FM 3099 ReAlign\06.00 Design\06.04 Sheets\06.04.11 Standards\ROADWAY STD\prd13.dgn



ELEVATION VIEW

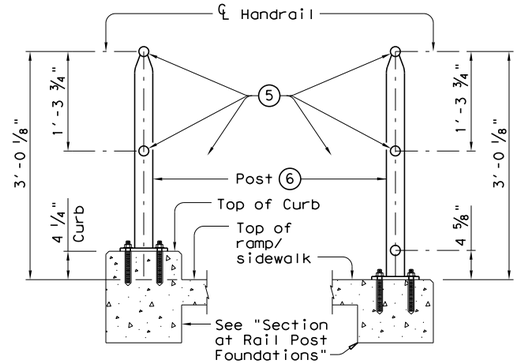
(Shop Splices and Splice Joints only shown on one Type for clarity)



ELEVATION VIEW

(Shop Splices and Splice Joints only shown on one Type for clarity)

RECOMMENDED USAGE ⑨⑩	
Dropoff Height/ Condition	Recommended Rail Options
< 30" dropoff	TY A, TY B, TY C, or TY D
≥ 30" dropoff, or along Bike Path	TY E or TY F

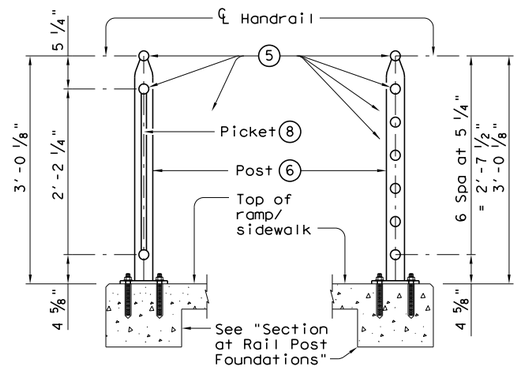


SECTION A-A

(Showing Handrail TY A)

SECTION B-B

(Showing Handrail TY B)



SECTION C-C

(Showing Handrail TY C)

SECTION D-D

(Showing Handrail TY D)

① Parallel to ground.

② One shop splice per panel is permitted with minimum 85 percent penetration. The weld may be square groove or single vee groove. Grind smooth.

③ Shop splice is permitted with minimum 85 percent penetration. The weld may be square groove or single vee groove. Grind smooth.

④ See Ramp Details located elsewhere in plans for ramp slope and dimensions. Maximum ramp slope will not exceed 8.3 percent. Level landing required for each 30" rise if grade exceeds 5 percent.

⑤ 1 ½" Dia. Standard Pipe (1.900" O.D., 0.145" wall thickness). Parallel to ramp / sidewalk. Provide holes as needed in 1 ½" Dia. pipe for galvanizing drainage and venting.

⑥ 2 ½" Dia. Standard Pipe (2.875" O.D., 0.203" wall thickness). See "Post Mount Detail" for crimping and trimming post to fit Dia. of top rail. Provide holes as needed in post for galvanizing drainage and venting. Plumb all posts.

⑦ See "Handrail Fabrication Details" for Splice Joints.

⑧ ℄ ⅝" Dia. Round Bar equal spacing at 4 ½" Max. Plumb all pickets.

⑨ When needed for accessibility (grade > 5 percent) or as needed for pedestrian safety.

⑩ Not to be used on bridges.

⑪ See "General Notes" for anchor bolt information.

SHEET 1 OF 3

Texas Department of Transportation

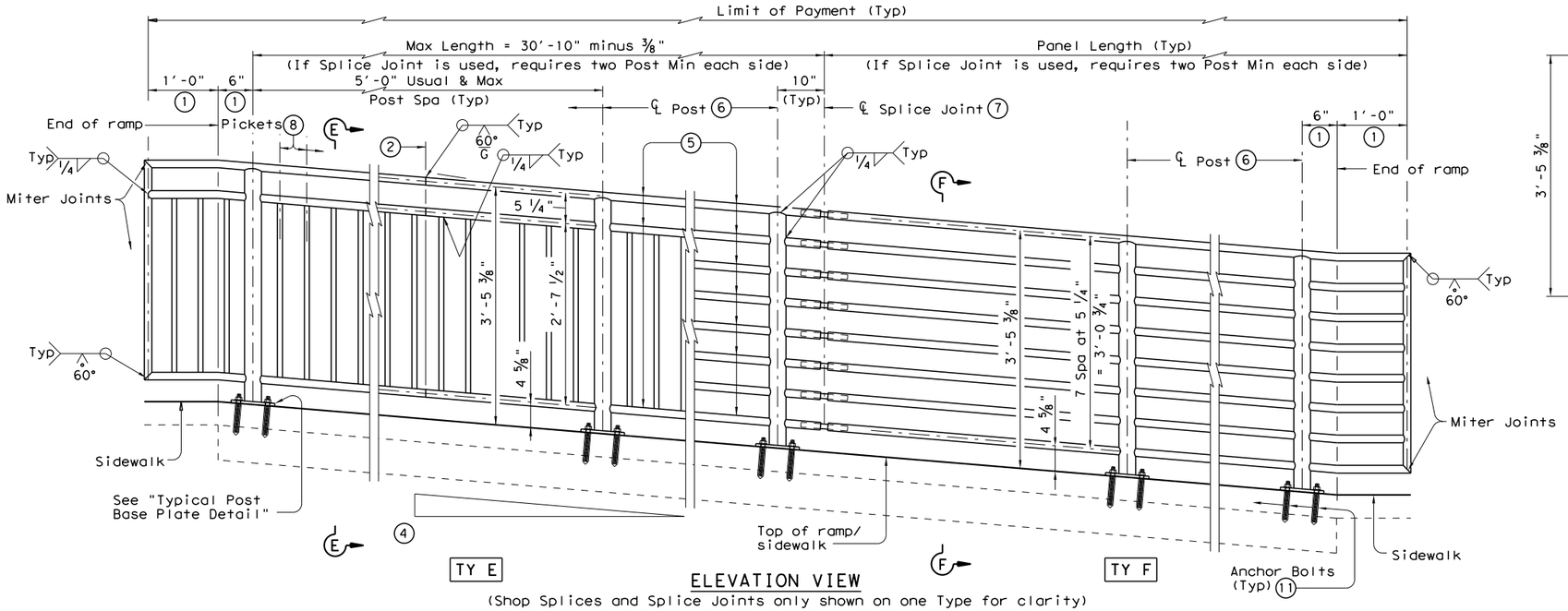
Design Division Standard

PEDESTRIAN HANDRAIL DETAILS

PRD-13

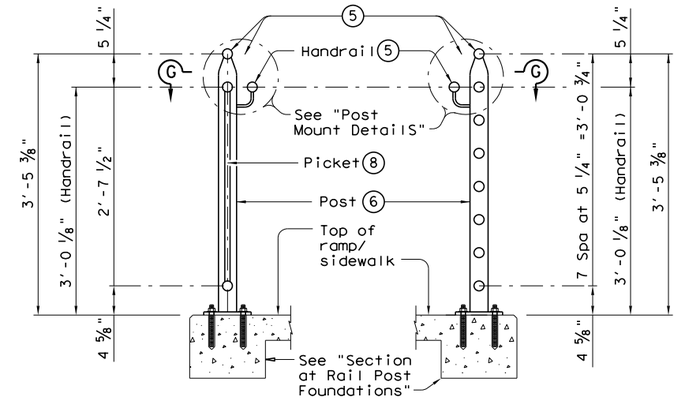
FILE: prd13.dgn	DN: TxDOT	CK: AM	DW: JTR	CK: CGL
©TxDOT Decmeber 2006	CONT	SECT	JOB	HIGHWAY
REVISIONS REVISED MAY, 2013 (VP)	3469	01	014,	FM 3099
	DIST	COUNTY		SHEET NO.
	BWD	STEPHENS		84

DATE: 8/27/2021
FILE: \\pusscshrfil01\J-Jobs\2079G TxDOT FM 3099 ReAlign\06.00 Design\06.04 Sheets\06.04.11 Standards\ROADWAY STD\prd13.dgn



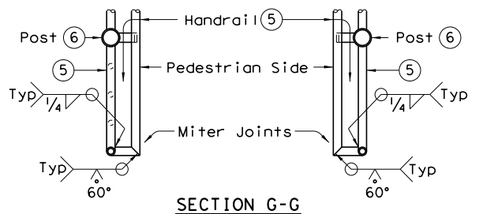
ELEVATION VIEW

(Shop Splices and Splice Joints only shown on one Type for clarity)

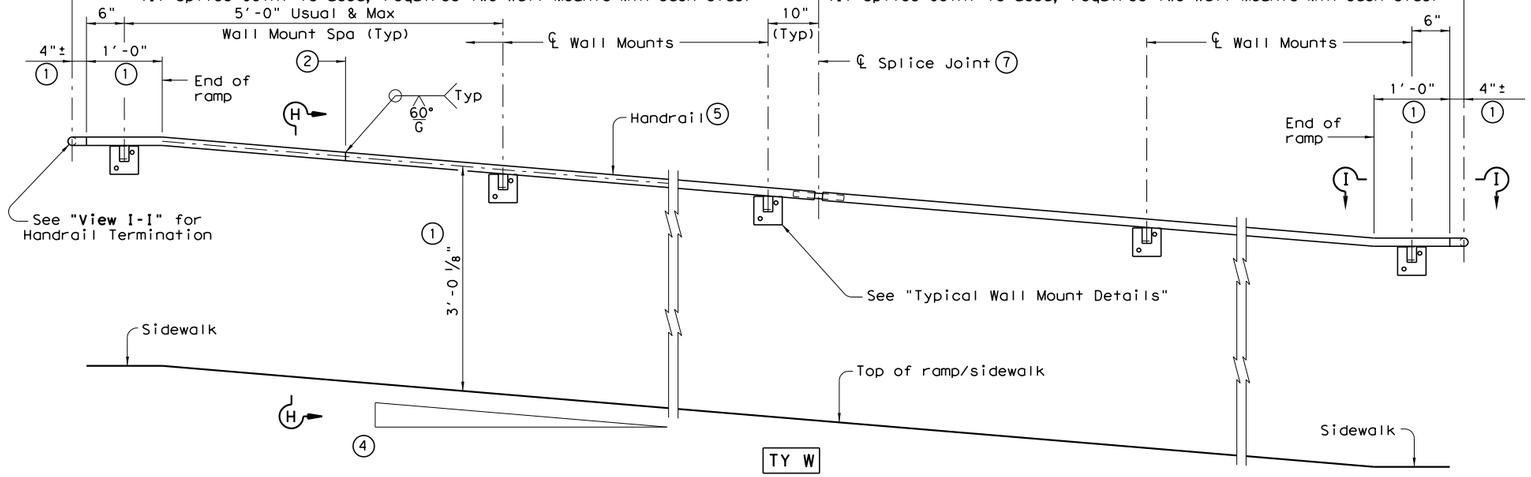


SECTION E-E
(Showing Handrail TY E)

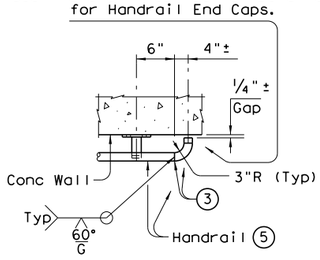
SECTION F-F
(Showing Handrail TY F)



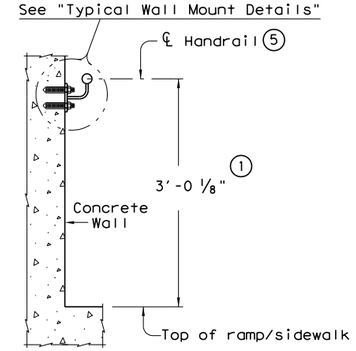
SECTION G-G
(Showing Handrail Termination)



ELEVATION VIEW



VIEW I-I
(Showing Handrail Termination)



SECTION H-H
(Showing Handrail TY W)

1. Parallel to ground.
2. One shop splice per panel is permitted with minimum 85 percent penetration. The weld may be square groove or single vee groove. Grind smooth.
3. Shop splice is permitted with minimum 85 percent penetration. The weld may be square groove or single vee groove. Grind smooth.
4. See Ramp Details located elsewhere in plans for ramp slope and dimensions. Maximum ramp slope will not exceed 8.3 percent. Level landing required for each 30" rise if grade exceeds 5 percent.
5. 1 ½" Dia. Standard Pipe (1.900" O.D., 0.145" wall thickness). Parallel to ramp / sidewalk. Provide holes as needed in 1 ½" Dia. pipe for galvanizing drainage and venting.
6. 2 ½" Dia. Standard Pipe (2.875" O.D., 0.203" wall thickness). See "Post Mount Detail" for crimping and trimming post to fit Dia. of top rail. Provide holes as needed in post for galvanizing drainage and venting. Plumb all posts.
7. See "Handrail Fabrication Details" for Splice Joints.
8. ℄ ⅝" Dia. Round Bar equal spacing at 4 ½" Max. Plumb all pickets.
11. See "General Notes" for anchor bolt information.

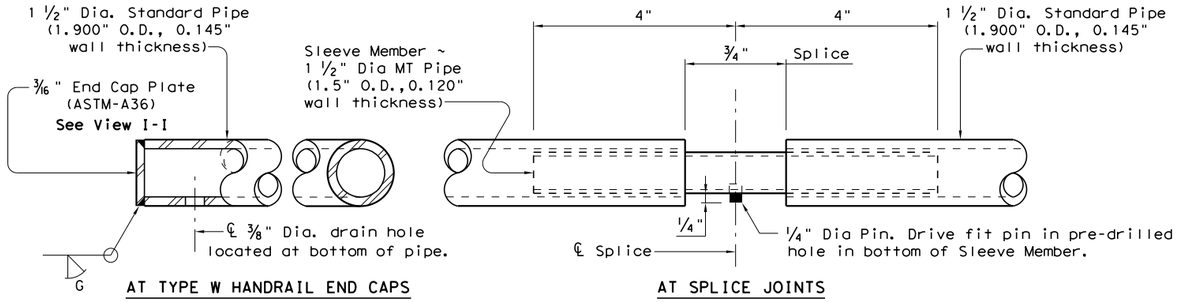
Texas Department of Transportation — Design Division Standard

PEDESTRIAN HANDRAIL DETAILS

PRD-13

FILE: prd13.dgn	DN: TxDOT	CK: AM	DW: JTR	CK: CGL
©TxDOT December 2006	CONT	SECT	JOB	HIGHWAY
REVISIONS REVISED MAY, 2013 (VP)	3469	01	014,	FM 3099
	DIST	COUNTY		SHEET NO.
	BWD	STEPHENS		85

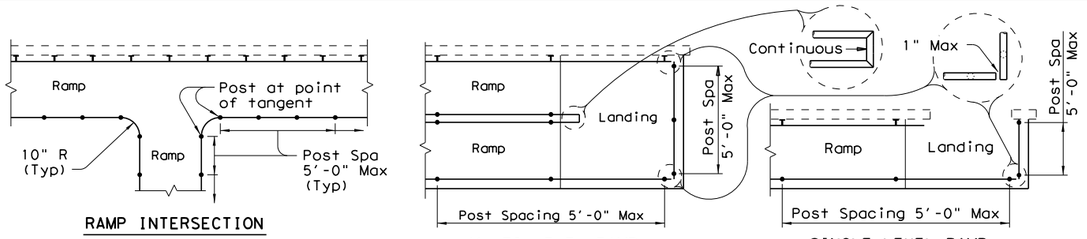
DATE: 8/27/2021
FILE: \\txussechrfil01\J-Jobs\20796 TxDOT FM 3099 ReAlign\06.00 Design\06.04 Sheets\06.04.11 Standards\ROADWAY STD\prd13.dgn



AT TYPE W HANDRAIL END CAPS

AT SPLICE JOINTS

HANDRAIL FABRICATION DETAILS

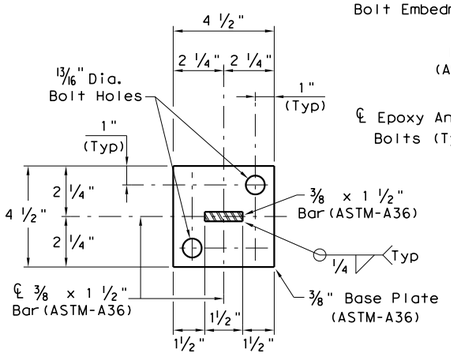


RAMP INTERSECTION

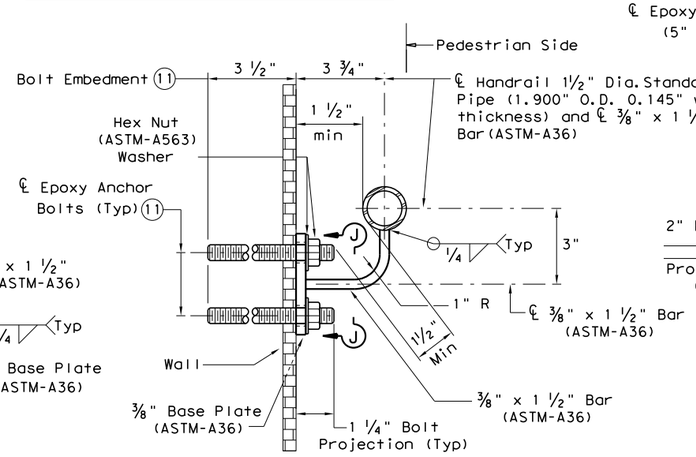
MULTI-LEVEL RAMP

SINGLE-LEVEL RAMP

PLAN SHOWING RAIL AT RAMP CONDITIONS

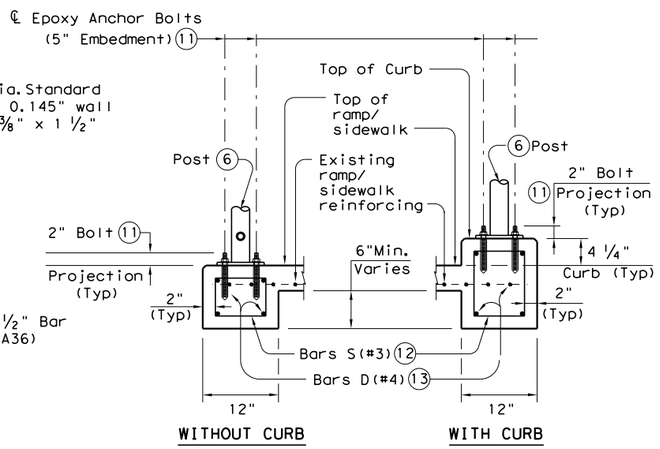


SECTION J-J
(Anchor Bolts not shown for clarity)



SECTION AT WALL MOUNT

TYPICAL WALL MOUNT DETAILS



WITHOUT CURB

WITH CURB

SECTION AT RAIL POST FOUNDATIONS

GENERAL NOTES

Designed according to ADAAG, Texas Accessibility Standards, Uniform Building Code, and AASHTO LRFD Specifications.

Handrail anchorage details shown on this standard may require modification for select structure types. See appropriate details elsewhere in plans for these modifications.

Pipe will conform to ASTM-A53 Grade B or A500 Grade B. Steel plates and steel bars will conform to ASTM-A36. Mechanical tubing (MT) will conform to ASTM A513 Grade 1015 or higher. Galvanize all steel components except reinforcing steel unless noted otherwise.

Concrete for foundations will be in accordance with Item 531 "Sidewalks". All reinforcing steel must be Grade 60. Bar laps, where required, will be as follows: Uncoated ~ #4 = 1'-5" Epoxy coated ~ #4 = 2'-1"

When the plans require painted steel, follow the requirements for painting galvanized steel in Item 446, "Cleaning and Painting Steel". Sleeve Members will receive galvanization and only get field painted after installation unless directed otherwise by Engineer.

Epoxy Anchor bolts for wall mount and post base plate will be ⅝" Dia. ASTM A36 threaded rods with one hex nut and one hardened steel washer at each bolt. ⅝" Dia. threaded rod embedment depth for wall mounts is 3 ½" and embedment depth for post base plate is 5".

Embed threaded rods into concrete with a Type III (Class C) epoxy meeting the requirements of DMS-6100, "Epoxies and Adhesives". Mix and dispense adhesive with the manufacturer's static mixing nozzle/dual cartridge system. Core drill holes (percussion drilling not permitted).

At the contractor's option the post base plate anchor bolts may be cast with the Ramp/Sidewalk (See Cast-in-Place Anchor Bolt Options).

Optional cast-in-place anchor bolts will be ⅝" Dia ASTM A307 Grade A bolts (or A36 threaded rods with one tack welded hex nut each) with one hex nut and one hardened steel washer at each bolt. Embedment depth of cast-in-place bolt will be 8" for post base plate.

Handrails and any wall or other surface adjacent to them will be free of any sharp or abrasive elements.

Submit shop drawings to the Engineer unless otherwise noted. For curved handrail applications, fabricate the handrail to the curve if radius is less than 600 ft. Shop drawings are required when rail is fabricated to the curve.

For all handrails, erection drawings will be submitted to the Engineer for approval to ensure proper installation.

Drawings will show handrail mount locations with bolts setting, spacing, ramp slope, and/or splice joint locations, and handrail lengths with identification showing where each handrail goes on the layout.

Payment for concrete sidewalks or curb ramps will be paid for in accordance with Item 531 "Sidewalks".

Payment for all items shown is to be included in unit price bid in accordance with Item 450 "Railing" of the type specified.

All exposed edges will be rounded or chamfered to approximately ⅛" by grinding.

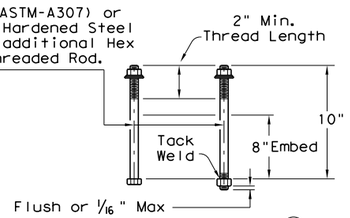
(5) 1 ½" Dia. Standard Pipe (1.900" O.D., 0.145" wall thickness). Parallel to ramp/sidewalk. Provide holes as needed in 1 ½" Dia. pipe for galvanizing drainage and venting.

(6) 2 ½" Dia. Standard Pipe (2.875" O.D., 0.203" wall thickness). Plumb all posts. See "Post Mount Detail" for crimping and trimming post to fit the diamenter of top rail. Provide holes as needed in post for galvanizing drainage and venting.

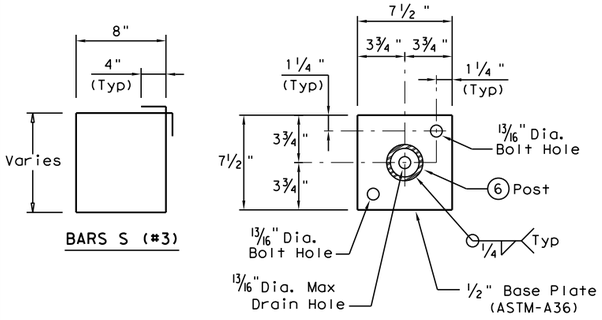
(11) See "General Notes" for anchor bolt information.

(12) Bars S(#3) spaced at 12" Max (Spaced 3" from outside edge of overall length of Ramp/Sidewalk).

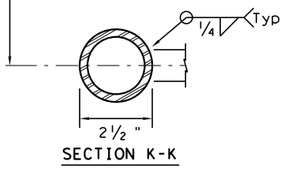
(13) Provide 1 ½" end cover to Bars D(#4) from outside edge of overall length of Ramp/Sidewalk.



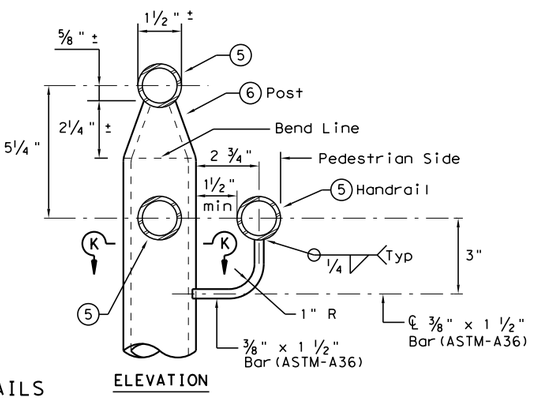
CAST-IN-PLACE ANCHOR BOLT OPTIONS (11)
(Used for Post Base Plate only)



TYPICAL POST BASE PLATE DETAIL



SECTION K-K



ELEVATION

POST MOUNT DETAILS

SHEET 3 OF 3

Texas Department of Transportation

Design Division Standard

PEDESTRIAN HANDRAIL DETAILS

PRD-13

FILE: prd13.dgn	DN: TxDOT	CK: AM	DW: JTR	CK: CGL
©TxDOT December 2006	CONT	SECT	JOB	HIGHWAY
REVISIONS	3469	01	014,	FM 3099
REVISED MAY, 2013 (VP)	DIST	COUNTY		SHEET NO.
	BWD	STEPHENS		86

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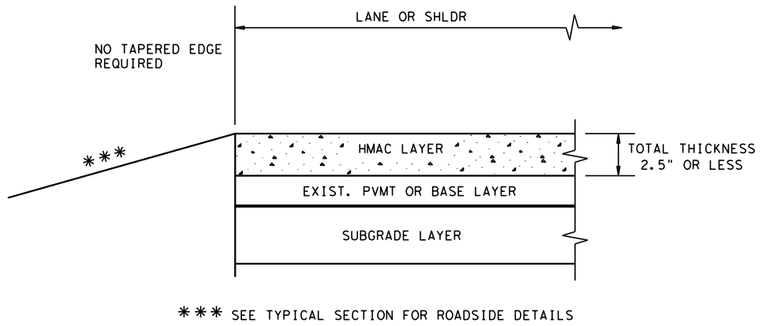
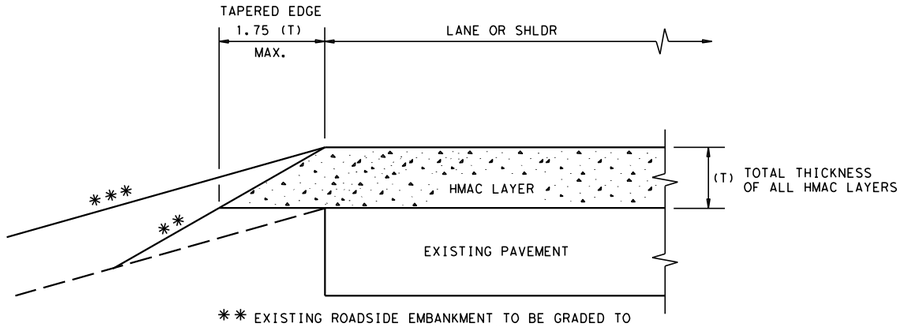


*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

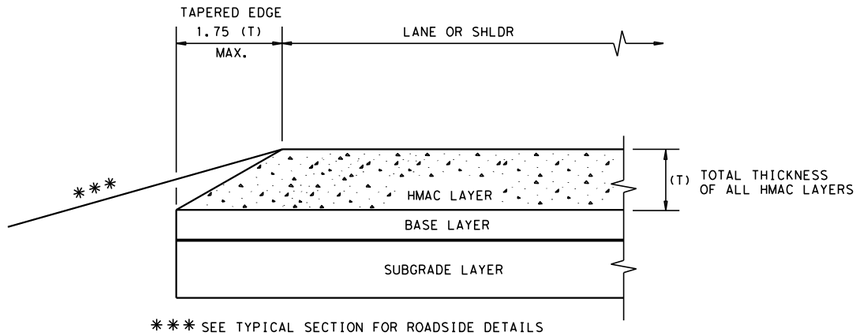
CONDITION - 1
THIN HMAC SURFACES OR HMAC OVERLAY
WITH THICKNESS OF 2.5" OR LESS



** EXISTING ROADSIDE EMBANKMENT TO BE GRADED TO PRODUCE A SMOOTH LEVEL SURFACE FOR PLACEMENT OF TAPERED EDGE. THIS WORK IS SUBSIDIARY TO THE VARIOUS BID ITEMS.

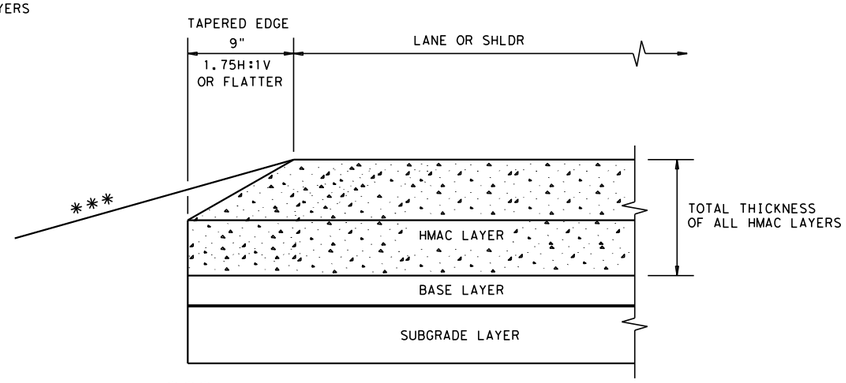
*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

CONDITION - 2
OVERLAY OF EXISTING PAVEMENT
HMAC THICKNESS 2.5" TO 5"



*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

CONDITION - 3
NEW OR RECONSTRUCTED PAVEMENT
HMAC THICKNESS 2.5" TO 5"



*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

CONDITION - 4
NEW OR RECONSTRUCTED PAVEMENT
HMAC THICKNESS 5" OR GREATER

(NOT TO SCALE)

GENERAL NOTES

1. UNLESS OTHERWISE SHOWN IN THE PLANS, A VERTICAL EDGE IS PERMISSIBLE FOR HMAC PLACED GREATER THAN 5" BELOW THE EDGE OF PAVEMENT AND FOR THICKNESS OF HMAC LESS THAN 2.5".
2. FOR FURTHER INFORMATION REGARDING THE ROADSIDE AND PAVEMENT DETAILS, SEE TYPICAL SECTIONS.
3. PAYMENT FOR TAPERED EDGE WILL BE IN ACCORDANCE WITH APPLICABLE ITEMS IN THE CONTRACT.
4. THE SLOPE OF THE TAPERED EDGE SHALL BE 1.75H:1V OR FLATTER.
5. THE TAPERED EDGE SHALL BE PRODUCED BY USE OF A SCREED ATTACHMENT CAPABLE OF PRODUCING A SMOOTH COMPACTED SURFACE. ADDITIONAL COMPACTING EFFORT BEHIND THE SCREED IS NOT REQUIRED.

Texas Department of Transportation | Design Division Standard

TAPERED EDGE DETAILS
HMAC PAVEMENT

TE(HMAC)-11

FILE: tehmac11.dgn	DN: TxDOT	CK: RL	DW: KB	CK:
© TxDOT January 2011	CONT	SECT	JOB	HIGHWAY
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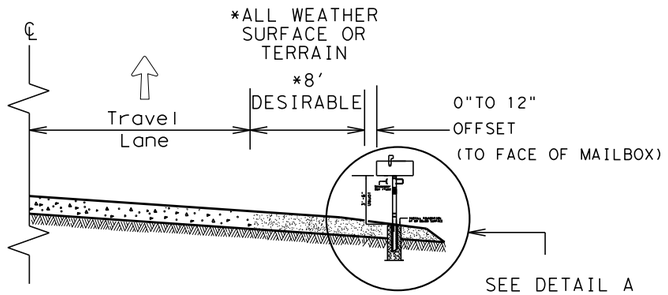
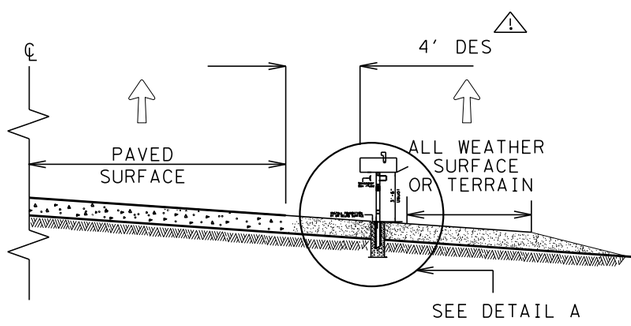
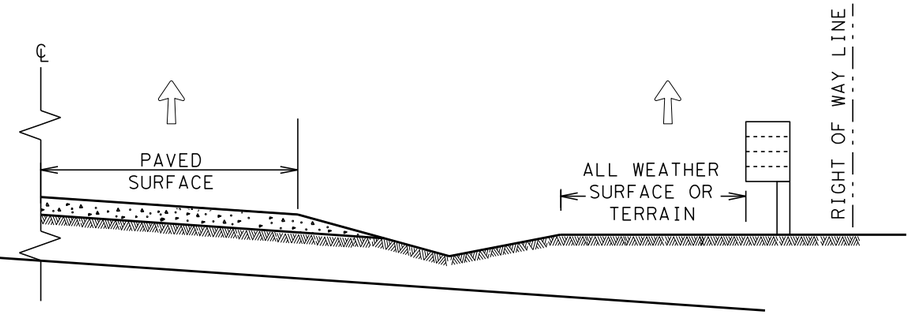


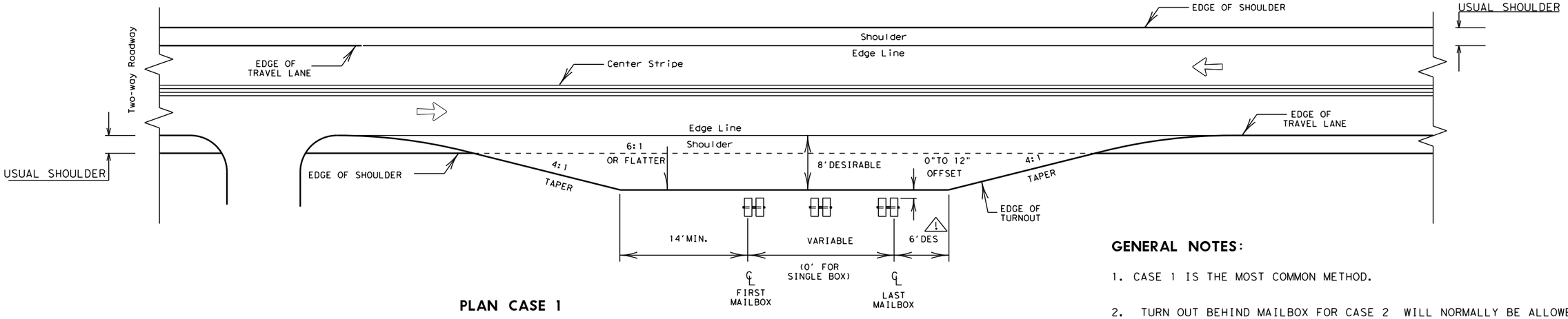
CASE 1. OFF TRAVEL WAY DELIVERY



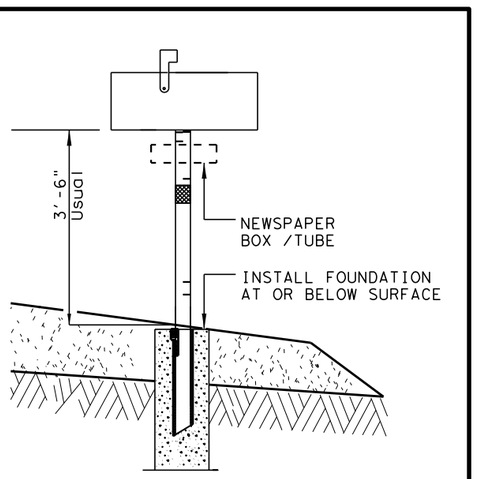
CASE 2. BACK SIDE DELIVERY



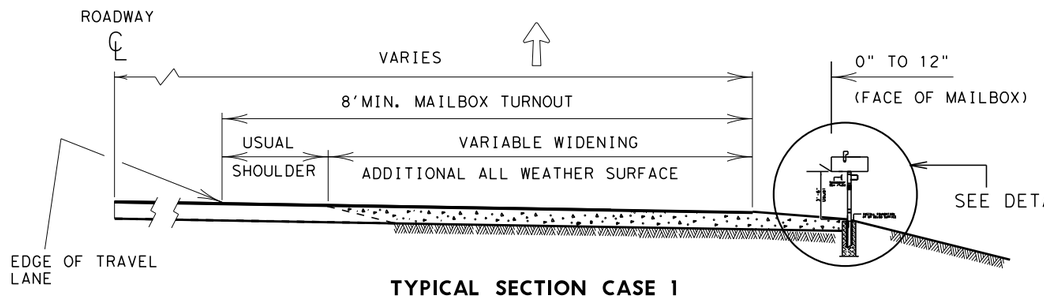
CASE 3. DELIVERY NEAR RIGHT OF WAY LINE



PLAN CASE 1



DETAIL A



TYPICAL SECTION CASE 1

MAIL DELIVERY VEHICLE TRAVEL DIRECTION

GENERAL NOTES:

1. CASE 1 IS THE MOST COMMON METHOD.
2. TURN OUT BEHIND MAILBOX FOR CASE 2 WILL NORMALLY BE ALLOWED FOR NATURAL TERRAIN THAT WILL SERVE AS AN ALL WEATHER SURFACE.
3. ALL WEATHER DRIVEWAYS FOR CASE 3 MAILBOXES LOCATED AT THE RIGHT OF WAY LINE SHOULD NORMALLY BE PLACED IN CONJUNCTION WITH COUNTY ROADS OR OTHER CONNECTING COMMUNITY ROADS OR STREETS. IF THE NUMBER OF MAILBOXES EXCEEDS FOUR, A COMMUNITY MAIL BOX SHOULD BE ENCOURAGED AT THESE LOCATIONS.

Texas Department of Transportation

Maintenance Division Standard

Guideline

MAILBOX SIDE ROAD PLACEMENT AND TURNOUTS
MB-14(2)

FILE: MB14(2).DGN	DN: JEO		CK:	DW: JEO		CK:
© TxDOT MAY 2014	CONT	SECT	JOB		HIGHWAY	
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DECEMBER 2012-NEW TXDOT TITLE BLOCK	DIST	COUNTY			SHEET NO.	
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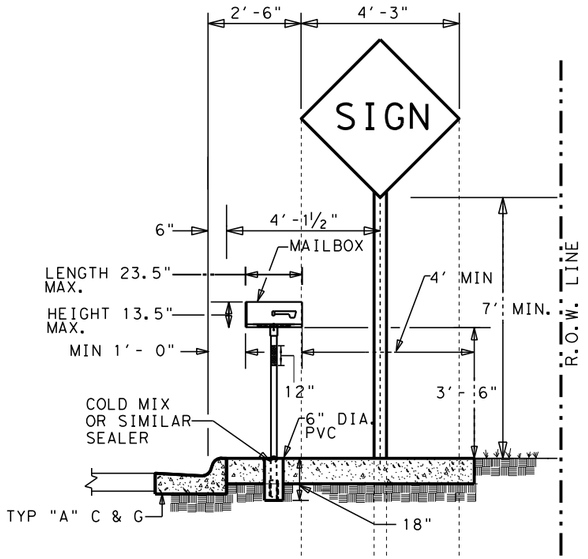
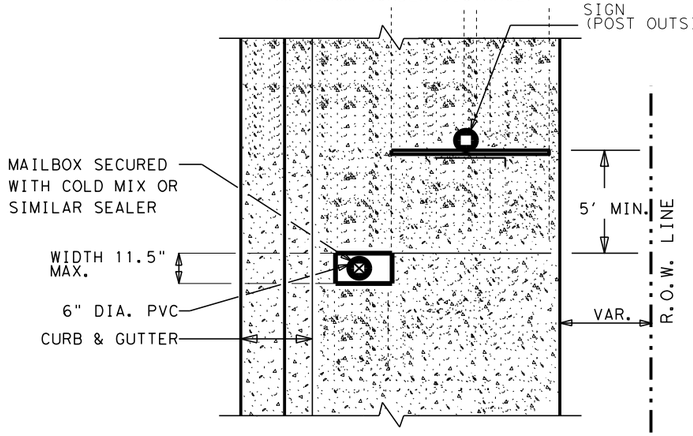


MAILBOX SIDEWALK INSTALLATION RELATIVE TO ANY OTHER OBSTRUCTION SUCH AS A SIGN
(MINIMUM BORDER DISTANCE)



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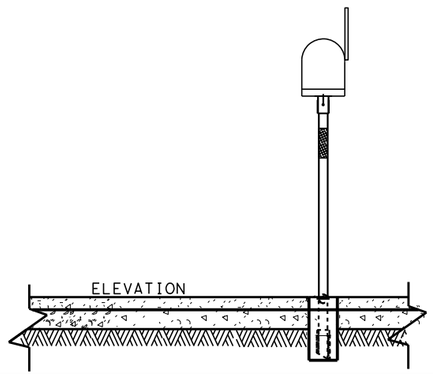
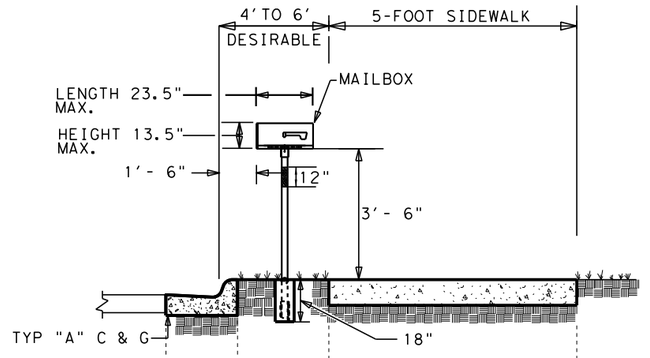
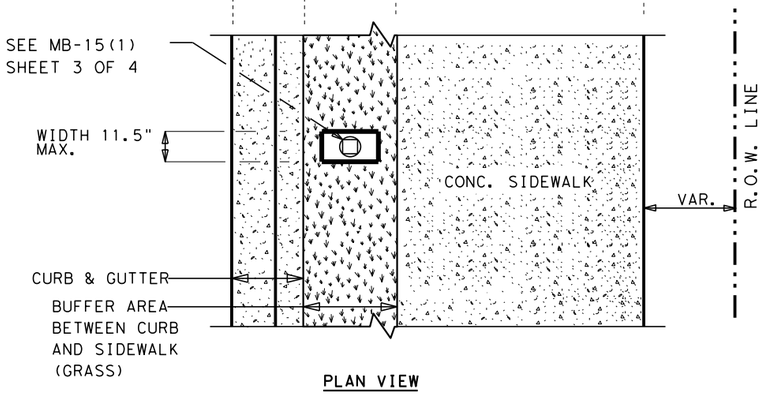




MAILBOX SIDEWALK INSTALLATION
(DESIRABLE BORDER DISTANCE)



PLAN VIEW

Texas Department of Transportation | Maintenance Division Standard

SINGLE MAILBOX PLACEMENT BEHIND CURBS WITH OR WITHOUT SIDEWALKS

MB-14(2A)

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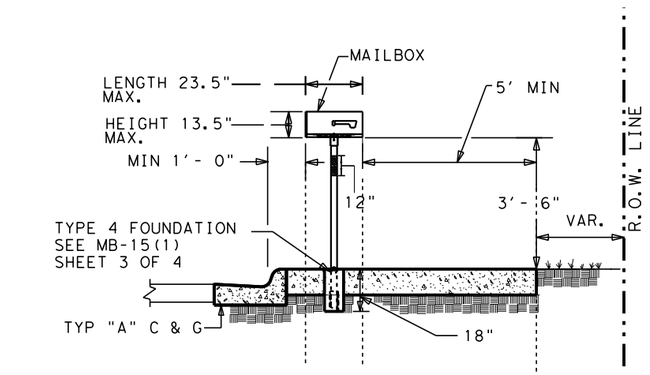
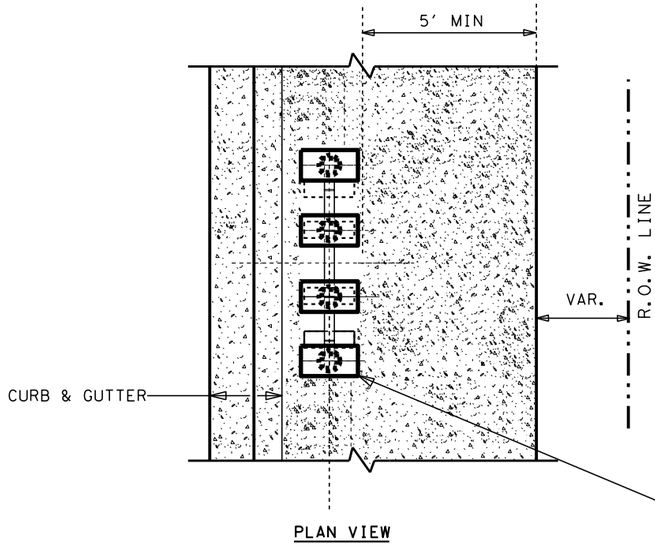
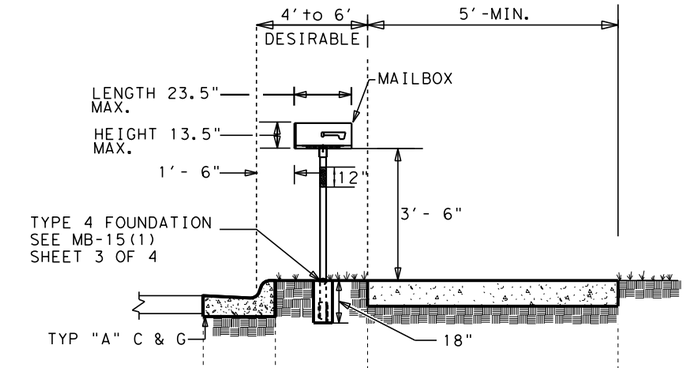


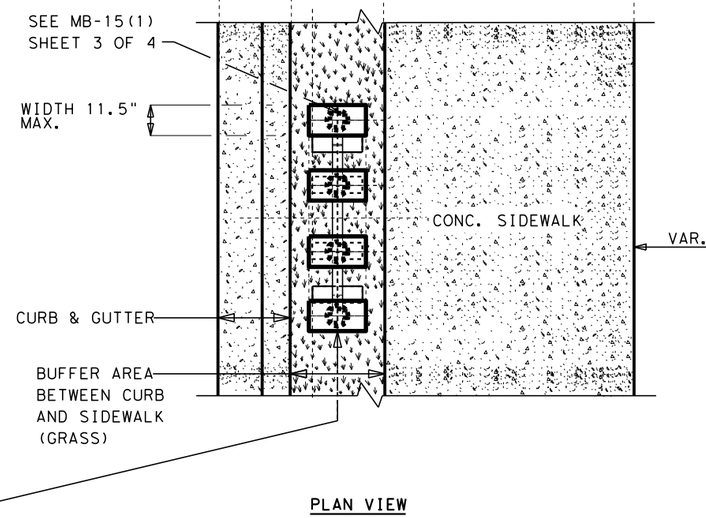
MAILBOX SIDEWALK INSTALLATION RELATIVE TO ANY OTHER OBSTRUCTION SUCH AS A SIGN
(MINIMUM BORDER DISTANCE)



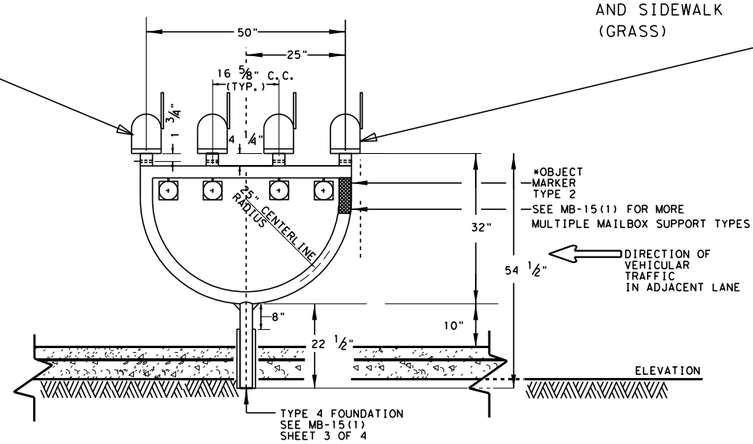
PLAN VIEW



MAILBOX SIDEWALK INSTALLATION
(DESIRABLE BORDER DISTANCE)



PLAN VIEW



SHEET 3 OF 3

Texas Department of Transportation

Maintenance Division Standard

MULTIPLE MAILBOX PLACEMENT BEHIND CURBS WITH OR WITHOUT SIDEWALKS

MB-14(2B)

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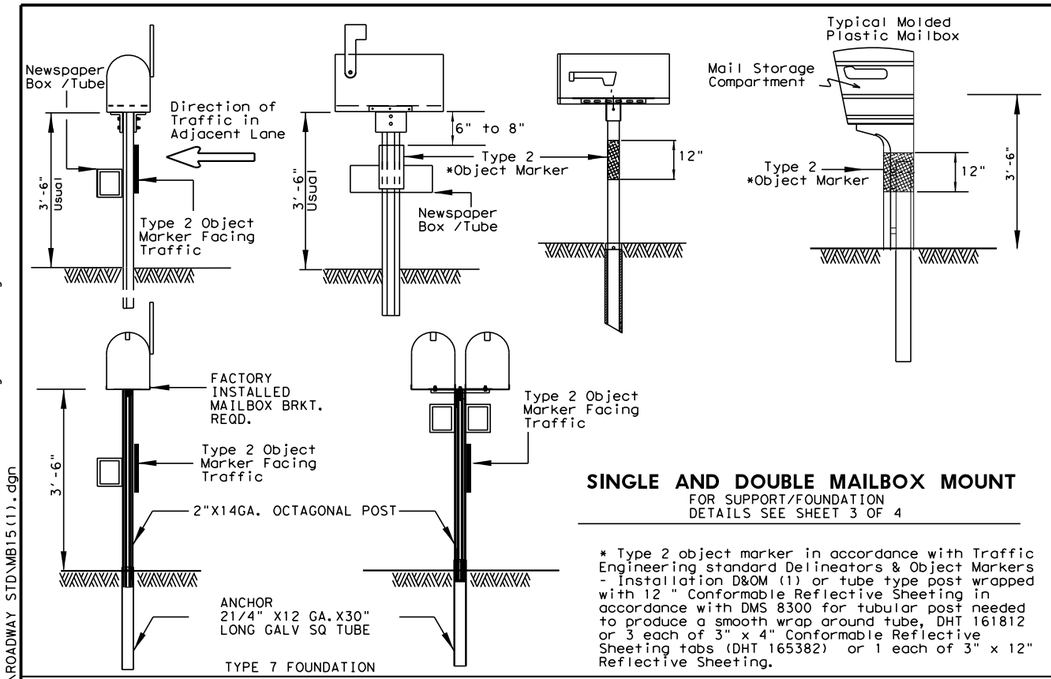


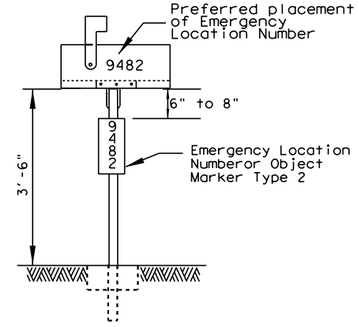
SINGLE AND DOUBLE MAILBOX MOUNT

FOR SUPPORT/FOUNDATION DETAILS SEE SHEET 3 OF 4

* Type 2 object marker in accordance with Traffic Engineering standard Delineators & Object Markers - Installation D&OM (1) or tube type post wrapped with 12 " Conformable Reflective Sheeting in accordance with DMS 8300 for tubular post needed to produce a smooth wrap around tube, DHT 161812 or 3 each of 3" x 4" Conformable Reflective Sheeting tabs (DHT 165382) or 1 each of 3" x 12" Reflective Sheeting.

Note: Mailbox installations in sidewalk areas shall be in accordance with the latest TxDOT Pedestrian Facilities Curb ramps standard *PED-XX for pedestrian facilities.

*PED-XX: XX is the standard year for example PED- 12 , PED-13,etc.



PLACEMENT OF EMERGENCY LOCATION NUMBER

Location Number shall be placed on: 1. A yellow, type A plate with class 1 flat surface reflective sheeting in accordance with DMS 8600. The color of numbers shall be black. or 2: A green or blue plate with white numbers attached to post beside the object marker. Other contrasting color configuration, as approved , may be used. (Use Same type plate as used for the type 2 Object Marker. Recommended sign size is 6" by 15")

TYPICAL MAILBOX SIZE				LIGHT WEIGHT MATERIAL	
				SHEET METAL	**PLASTIC
SIZE	LENGTH (INCHES)	WIDTH (INCHES)	HEIGHT (INCHES)	MAXIMUM WEIGHT (POUNDS)	
SMALL	19 1/2	6	7	5	5
MEDIUM	22 1/2	8	11 1/2	7	7
LARGE	23 1/2*	11 1/2*	13 1/2*	10	10

* Maximum allowed dimensions for mailbox
** Excluding Molded Plastic on 4 X 4 Post

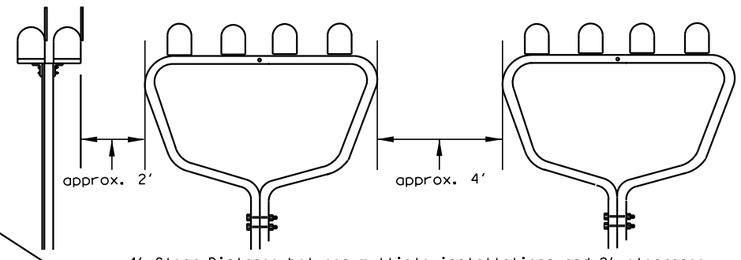
LOCKABLE ARCHITECTURAL MAILBOX SIZE (INCHES)					
VIEW	TOP	BOTTOM	FRONT SIDE	BACK SIDE	WEIGHT (POUNDS)
SIDE	18	15	18.3	15	22.4
BACK	11 1/2	11 1/2		15	

SEE TOP RIGHT CORNER OF SHEET 2 OF 4

MAILBOX SIZES

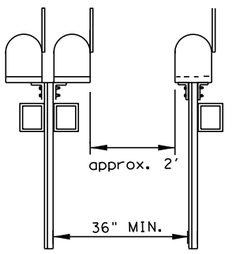
Mailboxes shall be made of light weight sheet metal or light weight plastic.
Lockable architectural mailboxes shall meet the requirements of the above table.

Heavy steel, cast iron or decorative mailboxes shall not be used on the state highway system.



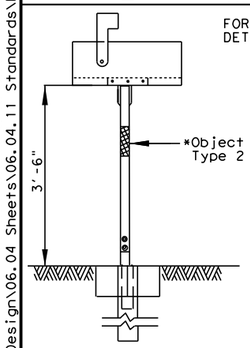
4' Clear Distance between multiple installations and 2' clearance between double or single installations and the multiple installation. DHT #'s 164116 or 149339.

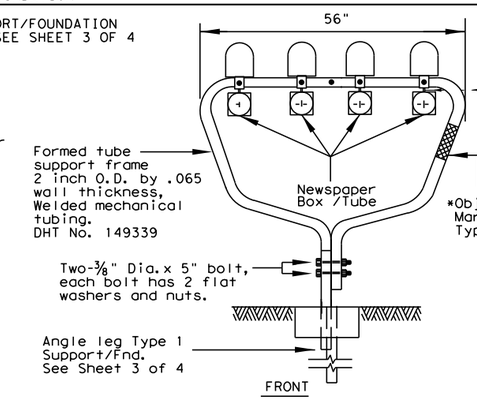
MULTIPLE MAILBOX PLACEMENT

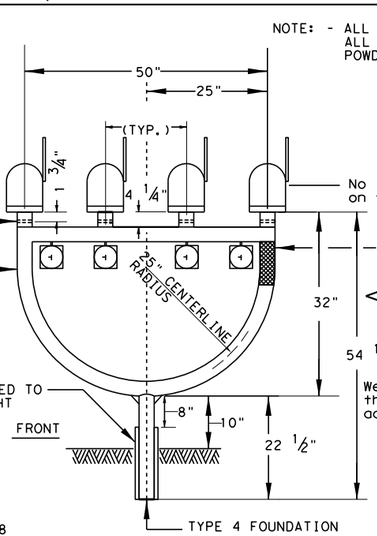


Clear Distance between single or double mounted posts. (Normally when 3 or more mailboxes are in one location, a multiple support is used).

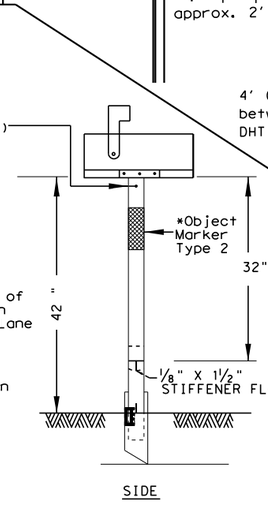
SINGLE & DOUBLE MAILBOX PLACEMENT

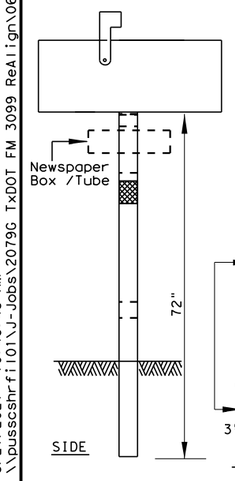


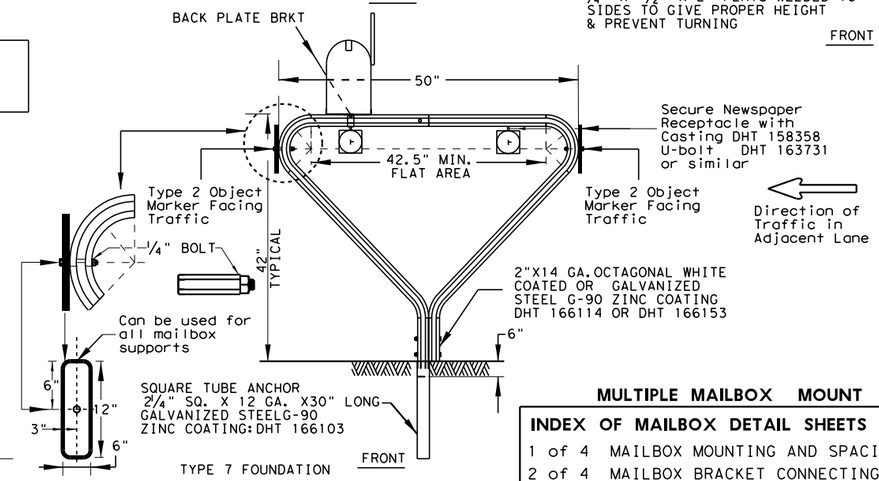




NOTE: - ALL WELDS 1/4" AROUND ALL JOINTS.
POWDERCOAT WHITE







DOUBLE AND MULTIPLE MAILBOX MOUNT

FOR SUPPORT/FOUNDATION DETAILS SEE SHEET 3 OF 4
FOR DHT NUMBERS SEE SHEET 4 OF 4

NEWSPAPER RECEPTACLE

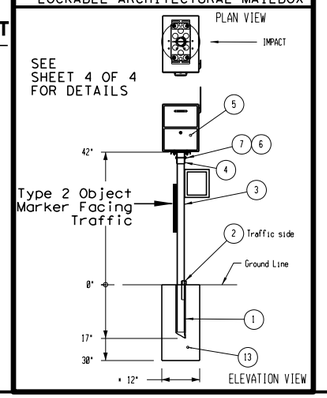
A light weight receptacle for newspaper delivery can be attached to mailbox posts as shown on this page if the receptacle:

- Does not touch the mailbox.
- Does not present a hazard to traffic or delivery of the mail.
- Does not extend beyond the front of the mailbox.
- Does not display advertising, except the publication title.
- Newspaper receptacles on separate supports are prohibited.

MULTIPLE MAILBOX MOUNT

INDEX OF MAILBOX DETAIL SHEETS

LOCKABLE ARCHITECTURAL MAILBOX



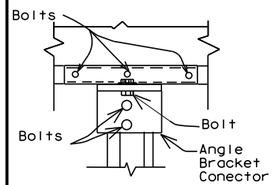
Texas Department of Transportation — Maintenance Division Standard

MAILBOX MOUNTING AND SPACING

MB-15(1)

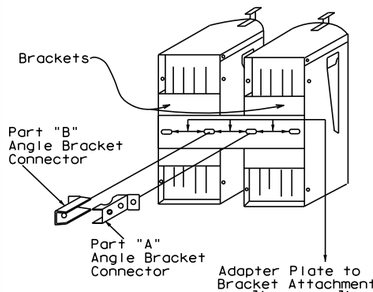
FILE: MB14(1).DGN	DN: JEO	CK: JEO	DW:	CK:
© TxDOT APRIL 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS: Added additional newspaper receptacle for double mailbox support	3469	01	014,	FM 3099
	DIST	COUNTY		SHEET NO.
	BWD	STEPHENS		91

DATE: 8/27/2021 10:46:49 AM
FILE: \\pusscshrfi101\J-Jobs\20796 TxDOT FM 3099 ReAlign\06.00 Design\06.04 Sheets\06.04.11 Standards\ROADWAY STD\MB15(1).dgn



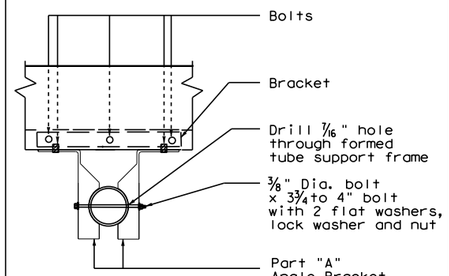
For bolt sizes see details below for "SMALL MAILBOX" and "MEDIUM AND LARGE MAILBOXES"

SINGLE MAILBOX

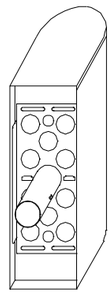


(Not permitted for Large Mailboxes)

DOUBLE MAILBOX

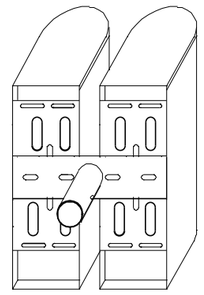


MULTIPLE MAILBOX



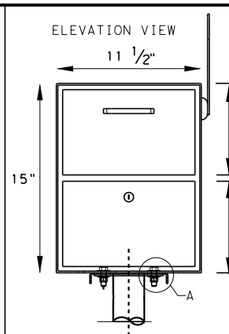
To be used with 2⅜" OD RR or thinwall Steel posts.

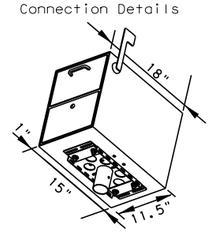
WELDED SINGLE MAILBOXBRACKET

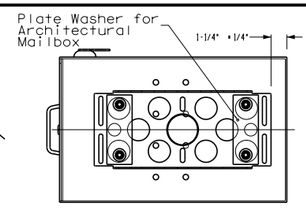


To be used with thinwall Steel posts. Not to be used with RR posts.

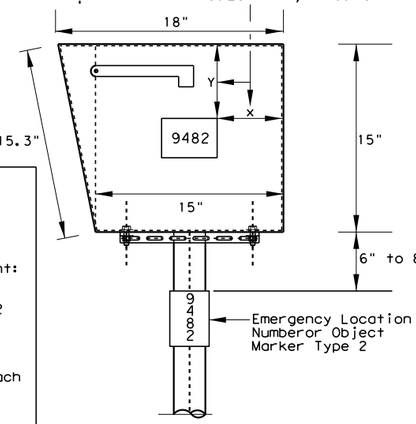
WELDED DOUBLE MAILBOX BRACKET WITHADAPTER PLATE







Preferred placement of Emergency Location Number
X~5.25" min; Y~5.75" min



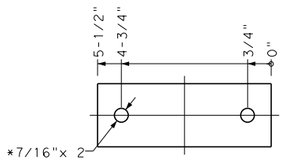
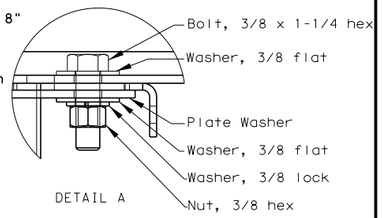
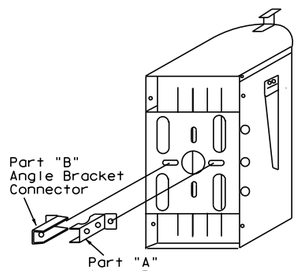
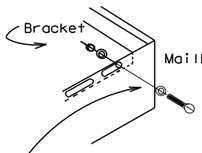


Plate Washer for Architectural Mailbox Plate, 2" x 1/8" ASTM A36 Steel



LOCKABLE ARCHITECTURAL MAILBOX CONNECTION DETAILS



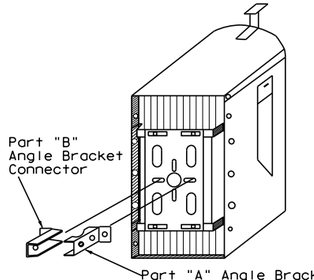


Bracket to mailbox attachment:
6 - ¼" Dia. x ¾" bolt w/ 2 flat washers and nut per each bolt.

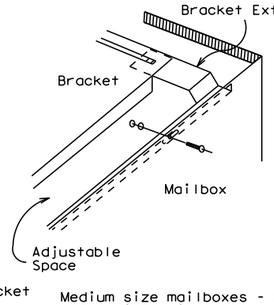
Angle to bracket attachment:
2 - ⅜" Dia. x ¾" bolt with 2 flat washers, lock washer and nut per each bolt.

Angle to
2 - ⅜" Dia. x 2½" bolt with 2 flat washers, lock washer and nut per each bolt.

SMALL MAILBOX



Use both Parts "A" and "B" Angle Bracket Connectors for Winged Channel Posts



Bracket to mailbox attachment:
6 - ¼" Dia. x ¾" bolt w/2 flat washers and nut per each bolt.

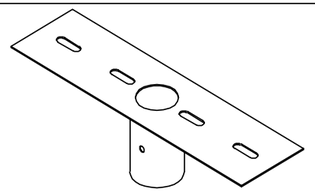
Bracket to bracket extension attachment:
2 - ¼" Dia. x ¾" carriage bolt w/ flat washer, lock washer and nut per bolt (4 bolts required if 2 bracket extensions are used).

Angle to bracket attachment:
2 - ⅜" Dia. x ¾" bolt w/2 flat washers, lock washer and nut per each bolt.

Angle to mailbox support attachment:
2 - ⅜" Dia. x 2½" bolt w/2 flat washers, lock washer, and nut per each bolt.

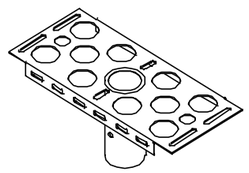
Medium size mailboxes - one extension bracket
Large size mailboxes - two extension brackets

MEDIUM AND LARGE MAILBOXES



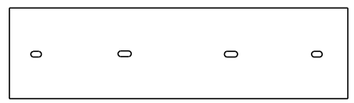
DHT 162323

For use with galvanized thinwall steel posts DHT # 143426 or powder-coated thinwall steel post DHT # 162911.



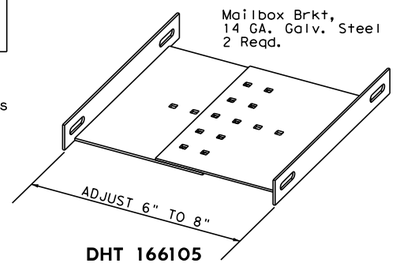
DHT 161443

For use with RCR post DHT # 161442 or galvanized thinwall steel post DHT # 143426 or powder-coated thinwall steel post. DHT # 162911.

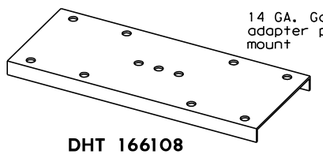


DHT #3789

Used for mounting two Mailboxes on the same post.



DHT 166105

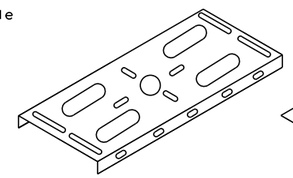


14 GA. Galv. Steel adapter plate for double mount

DHT 166108

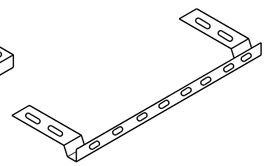
HARDWARE AT TXDOT REGIONAL WAREHOUSES

Brackets and adapter plate shown in this section should be available to the Contractor when stated elsewhere in plans or specifications.



DHT 148939

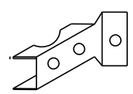
Mailbox Bracket



DHT 148938

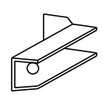
Used for extending 6" wide bracket to attach larger mailboxes.

Bracket Extension



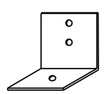
DHT 159489

Part "A" Angle Bracket Connector



DHT 159490

Part "B" Angle Bracket Connector



DHT 2917

Angle Bracket For Temporary Mailbox

See Table of Applicable DHT Numbers on sheet 4 of 4 for DHT description and unit of measure.

GENERAL NOTES

1. Connecting hardware detailed on this sheet is for the hardware that the Department stocks at the Regional Warehouses. This hardware is available to the contractor only when so stated elsewhere in the plans or specification.
2. Hardware for mounting mailboxes to the support/foundation furnished by industry should be used when shown on the Maintenance Divisions "Approved Products List." Only mailbox hardware that have been crash tested in accordance with NCHRP Report 350, will be on the approved list.
3. Hardware furnished by industry shall be erected in accordance with the manufacturer's recommendation.
4. Bracket and bracket extension shall be constructed of 14 gauge galvanized steel sheet metal.
5. The angles, brackets and adapter plates shall be constructed of 12 gauge galvanized steel sheet metal.
6. Items with evidence of damage to the galvanized coating or wet storage stains (white rust) will not be accepted.

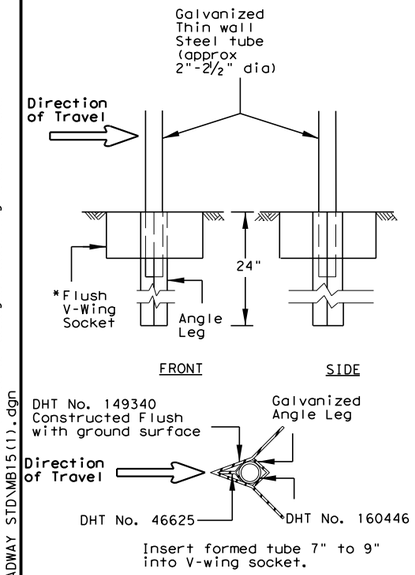
Texas Department of Transportation | Maintenance Division Standard

MAILBOX BRACKET CONNECTING DETAILS

MB-15(1)

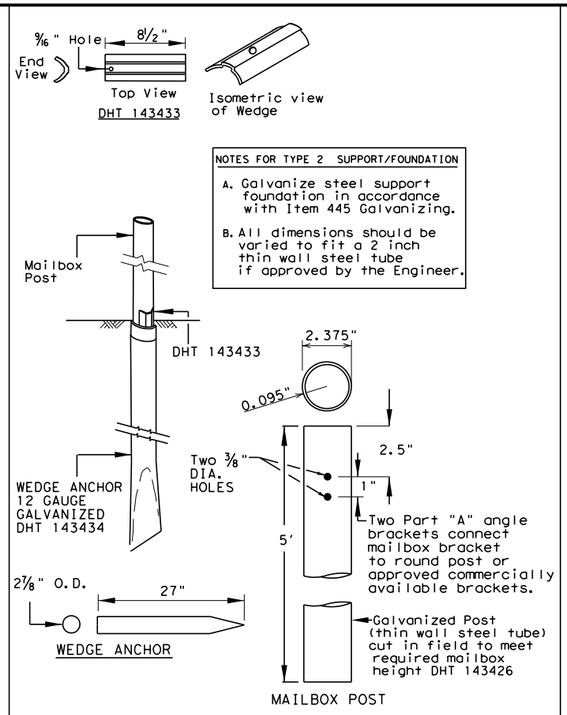
FILE: MB14(1).DGN	DN: JEO	CK:	DW: JEO	CK:
©TxDOT APRIL 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS ADDED DHT 163730	3469	01	014,	FM 3099
	DIST	COUNTY		SHEET NO.
	BWD	STEPHENS		92

DATE: 8/27/2021 10:46:50 AM
FILE: \\pussscshrfil01\J-Jobs\2079G TxDOT FM 3099 ReAlign\06.00 Design\06.04 Sheets\06.04.11 Standards\ROADWAY STD\MB15(1).dgn



TYPE 1 SUPPORT/FOUNDATION

THIN WALL STEEL TUBE w/ V-LOC ANCHORAGE



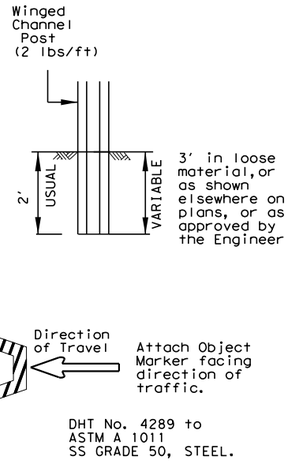
NOTES FOR TYPE 2 SUPPORT/FOUNDATION

A. Galvanize steel support foundation in accordance with Item 445 Galvanizing.

B. All dimensions should be varied to fit a 2 inch thin wall steel tube if approved by the Engineer.

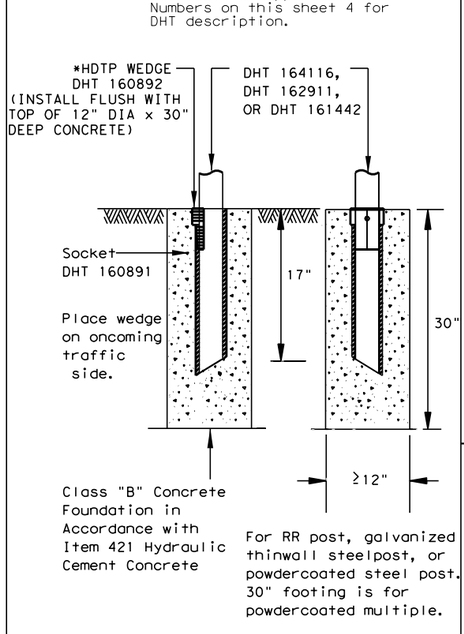
TYPE 2 SUPPORT/FOUNDATION

THIN WALL STEEL TUBE w/ WEDGE ANCHOR SYSTEM



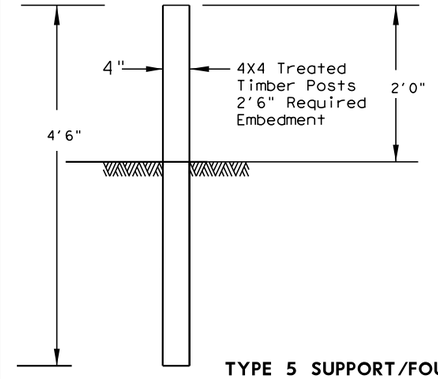
TYPE 3 SUPPORT/FOUNDATION

WINGED CHANNEL POST



TYPE 4 SUPPORT/FOUNDATION

FOR WHITECOATED STEEL POST, MULTIPLE POST, AND RECYCLED RUBBER.

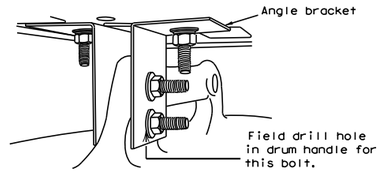


TYPE 5 SUPPORT/FOUNDATION

FOR ONE PIECE MOLDED PLASTIC MAILBOX

ONE PIECE MOLDED PLASTIC MAILBOXES

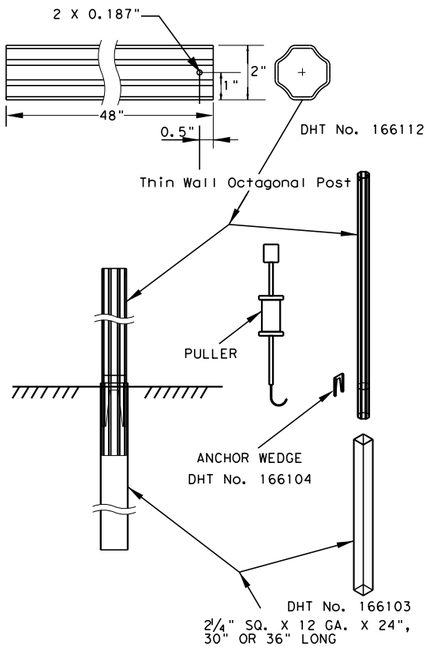
Molded Plastic Mailboxes shall be installed on 4"x4" treated timber posts only. The use of steel pipe or structural tubing in place of timber post is prohibited.



Placed on approved plastic drum as shown in the Compliant Work Zone Traffic Control Devices (CWZTCD).
Existing attachment hardware shall be used unless damaged. Damaged hardware shall be replaced.

TYPE 6 TEMPORARY MAILBOX SUPPORT

CONNECTION DETAIL



TYPE 7 MAILBOX SUPPORT/FOUNDATION

CONNECTION DETAIL

GENERAL NOTES

1. Erect post plumb or vertical.
2. When galvanized part is required galvanize in accordance with Item 445.
3. type 1, 2, 3, 4 or 7 supports or foundation can be used for single or double mailbox installations. The RCR post should be used only for a single installation with a small mailbox. The Type 5 support/foundation is used for the single molded plastic mailbox. The Type 4 support/foundation is used for the 2.375" O.D. RR post, thin wall steel post, and white multiple mailbox post.
4. The Type 1 or type 7 support/foundation can be used for a multiple mailbox mount.
5. The Type 4 support should be used with thin wall steel pipe for the medium, large and double mailbox installations.
6. 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.

MB-(X) ASSM TY (XXX) (X) (XX) (OPTIONAL)

Type of Mailbox
- S = Single
- D = Double
- M = Multiple
- SP = Single 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
- Ty 7 = Wedge Anchor

Type of Bracket
- AB = Angle Bracket.
- TB = 2.375" Tube Bracket

DOUBLE AND LARGE MAILBOXES MUST BE ON STEEL POST.

*HDTP: High density thermoplastic polyesters

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MAILBOX SUPPORT AND FOUNDATION

MB-15(1)

FILE: MB14(1).DGN	DN: JEO	CK:	DW: JEO	CK:
©TxDOT APRIL 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	3469	01	014,	FM 3099
	DIST	COUNTY		SHEET NO.
	BWD	STEPHENS		93

LOCKABLE ARCHITECTURAL MAILBOX

SINGLE-MOUNT INSTALLATION PARTS			
#	PART NAME	PART/DHT #	QTY
1	SOCKET, TYPE 4 FOUNDATION	160891	1
2	WEDGE FOR TYPE 4 FOUNDATION	160892	1
3	THIN-WALL WHITE STEEL TUBE 2.375 OD	162911	1
4	BRACKET FOR ATTACHING MAILBOX	161443	1
5	ARCHITECTURAL MAILBOX	SEE NOTE	1
6	NUT, 5/16" HEX	NUT, 5/16" HEX	1
7	BOLT, 5/16 X 3 HEX	GRADE 5	1
8	PLATE WASHER FOR ARCHITECTURAL MAILBOX	SEE SEE SHEET 2	2
9	WASHER, 3/8 FLAT		8
10	WASHER, 3/8 LOCK		4
11	NUT, 3/8 HEX		4
12	BOLT, 3/8 X 1-1/4 HEX	GRADE 5	4
13	CONCRETE, CLASS B (2000 PSI)		1

LOCKABLE ARCHITECTURAL MAILBOX DETAILS

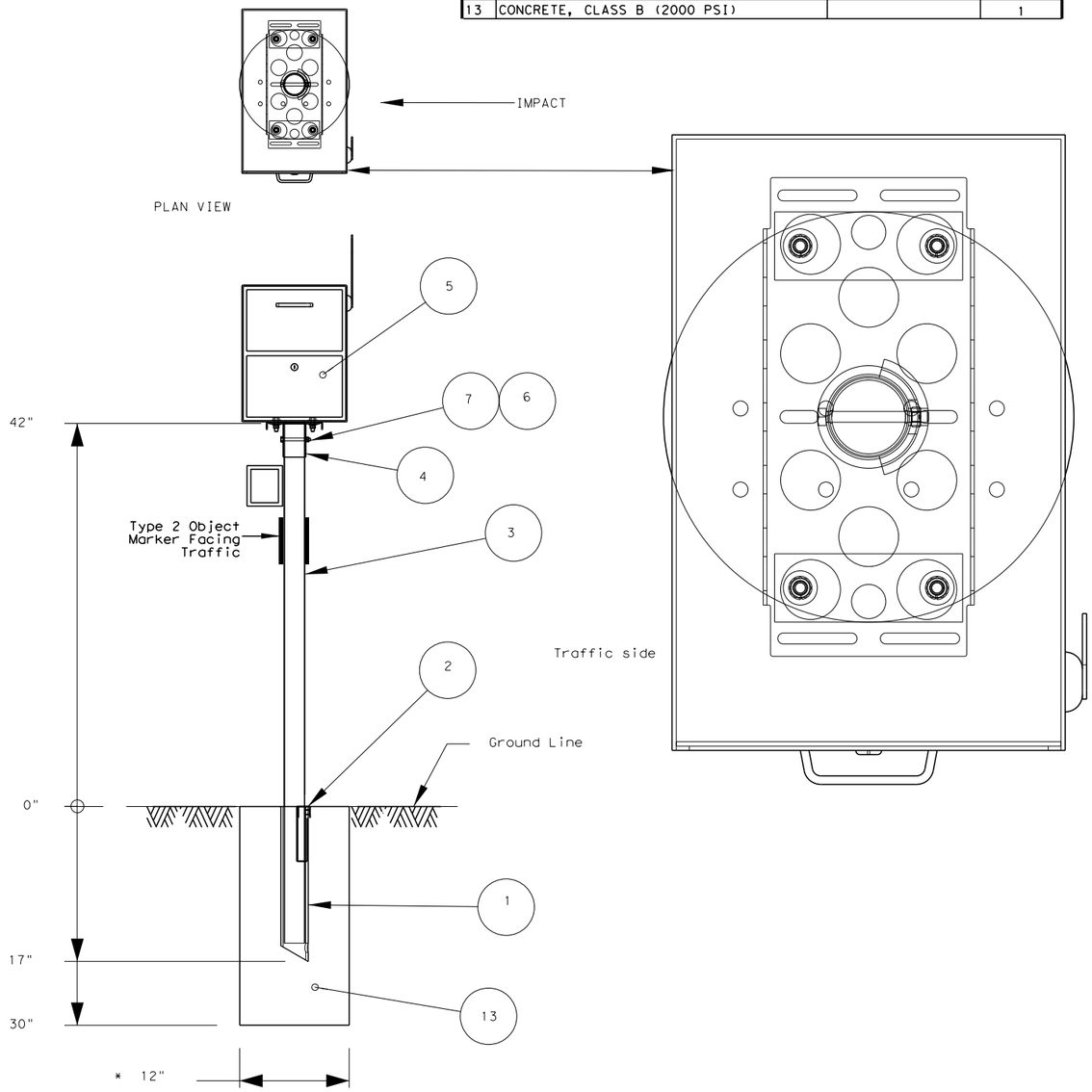

TABLE OF APPLICABLE DHT NUMBERS	
DHT NUMBER	DESCRIPTION
	FOUNDATIONS
46625	WEDGE FOR V-WING SOCKET FOR TYPE 1 FOUNDATION
149340	V-WING SOCKET FOR TYPE 1 FOUNDATION
143433	WEDGE FOR TYPE 2 FOUNDATION
143434	ANCHOR FOR TYPE 2 FOUNDATION
166103	ANCHOR FOR TYPE 7 FOUNDATION
160891	SOCKET FOR TYPE 4 FOUNDATION
160892	WEDGE FOR TYPE 4 FOUNDATION
166104	WEDGE FOR TYPE 7 FOUNDATION
	POSTS
4289	WINGED CHANNEL MAILBOX POST
149339	MULTIPLE MAILBOX POST (GALVANIZED TUBING)
164116	MULTIPLE MAILBOX POST (WHITE COATED)
166114	MULTIPLE MAILBOX POST (WHITE COATED OCTAGONAL)
166153	MULTIPLE MAILBOX POST (GALVANIZED OCTAGONAL)
161442	RECYCLED RUBBER POST. FOR SMALL MAILBOX ONLY
143426	THIN-WALL GALVANIZED STEEL TUBE 2.375" OUTER DIAMETER
162911	THINWALL WHITE STEEL TUBE 2.375" OUTER DIAMETER
166152	SINGLE OR DOUBLE THIN-WALL MAILBOX POST GALVANIZED 2" OCTAGONAL
166112	SINGLE OR DOUBLE THIN-WALL MAILBOX POST WHITECOATED 2" OCTAGONAL
	REFLECTIVE SHEETING
161812	REFLECTIVE SHEETING FOR EMERGENCY LOCATION NUMBER PANEL
	CONNECTING HARDWARE
2917	ANGLE BRACKET USED FOR TEMPORARY MAILBOX SUPPORT
166105	BRACKET FOR SINGLE MOUNTING OF MAILBOXES (MOUNTING KIT)
3789	PLATE FOR DOUBLE MOUNTING OF MAILBOXES
166108	BRACKET FOR DOUBLE MOUNTING OF MAILBOXES (MOUNTING KIT)
166111	BRACKET FOR MULTIPLE MOUNTING OF MAILBOXES (MOUNTING KIT)
148939	BRACKET FOR ATTACHING SMALL OR MEDIUM SIZE MAIL BOX
148938	EXTENDER TO BRACKET FOR ATTACHING LARGE MAILBOX
159489	ANGLE BRACKET PART A
159490	ANGLE BRACKET PART B
162323	BRACKET FOR DOUBLE MOUNTING OF MAILBOXES ON THINWALL STEEL POST, GALVANIZED OR POWDERCOATED.
161443	BRACKET FOR ATTACHING MAILBOX TO RECYCLED RUBBER POST AND TO MULTIPLE WHITE MAILBOX POST
158358	CASTING (NEWSPAPER RECEPTACLE BRACKET)
163731	U-BOLT (NEWSPAPER RECEPTACLE BRACKET)
160698	BOLT;HEX HEAD, GALV;3/8"DIA X 3/4"L HD, W/2-FLAT WASHERS
163750	BOLT;HEX HEAD, GALV;3/8" X 1-1/2, 16 NC, W/WASHERS
160701	BOLT;HEX HEAD, GALV;3/8"DIA X 2-1/2"L, HD, W/2-FLAT WASHERS
163730	BOLT;HEX HEAD, GALV;3/8" X 3-1/2", NC, W/NUT, 2 FLAT WASHERS
160699	BOLT;HEX HEAD, GALV;3/8"DIA X 3-3/4"L HD, W/2-FLAT WASHERS
160700	BOLT;HEX HEAD, GALV;3/8"DIA X 4"L HD, W/2-FLAT WASHERS

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Texas Department of Transportation — Maintenance Division Standard

DHT NUMBERS TABLE

MB-15(1)

FILE:MB14(1).DGN	DN:	CK:	DW:	CK:
© TxDOT APRIL 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	3469	01	014,	FM 3099
	DIST	COUNTY		SHEET NO.
	BWD	STEPHENS		94

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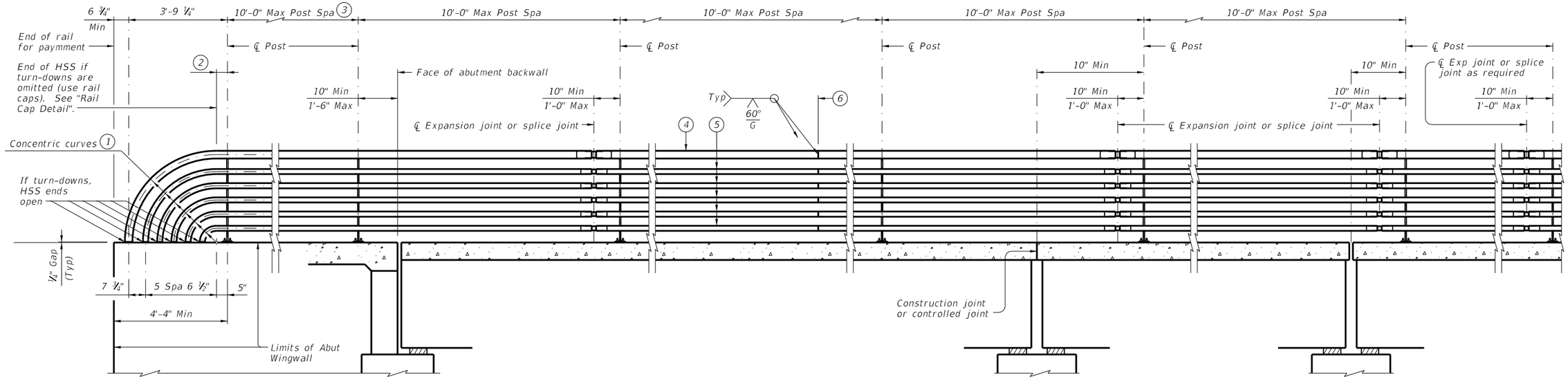


AT ABUTMENTS

AT BENTS WITHOUT SLAB EXP JOINTS

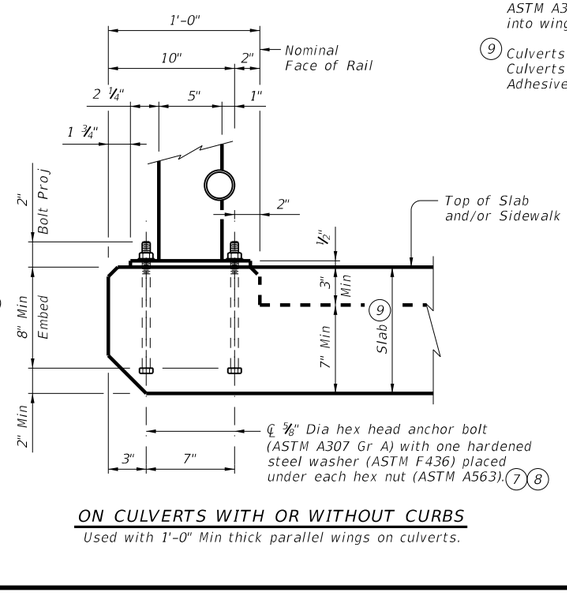
AT BENTS WITH SLAB EXP JOINTS

ROADWAY ELEVATION OF RAIL

ON BRIDGE SLAB

SECTION A-A

Showing base plate detail.



WASHER PLATE DETAIL

ON ABUTMENT WINGWALLS OR CIP RETAINING WALLS

ON CULVERTS WITH OR WITHOUT CURBS

Used with 1'-0" Min thick parallel wings on culverts.

SECTIONS THRU RAIL

(1) Portion of railing with turn-downs to be used or omitted as indicated on Bridge Layout.

(2) 10" Min ~ 1'-6" Max if turn-downs are omitted.

(3) Min of 2 posts required on wingwall.

(4) HSS 3.500 x 0.216 (Rail Member)

(5) HSS 2.375 x 0.154 (Rail Member)

(6) One shop splice per panel is permitted (with minimum 85 percent penetration). The weld may be square groove or single vee groove. Grind smooth.

(7) At Contractor's option, adhesive anchors may be used. Adhesive anchors must be ⅞" Dia ASTM A307 Grade A fully threaded rods. Minimum adhesive anchor embedment depth is 5" into slabs or culverts without curbs. See "Material Notes" for adhesive anchor requirements.

(8) At Contractor's option, adhesive anchors may be used. Adhesive anchors must be ⅞" Dia ASTM A307 Grade A fully threaded rods. Minimum adhesive anchor embedment depth is 7" into wingwalls or culverts with curbs. See "Material Notes" for adhesive anchor requirements.

(9) Culverts without curbs for cast-in-place anchor bolts require a 10" Min slab thickness. Culverts with curbs for cast-in-place anchor bolts require a curb plus slab thickness of 10" Min. Adhesive anchors may be used with a 7" Min slab thickness or culverts with curbs.

Texas Department of Transportation

Bridge Division Standard

PEDESTRIAN RAIL

TYPE PR11

FILE: r1std028-19.dgn	DN: TAR	CK: TBE	DW: JTR	CK: TAR
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	3469	01	014,	FM 3099
	DIST	COUNTY		SHEET NO.
	BWD	STEPHENS		95

DATE: 2/9/2021 12:42:38 PM
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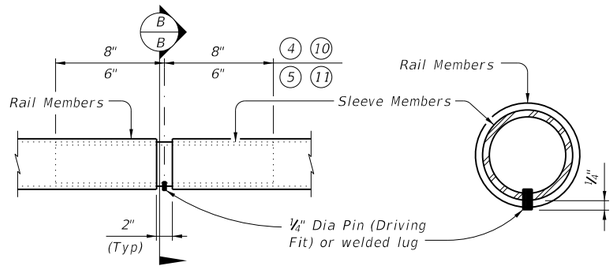
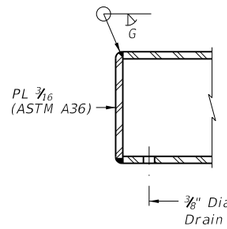
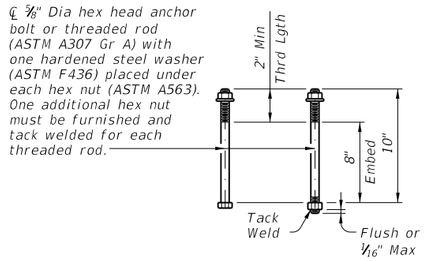


AT SPLICES OR EXP JTS SECTION B-B

PIPE SPLICE DETAIL



RAIL CAP DETAIL



CAST-IN-PLACE & FORMED HOLE ANCHOR BOLT OPTIONS

④ HSS 3.500 x 0.216 (Rail Member)
⑤ HSS 2.375 x 0.154 (Sleeve Member)
⑩ HSS 2.875 x 0.203 (Sleeve Member)
⑪ HSS 1.900 x 0.145 (Sleeve Member)

CONSTRUCTION NOTES:

Panel lengths of railing must be attached to a minimum of three posts except at abutment wingwalls.

At the Contractor's option anchor bolts may be an adhesive anchorage 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.

Face of rail and posts must be vertical transversely unless otherwise approved. Posts must be perpendicular to adjacent roadway grade. Use Type VIII epoxy mortar under post base plates if gaps larger than 1/16" exist.

For curved railing applications, fabricate the HSS rail to the radius when the radius is 600' or less. Submit shop drawings for approval when tubes are required to be fabricated to a radius. Shop drawings must be submitted to the Engineer for approval.

Round or chamfer all exposed edges of steel components 1/16" by grinding prior to galvanizing.

MATERIAL NOTES:

Provide ASTM A500 Gr B, A1085 or A53 Gr B for all HSS.

Galvanize all metal components of steel rail system. Apply additional coatings when shown elsewhere on the plans. When plans require paint over galvanizing, follow the requirements for painting galvanized steel in Item 445, "Galvanizing" and when field painting, Item 446, "Field Cleaning and Painting Steel". Sleeve members and anchor bolts must receive galvanization prior to installation and only field paint after installation unless directed otherwise by Engineer.

Anchor bolts must be ⅞" Dia ASTM A307 Gr A with one hardened steel washer (ASTM F436) placed under each hex nut or ASTM A307 Gr A threaded rods with one tack welded hex nut each and with one hex nut with one hardened steel washer (ASTM F436) each. Nuts must conform to ASTM A563 requirements.

Optional adhesive anchorage system must be ⅞" Dia ASTM A307 Gr A fully threaded rods with one hex nut and one hardened steel washer (ASTM F436). Nuts must conform to ASTM A563 requirements. Embed fully threaded rods into slab, wingwalls, or culvert curbs using a Type III, Class C, D, E, or F anchor adhesive. Anchor adhesive chosen must be able to achieve a nominal bond strength in tension, Na, of a single anchor of 10 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".

GENERAL NOTES:

Designed according to AASHTO LRFD Specifications.

Do not use this railing on bridges with expansion joints providing more than 5" movement.

Rail anchorage details shown on this standard may require modification for select structure types. See appropriate details elsewhere in plans for these modifications.

For all rails, submit erection drawings showing section lengths, splice locations, rail post spacing and anchor bolt setting for approval.

Average weight of railing is 30 plf.

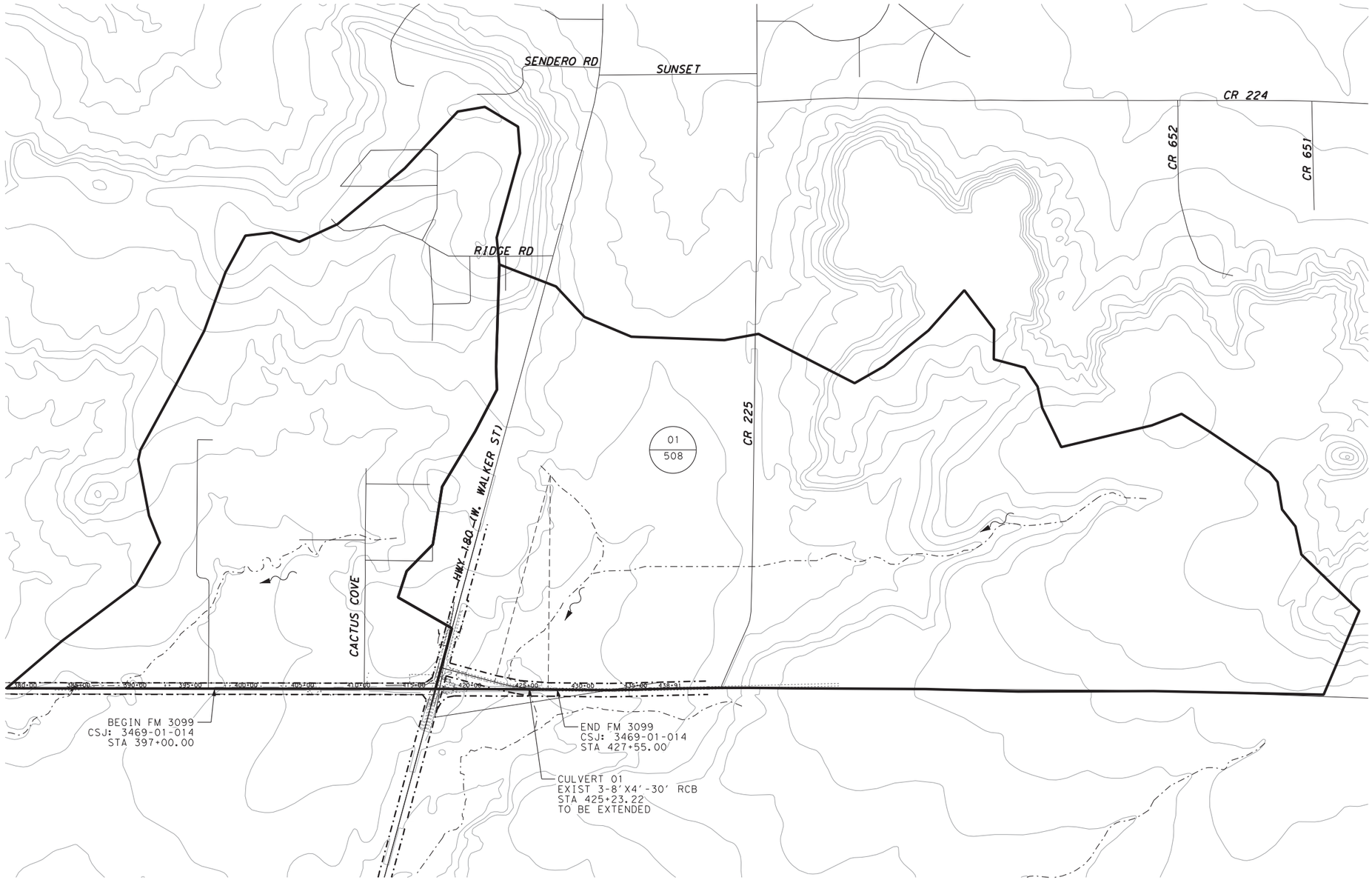
Texas Department of Transportation | Bridge Division Standard

PEDESTRIAN RAIL

TYPE PR11

FILE: rlstd028-19.dgn	DN: TAR	CK: TBE	DW: JTR	CK: TAR
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	3469	01	014,	FM 3099
	DIST	COUNTY		SHEET NO.
	BWD	STEPHENS		96

100% SUBMITTAL



LEGEND:

- 1 / XXX.X — DRAINAGE AREA ID / DRAINAGE AREA (ACRES)
- FLOW DIRECTION
- DRAINAGE AREA BOUNDARY
- EXISTING ROW
- ROAD

0 750 1500 3000

SCALE: 1"=1500'H

HYDROLOGIC CALCULATIONS															
NRCS Curve Number Method (Area >200 ac)															
EXISTING CONDITIONS															
Drainage Area-ID	Area (Ac)	Lag (min)	CN Composite	P (in)						Q (cfs)					
				2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
DA-01	508	50	86.7	3.36	4.30	5.13	6.35	7.34	8.44	247	353	449	590	705	833
PROPOSED CONDITIONS															
Drainage Area-ID	**Area (Ac)**	**Lag (min)**	**CN Composite**	**P (in)**						**Q (cfs)**					
				2-yr	**5-yr**	**10-yr**	**25-yr**	**50-yr**	**100-yr**	**2-yr**	**5-yr**	**10-yr**	**25-yr**	**50-yr**	**100-yr**
DA-01	508	50	86.8	3.36	4.30	5.13	6.35	7.34	8.44	248	354	450	591	706	834

Notes:

1. NRCS Curve Number Method in HEC-HMS version 4.4 was used to compute the peak flows

CULVERT CAPACITY		
TOP ROAD PGL & EOP (ft)		LEVEL OF SERVICE
EXISTING CONDITIONS		
PGL	EOP	(YR)
1230.42	1229.98	25

PROPOSED CONDITIONS		
PGL	EOP	(YR)
1230.96	1230.48	25

NO.	REVISION	BY	DATE

STATE OF TEXAS
WAN ZHANG
98668
LICENSED PROFESSIONAL ENGINEER

wan zhang

08/27/2021

ENTECH CIVIL ENGINEERS, INC
F-6932
15021 Katy Freeway, Suite 500
Houston, Texas, 77094
281-945-0069 Ph
281-945-0081 FX

FM 3099 REALIGNMENT

DRAINAGE AREA MAP

SHEET 1 OF 1

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
06	SEE TITLE SHEET		97
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

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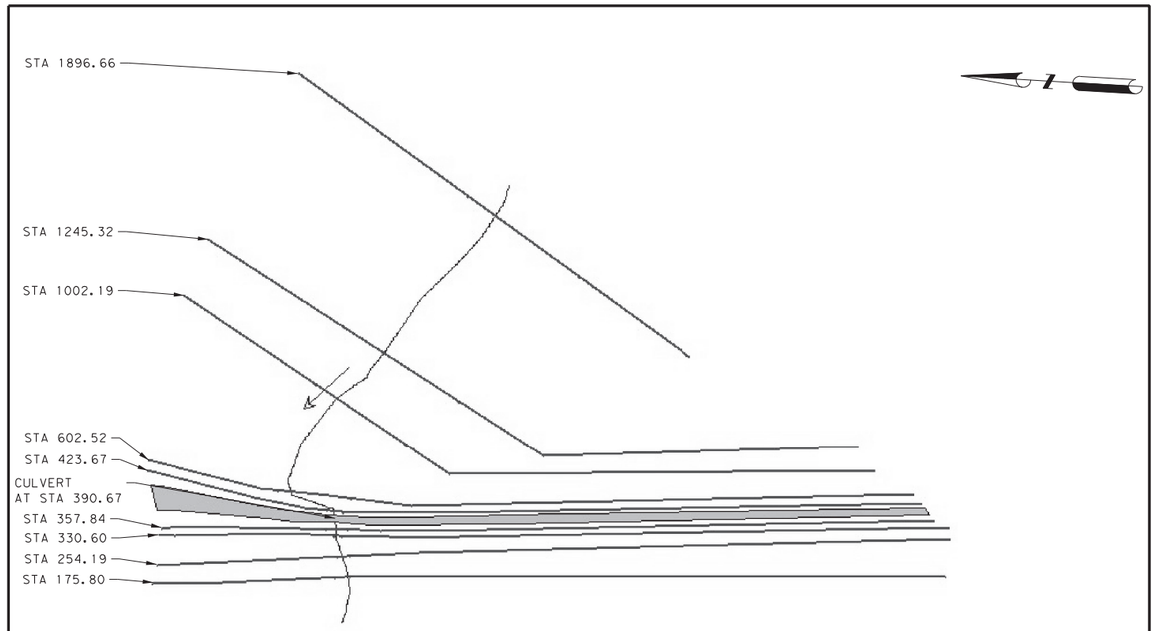
100% SUBMITTAL

HEC-RAS RESULTS

HEC-RAS STATION	STORM FREQUENCY	FLOW (CFS)	COMPUTED WATER SURFACE ELEVATIONS (FT)			VELOCITY (FT/S)	
			EXISTING	PROPOSED	DIFFERENCE	EXISTING	PROPOSED
1896.66	2-YEAR	248	1238.08	1238.17	0.09	1.96	1.67
	5-YEAR	354	1238.25	1238.25	0.00	2.07	2.07
	10-YEAR	450	1238.38	1238.38	0.00	2.13	2.13
	25-YEAR	591	1238.57	1238.57	0.00	2.11	2.11
	50-YEAR	706	1238.66	1238.66	0.00	2.21	2.22
	100-YEAR	834	1238.75	1238.75	0.00	2.36	2.36
1245.32	2-YEAR	248	1234.27	1234.11	-0.16	2.11	2.69
	5-YEAR	354	1234.44	1234.44	0.00	2.39	2.40
	10-YEAR	450	1234.57	1234.57	0.00	2.64	2.65
	25-YEAR	591	1234.86	1234.86	0.00	2.53	2.52
	50-YEAR	706	1234.98	1234.98	0.00	2.59	2.59
	100-YEAR	834	1235.08	1235.08	0.00	2.75	2.76
1002.19	2-YEAR	248	1231.54	1231.71	0.17	3.51	2.38
	5-YEAR	354	1231.65	1231.65	0.00	3.86	3.85
	10-YEAR	450	1231.74	1231.74	0.00	4.07	4.06
	25-YEAR	591	1231.86	1231.86	0.00	4.31	4.31
	50-YEAR	706	1231.94	1231.94	0.00	4.48	4.49
	100-YEAR	834	1232.01	1232.01	0.00	4.71	4.71
602.52	2-YEAR	248	1229.07	1228.77	-0.30	1.19	1.86
	5-YEAR	354	1229.38	1229.16	-0.22	1.23	1.53
	10-YEAR	450	1229.59	1229.50	-0.09	1.30	1.41
	25-YEAR	591	1230.07	1230.06	-0.01	1.20	1.21
	50-YEAR	706	1230.55	1230.59	0.04	1.08	1.06
	100-YEAR	834	1230.80	1231.17	0.37	1.12	0.95
423.67 (U/S)	2-YEAR	248	1227.83	1228.21	0.38	6.15	2.67
	5-YEAR	354	1228.17	1228.64	0.47	6.71	3.11
	10-YEAR	450	1228.96	1229.13	0.17	4.52	2.97
	25-YEAR	591	1229.88	1229.91	0.03	2.67	2.33
	50-YEAR	706	1230.45	1230.51	0.06	2.15	1.95
	100-YEAR	834	1230.72	1231.12	0.40	2.17	1.74
390.67	**EXISTING CULVERT: 3-8'x4'-30' RCB TO BE EXTENDED**						
357.84 (D/S)	2-YEAR	248	1227.92	1227.89	-0.03	3.73	2.68
	5-YEAR	354	1228.07	1227.99	-0.08	4.68	3.61
	10-YEAR	450	1228.18	1228.09	-0.09	5.46	4.30
	25-YEAR	591	1228.35	1228.22	-0.13	6.23	5.25
	50-YEAR	706	1228.64	1228.30	-0.34	5.85	5.95
	100-YEAR	834	1228.85	1228.37	-0.48	5.67	6.73
330.60	2-YEAR	248	1227.63	1227.63	0.00	4.66	4.67
	5-YEAR	354	1227.75	1227.75	0.00	5.01	5.02
	10-YEAR	450	1227.85	1227.85	0.00	5.36	5.37
	25-YEAR	591	1227.96	1227.96	0.00	5.68	5.68
	50-YEAR	706	1228.04	1228.04	0.00	5.91	5.91
	100-YEAR	834	1228.13	1228.13	0.00	6.14	6.14
254.19	2-YEAR	248	1226.76	1226.76	0.00	2.59	2.58
	5-YEAR	354	1226.93	1226.93	0.00	2.00	2.00
	10-YEAR	450	1227.03	1227.03	0.00	2.25	2.25
	25-YEAR	591	1227.16	1227.16	0.00	2.58	2.59
	50-YEAR	706	1227.25	1227.25	0.00	2.80	2.80
	100-YEAR	834	1227.37	1227.37	0.00	3.01	3.01
175.80	2-YEAR	248	1226.19	1226.20	0.01	2.31	2.31
	5-YEAR	354	1226.38	1226.38	0.00	1.90	1.90
	10-YEAR	450	1226.49	1226.49	0.00	1.95	1.95
	25-YEAR	591	1226.62	1226.62	0.00	2.23	2.23
	50-YEAR	706	1226.71	1226.71	0.00	2.42	2.42
	100-YEAR	834	1226.84	1226.84	0.00	2.66	2.66



HEC-RAS CROSS SECTIONAL LAYOUT

NOTES:

1. HEC-RAS (Version 5.0.7) was used to compute the water surface elevations of each outfall.
2. The flow input in HEC-RAS was computed from the Hydrologic Calculations table located in Sheet 1 of 1 "DRAINAGE AREA MAP".

NO.	REVISION	BY	DATE

STATE OF TEXAS
WAN ZHANG
98668
LICENSED
PROFESSIONAL ENGINEER

wanzhang 08/27/2021

ENTECH CIVIL ENGINEERS, INC
F-6932
15021 Katy Freeway, Suite 500
Houston, Texas, 77094
281-945-0069 Ph
281-945-0081 Fx

Texas Department of Transportation®

FM 3099 REALIGNMENT

HYDRAULIC DATA SHEET
(CULVERT AT STA 425+23.22)

SHEET 1 OF 1

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
06	SEE TITLE SHEET		98
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

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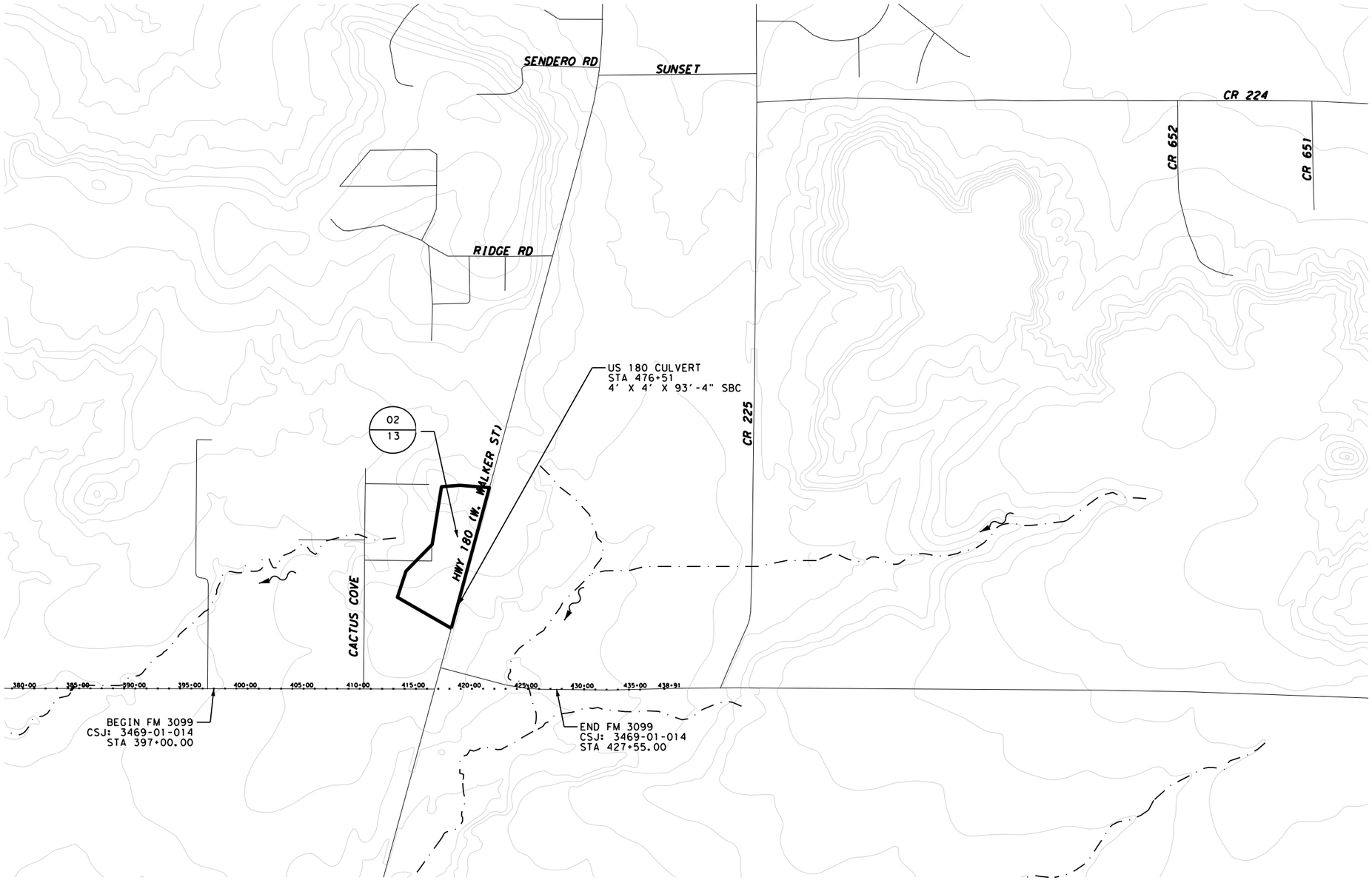

LEGEND:

- XX / XXX.X — DRAINAGE AREA ID / DRAINAGE AREA (ACRES)
- FLOW DIRECTION
- DRAINAGE AREA BOUNDARY
- EXISTING ROW
- ROAD

0 750 1500 3000

SCALE: 1"=1500'H

HYDROLOGY & HYDRAULICS

DA #	LOCATION OF STRUCTURE	C	TC (MIN)	I 10 (IN/HR)	I 100 (IN/HR)	A (ACRE)	Q 10 (CFS)	Q 100 (CFS)	DESCRIPTION	ALLOW HW (FT)	CE	ACTUAL HW^{10} (FT)	TW_{10} (FT)	V_{10} OUT (FT/S)	ACTUAL HW^{100} (FT)	TW_{100} (FT)	V_{100} OUT (FT/S)	Q 10 BACKWATER	Q 100 BACKWATER
02	476+51.00	0.75	10	7.479	11.021	13	73	108	4' X 4' X 93'-4" SBC	5.10	0.7	3.67	1248.23	6.52	5.09	1249.16	7.24	NO IMPACT	NO IMPACT

NOTES: 1. ALL TAILWATER CALCULATIONS WERE CALCULATED USING ONE SECTION METHOD INCLUDED IN HY-8 7.50
2. ALL HEADWATER ELEVATIONS WERE CALCULATED USING HY-8 7.50

STATE OF TEXAS
JASON H. SCANTLING
96633
LICENSED
PROFESSIONAL ENGINEER

11/29/2022

FM 3099
HYDROLOGY AND HYDRAULICS
US 180 CULVERT

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
3469	01	014,	FM 3099
DIST	COUNTY		SHEET NO.
BWD	STEPHENS		99

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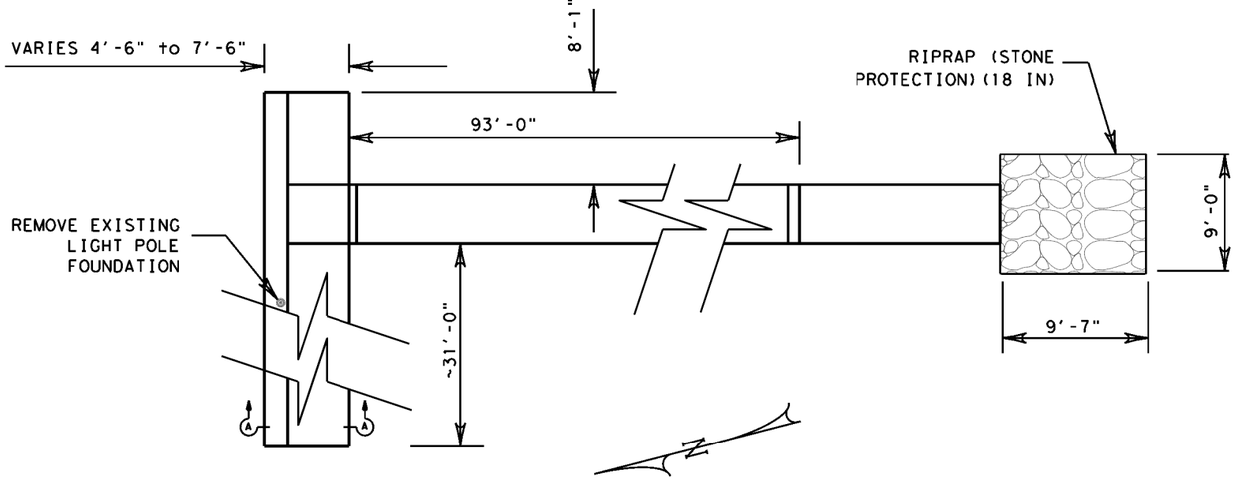
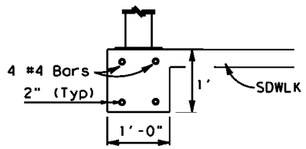


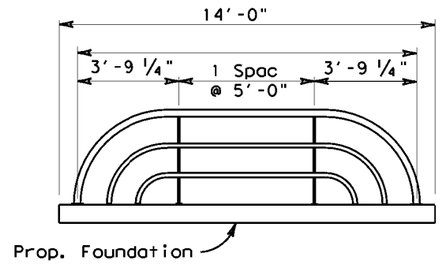
PLAN VIEW TO SHOW LIMITS
OF CONCRETE AND STONE RIP RAP



FOUNDATION DETAIL

LAP SIDEWALK REINFORCING INTO FOUNDATION AND POUR MONOLITHIC.

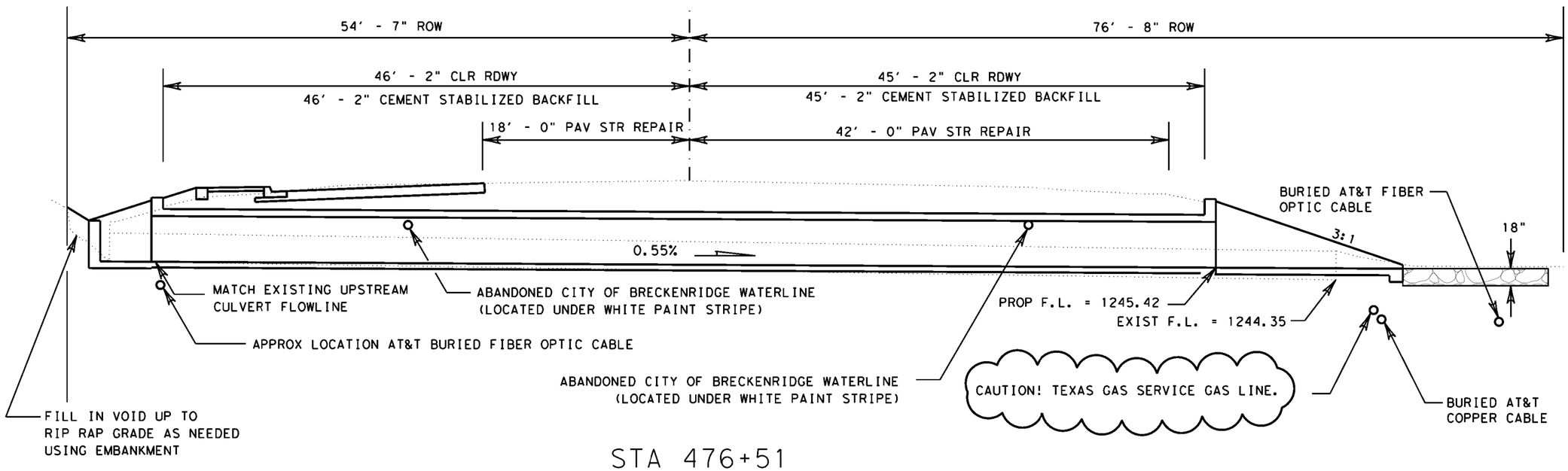
FOUNDATION SHALL BE CL A CONC(MISC).



PEDESTRIAN RAIL LAYOUT

Note:
The left curb shall be 1.00' high.

Note:
The right curb shall be 1.42' high.



STA 476+51

EXIST: 30" X 108' RCP (CL III)CH-II-B
PROP: REMOVE EXISTING 30" X 108' RCP AND PLACE
4' X 4'X 93'-4" SCP-4, SCP-MD, ECD
WITH SPR-DI SPL. UPSTRM AND SETB-CD DWNSTRM

STATE OF TEXAS
JASON H. SCANTLING
96633
LICENSED
PROFESSIONAL ENGINEER

JHS, P.E.

11/29/2022

US 180
CULVERT LAYOUT

SHEET 1 OF 2

CONT	SECT	JOB	HIGHWAY
3469	01	014	FM 3099
DIST	COUNTY		SHEET NO.
BWD	STEPHENS		100

DATE: 11/29/2022 4:37:34 PM
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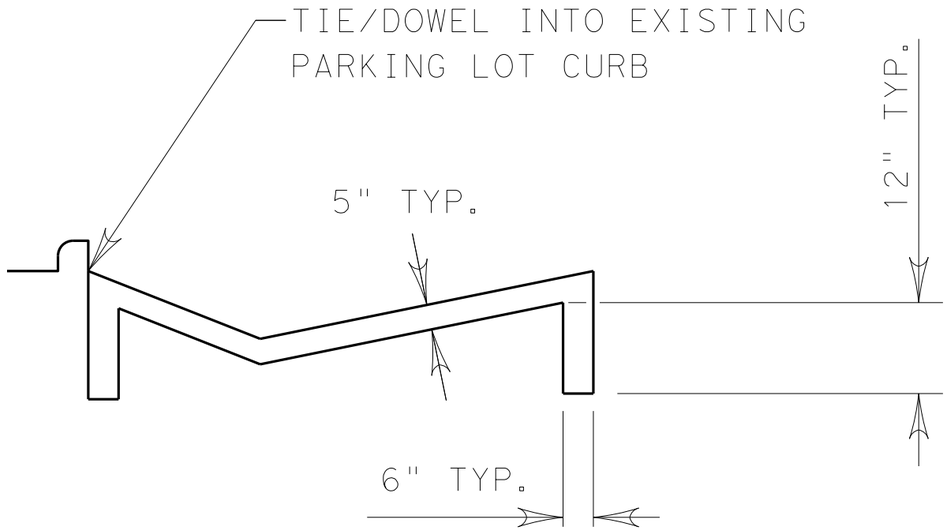
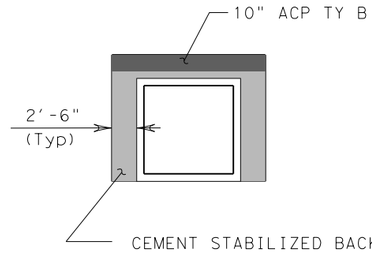


SECTION A-A:
CONCRETE RIP-RAP CROSS SECTION VIEW

ITEM	CODE	DESCRIPTION	QUANT	UNIT	FINAL
0132	6006	EMBANKMENT(FINAL)(DENS COMP)(TY C)	105.0	CY	
0351	6006	FLEXIBLE PAVEMENT STRUCTURE REPAIR (10 IN)	68.0	SY	
0400	6005	CEM STABIL BKFL	134.0	CY	
0402	6001	TRENCH EXCAVATION PROTECTION	93.0	LF	
0420	6002	CL A CONC (MISC)	0.5	CY	
0420	6054	CL C CONC (HEADWALL)	0.5	CY	
0432	6002	RIPRAP(CONC)(5IN)	8.5	CY	
0432	6033	RIPRAP(STONE PROTECTION)(18IN)	5.0	CY	
0450	6103	RAIL (TY PR11)	14.0	LF	
0462	6005	CONC BOX CULV (4FT X 4FT)	93.33	LF	
0467	6154	SET(TYI)(S=4FT)(HW=6FT)(3:1)(C)	1.0	EA	
0465	6372	INLET(COMPL)(DROP)(SPL)	1.0	EA	
0496	6007	REMOV STR (PIPE)	108.0	LF	
6000	6060	REMOVE FOUNDATION	1.0	EA	
0658	6047	INSTALL OM ASSM(OM-2Y)(WC)GND	2.0	EA	



EXCAVATE ROADWAY AND PLACE BOX CULVERT.
FOR TRAFFIC CONTROL, REFER TO TCP(2-4)-18, "TRAFFIC CONTROL PLAN LANE CLOSURES ON MULTILANE CONVENTIONAL ROADS." ALL LANES OF TRAFFIC SHALL BE OPEN BY THE END OF THE WORK DAY. CONTRACTOR SHALL PLACE CEMENT STABILIZED BACKFILL WITHIN THE LIMITS OF BACKFILL AND STRUCTURAL EXCAVATION.

STATE OF TEXAS
JASON H. SCANTLING
96633
LICENSED
PROFESSIONAL ENGINEER

JHS, P.E.

11/29/2022

US 180
CULVERT LAYOUT

Texas Department of Transportation®
SHEET 2 OF 2

CONT	SECT	JOB	HIGHWAY
3469	01	014,	FM 3099
DIST	COUNTY		SHEET NO.
BWD	STEPHENS		101

DATE: 10/6/2022 8:04:24 AM
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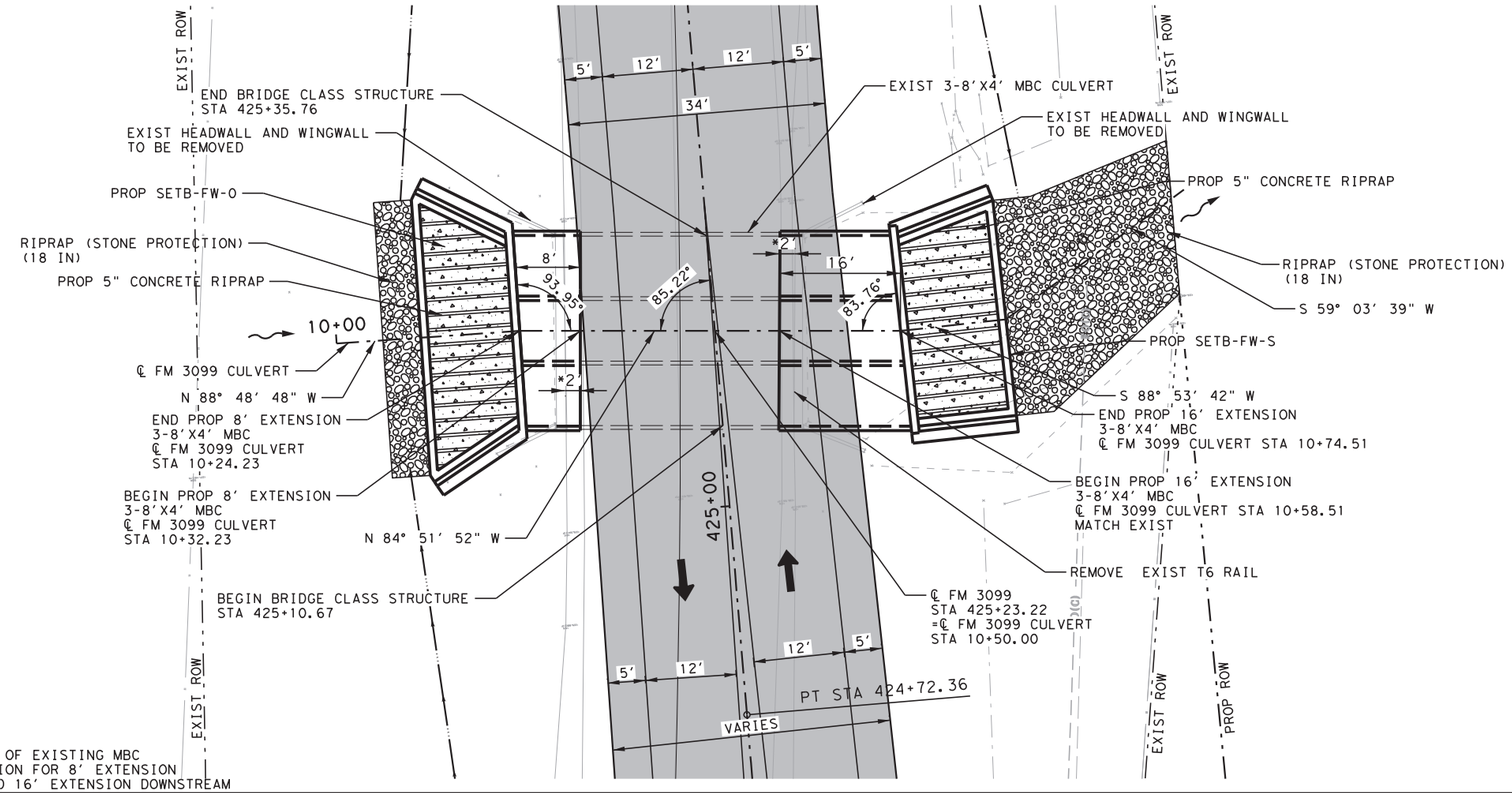
FINAL SUBMITTAL

USER:jhasler
OFFICE:IEA OFFICE:Houston
PROJECT # 2079G TxDOT FM 3099



* REMOVE 2' OF EXISTING MBC
IN PREPARATION FOR 8' EXTENSION
UPSTREAM AND 16' EXTENSION DOWNSTREAM

LEGEND

- PROP DITCH OR SWALE
- PROP STONE RIPRAP (18 IN)
- PROP CONC RIPRAP (5 IN)
- PROPOSED TRAFFIC
- EXIST TRAFFIC

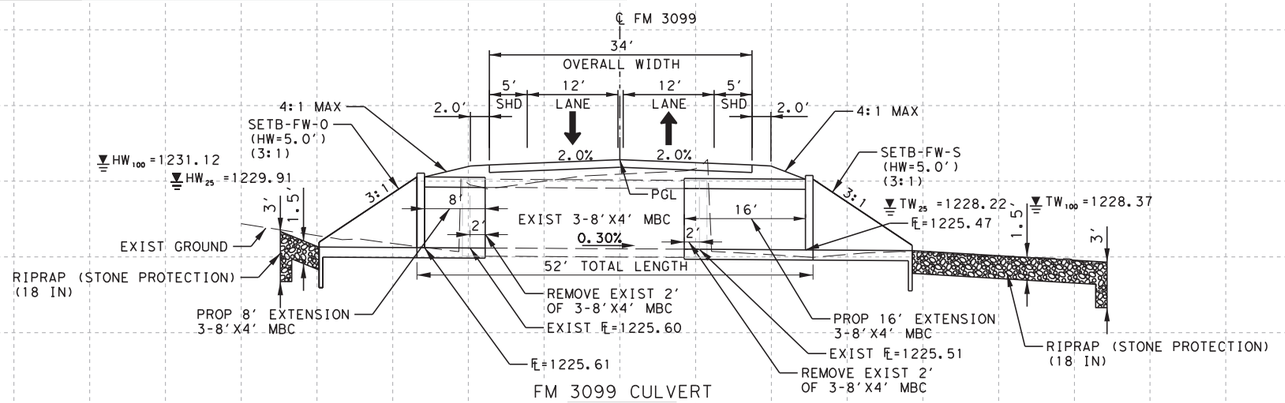
DESIGN SPEED = 50 MPH
ADT (2018) = 885
ADT (2038) = 1,239
FUNCT CLASS: MAJOR COLLECTOR

EXIST NBI: 23-215-0-3469-01-001

0 10 20 40
SCALE: 1"=20'
1"=10'V

HYDRAULIC TABLE PROPOSED CONDITIONS

	HEADWATER ELEVATIONS (FT)			TAILWATER ELEVATIONS (FT)			CULVERT VEL (FPS)		FLOW (CFS)
FREQUENCY	EXISTING	PROPOSED	Δ	EXISTING	PROPOSED	Δ	EXISTING	PROPOSED	PROPOSED
25 YR	1229.88	1229.91	0.05	1228.35	1228.22	-0.13	2.67	2.32	594
100 YR	1230.72	1231.12	0.40	1228.85	1228.37	-0.48	2.17	1.74	837



FM 3099 CULVERT

℄ FM 3099 STA 425+23.22
EXIST 3-8'X4'X30' MBC
REMOVE EXISTING WINGWALLS
REMOVE EXISTING MBC 2' UPSTREAM & DOWNSTREAM
EXTEND WITH 3-8'X4'X8.0' MBC UPSTREAM &
3-8'X4'X16.0' MBC DOWNSTREAM
WITH WINGWALL (SETB-FW-0) (HW=5 FT) UPSTREAM &
WITH WINGWALL (SETB-FW-S) (HW=5 FT) DOWNSTREAM
USING MC-8-13 AND SETB-FW-0 STANDARDS

1240 1230 1220 1210

10+00 11+00

NO.	REVISION	BY	DATE

STATE OF TEXAS
JORDAN HASLER
137316
LICENSED PROFESSIONAL ENGINEER

8/27/2021

IEA
1225 North Loop West
SUITE 320
HOUSTON, TEXAS 77008
(832) 494-3800
Firm Registration No. F-10161

FM 3099 REALIGNMENT

FM 3099 CULVERT PLAN AND PROFILE

SHEET 1 OF 1

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.	SHEET
6	SEE TITLE SHEET	102

STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

DATE:8/27/2021 TIME:10:47:09 AM
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TIME:10:47:09 AM FILE:049*2079G CULV*01.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" Conc (Curb) (2) (CY)	Class "C" Conc (Wingwall) (3) (CY)	Total Wingwall Area (SF)
FM3099 CL STA 425+23.22 UPSTREAM (LT)	3~8'X 4'	2'	MC-8-13	SETB-FW-0	0°	3:1	8	7	0.250	4.667	13.000	7.506	15.011	N/A	40.178	5.5	0.2	8.0	N/A
FM3099 CL STA 425+23.22 DOWNSTREAM (RT)	3~8'X 4'	2'	MC-8-13	SETB-FW-S	15°	3:1	8	7	0.250	4.667	13.000	7.506	15.011	N/A	33.560	5.1	0.3	7.1	N/A
US 180 CL STA 476+51 UPSTREAM (LT)	1~4'X 4'	1.99'	SCP-4	SPR-DI SPL	0°	N/A	7.5	5	1.000	5.375	N/A	N/A	N/A	N/A	N/A	N/A	0.2	N/A	N/A
US 180 CL STA 476+51 DOWNSTREAM (RT)	1~4'X 4'	1.99'	SCP-4	SETB-CD	0°	3:1	7.5	5	1.420	5.792	N/A	N/A	16.375	N/A	5.167	0.0	0.3	4.1	N/A

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
CHRISTOPHER GRAF
109925
LICENSED PROFESSIONAL ENGINEER

STATE OF TEXAS
JORDAN HASLER
137316
LICENSED PROFESSIONAL ENGINEER

10/27/2022

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	3469	01	014	FM 3099
	DIST	COUNTY		SHEET NO.
	BWD	STEPHENS		103

DATE: 10/27/2022 10:36:22 AM
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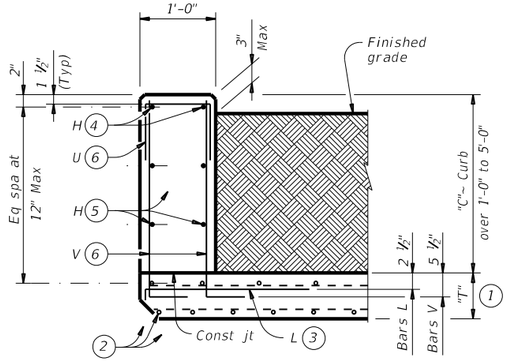
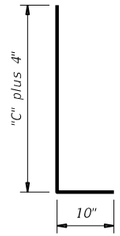
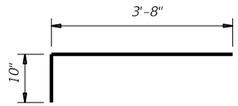


TYPICAL SECTION

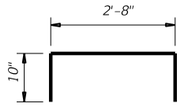
Used for curbs over 1'–0" to 5'–0"



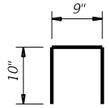
BARS V (#5) (6)
Spaced at 12" Max



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	3469	01	014,	FM 3099
	DIST	COUNTY		SHEET NO.
	BWD	STEPHENS		104

DATE: 8/27/2021 10:47:13 AM
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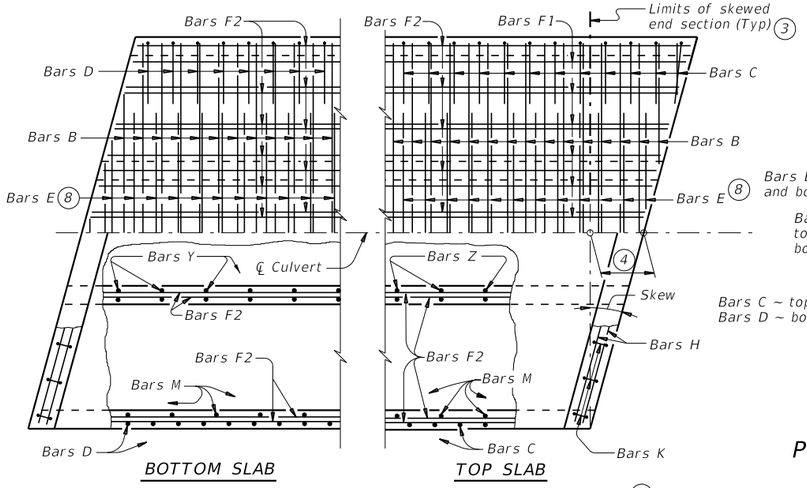
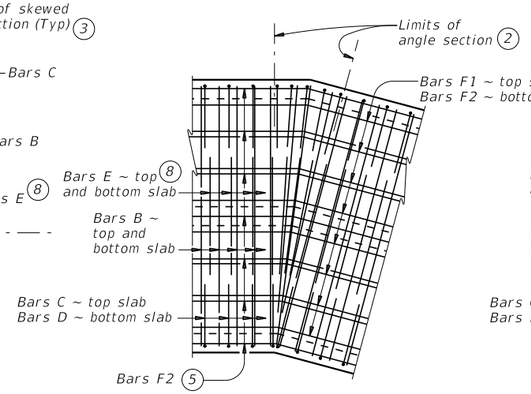
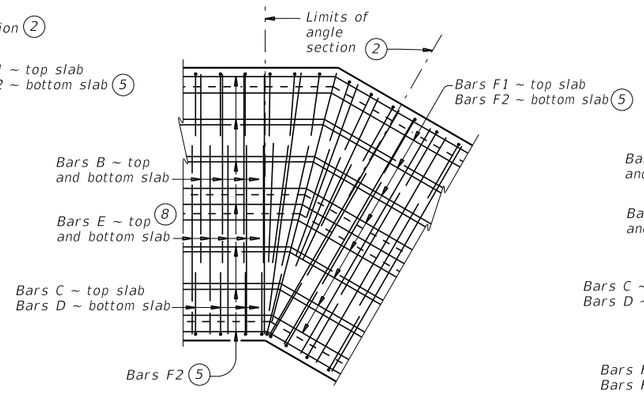


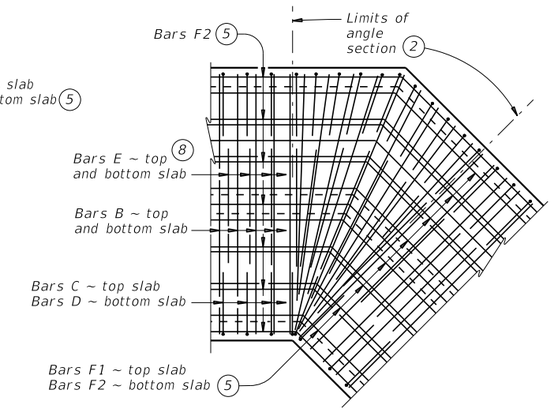
PLAN OF SKEWED ENDS ~ FROM 0° TO 15° 7



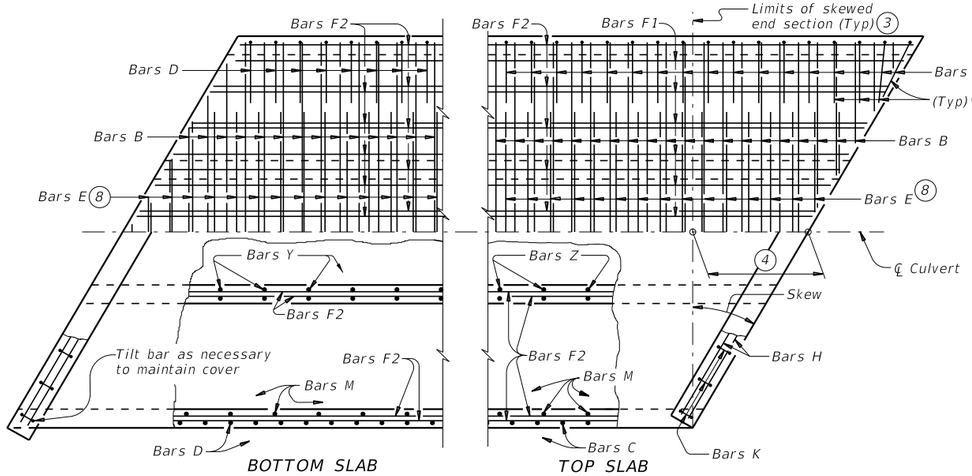
PLAN OF ANGLE SECTION ~ FROM 0° TO 15°



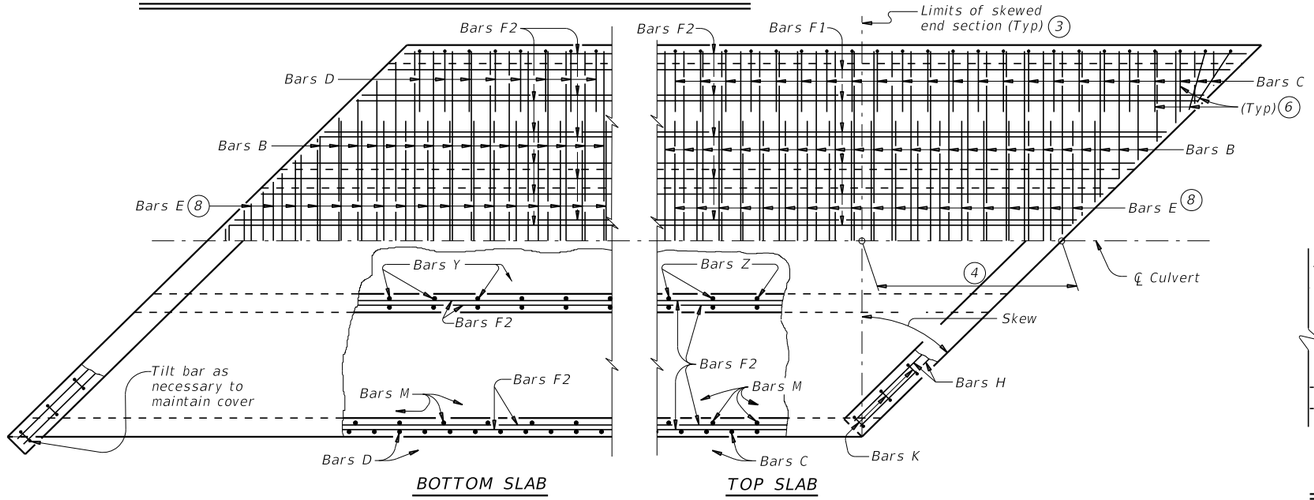
PLAN OF ANGLE SECTION ~ OVER 15° TO 30°



PLAN OF ANGLE SECTION ~ OVER 30° TO 45°

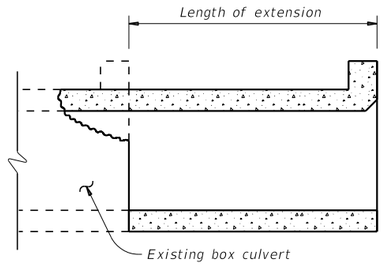


PLAN OF SKEWED ENDS ~ OVER 15° TO 30°



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

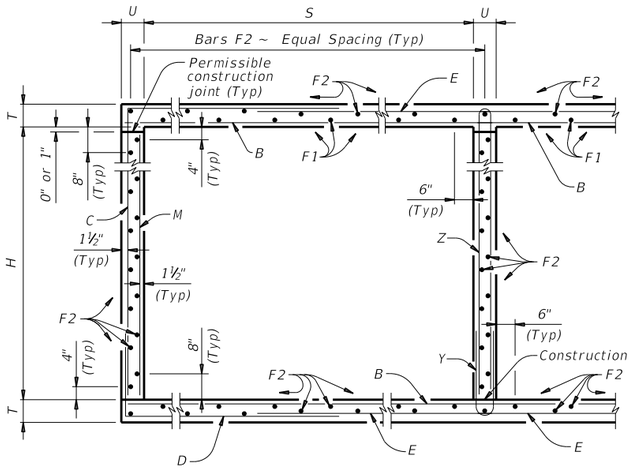
Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE MISCELLANEOUS DETAILS

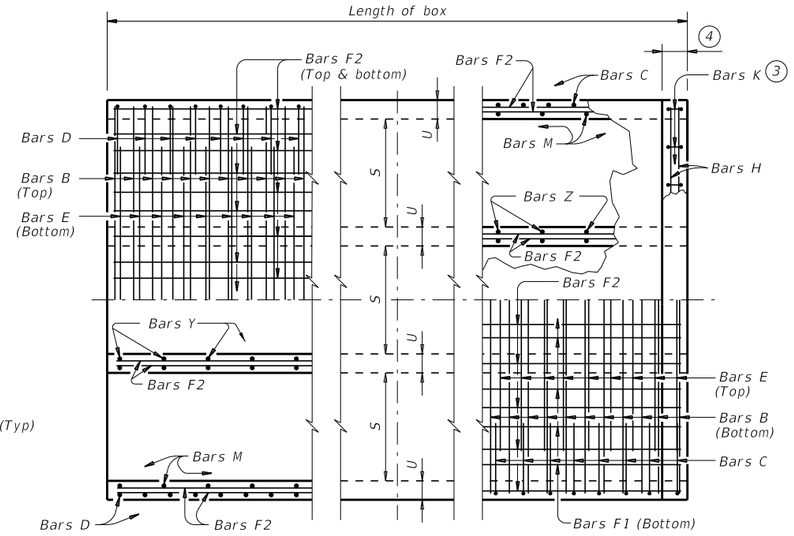
MC-MD

FILE: mc-mdste-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	3469	01	014,	FM 3099
	DIST	COUNTY		SHEET NO.
	BWD	STEPHENS		105

DATE: 8/27/2021 10:47:16 AM
FILE: \\pusscshrfil01\J-Jobs\20796 TxDOT FM 3099 ReAlign\06.00 Design\06.04 Sheets\06.04.06.11 Standards\Drainage Standards\mc813ste-20.dgn

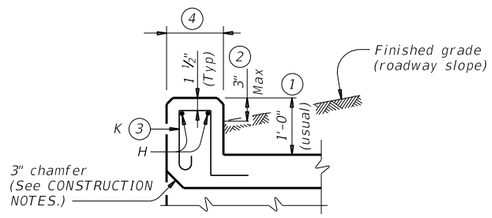


TYPICAL SECTION



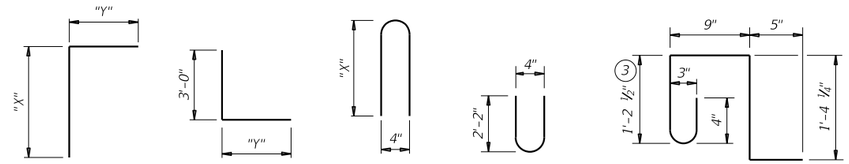
BOTTOM SLAB TOP SLAB

PART PLANS



SECTION THRU CURB

TABLE OF BAR DIMENSIONS		
H	"X"	"Y"
3'-0"	3'-6 ½"	5'-1"
4'-0"	4'-6 ½"	5'-1"
5'-0"	5'-6 ½"	5'-1"
6'-0"	6'-6 ½"	5'-1"
7'-0"	7'-6 ½"	5'-1"
8'-0"	8'-6 ½"	5'-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 SHEET 1 OF 2

Texas Department of Transportation — Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE
8'-0" SPAN
0' TO 13' FILL

MC-8-13

FILE: mc813ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	3469	01	014,	FM 3099
	DIST	COUNTY		SHEET NO.
	BWD	STEPHENS		106

NUMBER OF SPANS	SECTION DIMENSIONS				BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																														QUANTITIES					
					Bars B					Bars C & D							Bars E					Bars F1 ~ #4				Bars F2 ~ #4				Bars M ~ #4				Bars Y & Z ~ #4							Bars H 4 ~ #4		Bars K		Per Foot of Barrel		Curb		Total	
	S	H	T	U	No.	Size	Spa	Length	Wt	No.	Size	Spa	Bars C 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	Conc (CY)	Renf (Lb)	Conc (CY)	Renf (Lb)	Conc (CY)	Renf (Lb)
2	8' – 0"	3' – 0"	8"	7"	162	#6	6"	17' – 6"	4,258	108	#6	9"	8' – 8"	1,406	8' – 2"	1,325	162	#6	6"	12' – 9"	3,102	12	18"	39' – 9"	319	56	18"	39' – 9"	1,487	108	9"	3' – 0"	216	54	9"	4' – 7"	165	7' – 3"	262	17' – 6"	47	38	106	1.071	313.5	1.3	153	44.2	12,693
3	8' – 0"	3' – 0"	8"	7"	162	#6	6"	26' – 1"	6,347	108	#6	9"	8' – 8"	1,406	8' – 2"	1,325	162	#6	6"	21' – 4"	5,191	18	18"	39' – 9"	478	80	18"	39' – 9"	2,124	108	9"	3' – 0"	216	108	9"	4' – 7"	331	7' – 3"	523	26' – 1"	70	56	156	1.560	448.5	1.9	226	64.3	18,167
4	8' – 0"	3' – 0"	8"	7"	162	#6	6"	34' – 8"	8,435	108	#6	9"	8' – 8"	1,406	8' – 2"	1,325	162	#6	6"	29' – 11"	7,279	24	18"	39' – 9"	637	104	18"	39' – 9"	2,762	108	9"	3' – 0"	216	162	9"	4' – 7"	496	7' – 3"	785	34' – 8"	93	72	200	2.048	583.5	2.6	293	84.5	23,634
5	8' – 0"	3' – 0"	8"	7"	162	#6	6"	43' – 3"	10,524	108	#6	9"	8' – 8"	1,406	8' – 2"	1,325	162	#6	6"	38' – 6"	9,368	30	18"	39' – 9"	797	128	18"	39' – 9"	3,399	108	9"	3' – 0"	216	216	9"	4' – 7"	661	7' – 3"	1,046	43' – 3"	116	90	251	2.537	718.6	3.2	367	104.7	29,109
6	8' – 0"	3' – 0"	8"	7"	162	#6	6"	51' – 10"	12,612	108	#6	9"	8' – 8"	1,406	8' – 2"	1,325	162	#6	6"	47' – 1"	11,457	36	18"	39' – 9"	956	152	18"	39' – 9"	4,036	108	9"	3' – 0"	216	270	9"	4' – 7"	827	7' – 3"	1,308	51' – 10"	138	106	295	3.026	853.6	3.8	433	124.9	34,576
2	8' – 0"	4' – 0"	8"	7"	162	#6	6"	17' – 6"	4,258	108	#6	9"	9' – 8"	1,568	8' – 2"	1,325	162	#6	6"	12' – 9"	3,102	12	18"	39' – 9"	319	56	18"	39' – 9"	1,487	108	9"	4' – 0"	289	54	9"	4' – 7"	165	9' – 3"	334	17' – 6"	47	38	106	1.136	321.2	1.3	153	46.8	13,000
3	8' – 0"	4' – 0"	8"	7"	162	#6	6"	26' – 1"	6,347	108	#6	9"	9' – 8"	1,568	8' – 2"	1,325	162	#6	6"	21' – 4"	5,191	18	18"	39' – 9"	478	80	18"	39' – 9"	2,124	108	9"	4' – 0"	289	108	9"	4' – 7"	331	9' – 3"	667	26' – 1"	70	56	156	1.646	458.0	1.9	226	67.8	18,546
4	8' – 0"	4' – 0"	8"	7"	162	#6	6"	34' – 8"	8,435	108	#6	9"	9' – 8"	1,568	8' – 2"	1,325	162	#6	6"	29' – 11"	7,279	24	18"	39' – 9"	637	104	18"	39' – 9"	2,762	108	9"	4' – 0"	289	162	9"	4' – 7"	496	9' – 3"	1,001	34' – 8"	93	72	200	2.156	594.8	2.6	293	88.8	24,085
5	8' – 0"	4' – 0"	8"	7"	162	#6	6"	43' – 3"	10,524	108	#6	9"	9' – 8"	1,568	8' – 2"	1,325	162	#6	6"	38' – 6"	9,368	30	18"	39' – 9"	797	128	18"	39' – 9"	3,399	108	9"	4' – 0"	289	216	9"	4' – 7"	661	9' – 3"	1,335	43' – 3"	116	90	251	2.667	731.7	3.2	367	109.9	29,633
6	8' – 0"	4' – 0"	8"	7"	162	#6	6"	51' – 10"	12,612	108	#6	9"	9' – 8"	1,568	8' – 2"	1,325	162	#6	6"	47' – 1"	11,457	36	18"	39' – 9"	956	152	18"	39' – 9"	4,036	108	9"	4' – 0"	289	270	9"	4' – 7"	827	9' – 3"	1,668	51' – 10"	138	106	295	3.177	868.5	3.8	433	130.9	35,171
2	8' – 0"	5' – 0"	8"	7"	162	#6	6"	17' – 6"	4,258	108	#6	9"	10' – 8"	1,730	8' – 2"	1,325	162	#6	6"	12' – 9"	3,102	12	18"	39' – 9"	319	62	18"	39' – 9"	1,646	108	9"	5' – 0"	361	54	9"	4' – 7"	165	11' – 3"	406	17' – 6"	47	38	106	1.201	332.8	1.3	153	49.4	13,465
3	8' – 0"	5' – 0"	8"	7"	162	#6	6"	26' – 1"	6,347	108	#6	9"	10' – 8"	1,730	8' – 2"	1,325	162	#6	6"	21' – 4"	5,191	18	18"	39' – 9"	478	88	18"	39' – 9"	2,337	108	9"	5' – 0"	361	108	9"	4' – 7"	331	11' – 3"	812	26' – 1"	70	56	156	1.733	472.8	1.9	226	71.3	19,138
4	8' – 0"	5' – 0"	8"	7"	162	#6	6"	34' – 8"	8,435	108	#6	9"	10' – 8"	1,730	8' – 2"	1,325	162	#6	6"	29' – 11"	7,279	24	18"	39' – 9"	637	114	18"	39' – 9"	3,027	108	9"	5' – 0"	361	162	9"	4' – 7"	496	11' – 3"	1,217	34' – 8"	93	72	200	2.264	612.7	2.6	293	93.1	24,800
5	8' – 0"	5' – 0"	8"	7"	162	#6	6"	43' – 3"	10,524	108	#6	9"	10' – 8"	1,730	8' – 2"	1,325	162	#6	6"	38' – 6"	9,368	30	18"	39' – 9"	797	140	18"	39' – 9"	3,717	108	9"	5' – 0"	361	216	9"	4' – 7"	661	11' – 3"	1,623	43' – 3"	116	90	251	2.796	752.7	3.2	367	115.1	30,473
6	8' – 0"	5' – 0"	8"	7"	162	#6	6"	51' – 10"	12,612	108	#6	9"	10' – 8"	1,730	8' – 2"	1,325	162	#6	6"	47' – 1"	11,457	36	18"	39' – 9"	956	166	18"	39' – 9"	4,408	108	9"	5' – 0"	361	270	9"	4' – 7"	827	11' – 3"	2,029	51' – 10"	138	106	295	3.328	892.6	3.8	433	137.0	36,138
2	8' – 0"	6' – 0"	8"	7"	162	#6	6"	17' – 6"	4,258	108	#6	9"	11' – 8"	1,893	8' – 2"	1,325	162	#6	6"	12' – 9"	3,102	12	18"	39' – 9"	319	68	18"	39' – 9"	1,806	108	9"	6' – 0"	433	54	9"	4' – 7"	165	13' – 3"	478	17' – 6"	47	38	106	1.265	344.5	1.3	153	51.9	13,932
3	8' – 0"	6' – 0"	8"	7"	162	#6	6"	26' – 1"	6,347	108	#6	9"	11' – 8"	1,893	8' – 2"	1,325	162	#6	6"	21' – 4"	5,191	18	18"	39' – 9"	478	96	18"	39' – 9"	2,549	108	9"	6' – 0"	433	108	9"	4' – 7"	331	13' – 3"	956	26' – 1"	70	56	156	1.819	487.6	1.9	226	74.7	19,729
4	8' – 0"	6' – 0"	8"	7"	162	#6	6"	34' – 8"	8,435	108	#6	9"	11' – 8"	1,893	8' – 2"	1,325	162	#6	6"	29' – 11"	7,279	24	18"	39' – 9"	637	124	18"	39' – 9"	3,293	108	9"	6' – 0"	433	162	9"	4' – 7"	496	13' – 3"	1,434	34' – 8"	93	72	200	2.372	630.6	2.6	293	97.5	25,518
5	8' – 0"	6' – 0"	8"	7"	162	#6	6"	43' – 3"	10,524	108	#6	9"	11' – 8"	1,893	8' – 2"	1,325	162	#6	6"	38' – 6"	9,368	30	18"	39' – 9"	797	152	18"	39' – 9"	4,036	108	9"	6' – 0"	433	216	9"	4' – 7"	661	13' – 3"	1,912	43' – 3"	116	90	251	2.926	773.7	3.2	367	120.3	31,316
6	8' – 0"	6' – 0"	8"	7"	162	#6	6"	51' – 10"	12,612	108	#6	9"	11' – 8"	1,893	8' – 2"	1,325	162	#6	6"	47' – 1"	11,457	36	18"	39' – 9"	956	180	18"	39' – 9"	4,780	108	9"	6' – 0"	433	270	9"	4' – 7"	827	13' – 3"	2,390	51' – 10"	138	106	295	3.479	916.8	3.8	433	143.0	37,106
2	8' – 0"	7' – 0"	8"	7"	162	#6	6"	17' – 6"	4,258	108	#6	9"	12' – 8"	2,055	8' – 2"	1,325	162	#6	6"	12' – 9"	3,102	12	18"	39' – 9"	319	68	18"	39' – 9"	1,806	108	9"	7' – 0"	505	54	9"	4' – 7"	165	15' – 3"	550	17' – 6"	47	38	106	1.330	352.1	1.3	153	54.5	14,238
3	8' – 0"	7' – 0"	8"	7"	162	#6	6"	26' – 1"	6,347	108	#6	9"	12' – 8"	2,055	8' – 2"	1,325	162	#6	6"	21' – 4"	5,191	18	18"	39' – 9"	478	96	18"	39' – 9"	2,549	108	9"	7' – 0"	505	108	9"	4' – 7"	331	15' – 3"	1,100	26' – 1"	70	56	156	1.905	497.0	1.9	226	78.1	20,107
4	8' – 0"	7' – 0"	8"	7"	162	#6	6"	34' – 8"	8,435	108	#6	9"	12' – 8"	2,055	8' – 2"	1,325	162	#6	6"	29' – 11"	7,279	24	18"	39' – 9"	637	124	18"	39' – 9"	3,293	108	9"	7' – 0"	505	162	9"	4' – 7"	496	15' – 3"	1,650	34' – 8"	93	72	200	2.480	641.9	2.6	293	101.8	25,968
5	8' – 0"	7' – 0"	8"	7"	162	#6	6"	43' – 3"	10,524	108	#6	9"	12' – 8"	2,055	8' – 2"	1,325	162	#6	6"	38' – 6"	9,368	30	18"	39' – 9"	797	152	18"	39' – 9"	4,036	108	9"	7' – 0"	505	216	9"	4' – 7"	661	15' – 3"	2,200	43' – 3"	116	90	251	3.056	786.8	3.2	367	125.5	31,838
6	8' – 0"	7' – 0"	8"	7"	162	#6	6"	51' – 10"	12,612	108	#6	9"	12' – 8"	2,055	8' – 2"	1,325	162	#6	6"	47' – 1"	11,457	36	18"	39' – 9"	956	180	18"	39' – 9"	4,780	108	9"	7' – 0"	505	270	9"	4' – 7"	827	15' – 3"	2,750	51' – 10"	138	106	295	3.631	931.7	3.8	433	149.1	37,700
2	8' – 0"	8' – 0"	8"	7"	162	#6	6"	17' – 6"	4,258	108	#6	9"	13' – 8"	2,217	8' – 2"	1,325	162	#6	6"	12' – 9"	3,102	12	18"	39' – 9"	319	74	18"	39' – 9"	1,965	108	9"	8' – 0"	577	54	9"	4' – 7"	165	17' – 3"	622	17' – 6"	47	38	106	1.395	363.8	1.3	153	57.1	14,703
3	8' – 0"	8' – 0"	8"	7"	162	#6	6"	26' – 1"	6,347	108	#6	9"	13' – 8"	2,217	8' – 2"	1,325	162	#6	6"	21' – 4"	5,191	18	18"	39' – 9"	478	104	18"	39' – 9"	2,762	108	9"	8' – 0"	577	108	9"	4' – 7"	331	17' – 3"	1,244	26' – 1"	70	56	156	1.992	511.8	1.9	226	81.6	20,698
4	8' – 0"	8' – 0"	8"	7"	162	#6	6"	34' – 8"	8,435	108	#6	9"	13' – 8"	2,217	8' – 2"	1,325	162	#6	6"	29' – 11"	7,279	24	18"	39' – 9"	637	134	18"	39' – 9"	3,558	108	9"	8' – 0"	577	162	9"	4' – 7"	496	17' – 3"	1,867	34' – 8"	93	72	200	2.588	659.8	2.6	293	106.1	26,684
5	8' – 0"	8' – 0"	8"	7"	162	#6	6"	43' – 3"	10,524	108	#6	9"	13' – 8"	2,217	8' – 2"	1,325	162	#6	6"	38' – 6"	9,368	30	18"	39' – 9"	797	164	18"	39' – 9"	4,355	108	9"	8' – 0"	577	216	9"	4' – 7"	661	17' – 3"	2,489	43' – 3"	116	90	251	3.185	807.8	3.2	367	130.6	32,680
6	8' – 0"	8' – 0"	8"	7"	162	#6	6"	51' – 10"	12,612	108	#6	9"	13' – 8"	2,217	8' – 2"	1,325	162	#6	6"	47' – 1"	11,457	36	18"	39' – 9"	956	194	18"	39' – 9"	5,151	108	9"	8' – 0"	577	270	9"	4' – 7"	827	17' – 3"	3,111	51' – 10"	138	106	295	3.782	955.8	3.8	433	155.1	38,666

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HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation — Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE
8'-0" SPAN
0' TO 13' FILL

MC-8-13

FILE: mc813ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	3469	01	014,	FM 3099
	DIST	COUNTY		SHEET NO.
	BWD	STEPHENS		107

DATE: 8/27/2021 10:47:19 AM
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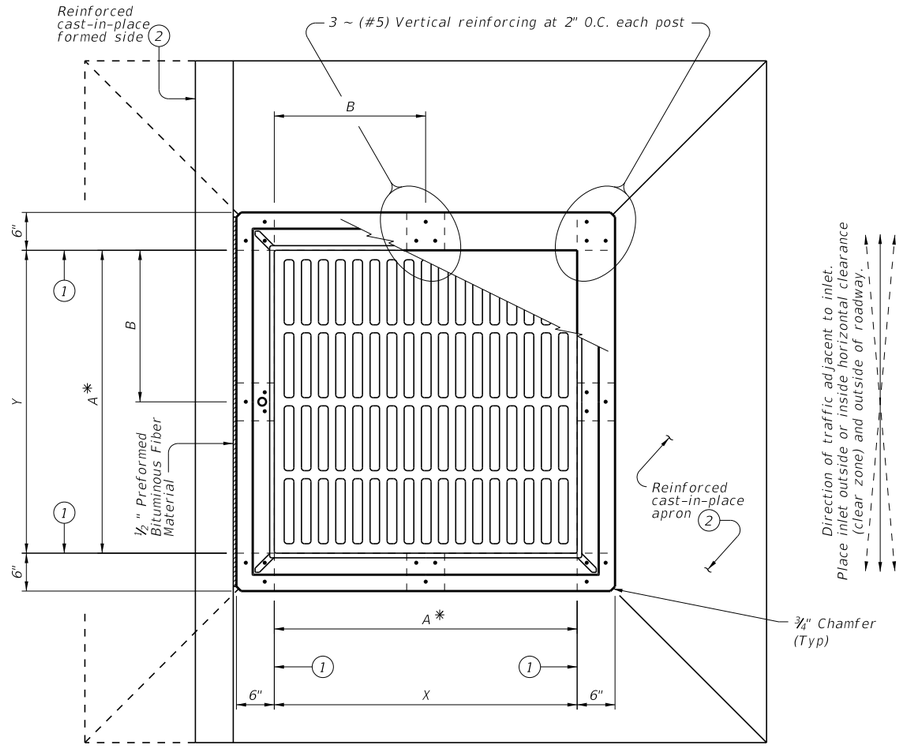
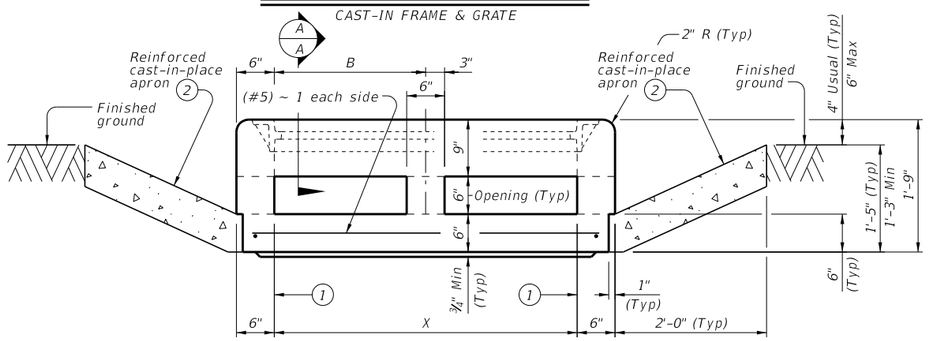
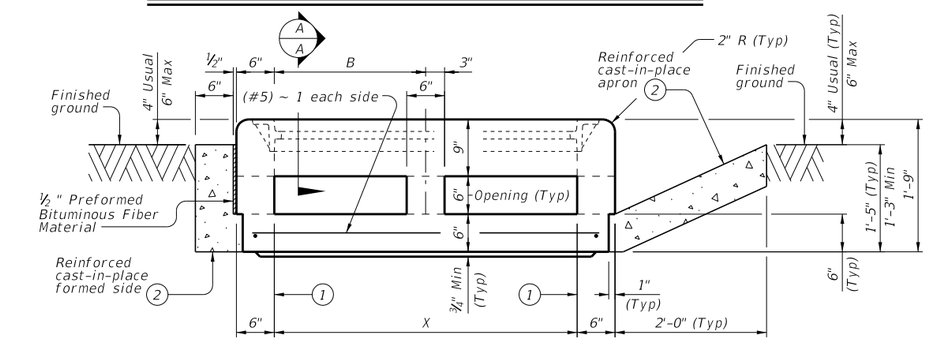


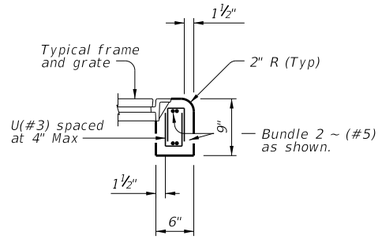
PLAN VIEW ~ STYLE 'FG' (3)



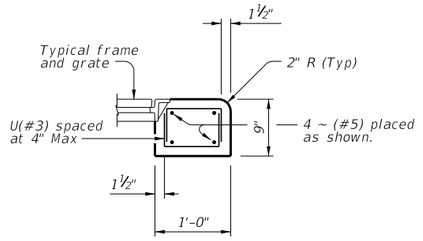
ELEVATION VIEW WITHOUT FORMED SIDE (4)



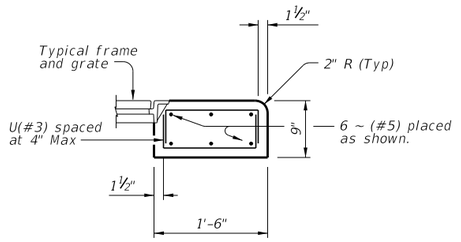
ELEVATION VIEW WITH FORMED SIDE (4)



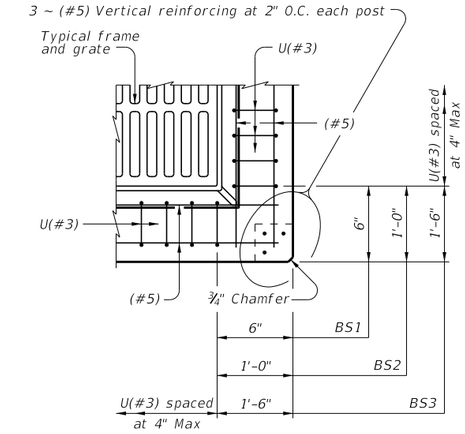
SECTION A-A ~ BS1



SECTION A-A ~ BS2

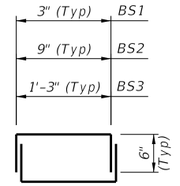


SECTION A-A ~ BS3



TYPICAL CORNER REINFORCING PLAN DETAIL

Showing BS2 other beam sections similar.



BARS U (#3)

Showing one complete bar.

Style	Size (X x Y)	A x A *	B x B	Beam Section
FG	3'x3'	3'x3'	1.5'x1.5'	BS1
FG	4'x4'	3'x3'	2'x2'	BS2
FG	4'x4'	4'x4'	2'x2'	BS1
FG	5'x5'	3'x3'	2.5'x2.5'	BS3
FG	5'x5'	4'x4'	2.5'x2.5'	BS2

* Nominal frame/grate size.

(1) Matches inside face of wall of precast base or riser below inlet.

(2) Construct cast-in-place reinforced concrete with or without formed side. Place formed side/sides as directed elsewhere in the plans. Formed sides may only be used on sides parallel to traffic. Use Class "C" concrete. Apron and formed side reinforcing not shown for clarity. Apron and formed side are subsidiary to PAZD-CZ. Apron is 2'-0" width around precast zone drain, unless an optional formed side is used. For apron and formed side, provide (#4) reinforcing at 12" O.C.

(3) Top slab reinforcing not shown for clarity.

(4) Top slab reinforcing and post reinforcing not shown for clarity.

FABRICATION NOTES:

1. Provide Class "H" concrete in accordance with Item 421 and having a minimum compressive strength of 5,000 psi.
2. Provide Grade 60 reinforcing steel or equivalent area of WWR.
3. Provide clear cover of ¾" to reinforcing from bottom of slab and 2" to reinforcing from top of slab for structural reinforcement.
4. Provide 1 ½" end cover on (#5) reinforcing.
5. Design tongue and groove joints for full closure on both shoulders. Minimum spigot depth is ¾".
6. Provide lifting devices in conformance with Manufacturer's recommendations.

INSTALLATION NOTES:

1. Precast Area Zone Drain within Clear Zone (PAZD-CZ) is for use in ditches and medians outside and inside of the horizontal clearance (clear zone). PAZD-CZ is never placed in the roadway.
2. Seal tongue and groove joints with preformed or bulk mastic in conformance with Manufacturer's recommendations. Tongue and groove joints may be grouted no more than 1" between each section, or ½ the joint depth, whichever is greater.
3. Do not grout rubber gasket joints without Manufacturer's recommendation.

GENERAL NOTES:

1. Designed according to ASTM C913.
2. Payment for inlet is per Item 465, "Junction Boxes, Manholes, and Inlets" by type, style, size, and opening size (when applicable).

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

PRECAST AREA ZONE DRAIN WITHIN CLEAR ZONE

PAZD-CZ

FILE: prestd15-20.dgn	DN: SDC	CK: TAR	DW: JTR	CK: SDC
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	3469	01	014,	FM 3099
	DIST	COUNTY		SHEET NO.
	BWD	STEPHENS		108

DATE: 8/27/2021 10:47:21 AM
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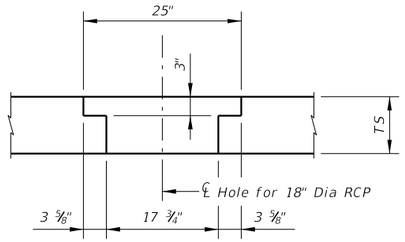
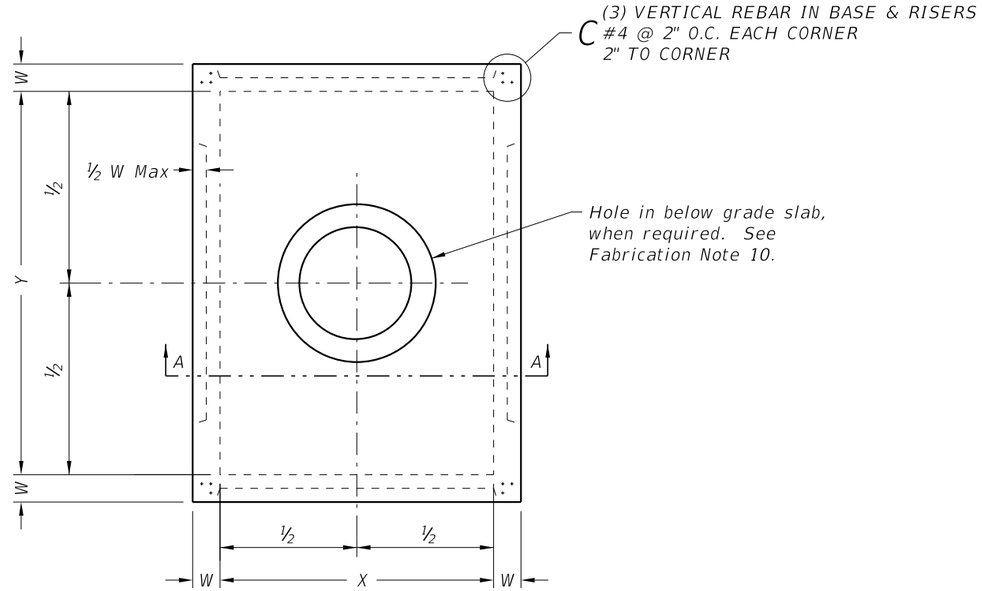
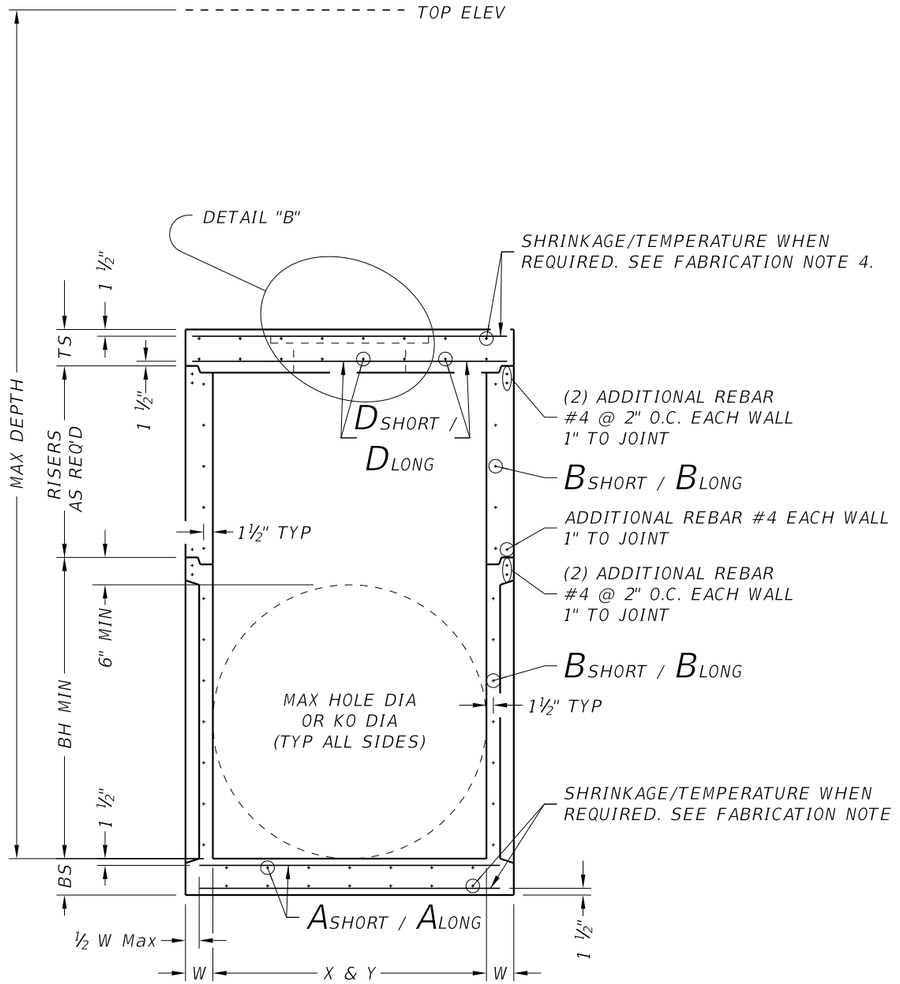


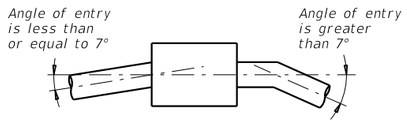
DETAIL "B"



PLAN VIEW



SECTION A-A



PIPE CONNECTION DETAIL

Connect pipes within 7° of normal to PJB wall. If necessary, use pipe elbow or curved approach alignment to stay within this limit.

FABRICATION NOTES:

1. Provide Class "H" concrete in accordance with Item 421 and having a minimum compressive strength of 5,000 psi.
2. Provide Grade 60 reinforcing steel or equivalent area of WWR.
3. Provide typical clear cover of 1 ½" to reinforcing steel at interior or exterior walls.
4. Walls or slabs with a thickness of 8" or greater require shrinkage and temperature reinforcing steel. Provide steel area = 0.11 in²/ft each way.
5. No substitution is allowed for vertical and horizontal #4 bars in corners.
6. Manufacture base and risers to nearest 3" increment.
7. Design tongue and groove joints for full closure on both shoulders. Minimum spigot depth is ¾".
8. Provide lifting devices in conformance with Manufacturer's recommendations.
9. See sheet PDD for sizes, dimensions, and reinforcing steel not shown.
10. Provide hole in below grade slab only when PJB is installed with inlet type POD.

INSTALLATION NOTES:

1. Inverts (benching) to be provided by Contractor. Concrete or mortar used for invert is subsidiary to junction box.
2. Seal tongue and groove joints with preformed or bulk mastic in conformance with Manufacturer's recommendations. Tongue and groove joints may be grouted no more than 1" between each section, or ½ the joint depth, whichever is greater.
3. Do not grout rubber gasket joints without Manufacturer's recommendation.
4. For rigid pipe, cut hole in thin wall panel (KO) 4" Max, 2" Min larger than pipe OD.
5. For flexible pipe, consult boot/seal Manufacturer's specification for placement tolerance and hole size. Center pipe in hole and install boot/seal per Manufacturer's specification.

GENERAL NOTES:

1. Precast Junction Box consists of base slab, base unit, risers (as required), and below grade slab. See sheet PDD for sizes.
2. Designed according to ASTM C913.
3. Payment for junction box is per Item 465 "Junction Boxes, Manholes, and Inlets" by type and size.

Cover dimensions are clear dimensions, unless noted otherwise.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

PRECAST JUNCTION BOX

PJB

FILE: prestd09-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	3469	01	014,	FM 3099
	DIST	COUNTY		SHEET NO.
	BWD	STEPHENS		109

	Size	MAX DEPTH = 15 ft. to top of BASE SLAB										MAX DEPTH = 25 ft. to top of BASE SLAB										Min Height (See Gen Note 3)	Max HOLE DIA (See Fab Note 2)	Max KO DIA (See Fab Note 2)
		Base Slab			Base Unit or Riser Walls			Below Grade Slab (w/PJB) Reducing Slab (w/PB)				Base Slab			Base Unit or Riser Walls			Below Grade Slab (w/PJB) Reducing Slab (w/PB)						
		Short Span Reinf Steel Area	Long Span Reinf Steel Area	Thickness	Short Span Reinf Steel Area	Long Span Reinf Steel Area	Thickness	Reduced Riser Size	Short Span Reinf Steel Area	Long Span Reinf Steel Area	Thickness	Short Span Reinf Steel Area	Long Span Reinf Steel Area	Thickness	Short Span Reinf Steel Area	Long Span Reinf Steel Area	Thickness	Reduced Riser Size	Short Span Reinf Steel Area	Long Span Reinf Steel Area	Thickness			
	X x Y	Ashort	Along	BS	Bshort	Blong	W	RWSxRWL or ID	Dshort	Dlong	TS	Ashort	Along	BS	Bshort	Blong	W	RWSxRWL or ID	Dshort	Dlong	TS	BH MIN	HOLE DIA	KO DIA
	ft.	in^2/ft	in^2/ft	in.	in^2/ft	in^2/ft	in.	ft. **	in^2/ft	in^2/ft	in.	in^2/ft	in^2/ft	in.	in^2/ft	in^2/ft	in.	ft. **	in^2/ft	in^2/ft	in.	ft.	in.	in.
Precast Junction Box (PJB)	3x3	0.23	0.23	6	0.19	0.19	6	N/A	0.37	0.37	9	0.29	0.29	6	0.24	0.24	6	N/A	0.37	0.37	9	3.5	36	36
	4x4	0.29	0.29	6	0.24	0.24	6	N/A	0.41	0.41	9	0.47	0.47	6	0.38	0.38	6	N/A	0.41	0.41	9	4.5	48	48
	3x5	0.29	0.18	6	0.19	0.35	6	N/A	0.48	0.48	9	0.39	0.18	6	0.23	0.59	6	N/A	0.48	0.48	9	3.5	36/60	36/60
	4x5	0.36	0.18	6	0.22	0.34	6	N/A	0.42	0.42	9	0.53	0.26	6	0.39	0.59	6	N/A	0.42	0.42	9	4.5	48/60	48/60
	5x5	0.36	0.36	6	0.34	0.34	6	N/A	0.43	0.43	9	0.62	0.62	6	0.59	0.59	6	N/A	0.43	0.43	9	5.5	60	60
	5x6	0.27	0.27	9	0.34	0.45	6	N/A	0.48	0.48	9	0.47	0.45	9	0.38	0.54	8	N/A	0.48	0.48	9	5.5	60/72	60/72
	6x6	0.27	0.27	9	0.45	0.45	6	N/A	0.56	0.56	9	0.52	0.52	9	0.54	0.54	8	N/A	0.56	0.56	9	6.5	72	72
	8x8	0.46	0.46	9	0.51	0.51	8	N/A	0.45	0.45	12	0.87	0.87	9	0.59	0.59	10	N/A	0.45	0.45	12	8.5	96	72
Precast Base (PB)	3x3	0.23	0.23	6	0.19	0.19	6	N/A	N/A	N/A	N/A	0.29	0.29	6	0.24	0.24	6	N/A	N/A	N/A	N/A	3.5	36	36
	4x4	0.29	0.29	6	0.24	0.24	6	N/A	N/A	N/A	N/A	0.47	0.47	6	0.38	0.38	6	N/A	N/A	N/A	N/A	4.5	48	48
	3x5	0.29	0.18	6	0.19	0.35	6	3x3	0.30	0.34	9	0.39	0.18	6	0.23	0.59	6	3x3	0.40	0.40	9	3.5	36/60	36/60
	4x5	0.36	0.18	6	0.22	0.34	6	3x3	0.30	0.30	9	0.53	0.26	6	0.39	0.59	6	3x3	0.46	0.37	9	4.5	48/60	48/60
	4x5	0.36	0.18	6	0.22	0.34	6	4x4	0.30	0.30	9	0.53	0.26	6	0.39	0.59	6	4x4	0.39	0.39	9	4.5	48/60	48/60
	4x5	0.36	0.18	6	0.22	0.34	6	48"	0.39	0.39	9	0.53	0.26	6	0.39	0.59	6	48"	0.47	0.47	9	4.5	48/60	48/60
	4x5	0.36	0.18	6	0.22	0.34	6	3x5	0.33	0.40	9	0.53	0.26	6	0.39	0.59	6	3x5	0.48	0.48	9	4.5	48/60	48/60
	5x5	0.36	0.36	6	0.34	0.34	6	3x3	0.34	0.34	9	0.62	0.62	6	0.59	0.59	6	3x3	0.53	0.53	9	5.5	60	60
	5x5	0.36	0.36	6	0.34	0.34	6	4x4	0.36	0.36	9	0.62	0.62	6	0.59	0.59	6	4x4	0.64	0.64	9	5.5	60	60
	5x5	0.38	0.38	6	0.34	0.34	6	48"	0.36	0.36	9	0.62	0.62	6	0.59	0.59	6	48"	0.64	0.64	9	5.5	60	60
	5x5	0.36	0.36	6	0.34	0.34	6	3x5	0.34	0.40	9	0.62	0.62	6	0.59	0.59	6	3x5	0.53	0.53	9	5.5	60	60
	5x6	0.31	0.31	9	0.34	0.45	6	3x3	0.34	0.34	9	0.47	0.45	9	0.38	0.54	8	3x3	0.61	0.50	9	5.5	60/72	60/72
	5x6	0.27	0.27	9	0.34	0.45	6	4x4	0.36	0.45	9	0.47	0.45	9	0.38	0.54	8	4x4	0.74	0.57	9	5.5	60/72	60/72
	5x6	0.29	0.29	9	0.34	0.45	6	48"	0.36	0.45	9	0.47	0.45	9	0.38	0.54	8	48"	0.74	0.57	9	5.5	60/72	60/72
	5x6	0.29	0.29	9	0.34	0.45	6	3x5	0.45	0.45	9	0.47	0.45	9	0.38	0.54	8	3x5	0.61	0.61	9	5.5	60/72	60/72
	6x6	0.29	0.29	9	0.45	0.45	6	3x3	0.41	0.41	9	0.52	0.52	9	0.54	0.54	8	3x3	0.74	0.74	9	6.5	72	72
	6x6	0.27	0.27	9	0.45	0.45	6	4x4	0.45	0.45	9	0.52	0.52	9	0.54	0.54	8	4x4	0.87	0.87	9	6.5	72	72
	6x6	0.29	0.29	9	0.45	0.45	6	48"	0.45	0.45	9	0.52	0.52	9	0.54	0.54	8	48"	0.87	0.87	9	6.5	72	72
	6x6	0.29	0.29	9	0.45	0.45	6	3x5	0.45	0.45	9	0.52	0.52	9	0.54	0.54	8	3x5	0.87	0.87	9	6.5	72	72
	8x8	0.52	0.52	9	0.51	0.51	8	3x3	0.61	0.61	12	0.91	0.91	9	0.70	0.70	10	3x3	0.85	0.85	12	8.5	96	72
	8x8	0.52	0.52	9	0.51	0.51	8	4x4	0.70	0.70	12	0.87	0.87	9	0.70	0.70	10	4x4	1.01	1.01	12	8.5	96	72
	8x8	0.52	0.52	9	0.51	0.51	8	48"	0.70	0.70	12	0.87	0.87	9	0.70	0.70	10	48"	1.01	1.01	12	8.5	96	72
	8x8	0.52	0.52	9	0.51	0.51	8	3x5	0.70	0.85	12	0.87	0.87	9	0.70	0.70	10	3x5	1.01	1.01	12	8.5	96	72

** Unless otherwise indicated.

FABRICATION NOTES:
1. Maximum spacing of reinforcement is 8".
2. At manufacturer's option, provide cast or cored holes or thin wall panels (KO) to the maximum diameter shown for each. When no penetration is required, it is acceptable to provide a wall with no sectional reduction.

GENERAL NOTES:
1. Precast Junction Box consists of base slab, base unit, risers (as required), and below grade slab. See sheet PJB for details.
2. Precast Base consists of base slab, base unit, risers (as required), reducing slab (as required), and reduced risers (as required). See sheet PB for details.
3. Min Height shown is for stock base units. Use stock base units whenever practical. Smaller height base units can be used in special installation circumstances, when noted elsewhere in the plans. Absolute minimum height of base units is 2'-6".

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DESIGN DATA FOR PRECAST BASE AND JUNCTION BOX

PDD

FILE: prestd10-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	3469	01	014,	FM 3099
	DIST	COUNTY		SHEET NO.
	BWD	STEPHENS		110

DATE: 8/27/2021 10:47:22 AM
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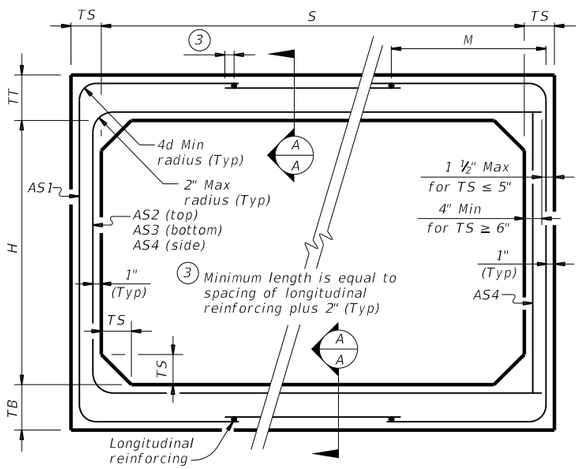
BOX DATA

SECTION DIMENSIONS					Fill Height	M (Min)	REINFORCING (sq. in. / ft.) (2)							(1) Lift Weight
S (ft.)	H (ft.)	TT (in.)	TB (in.)	TS (in.)	(ft.)	(in.)	AS1	AS2	AS3	AS4	AS5	AS7	AS8	(tons)
4	2	7.5	6	5	< 2	–	0.18	0.27	0.15	0.12	0.18	0.18	0.14	4.5
4	2	5	5	5	2 < 3	38	0.18	0.19	0.17	0.12	–	–	–	3.6
4	2	5	5	5	3 – 5	38	0.13	0.13	0.13	0.12	–	–	–	3.6
4	2	5	5	5	10	38	0.12	0.12	0.12	0.12	–	–	–	3.6
4	2	5	5	5	15	38	0.14	0.16	0.16	0.12	–	–	–	3.6
4	2	5	5	5	20	38	0.18	0.20	0.21	0.12	–	–	–	3.6
4	2	5	5	5	25	38	0.23	0.25	0.25	0.12	–	–	–	3.6
4	2	5	5	5	30	38	0.28	0.30	0.30	0.12	–	–	–	3.6
4	3	7.5	6	5	< 2	–	0.18	0.31	0.18	0.12	0.18	0.18	0.14	5.0
4	3	5	5	5	2 < 3	38	0.15	0.23	0.20	0.12	–	–	–	4.1
4	3	5	5	5	3 – 5	38	0.12	0.16	0.16	0.12	–	–	–	4.1
4	3	5	5	5	10	38	0.12	0.14	0.14	0.12	–	–	–	4.1
4	3	5	5	5	15	38	0.12	0.18	0.18	0.12	–	–	–	4.1
4	3	5	5	5	20	38	0.14	0.23	0.24	0.12	–	–	–	4.1
4	3	5	5	5	25	38	0.17	0.29	0.29	0.12	–	–	–	4.1
4	3	5	5	5	30	38	0.21	0.35	0.35	0.12	–	–	–	4.1
4	4	7.5	6	5	< 2	–	0.18	0.33	0.20	0.12	0.18	0.18	0.14	5.5
4	4	5	5	5	2 < 3	38	0.12	0.26	0.23	0.12	–	–	–	4.6
4	4	5	5	5	3 – 5	38	0.12	0.18	0.18	0.12	–	–	–	4.6
4	4	5	5	5	10	38	0.12	0.15	0.15	0.12	–	–	–	4.6
4	4	5	5	5	15	38	0.12	0.19	0.20	0.12	–	–	–	4.6
4	4	5	5	5	20	38	0.12	0.25	0.25	0.12	–	–	–	4.6
4	4	5	5	5	25	38	0.14	0.31	0.31	0.12	–	–	–	4.6
4	4	5	5	5	30	38	0.17	0.37	0.37	0.12	–	–	–	4.6

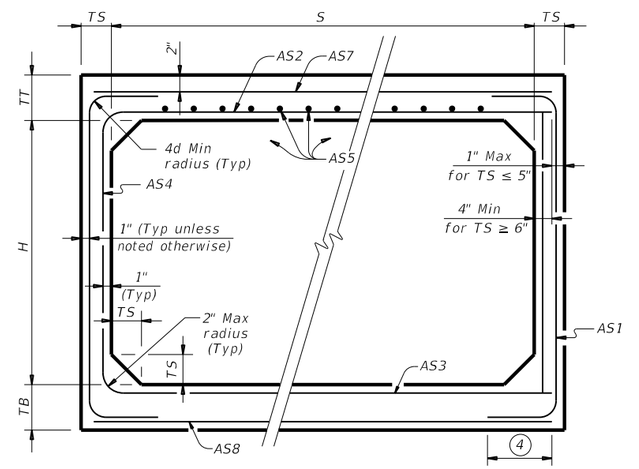
(1) For box length = 8'-0"

(2) AS1 thru AS4, AS7 and AS8 are minimum required areas of reinforcement per linear foot of box length. AS5 is minimum required area of reinforcement per linear foot of box width.



CORNER OPTION "A" CORNER OPTION "B"

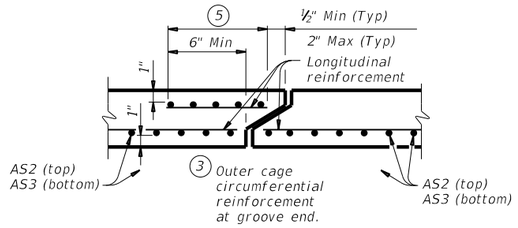
FILL HEIGHT 2 FT AND GREATER



CORNER OPTION "A" CORNER OPTION "B"

FILL HEIGHT LESS THAN 2 FT

(4) Length is equal to spacing of longitudinal reinforcing plus 2". (10" Min) (Typ)



SECTION A-A

(Showing top and bottom slab joint reinforcement.)

MATERIAL NOTES:

Provide 0.03 sq. in./ft. minimum longitudinal reinforcement at each face in slabs and walls. This minimum requirement may be met by the transverse wires when wire mesh reinforcement is used.

Provide Class H concrete (f`c = 5,000 psi).

GENERAL NOTES:

Designs shown conform to ASTM C1577. Refer to ASTM C1577 for information or details not shown.

See Box Culverts Precast Miscellaneous Details (SCP-MD) standard sheet for details and notes not shown.

In lieu of furnishing the designs shown on this sheet, the contractor may furnish an alternate design that is equal to or exceeds the box design for the design fill height in the table. Submit shop plans for alternate designs in accordance with Item "Precast Concrete Structural Members (Fabrication)".

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS PRECAST

4'-0" SPAN

SCP-4

FILE: scp04sts-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	BWD	STEPHENS		111

DATE: 2/9/2021 1:03:29 PM
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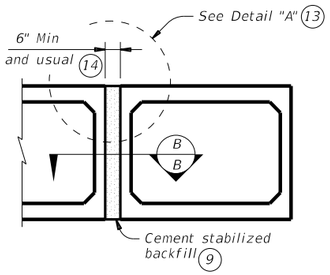
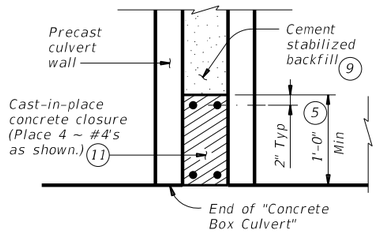
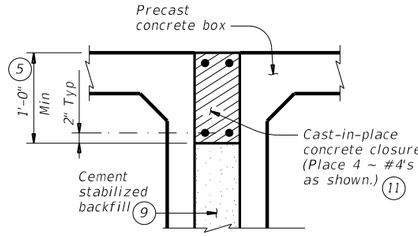


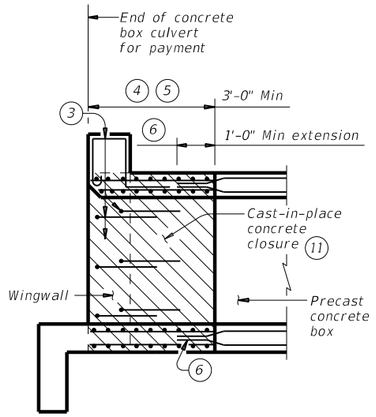
MULTIPLE UNIT PLACEMENT



SECTION B-B

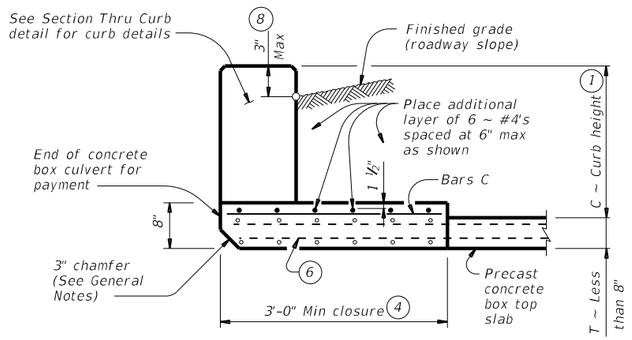


DETAIL "A" (13)

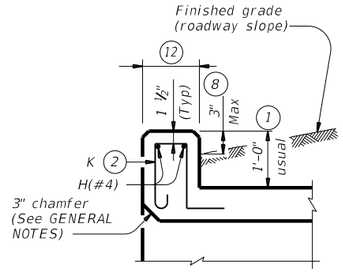


WINGWALL CONNECTION

(Also applies to safety end treatment.)

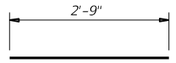


SECTION THRU TOP SLABS LESS THAN 8"

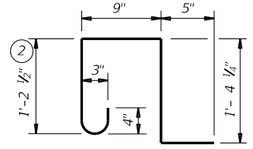


SECTION THRU CURB

QUANTITIES PER FOOT OF CURB (10)	
Reinforcing Steel	4.12 Lb
Concrete	0.037 CY



BARS C (#4)
(Spa = 1'–0" Max)



BARS K (#4)
(Spa = 1'–0" Max)
(Length = 4'–2")

1 0" Min to 5'–0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail, bicycle 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.

2 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.

3 Extend curb, wingwall, or safety end treatment reinforcing into concrete closure. Bend or trim, as necessary, any reinforcing that does not fit into closure area.

4 Provide a 3'–0" Min cast–in–place concrete closure. Break back boxes in the field or cast boxes short. Provide bands of reinforcing in the closure that are the same size and spacing as in the precast box section. Provide #4 longitudinal reinforcement spaced at 12 inches Max within the closure. Except where shown otherwise, construct the cast–in–place closure flush with the inside and outside faces of the precast box section.

5 For multiple unit placements, adjust the length of the closure for the interior walls as necessary. Provide a 3'–0" Min cast–in–place closure in the top slab, bottom slab, and exterior wall. See Section B–B detail when interior walls are cast full length.

6 Extend precast box reinforcing a minimum of 1'–0" into concrete closure (Typ).

7 Place bands of reinforcing matching the inside and outside face reinforcing in the gaps of the top and bottom slabs. Place a band matching the outside face reinforcing of the wall in the gaps of the walls (placed in the outside face only). Tack weld the bands to the exposed reinforcing at each point of contact.

8 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.

9 Cement stabilized backfill between boxes is considered part of the box culvert for payment.

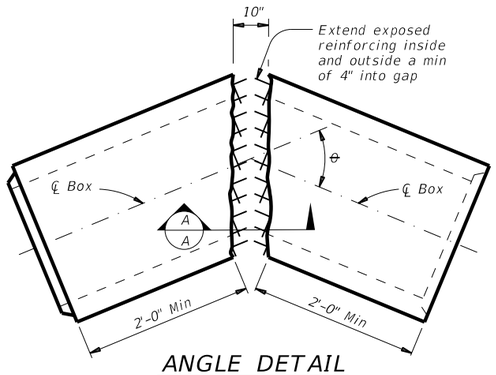
10 All curb concrete and reinforcing is considered part of the box culvert for payment.

11 Any additional concrete and reinforcing required for the closures will be considered subsidiary to the box culvert for payment.

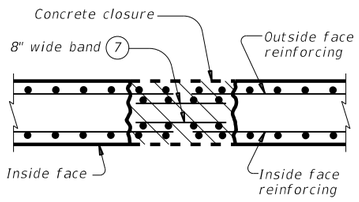
12 1'–0" typical. 2'–3" when the Box Culvert Rail Mounting Details (RAC) standard sheet is referred to elsewhere in the plans.

13 For multiple unit placement with overlay, with 1 to 2 course surface treatment, or with the top slab as the final riding surface, provide wall closure as shown in Detail "A".

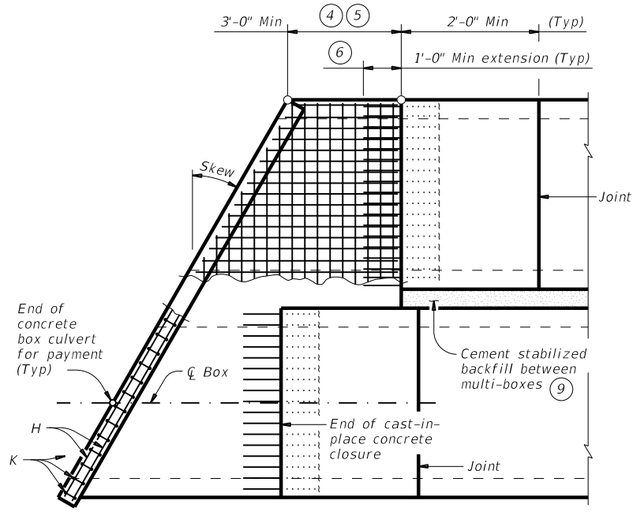
14 This dimension may be increased with approval of the Engineer to allow the precast boxes to be tunneled or jacked in accordance with Item 476, "Jacking, Boring, or Tunneling Pipe or Box". No payment will be made for any additional material in the gap between adjacent boxes.



ANGLE DETAIL



SECTION A-A



PLAN OF SKEWED ENDS

(Showing multi–box placement.)

MATERIAL NOTES:
Provide Grade 60 reinforcing steel.
Provide ASTM A1064 welded wire reinforcement.
Provide Class C concrete (f'c = 3,600 psi) for the closures.
Provide cement stabilized backfill meeting the requirements of Item 400, "Excavation and Backfill for Structures."
Any additional concrete required for the closures will be considered subsidiary to the box culvert.

GENERAL NOTES:
Designed according to AASHTO LRFD Bridge Design Specifications.
Refer to the Single Box Culverts Precast (SCP) standard sheets for details and notes not shown.
Chamfer the bottom edge of the top slab closure 3 inches at culvert closure ends.

Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bars dimensions are out–to–out of bars.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

BOX CULVERTS PRECAST MISCELLANEOUS DETAILS

SCP-MD

FILE: scpmdsts-20.dgn	DN: GAF	CK: LMW	DW: BWH/TxDOT	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	3469	01	014	FM 3099
	DIST	COUNTY		SHEET NO.
	BWD	STEPHENS		112

DATE: 8/27/2021 10:47:28 AM
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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.

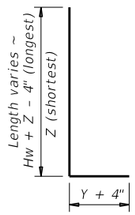
(7) 3" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures without railing and curbs taller than 1'-0", refer to the Extend Curb Details (ECD) standard sheet.

(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.

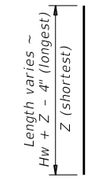
(9) See Table of Maximum Wing Heights for various slopes. Height is limited based on a 33'-6" maximum safety pipe runner length.

TABLE OF MAXIMUM WING HEIGHTS (9)

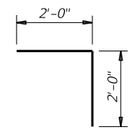
Side Slope	Hw Max
3:1	11'- 5"
4:1	8'-10"
6:1	6'- 1"



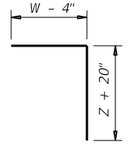
BARS J1



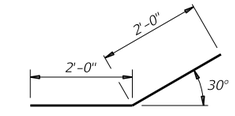
BARS V



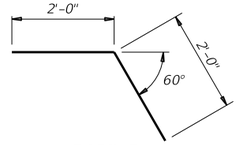
BARS L



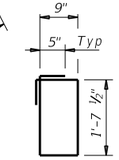
BARS J2



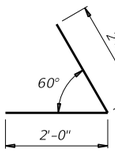
BARS D



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.

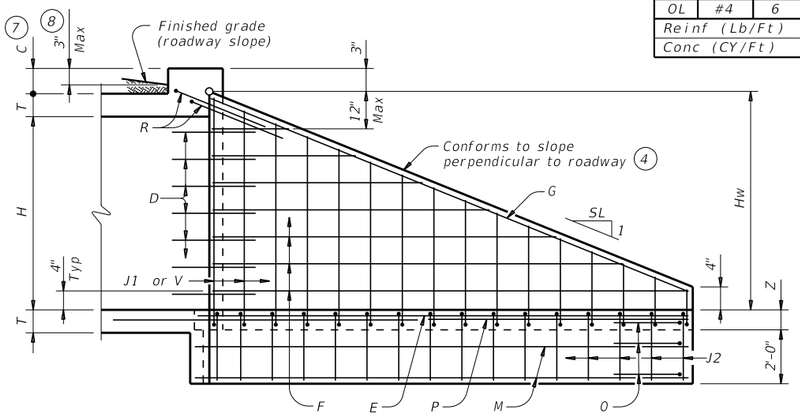
MATERIAL NOTES:

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:

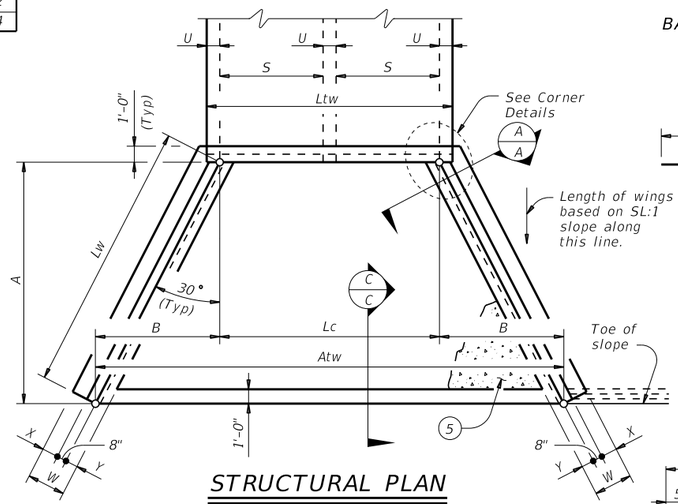
Designed according to AASHTO LRFD Bridge Design Specifications.
The safety end treatments shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the pipe runners.
Pipe runners are designed for a traversing 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.



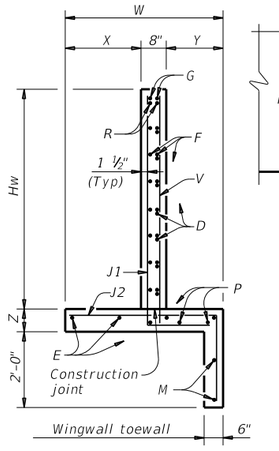
INSIDE ELEVATION OF WINGWALL

(Showing reinforcing. Culvert and culvert toewall reinforcing not shown for clarity.)

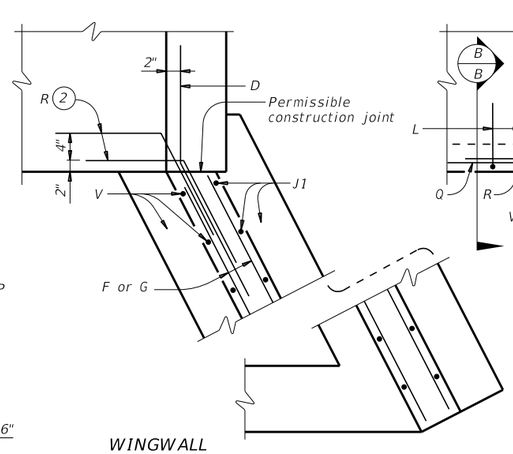


STRUCTURAL PLAN

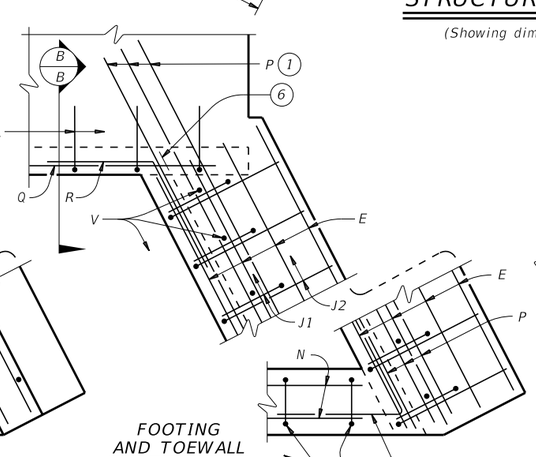
(Showing dimensions.)



SECTION A-A



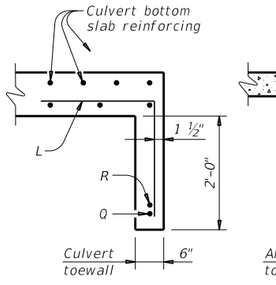
WINGWALL



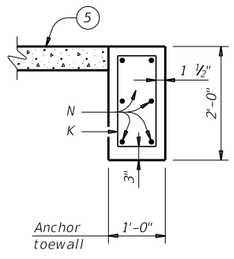
FOOTING AND TOEWALL

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

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	DIST	COUNTY		SHEET NO.
	BWD	STEPHENS		113

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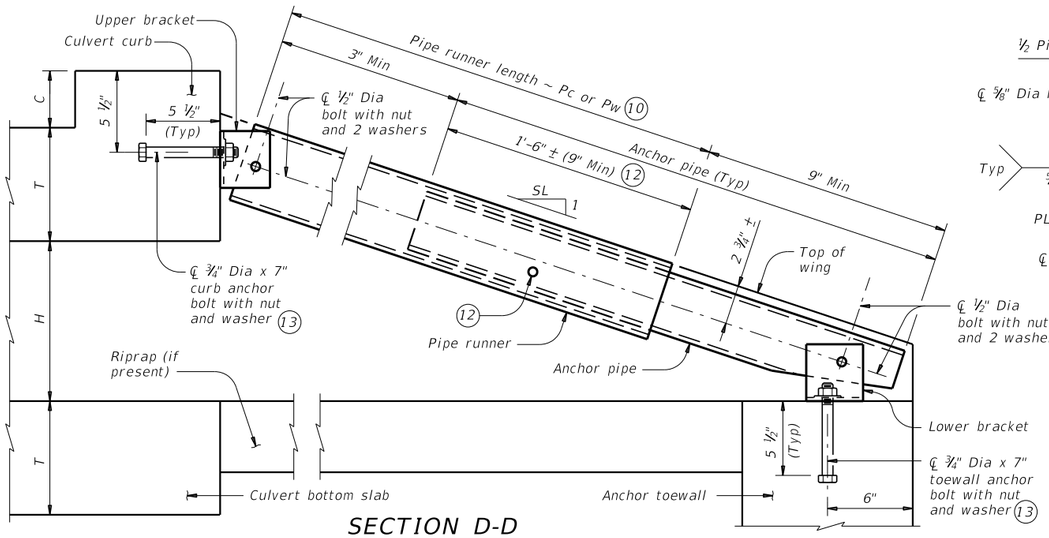
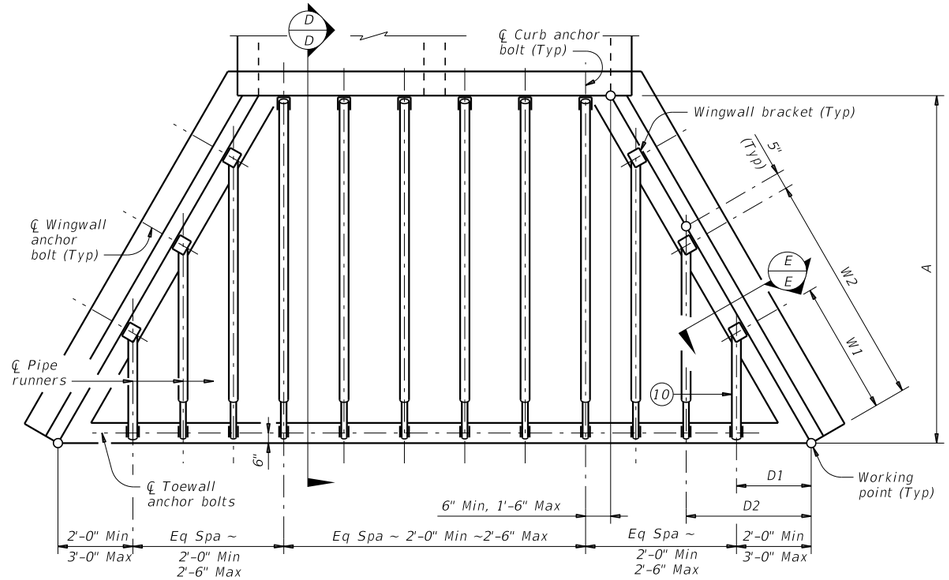
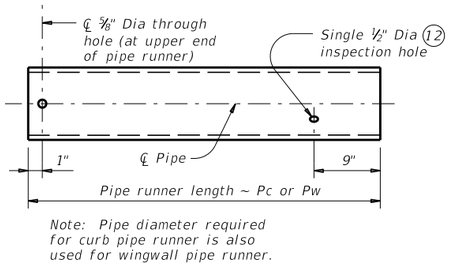


SECTION D-D

(Showing curb pipe runner. Except for upper bracket, wingwall pipe runners are similar.)

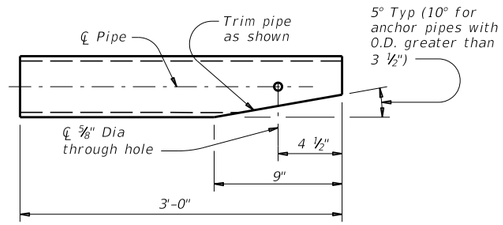


PIPE RUNNER PLAN

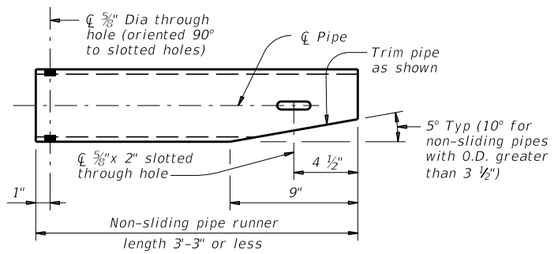


Note: Pipe diameter required for curb pipe runner is also used for wingwall pipe runner.

PIPE RUNNER DETAILS

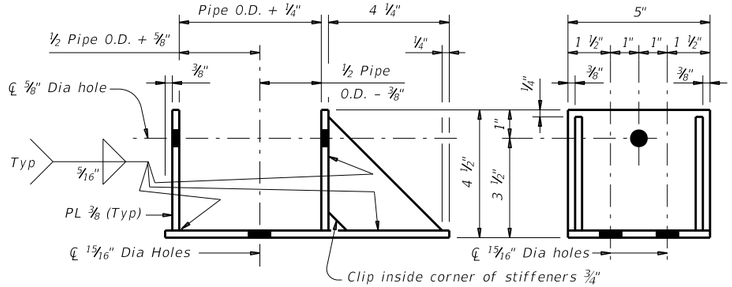


ANCHOR PIPE DETAILS



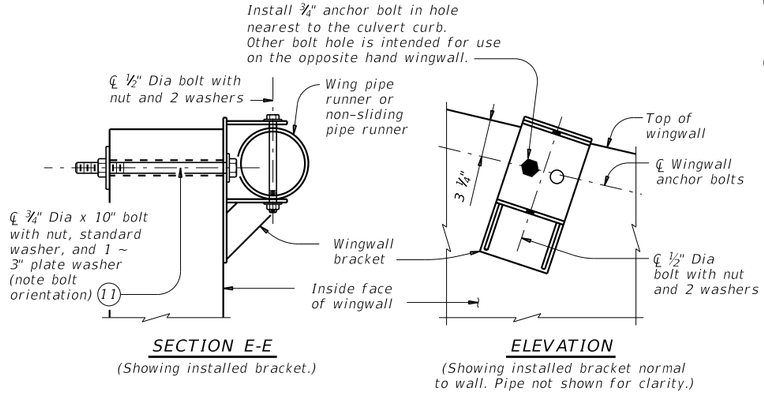
Note: Pipe size is the same as required for curb pipe runner. Adjust the corresponding lower bracket accordingly.

NON-SLIDING PIPE RUNNER DETAILS



ELEVATION

SIDE VIEW



SECTION E-E

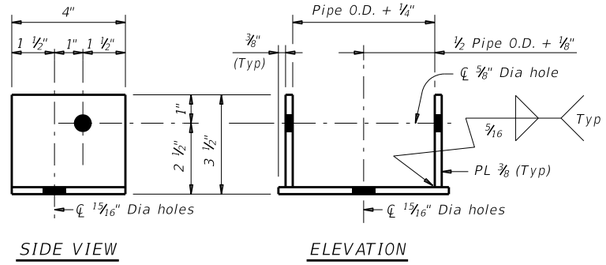
(Showing installed bracket.)

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

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

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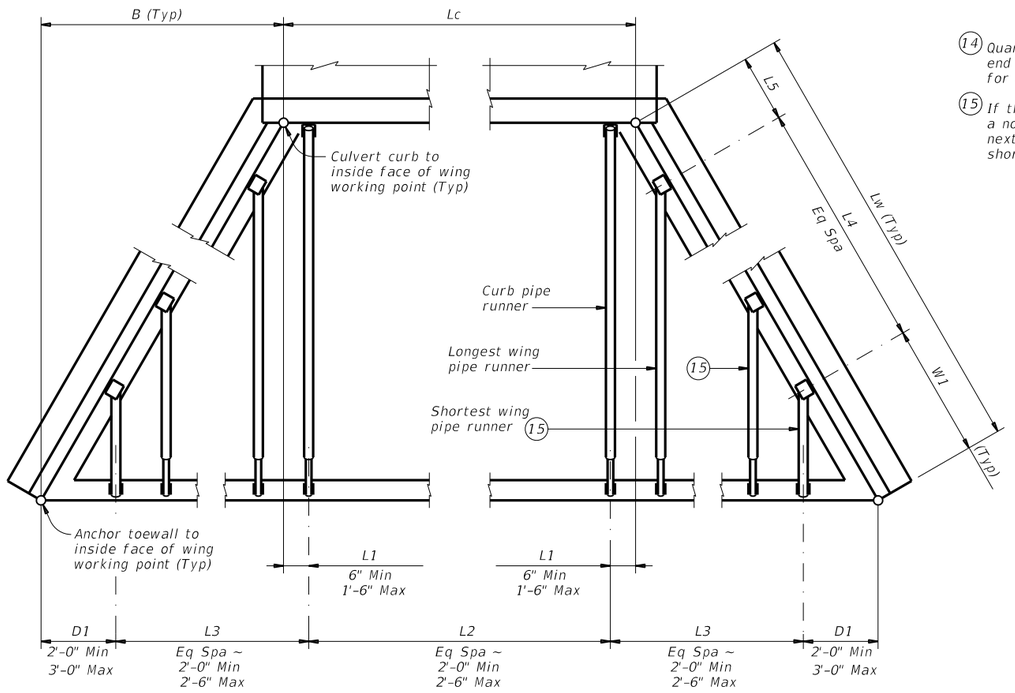
	DIST	COUNTY		SHEET NO.
	BWD	STEPHENS		114

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 Length (14) (Ft)	3'-0" Anchor Pipe Size (2",3" or 4")	3'-0" Anchor Pipe Total Length (14) (Ft)
FM 3099 CL STA 425+23.22 UPSTREAM (LT)	25.167	1.500	9	2.463	22.167	3.000	3	2.002	6.006	5.583	2	4.004	8.007	1.420	10	12.021	10.729	3.417	N/A	4"	162.646	3"	48.000



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.

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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

STATE OF TEXAS
JORDAN HASLER
137316
LICENSED PROFESSIONAL ENGINEER

10/27/2022

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TABLE OF DIMENSIONS AND REINFORCING STEEL
(Wings for One Structure End)

Maximum Wingwall Height (10) Hw	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 WINGWALL REINFORCING (Two~Wings)

Bar	Size	No.	Spa
DL & DS	#5	~	1'-0"
E	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	4	~
M	#4	4	~
P	#4	~	1'-0"
RL	#5	3	~
RS	#5	3	~
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	3	~
OS	#4	3	~
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 11#2" clearcover 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 0.5 (A+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 Extended 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.

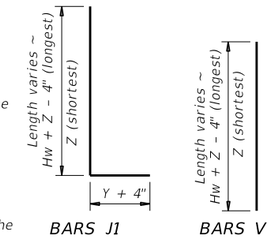
(9) Culvert skew (limit to 15° or 30°)

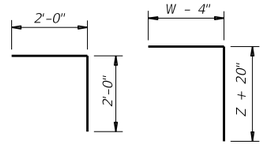
(10) See Table of Maximum Wing Heights for various slopes. Height is limited based on a 33'-6" maximum safety pipe runner length.

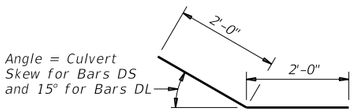
(11) Typical wingwall angle for all skews.

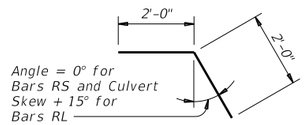
TABLE OF MAXIMUM WING HEIGHTS (10)

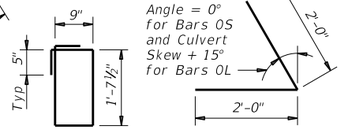
Side Slope	Hw Max
3:1	11'- 5"
4:1	8'-10"
6:1	6'- 1"











WING DIMENSION CALCULATIONS:

Formulas:

Hw = H + T + C - 0.250' (10)
A = (Hw - 0.333') (SL)
B = (A) [tan (θ + 15°)]
Lw = (A) ÷ [cos (θ + 15°)]

For cast-in-place culverts:

Ltw = [(N) (S) + (N + 1) (U)] ÷ (cos θ)

For precast culverts:

Ltw = [(N) (2U + S) + (N - 1) (0.500')] ÷ (cos θ)

Lc = (Ltw) - (2U) ÷ (cos θ)
Atw = (Lc) + (B)
Total Wingwall Area (two wings ~ S.F.) = (0.5) (Hw + 0.333') (Lw + A)

Hw = Height of wingwall (feet)
SL:1 = Side slope ratio (horizontal : 1 vertical)
Lw = Length of wingwall (feet)
Ltw = Culvert toewall length (feet)
Lc = Culvert curb between wings (feet)
Atw = Anchor toewall length (feet)
N = Number of culvert spans
θ = Culvert skew

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 elsewherein 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.

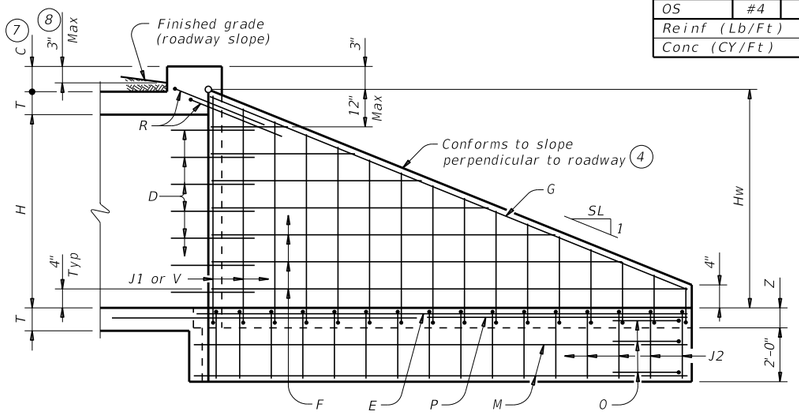
When structure is founded on solid rock, depth of toewalls for culverts and wingwalls may be reduced or eliminated as directed by the Engineer.

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.

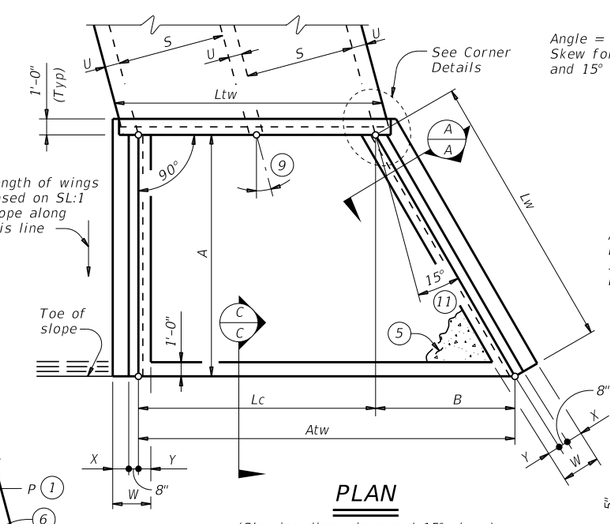
See Box Culvert Supplement (BCS) standard sheet for additional dimensions and information.

Cover dimensions are clear dimensions, unless noted otherwise. Reinforcing dimensions are out-to-out of bars.



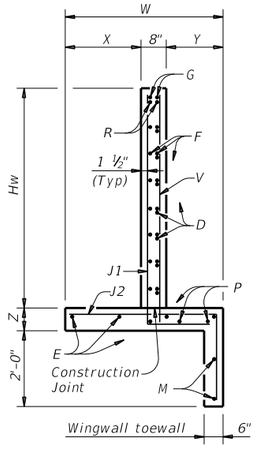
INSIDE ELEVATION OF WINGWALL

(Showing reinforcing. Culvert and culvert toewall reinforcing not shown for clarity.)

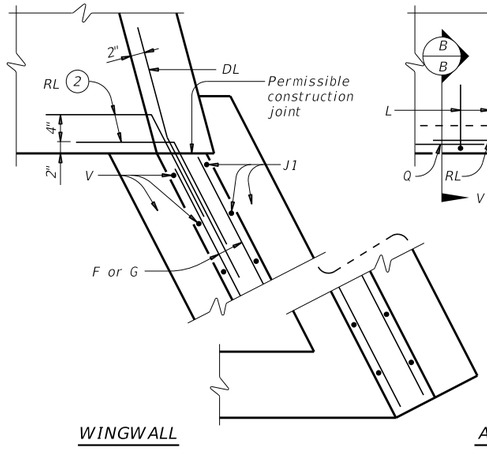


PLAN

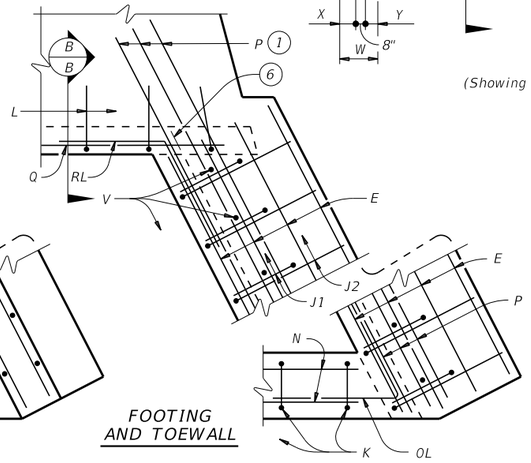
(Showing dimensions and 15° skew.)



SECTION A-A



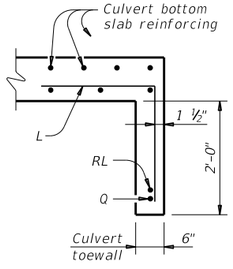
WINGWALL



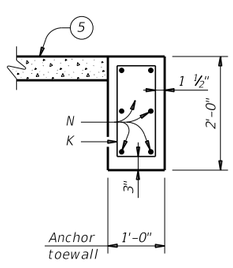
FOOTING AND TOEWALL

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 15° AND 30° SKEW BOX CULVERTS
TYPE I ~ CROSS DRAINAGE

SETB-FW-S

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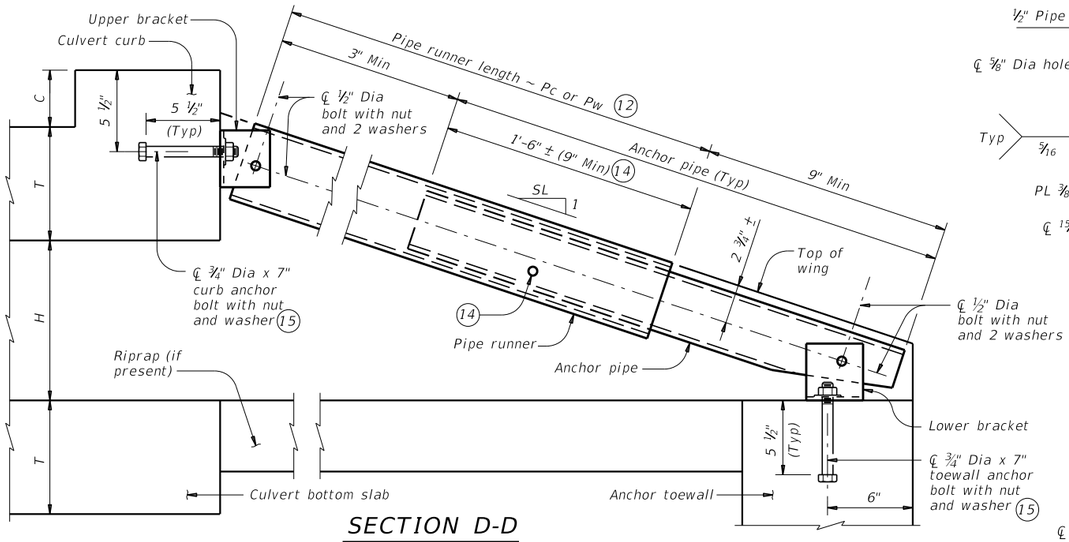
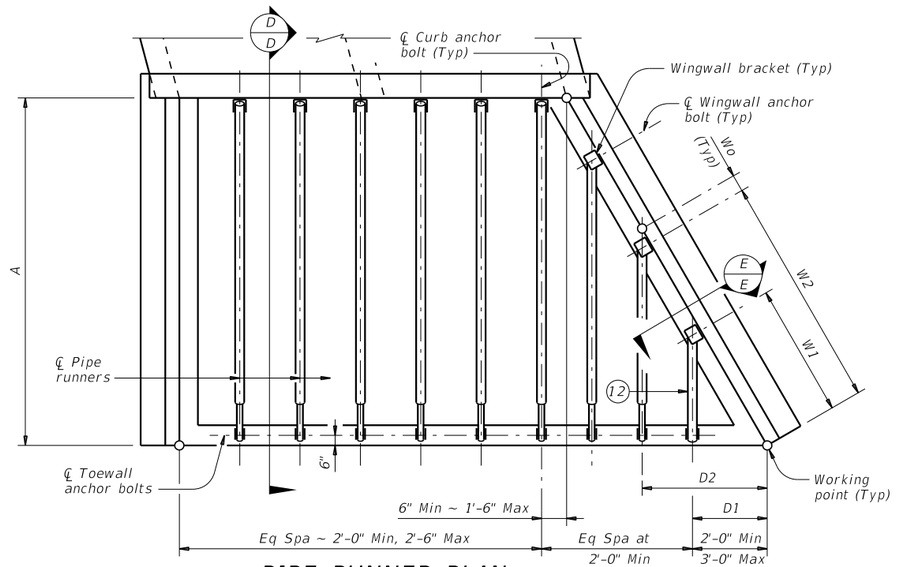
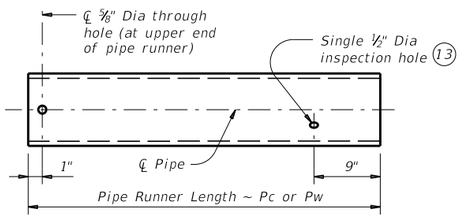


SECTION D-D

(Showing curb pipe runner. Except for upper bracket, wingwall pipe runners are similar.)

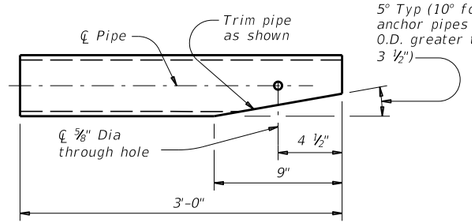


PIPE RUNNER PLAN

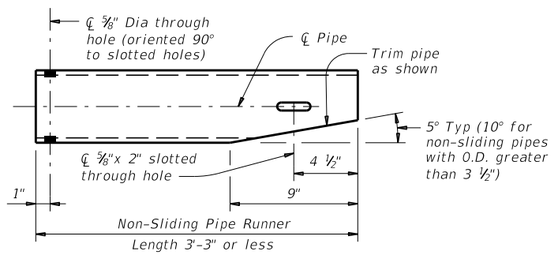


Note: Use pipe diameter required for curb pipe runner for wingwall pipe runner.

PIPE RUNNER DETAILS

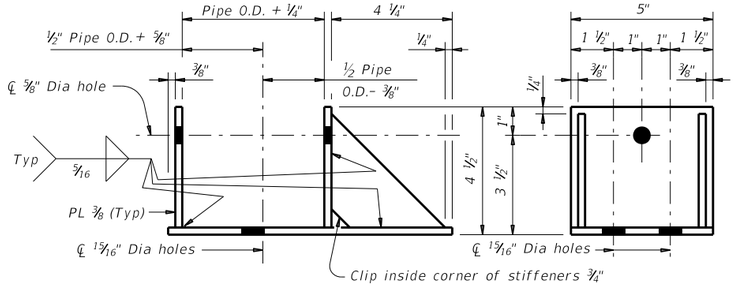


ANCHOR PIPE DETAILS



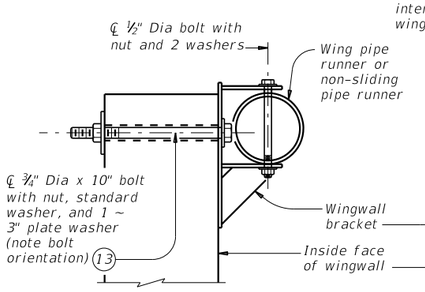
Note: Pipe size is the same as required for curb pipe runner. Adjust the corresponding lower bracket accordingly.

NON-SLIDING PIPE RUNNER DETAILS



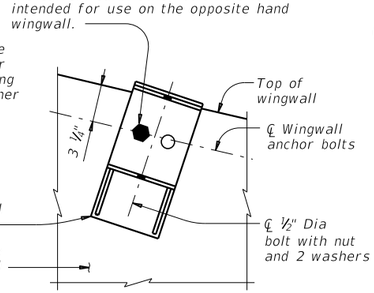
ELEVATION

SIDE VIEW



SECTION E-E

(Showing installed bracket.)

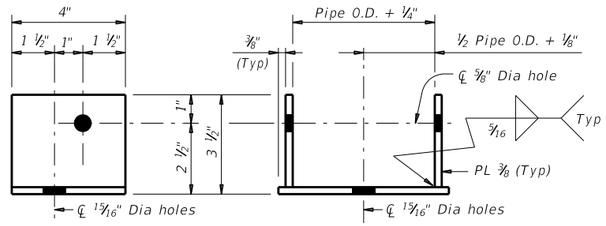


ELEVATION

(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 AND ANCHOR PIPE 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"

(12) 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.

(13) 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.

(14) 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.

(15) 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 = (K3) (Dn) – (Wo)
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	K2~15° Skew	K2~30° Skew
3:1	~ 1.054	~ 1.826	~ 1.054
4:1	~ 1.031	~ 1.785	~ 1.031
6:1	~ 1.014	~ 1.756	~ 1.014

K3 = 15° Skew ~ 2.000
30° Skew ~ 1.414
n = Wing pipe runner number
Wo = 15° Skew ~ 5"
30° Skew ~ 2 ½"

Texas Department of Transportation

Bridge Division Standard

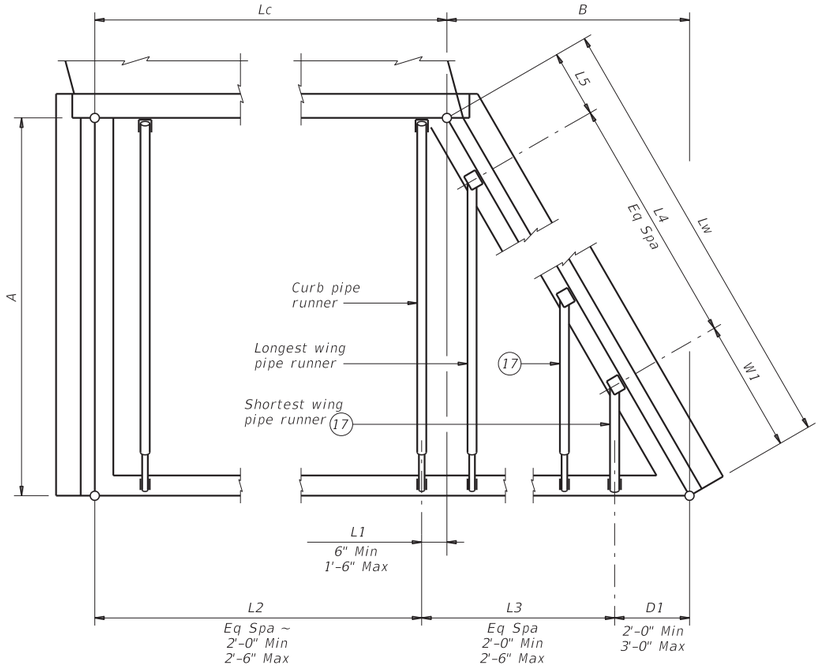
SAFETY END TREATMENT WITH FLARED WINGS

FOR 15° AND 30° SKEW BOX CULVERTS
TYPE I ~ CROSS DRAINAGE

SETB-FW-S

FILE: setbfsse-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	3469	01	014,	FM 3099
	DIST	COUNTY		SHEET NO.
	BWD	STEPHENS		117

Culvert Station and/or Creek name followed by applicable end (Lt, Rt or Both) (16)	Lc	L1	L2			D1	L3			W1	L4			L5	Curb Pipe Runner (Pc)		Longest Wing Pipe Runner (Pw)	Shortest Wing Pipe Runner (Pw)	Non-Sliding Wing Pipe Runner (if applicable)	Curb, Wing, and/or Non-Sliding Pipe Runners		3'-0" Anchor Pipe	
			No. Spa	Spa at	Overall Length		No. Spa	Spa at	Overall Length		No. Spa	Spa at	Overall Length		No.	Length				Size (3",4" or 5")	Total Length (16)	Size (2",3" or 4")	Total Length (16)
	(Ft)	(Ft)		(Ft)	(Ft)	(Ft)			(Ft)	(Ft)			(Ft)	(Ft)		(Ft)	(Ft)	(Ft)	(Ft)		(Ft)		(Ft)
FM 3099 CL STA 425+23.22 DOWNSTREAM (RT)	26.054	1.500	10	2.455	24.554	3.000	3	2.002	6.006	5.583	2	4.004	8.007	1.420	10	12.021	10.729	3.417	N/A	4"	141.427	3"	39.000



PIPE RUNNER LAYOUT

Note: Right forward culvert skew shown, actual culvert skew may be opposite hand.

(16) Quantities shown are for one structure end if Lt or Rt. Quantities shown are for two structure ends if Both.

(17) If the outermost wing pipe runner is a non-sliding pipe runner, consider the next outermost wing pipe runner as the shortest.

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STATE OF TEXAS
JORDAN HASLER
137316
LICENSED
PROFESSIONAL ENGINEER

8/27/2021

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT WITH FLARED WINGS

FOR 15° AND 30° SKEW BOX CULVERTS
TYPE I ~ CROSS DRAINAGE

SETB-FW-S

FILE: setbfsse-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	3469	01	014,	FM 3099
	DIST	COUNTY		SHEET NO.
	BWD	STEPHENS		118

DATE: 10/6/2022 9:21:49 AM
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TABLE OF DIMENSIONS AND REINFORCING STEEL
(Wings for One Structure End)

Dimensions					Variable Reinforcing				Estimated Quantities (3) per ft of wing length (Two~Wings)	
					Bars J1		Bars J2			
Maximum Wingwall Height Hw (9)	W	X	Y	Z	Size	Spa	Size	Spa	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 WINGWALL 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.

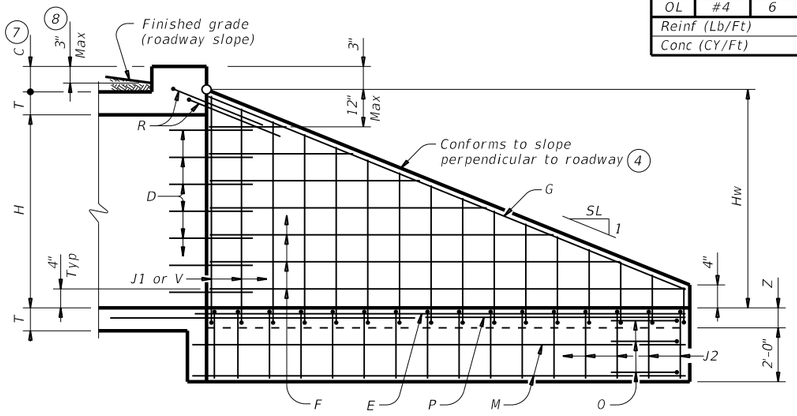
(7) 3" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures without railing and curbs taller than 1'-0", refer to Extended Curb Details (ECD) standard sheet.

(8) For vehicle safety, reduce curbs height, if necessary, to provide a maximum 3" projection above finished grade. No changes will be made in quantities and no additional compensation will be allowed for this work.

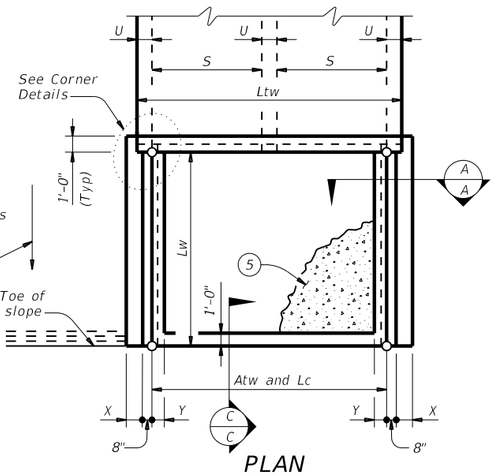
(9) See Table of Maximum Wing Heights for various slopes. Height is limited based on a 33'-6" maximum safety pipe runner length.

TABLE OF MAXIMUM WING HEIGHTS (9)

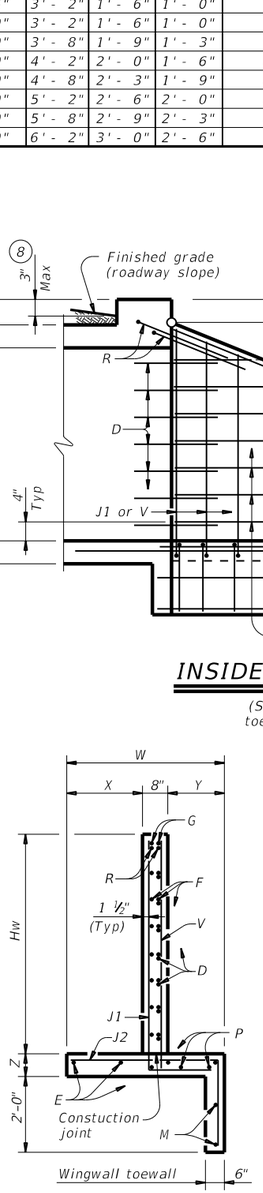
Side Slope	Hw Max
3:1	11'- 5"
4:1	8'-10"
6:1	6'- 1"



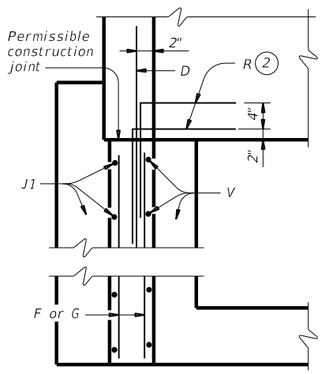
INSIDE ELEVATION OF WINGWALL
(Showing reinforcing. Culvert and culvert toewall reinforcing not shown for clarity.)



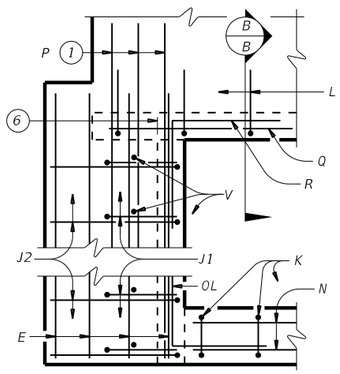
PLAN
(Showing dimensions.)



SECTION A-A

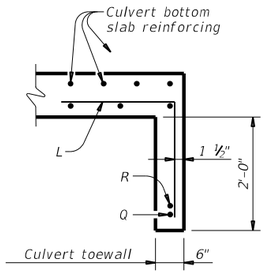


WINGWALL

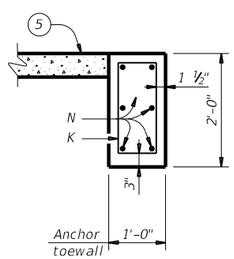


FOOTING AND TOEWALL

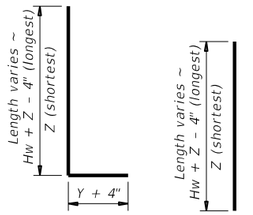
CORNER DETAILS
(Culvert and culvert toewall reinforcing not shown for clarity.)



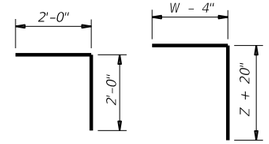
SECTION B-B (5)



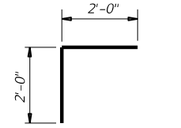
SECTION C-C



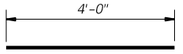
BARS J1 BARS V



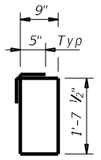
BARS L and OL BARS J2



BARS R



BARS D



BARS K
(Length = 5'-6")

WING DIMENSION CALCULATIONS:

Hw = H + T + C - 0.250' (9)
Lw = (Hw - 0.333') (SL)

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
Total Wingwall Area (two wings ~ SF)
= (Hw + 0.333') (Lw)

Hw = Height of wingwall (feet)
SL:1= Side slope ratio (horizontal : 1 vertical)
Lw = Length of wingwall (feet)
Ltw = Culvert toewall length (feet)
Lc = Culvert curb between wings (feet)
Atw = Anchor toewall length (feet)
N = Number of culvert spans

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 epoxy 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 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.

Texas Department of Transportation
Bridge Division Standard

SAFETY END TREATMENT WITH STRAIGHT WINGS

FOR 0° SKEW BOX CULVERTS
TYPE I ~ CROSS DRAINAGE

SETB-SW-O

FILE: setbs0se-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020 REVISIONS	CONT	SECT	JOB	HIGHWAY
	3469	01	014,	FM 3099
	DIST	COUNTY		SHEET NO.
	BWD	STEPHENS		119

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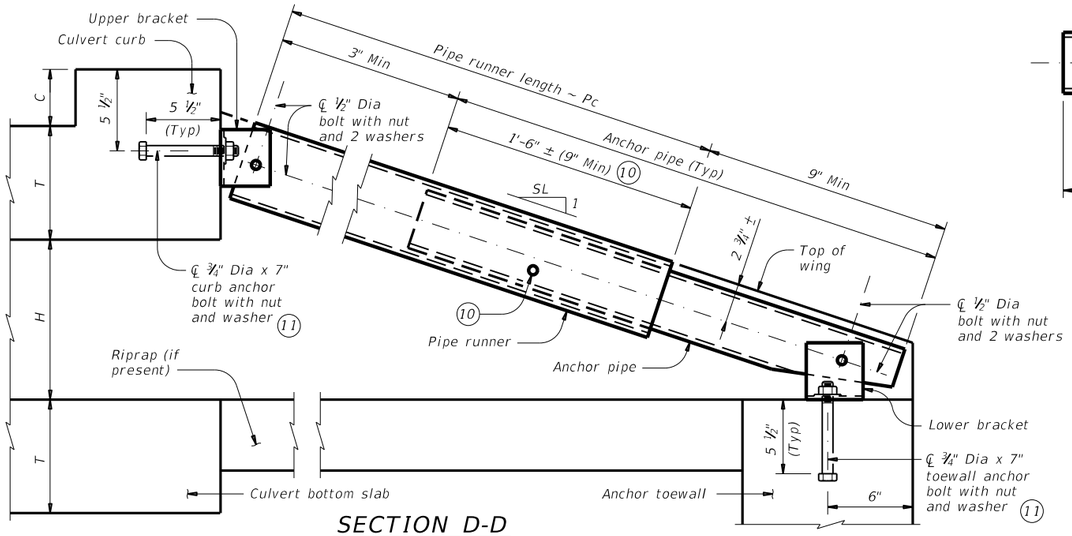
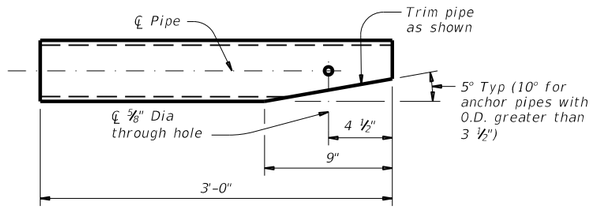
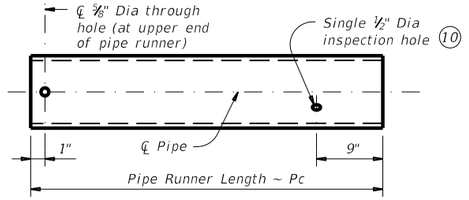


SECTION D-D

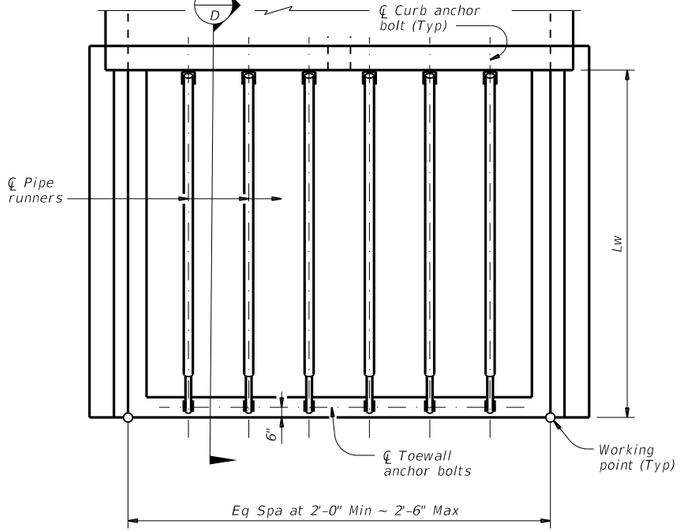
(Showing curb pipe runner.)



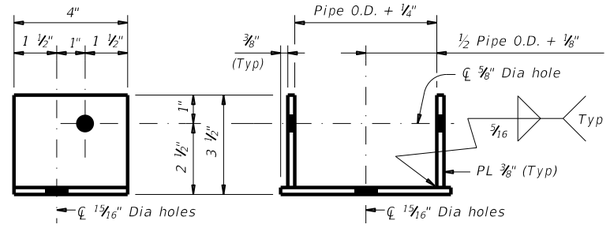
ANCHOR PIPE DETAILS



PIPE RUNNER DETAILS



PIPE RUNNER PLAN



SIDE VIEW ELEVATION

Note: Upper and lower brackets match the required pipe diameters as shown in the table.

UPPER AND LOWER BRACKET DETAILS

MAXIMUM PIPE RUNNER LENGTHS AND REQUIRED PIPE RUNNER AND ANCHOR PIPE SIZES

Maximum Pipe Runner Length (Pc)	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) 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.

(11) 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:

Pc = (Lw) (K) - (1.688)

Pc = Pipe runner length (feet)

K = Constant values for use in formulas

Slope SL:1		K
3:1	~	1.054
4:1	~	1.031
6:1	~	1.014

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT WITH STRAIGHT WINGS

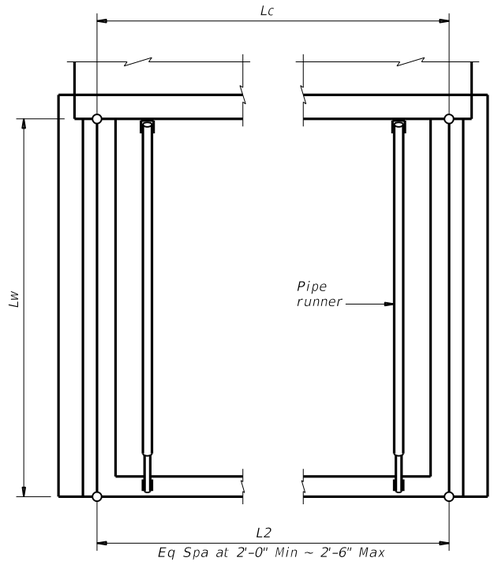
FOR 0° SKEW BOX CULVERTS
TYPE I ~ CROSS DRAINAGE

SETB-SW-O

FILE: setbs0se-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	3469	01	014,	FM 3099
	DIST	COUNTY		SHEET NO.
	BWD	STEPHENS		120

Culvert Station and/or Creek name followed by applicable end (Lt, Rt or Both) (12)	Lc	L2			Pipe Runner (Pc)				3'-0" Anchor Pipe	
	(Ft)	No. Spa	Spa at (Ft)	Overall Length (Ft)	No.	Length (Ft)	Size (3",4" or 5")	Total Length (Ft) (12)	Size (2",3" or 4")	Total Length (Ft) (12)
Sta 476+51 (LT)	4.000 '	2	2.000 '	4.000 '	1	4.313 '	3"	4.313 '	2"	3.000 '

(12) Quantities shown are for one structure end if Lt or Rt. Quantities shown are for two structure ends if Both.



PIPE RUNNER LAYOUT

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 STRAIGHT WINGS

FOR 0° SKEW BOX CULVERTS
TYPE I ~ CROSS DRAINAGE

SETB-SW-O

FILE: setbs0se-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
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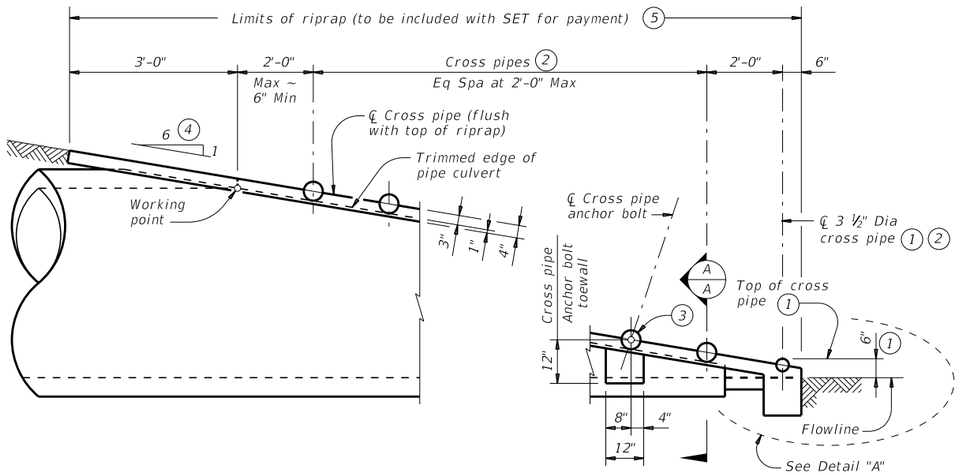


SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

(Showing reinforced concrete pipe (RCP) culvert. Details of corrugated metal pipe (CMP) culvert are similar. pipe runners not shown for clarity.)

CROSS PIPE LENGTHS AND REQUIRED PIPE SIZES 2

Corrugated Metal Pipe (CMP) Culverts

Design	Conc Riprap (CY) 6	Pipe Culvert Span	Pipe Culvert Rise	Pipe Culvert Spa ~ G	Single Barrel ~ Q1	Multi-Barrel ~ Q1	Q2	Conditions for Use of Cross Pipes	Cross Pipe Sizes
1	0.6	17"	13"	1' – 0"	N/A	2' – 8"	2' – 5"	3 or more pipe culverts	3" Std (3.500" O.D.)
2	0.7	21"	15"	1' – 2"	N/A	3' – 1"	2' – 11"		
3	0.9	28"	20"	1' – 5"	N/A	3' – 9"	3' – 9"	3 or more pipe culverts	3 ½" Std (4.000" O.D.)
4	1.0	35"	24"	1' – 8"	4' – 4"	4' – 6"	4' – 7"	All pipe culverts	4" Std (4.500" O.D.)
5	1.2	42"	29"	1' – 11"	4' – 11"	5' – 2"	5' – 5"		
6	1.4	49"	33"	2' – 2"	5' – 6"	5' – 11"	6' – 3"	All pipe culverts	5" Std (5.563" O.D.)
7	1.6	57"	38"	2' – 5"	6' – 2"	6' – 8"	7' – 2"		
8	1.8	64"	43"	2' – 10"	6' – 9"	7' – 6"	8' – 2"		
9	1.9	71"	47"	3' – 2"	7' – 4"	8' – 3"	9' – 1"		

Reinforced Concrete Pipe (RCP) Culverts

Design	Conc Riprap (CY) 6	Pipe Culvert Span	Pipe Culvert Rise	Pipe Culvert Spa ~ G	Single Barrel ~ Q1	Multi-Barrel ~ Q1	Q2	Conditions for Use of Cross Pipes	Cross Pipe Sizes
1	0.6	22"	13 ½"	1' – 0"	N/A	3' – 1"	2' – 10"	3 or more pipe culverts	3" Std (3.500" O.D.)
2	0.7	26"	15 ½"	1' – 2"	N/A	3' – 6"	3' – 4"		
3	0.9	28 ½"	18"	1' – 5"	N/A	3' – 10"	3' – 9 ½"	3 or more pipe culverts	3 ½" Std (4.000" O.D.)
4	1.0	36 ¼"	22 ½"	1' – 8"	4' – 5"	4' – 7"	4' – 8 ¼"	All pipe culverts	4" Std (4.500" O.D.)
5	1.2	43 ¾"	26 ⅝"	1' – 11"	5' – 1"	5' – 4"	5' – 6 ¾"		
6	1.4	51 ½"	31 ⅝"	2' – 2"	5' – 8"	6' – 1"	6' – 5 ¼"	All pipe culverts	5" Std (5.563" O.D.)
7	1.6	58 ½"	36"	2' – 5"	6' – 4"	6' – 10"	7' – 3 ½"		
8	1.8	65"	40"	2' – 10"	6' – 10"	7' – 7"	8' – 3"		
9	1.9	73"	45"	3' – 2"	7' – 6"	8' – 5"	9' – 3"		

1. The proper installation of the first cross pipe is critical for vehicle safety. Place the top of the first cross pipe no more than 6" above the flow line.
2. Provide cross pipes, except the first bottom pipe, of the size shown in the table. Provide a 3 1#2" standard pipe (4" O.D.) for the first bottom pipe.
3. Install the third Cross Pipe from the bottom of the culvert using a bolted connection. Ensure that riprap concrete does not flow into the cross pipe so as to permit disassembly of the bolted connection to allow cleanout access. At the Contractor's option, install all other cross pipes using the bolted connection details.
4. Match cross slope as shown elsewhere in the plans. Cross slope of 6:1 or flatter is required for vehicle safety.
5. Riprap placed beyond the limits shown will be paid as concrete riprap in accordance with Item 432, "Riprap".
6. Quantities shown are for one end of one pipe culvert. For multiple Pipe Culverts, quantities will need to be adjusted. Riprap quantities are for Contractor's information only.

MATERIAL NOTES:

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

Provide cross pipes that meet the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr B, or API 5LX52.

Provide ASTM A307 bolts and nuts.

Galvanize all steel components, except concrete reinforcing, after fabrication. Repair galvanizing damaged during transport or construction in accordance with the specifications.

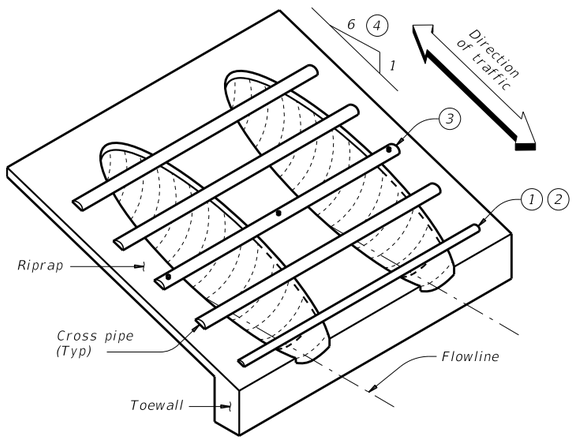
GENERAL NOTES:

Pipe runners are designed for a traversing load of 10,000 pounds at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.

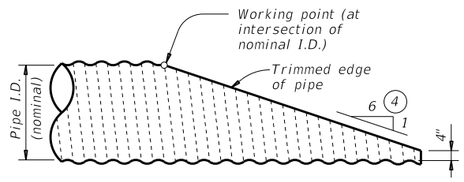
Safety end treatments (SET) shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the Pipe Runners.

Construct concrete riprap and all necessary inverts in accordance with the requirements of Item 432, "Riprap".

Payment for riprap and toewall is included in the price bid for each safety end treatment.



ISOMETRIC VIEW OF TYPICAL INSTALLATION



NOTE: All cross pipes, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

(Showing corrugated metal pipe (CMP) culvert. Details at reinforced concrete cipe (RCP) culvert are similar.)

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

FOR DESIGN 1 TO 9
ARCH PIPE CULVERTS
TYPE II ~ PARALLEL DRAINAGE

SETP-PD-A

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©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
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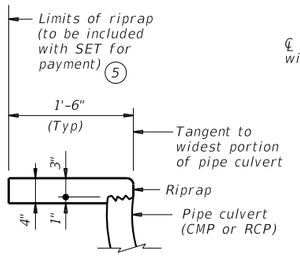
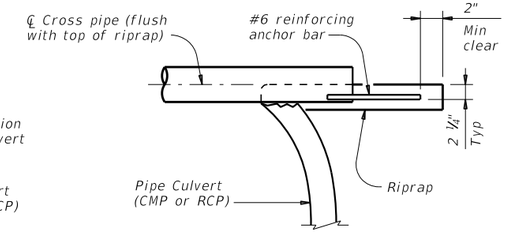
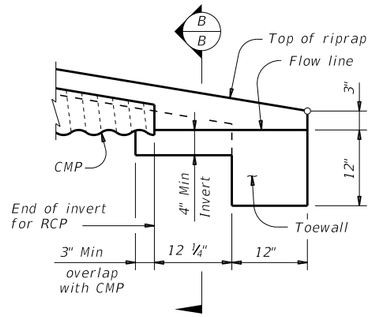
	BWD	STEPHENS		122



SHOWING TYPICAL PIPE CULVERT AND RIPRAP

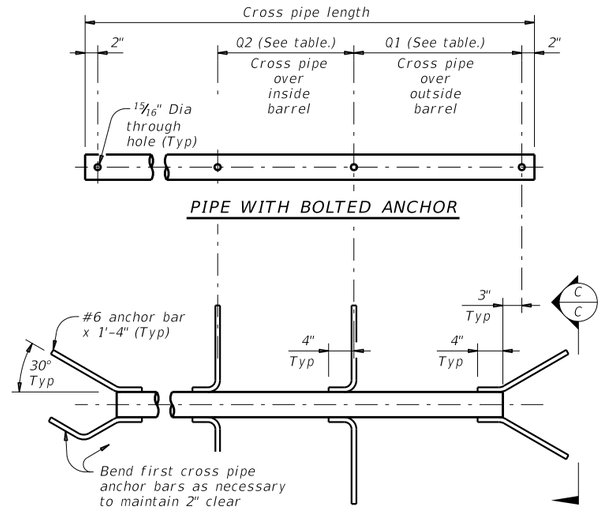


SHOWING CROSS PIPE WITH ANCHOR BAR

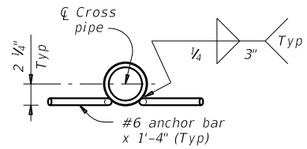


DETAIL "A"

(Showing invert with corrugated metal pipe (CMP) culvert. Reinforced concrete pipe (RCP) culvert details are similar. Cross pipes not shown for clarity.)

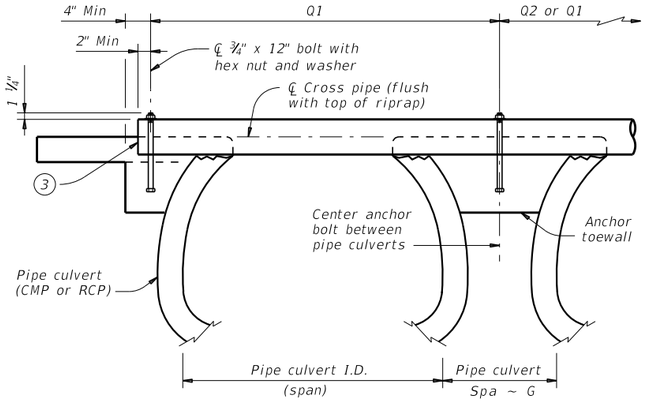


PIPE WITH ANCHOR BARS



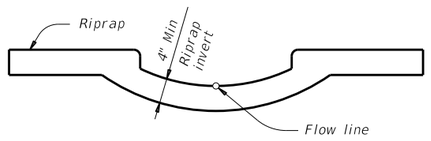
SECTION C-C

CROSS PIPE DETAILS



SHOWING CROSS PIPE WITH BOLTED ANCHOR

SECTION A-A



SECTION B-B

(Cross pipes not shown for clarity.)

SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

FOR DESIGN 1 TO 9
ARCH PIPE CULVERTS
TYPE II ~ PARALLEL DRAINAGE

SETP-PD-A

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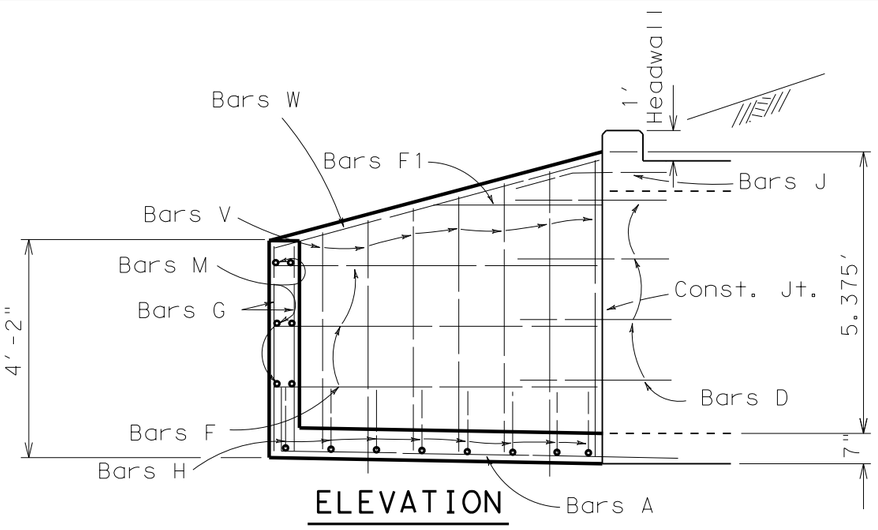
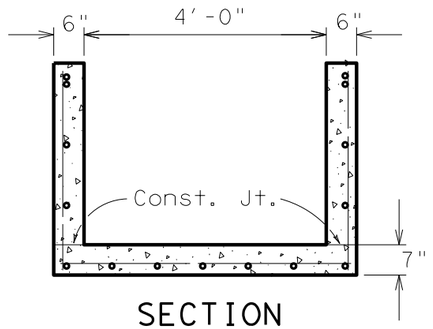


ELEVATION



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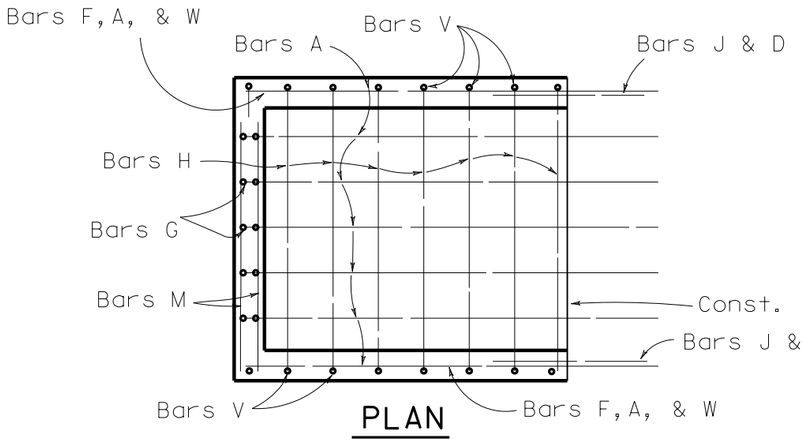
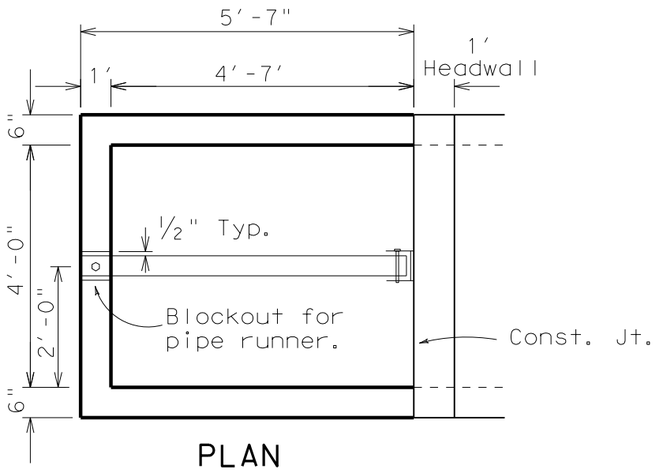
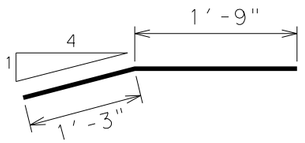


PLAN

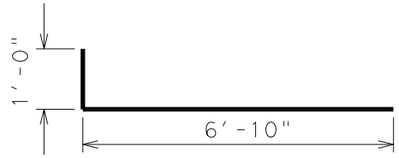


PLAN

Showing Dimensions & Pipe Runner

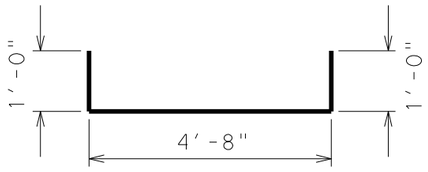


BARS J



BARS A

BARS V



BARS H

BILL OF REINFORCING STEEL FOR ONE INLET

BARS	NO.	SIZE	SPAC.	LENGTH	WT.
A	7	4	9"	7'-10"	38
D	8	4	12"	2'-6"	14
F	6	4	12"	5'-3"	22
F1	2	4	~	2'-8"	4
G	10	4	9"	3'-11"	28
H	8	4	9"	6'-8"	37
J	2	5	~	3'-0"	6
M	6	4	12"	4'-9"	20
V	16	4	9"	Av. 4'-9"	53
W	2	4	~	5'-5"	8
Pipe Runner L = 5'-9"				Total Lbs.	230
				Conc. CY	2.1

Note: See SETB-SW-0 Standard for pipe runner dimensions and mounting details.

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).
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.

STATE OF TEXAS
CANAAN CAVITT
132995
LICENSED
PROFESSIONAL ENGINEER

Canaan Cavitt

11/30/2022

SPR-DI SPL.

Texas Department of Transportation®

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
3469	01	014,	FM 3099
DIST	COUNTY		SHEET NO.
BWD	STEPHENS		124

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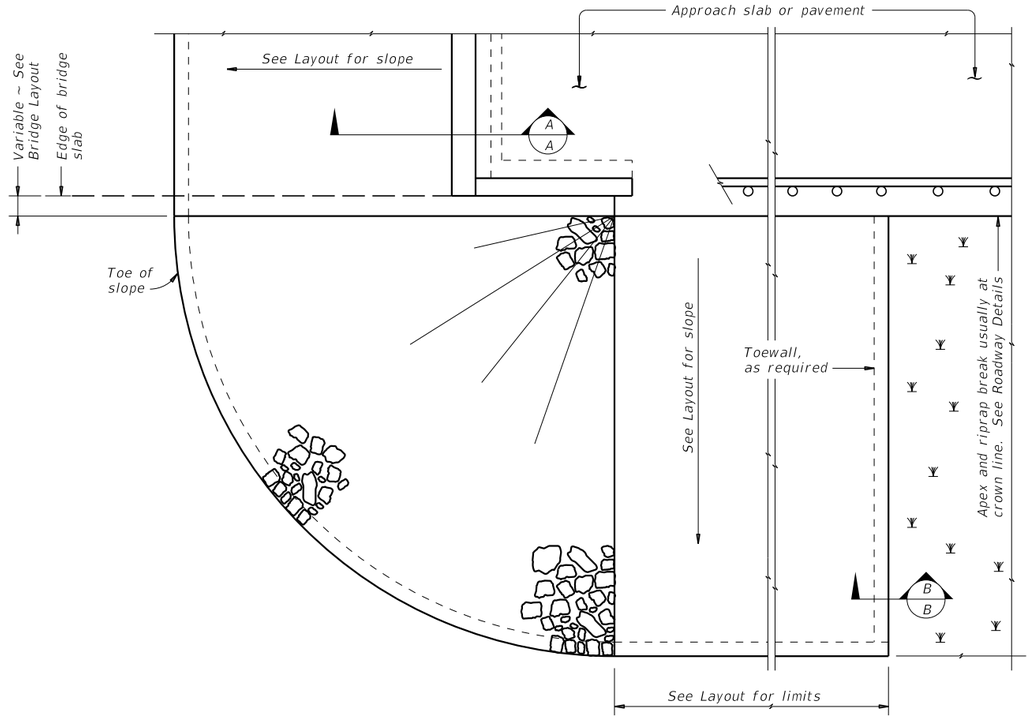
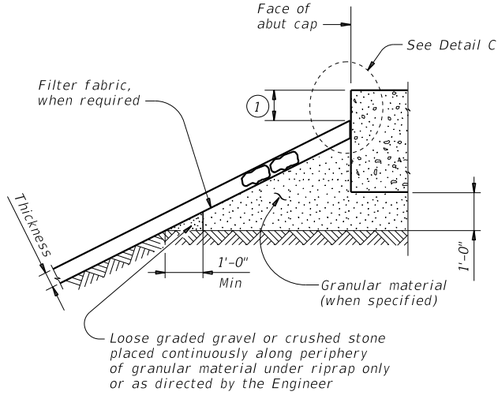
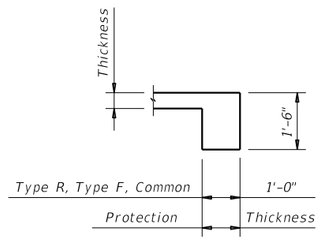


PLAN

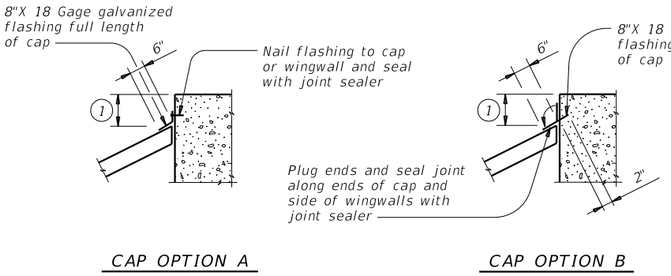


SECTION A-A AT CAP



SECTION B-B

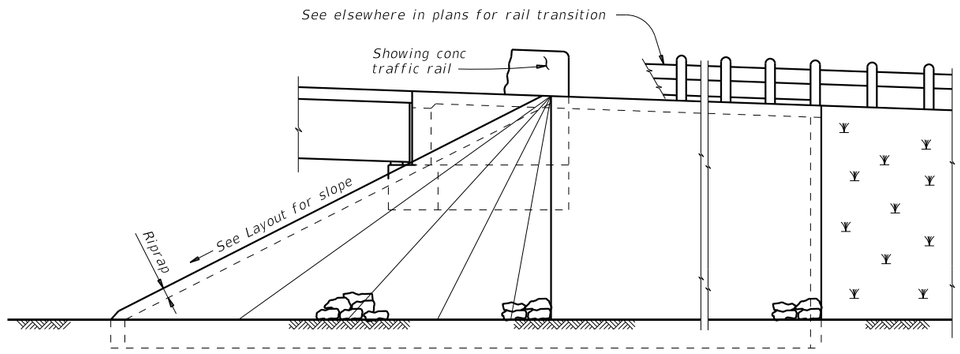
Provide toewall when shoulder drain is located adjacent to limits of stone riprap. Omit toewall when thickness of protection riprap is greater than 18".



CAP OPTION A

CAP OPTION B

DETAIL C



ELEVATION

(1) Top of cap to top of riprap dimension varies as directed by the Engineer. Provide 9" Min for beam/slab type bridges and 1'-6" for slab span, box beam, or slab beam bridges.

GENERAL NOTES:
Refer to Item 432, "Riprap" for stone size and gradation, and construction details. See Layout for limits and thickness of riprap specified.
See elsewhere in plans for locations and details of shoulder drains.

Texas Department of Transportation

Bridge Division Standard

STONE RIPRAP

SRR

FILE: srrstde1-19.dgn	DN: AES	CK: JGD	DW: BWH	CK: AES
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	3469	01	014,	FM 3099
	DIST	COUNTY		SHEET NO.
	BWD	STEPHENS		125

② Provide bedding material instead of filter fabric if shown elsewhere in plans. See Layout for thickness of bedding material.

③ Minimum toe depth is the larger of the maximum scour depth or 2 times the riprap thickness.

④ "Y" and Height need to be defined. See layout or detail sheet for values if this option is used.

⑤ List Stone Protection as size (XX inch) and thickness (YY inch) on the layout.
Example: Riprap (Stone Protection) XX inch, Thickness = YY inch.

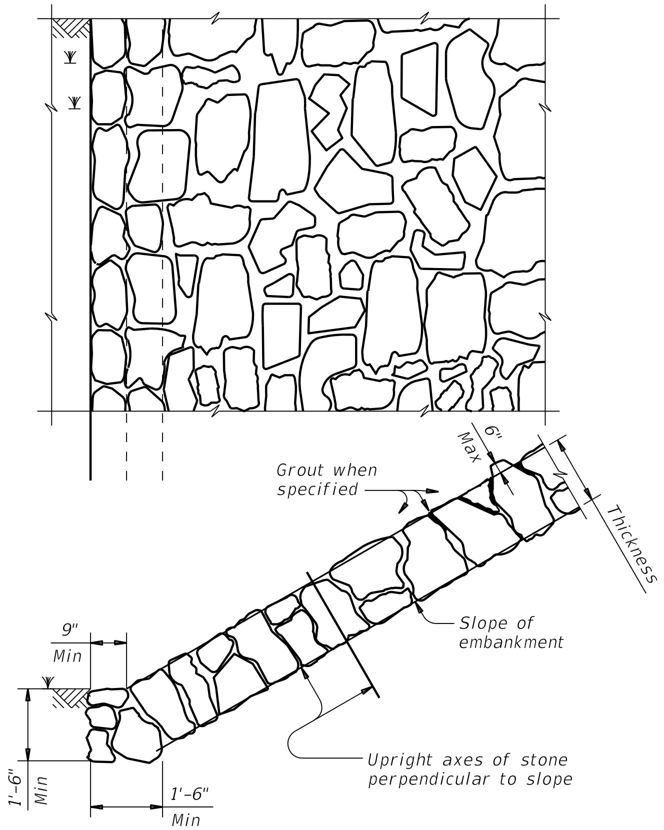


FIGURE 1 ~ TYPE R STONE RIPRAP

dry or grouted

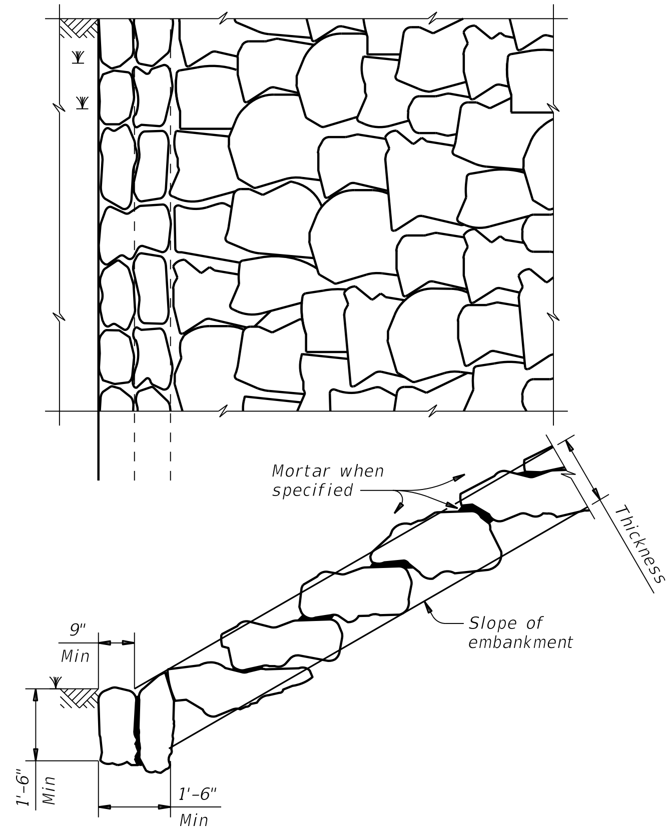


FIGURE 2 ~ TYPE F STONE RIPRAP

dry or mortared

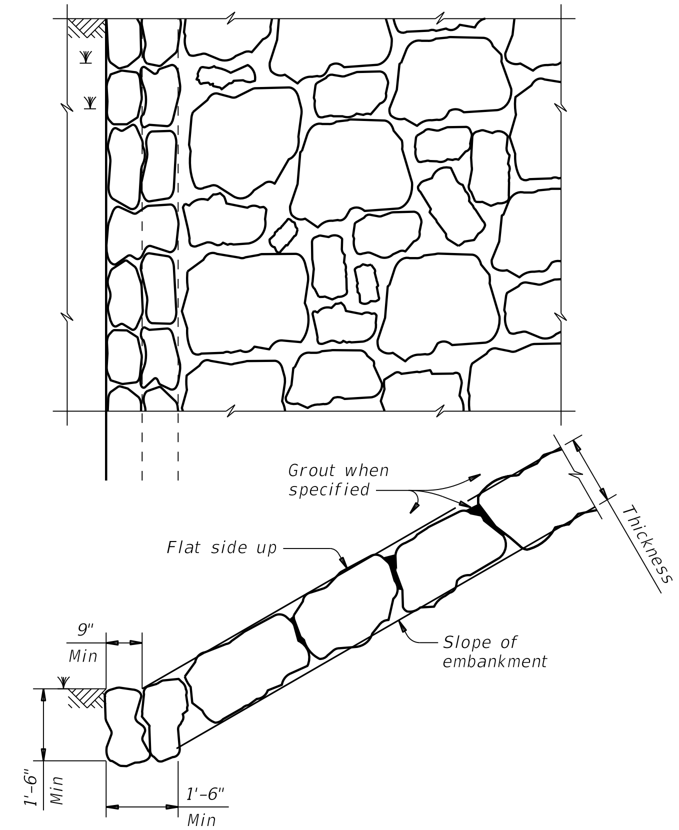
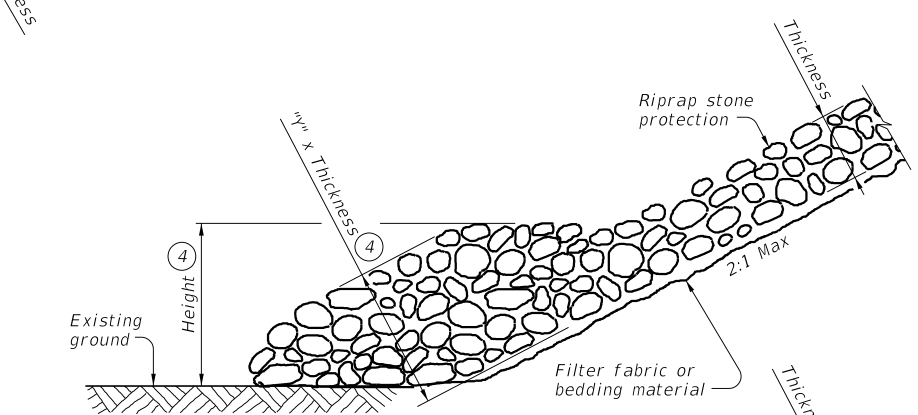
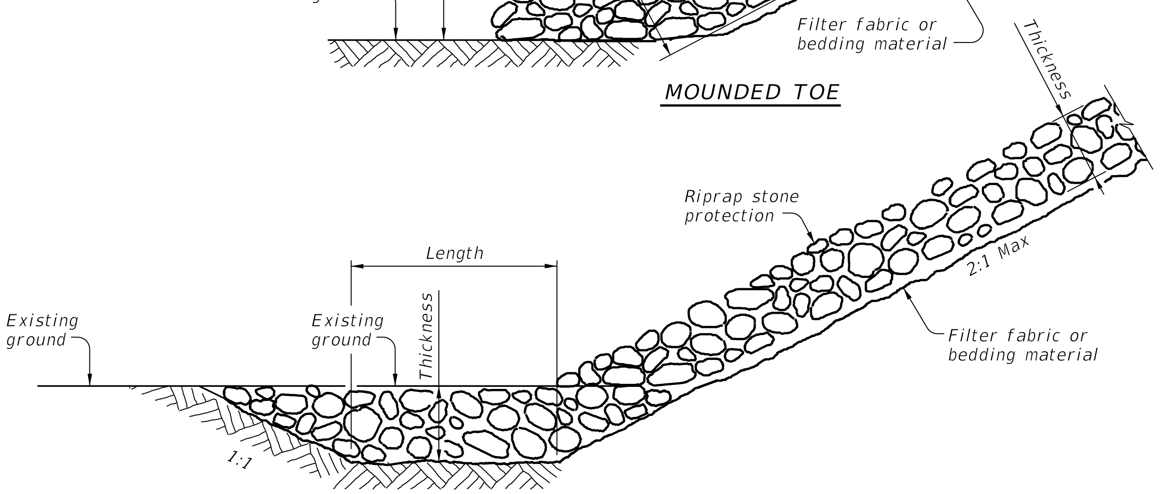


FIGURE 3 ~ TYPE F STONE RIPRAP

grouted



MOUNDED TOE



EXTENDED ROCK FILLED TRENCH

PROTECTION STONE RIPRAP TOE OPTIONS ⑤

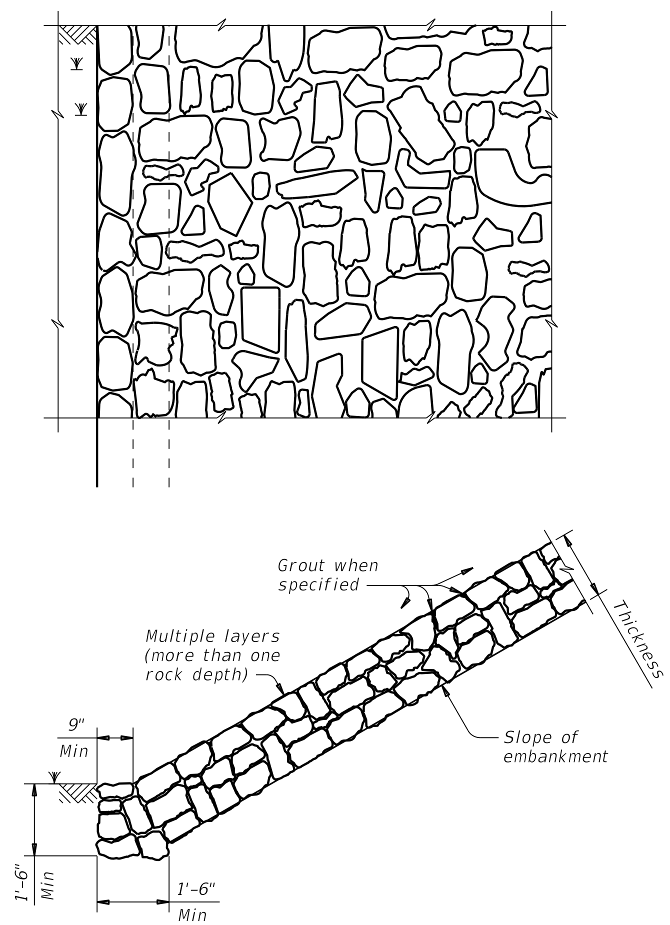


FIGURE 4 ~ COMMON STONE RIPRAP

dry or grouted

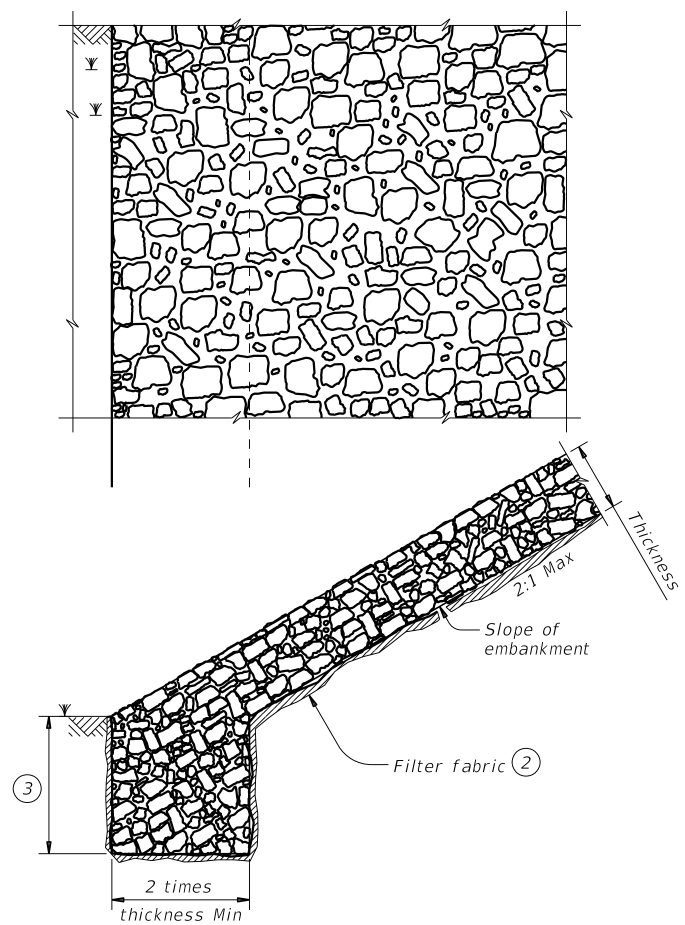


FIGURE 5 ~ PROTECTION STONE RIPRAP ⑤

SHEET 2 OF 2

Texas Department of Transportation | Bridge Division Standard

STONE RIPRAP

SRR

FILE: srrstde1-19.dgn	DN: AES	CK: JGD	DW: BWH	CK: AES
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	3469	01	014,	FM 3099
	DIST		COUNTY	SHEET NO.
	BWD		STEPHENS	126

DATE: 8/27/2021 10:47:45 AM
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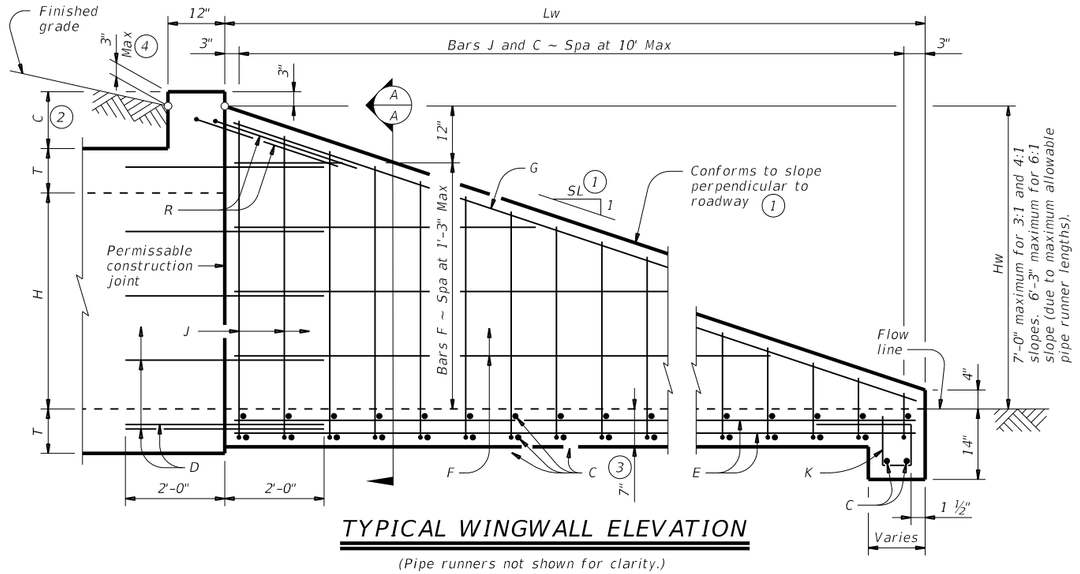
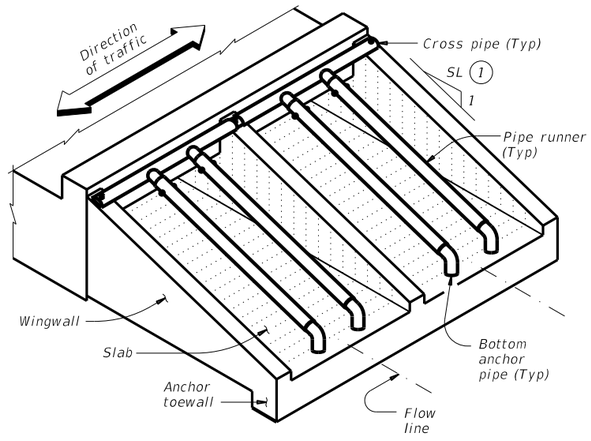


TYPICAL WINGWALL ELEVATION

(Pipe runners not shown for clarity.)



ISOMETRIC VIEW OF TYPICAL INSTALLATION

WING DIMENSION CALCULATIONS:

$Hw = H + T + C - 0.250'$

$Lw = (Hw - 0.333') (SL)$

For cast-in-place culverts:

$Atw = (N) (S) + (N + 1) (U)$

For precast culverts:

$Atw = (N) (2U + S) + (N - 1) (0.500')$

Total Wingwall Area (SF)
$= (0.5) (Hw + 0.333') (Lw) (N + 1)$

Total Concrete Volume (CY)
$= [(\text{Wingwall Area}) (0.583') + (Lw) (Atw) (0.583') + (Atw) (1.167') (1.167' - 0.583')] \div (27)$

PIPE RUNNER DIMENSION CALCULATIONS:

Pipe Runner Length
$= (Lw) (K1) - (1.917')$

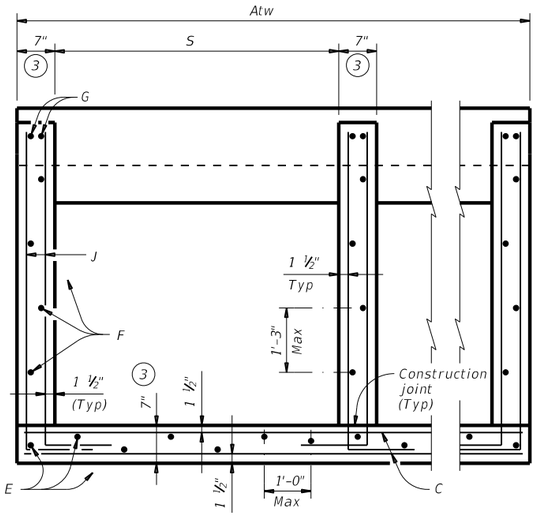
Total Reinforcing (Lb)
$= (1.55) (Lw) (Atw) + (4.43) (Atw) + (K2) (Hw) (N + 1) (\sqrt{Lw})$

C = Height of curb above top of top slab (feet)
Hw = Height of wingwall (feet)
K = Constant value for use in formulas

Slope SL:1	K1	K2
3:1	~ 1.054 ~	7.45
4:1	~ 1.031 ~	8.49
6:1	~ 1.014 ~	10.30

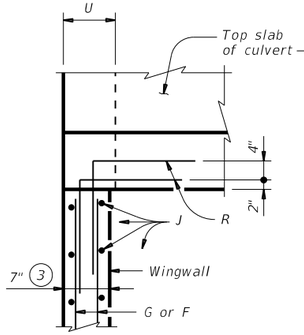
Atw = Anchor toewall length (feet)
Lw = Length of wingwall (feet)
N = Number of culvert barrels
SL:1 = Side slope ratio (horizontal : 1 vertical)

See applicable box culvert standard for H, S, T, and U values.



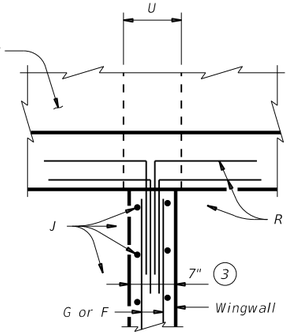
SECTION A-A

(Showing typical wingwall and wing slab reinforcing. Pipe runners not shown for clarity.)



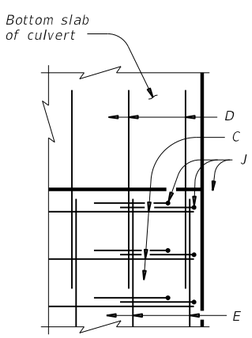
AT TOP OF EXTERIOR WINGWALL

(Cast-in-place culvert)



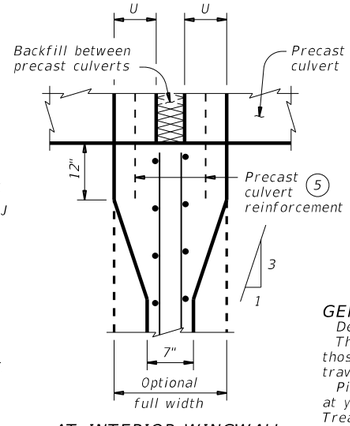
AT TOP OF INTERIOR WINGWALL

(Cast-in-place culvert)



AT OUTSIDE OF BOTTOM SLAB

(Cast-in-place culvert)



AT INTERIOR WINGWALL

(Precast culvert)

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.

Provide galvanized reinforcing steel if required elsewhere in the plans.

Adjust reinforcing as necessary to provide a minimum clear cover of 1 ½".

Provide Class "C" concrete (f`c = 3,600 psi).

Provide pipe runners, cross pipes, and anchor pipes meeting the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr B, or API 5LX52.

Provide ASTM A307 bolts.

Galvanize all steel components, except the concrete reinforcing, unless required elsewhere in the plans, after fabrication.

Repair galvanizing damaged during transport or construction in accordance with the Item 445, "Galvanizing".

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

The safety end treatments shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the pipe runners.

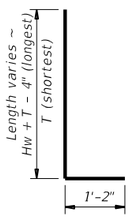
Pipe runners are designed for a traversing load of 1,800 pounds at yield as recommended by Research Report 280-1, "Safety Treatment of Roadside Cross-Drainage Structures", Texas Transportation Institute, March 1981.

The quantities for pipe runners, reinforcing steel, and concrete resulting from the formulas given herein are for Contractor's information only.

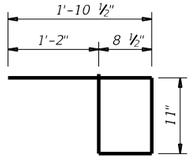
See the Box Culvert Supplement (BCS) standard sheet for additional dimensions and information.

Alternate design drawings bearing the seal of a professional engineer will be acceptable for precast construction of the safety end treatments.

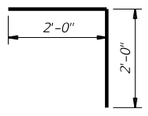
Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing dimensions are out-to-out of bars.



BARS J



BARS K
(Length = 4'-3")



BARS R

TABLE OF REINFORCING BAR SIZES AND SPACING

Bar	Size	Spacing
C	#4	10" Max
D	#4	Match F and E
E	#4	1'-0" Max
F	#4	1'-3" Max
G	#6	As shown
J	#4	10" Max
K	#4	1'-0" Max
R	#4	As shown

PLAN VIEWS OF CORNER DETAILS

(1) Recommended values of slope are: 3:1, 4:1, and 6:1. Provide 3:1 or flatter slope.

(2) 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures without railing and curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet.

(3) Wingwall and slab thicknesses may be the same as the adjacent culvert wall and slab thicknesses (7" minimum). If thicknesses greater than the minimum (7") are used, no changes will be made in quantities and no additional compensation will be allowed.

(4) For vehicle safety, reduce curb height, if necessary, to provide a maximum 3" projection. No changes will be made in quantities and no additional compensation will be allowed for this work.

(5) For culverts with C = 0", the precast culvert reinforcing may extend 1'-0" minimum into wingwall. Wingwall Bars D and R may be omitted. Otherwise, refer to the Wingwall Connection detail on the Box Culvert Precast Miscellaneous Details (SCP-MD) standard sheet.

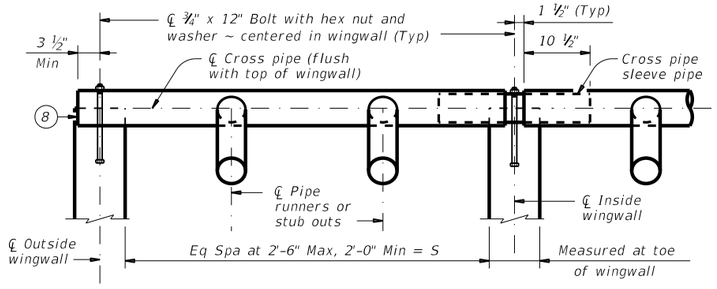
Texas Department of Transportation — Bridge Division Standard

SAFETY END TREATMENT

FOR 0° SKEW BOX CULVERTS
(MAXIMUM Hw = 7'-0")
TYPE I ~ CROSS DRAINAGE

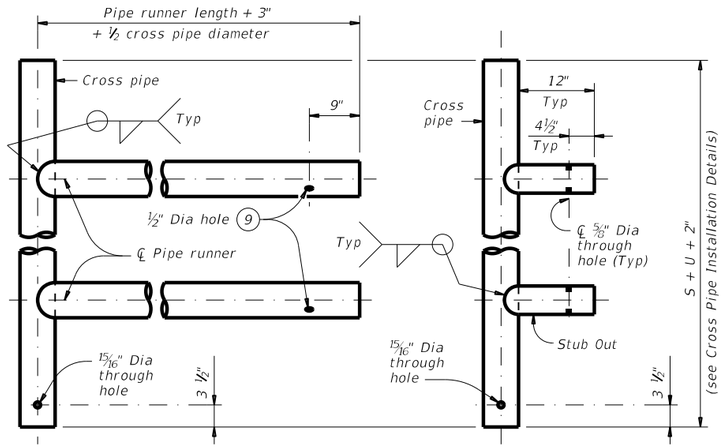
SETB-CD

FILE: setbcdse-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	3469	01	014,	FM 3099
	DIST	COUNTY		SHEET NO.
	BWD	STEPHENS		126A



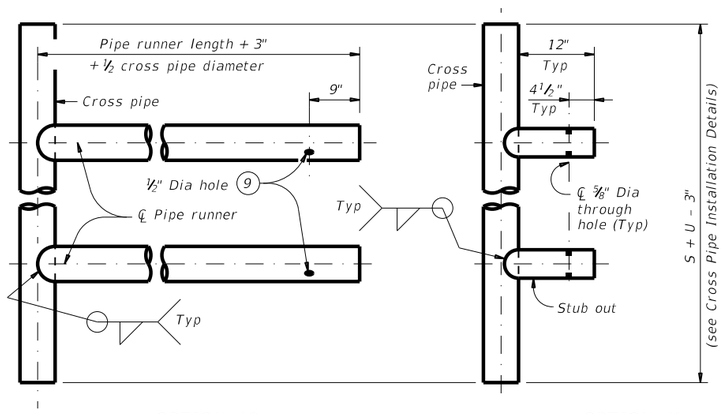
NOTE: At Contractor's option, make the cross pipe continuous across the inside wingwalls. If option is selected, omit the sleeve pipe and make a 15⁄16" diameter through hole in the cross pipe to accept the anchor bolt at the centerline of each inside wingwall.

CROSS PIPE INSTALLATION DETAILS



OPTION A2 OPTION A1

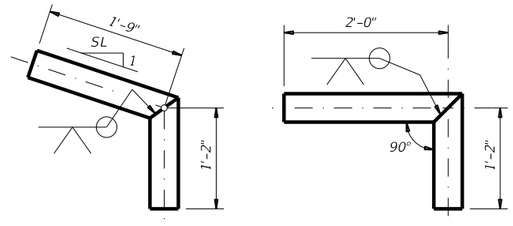
FOR USE IN OUTSIDE CULVERT BAY



OPTION A2 OPTION A1

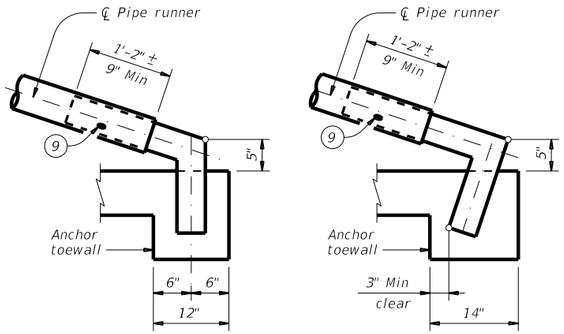
FOR USE IN INSIDE CULVERT BAY

CROSS PIPE AND CONNECTIONS DETAILS



OPTION A OPTION B

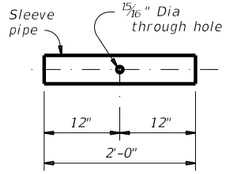
BOTTOM ANCHOR PIPE DETAILS (10)



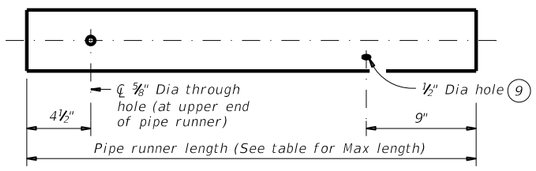
OPTION B1 OPTION B2

BOTTOM ANCHOR TOEWALL DETAILS

(Wingwall not shown for clarity.)

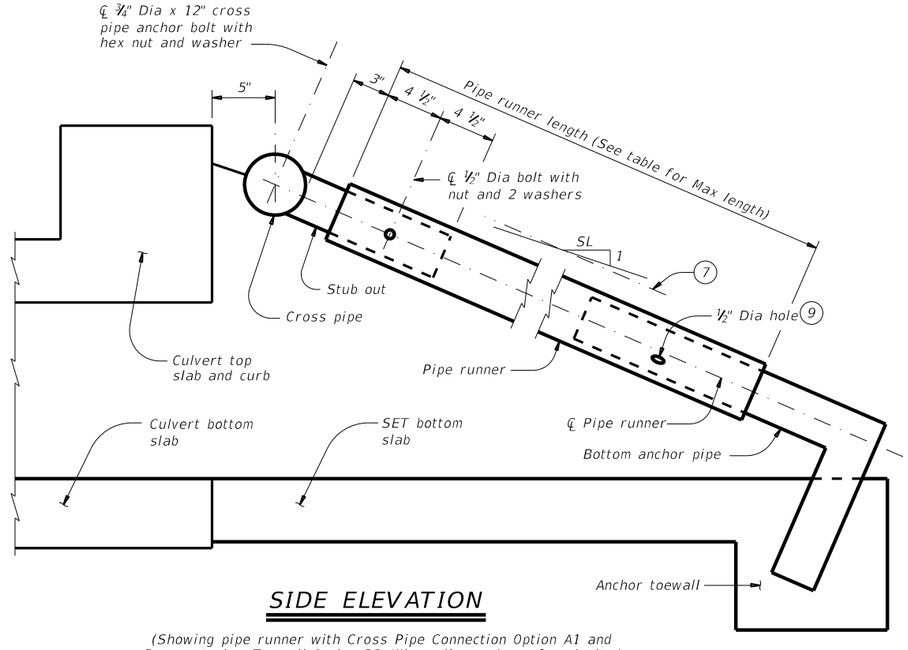


CROSS PIPE SLEEVE PIPE DETAILS



NOTE: The separate pipe runner shown is required when Cross Pipe Connection Option A1 is used.

PIPE RUNNER DETAILS



SIDE ELEVATION

(Showing pipe runner with Cross Pipe Connection Option A1 and Bottom Anchor Toewall Option B2. Wingwall not shown for clarity.)

(6) Cross pipe is the same size as the pipe runner. Cross pipe stub out is the same size as the anchor pipe.

(7) Note that actual slope of safety pipe runner may vary slightly from side slope.

(8) Take care to ensure that riprap concrete does not flow into the cross pipe so as to permit disassembly of the bolted connection to allow cleanout access.

(9) After installation, inspect the 1#2" hole to ensure that the lap of the safety pipe runner with the bottom anchor pipe is adequate.

(10) At fabricator's option, a heat bend to a smooth 5" radius or a manufactured elbow (of the same material as the runner) may be substituted for the mitered and welded joint in the bottom anchor pipe.

MAXIMUM PIPE RUNNER LENGTHS AND (6) REQUIRED PIPE RUNNER AND ANCHOR PIPE SIZES

Maximum Pipe Runner Length	Required Pipe Runner Size			Required Anchor Pipe Size		
	Pipe Size	Pipe O.D.	Pipe I.D.	Pipe Size	Pipe O.D.	Pipe I.D.
10'- 0"	3" STD	3.500"	3.068"	2" STD	2.375"	2.067"
19'- 8"	4" STD	4.500"	4.026"	3" STD	3.500"	3.068"
34'- 2"	5" STD	5.563"	5.047"	4" STD	4.500"	4.026"

SHEET 2 OF 2

Texas Department of Transportation — Bridge Division Standard

SAFETY END TREATMENT

FOR 0° SKEW BOX CULVERTS
(MAXIMUM Hw = 7'-0")
TYPE I ~ CROSS DRAINAGE

SETB-CD

FILE: setbcdse-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	3469	01	014,	FM 3099
	DIST	COUNTY		SHEET NO.
	BWD	STEPHENS		126B

DATE: 10/5/2022 10:29:45 AM
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FINAL SUBMITTAL

USER: jhasler
OFFICE:IEA OFFICE: Dallas
PROJECT #

DATE:8/27/2021 TIME:12:44:41 PM
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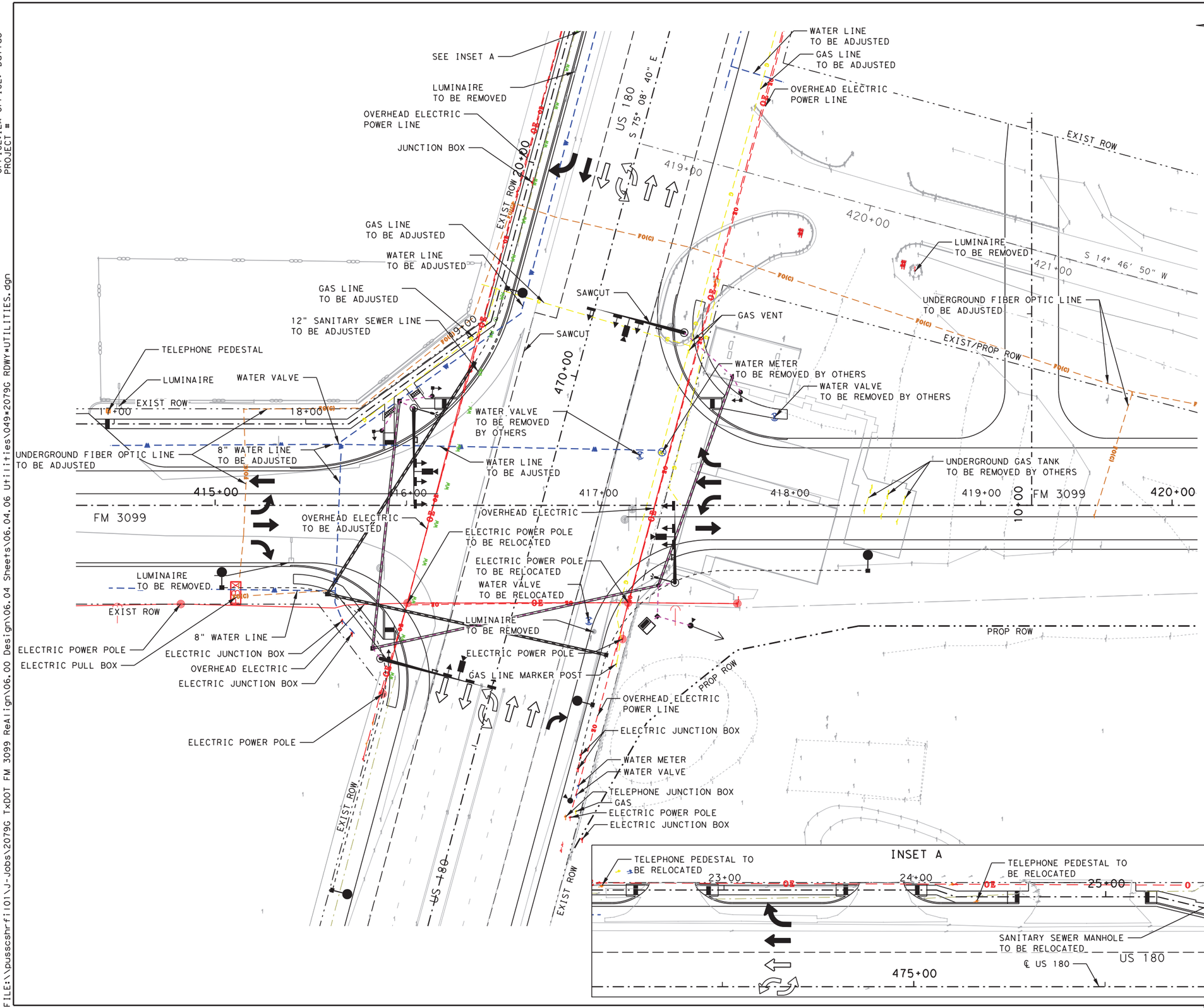

LEGEND

- PROPOSED LANE
- EXISTING LANE
- SAWCUT

NOTES:

1. EXISTING UTILITY LOCATIONS ARE APPROXIMATE. CONTRACTOR TO FIELD VERIFY.
2. EXISTING UTILITY SIZES AND ELEVATIONS ARE UNKNOWN UNLESS OTHERWISE NOTED. CONTRACTOR TO FIELD VERIFY.
3. UNDERGROUND FIBER OPTIC LINE CROSSING AT APPROXIMATELY ℄ FM 3099 STA 413+22. CONTRACTOR TO FIELD VERIFY.
4. GAS LINE CROSSING AT APPROXIMATELY ℄ FM 3099 STA 405+45. CONTRACTOR TO FIELD VERIFY.

0 25 50 100
SCALE: 1"=50'

NO.	REVISION	BY	DATE

STATE OF TEXAS
JORDAN HASLER
137316
LICENSED PROFESSIONAL ENGINEER

8/27/2021

IEA
1225 North Loop West
SUITE 320
HOUSTON, TEXAS 77008
(832) 494-3800
Firm Registration No. F-10161

Texas Department of Transportation®

FM 3099 ROADWAY REALIGNMENT

UTILITY LAYOUT

SHEET 1 OF 1

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
6	SEE TITLE SHEET		127
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

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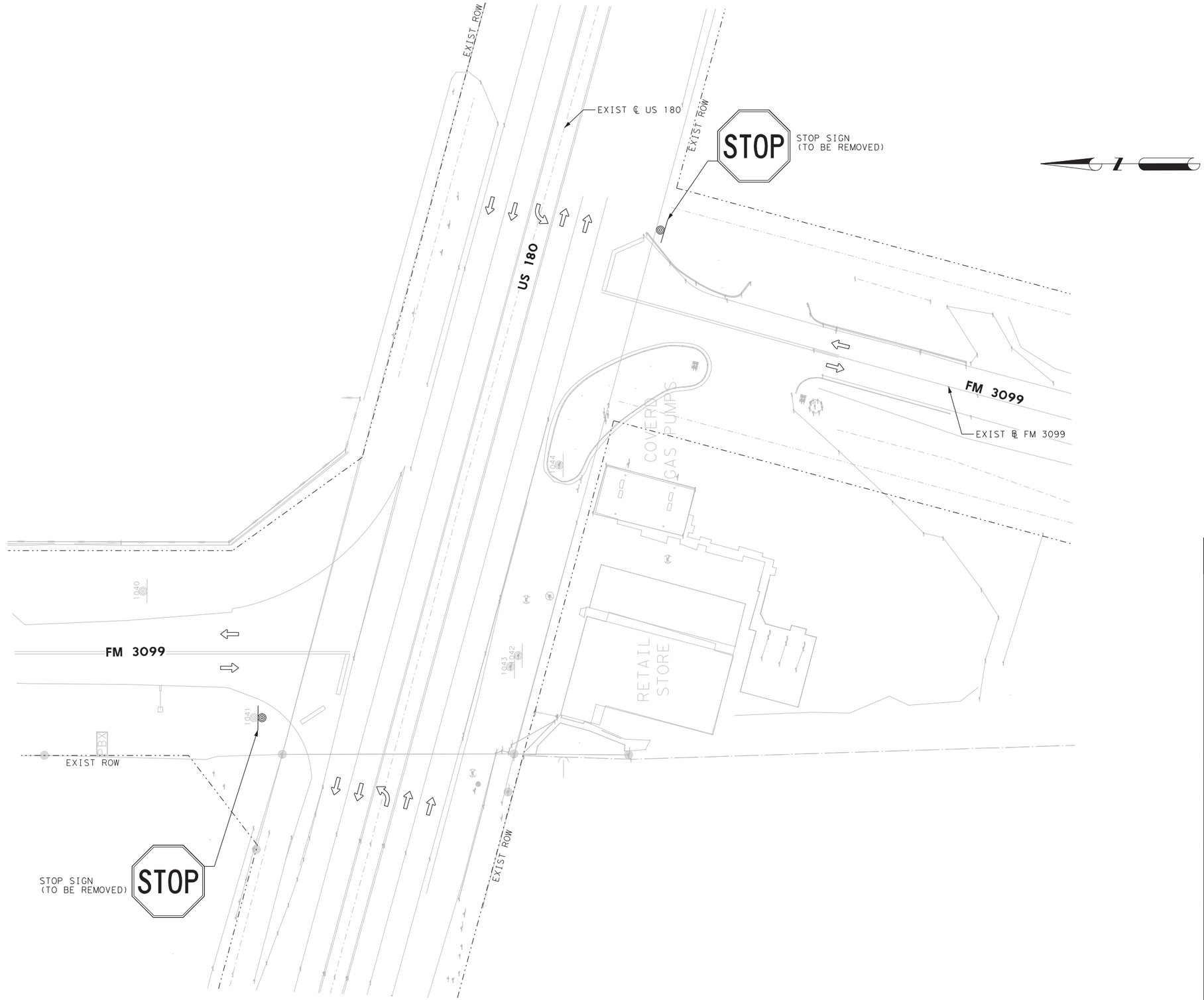
100% SUBMITTAL



0 25 50 100

SCALE: 1"=50'H

NO.	REVISION	BY	DATE

STATE OF TEXAS
VICTOR M. IRACHETA
84689
LICENSED
PROFESSIONAL ENGINEER

08/27/2021

ENTECH
CIVIL ENGINEERS, INC
F-6932
15021 Katy Freeway,
Suite 500
Houston, Texas, 77094
281-945-0069 PH
281-945-0081 FX

Texas Department of Transportation®

FM 3099 REALIGNMENT

EXISTING CONDITION DIAGRAM

SHEET 1 OF 1

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
06	SEE TITLE SHEET		128
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014,	FM 3099

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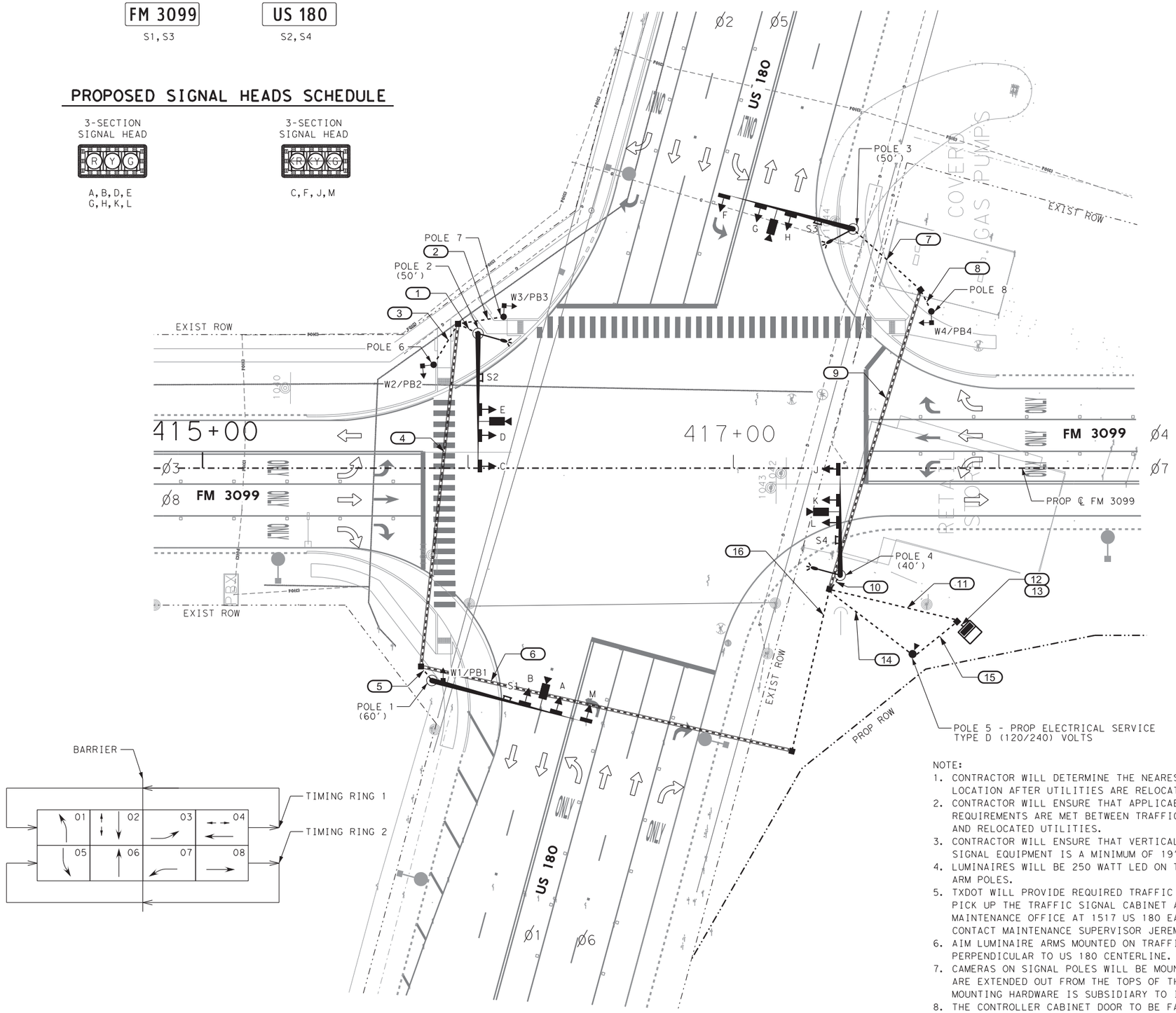
100% SUBMITTAL

PROPOSED SIGNS SCHEDULE

FM 3099	US 180
S1, S3	S2, S4

PROPOSED SIGNAL HEADS SCHEDULE

3-SECTION SIGNAL HEAD	3-SECTION SIGNAL HEAD
(R Y G)	(R Y Y G)
A, B, D, E G, H, K, L	C, F, J, M



LEGEND (PROPOSED)

- SIGNAL POLE AND MAST ARM
- SERVICE POLE ASSEMBLY
- TRAFFIC SIGNAL HEAD
- VIDEO DETECTION (VIVDS)
- GROUND BOX
- GROUND MOUNTED CONTROLLER CABINET W/APRON
- LUMINAIRE, 8' (LED) (.25KW EQ)
- CONDUIT (TRENCH)
- CONDUIT (BORE)
- OVERHEAD STREET NAME SIGN
- (X) WIRE RUN DESIGNATION
- DIRECTION OF TRAFFIC FLOW

0 20 40 80

SCALE: 1"=40'H

NOTE:
1. CONTRACTOR WILL DETERMINE THE NEAREST POWER SOURCE LOCATION AFTER UTILITIES ARE RELOCATED.
2. CONTRACTOR WILL ENSURE THAT APPLICABLE UTILITY CLEARANCE REQUIREMENTS ARE MET BETWEEN TRAFFIC SIGNAL EQUIPMENT AND RELOCATED UTILITIES.
3. CONTRACTOR WILL ENSURE THAT VERTICAL CLEARANCE FOR SIGNAL EQUIPMENT IS A MINIMUM OF 19'.
4. LUMINAIRES WILL BE 250 WATT LED ON TRAFFIC SIGNAL MAST ARM POLES.
5. TXDOT WILL PROVIDE REQUIRED TRAFFIC SIGNAL CABINET. PICK UP THE TRAFFIC SIGNAL CABINET AT STEPHENS COUNTY MAINTENANCE OFFICE AT 1517 US 180 EAST, BRECKINRIDGE, TX. CONTACT MAINTENANCE SUPERVISOR JEREMY ROBINSON AT 254-559-8203.
6. AIM LUMINAIRE ARMS MOUNTED ON TRAFFIC SIGNAL POLES PERPENDICULAR TO US 180 CENTERLINE.
7. CAMERAS ON SIGNAL POLES WILL BE MOUNTED ON ARMS THAT ARE EXTENDED OUT FROM THE TOPS OF THE SIGNAL POLES. ALL MOUNTING HARDWARE IS SUBSIDIARY TO ITEM 6306.
8. THE CONTROLLER CABINET DOOR TO BE FACING SOUTH.
9. CONTRACTOR TO INSTALL ALL CONDUITS DEPTH OF 4 FEET.

NO.	REVISION	BY	DATE

STATE OF TEXAS
VICTOR M. IRACHETA
84689
LICENSED PROFESSIONAL ENGINEER

08/03/2022

ENTECH CIVIL ENGINEERS, INC
F-6932
15021 Katy Freeway, Suite 500
Houston, Texas, 77094
281-945-0069 PH
281-945-0081 FX

FM 3099 REALIGNMENT

PROPOSED TRAFFIC SIGNAL LAYOUT

SHEET 1 OF 3

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
06	SEE TITLE SHEET		
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

rbartholomew
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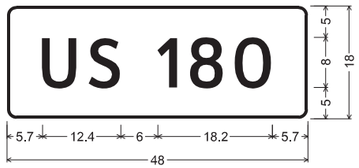
100% SUBMITTAL

CONDUIT SUMMARY						
CONDUIT RUN #	CONDUIT DESCRIPTION	CONDUIT LENGTH (FT)	NO.	CONDUIT CONTENTS	DESC.	CONDUCTOR LENGTH (FT)
1	2" SCH 80	15	1	12 CONDUCTOR	SIGNAL	20
			1	8 AWG BARE	SIGNAL	20
1A	2" SCH 80	15	1	VIVID	CAMERA	20
			1	8 AWG BARE	CAMERA	20
1B	2" SCH 80	15	1	8 AWG INSULATED	ILLUM	20
			1	8 AWG BARE	ILLUM	20
2	2" SCH 80	25	1	7 CONDUCTOR	PED	30
			1	8 AWG BARE	PED	30
3	2" SCH 80	25	1	7 CONDUCTOR	PED	30
			1	8 AWG BARE	PED	30
4	2" SCH 80 BORE	135	1	12 CONDUCTOR	SIGNAL	140
			1	8 AWG BARE	SIGNAL	140
4A	2" SCH 80 BORE	135	1	VIVID	CAMERA	140
			1	8 AWG BARE	CAMERA	140
4B	2" SCH 80 BORE	135	2	7 CONDUCTOR	PED	275
			1	8 AWG BARE	PED	140
4C	2" SCH 80 BORE	135	2	8 AWG INSULATED	ILLUM	275
			1	8 AWG BARE	ILLUM	140
4D	2" SCH 80 BORE	135	1	SPARE		
5	2" SCH 80	10	1	12 CONDUCTOR	SIGNAL	15
			1	8 AWG BARE	SIGNAL	15
5A	2" SCH 80	10	1	7 CONDUCTOR	PED	15
			1	8 AWG BARE	PED	15
5B	2" SCH 80	10	1	VIVID	CAMERA	15
			1	8 AWG BARE	CAMERA	15
6	2" SCH 80 BORE	150	2	12 CONDUCTOR	SIGNAL	305
			1	8 AWG BARE	SIGNAL	155
6A	2" SCH 80 BORE	150	2	VIVID	CAMERA	305
			1	8 AWG BARE	CAMERA	155
6B	2" SCH 80 BORE	150	4	8 AWG INSULATED	ILLUM	605
			1	8 AWG BARE	ILLUM	155
6C	2" SCH 80 BORE	150	2	7 CONDUCTOR	PED	305
			1	8 AWG BARE	PED	155
6D	2" SCH 80 BORE	150	1	SPARE		
7	2" SCH 80	40	1	12 CONDUCTOR	SIGNAL	45
			1	8 AWG BARE	SIGNAL	45
7A	2" SCH 80	40	1	VIVID	CAMERA	45
			1	8 AWG BARE	CAMERA	45
7B	2" SCH 80	40	1	8 AWG INSULATED	ILLUM	45
			1	8 AWG BARE	ILLUM	45
8	2" SCH 80	15	1	7 CONDUCTOR	PED	20
			1	8 AWG BARE	PED	20
9	2" SCH 80 BORE	120	1	12 CONDUCTOR	SIGNAL	125
			1	8 AWG BARE	SIGNAL	125
9A	2" SCH 80 BORE	120	1	VIVID	CAMERA	125
			1	8 AWG BARE	CAMERA	125
9B	2" SCH 80 BORE	120	1	7 CONDUCTOR	PED	125
			1	8 AWG BARE	PED	125
9C	2" SCH 80 BORE	120	1	8 AWG INSULATED	ILLUM	125
			1	8 AWG BARE	ILLUM	125
9D	2" SCH 80 BORE	120	1	SPARE		

CONDUIT SUMMARY						
CONDUIT RUN #	CONDUIT DESCRIPTION	CONDUIT LENGTH (FT)	NO.	CONDUIT CONTENTS	DESC.	CONDUCTOR LENGTH (FT)
10	2" SCH 80	15	1	12 CONDUCTOR	SIGNAL	20
			1	8 AWG BARE	SIGNAL	20
10A	2" SCH 80	15	1	VIVID	CAMERA	20
			1	8 AWG BARE	CAMERA	20
10B	2" SCH 80	15	1	8 AWG INSULATED	ILLUM	20
			1	8 AWG BARE	ILLUM	20
11	2" SCH 80	50	4	12 CONDUCTOR	SIGNAL	205
			1	8 AWG BARE	SIGNAL	55
11A	2" SCH 80	50	4	VIVID	CAMERA	205
			1	8 AWG BARE	CAMERA	55
11B	2" SCH 80	50	3	8 AWG INSULATED	ILLUM	155
			1	8 AWG BARE	ILLUM	55
11C	2" SCH 80	50	4	7 CONDUCTOR	PED	205
			1	8 AWG BARE	PED	55
12	2" SCH 80	10	4	12 CONDUCTOR	SIGNAL	45
			1	8 AWG BARE	SIGNAL	15
12A	2" SCH 80	10	4	VIVID	CAMERA	45
			1	8 AWG BARE	CAMERA	15
12B	2" SCH 80	10	4	7 CONDUCTOR	PED	45
			1	8 AWG BARE	PED	15
13	2" SCH 80	10	2	8 AWG INSULATED	CABINET	25
			1	8 AWG BARE	CABINET	15
14	2" SCH 80	40	8	8 AWG INSULATED	ILLUM	325
			1	8 AWG BARE	ILLUM	45
15	2" SCH 80	25	2	8 AWG INSULATED	CABINET	55
			1	8 AWG BARE	CABINET	30
16	2" SCH 80	65	2	12 CONDUCTOR	SIGNAL	135
			1	8 AWG BARE	SIGNAL	70
16A	2" SCH 80	65	2	VIVID	CAMERA	135
			1	8 AWG BARE	CAMERA	70
16B	2" SCH 80	65	5	8 AWG INSULATED	ILLUM	330
			1	8 AWG BARE	ILLUM	70
16C	2" SCH 80	65	2	7 CONDUCTOR	PED	135
			1	8 AWG BARE	PED	70
16D	2" SCH 80	65	1	SPARE		



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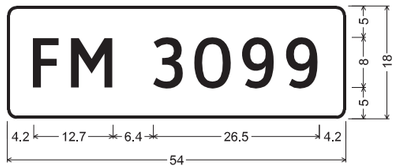

1.5" Radius, 0.5" Border, White on Green;
"FM 3099", ClearviewHwy-3-W;

TRAFFIC SIGNAL POLES			
POLE NO.	SIGNAL POLE DESIGNATION	FOUNDATION TYPE/DEPTH (FT)	STATION OFFSET
1	PROP 60' MAST ARM POLE , (1-VIVDS), W1/PB1	48-A/22	415+87, 80' RT
2	PROP 50' MAST ARM POLE W/LUMINAIRE, (1-VIVDS)	48-A/22	416+04, 51' LT
3	PROP 50' MAST ARM POLE W/LUMINAIRE, (1-VIVDS)	48-A/22	417+45, 90' LT
4	PROP 40' MAST ARM POLE W/LUMINAIRE, (1-VIVDS)	36-A/14	417+40, 40' RT
5	PROP ELECTRICAL SERVICE TY D (120/240)	N/A	417+68, 70' RT
6	W2/PB2	24-A/6	415+87, 39' LT
7	W3/PB3	24-A/6	416+14, 57' LT
8	W4/PB4	24-A/6	417+75, 59' LT

ELECTRICAL SERVICE DATA												
ELEC SERVICE ID	POLE NO	ELEC. SERV. DESCRIPTIOIN (SEE ED(4), (5), (6), (7) & (10)-14)	SERVICE CONDUIT SIZE	SERVICE CONDUCTORS NO / SIZE	SAFETY SWITCH AMPS	MAIN CKT BKR POLE /AMPS	TWO-POLE CONTRACTOR AMPS	PANEL BD LOAD CENTER AMP RATING	BRANCH CIRCUIT ID	BRANCH CKT BKR POLE / AMPS	BRANCH CIRCUIT AMPS	KVA LOAD
US 180 AT FM 3099	5	ELC SRV TY D 120/240 060 (NS)AL(E)SP(O)	1 1/4"	3/#6	N/A	2P/60	N/A	100	TRF SIGNAL	1P/20	16	< 1.8
									ILLUM	2P/15	7.33	

NO.	REVISION	BY	DATE

STATE OF TEXAS
VICTOR M. IRACHETA
84689
LICENSED PROFESSIONAL ENGINEER

08/03/2022

ENTECH CIVIL ENGINEERS, INC
F-6932
15021 Katy Freeway, Suite 500
Houston, Texas, 77094
281-945-0069 PH
281-945-0081 FX

FM 3099 REALIGNMENT

PROPOSED TRAFFIC SIGNAL LAYOUT

SHEET 2 OF 3

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
06	SEE TITLE SHEET		
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

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100% SUBMITTAL

SIGNAL POLE NO. 1

NORTHWEST SIGNAL POLE
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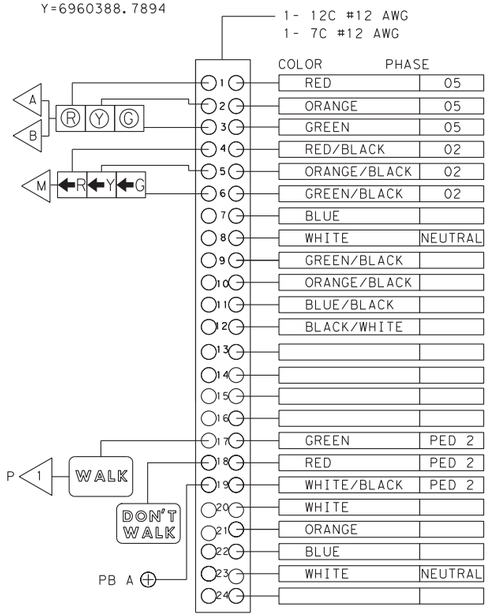
Y=6960388.7894



	COLOR	PHASE
1	RED	05
2	ORANGE	05
3	GREEN	05
4	RED/BLACK	02
5	ORANGE/BLACK	02
6	GREEN/BLACK	02
7	BLUE	
8	WHITE	NEUTRAL
9	GREEN/BLACK	
10	ORANGE/BLACK	
11	BLUE/BLACK	
12	BLACK/WHITE	
13		
14		
15		
16		
17	GREEN	PED 2
18	RED	PED 2
19	WHITE/BLACK	PED 2
20	WHITE	
21	ORANGE	
22	BLUE	
23	WHITE	NEUTRAL
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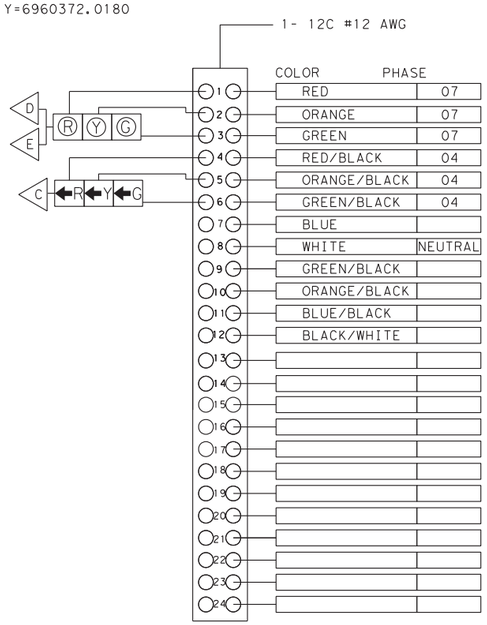
SIGNAL POLE NO. 2

NORTHEAST SIGNAL POLE
X=1831775.7827
Y=6960372.0180



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2	ORANGE	07
3	GREEN	07
4	RED/BLACK	04
5	ORANGE/BLACK	04
6	GREEN/BLACK	04
7	BLUE	
8	WHITE	NEUTRAL
9	GREEN/BLACK	
10	ORANGE/BLACK	
11	BLUE/BLACK	
12	BLACK/WHITE	
13		
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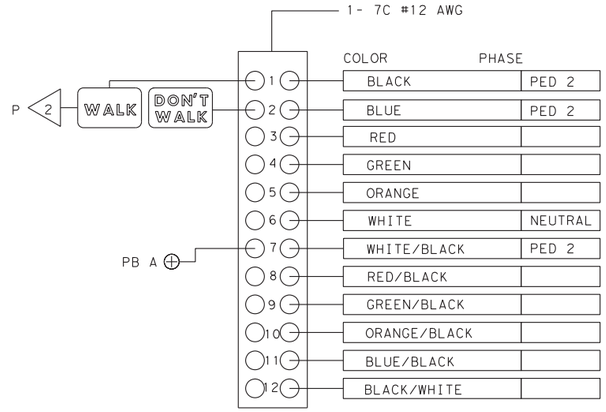
24		

PED POLE NO. 6



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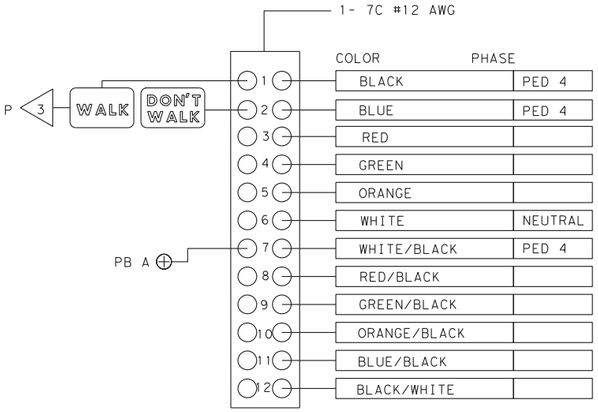
1	BLACK	PED 2
2	BLUE	PED 2
3	RED	
4	GREEN	
5	ORANGE	
6	WHITE	NEUTRAL
7	WHITE/BLACK	PED 2
8	RED/BLACK	
9	GREEN/BLACK	
10	ORANGE/BLACK	
11	BLUE/BLACK	
12	BLACK/WHITE	

PED POLE NO. 7



	COLOR	PHASE
1	BLACK	PED 4
2	BLUE	PED 4
3	RED	
4	GREEN	
5	ORANGE	
6	WHITE	NEUTRAL
7	WHITE/BLACK	PED 4
8	RED/BLACK	
9	GREEN/BLACK	
10	ORANGE/BLACK	
11	BLUE/BLACK	
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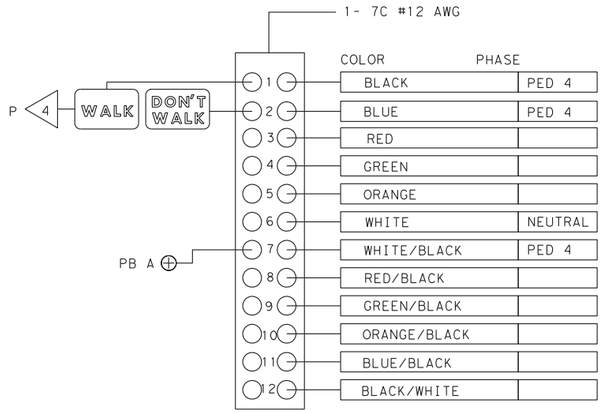
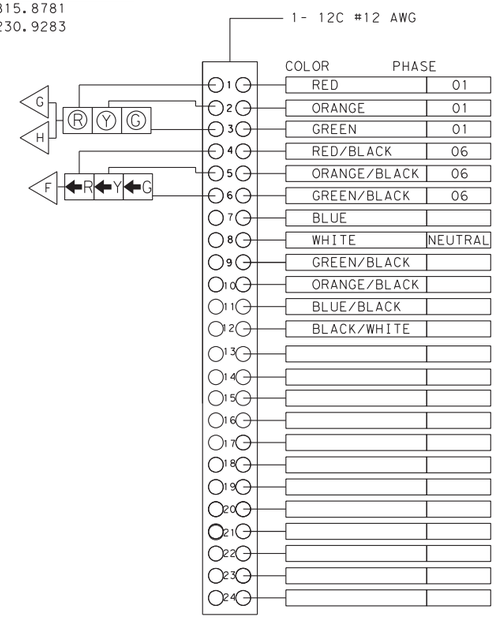
PED POLE NO. 8



	COLOR	PHASE
1	BLACK	PED 4
2	BLUE	PED 4
3	RED	
4	GREEN	
5	ORANGE	
6	WHITE	NEUTRAL
7	WHITE/BLACK	PED 4
8	RED/BLACK	
9	GREEN/BLACK	
10	ORANGE/BLACK	
11	BLUE/BLACK	
12	BLACK/WHITE	

SIGNAL POLE NO. 3

SOUTHEAST SIGNAL POLE
X=1831815.8781
Y=6960230.9283



	COLOR	PHASE
1	RED	01
2	ORANGE	01
3	GREEN	01
4	RED/BLACK	06
5	ORANGE/BLACK	06
6	GREEN/BLACK	06
7	BLUE	
8	WHITE	NEUTRAL
9	GREEN/BLACK	
10	ORANGE/BLACK	
11	BLUE/BLACK	
12	BLACK/WHITE	
13		
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16		
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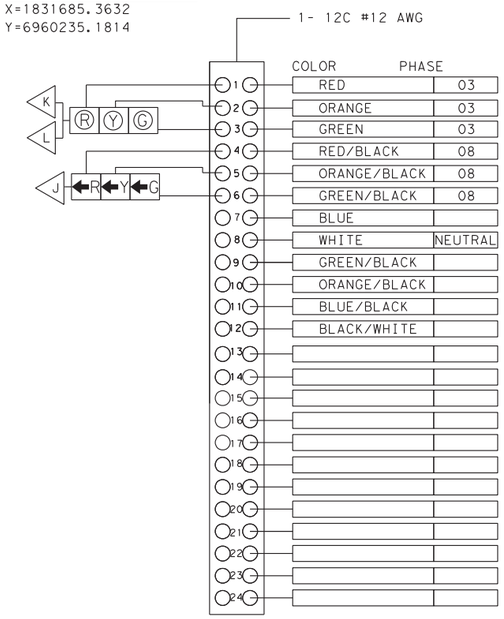
22		
23		
24		

SIGNAL POLE NO. 4

SOUTHWEST SIGNAL POLE
X=1831685.3632
Y=6960235.1814



	COLOR	PHASE
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2	ORANGE	03
3	GREEN	03
4	RED/BLACK	08
5	ORANGE/BLACK	08
6	GREEN/BLACK	08
7	BLUE	
8	WHITE	NEUTRAL
9	GREEN/BLACK	
10	ORANGE/BLACK	
11	BLUE/BLACK	
12	BLACK/WHITE	
13		
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NO.	REVISION	BY	DATE

STATE OF TEXAS
VICTOR M. IRACHETA
84689
LICENSED
PROFESSIONAL ENGINEER

08/27/2021

ENTECH CIVIL ENGINEERS, INC
F-6932
15021 Katy Freeway,
Suite 500
Houston, Texas, 77094
281-945-0069 Ph
281-945-0081 Fx

Texas Department of Transportation®

FM 3099 REALIGNMENT

PROPOSED TRAFFIC SIGNAL LAYOUT

SHEET 3 OF 3

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
06	SEE TITLE SHEET		131
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

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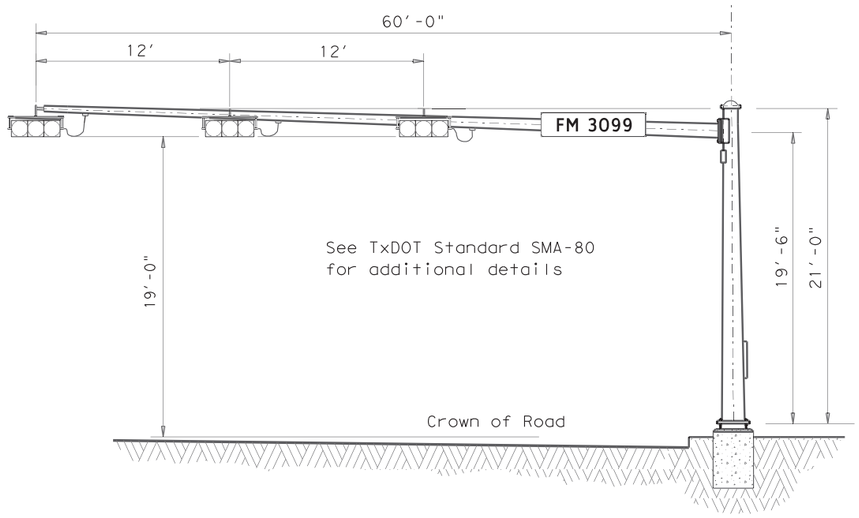

SIGNAL POLE #1

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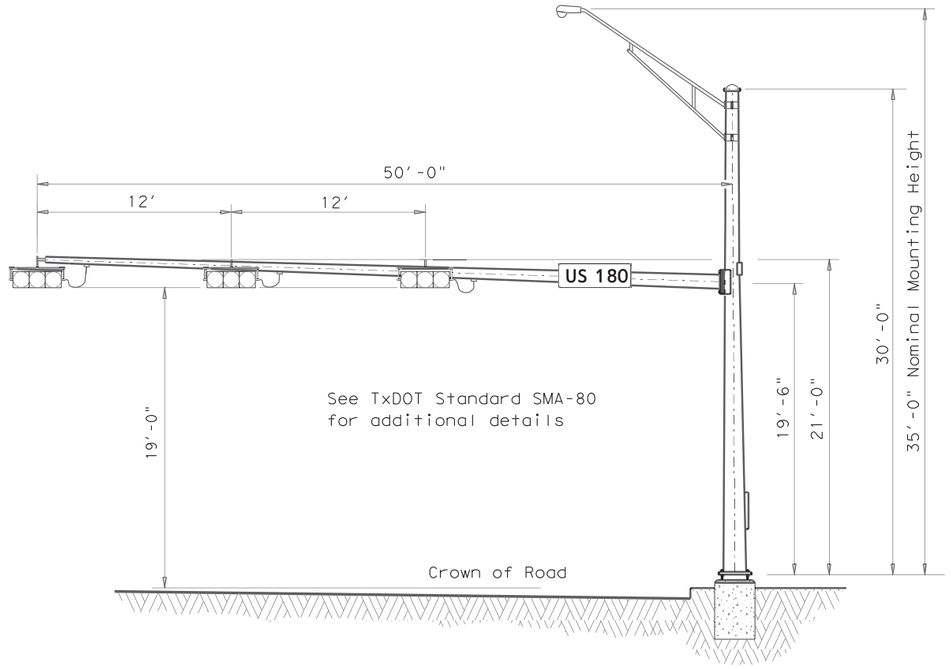

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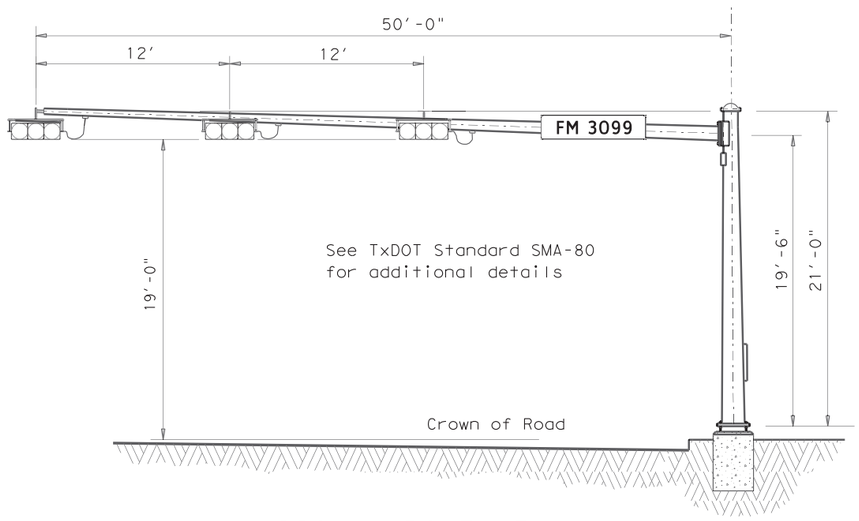

SIGNAL POLE #3

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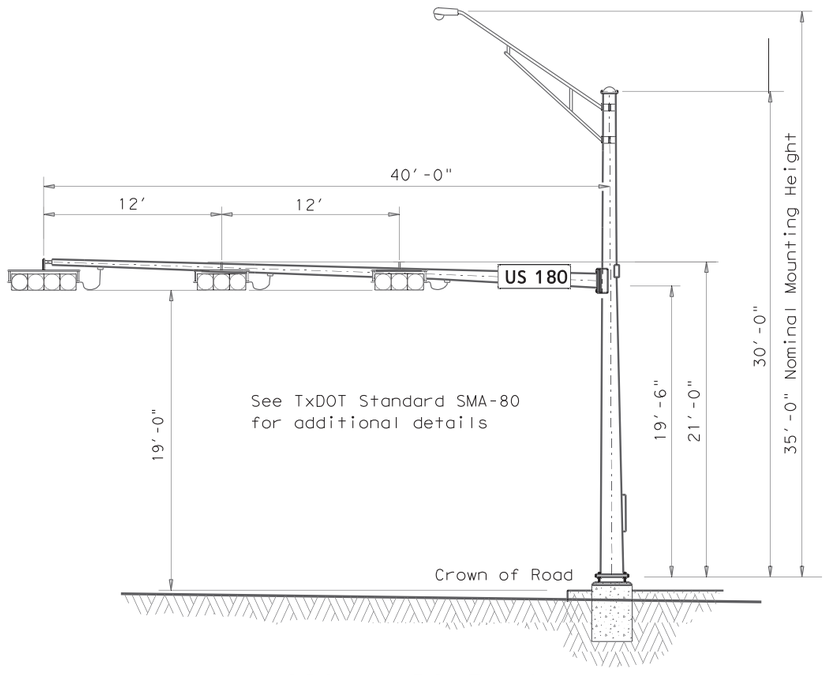

SIGNAL POLE #4

NTS

NO.	REVISION	BY	DATE

STATE OF TEXAS
VICTOR M. IRACHETA
84689
LICENSED PROFESSIONAL ENGINEER

08/27/2021

ENTECH CIVIL ENGINEERS, INC
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281-945-0081 FX

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PROPOSED TRAFFIC SIGNAL ELEVATION

SHEET 1 OF 1

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
06	SEE TITLE SHEET		132
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

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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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		BWD	STEPHENS		133

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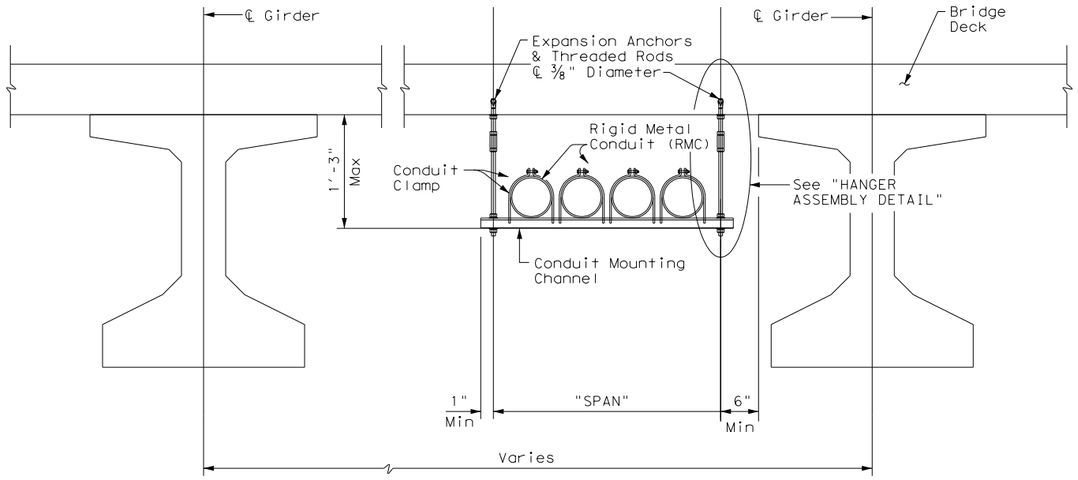
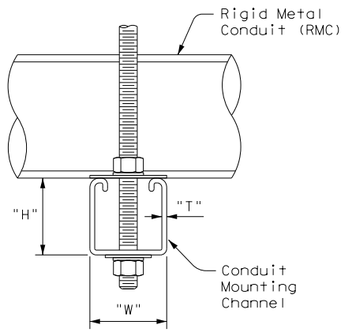
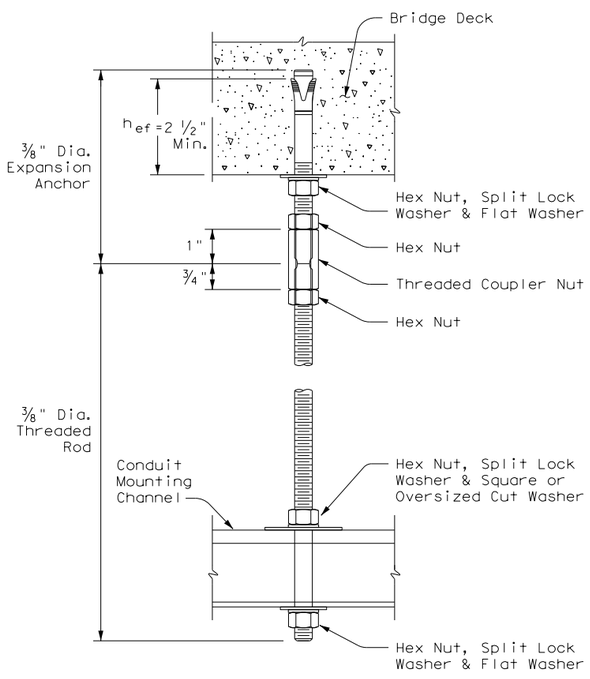


CONDUIT HANGING DETAIL

CONDUIT MOUNTING CHANNEL		
"SPAN"	"W" x "H"	"T"
less than 2'	1 5/8" x 1 3/8"	12 Ga.
2'-0" to 2'-6"	1 5/8" x 1 5/8"	12 Ga.
>2'-6" to 3'-0"	1 5/8" x 2 7/16"	12 Ga.

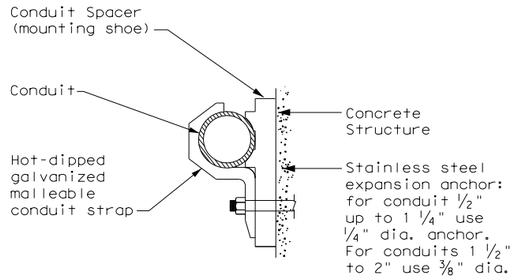
Channels with round or short slotted hole patterns are allowed, if the load carrying capacity is not reduced by more than 15%.

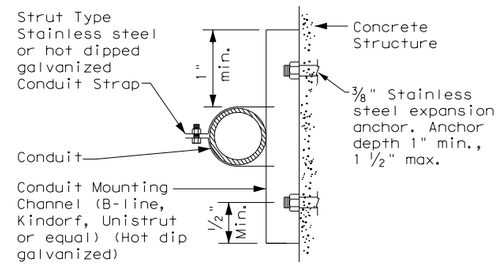




HANGER ASSEMBLY DETAIL

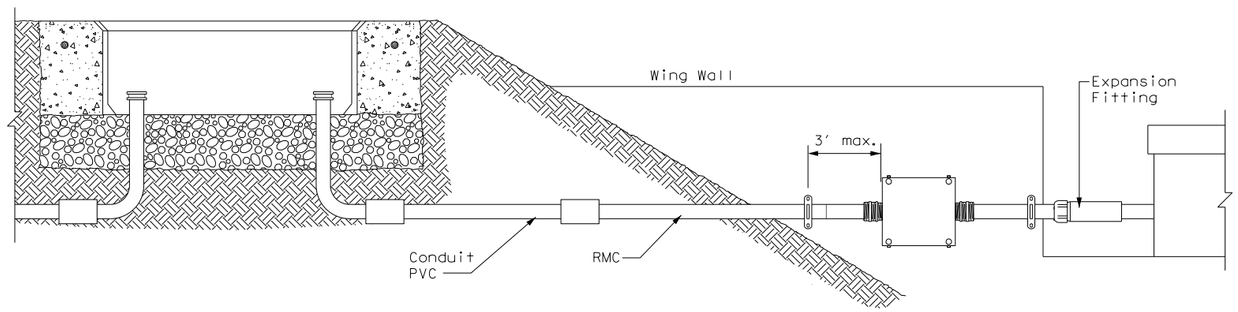
ELECTRIC CONDUIT TO BRIDGE DECK ATTACHMENT





CONDUIT MOUNTING OPTIONS

Attachment to concrete surfaces
See ED(1)B.2



TYPICAL CONDUIT ENTRY TO BRIDGE STRUCTURE DETAIL

EXPANSION ANCHOR NOTES FOR BRIDGE DECK ATTACHMENT

1. Use torque controlled mechanical expansion anchors that are approved for use in cracked concrete by the International Code Council, Evaluation Service (ICC-ES). The chosen anchor product shall have a designated ICC-ES Evaluation Report number, and its approval status shall be maintained on the ICC-ES website under Division 031600 for Concrete Anchors.

2. Unless otherwise approved by the Engineer: do not use adhesive anchors; do not use expansion anchors that are not included in the ICC-ES approval list; and do not use expansion anchors that are only approved for use in uncracked concrete.

3. Use anchors manufactured with stainless steel expansion wedges. Anchors manufactured with carbon steel expansion wedges are not allowed. Anchor bodies can be either zinc-plated carbon steel or stainless steel. For application in marine environment, both the anchor body and expansion wedge shall be stainless steel.

4. Install anchors as shown on the plans and in accordance with the anchor manufacturer's published installation instructions. Arrange a field demonstration test to evaluate the procedures and tools. The test shall be witnessed and approved by the Engineer prior to furnishing anchors on the structure.

5. Prior to hole drilling, use rebar locator to ensure clearing of existing deck strands or reinforcement. Install anchors to ensure a minimum effective embedment depth, (h_{ef}), as shown. Increase (h_{ef}) as needed to ensure sufficient thread length for proper torqueing and tightening of anchors.

6. Use anchors of minimum 1600 Lbs tensile capacity (minimum of steel, concrete breakout, and concrete pullout strengths as determined by ACI 318 Appendix D) at the required minimum embedment depth (h_{ef}). No lateral loads shall be introduced after conduit installation.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS CONDUIT SUPPORTS

ED(2)-14

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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.

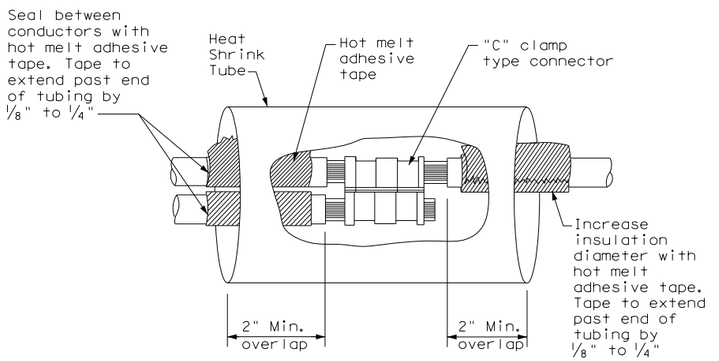
3. Install ground rods so the imprinted part number is at the upper end of the rod.

4. Remove all non-conductive coatings such as concrete splatter from the rod at the clamp location.

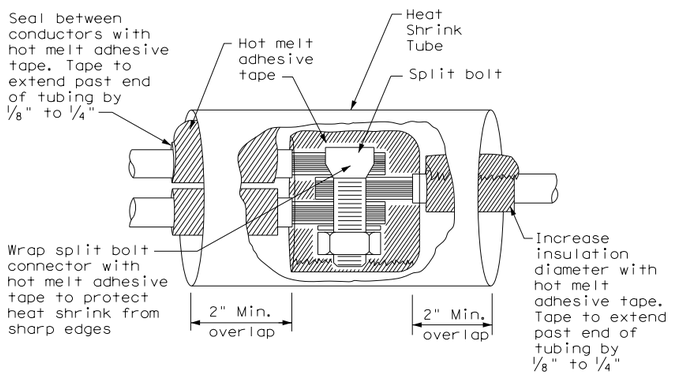
5. Route all conductors as short and straight as possible for connection to lightning protection ground rods. When a bend is required, ensure a minimum radius bend of four inches for these conductors.

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.

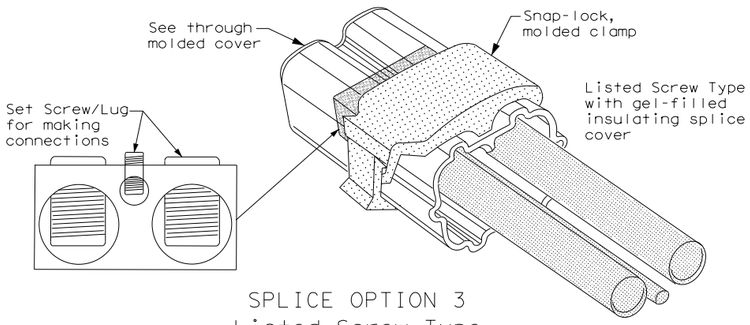
7. Written authorization is required before installing a ground rod in a horizontal trench for rocky soil or a solid rock bottom.



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

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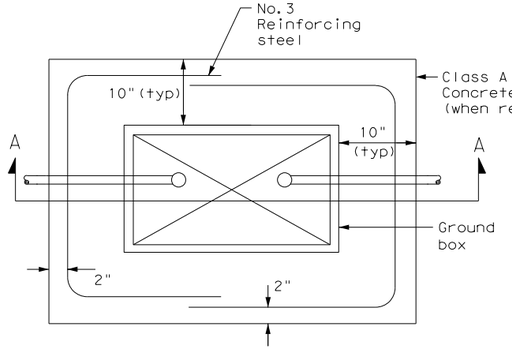
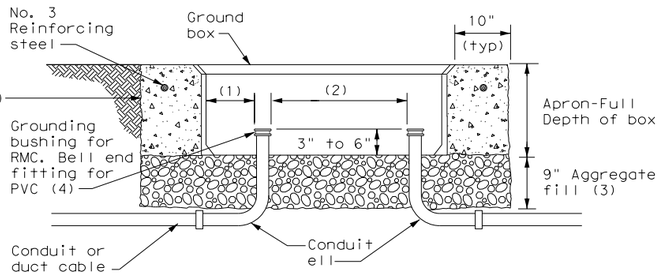


PLAN VIEW



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.

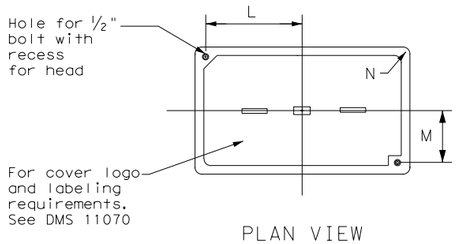
(2) Maintain sufficient space between conduits to allow for proper installation of bushing.

(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



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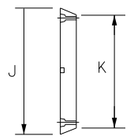
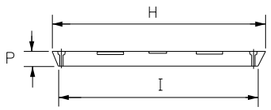


END



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

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ELECTRICAL SERVICES NOTES

1. Provide new materials. Ensure installation and materials comply with the applicable provisions of the National Electrical Code (NEC) and National Electrical Manufacturers Association (NEMA) standards. Ensure material is Underwriters Laboratories (UL) listed. Provide and install electrical service conduits, conductors, disconnects, contactors, circuit breaker panels, and branch circuit breakers as shown on the Electrical Service Data chart in the plans. Faulty fabrication or poor workmanship in material, equipment, or installation is justification for rejection. Where manufacturers provide warranties and guarantees as a customary trade practice, furnish these to the State.

2. Provide electrical services in accordance with Electrical Details standard sheets, Departmental Material Specification (DMS) 11080 "Electrical Services,"DMS 11081 "Electrical Services-Type A," DMS 11082 "Electrical Services-Type C," DMS 11083 "Electrical Services-Type D," DMS 11084 "Electrical Services-Type T," DMS 11085 "Electrical Services-Pedestal (PS)", and Item 628 "Electrical Services" of the Standard Specifications. Provide electrical service types A, C, and D, as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies," Item 628. Provide other service types as detailed on the plans.

3. Provide all work, materials, services, and any incidentals needed to install a complete electrical service as specified in the plans.

4. Coordinate with the Engineer and the utility provider for metering and compliance with utility requirements. Primary line extensions, connection charges, meter charges, and other charges by the utility company to provide power to the location are paid for in accordance with Item 628. Get approval for the costs associated with these charges prior to engaging the utility company to do the work. Consult with the utility provider to determine costs and requirements, and coordinate the work as approved.

5. The enclosure manufacturer will provide Master Lock Type 2 with brass tumblers keyed #2195 for all custom electrical enclosures. Installing Contractor is to provide Master Lock #2195 Type 2 with brass tumblers for "off the shelf" enclosures. Master Lock #2195 keys and locks become property of the State. Unless otherwise approved, do not energize electrical service equipment until locks are installed.

6. Enclosures with external disconnects that de-energize all equipment inside the enclosure do not need a dead front trim. Protect incoming line terminations from incidental contact as required by the NEC.

7. When galvanized is specified for nuts, screws, bolts or miscellaneous hardware, stainless steel may be used.

8. Provide wiring and electrical components rated for 75°C. Provide red, black, and white colored XHHW service entrance conductors of minimum size 6 American Wire Gauge (AWG). Identify size 6 AWG conductors by continuous color jacket. Identify electrical conductors sized 4 AWG and larger by continuous color jacket or by colored tape. Mark at least 6 inches of the conductor's insulation with half laps of colored tape, when identifying conductors. Ensure each service entrance conductor exits through a separately bushed non-metallic opening in the weatherhead. The lengths of the conductors outside the weatherhead are to be 12 inches minimum, 18 inches maximum, or as required by utility.

9. All electrical service conduit and conductors attached to the electrical service including the riser or the elbow below ground are subsidiary to the electrical service. For an underground utility feed, all service conduit and conductors after the elbow, including service conduit and conductors for the utility pole riser when furnished by the Contractor, will be paid for separately.

10. Provide rigid metal conduit (RMC) for all conduits on service, except for the ½ in. PVC conduit containing the electrical service grounding electrode conductor. Size the service entrance conduit as shown in the plans. Ensure conduit for branch circuit entry to enclosure is the same size as that shown on the layout sheets for branch circuit conduit. Extend all rigid metal conduits a minimum of 6 inches underground and then couple to the type and schedule of the conduit shown on the layout for that particular branch circuit. Install a grounding bushing on the RMC where it terminates in the service enclosure.

11. Use of liquidtight flexible metal conduit (LFMC) is allowed between the meter and service enclosure when they are mounted 90 to 180 degrees to each other. Size the LFMC the same size as service entrance conduit. LFMC must not exceed 3 feet in length. Strap LFMC within 1 foot of each end. LFMC less than 12 inches in length need not be strapped. Each end of LFMC must have a grounding bushing or be terminated with a grounding fitting. The LFMC must contain a grounded (neutral) conductor. Ensure any bend in LFMC never exceeds 180 degrees. A pull test is required on all installed conductors, with at least six inches of free conductor movement demonstrated to the satisfaction of the Engineer.

12. Ensure all mounting hardware and installation details of services conform to utility company specifications.

13. For all electrical service enclosures listed under Item 628 on the MPL, the UL 508 enclosure manufacturers will prepare and submit a schematic drawing unique to each service. Before shipment to the job site, place the applicable laminated schematic drawings and the laminated plan sheet showing the electrical service data chart used to build the enclosure in the enclosure's data pocket. The installing contractor will copy and laminate the actual project plan sheets detailing all equipment and branch circuits supplied by that service. The laminated plan sheets are to be placed in the service enclosure's document pocket. Reduce 11 in. x 17 in. plan sheets to 8 ½ in. x 11 in. before laminating. If the installation differs from the plan sheets, the installing contractor is to redline plan sheets before laminating.

14. When providing an "Off The Shelf" Type D or Type T service, provide laminated plan sheets detailing equipment and branch circuits supplied by that service. Reduce 11 in. x 17 in. plan sheets to 8 ½ in. x 11 in before laminating. Deliver these drawings before completion of the work to the Engineer, instead of placing in enclosure that has no door pocket.

15. Do not install conduit in the back wall of a service enclosure where it would penetrate the equipment mounting panel inside the enclosure. Provide grounding bushings on all metal conduits, and terminate bonding jumpers to grounding bus. Grounding bushings are not required when the end of the metal conduit is fitted with a conduit sealing hub or threaded boss, such as a meter base hub.

SERVICE ASSEMBLY ENCLOSURE

1. Provide threaded hub for all conduit entries into the top of enclosure.

2. Type galvanized steel (GS) enclosures may be used for Type C panelboards and for Type D and T services that do not use an enclosure mounted photocell or lighting contactor. Provide GS enclosures in accordance with DMS 11080, 11082, 11083, and 11084.

3. Provide aluminum (AL) and stainless steel (SS) enclosures for Types A, C, and D in accordance with DMS 11080, 11081, 11082, 11083, and 11084. Do not paint stainless steel.

4. Provide pedestal service (PS) enclosures in accordance with ED(9) and DMS 11080 and 11085. Do not provide GS pedestal services. If GS is shown in the PS descriptive code, provide an AL enclosure.

MAIN DISCONNECT & BRANCH CIRCUIT BREAKERS

1. Field drill flange-mounted remote operator handle if needed, to ensure handle is lockable in both the "On" and "Off" positions.

2. When the utility company provides a transformer larger than 50 KVA, verify that the available fault current is less than the circuit breaker's ampere interrupting capacity (AIC) rating and provide documentation from the electric utility provider to the Engineer.

PHOTOELECTRIC CONTROL

1. Provide photocell as listed on the MPL. Move, adjust, or shield the photocell from stray or ambient night time light to ensure proper operation. Mount photocell facing north when practical. Mount top of pole photocells as shown on Top Mounted Photocell Detail.

* ELECTRICAL SERVICE DATA

Elec. Service ID	Plan Sheet Number	Electrical Service Description	Service Conduit **Size	Service Conductors No./Size	Safety Switch Amps	Main Ckt. Bkr. Pole/Amps	Two-Pole Contractor Amps	Panelbd/ Loadcenter Amp Rating	Branch Circuit ID	Branch Ckt. Bkr. Pole/Amps	Branch Circuit Amps	KVA Load
SB 183	289	ELC SRV TY A 240/480 100(SS)AL(E)SF(U)	2"	3/#2	100	2P/100	100	N/A	Lighting NB	2P/40	26	28.1
									Lighting SB	2P/40	25	
									Underpass	1P/20	15	
NB Access	30	ELC SRV TY D 120/240 060(NS)SS(E)TS(O)	1 ¼"	3/#6	N/A	2P/60		100	Sig. Controller	1P/30	23	5.3
							30		Luminaires	2P/20	9	
									CCTV	1P/20	3	
2nd & Main	58	ELC SRV TY T 120/240 000(NS)GS(N)SP(O)	1 ¼"	3/#6	N/A	N/A	N/A	70	Flashing Beacon 1	1P/20	4	1.0
									Flashing Beacon 2	1P/20	4	

* Example only, not for construction. All new electrical services must have electrical service data chart specific to that service as shown in the plans.

** Verify service conduit size with utility. Size may change due to utility meter requirements. Ensure conduit size meets the National ELectrical Code.

EXPLANATION OF ELECTRICAL SERVICE DESCRIPTIVE CODE

ELEC SERV TY X XXX/XXX XXX (XX) XX (X) XX (X)

Schematic Type

Service Voltage V / V

Disconnect Amp Rating
000 indicates main lug only/
Typically Type T

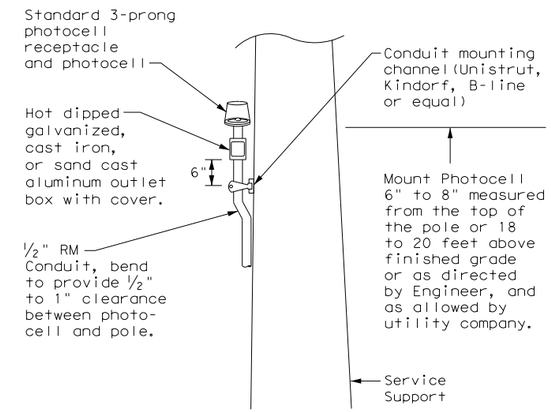
(SS)= Safety Switch Ahead of Meter-Check with Utility
(NS)= No safety Switch Ahead of Meter-Check with Utility

Enclosure Type
GS= Galvanized steel("off the shelf")
SS= Stainless steel(Custom Enclosure)See MPL
AL= Aluminum (Custom Enclosure)See MPL

Photocell Mounting Location
(E)= Inside Service/Enclosure Mounted
(T)= Top of pole
(L)= Luminaire mounted
(N)= None/No Photocell or Lighting Contactor Required

Service Support Type
GC= Granite concrete
OC= Other concrete
TP= Timber pole
SP= Steel pole
SF= Steel frame
OT= Pole by others or paid for separately
EX= Existing pole
TS= Service on traffic signal pole
PS= Pedestal Service

O= Overhead Service Feed from Utility
U= Underground Service Feed from Utility



TOP MOUNTED PHOTOCELL

Install conduit strap maximum 3 feet from box. 5 foot maximum spacing between straps supporting conduit.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE NOTES & DATA

ED(5)-14

FILE: ed5-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2014	CONT	SECT	JOB	HIGHWAY
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	BWD	STEPHENS		137

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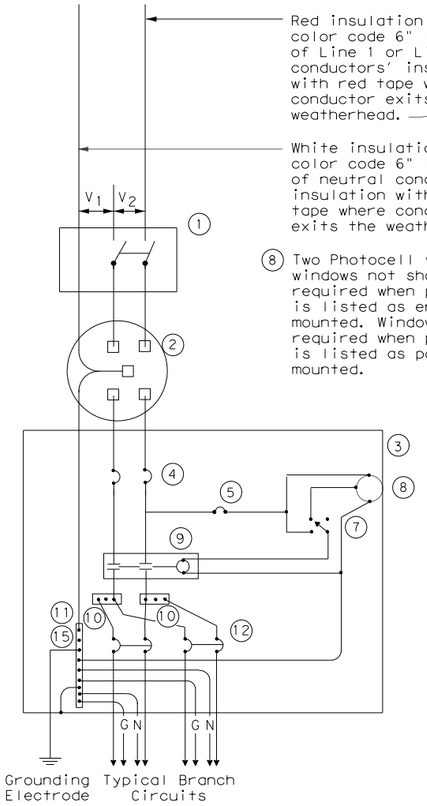
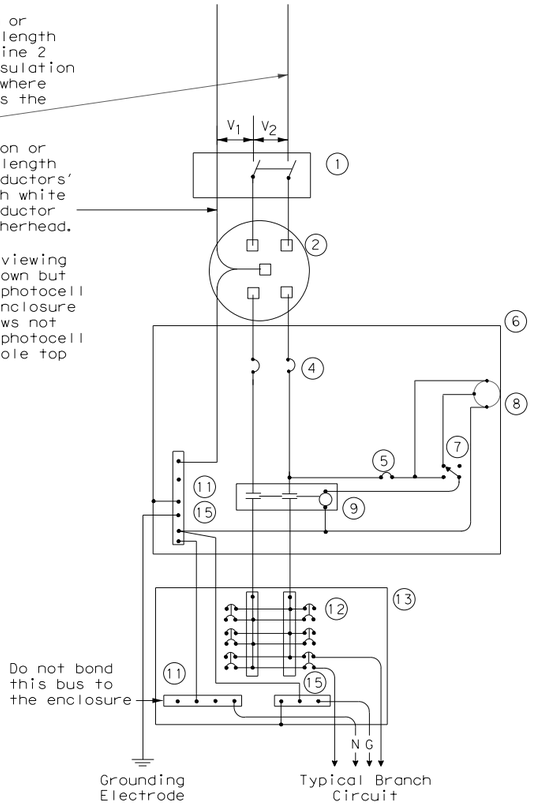
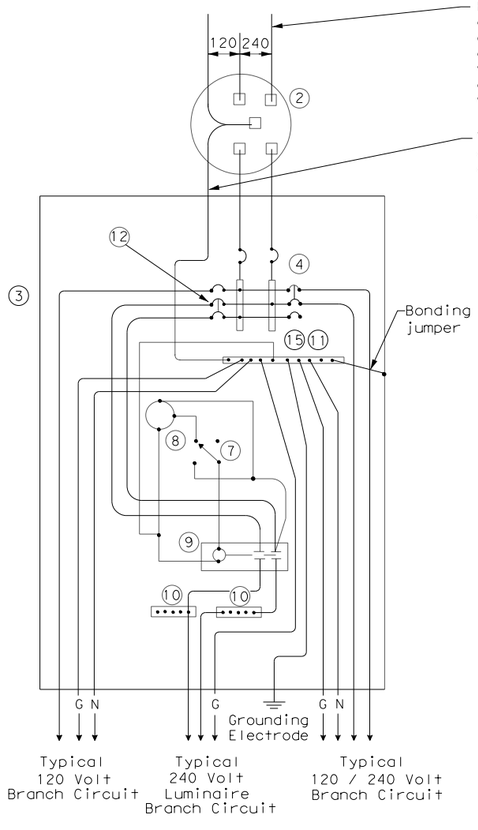


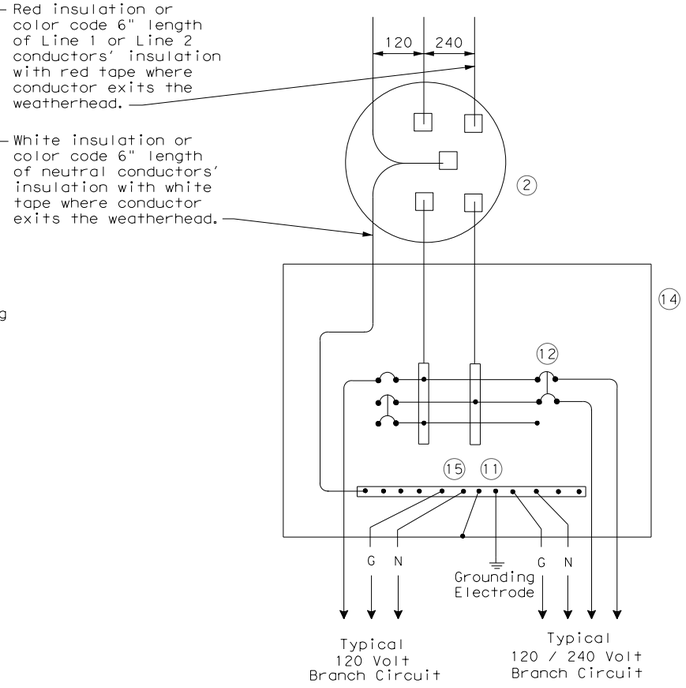
SCHEMATIC TYPE A
THREE WIRE



SCHEMATIC TYPE C
THREE WIRE



SCHEMATIC TYPE D - CUSTOM
120/240 VOLTS - THREE WIRE



SCHEMATIC TYPE T
120/240 VOLTS - THREE WIRE

Galvanized steel-"Buy Off The Shelf" only. When required install photocell top of the pole or on luminaire only, no lighting contractor will be installed.

WIRING LEGEND	
———	Power Wiring
———	Control Wiring
—N—	Neutral Conductor
—G—	Equipment grounding conductor-always required

SCHEMATIC LEGEND	
1	Safety Switch (when required)
2	Meter (when required-verify with electric utility provider)
3	Service Assembly Enclosure
4	Main Disconnect Breaker (See Electrical Service Data)
5	Circuit Breaker, 15 Amp (Control Circuit)
6	Auxiliary Enclosure
7	Control Station ("H-O-A" Switch)
8	Photo Electric Control (enclosure-mounted shown)
9	Lighting Contactor
10	Power Distribution Terminal Blocks
11	Neutral Bus
12	Branch Circuit Breaker (See Electrical Service Data)
13	Separate Circuit Breaker Panelboard
14	Load Center
15	Ground Bus

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE ENCLOSURE AND NOTES

ED(6)-14

FILE: ed6-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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DATE: 8/27/2021
FILE: N:\7023-17-102\CADD\DGN\08_TRAFFIC\A_TRAFFIC\SignalStdDetails\ed7-14f1.dgn

SUPPORT TYPE STEEL POLE (SP) AND STEEL FRAME (SF)

1. Provide steel pole and steel frame supports as per TxDOT Departmental Material Specification (DMS)11080 "Electrical Services." Mount all equipment and conduit on 12 gauge galvanized steel or stainless steel channel strut, 1 ½ in. or 1 ⅝ in. wide by 1 in. up to 3 ¾ in. deep Unistrut, Kindorf, B-line or equal. Bolt or weld all channel and hardware to vertical members as approved. Do not stack channel. File smooth and paint field cut ends of all channel with zinc-rich paint before installing.

2. Provide poles for overhead service with an eyebolt or similar fitting for attachment of the service drop to the pole in conformance with the electric utility provider's specifications.

3. Provide and install galvanized ¾ in. x 18 in. x 4 in. (dia. x length x hook length) anchor bolts for underground service supports. Provide and install galvanized ¾ in. x 56 in. x 4 in. anchor bolts for overhead service supports. Ensure anchor bolts have 3 in of thread, with 3 ¼ in. to 3 ½ in. of the exposed anchor bolt projecting above finished foundation. Provide and install leveling nuts for all anchor bolts.

4. Bond one of the anchor bolts to the rebar cage with 6 AWG bare stranded copper conductor. Use listed mechanical connectors rated for embedment in concrete. See Inset B.

5. Furnish and install rigid metallic ells in all steel pole and steel frame foundations for all conduits entering the service from underground.

6. Use class C concrete for foundations. Ensure reinforcing steel is Grade 60 with 3" of unobstructed concrete cover.

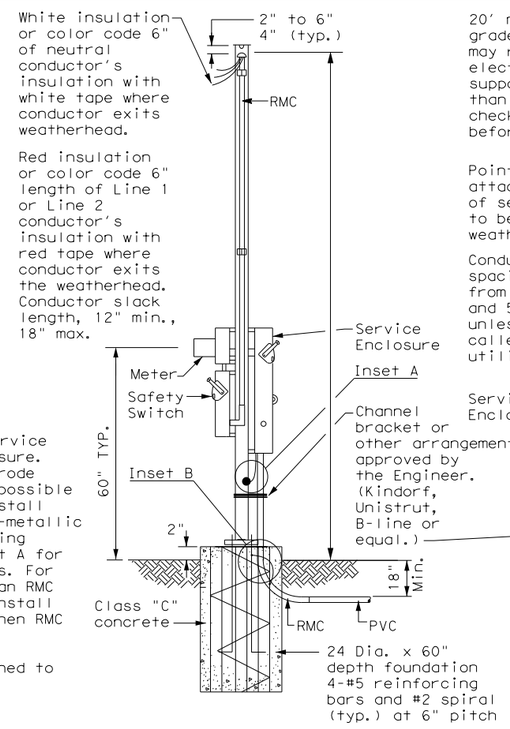
7. Drill and tap steel poles and frames for ½ in. X 13 UNC tank ground fitting. For steel pole service supports, provide and install tank ground fitting 4 in. to 6 in. below electrical service enclosure. Provide properly sized hole through the bottom of the enclosure for the service grounding electrode conductor. Ensure electrical service grounding electrode conductor is as short and straight as possible from the enclosure to the tank ground fitting. For steel frame service supports, provide and install tank ground fitting on steel frame post. Install service grounding electrode conductor in a non-metallic conduit or tubing from the enclosure to the steel frame post. Connect electrical service grounding electrode conductor to the tank ground fitting. See steel frame and steel pole details and Inset A for more information. Size service entrance conduit and branch circuit conduit as shown in the plans. For underground conduit runs from the electrical service, extend RMC from the service enclosure to an RMC elbow, and then connect the schedule type and size of conduit shown in the plans. Provide and install grounding bushings where RMC terminates in the enclosure. Grounding bushings are not required when RMC is fitted into a sealing hub or threaded boss.

8. If Steel pole or frame is painted, bond each separate painted piece with a bonding jumper attached to a tapped hole.

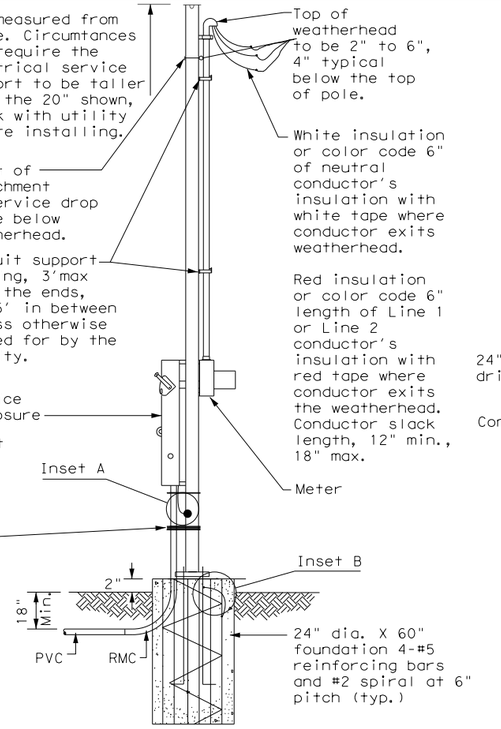
9. Provide ¼" - 20 machine screws for bonding. Do not use sheet metal screws. Remove all non-conductive material at contact points. Terminate bonding jumpers with listed devices. Install minimum size 6 AWG stranded copper bonding jumpers. Make up all threaded bonding connections wrench tight.

10. Avoid contact of the service drop and service entrance conductors with the metal pole to prevent abrasion of the insulated conductors.

11. Shop drawings are not required for service support structure unless specifically stated elsewhere or directed by the Engineer.

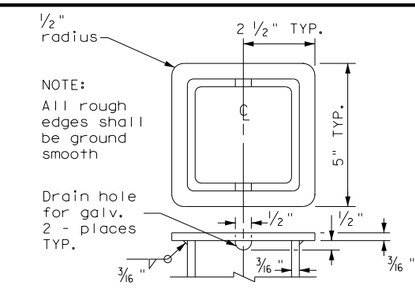


WITH SAFETY SWITCH

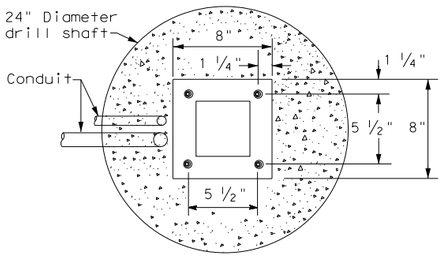


WITHOUT SAFETY SWITCH

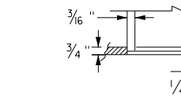
SERVICE SUPPORT TYPE SP (O) - OVERHEAD SERVICE



POLE TOP PLATE

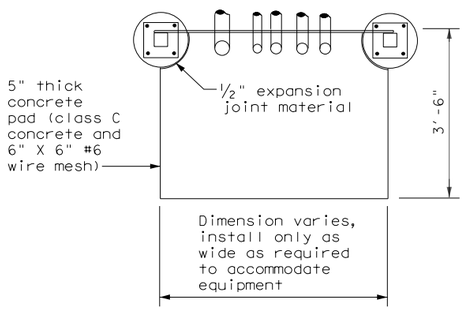


BASE PLATE DETAIL



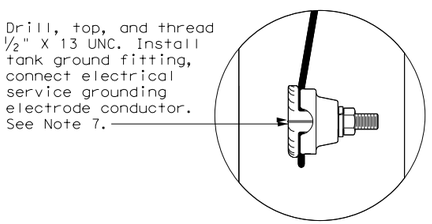
BOTTOM OF POLE

SERVICE SUPPORT TYPE SF & SP

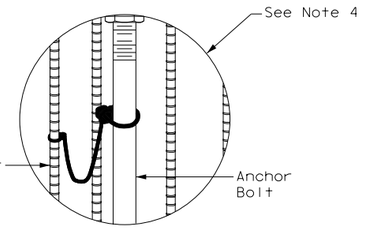


TOP VIEW

SERVICE SUPPORT TY SF (O) & SF (U)

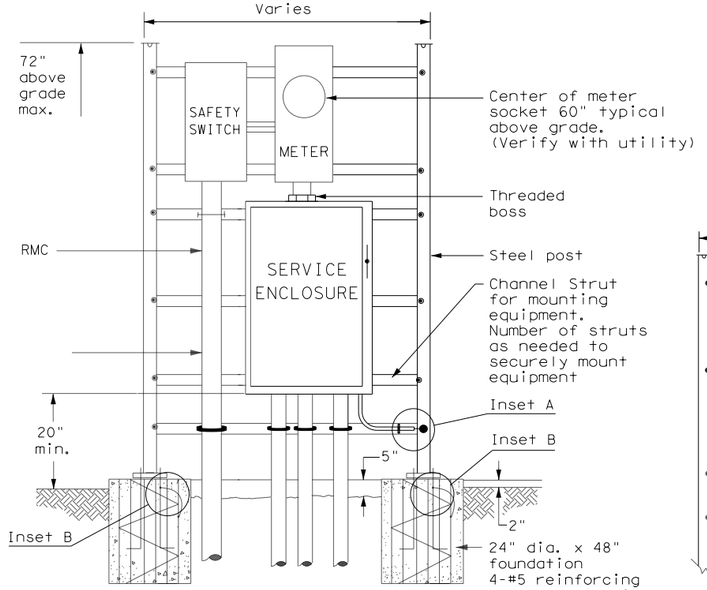


FRONT VIEW

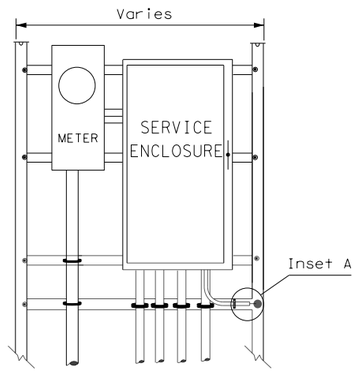


INSET B

INSET A

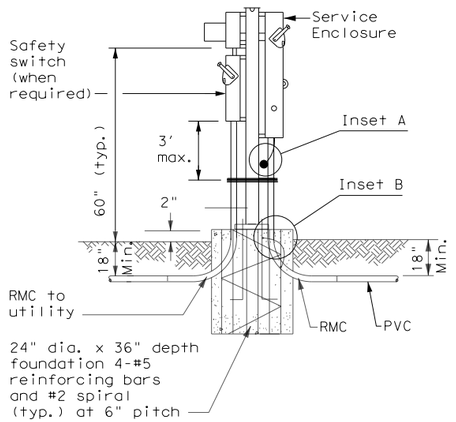


WITH SAFETY SWITCH
FRONT VIEW

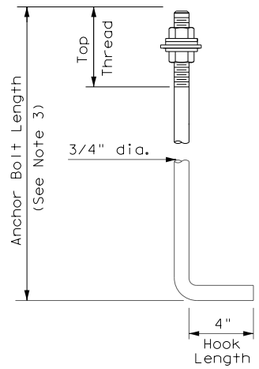


WITHOUT SAFETY SWITCH

SERVICE SUPPORT TYPE SF(U) - UNDERGROUND SERVICE



WITH SAFETY SWITCH



HOOKED ANCHOR DETAIL

SERVICE SUPPORT TYPE SP(U) - UNDERGROUND SERVICE

Texas Department of Transportation | Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE SUPPORT TYPES SF & SP

ED(7)-14

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	BWD	STEPHENS		139

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TIMBER POLE(TP)SERVICE SUPPORT NOTES

1. Ensure electrical service support is a class 5 treated timber pole as per Item 627 "Treated Timber Poles." Embed timber pole to depth required in Item 627.
2. Conduit and electrical conductors attached to the electrical service pole and underground within 12 in. of service pole are not paid for directly but are subsidiary to the electrial service.
3. Install pole-top mounted photocell (T) on north side of pole, or in service enclosure (E) as required. See Electrical Service Data chart in plan set.
4. Gain pole as required to provide flat surface for each channel. Gain timber pole to 5/8 in. max. depth and 1 7/8 in. max. height. Gain pole in a neat and workmanlike manner.
5. Mount meter and service equipment on stainless steel or galvanized channel (Unistrut, Kindorf, or equal). Provide channel sized 1 in. to 3 3/4 in. maximum depth, and 1½ in. to 1⅝ in. maximum width. File smooth the cut ends of galvanized channel and paint with zinc rich paint before installing on pole. Secure each channel section to timber pole with two galvanized or SS lag bolts, ¼ in. minimum diameter by 1½ in. minimum length. Use a galvanized or SS flat washer on each lag bolt. Do not stack channel.
6. When excess length must be trimmed from poles, trim from the top end only.

(1) Class 5 pole, height as required

(2) Service drop from utility company (attached below weatherhead)

(3) Service conduit (RMC)and service entrance conductors - One Red, One Black, One White (See Electrical Service Data)

(4) Safety switch (when required)

(5) Meter (when required)

(6) Service enclosure

(7) 6 AWG bare grounding electrode conductor in ½ in. PVC to ground rod - extend ½ in. PVC 6 in. underground.

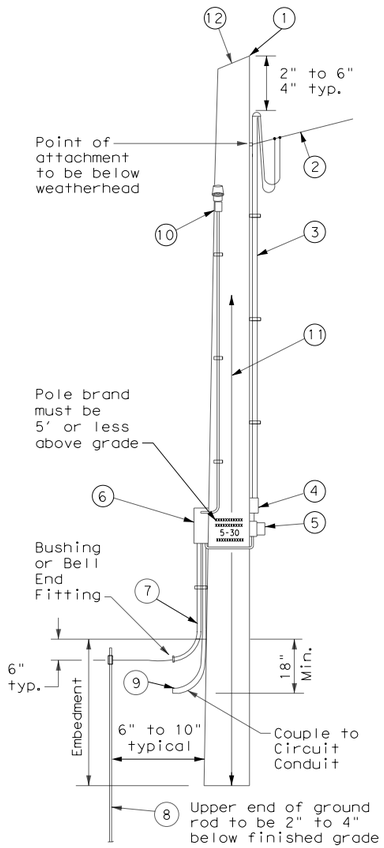
(8) 5/8 in. x 8 ft. Copper clad ground rod - drive ground rod to a depth of 2 in. to 4 in. below grade.

(9) RMC same size as branch circuit conduit.

(10) See pole-top mounted photocell detail on ED(5).

(11) When required by the serving utility provide bare 6 AWG copper conductor. Run wire from pole top to butt wrap or copper butt plate. Protect conductor with non-conductive material to a height of 8 ft. above finished grade.

(12) When required by utility, cut top of pole at an angle to enhance rain run off.

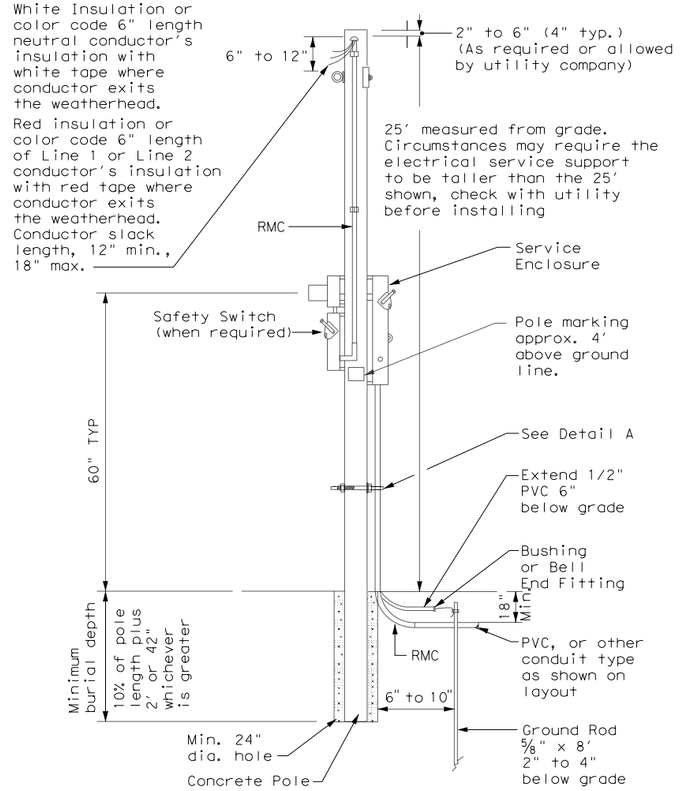


SERVICE SUPPORT TYPE TP (O)

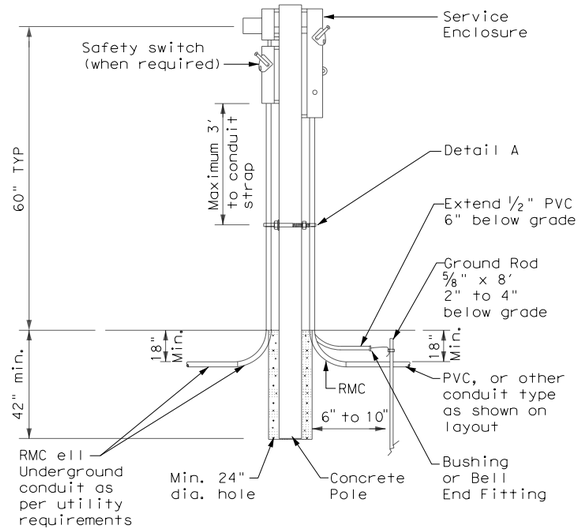
GRANITE CONCRETE(GC)& OTHER CONCRETE(OC)NOTES

Ensure electrical service support structures bid as type Granite Concrete (GC) or Other Concrete (OC) meet the following requirements.

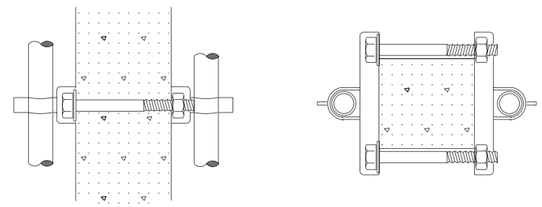
1. Provide GC and OC poles that meet the requirements of DMS 11080 "Electrical Services."
2. Provide prestressed concrete poles suitable for direct embedment into the ground without special foundations.
3. Verify poles are marked as required on DMS 11080. Location of marking should be approximately 4' above final grade. Use the two-point pickup locations when handling pole in horizontal position, and one-point pickup location for use in raising the pole to a vertical position. These marks are small but conspicuous.
4. Embed poles 42 in. or 10% of the length plus 2 ft., whichever is greater.
5. Ensure all installation details of services are in accordance with utility company specifications.
6. Install a one point rack or eye bolt bracket 6 inches to 12 inches below the weatherhead as an overhead service drop anchoring point for the electric utility.
7. Furnish and install galvanized or stainless steel channel strut 1 ½ in. or 1 5/8 in. wide by 1 in. up to 3 3/4 in. deep (Unistrut, Kindorf, B-line or equal). Attach channel strut with stainless steel concrete anchors (max. 1" depth), square U-bolts or back to back channel strut with long bolts, or other secure mounting as approved by the Engineer. Ensure bolts are galvanized in accordance with ASTM A153. Do not stack channel struts.
8. Backfill the holes thoroughly by tamping in 6 in. lifts. After tamping to grade, place additional backfill material in a 6 inch high cone around the pole to allow for settling. Use material equal in composition and density to the surrounding area. Backfilling will not be paid for directly but is subsidiary to various bid items.



CONCRETE SERVICE SUPPORT
Overhead(O)



CONCRETE SERVICE SUPPORT
Underground(U)



DETAIL A

See Note 7. Before installing channel that has been cut, file sharp edges and paint with zinc-rich paint. Ensure there is no paint splatter on the pole.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE SUPPORT TYPES GC, OC, & TP

ED(10)-14

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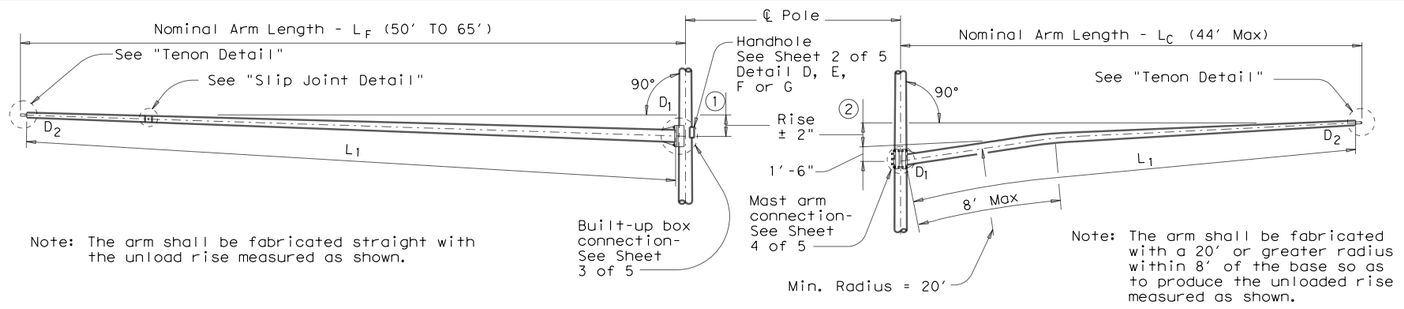
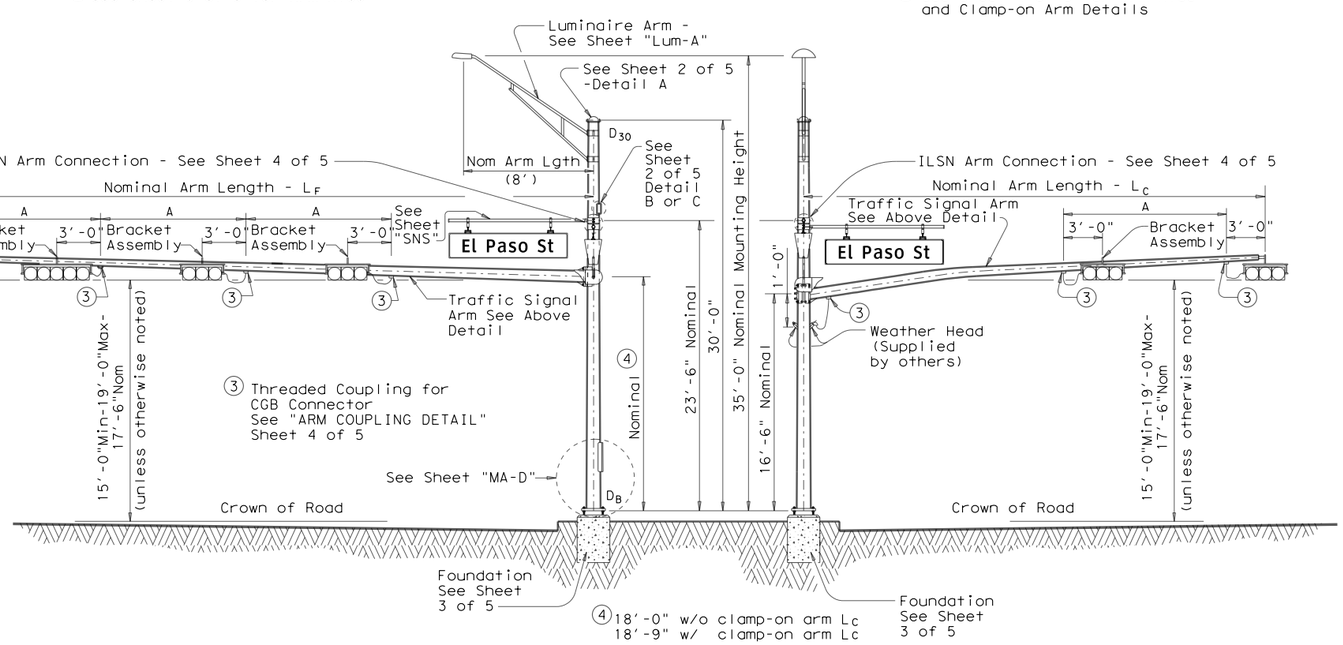


Note: The arm shall be fabricated straight with the unload rise measured as shown.

Note: The arm shall be fabricated with a 20' or greater radius within 8' of the base so as to produce the unloaded rise measured as shown.

FIXED MOUNT TRAFFIC SIGNAL ARM

① See Sheet 3 of 5 for Arm Rise



CLAMP-ON TRAFFIC SIGNAL ARM (IF REQUIRED)

② See Sheet 4 of 5 for Arm Rise and Clamp-on Arm Details

ELEVATION

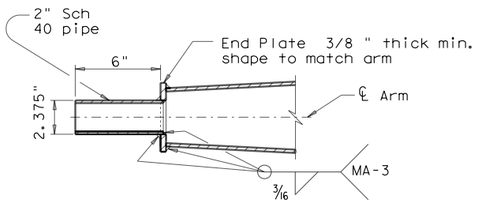
(Showing fixed mount arm)

STRUCTURE ASSEMBLY

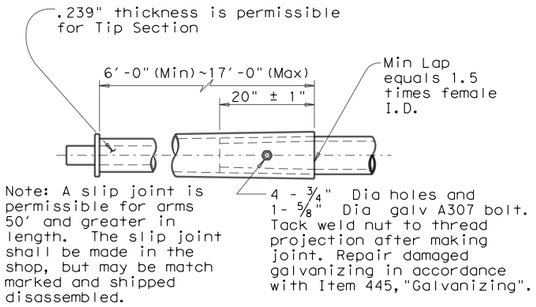
ELEVATION

(Showing clamp-on arm)

TABLE OF DIMENSIONS "A"										
Arm Length	24'	28'	32'	36'	40'	44'	50'	55'	60'	65'
Arm Type II	10'	11'	12'	13'						
Arm Type III			10'	11'	12'	12'				
Arm Type IV							12'	12'	12'	12'



TENON DETAIL



Note: A slip joint is permissible for arms 50' and greater in length. The slip joint shall be made in the shop, but may be match marked and shipped disassembled.

SLIP JOINT DETAIL (FIXED MOUNT ARM)

GENERAL NOTES:

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Specifications thereto. Design Wind Speed can be either 100 mph or 80 mph plus a 1.3 gust factor. If clamp-on traffic signal is required, designs are based on an arm included angle of 90 degrees or more. Angles of less than approximately 75 degrees will require a special design.

Poles are designed to support one 8'-0" luminaire arm, two 9'-0" internally lighted street name (ILSN) signs and two traffic signal arms with limited length combinations.

Each arm with its related attachment is shown below

Arm	Equivalent DL ⑤	WL EPA ⑤⑥
8' Luminaire Arm	Luminaire 60 lbs	1.6 sq ft
9' ILSN Arm	Sign 85 lbs	11.5 sq ft
50' to 65' Fixed Mount Arm	Signal Loads 310 lbs	52 sq ft
Up to 44' Clamp-on Arm	Signal Loads 180 lbs	32.4 sq ft

⑤ Equivalent dead load plus horizontal wind load applied at the end of arm except ILSN arm, which applied 4.5' from the centerline of the pole.

⑥ Effective projected area (actual area times drag coefficient) for the application of horizontal wind load.

Except as noted in Sheet 1 thru 5 of 5, other details not covered shall refer to Standard Sheet "MA-D" for pole details, "LUM-A" for luminaire arm and connection details, "SNS" for internally lighted street name sign details, and "TS-FD" for anchor bolt and foundation details.

Fabrication shall be in accordance with Item 686, "Traffic Signal Pole Assemblies (Steel)" and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. Material, fabrication tolerances, and shipping practices shall also meet the requirements of this sheet and Item 686, "Traffic Signal Pole Assemblies (Steel)".

Unless otherwise noted, all parts shall be galvanized in accordance with Item 445, "Galvanizing" after fabrication.

Deviations from the details and dimensions shown herein require submission of shop drawings in accordance with the Item 441, "Steel Structures". Alternate designs are not acceptable.

Installation of damping plate for the long mast arm is not recommended.

Provision of the bracket assembly used to support the traffic signal heads shall be under the direction of the Engineer for approval.

Design also conforms to NCHRP Report 412 for fatigue resistance except that there are no stiffeners at the base plate. TxDOT is conducting tests to determine if stiffeners at the base plate will or will not result in optimal performance; depending upon the results of the tests, poles may need a retrofit to ensure optimal fatigue performance.

Texas Department of Transportation
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TRAFFIC SIGNAL SUPPORT STRUCTURES
LONG MAST ARM ASSEMBLY (50 TO 65 FT) (80 AND 100 MPH WIND ZONE)
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Sheet 1 of 5

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

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CONT	SECT	JOB	HIGHWAY
3469	01	014	FM 3099

DIST	COUNTY	SHEET NO.
BWD	STEPHENS	141

131A

DATE: 8/27/2021
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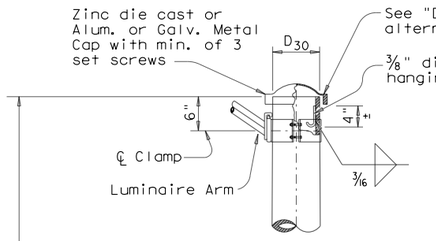
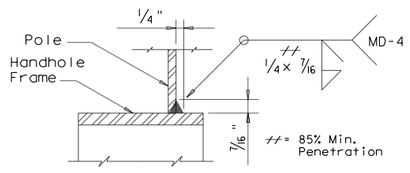
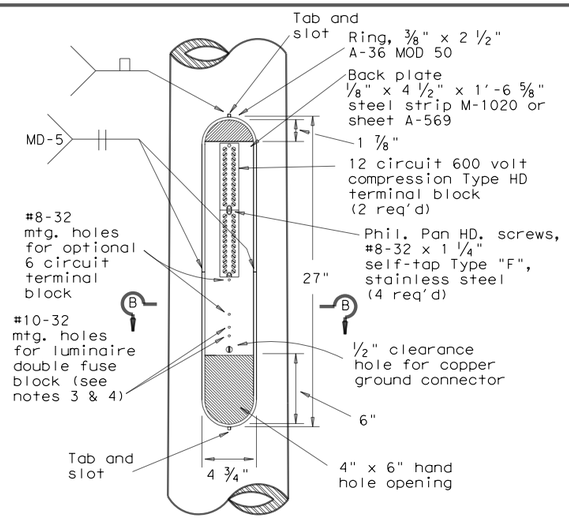


DETAIL A

(for pole with luminaire)



DETAIL H

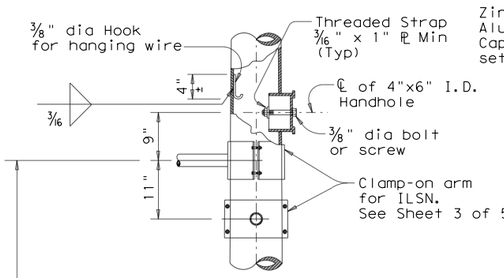


ACCESS COMPARTMENT

MATERIALS	
Round Shafts or Polygonal Shafts (7)	ASTM A595 Gr.A, A588, A1008 HSLAS Gr.50 Class 2, A1011 HSLAS Gr.50 Class 2, A572 Gr.50 or A1011 SS Gr.50 (8)
Plates (7)	ASTM A36, A588, or A572 Gr.50
Connection Bolts	ASTM A325, or A449 except where noted
Pin Bolts	ASTM A325
Pipe (7)	ASTM A53 Gr.B, A501, A1008 HSLAS-F Gr.50, A1011 HSLAS-F Gr.50
Misc. Hardware	Galvanized steel or stainless steel or as noted

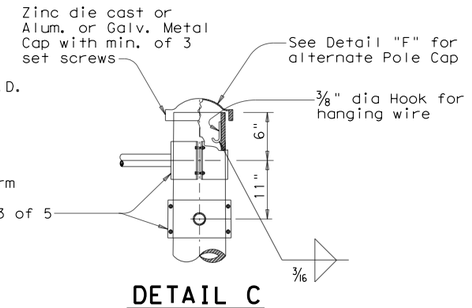
(7) ASTM A572, A1008 HSLAS, A1011 HSLAS, A1008 HSLAS-F, A1011 HSLAS-F, or A1011 SS may have higher yield strengths but shall not have less elongation than the grade indicated.

(8) ASTM A1011 SS Gr.50 shall also have a minimum elongation of 18 percent in 8 inches or 23 percent in 2 inches. Material thickness in excess of those stipulated under A1011 SS will be acceptable providing the material meets all other A1011 SS requirements and the requirements of this item.

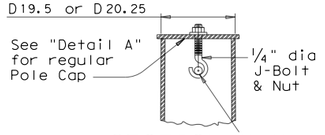


DETAIL B

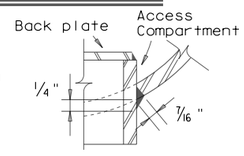
(If ILSN applied)



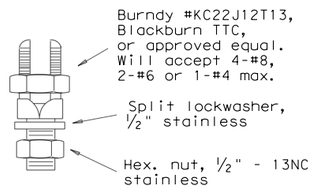
DETAIL C



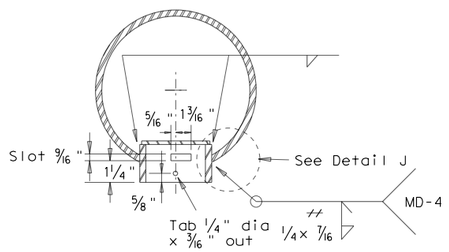
SECTION Y-Y



DETAIL J



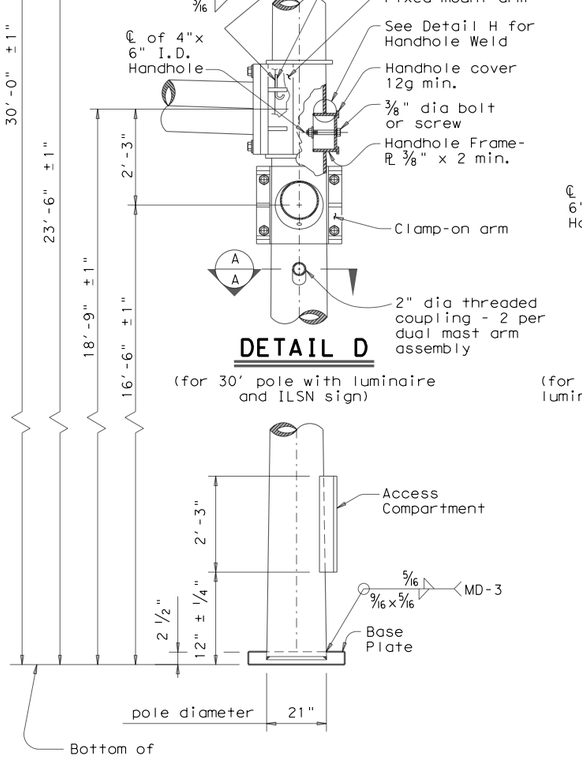
COPPER GROUND CONNECTOR



SECTION B-B

// = 85% Min. Penetration

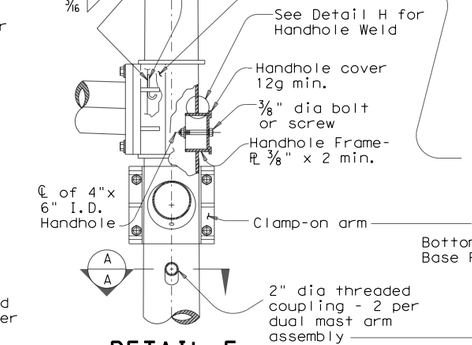
Opening for access compartment shall be no more than 1/16 inch wider than the access compartment itself.



DETAIL D

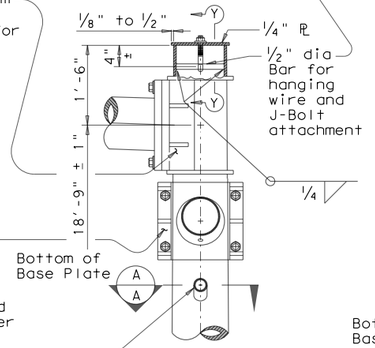
(for 30' pole with luminaire and ILSN sign)

POLE ELEVATION



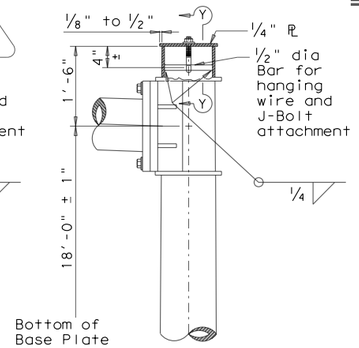
DETAIL E

(for 24' pole with ILSN sign and no luminaire, single or dual mast arm)



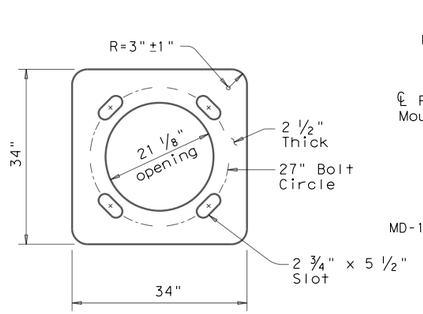
DETAIL F

(for 20.25' pole with no ILSN sign and no luminaire, dual mast arm)

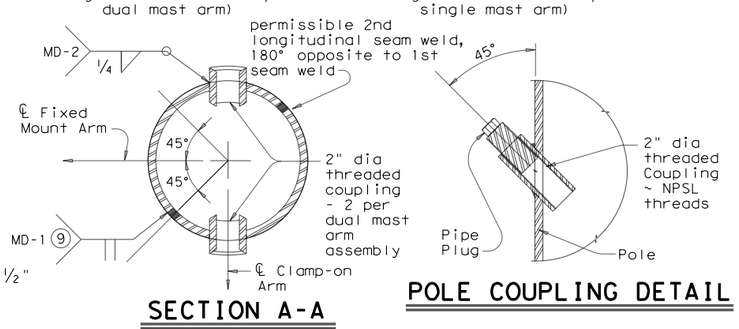


DETAIL G

(for 19.5' pole with no ILSN sign and no luminaire, single mast arm)



BASE PLATE



SECTION A-A

POLE COUPLING DETAIL

(9) Longitudinal seam weld must be oriented within 90° (45° rotation each side) along the fixed mount arm. 60% min penetration required, 100% penetration within 6" of circumferential base weld.

ACCESS COMPARTMENT NOTES:

1. The cover shall be one piece formed from ABS plastic, shall be a pearl gray color, and shall be suitable for exposure to harsh sunlight and extreme weather. Cover shall latch with two screw latches and shall fit tightly to the enclosure ring to create a rainproof seal. Latch screws shall be 1/4-20 stainless flat socket head screws with tamper proof feature.
2. The pole manufacturer shall provide with each pole a separate kit consisting of: one cover with two latching assemblies, two terminal strips (Marathon #985GP12CU or approved equal), four #8-32 x 1 1/4" self tapping type "F" stainless steel pan head screws, and one ground connector (Blackburn TTC, Burndy KC22J12T13, or Ilsco SSS-5). The traffic signal contractor shall install the kit items in the field.
3. The screw hole spacing on the enclosure back plate shall be for two Marathon #985GP12 terminal strips, one Marathon #985GP06CU terminal strip, and one Bussmann #BM6032B fuse block.
4. Install one Bussmann #BM6032B, Littelfuse #L60030M-2C, or Ferraz-Shawmut #30352 fuse block for poles where luminaires are to be installed.

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TRAFFIC SIGNAL SUPPORT STRUCTURES
LONG MAST ARM ASSEMBLY (50 TO 65 FT) (80 AND 100 MPH WIND ZONE)

Sheet 2 of 5

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CONT	SECT	JOB	HIGHWAY
3469	01	014	FM 3099

DIST	COUNTY	SHEET NO.
BWD	STEPHENS	142

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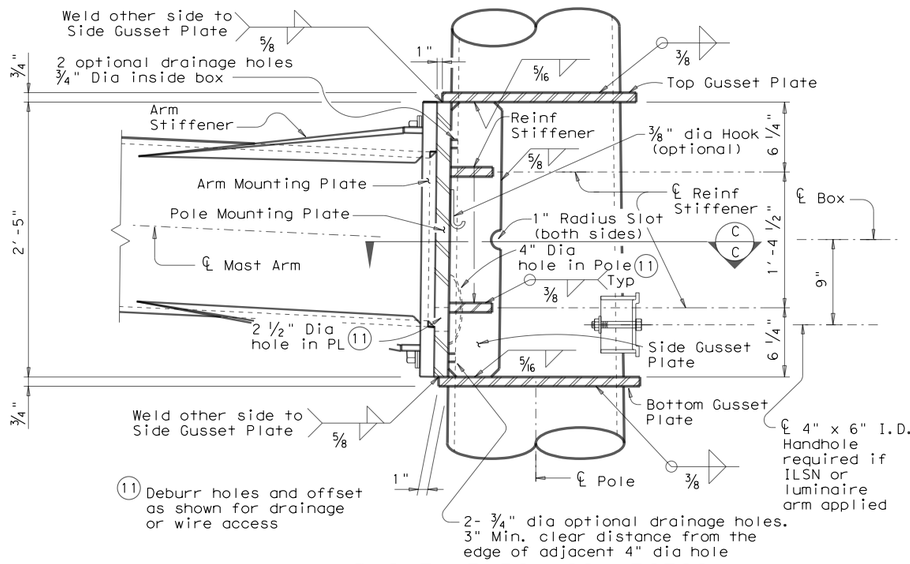
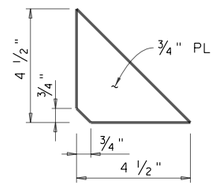
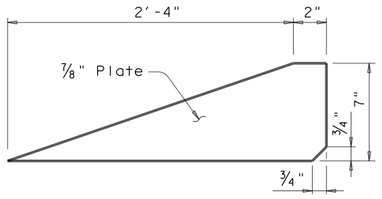


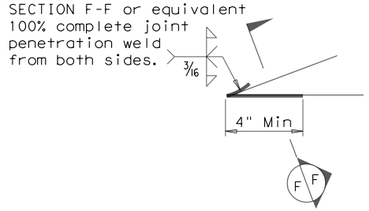
BUILT-UP BOX CONNECTION



REINFORCING STIFFENER

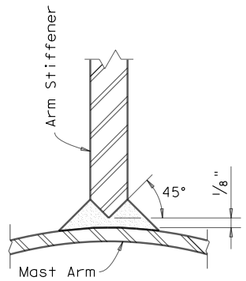


ARM STIFFENER
(Cut to match arm inclination and taper)



Only 4" length at tip of Arm Stiffener requires a complete joint penetration weld. Smooth weld radius to connect Stiffener. Only a fillet weld is required for the remaining weld length.

DETAIL "K"



SECTION F-F

Fixed Mount Arm L_F	ROUND POLES (13)					Foundation Type
	D_B	$D_{19.5}$ or $D_{20.25}$	D_{24}	D_{30}	(12) thk	
ft.	in.	in.	in.	in.	in.	
50', 55' 60', 65'	21.0	18.2	17.6	16.8	.3125	48-A

Fixed Mount Arm L_F	ROUND ARMS (13)				
	L_1	D_1	D_2	(12) thk	Rise
ft.	ft.	in.	in.	in.	
50	49	18.5	11.7	.3125	3'- 3"
55	54	18.5	11.0	.3125	3'- 7"
60	59	18.5	10.3	.3125	3'-11"
65	64	18.5	9.6	.3125	4'- 4"

D_B = Pole Base O.D.
$D_{19.5}$ = Pole Top O.D. with no Luminaire and no ILSN (single mast arm)
$D_{20.25}$ = Pole Top O.D. with no Luminaire and no ILSN (dual mast arm)
D_{24} = Pole Top O.D. with ILSN w/out Luminaire
D_{30} = Pole Top O.D. with Luminaire
D_1 = Arm Base O.D.
D_2 = Arm End O.D.
L_1 = Shaft Length
L_F = Fixed Arm Length

(12) Thickness shown is minimum, thicker materials may be used.

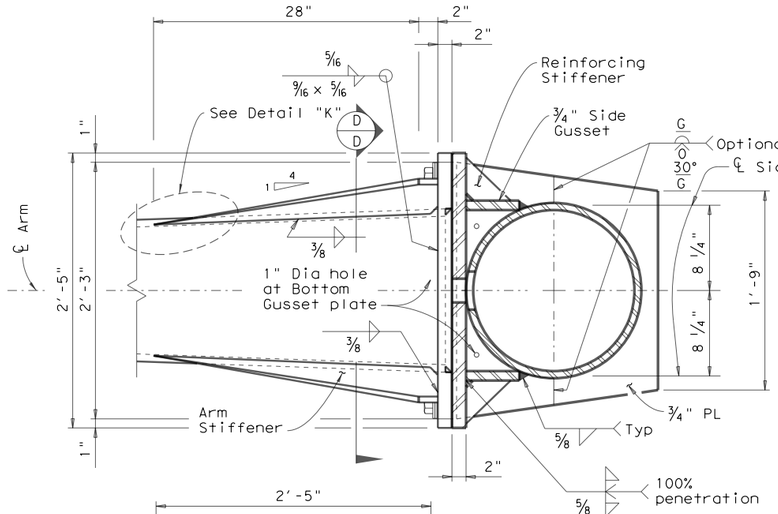
(13) Shaft profile 16-sided or 18-sided is considered to be equivalent to round section.

GENERAL NOTES:

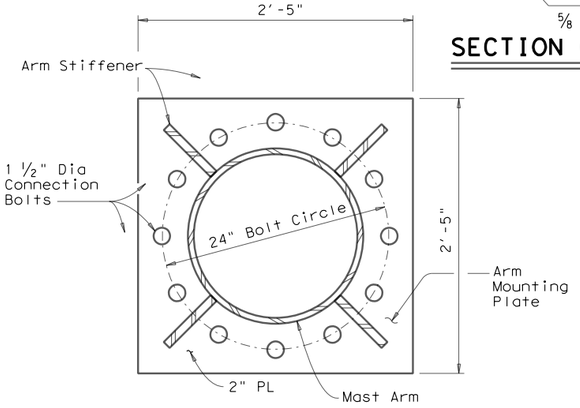
Built-up Box Connection: For the welded arm-to-pole connection as a build-up box configuration illustrated here is an example only, fabricators are required to submit a shop drawing of box connection for approval. The drawing shall specify the details of each box element, welds of arm-to-pole connection, arm-to-plate socket connection, and arm rise creation. Specify the proper location of drain holes along the pole. 2 1/2" dia hole in the pole mounting plate and 4" dia hole in the pole need to be aligned for wiring access or drainage. Arm stiffeners cut to match arm inclination and taper shall also be included.

The deviation from flat for either arm or pole mounting plate shall not exceed 1/32 in., which is measured along the center of mounting plate to a radial distance of 13.5 in. The deformed-from-flat connection between arm and pole mounting plates shall not be allowed if the center of both mounting plates cannot contact directly.

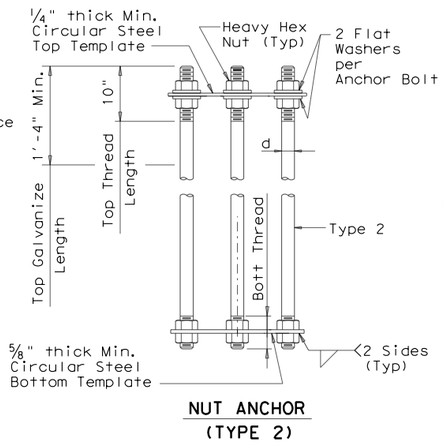
Fixed mount details are used for single mast arm assemblies and for the first arm on dual mast arm assemblies.



SECTION C-C

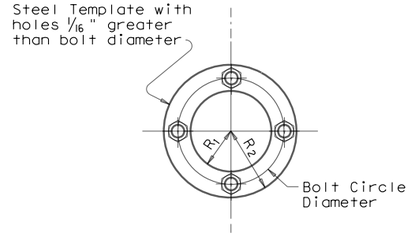


SECTION D-D



NUT ANCHOR
(TYPE 2)

ANCHOR BOLT ASSEMBLY



TEMPLATE DETAIL

ANCHOR BOLT & TEMPLATE SIZE						
Bolt Dia in.	Length ‡	Top Thread	Bottom Thread	Bolt Circle	R_2	R_1
2 1/2"	5'-2"	10"	6 1/2"	27"	16"	11"

‡ Min dimension given, longer bolts are acceptable.

FOUNDATION DESIGN TABLE													
FDN TYPE	DRILLED SHAFT DIA	REINFORCING STEEL		DRILLED SHAFT LENGTH-ft (16), (17), (18)			ANCHOR BOLT DESIGN (14)				FOUNDATION DESIGN LOAD (15)		TYPICAL APPLICATION
		VERT BARS	SPIRAL & PITCH	TEXAS CONE PENETROMETER N blows/ft			ANCHOR BOLT DIA	Fy (ksi)	BOLT CIR DIA	ANCHOR TYPE	MOMENT K-ft	SHEAR Kips	
				10	15	40							
48-A	48"	20 #9	#4 at 6"	21.9	19.5	14.7	2 1/2"	55	27"	2	490	10	50' to 65' Mast arm assembly.

SEE SHEET "TS-FD" FOR ADDITIONAL DETAILS.

(14) Anchor bolt design develops the foundation capacity given under Foundation Design Loods.

(15) Foundation Design Loads are the allowable moments and shears at the base of the structure.

(16) Field Penetrometer readings at a depth of approximately 3 to 5 feet may be used to adjust shaft lengths.

(17) If rock is encountered, the Drilled Shaft shall extend a minimum of two diameters into solid rock.

(18) Decimal lengths in Design Table are to allow interpolation for other penetrometer values. Round to nearest foot for entry into Summary Table.

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TRAFFIC SIGNAL SUPPORT STRUCTURES
LONG MAST ARM ASSEMBLY (50 TO 65 FT) (80 AND 100 MPH WIND ZONE)

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DN: JSY	CK: ARC	DW: TGG	CK: JSY

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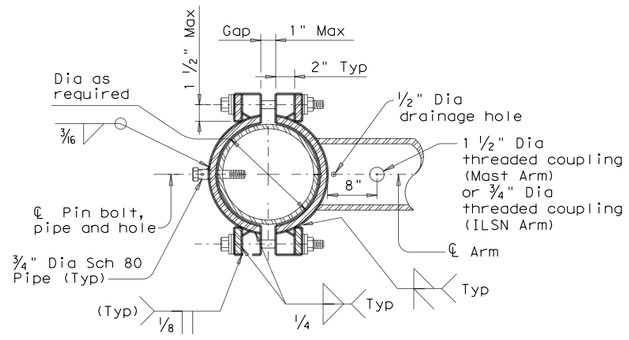
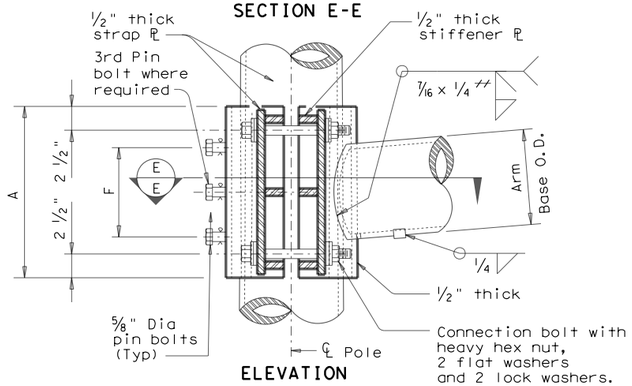
CONT	SECT	JOB	HIGHWAY
3469	01	014	FM 3099
DIST	COUNTY		SHEET NO.
BWD	STEPHENS		143

131C

DATE: 8/27/2021
FILE: N:\7023-17-102\CADD\DGN\08_TRAFFIC\A_TRAFFIC_SIGNAL\StdDetails\lma.dgn



SECTION E-E



ELEVATION
(Mast Arm or ILSN Arm to pole)

†† = 85% Min. Penetration

CLAMP-ON CONNECTION

80 MPH WIND

Clamp-on Arm Lc	ROUND ARMS					POLYGONAL ARMS				
	L1	D1	D2	thk (12)	Rise	L1	D1	D2	thk (12)	Rise
ft.	ft.	in.	in.	in.		ft.	in.	in.	in.	
20	19.1	6.5	3.8	.179	1'-9"	19.1	7.0	3.5	.179	1'-8"
24	23.1	7.5	4.3	.179	1'-10"	23.1	7.5	3.5	.179	1'-9"
28	27.1	8.0	4.2	.179	1'-11"	27.1	8.0	3.5	.179	1'-10"
32	31.0	9.0	4.7	.179	2'-1"	31.0	9.0	3.5	.179	2'-0"
36	35.0	9.5	4.6	.179	2'-4"	35.0	10.0	3.5	.179	2'-1"
40	39.0	9.5	4.1	.239	2'-8"	39.0	9.5	3.5	.239	2'-3"
44	43.0	10.0	4.1	.239	2'-11"	43.0	10.0	3.5	.239	2'-6"

100 MPH WIND

Clamp-on Arm Lc	ROUND ARMS					POLYGONAL ARMS				
	L1	D1	D2	thk (12)	Rise	L1	D1	D2	thk (12)	Rise
ft.	ft.	in.	in.	in.		ft.	in.	in.	in.	
20	19.1	8.0	5.3	.179	1'-8"	19.1	8.0	3.5	.179	1'-7"
24	23.1	9.0	5.8	.179	1'-9"	23.1	9.0	3.5	.179	1'-8"
28	27.1	9.5	5.7	.179	1'-10"	27.1	10.0	3.5	.179	1'-9"
32	31.0	9.5	5.2	.239	1'-11"	31.0	9.5	3.5	.239	1'-10"
36	35.0	10.0	5.1	.239	2'-0"	35.0	10.0	3.5	.239	1'-11"
40	39.0	10.5	5.1	.239	2'-3"	39.0	11.0	3.5	.239	2'-1"
44	43.0	11.0	5.1	.239	2'-8"	43.0	11.5	4.0	.239	2'-3"

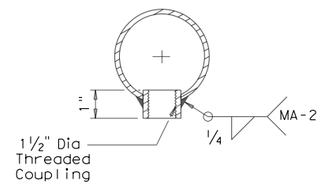
D1 = Arm Base O.D.
D2 = Arm End O.D.
L1 = Shaft Length
Lc = Clamp-on Arm Length

(12) Thickness shown is minimum, thicker materials may be used.

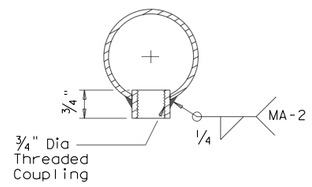
CLAMP-ON ARM CONNECTION

ILSN Arm Size		A	F	4 Conn. Bolts	5/8" Dia. Pin Bolts
Sch 40 pipe Dia	Thick			Dia	No.
in.	in.	in.	in.	in.	ea
3	.216	10	4	¾	2

Mast Arm Size		A	F	4 Conn. Bolts	5/8" Dia. Pin Bolts
Base Dia	Thick			Dia	No.
in.	in.	in.	in.	in.	ea
6.5	.179	12	6	1	2
7.5	.179	14	8	1	2
8.0	.179	14	8	1	2
9.0	.179	16	10	1	2
9.5	.179	18	12	1 ¼	3
9.5	.239	18	12	1 ¼	3
10.0	.239	18	12	1 ¼	3
10.5	.239	18	12	1 ¼	3
11.0	.239	18	12	1 ¼	3
11.5	.239	18	12	1 ¼	3



ARM COUPLING DETAIL



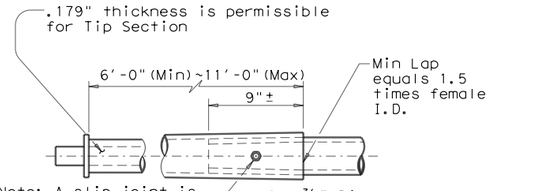
ILSN ARM COUPLING DETAIL

GENERAL NOTES:

Clamp-on details are used for the second arm on dual mast arm assemblies or ILSN arm support. For a clamp-on mast arm, a maximum 1 ½" wide vertical slotted hole may be cut in the front clamp plate to facilitate drainage during galvanizing. The slot shall be centered behind the arm and shall be no longer than the arm diameter minus 1". For an ILSN arm, a 1 ½" diameter hole shall be cut in the front clamp plate for wire access. A matched hole shall be field drilled through the pole to provide wire access after arm is oriented. Deburr both holes.

Where duplicate parts occur on a detail, welds shown for part shall apply to all similar parts on the detail.

Pin bolts are required to prevent rotation of clamp-on arms under design wind forces. Pin bolts shall be ASTM A325 with threads excluded from the shear plane. Pin bolt and ¾" diameter pipe shall have 3/16" diameter holes for a ⅛" diameter galvanized cotter pin. Back clamp plate shall be furnished with a ¾" diameter hole for each pin bolt. An 11/16" diameter hole for each pin bolt shall be field drilled through the pole after arm orientations have been approved by the Engineer.

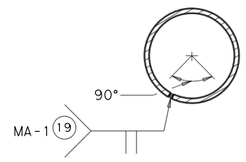


Note: A slip joint is permissible for arms 40' and greater in length. The slip joint shall be made in the shop, but may be match marked and shipped disassembled.

SLIP JOINT DETAIL (CLAMP-ON ARM)

Stainless steel bands (or Cables) and cast bracket as in "Astro-Brac", "Sky Bracket" or "Easy Bracket" with 1 ½" Dia Threaded Coupling.

BRACKET ASSEMBLY



ARM WELD DETAIL

(19) Longitudinal Seam Weld must be oriented within the lower 90° of the signal arm.
60% Min penetration
100% penetration within 6" of circumferential base welds.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES
LONG MAST ARM ASSEMBLY (50 TO 65 FT) (80 AND 100 MPH WIND ZONE)

Sheet 4 of 5 — LMA(4)-12

DN: JK	CK: GRB	DW: FDN	CK: CAL

REVISIONS
4-20-01
1-12

CONT	SECT	JOB	HIGHWAY
3469	01	014	FM 3099

DIST	COUNTY	SHEET NO.
BWD	STEPHENS	144

131D

DATE: 8/27/2021
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Shipping Parts List

Ship each pole with the following attached: enlarged hand hole, pole cap, fixed arm connection bolts and washers, and any additional hardware listed in the table.

Nominal Arm Length	30' Poles with Luminaire See note above plus: one (or two if ILSN attached) small hand hole, clamp-on simplex		24' Poles with ILSN See note above plus one small hand hole		19.50' (Single Mast Arm) 20.25' (Dual Mast Arm) Poles with no Luminaire and no ILSN See note above	
Single Mast Arm						
Lf ft.	Designation	Quantity	Designation	Quantity	Designation	Quantity
50	50L	2	50S		50	
55	55L		55S		55	
60	60L		60S		60	1
65	65L		65S		65	

Dual Mast Arm

Lf ft.	Lc ft.	Designation	Quantity	Designation	Quantity	Designation	Quantity
50	20	5020L		5020S		5020	
	24	5024L		5024S		5024	
	28	5028L		5028S		5028	
	32	5032L		5032S		5032	
	36	5036L		5036S		5036	
	40	5040L		5040S		5040	
	44	5044L		5044S		5044	
55	20	5520L		5520S		5520	
	24	5524L		5524S		5524	
	28	5528L		5528S		5528	
	32	5532L		5532S		5532	
	36	5536L		5536S		5536	
	40	5540L		5540S		5540	
	44	5544L		5544S		5544	
60	20	6020L		6020S		6020	
	24	6024L		6024S		6024	
	28	6028L		6028S		6028	
	32	6032L		6032S		6032	
	36	6036L		6036S		6036	
	40	6040L		6040S		6040	
	44	6044L		6044S		6044	
65	20	6520L		6520S		6520	
	24	6524L		6524S		6524	
	28	6528L		6528S		6528	
	32	6532L		6532S		6532	
	36	6536L		6536S		6536	
	40	6540L		6540S		6540	
	44	6544L		6544S		6544	

Foundation Summary Table **

Location Ident.	Avg. N Blow/ft.	No. Each	Drill Shaft *** Length (feet)
			48-A
POLE 1	10	1	22
POLE 2	10	1	22
POLE 3	10	1	22
Total Drill Shaft Length			66

Notes

** Foundations may be listed separately or grouped according to similarity of location and type. Quantities are for the Contractor's information only.

*** Decimal lengths in Design Table are to allow interpolation for other penetrometer values. Round to nearest foot for entry into Summary Table.

Shipping Parts List

Traffic Signal Arms (Fixed Mount) (1 per pole)
Ship each arm with listed equipment attached

Nominal Arm Length	Type IV Arm (4 Signals) 3 Bracket Assembly and 4 CGB Connectors	
ft.	Designation	Quantity
50	50IV	2
55	55IV	
60	60IV	1
65	65IV	

Luminaire Arms (1 per 30' pole)

Nominal Arm Length	Quantity
8' Arm	2

ILSN Arm (Max. 2 per pole) Ship with clamps, bolts and washers

Nominal Arm Length	Quantity
7' Arm	
9' Arm	

Traffic Signal Arms (80 MPH Clamp-On Mount) (1 per pole) Ship each arm with listed equipment attached

Nominal Arm Length	Type I Arm (1 Signal) 2 CGB connector and 1 clamp w/bolts and washers		Type II Arm (2 Signals) 1 Bracket Assembly and 3 CGB connectors, and 1 clamp w/bolts and washers		Type III Arm (3 Signals) 2 Bracket Assembly and 4 CGB connectors, and 1 clamp w/bolts and washers	
ft.	Designation	Quantity	Designation	Quantity	Designation	Quantity
20	20I-80					
24	24I-80		24II-80			
28	28I-80		28II-80			
32			32II-80		32III-80	
36			36II-80		36III-80	
40					40III-80	
44					44III-80	

Traffic Signal Arms (100 MPH Clamp-On Mount) (1 per pole) Ship each arm with listed equipment attached

Nominal Arm	Type I Arm (1 Signal) 2 CGB connector and 1 clamp w/bolts and washers		Type II Arm (2 Signals) 1 Bracket Assembly and 3 CGB connectors, and 1 clamp		Type III Arm (3 Signals) 2 Bracket Assembly and 4 CGB connectors, and 1 clamp	
ft.	Designation	Quantity	Designation	Quantity	Designation	Quantity
20	20I-100					
24	24I-100		24II-100			
28	28I-100		28II-100			
32			32II-100		32III-100	
36			36II-100		36III-100	
40					40III-100	
44					44III-100	

Anchor Bolt Assemblies (1 per pole)

Anchor Bolt Diameter	Anchor Bolt Length	Quantity
2 1/2 "	5' - 3"	3

Each anchor bolt assembly consists of the following: Top and bottom templates, 4 anchor bolts, 8 nuts, 8 flat washers and 4 nut anchor devices (type 2) per Standard Drawing "TS-FD". Templates may be removed for shipment.

Abbreviations
Lf= Fixed Arm Length
Lc= Clamp-on Arm Length (44' Max.)

08/27/2021

Texas Department of Transportation
Traffic Operations Division

LONG MAST ARM ASSEMBLY PARTS LIST

LMA(5)-12

Sheet 5 of 5

DN: JK	CK: GRB	DW: FDN	CK: CAL

REVISIONS	CONT	SECT	JOB	HIGHWAY
4-20-01 1-12	3469	01	014	FM 3099
	DIST	COUNTY		SHEET NO.
	BWD	STEPHENS		145

131E

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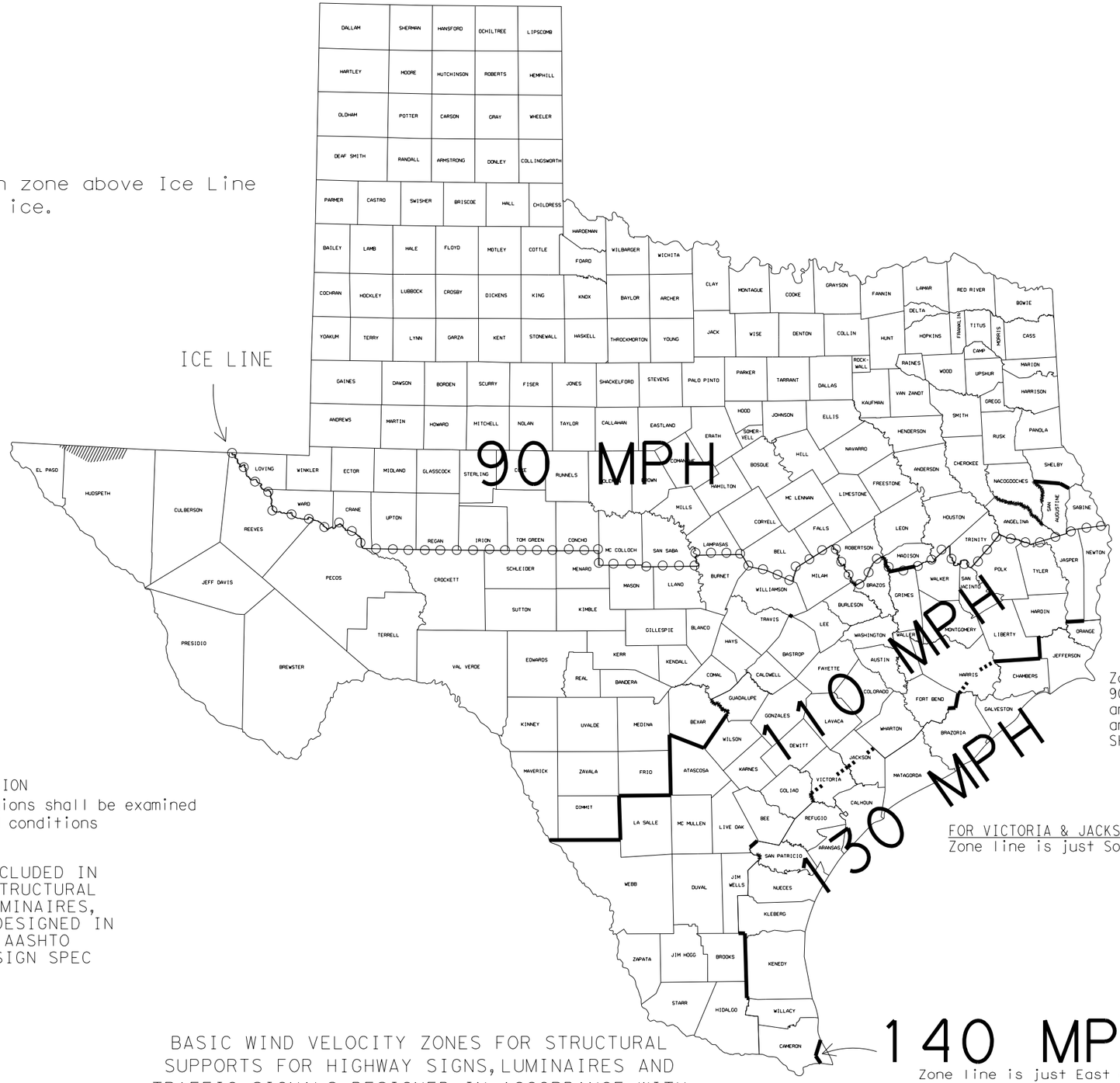
NOTE: Structures in zone above Ice Line to be designed for ice.



FOR HARRIS CO. ONLY
Zone line is just North of US 90, around on the North, West and South sides of IH 610 and down the West side of SH 288.

FOR VICTORIA & JACKSON COUNTIES ONLY
Zone line is just South of US 59.

SPECIAL WIND REGION
Special wind regions shall be examined for unusual wind conditions

THIS SHEET IS TO BE INCLUDED IN ALL P.S.&E.'s HAVING STRUCTURAL SUPPORTS FOR SIGNS, LUMINAIRES, AND/OR TRAFFIC SIGNALS DESIGNED IN ACCORDANCE WITH THE AASHTO 2001 THRU 2013 LTS DESIGN SPEC

NOTE: AASHTO 2001 THRU 2013 LTS DESIGN SPEC =AASHTO Standard Specifications for Structural Supports for Highway Signs,Luminaires and Traffic Signals, 4th thru 6th Edition

BASIC WIND VELOCITY ZONES FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS,LUMINAIRES AND TRAFFIC SIGNALS DESIGNED IN ACCORDANCE WITH THE AASHTO 2001 THRU 2013 LTS DESIGN SPEC

Values are nominal design 3-sec gust wind speeds in mph at 33 ft above ground for Exposure C category. (50-year mean recurrence interval)

140 MPH
Zone line is just East of both CO 1847 & FM 511

Texas Department of Transportation

Traffic Operations Division Standard

WIND VELOCITY AND ICE ZONES (AASHTO 2001-2013 LTS DESIGN SPEC)

WV & IZ(LTS2013)-14

FILE: lts2013.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	3469	01	014	FM 3099
	DIST	COUNTY		SHEET NO.
	BWD	STEPHENS		146

30B

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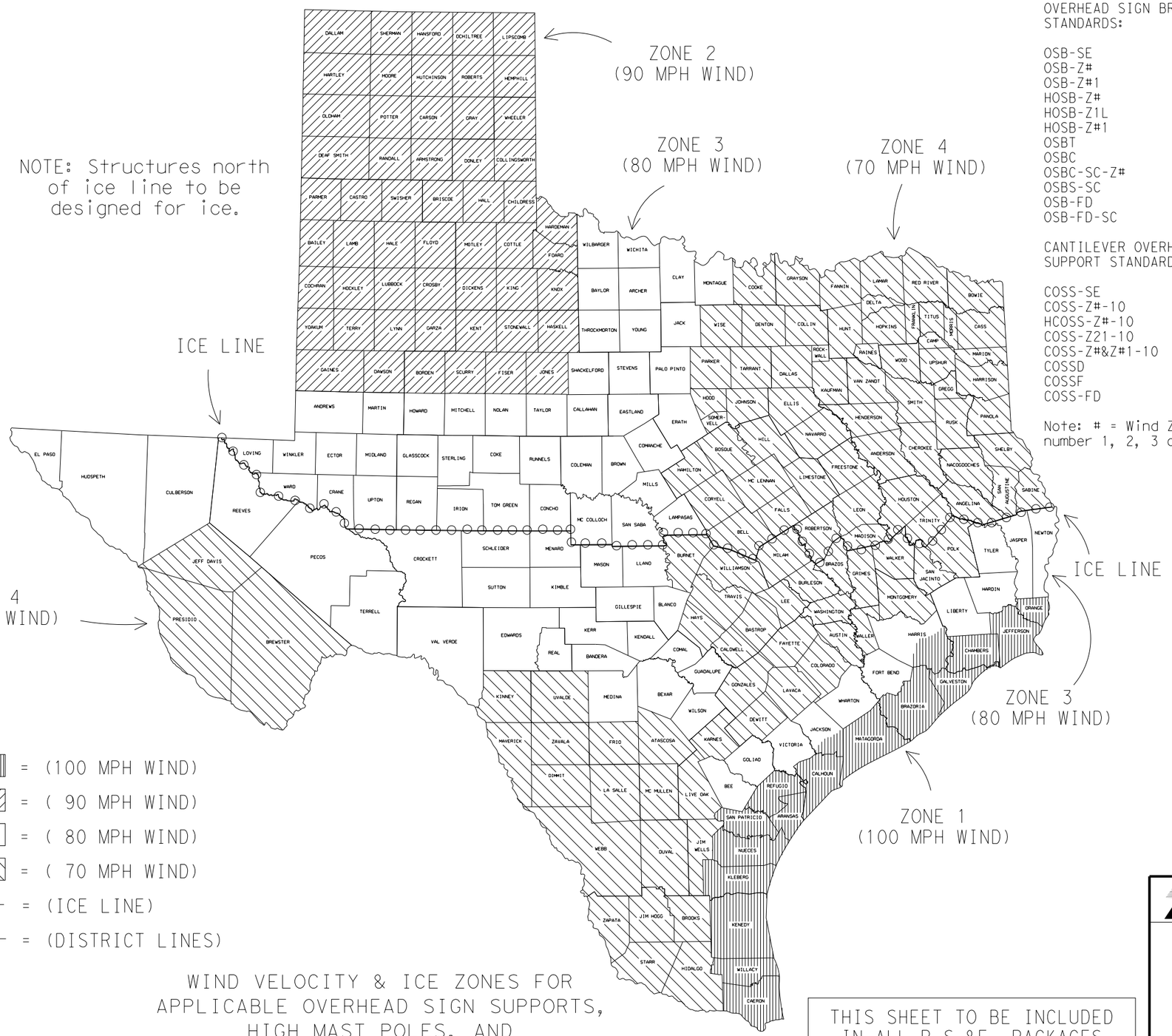

LEGEND

ZONE 1 - = (100 MPH WIND)
ZONE 2 - = (90 MPH WIND)
ZONE 3 - = (80 MPH WIND)
ZONE 4 - = (70 MPH WIND)
= (ICE LINE)
= (DISTRICT LINES)

APPLICABLE STANDARDS SHEETS

OVERHEAD SIGN BRIDGE STANDARDS:

OSB-SE
OSB-Z#
OSB-Z#1
HOSB-Z#
HOSB-Z1L
HOSB-Z#1
OSBT
OSBC
OSBC-SC-Z#
OSBS-SC
OSB-FD
OSB-FD-SC

CANTILEVER OVERHEAD SIGN SUPPORT STANDARDS:

COSS-SE
COSS-Z#-10
HCOSS-Z#-10
COSS-Z21-10
COSS-Z#&Z#1-10
COSSD
COSSF
COSS-FD

Note: # = Wind Zone number 1, 2, 3 or 4

HIGH MAST ILLUMINATION POLE STANDARDS:

HMIP-98
HMIF-98

WALKWAYS AND BRACKETS STANDARDS:

SWW
SB(SWL-1)

TRAFFIC SIGNAL POLE STANDARDS:

SP-80
SP-100
SMA-80
SMA-100
DMA-80
DMA-100
MA-C
MAC(ILSN)
MAD-D
TS-FD
LUM-A
CFA
LMA
TS-C
MA-DPD

FOR HARRIS CO. ONLY
Zone line is just North of US 90, around on the North, West and South sides of IH 610 and down the West side of SH 288.

FOR JACKSON CO. ONLY
Zone line is just North of SH 616.

WIND VELOCITY & ICE ZONES FOR APPLICABLE OVERHEAD SIGN SUPPORTS, HIGH MAST POLES, AND TRAFFIC SIGNAL POLES

Based on 50 Year Mean Recurrence Interval of Fastest Mile Wind Velocity at 33 feet height.

THIS SHEET TO BE INCLUDED IN ALL P.S.&E. PACKAGES CONTAINING ONE OR MORE OF THE APPLICABLE STANDARD SHEETS LISTED HEREON

Texas Department of Transportation

Traffic Operations Division Standard

WIND VELOCITY AND ICE ZONES

WV & IZ-14

FILE: windice.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT April 1996	CONT	SECT	JOB	HIGHWAY
REVISIONS	3469	01	014	FM 3099
8-14-Added list of applicable standards, restricting use to structures designed for Fastest Mile wind speeds.	DIST	COUNTY		SHEET NO.
	BWD	STEPHENS		147

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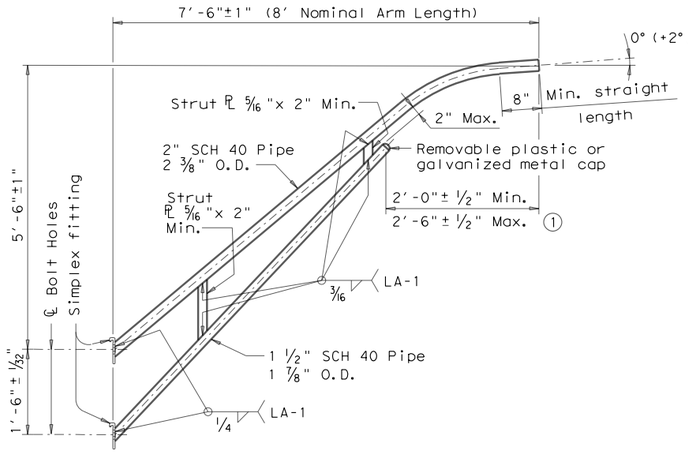
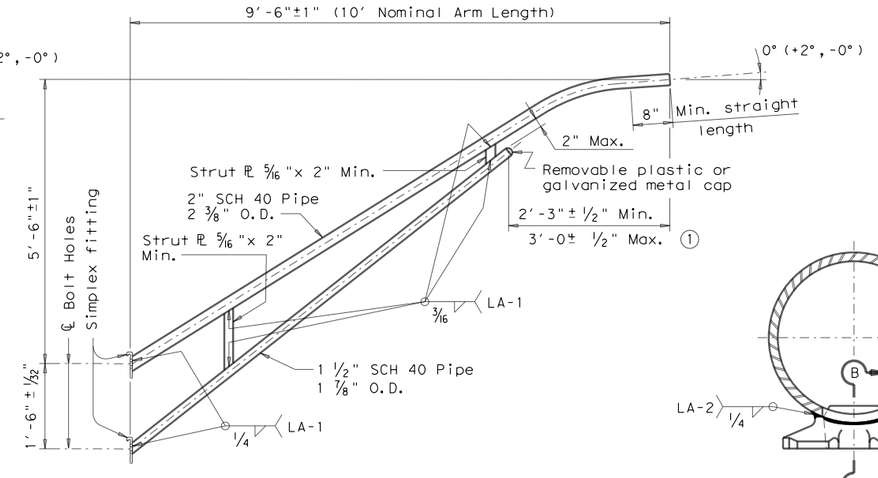


8-FOOT LUMINAIRE ARM



10-FOOT LUMINAIRE ARM

DIRECT ATTACHMENT DETAIL

MATERIALS	
Pole or Arm Simplex	ASTM A27 Gr.65-35 or A148 Gr.80-50, A576 Gr.1021 (3), or A36 (Arm only)
Arm Pipes	ASTM A53 Gr.B, A501, A1008 HSLAS-F Gr.50 (4), or A1011 HSLAS-F Gr.50 (4)
Arm Strut Plates (2)	ASTM A36, A572 Gr.50 (4), or A588
Misc.	ASTM designations as noted

(1) Dimensional limits are given to show acceptable variation in design. All of a Fabricator's production of a particular arm length shall have the same dimensions within specified tolerances.

(2) Any of the materials listed for plates may be used where the drawings do not specify a particular ASTM designation.

(3) A576 must be suitable for forging and also meet minimum tensile strength of 65 ksi, minimum yield of 35 ksi, and elongation in 2 inches of 22 percent.

(4) ASTM A572, A1008 HSLAS-F, and A1011 HSLAS-F may have higher yield strengths but shall not have less elongation than the grade indicated.

GENERAL NOTES:

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Revisions thereto. Design Wind Speed equals 90 mph plus a 1.3 gust factor. Arms are designed to support a 60 lb. luminaire having an effective projected area (actual area times drag coefficient) of 1.6 sq. ft.

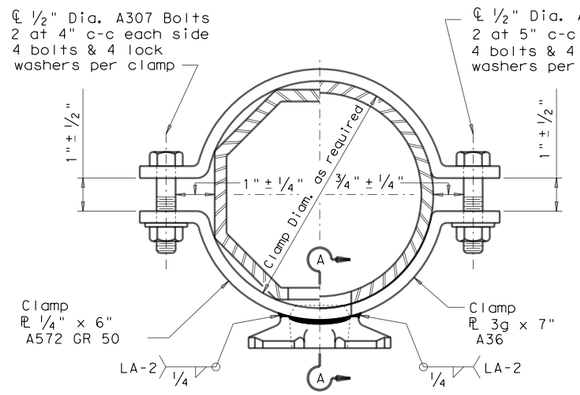
Materials and fabrication shall be in accordance with Item 686, "Traffic Signal Pole Assemblies (Steel)" and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. In the absense of specified Fabricaton tolerances, dimensions shall be within the tolerances generally obtainable in normal fabrication practice.

Unless otherwise noted, all parts shall be galvanized after fabrication in accordance with Item 445, "Galvanizing".

Deviation from the details and dimensions shown herein require submission of shop drawings in accordance with Item 441, "Steel Structures". Alternate designs are not acceptable.

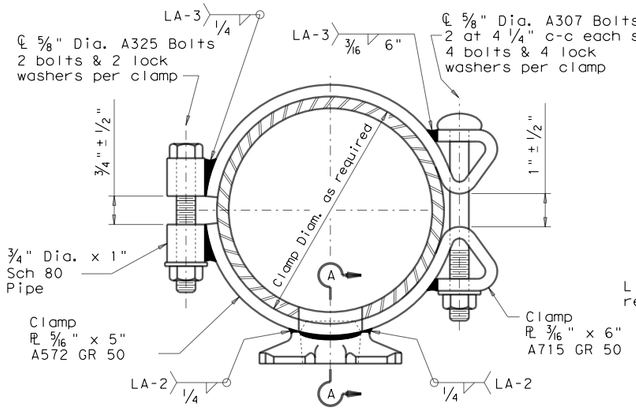
Each pole simplex fitting shall be supplied with 2 ASTM A325 bolts and 2 lock washers of the size specified. The bolts and lock washers shall be secured to the pole with the other hardware items called for in the plans. When clamp attachment is specified, the Fabricator shall ship the clamp assembly securely attached to the pole at the location shown on the plans.

If clamp assemblies are ordered without poles, the Fabricator shall ship one upper and one lower clamp assembly together in a single package, including all nuts and washers required for the clamps and simplex fittings.



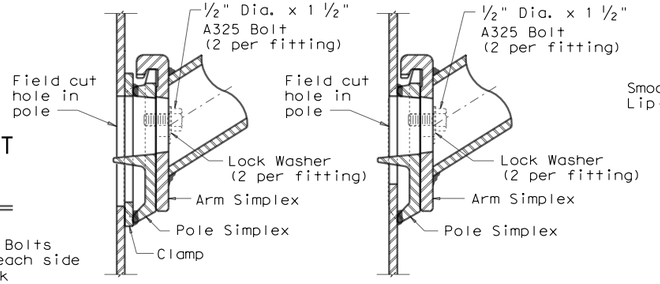
CLAMP ATTACHMENT DETAIL NO. 1 (HALF SECTION)

CLAMP ATTACHMENT DETAIL NO. 2 (HALF SECTION)



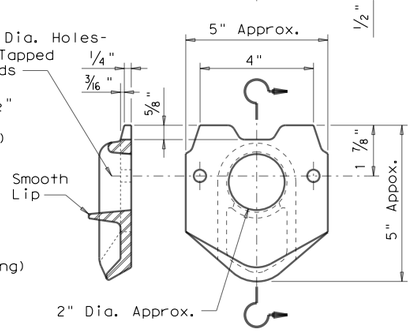
CLAMP ATTACHMENT DETAIL NO. 3 (HALF SECTION)

CLAMP ATTACHMENT DETAIL NO. 4 (HALF SECTION)

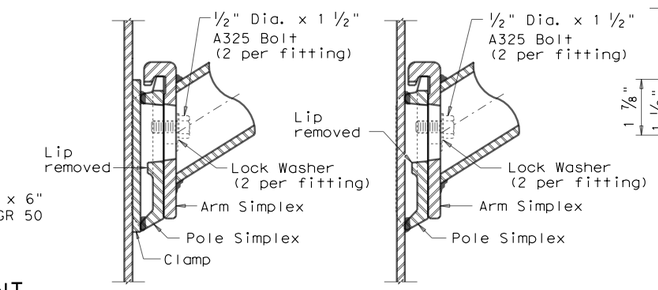


UPPER SIMPLEX FITTING

UPPER SIMPLEX FITTING



POLE SIMPLEX DETAIL

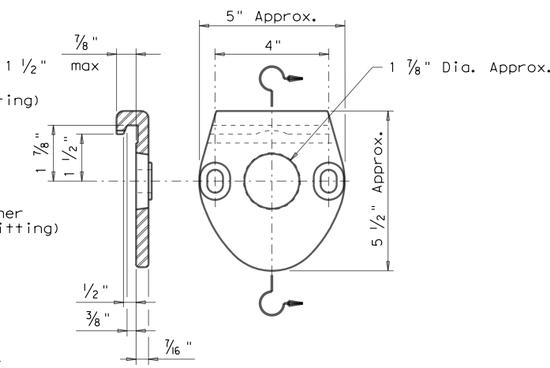


LOWER SIMPLEX FITTING

LOWER SIMPLEX FITTING

SECTON A-A

SECTON B-B



ARM SIMPLEX DETAIL

Texas Department of Transportation
Traffic Operations Division

STANDARD ASSEMBLY DRAWINGS FOR LUMINAIRE SUPPORT STRUCTURES

ARM DETAILS

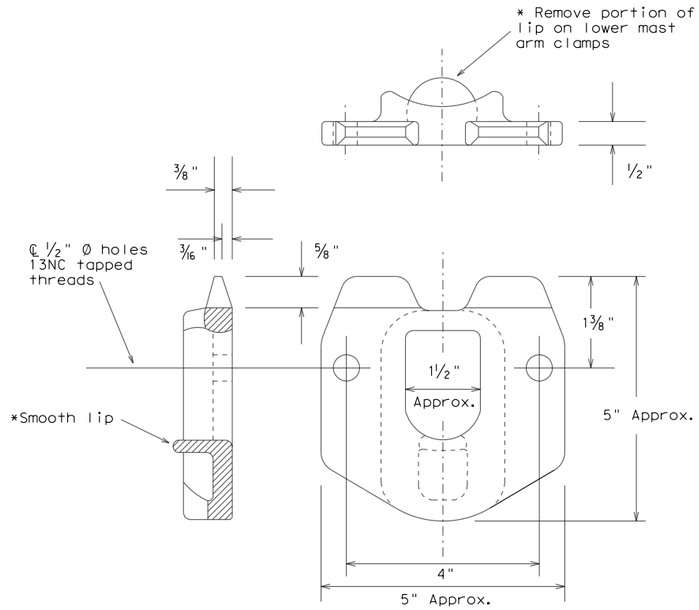
LUM-A-12

DN: LEH	CK: JSY	DW: LTT	CK: TEB

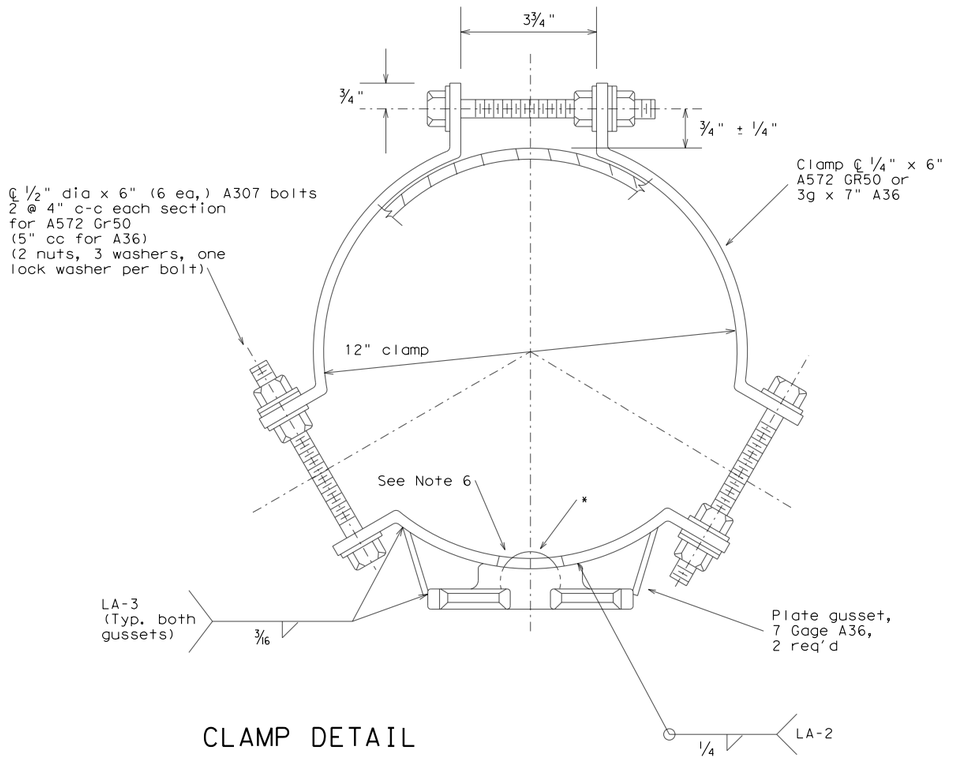
REVISIONS
5-96
1-99
1-12

CONT	SECT	JOB	HIGHWAY
3469	01	014	FM 3099

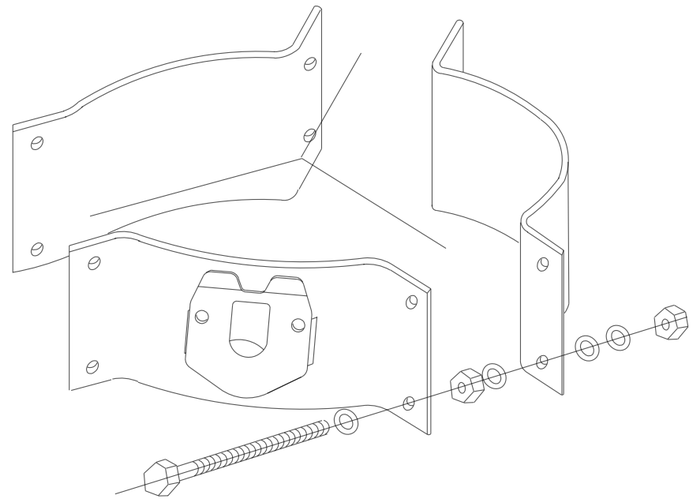
DIST	COUNTY	SHEET NO.
BWD	STEPHENS	148



POLE SIMPLEX DETAILS



CLAMP DETAIL



PROJECTION

OTHER MATERIALS:

1. Pole simplex shall be ASTM A27 GR65-35 or A148 GR80-50 or A576 GR1021. ASTM A576 must be suitable for forging and also meet minimum tensile of 65ksi, minimum yield of 35ksi, and a minimum elongation of 22 percent in 2 inches.
2. Welded tabs and backplates shall be ASTM A-36 steel or better.
3. Nylon insert locknuts shall conform to ASTM A563.

GENERAL NOTES:

1. Materials and fabrication shall be in accordance with Standard Sheet "MA-C" and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. In the absence of specified fabrication tolerances, dimensions shall be within the tolerances generally obtainable in normal fabrication practice.
2. All parts shall be galvanized after fabrication in accordance with Item 445, "Galvanizing". The throat of the Simplex shall be made free of all rough or sharp edges resulting from the galvanizing process.
3. Each simplex fitting shall be supplied with 2 ASTM A325 bolts, 1/2in. X 1 1/2in. and 2 lock washers. The bolts and lock washers shall be secured to the clamp with the other hardware items. The Fabricator shall ship clamp assembly together in a single package, including all bolts, nuts, and washers required for the clamp and simplex fitting.
4. Design conforms to 1994 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals" and interim revisions thereto. Design Wind Speed equals 80 mph plus a 1.3 gust factor. Clamps are designed to support a 60 lb. luminaire having an effective projected area (actual area times drag coefficient) of 1.6 sq.ft.,12 ft. maximum arm length.
5. Each assembly shall consist of one upper piece simplex fitting having a smooth lip and one lower piece simplex fitting with the lip removed.
6. Approximately 2 in. diameter hole in upper mast arm clamp.

For 8.9 - 12 inch diameter Signal Poles
(Two req'd for each mast arm)

Texas Department of Transportation
Traffic Operations Division

CLAMP ON FITTING ASSEMBLY FOR LUMINAIRE MAST ARM

CFA-12

DN: KAB	CK: RES	DW: FDN	CK: CAL

REVISIONS
11-99
1-12

CONT	SECT	JOB	HIGHWAY
3469	01	014	FM 3099

DIST	COUNTY	SHEET NO.
BWD	STEPHENS	149

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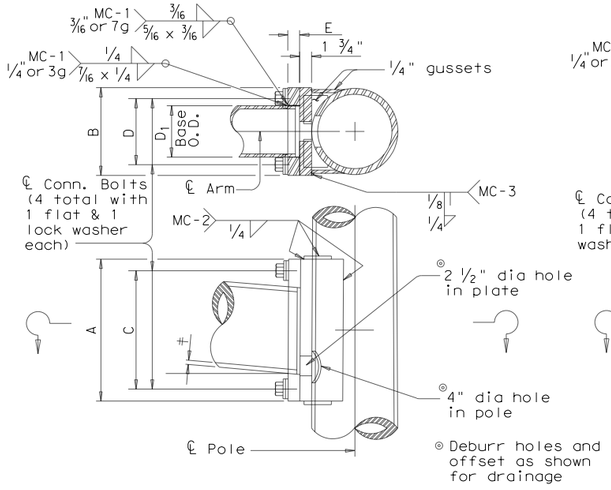
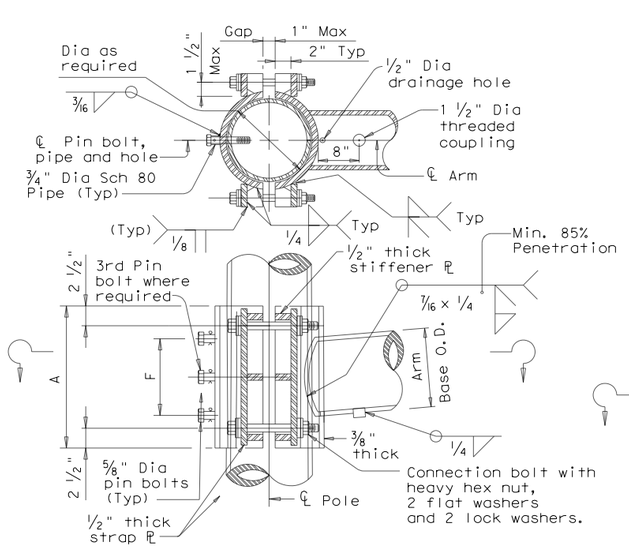
DATE: 8/27/2021
FILE: N:\7023-17-102\CADD\DGN\08_TRAFFIC\A_TRAFFIC_SIGNAL\StdDetails\mac.dgn

ARM SIZE D_1	ARM SIZE ±	A	B	C	D	E	CONN BOLT DIA
in.	in.	in.	in.	in.	in.	in.	in.
6.5	.179	12	9	9	6	1 ¾	1
7.5	.179	13	9	10	6	1 ¾	1
8.0	.179	14	10	11	7	2	1 ¼
9.0	.179	16	11	13	8	2	1 ¼
9.5	.179	17	12	14	9	2	1 ¼
9.5	.239	18	12	15	9	2	1 ¼
10.0	.239	18	12	15	9	2	1 ¼
10.5	.239	18	13	15	10	3	1 ½
11.0	.239	18	13	15	10	3	1 ½



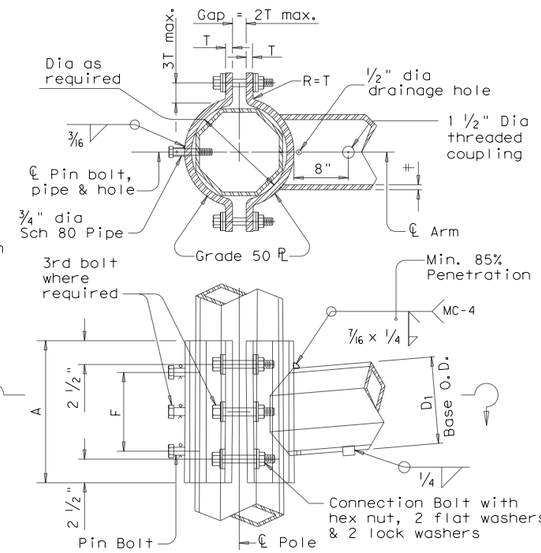
FIXED MOUNT DETAIL 1

ARM SIZE D_1	ARM SIZE ±	A	F	CONN. BOLTS No.	CONN. BOLTS Dia	PIN BOLTS No.	PIN BOLTS Dia
in.	in.	in.	in.	ea.	in.	ea.	in.
6.5	.179	12	6	4	1	2	5/8
7.5	.179	14	8	4	1	2	5/8
8.0	.179	14	8	4	1	2	5/8
9.0	.179	16	10	4	1	2	5/8
9.5	.179	18	12	4	1 1/4	3	5/8
9.5	.239	18	12	4	1 1/4	3	5/8
10.0	.239	18	12	4	1 1/4	3	5/8



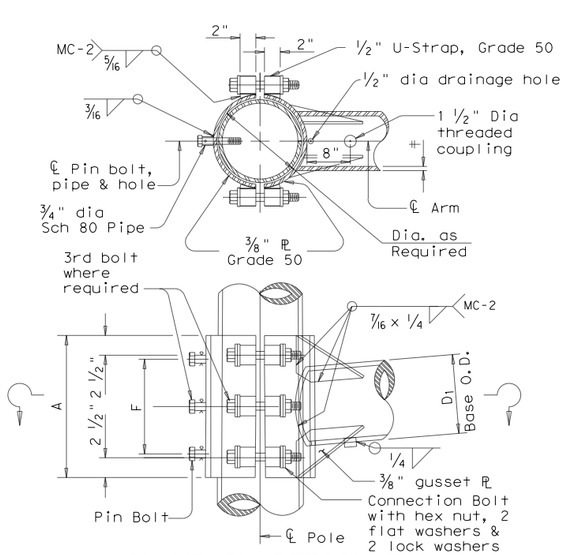
CLAMP-ON DETAIL 1

ARM SIZE D_1	ARM SIZE ±	A	F	T	CONN. BOLTS No.	CONN. BOLTS Dia	PIN BOLTS No.	PIN BOLTS Dia
in.	in.	in.	in.	in.	ea.	in.	ea.	in.
7.0	.179	12	6	3/4	4	3/4	2	5/8
7.5	.179	14	8	3/4	4	3/4	2	5/8
8.0	.179	14	8	3/4	4	3/4	2	5/8
9.0	.179	16	10	7/8	4	1	2	5/8
10.0	.179	18	10	7/8	4	1	2	5/8
9.5	.239	18	10	1	6	1	3	5/8
10.0	.239	18	10	1	6	1	3	5/8

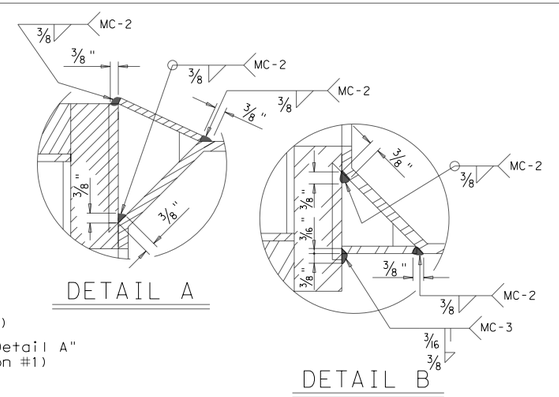


CLAMP-ON DETAIL 2

ARM SIZE D_1	ARM SIZE ±	A	F	CONN. BOLTS No.	CONN. BOLTS Dia	PIN BOLTS No.	PIN BOLTS Dia
in.	in.	in.	in.	ea.	in.	ea.	in.
6.5	.179	12	6	4	1	2	5/8
7.5	.179	14	8	4	1	2	5/8
8.0	.179	14	8	4	1	2	5/8
9.0	.179	16	10	4	1	2	5/8
9.5	.179	18	12	6	1	3	5/8
9.5	.239	18	12	6	1	3	5/8
10.0	.239	18	12	6	1	3	5/8

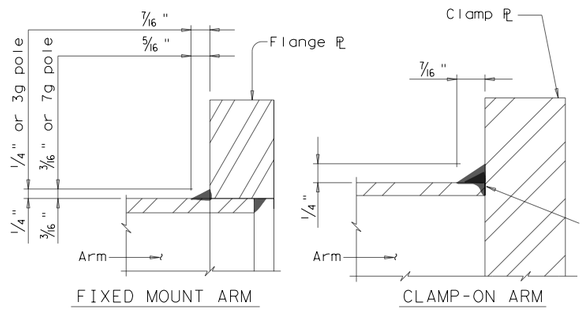


CLAMP-ON DETAIL 3



DETAIL A

DETAIL B



ARM BASE WELD DETAILS

MATERIALS	
Round Shafts or Polygonal Shafts ①	ASTM A595 Gr.A, A588, A1008 HSLAS Gr.50 Class 2, A1011 HSLAS Gr.50 Class 2, A572 Gr.50 or A1011 SS Gr.50 ②
Plates ①	ASTM A36, A588, or A572 Gr.50
Connection Bolts	ASTM A325 or A449, except where noted
Pin Bolts	ASTM A325
Pipe ①	ASTM A53 Gr.B, A501, A1008 HSLAS-F Gr.50, A1011 HSLAS-F Gr.50
Misc. Hardware	Galvanized steel or stainless steel or as noted

① ASTM A572, A1008 HSLAS, A1011 HSLAS, A1008 HSLAS-F, A1011 HSLAS-F or A1011 SS may have higher yield strengths but shall not have less elongation than the grade indicated.

② ASTM A1011 SS Gr.50 material shall also have a minimum elongation of 18 percent in 8 inches or 23 percent in 2 inches. Material thickness in excess of those stipulated under A1011 SS will be acceptable providing the material meets all other A1011 SS requirements and the requirements of this item.

GENERAL NOTES:

Clamp-on details are used for the second arm on dual mast arm assemblies. A Maximum 1 ½" wide vertical slotted hole shall be cut in the front clamp plate to facilitate drainage during galvanizing. The slot shall be centered behind the arm and shall be no longer than the arm diameter minus 1"

Fixed mount details are used for single mast arm assemblies and for the first arm on dual mast arm assemblies.

Where duplicate parts occur on a detail, welds shown for one part shall apply to all similar parts on the detail.

Pin bolts are required to prevent rotation of clamp-on arms under design wind forces.

NOTE:

Pin bolts shall be A325 with threads excluded from the shear plane. Pin bolt and ¾" dia pipe shall have 5/16" dia holes for a 1/8" dia galvanized cotter pin. Back clamp plate shall be furnished with a ¾" dia hole for each pin bolt. An 11/16" dia hole for each pin bolt shall be field drilled through the pole after arm orientations have been approved by the Engineer.

Texas Department of Transportation
Traffic Operations Division

STANDARD ASSEMBLY FOR TRAFFIC SIGNAL SUPPORT STRUCTURES

MAST ARM CONNECTIONS

MA-C-12

REVISIONS	DN: MS	CK: JSY	DW: MMF	CK: JSY
5-96	CONT	SECT	JOB	HIGHWAY
5-09	3469	01	014	FM 3099
1-12	DIST	COUNTY		SHEET NO.
	BWD	STEPHENS		150

126A

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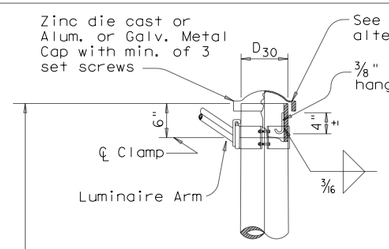
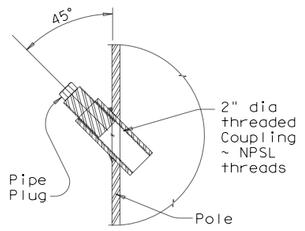
DATE: 8/27/2021
FILE: N:\7023-17-102\CADD\DGN\08_TRAFFIC\A_TRAFFIC_SIGNAL\StdDetails\mad.dgn

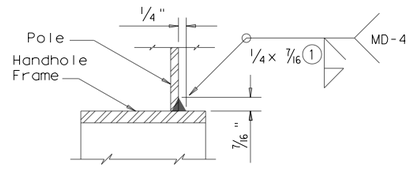


DETAIL A

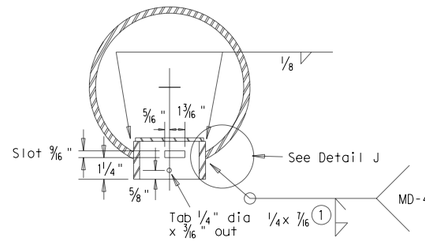
(for pole with luminaire)



POLE COUPLING DETAIL

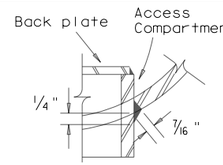


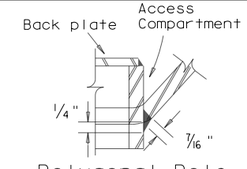
DETAIL G



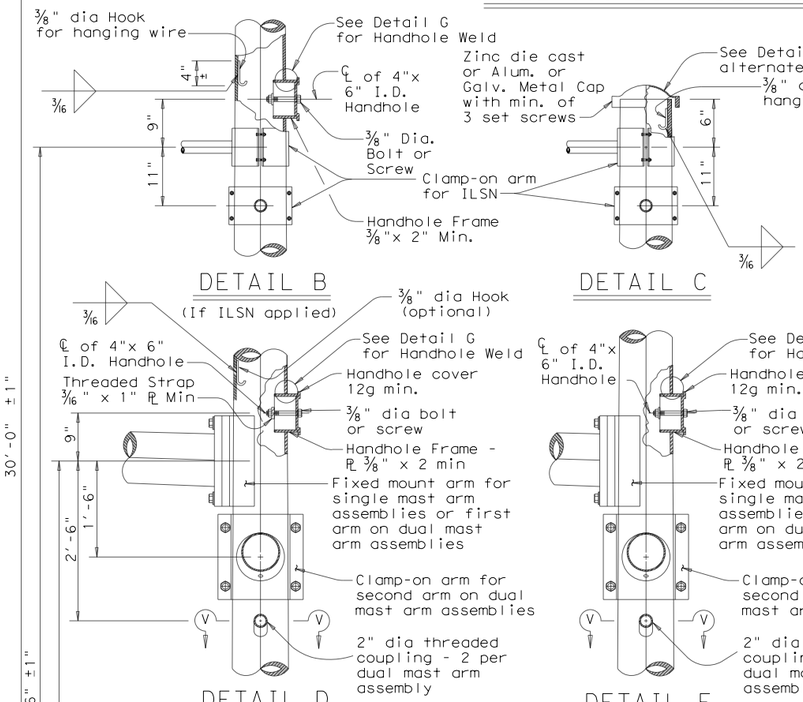
SECTION X-X

Opening for access compartment shall be no more than 1/16 inch wider than the access compartment itself.





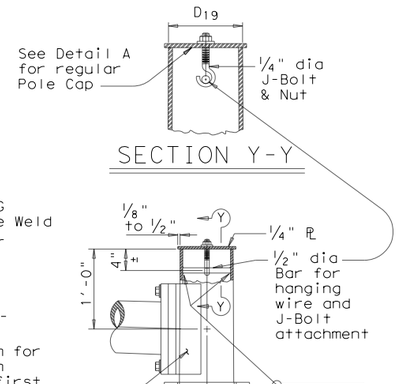
DETAIL J



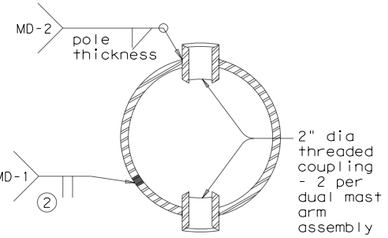
DETAIL B

(If ILSN applied)

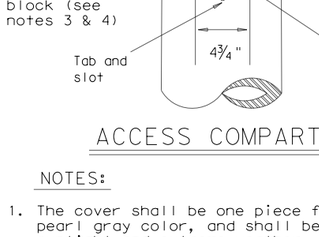
DETAIL C



SECTION Y-Y



COPPER GROUND CONNECTOR

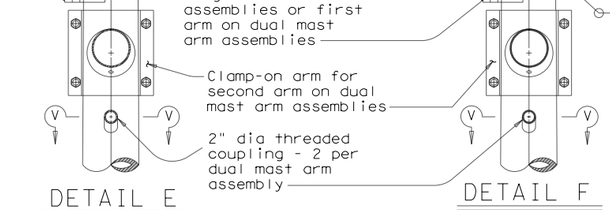


SECTION V-V

ACCESS COMPARTMENT

DETAIL D

(for 30' pole with luminaire and ILSN sign)

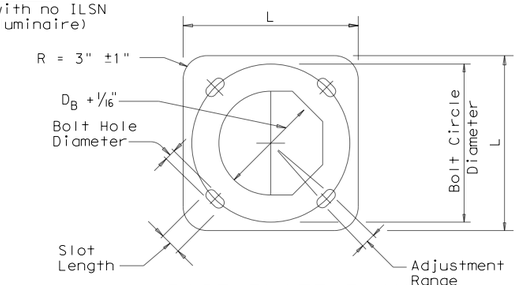


DETAIL E

(for 24' pole with ILSN sign and no luminaire)

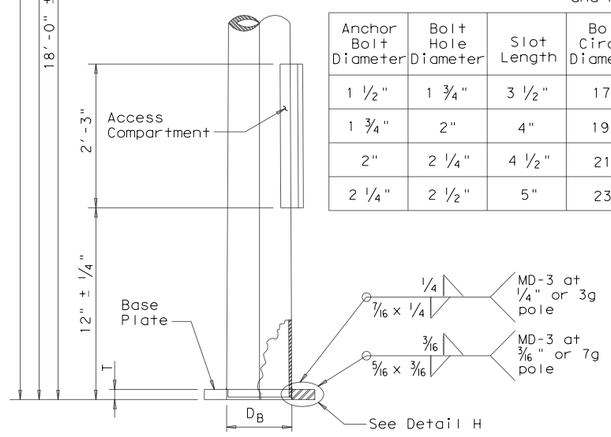
DETAIL F

(for 19' pole with no ILSN sign and no luminaire)

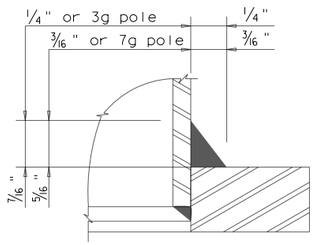


BASE PLATE PLAN

Anchor Bolt Diameter	Bolt Hole Diameter	Slot Length	Bolt Circle Diameter	Base ℞ Dim. L x T	Adjust. Range
1 1/2"	1 3/4"	3 1/2"	17"	18" x 1 1/2"	13.4°
1 3/4"	2"	4"	19"	20" x 1 3/4"	13.5°
2"	2 1/4"	4 1/2"	21"	22" x 2"	13.6°
2 1/4"	2 1/2"	5"	23"	24" x 2 1/4"	13.7°



POLE ELEVATION



DETAIL H

NOTES:

1. The cover shall be one piece formed from ABS plastic, shall be a pearl gray color, and shall be suitable for exposure to harsh sunlight and extreme weather. Cover shall latch with two screw latches and shall fit tightly to the enclosure ring to create a rainproof seal. Latch screws shall be 1/4-20 stainless flat socket head screws with tamper proof feature.
2. The pole manufacturer shall provide with each pole a separate kit consisting of: one cover with two latching assemblies, two terminal strips (Marathon #985GP12CU or approved equal), four #8-32 x 1 1/4" self tapping type "F" stainless steel pan head screws, and one ground connector (Blackburn TTC, Burndy KC22J12T13, or Ilsco SSS-5). The traffic signal contractor shall install the kit items in the field.
3. The screw hole spacing on the enclosure back plate shall be for two Marathon #985GP12 terminal strips, one Marathon #985GP06CU terminal strip, and one Bussmann #BM6032B fuse block.
4. Install one Bussmann #BM6032B, Littelfuse #L60030M-2C, or Ferraz-Shawmut #30352 fuse block for poles where luminaires are to be installed.

(1) 85% Min. penetration

(2) 60% Min. penetration 100% pemetration within 6" of circumferential base welds.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES MAST ARM POLE DETAILS

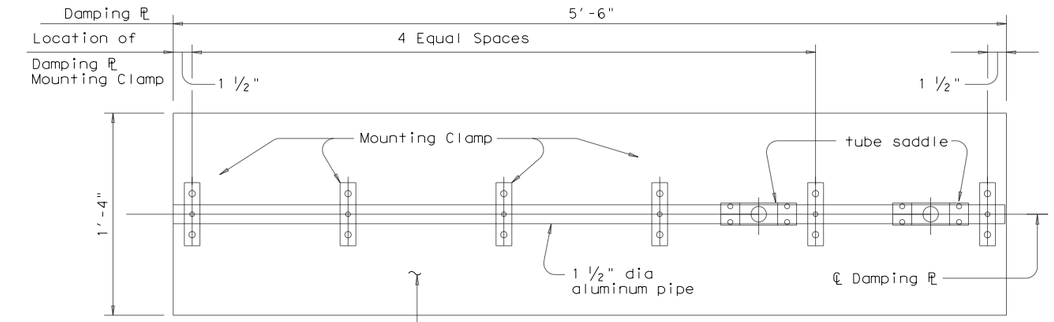
MA-D-12

DN: MS	CK: JSY	DW: FDN	CK: CAL

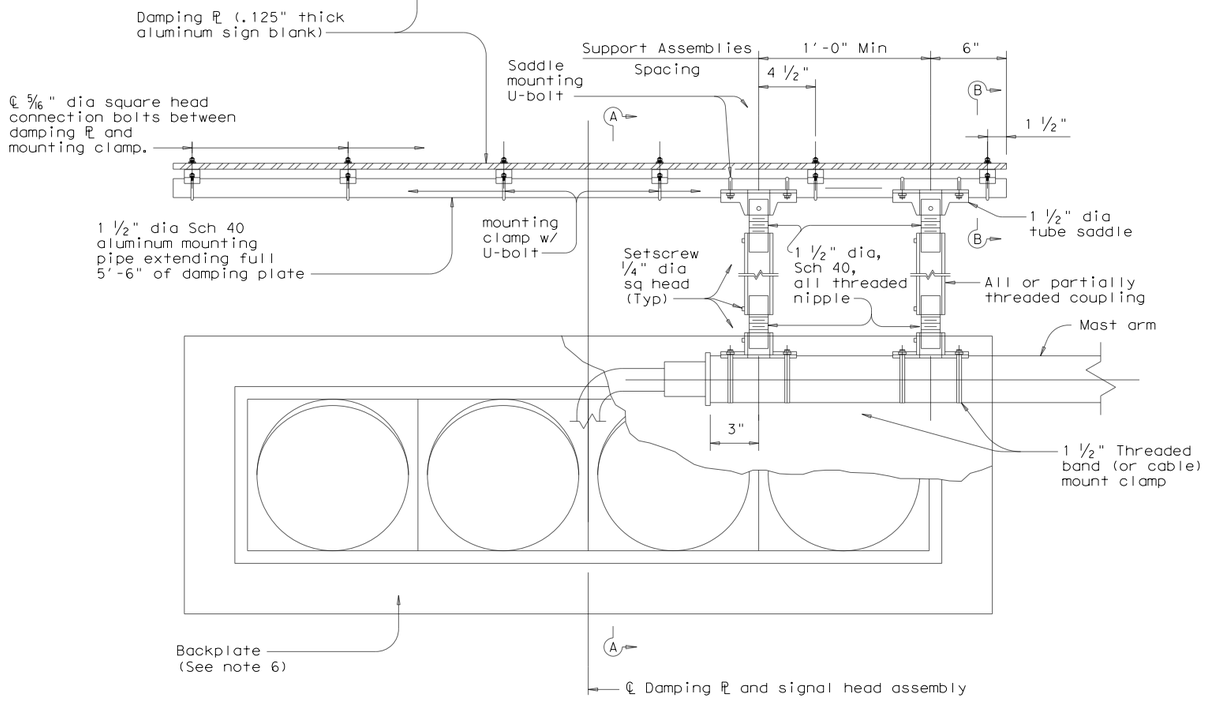
REVISIONS
8-99
1-12

CONT	SECT	JOB	HIGHWAY
3469	01	014	FM 3099
DIST	COUNTY		SHEET NO.
BWD	STEPHENS		151

DATE: **DATE TIME**
FILE: **DOCUMENT NAME**



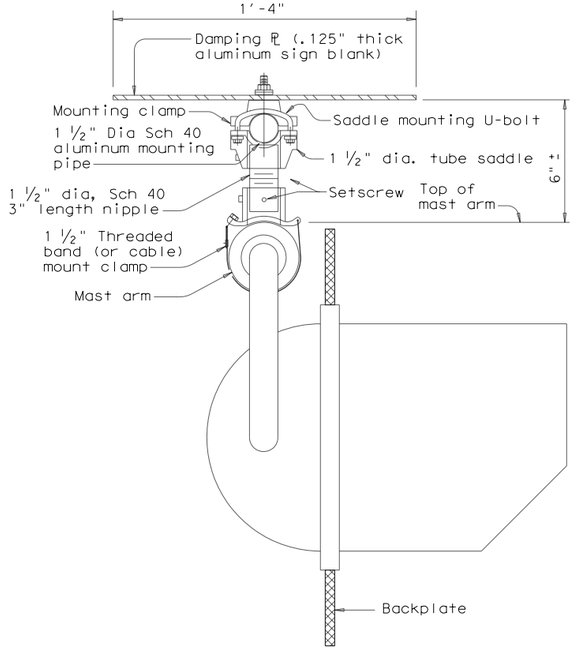
PLAN



ELEVATION

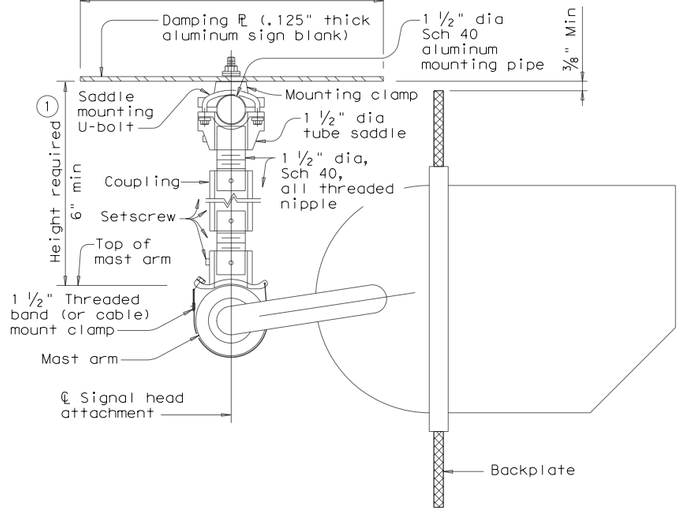
DAMPING PLATE MOUNTING DETAILS

(Showing alternate placement of signal head)



SECTION A-A

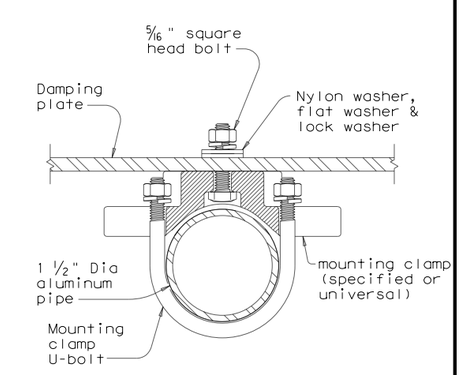
(Showing standard placement of signal head)
(Mounting clamp U-bolt is not shown for clarity)



SECTION A-A

(Showing alternate placement of signal head)
(Mounting clamp U-bolt is not shown for clarity)

① Recommended supporting assemblies to achieve required height for horizontal section heads			
Height required	One nipple each length	Two nipples each length plus	One coupling each length
6"-6 ¾"	3"	-	-
7"-8 ½"	4"	-	-
9"-10 ½"	6"	-	-
11"-15 ½"	-	4"	5"
16"-24"	-	6"	10"



SECTION B-B

(Showing damping plate attachment)

GENERAL NOTES:

1. In accordance with the findings of TxDOT sponsored research, the installation of a damping plate in accordance with the details shown here at the end of signal mast arms of SMA and DMA standard structures reduces excessive harmonic vertical vibration, and thus fatigue damage. Any deviation from these details may reduce the effectiveness of this damping device.

2. Aluminum sign blank for damping plate will conform to Departmental Material Specifications DMS-7110. Materials for mast arm mounting clamp and tube saddle will be aluminum castings or aluminum alloys as in accordance with manufacturers' stipulations. Mounting pipe, pipe nipple and coupling will be aluminum alloy 6061-T6 or 6063-T6. Damping plate mounting clamp and u-bolt assemblies will conform to Standard sheet SMD(GEN). U-bolts for saddle mounting will have a minimum yield strength of 36 ksi.

3. Damping plate will be mounted horizontally. Position centerline of damping plate to align with centerline of mast arm or horizontal signal head assembly. Vertical clearance between signal head (with or without backing plate) and bottom of damping plate will be maintained as shown. The attachments shown here are examples only, other supporting details which meet both alignment and vertical clearance requirements are also acceptable.

4. Unless stipulated by the manufacturers, all steel parts will be galvanized finish in accordance with Standard Specification Item 445, "Galvanizing".

5. Contractor will verify applicable field dimensions before the installation.

6. Backplates are optional for traffic signals. When backplates are used, Backplates will have a 2-inch fluorescent yellow AASHTO Type B_{FL} or C_{FL} retroreflective border conforming to TxDOT DMS-8300 "Sign Face Materials." See Sheet TS-BP-20 for backplate details.

Texas Department of Transportation

Traffic Safety Division Standard

MAST ARM DAMPING PLATE DETAILS

MA-DPD-20

FILE: ma-dpd-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT June 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	3469	01	014	FM 3099
4-20	DIST	COUNTY		SHEET NO.
6-20	BWD	STEPHENS		152

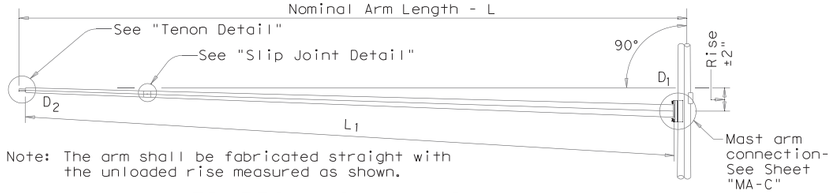
Arm Length	ROUND POLES					POLYGONAL POLES					Foundation Type
	D_B	D_{19}	D_{24}	D_{30}	① thk	D_B	D_{19}	D_{24}	D_{30}	① thk	
ft.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	
20	10.5	7.8	7.1	6.3	.179	11.5	8.5	7.7	6.8	.179	30-A
24	11.0	8.3	7.6	6.8	.179	12.0	9.0	8.2	7.3	.179	30-A
28	11.5	8.8	8.1	7.3	.179	12.5	9.5	8.7	7.8	.179	30-A
32	12.5	9.8	9.1	8.3	.179	12.0	9.0	8.2	7.3	.239	30-A
36	12.0	9.3	8.6	7.8	.239	12.5	9.5	8.7	7.8	.239	36-A
40	12.0	9.3	8.6	7.8	.239	13.5	10.5	9.7	8.8	.239	36-A
44	12.5	9.8	9.1	8.3	.239	14.0	11.0	10.2	9.3	.239	36-A
48	13.0	10.3	9.6	8.8	.239	15.0	12.0	11.2	10.3	.239	36-A

Arm Length	ROUND ARMS					POLYGONAL ARMS				
	L_1	D_1	D_2	① thk	Rise	L_1	D_1	② D_2	① thk	Rise
ft.	ft.	in.	in.	in.		ft.	in.	in.	in.	
20	19.1	6.5	3.8	.179	1′-9"	19.1	7.0	3.5	.179	1′-8"
24	23.1	7.5	4.3	.179	1′-10"	23.1	7.5	3.5	.179	1′-9"
28	27.1	8.0	4.2	.179	1′-11"	27.1	8.0	3.5	.179	1′-10"
32	31.0	9.0	4.7	.179	2′-1"	31.0	9.0	3.5	.179	2′-0"
36	35.0	9.5	4.6	.179	2′-4"	35.0	10.0	3.5	.179	2′-1"
40	39.0	9.5	4.1	.239	2′-8"	39.0	9.5	3.5	.239	2′-3"
44	43.0	10.0	4.1	.239	2′-11"	43.0	10.0	3.5	.239	2′-6"
48	47.0	10.5	4.1	.239	3′-4"	47.0	11.0	3.5	.239	2′-9"

D_B = Pole Base O.D.
D_{19} = Pole Top O.D. with no Luminaire and no ILSN
D_{24} = Pole Top O.D. with ILSN w/out Luminaire
D_{30} = Pole Top O.D. with Luminaire
D_1 = Arm Base O.D.
D_2 = Arm End O.D.
L_1 = Shaft Length
L = Nominal Arm Length

① Thickness shown are minimums, thicker materials may be used.

② D_2 may be increased by up to 1" for polygonal arms.



Note: The arm shall be fabricated straight with the unloaded rise measured as shown.

TRAFFIC SIGNAL ARM

(Fixed Mount)

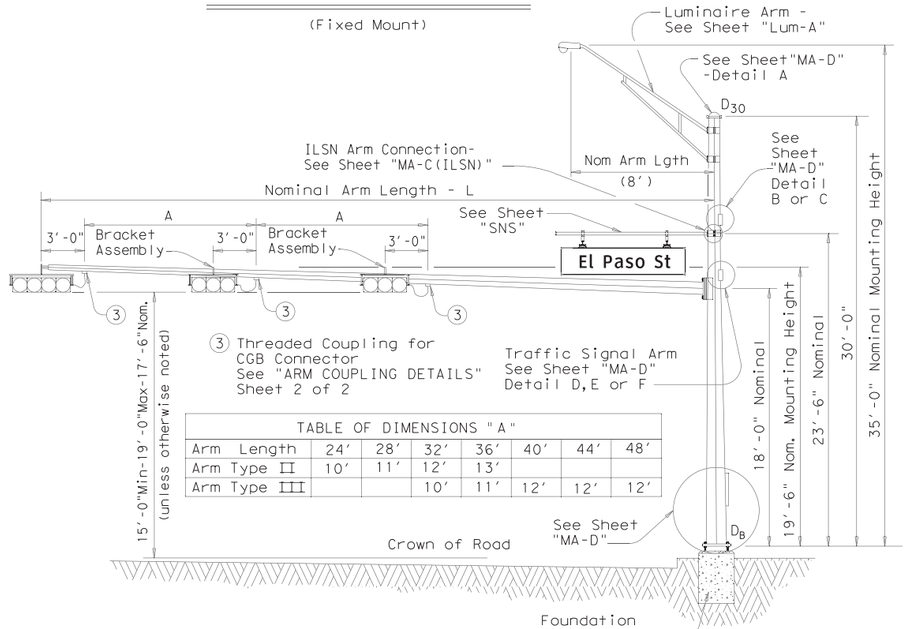


TABLE OF DIMENSIONS "A"

Arm Length	24′	28′	32′	36′	40′	44′	48′
Arm Type II	10′	11′	12′	13′			
Arm Type III			10′	11′	12′	12′	12′

STRUCTURE ASSEMBLY

SHIPPING PARTS LIST

Ship each pole with the following attached: enlarged hand hole, pole cap, fixed-arm connection bolts and washers and any additional hardware listed in the table.

Nominal Arm Length	30′ Poles With Luminaire		24′ Poles With ILSN		19′ Poles With No Luminaire and No ILSN	
	Above hardware plus: One (or two if ILSN attached) small hand hole, clamp-on simplex		Above hardware plus one small hand hole		See note above	
ft	Designation	Quantity	Designation	Quantity	Designation	Quantity
20	20L-80		20S-80		20-80	
24	24L-80		24S-80		24-80	
28	28L-80		28S-80		28-80	
32	32L-80		32S-80		32-80	
36	36L-80		36S-80		36-80	
40	40L-80	1	40S-80		40-80	
44	44L-80		44S-80		44-80	
48	48L-80		48S-80		48-80	

Traffic Signal Arms (1 per Pole) Ship each arm with the listed equipment attached

Nominal Arm Length	Type I Arm (1 Signal)		Type II Arm (2 Signals)		Type III Arm (3 Signals)	
	1 CGB connector		1 Bracket Assembly and 2 CGB Connectors		2 Bracket Assemblies and 3 CGB Connectors	
ft	Designation	Quantity	Designation	Quantity	Designation	Quantity
20	20I-80					
24	24I-80		24II-80			
28	28I-80		28II-80			
32			32II-80		32III-80	
36			36II-80		36III-80	
40					40III-80	1
44					44III-80	
48					48III-80	

Luminaire Arms (1 per 30′ pole)

Nominal Arm Length	Quantity
8′ Arm	1

ILSN Arm (Max. 2 per pole) Ship with clamps, bolts and washers

Nominal Arm Length	Quantity
7′ Arm	
9′ Arm	

Anchor Bolt Assemblies (1 per pole)

Anchor Bolt Diameter	Anchor Bolt Length	Quantity
1 ½"	3′-4"	
1 ¾"	3′-10"	1

Each anchor bolt assembly consists of the following: Top and Bottom templates, 4 anchor bolts, 8 nuts, 8 flat washers, and 4 nut anchor devices (Type 2) per Standard Drawing "TS-FD".

Templates may be removed for shipment.

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08/27/2021

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES

SINGLE MAST ARM ASSEMBLY

(80 MPH WIND ZONE)

SMA-80(1)-12

DN: MS	CK: JSY	DW: MWF	CK: JSY

REVISIONS	CONT	SECT	JOB	HIGHWAY
5-96	3469	01	014	FM 3099
11-99	DIST	COUNTY		SHEET NO.
1-12	BWD	STEPHENS		153

122A

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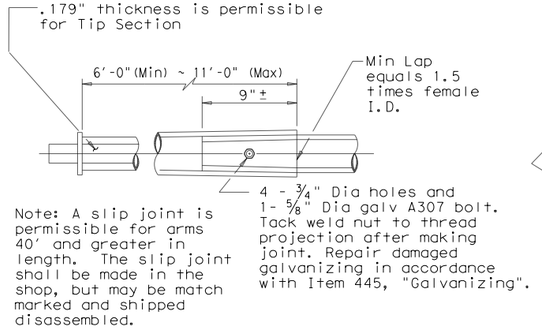
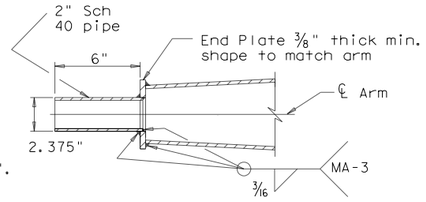


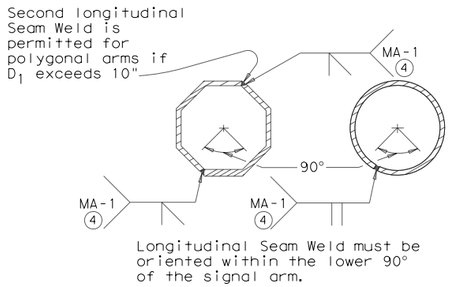
SLIP JOINT DETAIL



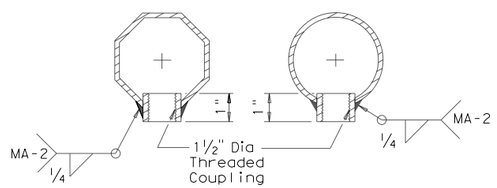
TENON DETAIL

Stainless steel bands (or Cables) and cast bracket as in "Astro-Brac", "Sky Bracket" or "Easy Bracket" with 1 ½" Dia Threaded Coupling.

BRACKET ASSEMBLY



ARM WELD DETAIL



ARM COUPLING DETAILS

(4) 60% Min. penetration 100% pemetration within 6" of circumferential base welds.

VIBRATION WARNING

Mast Arms of SMA and DMA structures and clamp-on Arms of LMA structures of approximately 40 ft or longer are subject to harmonic vertical vibrations in light wind conditions due to the aeroelastic characteristics of a few of the myriads of possible combinations of the following: signal numbers, weights and positions; existence/solidity of backplates; presence of additional attachments to the arm, such as signs and cameras; arm-wind orientation; and arm-pole stiffness.

Such vibrations may cause fatigue damage to the structure and may lead to galloping in moderate wind conditions which may further damage the structure and alarm the public. Tests have indicated that when wind is blowing toward the back side of signal heads having un-vented backplates attached the probability of unacceptable harmonic vibration and/or galloping is rather high.

If backplates are not required for improved visibility they should not be applied to the signal heads or, if they must be applied, they should be vented as a first and inexpensive measure to mitigate vibrations.

The traffic signal mast arms shall be visually inspected in 5 to 20 mph wind conditions after installation of signal heads and any attachments, including any required backpates. If vertical movements with a total excursion (maximum upward excursion to maximum downward excursion) of more than approximately 8" are observed at the arm tip, a damping plate shall be fitted to the arm. See "Damping Plate Mounting Details" on standard sheet, MA-DPD-10.

This visual inspection shall be repeated after each modification of the structure that could affect its aeroelastic response. Excessive vibrations shall not be allowed to continue for more than two days.

GENERAL NOTES:

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Specifications thereto. Design Wind Speed equals 80 mph plus a 1.3 gust factor.

Poles are designed to support one 8'-0" luminaire arm, one 9'-0" internally lighted street name sign and one traffic signal arm with a length as tabulated. The specified luminaire load applied at the end of the luminaire arm equals 60 lbs vertical dead load plus the horizontal wind load on an effective projected area of 1.6 sq ft. The specified internally lighted street name sign load applied 4.5 ft from the centerline of the pole equals 85 lbs vertical dead load plus horizontal wind load on an effective projected area of 11.5 sq ft. The specified signal load applied at the end of the traffic signal arm equals 180 lbs vertical dead load plus the horizontal wind load on an effective projected area of 32.4 sq ft (actual area times drag coefficient).

See Standard Sheet "MA-D" for pole details, "MA-C" for traffic signal arm connection details, "MA-C (ILSN)" for internally lighted street name sign arm connection details, "LUM-A" for luminaire arm and connection details, "SNS" for internally lighted street name sign details, and "TS-FD" for anchor bolt and foundation details. See "MA-C" for material specifications.

Fabrication shall be in accordance with Item 686, "Traffic Signal Pole Assemblies (Steel)" and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. Materials, fabrication tolerances, and shipping practices shall meet the requirements of this sheet and Item 686, "Traffic Signal Pole Assemblies (Steel)".

Unless otherwise noted, all parts shall be galvanized in accordance with Item 445, "Galvanizing", after fabrication.

Deviation from the details and dimensions shown herein require submission of shop drawings in accordance with Item 441, "Steel Structures". Alternate designs are not acceptable.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES

SINGLE MAST ARM ASSEMBLY

(80 MPH WIND ZONE)

SMA-80(2)-12

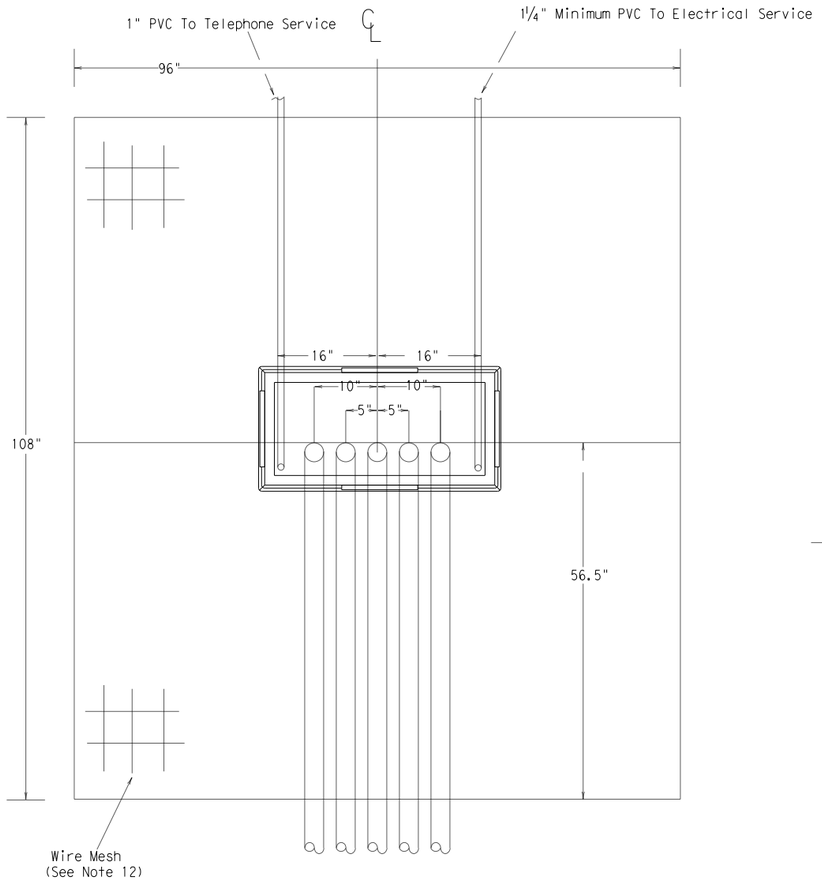
DN: MS	CK: JSY	DW: MMF	CK: JSY

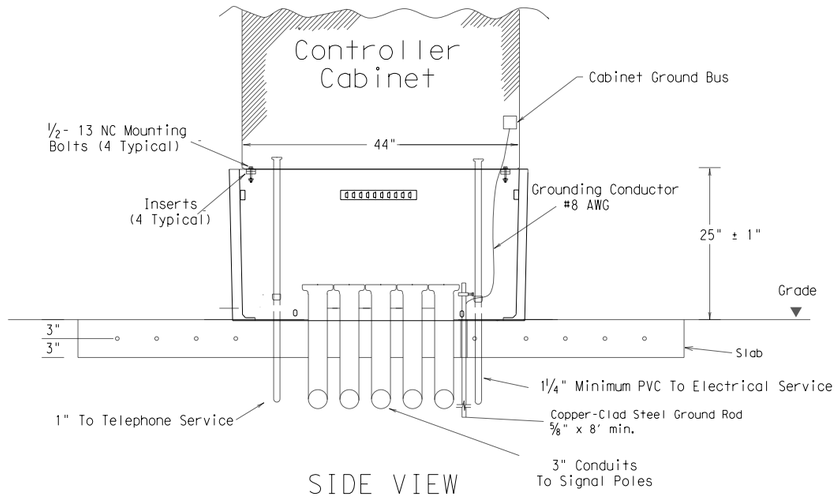
REVISIONS
5-96
1-12

CONT	SECT	JOB	HIGHWAY
3469	01	014	FM 3099
DIST	COUNTY		SHEET NO.
BWD	STEPHENS		154

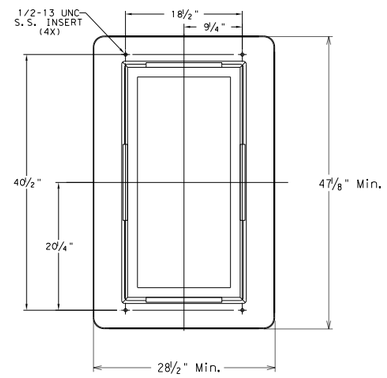
122B

TOP VIEW
(Slab & Base)





SIDE VIEW
(Slab & Base)



CABINET BASE

TRAFFIC SIGNAL CONTROLLER BASE:

1. Provide a traffic signal controller base (cabinet base) manufactured of polymer concrete material consisting of calcareous and siliceous stone; glass fibers and thermoset polyester resin. The polymer concrete cabinet base must be reinforced on the inside of the cabinet base with fiberglass matting. Provide one of the following bases: Armorcast Part # A6001848X24, Quazite Model # PG3048Z709, or other as approved by TxDOT Traffic Operation Division.
2. The polymer concrete material must have a minimum compressive strength of 10,300 pounds per square inch (psi), minimum flexural strength of 3600 psi, and minimum shear strength of 3600 psi.
3. The polymer concrete cabinet base must conform to the dimensions shown and must accommodate a standard TxDOT basemount cabinet.
4. Supply the cabinet base with four ½"-13 UNC stainless steel inserts for attachment of the cabinet to the base. Inserts must withstand a minimum torque of 50 ft-lb and a minimum straight pull out strength of 750 lbs.
5. Provide the cabinet base with 4 cable racks mounted one on each side of the base 2" to 7 " from the top edge of the base. Unless approved otherwise, cable racks must be 1-1/2 x ⅝ x ⅜ inch steel channel with eight T-slots spaced at 1-1/2 inches. The cable racks must easily accommodate the insertion of tie wraps to attach field wiring to the racks to serve as strain relief. Secure cable racks to the base using ½"-13 UNC stainless steel screws and inserts.
6. The cabinet base, when secured to the concrete slab with controller cabinet attached, must withstand a minimum wind load of 125 mph or a 850 lb force applied at 49" above the bottom of the base without causing the base or cabinet to come out of their anchored position or cause any permanent deformation. The manufacturer must supply certification by an independent testing laboratory or sealed by a Texas Licensed Professional Engineer. Provide the cabinet base with hardware for attachment to a concrete slab.
7. The traffic signal base must be permanently marked either by impress or by permanent ink with the manufacturer's model number and name or logo.
8. Seal the base to the concrete with a silicone caulk bead and fastened to the slab per manufacturer's instructions.

CONCRETE SLAB:

9. Traffic signal controller pad must be a portland cement concrete slab poured in place, must conform to the dimensions shown, and must be level.
10. Bond a #8 AWG copper ground wire and an 8 ft ground rod bonded to the reinforcing mesh by a suitable UL Listed clamp and terminated to the cabinet grounding bus for the purpose of providing a local ground for the electrical grounding conductor. The electrical grounding conductor specified in Item 680-3.A.4 is required and must be terminated to the cabinet ground bus.
11. Install a PVC sleeve to prevent the ground rod from direct embedment in the slab.
12. Provide welded wire mesh 6X6-W2.9 X W2.9 for reinforcement. Provide joints and splices in the mesh with a minimum 6-inch overlap. Center the mesh between top and bottom and provide a minimum 3 inch cover on the edges.
13. Provide Class B concrete minimum for the slab in accordance with Item 421. Construct the slab in accordance with Item 531.

CONDUITS:

14. Stub up and run 3-inch conduits through the slab to the various traffic signal poles and ground boxes as shown on the layouts. Install the number of conduits as shown on layouts plus two additional 3 inch conduits for future use. Terminate the conduits with a bushing between 2 and 4-inches above the slab.
15. Extend conduits for future use at least 18-inches from the edge of the slab, terminate underground with a coupling, and cap and seal so that the seal can be removed without damaging the coupling. This must also apply to unused telephone conduit.
16. Stub up two separate conduits through the slab from the electrical and telephone services. Run the conduit for the electrical feed directly to the electrical service enclosure. Run the conduit for the telephone line directly to the telephone service, usually located on the same pole as the electrical service. Telephone must not under any circumstance share a conduit with any other function.
17. Terminate electric and telephone conduits above the slab with a coupling. After the base is installed, extend the conduits above the top of the base and secure to the base using a steel one-hole strap or similar suitable substitute.

CONTROLLER CABINET:

18. Anchor the controller cabinet to the base using four stainless steel 1/2-13 NC bolts.
19. The silicone caulk bead specified in Item 680.3.B must be RTV 133.

PAYMENT:

20. Bid TS-CF as subsidiary to Item 680.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL CONTROLLER CABINET BASE AND PAD

TS-CF-04

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

CONT	SECT	JOB	HIGHWAY
3469	01	014	FM 3099

DIST	COUNTY	SHEET NO.
BWD	STEPHENS	155

12-04 REVISIONS

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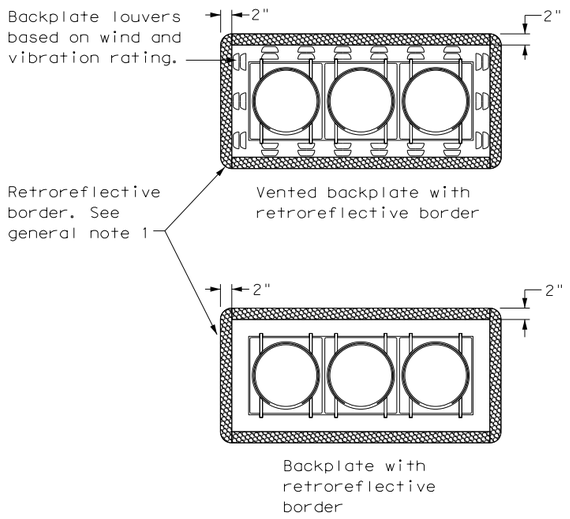
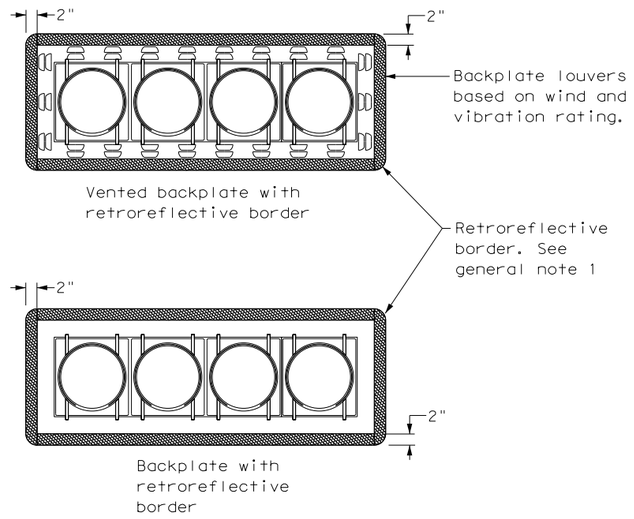
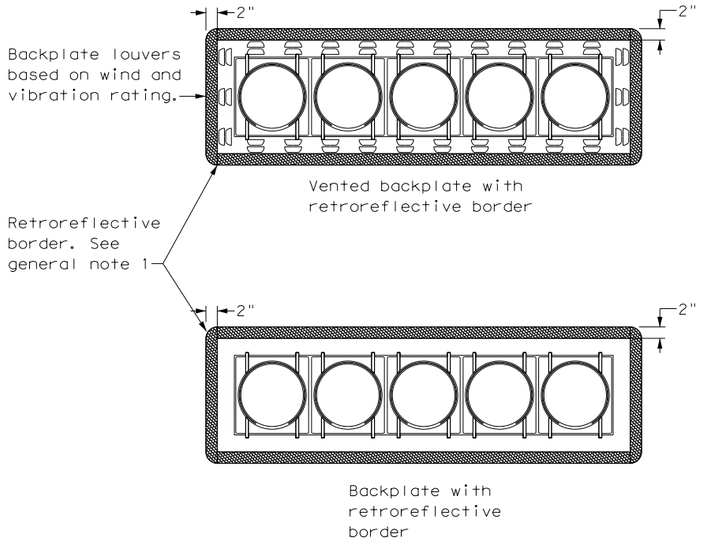


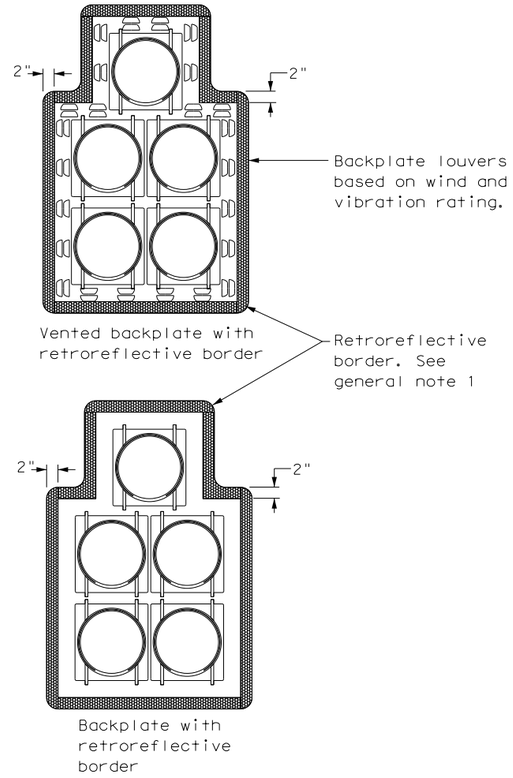
THREE-SECTION HEAD
HORIZONTAL OR VERTICAL



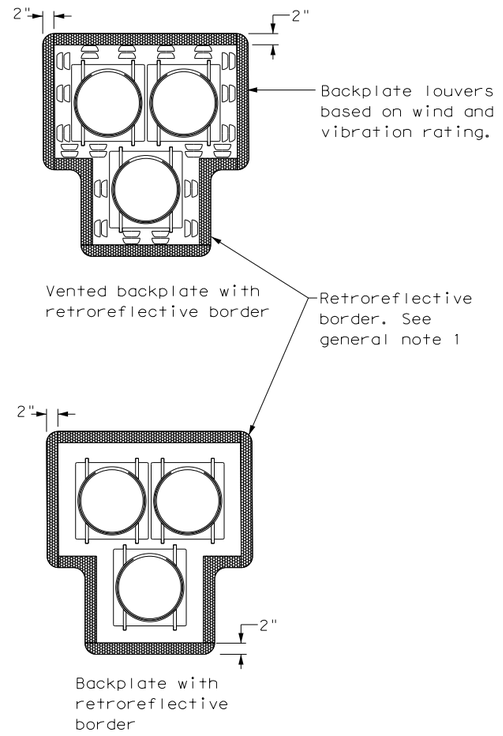
FOUR-SECTION HEAD
HORIZONTAL OR VERTICAL



FIVE-SECTION HEAD
HORIZONTAL OR VERTICAL



FIVE-SECTION HEAD
CLUSTER



PEDESTRIAN HYBRID
BEACON

GENERAL NOTES:

1. Backplates are optional for traffic signals and pedestrian hybrid beacons. When backplates are used, a 2-inch wide fluorescent yellow AASHTO Type B_{FL} or C_{FL} retroreflective border conforming to TxDOT DMS-8300 is required. Place on all approaches when used.
2. Signal head and backplate compatability must be verified by the contractor prior to installation.
3. When using backplates on signal heads, venting is preferred to reduce cyclic vibration stress.
4. When a vented backplate is used, the retroreflective border must not be placed over the louvers.
5. This standard sheet applies to all signal heads with backplates, including but not limited to:
   - Pole mounted
   - Overhead mounted
   - Span wire mounted
   - Mast arm mounted
   - Vertical signal heads
   - Horizontal signal heads
   - Clustered signal heads
   - Pedestrian hybrid beacons

Texas Department of Transportation

Traffic Safety Division Standard

TRAFFIC SIGNAL HEAD WITH BACKPLATE

TS-BP-20

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©TxDOT June 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	3469	01	014	FM 3099
	DIST	COUNTY		SHEET NO.
	BWD	STEPHENS		156

DATE: 8/27/2021
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FOUNDATION DESIGN TABLE

FDN TYPE	DRILLED SHAFT DIA	REINFORCING STEEL		EMBEDDED DRILLED SHAFT LENGTH-ft (4), (5), (6)			ANCHOR BOLT DESIGN (1)				FOUNDATION DESIGN LOAD (2)		TYPICAL APPLICATION
		VERT BARS	SPIRAL & PITCH	TEXAS CONE PENETROMETER N blows/ft			ANCHOR BOLT DIA	Fy (ksi)	BOLT CIR DIA	ANCHOR TYPE	MOMENT K-ft	SHEAR Kips	
				10	15	40							
24-A	24"	4- #5	#2 at 12"	5.7	5.3	4.5	¾"	36	12 ¾"	1	10	1	Pedestal pole, pedestal mounted controller.
30-A	30"	8- #9	#3 at 6"	11.3	10.3	8.0	1 ½"	55	17"	2	87	3	Mast arm assembly. (see Selection Table)
36-A	36"	10- #9	#3 at 6"	13.2	12.0	9.4	1 ¾"	55	19"	2	131	5	Mast arm assembly. (see Selection Table) 30' strain pole with or without luminaire.
36-B	36"	12- #9	#3 at 6"	15.2	13.6	10.4	2"	55	21"	2	190	7	Mast arm assembly. (see Selection Table) Strain pole taller than 30' & strain pole with mast arm
42-A	42"	14- #9	#3 at 6"	17.4	15.6	11.9	2 ¼"	55	23"	2	271	9	Mast arm assembly. (see Selection Table)

NOTES:

(1) Anchor bolt design develops the foundation capacity given under Foundation Design Loads.

(2) Foundation Design Loads are the allowable moments and shears at the base of the structure.

(3) Foundations may be listed separately or grouped according to similarity of location and type. Quantities are for the Contractor's information only.

(4) Field Penetrometer readings at a depth of approximately 3 to 5 feet may be used to adjust shaft lengths.

(5) If rock is encountered, the Drilled Shaft shall extend a minimum of two diameters into solid rock.

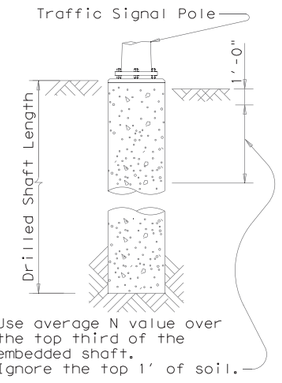
(6) Decimal lengths in Design Table are to allow interpolation for other penetrometer values. Round to nearest foot for entry into Summary Table.

FOUNDATION SUMMARY TABLE (3)

LOCATION IDENTIFICATION	AVG. N BLOW /ft.	FDN TYPE	NO. EA	DRILLED SHAFT LENGTH (6) (FEET)				
				24-A	30-A	36-A	36-B	42-A
POLE 4	10	36-A	1			14		
POLE 6	10	24-A	1	6				
POLE 7	10	24-A	1	6				
POLE 8	10	24-A	1	6				
TOTAL DRILLED SHAFT LENGTHS				18		14		

FOUNDATION SELECTION TABLE FOR STANDARD MAST ARM PLUS ILSN SUPPORT ASSEMBLIES (ft)

		FDN 30-A	FDN 36-A	FDN 36-B	FDN 42-A
80 MPH DESIGN WIND SPEED	MAX SINGLE ARM LENGTH	32'	48'		
	MAXIMUM DOUBLE ARM LENGTH COMBINATIONS	24' X 24'			
		28' X 28'			
		32' X 28'	32' X 32'		
			36' X 36'		
			40' X 36'		
			44' X 28'	44' X 36'	
100 MPH DESIGN WIND SPEED	MAX SINGLE ARM LENGTH		36'	44'	
	MAXIMUM DOUBLE ARM LENGTH COMBINATIONS		24' X 24'		
			28' X 28'		
			32' X 24'	32' X 32'	
				36' X 36'	
				40' x24'	40' X 36'
					44' x 36'

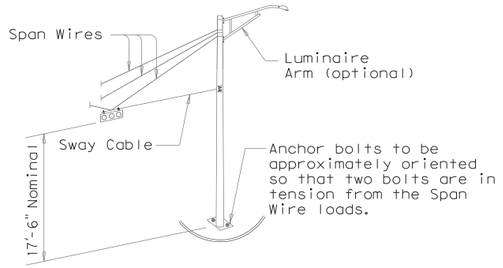


ANCHOR BOLT & TEMPLATE SIZES

BOLT DIA IN.	(7) BOLT LENGTH	TOP THREAD	BOTTOM THREAD	BOLT CIRCLE	R2	R1
¾"	1'-6"	3"	—	12 ¾"	7 ⅛"	5 ⅝"
1 ½"	3'-4"	6"	4"	17"	10"	7"
1 ¾"	3'-10"	7"	4 ½"	19"	11 ¼"	7 ¾"
2"	4'-3"	8"	5"	21"	12 ½"	8 ½"
2 ¼"	4'-9"	9"	5 ½"	23"	13 ¾"	9 ¼"

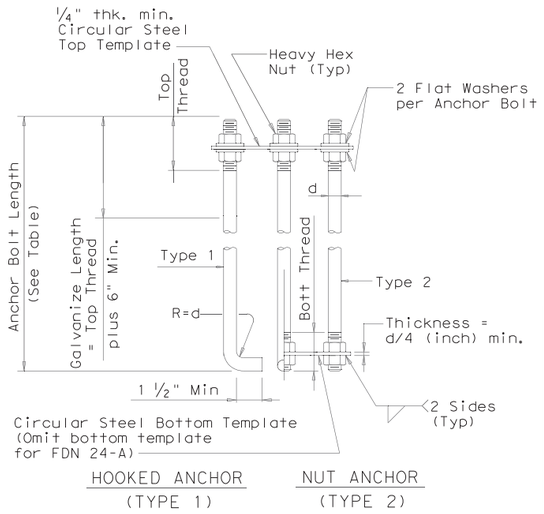
(7) Min dimensions given, longer bolts are acceptable.

EXAMPLE:
1. For 80mph design wind speed, foundation 30-A can support up to a 32' arm with another arm up to 28'
2. For 100mph design wind speed, foundation 36-A can support a single 36' mast arm.



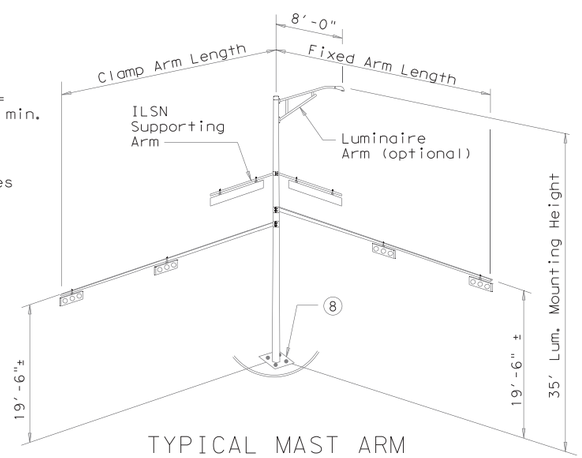
TYPICAL STRAIN POLE ASSEMBLY

TOP VIEW



HOOKED ANCHOR (TYPE 1) NUT ANCHOR (TYPE 2)

ANCHOR BOLT ASSEMBLY



TYPICAL MAST ARM ASSEMBLY

(8) Orient anchor bolts orthogonal with the fixed arm direction to ensure that two bolts are in tension under dead load.

ELEVATION

FOUNDATION DETAILS

GENERAL NOTES:

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals and interim revisions thereto.

Reinforcing steel shall conform to Item 440, "Reinforcing Steel".

Concrete shall be Class "C".

Threads for anchor bolts and nuts shall be rolled or cut threads of 8UN series up to 2" in diameter or UNC series for all sizes. Bolts and nuts shall have Class 2A and 2B fit tolerances. Galvanized nuts shall be tapped after galvanizing.

Anchor bolts that are larger than 1" in diameter shall conform to "alloy steel" or "medium-strength mild steel" per Item 449, "Anchor Bolts". Anchor bolts that are 1" in diameter or less shall conform to ASTM A36. Galvanize a minimum of the top end thread length plus 6" for all anchor bolts unless otherwise noted. Exposed washers and exposed nuts shall be galvanized. All galvanizing shall be in accordance with Item 445, "Galvanizing".

Templates and embedded nuts need not be galvanized. Lubricate and tighten anchor bolts when erecting the structure in accordance with Item 449, "Anchor Bolts".

STATE OF TEXAS
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08/27/2021

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL POLE FOUNDATION

TS-FD-12

DN: MS	CK: JSY	DW: MAO/MMF	CK: JSY/TEB

REVISIONS: 5-96, 11-99, 1-12

CONT	SECT	JOB	HIGHWAY
3469	01	014	FM 3099

DIST	COUNTY	SHEET NO.
BWD	STEPHENS	157

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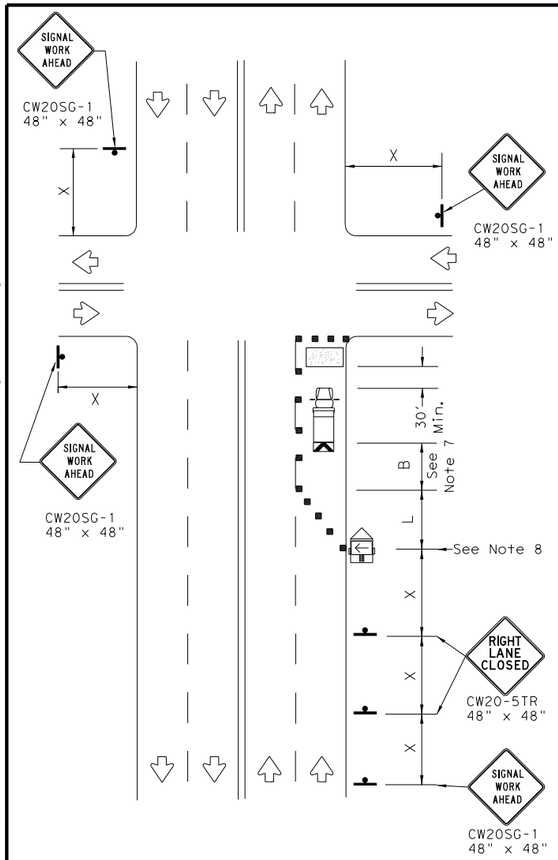
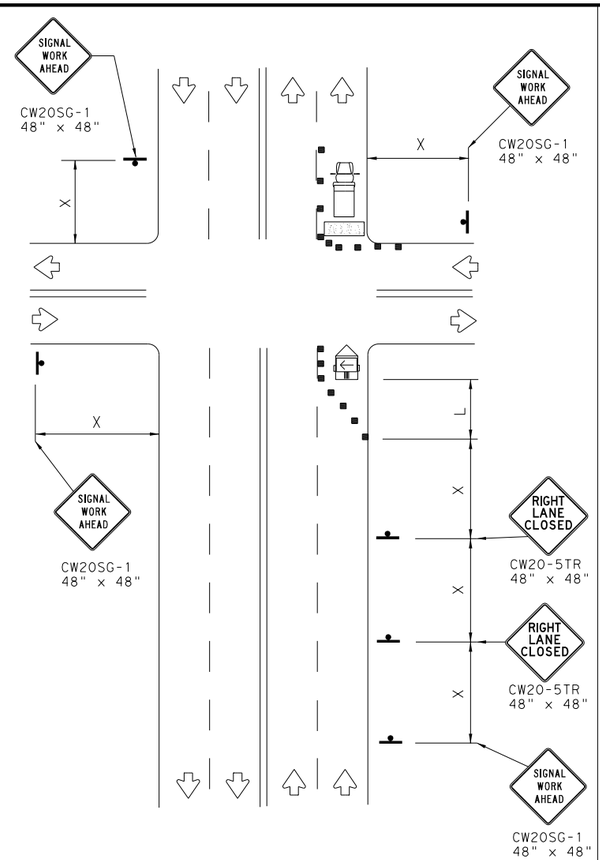


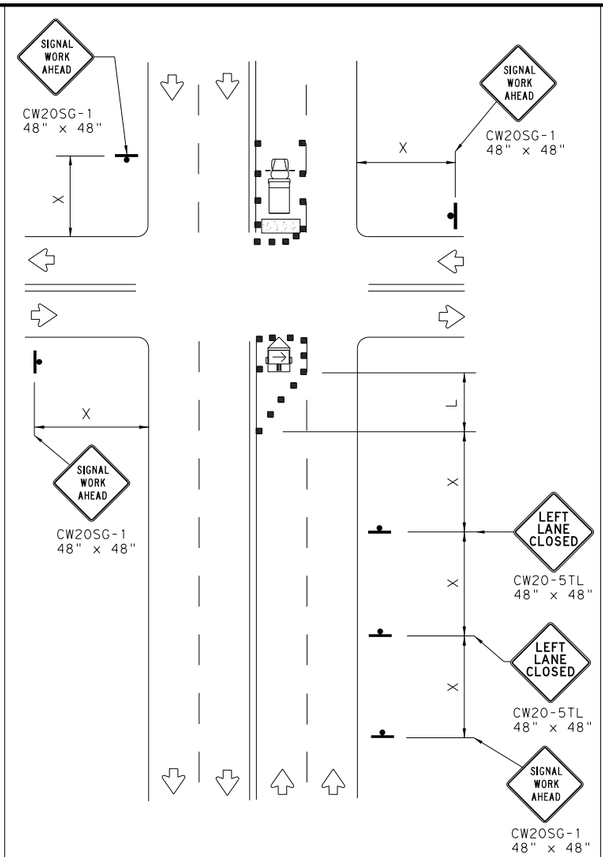
NEAR SIDE LANE CLOSURE

SHORT DURATION OR SHORT TERM STATIONARY



FAR SIDE RIGHT LANE CLOSURE

SHORT DURATION OR SHORT TERM STATIONARY



FAR SIDE LEFT LANE CLOSURE

SHORT DURATION OR SHORT TERM STATIONARY

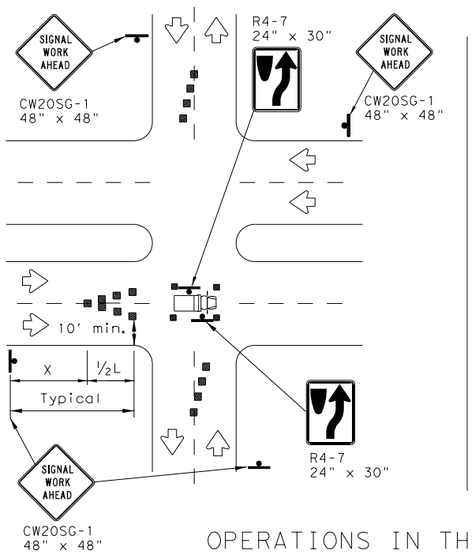
LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board	M	Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

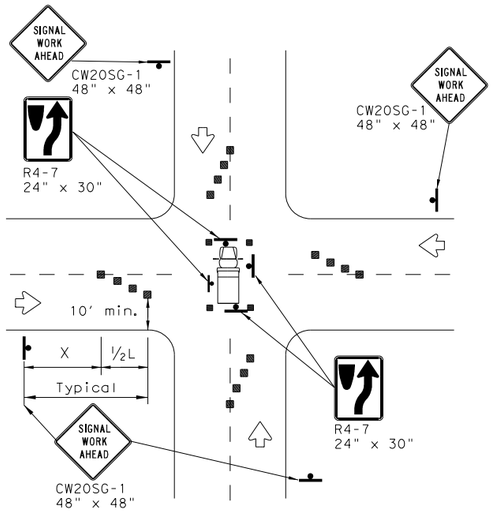
Posted Speed *	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices On a Taper	On a Tangent	Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'
35		205'	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)

WORKERS IN BUCKET TRUCKS SHALL NOT WORK ABOVE OPEN LANES OF TRAFFIC.





OPERATIONS IN THE INTERSECTION

SHORT DURATION

GENERAL NOTES

1. The minimum size channelizing device is the 28" cone. 42" Two-piece cones, drums, vertical panels or barricades will be required when the device must be left unattended at night.
2. Obstructions or hazards at the work area shall be clearly marked and delineated at all times.
3. Flaggers and Flagger Symbol (CW20-7) signs may be required according to field conditions.
4. Vehicles parked in roadway shall be equipped with at least two high intensity rotating, flashing, oscillating or strobe type lights.
5. High level warning devices (flag trees) may be used at corners of the vehicle.
6. When work operations are performed on existing signals, the signals may be placed in flashing red mode when approved by the engineer. If existing signals do not have power, All-Way Stop (R1-1 and R1-3P) signs may be implemented when approved by the engineer.
7. For Short-Term Stationary work the buffer space "B" from the above table should be used if field conditions permit. For Short Duration (less than 1 hour) any buffer space provided will enhance the safety of the setup.
8. The arrow board at this location may be omitted for Short Duration work if the work vehicle has an arrow board in operation. As an option, the arrow board may be placed at the end of the taper in the closed lane if space is not available at the beginning of the taper.
9. Signs and devices for the NEAR SIDE LANE CLOSURE may be altered for a left lane closure by using a LEFT LANE CLOSED (CW20-5TL) and adding channelizing devices on the centerline to protect the work space from opposing traffic.

SHEET 1 OF 2

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC SIGNAL WORK TYPICAL DETAILS

WZ(BTS-1)-13

FILE: wzbts-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS	3469	01	014	FM 3099
2-98 10-99 7-13	DIST	COUNTY		SHEET NO.
4-98 3-03	BWD	STEPHENS		158

DATE: 8/27/2021
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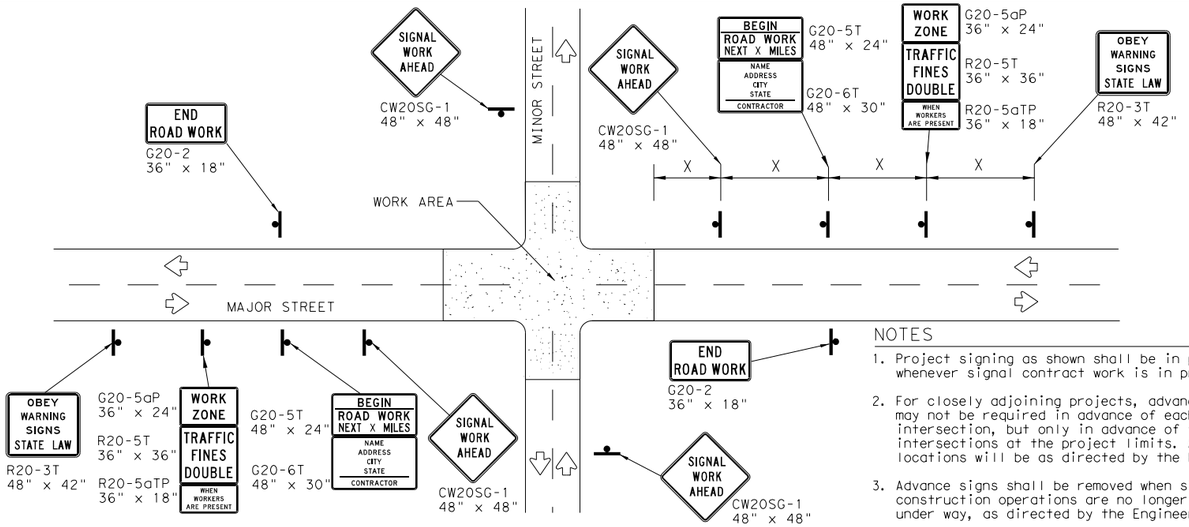


TYPICAL ADVANCE SIGNAL PROJECT SIGNING

FOR LONG TERM and INTERMEDIATE-TERM STATIONARY WORK OPERATIONS

NOTES

1. Project signing as shown shall be in place whenever signal contract work is in progress.
2. For closely adjoining projects, advance signing may not be required in advance of each intersection, but only in advance of the intersections at the project limits. Actual locations will be as directed by the Engineer.
3. Advance signs shall be removed when signal construction operations are no longer under way, as directed by the Engineer.
4. Warning sign spacing shown is typical for both directions.
5. See the Table on sheet 1 of 2 for Typical warning sign spacing.

GENERAL NOTES FOR WORK ZONE SIGNS

1. Signs shall be installed and maintained in a straight and plumb condition.
2. Wooden sign posts shall be painted white.
3. Barricades shall NOT be used as sign supports.
4. Nails shall NOT be used to attach signs to any support.
5. All signs shall be installed in accordance with the plans or as directed by the Engineer.
6. The Contractor shall furnish the sign design shown in the plans or in the "Standard Highway Sign Designs for Texas" (SHSD).
7. The Contractor shall furnish sign supports and substrates listed in the "Compliant Work Zone Traffic Control Device List" (CWZTCD), installed as per the manufacturer's recommendations.
8. Temporary signs that have damaged or cracked substrates and/or damaged or marred reflective sheeting shall be replaced as directed by the Engineer.
9. 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".
10. Damaged wood posts shall be replaced. Splicing wood posts will not be allowed.

DURATION OF WORK

1. Work zone durations are defined in Part 6, Section 6G.02 of the Texas Manual on Uniform Traffic Control Devices (TMUTCD).

SIGN MOUNTING HEIGHT

1. Sign height of Long-term/Intermediate-term warning signs shall be as shown on Figure 6F-1 of the TMUTCD.
2. Sign height of Short-term/Short Duration warning signs shall be as shown on Figure 6F-2 of the TMUTCD.
3. Regulatory signs shall be mounted at least 7 feet, but not more than 9 feet, above the paved surface regardless of work duration.

REMOVING OR COVERING

1. When sign messages may be confusing or do not apply, the signs shall be removed or completely covered, unless otherwise approved by the Engineer.
2. 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. Burlap, or heavy materials such as plywood or aluminum shall not be used to cover signs.
3. Duct tape or other adhesive material shall NOT be affixed to a sign face.
4. Signs and anchor stubs shall be removed and holes back filled upon completion of the work.

REFLECTIVE SHEETING

1. All signs shall be retroreflective and constructed of sheeting meeting the requirements of the DMS and color usage table shown on this sheet.

SIGN SUPPORT WEIGHTS

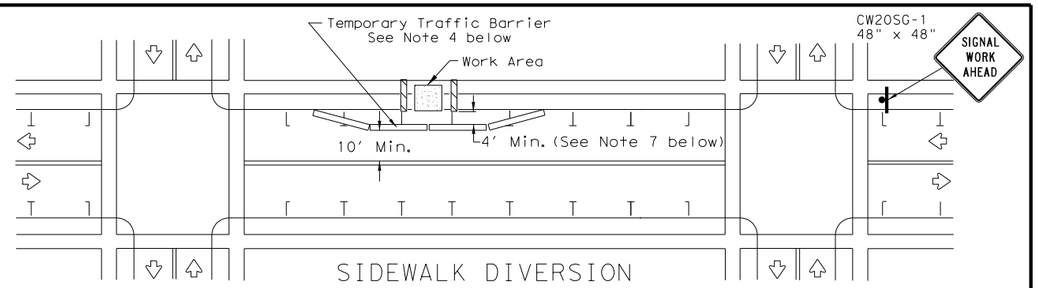
1. Weights used to keep signs from turning over should be sandbags filled with dry, cohesionless material.
2. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
3. Rock, concrete, iron, steel or other solid objects will not be permitted for use as sign support 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 fastners. 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.

LEGEND	
	Sign
	Channelizing Devices
	Type 3 Barricade

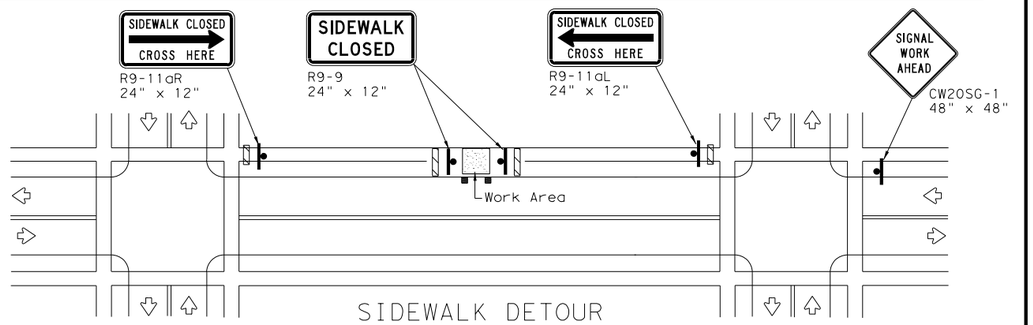
DEPARTMENTAL MATERIAL SPECIFICATIONS	
SIGN FACE MATERIALS	DMS-8300
FLEXIBLE ROLL-UP REFLECTIVE SIGNS	DMS-8310

COLOR	USAGE	SHEETING MATERIAL
ORANGE	BACKGROUND	TYPE B_{FL} OR TYPE C_{FL} SHEETING
WHITE	BACKGROUND	TYPE A SHEETING
BLACK	LEGEND & BORDERS	ACRYLIC NON-REFLECTIVE SHEETING

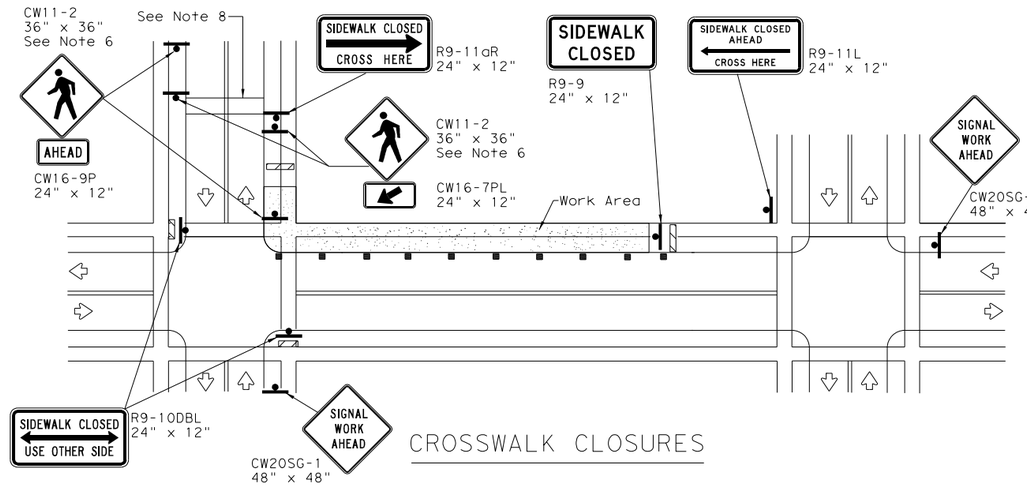
Only pre-qualified products shall be used. A copy of the "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources and may be found at the following web address:
http://www.txdot.gov/txdot_library/publications/construction.htm



SIDEWALK DIVERSION



SIDEWALK DETOUR



CROSSWALK CLOSURES

PEDESTRIAN CONTROL

1. Holes, trenches or other hazards shall be adequately protected by covering, delineating or surrounding the hazard with orange plastic pedestrian fencing or longitudinal channelizing devices, or as directed by the Engineer.
2. "CROSSWALK CLOSURES" as detailed above will require the Engineer's approval prior to installation.
3. R9 series signs shown may be placed on supports detailed on the BC standards or CWZTCD list, or when fabricated from approved lightweight plastic substrates, they may be mounted on top of a plastic drum at or near the location shown.
4. For speeds less than 45 mph longitudinal channelizing devices may be used instead of traffic barriers when approved by the Engineer. Attenuation of blunt ends and installation of water filled devices shall be as per BC(9) and manufacturer's recommendations.
5. Location of devices are for general guidance. Actual device spacing and location must be field adjusted to meet actual conditions.
6. Where pedestrians with visual disabilities normally use the closed sidewalk Detectable Pedestrian Barricades should be used instead of the Type 3 Barricades shown.
7. The width of existing sidewalk should be maintained if practical.
8. Pavement markings for mid-block crosswalks shall be paid for under the appropriate bid items.
9. When crosswalks or other pedestrian facilities are closed or relocated, temporary facilities shall be detectable and shall include accessibility features consistent with the features present in the existing pedestrian facility.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC SIGNAL WORK BARRICADES AND SIGNS

WZ(BTS-2)-13

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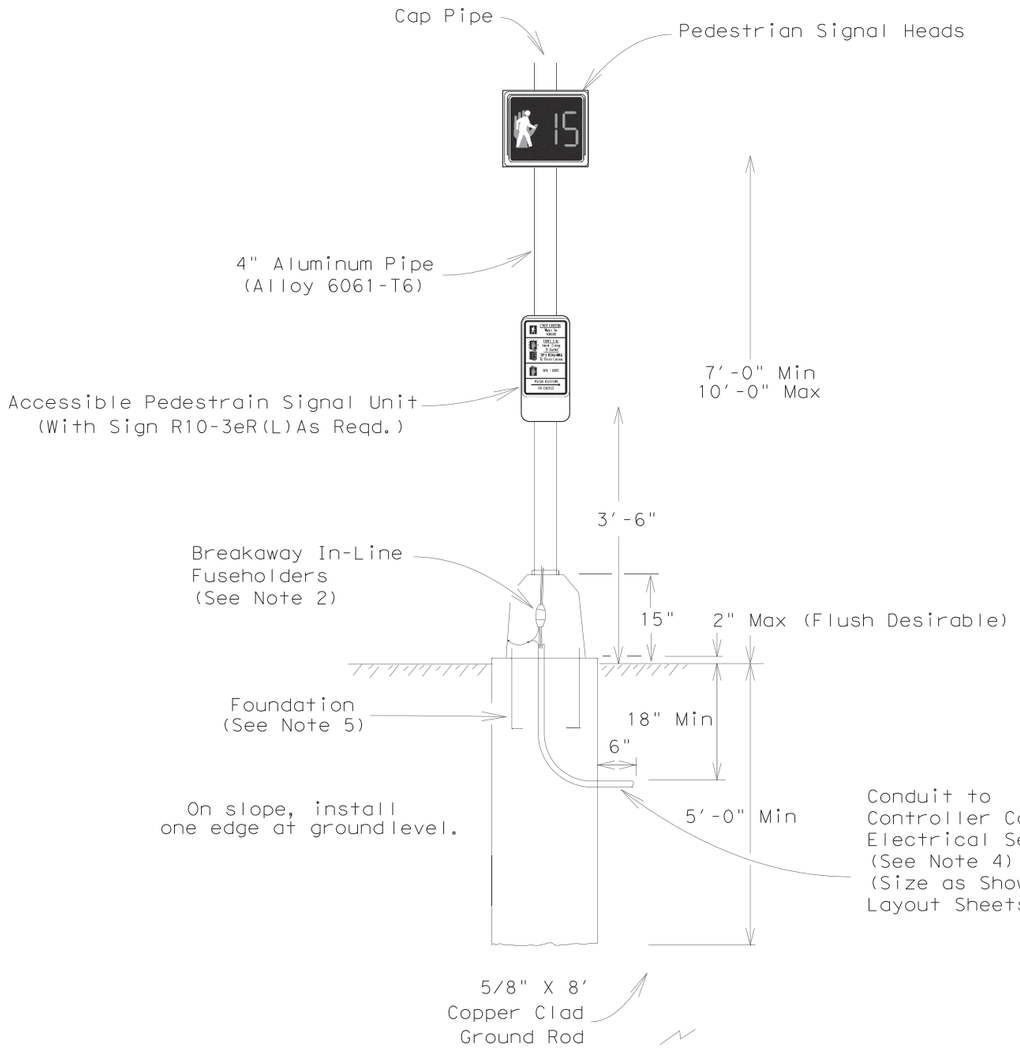
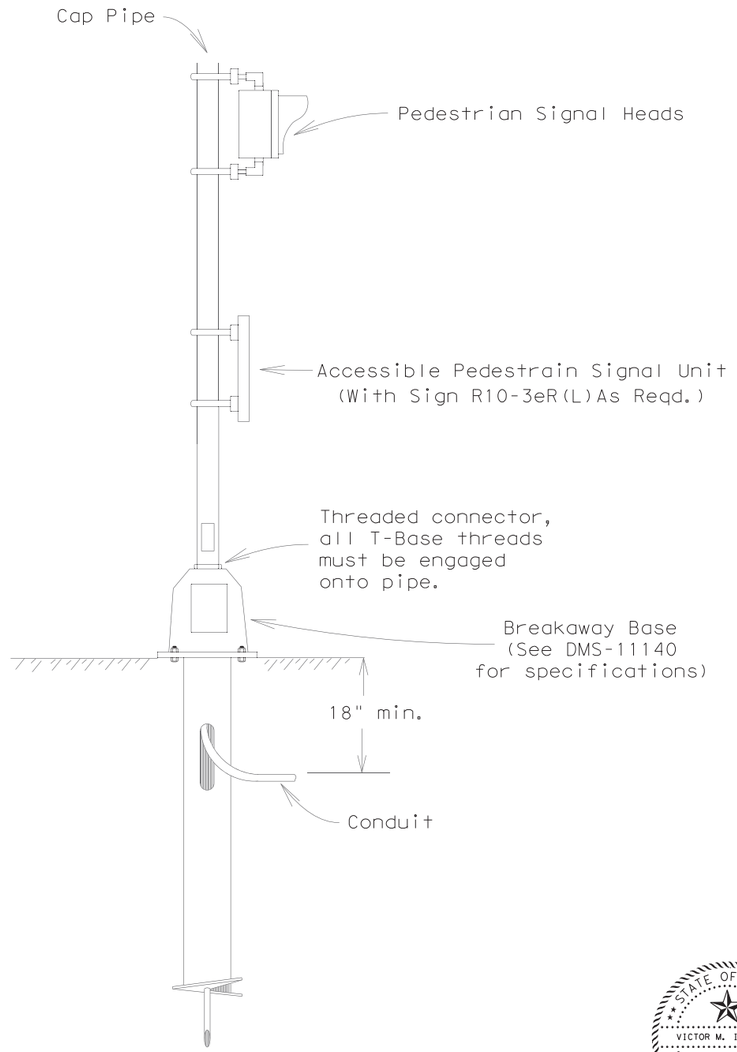
REVISIONS	3469	01	014	FM 3099
2-98 10-99 7-13	DIST	COUNTY		SHEET NO.
4-98 3-03	BWD	STEPHENS		159



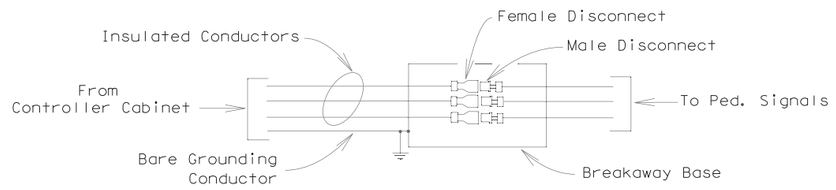
FRONT

Showing Drilled Shaft Foundation



SIDE

Showing Screw-in Type Foundation



BREAKAWAY IN-LINE FUSEHOLDERS

NOTES:

1. See Item 618 "Conduit", 624 "Ground Boxes", 682 "Vehicle and Pedestrain Signal Heads", 684 "Traffic signal Cable",687 "Pedestal Pole Assembly",688 "Pedestrain Detectors and Vehicle Loop Detectors", and Special Specification 8835 "Accessible Pedestrain Signal Units" for further requirements.

2. All electrical connectors for breakaway poles shall be water tight breakaway fuseholders (Buchannan 65U, Bussmann HEBW, Lettelfuse LEB, or equal). All electrical connections for neutrals shall be breakaway and shall have a white color marking and a permanently installed solid neutral (Buchannan 20U, Bussmann HET, littelfuse LET, or equal). Fuses shall be 10 amp time delay.

3. Refer to Item 682 for Pedestrian Signal Heads. Ped. Signal head mounting shall be as shown elsewhere on the plans or, when no other details are shown, shall be as shown here or as otherwise approved by the Engineer.

4. Conduit in foundation and within 6 inches of foundation is subsidiary to the Item, "Pedestal Pole Assembly."

5. Use drilled shaft or galvanized steel screw-in type foundation. Drilled shaft foundations shall be Type 24-A (See Standard Sheet TS-FD for details). Drilled shafts and screw-in foundations shall be minimum five feet length. See Special Specification 4003 "Screw-in Type Anchor Foundations" for details of galvanized steel foundations.

STATE OF TEXAS
VICTOR M. IRACHETA
84689
LICENSED
PROFESSIONAL ENGINEER

08/27/2021

FM 3099
PEDESTAL POLE ASSEMBLY

Texas Department of Transportation®

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
3469	01	014,	FM 3099
DIST	COUNTY		SHEET NO.
BWD	STEPHENS		160

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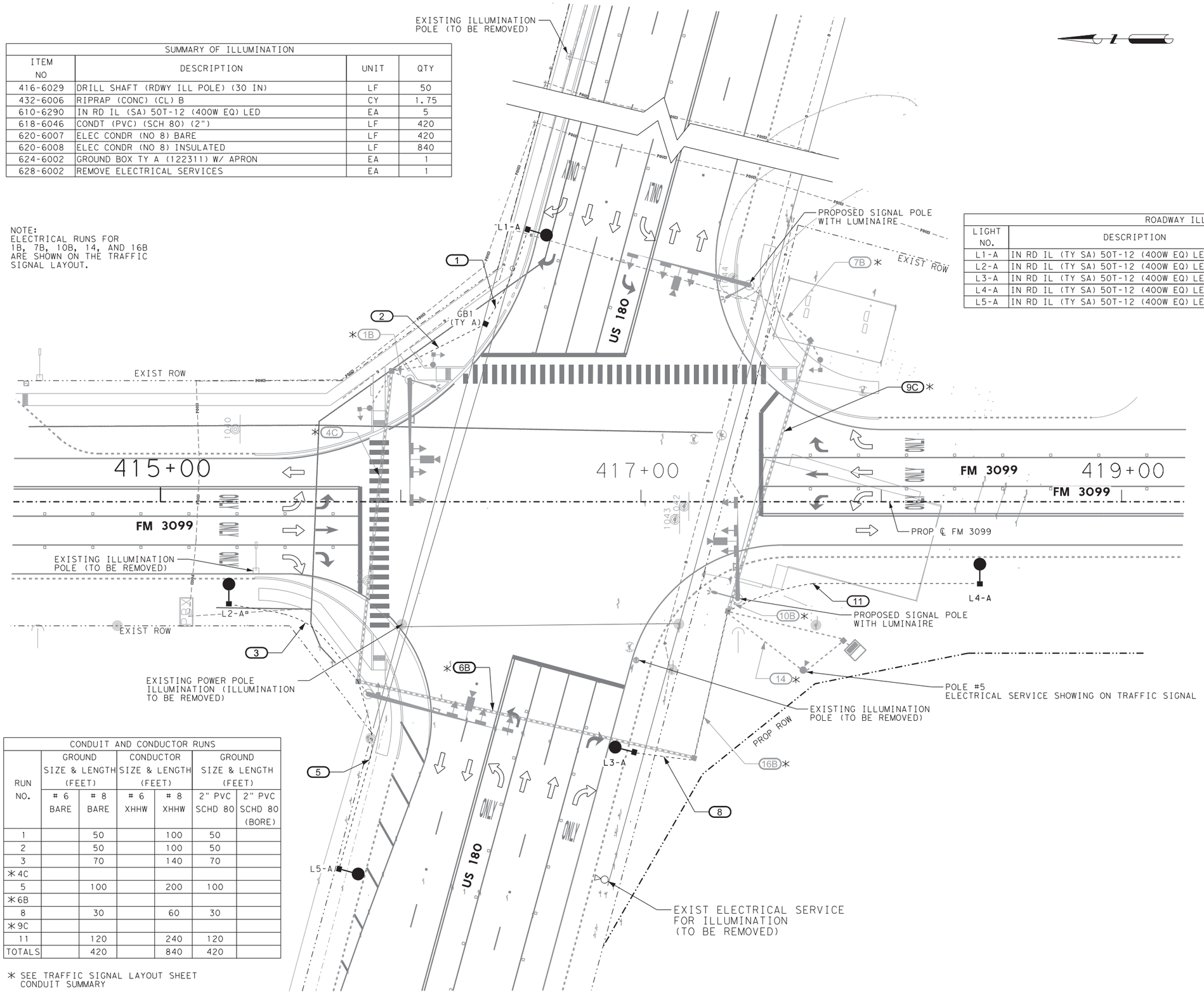
100% SUBMITTAL

SUMMARY OF ILLUMINATION			
ITEM NO	DESCRIPTION	UNIT	QTY
416-6029	DRILL SHAFT (RDWY ILL POLE) (30 IN)	LF	50
432-6006	RIPRAP (CONC) (CL) B	CY	1.75
610-6290	IN RD IL (SA) 50T-12 (400W EQ) LED	EA	5
618-6046	CONDT (PVC) (SCH 80) (2")	LF	420
620-6007	ELEC CONDR (NO 8) BARE	LF	420
620-6008	ELEC CONDR (NO 8) INSULATED	LF	840
624-6002	GROUND BOX TY A (122311) W/ APRON	EA	1
628-6002	REMOVE ELECTRICAL SERVICES	EA	1

NOTE:
ELECTRICAL RUNS FOR
1B, 7B, 10B, 14, AND 16B
ARE SHOWN ON THE TRAFFIC
SIGNAL LAYOUT.



CONDUIT AND CONDUCTOR RUNS						
RUN NO.	GROUND SIZE & LENGTH (FEET)		CONDUCTOR SIZE & LENGTH (FEET)		GROUND SIZE & LENGTH (FEET)	
	# 6 BARE	# 8 BARE	# 6 XHHW	# 8 XHHW	2" PVC SCHD 80	2" PVC SCHD 80 (BORE)
1		50		100	50	
2		50		100	50	
3		70		140	70	
*4C						
5		100		200	100	
*6B						
8		30		60	30	
*9C						
11		120		240	120	
TOTALS		420		840	420	

* SEE TRAFFIC SIGNAL LAYOUT SHEET CONDUIT SUMMARY

LEGEND (PROPOSED)

- PROP RDWY ILL AM (TY SA) 50T-12(400W EQ)LED
- SERVICE POLE ASSEMBLY
- GROUND BOX
- CONDUIT (TRENCH)
- CONDUIT (BORE)
- (X) WIRE RUN DESIGNATION
- DIRECTION OF TRAFFIC FLOW

ROADWAY ILLUMINATION POLES			
LIGHT NO.	DESCRIPTION	DRILL SHAFT DIA/DEPTH (FT)	STATION OFFSET
L1-A	IN RD IL (TY SA) 50T-12 (400W EQ) LED	30"/10'	416+53, 114' LT
L2-A	IN RD IL (TY SA) 50T-12 (400W EQ) LED	30"/10'	415+29, 43' RT
L3-A	IN RD IL (TY SA) 50T-12 (400W EQ) LED	30"/10'	416+97, 104' RT
L4-A	IN RD IL (TY SA) 50T-12 (400W EQ) LED	30"/10'	418+41, 34' RT
L5-A	IN RD IL (TY SA) 50T-12 (400W EQ) LED	30"/10'	415+75, 153' RT

0 20 40 80
SCALE: 1"=40'H

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STATE OF TEXAS
VICTOR M. IRACHETA
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LICENSED PROFESSIONAL ENGINEER

08/03/2022

ENTECH CIVIL ENGINEERS, INC
F-6932
15021 Katy Freeway, Suite 500
Houston, Texas, 77094
281-945-0069 PH
281-945-0081 FX

FM 3099 REALIGNMENT

PROPOSED TRAFFIC ILLUMINATION LAYOUT

SHEET 1 OF 2

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
06	SEE TITLE SHEET		
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
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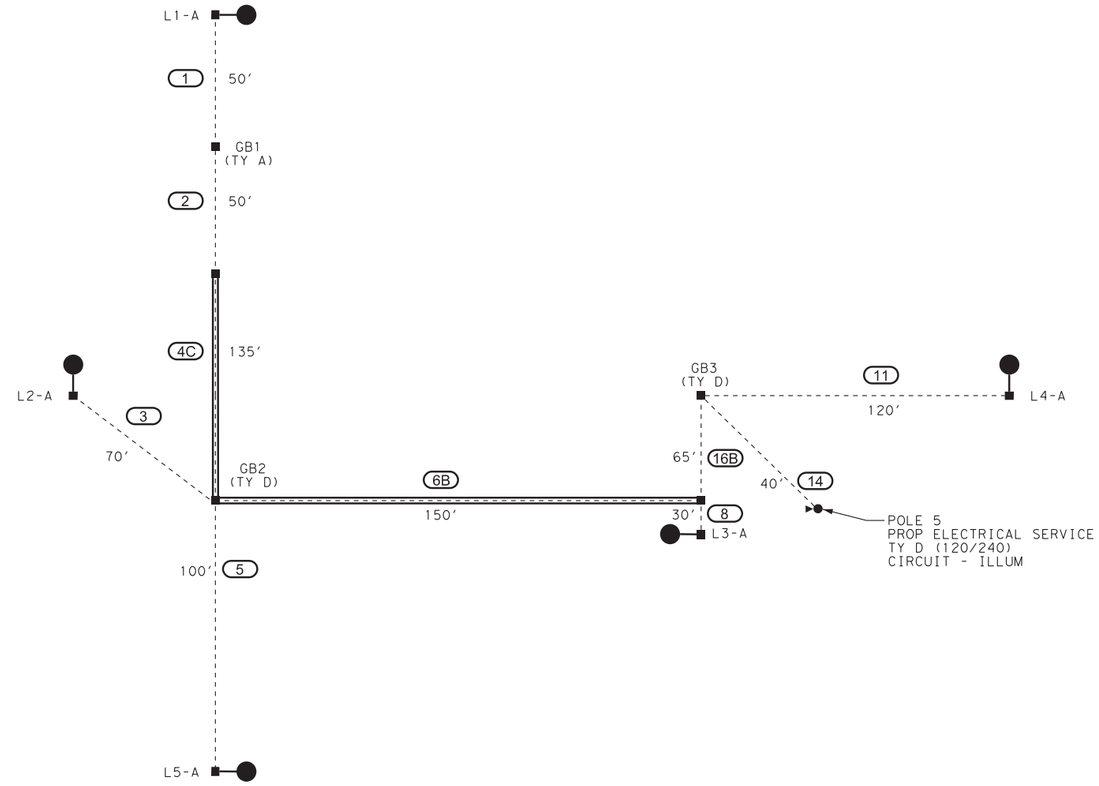
LEGEND (PROPOSED)

- PROP RDWY ILL AM (TY SA) 50T-12(400W EQ)LED
- SERVICE POLE ASSEMBLY
- GROUND BOX
- CONDUIT (TRENCH)
- CONDUIT (BORE)
- (X) WIRE RUN DESIGNATION
- DIRECTION OF TRAFFIC FLOW



NOT TO SCALE

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STATE OF TEXAS

08/03/2022

ENTECH CIVIL ENGINEERS, INC
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PROPOSED TRAFFIC ILLUMINATION LAYOUT

SHEET 2 OF 2

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
06	SEE TITLE SHEET		
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
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ROADWAY ILLUMINATION ASSEMBLY NOTES

1. Details apply to roadway lighting installations bid or referenced under Item 610, "Roadway Illumination Assemblies." Provide, furnish, and install all other materials not shown on the plans which may be necessary for complete and proper construction. Where manufacturers provide warranties or guarantees as a customary trade practice, furnish to the State such warranties or guarantees.

2. The locations of poles and fixtures may be shifted by the Engineer to accommodate local conditions. Install or remove poles and luminaires located near overhead electrical lines using established industry and utility safety practices and in accordance with laws governing such work. Consult with the appropriate utility company prior to beginning such work.

3. 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, Intertek Testing Services NA Inc., or FM Approvals LLC can be considered equivalent to UL. Faulty fabrication or poor workmanship in any material, equipment, or installation is justification for rejection.

4. Provide Roadway Illumination Light Fixtures as per TxDOT Departmental Material Specification (DMS) 11010, Item 610, and as shown on the Material Producers List (MPL) for Roadway Illumination and Electrical Supplies.

5. Fabricate steel roadway illumination poles in accordance with Roadway Illumination Poles (RIP) standards and Item 610. Poles fabricated according to RIP standards do not require shop drawing submittals.

   a. Alternate designs to RIP standards or the use of aluminum to fabricate poles will require the submission of shop drawings electronically. For instructions on submitting shop drawings electronically see "Guide to Electronic Shop Drawing Submittal" on the TxDOT web site.

   b. Limitations on use of the RIP standard: The RIP standard details were developed for installations in locations where the 3-second gust basic maximum wind speed is 110 mph, and where the elevation of the base of the pole is less than (i.e. not more than) 25′ above the elevation of the surrounding terrain, in accordance with the "AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals," 6th Edition (2013) of the AASHTO Design Specifications. For poles to be installed in regions where the maximum basic wind speed exceeds 110 mph or to be mounted more than 25′ above the surrounding terrain, provide poles meeting the following requirements:

      i. Submittals. Following the electronic shop drawing submittal process (see Guide to Electronic Shop Drawing Submittal on the TxDOT web site), submit to the Engineer for approval fabrication drawings and calculations for the poles, sealed by a Texas licensed professional engineer (P.E.).

      ii. Luminaire Structural Support Requirements. Provide light poles, arms, and anchor bolt assemblies with a 25 year design life to safely resist dead loads, ice loads and the required basic wind speeds at the location of installation in accordance with the 6th edition (2013) of the AASHTO Design Specifications. For transformer base poles, include transformer base and connecting hardware in calculations and shop drawing submittals. Structurally test all transformer bases to resist the theoretical plastic moment capacity of the pole. Submit certification of the plastic moment load test and FHWA breakaway requirement test of the model of base being furnished with the shop drawings. Show breakaway base model number, manufacturer's name, and logo on shop drawings. Include on manufacturer's shop drawings the ASTM designations for all materials to be used.

6. For both transformer and shoe-base type illumination poles, provide and install double-pole breakaway fuse holders as specified by DMS-11040. Breakaway fuse holders are listed on the MPL for Roadway Illumination and Electrical Supplies under Items 610 & 620. Provide 10 amp time delay fuses for breakaway connectors in light poles, or inside the light fixture for underpass luminaires. In each pole, connect luminaires to the breakaway connector with continuous stranded 12 AWG copper conductors as listed on the MPL. Bond all equipment grounding conductors together and to the ground lug in the transformer base or hand hole.

7. Tighten anchor bolts for shoe base, concrete traffic barrier base, and bridge mount roadway illumination poles, in accordance with Item 449.

8. Install T-Base with following procedure:

   a. Anchor Bolt Tightening.

      i. Coat the threads of the anchor bolts with electrically conductive lubricant.

      ii. Place the T-base over the anchor bolts. Foundation must be level and flat. The maximum permissible gap under any one corner of the t-base is 1/8" before nuts are tightened.

      iii. Coat the bearing surfaces of the nuts and washers with electrically conductive lubricant. Install (1) 1/2" hold down washer, (1) lock washer, and (1) nut on each anchor bolt. Turn the nuts onto the bolts so that each is hand-tight against the washer.

      iv. Using a torque wrench, tighten each nut to 150 ft-lb. Uniform contact is required between the foundation and the T-base in the corner regions of the T-base, and all corner gaps must be closed after applying torque. If a gap still exists after torquing to 150 ft-lbs, continue torquing each bolt incrementally until gap is closed or maximum allowable torque of 250 ft. pound is reached, whichever comes first. If 250 ft-lbs is not enough to close the gap the foundation must be leveled. Gaps along the straight sides of the T-bases and the foundation are permissible. Ensure that no high point of contact occurs between the straight sides of the T-base and the foundation.

      v. Check top of T-base for level. If not level then foundation must be leveled.

   b. Top Bolt Procedure

      i. Erect pole over T-base with crane. Coat bolts, nuts, washers, and lock washers with electrically conductive lubricant.

      ii. Install bolts and 1/2" connecting washers from the inside of the T-base, thread up through the pole base. Install flat washers, lock washers and nuts snug tight according to Item 447, "Structural Bolting."

      iii. Tighten each nut to 150 ft-lb. using a torque wrench.

   c. Level and Plumb

      i. Ensure pole is plumb and mast arm is perpendicular to the roadway according to plans to within 5 degrees.

9. Construct luminaire pole foundations in accordance with Item 416, "Drilled Shaft Foundations," and TxDOT standard sheet RID(2).

10. Provide and install underpass luminaires in accordance with Item 610, DMS-11010, and TxDOT standard sheet RID(3). Typical luminaire size for underpass luminaires is 150W HPS or 150W EQ LED.

11. Mount luminaires on arms level as shown by the luminaire level indicator.

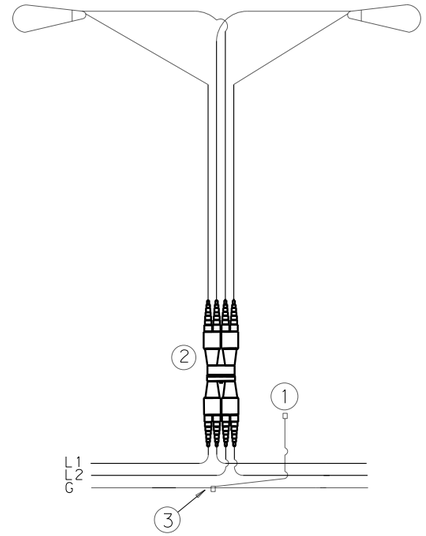
12. Orient luminaires perpendicular to the roadway intended to be lit unless otherwise shown on the plans.

Wiring Diagram Notes:

(1) Use 1/2 in.-13 UNC threaded, copper or tin-plated copper, pole bonding connector, sized appropriately for conductors, bonded to T-base, or use ground lug in handhole as available.

(2) Use pre-qualified two-pole breakaway connectors for all luminaire pole installations. For luminaires fed by a circuit with a neutral conductor, use double pole breakaway connectors with the neutral side unfused and marked white.

(3) Split Bolt or other connector.



L1,L2 = Hot Conductors
G = Grounding Conductor

TYPICAL WIRING DIAGRAM

LUMINAIRES SERVED AT 480V ON 240/480 VOLT SERVICE OR LUMINAIRES SERVED AT 240V FOR 120/240 VOLT SERVICE.

Decorative LED Lighting Notes:

1. LED Drivers in Remote Outdoor enclosures (for drivers that do not include an enclosure as part of a factory assembly):

   a. Provide NEMA 3R outdoor enclosure or as approved.

   b. Install enclosure at least 12" above ground or other horizontal surface. Mount vertically or on ceiling, and avoid direct sun where possible.

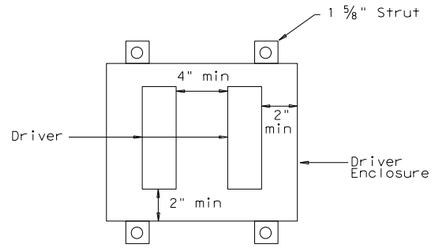
   c. Install drivers with at least 2 inches of space from enclosure walls.

   d. For multiple drivers in an enclosure, provide at least 4 inches side to side and 1 inch end to end from other drivers or electronic equipment

   e. For drivers mounted on back wall of enclosure, mount enclosure on 1 5/8" strut or other standoff to dissipate heat, or mount driver to side of the enclosure or to the metal cover.

   f. Provide remote drivers with a maximum of 100 watts

   g. Provide drivers with documentation of 100,000 hr lifetime at Tcase of 65C or higher.



Driver Spacing In Remote Enclosure

Texas Department of Transportation

Traffic Safety Division Standard

ROADWAY ILLUMINATION DETAILS

RID(1)-20

FILE: rid1-20.dgn	DN:	CK:	DW:	CK:
©TxDOT January 2007	CONT	SECT	JOB	HIGHWAY
REVISIONS	3469	01	014	FM 3099
7-17	DIST	COUNTY		SHEET NO.
12-20	BWD	STEPHENS		163

72A

DATE: 8/27/2021
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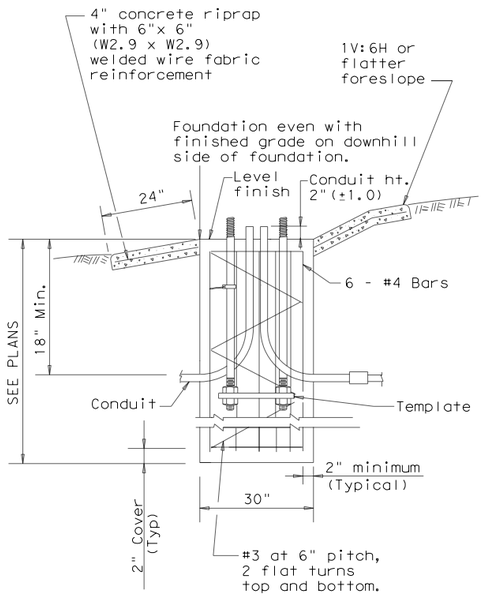
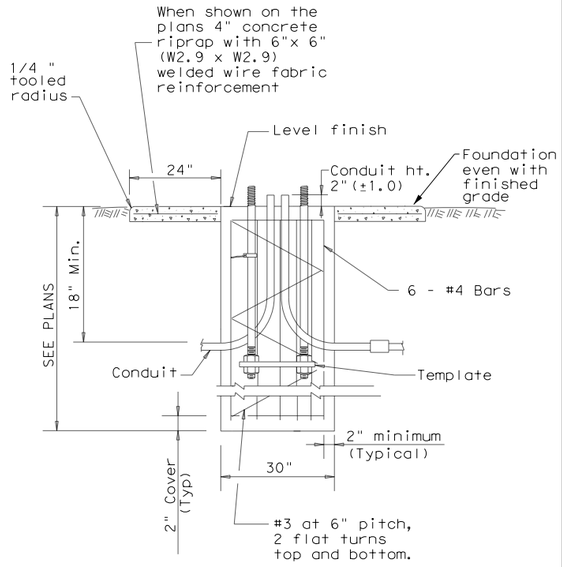


SECTION A-A
SHOWING SLOPED GRADE



SECTION A-A
SHOWING CONSTANT GRADE

TABLE 1

ANCHOR BOLTS

POLE MOUNTING HEIGHT	BOLT CIRCLE		ANCHOR BOLT SIZE
	Shoe Base	T-Base	
<40 ft.	13 in.	14 in.	1in. x 30in.
40-50 ft.	15 in.	17 ¼in.	1 ¼in. x 30in.

TABLE 2

RECOMMENDED FOUNDATION LENGTHS (See note 1)

MOUNTING HEIGHT	TEXAS CONE PENETROMETER N Blows/ft		
	10	15	40
≤20 ft.	6′	6′	6′
>20 ft. to 30 ft.	8′	6′	6′
>30 ft. to 40 ft.	8′	8′	6′
>40 ft. to 50 ft.	10′	8′	6′

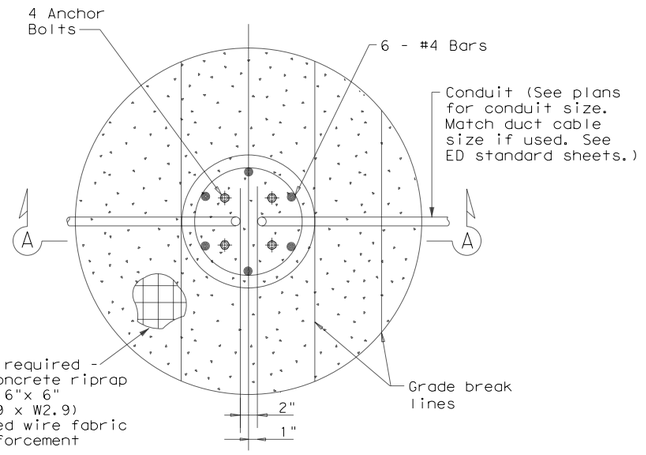
TABLE 3

PAY QUANTITY OF RIPRAP PER FOUNDATION (Install only when shown on the plans)

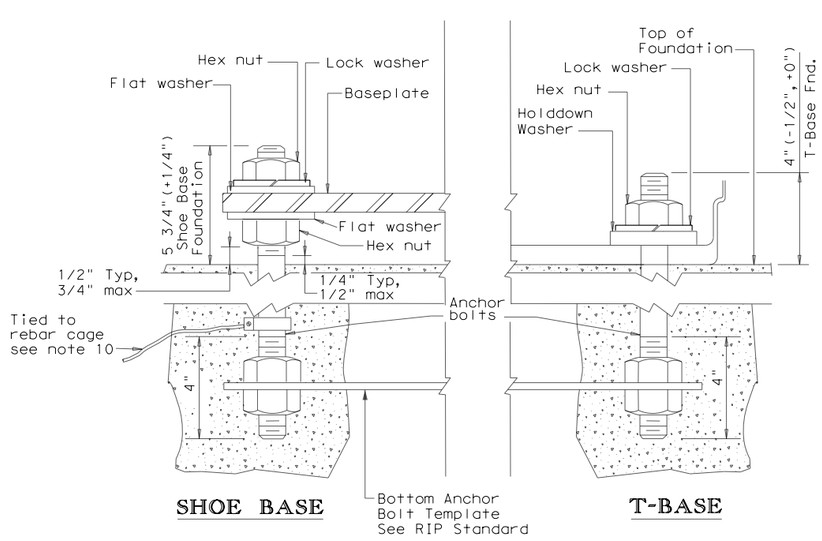
Foundation Diameter	RIPRAP DIAMETER	RIPRAP (CONC) (CL B)
30 in.	78 in.	0.35 CY

GENERAL NOTES:

1. "Recommended Foundation Lengths" table is for information purposes only. Foundation lengths shall be as shown on the plans, or as directed by the Engineer. Foundations will be paid for under Item 416, "Drilled Shaft Foundations," unless otherwise shown on the plans.
2. Erect roadway illumination assembly poles plumb and true. Form and level the top 6" of the foundation so the pole will be plumb. Use leveling nuts to plumb shoe base poles. Do not use shims or leveling nuts under transformer bases. Do not grout between baseplate and the foundation.
3. Ensure Class 2A and 2B fit for anchor bolts and nuts. Tap and chase nuts after galvanizing. Anchor bolt body with rolled threads need not be full size.
4. Use appropriate class of concrete as specified in Items 416 and 432. Concrete for riprap may be upgraded to Class C at no extra cost to the Department.
5. Place riprap around the foundation when called for elsewhere in the plans. Riprap will be paid for under Item 432.
6. Locate breakaway roadway illumination assemblies as shown in the placement table, unless otherwise dimensioned on the plans. Protect non-breakaway illumination assemblies from vehicular impact (i.e. 2.5 ft. behind guard rail or mounted on traffic barrier), or located outside the clear zone, except that 2.5 ft. from curb face is minimum desired for light poles on city streets, 45 mph or less. See Roadway Design Manual for further information.
7. Use 4 hold down and 4 connecting washers on transformer base poles as recommended by the manufacturer and supplied with base.
8. Install a minimum of 2 conduits in each foundation. See lighting layout sheets for locations of foundations with more than 2 conduits. Cap unused conduits in foundations on both ends.
9. Conduit location in foundations is critical for breakaway devices. Place conduits 2 in. apart on centerline as shown.
10. Bond anchor bolt to rebar cage with #6 bare stranded copper conductor. Use listed mechanical connectors rated for embedment in concrete. The bonded steel in the foundation creates a concrete encased grounding electrode which replaces the ground rod.
11. Grade earthwork around T-base foundations even with the finished grade as shown in Section A-A to ensure proper function of the breakaway device. Use riprap on T-base foundations that are located on sloped grades, and as shown on the plans for level grades.



FOUNDATION DETAIL



ANCHOR BOLT DETAIL

TABLE 4

BREAKAWAY POLE PLACEMENT (See note 6)

ROADWAY FUNCTIONAL CLASSIFICATION	** POLE OFFSET (DISTANCE TO FACE OF TRANSFORMER BASE)
Freeway Mainlanes (roadway with full control of access)	15 ft. (minimum and typical) from lane edge
All curbed, 45 mph or less design speed	2.5 ft. minimum (15 ft. desirable) from curb face
All others	10 ft. minimum*(15 ft. desirable) from lane edge

* or as close to ROW line as is practical

** provide 2/5 of the luminaire mounting height behind the pole for "falling area" to prevent encroachment on the other travel lanes. See design guidelines.

Texas Department of Transportation

Traffic Safety Division Standard

ROADWAY ILLUMINATION DETAILS
(RDWY ILLUM FOUNDATIONS)

RID(2)-20

FILE: rid2-20.dgn	DN:	CK:	DW:	CK:
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REVISIONS	3469	01	014	FM 3099
1-11	DIST	COUNTY		SHEET NO.
7-17	BWD	STEPHENS		164
12-20				

72B

DATE: 8/27/2021
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SHIPPING PARTS LIST - POLES AND LUMINAIRE ARMS

Nominal Mounting Ht. (ft)	Shoe Base Designation Pole	A1	A2	Luminaire	Quantity	T-Base Designation Pole	A1	A2	Luminaire	Quantity	CSB/SSCB Mounted Designation Pole	A1	A2	Luminaire	Quantity
20	(Type SA 20 S - 4)			(150W EQ) LED		(Type SA 20 T - 4)			(150W EQ) LED						
	(Type SA 20 S - 4 - 4)			(150W EQ) LED		(Type SA 20 T - 4 - 4)			(150W EQ) LED						
30	(Type SA 30 S - 4)			(250W EQ) LED		(Type SA 30 T - 4)			(250W EQ) LED		(Type SP 28 S - 4)			(250W EQ) LED	
	(Type SA 30 S - 4 - 4)			(250W EQ) LED		(Type SA 30 T - 4 - 4)			(250W EQ) LED		(Type SP 28 S - 4 - 4)			(250W EQ) LED	
	(Type SA 30 S - 8)			(250W EQ) LED		(Type SA 30 T - 8)			(250W EQ) LED		(Type SP 28 S - 8)			(250W EQ) LED	
	(Type SA 30 S - 8 - 8)			(250W EQ) LED		(Type SA 30 T - 8 - 8)			(250W EQ) LED		(Type SP 28 S - 8 - 8)			(250W EQ) LED	
40	(Type SA 40 S - 4)			(250W EQ) LED		(Type SA 40 T - 4)			(250W EQ) LED		(Type SP 38 S - 4)			(250W EQ) LED	
	(Type SA 40 S - 4 - 4)			(250W EQ) LED		(Type SA 40 T - 4 - 4)			(250W EQ) LED		(Type SP 38 S - 4 - 4)			(250W EQ) LED	
	(Type SA 40 S - 8)			(250W EQ) LED		(Type SA 40 T - 8)			(250W EQ) LED		(Type SP 38 S - 8)			(250W EQ) LED	
	(Type SA 40 S - 8 - 8)			(250W EQ) LED		(Type SA 40 T - 8 - 8)			(250W EQ) LED		(Type SP 38 S - 8 - 8)			(250W EQ) LED	
	(Type SA 40 S - 10)			(250W EQ) LED		(Type SA 40 T - 10)			(250W EQ) LED		(Type SP 38 S - 10)			(250W EQ) LED	
	(Type SA 40 S - 10 - 10)			(250W EQ) LED		(Type SA 40 T - 10 - 10)			(250W EQ) LED		(Type SP 38 S - 10 - 10)			(250W EQ) LED	
	(Type SA 40 S - 12)			(250W EQ) LED		(Type SA 40 T - 12)			(250W EQ) LED		(Type SP 38 S - 12)			(250W EQ) LED	
	(Type SA 40 S - 12 - 12)			(250W EQ) LED		(Type SA 40 T - 12 - 12)			(250W EQ) LED		(Type SP 38 S - 12 - 12)			(250W EQ) LED	
50	(Type SA 50 S - 4)			(400W EQ) LED		(Type SA 50 T - 4)			(400W EQ) LED		(Type SP 48 S - 4)			(400W EQ) LED	
	(Type SA 50 S - 4 - 4)			(400W EQ) LED		(Type SA 50 T - 4 - 4)			(400W EQ) LED		(Type SP 48 S - 4 - 4)			(400W EQ) LED	
	(Type SA 50 S - 8)			(400W EQ) LED		(Type SA 50 T - 8)			(400W EQ) LED		(Type SP 48 S - 8)			(400W EQ) LED	
	(Type SA 50 S - 8 - 8)			(400W EQ) LED		(Type SA 50 T - 8 - 8)			(400W EQ) LED		(Type SP 48 S - 8 - 8)			(400W EQ) LED	
	(Type SA 50 S - 10)			(400W EQ) LED		(Type SA 50 T - 10)			(400W EQ) LED		(Type SP 48 S - 10)			(400W EQ) LED	
	(Type SA 50 S - 10 - 10)			(400W EQ) LED		(Type SA 50 T - 10 - 10)			(400W EQ) LED		(Type SP 48 S - 10 - 10)			(400W EQ) LED	
	(Type SA 50 S - 12)			(400W EQ) LED		(Type SA 50 T - 12)			(400W EQ) LED	5	(Type SP 48 S - 12)			(400W EQ) LED	
	(Type SA 50 S - 12 - 12)			(400W EQ) LED		(Type SA 50 T - 12 - 12)			(400W EQ) LED		(Type SP 48 S - 12 - 12)			(400W EQ) LED	

OTHER Designation Pole	A1	A2	Luminaire	Quantity

GENERAL NOTES:

1. All work, materials and services not shown on the plans which may be necessary for complete and proper construction shall be performed, furnished and installed by the Contractor. Faulty fabrication or poor workmanship in any material, equipment or installation will be considered justification for rejection. Where manufacturers provide warranties or guarantees as a customary trade practice, furnish to the Department such warranties or guarantees.

2. The location of poles and fixtures are diagrammatic only and may be shifted by the Engineer to accommodate local conditions. Install or remove poles and luminaires located near overhead electrical lines using established industry and utility safety practices and in accordance with laws governing such work. Consult with the appropriate utility company prior to beginning such work.

3. Standard Steel Pole Designs. Steel poles fabricated in accordance with the details and dimensions shown herein, shall be considered standard designs. Submission of shop drawings and design calculations for standard designs is not required.

4. Optional Steel Pole Designs. Multi-sided steel poles may be allowed as optional designs, if steel poles are permitted or required, pending approval by the Department as outlined below.

   a. Shop Drawings. Optional designs require submission of shop drawings and design calculations bearing the seal of an engineer licensed in the State of Texas, in accordance with Item 441, "Steel Structures." The Department may elect to pre-approve some shop drawings for optionally designed poles. Submission of shop drawings and design calculations is not required for structures fabricated in accordance with the details of shop drawings on the pre-approved list maintained by the TxDOT Traffic Operations Division. Any deviation from the pre-approved shop drawings will require submission of shop drawings of the complete assembly and design calculations as described above.
   b. Structural Support Design for Luminaires. Lighting support structures shall be designed for a 25 year design life in accordance with the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 6th Edition (2013) and Interim Revisions thereto. All poles shall be designed for 110 mph 3-second gust wind speeds. The Gust Factor, G, and Wind Importance Factor, Ir, shall be applied as per the AASHTO Specifications assuming a 25-year design life. The design wind pressure for hurricane wind velocities greater than 100 mph shall not be less than the design wind pressure using 100 mph with the non-hurricane Wind Importance Factor, Ir, value. For transformer base poles, fabricator shall include transformer base and connecting hardware in design calculations and shop drawing submittals. All transformer bases shall have been structurally tested to resist the theoretical plastic moment capacity of the pole. Certification of the plastic moment load test and FHWA breakaway requirement test of the model of base being furnished shall be submitted with the shop drawings. Shop drawings shall show breakaway base model number, and manufacturer's name and logo. Manufacturer's shop drawings shall include the ASTM designations for all materials to be used.
   c. Mast Arm Attachments. All poles and attachments shall be structurally designed to support two 12-foot mast arms and luminaires. Poles shall be supplied with mast arm combinations as shown in the plans. All mast arms shall be designed for a 60-pound luminaire having an effective projected area of 1.6 square feet.
   d. Anchor Bolt Assembly. Anchor bolt assemblies for optionally designed poles shall be the same as those shown herein.

5. Aluminum Pole Designs. Aluminum pole designs may be allowed, if aluminum poles are permitted or required, pending approval by the Department as outlined below.

   a. Meet all of the requirements stated above for optional steel pole designs and the following:
      1. Aluminum poles shall be fabricated in accordance with "Structural Welding Code-Aluminum" AWS D1.2.
      2. Aluminum pole designs shall use the same anchor bolt assembly and be subject to the same geometric restraints and other requirements for steel poles specified herein.
      3. Aluminum poles shall be equipped with vibration mitigation devices, as approved by the engineer.
      4. Pole components shall be constructed using the following material:
         Shaft: ASTM B221 or B241 Alloy 6063-T6, ASTM B209 Alloy 5086-H34, ASTM B221 Alloy 6005-T5.
         Base Flange: ASTM B26 Alloy 356.0-T6 or ASTM B108 Alloy 356.0-T6 (Yield strength test required).
         Mast Arm Fitting: ASTM B209 Alloy 6061-T6 or ASTM B221 Alloy 6005-T5.
         Mast Arms: ASTM B241 Alloy 6061-T6 or Alloy 6063-T6.
         Pole Cap: ASTM B209 Alloy 5086-H32 or ASTM B108 or B26 Alloy 356.0-T6.
         Bolts: Stainless Steel AISI 300 series. Bolts threading into aluminum threads shall be treated with anti-seize compound, Never-Seez Compound, Permatex 133K or equal.

6. Special Designs. Poles with architectural treatments shall meet the requirements shown elsewhere in the plans.

7. Luminaire Mounting Height. Actual luminaire mounting height shall be the nominal mounting height given on RIP(2) for all pole-arm combinations except for poles with 4 ft. luminaire arms, which shall be 3'-0" lower than the nominal height, unless otherwise shown or directed.

EXPLANATION OF ROADWAY ILLUMINATION ASSEMBLY DESIGNATIONS

(TYPE SA 50 T - X - X) (400W EQ) LED

SA: Pole and mast arm may be steel or aluminum.
ST: Pole and mast arm must be steel.
AL: Pole and mast arm must be aluminum.
SP: Special (ovalized) steel or aluminum pole for installing on CSB or SSCB. See standard sheet CSB (4), or SSCB (4).

Two numerical digits denote nominal mounting height in feet.

Next letter denotes type of base, (S-Shoe Base, T-Transformer Base, or B-Bridge/Ret.Wall Mount)

First number denotes length of mast arm in feet.

Use of second mast arm is indicated by second dashed number which denotes length in feet.

Luminaire rating in watts (i.e. 400W). Equivalent wattage LED fixtures will include EQ (i.e. 400W EQ)

Last letters indicate light source (S - High Pressure Sodium; LED - LED luminaire)

STATE OF TEXAS
VICTOR M. IRACHETA
84689
LICENSED
PROFESSIONAL ENGINEER

08/27/2021

SHEET 1 OF 4

Texas Department of Transportation

Traffic Safety Division Standard

ROADWAY ILLUMINATION POLES

RIP(1)-19

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	BWD	STEPHENS		165

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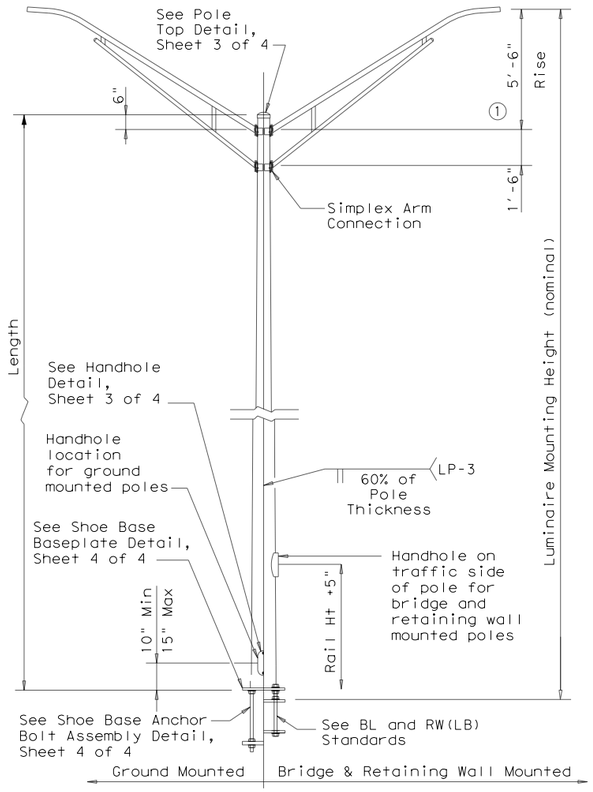
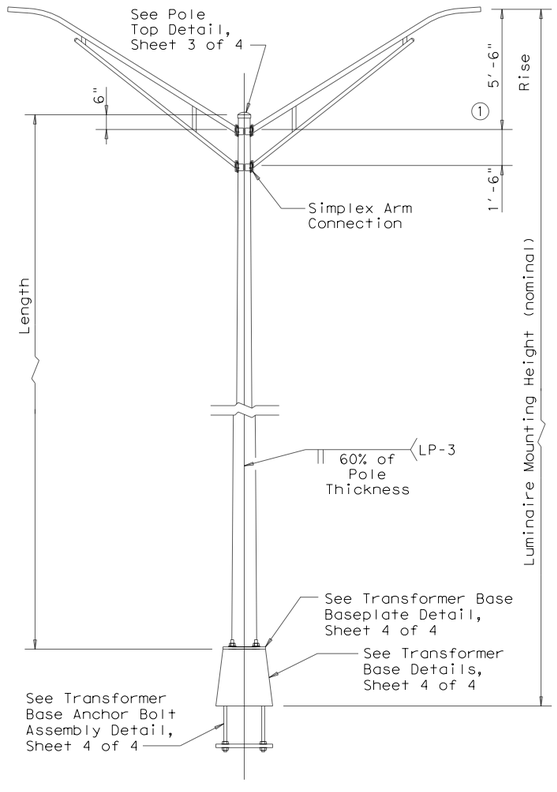


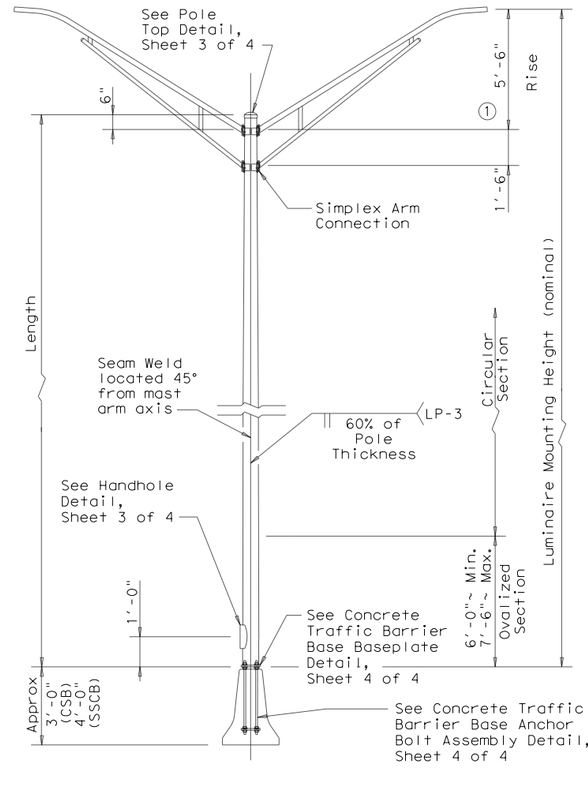
SHOE BASE POLE

SHOE BASE POLE					
Luminaire Mounting Height (Nominal) (ft)	Base Diameter (in)	Top Diameter (in)	Length (ft)	Pole Thickness (in)	Design Moment (K-ft)
20.00	7.00	4.90	15.00	0.1196	7.1
30.00	7.50	4.00	25.00	0.1196	13.2
31.00-39.00	8.00	4.36-3.24	26.00-34.00	0.1196	20.7
40.00	8.50	3.60	35.00	0.1196	20.7
50.00	10.50	4.20	45.00	0.1196	30.3



TRANSFORMER BASE POLE

TRANSFORMER BASE POLE					
Luminaire Mounting Height (Nominal) (ft)	Base Diameter (in)	Top Diameter (in)	Length (ft)	Pole Thickness (in)	Design Moment (K-ft)
20.00	7.00	5.11	13.50	0.1196	7.1
30.00	7.50	4.21	23.50	0.1196	13.2
31.00-39.00	8.00	4.57-3.45	24.50-32.50	0.1196	20.7
40.00	8.50	3.81	33.50	0.1196	20.7
50.00	10.00	3.91	43.50	0.1196	30.3



CONCRETE TRAFFIC BARRIER BASE POLE

CONCRETE TRAFFIC BARRIER BASE POLE (CSB/SSCB)						
Luminaire Mounting Height (Nominal) (ft)	Base ② Diameter (in)	Top Diameter (in)	Length (ft)	Pole Thickness (in)	Design Moment (K-ft)	
					About ℄ of Rail	Perp. to Rail
28.00	9.00	5.78	23.00	0.1196	10.3	13.2
38.00	9.00	4.38	33.00	0.1196	16.6	20.8
48.00	10.50	4.48	43.00	0.1345	25.1	30.5

MATERIAL DATA		
COMPONENT	ASTM DESIGNATION	MIN. YIELD (ksi)
Pole Shaft (0.14"/ft. Taper)	A572 Gr 50, A595 Gr A, A1011 HSLAS Gr 50 Cl 2 ③, or A1008 HSLAS Gr 50 Cl 2	50
Base Plate and Handhole Frame	A572 Gr.50, or A36	36
T-Base Connecting Bolts	F3125 Gr A325	92
Anchor Bolts	F1554 Gr 55, A193-B7 or A321	55 105
Anchor Bolt Templates	A36	36
Heavy Hex (H.H.) Nuts	A194 Gr 2H, or A563 Gr DH	
Flat Washers	F436	

NOTES:

① 2'-6" rise for 4 ft. luminaire arms.

② Before ovalized as shown on Concrete Traffic Barrier Base Baseplate details, Sheet 4 of 4.

③ A1011 SS Gr 50 may be used instead of HSLAS, provided the material meets the elongation requirements for HSLAS.

POLE ASSEMBLY FABRICATION TOLERANCES TABLE	
DIMENSION	TOLERANCE
Shaft length	+1"
I.D. of outside piece of slip fitting pieces	+1/8", -1/16"
O.D. of inside piece of slip fitting pieces	+1/32", -1/8"
Shaft diameter: other	+3/16"
Out of "round"	1/4"
Straightness of shaft	±1/4" in 10 ft
Twist in multi-sided shaft	4° in 50 ft
Perpendicular to baseplate	1/8" in 24"
Pole centered on baseplate	±1/4"
Location of Attachments	±1/4"
Bolt hole spacing	±1/16"

GENERAL NOTES:

1. Designs conform to AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals , 6th Edition (2013) and Interim Revisions thereto. Design 3-Second Gust Wind Speed equals 110 mph with a 1.14 gust factor. A wind importance factor of 0.80 is applied to adjust the wind speed to a 25 year recurrence interval. Design moments listed in tables assume base of pole is 25' above natural ground level.
2. Structures are designed to support two 12' luminaire mast arms and luminaires. Mast arms are designed to support a 60-pound luminaire having an effective projected area of 1.6 square feet.
3. Fabrication shall be in accordance with the Specifications and with the details, dimensions, and weld procedures shown herein. Do not submit shop drawings for roadway illumination pole assemblies fabricated in accordance with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. Materials, fabrication tolerances, and shipping practices shall meet the requirements of these sheets and the Specifications. In the absence of specified fabrication tolerances, dimensions shall be within the tolerances generally obtainable in normal fabrication practice.
4. For mounting heights between values shown in the tables, use base diameter and thickness values for the larger height.
5. Unless otherwise noted, all steel parts shall be galvanized in accordance with Item 445, "Galvanizing."
6. Steel poles shall be fabricated in accordance with Item 441, "Steel Structures." Longitudinal seam welds for pole sections shall have 60% minimum penetration. All welding shall be in accordance with AWS D1.1, Structural Welding Code-Steel.
7. Two-section poles joined by circumferential welds will not be permitted, unless otherwise shown on the plans. Poles may be fabricated in two sections and field-assembled by the lap-joint method. The two sections shall telescope together with a lap length of not less than 1-1/2 times the shaft diameter at the lap joint.
8. Alternate material equal to or better than material specified may be substituted with the approval of the Engineer.
9. Lubricate and tighten anchor bolts, when erecting shoe base poles and concrete traffic barrier base poles, in accordance with Item 449, "Anchor Bolts."
10. All poles, except Transformer Base Poles, shall have hand holes with reinforcing frames and covers. For ground mounted shoe base poles, hand holes shall be placed 90 degrees to mast arm unless otherwise noted on the plans. For poles mounted on a concrete traffic barrier with one luminaire arm, hand holes shall be located 180 degrees from luminaire arm. For poles mounted on a concrete traffic barrier with two luminaire arms, all hand holes shall be on the same side of the barrier. For poles mounted on a bridge lighting bracket or a retaining wall lighting bracket, hand hole shall be on traffic side of the pole, at a height that will clear the barrier.
11. The finished pole shall have a smooth, uniform finish free of pits, blisters, or other defects. Scratched, chipped, and other damaged galvanized areas on poles and mast arms shall be repaired in accordance with Item 445, "Galvanizing."
12. Pole length is based on a 5'-6" luminaire arm rise. 4 ft. luminaire arms have a 2'-6" rise. A pole with 4 ft. luminaire arms will have an actual mounting height 3'-0" less than the nominal mounting height. Increasing the pole length to meet the nominal mounting height is allowed, but unnecessary unless otherwise directed by the engineer.
13. Erect transformer base poles in accordance with sheet RID(1).

Texas Department of Transportation

Traffic Safety Division Standard

ROADWAY ILLUMINATION POLES

RIP(2)-19

FILE: rip-19.dgn	DN:	CK:	DW:	CK:
©TxDOT January 2007	CONT	SECT	JOB	HIGHWAY
REVISIONS	3469	01	014	FM 3099
7-17	DIST	COUNTY		SHEET NO.
12-19	BWD	STEPHENS		166

73B

DATE: 8/27/2021
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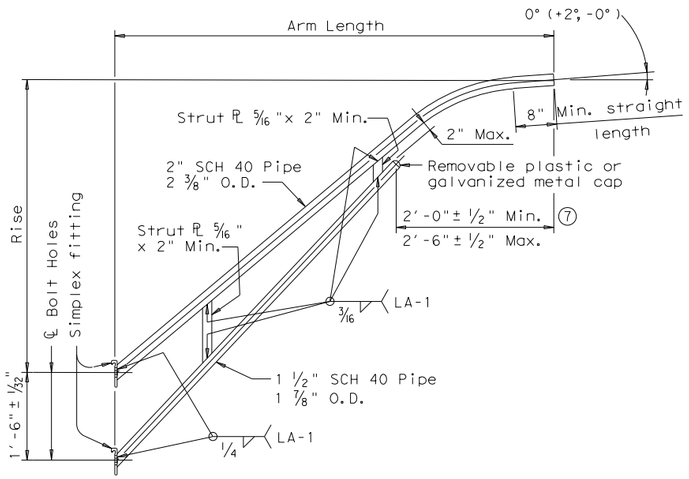
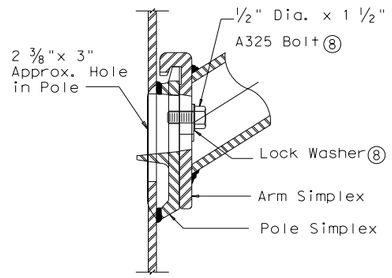


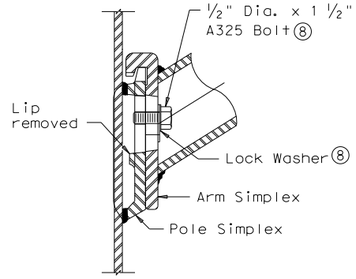
LUMINAIRE ARM

LUMINAIRE ARM DIMENSIONS		
Nominal Arm Length	Arm Length	Rise
4'-0"	3'-6"	2'-6"
6'-0"	5'-6"	5'-6"
8'-0"	7'-6"	5'-6"
10'-0"	9'-6"	5'-6"
12'-0"	11'-6"	5'-6"

ARM ASSEMBLY FABRICATION TOLERANCES TABLE	
DIMENSION	TOLERANCE
Arm Length	±1"
Arm Rise	±1"
Deviation from flat	1/8" in 12"
Spacing between holes	±1/32"

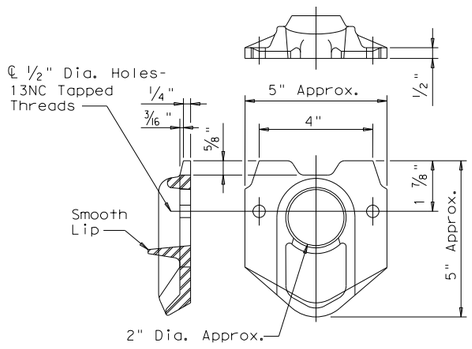


UPPER SIMPLEX FITTING
(Gusset not shown for clarity)

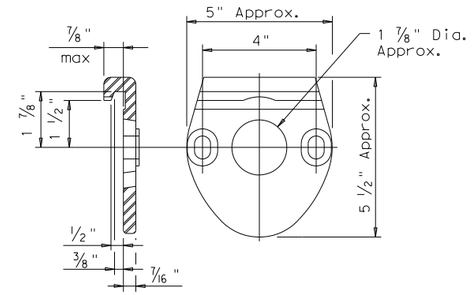


LOWER SIMPLEX FITTING
(Gusset not shown for clarity)

SECTION B-B



POLE SIMPLEX DETAIL ⑨



ARM SIMPLEX DETAIL ⑨

NOTES:

④ Any of the materials listed for plates may be used where the drawings do not specify a particular ASTM designation.

⑤ A576 must be suitable for forging and also meet minimum tensile strength of 65 ksi, minimum yield of 35 ksi, and elongation in 2 inches of 22 percent.

⑥ A572, A1008 HSLAS-F, and A1011 HSLAS-F materials may have higher yield strengths but shall not have less elongation than the grade indicated.

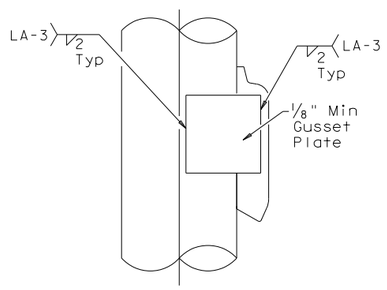
⑦ Dimensional limits are given to show acceptable variation in design. All of a Fabricator's production of a particular arm length shall have the same dimensions within specified tolerances.

⑧ Each pole simplex fitting shall be supplied with 2 bolts and 2 lock washers of the size specified. The bolts and lock washers shall be secured to the pole with the other hardware items called for in the plans.

⑨ Proposed deviations in arm simplex dimensions or materials must be submitted to the Department for approval.

⑩ A welded handhole frame is permissible. Maximum of two (2) CJP weld splices is allowed.

MATERIALS	
Pole or Arm Simplex	ASTM A27 Gr 65-35 or Gr 70-36, A148 Gr 80-50, A576 Gr 1021 ⑤, or A36 (Arm only)
Arm Pipes	ASTM A53 Gr A or B, A500 Gr B, A501, A 1008 HSLAS-F Gr 50 ⑥, or A1011 HSLAS-F Gr 50 ⑥
Arm Struts and Gusset Plates ④	ASTM A36, A572 Gr 50 ⑥, or A588
Misc.	ASTM designations as noted



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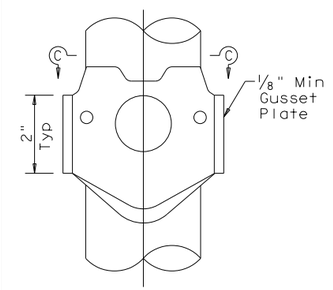

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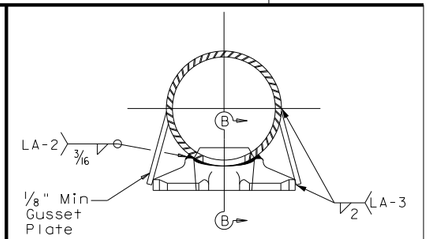
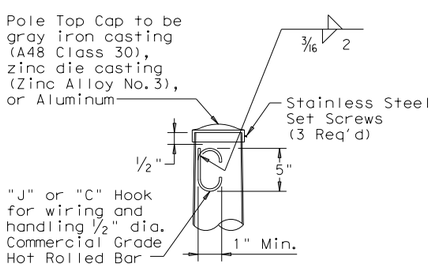
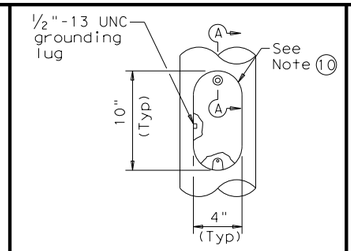


SECTION C-C

SIMPLEX ATTACHMENT DETAIL



POLE TOP



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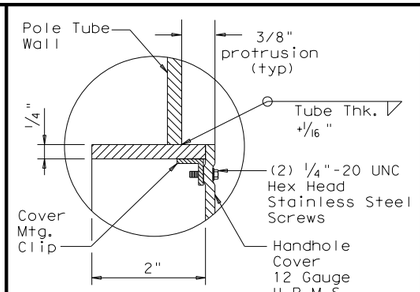

SECTION A-A

HANDHOLE

SHEET 3 OF 4

Texas Department of Transportation

Traffic Safety Division Standard

ROADWAY ILLUMINATION POLES

RIP(3)-19

FILE: rip-19.dgn	DN:	CK:	DW:	CK:
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REVISIONS	3469	01	014	FM 3099
7-17	DIST	COUNTY		SHEET NO.
12-19	BWD	STEPHENS		167

73C

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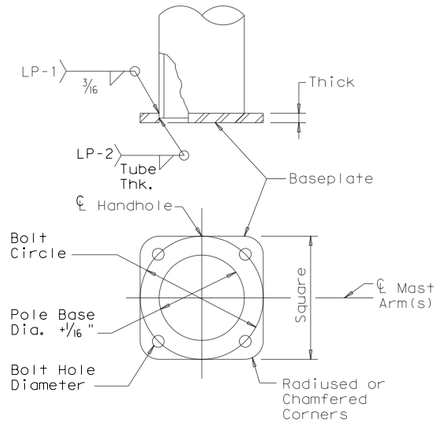
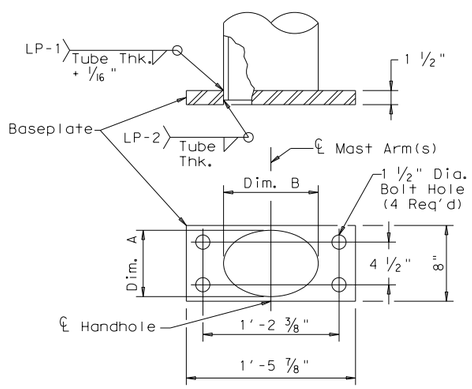


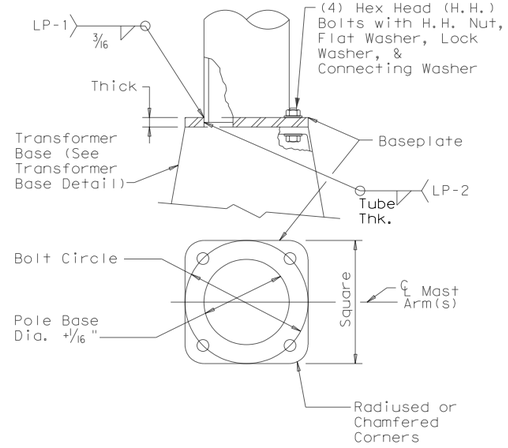
SHOE BASE BASEPLATE

SHOE BASE BASEPLATE TABLE				
MOUNTING HEIGHTS (nominal)	BOLT CIRCLE	SQUARE	THICK	BOLT HOLE DIAMETER
20′ - 39′	13"	13"	1 1/4"	1 1/4"
40′	15"	15"	1 1/4"	1 1/2"
50′	15"	15"	1 1/2"	1 1/2"



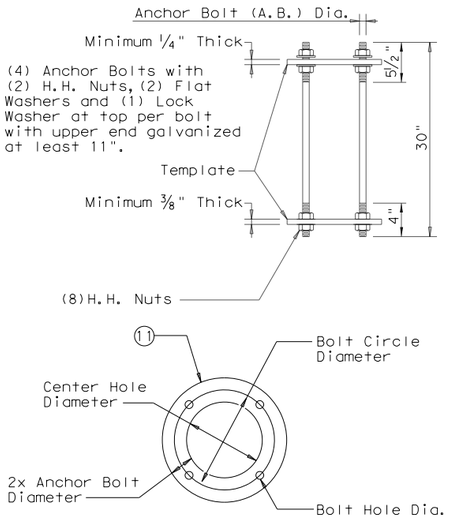
CONCRETE TRAFFIC BARRIER BASE BASEPLATE

CONCRETE TRAFFIC BARRIER BASE BASEPLATE TABLE			
MOUNTING HEIGHTS (nominal)	POLE DIA.(12)	DIM. A	DIM. B
28′ - 38′	9"	7"± 1/4"	10"± 1/4"
48′	10 1/2"	7"± 1/4"	13"± 1/4"



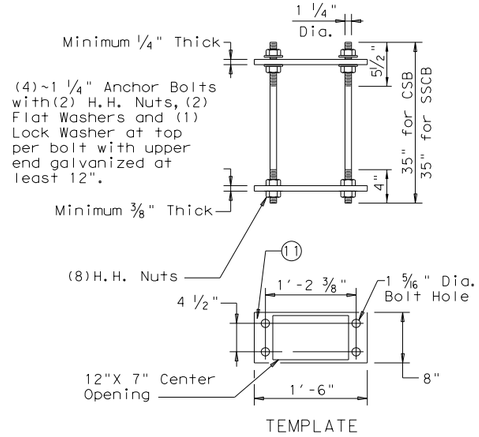
TRANSFORMER BASE BASEPLATE

TRANSFORMER BASE BASEPLATE TABLE						
MOUNTING HEIGHTS (nominal)	BOLT CIRCLE	SQUARE	THICK	CONNECTING BOLT DIA.	BOLT HOLE DIAMETER	TRANSFOMER BASE TYPE
20′ - 39′	13"	13"	1 1/4"	1"	1 1/4"	A
40′	15"	15"	1 1/4"	1 1/4"	1 1/2"	B
50′	15"	15"	1 1/2"	1 1/4"	1 1/2"	B



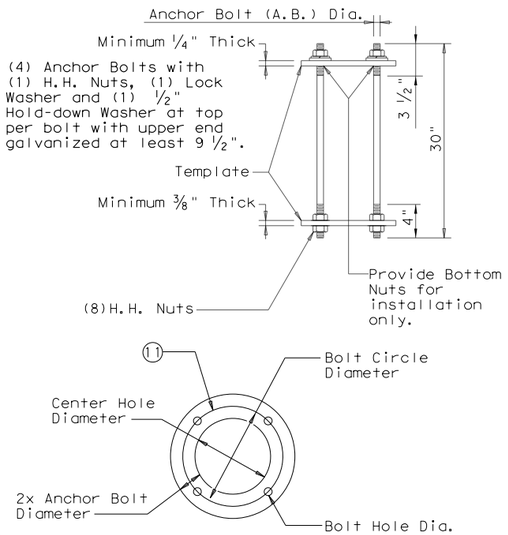
SHOE BASE ANCHOR BOLT ASSEMBLY

SHOE BASE ANCHOR BOLT ASSEMBLY TABLE				
MOUNTING HEIGHTS (nominal)	A.B. Dia.	BOLT CIRCLE DIAMETER	CTR. HOLE DIAMETER	BOLT HOLE DIAMETER
20′-39′	1"	13"	11"	1 1/16"
40′-50′	1 1/4"	15"	12 1/2"	1 5/16"



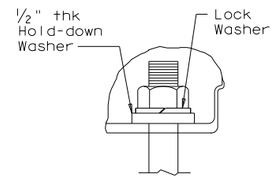
CONCRETE TRAFFIC BARRIER BASE ANCHOR BOLT ASSEMBLY

TRANSFORMER BASE ANCHOR BOLT ASSEMBLY TABLE				
MOUNTING HEIGHTS (nominal)	A.B. Dia.	BOLT CIRCLE DIAMETER	CTR. HOLE DIAMETER	BOLT HOLE DIAMETER
20′- 39′	1"	14"	12"	1 1/16"
40′- 50′	1 1/4"	17 1/4"	14 3/4"	1 5/16"

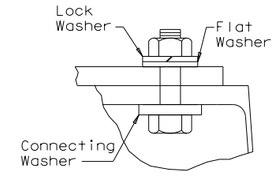


TRANSFORMER BASE ANCHOR BOLT ASSEMBLY

TRANSFORMER BASE TABLE		
TYPE	TOP B.C.	BTM. B.C.
A	13"	14"
B	15"	17 1/4"



DETAIL A



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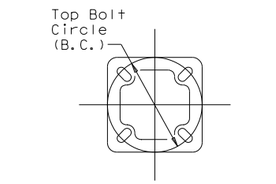
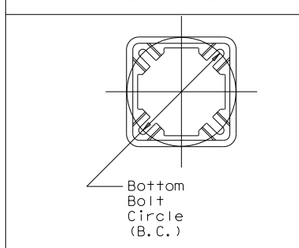
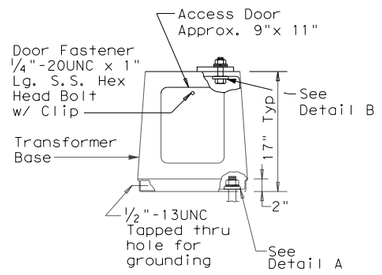


TOP PLAN



BOTTOM PLAN



ELEVATION

TRANSFORMER BASE DETAILS

GENERAL NOTES:

1. For mounting heights between those shown in the table, use the values in the table for the larger mounting height.
2. All breakaway bases shall meet the breakaway requirements of the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 6th Edition (2013) and Interim Revisions thereto, and shall have been tested by FHWA-approved methods. All bases shall have been structurally tested to resist 150% of the design moment.
3. Transformer bases shall be cast from aluminum, ASTM B108 or B26 Alloy 356.0-T6, or other material approved by the Engineer. Four Hex Head (H.H.) bolts with four H.H. nuts, four lock washers, four flat washers, and connecting and hold-down washers as recommended by the manufacturer, galvanized to ASTM A153 Class C or D, or B695 Class 50, shall be provided with each transformer base for connecting the pole. Bolts shall be ASTM A325 or approved equal. Nuts shall be ASTM A563 grade DH galvanized.
4. Bases shall be stamped, incised or by other approved permanent means, marked to show fabricator's name or logo, and model number. Such information shall be placed in a readily seen location, inside or outside the base, but shall not be placed on the door.
5. Doors for transformer bases shall be made of plastic, fiberglass or other non-metallic material approved by the Engineer and shall be attached with stainless steel screws or bolts. Transformer bases shall be cleaned by grit blast cleaning after heat treatment. Certification by the manufacturer of heat treatment shall be furnished with transformer bases. The certification shall show the metal alloy and temper and that the base meets those requirements, chemical and physical. The certification shall also show the material ASTM specification. Transformer bases shall be cast with a removable tab bar for material testing. Some bars may have been removed by the manufacturer for testing.

NOTES:

(11) Anchor Bolt Templates do not need to be galvanized.

(12) Pole diameter before ovalized.

ANCHOR BOLT FABRICATION TOLERANCES TABLE	
DIMENSION	TOLERANCE
Length	± 1/2"
Threaded length	± 1/2"
Galvanized length (if required)	- 1/4"

Texas Department of Transportation

Traffic Safety Division Standard

ROADWAY ILLUMINATION POLES

RIP(4)-19

FILE: rip-19.dgn	DN:	CK:	DW:	CK:
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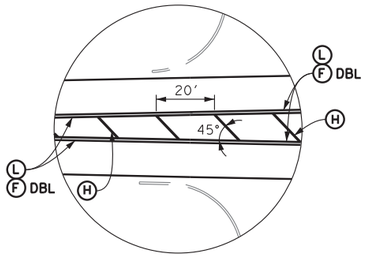
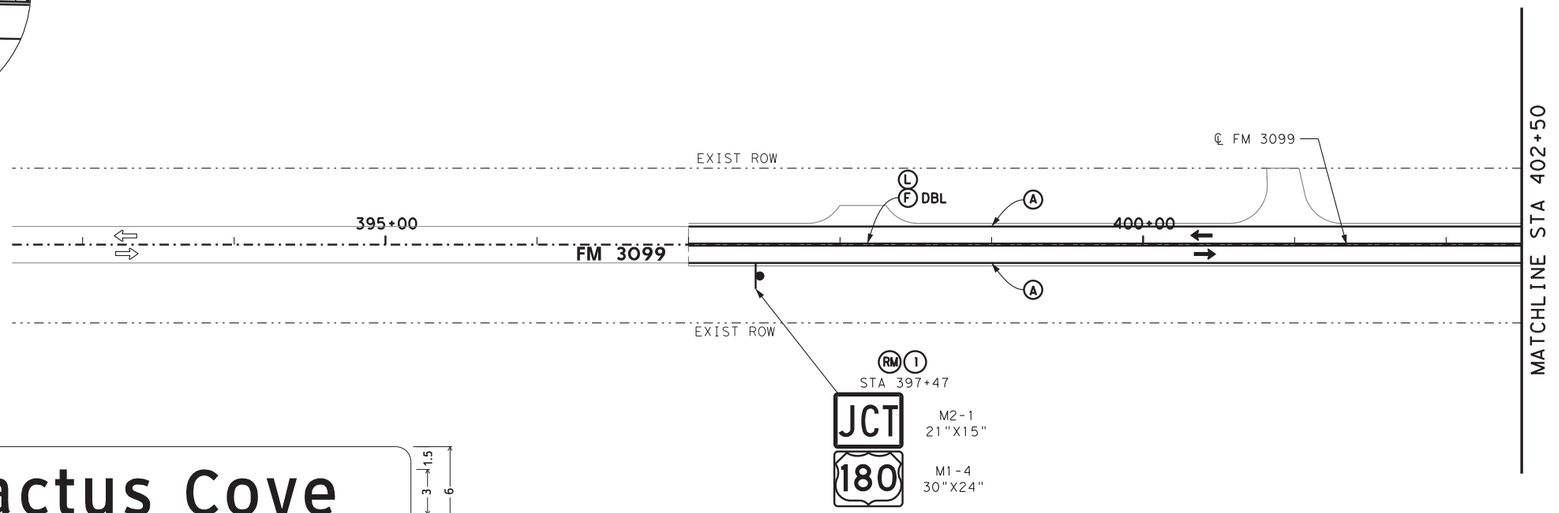
REVISIONS 7-17 12-19	3469	01	014	FM 3099
	DIST	COUNTY		SHEET NO.
	BWD	STEPHENS		168

730

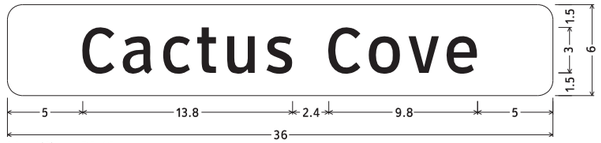
100% SUBMITTAL



GORE DETAIL



Cactus Cove



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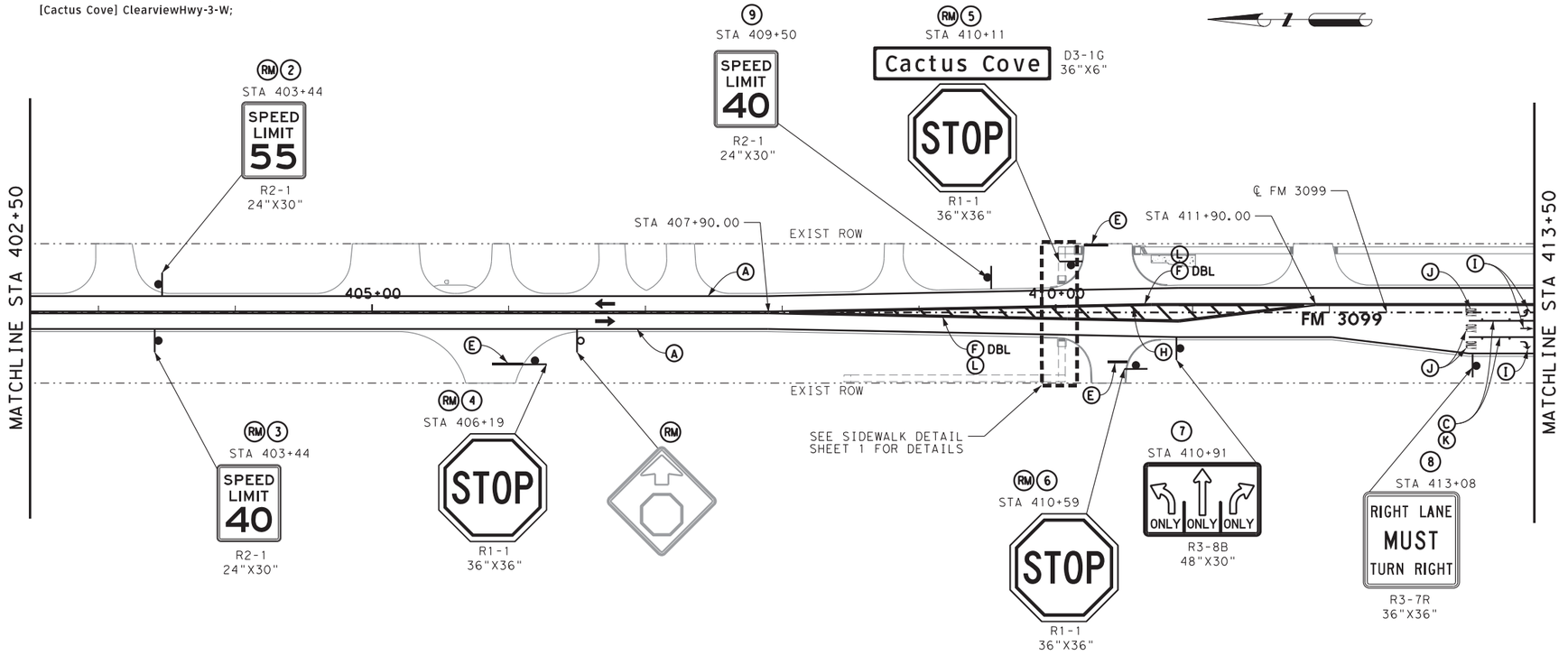

LEGEND

- (A) RE PM W/RET REQ TY I (W)4"(SLD)(100 MIL)
- (B) RE PM W/RET REQ TY I (W)4"(BRK)(100 MIL)
- (C) REFL PAV MRK TY I (W)8"(SLD)(100 MIL)
- (D) REFL PAV MRK TY I (W)12"(SLD)(100 MIL)
- (E) REFL PAV MRK TY I (W)24"(SLD)(100 MIL)
- (F) RE PM W/RET REQ TY I (Y)4"(SLD)(100 MIL)
- (G) RE PM W/RET REQ TY I (Y)4"(BRK)(100 MIL)
- (H) REFL PAV MRK TY I (Y)12"(SLD)(100 MIL)
- (I) REFL PAV MRK TY I (W)(ARROW)(100 MIL)
- (J) REFL PAV MRK TY I (W)(WORD)(100 MIL)
- (K) REFL PAV MRKR TY I-C
- (L) REFL PAV MRKR TY II-A-A
- (M) PREFORMED CENTERLINE RUMBLE STRIP
- (#) PROP SMALL SIGN
- (RM) EXIST SMALL SIGN TO BE REMOVED
- EXIST SMALL POST
- PROP SMALL POST
- PROP WHITE BRF GF2 DELINEATOR
- OBJECT MARKER (OM-2Y)
- EXIST TRAFFIC FLOW
- PROP TRAFFIC FLOW

0 50 100 200

SCALE: 1"=100'H

NO.	REVISION	BY	DATE

STATE OF TEXAS
VICTOR M. IRACHETA
84689
LICENSED PROFESSIONAL ENGINEER

08/27/2021

ENTECH CIVIL ENGINEERS, INC
F-6932
15021 Katy Freeway, Suite 500
Houston, Texas, 77094
281-945-0069 PH
281-945-0081 FX

Texas Department of Transportation®

FM 3099 REALIGNMENT

SIGNING AND PAVEMENT MARKINGS LAYOUT BEGIN PROJECT TO STA 413+50

SHEET 1 OF 3

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
06	SEE TITLE SHEET		169
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

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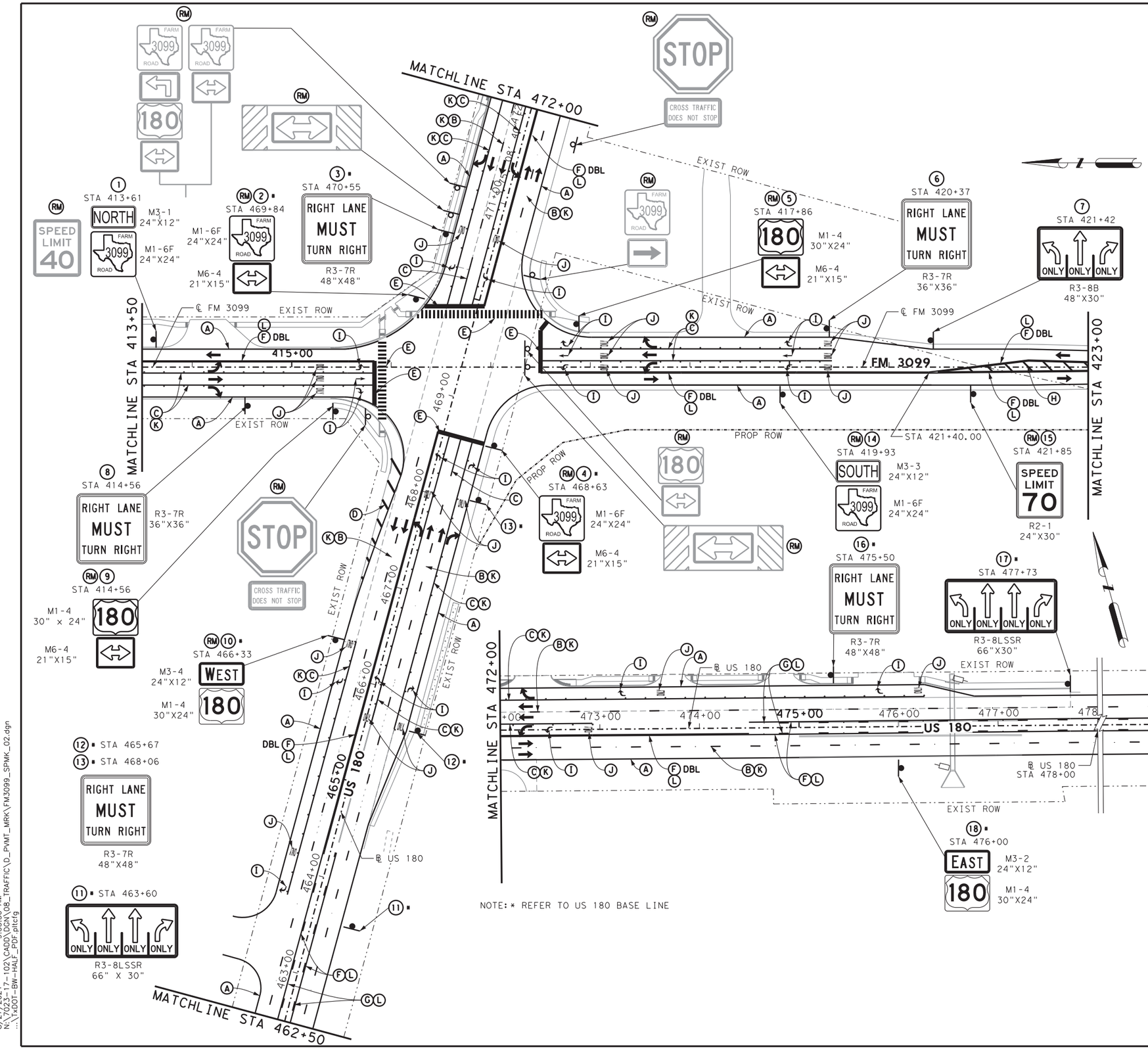

LEGEND

- (A) RE PM W/RET REQ TY I (W)4"(SLD)(100 MIL)
- (B) RE PM W/RET REQ TY I (W)4"(BRK)(100 MIL)
- (C) REFL PAV MRK TY I (W)8"(SLD)(100 MIL)
- (D) REFL PAV MRK TY I (W)12"(SLD)(100 MIL)
- (E) REFL PAV MRK TY I (W)24"(SLD)(100 MIL)
- (F) RE PM W/RET REQ TY I (Y)4"(SLD)(100 MIL)
- (G) RE PM W/RET REQ TY I (Y)4"(BRK)(100 MIL)
- (H) REFL PAV MRK TY I (Y)12"(SLD)(100 MIL)
- (I) REFL PAV MRK TY I (W)(ARROW)(100 MIL)
- (J) REFL PAV MRK TY I (W)(WORD)(100 MIL)
- (K) REFL PAV MRKR TY I-C
- (L) REFL PAV MRKR TY II-A-A
- (M) PREFORMED CENTERLINE RUMBLE STRIP
- (#) PROP SMALL SIGN
- (RM) EXIST SMALL SIGN TO BE REMOVED
- EXIST SMALL POST
- PROP SMALL POST
- PROP WHITE BRF GF2 DELINEATOR
- OBJECT MARKER (OM-2Y)
- EXIST TRAFFIC FLOW
- PROP TRAFFIC FLOW

0 50 100 200

SCALE: 1"=100'H

NO.	REVISION	BY	DATE

STATE OF TEXAS
VICTOR M. IRACHETA
84689
LICENSED PROFESSIONAL ENGINEER

08/27/2021

ENTECH CIVIL ENGINEERS, INC
F-6932
15021 Katy Freeway, Suite 500
Houston, Texas, 77094
281-945-0069 PH
281-945-0081 FX

FM 3099 REALIGNMENT

SIGNING AND PAVEMENT MARKINGS LAYOUT STA 413+50 TO STA 423+00

SHEET 2 OF 3

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
06	SEE TITLE SHEET		170
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

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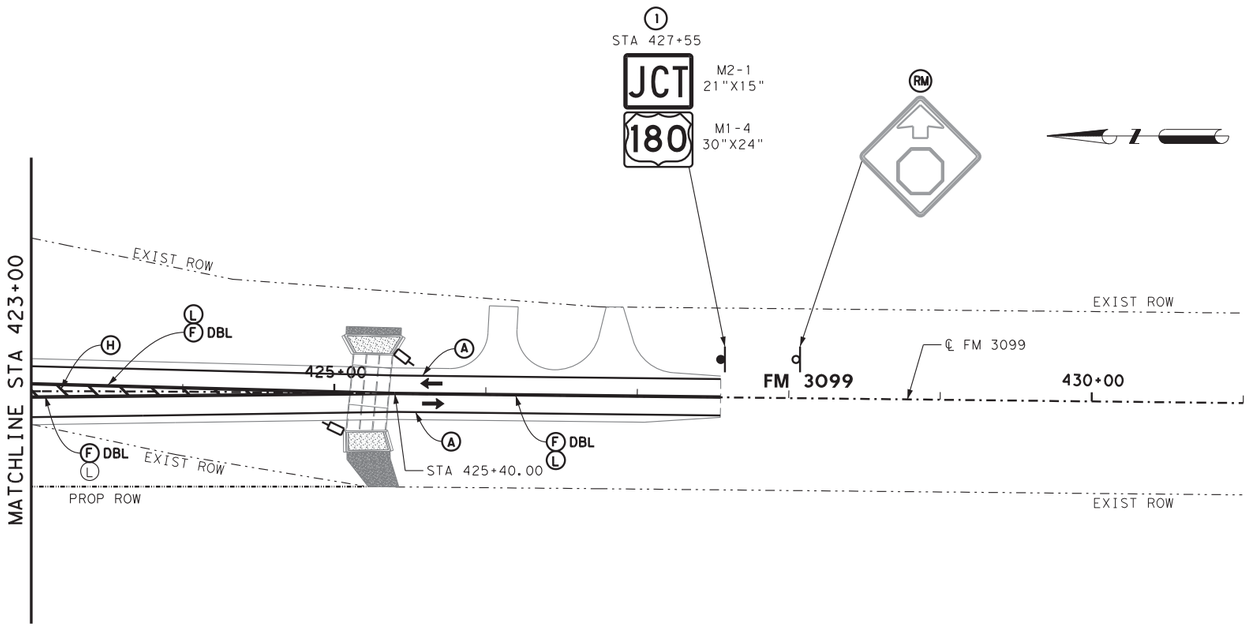

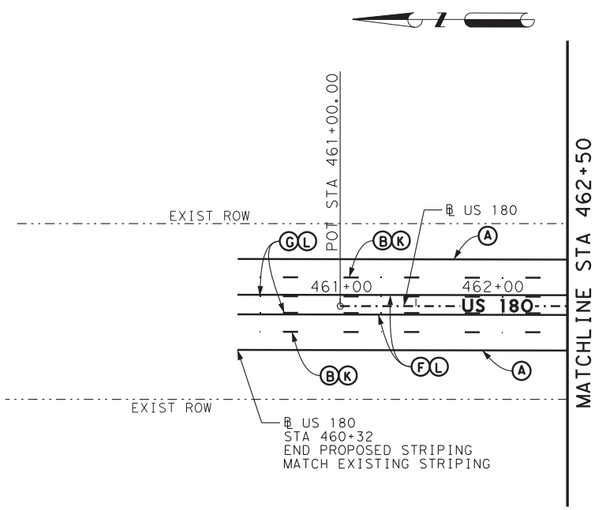

LEGEND

- (A) RE PM W/RET REQ TY I (W)4"(SLD)(100 MIL)
- (B) RE PM W/RET REQ TY I (W)4"(BRK)(100 MIL)
- (C) REFL PAV MRK TY I (W)8"(SLD)(100 MIL)
- (D) REFL PAV MRK TY I (W)12"(SLD)(100 MIL)
- (E) REFL PAV MRK TY I (W)24"(SLD)(100 MIL)
- (F) RE PM W/RET REQ TY I (Y)4"(SLD)(100 MIL)
- (G) RE PM W/RET REQ TY I (Y)4"(BRK)(100 MIL)
- (H) REFL PAV MRK TY I (Y)12"(SLD)(100 MIL)
- (I) REFL PAV MRK TY I (W)(ARROW)(100 MIL)
- (J) REFL PAV MRK TY I (W)(WORD)(100 MIL)
- (K) REFL PAV MRKR TY I-C
- (L) REFL PAV MRKR TY II-A-A
- (M) PREFORMED CENTERLINE RUMBLE STRIP
- (#) PROP SMALL SIGN
- (RM) EXIST SMALL SIGN TO BE REMOVED
- EXIST SMALL POST
- PROP SMALL POST
- PROP WHITE BRF GF2 DELINEATOR
- OBJECT MARKER (OM-2Y)
- EXIST TRAFFIC FLOW
- PROP TRAFFIC FLOW

0 50 100 200

SCALE: 1"=100'H

NO.	REVISION	BY	DATE

STATE OF TEXAS
VICTOR M. IRACHETA
84689
LICENSED PROFESSIONAL ENGINEER

08/27/2021

ENTECH
CIVIL ENGINEERS, INC
F-6932
15021 Katy Freeway,
Suite 500
Houston, Texas, 77094
281-945-0069 Ph
281-945-0081 Fx

Texas Department of Transportation®

FM 3099 REALIGNMENT

SIGNING AND PAVEMENT MARKINGS LAYOUT STA 423+00 TO END PROJECT

SHEET 3 OF 3

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
06	SEE TITLE SHEET		171
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

SHernandez
8/27/2021 9:55:54 AM
N:\7023-17-102\CADD\DGN\08_TRAFFIC\0_PVMT_MRK\FM3099_SPMK_03.dgn
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DATE: 8/27/2021
FILE: N:\7023-17-102\CADD\DGN\08_TRAFFIC\C_SIGNING\StdDetails\013\tsr3-13.dgn

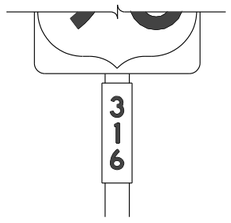
REQUIREMENTS FOR INDEPENDENT MOUNTED ROUTE SIGNS

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

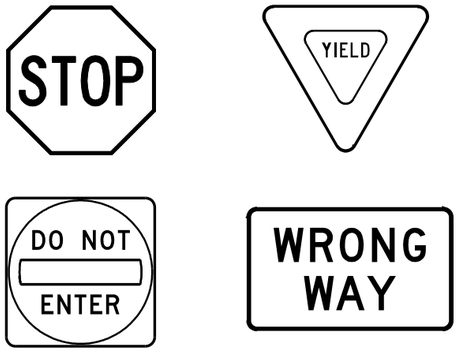
TSR(3)-13

FILE: tsr3-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	3469	01	014	FM 3099
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	BWD	STEPHENS		172

DATE: 8/27/2021
FILE: N:\7023-17-102\CADD\DGN\08_TRAFFIC\C_SIGNING\StdDetails\013\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

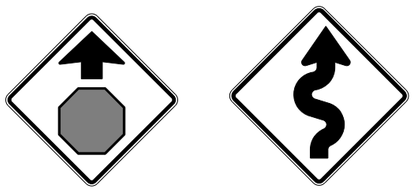
REQUIREMENTS FOR WHITE BACKGROUND REGULATORY SIGNS

(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

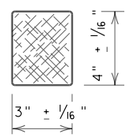
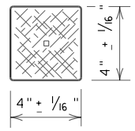
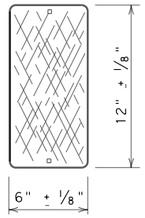
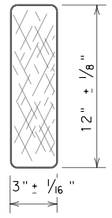
TYPICAL SIGN REQUIREMENTS

TSR(4)-13

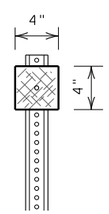
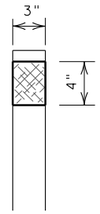
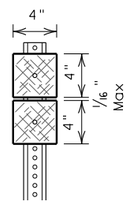
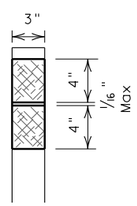
FILE: tsr4-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	3469	01	014	FM 3099
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	BWD	STEPHENS		173

4

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

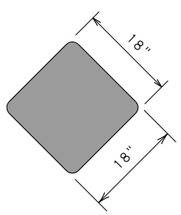
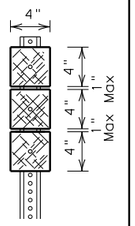
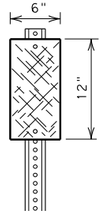
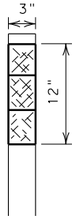
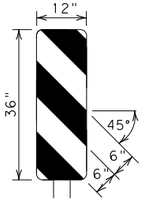
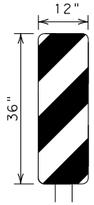
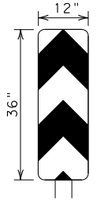
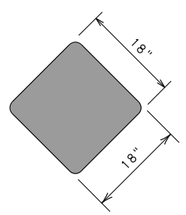
NUMBER OF REFLECTORS OR DIRECTION
X = 3-Size 2 reflector units (Type 2 only)
Y = 1-Size 3 reflector unit (Type 2 only)
Z = 3-Size 1 or 1-Size 4 reflector unit(s)(Type 2 only)
L = Left Side (Type 3 Object Marker only)
R = Right Side (Type 3 Object Marker only)
C = Center (Type 3 Object Marker only)

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

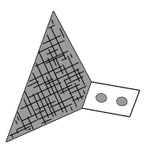
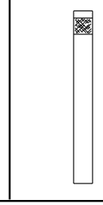
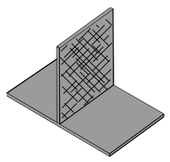
OBJECT MARKERS

	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

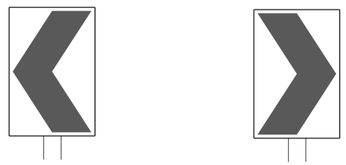
FLEXIBLE DELINEATOR & OBJECT MARKER POSTS (EMBEDDED & SURFACE MOUNT TYPES)	DMS-4400
SIGN FACE MATERIALS	DMS-8300
DELINEATORS, OBJECT MARKERS AND BARRIER REFLECTORS	DMS-8600

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



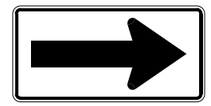
W1-8

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	3469	01	014	FM 3099
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	BWD	STEPHENS		174

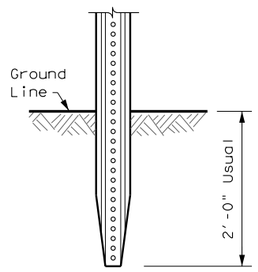
20A

DATE: 8/27/2021 9:55:58 AM
FILE: dom1-20.dgn

POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

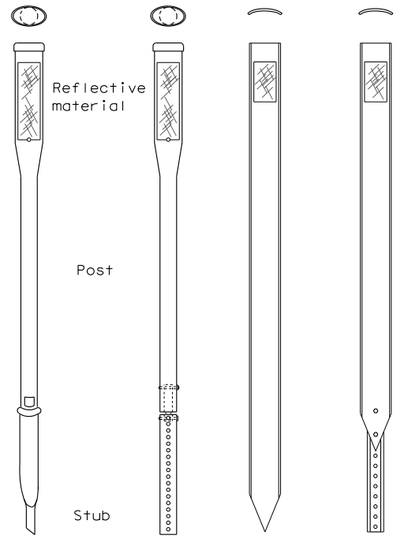


NOTES

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.

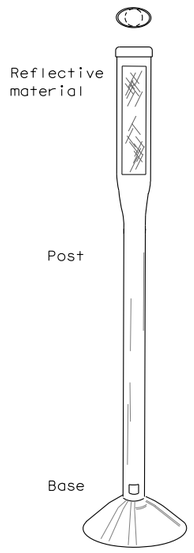
FLEXIBLE POSTS (YFLX, WFLX)

GND



EMBEDDED

SRF



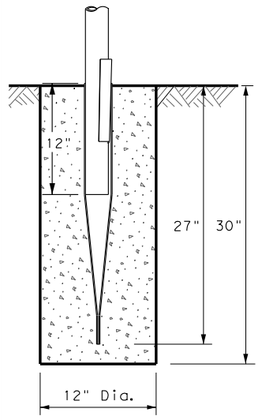
SURFACE MOUNT

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.

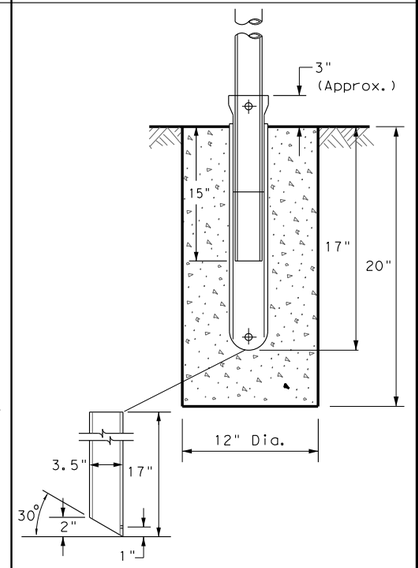
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

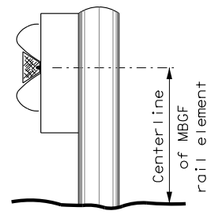
NOTE

1. Install per manufacturer's recommendations.

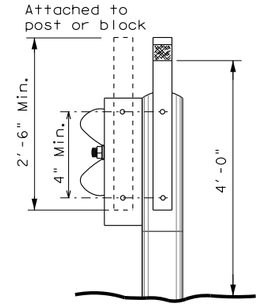
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

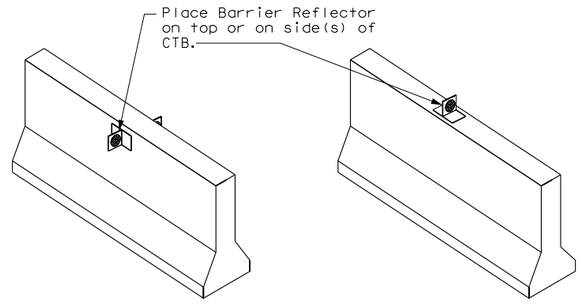
GF1



GF2



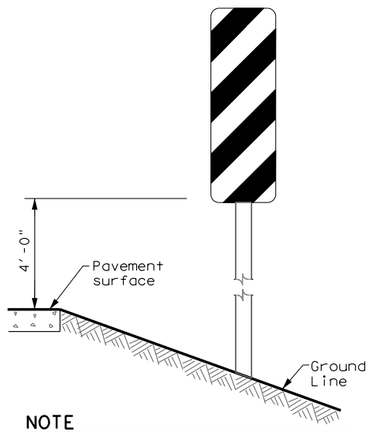
CONCRETE TRAFFIC BARRIER (CTB)



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.

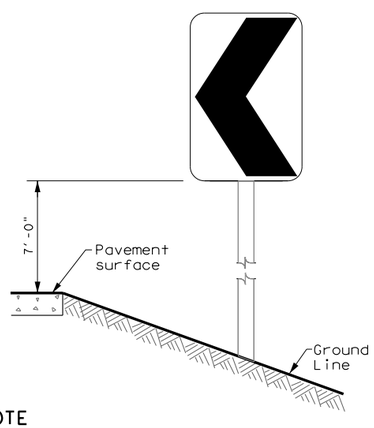
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



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)

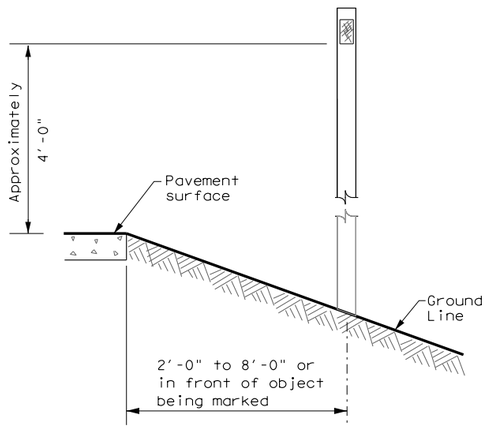
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



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.

Texas Department of Transportation — Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER INSTALLATION

D & OM(2)-20

FILE: dom2-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	3469	01	014	FM 3099
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	BWD	STEPHENS		175

20B

DATE: 8/27/2021 9:55:59 AM
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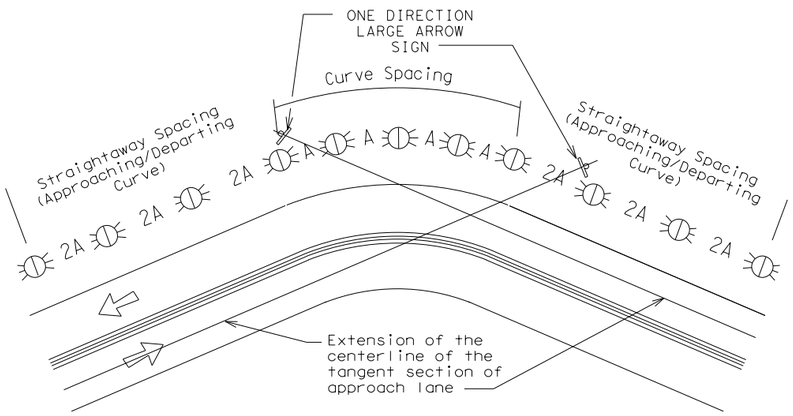
DATE: 8/27/2021 9:56:01 AM
FILE: N:\7023-17-102\CADD\DGN\08_TRAFFIC\C_SIGNING\StdDetails\014\dom3-20.dgn

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

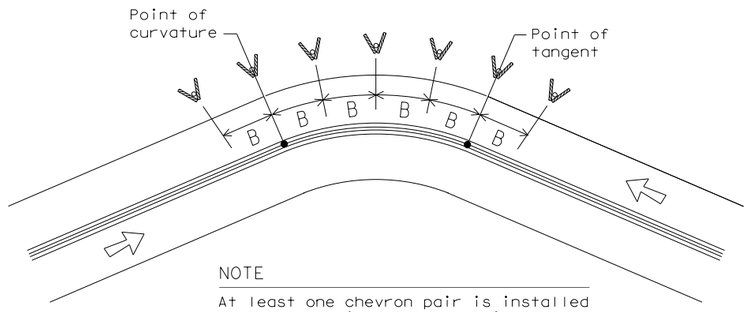
SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



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

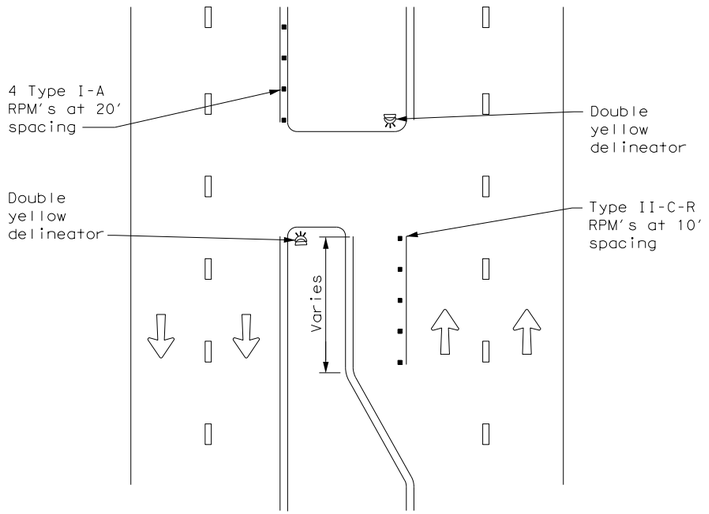
DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(3)-20

FILE: dom3-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	3469	01	014	FM 3099
3-15 8-15	DIST	COUNTY		SHEET NO.
8-15 7-20	BWD	STEPHENS		176

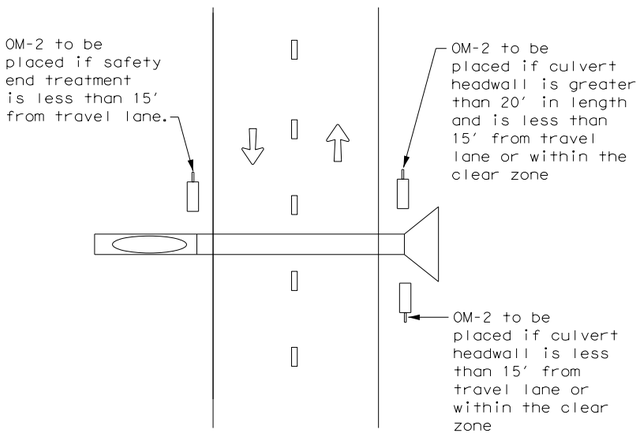
20C

CROSSOVERS



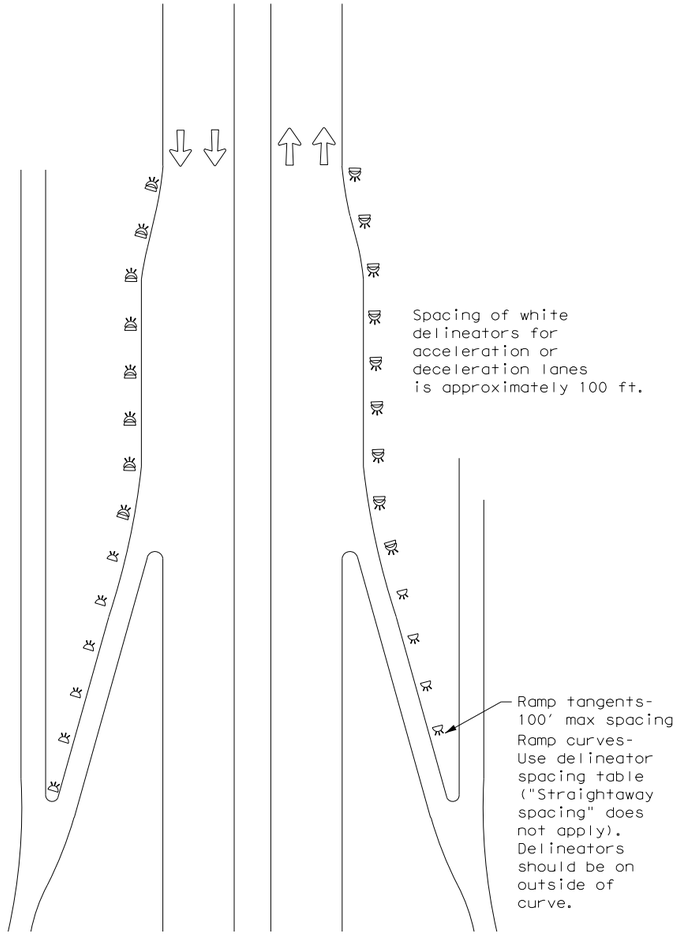
DETAIL 1

FOR CULVERTS WITHOUT MBGF



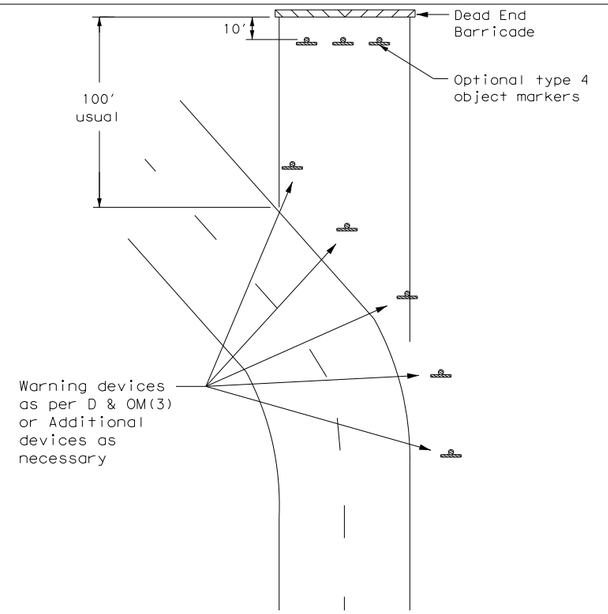
DETAIL 2

FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES



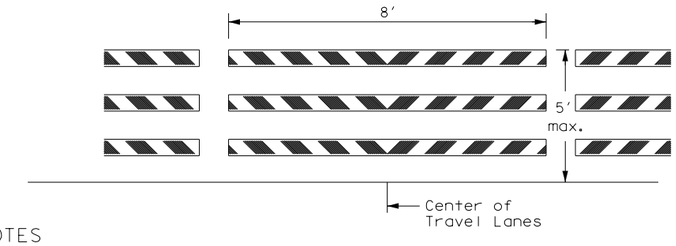
DETAIL 3

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	3469	01	014	FM 3099
3-15	DIST	COUNTY		SHEET NO.
7-20	BWD	STEPHENS		177

20D

DATE: 8/27/2021 9:56:02 AM
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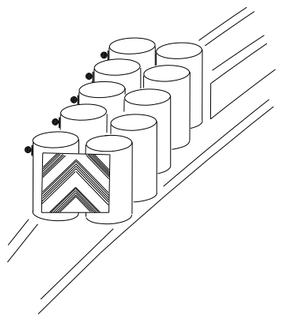
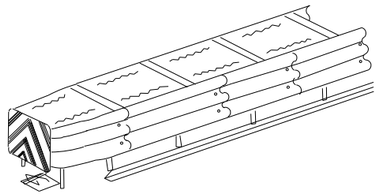
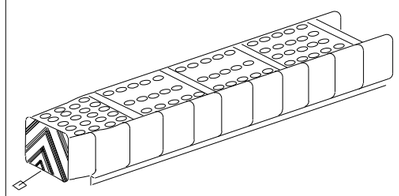
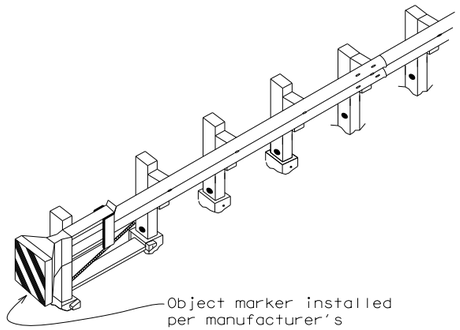
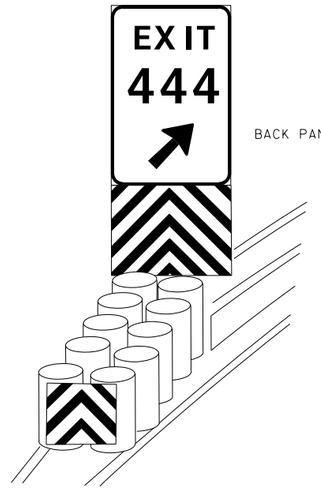
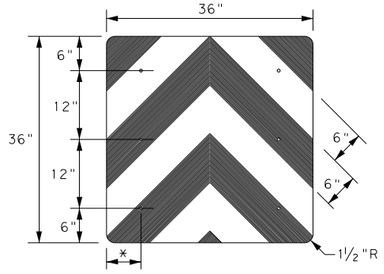


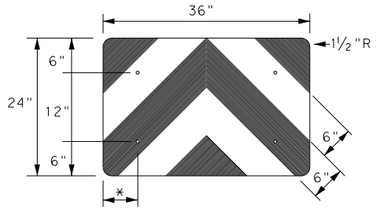




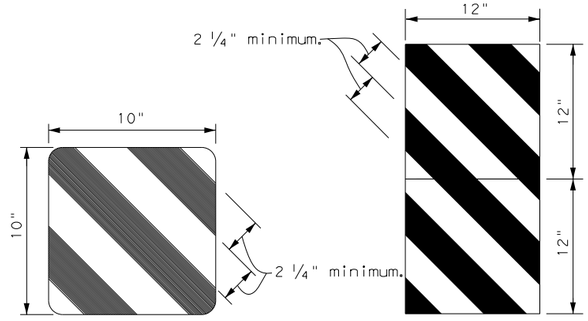




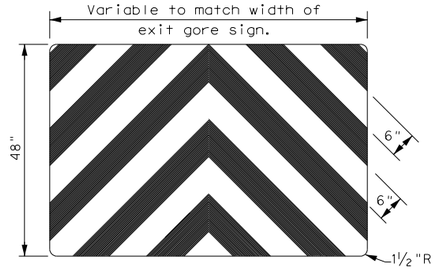


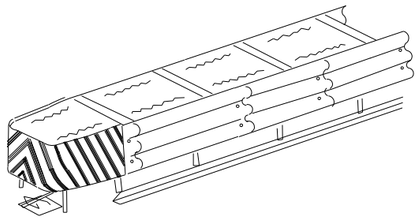


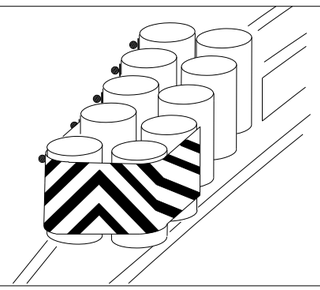
* Adjust to fit attenuator per manufacturer's recommendation, or as directed by the Engineer

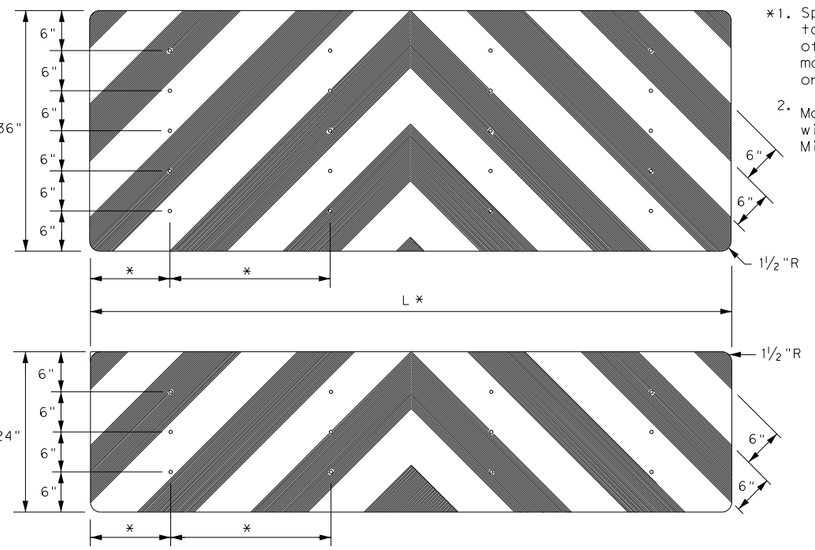


OBJECT MARKERS SMALLER THAN 3 FT^2









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.

DATE: 8/27/2021 9:56:03 AM
FILE: domvia20.dgn

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS

D & OM(VIA)-20

FILE: domvia20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT December 1989	CONT	SECT	JOB	HIGHWAY
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4-92 8-04	DIST	COUNTY		SHEET NO.
8-95 3-15	BWD	STEPHENS		178
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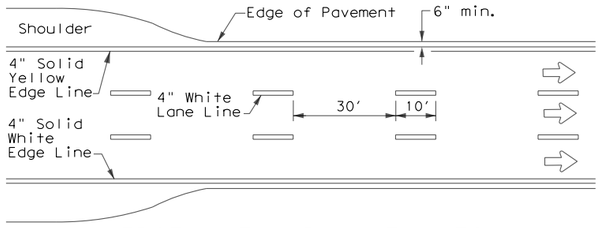
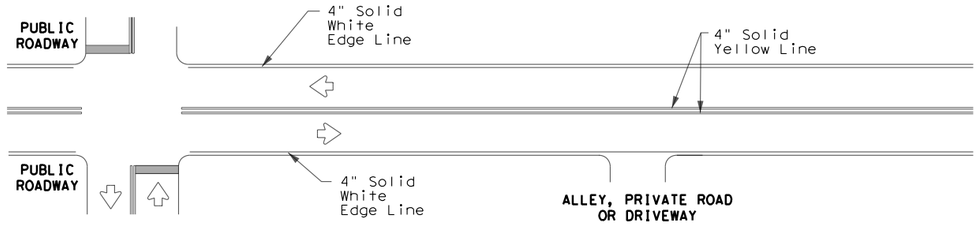
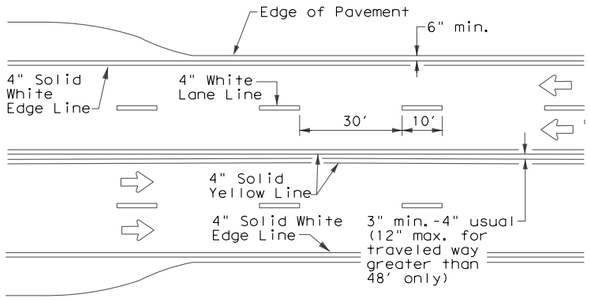
20G



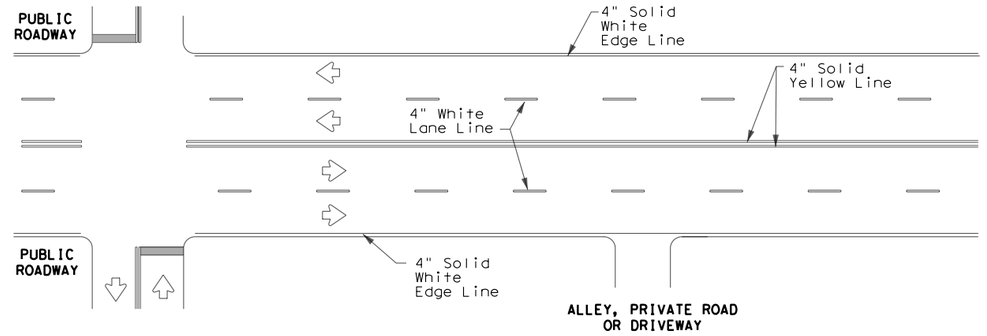
EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



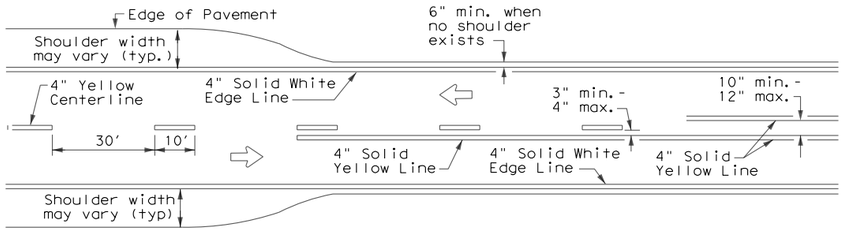
TYPICAL TWO-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



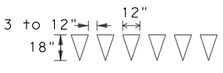
CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



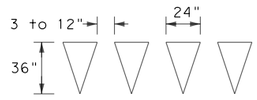
TYPICAL MULTI-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS

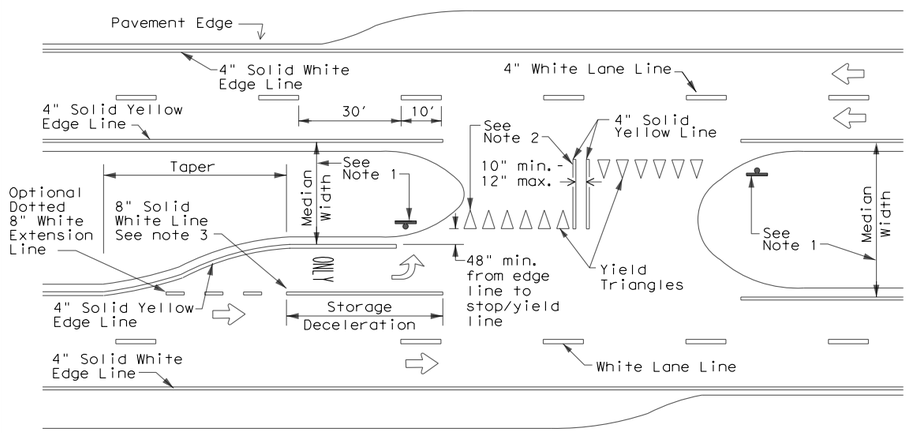


For posted speed on road being marked equal to or less than 40 MPH.



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.

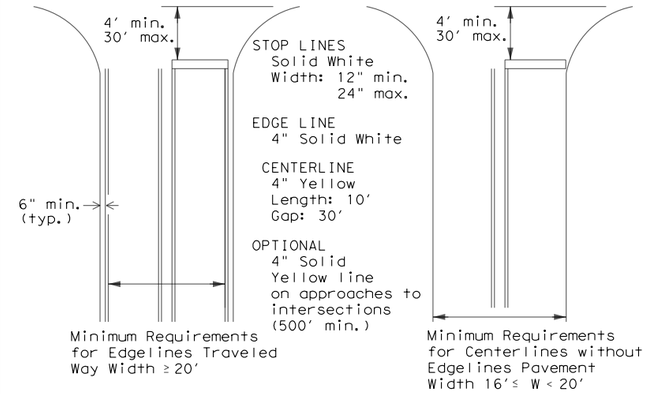
GENERAL NOTES

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

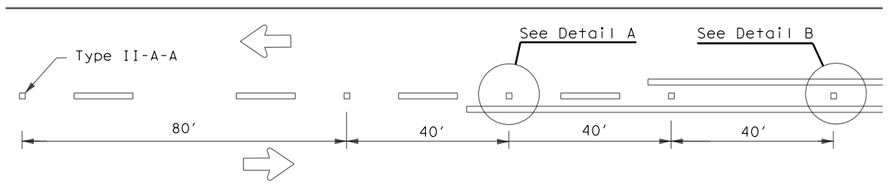
PM(1)-20

FILE: pm1-20.dgn	DN:	CK:	DW:	CK:
© TxDOT November 1978	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03	3469	01	014	FM 3099
5-00 2-12	DIST	COUNTY		SHEET NO.
8-00 6-20	BWD	STEPHENS		179

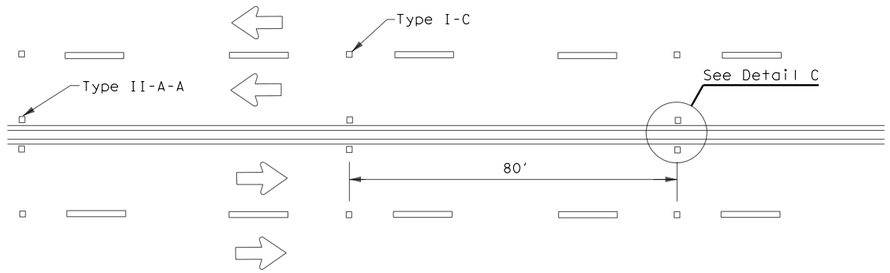
22A

DATE: 8/27/2021 9:56:04 AM
FILE: pm1-20 (1).dgn

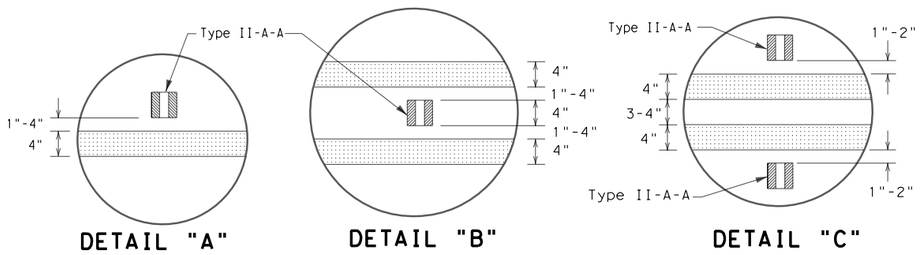
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE



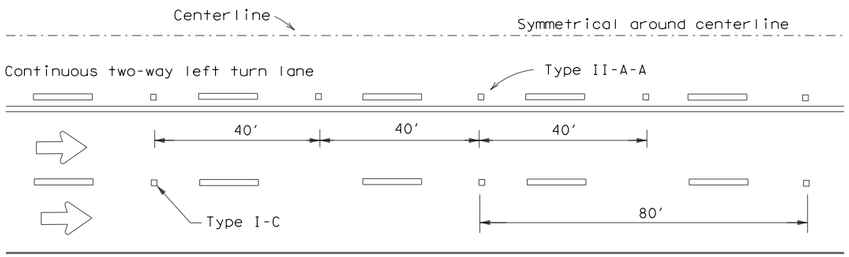
CENTERLINE FOR ALL TWO LANE ROADWAYS



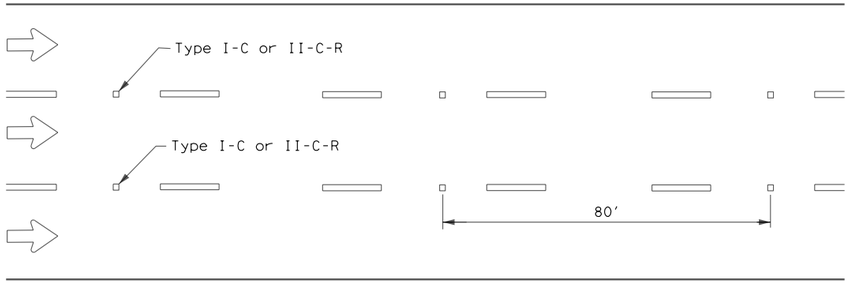
CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY HIGHWAYS



DETAIL "A" **DETAIL "B"** **DETAIL "C"**

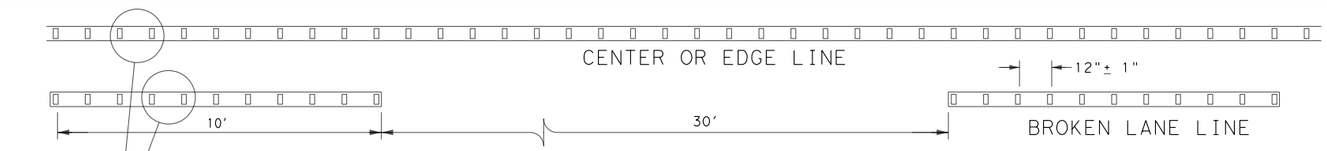


CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



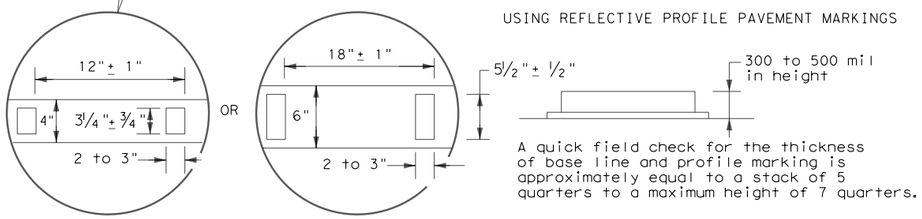
LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

Raised pavement markers Type II-C-R shall have clear face toward normal traffic and red face toward wrong-way traffic.



REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS



4" EDGE LINE, CENTER LINE OR LANE LINE

OPTIONAL 6" EDGE LINE, CENTER LINE OR LANE LINE

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.

NOTE

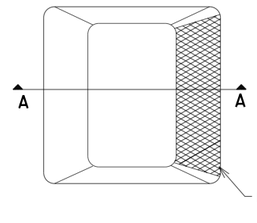
Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

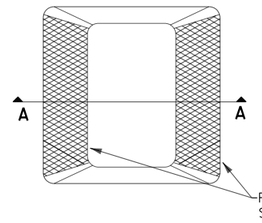
1. All raised pavement markers placed in broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.

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

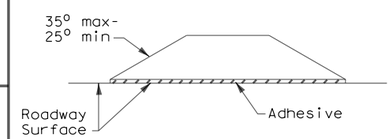
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)



Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS

Texas Department of Transportation

Traffic Safety Division Standard

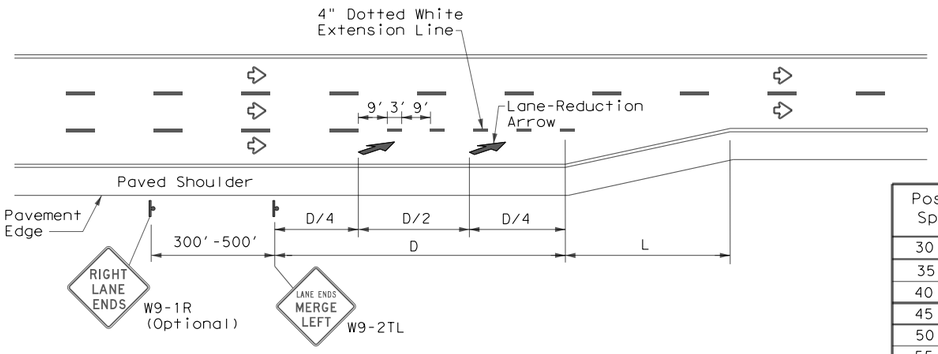
POSITION GUIDANCE USING RAISED MARKERS RELECTORIZED PROFILE MARKINGS PM(2)-20

FILE: pm2-20.dgn	DN:	CK:	DW:	CK:
©TxDOT April 1977	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-92 2-10 5-00 2-12 8-00 6-20	3469	01	014	FM 3099
	DIST	COUNTY		SHEET NO.
	BWD	STEPHENS		180

22B

DATE: 8/27/2021 9:56:05 AM
FILE: pm2-20 (1).dgn

DATE: 8/21/2021
FILE: N:\7023-17-102\CADD\DGN\08_TRAFFIC\C_SIGNING\StdDetails\013\pm3-20 (pf_dgn)

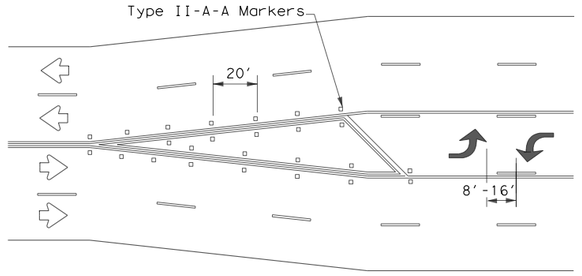


LANE REDUCTION

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 arrows.
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.

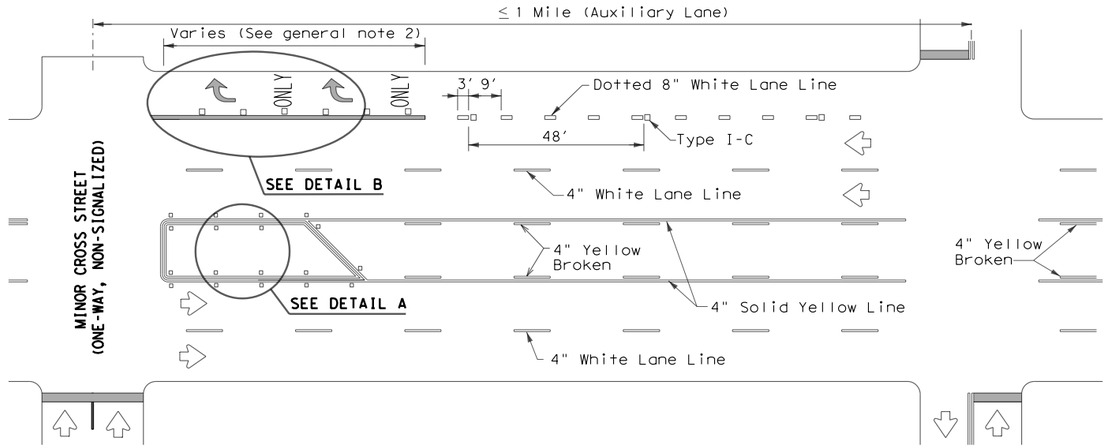
TYPICAL TRANSITION FOR TWLTL AND DIVIDED HIGHWAY

GENERAL NOTES

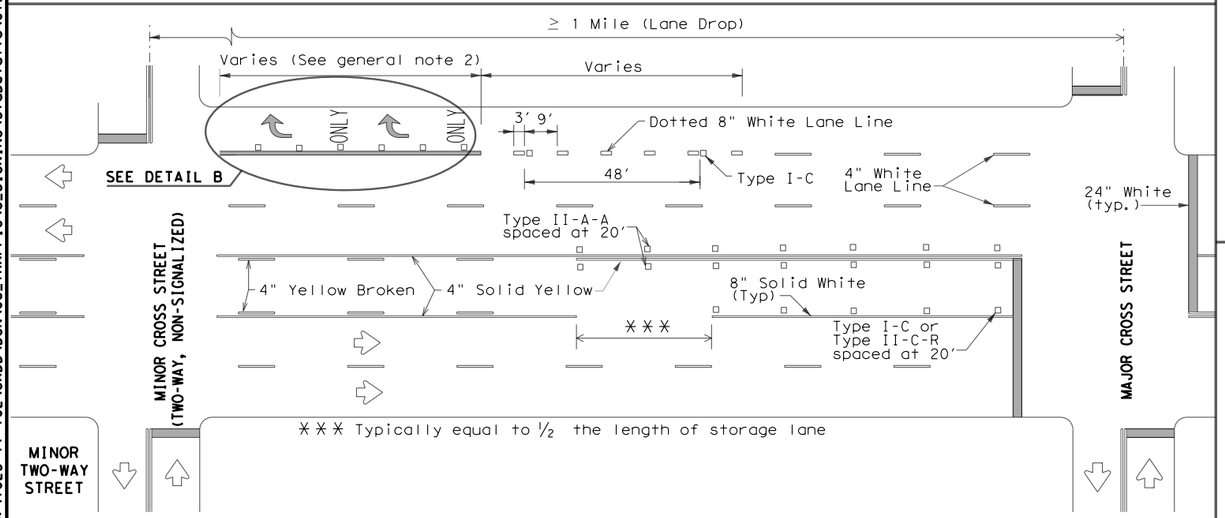
1. Lane use word and arrow markings shall be used where through lanes approaching an intersection become mandatory turn lanes. Lane use word and arrow markings should be used in auxiliary lanes of substantial length. Lane use arrow markings or word and arrow markings may be used in other lanes and turn 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

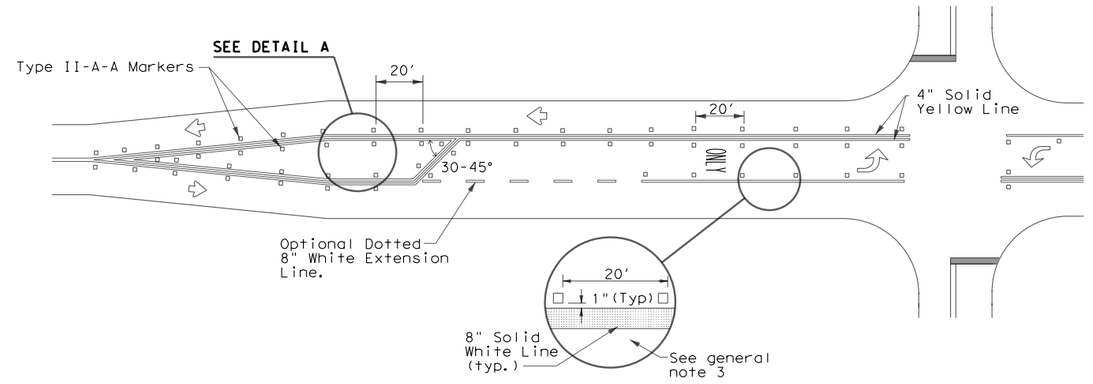
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



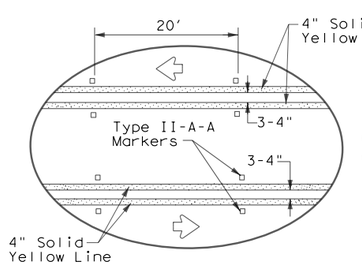
TYPICAL TWLTL AT ONE-WAY STREET AND RIGHT TURN AUXILIARY LANE



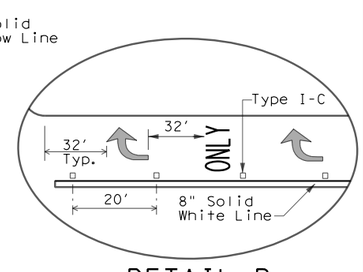
TYPICAL TWLTL AT TWO-WAY CROSS STREET AND RIGHT TURN LANE DROP



TYPICAL TWO-LANE HIGHWAY INTERSECTION WITH LEFT TURN BAYS



DETAIL A



DETAIL B

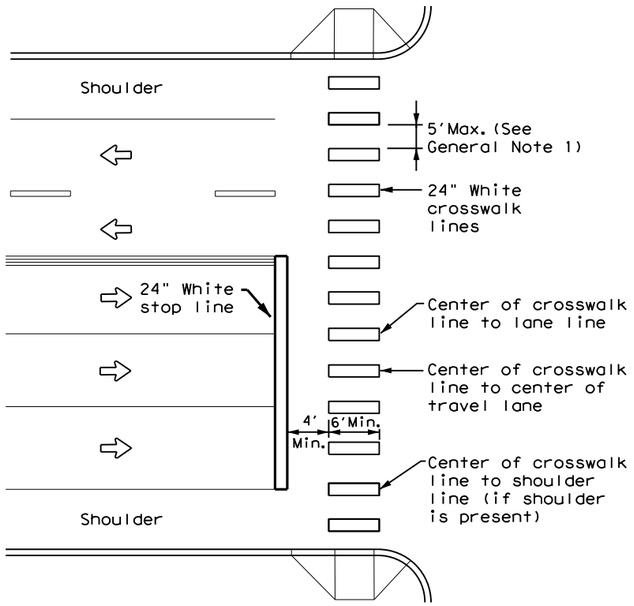
Texas Department of Transportation

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	3469	01	014	FM 3099
5-00 2-10	DIST	COUNTY		SHEET NO.
8-00 2-12	BWD	STEPHENS		181
3-03 6-20				

22C



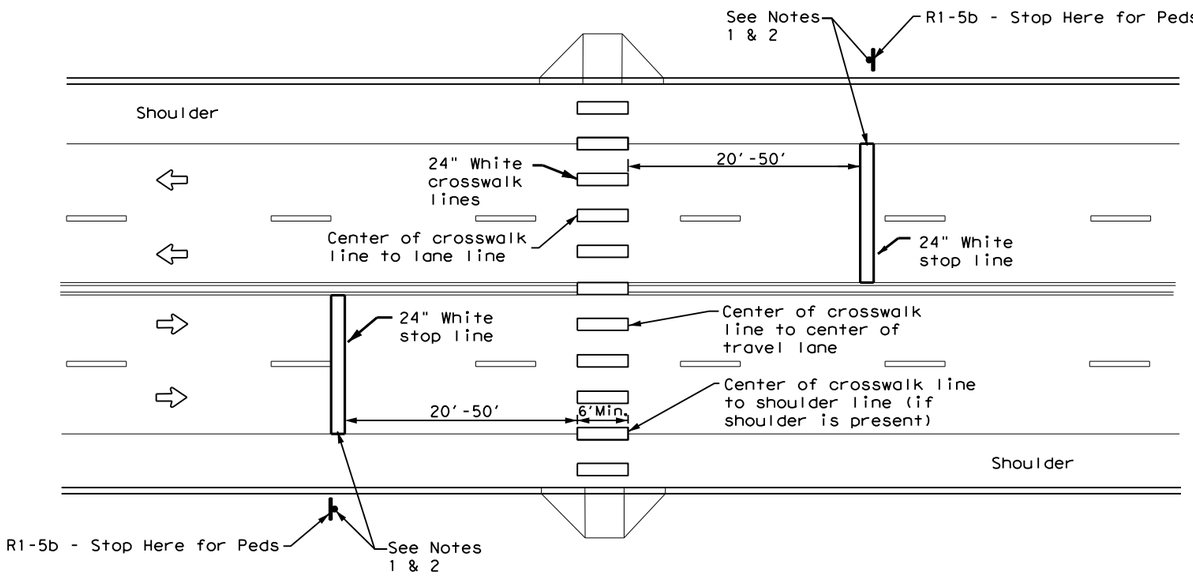
HIGH-VISIBILITY LONGITUDINAL CROSSWALK AT CONTROLLED APPROACH

GENERAL NOTES

1. Longitudinal crosswalk lines should not be placed in the wheel path of vehicles. Center the crosswalk lines on travel lanes, lane lines, and shoulder lines (if present).
2. A minimum 6" clear distance shall be provided to the curb face. If the last crosswalk line falls into this distance it must be omitted.
3. For divided roadways, adjustments in spacing of the crosswalk lines should be made in the median so that the crosswalk lines are maintained in their proper location across the travel portion of the roadway.
4. At skewed crosswalks, the crosswalk lines are to remain parallel to the lane lines.
5. Each crosswalk shall be a minimum of 6' wide.
6. The High-Visibility Longitudinal Crosswalk is the preferred crosswalk pattern on State Highways. Other crosswalk patterns as shown in the "Texas Manual on Uniform Traffic Control Devices" may be used. All crosswalk designs and dimension shall comply with the "Texas Manual on Uniform Traffic Control Devices."
7. Final placement of Stop Bar and Crosswalk shall be approved by the Engineer in the field.

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.



UNSIGNALIZED MID BLOCK HIGH-VISIBILITY LONGITUDINAL CROSSWALK

NOTES:

1. Use stop bars with "Stop Here for Pedestrians" signs at unsignalized mid block cross walks.
2. Use stop bars with "Stop Here on Red" signs at mid block crosswalks controlled by traffic signals or pedestrian hybrid beacons.

Texas Department of Transportation

Traffic Safety Division Standard

CROSSWALK PAVEMENT MARKINGS

PM(4)-22

FILE: pm4-22.dgn	DN:	CK:	DW:	CK:
© TxDOT June 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS 3-22	3469	01	014	FM 3099
	DIST	COUNTY		SHEET NO.
	BWD	STEPHENS		181A

22D

DATE: 10/21/2022 11:14:20 AM
FILE: C:\Users\bswenso\Downloads\pm4-22.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)

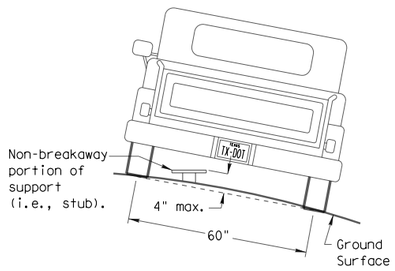
Anchor Type

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-1))

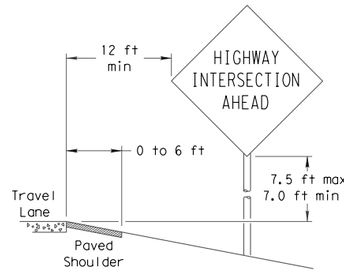
REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



To avoid vehicle undercarriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).

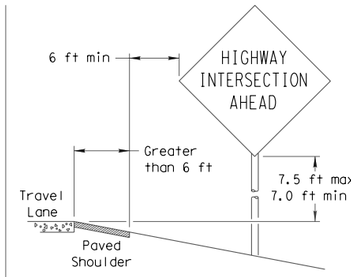
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

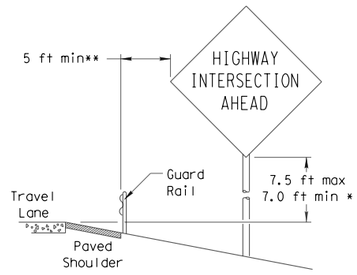
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



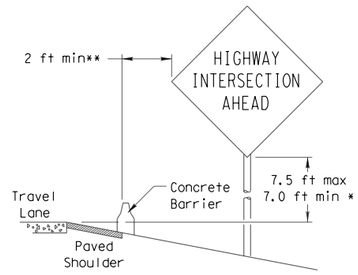
GREATER THAN 6 FT. WIDE

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



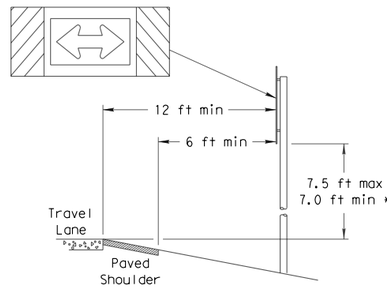
BEHIND GUARDRAIL



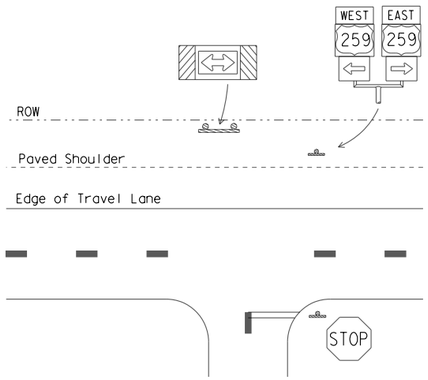
BEHIND CONCRETE BARRIER

**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

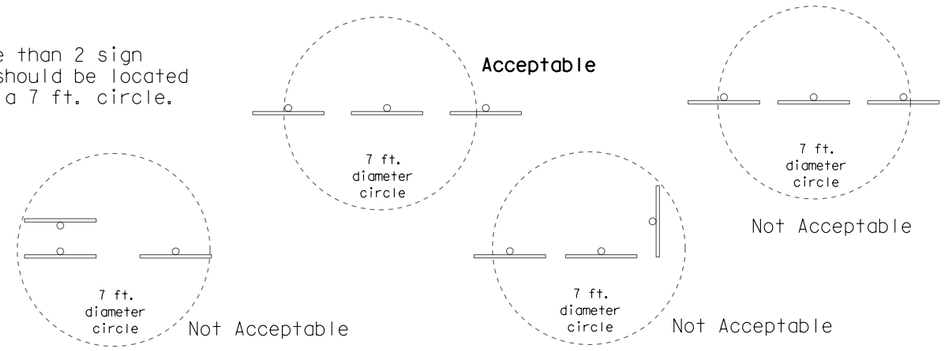
(2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.

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.

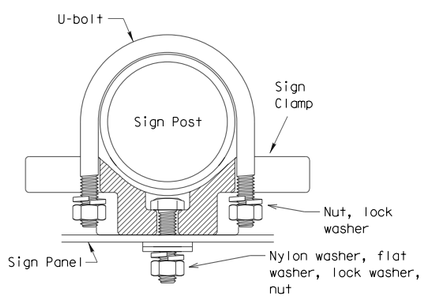
The website address is:
http://www.txdot.gov/publications/traffic.htm

No more than 2 sign posts should be located within a 7 ft. circle.



TYPICAL SIGN ATTACHMENT DETAIL

Single Signs

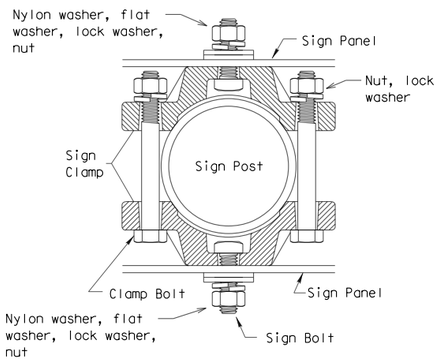


Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

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.

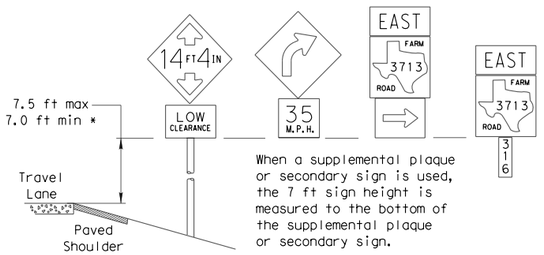
Sign clamps may be either the specific size clamp or the universal clamp.

Back-to-Back Signs



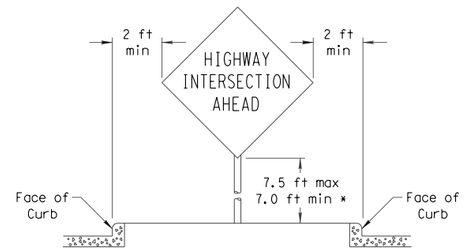
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



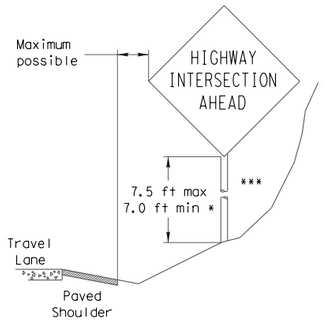
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

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

9-08 REVISIONS

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

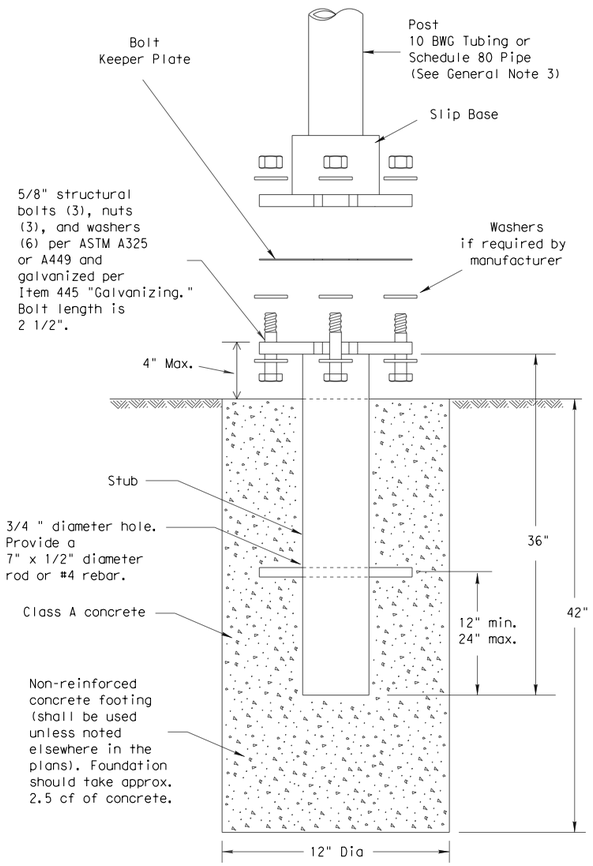
CONT	SECT	JOB	HIGHWAY
3469	01	014	FM 3099

DIST	COUNTY	SHEET NO.
BWD	STEPHENS	182

26A

DATE: 8/27/2021 9:56:08 AM
FILE: N:\7023-17-102\CADD\DGN\08*TRAFFIC\D*PVMT*MRK\StdDetails\smdgen.dgn

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.

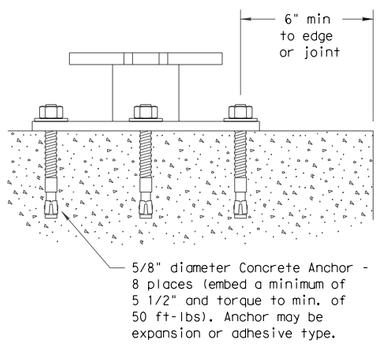
   Schedule 80 Pipe (2.875" outside diameter)
   - 0.276" nominal wall thickness
   - Steel tubing per ASTM A500 Gr C
   - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
     - 46,000 PSI minimum 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
3469	01	014	FM 3099

DIST	COUNTY	SHEET NO.
BWD	STEPHENS	183

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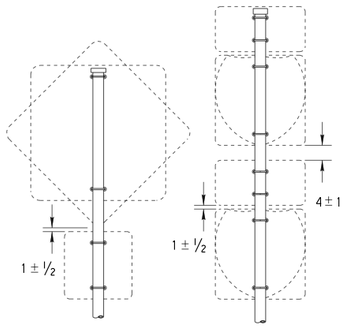
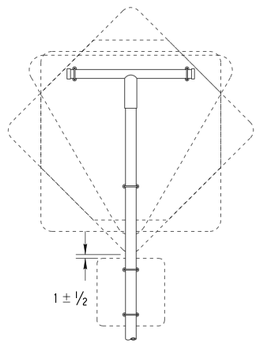
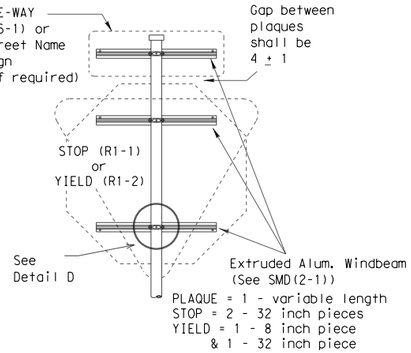


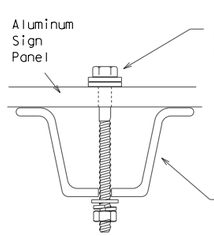
SM RD SGN ASSM TY XXXXX(1)XX(P)



SM RD SGN ASSM TY XXXXX(1)XX(T)

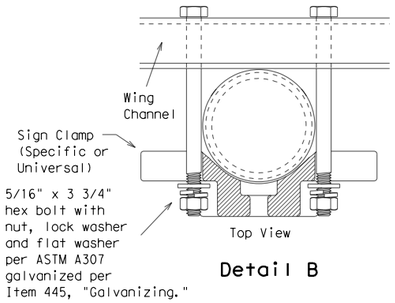


SM RD SGN ASSM TY XXXXX(1)XX(P-BM)



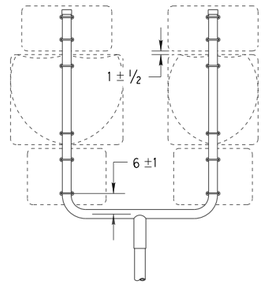
Top View

Detail A

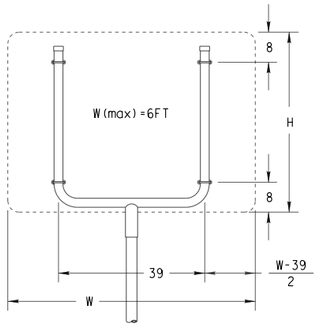


Top View

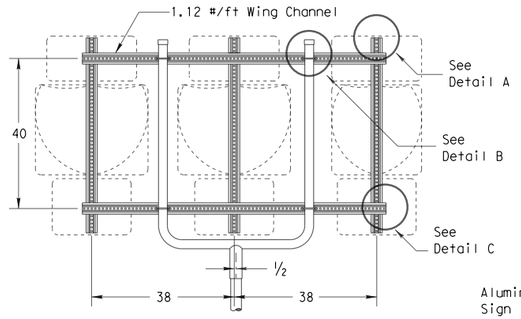
Detail B



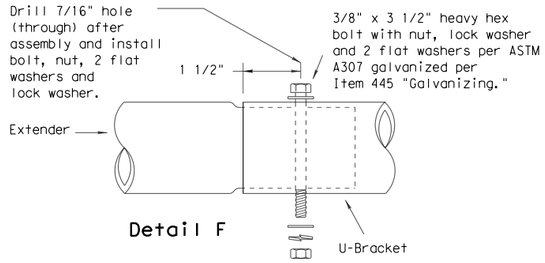
SM RD SGN ASSM TY XXXXX(1)XX(U)



SM RD SGN ASSM TY XXXXX(1)XX(U)

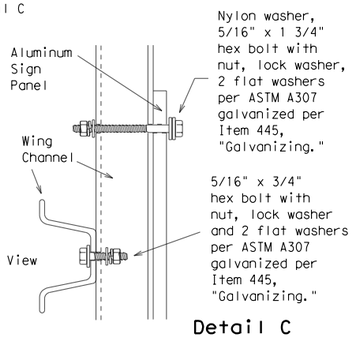


SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)

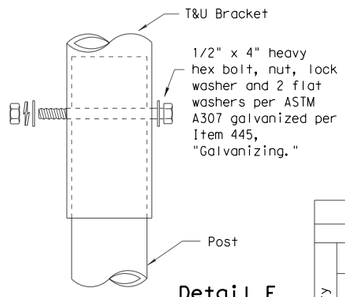


Detail F

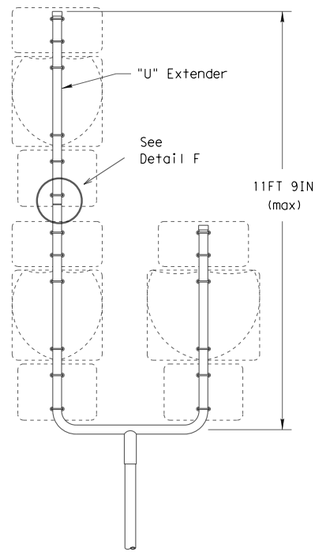
Splices shall only be allowed behind the sign substrate.



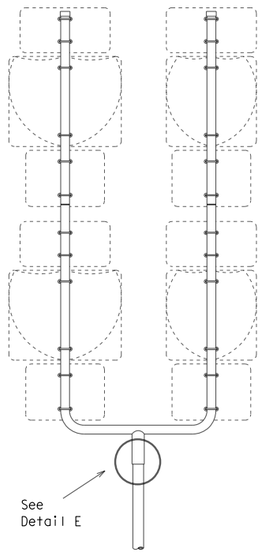
Detail C



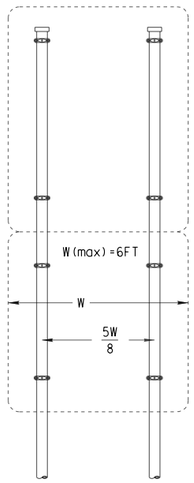
Detail E



SM RD SGN ASSM TY S80(1)XX(U-1EXT)

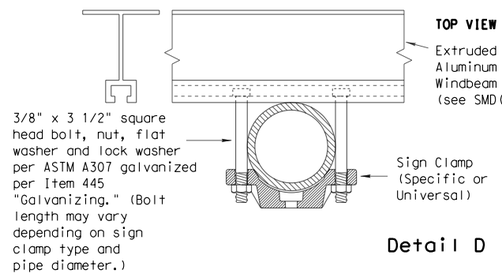


SM RD SGN ASSM TY S80(1)XX(U-2EXT)

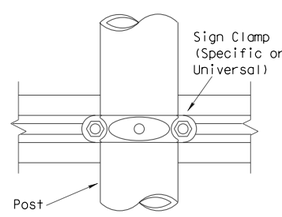


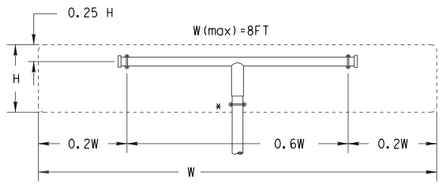
SM RD SGN ASSYM TY XXXXX(2)XX(P)

SIDE VIEW



Detail D

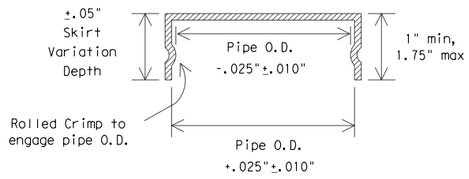




SM RD SGN ASSM TY XXXXX(1)XX(T)
(* - See Note 12)

All dimensions are in english unless detailed otherwise.

FRICTION CAP DETAIL



Friction caps may be manufactured from hot rolled or cold rolled steel sheets. The minimum sheet metal thickness shall be 24 gauge for all cap sizes.

The rim edges shall be reasonably straight and smooth. Caps shall be sized and formed in such a manner as to produce a drive-on friction fit and have no tendency to rock when seated on the pipe. The depth shall be sufficient to give positive protection against entrance of rainwater. They shall be free of sharp creases or indentations and show no evidence of metal fracture.

Caps shall have an electrodeposited coating of zinc in accordance with the requirements of ASTM B633 Class FE/ZN 8.

GENERAL NOTES:

1.

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

2. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
3. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
4. Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
5. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
6. For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
7. When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
8. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
9. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
10. Additional route markers may be added vertically, provided the total sign area does not exceed the maximum allowable amount per Note 1.
11. Additional sign clamp required on the "T-bracket" post for 24 inch height signs. Place the clamp 3 inches above bottom of sign when possible.
12. Post open ends shall be fitted with Friction Caps.
13. Sign blanks shall be the sizes and shapes shown on the plans.

REQUIRED SUPPORT

	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
Warning	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-2)-08

REVISIONS	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
9-08	CONT	SECT	JOB	HIGHWAY
	3469	01	014	FM 3099
	DIST	COUNTY		SHEET NO.
	BWD	STEPHENS		184

26C

DATE: 8/27/2021
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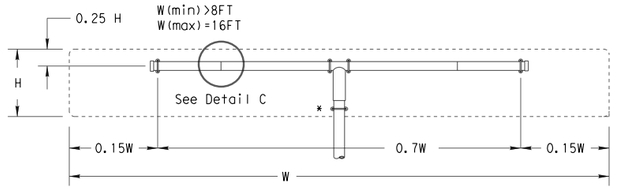
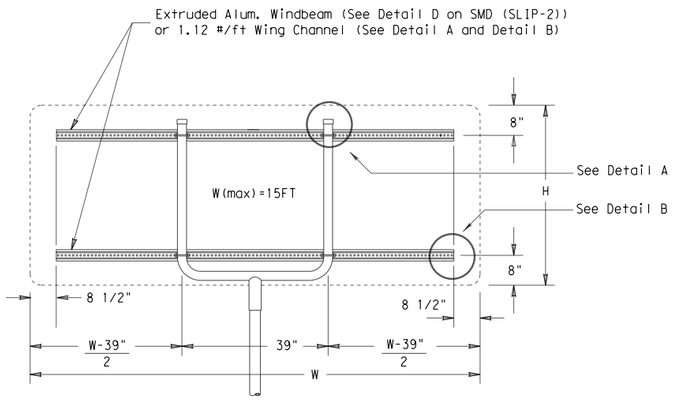
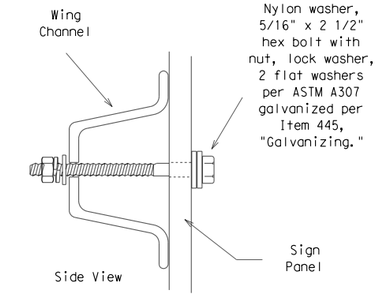


SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)

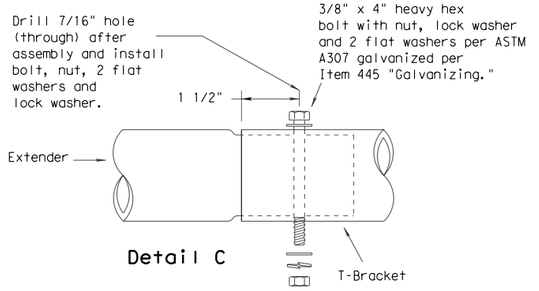
(* - See Note 12)



SM RD SGN ASSM TY XXXXX(1)XX(U-XX)



Detail B



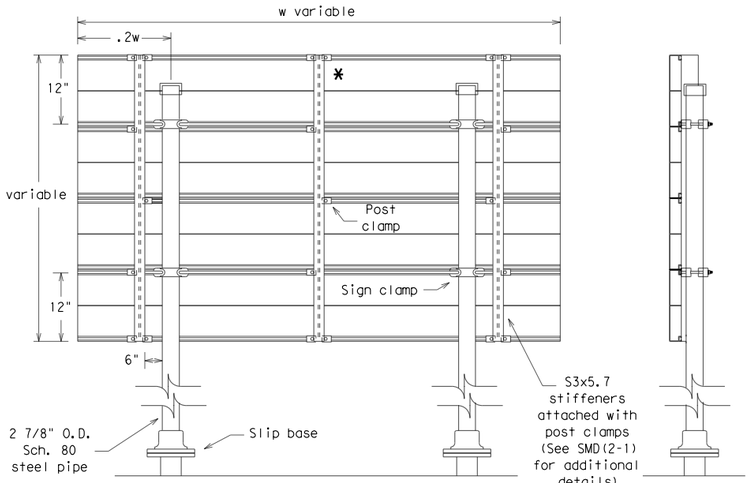
Detail C

Splices shall only be allowed behind the sign substrate.

GENERAL NOTES:

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

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.

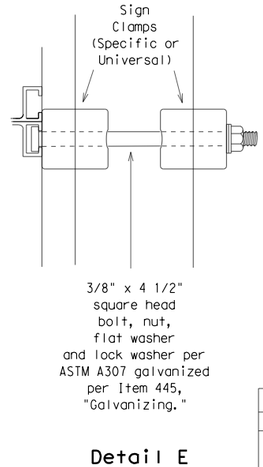


Typical Sign Mount

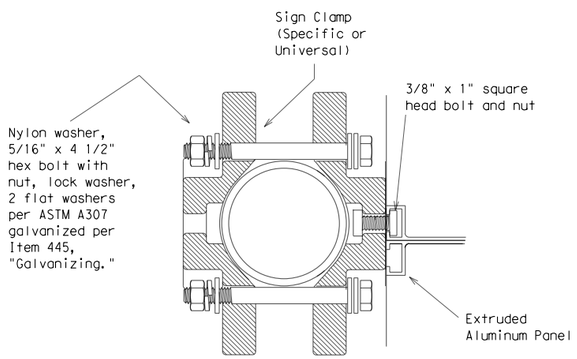
SM RD SGN ASSM TY S80(2)XX(P-EXAL)

✱ Additional stiffener placed at approximate center of signs when sign width is greater than 10′.

See Detail E
for clamp installation

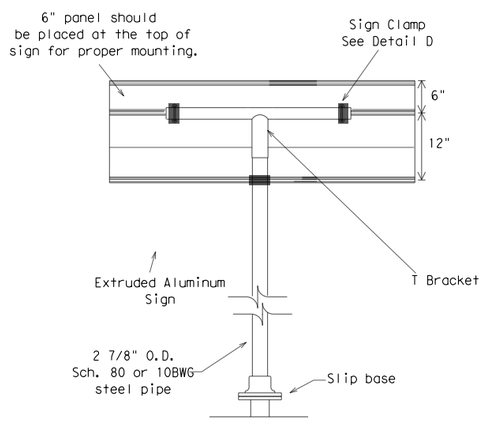


Detail E

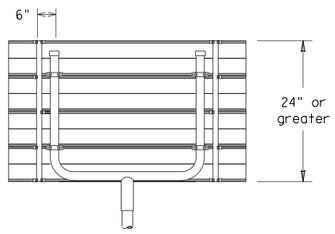


Detail A

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

REVISIONS
9-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
CONT	SECT	JOB	HIGHWAY
3469	01	014	FM 3099
DIST	COUNTY		SHEET NO.
BWD	STEPHENS		185

26D

DATE: 8/27/2021
FILE: smds3.dgn

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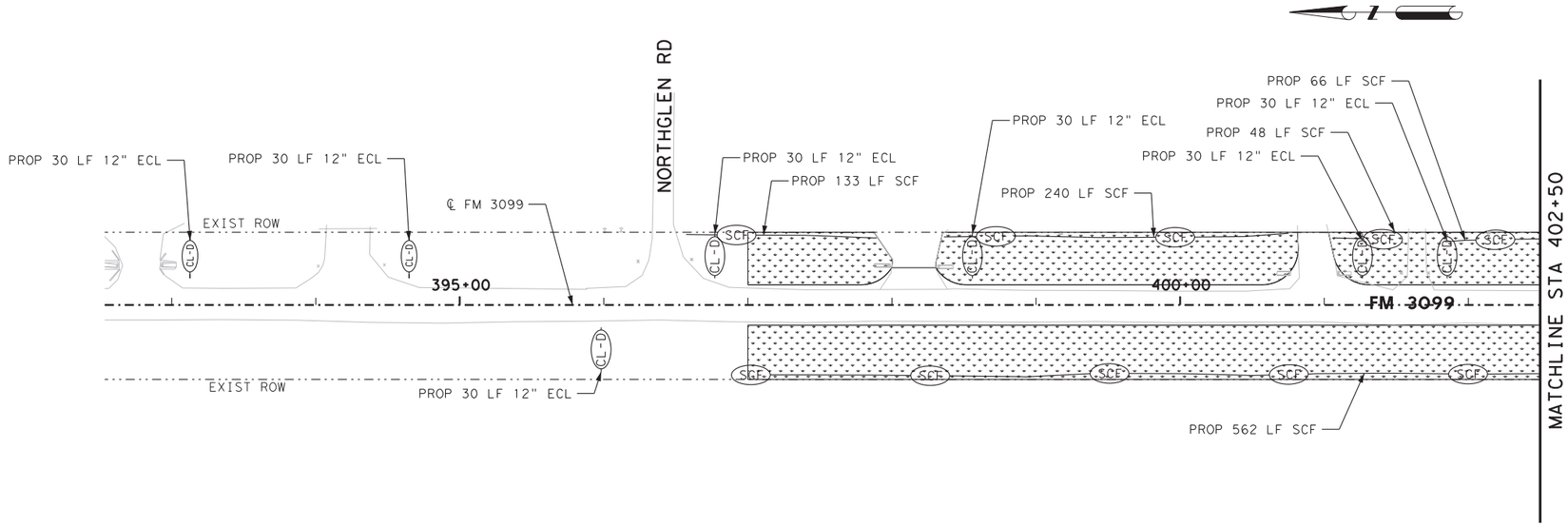

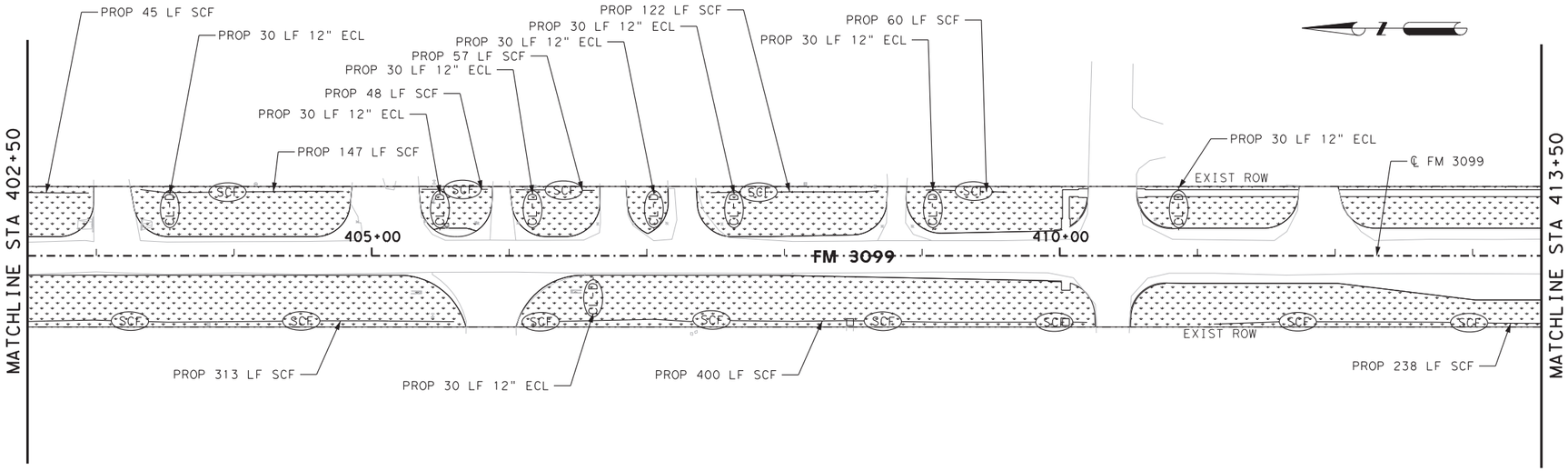

LEGEND

- SCF — SEDIMENT CONTROL FENCE
- CL-D — 12" EROSION CONTROL LOG
- RFD-2 — ROCK FILTER DAM (TY 2)
- RFD-3 — ROCK FILTER DAM (TY 3)
- FLOW DIRECTION
- LIMITS OF PERMANENT SEEDING

0 50 100 200

SCALE: 1"=100'H

NO.	REVISION	BY	DATE

STATE OF TEXAS
JUAN SEBASTIAN HERNANDEZ
131592
LICENSED
PROFESSIONAL ENGINEER

08/27/2021

ENTECH
CIVIL ENGINEERS, INC
F-6932
15021 Katy Freeway, Suite 500
Houston, Texas, 77094
281-945-0069 Ph
281-945-0081 Fx

Texas Department of Transportation®

FM 3099 REALIGNMENT

SW3P LAYOUT
BEGIN PROJECT TO STA 413+50

SHEET 1 OF 3

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
06	SEE TITLE SHEET		186
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

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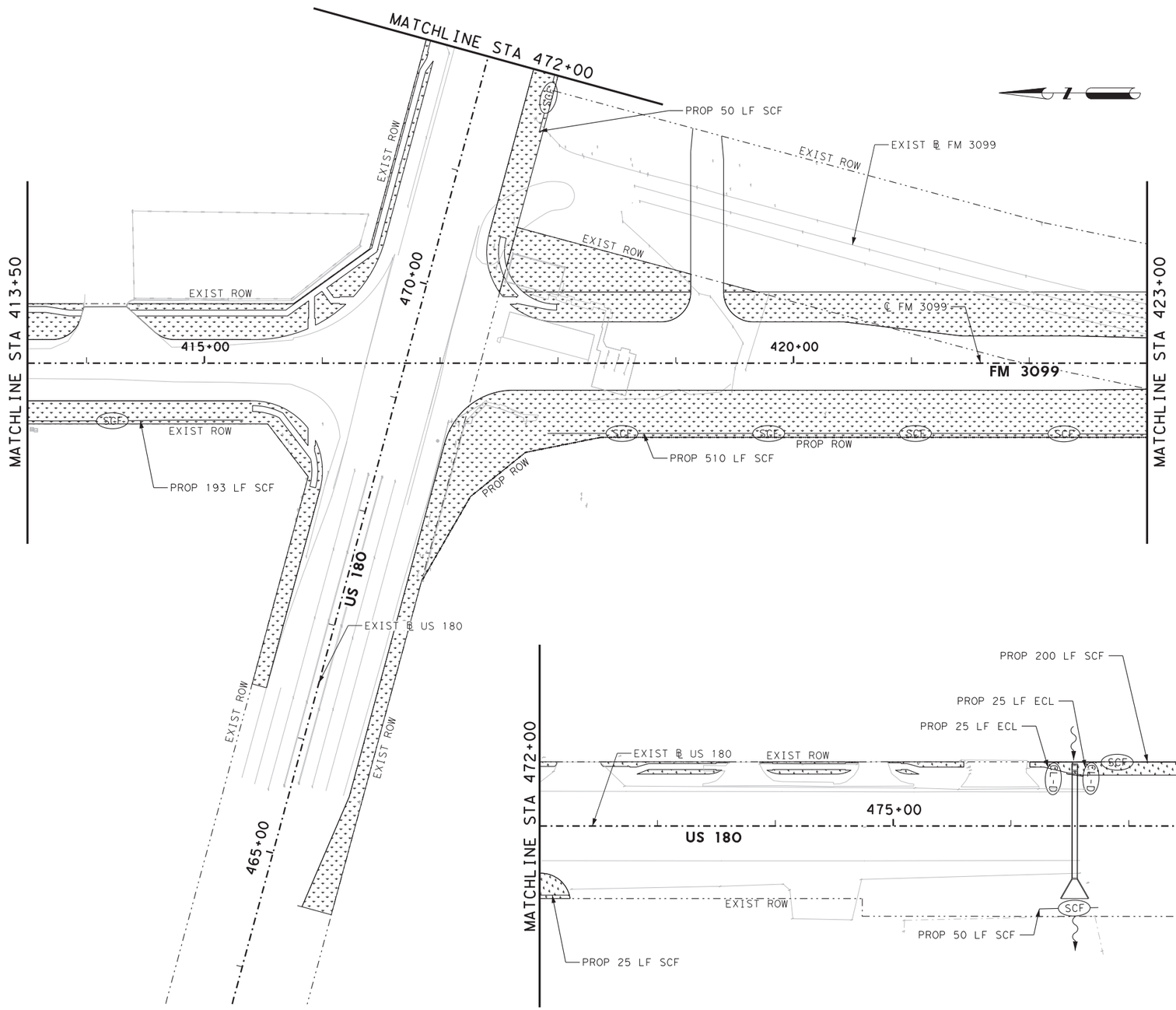

LEGEND

- SCF — SEDIMENT CONTROL FENCE
- CL-D — 12" EROSION CONTROL LOG
- RFD-2 — ROCK FILTER DAM (TY 2)
- RFD-3 — ROCK FILTER DAM (TY 3)
- FLOW DIRECTION
- LIMITS OF PERMANENT SEEDING

0 50 100 200

SCALE: 1"=100'H

NO.	REVISION	BY	DATE

STATE OF TEXAS
JUAN SEBASTIAN HERNANDEZ
131592
LICENSED PROFESSIONAL ENGINEER

08/27/2021

ENTECH CIVIL ENGINEERS, INC
F-6932
15021 Katy Freeway, Suite 500
Houston, Texas, 77094
281-945-0069 PH
281-945-0081 FX

Texas Department of Transportation®

FM 3099 REALIGNMENT

SW3P LAYOUT
STA 413+50 TO STA 423+00

SHEET 2 OF 3

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
06	SEE TITLE SHEET		187
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

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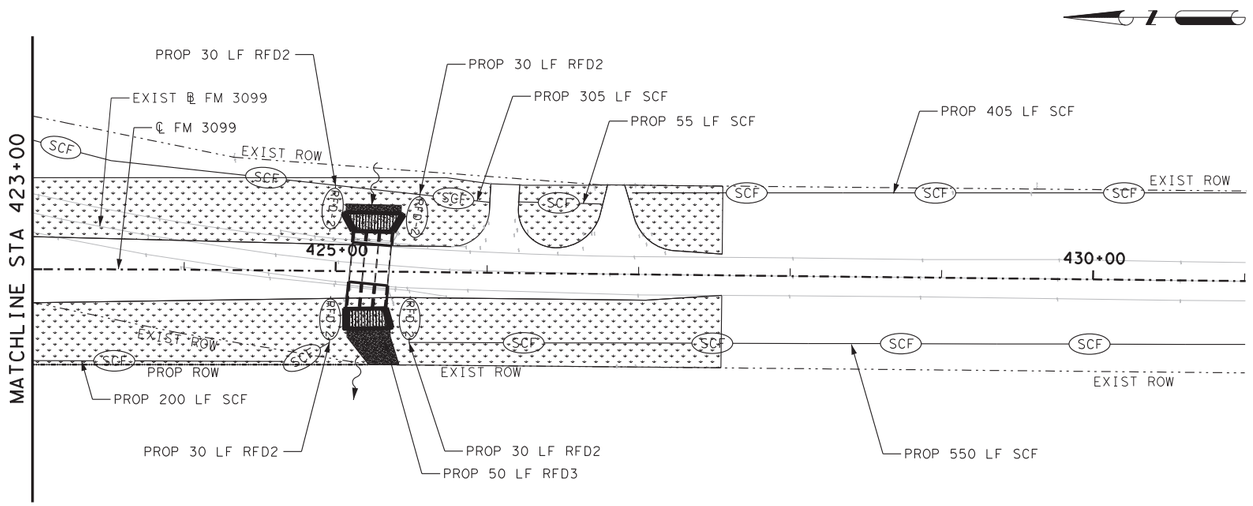

LEGEND

- SCF — SEDIMENT CONTROL FENCE
- CL-D — 12" EROSION CONTROL LOG
- RFD-2 — ROCK FILTER DAM (TY 2)
- RFD-3 — ROCK FILTER DAM (TY 3)
- FLOW DIRECTION
- LIMITS OF PERMANENT SEEDING

0 50 100 200

SCALE: 1"=100'H

NO.	REVISION	BY	DATE

STATE OF TEXAS
JUAN SEBASTIAN HERNANDEZ
131592
LICENSED
PROFESSIONAL ENGINEER

08/27/2021

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Houston, Texas, 77094
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FM 3099 REALIGNMENT

SW3P LAYOUT
STA 423+00 TO END PROJECT

SHEET 3 OF 3

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET
06	SEE TITLE SHEET		188
STATE	DISTRICT	COUNTY	
TEXAS	BWD	STEPHENS	
CONTROL	SECTION	JOB	HIGHWAY NO.
3469	01	014	FM 3099

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UPDATED 2/18/2020

SITE DESCRIPTION

PROJECT LIMITS:

CSJ 3469-01-014 FROM NEAR NORTHGLEN RD TO 0.2 MILES SOUTH OF US 180

Latitude = 32.759320
Longitude = -98.945586

LOCATION MAPS:

Refer to title sheet for project location map.

PROJECT DESCRIPTION:

CSJ 3469-01-014

Realign intersection and extend culvert

MAJOR SOIL DISTURBING ACTIVITIES:

The major soil disturbing activities for this project include the realignment of FM 3099 south of US 180 and the extension of the culvert.

TOTAL PROJECT AREA:	7.742 AC.
TOTAL AREA TO BE DISTURBED:	7.220 AC.

EXISTING CONDITION OF SOIL & VEGETATIVE COVER AND % OF EXISTING VEGETATIVE COVER:

CSJ 3469-01-014
Surrounding land is used as urban development. The existing soils primarily consist of loamy fine sand. The 67% of vegetative cover is comprised of various native grasses and wild flowers.

NAME OF RECEIVING WATERS:

CSJ 3469-01-014
Runoff from project flows into Segment #1233 (Hubbard Creek Reservoir) - from a point immediately upstream of Dry Branch in Stephens County ultimately in to the Brazos River Basin.

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
____ LOADED HAUL TRUCKS TO BE COVERED WITH TARPAULIN
____ 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.

Sedimentation Basins - Since the area disturbed is less than 10 acres per drainage area; a sedimentation basin is not required.

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
[X] 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:

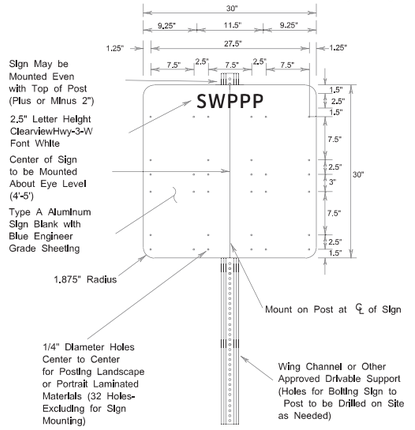
1. Install temporary sediment control items when needed prior to any soil disturbing activities.
2. Construct the realignment of the roadway and create the roadside ditches with minimal soil disturbance.
3. Construct the extension and end treatments for the existing culvert with minimal soil disturbance.
4. Place permanent seeding/other stabilization measures as shown in the plans and as directed by the engineer.

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

No Permanent Installation Allowed.
Sign to be Removed After Project Completion.
Other variations of the SW3P sign may be used If Approved by the Engineer.



Texas Department of Transportation
Brownwood District Office
2495 Highway 183 North
Brownwood Texas, 76802

STATE OF TEXAS
JUAN SEBASTIAN HERNANDEZ
131592
LICENSED PROFESSIONAL ENGINEER

08/27/2021

BROWNWOOD DIST.
STORM WATER POLLUTION PREVENTION PLAN

Texas Department of Transportation®

CONT	SECT	JOB	HIGHWAY
3469	01	014	FM 3099
DIST	COUNTY		SHEET NO.
BWD	STEPHENS		189

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UPDATED 6/22/2017

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 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	various	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
1.	---	---

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.	All	Avoid non-mow locations for stockpiles and equipment parking/storage.
2.	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

Contractor is to be aware of the potential for specific species to be in the project area and to avoid harm to them.
The contractor is also informed that if bats or bird nests are identified that work shall stop.
The contractor is also informed to avoid impacts to burrows as these may be inhabited by several species.

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

---

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 10 working days prior to scheduled abatement and/or demolition.

If "No", then TxDOT is still required to notify DSHS 10 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.

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
1.	---	---

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

FM 3099 ENVIRONMENTAL PERMITS, ISSUES, AND COMMITMENTS (EPIC)

Texas Department of Transportation
BROWNWOOD DISTRICT

CONT	SECT	JOB	HIGHWAY
3469	01	014	FM 3099
DIST	COUNTY		SHEET NO.
BWD	STEPHENS		190

Prepared by *Andrew Chisholm
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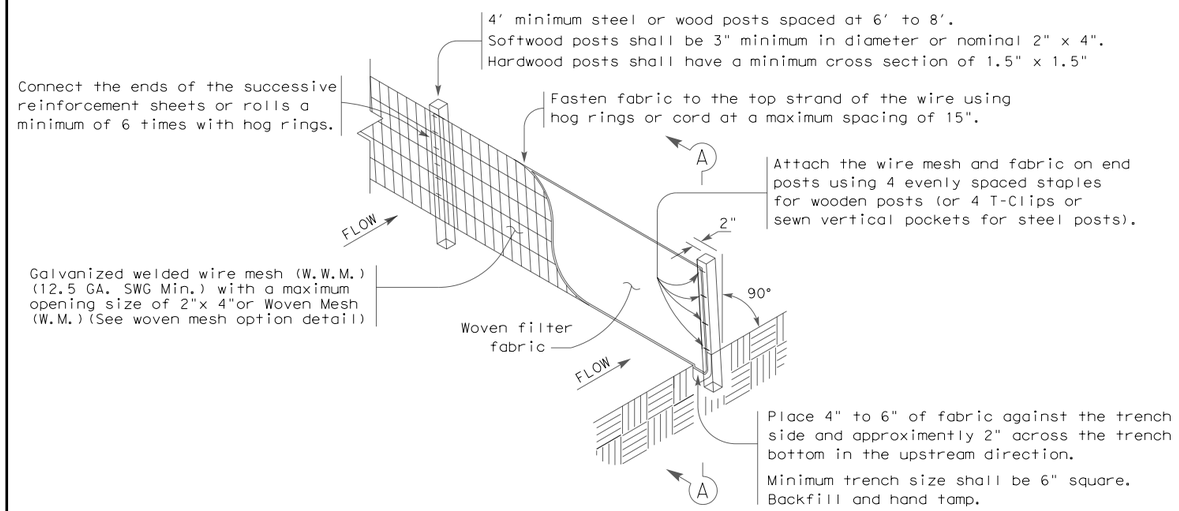
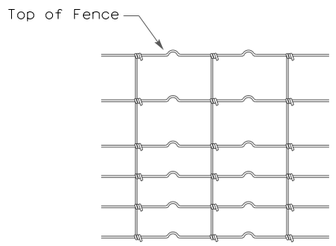
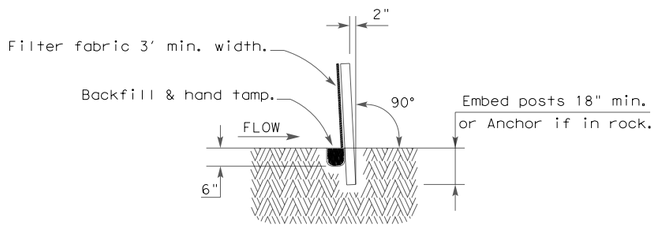


TEMPORARY SEDIMENT CONTROL FENCE

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.

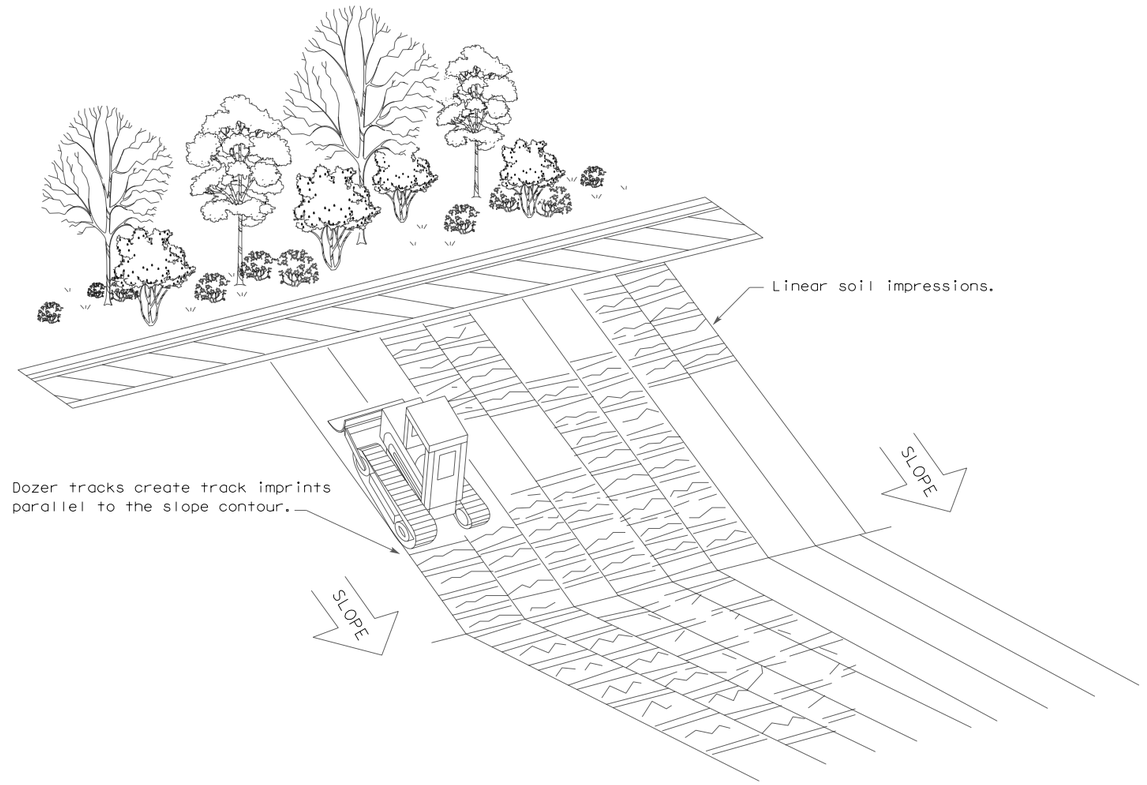
LEGEND

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	3469	01	014	FM 3099
	DIST	COUNTY		SHEET NO.
	BWD	STEPHENS		191

8/17/2021
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DATE: 8/27/2021
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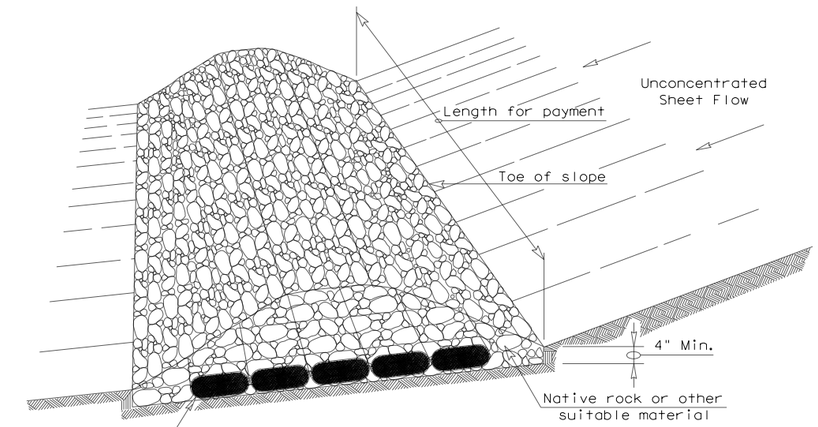
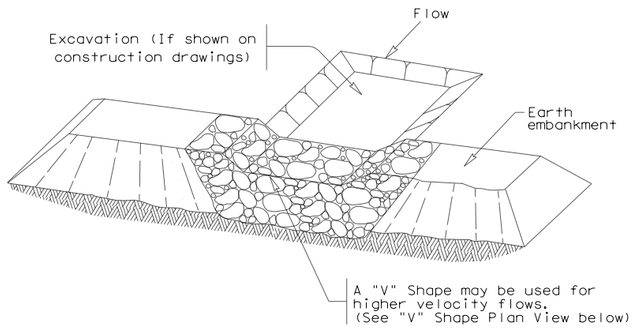


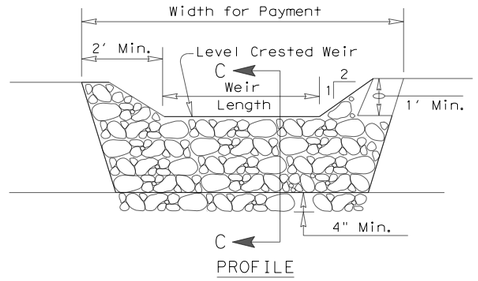
FILTER DAM AT TOE OF SLOPE

RFD1

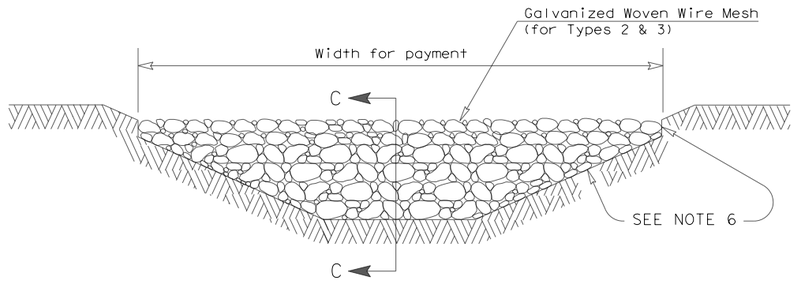


FILTER DAM AT SEDIMENT TRAP

RFD1 — OR — RFD2

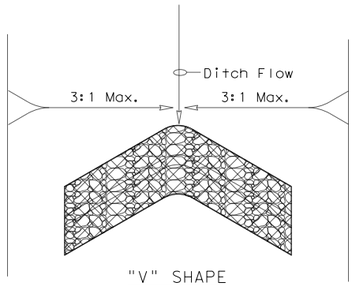


PROFILE

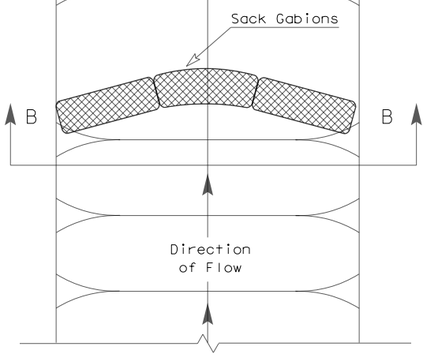


FILTER DAM AT CHANNEL SECTIONS

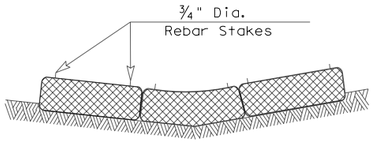
RFD1 — OR — RFD2 — OR — RFD3



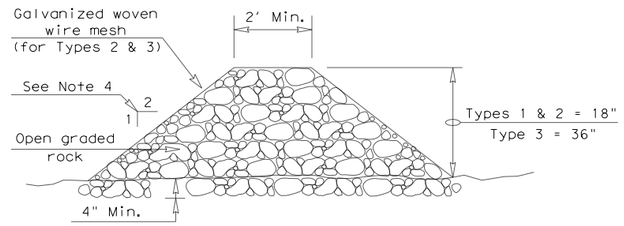
"V" SHAPE
PLAN VIEW



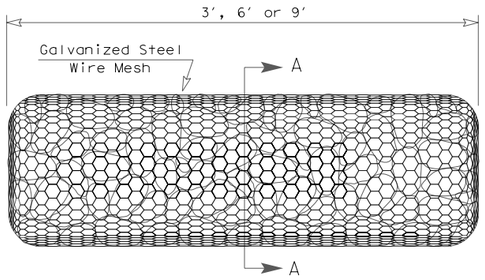
PLAN VIEW



SECTION B-B

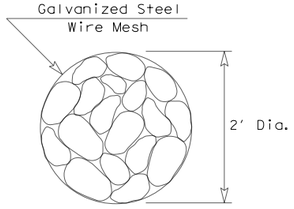


SECTION C-C



TYPE 4 (SACK GABIONS)

RFD4



SECTION A-A

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.

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
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	3469	01	014	FM 3099
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	BWD	STEPHENS		192

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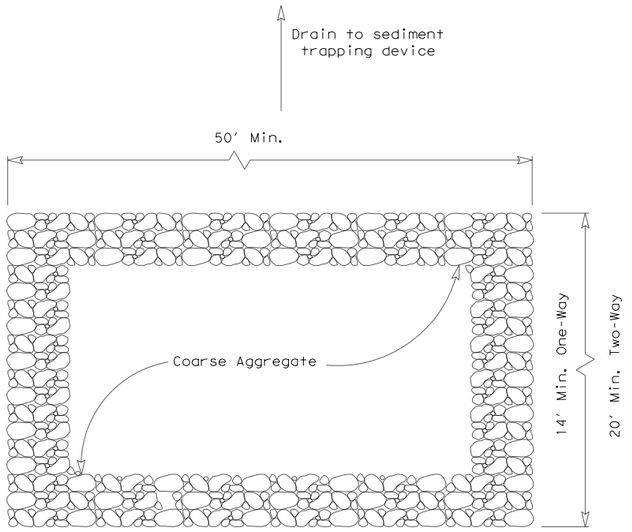
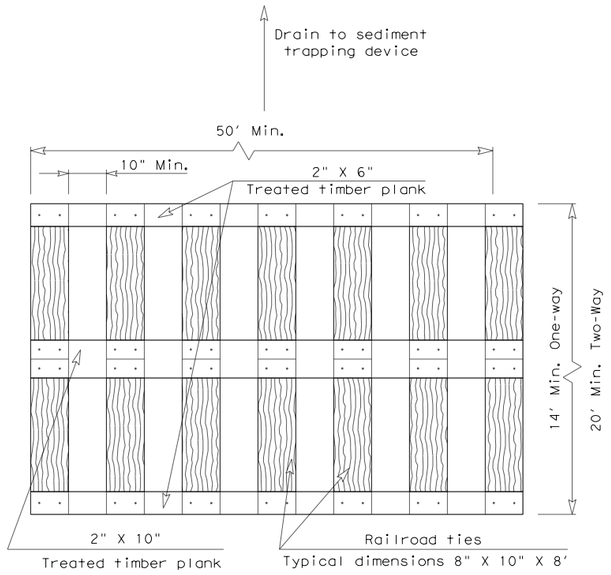


PLAN VIEW



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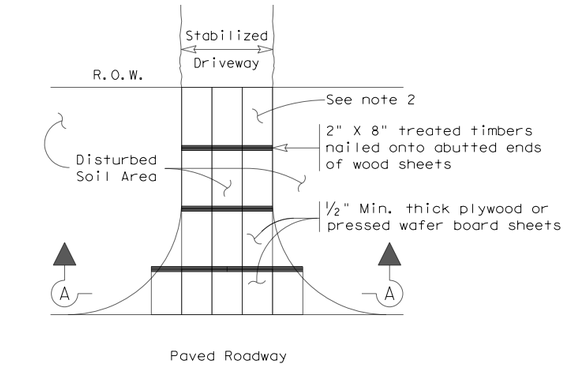
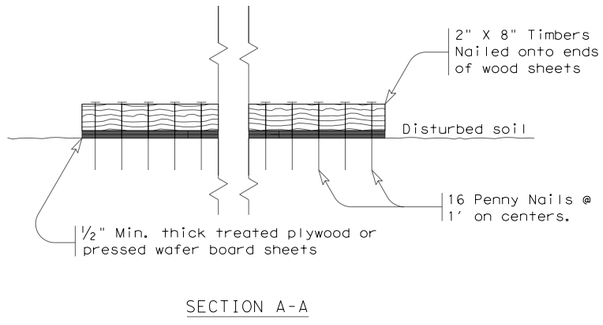


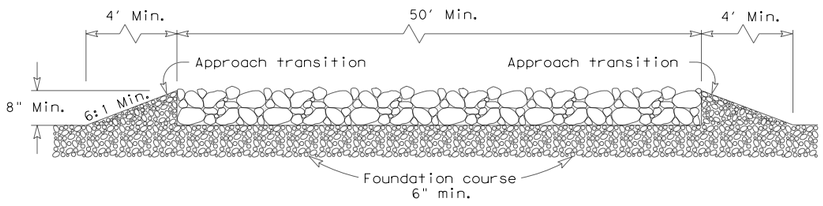
PLAN VIEW



SECTION A-A

CONSTRUCTION EXIT (TYPE 3)

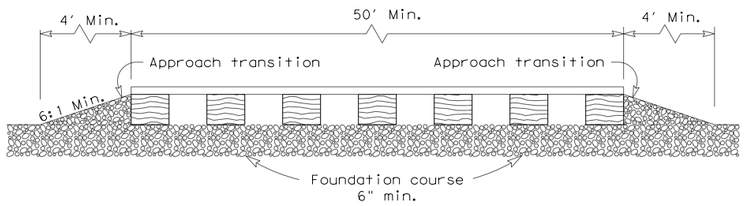
SHORT TERM



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
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REVISIONS	3469	01	014	FM 3099
	DIST	COUNTY		SHEET NO.
	BWD	STEPHENS		193

DATE: 8/27/2021
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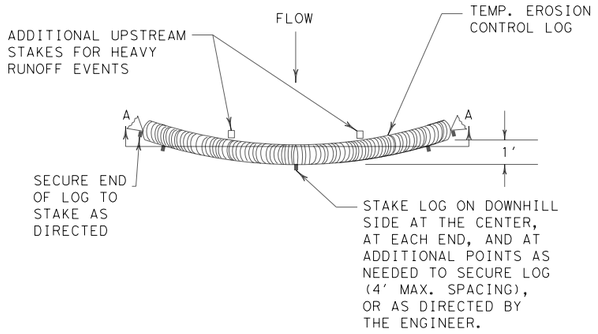
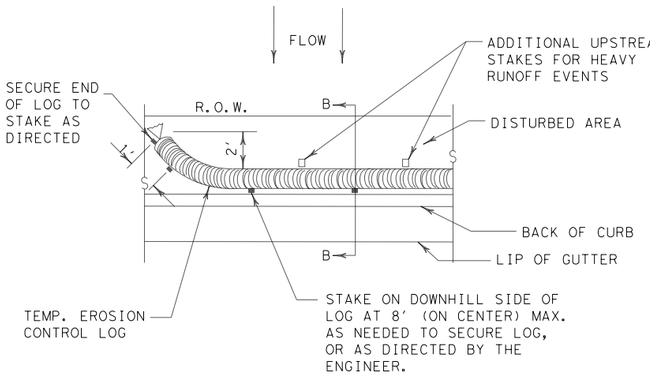


PLAN VIEW



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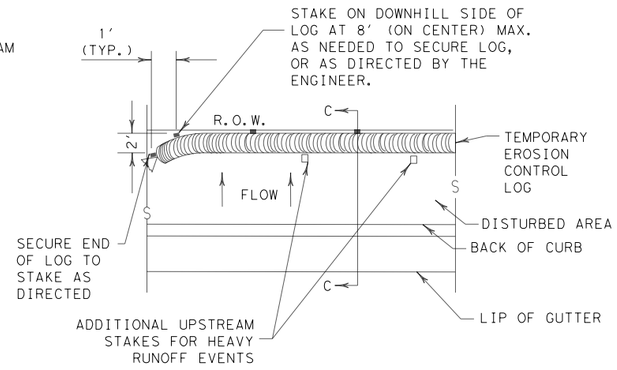

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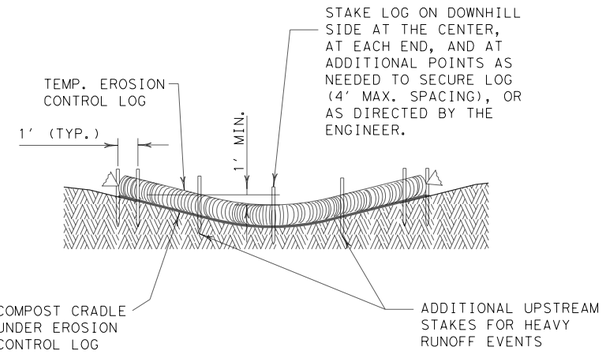
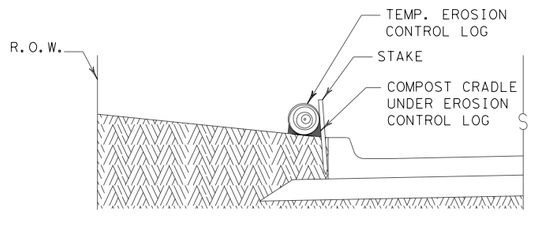


SECTION A-A

EROSION CONTROL LOG DAM

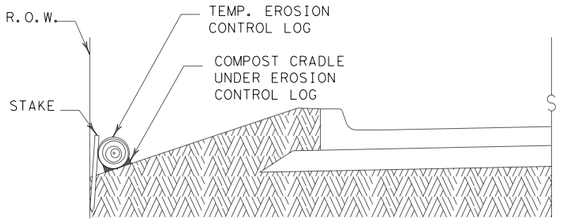
CL-D



SECTION B-B

EROSION CONTROL LOG AT BACK OF CURB

CL-BOC



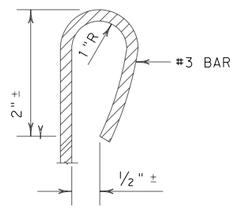
SECTION C-C

EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY

CL-ROW

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



REBAR STAKE DETAIL

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.

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.

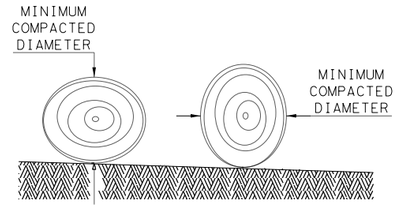
Log Traps: The drainage area for a sediment trap should not exceed 5 acres. The trap capacity should be 1800 CF/Acre (0.5" over the drainage area).

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.



DIAMETER MEASUREMENTS OF EROSION CONTROL LOGS SPECIFIED IN PLANS

Texas Department of Transportation — Design Division Standard

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
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	DIST	COUNTY		SHEET NO.
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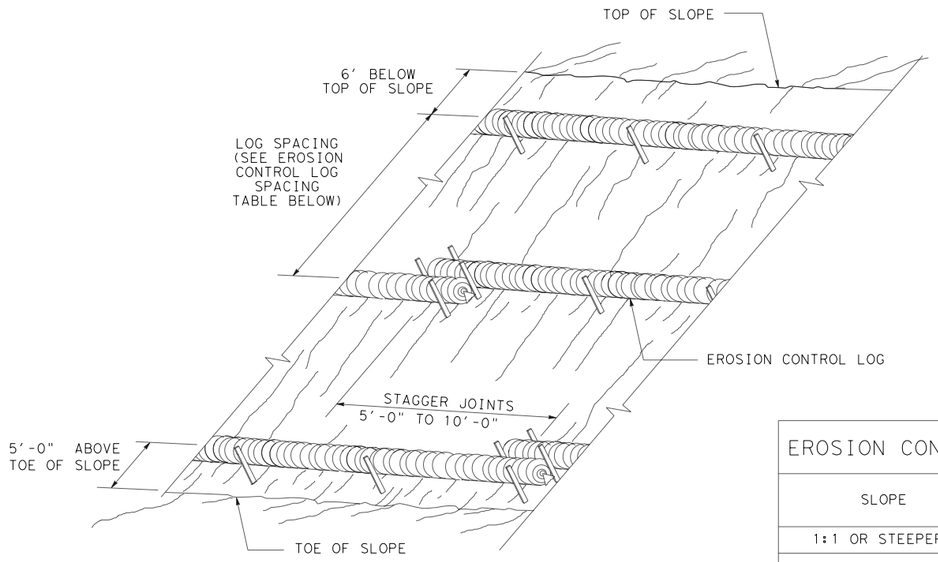
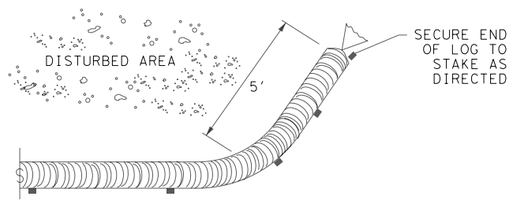


EROSION CONTROL LOGS ON SLOPES
STAKE AND TRENCHING ANCHORING

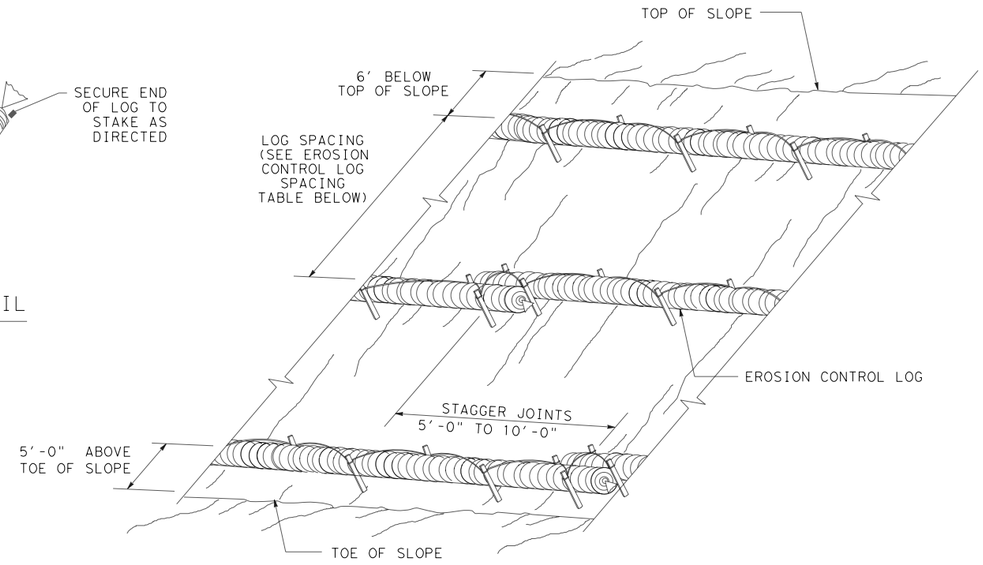
CL-SST



END SECTION RAP DETAIL

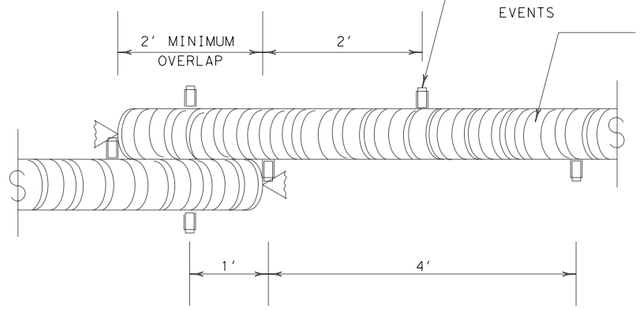
EROSION CONTROL LOG SPACING TABLE				
SLOPE	LOG DIAMETER			
	6"	8"	12"	18"
1:1 OR STEEPER	5'	10'	15'	20'
2:1	10'	20'	30'	40'
3:1	15'	30'	45'	60'
4:1 OR FLATTER	20'	40'	60'	80'

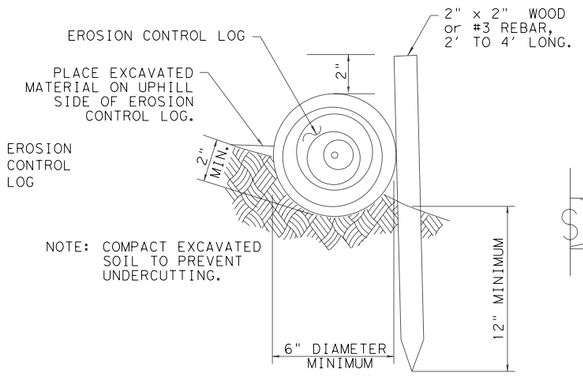
* ADJUSTMENTS CAN BE MADE FOR SOIL TYPE:
SOFT, LOAMY SOILS-ADJUST ROWS CLOSER TOGETHER;
HARD, ROCKY SOILS- ADJUST ROWS FARTHER APART



EROSION CONTROL LOGS ON SLOPES
STAKE AND LASHING ANCHORING

CL-SSL

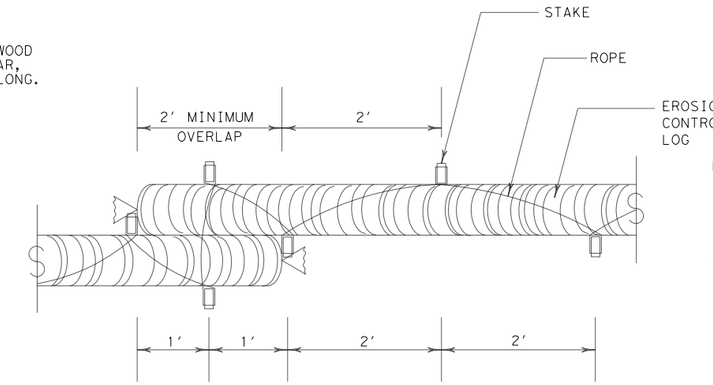




STAKE AND TRENCHING ANCHORING DETAIL

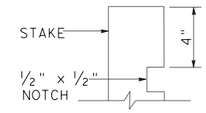
CL-SST

TRENCH DEPTH TABLE	
LOG DIAMETER	DEPTH
6"	2"
8"	3"
12"	4"
18"	5"

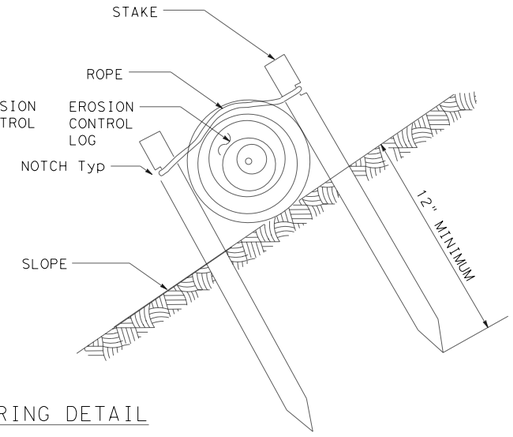


STAKE AND LASHING ANCHORING DETAIL

CL-SSL



STAKE NOTCH DETAIL



SHEET 2 OF 3

Texas Department of Transportation

Design Division Standard

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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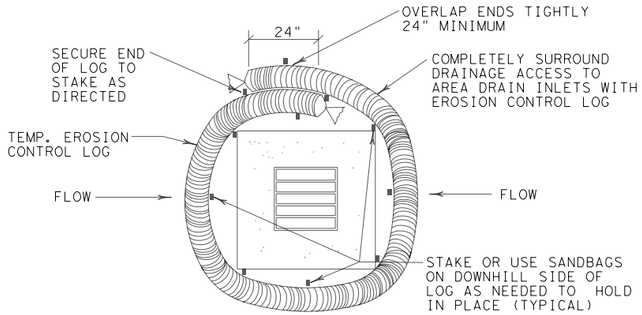
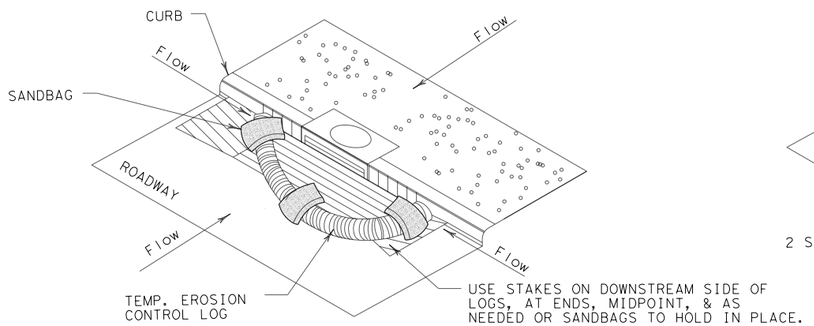
REVISIONS	3469	01	014	FM 3099		
	DIST	COUNTY		SHEET NO.		
	BWD	STEPHENS		195		



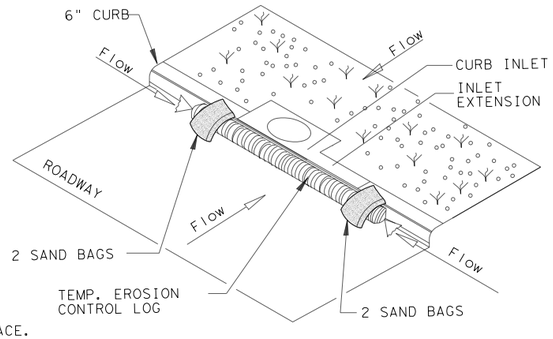
EROSION CONTROL LOG AT DROP INLET

CL-DI



EROSION CONTROL LOG AT CURB INLET

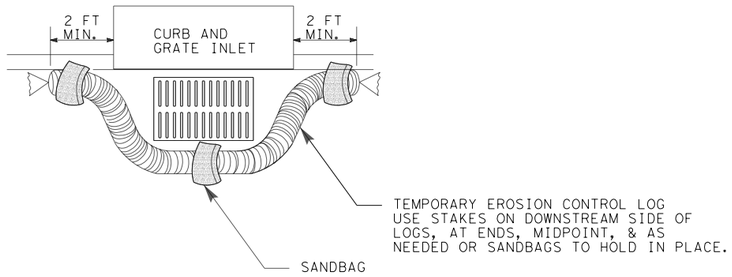
CL-CI



EROSION CONTROL LOG AT CURB INLET

CL-CI

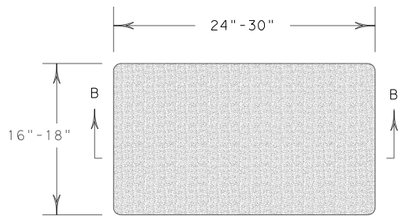
NOTE:
EROSION CONTROL LOGS USED AT CURB INLETS SHOULD ONLY BE USED IF THEY WILL NOT IMPEDE TRAFFIC OR FLOOD THE ROADWAY OR WHEN THE STORM SEWER SYSTEM IS NOT FULLY FUNCTIONAL.



EROSION CONTROL LOG AT CURB & GRADE INLET

CL-GI

SECTION B-B



SANDBAG DETAIL

DATE: 8/27/2021
FILE: N:\7023-17-102\CADD\DGN\09_ENVIRONMENTAL\StdDetails\014\ec916.dgn

Texas Department of Transportation

Design Division Standard

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	3469	01	014	FM 3099			
	DIST	COUNTY		SHEET NO.			
	BWD	STEPHENS		196			