FED.RD. DIV.NO.	FEDERAL PROJECT NO.		SHEET NO.
6	F 2023(456)		1
STATE	STATE DIST.	COUNTY	
TEXAS	AMA	HUTCHINSON CO	
CONT.	SECT.	JOB	HIGHWAY NO.
0356	01	107	SH 136

DESIGN SPEED = N/A
2022 ADT = 5,600
2042 ADT = 7,800
MINOR ARTERIAL

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT
FEDERAL PROJECT: F 2023(456)
HIGHWAY - SH 136
HUTCHINSON COUNTY

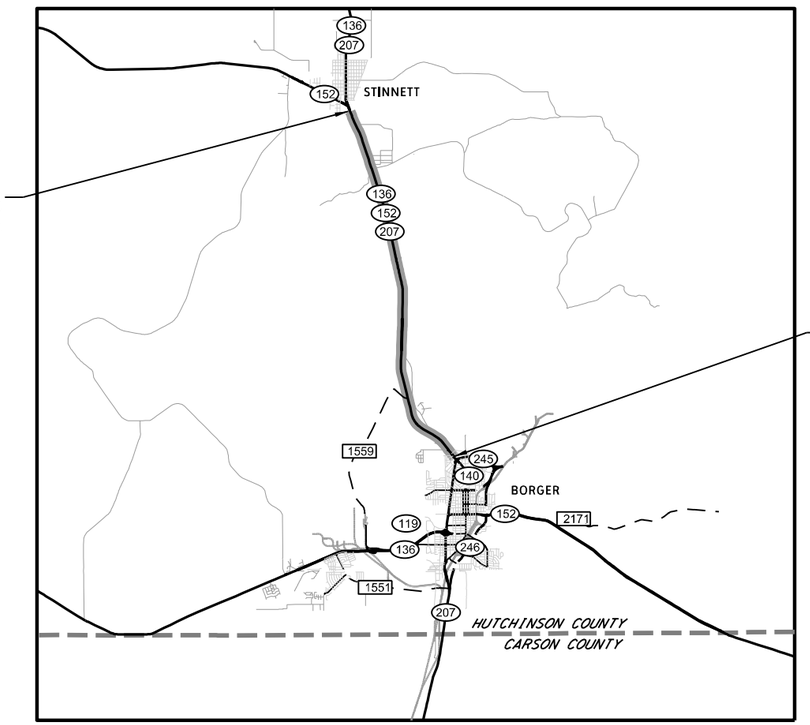
CONTROL: 0356-01-107

FOR THE CONSTRUCTION OF OVERLAY.
CONSISTING OF OVERLAY, PAVEMENT REPAIR, SAFETY TREAT FIXED OBJECTS, SIGNING AND STRIPING.

PROJECT LIMITS FROM: 0.1 MILES SOUTH OF SH 152
TO: NORTH BORGER TRAFFIC CIRCLE

ROADWAY LENGTH: 44,750.83 FT. = 8.476 MILES
BRIDGE LENGTH: 4,914.14 FT. = 0.931 MILES
TOTAL LENGTH: 49,664.97 FT. = 9.406 MILES

INDEX OF SHEETS



STA. 644+00.00
END CSJ: 0356-01-107
RM: 62+1.354

STA. 147+35.03
BEGIN CSJ: 0356-01-107
RM: 72+0.077

EXCEPTIONS:
NONE

RAILROADS:
NONE

EQUATIONS:
NONE

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 CONSTRUCTION CONTRACTS (FORM FHWA 1273, JULY 2022).

FINAL PLANS

LETTING DATE: _____

DATE CONTRACTOR BEGAN WORK: _____

DATE WORK WAS COMPLETED & ACCEPTED: _____

FINAL CONTRACT COST: $ _____

CONTRACTOR : _____

AE : _____

2022 Texas Department of Transportation

RECOMMENDED FOR LETTING: DATE: 11/30/2022

DocuSigned by: Bernard Funk, PE
25B59152F691499...

AREA ENGINEER

DATE: 11/30/2022

DocuSigned by: Kit Black
9B5A6EA6AE8B46E...

DISTRICT DIRECTOR OF TRANSPORTATION PLANNING AND DEVELOPMENT

APPROVED FOR LETTING: DATE: 12/2/2022

DocuSigned by: Blair Johnson
8B80E3AEB2BC43A...

DISTRICT ENGINEER

INDEX OF SHEETS

THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ABOVE HAVE BEEN SELECTED BY ME OR UNDER MY RESPONSIBLE SUPERVISION AS BEING APPLICABLE TO THIS PROJECT.

STATE OF TEXAS
CASEY B. STRIPLING
136887
LICENSED PROFESSIONAL ENGINEER

Casey B. Stripling

11-17-2022

SH 136

INDEX OF SHEETS

2023 Texas Department of Transportation

SHEET 1 OF 1

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		2

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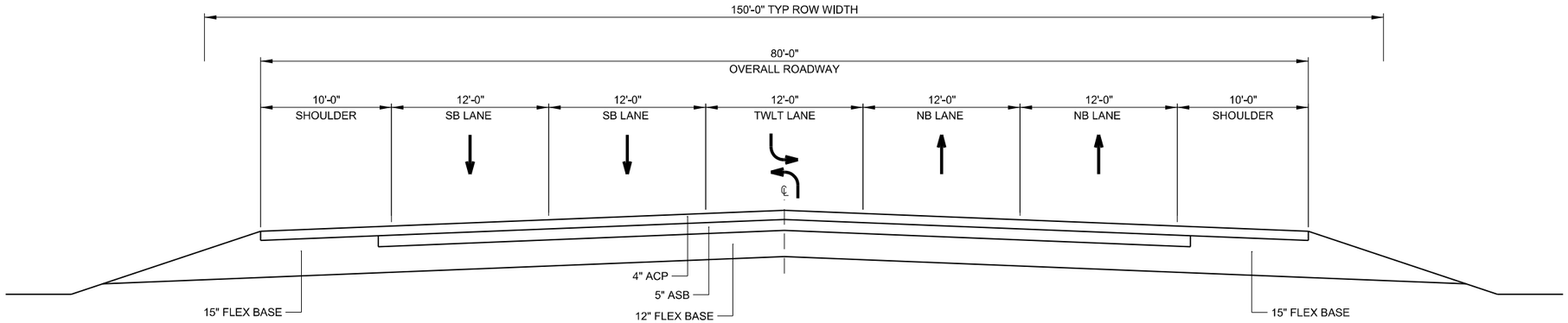

Ⓐ EXISTING TYPICAL SECTION

CSJ: 0356-01-107
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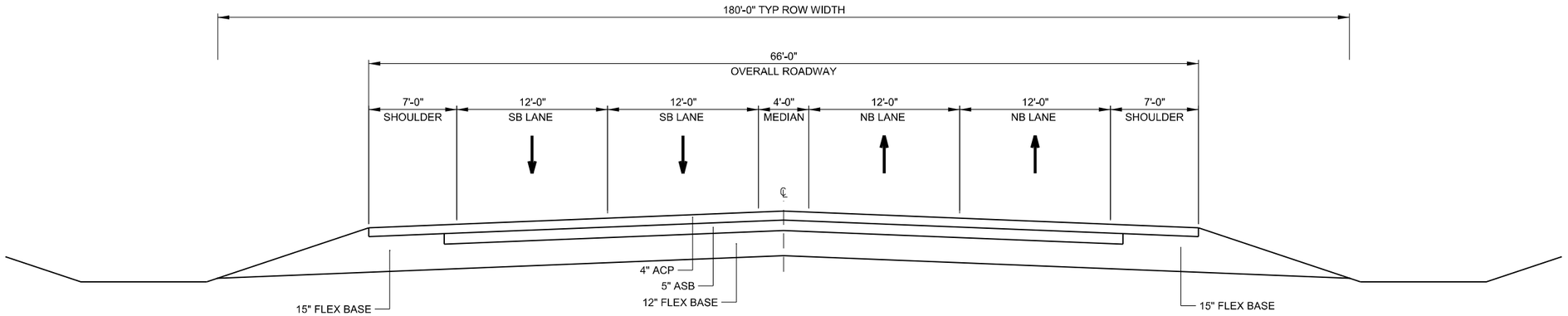
TRANSITION STA. 310+00 TO 312+40 (SECTION A TO SECTION E) (AVG. 83')
STA 517+00 TO 644+00



Ⓑ EXISTING TYPICAL SECTION

CSJ: 0356-01-107
TRANSITION STA. 147+35 TO 158+18 (TRAFFIC CIRCLE TO SECTION B) (AVG. 73')
STA. 158+18 TO 189+50
TRANSITION STA. 189+50 TO 190+00 (SECTION B TO SECTION C) (AVG. 62')
STA. 224+00 TO 230+00
STA. 238+00 TO 247+00
TRANSITION STA. 247+00 TO 249+00 (SECTION B TO SECTION A) (AVG. 73')
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STA. 422+00 TO 515+00
TRANSITION STA. 515+00 TO 517+00 (SECTION B TO SECTION A) (AVG. 73')

STATE OF TEXAS
CASEY B. STRIPLING
136887
LICENSED PROFESSIONAL ENGINEER

Casey B. Stripling

11-17-2022

SH 136

TYPICAL SECTIONS

SCALE H: 1" = 10'
V: 1" = 5'

2023 Texas Department of Transportation

SHEET 1 OF 6

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		3

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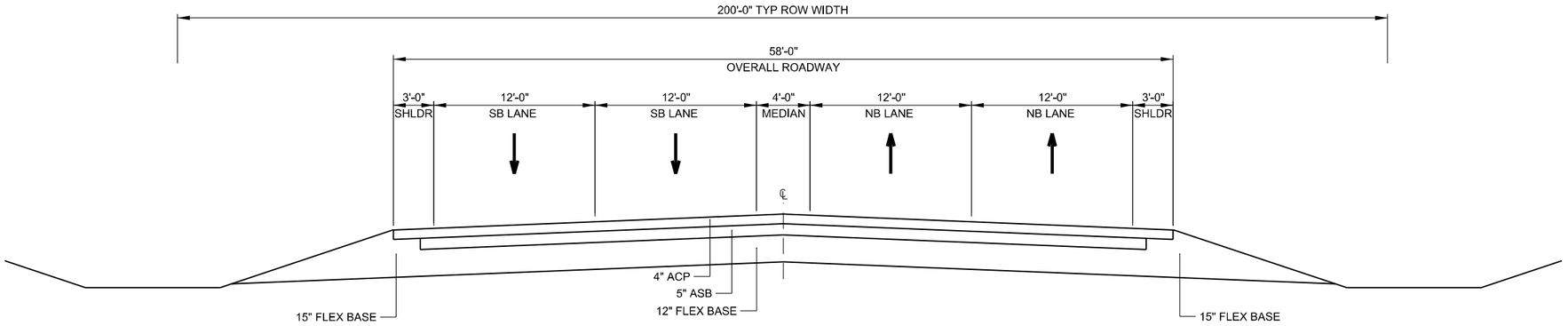

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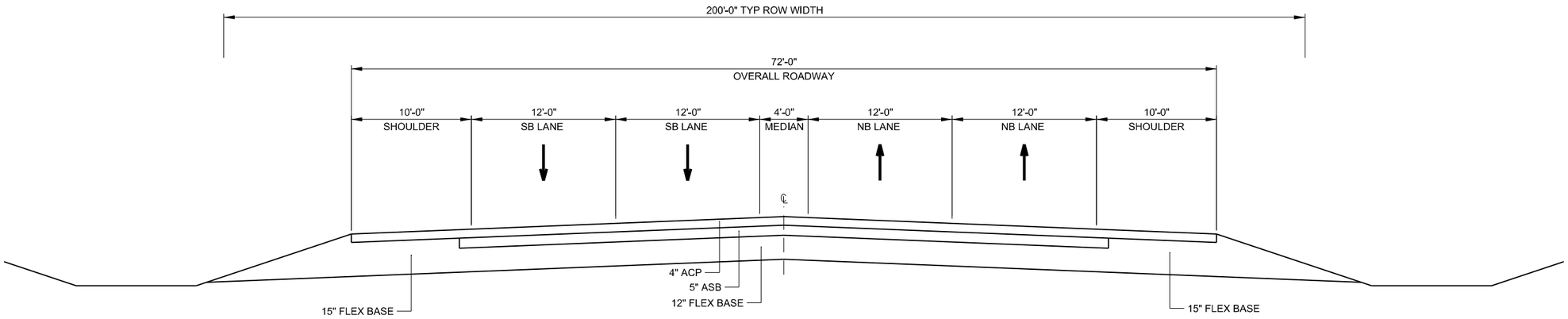
TRANSITION STA. 421+50 TO 422+00 (SECTION C TO SECTION B (AVG. 62')



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CSJ: 0356-01-107
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STA. 231+00 TO 232+10
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TRANSITION STA. 237+00 TO 238+00 (SECTION D TO SECTION B) (AVG. 69)
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STA. 359+00 TO 364+00
TRANSITION STA. 364+00 TO 365+50 (SECTION D TO SECTION B) (AVG. 69')

ROCK CREEK BRIDGE:

NOTE: STA IS FROM BEGIN TO END OF APPROACH SLAB

STA. 232+10 - 235+95

STATE OF TEXAS
CASEY B. STRIPLING
136887
LICENSED
PROFESSIONAL ENGINEER

Casey B. Stripling

11-17-2022

SH 136

TYPICAL SECTIONS

SCALE H: 1" = 10'
V: 1" = 5'

2023 Texas Department of Transportation

SHEET 2 OF 6

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		4

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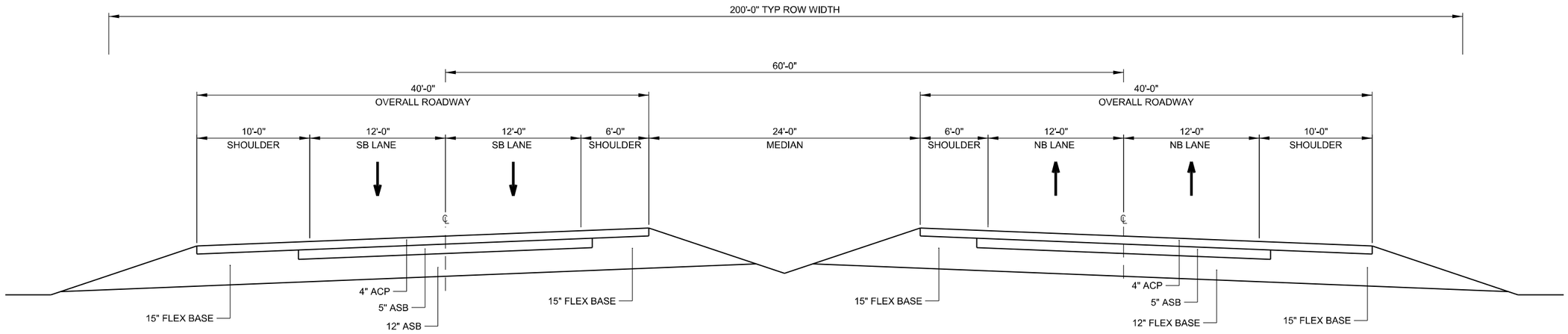

Ⓔ EXISTING TYPICAL SECTION

CSJ: 0356-01-107 (SOUTH BOUND)
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STA. 340+50.75 TO 354+40

CSJ: 0356-01-107 (NORTH BOUND)
STA. 312+40 TO 319+88.75
STA. 340+50.00 TO STA.354+40

ROCK CREEK BRIDGE:

NOTE: STA IS FROM BEGIN TO END OF BRIDGE

NB STA. 319+88.75 - 340+50.00
SB STA. 314+49.25 - 340+50.75

STATE OF TEXAS
CASEY B. STRIPLING
136887
LICENSED PROFESSIONAL ENGINEER

Casey B. Stripling

11-17-2022

SH 136

TYPICAL SECTIONS

SCALE H: 1" = 10'
V: 1" = 5'

2023 Texas Department of Transportation

SHEET 3 OF 6

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		5

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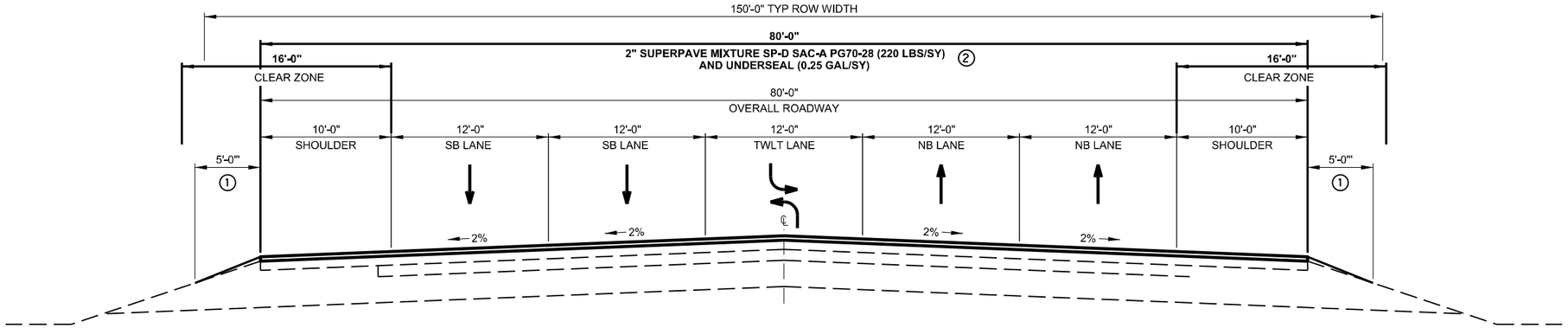

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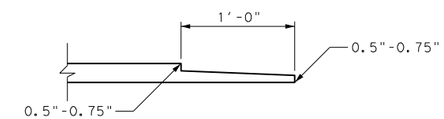
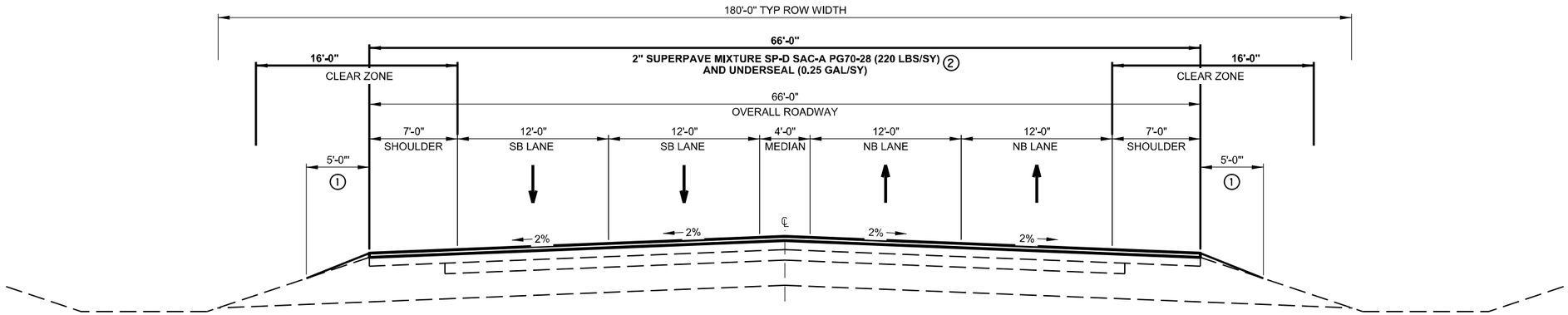


NOTCHED WEDGE LONGITUDINAL JOINT DETAIL
N.T.S.

NOTES:

① PREP ROW & TYPE A BACKFILL. SEE EROSION CONTROL LAYOUT FOR SEEDING& EMULSION.

② NOTCHED WEDGE LONGITUDINAL JOINT WILL BE REQUIRED, VARIANCE TO THE DIMENSIONS SHOWN AS APPROVED BY THE ENGINEER.



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STATE OF TEXAS
CASEY B. STRIPLING
136887
LICENSED
PROFESSIONAL ENGINEER

Casey B. Stripling

11-17-2022

SH 136

TYPICAL SECTIONS

SCALE H: 1" = 10'
V: 1" = 5'

2023 Texas Department of Transportation

SHEET 4 OF 6

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		6

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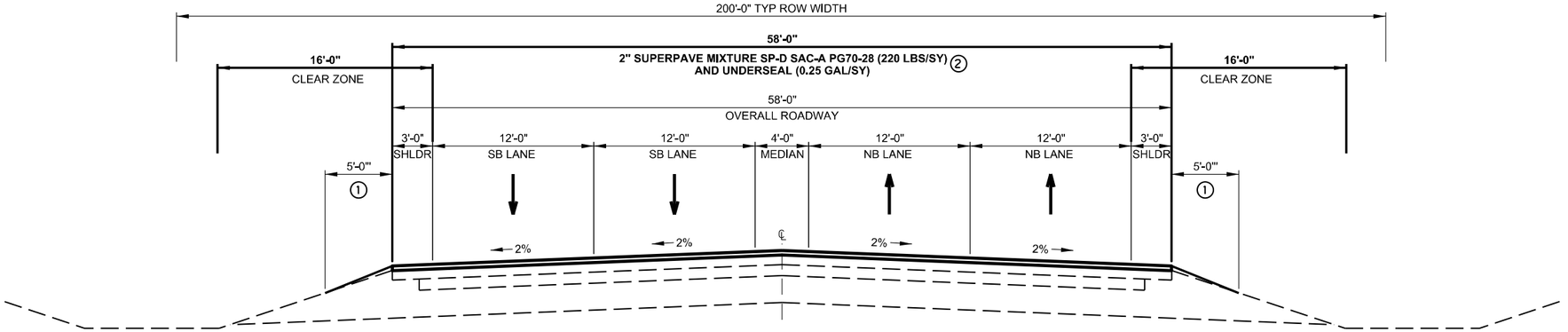

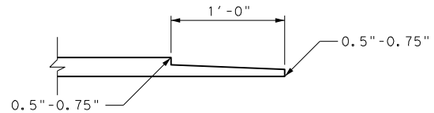

NOTCHED WEDGE LONGITUDINAL JOINT DETAIL

N.T.S.

NOTES:

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SEE EROSION CONTROL LAYOUT FOR SEEDING& EMULSION.

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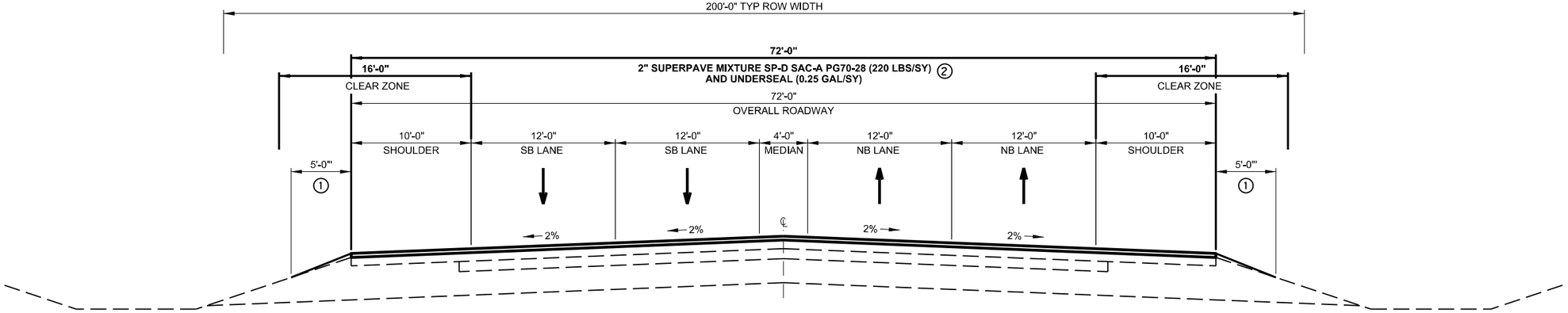

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ROCK CREEK BRIDGE:

NOTE: STA IS FROM BEGIN TO END OF APPROACH SLAB.
NO PROPOSE WORK ON APROACH SLAB & BRIDGE

STA. 232+10 - 235+95

STATE OF TEXAS
CASEY B. STRIPLING
136887
LICENSED PROFESSIONAL ENGINEER

Casey B. Stripling

11-17-2022

SH 136

TYPICAL SECTIONS

SCALE H: 1" = 10'
V: 1" = 5'

2023 Texas Department of Transportation

SHEET 5 OF 6

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		7

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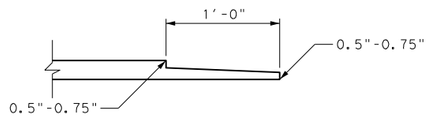

NOTCHED WEDGE LONGITUDINAL JOINT DETAIL
N.T.S.

NOTES:

1. PREP ROW & TYPE A BACKFILL. SEE EROSION CONTROL LAYOUT FOR SEEDING& EMULSION.
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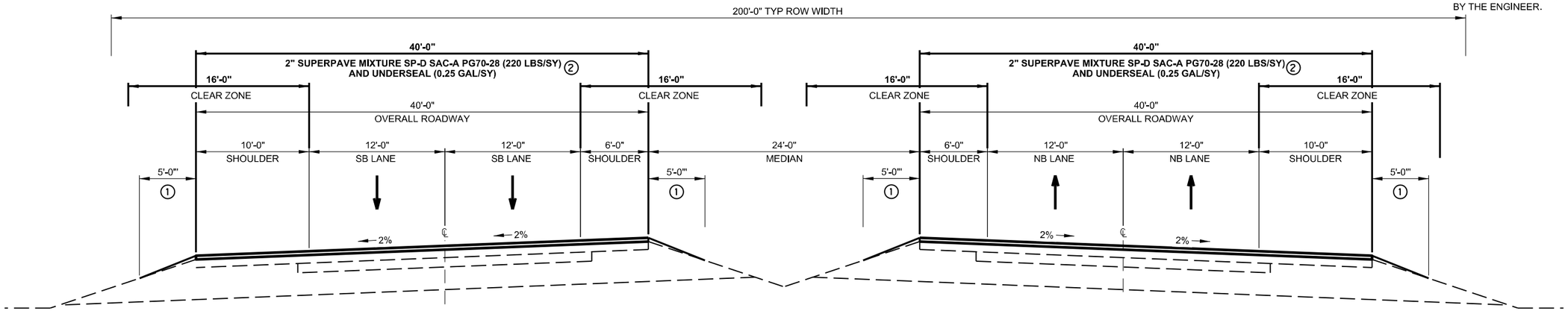

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CSJ: 0356-01-107 (SOUTH BOUND)
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CSJ: 0356-01-107 (NORTH BOUND)
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ROCK CREEK BRIDGE:

NOTE: STA IS FROM BEGIN TO END OF BRIDGE
NO PROPOSED WORK TO BRIDGE

NB STA. 319+88.75 - 340+50.00
SB STA. 314+49.25 - 340+50.75

STATE OF TEXAS
CASEY B. STRIPLING
136887
LICENSED
PROFESSIONAL ENGINEER

Casey B. Stripling
11-17-2022

SH 136

TYPICAL SECTIONS

SCALE H: 1" = 10'
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2023 Texas Department of Transportation

SHEET 6 OF 6

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		8

DATE: 11/17/2022 4:25:17 PM
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GENERAL NOTES

CSJ: *0356-01-107*

BASIS OF ESTIMATE FOR CONSTRUCTION				
Item	Description	Unit	Rate	
164	SEEDING		SEE PLAN SHEETS	
166	FERTILIZER		SEE PLAN SHEETS	
314	EMULSION ASPHALT (MULTI) (MS-2 OR SS-1)	GAL	SEE NOTE 2	
3077(1)	SUPERPAVE MIXTURES	TON	1.5" AVG 2"	165 LB/SY/2000 220 LB/SY/2000
3077	TACK COAT	GAL	0.13 GAL/SY	
3085	UNDERSEAL COARSE	GAL	SEE GENERAL NOTE FOR RATE INFORMATION	
NOTE:				
(1)	*"SUPERPAVE MIXTURES"* Weight Based On 110Lbs/SY/In			
(2)	40% Emulsified Asphalt 60% Water Mixture Applied At 0.25 Gal/Sy. Paid using 0.1 Gal/Sy.			
(3)	The TRAIL hot asphalt type options will only be allowed.			

General

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

TO:	Dumas Area Engineer	Bernardo.Ferrel@txdot.gov
CC:	Assistant Area Engineer	Ofelia.Garbalena@txdot.gov
	Director of Construction	Kenneth.Petr@txdot.gov
	Construction Manager	Thomas.Nagel@txdot.gov

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

All Contractor questions will be reviewed by the Engineer. Once a response is developed, it will be posted to TxDOT's Public FTP at the following Address.

https://ftp.dot.state.tx.us/pub/txdot-info/Pre-Letting%20Responses/

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

There are approximately *5* "reference markers" within the project limits. If a marker needs to be moved for any reason during construction operations, the Contractor is to remove it, install it in a temporary location and then reinstall it in its correct permanent location. Both the temporary and permanent locations are to be on a line that is perpendicular to the original "station" along the roadway. The temporary location is to be at or near the right-of-way. The permanent location is to be directed by the Engineer.

The following Standard Detail Sheets have been modified:

MC-5-20 (MOD)

The Contractor is advised that a construction speed zone will be applicable for this project and is to be limited to the actual work areas under construction. The approved construction speed limit will be made available upon request to the Engineer.

Remove all excess material from bridge substructure resulting from all construction including planing, seal coat and ACP overlays. This work will not be paid for directly, but will be considered subsidiary to various bid items in the contract.

If portions of the right-of-way is used to store materials, equipment, and other uses with the approval of the Engineer, materials, equipment, etc., must either be located outside the *30* feet traffic safety clearance zone or be adequately protected.

Contractor facilities, such as asphalt plants, concrete plants, rock crushers, etc. are not allowed to be located within Department right of way.

The slopes indicated on the typical sections may be varied when fixed features required slopes are re-established as directed by the Engineer.

Dust caused by construction operations is to be controlled by applying water in conformance with the requirements of Item 204, "Sprinkling". Sprinkling for dust control will not be paid for directly, but will be considered as subsidiary work to the various bid items.

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.

Item 7 Legal Relations and Responsibilities

No significant traffic generator events identified.

The total area disturbed for this project is approximately *6* acres. The disturbed area in this project, all project locations in the Contract, and the Contractor Project Specific Locations (PSLs), within 1 mile of the project limits, for the Contract will further establish the authorization requirements for storm water discharges. The Department will obtain an authorization to discharge storm water from the Texas Commission on Environmental Quality (TCEQ) for the construction activities shown on the plans. The Contractor is to obtain required authorization from the TCEQ for Contractor PSLs for construction support activities on or off the ROW. When the total area disturbed in the Contract and PSLs within 1 mile of the project limits exceeds 5 acres, provide a copy of the Contractor NOI for PSLs on the ROW to the Engineer and to the local government that operates a separate storm sewer system.

Item 8 Prosecution and Progress

Create, maintain, and submit for approval, a Critical Path Method (CPM) project schedule and a Project Schedule Summary Report (PSSR) using computer software that is fully compatible with the latest version of Primavera Systems, Inc. or Primavera P6.

All paving work must be completed within the *2023* asphalt season.

Item 100 Preparing Right Of Way

Preparing right of way will consist exclusively of mowing the vegetation to the width shown in the plans for Backfilling Pavement Edges. Set mower cutting height to cut as low as practical but no higher than 6 inches. Payment for Preparing Right Of Way will be made only in the case where mowing is actually used.

All tree removal activities are to take place outside nesting season. See EPIC for nesting season.

Remove trees of various diameters as shown on the plans, or as directed. Remove tree stumps to at least 12 in. below the surrounding terrain. Before backfilling holes treat the remainder of the stump with the following herbicide: Manufacture - Dow AgroScience; Product - Remedy or other as approved by the Engineer. Follow manufacture recommendations for herbicide. Backfill holes with acceptable material and compact flush with surrounding areas.
Identify each individual tree proposed to be removed. Obtain approval from the Engineer in the field for each individual tree proposed to be removed prior to any tree being removed.

Item 110 Excavation

Before grading begins, the vegetative cover within the areas to be graded are to be bladed into a windrow outside the limits of the slopes. After all grading is complete; the vegetative cover is to be spread over the adjacent disturbed areas. This work is not to be paid for directly, but will be considered subsidiary work to the various bid items.

Item 132 Embankment

The plasticity index for *TY B* will not exceed 25.

Materials excavated from the project will be allowed to be used on the project as directed by the Engineer.

Item 134 Backfilling Pavement Edges

Mow according to Item 100 just prior to backfill pavement edge operations.

Do not overlay any roadway unless the pavement edges can be backfilled within 24 hours. Preferably, both edges of all roadways should be completely backfilled at the end of each day's overlay operations. Damage to delineators, signs, or other roadside features will be repaired or replaced at the expense of the Contractor.

The backfill material will not be obtained from within the right-of-way or from any area that contains perennial plants such as “bindweed” or “jointgrass” that would be detrimental to agricultural land.

Item 164 Seeding for Erosion Control

Perform planting operations in accordance with the recommendations contained in the latest version of the TxDOT manual “A Guide to Roadside Vegetation Establishment” developed by the Vegetation Management Section of the Maintenance Division.

Seeding may require more than one mobilization, depending upon the Contractor’s sequence of work.

Item 166 Fertilizer

Fertilize all areas of project to be seeded or sodded in accordance with the Amarillo District Vegetation Specification Sheet.

Item 314 Emulsified Asphalt Treatment

A *5* foot wide strip of finished material adjacent to each shoulder is to be treated with an emulsified asphalt mixture. The mixture may be placed in one or more applications at a total rate of 0.25 gallons per square yard, unless directed otherwise by the Engineer. The homogeneous mixture may be composed of approximately 40% asphalt (MS-2 or SS-1) and 60% water, unless directed otherwise by the Engineer.

Item 320 Equipment for Asphalt Concrete Pavement

A self-propelled, wheel mounted material transfer vehicle (MTV) capable of receiving hot mix from the haul trucks separate from the paver is required on all courses and all types of hot mix for this project. The MTV is to have a minimum storage capacity of approximately 25 tons, and equipped with a pivoting discharge conveyor and a means of completely remixing the hot mix prior to placement. The paver hopper is to be equipped with a separate surge storage insert with a minimum capacity of approximately 20 tons.

If used, the IR bar read out screen must be visible at all times to the Engineer.

Item 351 Flexible Pavement Structure Repair

Contractor is not to remove more pavement than can be replaced that same day.

All flexible pavement structure repairs must be overlaid within the same asphalt season.

Item 354 Planing and Texturing Pavement

The Contractor will retain ownership of planed materials.

Item 421 Hydraulic Cement Concrete

The sand equivalent value of fine aggregate is not to be less than 85 when subjected to test method tex-203-F.

The Engineer will perform all job control testing for acceptance.

The Engineer will provide strength-testing equipment when required in accordance with the Contract-controlling tests.

Furnish and maintain the following testing equipment:

- ♦ Test Molds

All cast-in-place concrete except for drilled shafts are to be air-entrained. Pre-cast and drilled shaft concrete may be air-entrained at the Contractor's option.

The Engineer will provide strength testing equipment for acceptance testing.

Item 432 Riprap

24" tie bars (#3 bars at 18" c-c) are to be used across all construction joints. Tie bars should be 12'' into each side of the construction joint. When tying new riprap into existing riprap drill and epoxy grout 8" minimum into existing concrete. This is to be considered subsidiary to the payment for riprap.

Use of #3 rebar for reinforcing is required.

Item 460 Corrugated Metal Pipe

Bedding for pipe culverts is to be 6 inches of sand. The excavation required to place the sand will not be paid for directly but will be considered subsidiary to this item.

Item 462 Concrete Box Culverts and Storm Drains

Joint material for reinforced concrete pipe is to be either cold applied preformed plastic gaskets or cold applied plastic asphalt sewer joint compound.

Backfill pipe up to the springline with granular material. The ponding method of backfilling will be allowed for the granular material only.

Item 464 Reinforced Concrete Pipe

Joint material for all pipes will be cold applied plastic asphalt sewer joint compound.

Bedding for pipe culverts is to be 6 inches of sand. The excavation required to place the sand will not be paid for directly but will be considered subsidiary to this item.

Backfill pipe up to the springline with granular material. The ponding method of backfilling will be allowed for the granular material only.

Item 467 Safety End Treatment

Pre-cast Safety End Treatments are allowed; however, a cast-in-place concrete apron will be required as shown on the plans & will be subsidiary to the Safety End Treatment.

Item 502 Barricades, Signs, and Traffic Handling

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.

Temporary rumble strips will be required as shown on WZ(RS)-22 regardless of loose gravel, and/or soft or bleeding asphalt. Adjust the traffic control setup such that rumble strips are not placed in areas of heavily rutted pavements, unpaved surfaces, or horizontal curves. Temporary rumble strips will not be allowed on interstate highway.

The Contractor is to have the option of using either plastic drums, vertical panels, grabber cones or a combination where drums are shown as channelizing devices, as approved by the Engineer. Plastic drums are to be used in all transition areas in accordance with BC(8)-21 and WZ(TD)-17.

Furnish and install "soft shoulder" signs as directed by the Engineer. This work will not be paid for directly, but will be considered as subsidiary to item 502, "Barricades, Signs and Traffic Handling".

Provide a 3:1 backfill "safety slope" at the end of the day for any drop off exceeding 2" that is adjacent to a travel lane.

Lane closures are to be limited to a maximum of 3 miles.

If more than one lane closure location is desired a minimum of 2 miles passing zone is required between each location.

Notify the Engineer 24 hours prior to any lane closure.

Item 504 Field Office and Laboratory

The following buildings will be required for this project:

One Type (D) structure, asphalt mix control laboratory

Each building is to be provided before work is begun on the pertinent construction items for which it is needed.

Any laboratory furnished is to be a minimum of 10 ft in width.

Chain link security fence will be required to be placed around the perimeter of all field offices. The dimensions of the fence will be as directed by the Engineer.

The Type D structures are to be equipped with the following in addition to requirements specified under item 504:

a. Safety equipment
   (1) One eye wash station
   (2) One fire extinguisher
   (3) One first aid kit

Furnish a Type D structure for the asphalt mix control laboratory for the Engineer's exclusive use. In addition to requirements of item 504, this structure is to have a minimum height of 8 feet and provide a minimum 400 square feet gross floor area for permanently located plants or 200 square feet for temporary located plants serving one project. The floor area will be partitioned into a minimum of two interconnected rooms, each room furnished with an exterior door and a minimum of two windows. The floor is to have sufficient strength to support the testing equipment and have an impervious covering.

The Type D structures are to be adequately air conditioned and be furnished with a minimum of one desk, three chairs, one file cabinet, a telephone and one built-in equipment storage cabinet for the storage of nuclear equipment. The cabinet is to be a minimum of 3 feet wide by 2 feet deep by 3 feet high and have provisions for locking security. The structure is to be provided with a 240-volt electrical service entrance. The service is to consist of a minimum of 4 - 120 volt circuits with 20 amp breakers and no more than two grounded convenience outlets per circuit and provisions for a minimum of two 220-volt ovens with vents to the outside. The structure is to have a minimum of 2 convenience outlets per wall, and a utility sink with an adequate clean potable water supply for testing. The state building is to be equipped with at minimum a hot water dispenser or hot water heater capable of generating 1 gallon of water per use at 140º F with adequate water pressure. Space heaters for heating the structure are unacceptable. Portable structures are to be support blocked for stability and are to be tied down.

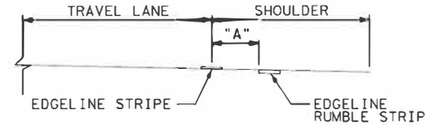
If needed, each building is to be moved to a new location as directed by the Engineer. Any building that is no longer required on the job after completion of the pertinent construction items may be released to the Contractor upon consent of the Engineer.

Item 506 Temporary Erosion, Sedimentation, and Environmental Controls

Erosion control devices are to be installed as needed in coordination with the work progress, or as directed by the Engineer.

Item 533 Milled Rumble Stripes

Use the applicable option in the table below for installation of the continuous milled depressions, as shown on the Depressed Shoulder Texturing Standard Sheet RS(1)-13 and RS(4)-13.



EDGELINE RUMBLE STRIP DETAIL
NTS
(MIRROR FOR INSIDE SHOULDER)

SHOULDER WIDTH (SW)	RUMBLE STRIP WIDTH (RS)	PLACEMENT "A"	OPTION (SEE RS(1)-13 or RS(4)-13)
SW ≤ 2'	8" RS	SEE RS(1)-13*	Option 1
2' < SW ≤ 8'	8" RS	4" OFF EDGELINE*	Option 3
SW ≥ 8'	16" RS	24" OFF EDGELINE*	Option 4

Use milled option 1 for installation of the centerline rumble strips, as shown on the Standard Sheet RS(2)-13 and RS(3)-13.

Item 540 Metal Beam Guard Fence

Drive steel posts for metal beam guard fence a minimum of 1/3 of the post length to final specified depth.

Item 542 Removing Metal Beam Guard Fence

All MBGF, GET & TAS materials will remain property of the Contractor.

Item 544 Guardrail End Treatments

Use Single Guardrail End Treatment (Ty III)(Steel Post).

Item 585 Ride Quality for Pavement

Use Surface Test Type B pay adjustment schedule *2* to evaluate ride quality of the travel lanes in accordance with Item 585, "Ride Quality for Pavement Surfaces."

Use Surface Test Type B pay adjustment schedule *2* to evaluate ride quality of the shoulders and ramps in accordance with Item 585, "Ride Quality for Pavement Surfaces."

Item 644 Small Roadside Sign Supports and Assemblies

ALUMINUM SIGN BLANKS THICKNESS	Square Feet	Minimum Thickness
	Less than 7.5	0.100
	7.5 or Greater	0.125

All slip base signs will have a triangular slip base with a 2-bolt clamp to prevent rotation of signpost. Set screw type slip base will not be allowed.

A 7" x 1/2" diameter galvanized rod or #4 rebar is to be installed in the sign stub as shown on SMD(SLIP-1)-08 to prevent rotation of the sign stub in the concrete footing.

The exact locations of the large and small roadside signs are to be as designated by the Engineer.

The existing riprap aprons are to be removed and disposed of as approved by the Engineer. This work is not to be paid for directly, but will be considered subsidiary to the removal of foundations under this item.

Probe before drilling for foundations to determine the location of all utilities and structures. This work will not be paid for directly, but will be considered subsidiary to bid items involved.

Details for standard signs not shown on the signing standards of the signing detail plan sheets are to be in conformance with the department's "Standard Highway Sign Designs for Texas" Manual, Latest Edition.

Install a wrap of retroreflective sheeting conforming to DMS-8300 on all posts for small road sign assemblies. Sign post wraps will not be paid for directly, but are considered subsidiary to Item 644.

Install red sheeting on the posts containing the following signs:
Stop, Yield, Wrong Way & Do Not Enter

Install yellow sheeting on all other small sign posts.

Install all retroreflective wraps at a height of 4 ft. from bottom of the wrap to the edge of the travel lane surface. All retroreflective wraps will cover the full circumference of the sign post for a vertical width of 12 inches.

Item 658 Delineator and Object Marker Assemblies

For all ground mount applications provide hollow or tubular posts embedded in concrete using plastic wedged anchor system.

For all concrete barrier, bridge rail, and guard fence post mounted applications provide hollow or tubular posts with approved anchorage.

Item 666 Reflectorized Pavement Markings

Retroreflectivity Requirements:

All Type I markings must meet the minimum retroreflectivity values for edgeline markings, centerline or no passing barrier-line, and lane lines when measured any time after 3 days, but not later than 10 days after application:

- White markings: 250 millicandelas per square meter per lux (mcd/m^2/lx)
- Yellow markings: 175 mcd/m^2/lx

Retroreflectivity Measurements: Mobile or portable retroreflectometers may be used at the Contractor's discretion.

All Type I markings must meet the minimum retroreflectivity values for edgeline markings, centerline or no passing barrier-line, and lane lines when measured any time after 3 days, but not later than 10 days after application.

Item 3077 Superpave Mixtures

Use aggregate that meets the SAC requirement of class A.

Only fractionated RAP is allowed.

Use of RAS is not allowed.

All SP-D on this project is considered surface mix. A substitution PG binder is not allowed, as shown in Table 5.

When laying ACP on a roadway that has two or more lanes and the work is being done under traffic, then the adjacent lane or lanes are to be overlaid by the end of the following day.

Make a smooth, clean, minimum 1 inch deep butt joint where each end of the new pavement joins the existing pavement. Any method approved by the Engineer can be used to make the joint.

The District Lab will perform a maximum of 2(two) design verification tests. If additional verification tests are needed, the Contractor will be billed $3,500.00 per each additional verification test required to obtain an approved asphaltic concrete pavement mix design.

If lime is not used as an antistrip agent, then the production and placement testing frequency for the Boil test (TEX-530-C) shown in the table below.

Description	Test Method	Minimum Contractor Testing Frequency	Minimum Engineer Testing Frequency
Boil test	Tex-530-C	1 per lot	1 per 12 sublots

If used, the IR bar read out screen must be visible at all times to the Engineer.

Item 3085 Underseal Course

For estimating purposes the Underseal Course is applied at a rate of 0.25 Gal/SY.

Item	Option	Material	Application Rate	Conversion Rate
316	Seal Coat	AGGR[4]	110 SY/CY	0.66[1]
		ASPH[5]	0.38 Gal/SY	
3002	Spray Applied Underseal Membrane	ASPH	0.25 Gal/SY	1.0[2]
3019	TRAIL-Ultrafuse and Jebro	ASPH	0.15 Gal/SY	1.67[3]

1. Aggregate is considered subsidiary to the asphalt. For estimating purposes 0.66 Gallons of Seal Coat Asphalt is equivalent to 1.0 Gallons of Underseal Course. Refer to Item 316 in these General notes for more information on this option.
2. For estimating purposes 1.0 Gallon of Spray Applied Underseal Membrane is equivalent to 1.0 Gallon of Underseal Course. Refer to Special Specification SS3002 for more information on this item.
3. For estimating purposes 1.67 Gallons of TRAIL is equivalent to 1.0 Gallons of Underseal Course. Refer to Special Specification SS3085 for more information on this item.
4. Use GR4 TY B SAC B in accordance with Item 316
5. Use AC-10 or other equivalent as approved by the Engineer.

Example: If TRAIL Option Is Selected For Use.
A conversion rate of 1.67 will be applied to every one gallon of oil that is used.
If the NET gallons determined after strapping the tank is 1,000 gallons. Then the 1,000 gallons will be multiplied by the 1.67 conversion rate in the table above.
1,000 GAL * 1.67 CR = 1670 gallons for payment.

Ultrafuse and Jebro is the only allowed "seal" for the TRAIL option. None of the "tack" options are allowed.

If the Spray Applied Underseal Membrane or TRAIL options are used, the use of tack is not required.

Item 3096 Asphalts, Oils, and Emulsions

Asphalt from different sources is not to be blended.

The "Open" seasons for applying asphaltic materials and mixtures for the listed items are to be as follows, unless authorized otherwise in writing by the Engineer:

ITEMS	OPEN SEASON
314	All Year
3077	From April 15th through October 31st

Item 6001 Portable Changeable Message Sign

Supply 2 Portable Changeable Message Signs (Type II – Lamp Matrix) for this project.
No payment will be made for removing and replacing damaged PCMS.

If the Contractor chooses to have more than one lane closure set-up at a time, provide additional PCMS in accordance with TCP at no additional charge to the department.

Item 6185 Truck Mounted Attenuator (TMA) and Trailer Attenuator (TA)

In addition to the shadow vehicles with truck mounted attenuator (TMA) that are specified as being required on the traffic control plan for this project, provide 0 additional shadow vehicle(s) with TMA for TCP (1-1)-18, (1-2)-18, (1-3)-18, (1-4)-18, (1-5), (2-1)-18, (2-2)-18, (2-3)-18, (2-4)-18, (2-5)-18, (2-6)-18, (3-1)-13, (3-2)-13, (3-3)-14, (3-4)-13 as detailed on the General Notes of this standard sheets.

Therefore, 2 total shadow vehicles with TMA will be required for this type of work. The Contractor will be responsible for determining if one or more of these operations will be ongoing at the same time to determine the total number of TMAs needed for the project.

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0356-01-107 **DISTRICT** Amarillo **COUNTY** Hutchinson
HIGHWAY SH 136

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**0356-01-107**			
		PROJECT ID		**A00127830**			
		COUNTY		**Hutchinson**			
		HIGHWAY		**SH 136**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	100-6001	PREPARING ROW	AC	11.000		11.000	
	100-6006	PREP ROW (TREE)(LESS THAN 24" DIA)	EA	90.000		90.000	
	100-6007	PREP ROW (TREE)(GREATER THAN 24" DIA)	EA	48.000		48.000	
	104-6022	REMOVING CONC (CURB AND GUTTER)	LF	30.000		30.000	
	110-6001	EXCAVATION (ROADWAY)	CY	1,491.000		1,491.000	
	132-6003	EMBANKMENT (FINAL)(ORD COMP)(TY B)	CY	1,043.000		1,043.000	
	134-6001	BACKFILL (TY A)	STA	493.000		493.000	
	150-6002	BLADING	HR	9.000		9.000	
	164-6034	DRILL SEEDING (PERM) (RURAL) (SANDY)	AC	18.000		18.000	
	164-6053	DRILL SEEDING (TEMP)(WARM OR COOL)	AC	18.000		18.000	
	314-6009	EMULS ASPH (EROSN CONT)(MULTI)	GAL	8,905.000		8,905.000	
	351-6012	FLEXIBLE PAVEMENT STRUCTURE REPAIR(2")	SY	24,861.000		24,861.000	
	354-6021	PLANE ASPH CONC PAV(0" TO 2")	SY	8,399.000		8,399.000	
	420-6009	CL A CONC (COLLAR)	EA	55.000		55.000	
	432-6001	RIPRAP (CONC)(4 IN)	CY	10.000		10.000	
	460-6003	CMP (GAL STL 24 IN)	LF	64.000		64.000	
	460-6004	CMP (GAL STL 30 IN)	LF	18.000		18.000	
	462-6091	CONC BOX CULV (5FT X 2.5FT)	LF	24.000		24.000	
	464-6005	RC PIPE (CL III)(24 IN)	LF	58.000		58.000	
	464-6007	RC PIPE (CL III)(30 IN)	LF	8.000		8.000	
	464-6008	RC PIPE (CL III)(36 IN)	LF	8.000		8.000	
	467-6006	SET (TY I) (24 IN) (4: 1) (C)	EA	2.000		2.000	
	467-6008	SET (TY I) (30 IN) (3: 1) (C)	EA	1.000		1.000	
	467-6009	SET (TY I) (30 IN) (4: 1) (C)	EA	1.000		1.000	
	467-6010	SET (TY I) (30 IN) (6: 1) (C)	EA	4.000		4.000	
	467-6015	SET (TY I) (36 IN) (4: 1) (C)	EA	1.000		1.000	
	467-6141	SET (TY I)(S= 4 FT)(HW= 3 FT)(6:1) (C)	EA	1.000		1.000	
	467-6179	SET (TY I)(S= 5 FT)(HW= 4 FT)(6:1) (C)	EA	2.000		2.000	
	467-6348	SET (TY II) (18 IN) (CMP) (6: 1) (P)	EA	2.000		2.000	
	467-6380	SET (TY II) (24 IN) (CMP) (6: 1) (P)	EA	40.000		40.000	
	467-6388	SET (TY II) (24 IN) (RCP) (3: 1) (C)	EA	2.000		2.000	
	467-6390	SET (TY II) (24 IN) (RCP) (4: 1) (C)	EA	3.000		3.000	
	467-6394	SET (TY II) (24 IN) (RCP) (6: 1) (C)	EA	11.000		11.000	
	467-6410	SET (TY II) (30 IN) (CMP) (6: 1) (P)	EA	6.000		6.000	
	467-6422	SET (TY II) (30 IN) (RCP) (6: 1) (C)	EA	1.000		1.000	
	496-6006	REMOV STR (HEADWALL)	EA	27.000		27.000	
	496-6007	REMOV STR (PIPE)	LF	205.000		205.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0356-01-107 **DISTRICT** Amarillo **COUNTY** Hutchinson
HIGHWAY SH 136

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**0356-01-107**			
		PROJECT ID		**A00127830**			
		COUNTY		**Hutchinson**			
		HIGHWAY		**SH 136**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	500-6001	MOBILIZATION	LS	1.000		1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	6.000		6.000	
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	600.000		600.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	600.000		600.000	
	506-6040	BIODEG EROSN CONT LOGS (INSTL) (8")	LF	3,750.000		3,750.000	
	506-6043	BIODEG EROSN CONT LOGS (REMOVE)	LF	3,750.000		3,750.000	
	529-6007	CONC CURB & GUTTER (TY I)	LF	30.000		30.000	
	533-6002	RUMBLE STRIPS (CENTERLINE)	LF	17,632.000		17,632.000	
	533-6003	RUMBLE STRIPS (SHOULDER) ASPHALT	LF	67,297.000		67,297.000	
	540-6002	MTL W-BEAM GD FEN (STEEL POST)	LF	14,325.000		14,325.000	
	540-6006	MTL BEAM GD FEN TRANS (THRIE-BEAM)	EA	8.000		8.000	
	540-6008	MTL BEAM GD FEN TRANS (T101)	EA	4.000		4.000	
	540-6038	CONNECTOR PLATE FOR THRIE BEAM	EA	4.000		4.000	
	542-6001	REMOVE METAL BEAM GUARD FENCE	LF	6,616.000		6,616.000	
	542-6003	REMOVE DOWNSTREAM ANCHOR TERMINAL	EA	6.000		6.000	
	542-6004	RM MTL BM GD FENCE TRANS (THRIE-BEAM)	EA	4.000		4.000	
	544-6001	GUARDRAIL END TREATMENT (INSTALL)	EA	50.000		50.000	
	544-6003	GUARDRAIL END TREATMENT (REMOVE)	EA	10.000		10.000	
	658-6060	REMOVE DELIN & OBJECT MARKER ASSMS	EA	600.000		600.000	
	658-6061	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2	EA	272.000		272.000	
	658-6081	INSTL DEL ASSM (D-SW)SZ 1(WFLX)GND(BI)	EA	228.000		228.000	
	658-6100	INSTL OM ASSM (OM-2Z)(WFLX)GND(BI)	EA	100.000		100.000	
	666-6035	REFL PAV MRK TY I (W)8"(SLD)(090MIL)	LF	600.000		600.000	
	666-6047	REFL PAV MRK TY I (W)24"(SLD)(090MIL)	LF	520.000		520.000	
	666-6053	REFL PAV MRK TY I (W)(ARROW)(090MIL)	EA	18.000		18.000	
	666-6098	REF PAV MRK TY I(W)18"(YLD TRI)(090MIL)	EA	62.000		62.000	
	666-6140	REFL PAV MRK TY I (Y)12"(SLD)(090MIL)	LF	220.000		220.000	
	3077-6058	SP MIXESSP-DSAC-A PG70-28	TON	44,829.000		44,829.000	
	3077-6075	TACK COAT	GAL	565.000		565.000	
	3085-6001	UNDERSEAL COURSE	GAL	101,608.000		101,608.000	
	6001-6002	PORTABLE CHANGEABLE MESSAGE SIGN	EA	2.000		2.000	
	6024-6002	HPPM W/RET REQ TY I(W)4"(BRK)(090MIL)	LF	26,188.000		26,188.000	
	6024-6005	HPPM W/RET REQ TY I(W)4"(SLD)(090MIL)	LF	98,672.000		98,672.000	
	6024-6014	HPPM W/RET REQ TY I(Y)4"(BRK)(090MIL)	LF	9,672.000		9,672.000	
	6024-6017	HPPM W/RET REQ TY I(Y)4"(SLD)(090MIL)	LF	154,472.000		154,472.000	
	6185-6002	TMA (STATIONARY)	DAY	100.000		100.000	
	6185-6003	TMA (MOBILE OPERATION)	HR	136.000		136.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0356-01-107 **DISTRICT** Amarillo **COUNTY** Hutchinson
HIGHWAY SH 136

		CONTROL SECTION JOB		**0356-01-107**		TOTAL EST.	TOTAL FINAL
		PROJECT ID		**A00127830**			
		COUNTY		**Hutchinson**			
		HIGHWAY		**SH 136**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	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	

SUMMARY OF REMOVAL ITEMS

LOCATION	100 6006 PREP ROW (TREE) (LESS THAN 24" DIA) EA	100 6007 PREP ROW (TREE) (GREATER THAN 24" DIA) EA	110 6001 EXCAVATION (ROADWAY) CY	496 6007 REMOV STR (PIPE) LF	542 6001 REMOVE METAL BEAM GUARD FENCE LF	542 6003 REMOVE DOWNSTREAM ANCHOR TERMINAL EA	542 6004 RM MTL BM GD FENCE TRANS (THRIE-BEAM) EA	544 6003 GUARDRAIL END TREATMENT (REMOVE) EA
CSJ: 0356-01-107								
ADDITIONAL AREAS 7 OF 8			114	81				
MBGF LAYOUT SHEET 4 OF 20					182	1		1
MBGF LAYOUT SHEET 5 OF 20					1,180		1	
MBGF LAYOUT SHEET 6 OF 20					413		3	
MBGF LAYOUT SHEET 7 OF 20					141			2
MBGF LAYOUT SHEET 8 OF 20					486	2		2
MBGF LAYOUT SHEET 9 OF 20					239			
MBGF LAYOUT SHEET 10 OF 20					375	2		2
MBGF LAYOUT SHEET 13 OF 20					475			1
MBGF LAYOUT SHEET 14 OF 20					675			1
MBGF LAYOUT SHEET 15 OF 20					1,200			
MBGF LAYOUT SHEET 16 OF 20					1,200			
MBGF LAYOUT SHEET 17 OF 20					50	1		1
TREE REMOVAL LAYOUT SHEET 1 OF 5	17							
TREE REMOVAL LAYOUT SHEET 2 OF 5	15	10						
TREE REMOVAL LAYOUT SHEET 3 OF 5	18	1						
TREE REMOVAL LAYOUT SHEET 4 OF 5	26	17						
TREE REMOVAL LAYOUT SHEET 5 OF 5	14	20						
EROSION CONTROL LAYOUT SHEET 2 OF 2			1,067					
CULVERT DETAIL SHEET 1 OF 33			42	2				
CULVERT DETAIL SHEET 2 OF 33			12	10				
CULVERT DETAIL SHEET 3 OF 33			24	6				
CULVERT DETAIL SHEET 5 OF 33				4				
CULVERT DETAIL SHEET 6 OF 33			13	6				
CULVERT DETAIL SHEET 7 OF 33				10				
CULVERT DETAIL SHEET 8 OF 33				2				
CULVERT DETAIL SHEET 11 OF 33			19	6				
CULVERT DETAIL SHEET 12 OF 33			5	8				
CULVERT DETAIL SHEET 13 OF 33			8	4				
CULVERT DETAIL SHEET 14 OF 33			12	4				
CULVERT DETAIL SHEET 15 OF 33			21	4				
CULVERT DETAIL SHEET 16 OF 33			18	4				
CULVERT DETAIL SHEET 17 OF 33			10	4				
CULVERT DETAIL SHEET 18 OF 33			4					
CULVERT DETAIL SHEET 19 OF 33			7					
CULVERT DETAIL SHEET 20 OF 33			9	4				
CULVERT DETAIL SHEET 21 OF 33			4	4				
CULVERT DETAIL SHEET 22 OF 33			7	4				
CULVERT DETAIL SHEET 23 OF 33			12					
CULVERT DETAIL SHEET 24 OF 33			10	4				
CULVERT DETAIL SHEET 25 OF 33			8	4				
CULVERT DETAIL SHEET 26 OF 33			4	4				
CULVERT DETAIL SHEET 27 OF 33			4					
CULVERT DETAIL SHEET 28 OF 33			3	6				
CULVERT DETAIL SHEET 29 OF 33			9	4				
CULVERT DETAIL SHEET 30 OF 33			12	4				
CULVERT DETAIL SHEET 31 OF 33			13	4				
CULVERT DETAIL SHEET 32 OF 33			10	4				
CULVERT DETAIL SHEET 33 OF 33			7	4				
PROJECT TOTALS	**90**	**48**	**1,491**	**205**	**6,616**	**6**	**4**	**10**

SH 136

PROJECT SUMMARY

SCALE: N/A

2023 Texas Department of Transportation

SHEET 1 OF 4

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		11

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SUMMARY OF ROADWAY ITEMS

LOCATION	100 6001 PREPARING ROW	134 6001 BACKFILL (TY A)	351 6012 FLEXIBLE PAVEMENT STRUCTURE REPAIR(2")	354 6021 PLANE ASPH CONC PAV(0" TO 2")	540 6002 MTL W-BEAM GD FEN (STEEL POST)	540 6006 MTL BEAM GD FEN TRANS (THRIE-BEAM)	540 6008 MTL BEAM GD FEN TRANS (T101)	540 6038 CONNECTOR PLATE FOR THRIE BEAM	544 6001 GUARDRAIL END TREATMENT (INSTALL)	3077 6058 SP MIXES SP-D SAC-A PG70-28 (220 LBS/SY)	3077 6075 TACK COAT (0.13 GAL/SY)	3085 6001 UNDERSEAL COURSE (0.25 GAL/SY)
	AC	STA	SY	SY	LF	EA	EA	EA	EA	TON	GAL	GAL
CSJ: 0356-01-107												
PROPOSED TYPICAL SECTION A	3	190								18,626		42,331
PROPOSED TYPICAL SECTION B	5	193								16,426		37,332
PROPOSED TYPICAL SECTION C	1	52								3,694		8,395
PROPOSED TYPICAL SECTION D	1	15								1,385		3,149
PROPOSED TYPICAL SECTION E	1	37								1,827		4,153
ADDITIONAL AREAS SHEET 1 OF 8				2,180						1,036		2,353
ADDITIONAL AREAS SHEET 2 OF 8				2,138						1,104		3,045
ADDITIONAL AREAS SHEET 3 OF 8		2		1,606						177		402
ADDITIONAL AREAS SHEET 4 OF 8		2		915						101		229
ADDITIONAL AREAS SHEET 5 OF 8				171						41		92
ADDITIONAL AREAS SHEET 6 OF 8		2		506						56		127
ADDITIONAL AREAS SHEET 8 OF 8				883								
DRIVEWAY DETAIL SHEET 1 OF 1										356	565	
MBGF LAYOUT SHEET 1 OF 20					1,290				7			
MBGF LAYOUT SHEET 2 OF 20					610				5			
MBGF LAYOUT SHEET 3 OF 20					1,000				6			
MBGF LAYOUT SHEET 4 OF 20					584				2			
MBGF LAYOUT SHEET 5 OF 20					1,180	1						
MBGF LAYOUT SHEET 6 OF 20					413	3						
MBGF LAYOUT SHEET 7 OF 20					198				2			
MBGF LAYOUT SHEET 8 OF 20					536	2		2	4			
MBGF LAYOUT SHEET 9 OF 20					189		2					
MBGF LAYOUT SHEET 10 OF 20					275	2	2	2	4			
MBGF LAYOUT SHEET 11 OF 20					1,150				1			
MBGF LAYOUT SHEET 12 OF 20									1			
MBGF LAYOUT SHEET 13 OF 20					475				1			
MBGF LAYOUT SHEET 14 OF 20					675				1			
MBGF LAYOUT SHEET 15 OF 20					1,200							
MBGF LAYOUT SHEET 16 OF 20					1,200							
MBGF LAYOUT SHEET 17 OF 20					50				2			
MBGF LAYOUT SHEET 18 OF 20					1,525				3			
MBGF LAYOUT SHEET 19 OF 20					975				5			
MBGF LAYOUT SHEET 20 OF 20					800				6			
PAVEMENT REPAIR DETAIL			24,861									
PROJECT TOTALS	**11**	**493**	**24,861**	**8,399**	**14,325**	**8**	**4**	**4**	**50**	**44,829**	**565**	**101,608**

SH 136

PROJECT SUMMARY

SCALE: N/A

Texas Department of Transportation

SHEET 2 OF 4

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		12

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SUMMARY OF PAVEMENT MARKING ITEMS

LOCATION	533 6002 RUMBLE STRIPS (CENTERLINE) LF	533 6003 RUMBLE STRIPS (SHOULDER) ASPHALT LF	658 6060 REMOVE DELIN & OBJECT MARKER ASSMS EA	658 6061 INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2 EA	658 6081 INSTL DEL ASSM (D-SW)SZ 1(WFLX) GND(BI) EA	658 6100 INSTL OM ASSM (OM-2Z)(WFLX) GND(BI) EA	666 6035 REFL PAV MRK TY I (W)8"(SLD) (090MIL) LF	666 6047 REFL PAV MRK TY I (W)24"(SLD) (090MIL) LF	666 6053 REFL PAV MRK TY I (W)(ARROW) (090MIL) EA
CSJ: 0356-01-107									
SH 136	17,632	67,297	600	272	228	100	600	520	18
PROJECT TOTALS:	**17,632**	**67,297**	**600**	**272**	**228**	**100**	**600**	**520**	**18**

SUMMARY OF PAVEMENT MARKING ITEMS (CONT.)

LOCATION	666 6140 REFL PAV MRK TY I (Y)12"(SLD) (090MIL) LF	666 6098 REF PAV MRK TY I(W)18"(YLD TRI) (090MIL) EA	6024 6002 HPPM W/RET REQ TY I(W)4"(BRK) (090MIL) LF	6024 6005 HPPM W/RET REQ TY I(W)4"(SLD) (090MIL) LF	6024 6014 HPPM W/RET REQ TY I(Y)4"(BRK) (090MIL) LF	6024 6017 HPPM W/RET REQ TY I(Y)4"(SLD) (090MIL) LF
CSJ: 0356-01-107						
SH 136	220	14	24,668	98,672	9,672	152,008
PAVEMENT MARKING LAYOUT SHEET 1 OF 2		16	710			210
PAVEMENT MARKING LAYOUT SHEET 2 OF 2		32	810			2,254
PROJECT TOTALS:	**220**	**62**	**26,188**	**98,672**	**9,672**	**154,472**

SUMMARY OF DRAINAGE ITEMS

LOCATION	104 6022 REMOVING CONC (CURB AND GUTTER) LF	132 6003 EMBANKMENT (FINAL)(ORD COMP)(TY B) CY	420 6009 CL A CONC (COLLAR) EA	432 6001 RIPRAP (CONC)(4 IN) CY	460 6003 CMP (GAL STL 24 IN) LF	460 6004 CMP (GAL STL 30 IN) LF	462 6091 CONC BOX CULV (5FT X 2.5FT) LF	464 6005 RC PIPE (CL III)(24 IN) LF	464 6007 RC PIPE (CL III)(30 IN) LF	464 6008 RC PIPE (CL III)(36 IN) LF	467 6006 SET (TY I) (24 IN) (4: 1) (C) EA	467 6008 SET (TY I) (30 IN) (3: 1) (C) EA
CSJ: 0356-01-107												
CULVERT DETAIL SHEET 1 OF 33	30	9	2	10				6				
CULVERT DETAIL SHEET 2 OF 33		24	1					4				
CULVERT DETAIL SHEET 3 OF 33		80	3					10			2	
CULVERT DETAIL SHEET 4 OF 33		49					24					
CULVERT DETAIL SHEET 5 OF 33		6	2		4							
CULVERT DETAIL SHEET 6 OF 33		24										
CULVERT DETAIL SHEET 7 OF 33		144	2					10				
CULVERT DETAIL SHEET 8 OF 33		40	2					10				
CULVERT DETAIL SHEET 9 OF 33		143	2					4		8		
CULVERT DETAIL SHEET 10 OF 33		127	1						8			1
CULVERT DETAIL SHEET 11 OF 33		81	1					6				
CULVERT DETAIL SHEET 12 OF 33		116	3			8		8				
CULVERT DETAIL SHEET 13 OF 33		13	2		4							
CULVERT DETAIL SHEET 14 OF 33		10	2		4							
CULVERT DETAIL SHEET 15 OF 33		11	2		4							
CULVERT DETAIL SHEET 16 OF 33		13	2		4							
CULVERT DETAIL SHEET 17 OF 33		6	2		4							
CULVERT DETAIL SHEET 18 OF 33		4										
CULVERT DETAIL SHEET 19 OF 33		8										
CULVERT DETAIL SHEET 20 OF 33		10	2		4							
CULVERT DETAIL SHEET 21 OF 33		8	2		4							
CULVERT DETAIL SHEET 22 OF 33		13	2		4							
CULVERT DETAIL SHEET 23 OF 33		12	2									
CULVERT DETAIL SHEET 24 OF 33		11	2		4							
CULVERT DETAIL SHEET 25 OF 33		6	2		4							
CULVERT DETAIL SHEET 26 OF 33		7	2			4						
CULVERT DETAIL SHEET 27 OF 33		5										
CULVERT DETAIL SHEET 28 OF 33		14	2			6						
CULVERT DETAIL SHEET 29 OF 33		10	2		4							
CULVERT DETAIL SHEET 30 OF 33		7	2		4							
CULVERT DETAIL SHEET 31 OF 33		10	2		4							
CULVERT DETAIL SHEET 32 OF 33		9	2		4							
CULVERT DETAIL SHEET 33 OF 33		13	2		4							
PROJECT TOTALS:	**30**	**1,043**	**55**	**10**	**64**	**18**	**24**	**58**	**8**	**8**	**2**	**1**

SH 136

PROJECT SUMMARY

SCALE: N/A

2023 Texas Department of Transportation

SHEET 3 OF 4

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		13

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SUMMARY OF DRAINAGE ITEMS

LOCATION	467 6009 SET (TY I) (30 IN) (4: 1) (C) EA	467 6010 SET (TY I) (30 IN) (6: 1) (C) EA	467 6015 SET (TY I) (36 IN) (4: 1) (C) EA	467 6141 SET (TY I)(S= 4 FT)(HW= 3 FT)(6:1) (C) EA	467 6179 SET (TY I)(S= 5 FT)(HW= 4 FT)(6:1) (C) EA	467 6348 SET (TY II) (18 IN) (CMP) (6: 1) (P) EA	467 6380 SET (TY II) (24 IN) (CMP) (6: 1) (P) EA	467 6388 SET (TY II) (24 IN) (RCP) (3: 1) (C) EA	467 6390 SET (TY II) (24 IN) (RCP) (4: 1) (C) EA	467 6394 SET (TY II) (24 IN) (RCP) (6: 1) (C) EA	467 6410 SET (TY II) (30 IN) (CMP) (6: 1) (P) EA	467 6422 SET (TY II) (30 IN) (RCP) (6: 1) (C) EA	496 6006 REMOV STR (HEADWALL) EA	529 6007 CONC CURB & GUTTER (TY I) LF
CSJ: 0356-01-107														
CULVERT DETAIL SHEET 1 OF 33										2			2	30
CULVERT DETAIL SHEET 2 OF 33										1		1	2	
CULVERT DETAIL SHEET 3 OF 33									1	2			5	
CULVERT DETAIL SHEET 4 OF 33					2		4						2	
CULVERT DETAIL SHEET 5 OF 33							2							
CULVERT DETAIL SHEET 6 OF 33										1			1	
CULVERT DETAIL SHEET 7 OF 33		4						1	1				4	
CULVERT DETAIL SHEET 8 OF 33								1		1			2	
CULVERT DETAIL SHEET 9 OF 33			1						1	1			3	
CULVERT DETAIL SHEET 10 OF 33	1												2	
CULVERT DETAIL SHEET 11 OF 33										2			2	
CULVERT DETAIL SHEET 12 OF 33										1	2		1	
CULVERT DETAIL SHEET 13 OF 33							2							
CULVERT DETAIL SHEET 14 OF 33							2							
CULVERT DETAIL SHEET 15 OF 33							2							
CULVERT DETAIL SHEET 16 OF 33							2							
CULVERT DETAIL SHEET 17 OF 33							2							
CULVERT DETAIL SHEET 18 OF 33						2								
CULVERT DETAIL SHEET 19 OF 33							2							
CULVERT DETAIL SHEET 20 OF 33							2							
CULVERT DETAIL SHEET 21 OF 33							2							
CULVERT DETAIL SHEET 22 OF 33							2							
CULVERT DETAIL SHEET 23 OF 33														
CULVERT DETAIL SHEET 24 OF 33							2							
CULVERT DETAIL SHEET 25 OF 33							2							
CULVERT DETAIL SHEET 26 OF 33											2			
CULVERT DETAIL SHEET 27 OF 33							2							
CULVERT DETAIL SHEET 28 OF 33											2			
CULVERT DETAIL SHEET 29 OF 33							2							
CULVERT DETAIL SHEET 30 OF 33							2							
CULVERT DETAIL SHEET 31 OF 33							2							
CULVERT DETAIL SHEET 32 OF 33							2							
CULVERT DETAIL SHEET 33 OF 33				1			2						1	
PROJECT TOTALS:	**1**	**4**	**1**	**1**	**2**	**2**	**40**	**2**	**3**	**11**	**6**	**1**	**27**	**30**

SUMMARY OF EROSION CONTROL ITEMS

LOCATION	150 6002 BLADING HR	164 6034 DRILL SEEDING (PERM) (RURAL) (SANDY) AC	164 6053 DRILL SEEDING (TEMP) (WARM OR COOL) AC	314 6009 EMULS ASPH (EROSN CONT) (MULTI) GAL	506 6038 TEMP SEDMT CONT FENCE (INSTALL) LF	506 6039 TEMP SEDMT CONT FENCE (REMOVE) LF	506 6040 BIODEG EROSN CONT LOGS (INSTL) (8") LF	506 6043 BIODEG EROSN CONT LOGS (REMOVE) LF
CSJ: 0356-01-107	9	18.4	18.4	8,905	600	600	3,750	3,750
PROJECT TOTALS:	**9**	**▪ 18**	**▪ 18**	**8,905**	**600**	**600**	**3,750**	**3,750**

▪ ROUNDED FOR BIDDING PURPOSES

SH 136

PROJECT SUMMARY

SCALE: N/A

2023 Texas Department of Transportation

SHEET 4 OF 4

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		14

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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	0356	01	107	SH 136
4-03 7-13	DIST	COUNTY		SHEET NO.
9-07 8-14	AMA	HUTCHINSON CO		15
5-10 5-21				

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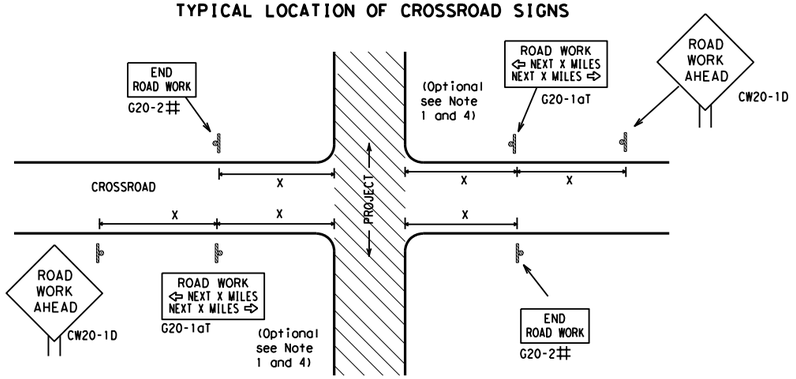
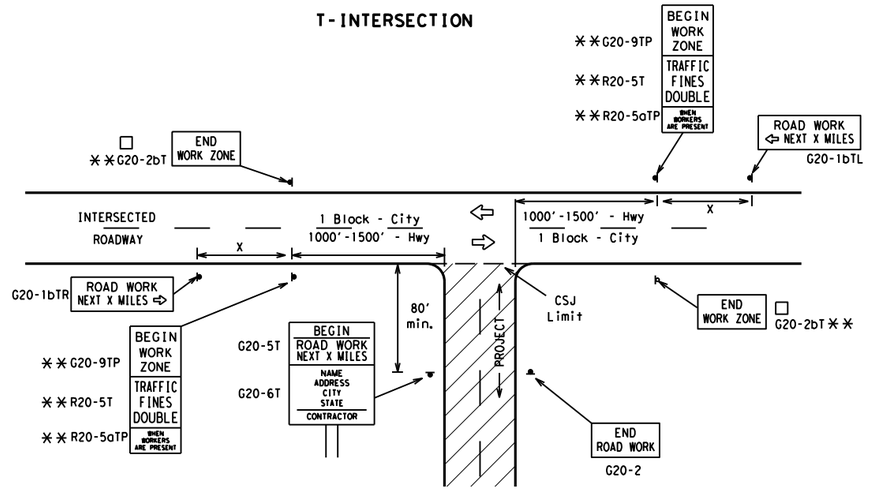
TYPICAL LOCATION OF CROSSROAD SIGNS



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.

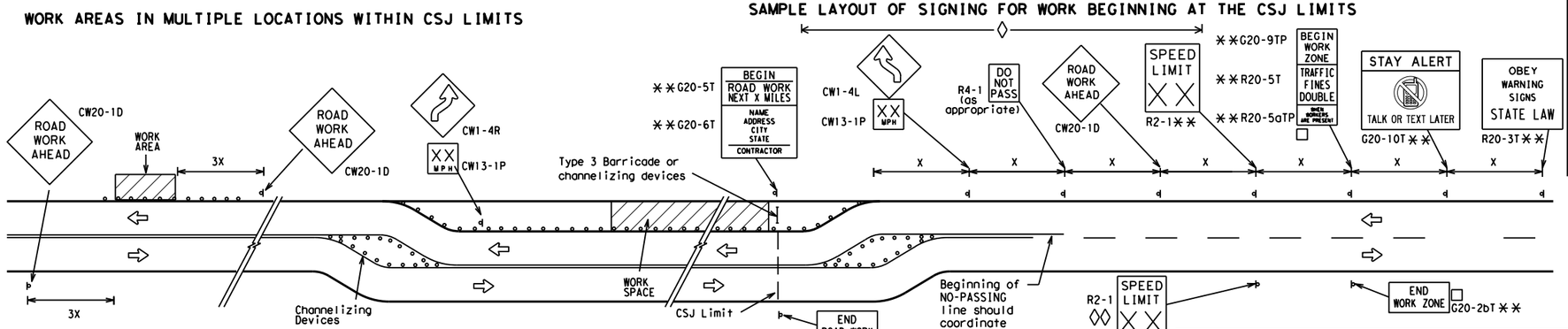
△ Minimum distance from work area to first Advance Warning sign nearest the work area and/or distance between each additional sign.

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.

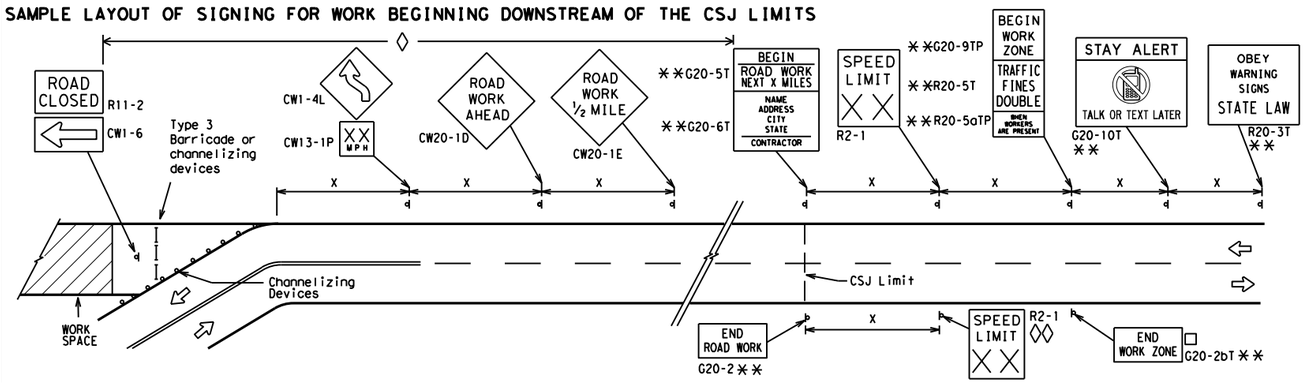
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE 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



NOTES

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

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

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

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

◊◊ Contractor will install a regulatory speed limit sign at the end of the work zone.

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

Texas Department of Transportation — Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	0356	01	107	SH 136
9-07 8-14	DIST	COUNTY		SHEET NO.
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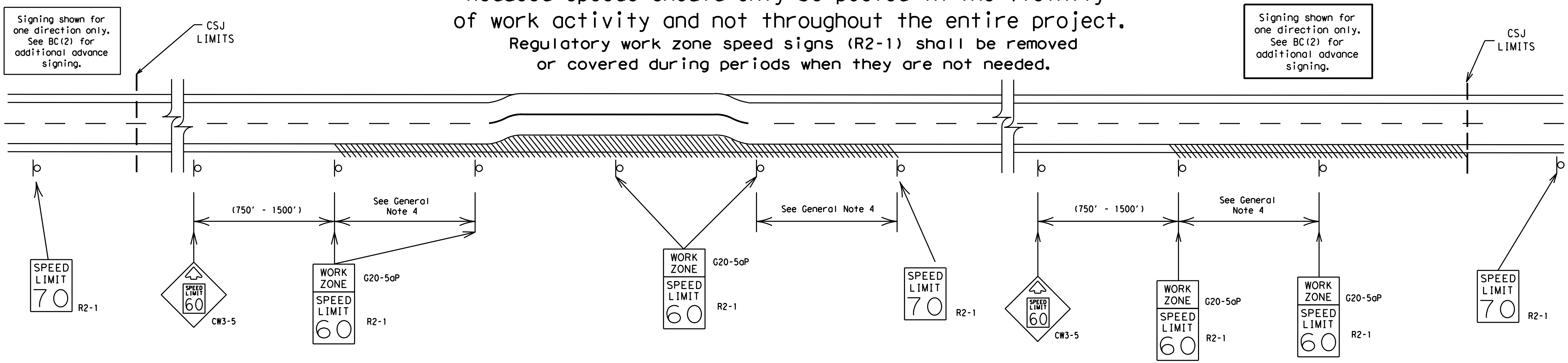
TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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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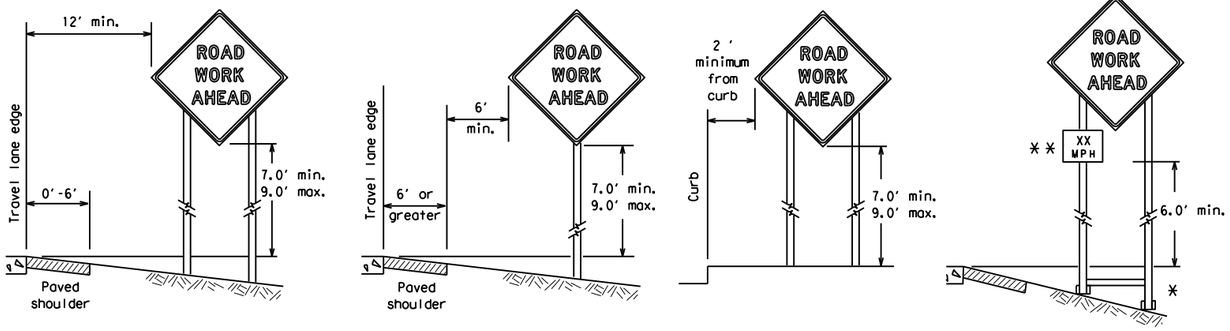
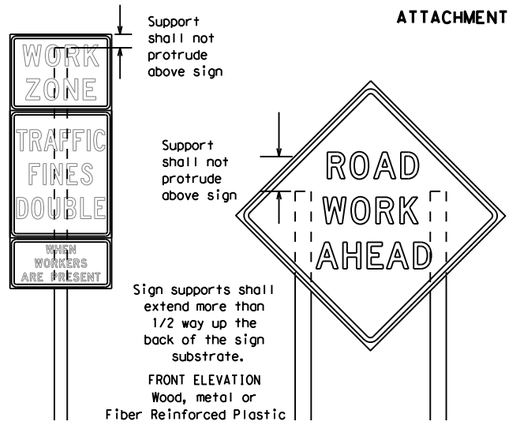
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

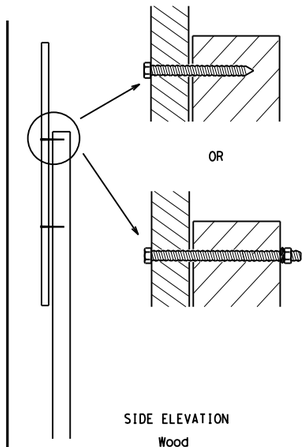


* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

** 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





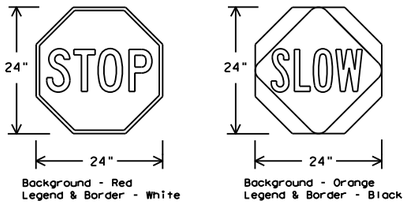
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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
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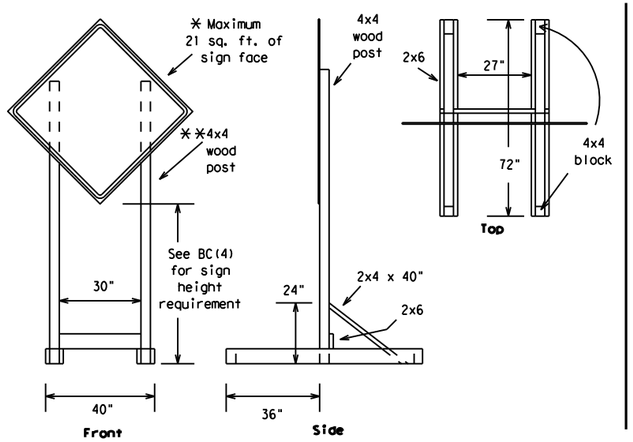
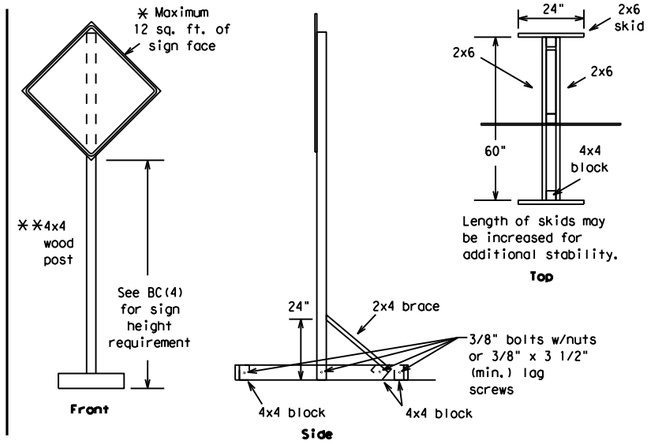
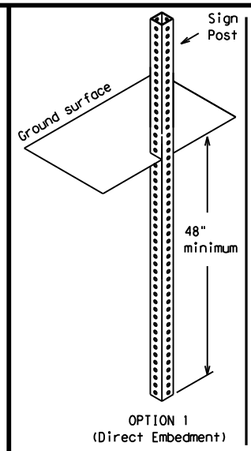
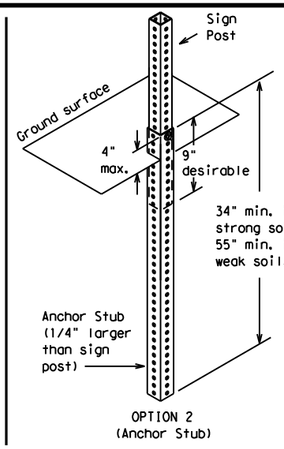


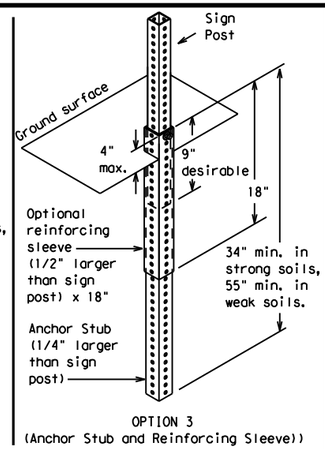


SKID MOUNTED WOOD SIGN SUPPORTS

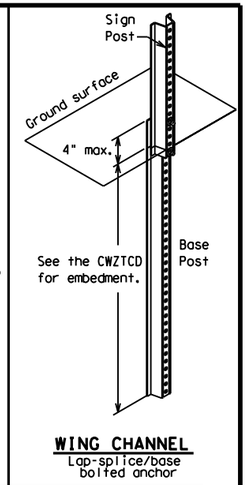
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS







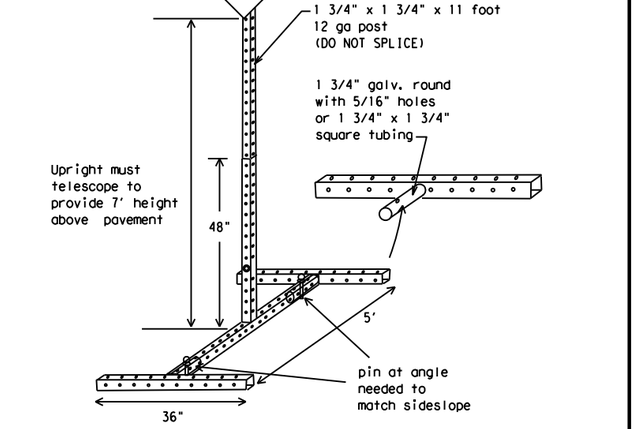
PERFORATED SQUARE METAL TUBING

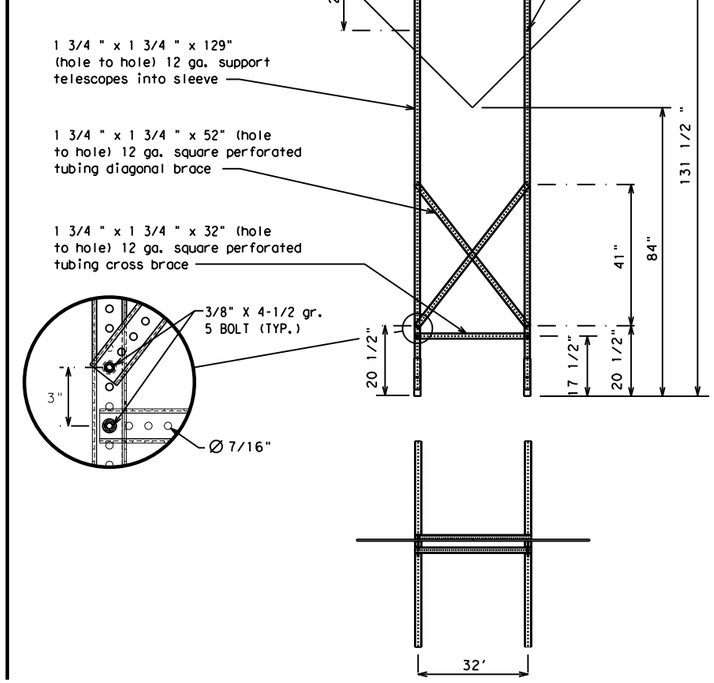


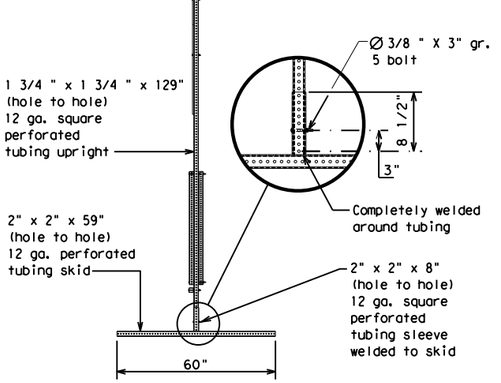
WING CHANNEL
Lap-splice/base bolted anchor

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.

SHEET 5 OF 12

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-21

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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		Other Condition List	
FREEWAY CLOSED X MILE	FRONTAGE ROAD CLOSED	ROADWORK XXX FT	ROAD REPAIRS XXXX FT
ROAD CLOSED AT SH XXX	SHOULDER CLOSED XXX FT	FLAGGER XXXX FT	LANE NARROWS XXXX FT
ROAD CLSD AT FM XXXX	RIGHT LN CLOSED XXX FT	RIGHT LN NARROWS XXXX FT	TWO-WAY TRAFFIC XX MILE
RIGHT X LANES CLOSED	RIGHT X LANES OPEN	MERGING TRAFFIC XXXX FT	CONST TRAFFIC XXX FT
CENTER LANE CLOSED	DAYTIME LANE CLOSURES	LOOSE GRAVEL XXXX FT	UNEVEN LANES XXXX FT
NIGHT LANE CLOSURES	I-XX SOUTH EXIT CLOSED	DETOUR X MILE	ROUGH ROAD XXXX FT
VARIOUS LANES CLOSED	EXIT XXX CLOSED X MILE	ROADWORK PAST SH XXXX	ROADWORK NEXT FRI-SUN
EXIT CLOSED	RIGHT LN TO BE CLOSED	BUMP XXXX FT	US XXX EXIT X MILES
MALL DRIVEWAY CLOSED	X LANES CLOSED TUE - FRI	TRAFFIC SIGNAL XXXX FT	LANES SHIFT *
XXXXXXXX BLVD CLOSED			

* 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		Location List	Warning List	**Advance Notice List
MERGE RIGHT	FORM X LINES RIGHT	AT FM XXXX	SPEED LIMIT XX MPH	TUE-FRI XX AM- X PM
DETOUR NEXT X EXITS	USE XXXXX RD EXIT	BEFORE RAILROAD CROSSING	MAXIMUM SPEED XX MPH	APR XX-XX X PM-X AM
USE EXIT XXX	USE EXIT I-XX NORTH	NEXT X MILES	MINIMUM SPEED XX MPH	BEGINS MONDAY
STAY ON US XXX SOUTH	USE I-XX E TO I-XX N	PAST US XXX EXIT	ADVISORY SPEED XX MPH	BEGINS MAY XX
TRUCKS USE US XXX N	WATCH FOR TRUCKS	XXXXXXX TO XXXXXXX	RIGHT LANE EXIT	MAY X-X XX PM - XX AM
WATCH FOR TRUCKS	EXPECT DELAYS	US XXX TO FM XXXX	USE CAUTION	NEXT FRI-SUN
EXPECT DELAYS	PREPARE TO STOP		DRIVE SAFELY	XX AM TO XX PM
REDUCE SPEED XXX FT	END SHOULDER USE		DRIVE WITH CARE	NEXT TUE AUG XX
USE OTHER ROUTES	WATCH FOR WORKERS			TONIGHT XX PM- XX AM
STAY IN LANE *				

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

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

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

WORDING ALTERNATIVES

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

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

FULL MATRIX PCMS SIGNS

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

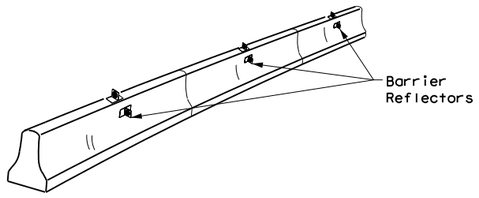
BC(6)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0356	01	107	SH 136
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	AMA	HUTCHINSON CO		20

100

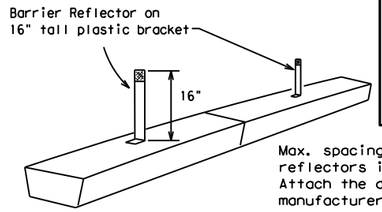
DATE: 11/17/2022 4:25:32 PM
FILE: T:\AMA\PDV\Construction Projects\0356-01\107 PM Overlay\4 - Design\Plan Set\2. TCP\TCP STANDARDS\BC (1)-21 THRU BC (12).dgn

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



CONCRETE TRAFFIC BARRIER (CTB)

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

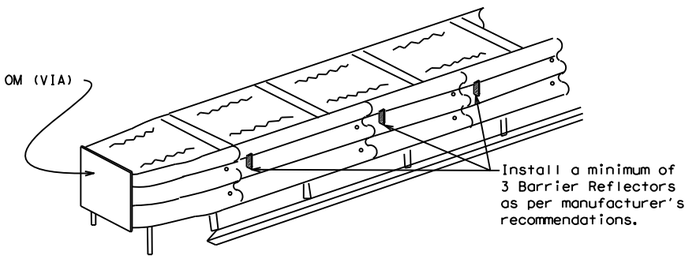


Max. spacing of barrier reflectors is 20 feet. Attach the delineators as per manufacturer's recommendations.

LOW PROFILE CONCRETE BARRIER (LPCB) 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)

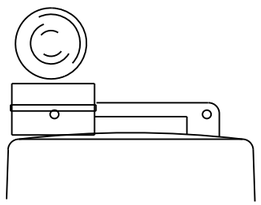


DELINEATION OF END TREATMENTS

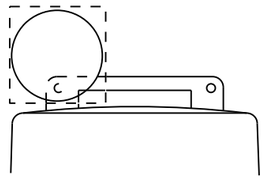
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

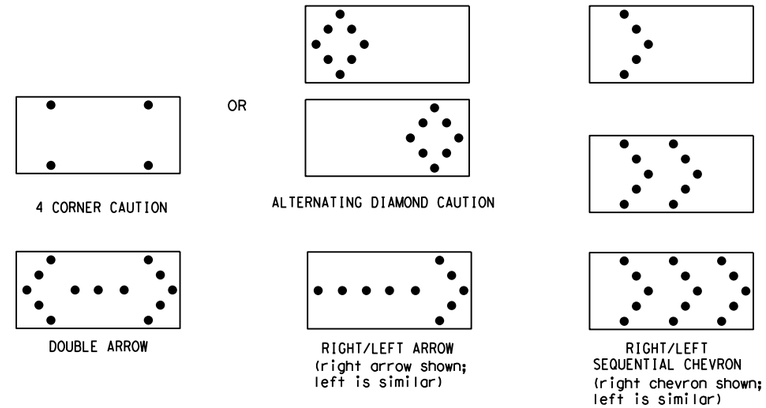
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

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	0356	01	107	SH 136
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	AMA	HUTCHINSON CO		21

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:

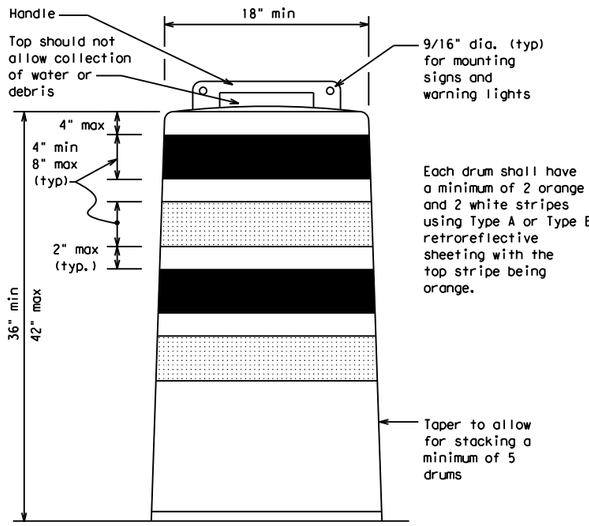
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

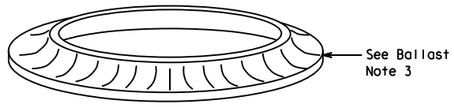
RETROREFLECTIVE SHEETING

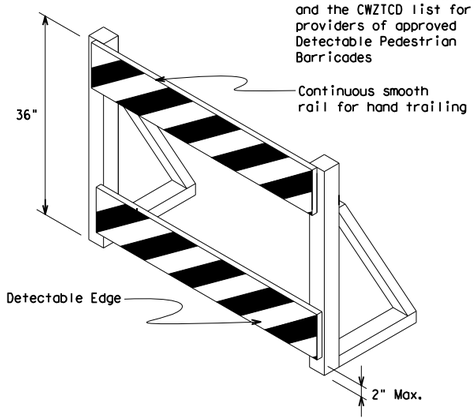
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials," Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall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

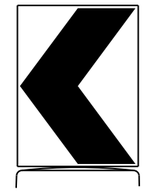




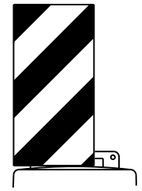


DETECTABLE PEDESTRIAN BARRICADES

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

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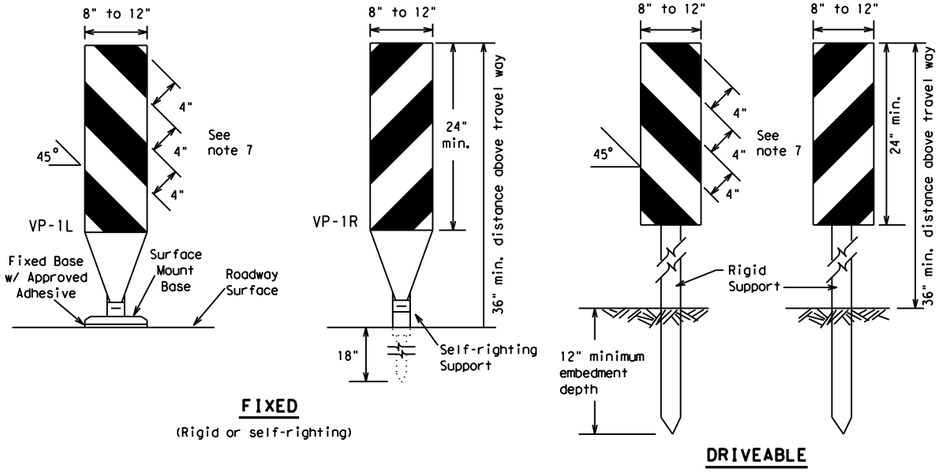
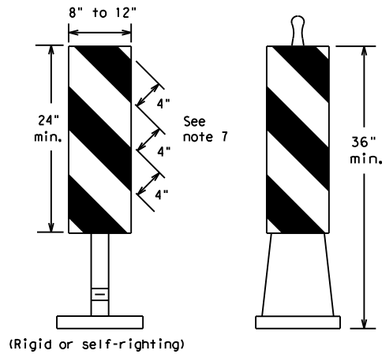


FIXED
(Rigid or self-righting)

DRIVEABLE

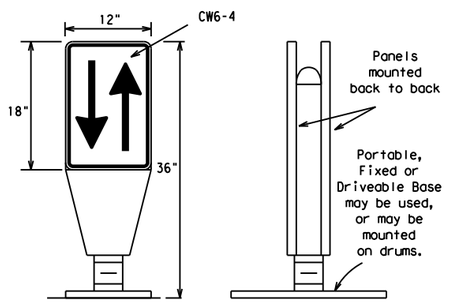


(Rigid or self-righting)

PORTABLE

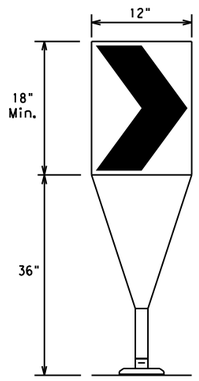
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is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



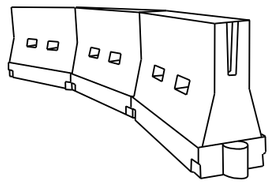
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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

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BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

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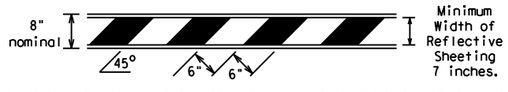
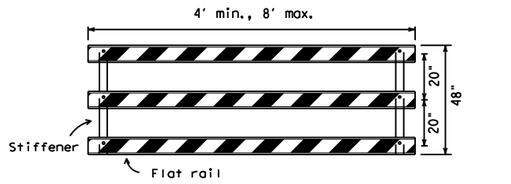
TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



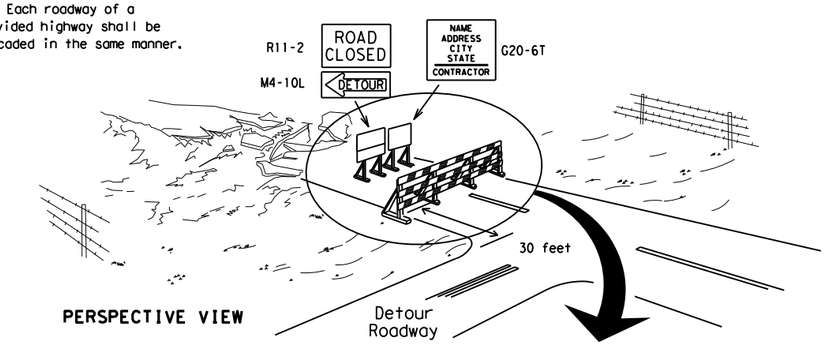
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

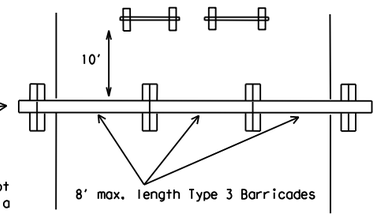
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

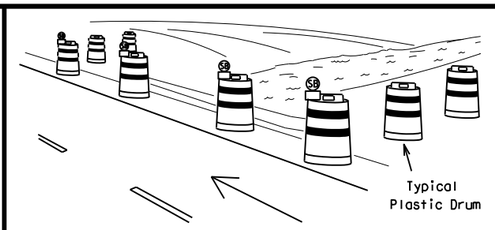
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

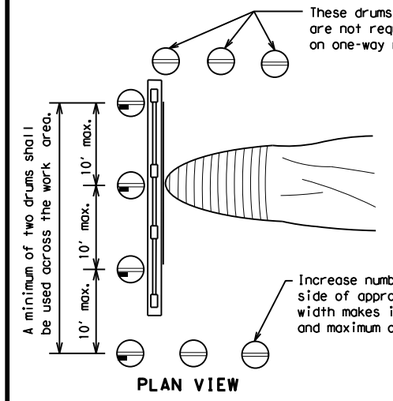
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

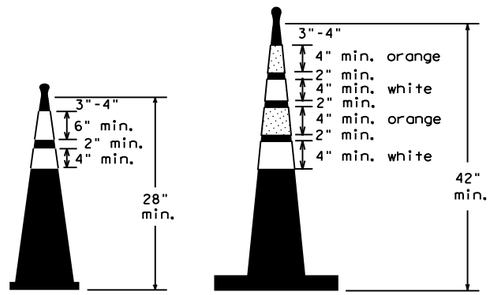
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



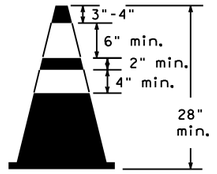
PLAN VIEW

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

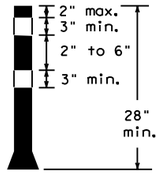
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



Two-Piece cones



One-Piece cones

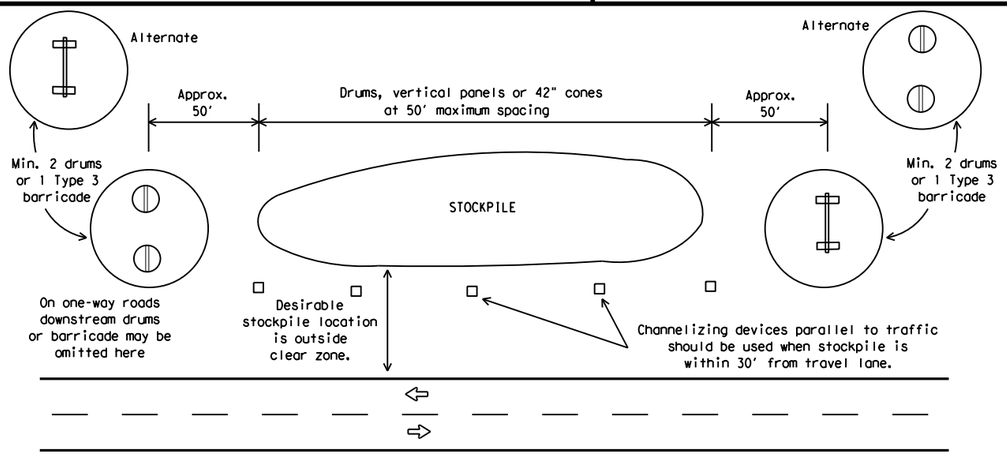


Tubular Marker

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

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

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



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

Texas Department of Transportation — Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-21

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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.

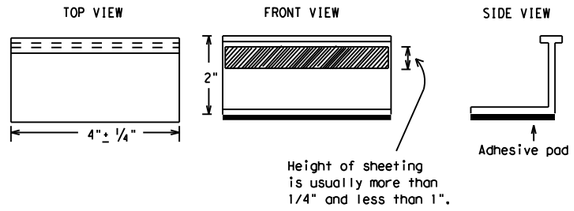
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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).

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BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

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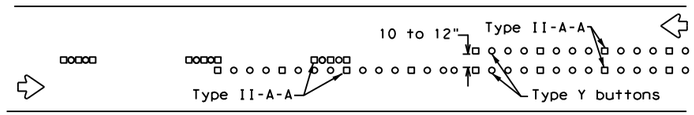
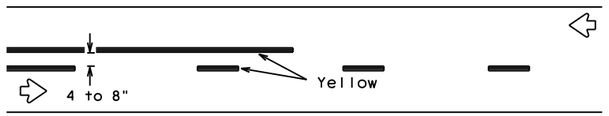
PAVEMENT MARKING PATTERNS

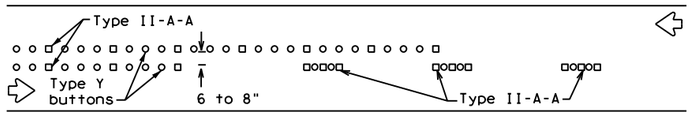
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



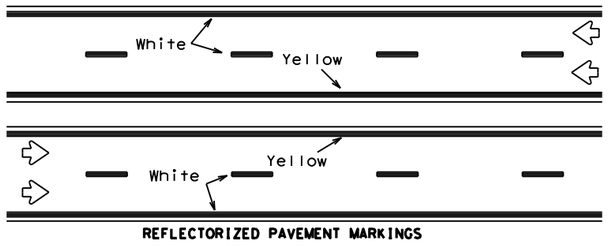
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



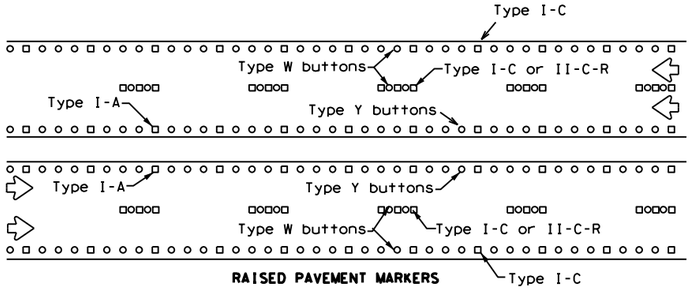
RAISED PAVEMENT MARKERS - PATTERN B

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

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



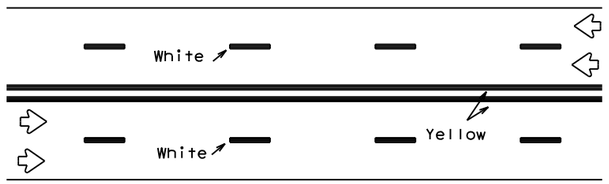
REFLECTORIZED PAVEMENT MARKINGS



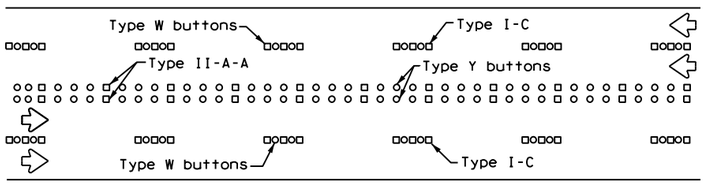
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



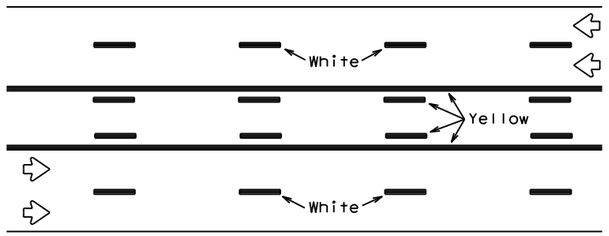
REFLECTORIZED PAVEMENT MARKINGS



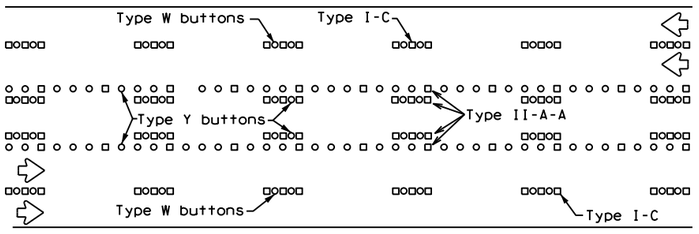
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

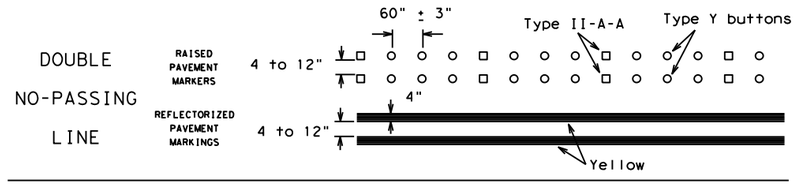
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

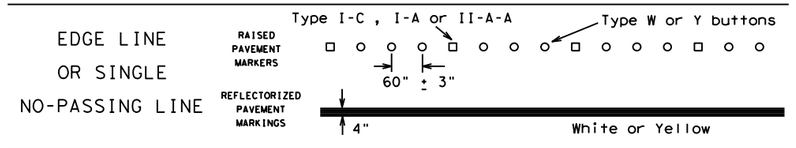
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

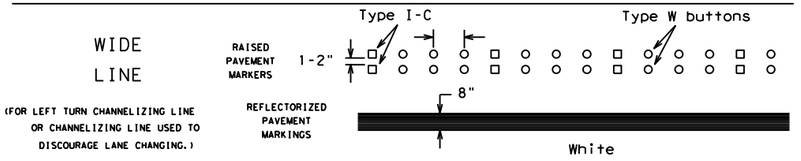


EDGE LINE OR SINGLE NO-PASSING LINE



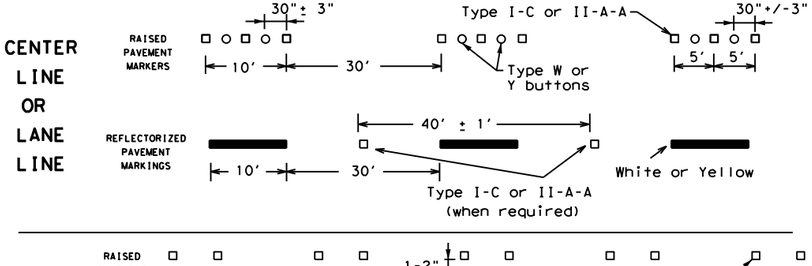
WIDE LINE

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

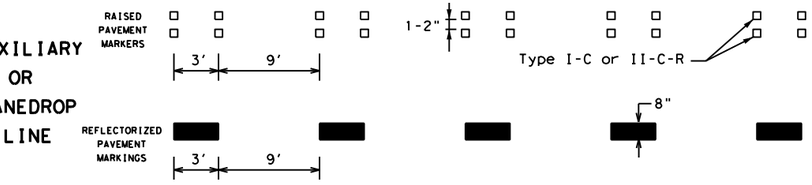


BROKEN LINES

CENTER LINE OR LANE LINE

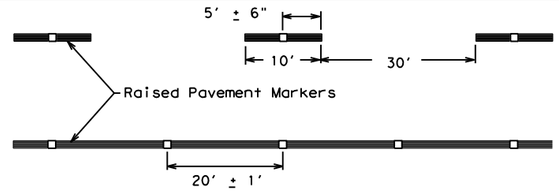


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

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



Centerline only - not to be used on edge lines

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 1-97 9-07 5-21 2-98 7-13 11-02 8-14	0356	01	107	SH 136
	DIST	COUNTY		SHEET NO.
	AMA	HUTCHINSON CO		26

106

DATE: 11/17/2022 4:25:39 PM
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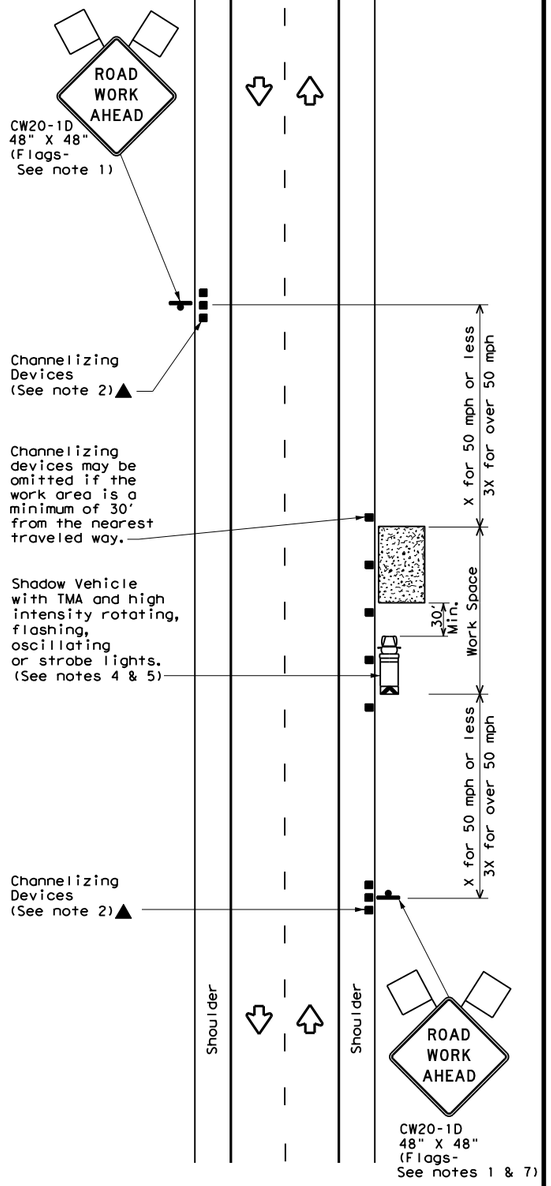
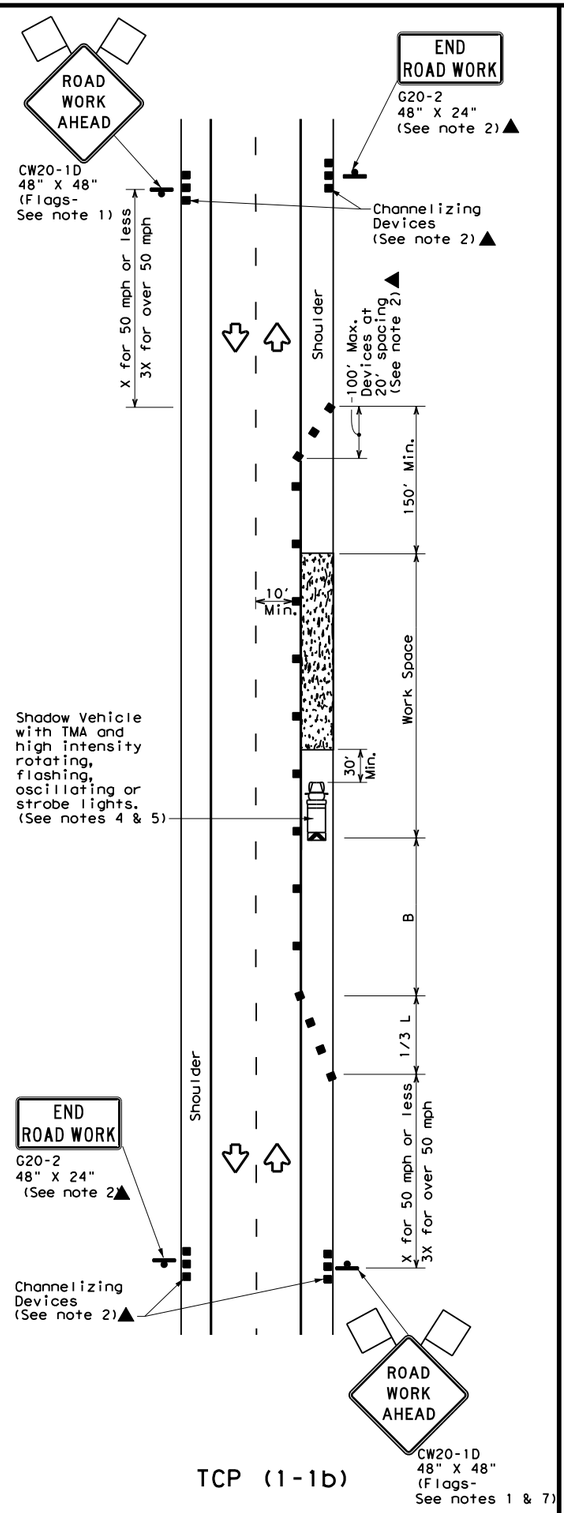


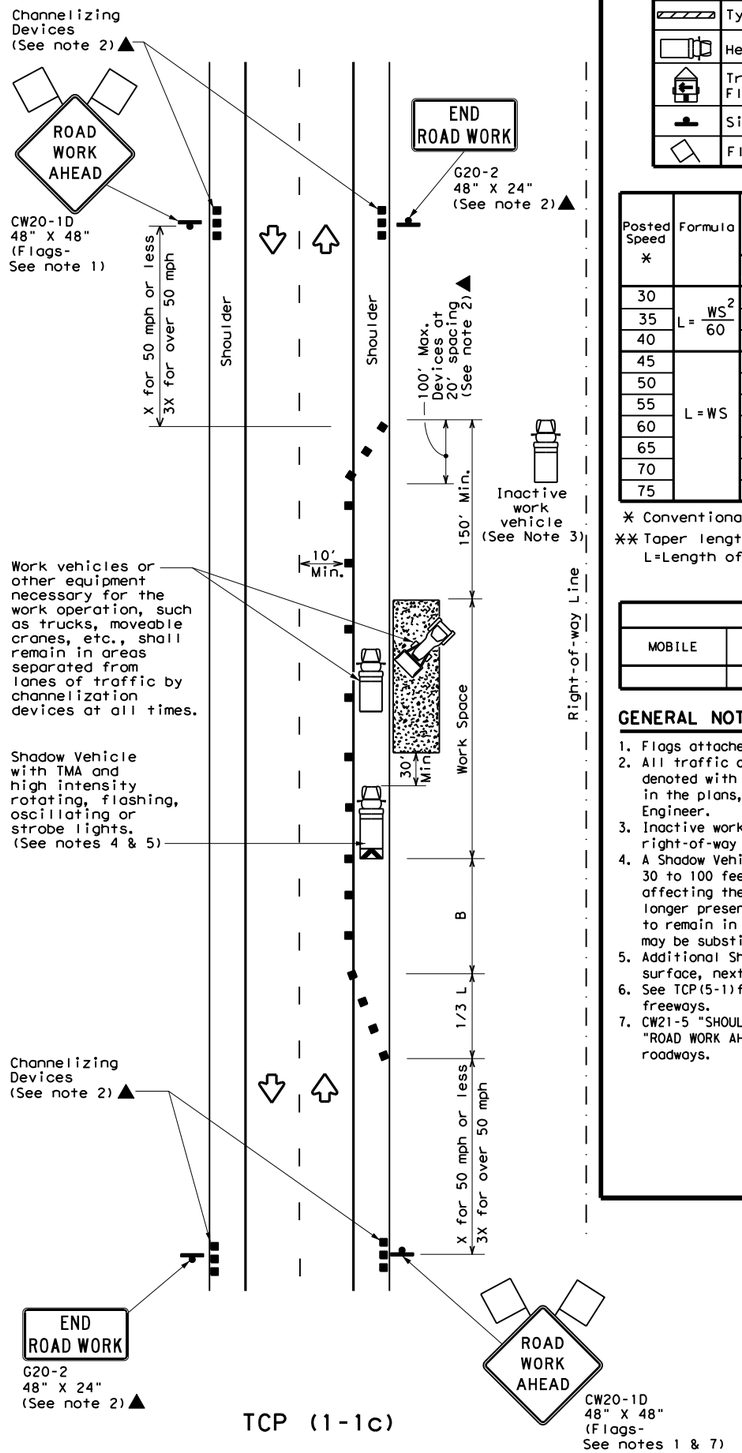
TCP (1-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (1-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (1-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

1. Flags attached to signs where shown are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. Inactive work vehicles or other equipment should be parked near the right-of-way line and not parked on the paved shoulder.
4. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
5. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.
6. See TCP(5-1)for shoulder work on divided highways, expressways and freeways.
7. CW21-5 "SHOULDER WORK" signs may be used in place of CW20-1D "ROAD WORK AHEAD" signs for shoulder work on conventional roadways.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(1-1)-18

FILE: tcp1-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 2-12 1-97 2-18	0356	01	107	SH 136
	DIST	COUNTY		SHEET NO.
	AMA	HUTCHINSON CO		27

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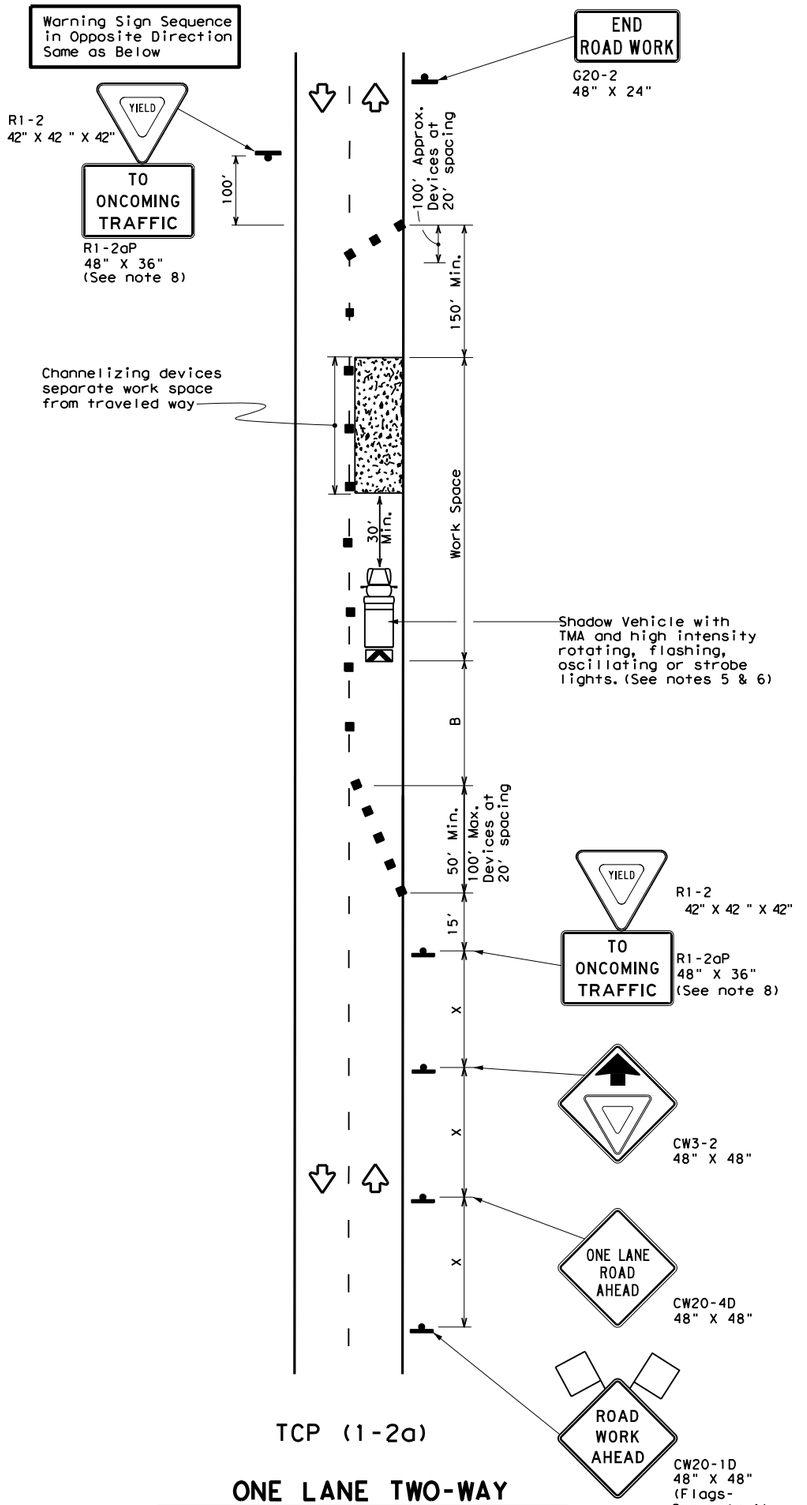
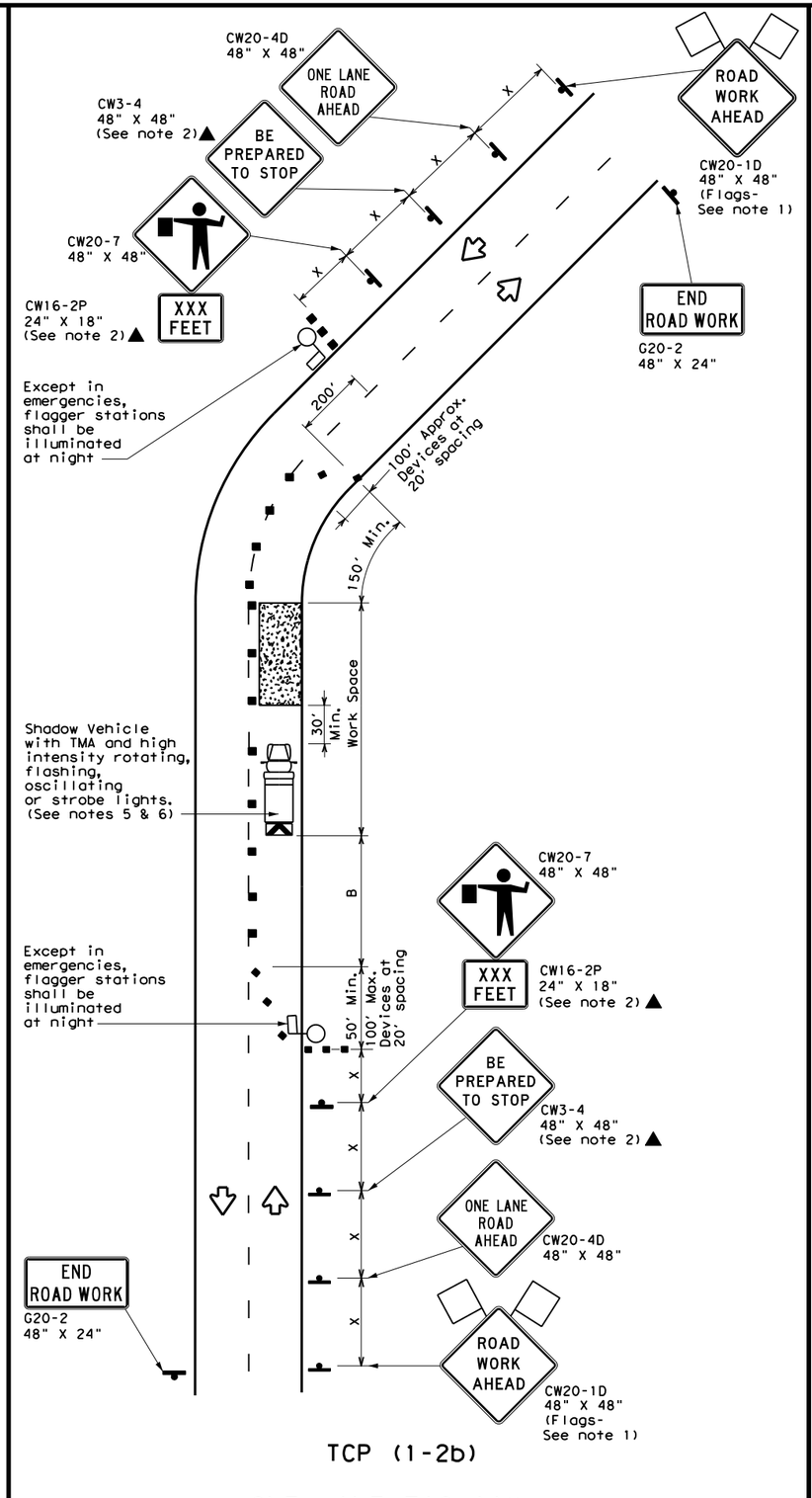


TCP (1-2a)

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



TCP (1-2b)

ONE LANE TWO-WAY CONTROL WITH FLAGGERS

LEGEND

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

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

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

TYPICAL USAGE

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

GENERAL NOTES

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

TCP (1-2a)

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

TCP (1-2b)

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN ONE-LANE TWO-WAY TRAFFIC CONTROL

TCP(1-2)-18

FILE: tcp1-2-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-90 4-98 2-94 2-12 1-97 2-18	0356	01	107	SH 136
	DIST	COUNTY		SHEET NO.
	AMA	HUTCHINSON CO		28

DATE: 11/17/2022 4:25:41 PM
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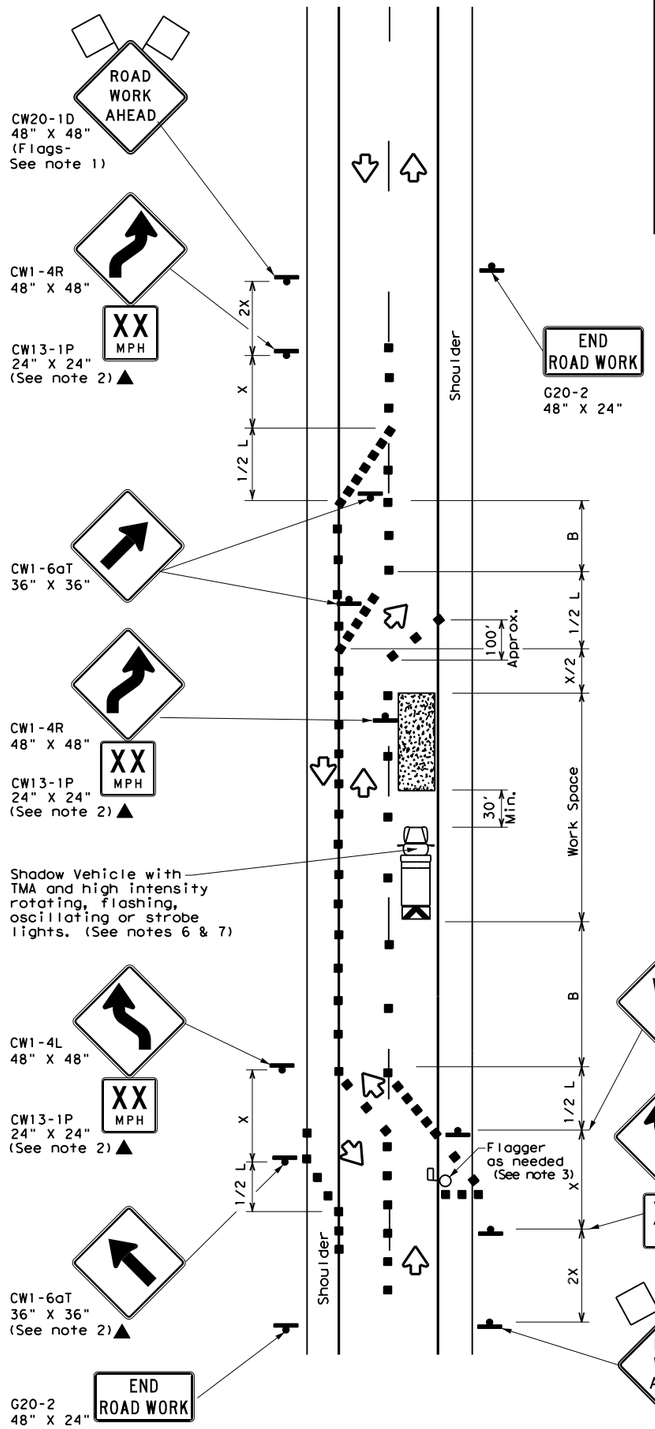
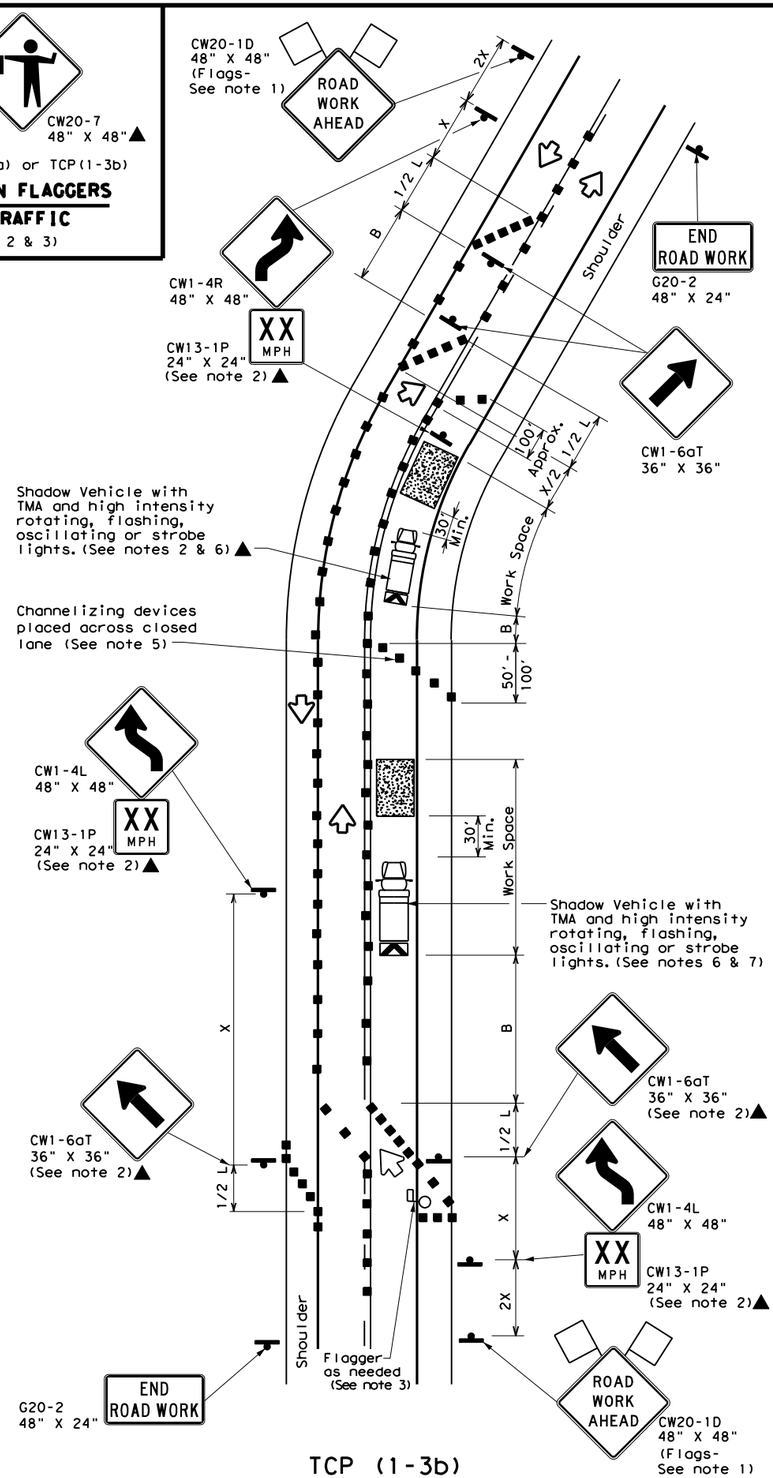


TCP (1-3a)
2-LANE ROADWAY WITH PAVED SHOULDERS

ONE LANE CLOSED
ADEQUATE FIELD OF VIEW

BE PREPARED TO STOP
CW3-4 48" X 48"
CW20-7 48" X 48"
For either TCP(1-3a) or TCP(1-3b)
USE ONLY WHEN FLAGGERS CONTROL TRAFFIC
(See Notes 2 & 3)



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

ONE LANE CLOSED
INADEQUATE FIELD OF VIEW

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

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

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

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

GENERAL NOTES

1. Flags attached to signs where shown are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. Flagger control should NOT be used unless roadway conditions or heavy traffic volume require additional emphasis to safely control traffic. Additional flaggers may be positioned in advance of traffic queues to alert traffic to reduce speed.
4. DO NOT PASS, PASS WITH CARE and construction regulatory speed zone signs may be installed downstream of the ROAD WORK AHEAD signs.
5. When the work zone is made up of several work spaces, channelizing devices should be placed laterally across the closed lane to re-emphasize closure. Laterally placed channelizing devices should be repeated every 500 to 1000 feet in urban areas and every 1/4 to 1/2 mile in rural areas.
6. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
7. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.
8. Where traffic is directed over a yellow centerline, channelizing devices which separate two-way traffic should be spaced on tapers at 20', or 15' if posted speed are 35 mph or slower, and for tangent sections, at 1/2S where S is the speed in mph. This tighter device spacing is intended for the area of conflicting markings not the entire work zone.

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
TRAFFIC SHIFTS ON TWO LANE ROADS

TCP(1-3)-18

FILE: tcp1-3-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0356	01	107	SH 136
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	AMA	HUTCHINSON CO		29
1-97 2-18				

DATE: 11/17/2022 4:25:43 PM
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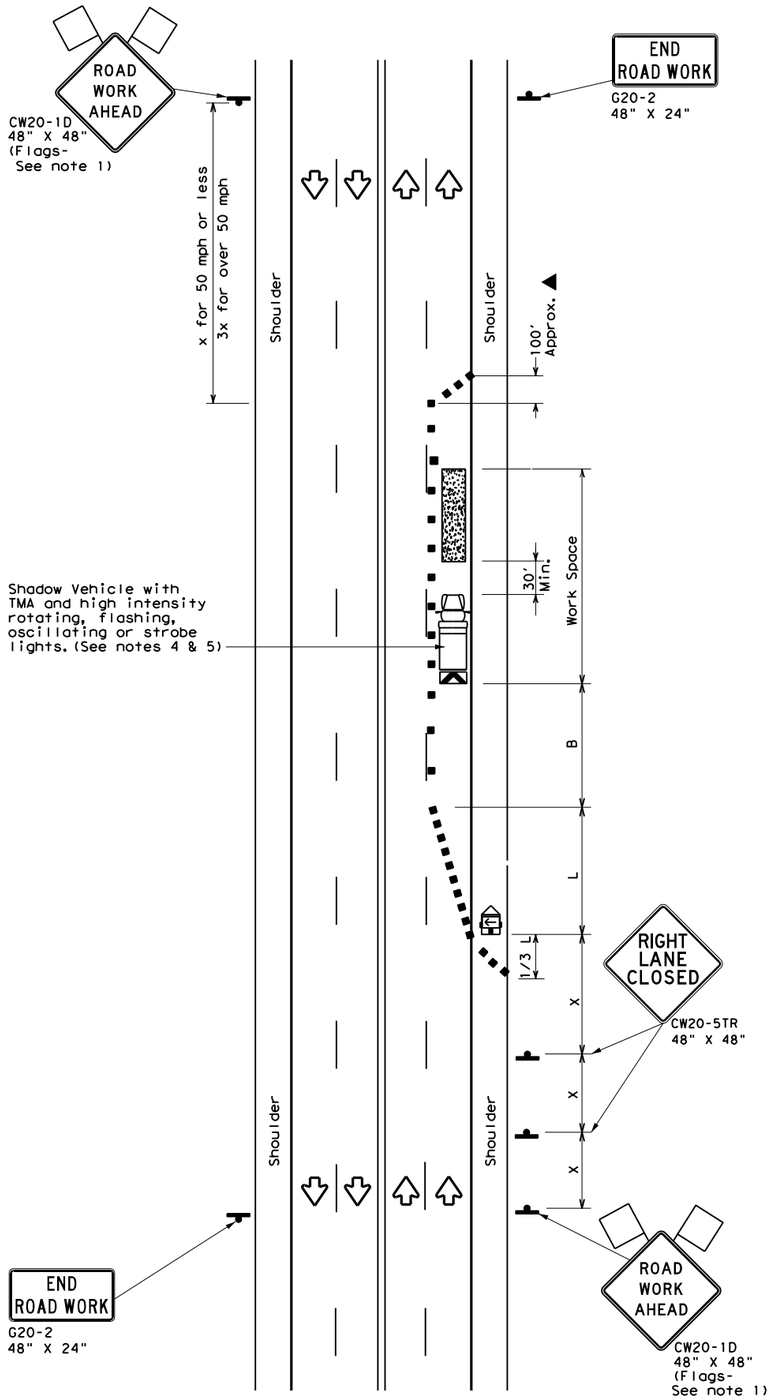
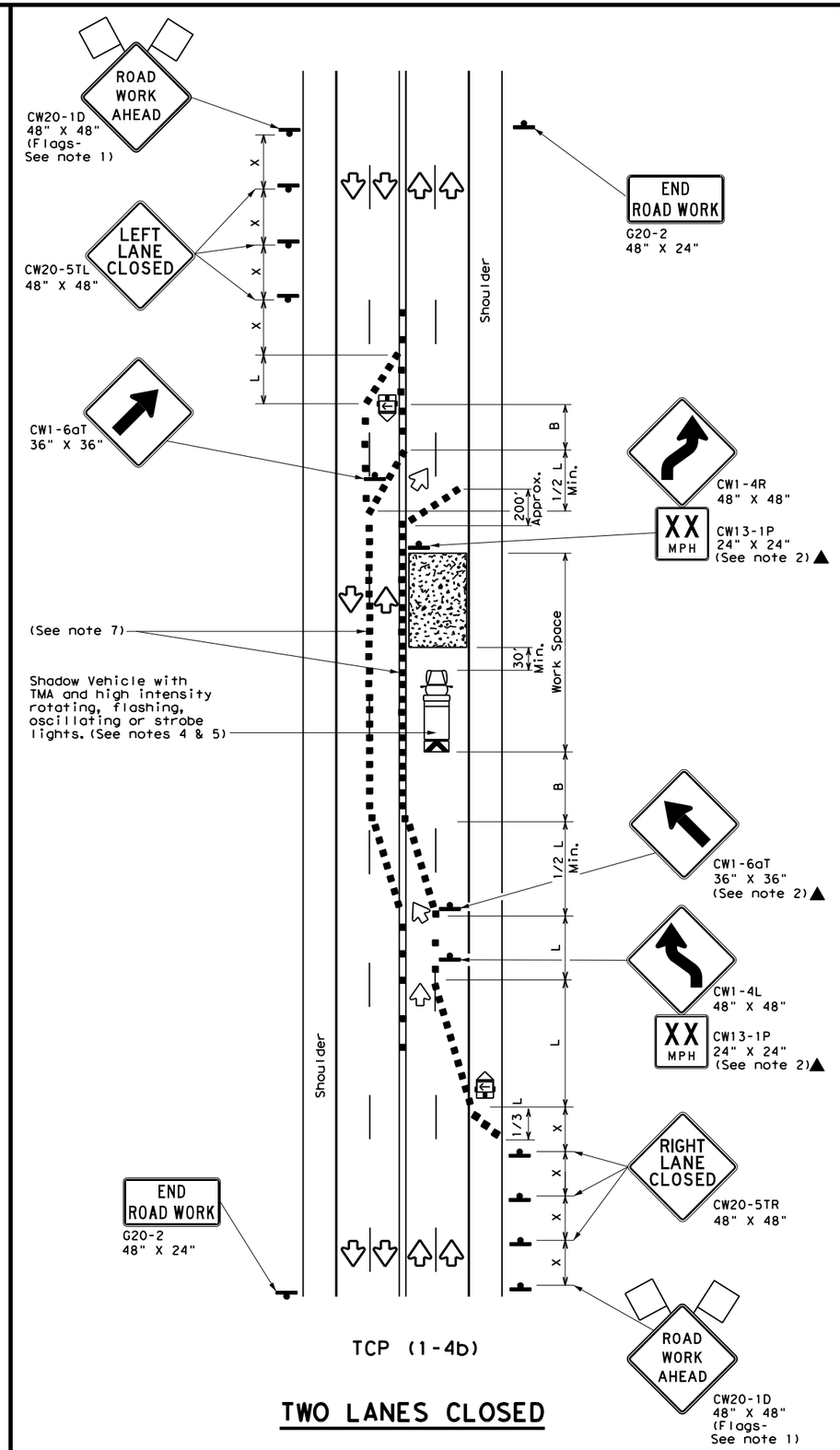


TCP (1-4a)

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	0356	01	107	SH 136
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	AMA	HUTCHINSON CO		30
1-97 2-18				

DATE: 11/17/2022 4:25:44 PM
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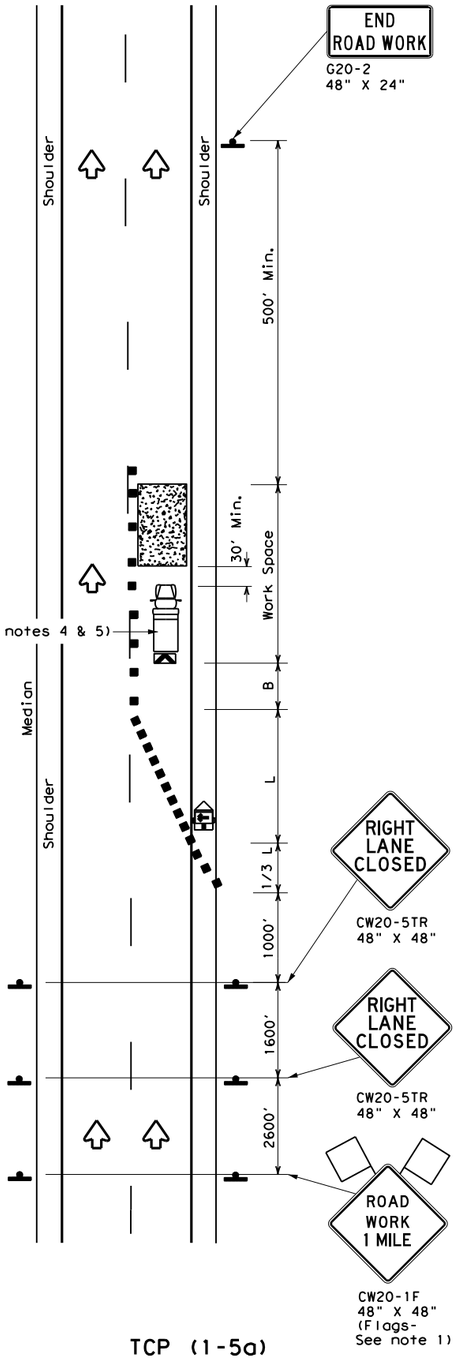
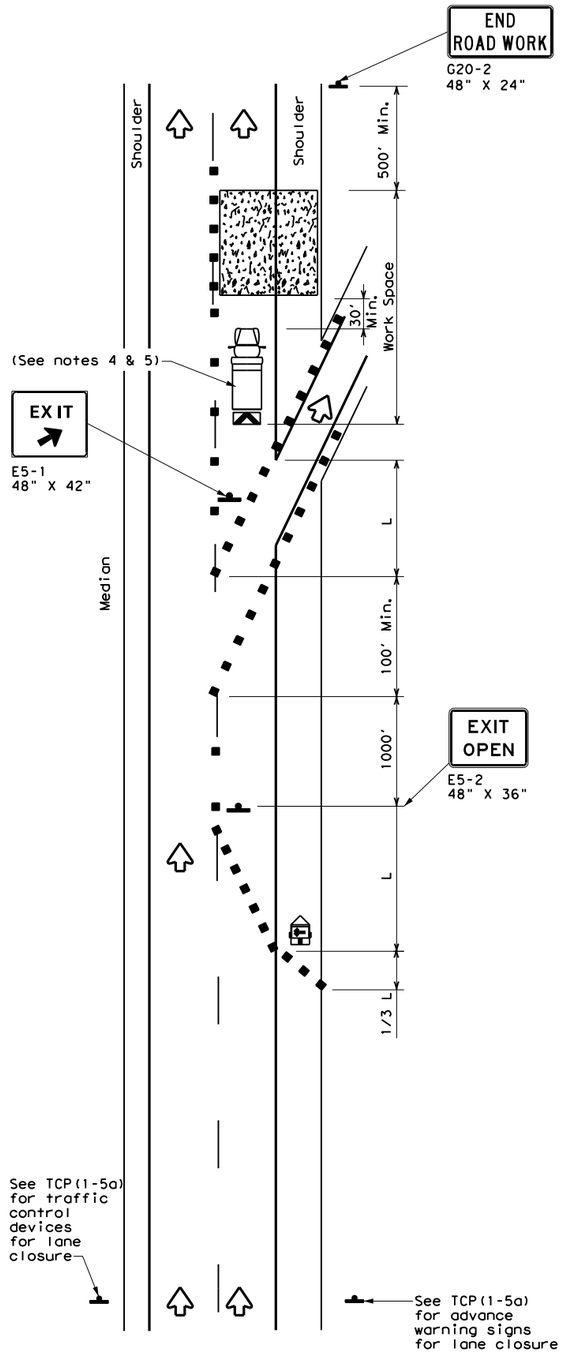


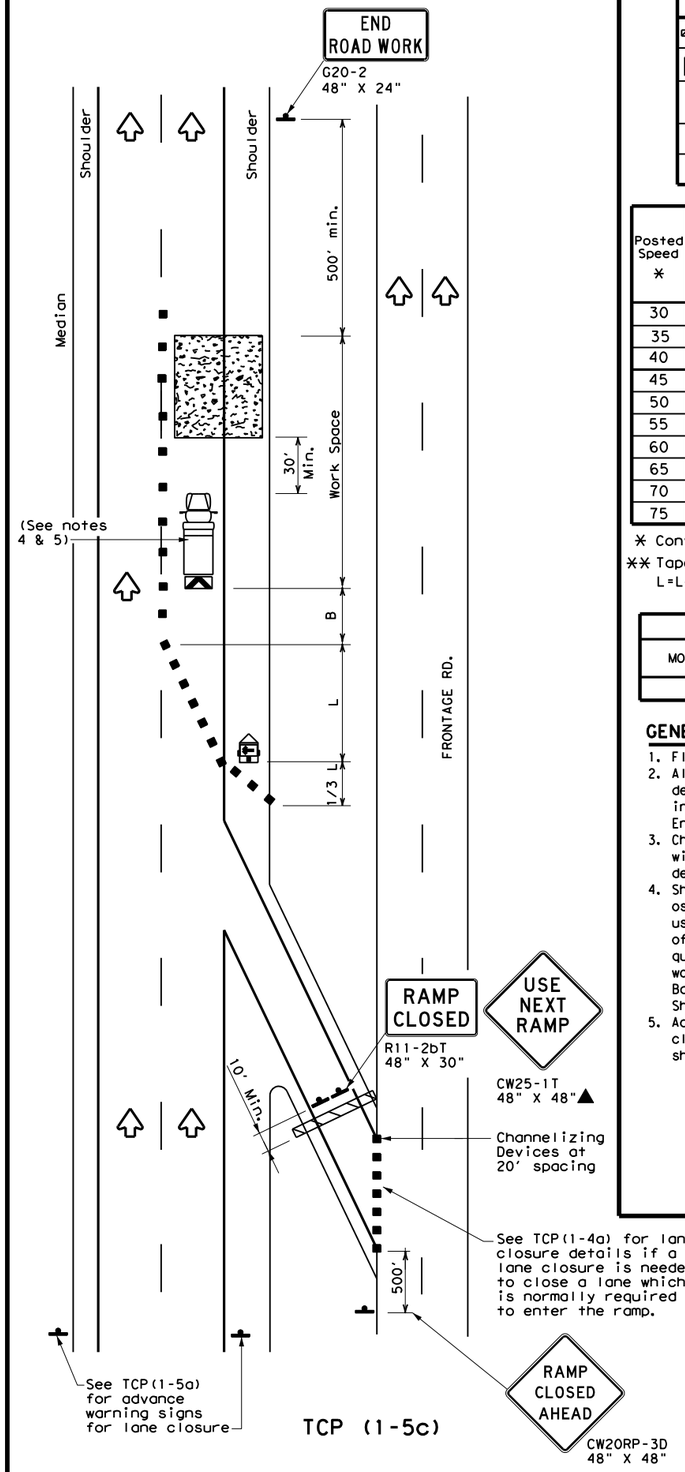
TCP (1-5a)

ONE LANE CLOSURE



TCP (1-5b)

LANE CLOSURE NEAR EXIT RAMPS



TCP (1-5c)

LANE CLOSURE NEAR ENTRANCE RAMPS

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. Channelizing devices used to close lanes may be supplemented with the Chevron Alignment Sign placed on every other channelizing device. Chevrons may be attached to plastic drums as per BC Standards.
4. Shadow Vehicle with TMA and high intensity rotating, flashing, oscillating or strobe lights. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
5. Additional Shadow Vehicles with TMAs may be positioned in each closed lane, on the shoulder or off the paved surface, next to those shown in order to protect a wider work space.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LANE CLOSURES FOR DIVIDED HIGHWAYS

TCP(1-5)-18

FILE: tcp1-5-18.dgn	DN:	CK:	DW:	CK:
©TxDOT February 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-18	0356	01	107	SH 136
	DIST	COUNTY		SHEET NO.
	AMA	HUTCHINSON CO		31

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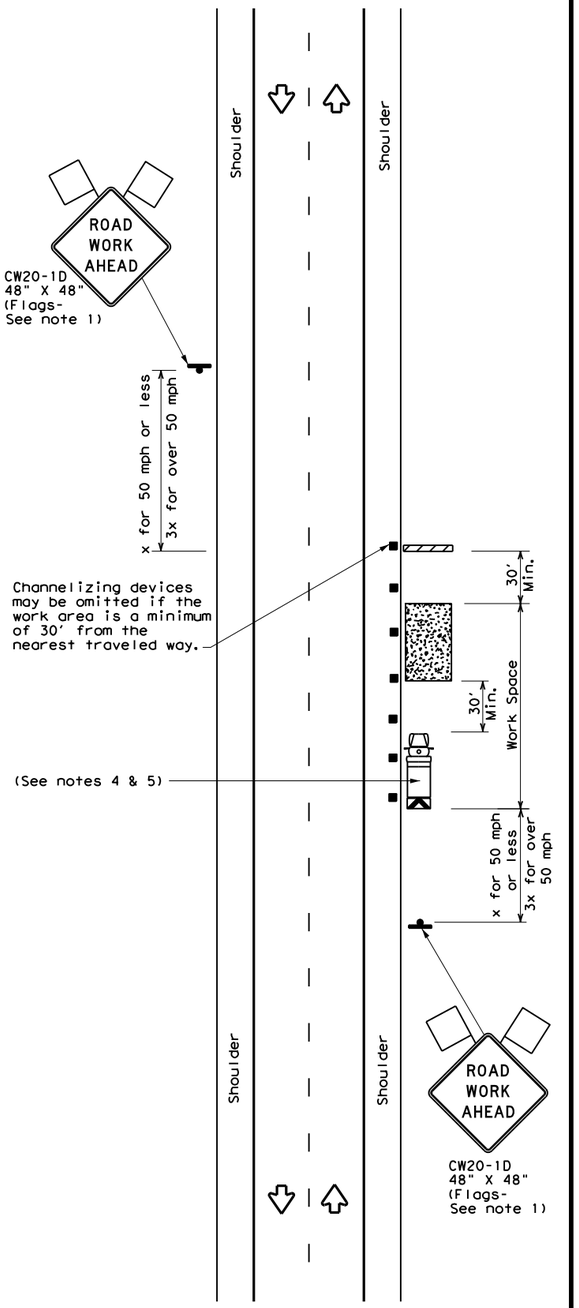
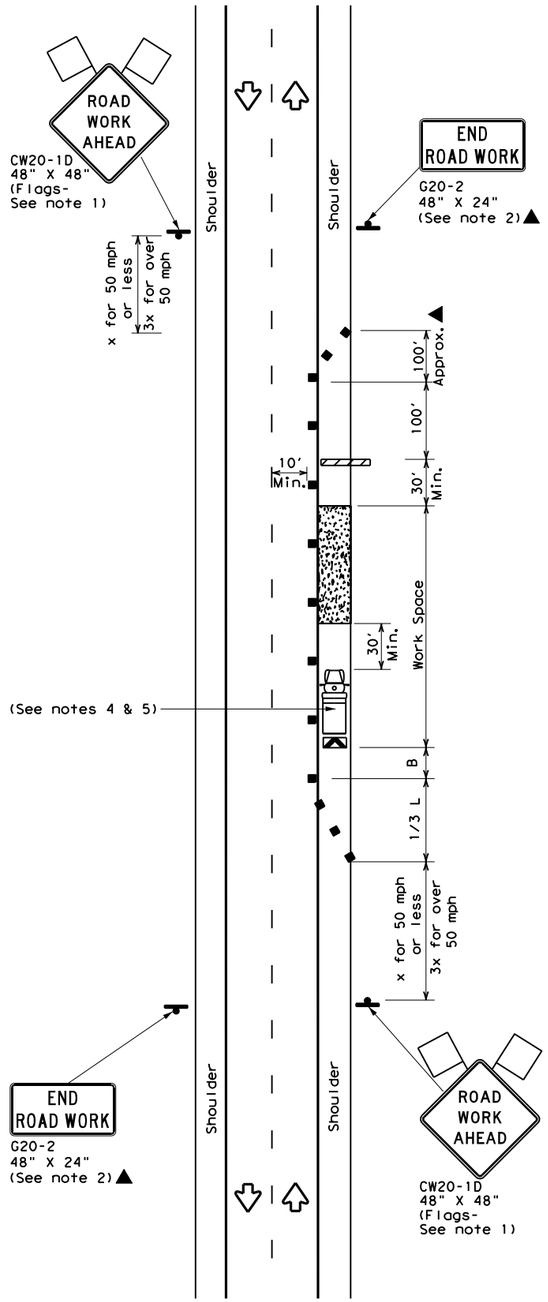


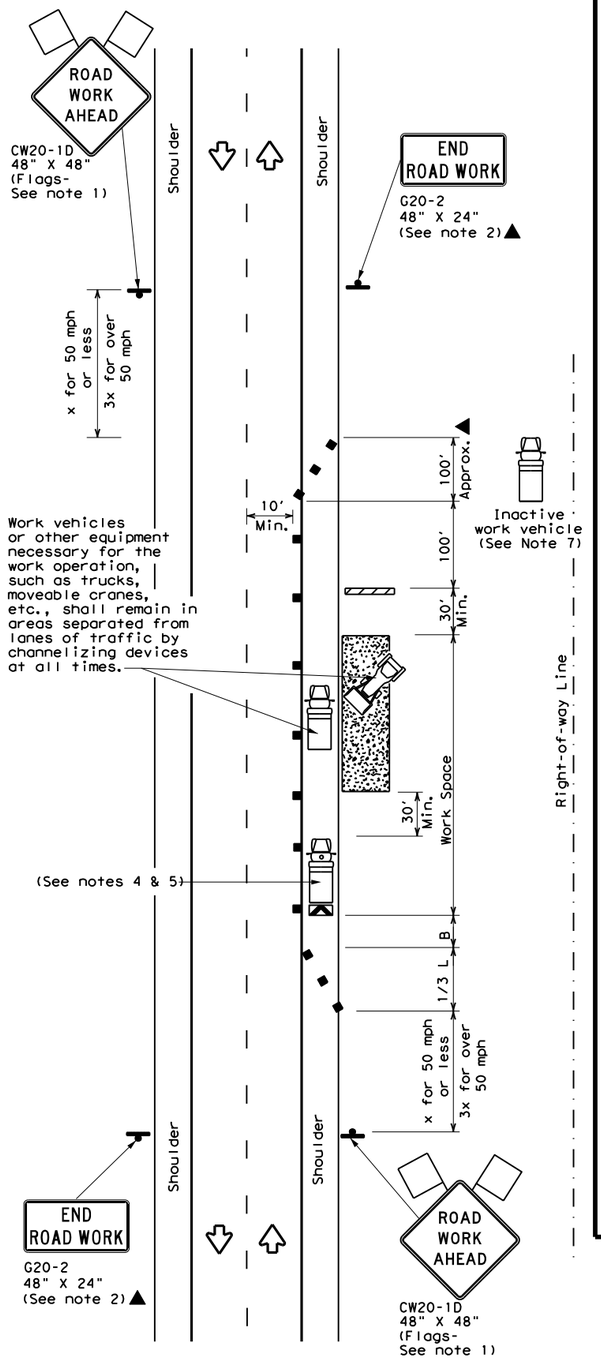
TCP (2-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (2-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (2-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated in the plans, or for routine maintenance work, when approved by the Engineer.
3. Stockpiled material should be placed a minimum of 30 feet from nearest traveled way.
4. Shadow Vehicle with TMA and high intensity rotating, flashing, oscillating or strobe lights. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
5. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect a wider work space.
6. See TCP(5-1) for shoulder work on divided highways, expressways and freeways.
7. Inactive work vehicles or other equipment should be parked near the right-of-way line and not parked on the paved shoulder.
8. CW21-5 "SHOULDER WORK" signs may be used in place of CW20-1D "ROAD WORK AHEAD" signs for shoulder work on conventional roadways.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(2-1)-18

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© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0356	01	107	SH 136
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	AMA	HUTCHINSON CO		32
1-97 2-18				

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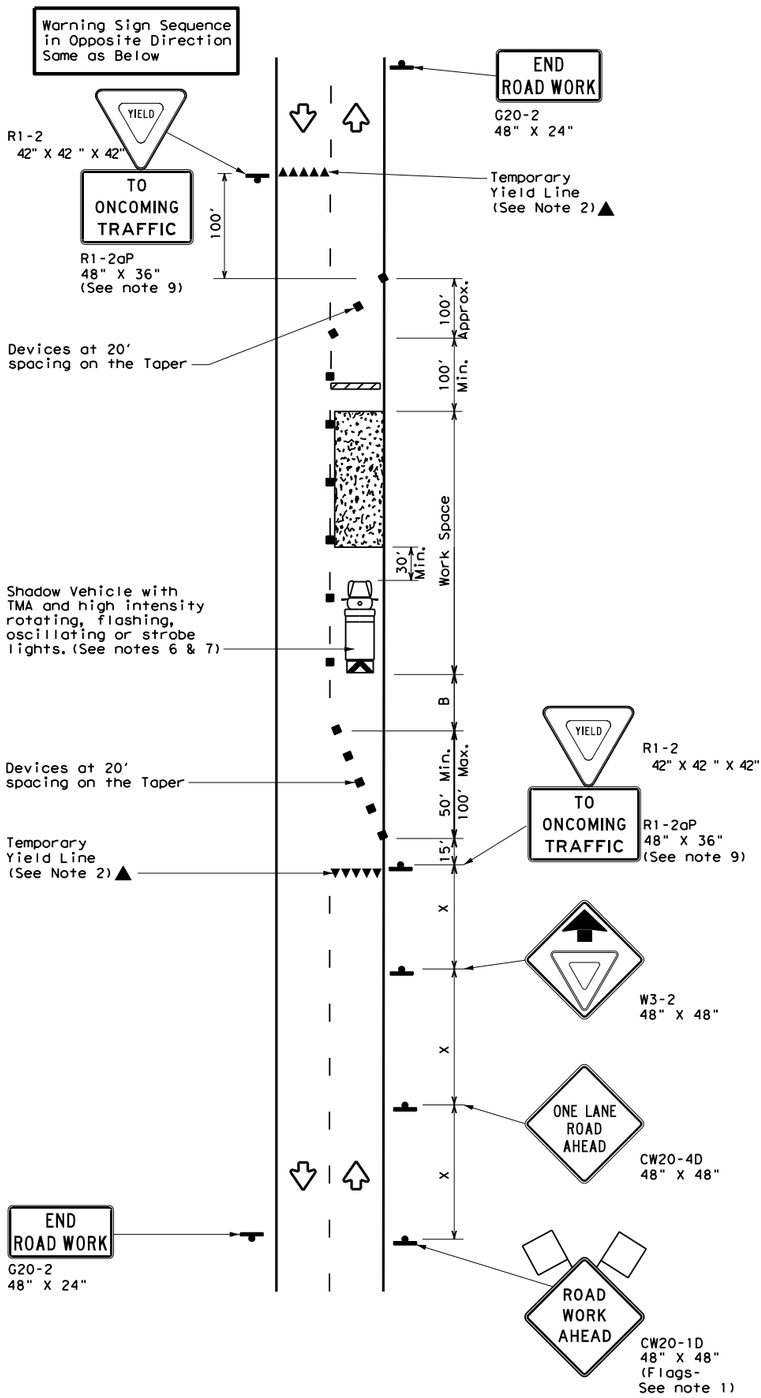
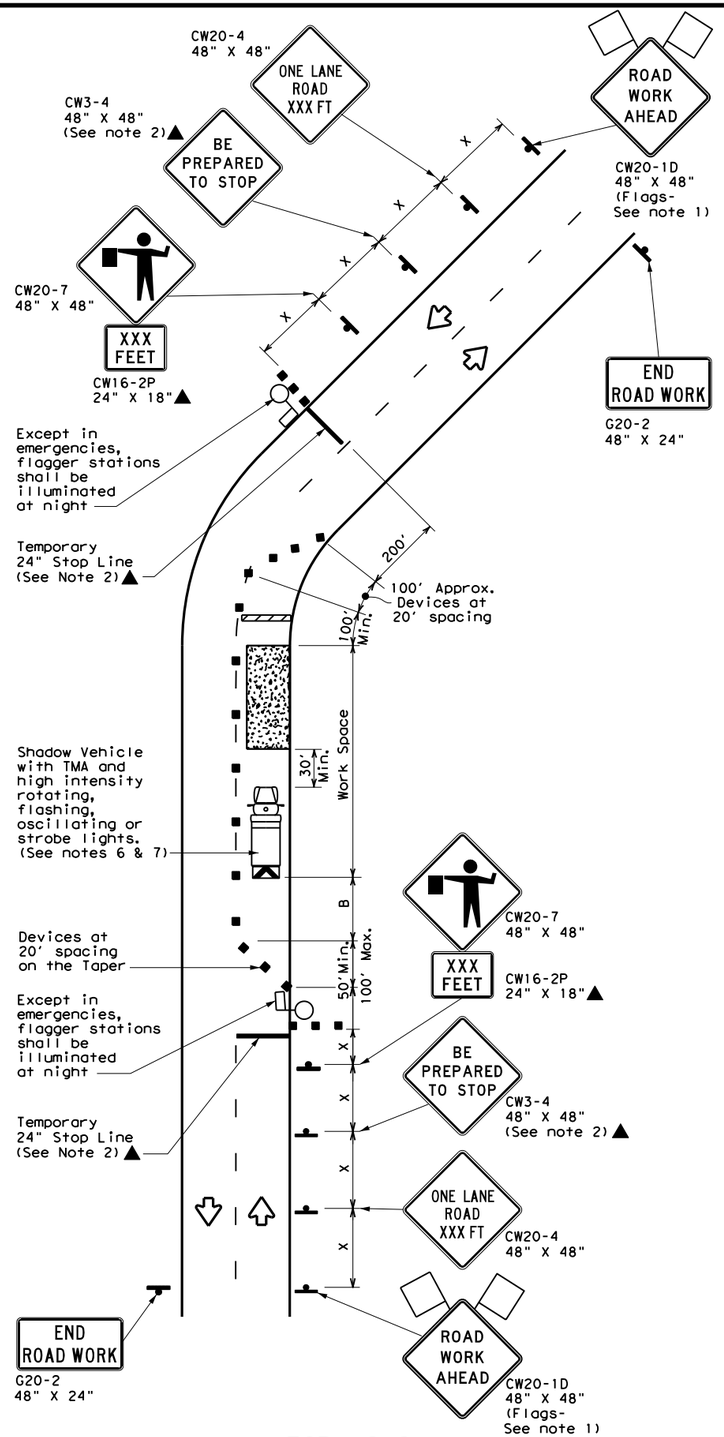


TCP (2-2a)
2-LANE ROADWAY WITHOUT PAVED SHOULDERS
ONE LANE TWO-WAY
CONTROL WITH YIELD SIGNS
(Less than 2000 ADT - See Note 9)



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)

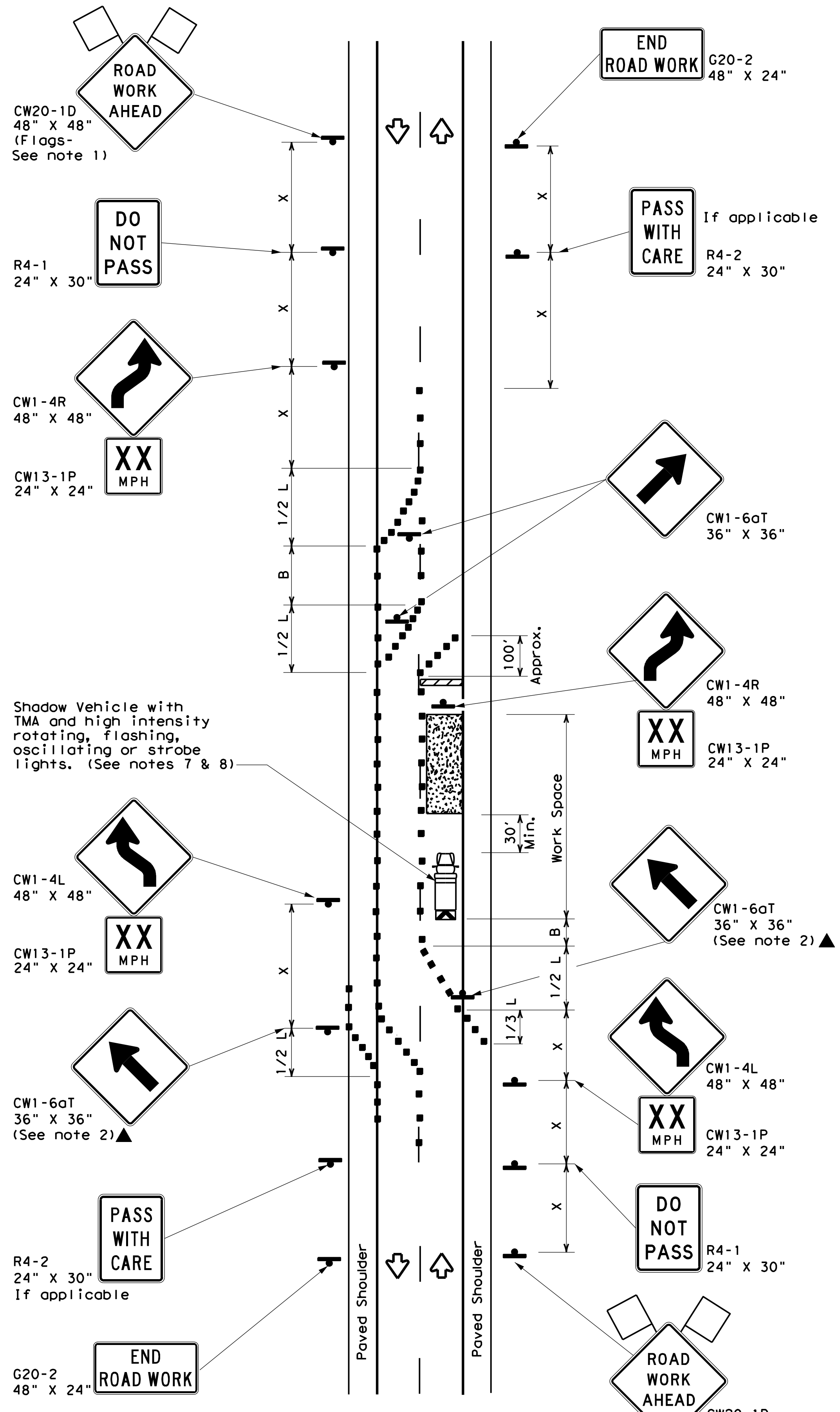
10. Channelizing devices on the center line may be omitted when a pilot car is leading traffic and approved by the Engineer.
11. If the work space is located near a horizontal or vertical curve, the buffer distances should be increased in order to maintain stopping sight distance to the flagger and a 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 8-95 3-03 1-97 2-12 4-98 2-18	0356	01	107	SH 136
	DIST	COUNTY		SHEET NO.
	AMA	HUTCHINSON CO		33

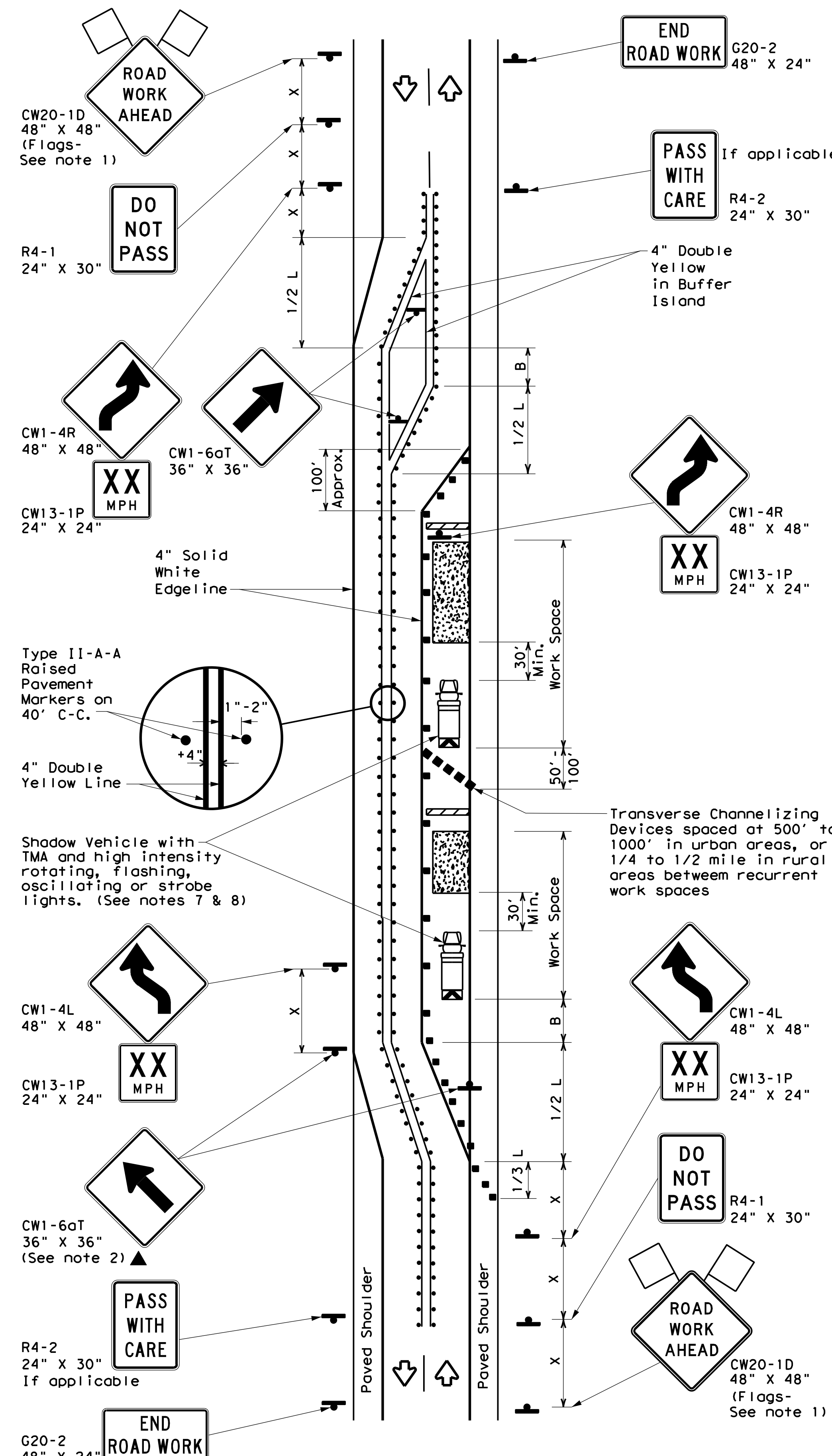


TCP (2-3a)

2-LANE ROADWAY WITH PAVED SHOULDERS

ONE LANE CLOSED

ADEQUATE FIELD OF VIEW



TCP (2-3b)

2-LANE ROADWAY WITH PAVED SHOULDERS

ONE LANE CLOSED

INADEQUATE FIELD OF VIEW

LEGEND

(symbol)	Type 3 Barricade	(symbol)	Channelizing Devices
(symbol)	Heavy Work Vehicle	(symbol)	Truck Mounted Attenuator (TMA)
(symbol)	Trailer Mounted Flashing Arrow Board	(symbol)	Raised Pavement Markers Ty II-AA
(symbol)	Sign	(symbol)	Traffic Flow
(symbol)	Flag	(symbol)	Flagger

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

* Conventional Roads Only

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

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY TCP(2-3b)ONLY
			✓	✓

GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. When work space will be in place less than three days existing pavement markings may remain in place. Channelizing devices shall be used to separate traffic.
4. Flagger control should NOT be used unless roadway conditions or heavy traffic volume require additional emphasis to safely control traffic. Flagger should be positioned at end of traffic queue.
5. The R4-1 "DO NOT PASS," R4-2 " PASS WITH CARE" and construction regulatory speed zone signs may be installed within CW20-1D "ROAD WORK AHEAD" signs. Proper spacing of signs shall be maintained.
6. Conflicting pavement marking shall be removed for long term projects.
7. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted.
8. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect a wider work space.

TCP (2-3a)

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN TRAFFIC SHIFTS ON TWO-LANE ROADS

TCP(2-3)-18

FILE: tcp(2-3)-18.dgn	DN:		CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY	
REVISIONS 8-95 3-03 1-97 2-12 4-98 2-18	0356	01	107	SH 136	
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	AMA	HUTCHINSON CO		34	

163

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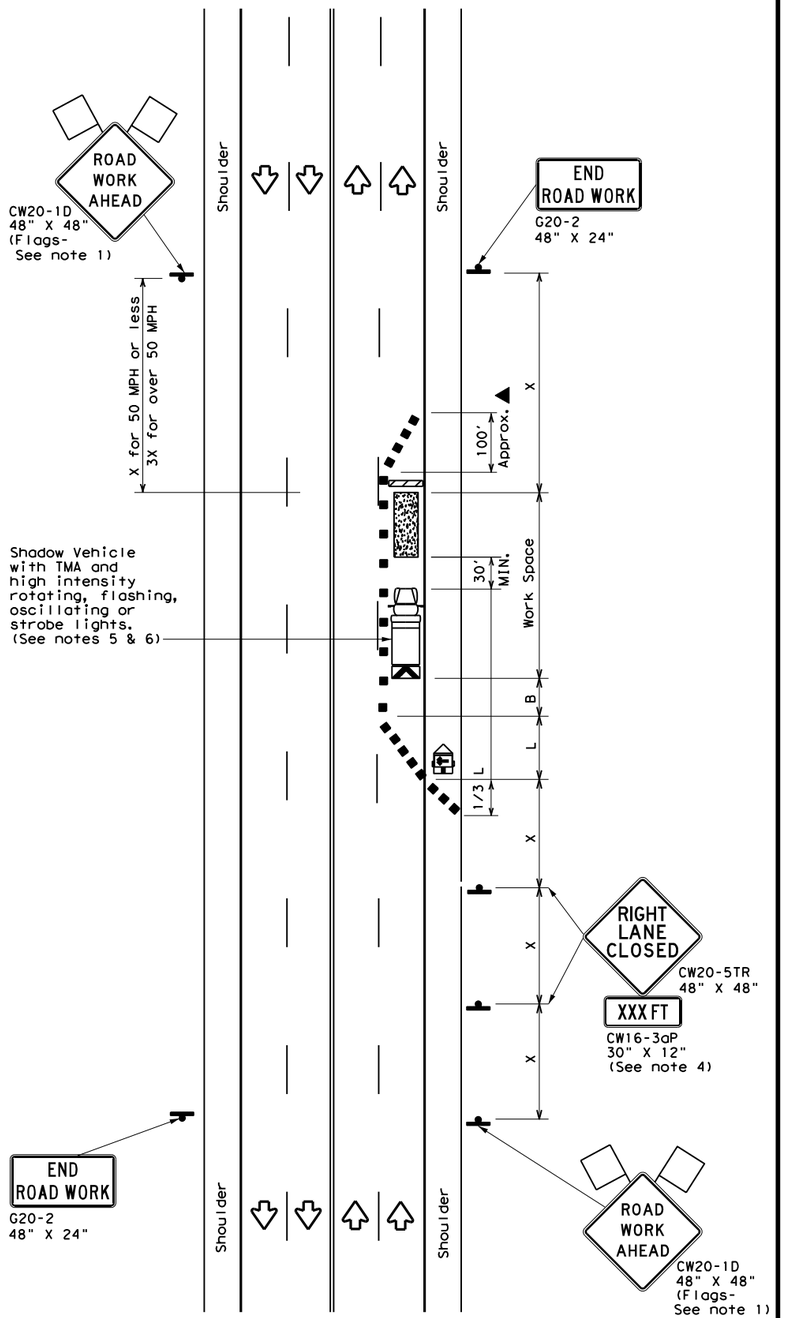
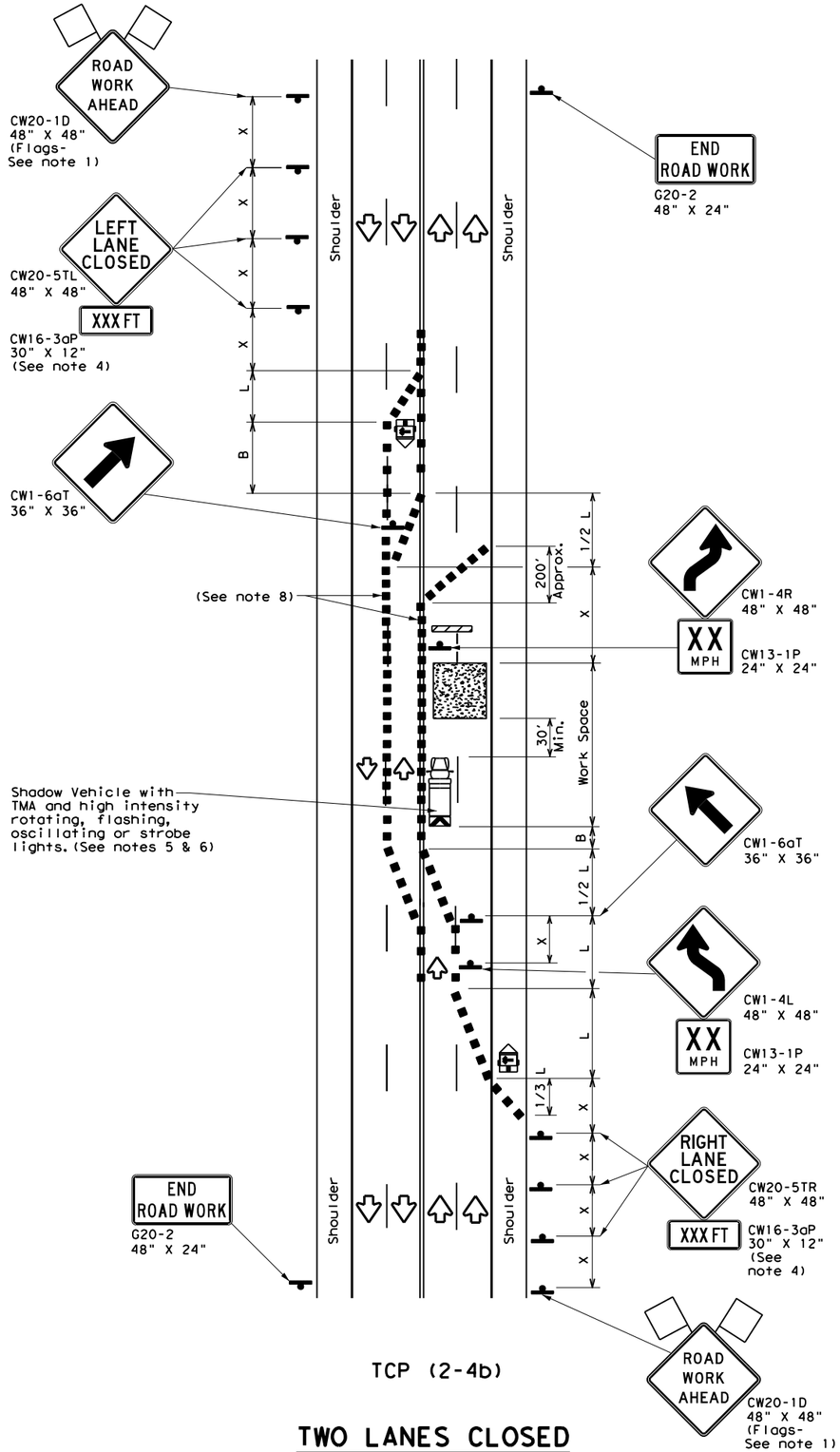


TCP (2-4a)

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	0356	01	107	SH 136
8-95 3-03	DIST	COUNTY		SHEET NO.
1-97 2-12	AMA	HUTCHINSON CO		35
4-98 2-18				

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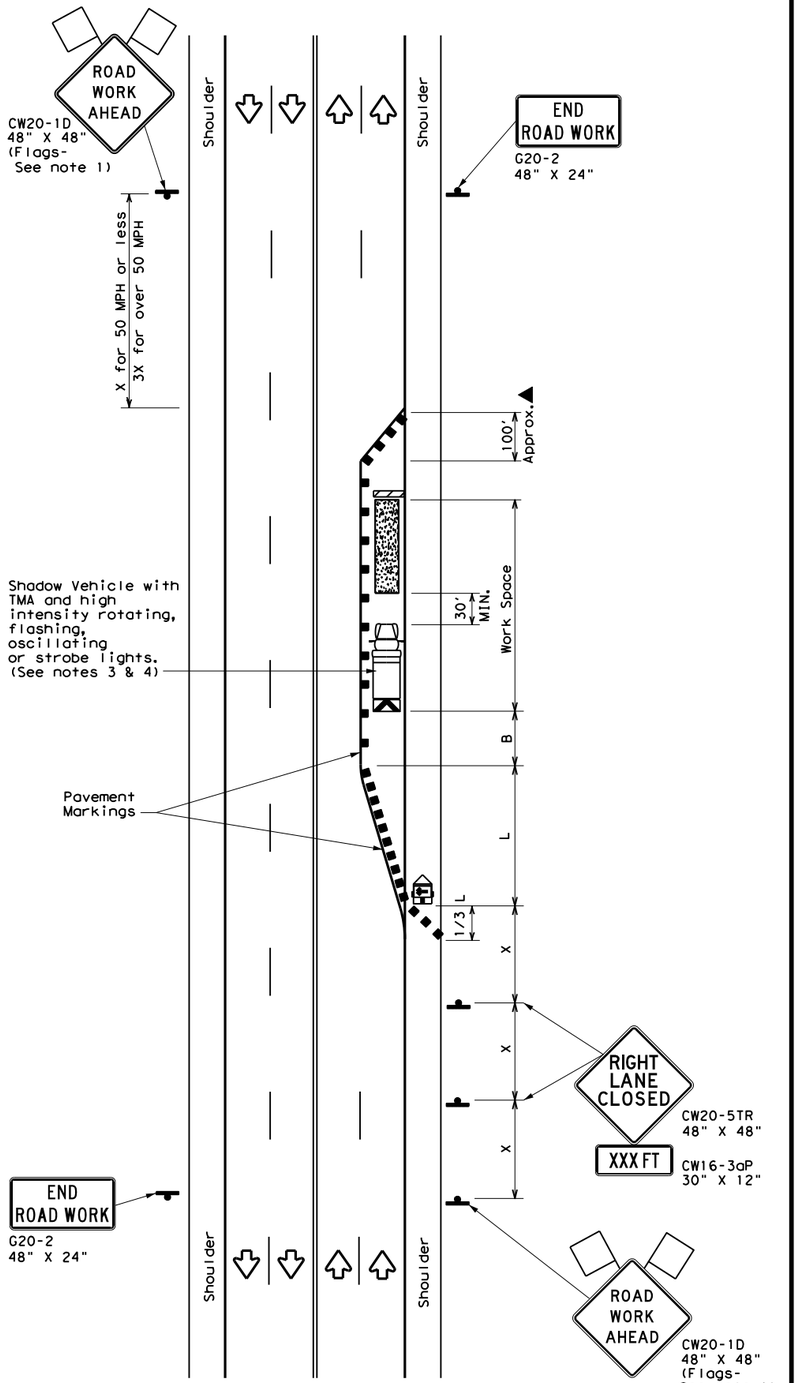
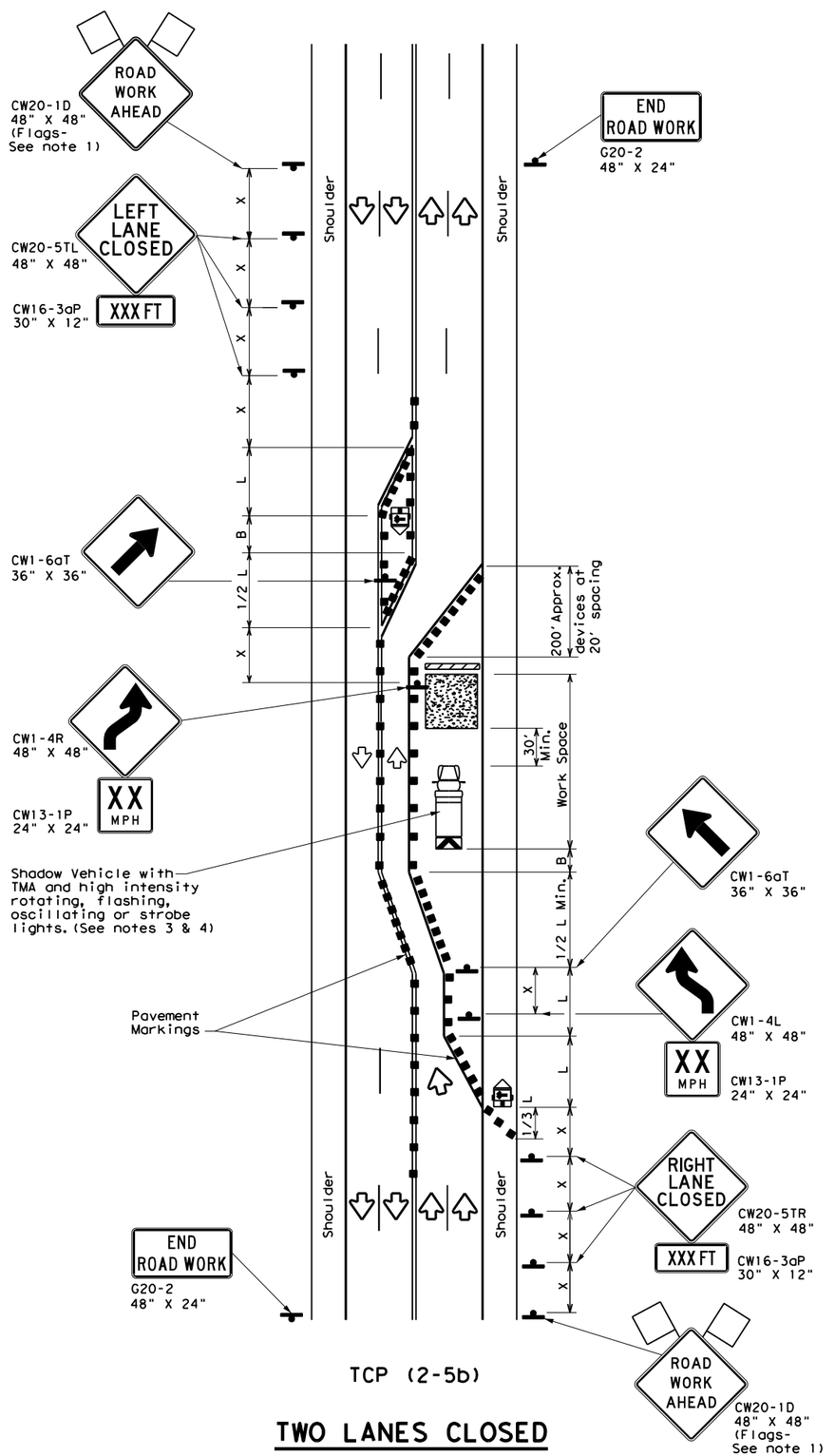


TCP (2-5a)

ONE LANE CLOSED



TCP (2-5b)

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. 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 eposure 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 substitutued for the Shadow Vehicle and TMA.
4. 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.
5. The downstream taper is optional. When used, it should be 100 feet approximately per lane, with channelizing devices spaced at 20 feet.

TCP (2-5a)

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 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 (2-5b)

7. Conflicting pavement markings shall be removed for long-term projects.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
LONG TERM LANE CLOSURES
MULTILANE CONVENTIONAL RDS.

TCP(2-5)-18

FILE: tcp2-5-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 2-12	0356	01	107	SH 136
1-97 3-03	DIST	COUNTY		SHEET NO.
4-98 2-18	AMA	HUTCHINSON CO		36

DATE: 11/17/2022 4:25:52 PM
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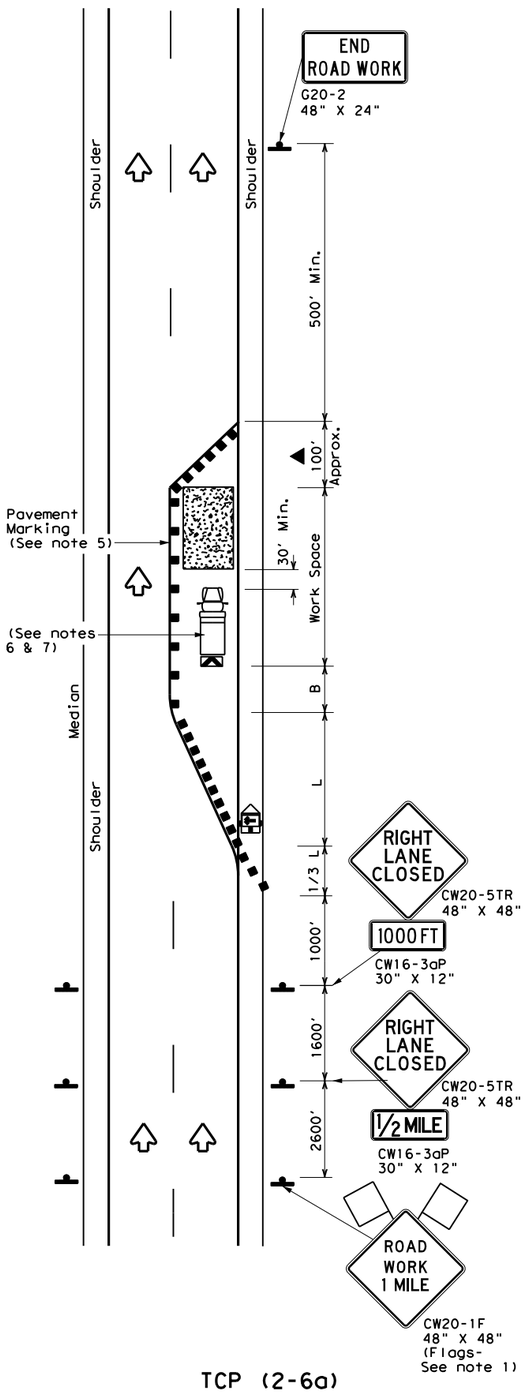
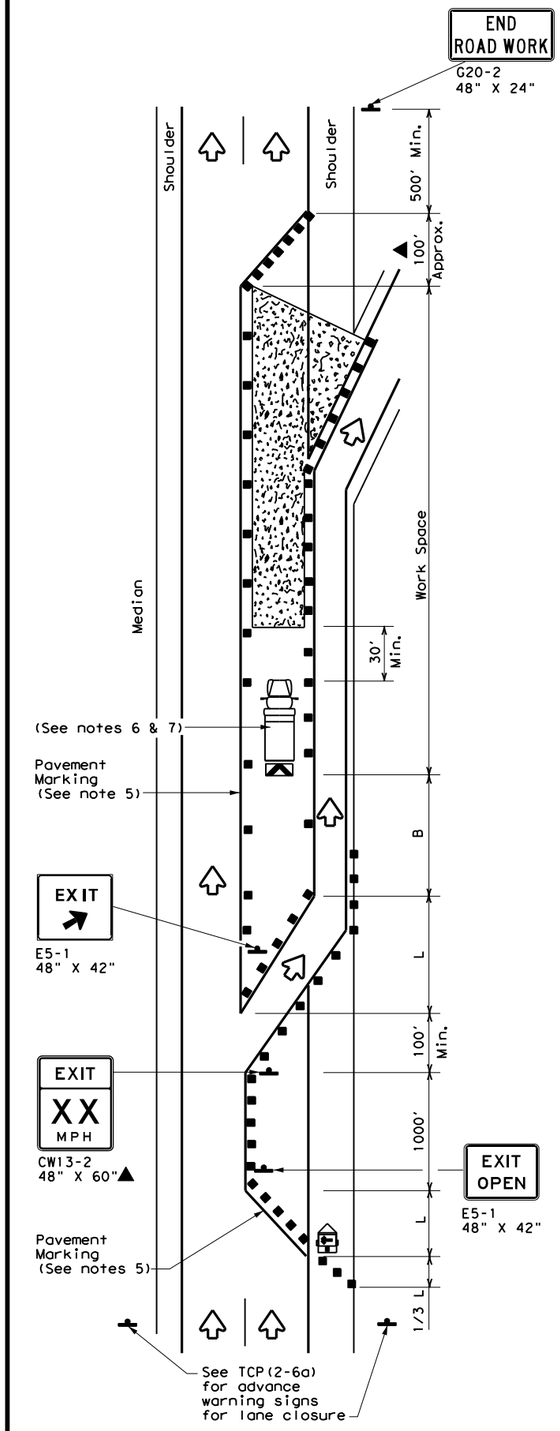


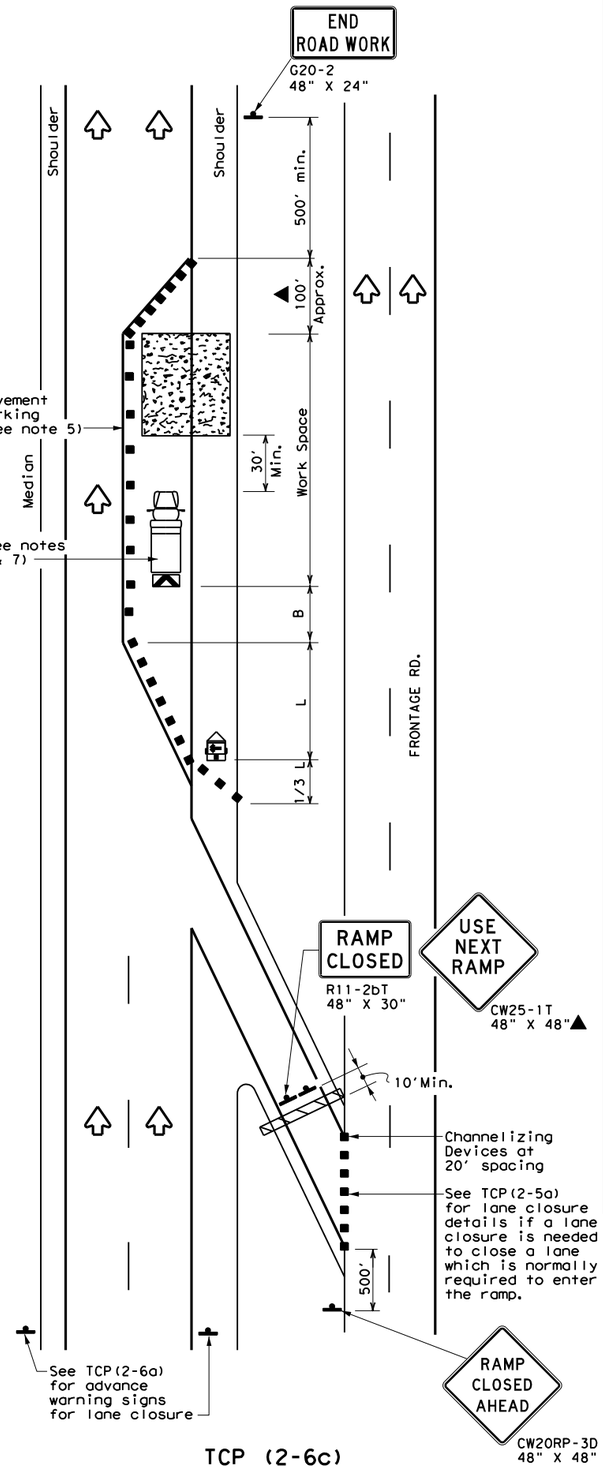
TCP (2-6a)

ONE LANE CLOSURE



TCP (2-6b)

LANE CLOSURE NEAR EXIT RAMPS



TCP (2-6c)

LANE CLOSURE NEAR ENTRANCE RAMPS

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. Channelizing devices used to close lanes may be supplemented with the Chevron Alignment Sign placed on every other channelizing device. Chevrons may be attached to plastic drums as per BC Standards.
4. Channelizing devices used along the work space or along tangent sections may be supplemented with vertical panels (VP) placed on everyother channelizing device. If night time conditions make it difficult to see at least two VPs, the VPs may be placed on each channelizing device.
5. The placement of pavement markings may be omitted on Intermediate-term stationary work zones with the approval of the Engineer.
6. Shadow Vehicle with TMA and high intensity rotating, flashing,oscillating or strobe lights. Shadow Vehicle with TMA and high intensity rotating, flashing, oscillating or strobe lights. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
7. 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.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LANE CLOSURES ON DIVIDED HIGHWAYS

TCP(2-6)-18

FILE: tcp2-6-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 2-12 1-97 2-18	0356	01	107	SH 136
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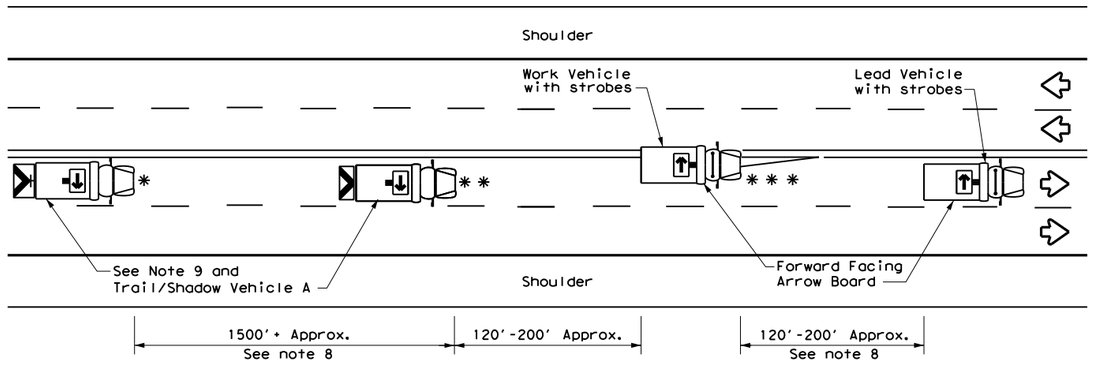
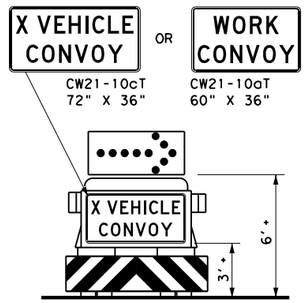
	AMA	HUTCHINSON CO		37



TCP (3-1a)

UNDIVIDED MULTILANE ROADWAY



TRAIL/SHADOW VEHICLE A

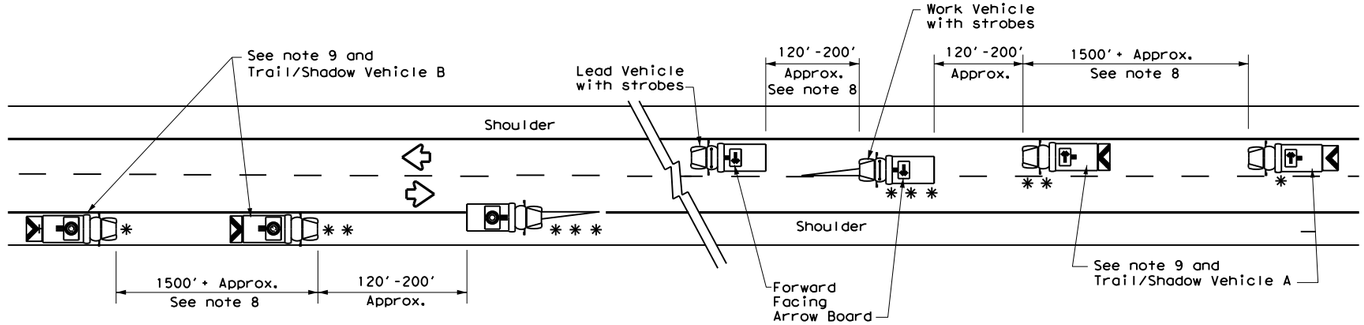
with RIGHT Directional display Flashing Arrow Board

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

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

GENERAL NOTES

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

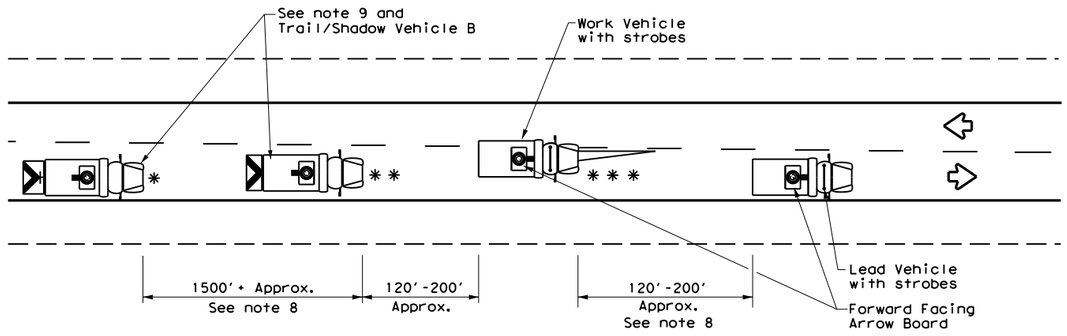


WORK ON SHOULDER

WORK ON TRAVEL LANE

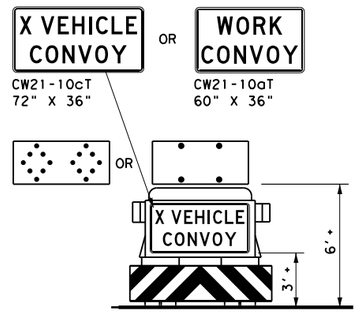
TCP (3-1b)

TWO-WAY ROADWAY WITH PAVED SHOULDERS



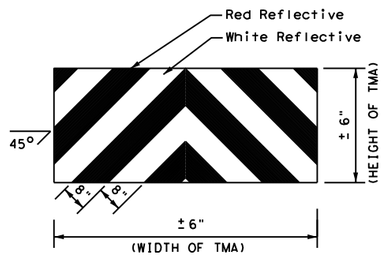
TCP (3-1c)

TWO-WAY ROADWAY WITHOUT PAVED SHOULDERS



TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board in CAUTION display



STRIPING FOR TMA

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS UNDIVIDED HIGHWAYS

TCP(3-1)-13

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©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 7-13 1-97	0356	01	107	SH 136
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	AMA	HUTCHINSON CO		38

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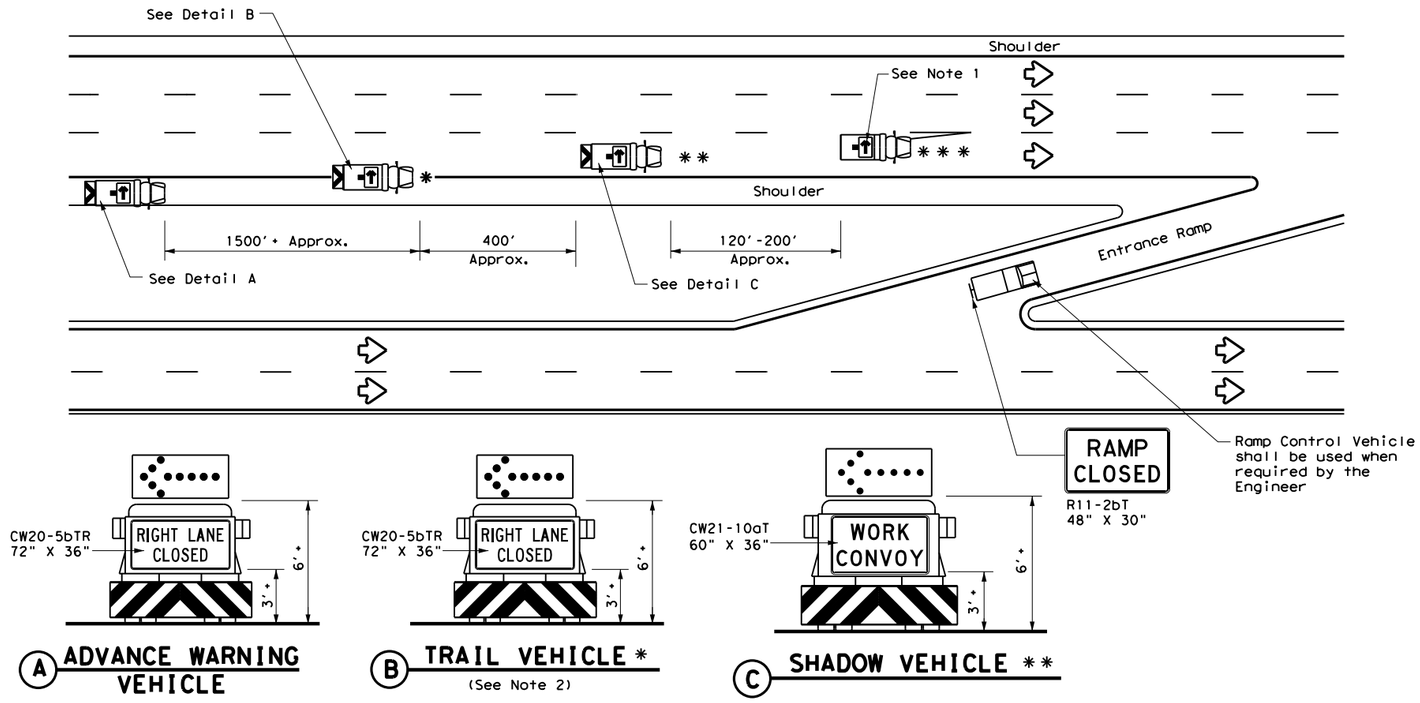
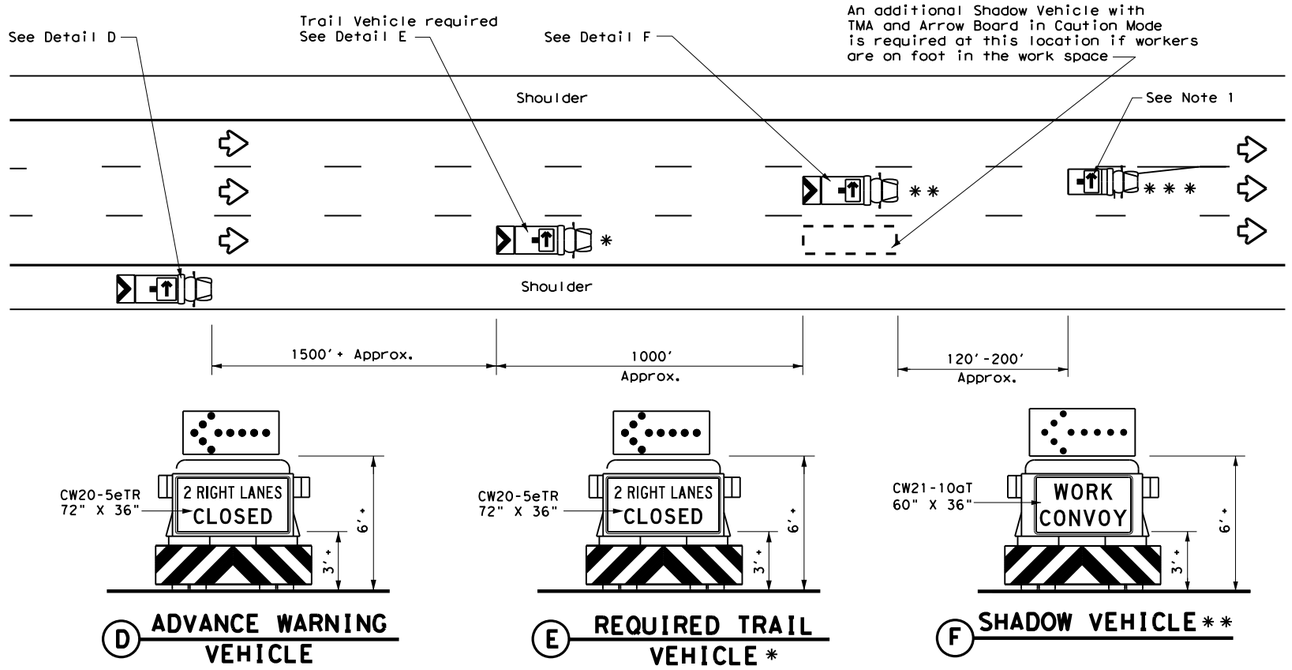


RIGHT LANE CLOSURE ON DIVIDED HIGHWAY - TCP(3-2a)



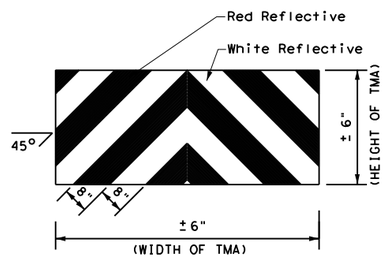
INTERIOR LANE CLOSURE ON MULTI-LANE DIVIDED HIGHWAY - TCP(3-2b)

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. ADVANCE WARNING, TRAIL and SHADOW vehicles shall be equipped with Type B or Type C flashing arrow boards as per the Barricade and Construction (BC) standards. Arrow boards on WORK vehicles will be optional based on the type of work being performed. The arrow boards shall be operated from inside the vehicle.
2. For TCP(3-2a) the Engineer will determine if the TRAIL VEHICLE is required based on prevailing roadway conditions, traffic volume, and sight distance restrictions. All other vehicles shown for both TCP(3-2a) and TCP(3-2b) are required.
3. 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.
4. The use of truck mounted attenuators (TMA) on the ADVANCE WARNING, SHADOW, and TRAIL vehicles are required.
5. Reflective sheeting on the rear of the TMA shall meet or exceed the reflectivity and color requirements of DMS 8300, Type A.
6. Each vehicle shall have two-way radio communication capability.
7. When work convoys must change lanes, the TRAIL VEHICLE should change lanes first to shadow the other convoy vehicles.
8. Vehicle spacing between the TRAIL VEHICLE and the SHADOW VEHICLE will vary depending on sight distance restrictions. Motorists approaching the work convoy should be able to see the TRAIL VEHICLE in time to slow down and/or change lanes as they approach the TRAIL VEHICLE. Vehicle spacing between the WORK VEHICLE and SHADOW VEHICLE may vary according to terrain, work activity and other factors.
9. Standard 48" X 48" diamond shaped warning signs with the same message as those shown may be used where adequate mounting space exists.
10. The signs shown should be used on the Advance Warning Vehicle. As an option, a portable changeable message sign (PCMS) or a 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, must 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. Standard diamond shape versions of the CW20-5 series signs may be used as an option if the rectangular signs shown are not available.
12. The principles on this sheet may be used to close lanes from the left side of the roadway considering the number of lanes, shoulder width, sight distance, and ramp frequency.
13. Signs and flashing arrow board modes shall be appropriately altered when implementing left lane closures or interior closures which close the left lanes.
14. The Advance Warning Vehicle may straddle the edgeline when shoulder width makes it necessary.



STRIPING FOR TMA

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS DIVIDED HIGHWAYS

TCP(3-2)-13

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© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
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2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 7-13	AMA	HUTCHINSON CO		39
1-97				

176

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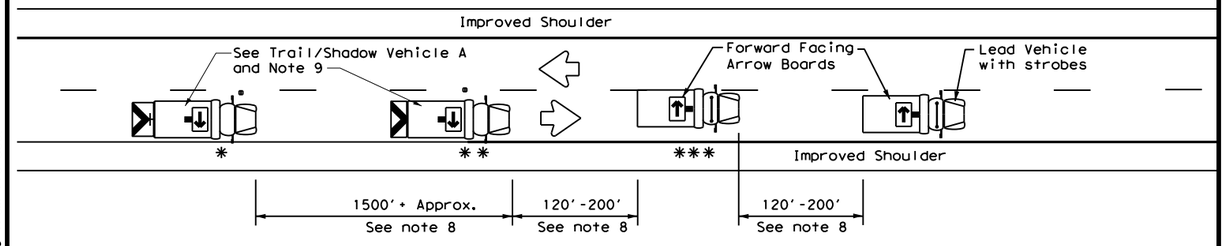
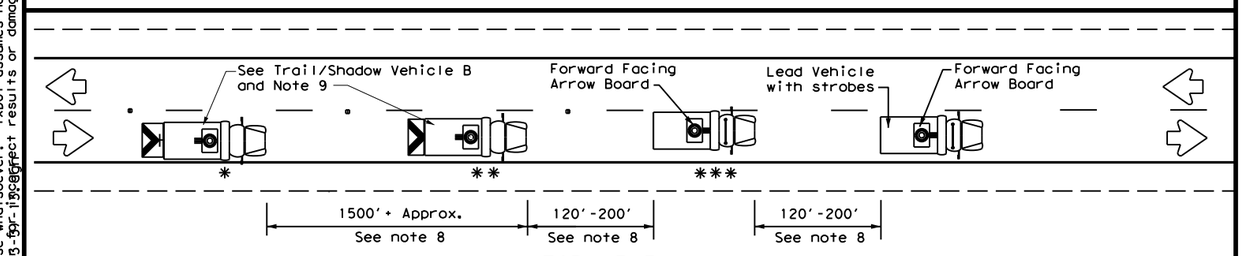


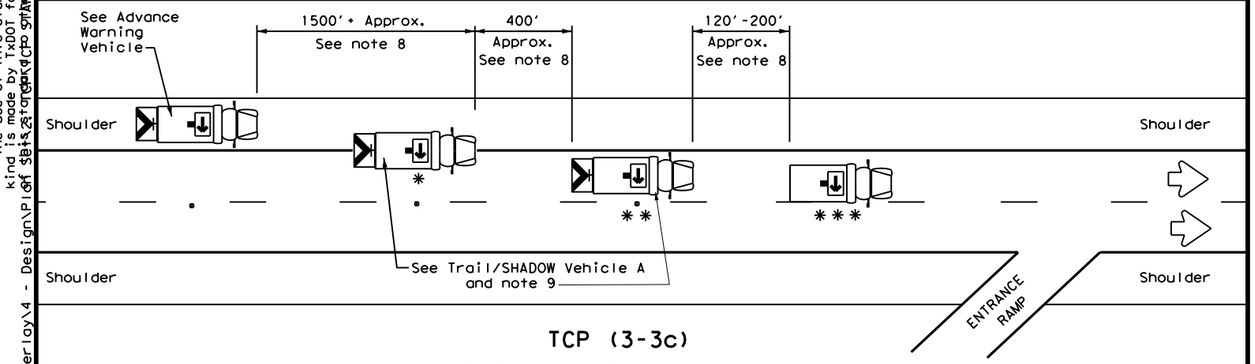
TCP (3-3a)

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



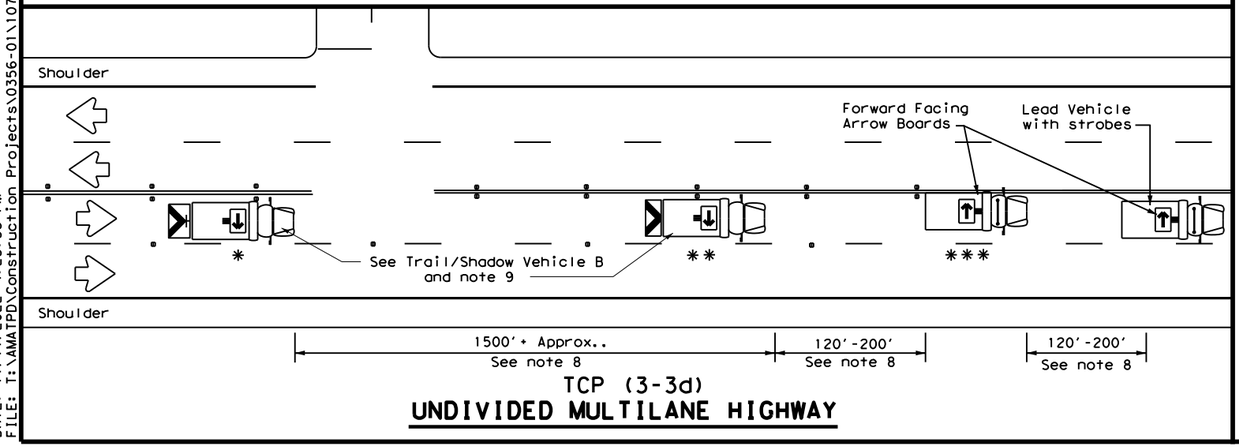
TCP (3-3b)

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



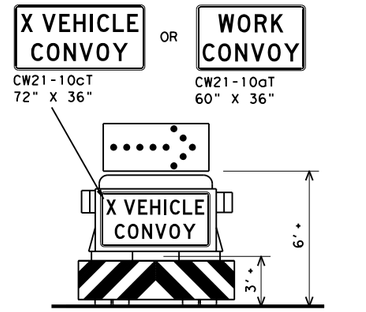
TCP (3-3c)

DIVIDED MULTILANE HIGHWAY



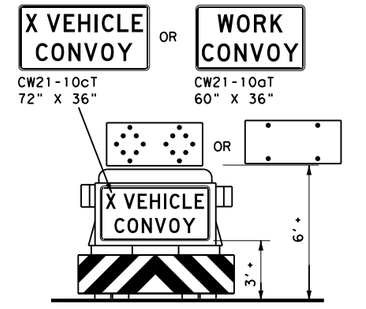
TCP (3-3d)

UNDIVIDED MULTILANE HIGHWAY



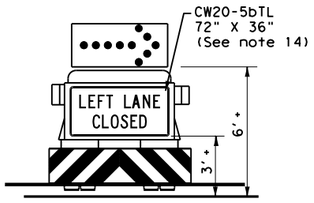
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display
Flashing Arrow Board

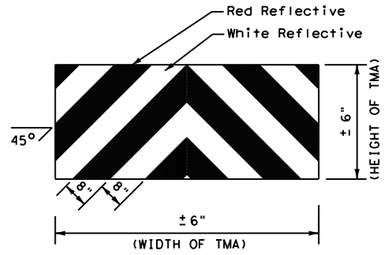


TRAIL/SHADOW VEHICLE B

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
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REVISIONS	0356	01	107	SH 136
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 7-13	AMA	HUTCHINSON CO		40
1-97 7-14				

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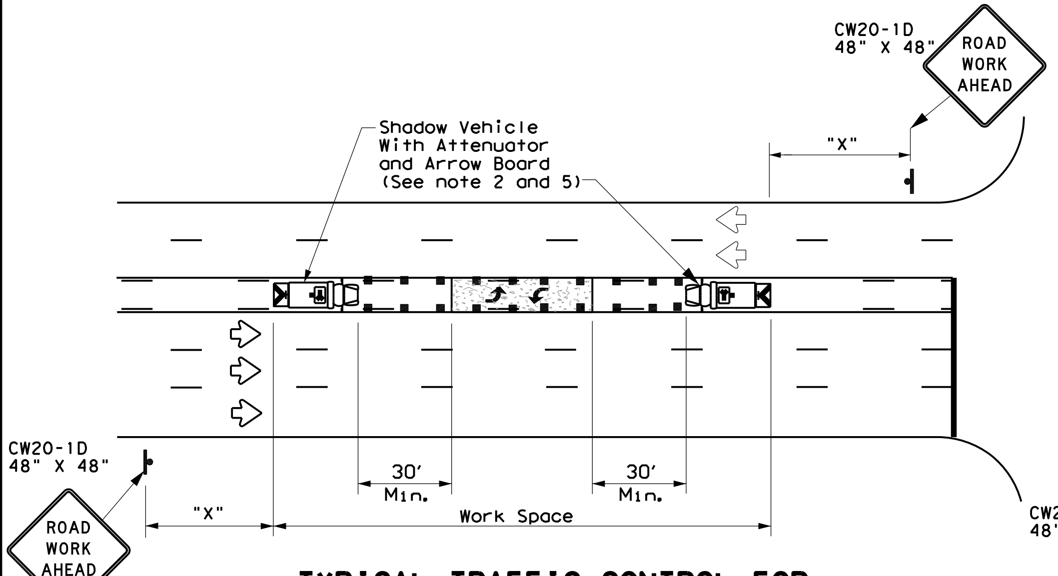
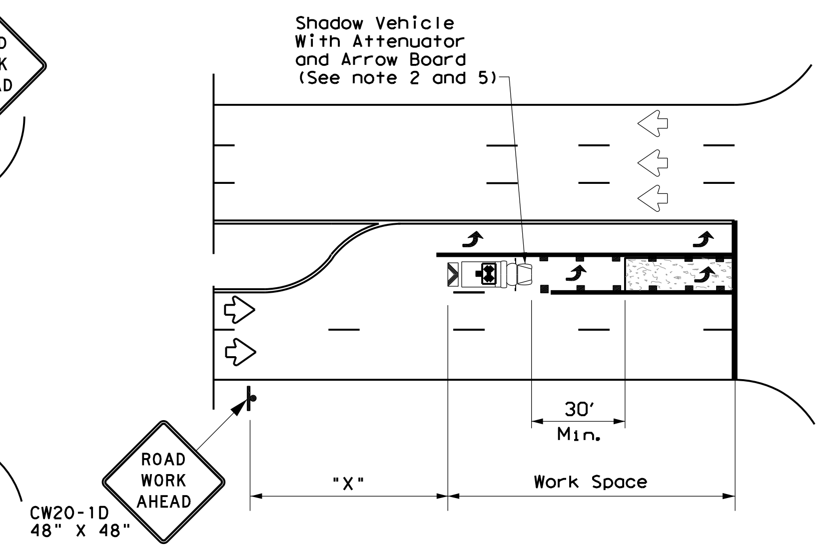


TYPICAL TRAFFIC CONTROL FOR
CONTINUOUS LEFT TURN LANE SYMBOL MARKINGS



TYPICAL TRAFFIC CONTROL FOR
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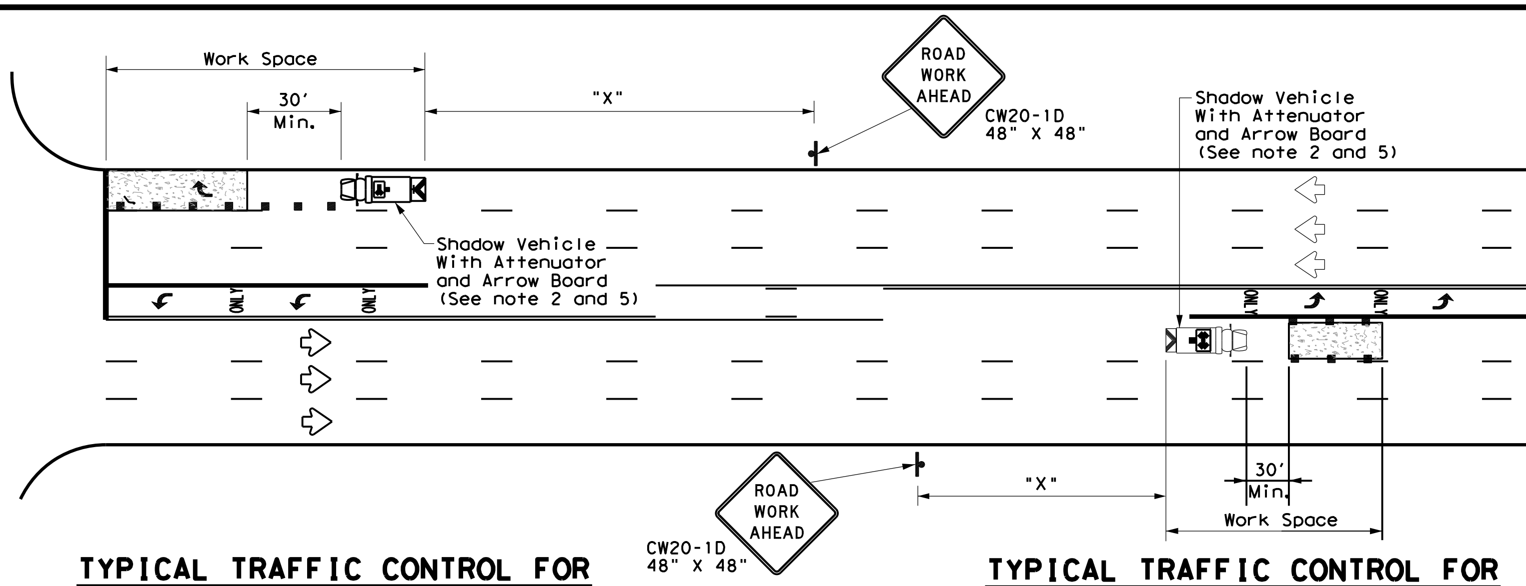
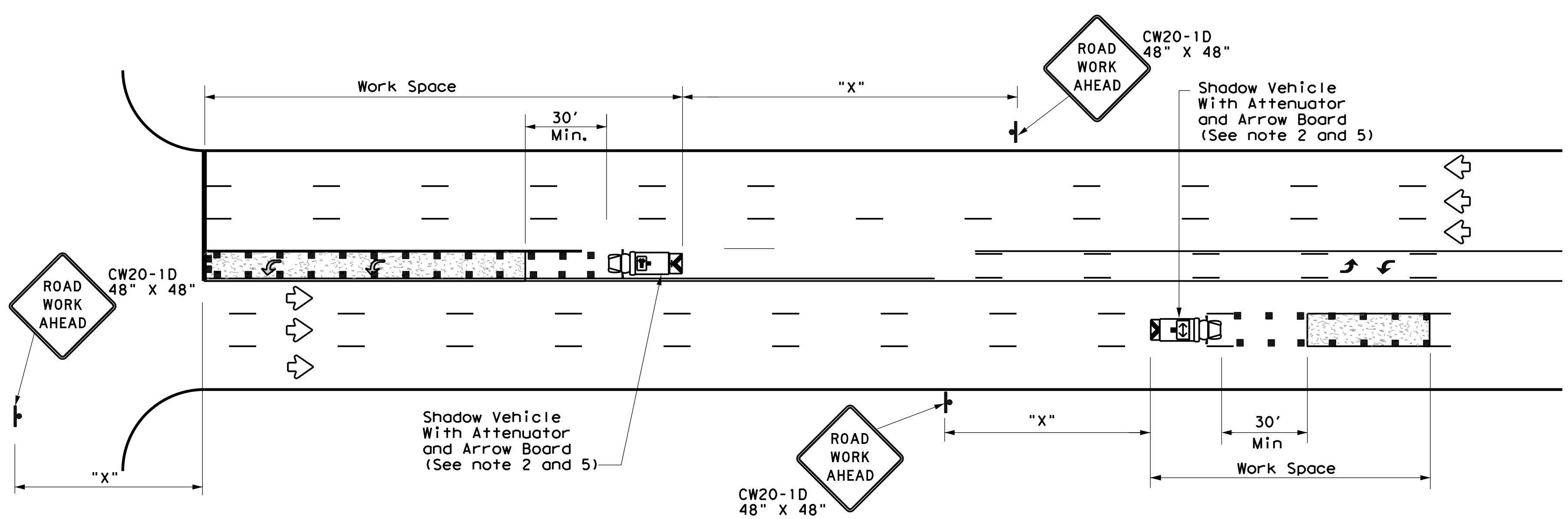


TYPICAL TRAFFIC CONTROL FOR
OUTSIDE LANE MARKINGS

TYPICAL TRAFFIC CONTROL FOR
INSIDE LANE MARKINGS



TYPICAL TRAFFIC CONTROL FOR
LEFT TURN LANE MARKINGS

TYPICAL TRAFFIC CONTROL FOR
CENTER LANE MARKINGS

LEGEND			
*	Trail Vehicle	ARROW BOARD DISPLAY	
* *	Shadow Vehicle		
* * *	Work Vehicle	(symbol)	RIGHT Directional
(symbol)	Heavy Work Vehicle	(symbol)	LEFT Directional
(symbol)	Truck Mounted Attenuator (TMA)	(symbol)	Double Arrow
(symbol)	Traffic Flow	■ ■ ■	Channelizing Devices

Posted Speed *	Formula	Minimum Desirable Taper Lengths **			Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent		
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'

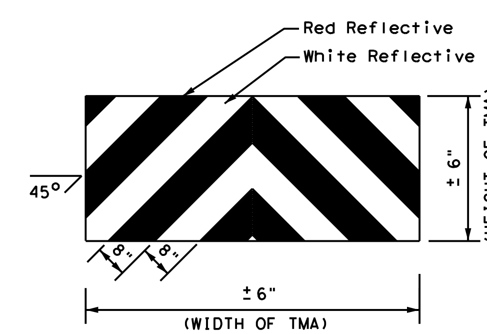
* Conventional Roads Only

** 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. This traffic control plan is for use on conventional roads posted at 45 mph or less and is intended for mobile operations that move continuously or intermittently (stopping up to approximately 15 minutes) such as short-line striping and in-lane rumble strips. When activities are anticipated to take longer amounts of time or traffic conditions warrant, a short duration or short-term stationary traffic control plan should be used.
2. A Truck Mounted Attenuator shall be used on Shadow Vehicle. Striping on the back panel of all truck mounted attenuators shall be 8" red and white reflective sheeting placed in an inverted "V" design. Reflective sheeting shall meet or exceed the reflectivity and color requirements of departmental material specification DMS-8300, Type A.
3. All traffic control devices shall be in accordance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD), latest edition.
4. The use of yellow rotating beacons or strobe lights on vehicles are required. Blue high intensity rotating, flashing, oscillating or strobe lights when mounted on the drivers side of the vehicle may be operated simultaneously with the amber beacons or strobe lights.
5. Flashing arrow board shall be used on Shadow Vehicle. Flashing arrow board shall be Type B or Type C as per BC Standards. The arrow board operation shall be controlled from inside the truck.



STRIPING FOR TMA

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS FOR ISOLATED WORK AREAS UNDIVIDED HIGHWAYS

TCP(3-4)-13

FILE: tcp3-4.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT July, 2013	CONT	SECT	JOB	HIGHWAY
REVISIONS	0356	01	107	SH 136
	DIST		COUNTY	SHEET NO.
	AMA		HUTCHINSON CO	41

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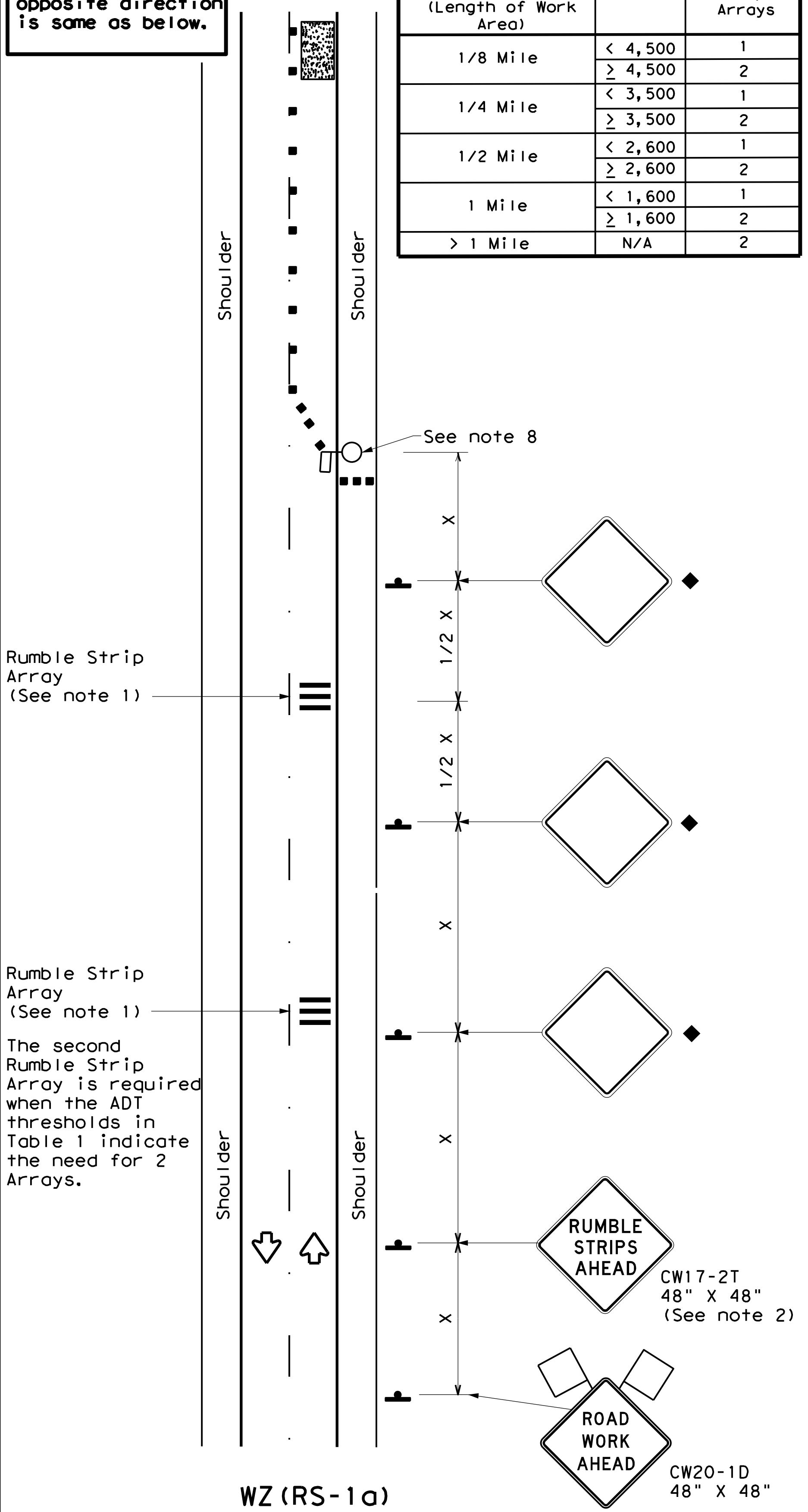
Warning sign and rumble strip sequence in opposite direction is same as below.

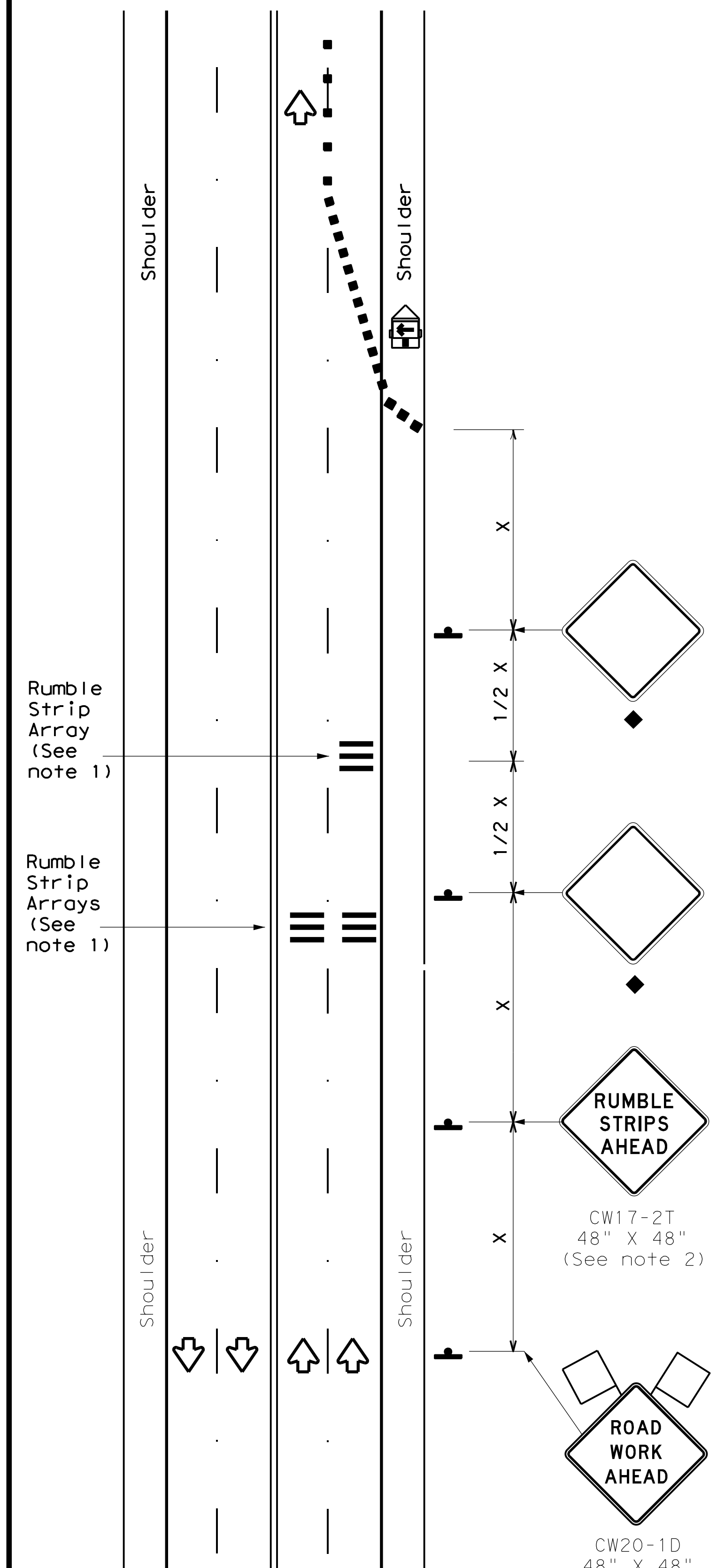
TABLE 1

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



WZ(RS-1a)

RUMBLE STRIPS ON ONE-LANE TWO-WAY APPLICATION



WZ(RS-1b)

RUMBLE STRIPS FOR LANE CLOSURE ON CONVENTIONAL ROADWAY

GENERAL NOTES

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

TABLE 2

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

LEGEND

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

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

* Conventional Roads Only

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

TYPICAL USAGE

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

TEMPORARY RUMBLE STRIPS

WZ(RS)-22

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	AMA	HUTCHINSON CO		42

117

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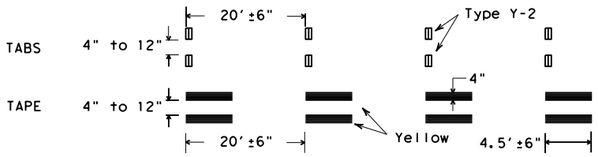
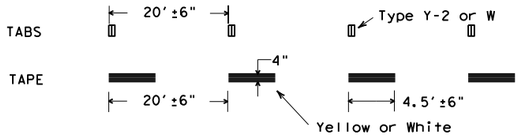
WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

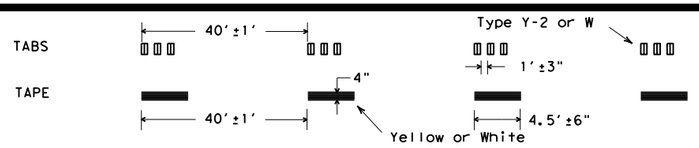


SINGLE NO-PASSING LINE or CHANNELIZATION LINE



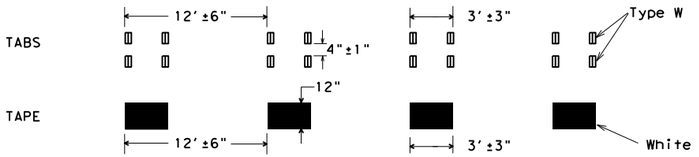
BROKEN LINES

(FOR CENTER LINE OR LANE LINE)

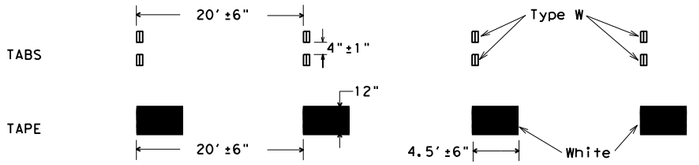


WIDE DOTTED LINES

(FOR LANE DROP LINES)



WIDE GORE MARKINGS



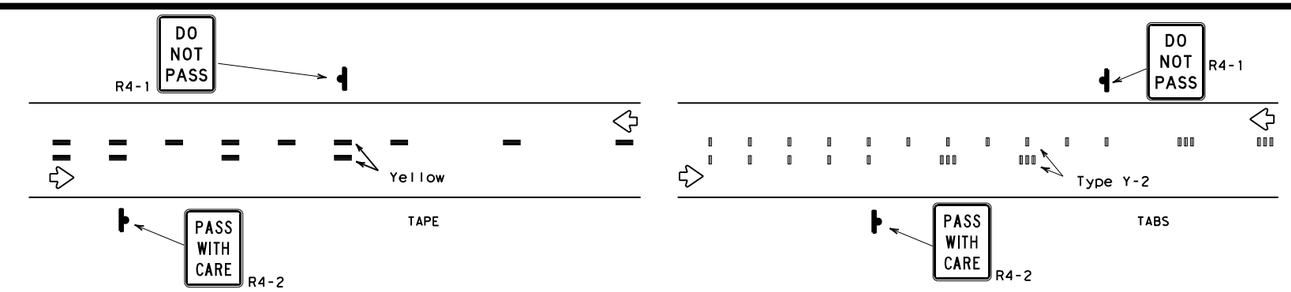
NOTES:

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

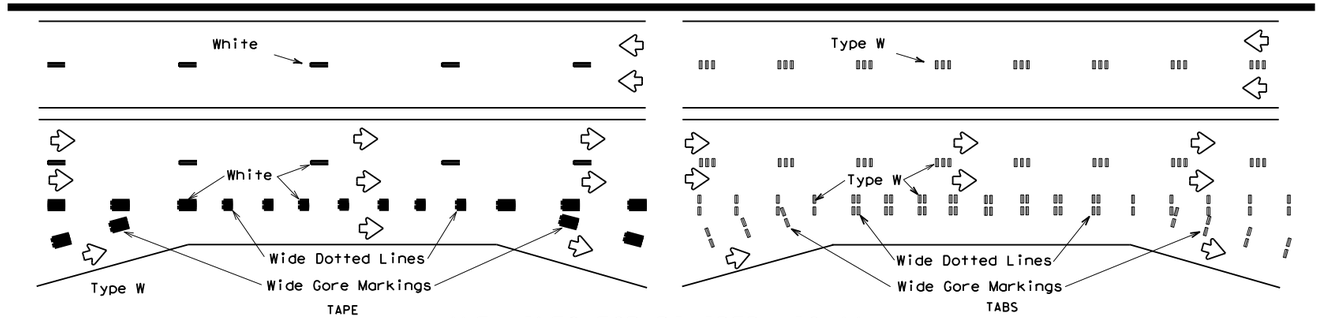
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS (TABS)

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

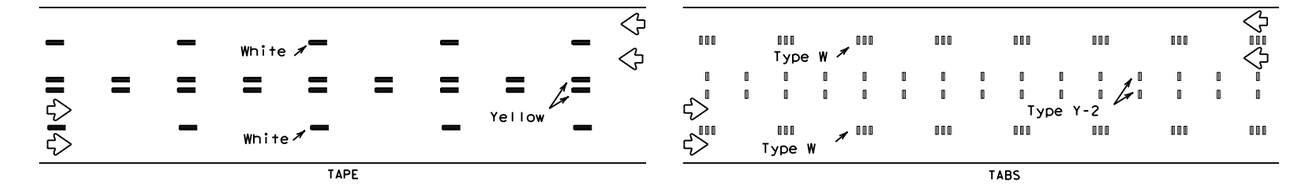
WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS



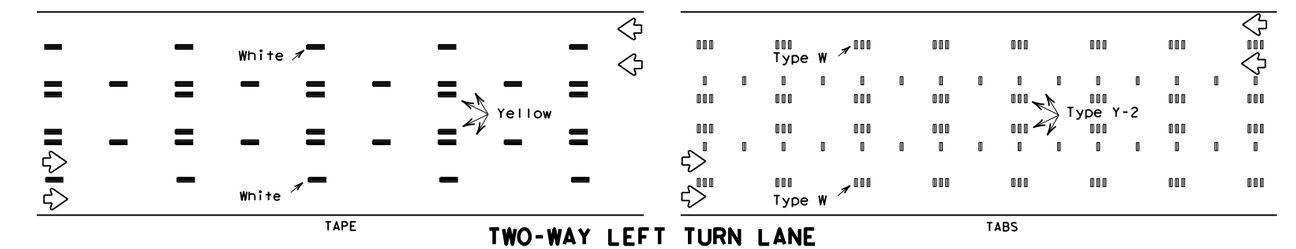
CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO LANE TWO-WAY HIGHWAYS



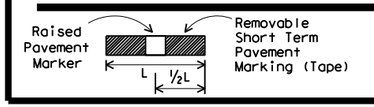
LANE LINES FOR DIVIDED HIGHWAY



LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



TWO-WAY LEFT TURN LANE



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

PREFABRICATED PAVEMENT MARKINGS

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

RAISED PAVEMENT MARKERS

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

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

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

Texas Department of Transportation

Traffic Operations Division Standard

WORK ZONE SHORT TERM PAVEMENT MARKINGS

WZ(STPM)-13

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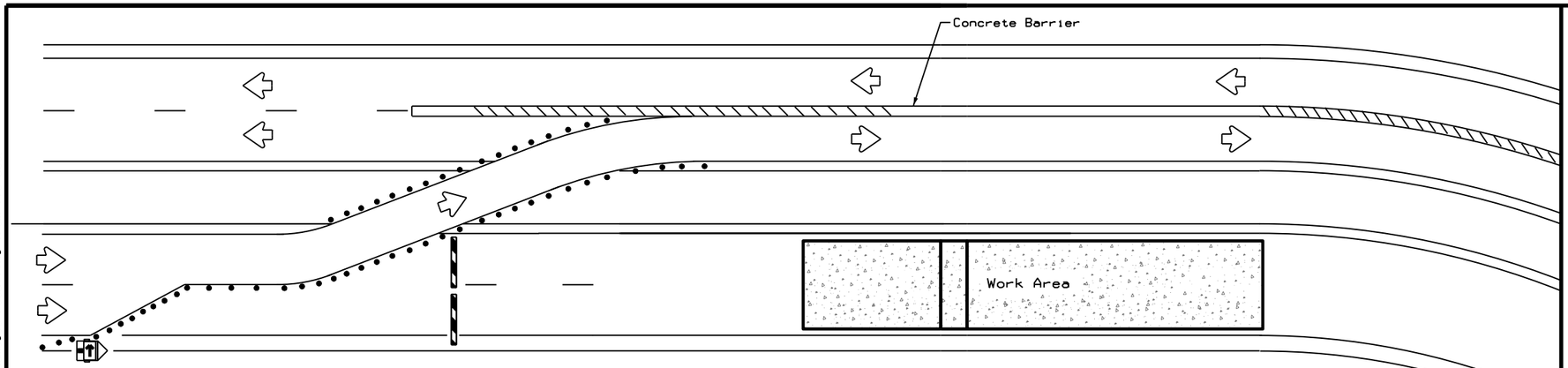


BARRIER DELINEATION WITH MODULAR GLARE SCREENS

NOTES:

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

LEGEND

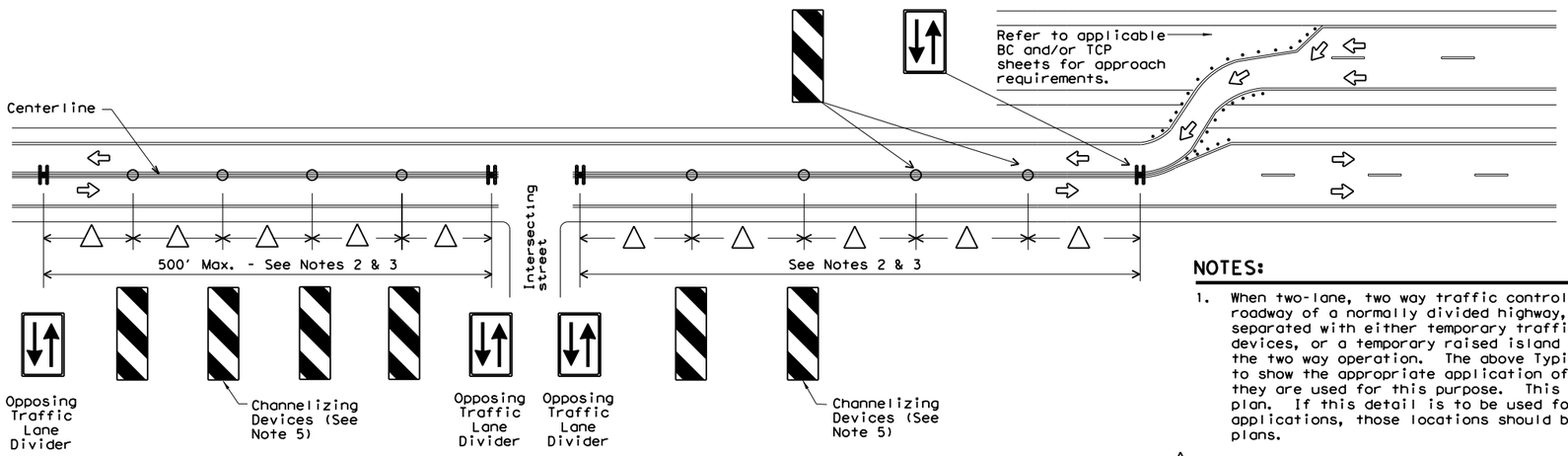
	Type 3 Barricade
• • •	Channelizing Devices
	Trailer Mounted Flashing Arrow Board
	Sign
\\\\	Safety glare screen

DEPARTMENTAL MATERIAL SPECIFICATIONS

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

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

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



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

NOTES:

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

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

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN TYPICAL DETAILS

WZ(TD)-17

FILE: wztd-17.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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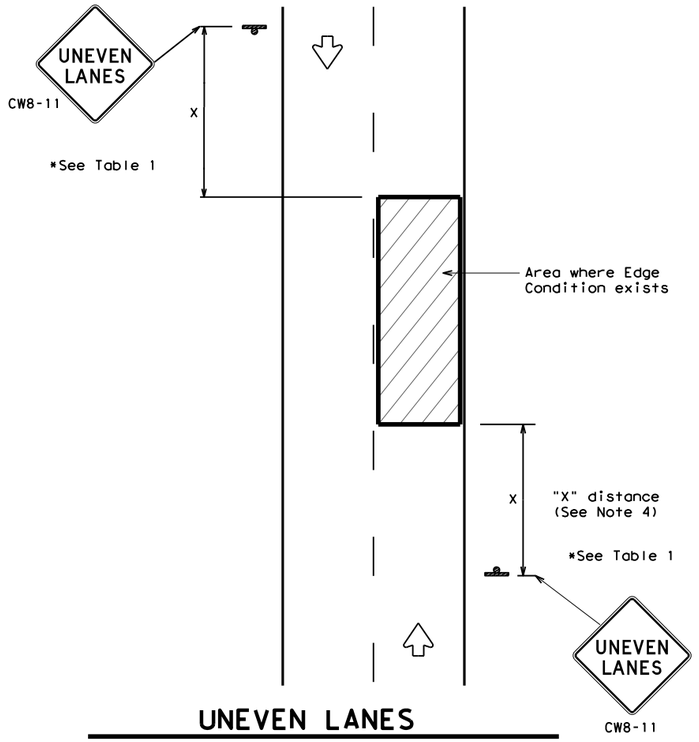
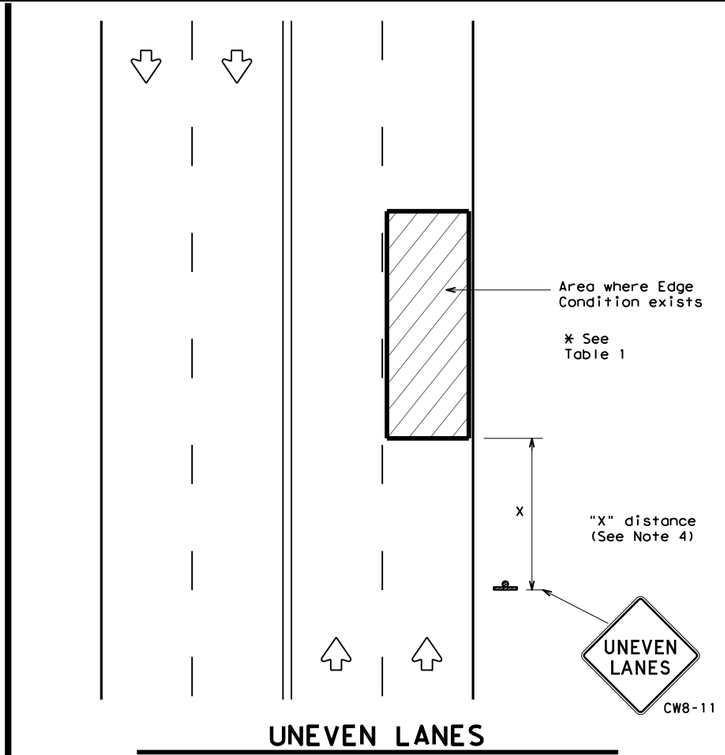
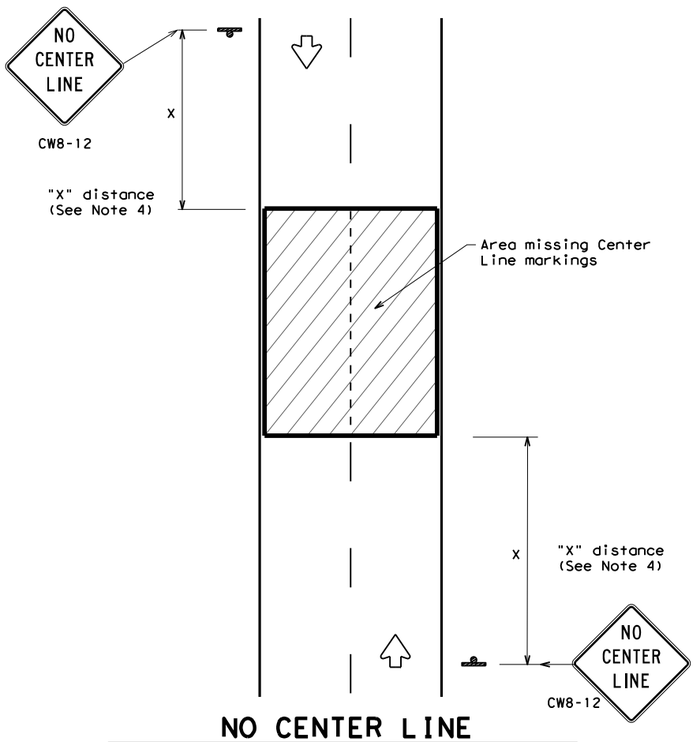


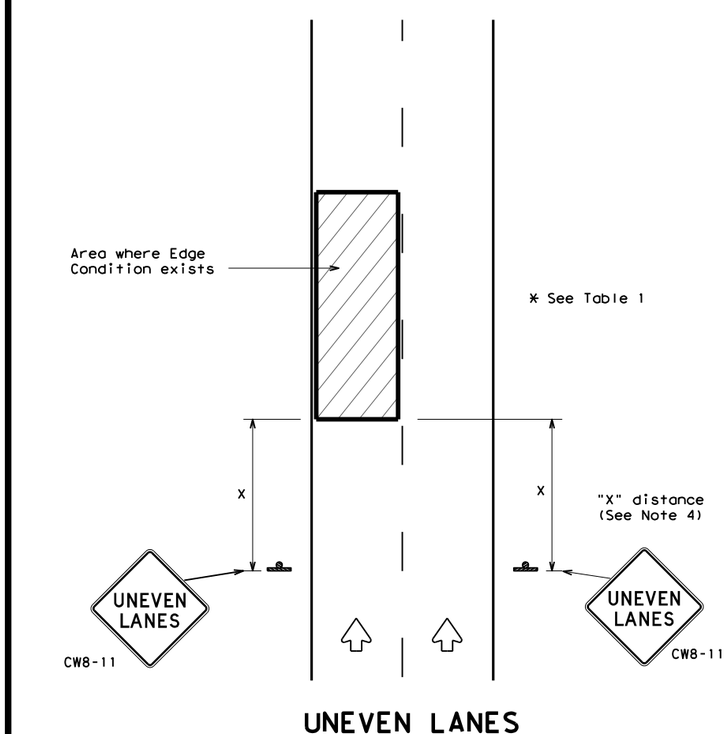
UNEVEN LANES
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
FOUR LANE CONVENTIONAL ROAD



NO CENTER LINE
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
DIVIDED ROADWAY

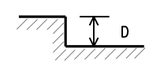
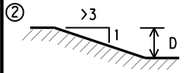
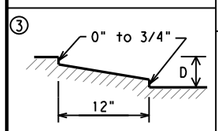
DEPARTMENTAL MATERIAL SPECIFICATIONS	
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY (REMOVABLE) PREFABRICATED PAVEMENT MARKINGS	DMS-8241
SIGN FACE MATERIALS	DMS-8300

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"

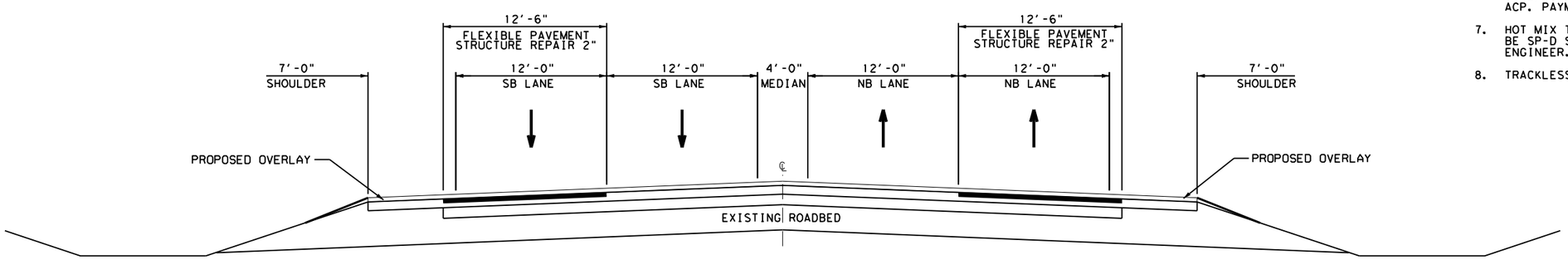
Texas Department of Transportation

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	0356	01	107	SH 136
8-95 2-98 7-13	DIST	COUNTY		SHEET NO.
1-97 3-03	AMA	HUTCHINSON CO		45



TYPICAL PAVEMENT REPAIR DETAIL

CSJ: 0356-01-107
STA. 147+35 TO 644+00
NO PROPOSED WORK TO BRIDGES

CSJ: 0356-01-107 PAVEMENT REPAIR DETAILS			
LOCATION	① 3077 6058 SP MIXES SP-D SAC-A PG70-28 (220 LBS/SY)	351 6012 FLEXIBLE PAVEMENT STRUCTURE REPAIR(2")	① 354 6048 PLANE ASPH CONC PAV (2")
	TON	SY	SY
CSJ: 0356-01-107:	2,735	24,861	24,861
PROJECT TOTALS:	2,735	24,861	24,861

BASED ON 10% PAVEMENT REPAIR FOR THE TRAVEL LANES.

① FOR CONTRACTOR'S INFORMATION ONLY. ALL ITEMS LISTED AS "FOR CONTRACTOR'S INFORMATION ONLY" WILL BE COMPLETED IN ACCORDANCE WITH THE APPLICABLE TXDOT STANDARD SPECIFICATIONS, AND ARE CONSIDERED SUBSIDIARY TO ITEM 351 FLEXIBLE PAVEMENT STRUCTURE REPAIR.

LEGEND

2" PROPOSED OVERLAY

2" FLEXIBLE PAVEMENT STRUCTURE REPAIR

NOTES

1. QUANTITIES CARRIED TO PROJECT SUMMARY.
2. CONTRACTOR WILL NOT REMOVE MORE MATERIAL THAN CAN BE REPLACED IN A SINGLE WORK DAY.
3. LOCATIONS OF PAVEMENT REPAIR TO VARY AS DIRECTED BY THE ENGINEER.
4. PAVEMENT REPAIR AREA WILL BE A MINIMUM 20'-0" IN LENGTH.
5. EXTEND REPAIR WIDTH TO INCLUDE INTERIOR EXISTING PAVEMENT JOINTS, WHERE INSTRUCTED BY THE ENGINEER. PAVEMENT REPAIR ON OUTSIDE EDGE OF TRAVEL LANE WILL INCLUDE AN OVERLAP OF 6" ONTO SHOULDER.
6. FLEX BASE TO NOT BE EXPOSED DURING THE PAVEMENT REPAIR OPERATION. IF CONTRACTOR EXPOSES BASE, INTENTIONALLY OR OTHERWISE, THE BASE WILL BE PRIMED PRIOR TO PLACING ACP. PAYMENT WILL BE CONSIDERED SUBSIDIARY TO ITEM 351.
7. HOT MIX TO BE USED FOR FLEXIBLE PAVEMENT REPAIR WILL BE SP-D SAC-A PG 70-28 OR APPROVED ALTERNATE, BY THE ENGINEER.
8. TRACKLESS TACK COAT WILL BE USED FOR ALL REPAIR AREAS.

STATE OF TEXAS
CASEY B. STRIPLING
136887
LICENSED PROFESSIONAL ENGINEER

Casey B. Stripling

11-17-2022

SH 136
PAVEMENT
REPAIR
DETAIL

SCALE: NTS

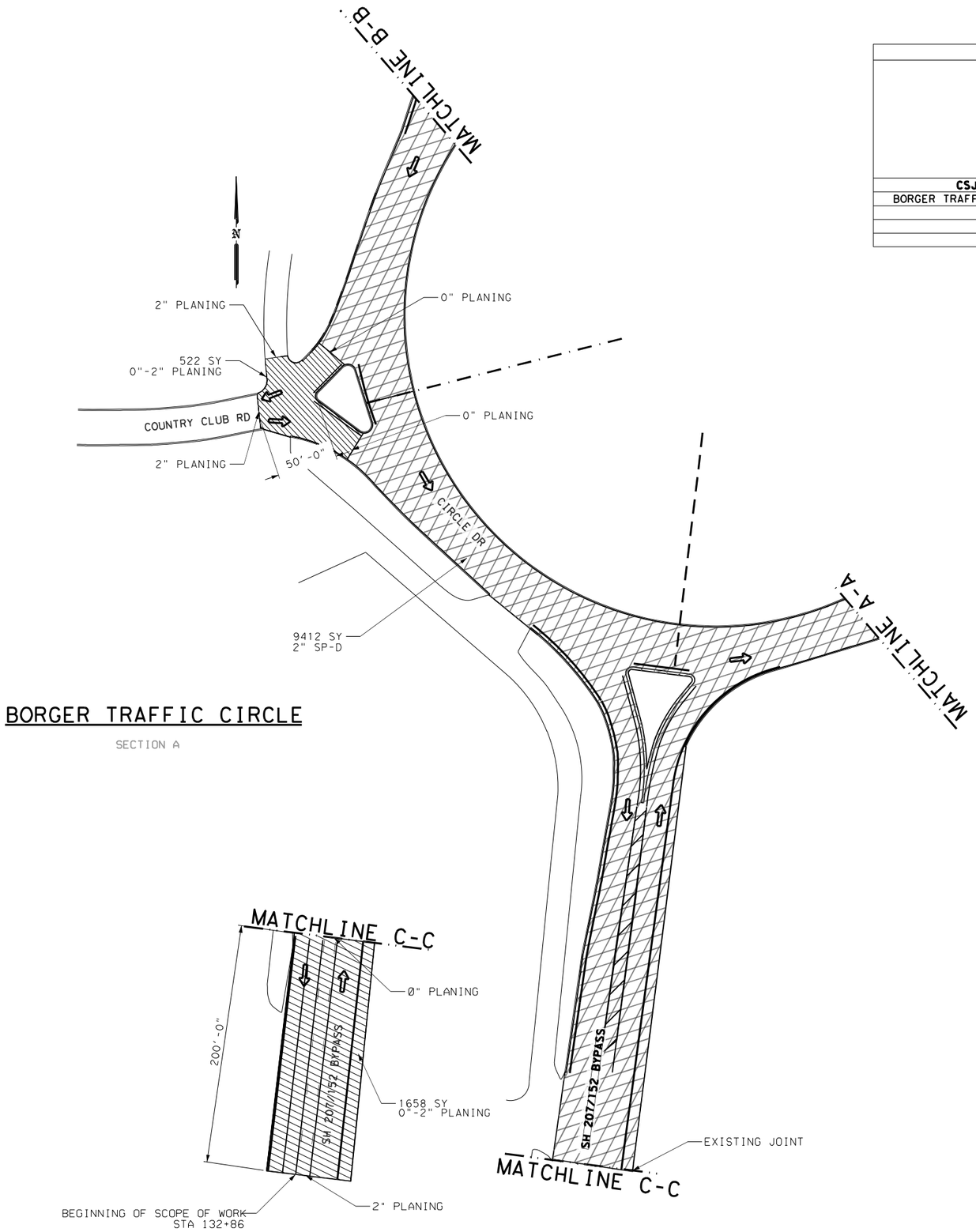
2023 Texas Department of Transportation

SHEET 1 OF 1

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		46

DATE: 11/17/2022 4:26:03 PM
FILE: T:\AMA\PD\Construction Projects\0356-01\107 PM Overlay\4 - Design\Plan Set\3. Roadway\107_PAVEMENT REPAIR DETAIL.dgn

CSJ: 0356-01-107 ADDITIONAL AREAS SHEET 1 OF 8				
		354	3077	3085
		6021	6058	6001
LOCATION	DESCRIPTION	PLANE ASPH CONC PAV(0" TO 2")	SP MIXES SP-D SAC-A PG70-28 (220 LB/SY)	UNDERSEAL COURSE (0.25 GAL/SY)
		SY	TON	GAL
CSJ: 0356-01-107				
BORGER TRAFFIC CIRCLE	COUNTRY CLUB RD	522		
	HW 207/152 BYPASS	1658		
	BORGER TRAFFIC CIRCLE SECTION A		1036	2353
	PROJECT TOTALS	**2180**	**1036**	**2353**



BORGER TRAFFIC CIRCLE

SECTION A

2" SUPERPAVE MIXTURES SP-D SAC-A PG70-28 (220 LBS/SY), UNDERSEAL (0.25 GAL/SY)

0" TO 2" PLANE ASPHALT, 2" SP-D SAC-A PG70-28 (220 LB/SY) & UNDERSEAL (0.25 GAL/SY)

STATE OF TEXAS
CASEY B. STRIPLING
136887
LICENSED PROFESSIONAL ENGINEER

Casey B. Stripling

11-17-2022

SH 136

ADDITIONAL AREAS

SCALE: 1" = 100'

2023 Texas Department of Transportation

SHEET 1 OF 8

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		47

DATE: 11/17/2022 4:26:08 PM
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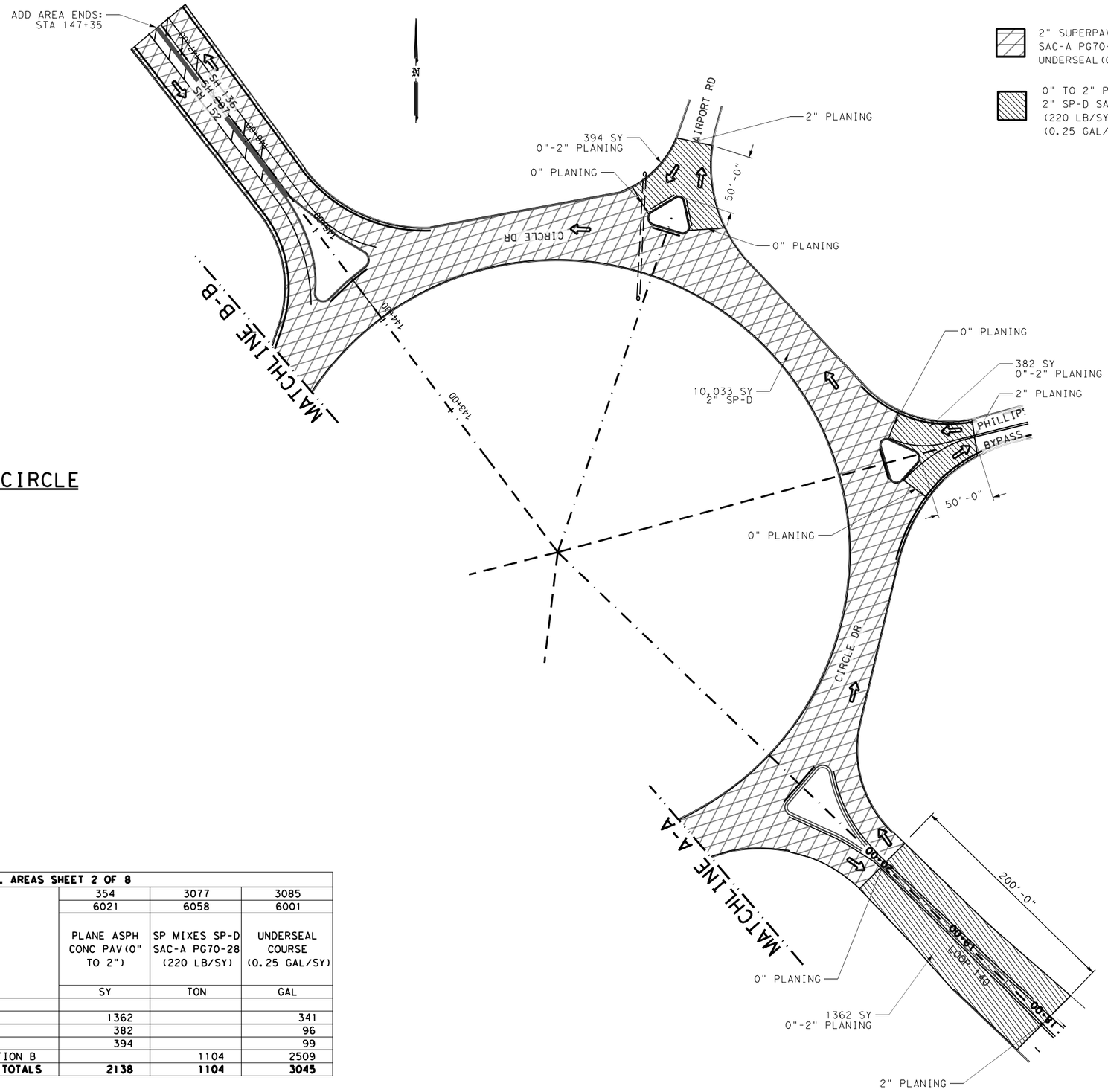

BORGER TRAFFIC CIRCLE

SECTION B

CSJ: 0356-01-107 ADDITIONAL AREAS SHEET 2 OF 8				
LOCATION	DESCRIPTION	354 6021	3077 6058	3085 6001
		PLANE ASPH CONC PAV(0" TO 2")	SP MIXES SP-D SAC-A PG70-28 (220 LB/SY)	UNDERSEAL COURSE (0.25 GAL/SY)
		SY	TON	GAL
CSJ: 0356-01-107				
BORGER TRAFFIC CIRCLE	LOOP 140	1362		341
	PHILLIPS BYPASS	382		96
	AIRPORT RD	394		99
	BORGER TRAFFIC CIRCLE SECTION B		1104	2509
	PROJECT TOTALS	**2138**	**1104**	**3045**

STATE OF TEXAS
CASEY B. STRIPLING
136887
LICENSED PROFESSIONAL ENGINEER

Casey B. Stripling

11-17-2022

SH 136

ADDITIONAL AREAS

SCALE: 1" = 100'

2023 Texas Department of Transportation

SHEET 2 OF 8

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		48

DATE: 11/17/2022 4:26:10 PM
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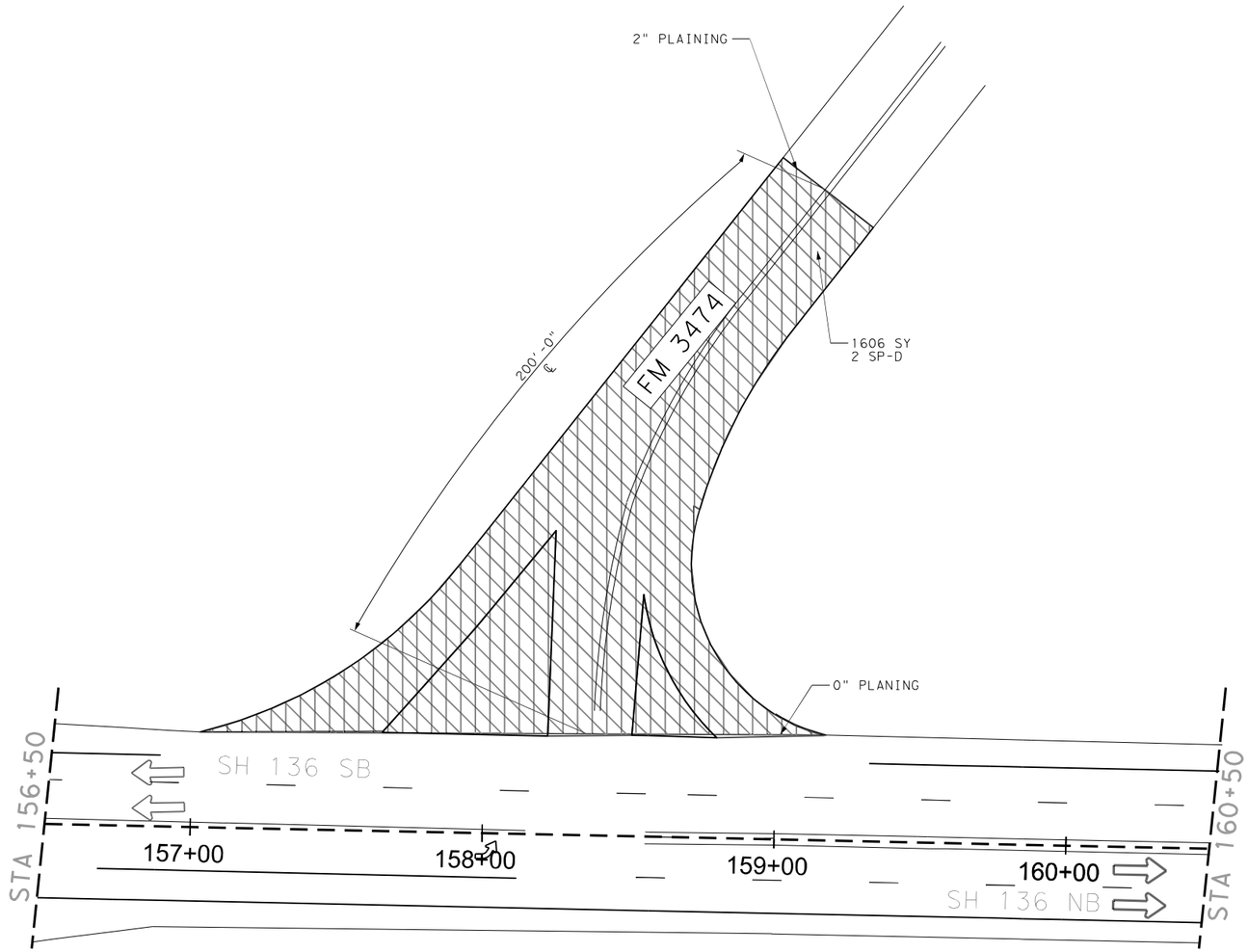

SH 136 @ FM 3474

0" TO 2" PLANE ASPHALT, 2" SUPERPAVE MIXTURES SP-D SAC-A PG70-28 (220 LBS/SY), UNDERSEAL (0.25 GAL/SY)

CSJ: 0356-01-107 ADDITIONAL AREAS SHEET 3 OF 8					
LOCATION	DESCRIPTION	134 6001 BACKFILL <TY A>	354 6021 PLANE ASPH CONC PAV (0" TO 2")	3077 6058 SP MIXES SP-D SAC-A PG70-28 (220 LB/SY)	3085 6001 UNDERSEAL COURSE (0.25 GAL/SY)
		STA	SY	TON	GAL
CSJ: 0356-01-107					
FM 3474 AT SH 136	FM 3474	2	1606	177	402
	PROJECT TOTALS	**2**	**1606**	**177**	**402**

STATE OF TEXAS
CASEY B. STRIPLING
136887
LICENSED PROFESSIONAL ENGINEER

Casey B. Stripling

11-17-2022

SH 136

ADDITIONAL AREAS

SCALE: 1" = 50'

2023 Texas Department of Transportation

SHEET 3 OF 8

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		49

DATE: 11/17/2022 4:26:12 PM
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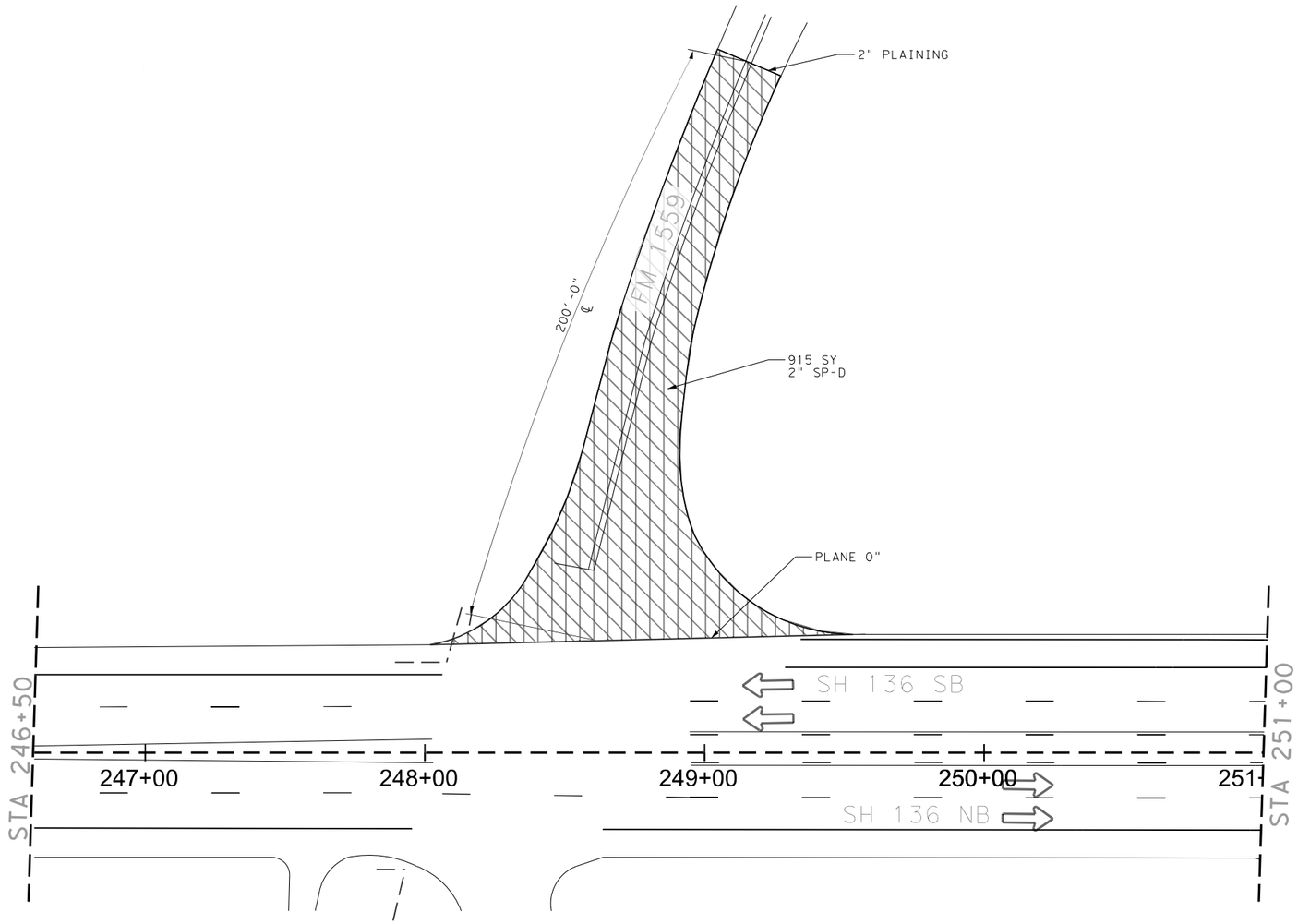


SH 136 @ FM 1559

CSJ: 0356-01-107 ADDITIONAL AREAS SHEET 4 OF 8					
LOCATION	DESCRIPTION	134 6001 BACKFILL <TY A>	354 6021 PLANE ASPH CONC PAV (0" TO 2")	3077 6058 SP MIXES SP-D SAC-A PG70-28 (220 LB/SY)	3085 6001 UNDERSEAL COURSE (0.25 GAL/SY)
		STA	SY	TON	GAL
CSJ: 0356-01-107					
SH 136 AT FM 1559	FM 1559	2	915	101	229
	PROJECT TOTALS	**2**	**915**	**101**	**229**

STATE OF TEXAS
CASEY B. STRIPLING
136887
LICENSED PROFESSIONAL ENGINEER

Casey B. Stripling

11-17-2022

SH 136

ADDITIONAL AREAS

SCALE: 1" = 50'

2023 Texas Department of Transportation

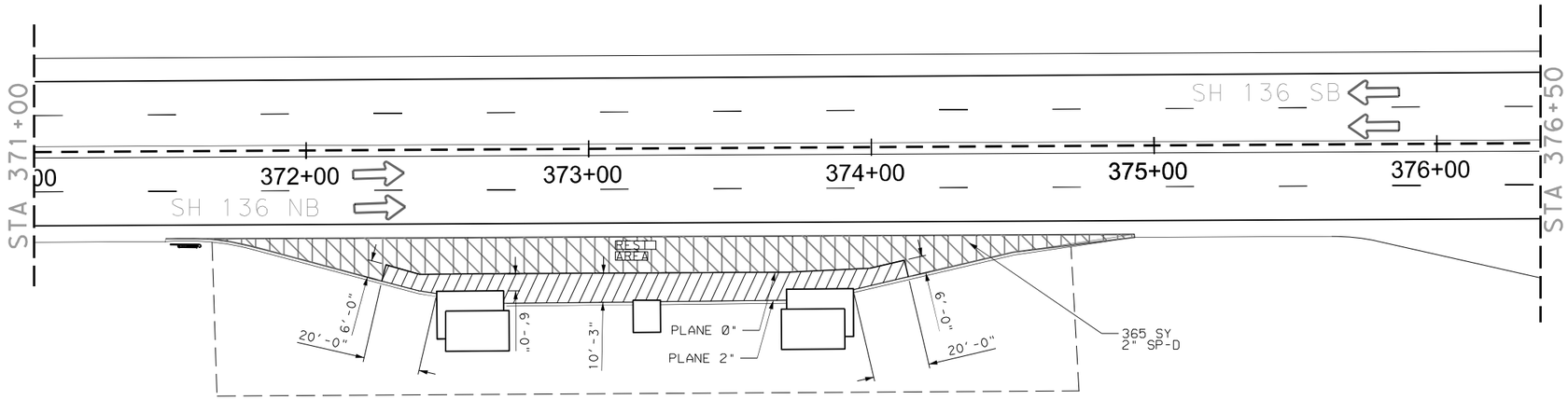
SHEET 4 OF 8

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		50

DATE: 11/17/2022 4:26:14 PM
FILE: I:\AMA\PD\Construction Projects\0356-01\107 PM Overlay\4 - Design\Plan Set\3. Roadway\107_ ADDITIONAL AREAS.dgn

2" SUPERPAVE MIXTURES SP-D
SAC-A PG70-28 (220 LBS/SY),
UNDERSEAL (0.25 GAL/SY)

0" TO 2" PLANE ASPHALT, 2"
SUPERPAVE MIXTURES SP-D
SAC-A PG70-28 (220 LBS/SY),
UNDERSEAL (0.25 GAL/SY)



SH 136 REST/PICNIC AREA

CSJ: 0356-01-107 ADDITIONAL AREAS SHEET 5 OF 8				
LOCATION	DESCRIPTION	354 6021 PLANE ASPH CONC PAV (0" TO 2")	3077 6058 SP MIXES SP-D SAC-A PG70-28 (220 LB/SY)	3085 6001 UNDERSEAL COURSE (0.25 GAL/SY)
		SY	TON	GAL
CSJ: 0356-01-107				
ADDITIONAL AREAS SHEET 5 OF 5	SH 136 REST AREA	171	41	92
	PROJECT TOTALS	**171**	**41**	**92**

STATE OF TEXAS
CASEY B. STRIPLING
136887
LICENSED PROFESSIONAL ENGINEER

Casey B. Stripling

11-17-2022

SH 136

ADDITIONAL AREAS

SCALE: 1" = 50'

2023 Texas Department of Transportation

SHEET 5 OF 8

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		51

DATE: 11/17/2022 4:26:15 PM
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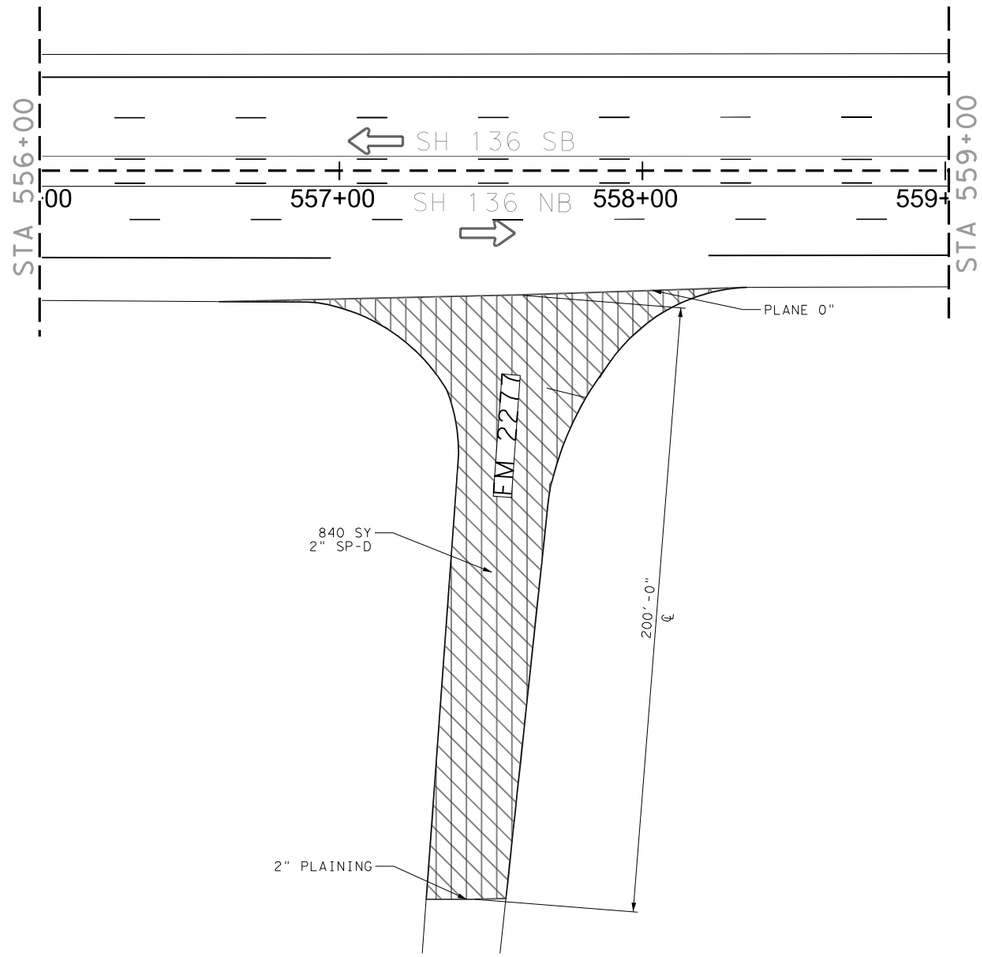

0" TO 2" PLANE ASPHALT, 2" SUPERPAVE MIXTURES SP-D SAC-A PG70-28 (220 LBS/SY), UNDERSEAL (0.25 GAL/SY)

SH 136 & FM 2277

CSJ: 0356-01-107 ADDITIONAL AREAS SHEET 6 OF 8					
LOCATION	DESCRIPTION	134 6001 BACKFILL <TY A>	354 6021 PLANE ASPH CONC PAV (0" TO 2")	3077 6058 SP MIXES SP-D SAC-A PG70-28 (220 LBS/SY)	3085 6001 UNDERSEAL COURSE (0.25 GAL/SY)
		STA	SY	TON	GAL
CSJ: 0356-01-107					
ADDITIONAL AREAS SHEET 6 OF 9	FM 2277	2	506	56	127
	PROJECT TOTALS	**2**	**506**	**56**	**127**

CASEY B. STRIPLING
136887
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS

Casey B. Stripling

11-17-2022

SH 136

ADDITIONAL AREAS

SCALE: 1" = 50'

2023 Texas Department of Transportation

SHEET 6 OF 8

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		52

DATE: 11/17/2022 4:26:17 PM
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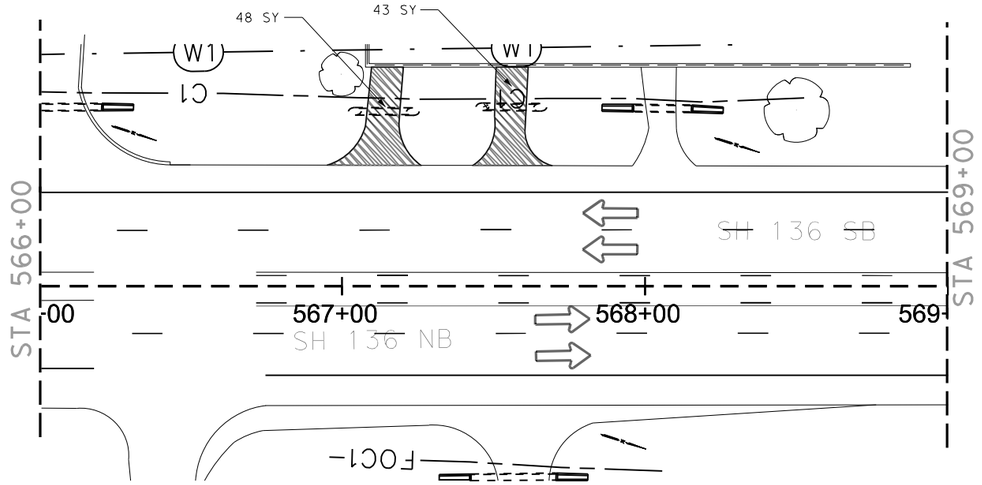
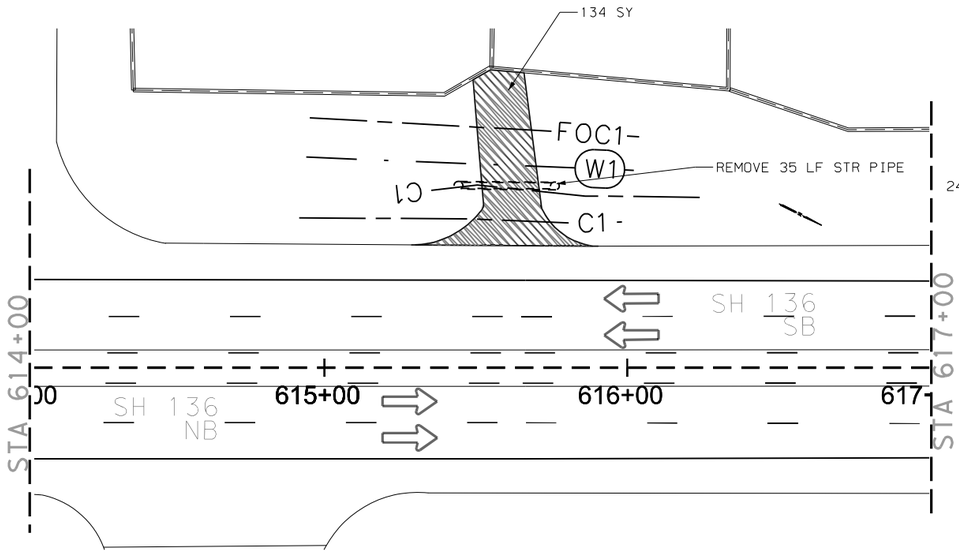


SH 136 STA 567+00 THRU STA 568+68

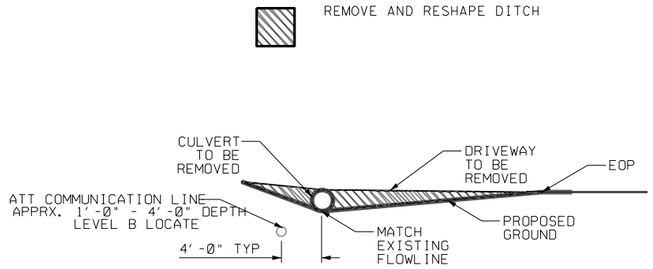
40 LF O/S LEFT



SH 136 PRIVATE DRIVE AT STA 615+64

40 LF O/S LEFT

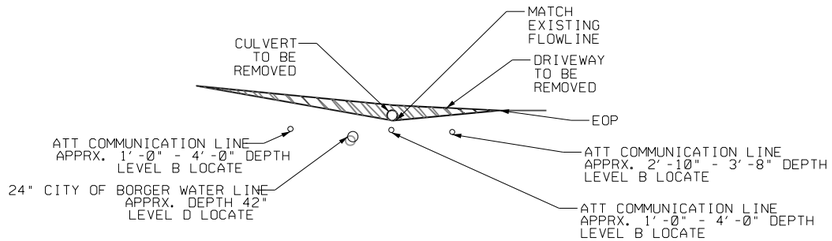
CSJ: 0356-01-107 ADDITIONAL AREAS SHEET 7 OF 8			
	110	150	496
	6001	6002	6007
LOCATION	EXCAVATION (ROADWAY)	BLADING	REMOVE STR (PIPE)
CSJ: 0356-01-107	CY	HR	LF
STA 567+15	25	2	23
STA 567+56	22	2	23
STA 615+66	67	2	35
PROJECT TOTALS	**114**	**6**	**81**



TYPICAL CROSS SECTION

NTS

NOTE: MATCH EXISTING DITCH CROSS SECTION



TYPICAL CROSS SECTION

NTS

NOTE: MATCH EXISTING DITCH CROSS SECTION

STATE OF TEXAS
CASEY B. STRIPLING
136887
LICENSED PROFESSIONAL ENGINEER

Casey B. Stripling

11-17-2022

SH 136

ADDITIONAL AREAS

SCALE: 1" = 50'

2023 Texas Department of Transportation

SHEET 7 OF 8

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		53

DATE: 11/17/2022 4:26:19 PM
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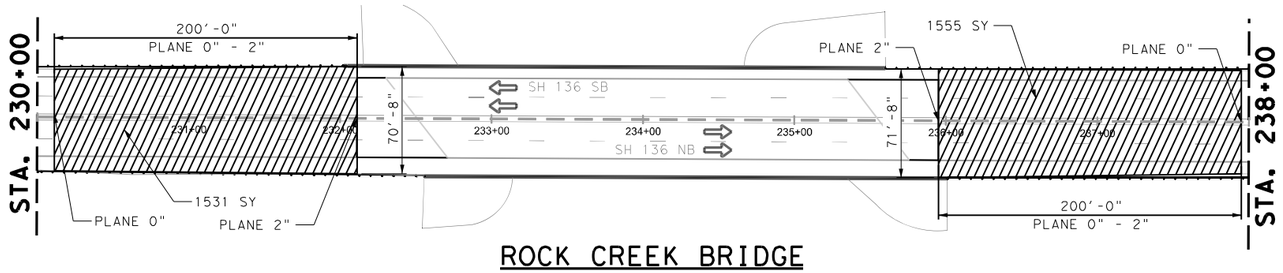
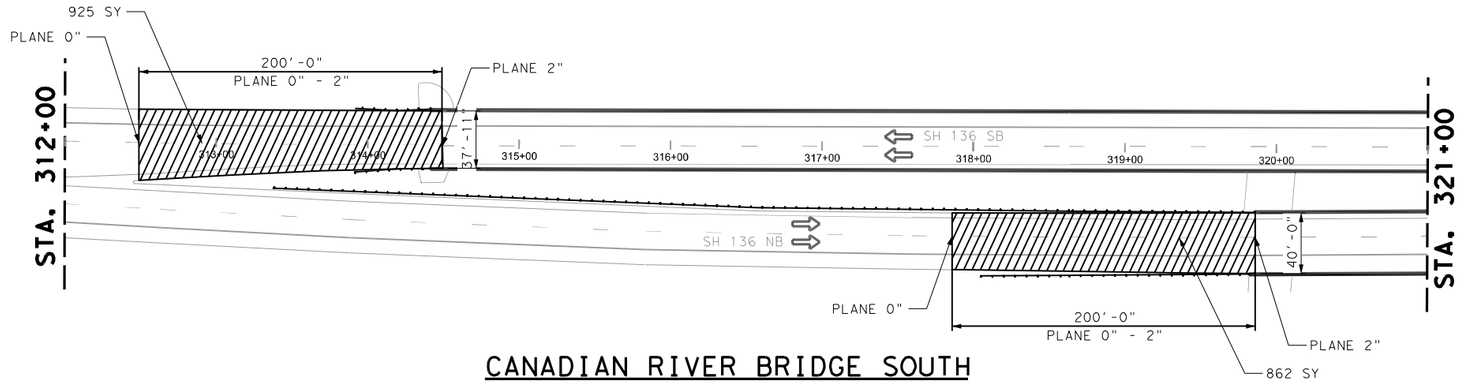


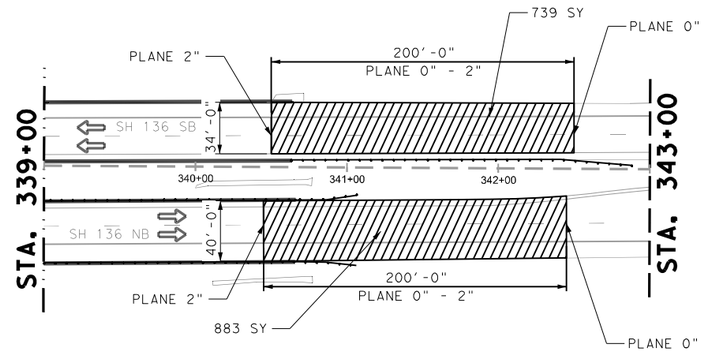
ROCK CREEK BRIDGE

STA. 230+11 TO STA. 232+11
STA. 235+96 TO STA. 237+96



CANADIAN RIVER BRIDGE SOUTH

STA. 312+49 TO STA. 314+49 SB
STA. 317+86 TO STA. 319+86 NB



CANADIAN RIVER BRIDGE NORTH

STA. 340+50 TO STA. 342+50 SB
STA. 340+45 TO STA. 342+45 NB

CSJ: 0356-01-107 ADDITIONAL AREA SHEET 8 OF 8	
	354
	6021
LOCATION	PLANE ASPH CONC PAV(0" TO 2")
CSJ: 0356-01-107	SY
230+11 - 232+11	1531
235+96 - 237+96	1555
312+49 - 314+49 SB	925
317+86 - 319+86 NB	862
340+50 - 342+50 SB	739
340+45 - 342+45 NB	883
PROJECT TOTALS:	**883**

0" TO 2" PLANE ASPHALT

STATE OF TEXAS
CASEY B. STRIPLING
136887
LICENSED PROFESSIONAL ENGINEER

Casey B. Stripling

11-17-2022

SH 136

ADDITIONAL AREAS

SCALE: 1" = 100'

2023 Texas Department of Transportation

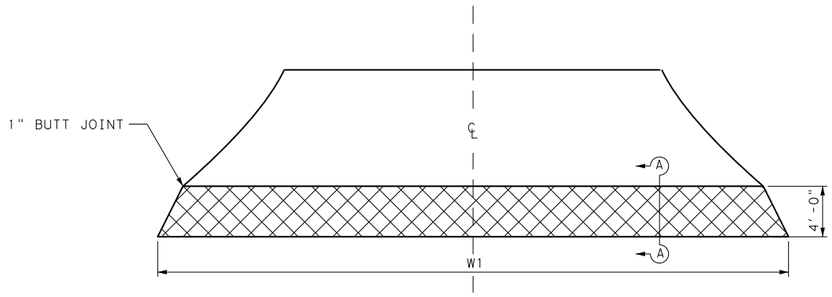
SHEET 8 OF 8

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		54

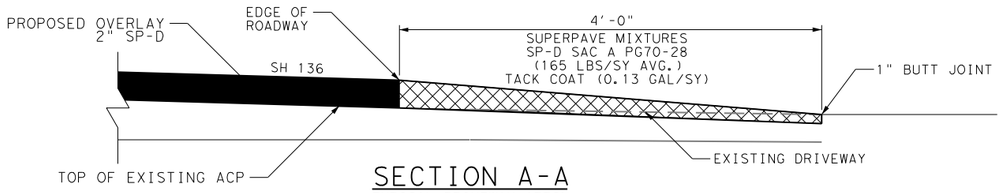
DATE: 11/17/2022 4:26:20 PM
FILE: T:\AMATPD\Construction Projects\0356-01\107 PM Overlay\4 - Design\Plan Set\3. Roadway\107_ ADDITIONAL AREAS.dgn

CSJ: 0356-01-107 DRIVEWAY & INTERSECTION DETAILS SHEET 1 OF 1

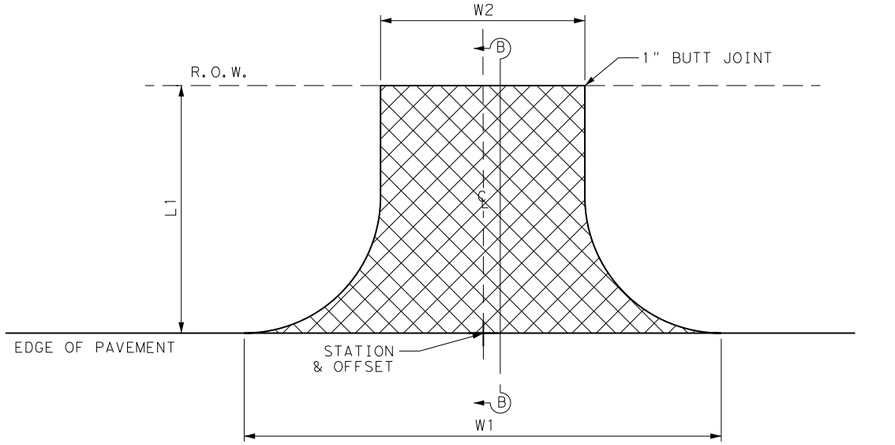
DRIVEWAYS						3077 6058 SP MIXES SP-D SAC-A PG70-28 165 lb/sy	3077 6075 TACK COAT (0.13) GAL/SY
STATION	LOCATION	DISCRIPTION	W1 IN FT	W2 IN FT	L1 in FT	TON	GAL
147+50	L	INTERSECTION	78	30	30	8	13
147+50	R	INTERSECTION	89	88	30	24	38
151+00	L	INTERSECTION	76	72	30	20	31
151+00	R	INTERSECTION	70	63	30	17	27
156+00	L	DRIVEWAY	107	107	4	4	6
156+00	R	DRIVEWAY	154		4	6	9
171+25	L	INTERSECTION	94	27	30	7	12
177+50	R	DRIVEWAY	124		4	5	7
184+30	R	INTERSECTION	98	30	30	8	13
224+00	R	INTERSECTION	182	25	30	7	11
241+15	R	DRIVEWAY	64		4	2	4
241+50	L	INTERSECTION	99	35	30	10	15
247+80	R	DRIVEWAY	26		4	1	2
248+30	R	INTERSECTION	78	25	30	7	11
251+20	R	DRIVEWAY	71		4	3	4
266+50	R	DRIVEWAY	55		4	2	3
285+25	L	DRIVEWAY	45		4	2	3
289+00	R	DRIVEWAY	55		4	2	3
289+20	L	DRIVEWAY	76		4	3	4
294+00	R	DRIVEWAY	96		4	4	6
302+80	L	DRIVEWAY	90		4	3	5
306+00	R	DRIVEWAY	76		4	3	4
309+50	R	INTERSECTION	91	60	30	17	26
345+00	L	INTERSECTION	76	20	30	6	9
345+00	R	INTERSECTION	82	20	30	6	9
376+00	R	DRIVEWAY	117		4	4	7
420+50	R	DRIVEWAY	44		4	2	3
426+00	R	DRIVEWAY	60		4	2	4
440+00	L	INTERSECTION	321	45	30	12	20
446+50	R	DRIVEWAY	87		4	3	5
472+50	L	INTERSECTION	93	20	30	6	9
472+50	R	INTERSECTION	107	20	30	6	9
504+60	R	INTERSECTION	271	20	30	6	9
519+50	R	DRIVEWAY	36		4	1	2
550+50	R	DRIVEWAY	53		4	2	3
551+00	L	INTERSECTION	139	20	30	6	9
563+50	R	INTERSECTION	107	20	30	6	9
566+00	L	DRIVEWAY	77		4	3	5
566+50	R	INTERSECTION	74	23	30	6	10
567+50	R	DRIVEWAY	46		4	2	3
572+50	L	DRIVEWAY	39		4	1	2
575+00	L	DRIVEWAY	120		4	4	7
576+00	R	DRIVEWAY	305		4	11	18
578+00	L	DRIVEWAY	60		4	2	4
579+00	L	DRIVEWAY	52		4	2	3
583+00	R	DRIVEWAY	173		4	6	10
584+00	L	INTERSECTION	68	23	30	6	10
586+00	L	DRIVEWAY	50		4	2	3
587+80	R	DRIVEWAY	26		4	1	2
588+50	L	DRIVEWAY	36		4	1	2
588+50	R	DRIVEWAY	40		4	1	2
589+00	R	DRIVEWAY	36		4	1	2
591+50	L	DRIVEWAY	143		4	5	8
593+50	L	DRIVEWAY	80		4	3	5
595+30	L	DRIVEWAY	65		4	2	4
596+00	R	INTERSECTION	76	20	30	6	9
598+80	L	DRIVEWAY	71		4	3	4
600+00	R	DRIVEWAY	53		4	2	3
601+50	L	DRIVEWAY	73		4	3	4
603+50	L	DRIVEWAY	63		4	2	4
604+00	R	DRIVEWAY	41		4	2	2
606+00	R	INTERSECTION	225	23	30	6	10
606+70	L	DRIVEWAY	47		4	2	3
612+50	L	DRIVEWAY	75		4	3	4
613+20	R	DRIVEWAY	113		4	4	7
614+00	L	INTERSECTION	100	30	30	8	13
614+50	R	DRIVEWAY	119		4	4	7
620+00	R	INTERSECTION	63	20	30	6	9
621+00	L	DRIVEWAY	155		4	6	9
626+00	R	INTERSECTION	72	20	30	6	9
630+00	L	DRIVEWAY	60		4	2	4
					PROJECT TOTALS	356	565



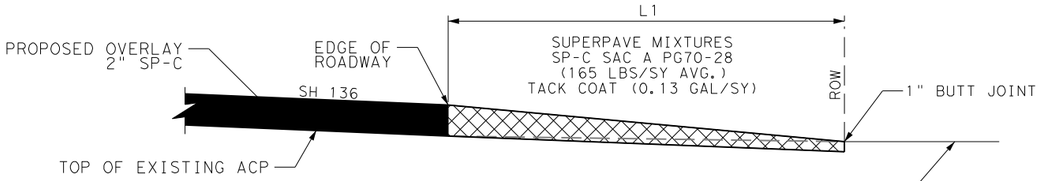
TYPICAL DRIVEWAY APRON
PLAN VIEW
NTS



SECTION A-A
TYPICAL DRIVEWAY APRON
NTS



TYPICAL INTERSECTION DETAIL
PLAN VIEW
NTS



SECTION B-B
TYPICAL INTERSECTION TIE-IN
NTS

NOTES:

1. AREAS CALCULATED GRAPHICALLY.
2. QUANTITIES CARRIED TO PROJECT SUMMARY.

STATE OF TEXAS
CASEY B. STRIPLING
136887
LICENSED
PROFESSIONAL ENGINEER

Casey B. Stripling

11-17-2022

SH 136
DRIVEWAY & INTERSECTION DETAILS

SCALE: NTS

2023 Texas Department of Transportation

SHEET 1 OF 1

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		55

DATE: 11/17/2022 4:26:22 PM
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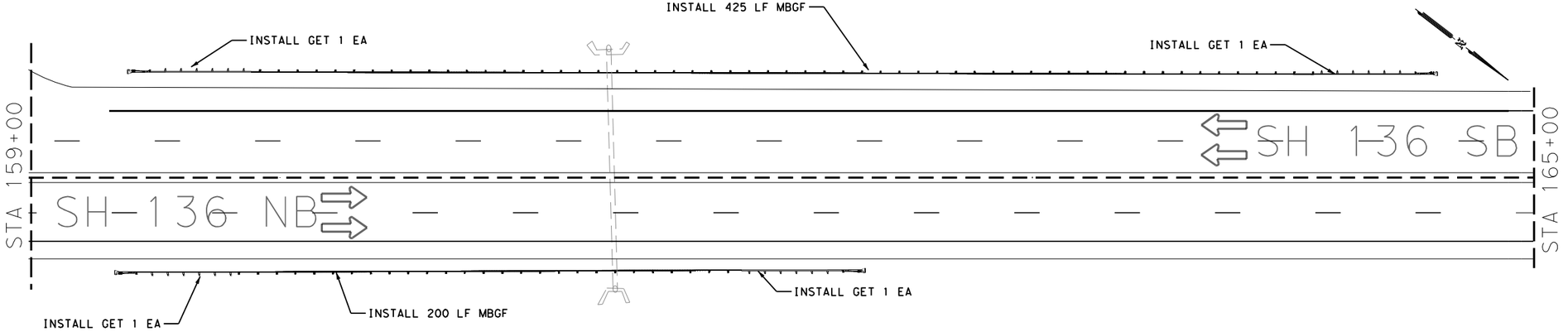
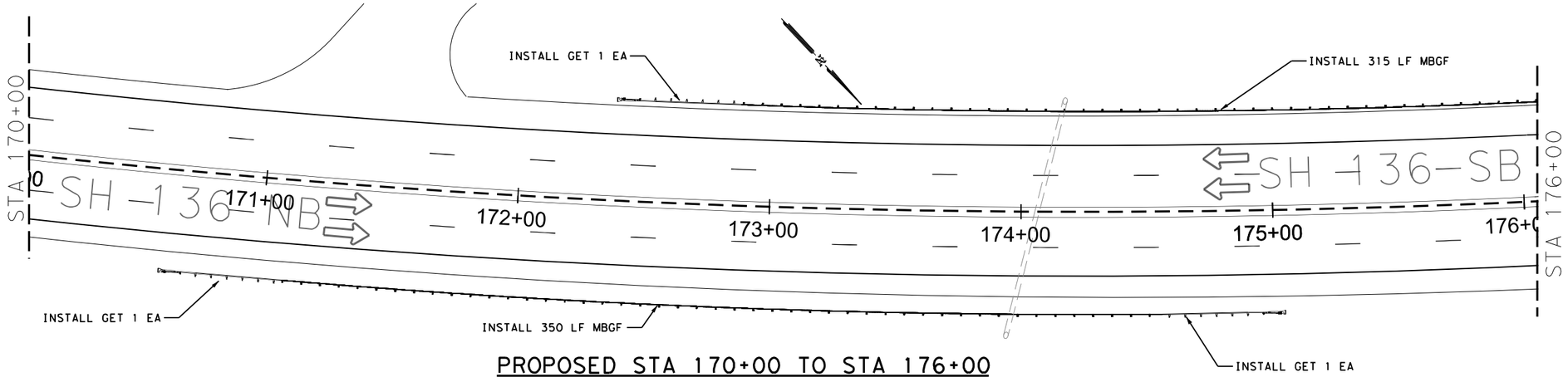


PROPOSED STA 159+00 TO STA 165+00



PROPOSED STA 170+00 TO STA 176+00

CSJ: 0356-01-107 MBGF LAYOUT SHEET 1 OF 20		
	540	544
	6002	6001
LOCATION	MTL W-BEAM GD FEN (STEEL POST)	GUARDRAIL END TREATMENT (INSTALL)
CSJ: 0356-01-107	LF	EA
STA 159+34 TO STA 161+94 L	200	2
STA 160+77 TO STA 164+62 R	425	2
STA 172+75 TO STA 176+00 L	315	1
STA 170+55 TO STA 174+65 R	350	2
PROJECT TOTALS:	**1,290**	**7**

STATE OF TEXAS
CASEY B. STRIPLING
136887
LICENSED PROFESSIONAL ENGINEER

Casey B. Stripling

11-17-2022

SH 136

MBGF LAYOUT

SCALE: 1" = 50'

2023 Texas Department of Transportation

SHEET 1 OF 21

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		56

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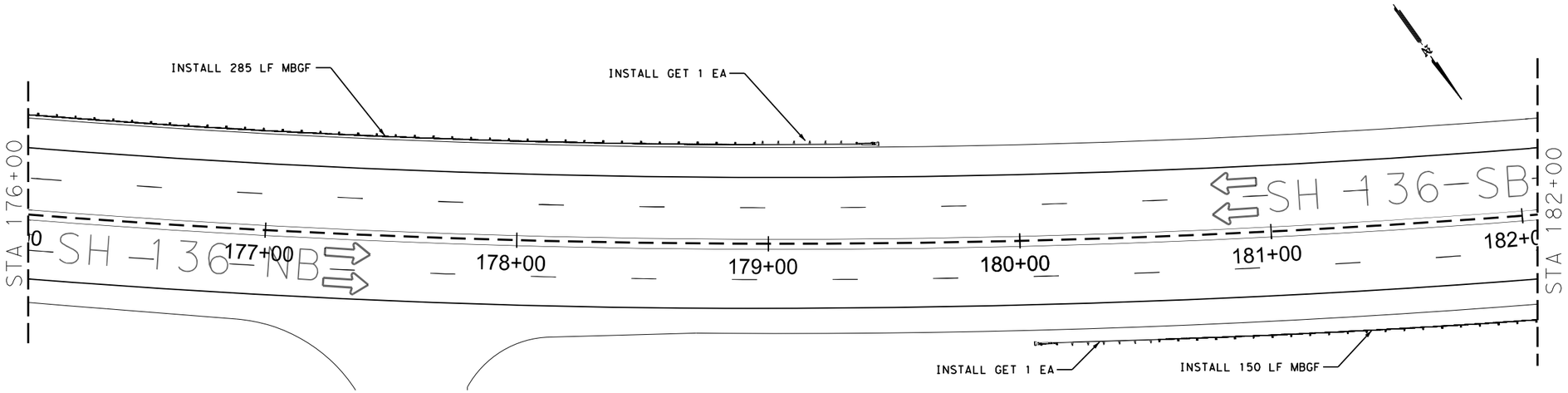
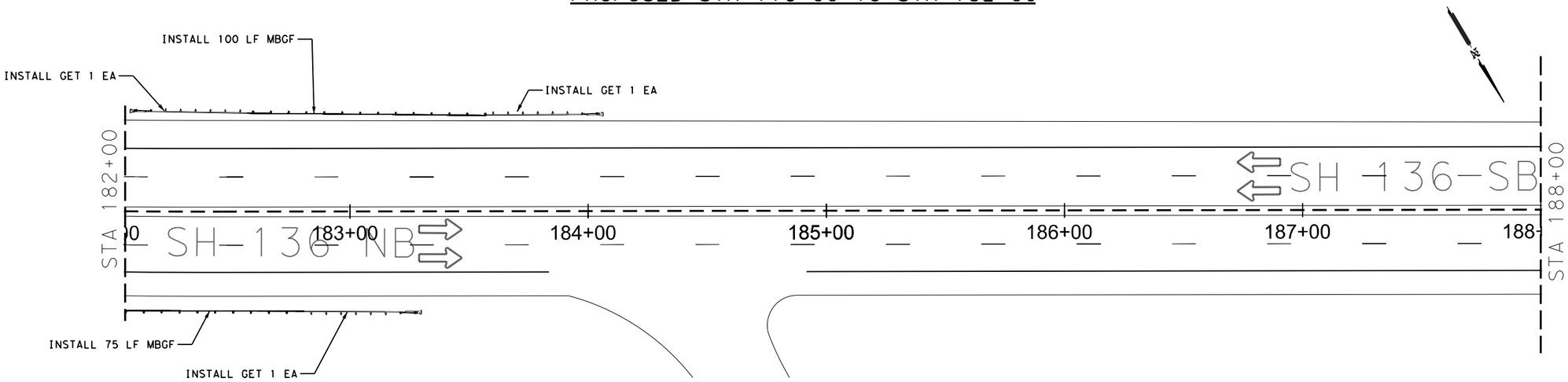


PROPOSED STA 176+00 TO STA 182+00



PROPOSED STA 182+00 TO STA 188+00

CSJ: 0356-01-107 MBGF LAYOUT SHEET 2 OF 20		
	540	544
	6002	6001
LOCATION	MTL W-BEAM GD FEN (STEEL POST)	GUARDRAIL END TREATMENT (INSTALL)
CSJ: 0356-01-107	LF	EA
STA 176+00 TO STA 179+35 L	285	1
STA 180+00 TO STA 182+85 R	150	1
STA 182+15 TO STA 184+00 L	100	2
STA 182+00 TO STA 183+27 R	75	1
PROJECT TOTALS:	**610**	**5**

STATE OF TEXAS
CASEY B. STRIPLING
136887
LICENSED PROFESSIONAL ENGINEER

Casey B. Stripling

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SH 136

MBGF LAYOUT

SCALE: 1" = 50'

2023 Texas Department of Transportation

SHEET 2 OF 21

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		57

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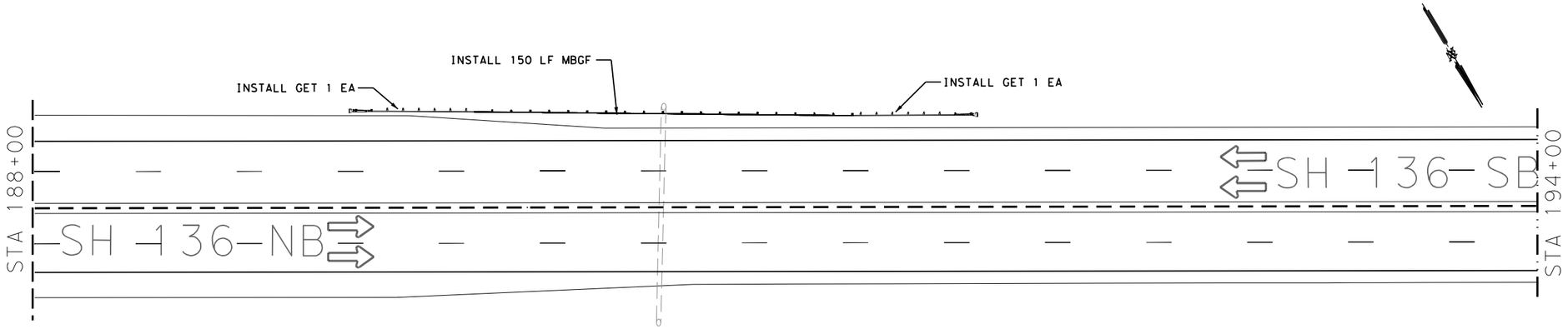
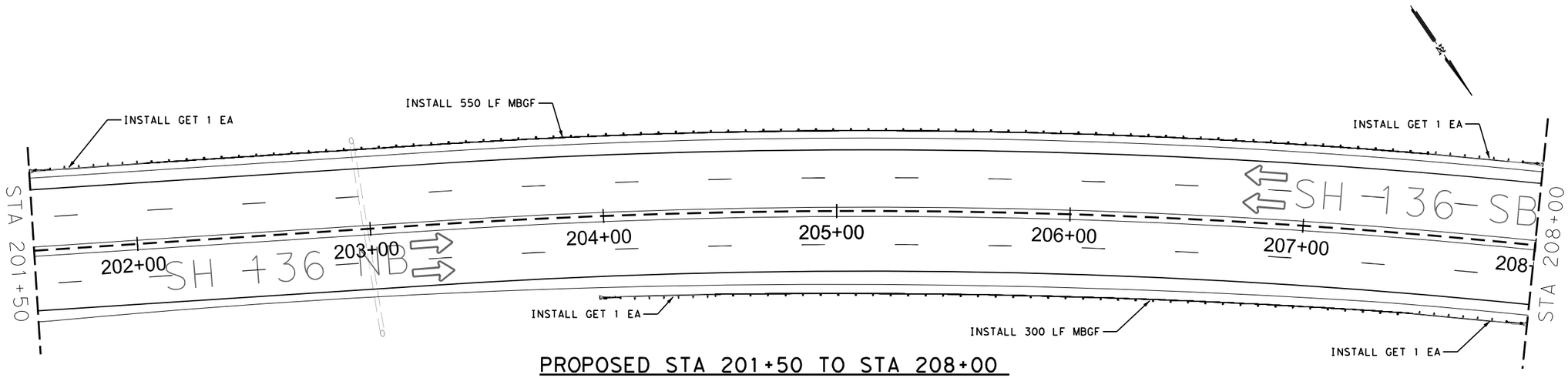


PROPOSED STA 188+00 TO STA 194+00



PROPOSED STA 201+50 TO STA 208+00

CSJ: 0356-01-107 MBGF LAYOUT SHEET 3 OF 20		
	540	544
	6002	6001
LOCATION	MTL W-BEAM GD FEN (STEEL POST)	GUARDRAIL END TREATMENT (INSTALL)
CSJ: 0356-01-107	LF	EA
STA 189+63 TO STA 191+73 L	150	2
STA 201+50 TO STA 208+00 L	550	2
STA 204+10 TO STA 208+00 R	300	2
PROJECT TOTALS:	**1,000**	**6**

STATE OF TEXAS
CASEY B. STRIPLING
136887
LICENSED PROFESSIONAL ENGINEER

Casey B. Stripling

11-17-2022

SH 136

MBGF LAYOUT

SCALE: 1" = 50'

2023 Texas Department of Transportation

SHEET 3 OF 20

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		58

DATE: 11/17/2022 4:26:33 PM
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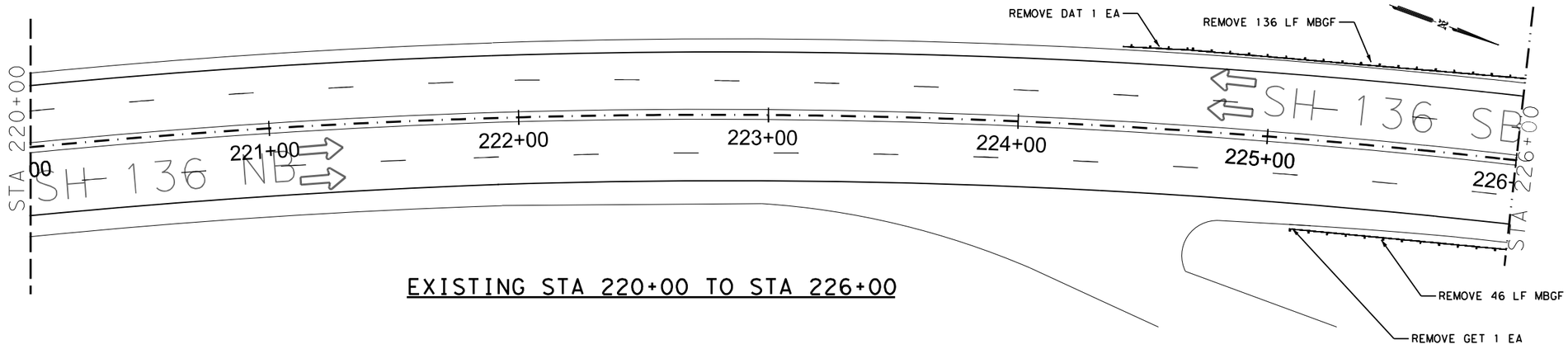
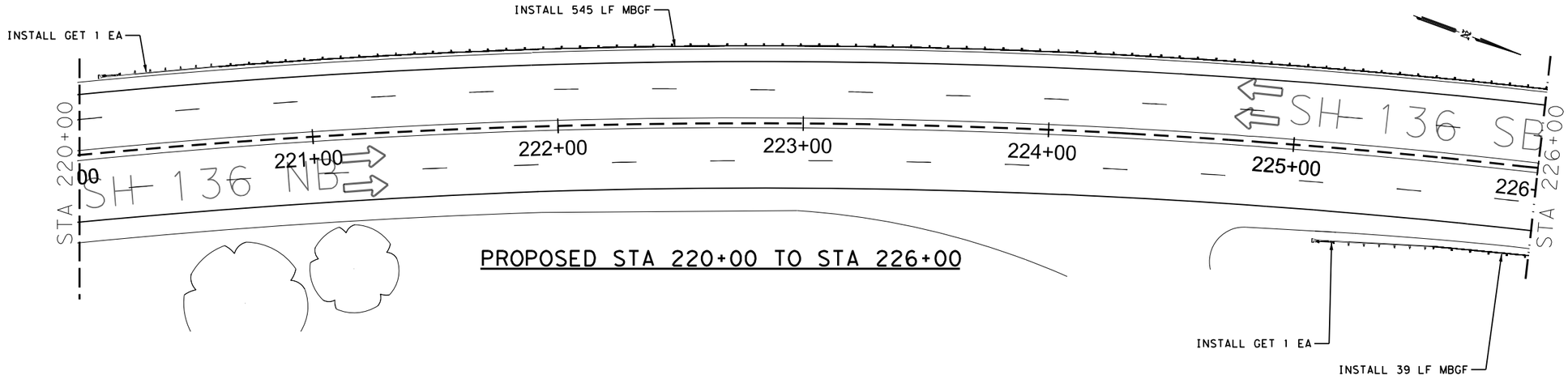


EXISTING STA 220+00 TO STA 226+00



PROPOSED STA 220+00 TO STA 226+00

CSJ: 0356-01-107 MBGF LAYOUT SHEET 4 OF 20					
LOCATION	540 6002 MTL W-BEAM GD FEN (STEEL POST)	542 6001 REMOVE METAL BEAM GUARD FENCE	542 6003 REMOVE DOWNSTREAM ANCHOR TERMINAL	544 6001 GUARDRAIL END TREATMENT (INSTALL)	544 6003 GUARDRAIL END TREATMENT (REMOVE)
CSJ: 0356-01-107	LF	LF	EA	EA	EA
STA 224+39 TO STA 226+00 L		136	1		
STA 225+10 TO STA 226+00 R		46			1
STA 220+50 TO STA 226+50 L	545			1	
STA 225+10 TO STA 226+00 R	39			1	
PROJECT TOTALS:	**584**	**182**	**1**	**2**	**1**

STATE OF TEXAS
CASEY B. STRIPLING
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LICENSED PROFESSIONAL ENGINEER

Casey B. Stripling

11-17-2022

SH 136

MBGF LAYOUT

SCALE: 1" = 50'

2023 Texas Department of Transportation

SHEET 4 OF 20

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		59

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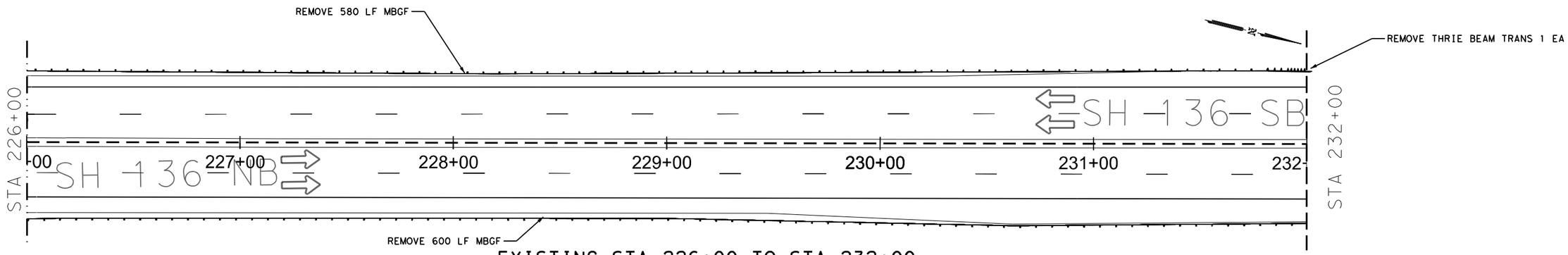
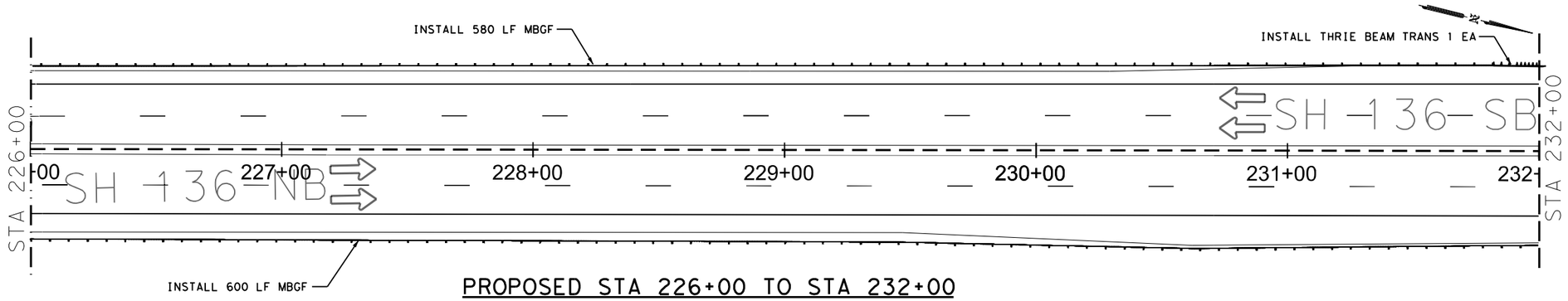


EXISTING STA 226+00 TO STA 232+00



PROPOSED STA 226+00 TO STA 232+00

CSJ: 0356-01-107 MBGF LAYOUT SHEET 5 OF 20				
LOCATION	540 6002 MTL W-BEAM GD FEN (STEEL POST)	540 6006 MTL BEAM GD FEN TRANS (THRIE-BEAM)	542 6001 REMOVE METAL BEAM GUARD FENCE	542 6004 RM MTL BM GD FENCE TRANS (THRIE-BEAM)
CSJ: 0356-01-107	LF	EA	LF	EA
STA 226+00 TO STA 232+00 L			580	1
STA 226+00 TO STA 232+00 R			600	
STA 226+00 TO STA 232+00 L	580	1		
STA 226+00 TO STA 232+00 R	600			
PROJECT TOTALS:	**1,180**	**1**	**1,180**	**1**

STATE OF TEXAS
CASEY B. STRIPLING
136887
LICENSED PROFESSIONAL ENGINEER

Casey B. Stripling

11-17-2022

SH 136

MBGF LAYOUT

SCALE: 1" = 50'

2023 Texas Department of Transportation

SHEET 5 OF 20

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		60

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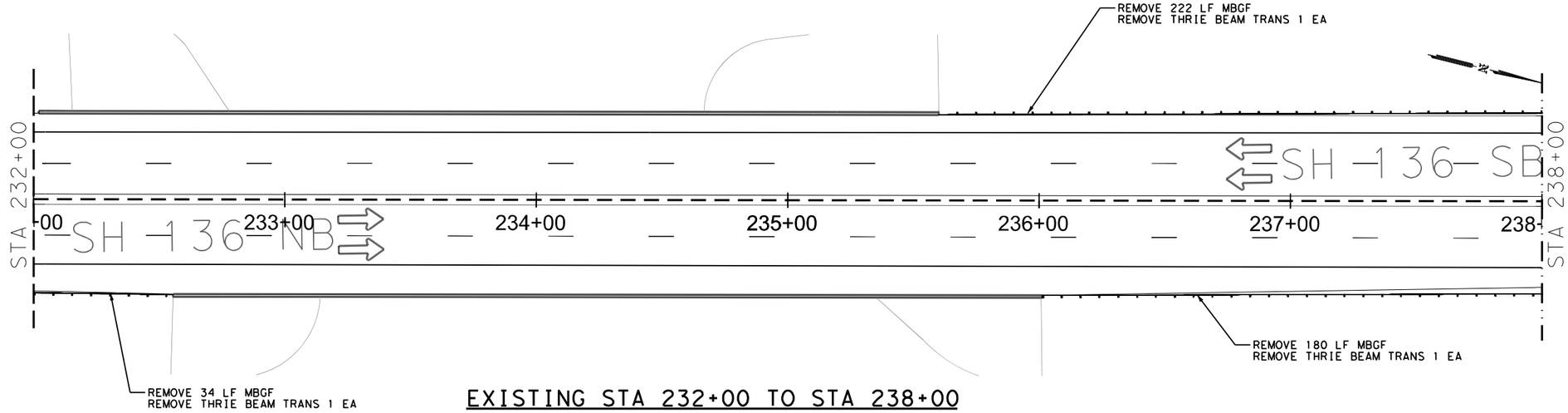
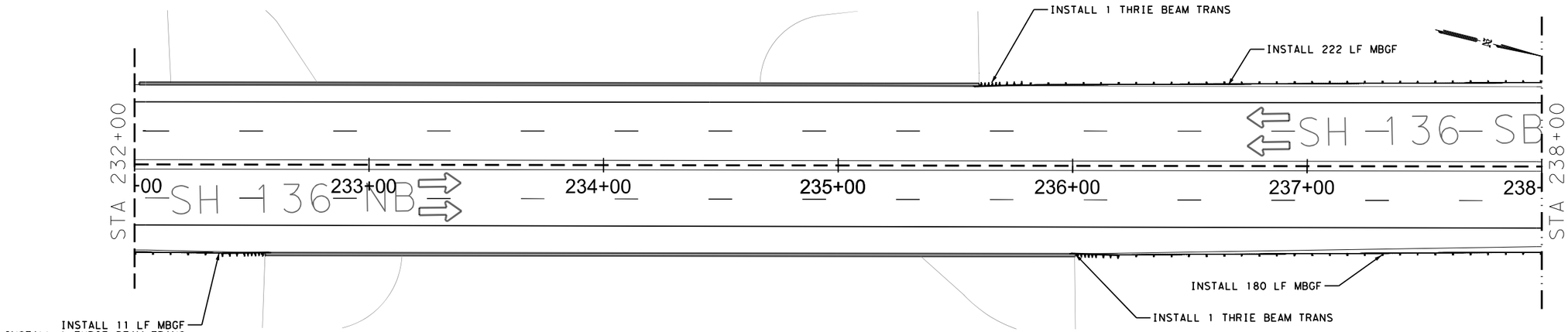


EXISTING STA 232+00 TO STA 238+00



PROPOSED STA 232+00 TO STA 238+00

CSJ: 0356-01-107 MBGF LAYOUT SHEET 6 OF 20				
LOCATION	540 6002 MTL W-BEAM GD FEN (STEEL POST)	540 6006 MTL BEAM GD FEN TRANS (THRIE-BEAM)	542 6001 REMOVE METAL BEAM GUARD FENCE	542 6004 RM MTL BM GD FENCE TRANS (THRIE-BEAM)
CSJ: 0356-01-107	LF	EA	LF	EA
STA 235+55 TO STA 238+00 L			222	1
STA 232+00 TO STA 232+38 R			11	1
STA 236+00 TO STA 238+00 R			180	1
STA 235+55 TO STA 238+00 L	222	1		
STA 232+00 TO STA 232+38 R	11	1		
STA 236+00 TO STA 238+00 R	180	1		
PROJECT TOTALS:	**413**	**3**	**413**	**3**

STATE OF TEXAS
CASEY B. STRIPLING
136887
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PROFESSIONAL ENGINEER

Casey B. Stripling

11-17-2022

SH 136

MBGF LAYOUT

SCALE: 1" = 50'

2023 Texas Department of Transportation

SHEET 6 OF 20

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		61

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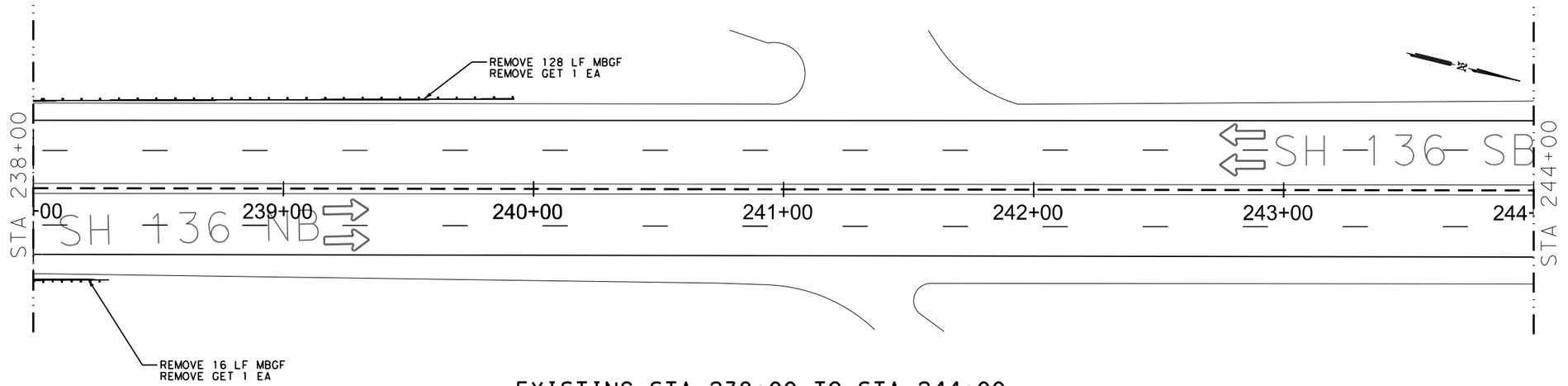
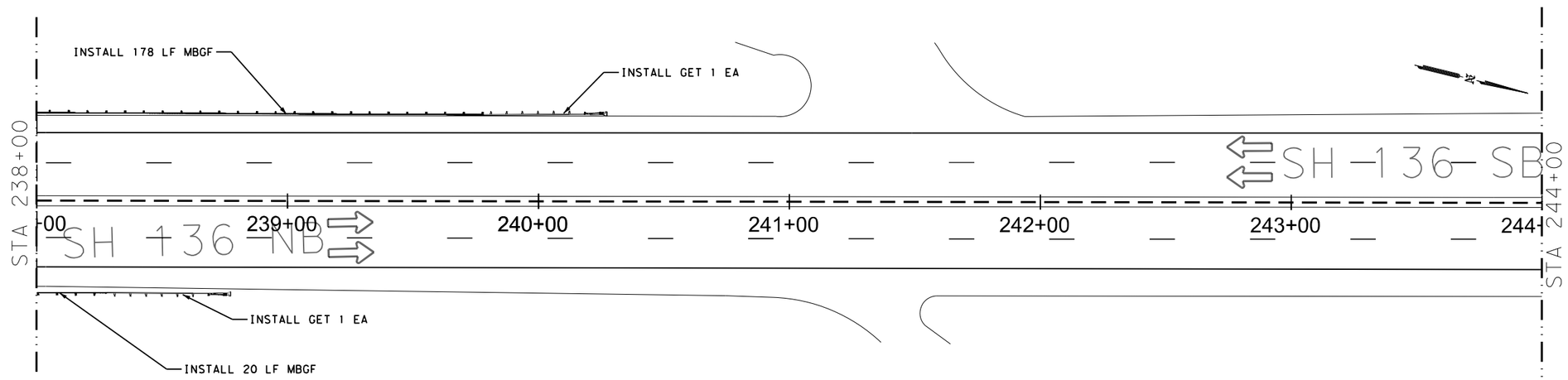


EXISTING STA 238+00 TO STA 244+00



PROPOSED STA 238+00 TO STA 244+00

CSJ: 0356-01-107 MBGF LAYOUT SHEET 7 OF 20				
	540	542	544	544
	6002	6001	6001	6003
LOCATION	MTL W-BEAM GD FEN (STEEL POST)	REMOVE METAL BEAM GUARD FENCE	GUARDRAIL END TREATMENT (INSTALL)	GUARDRAIL END TREATMENT (REMOVE)
CSJ: 0356-01-107	LF	LF	EA	EA
STA 238+00 TO STA 240+10 L		125		1
STA 238+00 TO STA 239+23 R		16		1
STA 238+00 TO STA 240+10 L	178		1	
STA 238+00 TO STA 239+23 R	20		1	
PROJECT TOTALS:	**198**	**141**	**2**	**2**

STATE OF TEXAS
CASEY B. STRIPLING
136887
LICENSED PROFESSIONAL ENGINEER

Casey B. Stripling

11-17-2022

SH 136

MBGF LAYOUT

SCALE: 1" = 50'

2023 Texas Department of Transportation

SHEET 7 OF 20

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		62

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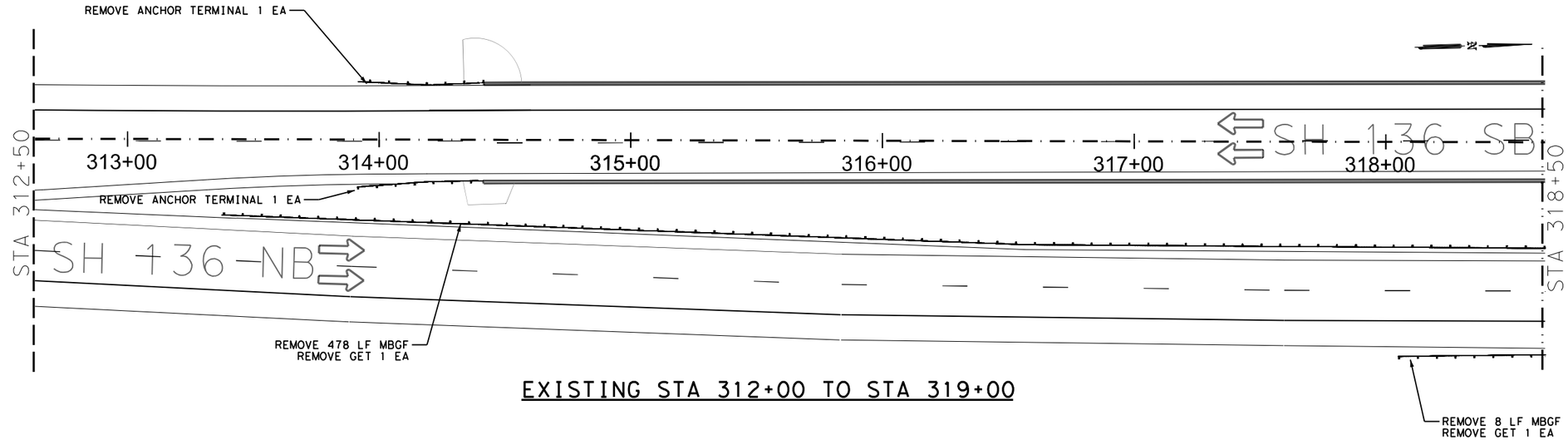
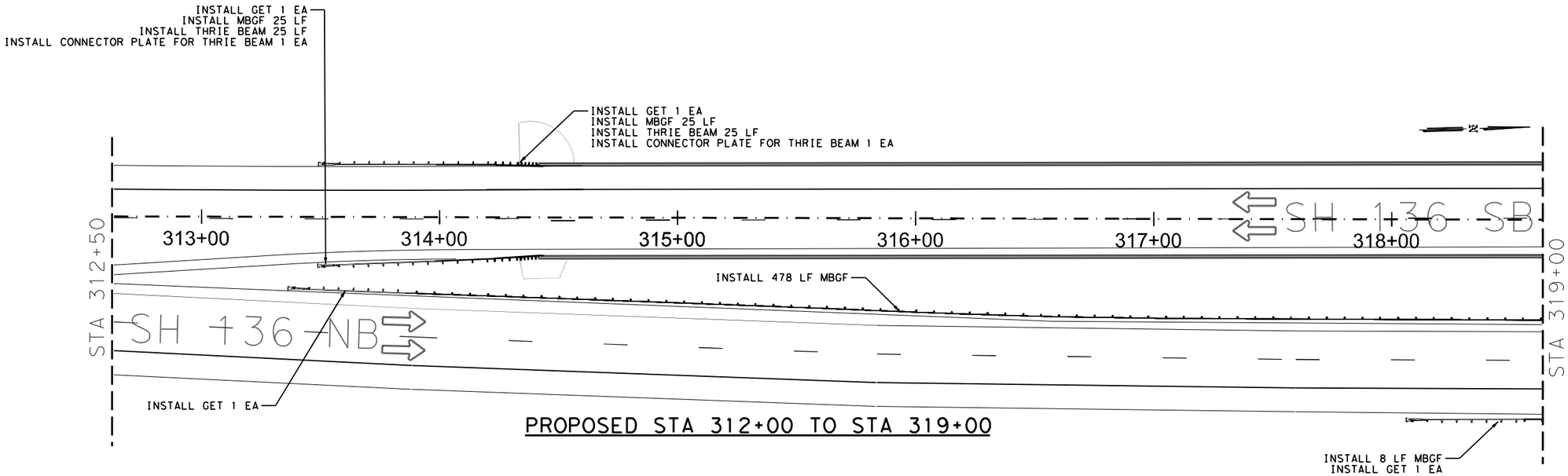


EXISTING STA 312+00 TO STA 319+00



PROPOSED STA 312+00 TO STA 319+00

CSJ: 0356-01-107 MBGF LAYOUT SHEET 8 OF 20

LOCATION	540 6002 MTL W-BEAM GD FEN (STEEL POST)	540 6006 MTL BEAM GD FEN TRANS (THRIE-BEAM)	540 6038 CONNECTOR PLATE FOR THRIE BEAM	542 6001 REMOVE METAL BEAM GUARD FENCE	542 6003 REMOVE DOWNSTREAM ANCHOR TERMINAL	544 6001 GUARDRAIL END TREATMENT (INSTALL)	544 6003 GUARDRAIL END TREATMENT (REMOVE)
CSJ: 0356-01-107	LF	EA	EA	LF	EA	EA	EA
STA 313+90 TO STA 314+28 L1					1		
STA 313+90 TO STA 314+28 R1					1		
STA 314+00 TO STA 319+00 L2				478			1
STA 317+90 to STA 319+00 R2				8			1
STA 313+50 TO STA 314+28 L1	25	1	1			1	
STA 313+50 TO STA 314+28 R1	25	1	1			1	
STA 314+00 TO STA 319+00 L2	478					1	
STA 317+90 to STA 319+00 R2	8					1	
PROJECT TOTALS:	**536**	**2**	**2**	**486**	**2**	**4**	**2**

STATE OF TEXAS
CASEY B. STRIPLING
136887
LICENSED PROFESSIONAL ENGINEER
Casey B. Stripling
11-17-2022

SH 136

MBGF LAYOUT

SCALE: 1" = 50'

2023 Texas Department of Transportation

SHEET 8 OF 20

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		63

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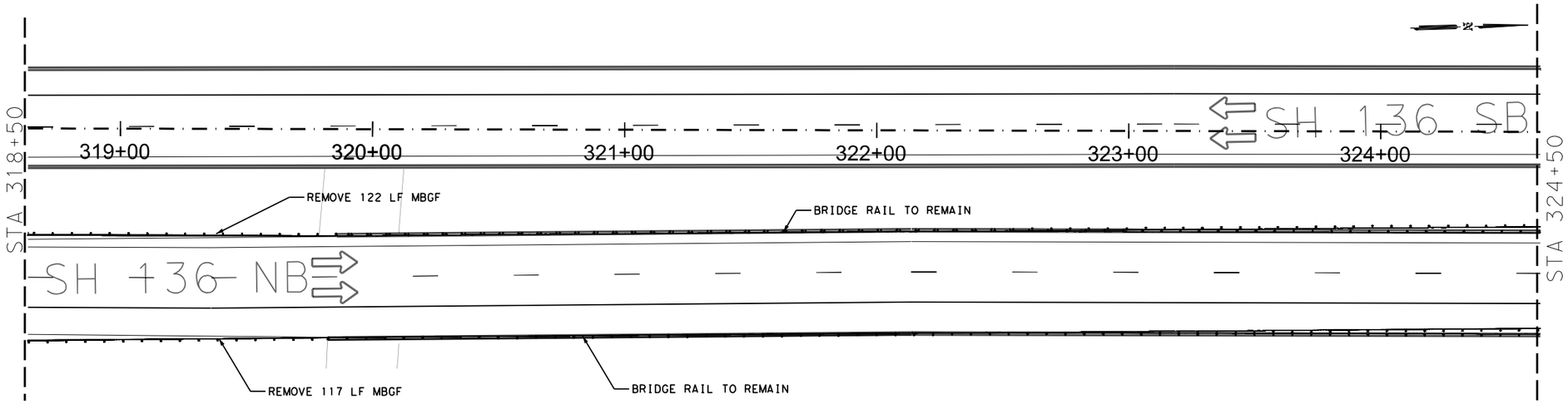
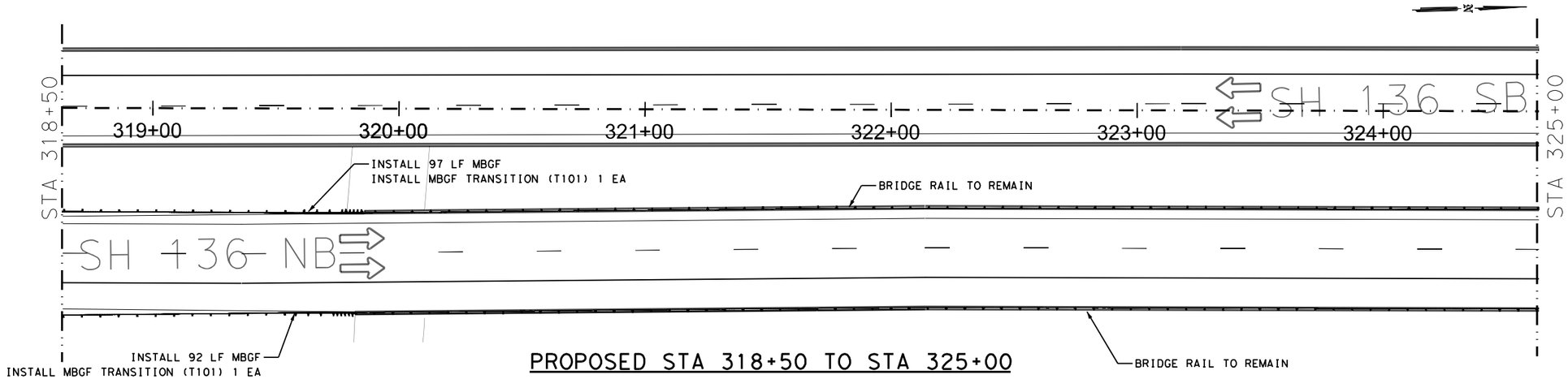


EXISTING STA 318+50 TO STA 325+00



PROPOSED STA 318+50 TO STA 325+00

CSJ: 0356-01-107 MBGF LAYOUT SHEET 9 OF 20			
	540	540	542
	6002	6008	6001
LOCATION	MTL W-BEAM GD FEN (STEEL POST)	MTL BEAM GD FEN TRANS (T101)	REMOVE METAL BEAM GUARD FENCE
CSJ: 0356-01-107	LF	EA	LF
STA 318+50 TO STA 319+96 L			122
STA 318+50 TO STA 319+96 R			117
STA 318+50 TO STA 319+96 L	97	1	
STA 318+50 TO STA 319+96 R	92	1	
PROJECT TOTALS:	**189**	**2**	**239**

STATE OF TEXAS
CASEY B. STRIPLING
136887
LICENSED PROFESSIONAL ENGINEER

Casey B. Stripling

11-17-2022

SH 136

MBGF LAYOUT

SCALE: 1" = 50'

2023 Texas Department of Transportation

SHEET 9 OF 20

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		64

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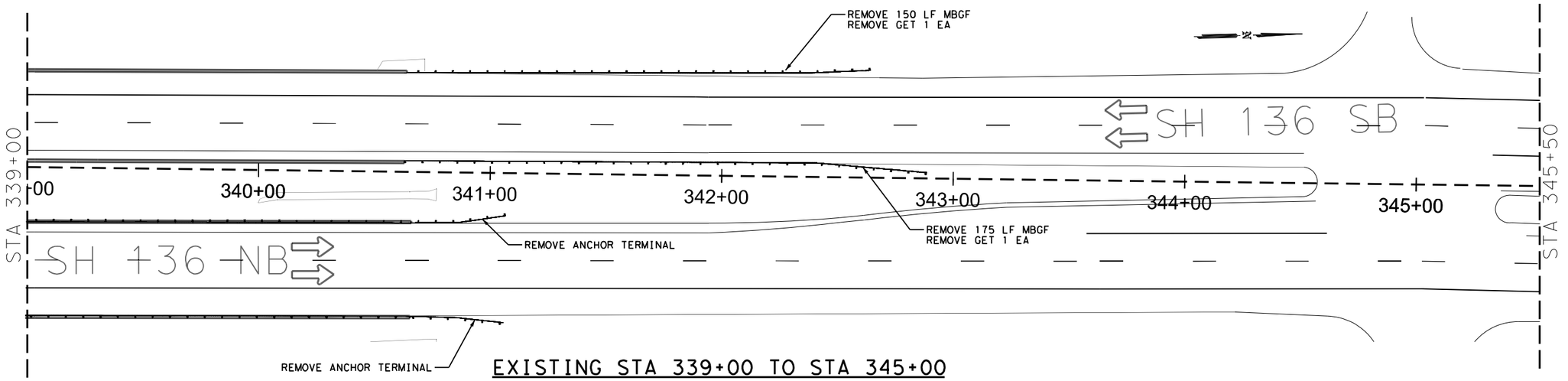
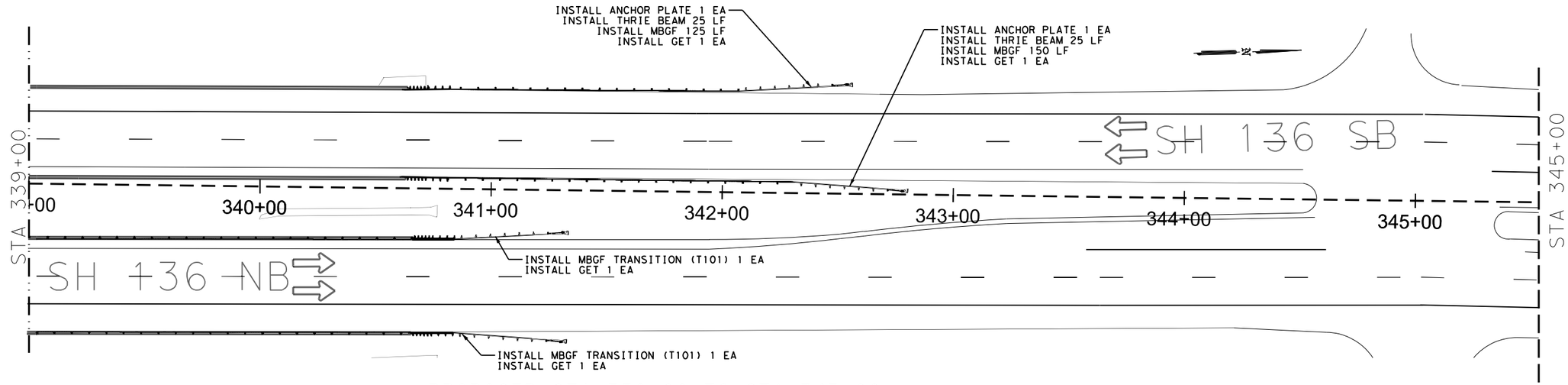


EXISTING STA 339+00 TO STA 345+00



PROPOSED STA 339+00 TO STA 345+00

CSJ: 0356-01-107 MBGF LAYOUT SHEET 10 OF 20

LOCATION	540 6002 MTL W-BEAM GD FEN (STEEL POST)	540 6006 MTL BEAM GD FEN TRANS (THRIE-BEAM)	540 6008 MTL BEAM GD FEN TRANS (T101)	540 6038 CONNECTOR PLATE FOR THRIE BEAM	542 6001 REMOVE METAL BEAM GUARD FENCE	542 6003 REMOVE DOWNSTREAM ANCHOR TERMINAL	544 6001 GUARDRAIL END TREATMENT (INSTALL)	544 6003 GUARDRAIL END TREATMENT (REMOVE)
CSJ: 0356-01-107	LF	EA	EA	EA	LF	EA	EA	EA
STA 340+65 TO STA 342+68 L1					150			1
STA 340+65 TO STA 342+88 R1					175			1
STA 340+70 TO STA 340+98 L2					25	1		
STA 340+70 TO STA 340+98 R2					25	1		
STA 340+65 TO STA 342+68 L1	125	1		1			1	
STA 340+65 TO STA 342+88 R1	150	1		1			1	
STA 340+70 TO STA 340+98 L2			1				1	
STA 340+70 TO STA 340+98 R2			1				1	
PROJECT TOTALS:	**275**	**2**	**2**	**2**	**375**	**2**	**4**	**2**

STATE OF TEXAS
CASEY B. STRIPLING
136887
LICENSED PROFESSIONAL ENGINEER

Casey B. Stripling

11-17-2022

SH 136

MBGF LAYOUT

SCALE: 1" = 50'

2023 Texas Department of Transportation

SHEET 10 OF 20

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		65

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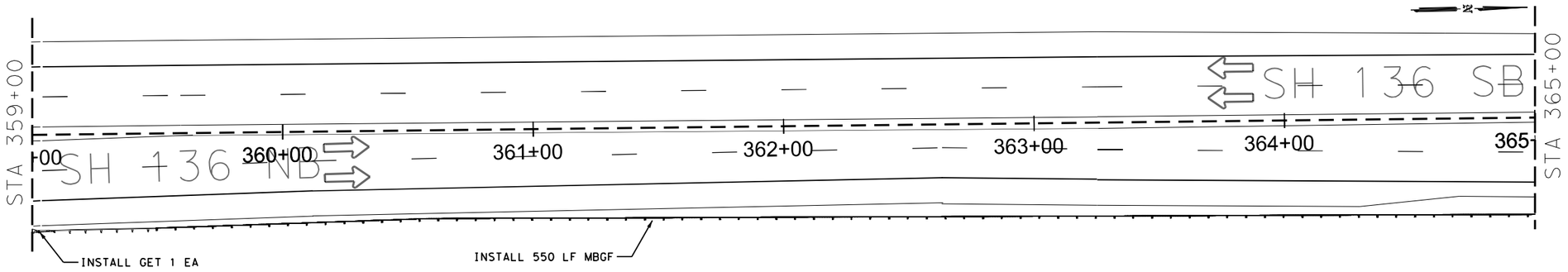
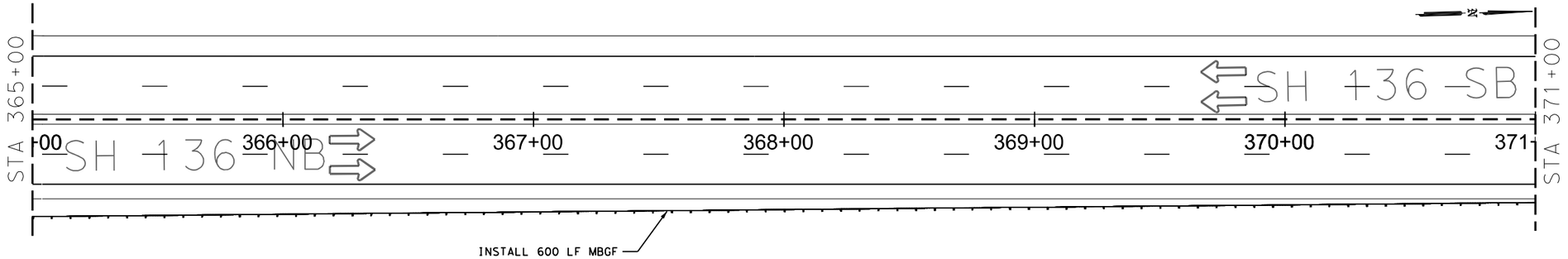


PROPOSED STA 359+00 TO STA 365+00



PROPOSED STA 365+00 TO STA 371+00

CSJ: 0356-01-107 MBGF LAYOUT SHEET 11 OF 20		
	540	544
	6002	6001
LOCATION	MTL W-BEAM GD FEN (STEEL POST)	GUARDRAIL END TREATMENT (INSTALL)
CSJ: 0356-01-107	LF	LF
STA 359+00 TO STA 365+00 R1	500	1
STA 365+00 TO STA 371+00 R2	600	
PROJECT TOTALS:	**1,100**	**1**

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11-17-2022

SH 136

MBGF LAYOUT

SCALE: 1" = 50'

2023 Texas Department of Transportation

SHEET 11 OF 20

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		66

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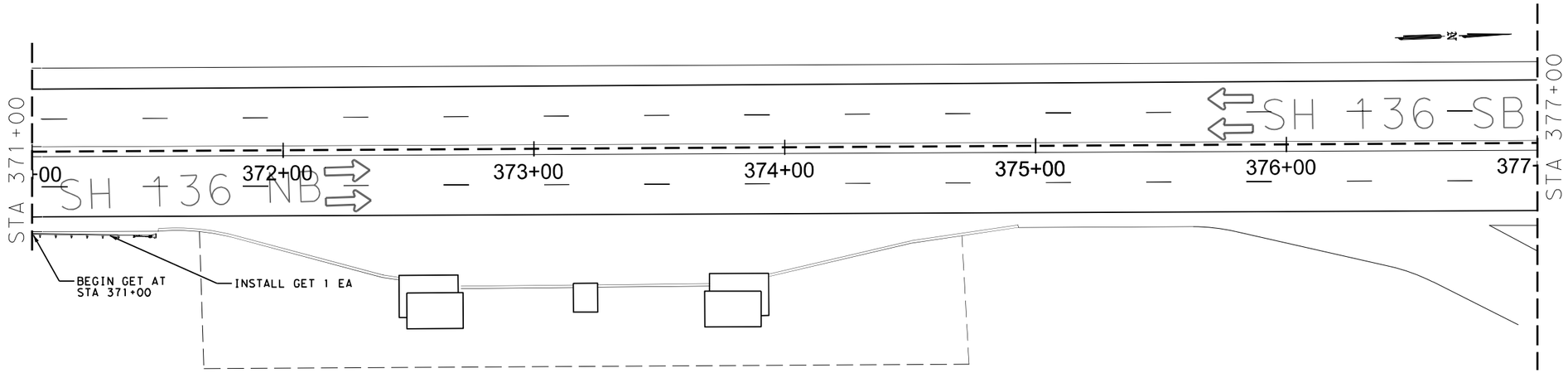

PROPOSED STA 371+00 TO STA 377+00

CSJ: 0356-01-107 MBGF LAYOUT SHEET 12 OF 20	
	544
	6001
LOCATION	GUARDRAIL END TREATMENT (INSTALL)
CSJ: 0356-01-107	EA
STA 371+00 TO STA 371+58 R	1
PROJECT TOTALS:	**1**

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11-17-2022

SH 136

MBGF LAYOUT

SCALE: 1" = 50'

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SHEET 12 OF 20

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		67

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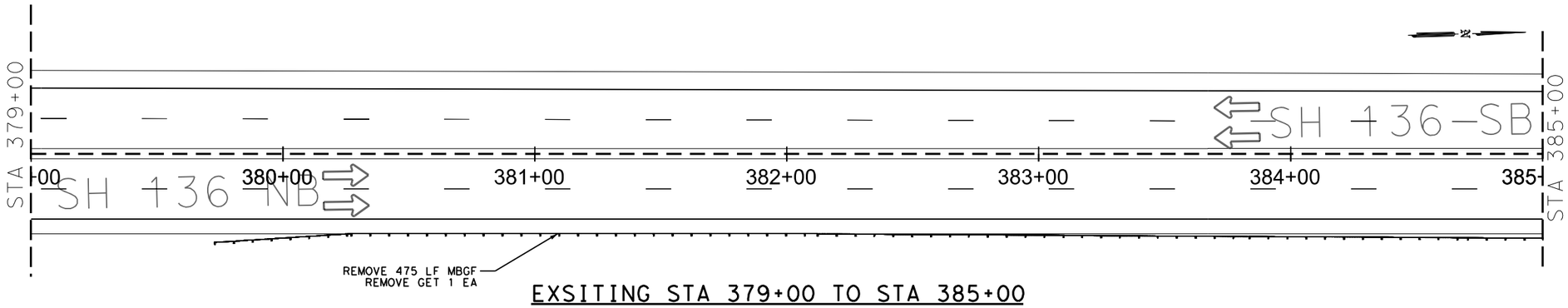
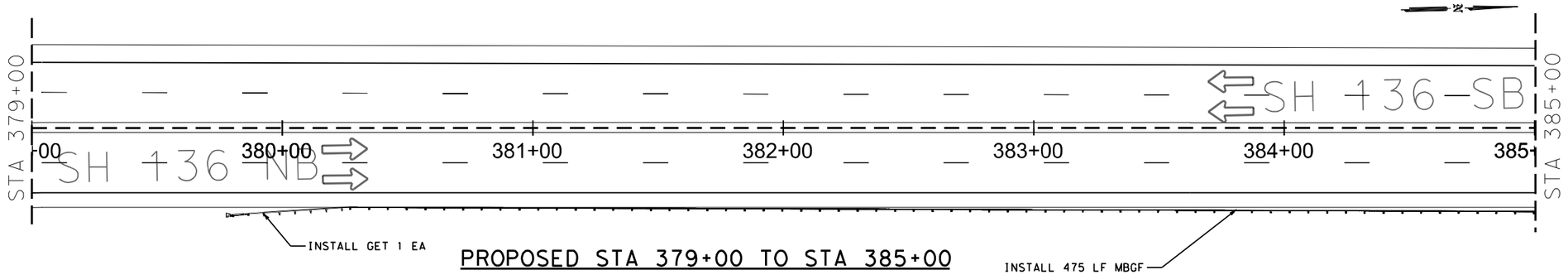


EXSITING STA 379+00 TO STA 385+00



PROPOSED STA 379+00 TO STA 385+00

CSJ: 0356-01-107 MBGF LAYOUT SHEET 13 OF 20				
LOCATION	540 6002 MTL W-BEAM GD FEN (STEEL POST)	542 6001 REMOVE METAL BEAM GUARD FENCE	544 6001 GUARDRAIL END TREATMENT (INSTALL)	544 6003 GUARDRAIL END TREATMENT (REMOVE)
CSJ: 0356-01-107	LF	LF	EA	EA
STA 379+74 TO STA 385+00 R		475		1
STA 379+74 TO STA 385+00 R	475		1	
PROJECT TOTALS:	**475**	**475**	**1**	**1**

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Casey B. Stripling

11-17-2022

SH 136

MBGF LAYOUT

SCALE: 1" = 50'

2023 Texas Department of Transportation

SHEET 13 OF 20

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		68

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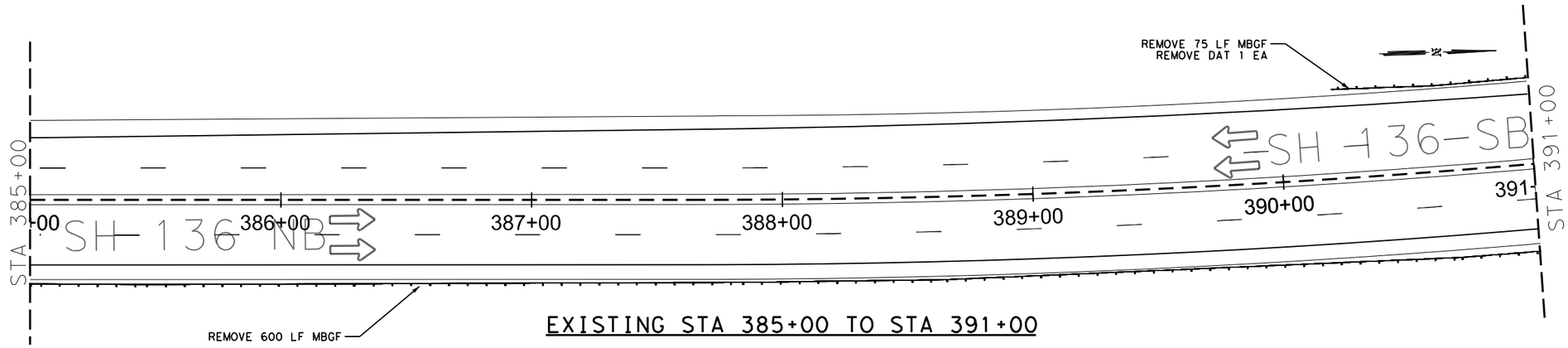
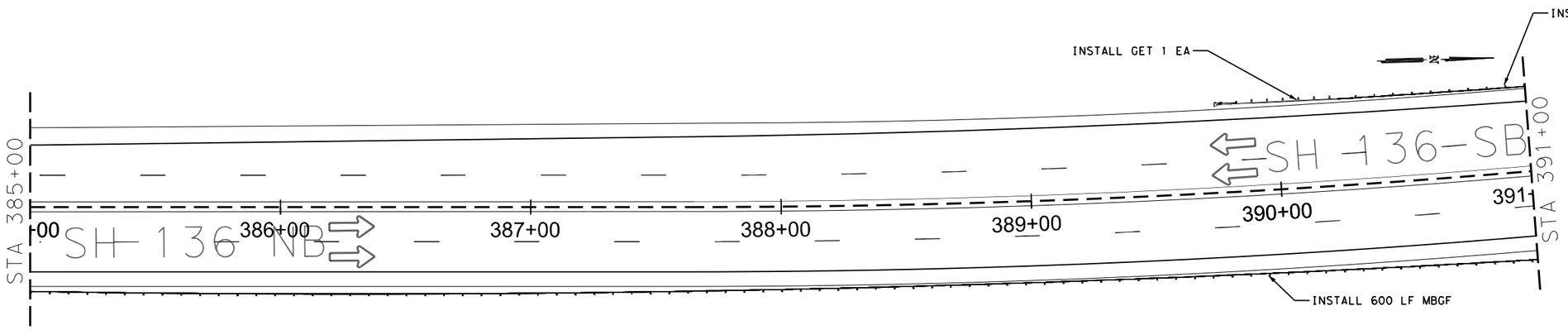


EXISTING STA 385+00 TO STA 391+00



PROPOSED STA 385+00 TO STA 391+00

CSJ: 0356-01-107 MBGF LAYOUT SHEET 14 OF 20				
	540	542	542	544
	6002	6001	6003	6001
LOCATION	MTL W-BEAM GD FEN (STEEL POST)	REMOVE METAL BEAM GUARD FENCE	REMOVE DOWNSTREAM ANCHOR TERMINAL	GUARDRAIL END TREATMENT (INSTALL)
CSJ: 0356-01-107	LF	LF	EA	EA
STA 390+25 TO STA 391+00 R		75	1	
STA 385+00 TO STA 391+00 L		600		
STA 390+25 TO STA 391+00 R	75			1
STA 385+00 TO STA 391+00 L	600			
PROJECT TOTALS:	**675**	**675**	**1**	**1**

STATE OF TEXAS
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11-17-2022

SH 136

MBGF LAYOUT

SCALE: 1" = 50'

2023 Texas Department of Transportation

SHEET 14 OF 20

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		69

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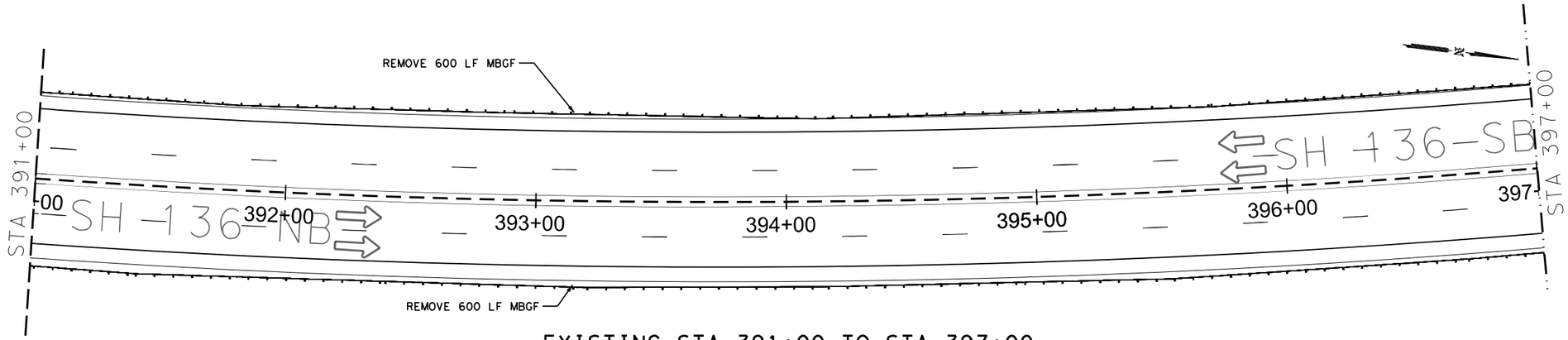
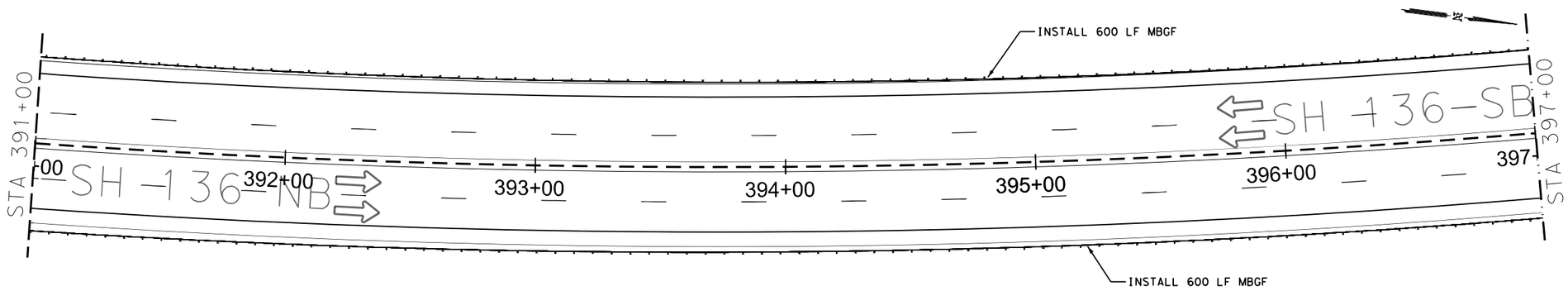


EXISTING STA 391+00 TO STA 397+00



PROPOSED STA 391+00 TO STA 397+00

CSJ: 0356-01-107 MBGF LAYOUT SHEET 15 OF 20		
	540	542
	6002	6001
LOCATION	MTL W-BEAM GD FEN (STEEL POST)	REMOVE METAL BEAM GUARD FENCE
CSJ: 0356-01-107	LF	LF
STA 391+00 TO STA 397+00 L		600
STA 391+00 TO STA 397+00 R		600
STA 391+00 TO STA 397+00 L	600	
STA 391+00 TO STA 397+00 R	600	
PROJECT TOTALS:	**1,200**	**1,200**

STATE OF TEXAS
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Casey B. Stripling

11-17-2022

SH 136

MBGF LAYOUT

SCALE: 1" = 50'

2023 Texas Department of Transportation

SHEET 15 OF 20

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		70

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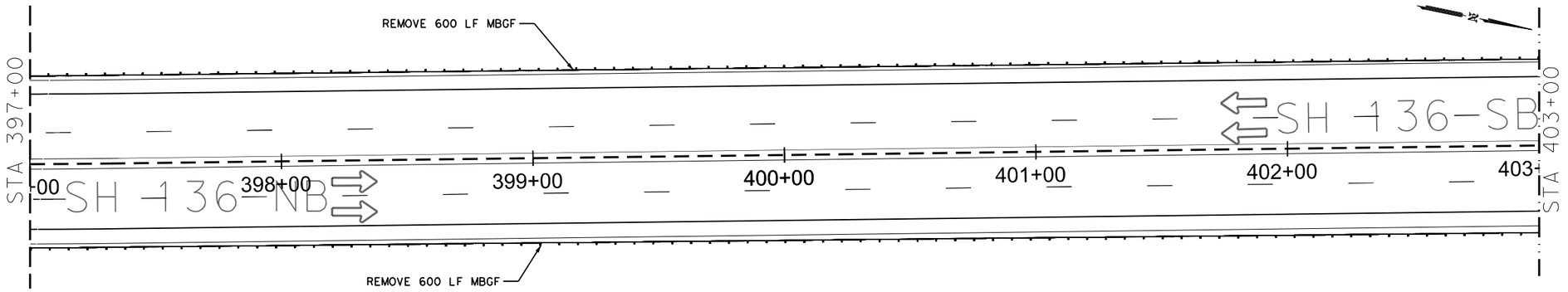
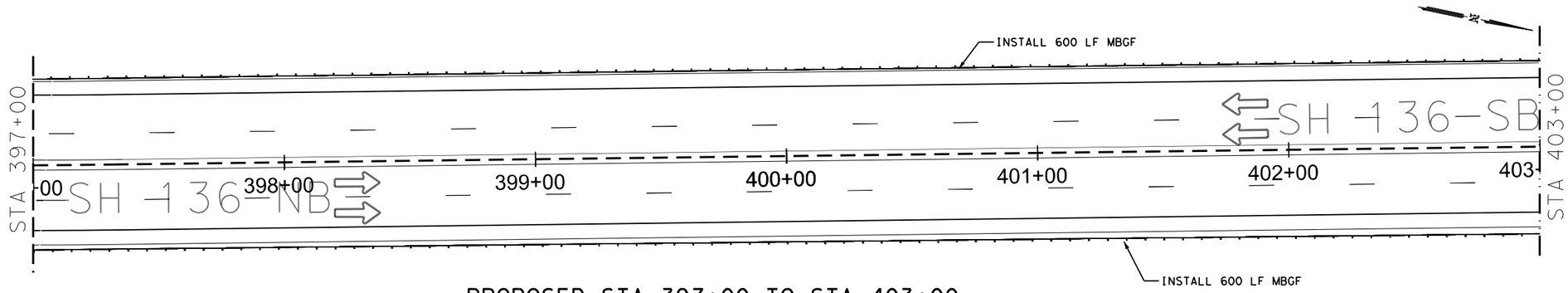


EXISTING STA 397+00 TO STA 403+00



PROPOSED STA 397+00 TO STA 403+00

CSJ: 0356-01-107 MBGF LAYOUT SHEET 16 OF 20		
LOCATION	540	542
	6002	6001
	MTL W-BEAM GD FEN (STEEL POST)	REMOVE METAL BEAM GUARD FENCE
CSJ: 0356-01-107	LF	LF
STA 397+00 TO STA 403+00 L		600
STA 397+00 TO STA 403+00 R		600
STA 397+00 TO STA 403+00 L	600	
STA 397+00 TO STA 403+00 R	600	
PROJECT TOTALS:	**1,200**	**1,200**

STATE OF TEXAS
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Casey B. Stripling

11-17-2022

SH 136

MBGF LAYOUT

SCALE: 1" = 50'

2023 Texas Department of Transportation

SHEET 16 OF 20

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		71

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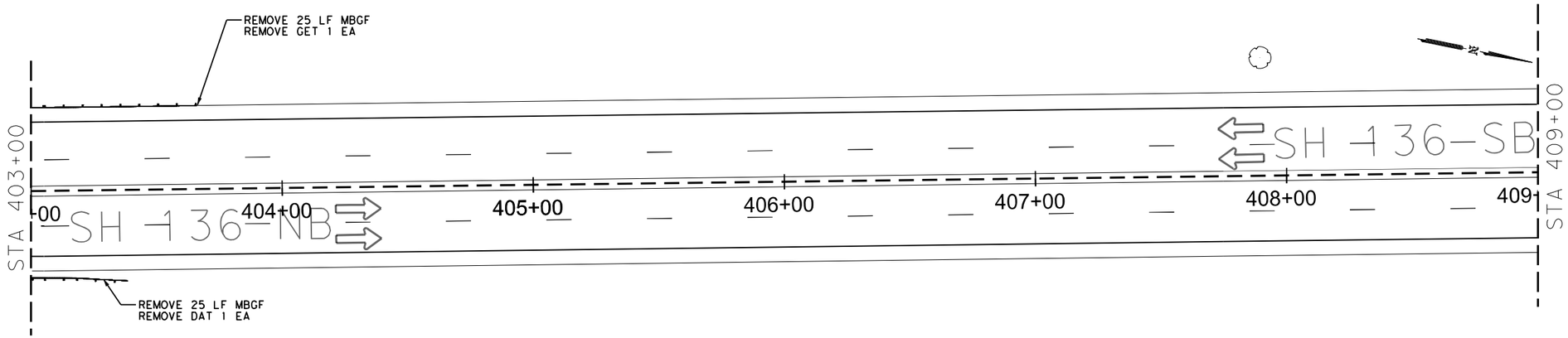
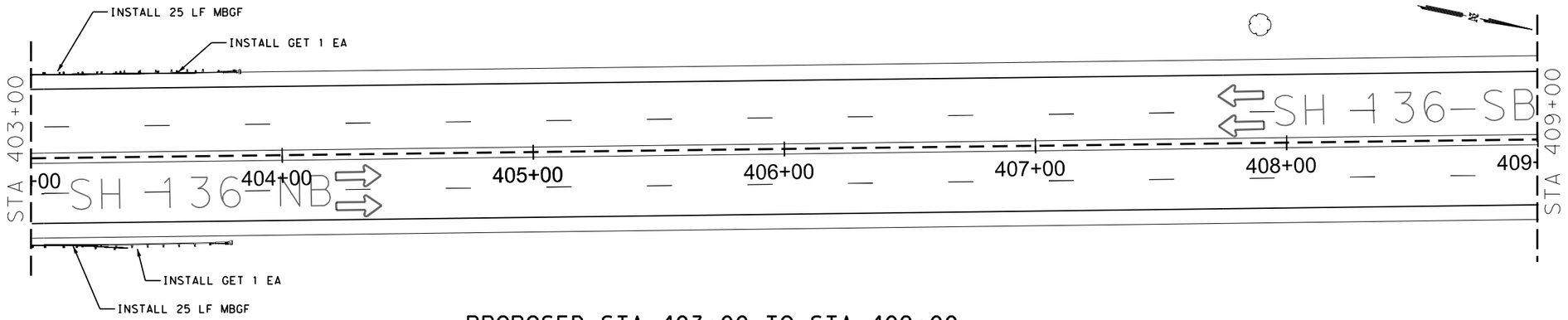


EXISTING STA 403+00 TO STA 409+00



PROPOSED STA 403+00 TO STA 409+00

CSJ: 0356-01-107 MBGF LAYOUT SHEET 17 OF 20					
LOCATION	540 6002 MTL W-BEAM GD FEN (STEEL POST)	542 6001 REMOVE METAL BEAM GUARD FENCE	542 6003 REMOVE DOWNSTREAM ANCHOR TERMINAL	544 6001 GUARDRAIL END TREATMENT (INSTALL)	544 6003 GUARDRAIL END TREATMENT (REMOVE)
CSJ: 0356-01-107	LF	LF	EA	EA	EA
STA 403+00 TO STA 403+75 L		25			1
STA 403+00 TO STA 403+35 R		25	1		
STA 403+00 TO STA 403+75 L	25			1	
STA 403+00 TO STA 403+35 R	25			1	
PROJECT TOTALS:	**50**	**50**	**1**	**2**	**1**

STATE OF TEXAS
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Casey B. Stripling

11-17-2022

SH 136

MBGF LAYOUT

SCALE: 1" = 50'

2023 Texas Department of Transportation

SHEET 17 OF 20

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		72

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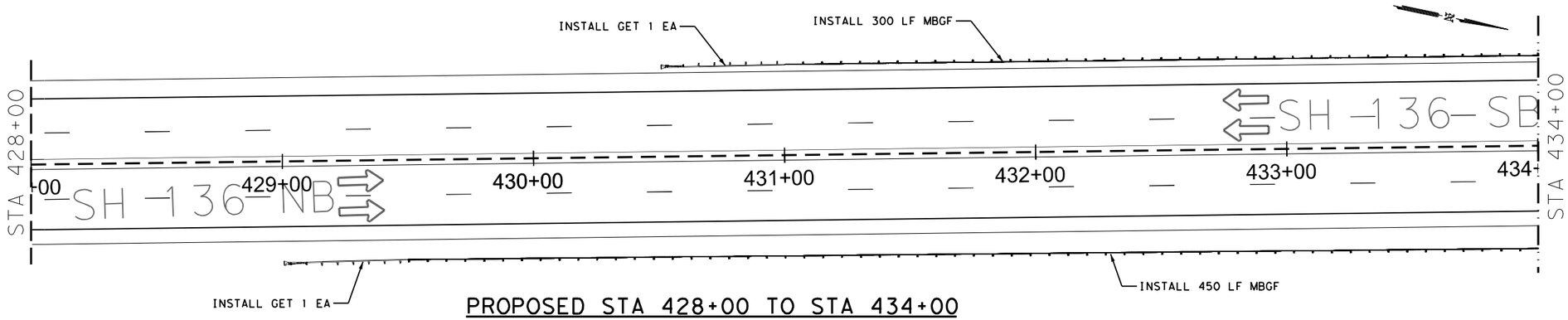
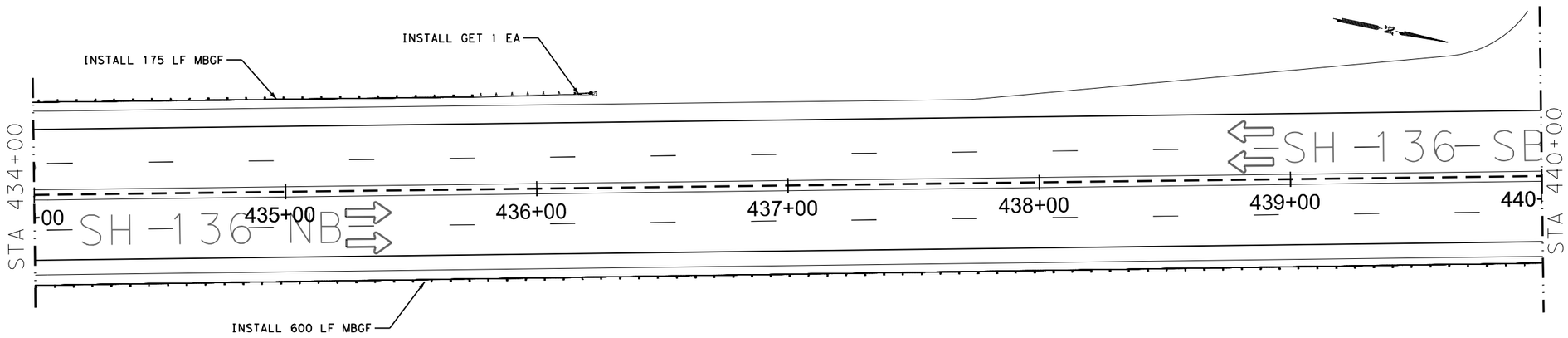


PROPOSED STA 428+00 TO STA 434+00



PROPOSED STA 434+00 TO STA 440+00

CSJ: 0356-01-107 MBGF LAYOUT SHEET 18 OF 20		
LOCATION	540 6002 MTL W-BEAM GD FEN (STEEL POST)	544 6001 GUARDRAIL END TREATMENT (INSTALL)
CSJ: 0356-01-107	LF	EA
STA 428+73 TO STA 433+98 L	300	1
STA 430+00 TO STA 434+00 R	450	1
STA 434+00 TO STA 436+34 L	175	1
STA 434+00 TO STA 440+00 R	600	
PROJECT TOTALS:	**1,525**	**3**

STATE OF TEXAS
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Casey B. Stripling

11-17-2022

SH 136

MBGF LAYOUT

SCALE: 1" = 50'

2023 Texas Department of Transportation

SHEET 18 OF 20

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		73

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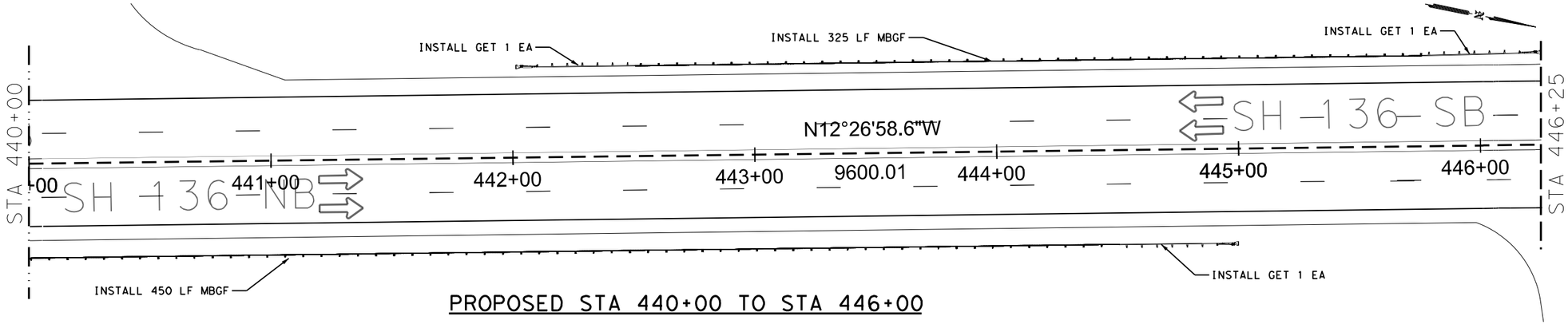
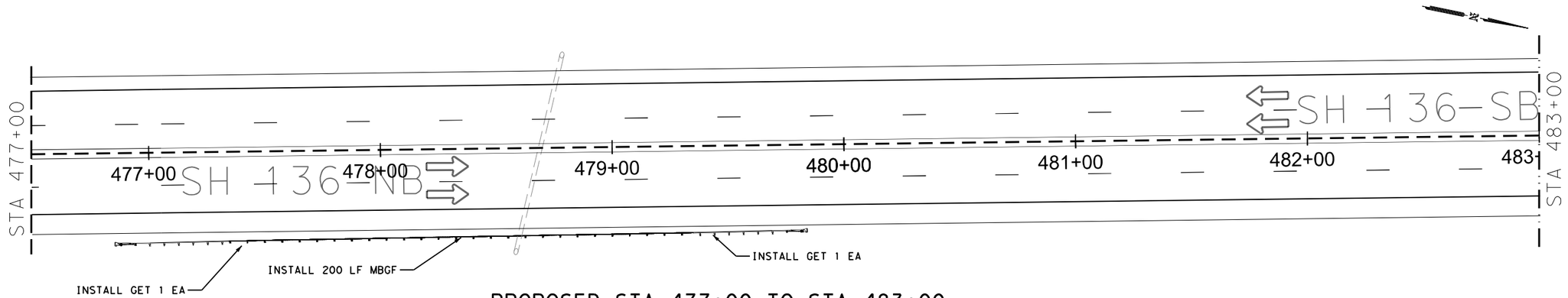


PROPOSED STA 440+00 TO STA 446+00



PROPOSED STA 477+00 TO STA 483+00

CSJ: 0356-01-107 MBGF LAYOUT SHEET 19 OF 20		
LOCATION	540 6002 MTL W-BEAM GD FEN (STEEL POST)	544 6001 GUARDRAIL END TREATMENT (INSTALL)
CSJ: 0356-01-107	LF	EA
STA 441+80 TO STA 445+55 L	325	2
STA 440+00 TO STA 445+35 R	450	1
STA 476+79 TO STA 479+39 R	200	2
PROJECT TOTALS:	**975**	**5**

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11-17-2022

SH 136

MBGF LAYOUT

SCALE: 1" = 50'

2023 Texas Department of Transportation

SHEET 19 OF 20

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		74

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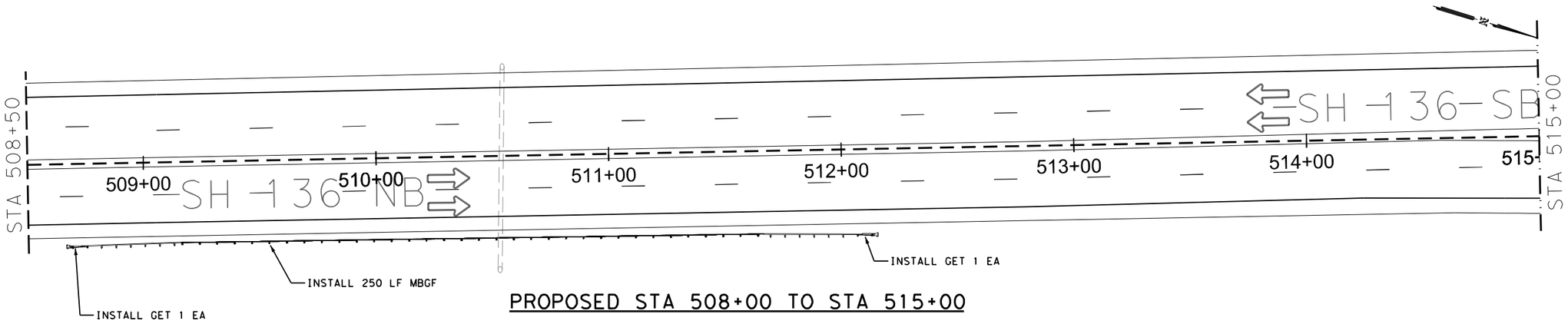
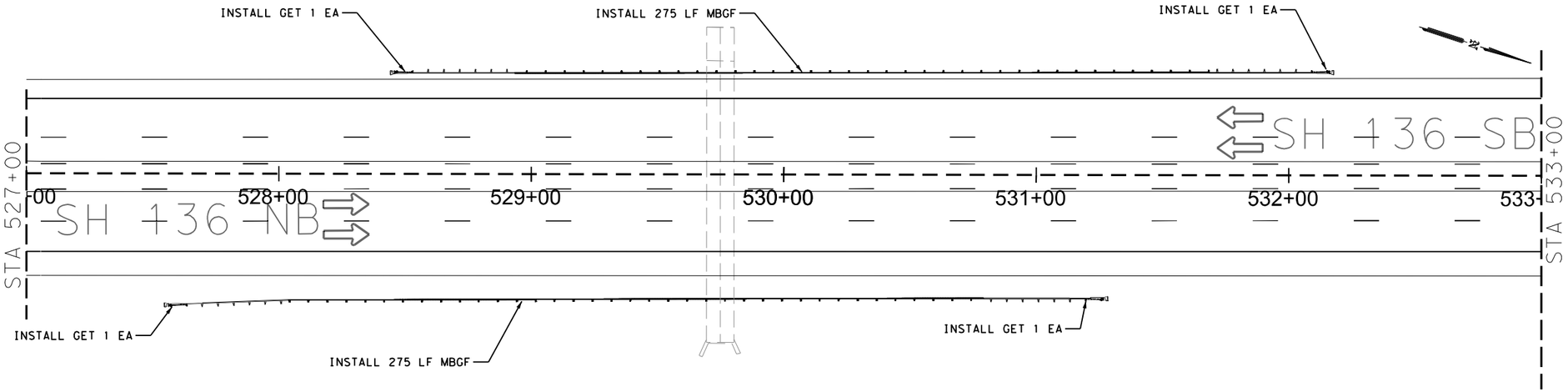


PROPOSED STA 508+00 TO STA 515+00



PROPOSED STA 527+00 TO STA 533+00

CSJ: 0356-01-107 MBGF LAYOUT SHEET 20 OF 20		
LOCATION	540 6002 MTL W-BEAM GD FEN (STEEL POST)	544 6001 GUARDRAIL END TREATMENT (INSTALL)
CSJ: 0356-01-107	LF	EA
STA 508+50 TO STA 514+10 R	250	2
STA 525+75 TO STA 532+10 L	275	2
STA 527+75 TO STA 529+60 R	275	2
PROJECT TOTALS:	**800**	**6**

STATE OF TEXAS
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SH 136

MBGF LAYOUT

SCALE: 1" = 50'

2023 Texas Department of Transportation

SHEET 20 OF 20

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		75

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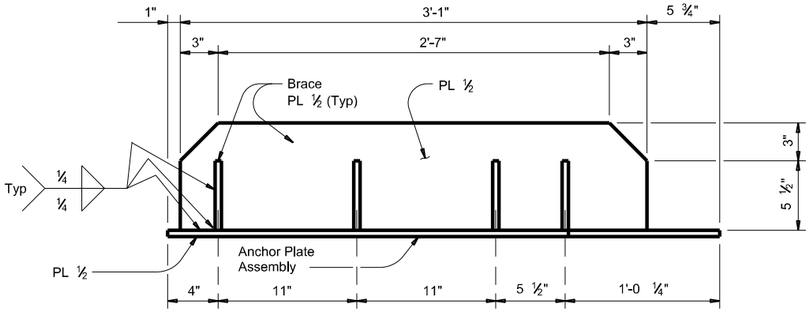
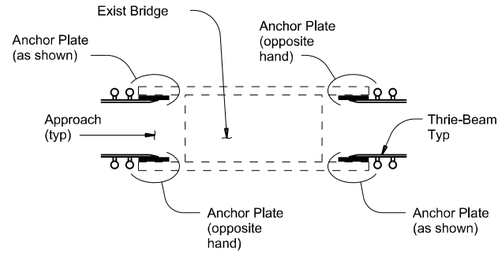
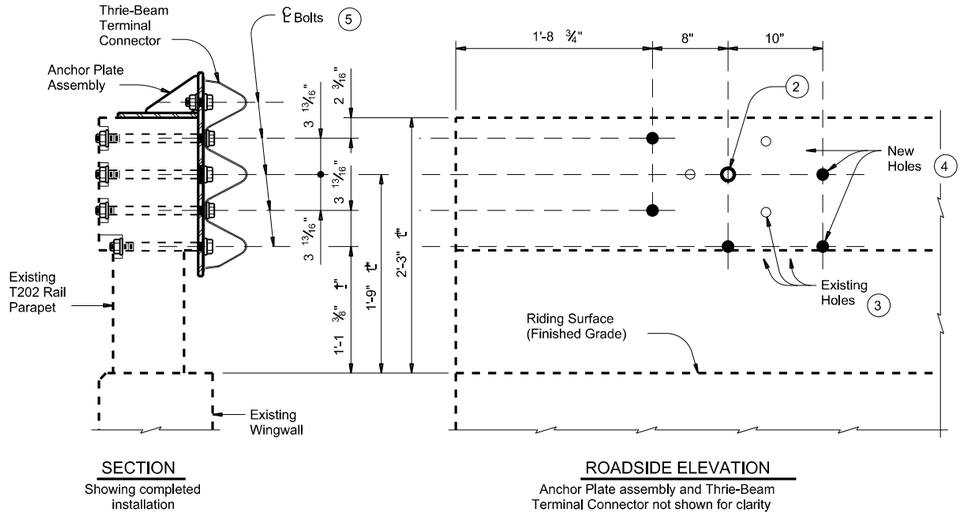


PLAN



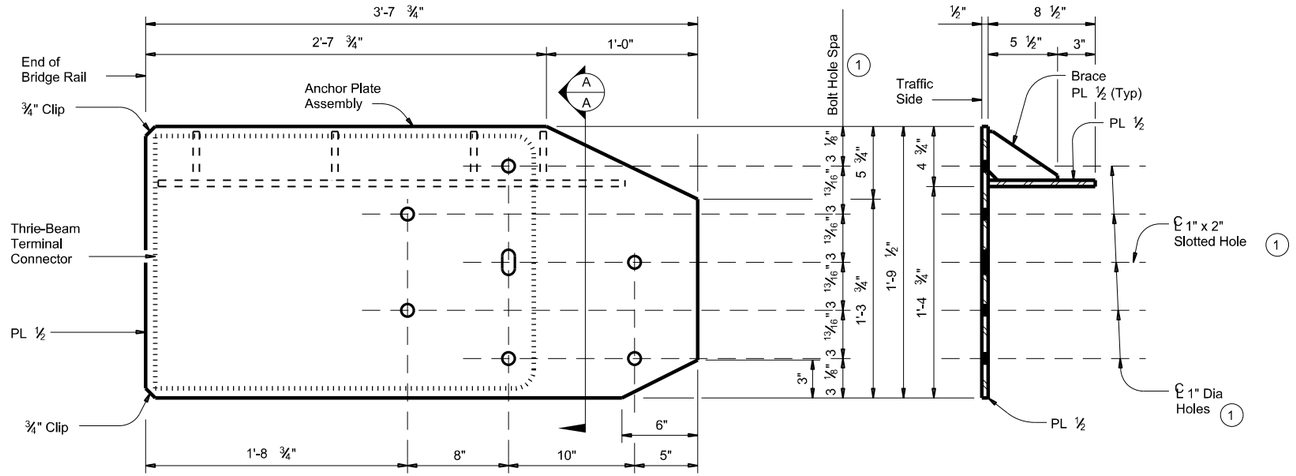
LOCATION DETAILS



SECTION
Showing completed installation

ROADSIDE ELEVATION
Anchor Plate assembly and Thrie-Beam Terminal Connector not shown for clarity

DETAILS OF BOLTS AND HOLES (1)

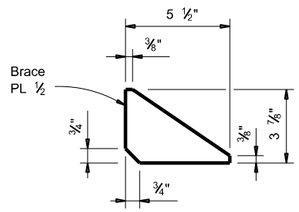


ROADSIDE ELEVATION

SECTION A-A

ANCHOR PLATE DETAILS

Anchor Plate shown is detailed for one end of one side of rail only.
For other side, Anchor Plate must be built opposite hand.



BRACE PLATE DETAILS

CONSTRUCTION NOTES:

Field verify dimensions before commencing work and ordering materials.

Plugging of newly exposed existing bolt holes is not necessary except as stated here in or otherwise indicated on the plans. This work is considered subsidiary to the pertinent bid items.

Attach the MBGF Transition to the existing parapet using the Anchor Plate assembly and the Thrie-Beam Terminal Connection. Splice the Thrie-Beam Terminal Connection to the Thrie-Beam with the normal 12 connection bolts. Refer to Metal Beam Guard Fence Transition and Metal Beam Guard Fence detail sheets for additional details and information not shown herein.

MATERIAL NOTES:

Fabricate Anchor Plate assembly with steel conforming to either ASTM A36 or A572 Gr 50. Anchor Plate assembly must be free of burrs, sharp edges and weld splatter. Grind edges and corners to a 1/16" flat or radius. Hot-dip galvanize Anchor Plate assembly in accordance with Item 445, "Galvanizing". Anchor bolts, nuts, and washers must conform to Item 449, "Anchor Bolts".

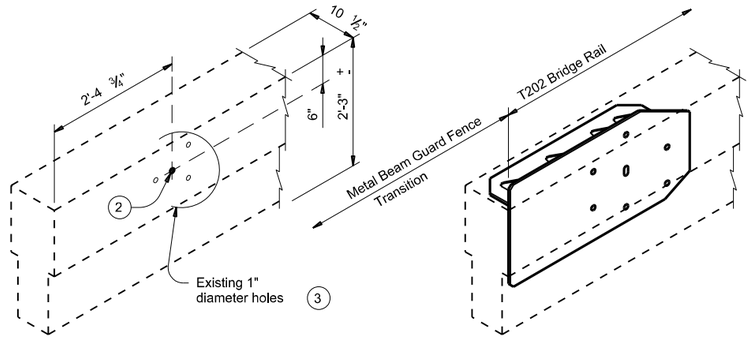
GENERAL NOTES:

These details are for retrofitting existing rails only, not new construction, with a Thrie-Beam Terminal Connection.

Shop drawings are not required for this installation.

Materials, fabrication and installation of this assembly are to be included in the price bid for "Metal Beam Guard Fence Transition".

Estimated weight of a single Anchor Plate assembly, including bolts, nuts, and washers, but not including the Thrie-Beam Terminal Connector = 190 Lbs.



EXISTING PARAPET
Shown after removal of existing MBGF Transition connector and prior to coring new bolt holes

ANCHOR PLATE PLACEMENT

INSTALLATION DETAILS

(1) The Contractor must verify that locations of bolt holes match those in the Thrie-Beam Terminal Connector to be installed in that location prior to fabrication of the Anchor Plate assembly and prior to coring bolt holes in the existing T202 parapet.

(2) If the existing holes are aligned as expected, use the indicated existing 1" diameter hole in the installation of the Anchor Plate assembly and the Thrie-Beam Terminal Connector.

(3) If the existing holes are not aligned as expected, holes that cannot be utilized in the installation and are within 3" of a new bolt hole must be filled with epoxy grout prior to coring new holes.

(4) Drill new 1" diameter holes, each with a 2 ½" diameter x 1" deep recess, through existing railing parapet. Recesses are only required when pedestrian sidewalks are adjacent to back of rail unless directed otherwise by the Engineer. Holes should be perpendicular to the roadside face of the parapet. Drill holes and recesses with coring type equipment. Percussion drilling is not allowed. Patch spalls, when directed by the Engineer, in accordance with Item 429, "Concrete Structure Repair", at the contractor's expense.

(5) 7 ~ ⅞" diameter ASTM F3125 Gr A325 Hex Head Anchor Bolts each with 2 ~ 1¾" O.D. washers. Place washer under each head and nut. Provide bolts of sufficient length to extend a minimum of ½" beyond nut. Cut excess bolt length and paint cut surface with zinc-rich paint if directed by the Engineer.

Casey B. Stripling
11-17-2022

Texas Department of Transportation

Bridge Division Standard

T202 TRANSITION RETROFIT GUIDE

T202TR

FILE:	rlstd026-18.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT	March 2018	CONT	SECT	JOB	HIGHWAY
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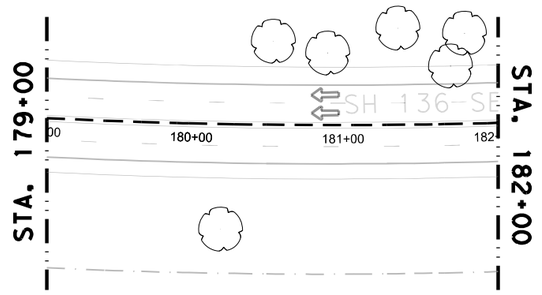
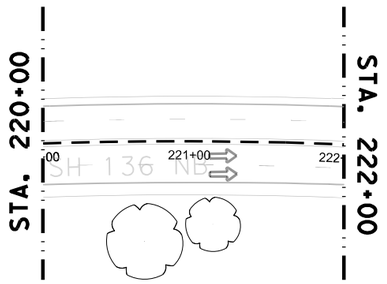
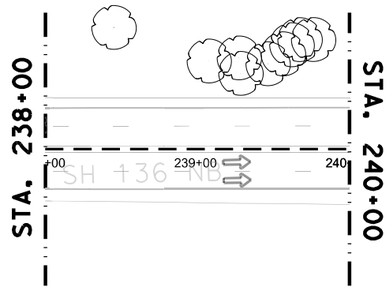
		DIST	COUNTY		SHEET NO.
		AMA	HUTCHINSON CO		76







CSJ: 0356-01-107 TREE REMOVAL LAYOUT 1 OF 5	
	100
	6006
LOCATION	PREP ROW (TREE) (LESS THAN 24" DIA)
CSJ: 0356-01-107	EA
STA 179+00 TO 182+00	5
STA 220+00 TO 222+00	2
STA 238+00 TO 240+00	10
PROJECT TOTALS:	**17**

STATE OF TEXAS
CASEY B. STRIPLING
136887
LICENSED
PROFESSIONAL ENGINEER

Casey B. Stripling

11-17-2022

SH 136

REMOVAL LAYOUT

SCALE: 1" = 100'

2023 Texas Department of Transportation

SHEET 1 OF 5

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		77

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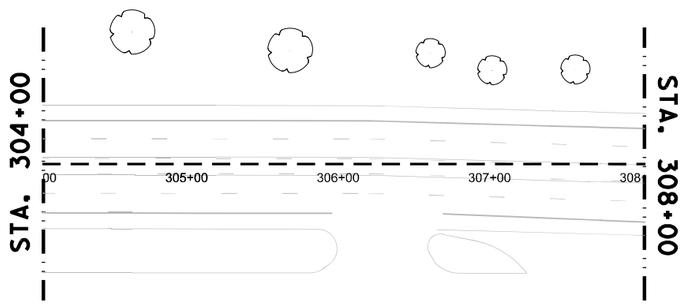

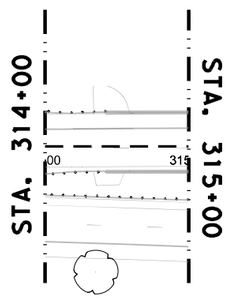

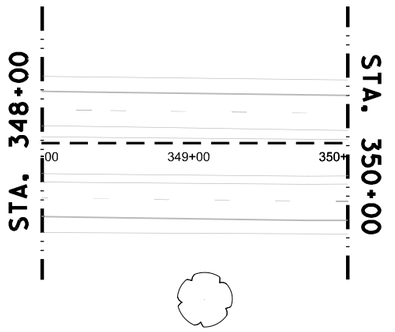

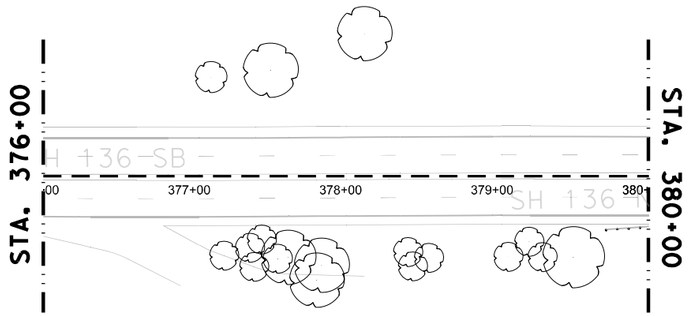

CSJ: 0356-01-107 TREE REMOVAL LAYOUT 2 OF 5		
LOCATION	100 6006 PREP ROW (TREE) (LESS THAN 24" DIA)	100 6007 PREP ROW (TREE) (GREATER THAN 24" DIA)
CSJ: 0356-01-107	EA	EA
STA 304+00 TO 308+00	3	2
STA 314+00 TO 315+00		1
STA 348+00 TO 350+00	1	
STA 376+00 TO 380+00	11	7
PROJECT TOTALS:	**15**	**10**

STATE OF TEXAS
CASEY B. STRIPLING
136887
LICENSED PROFESSIONAL ENGINEER

Casey B. Stripling

11-17-2022

SH 136

REMOVAL LAYOUT

SCALE: 1" = 100'

2023 Texas Department of Transportation

SHEET 2 OF 5

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		78

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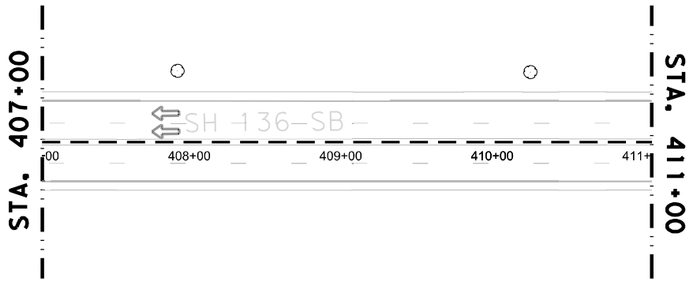

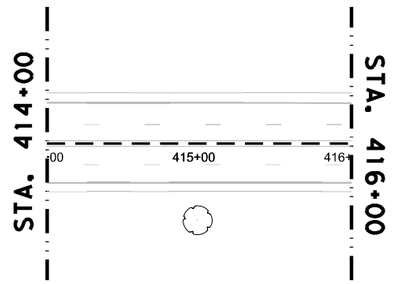

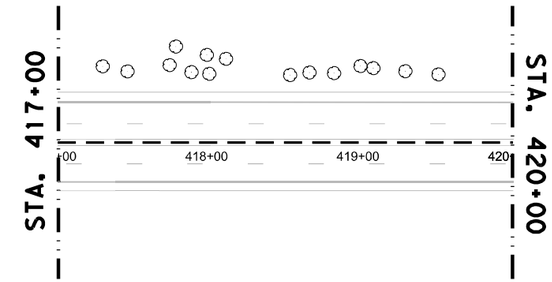

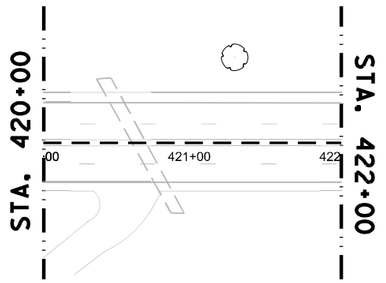

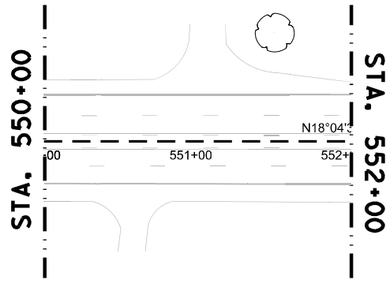

CSJ: 0356-01-107 TREE REMOVAL LAYOUT 3 OF 5		
LOCATION	100 6006 PREP ROW (TREE) (LESS THAN 24" DIA)	100 6007 PREP ROW (TREE) (GREATER THAN 24" DIA)
CSJ: 0356-01-107	EA	EA
STA 407+00 TO 411+00	2	
STA 414+00 TO 416+00	1	
STA 417+00 TO 420+00	14	
STA 420+00 TO 422+00	1	
STA 550+00 TO 552+00		1
PROJECT TOTALS:	**18**	**1**

STATE OF TEXAS
CASEY B. STRIPLING
136887
LICENSED PROFESSIONAL ENGINEER

Casey B. Stripling

11-17-2022

SH 136

REMOVAL LAYOUT

SCALE: 1" = 100'

2023 Texas Department of Transportation

SHEET 3 OF 5

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		79

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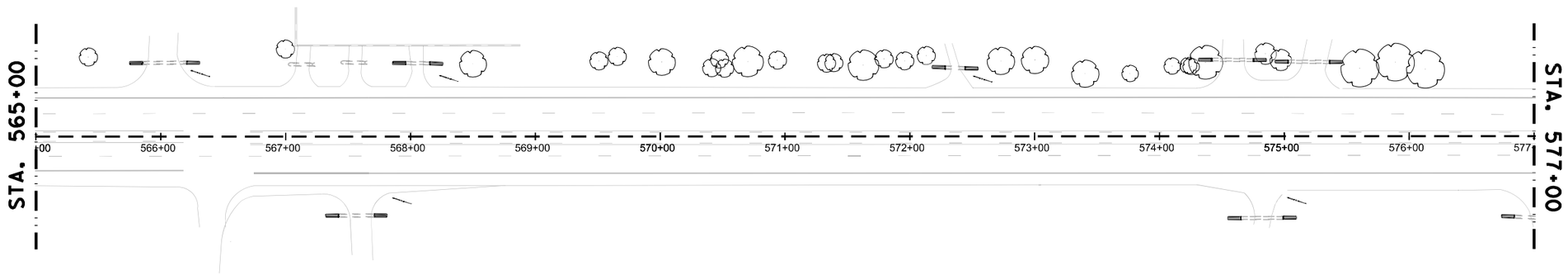

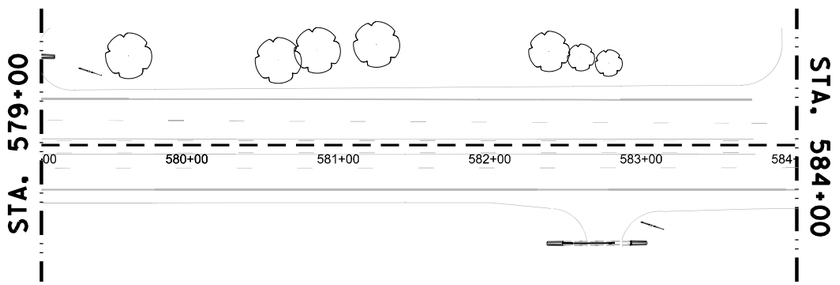

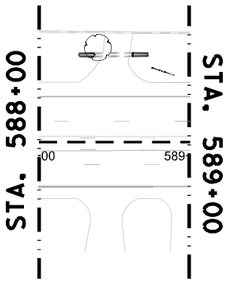

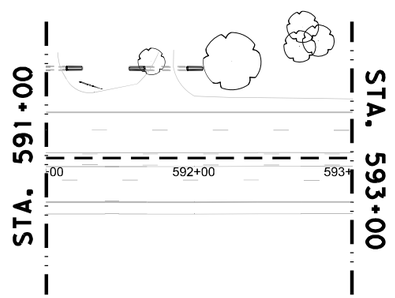

CSJ: 0356-01-107 TREE REMOVAL LAYOUT 4 OF 5		
LOCATION	100 6006 PREP ROW (TREE) (LESS THAN 24" DIA)	100 6007 PREP ROW (TREE) (GREATER THAN 24" DIA)
CSJ: 0356-01-107	EA	EA
STA 565+00 TO 577+00	19	11
STA 579+00 TO 584+00	2	5
STA 588+00 TO 589+00	1	
STA 591+00 TO 593+00	4	1
PROJECT TOTALS:	**26**	**17**

STATE OF TEXAS
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136887
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PROFESSIONAL ENGINEER

Casey B. Stripling

11-17-2022

SH 136

REMOVAL LAYOUT

SCALE: 1" = 100'

2023 Texas Department of Transportation

SHEET 4 OF 5

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		80

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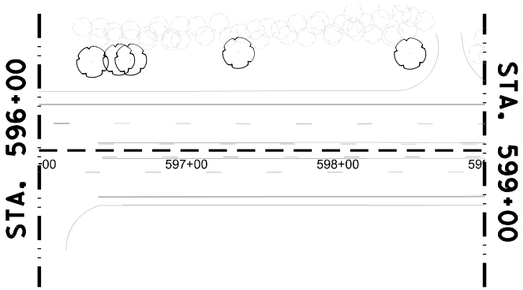

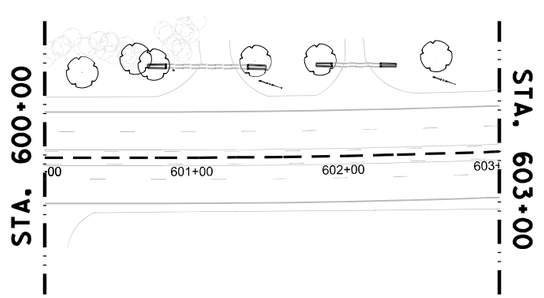

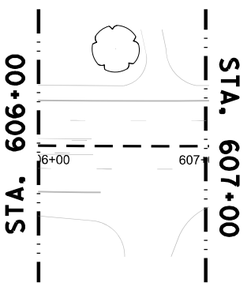

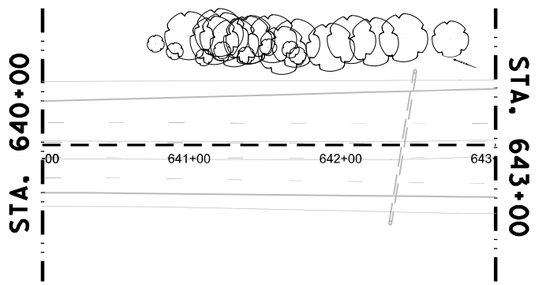

CSJ: 0356-01-107 TREE REMOVAL LAYOUT 5 OF 5		
LOCATION	100 6006 PREP ROW (TREE) (LESS THAN 24" DIA)	100 6007 PREP ROW (TREE) (GREATER THAN 24" DIA)
CSJ: 0356-01-107	EA	EA
STA 596+00 TO 599+00	3	1
STA 600+00 TO 603+00		4
STA 606+00 TO 607+00		1
STA 640+00 TO 643+00	11	14
PROJECT TOTALS:	**14**	**20**

STATE OF TEXAS
CASEY B. STRIPLING
136887
LICENSED PROFESSIONAL ENGINEER

Casey B. Stripling

11-17-2022

SH 136

REMOVAL LAYOUT

SCALE: 1" = 100'

2023 Texas Department of Transportation

SHEET 5 OF 5

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		81

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DATE: 11/17/2022
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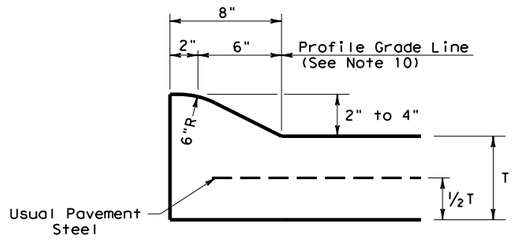
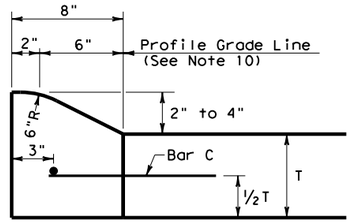
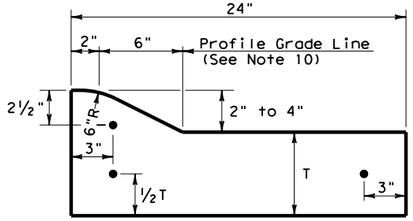


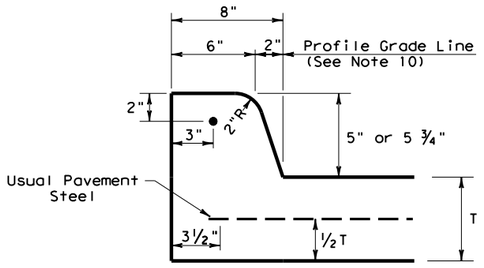
TYPE I CURB (MONOLITHIC)
2" - 4" HEIGHT



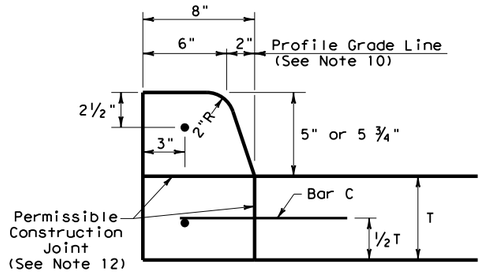
TYPE I CURB
2" - 4" HEIGHT



TYPE I CURB AND GUTTER
2" - 4" HEIGHT



TYPE II CURB (MONOLITHIC)
5" - 5 ¾" HEIGHT



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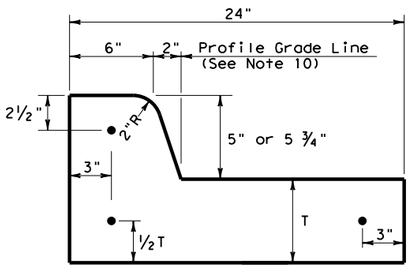
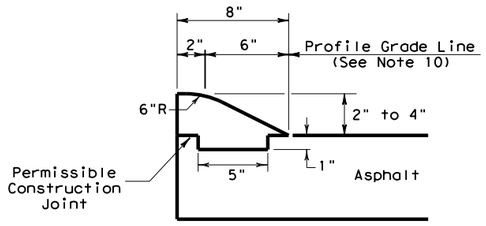
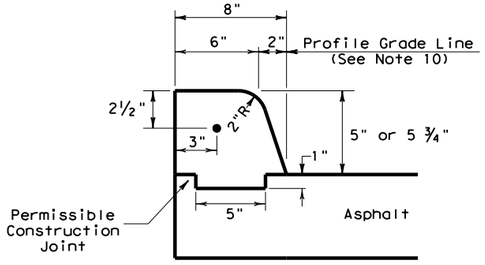


TYPE II CURB AND GUTTER
5" - 5 ¾" HEIGHT



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



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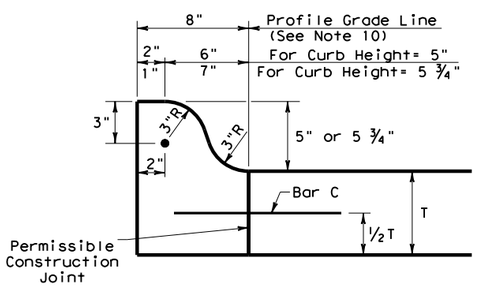
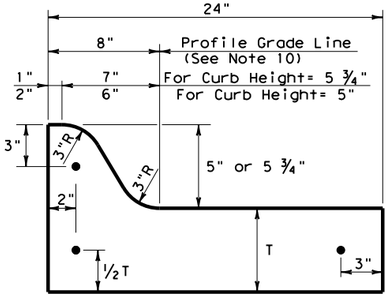
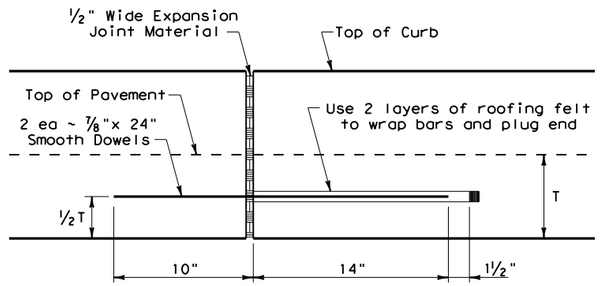


TYPE IIa CURB
5" - 5 ¾" HEIGHT

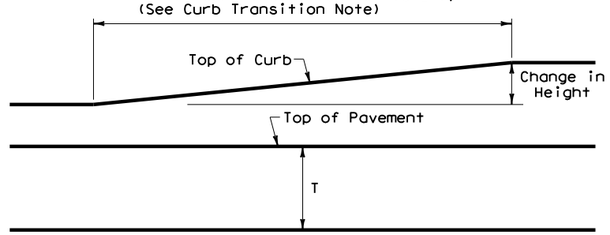


TYPE IIa CURB AND GUTTER
5" - 5 ¾" HEIGHT



EXPANSION JOINT DETAIL

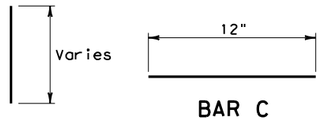
CURB TRANSITION NOTE:
Field conditions may require a longer or shorter transition, and shall be shown elsewhere in the plans, or as directed by the Engineer.



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.



BAR B

BAR C

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 REVISIONS	CONT	SECT	JOB	HIGHWAY
	0356	01	107	SH 136
	DIST	COUNTY		SHEET NO.
	AMA	HUTCHINSON CO		82

DATE: 11/17/2022
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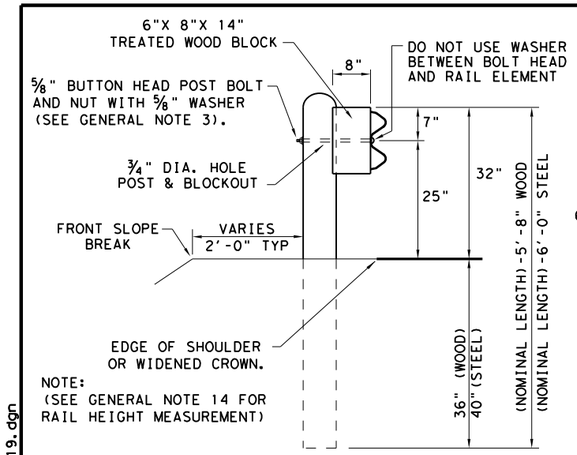
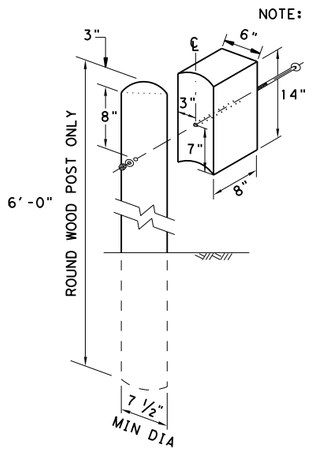
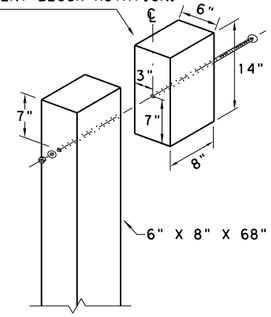


TYPICAL POST PLACEMENT

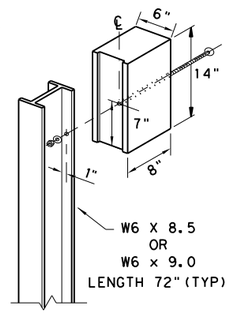


WOOD BLOCK TO ROUND WOOD POST

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

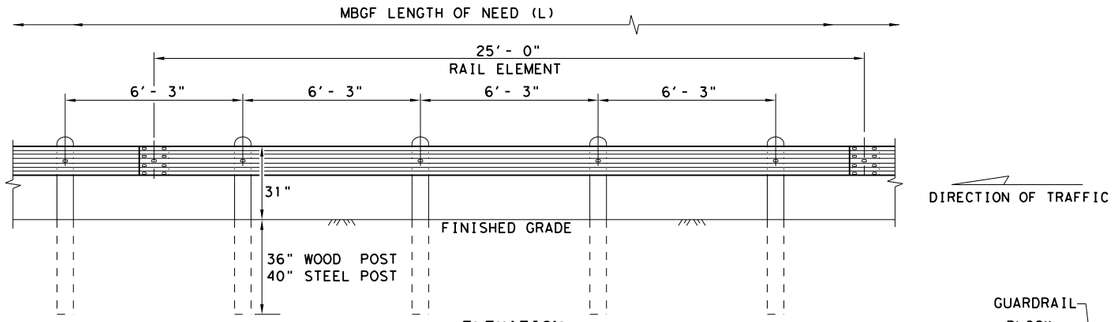


WOOD BLOCK TO RECTANGULAR WOOD POST



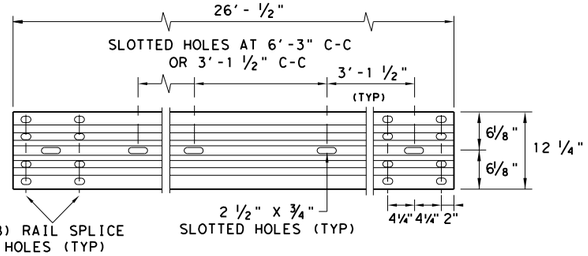
ROUTED WOOD BLOCK TO I-BEAM STEEL POST

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



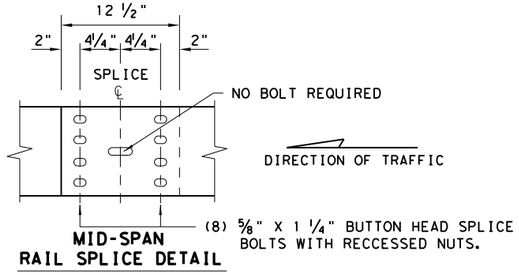
ELEVATION
MID-SPAN RAIL SPLICE

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



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

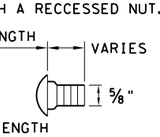
NOTES: SEE GENERAL NOTE 2 FOR ALLOWABLE RAIL TYPES.
SEE RAIL SPLICE DETAIL FOR REQUIRED HARDWARE.



MID-SPAN RAIL SPLICE DETAIL

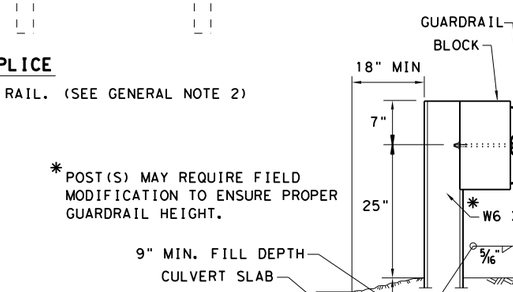
NOTE: GF(31), MID-SPAN RAIL SPLICES ARE REQUIRED WITH 6'-3" POST SPACINGS.

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



BUTTON HEAD BOLT

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



LOW FILL CULVERT POST

NOTE: TWO INSTALLATION OPTIONS.

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

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

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

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

GENERAL NOTES

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

Texas Department of Transportation — Design Division Standard

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

FILE: gf3119.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0356	01	107	SH 136
	DIST	COUNTY		SHEET NO.
	AMA	HUTCHINSON CO		83

DATE: 11/17/2022
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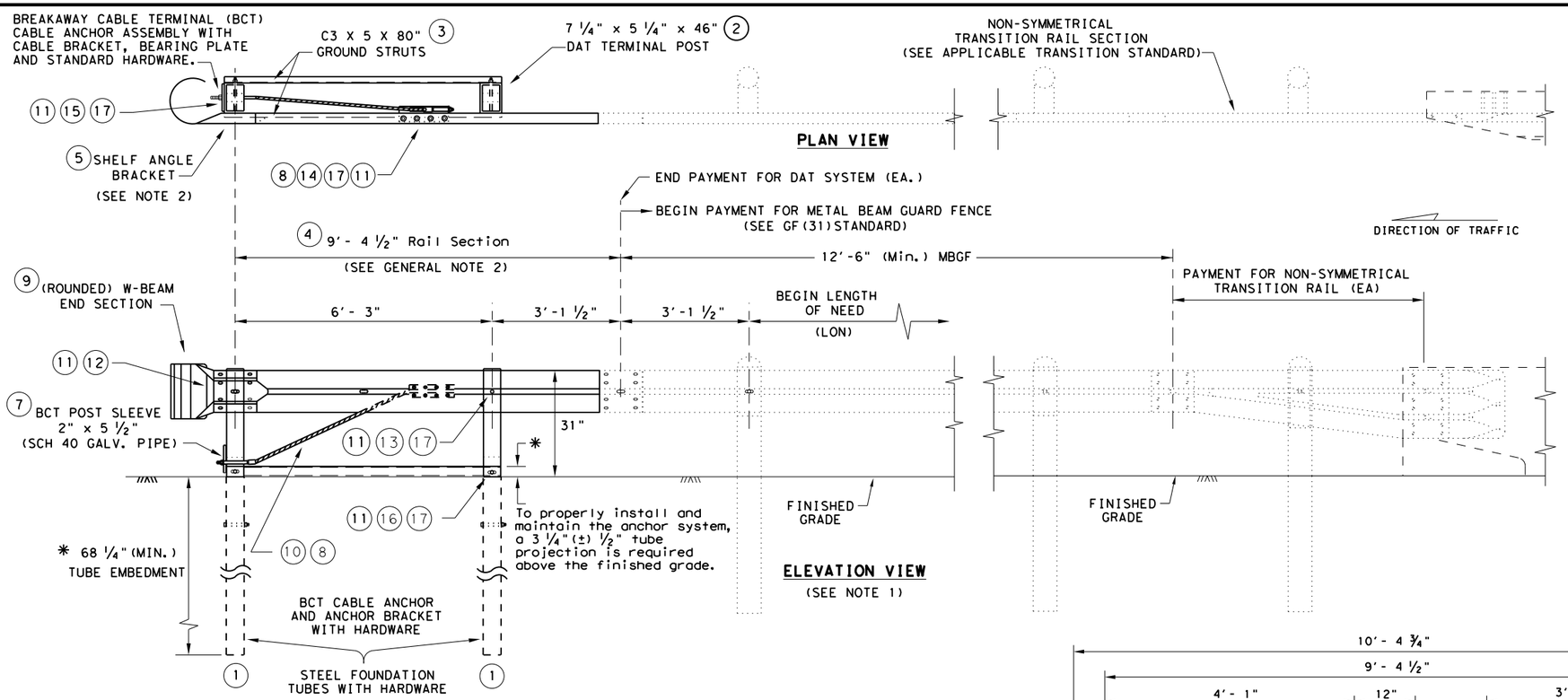


DOWNSTREAM ANCHOR TERMINAL (DAT)

NOTE: ONLY FOR DOWNSTREAM USE, WHEN LOCATED OUTSIDE THE HORIZONTAL CLEARANCE AREA OF OPPOSING TRAFFIC.

GENERAL NOTES

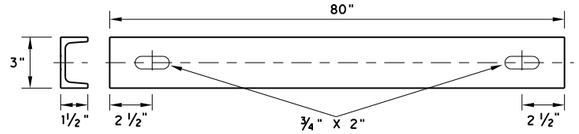
1. THE DETAIL SHOWN IS THE MINIMUM LENGTH OF NEED (LON) FOR A DOWNSTREAM ANCHOR TERMINAL (DAT) CONNECTED TO A CONCRETE RAIL.
2. THE RAIL SECTION AT THE END POST IS SUPPORTED BY THE SHELF ANGLE BRACKET. THE RAIL ELEMENT IS NOT ATTACHED TO THE END POST.
3. THE FOUNDATION TUBES SHALL NOT PROJECT MORE THAN 3 3/4" ABOVE THE FINISHED GRADE.
4. ALL HARDWARE FOR DAT SHALL BE ASTM A307 UNLESS OTHERWISE SHOWN.
5. REFER TO GF(31) SHEET FOR TERMINAL CONNECTION DETAILS.

MOW STRIP INSTALLATION

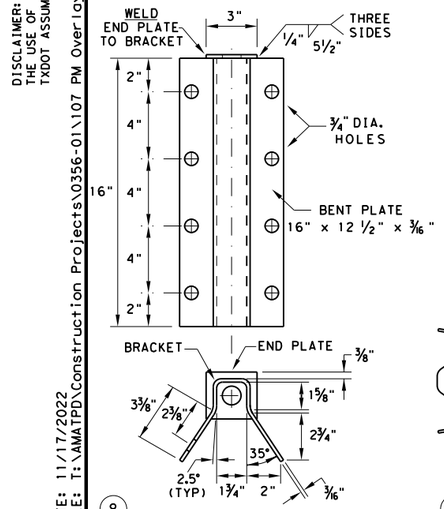
IF A MOW STRIP IS REQUIRED WITH THE DAT INSTALLATION THE LEAVE-OUT AREA AROUND THE STEEL FOUNDATION TUBES AND THE TWO CHANNEL STRUTS MAY BE OMITTED. THIS WILL REQUIRE A FULL POUR AT THE FOUNDATION TUBES.

#	(DAT) PARTS LIST	QTY
(1)	STEEL FOUNDATION TUBE	2
(2)	DAT TERMINAL POST	2
(3)	CHANNEL STRUT	2
(4)	TERMINAL RAIL ELEMENT	1
(5)	SHELF ANGLE BRACKET	1
(6)	BCT BEARING PLATE	1
(7)	BCT POST SLEEVE	1
(8)	GUARDRAIL ANCHOR BRACKET	1
(9)	(ROUNDED) W-BEAM END SECTION	1
(10)	BCT CABLE ANCHOR	1
(11)	RECESSED NUT, GUARDRAIL	20
(12)	1 1/4" BUTTON HEAD BOLT	4
(13)	10" BUTTON HEAD BOLT	2
(14)	5/8" X 2" HEX HEAD BOLT	8
(15)	5/8" X 8" HEX HEAD BOLT	4
(16)	5/8" X 10" HEX HEAD BOLT	2
(17)	5/8" FLAT WASHER	18

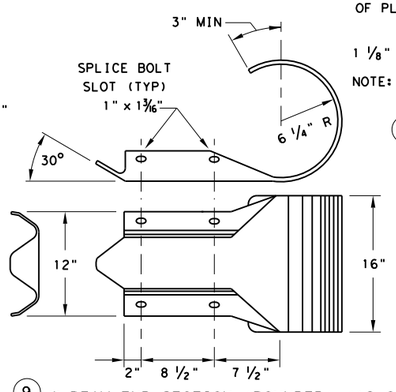
(4) TERMINAL RAIL ELEMENT FOR DAT



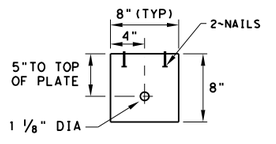
(3) CHANNEL STRUT
C3 X 5 X 80", GRADE A36



(8) GUARDRAIL ANCHOR BRACKET

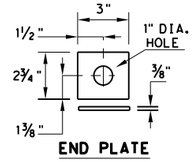


(9) W-BEAM END SECTION (ROUNDED) (12 GA.)

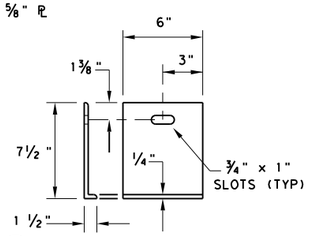


NOTE: DRIVE NAILS AND BEND OVER TO PREVENT PLATE ROTATION

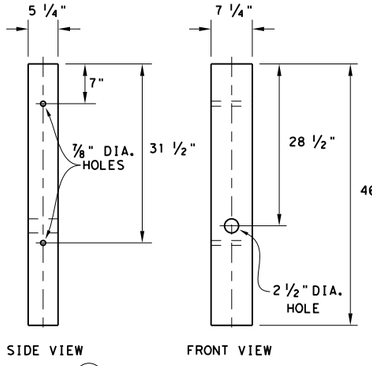
(6) BEARING PLATE
8"x 8"x 5/8" PL



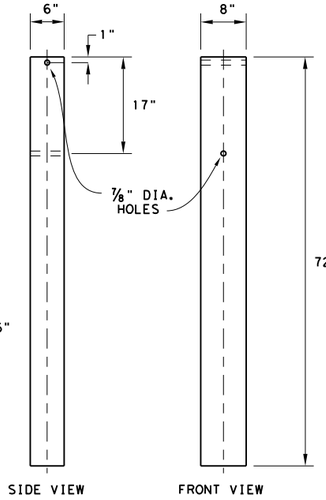
END PLATE



(5) SHELF ANGLE BRACKET



(2) TERMINAL POST
7 1/4"x 5 1/4"x 46" WOOD POST



(1) STEEL FOUNDATION TUBE
6"x 8"x 1/8" x 72" STEEL TUBE

Texas Department of Transportation

Design Division Standard

METAL BEAM GUARD FENCE
(DOWNSTREAM ANCHOR TERMINAL)
TL-3 MASH COMPLIANT

GF(31)DAT-19

FILE: gf31dat19.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
© TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0356	01	107	SH 136
	DIST	COUNTY		SHEET NO.
	AMA	HUTCHINSON CO		84

DATE: 11/17/2022
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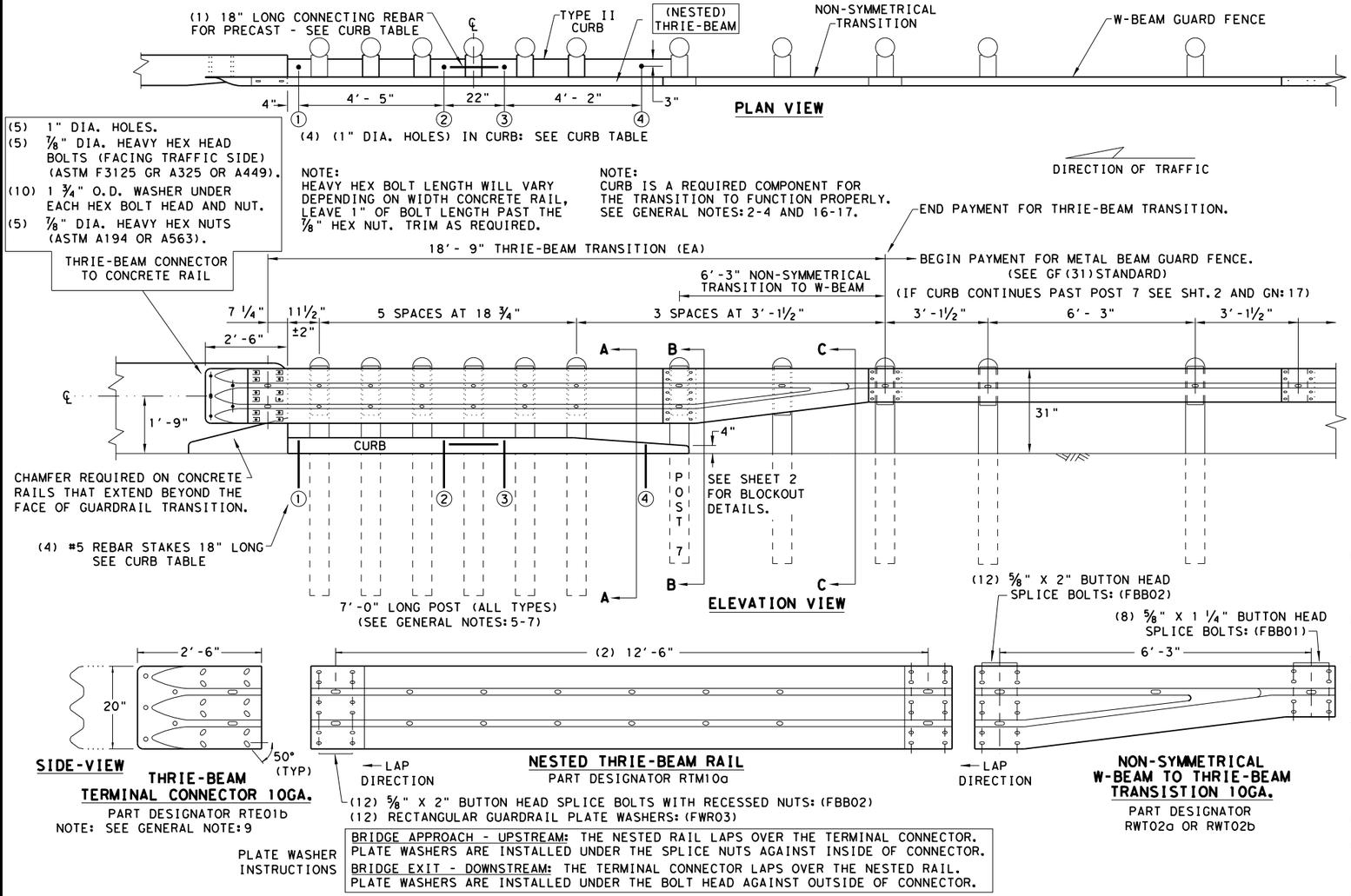


GENERAL NOTES

1. CONTACT THE DESIGN DIVISION FOR DRAINAGE CUT OUT OPTIONS NEEDED WITHIN THE CURB SECTION OF THE THRIE-BEAM TRANSITION. (512) 416-2678
2. CONCRETE CURB MAY BE CAST-IN-PLACE OR PRECAST AS SHOWN ON THIS SHEET. WHEN USED IN CONJUNCTION WITH THE THRIE-BEAM TRANSITIONS, CURB SHALL BE TYPE II (5- ¾" HEIGHT); SEE CURRENT CCCG STANDARD SHEET FOR FURTHER DETAILS. IF OTHER CURB HEIGHTS ARE SHOWN IN THE PLANS IN CONJUNCTION WITH THE TRANSITION, THE CURB HEIGHT MAY BE FROM 4" TO 8" WITH A RELATIVELY VERTICAL FACE. CONCRETE CURB SHALL BE CONTINUOUS TO THE SEVENTH POST UNLESS OTHERWISE SHOWN IN THE PLANS. SEE GENERAL NOTE: 17 FOR CIRCUMSTANCES WHERE CURB CONTINUES PAST POST 7.
3. CONCRETE CURB TYPE II SUBSIDIARY TO "METAL BEAM GUARD FENCE TRANSITION". IF NO ADDITIONAL CURB IS INDICATED BEYOND THE TRANSITION, THEN ANY CURB HEIGHT GREATER THAN 4" WILL BE TAPERED DOWN BEGINNING AT THE LAST 7 FT. POST TO A MAXIMUM HEIGHT OF 4" AT POST 7. IF SHOWN ELSEWHERE IN THE PLANS, ADDITIONAL CURB UNDERNEATH GUARDRAIL WILL BE PAID FOR BY THE LINEAR FOOT.
4. UNLESS OTHERWISE SHOWN IN THE PLANS, TRANSITIONS SHALL BE PLACED WITH THE BLOCKOUT FACE IN FRONT OF OR DIRECTLY ABOVE THE CURB FACE. SEE SECTION A-A.
5. FOR ROUND WOOD POST SYSTEMS, ALL ROUND WOOD POSTS SHALL BE 7 ½" DIA. MINIMUM THROUGHOUT THE THRIE-BEAM TRANSITION.
6. THE TYPE OF POST (ROUND WOOD POST, RECTANGULAR WOOD POST OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. REFER TO GF(31) STANDARD SHEET.
7. THE POST LENGTH SHALL BE MARKED ON ALL 7'- 0" LONG POSTS BY THE MANUFACTURER. THE MARK SHALL BE LOCATED WITHIN THE TOP 1 FT. REGION OF THE POST, AT LEAST ⅝" IN HEIGHT, AND VISIBLE AFTER INSTALLATION. WOODEN POSTS SHALL BE MARKED WITH A BRAND, AND STEEL POSTS WITH A STENCIL BEFORE GALVANIZING.
8. POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
9. RAIL ELEMENTS SHALL MEET THE REQUIREMENTS OF ITEM 540, "METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED ON THE PLANS. THE THRIE-BEAM TERMINAL CONNECTOR AND THE THRIE-BEAM TRANSITION TO W-BEAM SHALL BE OF THE SAME MATERIAL, BUT SHALL NOT BE LESS THAN 10 GAUGE. CONTRACTOR SHALL VERIFY THAT THE LOCATIONS OF BOLT HOLES MATCH THOSE IN THE THRIE-BEAM TERMINAL CONNECTOR PRIOR TO ORDERING MATERIALS.
10. BUTTON HEAD "POST BOLTS & NUTS" SHALL MEET THE REQUIREMENTS OF (ASTM A307), AND SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT AND ⅝" WASHER (FWC16a) AND NOT MORE THAN 1" BEYOND IT. TRIM REMAINING BOLT LENGTH TO MEET REQUIRED LENGTH.
11. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
12. CROWN SHALL BE WIDENED TO ACCOMMODATE TRANSITIONS.
13. WHERE SOLID ROCK IS ENCOUNTERED, CONTACT THE DESIGN DIVISION FOR ADDITIONAL GUIDANCE. (512) 416-2678
14. UNLESS OTHERWISE SHOWN IN THE PLANS, A COMPOSITE MATERIAL BLOCK THAT MEETS THE REQUIREMENTS OF DMS-7210, "COMPOSITE MATERIAL POSTS AND BLOCKS FOR METAL BEAM GUARD FENCE" MAY BE SUBSTITUTED FOR BLOCKS OF SIMILAR DIMENSIONS. TXDOT'S MATERIALS AND TESTS DIVISION MAINTAINS A MATERIAL PRODUCER LIST (MPL) FOR PRODUCERS OF MATERIALS CONFORMING TO DMS-7210. ONLY PRODUCERS ON THE MPL CAN FURNISH COMPOSITE MATERIAL BLOCKS.
15. REFER TO GF(31) STANDARD SHEET & BRIDGE RAILING DETAILS FOR ADDITIONAL DETAILS.
16. THE INSTALLATION OF THE TYPE II CURB IS CRITICAL FOR THE PERFORMANCE OF THE THRIE-BEAM TRANSITION SYSTEM. THE CURB PREVENTS (VEHICLE WHEEL SNAGGING) AT THE CONCRETE RAIL AND IS REQUIRED TO MEET MASH CRASH TEST CRITERIA.
17. IF CURB EXTENDS BEYOND POST 7, 25' OF NESTED W-BEAM GUARDRAIL SHALL BE INSTALLED BEYOND THE PAY LIMITS OF THRIE-BEAM TRANSITION SECTION, (SEE SHT.2). PAYMENT FOR THIS 25' SECTION WILL BE BY LINEAR FOOT, PAY ITEM "0540 6XXX MTL W-BEAM GD FEN (NESTED) (TIM POST)" OR "540 6XXX MTL W-BEAM GD FEN (NESTED) (STEEL POST)" AS APPLICABLE FOR POST TYPE. SEE SHT.2 FOR ADDITIONAL INFORMATION.

THRIE-BEAM TERMINAL - CURB TABLE

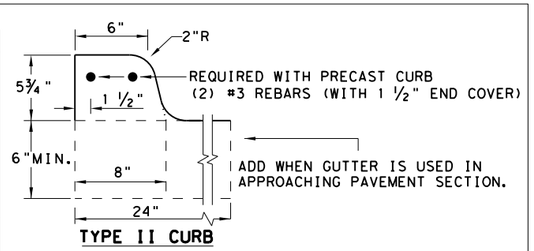
PRECAST CURB FULL LENGTH EQUALS 12'- 2"
THE PRECAST CURB MAY BE FORMED INTO TWO SECTIONS.

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

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

SECURING PRECAST OR CAST-IN-PLACE TO FINISHED GRADE *:
FORM OR CORE (4) 1" DIA. HOLES, SEE PLAN AND ELEVATION VIEWS FOR HOLE LOCATIONS. DRIVE (4) #5 GR.60 REBAR STAKES 18" LONG INTO THE GROUND AND ½" BELOW TOP OF CURB.
FILL HOLES WITH APPROVED GROUT MIXTURE.

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



TYPE II CURB

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

TYPE II CURB DETAILS

HIGH-SPEED TRANSITION

SHEET 1 OF 2

Texas Department of Transportation | Design Division Standard

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

GF(31)TR TL3-20

FILE: gf31tr1320.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG	
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REVISIONS	0356	01	107	SH 136	
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	AMA	HUTCHINSON CO		85	

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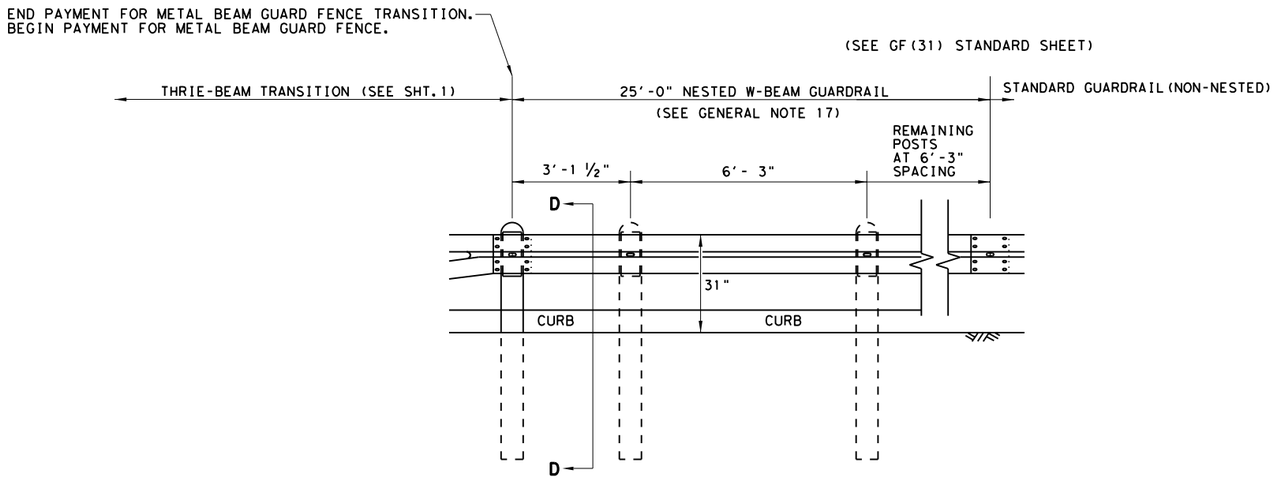
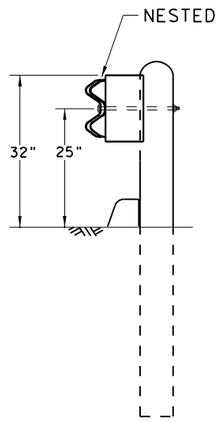
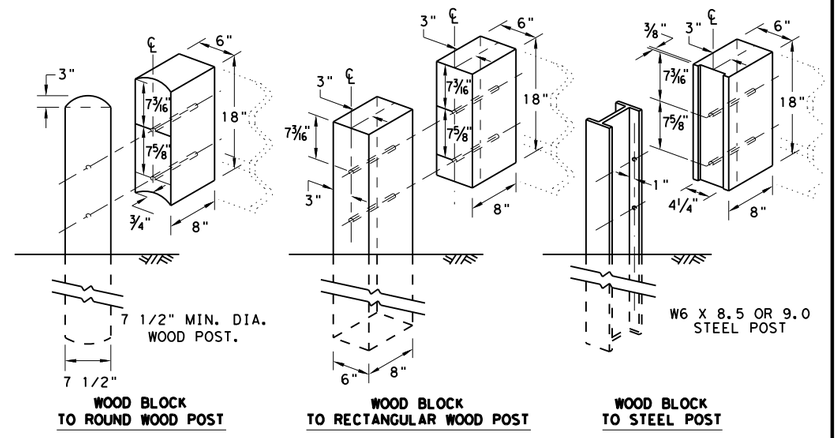
REQUIRED ALTERNATIVE FOR CONTINUOUS CURB EXTENDING PAST POST 7 (SEE SHT. 1 GENERAL NOTE 17)



ELEVATION VIEW



SECTION D-D



THRIE BEAM TRANSITION BLOCKOUT DETAILS

HIGH-SPEED TRANSITION

SHEET 2 OF 2

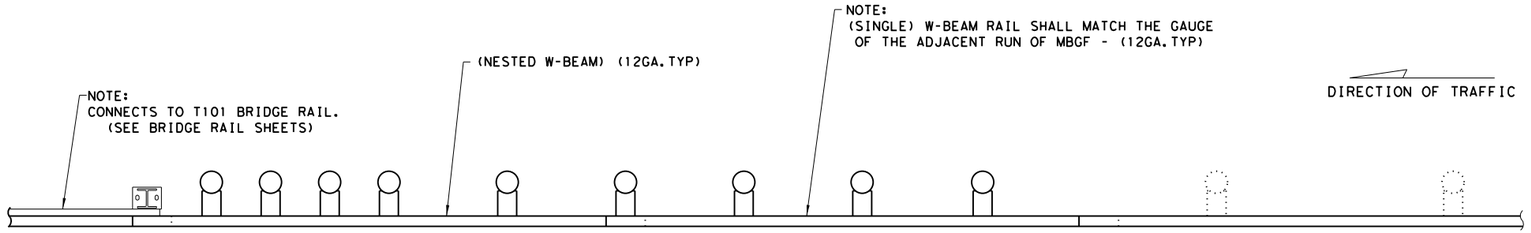
Texas Department of Transportation | Design Division Standard

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

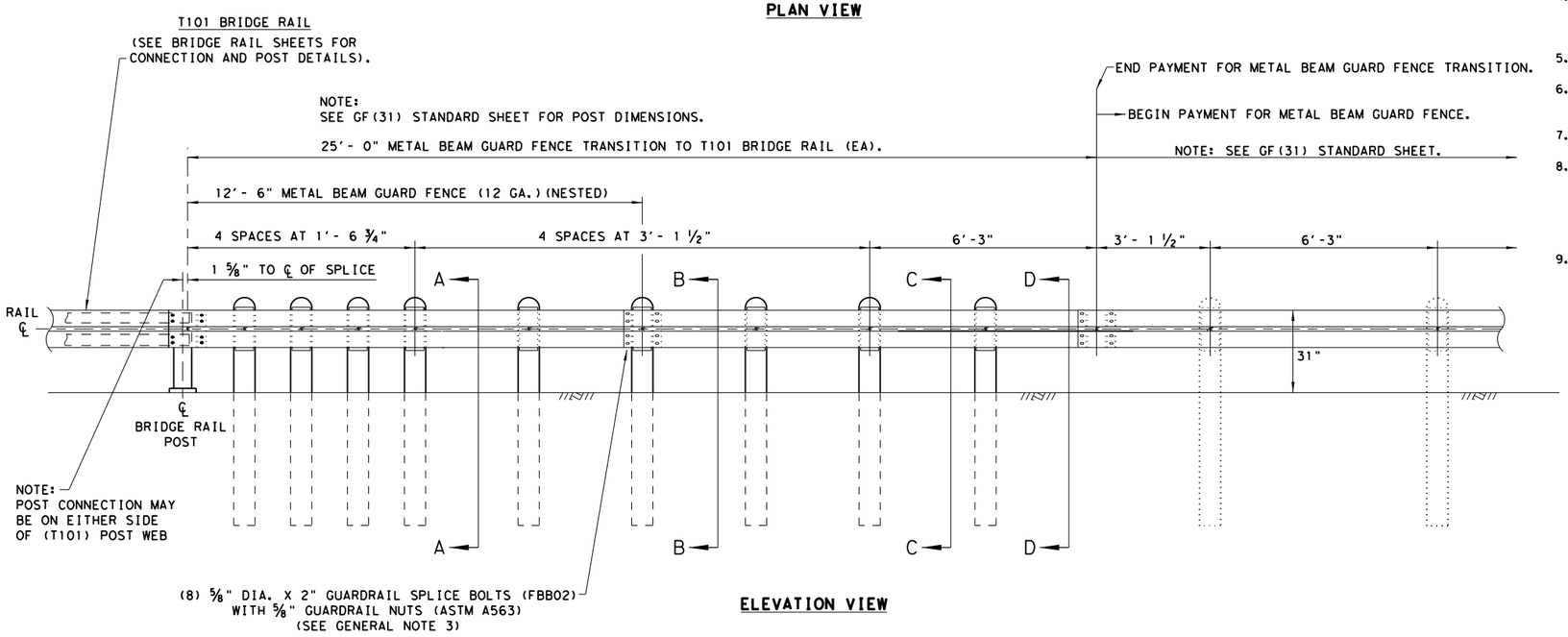
GF(31)TR TL3-20

FILE: gf31tr1320.dgn	DN: TxDOT	CK: KM	DW: KM	CK: CGL/AG	
©TxDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0356	01	107	SH 136	
	DIST	COUNTY		SHEET NO.	
	AMA	HUTCHINSON CO		86	

DATE: 11/17/2022
FILE: T:\AMATPD\Construction Projects\0356-01\107 PM Overlay\4 - Design\Plan Set\3. Roadway\ROADWAY DETAILS STANDARDS\GF (31) T101-19.dgn

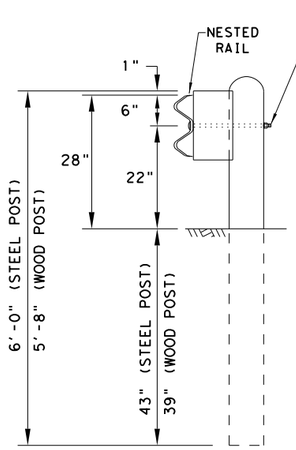


PLAN VIEW

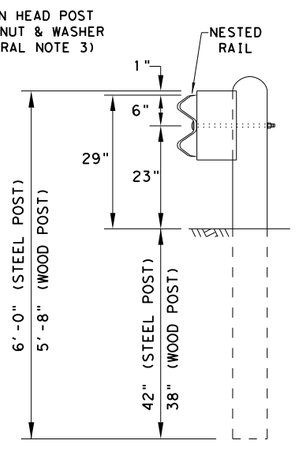


ELEVATION VIEW

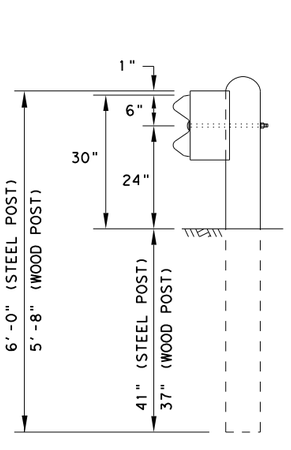
* "WOOD" INDICATES DIMENSIONS FOR BOTH ROUND AND RECTANGULAR WOOD POST SYSTEMS.



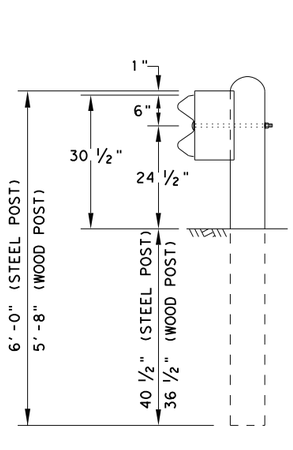
SECTION A-A



SECTION B-B



SECTION C-C



SECTION D-D

GENERAL NOTES

1. THE TYPE OF POST (ROUND WOOD POST, RECTANGULAR WOOD POST, OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. THE EXACT POSITION OF MBGF SHALL BE SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER. STEEL POSTS TO BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING."
2. RAIL ELEMENT SHALL MEET THE REQUIREMENTS OF ITEM 540,"METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED IN THE PLANS. THE CONTRACTOR MAY FURNISH RAIL ELEMENTS OF 25'- 0", OR 12'- 6" (NOM.) LENGTHS. RAIL ELEMENTS MAY HAVE SLOTTED HOLES AT 3'- 1 1/2" C-C OR 6'-3" C-C. A SPECIAL LENGTH OF RAIL MAY BE MANUFACTURED TO ACCOMMODATE THE TRANSITION SECTIONS OF GUARDRAIL.
3. BUTTON HEAD "POST" BOLTS (ASTM A307 GR.A) SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT (ASTM A563) AND 5/8" ROUND WASHER (ASTM F436) AND NOT MORE THAN 1" BEYOND IT. BUTTON HEAD "SPLICE" BOLTS (ASTM A307) ARE 5/8" X 1- 1/4" WITH 5/8" NUTS (ASTM A563).
4. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING." FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM REQUIRING CONSTRUCTION OF THE TRANSITION.
5. CROWN SHALL BE WIDENED TO ACCOMMODATE THE METAL BEAM GUARD FENCE.
6. WHERE SOLID ROCK IS ENCOUNTERED. CONTACT THE DESIGN DIVISION FOR ADDITIONAL GUIDANCE. (512) 416-2678
7. POSTS SHALL NOT BE SET IN CONCRETE.
8. UNLESS OTHERWISE SHOWN IN THE PLANS, A COMPOSITE MATERIAL BLOCK THAT MEETS THE REQUIREMENTS OF DMS-7210,"COMPOSITE MATERIAL POSTS AND BLOCKS FOR METAL BEAM GUARD FENCE" MAY BE SUBSTITUTED FOR BLOCKS OF SIMILAR DIMENSIONS. THE CONSTRUCTION DIVISION, TXDOT MAINTAINS A MATERIAL PRODUCER LIST (MPL) FOR PRODUCERS OF MATERIALS CONFORMING TO DMS-7210. ONLY PRODUCERS ON THE MPL MAY FURNISH COMPOSITE MATERIAL BLOCKS.
9. REFER TO STANDARD GF(31) AND APPLICABLE BRIDGE RAILING STANDARD FOR ADDITIONAL DETAILS.

Texas Department of Transportation

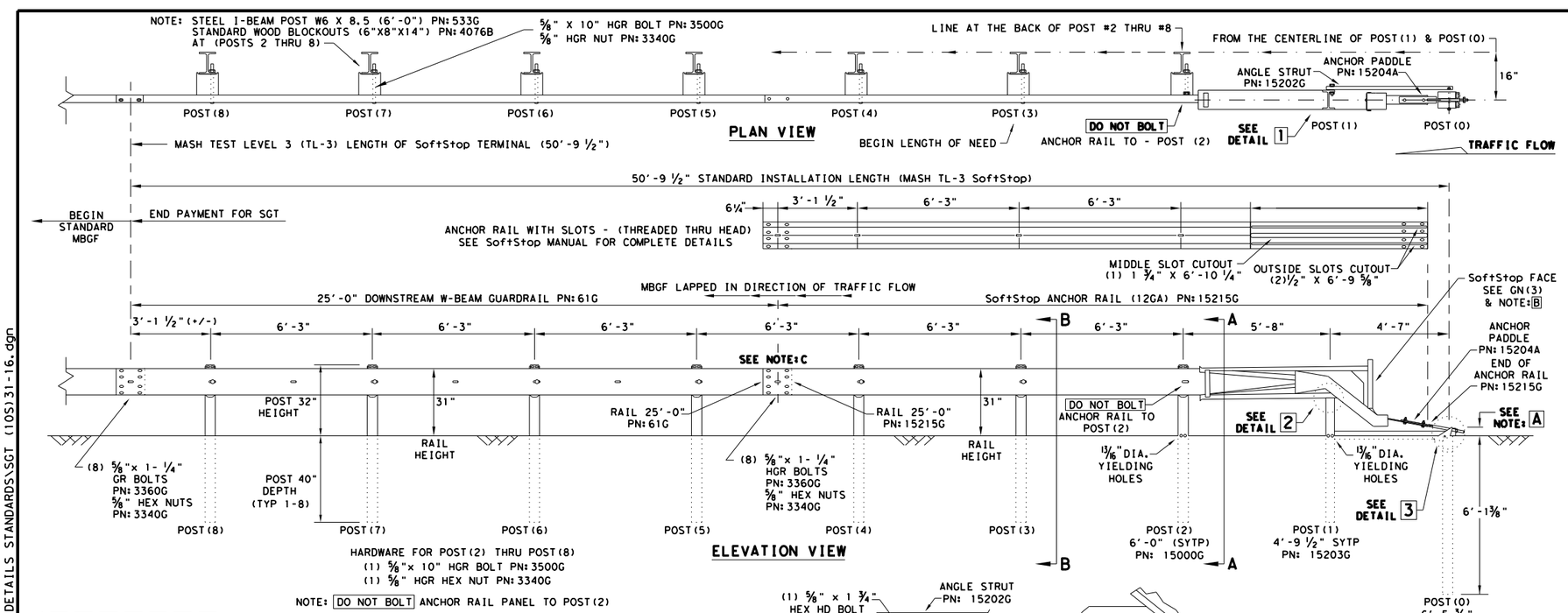
Design Division Standard

METAL BEAM GUARD FENCE TRANSITION (T101)

GF(31)T101-19

FILE: gf31t10119	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0356	01	107	SH 136
	DIST	COUNTY		SHEET NO.
	AMA	HUTCHINSON CO		87

DATE: 11/17/2022
FILE: I:\AMA\PD\Construction Projects\0356-01\107 PM Overlay\4 - Design\Plan Set\3. Roadway\ROADWAY DETAILS STANDARDS\SGT (10S)31-16.dgn



GENERAL NOTES

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

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

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

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

Texas Department of Transportation

Design Division Standard

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

FILE: sgt10s3116	DN: TxDOT	CK: KM	DW: VP	CK: MB/VP		
©TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY		
REVISIONS	0356	01	107	SH 136		
	DIST	COUNTY		SHEET NO.		
	AMA	HUTCHINSON CO		88		

DATE: 11/17/2022
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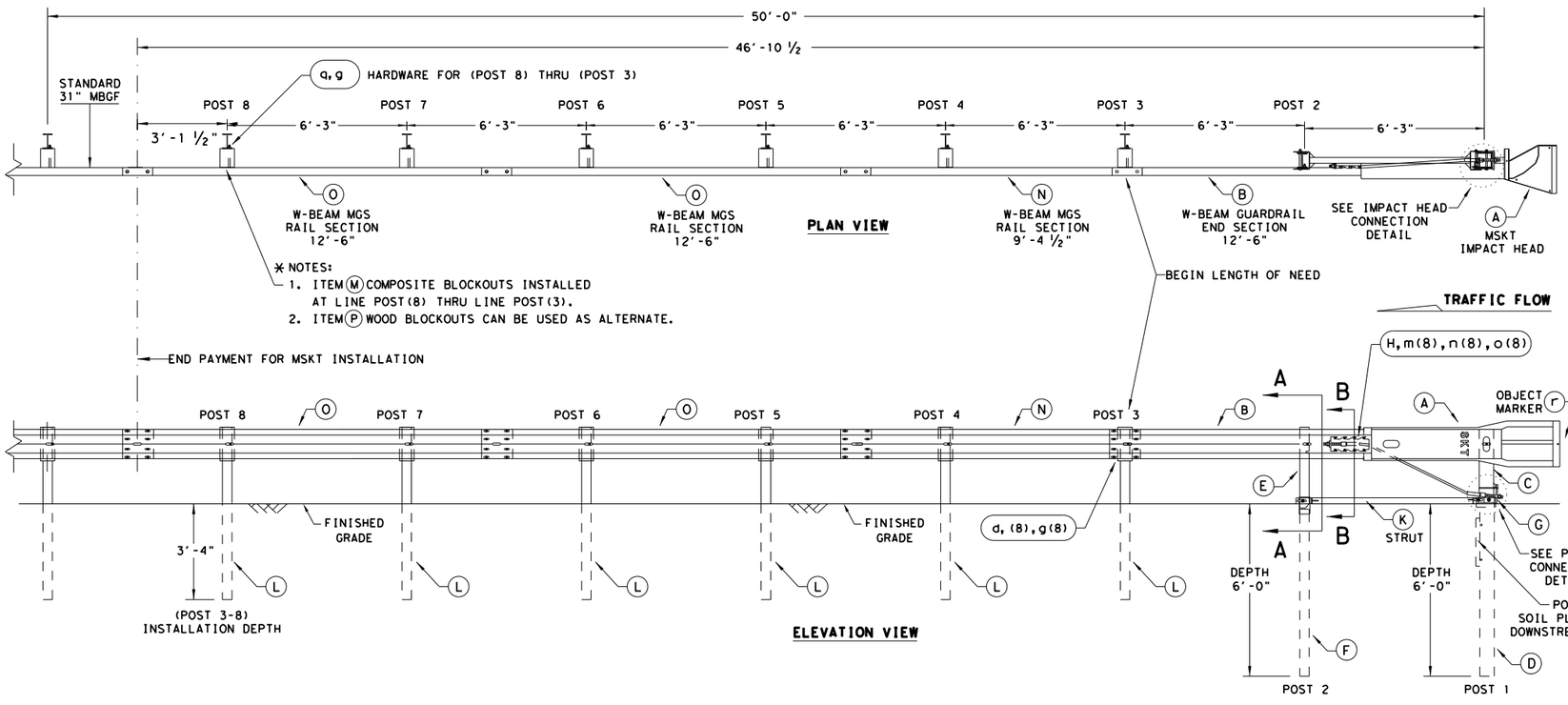


NOTE: SEE (GENERAL NOTE 14) FOR DRIVING CAP INFORMATION.

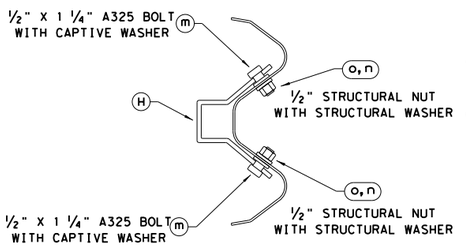
GENERAL NOTES

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

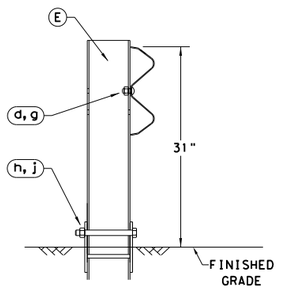
ITEM	QTY	MAIN SYSTEM COMPONENTS	ITEM NUMBERS
A	1	MSKT IMPACT HEAD	MS3000
B	1	W-BEAM GUARDRAIL END SECTION, 12 Ga.	SF1303
C	1	POST 1 - TOP (6" X 6" X 1/8" TUBE)	MTPHP1A
D	1	POST 1 - BOTTOM (6' W6X15)	MTPHP1B
E	1	POST 2 - ASSEMBLY TOP	UHP2A
F	1	POST 2 - ASSEMBLY BOTTOM (6' W6X9)	HP2B
G	1	BEARING PLATE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

SEE NOTES: *

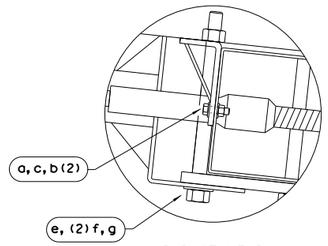
ALTERNATIVE ITEMS NOT SHOWN. **
* ITEM(P) 8" WOOD-BLOCKOUT
** ITEM(Q) 25'GUARD FENCE PANEL



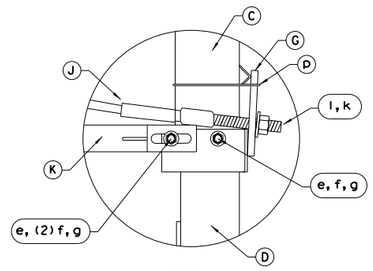
SECTION B-B
ANCHOR BRACKET



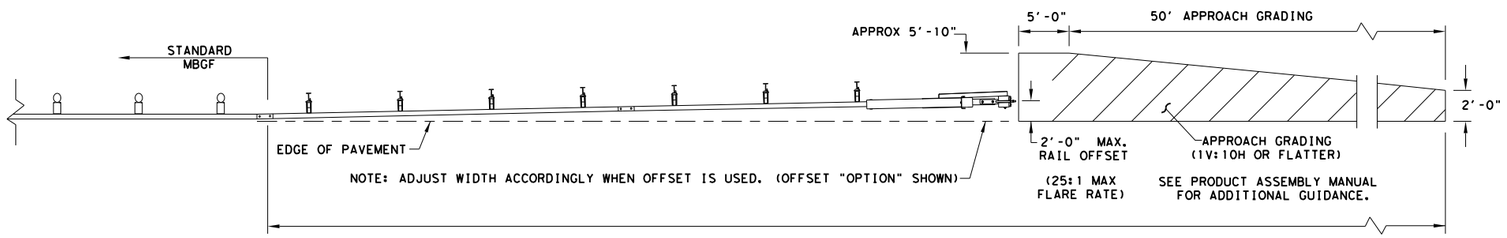
POST 2
SECTION A-A



IMPACT HEAD
CONNECTION DETAIL



POST 1
CONNECTION DETAIL



NOTE: ADJUST WIDTH ACCORDINGLY WHEN OFFSET IS USED. (OFFSET "OPTION" SHOWN)

TRAFFIC FLOW

APPROACH GRADING AT GUARDRAIL END TREATMENTS

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

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

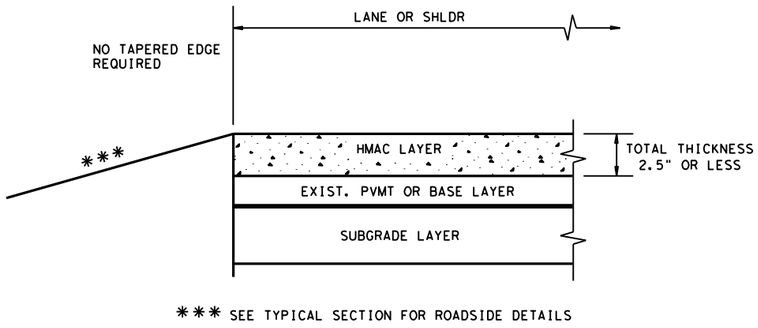
Texas Department of Transportation

Design Division Standard

SINGLE GUARDRAIL TERMINAL
MSKT-MASH-TL-3
SGT(12S)31-18

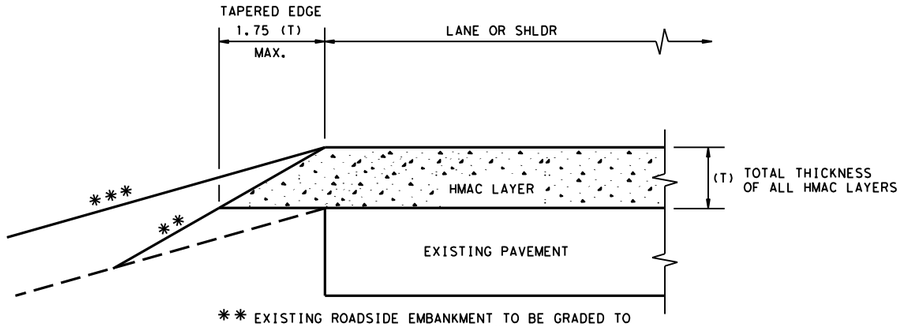
FILE: sgt12s3118.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CL	
© TxDOT: APRIL 2018	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0356	01	107	SH 136	
	DIST	COUNTY		SHEET NO.	
	AMA	HUTCHINSON CO		89	

DATE: 11/17/2022
FILE: T:\AMATPD\Construction Projects\0356-01\107 PM Overlay\4 - Design\Plan Set\3. Roadway\ROADWAY DETAILS STANDARDS\TE (HMAC)-11.dgn



*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

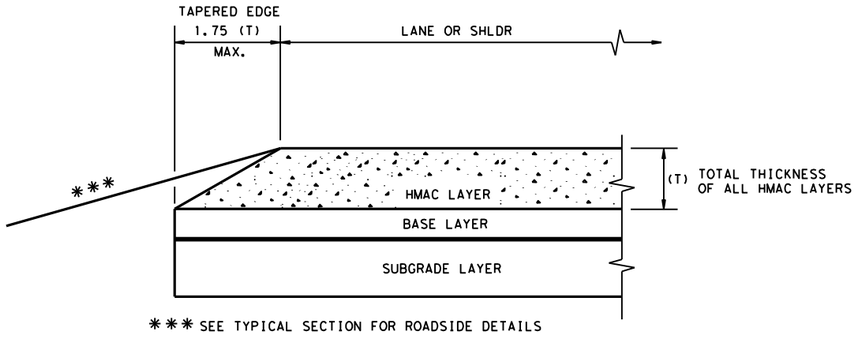
CONDITION - 1
THIN HMAC SURFACES OR HMAC OVERLAY WITH THICKNESS OF 2.5" OR LESS



** 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.

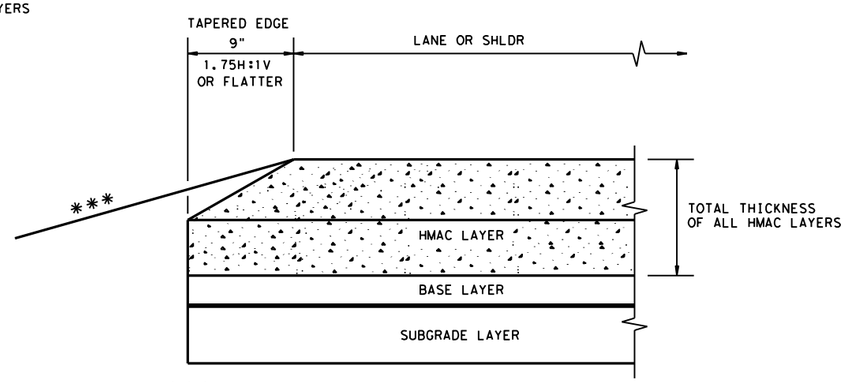
*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

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

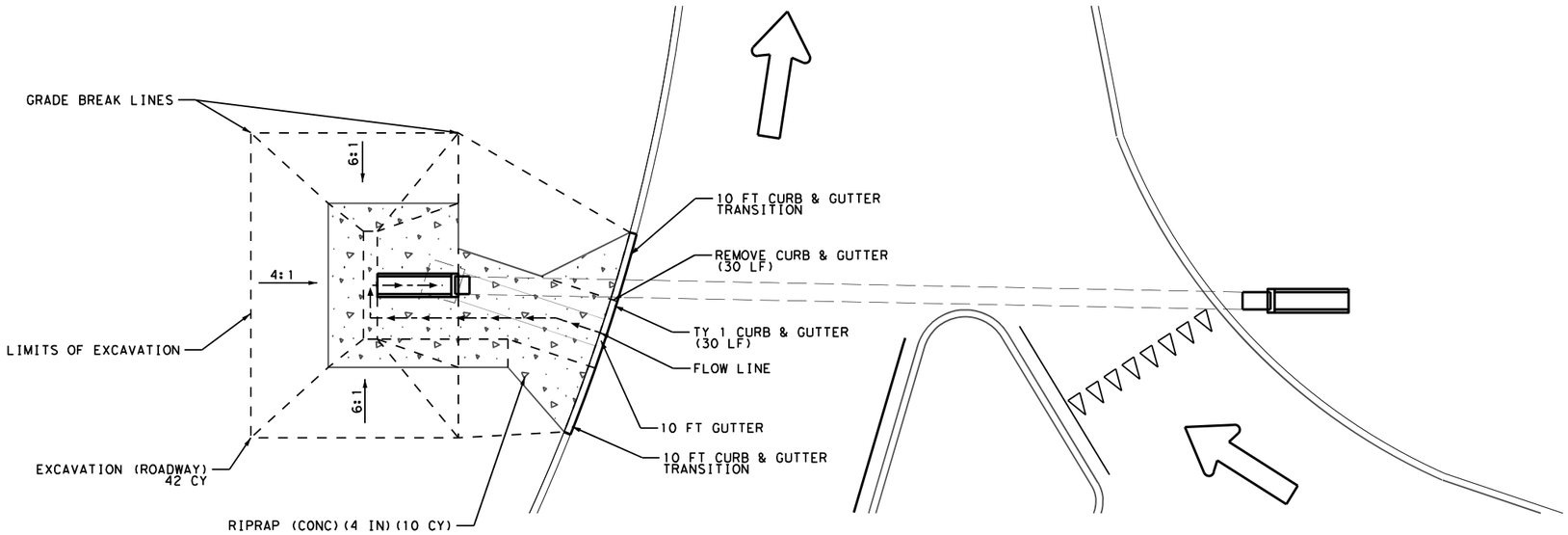
TAPERED EDGE DETAILS HMAC PAVEMENT

TE(HMAC)-11

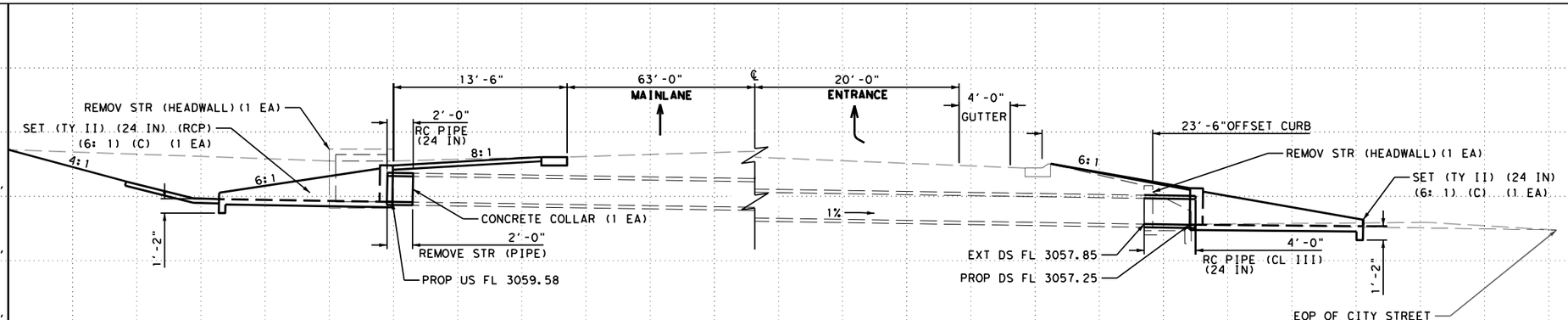
FILE: tehmac11.dgn		DN: TxDOT	CK: RL	DW: KB		CK:	
© TxDOT January 2011		CONT	SECT	JOB		HIGHWAY	
REVISIONS		0356	01	107		SH 136	
		DIST	COUNTY			SHEET NO.	
		AMA	HUTCHINSON CO			90	

NOTE:

1. SEE MISCELLANEOUS CULVERT DETAILS FOR CONCRETE COLLAR DETAIL



PROPOSED CULVERT AT STA 15+36 AND TRAFFIC CIRCLE



LOCATION: TRAFFIC CIRCLE STA 15+36 (CROSSING) AT INTERSECTION OF AIRPORT RD

EXISTING: 1-24" x112' RCP, LT - U.S. INLET 4'x4'x3', RT - D.S. CH-II-TYPE B HDWL

PROPOSED: 1-24" x116' RCP (INSTALL: LT - U.S. 6:1 PSET-SC, RT - 6:1 PSET-SC)

CSJ: 0356-01-107 CULVERT DETAIL SHEET 1 OF 33

LOCATION	104 6022	110 6001	132 6003	420 6009	432 6001	464 6005	467 6394	496 6006	496 6007	529 6007
	REMOVING CONC (CURB AND GUTTER)	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL) (ORD COMP) (TY B)	CL A CONC (COLLAR)	RIPRAP (CONC) (4 IN)	RC PIPE (CL III) (24 IN)	SET (TY II) (24 IN) (RCP) (6: 1) (C)	REMOV STR (HEADWALL)	REMOV STR (PIPE)	CONC CURB & GUTTER (TY I)
CSJ: 0356-01-107	LF	CY	CY	EA	CY	LF	EA	EA	LF	LF
STA 15+36 (C) AT TRAFFIC CIRCLE	30	42	8.64	2	10	6	2	2	2	30
PROJECT SUMMARY:	**30**	**42**	**8.64**	**2**	**10**	**6**	**2**	**2**	**2**	**30**

STATE OF TEXAS
CASEY B. STRIPLING
136887
LICENSED PROFESSIONAL ENGINEER

Casey B. Stripling

11-17-2022

SH 136

CULVERT DETAILS

SCALE: 1" = 10'

2023 Texas Department of Transportation

SHEET 1 OF 33

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		91

DATE: 11/17/2022 4:28:21 PM
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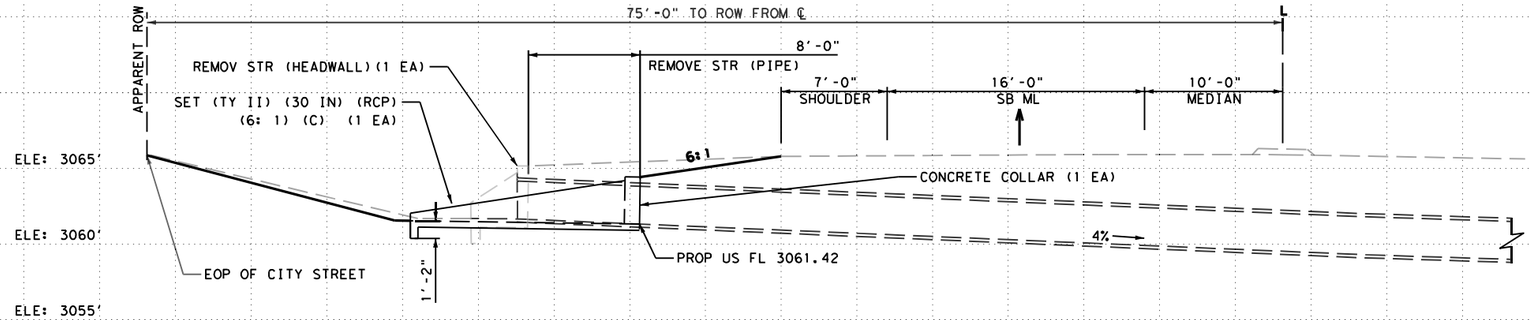
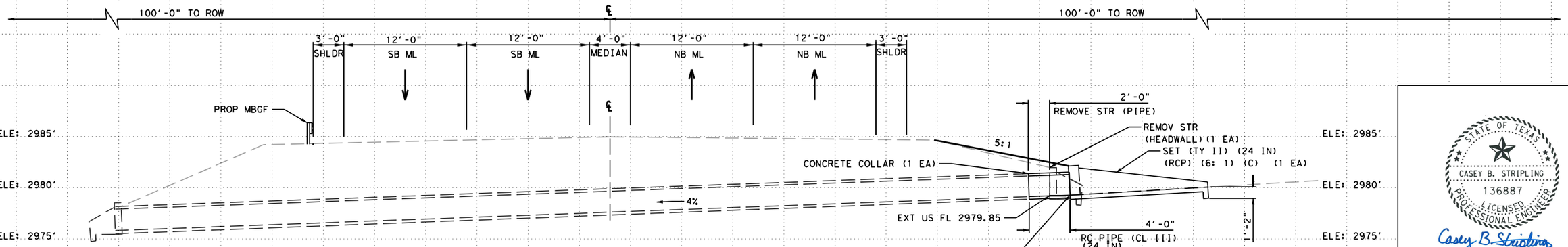
DN: CK: DW: CK:



LOCATION: SH 136 STA 145+55 (CROSSING) AT TRAFFIC CIRCLE
EXISTING: 1-30" x139' RCP, LT - U.S. CH-7-TYPE B HDWL
PROPOSED: 1-30" x131' RCP (INSTALL LT - U.S. 6:1 PSET-SC)



LOCATION: STA 190+40 (CROSSING)
EXISTING: 1-24" x92' RCP, RT - U.S. CH-7-TYPE B HDWL
PROPOSED: 1-24" x94' RCP (INSTALL: RT - U.S. EXTEND 6:1 PSET-SC)

CSJ: 0356-01-107 CULVERT DETAIL SHEET 2 OF 33

LOCATION	110 6001 EXCAVATION (ROADWAY)	132 6003 EMBANKMENT (FINAL) (ORD COMP) (TY B)	420 6009 CL A CONC (COLLAR)	464 6005 RC PIPE (CL III) (24 IN)	467 6394 SET (TY II) (24 IN) (RCP) (6: 1) (C)	467 6422 SET (TY II) (30 IN) (RCP) (6: 1) (C)	496 6006 REMOV STR (HEADWALL)	496 6007 REMOV STR (PIPE)
CSJ: 0356-01-107	CY	CY	EA	LF	EA	EA	EA	LF
STA 145+55 (L) C	11.85					1	1	8
STA 190+40 (RT) C		23.70	1	4	1		1	2
PROJECT SUMMARY:	**11.85**	**23.70**	**1**	**4**	**1**	**1**	**2**	**10**

STATE OF TEXAS
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LICENSED PROFESSIONAL ENGINEER
Casey B. Stripling
11-17-2022

SH 136 CULVERT DETAILS

SCALE: 1" = 10'

SHEET 2 OF 33

Texas Department of Transportation

CONTSEC	JOB	HIGHWAY
0356 01	107	SH 136
DIST	COUNTY	SHEET NO
AMA	HUTCHINSON CO	92

DATE: 7/2022 4:28:23 PM
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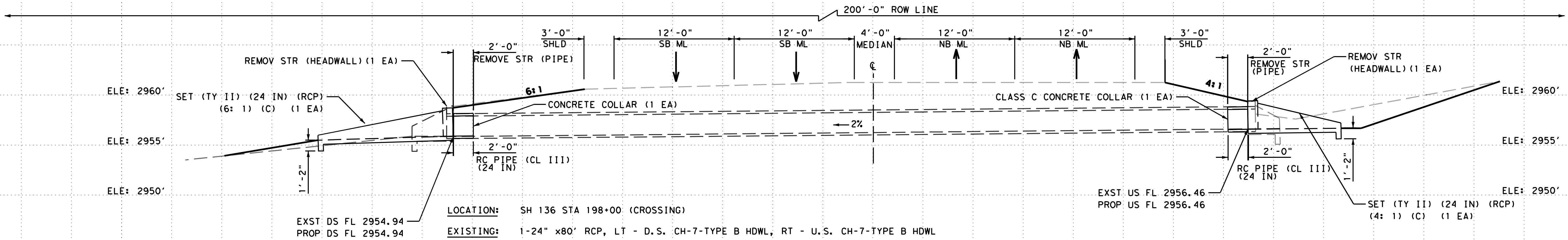
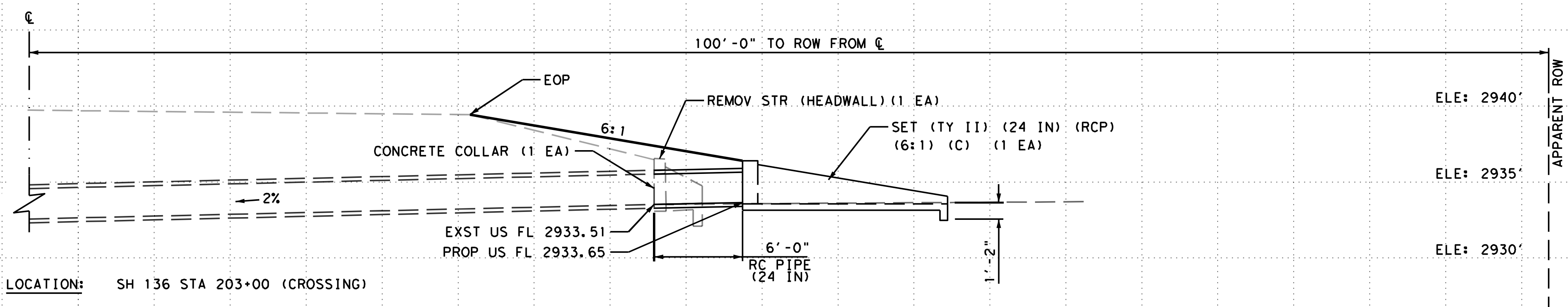


LOCATION: SH 136 STA 198+00 (CROSSING)

EXISTING: 1-24" x80' RCP, LT - D.S. CH-7-TYPE B HDWL, RT - U.S. CH-7-TYPE B HDWL

PROPOSED: 1-24" x80' RCP, (INSTALL: LT - D.S. 6:1 PSET-SC, RT - U.S. 4:1 PSET-SC)



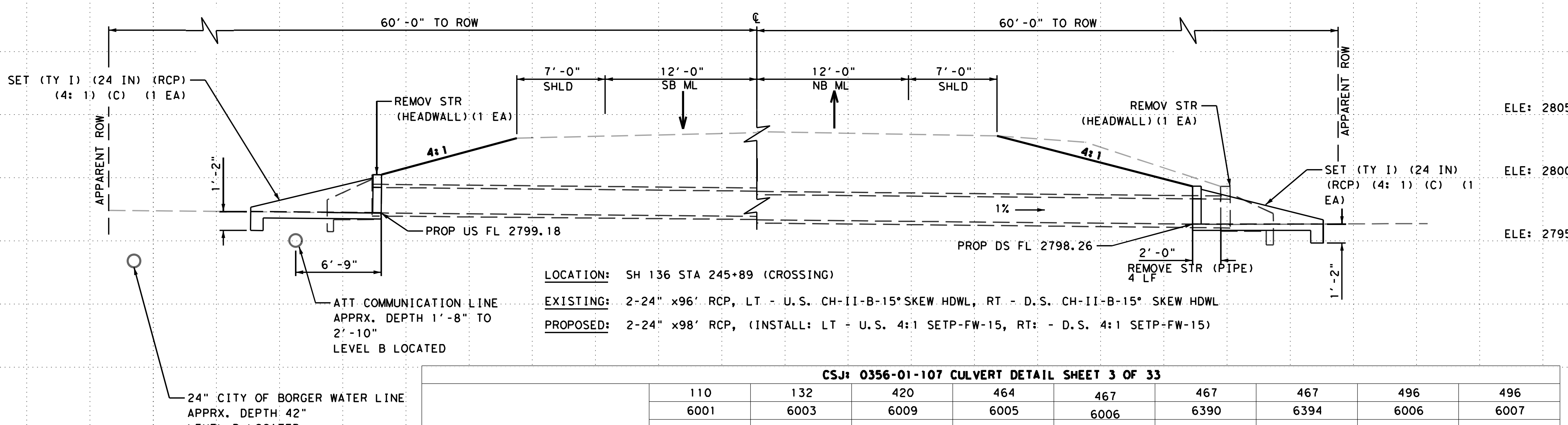
LOCATION: SH 136 STA 203+00 (CROSSING)

EXISTING: 1-24" x36' RCP, RT - U.S. CH-7-TYPE B HDWL

PROPOSED: 1-24" x42' RCP, (INSTALL: RT - U.S. 6:1 PSET:SC)

NOTE:

1. SEE MISCELLANEOUS CULVERT DETAILS FOR CONCRETE COLLAR DETAIL



LOCATION: SH 136 STA 245+89 (CROSSING)

EXISTING: 2-24" x96' RCP, LT - U.S. CH-II-B-15° SKEW HDWL, RT - D.S. CH-II-B-15° SKEW HDWL

PROPOSED: 2-24" x98' RCP, (INSTALL: LT - U.S. 4:1 SETP-FW-15, RT: - D.S. 4:1 SETP-FW-15)

CSJ: 0356-01-107 CULVERT DETAIL SHEET 3 OF 33

LOCATION	110 6001 EXCAVATION (ROADWAY)	132 6003 EMBANKMENT (FINAL)(ORD COMP)(TY B)	420 6009 CL A CONC (COLLAR)	464 6005 RC PIPE (CL III)(24 IN)	467 6006 SET (TY I) (24 IN) (4: 1) (C)	467 6390 SET (TY II) (24 IN) (RCP) (4: 1) (C)	467 6394 SET (TY II) (24 IN) (RCP) (6: 1) (C)	496 6006 REMOV STR (HEADWALL)	496 6007 REMOV STR (PIPE)
CSJ: 0356-01-107	CY	CY	EA	LF	EA	EA	EA	EA	LF
STA 198+00 (LT/RT) C	16.23	30.70	2	4		1	1	2	4
STA 203+00 (RT) C		29.63	1	6			1	1	
STA 245+89 (LT/RT) C	7.41	19.53			2			2	2
PROJECT SUMMARY:	**23.64**	**79.86**	**3**	**10**	**2**	**1**	**2**	**5**	**6**

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11-17-2022

SH 136 CULVERT DETAILS

SCALE: 1" = 10'

SHEET 3 OF 33

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0356	01	107	SH 136
DIST		COUNTY	SHEET NO
AMA		HUTCHINSON CO	93

DATE: 11/17/2022 4:28:24 PM
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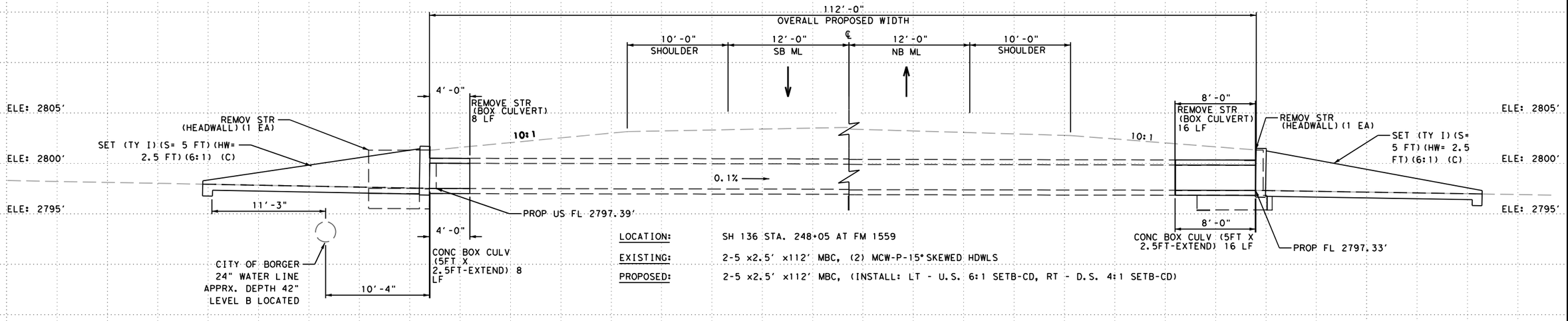

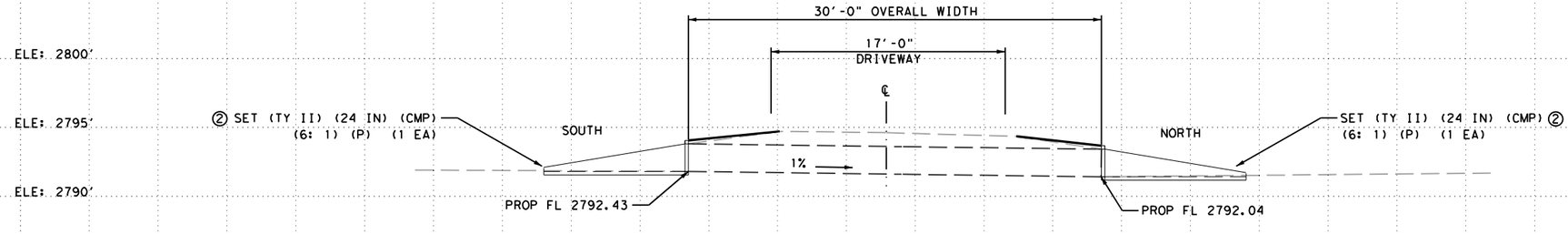

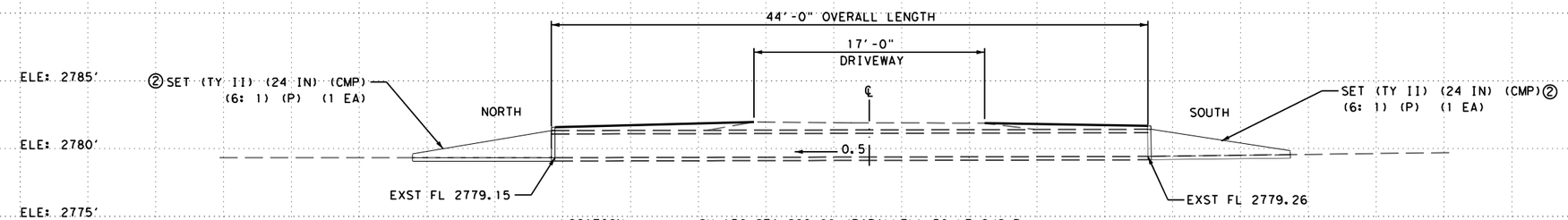

NOTE:

1. SEE MISCELLANEOUS CULVERT DETAILS FOR CONCRETE COLLAR DETAIL
2. PRE-CAST SET WITHOUT TOE WALL IS REQUIRED FOR SET

CSJ: 0356-01-107 CULVERT DETAIL SHEET 4 OF 33

LOCATION	132 6003 EMBANKMENT (FINAL) (ORD COMP) (TY B)	462 6091 CONC BOX CULV (5FT X 2.5FT)	467 6179 SET (TY I) (S= 5 FT) (HW= 4 FT) (6:1) (C)	467 6380 SET (TY II) (24 IN) (CMP) (6: 1) (P)	496 6006 REMOV STR (HEADWALL)	496 6008 REMOV STR (BOX CULVERT)
CSJ: 0356-01-107	CY	LF	EA	EA	EA	LF
STA 248+05 (LT/RT) C	38.00	24	2		2	24
STA 266+03 (L) P				2		
STA 289+00 (R) P	11.42			2		
PROJECT SUMMARY:	**49.42**	**24**	**2**	**4**	**2**	**24**

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11-17-2022

SH 136 CULVERT DETAILS

SCALE: 1" = 10'

SHEET 4 OF 33

Texas Department of Transportation

CONTSECT	JOB	HIGHWAY
0356 01	107	SH 136
DIST	COUNTY	SHEET NO
AMA	HUTCHINSON CO	94

DN: CK: DW: CK:

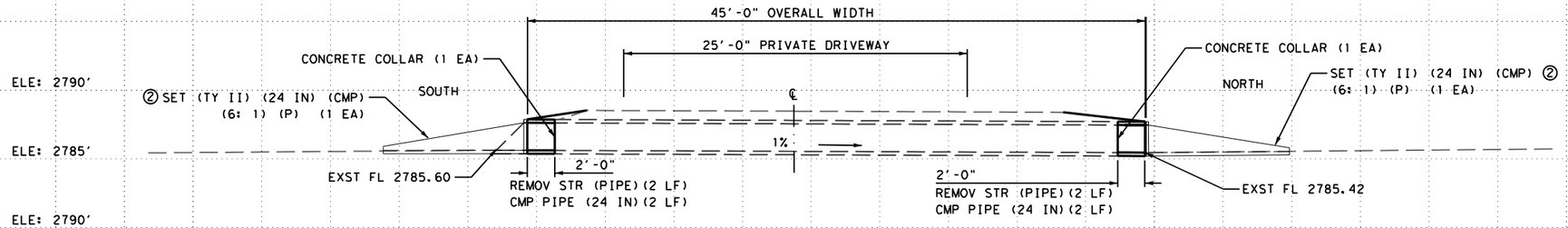
DATE: 11/7/2022 4:28:26 PM
FILE: Overlay4 - Design\Plan Set\5. Drainage\107_CULVERT DETAILS.dgn

DN: CK: DW: CK:

NOTE:

1. SEE MISCELLANEOUS CULVERT DETAILS FOR CONCRETE COLLAR DETAIL

(2.) PRE-CAST SET WITHOUT TOE WALL IS REQUIRED FOR SET



LOCATION: SH 136 STA 344+86 (PARALLEL) 45 LF O/S L

EXISTING: 1-24" x45' CMP

PROPOSED: 1-24" x45' CMP, (INSTALL: LT - U.S. EXTEND 6:1 PSET-SP, RT - D.S. EXTEND 6:1 PSET-SP)

CSJ: 0356-01-107 CULVERT DETAIL SHEET 5 OF 33					
LOCATION	132	420	460	467	496
	6003	6009	6003	6380	6007
	EMBANKMENT (FINAL) (ORD COMP) (TY B)	CL A CONC (COLLAR)	CMP (GAL STL 24 IN)	SET (TY II) (24 IN) (CMP) (6: 1) (P)	REMOV STR (PIPE)
CSJ: 0356-01-107	CY	EA	LF	EA	LF
STA 344+86 (LT) P	6.00	2	4	2	4
PROJECT SUMMARY:	**6.00**	**2**	**4**	**2**	**4**

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11-17-2022

SH 136 CULVERT DETAILS

SCALE: 1" = 10'

SHEET 5 OF 33

Texas Department of Transportation

CONT	SEC	JOB	HIGHWAY
0356	01	107	SH 136
DIST	COUNTY		SHEET NO
AMA	HUTCHINSON CO		95

DATE: 7/2022 4:28:27 PM
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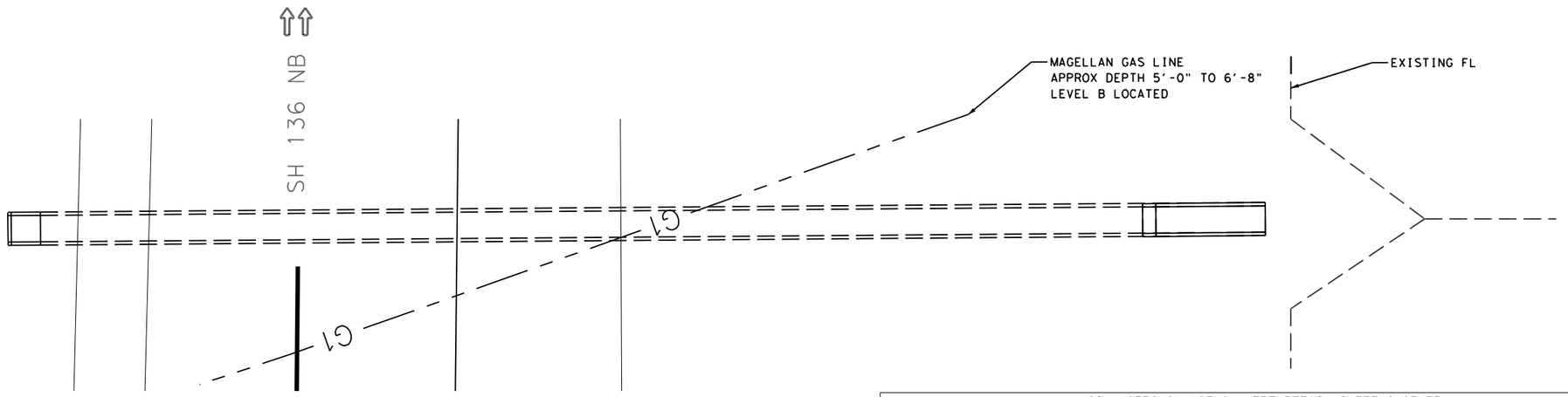
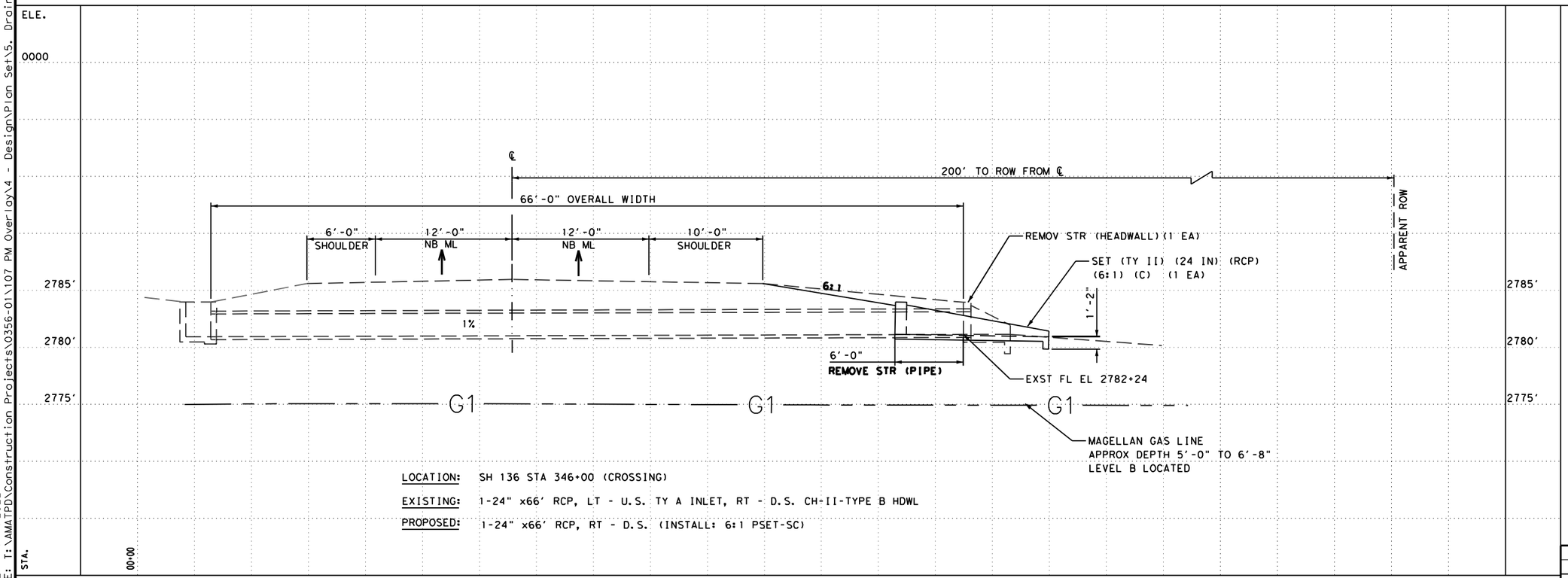


PROPOSED CULVERT AT STA 346+00

CSJ: 0356-01-107 CULVERT DETAIL SHEET 6 OF 33					
LOCATION	110 6001 EXCAVATION (ROADWAY)	132 6003 EMBANKMENT (FINAL) (ORD COMP) (TY B)	467 6394 SET (TY II) (24 IN) (RCP) (6: 1) (C)	496 6006 REMOV STR (HEADWALL)	496 6007 REMOV STR (PIPE)
CSJ: 0356-01-107	CY	CY	EA	EA	LF
STA 346+00 (RT) C	12.84	24.10	1	1	6
PROJECT SUMMARY:	**12.84**	**24.10**	**1**	**1**	**6**



LOCATION: SH 136 STA 346+00 (CROSSING)

EXISTING: 1-24" x66' RCP, LT - U.S. TY A INLET, RT - D.S. CH-II-TYPE B HDWL

PROPOSED: 1-24" x66' RCP, RT - D.S. (INSTALL: 6:1 PSET-SC)

STATE OF TEXAS
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11-17-2022

SH 136

CULVERT DETAILS

SCALE: 1" = 10'

2023 Texas Department of Transportation

SHEET 6 OF 33

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		96

DATE: 11/17/2022 4:28:40 PM
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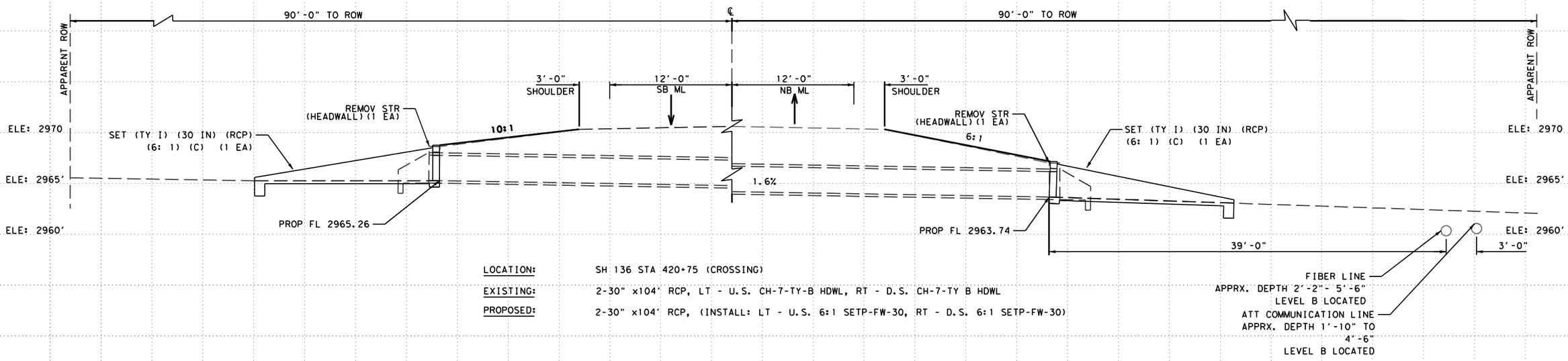
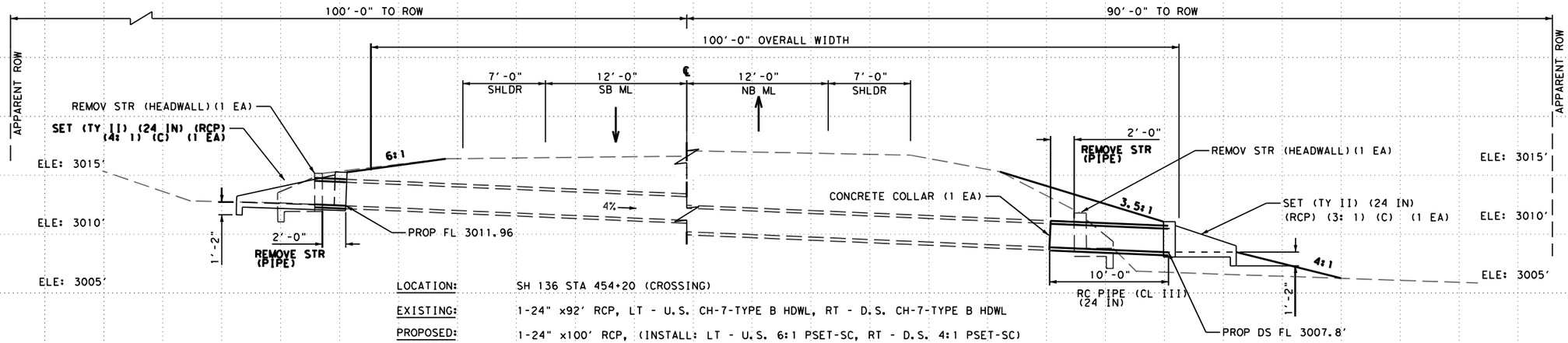


LOCATION: SH 136 STA 420+75 (CROSSING)

EXISTING: 2-30" x104' RCP, LT - U.S. CH-7-TY-B HDWL, RT - D.S. CH-7-TY B HDWL

PROPOSED: 2-30" x104' RCP, (INSTALL: LT - U.S. 6:1 SETP-FW-30, RT - D.S. 6:1 SETP-FW-30)



LOCATION: SH 136 STA 454+20 (CROSSING)

EXISTING: 1-24" x92' RCP, LT - U.S. CH-7-TYPE B HDWL, RT - D.S. CH-7-TYPE B HDWL

PROPOSED: 1-24" x100' RCP, (INSTALL: LT - U.S. 6:1 PSET-SC, RT - D.S. 4:1 PSET-SC)

NOTE:

1. SEE MISCELLANEOUS CULVERT DETAILS FOR CONCRETE COLLAR DETAIL

CSJ: 0356-01-107 CULVERT DETAIL SHEET 7 OF 33

LOCATION	132	420	464	467	467	467	496	496
	6003	6009	6005	6010	6388	6390	6006	6007
	EMBANKMENT (FINAL) (ORD COMP) (TY B)	CL A CONC (COLLAR)	RC PIPE (CL III) (24 IN)	SET (TY I) (30 IN) (6: 1) (C)	SET (TY II) (24 IN) (RCP) (3: 1) (C)	SET (TY II) (24 IN) (RCP) (4: 1) (C)	REMOV STR (HEADWALL)	REMOV STR (PIPE)
CSJ: 0356-01-107	CY	EA	LF	EA	EA	EA	EA	LF
STA 420+775 (LT/RT) C	52.67			2			2	6
STA 454+20 (LT/RT) C	91.54	2	10	2	1	1	2	4
PROJECT SUMMARY:	**144.21**	**2**	**10**	**4**	**1**	**1**	**4**	**10**

STATE OF TEXAS
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Casey B. Stripling

11-17-2022

SH 136 CULVERT DETAILS

SCALE: 1" = 10'
SHEET 7 OF 33

Texas Department of Transportation

CONTSEC	JOB	HIGHWAY
0356	01 107	SH 136
DIST	COUNTY	SHEET NO
AMA	HUTCHINSON CO	97

DN: CK: DW: CK:

DATE: 11/17/2022 4:28:42 PM
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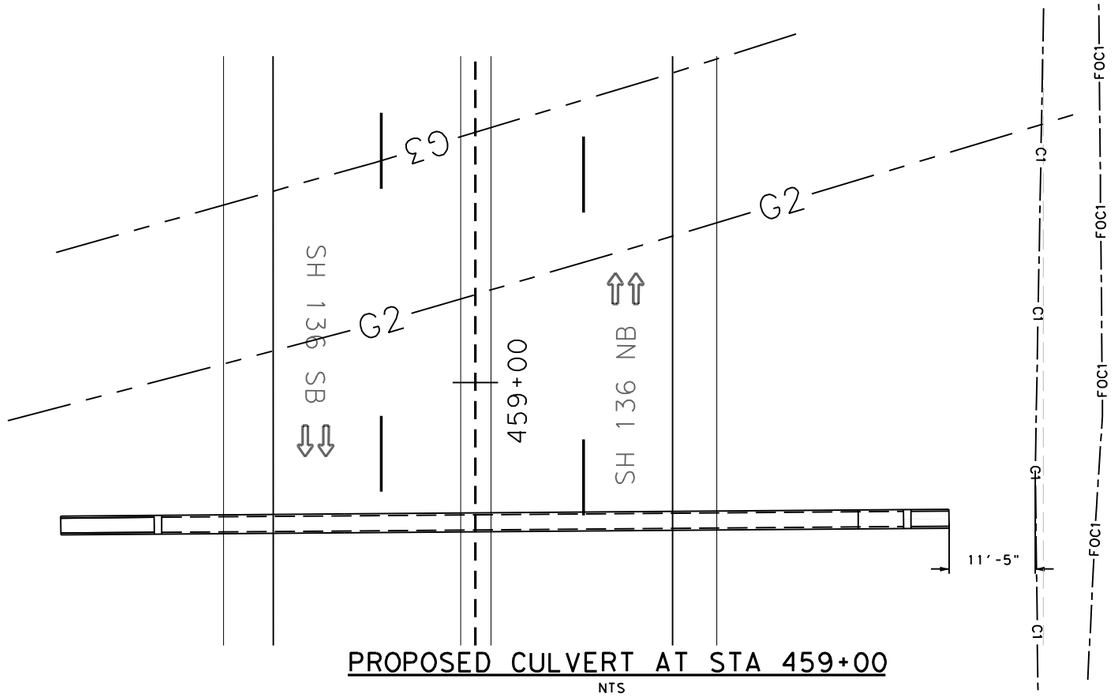
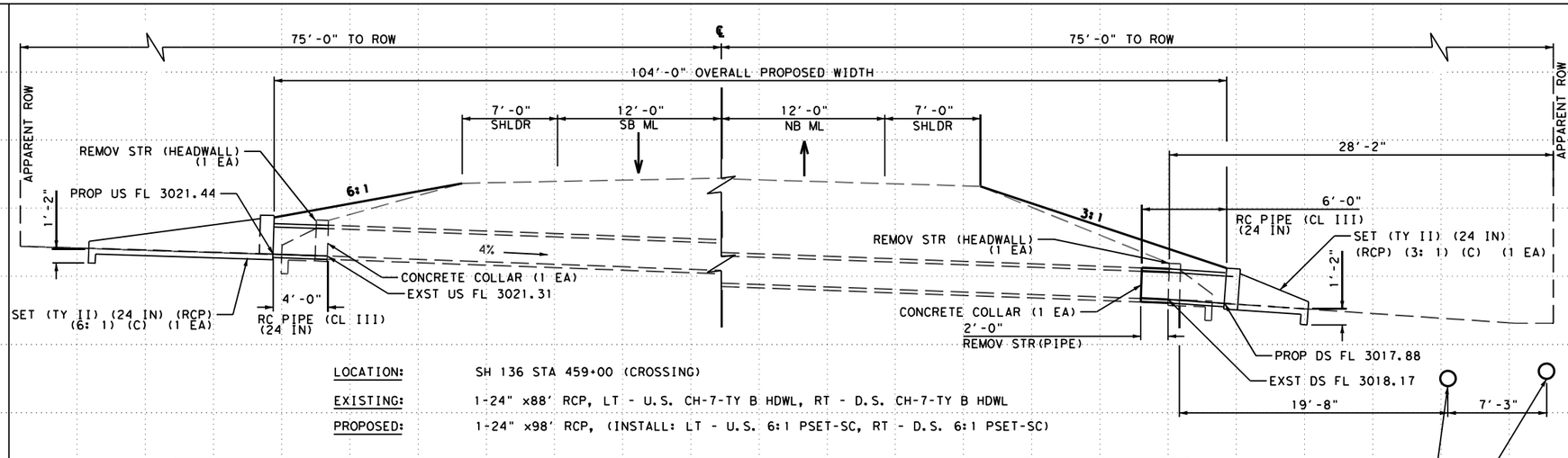


PROPOSED CULVERT AT STA 459+00

NTS

NOTE:

1. SEE MISCELLANEOUS CULVERT DETAILS FOR CONCRETE COLLAR DETAIL



LOCATION: SH 136 STA 459+00 (CROSSING)

EXISTING: 1-24" x88' RCP, LT - U.S. CH-7-TY B HDWL, RT - D.S. CH-7-TY B HDWL

PROPOSED: 1-24" x98' RCP, (INSTALL: LT - U.S. 6:1 PSET-SC, RT - D.S. 6:1 PSET-SC)

CSJ: 0356-01-107 CULVERT DETAIL SHEET 8 OF 33

LOCATION	132 6003 EMBANKMENT (FINAL) (ORD COMP) (TY B)	420 6009 CL A CONC (COLLAR)	464 6005 RC PIPE (CL III) (24 IN)	467 6388 SET (TY II) (24 IN) (RCP) (3:1) (C)	467 6394 SET (TY II) (24 IN) (RCP) (6:1) (C)	496 6006 REMOV STR (HEADWALL)	496 6007 REMOV STR (PIPE)
CSJ: 0356-01-107	CY	EA	LF	EA	EA	EA	LF
459+00 (LT/RT) C	40.46	2	10	1	1	2	2
PROJECT SUMMARY:	**40.46**	**2**	**10**	**1**	**1**	**2**	**2**

SH 136

CULVERT DETAILS

SCALE: 1" = 10'

2023 Texas Department of Transportation

SHEET 8 OF 33

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		98

DATE: 11/17/2022 4:28:43 PM
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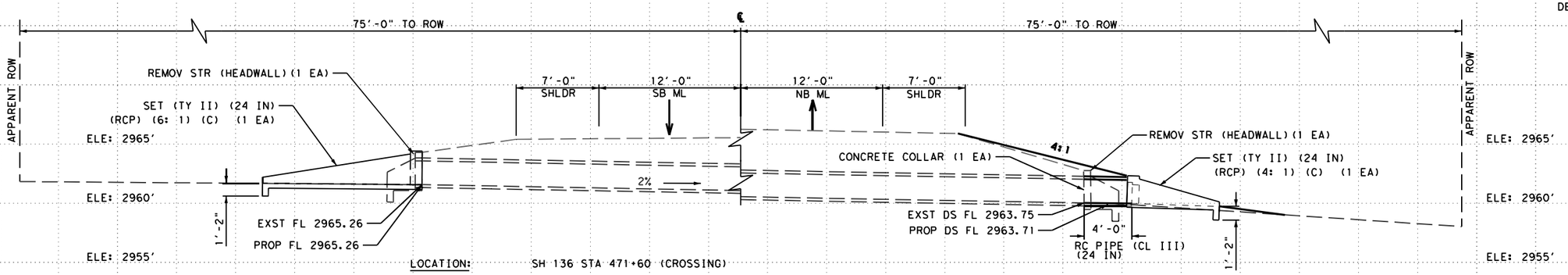
DN: CK: DW: CK:

NOTE:

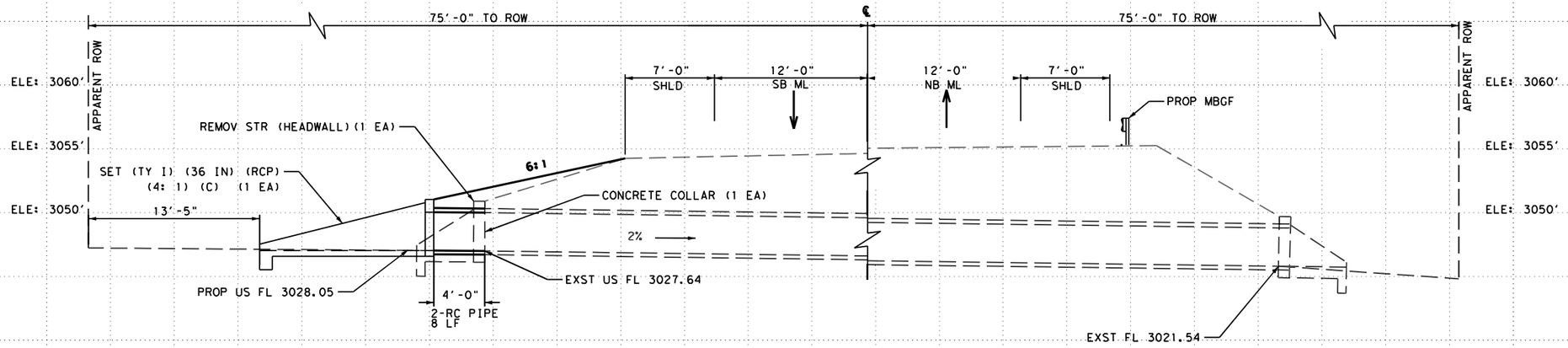
1. SEE MISCELLANEOUS CULVERT DETAILS FOR CONCRETE COLLAR DETAIL



LOCATION: SH 136 STA 471+60 (CROSSING)

EXISTING: 1-24" x84' RCP, LT - U.S. CH-7-TY B HDWL, RT - D.S. CH-7-TY B HDWL

PROPOSED: 1-24" x88' RCP, (INSTALL: LT - U.S. 6:1 PSET-SC, RT - D.S. 4:1 PSET-SC)



LOCATION: SH 136 STA 478+82 15° SKEW (CROSSING)

EXISTING: 2-36" x92' RCP, (2) CH-7-TY B 15 DEG SKEWED HDWLS

PROPOSED: 2-36" x96' RCP, (INSTALL: LT - U.S. 4:1 PSET-FW-15)

CSJ: 0356-01-107 CULVERT DETAIL SHEET 9 OF 33

LOCATION	132 6003 EMBANKMENT (FINAL) (ORD COMP) (TY B)	420 6009 CL A CONC (COLLAR)	464 6005 RC PIPE (CL III) (24 IN)	464 6008 RC PIPE (CL III) (36 IN)	467 6015 SET (TY I) (36 IN) (4: 1) (C)	467 6390 SET (TY II) (24 IN) (RCP) (4: 1) (C)	467 6394 SET (TY II) (24 IN) (RCP) (6: 1) (C)	496 6006 REMOV STR (HEADWALL)
CSJ: 0356-01-107	CY	EA	LF	LF	EA	EA	EA	EA
471+60 (LT/RT) C	71.23	1	4			1	1	2
478+82 (L) C	71.56	1		8	1			1
PROJECT SUMMARY:	**142.79**	**2**	**4**	**8**	**1**	**1**	**1**	**3**

STATE OF TEXAS
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Casey B. Stripling

11-17-2022

SH 136 CULVERT DETAILS

SCALE: 1" = 10'

SHEET 9 OF 33

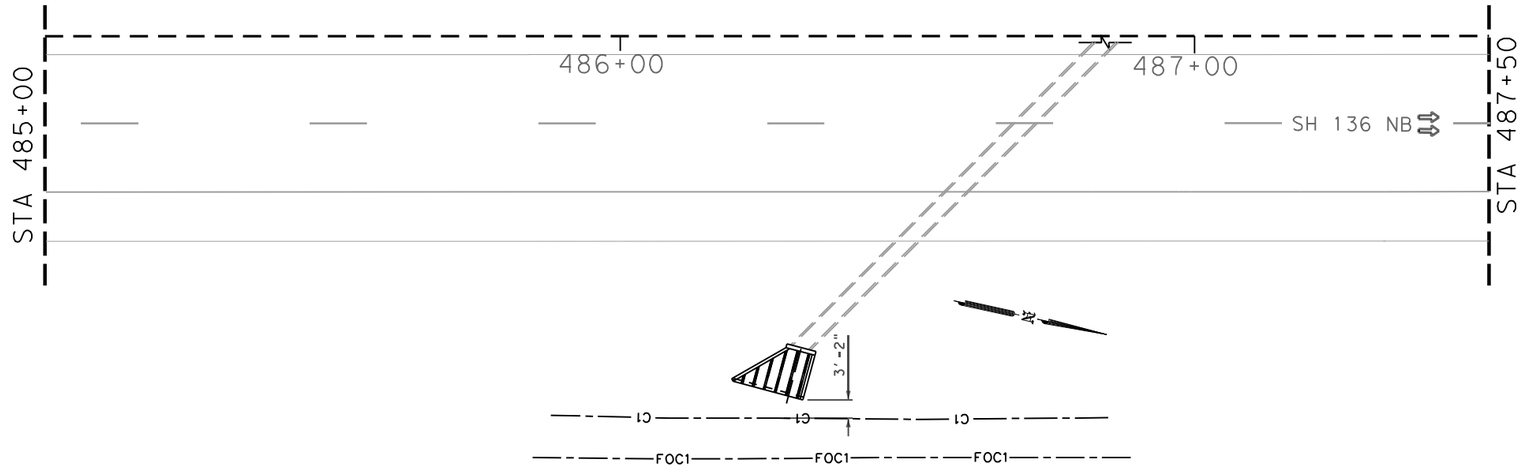
Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0356	01	107	SH 136
DIST	COUNTY		SHEET NO
AMA	HUTCHINSON CO		99

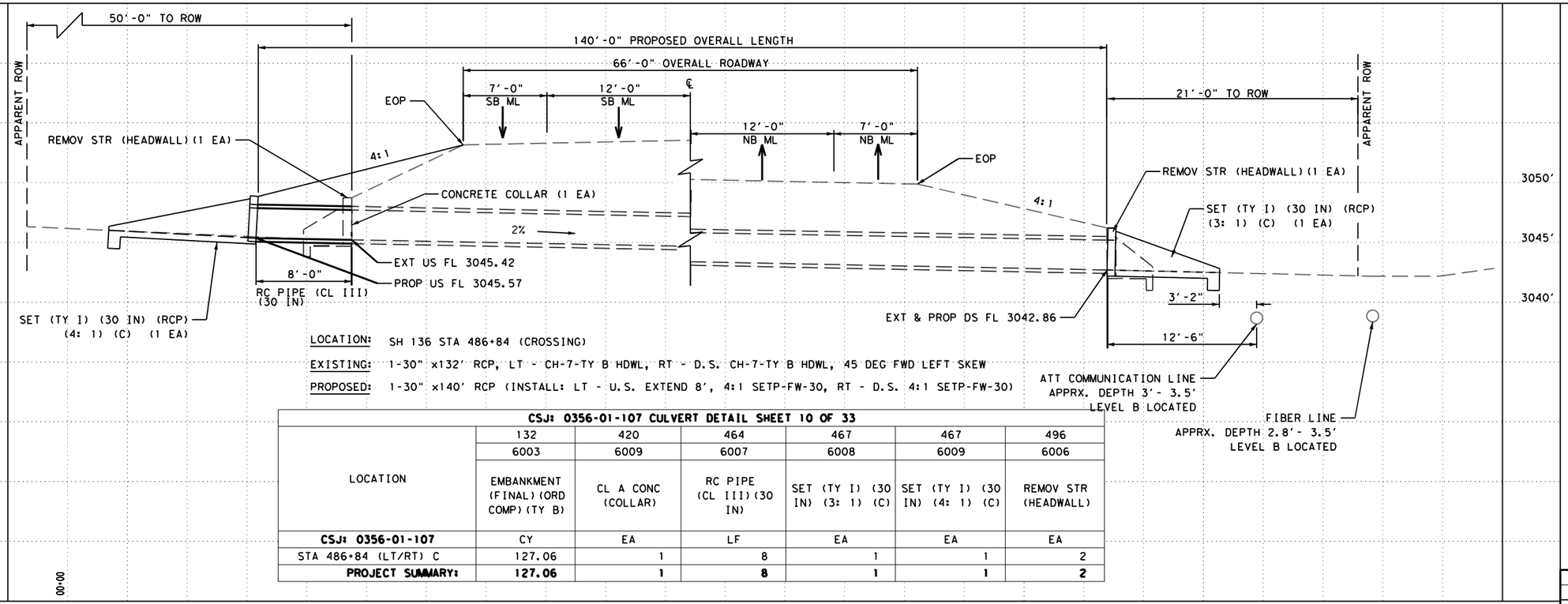
DATE: 11/7/2022 4:28:45 PM
FILE: Overlay4 - Design\Plan Sets\5. Drainage\107_CULVERT DETAILS.dgn

NOTE:

1. SEE MISCELLANEOUS CULVERT DETAILS FOR CONCRETE COLLAR DETAIL



PROPOSED CULVERT AT STA 486+84
NTS



LOCATION: SH 136 STA 486+84 (CROSSING)

EXISTING: 1-30" x132' RCP, LT - CH-7-TY B HDWL, RT - D.S. CH-7-TY B HDWL, 45 DEG FWD LEFT SKEW

PROPOSED: 1-30" x140' RCP (INSTALL: LT - U.S. EXTEND 8', 4:1 SETP-FW-30, RT - D.S. 4:1 SETP-FW-30)

CSJ: 0356-01-107 CULVERT DETAIL SHEET 10 OF 33

LOCATION	132 6003 EMBANKMENT (FINAL) (ORD COMP) (TY B)	420 6009 CL A CONC (COLLAR)	464 6007 RC PIPE (CL III) (30 IN)	467 6008 SET (TY I) (30 IN) (3: 1) (C)	467 6009 SET (TY I) (30 IN) (4: 1) (C)	496 6006 REMOV STR (HEADWALL)
CSJ: 0356-01-107	CY	EA	LF	EA	EA	EA
STA 486+84 (LT/RT) C	127.06	1	8	1	1	2
PROJECT SUMMARY:	**127.06**	**1**	**8**	**1**	**1**	**2**

SH 136

CULVERT DETAILS

SCALE: 1" = 10'

2023 Texas Department of Transportation

SHEET 10 OF 33

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		100

DATE: 11/17/2022 4:28:46 PM
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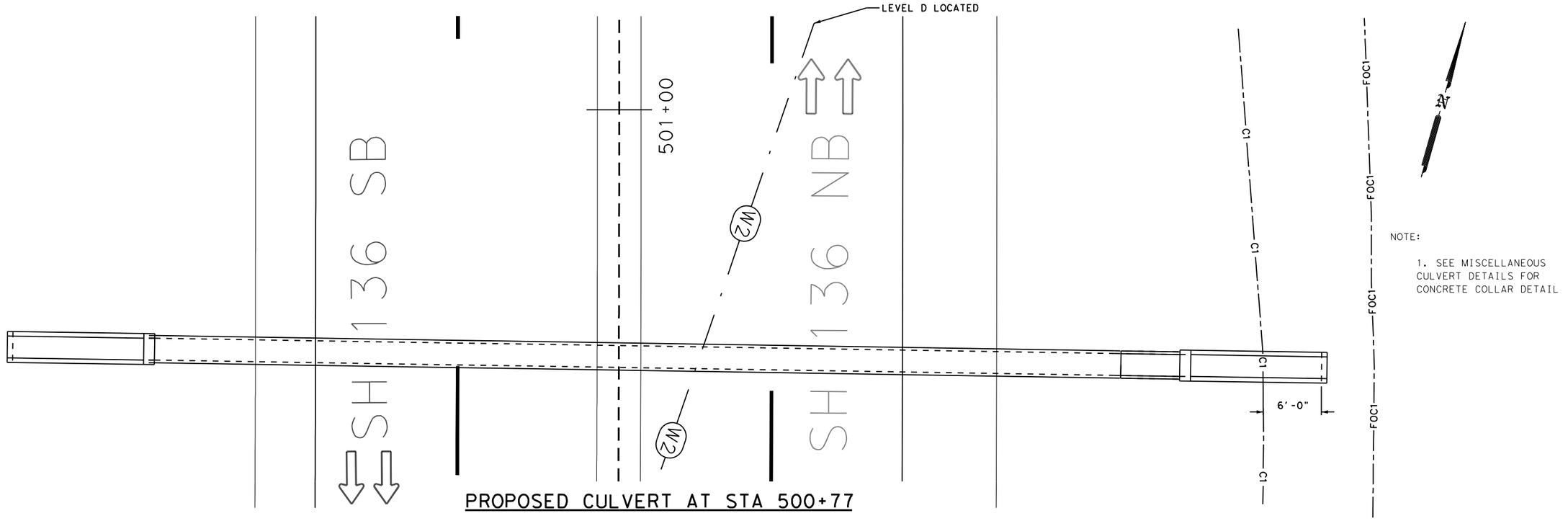
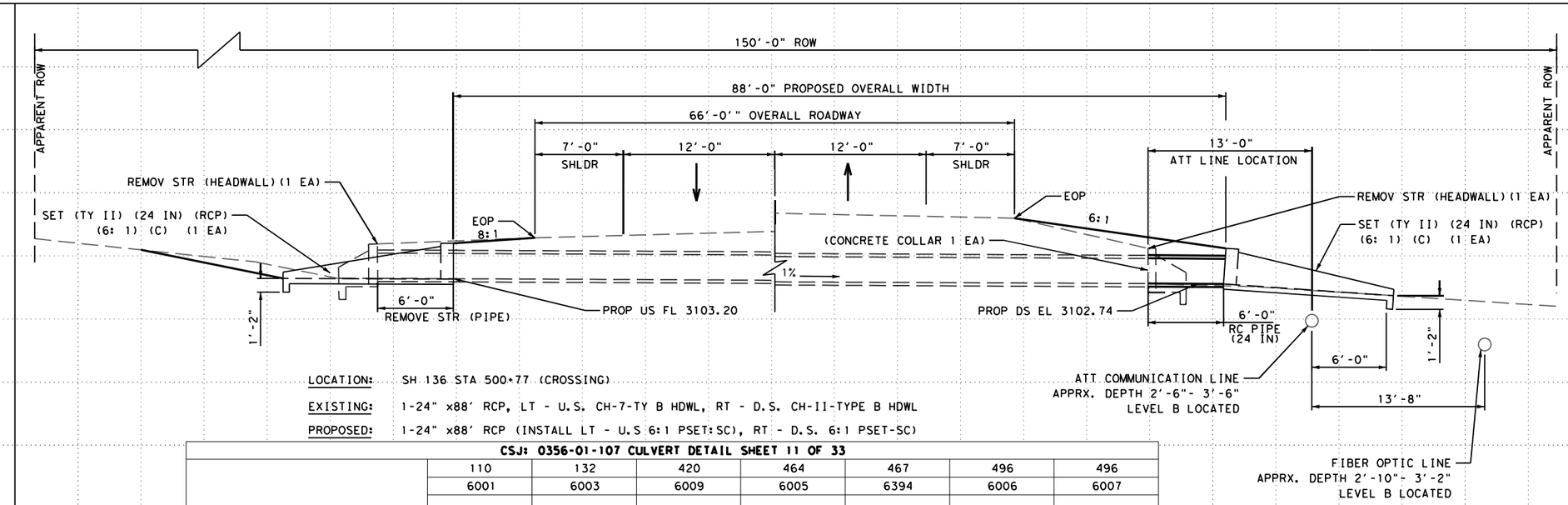


PROPOSED CULVERT AT STA 500+77



LOCATION: SH 136 STA 500+77 (CROSSING)

EXISTING: 1-24" x88' RCP, LT - U.S. CH-7-TY B HDWL, RT - D.S. CH-II-TYPE B HDWL

PROPOSED: 1-24" x88' RCP (INSTALL LT - U.S 6:1 PSET:SC), RT - D.S. 6:1 PSET-SC)

CSJ: 0356-01-107 CULVERT DETAIL SHEET 11 OF 33

LOCATION	110 6001 EXCAVATION (ROADWAY)	132 6003 EMBANKMENT (FINAL) (ORD COMP) (TY B)	420 6009 CL A CONC (COLLAR)	464 6005 RC PIPE (CL III) (24 IN)	467 6394 SET (TY II) (24 IN) (RCP) (6: 1) (C)	496 6006 REMOV STR (HEADWALL)	496 6007 REMOV STR (PIPE)
CSJ: 0356-01-107	CY	CY	EA	LF	EA	EA	LF
STA 500+77 (LT/RT) C	19.14	81.41	1	6	2	2	6
PROJECT SUMMARY:	**19.14**	**81.41**	**1**	**6**	**2**	**2**	**6**

SH 136

CULVERT DETAILS

SCALE: 1" = 10'

2023 Texas Department of Transportation

SHEET 11 OF 33

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		101

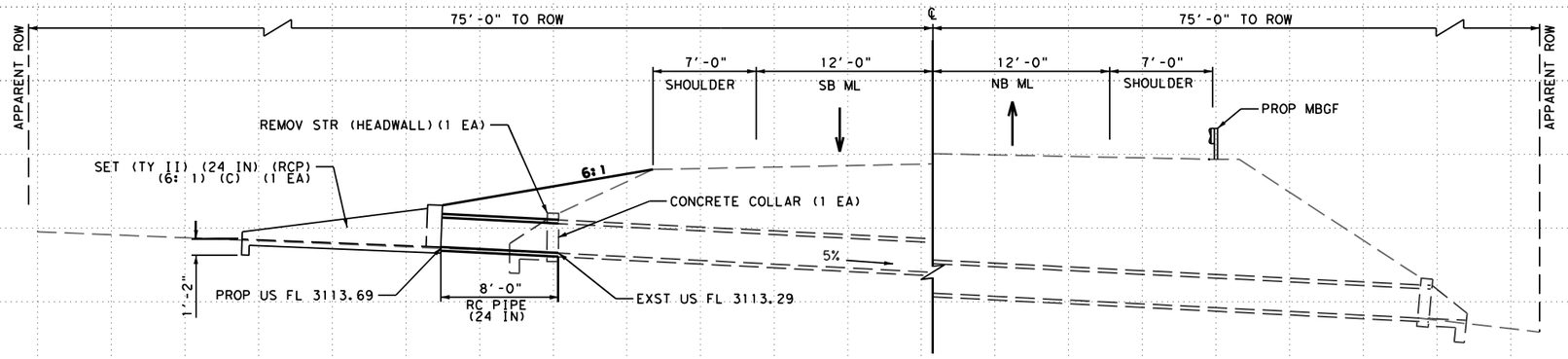
DATE: 11/17/2022 4:28:48 PM
FILE: T:\AMA\PD\Construction Projects\0356-01\107 PM Overlay\4 - Design\Plan Set\5. Drainage\107_CULVERT DETAILS.dgn

DN: CK: DW: CK:

NOTE:

1. SEE MISCELLANEOUS CULVERT DETAILS FOR CONCRETE COLLAR DETAIL

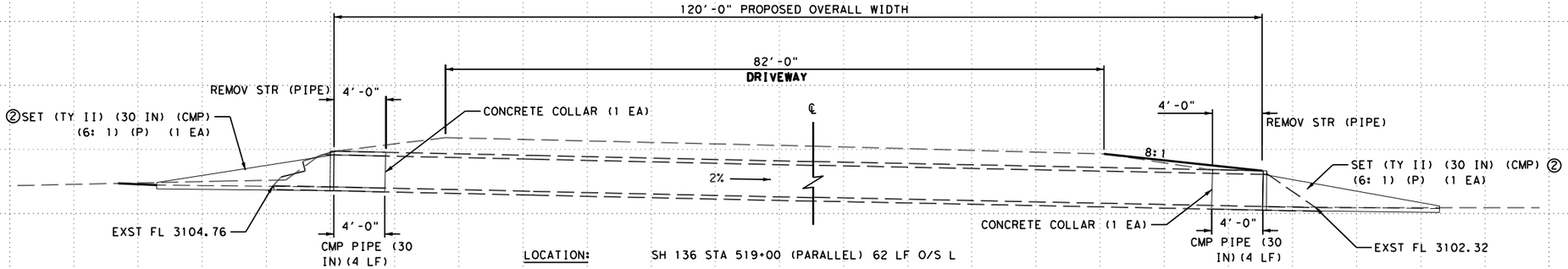
2. PRE-CAST SET WITHOUT TOE WALL IS REQUIRED FOR SET



LOCATION: SH 136 STA 510+70 (CROSSING)

EXISTING: 1-24" x88' RCP, LT - U.S. CH-7-TY B HDWL, RT - D.S. CH-7-TY B HDWL

PROPOSED: 1-24" x96' RCP (INSTALL: LT - U.S. 6:1 PSET-SC)



LOCATION: SH 136 STA 519+00 (PARALLEL) 62 LF O/S L

EXISTING: 1-30" x120' CMP

PROPOSED: 1-30" x120' CMP, (INSTALL: LT - U.S. 6:1 PSET-SP, RT - D.S. 6:1 PSET-SP)

CSJ: 0356-01-107 CULVERT DETAIL SHEET 12 OF 33

LOCATION	110 6001 EXCAVATION (ROADWAY)	132 6003 EMBANKMENT (FINAL) (ORD COMP) (TY B)	420 6009 CL A CONC (COLLAR)	460 6004 CMP (GAL STL 30 IN)	464 6005 RC PIPE (CL III) (24 IN)	467 6394 SET (TY II) (24 IN) (RCP) (6:1) (C)	467 6410 SET (TY II) (30 IN) (CMP) (6: 1) (P)	496 6006 REMOV STR (HEADWALL)	496 6007 REMOV STR (PIPE)
CSJ: 0356-01-107	CY	CY	EA	LF	LF	EA	EA	EA	LF
STA 510+70 (L) C		94.44	1		8	1		1	
STA 519+00 (L) P	5.19	21.19	2	8			2		8
PROJECT SUMMARY:	**5.19**	**115.63**	**3**	**8**	**8**	**1**	**2**	**1**	**8**

STATE OF TEXAS
CASEY B. STRIPLING
136887
LICENSED PROFESSIONAL ENGINEER

Casey B. Stripling

11-17-2022

SH 136 CULVERT DETAILS

SCALE: 1" = 10'

SHEET 12 OF 33

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0356	01	107	SH 136
DIST	COUNTY		SHEET NO
AMA	HUTCHINSON CO		102

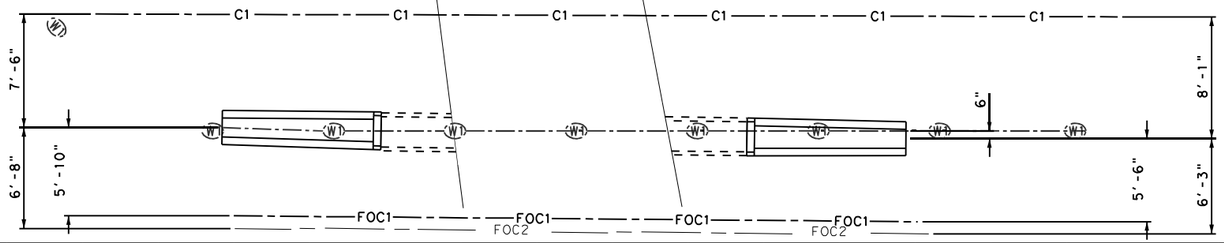
DATE: 11/17/2022 4:28:50 PM
FILE: Overlay\4 - Design\Plan Set\5. Drainage\107_CULVERT DETAILS.dgn

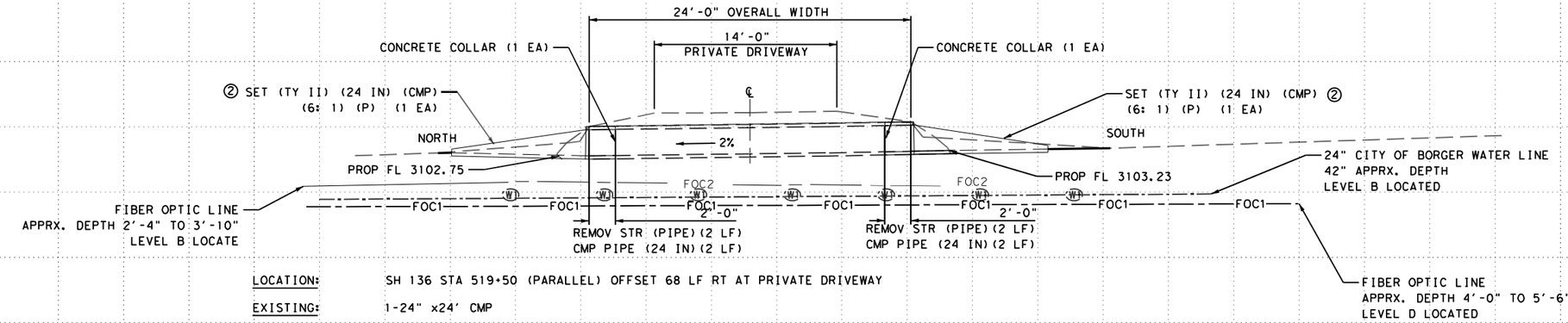
SH 136 NB ⇨

NOTE:

1. SEE MISCELLANEOUS CULVERT DETAILS FOR CONCRETE COLLAR DETAIL
2. PRE-CAST SET WITHOUT TOE WALL IS REQUIRED FOR SET

PROPOSED CULVERT AT STA 519+50





LOCATION: SH 136 STA 519+50 (PARALLEL) OFFSET 68 LF RT AT PRIVATE DRIVEWAY

EXISTING: 1-24" x24' CMP

PROPOSED: 1-24" x24' CMP, (INSTALL: LT - U.S. 6:1 PSET-SP, RT - D.S. 6:1 PSET-SP)

CSJ: 0356-01-107 CULVERT DETAIL SHEET 13 OPF 33

LOCATION	110 6001 EXCAVATION (ROADWAY)	132 6003 EMBANKMENT (FINAL) (ORD COMP) (TY B)	420 6009 CL A CONC (COLLAR)	460 6003 CMP (GAL STL 24 IN)	467 6380 SET (TY II) (24 IN) (CMP) (6: 1) (P)	496 6007 REMOV STR (PIPE)
CSJ: 0356-01-107	CY	CY	EA	LF	EA	LF
STA 519+50 (R) P	8.40	12.56	2	4	2	4
PROJECT SUMMARY:	**8.40**	**12.56**	**2**	**4**	**2**	**4**

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11-17-2022

SH 136

CULVERT DETAILS

SCALE: 1" = 10'

2023 Texas Department of Transportation

SHEET 13 OF 33

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		103

DATE: 11/17/2022 4:28:51 PM
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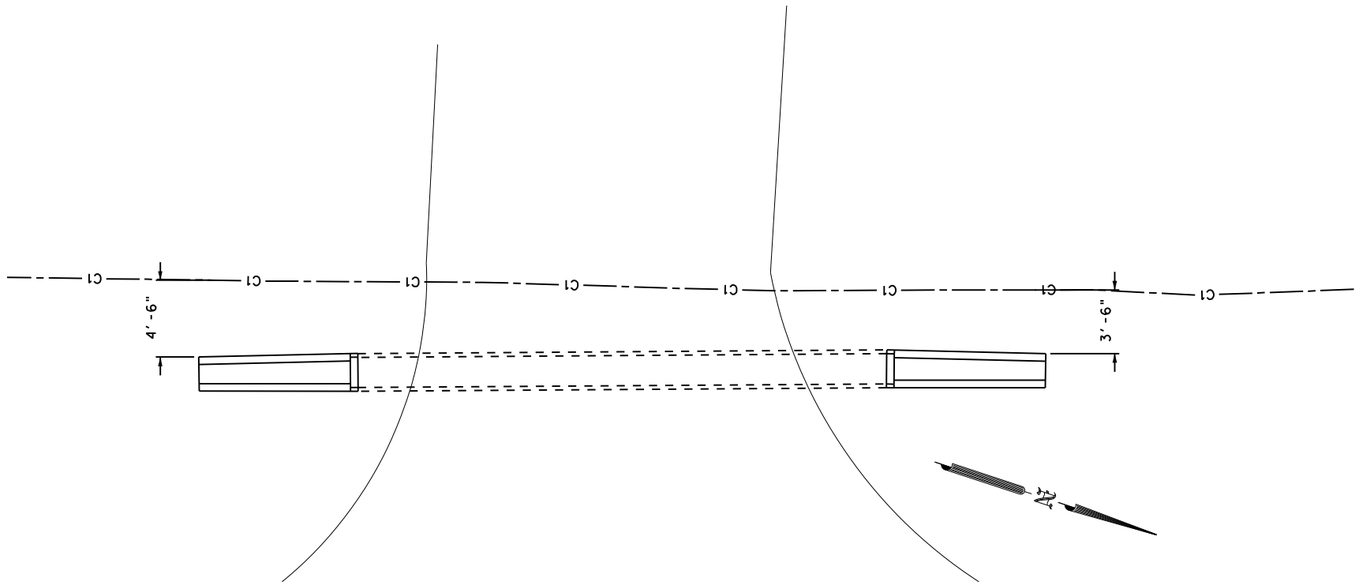
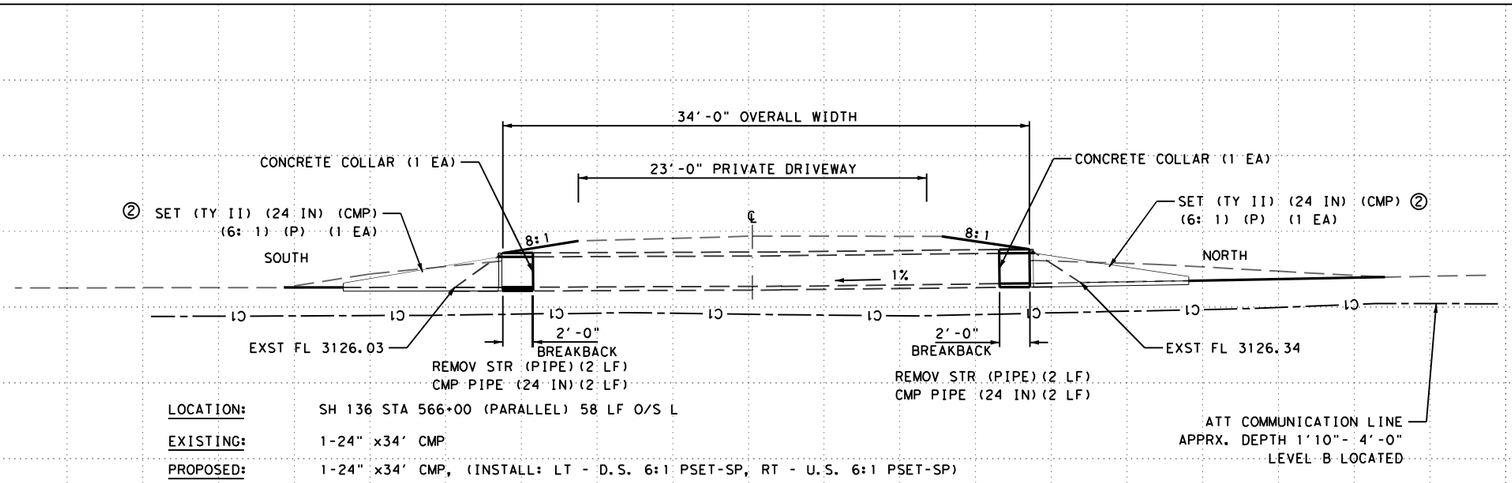


PROPOSED CULVERT AT STA 566+00

NOTE:

1. SEE MISCELLANEOUS CULVERT DETAILS FOR CONCRETE COLLAR DETAIL
2. PRE-CAST SET WITHOUT TOE WALL IS REQUIRED FOR SET



LOCATION: SH 136 STA 566+00 (PARALLEL) 58 LF O/S L

EXISTING: 1-24" x34' CMP

PROPOSED: 1-24" x34' CMP, (INSTALL: LT - D.S. 6:1 PSET-SP, RT - U.S. 6:1 PSET-SP)

CSJ: 0356-01-107 CULVERT DETAIL SHEET 14 OF 33

LOCATION	110 6001 EXCAVATION (ROADWAY)	132 6003 EMBANKMENT (FINAL) (ORD COMP) (TY B)	420 6009 CL A CONC (COLLAR)	460 6003 CMP (GAL STL 24 IN)	467 6394 SET (TY II) (24 IN) (CMP) (6: 1) (P)	496 6007 REMOV STR (PIPE)
CSJ: 0356-01-107	CY	CY	EA	LF	EA	LF
STA 566+00 (L) P	12.30	9.78	2	4	2	4
PROJECT SUMMARY:	**12.30**	**9.78**	**2**	**4**	**2**	**4**

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11-17-2022

SH 136

CULVERT DETAILS

SCALE: 1" = 10'

2023 Texas Department of Transportation

SHEET 14 OF 33

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		104

DATE: 11/17/2022 4:28:53 PM
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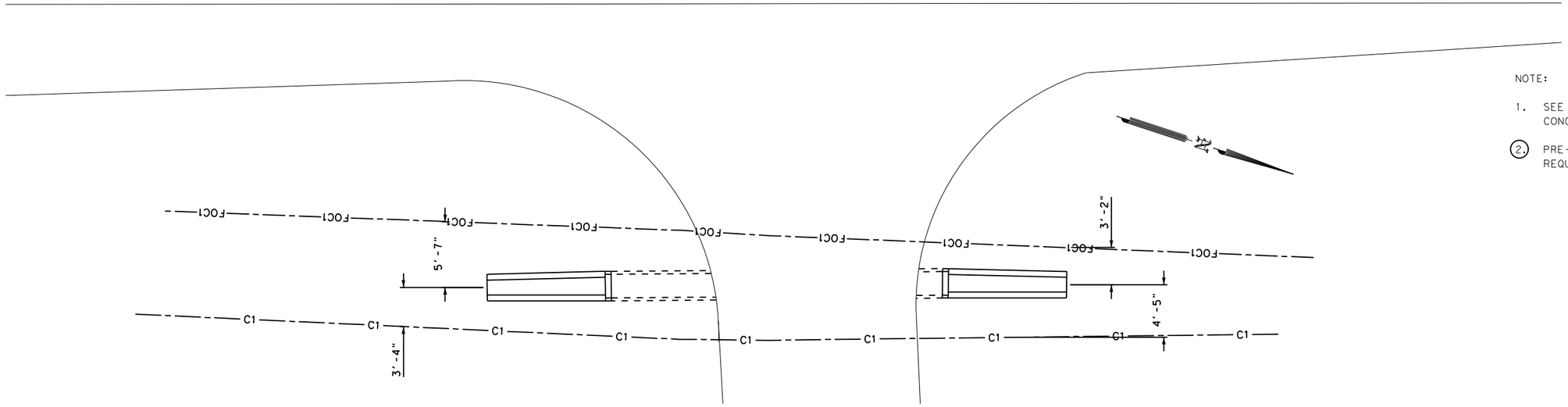
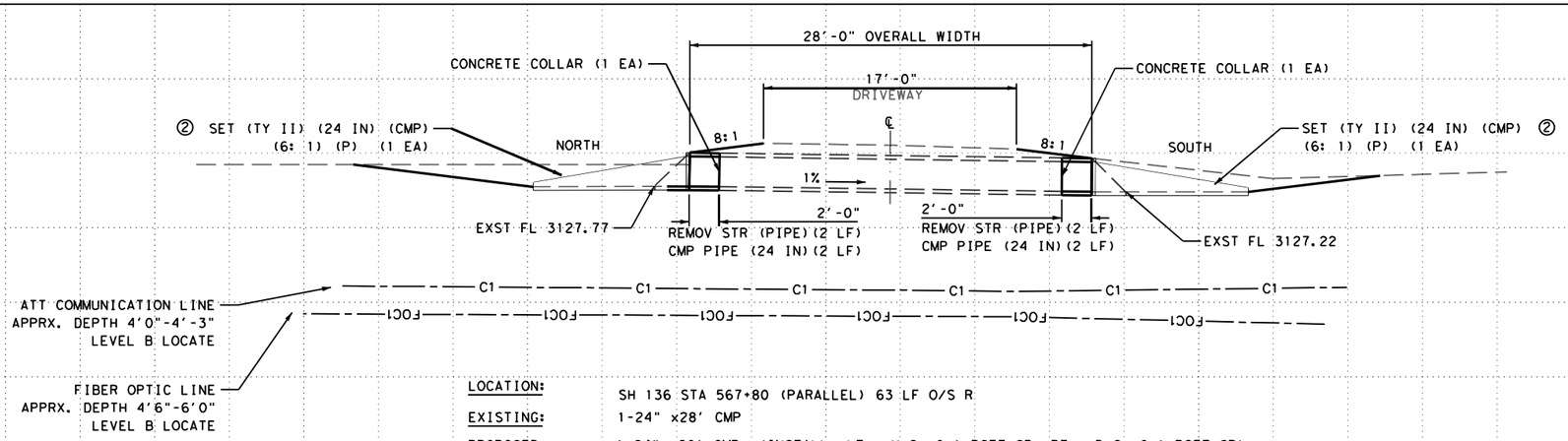
SH 136 NB



NOTE:

1. SEE MISCELLANEOUS CULVERT DETAILS FOR CONCRETE COLLAR DETAIL
2. PRE-CAST SET WITHOUT TOE WALL IS REQUIRED FOR SET

PROPOSED CULVERT AT STA 567+80



LOCATION: SH 136 STA 567+80 (PARALLEL) 63 LF O/S R

EXISTING: 1-24" x28' CMP

PROPOSED: 1-24" x28' CMP, (INSTALL: LT - U.S. 6:1 PSET-SP, RT - D.S. 6:1 PSET-SP)

CSJ: 0356-01-107 CULVERT DETAIL SHEET 15 OF 33

LOCATION	110 6001 EXCAVATION (ROADWAY)	132 6003 EMBANKMENT (FINAL) (ORD COMP) (TY B)	420 6009 CL A CONC (COLLAR)	460 6003 CMP (GAL STL 24 IN)	467 6380 SET (TY II) (24 IN) (CMP) (6: 1) (P)	496 6007 REMOV STR (PIPE)
CSJ: 0356-01-107	CY	CY	EA	LF	EA	LF
STA 567+80 (R) P	21.20	11.33	2	4	2	4
PROJECT SUMMARY:	**21.20**	**11.33**	**2**	**4**	**2**	**4**

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11-17-2022

SH 136

CULVERT DETAILS

SCALE: 1" = 10'

2023 Texas Department of Transportation

SHEET 15 OF 33

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		105

DATE: 11/17/2022 4:28:54 PM
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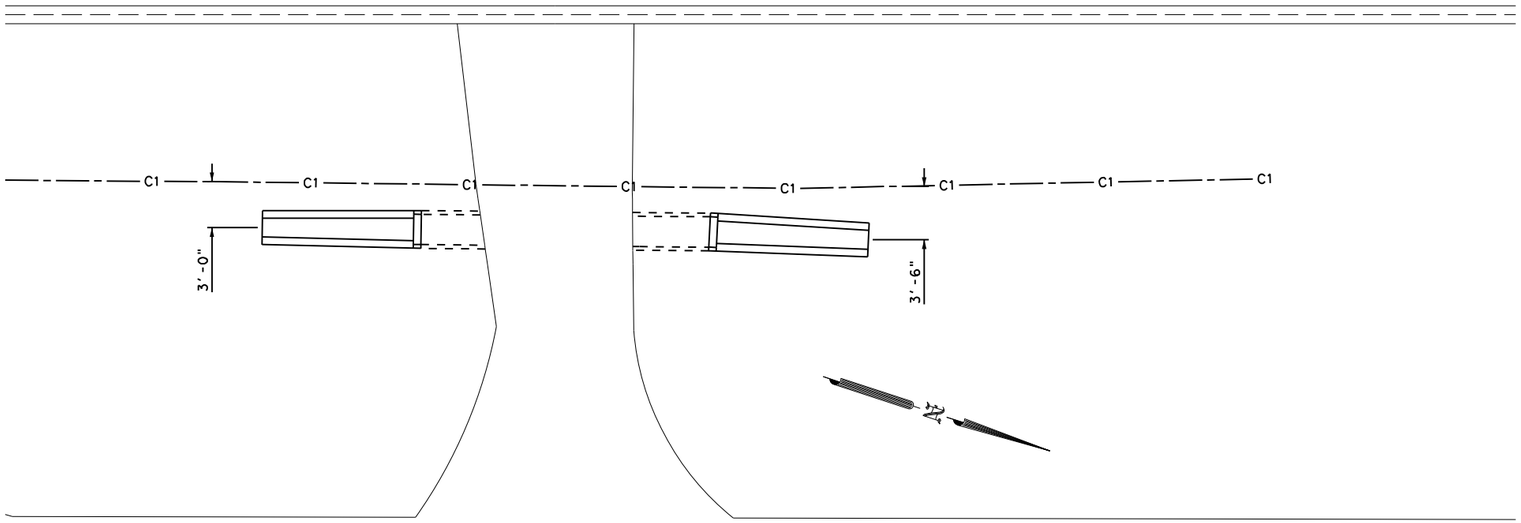
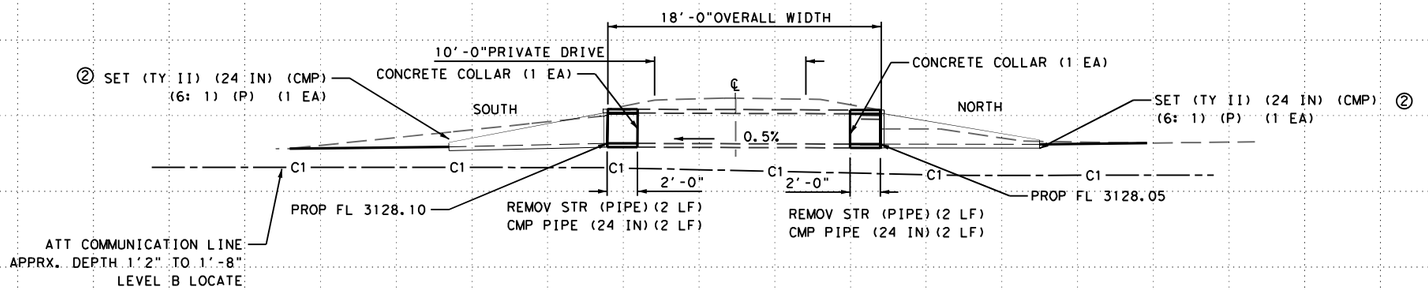


PROPOSED CULVERT AT STA 568+06

59'-0" OFFSET LT ℄

NOTE:

1. SEE MISCELLANEOUS CULVERT DETAILS FOR CONCRETE COLLAR DETAIL
2. PRE-CAST SET WITHOUT TOE WALL IS REQUIRED FOR SET



LOCATION: SH 136 STA 568+06 (PARALLEL) 59 LF O/S L

EXISTING: 1-24" x18' CMP

PROPOSED: 1-24" x18' CMP, (INSTALL: LT - D.S. 6:1 PSET-SP, RT - U.S. 6:1 PSET-SP)

CSJ: 0356-01-107 CULVERT DETAIL SHEET 16 FO 33

LOCATION	110 6001 EXCAVATION (ROADWAY)	132 6003 EMBANKMENT (FINAL) (ORD COMP) (TY B)	420 6009 CL A CONC (COLLAR)	460 6003 CMP (GAL STL 24 IN)	467 6380 SET (TY II) (24 IN) (CMP) (6: 1) (P)	496 6007 REMOV STR (PIPE)
CSJ: 0356-01-107	CY	CY	EA	LF	EA	LF
STA 568+06 (L) P	17.90	13.33	2	4	2	4
PROJECT SUMMARY:	**17.90**	**13.33**	**2**	**4**	**2**	**4**

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Casey B. Stripling

11-17-2022

SH 136

CULVERT DETAILS

SCALE: 1" = 10'

2023 Texas Department of Transportation

SHEET 16 OF 33

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		106

DATE: 11/17/2022 4:28:56 PM
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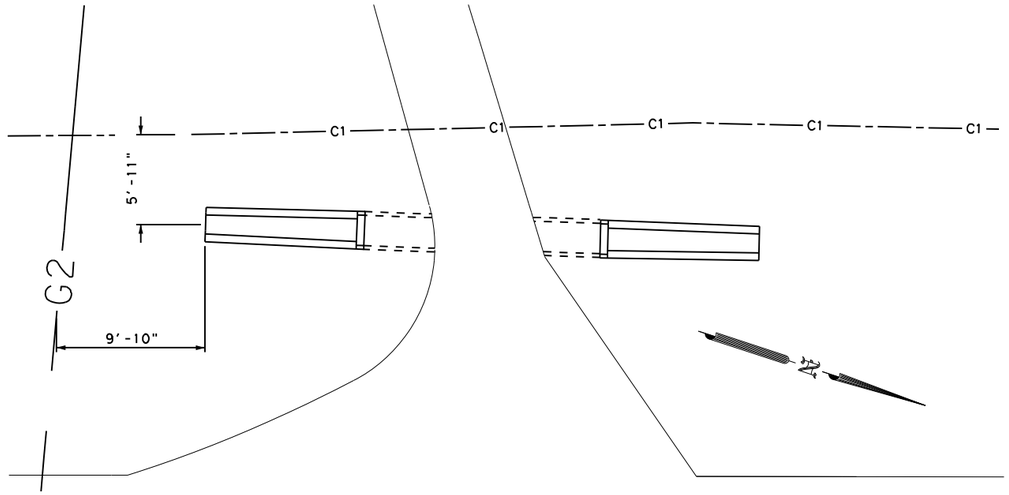
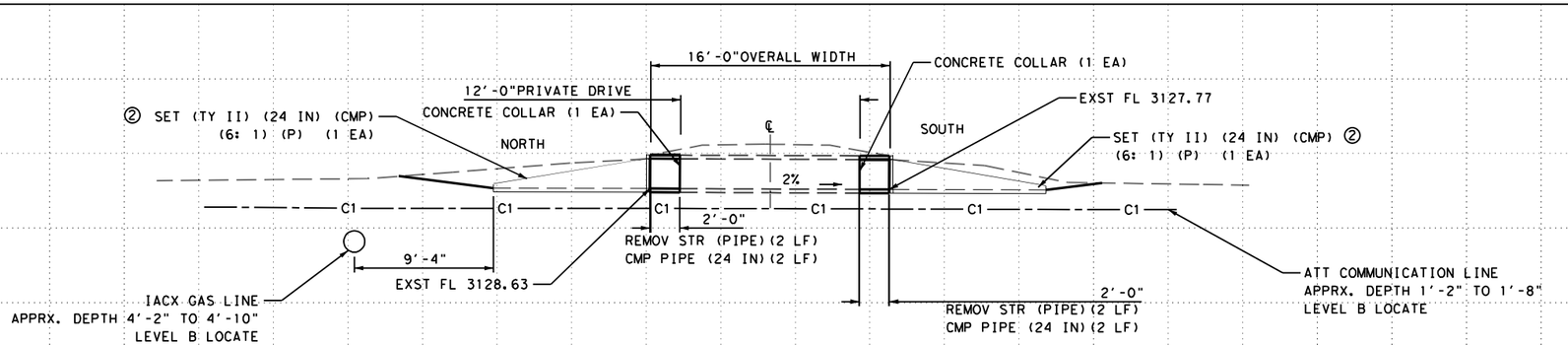


NOTE:

1. SEE MISCELLANEOUS CULVERT DETAILS FOR CONCRETE COLLAR DETAIL
2. PRE-CAST SET WITHOUT TOE WALL IS REQUIRED FOR SET

PROPOSED CULVERT AT STA 572+40



LOCATION: SH 136 STA 572+40 (PARALLEL) 53 LF O/S L

EXISTING: 1-24" x16' CMP

PROPOSED: 1-24" x16' CMP, (INSTALL: LT - D.S. 6:1 PSET-SP, RT - U.S. 6:1 PSET-SP)

CSJ: 0356-01-107 CULVERT DETAIL SHEET 17 OF 33

LOCATION	110 6001 EXCAVATION (ROADWAY)	132 6003 EMBANKMENT (FINAL) (ORD COMP) (TY B)	420 6009 CL A CONC (COLLAR)	460 6003 CMP (GAL STL 24 IN)	467 6380 SET (TY II) (24 IN) (CMP) (6: 1) (P)	496 6007 REMOV STR (PIPE)
CSJ: 0356-01-107	CY	CY	EA	LF	EA	LF
STA 572+40 (L) P	9.79	6.49	2	4	2	4
PROJECT SUMMARY:	9.79	6.49	2	4	2	4

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Casey B. Stripling

11-17-2022

SH 136

CULVERT DETAILS

SCALE: 1" = 10'

2023 Texas Department of Transportation

SHEET 17 OF 33

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		107

DATE: 11/17/2022 4:28:57 PM
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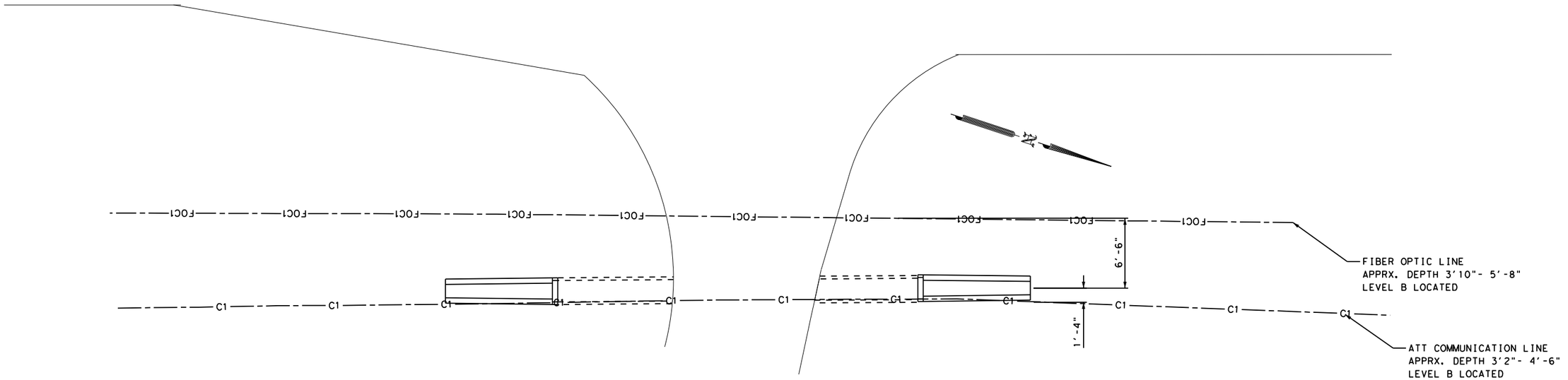
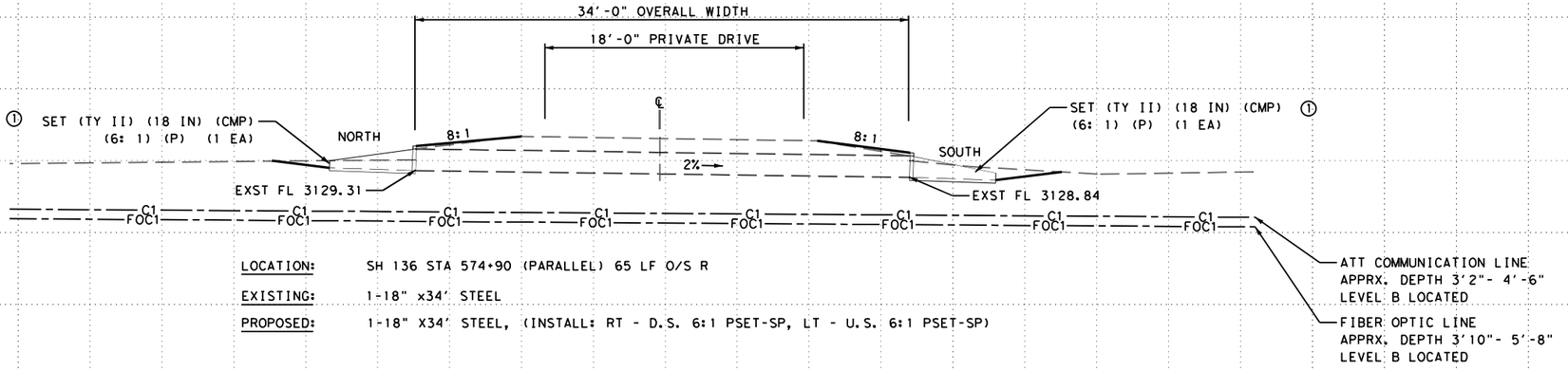
NOTE:

1. PRE-CAST SET WITHOUT TOE WALL IS REQUIRED FOR SET



PROPOSED CULVERT AT STA 574+90

65'-0" OFFSET RT ℄



LOCATION: SH 136 STA 574+90 (PARALLEL) 65 LF O/S R

EXISTING: 1-18" x34' STEEL

PROPOSED: 1-18" X34' STEEL, (INSTALL: RT - D.S. 6:1 PSET-SP, LT - U.S. 6:1 PSET-SP)

CSJ: 0356-01-107 CULVERT DETAIL SHEET 18 OF 33

LOCATION	110 6001 EXCAVATION (ROADWAY)	132 6003 EMBANKMENT (FINAL) (ORD COMP) (TY B)	467 6348 SET (TY II) (18 IN) (CMP) (6: 1) (P)
CSJ: 0356-01-107	CY	CY	EA
STA 574+90 (L) P	3.60	3.58	2
PROJECT SUMMARY:	3.60	3.58	2

STATE OF TEXAS
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136887
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Casey B. Stripling

11-17-2022

SH 136

CULVERT DETAILS

SCALE: 1" = 10'

2023 Texas Department of Transportation

SHEET 18 OF 27

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		108

DATE: 11/17/2022 4:28:59 PM
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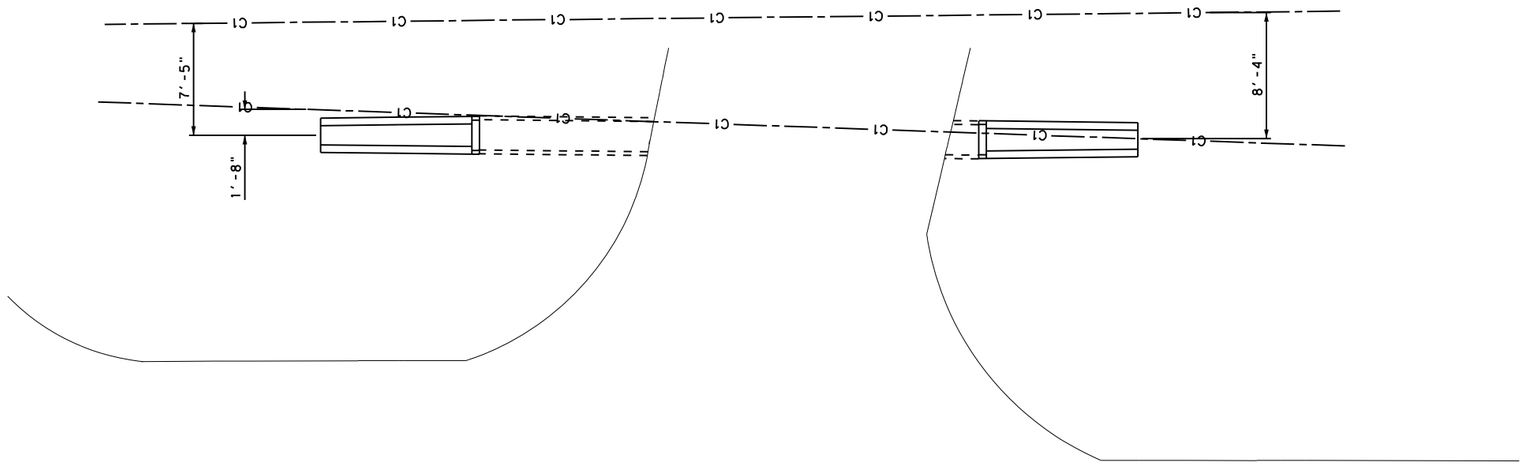
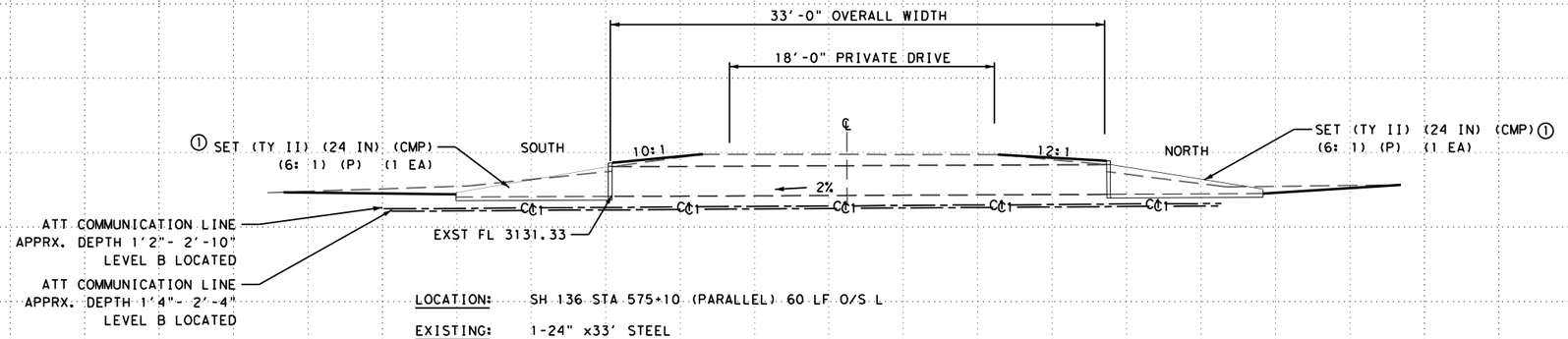


NOTE:

1. PRE-CAST SET WITHOUT TOE WALL IS REQUIRED FOR SET

PROPOSED CULVERT AT STA 575+10



LOCATION: SH 136 STA 575+10 (PARALLEL) 60 LF O/S L

EXISTING: 1-24" x33' STEEL

PROPOSED: 1-24" x33' STEEL, (INSTALL: RT - U.S. 6:1 PSET-SP, LT - D.S. 6:1 PSET-SP)

CSJ: 0356-01-107 CULVERT DETAIL SHEET 19 OF 33

LOCATION	110 6001 EXCAVATION (ROADWAY)	132 6003 EMBANKMENT (FINAL) (ORD COMP) (TY B)	467 6380 SET (TY II) (24 IN) (CMP) (6: 1) (P)
CSJ: 0356-01-107	CY	CY	EA
STA 575+10 (L) P	7.24	7.52	2
PROJECT SUMMARY:	7.24	7.52	2

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Casey B. Stripling

11-17-2022

SH 136

CULVERT DETAILS

SCALE: 1" = 10'

2023 Texas Department of Transportation

SHEET 19 OF 33

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		109

DATE: 11/17/2022 4:29:00 PM
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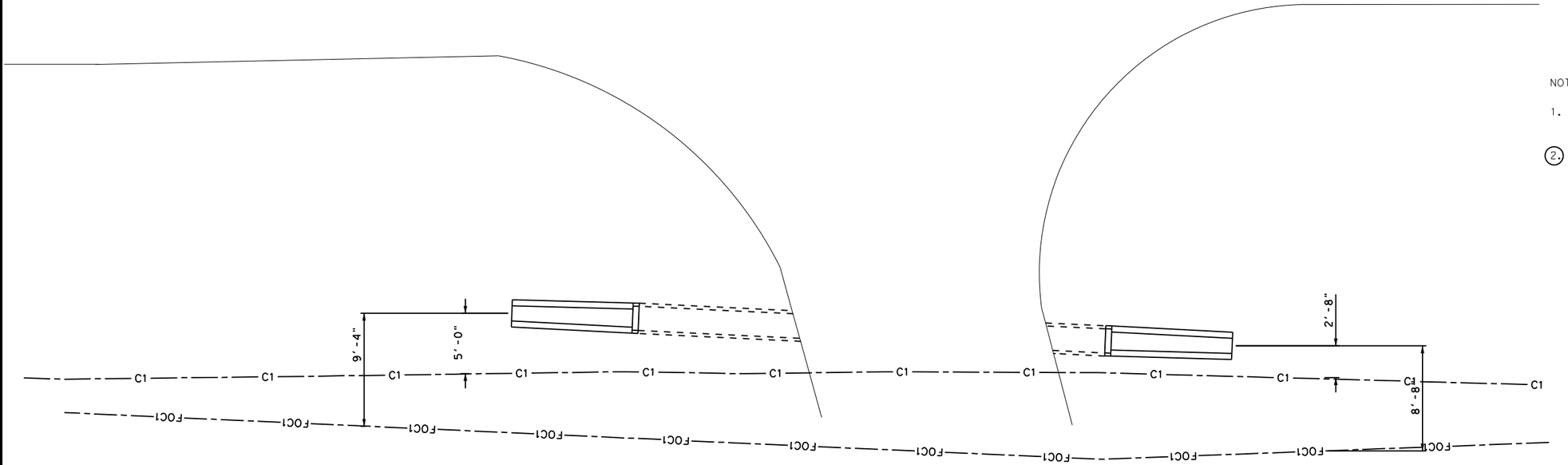
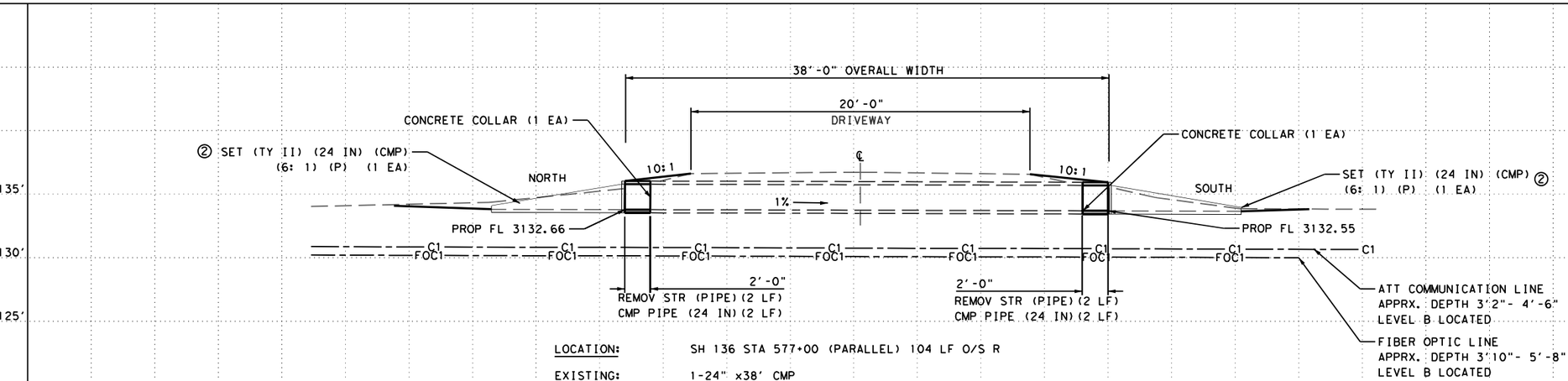


NOTE:

1. SEE MISCELLANEOUS CULVERT DETAILS FOR CONCRETE COLLAR DETAIL
2. PRE-CAST SET WITHOUT TOE WALL IS REQUIRED FOR SET

PROPOSED CULVERT AT STA 577+00



LOCATION: SH 136 STA 577+00 (PARALLEL) 104 LF O/S R

EXISTING: 1-24" x38' CMP

PROPOSED: 1-24" x38' CMP, (INSTALL: LT - U.S. 6:1 PSET-SP, RT - D.S. 6:1 PSET-SP)

CSJ: 0356-01-107 CULVERT DETAIL SHEET 20 OF 33

LOCATION	110 6001 EXCAVATION (ROADWAY)	132 6003 EMBANKMENT (FINAL) (ORD COMP) (TY B)	420 6009 CL A CONC (COLLAR)	460 6003 CMP (GAL STL 24 IN)	467 6380 SET (TY II) (24 IN) (CMP) (6: 1) (P)	496 6007 REMOV STR (PIPE)
CSJ: 0356-01-107	CY	CY	EA	LF	EA	LF
STA 577+00 (R) P	9.32	10.34	2	4	2	4
PROJECT SUMMARY:	9.32	10.34	2	4	2	4

STATE OF TEXAS
CASEY B. STRIPLING
136887
LICENSED PROFESSIONAL ENGINEER

Casey B. Stripling

11-17-2022

SH 136

CULVERT DETAILS

SCALE: 1" = 10'

2023 Texas Department of Transportation

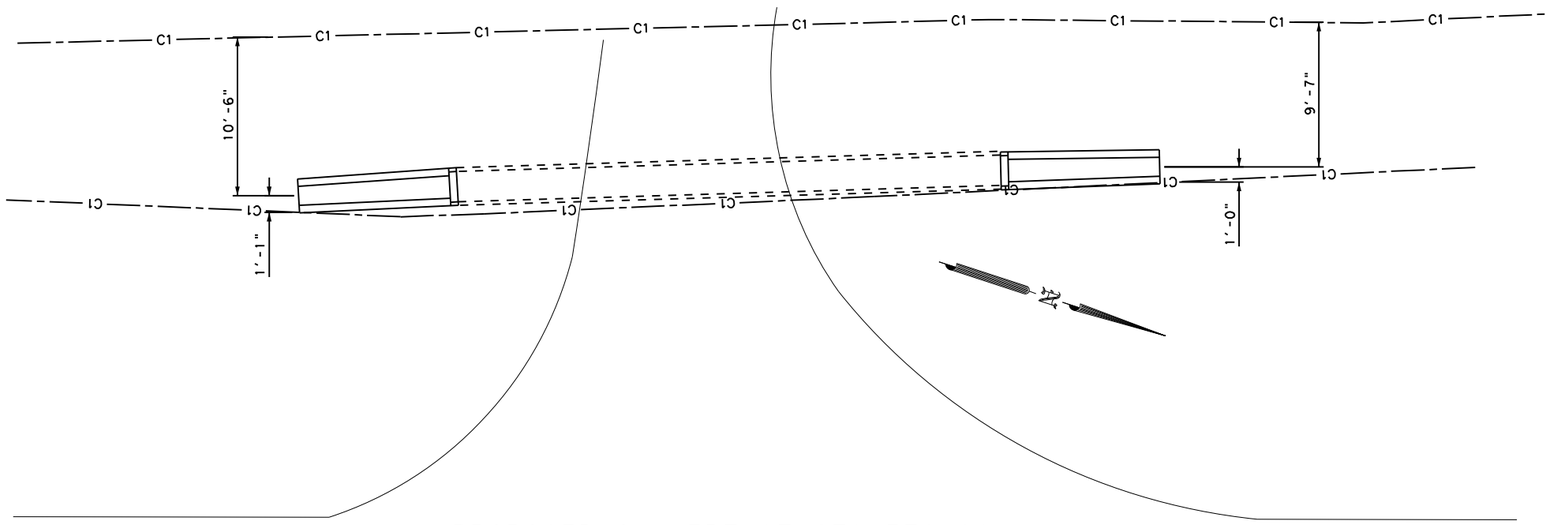
SHEET 20 OF 33

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		110

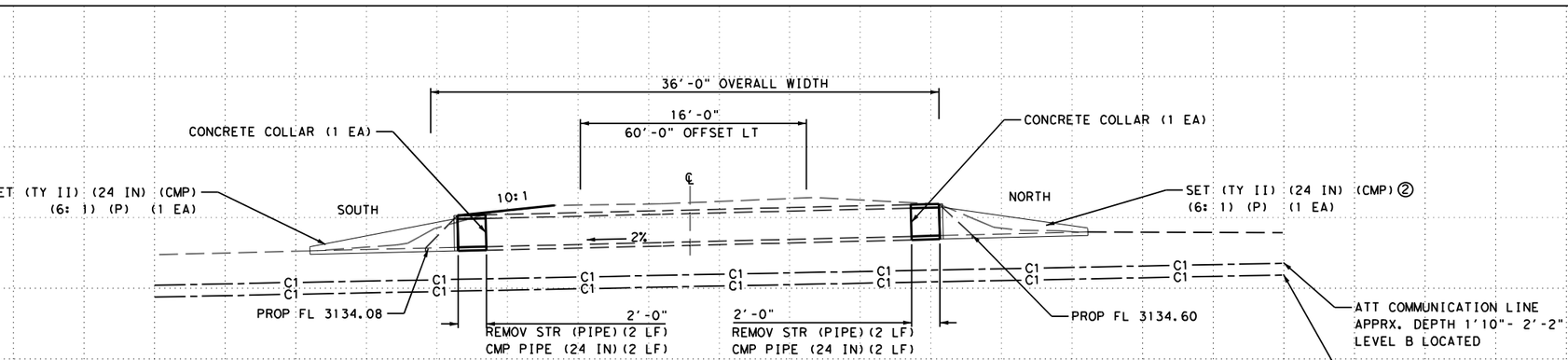
DATE: 11/17/2022 4:29:02 PM
FILE: T:\AMA\PD\Construction Projects\0356-01\107 PM Overlay\4 - Design\Plan Set\5. Drainage\107_CULVERT DETAILS.dgn

NOTE:

1. SEE MISCELLANEOUS CULVERT DETAILS FOR CONCRETE COLLAR DETAIL
2. PRE-CAST SET WITHOUT TOE WALL IS REQUIRED FOR SET



PROPOSED CULVERT AT STA 578+00



LOCATION: SH 136 STA 578+00 (PARALLEL) 60 LF O/S L

EXISTING: 1-24" x36' CMP

PROPOSED: 1-24" x36' CMP, (INSTALL: LT - D.S. 6:1 PSET-SP, RT - U.S. 6:1 PSET-SP)

CSJ: 0356-01-107 CULVERT DETAIL SHEET 21 OF 33

LOCATION	110 6001 EXCAVATION (ROADWAY)	132 6003 EMBANKMENT (FINAL) (ORD COMP) (TY B)	420 6009 CL A CONC (COLLAR)	460 6003 CMP (GAL STL 24 IN)	467 6380 SET (TY II) (24 IN) (CMP) (6: 1) (P)	496 6007 REMOV STR (PIPE)
CSJ: 0356-01-107	CY	CY	EA	LF	EA	LF
STA 578+00 (L) P	3.89	7.88	2	4	2	4
PROJECT SUMMARY:	3.89	7.88	2	4	2	4

STATE OF TEXAS
CASEY B. STRIPLING
136887
LICENSED PROFESSIONAL ENGINEER

Casey B. Stripling

11-17-2022

SH 136

CULVERT DETAILS

SCALE: 1" = 10'

2023 Texas Department of Transportation

SHEET 21 OF 33

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		111

DATE: 11/17/2022 4:29:03 PM
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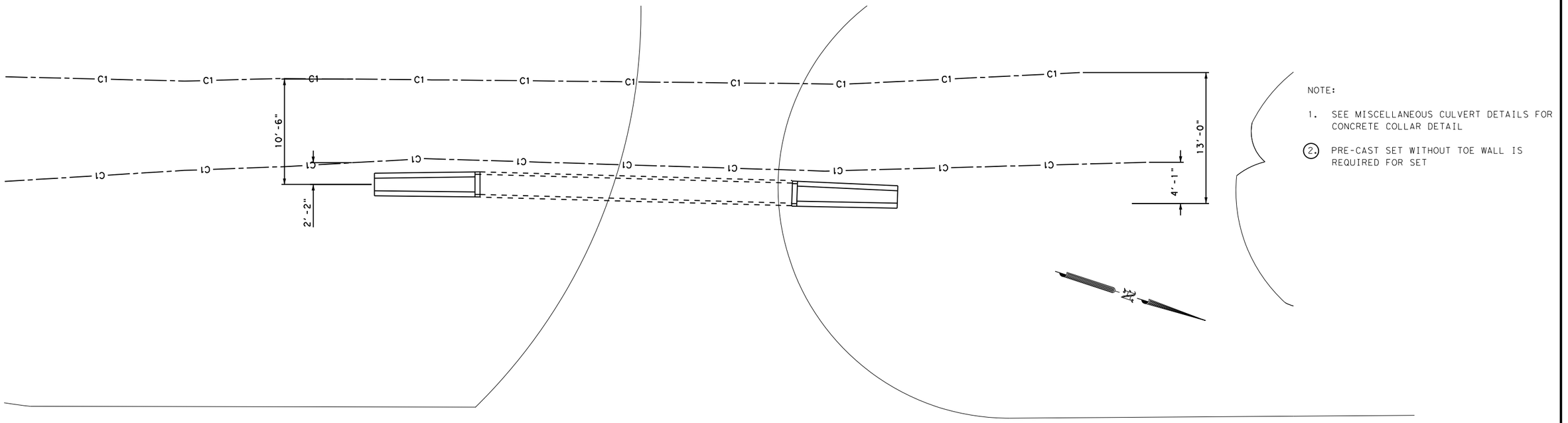
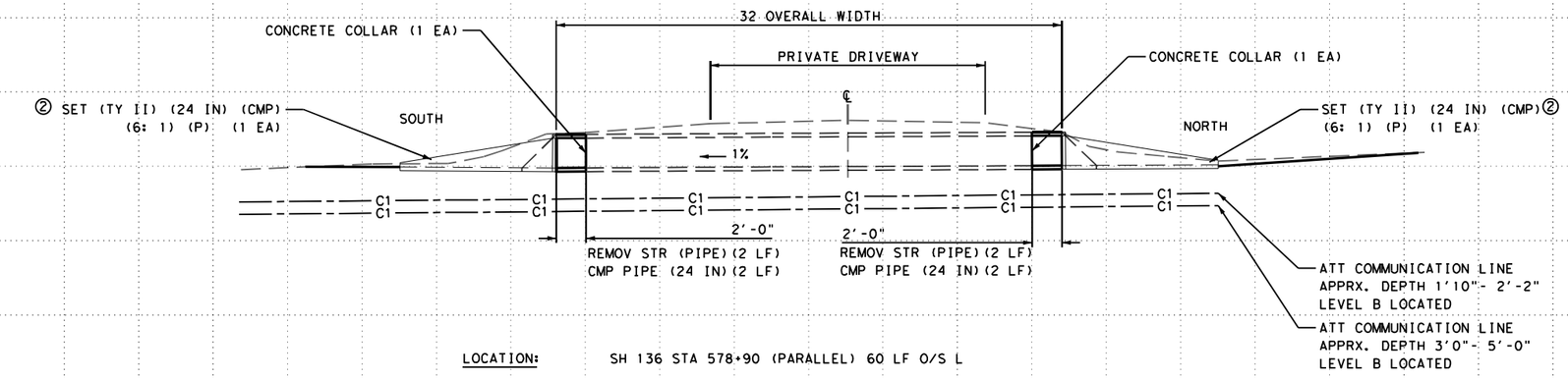


NOTE:

1. SEE MISCELLANEOUS CULVERT DETAILS FOR CONCRETE COLLAR DETAIL
2. PRE-CAST SET WITHOUT TOE WALL IS REQUIRED FOR SET

PROPOSED CULVERT AT STA 578+90



LOCATION: SH 136 STA 578+90 (PARALLEL) 60 LF O/S L

EXISTING: 1-24" x32' CMP

PROPOSED: 1-24" x32' CMP, (INSTALL: RT - U.S. 6:1 PSET-SP, LT - D.S. 6:1 PSET-SP)

CSJ: 0356-01-107 CULVERT DETAIL SHEET 22 OF 33

LOCATION	110 6001 EXCAVATION (ROADWAY)	132 6003 EMBANKMENT (FINAL) (ORD COMP) (TY B)	420 6009 CL A CONC (COLLAR)	460 6003 CMP (GAL STL 24 IN)	467 6380 SET (TY II) (24 IN) (CMP) (6: 1) (P)	496 6007 REMOV STR (PIPE)
CSJ: 0356-01-107	CY	CY	EA	LF	EA	LF
STA 578+90 (L) P	7.47	13.02	2	4	2	4
PROJECT SUMMARY:	7.47	13.02	2	4	2	4

STATE OF TEXAS
CASEY B. STRIPLING
136887
LICENSED PROFESSIONAL ENGINEER

Casey B. Stripling

11-17-2022

SH 136

CULVERT DETAILS

SCALE: 1" = 10'

2023 Texas Department of Transportation

SHEET 22 OF 33

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		112

DATE: 11/17/2022 4:29:05 PM
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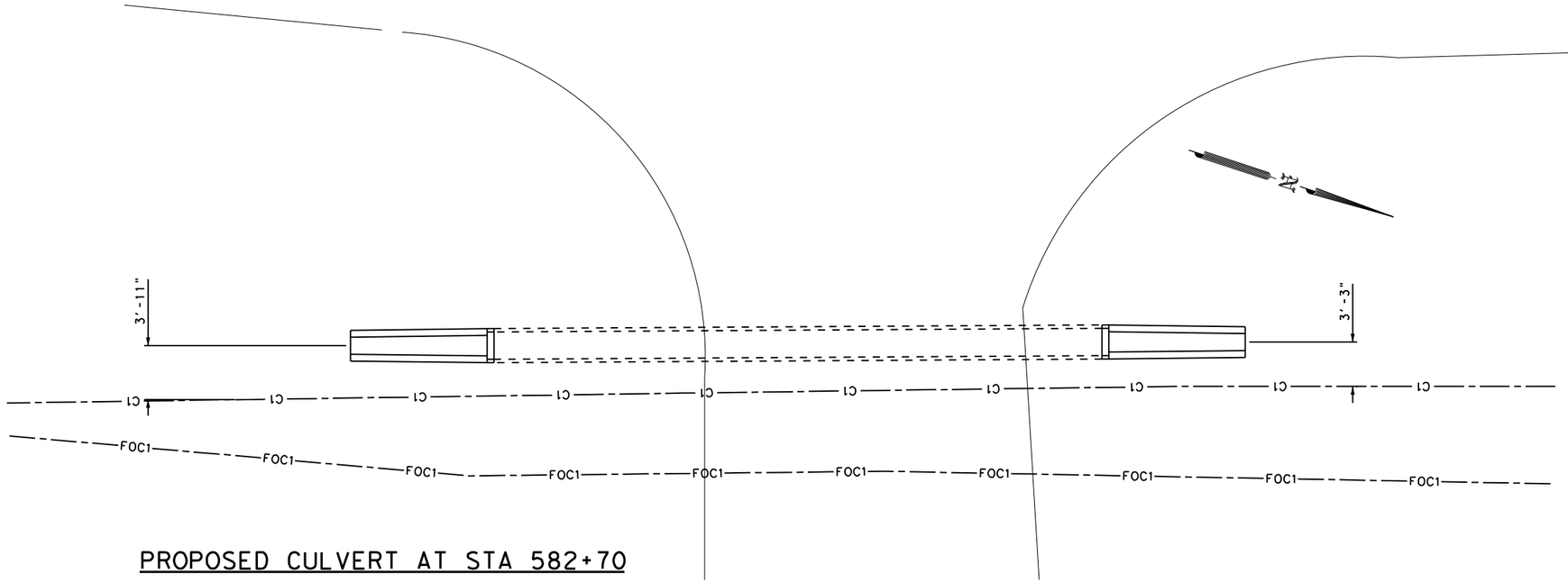
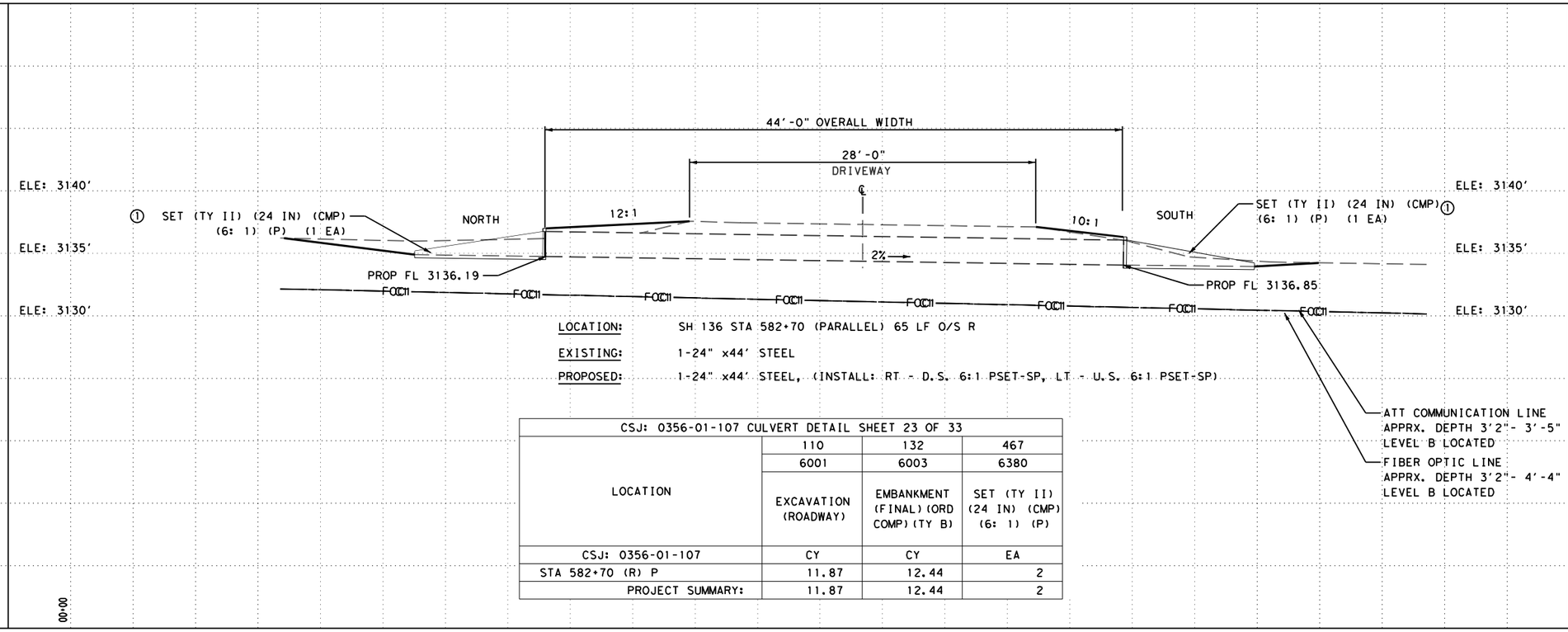


NOTE:

1. PRE-CAST SET WITHOUT TOE WALL IS REQUIRED FOR SET

PROPOSED CULVERT AT STA 582+70



LOCATION: SH 136 STA 582+70 (PARALLEL) 65 LF O/S R

EXISTING: 1-24" x44' STEEL

PROPOSED: 1-24" x44' STEEL, (INSTALL: RT - D.S. 6:1 PSET-SP, LT - U.S. 6:1 PSET-SP)

CSJ: 0356-01-107 CULVERT DETAIL SHEET 23 OF 33			
	110	132	467
	6001	6003	6380
LOCATION	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL) (ORD COMP) (TY B)	SET (TY II) (24 IN) (CMP) (6: 1) (P)
CSJ: 0356-01-107	CY	CY	EA
STA 582+70 (R) P	11.87	12.44	2
PROJECT SUMMARY:	11.87	12.44	2

STATE OF TEXAS
CASEY B. STRIPLING
136887
LICENSED PROFESSIONAL ENGINEER

Casey B. Stripling

11-17-2022

SH 136

CULVERT DETAILS

SCALE: 1" = 10'

2023 Texas Department of Transportation

SHEET 23 OF 33

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		113

DATE: 11/17/2022 4:29:07 PM
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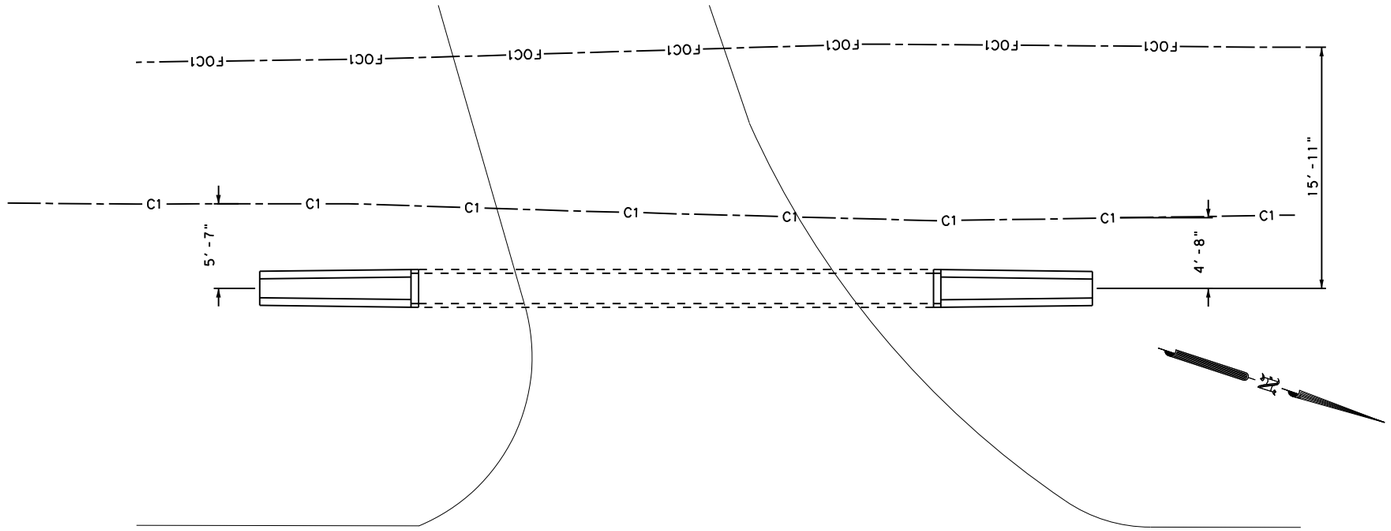
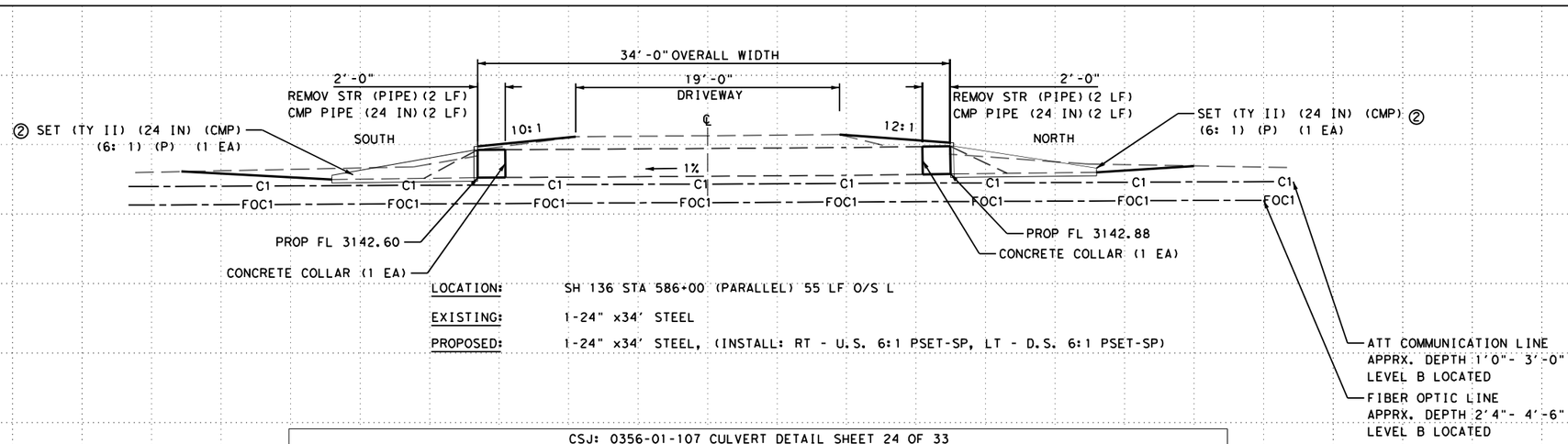


NOTE:

1. SEE MISCELLANEOUS CULVERT DETAILS FOR CONCRETE COLLAR DETAIL
2. PRE-CAST SET WITHOUT TOE WALL IS REQUIRED FOR SET

PROPOSED CULVERT AT STA 586+00



LOCATION: SH 136 STA 586+00 (PARALLEL) 55 LF O/S L

EXISTING: 1-24" x34' STEEL

PROPOSED: 1-24" x34' STEEL, (INSTALL: RT - U.S. 6:1 PSET-SP, LT - D.S. 6:1 PSET-SP)

CSJ: 0356-01-107 CULVERT DETAIL SHEET 24 OF 33

LOCATION	110 6001 EXCAVATION (ROADWAY)	132 6003 EMBANKMENT (FINAL) (ORD COMP) (TY B)	420 6009 CL A CONC (COLLAR)	460 6003 CMP (GAL STL 24 IN)	467 6380 SET (TY II) (24 IN) (CMP) (6:1) (P)	496 6007 REMOV STR (PIPE)
CSJ: 0356-01-107	CY	CY	EA	LF	EA	LF
STA 586+00 (L) P	10.07	10.56	2	4	2	4
PROJECT SUMMARY:	10.07	10.56	2	4	2	4

STATE OF TEXAS
CASEY B. STRIPLING
136887
LICENSED PROFESSIONAL ENGINEER
Casey B. Stripling
11-17-2022

SH 136

CULVERT DETAILS

SCALE: 1" = 10'

2023 Texas Department of Transportation

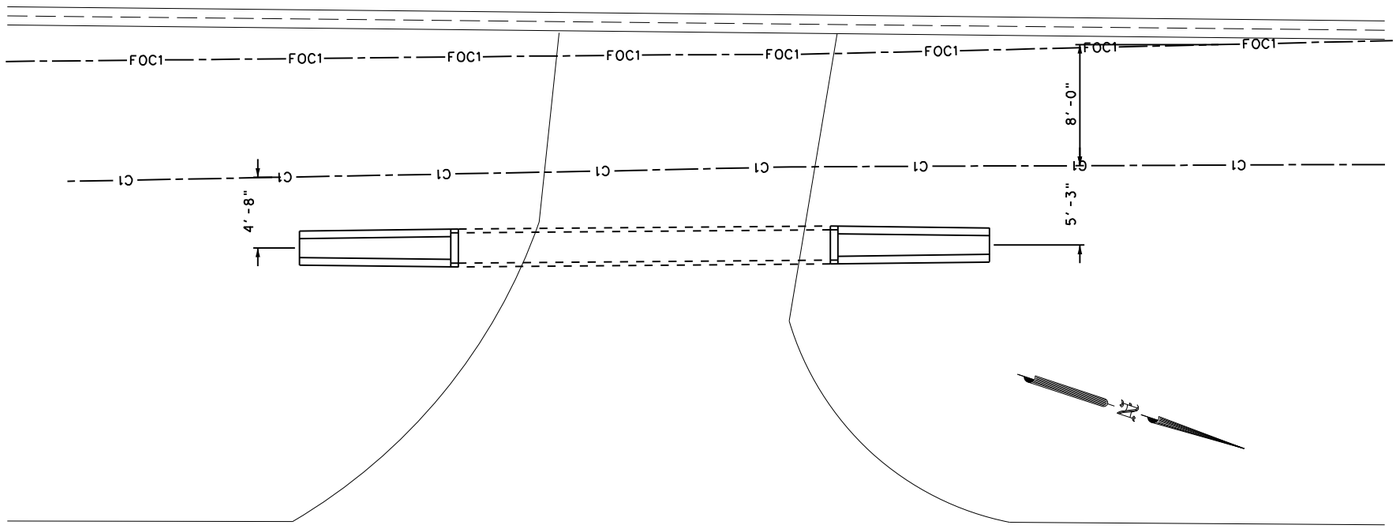
SHEET 24 OF 33

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		114

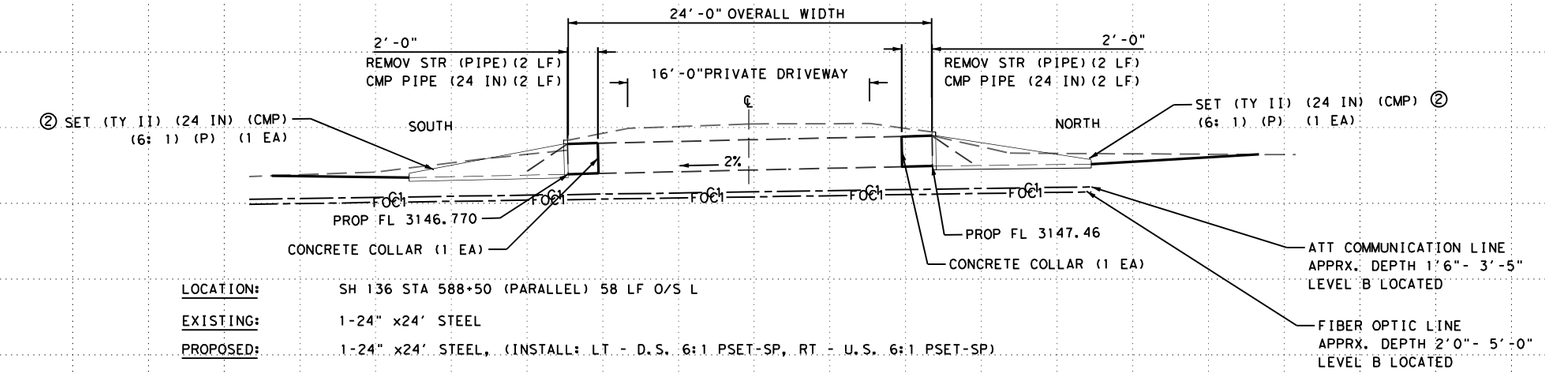
DATE: 11/17/2022 4:29:08 PM
FILE: T:\AMA\PD\Construction Projects\0356-01\107 PM Overlay\4 - Design\Plan Set\5. Drainage\107_CULVERT DETAILS.dgn

NOTE:

1. SEE MISCELLANEOUS CULVERT DETAILS FOR CONCRETE COLLAR DETAIL
2. PRE-CAST SET WITHOUT TOE WALL IS REQUIRED FOR SET



PROPOSED CULVERT AT STA 588+50



LOCATION: SH 136 STA 588+50 (PARALLEL) 58 LF O/S L

EXISTING: 1-24" x24' STEEL

PROPOSED: 1-24" x24' STEEL, (INSTALL: LT - D.S. 6:1 PSET-SP, RT - U.S. 6:1 PSET-SP)

CSJ: 0356-01-107 CULVERT DETAIL SHEET 25 OF 33

LOCATION	110 6001 EXCAVATION (ROADWAY)	132 6003 EMBANKMENT (FINAL) (ORD COMP) (TY B)	420 6009 CL A CONC (COLLAR)	460 6003 CMP (GAL STL 24 IN)	467 6380 SET (TY II) (24 IN) (CMP) (6: 1) (P)	496 6007 REMOV STR (PIPE)
CSJ: 0356-01-107	CY	CY	EA	LF	EA	LF
STA 588+50 (L) P	7.75	6.37	2	4	2	4
PROJECT SUMMARY:	7.75	6.37	2	4	2	4

STATE OF TEXAS
CASEY B. STRIPLING
136887
LICENSED PROFESSIONAL ENGINEER

Casey B. Stripling

11-17-2022

SH 136

CULVERT DETAILS

SCALE: 1" = 10'

2023 Texas Department of Transportation

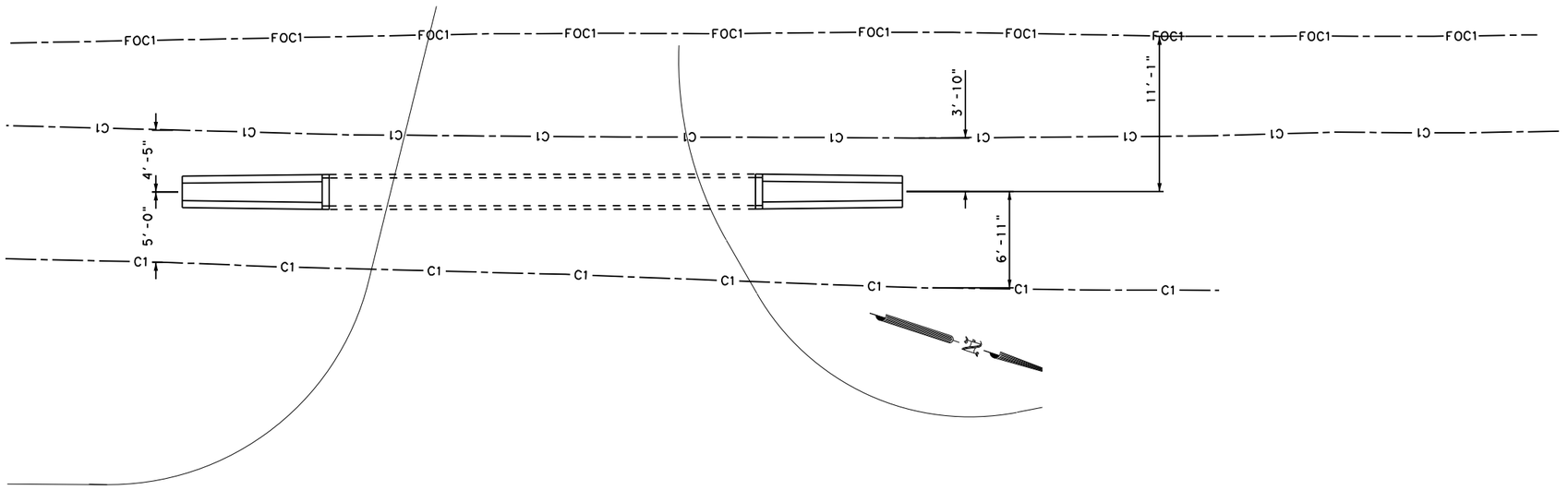
SHEET 25 OF 33

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		115

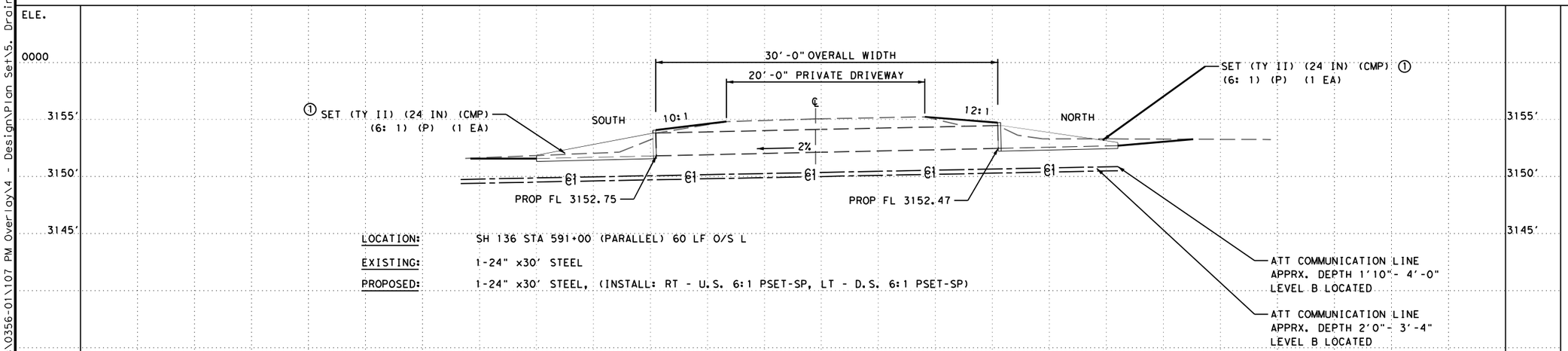
DATE: 11/17/2022 4:29:09 PM
FILE: T:\AMA\PD\Construction Projects\0356-01\107 PM Overlay\4 - Design\Plan Set\5. Drainage\107_CULVERT DETAILS.dgn

NOTE:

1. PRE-CAST SET WITHOUT TOE WALL IS REQUIRED FOR SET



PROPOSED CULVERT AT STA 591+00



LOCATION: SH 136 STA 591+00 (PARALLEL) 60 LF O/S L

EXISTING: 1-24" x30' STEEL

PROPOSED: 1-24" x30' STEEL, (INSTALL: RT - U.S. 6:1 PSET-SP, LT - D.S. 6:1 PSET-SP)

CSJ: 0356-01-107 CULVERT DETAIL SHEET 26 OF 33

LOCATION	110 6001 EXCAVATION (ROADWAY)	132 6003 EMBANKMENT (FINAL) (ORD COMP) (TY B)	420 6009 CL A CONC (COLLAR)	460 6004 CMP (GAL STL 30 IN)	467 6410 SET (TY II) (30 IN) (CMP) (6:1) (P)	496 6007 REMOV STR (PIPE)
CSJ: 0356-01-107	CY	CY	EA	LF	EA	LF
STA 591+00 (L) P	4.47	6.74	2	4	2	4
PROJECT SUMMARY:	4.47	6.74	2	4	2	4

STATE OF TEXAS
CASEY B. STRIPLING
136887
LICENSED PROFESSIONAL ENGINEER

Casey B. Stripling

11-17-2022

SH 136

CULVERT DETAILS

SCALE: 1" = 10'

2023 Texas Department of Transportation

SHEET 26 OF 33

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		116

DATE: 11/17/2022 4:29:11 PM
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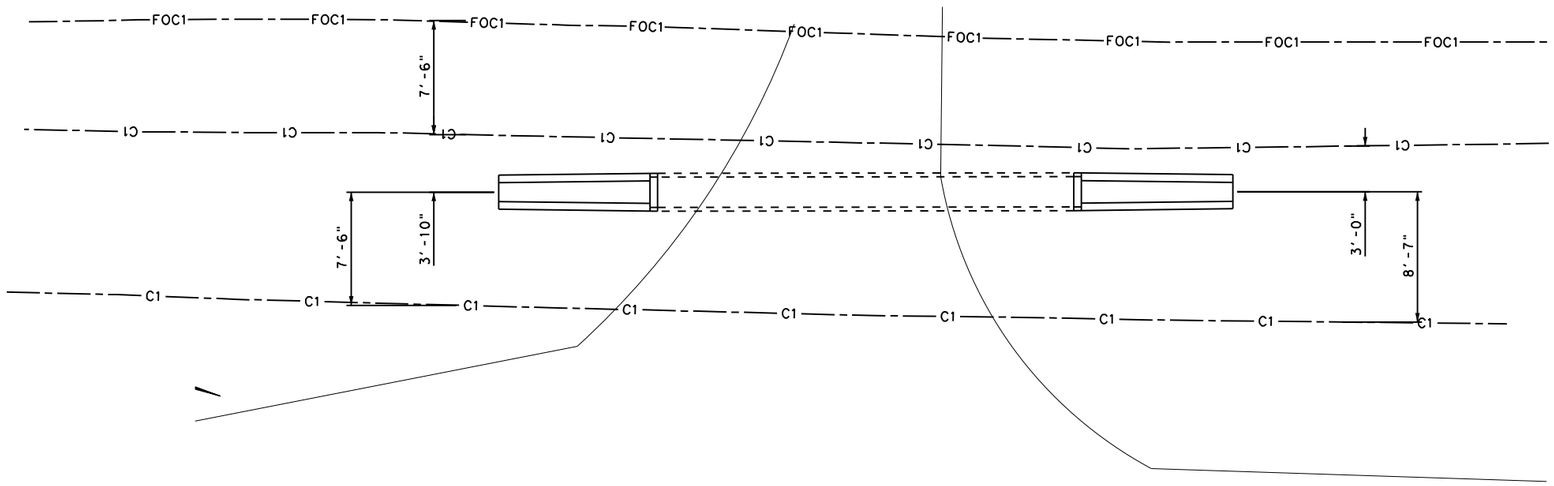
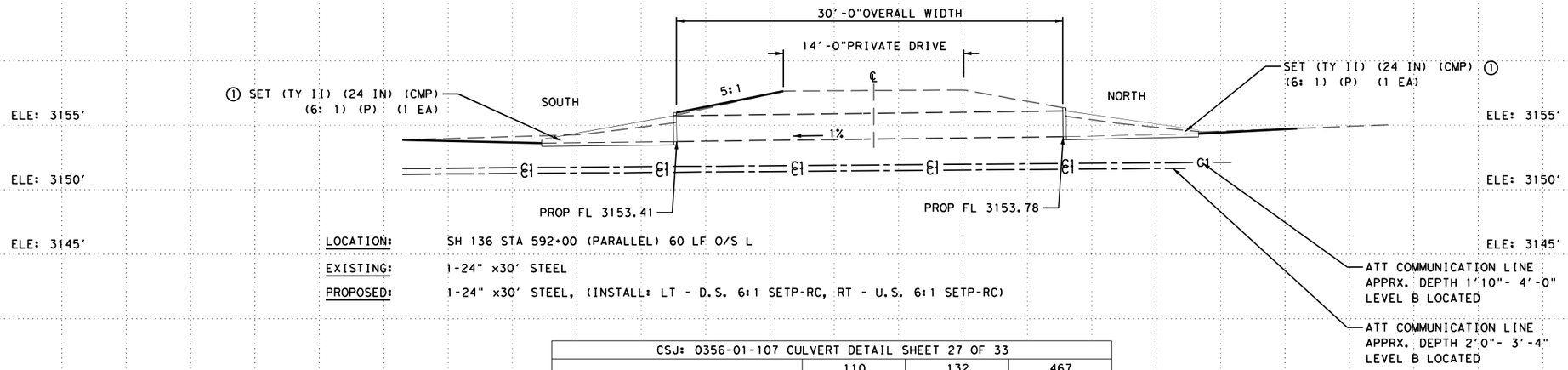


NOTE:

1. PRE-CAST SET WITHOUT TOE WALL IS REQUIRED FOR SET

PROPOSED CULVERT AT STA 592+00



LOCATION: SH 136 STA 592+00 (PARALLEL) 60 LF O/S L

EXISTING: 1-24" x30' STEEL

PROPOSED: 1-24" x30' STEEL, (INSTALL: LT - D.S. 6:1 SETP-RC, RT - U.S. 6:1 SETP-RC)

CSJ: 0356-01-107 CULVERT DETAIL SHEET 27 OF 33

LOCATION	110	132	467
	6001	6003	6380
	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL) (ORD COMP) (TY B)	SET (TY II) (24 IN) (CMP) (6: 1) (P)
CSJ: 0356-01-107	CY	CY	EA
STA 591+00 (L) P	4.40	4.70	2
PROJECT SUMMARY:	4.40	4.70	2

STATE OF TEXAS
CASEY B. STRIPLING
136887
LICENSED PROFESSIONAL ENGINEER
Casey B. Stripling
11-17-2022

SH 136

CULVERT DETAILS

SCALE: 1" = 10'

2023 Texas Department of Transportation

SHEET 27 OF 33

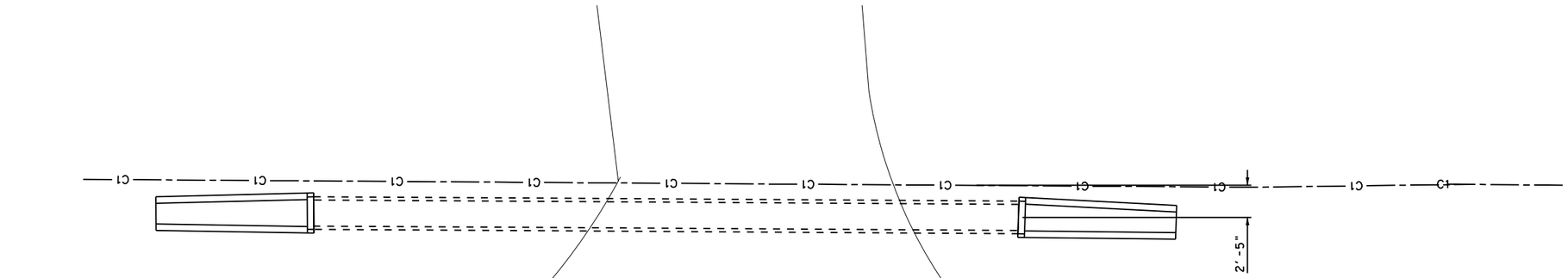
DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		117

DATE: 11/17/2022 4:29:12 PM
FILE: T:\AMA\PD\Construction Projects\0356-01\107 PM Overlay\4 - Design\Plan Set\5. Drainage\107_CULVERT DETAILS.dgn

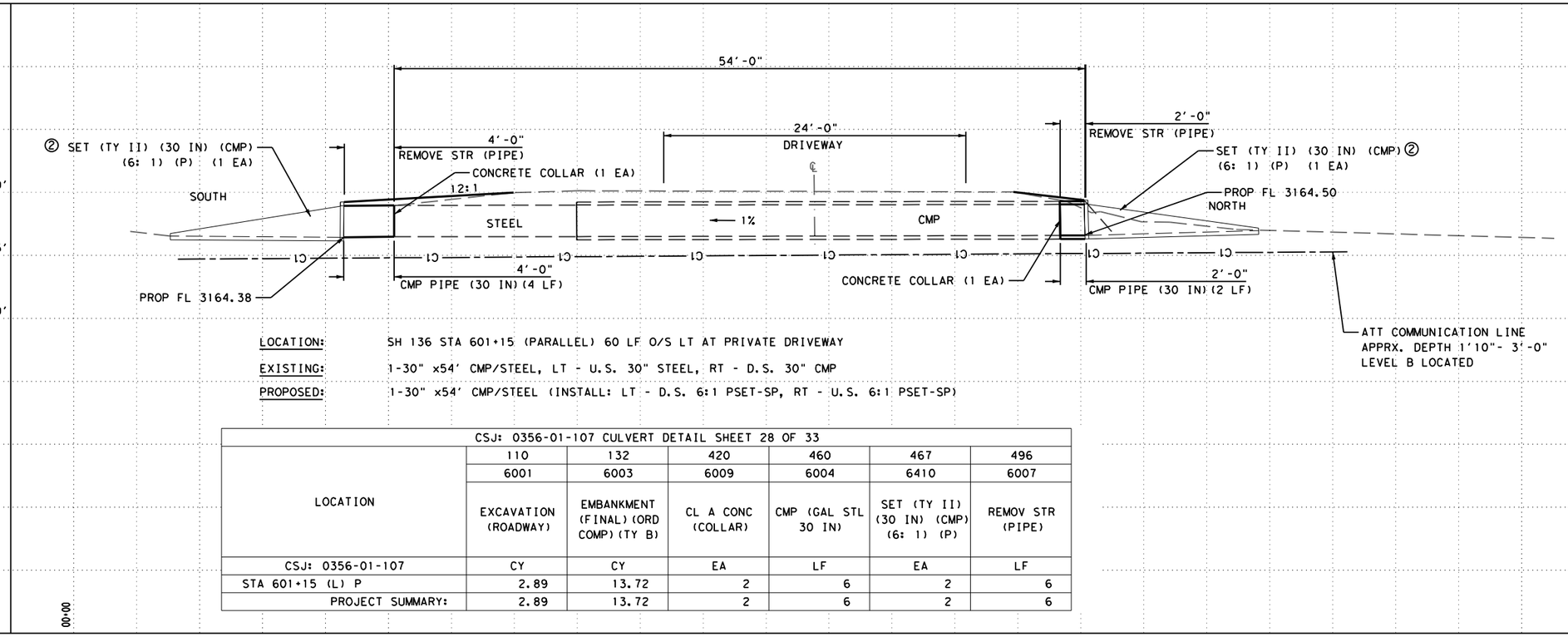
NOTE:

1. SEE MISCELLANEOUS CULVERT DETAILS FOR CONCRETE COLLAR DETAIL

2. PRE-CAST SET WITHOUT TOE WALL IS REQUIRED FOR SET



PROPOSED CULVERT AT STA 601+15



LOCATION: SH 136 STA 601+15 (PARALLEL) 60 LF O/S LT AT PRIVATE DRIVEWAY

EXISTING: 1-30" x54' CMP/STEEL, LT - U.S. 30" STEEL, RT - D.S. 30" CMP

PROPOSED: 1-30" x54' CMP/STEEL (INSTALL: LT - D.S. 6:1 PSET-SP, RT - U.S. 6:1 PSET-SP)

CSJ: 0356-01-107 CULVERT DETAIL SHEET 28 OF 33

LOCATION	110	132	420	460	467	496
	6001	6003	6009	6004	6410	6007
	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL) (ORD COMP) (TY B)	CL A CONC (COLLAR)	CMP (GAL STL 30 IN)	SET (TY II) (30 IN) (CMP) (6: 1) (P)	REMOV STR (PIPE)
CSJ: 0356-01-107	CY	CY	EA	LF	EA	LF
STA 601+15 (L) P	2.89	13.72	2	6	2	6
PROJECT SUMMARY:	2.89	13.72	2	6	2	6

STATE OF TEXAS
CASEY B. STRIPLING
136887
LICENSED
PROFESSIONAL ENGINEER

Casey B. Stripling

11-17-2022

SH 136

CULVERT DETAILS

SCALE: 1" = 10'

2023 Texas Department of Transportation

SHEET 28 OF 33

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		118

DATE: 11/17/2022 4:29:14 PM
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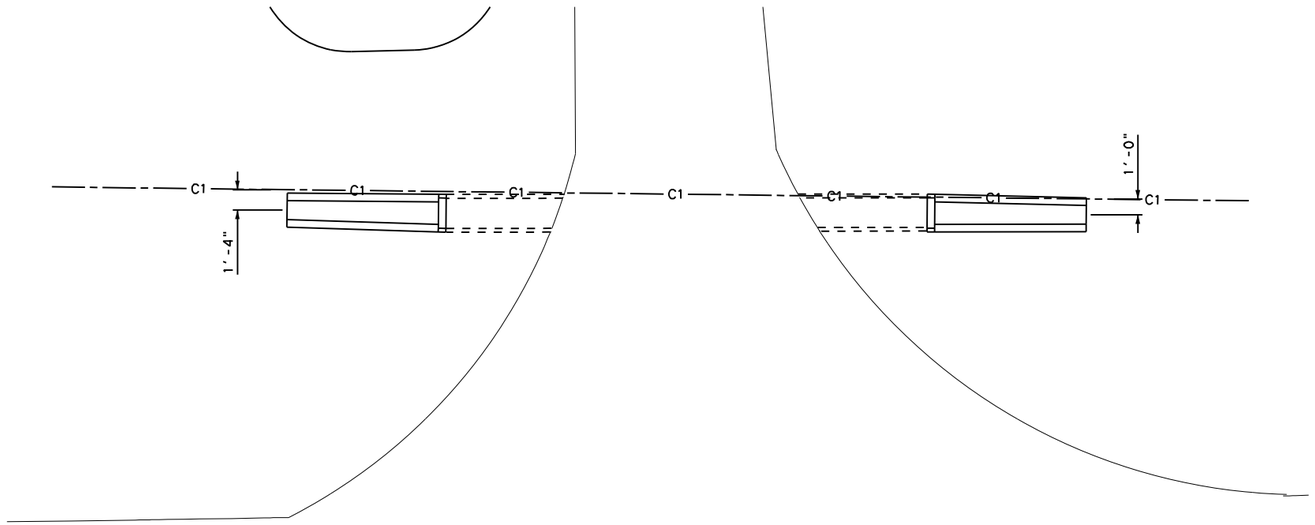
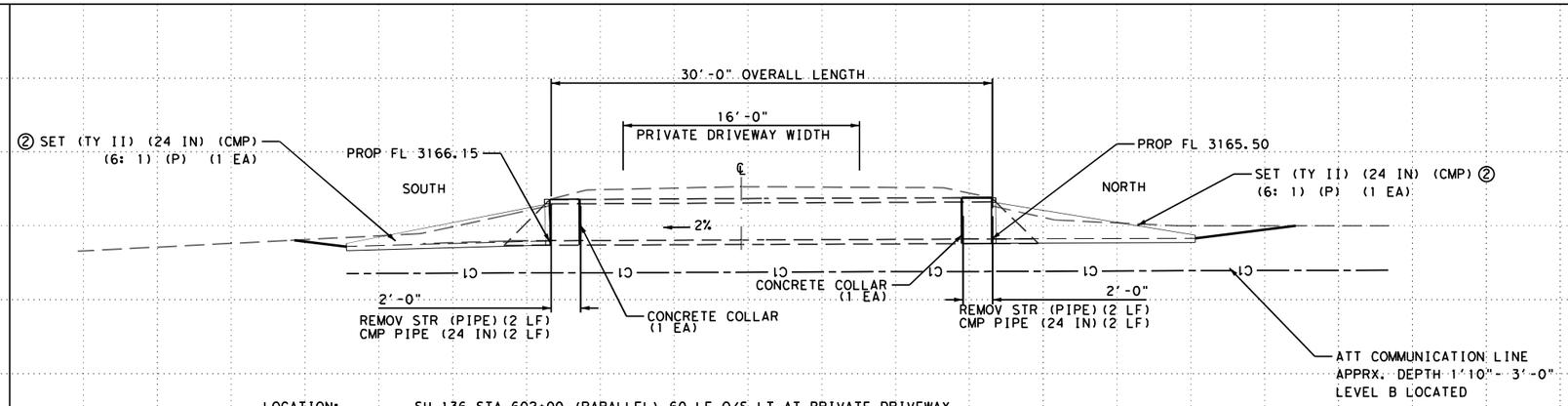
NOTE:

1. SEE MISCELLANEOUS CULVERT DETAILS FOR CONCRETE COLLAR DETAIL

(2.) PRE-CAST SET WITHOUT TOE WALL IS REQUIRED FOR SET



PROPOSED CULVERT AT STA 602+00



LOCATION: SH 136 STA 602+00 (PARALLEL) 60 LF O/S LT AT PRIVATE DRIVEWAY

EXISTING: 1-24" x30' CMP

PROPOSED: 1-24" x30' CMP, (INSTALL: LT - D.S. 6:1 PSET-SP, RT - U.S. 6:1 PSET-SP)

CSJ: 0356-01-107 CULVERT DETAIL SHEET 29 OF 33

LOCATION	110 6001 EXCAVATION (ROADWAY)	132 6003 EMBANKMENT (FINAL) (ORD COMP) (TY B)	420 6009 CL A CONC (COLLAR)	460 6003 CMP (GAL STL 24 IN)	467 6380 SET (TY II) (24 IN) (CMP) (6: 1) (P)	496 6007 REMOV STR (PIPE)
CSJ: 0356-01-107	CY	CY	EA	LF	EA	LF
STA 602+00 (L) P	9.35	9.78	2	4	2	4
PROJECT SUMMARY:	9.35	9.78	2	4	2	4

STATE OF TEXAS
CASEY B. STRIPLING
136887
LICENSED PROFESSIONAL ENGINEER

Casey B. Stripling

11-17-2022

SH 136

CULVERT DETAILS

SCALE: 1" = 10'

2023 Texas Department of Transportation

SHEET 29 OF 33

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		119

DATE: 11/17/2022 4:29:16 PM
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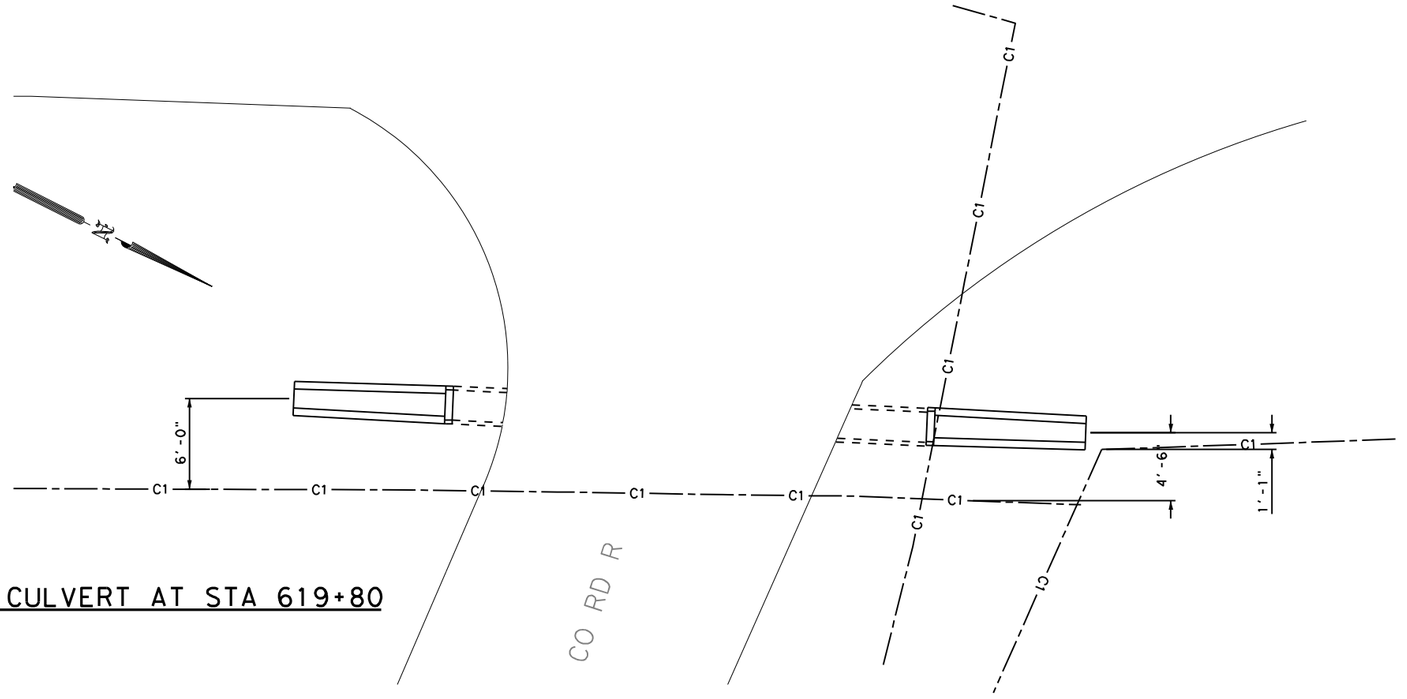
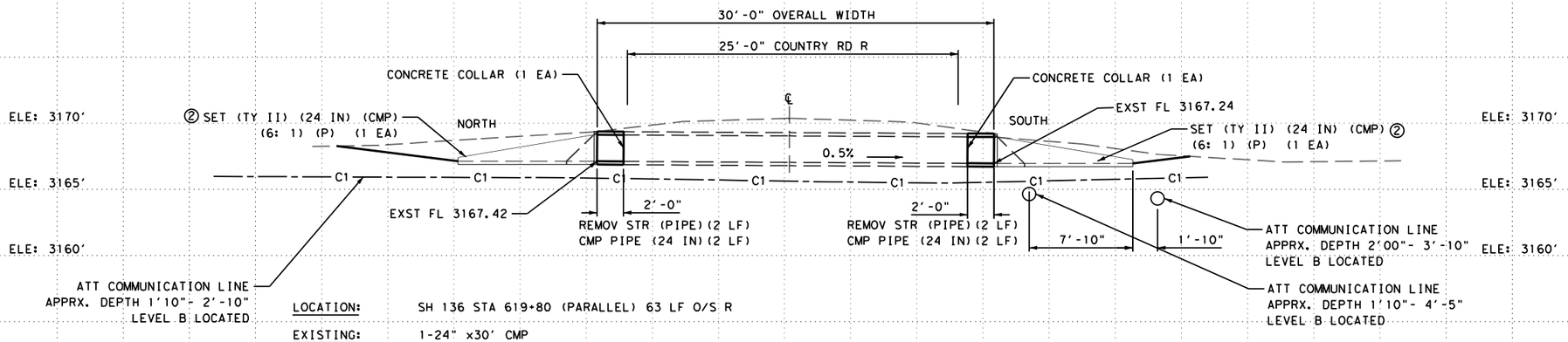


PROPOSED CULVERT AT STA 619+80

NOTE:

1. SEE MISCELLANEOUS CULVERT DETAILS FOR CONCRETE COLLAR DETAIL
2. PRE-CAST SET WITHOUT TOE WALL IS REQUIRED FOR SET



LOCATION: SH 136 STA 619+80 (PARALLEL) 63 LF O/S R

EXISTING: 1-24" x30' CMP

PROPOSED: 1-24" x30' CMP, (INSTALL: LT - U.S. 6:1 PSET-SP, RT - D.S. 6:1 PSET-SP)

CSJ: 0356-01-107 CULVERT DETAIL SHEET 30 OF 33

LOCATION	110 6001 EXCAVATION (ROADWAY)	132 6003 EMBANKMENT (FINAL) (ORD COMP) (TY B)	420 6009 CL A CONC (COLLAR)	460 6003 CMP (GAL STL 24 IN)	467 6394 SET (TY II) (24 IN) (CMP) (6: 1) (P)	496 6007 REMOV STR (PIPE)
CSJ: 0356-01-107	CY	CY	EA	LF	EA	LF
STA 619+80 (R) P	12.47	7.39	2	4	2	4
PROJECT SUMMARY:	12.47	7.39	2	4	2	4

STATE OF TEXAS
CASEY B. STRIPLING
136887
LICENSED PROFESSIONAL ENGINEER

Casey B. Stripling

11-17-2022

SH 136

CULVERT DETAILS

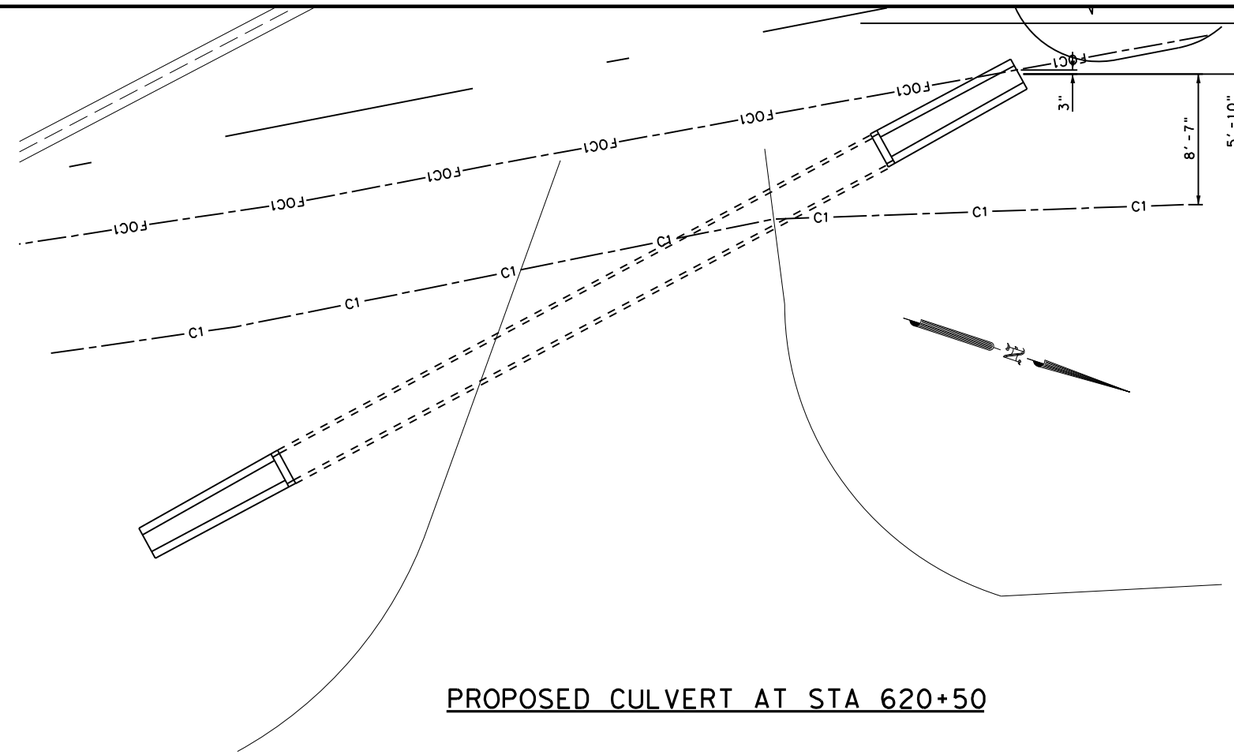
SCALE: 1" = 10'

2023 Texas Department of Transportation

SHEET 30 OF 33

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		120

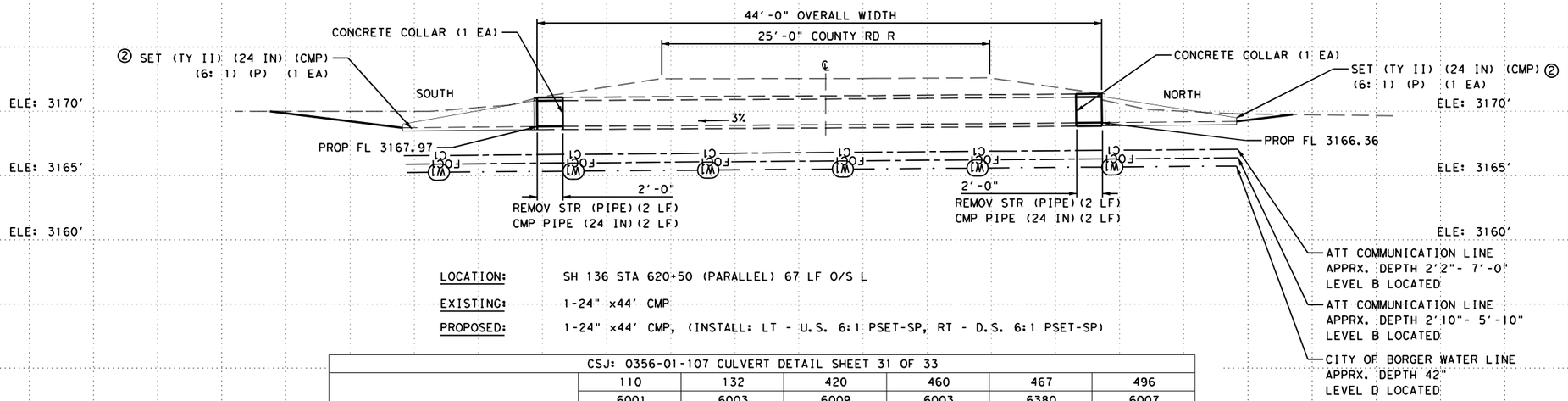
DATE: 11/17/2022 4:29:17 PM
FILE: T:\AMA\PD\Construction Projects\0356-01\107 PM Overlay\4 - Design\Plan Set\5. Drainage\107_CULVERT DETAILS.dgn



NOTE:

1. SEE MISCELLANEOUS CULVERT DETAILS FOR CONCRETE COLLAR DETAIL
2. PRE-CAST SET WITHOUT TOE WALL IS REQUIRED FOR SET

PROPOSED CULVERT AT STA 620+50



LOCATION: SH 136 STA 620+50 (PARALLEL) 67 LF O/S L

EXISTING: 1-24" x44' CMP

PROPOSED: 1-24" x44' CMP, (INSTALL: LT - U.S. 6:1 PSET-SP, RT - D.S. 6:1 PSET-SP)

CSJ: 0356-01-107 CULVERT DETAIL SHEET 31 OF 33

LOCATION	110 6001 EXCAVATION (ROADWAY)	132 6003 EMBANKMENT (FINAL) (ORD COMP) (TY B)	420 6009 CL A CONC (COLLAR)	460 6003 CMP (GAL STL 24 IN)	467 6380 SET (TY II) (24 IN) (CMP) (6: 1) (P)	496 6007 REMOV STR (PIPE)
CSJ: 0356-01-107	CY	CY	EA	LF	EA	LF
STA 620+50 (L) P	12.96	9.82	2	4	2	4
PROJECT SUMMARY:	12.96	9.82	2	4	2	4

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11-17-2022

SH 136

CULVERT DETAILS

SCALE: 1" = 10'

2023 Texas Department of Transportation

SHEET 31 OF 33

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		121

DATE: 11/17/2022 4:29:19 PM
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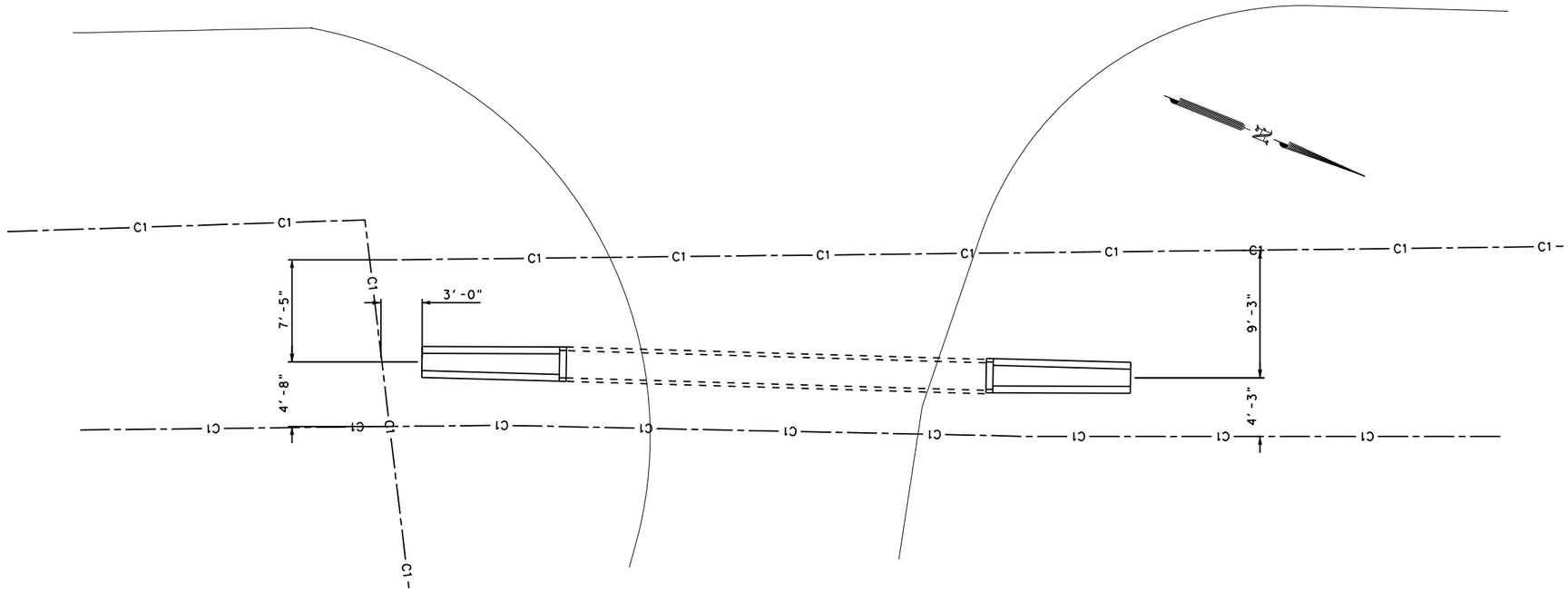
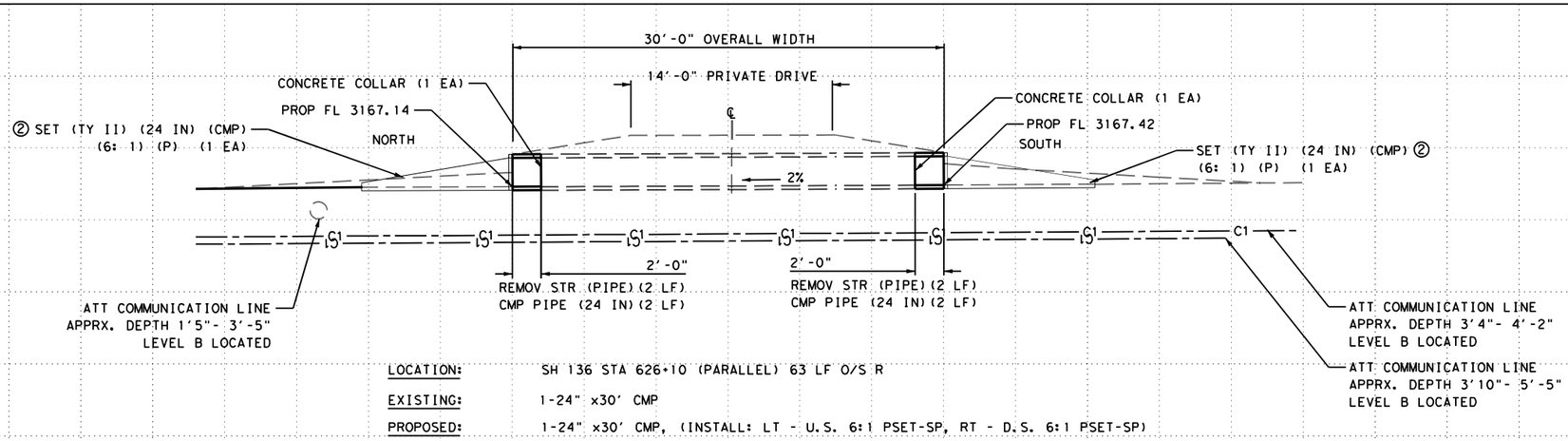


NOTE:

1. SEE MISCELLANEOUS CULVERT DETAILS FOR CONCRETE COLLAR DETAIL
2. PRE-CAST SET WITHOUT TOE WALL IS REQUIRED FOR SET

PROPOSED CULVERT AT STA 626+10



LOCATION: SH 136 STA 626+10 (PARALLEL) 63 LF O/S R

EXISTING: 1-24" x30' CMP

PROPOSED: 1-24" x30' CMP, (INSTALL: LT - U.S. 6:1 PSET-SP, RT - D.S. 6:1 PSET-SP)

CSJ: 0356-01-107 CULVERT DETAIL SHEET 32 OF 33

LOCATION	110 6001 EXCAVATION (ROADWAY)	132 6003 EMBANKMENT (FINAL) (ORD COMP) (TY B)	420 6009 CL A CONC (COLLAR)	460 6003 CMP (GAL STL 24 IN)	467 6380 SET (TY II) (24 IN) (CMP) (6: 1) (P)	496 6007 REMOV STR (PIPE)
CSJ: 0356-01-107	CY	CY	EA	LF	EA	LF
STA 626+10 (R) P	10.31	8.99	2	4	2	4
PROJECT SUMMARY:	10.31	8.99	2	4	2	4

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11-17-2022

SH 136

CULVERT DETAILS

SCALE: 1" = 10'

2023 Texas Department of Transportation

SHEET 32 OF 33

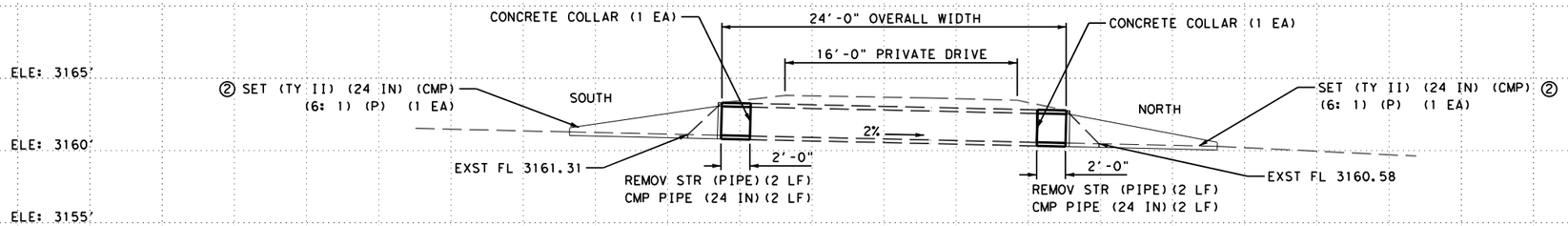
DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		122

DATE: 11/17/2022 4:29:20 PM
FILE: I:\AMA\PD\Construction Projects\0356-01\107 PM Overlay\4 - Design\Plan Set\5. Drainage\107_CULVERT DETAILS.dgn

DN: CK: DW: CK:

NOTE:

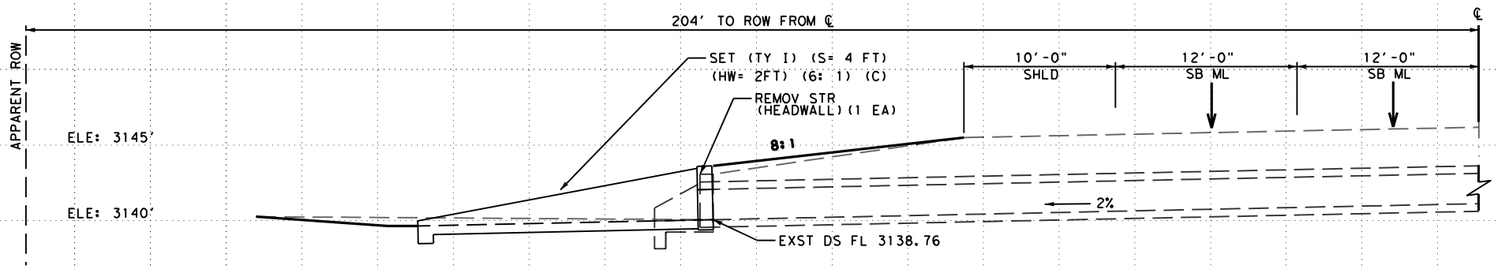
1. SEE MISCELLANEOUS CULVERT DETAILS FOR CONCRETE COLLAR DETAIL
2. PRE-CAST SET WITHOUT TOE WALL IS REQUIRED FOR SET



LOCATION: SH 136 STA 629+90 (PARALLEL) 50 LF O/S L

EXISTING: 1-24" x24' CMP

PROPOSED: 1-24" x24' CMP, (INSTALL: LT - U.S. 2', 6:1 PSET-SP, RT - D.S. 2', 6:1 PSET-SP)



LOCATION: SH 136 STA 642+50 (CROSSING)

EXISTING: 1-4' x2' x102' CBC, CH-7-TY B HDWL

PROPOSED: 1-4' x2' x102' CBC, (INSTALL: LT - U.S. 6:1 SETB-CD)

CSJ: 0356-01-107 CULVERT DETAIL SHEET 33 OF 33

LOCATION	110	132	420	460	467	467	496	496
	6001	6003	6009	6003	6141	6380	6006	6007
	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL) (ORD COMP) (TY B)	CL A CONC (COLLAR)	CMP (GAL STL 24 IN)	SET (TY I) (S= 4 FT) (HW= 3FT) (6: 1) (C)	SET (TY II) (24 IN) (CMP) (6: 1) (P)	REMOV STR (HEADWALL)	REMOV STR (PIPE)
CSJ: 0356-01-107	CY	CY	EA	LF	EA	EA	EA	LF
STA 629+90 (L) P		5.93	2	4		2		4
STA 642+50 (C)	7.35	7.35			1		1	
PROJECT SUMMARY:	7.35	13.27	2	4	1	2	1	4

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11-17-2022

SH 136 CULVERT DETAILS

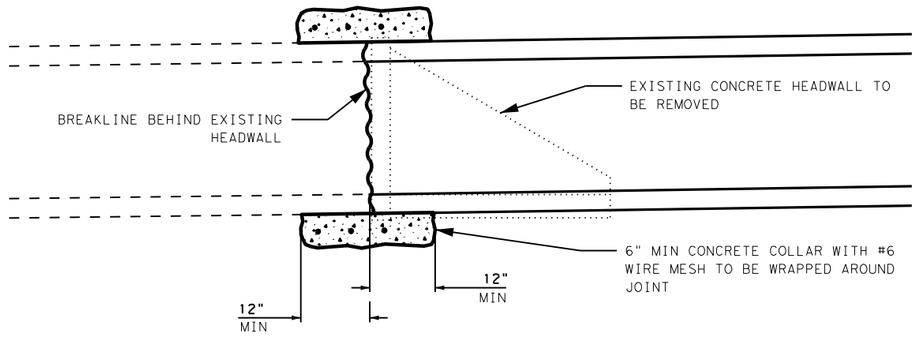
SCALE: 1" = 10'

SHEET 33 OF 33

Texas Department of Transportation

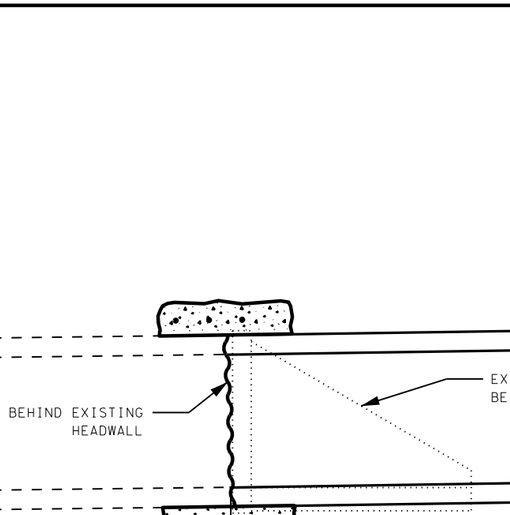
CONTSEC	JOB	HIGHWAY
0356 01	107	SH 136
DIST	COUNTY	SHEET NO
AMA	HUTCHINSON CO	123

DATE: 11/17/2022 4:29:22 PM
FILE: Overlay4 - Design\Plan Set\V5. Drainage\107_CULVERT DETAILS.dgn



DETAIL A

CONCRETE COLLAR DETAIL



CROSS CULVERT EMBANKMENT DETAIL

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11-17-2022

SH 136

MISCELLANEOUS CULVERT DETAILS

SCALE: N/A

2023 Texas Department of Transportation

SHEET 1 OF 1

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		124

DATE: 11/17/2022 4:29:23 PM
FILE: T:\AMATPD\Construction Projects\0356-01\107 PM Overlay\4 - Design\Plan Set\5. Drainage\107_CULVERT DETAILS.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 Height of Wingwall (1) (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)
248+05 (LT & RT)	2 ~ 5'x 2.5'	6'	MC-5-20(MOD)	SETB-CD	0°	6:1	8"	7"	1.000'	3.917'	N/A	N/A	21.500'	N/A	11.75'	0.0	0.8	17.4	N/A
642+50 (LT)	1 ~ 4'x 2'	6'	SCC-3&4	SETB-CD	0°	6:1	8"	7"	1.000'	3.417'	N/A	N/A	18.500'	N/A	5.167'	0.0	0.2	3.7	N/A

DATE: 11/17/2022 4:29:24 PM
FILE: T:\AMA\PDConstruction Projects\0356-01\107 PM Overlay\4 - Design\PlanSheets\bcsside1-20.dgn

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
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LICENSED
PROFESSIONAL ENGINEER

Casey B. Stripling

11-17-2022

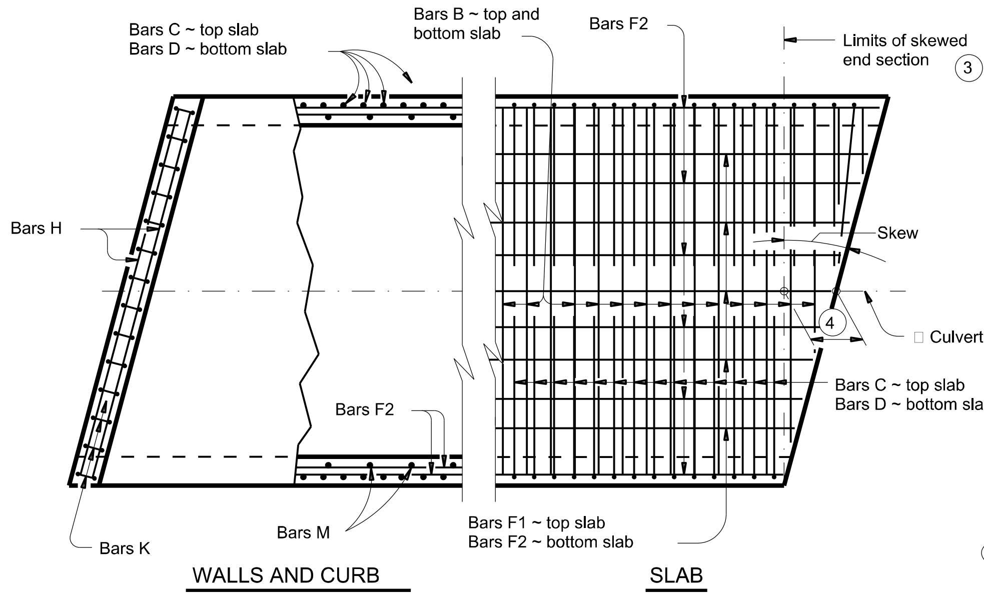
Texas Department of Transportation

Bridge Division Standard

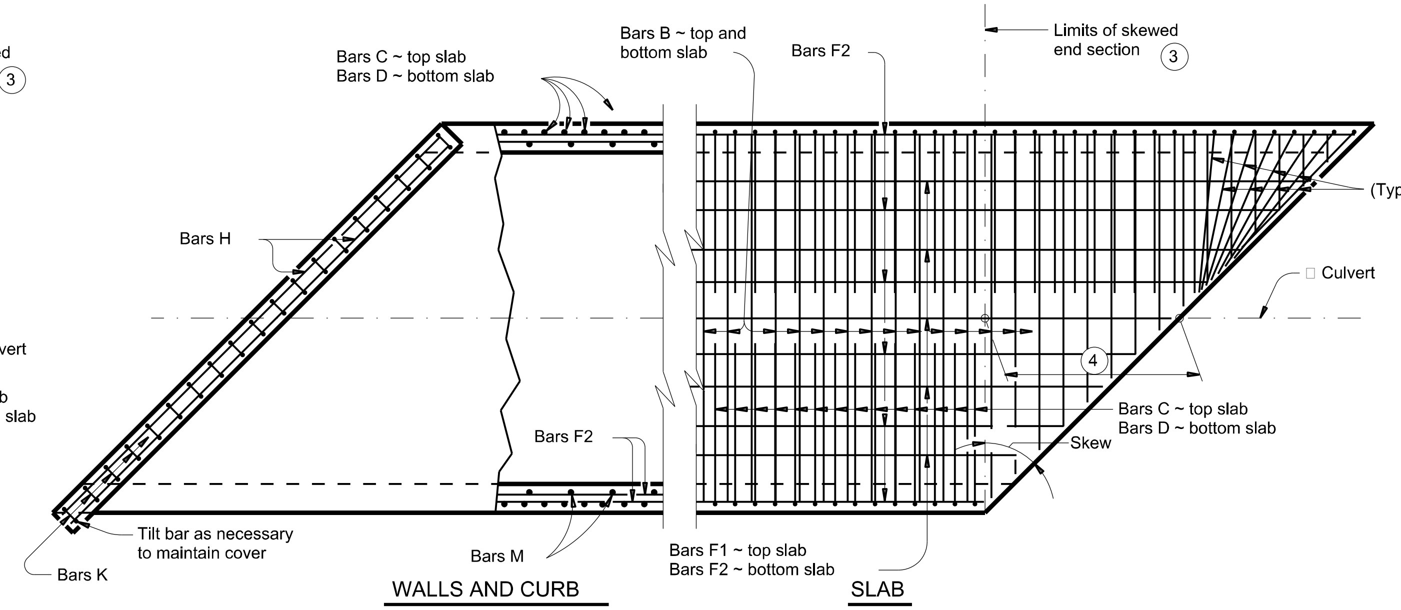
BOX CULVERT SUPPLEMENT
WINGS AND END TREATMENTS

BCS

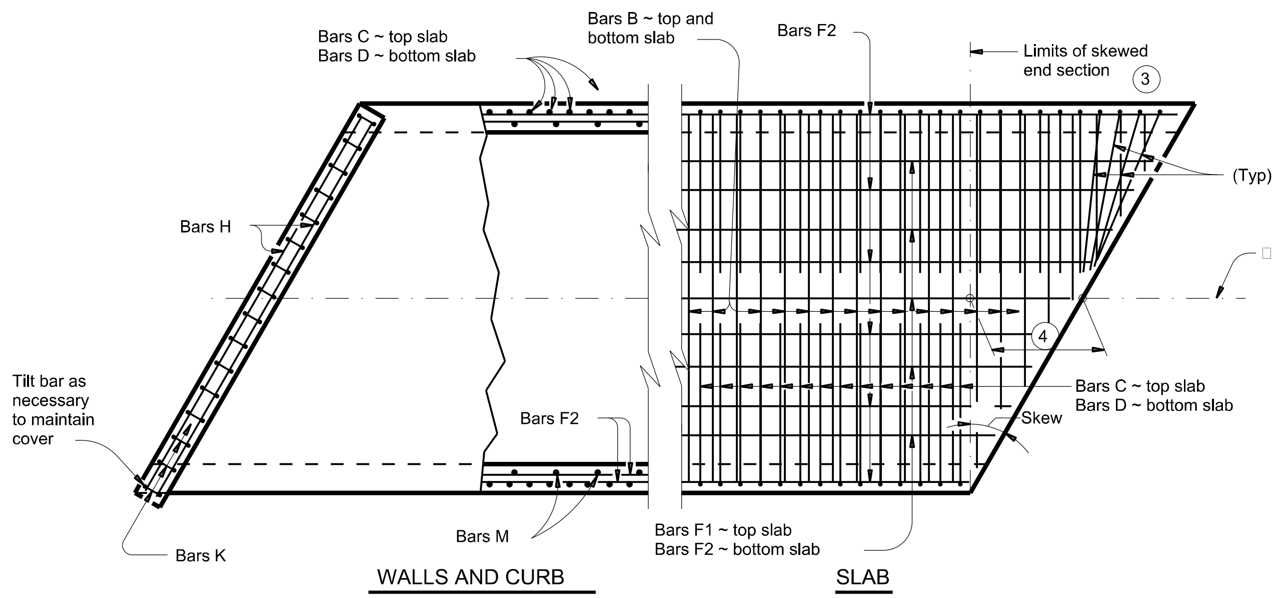
FILE: bcsside1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0356	01	107	SH 136
	DIST	COUNTY		SHEET NO.
	AMA	HUTCHINSON CO		125



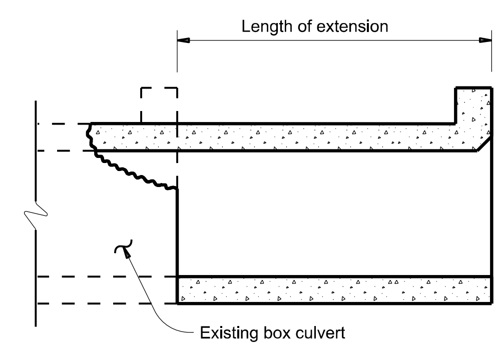
PLAN OF SKEWED ENDS ~ FROM 0° TO 15° (7)



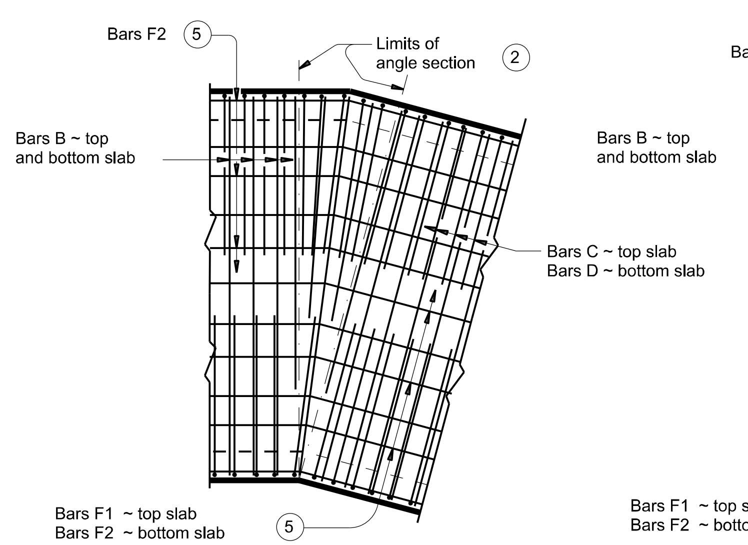
PLAN OF SKEWED ENDS ~ OVER 30° TO 45°



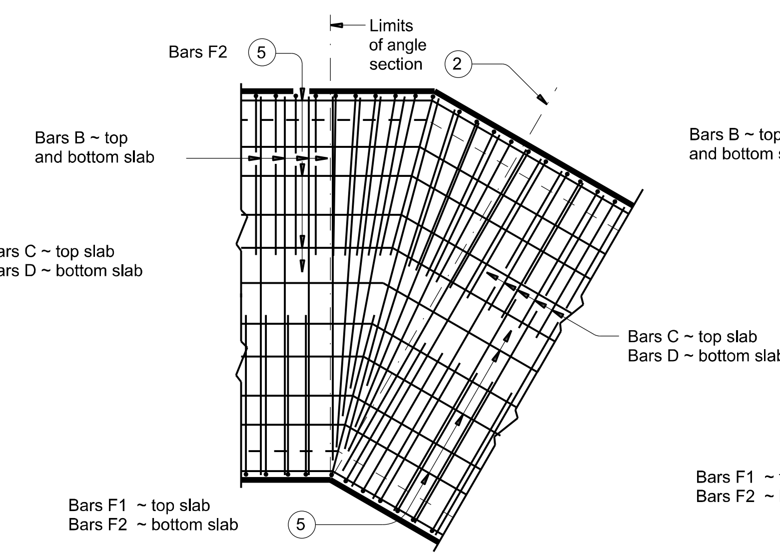
PLAN OF SKEWED ENDS ~ OVER 15° TO 30°



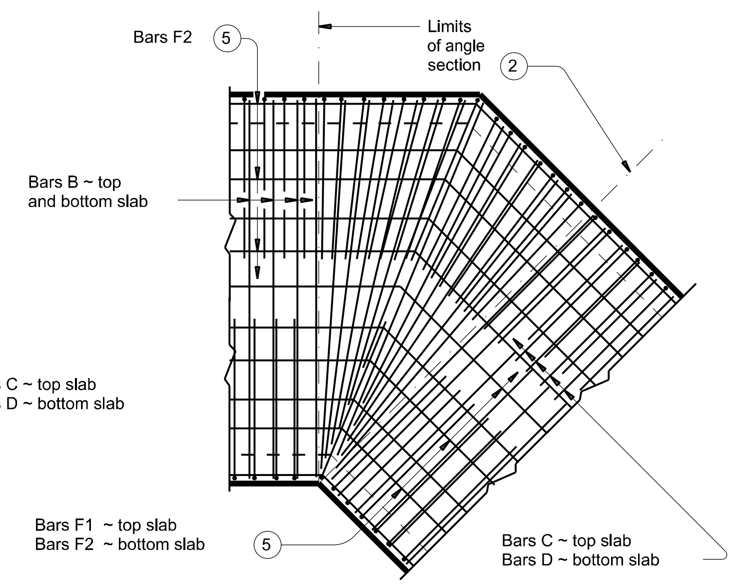
LENGTHENING DETAIL (1)



PLAN OF ANGLE SECTION ~ FROM 0° TO 15°



PLAN OF ANGLE SECTION ~ OVER 15° TO 30°



PLAN OF ANGLE SECTION ~ OVER 30° TO 45°

(1) For skewed box culverts with less than 2'-0" of fill, break back the top slab to provide a 1'-10" minimum lap of the existing longitudinal bars with the longitudinal bars in the extension.
For non-skewed box culverts with less than 2'-0" of fill and for skewed or non-skewed culverts with a fill depth of 2'-0" or greater, break back the top slab to provide a 1'-10" minimum lap of the existing longitudinal bars with the longitudinal bars in the extension. Alternatively, if the box is non-skewed, embed #6 anchor bars with a Type III, C, D , E, or F 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 becomes less than half of the normal spacing, cut bars to avoid conflict.

(3) The length of Bars B vary in the skewed end sections.

(4) [One half of overall width] x [tangent of the skew angle]

(5) Place Bars F1 and F2 continuously through the angle section. Bend Bars F1 and F2 to remain parallel to the walls of the box culvert.

(6) When necessary to avoid 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, and D parallel to the skewed end while maintaining spacing along centerline of box. Increase lengths of Bars B shown on the Single Box Culverts Cast-In-Place (SCC) standards sheets to accommodate the skew.

CONSTRUCTION NOTES:

Do not use permanent forms.
When required, lap Bars H 1'-8" for uncoated or galvanized bars.
Provide a minimum of 1½" clear cover.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel, if required elsewhere in the plans.
Provide Class C concrete (f'c = 3,600 psi) with these exceptions: provide Class S concrete (f'c = 4,000 psi) for top slabs of culverts with overlay, with 1-to-2 course surface treatment, or with the top slab as the final riding surface.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
Refer to Single Box Culverts Cast-in-Place (SCC) standard sheets for details of straight sections of culvert.
For skewed sections and angle sections, refer to Single Box Culverts Cast-in-Place (SCC) standard sheets for slab and wall dimensions, bar sizes, maximum bar spacing, and any other details not shown.
For skewed ends with curbs, adjust length of Bars H, number of Bars K, curb concrete volume, and reinforcing steel weight by dividing the values shown on the culvert Single Box Culverts Cast-In-Place (SCC) standard sheets by the cosine of the skew angle.

Cover dimensions are clear dimensions, unless noted otherwise.

HL93 LOADING

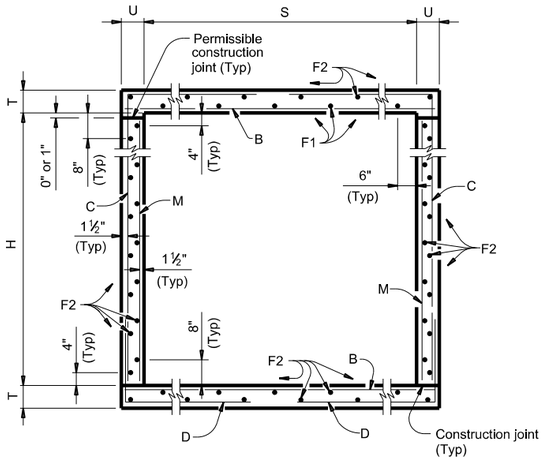
Texas Department of Transportation — Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE MISCELLANEOUS DETAILS

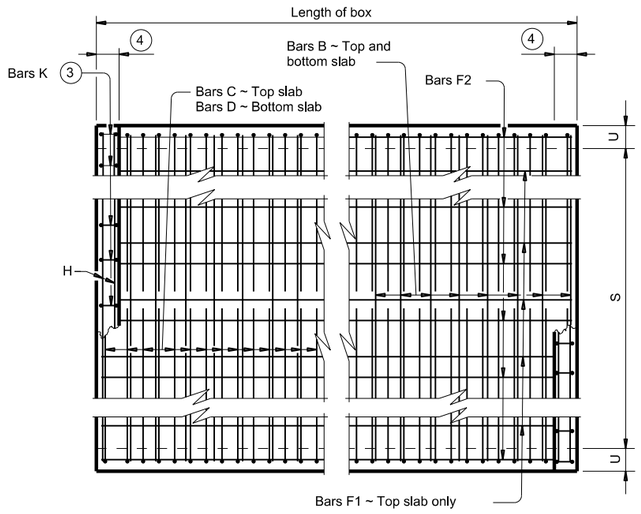
SCC-MD

FILE: sccmdste-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0356	01	107	SH 136
	DIST		COUNTY	SHEET NO.
	AMA		HUTCHINSON CO	126

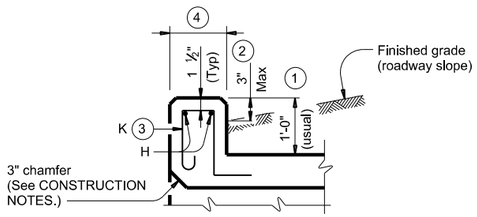
DATE: 11/17/2022 4:29:26 PM
FILE: T:\AMATPD\Construction Projects\0356-01\107 PM Overlay\4 - Design\



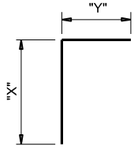
TYPICAL SECTION



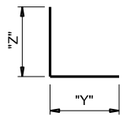
PLAN OF REINF STEEL



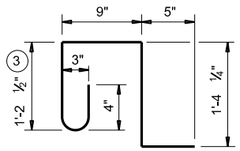
SECTION THRU CURB



BARS C



BARS D



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

1 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Rail Anchorage Curb (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.

2 For vehicle safety, the following requirements must be met:
- For structures without bridge rail, construct curbs no more than 3" above finished grade.
- For structures with bridge rail, construct curbs flush with finished grade.

Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

3 For curbs less than 1'-0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.

4 1'-0" typical. 2'-3" when the Rail Anchorage Curb (RAC) standard sheet is referred to elsewhere in the plans.

The Contractor may replace Bars B, C, D, E, F1, F2, M, Y, and/or Z with deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064. The area of required reinforcement may be reduced by the ratio of 60 ksi / 70 ksi. Spacing of WWR is limited to 4" Min and 18" Max. When required, provide lap splices in the WWR of the same length required for the equivalent bar size, rounded up for wire sizes between conventional bar sizes. The lap length required for WWR is never less than the lap length required for uncoated #4 bars.

Example conversion: Replacing No. 6 Gr 60 at 6" Spacing with WWR.
Required WWR = (0.44 sq. in. per 0.5 ft.) x (60 ksi / 70 ksi) = 0.755 sq. in. per ft.
If D30.6 wire is used to meet the 0.755 sq. in. per ft. requirement in this example, the required spacing = (0.306 sq. in.) / (0.755 sq. in. per ft.) x (12 in. per ft.) = 4.86" Max spacing. Required lap length for the provided D30.6 wire is 2'-1" (the same minimum lap length required for uncoated #5 bars, as listed under MATERIAL NOTES).

CONSTRUCTION NOTES:

Do not use permanent forms.
Chamfer the bottom edge of the top slab 3" at the entrance.
Optionally, raise construction joints shown at the flow line by a maximum of 6". If this option is taken, Bars M may be cut off or raised, Bars C and D may be reversed.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Provide Class C concrete (f'c = 3,600 psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete (f'c = 4,000 psi) for top slabs of:
- culverts with overlay,
- culverts with 1-to-2 course surface treatment, or
- culverts with the top slab as the final riding surface.

Provide bar laps, where required, as follows:
- Uncoated or galvanized ~ #4 = 1'-8" Min
- Uncoated or galvanized ~ #5 = 2'-1" Min

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications for the range of fill heights shown.
See the Single Box Culverts Cast-In-Place Miscellaneous Detail (SCC-MD) standard sheet for details pertaining to skewed ends, angle sections, and lengthening.

Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE
0' TO 30' FILL

SCC-3 & 4

FILE: scc34ste-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0356	01	107	SH 136
04/2021 Updated X values.	DIST	COUNTY		SHEET NO.
	AMA	HUTCHINSON CO		127

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SECTION DIMENSIONS				FILL HEIGHT (5)	BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																												QUANTITIES					
					Bars B					Bars C							Bars D							Bars M ~ #4				Bars F1 ~ #4 at 18" Spa			Bars F2 ~ #4 at 18" Spa			Bars H 4 ~ #4		Bars K		Per Foot of Barrel		Curb		Total	
S	H	T	U		No.	Size	Spa	Length	Weight	No.	Size	Spa	Length	Weight	" X "	" Y "	No.	Size	Spa	Length	Weight	" Y "	" Z "	No.	Spa	Length	Weight	No.	Length	Wt	No.	Length	Weight	Length	Wt	No.	Wt	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)
3' - 0"	2' - 0"	8"	7"	30'	108	#5	9"	3' - 11"	441	108	#4	9"	5' - 4"	385	2' - 6"	2' - 10"	108	#4	9"	5' - 1"	367	2' - 10"	2' - 3"	108	9"	2' - 0"	144	3	39' - 9"	80	19	39' - 9"	505	3' - 11"	10	10	28	0.292	48.1	0.3	38	12.0	1,960
3' - 0"	3' - 0"	8"	7"	30'	108	#5	9"	3' - 11"	441	108	#4	9"	6' - 4"	457	3' - 6"	2' - 10"	108	#4	9"	5' - 1"	367	2' - 10"	2' - 3"	108	9"	3' - 0"	216	3	39' - 9"	80	23	39' - 9"	611	3' - 11"	10	10	28	0.335	54.3	0.3	38	13.7	2,210
4' - 0"	2' - 0"	8"	7"	30'	108	#5	9"	4' - 11"	554	162	#4	6"	5' - 8"	613	2' - 6"	3' - 2"	162	#4	6"	5' - 5"	586	3' - 2"	2' - 3"	108	9"	2' - 0"	144	3	39' - 9"	80	21	39' - 9"	558	4' - 11"	13	12	33	0.342	63.4	0.4	46	14.1	2,581
4' - 0"	3' - 0"	8"	7"	30'	108	#5	9"	4' - 11"	554	162	#4	6"	6' - 8"	721	3' - 6"	3' - 2"	162	#4	6"	5' - 5"	586	3' - 2"	2' - 3"	108	9"	3' - 0"	216	3	39' - 9"	80	25	39' - 9"	664	4' - 11"	13	12	33	0.385	70.5	0.4	46	15.8	2,867
4' - 0"	4' - 0"	8"	7"	30'	108	#5	9"	4' - 11"	554	162	#4	6"	7' - 8"	830	4' - 6"	3' - 2"	162	#4	6"	5' - 5"	586	3' - 2"	2' - 3"	108	9"	4' - 0"	289	3	39' - 9"	80	25	39' - 9"	664	4' - 11"	13	12	33	0.428	75.1	0.4	46	17.5	3,049

(5) For direct traffic culverts (fill height ≤ 2 ft.), identify the required box size and select the option with the minimum fill height.

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HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation

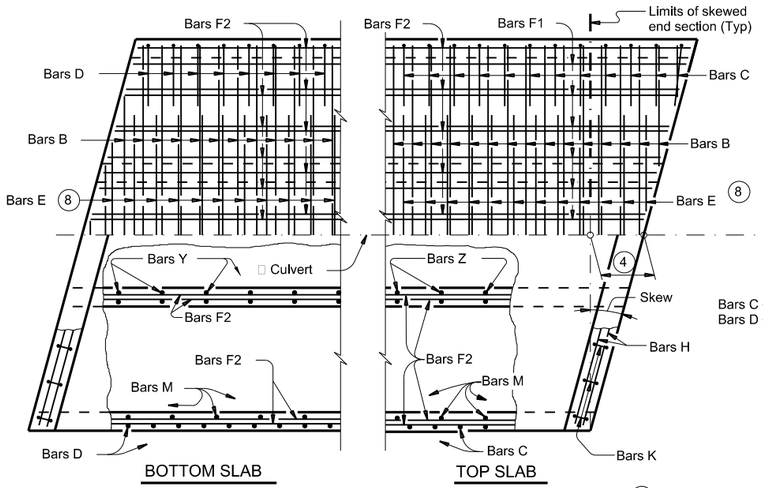
Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE
0' TO 30' FILL

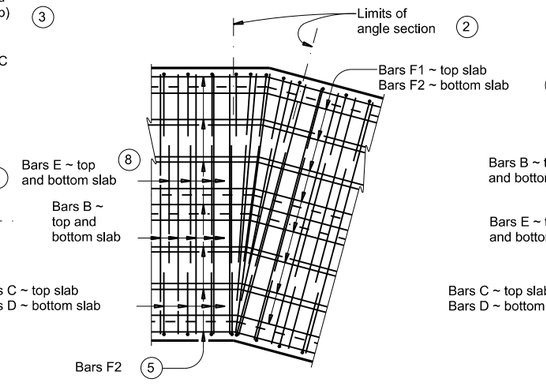
SCC-3 & 4

FILE: scc34ste-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0356	01	107	SH 136
04/2021 Updated X values.	DIST	COUNTY		SHEET NO.
	AMA	HUTCHINSON CO		128

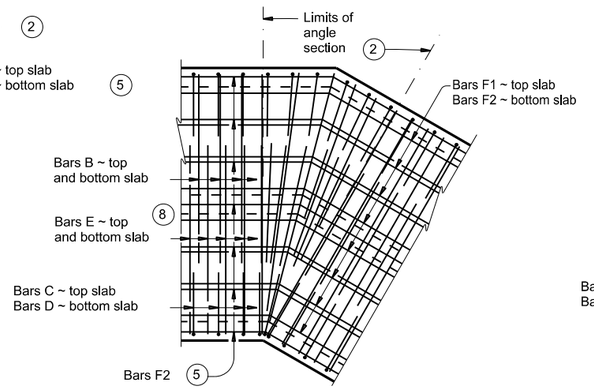
DATE:
FILE:



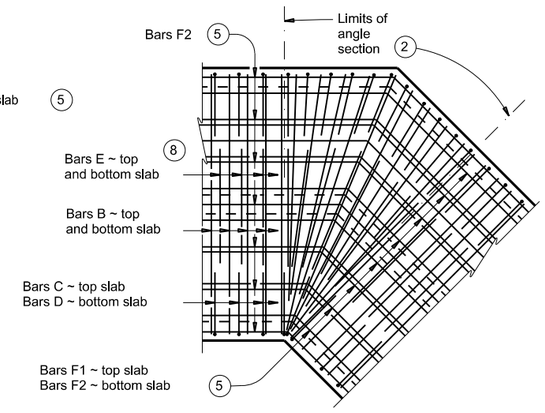
PLAN OF SKEWED ENDS ~ FROM 0° TO 15° (7)



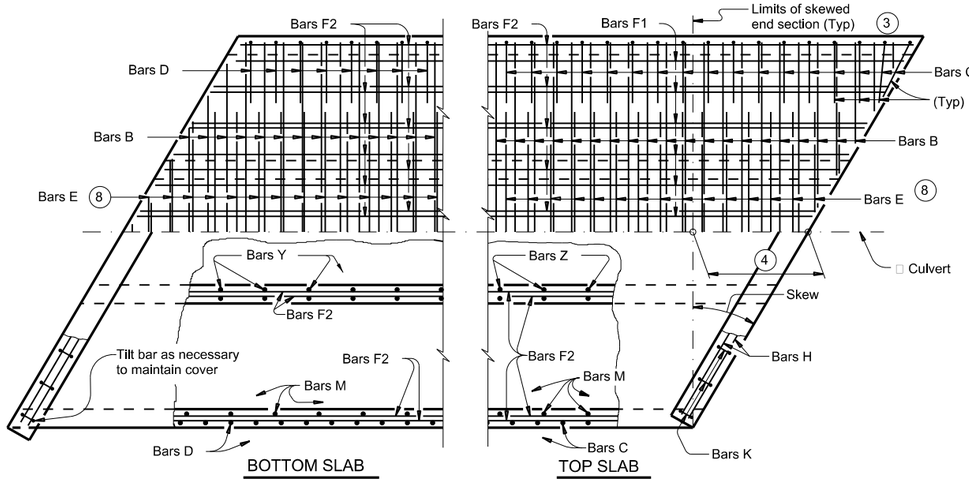
PLAN OF ANGLE SECTION ~ FROM 0° TO 15°



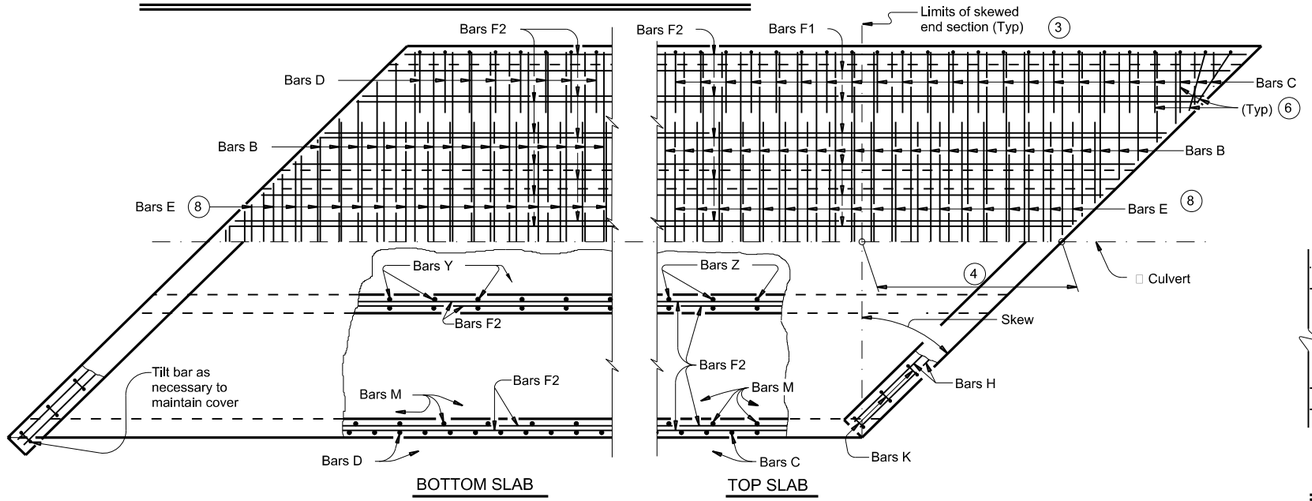
PLAN OF ANGLE SECTION ~ OVER 15° TO 30°



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.

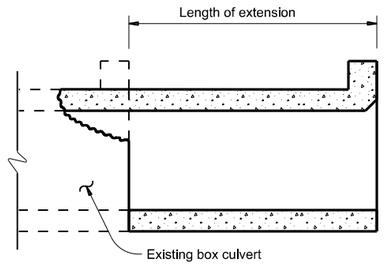
(4) [One half of overall width] x [tangent of the skew angle]

(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
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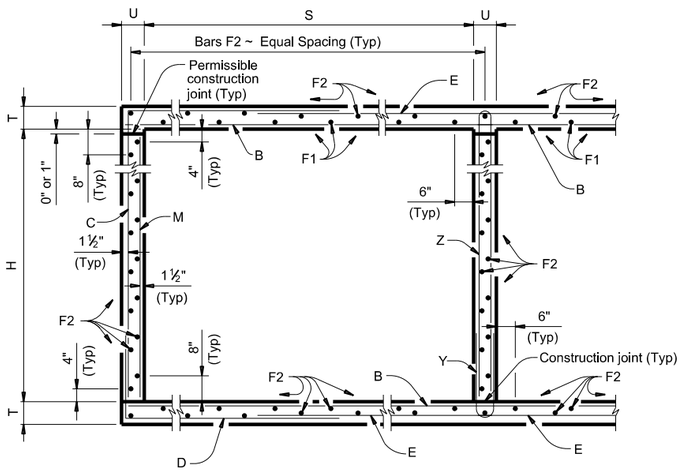
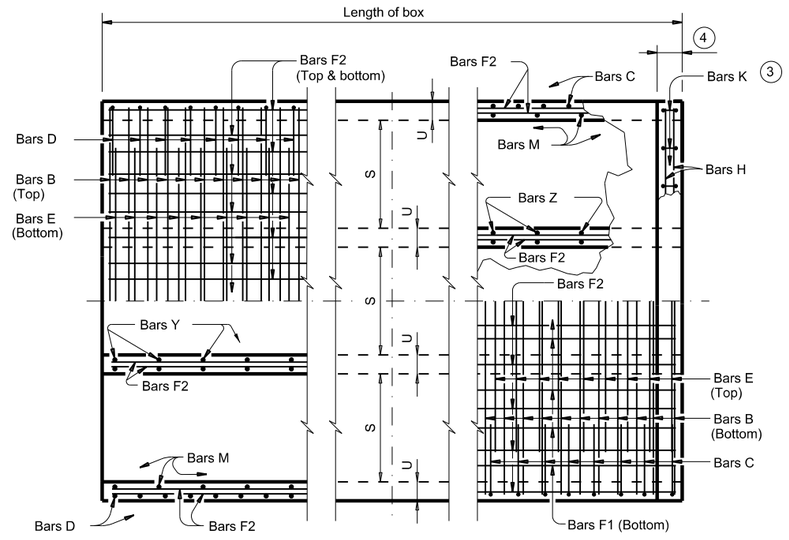
REVISIONS	DIST	COUNTY		SHEET NO.

DATE: 11/17/2022 4:29:32 PM
FILE: T:\AMA\PD\Construction Projects\0356-01-107 PM Overlay\4 - Design\Plans\Standards\mc520ste-20.dgn



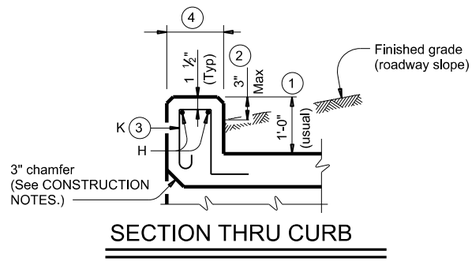
TYPICAL SECTION



BOTTOM SLAB

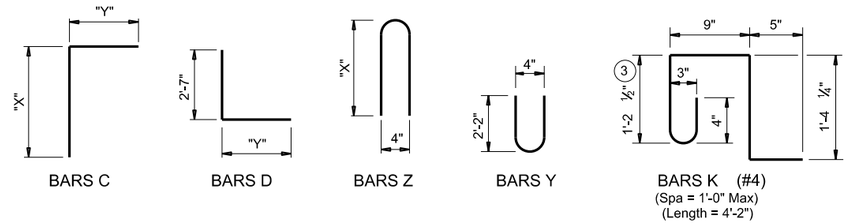
TOP SLAB

PART PLANS



SECTION THRU CURB

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



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
5'-0" SPAN
0' TO 20' FILL

MC-5-20 (MOD)

FILE: mc520ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
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REVISIONS	0356	01	107	SH 136
	DIST	COUNTY		SHEET NO.
	AMA	HUTCHINSON CO		130

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NUMBER OF SPANS	SECTION DIMENSIONS				BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																																QUANTITIES					
					Bars B					Bars C & D							Bars E					Bars F1 ~ #4				Bars F2 ~ #4				Bars M ~ #4				Bars Y & Z ~ #4							Bars H 4 ~ #4		Bars K		Per Foot of Barrel		Curb		Total	
	S	H	T	U	No.	Size	Spa	Length	Wt	No.	Size	Spa	Bars C		Bars D		No.	Size	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Bars Y		Bars Z		Length	Wt	No.	Wt	Conc (CY)	Renf (Lb)	Conc (CY)	Renf (Lb)	Conc (CY)	Renf (Lb)
													Length	Wt	Length	Wt																					Length	Wt	Length	Wt										
2	5' - 0"	2' - 0"	8"	7"	108	#5	9"	11' - 6"	1,295	108	#5	9"	6' - 3"	704	6' - 4"	713	108	#5	9"	8' - 8"	976	8	18"	39' - 9"	212	38	18"	39' - 9"	1,009	108	9"	2' - 0"	144	54	9"	4' - 7"	165	5' - 3"	189	11' - 6"	31	26	72	0.710	135.2	0.9	103	29.3	5,510
3	5' - 0"	2' - 0"	8"	7"	108	#5	9"	17' - 1"	1,924	108	#5	9"	6' - 3"	704	6' - 4"	713	108	#5	9"	14' - 3"	1,605	12	18"	39' - 9"	319	54	18"	39' - 9"	1,434	108	9"	2' - 0"	144	108	9"	4' - 7"	331	5' - 3"	379	17' - 1"	46	38	106	1.029	188.8	1.3	152	42.4	7,705
4	5' - 0"	2' - 0"	8"	7"	108	#5	9"	22' - 8"	2,553	108	#5	9"	6' - 3"	704	6' - 4"	713	108	#5	9"	19' - 10"	2,234	16	18"	39' - 9"	425	70	18"	39' - 9"	1,859	108	9"	2' - 0"	144	162	9"	4' - 7"	496	5' - 3"	568	22' - 8"	61	48	134	1.348	242.4	1.7	195	55.6	9,891
5	5' - 0"	2' - 0"	8"	7"	108	#5	9"	28' - 3"	3,182	108	#5	9"	6' - 3"	704	6' - 4"	713	108	#5	9"	25' - 5"	2,863	20	18"	39' - 9"	531	86	18"	39' - 9"	2,284	108	9"	2' - 0"	144	216	9"	4' - 7"	661	5' - 3"	758	28' - 3"	75	60	167	1.667	296.0	2.1	242	68.8	12,082
6	5' - 0"	2' - 0"	8"	7"	108	#5	9"	33' - 10"	3,811	108	#5	9"	6' - 3"	704	6' - 4"	713	108	#5	9"	31' - 0"	3,492	24	18"	39' - 9"	637	102	18"	39' - 9"	2,708	108	9"	2' - 0"	144	270	9"	4' - 7"	827	5' - 3"	947	33' - 10"	90	70	195	1.986	349.6	2.5	285	82.0	14,268
2	5' - 0"	2' - 6"	8"	7"	108	#6	9"	11' - 6"	1,865	108	#5	9"	6' - 9"	761	6' - 4"	713	108	#5	9"	8' - 8"	976	8	18"	39' - 9"	212	44	18"	39' - 9"	1,168	108	9"	2' - 6"	180	54	9"	4' - 7"	165	6' - 3"	225	11' - 6"	31	26	72	0.741	156.6	0.9	103	30.5	6,368
2	5' - 0"	3' - 0"	8"	7"	108	#6	9"	11' - 6"	1,865	108	#5	9"	7' - 3"	817	6' - 4"	713	108	#5	9"	8' - 8"	976	8	18"	39' - 9"	212	44	18"	39' - 9"	1,168	108	9"	3' - 0"	216	54	9"	4' - 7"	165	7' - 3"	262	11' - 6"	31	26	72	0.775	159.9	0.9	103	31.9	6,497
3	5' - 0"	3' - 0"	8"	7"	108	#6	9"	17' - 1"	2,771	108	#5	9"	7' - 3"	817	6' - 4"	713	108	#5	9"	14' - 3"	1,605	12	18"	39' - 9"	319	62	18"	39' - 9"	1,646	108	9"	3' - 0"	216	108	9"	4' - 7"	331	7' - 3"	523	17' - 1"	46	38	106	1.115	223.5	1.3	152	45.9	9,093
4	5' - 0"	3' - 0"	8"	7"	108	#6	9"	22' - 8"	3,677	108	#5	9"	7' - 3"	817	6' - 4"	713	108	#5	9"	19' - 10"	2,234	16	18"	39' - 9"	425	80	18"	39' - 9"	2,124	108	9"	3' - 0"	216	162	9"	4' - 7"	496	7' - 3"	785	22' - 8"	61	48	134	1.456	287.2	1.7	195	59.9	11,682
5	5' - 0"	3' - 0"	8"	7"	108	#6	9"	28' - 3"	4,583	108	#5	9"	7' - 3"	817	6' - 4"	713	108	#5	9"	25' - 5"	2,863	20	18"	39' - 9"	531	98	18"	39' - 9"	2,602	108	9"	3' - 0"	216	216	9"	4' - 7"	661	7' - 3"	1,046	28' - 3"	75	60	167	1.796	350.8	2.1	242	73.9	14,274
6	5' - 0"	3' - 0"	8"	7"	108	#6	9"	33' - 10"	5,488	108	#5	9"	7' - 3"	817	6' - 4"	713	108	#5	9"	31' - 0"	3,492	24	18"	39' - 9"	637	116	18"	39' - 9"	3,080	108	9"	3' - 0"	216	270	9"	4' - 7"	827	7' - 3"	1,308	33' - 10"	90	70	195	2.137	414.5	2.5	285	88.0	16,863
2	5' - 0"	4' - 0"	8"	7"	108	#6	9"	11' - 6"	1,865	108	#5	9"	8' - 3"	929	6' - 4"	713	108	#5	9"	8' - 8"	976	8	18"	39' - 9"	212	44	18"	39' - 9"	1,168	108	9"	4' - 0"	289	54	9"	4' - 7"	165	9' - 3"	334	11' - 6"	31	26	72	0.840	166.3	0.9	103	34.5	6,754
3	5' - 0"	4' - 0"	8"	7"	108	#6	9"	17' - 1"	2,771	108	#5	9"	8' - 3"	929	6' - 4"	713	108	#5	9"	14' - 3"	1,605	12	18"	39' - 9"	319	62	18"	39' - 9"	1,646	108	9"	4' - 0"	289	108	9"	4' - 7"	331	9' - 3"	667	17' - 1"	46	38	106	1.202	231.8	1.3	152	49.4	9,422
4	5' - 0"	4' - 0"	8"	7"	108	#6	9"	22' - 8"	3,677	108	#5	9"	8' - 3"	929	6' - 4"	713	108	#5	9"	19' - 10"	2,234	16	18"	39' - 9"	425	80	18"	39' - 9"	2,124	108	9"	4' - 0"	289	162	9"	4' - 7"	496	9' - 3"	1,001	22' - 8"	61	48	134	1.564	297.2	1.7	195	64.3	12,083
5	5' - 0"	4' - 0"	8"	7"	108	#6	9"	28' - 3"	4,583	108	#5	9"	8' - 3"	929	6' - 4"	713	108	#5	9"	25' - 5"	2,863	20	18"	39' - 9"	531	98	18"	39' - 9"	2,602	108	9"	4' - 0"	289	216	9"	4' - 7"	661	9' - 3"	1,335	28' - 3"	75	60	167	1.926	362.7	2.1	242	79.1	14,748
6	5' - 0"	4' - 0"	8"	7"	108	#6	9"	33' - 10"	5,488	108	#5	9"	8' - 3"	929	6' - 4"	713	108	#5	9"	31' - 0"	3,492	24	18"	39' - 9"	637	116	18"	39' - 9"	3,080	108	9"	4' - 0"	289	270	9"	4' - 7"	827	9' - 3"	1,668	33' - 10"	90	70	195	2.288	428.1	2.5	285	94.0	17,408
2	5' - 0"	5' - 0"	8"	7"	108	#6	9"	11' - 6"	1,865	108	#5	9"	9' - 3"	1,042	6' - 4"	713	108	#5	9"	8' - 8"	976	8	18"	39' - 9"	212	50	18"	39' - 9"	1,328	108	9"	5' - 0"	361	54	9"	4' - 7"	165	11' - 3"	406	11' - 6"	31	26	72	0.904	176.7	0.9	103	37.0	7,171
3	5' - 0"	5' - 0"	8"	7"	108	#6	9"	17' - 1"	2,771	108	#5	9"	9' - 3"	1,042	6' - 4"	713	108	#5	9"	14' - 3"	1,605	12	18"	39' - 9"	319	70	18"	39' - 9"	1,859	108	9"	5' - 0"	361	108	9"	4' - 7"	331	11' - 3"	812	17' - 1"	46	38	106	1.288	245.3	1.3	152	52.8	9,965
4	5' - 0"	5' - 0"	8"	7"	108	#6	9"	22' - 8"	3,677	108	#5	9"	9' - 3"	1,042	6' - 4"	713	108	#5	9"	19' - 10"	2,234	16	18"	39' - 9"	425	90	18"	39' - 9"	2,390	108	9"	5' - 0"	361	162	9"	4' - 7"	496	11' - 3"	1,217	22' - 8"	61	48	134	1.672	313.9	1.7	195	68.6	12,750
5	5' - 0"	5' - 0"	8"	7"	108	#6	9"	28' - 3"	4,583	108	#5	9"	9' - 3"	1,042	6' - 4"	713	108	#5	9"	25' - 5"	2,863	20	18"	39' - 9"	531	110	18"	39' - 9"	2,921	108	9"	5' - 0"	361	216	9"	4' - 7"	661	11' - 3"	1,623	28' - 3"	75	60	167	2.056	382.5	2.1	242	84.3	15,540
6	5' - 0"	5' - 0"	8"	7"	108	#6	9"	33' - 10"	5,488	108	#5	9"	9' - 3"	1,042	6' - 4"	713	108	#5	9"	31' - 0"	3,492	24	18"	39' - 9"	637	130	18"	39' - 9"	3,452	108	9"	5' - 0"	361	270	9"	4' - 7"	827	11' - 3"	2,029	33' - 10"	90	70	195	2.439	451.0	2.5	285	100.1	18,326

HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE

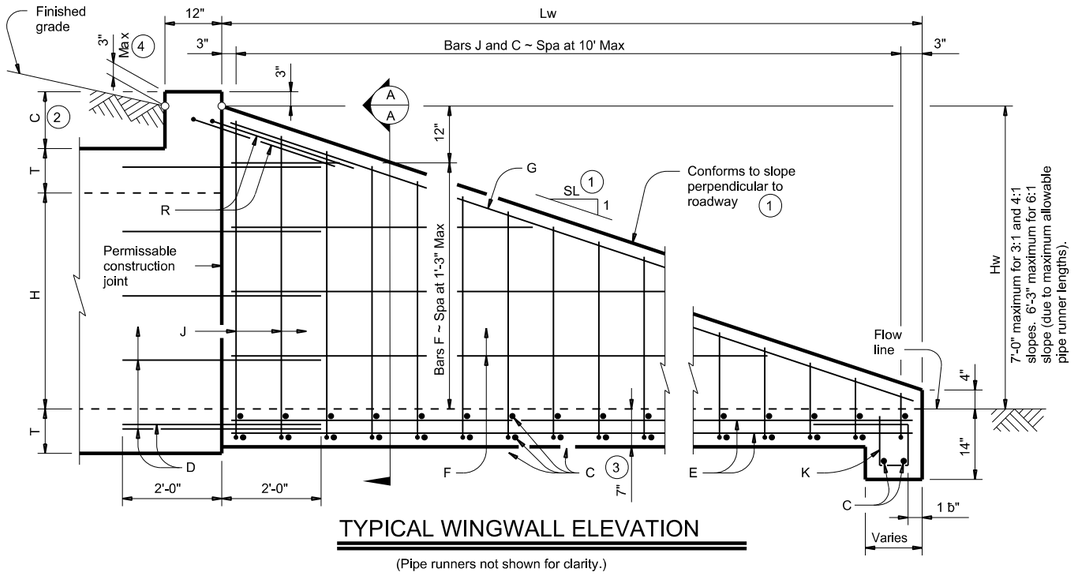
5'-0" SPAN

0' TO 20' FILL

MC-5-20 (MOD)

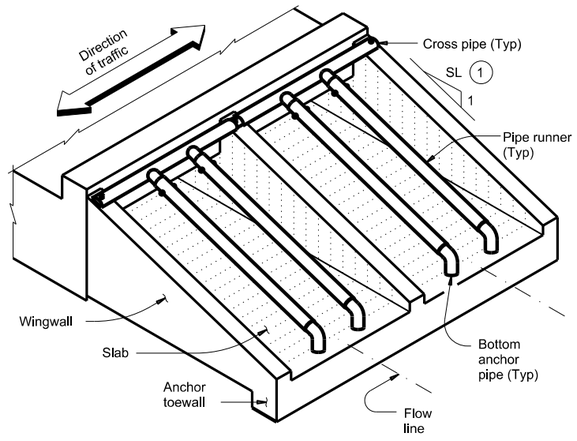
FILE: mc520ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0356	01	107	SH 136
	DIST	COUNTY		SHEET NO.
	AMA	HUTCHINSON CO		131

DATE:
FILE:



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)
= [(Wingwall Area) (0.583') +
(Lw) (Atw) (0.583') +
(Atw) (1.167') (1.167' - 0.583')] ÷ (27)

PIPE RUNNER DIMENSION CALCULATIONS:

Pipe Runner Length
= (Lw) (K1) (1.917')

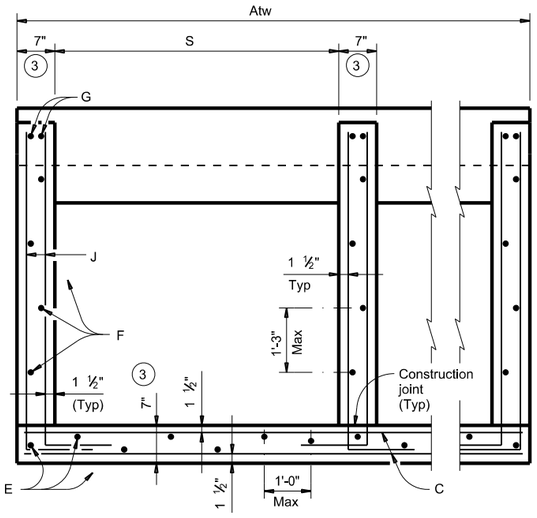
Total Reinforcing (Lb)
= (1.55) (Lw) (Atw) +
(4.43) (Atw) +
(K2) (Hw) (N + 1) (Lw) √

C = Height of curb above top of top slab (feet)
Hw = Height of wingwall (feet)
K = Constant value for use in formulas

Slope SL:1	K1	K2
3:1	~ 1.054 ~	7.45
4:1	~ 1.031 ~	8.49
6:1	~ 1.014 ~	10.30

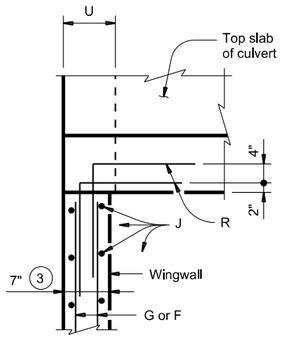
Atw = Anchor toewall length (feet)
Lw = Length of wingwall (feet)
N = Number of culvert barrels
SL:1 = Side slope ratio (horizontal : 1 vertical)

See applicable box culvert standard for H, S, T, and U values.



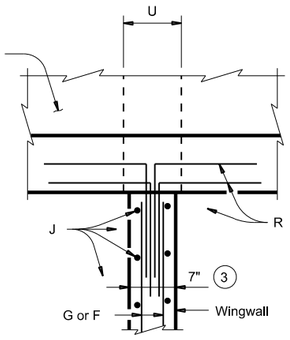
SECTION A-A

(Showing typical wingwall and wing slab reinforcing. Pipe runners not shown for clarity.)



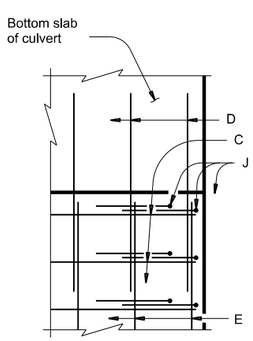
AT TOP OF EXTERIOR WINGWALL

(Cast-in-place culvert)



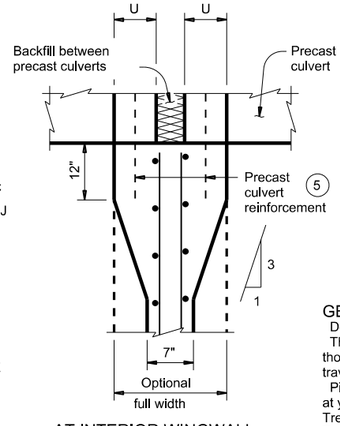
AT TOP OF INTERIOR WINGWALL

(Cast-in-place culvert)



AT OUTSIDE OF BOTTOM SLAB

(Cast-in-place culvert)



AT INTERIOR WINGWALL

(Precast culvert)

PLAN VIEWS OF CORNER DETAILS

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.

Provide galvanized reinforcing steel if required elsewhere in the plans.

Adjust reinforcing as necessary to provide a minimum clear cover of 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.

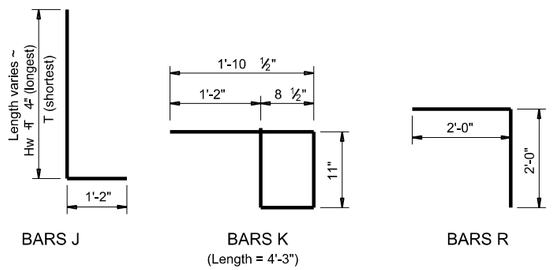


TABLE OF REINFORCING BAR SIZES AND SPACING		
Bar	Size	Spacing
C	#4	10" Max
D	#4	Match F and E
E	#4	1'-0" Max
F	#4	1'-3" Max
G	#6	As shown
J	#4	10" Max
K	#4	1'-0" Max
R	#4	As shown

1. 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.

SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

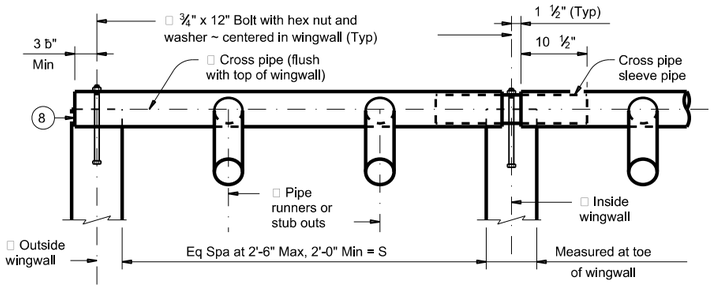
SAFETY END TREATMENT

FOR 0° SKEW BOX CULVERTS
(MAXIMUM Hw = 7'-0")
TYPE I ~ CROSS DRAINAGE

SETB-CD

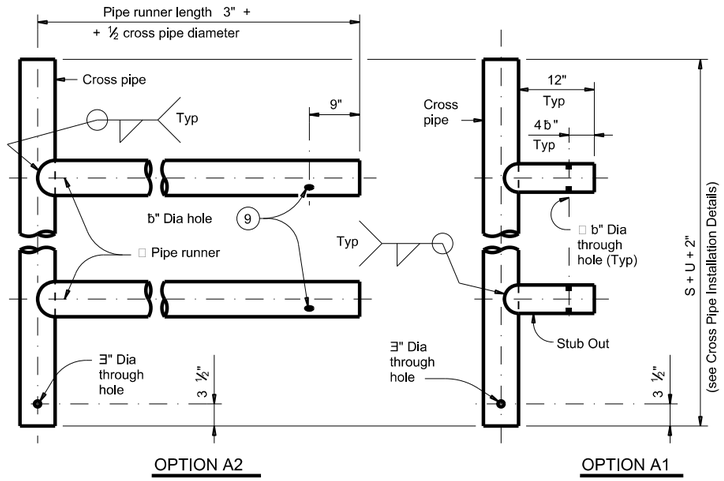
FILE:	setbcdse-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT	February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS					
		DIST	COUNTY		SHEET NO.

DATE:
FILE:



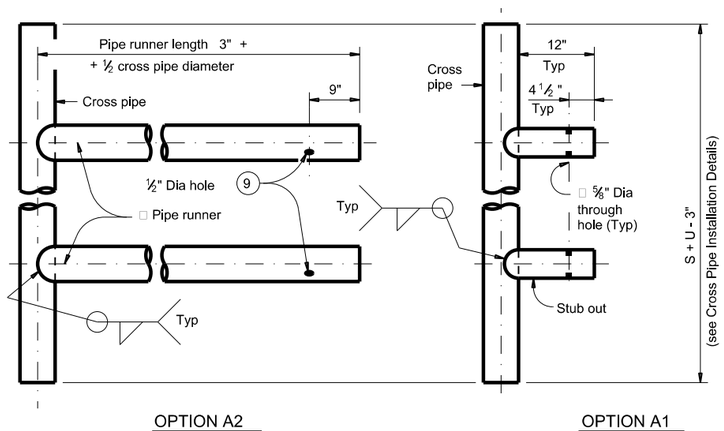
NOTE: At Contractor's option, make the cross pipe continuous across the inside wingwalls. If option is selected, omit the sleeve pipe and make a ∃" diameter through hole in the cross pipe to accept the anchor bolt at the centerline of each inside wingwall.

CROSS PIPE INSTALLATION DETAILS



OPTION A2 OPTION A1

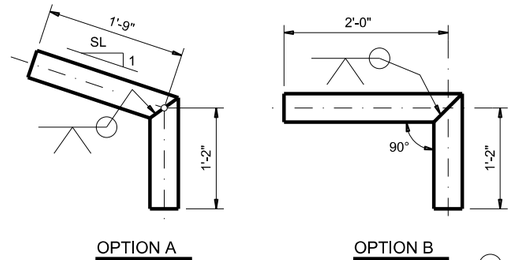
FOR USE IN OUTSIDE CULVERT BAY



OPTION A2 OPTION A1

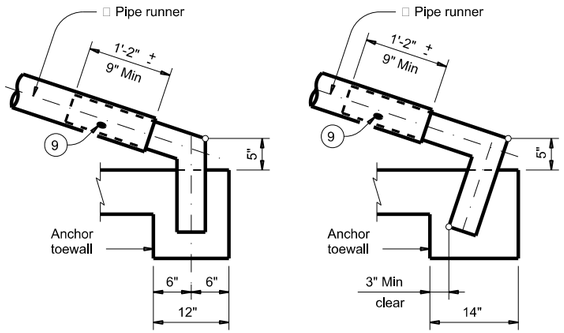
FOR USE IN INSIDE CULVERT BAY

CROSS PIPE AND CONNECTIONS DETAILS



OPTION A OPTION B

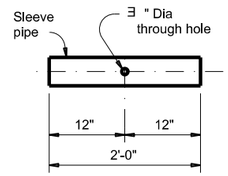
BOTTOM ANCHOR PIPE DETAILS



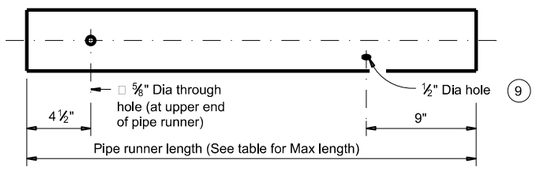
OPTION B1 OPTION B2

BOTTOM ANCHOR TOEWALL DETAILS

(Wingwall not shown for clarity.)

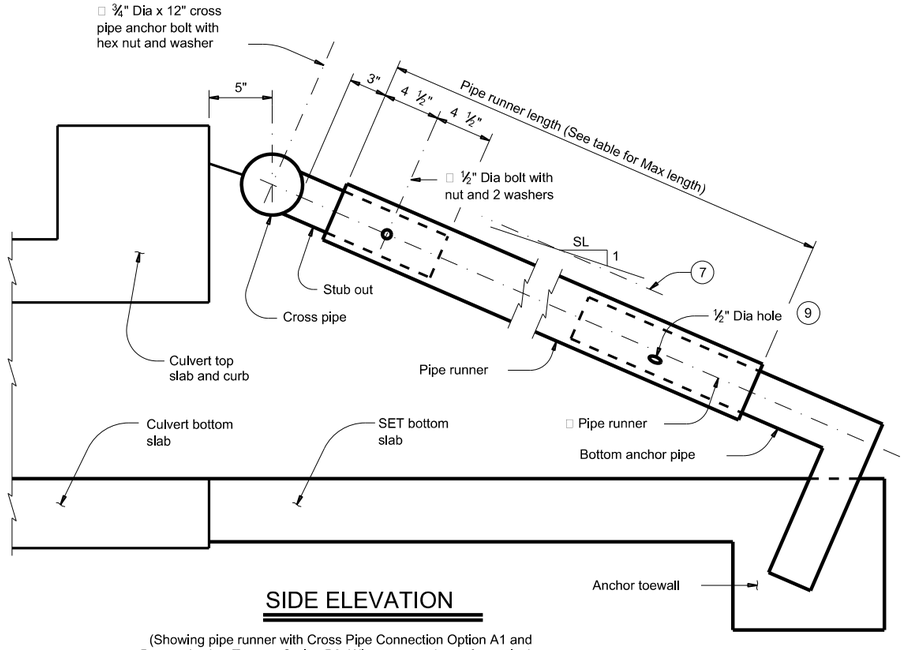


CROSS PIPE SLEEVE PIPE DETAILS



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 REQUIRED PIPE RUNNER AND ANCHOR PIPE SIZES (6)

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

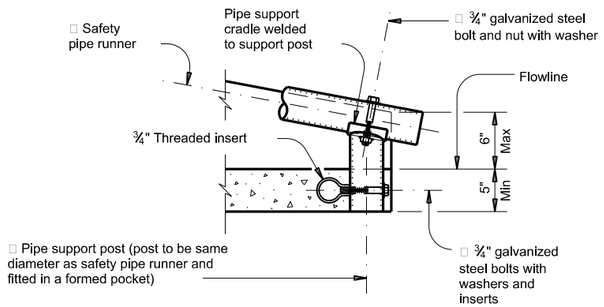
SETB-CD

FILE: setbcdse-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	DIST	COUNTY		SHEET NO.

DATE:
FILE:

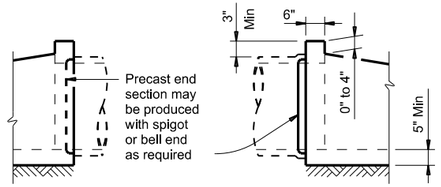
REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

Pipe I.D.	RCP Wall "B" Thickness	TP Wall Thickness (8)	"D" (1)	Slope	Min Length of Unit	Single Pipe		Multiple Pipes	
						Skew	Pipe Runners Required	Skew	Pipe Runners Required
12"	2"	1.15"	17.00"	3:1	2' - 11"	≤ 45°	No	≤ 45°	No
				4:1	3' - 6"				
				6:1	4' - 9"				
15"	2 ¼"	1.30"	20.50"	3:1	3' - 8"	≤ 45°	No	≤ 45°	No
				4:1	4' - 7"				
				6:1	6' - 5"				
18"	2 ½"	1.60"	24.00"	3:1	4' - 6"	≤ 45°	No	≤ 45°	No
				4:1	5' - 8"				
				6:1	8' - 0"				
24"	3"	1.95"	31.00"	3:1	6' - 2"	≤ 45°	No	= 30°	No
				4:1	7' - 10"			> 30°	Yes
				6:1	11' - 3"				
30"	3 ½"	2.65"	38.50"	3:1	7' - 10"	= 15°	No	= 15°	No
				4:1	10' - 1"	> 15°	Yes	> 15°	Yes
				6:1	14' - 8"				
36"	4"	2.75"	45.50"	3:1	9' - 5"	= 0°	No	≥ 0°	Yes
				4:1	12' - 3"	> 0°	Yes		
				6:1	17' - 11"				
42"	4 ½"	2.7"	52.50"	3:1	11' - 1"	≥ 0°	Yes	≥ 0°	Yes
				4:1	14' - 5"				
				6:1	21' - 2"				



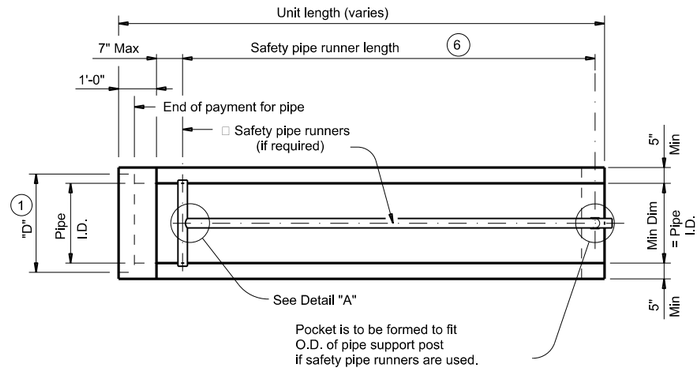
END DETAIL FOR INSTALLATION OF SAFETY PIPE RUNNERS

(If required)



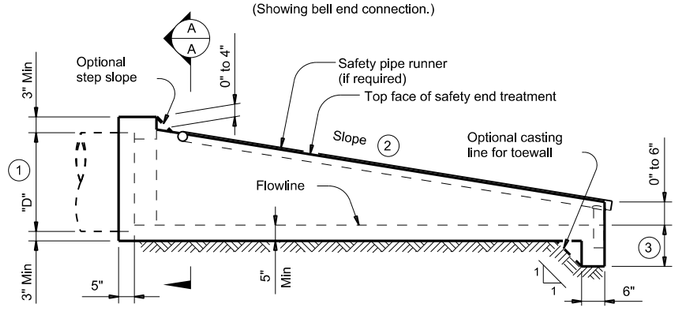
OPTIONAL JOINT FOR RCP

(Showing joint between RCP and precast safety end treatment)



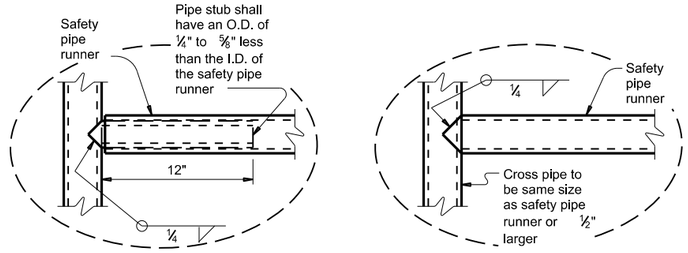
PLAN

(Showing bell end connection.)



LONGITUDINAL ELEVATION

(Showing bell end connection.)

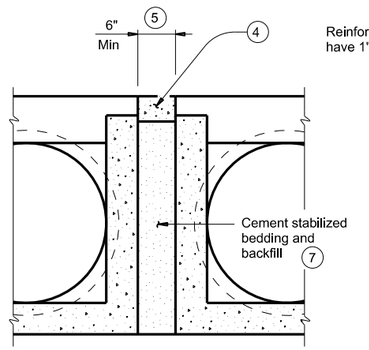


OPTION A

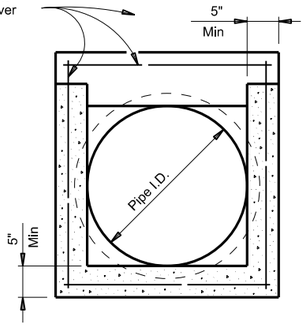
DETAIL A

(If required)

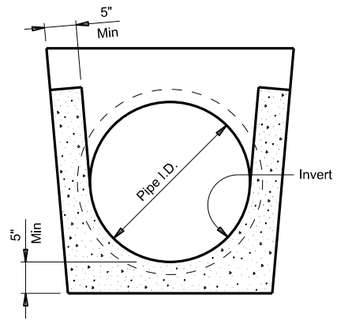
OPTION B



MULTIPLE PIPE INSTALLATION

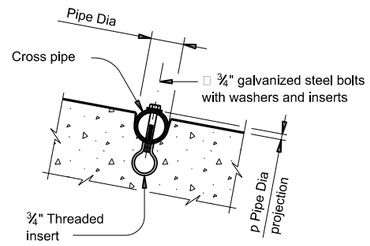


OPTION WITH SQUARE BOTTOM



OPTION WITH INVERT BOTTOM

SECTION A-A



INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)

SAFETY PIPE RUNNER DIMENSIONS

Max Safety Pipe Runner Length	Required Pipe Runner Size		
	Pipe Size	Pipe O.D.	Pipe I.D.
11' - 2"	3" STD	3.500"	3.068"
15' - 6"	3 ½" STD	4.000"	3.548"
20' - 10"	4" STD	4.500"	4.026"
35' - 4"	5" STD	5.563"	5.047"

(1) Dimension "D" is based on reinforced concrete pipe (RCP) meeting the requirements of ASTM C-76, Class III, (RCP Wall "B" thickness). Adjust "D" for any other wall thickness used. For thermoplastic pipe (TP) take into account the annular space requirements for grouted connections.

(2) Slope as shown elsewhere in plans. Slope of 3:1 or flatter is required for vehicle safety.

(3) Toewall to be used only when dimension is shown elsewhere in the plans.

(4) Fill the top 4" of void between precast end treatments with concrete riprap. Concrete riprap is considered subsidiary to the Item 467, "Safety End Treatment".

(5) Adjust clear distance between pipes to provide for the minimum distance between safety end treatments.

(6) Measured along slope.

(7) Provide cement stabilized bedding and backfill in accordance with the Item 400, "Excavation and Backfill for Structures". Bedding and backfill is considered subsidiary to the Item 467, "Safety End Treatment". When concrete riprap is specified around the safety end treatment, backfill as directed by Engineer.

(8) Thermoplastic pipe wall thickness may vary. Adjust accordingly. Thermoplastic pipe requires the safety end treatments to have a bell end for grouted connections.

GENERAL NOTES:

Precast safety end treatment for reinforced concrete pipe (RCP), and thermoplastic pipe (TP) may be used for TYPE II end treatment as specified in Item "Safety End Treatment".

When precast safety end treatment is used as a Contractor's alternate to mitered RCP, riprap will not be required unless noted otherwise on the plans.

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

Manufacture this product in accordance with Item 467, "Safety End Treatment" except as noted below :

A. Provide minimum reinforcing of #4 at 6" (Grade 40) or #4 at 9" (Grade 60) each way or 6"x6" - D12 x D12 or 5"x5" - D10 x D10 welded wire reinforcement (WWR).

B. For precast (steel formed) sections, provide Class "C" concrete (f'c = 3,600 psi).

At the option and expense of the Contractor, the next larger size of safety end treatment may be furnished as long as the "D" dimension cast is that of the required size of pipe.

Pipe runners are designed for a traversing load of 1,800 Lbs at yield as recommended by Research Report 280-1, "Safety Treatment of Roadside Cross-Drainage Structures", Texas Transportation Institute, March 1981.

Provide safety pipe runners, cross pipes, pipe support posts, and pipe stubs meeting the requirements of ASTM A53 (Type E or S, Grade B), ASTM A500 (Grade B), or API 5LX52.

Galvanize all steel components except reinforcing steel after fabrication. Repair galvanizing damaged during transport or construction in accordance with the specifications.

Connect RCP using the Optional Joint for RCP detail shown or in accordance with Item 464 "Reinforced Concrete Pipe". Connect TP by grouting. See Pipe and Box Grouted Connections (PBGC) standard for grouted connections with TP and precast safety end treatment.

Texas Department of Transportation

Bridge Division Standard

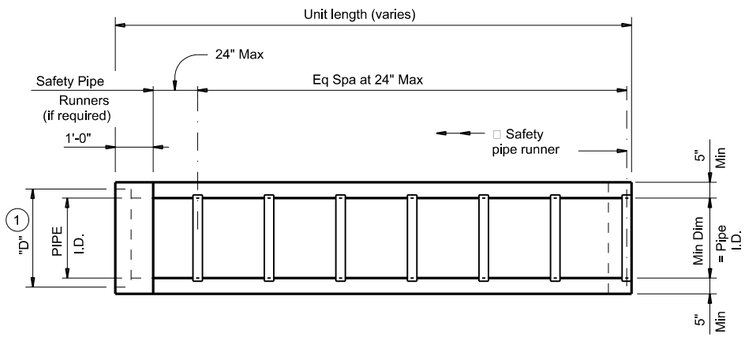
PRECAST SAFETY END TREATMENT

TYPE II ~ CROSS DRAINAGE

PSET-SC

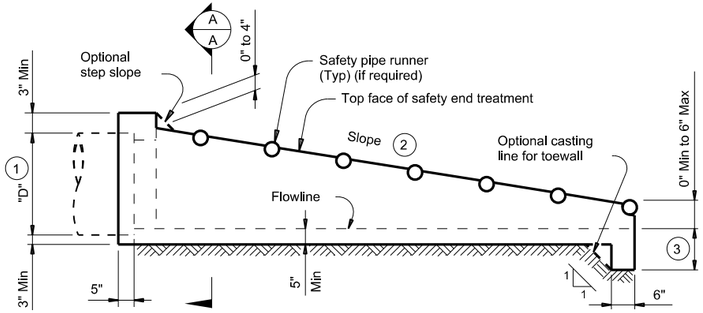
FILE: psetscss-21.dgn	DN: RLW	CK: KLR	DW: JTR	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS 12-21: Added 42" TP	DIST	COUNTY		SHEET NO.

DATE:
FILE:



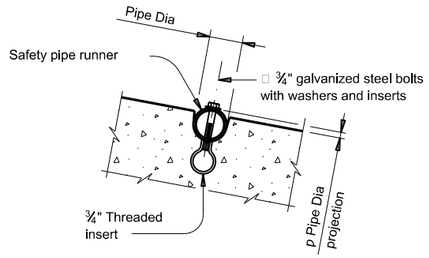
PLAN

(Showing bell end connection.)



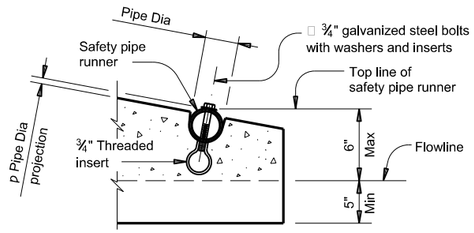
LONGITUDINAL ELEVATION

(Showing bell end connection.)

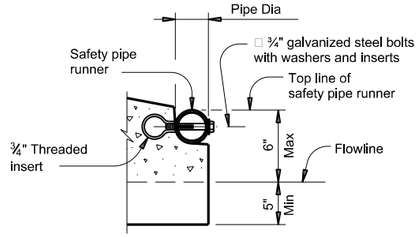


INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)



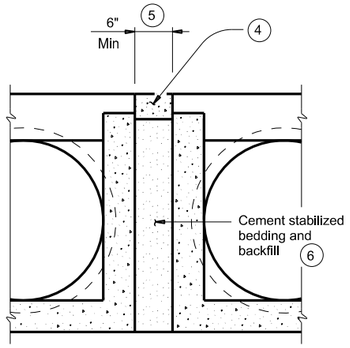
OPTION A



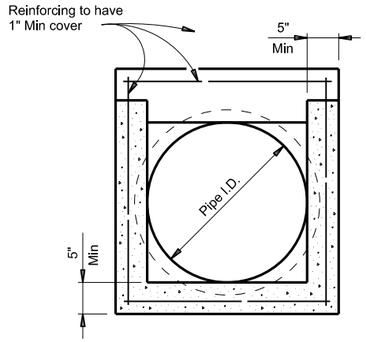
OPTION B

END DETAILS FOR INSTALLATION OF SAFETY PIPE RUNNERS

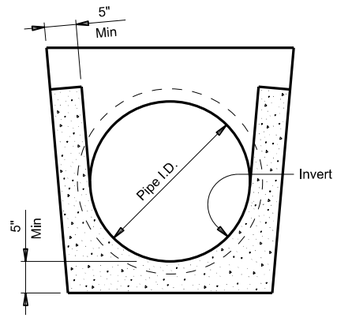
(If required)



MULTIPLE PIPE INSTALLATION

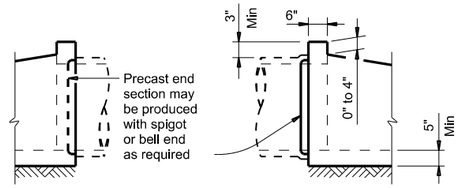


OPTION WITH SQUARE BOTTOM



OPTION WITH INVERT BOTTOM

SECTION A-A



OPTIONAL JOINT FOR RCP

(Showing joint between RCP and precast safety end treatment.)

REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

Pipe I.D.	RCP Wall "B" Thickness	TP Wall Thickness (7)	"D" (1)	Slope	Min Length	Pipe Runners Required		Required Pipe Runner Size		
						Single Pipe	Multiple Pipe	Nominal Dia.	O.D.	I.D.
12"	2"	1.15"	17.00"	6:1	4' - 9"	No	Yes, for > 2 pipes	3" STD	3.500"	3.068"
15"	2 ¼"	1.30"	20.50"	6:1	6' - 5"	No	Yes, for > 2 pipes	3" STD	3.500"	3.068"
18"	2 ½"	1.60"	24.00"	6:1	8' - 0"	No	Yes, for > 2 pipes	3" STD	3.500"	3.068"
24"	3"	1.95"	31.00"	6:1	11' - 3"	No	Yes, for > 2 pipes	3" STD	3.500"	3.068"
30"	3 ½"	2.65"	38.50"	6:1	14' - 8"	No	Yes	4" STD	4.500"	4.026"
36"	4"	2.75"	45.50"	6:1	17' - 11"	Yes	Yes	4" STD	4.500"	4.026"
42"	4 ½"	2.7"	52.50"	6:1	21' - 2"	Yes	Yes	4" STD	4.500"	4.026"

(1) Dimension "D" is based on reinforced concrete pipe (RCP) meeting the requirements of ASTM C-76, Class III, (RCP Wall "B" thickness). Adjust "D" for any other wall thickness used. For thermoplastic pipe (TP) take into account the annular space requirements for grouted connections.

(2) Slope as shown elsewhere in the plans. Slope of 6:1 or flatter is required for vehicle safety.

(3) Toewall to be used only when dimension is shown elsewhere in the plans.

(4) Fill the top 4" of void between precast end treatments with concrete riprap. Concrete riprap is considered subsidiary to the Item 467, "Safety End Treatment".

(5) Adjust clear distance between pipes to provide for the minimum distance between safety end treatments.

(6) Provide cement stabilized bedding and backfill in accordance with the Item 400, "Excavation and Backfill for Structures". Bedding and backfill is considered subsidiary to the Item 467, "Safety End Treatment". When concrete riprap is specified around the safety end treatment, backfill as directed by Engineer.

(7) Thermoplastic pipe wall thickness may vary. Adjust accordingly. Thermoplastic pipe requires the safety end treatments to have a bell end for grouted connections.

GENERAL NOTES:

Precast safety end treatment for reinforced concrete pipe (RCP), and thermoplastic pipe (TP) may be used for TYPE II end treatment as specified in Item "Safety End Treatment".

When precast safety end treatment is used as a Contractor's alternate to mitered RCP, riprap will not be required unless noted otherwise on the plans.

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

Manufacture this product in accordance with Item 467, "Safety End Treatment" except as noted below :

A. Provide minimum reinforcing of #4 at 6" (Grade 40) or #4 at 9" (Grade 60) each way or 6"x6" - D12 x D12 or 5"x5" - D10 x D10 welded wire reinforcement (WWR).

B. For precast (steel formed) sections, provide Class "C" concrete (f'c = 3,600 psi).

At the option and expense of the Contractor the next larger size of safety end treatment may be furnished; as long as the "D" dimension cast is that of the required size of pipe.

Pipe runners are designed for a traversing load of 10,000 Lbs at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.

Provide pipe runners meeting the requirements of ASTM A53 (Type E or S, Grade B), ASTM A500 (Grade B), or API 5LX52.

Galvanize all steel components except reinforcing steel after fabrication. Repair galvanizing damaged during transport or construction in accordance with the specifications.

Connect RCP using the Optional Joint for RCP detail shown or in accordance with Item 464, "Reinforced Concrete Pipe". Connect TP by grouting. See Pipe and Box Grouted Connections (PBGC) standard for grouted connections with TP and precast safety end treatment.

Texas Department of Transportation

Bridge Division Standard

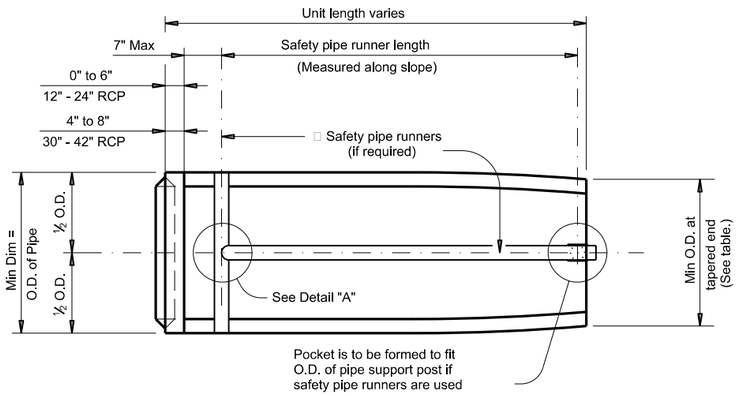
PRECAST SAFETY END TREATMENT

TYPE II ~ PARALLEL DRAINAGE

PSET-SP

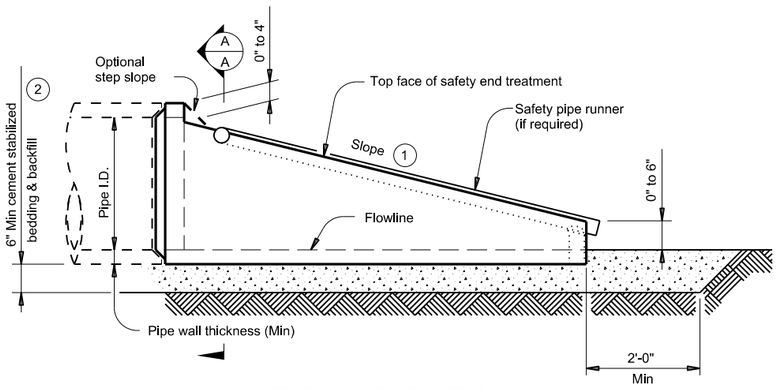
FILE: psetspss-21.dgn	DN: RLW	CK: KLR	DW: JTR	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS 12-21: Added 42" TP	DIST	COUNTY		SHEET NO.

DATE:
FILE:



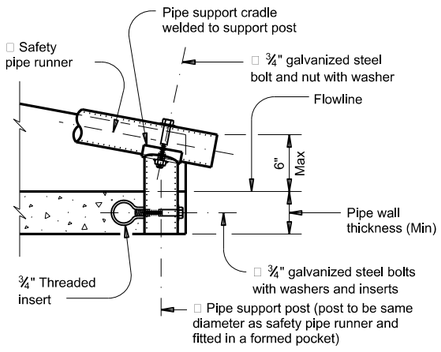
PLAN VIEW

(Showing spigot end connection.)



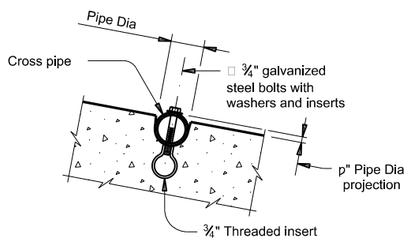
LONGITUDINAL ELEVATION

(Showing spigot end connection.)



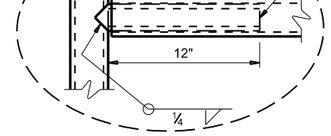
END DETAIL FOR INSTALLATION OF SAFETY PIPE RUNNERS

(If required)

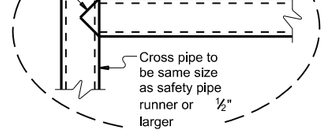


INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)

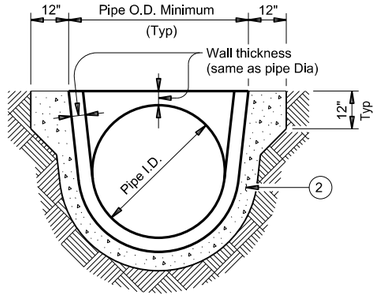


OPTION A

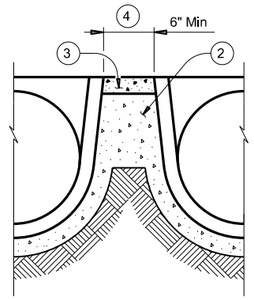


OPTION B

DETAIL A



SECTION A-A



MULTIPLE PIPE INSTALLATION

MAX SAFETY PIPE RUNNER LENGTHS AND REQUIRED SAFETY PIPE RUNNER SIZES

Max Safety Pipe Runner Length	Required Pipe Runner Size		
	Pipe Size	Pipe O.D.	Pipe I.D.
11' - 2"	3" STD	3.500"	3.068"
15' - 6"	3 ½" STD	4.000"	3.548"
20' - 10"	4" STD	4.500"	4.026"
35' - 4"	5" STD	5.563"	5.047"

1. Slope as shown elsewhere in the plans. Slope of 3:1 or flatter is required for vehicle safety.
2. Provide cement stabilized bedding and backfill in accordance with the Item, "Excavation and Backfill for Structures". Bedding and backfill is considered subsidiary to the Item "Safety End Treatment". When concrete riprap is specified around the safety end treatment, backfill as directed by Engineer.
3. Fill the top 4" of void between precast end treatments with concrete riprap. Concrete riprap be considered subsidiary to the Item "Safety End Treatment".
4. Adjust clear distance between pipes to provide for the minimum distance between safety end treatments.

REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

Pipe I.D.	Min Wall Thickness	Min O.D.	Min O.D. at Tapered End	Min Reinf Requirements (sq. in. / ft. of pipe)	Slope	Minimum Length of Unit	Single Pipe		Multiple Pipe	
							Skew	Pipe Runners Required	Skew	Pipe Runners Required
12"	2"	16"	16"	0.07 Circ.	3:1	2' - 0"	≤ 45°	No	≤ 45°	No
					4:1	2' - 8"				
					6:1	4' - 0"				
15"	2 ¼"	19 ½"	19"	0.07 Circ.	3:1	2' - 10"	≤ 45°	No	≤ 45°	No
					4:1	3' - 9"				
					6:1	5' - 8"				
18"	2 ½"	23"	21 ½"	0.07 Circ.	3:1	3' - 8"	≤ 45°	No	≤ 45°	No
					4:1	4' - 10"				
					6:1	7' - 3"				
24"	3"	30"	27"	0.07 Circ.	3:1	5' - 3"	≤ 45°	No	≤ 30°	No
					4:1	7' - 0"			> 30°	Yes
					6:1	10' - 6"				
30"	3 ½"	37"	31"	0.18 Circ.	3:1	6' - 3"	≤ 15°	No	≤ 15°	No
					4:1	8' - 2"	> 15°	Yes	> 15°	Yes
					6:1	12' - 1"				
36"	4"	44"	36"	0.19 Ellip.	3:1	7' - 10"	= 0°	No	≥ 0 °	Yes
					4:1	10' - 4"	> 0°	Yes		
					6:1	15' - 4"				
42"	4 ½"	51"	41 ½"	0.23 Ellip.	3:1	9' - 6"	≥ 0 °	Yes	≥ 0 °	Yes
					4:1	12' - 6"				
					6:1	18' - 7"				

MATERIAL NOTES:

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

Provide safety pipe runners, cross pipes, pipe support posts, and pipe stubs meeting the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr B, or API 5LX52.

Galvanize all steel components except reinforcing steel after fabrication. Repair galvanizing damaged during transport or construction in accordance with the specifications.

GENERAL NOTES:

Precast safety end treatment for reinforced concrete pipe (CRP) may be used for TYPE II end treatment as specified in Item 467, "Safety End Treatment".

When precast safety end treatment is used as a Contractor's alternate to mitered RCP, riprap will not be required unless noted otherwise on the plans.

Manufacture precast concrete end sections in accordance with Item 464, "Reinforced Concrete Pipe" and in accordance with ASTM Specification C-76, Class III, Wall B for circular pipe.

Provide precast concrete end sections with a spigot or bell end for compatibility to upstream or downstream end conditions with sufficient annular space to allow for grout, mortar, cold applied asphalt joint compound or pre-formed plastic gasket material.

Methods of lifting shall be provided by the manufacturer for ease of loading, unloading, and installation.

Pipe runners are designed for a traversing load of 1,800 Lbs at yield as recommended by Research Report 280-1, "Safety Treatment of Roadside Cross-Drainage Structures", Texas Transportation Institute, March 1981.

Texas Department of Transportation

Bridge Division Standard

PRECAST SAFETY END TREATMENT

TYPE II ~ CROSS DRAINAGE

PSET-RC

FILE: psetrcss-20.dgn	DN: RLW	CK: KLR	DW: JTR	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS				
	DIST	COUNTY		SHEET NO.

DATE: 11/17/2022 4:29:43 PM
FILE: T:\AMATPD\Construction Projects\0356-01\107 PM Overlay\4 - Design\Plan Set\5. Drainage\STANDARDS\PSET-RP.dgn

PLAN VIEW - 12" THRU 24"

(Showing spigot end connection.)

LONGITUDINAL ELEVATION - 12" THRU 24"

(Showing spigot end connection.)

SECTION A-A

MULTIPLE PIPE INSTALLATION

① Slope as shown elsewhere in the plans. Slope of 6:1 or flatter is required for vehicle safety.

② Provide cement stabilized bedding and backfill in accordance with the Item, "Excavation and Backfill for Structures". Bedding and backfill is considered subsidiary to the Item 467, "Safety End Treatment". When concrete riprap is specified around the safety end treatment, backfill as directed by Engineer.

③ Fill the top 4" of void between precast end treatments with concrete riprap. Concrete riprap is considered subsidiary to the Item 467, "Safety End Treatment".

④ Adjust clear distance between pipes to provide for the minimum distance between safety end treatments.

⑤ Safety pipe runners are required for multiple pipe culverts with more than two pipes.

INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)

OPTION A

OPTION B

END DETAILS FOR INSTALLATION OF SAFETY PIPE RUNNERS

(If required)

REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

Pipe I.D.	Min Wall Thickness	Min O.D.	Min O.D. at Tapered End	Min Reinf Requirements (sq. in. per ft. of Pipe)	Max Slope	Min Length of Unit	Pipe Runner Requirements		Required Pipe Runner Sizes		
							Single Pipe	Multiple Pipe	Nominal Dia	O.D.	I.D.
12"	2"	16"	16"	0.07 Circ.	6:1	4' - 0"	No	⑤	3" STD	3.500"	3.068"
15"	2 ¼"	19 ½"	19"	0.07 Circ.	6:1	5' - 8"	No	⑤	3" STD	3.500"	3.068"
18"	2 ½"	23"	21 ½"	0.07 Circ.	6:1	7' - 3"	No	⑤	3" STD	3.500"	3.068"
24"	3"	30"	27"	0.07 Circ.	6:1	10' - 6"	No	⑤	3" STD	3.500"	3.068"
30"	3 ½"	37"	31"	0.18 Circ.	6:1	12' - 1"	No	Yes	4" STD	4.500"	4.026"
36"	4"	44"	36"	0.19 Ellip.	6:1	15' - 4"	Yes	Yes	4" STD	4.500"	4.026"
42"	4 ½"	51"	41 ½"	0.23 Ellip.	6:1	18' - 7"	Yes	Yes	4" STD	4.500"	4.026"

MATERIAL NOTES:

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

Provide pipe runners meeting the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr B, or API 5LX52.

Galvanize steel components except reinforcing steel after fabrication. Repair galvanizing damaged during transport or construction in accordance with the specifications.

GENERAL NOTES:

Precast safety end treatment for reinforced concrete pipe (RCP) may be used for TYPE II end treatment as specified in Item 467, "Safety End Treatment".

When precast safety end treatment is used as a Contractor's alternate to mitered RCP, riprap will not be required unless noted otherwise on the plans.

Manufacture precast concrete end sections in accordance with Item 464, "Reinforced Concrete Pipe" and in accordance with ASTM Specification C-76, Class III, Wall B for circular pipe.

Provide precast concrete end sections with a spigot or bell end for compatibility to upstream or downstream end conditions with sufficient annular space to allow for grout, mortar, cold applied asphalt joint compound or pre-formed plastic gasket material.

Methods of lifting shall be provided by the manufacturer for ease of loading, unloading and installation.

Pipe runners are designed for a traversing load of 10,000 Lbs at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.

Texas Department of Transportation®

Bridge Division Standard

PRECAST SAFETY END TREATMENT

TYPE II ~ PARALLEL DRAINAGE

PSET-RP

FILE: psetrpss-20.dgn	DN: RLW	CK: KLR	DW: JTR	CK: GAF

REVISIONS

CONT	SECT	JOB	HIGHWAY
0356	01	107	SH 136

DIST	COUNTY	SHEET NO.
AMA	HUTCHINSON CO	137

DATE: 11/17/2022 4:29:44 PM
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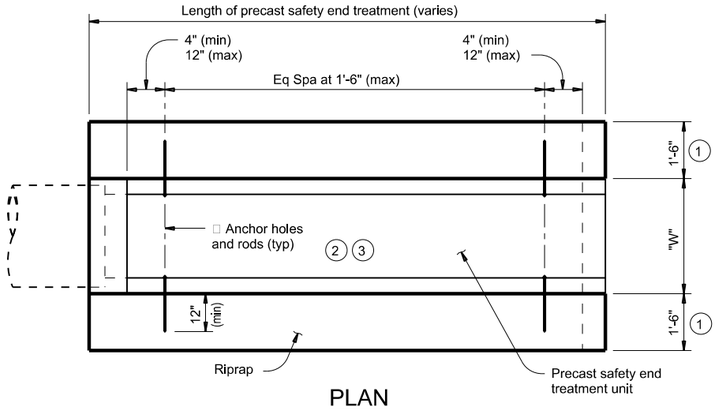
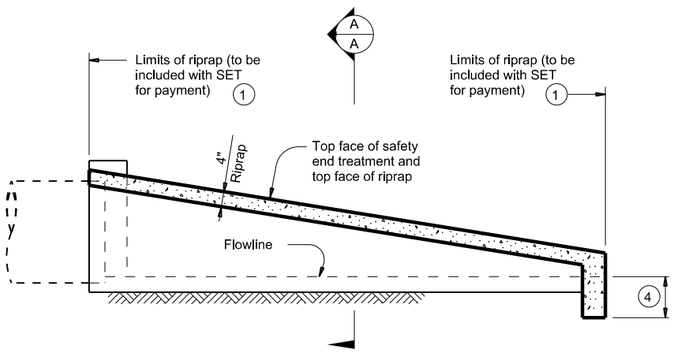
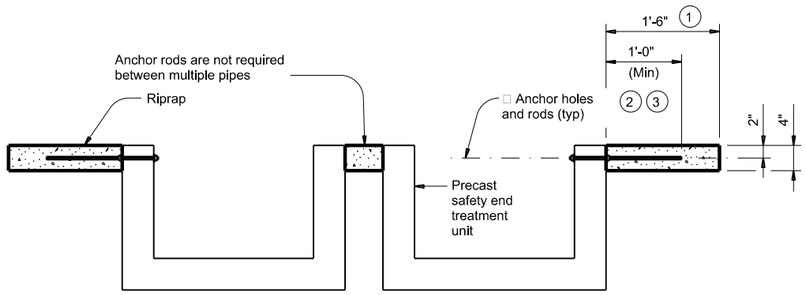


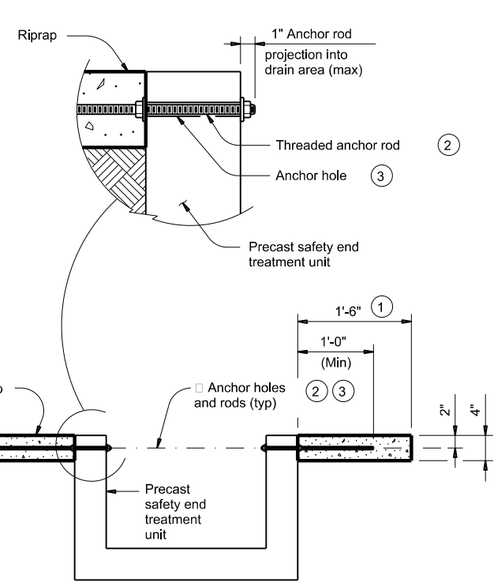
PLAN



LONGITUDINAL ELEVATION



MULTIPLE PIPE INSTALLATION



SINGLE PIPE INSTALLATION

SECTION A-A

ESTIMATED CONCRETE RIPRAP QUANTITIES (CY)

5

Nominal Culvert (Pipe) I.D.	PSET-SC and PSET-SP Standards				PSET-RC and PSET-RP Standards			
	Unit Width "W"	Side Slope			Unit Width "W"	Side Slope		
		3:1	4:1	6:1		3:1	4:1	6:1
12"	23.0"	0.1	0.2	0.2	16.0"	0.1	0.1	0.2
15"	26.5"	0.2	0.2	0.3	19.5"	0.1	0.2	0.2
18"	30.0"	0.2	0.2	0.3	23.0"	0.2	0.2	0.3
24"	37.0"	0.3	0.3	0.5	30.0"	0.2	0.3	0.4
30"	44.5"	0.3	0.4	0.6	37.0"	0.3	0.3	0.5
36"	51.5"	0.4	0.5	0.7	44.0"	0.3	0.4	0.6
42"	58.5"	0.5	0.6	0.8	51.0"	0.4	0.5	0.7

(1) Riprap placed beyond the limits shown will be paid as concrete riprap in accordance with Item 432, "Riprap". When riprap is cast integrally with the precast safety end treatment, this dimension is 1'-0" minimum.

(2) 1#2" Dia ASTM A307 Gr A threaded anchor rod with 2 nuts and 2 washers. Galvanize all components in accordance with Item 445, "Galvanizing". Repair galvanizing that is damaged during transport or construction in accordance with the specifications.

(3) 3#4" through holes in walls of safety end treatment for riprap anchor rods may be drilled with rotary (coring or masonry) type drilling equipment or may be formed. Do not use percussive (star) type drilling equipment. If holes are drilled, patch spalls in the inside face of the wall exceeding 1#2" from the holes.

(4) Provide riprap toe wall when dimension is shown elsewhere in the plans or when field conditions require a toe wall.

(5) Quantities shown are for one end of one reinforced concrete pipe culvert. For multiple pipe culverts, quantities will need to be adjusted. Riprap quantities are for Contractor's information only. Quantities are based on the minimum unit lengths shown on the Precast Saftey End Treatment (SET) standard sheets.

MATERIAL NOTES:

Provide Class "B" riprap in accordance with Item 432, "Riprap".
Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise. The anchor rods shown are always required.

GENERAL NOTES:

Precast safety end treatment for reinforced concrete pipe may be used for TYPE II end treatment as specified in Item 467, "Safety End Treatment".
Refer to PSET-SC or PSET-SP standard sheets for details of square safety end treatments not shown. Refer to PSET-RC or PSET-RP standard sheets for details of round safety end treatments not shown.
For precast units with integrally cast riprap, substitute reinforcing steel in the amount on 0.26 in./ft. minimum for the threaded anchor rods shown. When requested, submit sealed engineering drawings for approval prior to construction. Shop drawings will not be required. Note that a proprietary precast unit with integral riprap is available from L&R Precast Concrete Works, Inc. (956) 583-6293 or www.lrprecast.com.
Payment for riprap and toewalls is included in the price bid for each safety end treatment.

These riprap details are only applicable when notes that require placement of riprap with precast safety end treatments are shown elsewhere in the plans.

Precast units with integrally cast riprap are permitted unless noted otherwise on the plans.

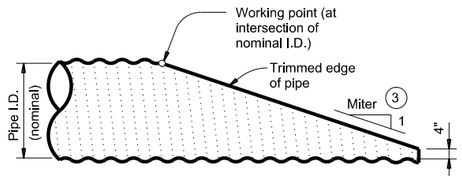
Texas Department of Transportation

Bridge Division Standard

PRECAST SAFETY END TREATMENT
TYPE II
RIPRAP DETAILS

PSET-RR

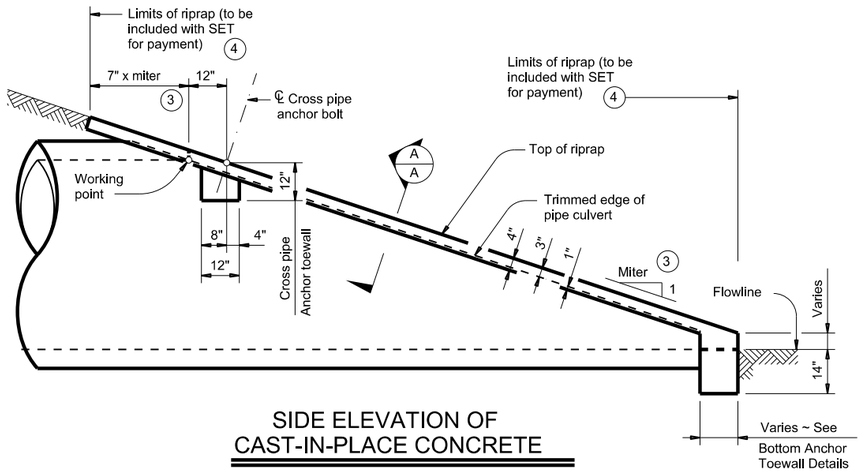
FILE: psetrrse-20.dgn	DN: GAF	CK: TxDOT	DW: JRP	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0356	01	107	SH 136
	DIST	COUNTY		SHEET NO.
	AMA	HUTCHINSON CO		138



NOTE: All pipe runners, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

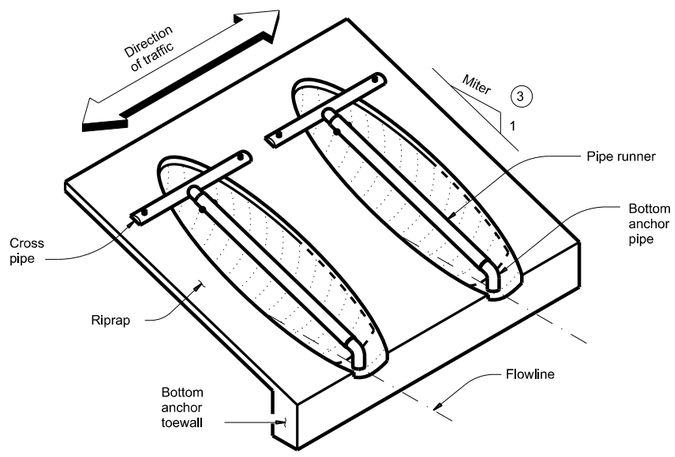
SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

(Showing corrugated metal pipe (CMP) culvert. Details of reinforced concrete pipe (RCP) culvert are similar.)



SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

(Showing reinforced concrete pipe (RCP) culvert. Details of corrugated metal pipe (CMP) culvert are similar. Pipe runners not shown for clarity)



ISOMETRIC VIEW OF TYPICAL INSTALLATION

(Showing installation with no skew.)

CROSS PIPE LENGTHS AND PIPE RUNNER LENGTHS (1) (2)

Nominal Culvert I.D.	Pipe Culvert Spa ~ G	Cross Pipe Length	Pipe Runner Length											
			3:1 Side Slope				4:1 Side Slope				6:1 Side Slope			
			0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew
24"	1' - 7"	3' - 5"	N/A	N/A	N/A	5' - 10"	N/A	N/A	N/A	8' - 1"	N/A	N/A	N/A	12' - 9"
27"	1' - 8"	3' - 8"	N/A	N/A	5' - 5"	6' - 11"	N/A	N/A	7' - 7"	9' - 7"	N/A	N/A	11' - 11"	14' - 11"
30"	1' - 10"	3' - 11"	N/A	N/A	6' - 4"	8' - 0"	N/A	N/A	8' - 9"	11' - 0"	N/A	N/A	13' - 8"	17' - 0"
33"	1' - 11"	4' - 2"	6' - 2"	6' - 5"	7' - 3"	9' - 1"	8' - 6"	8' - 10"	10' - 0"	12' - 5"	13' - 3"	13' - 9"	15' - 5"	19' - 2"
36"	2' - 1"	4' - 5"	6' - 11"	7' - 3"	8' - 2"	10' - 2"	9' - 6"	9' - 11"	11' - 2"	13' - 10"	14' - 9"	15' - 3"	17' - 2"	21' - 3"
42"	2' - 4"	4' - 11"	8' - 6"	8' - 10"	9' - 11"	12' - 4"	11' - 7"	12' - 0"	13' - 6"	16' - 8"	17' - 9"	18' - 5"	20' - 8"	25' - 7"
48"	2' - 7"	5' - 5"	10' - 1"	10' - 5"	11' - 9"	N/A	13' - 7"	14' - 2"	15' - 10"	N/A	20' - 9"	21' - 6"	24' - 2"	N/A
54"	3' - 0"	5' - 11"	11' - 8"	12' - 1"	N/A	N/A	15' - 8"	16' - 3"	N/A	N/A	23' - 10"	24' - 8"	N/A	N/A
60"	3' - 3"	6' - 5"	13' - 3"	N/A	N/A	N/A	17' - 9"	N/A	N/A	N/A	26' - 10"	N/A	N/A	N/A

TYPICAL PIPE CULVERT MITERS (3)

Side Slope	0° Skew	15° Skew	30° Skew	45° Skew
3:1	3:1	3.106:1	3.464:1	4.243:1
4:1	4:1	4.141:1	4.619:1	5.657:1
6:1	6:1	6.212:1	6.928:1	8.485:1

CONDITIONS WHERE PIPE RUNNERS ARE NOT REQUIRED (2)

Nominal Culvert I.D.	Single Pipe Culvert	Multiple Pipe Culverts
12" thru 21"	Skews thru 45°	Skews thru 45°
24"	Skews thru 45°	Skews thru 30°
27"	Skews thru 30°	Skews thru 15°
30"	Skews thru 15°	Skews thru 15°
33"	Skews thru 15°	Always required
36"	Normal (no skew)	Always required
42" thru 60"	Always required	Always required

STANDARD PIPE SIZES AND MAX PIPE RUNNER LENGTHS (1)

Pipe Size	Pipe O.D.	Pipe I.D.	Max Pipe Runner Length
2" STD	2.375"	2.067"	N/A
3" STD	3.500"	3.068"	10' - 0"
4" STD	4.500"	4.026"	19' - 8"
5" STD	5.563"	5.047"	34' - 2"

ESTIMATED CONCRETE RIPRAP QUANTITIES (CY) (5)

Nominal Culvert I.D.	3:1 Side Slope				4:1 Side Slope				6:1 Side Slope			
	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew
12"	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.6	0.7	0.7	0.7	0.8
15"	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.9
18"	0.5	0.5	0.6	0.6	0.6	0.7	0.7	0.8	0.8	0.8	0.9	1.0
21"	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.9	0.9	0.9	1.0	1.2
24"	0.6	0.7	0.7	0.8	0.8	0.8	0.8	1.0	1.0	1.0	1.1	1.3
27"	0.7	0.7	0.8	0.9	0.8	0.9	0.9	1.1	1.1	1.1	1.2	1.4
30"	0.8	0.8	0.8	0.9	0.9	0.9	1.0	1.2	1.2	1.2	1.3	1.6
33"	0.8	0.8	0.9	1.0	1.0	1.0	1.1	1.3	1.3	1.4	1.5	1.7
36"	0.9	0.9	0.9	1.1	1.1	1.1	1.2	1.4	1.4	1.5	1.6	1.8
42"	1.0	1.0	1.1	1.3	1.2	1.3	1.3	1.6	1.6	1.7	1.8	2.1
48"	1.1	1.1	1.2	N/A	1.4	1.4	1.5	N/A	1.9	1.9	2.1	N/A
54"	1.3	1.3	N/A	N/A	1.6	1.6	N/A	N/A	2.1	2.1	N/A	N/A
60"	1.4	N/A	N/A	N/A	1.7	N/A	N/A	N/A	2.3	N/A	N/A	N/A

(1) Provide pipe runner of the size shown in the tables. Provide cross pipe of the same size as the pipe runner. Provide cross pipe stub out and bottom anchor pipe of the next smaller size pipe as shown in the Standard Pipe Sizes and Max Pipe Runner Lengths table.

(2) This standard allows for the placement of only one pipe runner across each culvert pipe opening. In order to limit the clear opening to be traversed by an errant vehicle, the following conditions must be met:

For 60" culvert pipes, the skew must not exceed 0°.
For 54" culvert pipes, the skew must not exceed 15°.
For 48" culvert pipes, the skew must not exceed 30°.
For all culvert pipe sizes 42" and less, the skew must not exceed 45°.

If the above conditions cannot be met, the designer should consider using a safety end treatment with flared wings. For further information, refer to the TxDOT Roadway Design Manual.

(3) Miter = slope of mitered end of pipe culvert.

(4) Riprap placed beyond the limits shown will be paid for as concrete riprap in accordance with Item 432, "Riprap".

(5) Quantities shown are for one end of one reinforced concrete pipe (RCP) culvert. For multiple pipe culverts or for corrugated metal pipe (CMP) culverts, quantities will need to be adjusted. Riprap quantities are for Contractor's information only.

DATE:
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SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

FOR 12" DIA TO 60" DIA
PIPE CULVERTS
TYPE II ~ CROSS DRAINAGE

SETP-CD

FILE:	setpcdse-20.dgn	DN: GAF	CK: CAT	DW: JRP	CK: GAF
©TxDOT	February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS					
		DIST	COUNTY		SHEET NO.

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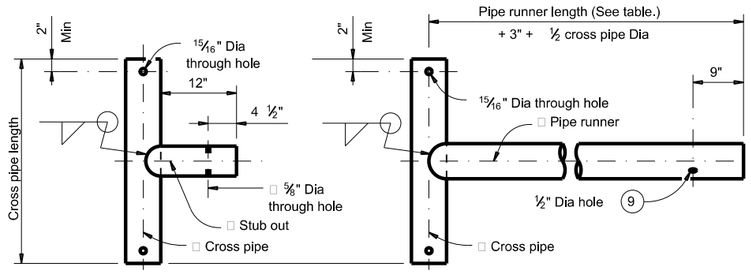
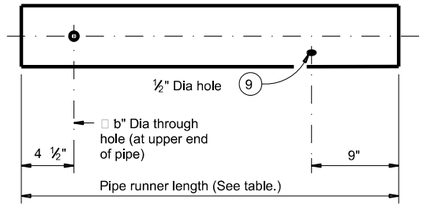


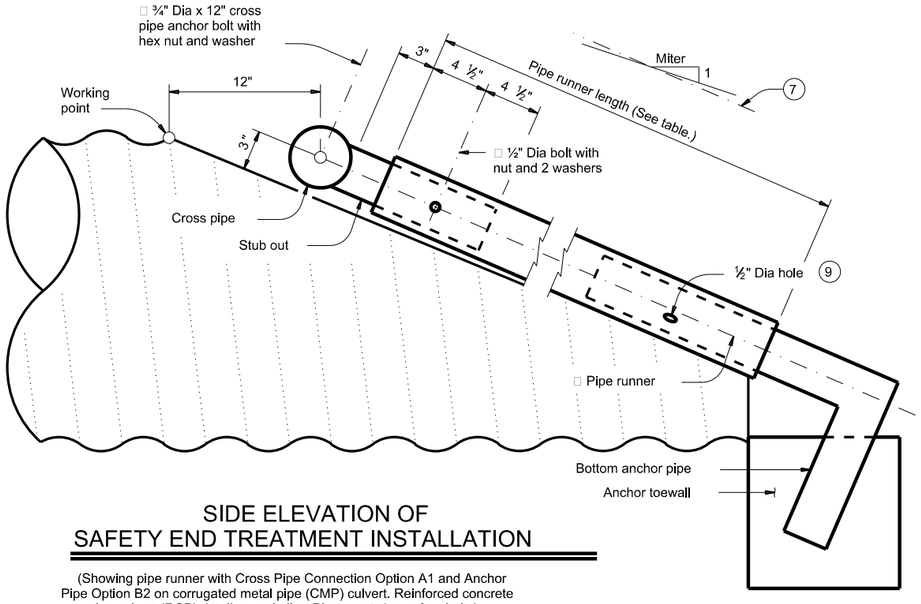
OPTION A1 OPTION A2

CROSS PIPE AND CONNECTIONS DETAILS



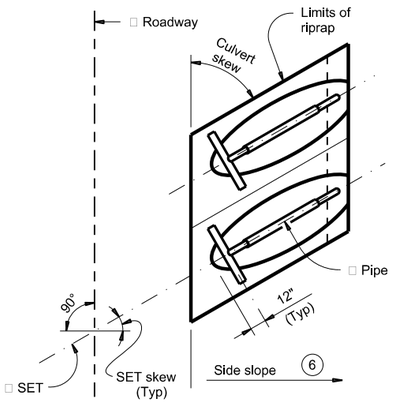
NOTE: The separate pipe runner shown is required when Cross Pipe Connection Option A1 is used.

PIPE RUNNER DETAILS

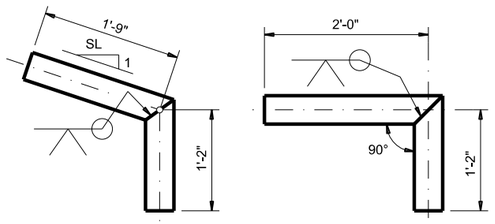


SIDE ELEVATION OF SAFETY END TREATMENT INSTALLATION

(Showing pipe runner with Cross Pipe Connection Option A1 and Anchor Pipe Option B2 on corrugated metal pipe (CMP) culvert. Reinforced concrete pipe culvert (RCP) details are similar. Riprap not shown for clarity)

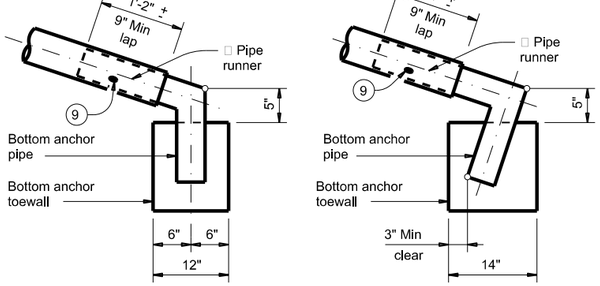


PLAN OF SKEWED INSTALLATION



OPTION B1 OPTION B2

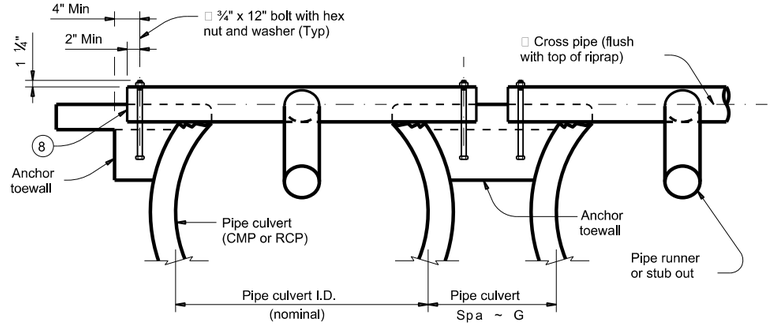
BOTTOM ANCHOR PIPE DETAILS (10)



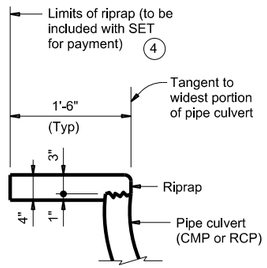
OPTION B1 OPTION B2

BOTTOM ANCHOR TOEWALL DETAILS

(Culvert and riprap not shown for clarity.)



SHOWING CROSS PIPE AND ANCHOR TOEWALL



SHOWING TYPICAL PIPE CULVERT AND RIPRAP

SECTION A-A

(4) Riprap placed beyond the limits shown will be paid for as concrete riprap in accordance with Item 432, "Riprap".

(6) Recommended values of side slope are 3:1, 4:1, and 6:1. All quantities, calculations, and dimensions shown herein are based on these recommended values. Slope of 3:1 or flatter is required for vehicle safety.

(7) Note that actual slope of pipe runner may vary slightly from side slope of riprap and trimmed culvert pipe edge.

(8) Ensure that riprap concrete does not flow into the cross pipe so as to permit disassembly of the bolted connection to allow cleanout access.

(9) After installation, inspect the ½" hole to ensure that the lap of the pipe runner with the bottom anchor pipe is adequate.

(10) At fabricator's option, a heat bend to a smooth 5" radius or a manufactured elbow (of the same material as the runner) may be substituted for the mitered and welded joint in the bottom anchor pipe.

MATERIAL NOTES:
Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.
Provide pipe runners, cross pipes, and anchor pipes conforming to the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr B, or API 5LX52.
Provide ASTM A307 bolts and nuts.
Galvanize all steel components, except concrete reinforcing, after fabrication.
Repair galvanizing damaged during transport or construction in accordance with the specifications.

GENERAL NOTES:
Pipe runners are designed for a traversing load of 1,800 pounds at yield as recommended by Research Report 280-1, "Safety Treatment of Roadside Cross-Drainage Structures", Texas Transportation Institute, March 1981.
Safety end treatments (SET) shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the pipe runners.
Payment for riprap and toewall is included in the price bid for each safety end treatment.
Construct concrete riprap and all necessary inverts in accordance with the requirements of Item 432, "Riprap".

SHEET 2 OF 2

Texas Department of Transportation

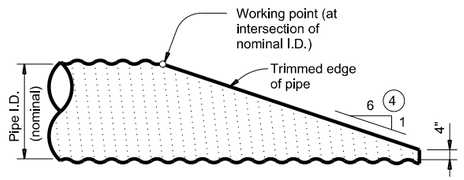
Bridge Division Standard

SAFETY END TREATMENT

FOR 12" DIA TO 60" DIA
PIPE CULVERTS
TYPE II ~ CROSS DRAINAGE

SETP-CD

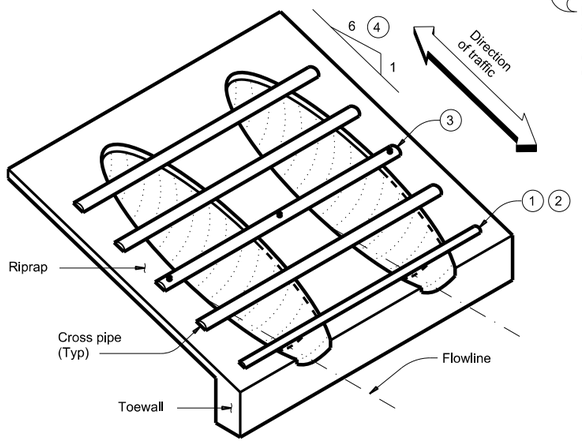
FILE: setpcdse-20.dgn	DN: GAF	CK: CAT	DW: JRP	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS				
	DIST	COUNTY		SHEET NO.



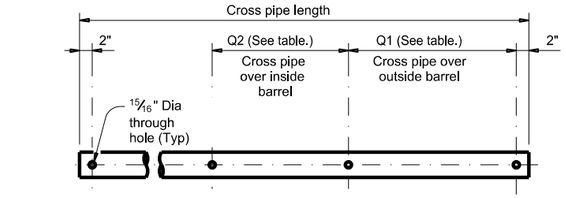
NOTE: All cross pipes, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

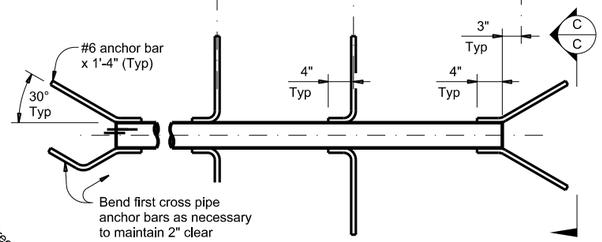
(Showing corrugated metal pipe (CMP) culvert Details at reinforced concrete pipe (RCP) culvert are similar.)



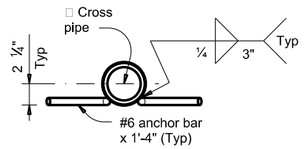
ISOMETRIC VIEW OF TYPICAL INSTALLATION



PIPE WITH BOLTED ANCHOR

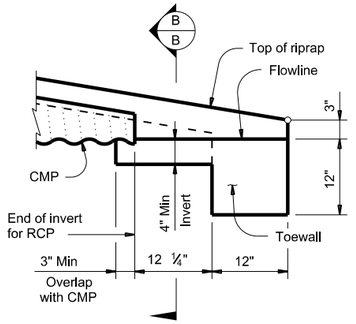


PIPE WITH ANCHOR BARS



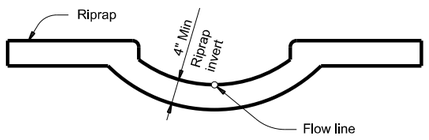
SECTION C-C

CROSS PIPE DETAILS



DETAIL "A"

(Showing invert with corrugated metal pipe (CMP) culvert. Reinforced concrete pipe (RCP) culvert details are similar. Cross pipes not shown for clarity.)



SECTION B-B

(Cross pipes not shown for clarity.)

CROSS PIPE LENGTHS, REQUIRED PIPE SIZES, AND RIPRAP QUANTITIES (2)

Nominal Culvert I.D.	Conc Riprap (CY) (6)	Pipe Culvert Spa ~ G	Single Barrel ~ Q1	Multi-Barrel ~ Q1	Q2	Conditions for Use of Cross Pipes	Cross Pipe Sizes
12"	0.6	0' - 9"	N/A	2' - 1"	1' - 9"	3 or more pipe culverts	3" Std (3.500" O.D.)
15"	0.7	0' - 11"	N/A	2' - 5"	2' - 2"		
18"	0.8	1' - 2"	N/A	2' - 10"	2' - 8"		
21"	0.9	1' - 4"	N/A	3' - 2"	3' - 1"		
24"	0.9	1' - 7"	N/A	3' - 6"	3' - 7"		
27"	1.0	1' - 8"	N/A	3' - 10"	3' - 11"	3 or more pipe culverts	3 ½" Std (4.000" O.D.)
30"	1.1	1' - 10"	N/A	4' - 2"	4' - 4"	2 or more pipe culverts	
33"	1.2	1' - 11"	4' - 2"	4' - 5"	4' - 8"	All pipe culverts	
36"	1.3	2' - 1"	4' - 5"	4' - 9"	5' - 1"	All pipe culverts	4" Std (4.500" O.D.)
42"	1.5	2' - 4"	4' - 11"	5' - 5"	5' - 10"		
48"	1.7	2' - 7"	5' - 5"	6' - 0"	6' - 7"	All pipe culverts	5" Std (5.563" O.D.)
54"	2.0	3' - 0"	5' - 11"	6' - 9"	7' - 6"		
60"	2.2	3' - 3"	6' - 5"	7' - 4"	8' - 3"		
66"	2.4	3' - 3"	6' - 11"	7' - 10"	8' - 9"		
72"	2.7	3' - 4"	7' - 5"	8' - 5"	9' - 4"		

(1) The proper installation of the first cross pipe is critical for vehicle safety. Place the top of the first cross pipe no more than 6" above the flow line.

(2) Provide cross pipes, except the first bottom pipe, of the size shown in the table. Provide a 3 1#2" standard pipe (4" O.D.) for the first bottom pipe.

(3) Install the third cross pipe from the bottom of the culvert using a bolted connection. Ensure that riprap concrete does not flow into the cross pipe so as to permit disassembly of the bolted connection to allow cleanout access. At the Contractor's option, install all other cross pipes using the bolted connection details.

(4) Match cross slope as shown elsewhere in the plans. Cross slope of 6:1 or flatter is required for vehicle safety.

(5) Riprap placed beyond the limits shown will be paid for as concrete riprap in accordance with Item 432, "Riprap".

(6) Quantities shown are for one end of one reinforced concrete pipe (RCP) culvert. For multiple pipe culverts or for corrugated metal pipe (CMP) culverts, quantities will need to be adjusted. Riprap quantities are for contractor's information only.

MATERIAL NOTES:

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

Provide cross pipes that meet the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 (Gr B), or API 5LX52.

Provide ASTM A307 bolts and nuts.

Galvanize all steel components, except concrete reinforcing, after fabrication. Repair galvanizing damaged during transport or construction in accordance with the specifications.

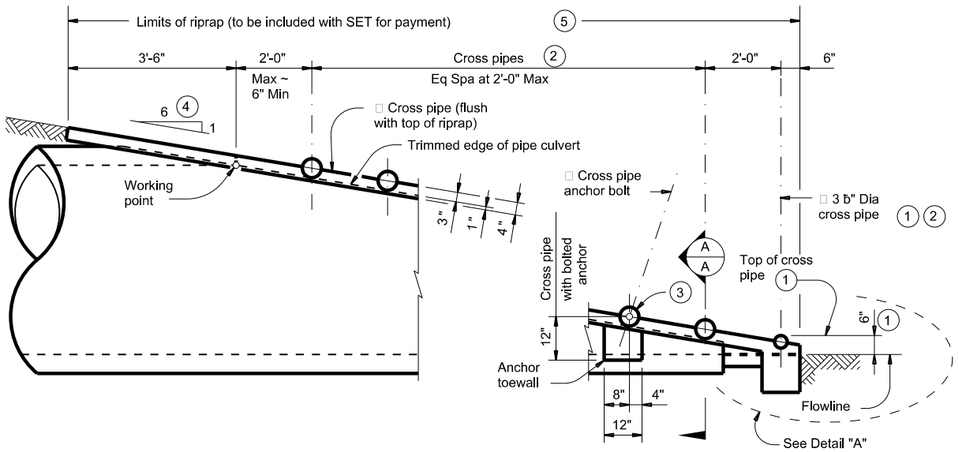
GENERAL NOTES:

Cross pipes are designed for a traversing load of 10,000 pounds at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.

Safety end treatments (SET) shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the cross pipes.

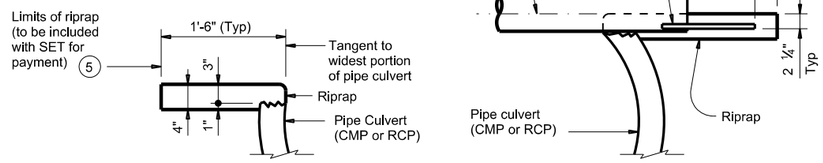
Construct concrete riprap and all necessary inverts in accordance with the requirements of Item 432, "Riprap".

Payment for riprap and toewall is included in the Price Bid for each Safety End Treatment.



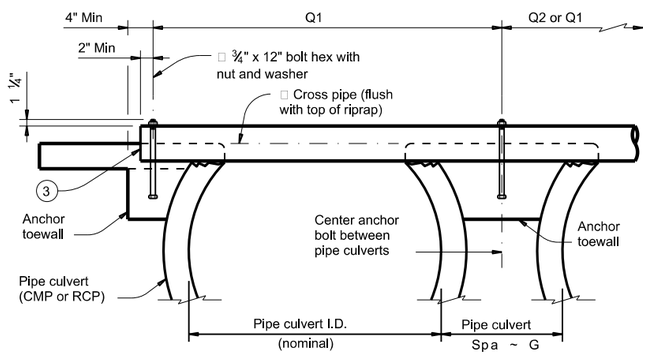
SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

(Showing reinforced concrete pipe (RCP) culvert. Details at corrugated metal pipe (CMP) culvert are similar.)



SHOWING TYPICAL PIPE CULVERT AND RIPRAP

SHOWING CROSS PIPE WITH ANCHOR BAR



SHOWING CROSS PIPE WITH BOLTED ANCHOR

SECTION A-A

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Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

FOR 12" DIA TO 72" DIA PIPE CULVERTS
TYPE II ~ PARALLEL DRAINAGE

SETP-PD

FILE: setppdse-20.dgn	DN: GAF	CK: CAT	DW: JRP	CK: GAF
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REVISIONS	DIST	COUNTY		SHEET NO.

TABLE OF VARIABLE DIMENSIONS AND QUANTITIES FOR ONE HEADWALL (5)

Slope	Dia of Pipe (D)	Values for One Pipe W	X	Y	L	Reinf (Lbs)	Conc (CY) (1)	Values to be Added for Each Addt'l Pipe X and W	Reinf (Lbs)	Conc (CY) (1)
3:1	24"	7' - 2"	4' - 0 ¾"	7' - 3"	8' - 4 ½"	202	1.8	3' - 8 ½"	59	0.8
	27"	7' - 11"	4' - 4 ½"	8' - 0"	9' - 2 ¾"	223	2.1	4' - 0 ¾"	68	0.9
	30"	8' - 7 ¾"	4' - 8"	8' - 9"	10' - 1 ¼"	258	2.4	4' - 5 ¾"	79	1.1
	33"	9' - 4 ½"	4' - 11 ¾"	9' - 6"	10' - 11 ¾"	280	2.7	4' - 10"	86	1.3
	36"	10' - 1 ¼"	5' - 3 ¼"	10' - 3"	11' - 10"	311	3.1	5' - 3 ¼"	97	1.5
	42"	11' - 7"	5' - 10 ½"	11' - 9"	13' - 6 ¾"	377	3.9	6' - 0 ½"	122	1.9
	48"	13' - 5 ¾"	6' - 5 ¾"	14' - 0"	16' - 2"	463	5.2	6' - 9 ¾"	152	2.5
	54"	14' - 11 ½"	7' - 1"	15' - 6"	17' - 10 ¾"	542	6.2	7' - 9 ¼"	190	3.1
	60"	16' - 5"	7' - 8 ¼"	17' - 0"	19' - 7 ½"	614	7.3	8' - 6 ½"	224	3.7
	66"	17' - 10 ¾"	8' - 3 ½"	18' - 6"	21' - 4 ¼"	699	8.5	9' - 0 ¾"	248	4.2
	72"	19' - 4 ¼"	8' - 10 ¾"	20' - 0"	23' - 1 ¼"	784	9.8	9' - 8"	281	4.7
4:1	24"	8' - 6 ¾"	4' - 0 ¾"	9' - 8"	11' - 2"	262	2.4	3' - 8 ½"	68	1.0
	27"	9' - 5 ¼"	4' - 4 ½"	10' - 8"	12' - 3 ¾"	290	2.8	4' - 0 ¾"	79	1.1
	30"	10' - 4"	4' - 8"	11' - 8"	13' - 5 ¾"	331	3.2	4' - 5 ¾"	91	1.4
	33"	11' - 2 ½"	4' - 11 ¾"	12' - 8"	14' - 7 ½"	366	3.7	4' - 10"	104	1.6
	36"	12' - 1"	5' - 3 ¼"	13' - 8"	15' - 9 ¼"	409	4.2	5' - 3 ¼"	115	1.8
	42"	13' - 10"	5' - 10 ½"	15' - 8"	18' - 1"	493	5.3	6' - 0 ½"	144	2.3
	48"	16' - 2 ¼"	6' - 5 ¾"	18' - 8"	21' - 6 ¾"	610	7.2	6' - 9 ¾"	183	3.1
	54"	17' - 11 ¼"	7' - 1"	20' - 8"	23' - 10 ¼"	727	8.6	7' - 9 ¼"	231	3.8
	60"	19' - 8 ¼"	7' - 8 ¼"	22' - 8"	26' - 2"	822	10.1	8' - 6 ½"	270	4.6
	66"	21' - 5 ½"	8' - 3 ½"	24' - 8"	28' - 5 ¾"	945	11.8	9' - 0 ¾"	305	5.2
	72"	23' - 2 ½"	8' - 10 ¾"	26' - 8"	30' - 9 ½"	1,058	13.6	9' - 8"	342	5.9
6:1	24"	11' - 4 ¼"	4' - 0 ¾"	14' - 6"	16' - 9"	375	3.8	3' - 8 ½"	83	1.3
	27"	12' - 6 ¼"	4' - 4 ½"	16' - 6"	18' - 5 ¾	426	4.5	4' - 0 ¾"	98	1.5
	30"	13' - 8 ¼"	4' - 8"	17' - 6"	20' - 2 ½"	486	5.2	4' - 5 ¾"	113	1.8
	33"	14' - 10 ¼"	4' - 11 ¾"	19' - 0"	21' - 11 ¼"	549	6.0	4' - 10"	130	2.1
	36"	16' - 0 ¼"	5' - 3 ¼"	20' - 6"	23' - 8"	604	6.8	5' - 3 ¼"	145	2.5
	42"	18' - 4 ½"	5' - 10 ½"	23' - 6"	27' - 1 ½"	738	8.7	6' - 0 ½"	184	3.2
	48"	21' - 6 ¾"	6' - 5 ¾"	28' - 0"	32' - 4"	944	11.8	6' - 9 ¾"	240	4.3
	54"	23' - 10 ¾"	7' - 1"	31' - 0"	35' - 9 ½"	1,122	14.2	7' - 9 ¼"	303	5.3
	60"	26' - 2 ¾"	7' - 8 ¼"	34' - 0"	39' - 3"	1,276	16.9	8' - 6 ½"	358	6.4

(1) Quantities shown are for concrete pipe and will increase slightly for metal pipe installation.

(2) 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.

(3) Provide a 1'-0" footing as shown where required to maintain 4" minimum cover for pipes.

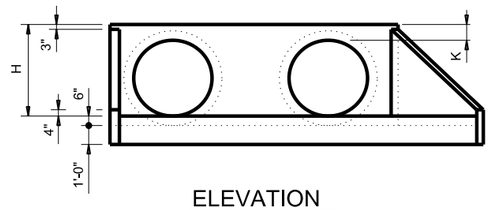
(4) Dimensions shown are usual and maximum.

(5) Quantities shown are for one structure end. (One headwall)

(6) Min Length = 6" + 3" x $\left(\frac{12 \times H - 7}{12 \times L}\right)$

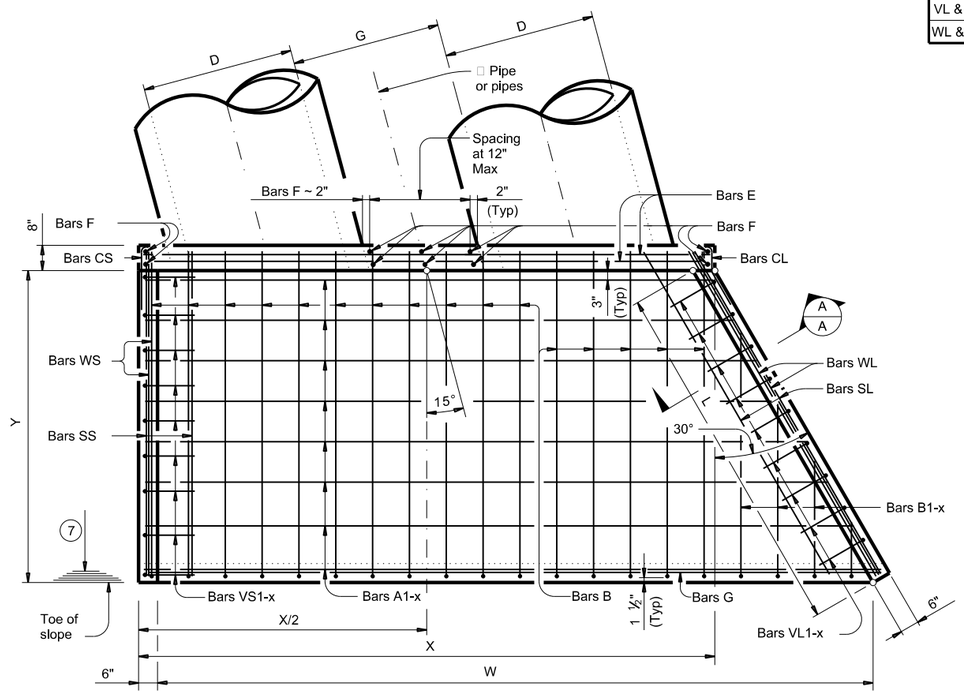
Max Length = 12 x H - 3" x $\left(\frac{12 \times H - 7}{12 \times L}\right)$

(7) Lengths of wings based on SL:1 slope along this line.

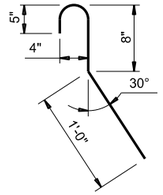


ELEVATION

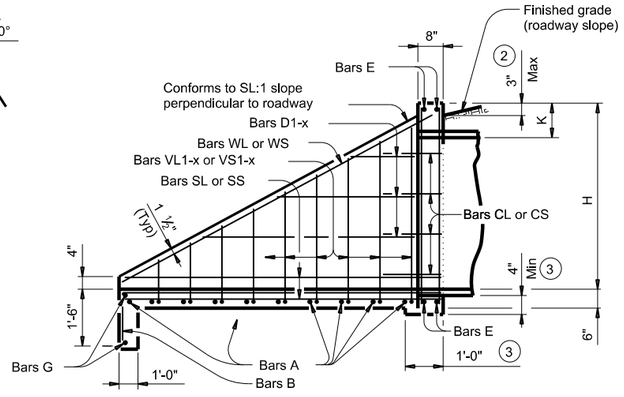
(Showing dimensions.)



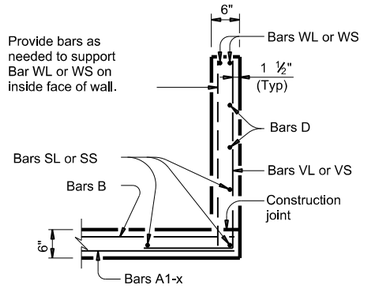
PLAN



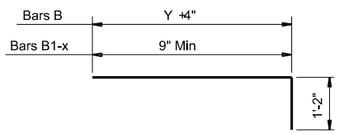
BARS CL
(Length = 2'-5")



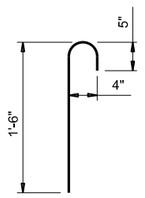
TYPICAL WING ELEVATION



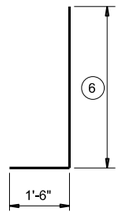
SECTION A-A



BARS B and B1-x



BARS CS
(Length = 2'-3")



BARS VL and VS

TABLE OF REINFORCING STEEL (5)

Bar	Size	Spa	No.
A	#4	1' - 0"	~
B	#3	1' - 6"	~
CL & CS	#4	1' - 0"	~
D	#3	1' - 0"	~
E	#5	~	4
F	#5	~	~
G	#3	~	2
SL & SS	#4	~	6
VL & VS	#4	1' - 0"	~
WL & WS	#5	~	4

TABLE OF CONSTANT DIMENSIONS

Dia of Pipe (D)	G	K (4)	H
24"	1' - 7"	1' - 0"	3' - 0"
27"	1' - 8"	1' - 0"	3' - 3"
30"	1' - 10"	1' - 0"	3' - 6"
33"	1' - 11"	1' - 0"	3' - 9"
36"	2' - 1"	1' - 0"	4' - 0"
42"	2' - 4"	1' - 0"	4' - 6"
48"	2' - 7"	1' - 3"	5' - 3"
54"	3' - 0"	1' - 3"	5' - 9"
60"	3' - 3"	1' - 3"	6' - 3"
66"	3' - 3"	1' - 3"	6' - 9"
72"	3' - 4"	1' - 3"	7' - 3"

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.

Provide galvanized reinforcing steel, if required elsewhere in the plans.

Adjust reinforcing bars, as neccessary, to provide a minimum clear cover of 1 ½".

Provide Class C concrete ($f'c$= 3,600 psi).

Provide pipe runners 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.

Provide ASTM A36 steel plates.

Galvanize all steel components, except reinforcing unless required elsewhere in the plans, after lubrication. Repair galvanizing damaged during transport or construction in accordance with the specifications.

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. Anchorage rods must be 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.

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.

The safety 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.

All bolts, nuts, washers, brackets, angles and pipe runners are considered parts of the safety end treatment for payment.

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

DATE:
FILE:

SHEET 1 OF 3

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT WITH FLARED WINGS

FOR 15° SKEW PIPE CULVERTS
TYPE I ~ CROSS DRAINAGE

SETP-FW-15

FILE:	stpf15se-20.dgn	DN: GAF	CK: CAT	DW: BWH	CK: GAF
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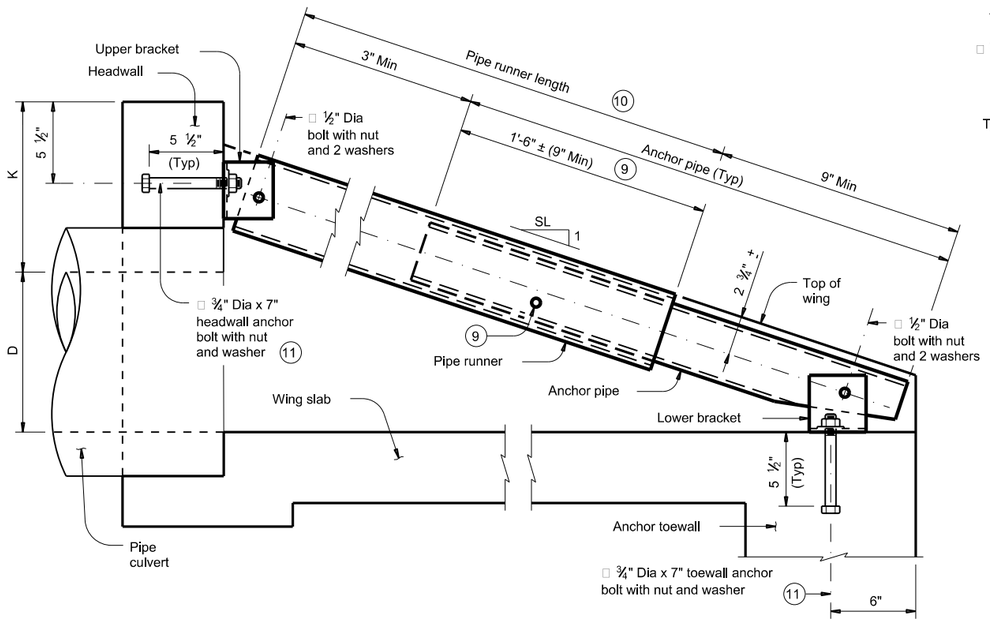
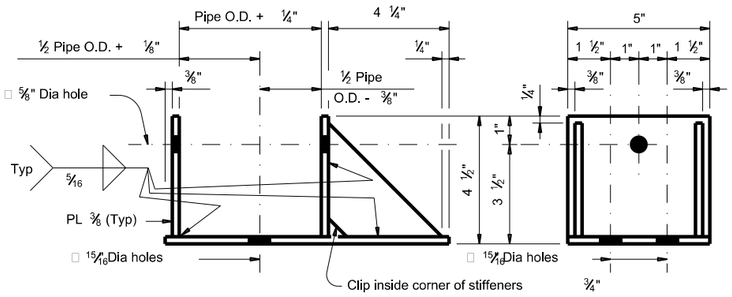


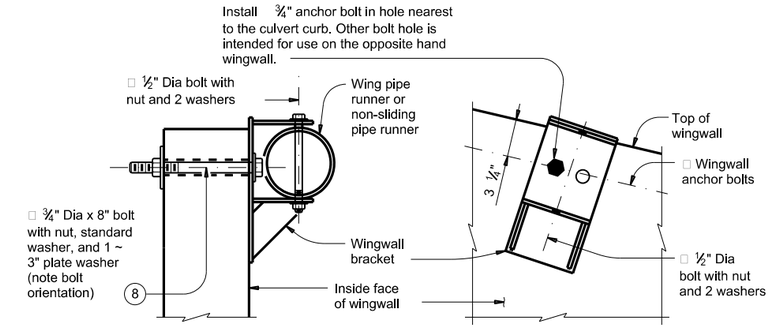
SECTION B-B

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



ELEVATION

SIDE VIEW



SECTION C-C

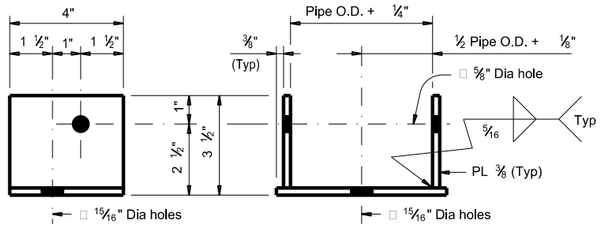
(Showing installed bracket.)

ELEVATION

(Showing installed bracket normal to wall. Pipe not shown for clarity.)

NOTE: Match the wingwall bracket to the upper bracket size.

WINGWALL BRACKET DETAILS

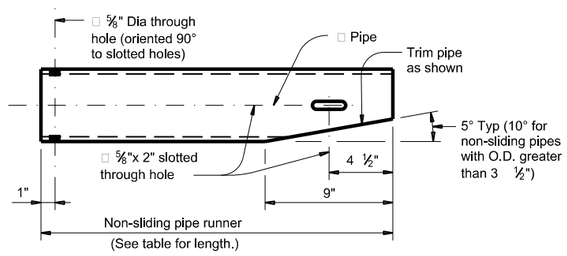


SIDE VIEW

ELEVATION

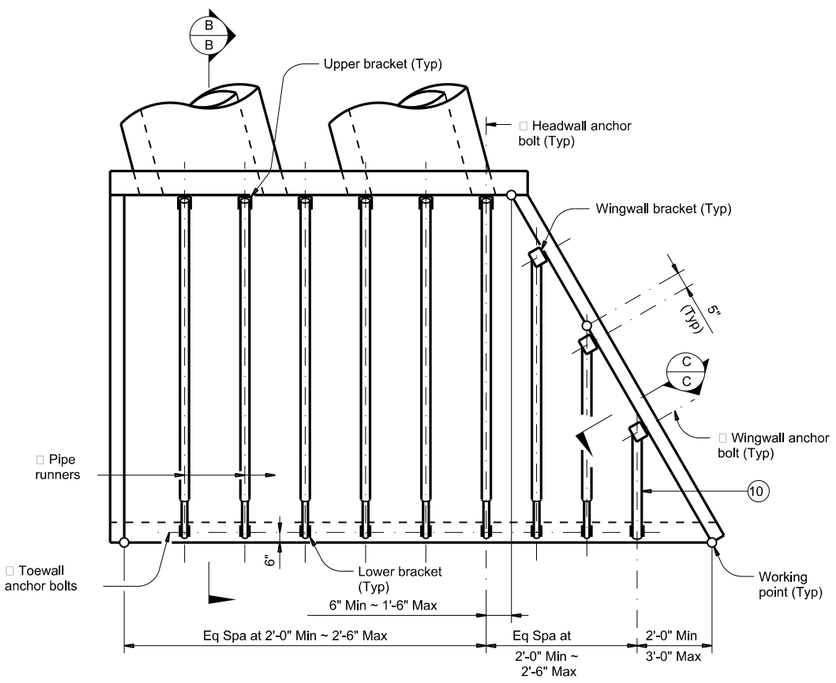
NOTE: Match upper and lower brackets, except for the brackets used with non-sliding pipe runners, with the required pipe diameters as shown in the table.

UPPER AND LOWER BRACKET DETAILS



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

NON-SLIDING PIPE RUNNER DETAILS (10)



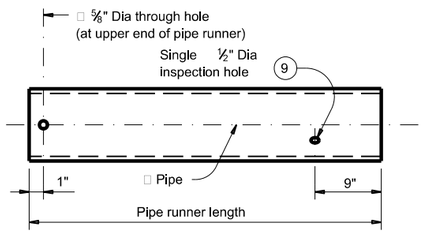
PIPE RUNNER PLAN

8 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.

9 After installation of the pipe runner, use the ½" inspection hole to ensure that the lap of the anchor pipe with the pipe runner is adequate.

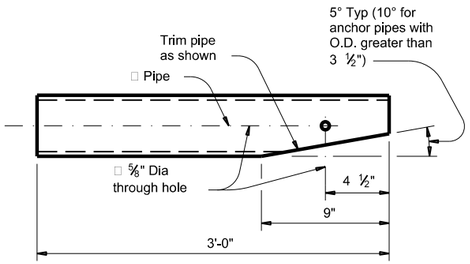
10 Non-sliding pipe runners are used for those installations that would require pipe runner lengths of 1'-9" or less. The non-sliding pipe runner, when required, replaces the outermost pipe runner and anchor pipe. See table on Sheet 3 of 3 to determine if the non-sliding pipe runner is required.

11 At Contractor's option, an adhesive anchor may be used. Provide adhesive anchors that are ¾" Dia ASTM A307 Grade A fully threaded rods. Embed threaded rods into curb, wingwalls, and/or toewall using a Type III, Class C, D, E, or F anchor adhesive. Minimum embedment depth is 5 b". Anchor adhesive chosen must be 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.



Note: Use pipe diameter required for headwall pipe runner for wingwall pipe runner.

PIPE RUNNER DETAILS



ANCHOR PIPE DETAILS

SHEET 2 OF 3

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT WITH FLARED WINGS

FOR 15° SKEW PIPE CULVERTS
TYPE I ~ CROSS DRAINAGE

SETP-FW-15

FILE:	stpf15se-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: GAF
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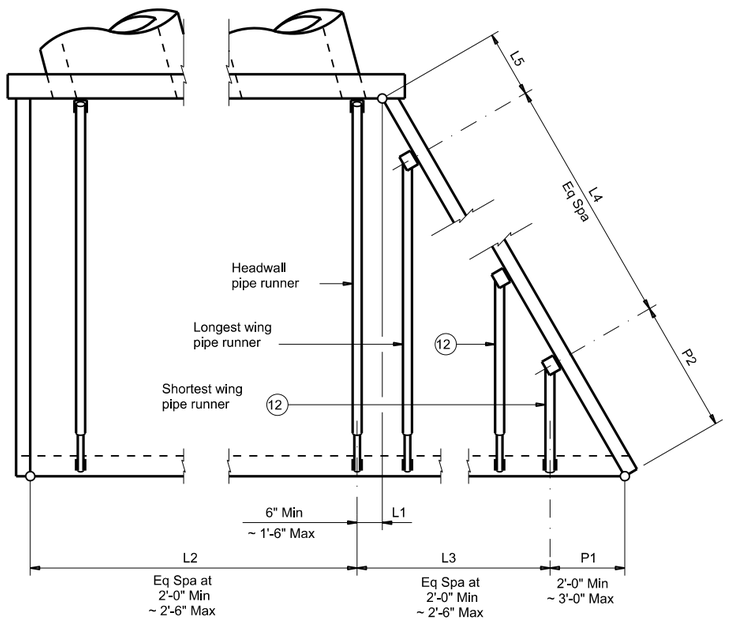
Pipe Culvert Dia	No. of Pipe Culverts	No. of L2 Spaces	L2 Overall Dimension	No. of Headwall Pipes
24"	1	1	2' - 5 ¾"	1
	2	3	6' - 2 ¼"	3
	3	4	9' - 10 ¾"	4
	4	6	13' - 7 ¼"	6
	5	7	17' - 3 ¾"	7
	6	9	21' - 0 ¼"	9
27"	1	1	2' - 6 ½"	1
	2	3	6' - 7 ¼"	3
	3	5	10' - 8"	5
	4	6	14' - 8 ¾"	6
	5	8	18' - 9 ½"	8
	6	10	22' - 10 ¼"	10
30"	1	1	2' - 4"	1
	2	3	6' - 9 ¾"	3
	3	5	11' - 3 ½"	5
	4	7	15' - 9 ¼"	7
	5	9	20' - 3"	9
	6	10	24' - 8 ¾"	10
33"	1	1	2' - 4 ¾"	1
	2	3	7' - 2 ¾"	3
	3	5	12' - 0 ¾"	5
	4	7	16' - 10 ¾"	7
	5	9	21' - 8 ¾"	9
	6	11	26' - 6 ¾"	11
36"	1	2	3' - 8 ¼"	2
	2	4	8' - 11 ½"	4
	3	6	14' - 2 ¾"	6
	4	8	19' - 6"	8
	5	10	24' - 9 ¼"	10
	6	12	30' - 0 ½"	12
42"	1	2	4' - 3 ½"	2
	2	5	10' - 4"	5
	3	7	16' - 4 ½"	7
	4	10	22' - 5"	10
	5	12	28' - 5 ½"	12
	6	14	34' - 6"	14
48"	1	2	4' - 10 ¾"	2
	2	5	11' - 8 ½"	5
	3	8	18' - 6 ¼"	8
	4	11	25' - 4"	11
	5	13	32' - 1 ¾"	13
	6	16	38' - 11 ½"	16
54"	1	2	5' - 0"	2
	2	6	12' - 9 ¼"	6
	3	9	20' - 6 ½"	9
	4	12	28' - 3 ¾"	12
	5	15	36' - 1"	15
	6	18	43' - 10 ¼"	18
60"	1	3	6' - 1 ¼"	3
	2	6	14' - 7 ¾"	6
	3	10	23' - 2 ¼"	10
	4	13	31' - 8 ¾"	13
	5	17	40' - 3 ¼"	17
	6	20	48' - 9 ¾"	20
66"	1	3	6' - 8 ½"	3
	2	7	15' - 9 ¼"	7
	3	10	24' - 10"	10
	4	14	33' - 10 ¾"	14
	5	18	42' - 11 ½"	18
	6	21	52' - 0 ¼"	21
72"	1	3	7' - 3 ¾"	3
	2	7	16' - 11 ¾"	7
	3	11	26' - 7 ¾"	11
	4	15	36' - 3 ¾"	15
	5	19	45' - 11 ¾"	19
	6	23	55' - 7 ¾"	23

Pipe Culvert Dia	L1	P1	No. of Spaces in L3	L3 Overall Dimension	P2	No. of Spaces in L4	L4 Overall Dimension	Headwall Pipe Runner Length	No. of Wing Pipes (13)	Longest Wingwall Pipe Runner Length	Shortest Wingwall Pipe Runner Length	Non-Sliding Pipe Length	Pipe Runner Size (14)	Total Length of Wingwall Pipe Runners (13)
24"	0' - 6"	2' - 3"	1	2' - 5 ¼"	4' - 1"	0	N/A	5' - 11 ½"	1	2' - 0 ½"	N/A	N/A	3" STD	2' - 0 ½"
27"	0' - 9"	3' - 0"	1	2' - 4 ½"	5' - 7"	0	N/A	6' - 9"	1	3' - 5"	N/A	N/A	3" STD	3' - 5"
30"	1' - 3"	2' - 0"	2	4' - 3 ½"	3' - 7"	1	4' - 3 ½"	7' - 6 ½"	2	5' - 6 ¼"	N/A	3' - 1"	3" STD	8' - 7 ¼"
33"	1' - 6"	2' - 0"	2	4' - 11 ¾"	3' - 7"	1	4' - 11 ¾"	8' - 4"	2	6' - 1 ¾"	N/A	3' - 1"	3" STD	9' - 2 ¾"
36"	0' - 6"	2' - 0"	2	4' - 5"	3' - 7"	1	4' - 5"	9' - 1 ½"	2	5' - 7 ½"	N/A	3' - 1"	3" STD	8' - 8 ½"
42"	0' - 6"	2' - 6"	2	4' - 9 ½"	4' - 7"	1	4' - 9 ½"	10' - 8 ¼"	2	6' - 10 ½"	2' - 6"	N/A	4" STD	9' - 4 ½"
48"	0' - 6"	2' - 0"	3	6' - 7"	3' - 7"	2	8' - 9 ¼"	13' - 0 ¾"	3	9' - 7 ¼"	5' - 7 ¼"	3' - 1"	4" STD	18' - 3 ½"
54"	1' - 0"	2' - 6"	3	7' - 5 ½"	4' - 7"	2	9' - 11 ¼"	14' - 7 ¾"	3	11' - 6 ¾"	2' - 6"	N/A	4" STD	21' - 1 ¼"
60"	0' - 6"	3' - 0"	3	7' - 3 ¾"	5' - 7"	2	9' - 9"	16' - 2 ¾"	3	12' - 3 ¾"	3' - 5"	N/A	4" STD	23' - 7 ¼"
66"	0' - 6"	2' - 0"	4	9' - 2 ¼"	3' - 7"	3	13' - 9 ¼"	17' - 9 ¾"	4	14' - 2"	5' - 9 ¼"	3' - 1"	4" STD	33' - 0"
72"	0' - 6"	2' - 3"	4	9' - 9 ½"	4' - 1"	3	14' - 8 ¼"	19' - 4 ¾"	4	15' - 5 ½"	2' - 0 ½"	N/A	5" STD	35' - 0"
24"	0' - 6"	2' - 0"	2	4' - 1"	3' - 7"	1	4' - 1"	8' - 3 ¼"	2	5' - 1 ¾"	N/A	3' - 0"	3" STD	8' - 1 ¾"
27"	0' - 9"	2' - 0"	2	4' - 11"	3' - 7"	1	4' - 11"	9' - 3 ¾"	2	5' - 10 ¾"	N/A	3' - 0"	4" STD	8' - 10 ¾"
30"	1' - 3"	3' - 0"	2	4' - 11 ¾"	5' - 7"	1	4' - 11 ¾"	10' - 4"	2	7' - 9"	3' - 3 ½"	N/A	4" STD	11' - 0 ½"
33"	1' - 6"	2' - 0"	3	6' - 9 ¾"	3' - 7"	2	8' - 6 ¼"	11' - 4 ½"	3	9' - 7 ½"	5' - 6 ¾"	3' - 0"	4" STD	18' - 2 ¼"
36"	0' - 6"	2' - 0"	3	6' - 4 ¾"	3' - 7"	2	9' - 8 ¾"	12' - 4 ¾"	3	9' - 1 ¼"	5' - 3 ¾"	3' - 0"	4" STD	17' - 5"
42"	0' - 6"	2' - 3"	3	7' - 3 ½"	4' - 1"	2	9' - 8 ¾"	14' - 5 ½"	3	10' - 7 ½"	1' - 11 ½"	N/A	4" STD	18' - 10 ½"
48"	0' - 6"	2' - 0"	4	9' - 3 ¼"	3' - 7"	3	13' - 11"	17' - 6 ¾"	4	13' - 11"	5' - 7 ¾"	3' - 0"	4" STD	32' - 4 ¼"
54"	1' - 0"	3' - 0"	4	9' - 11 ¼"	5' - 7"	3	14' - 10 ¾"	19' - 7 ½"	4	16' - 7"	3' - 3 ½"	N/A	5" STD	39' - 9"
60"	0' - 6"	2' - 0"	5	11' - 7"	3' - 7"	4	18' - 6 ½"	21' - 8 ¼"	5	18' - 0 ¾"	5' - 7 ¾"	3' - 0"	5" STD	50' - 5"
66"	0' - 6"	2' - 3"	5	12' - 6"	4' - 1"	4	19' - 11 ¾"	23' - 9"	5	19' - 9 ½"	1' - 11 ½"	N/A	5" STD	54' - 4 ½"
72"	0' - 6"	2' - 0"	6	13' - 10 ¾"	3' - 7"	5	23' - 2"	25' - 9 ¾"	6	22' - 2 ¼"	5' - 7 ¾"	3' - 0"	5" STD	72' - 7"
24"	0' - 6"	2' - 0"	3	6' - 10 ½"	3' - 7"	2	9' - 2"	13' - 0 ½"	3	9' - 6"	5' - 5 ¾"	2' - 11 ½"	4" STD	17' - 11 ¼"
27"	0' - 9"	2' - 6"	3	7' - 5 ¾"	4' - 7"	2	9' - 11 ¾"	14' - 6 ½"	3	11' - 1"	2' - 4"	N/A	4" STD	20' - 1 ½"
30"	1' - 3"	2' - 0"	4	9' - 4 ¼"	3' - 7"	3	14' - 0 ¼"	16' - 0 ¾"	4	13' - 9 ¼"	5' - 6 ¾"	2' - 11 ½"	4" STD	31' - 11 ½"
33"	1' - 6"	2' - 6"	4	9' - 11 ¾"	4' - 7"	3	14' - 11 ½"	17' - 7"	4	15' - 5 ½"	2' - 4"	N/A	4" STD	35' - 7"
36"	0' - 6"	2' - 6"	4	9' - 10"	4' - 7"	3	14' - 9"	19' - 1 ¼"	4	15' - 3 ¼"	2' - 4"	N/A	5" STD	35' - 2 ½"
42"	0' - 6"	2' - 0"	5	12' - 0 ¾"	3' - 7"	4	19' - 3 ¾"	22' - 1 ¾"	5	18' - 4 ¾"	5' - 8 ¼"	2' - 11 ½"	5" STD	51' - 1 ½"
48"	0' - 6"	2' - 0"	6	14' - 8"	3' - 7"	5	24' - 5 ¼"	26' - 8 ½"	6	22' - 11"	5' - 9"	2' - 11 ½"	5" STD	74' - 7 ½"
54"	1' - 0"	2' - 0"	7	16' - 10 ¾"	3' - 7"	6	28' - 11 ½"	29' - 9"	7	26' - 10 ½"	5' - 8 ¼"	2' - 11 ½"	5" STD	100' - 7 ¾"
60"	0' - 6"	2' - 9"	7	17' - 4 ½"	5' - 1"	6	29' - 9 ½"	32' - 9 ½"	7	28' - 11"	2' - 9 ¼"	N/A	5" STD	110' - 11"



PIPE RUNNER LAYOUT

(Left forward culvert skew shown, actual culvert skew may be opposite hand.)

(12) If the outermost wing pipe runner is a non-sliding pipe runner, consider the next outermost wing pipe runner the shortest.

(13) Quantities shown include, if present, the non-sliding pipes.

(14) The anchor pipe size is the next smaller size than the pipe runner size.

SPECIAL NOTE:

Note that the tabular quantities are given for estimating purposes only. It is likely that these quantities will change due to field conditions. Therefore, verify all dimensions in the field prior to fabrication of the safety end treatment components.

STANDARD PIPE RUNNER AND ANCHOR PIPE SIZES (14)

Pipe Size	Pipe O.D.	Pipe I.D.
2" STD	2.375"	2.067"
3" STD	3.500"	3.068"
4" STD	4.500"	4.026"
5" STD	5.563"	5.047"

TOTAL PIPE LENGTHS FORMULAS:

Total Length of All Pipe Runners = Total Length of Wingwall Pipe Runners + (No. of Headwall Pipe Runners) (Headwall Pipe Runner Length)

Total Length of All Anchor Pipes = (3.000') (No. of Wing Pipe Runners + No. of Headwall Pipe Runners - No. of Non-Sliding Pipe Runners)

SHEET 3 OF 3

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT WITH FLARED WINGS

FOR 15° SKEW PIPE CULVERTS
TYPE I ~ CROSS DRAINAGE

SETP-FW-15

FILE: stpf15se-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS				
	DIST	COUNTY		SHEET NO.

TABLE OF VARIABLE DIMENSIONS AND QUANTITIES FOR ONE HEADWALL (5)

Slope	Dia of Pipe (D)	Values for One Pipe W	X	Y	L	Reinf (Lbs)	Conc (CY) (1)	Values to be Added for Each Addt'l Pipe X and W	Reinf (Lbs)	Conc (CY) (1)
3:1	24"	10' - 7 ½"	4' - 7"	7' - 3"	10' - 3"	231	2.3	4' - 1 ¾"	65	0.9
	27"	11' - 8 ½"	4' - 11"	8' - 0"	11' - 3 ¾"	259	2.7	4' - 6 ¼"	75	1.0
	30"	12' - 9 ½"	5' - 3"	8' - 9"	12' - 4 ½"	302	3.1	5' - 0"	86	1.2
	33"	13' - 10 ¾"	5' - 7"	9' - 6"	13' - 5 ¼"	328	3.5	5' - 4 ¾"	94	1.4
	36"	14' - 11 ¾"	5' - 11 ¼"	10' - 3"	14' - 6"	361	4.0	5' - 10 ½"	108	1.6
	42"	17' - 1 ¾"	6' - 7 ¼"	11' - 9"	16' - 7 ½"	447	5.0	6' - 8 ¾"	133	2.1
	48"	20' - 0 ¾"	7' - 3 ¼"	14' - 0"	19' - 9 ½"	550	6.6	7' - 7 ¼"	176	2.8
	54"	22' - 3"	7' - 11 ½"	15' - 6"	21' - 11"	636	7.9	8' - 8"	211	3.5
	60"	24' - 5"	8' - 7 ½"	17' - 0"	24' - 0 ½"	735	9.4	9' - 6 ¼"	246	4.1
	66"	26' - 7"	9' - 3 ½"	18' - 6"	26' - 2"	833	10.9	10' - 1 ¼"	274	4.6
	72"	28' - 9 ¼"	9' - 11 ¾"	20' - 0"	28' - 3 ½"	942	12.5	10' - 9 ¼"	309	5.3
4:1	24"	13' - 0 ½"	4' - 7"	9' - 8"	13' - 8"	305	3.1	4' - 1 ¾"	75	1.1
	27"	14' - 4 ½"	4' - 11"	10' - 8"	15' - 1"	343	3.7	4' - 6 ¼"	87	1.3
	30"	15' - 8 ½"	5' - 3"	11' - 8"	16' - 6"	398	4.2	5' - 0"	99	1.5
	33"	17' - 0 ¾"	5' - 7"	12' - 8"	17' - 11"	438	4.9	5' - 4 ¾"	112	1.7
	36"	18' - 4 ¾"	5' - 11 ¼"	13' - 8"	19' - 4"	485	5.5	5' - 10 ½"	128	2.0
	42"	21' - 0 ¾"	6' - 7 ¼"	15' - 8"	22' - 1 ¾"	593	7.0	6' - 8 ¾"	158	2.6
	48"	24' - 8 ¾"	7' - 3 ¼"	18' - 8"	26' - 4 ¾"	746	9.4	7' - 7 ¼"	211	3.4
	54"	27' - 5"	7' - 11 ½"	20' - 8"	29' - 2 ¾"	881	11.3	8' - 8"	257	4.3
	60"	30' - 1"	8' - 7 ½"	22' - 8"	32' - 0 ¾"	1,009	13.3	9' - 6 ¼"	297	5.1
	66"	32' - 9"	9' - 3 ½"	24' - 8"	34' - 10 ½"	1,151	15.6	10' - 1 ¼"	340	5.8
	72"	35' - 5 ¼"	9' - 11 ¾"	26' - 8"	37' - 8 ½"	1,302	18.0	10' - 9 ¼"	378	6.6
6:1	24"	17' - 10 ½"	4' - 7"	14' - 6"	20' - 6"	454	5.1	4' - 1 ¾"	91	1.5
	27"	19' - 8 ½"	4' - 11"	16' - 0"	22' - 7 ½"	523	6.0	4' - 6 ¼"	108	1.7
	30"	21' - 6 ½"	5' - 3"	17' - 6"	24' - 9"	599	7.1	5' - 0"	124	2.0
	33"	23' - 4 ¾"	5' - 7"	19' - 0"	26' - 10 ½"	680	8.2	5' - 4 ¾"	143	2.4
	36"	25' - 2 ¾"	5' - 11 ¼"	20' - 6"	29' - 0"	743	9.3	5' - 10 ½"	162	2.8
	42"	28' - 10 ¾"	6' - 7 ¼"	23' - 6"	33' - 2 ¾"	926	11.9	6' - 8 ¾"	202	3.6
	48"	34' - 0 ¾"	7' - 3 ¼"	28' - 0"	39' - 7 ¼"	1,197	16.2	7' - 7 ¼"	274	4.7

(1) Quantities shown are for concrete pipe and will increase slightly for metal pipe installation.

(2) 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.

(3) Provide a 1'-0" footing as shown where required to maintain 4" minimum cover for pipes.

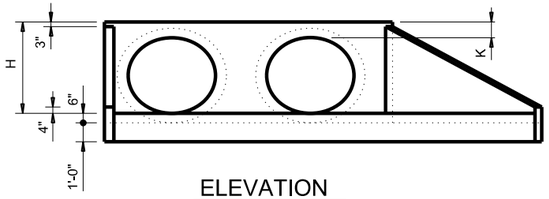
(4) Dimensions shown are usual and maximum.

(5) Quantities shown are for one structure end. (One headwall)

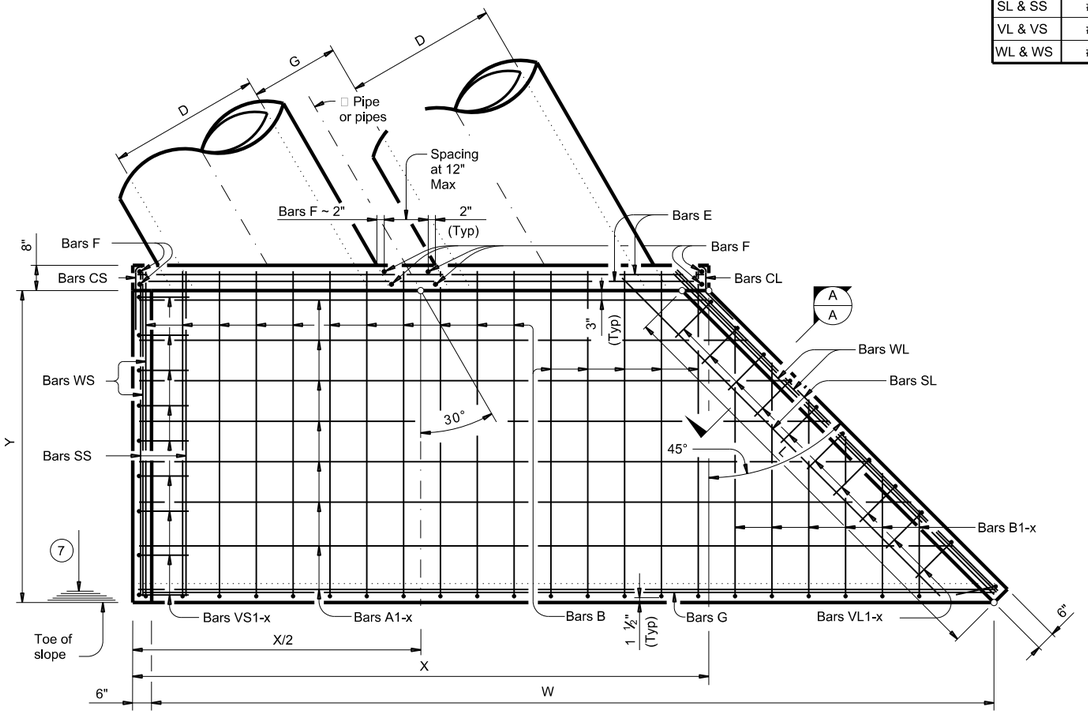
(6) Min Length = 6" + 3" x $\left(\frac{12 \times H - 7}{12 \times L}\right)$

Max Length = 12 x H - 3" x $\left(\frac{12 \times H - 7}{12 \times L}\right)$

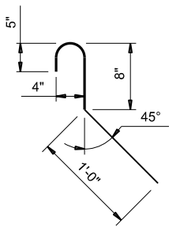
(7) Lengths of wings based on SL:1 slope along this line.



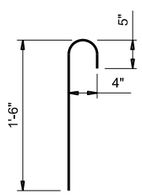
ELEVATION
(Showing dimensions.)



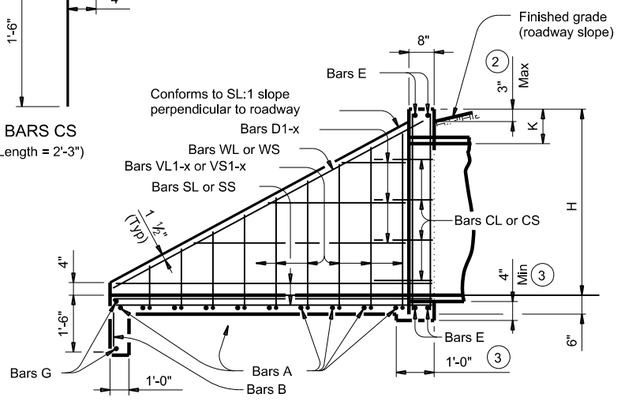
PLAN



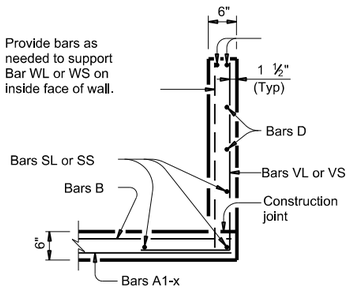
BARS CL
(Length = 2'-5")



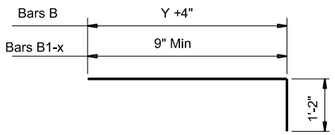
BARS CS
(Length = 2'-3")



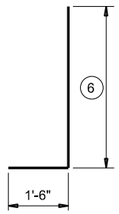
TYPICAL WING ELEVATION



SECTION A-A



BARS B and B1-x



BARS VL and VS

TABLE OF REINFORCING STEEL (5)

Bar	Size	Spa	No.
A	#4	1' - 0"	~
B	#3	1' - 6"	~
CL & CS	#4	1' - 0"	~
D	#3	1' - 0"	~
E	#5	~	4
F	#5	~	~
G	#3	~	2
SL & SS	#4	~	6
VL & VS	#4	1' - 0"	~
WL & WS	#5	~	4

TABLE OF CONSTANT DIMENSIONS

Dia of Pipe (D)	G	K (4)	H
24"	1' - 7"	1' - 0"	3' - 0"
27"	1' - 8"	1' - 0"	3' - 3"
30"	1' - 10"	1' - 0"	3' - 6"
33"	1' - 11"	1' - 0"	3' - 9"
36"	2' - 1"	1' - 0"	4' - 0"
42"	2' - 4"	1' - 0"	4' - 6"
48"	2' - 7"	1' - 3"	5' - 3"
54"	3' - 0"	1' - 3"	5' - 9"
60"	3' - 3"	1' - 3"	6' - 3"
66"	3' - 3"	1' - 3"	6' - 9"
72"	3' - 4"	1' - 3"	7' - 3"

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.

Provide galvanized reinforcing steel, if required elsewhere in the plans.

Adjust reinforcing bars, as neccessary, to provide a minimum clear cover of 1 ½".

Provide Class C concrete ($f'c$= 3,600 psi).

Provide pipe runners 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.

Provide ASTM A36 steel plates.

Galvanize all steel components, except reinforcing unless required elsewhere in the plans, after lubrication. Repair galvanizing damaged during transport or construction in accordance with the specifications.

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. Anchorage rods must be 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.

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.

The safety 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.

All bolts, nuts, washers, brackets, angles and pipe runners are considered parts of the safety end treatment for payment.

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

SHEET 1 OF 3

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT WITH FLARED WINGS

FOR 30° SKEW PIPE CULVERTS
TYPE I ~ CROSS DRAINAGE

SETP-FW-30

FILE:	stpf30se-20.dgn	DN: GAF	CK: CAT	DW: BWH	CK: GAF
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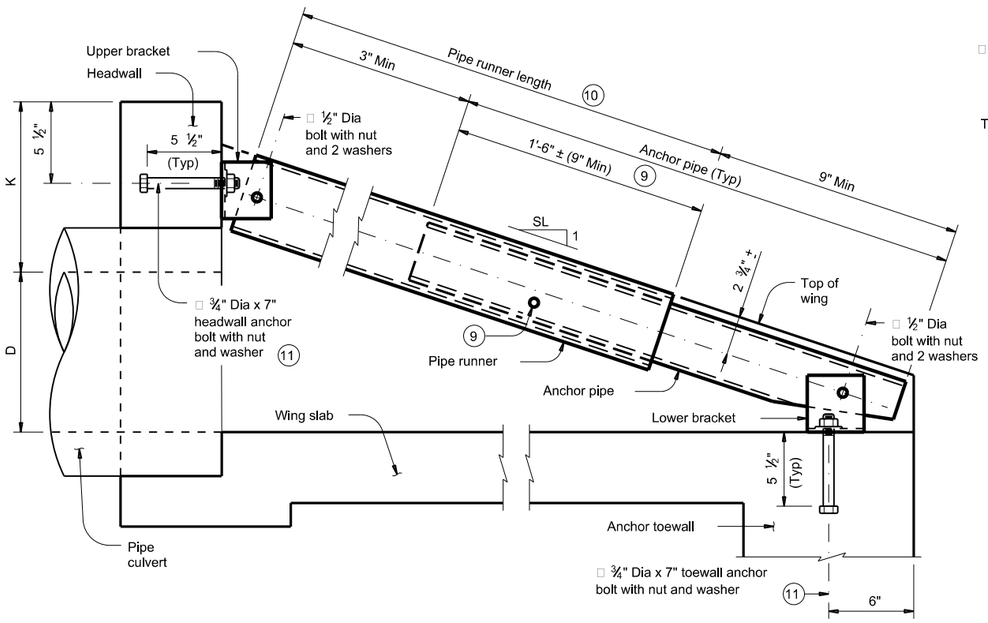
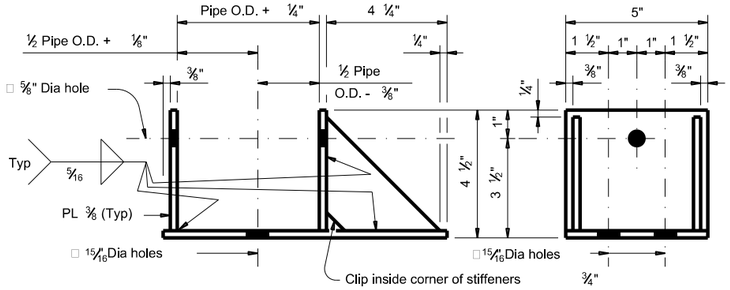
REVISIONS		DIST	COUNTY		SHEET NO.

DATE:
FILE:



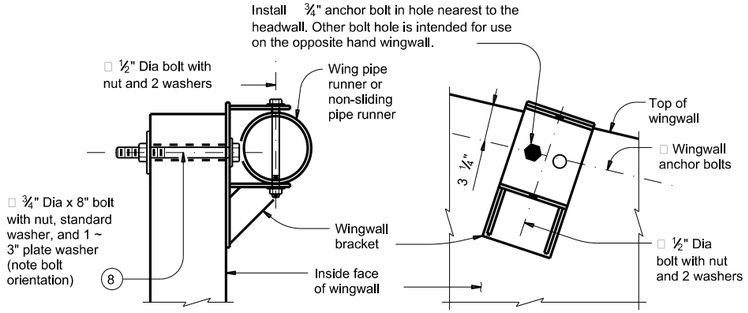
SECTION B-B

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



ELEVATION

SIDE VIEW



SECTION C-C

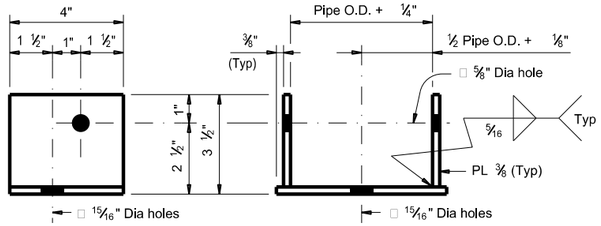
(Showing installed bracket.)

ELEVATION

(Showing installed bracket normal to wall. Pipe not shown for clarity.)

NOTE: Match the wingwall bracket to the upper bracket size.

WINGWALL BRACKET DETAILS

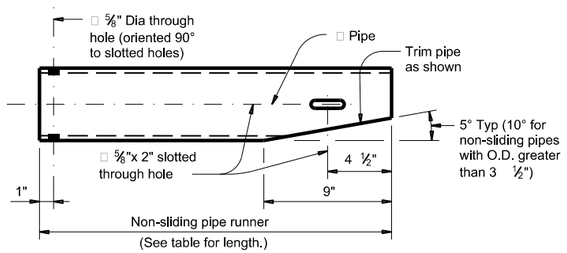


SIDE VIEW

ELEVATION

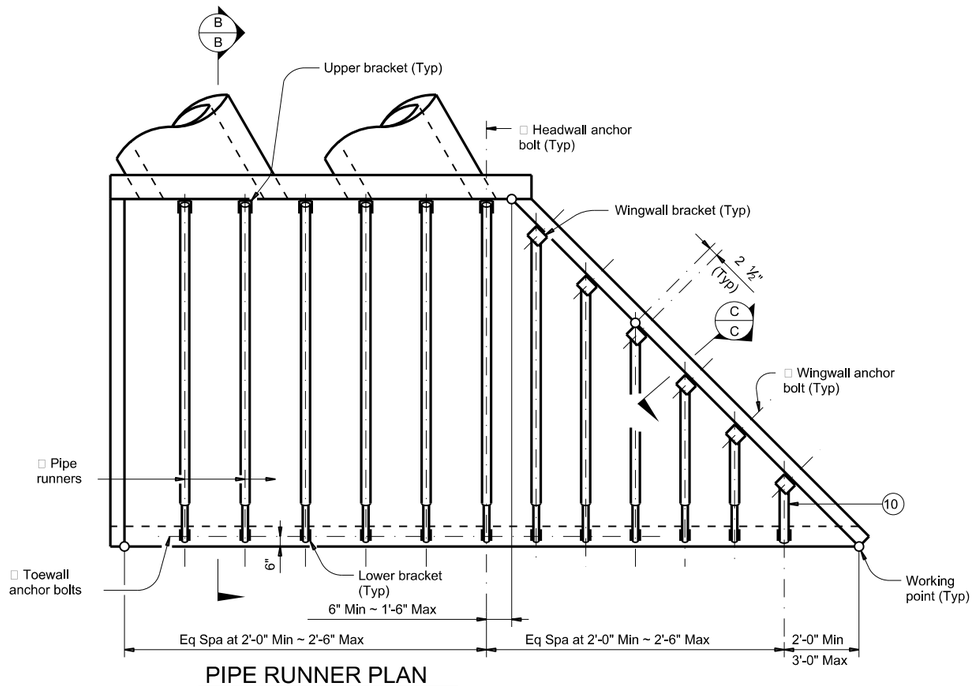
NOTE: Match upper and lower brackets, except for the brackets used with non-sliding pipe runners, with the required pipe diameters as shown in the table.

UPPER AND LOWER BRACKET DETAILS



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

NON-SLIDING PIPE RUNNER DETAILS 10



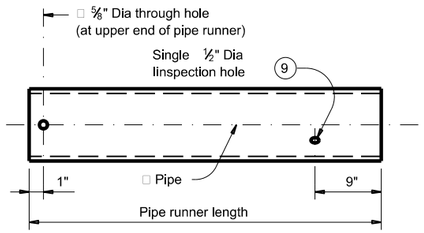
PIPE RUNNER PLAN

8 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.

9 After installation of the pipe runner, use the ½" inspection hole to ensure that the lap of the anchor pipe with the pipe runner is adequate.

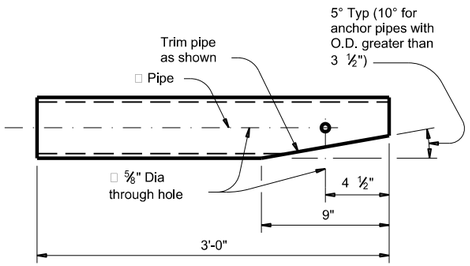
10 Non-sliding pipe runners are used for those installations that would require pipe runner lengths of 1'-9" or less. The non-sliding pipe runner, when required, replaces the outermost pipe runner and anchor pipe. See table on Sheet 3 of 3 to determine if the non-sliding pipe runner is required.

11 At Contractor's option, an adhesive anchor may be used. Provide adhesive anchors that are 5" Dia ASTM A307 Grade A fully threaded rods. Embed threaded rods into curb, wingwalls, and/or toewall using a Type III, Class C, D, E, or F anchor adhesive. Minimum embedment depth is 5 b". Anchor adhesive chosen must be 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.



Note: Use pipe diameter required for headwall pipe runner for wingwall pipe runner.

PIPE RUNNER DETAILS



ANCHOR PIPE DETAILS

SHEET 2 OF 3

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT WITH FLARED WINGS

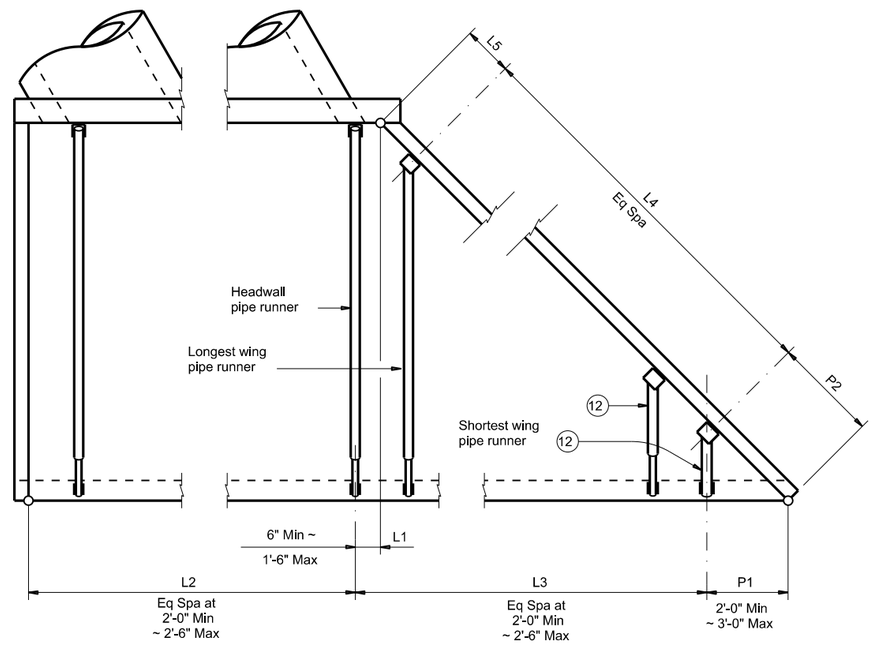
FOR 30° SKEW PIPE CULVERTS
TYPE I ~ CROSS DRAINAGE

SETP-FW-30

FILE:	stpf30se-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: GAF
©TxDOT	February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS					
		DIST	COUNTY		SHEET NO.

Pipe Culvert Dia	No. of Pipe Culverts	No. of L2 Spaces	L2 Overall Dimension	No. of Headwall Pipes
24"	1	1	2' - 4 ½"	1
	2	3	6' - 6 ¼"	3
	3	5	10' - 8"	5
	4	6	14' - 9 ¾"	6
	5	8	18' - 11 ½"	8
	6	10	23' - 1 ¼"	10
27"	1	1	2' - 5 ½"	1
	2	3	6' - 11 ¾"	3
	3	5	11' - 6"	5
	4	7	16' - 0 ¼"	7
	5	9	20' - 6 ½"	9
	6	10	25' - 0 ¾"	10
30"	1	1	2' - 6 ½"	1
	2	3	7' - 6 ½"	3
	3	5	12' - 6 ½"	5
	4	7	17' - 6 ½"	7
	5	9	22' - 6 ½"	9
	6	11	27' - 6 ½"	11
33"	1	2	3' - 10 ½"	2
	2	4	9' - 3 ¼"	4
	3	6	14' - 8"	6
	4	9	20' - 0 ¾"	9
	5	11	25' - 5 ½"	11
	6	13	30' - 10 ¼"	13
36"	1	2	3' - 11 ¾"	2
	2	4	9' - 10 ¼"	4
	3	7	15' - 8 ¾"	7
	4	9	21' - 7 ¼"	9
	5	11	27' - 5 ¾"	11
	6	14	33' - 4 ¼"	14
42"	1	2	4' - 10 ¾"	2
	2	5	11' - 7 ½"	5
	3	8	18' - 4 ¼"	8
	4	11	25' - 1"	11
	5	13	31' - 9 ¾"	13
	6	16	38' - 6 ½"	16
48"	1	2	4' - 9 ¾"	2
	2	5	12' - 5"	5
	3	8	20' - 0 ¼"	8
	4	12	27' - 7 ½"	12
	5	15	35' - 2 ¾"	15
	6	18	42' - 10"	18
54"	1	3	6' - 3"	3
	2	6	14' - 11"	6
	3	10	23' - 7"	10
	4	13	32' - 3"	13
	5	17	40' - 11"	17
	6	20	49' - 7"	20
60"	1	3	6' - 11"	3
	2	7	16' - 5 ¼"	7
	3	11	25' - 11 ½"	11
	4	15	35' - 5 ¾"	15
	5	19	45' - 0"	19
	6	22	54' - 6 ¼"	22
66"	1	3	7' - 4"	3
	2	7	17' - 5 ¼"	7
	3	11	27' - 6 ½"	11
	4	16	37' - 7 ¾"	16
	5	20	47' - 9"	20
	6	24	57' - 10 ¼"	24
72"	1	3	7' - 3 ¼"	3
	2	8	18' - 0 ½"	8
	3	12	28' - 9 ¾"	12
	4	16	39' - 7"	16
	5	21	50' - 4 ¼"	21
	6	25	61' - 1 ½"	25

Side Slope	Pipe Culvert Dia	L1	P1	No. of Spaces in L3	L3 Overall Dimension	P2	No. of Spaces in L4	L4 Overall Dimension	Headwall Pipe Runner Length	No. of Wing Pipes (13)	Longest Wingwall Pipe Runner Length	Shortest Wingwall Pipe Runner Length	Non-Sliding Pipe Length	Pipe Runner Size (14)	Total Length of Wingwall Pipe Runners (13)
3:1	24"	1' - 0"	2' - 0"	3	6' - 3"	2' - 7 ½"	2	5' - 10 ¾"	5' - 11 ½"	3	4' - 5 ¼"	2' - 3"	1' - 6 ½"	3" STD	8' - 2 ¾"
	27"	1' - 3"	2' - 0"	3	7' - 3"	2' - 7 ½"	2	6' - 10"	6' - 9"	3	5' - 1 ¾"	2' - 7"	1' - 6 ½"	3" STD	9' - 3 ¼"
	30"	1' - 6"	3' - 0"	3	7' - 3"	4' - 0 ½"	2	6' - 10"	7' - 6 ½"	3	6' - 2 ¼"	3' - 7 ¾"	2' - 7 ¼"	3" STD	12' - 5 ¼"
	33"	0' - 6"	2' - 6"	3	7' - 6"	3' - 4"	2	7' - 0 ¾"	8' - 4"	3	5' - 10"	3' - 2 ½"	2' - 0 ¾"	3" STD	11' - 1 ¼"
	36"	0' - 9"	2' - 0"	4	9' - 0"	2' - 7 ½"	3	9' - 6 ½"	9' - 1 ½"	4	7' - 2"	2' - 5"	1' - 6 ½"	4" STD	15' - 11"
	42"	0' - 6"	2' - 3"	4	10' - 0"	2' - 11 ¾"	3	10' - 7 ¼"	10' - 8 ¼"	4	8' - 2 ½"	2' - 11 ¼"	1 - 9 ¾"	4" STD	18' - 6 ½"
	48"	1' - 3"	2' - 9"	5	12' - 6"	3' - 8 ¼"	4	14' - 1 ¾"	13' - 0 ¾"	5	11' - 4 ½"	3' - 5 ¾"	2' - 4"	4" STD	32' - 0 ½"
	54"	0' - 6"	2' - 0"	6	14' - 0"	2' - 7 ½"	5	16' - 6"	14' - 7 ¾"	6	12' - 4"	2' - 6"	1' - 6 ½"	4" STD	38' - 7 ½"
	60"	0' - 6"	2' - 6"	6	15' - 0"	3' - 4"	5	17' - 8"	16' - 2 ¾"	6	13' - 9"	3' - 2 ½"	2' - 0 ¾"	4" STD	44' - 5 ½"
	66"	0' - 9"	2' - 0"	7	17' - 3"	2' - 7 ½"	6	20' - 11"	17' - 9 ¾"	7	15' - 7 ½"	2' - 7 ¾"	1' - 6 ½"	4" STD	56' - 4 ¼"
	72"	1' - 6"	2' - 0"	8	19' - 6"	2' - 7 ½"	7	24' - 1 ½"	19' - 4 ¾"	8	18' - 0 ¼"	2' - 7 ¼"	1 - 6 ½"	5" STD	73' - 8 ¾"
4:1	24"	1' - 0"	2' - 0"	4	8' - 8"	2' - 7 ½"	3	9' - 2 ¼"	8' - 3 ¼"	4	6' - 8 ½"	2' - 2 ¾"	1' - 6"	3" STD	14' - 11"
	27"	1' - 3"	2' - 0"	4	9' - 11"	2' - 7 ½"	3	10' - 6 ¼"	9' - 3 ¾"	4	7' - 8"	2' - 6 ¾"	1' - 6"	4" STD	16' - 10 ¼"
	30"	1' - 6"	2' - 0"	5	11' - 2"	2' - 7 ½"	4	12' - 7 ½"	10' - 4"	5	9' - 2 ½"	2' - 3 ½"	1' - 6"	4" STD	24' - 6"
	33"	0' - 6"	2' - 0"	5	11' - 2"	2' - 7 ½"	4	12' - 7 ½"	11' - 4 ½"	5	9' - 2 ½"	2' - 3 ½"	1' - 6"	4" STD	24' - 6"
	36"	0' - 9"	2' - 0"	5	12' - 5"	2' - 7 ½"	4	14' - 0 ½"	12' - 4 ¾"	5	10' - 3"	2' - 6 ¾"	1' - 6"	4" STD	27' - 1 ½"
	42"	0' - 6"	2' - 0"	6	14' - 2"	2' - 7 ½"	5	16' - 8 ¼"	14' - 5 ½"	6	12' - 2"	2' - 5 ¼"	1 - 6"	4" STD	38' - 0 ¼"
	48"	1' - 3"	2' - 6"	7	17' - 5"	3' - 4"	6	21' - 1 ¼"	17' - 6 ¾"	7	15' - 10 ¾"	3' - 1"	2 - 0 ¼"	4" STD	58' - 11 ½"
	54"	0' - 6"	2' - 0"	8	19' - 2"	2' - 7 ½"	7	23' - 8 ½"	19' - 7 ½"	8	17' - 3 ½"	2' - 5 ¾"	1 - 6"	5" STD	70' - 8 ½"
	60"	0' - 6"	2' - 0"	9	21' - 2"	2' - 7 ½"	8	26' - 7 ¼"	21' - 8 ¼"	9	19' - 4 ¾"	2' - 5"	1' - 6"	5" STD	88' - 9"
	66"	0' - 9"	3' - 0"	9	22' - 5"	4' - 0 ½"	8	28' - 2"	23' - 9"	9	21' - 7"	3' - 7 ¼"	2 - 6 ¼"	5" STD	103' - 3 ¼"
	72"	1' - 6"	2' - 0"	11	26' - 2"	2' - 7 ½"	10	33' - 7 ¾"	25' - 9 ¾"	11	24' - 6 ¼"	2' - 5 ½"	1' - 6"	5" STD	136' - 4 ¾"
6:1	24"	1' - 0"	3' - 0"	5	12' - 6"	4' - 0 ½"	4	14' - 1 ¾"	13' - 0 ¼"	5	11' - 1 ½"	3' - 6 ¼"	2' - 5 ¾"	4" STD	31' - 9 ¼"
	27"	1' - 3"	2' - 3"	6	15' - 0"	2' - 11 ¾"	5	17' - 8"	14' - 6 ½"	6	12' - 10 ¾"	2' - 9"	1' - 8 ½"	4" STD	40' - 10"
	30"	1' - 6"	2' - 0"	7	17' - 0"	2' - 7 ½"	6	20' - 7 ¼"	16' - 0 ¾"	7	14' - 9"	2' - 5 ½"	1' - 5 ½"	4" STD	53' - 0 ¼"
	33"	0' - 6"	2' - 0"	7	17' - 6"	2' - 7 ½"	6	21' - 2 ½"	17' - 7"	7	15' - 2"	2' - 6"	1' - 5 ½"	4" STD	54' - 5 ½"
	36"	0' - 9"	2' - 0"	8	19' - 3"	2' - 7 ½"	7	23' - 9 ¾"	19' - 1 ¼"	8	17' - 0 ½"	2' - 4 ¾"	1 - 5 ½"	5" STD	69' - 6"
	42"	0' - 6"	2' - 0"	9	22' - 0"	2' - 7 ½"	8	27' - 7 ¾"	22' - 1 ¾"	9	19' - 9 ½"	2' - 5 ¼"	1' - 5 ½"	5" STD	90' - 4 ½"
	48"	1' - 3"	2' - 0"	11	27' - 3"	2' - 7 ½"	10	35' - 0 ¼"	26' - 8 ½"	11	25' - 1"	2' - 5 ¾"	1' - 5 ½"	5" STD	139' - 3 ¼"



PIPE RUNNER LAYOUT

Note: Left forward culvert skew shown, actual culvert skew may be opposite hand.

(12) If the outermost wing pipe runner is a non-sliding pipe runner, consider the next outermost wing pipe runner the shortest.

(13) Quantities shown include, if present, the non-sliding pipes.

(14) The anchor pipe size is the next smaller size than the pipe runner size.

SPECIAL NOTE:

Note that the tabular quantities are given for estimating purposes only. It is likely that these quantities will change due to field conditions. Therefore, verify all dimensions in the field prior to fabrication of the safety end treatment components.

STANDARD PIPE RUNNER AND ANCHOR PIPE SIZES (14)

Pipe Size	Pipe O.D.	Pipe I.D.
2" STD	2.375"	2.067"
3" STD	3.500"	3.068"
4" STD	4.500"	4.026"
5" STD	5.563"	5.047"

TOTAL PIPE LENGTHS FORMULAS:

Total Length of All Pipe Runners = Total Length of Wingwall Pipe Runners + (No. of Headwall Pipe Runners) (Headwall Pipe Runner Length)

Total Length of All Anchor Pipes = (3.000') (No. of Wing Pipe Runners + No. of Headwall Pipe Runners - No. of Non-Sliding Pipe Runners)

DATE:
FILE:

SHEET 3 OF 3

Texas Department of Transportation

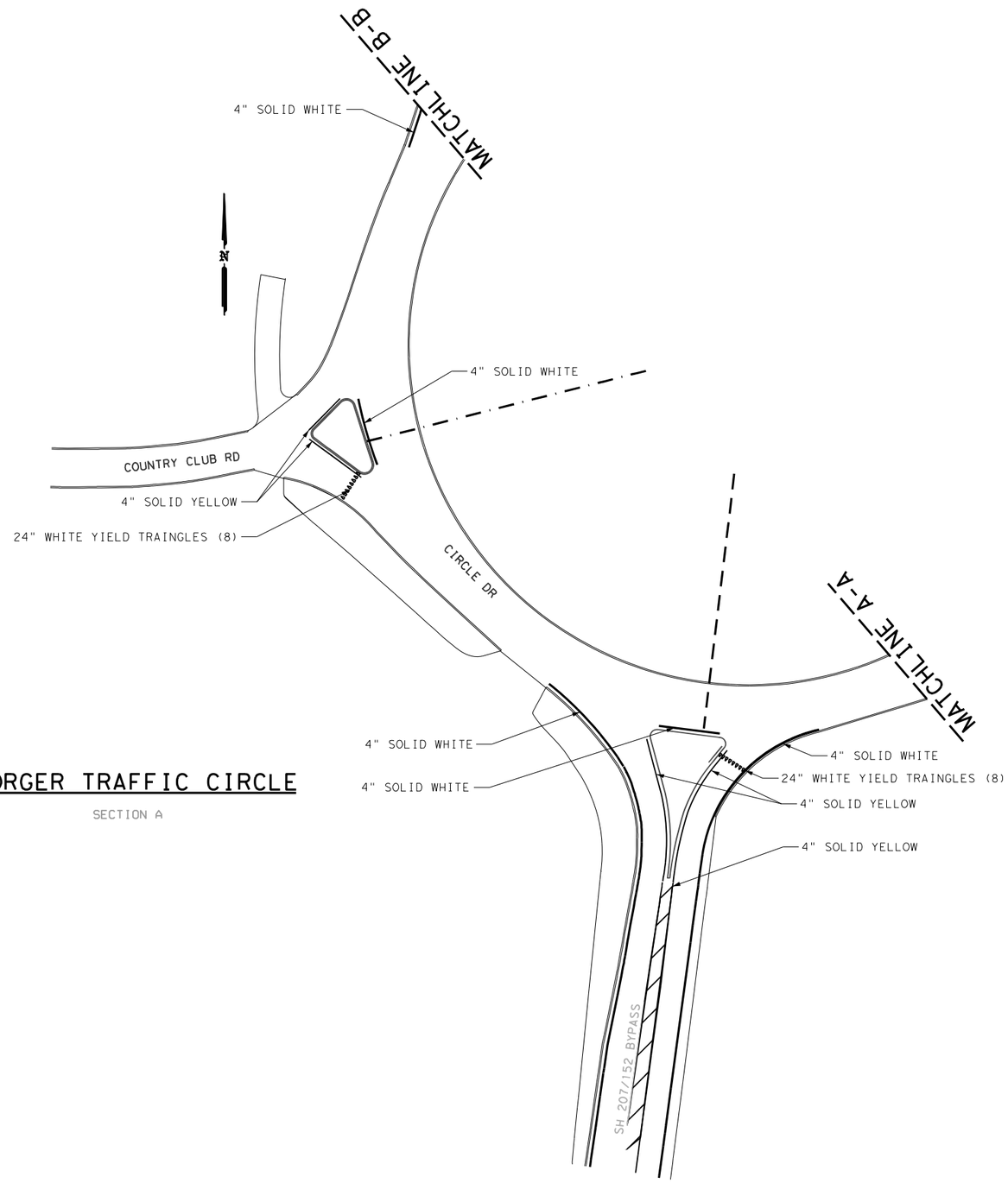
Bridge Division Standard

SAFETY END TREATMENT WITH FLARED WINGS

FOR 30° SKEW PIPE CULVERTS
TYPE I ~ CROSS DRAINAGE

SETP-FW-30

FILE: stpf30se-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS				
	DIST	COUNTY		SHEET NO.



BORGER TRAFFIC CIRCLE

SECTION A

STATE OF TEXAS
CASEY B. STRIPLING
136887
LICENSED PROFESSIONAL ENGINEER

Casey B. Stripling

11-17-2022

SH 136
PAVEMENT MARKING LAYOUT

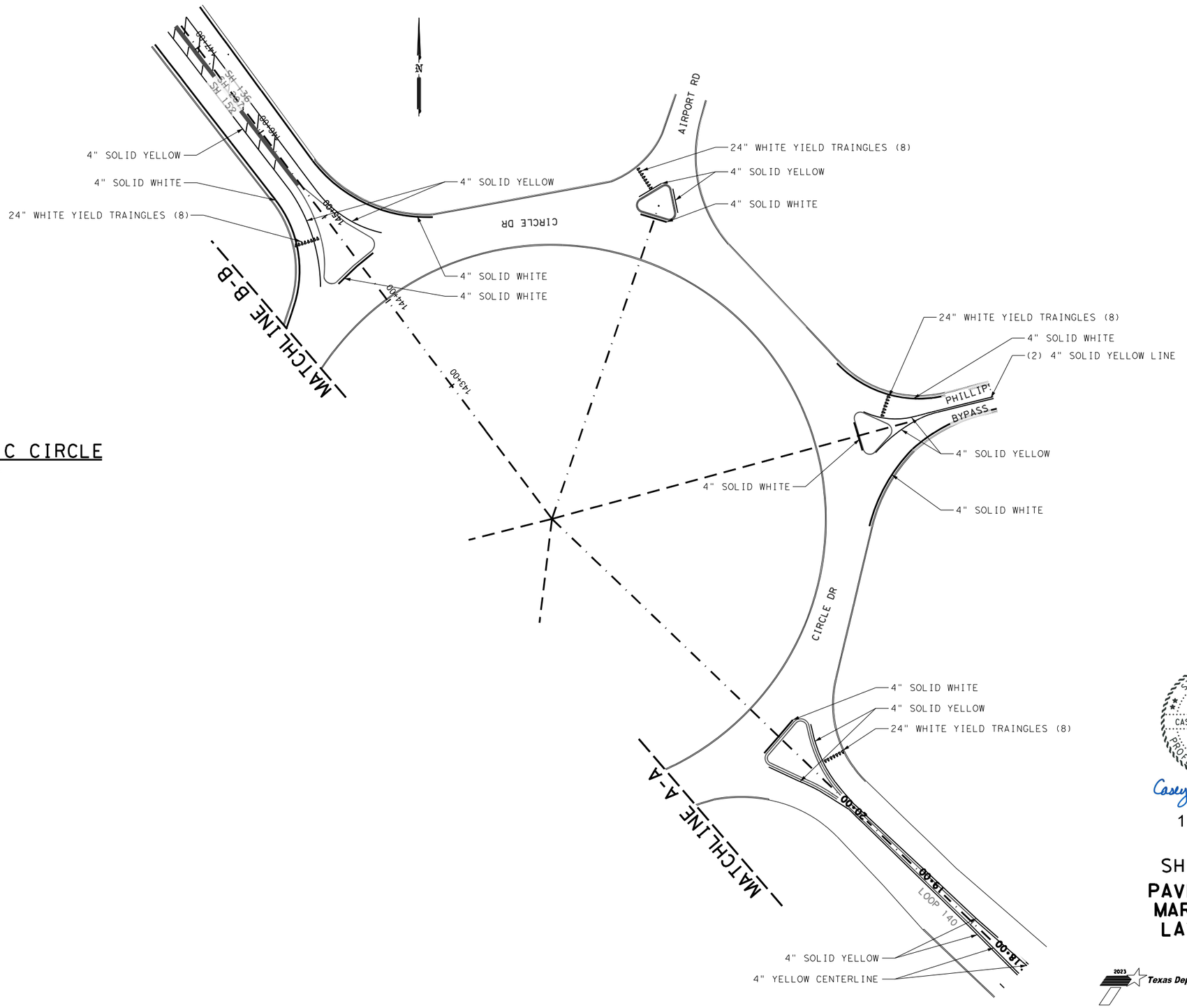
SCALE: 1" = 100'

2023 Texas Department of Transportation

SHEET 1 OF 2

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		148

DATE: 11/17/2022 4:30:00 PM
FILE: T:\AMATPD\Construction Projects\0356-01\107 PM Overlay\4 - Design\Plan Set\8. Traffic\107_ PAVEMENT MARKING LAYOUT.dgn



BORGER TRAFFIC CIRCLE

SECTION B

STATE OF TEXAS
CASEY B. STRIPLING
136887
LICENSED
PROFESSIONAL ENGINEER

Casey B. Stripling

11-17-2022

SH 136
PAVEMENT MARKING LAYOUT

SCALE: 1" = 100'

2023 Texas Department of Transportation

SHEET 2 OF 2

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		149

DATE: 11/17/2022 4:30:02 PM
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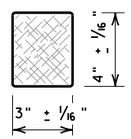
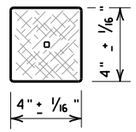
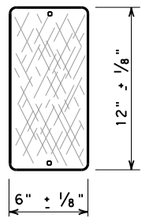
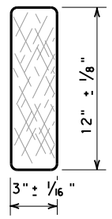
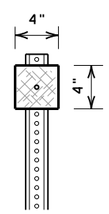
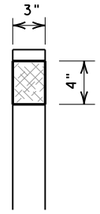
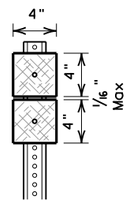
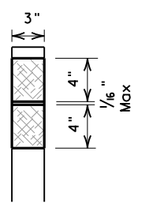
REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

	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

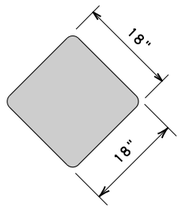
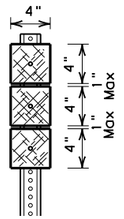
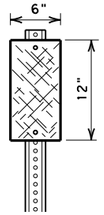
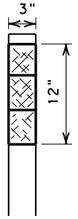
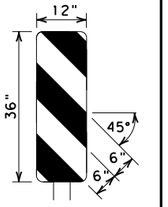
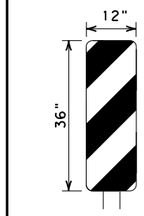
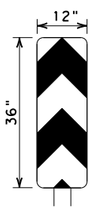
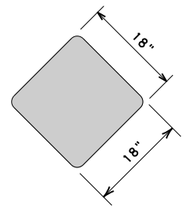
NUMBER OF REFLECTORS OR DIRECTION
X = 3-Size 2 reflector units (Type 2 only)
Y = 1-Size 3 reflector unit (Type 2 only)
Z = 3-Size 1 or 1-Size 4 reflector unit(s) (Type 2 only)
L = Left Side (Type 3 Object Marker only)
R = Right Side (Type 3 Object Marker only)
C = Center (Type 3 Object Marker only)

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

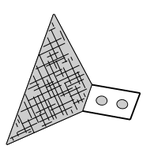
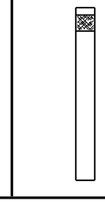
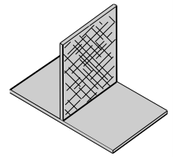
OBJECT MARKERS

	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

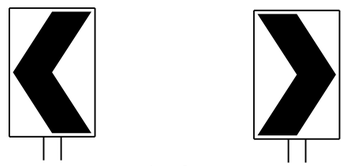
FLEXIBLE DELINEATOR & OBJECT MARKER POSTS (EMBEDDED & SURFACE MOUNT TYPES)	DMS-4400
SIGN FACE MATERIALS	DMS-8300
DELINEATORS, OBJECT MARKERS AND BARRIER REFLECTORS	DMS-8600

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

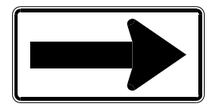


SIZE (W x L)	18"x 24" (Conventional)	24"x 30" (Conventional Oversize)	30"x 36" (Expressway)	36" x 48" (Freeway)
MOUNTING HEIGHT	4'-0" or 7'-0"		7'-0" Only	

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



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.

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DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION

D & OM(1)-20

FILE: dom1-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
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REVISIONS				
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20				

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DATE:
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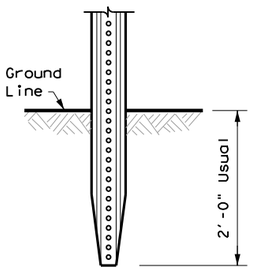
POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

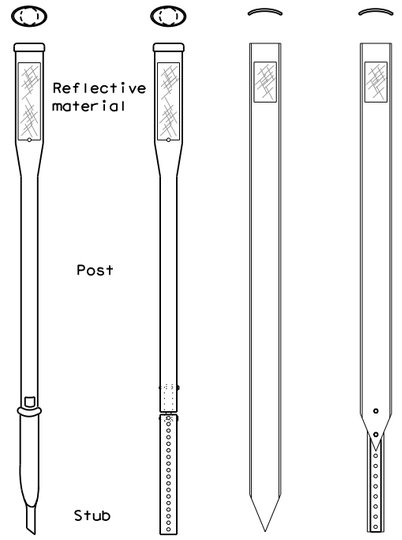


NOTES

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.

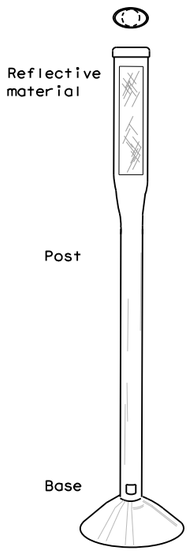
FLEXIBLE POSTS (YFLX, WFLX)

GND



EMBEDDED

SRF



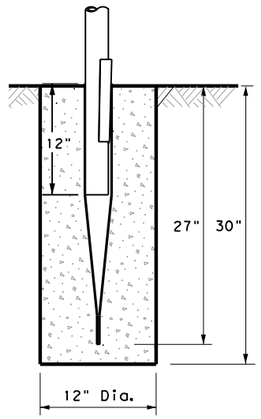
SURFACE MOUNT

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.

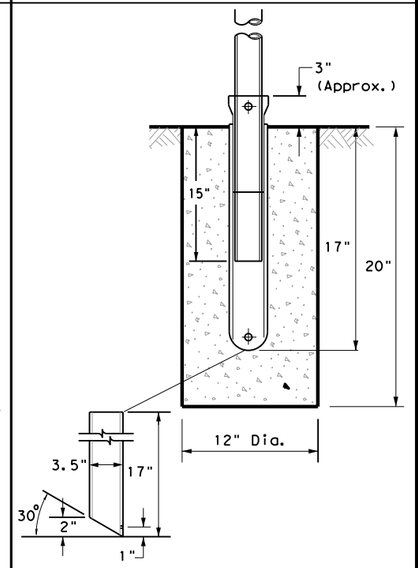
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

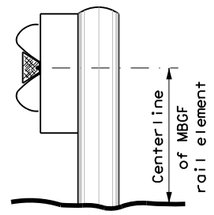
NOTE

1. Install per manufacturer's recommendations.

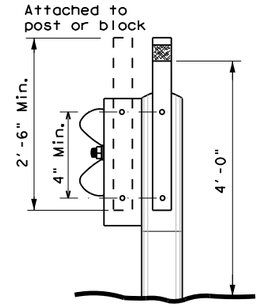
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

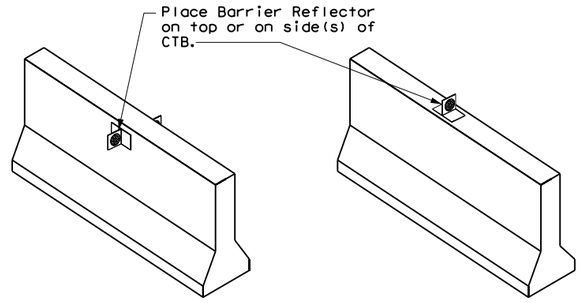
GF1



GF2



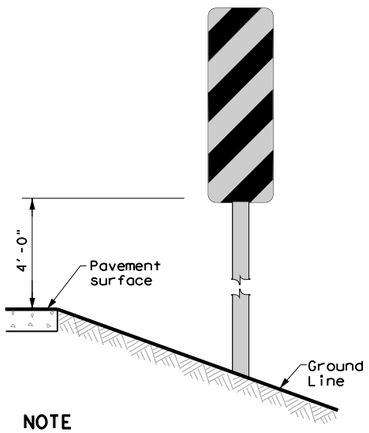
CONCRETE TRAFFIC BARRIER (CTB)



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.

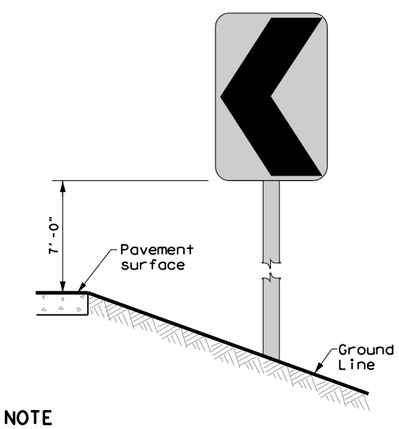
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



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)

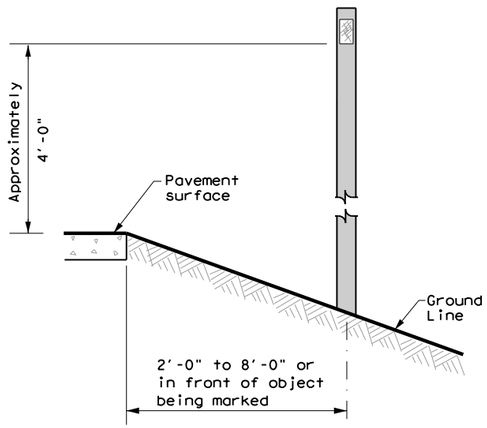
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



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

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DELINEATOR & OBJECT MARKER INSTALLATION

D & OM(2)-20

FILE: dom2-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
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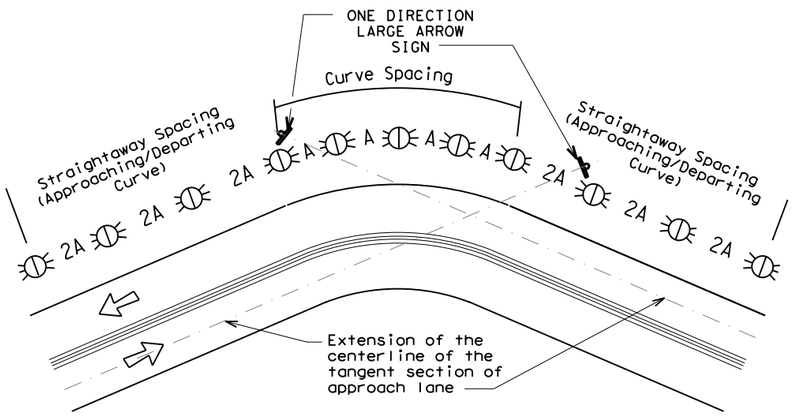
MINIMUM WARNING DEVICES AT CURVES WITH ADVISORY SPEEDS

Amount by which Advisory Speed is less than Posted Speed	Curve Advisory Speed	
	Turn (30 MPH or less)	Curve (35 MPH or more)
5 MPH & 10 MPH	• RPMs	• RPMs
15 MPH & 20 MPH	• RPMs and One Direction Large Arrow sign	• RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons.
25 MPH & more	• RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons	• RPMs and Chevrons

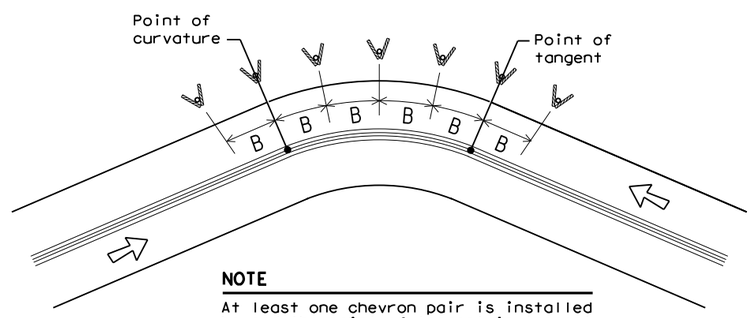
SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



NOTE

ONE DIRECTION LARGE ARROW (W1-6) sign should be located at approximately and perpendicular to the extension of the centerline of the tangent section of approach lane.

SUGGESTED SPACING FOR CHEVRONS ON HORIZONTAL CURVES



NOTE

At least one chevron pair is installed beyond the point of tangent in tangent section.

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS KNOWN

Degree of Curve	FEET			
	Radius of Curve	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
		A	2A	B
1	5730	225	450	—
2	2865	160	320	—
3	1910	130	260	200
4	1433	110	220	160
5	1146	100	200	160
6	955	90	180	160
7	819	85	170	160
8	716	75	150	160
9	637	75	150	120
10	573	70	140	120
11	521	65	130	120
12	478	60	120	120
13	441	60	120	120
14	409	55	110	80
15	382	55	110	80
16	358	55	110	80
19	302	50	100	80
23	249	40	80	80
29	198	35	70	40
38	151	30	60	40
57	101	20	40	40

Curve delineator approach and departure spacing should include 3 delineators spaced at 2A. This spacing should be used during design preparation or when the degree of curve is known.

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS NOT KNOWN

Advisory Speed (MPH)	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
	A	2xA	B
65	130	260	200
60	110	220	160
55	100	200	160
50	85	170	160
45	75	150	120
40	70	140	120
35	60	120	120
30	55	110	80
25	50	100	80
20	40	80	80
15	35	70	40

If the degree of curve is not known, delineator spacing may be determined based on the Advisory Speed of the curve. Use the delineator curve spacing for each Advisory Speed (MPH).

DELINEATOR AND OBJECT MARKER APPLICATION AND SPACING

CONDITION	REQUIRED TREATMENT	MINIMUM SPACING
Frwy./Exp. Tangent	RPMs	See PM-series and FPM-series standard sheets
Frwy./Exp. Curve	Single delineators on right side	See delineator spacing table
Frwy/Exp.Ramp	Single delineators on at least one side of ramp (should be on outside of curves) (see Detail 3 on D&OM(4))	100 feet on ramp tangents Use delineator spacing table for ramp curves ("straightway spacing" does not apply to ramp curves)
Acceleration/Deceleration Lane	Double delineators (see Detail 3 on D&OM(4))	100 feet (See Detail 3 on D & OM (4))
Truck Escape Ramp	Single red delineators on both sides	50 feet
Bridge Rail (steel or concrete)and Metal Beam Guard Fence	Bi-Directional Delineators when undivided with one lane each direction Single Delineators when multiple lanes each direction	Equal spacing (100'max) but not less than 3 delineators
Concrete Traffic Barrier (CTB) or Steel Traffic Barrier	Barrier reflectors matching the color of the edge line	Equal spacing 100' max
Cable Barrier	Reflectors matching the color of the edge line	Every 5th cable barrier post (up to 100'max)
Guard Rail Terminus/Impact Head	Divided highway - Object marker on approach end Undivided 2-lane highways - Object marker on approach and departure end	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5) and D & OM (6)
Bridges with no Approach Rail	Type 3 Object Marker (OM-3) at end of rail and 3 single delineators approaching rail	See D & OM(5)
Reduced Width Approaches to Bridge Rail	Type 2 and Type 3 Object Markers (OM-3) and 3 single delineators approaching bridge	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5)
Culverts without MBGF	Type 2 Object Markers	See Detail 2 on D & OM(4)
Crossovers	Double yellow delineators and RPMs	See Detail 1 on D & OM (4)
Pavement Narrowing (lane merge) on Freeways/Expressway	Single delineators adjacent to affected lane for full length of transition	100 feet

NOTES

1. Unless indicated otherwise, the delineator or barrier reflector color shall conform to the color of the pavement edge line on the side of the road where the delineators or barrier reflectors are placed.
2. Barrier reflectors may be used to replace required delineators.
3. Single red delineators may be mounted on the back side of delineator posts for wrong way driver applications

LEGEND

	Bi-directional Delineator
	Delineator
	Sign

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(3)-20

FILE: dom3-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
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8-15 7-20				

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DATE:
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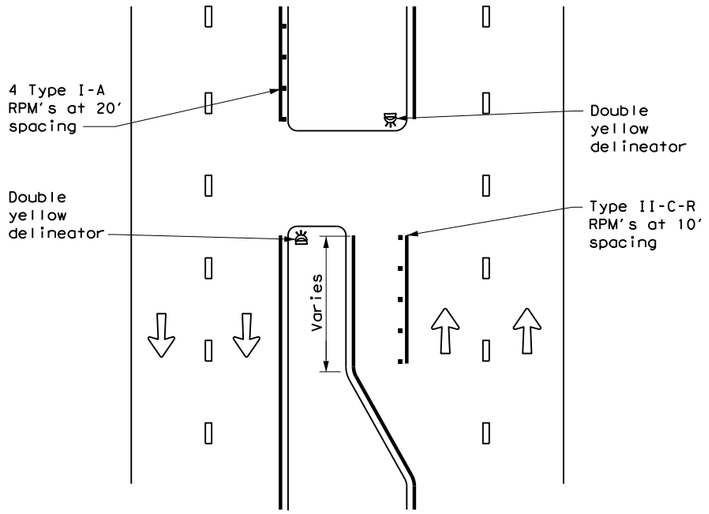
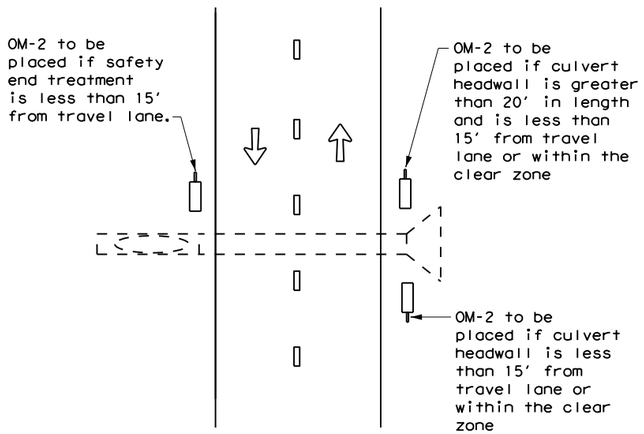
CROSSOVERS



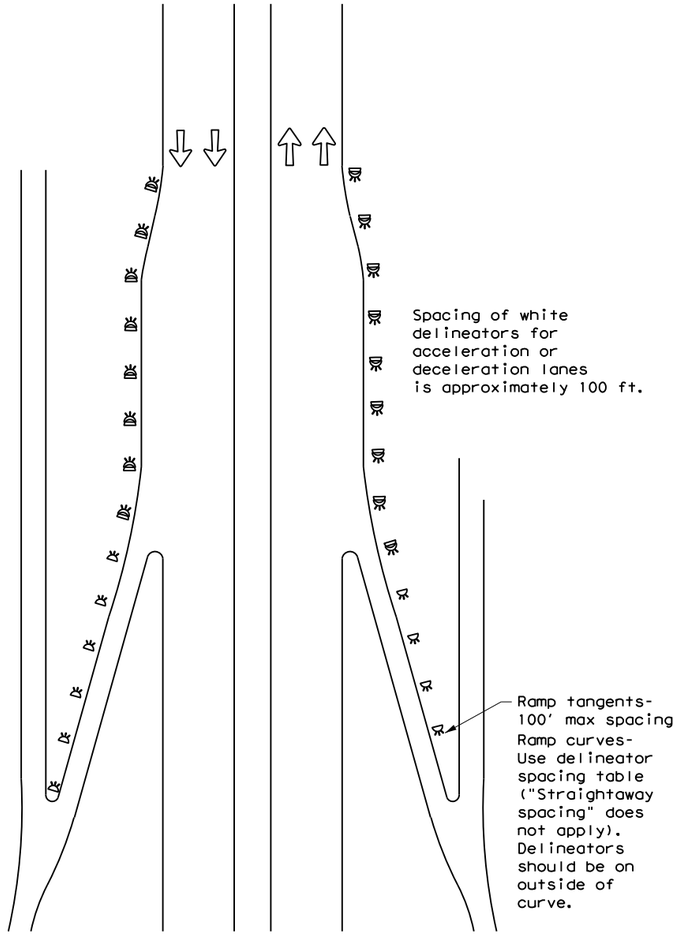
DETAIL 1

FOR CULVERTS WITHOUT MBGF



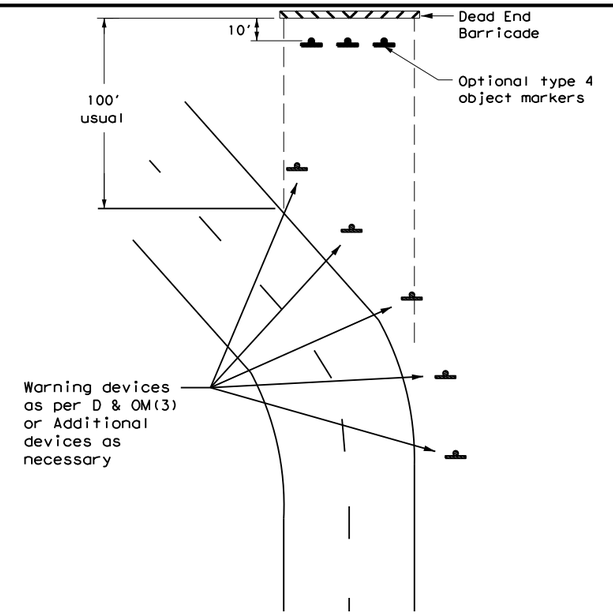
DETAIL 2

FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES



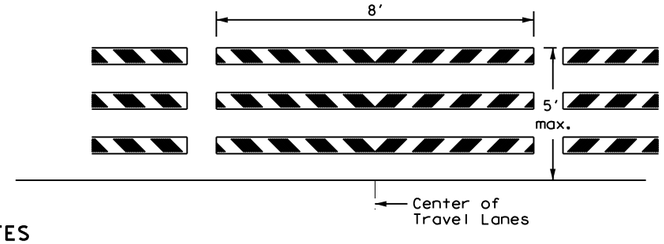
DETAIL 3

TYPICAL APPLICATION OF DEAD END BARRICADE



DETAIL 4

TYPICAL DEAD END BARRICADE INSTALLATION



NOTES

1. Barricade striping shall be red and white reflective sheeting for all permanent road closures.
2. Barricade striping is red and white sloping toward the center of the roadway.
3. Type 3 Barricade Supports should be anchored to soil or pavement as described in compliant Work Zone Traffic Control Devices List, section D.2.f and D.2.g.

DETAIL 5

LEGEND	
	Bidirectional Delineator
	Delineator
	OM-3
	Barricade
	Sign
	OM-2
	Double Delineator

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DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(4)-20

FILE: dom4-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
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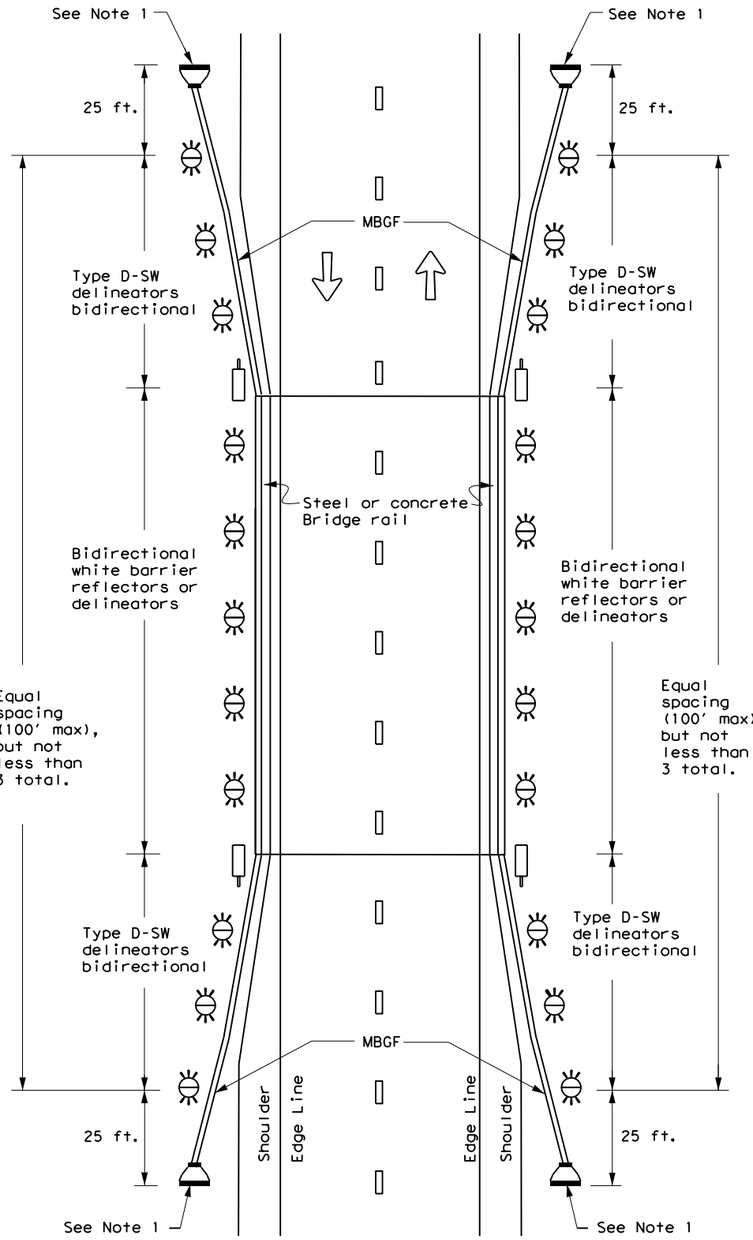
3-15	DIST	COUNTY		SHEET NO.
7-20				

DATE:
FILE:

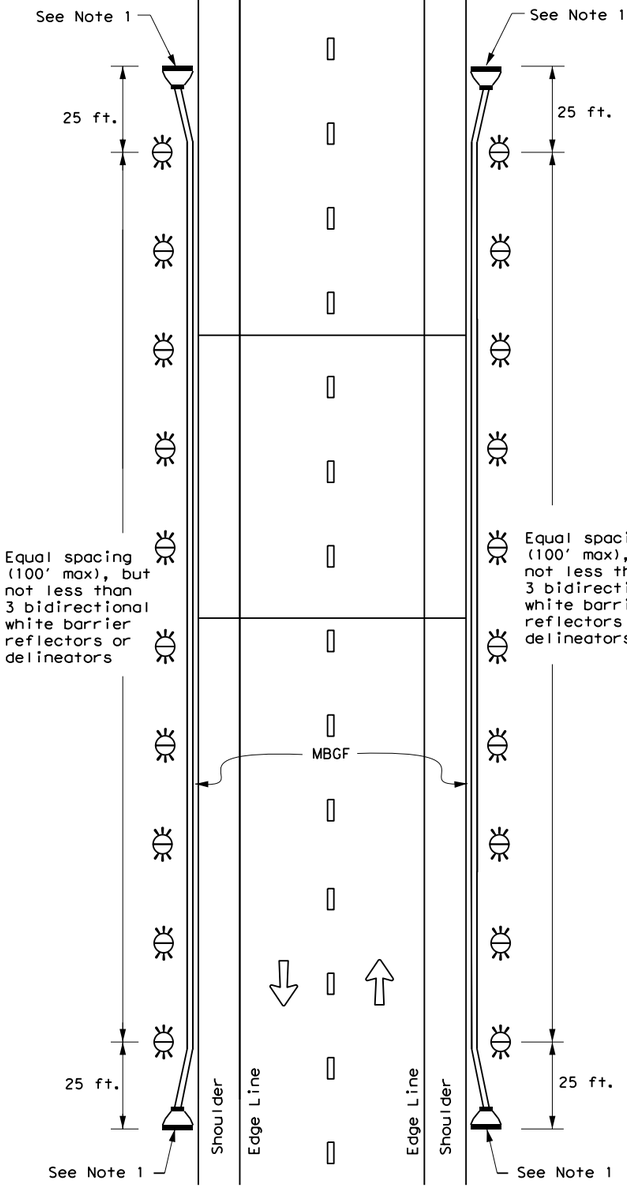
TWO-WAY, TWO LANE ROADWAY WITH REDUCED WIDTH APPROACH RAIL



NOTE:

1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

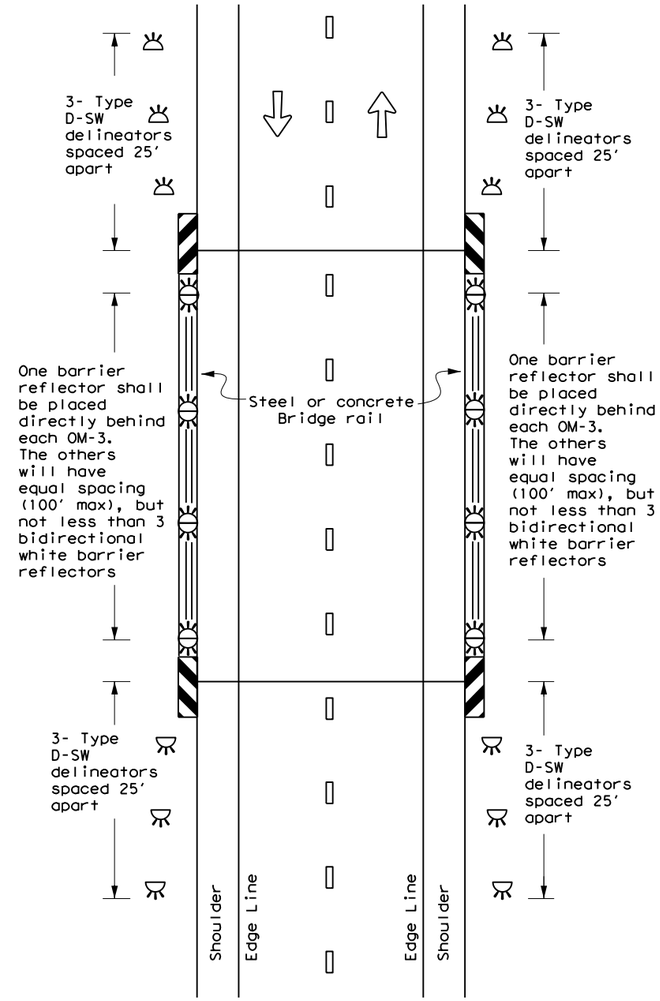
TWO-WAY, TWO LANE ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



NOTE:

1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

TWO-WAY, TWO LANE ROADWAY BRIDGE WITH NO APPROACH RAIL



LEGEND

	Bidirectional Delineator
	Delineator
	OM-3
	OM-2
	Terminal End
	Traffic Flow

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(5)-20

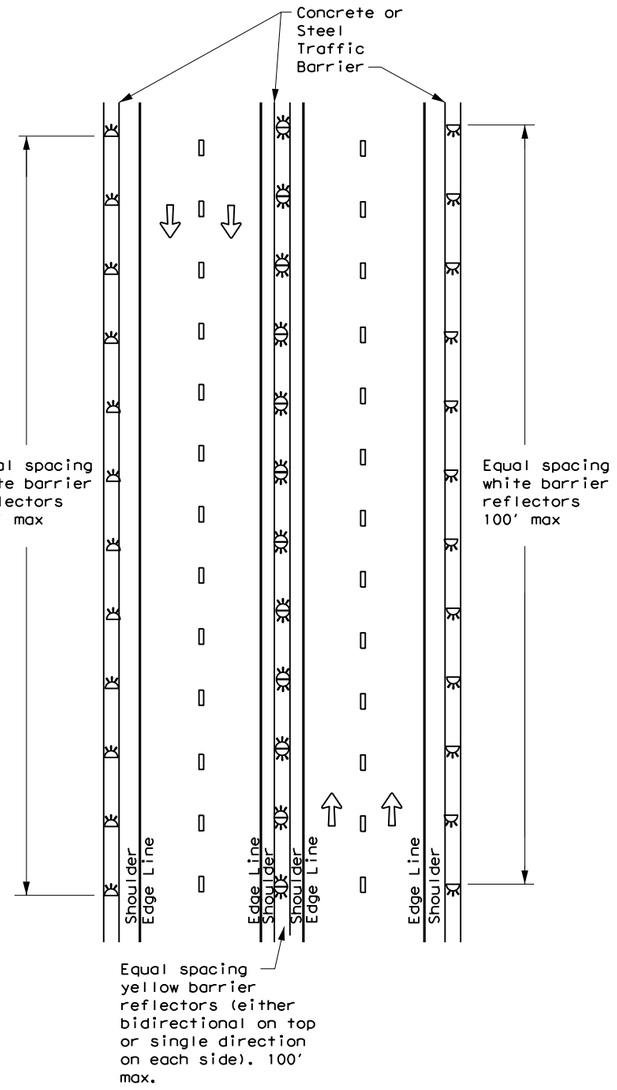
FILE: dom5-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS 7-20	DIST	COUNTY		SHEET NO.

20E

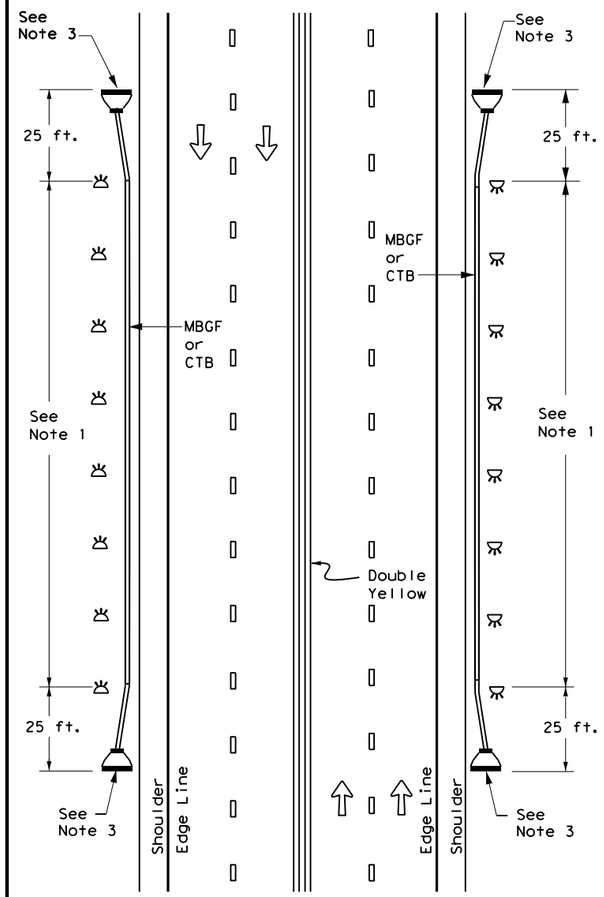
DATE:
FILE:

DATE:
FILE:

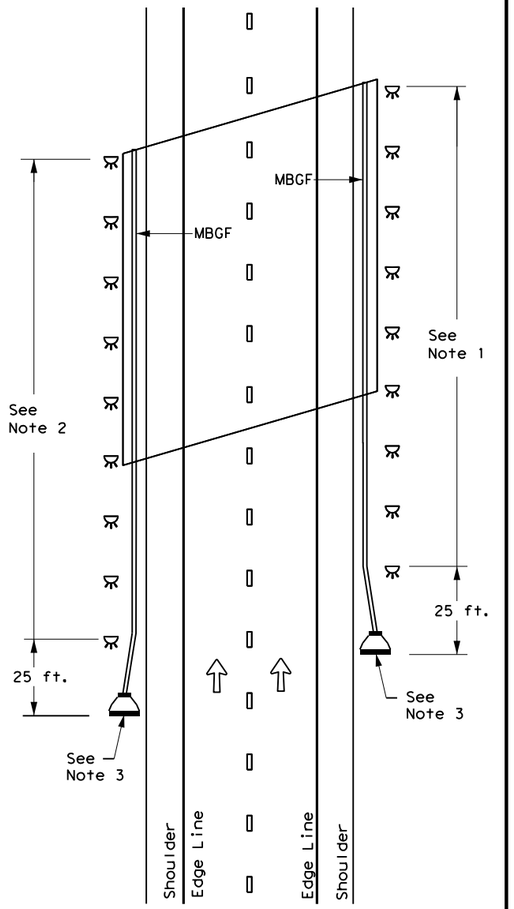
CONTINUOUS CONCRETE OR STEEL BARRIER



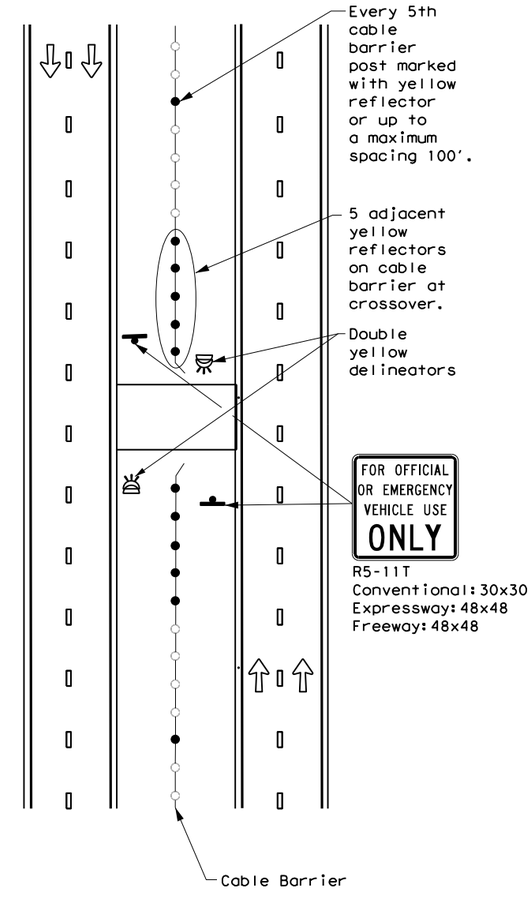
MULTI-LANE UNDIVIDED, TWO-WAY ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



DIVIDED ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



EMERGENCY CROSSOVER



NOTES

1. Equal spacing (100′ max), but not less than 3 single directional white barrier reflectors or delineators. On Continuos Barrier, equal spacing (100′ max.)
2. Equal spacing (100′ max), but not less than 3 single directional yellow barrier reflectors or delineators.
3. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3)in front of the terminal end.

LEGEND

	Bidirectional Delineator
	Delineator
	OM-3
	OM-2
	Terminal End
	Traffic Flow

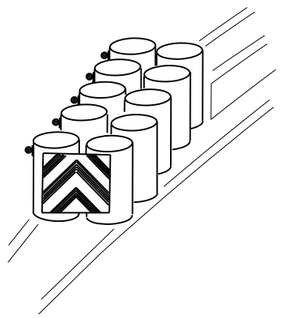
Texas Department of Transportation

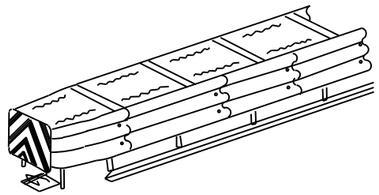
Traffic Safety Division Standard

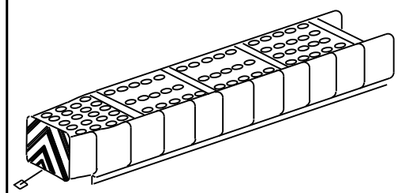
DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

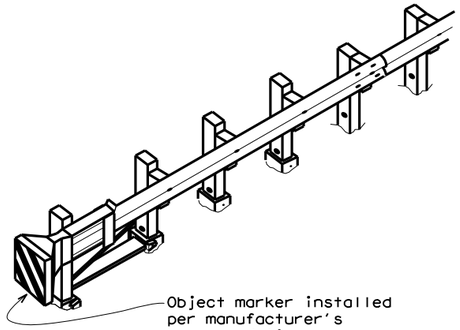
D & OM(6)-20

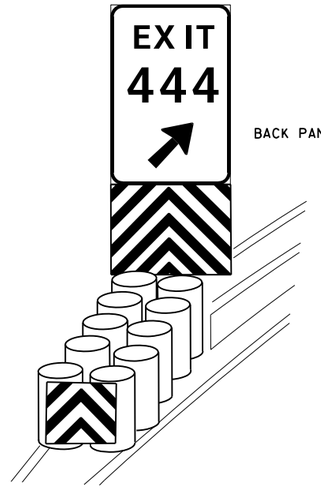
FILE: dom6-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS				
7-20	DIST	COUNTY		SHEET NO.

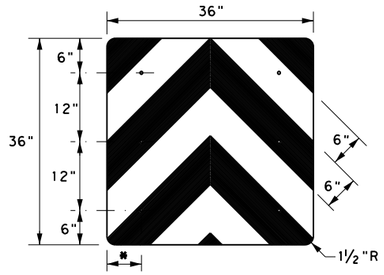


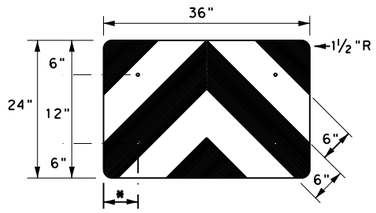




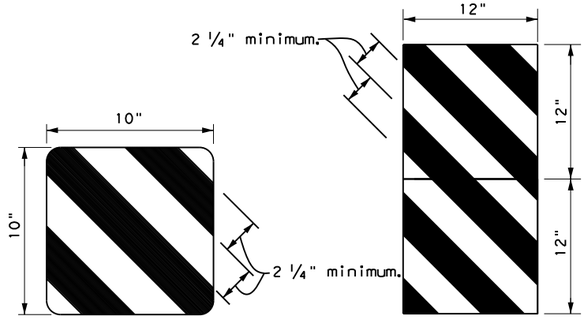




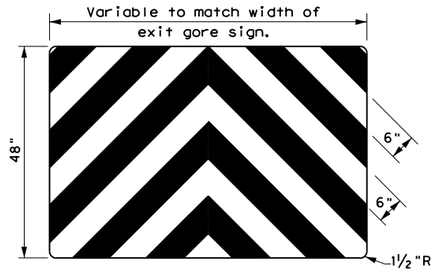


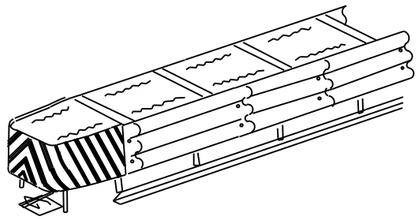


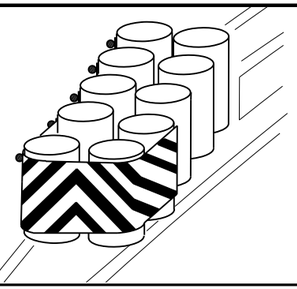
* Adjust to fit attenuator per manufacturer's recommendation, or as directed by the Engineer

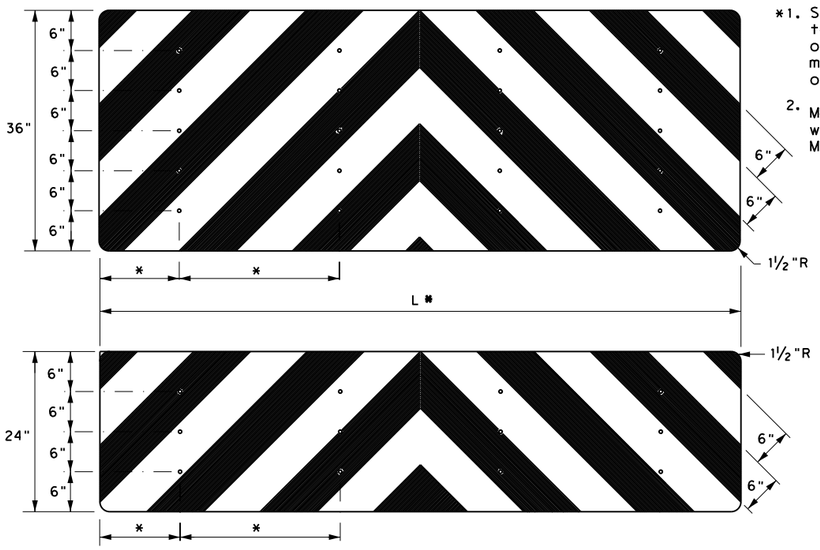


OBJECT MARKERS SMALLER THAN 3 FT^2









NOTES

*1. Spacing should be adjusted to attach through centerline of drum, per attenuator manufacturers recommendation, or as directed by the Engineer.

2. Mounting should be flush with top of attenuator. Minimum size 96" x 24".

NOTES

1. Object Markers shall conform to the Texas MUTCD and meet the color and reflectivity requirement of Department Material Specification DMS 8300. Background shall be yellow reflective sheeting (Type B or C) and Chevron shall be black.

2. Object Markers may be fabricated from adhesive backed reflective sheeting applied directly to guardrail end treatment, or applied directly to an "end cap" as per the manufacturer's recommendation. Direct applied sheeting shall provide a smooth surface and have no wrinkles, air bubbles, cuts or tears. A radius at the corners is not required for direct applied sheeting.

3. Object Marker size may be reduced to fit smaller devices. Width of alternating black and yellow stripes are typically 6". Object Markers smaller than 3ft may have reduced width stripes of a minimum of 2 ¼".

4. Pop rivets, screws, or nuts and bolts may be used to attach object markers and reflectors. Holes, slots or other openings may be cut or drilled through object markers to allow cable or other attachments.

5. Object Marker at nose of attenuator is subsidiary to the attenuator.

6. See D & OM (1-4) for required barrier reflectors.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS

D & OM(VIA)-20

FILE: domvia20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT December 1989	CONT	SECT	JOB	HIGHWAY
REVISIONS	0356	01	107	SH 136
4-92 8-04	DIST	COUNTY		SHEET NO.
8-95 3-15	AMA	HUTCHINSON CO		156
4-98 7-20				

20G

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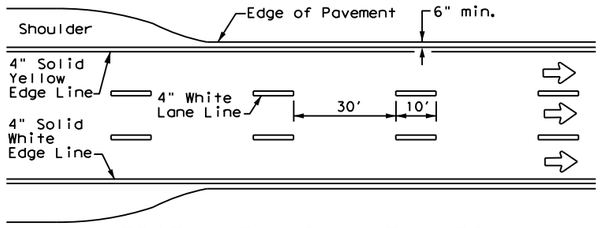
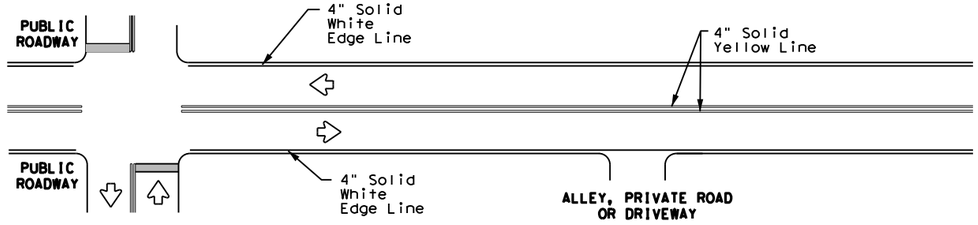
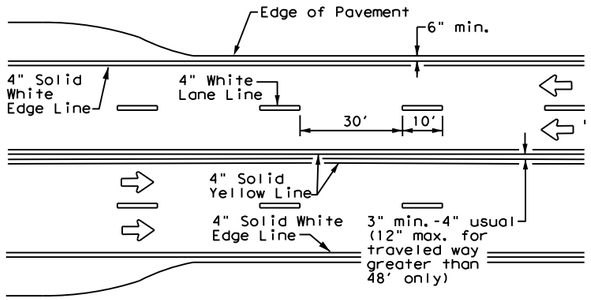


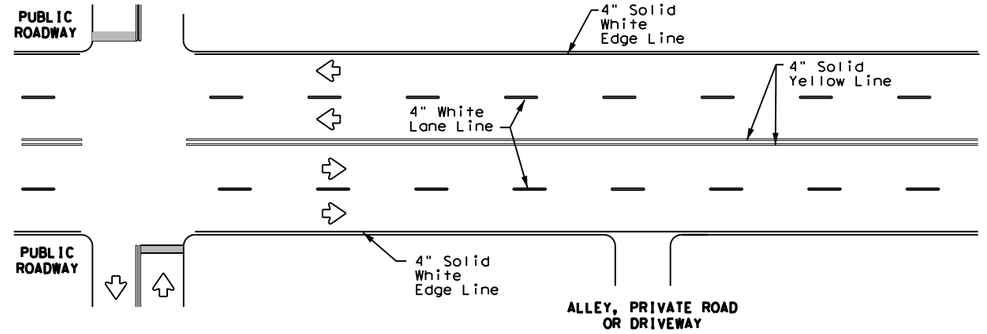
EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



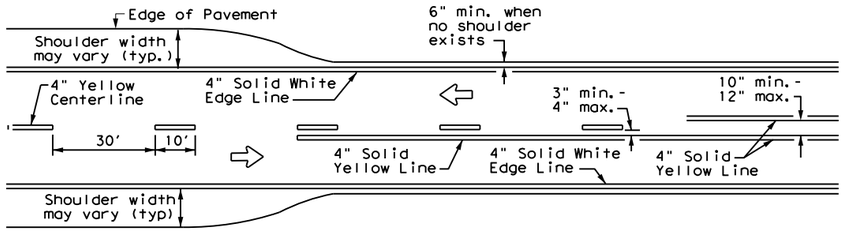
TYPICAL TWO-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



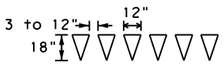
CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



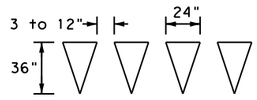
TYPICAL MULTI-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS

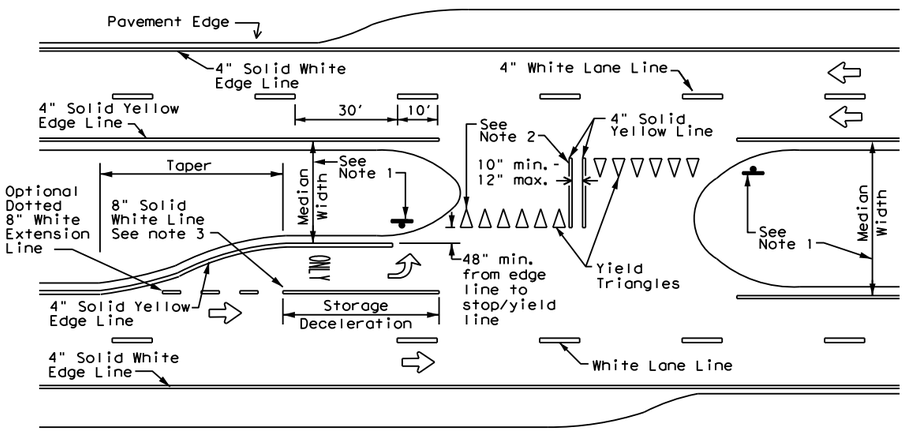


For posted speed on road being marked equal to or less than 40 MPH.



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.

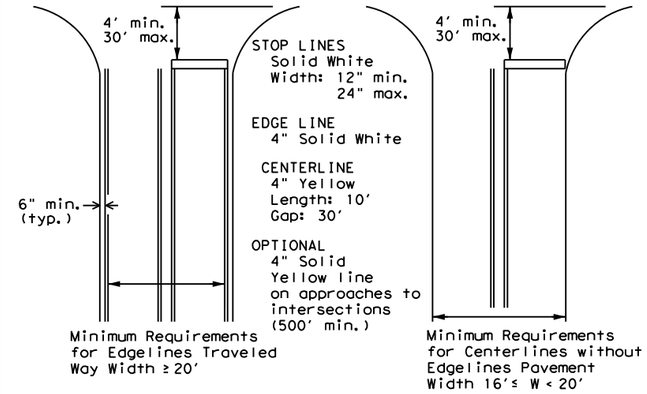
GENERAL NOTES

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

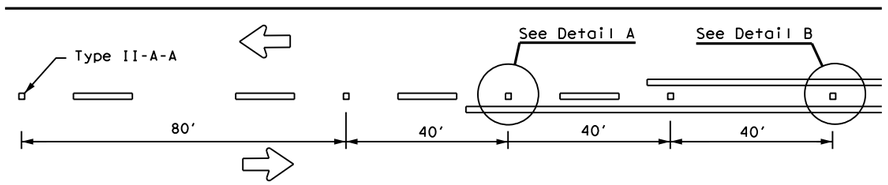
TYPICAL STANDARD PAVEMENT MARKINGS

PM(1)-20

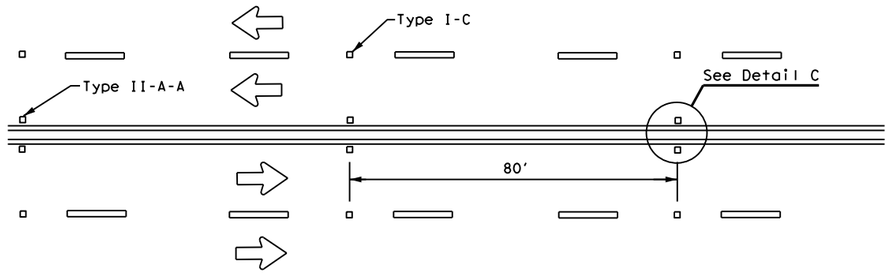
FILE: pm1-20.dgn	DN:	CK:	DW:	CK:
© TxDOT November 1978	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03	0356	01	107	SH 136
5-00 2-12	DIST	COUNTY		SHEET NO.
8-00 6-20	AMA	HUTCHINSON CO		157

22A

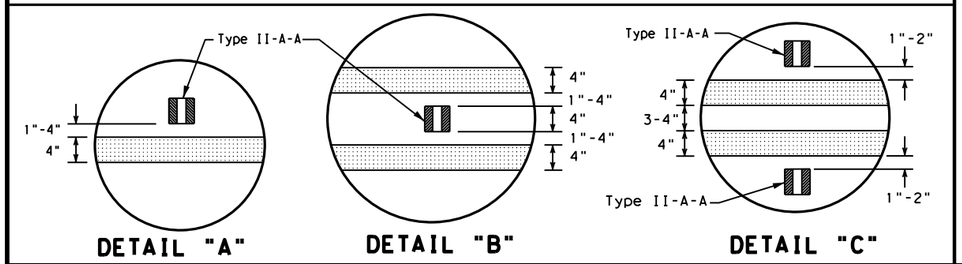
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE



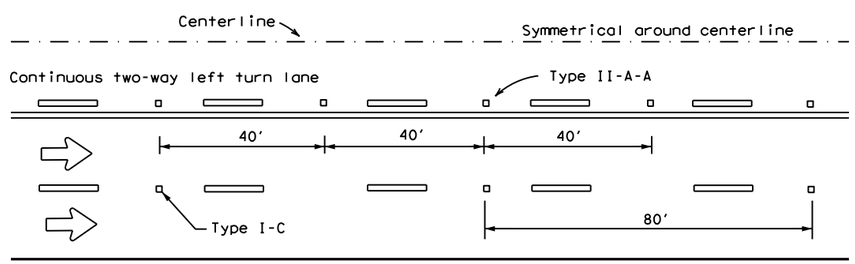
CENTERLINE FOR ALL TWO LANE ROADWAYS



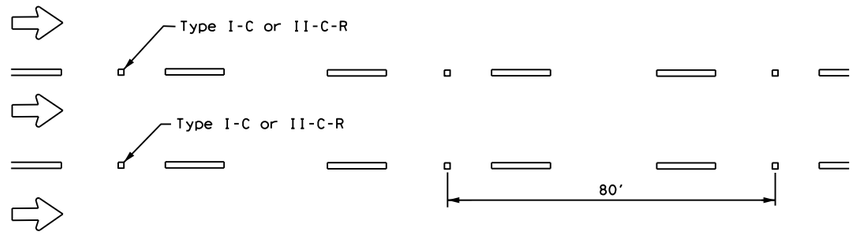
CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY HIGHWAYS



DETAIL "A" **DETAIL "B"** **DETAIL "C"**

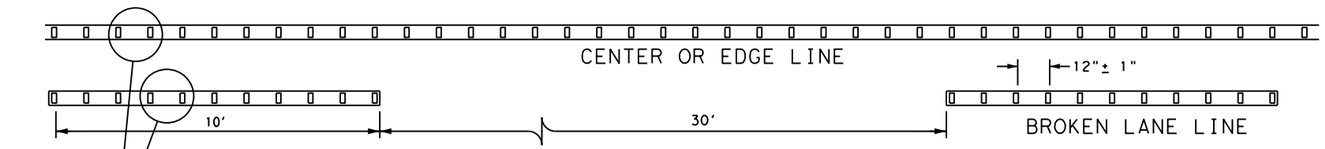


CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



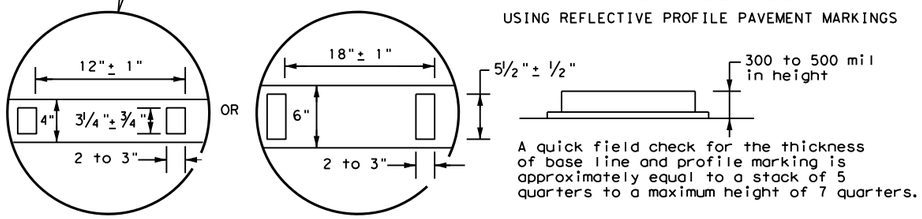
LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

Raised pavement markers Type II-C-R shall have clear face toward normal traffic and red face toward wrong-way traffic.



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

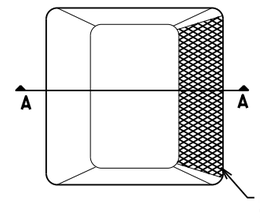
Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

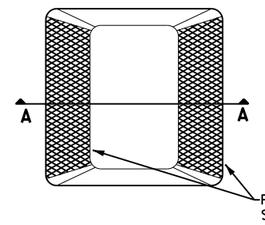
1. All raised pavement markers placed in broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.

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

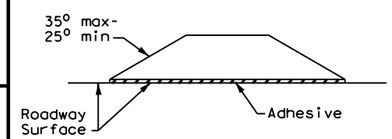
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)



Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS

Texas Department of Transportation

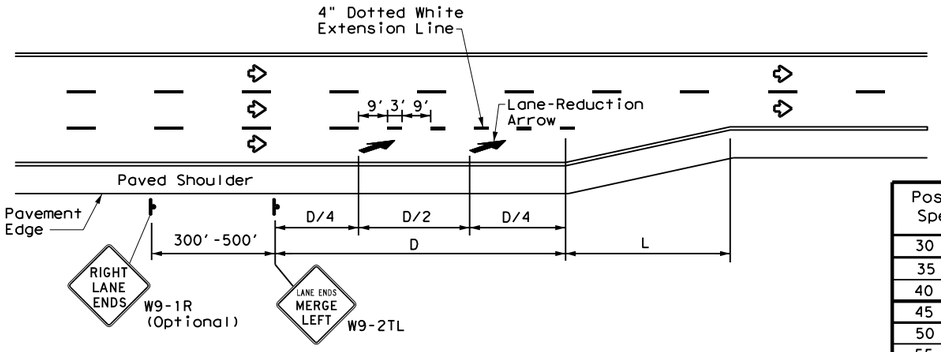
Traffic Safety Division Standard

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	DIST	COUNTY		SHEET NO.

22B

DATE:
FILE:

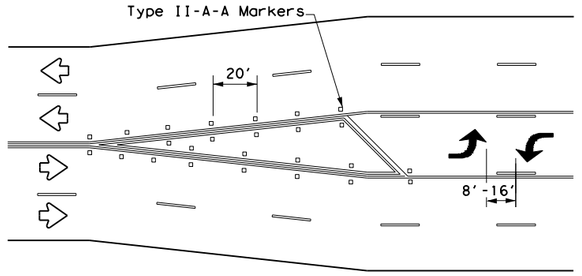


LANE REDUCTION

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.

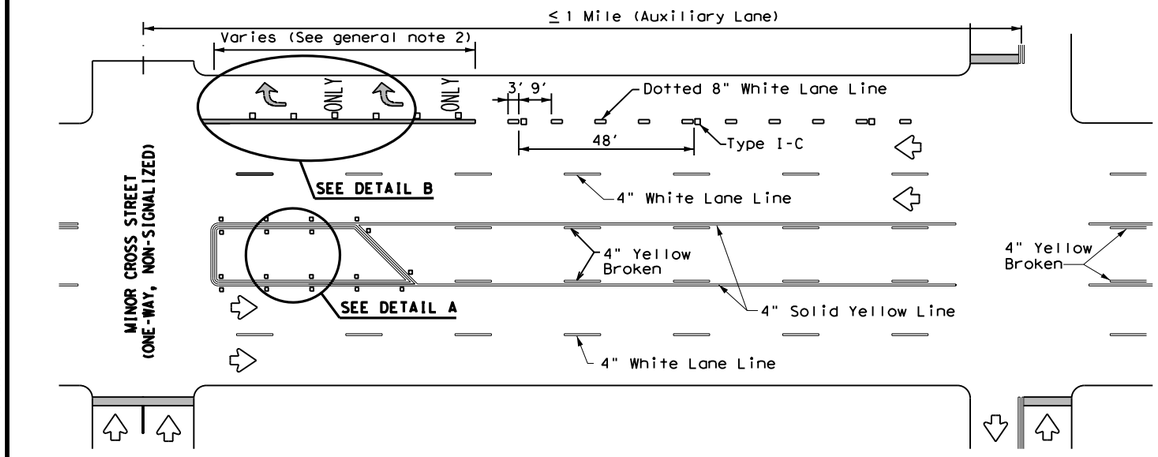
TYPICAL TRANSITION FOR TWLTL AND DIVIDED HIGHWAY

GENERAL NOTES

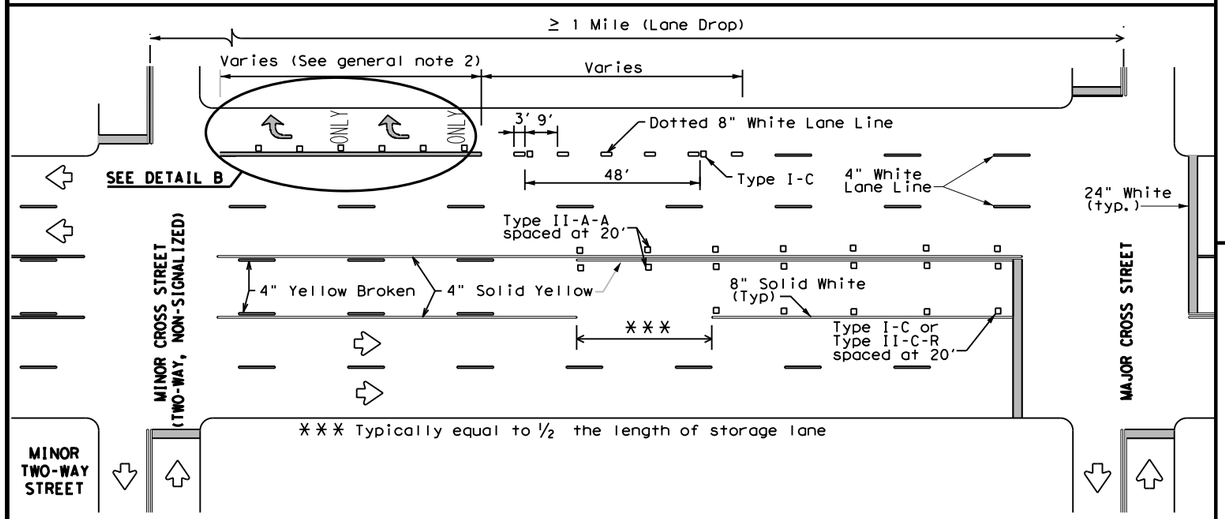
1. Lane use word and arrow markings shall be used where through lanes approaching an intersection become mandatory turn lanes. Lane use word and arrow markings should be used in auxiliary lanes of substantial length. Lane use arrow markings or word and arrow markings may be used in other lanes and turn 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

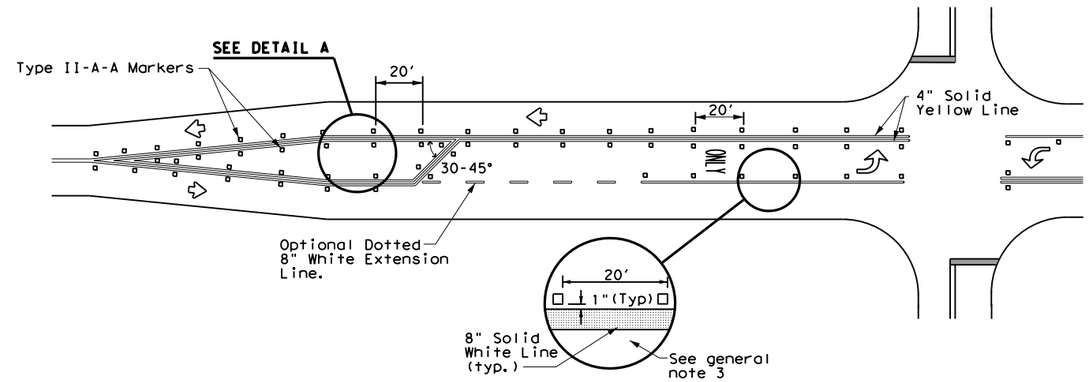
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



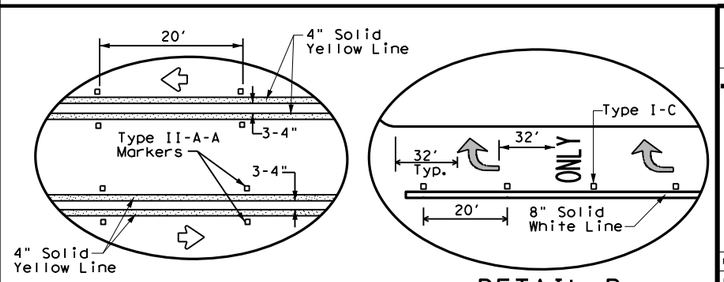
TYPICAL TWLTL AT ONE-WAY STREET AND RIGHT TURN AUXILIARY LANE



TYPICAL TWLTL AT TWO-WAY CROSS STREET AND RIGHT TURN LANE DROP



TYPICAL TWO-LANE HIGHWAY INTERSECTION WITH LEFT TURN BAYS



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:
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REVISIONS 5-00 2-10 8-00 2-12 3-03 6-20	DIST	COUNTY		SHEET NO.

220

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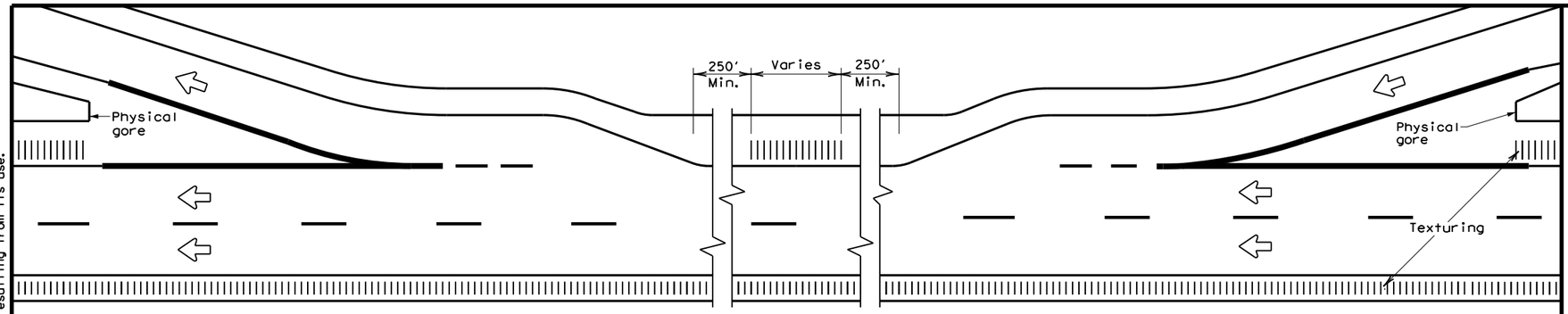
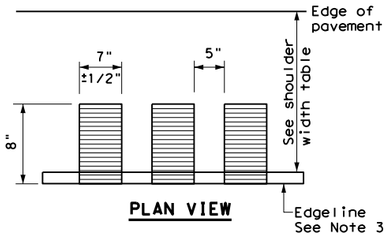
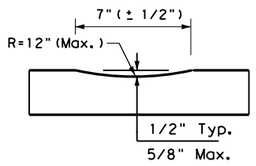


TYPICAL RUMBLE STRIP PLACEMENT AT EXIT AND ENTRANCE RAMPS

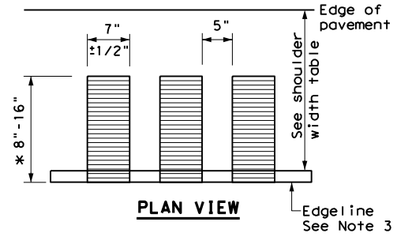


PLAN VIEW



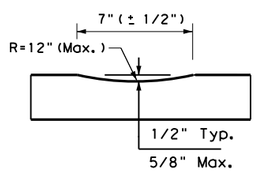
PROFILE VIEW
OPTION 1

CONTINUOUS MILLED DEPRESSIONS
(Rumble Stripes)



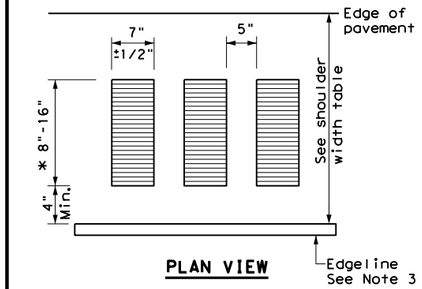
PLAN VIEW

* This distance may vary based on width of shoulder



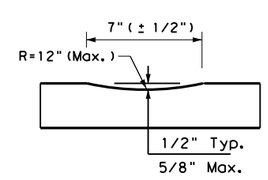
PROFILE VIEW
OPTION 2

CONTINUOUS MILLED DEPRESSIONS
(Rumble Stripes)



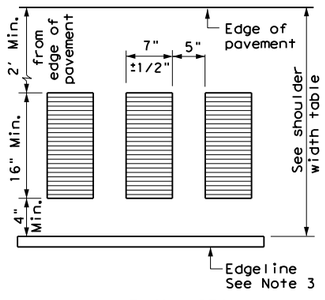
PLAN VIEW

* This distance may vary based on width of shoulder

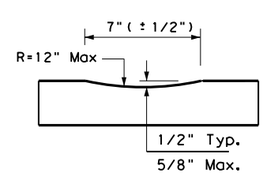


PROFILE VIEW
OPTION 3

CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)

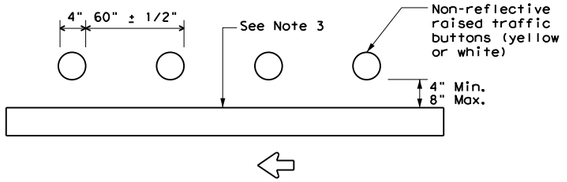


PLAN VIEW



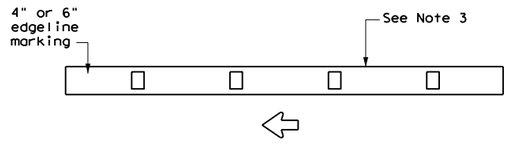
PROFILE VIEW
OPTION 4

CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)



PLAN VIEW
OPTION 5

RAISED EDGELINE RUMBLE STRIPS



PLAN VIEW
OPTION 6

PROFILE EDGELINE MARKINGS

GENERAL NOTES

1. Rumble strips and profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
2. Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
3. Use Standard Sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, pavement markings, and profile markings.
4. See the table below for determining what options may be used for edgeline rumble strips.

WHEN INSTALLING MILLED DEPRESSION EDGELINE RUMBLE STRIPS:

5. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Operations Division.
6. Pavement markings can be applied over milled shoulder rumble strips to create an edgeline rumble stripe.
7. Breaks in edgeline rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections and driveways with high usage of large trucks when installed on conventional highways.
8. Rumble strips shall not be placed across exit or entrance ramps, acceleration and deceleration lanes, crossovers, gore areas or intersections with other roadways.
9. Consideration should be given to noise levels when edgeline rumble strips are installed near residential areas, schools, churches, etc. A minimum of 3/8 inches depth of milled rumble strip may be considered in these areas.
10. On roadways with high bicycle activity, consideration should be given before the installation of edgeline rumble strips. Things to consider include size of rumble strips, rumble strip material and location of rumble strips on the shoulder. If the designer determines that gaps are needed in the rumble strips due to bicycle use of the road, then follow the requirement shown in FHWA Technical Advisory T5040.39, or latest version. A detail of the spacing shall be included in the plans.

WHEN INSTALLING RAISED OR PROFILE EDGELINE RUMBLE STRIPS:

11. Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per the manufacturer's recommendations.
12. Non-reflective traffic buttons shall be placed adjacent to the pavement marking delineating the edgeline when used as a rumble strip. The color of the button should match the color of the adjacent edgeline marking (white or yellow). The buttons will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
13. Non-reflective traffic buttons shall not be placed across exit or entrance ramps, acceleration and deceleration lanes, crossovers, gore areas or intersections with other roadways.
14. Breaks in edgeline rumble strips using raised traffic buttons shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossing, intersections and driveways with high usage of large trucks when installed on conventional highways.
15. The minimum distance between the edgeline and the buttons should be used if the shoulder is less than 8 feet in width.
16. Raised profile thermoplastic markings used as edgelines may substitute for buttons.

SHOULDER WIDTH TABLE		
EQUAL TO OR LESS THAN 2 FEET	GREATER THAN 2 FEET LESS THAN 4 FEET	EQUAL TO OR GREATER THAN 4 FEET
Option 1, 5 OR 6	Option 1, 2, 3, 5 or 6	Option 2, 4, 5 OR 6

Texas Department of Transportation

Traffic Operations Division Standard

EDGELINE RUMBLE STRIPS ON FREEWAYS AND DIVIDED HIGHWAYS

RS(1)-13

FILE: rs(1)-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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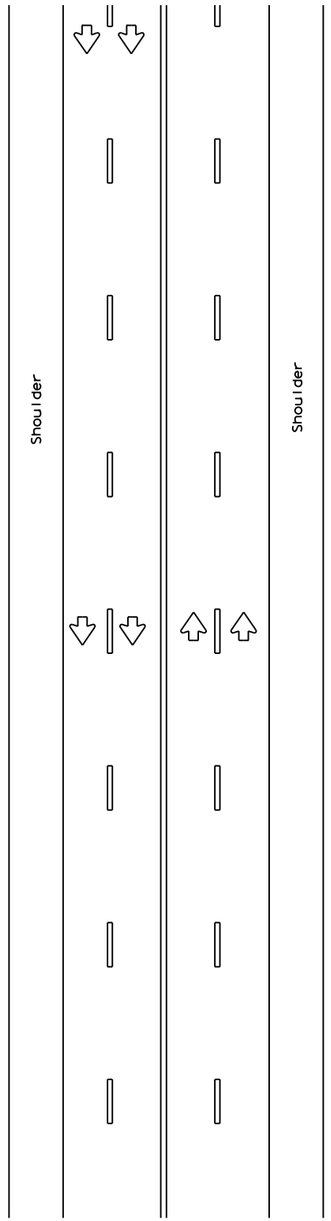
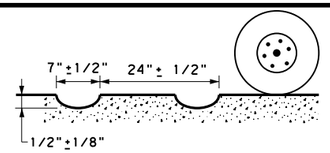
REVISIONS 2-10 10-13	DIST	COUNTY		SHEET NO.

DATE:
FILE:

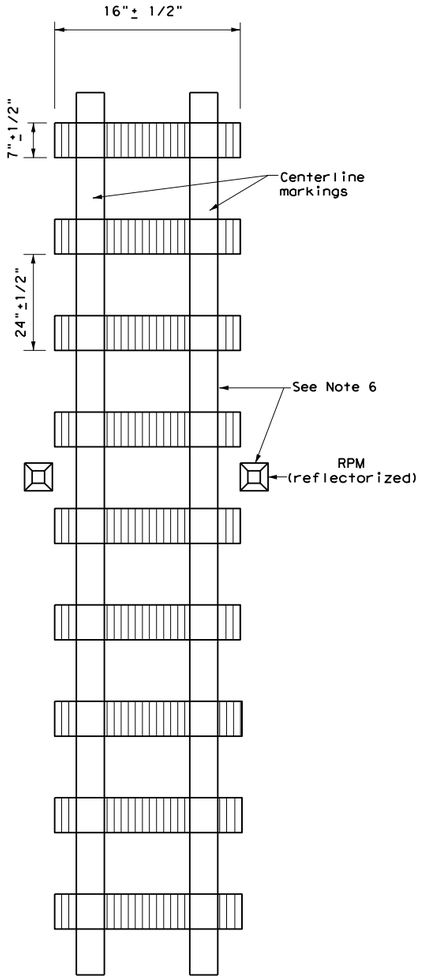
CENTERLINE RUMBLE STRIPS



MULTILANE UNDIVIDED HIGHWAY WITH SHOULDER

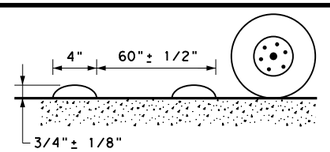


PROFILE VIEW

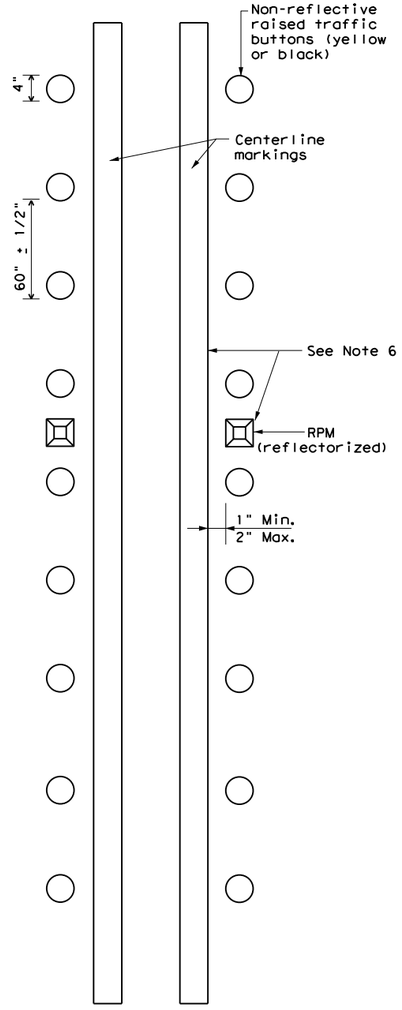


PLAN VIEW
OPTION 1

MILLED CENTERLINE RUMBLE STRIPS

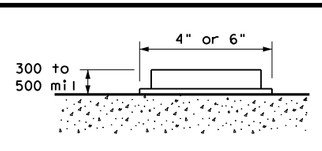


PROFILE VIEW

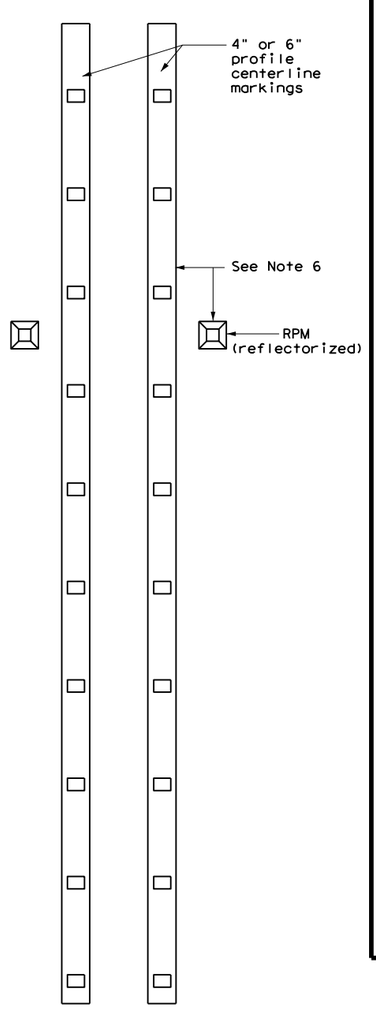


PLAN VIEW
OPTION 2

RAISED CENTERLINE RUMBLE STRIPS



PROFILE VIEW



PLAN VIEW
OPTION 3

PROFILE CENTERLINE MARKINGS

GENERAL NOTES

1. This standard sheet provides guidelines for installing centerline rumble strips on multilane undivided highways.
2. Centerline and edgeline rumble strips or profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
3. Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
4. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Operations Division.
5. Breaks in milled centerline rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossing, intersections and driveways with high usage of large trucks.
6. Use Standard Sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, pavement markings and profile markings.
7. Consideration should be given to noise levels when centerline rumble strips are installed near residential areas, schools, churches, etc. A minimum of 3/8 inch depth of milled rumble strip may be considered in these areas.
8. Pavement markings must be applied over milled centerline rumble strips for normal centerline spacing. For wider medians, specify in the plans the exact placement of the rumble strips. Place the rumble strips under each centerline marking or centered in the middle of the median.

WHEN INSTALLING CENTERLINE RUMBLE STRIPS:

9. Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per manufacturer's recommendations.
10. When using non-reflective raised traffic buttons as a centerline rumble strip, the button shall be placed adjacent to the pavement marking delineating the centerline. The color of the button should be yellow for a continuous no passing roadway. The button will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.

WHEN INSTALLING EDGELINE RUMBLE STRIPS WITH OR WITHOUT CENTERLINE RUMBLE STRIPS ON UNDIVIDED HIGHWAYS:

11. See standard sheet RS(4).

Texas Department of Transportation®

Traffic Operations Division Standard

CENTERLINE RUMBLE STRIPS ON MULTILANE UNDIVIDED HIGHWAYS

RS(2)-13

FILE: rs(2)-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
	CONT	SECT	JOB	HIGHWAY
REVISIONS				
	DIST	COUNTY		SHEET NO.

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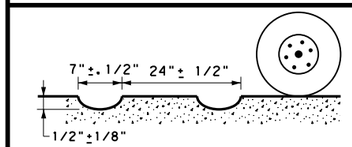
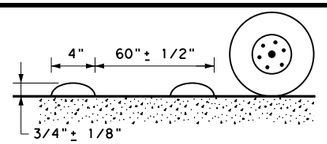
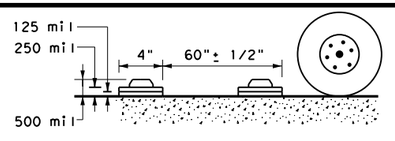
CENTERLINE RUMBLE STRIPS



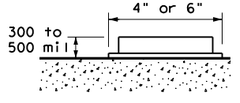
MILLED RUMBLE STRIPS



RAISED TRAFFIC BUTTONS

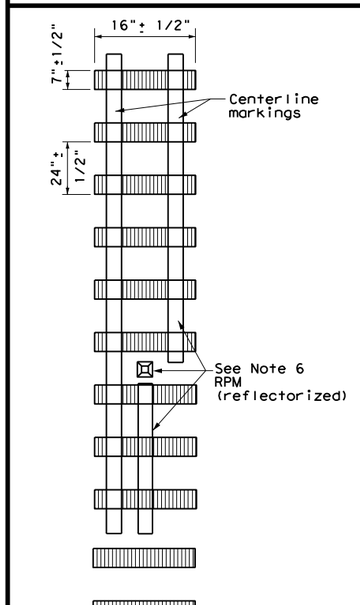


PREFORMED THERMOPLASTIC STRIPS



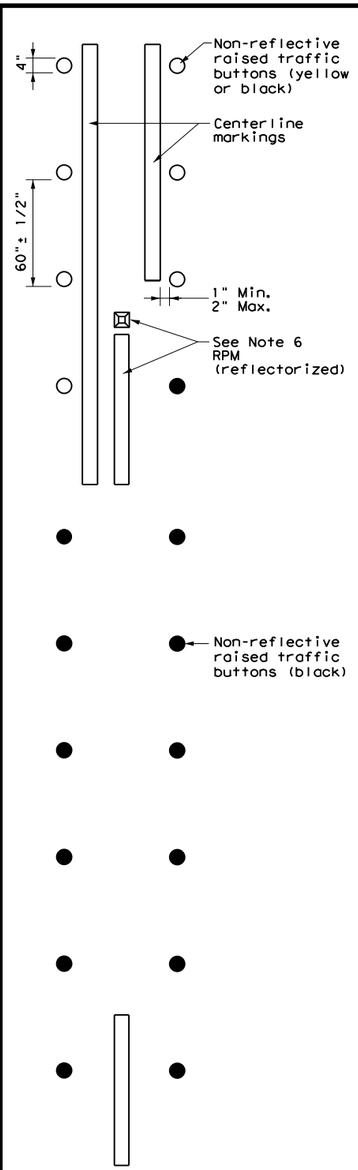
PROFILE MARKINGS

PROFILE VIEW



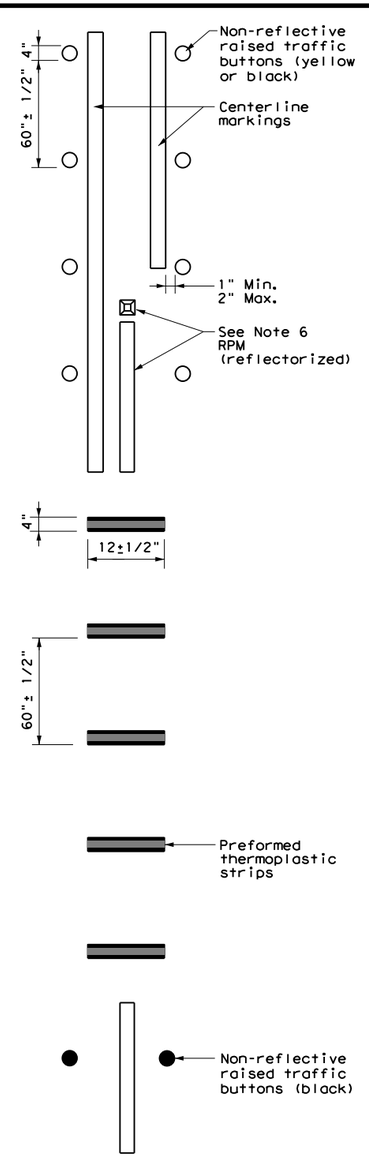
PLAN VIEW
OPTION 1

MILLED CENTERLINE RUMBLE STRIPS



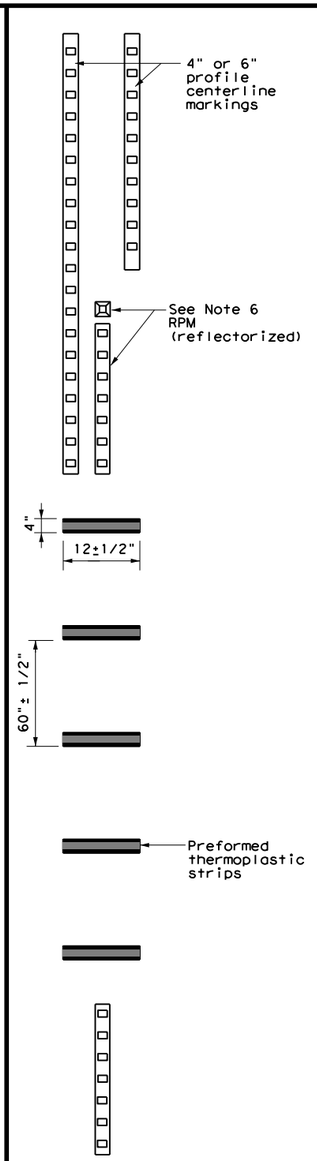
PLAN VIEW
OPTION 2

RAISED CENTERLINE RUMBLE STRIPS



PLAN VIEW
OPTION 3

RAISED CENTERLINE RUMBLE STRIPS AND PREFORMED THERMOPLASTIC STRIPS



PLAN VIEW
OPTION 4

PROFILE CENTERLINE MARKINGS AND PREFORMED THERMOPLASTIC STRIPS

GENERAL NOTES

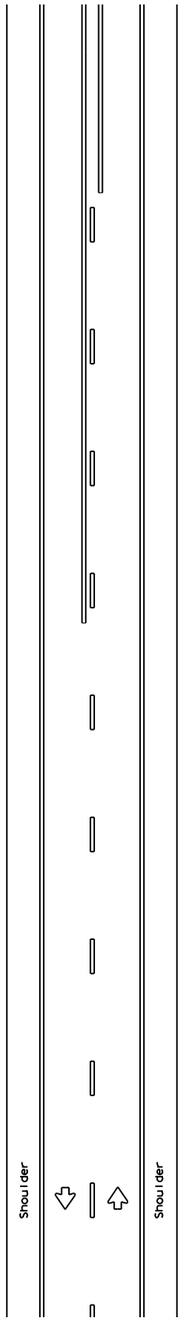
1. This standard sheet provides guidelines for installing centerline rumble strips on two-lane highways with or without shoulders.
2. Centerline and edgeline rumble strips or profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
3. Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
4. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Operations Division.
5. Breaks in milled centerline rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections and driveways with high usage of large trucks.
6. Use Standard Sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, and dimensions pavement markings and profile markings.
7. Consideration should be given to noise levels when centerline rumble strips are installed near residential areas, schools, churches, etc. A minimum of 3/8 inch depth of milled rumble strip may be considered in these areas.
8. Pavement markings must be applied over milled centerline rumble strips.

WHEN INSTALLING CENTERLINE RUMBLE STRIPS:

9. Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per manufacturer's recommendations.
10. When using non-reflective raised traffic buttons as a centerline rumble strip, the button shall be placed adjacent to the pavement marking delineating the centerline. The buttons will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
11. The color of the button should be yellow for a continuous no passing roadway. Black buttons should be used in areas where passing is allowed.

WHEN INSTALLING EDGELINE RUMBLE STRIPS WITH OR WITHOUT CENTERLINE RUMBLE STRIPS ON UNDIVIDED HIGHWAYS:

12. See standard sheet RS(4).



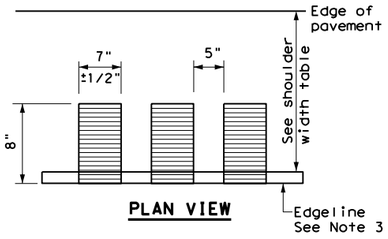
TWO LANE TWO-WAY ROADWAYS

Texas Department of Transportation®
Traffic Operations Division Standard

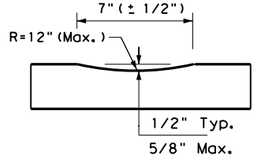
CENTERLINE RUMBLE STRIPS ON TWO LANE TWO-WAY HIGHWAYS

RS(3)-13

FILE: rs(3)-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2013 REVISIONS	CONT	SECT	JOB	HIGHWAY
	DIST	COUNTY		SHEET NO.

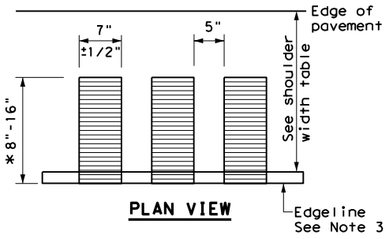


PLAN VIEW

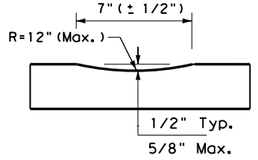


PROFILE VIEW
OPTION 1

CONTINUOUS MILLED DEPRESSIONS
(Rumble Stripes)



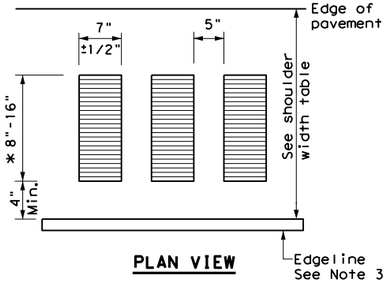
PLAN VIEW



* This distance may vary based on width of shoulder

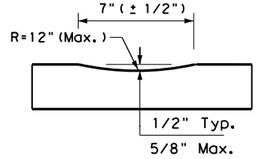
PROFILE VIEW
OPTION 2

CONTINUOUS MILLED DEPRESSIONS
(Rumble Stripes)



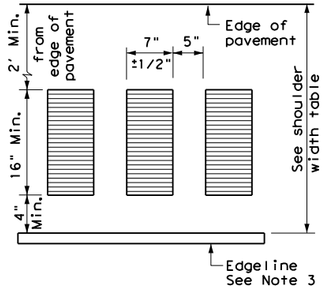
PLAN VIEW

* This distance may vary based on width of shoulder

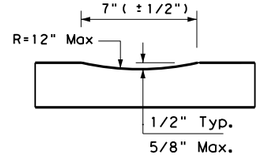


PROFILE VIEW
OPTION 3

CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)

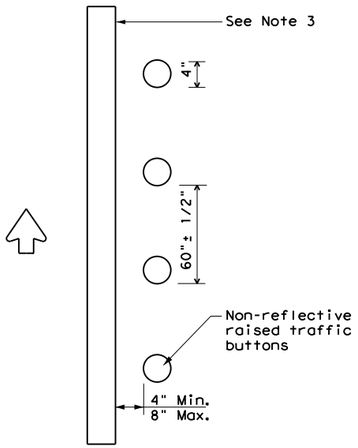


PLAN VIEW



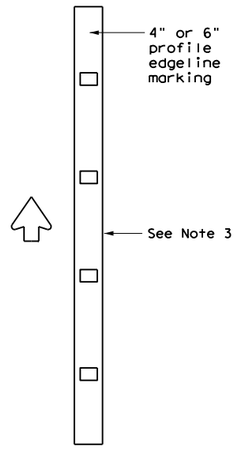
PROFILE VIEW
OPTION 4

CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)



PLAN VIEW
OPTION 5

RAISED EDGELINE RUMBLE STRIPS



PLAN VIEW
OPTION 6

PROFILE EDGELINE MARKINGS

SHOULDER WIDTH TABLE		
EQUAL TO OR LESS THAN 2 FEET	GREATER THAN 2 FEET LESS THAN 4 FEET	EQUAL TO OR GREATER THAN 4 FEET
Option 1, 5 OR 6	Option 1, 2, 3 5 OR 6	Option 2, 4, 5 OR 6

GENERAL NOTES

1. Rumble strips and profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
2. Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
3. Use Standard Sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, pavement markings, and profile markings.
4. See the table below for determining what options may be used for edgeline rumble strips.

WHEN INSTALLING MILLED DEPRESSION EDGELINE RUMBLE STRIPS:

5. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Operations Division.
6. Pavement markings can be applied over milled shoulder rumble strips to create an edgeline rumble stripe.
7. Breaks in edgeline rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections and driveways with high usage of large trucks when installed on conventional highways.
8. Rumble strips shall not be placed across exit or entrance ramps, acceleration and deceleration lanes, crossovers, gore areas or intersections with other roadways.
9. Consideration should be given to noise levels when edgeline rumble strips are installed near residential areas, schools, churches, etc. A minimum of 3/8 inches depth of milled rumble strip may be considered in these areas.
10. On roadways with high bicycle activity, consideration should be given before the installation of edgeline rumble strips. Things to consider include size of rumble strips, rumble strip material and location of rumble strips on the shoulder. If the designer determines that gaps are needed in the rumble strips due to bicycle use of the road, then follow the requirement shown in FHWA Technical Advisory T5040.39, or latest version. A detail of the spacing shall be included in the plans.

WHEN INSTALLING RAISED OR PROFILE EDGELINE RUMBLE STRIPS:

11. Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per the manufacturer's recommendations.
12. Non-reflective traffic buttons shall be placed adjacent to the pavement marking delineating the edgeline when used as a rumble strip. The color of the button should match the color of the adjacent edgeline marking (white or yellow). The buttons will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
13. Non-reflective traffic buttons shall not be placed across exit or entrance ramps, acceleration and deceleration lanes, crossovers, gore areas or intersections with other roadways.
14. Breaks in edgeline rumble strips using raised traffic buttons shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossing, intersections and driveways with high usage of large trucks when installed on conventional highways.
15. The minimum distance between the edgeline and the buttons should be used if the shoulder is less than 8 feet in width.
16. Raised profile thermoplastic markings used as edgelines may substitute for buttons.

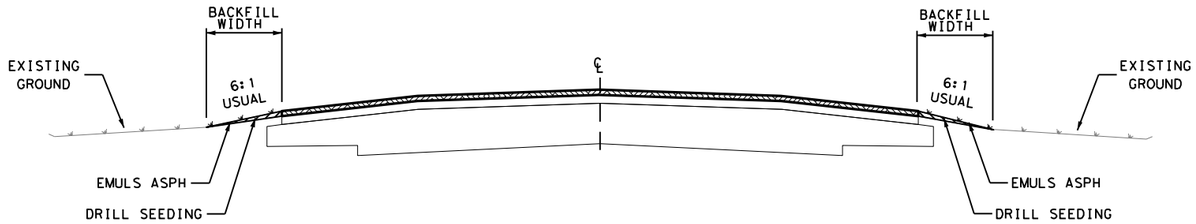
Texas Department of Transportation

Traffic Operations Division Standard

EDGELINE RUMBLE STRIPS ON UNDIVIDED OR TWO LANE HIGHWAYS RS(4)-13

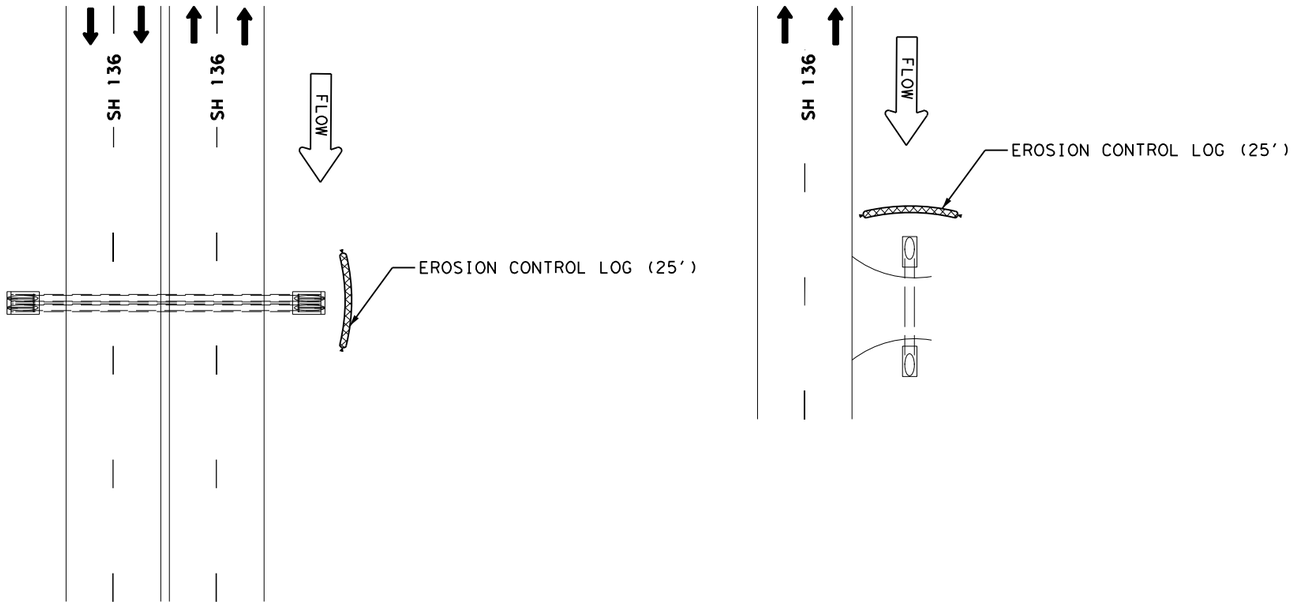
FILE: rs(4)-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2013	CONT	SECT	JOB	HIGHWAY
REVISIONS				
	DIST	COUNTY		SHEET NO.

DATE:
FILE:



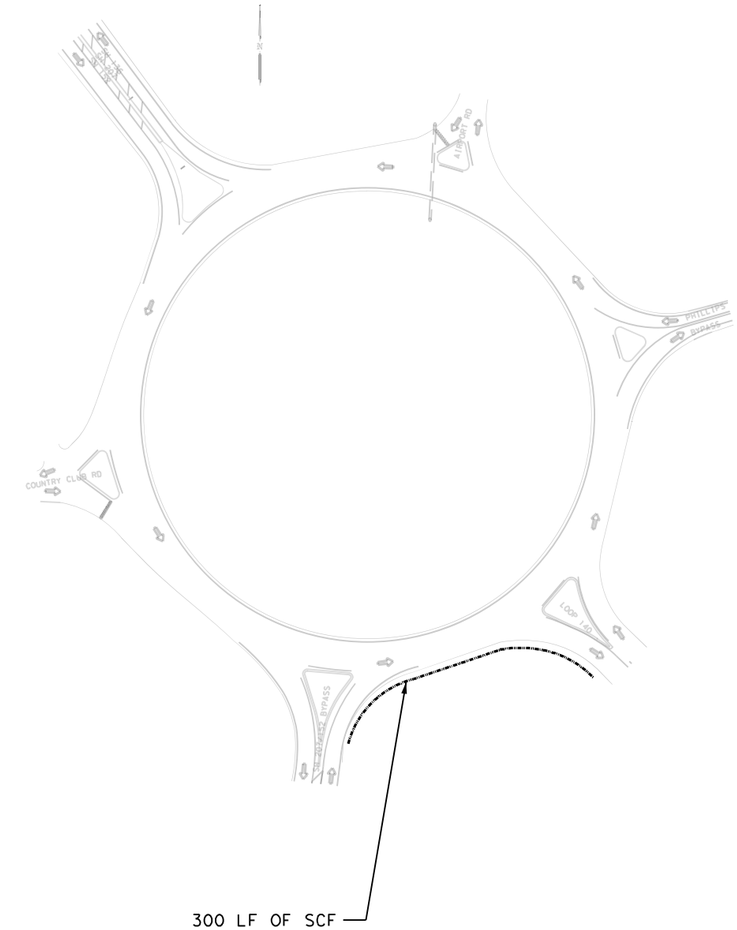
EROSION CONTROL TYPICAL SECTION

147+35 - 232+10
235+95 - 312+40
312+40 - 341+50
340+51 - 354+40
312+40 - 319+89
340+50 - 354+40
354+40 - 644+00



TYPICAL EROSION CONTROL LOG LAYOUT

*APPLIES ONLY TO CULVERT ENDS WHERE WORK IS BEING PERFORMED AND ARE TO BE INSTALLED UPSTREAM



CSJ: 0356-01-107 EROSION CONTROL LAYOUT								
		164	164	314	506	506	506	506
		6034	6053	6009	6038	6039	6040	6043
LOCATION		DRILL SEEDING (PERM) (RURAL) (SANDY)	DRILL SEEDING (TEMP) (WARM OR COOL)	EMULS ASPH(EROSN CONT) (MULTI) (0.1 GAL/SY)	TEMP SEDMT CONT FENCE (INSTALL)	TEMP SEDMT CONT FENCE (REMOVE)	BIODEG EROSN CONTLOGS (INSTL) (8")	BIODEG EROSN CONTLOGS (REMOVE)
		AC	AC	GAL	LF	LF	LF	LF
EROSION CONTOL LAYOUT SHEET 1 OF 2	EROSION CONTROL TYPICAL SECTION	12.1	12.1	5,856				
EROSION CONTOL LAYOUT SHEET 1 OF 2	CULVERTS	5.7	5.7	2,759			1,550	1,550
EROSION CONTOL LAYOUT SHEET 1 OF 2	TRAFFIC CIRCLE				300	300		
EROSION CONTOL LAYOUT SHEET 2 OF 2	REGRADED DITCH WORK	0.3	0.3	145			100	100
	PROJECT SUMMARY:	**18**	**18**	**8,760**	**300**	**300**	**1,650**	**1,650**

QUANTITIES CARRIED TO PROJECT SUMMARY

STATE OF TEXAS
CASEY B. STRIPLING
136887
LICENSED PROFESSIONAL ENGINEER
Casey B. Stripling
11-17-2022

SH 136

EROSION CONTROL LAYOUT

2023 Texas Department of Transportation

SHEET 1 OF 2

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		164

DATE: 11/17/2022 4:30:21 PM
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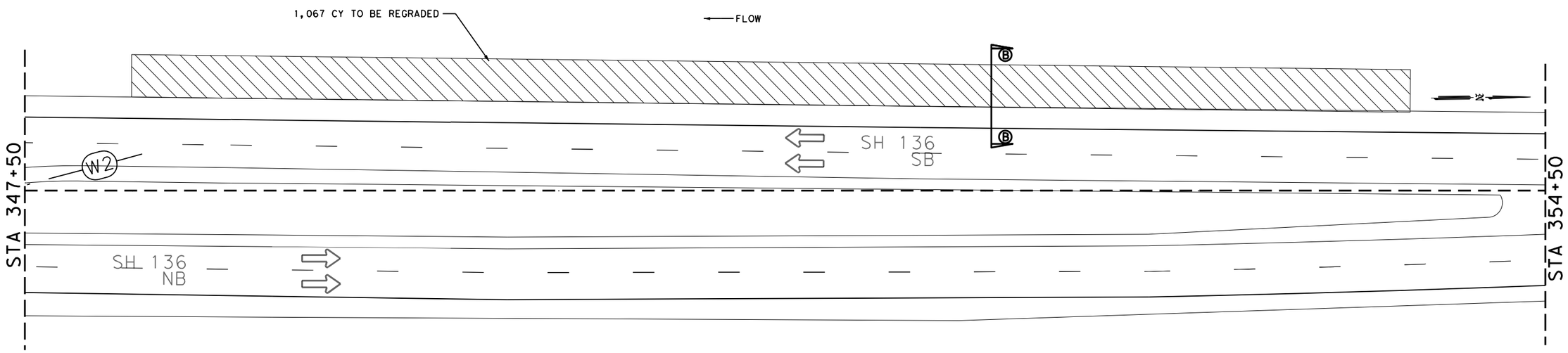

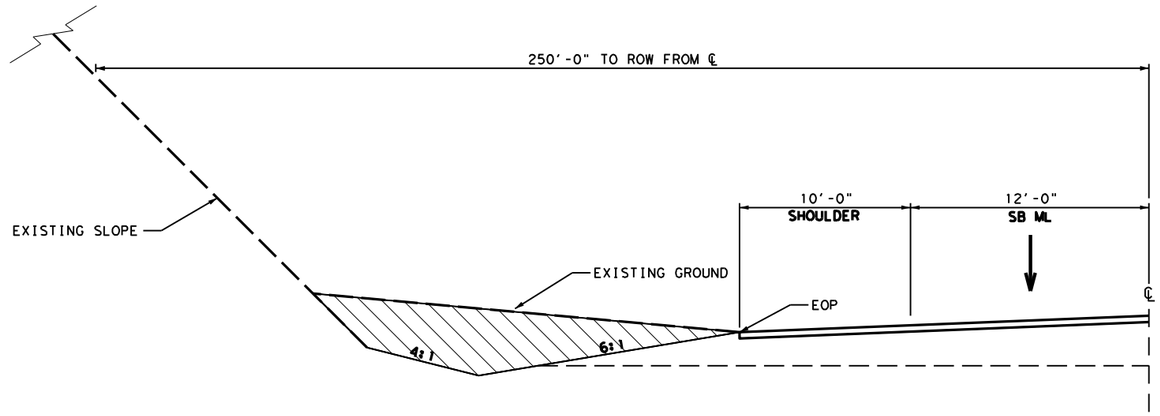

B-B STA 348+00 TO STA 354+00

NTS

CSJ: 0356-01-107 EROSION CONTROL LAYOUT								
LOCATION		110	150	164	164	314	506	506
		6001	6002	6034	6053	6009	6040	6043
		EXCAVATION (ROADWAY)	BLADING	DRILL SEEDING (PERM) (RURAL) (SANDY)	DRILL SEEDING (TEMP) (WARM OR COOL)	EMULS ASPH (EROSN CONT) (MULTI) (0.1 GAL/SY)	BIODEG EROSN CONTLOGS (INSTL) (8")	BIODEG EROSN CONTLOGS (REMOVE)
		CY	HR	AC	AC	GAL	LF	LF
EROSION CONTOL LAYOUT SHEET 2 OF 2	REGRADED DITCH WORK	1067	3	0.3	0.3	145	100	100
	PROJECT SUMMARY:	**1067**	**3**	**0.3**	**0.3**	**145**	**100**	**100**

STATE OF TEXAS
CASEY B. STRIPLING
136887
LICENSED PROFESSIONAL ENGINEER
Casey B. Stripling
11-17-2022

SH 136

EROSION CONTROL LAYOUT

SCALE: 1" = 50'

2023 Texas Department of Transportation

SHEET 2 OF 2

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		165

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SITE DESCRIPTION

PROJECT LIMITS: NORTH BORGER TRAFFIC CIRCLE TO 0.1 MILES SOUTH OF SH 152

PROJECT DESCRIPTION: OVERLAY AND SAFETY TREAT FIXED OBJECTS

MAJOR SOIL DISTURBING ACTIVITIES: SAFETY TREAT CULVERTS & DITCH REGRADING

TOTAL PROJECT AREA: 168 AC

TOTAL AREA TO BE DISTURBED: 6 AC

WEIGHTED RUNOFF COEFFICIENT

(BEFORE CONSTRUCTION): 0.35

(AFTER CONSTRUCTION): 0.35

EXPLANATION OF THE TECHNICAL BASIS USED TO SELECT THE PRACTICES TO CONTROL POLLUTION WHERE FLOWS EXCEED PRE-DEVELOPMENT LEVELS:

EXISTING CONDITION OF SOIL & VEGETATIVE COVER AND % OF EXISTING VEGETATIVE COVER: 70%

NAME OF RECEIVING WATERS: CANADIAN RIVER

EROSION AND SEDIMENT CONTROLS

SOIL STABILIZATION PRACTICES:

X	TEMPORARY SEEDING
X	PERMANENT PLANTING, SODDING, OR SEEDING
	MULCHING
	SOIL RETENTION BLANKET
X	BUFFER ZONES
X	PRESERVATION OF NATURAL RESOURCES

OTHER:

EROSION AND SEDIMENT CONTROLS (CONT.)

STRUCTURAL PRACTICES:

Permanent	Temporary	
	X	SILT FENCES
		HAY BALES
		ROCK BERMS
		DIVERSION, INTERCEPTOR, OR PERIMETER DIKES
		DIVERSION, INTERCEPTOR, OR PERIMETER SWALES
		DIVERSION DIKE AND SWALE COMBINATIONS
		PIPE SLOPE DRAINS
X		PAVED FLUMES
		ROCK BEDDING AT CONSTRUCTION EXIT
		TIMBER MATTING AT CONSTRUCTION EXIT
		CHANNEL LINERS
		SEDIMENT TRAPS
		SEDIMENT BASINS
		STORM INLET SEDIMENT TRAP
		STONE OUTLET STRUCTURES
		CURBS AND GUTTERS
		STORM SEWERS
	X	VELOCITY CONTROL DEVICES
	X	EROSION CONTROL LOGS

OTHER:

NARRATIVE - SEQUENCE OF CONSTRUCTION (STORM WATER MANAGEMENT) ACTIVITIES:

THE ORDER OF ACTIVITIES ARE AS FOLLOWS:

1. INSTALL CONTROL DEVICES AS SHOWN ON PLANS AND DIRECTED BY THE ENGINEER.
2. MAINTAIN AND UPGRADE DEVICES AS NEEDED.
3. WHEN CONSTRUCTION ACTIVITY IS COMPLETED TEMPORARY CONTROLS SHALL BE REMOVED AS APPROVED BY THE ENGINEER.

STORM WATER MANAGEMENT: CARE SHOULD BE TAKEN TO DISTURB AS LITTLE OF THE NATURAL AREA AS POSSIBLE.

STORM WATER DRAINAGE WILL BE PROVIDED BY EXISTING DITCHES AND CULVERTS. STORM WATER SHALL BE FILTERED THROUGH SEDIMENT CONTOL DEVICES BEFORE LEAVING THE PROJECT.

DESCRIPTION OF ANY MEASURES INSTALLED DURING THE CONSTRUCTION PROCESS TO CONTROL STORM WATER DISCHARGES AFTER CONSTRUCTION OPERATIONS HAVE BEEN COMPLETED:

ALL DISTURBED AREAS SHALL BE SEEDED BEFORE CONSTUCTION COMPLETION.

OTHER EROSION AND SEDIMENT CONTROLS:

MAINTENANCE: ALL EROSION AND SEDIMENT CONTROLS WILL BE MAINTAINED IN GOOD WORKING ORDER. IF A REPAIR IS NECESSARY, IT WILL BE DONE AT THE EARLIEST DATE POSSIBLE, BUT NO LATER THAN 7 CALENDAR DAYS AFTER THE SURROUNDING EXPOSED GROUND HAS DRIED SUFFICIENTLY TO PREVENT FURTHER DAMAGE FROM HEAVY EQUIPMENT.

INSPECTION: AN INSPECTION WILL BE PERFORMED BY A TXDOT INSPECTOR OF THE CONSTRUCTION SITE AT LEAST ONCE EVERY 7 CALENDAR DAYS REGARDLESS OF RAINFALL. AN INSPECTION AND MAINTENANCE REPORT WILL BE MADE PER EACH INSPECTION. BASED ON THE INSPECTION RESULTS, THE CONTROLS SHALL BE REVISED PER THE INSPECTION REPORT.

WASTE MATERIALS: ALL WASTE MATERIALS WILL BE COLLECTED AND STORED IN A SECURELY LIDDED METAL DUMPSTER. THE DUMPSTER WILL MEET ALL STATE AND LOCAL CITY SOLID WASTE MANAGEMENT REGULATIONS. ALL TRASH AND CONSTRUCTION DEBRIS FROM THE SITE WILL BE DEPOSITED IN THE DUMPSTER. THE DUMPSTER WILL BE EMPTIED AS NECESSARY OR AS REQUIRED BY LOCAL REGULATION, AND THE TRASH WILL BE HAULED TO A PERMITTED LANDFILL. NO CONSTRUCTION WASTE MATERIAL WILL BE BURIED ON SITE.

HAZARDOUS WASTE (INCLUDING SPILL REPORTING): AT A MINIMUM, ANY PRODUCTS IN THE FOLLOWING CATAGORIES ARE CONSIDERED TO BE HAZARDOUS: PAINTS, ACIDS FOR CLEANING MASONRY SURFACES, CLEANING SOLVENTS, ASPHALT PRODUCTS, CHEMICAL ADDITIVES FOR SOIL STABILIZATION, OR CONCRETE CURING COMPOUNDS AND ADDITIVES. IN THE EVENT OF A SPILL WHICH MAY BE HAZARDOUS, THE SPILL COORDINATOR SHOULD BE CONTACTED IMMEDIATELY AT (806)-356-3299.

SANITARY WASTE: ALL SANITARY WASTE WILL BE COLLECTED FROM THE PORTABLE UNITS AS NECESSARY OR AS REQUIRED BY LOCAL REGULATION BY A LICENSED SANITARY WASTE MANAGEMENT CONTRACTOR.

OFF SITE VEHICLE TRACKING:

	HAUL ROADS DAMPENED FOR DUST CONTROL
	LOADED HAUL TRUCKS TO BE COVERED WITH TARPAULIN
	EXCESS DIRT ON ROAD REMOVED DAILY
	STABILIZED CONSTRUCTION ENTRANCE

OTHER:

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, WATERBODY OR STREAMBED. CONSTRUCTION STAGING AREAS AND VEHICLE MAINTENANCE AREAS 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, FALSEWORK, PILING, DEBRIS OR OTHER OBSTRUCTIONS PLACED DURING CONSTRUCTION OPERATIONS THAT ARE NOT A PART OF THE FINISHED WORK.

STATE OF TEXAS
CASEY B. STRIPLING
136887
LICENSED PROFESSIONAL ENGINEER

Casey B. Stripling

11-17-2022

SH 136

TxDOT STORM WATER POLLUTION PREVENTION PLAN (SW3P)

2023 Texas Department of Transportation

SHEET 1 OF 1

DSN	CK	CONT	SECT	JOB	HIGHWAY
KK	CS	0356	01	107	SH 136
DRWN	CK	DIST	COUNTY		SHEET NO.
KK	CS	AMA	HUTCHINSON CO		166

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DATE: 11/17/2022
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I. STORMWATER POLLUTION PREVENTION-CLEAN WATER ACT SECTION 402

TPDES TXR 150000: Stormwater Discharge Permit or Construction General Permit required for projects with 1 or more acres disturbed soil. Projects with any disturbed soil must protect for erosion and sedimentation in accordance with Item 506.

List MS4 Operator(s) that may receive discharges from this project. They may need to be notified prior to construction activities.

1. City of Amarillo

☐ No Action Required ☒ Required Action

Action No.

1. Comply with Construction General Permit and implement project SW3P's.
2. Post a construction site notice in the project area.
3. Submit an NOI to TCEQ

II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS CLEAN WATER ACT SECTIONS 401 AND 404

USACE Permit required for filling, dredging, excavating or other work in any water bodies, rivers, creeks, streams, wetlands or wet areas.

The Contractor must adhere to all of the terms and conditions associated with the following permit(s):

☐ No Permit Required
☒ Nationwide Permit 14 - PCN not Required (less than 1/10th acre waters or wetlands affected)
☐ Nationwide Permit 14 - PCN Required (1/10 to <1/2 acre, 1/3 in tidal waters)
☐ Individual 404 Permit Required
☐ Other Nationwide Permit Required: NWP# _____

Required Actions: List waters of the US permit applies to, location in project and check Best Management Practices planned to control erosion, sedimentation and post-project TSS.

1. TRIBUTARIES OF COTTONWOOD CREEK
2.
3.
4.

The elevation of the ordinary high water marks of any areas requiring work to be performed in the waters of the US requiring the use of a nationwide permit can be found on the Bridge Layouts.

Best Management Practices:

Erosion	Sedimentation	Post-Construction TSS
☒ Temporary Vegetation	☐ Silt Fence	☒ Vegetative Filter Strips
☐ Blankets/Matting	☐ Rock Berm	☐ Retention/Irrigation Systems
☐ Mulch	☐ Triangular Filter Dike	☐ Extended Detention Basin
☐ Sodding	☐ Sand Bag Berm	☐ Constructed Wetlands
☐ Interceptor Swale	☐ Straw Bale Dike	☐ Wet Basin
☐ Diversion Dike	☐ Brush Berms	☐ Erosion Control Compost
☐ Erosion Control Compost	☐ Erosion Control Compost	☐ Mulch Filter Berm and Socks
☒ Mulch Filter Berm and Socks	☒ Mulch Filter Berm and Socks	☐ Compost Filter Berm and Socks
☐ Compost Filter Berm and Socks	☐ Compost Filter Berm and Socks	☒ Vegetation Lined Ditches
	☐ Stone Outlet Sediment Traps	☐ Sand Filter Systems
	☐ Sediment Basins	☐ Grassy Swales

III. CULTURAL RESOURCES

Refer to TxDOT Standard Specifications in the event historical issues or archeological artifacts are found during construction. Upon discovery of archeological artifacts (bones, burnt rock, flint, pottery, etc.) cease work in the immediate area and contact the Engineer immediately.

☐ No Action Required ☒ Required Action

Action No.

1. In the event that unanticipated archeological deposits are encountered during construction, work in the immediate area will cease and TxDOT archeological staff will be contacted to initiate post-review discovery procedures.

IV. VEGETATION RESOURCES

Preserve native vegetation to the extent practical.
Contractor must adhere to Construction Specification Requirements Specs 162, 164, 192, 193, 506, 730, 751, 752 in order to comply with requirements for invasive species, beneficial landscaping, and tree/brush removal commitments.

☐ No Action Required ☒ Required Action

Action No.

1. Comply with Executive Order 13112 on Invasive Species and the intent of the Executive Order Memorandum on Beneficial Landscapes for re-vegetating the project area. The proposed seed mixture (both grasses and forbs) would be in accordance with Item 164, Seeding for Erosion Control in TxDOT's Standard Specifications for the construction of Highways, Streets, and Bridges.

V. FEDERAL LISTED, PROPOSED THREATENED, ENDANGERED SPECIES, CRITICAL HABITAT, STATE LISTED SPECIES, CANDIDATE SPECIES AND MIGRATORY BIRDS.

☐ No Action Required ☒ Required Action

1. If any species on the Hutchinson County Threatened & Endangered Lists is sighted in the project area during construction, stop construction and notify the Area Engineer.

2. Eastern Spotted Skunk, Swift Fox, Black-tailed Prairie Dog: Contractors will be advised of potential occurrence in the project area, and to avoid harming the species if encountered, and to avoid unnecessary impacts to dens.

3. Texas Horned Lizard, Woodhouse Toad, Slender Glass Lizard, Texas Garter Snake, Western Box Turtle, Prairie Rattlesnake, Western Hognose Snake: Contractors will be advised of potential occurrence in the project area, and to avoid harming the species if encountered. This should include avoiding harvester ant beds in the selection of Project Specific Locations (PSL's). For open trenches and excavated pits, install escape ramps at an angle of less than 45 degrees (1:1) in areas left uncovered. Visually inspect excavation areas for trapped wildlife prior to backfilling.

4. Bird BMP's: a) Do not disturb, destroy, or remove active nests, including ground nesting birds, during the nesting season; b) avoid the removal of unoccupied, inactive nests, as practicable; c) do not collect, capture, relocate, or transport birds, eggs, young, or active nests without a permit.

5. 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, egg in part or in whole, without a Federal permit issued in accordance within the Act's policies and regulations. Migratory birds (swallows) will likely be encountered on-site in the bridge culvert during bridge demolition. Adverse impacts on these protected birds, active nests, eggs, and/or young will be avoided. Swallow nests should be removed before April 1, when they are not occupied and preventative measures would be taken to prevent re-colonization in the bridge culvert prior to and during demolition. If active nests are established with eggs laid, bridge demolition work would not begin until the young have left the nest (August 1").

6. Tree removal should be planned to take place outside the bird nesting season (April 1-Aug 31). If the tree removal occurs between April 1 and August 31, the contractor shall complete a survey of active bird nests and will coordinate with the TxDOT Amarillo District Environmental Coordinator to determine appropriate survey procedures in accordance with TxDOT requirements.

LIST OF ABBREVIATIONS

BMP:	Best Management Practice	SPCC:	Spill Prevention Control and Countermeasure
CGP:	Construction General Permit	SW3P:	Storm Water Pollution Prevention Plan
DSHS:	Texas Department of State Health Services	PCN:	Pre-Construction Notification
FHWA:	Federal Highway Administration	PSL:	Project Specific Location
MOA:	Memorandum of Agreement	TCEQ:	Texas Commission on Environmental Quality
MOU:	Memorandum of Understanding	TPDES:	Texas Pollutant Discharge Elimination System
MS4:	Municipal Separate Stormwater Sewer System	TPWD:	Texas Parks and Wildlife Department
MBTA:	Migratory Bird Treaty Act	TxDOT:	Texas Department of Transportation
NOT:	Notice of Termination	T&E:	Threatened and Endangered Species
NWP:	Nationwide Permit	USACE:	U.S. Army Corps of Engineers
NOI:	Notice of Intent	USFWS:	U.S. Fish and Wildlife Service

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

General (applies to all projects):

Comply with the Hazard Communication Act (the Act) for personnel who will be working with hazardous materials by conducting safety meetings prior to beginning construction and making workers aware of potential hazards in the workplace. Ensure that all workers are provided with personal protective equipment appropriate for any hazardous materials used.

Obtain and keep on-site Material Safety Data Sheets (MSDS) for all hazardous products used on the project, which may include, but are not limited to the following categories: Paints, acids, solvents, asphalt products, chemical additives, fuels and concrete curing compounds or additives. Provide protected storage, off bare ground and covered, for products which may be hazardous. Maintain product labelling as required by the Act.

Maintain an adequate supply of on-site spill response materials, as indicated in the MSDS. In the event of a spill, take actions to mitigate the spill as indicated in the MSDS, in accordance with safe work practices, and contact the District Spill Coordinator immediately. The Contractor shall be responsible for the proper containment and cleanup of all product spills.

Contact the Engineer if any of the following are detected:

* Dead or distressed vegetation (not identified as normal)
* Trash piles, drums, canister, barrels, etc.
* Undesirable smells or odors
* Evidence of leaching or seepage of substances

Does the project involve any bridge class structure rehabilitation or replacements (bridge class structures not including box culverts)?

☐ Yes ☒ No

If "No", then no further action is required.
If "Yes", then TxDOT is responsible for completing asbestos assessment/inspection.

Are the results of the asbestos inspection positive (is asbestos present)?

☐ Yes ☒ No

If "Yes", then TxDOT must retain a DSHS licensed asbestos consultant to assist with the notification, develop abatement/mitigation procedures, and perform management activities as necessary. The notification form to DSHS must be postmarked at least 15 working days prior to scheduled demolition.

If "No", then TxDOT is still required to notify DSHS 15 working days prior to any scheduled demolition.

In either case, the Contractor is responsible for providing the date(s) for abatement activities and/or demolition with careful coordination between the Engineer and asbestos consultant in order to minimize construction delays and subsequent claims.

Any other evidence indicating possible hazardous materials or contamination discovered on site. Hazardous Materials or Contamination Issues Specific to this Project:

☒ No Action Required ☐ Required Action

Action No.

VII. OTHER ENVIRONMENTAL ISSUES

(includes regional issues such as Edwards Aquifer District, etc.)

☐ No Action Required ☒ Required Action

Action No.

1. Avoid direct impacts to intermittent and perennial streams within the ROW during construction including selection of and access to project specific locations (PSLs). Ensure sediment and erosion control BMPs are installed as needed near these streams to prevent sediment loading from nearby construction erosion.

2. Erect 300 feet of Sediment Control Fence (SCF) in TxDOT ROW on the SE side of the traffic circle between SH 136 (N Cedar Street) and North Main Street to discourage black-tailed prairie dogs in the adjacent Grace Meredith Park from moving into the work zone when the overlay work on the traffic circle is taking place. See General Notes and plan sheet 'I' for more specific information on SCF location.

Texas Department of Transportation — Design Division Standard

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS
EPIC

FILE: epic.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT: February 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	0356	01	107	SH 136
12-12-2011 IDS 05-07-14 ADDED NOTE SECTION IV. 01-23-2015 SECTION I CHANGED ITEM 1122 TO ITEM 506, ADDED GRASSY SWALES.	DIST	COUNTY		SHEET NO.
	AMA	HUTCHINSON CO		167

DATE: 11/17/2022
FILE: T:\AMATPD\Construction Projects\0356-01\107 PM Overlay\4 - Design\Plan Set\9. Environmental\VEGETATION SPECIFICATION SHEET.dgn

ITEM 164 SEEDING FOR EROSION CONTROL

SEED (PERM) (RURAL or URBAN) (SAND or CLAY)

"WARM SEASON" PLANTING DATES	SEED MIXTURE	PURE LIVE SEED RATE & PLANT DEPTH
PERMANENT: EARLY SPRING SEED FROM FEBRUARY 15th THROUGH May 15th. AS AREAS OF THE ROW ARE PREPARED AND DETERMINED READY FOR DRILL SEEDING.	NEW CROP SEED: TYPE: BUFFALO GRASS (Texoka) "Fluffy" WESTERN WHEATGRASS (ARRIBA) "Hard" BERMUDA GRASS (BLACK JACK) "Hard Tiny Seed" 100% "Unhulled"	 3.0 LBS PLS / ACRE 6.0 LBS PLS / ACRE 5.0 LBS PLS / ACRE @ 1/4"-1/2" SOIL DEPTH
PERMANENT and TEMP. LATE SPRING SEED FROM MAY 15th THROUGH AUGUST 1st AS AREAS OF THE ROW THAT ARE LAID BY BUT DETERMINED TO BE OUT OF SEASON FOR PERMANENT DRILL SEEDING.	TYPE: MILLET (BROWN TOP) "Hard Shell, "Small Seed" - Nurse crop BERMUDA GRASS (BLACK JACK) "Hard Tiny Seed" 100% "Unhulled"	30. LBS PLS / ACRE @ 1/4" SOIL DEPTH 5.0 LBS PLS / ACRE
SOIL PREPARATION EQUIPMENT AND PRACTICES: RIPPER --- DISK --- HARROW --- CULTI-PACKER.		

NOTES:

1. ALL SEED MIXTURE TYPES SHALL BE PURCHASED IN PRE- MIXED BAGS, "BY TYPE" BLENDED BY THE GROWER SHIPPER.
2. SOILS THAT ARE COMPACTED, HAVE CLODS, SHALL BE REWORKED UNTIL READY FOR SEEDING. AS DIRECTED.
3. ALL SOIL SURFACES SHALL BE LEVEL WITH NATURAL FLOWING SMOOTH GRADES. NO TIRE RUTS OR FURTHER TRAFFIC ALLOWED.
4. SOIL SURFACE SHALL BE FIRM BUT NOT COMPACTED, ALLOWING 1/4" DEPRESSION UNDER NORMAL FOOT TRAFFIC.
5. SEED 100% OF THE BED AREA. NO SKIPS OR VOID AREAS ALLOWED. EXAMPLE: AREAS AROUND SIGN POSTS AND INLETS.
6. SEED UP TO THE FIRST 6" OF THE EDGE OF PAVEMENT. AS DIRECTED, HAND RAKE ISOLATED SEEDED AREAS.
7. WEIGH ALL CALIBRATED SEED SAMPLES FOR ACCURACY AND PRESENT DOCUMENTATION TO ENGINEER.

FOR DRILL SEEDING

1. USE ONLY PROFESSIONAL NATIVE GRASS OR TURF GRASS (MULTI- 3 BIN) DRILL SEEDERS.
2. CALIBRATE DRILL SEEDER FOR SPECIFIED (PLS) PER ACRE BEFORE DRILL SEEDING.
3. DRILL SEEDER MUST BE EQUIPPED WITH THE LARGE FRONT CUTTING COULTERS DURING THE INSPECTION OF DRILL SEEDER.

FOR BROADCAST SEEDING

1. USE ONLY COMMERCIAL TYPE CYCLONE TYPE SPREADERS.
2. CALIBRATE CYCLONE SPREADER FOR 1000 Sq. Ft. (PLS) PER ACRE BEFORE SEEDING.
3. TO PREVENT SEED SEPARATION IN SPREADERS, SPREAD ALL SEED TYPES INDEPENDENTLY IN A SEPARATE APPLICATION.
4. IMMEDIATELY AFTER SEEDING, IN ONE OR TWO OPERATIONS, CULTI-PACK THE SEEDED SOILS AND FIRM SEED INTO SURFACE.
5. DISCONTINUE SEEDING IF WIND EXCEEDS 10 MPH.

ITEM 164 SEEDING FOR EROSION CONTROL

SEED (TEMPORARY) COOL SEASON SEEDING

"COOL SEASON" PLANTING DATES	SEED MIXTURE	PURE LIVE SEED RATE & PLANT DEPTH
TEMPORARY: EARLY FALL SEED FROM AUGUST 1st THROUGH DECEMBER 1st. AS AREAS OF THE ROW ARE PREPARED AND DETERMINED READY FOR DRILL SEEDING.	NEW CROP SEED: TYPE: WESTERN WHEATGRASS "Hard Shell" RED WINTER WHEAT, VAR: TAM III "Hard Shell"	6.0 LBS PLS / ACRE 34. LBS PLS / ACRE @ 1" SOIL DEPTH
TEMPORARY: LATE FALL SEED FROM DECEMBER 1st THROUGH DECEMBER 31ST. AS AREAS OF THE ROW ARE PREPARED AND DETERMINED READY FOR DRILL SEEDING.	NEW CROP SEED: TYPE: RED WINTER WHEAT, VAR: TAM III "Hard Shell"	34. LBS ACRE / PLS @ 1" SOIL DEPTH
SOIL PREPARATION EQUIPMENT AND PRACTICES: RIPPER --- DISK --- HARROW --- CULTI-PACKER.		

ITEM 314 EMULSIFIED ASPHALT TREATMENT

TIME SCHEDULE:

IMMEDIATELY AFTER SOIL PREPARATION OR WITHIN 24 HOURS AFTER SEEDING, APPLY THE TACK COAT TO DESIGNATED SOIL SURFACES.

FUNCTIONAL USE:
SOIL EROSION CONTROL, OR MOISTURE RETENTION BARRIER.

NOTES:

1. ALL TRUCK APPLICATIONS SHALL BE COMPLETED IN ONE PASS OF THE DISTRIBUTOR. ALL TOUCH UP WORK WILL BE FINISHED BY HAND AND HOSE PROCEDURES. APPLY FROM EDGE OF PAVEMENT THROUGH THE FULL SPECIFIED AREAS.
2. ENGINEER WILL INSPECT FOR ACCURACY THE OVERALL DEPTH OF THE APPLIED TACK COAT MATERIALS.
3. FURTHER VEHICULAR TRAFFIC IS NOT ALLOWED ON LAID BY TACK COAT SURFACES. AT THE CONTRACTORS EXPENSE ALL DAMAGES TO TACK COAT SURFACES WILL BE RE -SHOT AS DIRECTED BY THE ENGINEER.

ITEM 166 FERTILIZER

TIME SCHEDULE:

AFTER TOPSOIL PLOWING PEPARATIONS ARE COMPLETED, FERTILIZE R.O.W. SOIL SURFACES AND HARROW 2" TO 4" DEEP INTO PLACE.

FUNCTIONAL USE:
PLANT NUTRIENTS FOR PLANT AND ROOT DEVELOPMENT.

FERTILIZER SHALL BE EVENLY DISTRIBUTED AT A RATE OF 28 LBS OF NITROGEN PER ACRE.
THE BREAK DOWN OF THE NITROGEN ELEMENT SHALL BE IN A 50% SLOW RELEASE FORM.
ANALYSIS OF THE (NPK) IS: 1-5-0 A HIGH PHOSPHATE BLEND.
AS DIRECTED BY THE VEGETATION MANAGER.

ITEM 166 NOTES:

1. BROADCAST SPECIFIED FERTILIZER FROM THE EDGE OF PAVEMENT, THROUGH THE ENTIRE ROW SEED BED AREA. APPLICATIONS FOR EDGE OF PAVEMENT, CULVERTS, SIGN POST AREAS, GUARD RAILS AND ISOLATED AREAS SHALL BE APPLIED BY WALK BEHIND SPREADERS AND BY HAND. NO FERTILIZER ALLOWED ON PAVEMENT SURFACES.
2. ALL SPREADERS SHALL BE CALIBRATED BY THE CONTRACTOR AND THE ENGINEER FOR ACCURACY AND PERFORMANCE. SHALL USE UNOPENED 50# BAGS OF SPECIFIED FERTILIZER FOR DAILY CALIBRATIONS. APPLICATION SHALL BE AN EVEN DISTRIBUTION OF PRODUCT ON DESIGNATED SOIL SURFACES.
3. FERTILIZER SHALL BE DELIVERED IN 50# BAGS UNLESS OTHERWISE SPECIFIED OR APPROVED PRIOR TO DELIVERY. BAGS SHALL BE CLEARLY LABELED SHOWING CONTENTS. IF BULK FERTILIZER IS APPROVED, DOCUMENTATION WILL BE REQUIRED FOR EACH LOAD OF MATERIAL DELIVERED VERIFYING AUTHENTICITY OF THE MATERIAL. CULTURAL PROCEDURES ARE UNDER THE DIRECTION OF THE TXDOT VEGETATION MANAGER.

STATE OF TEXAS
CASEY B. STRIPLING
136887
LICENSED PROFESSIONAL ENGINEER

Casey B. Stripling

11-17-2022

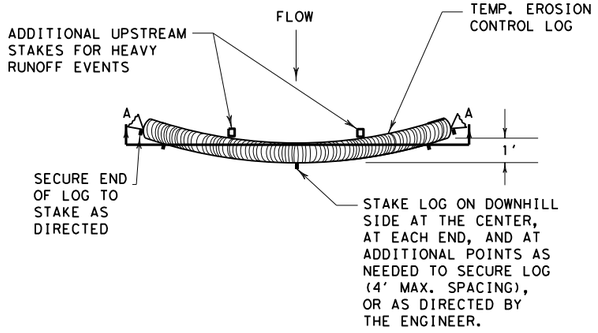
Texas Department of Transportation

AMARILLO DISTRICT STANDARD

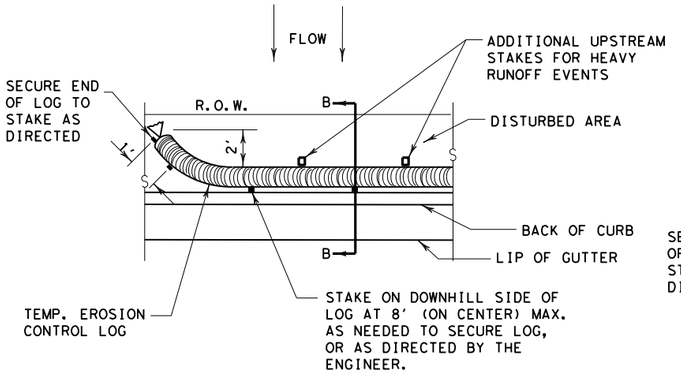
VEGETATION SPECIFICATION SHEET

FEDERAL AID PROJECT	DN: ADD	CK: ADD	DW: ADD	CK: ADD
See Title Sheet	CONT	SECT	JOB	HIGHWAY
REVISIONS	0356	01	107	SH 136
03/27/20	DIST	COUNTY		SHEET NO.
	AMA	HUTCHINSON CO		168

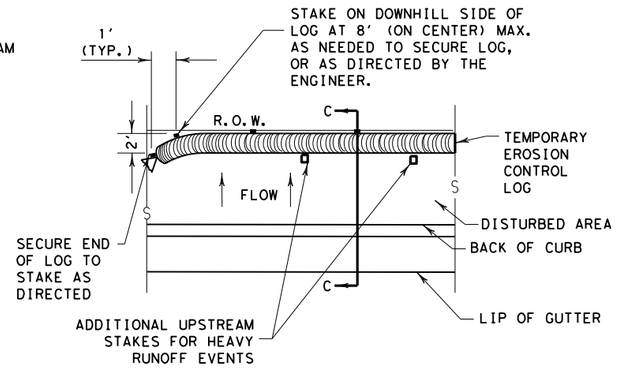
DATE: 11/17/2022
FILE: T:\AMA\TPD\Construction Projects\0356-01-107 PM Overlay\4 - Design\Plan Set\9. Environmental\standards\EC(9)-16.dgn



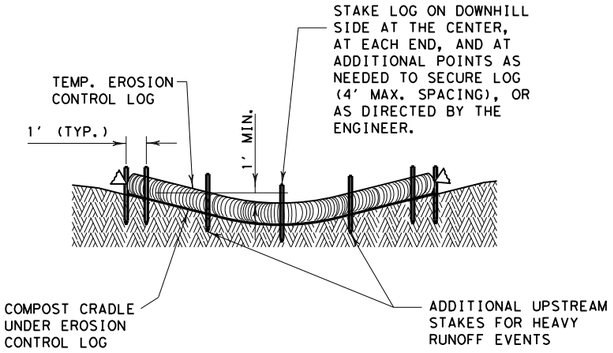
PLAN VIEW



PLAN VIEW



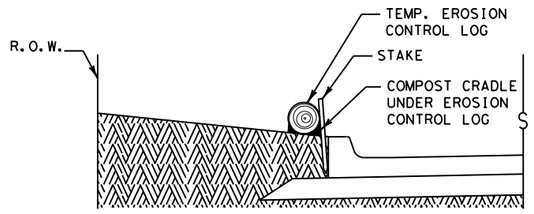
PLAN VIEW



SECTION A-A

EROSION CONTROL LOG DAM

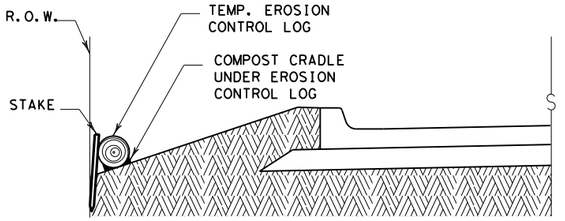
CL-D



SECTION B-B

EROSION CONTROL LOG AT BACK OF CURB

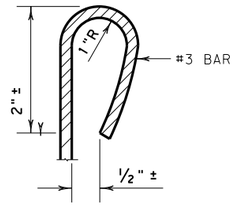
CL-BOC



SECTION C-C

EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY

CL-ROW



REBAR STAKE DETAIL

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

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.

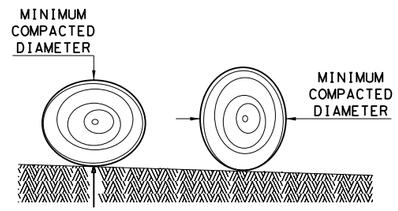
Log Traps: The drainage area for a sediment trap should not exceed 5 acres. The trap capacity should be 1800 CF/Acre (0.5" over the drainage area).

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
REVISIONS	0356	01	107	SH 136
	DIST	COUNTY		SHEET NO.
	AMA	HUTCHINSON CO		169

DATE: 11/17/2022
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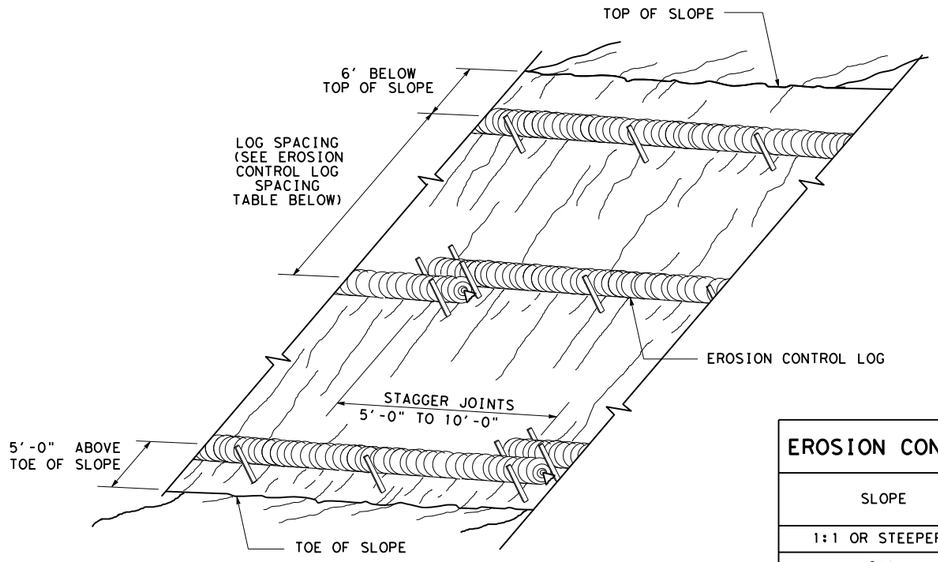
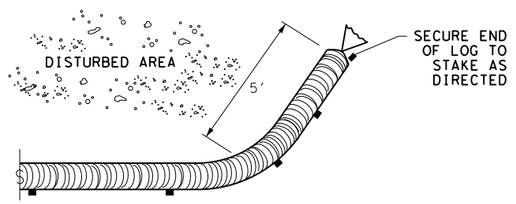


EROSION CONTROL LOGS ON SLOPES
STAKE AND TRENCHING ANCHORING

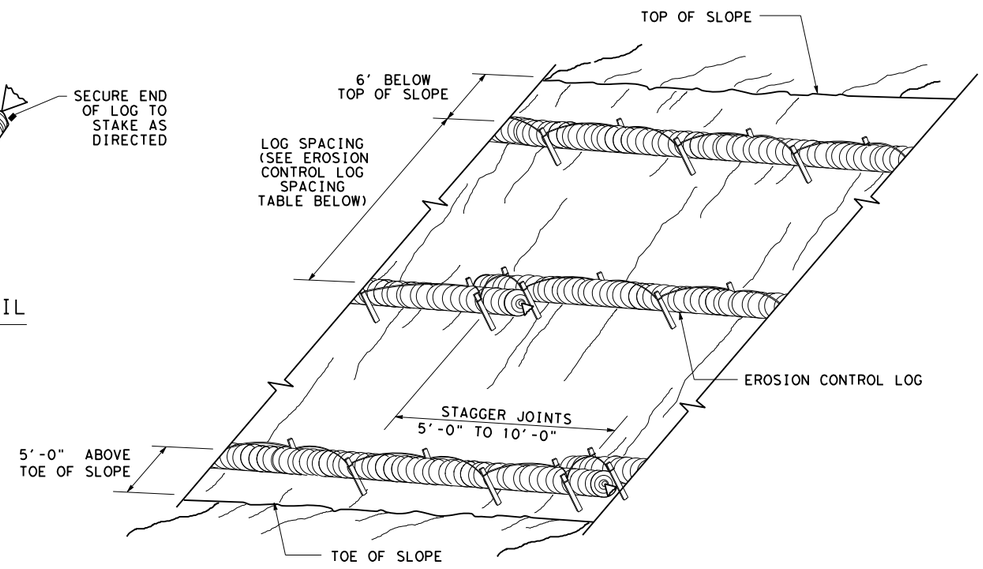
CL-SST



END SECTION RAP DETAIL

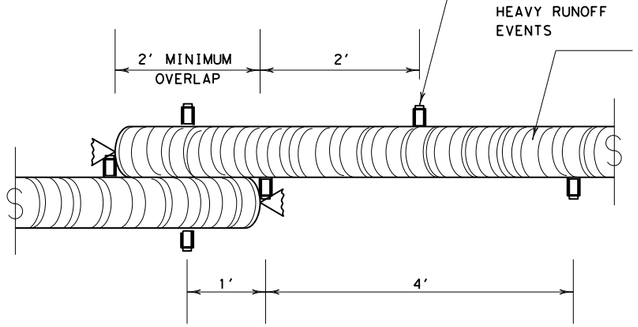
EROSION CONTROL LOG SPACING TABLE				
SLOPE	LOG DIAMETER			
	6"	8"	12"	18"
1:1 OR STEEPER	5'	10'	15'	20'
2:1	10'	20'	30'	40'
3:1	15'	30'	45'	60'
4:1 OR FLATTER	20'	40'	60'	80'

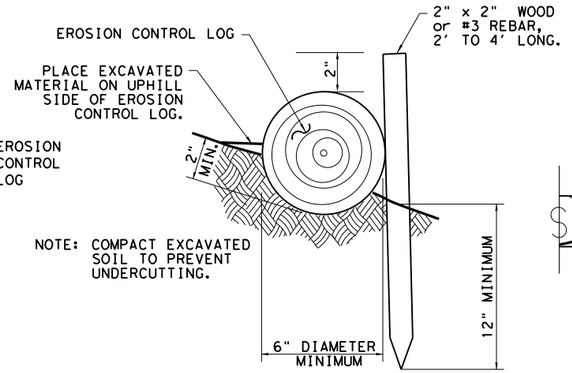
* ADJUSTMENTS CAN BE MADE FOR SOIL TYPE:
SOFT, LOAMY SOILS-ADJUST ROWS CLOSER TOGETHER;
HARD, ROCKY SOILS- ADJUST ROWS FARTHER APART



EROSION CONTROL LOGS ON SLOPES
STAKE AND LASHING ANCHORING

CL-SSL

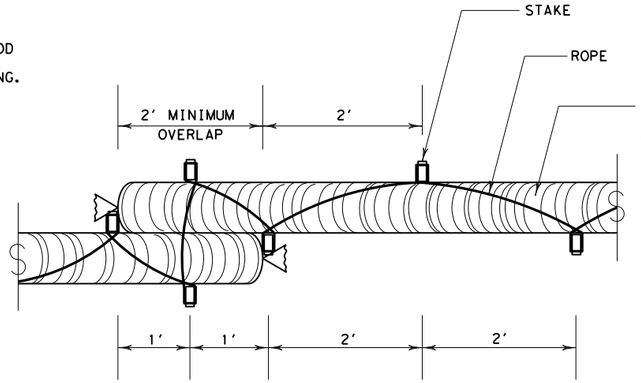


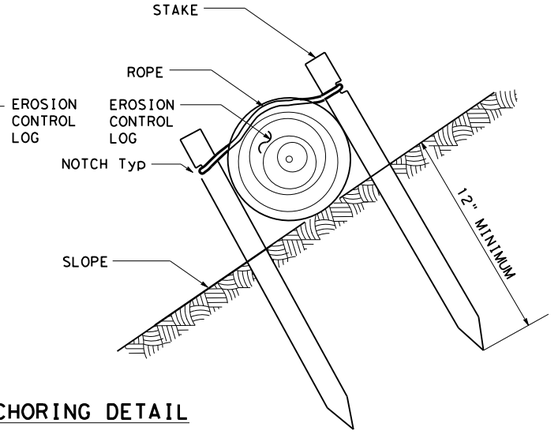


STAKE AND TRENCHING ANCHORING DETAIL

CL-SST

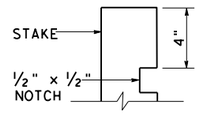
TRENCH DEPTH TABLE	
LOG DIAMETER	DEPTH
6"	2"
8"	3"
12"	4"
18"	5"





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		
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY		
REVISIONS	0356	01	107	SH 136		
	DIST	COUNTY		SHEET NO.		
	AMA	HUTCHINSON CO		170		

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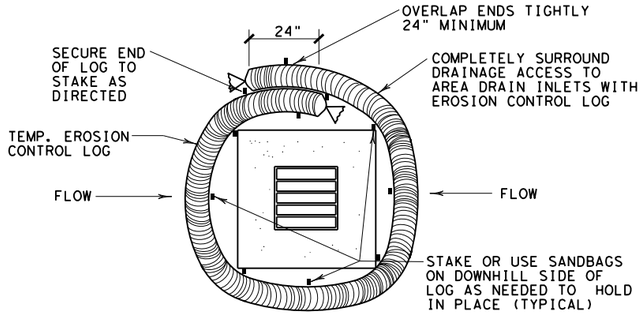
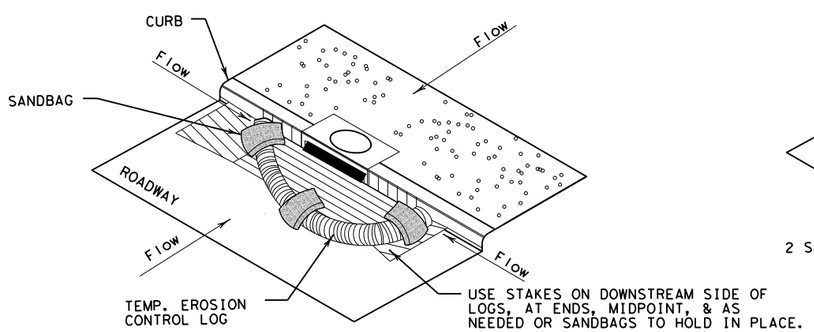


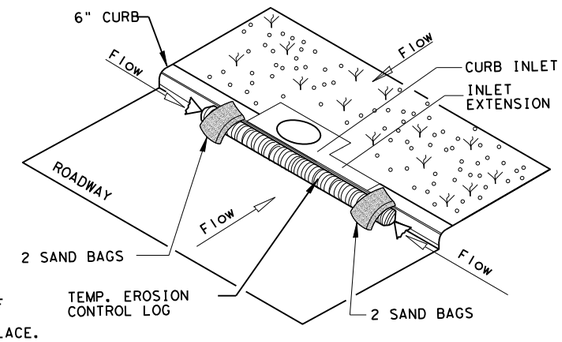
EROSION CONTROL LOG AT DROP INLET

CL-DI



EROSION CONTROL LOG AT CURB INLET

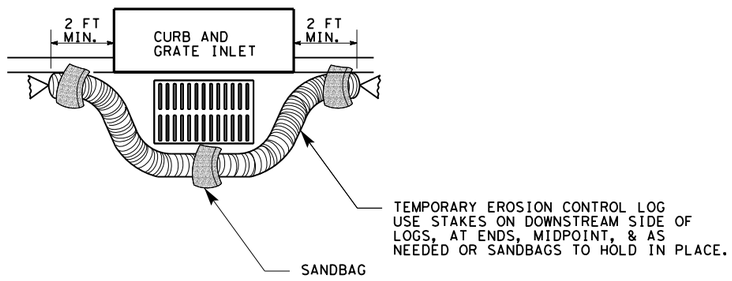
CL-CI



EROSION CONTROL LOG AT CURB INLET

CL-CI

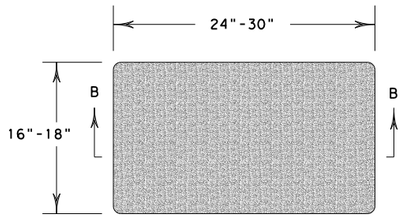
NOTE:
EROSION CONTROL LOGS USED AT CURB INLETS SHOULD ONLY BE USED IF THEY WILL NOT IMPEDE TRAFFIC OR FLOOD THE ROADWAY OR WHEN THE STORM SEWER SYSTEM IS NOT FULLY FUNCTIONAL.



EROSION CONTROL LOG AT CURB & GRADE INLET

CL-GI

SECTION B-B



SANDBAG DETAIL

SHEET 3 OF 3

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	0356	01	107		SH 136	
	DIST	COUNTY				SHEET NO.
	AMA	HUTCHINSON CO				171